Back

Advantys STB Hardware Components Reference Guide

890 USE 172 00

5/2005

31002952.03

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Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book

At a Glance

Document Scope

This document describes the physical and functional characteristics of the I/O modules, power distribution modules, island bus extension modules, and module accessories in the Advantys STB family of products.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Revision History

Rev. No.	Changes
1	Initial version.
2	Contains release 2B module descriptions and closes IPRs and other release note issues
3	contains basic I/O modules and IPR fixes
4	for Aux P/S December 2004
5	Alfa launch, May 2005

Related Documents

Title of Documentation	Reference Number
Advantys STB System Planning and Installation Guide	890 USE 171 00
Advantys STB Standard Profibus DP Network Interface Applications Guide	890 USE 173 00
Advantys STB Basic Profibus DP Network Interface Applications Guide	890 USE 192 00
Advantys STB Standard INTERBUS Network Interface Applications Guide	890 USE 174 00
Advantys STB Basic INTERBUS Network Interface Applications Guide	890 USE 196 00
Advantys STB Standard DeviceNet Network Interface Applications Guide	890 USE 175 00
Advantys STB Basic DeviceNet Network Interface Applications Guide	890 USE 194 00
Advantys STB Standard CANopen Network Interface Applications Guide	890 USE 176 00
Advantys STB Basic CANopen Network Interface Applications Guide	890 USE 193 00
Advantys STB Economy CANopen Network Interface Applications Guide	890 USE 187 00
Advantys STB Standard Ethernet Modbus TCP/IP Network Interface Applications Guide	890 USE 177 00
Advantys STB Basic Ethernet Modbus TCP/IP Network Interface Applications Guide	890 USE 197 00
Advantys STB Standard Modbus Plus Network Interface Applications Guide	890 USE 178 00
Advantys STB Standard Fipio Network Interface Applications Guide	890 USE 179 00
Advantys STB Configuration Software Quick Start User Guide	890 USE 180 00

Product Related Warnings

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

The Advantys STB Architecture: Theory of Operation

1

At a Glance

Overview

This chapter provides an overview of the Advantys STB system. It provides you with context for understanding the functional capabilities of an island and how its various hardware components interoperate with one other.

What's in this Chapter?

This chapter contains the following topics:

Advantys STB Islands of Automation

System Definition

Advantys STB is an open, modular distributed I/O system designed for the machine industry, with a migration path to the process industry. Modular I/O, power distribution modules (PDMs) and a network interface module (NIM) reside in a structure called an *island*. The island functions as a node on a fieldbus control network and is managed by an upstream fieldbus master controller.

Open Fieldbus Choices

An island of Advantys STB modules can function on a variety of different open industry-standard fieldbus networks. Among these are:

- Profibus DP
- DeviceNet
- Ethernet
- CANopen
- Fipio
- Modbus Plus
- INTERBUS

A NIM resides in the first position on the island bus (leftmost on the physical setup). It acts as the gateway between the island and the fieldbus, facilitating data exchange between the fieldbus master and the I/O modules on the island. It is the only module on the island that is fieldbus-dependent—a different type of NIM module is available for each fieldbus. The rest of the I/O and power distribution modules on the island bus function exactly the same, regardless of the fieldbus on which the island resides. You have the advantage of being able to select the I/O modules to build an island independent of the fieldbus on which it will operate.

Granularity

Advantys STB I/O modules are designed to be small, economical devices that provide you with just enough input and output channels to satisfy your application needs. Specific types of I/O modules are available with two or more channels. You can select exactly the amount of I/O you need and you do not have to pay for channels that you don't need.

Mechatronics

An Advantys STB system lets you place the control electronics in the I/O modules as close as possible to the mechanical devices they are controlling. This concept is known as *mechatronics*.

Depending on the type of NIM you use, an Advantys STB island bus may be extended to multiple segments of I/O on one or more DIN rails. Island bus extensions allow you to position the I/O as close as possible to the sensors and actuators they control. Using special extension cables and modules, an island bus may be stretched to distances up to 15 m (49.21 ft).

Types of Modules on an Advantys STB Island

Summary

Your island's performance is determined by the type of NIM that you use. NIMs for various field buses are available in different model numbers at different price points and with scalable operating capabilities. Standard NIMs, for example, can support up to 32 I/O modules in multiple (extension) segments. Low-cost basic NIMs, on the other hand, are limited to 16 I/O modules in a single segment.

If you are using a basic NIM, you may use only Advantys STB I/O modules on the island bus. With a standard NIM, you may use:

- Advantys STB I/O modules
- optional preferred modules
- optional standard CANopen devices

Advantys STB Modules

The core set of Advantys STB modules comprises:

- a set of analog, digital and special I/O modules
- open fieldbus NIMs
- power distribution modules (PDMs)
- island bus extension modules
- special modules

These core modules are designed to specific Advantys STB form factors and fit on base units on the island bus. They take full advantage of the island's communication and power distribution capabilities, and they are auto-addressable.

Preferred Modules

A *preferred module* is a device from another Schneider catalog, or potentially from a third-party developer, that fully complies with the Advantys STB island bus protocol. Preferred modules are developed and qualified under agreement with Schneider; they conform fully to Advantys STB standards and are auto-addressable.

For the most part, the island bus handles a preferred module as it does standard Advantys STB I/O module, with four key differences:

- A preferred module is not designed in the standard form factor of an Advantys STB module and does not fit into one of the standard base units. It therefore does not reside in an Advantys STB segment.
- A preferred module requires its own power supply. It does not get logic power from the island bus.
- To place preferred modules in you island, you must use the Advantys configuration software.
- You cannot use preferred modules with a basic NIM.

Preferred modules can be placed between segments of STB I/O or at the end of the island. If a preferred module is the last module on the island bus, it must be terminated with a 120 Ω terminator resistor.

Standard CANopen Devices

An Advantys STB island can support standard off-the-shelf CANopen devices. These devices are not auto-addressable on the island bus, and therefore they must be manually addressed, usually with physical switches built into the devices. They are configured using the Advantys configuration software. You cannot use a standard CANopen device with a basic NIM.

When standard CANopen devices are used, they must be installed at the end of the island. 120 Ω termination must be provided both at the end of the last Advantys STB segment and at the last standard CANopen device.

Island Segments

Summary

An Advantys STB system starts with a group of interconnected devices called the *primary segment*. This first segment is a mandatory piece of an island. Depending on your needs and on the type of NIM you are using (See p. *19*), the island may optionally be expanded to additional segments of Advantys STB modules, called *extension segments* and to non-STB devices such as preferred modules and/or standard CANopen devices.

The Primary Segment

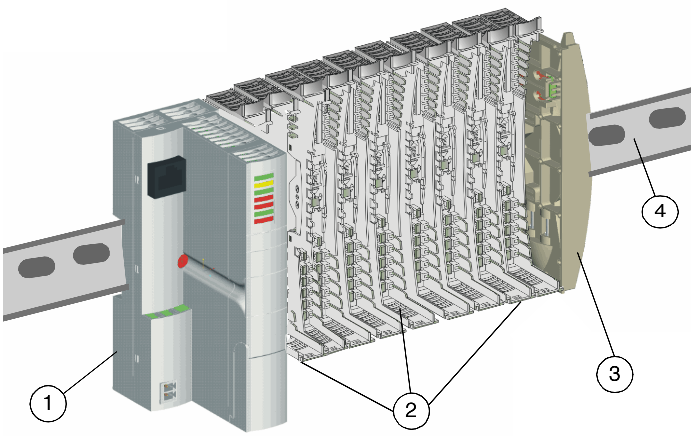
Every island bus begins with a primary segment. The primary segment consists of the island's NIM and a set of interconnected module bases attached to a DIN rail. The PDMs and Advantys STB I/O module mount in these bases on the DIN rail. The NIM is always the first (leftmost) module in the primary segment.

The Island Bus

The bases that you interconnect on the DIN rail form an island bus structure. The island bus houses the modules and supports the communications buses across the island. A set of contacts on the sides of the base units (See *p. 39*) provides the bus structure for:

- logic power
- sensor field power to the input modules
- actuator power to the output modules
- the auto-addressing signal
- island bus communications between the I/O and the NIM

The NIM, unlike the PDMs and I/O modules, attaches directly to a DIN rail:



1 NIM
2 module bases
3 termination plate
4 DIN rail

The DIN Rail

The NIM and the module bases snap onto a conductive metal DIN rail. The rail may be 7.5 mm or 15 mm deep.

The NIM

A NIM performs several key functions:

- It is the master of the island bus, supporting the I/O modules by acting as their communications interface across the island backplane
- It is the gateway between the island and the fieldbus on which the island operates, managing data exchange between the island's I/O modules and the fieldbus master
- It may be the interface to the Advantys configuration software; basic NIMs to not provide a software interface
- It is the primary power supply for logic power on the island bus, delivering a 5 VDC logic power signal to the I/O modules in the primary segment

Different NIM models are available to support the various open fieldbuses and different operational requirements. Choose the NIM that meets your needs and operates on the appropriate fieldbus protocol. Each NIM is documented in its own user manual.

PDMs

The second module on the primary segment is a PDM. PDMs are available in different models to support:

- 24 VDC field power to the I/O modules in a segment
- 115 VAC or 230 VAC field power to the I/O modules in a segment

The number of different I/O voltage groups that are installed on the segment determine the number of PDMs that need to be installed. If your segment contains I/O from all three voltage groups, you will need to install at least three separate PDMs in the segment.

Different PDM models are available with scalable performance characteristics. A standard PDM, for example, delivers actuator power to the output modules and sensor power to the input modules in a segment over two separate power lines on the island bus. A basic PDM, on the other hand, delivers actuator power and field power over a single power line.

The Bases

There are six types of bases that can be used in a segment. Specific bases must be used with specific module types, and it is important that you always install the correct bases in the appropriate locations in each segment:

Base Model	Base Width	Advantys STB Modules It Supports
STB XBA 1000	13.9 mm (0.54 in)	the size 1 base that supports 13.9 mm wide I/O modules (24 VDC digital I/O and analog I/O)
STB XBA 2000	18.4 mm (0.72 in)	the size 2 base that supports 18.4 mm I/O modules and the STB XBE 2100 CANopen extension module (See *p. 726*)
STB XBA 2100	18.4 mm (0.72 in)	the size 2 base that supports an auxiliary power supply
STB XBA 2200	18.4 mm (0.72 in)	the size 2 base that supports the PDMs
STB XBA 2300	18.4 mm (0.72 in)	the size 2 base that supports BOS modules
STB XBA 2400	18.4 mm (0.72 in)	the size 2 base that supports EOS modules
STB XBA 3000	28.1 mm (1.06 in)	the size 3 base that supports many of the special modules

As you plan and assemble the island bus, make sure that you choose and insert the correct base in each location on the island bus.

I/O

Each segment contains a minimum of one Advantys STB I/O module. The maximum number of modules in a segment is determined by their total current draw on the 5 VDC logic power supply in the segment. A built-in power supply in the NIM provides 5 VDC to the I/O modules in the primary segment. A similar power supply built into the BOS modules provides 5 VDC for the I/O modules in any extension segments. Each of these supplies produce 1.2 A, and the sum of the logic power current consumed by all the I/O modules in a segment cannot exceed 1.2 A.

The Last Device on the Primary Segment

The island bus must be terminated with a 120 Ω terminator resistor. If the last module on the island bus is an Advantys STB I/O module, use an STB XMP 1100 terminator plate at the end of the segment.

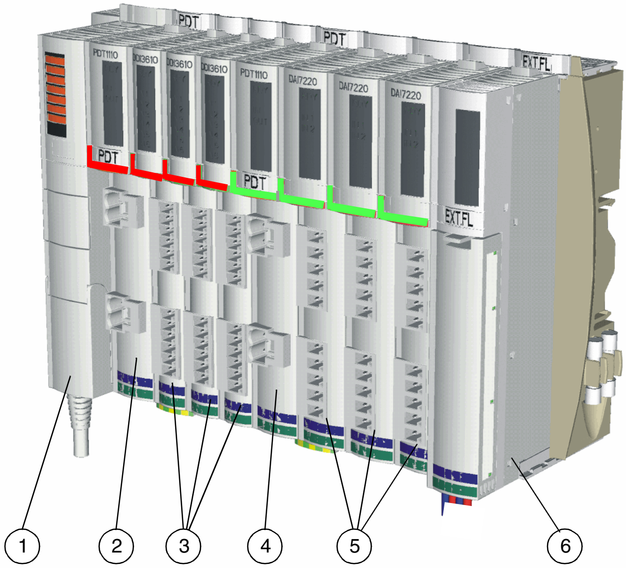
If the island bus is extended to another segment of Advantys STB modules or to a preferred module (See *p. 20*), you need to install an STB XBE 1000 EOS bus extension module in the last position of the segment that will be extended. Do not apply 120 Ω termination to the EOS module. The EOS module has an IEEE 1394-style output connector for a bus extension cable. The extension cable carries the island's communications bus and auto-addressing line to the extension segment or to the preferred module.

If the island bus is extended to a standard CANopen device (See *p. 19*), you need to install an STB XBE 2100 CANopen extension module in the rightmost position of the segment and apply 120 Ω termination to island bus after the CANopen extension module—use the STB XMP 1100 terminator plate. You must also provide 120 Ω termination on the last CANopen device that is installed on the island bus.

Remember that you cannot use extensions when a basic NIM is in the primary segment.

An Illustrative Example

The illustration below shows an example of a primary segment with PDMs and I/O modules installed in their bases:



1 The NIM resides in the first location. One and only one NIM is used on an island.
2 A 115/230 VAC STB PDT 2100 PDM, installed directly to the right of the NIM. This module distributes AC power over two separate field power buses, a sensor bus and an actuator bus.
3 A set of digital AC I/O modules installed in a voltage group directly to the right of the STB PDT 2100 PDM. The input modules in this group receive field power from the island's sensor bus, and the output modules in this group receive AC field power from the island's actuator bus.
4 A 24 VDC STB PDT 3100 PDM, which will distribute 24 VDC across the island's sensor and actuator buses to a voltage group of 24 VDC I/O modules. This PDM also provides isolation between the AC voltage group to its left and the DC voltage group to its right.
5 A set of analog and digital I/O modules installed directly to the right of the STB PDT 3100 PDM.
6 An STB XBE 1000 EOS extension module installed in the last location in the segment. Its presence indicates that the island bus will be extended beyond the primary segment and that you are not using a basic NIM.

Logic Power Flow

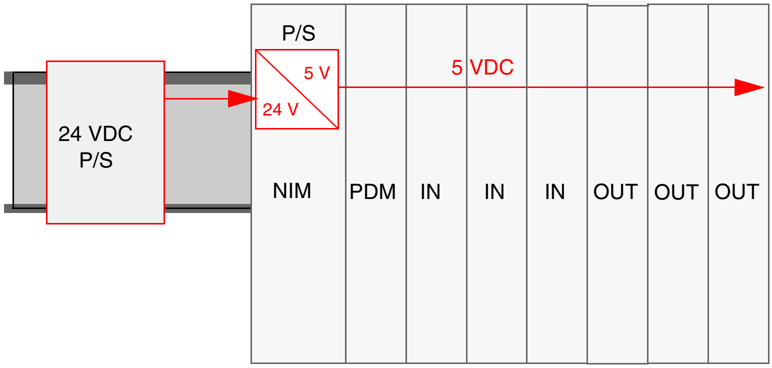
Summary

Logic power is the power that the Advantys STB I/O modules require to run their internal processing and light their LEDs. It is distributed across an island segment by a 5-to-24 VDC power supply. One of these power supplies is built into the NIM to support the primary segment; another is built into the STB XBE 1200 BOS modules to support any extension segments. If you need to provide more logic power in a primary or extension segment than the initial power supply can deliver, you may also use an STB CPS 2111 auxiliary power supply (See *p. 740*).

These power supplies require an external SELV-rated 24 VDC power source, which is usually mounted in the enclosure with the island.

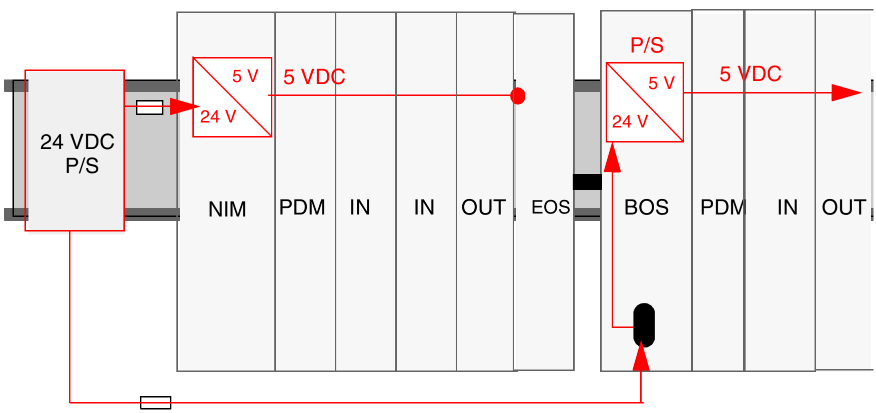
Logic Power Flow

The NIM converts the incoming 24 VDC to 5 VDC, and sends it across the island bus to the I/O modules in the primary segment:



This power supply provides 1.2 A of current to the primary segment. If the total current draw of all the modules on the island bus exceeds 1.2 A, you need to either use an auxiliary power supply or place some of the modules in one or more extension segment(s). If you use an extension segment, an EOS module is needed at the end of the primary segment, followed by an extension cable to a BOS module in an extension segment. The EOS terminates the 5 V logic power in the primary segment. The BOS in the next segment has its own 24-to-5 VDC power supply. It requires its own external 24 V power supply.

Here is an illustration of the extension segment scenario:



The Power Distribution Modules

Functions

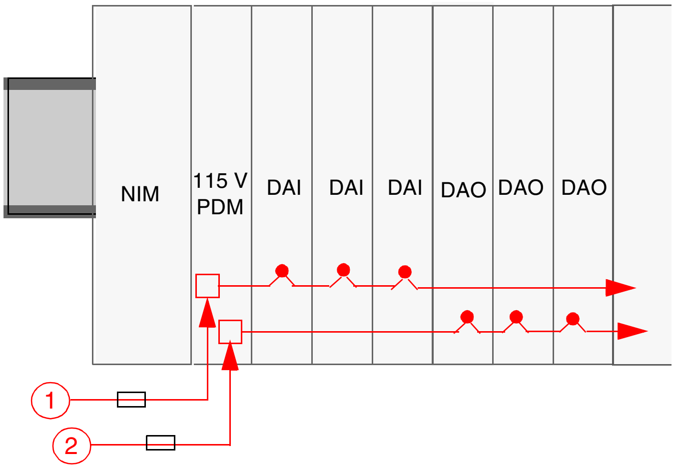
A PDM distributes field power to a set of Advantys STB I/O modules on the island bus. The PDM sends field power to the input and output modules in a segment. Depending on the PDM module you are using, it may distribute sensor power and actuator power on the same or on separate power lines across the island bus. The PDM protects the input and output modules with a user-replaceable fuse. It also provides a protective earth (PE) connection for the island.

Voltage Groupings

I/O modules with different voltage requirements need to be isolated from each other in the segment, and the PDMs serve this role. Each voltage group requires its own PDM

Standard PDM Power Distribution

A PDM is placed immediately to the right of the NIM in slot 2 on the island. The modules in a specific voltage group follow in series to the right of the PDM. The following illustration shows a standard STB PDT 2100 PDM supporting a cluster of 115 VAC I/O modules:



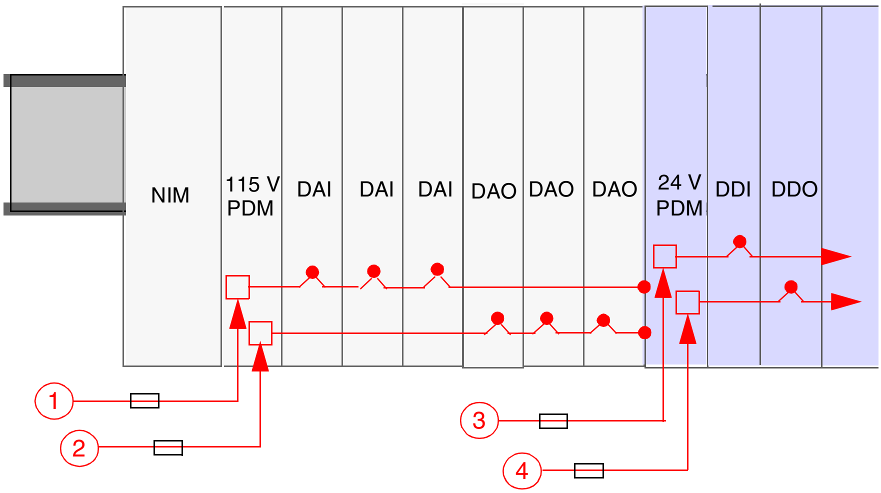
1 115 VAC sensor power signal to the PDM
2 115 VAC actuator power signal to the PDM

Notice that sensor power (to the input modules) and actuator power (to the output modules) are brought to the island via separate two-pin connectors on the PDM.

The island layout shown above assumes that all the I/O modules in the segment use 115 VAC for field power. Suppose, however, that your application requires a mix of 24 VDC and 115 VAC modules. A second PDM (this time a standard STB PDT 3100 module) is used for the 24 VDC I/O.

> **Note:** When you plan the layout of an island segment that contains a mixture of AC and DC modules, we recommend that you place the AC voltage group(s) to the left of the DC voltage group(s) in a segment.

In this case, the STB PDT 3100 PDM is placed directly to the right of the last 115 VAC module. It terminates the sensor and actuator buses for the 115 VAC I/O voltage group and initiates new sensor and actuator buses for the 24 VDC modules:

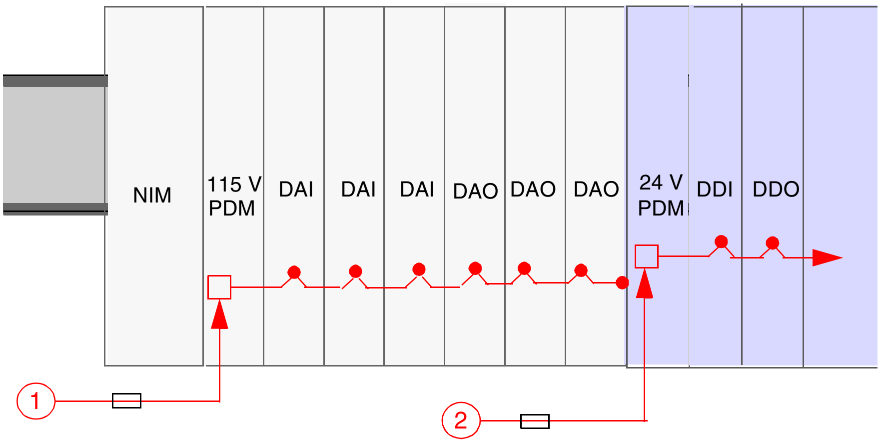


1 115 VAC sensor power signal to the PDM
2 115 VAC actuator power signal to the PDM
3 24 VDC sensor power signal to the PDM
4 24 VDC actuator power signal to the PDM

Each standard PDM contains a pair of time-lag fuses to protect the I/O modules in the segment. A 10 A fuse protects the output modules on the actuator bus, and a 5 A fuse protects the input modules on the sensor bus. These fuses are user-replaceable.

Basic PDM Power Distribution

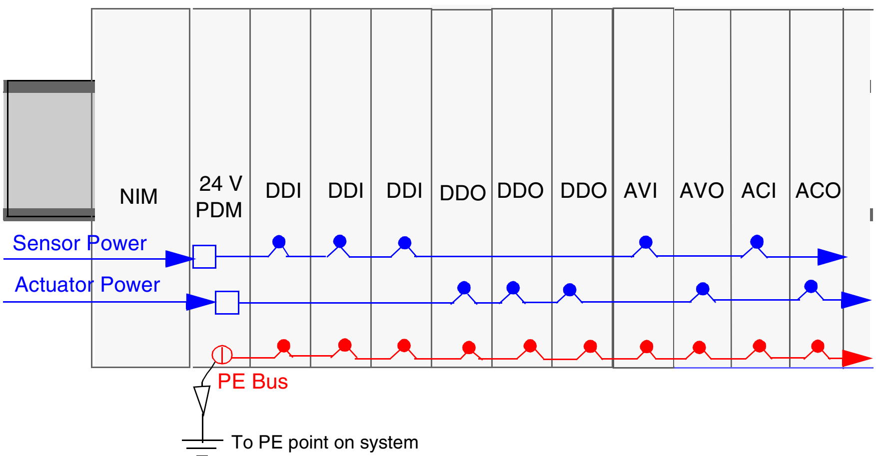
If your island uses basic PDMs instead of standard PDMs, then actuator power and sensor power are sent over a single power line:



Each basic PDM contains on 5 A time-lag fuse that protects the I/O modules in the segment. This fuse is user-replaceable.

PE Grounding

A captive screw terminal on the bottom of the PDM base makes contact with pin 12 (See *p. 41*) on each I/O base, establishing an island PE bus. The screw terminal on the PDM base meets IEC-1131 requirements for field power protection. The screw terminal should be wired to the PE point on your system.



Sensor Power and Actuator Power Distribution on the Island Bus

Summary

The sensor bus and the actuator bus need to be powered separately from external sources. Depending on your application, you may want to use the same or different external power supplies to feed the sensor bus and the actuator bus. The source power is fed to two two-pin power connectors on a PDM.

- The top connector is for the sensor power bus
- The bottom two-pin connector is for the actuator power bus

24 VDC Field Power Distribution

An external power supply delivers field power distributed to an STB PDT 3100 PDM.

Caution

IMPROPER GALVANIC ISOLATION

The power components are not galvanically isolated. They are intended for use only in systems designed to provide SELV isolation between the supply inputs or outputs and the load devices or system power bus. You must use SELV-rated supplies to provide 24 VDC source power to the NIM.

Failure to follow this instruction can result in injury or equipment damage.

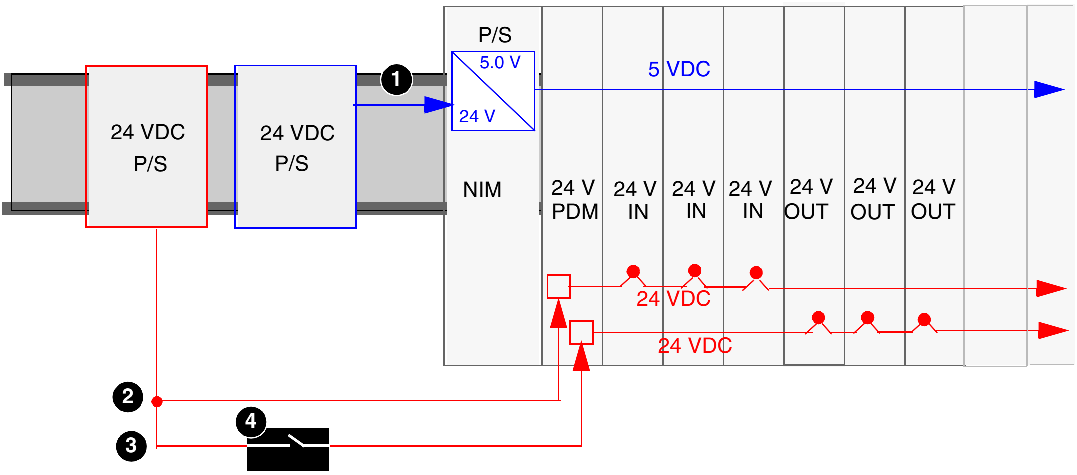
Caution

COMPROMISED DOUBLE INSULATION

Above 130 VAC, the relay module may compromise the double insulation provided by a SELV-rated power supply.
When you use a relay module, use separate external 24 VDC power supplies for the PDM supporting that module and the logic power to the NIM or BOS module when the contact voltage is above 130 VAC.

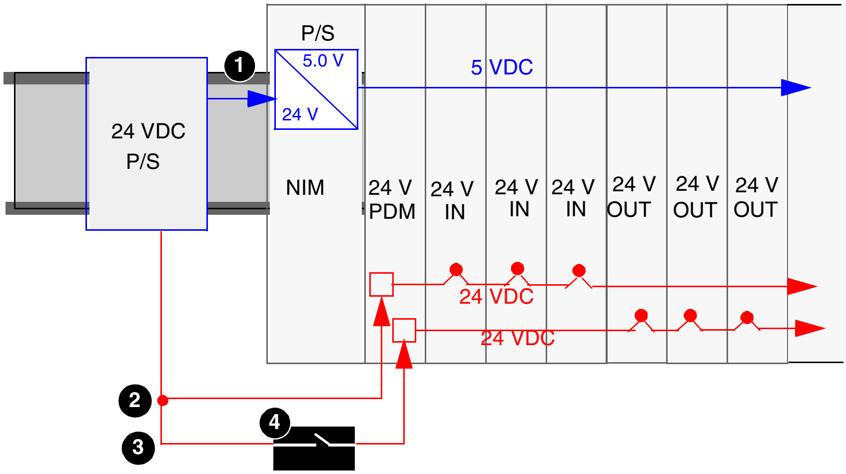
Failure to follow this instruction can result in injury or equipment damage.

To assure that the installation will perform to system specifications, it is advisable to use a separate 24 VDC supply for logic power to the NIM and for field power to the PDM:



1 24 VDC signal to the NIM's logic power supply
2 24 VDC signal to the segment's sensor bus
3 24 VDC signal to the segment's actuator bus
4 optional relay on the actuator bus

If the I/O load on the island bus is low and the system is operating in a low-noise environment, you may use the same supply for both logic power and field power:

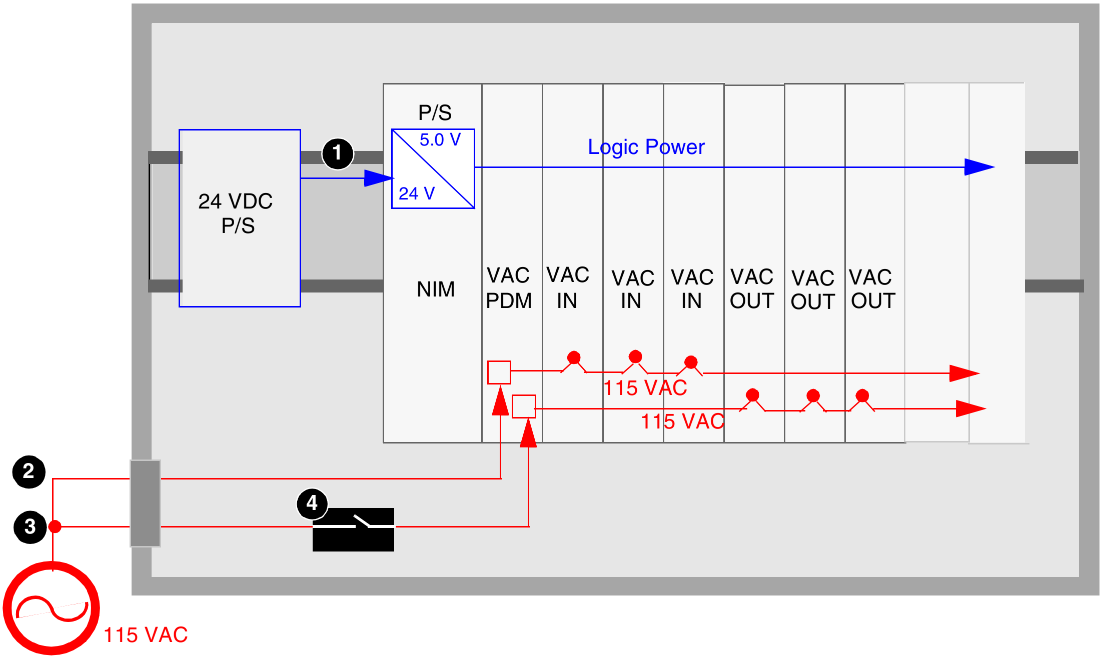


1 24 VDC signal to the NIM's logic power supply
2 24 VDC signal to the segment's sensor bus
3 24 VDC signal to the segment's actuator bus
4 optional relay on the actuator bus

Note: In the example above, a single power supply is used to provide 24 VDC to the NIM (for logic power) and the PDM. If any of the modules supported by the PDM is an STB relay module that operates at a contact voltage above 130 VAC, the double insulation provided by the SELV power supply is no longer present. Therefore, you will need to use a separate 24 VDC power supply to support the relay module.

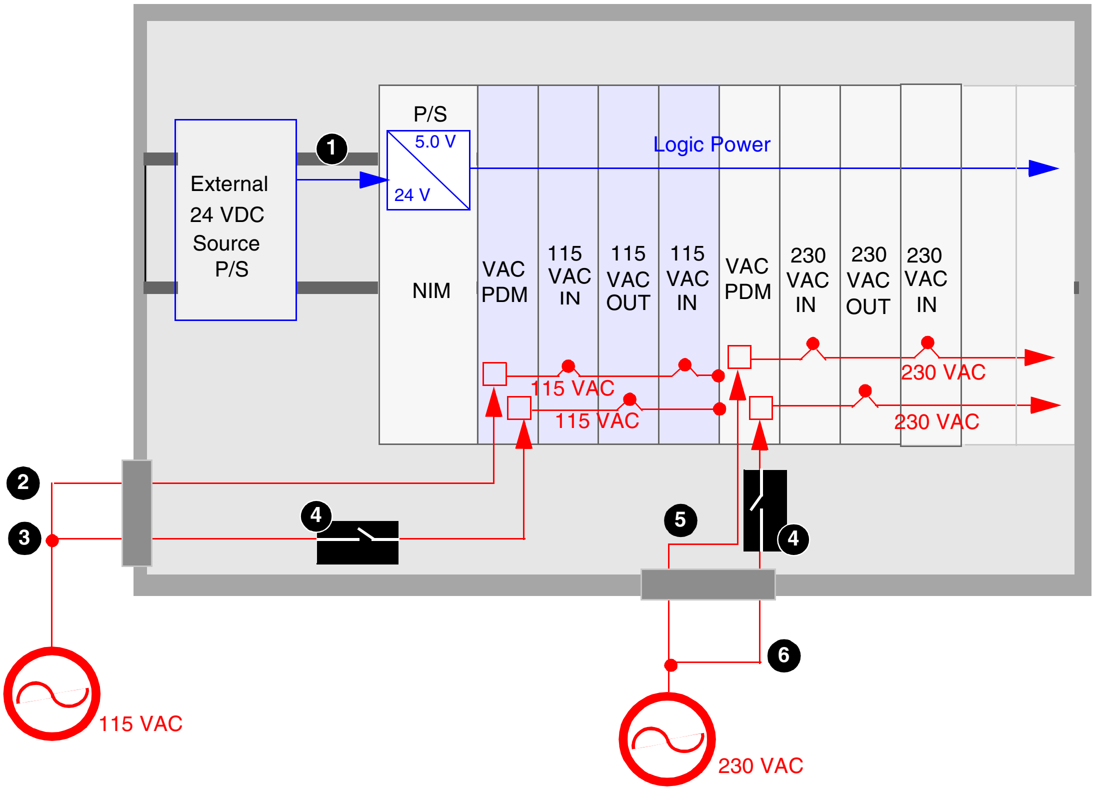
115 and 230 VAC Field Power Distribution

AC field power is distributed across the island by an STB PDT 2100 PDM. It can accept field power in the range 85 ... 264 VAC. The following illustration shows a simple view of 115 VAC power distribution:



1 24 VDC signal to the NIM's logic power supply
2 115 VAC signal to the segment's sensor bus
3 115 VAC signal to the segment's actuator bus
4 optional relay on the actuator bus

If the segment contains a mixture of both 115 VAC and 230 VAC I/O modules, you must take care to install them in separate voltage groups and support the different voltages with separate STB PDT 2100 PDMs:



1	24 VDC signal to the NIM's logic power supply
2	115 VAC signal to the segment's sensor bus
3	115 VAC signal to the segment's actuator bus
4	optional relay on the actuator bus
5	230 VAC signal to the segment's sensor bus
6	230 VAC signal to the segment's actuator bus

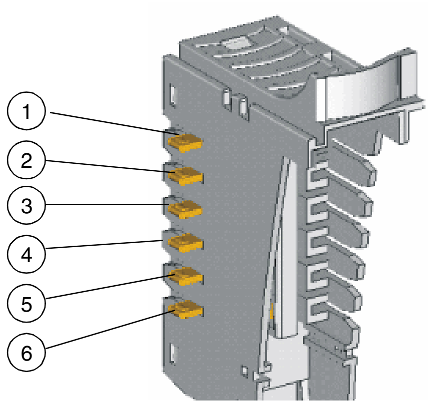
Communications Across the Island

Island Bus Architecture

Two sets of contacts on the left side of the base units—one set on the bottom and one on the top—enable the island to support several different communication and power buses. The contacts on the top left of a base support the island's logic side functions. The contacts at the bottom left of a base support the island's field power side.

Logic Side Contacts

The following illustration shows the location of the contacts as they appear on all the I/O bases. The six contacts at the top of the base support the logic side functionality:



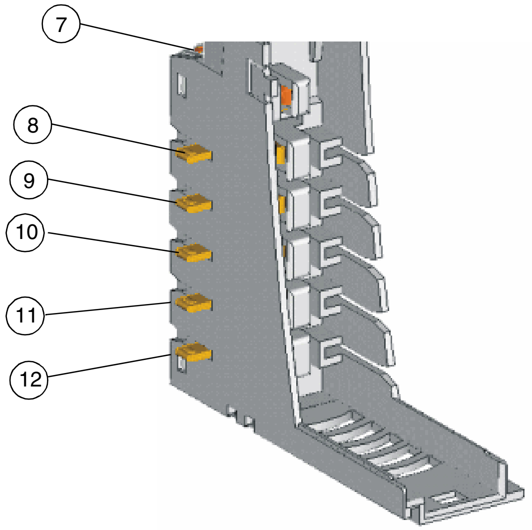
1 reserved
2 common ground contact
3 5 VDC logic power contact
4 island bus communications (+) contact
5 island bus communications (-) contact
6 address line contact

The following table lists the way the logic-side contacts are implemented on the different base units.

Base Unit	Logic-side Contacts
STB XBA 1000 size 1 I/O base	Contacts 2 ... 6 present and pass signals to the right. Contacts 2 and 3 terminate at the end of the segment; contacts 4, 5 and 6 pass to the end of the island bus.
STB XBA 2000 size 2 I/O base	Contacts 2 ... 6 present and pass signals to the right. Contacts 2 and 3 terminate at the end of the segment; contacts 4, 5 and 6 pass to the end of the island bus
STB XBA 2200 size 2 PDM base	Contacts 2 ... 6 present and pass signals to the right. Contacts 2 and 3 terminate at the end of the segment; contacts 4, 5 and 6 pass to the end of the island bus
STB XBA 2300 size 2 BOS base	Contacts 2 ... 6 are present and pass signals to the right
STB XBA 2400 size 2 EOS base	Contacts 1 ... 6 are present but the signals do not pass to the right
STB XBA 3000 size 3 I/O base	Contacts 2 ... 6 present and pass signals to the right. Contacts 2 and 3 terminate at the end of the segment; contacts 4, 5 and 6 pass to the end of the island bus

Field Power Distribution Contacts

The following illustration highlights the contacts at the bottom of the base, which support the island’s field power distribution functionality:



7 a DIN rail clip that provides functional ground for noise immunity, RFI, etc.
8 and 9 sensor bus
10 and 11 actuator bus
12 PE, established via a captive screw on the PDM base units

The following table lists the way the field-side contacts are implemented on the different base units.

Base Unit	Logic-side Contacts
STB XBA 1000 size 1 I/O base	Contacts 7 ... 12 present. Contacts 7 and 12 are always made. Contacts 8 and 9 are made for input modules but not for output modules. Contacts 10 and 11 are made for output modules but not for input modules.
STB XBA 2000 size 2 I/O base	Contacts 7 ... 12 present. Contacts 7 and 12 are always made. Contacts 8 and 9 are made for input modules but not for output modules. Contacts 10 and 11 are made for output modules but not for input modules.
STB XBA 2200 size 2 PDM base	Contacts 7 and 12 present and are always made. Contacts 8 ... 11 are not connected on the left side—sensor and actuator power are delivered to the PDM from external power sources and passed to the right.
STB XBA 2300 size 2 BOS base	Contacts 7 ... 12 present but do not pass signals to the right. The BOS module does not receive field power.
STB XBA 2400 size 2 EOS base	Contacts 7 ... 12 are present but do not pass signals to the right. The EOS module does not receive field power.
STB XBA 3000 type 3 I/O base	Contacts 7 ... 12 present. Contacts 7 and 12 are always made. Contacts 8 and 9 are made for input modules but not for output modules. Contacts 10 and 11 are made for output modules but not for input modules.

An Overview of the Advantys STB I/O Modules

2

At a Glance

Overview

The tables on the following pages list the I/O modules in the Advantys STB family.

What's in this Chapter?

This chapter contains the following topics:

An Overview of the Advantys STB I/O Modules

Summary

The Advantys STB input and output modules include:

- digital input and output modules
- relay output modules
- analog input and output modules
- special modules

The modules are characterized briefly in the following tables. Detailed descriptions of the individual modules are provided in the chapters that follow.

Digital Input

Model	Sink Voltage	Number of Channels	Supporting Modules and Accessories		Features and Characteristics
STB DDI 3230 (standard input)	24 VDC	two	I/O base:	STB XBA 1000	IEC type 2 inputs
			PDM:	STB PDT 3100	short-circuit protection
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	two-, three- and four-wire device support
				STB XTS 2100	may be used as inputs to reflex actions
					filter time constant configurable down to 0.2 ms
STB DDI 3420 (standard input)	24 VDC	four	I/O base:	STB XBA 1000	IEC type 1+ inputs
			PDM:	STB PDT 3100	short-circuit protection
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	two- and three-wire device support
				STB XTS 2100	may be used as inputs to reflex actions
					filter time constant configurable down to 0.5 ms
STB DDI 3425 (basic input)	24 VDC	four	I/O base:	STB XBA 1000	IEC type 1+ inputs
			PDM:	STB PDT 3100	short-circuit protection
				STB PDT 3105	fixed nonconfigurable operating parameters
			field wiring connectors:	STB XTS 1100	two- and three-wire device support
				STB XTS 2100	
					cannot be used in reflex actions
					filter time constant fixed at 3.0 ms

Model	Sink Voltage	Number of Channels	Supporting Modules and Accessories		Features and Characteristics
STB DDI 3610 (standard input)	24 VDC	six	I/O base:	STB XBA 1000	IEC type 1 inputs
			PDM:	STB PDT 3100	two-wire device support
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	may be used as inputs to reflex actions
				STB XTS 2100	
					filter time constant fixed at 1.0 ms
STB DDI 3615 (basic input)	24 VDC	six	I/O base:	STB XBA 1000	IEC type 1 inputs
			PDM:	STB PDT 3100	two-wire device support
				STB PDT 3105	fixed nonconfigurable operating parameters
			field wiring connectors:	STB XTS 1100	cannot be used in reflex actions
				STB XTS 2100	
					filter time constant fixed at 5.0 ms
STB DAI 5230 (standard input)	115 VAC	two	I/O base:	STB XBA 2000	47 ... 63 Hz
			PDM:	STB PDT 2100	IEC type 1 inputs
				STB PDT 2105	
			field wiring connectors:	STB XTS 1110	user-configurable operating parameters
				STB XTS 2110	cannot be used in reflex actions
					two- and three-wire device support
STB DAI 7220 (standard input)	230 VAC	two	I/O base:	STB XBA 2000	47 ... 63 Hz
			PDM:	STB PDT 2100	IEC type 1 inputs
				STB PDT 2105	user-configurable operating parameters
					cannot be used in reflex actions
			field wiring connectors:	STB XTS 1110	two- and three-wire device support
				STB XTS 2110	

Digital Output

Model	Source Voltage	Number of Channels	Supporting Modules and Accessories		Features and Characteristics
STB DDO 3200 (standard output)	24 VDC	two	I/O base:	STB XBA 1000	0.5 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	over-current protection
			field wiring connectors:	STB XTS 1100	user-configurable operating parameters
				STB XTS 2100	
					two- and three-wire device support
					can support up to two reflex actions
STB DDO 3230 (standard output)	24 VDC	two	I/O base:	STB XBA 1000	2 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	isolated channels
					over-current protection
			Note An external power supply may be used instead of a PDM		user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	two- and three-wire device support
				STB XTS 2100	
					can support up to two reflex actions
STB DDO 3410 (standard output)	24 VDC	four	I/O base:	STB XBA 1000	0.5 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	over-current protection
			field wiring connectors:	STB XTS 1100	user-configurable operating parameters
				STB XTS 2100	
					two-wire device support
					can support up to two reflex actions
STB DDO 3415 (basic output)	24 VDC	four	I/O base:	STB XBA 1000	0.25 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	over-current protection
			field wiring connectors:	STB XTS 1100	fixed nonconfigurable operating parameters
				STB XTS 2100	
					two-wire device support
					no reflex actions

Model	Source Voltage	Number of Channels	Supporting Modules and Accessories		Features and Characteristics
STB DDO 3600 (standard output)	24 VDC	six	I/O base:	STB XBA 1000	0.5 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	over-current protection
			field wiring connectors:	STB XTS 1100	user-configurable operating parameters
				STB XTS 2100	
					two-wire device support
					can support up to two reflex actions
STB DDO 3605 (basic output)	24 VDC	six	I/O base:	STB XBA 1000	0.25 A/channel maximum load current
			PDM:	STB PDT 3100	
				STB PDT 3105	over-current protection
			field wiring connectors:	STB XTS 110	fixed nonconfigurable operating parameters
				STB XTS 2100	
					two-wire device support
					no reflex actions
STB DAO 8210 (standard output)	115/ 230 VAC	two	I/O base:	STB XBA 2000	1.0 A/channel maximum load current
			PDM:	STB PDT 2100	
				STB PDT 2105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1110	two-, three- and four-wire device support
				STB XTS 2110	
					requires external fusing
					can support up to two reflex actions

Relay Output

Model	Number of Relays	Relay Type	Supporting Modules and Accessories		Features and Characteristics
STB DRC 3210 (type C relay)	two	form C relay output	I/O base:	STB XBA 2000	2 A/relay load current @ 30 degrees C
			PDM:	STB PDT 3100	
				STB PDT 3105	24 V coil
					isolated relays
			field wiring connectors:	STB XTS 1110	user-configurable operating parameters
				STB XTS 2110	
					requires external fusing
					can support up to two reflex actions
STB DRA 3290 (type A/B relay)	two	form A/B relay output	I/O base:	STB XBA 2000	7 A/relay load current
			PDM:	STB PDT 3100	24 V coil
					isolated relays
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1110	
				STB XTS 2110	requires external fusing
					can support up to two reflex actions

Analog Input

Model	Number of Channels	Input Types	Supporting Modules and Accessories		Features and Characteristics
STB AVI 1255 (basic input)	two	single-ended analog voltage	I/O base:	STB XBA 1000	0 ... 10 V inputs from the analog sensors
			PDM:	STB PDT 3100	
				STB PDT 3105	fixed nonconfigurable operating parameters
					cannot be used in reflex actions
			field wiring connectors:	STB XTS 1100	10-bit data resolution
				STB XTS 2100	analog components isolated from the island's sensor bus
STB AVI 1270 (standard input)	two	single-ended analog voltage	I/O base:	STB XBA 1000	+/-10 V inputs from the analog sensors
			PDM:	STB PDT 3100	user-configurable operating parameters
				STB PDT 3105	
			field wiring connectors:	STB XTS 1100	may be used as inputs to reflex actions
				STB XTS 2100	
					11-bit + sign data resolution
					analog components isolated from the island's sensor bus
STB AVI 1275 (basic input)	two	single-ended analog voltage	I/O base:	STB XBA 1000	+/-10 V inputs from the analog sensors
			PDM:	STB PDT 3100	
				STB PDT 3105	fixed nonconfigurable operating parameters
			field wiring connectors:	STB XTS 1100	9-bit + sign data resolution
				STB XTS 2100	cannot be used in reflex actions
					analog components isolated from the island's sensor bus

Model	Number of Channels	Input Types	Supporting Modules and Accessories		Features and Characteristics
STB ACI 1225 (basic input)	two	analog current	I/O base:	STB XBA 1000	4 ... 20 mA inputs from analog sensors
			PDM:	STB PDT 3100	
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	
				STB XTS 2100	10-bit data resolution
					cannot be used in reflex actions
					analog components isolated from the island's sensor bus
STB ACI 1230 (standard input)	two	analog current	I/O base:	STB XBA 1000	0 ... 20 mA inputs from analog sensors
			PDM:	STB PDT 3100	
				STB PDT 3105	user-configurable operating parameters
			field wiring connectors:	STB XTS 1100	
				STB XTS 2100	12-bit data resolution
					may be used as inputs to reflex actions
					analog components isolated from the island's sensor bus
STB ART 0200 (standard input)	two	supports RTD, thermocouple and mV devices	I/O base:	STB XBA 1000	15-bit + sign data resolution
			PDM:	STB PDT 3100	
				STB PDT 3105	user-configurable operating modes and parameters
		each channel may be configured independently	field wiring connectors:	STB XTS 1100	may be used as inputs to reflex actions
				STB XTS 2100	
					channel-to-channel isolation

Note: To make the analog input modules CE compliant, you must run shielded wires from the field sensors and you must clamp the shields to functional earth. An STB XSP 3000 EMC kit is available for this purpose. Use and installation details are provided in the *Advantys System Planning and Installation Guide* (890 USE 171).

Analog Output

Model	Number of Channels	Output Types	Supporting Modules and Accessories		Features and Characteristics
STB AVO 1250 (standard output)	two	single-ended analog voltage	I/O base:	STB XBA 1000	user-configurable operating parameters
			PDM:	STB PDT 3100 STB PDT 3105	user-selectable for: ● 0 ... 10 V outputs ● +/-10 V outputs
			field wiring connectors:	STB XTS 1100 STB XTS 2100	12-bit or 11 bit + sign data resolution
					short-circuit protection
					analog components isolated from the island's actuator bus
					can support up to two reflex actions
STB AVO 1255 (basic output)	two	single-ended analog voltage	I/O base:	STB XBA 1000	fixed nonconfigurable operating parameters
			PDM:	STB PDT 3100 STB PDT 3105	0 ... 10 V outputs to the analog actuators
			field wiring connectors:	STB XTS 1100 screw type	analog components isolated from the island's actuator bus
				STB XTS 2100 spring clamp	10-bit data resolution
					short-circuit protection
					no reflex actions
STB AVO 1265 (basic output)	two	single-ended analog voltage	I/O base:	STB XBA 1000	fixed nonconfigurable operating parameters
			PDM:	STB PDT 3100 STB PDT 3105	-10 ... +10 V outputs to the analog actuators
			field wiring connectors:	STB XTS 1100 screw type	analog components isolated from the island's actuator bus
				STB XTS 2100 spring clamp	9-bit + sign data resolution
					short-circuit protection
					no reflex actions

Model	Number of Channels	Output Types	Supporting Modules and Accessories		Features and Characteristics
STB ACO 1210 (standard output)	two	analog current	I/O base:	STB XBA 1000	0 ... 20 mA outputs to the analog actuators
			PDM:	STB PDT 3100	user-configurable operating parameters
				STB PDT 3105	
			field wiring connectors:	STB XTS 1100	12-bit data resolution
				STB XTS 2100	short-circuit protection
					analog components isolated from the island's actuator bus
					can support up to two reflex actions
STB ACO 1225 (basic output)	two	analog current	I/O base:	STB XBA 1000	4 ... 20 mA outputs to the analog actuators
			PDM:	STB PDT 3100	fixed nonconfigurable operating parameters
				STB PDT 3105	
			field wiring connectors:	STB XTS 1100	10-bit data resolution
				STB XTS 2100	short-circuit protection
					analog components isolated from the island's actuator bus
					no reflex actions

Note: To make the analog output modules CE compliant, you must run shielded wires to the field actuators and you must clamp the shields to functional earth. An STB XSP 3000 EMC kit is available for this purpose. For details for use and installation, refer to the *Advantys System Planning and Installation Guide* (890 USE 171).

Special

<table>
<tr><th>Model</th><th>Number of Channels</th><th>I/O Types</th><th colspan="2">Supporting Modules and Accessories</th><th>Features and Characteristics</th></tr>
<tr><td rowspan="5">STB EPI 1145 (parallel interface)</td><td>16 in</td><td rowspan="5">digital voltage</td><td>I/O base:</td><td>STB XBA 2000</td><td>Tego HE10 parallel interface</td></tr>
<tr><td rowspan="4">8 out</td><td rowspan="2">PDM:</td><td>STB PDT 3100</td><td>500 mA</td></tr>
<tr><td>STB PDT 3105</td><td rowspan="3">outputs can support up to two reflex actions</td></tr>
<tr><td rowspan="2">field wiring connectors:</td><td>STB XCA 3002 1 m cable</td></tr>
<tr><td>STB XCA 3003 2 m cable</td></tr>
<tr><td rowspan="6">STB EPI 2145 (parallel interface)</td><td>12 in</td><td rowspan="6">digital voltage</td><td>I/O base</td><td>STB XBA 3000</td><td rowspan="3">parallel interface to TeSys model U controller starter</td></tr>
<tr><td rowspan="5">8 out</td><td rowspan="2">PDM:</td><td>STB PDT 3100</td></tr>
<tr><td>STB PDT 3105</td></tr>
<tr><td rowspan="3">field wiring connectors:</td><td>LU9 R03 0.3 m cable</td><td>500 mA</td></tr>
<tr><td>LU9 R10 1 m cable</td><td rowspan="2">outputs can support up to two reflex actions</td></tr>
<tr><td>LU9 R30 3 m cable</td></tr>
<tr><td rowspan="6">STB EHC 3020 (counter)</td><td rowspan="3">4 in</td><td rowspan="6">counter frequency and period</td><td>I/O base:</td><td>STB XBA 3000</td><td>40 kHz incremental counter</td></tr>
<tr><td rowspan="2">PDM:</td><td>STB PDT 3100</td><td rowspan="2">six user-configurable counting modes</td></tr>
<tr><td>STB PDT 3105</td></tr>
<tr><td rowspan="3">2 out</td><td rowspan="3">field wiring connector:</td><td rowspan="3">STB XTS 2150 18-terminal spring clamp connector</td><td>user-configurable operating modes and parameters</td></tr>
<tr><td>built-in compare block</td></tr>
<tr><td>no reflex actions</td></tr>
</table>

Advantys STB I/O Modules

Summary

The following discussion provides some criteria for identifying the modules you may use in your installation.

Distinguishing One I/O Module from Another

There are two visual characteristics that allow you to quickly distinguish one I/O module from another—the model number on the top front panel and the color-coded stripe below the LED array. Each STB I/O module has a unique seven-character model number displayed on the top of the module's face. The color stripes are a useful way to distinguish one type of module from another—for example, a digital from an analog or an input from an output.

Color stripe Table

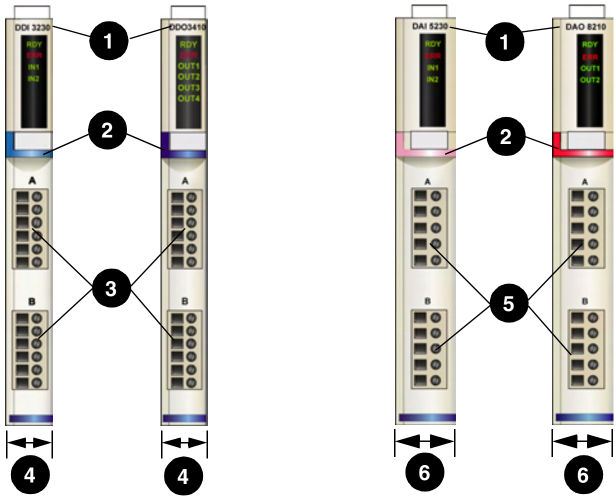
Here is a table of I/O module color codes:

Module type	Details	Color
digital	24 VDC input	Light blue
	24 VDC output	Dark blue
	115/230 VAC input	Pink
	115/230 VAC output	Red
relay and special		Black
analog	Input, current or voltage	Light green
	Output, current or voltage	Dark green

Digital I/O Modules

A wide assortment of digital I/O modules is available in the Advantys STB family. Some support 24 VDC field devices, and others support AC field devices. Some modules support two input or output channels, others support four or more channels.

The following illustration shows four typical digital I/O modules and some of their distinguishing physical characteristics:



1 The model number label
2 The color-coded stripe
3 Six-terminal field wiring connectors
4 13.9 mm (0.58 in) module width
5 Five-terminal field wiring connectors
6 18.4 mm (0.72 in) module width

The model number

The first three characters in the seven-character model number are alphabetical characters that indicate the following:

Position	Character	Meaning
first (leftmost)	*D*	The module is digital
second	*D* or *A*	*D* if the module supports VDC field devices
		A if the module supports VAC field devices
third	*I* or *O*	*I* if the module is an input
		O if the module is an output

For example, if the module is labelled *DDI*, it is a digital DC input module. If it is labelled *DAO*, it is a digital AC output module.

With respect to the four-digit numeric in the module number, the second digit from the left indicates the number of channels supported by the module. For example, a *DDO 3230* is a two-channel VDC output module, and a *DDI 3610* is a six-channel VDC input module. A 0 as the last digit indicates that the module is standard, and a 5 as the last digit indicates that the module is basic. For example, a *DDO 3420* is a standard four-channel VDC output module and a *DDO 3425* is a basic four-channel VDC output module.

The color-coded stripe

The color-coded stripe gives you a quick visual indication of whether the module is:

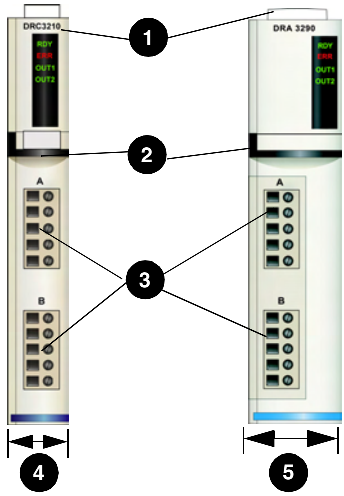
- A digital module
- An input or an output module
- An AC or a DC module

The colors indicate the following:

Digital Module Type	Color Stripe
DC input	light blue
DC output	dark blue
AC input	pink
AC output	red

Relay Modules

The relay modules are special implementations of the digital output modules. The coil they use runs on island's 24 VDC, so it needs to be installed in a 24 VDC voltage group. The field devices that it switches, however, may be 24 VDC, 115 VAC or 230 VAC. Relay modules are available in size 2 (18.4 mm wide) and size 3 (28.1 mm wide) form factors:



1 The model number label
2 The color-coded stripe
3 Five-terminal field wiring connectors
4 18.4 mm (0.72 in) module width
5 28.1 mm (1,12 in) module width

> **Note:** Because relays can be used to switch high voltages, they have five-terminal field wiring connectors. This is different from most other modules that mount in a 24 VDC voltage group, which use six-terminal field wiring connectors. The five-terminal connectors provide the 5.08 mm (0.2 in) spacing between terminals that is necessary for supporting a high voltage device.

The model number

The first three characters in the seven-character model number are alphabetical characters that indicate the following:

Position	Character	Meaning
first (leftmost)	*D*	The module is digital
second	*R*	The module is a relay
third	*A* or *C*	*A* if the module is a form A relay
		C if the module is a form C relay

For example, if the module is labelled *DRC*, it is a digital relay module with a form C relay.

With respect to the four-digit numeric in the module number, the second digit from the left is the important digit, indicating the number of channels supported by the module. For example, a *DRC 3210* is a two-relay module.

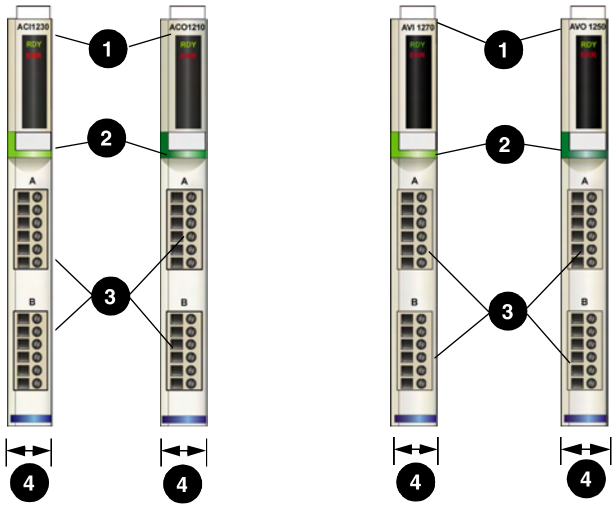
The color-coded stripe

Relay output modules have a black color-coded stripe on their front panels.

Analog I/O Modules

The Advantys STB analog I/O modules are designed to support current and/or voltage driven field equipment. Each module provides two or more input or output channels.

The following illustration shows four typical analog I/O modules and some of their distinguishing physical characteristics:



1 The model number label
2 The color-coded stripe
3 Six-terminal field wiring connectors
4 13.9 mm (0.58 in) module width

The model number

The first three characters in the seven-character model number are alphabetical characters that indicate the following:

Position	Character	Meaning
first (leftmost)	*A*	The module is analog
second	*C* or *V*	*C* if the module supports current-driven field devices
		V if the module supports voltage-driven field devices
third	*I* or *O*	*I* if the module is an input
		O if the module is an output

For example, if the module is labelled *ACI*, it is an analog current input module. If the module is labelled *AVO*, it is an analog voltage output module.

With respect to the four-digit numeric in the module number, the second digit from the left indicates the number of analog channels supported by the module. For example, a *AVO 1250* is a two-channel output module. A 0 as the last digit indicates that the module is standard, and a 5 as the last digit indicates that the module is basic. For example, an *AVO 1250* is a standard two-channel analog voltage output module and an *ACO 1225* is a basic two-channel analog current output module.

The color-coded stripe

The color-coded stripe gives you a quick visual indication of whether the module is an analog input or analog output module. It does not differentiate between current and voltage modules.

- An analog input module has a light green color stripe
- An analog output module has a dark green color stripe

Operating Environment

Environmental Specifications

The following information describes systemwide environmental requirements and specifications for the Advantys STB system.

Enclosure

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted and/or radiated disturbance.

All Advantys STB modules meet CE mark requirements for *open equipment* and should be installed in an enclosure that is designed for specific environmental conditions and designed to prevent personal injury resulting from access to live parts. The interior of the enclosure must be accessible only by the use of a tool.

Requirements

This equipment meets agency certification for UL, CSA, CE and FM class 1 div 2. This equipment is intended for use in a Pollution Degree 2 industrial environment, in over-voltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 m (6500 ft) without derating.

Parameter	Specification	
protection	ref. EN61131-2	IP20, class 1
agency	ref. EN61131-2	UL 508, CSA 1010-1, FM Class 1 Div. 2, CE
isolation voltage	ref. EN61131-2	1500 VDC field-to-bus for 24 VDC
		2500 VDC field-to-bus for 115/230 VAC
	Note: No internal isolation voltage; isolation requirements must be met by using SELV-based external power supply.	
over-voltage class	ref. EN61131-2	category II
operating temperature	0 ... 60° C (32 ... 140° F)	
storage temperature	-40 ... +85° C (-40 ... +185° F)	
maximum humidity	95% relative humidity @ 60° C (noncondensing)	
supply voltage variation, interruption, shut-down and start-up	IEC 61000-4-11	
damped oscillatory wave	IEC 61000-4-12	
sinusoidal vibration	10 ... 58 Hz at +/- 0.35 mm	58 150 Hz at 5 g on a 15 mm DIN rail
		58 150 Hz at 3 g on a 7.5 mm DIN rail
shock	ref. IEC88, part 2-27	+/-15 g peak, 11 ms, half-sine wave for 3 shocks/axis
operating altitude	2000 m (2187 yd)	
transport altitude	3000 m (3281 yd)	
free-fall	ref. EN61131-2	1 m (1.09 yd)

Electromagnetic Susceptibility

The following table lists the electromagnetic susceptibility specifications:

Characteristic	Specification
electrostatic discharge	ref. EN61000-4-2
radiated	ref. EN61000-4-3
fast transients	ref. EN61000-4-4
surge withstand (transients)	ref. EN61000-4-5
conducted RF	ref. EN61000-4-6
pulse-modulated field	ref. EN61131-2

Radiated Emission

The following table lists the emission specification ranges:

Description	Specification	Range
radiated emission	ref. EN 55011 Class A	30 ... 230 MHz, 10 m @ 40 dBμV
		230 ... 1000 MHz, 10 m @ 47 dBμV

The Advantys STB Digital Input Modules

3

At a Glance

Overview

This chapter describes the features of the standard and basic Advantys STB digital input modules.

What's in this Chapter?

This chapter contains the following sections:

3.1 STB DDI 3230 Digital 24 VDC Sink Input Module (two-channel, four-wire, IEC type 2, 0.2 ms-configurable, short-circuit protected)

At a Glance

Overview

This section provides a detailed description of the Advantys STB DDI 3230 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

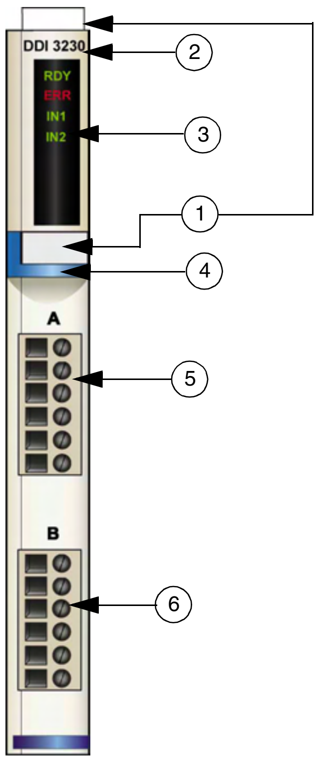
This section contains the following topics:

STB DDI 3230 Physical Description

Physical Characteristics

The STB DDI 3230 is a standard Advantys STB two-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Sensor 1 is wired to the top connector and sensor 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

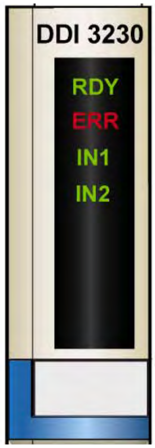
STB DDI 3230 LED Indicators

Purpose

The four LEDs on the STB DDI 3230 module provide visual indications of the operating status of module and its two digital input channels. The LED locations and their meanings are described below.

LED Locations

The four LEDs are positioned in a column on the top front of the module directly below the model number. The figure below shows their locations:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Voltage is present on input channel 1.	
		off		Voltage is absent on input channel 1.	
			on	Voltage is present on input channel 2.	
			off	Voltage is absent on input channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.			
blink 1**				The module is in pre-operational mode.	
	flicker*			Field power absent or a PDM short circuit detected.	Check power
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The island bus is not running.	Check network connections, replace NIM
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.					
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.					
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.					

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB DDI 3230 Field Wiring

Summary

The STB DDI 3230 module uses two six-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and a field wiring example is presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3230 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-, three-, or four-wire sensors that draw current up to:

- 100 mA at 30 degrees C
- 50 mA/channel at 60 degrees C

The module has IEC type 2 inputs designed to support sensor signals from solid state devices or mechanical contact switching devices such as relay contacts, push buttons (in normal or harsh environmental conditions), and two- or three-wire proximity switches.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wires in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connections on pin 6.

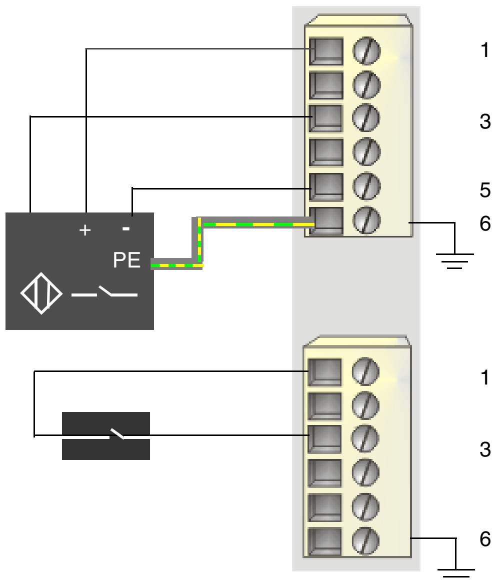
Field Wiring Pinout

The top connector supports the input from sensor 1, and the bottom connector supports the input from sensor 2:

Pin	Top Connector	Bottom Connector
1	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
2	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
3	input from sensor 1	input from sensor 2
4	field power return (to the module)	field power return (to the module)
5	field power return (to the module)	field power return (to the module)
6	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two sensors connected to the STB DDI 3230 module:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
3 input from sensor 1 (top) and sensor 2 (bottom)
5 field power return to the module from sensor 1
6 protective earth connection for actuator 1 (top)

The four-wire sensor on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 6.

STB DDI 3230 Functional Description

Functional Characteristics

The STB DDI 3230 is a two-channel module that handles digital input data from two 24 VDC field sensors. Using the Advantys configuration software, you can customize the following operating parameters on the module:

- an input filter time constant for the module
- *logic normal* or *logic reverse* input polarity for each channel on the module

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameter:

- Input Filter Time Constant

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

> **Note:** Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Input Filter Time Constant

By default, the module filters the two input channels for 1.0 ms on-to-off and 1.0 ms off-to-on. If you want to change this input filtering value, you need to use the Advantys configuration software.

The following filter time constants may be configured:

- 0.2 ms (+/-0.1 ms)
- 0.5 ms (+/-0.1 ms)
- 1.0 ms (+/-0.1 ms)
- 2.0 ms (+/-0.1 ms)
- 4.0 ms (+/-0.1 ms)
- 8.0 ms (+/-0.1 ms)
- 16.0 ms (+/-0.1 ms)

Advantys STB products are designed to perform reliably at 1 ms in normal operating environments (see *p. 62*). If your island is operating in a harsher environment, you may set the filter time constant above 1 ms. In this case, performance will be slower.

If your application requires faster performance and if the island is operating in a low-noise environment, you may set the filter time constant below 1 ms. However, performance reliability cannot be guaranteed when the filter time is below 1 ms.

Warning

UNINTENDED EQUIPMENT OPERATION

Operating with a filter time constant that is faster than 1 ms makes the system more susceptible to power transients and environmental noise.
Qualify the behavior of your system if you set the filter time to 0.2 ms or 0.5 ms.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

To configure the input filter time constant:

Step	Action	Result
1	Double click on the STB DDI 3230 module you want to configure in the island editor.	The selected STB DDI 3230 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Filter Time Constant** row, select the desired time constant.	-

The input filter time constant is configured at the module level. One parameter value is set, and it applies to both input channels.

The value stored in the input filter time constant parameter is 10 times the actual value (in milliseconds) of the filter time constant.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0x02
Index (high byte)	0x20
Sub-index	0
Data Byte 1	0x02 for filter time constant of 0.2 ms 0x05 for filter time constant of 0.5 ms 0x0A for filter time constant of 1.0 ms 0x14 for filter time constant of 2.0 ms 0x28 for filter time constant of 4.0 ms 0x50 for filter time constant of 8.0 ms 0xA0 for filter time constant of 16.0 ms

Input Polarity

By default, the polarity on both input channels is *logic normal*, where:

- an input value of 0 indicates that the physical sensor is off (or the input signal is low)
- an input value of 1 indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or both channels may optionally be configured for *logic reverse*, where:

- an input value of 1 indicates that the physical sensor is off (or the input signal is low)
- an input value of 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from the *logic normal* (0) or back to normal from *logic reverse* (1), use the Advantys configuration software.

You can configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB DDI 3230 you want to configure in the island editor.	The selected STB DDI 3230 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
3	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	Notice that when you select the **Input Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 2, **Channel 1** has normal polarity and **Channel 2** has reverse polarity.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 1 to *logic normal* and channel 2 to *logic reverse*, the **Input Polarity** value changes to 2.

STB DDI 3230 Data and Status for the Process Image

Representing Digital Input Data and Status

The STB DDI 3230 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in two 16-bit registers—one for data and one for error-detection status. The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

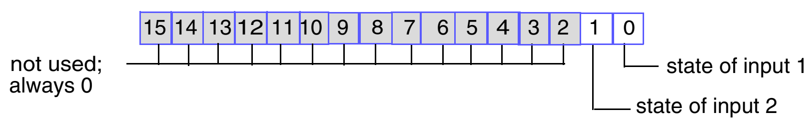
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3230 module is represented by two contiguous registers in this block—the data register followed by the status register. The specific registers used in the block are determined by the module's physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DDI 3230 register in the input block of the process image is the data register. The least significant bit (LSB) in the represents the on/off state of input 1, and the bit to its immediate left represents the on/off state of input 2:

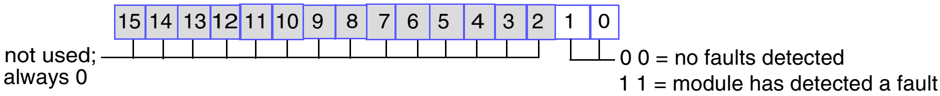
STB DDI 3230 Data Register



Input Status Register

The second STB DDI 3230 register in the input block of the process image is the status register. The STB DDI 3230 performs on-board error input filtering and short circuit power protection. The two LSBs in the status register indicate whether or not the module has detected a fault. The fault might be field power absent or a short circuit on the island's sensor bus:

STB DDI 3230 Status Register



> **Note:** The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
> Field power faults that are local to the input module are reported immediately.

STB DDI 3230 Specifications

Table of Technical Specifications

description		24 VDC IEC type 2 sink input
number of input channels		two
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		as inputs only**
input protection		resistor-limited
isolation	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
nominal logic bus current consumption		70 mA
nominal sensor bus current consumption		30 mA, with no load
input voltage	on	+11 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	6 mA min.
	off	2 mA max.
input impedance		3.3 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	56 VDC, decaying pulse
input filter time constant	default	1.0 ms (+/-0.1 ms)
	user-configurable settings**	0.2 ms (+/-0.1 ms) 0.5 ms (+/-0.1 ms) 1.0 ms (+/-0.1 ms) 2.0 ms (+/-0.1 ms) 4.0 ms (+/-0.1 ms) 8.0 ms (+/-0.1 ms) 16.0 ms (+/-0.1 ms)
input response time	on-to-off	625 µs @ 0.2 ms input filter time
	off-to-on	610 µs @ 0.2 ms input filter time
polarity of the individual input channels	default	*logic normal* on both channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel

sensor bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements	field power voltage	from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

3.2 STB DDI 3420 Digital 24 VDC Sink Input Module (four-channel, three-wire, IEC type 3, 0.5 ms-configurable, short-circuit protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDI 3420 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

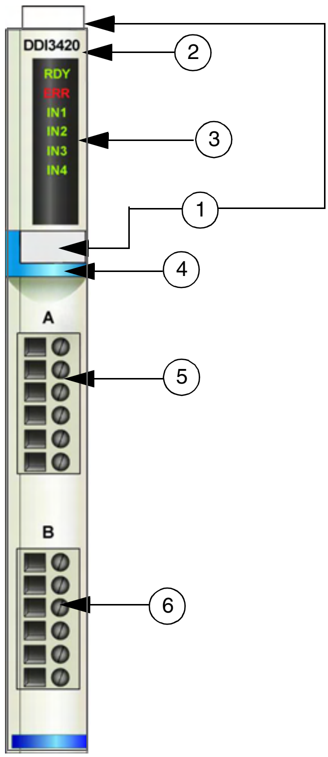
This section contains the following topics:

STB DDI 3420 Physical Description

Physical Characteristics

The STB DDI 3420 is a standard Advantys STB four-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Sensors 1 and 2 are wired to the top connector, and sensors 3 and 4 are wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensors 1 and 2 connect to the top field wiring connector
6 sensors 3 and 4 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

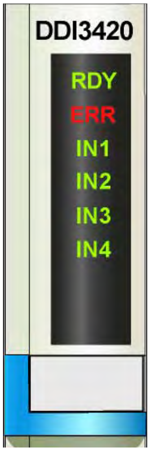
STB DDI 3420 LED Indicators

Overview

The six LEDs on the STB DDI 3420 module provide visual indications of the operating status of the module and its four digital input channels. The LED locations and their meanings are described below.

Location

The six LEDs are positioned in a column at the top of the STB DDI 3420 digital input module. The figure below shows their location:



Indications

The following table defines the meaning of the six LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	IN3	IN4	Meaning	What to Do
off	off					The module is either not receiving logic power or has failed.	Check power
flicker*	off					Auto-addressing is in progress.	
on	off					The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on				Voltage is present on input channel 1.	
		off				Voltage is absent on input channel 1.	
			on			Voltage is present on input channel 2.	
			off			Voltage is absent on input channel 2.	
				on		Voltage is present on input channel 3.	
				off		Voltage is absent on input channel 3.	
					on	Voltage is present on input channel 4.	
					off	Voltage is absent on input channel 4.	
on	on	on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.					

RDY	ERR	IN1	IN2	IN3	IN4	Meaning	What to Do
blink 1**						The module is in pre-operational mode.	
	flicker*					Field power absent or a PDM short circuit detected.	Check power
	blink 1**					A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***					The island bus is not running.	Check network connections, replace NIM
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.						
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.						
***	blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.						

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB DDI 3420 Field Wiring

Summary

The STB DDI 3420 module uses two six-terminal field wiring connectors. Sensors 1 and 2 are wired to the top connector, and sensors 3 and 4 are wired to the bottom connector. The choices of connector types and field wire types are described below, and a field wiring example is presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in kits of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in kits of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3430 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two- or three-wire sensors that draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

The module has IEC type 3 inputs designed to work with sensor signals from mechanical switching devices such as relay contacts, push buttons (in normal-to-moderate environmental conditions), three-wire proximity switches and two-wire proximity switches that have:

- a voltage drop of no more than 8 V
- a minimum operating current capability less than or equal to 2.5 mA
- a maximum off-state current less than or equal to 1.5 mA

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire’s jacket for the module connection.

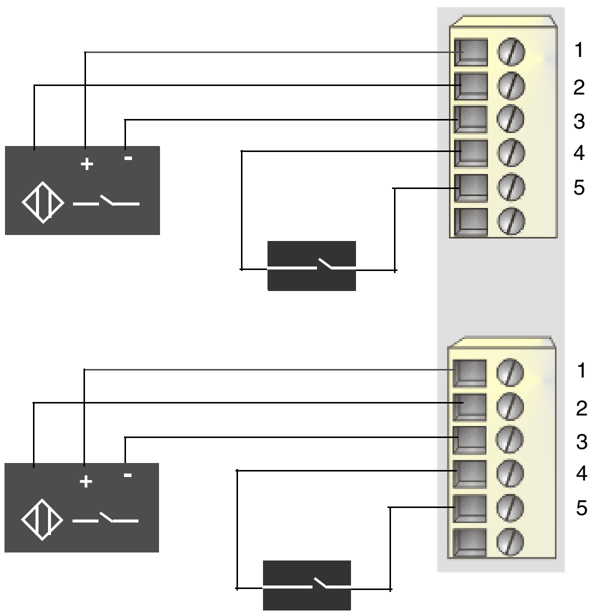
Field Wiring Pinout

The top connector supports sensors 1 and 2, and the bottom connector supports sensors 3 and 4:

Pin	Top Connector	Bottom Connector
1	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
2	input from sensor 1	input from sensor 3
3	field power return (to the module)	field power return (to the module)
4	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
5	input from sensor 2	input from sensor 4
6	field power return (to the module)	field power return (to the module)

Sample Wiring Diagram

The following field wiring example shows two- and three-wire sensors connected to the STB DDI 3420:



1 +24 VDC for sensor 1 (top and for sensor 3 (bottom)
2 input from sensor 1 (top) and sensor 3 (bottom)
3 field power return from sensor 1 (top) and sensor 3 (bottom)
4 +24 VDC for sensor 2 (top and for sensor 4 (bottom)
5 input from sensor 2 (top) and sensor 4 (bottom)

STB DDI 3420 Functional Description

Functional Characteristics

The STB DDI 3420 is a four-channel module that handles digital input data from four 24 VDC field sensors. Using the Advantys configuration software, you can customize the following operating parameters on the module:

- an input filter time constant for the module
- *logic normal* or *logic reverse* input polarity for each channel on the module

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameter:

- Input Filter Time Constant

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Input Filter Time Constant

By default, the module filters each input channel for 1.0 ms on-to-off and 1.0 ms off-to-on. To increase or lower the input filtering value, you need to use the Advantys configuration software.

The following user-configurable input filtering times are available:

- 0.5 ms (+/-0.25 ms)
- 1.0 ms (+/-0.25 ms)
- 2.0 ms (+/-0.25 ms)
- 4.0 ms (+/-0.25 ms)
- 8.0 ms (+/-0.25 ms)
- 16.0 ms (+/-0.25 ms)

Advantys STB products are designed to perform reliably at 1 ms in normal operating environments (see *p. 62*). If your island is operating in a harsher environment, you may set the filter time constant above 1 ms. In this case, performance will be slower.

If your application requires faster performance and if the island is operating in a low-noise environment, you may set the filter time constant below 1 ms. However, performance reliability cannot be guaranteed when the filter time is below 1 ms.

Warning

UNINTENDED EQUIPMENT OPERATION

Operating with a filter time constant that is faster than 1 ms makes the system more susceptible to power transients and environmental noise.
Qualify the behavior of your system if you set the filter time to 0.5 ms.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

To configure the input filter time constant:

Step	Action	Result
1	Double click on the STB DDI 3420 you want to configure in the island editor.	The selected STB DDI 3420 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Filter Time Constant** row, select the desired time constant.	

The input filter time constant is configured at the module level. One parameter value is set, and it applies to all four input channels.

The value stored in the input filter time constant parameter is 4 times the actual value (in milliseconds) of the filter time constant.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0x02
Index (high byte)	0x20
Sub-index	0
Data Byte 1	0x02 for filter time constant of 0.5 ms 0x04 for filter time constant of 1.0 ms 0x08 for filter time constant of 2.0 ms 0x10 for filter time constant of 4.0 ms 0x20 for filter time constant of 8.0 ms 0x40 for filter time constant of 16.0 ms

Input Polarity

By default, the polarity on all four input channels is *logic normal*, where:

- an input value of 0 indicates that the physical sensor is off (or the input signal is low)
- an input value of 1indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an input value of 1 indicates that the physical sensor is off (or the input signal is low)
- an input value of 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from *logic normal* (0) or back to normal from *logic reverse* (1), you need to use the Advantys configuration software.

You can configure input polarity values independently on each input channel:

Step	Action	Result
1	Double click on the STB DDI 3420 you want to configure in the island editor.	The selected STB DDI 3420 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
4	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3** and **Channel 4** appear.
5a	To change the polarity settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 15 (0x0 to 0xF), where 0 means that all channels have normal polarity and 0xF means that all four channels have reverse polarity.	Notice that when you select the **Input Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new integer value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 6, **Channel 1** and **Channel 4** will have *normal polarity*, while **Channel 2** and **Channel 3** will have *reverse polarity*.

Step	Action	Result
5b	To change the polarity settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new integer value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channels 1 and 4 to *normal polarity* and channels 2 and 3 to *reverse polarity*, the **Input Polarity** value changes to 6.

STB DDI 3420 Data and Status for the Process Image

Representing Digital Input Data and Status

The STB DDI 3420 sends a representation of the operating state of its input points to the NIM. The NIM stores this information in two 16-bit registers—one for data and one for error-detection status. The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

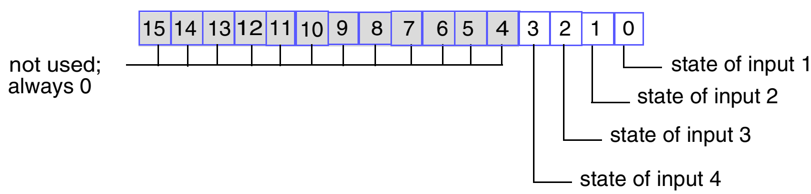
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3420 module is represented by two contiguous registers in this block—the data register followed by the status register. The specific registers used are based on the module's physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DDI 3420 register in the input block of the process image is the data register. The least significant bit (LSB) in the represents the on/off state of input 1, and the three bits to its immediate left represent the on/off states of inputs 2, 3, and 4 respectively:

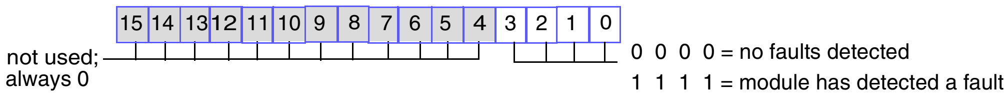
STB DDI 3420 Data Register



Input Status Register

The second STB DDI 3420 register in the input block of the process image is the status register. The STB DDI 3420 provides on-board error input filtering and short circuit power protection. The four LSBs indicate whether or not the module has detected a fault. The fault might be field power absent or a short circuit on the island's sensor bus:

STB DDI 3420 Status Register



Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB DDI 3420 Specifications

Table of Technical Specifications

description		24 VDC IEC type 3 sink input
number of input channels		four
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		as inputs only**
input protection		resistor-limited
isolation	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
nominal logic bus current consumption		60 mA
nominal sensor bus current consumption		0 mA, with no load
input voltage	on	11 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	2.5 mA min.
	off	1.2 mA max.
input impedance		2.8 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	56 VDC, decaying pulse
input filter time constant	default	1.0 ms (+/-0.25 ms)
	user-configurable settings**	0.5 ms (+/-0.25 ms)) 1.0 ms (+/-0.25 ms) 2.0 ms (+/-0.25 ms) 4.0 ms (+/-0.25 ms) 8.0 ms (+/-0.25 ms) 16.0 ms (+/-0.25 ms)
input response time	on-to-off	1.35 ms @ 05 ms input filter time
	off-to-on	925 µs @ 0.5 ms input filter time
polarity of the individual input channels	default	*logic normal* on all channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel

sensor bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements	field power voltage	from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

3.3 STB DDI 3425 Digital 24 VDC Sink Input Module (four-channel, three-wire, IEC type 3)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDI 3425 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

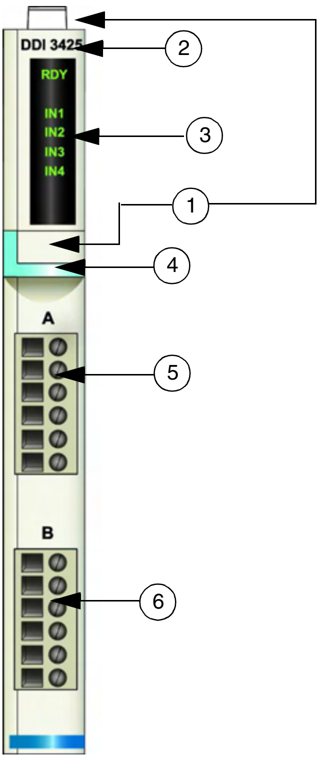
This section contains the following topics:

STB DDI 3425 Physical Description

Physical Characteristics

The STB DDI 3425 is a basic Advantys STB four-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Sensors 1 and 2 are wired to the top connector, and sensors 3 and 4 are wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensors 1 and 2 connect to the top field wiring connector
6 sensors 3 and 4 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

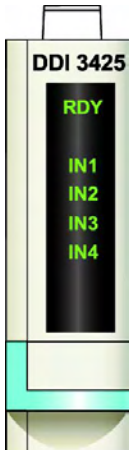
STB DDI 3425 LED Indicators

Overview

The five LEDs on the STB DDI 3425 module provide visual indications of the operating status of the module and its four digital input channels.

Location

The LEDs are located on the front bezel of the module below the model number:



Indications

The following table defines the meaning of the five LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	IN1	IN2	IN3	IN4	Meaning
off					The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*					Auto-addressing is in progress.
on					The module has achieved all of the following: • it has power • it has passed its confidence tests • it is operational
	on				Voltage is present on input channel 1.
	off				Voltage is absent on input channel 1.
		on			Voltage is present on input channel 2.
		off			Voltage is absent on input channel 2.
			on		Voltage is present on input channel 3.
			off		Voltage is absent on input channel 3.
				on	Voltage is present on input channel 4.
				off	Voltage is absent on input channel 4.
blink 1**					The module is in pre-operational mode.
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.					
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.					

STB DDI 3425 Field Wiring

Summary

The STB DDI 3425 module uses two six-terminal field wiring connectors. Sensors 1 and 2 are wired to the top connector, and sensors 3 and 4 are wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in kits of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in kits of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3425 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two- or three-wire sensors that draw current up to:

- 50 mA/channel at 30 degrees C
- 25 mA/channel at 60 degrees C

The module has IEC type 3 inputs designed to work with sensor signals from mechanical switching devices such as relay contacts, push buttons (in normal-to-moderate environmental conditions), three-wire proximity switches and two-wire proximity switches that have:

- a voltage drop of no more than 8 V
- a minimum operating current capability less than or equal to 2.5 mA
- a maximum off-state current less than or equal to 1.5 mA

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

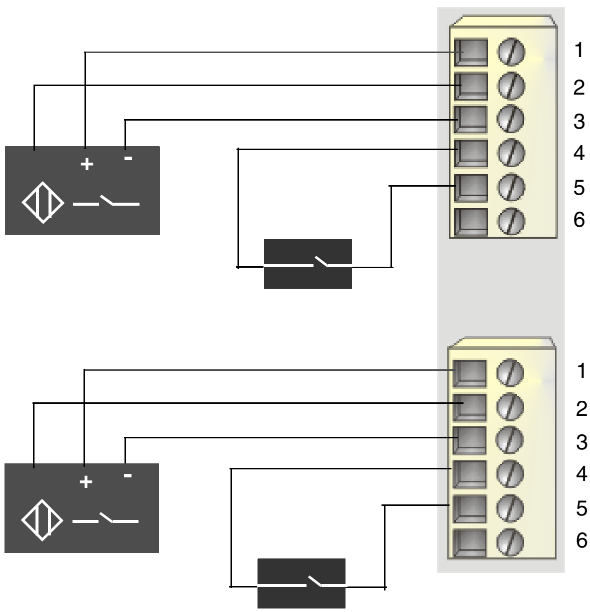
Field Wiring Pinout

The top connector supports sensors 1 and 2, and the bottom connector supports sensors 3 and 4:

Pin	Top Connector	Bottom Connector
1	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
2	input from sensor 1	input from sensor 3
3	field power return (to the module)	field power return (to the module)
4	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
5	input from sensor 2	input from sensor 4
6	field power return (to the module)	field power return (to the module)

Sample Wiring Diagram

The following field wiring example shows two- and three-wire sensors connected to the STB DDI 3425:



1 +24 VDC for sensor 1 (top and for sensor 3 (bottom)
2 input from sensor 1 (top) and sensor 3 (bottom)
3 field power return from sensor 1 (top) and sensor 3 (bottom)
4 +24 VDC for sensor 2 (top and for sensor 4 (bottom)
5 input from sensor 2 (top) and sensor 4 (bottom)

STB DDI 3425 Functional Description

Functional Characteristics

The STB DDI 3425 is a four-channel module that handles digital input data from four 24 VDC field sensors. It does not support user-configurable operating parameters or reflex actions.

Input Filter Time Constant

The module filters each input channel for 3.0 ms on-to-off and 3.0 ms off-to-on.

Input Polarity

The input polarity on all four input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1 indicates that the physical sensor is on (or the input signal is high)

STB DDI 3425 Data for the Process Image

Representing Digital Input Data

The STB DDI 3425 sends a representation of the operating state of its input points to the NIM. The NIM stores this information in a 16-bit data register. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

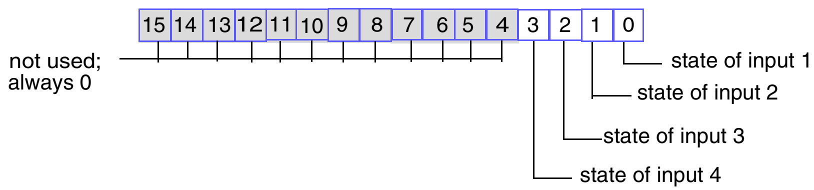
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3425 module is represented by one register in this block. The specific registers used are based on the module's physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Input Data Register

The least significant bit in the register represents the on/off state of input 1, and the three bits to its immediate left represent the on/off states of inputs 2, 3, and 4 respectively:

STB DDI 3425 Data Register



STB DDI 3425 Specifications

Table of Technical Specifications

description		24 VDC IEC type 1+ sink input
number of input channels		four
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		no
input protection		resistor-limited
isolation	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
nominal logic bus current consumption		60 mA
nominal sensor bus current consumption		0 mA, with no load
input voltage	on	11 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	2.5 mA min.
	off	1.2 mA max.
input impedance		2.8 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	56 VDC, decaying pulse
input filter time constant		3.0 ms
input response time	on-to-off	3.8 ms
	off-to-on	3.5 ms
polarity		*logic normal* on all channels
sensor bus power for accessories		50 mA/channel @ 30 degrees C
		25 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

3.4 STB DDI 3610 Digital 24 VDC Sink Input Module (six-channel, two-wire, IEC type 1, fixed 1 ms)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDI 3610 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

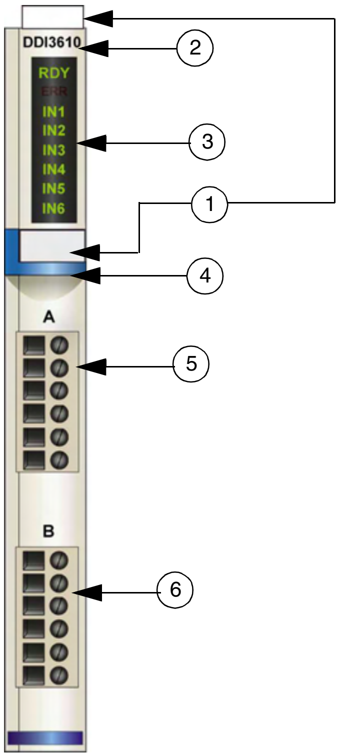
This section contains the following topics:

STB DDI 3610 Physical Description

Physical Characteristics

The STB DDI 3610 is a standard Advantys STB six-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Sensors 1, 2 and 3 are wired to the top connector, and sensors 4, 5 and 6 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensors 1 ... 3 connect to the top field wiring connector
6 sensors 4 ... 6 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DDI 3610 LED Indicators

Overview

The eight LEDs on the STB DDI 3610 module are visual indications of the operating status of the module and its six digital input channels. The LED locations and their meanings are described below.

Location

The eight LEDs are positioned in a column on the top front of the STB DDI 3610 digital input module. The figure below shows their location:

Indications

The following table defines the meaning of the eight LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	IN3	IN4	IN5	IN6	Meaning	What to Do
off	off							The module is either not receiving logic power or has failed.	Check power
flicker*	off							Auto-addressing is in progress.	

RDY	ERR	IN1	IN2	IN3	IN4	IN5	IN6	Meaning	What to Do
on	off							The module has achieved all of the following: • it has power • it has passed its confidence tests • it is operational	
		on						Voltage is present on input channel 1.	
		off						Voltage is absent on input channel 1.	
			on					Voltage is present on input channel 2.	
			off					Voltage is absent on input channel 2.	
				on				Voltage is present on input channel 3.	
				off				Voltage is absent on input channel 3.	
					on			Voltage is present on input channel 4.	
					off			Voltage is absent on input channel 4.	
						on		Voltage is present on input channel 5.	
						off		Voltage is absent on input channel 5.	
							on	Voltage is present on input channel 6.	
							off	Voltage is absent on input channel 6.	
on	on	on	on	on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.							

RDY	ERR	IN1	IN2	IN3	IN4	IN5	IN6	Meaning	What to Do
blink 1**								The module is in pre-operational mode.	
	flicker*							Field power absent or a PDM short circuit detected.	Check power
	blink 1**							A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***							The island bus is not running.	Check network connections, replace NIM
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.								
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.								
***	blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.								

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB DDI 3610 Field Wiring

Summary

The STB DDI 3610 module uses two six-terminal field wiring connectors. Sensors 1, 2 and 3 are wired to the top connector, and sensors 4, 5 and 6 are wired to the bottom connector. The choices of connector types and field wire types are described below, and a field wiring example is presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3610 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire sensors.

The module has IEC type 1 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 .to 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

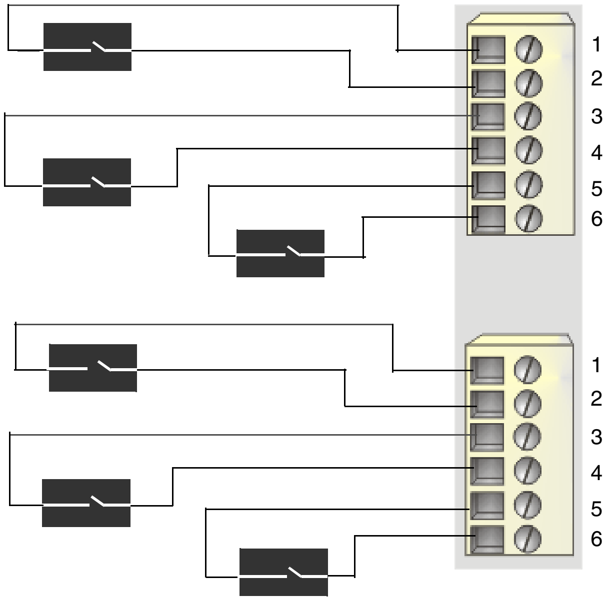
Field Wiring Pinout

The top connector supports digital sensors 1, 2 and 3; the bottom connector supports digital sensors 4, 5 and 6:

Pin	Top Connector	Bottom Connector
1	+24 VDC sensor bus power	+24 VDC sensor bus power
2	input from sensor 1	input from sensor 4
3	+24 VDC sensor bus power	+24 VDC sensor bus power
4	input from sensor 2	input from sensor 5
5	+24 VDC sensor bus power	+24 VDC sensor bus power
6	input from sensor 3	input from sensor 6

Sample Wiring Diagram

The following illustration shows a field wiring example where six two-wire switches are connected to the STB DDI 3610:



1 +24 VDC to sensor 1 (top) and to sensor 4 (bottom)
2 input from sensor 1 (top) and sensor 4 (bottom)
3 +24 VDC to sensor 2 (top) and to sensor 5 (bottom)
4 input from sensor 2 (top) and sensor 5 (bottom)
5 +24 VDC to sensor 3 (top) and to sensor 6 (bottom)
6 input from sensor 3 (top) and sensor 6 (bottom)

STB DDI 3610 Functional Description

Functional Characteristics

The STB DDI 3610 is a six-channel module that handles digital input data from six 24 VDC field sensors. Using the Advantys configuration software, you can customize each channel for *logic normal* or *logic reverse* input polarity.

Input Polarity

By default, the polarity on all six input channels is *logic normal*, where:

- an input value of 0 indicates that the physical sensor is off (or the input signal is low)
- an input value of 1 indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an input value of 1 indicates that the physical sensor is off (or the input signal is low)
- an input value of 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB DDI 3610 you want to configure in the island editor.	The selected STB DDI 3610 module opens in the software module editor.
2	Choose the format in which you want your values to be displayed by either checking or unchecking the **Hexadecimal** checkbox (at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
4	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3**, **Channel 4**, **Channel 5** and **Channel 6** appear.
5a	To change the polarity settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 63 (0x0 to 0x3F), where 0 means that all six channels have normal polarity and 0x3F means that all six channels have reverse polarity.	Notice that when you select the **Input Polarity** value, the maxi/min values of the range appear at the bottom of the module editor screen. Notice that when you accept a new integer value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 0x2F, **Channel 5** will have *normal polarity* and the other five channels will have *reverse polarity*.

Step	Action	Result
5b	To change the polarity settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new integer value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 5 to *normal polarity* and the other five channel to *reverse polarity*, the **Input Polarity** value changes to 0x2F.

STB DDI 3610 Data for the Process Image

Representing Digital Input Data

The STB DDI 3610 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in two 16-bit registers—one for data and one for error-detection status. The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

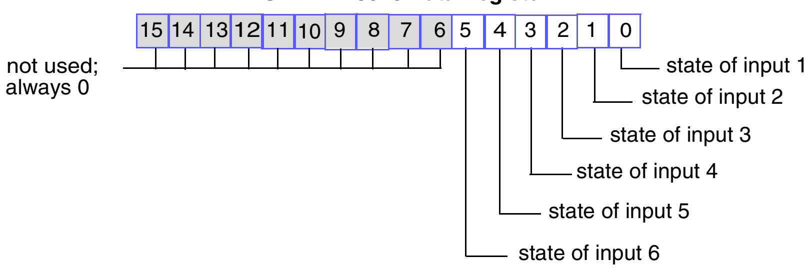
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3610 module is represented by two contiguous registers in this block—the data register followed by the status register. The specific registers used in the block are determined by the module's physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DDI 3610 register in the input block of the process image is the data register. The least significant bit (LSB) represents the on/off state of input 1, and the five bits to its immediate left represent the on/off states of inputs 2, 3, 4, 5 and 6, respectively:

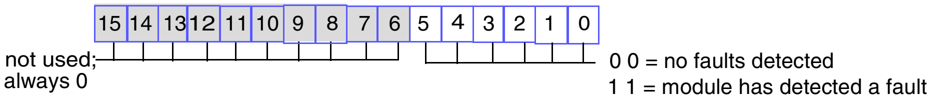
STB DDI 3610 Data Register



Input Status Register

The second STB DDI 3610 register in the input block of the process image is the status register. The STB DDI 3610 provide on-board error input filtering and short circuit power protection. The six LSBs indicate whether or not the module has detected a fault. The fault might be field power absent or a short circuit on the island's sensor bus:

STB DDI 3610 Status Register



Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB DDI 3610 Specifications

Table of Technical Specifications

description		24 VDC IEC type 1 sink input
number of input channels		six
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent
reflex actions supported		for inputs only**
input protection		resistor-limited
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
maximum logic bus current consumption		70 mA
nominal sensor bus current consumption		0 mA, with no load
input voltage	on	+15 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	2 mA min.
	off	0.5 mA max.
input impedance		5.3 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	56 VDC, decaying pulse
input filter time constant		1.0 ms
input response time	on-to-off	1.74 ms
	off-to-on	1.21 ms
polarity of the individual input channels	default	*logic normal* on both channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel
field power requirements		from a 24 VDC PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

3.5 STB DDI 3615 Digital 24 VDC Sink Input Module (six-channel, two-wire, IEC type 1)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDI 3615 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

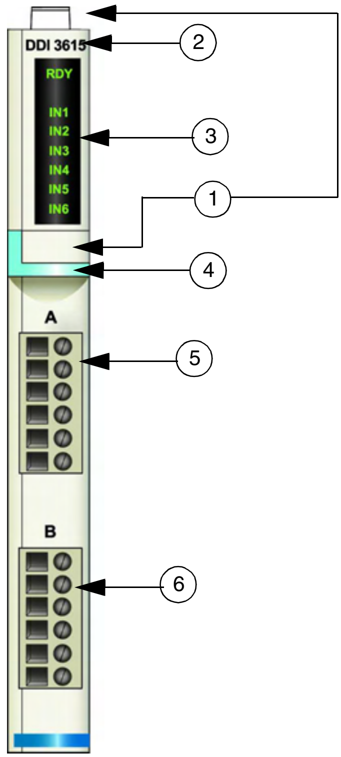
This section contains the following topics:

STB DDI 3615 Physical Description

Physical Characteristics

The STB DDI 3615 is a basic Advantys STB six-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Sensors 1, 2 and 3 are wired to the top connector, and sensors 4, 5 and 6 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensors 1 ... 3 connect to the top field wiring connector
6 sensors 4 ... 6 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DDI 3615 LED Indicators

Overview

The seven LEDs on the STB DDI 3615 module are visual indications of the operating status of the module and its six digital input channels.

Location

The LEDs are located on the front bezel of the module below the model number

Indications

The following table defines the meaning of the seven LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	IN1	IN2	IN3	IN4	IN5	IN6	Meaning
off							The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*							Auto-addressing is in progress.
on							The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
	on						Voltage is present on input channel 1.
	off						Voltage is absent on input channel 1.
		on					Voltage is present on input channel 2.
		off					Voltage is absent on input channel 2.
			on				Voltage is present on input channel 3.
			off				Voltage is absent on input channel 3.
				on			Voltage is present on input channel 4.
				off			Voltage is absent on input channel 4.
					on		Voltage is present on input channel 5.
					off		Voltage is absent on input channel 5.
						on	Voltage is present on input channel 6.
						off	Voltage is absent on input channel 6.

RDY	IN1	IN2	IN3	IN4	IN5	IN6	Meaning
blink 1**							The module is in pre-operational mode.
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.						
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.						

STB DDI 3615 Field Wiring

Summary

The STB DDI 3615 module uses two six-terminal field wiring connectors. Sensors 1 ... 3 are wired to the top connector, and sensors 4 ... 6 are wired to the bottom connector.

Connectors

Use a set of either:

- Two *screw type* field wiring connectors, available in a kit of 20 (model STB XTS 1100)
- Two *spring clamp* field wiring connectors, available in a kit of 20 (model STB XTS 2100)

Note: These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3615 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire sensors.

The module has IEC type 1 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.51 ... 1.29 mm (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

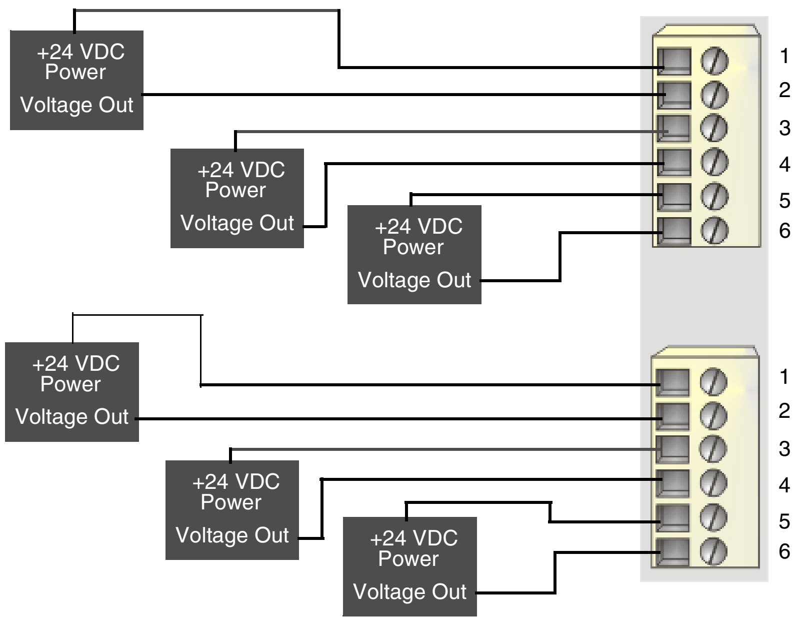
Field Wiring Pinout

The top connector supports digital sensors 1, 2 and 3; the bottom connector supports digital sensors 4, 5 and 6. Two terminals on each connector support each of the six sensors:

Pin	Top Connector	Bottom Connector
1	+24 VDC Field Power (from the PDM)	+24 VDC Field Power (from the PDM)
2	Input from Sensor 1	Input from Sensor 4
3	+24 VDC Field Power (from the PDM)	+24 VDC Field Power (from the PDM)
4	Input from Sensor 2	Input from Sensor 5
5	+24 VDC Field Power (from the PDM)	+24 VDC Field Power (from the PDM)
6	Input from Sensor 3	Input from Sensor 6

Sample Wiring Diagram

The following illustration shows an example where six two-wire sensors are field wiring to the STB DDI 3615.



STB DDI 3615 Functional Description

Functional Characteristics

The STB DDI 3615 is a six-channel module that handles digital input data from six 24 VDC field sensors. It does not support user-configurable operating parameters or reflex actions.

Input Polarity

The input polarity on all six input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1 indicates that the physical sensor is on (or the input signal is high)

STB DDI 3615 Data for the Process Image

Representing Digital Input Data

The STB DDI 3615 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in a 16-bit data register. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

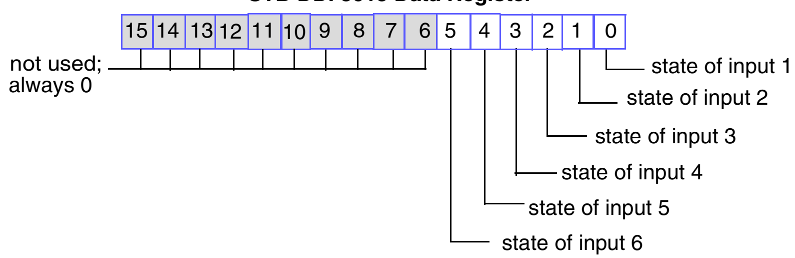
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3615 module is represented by one register in this block. The specific registers used in the block are determined by the module's physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The least significant bit represents the on/off state of input 1, and the five bits to its immediate left represent the on/off states of inputs 2, 3, 4, 5 and 6, respectively:

STB DDI 3615 Data Register



STB DDI 3615 Specifications

Table of Technical Specifications

description		24 VDC IEC type 1 sink input
number of input channels		six
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		no
input protection		resistor-limited
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
maximum logic bus current consumption		70 mA
nominal sensor bus current consumption		0 mA, with no load
input voltage	on	+15 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	2 mA min.
	off	0.5 mA max.
input impedance		5.3 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	56 VDC, decaying pulse
input filter time constant		5.0 ms
input response time	on-to-off	5.75 ms
	off-to-on	5.25 ms
polarity of the individual input channels		*logic normal*
field power requirements	field power voltage	from a 24 VDC PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

3.6 STB DDI 3725 High Density Input Module

At a Glance

Introduction

The STB DDI 3725 - described below - is a basic Advantys STB sixteen-channel digital input module.

What's in this Section?

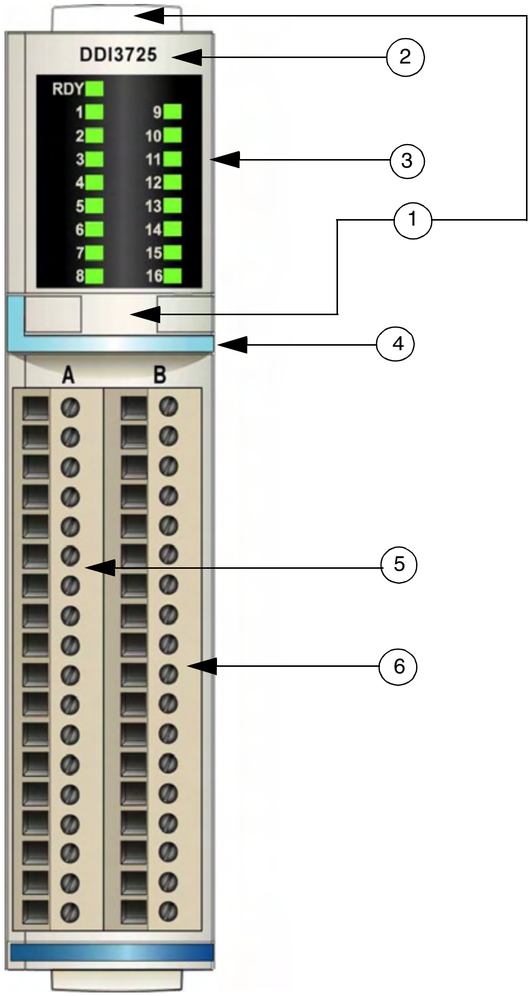
This section contains the following topics:

STB DDI 3725 Physical Description

Physical Characteristics

The STB DDI 3725 is a basic Advantys STB sixteen-channel digital input module that reads inputs from 24 VDC sensor devices and provides power to the sensors. The module mounts in a size 3 base and uses two 18-pin field wiring connectors. The connectors are positioned side-by-side on the bezel; connector A (which supports input channels 1 ... 8) is on the left, and connector B (which supports input channels 9 ... 16) is on the right.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light blue identification stripe, indicating a digital DC input module
5 sensor power groups 1 and 2 are wired to the left connector (A)
6 sensor power groups 3 and 4 are wired to the right connector (B)

Module Accessories

Required

- an STB XBA 3000 (see *p. 808*) base
- two pairs of 18-terminal field wiring connectors, either STB XTS 1180 screw type connectors or STB XTS 2180 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	28.1 mm (1.11 in)
height	module only	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

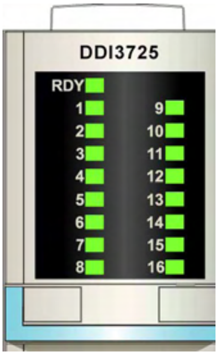
STB DDI 3725 LED Indicators

Overview

The seventeen LEDs on the STB DDI 3725 module are visual indications of the operating status of the module and its sixteen digital input channels.

Location

The LEDs are positioned in two columns at the top of the STB DDI 3725 digital input module's bezel. Indicators for the RDY signal and input channels 1...8 are in the left column, and input channels 9...16 in the right column.



Indications

The following two-part table defines the meaning of the 17 LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter). The STB DDI 3725 high-density digital input module features 16 green LEDs to indicate the state of each input point, and one green RDY LED to indicate the health of the input module. The first part of the table corresponds to the left column of LED indicators:

RDY	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	Meaning
off									The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*									Auto-addressing is in progress.
blink 1**									The module is in pre-operational mode.
on									The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
	on								Voltage is present on input ch. 1.
	off								Voltage is absent on input ch. 1.
		on							Voltage is present on input ch. 2.
		off							Voltage is absent on input ch. 2.
			on						Voltage is present on input ch. 3.
			off						Voltage is absent on input ch. 3.
				on					Voltage is present on input ch. 4.
				off					Voltage is absent on input ch. 4.
					on				Voltage is present on input ch. 5.
					off				Voltage is absent on input ch. 5.
						on			Voltage is present on input ch. 6.
						off			Voltage is absent on input ch. 6.
							on		Voltage is present on input ch. 7.
							off		Voltage is absent on input ch. 7.
								on	Voltage is present on input ch. 8.
								off	Voltage is absent on input ch. 8.
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.									
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.									

The second part of the table describes the combination of the left column RDY indicator plus the right column LED indicators:

RDY	IN9	IN10	IN11	IN12	IN13	IN14	IN15	IN16	Meaning
	on								Voltage is present on input ch. 9
	off								Voltage is absent on input ch. 9.
		on							Voltage is present on input ch. 10.
		off							Voltage is absent on input ch. 10.
			on						Voltage is present on input ch. 11.
			off						Voltage is absent on input ch. 11.
				on					Voltage is present on input ch. 12.
				off					Voltage is absent on input ch. 12.
					on				Voltage is present on input ch. 13.
					off				Voltage is absent on input ch. 13.
						on			Voltage is present on input ch. 14
						off			Voltage is absent on input ch. 14.
							on		Voltage is present on input ch. 15.
							off		Voltage is absent on input ch. 15.
								on	Voltage is present on input ch. 16.
								off	Voltage is absent on input ch. 16
blink 1**									The module is in pre-operational mode.
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.								
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.								

STB DDI 3725 Field Wiring

Summary

The STB DDI 3725 module uses two eighteen-terminal field wiring connectors. Sensor power group 1 (sensors 1-4) and sensor power group 2 (sensors 5-8) are wired to the left connector (A); sensor power group 3 (sensors 9-12) and sensor power group 4 (sensors 13-16) are wired to the right connector (B).

Connectors

Use a set of either:

- two STB XTS 1180 *screw type* field wiring connectors, available in a kit of 2
- two STB XTS 2180 *spring clamp* field wiring connectors, available in a kit of 2

These field wiring connectors each have eighteen-connection terminals, with a 3.81 mm (0.15 in) pitch between each pin.

Field Sensors

The STB DDI 3725 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire and three-wire sensors.

The module has IEC type 3 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions, and solid state input devices such as proximity switches.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.51 ... 1.52 mm^2 (24 ... 16 AWG).

We recommend that you strip 9 mm from the wire's jacket for the module connection.

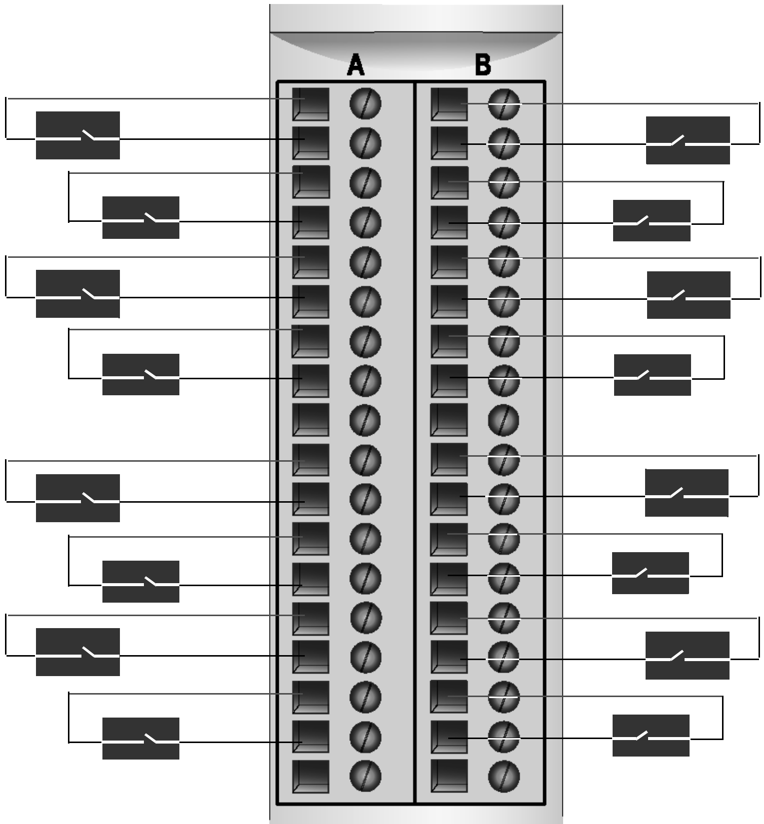
Field Wiring Pinout

The left connector supports digital sensor power groups 1 and 2; the right connector supports digital sensor power groups 3 and 4. Two terminals on each connector support each of the sixteen sensors, as follows:

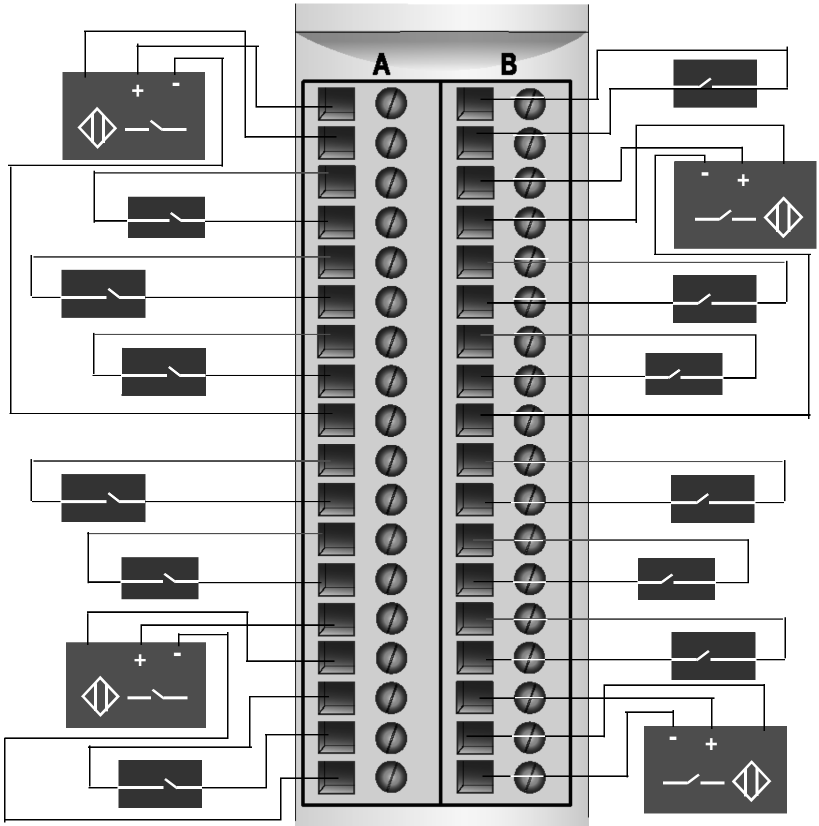
Pin	Left Connector	Right Connector
1	Sensor power group 1 (+)	Sensor power group 3 (+)
2	Input from Sensor 1	Input from Sensor 9
3	Sensor power group 1 (+)	Sensor power group 3 (+)
4	Input from Sensor 2	Input from Sensor 10
5	Sensor power group 1 (+)	Sensor power group 3 (+)
6	Input from Sensor 3	Input from Sensor 11
7	Sensor power group 1 (+)	Sensor power group 3 (+)
8	Input from Sensor 4	Input from Sensor 12
9	Sensor power (-) for a 3-wire sensor (PDM-)	Sensor power (-) for a 3-wire sensor (PDM-)
10	Sensor power group 2 (+)	Sensor power group 4 (+)
11	Input from Sensor 5	Input from Sensor 13
12	Sensor power group 2 (+)	Sensor power group 4 (+)
13	Input from Sensor 6	Input from Sensor 14
14	Sensor power group 2 (+)	Sensor power group 4 (+)
15	Input from Sensor 7	Input from Sensor 15
16	Sensor power group 2 (+)	Sensor power group 4 (+)
17	Input from Sensor 8	Input from Sensor 16
18	Sensor power (-) for a 3-wire sensor (PDM-)	Sensor power (-) for a 3-wire sensor (PDM-)

Sample Wiring Diagrams

The following illustration shows 16 two-wire sensors: sensors 1-4 in group 1 and sensors 5-8 in group 2 connected to the left-side connector (A); and sensors 9-12 in group 3 and sensors 13-16 in group 4 connected to the right-side connector (B). When only two-wire sensors are used, pins 9 and 18 on both connectors are not used:



The following illustration shows you how you could connect four 3-wire sensors - one per input group - using the pins 9 and 18:



STB DDI 3725 Functional Description

Functional Characteristics

The STB DDI 3725 is a sixteen-channel module that handles digital input data from 4 groups of four 24 VDC field sensors. The module's operating parameters are auto-configured when the module is installed. The module does not support user-configurable operating parameters or reflex actions.

Input Polarity

The input polarity on all sixteen input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1 indicates that the physical sensor is on (or the input signal is high)

Module Sensor Power

The module provides sensor power on a per group basis. Refer to the Field Wiring Pinout section, below, for a listing of sensor power groups. Each sensor power connection is thermally protected. In the event of a short-circuit, all field devices that receive power from this connection will no longer receive power. When the short-circuit condition is removed, power will be restored to all devices in that sensor power group.

STB DDI 3725 Data for the Process Image

Representing Digital Input Data

The STB DDI 3725 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in a 16-bit data register. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

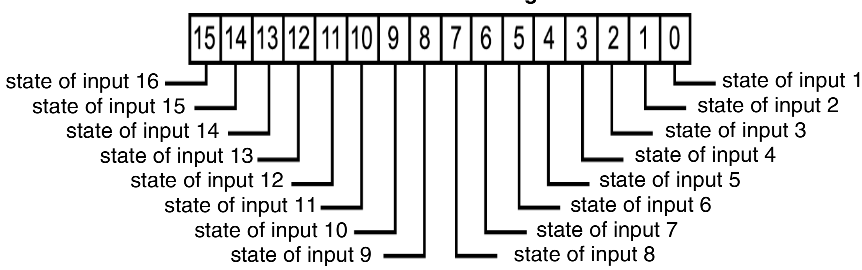
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB DDI 3725 module is represented by one register in this block. The specific registers used in the block are determined by the module's physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The least significant bit represents the on/off state of input 1, and all remaining bits to its left represent the on/off states of inputs 2...16, respectively:

STB DDI 3725 Data Register



STB DDI 3725 Specifications

Table of Technical Specifications

description		24 VDC IEC type 3 sink input
number of input channels		16
module width		28.1 mm (1.11 in)
I/O base		STB XBA 3000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		no
input protection		resistor-limited
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		the module is internally protected from damage
maximum logic bus current consumption		150 mA
nominal sensor bus current consumption		0 mA, with no load
Sensor power	per group	50 mA
	per module	200 mA
input voltage	on	+11 ... 30 VDC
	off	-3 ... +5 VDC
input current	on	2 mA min. @ 11V
	off	1.5 mA
input impedance		5.3 kΩ @ 30 V
absolute maximum input	continuous	30 VDC
	for 1.3 ms	35 VDC, decaying pulse
input filter time constant		1 ms
input response time	on-to-off	2 ms
	off-to-on	2 ms
polarity of the individual input channels		*logic normal*
field power requirements	field power voltage	from a 24 VDC PDM
* Basic NIMs do not allow the user to hot swap I/O modules.		

3.7 STB DAI 5230 Digital 115 VAC Input Module (two-channel, three-wire, IEC type 1)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DAI 5230 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

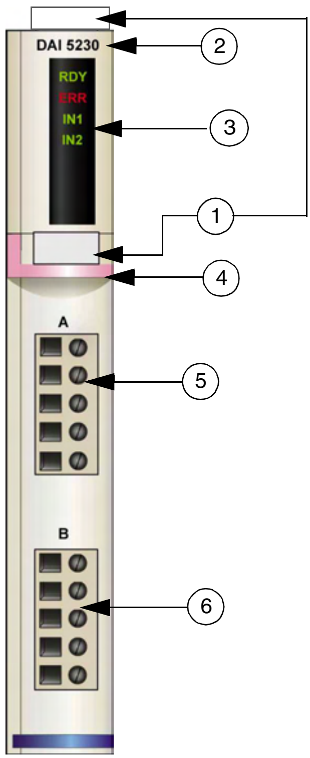
This section contains the following topics:

STB DAI 5230 Physical Description

Physical Characteristics

The STB DAI 5230 is a standard Advantys STB two-channel digital input module that reads inputs from 115 VAC sensor devices and provides power to the sensors. The module mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 pink identification stripe, indicating a digital AC input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

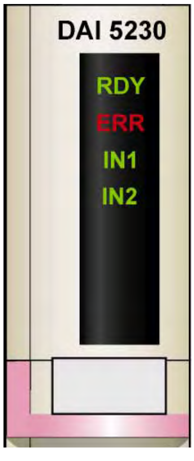
STB DAI 5230 LED Indicators

Purpose

The four LEDs on the STB DAI 5230 module provide visual indications of the operating status of the module and its two digital input channels. Their locations and meanings are described below.

Location

The four LEDs are located in a column on the top of the front bezel of the module, directly below the model number:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Voltage is present on input channel 1.	
		off		Voltage is absent on input channel 1.	
			on	Voltage is present on input channel 2.	
			off	Voltage is absent on input channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.			
blink 1**				The module is in pre-operational mode.	
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The island bus is not running.	Check network connections, replace NIM

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

STB DAI 5230 Field Wiring

Summary

The STB DAI 5230 module uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Sensors

The STB DAI 5230 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-, three-, or four-wire sensors that draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

The module has IEC type 1 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

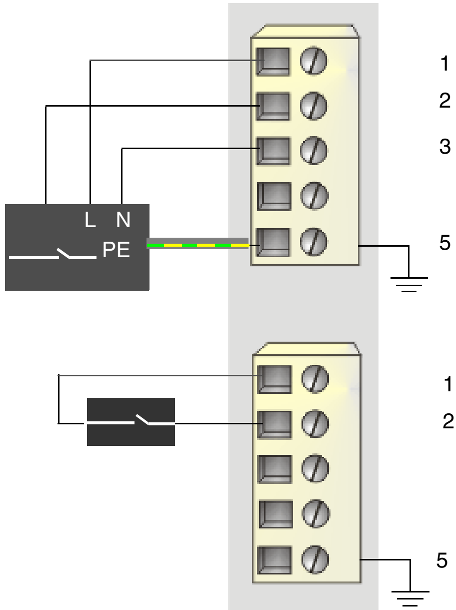
Field Wiring Pinout

The top connector supports sensor 1, and the bottom connector supports sensor 2:

Pin	Top Connector	Bottom Connector
1	115 VAC sensor bus power (L)	115 VAC sensor bus power (L)
2	input from sensor 1	input from sensor 2
3	field power neutral (to the module)	field power neutral (to the module)
4	field power neutral (to the module)	field power neutral (to the module)
5	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two sensors connected to an STB DAI 5230 module:



1 115 VAC (L) to sensor 1 (top) and to sensor 2 (bottom)
2 input from sensor 1 (top) and from sensor 2 (bottom)
3 field power neutral from sensor 1
5 PE connection point for field device (top)

The four-wire sensor on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DAI 5230 Functional Description

Functional Characteristics

The STB DAI 5230 is a two-channel module that handles digital input data from two 115 VAC field sensors. Each channel is user-configurable for *logic normal* or *logic reverse* input polarity.

Input Polarity

By default, the polarity on both input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or both channels may optionally be configured for *logic reverse*, where:

- 1 indicates that the physical sensor is off (or the input signal is low)
- 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB DAI 5230 you want to configure in the island editor.	The selected STB DAI 5230 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
3	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the polarity settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	Notice that when you select the **Input Polarity** value, the maxi/min values of the polarity range appear at the bottom of the module editor screen. When you accept a new integer value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 2, **Channel 1** = 0 and **Channel 2** = 1.
4b	To change the polarity settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new integer value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Input Polarity** value changes to 2.

STB DAI 5230 Data and Status for the Process Image

Representing Digital Input Data

The STB DAI 5230 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in one 16-bit register. The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

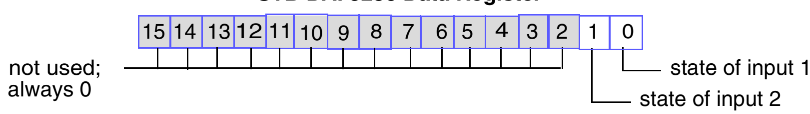
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The specific registers used in the block are determined by the module's physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DAI 5230 register in the input block of the process image is the data register. The least significant bit (LSB) in the represents the on/off state of input 1, and the bit to its immediate left represents the on/off state of input 2:

STB DAI 5230 Data Register



STB DAI 5230 Specifications

Table of Technical Specifications

description		115 VAC IEC type 1 (47 ... 63 Hz) input
number of input channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		no—cannot be used as inputs to a reflex action
input surge protection		metal oxide varistor
isolation voltage	field-to-bus	1780 VAC for 1 min
nominal logic bus current consumption		50 mA
nominal sensor bus current consumption		0 mA, with no load
sensor bus power to field		200 mA @ 30 degrees C
sensor power limit		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
current field		60 mA
input voltage	on	74 ... 132 VAC
	off	0 ... 20 VAC
input current	on	4 mA min.
	off	2 mA max.
absolute maximum input	continuous	132 VAC
	for one cycle	200 VAC
input response time	on-to-off	1.5 line cycles
	off-to-on	1.5 line cycles
polarity of the individual input channels	default	*logic normal* on both channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel
field power requirement		from a 115 VAC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

3.8 STB DAI 5260 Digital 115 VAC Input Module (two-channel, isolated, IEC type 1)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DAI 5260 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

This section contains the following topics:

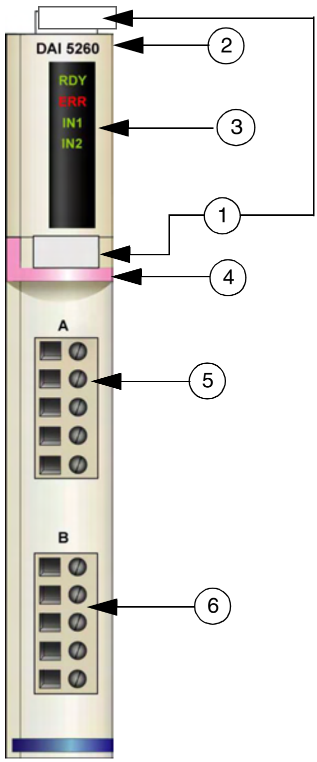
STB DAI 5260 Physical Description

Physical Characteristics

The STB DAI 5260 is a standard Advantys STB two-channel isolated digital input module that reads inputs from 115 VAC sensor devices. This module can receive power from different phases of an AC power source. The module mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector.

The STB DAI 5260 module does not receive power from the PDM.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 pink identification stripe, indicating a digital AC input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DAI 5260 LED Indicators

Purpose

The four LEDs on the STB DAI 5260 module provide visual indications of the operating status of the module and its two digital input channels. Their locations and meanings are described below.

Location

The four LEDs are located in a column on the top of the front bezel of the module, directly below the model number:

Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Voltage is present on input channel 1.	
		off		Voltage is absent on input channel 1.	
			on	Voltage is present on input channel 2.	
			off	Voltage is absent on input channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.			
blink 1**				The module is in pre-operational mode.	
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The module is not communicating with the island bus.	If all Standard I/O modules have the same blink pattern, cycle power to the island and/ or replace the NIM. If the blink pattern applies only to this module, replace it.

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

STB DAI 5260 Field Wiring

Summary

The STB DAI 5260 module uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Sensors

The STB DAI 5260 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire sensors.

The module has IEC type 1 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

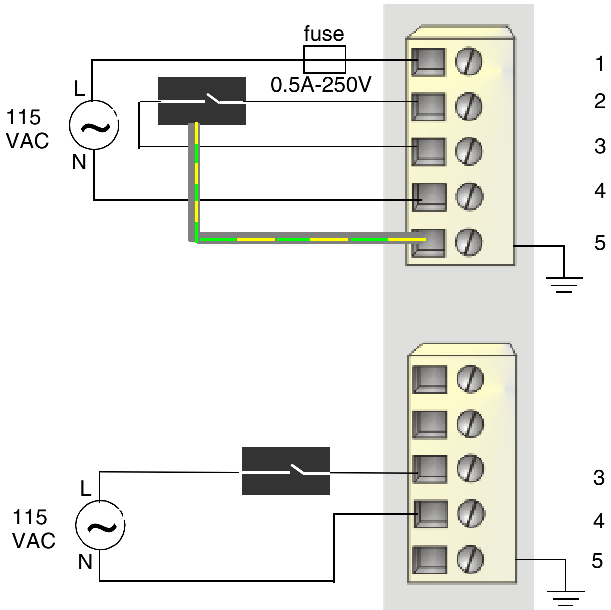
Field Wiring Pinout

The top connector supports sensor 1, and the bottom connector supports sensor 2:

Pin	Top Connector	Bottom Connector
1	115 VAC source power 1 (to the module)	115 VAC source power 2 (to the module)
2	sensor power 1	sensor power 2
3	input from sensor 1	input from sensor 2
4	field power neutral 1 (to the module)	field power neutral 2 (to the module)
5	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two sensors connected to an STB DAI 5260 module:



Within each connector, pins 1 and 2 are internally tied. The sensor on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DAI 5260 Functional Description

Functional Characteristics

The STB DAI 5260 is a two-channel module that handles digital input data from two 115 VAC field sensors. Each channel is user-configurable for *logic normal* or *logic reverse* input polarity.

Input Polarity

By default, the polarity on both input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or both channels may optionally be configured for *logic reverse*, where:

- 1 indicates that the physical sensor is off (or the input signal is low)
- 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB DAI 5260 you want to configure in the island editor.	The selected STB DAI 5260 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
3	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the polarity settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	Notice that when you select the **Input Polarity** value, the maxi/min values of the polarity range appear at the bottom of the module editor screen. When you accept a new integer value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 2, **Channel 1** = 0 and **Channel 2** = 1.
4b	To change the polarity settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new integer value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Input Polarity** value changes to 2.

STB DAI 5260 Data for the Process Image

Representing Digital Input Data

The STB DAI 5260 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in one 16-bit register. The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

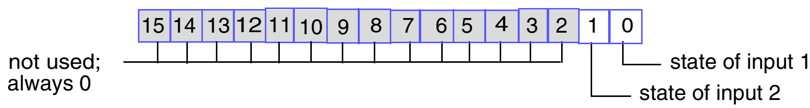
The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The specific registers used in the block are determined by the module's physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DAI 5260 register in the input block of the process image is the data register. The least significant bit (LSB) in the represents the on/off state of input 1, and the bit to its immediate left represents the on/off state of input 2:

STB DAI 5260 Data Register



STB DAI 5260 Specifications

Table of Technical Specifications

description		115 VAC IEC type 1 (47 ... 63 Hz) input
number of input channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		no—cannot be used as inputs to a reflex action
prioritization supported		yes
input surge protection		metal oxide varistor
isolation voltage	field-to-bus	1780 VAC for 1 min
	input-to-input	1780 VAC for 1 min
nominal logic bus current consumption		50 mA
input voltage	on	74 ... 132 VAC
	off	0 ... 20 VAC
input current	on	4 mA min.
	off	2 mA max.
absolute maximum input	continuous	132 VAC
	for one cycle	200 VAC
input response time	on-to-off	1.5 line cycles
	off-to-on	1.5 line cycles
polarity of the individual input channels	default	*logic normal* on both channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel
field power requirement		from a 115 VAC field source
power protection		0.5A external fuse required (e.g. Wickmann 1910500000)
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

3.9 STB DAI 7220 Digital 230 VAC Input Module (two-channel, three-wire, IEC type 1)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DAI 7220 digital input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

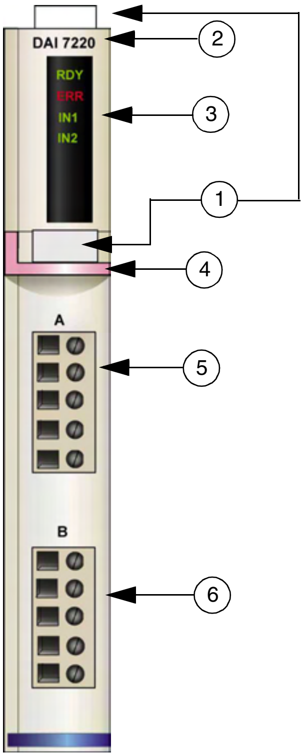
This section contains the following topics:

STB DAI 7220 Physical Description

Physical Characteristics

The STB DAI 7220 is a standard Advantys STB two-channel digital input module that reads inputs from 230 VAC sensor devices and provides power to the sensors. The module mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 pink identification stripe, indicating a digital AC input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

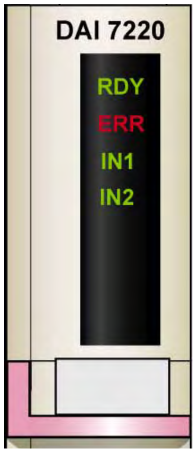
STB DAI 7220 LED Indicators

Purpose

The four LEDs on the STB DAI 7220 module are visual indicators of the operating status of the module and its two digital input channels. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top front of the STB DAI 7220 digital input module. The figure below shows their location:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	IN1	IN2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Voltage is present on input channel 1.	
		off		Voltage is absent on input channel 1.	
			on	Voltage is present on input channel 2.	
			off	Voltage is absent on input channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green input LEDs will be on even though the power is absent from the input channels when a watchdog time-out occurs.			
blink 1**				The module is in pre-operational mode.	
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The island bus is not running.	Check network connections, replace NIM
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.				
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.				
***	blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.				

STB DAI 7220 Field Wiring

Summary

The STB DAI 7220 module uses two five-terminal field wiring connectors. Sensor 1 is wired to the top connector, and sensor 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and a field wiring example is presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Sensors

The STB DAI 7220 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-, three-, or four-wire sensors that draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

The module has IEC type 1 inputs that support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

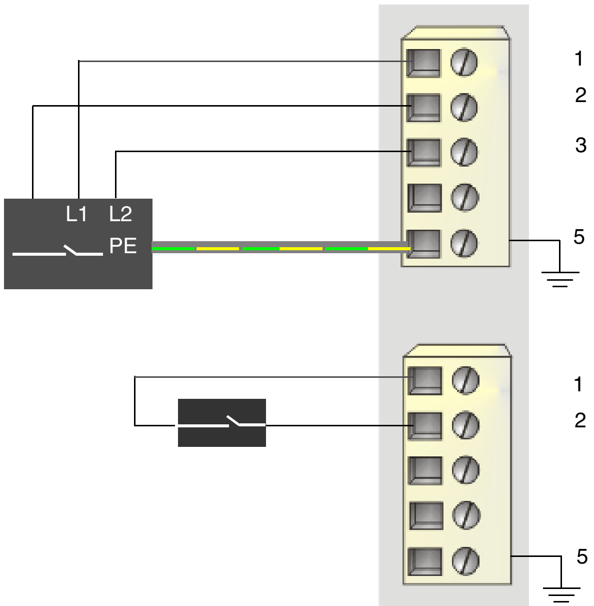
Field Wiring Pinout

The top connector supports digital input channel 1, and the bottom connector supports digital input channel 2:

Pin	Top Connector	Bottom Connector
1	230 VAC sensor bus power (L1)	230 VAC sensor bus power (L1)
2	input from sensor 1	input from sensor 2
3	field power neutral or L2 (to the module)	field power neutral or L2 (to the module)
4	field power neutral or L2 (to the module)	field power neutral or L2 (to the module)
5	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two sensors connected to an STB DAI 7220 module:



1 230 VAC (L1) to sensor 1 (top) and to sensor 2 (bottom)
2 input from sensor 1 (top) and from sensor 2 (bottom)
3 field power neutral or L2 from sensor 1
5 PE connection point for sensor 1 (top)

The four-wire sensor on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DAI 7220 Functional Description

Functional Characteristics

The STB DAI 7220 module is a two-channel module that handles digital input data from two 230 VAC field sensors. Using the Advantys configuration software, you can customize each channel for *logic normal* or *logic reverse* input polarity.

Input Polarity

By default, the polarity on both input channels is *logic normal*, where:

- 0 indicates that the physical sensor is off (or the input signal is low)
- 1 indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or both channels may optionally be configured for *logic reverse*, where:

- 1 indicates that the physical sensor is off (or the input signal is low)
- 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB DAI 7220 you want to configure in the island editor.	The selected STB DAI 7220 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Input Polarity** appears.
3	Expand the **+ Input Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the polarity settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Input Polarity** value, the maxi/min values of the polarity range appear at the bottom of the module editor screen. When you accept a new integer value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 2, **Channel 1** = 0 and **Channel 2** = 1.
4b	To change the polarity settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new integer value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Input Polarity** value changes to 2.

STB DAI 7220 Data for the Process Image

Representing Digital Input Data

The STB DAI 7220 sends a representation of the operating state of its input channels to the NIM. The NIM stores this information in one 16-bit register.The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

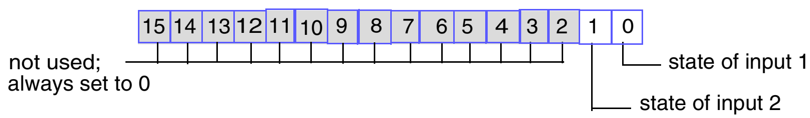
The input data process image is part of a block of 4096 reserved registers (in the range 45392 through 49487) in the NIM's memory. The specific registers used in the block are determined by the module's physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus,

Input Data Register

The first STB DAI 7220 register in the input block of the process image is the data register. The least significant bit (LSB) in the register represents the on/off state of input 1, and the bit to its immediate left represents the on/off state of input 2:

STB DAI 7220 Data Register



STB DAI 7220 Specifications

Table of Technical Specifications

description		230 VAC IEC type 1 (47 ... 63 Hz) input
number of input channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		no—cannot be used as inputs to a reflex action
input surge protection		metal oxide varistor
isolation voltage	field-to-bus	1780 VAC for 1 min
nominal logic bus current consumption		50 mA
nominal sensor bus current consumption		0 mA, with no load
sensor bus power to field		200 mA @30 degrees C
sensor power limit		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
input voltage	on	+159 ... 265 VAC
	off	0 ... 40 VAC
input current	on	4 mA min.
	off	2 mA max.
absolute maximum input	continuous	265 VAC
	for one cycle	400 VAC
input response time	on-to-off	1.5 line cycles
	off-to-on	1.5 line cycles
polarity of the individual input channels	default	*logic normal* on both channels
	user-configurable settings**	*logic reversed*, configurable by channel
		logic normal, configurable by channel
field power requirements		from a 230 VAC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

The Advantys STB Digital Output Modules

4

At a Glance

Overview

This chapter describes the features of the standard and basic Advantys STB digital output modules.

What's in this Chapter?

This chapter contains the following sections:

4.1 STB DDO 3200 Digital 24 VDC Source Output Module (two-channel, 0.5 A, over-current protected)

At a Glance

Overview

This section provides a detailed description of the Advantys STB DDO 3200 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

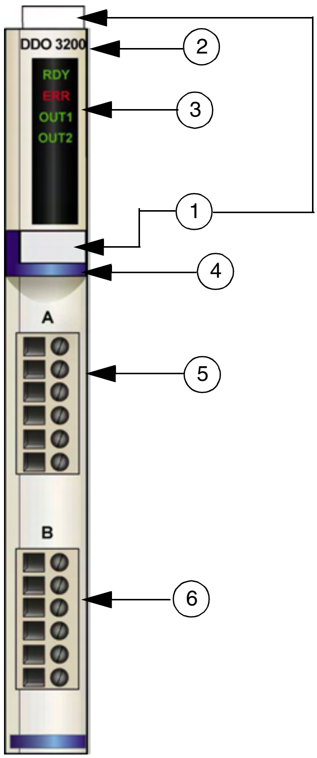
This section contains the following topics:

STB DDO 3200 Physical Description

Physical Characteristics

The STB DDO 3200 is a standard Advantys STB two-channel digital output module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

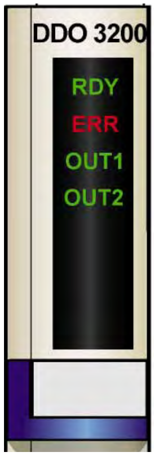
STB DDO 3200 LED Indicators

Overview

The four LEDs on the STB DDO 3200 module provide visual indications of the operating status of the module and its two digital output channels. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top front of the module directly below the model number. The figure below shows their locations:



Indications The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

<table>
<tr><th>RDY</th><th>ERR</th><th>OUT1</th><th>OUT2</th><th>Meaning</th><th>What to Do</th></tr>
<tr><td>off</td><td>off</td><td></td><td></td><td>The module is either not receiving logic power or has failed.</td><td>Check power</td></tr>
<tr><td>flicker*</td><td>off</td><td></td><td></td><td>Auto-addressing is in progress.</td><td rowspan="6"></td></tr>
<tr><td rowspan="5">on</td><td rowspan="5">off</td><td></td><td></td><td>The module has achieved all of the following:
● it has power
● it has passed its confidence tests
● it is operational</td></tr>
<tr><td>on</td><td></td><td>Voltage is present on output channel 1.</td></tr>
<tr><td>off</td><td></td><td>Voltage is absent on output channel 1.</td></tr>
<tr><td></td><td>on</td><td>Voltage is present on output channel 2.</td></tr>
<tr><td></td><td>off</td><td>Voltage is absent on output channel 2.</td></tr>
<tr><td rowspan="2">on</td><td rowspan="2">on</td><td>on</td><td>on</td><td>The watchdog has timed out.</td><td rowspan="2">Cycle power, restart the communications</td></tr>
<tr><td colspan="3">Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.</td></tr>
<tr><td>blink 1**</td><td></td><td></td><td></td><td>The module is in pre-operational mode or in its fallback state.</td><td></td></tr>
<tr><td></td><td>flicker*</td><td></td><td></td><td>Field power absent or a short circuit detected at the actuator.</td><td>Check power</td></tr>
<tr><td></td><td>blink 1**</td><td></td><td></td><td>A nonfatal error has been detected.</td><td>Cycle power, restart the communications</td></tr>
<tr><td></td><td>blink 2***</td><td></td><td></td><td>The island bus is not running.</td><td>Check network connections, replace NIM</td></tr>
<tr><td>blink 3****</td><td></td><td></td><td></td><td>Some of the output channels are in fallback and some are operational. This condition can occur only if the module is used in a reflex action.</td><td></td></tr>
<tr><td colspan="6">* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.</td></tr>
<tr><td colspan="6">** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
</table>

STB DDO 3200 Field Wiring

Summary

The STB DDO 3200 module uses two six-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and a field wiring example is presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors, available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3200 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two- or three-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

> **Note:** If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

External Fusing

The STB DDO 3200 does not provide electronic over-current protection for the field power. To achieve over-current protection, you should place external fuses in-line on pin 1 or 2.

If you do not use fuses, an over-current condition could damage the module and blow the 10 A fuse in the PDM.

Use a 0.5 A, 250 V 5 x 20 mm time-lag fuse such as the Wickmann 1910500000.

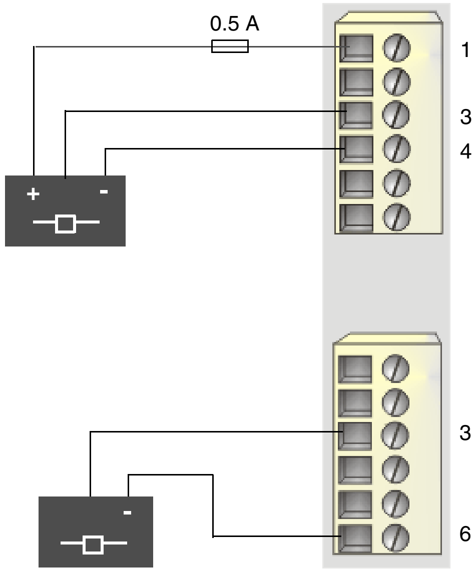
Field Wiring Pinout

The top connector supports actuator 1, and the bottom connector supports actuator 2:

Pin	Top Connector	Bottom Connector
1	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
2	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
3	output to actuator 1	output to actuator 2
4	field power return	field power return
5	field power return	field power return
6	field power return	field power return

Sample Wiring Diagram

The following field wiring example shows two actuators connected to the STB DDO 3200 module:



1 +24 VDC for actuator 1
3 output to actuator 1 (top) and actuator 2 (bottom)
4 field power return from actuator 1
6 field power return from actuator 2

STB DDO 3200 Functional Description

Functional Characteristics

The STB DDO 3200 is a two-channel module that sends digital output data to two 24 VDC field actuators. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's response to fault recovery
- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect a short circuit on the actuator bus, an overcurrent fault or a loss of PDM power on an output channel when the channel is turned on. If a fault is detected on either channel, the module will do one of the following:

- automatically latch off the channel, or
- automatically recover and resume operation on the channel when the fault is corrected

The factory default setting is *latched off*, where the module turns off an output channel that is on if it detects a fault and keeps the channel off until you explicitly reset it.

If you want to set the module to *auto-recover* when the fault is corrected, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3200 module you want to configure in the island editor.	The selected STB DDO 3200 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu—**Latched Off** and **Auto Recovery**.

The fault recovery mode is set at the module level—you cannot configure one channel to latch off and the other to auto-recover. Once the module is operational, an output channel on which a fault has been detected will implement the specified recovery mode; the other healthy channel will continue to operate.

Resetting a Latched-off Output

When an output channel has been latched off because of fault detection, it will not recover until two things happen:

- the error has been corrected
- you explicitly reset the channel

To reset a latched-off output channel, you must send it a value of 0. The 0 value resets the channel to a standard off condition and restores its ability to respond to control logic. You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel that has been turned off because of fault detection will start operating again as soon as the fault is corrected. No user intervention is required to reset the channels. If the fault was transient, the channel may reactivate itself without leaving any history of the short circuit.

Output Polarity

By default, the polarity on both output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or both channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from *logic normal* or back to normal from *logic reverse*, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DDO 3200 you want to configure in the island editor.	The selected STB DDO 3200 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have *logic normal* polarity, and 3 means that both channels have *logic reverse* polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has *normal* polarity and **Channel 2** has *reverse* polarity.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to *logic normal*, and channel 2 to *logic reverse*, the **Output Polarity** value changes to 2.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* (1) or *hold last value* (0). When a channel has *predefined* (1) as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* (0) as its fallback mode, it stays at its last known state when communication is lost—it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a *predefined state*. To change the fallback mode to *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3200 module you want to configure in the island editor.	The selected STB DDO 3200 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels hold their last values and 3 means that both channels go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you configure a fallback mode value of 2, **Channel 1** is *hold last value* and **Channel 2** is *predefined state*.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to *hold last value* and channel 2 to *predefined*, the **Fallback Mode** value changes to 2.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

> **Note:** If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from *hold last value*, or to revert back to the default from a *predefined* state, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have 0 as their predefined fallback value and 3 means that both channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, suppose that the fallback mode for both channels is *predefined state* and the polarity setting for each channel is *logic normal*. If you configure a value of 2 as the **Predefined Fallback Value**, **Channel 2** will have a fallback state of 1 (actuator on) and **Channel 1** will have fallback state of 0 (actuator off).

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you configure channel 2 to a value of 1 and configure channel 1 to a value of 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DDO 3200 Data and Status for the Process Image

Representing Digital Output Data and Status

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DDO 3200 module are based on its physical location on the island bus.

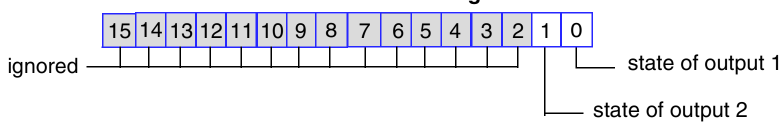
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB DDO 3200 uses one register in the output data block.

The STB DDO 3200's output data register displays the most current on/off states of the module's two output channels:

STB DDO 3200 Data Register



These values are written to the island bus by the fieldbus master.

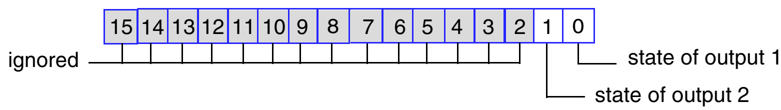
Echo and Status Registers

The echo output data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DDO 3200 is represented by two contiguous registers in this block—one register that echoes the information in the output data register followed by one that displays the status of the output channels.

The first STB DDO 3200 register in the I/O status block is the module's *echo output data* register. This register represents the data that has just been sent to the output field devices by the STB DDO 3200 module:

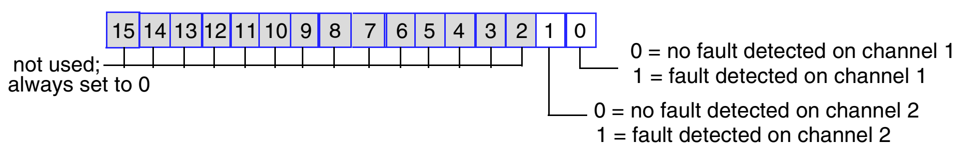
STB DDO 3200 Echo Output Data Register



Under normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

The next contiguous register is the STB DDO 3200's status register. It indicates whether or not a fault condition has been detected on either of the module's two output channels. The fault might be field power absent or actuator power shorted:

STB DDO 3200 Status Register



STB DDO 3200 Specifications

Table of Technical Specifications

description		24 VDC, 0.5 A source output
number of output channels		two
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output protection (internal)		transient voltage suppression
short circuit protection		per channel
short circuit feedback		per channel
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		internal protection on the module
fault recovery response	default	channels latched off—requires user reset
	user-configurable settings**	auto-recovery
		latched off
nominal logic bus current consumption		60 mA
nominal actuator bus current consumption		16 mA, with no load
maximum load current		0.5 A/channel
minimum load current		none
output response time	off-to-on	620 µs @ 0.5 A load
	on-to-off	575 µs @ 0.5 A load
output voltage	working	19.2 ... 30 VDC
	absolute maximum	56 VDC for 1.3 ms, decaying voltage pulse
	on-state drop/channel	0.4 VDC max.
off-state leakage/channel		0.4 mA @ 30 VDC max.
maximum surge current		5 A/channel @ 500 µs (no more than six/min)
maximum load capacitance		50 µF

maximum load inductance		0.5 H @ 4 Hz switch frequency $L = 0.5/I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	default	predefined fallback values on both channels
	user-configurable settings**	hold last value
		predefined fallback value on one or both channels
fallback states (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings**	each channel configurable for 1 or 0
polarity on individual outputs	default	*logic normal* on both channels
	user-configurable settings**	*logic reverse* on one or both channels
		logic normal on one or both channels
actuator bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		none
external fusing		0.5 A time-lag fuses on pin 1 or 2 for accessory power over-current protection
field power requirements		from a 24 VDC PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

4.2 STB DDO 3230 Digital 24 VDC Source Output Module (two-channel, 2.0 A, over-current protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDO 3230 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

This output module supports high-current actuators, and special field wiring capabilities are provided. If your actuators require field power, the +24 VDC should be delivered by an independent power supply connected directly to the actuator, not from the island's actuator bus. The implications of this alternative field wiring are described.

What's in this Section?

This section contains the following topics:

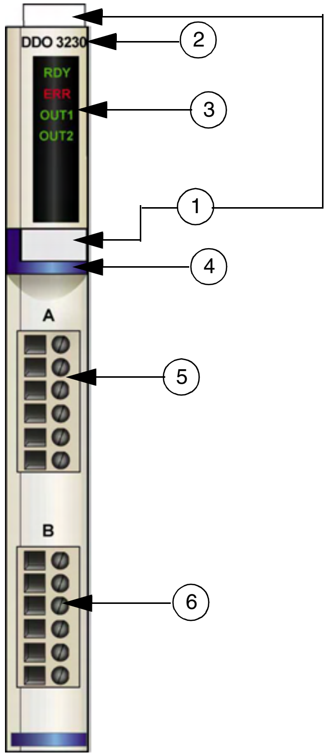
STB DDO 3230 Physical Description

Physical Characteristics

The STB DDO 3230 is a standard Advantys STB two-channel digital output module that writes outputs to 24 VDC actuator devices that draw current up to 2.0 A each. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector.

Because the module supports field actuators with loads up to 2.0 A/channel, the module lets you connect directly to an external 24 VDC power supply for field power instead of using a PDM. You can also use the island's actuator bus for field power. In either case, use the module in conjunction with a 24 VDC PDM.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

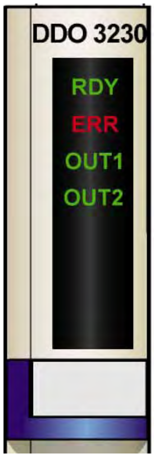
STB DDO 3230 LED Indicators

Overview

The four LEDs on the STB DDO 3230 module are visual indications of the operating status of the module and its two digital output channels. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top front of the STB DDO 3230 digital output module. The figure below shows their location:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	OUT1	OUT2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Voltage is present on output channel 1.	
		off		Voltage is absent on output channel 1.	
			on	Voltage is present on output channel 2.	
			off	Voltage is absent on output channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.			
blink 1**				The module is either in pre-operational mode or in its fallback state.	
	flicker*			Field power absent or a short circuit detected at the actuator.	Check power
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The island bus is not running.	Check network connections, replace NIM
blink 3****				Some of the output channels are in fallback and some are operational. This condition can occur only if the module is used in a reflex action.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.					
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.					
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.					
**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.					

STB DDO 3230 Field Wiring

Summary

The STB DDO 3230 module uses two six-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector. The choices of connector types and field wire types are described below, and some field wiring examples are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3230 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two- or three-wire actuators. The actuators may be high-power devices such as motor starters, valves or incandescent lamps that draw current up to 2.0 A/channel.

When field power is required for the actuators, the recommended procedure is to connect the field devices to an external 24 VDC power supply.

> **Note:** If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

External Fusing

If you field-wire an STB DDO 3230 output module with an independent power supply instead of through a PDM, the overcurrent protection provided by the PDM (see *p. 761*) is lost. You must provide external protection with a 2.5 A time-lag fuse (such as the Wickmann 1911250000).

Warning

FIRE HAZARD

When an independent power supply is used, you must fuse each unprotected channel independently.

- Install a fuse between the external power supply and pin 2 on the unprotected field wiring connector(s).

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Field Wiring Pinout

The top connector supports the actuator 1, and the bottom connector supports actuator 2. The module may be field wired in either of two ways:

- so that the module delivers field power to the actuators from the PDM
- so that the actuators get field power from an independent power source

Use pin 1 if field power comes from the island's actuator bus. Use pin 2 if an independent power supply is used for the actuators:

Pin	Top Connector	Bottom Connector
1	+24 VDC actuator bus power	+24 VDC actuator bus power
2	independent power supply in	independent power supply in
3	output to actuator 1	output to actuator 2
4	independent power supply return	independent power supply return
5	field power return (to the module)	field power return (to the module)
6	field power return (to the module)	field power return (to the module)

Note: If you are using the island's actuator bus for +24 VDC operating power:

- externally jumper pin 1 to pin 2
- externally jumper pin 4 to pin 5
- use pin 6 as the field power return from the actuators

If you are using an independent power supply, use pin 2 as the +24 VDC line and pin 4 as the return line.

Sample Wiring Diagrams

⚠ Warning

UNINTENDED EQUIPMENT OPERATION

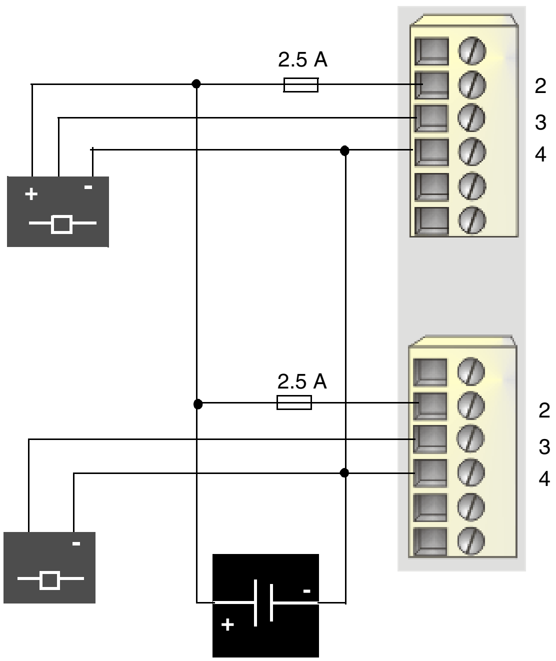
If you field-wire an STB DDO 3230 output module with an independent power supply instead of through a PDM, the mechanism in the PDM that protects the actuators from miswiring is no longer present.

- Make certain that you wire pins 2, 3 and 4 correctly as shown below.

A miswired field connection will cause the field actuator devices wired to this module to turn on as soon as field power is applied, even if logic control is not present.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

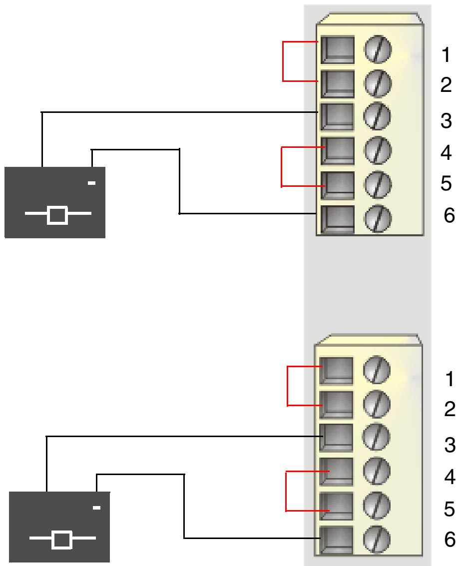
The following illustration shows two field actuators connected to the STB DDO 3230 module and receiving field power from an independent 24 VDC power supply instead of the PDM:



2 +24 VDC from an independent power supply, with user-supplied external fuses (top and bottom)

3 output to actuator 1 (top) and actuator 2 (bottom)
4 power supply return from actuator 1 (top) and actuator 2 (bottom)

The following field wiring example shows two two-wire actuators wired to the STB DDO 3230 module. These devices do not use field power from the actuator bus. The jumpers between pins 1 and 2 and between pins 4 and 5 are required:



1 +24 VDC field power from the PDM (top) jumpered to pin 2 (top and bottom)
2 jumpered to pin 1 (top and bottom)
3 output to actuator 1 (top) and actuator 2 (bottom)
4/5 jumpered together (top and bottom)
6 field power return from actuator 1 (top) and actuator 2 (bottom)

STB DDO 3230 Functional Description

Functional Characteristics

The STB DDO 3230 module is two-channel module that sends digital output data to two 24 VDC field actuators. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's response to fault recovery
- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect an overcurrent situation or a loss of PDM power on an output channel when the channel is turned on. If a fault is detected on either channel, the module will do one of the following:

- automatically latch off the channel, or
- automatically recover and resume operation on the channel when the fault is corrected

The factory default setting is *latched off*, where the module turns off an output channel that is on if it detects a fault and keeps the channel off until you reset it explicitly.

If you want to set the module to *auto-recover* when the fault is corrected, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3230 you want to configure in the island editor.	The selected STB DDO 3230 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu—**Latched Off** and **Auto Recovery**.

The fault recovery mode is set at the module level—you cannot configure one channel to latch off and the other to auto-recover. Once the module is operational, an output channel on which a fault has been detected will implement the specified recovery mode; the other healthy channel will continue to operate.

Resetting a Latched-off Output

When an output channel has been latched off because of fault detection, it will not recover until two things happen:

- the error has been corrected
- you explicitly reset the channel

To reset a latched off output channel, you must send it a value of 0. The 0 value resets the channel to a standard off condition and restores its ability to respond to control logic. You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel that has been turned off because of a short circuit will start operating again as soon as the fault is corrected. No user intervention is required to reset the channels. If the fault was transient, the channel may reactivate itself without leaving any history of the short circuit.

Output Polarity

By default, the polarity on both output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or both channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DDO 3230 you want to configure in the island editor.	The selected STB DDO 3230 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Output Polarity** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has normal polarity and **Channel 2** has reverse polarity.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to normal polarity and channel 2 to reverse polarity, the **Output Polarity** value changes to 2.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each individual channel. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined* (1) or *hold last value* (0). When a channel has *predefined* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a *predefined* state (1). If you want to change the fallback mode to *hold last value* (0), use the Advantys configuration software:

Step	**Action**	**Result**
1	Double click on the STB DDO 3230 you want to configure in the island editor.	The selected STB DDO 3230 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels hold their last values and 3 means that both channels go to a predefined state.	When you select the **Fallback Mode** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then **Channel 1** goes to *hold last value* and **Channel 2** goes to a *predefined* state.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to *hold last value* and channel 2 to *predefined*, the **Fallback Mode** value changes to 2.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have 0 as their predefined fallback value and 3 means that both channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 2, then **Channel 2** will turn on as its fallback state. **Channel 1** will either turn off or be ignored, depending on its fallback mode setting.

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s). You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channel 2 to 1 and leave channel 1 at 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DDO 3230 Data and Status for the Process Image

Representing Digital Output Data and Status

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DDO 3230 module are based on its physical location on the island bus.

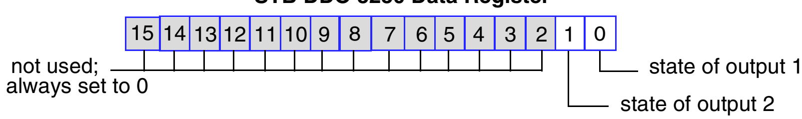
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB DDO 3230 uses one register in the output data block.

The STB DDO 3230's output data register displays the most current on/off states of the module's two output channels:

STB DDO 3230 Data Register



These values are written to the island bus by the fieldbus master.

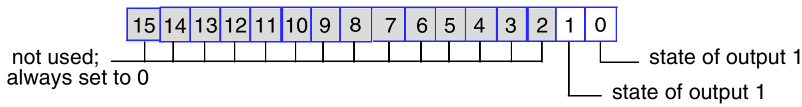
Output Status Registers

The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DDO 3230 is represented by two contiguous registers—one register that echoes the output data register followed by one that displays the status of the output channels.

The first STB DDO 3230 register in the I/O status block is the module's *echo output data* register. This register represents the data that has just been sent to the output field devices by the STB DDO 3200 module.

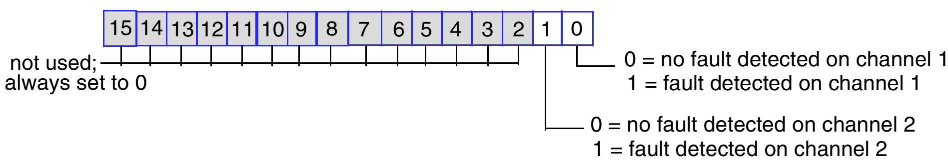
STB DDO 3230 Echo Output Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

The next contiguous register is the STB DDO 3230's status register. It indicates whether or not a fault condition has been detected on either of the module's two output channels. The fault would be either field power absent or actuator power shorted:

STB DDO 3230 Status Register



STB DDO 3230 Specifications

Table of Technical Specifications

description		24 VDC, 2.0 A source output
number of output channels		two
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output protection (internal)		transient voltage suppression
short circuit protection		per channel
short circuit feedback		per channel
isolation voltage	channel-to-channel	500 VDC for 1 min
reverse polarity protection from a miswired PDM		internal protection on the module
fault recovery response	default	channel latched off—requires user reset
	user-configurable settings**	auto-recovery
		latched off
nominal logic bus current consumption		60 mA
nominal actuator bus current consumption		5 mA, with no load
maximum load current		2.0 A/channel
minimum load current		none
output response time	off-to-on	520 µs
	on-to-off	720 µs
output voltage	working	19.2 ... 30 VDC
	absolute maximum	56 VDC for 1.3 ms, decaying voltage pulse
	on-state drop/ channel	0.4 VDC max.
off-state leakage/channel		1.0 mA @ 30 VDC max.
maximum surge current		10 A/channel for 500 µs (no more than six/ min)
maximum load capacitance		50 µF

maximum load inductance		$L = 0.5/I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	default	predefined
	user-configurable settings**	hold last value
		predefined fallback value on one or both channels
fallback states (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings**	each channel configurable for 1 or 0
polarity on individual outputs	default	*logic normal* on both channels
	user-configurable settings**	*logic reverse* on one or both channels
		logic normal on one or both channels
field power requirements	field power voltage	24 VDC
	recommended source	external 24 VDC power supply
power protection		recommendation: user-supplied 2.5 A time-lag fuses externally applied to each channel
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

4.3 STB DDO 3410 Digital 24 VDC Source Output Module (four-channel, 0.5 A, over-current protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDO 3410 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

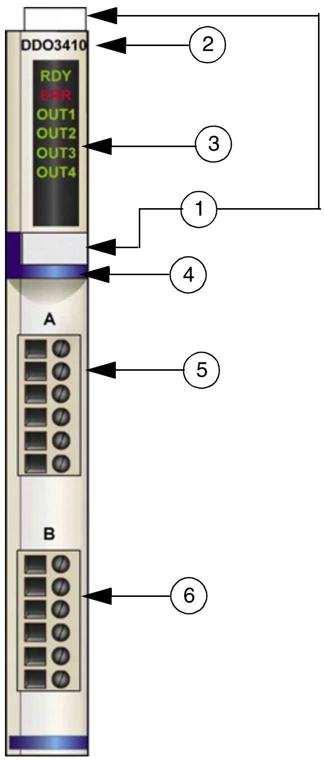
This section contains the following topics:

STB DDO 3410 Physical Description

Physical Characteristics

The STB DDO 3410 is a standard Advantys STB four-channel digital input module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuators 1and 2 are wired to the top connector, and actuators 3 and 4 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

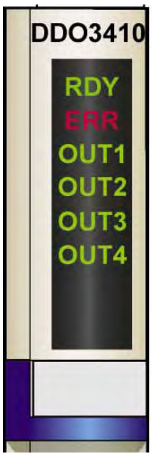
STB DDO 3410 LEDs

Overview

The six LEDs on the STB DDO 3410 module are visual indicators of the operating status of the module and its four digital output channels. The LED locations and their meanings are described below.

Location

The six LED are positioned in a column on the top front of the STB DDO3410 digital output module. The figure below shows their locations:



Indications

The following table defines the meaning of the six LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	OUT1	OUT2	OUT3	OUT4	Meaning	What to Do
off	off					The module is either not receiving logic power or has failed.	Check power
flicker*	off					Auto-addressing is in progress.	
on	off					The module has achieved all of the following: • it has power • it has passed its confidence tests • it is operational	
		on				Voltage is present on output channel 1.	
		off				Voltage is absent on output channel 1.	
			on			Voltage is present on output channel 2.	
			off			Voltage is absent on output channel 2.	
				on		Voltage is present on output channel 3.	
				off		Voltage is absent on output channel 3.	
					on	Voltage is present on output channel 4.	
					off	Voltage is absent on output channel 4.	
on	on	on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.					
blink 1**						The module is either in pre-operational mode or in its fallback state.	
	flicker*					Field power absent or a short circuit detected at the actuator.	Check power
	blink 1**					A nonfatal error has been detected.	Cycle power, restart the communications

RDY	ERR	OUT1	OUT2	OUT3	OUT4	Meaning	What to Do
	blink 2***					The island bus is not running.	Check network connections, replace NIM
blink 3****						Some of the output channels are in fallback and some are operational. This condition can occur only if the module is used in a reflex action.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.							
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.							
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.							
**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.							

STB DDO 3410 Field Wiring

Summary

The STB DDO 3410 module uses two six-terminal field wiring connectors. Actuators 1 and 2 are wired to the top connector, and actuators 3 and 4 are wired to the bottom connector. The choices of connector types and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3410 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to four two-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to 0.5 A/channel.

> **Note:** If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 to 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

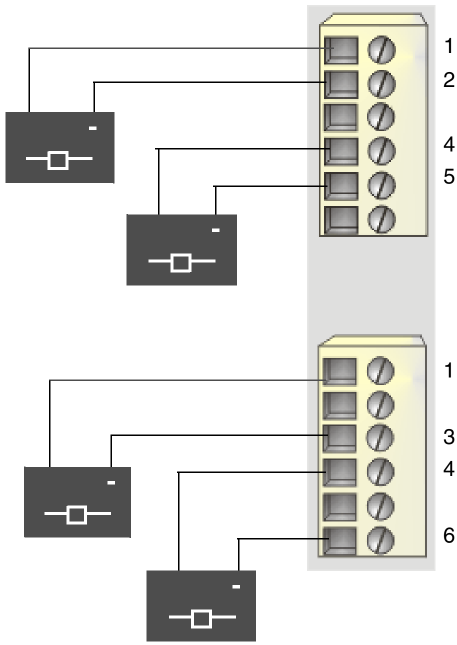
Field Wiring Pinout

The top connector supports digital output channels 1and 2; the bottom connector supports digital output channels 3 and 4:

Pin	Top Connector	Bottom Connector
1	output to actuator 1	output to actuator 3
2	field power return	field power return
3	field power return	field power return
4	output to actuator 2	output to actuator 4
5	field power return	field power return
6	field power return	field power return

Sample Wiring Diagram

The following field wiring example shows four actuators connected to the STB DDO 3410 module:



1 output to actuator 1 (top) and actuator 3 (bottom)
2 field power return from actuator 1 (top)
3 field power return from actuator 3 (bottom)
4 output to actuator 2 (top) and actuator 4 (bottom)
5 field power return from actuator 2 (top)
6 field power return from actuator 4 (bottom)

STB DDO 3410 Functional Description

Functional Characteristics

The STB DDO 3410 module is a four-channel module that sends digital output data to four 24 VDC field actuators. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's response to fault recovery
- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect a short circuit on the actuator bus, an overcurrent fault or a PDM power failure on an output channel when the channel is turned on. If a fault is detected on any channel, the module will do one of the following:

- automatically latch off that channel plus another channel with which that channel is grouped, if that other channel is on, or
- automatically recover and resume operation on the channel group when the fault is corrected

The factory default setting is *latched off*, where the module turns off the output channels in a group when a short circuit or overcurrent condition is detected on any channel in that group. The channels will remain off until you explicitly reset them.

If you want to set the module to *auto-recover* when the fault is corrected, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3410 you want to configure in the island editor.	The selected STB DDO 3410 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu—**Latched Off** and **Auto Recovery**.

The fault recovery parameter is set at the module level—you cannot configure one group of channels to latch off and another to auto-recover. The module will apply the fault recovery response the channels in two groups (two channels/group):

- group 1 comprises output channels 1 and 2
- group 2 comprises output channels 3 and 4

For example, suppose the module is configured to *latch off* a shorted output channel. If a short circuit occurs on output channel 1, both group 1 channels (output 1 and output 2) are latched off. Channels 1 and 2 remain latched off until they are reset, and channels 3 and 4 continue to operate.

Resetting a Latched-off Output

When an output channel (or channel group) has been latched off because of fault detection, it will not recover until two things happen:

- the error has been corrected
- you explicitly reset the channel

To reset a latched off output channel, send a value of 0 to both channels in the latched-off group. The 0 value resets the channels to a standard off condition and restores their ability to respond to control logic. You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel group that has been turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. No user intervention is required to reset the channels. If the fault was transient, the channels may reactivate themselves without leaving any history of the short circuit.

Output Polarity

By default, the polarity on all four output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or more channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from *logic normal*, or back to normal from *logic reverse*, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DDO 3410 you want to configure in the island editor.	The selected STB DDO 3410 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
4	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3** and **Channel 4** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 15 (0 to 0xF), where 0 means all channels have normal polarity and 0xF means that all four channels have reverse polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 6, **Channel 1** and **Channel 4** will have *normal polarity* while **Channel 2** and **Channel 3** will have *reverse polarity*.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channels 1 and 4 to *normal polarity* and channels 2 and 3 to *reverse polarity*, the **Output Polarity** value changes to 6.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* (1) or *hold last value* (0). When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* as its fallback mode, it remains in its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for all four channels is a *predefined state*. To change the fallback mode to *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3410 you want to configure in the island editor.	The selected STB DDO 3410 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
4	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3** and **Channel 4** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 15 (0 to 0xF), where 0 means all four channels hold their last values and 0xF means that all four channels go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 6, **Channel 1** and **Channel 4** will be configured to *hold last value*, while **Channel 2** and **Channel 3** will be configured to *predefined state*.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 2 to *hold last value*, and leave the remaining channels in their *predefined state*, the **Fallback Mode** value changes to 0xD.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, all four channels are configured to go to a *predefined state* (1) as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its *predefined state*, or to revert back tonormal from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
4	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3** and **Channel 4** appear.
5a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 15 (0 to 0xF), where 0 means both channels have 0 as their predefined fallback value and 15 means that all channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 6, **Channel 1** and **Channel 4** will be 0, while **Channel 2** and **Channel 3** will be 1.

Step	Action	Result
5b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down men. You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channels 1 and 4 to a value of 0, and set channels 2 and 3 to 1, the **Predefined Fallback Value** changes to 6.

STB DDO 3410 Data and Status for the Process Image

Representing Digital Output Data and Status

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DDO 3410 module are based on its physical location on the island bus.

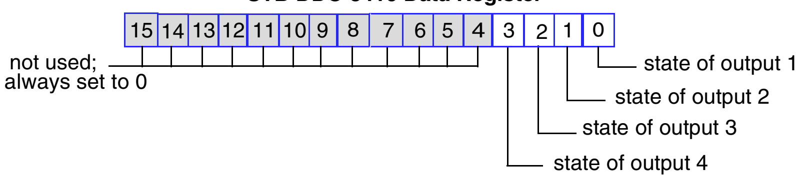
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB DDO 3410 uses one register in the output data block.

The STB DDO 3410's output data register displays the most current on/off states of the module's four output channels:

STB DDO 3410 Data Register



These values are written to the island bus by the fieldbus master.

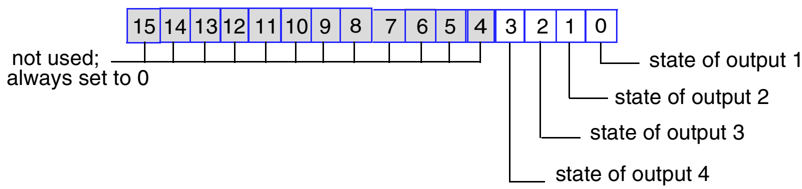
Output Status Registers

The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DDO 3410 is represented by two contiguous registers—one register that echoes the output data register followed by one that displays the status of the output channels.

The first STB DDO 3410 register in the I/O status block is the module's *echo output data* register. This register represents the data that has just been sent to the output field devices by the STB DDO 3410 module:

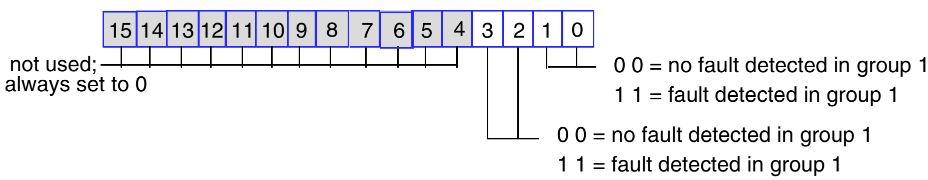
STB DDO 3410 Echo Output Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

The next contiguous register is the STB DDO 3410's status register. It indicates whether or not a fault condition has been detected on any of the module's four output channels.The fault might be field power absent or actuator power shorted:

STB DDO 3410 Status Register



Group 1 comprises outputs 1 and 2. Group 2 comprises outputs 3 and 4.

STB DDO 3410 Specifications

Table of Technical Specifications

description		24 VDC, 0.5 A source output
number of output channels		four
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output protection (internal)		transient voltage suppression
short circuit protection		per channel
short circuit feedback		per group: group 1 comprises channels 1 and 2; group 2 comprises channels 3 and 4
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		internal protection on the module
fault recovery response	default	channel latched off; requires off-on command to reset
	user-configurable settings**	auto-recovery
		latched off
nominal logic bus current consumption		80 mA
nominal actuator bus current consumption		10 mA, with no load
maximum load current		0.5 A/channel
minimum load current		none
output response time	off-to-on	560 µs @ 0.5 A load
	on-to-off	870 µs @ 0.5 A load
output voltage	working	19.2 ... 30 VDC
	absolute maximum	56 VDC for 1.3 ms, decaying voltage pulse
	on-state drop/channel	0.4 VDC max.
off-state leakage/channel		0.4 mA @ 30 VDC max.
maximum surge current		5 A/channel for 500 µs (no more than six/min)
maximum load capacitance		50 µF

maximum load inductance		0.5 H @ 4 Hz switch frequency $L = 0.5/I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	default	predefined
	user-configurable settings**	hold last value
		predefined fallback value on one or more channels
fallback states (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings**	each channel configurable for 1 or 0
polarity on individual outputs	default	*logic normal* on all four channels
	user-configurable settings**	*logic reverse* on one or more channels
		logic normal on one or more channels
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

4.4 STB DDO 3415 Digital 24 VDC Source Output Module (four-channel, 0.25 A, over-current protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDO 3415 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

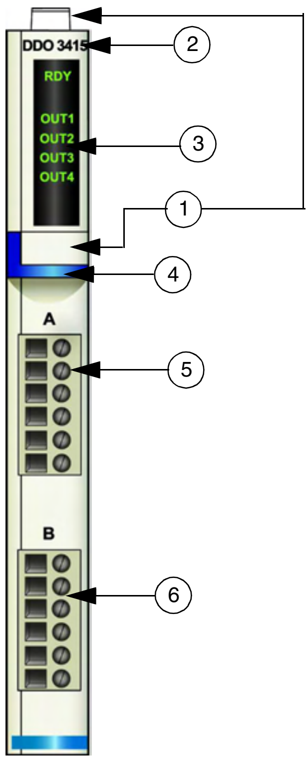
This section contains the following topics:

STB DDO 3415 Physical Description

Physical Characteristics

The STB DDO 3415 is a basic Advantys STB four-channel digital output module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuators 1and 2 are wired to the top connector, and actuators 3 and 4 are wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuators 1 and 2 connect to the top field wiring connector
6 actuator 3 and 4 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DDO 3415 LEDs

Overview

The five LEDs on the STB DDO 3415 module are visual indicators of the operating status of the module and its four digital output channels.

Location

The LEDs are located on the front bezel of the module below the model number:

Indications

The following table defines the meaning of the LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	OUT1	OUT2	OUT3	OUT4	Meaning
off					The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*					Auto-addressing is in progress.
on					The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
	on				Voltage is present on output channel 1.
	off				Voltage is absent on output channel 1.
		on			Voltage is present on output channel 2.
		off			Voltage is absent on output channel 2.
			on		Voltage is present on output channel 3.
			off		Voltage is absent on output channel 3.
				on	Voltage is present on output channel 4.
				off	Voltage is absent on output channel 4.
blink 1**					The module is either in pre-operational mode or in its fallback state.
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.				
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.				

STB DDO 3415 Field Wiring

Summary

The STB DDO 3415 module uses two six-terminal field wiring connectors. Actuators 1 and 2 are wired to the top connector, and actuators 3 and 4 are wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3415 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to four two-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to 250 mA/channel.

> **Note:** If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 to 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

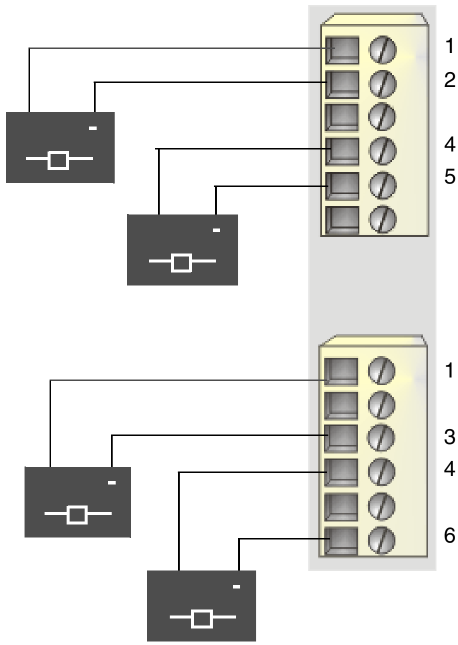
Field Wiring Pinout

The top connector supports digital output channels 1and 2; the bottom connector supports digital output channels 3 and 4:

Pin	Top Connector	Bottom Connector
1	output to actuator 1	output to actuator 3
2	field power return	field power return
3	field power return	field power return
4	output to actuator 2	output to actuator 4
5	field power return	field power return
6	field power return	field power return

Sample Wiring Diagram

The following field wiring example shows four actuators connected to the STB DDO 3415 module:



1 output to actuator 1 (top) and actuator 3 (bottom)
2 field power return from actuator 1 (top)
3 field power return from actuator 3 (bottom)
4 output to actuator 2 (top) and actuator 4 (bottom)
5 field power return from actuator 2 (top)
6 field power return from actuator 4 (bottom)

STB DDO 3415 Functional Description

Functional Characteristics

The STB DDO 3415 module is a four-channel module that sends digital output data to four 24 VDC field actuators. It does not support user-configurable operating parameters or reflex actions.

Auto-recovery from Detected Faults

If an overcurrent fault is detected on any channel, that channel plus the one with which it is grouped turns off. The module applies the fault recovery response to the channels in two groups:

- group 1 comprises output channels 1 and 2
- group 2 comprises output channels 3 and 4

A channel group that has been turned off because of a short circuit will start operating automatically as soon as the faulty channel is corrected. No user intervention is required to reset the channels.

Fallback States

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. All four channels go to a predefined fallback state of 0 VDC.

STB DDO 3415 Data for the Process Image

Representing Digital Output Data

The NIM keeps a record of output data in one block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output modules. This information can be monitored by the fieldbus master. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

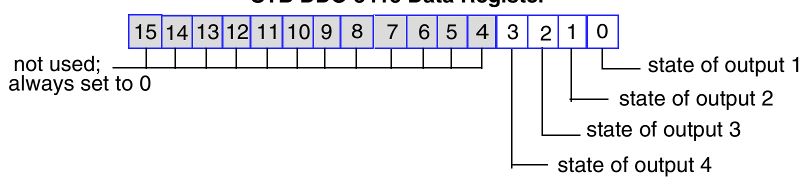
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. An STB DDO 3415 uses one register in the output data block. The specific register is based on its physical location on the island bus.

> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The STB DDO 3415's output data register displays the most current on/off states of the module's four output channels:

STB DDO 3415 Data Register



STB DDO 3415 Specifications

Table of Technical Specifications

<table>
<tr><td colspan="2">description</td><td>24 VDC, 0.25 A source output</td></tr>
<tr><td colspan="2">number of output channels</td><td>four</td></tr>
<tr><td colspan="2">module width</td><td>13.9 mm (0.58 in)</td></tr>
<tr><td colspan="2">I/O base</td><td>STB XBA 1000 (see p. 808)</td></tr>
<tr><td colspan="2">hot swapping supported</td><td>NIM-dependent*</td></tr>
<tr><td colspan="2">reflex actions supported</td><td>no</td></tr>
<tr><td colspan="2">output protection (internal)</td><td>transient voltage suppression</td></tr>
<tr><td colspan="2">short circuit protection</td><td>no</td></tr>
<tr><td colspan="2">fault recovery</td><td>per group:
• group 1 comprises channels 1 and 2
• group 2 comprises channels 3 and 4</td></tr>
<tr><td>isolation voltage</td><td>field-to-bus</td><td>1500 VDC for 1 min</td></tr>
<tr><td colspan="2">reverse polarity protection from a miswired PDM</td><td>internal protection on the module</td></tr>
<tr><td colspan="2">fault recovery response</td><td>auto-recovery</td></tr>
<tr><td colspan="2">nominal logic bus current consumption</td><td>80 mA</td></tr>
<tr><td colspan="2">nominal actuator bus current consumption</td><td>10 mA, with no load</td></tr>
<tr><td colspan="2">maximum load current</td><td>0.25 A/channel</td></tr>
<tr><td colspan="2">minimum load current</td><td>none</td></tr>
<tr><td rowspan="2">output response time</td><td>off-to-on</td><td>560 µs @ 0.25 A load</td></tr>
<tr><td>on-to-off</td><td>870 µs @ 0.25 A load</td></tr>
<tr><td rowspan="3">output voltage</td><td>working</td><td>19.2 ... 30 VDC</td></tr>
<tr><td>absolute maximum</td><td>56 VDC for 1.3 ms, decaying voltage pulse</td></tr>
<tr><td>on-state drop/channel</td><td>0.4 VDC max.</td></tr>
<tr><td colspan="2">off-state leakage/channel</td><td>0.4 mA @ 30 VDC max.</td></tr>
<tr><td colspan="2">maximum surge current</td><td>2.5 A/channel for 500 µs (no more than six/min)</td></tr>
<tr><td colspan="2">maximum load capacitance</td><td>50 µF</td></tr>
</table>

maximum load inductance	0.5 H @ 4 Hz switch frequency $L = 0.5 / I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	predefined
fallback states	both channels go to 0
output polarity	*logic normal* on all four channels
field power requirements	from a 24 VDC PDM
power protection	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.	

4.5 STB DDO 3600 Digital 24 VDC Source Output Module (six-channel, 0.5 A, over-current protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDO 3600 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

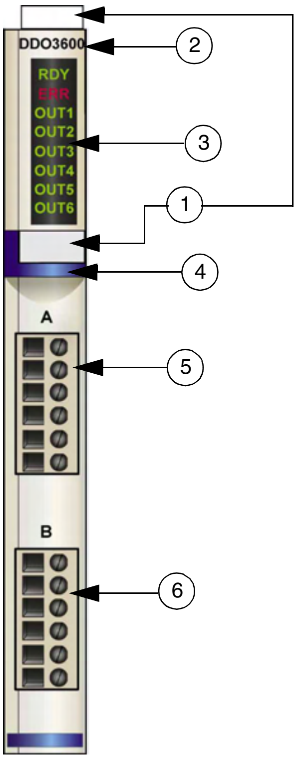
This section contains the following topics:

STB DDO 3600 Physical Description

Physical Characteristics

The STB DDO 3600 is a standard Advantys STB six-channel digital output module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuators 1, 2 and 3 are wired to the top connector, and actuators 4, 5 and 6 are wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuators 1 ... 3 connect to the top field wiring connector
6 actuator 4 ... 6 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

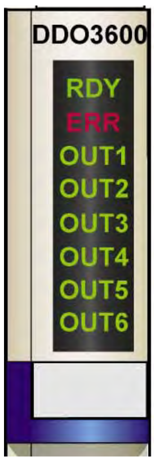
STB DDO 3600 LED Indicators

Overview

The eight LEDs on the STB DDO 3600 module are visual indications of the operating status of the module and its six digital output channels. The LED locations and their meanings are described below.

Location

The eight LED indicators are positioned in a column at the top front of the STB DDO 3600 digital output module. The figure below shows their location:



Indications

The following table defines the meaning of the eight LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	Meaning	What to Do
off	off							The module is either not receiving logic power or has failed.	Check power
flicker*	off							Auto-addressing is in progress.	
on	off							The module has achieved all of the following: • it has power • it has passed its confidence tests • it is operational	
		on						Voltage is present on output channel 1.	
		off						Voltage is absent on output channel 1.	
			on					Voltage is present on output channel 2.	
			off					Voltage is absent on output channel 2.	
				on				Voltage is present on output channel 3.	
				off				Voltage is absent on output channel 3.	
					on			Voltage is present on output channel 4.	
					off			Voltage is absent on output channel 4.	
						on		Voltage is present on output channel 5.	
						off		Voltage is absent on output channel 5.	
							on	Voltage is present on output channel 6.	
							off	Voltage is absent on output channel 6.	

RDY	ERR	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	Meaning	What to Do
on	on	on	on	on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.							
blink 1**								The module is either in pre-operational mode or in its fallback state.	
	flicker*							Field power absent or a short circuit detected at the actuator.	Check power
	blink 1**							A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***							The island bus is not running.	Check network connections, replace NIM
blink 3****								Some of the output channels are in fallback and some are operational. This condition can occur only if the module is used in a reflex action.	

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

STB DDO 3600 Field Wiring

Summary

The STB DDO 3600 module uses two six-terminal field wiring connectors. Actuators 1, 2 and 3 are wired to the top connector, and actuators 4, 5 and 6 are wired to the bottom connector. The choices of connector types and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors, available in a kit of 20 (model STB XTS 2100)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3600 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to 0.5 A/channel.

Note: If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 to 16 AWG).

We recommend that you strip at least 9 mm from the wire’s jacket for the module connection.

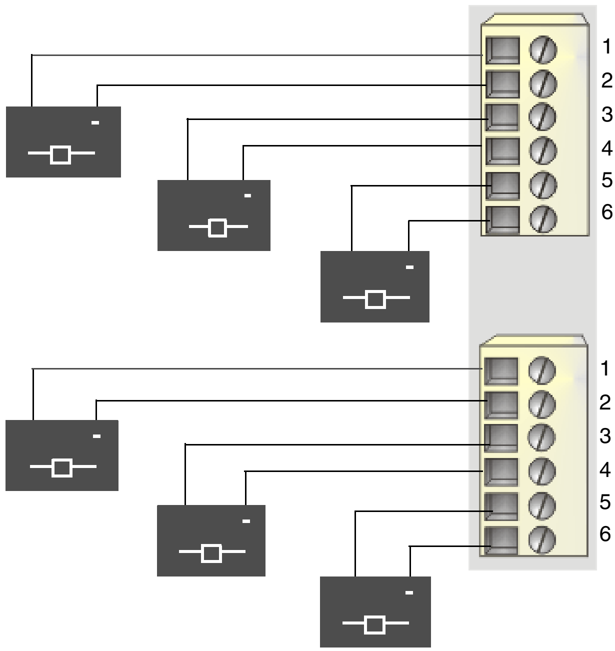
Field Wiring Pinout

The top connector supports digital input channels 1, 2, and 3; the bottom connector supports digital input channels 4, 5, and 6:

Pin	Top Connector	Bottom Connector
1	output to actuator 1	output to actuator 4
2	field power return	field power return
3	output to actuator 2	output to actuator 5
4	field power return	field power return
5	output to actuator 3	output to actuator 6
6	field power return	field power return

Sample Wiring Diagram

The following field wiring example shows six actuators connected to the STB DDO 3600 module:



1 output to actuator 1 (top) and actuator 4 (bottom)
2 field power return from actuator 1 (top) and actuator 4 (bottom)
3 output to actuator 2 (top) and actuator 5 (bottom)
4 field power return from actuator 2 (top) and actuator 5 (bottom)
5 output to actuator 3 (top) and actuator 6 (bottom)
6 field power return from actuator 3 (top) and actuator 6 (bottom)

STB DDO 3600 Functional Description

Functional Characteristics

The STB DDO 3600 is a six-channel module that sends digital output data to six 24 VDC field actuators. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's response to fault recovery
- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect a short circuit on the actuator bus, an overcurrent fault or a loss of PDM power on an output channel when the channel is turned on. If a fault is detected on any channel, the module will do one of the following:

- automatically latch off that channel plus another channel with which that channel is grouped, if that other channel is on, or
- automatically recover and resume operation on the channel group when the fault is corrected

The factory default setting is *latched off*, where the module turns off the output channels in a group when a short circuit or overcurrent condition is detected on any channel in that group. The channels will remain off until you reset them explicitly.

If you want to set the module to *auto-recover* when the fault is corrected, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3600 module you want to configure in the island editor.	The selected STB DDO 3600 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu—**Latched Off** and **Auto Recovery**.

The fault recovery parameter is set at the module level—you cannot configure one group of channels to latch off and another to auto-recover. The module will apply the fault recovery response the channels in three groups (two channels/group):

- group 1 comprises output channels 1 and 2
- group 2 comprises output channels 3 and 4
- group 3 comprises output channels 5 and 6

For example, suppose the module is configured to *latch off* a shorted output channel. If a short circuit occurs on output channel 1, both group 1 channels (output 1 and output 2) are latched off. Channels 1 and 2 remain latched off until they are reset, and channels 3 through 6 continue to operate.

Resetting a Latched-off Output

When an output channel (or channel group) has been latched off because of fault detection, it will not recover until two things happen:

- the error has been corrected
- you explicitly reset the channel

To reset a latched off output channel, send a value of 0 to both channels in the latched-off group. The 0 value resets the channels to a standard off condition and restores their ability to respond to control logic. You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel group that has been turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. No user intervention is required to reset the channels. If the fault was transient, the channels may reactivate themselves without leaving any history of the short circuit having occurred.

Output Polarity

By default, the polarity on all six output channels is *logic normal*, where:

- a output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or more channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from *logic normal*, or back to normal from *logic reverse*, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DDO 3600 module you want to configure in the island editor.	The selected STB DDO 3600 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
4	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3**, **Channel 4**, **Channel 5** and **Channel 6** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 63 (0 to 0x3F), where 0 means all channels have normal polarity and 0x3F means that all six channels have reverse polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 0x2F, **Channel 5** will have normal polarity and the other five channels will have reverse polarity.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channels 2 and 3 to *reverse polarity*, and leave the other four channels set to *normal polarity*, the **Output Polarity** value changes to 0x6.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* (0) as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for all six channels is a *predefined state* (1). If you want to change the fallback mode to *hold last value* (0), use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DDO 3600 module you want to configure in the island editor.	The selected STB DDO 3600 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
4	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3**, **Channel 4**, **Channel 5** and **Channel 6** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 63 (0 to 0x3F), where 0 means all six channels hold their last values and 0x3F means that all six channels go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 0x2F, **Channel 5** will be set to *hold last value* and the other five channels will be set to *predefined state*.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 5 to *hold last value*, and leave the other five channels set to *predefined state*, the **Fallback Mode** value changes to 0x2F.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, all four channels are instructed to go to *hold last value* (0) as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
4	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1**, **Channel 2**, **Channel 3**, **Channel 4**, **Channel 5** and **Channel 6** appear.
5a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 63 (0 to 0x3F), where 0 means all six channels have 0 as their predefined fallback value and 0x3F means that all six channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 0x2F, **Channel 5** will have a value of 0 (off) and the other five channels will have 1 (on) as their value.

Step	Action	Result
5b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channel 5 to 0 and leave the other five channels set to 1, the **Predefined Fallback Value** value changes to 0x2F.

STB DDO 3600 Data and Status for the Process Image

Representing Digital Output Data and Status

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master ad is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DDO 3600 module are based on its physical location on the island bus.

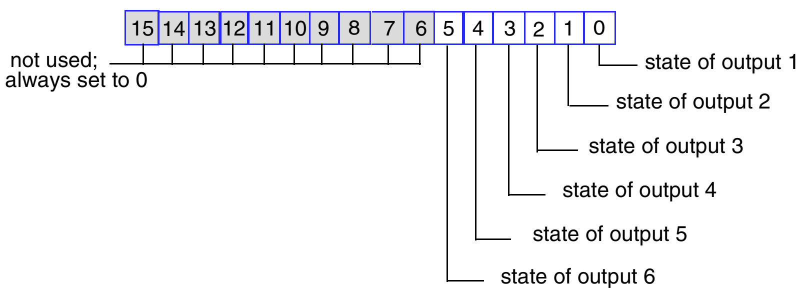
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in a register in this data block. The STB DDO 3600 uses one register in the output data block.

The STB DDO 3600's output data register displays the most current on/off states of the module's six output channels:

STB DDO 3600 Data Register



These values are written to the island bus by the fieldbus master.

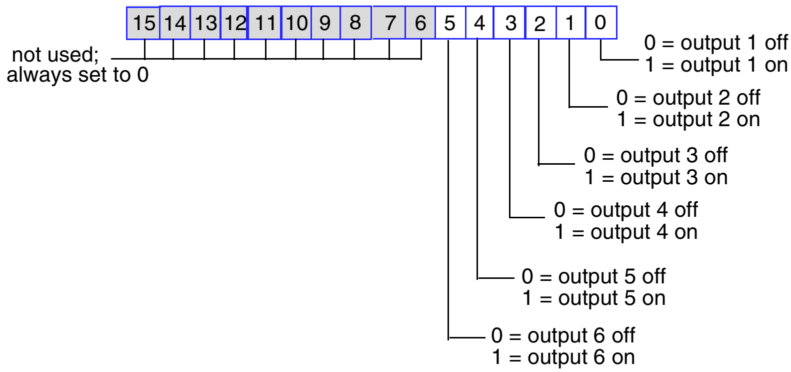
Output Status Registers

The echo output data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DDO 3600 is represented by two contiguous registers—one register that echoes the output data register followed by one that displays the status of the output channels.

The first STB DDO 3600 register in the I/O status block is the module's *echo output data* register. This register represents the data that has just been sent to the output field devices by the STB DDO 3600 module.

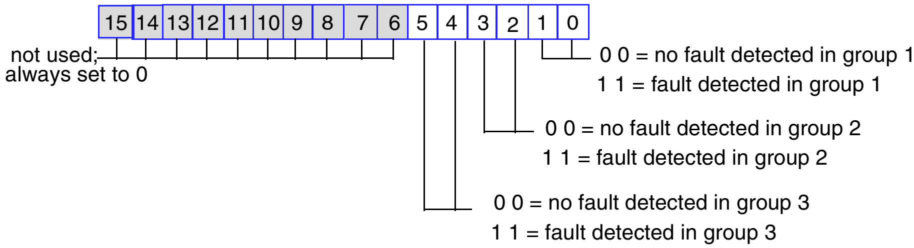
STB DDO 3600 Echo Output Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

The next contiguous register is the STB DDO 3600's status register. It indicates whether or not a fault condition has been detected on either of the module's two output channels. The fault might be field power absent or actuator power shorted:

STB DDO 3600 Status Register



Group 1 comprises outputs 1 and 2. Group 2 comprises outputs 3 and 4. Group 3 comprises outputs 5 and 6.

STB DDO 3600 Specifications

Table of Technical Specifications

description		24 VDC, 0.5 A source output
number of output channels		six
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output protection (internal)		transient voltage suppression
short circuit protection		per channel
short circuit feedback		per group: ● group 1 comprises channels 1 and 2 ● group 2 comprises channels 3 and 4 ● group 3 comprises channels 5 and 6
fault recovery response	default setting	shorted channel latched off—requires user reset action
	user-configurable settings**	auto-recovery
		latched off
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		internal protection on the module
nominal logic bus current consumption		90 mA
nominal actuator bus current consumption		15 mA, with no load
maximum load current		0.5 A/channel
minimum load current		none
output response time	off-to-on	715 µs @ 0.5 A load
	on-to-off	955 µs @ 0.5 A load
output voltage	working	19.2 ... 30 VDC
	absolute maximum	56 VDC for 1.3 ms, decaying voltage pulse
	on-state drop/channel	0.4 VDC max.
off-state leakage/channel		0.4 mA @ 30 VDC max.
maximum surge current		5 A/channel for 500 µs (no more than six/min)
maximum load capacitance		50 µF

<table>
<tr><td colspan="2">maximum load inductance</td><td>0.5 H @ 4 Hz switch frequency
$L = 0.5/I^2 \times F$
where:
L = load inductance (H)
I = load current (A)
F = switching frequency (Hz)</td></tr>
<tr><td rowspan="3">fallback mode</td><td>default</td><td>predefined fallback values on all six channels</td></tr>
<tr><td rowspan="2">user-configurable settings**</td><td>hold last value</td></tr>
<tr><td>predefined fallback value on one or more channels</td></tr>
<tr><td rowspan="2">fallback states (when predefined is the fallback mode)</td><td>default</td><td>all six channels go to 0</td></tr>
<tr><td>user-configurable settings**</td><td>each channel configurable for 1 or 0</td></tr>
<tr><td rowspan="3">polarity on individual outputs</td><td>default</td><td>logic normal on all six channels</td></tr>
<tr><td rowspan="2">user-configurable settings**</td><td>logic reverse on one or more channels</td></tr>
<tr><td>logic normal on one or more channels</td></tr>
<tr><td colspan="2">field power requirements</td><td>from a 24 VDC PDM</td></tr>
<tr><td colspan="2">power protection</td><td>time-lag fuse on the PDM</td></tr>
<tr><td colspan="3">* Basic NIMs do not let you hot swap I/O modules.</td></tr>
<tr><td colspan="3">** Requires the Advantys configuration software.</td></tr>
</table>

4.6 STB DDO 3605 Digital 24 VDC Source Output Module (six-channel, 0.25 A, over-current protected)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DDO 3605 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

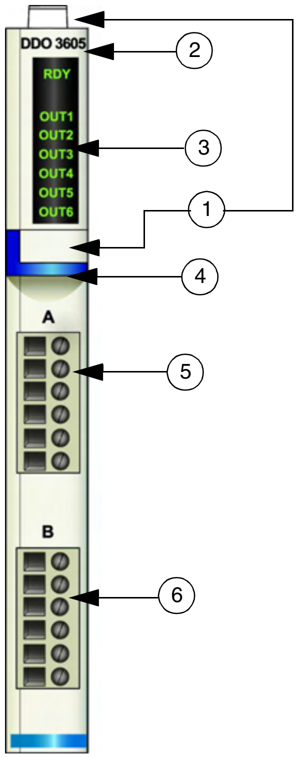
This section contains the following topics:

STB DDO 3605 Physical Description

Physical Characteristics

The STB DDO 3605 is a basic Advantys STB six-channel digital output module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors. Actuators 1, 2 and 3 are wired to the top connector, and actuators 4, 5 and 6 are wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 actuators 1 ... 3 connect to the top field wiring connector
6 actuator 4 ... 6 connect to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DDO 3605 LED Indicators

Overview

The seven LEDs on the STB DDO 3605 module are visual indications of the operating status of the module and its six digital output channels.

Location

The LED indicators are positioned in a column at the top front of the STB DDO 3605 digital output module:

Indications

The following table defines the meaning of the eight LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	Meaning
off							The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*							Auto-addressing is in progress.
on							The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
	on						Voltage is present on output channel 1.
	off						Voltage is absent on output channel 1.
		on					Voltage is present on output channel 2.
		off					Voltage is absent on output channel 2.
			on				Voltage is present on output channel 3.
			off				Voltage is absent on output channel 3.
				on			Voltage is present on output channel 4.
				off			Voltage is absent on output channel 4.
					on		Voltage is present on output channel 5.
					off		Voltage is absent on output channel 5.
						on	Voltage is present on output channel 6.
						off	Voltage is absent on output channel 6.
blink 1**							The module is either in pre-operational mode or in its fallback state.

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

STB DDO 3605 Field Wiring

Summary

The STB DDO 3605 module uses two six-terminal field wiring connectors. Actuators 1, 2 and 3 are wired to the top connector, and actuators 4, 5 and 6 are wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors, available in a kit of 20 (model STB XTS 2100)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3605 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to 250 mA/channel.

Note: If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 to 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

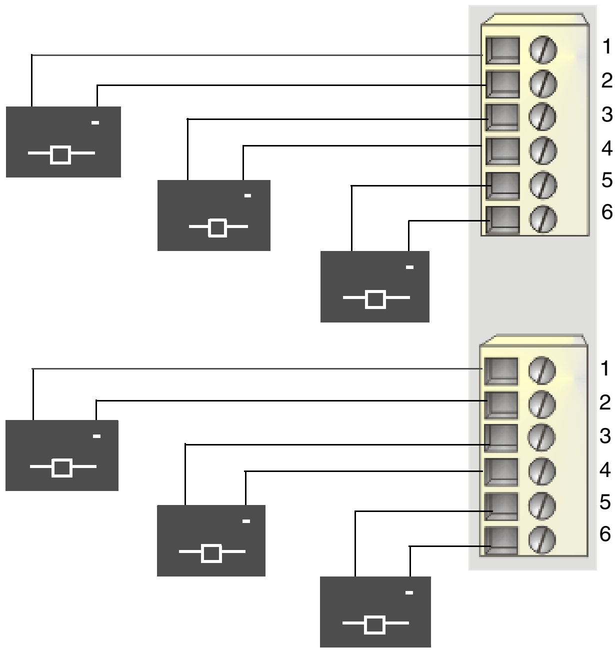
Field Wiring Pinout

The top connector supports digital input channels 1, 2, and 3; the bottom connector supports digital input channels 4, 5, and 6:

Pin	Top Connector	Bottom Connector
1	output to actuator 1	output to actuator 4
2	field power return	field power return
3	output to actuator 2	output to actuator 5
4	field power return	field power return
5	output to actuator 3	output to actuator 6
6	field power return	field power return

Sample Wiring Diagram

The following field wiring example shows six actuators connected to the STB DDO 3605 module:



1 output to actuator 1 (top) and actuator 4 (bottom)
2 field power return from actuator 1 (top) and actuator 4 (bottom)
3 output to actuator 2 (top) and actuator 5 (bottom)
4 field power return from actuator 2 (top) and actuator 5 (bottom)
5 output to actuator 3 (top) and actuator 6 (bottom)
6 field power return from actuator 3 (top) and actuator 6 (bottom)

STB DDO 3605 Functional Description

Functional Characteristics

The STB DDO 3605 is a six-channel module that sends digital output data to six 24 VDC field actuators. It does not support user-configurable operating parameters or reflex actions.

Auto-recovery from Detected Faults

If an overcurrent fault is detected on any channel, that channel plus the one with which it is grouped turns off. The module applies the fault recovery response to the channels in three groups:

- group 1 comprises output channels 1 and 2
- group 2 comprises output channels 3 and 4
- group 3 comprises output channels 5 and 6

A channel group that has been turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. No user intervention is required to reset the channels.

Output Polarity

The polarity on all four output channels is *logic normal*, where:

- 0 indicates that the physical actuator is off (or the output signal is low)
- 1 indicates that the physical actuator is on (or the output signal is high)

Fallback States

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. All six channels go to a predefined fallback state of 0 VDC.

STB DDO 3605 Data for the Process Image

Representing Digital Output Data

The NIM keeps a record of output data in one block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master ad is used to update the output module. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

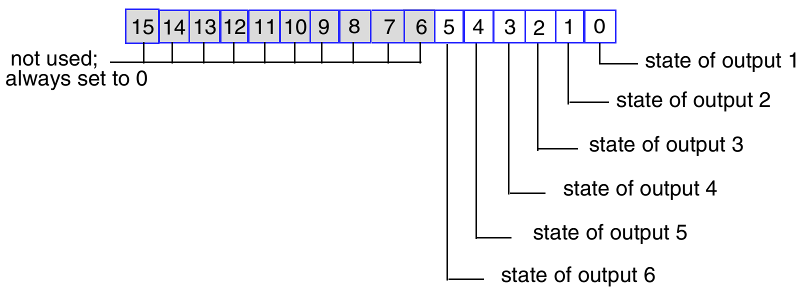
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. The STB DDO 3605 uses one register in the output data block. The specific register is based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The STB DDO 3605's output data register displays the most current on/off states of the module's six output channels:

STB DDO 3605 Data Register



STB DDO 3605 Specifications

Table of Technical Specifications

<table>
<tr><td colspan="2">description</td><td>24 VDC, 0.25 A source output</td></tr>
<tr><td colspan="2">number of output channels</td><td>six</td></tr>
<tr><td colspan="2">module width</td><td>13.9 mm (0.58 in)</td></tr>
<tr><td colspan="2">I/O base</td><td>STB XBA 1000 (see p. 808)</td></tr>
<tr><td colspan="2">hot swapping supported</td><td>NIM-dependent*</td></tr>
<tr><td colspan="2">reflex actions supported</td><td>no</td></tr>
<tr><td colspan="2">output protection (internal)</td><td>transient voltage suppression</td></tr>
<tr><td colspan="2">short circuit protection</td><td>no</td></tr>
<tr><td colspan="2">fault recovery</td><td>per group:
● group 1 comprises channels 1 and 2
● group 2 comprises channels 3 and 4
● group 3 comprises channels 5 and 6</td></tr>
<tr><td colspan="2">fault recovery response</td><td>auto-recovery</td></tr>
<tr><td>isolation voltage</td><td>field-to-bus</td><td>1500 VDC for 1 min</td></tr>
<tr><td colspan="2">reverse polarity protection from a miswired PDM</td><td>internal protection on the module</td></tr>
<tr><td colspan="2">nominal logic bus current consumption</td><td>90 mA</td></tr>
<tr><td colspan="2">nominal island bus current consumption</td><td>15 mA, with no load</td></tr>
<tr><td colspan="2">maximum load current</td><td>250 mA/channel</td></tr>
<tr><td colspan="2">minimum load current</td><td>none</td></tr>
<tr><td rowspan="2">output response time</td><td>off-to-on</td><td>550 µs @ 250 mA resistive load</td></tr>
<tr><td>on-to-off</td><td>900 µs @ 250 mA resistive load</td></tr>
<tr><td rowspan="3">output voltage</td><td>working</td><td>19.2 ... 30 VDC</td></tr>
<tr><td>absolute maximum</td><td>56 VDC for 1.3 ms, decaying voltage pulse</td></tr>
<tr><td>on-state drop/channel</td><td>0.4 VDC max.</td></tr>
<tr><td colspan="2">off-state leakage/channel</td><td>0.4 mA @ 30 VDC max.</td></tr>
<tr><td colspan="2">maximum surge current</td><td>2.5 A/channel for 500 µs (no more than six/min)</td></tr>
<tr><td colspan="2">maximum load capacitance</td><td>50 µF</td></tr>
</table>

maximum load inductance	0.5 H @ 4 Hz switch frequency $L = 0.5/I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	predefined fallback values on all six channels
fallback states	all six channels go to 0
polarity on individual outputs	*logic normal* on all six channels
field power requirements	from a 24 VDC PDM
power protection	time-lag fuse on the PDM
* Basic NIMs do not let you hot swap I/O modules.	

4.7 STB DDO 3705 High Density Output Module

At a Glance

Introduction

The STB DDO 3705—described below—is a basic Advantys STB sixteen-channel digital output module

What's in this Section?

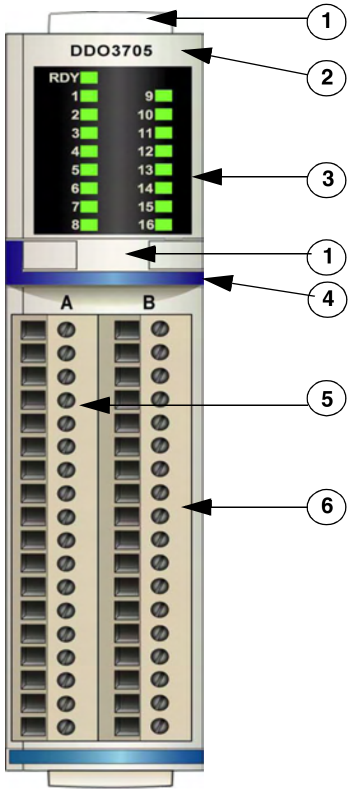
This section contains the following topics:

STB DDO 3705 Physical Description

Physical Characteristics

The STB DDO 3705 is a basic Advantys STB sixteen-channel digital output module that writes outputs to 24 VDC actuator devices and provides power to the actuators. The module mounts in a size 3 base and uses two 18-pin field wiring connectors. The connectors are positioned side-by-side on the bezel; connector A (which supports output channels 1...8) is on the left, and connector B (which supports output channels 9...16) is on the right.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a digital VDC output module
5 group 1 actuators (1 - 8) connect to the left field wiring connector (A)
6 group 2 actuators (9 - 16) connect to the right field wiring connector (B)

Module Accessories

Required

- an STB XBA 3000 (see *p. 808*) base
- two eighteen-terminal field wiring connectors, either STB XTS 1180 screw type connectors or STB XTS 2180 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit to control the insertion of the module into the base
- the STB XMP 7800 keying pin kit to control the insertion of the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

The following table provides dimensions for standard size 3 modules:

width	module on a base	28.1 mm (1.06 in)
height	module only	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

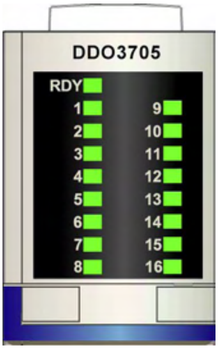
STB DDO 3705 LED Indicators

Overview

The seventeen LEDs on the STB DDO 3705 module are visual indicators of the module's operating status and its sixteen digital output channels.

Location

The LED indicators are positioned in two columns at the top of the STB DDO 3705 digital output module's bezel. Indicators for the RDY signal and output channels 1...8 are in the left column, and output channels 9...16 in the right column.



Indicators

The following two-part table defines the meaning of the seventeen LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter). The first part of the table corresponds to the left column of LED indicators:

RDY	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	OUT7	OUT8	Meaning
off									The module is either not receiving logic power, has experienced a watchdog timer error or has failed.
flicker*									Auto-addressing is in progress.
blink 1**									The module is in pre-operational mode and in its fallback state.

RDY	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	OUT7	OUT8	Meaning
on									The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
	on								Voltage is present on output channel 1.
	off								Voltage is absent on output channel 1.
		on							Voltage is present on output channel 2.
		off							Voltage is absent on output channel 2.
			on						Voltage is present on output channel 3.
			off						Voltage is absent on output channel 3.
				on					Voltage is present on output channel 4.
				off					Voltage is absent on output channel 4.
					on				Voltage is present on output channel 5.
					off				Voltage is absent on output channel 5.
						on			Voltage is present on output channel 6.
						off			Voltage is absent on output channel 6.
							on		Voltage is present on output channel 7.
							off		Voltage is absent on output channel 7.
								on	Voltage is present on output channel 8.
								off	Voltage is absent on output channel 8.
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.									
** blink 1—the LED blinks on for 200 ms then off for 200 ms.									

The second part of the table describes combinations of the RDY indicator in the left column plus the right column LED indicators:

RDY	OUT9	OUT10	OUT11	OUT12	OUT13	OUT14	OUT15	OUT16	Meaning
on	on								Voltage is present on output ch. 9.
	off								Voltage is absent on output ch. 9.
		on							Voltage is present on output ch. 10.
		off							Voltage is absent on output ch. 10.
			on						Voltage is present on output ch. 11.
			off						Voltage is absent on output ch. 11.
				on					Voltage is present on output ch. 12.
				off					Voltage is absent on output ch. 12.
					on				Voltage is present on output ch. 13.
					off				Voltage is absent on output ch. 13.
						on			Voltage is present on output ch. 14.
						off			Voltage is absent on output ch. 14.
							on		Voltage is present on output ch. 15.
							off		Voltage is absent on output ch. 15.
								on	Voltage is present on output ch. 16.
								off	Voltage is absent on output ch. 16.
blink 1**									The module is either in pre-operational mode or in its fallback state.
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.									
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.									

STB DDO 3705 Field Wiring

Summary

The STB DDO 3705 module uses two eighteen-terminal field wiring connectors. Actuators 1 ... 8 are wired to the left connector (A), and actuators 9 ... 16 are wired to the right connector (B).

Connectors

Use a set of either:

- two STB XTS 1180 *screw-type* field wiring connectors (available in a kit of 2)
- two STB XTS 2180 *spring clamp* field wiring connectors (available in a kit of 2)

These field wiring connectors each have eighteen-channel connection terminals, with a 3.81 mm (0.15 in) pitch between each pin.

Field Actuators

The STB DDO 3705 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-wire actuators such as solenoids, contactors, relays, alarms or panel lamps that draw current up to 500 mA/channel.

> **Note:** If you are using this module to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn the field device off before removing the field power connector from the module. The output channel on the module may be damaged if you remove the connector while the field device is on.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 to 16 AWG).

We recommend that you strip 9 mm from the wire's jacket for the module connection.

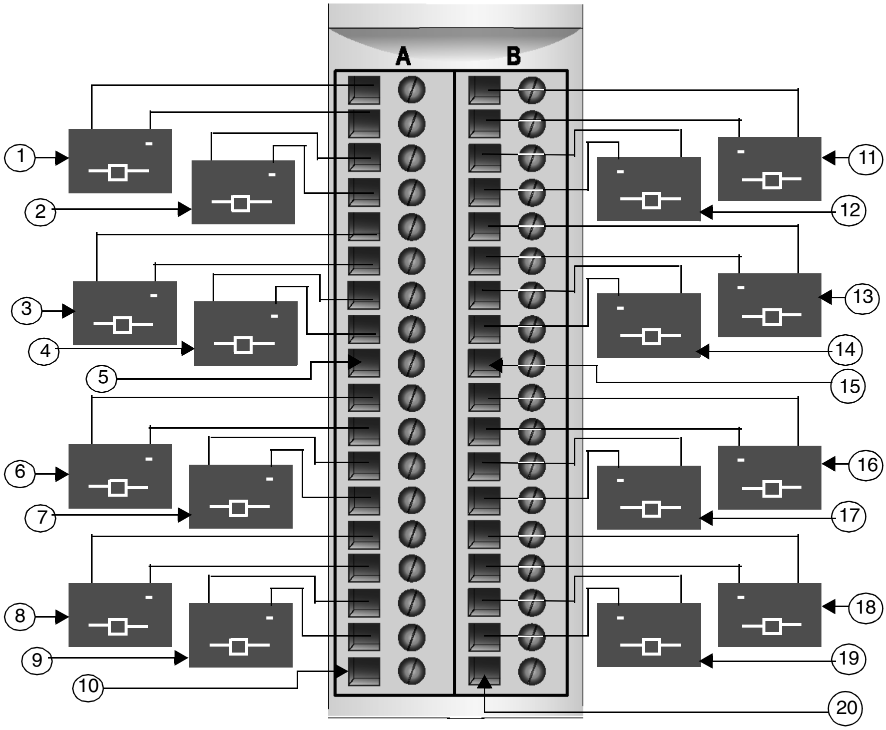
Field Wiring Pinout

The left connector (A) supports digital output channels 1 ... 8; the right connector (B) supports digital output channels 9 ... 16:

Pin	Left Connector	Right Connector
1	output to actuator 1	output to actuator 9
2	field power return	field power return
3	output to actuator 2	output to actuator 10
4	field power return	field power return
5	output to actuator 3	output to actuator 11
6	field power return	field power return
7	output to actuator 4	output to actuator 12
8	field power return	field power return
9	no connection	no connection
10	output to actuator 5	output to actuator 13
11	field power return	field power return
12	output to actuator 6	output to actuator 14
13	field power return	field power return
14	output to actuator 7	output to actuator 15
15	field power return	field power return
16	output to actuator 8	output to actuator 16
17	field power return	field power return
18	no connection	no connection

Sample Wiring Diagram

The following field wiring example shows 16 actuators - 8 in group 1 (channels 1-8) and 8 in group 2 (channels 9-16) - connected to the STB DDO 3705 module. Pins 9 and 18 on each connector are not used.



#	Group 1	#	Group 2
1	Channel 1, Connector A, Actuator	11	Channel 1, Connector B, Actuator
2	Channel 2, Connector A, Actuator	12	Channel 2, Connector B, Actuator
3	Channel 3, Connector A, Actuator	13	Channel 3, Connector B, Actuator
4	Channel 4, Connector A, Actuator	14	Channel 4, Connector B, Actuator
5	Pin 9, Connector A (not used)	15	Pin 9, Connector B (not used)
6	Channel 5, Connector A, Actuator	16	Channel 5, Connector B, Actuator
7	Channel 6, Connector A, Actuator	17	Channel 6, Connector B, Actuator
8	Channel 7, Connector A, Actuator	18	Channel 7, Connector B, Actuator
9	Channel 8, Connector A, Actuator	19	Channel 8, Connector B, Actuator
10	Pin 18, Connector A (not used)	20	Pin 18, Connector B (not used)

STB DDO 3705 Functional Description

Functional Characteristics

The STB DDO 3705 is a basic sixteen-channel module that writes digital output data to 2 groups of eight 24 VDC field actuators, sd follows:

- group 1 comprises output channels 1 through 8
- group 2 comprises output channels 9 through 16

The module does not support user-configurable operating parameters or reflex actions.

Auto-recovery from Detected Faults

If an overcurrent fault is detected on any channel, that channel plus the others with which it is grouped turns off. The module applies the fault recovery response to the channels in two groups:

- group 1 comprises output channels 1 through 8
- group 2 comprises output channels 9 through 16

A channel group that has been turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. The module is permanently set to *auto-recover*; no user intervention is required to reset the channels.

Output Polarity

The polarity on all output channels is *logic normal*, where:

- 0 indicates that the physical actuator is off (or the output signal is low)
- 1 indicates that the physical actuator is on (or the output signal is high)

Fallback States

When communications are lost between the output module and the fieldbus master, the module’s output channels must go to a known state where they will remain until communications are restored. This is known as the channel’s *fallback state*. All sixteen channels go to a predefined fallback state of 0 VDC.

STB DDO 3705 Data for the Process Image

Representing Digital Output Data

The NIM keeps a record of output data in one block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

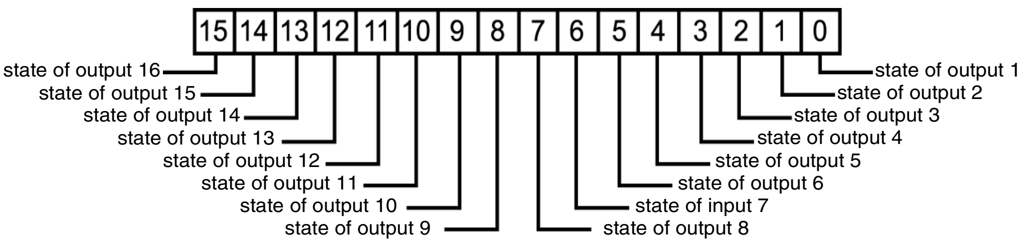
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. The STB DDO 3705 uses one register in the output data block. The specific register is based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module (*NIM*) Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The STB DDO 3705 basic high density output module's output data register displays the most current on/off states of the module's sixteen output channels:

STB DDO 3705 Data Register



STB DDO 3705 Specifications

Table of Technical Specifications

description		24 VDC, 0.5 A source output
number of output channels		sixteen
module width		28.1 mm (1.11 in)
I/O base		STB XBA 3000 (see *p. 808*)
hot swapping supported		NIM-dependent*
reflex actions supported		no
short circuit protection		yes
fault recovery		per group: ● group 1 comprises channels 1...8 ● group 2 comprises channels 9...16
fault recovery response		auto-recovery
isolation voltage	field-to-bus	1500 VDC for 1 min
reverse polarity protection from a miswired PDM		PDM will blow the fuse
nominal logic bus current consumption		150 mA
nominal actuator bus current consumption		50 mA, with no load
maximum load current		4 A total per module: ● 2 A per group ● .5 A per channel
minimum load current		None
output response time	off-to-on	2 ms@ 500 mA resistive load
	on-to-off	2 ms @ 500 mA resistive load
output voltage	working	19.2 ... 30 VDC
	absolute maximum	35 VDC for 1.3 ms, decaying voltage pulse
	on-state drop/channel	0.4 VDC max.
off-state leakage/channel		0.4 mA @ 30 VDC max.
maximum surge current		Self Limiting Per Point
maximum load capacitance		10 µF

maximum load inductance	1 H @ 4 Hz switch frequency $L = 0.5/I^2 \times F$ where: L = load inductance (H) I = load current (A) F = switching frequency (Hz)
fallback mode	predefined fallback values on all sixteen channels
fallback states	all sixteen channels go to 0 VDC
polarity on individual outputs	*logic normal* on all sixteen channels
field power requirements	from a 24 VDC PDM
power protection	time-lag fuse on the PDM
* Basic NIMs do not allow the user to hot swap I/O modules.	

4.8 STB DAO 5260 Digital 115 VAC Source, Isolated Output Module (two-channel, 2 A)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DAO 5260 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

This section contains the following topics:

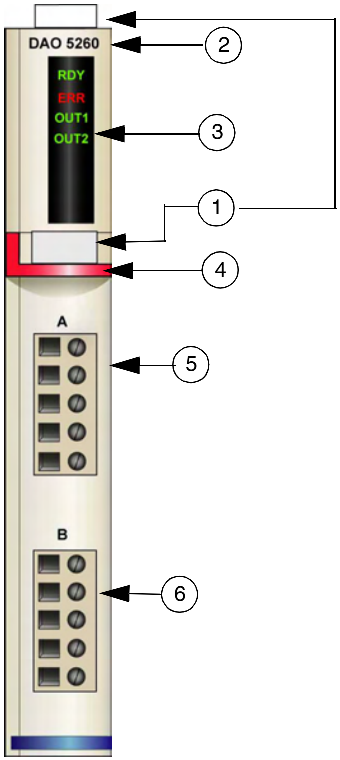
STB DAO 5260 Physical Description

Physical Characteristics

The STB DAO 5260 is a standard Advantys STB two-channel isolated digital output module that writes outputs to 115 VAC actuator devices and provides power to the actuators. This module can receive power from different phases of an AC power source. The module mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector.

The STB DAO 5260 module does not receive power from the PDM.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 red identification stripe, indicating a digital AC output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

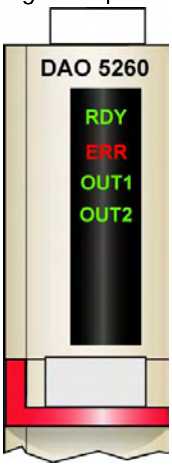
STB DAO 5260 LED Indicators

Purpose

The four LEDs on the STB DAO 5260 module are visual indications of the operating status of the module and its two digital output channels. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top front of the STB DAO 5260 digital output module. The figure below shows their location:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	OUT1	OUT2	Meaning	What to Do
off	off			The module is either not receiving logic power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: • it has power • it has passed its confidence tests • it is operational	
		on		Voltage is present on output channel 1.	
		off		Voltage is absent on output channel 1.	
			on	Voltage is present on output channel 2.	
			off	Voltage is absent on output channel 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.			
blink 1**				The module is either in pre-operational mode or in its fallback state.	
	blink 1**			A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***			The module is not communicating with the island bus.	If all I/O modules have a blink 2 pattern, cycle power to the island or replace the NIM. If only this module has a blink 2 pattern, replace the module.
blink 3****				One or more of the output channels are in fallback. This condition can occur only if one or more output channels are configured for reflex aciton.	

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

STB DAO 5260 Field Wiring

Summary

The STB DAO 5260 module uses two five-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector. Each output must be wired with an external fuse to protect the module from possible damage. The choices of connector types and field wire types are described below, and some field wiring considerations are presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Actuators

The STB DAO 5260 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-, three- or four-wire devices such as solenoids, contactors, relays, alarms or panel lamps.

When the module is operating at 30 degrees C, it supports two actuators that can draw current up to 2.0 A/channel. At 60 degrees C, it supports two actuators that can draw current up to 1.0 A/channel.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

External Fusing

External fusing is required for each output. Use a 5 A fuse for each output.

To achieve over-current protection on the outputs, you must place external fuses in-line on each output channel. Use a 5 A, 250 V 5 x 20 mm fuse such as the Wickmann 1911500000 on the wires that connect the field device to pin 1 on each connector.

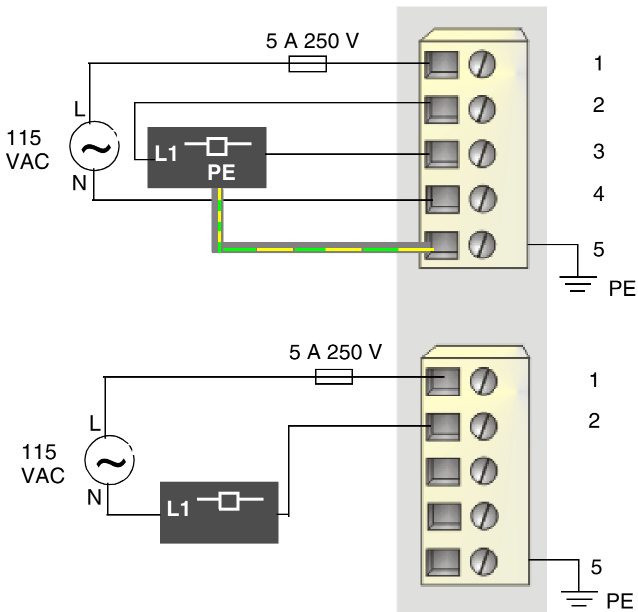
Field Wiring Pinout

The top connector supports actuator 1, and the bottom connector supports actuator 2:

Pin	Top Connector	Bottom Connector
1	115VAC source power 1 (to the module)	115VAC source power 2 (to the module)
2	output to actuator 1	output to actuator 2
3	output neutral 1	output neutral 2
4	field power neutral 1 (to the module)	field power neutral 2 (to the module)
5	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two actuators connected to an STB DAO 5260 output module, with user-installed external fuses on each channel connection:



Within each connector, pins 3 and 4 are internally tied. The actuator on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DAO 5260 Functional Description

Functional Characteristics

The STB DAO 5260 module is a two-channel module that sends digital output data to two field actuators that may be operating at 115 VAC. Using the Advantys configuration software, you can customize the following operating parameters:

- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Output Polarity

By default, the polarity on both output channels is *logic normal*, where:

- 0 indicates that the physical actuator is off (or the output signal is low)
- 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or both channels may optionally be configured for *logic reverse*, where:

- 1 indicates that the physical actuator is off (or the output signal is low)
- 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DAO 5260 module you want to configure in the island editor.	The selected STB DAO 5260 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has normal polarity and **Channel 2** has reverse polarity.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Output Polarity** value changes to 2.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a predefined state. If you want to change the fallback mode to *hold last value*, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DAO 5260 module you want to configure in the island editor.	The selected STB DAO 5260 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels hold their last values and 3 means that both channels go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then **Channel 1** goes to hold last value and **Channel 2** goes to a predefined state.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Fallback Mode** value changes to 2.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have 0 as their predefined fallback value and 3 means that both channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 2, then **Channel 2** will turn on as its fallback state. **Channel 1** will either turn off or be ignored, depending on its fallback mode setting.

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s). You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 2 to 1 and leave channel 1 at 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DAO 5260 Data and Status for the Process Image

Representing Digital Output Data

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DAO 5260 module are based on its physical location on the island bus.

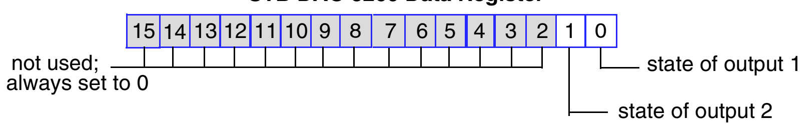
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus has its data values represented in a register in this data block. The STB DAO 5260 uses one register in the output data block.

The STB DAO 5260's output data register displays the most current on/off states of the module's two output channels:

STB DAO 5260 Data Register



These values are written to the island bus by the fieldbus master.

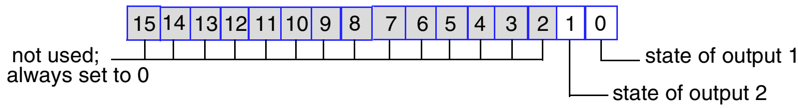
Output Echo Register

The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DAO 5260 is represented by one register that echoes the output data register.

This register represents the data that has just been sent to the output field devices by the STB DAO 5260 module:

STB DAO 5260 Echo Output Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

STB DAO 5260 Specifications

Table of Technical Specifications

description		115 VAC source (47 ... 63 Hz) output
number of output channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output surge protection		metal oxide varistor and RC suppression
output voltage (rms)	working	20 ... 132 VAC
	absolute maximum	200 VAC for 1 cycle
	on-state drop/channel	2.0 VAC max.
off-state leakage/ channel	132 VAC max.	2.0 mA
maximum surge current (rms)	one cycle	30 A/channel
	two cycles	20 A/channel
isolation voltage	output-to-output	1780 VAC for 1 min
	field-to-bus	1780 VAC for 1 min
nominal logic bus current consumption		70 mA
maximum load current (rms)		2 A/channel @ 30 degrees C
		1 A/channel @ 60 degrees C
external fusing for the outputs		5 A time-lag fuses
minimum load current (rms)		1 mA
output response time output turns on at AC voltage 0 crossing	off-to-on	0.5 line cycle
	on-to-off	0.5 line cycle
fallback mode	default	predefined
	user-configurable setting**	hold last value
		predefined fallback value on one or both channels
fallback states (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings**	each channel configurable for 1 or 0

description		115 VAC source (47 ... 63 Hz) output
polarity on individual outputs	default	*logic normal* on both channels
	user-configurable settings**	*logic reverse* on one or both channels
		logic normal on one or both channels
field power requirements		from a 115 VAC field source
power protection	—	5 A external fuse required (e.g. Wickman 1911500000)
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

4.9 STB DAO 8210 Digital 115/230 VAC Source Output Module (two-channel, 2 A)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DAO 8210 digital output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

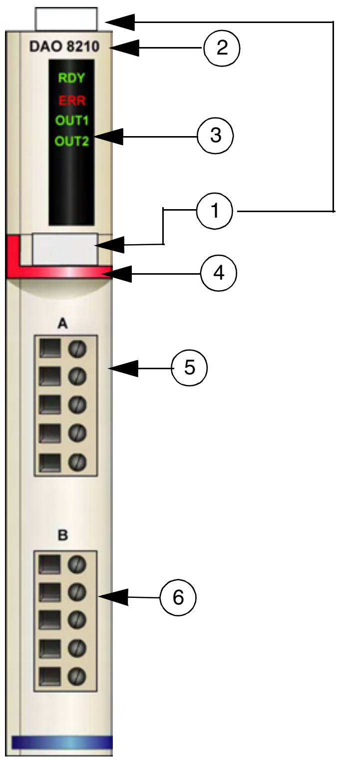
This section contains the following topics:

STB DAO 8210 Physical Description

Physical Characteristics

The STB DAO 8210 is a standard Advantys STB two-channel digital output module that writes outputs to either 115 VAC or 230 VAC actuator devices and provides power to the actuators. The module mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 red identification stripe, indicating a digital AC output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

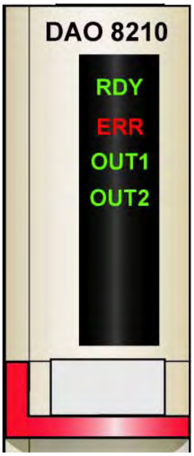
STB DAO 8210 LED Indicators

Purpose

The four LEDs on the STB DAO 8210 module are visual indications of the operating status of the module and its two digital output channels. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top front of the STB DAO 8210 digital output module. The figure below shows their location:



Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

<table>
<tr><th>RDY</th><th>ERR</th><th>OUT1</th><th>OUT2</th><th>Meaning</th><th>What to Do</th></tr>
<tr><td>off</td><td>off</td><td></td><td></td><td>The module is either not receiving logic power or has failed.</td><td>Check power</td></tr>
<tr><td>flicker*</td><td>off</td><td></td><td></td><td>Auto-addressing is in progress.</td><td rowspan="6"></td></tr>
<tr><td rowspan="5">on</td><td rowspan="5">off</td><td></td><td></td><td>The module has achieved all of the following:
● it has power
● it has passed its confidence tests
● it is operational</td></tr>
<tr><td>on</td><td></td><td>Voltage is present on output channel 1.</td></tr>
<tr><td>off</td><td></td><td>Voltage is absent on output channel 1.</td></tr>
<tr><td></td><td>on</td><td>Voltage is present on output channel 2.</td></tr>
<tr><td></td><td>off</td><td>Voltage is absent on output channel 2.</td></tr>
<tr><td rowspan="2">on</td><td rowspan="2">on</td><td>on</td><td>on</td><td>The watchdog has timed out.</td><td rowspan="2">Cycle power, restart the communications</td></tr>
<tr><td colspan="3">Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.</td></tr>
<tr><td>blink 1**</td><td></td><td></td><td></td><td>The module is either in pre-operational mode or in its fallback state.</td><td></td></tr>
<tr><td></td><td>blink 1**</td><td></td><td></td><td>A nonfatal error has been detected.</td><td>Cycle power, restart the communications</td></tr>
<tr><td></td><td>blink 2***</td><td></td><td></td><td>The island bus is not running.</td><td>Check network connections, replace NIM</td></tr>
<tr><td>blink 3****</td><td></td><td></td><td></td><td>The output channels on this module are operational while the rest of the island modules are in their fallback states. This condition could occur if the module is used in a reflex action.</td><td></td></tr>
<tr><td colspan="6">* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.</td></tr>
<tr><td colspan="6">** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
</table>

STB DAO 8210 Field Wiring

Summary

The STB DAO 8210 module uses two five-terminal field wiring connectors. Actuator 1 is wired to the top connector, and actuator 2 is wired to the bottom connector. Each output should be wired with an external fuse to protect the module from possible damage. The choices of connector types and field wire types are described below, and some field wiring considerations are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Actuators

The STB DAO 8210 is designed to handle high duty cycles and to control continuous-operation equipment. It supports field wiring to two-, three- or four-wire devices such as solenoids, contactors, relays, alarms or panel lamps.

When the module is operating at 30 degrees C, it supports two actuators that can draw current up to 2.0 A/channel. At 60 degrees C, it supports two actuators that can draw current up to 1.0 A/channel.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

External Fusing

Two different external fuse types may be used:

- 5 A fuses for the outputs
- 0.5 A fuses for accessory power

Because of the triac used in this module, the 10 A fuse in the PDM will not provide over-current protection to the outputs. To achieve over-current protection on the outputs, you must place external fuses in-line on each output channel. Use a 5 A, 250 V 5 x 20 mm fuse such as the Wickmann 1911500000 on the wires that connect the field device to pin 2 on each connector.

The STB DAO 8210 does not provide electronic over-current protection when the actuator bus is supplying accessory power to a field device. To achieve over-current protection for accessories, you should place external fuses in-line on pin 1. If you do not use fuses, an over-current condition could damage the module and blow the 10 A fuse in the PDM. Use a 0.5 A, 250 V 5 x 20 mm time-lag fuse such as the Wickmann 1910500000.

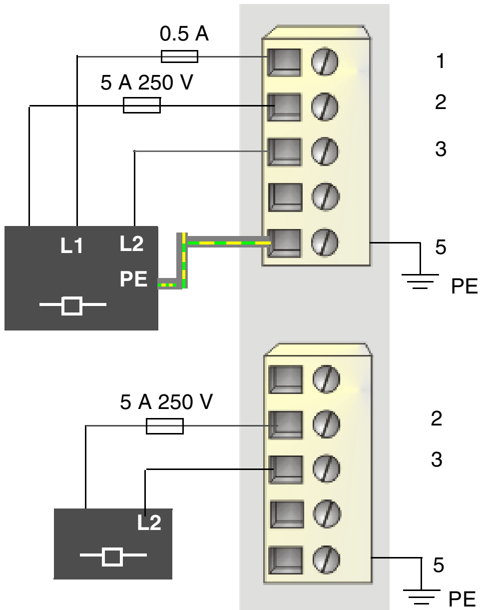
Field Wiring Pinout

The top connector supports actuator 1, and the bottom connector supports actuator 2:

Pin	Top Connector	Bottom Connector
1	actuator bus power (L1)	actuator bus power (L1)
2	output to actuator 1 (common with L1)	output to actuator 2 (common with L1)
3	field power neutral or L2	field power neutral or L2
4	field power neutral or L2	field power neutral or L2
5	protective earth	protective earth

Sample Wiring Diagram

The following field wiring example shows two actuators connected to an STB DAO 8210 output module, with user-installed external fuses on each channel connection:



1 actuator bus power (L1) to actuator 1 (top)
2 output to actuator 1 (top) and actuator 2 (bottom)
3 L2 from actuator 1 (top) and field power neutral from actuator 2 (bottom)
5 PE connection point for actuator 1 (top)

The four-wire actuator on the top connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DAO 8210 Functional Description

Functional Characteristics

The STB DAO 8210 module is a two-channel module that sends digital output data to two field actuators that may be operating at either 115 or 230 VAC. Using the Advantys configuration software, you can customize the following operating parameters:

- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback state for each channel on the module

Output Polarity

By default, the polarity on both output channels is *logic normal*, where:

- 0 indicates that the physical actuator is off (or the output signal is low)
- 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or both channels may optionally be configured for *logic reverse*, where:

- 1 indicates that the physical actuator is off (or the output signal is low)
- 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from the default or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DAO 8210 module you want to configure in the island editor.	The selected STB DAO 8210 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has normal polarity and **Channel 2** has reverse polarity.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Output Polarity** value changes to 2.

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a predefined state. If you want to change the fallback mode to *hold last value*, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DAO 8210 module you want to configure in the island editor.	The selected STB DAO 8210 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels hold their last values and 3 means that both channels go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then **Channel 1** goes to hold last value and **Channel 2** goes to a predefined state.
4b	To change the settings *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s).	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to 0 and channel 2 to 1, the **Fallback Mode** value changes to 2.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*

> **Note:** If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value for the channel is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have 0 as their predefined fallback value and 3 means that both channels have 1 as their predefined fallback value.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 2, then **Channel 2** will turn on as its fallback state. **Channel 1** will either turn off or be ignored, depending on its fallback mode setting.

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel value(s) you want to change, then select the desired setting(s) from the pull-down menu(s). You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channel 2 to 1 and leave channel 1 at 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DAO 8210 Data for the Process Image

Representing Digital Output Data

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DAO 8210 module are based on its physical location on the island bus.

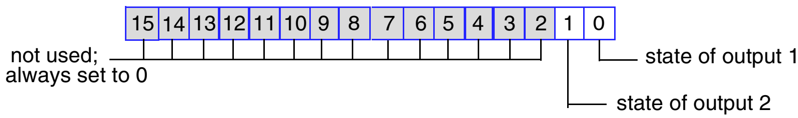
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus has its data values represented in a register in this data block. The STB DAO 8210 uses one register in the output data block.

The STB DAO 8210's output data register displays the most current on/off states of the module's two output channels:

STB DAO 8210 Data Register



These values are written to the island bus by the fieldbus master.

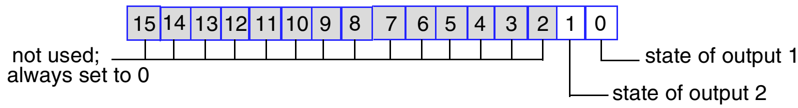
Output Status Registers

The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DAO 8210 is represented by one register that echoes the output data register.

This register represents the data that has just been sent to the output field devices by the STB DAO 8210 module:

STB DAO 8210 Echo Output Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

STB DAO 8210 Specifications

Table of Technical Specifications

description		115/230 VAC source output
number of output channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output surge protection		metal oxide varistor and RC suppression
output voltage (rms)	working	20 ... 265 VAC
	absolute maximum	300 VAC for 10 s 400 VAC for 1 cycle
	on-state drop/channel	1.5 VAC max.
off-state leakage/ channel	@ 230 VAC max.	2.5 mA
	@ 115 VAC max.	2.0 mA
maximum surge current (rms)	one cycle	30 A/channel
	two cycles	20 A/channel
nominal logic bus current consumption		70 mA
nominal actuator bus current consumption		0 mA, with no load
maximum load current (rms)		2 A/channel @ 30 degrees C
		1 A/channel @ 60 degrees C
external fusing for the outputs		5 A time-lag fuses
minimum load current (rms)		5 mA
Applied dV/dt		400 V/µs
output response time output turns on at AC voltage 0 crossing	off-to-on	10.0 ms
	on-to-off	10.5 ms
fallback mode	default	predefined
	user-configurable setting**	hold last value
		predefined fallback value on one or both channels
fallback states (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings**	each channel configurable for 1 or 0

polarity on individual outputs	default	*logic normal* on both channels
	user-configurable settings**	*logic reverse* on one or both channels
		logic normal on one or both channels
actuator bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		none
external fusing for accessories		0.5 A time-lag fuses
field power requirements		from a 115 VAC or 230 VAC PDM
power protection	with an STB PDT 2100	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

The Advantys STB Relay Modules

5

At a Glance

Overview

This chapter describes in detail the features of the relay modules in the Advantys STB family.

What's in this Chapter?

This chapter contains the following sections:

5.1 STB DRC 3210 Relay Output Module (two-point, form C, 2 A, 24 V coil)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DRC 3210 relay output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

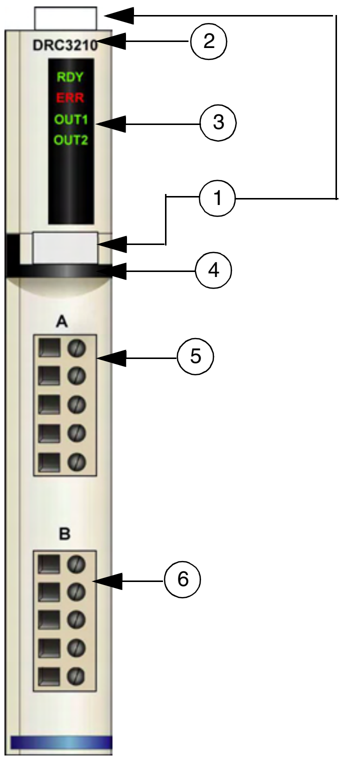
This section contains the following topics:

STB DRC 3210 Physical Description

Physical Characteristics

The STB DRC 3210 is a standard Advantys STB form C relay module that switches 24 VDC, 115 VAC or 230 VAC field devices. Its coil runs on 24 VDC from the island's actuator bus. The module provides access to both the normally open (N.O.) and normally closed (N.C.) contacts of the internal relays. It mounts in a size 2 I/O base and uses two five-terminal field wiring connectors. Field device 1 is wired to the top connector, and field device 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 black identification stripe, indicating a relay output module
5 field device 1 connects to the top field wiring connector)
6 field device 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 2000 (see *p. 812*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

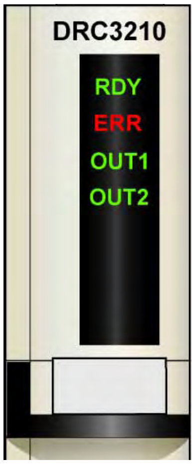
STB DRC 3210 LED Indicators

Overview

The four LEDs on the STB DRC 3210 module are visual indications of the operating status of the module and its two relay outputs. The LED locations and their meanings are described below.

Location

The four LEDs are positioned in a column on the top of the STB DRC 3210 relay output module. The figure below shows their location:



Indications The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	OUT1	OUT2	Meaning	What to Do
off	off			The module is either not receiving power or has failed.	Check power
flicker*	off			Auto-addressing is in progress.	
on	off			The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
		on		Relay 1 is energized.	
		off		Voltage is absent on relay 1.	
			on	Relay 2 is energized.	
			off	Voltage is absent on relay 2.	
on	on	on	on	The watchdog has timed out.	Cycle power, restart the communications
		Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.			
blink 1**				The module is either in pre-operational mode or in its fallback state.	
on or blink 1**	blink 1**			A nonfatal error has been detected—e.g., a counter overflow.	Cycle power, restart communications
	blink 2***			The island bus is not running.	Check network connections, replace NIM
blink 3****				The relays on this module are operational while the rest of the island modules are in their fallback states—i.e., it is a reflex action module.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.					
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.					
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.					
**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.					

STB DRC 3210 Field Wiring

Summary

The STB DRC 3210 module uses two five-terminal field wiring connectors. Relay output 1 is wired from the top connector, and relay output 2 is wired from the bottom connector. The choices of connector types and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

Field Devices

The STB DRC 3210 module provides two form C relay outputs that can be independently field wired as N.O. and/or N.C. contacts The module is designed to handle high duty cycles and to control continuous-operation equipment. It can switch 24 VDC, 115 VAC, and/or 230 VAC field devices that draw up to 2 A/relay at 30 degrees C.

The relay module needs to be placed in a voltage group supported by a 24 VDC PDM.

Caution

COMPROMISED DOUBLE INSULATION

Above 130 VAC, the relay module may compromise the double insulation provided by a SELV-rated power supply.
When you use a relay module, use separate external 24 VDC power supplies for the PDM supporting that module and the logic power to the NIM or BOS module when the contact voltage is above 130 VAC.

Failure to follow this instruction can result in injury or equipment damage.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Local electrical codes take precedence over our recommended wire size for the protective earth (PE) connection on pin 5.

External Fusing

The STB DRC 3210 does not provide internal over-current protection. You must provide external fuse protection with 2.0 A time-lag fuses (such as the Wickmann 1911200000). If you do not use fuses, an over-current condition could damage the module. Place a fuse in series with each relay on the common line (pin 1).

Field Wiring Pinout

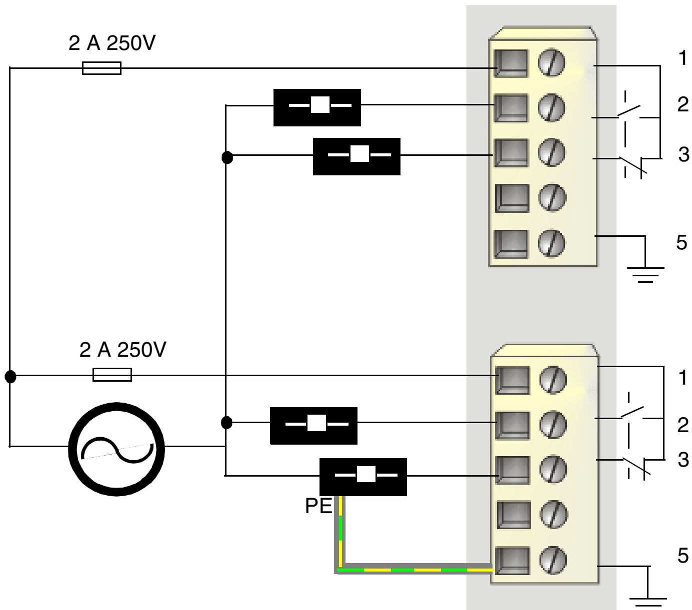
The top connector supports relay 1, and the bottom connector supports relay 2. Field actuators can be wired as normally open (N.O.) or normally closed (N.C.). Two- and three-wire actuators are supported.

The table below shows the pinouts:

Pin	Top Connector	Bottom Connector
1	relay common 1	relay common 2
2	N.O. connection for relay 1	N.O. connection for relay 2
3	N.C. connection for relay 1	N.C. connection for relay 2
4	no connection	no connection
5	PE	PE

Sample Wiring Diagrams

The following field wiring example shows a N.O. device and a N.C. device wired to each connector:



1 relay common connections
2 N.O. connections
3 N.C. connections
5 PE connection point for field device (bottom)

The N.C. load on the bottom connector has a PE connection that is tied to the PE connection on the PDM base through pin 5.

STB DRC 3210 Functional Description

Functional Characteristics

The STB DRC 3210 module provides two form C relay outputs that can be independently field wired as N.O. and/or N.C. contacts. Using the Advantys configuration software, you can customize the following operating parameters:

- *logic normal* or *logic reverse* polarity for each relay contact on the module
- a fallback state for each of the two channels

Output Polarity

By default, the polarity on both output channels is *logic normal* (0). Polarity on one or both channels may optionally be configured for *logic reverse* (1). Depending on whether the field devices are wired as N.O. or N.C., the output will behave as follows:

If the channel is field wired to be:	and the polarity is configured to be:	when the channel's value is:	the output will be:
N.O.	*logic normal* (the factory default setting	0	open
		1	closed
N.C.		0	closed
		1	open
N.O.	*logic reverse*	0	closed
		1	open
N.C.		0	open
		1	closed

Essentially, if you reverse the polarity on a N.O. contact it will behave as an N.C. contact, and if you reverse the polarity on an N.C. contact it will behave as an N.O. contact.

To change an output polarity parameter from *logic normal* (0), or back to normal from *logic reverse* (1), use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DRC 3210 you want to configure in the island editor.	The selected STB DRC 3210 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Output Polarity** value, the maxi/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has *normal polarity* and **Channel 2** has *reverse polarity*.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to *normal polarity* and channel 2 to *reverse polarity*, the **Output Polarity** value changes to 2.

Fallback Modes

When communications are lost between the relay module and the fieldbus master, the module's output relays must go to a known state where they will remain until communications are restored. This is known as the relay's *fallback state*. You may configure fallback states for each relay individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each relay
- then (if necessary) configuring the fallback states

All relay outputs have a fallback mode—either *predefined state* (1), or *hold last value* (0). When a relay has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a relay has *hold last value* (0) as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both relays is a *predefined state*. In order to change the fallback mode to *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DRC 3210 module you want to configure in the island editor.	The selected STB DDO 3200 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both relays hold their last values and 3 means that both relays go to a predefined state.	When you select the **Fallback Mode** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then **Channel 1** goes to *hold last value*, and **Channel 2** goes to its *predefined state*.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to *hold last value*, and channel 2 to *predefined state*, the **Fallback Mode** value changes to 2.

Fallback States

If a relay's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- 0 indicates that the predefined fallback state of the relay is *de-energized*
- 1 indicates that the predefined fallback state of the relay is *energized*

Note: If a relay channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its *predefined state*, or to revert back to the default from *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the relay you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, select the integer that appears in the **Value** column of the **Predefined Fallback Value** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both relays will turn off as their fallback state and 3 means that both relays will turn on as their predefined state.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 2, then **Channel 2** will turn on as its fallback state. **Channel 1** will either turn off or be ignored, depending on its fallback mode setting.

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. Select 0 if you want the fallback state to be *relay de-energized*; select 1 if you want the fallback state to be *relay energized*.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channel 2 to 1 and leave channel 1 on 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DRC 3210 Data for the Process Image

Representing Relay Output Data

The NIM keeps a record of relay data in one block of registers in the process image and a record of relay status in another block of registers in the process image. Relay data is written to the output data block by the fieldbus master and is used to update the relay module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DRC 3210 module are based on its physical location on the island bus.

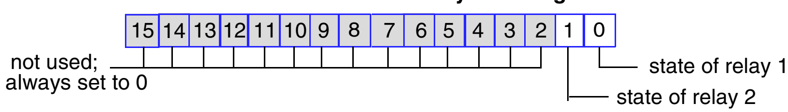
Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Relay Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB DRC 3210 uses one register in the output data block.

The STB DRC 3210's data register represents the energized/de-energized states of the two relays:

STB DRC 3210 Relay Data Register



These values are written to the island bus by the fieldbus master.

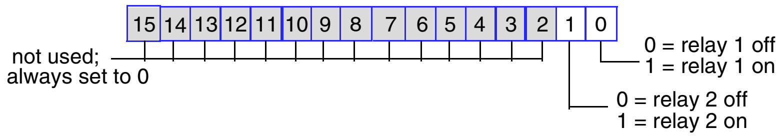
Relay Status Registers

The echo output data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DRC 3210 is represented by one register that echoes the relay data register.

This register represents the data that has just been sent to the field devices by the relay module.

STB DRC 3210 Echo Relay Data Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the relay data register. A difference between the bit values in the output data register and the echo register could result from a relay channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

STB DRC 3210 Specification

Table of Technical Specifications

The module's technical specifications are described in the following table.

description		form C N.O./N.C. contact relay pairs
number of relay channels		two
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 812*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
relay contact life	mechanical	10,000,000 operations
	electrical	10,000 operations (resistive load @ maximum voltage and current
output surge protection		metal oxide varistor
output voltage	working DC	5 ... 30 VDC
	working AC	20 ... 250 VAC
isolation voltage	logic bus-to-actuator bus	1500 VDC for 1 min
	point-to-point	500 VAC for 1 min
	field-to-logic bus	1780 VAC for 1 min
nominal logic bus current consumption		60 mA
nominal actuator bus current consumption		16 mA with no load
load current	maximum	2.0 A./relay
	minimum	50 mA
output response time	off-to-on	5.25 ms
	on-to-off	6.75 ms
maximum surge current		20 A/relay capacitive load@ τ = 10 ms
off-state leakage current	for resistive loads	2 mA (internal MOV)
switching capability		600 VA resistive load
fallback mode	default	predefined
	user-configurable settings**	hold last value
		predefined fallback value on one or both relays
fallback states (when *predefined* is the fallback mode)	default	both relays de-energized
	user-configurable settings**	each relay configurable for energized or de-energized

polarity on individual relay contacts	default	*logic normal* on both relays
	user-configurable settings**	*logic reverse* on one or both relays
		logic normal on one or both relays
coil power requirements		from a 24 VDC PDM
coil protection		time lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software		

5.2 STB DRA 3290 Relay Output Module (two-point, form A/B, 7 A/contact, 24 V coil)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB DRA 3290 relay output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

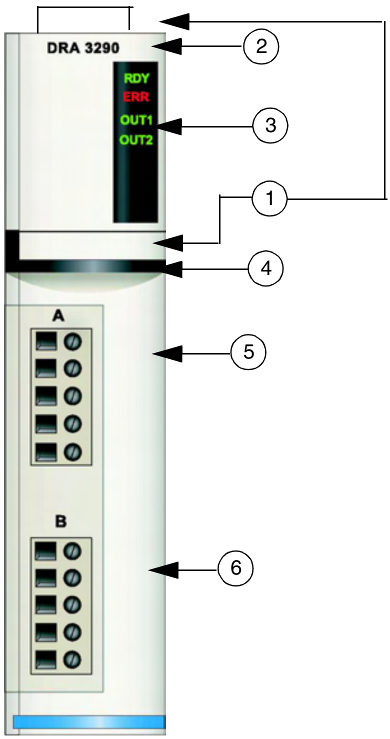
This section contains the following topics:

STB DRA 3290 Physical Description

Physical Characteristics

The STB DRA 3290 is a standard Advantys STB Form A/Form B, high current relay module that switches 24 VDC, 115 VAC, or 230 VAC field devices. Its coil runs on 24 VDC from the island's actuator bus. The module provides access to both the normally open (N.O.) and normally closed (N.C.) contacts of the internal relays. The module mounts in a size 3 I/O base and uses two five-terminal field wiring connectors. Field device 1 is wired to the top connector, and field device 2 is wired to the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 black identification stripe, indicating that this is a special module (the contacts can use either AC or DC power)
5 field device 1 connects to the top field wiring connector
6 field device 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 3000 (see *p. 817*) I/O base
- a pair of five-terminal field wiring connectors, either STB XTS 1110 screw type connectors or STB XTS 2110 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	28.1 mm (1.06 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB DRA 3290 LED Indicators

Overview

Four LEDs on the STB DRA 3290 module are visual indications of the operating status of the module and its two relay outputs. The LED locations and their meanings are described below.

Location

The four LED indicators are positioned in a column on the top of the STB DRA 3290 relay output module. The figure below shows their location:

Indications

The following table defines the meaning of the four LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

<table>
<tr><th>RDY</th><th>ERR</th><th>OUT1</th><th>OUT2</th><th>Meaning</th><th>What to Do</th></tr>
<tr><td>off</td><td>off</td><td></td><td></td><td>The module is either not receiving power or has failed.</td><td>Check power</td></tr>
<tr><td>flicker*</td><td>off</td><td></td><td></td><td>Auto-addressing is in progress.</td><td rowspan="6"></td></tr>
<tr><td rowspan="5">on</td><td rowspan="5">off</td><td></td><td></td><td>The module has achieved all of the following:
● it has power
● it has passed its confidence tests
● it is operational</td></tr>
<tr><td>on</td><td></td><td>Relay 1 is energized.</td></tr>
<tr><td>off</td><td></td><td>Relay 1 is not energized.</td></tr>
<tr><td></td><td>on</td><td>Relay 2 is energized.</td></tr>
<tr><td></td><td>off</td><td>Relay 2 is not energized.</td></tr>
<tr><td>on</td><td>on</td><td>on</td><td>on</td><td>The watchdog has timed out.</td><td rowspan="2">Cycle power, restart the communications</td></tr>
<tr><td></td><td></td><td colspan="3">Note that the green output LEDs will be on even though the power is absent from the output channels when a watchdog time-out occurs.</td></tr>
<tr><td>blink 1**</td><td></td><td></td><td></td><td>The module is either in pre-operational mode or in its fallback state.</td><td></td></tr>
<tr><td>on or blink 1**</td><td>blink 1**</td><td></td><td></td><td>A nonfatal error has been detected—e.g., a counter overflow.</td><td>Cycle power, restart communications</td></tr>
<tr><td></td><td>blink 2***</td><td></td><td></td><td>The island bus is not running.</td><td>Check network connections, replace NIM</td></tr>
<tr><td>blink 3****</td><td></td><td></td><td></td><td>The relays on this module are operational while the rest of the island modules are in their fallback states—i.e., it is a reflex action module.</td><td></td></tr>
<tr><td colspan="6">* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.</td></tr>
<tr><td colspan="6">** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
<tr><td colspan="6">**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.</td></tr>
</table>

STB DRA 3290 Field Wiring

Summary

The STB DRA 3290 module uses two five-terminal field wiring connectors to connect the two field devices. Output 1 is wired from the top connector, and output 2 is wired from the bottom connector. The choices of connector types and field wire types are described below, and a field wiring diagram is presented.

Connectors

Use a set of either:

- two STB XTS 1110 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2110 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

The relay module needs to be placed in a voltage group supported by a 24 VDC PDM.

Caution

COMPROMISED DOUBLE INSULATION

Above 130 VAC, the relay module may compromise the double insulation provided by a SELV-rated power supply.
When you use a relay module, use separate external 24 VDC power supplies for the PDM supporting that module and the logic power to the NIM or BOS module when the contact voltage is above 130 VAC.

Failure to follow this instruction can result in injury or equipment damage.

Field Devices

The STB DRA 3290 module provides two form A/B relay outputs that can be independently field wired as N.O. and/or N.C. contacts The module is designed to handle high duty cycles and to control continuous-operation equipment. It can switch 24 VDC, 115 VAC, and/or 230 VAC field devices that draw up to 7.0 A/contact at 60° C (140° F).

Field Wire Requirements

Individual connector terminals accept one field wire in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

We recommend that you strip at least 9 mm from the wire’s jacket for the module connection.

External Fusing

The STB DRA 3290 does not provide internal over-current protection. You must provide external fuse protection with 7.0 A/ time-lag fuses (such as the Wickmann 1911700000). If you do not use fuses, an over-current condition could damage the module. Place a fuse in series with each contact used on each relay (pins 1 and 4).

Surge Protection

The STB DRA 3290 relay outputs have internal metal oxide varistors (MOVs) that enable the contacts to control:

- electrically isolated inputs with low energy levels, which require zero leakage current
- power circuits—by eliminating induced overvoltages at the source

However, when the contacts are exposed to large dv/dt we recommend that additional surge protection be used. The specifications for the MOV are listed in the module specification chart at the end of this section (see *p. 367*).

Field Wiring Pinout

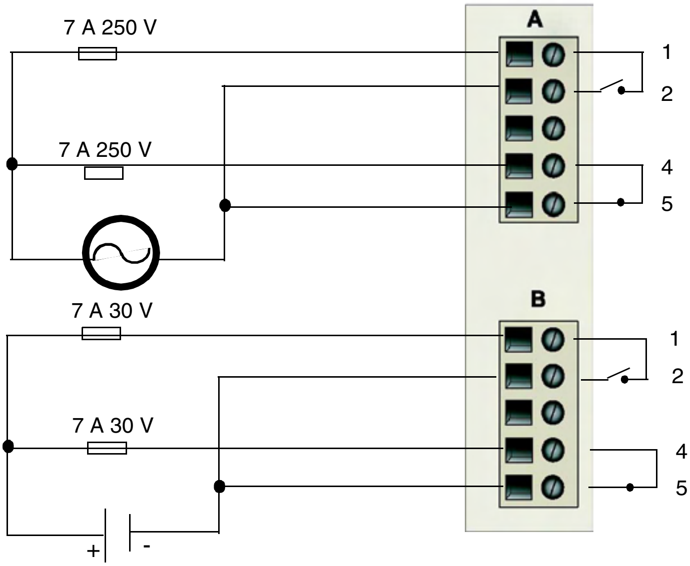
The top connector supports relay 1, and the bottom connector supports relay 2. Field actuators can be wired for normally open (N.O.) or normally closed (N.C.) operations.

The table below shows the pinouts:

Pin	Top Connector	Bottom Connector
1	N.O. connection for relay 1	N.O. connection for relay 2
2	N.O. connection for relay 1	N.O. connection for relay 2
3	no connection	no connection
4	N.C. connection for relay 1	N.C. connection for relay 2
5	N.C. connection for relay 1	N.C. connection for relay 2

Sample Wiring Diagram

The following field wiring example shows an N.O. device and an N.C. device wired to each connector. An AC power supply is used for the circuits on the top connector, and a DC power supply is used for the circuits on the bottom connector:



1 and 2 N.O. contacts
4 and 5 N.C. contacts

STB DRA 3290 Functional Description

Functional Characteristics

The STB DRA 3290 module provides two form A/B relays that can be independently field wired as either N.O. or N.C. contacts. The module is designed to handle high duty cycles and to control continuous-operation equipment. Using the Advantys configuration software, you can customize the following operating parameters:

- *logic normal* or *logic reverse* polarity for each relay contact on the module
- a fallback state for each of the two channels

Output Polarity

By default, the polarity on both output channels is *logic normal*. Polarity on one or both channels may optionally be configured for *logic reverse*. Depending on whether the field devices are wired as N.O. or N.C., the output will behave as follows:

If the channel is field wired to be:	and the polarity is configured to be:	when the channel's output value is:	the output will be:
N.O.	*logic normal* (the factory default setting	0	open
		1	closed
N.C.		0	closed
		1	open
N.O.	*logic reverse*	0	closed
		1	open
N.C.		0	open
		1	closed

Essentially, if you reverse the polarity on a N.O. contact it will behave as an N.C. contact, and if you reverse the polarity on an N.C. contact it will behave as an N.O. contact.

To change an output polarity parameter from *logic normal*, or back to normal from *logic reverse*, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB DRA 3290 you want to configure in the island editor.	The selected STB DRA 3290 module opens in the software module editor.
2	Expand the **+ Polarity Settings** fields by clicking on the **+** sign.	A row called **+ Output Polarity** appears.
3	Expand the **+ Output Polarity** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have normal polarity and 3 means that both channels have reverse polarity.	When you select the **Output Polarity** value, the maxi/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 2, **Channel 1** has *normal polarity* and **Channel 2** has *reverse polarity*.

Step	Action	Result
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channel 1 to *normal polarity*, and channel 2 to *reverse polarity*, the **Output Polarity** value changes to 2.

Fallback Modes

When communications on the island bus are stopped between the module and the NIM, the module will set both output channels to a known state where they will remain until communications are restored. This is known as the relay's *fallback state*. You may configure fallback states for each relay individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each relay
- then (if necessary) configuring the fallback states

Both output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* (1) as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* (0) as its fallback mode, it stays at its last known state when communication is lost—it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a *predefined state* (1). To change the fallback mode to *hold last value* (0), use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB DRA 3290 module you want to configure in the island editor.	The selected STB DRA 3290 module opens in the software module editor.
2	Expand the **+ Fallback Mode Settings** fields by clicking on the **+** sign.	A row called **+ Fallback Mode** appears.
3	Expand the **+ Fallback Mode** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change the settings *at the module level*, double-click on the integer that appears in the **Value** column of the **Fallback Mode** row, then enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both relays hold their last values and 3 means that both relays go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom left and right of the module editor screen. When you accept a new value for **Fallback Mode**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then **Channel 1** goes to hold last value and **Channel 2** goes to a predefined state.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode** row changes. For example, if you set channel 1 to *hold last value*, and channel 2 to its *predefined state*, the **Fallback Mode** value changes to 2.

Fallback States

If a channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the NIM and the fieldbus master is lost. By default, both channels are configured to 0 as their fallback states:

- 0 indicates that the predefined fallback state of the relay is *de-energized*
- 1 indicates that the predefined fallback state of the relay is *energized*

Note: If a relay channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from *hold last value*, or to revert back to the default from a *predefined state*, use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the relay you want to configure is 1 (*predefined state*).	If the **Fallback Mode** value is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	A row called **+ Predefined Fallback Value** appears.
3	Expand the **+ Predefined Fallback Value** row further by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4a	To change a setting *at the module level*, double-click on the integer that appears in the **Value** column of the **Predefined Fallback Value** row, then enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both relays will turn off as their fallback state and 3 means that both relays will turn on as their predefined state.	When you select the value associated with **Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose a fallback state value of 2, then **Channel 2** will turn on as its fallback state. **Channel 1** will either turn off or be ignored, depending on its fallback mode setting.

Step	Action	Result
4b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. Select 0 if you want the fallback state to be *relay de-energized*; select 1 if you want the fallback state to be *relay energized*.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set channel 2 to 1, and leave channel 1 set to 0, the **Predefined Fallback Value** value changes from 0 to 2.

STB DRA 3290 Data for the Process Image

Representing Relay Output Data

The NIM keeps a record of relay data in one block of registers in the process image and a record of relay status in another block of registers in the process image. Relay data is written to the output data block by the fieldbus master and is used to update the relay module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB DRA 3290 module are based on its physical location on the island bus; they can be viewed using the Advantys configuration software.

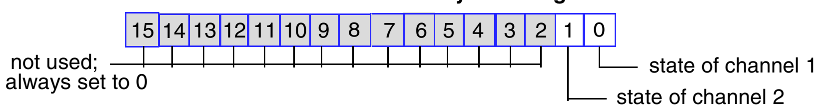
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Relay Data Register

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data received by the fieldbus master. Each output module on the island bus is represented in this data block. The STB DRA 3290 uses one register in the output data block.

The STB DRA 3290's data register represents the energized/de-energized states of the two channels:

STB DRA 3290 Relay Data Register



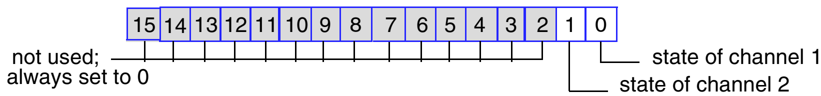
These values are written to the island bus by the fieldbus master.

Relay Status Register

The echo output data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represents the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB DRA 3290 status register is the module's *echo relay data* register. This register represents the data that has just been sent to the field devices by the relay module:

STB DRA 3290 Status Register



Under most normal operating conditions, the bit values in this register should be an exact replica of the bits in the relay data register. A difference between the bit values in the output data and the echo relay data could result from a relay channel used for a reflex action, where the channel is updated directly by the output module instead of by the fieldbus master.

STB DRA 3290 Specifications

Table of Technical Specifications

description		form A/B N.O./N.C. contact high current relay
number of channels		two
module width		28.1 mm (1.06 in)
I/O base		STB XBA 3000 (see *p. 817*)
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
protection		IP20
protection class		class 1
relay contact life	mechanical	1,000,000 operations
	electrical	100,000 operations @ 60 degrees C ambient, 7 A, 0.5 Hz resistive load (or with external protection for inductive loads)
output surge protection		two MOVs, one/relay
MOV characteristics	Vrms	300 V
	VDC	375 V
	Imax (8/20 µs)	400 A
	Wmax (2 ms)	9.6 J
	Pmax	0.1 W
output voltage	working DC	5 ... 30 VDC
	working AC	20 ... 250 VAC
isolation voltage	logic bus-to-actuator bus	1500 VDC for 1 min
	point-to-point	500 VAC for 1 min
	field-to-logic bus	1780 VAC for 1 min
actuator voltage	@ ambient temperature	19.2 ... 30 VDC
	@ maximum temperature	22 ... 30 VDC
nominal logic bus current consumption		70 mA
nominal actuator bus current consumption		30 mA with no load
maximum load current		7.0 A/contact
minimum load current		50 mA

output response time	off-to-on	20 ms maximum
	on-to-off	20 ms maximum
switching frequency		30 operations/min (0.5 Hz)
maximum surge current		70 A for 10 ms for a capacitive load
off-state leakage current	for resistive loads	2 mA (internal MOV)
external user-supplied surge protection (recommended for inductive loads)	with an AC power supply	RC circuit or MOV (ZNO) peak limiter
	with a DC power supply	discharge diode
switching capability		2100 VA resistive load
fallback mode	default	predefined
	user-configurable setting**	hold last value
		predefined fallback value on one or both relays
fallback states (when *predefined* is the fallback mode)	default	both channels de-energized
	user-configurable settings**	each channel configurable for energized or de-energized
polarity on individual relay contacts	default	*logic normal* on both relays
	user-configurable settings**	*logic reverse* on one or both relays
		logic normal on one or both relays
coil power requirements		from a 24 VDC PDM
coil protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

The Advantys STB Analog Input Modules

6

At a Glance

Overview

This chapter describes the features of the standard and basic Advantys STB analog input modules.

What's in this Chapter?

This chapter contains the following sections:

6.1 STB AVI 1255 Analog Voltage Input Module (two-channel, 0 ... 10 V, 10-bit, single-ended)

At a Glance

Overview

This section provides you with a detailed description of the STB AVI 1255 analog input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

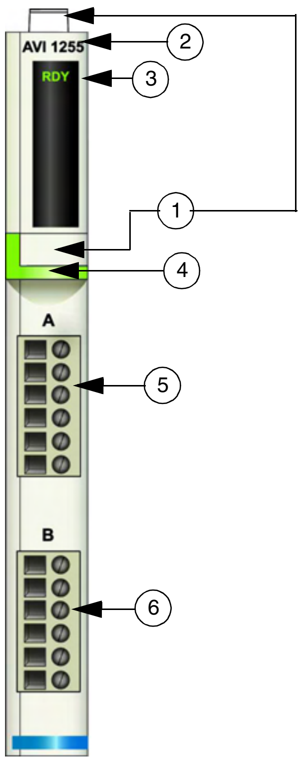
This section contains the following topics:

STB AVI 1255 Physical Description

Physical Characteristics

The STB AVI 1255 is a basic Advantys STB two-channel analog input module that reads inputs from analog sensors that operate over the range 0 to +10 V. The analog portion of the module is isolated from the island's field power bus to improve performance. To take advantage of this internal isolation feature, the sensors must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the sensors—24 VDC for sensor 1 from the top connector, and 24 VDC for sensor 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB AVI 1255 LED Indicator

Purpose

The LED on the STB AVI 1255 provide a visual indication of the module's operating status.

Location

The LED is located on the top front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is in pre-operational mode.	
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.	
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.	

STB AVI 1255 Field Wiring

Summary

The STB AVI 1255 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB AVI 1255 module handles analog input data from two 0 to 10 V single-ended analog field sensors. Data on each channel has a resolution of 10 bits. The module supports two-, three- and four-wire devices that draw current up 100 mA/ module.

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's sensor bus, you can make only two-wire connections.

Note: An open circuit in the input cabling causes a voltage with an indeterminate value to be reported.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog sensor 1, and the bottom connector supports analog sensor 2. Four field wires may be used on each connector—on pins 1, 3, 4 and 6.

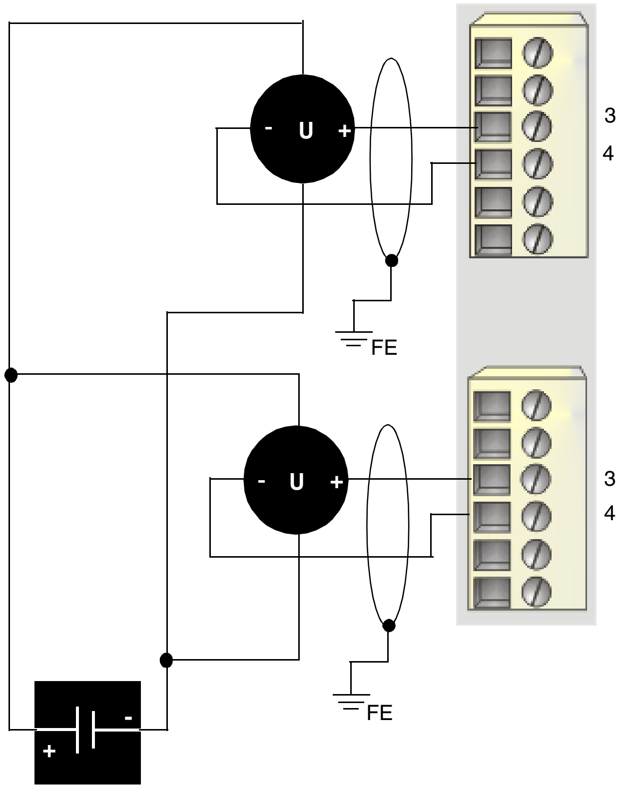
The connections on pin 1 and pin 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's field power bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from field power bus for field device accessories	+24 VDC from field power bus for field device accessories
2	no connection	no connection
3	input from sensor 1	input from sensor 2
4	analog input return	analog input return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

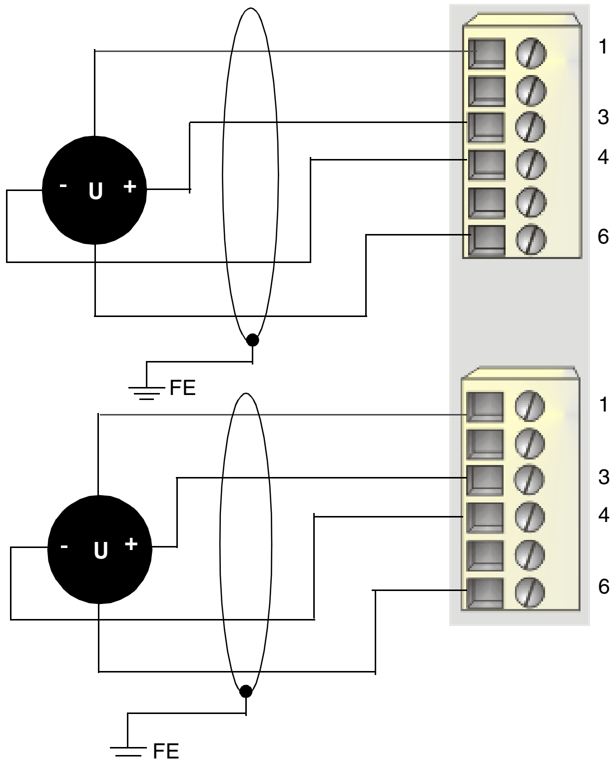
Sample Wiring Diagrams

The following field wiring example shows how two single-ended analog sensors can be wired to the STB AVI 1255 module. An external power supply is required to power the single-ended sensors:



3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)

If you want to use 24 VDC from the island's field power bus for the single-ended analog field devices, this power can be delivered through the input module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)
6 field power return from sensor 1 (top) and sensor 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island's field power bus.

STB AVI 1255 Functional Description

Functional Characteristics

The STB AVI 1255 module is a two-channel module that handles analog input data from two 0 ... 10 V single-ended analog field sensors. It does not support user-configurable operating parameters or reflex actions.

STB AVI 1255 Data for the Process Image

Representing the Analog Input Data

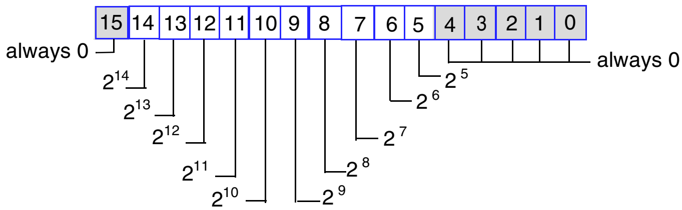
The STB AVI 1255 sends a representation of the operating states of its input channels to the NIM. The NIM stores this information in two 16-bit registers—one data register for each channel. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB AVI 1255 module is represented by two contiguous registers in this block. The specific registers used are based on the module's physical location on the island bus.

Input Data Registers

Each STB AVI 1255 data register represents the input voltage of a channel in the IEC data format. The data has 10-bit resolution. The bit structure in each data register is as follows:

STB AVI 1255 Data Register Format

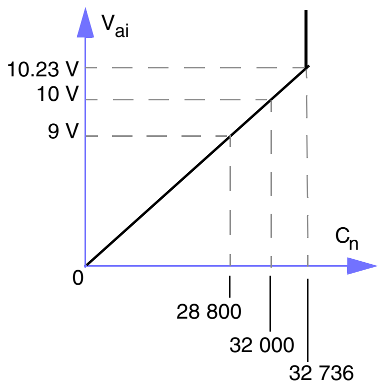


There are 10 significant bits in each data word—bits 14 through 5. They allow you to represent voltage data with integer values ranging from 0 to +32 736 in increments of 32. A value 32 000 represents an input of 10 V.

Linear voltage is interpreted using the formula:

$$V_{ai} = C_n / 3200$$

where *Cn* is the numerical count and *Vai* is the analog input voltage.



A value above 32 000 does not produce an over-range indication.

STB AVI 1255 Specifications

Table of Technical Specifications

description		two single-ended analog voltage input channels
analog input voltage range		0 ... 10 V
resolution		10 bits
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		60 mA
nominal field power bus current consumption		30 mA, with no load
hot swapping supported		NIM-dependent*
reflex actions supported		no
input response time	nominal	5.0 ms both channels
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-sensor bus	500 VAC rms (when sensor bus is not used for field power
input filter		single low-pass filter at a nominal 25 Hz
integral linearity		+/- 0.2% of full scale, typical
differential linearity		monotonic
absolute accuracy		+/- 0.75% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
input impedance		400 kΩ @ DC
source impedance		1 kΩ max.
maximum input voltage		50 VDC without damage
addressing requirement		two words (one data word/channel)
sensor bus power for accessories		100 mA/module
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

6.2 STB AVI 1270 Analog Voltage Input Module (two-channel, isolated, +/-10 V, 11-bit + sign)

At a Glance

Overview

This section provides you with a detailed description of the STB AVI 1270 analog input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

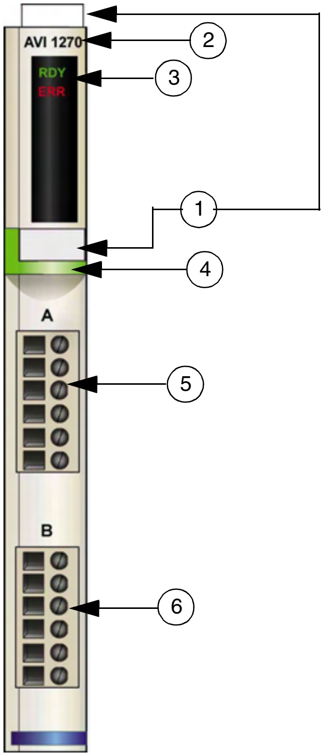
This section contains the following topics:

STB AVI 1270 Physical Description

Physical Characteristics

The STB AVI 1270 is a standard Advantys STB two-channel analog input module that reads inputs from analog sensors that operate over the range -10 to +10 V. The analog portion of the module is isolated from the island's sensor bus to improve performance. To take advantage of this internal isolation feature, the sensors must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the sensors—24 VDC for sensor 1 from the top connector, and 24 VDC for sensor 2 from the bottom connector. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

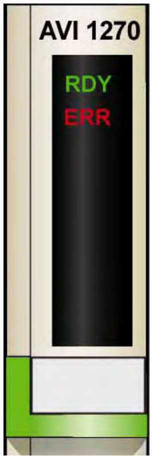
STB AVI 1270 LED Indicator

Purpose

The two LEDs on the STB AVI 1270 provide visual indications of the module's operating status. Their location and meanings are described below.

Location

The two LEDs are located on the top front bezel of the module, directly below the model number:



Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	Meaning	What to Do
off	off	The module is either not receiving logic power or has failed.	Check power
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
on	on	The watchdog has timed out.	Cycle power, restart the communications
blink 1**		The module is in pre-operational mode.	
	flicker*	Field power absent or a PDM short circuit detected.	Check power
	blink 1**	A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***	The island bus is not running.	Check network connections, replace NIM

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB AVI 1270 Field Wiring

Summary

The STB AVI 1270 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector. The choices of connectors and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB AVI 1270 module handles analog input data from two +/-10 V single-ended analog field sensors. Data on each channel has a resolution of 11 bits plus the sign bit. The module is designed to support high duty cycles and to control continuous-operation equipment.

The module supports two-, three- and four-wire devices that draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's sensor bus, you can make only two-wire connections.

Note: An open circuit in the input cabling will cause a voltage with an indeterminate value to be reported.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to protective earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog sensor 1, and the bottom connector supports analog sensor 2. Four field wires may be used on each connector—on pins 1, 3, 4 and 6.

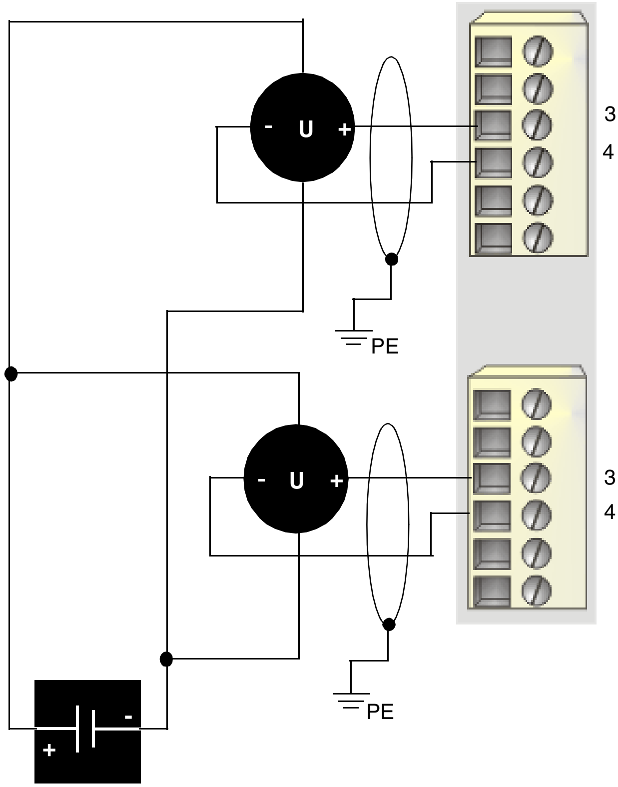
The connections on pin 1 and pin 6 are optional, and using these pins will defeat the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
2	no connection	no connection
3	input from sensor 1	input from sensor 2
4	analog input return	analog input return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

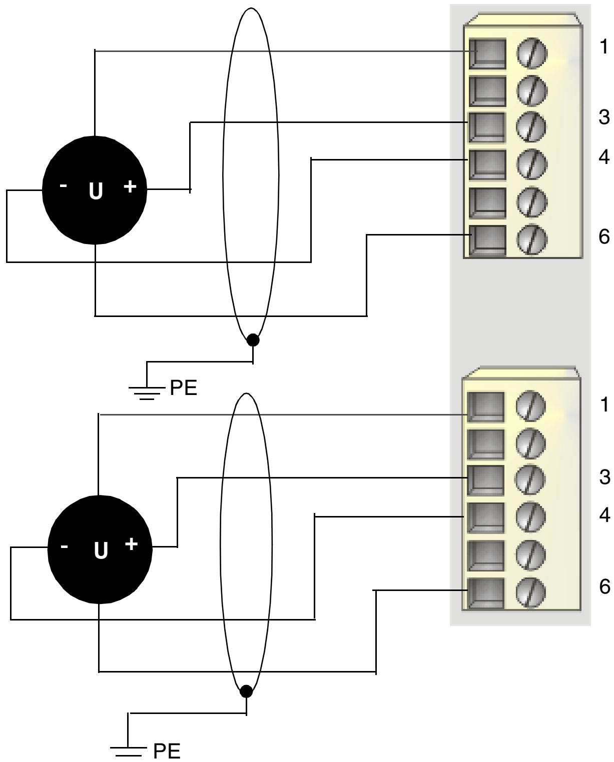
Sample Wiring Diagrams

The following field wiring example shows how two single-ended analog sensors can be wired to the STB AVI 1270 module. An external power supply is required to power the sensors:



3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)

If you want to use 24 VDC from the island's sensor bus to power the analog field devices, this power can be delivered through the input module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)
6 field power return from sensor 1 (top) and sensor 2 (bottom)

Remember that using pins 1 and 6 will defeat the built-in isolation between the analog portion of the module and the island's sensor bus.

STB AVI 1270 Functional Description

Functional Characteristics

The STB AVI 1270 module is a two channel module that handles analog input data from two +/-10 V single-ended analog field sensors. The following operating parameters are user-configurable:

- offset and maximum count on each analog input channel
- a sampling of analog input values used to average the signal

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameters:

- Offset
- Maximum Count
- Averaging

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Offset and Maximum Count

You may apply an offset value to the low end of the operating voltage range and a maximum count to the high end of the voltage range. This feature allows you to calibrate the analog input channels to match your equipment.

Offset is configured as a signed integer. It may be a decimal or hexadecimal value in the range -8191 to +8191 (0xE001 to 0x1FFF), representing a voltage offset in the range -2.56 to +2.56 V. By default, the offset on both channels is 0 (indicating no offset applied).

Maximum count is configured as a decimal or hexadecimal value in the range 23 800 to 32 760, representing a voltage in the range 7.44 to 10.24 V. By default, the maximum count on both channels is 32 000 (indicating no gain applied).

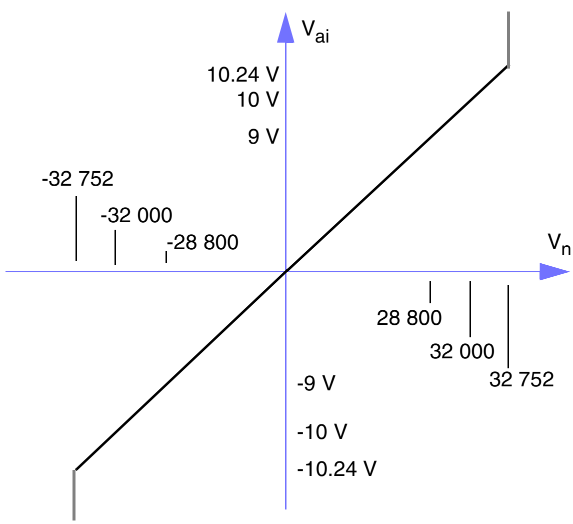
Offset and maximum count may be applied on each channel independently.

These parameters are provided only for sensor compensation, not for scaling. The module is able to measure over the physical range of -10 to +10 VDC. An offset adjustment will move the interpretation of 0, and a max count adjustment will move the interpretation of only the high end of the range.

An ideal linear voltage representation (one without offset or max count adjustments) is interpreted using the formula:

$$V_n = 3200 \times V_{ai}$$

where V_n is the numerical count and V_{ai} is the analog input voltage:

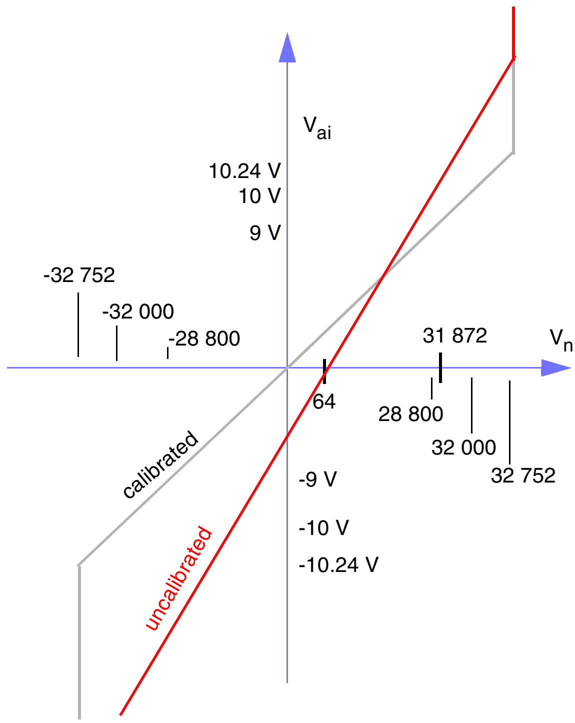


However, in systems that require calibration, the formula may actually be:

$$V_n = a \times V_{ai} + b$$

(In a perfectly calibrated system, a = 32 000 and b = 0.)

For example, if you use the Advantys configuration software to calibrate an offset of +64 at 0 V and a max count 0f 31 872 at 10 V, the system could be represented as follows:



Here are some voltage representations after calibration with offset and max count:

V_{ai}	**Uncalibrated**	**Calibrated**
0 V	64	0
2.5 V	8016	8000
5 V	15 968	16 000
7.5 V	23 920	24 000
10 V	31 872	32 000

Offset and RTP:

The offset parameter is represented as a signed 16-bit number. To access it using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x00
Index (high byte)	0x24
Sub-index	1 for channel 1 2 for channel 2
Data Bytes 2 (high byte) & 1 (low byte)	-8191 to +8191

Maximum Count and RTP:

The maximum count parameter is represented as a signed 16-bit number. To access it using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x01
Index (high byte)	0x24
Sub-index	1 for channel 1 2 for channel 2
Data Bytes 2 (high byte) & 1 (low byte)	23800 to 32787

Determining Offset and Maximum Count Values

To calibrate offset and maximum count for an analog channel:

Step	Action	Result
1	Connect the Advantys configuration software to a physical island.	The software will be in online mode.
2	Double-click on the appropriate STB AVI 1270 module in the island editor.	The module editor for the selected STB AVI 1270 module will open.
3	Open the I/O Data Animation sheet, which can be accessed from the module editor in the Advantys configuration software when it is online.	
4	Apply 0 V to the appropriate field sensor and read the analog input channel's data in the I/O Data Animation sheet.	Ideally, the channel data should read 0. If this is true, then no offset adjustment is necessary. If the data value is not 0, make a note of it.
5	Now apply 10 V to the field sensor and read the analog input channel's data in the module's I/O Data Animation sheet.	Ideally, the channel data should read 32 000. If this is true, then no maximum count adjustment is necessary. If the data value is not 32 000, make a note of it.
6	If adjustments need to be made, take the Advantys configuration software offline.	
7	Double-click on the appropriate STB AVI 1270 module in the island editor.	The module editor for the selected STB AVI 1270 module will open.
8	Open the Properties sheet in the module editor. In the Offset value field, enter the data value that you read when 0 V was applied. In the Max. Count value field, enter the data value that you read when 10 V was applied.	
9	Save the new configuration parameters.	When the configuration is downloaded to the physical island, the new offset and maximum count parameters will be applied to the analog input channel.

Averaging

You may apply a filter that will smooth the values of the analog inputs reported by the STB AVI 1270. The Advantys configuration software allows you to average over a specified number of samples. By default, the number of samples averaged is one (no averaging); you may a average over up to eight samples. To configure an averaging sample:

Step	Action	Result
1	Double click on the STB AVI 1270 module you want to configure in the island editor.	The selected STB AVI 1270 module opens in the software module editor.
2	In the **Value** column of the **Averaging** row, enter a decimal or hexadecimal value in the range 1 to 8.	When you select the **Averaging** value, the max/min values of the range appear at the bottom of the module editor screen.

Averaging is applied at the module level, not on a per-channel basis.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x02
Index (high byte)	0x24
Sub-index	0
Data Byte 1	1 to 8

STB AVI 1270 Data and Status for the Process Image

Representing the Analog Input Data

The STB AVI 1270 sends a representation of the operating states of its input channels to the NIM. The NIM stores this information in four 16-bit registers—two data registers (one for each channel) and two status registers (one per channel). The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB AVI 1270 module is represented by four contiguous registers in this block, which appear in the following order:

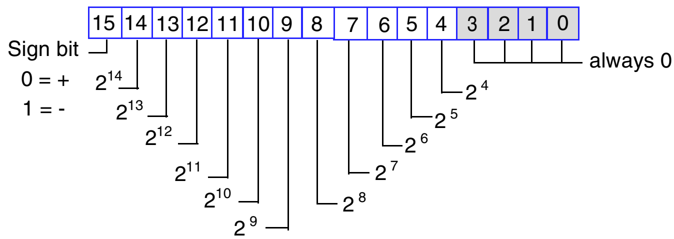
- The data in input channel 1
- the status of input channel 1
- the data in input channel 2
- the status of input channel 2

The specific registers used are based on the module's physical location on the island bus.

Input Data Registers

The first and third STB AVI 1270 registers in the input block of the process image are the data words. Each register represents the input voltage of a channel in the IEC data format. The data has 11-bit + sign resolution. The bit structure in each data register is as follows:

STB AVI 1270 Data Register Format



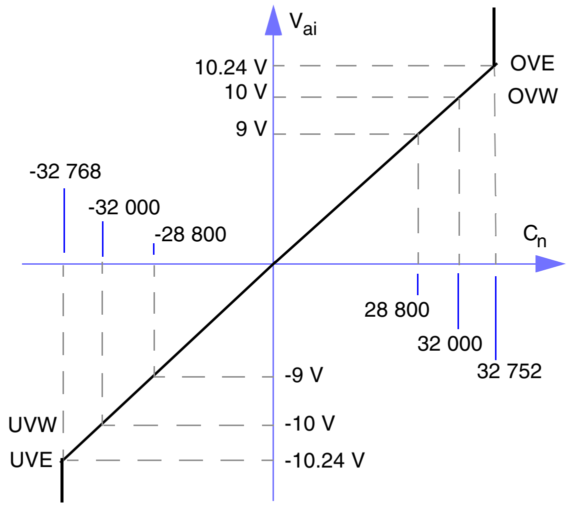
There are 12 significant bits in each data word—bits 15 through 4. They allow you to represent voltage data with integer values ranging from -32 768 to +32 752 in increments of 16. When the sign bit (bit 15) is 0, the value is positive; when bit 15 is 1, the value is negative.

In an ideal linear voltage representation (one without offset or max count settings (see *p. 393*)), the value 32 000 represents an input of 10 V and -32 000 represents an input of -10 V. If the input value exceeds 10 V, the input channel reports an over-voltage warning (OVW). If the input value drops below -10 V, the input channel reports an under-voltage warning (UVW). If the input value reaches 10.24 V, an over-voltage error (OVE) is reported. If it drops to -10.24 V, an under-voltage error (UVE) is reported.

An ideal linear voltage representation (one without offset or max count settings (see *p. 393*)) is interpreted using the formula:

$$V_{ai} = C_n / 3200$$

where *Cn* is the numerical count and *Vai* is the analog input voltage.

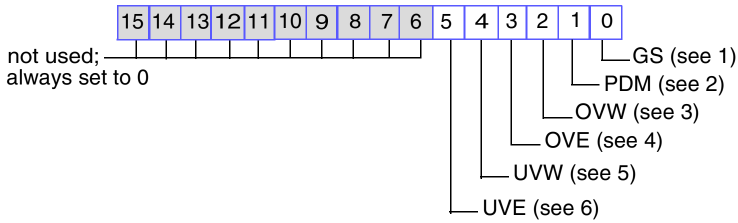


However due to use of manufacturing offset (and also user-configurable offset and max count, if used), an OVW may be generated before the reported count reaches 32000. Similarly, the reported count may be at 32 752, but you may not receive the expected OVE*Input Data Registers, p. 399*.

Input Status Registers

The second and fourth STB AVI 1270 registers in the input block of the process image are the status registers for the two analog input channels. The six LSBs in each register represent the status of each input channel:

STB AVI 1270 Status Register Format



1 Bit 0 is the global status (GS) bit for the input channel. It has a value of 0 when no errors have been detected. It has a value of 1 when bit 1, bit 3, and/or bit 5 has a value of 1.

2 Bit 1 represents the status of PDM voltage on the island's sensor bus. It has a value of 0 when no PDM voltage errors are detected. It has a value of 1 if sensor power is absent. A PDM error turns on the GS bit (bit 0).

3 Bit 2 represents the presence or absence of an OVW. It has a value of 0 when the voltage is less than or equal to 10 V. It has a value of 1 when the voltage is greater than 10 V. An OVW in the STB AVI 1270 does not turn on the GS bit (bit 0).

4 Bit 3 represents the presence or absence of an OVE. It has a value of 0 when the voltage is less than 10.24 V and a value of 1 when the voltage equals or exceeds 10.24 V. An OVE in the STB AVI 1270 turns on the GS bit (bit 0).

5 Bit 4 represents the presence or absence of a UVW. It has a value of 0 when the voltage is greater than or equal to -10 V and a value of 1 when the voltage is below -10 V. A UVW in the STB AVI 1270 does not turn on the GS bit (bit 0).

6 Bit 5 represents the presence or absence of a UVE. It has a value of 0 when the voltage is greater than -10.24 V) and a value of 1 when the voltage is less than or equal to -10.24 V). A UVE in the STB AVI 1270 turns on the GS bit (bit 0).

> **Note:** The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
> Field power faults that are local to the input module are reported immediately.

STB AVI 1270 Specifications

Table of Technical Specifications

description		two single-ended analog voltage input channels
analog input voltage range		+/- 10 V
resolution		11 bits + sign
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		60 mA
nominal sensor bus current consumption		30 mA, with no load
hot swapping supported		NIM-dependent*
reflex actions supported		as inputs only**
input response time	nominal	5.0 ms both channels
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-sensor bus	500 VAC rms (when sensor bus is not used for field power
input filter		single low-pass filter at a nominal 25 Hz
integral linearity		+/- 0.2% of full scale, typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
input impedance		400 kΩ @ DC
source impedance		1 kΩ max.
maximum input voltage		50 VDC without damage
addressing requirement		four words (two/channel)
offset calibration constant**		configurable in the range -8191 ... +8191 (representing -2.56 ... +2.56 V)
maximum count**		configurable in the range 23 800 ... 32 760 (representing 7.44 ... 10.24 V)
sensor bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM

power protection	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.	
** Requires the Advantys configuration software.	

6.3 STB AVI 1275 Analog Voltage Input Module (two-channel, +/-10 V, 9-bit + sign)

At a Glance

Overview

This section provides you with a detailed description of the STB AVI 1275 analog input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

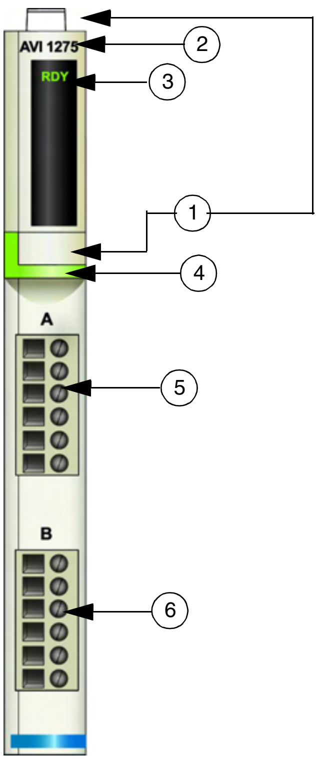
This section contains the following topics:

STB AVI 1275 Physical Description

Physical Characteristics

The STB AVI 1275 is a basic Advantys STB two-channel analog input module that reads inputs from analog sensors that operate over the range -10 to +10 V. The analog portion of the module is isolated from the island's sensor bus to improve performance. To take advantage of this internal isolation feature, the sensors must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the sensors—24 VDC for sensor 1 from the top connector, and 24 VDC for sensor 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB AVI 1275 LED Indicator

Purpose

The LED on the STB AVI 1275 provides a visual indication of the module’s operating status.

Location

The LED is located on the top front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is in pre-operational mode.	
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.	
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.	

STB AVI 1275 Field Wiring

Summary

The STB AVI 1275 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB AVI 1275 module handles analog input data from two +/-10 V single-ended analog field sensors. Data on each channel has a resolution of 9 bits plus the sign bit. The module supports two-, three- and four-wire devices that draw current up to 100 mA/module.

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's sensor bus, you can make only two-wire connections.

Note: An open circuit in the input cabling causes a voltage with an indeterminate value to be reported.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog sensor 1, and the bottom connector supports analog sensor 2. Four field wires may be used on each connector—on pins 1, 3, 4 and 6.

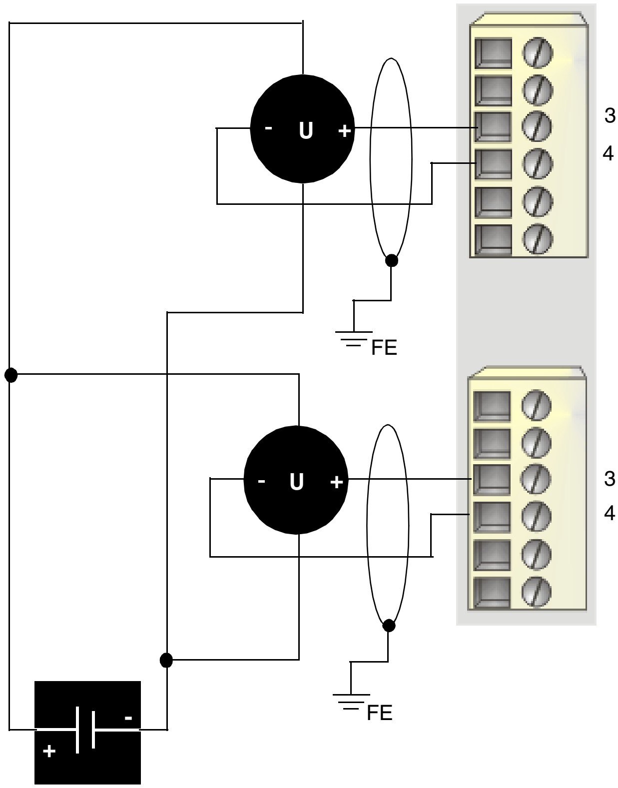
The connections on pin 1 and pin 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from field power bus for field device accessories	+24 VDC from field power bus for field device accessories
2	no connection	no connection
3	input from sensor 1	input from sensor 2
4	analog input return	analog input return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

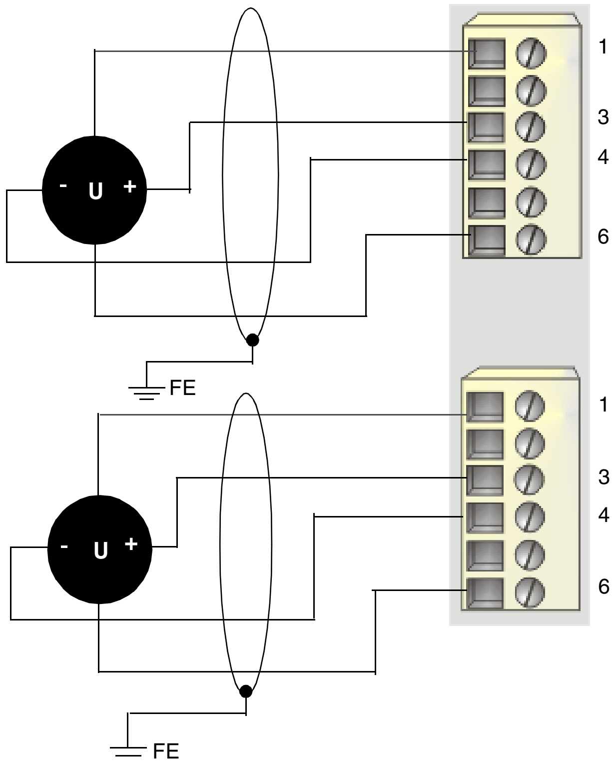
Sample Wiring Diagrams

The following field wiring example shows how two analog single-ended sensors can be wired to the STB AVI 1275 module. An external power supply is required to power the sensors:



3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)

If you want to use 24 VDC from the island’s field power bus for the single-ended analog field devices, this power can be delivered through the input module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
3 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)
6 field power return from sensor 1 (top) and sensor 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island’s field power bus.

STB AVI 1275 Functional Description

Functional Characteristics

The STB AVI 1275 module is a two channel module that handles analog input data from two +/-10 V single-ended analog field sensors. It does not support user-configurable operating parameters or reflex actions.

STB AVI 1275 Data for the Process Image

Representing the Analog Input Data

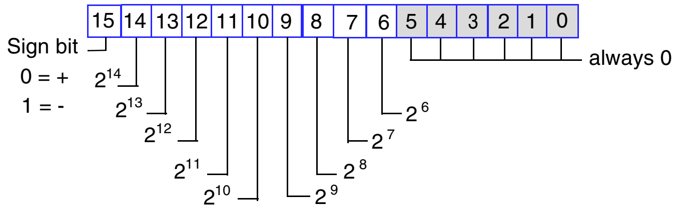
The STB AVI 1275 sends a representation of the operating states of its input channels to the NIM. The NIM stores this information in two 16-bit registers—one data register for each channel. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB AVI 1275 module is represented by two contiguous registers in this block. The specific registers used are based on the module's physical location on the island bus.

Input Data Registers

Each STB AVI 1275 data register represents the input voltage of a channel in the IEC data format. The data has 9-bit + sign resolution. The bit structure in each data register is as follows:

STB AVI 1275 Data Register Format

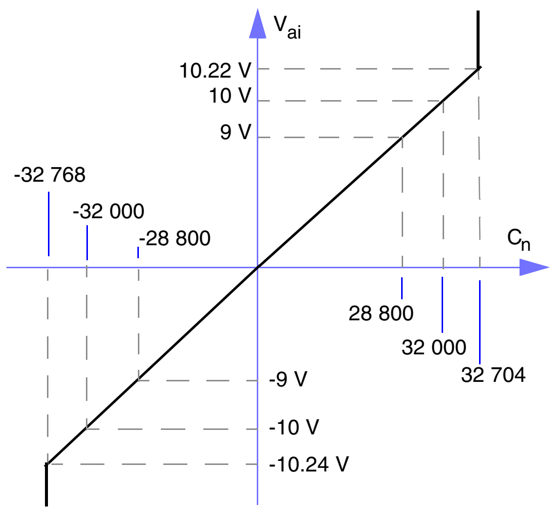


There are 10 significant bits in each data word—bits 15 through 6. They allow you to represent voltage data with integer values ranging from -32 768 to +32 704 in increments of 64. A value 32 000 represents +10 V and a value of -32 000 represents -10 V. When bit 15 is 0, the value is positive; when bit 15 is 1, the value is negative.

Linear voltage is interpreted using the formula:

$$V_{ai} = C_n / 3200$$

where *Cn* is the numerical count and *Vai* is the analog input voltage.



Values greater than 32 000 and less than -32 000 do not produce out-of-range indications.

STB AVI 1275 Specifications

Table of Technical Specifications

description		two single-ended analog voltage input channels
analog input voltage range		+/- 10 V
resolution		9 bits + sign
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		60 mA
nominal sensor bus current consumption		30 mA, with no load
hot swapping supported		NIM-dependent*
reflex actions supported		no
input response time	nominal	5.0 ms both channels
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-sensor bus	500 VAC rms (when sensor bus is not used for field power
input filter		single low-pass filter at a nominal 25 Hz
integral linearity		+/- 0.2% of full scale, typical
differential linearity		monotonic
absolute accuracy		+/- 0.75% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
input impedance		400 kΩ @ DC
source impedance		1 kΩ max.
maximum input voltage		50 VDC without damage
addressing requirement		two words (one data word/channel)
sensor bus power for accessories		100 mA/module
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

6.4 STB ACI 1225 Analog Current Input Module (two-channel, 10-bit single-ended, 4 ... 20 mA)

At a Glance

Overview

This section provides you with a detailed description of the STB ACI 1225 analog input module—its physical design and functional capabilities.

What's in this Section?

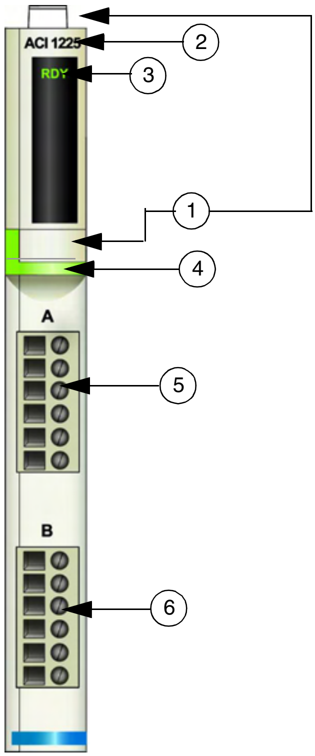
This section contains the following topics:

STB ACI 1225 Physical Description

Physical Characteristics

The STB ACI 1225 is a basic Advantys STB single-ended two-channel analog current input module that reads inputs from analog sensors that operate over the range 4 to 20 mA. The analog portion of the module is isolated from the island's sensor bus to improve performance. To take advantage of this internal isolation feature, the sensors must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the sensors—24 VDC for sensor 1 from the top connector, and 24 VDC for sensor 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB ACI 1225 LED Indicator

Purpose

The LED on the STB ACI 1225 provides a visual indication of the module's operating status. Its location and meanings are described below.

Location

The LED is located on the top front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is in pre-operational mode.	
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.	
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.	

STB ACI 1225 Field Wiring

Summary

The STB ACI 1225 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB ACI 1225 module handles analog input data from two 4 to 20 mA single-ended analog field sensors. Data on each channel has a resolution of 10 bits. The module supports two-, three- and four-wire devices that draw current up to 100 mA/module.

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's sensor bus, you can make only two-wire connections.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog sensor 1, and the bottom connector supports analog sensor 2. Four field wires may be used on each connector—on pins 1, 2, 4 and 6.

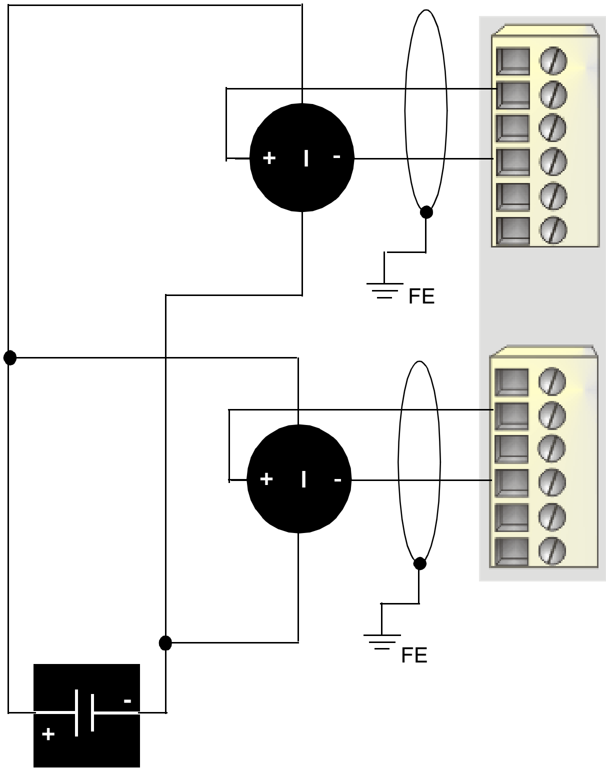
The connections on pins 1 and 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's field power bus. No connections are made on pins 3 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from field power bus for field device accessories	+24 VDC from field power bus for field device accessories
2	input from sensor 1	input from sensor 2
3	no connection	no connection
4	analog input return	analog input return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

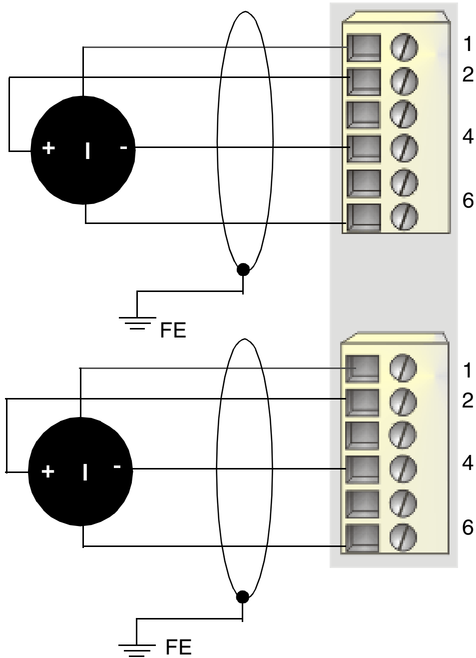
Sample Wiring Diagrams

The following field wiring example shows how two isolated single-ended analog sensors can be wired to the STB ACI 1225 module. An external power supply is required to power the sensors:



2 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)

If you want to use 24 VDC from the island's field power bus for the single-ended analog field devices, this power can be delivered through the input module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
2 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)
6 field power return from sensor 1 (top) and sensor 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island's field power bus.

STB ACI 1225 Functional Description

Functional Characteristics

The STB ACI 1225 module is a two channel module that handles analog input data from two field sensors operating in a 4 to 20 mA current range. It does not support user-configurable operating parameters or reflex actions.

STB ACI 1225 Data for the Process Image

Representing the Analog Input Data

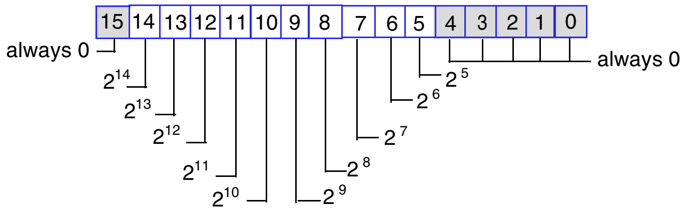
The STB ACI 1225 sends a representation of the operating states of its input channels to the NIM. The NIM stores this information in two 16-bit registers—one data register for each channel. The information can be read by the fieldbus master. If you are not using a basic NIM, the information can also be read by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB ACI 1225 is represented by two contiguous registers in this block. The specific registers used are based on the module's physical location on the island bus.

Data Word Structure

Each STB ACI 1225 data register represents the input voltage of a channel in the IEC data format. The data has 10-bit resolution. The bit structure in each data register is as follows:

STB ACI 1225 Data Register Format

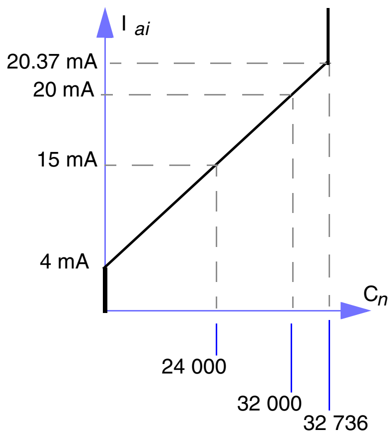


There are 10 significant bits in each data word—bits 14 through 5. They allow you to represent current data with integer values ranging from 0 to 32,736 in increments of 32. A value 32 000 represents an input of 20 mA. A value of 0 represents an input less than or equal to 4 mA.

Linear current representations can be interpreted using the formula:

$$I_{ai} = (C_n + 8000)/2000$$

where C*n* is the numerical count and I*ai* is the analog input current.



Values greater than 32 000 do not produce over-range indications.

STB ACI 1225 Specifications

Table of Technical Specifications

<table>
<tr><td colspan="2">description</td><td>two single-ended analog current input channels</td></tr>
<tr><td colspan="2">analog current range</td><td>4 ... 20 mA</td></tr>
<tr><td colspan="2">resolution</td><td>10 bits</td></tr>
<tr><td colspan="2">returned data format</td><td>IEC</td></tr>
<tr><td colspan="2">module width</td><td>13.9 mm (0.58 in)</td></tr>
<tr><td colspan="2">I/O base</td><td>STB XBA 1000 (see p. 808)</td></tr>
<tr><td colspan="2">nominal logic bus current consumption</td><td>60 mA</td></tr>
<tr><td colspan="2">nominal field power bus current consumption</td><td>30 mA, with no load</td></tr>
<tr><td colspan="2">hot swapping supported</td><td>NIM-dependent*</td></tr>
<tr><td colspan="2">reflex actions supported</td><td>no</td></tr>
<tr><td>input response time</td><td>nominal</td><td>5.0 ms both channels</td></tr>
<tr><td rowspan="2">isolation</td><td>field-to-bus</td><td>1500 VDC for 1 min</td></tr>
<tr><td>analog module-to-sensor bus</td><td>500 VAC rms (when sensor bus is not used for field power</td></tr>
<tr><td colspan="2">input filter</td><td>single low-pass filter at a nominal 20 Hz</td></tr>
<tr><td colspan="2">integral linearity</td><td>+/- 0.2% of full scale</td></tr>
<tr><td colspan="2">differential linearity</td><td>monotonic</td></tr>
<tr><td colspan="2">absolute accuracy</td><td>typically +/- 0.75% of full scale @ 25°C</td></tr>
<tr><td colspan="2">temperature drift</td><td>typically +/- 0.01% of full scale/ °C</td></tr>
<tr><td colspan="2">over-range margin</td><td>2.4%</td></tr>
<tr><td colspan="2">input impedance</td><td>≤ 300 Ω</td></tr>
<tr><td colspan="2">maximum input current</td><td>25 mA, 50 VDC without damage</td></tr>
<tr><td colspan="2">addressing requirement</td><td>two words (one data word/channel)</td></tr>
<tr><td colspan="2">sensor bus power for accessories</td><td>100 mA/module</td></tr>
<tr><td colspan="2">over-current protection for accessory power</td><td>yes</td></tr>
<tr><td colspan="2">field power requirements</td><td>from a 24 VDC PDM</td></tr>
<tr><td colspan="2">power protection</td><td>time-lag fuse on the PDM</td></tr>
<tr><td colspan="3">* Basic NIMs do not allow you to hot swap I/O modules.</td></tr>
</table>

6.5 STB ACI 1230 Analog Current Input Module (two-channel, 12-bit single-ended, 0 ... 20 mA)

At a Glance

Overview

This section provides you with a detailed description of the STB ACI 1230 analog input module—its physical design and functional capabilities.

What's in this Section?

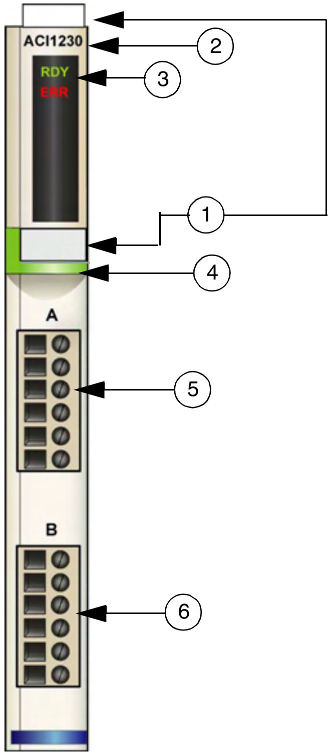
This section contains the following topics:

STB ACI 1230 Physical Description

Physical Characteristics

The STB ACI 1230 is a standard Advantys STB analog current input module with two single-ended analog channels that read inputs from analog sensors operating in the range 0 to 20 mA. The analog portion of the module is isolated from the island's sensor bus to improve performance. To take advantage of this internal isolation feature, the sensors must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the sensors—24 VDC for sensor 1 from the top connector, and 24 VDC for sensor 2 from the bottom connector. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB ACI 1230 LED Indicator

Purpose

The two LEDs on the STB ACI 1230 provide visual indications of the module's operating status. Their location and meanings are described below.

Location

The LEDs are located on the top front bezel of the module, directly below the model number:

Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	Meaning	What to Do
off	off	The module is either not receiving logic power or has failed.	Check power
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
on	on	The watchdog has timed out.	Cycle power, restart the communications
blink 1**		The module is in pre-operational mode.	
	flicker*	Field power absent or a PDM short circuit detected.	Check power
	blink 1**	A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***	The island bus is not running.	Check network connections, replace NIM
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.		
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.		
***	blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.		

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported immediately.

STB ACI 1230 Field Wiring

Summary

The STB ACI 1230 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector. The choices of connectors and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB ACI 1230 module handles analog input data from two 0 to 20 mA single-ended analog field sensors. Data on each channel has a resolution of 12 bits. The module is designed to support high duty cycles and to control continuous-operation equipment.

The module supports two-, three- and four-wire devices that draw current up to100 mA/channel at 30 degrees C or 50 mA/channel at 60 degrees C. If you want to maintain the module's built-in isolation between the analog portion of the module and the island's sensor bus, you can make only two-wire connections.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to protective earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog sensor 1, and the bottom connector supports analog sensor 2. Four field wires may be used on each connector—on pins 1, 2, 4 and 6.

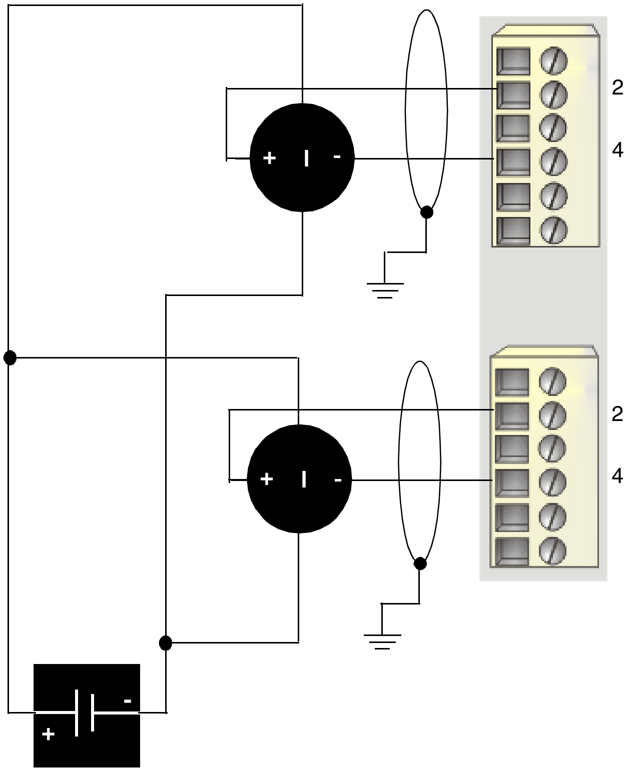
The connections on pins 1 and 6 are optional, and using these pins will defeat the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 3 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from sensor bus for field device accessories	+24 VDC from sensor bus for field device accessories
2	input from sensor 1	input from sensor 2
3	no connection	no connection
4	analog input return	analog input return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

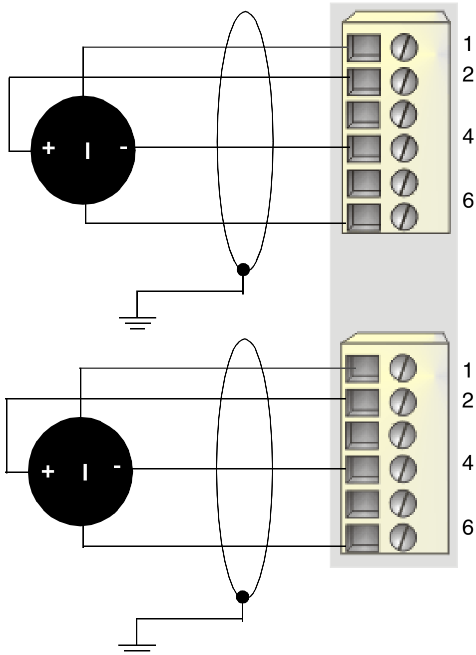
Sample Wiring Diagrams

The following field wiring example shows how two isolated analog sensors can be wired to the STB ACI 1230 module. An external power supply is required to power the sensors:



2 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)

If you want to use 24 VDC from the island's sensor bus to power the analog field devices, this power can be delivered through the input module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for sensor 1 (top) and for sensor 2 (bottom)
2 inputs from sensor 1 (top) and sensor 2 (bottom)
4 returns from input 1 (top) and input 2 (bottom)
6 field power return from sensor 1 (top) and sensor 2 (bottom)

Remember that using pins 1 and 6 will defeat the built-in isolation between the analog portion of the module and the island's sensor bus.

STB ACI 1230 Functional Description

Functional Characteristics

The STB ACI 1230 module is a two channel module that handles analog input data from two field sensors operating in a 0 to 20 mA current range. The following operating parameters are user configurable:

- offset and maximum count on each analog input channel
- a sampling of analog input values used to average the signal

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameters:

- Offset
- Maximum Count
- Averaging

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Offset and Maximum Count

You may apply an offset value to the low end of the operating current range and a maximum count to the high end of the current range. This feature allows you to calibrate the analog input channels to match your equipment.

Offset is configured as a signed integer. It may be a decimal or hexadecimal value in the range -8191 to +8191 (0xE001 to 0x1FFF), representing a current offset in the range -5.12 to +5.12 mA. By default, the offset on both channels is 0 (indicating no offset applied).

Maximum count is configured as a decimal or hexadecimal value in the range 23 800 to 32 760, representing a current in the range 14.88 to 20.48 mA. By default, the maximum count on both channels is 32 000 (indicating no gain applied).

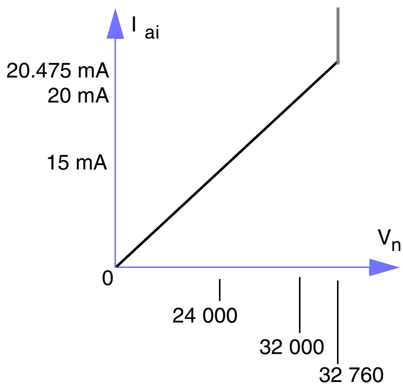
Offset and maximum count may be applied on each channel independently.

These parameters are provided only for sensor compensation, not for scaling. The module is able to measure over the physical range of 0 to 20 mA. An offset adjustment will move the interpretation of 0, and a max count adjustment will move the interpretation of only the high end of the range.

An ideal linear current representation (one without offset or max count adjustments) is interpreted using the
formula:

$$V_n = 1600 \times I_{ai}$$

where V_n is the numerical count and I_{ai} is the analog input current:

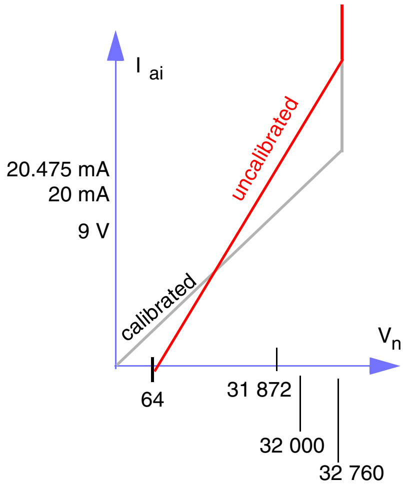


However, in systems that require calibration, the formula may actually be:

$$V_n = a \times I_{ai} + b$$

(In a perfectly calibrated system, a = 32 000 and b = 0.)

For example, you use the Advantys configuration software to calibrate an offset of +64 at 0 mA and a max count 0f 31 744 at 20 mA, the system could be represented as follows:



Here are some current representations after calibration with offset and max count:

I_{ai}	**Uncalibrated**	**Calibrated**
0 mA	64	0
5 mA	7984	8000
10 mA	15 904	16 000
15 mA	23 824	24 000
20 mA	31 744	32 000

Offset and RTP:

The offset parameter is represented as a signed 16-bit number. To access it using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x00
Index (high byte)	0x24
Sub-index	1 for channel 1 2 for channel 2
Data Bytes 2 (high byte) & 1 (low byte)	-8191 to +8191

Maximum Count and RTP:

The maximum count parameter is represented as a signed 16-bit number. To access it using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x01
Index (high byte)	0x24
Sub-index	1 for channel 1 2 for channel 2
Data Bytes 2 (high byte) & 1 (low byte)	23800 to 32787

Determining Offset and Maximum Count Values

To apply offset and maximum count to an analog channel:

Step	Action	Result
1	Connect the Advantys configuration software to a physical island.	The software will be in online mode.
2	Double-click on the appropriate STB ACI 1230 module in the island editor.	The module editor for the selected STB ACI 1230 module will open.
3	Open the I/O Data Animation sheet, which can be accessed from the module editor in the Advantys configuration software when it is online.	
4	Apply 0 mA to the appropriate field sensor and read the analog input channel's data in the I/O Data Animation sheet.	Ideally, the channel data should read 0. If this is true, then no offset adjustment is necessary. If the data value is not 0, make a note of it.
5	Now apply 20 mA to the field sensor and read the analog input channel's data in the module's I/O Data Animation sheet.	Ideally, the channel data should read 32 000. If this is true, then no maximum count adjustment is necessary. If the data value is not 32 000, make a note of it.
6	If adjustments need to be made, take the Advantys configuration software offline.	
7	Double-click on the appropriate STB ACI 1230 module in the island editor.	The module editor for the selected STB ACI 1230 module will open.
8	Open the Properties sheet in the module editor. In the Offset value field, enter the data value that you read when 0 mA was applied. In the Max. Count value field, enter the data value that you read when 20 mA was applied.	
9	Save the new configuration parameters.	When the configuration is downloaded to the physical island, the new offset and maximum count parameters will be applied to the analog input channel.

Averaging

You may apply a filter that will smooth the values of the analog inputs reported by the STB ACI 1230. The Advantys configuration software allows you to average over a specified number of samples. By default, the number samples averaged is one (no averaging); you may a filtering average over up to eight samples. To configure an averaging sample:

Step	Action	Result
1	Double click on the STB ACI 1230 module you want to configure in the island editor.	The selected STB ACI 1230 module opens in the software module editor.
2	In the **Value** column of the **Averaging** row, enter a decimal or hexadecimal value in the range 1 to 8.	When you select the **Averaging** value, the max/min values of the range appear at the bottom of the module editor screen.

Averaging is applied at the module level, not on a per-channel basis.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0x02
Index (high byte)	0x24
Sub-index	0
Data Byte 1	1 to 8

STB ACI 1230 Data and Status for the Process Image

Representing the Analog Input Data

The STB ACI 1230 sends a representation of the operating states of its input channels to the NIM. The NIM stores this information in four 16-bit registers—two data register (one for each channel) and two status registers (one per channel). The information can be read by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB ACI 1230 module is represented by four contiguous registers in this block, which appear in the following order:

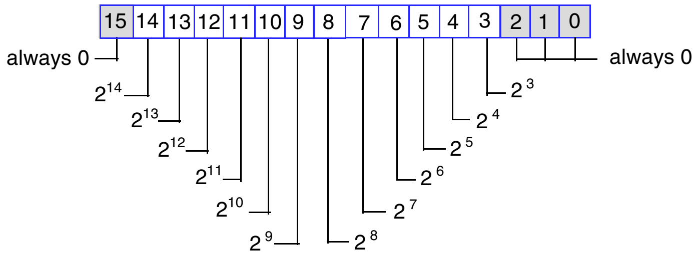
- The data in input channel 1
- the status of input channel 1
- the data in input channel 2
- the status of input channel 2

The specific registers used are based on the module's physical location on the island bus.

Data Word Structure

The first and third STB ACI 1230 registers in the input block of the process image are the data words. Each register represents the input current of a channel in the IEC data format. The data has 12-bit resolution. The bit structure in each data register is as follows:

STB ACI 1230 Data Register Format



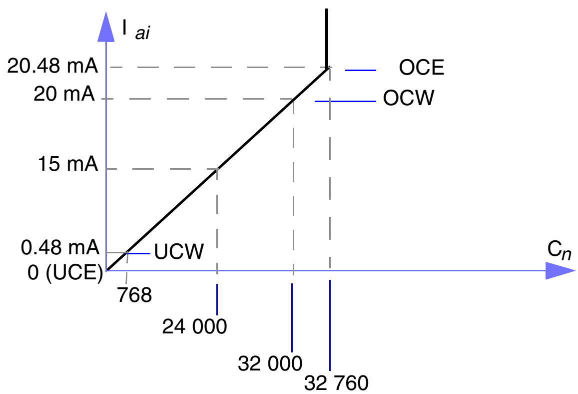
There are 12 significant bits in each data word—bits 14 through 3. They allow you to represent current data with integer values ranging from 0 to 32,760 in increments of eight.

The value 32 000 represents 20 mA. If the input value exceeds 20 mA, the input channel reports an over-current warning (OCW). If the input value reaches 20.48 mA, an over-current error (OCE) is reported. If the input value drops below 0.48 mA, the input channel reports an under-current warning (UCW), and if the value is less than or equal to 0 the channel reports an under-current error (UCE).

Linear current representations can be interpreted using the formula:

$$I_{ai} = C_n / 1600$$

where C*n* is the numerical count and I*ai* is the analog input current.



The sign bit (bit 15) is always 0, indicating that negative values are not represented.

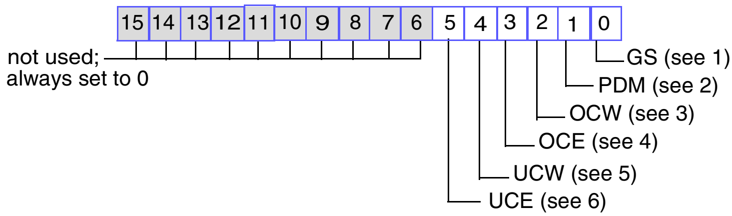
The three least significant bits in the data words are always 0.

Status Byte Structure

The second and fourth STB ACI 1230 registers in the input block of the process image are the status words. The STB ACI 1230 can detect and report current overflow conditions.

The six LSBs in each register represent the status of each input channel:

STB ACI 1230 Status Register Format



1 Bit 0 represents global status (GS). It has a value of 0 when no errors have been detected. It has a value of 1 when bit 1 and/or bit 3 has a value of 1.

2 Bit 1 represents the status of PDM voltage on the island's sensor bus. It has a value of 0 when no PDM voltage errors are detected. It has a value of 1 if sensor power has been shorted. A PDM short turns on the GS bit (bit 0).

3 Bit 2 represents the presence or absence of an OCW. It has a value of 0 when the current is less than or equal to 20 mA. It has a value of 1 when the current is greater than 20 mA. An OCW in the STB ACI 1230 does not turn on the GS bit (bit 0).

4 Bit 3 represents the presence or absence of an OCE. It has a value of 0 when the current is less than 20.48 mA and a value of 1 when the current is greater than or equal to 20.48 mA. An OCE in the STB ACI 1230 turns on the GS bit (bit 0).

5 Bit 4 represents the presence or absence of an UCW. It has a value of 0 when the current is greater than or equal to 0.48 mA and a value of 1 when the current is less than 0.48 mA. An OCE in the STB ACI 1230 does not turn on the GS bit (bit 0).

6 Bit 5 represents the presence or absence of UCE. It has a value of 0 when the current is greater than 0 mA and a value of 1 when the current is less than or equal to 0 mA.

> **Note:** The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
> Field power faults that are local to the input module are reported immediately.

STB ACI 1230 Specifications

Table of Technical Specifications

The module's technical specifications are described in the following table.

description		two single-ended analog current input channels
analog current range		0 ... 20 mA
resolution		12 bits
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		60 mA
nominal sensor bus current consumption		30 mA, with no load
hot swapping supported		NIM-dependent*
reflex actions supported		as inputs only**
input response time	nominal	5.0 ms both channels
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-sensor bus	500 VAC rms (when sensor bus is not used for field power
input filter		single low-pass filter at a nominal 25 Hz
integral linearity		+/- 0.1% of full scale
differential linearity		monotonic
absolute accuracy		typically +/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
over-range margin		2.4%
input impedance		$\leq 300\ \Omega$
maximum input current		25 mA, 50 VDC without damage
addressing requirement		four words (two/channel)
offset calibration constant**		configurable in the range 0 ... +8191 (representing 0 ... +5.12 mA)
maximum count**		configurable in the range 23 800 ... 32 760 (representing 14.88 ... 20.48 mA)
sensor bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM

power protection	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.	
** Requires the Advantys configuration software.	

6.6 STB ART 0200 Analog Multirange Input Module (two-channel, isolated, 16-bit, RTD/TC/mV)

At a Glance

Overview

This section provides a detailed description of the STB ART 0200 analog input module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

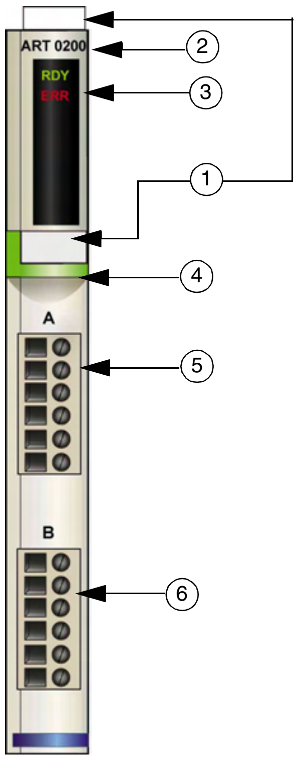
This section contains the following topics:

STB ART 0200 Physical Description

Physical Characteristics

The STB ART 0200 is a standard Advantys STB two-channel analog input module that can support RTD, thermocouple or mV analog sensors. Each channel can be configured independently. By default, both channels support three-wire RTD sensors. You may reconfigure one or both channels using the Advantys configuration software. The STB ART 0200 takes 24 VDC from the island's sensor bus and passes power to two analog sensor devices.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 light green identification stripe, indicating an analog input module
5 sensor 1 connects to the top field wiring connector
6 sensor 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width		13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

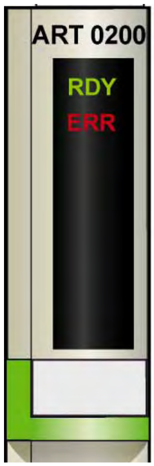
STB ART 0200 LEDs

Purpose

The two LEDs on the STB ART 0200 module provide visual indications of the operating status of the module and its RDT or TC sensors. The LED locations and their meanings are described below.

Location

The two LEDs are located on the top front bezel of the module, directly below the model number:



Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	Meaning	What to Do
off	off	The module is either not receiving power or has failed.	Check power
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
on	on	The watchdog has timed out.	Cycle power, restart the communications
blink 1**		The module is in pre-operational mode.	
	blink 1**	Island bus controller error.	Replace the module.
	flicker*	Field power absent or a PDM short circuit detected.	Check power
		Broken wire detected in RTD or TC mode.	Locate and repair wiring problem.
		Measurement out of limits	Check configuration and application.
		Internal error	Cycle power; if the problem remains replace the module.

* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.

** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.

STB ART 0200 Field Wiring

Summary

The STB ART 0200 module uses two six-terminal field wiring connectors. Analog sensor 1 is wired to the top connector, and analog sensor 2 is wired to the bottom connector. The choices of connectors and field wire types are described below, and some field wiring options are presented.

Connectors

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These connectors each have six terminal connectors on them, with a 3.8 mm (0.15 in) pitch between each pin.

Field Sensors

The STB ART 0200 allows each channel to be independently configured to support an RTD, a TC sensor or a mV sensor. An RTD may be a two-, three-, or four-wire sensor. TC and mV sensors must be two-wire devices.

If you are using channel 1 to support an RTD sensor, then do not use channel 2 for an externally cold-junction-compensated TC sensor. All other device combinations are valid.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.51 ... 1.29 mm (24 ... 16 AWG).

- Shielded twisted-pair cable is recommended. The shield should be tied to an external clamp that is tied to functional earth on only one side of the cable and as close as possible to the module. Pin 6 (cable shield) should have *no connection*.
- In high-noise environments, double-shielded twisted-pair cable is recommended, with the inner shield tied to pin 6 and the outer shield tied to an external clamp that is tied to protective earth.

We recommend that you strip at least 9 mm from the wire’s jacket for the module connection.

Field Wiring Pinout

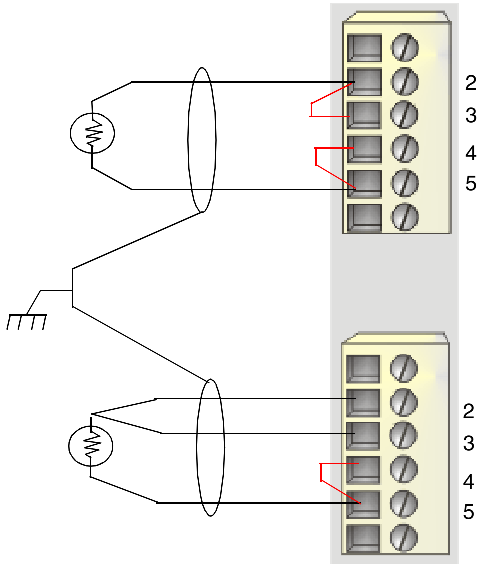
Note: Successful operation of the STB ART 0200 is determined by both the way the module is configured and the way it is field-wired. If you configure a channel to operate with one type of analog sensor (thermocouple, RTD or mV), you must also make the proper field connections to make the channel work properly. Similarly, you need to make sure that the module's configuration matches the field wiring. For example, if you have configured a channel to work with a thermocouple and have field-wired the module correctly, the channel will work properly. If you then disconnect the TC wiring, the module will detect a broken wire and stop communicating with that channel. If you then attempt to rewire the channel to support a different sensor type without changing the configuration, the module will not detect the new sensor.

The top connector supports sensor 1, and the bottom connector supports sensor 2. No connections are ever made on pin 1 of either connector:

Pin	Top Connections	Bottom Connections
1	no connection	no connection
2	Always used for RTD +	Always used for RTD +
	RTD + connection for external cold-junction compensation on a TC sensor	
	no connection for TC or mV	no connection for TC or mV
3	TC + or mV + connection	TC + or mV + connection
	Either used or jumpered for a two-, three-, or four-wire RTD	Either used or jumpered for a two-, three-, or four-wire RTD
4	TC - or mV - connection	TC - or mV - connection
	Either used or jumpered for a two-, three-, or four-wire RTD	Either used or jumpered for a two-, three-, or four-wire RTD
5	Always used for RTD -	Always used for RTD -
	RTD - connection for external cold-junction compensation on a TC sensor	
	no connection for TC or mV	no connection for TC or mV
6	inner double-shield cable	cable shield

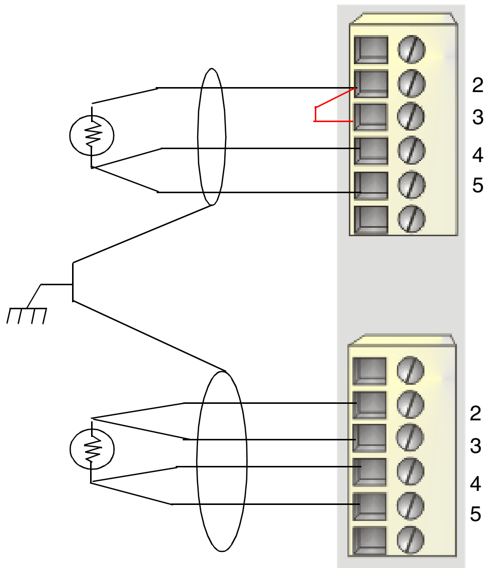
Sample RTD Wiring Diagrams

The following field wiring example shows a two-wire RTD and a three-wire RTD connected to the STB ART 0200:

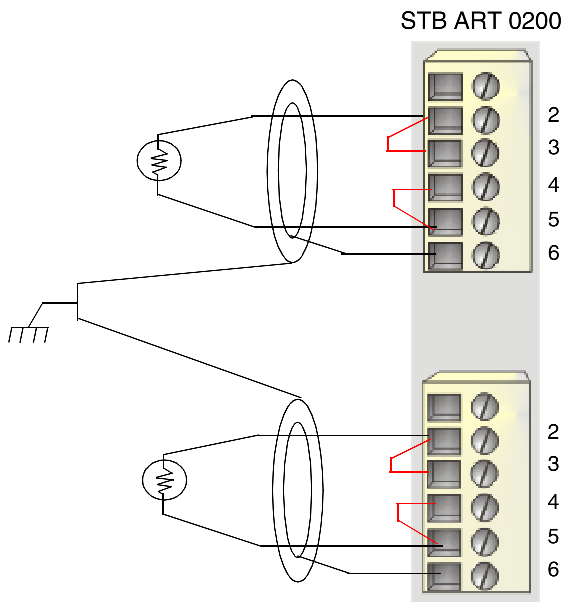


top connector two-wire RTD sensor
bottom connector three-wire RTD sensor

The next example shows three- and four-wire RTDs. The three-wire sensor on the top connector uses a jumper between pins 2 and 3. The four-wire RTD does not use jumpers:



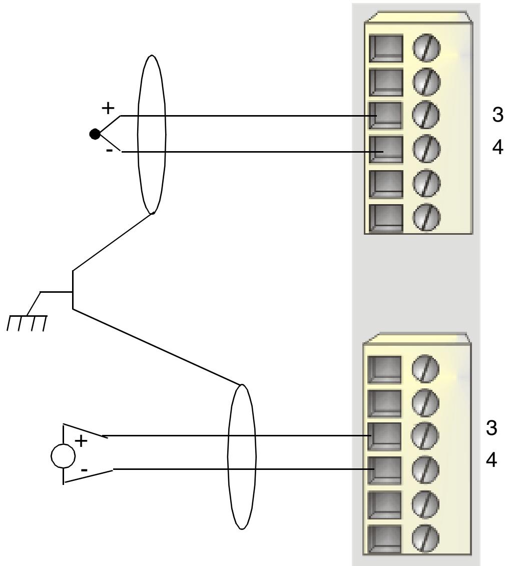
Double-shielded cable may be used with two-, three- or four-wire RTDs operating in high-noise environments. The example below shows a two-wire RTD set-up with double-shielded, twisted-pair cable:



When double-shielded twisted-pair cable is used, the inner shield is tied to pin 6. Pin 6 is not used when standard (single-shielded) twisted-pair cable is used.

Sample mV and TC Wiring Diagram

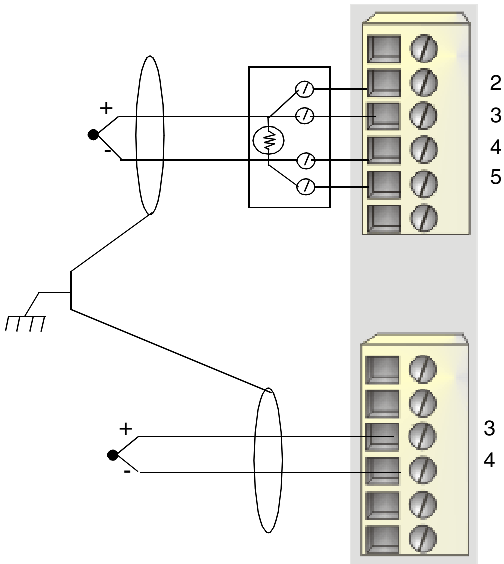
The illustration below shows a TC sensor on the top connector and a mV sensor on the bottom connector. TC and mV applications make use of pins 3 and 4:



top connector thermocouple sensor
bottom connector mV sensor

Wiring a TC with External Cold-junction Compensation

When you apply external cold-junction compensation (see *p. 468*) to the module, you must use a two-wire RTD and connect it to pins 2 and 5 on the top connector. For optimum results, connect copper wires to pins 2 and 5 on the top connector and run them to an isothermal terminal block. Make the TC wiring connection to the terminal block and embed the RTD in the terminal block:



Cold-junction compensation is configured at the module level, and therefore it applies to any TC sensor(s) connected to the top and/or bottom connector on the STB ART 0200 module.

Note: When external cold-junction compensation is applied to the module, you may configure channel 1 to support a TC or mV sensor, but you should not configure it to support an RTD that senses process values.

STB ART 0200 Functional Description

Functional Characteristics

The STB ART 0200 is a two-channel analog input module with on-board diagnostics and a high degree of user configurability. Each channel can be configured independently to support a:

- RTD sensor
- thermocouple sensor
- mV sensor

Using the Advantys configuration software's module editor, you can change the operating parameters on each channel.

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameter:

- Averaging

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Averaging

You may apply a filter that will smooth the values of the analog inputs reported by the STB ART 0200. The Advantys configuration software allows you to average over a specified number of samples on a per channel basis. By default, the number of samples averaged is one (no averaging); you may average over up to eight samples. To configure the number of samples to average over:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	Click on the **+** sign in front of the **Averaging** parameter.	Channel 1 and Channel 2 are displayed.
3	In the **Value** column of the Channel you want to configure, enter a decimal or hexadecimal value in the range 1 to 8.	When you select the Averaging value, the max/min values of the range appear at the bottom of the module editor screen.
4	Repeat step 3 if you want to apply averaging to the other channel.	-

To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0x02
Index (high byte)	0x24
Sub-index	1 for channel 1 2 for channel 2
Data Byte 1	1 to 8

Frequency Rejection

The frequency rejection parameter sets the value for the maximum rejection (filtering) of power line induced noise. It is configured at the module level—the same frequency rejection value applies to both channels. This parameter applies to all three sensor types. The default value is 50 Hz. You can change the value to 60 Hz. To change the value:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	In the **Value** column, select the desired frequency rejection value from the pull-down menu.	The menu gives you two choices,*50 Hz* and *60 Hz*.

Temperature Unit

The temperature unit parameter specifies whether the temperature data for a channel will be reported in degrees C or degrees F. The default temperature unit value is degrees C. It is configured at the module level. The temperature unit applies to both channels (and to cold-junction compensation, if applicable). This parameter applies to RTD and TC sensor devices; it is ignored if the channel supports a mV sensor.To change the value:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	In the **Value** column, select the desired temperature unit value from the pull-down menu.	The menu gives you two choices, *degrees C* and *degrees F*.

Input Sensor Type

The input sensor type parameter defines the type of analog field device that each channel will support. By default, both channels support three-wire IEC Pt100 RTD sensors. You may change the input sensor type on a per/channel basis to be one of several types of TC, mV, or RTD devices.

If you are not using a sensor on one of the channels, you may configure it as type *none*. If you configure it as a particular sensor type and do not connect a physical device to the channel, the module will detect a broken wire and flash an error on the LED. Broken wire detection is not provided for mV sensors.

Use the following procedure to configure the input sensor type:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	Click on the **+** sign in front of the **Input sensor type** parameter.	Channel 1 and Channel 2 are displayed.
3	In the **Value** column, select the desired sensor type from the pull-down menu.	The menu gives you 16 choices, as listed below.
4	Repeat step 3 if you want to configure a sensor type for the other channel.	

The 16 available input sensor types are:

Input Sensor Type		ORE	ORW	Normal Range	URW	URE
none		N/A	N/A	N/A	N/A	N/A
+/- mV		>/= 81.92	> 80	-80 ... +80	< -80	</= -81.92
Pt100 RTD (IEC)	degrees C	>/= 850	> 829.6	-200 ... +850	< -195.2	</= -200
	degrees F	>/= 1562	> 1524.5	-328 ... +1562	< -320.1	</= -328
Pt1000 RTD (IEC)	degrees C	>/= 850	> 829.6	-200 ... +850	< -195.2	</= -200
	degrees F	>/= 1562	> 1524.5	-328 ... +1562	< -320.1	</= -328
Pt100 RTD (US/JIS)	degrees C	>/= 450	> 439.2	-100 ... +450	< -97.6	</= -100
	degrees F	>/= 842	> 821.8	-148 ... +842	< -144.4	</= -148
Pt1000 RTD (US/JIS)	degrees C	>/= 450	> 439.2	-100 ... +450	< -97.6	</= -100
	degrees F	>/= 842	> 821.8	-148 ... +842	< -144.4	</= -148
Ni100 RTD	degrees C	>/= 180	> 175.7	-60 ... +180	< -58.6	</= -60
	degrees F	>/= 356	> 347.5	-76 ... +356	< -74.2	</= -76
Ni1000 RTD	degrees C	>/= 180	> 175.7	-60 ... +180	< -58.6	</= -60
	degrees F	>/= 356	> 347.5	-76 ... +356	< -74.2	</= -76

Input Sensor Type		ORE	ORW	Normal Range	URW	URE
Cu10 RTD	degrees C	>/= 260	> 253.8	-100 ...+260	< -97.6	</= -100
	degrees F	>/= 500	> 488.0	-148 ...+500	< -144.4	</= -148
J type TC	degrees C	>/= 760	741.8	-200 ... +760	< -195.2	</= -200
	degrees F	>/= 1400	> 1366.4	-328 ... +1400	< -320.1	</= -328
K type TC	degrees C	>/= 1370	> 1337.1	-270 ... +1370	< -263.5	</= -270
	degrees F	>/= 2498	> 2438	-454 ... +2498	< -443.1	</= -454
E type TC	degrees C	>/= 1000	> 976	-270 ... +1000	< -263.5	</= -270
	degrees F	>/= 1832	> 1788	-454 ... +1832	< -443.1	</= -454
T type TC	degrees C	>/= 400	> 390.4	-270 ... +400	< -263.5	</= -270
	degrees F	>/= 752	> 734	-454 ... +752	< -443.1	</= -454
S type TC	degrees C	>/= 1665	> 1625	-50 ... +1665	< -48.8	</= -50
	degrees F	>/= 3029	> 2956.3	-58 ... +3029	< -56.6	</= -58
R type TC	degrees C	>/= 1665	> 1625	-50 ... +1665	< -48.8	</= -50
	degrees F	>/= 3029	> 2956.3	-58 ... +3029	< -56.6	</= -58
B type TC	degrees C	>/= 1820	> 1776.3	+130 ... 1820	< 133	</= 130
	degrees F	>/= 3200	> 3123.2	+266 ... 3200	< 272	</= 266

- ORE is over-range error
- ORW is over-range warning
- URW is under-range warning
- URE is under-range error

Wiring Type for RTD Sensors

If a channel is configured to support an RTD sensor, you can specify the number of wires for the device—two, three or four. This parameter is required for RTD sensors; it is ignored if the channel is not supporting an RTD sensor. By default, the parameter is set for three-wire devices on both channels. To change the parameter:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	Click on the **+** sign in front of the **Wiring type if RTD** parameter.	Channel 1 and Channel 2 are displayed.
3	In the **Value** column, select the desired wiring type from the pull-down menu.	The menu gives you three choices, *two-wire*, *three-wire* and *four-wire*.
4	Repeat step 3 if you want to configure a wiring type for the other channel.	

Cold Junction Compensation for TC Sensors

Cold-junction compensation helps to provide proper temperature measurement for TC sensors. It is a compensation applied to the junction between the copper connections on the module and the dissimilar metal in the TC sensor connections.

Cold-junction compensation may be configured as an internal control or externally using one of several two-wire RTD choices. The parameter is set at the module level—both channels have the same value, but the value is ignored by any channel that is not configured to support a TC sensor:

Step	Action	Result
1	Double click on the STB ART 0200 module you want to configure in the island editor.	The selected STB ART 0200 module opens in the software module editor.
2	In the **Value** column, select the desired cold-junction compensation value from the pull-down menu.	The menu gives you eight choices, as listed below.

The eight available cold-junction compensation values are:

Cold-junction Compensation Device		Operating Range
internal		determined by the module’s internal sensors
external Pt100 RTD (IEC)	degrees C	-200 ... +850
	degrees F	-328 ... +1562
external Pt1000 RTD (IEC)	degrees C	-200 ... +850
	degrees F	-328 ... +1562
external Pt100 RTD (US/JIS)	degrees C	-100 ... +450
	degrees F	-148 ... +842
external Pt1000 RTD (US/JIS)	degrees C	-100 ... +450
	degrees F	-148 ... +842
external Ni100 RTD	degrees C	-60 ... +180
	degrees F	-76 ... +356
external Ni1000 RTD	degrees C	-60 ... +180
	degrees F	-76 ... +356
external Cu10 RTD	degrees C	-100 ...+260
	degrees F	-148 ...+500

Note: If you are using *external* cold-junction compensation, you need to connect the RTD sensor to the top field wiring connector (see *p. 456*) on the STB ART 0200. You must connect the wires to pins 2 and 5 on the connector. Use only a two-wire RTD. Because cold-junction compensation is configured at the module level, the RTD will provide compensation for TC sensors that are connected on either the top or bottom connector (or both).
When external cold-junction compensation is applied to the module, you may configure channel 1 to support a TC or mV sensor, but you should not configure it to support an RTD that senses process values.

Note: With *internal* cold junction compensation, it takes approximately 45 min after power-up for the module's internal temperature to stabilize.

With the use of internal cold junction compensation, air movement inside the module should not exceed 0.1 m/s. Temperature variations outside the module should not exceed 10 degrees C/hour. The module must be positioned at least 100 mm away from any heat source.

STB ART 0200 Data for the Process Image

Introduction

The STB ART 0200 sends a representation of the operating state of each analog input channel to the NIM. The NIM stores this information in five 16-bit registers—three for data and two for status. The information can be read by the Advantys configuration software or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port.

The input data process image is part of a block of 4096 registers (in the range 45392 through 49487) reserved in the NIM's memory. The STB ART 0200 module is represented by five contiguous registers in this block, which appear in the following order:

- the data in input channel 1
- the status of input channel 1
- the data in input channel 2
- the status of input channel 2
- a cold-junction compensation data

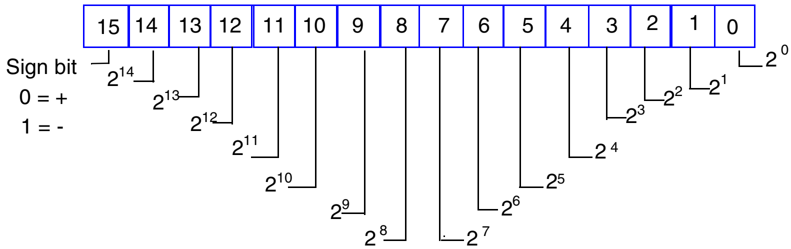
The specific registers used are based on the module's physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transmitted to the master in a fieldbus-specific format. For fieldbus-specific format descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Input Data Registers

The first and third STB ART0200 registers in the input block of the process image are the data words. Each register represents either the temperature or the mV data of the associated channel. The data has15-bit + sign resolution. The bit structure for a data register is:

STB ART 0200 Data Register Format



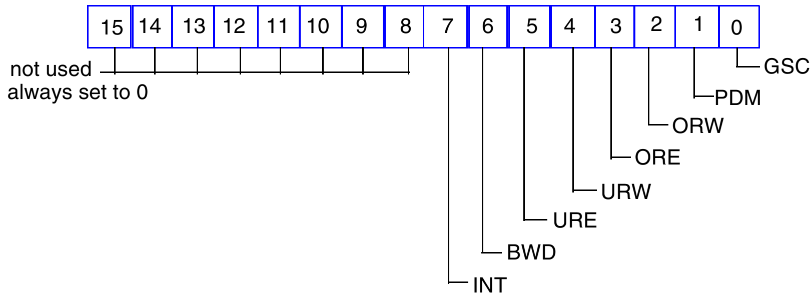
If a register holds temperature data, it represents it as degree C x 10 or degrees F x 10. For example, if the channel data is 74.9 degrees C, the register representing that channel reads 749 (in decimal) or 0*x*2ED (in hexadecimal). You can configure degree C or degrees F in the module editor (see *p. 464*).

If a register holds mV data, it represents it as mV x 100. For example, if the channel data is 62.35 mV, the register reads 6235 (in decimal) or 0*x*185B (in hexadecimal).

Input Status Registers

The second and fourth STB ART 0200 registers in the input block of the process image are the channel status registers for the two analog input channels. The eight LSBs in each register represent the status of each input channel:

STB ART 0200 Status Register Format



Bit meanings are described below:

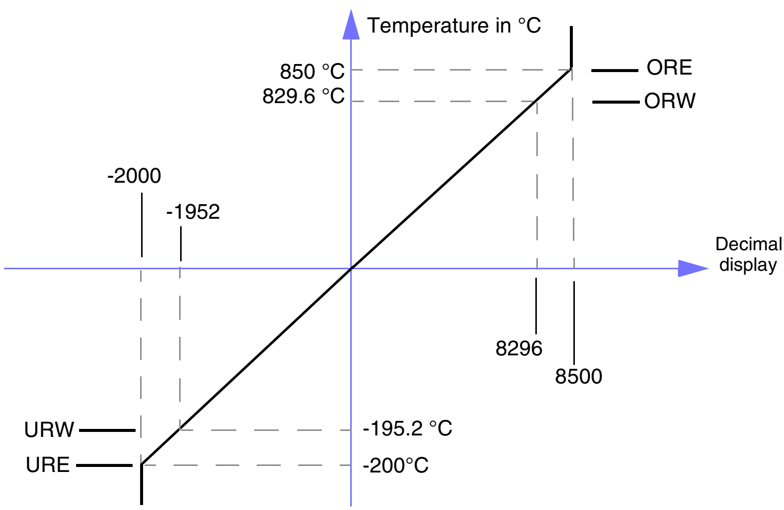
Bit	Indication	Meaning
0	global status channel (GSC)	The value is 0 when no errors have been detected. It is 1 when one or more of the bits1, 3, 5, 6 and 7 has a value of 1.
1	PDM voltage status on the sensor bus	The value is 0 when no PDM voltage errors are detected. It is 1 if sensor power is absent. A PDM short turns on the GSC bit (bit 0).
2	over-range warning (ORW) status	The value is 1 when the input sensor value is over the normal temperature or mV range (see *p. 465*). An ORW does not turn on the GSC bit (bit 0).
3	over-range error (ORE) status	The value is 1 when the input sensor value is in the ORE temperature or mV range (see *p. 465*). An ORE turns on the GSC bit (bit 0)
4	under-range warning (URW) status	The value is 1 when the input sensor value is in the URW temperature or mV range (see *p. 465*). (A URW does not turn on the GSC bit (bit 0).
5	under-range error (URE) status	The value is 1 when the input sensor value is in the URE temperature or mV range (see *p. 465*). A URE turns on the GSC bit (bit 0).
6	broken wire detection (BWD) status	The value is 1 when the channel is configured for an RTD or TC sensor and it detects a broken wire. if you have a mV sensor connected to the channel, BWD does not work. When the channel is configured for a TC sensor, the bit may also be set when external cold-junction compensation is used and a broken wire is detected in the RTD connection. In this case, the cold-junction compensation data will be near 0 and the TC data will be uncompensated. BWD turns on the GSC bit (bit 0).

Bit	Indication	Meaning
7	internal module error (INT) status	Internal hardware/firmware error has been detected or differential between two internal sensors is in excess of 10 degrees C.

Note: The detection of error conditions on the PDM input power connection may be delayed by as much as 15 ms from the event, depending on the sensor bus load, the system configuration and the nature of the fault.
Field power faults that are local to the input module are reported without delay.

Note: If the INT bit is set, you need to either cycle power or hot swap the module to reset the bit. If the bit does not reset, the module needs to be replaced.

The following example illustrates the key points reported to the status register temperature for an IEC Platinum Pt1000 RTD sensor. The temperature input data is shown in degrees C along the y-axis and in decimal format along the x-axis:



Cold-junction Compensation Register

Cold-junction compensation provides improved temperature measurement in TC mode. The STB ART 0200 sends the cold-junction compensation temperature value to the NIM and the fieldbus as the fifth register in the STB ART 0200 process image block. The data has15-bit + sign resolution.

The register represents temperature data as degree C x 10 or degrees F x 10. For example, if the compensation temperature is 74.9 degrees C, the register representing that channel reads 748 (in decimal) or 0*x*1F2 (in hexadecimal). You can configure degrees C or degrees F in the module editor (see *p. 464*).

Cold-junction compensation can be effected by either internal or external compensation (see *p. 468*). The module has two internal sensors that can be used for internal cold-junction compensation. The two sensors calculate the compensation for each channel, and the module reports the average of the two sensed temperatures as compensation data to the process image.

External cold-junction compensation requires that you connect an external RTD device to the top connector on the module. The module uses the real temperature of the RTD for external cold-junction compensation. It reports the real temperature as compensation data to the process image.

STB ART 0200 Specifications

Summary

Each channel on the STB ART 0200 can be configured independently to support an RTD sensor, a TC sensor or a mV sensor. The following four tables describe the module specifications.

General Specifications

.

description		two analog input channels individually configurable for RTD, thermocouple, or mV operations
data resolution		15 bits plus sign
conversion method		Σ - Δ
operating mode		self-scan
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		55 mA
nominal sensor bus current consumption		180 mA
hot swapping supported		NIM-dependent*
reflex actions supported		as inputs only**
isolation	field-to-bus	1500 VAC for 1 min
	channel-to-channel	500 VDC for 1 min
	channel-to-field power supply	500 VDC for 1 min
input protection		+/- 7.5 V maximum
input filter		single low-pass filter @ nominal 25 Hz
cross-talk between channels		not measurable
common mode rejection		50 or 60 Hz (100 dB typical)
differential mode rejection		50 or 60 Hz (60 dB typical)
over-range/under-range margins		+/- 2.4%
addressing requirement		five words (two/channel plus cold-junction compensation data)
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

RTD Specifications

temperature unit	default	degrees C	
	user configurable*	degrees C or degrees F	
data resolution		increments of 0.1 degree (C or F)	
broken wire detection		monitored independently on each channel	
RTD wiring types	default	three-wire	
	user configurable*	two-, three- or four-wire	
typical conversion times	three-wire devices	@ 50 Hz	340 ms
		@ 60 Hz	300 ms
	two- or four-wire devices	@ 50 Hz	200 ms
		@ 60 Hz	180 ms
RTD sensor types	default	IEC platinum Pt100	-200 ... +850 degrees C
			-328 ... +1562 degrees F
	user-configurable*	IEC platinum Pt100 and Pt1000	-200 ... +850 degrees C
			-328 ... +1562 degrees F
		US/JIS platinum Pt100 and Pt1000	-100 ... +450 degrees C
			-148 ... 842 degrees F
		copper Cu10	-100 ... +260 degrees C
			-148 ... +500 degrees F
		nickel Ni100 and Ni1000	-60 ... +180 degrees C
			-76 ... +356 degrees F
maximum wiring resistance	IEC Pt100	four-wire	50 Ω
		two- or three-wire	20 Ω
	IEC Pt1000	four-wire	500 Ω
		two- or three-wire	200 Ω
	US/JIS Pt100	four-wire	50 Ω
		two- or three-wire	20 Ω
	US/JIS Pt1000	four-wire	500 Ω
		two- or three-wire	200 Ω
	Ni100	four-wire	50 Ω
		two- or three-wire	20 Ω
	Ni1000	four-wire	500 Ω
		two- or three-wire	200 Ω
	Cu10	four-wire	50 Ω
		two- or three-wire	20 Ω

absolute accuracy (RTD errors not included)	Pt @ 25° C (77° F)	+/- 1.0 degrees C
		+/- 1.6 degrees F
	Cu @ 25° C (77° F)	+/- 4.0 degrees C
		+/- 6 degrees F
	Ni @ 25° C (77° F)	+/- 1.0 degrees C
		+/- 1.6 degrees F
	Pt @ 60° C (140° F)	+/- 2.0 degrees C
		+/- 3.6 degrees F
	Cu @ 60° C (140° F)	+/- 4.0 degrees C
		+/- 6 degrees F
	Ni @ 60° C (140° F)	+/- 1.0 degrees C
		+/- 1.6 degrees F
* Requires the Advantys configuration software.		

TC Specifications

temperature unit	default	degrees C	
	user configurable*	degrees C or degrees F	
data resolution		increments of 0.1 degree (C or F)	
broken wire detection		monitored independently on each channel	
TC sensor types	user-configurable*	type J	-200 ... +760 degrees C
			-328 ... +1400 degrees F
		type K	-270 ... +1370 degrees C
			-454 ... +2498 degrees F
		type E	-270 ... +1000 degrees C
			-328 ... +1832 degrees F
		type T	-270 ... +400 degrees C
			-328 ... +752 degrees F
		type S	-50 ... +1665 degrees C
			-58 ... +3029 degrees F
		type R	-50 ... +1665 degrees C
			-58 ... +3029 degrees F
		type B	+130 ... 1820 degrees C
			+266 ... 3200 degrees F
maximum error (TC error not included	with internal cold-junction compensation	type J	5.1 degrees @ 25 degrees C
			9.18 degrees @ 77 degrees F
		type K	4 degrees @ 25 degrees C
			7.2 degrees @ 77 degrees F
		type E	4.6 degrees @ 25 degrees C
			8.28 degrees @ 77 degrees F
		type T	4.4 degrees @ 25 degrees C
			7.92 degrees @ 77 degrees F
		type S	4.1 degrees @ 25 degrees C
			7.38 degrees @ 77 degrees F
		type R	3.6 degrees @ 25 degrees C
			6.48 degrees @ 77 degrees F
		type B	4.6 degrees @ 25 degrees C
			8.28 degrees @ 77 degrees F
	with external cold-junction compensation	all types (RTD errors not included)	1.75 degrees @ 25 degrees C
			3.15 degrees @ 77 degrees F

typical conversion times	with internal cold-junction compensation	@ 50 Hz	230 ms
		@ 60 Hz	210 ms
	with external cold-junction compensation	@ 50 Hz	400 ms
		@ 60 Hz	360 ms
* Requires the Advantys configuration software.			

mV Specifications

range of the scale		+/- 80 mV (2.4% over- or under-range)
data resolution		increments of 0.01 mV
accuracy		+/- 0.1% of full scale @ = 25 degrees C ambient temperature
		+/- 0.15% of full scale max @ = 60 degrees C ambient temperature
typical conversion times	@ 50 Hz	170 ms
	@ 60 Hz	150 ms
input impedance		10 MΩ typical

The Advantys STB Analog Output Modules

7

At a Glance

Overview

This chapter describes the features of the standard and basic Advantys STB analog output modules.

What's in this Chapter?

This chapter contains the following sections:

7.1 STB AVO 1250 Analog Voltage Output Module (two-channel, bipolar-selectable, 11-bit + sign)

At a Glance

Overview

This section provides you with a detailed description of the STB AVO 1250 analog output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

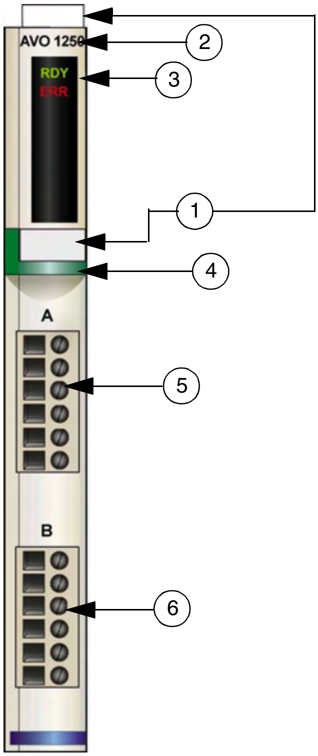
This section contains the following topics:

STB AVO 1250 Physical Description

Physical Characteristics

The STB AVO 1250 is a standard Advantys STB two-channel analog voltage output module that writes outputs to analog actuators that operate over a user-selectable range of either 0 to10 V or -10 to +10 V. The analog portion of the module is isolated from the island's actuator bus to improve performance. To take advantage of this internal isolation feature, the actuators must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the actuators—24 VDC for actuator 1 from the top connector, and 24 VDC for actuator 2 from the bottom connector. The module mounts in a size 1 I/O base and uses two six-terminal field wiring connectors.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark green identification stripe, indicating an analog output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

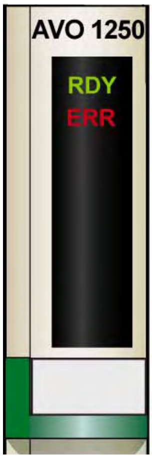
STB AVO 1250 LED Indicator

Purpose

The two LEDs on the STB AVO 1250 provide visual indications of the module's operating status. Their location and meanings are described below.

Location

The LEDs are located on the top of the front bezel of the module, directly below the model number:



Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	Meaning	What to Do
off	off	The module is either not receiving logic power or has failed.	Check power
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
on	on	The watchdog has timed out.	Cycle power, restart the communications
blink 1**		The module is either in pre-operational mode or in its fallback state.	
	flicker*	Field power absent or a PDM short circuit detected.	Check power
	blink 1**	A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***	The island bus is not running.	Check network connections, replace NIM
blink 3****		The output channels on this module are operational while the rest of the island modules are in their fallback states. This condition could occur if the module is used in a reflex action.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.			
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.			
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.			
**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.			

STB AVO 1250 Field Wiring

Summary

The STB AVO 1250 module uses two six-terminal field wiring connectors. Analog actuator 1 is wired to the top connector, and the analog actuator 2 is wired to the bottom connector. The choices of connectors and field wire types are described below, and some field wiring options are presented.

Connector Types

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB AVO 1250 module handles analog output data from two 0 to 10 V or +/- 10 V single-ended analog field actuators. Data on each channel has a resolution of 12 bits or 12 bits plus sign. The module is designed to support high duty cycles and to control continuous-operation equipment.

The module allows you to connect to two-, three- and four-wire devices that can draw current up to 100 mA/channel at 30 degrees C or 50 mA/channel at 60 degrees C. If you want to maintain the module's built-in isolation between the analog portion of the module and the island's actuator bus, you can make only two-wire connections.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair wire is recommended. The shield should be tied to an external clamp that is tied to protective earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog actuator 1, and the bottom connector supports analog actuator 2. Four field wires may be used on each connector—on pins 1, 3, 4 and 6.

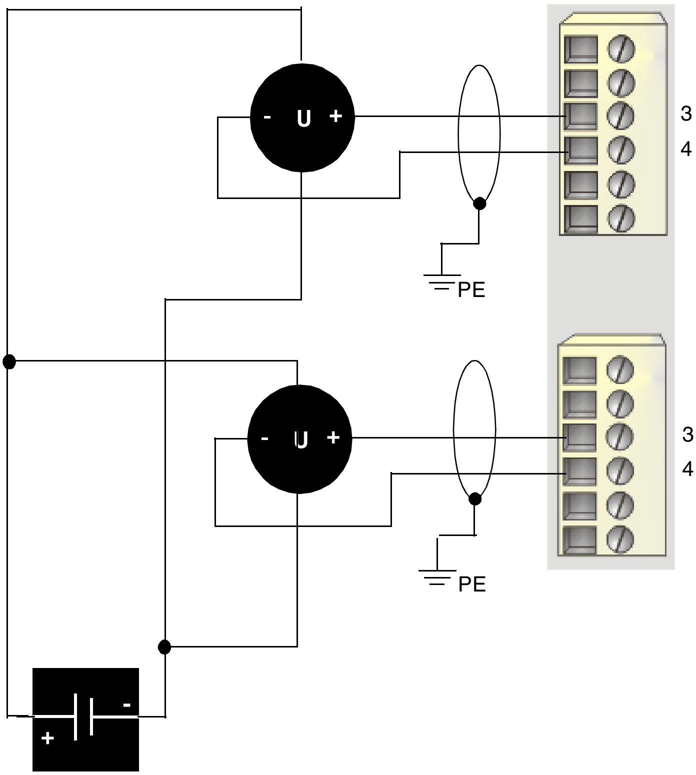
The connections on pin 1 and pin 6 are optional, and using these pins will defeat the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
2	no connection	no connection
3	output to actuator 1	output to actuator 2
4	output channel return	output channel return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

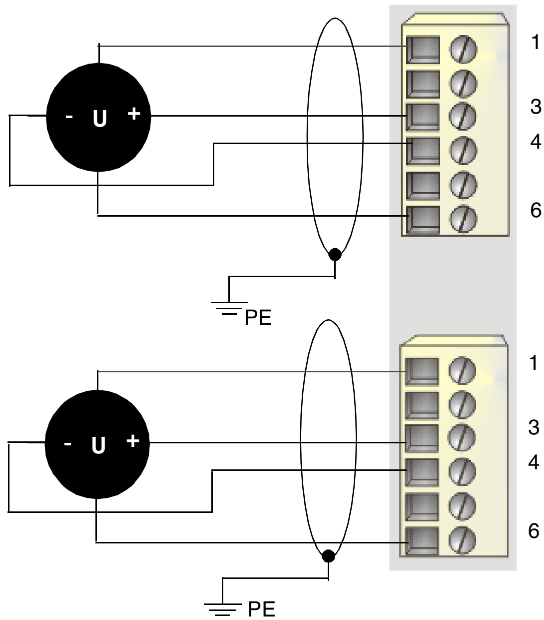
Sample Wiring Diagrams

The following field wiring example shows how two isolated analog actuators can be wired to the STB AVO 1250 module. An external power supply is required to power the actuators:



3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 field power returns from actuator 1 (top) and actuator 2 (bottom)

If you want to use 24 VDC from the island's actuator bus to power the analog field devices, this power can be delivered through the output module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for actuator 1 (top) and for actuator 2 (bottom)
3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 returns from actuator 1 (top) and actuator 2 (bottom)
6 field power return from actuator 1 (top) and actuator 2 (bottom)

Remember that using pins 1 and 6 will defeat the built-in isolation between the analog portion of the module and the island's actuator bus.

STB AVO 1250 Functional Description

Functional Characteristics

The STB AVO 1250 is a two-channel analog output module that sends data to two voltage field actuators. The following operating parameters are user-configurable:

- the voltage range of the module
- the module’s analog output period
- the fallback states of the two analog output channels

Using the Run-time Parameters (see *p. 859*)(RTP) feature in your NIM, you can access the value of the following parameter:

- Analog Output Period

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Voltage Range

The voltage range of the module is user-configurable for either:

- 0 to 10 V (with 12-bit resolution)
- +/- 10 V (with 11-bit + sign resolution)

By default, the range is 0 to 10 V. If you want to transfer signals in the +/- 10 V range or return to the default setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB AVO 1250 module you want to configure in the island editor.	The selected STB AVO 1250 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Voltage Range** row, select the desired voltage range.	Two choices appear in the pull-down menu—**0 to 10 VDC** and **-10 to +10 VDC**.

The voltage range parameter is configurable at the module level—both output channels must operate over the same voltage range.

Analog Output Period

If the data sent by the module to an analog output channel is not updated by the fieldbus master in a specified number of milliseconds, the module will refresh the old data held by the channel. The purpose of this update is to prevent the analog value from drifting in the event that there is a long interval between data updates. The interval between refreshes is defined as the *analog output period*. This period is user-configurable in the range 5 to 255 ms.

The analog output period is configurable as a decimal or hexadecimal value in the range 5 to 255 (0x5 to 0xFF). By default, the analog output period is 10 (0xA). If you want to configure a different period, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB AVO 1250 module you want to configure in the island editor.	The selected STB AVO 1250 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	In the **Value** column of the **Analog Output Period** row, enter the desired value.	When you select the **Analog Output Period** value, the max/ min values of the range appear at the bottom of the module editor screen.

The analog output period is set at the module level—you cannot configure different channels to refresh at different intervals.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0x10
Index (high byte)	0x23
Sub-index	0
Data Byte 1	5 to 255

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, which can be any value in the valid range. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a *predefined state*. If you want to change the fallback mode to *hold last value*, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB AVO 1250 module you want to configure in the island editor.	The selected STB AVO 1250 module opens in the software module editor.
2	Expand the **+ Fallback Mode** row by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
3	From the pull-down menu in the **Value** column of the **Channel 1** and/or **Channel 1** row, select the desired fallback mode setting.	Two choices appear in the pull-down menus—**Predefined** and **Hod Last Value**.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to go to any value in the valid range.

- If your voltage range is 0 to 10 VDC, then the fallback state value may be configured as a decimal or hexadecimal integer in the range 0 to 32 000 (0 to 0x7D00).
- If your voltage range of -10 to +10 VDC, then the fallback state value may be configured as a decimal or hexadecimal integer in the range -32 000 to +32 000 (0x8300 to 0x7D00).

By default, both channels are configured to go to 0 VDC as their predefined fallback state.

> **Note:** If an output channel has been configured with *hold last value* as its fallback mode, any value that you assign its fallback state parameter will be ignored.

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is *predefined state*.	If the **Fallback Mode** value for the channel is *hold last value*, any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4	Double click on the channel value(s) you want to change, then type in the desired value(s). The max/min values of the range appear at the bottom of the module editor screen: -32 000 to +32 000 (0x8300 to 0x7D00)	The software does not change the way it displays the minimum range value when your voltage range is 0 to 10 V. You should not enter a value less than 0 when your outputs are in this voltage range. If you enter a negative predefined state value when the voltage range is 0 to 10 V, the fallback state of the affected channel will become 0.

STB AVO 1250 Data and Status for the Process Image

Representing the Analog Output Data

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB AVO 1250 module are based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

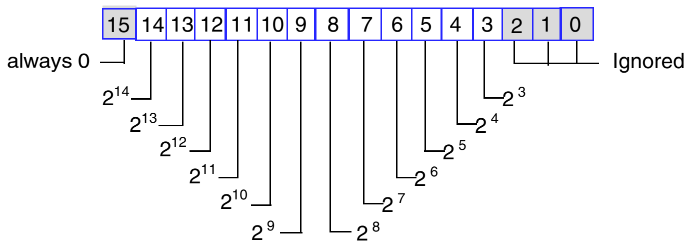
Output Data Registers

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB AVO 1250 uses two contiguous registers in the output data block—the first for the data in channel 1 and the second for the data in channel 2.

The two output data registers represent the channel data in the IEC data format.

When the module is configured to operate over a voltage range of 0 to 10 V, the data has a resolution of 12 bits:

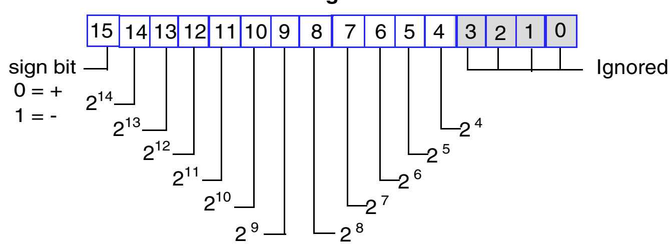
STB AVO 1250 Data Register Format for 0 to 10 V



In this case, you can represent voltage data with integer values in the range 0... +32 760 in increments of 8. The value of bit 15 should always be 0. If a negative value is sent, the output will be set to 0 VDC and an under-voltage error will be returned. The value 32 000 produces a 10 V output, and the value 0 produces a 0 V output. If the output value is set to 32 760 or greater, an over-voltage error (OVE) is reported.

When the module is configured to operate over a voltage range of -10 to +10 V, the data has a resolution of 11 bits plus sign bit:

STB AVO 1250 Data Register Format for -10 to +10 V

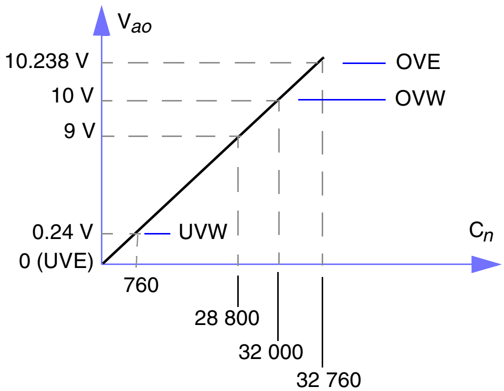


In this case, you can represent voltage data with integer values in the range -32 768... +32 752 in increments of 16. The value +32 000 produces a 10 V output, and -32 000 produces a -10 V output. If the value exceeds +32 000, the output channel reports an over-voltage warning (OVW). If the output value drops below -32 000, the output channel reports an under-voltage warning (UVW). If the output value goes up to +32 752, an over-voltage error (OVE) is reported, and if it drops to -32 768 an under-voltage error (UVE) is reported.

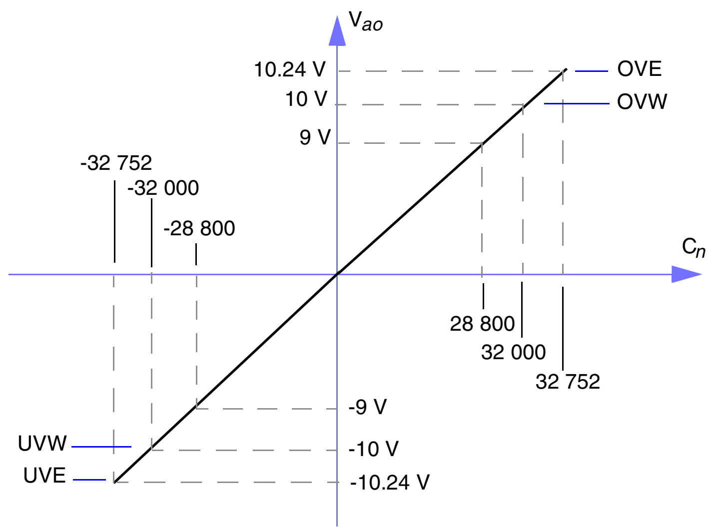
Linear voltage representations can be interpreted using the formula:

$$C_n = 3200 \times V_{ao}$$

where C*n* is the numerical count and V*ao* is the analog output voltage. When the voltage range is from 0 to 10 VDC, voltage data is represented as follows:



When the voltage range is from -10 to +10 VDC, voltage data is represented as follows:



Output Status Registers

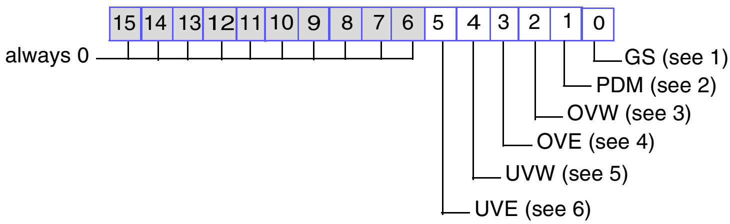
The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45392 through 49487) that represent the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB AVO 1250 is represented by two contiguous registers—the first shows output status for channel 1 and the second shows output status for channel 2. The STB AVO 1250 can detect and report voltage overflow and voltage underflow conditions on each channel.

A voltage overflow occurs when the voltage of an output channel is set to 10.24 V (represented by the value 32 752 in the channel's data word). A voltage underflow can occur when the module is configured to operate at +/-10 V and when the voltage of an output channel is set to -10.24 V (represented by the value -32 752 in the channel's data word).

The six LSBs in each register represent the status of each output channel:

STB AVO 1250 Status Register Format



1 Bit 0 represents global status (GS). It has a value of 0 when no errors have been detected. It has a value of 1 when bit 1 has a value of 1.

2 Bit 1 represents the status of PDM voltage on the island's actuator bus. It has a value of 0 when no PDM voltage errors are detected. It has a value of 1 when power is shorted. A PDM short turns on the GS bit (bit 0).

3 Bit 2 represents the presence or absence of an OVW. It has a value of 0 when the voltage is less than or equal to 10 V. It has a value of 1 when the numerical count is greater than 32 000. An OVW does not turn on the GS bit (bit 0).

4 Bit 3 represents the presence or absence of an over-voltage error (OVE). It has a value of 0 when the numerical count is less than 32 752 and a value of 1 when the voltage equals 32 752. An OVE does not turn on the GS bit (bit 0).

5 Bit 4 represents the presence or absence of a UVW. If the module is configured for +/-10 V operations, it has a value of 0 when the numerical is greater than or equal to -32 000 and a value of 1 when the count is below -32 000 but above -32 752. A UVW does not turn on the GS bit (bit 0).

5 Bit 5 represents the presence or absence of a UVE. If the module is configured for +/-10 V operations, it has a value of 0 when the numerical count is greater than -32 752 and a value of 1 when the voltage equals -32 752. A UVE does not turn on the GS bit (bit 0).

STB AVO 1250 Specifications

Table of Technical Specifications

description		two single-ended analog voltage output channels
analog voltage range	default	0 ... 10 V
	user-configurable setting**	-10 ... +10 V
resolution	@ 0 ... 10 V	12 bits
	@ -10 ... +10 V	11 bits + sign
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		80 mA
nominal actuator bus current consumption		50 mA, with no load
maximum output current		5 mA/channel
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
output response time	nominal	3.0 ms plus settling time both channels
short-circuit protection on the outputs		yes
output fault detection		none
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-actuator bus	500 VAC rms (when actuator bus is not used for field power
integral linearity		+/- 0.1% of full scale typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
capacitive load		1 µF
fallback mode	default	predefined
	user-configurable settings**	hold last value
		predefined on one or both channels

fallback states (when *predefined* is the fallback mode)	default setting	0 V on both channels
	user-configurable settings**	when the voltage is 0 ... 10 V, integer values between 0 ... 32 000 on each channel
		when the voltage is -10 ... +10 V, integer values between -32 000 ... +32 000 on each channel
addressing requirements		two words of output data and two noncontiguous bytes of configuration data (for *voltage range* and *fallback state*)
actuator bus power for accessories		100 mA/channel @ 30 degrees C
		50 mA/channel @ 60 degrees C
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-la fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		
** Requires the Advantys configuration software.		

7.2 STB AVO 1255 Analog Voltage Output Module (two-channel, 0 to 10 V, 10-bit)

At a Glance

Overview

This section provides a detailed description of the STB AVO 1255 analog output module—its functions, physical design, technical specifications and field wiring requirements.

What's in this Section?

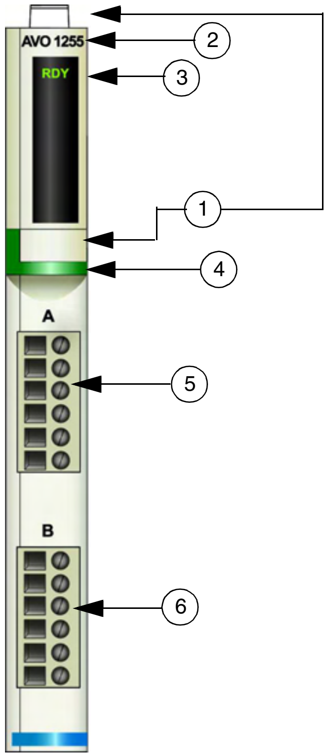
This section contains the following topics:

STB AVO 1255 Physical Description

Physical Characteristics

The STB AVO 1255 is a basic Advantys STB two-channel analog voltage output module that writes outputs to analog actuators that operate over a range of 0 to10 V. The analog portion of the module is isolated from the island's field power bus to improve performance. To take advantage of this internal isolation feature, power the actuators from an external power supply. If isolation is not required, you can use the module to deliver field power to the actuators—24 VDC for actuator 1 from the top connector, and 24 VDC for actuator 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED
4 dark green identification stripe, indicating an analog output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB AVO 1255 LED Indicator

Purpose

The LED on the STB AVO 1255 provides a visual indication of the module's operating status.

Location

The LED is located on the top of the front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is either in pre-operational mode or in its fallback state.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.		
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.		

STB AVO 1255 Field Wiring

Summary

The STB AVO 1255 module uses two six-terminal field wiring connectors. Analog actuator 1 is wired to the top connector, and the analog actuator 2 is wired to the bottom connector.

Connector Types

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB AVO 1255 module handles analog output data from two 0 to 10 V single-ended analog field actuators. Data on each channel has a resolution of 10 bits. The module allows you to connect to two-, three- and four-wire actuators that can draw current up to 100 mA/module.

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's field power bus, you can make only two-wire connections.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair wire is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

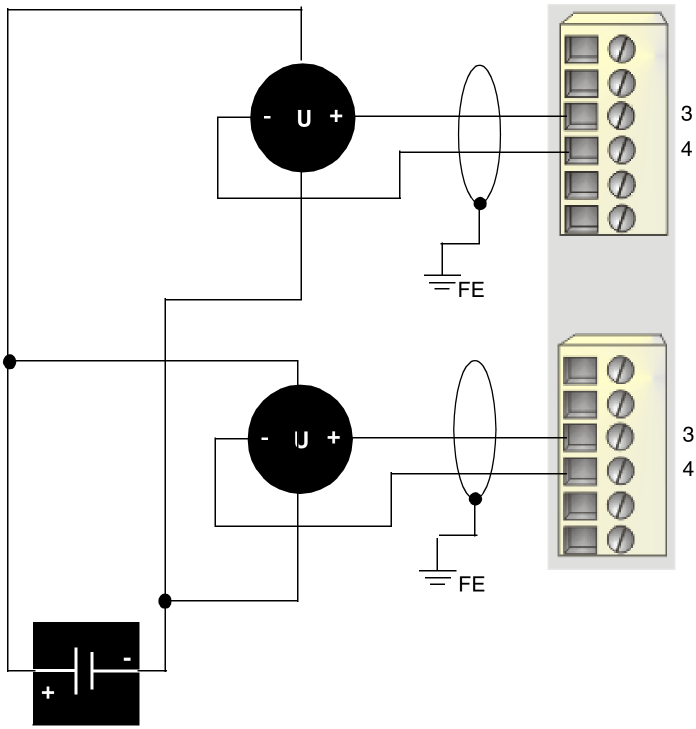
The connections on pin 1 and pin 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5:

Pin	Top Connections	Bottom Connections
1	+24 VDC from the island's field power bus for field device accessories	+24 VDC from the island's field power bus for field device accessories
2	no connection	no connection
3	output to actuator 1	output to actuator 2
4	output channel return	output channel return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

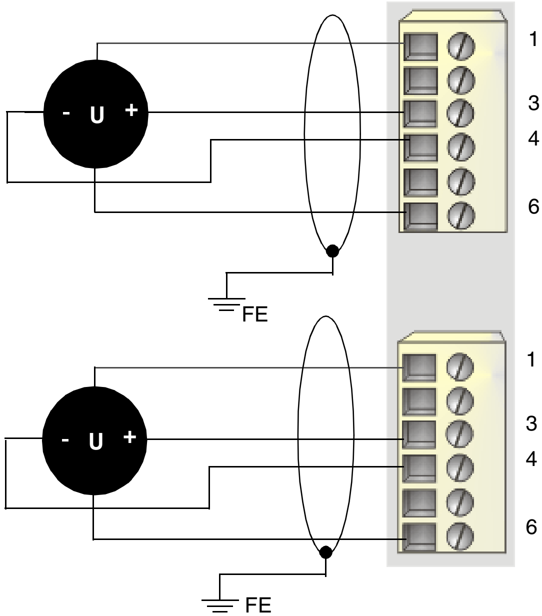
Sample Wiring Diagrams

The following field wiring example shows how two isolated single-ended analog actuators can be wired to the STB AVO 1255 module. An external power supply is required:



3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 field power returns from actuator 1 (top) and actuator 2 (bottom)

If you want to use 24 VDC from the island's field power bus to power the single-ended analog field devices, use pins 1 and 6 as follows:



1 +24 VDC for actuator 1 (top) and for actuator 2 (bottom)
3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 returns from actuator 1 (top) and actuator 2 (bottom)
6 field power return from actuator 1 (top) and actuator 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island's actuator bus.

STB AVO 1255 Functional Description

Functional Characteristics

The STB AVO 1255 is a two-channel analog module that sends output data to two voltage field actuators. It does not support user-configurable operating parameters or reflex actions.

Operating Parameters

The voltage range of the module is 0 to 10 V, with 10-bit resolution.

When communications are lost between the output module and the fieldbus master, the module's output channels go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. Both output channels go to a predefined fallback state of 0 VDC.

STB AVO 1255 Data for the Process Image

Representing the Analog Output Data

The NIM keeps a record of output data in a block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output modules. This information can be monitored by the fieldbus master. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

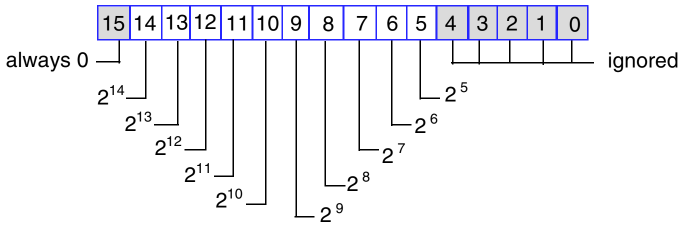
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. An STB AVO 1255 is represented by two contiguous registers in the output data block. The specific registers used by an STB AVO 1255 module are based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Registers

Each STB AVO 1255 data register represents the output voltage of a channel in the IEC data format. The data has 10-bit resolution. The bit structure in each data register is as follows:

0 to 10 V Data Register Format

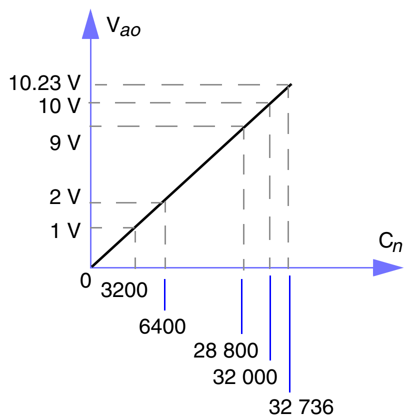


There are 10 significant bits in each data word—bits 14 through 5. They allow you to represent voltage data with integer values ranging from 0 to 32,736 in increments of 32. A value 32 000 results in an output of 10 V. If the sign bit (bit 15) is set, the output is set to 0 V.

Linear voltage representations can be interpreted using the formula:

$$C_n = 3200 \times V_{ao}$$

where C*n* is the numerical count and V*ao* is the analog output voltage. Voltage data is represented as follows:



Values greater than 32 000 do not produce over-range indications.

STB AVO 1255 Specifications

Table of Technical Specifications

description		two single-ended analog voltage output channels
analog voltage range		0 ... 10 V
resolution		10 bits
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		80 mA
nominal actuator bus current consumption		50 mA, with no load
maximum output current		5 mA/channel
hot swapping supported		NIM-dependent*
reflex actions supported		no
output response time	nominal	3.0 ms plus settling time for both channels
short-circuit protection on the outputs		yes
output fault detection		none
isolation	field-to-bus	1500 VDC for 1 min
	module-to-field power bus	500 VAC rms (when actuator bus is not used for field power
integral linearity		+/- 0.1% of full scale typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
capacitive load		1 µF
fallback mode		predefined
fallback states		0 V on both channels
addressing requirements		two words of output data
actuator bus power for accessories		100 mA/module
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

7.3 STB AVO 1265 Analog Voltage Output Module (two-channel, -10 to +10 V, 9-bit + sign)

At a Glance

Overview

This section provides a detailed description of the STB AVO 1265 analog output module—its functions, physical design, technical specifications and field wiring requirements.

What's in this Section?

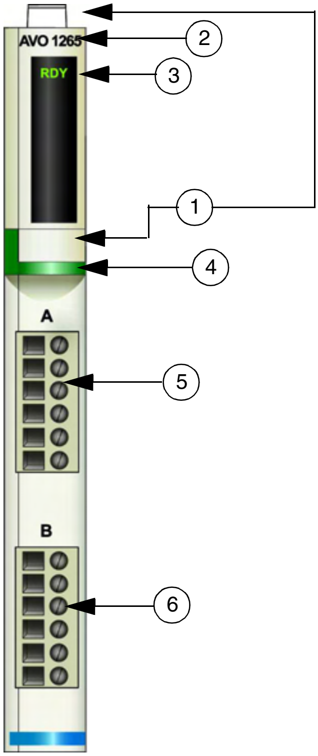
This section contains the following topics:

STB AVO 1265 Physical Description

Physical Characteristics

The STB AVO 1265 is a basic Advantys STB two-channel analog voltage output module that writes outputs to analog actuators that operate over a range of -10 to +10 V. The analog portion of the module is isolated from the island's actuator bus to improve performance. To take advantage of this internal isolation feature, the actuators must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the actuators—24 VDC for actuator 1 from the top connector, and 24 VDC for actuator 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark green identification stripe, indicating an analog output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying kit for inserting the module into the base
- the STB XMP 7800 keying kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB AVO 1265 LED Indicator

Purpose

The LED on the STB AVO 1265 provides a visual indication of the module's operating status.

Location

The LED is located on the top of the front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is either in pre-operational mode or in its fallback state.	
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.	
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.	

STB AVO 1265 Field Wiring

Summary

The STB AVO 1265 module uses two six-terminal field wiring connectors. Analog actuator 1 is wired to the top connector, and the analog actuator 2 is wired to the bottom connector.

Connector Types

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB AVO 1265 module handles analog output data from two +/- 10 V single-ended analog field actuators. Data on each channel has a resolution of 9 bits plus sign.

The module allows you to connect to two-, three- and four-wire devices. If you want to maintain the module's built-in isolation between the analog portion of the module and the island's actuator bus, you can make only two-wire connections. The actuators can draw current up to 100 mA/module.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair wire is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

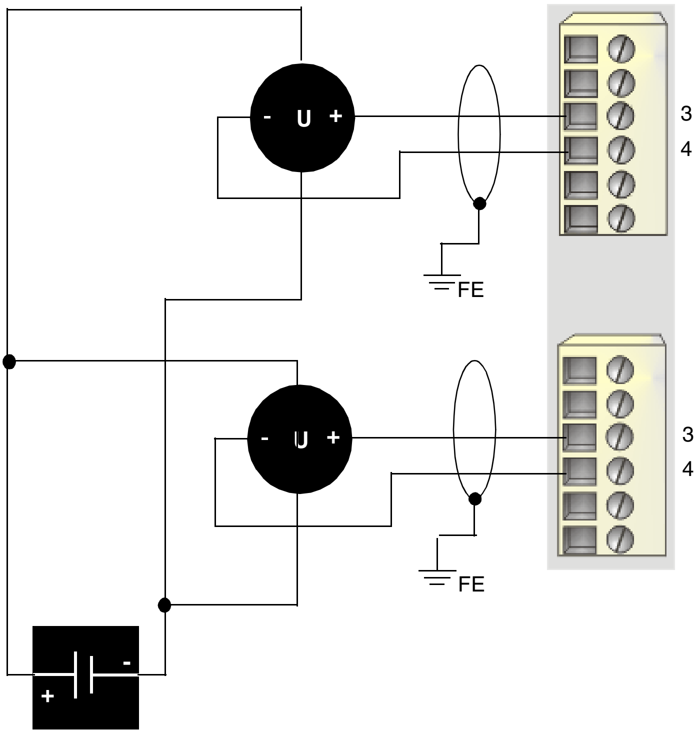
The connections on pin 1 and pin 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
2	no connection	no connection
3	output to actuator 1	output to actuator 2
4	output channel return	output channel return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

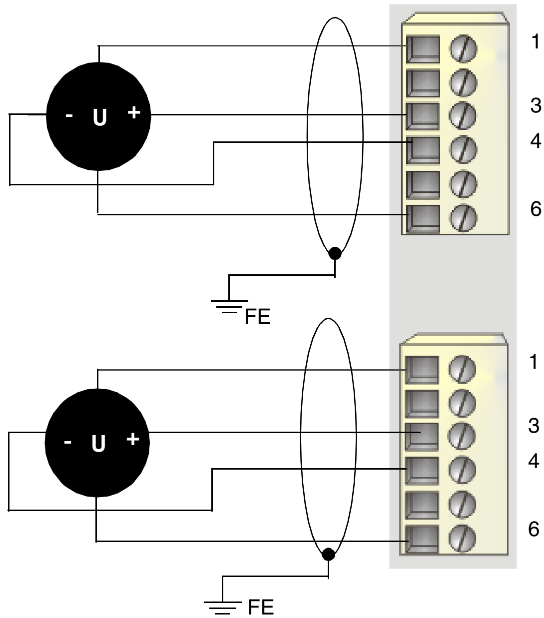
Sample Wiring Diagrams

The following field wiring example shows how two isolated single-ended analog actuators can be wired to the STB AVO 1265 module. An external power supply is required:



3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 field power returns from actuator 1 (top) and actuator 2 (bottom)

If you want to use 24 VDC from the island's actuator bus to power the single-ended analog field devices, use pins 1 and 6 as follows:



1 +24 VDC for actuator 1 (top) and for actuator 2 (bottom)
3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 returns from actuator 1 (top) and actuator 2 (bottom)
6 field power return from actuator 1 (top) and actuator 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island's actuator bus.

STB AVO 1265 Functional Description

Functional Characteristics

The STB AVO 1265 is a two-channel analog output module that sends data to two voltage field actuators. It does not support user-configurable operating parameters or reflex actions.

Operating Parameters

The voltage range of the module is +/-10 V, with 9-bit plus sign resolution.

When communications are lost between the output module and the fieldbus master, the module's output channels go to a known state where they remain until communications are restored. This is known as the channel's *fallback state*. Both output channels go to a predefined fallback state of 0 VDC.

STB AVO 1265 Data for the Process Image

Representing the Analog Output Data

The NIM keeps a record of output data in one block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output modules. This information can be monitored by the fieldbus master. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

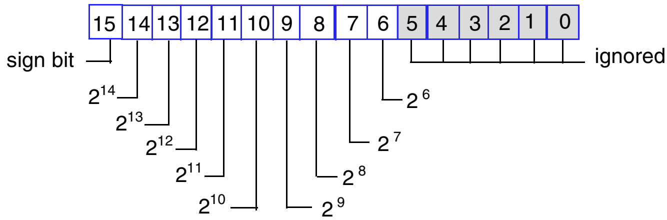
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. An STB AVO 1265 is represented by two contiguous registers in the output data block. The specific registers used by an STB AVO 1265 module are based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Registers

Each STB AVO 1265 data register represents the output voltage data in the IEC data format. The data has 9-bit + sign resolution:

-10 to +10 V Data Register Format

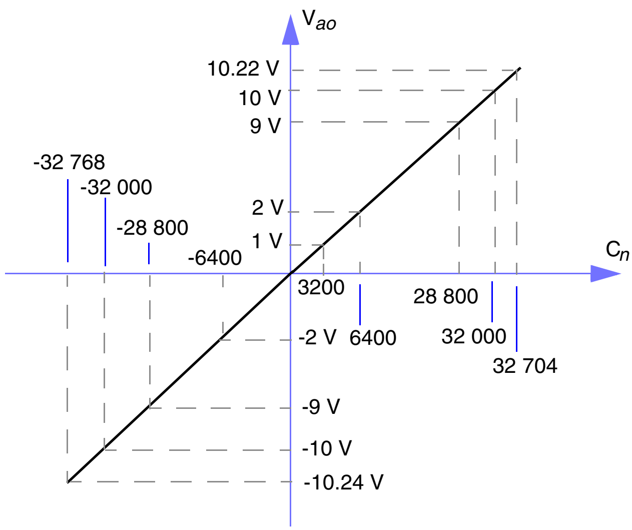


The value of each data word is represented in bits 15 through 6, The bits represent voltage data as integer values in the range -32 768 ... +32 704 in increments of 64. When the sign bit (bit 15) is 0, the value is positive; when bit 15 is 1, the value is negative.

Linear voltage representations can be interpreted using the formula:

$$C_n = V_{ao} \times 3200$$

where C*n* is the numerical count and V*ao* is the analog output voltage. Voltage data is represented as follows:



Values greater than 32 000 and less than -32 000 do not produce out-of-range indications.

STB AVO 1265 Specifications

Table of Technical Specifications

description		two single-ended analog voltage output channels
analog voltage range		-10 ... +10 V
resolution		9 bits + sign
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		80 mA
nominal actuator bus current consumption		50 mA, with no load
maximum output current		5 mA/channel
hot swapping supported		NIM-dependent*
reflex actions supported		no
output response time	nominal	3.0 ms plus settling time both channels
short-circuit protection on the outputs		yes
output fault detection		none
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-actuator bus	500 VAC rms (when actuator bus is not used for field power
integral linearity		+/- 0.1% of full scale typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
capacitive load		1 µF
fallback mode		predefined
fallback states		0 V on both channels
addressing requirements		two words of output data)
actuator bus power for accessories		100 mA/module
over-current protection for accessory power		yes
field power requirements		from a 24 VDC PDM
power protection		time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.		

7.4 STB ACO 1210 Analog Current Output Module (two-channel, 12-bit, 0 ... 20 mA)

At a Glance

Overview

This section provides you with a detailed description of the STB ACO 1210 analog output module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

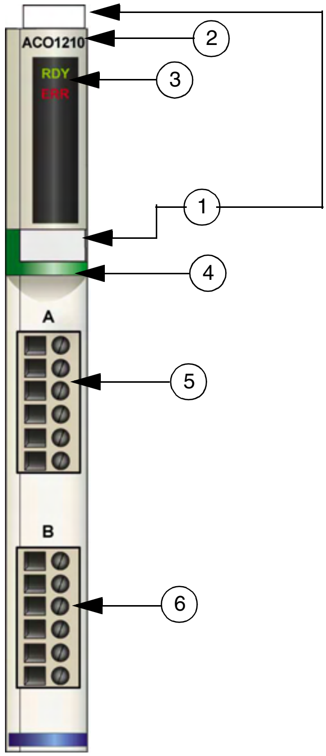
This section contains the following topics:

STB ACO 1210 Physical Description

Summary

The STB ACO 1210 is a standard Advantys STB two-channel analog current output module that writes outputs to analog actuators that operate over a range of 0 to 20 mA. The analog portion of the module is isolated from the island's actuator bus to improve performance. To take advantage of this internal isolation feature, the actuators must be powered from an external power supply. If isolation is not required, you can use the module to deliver field power to the actuators—24 VDC for actuator 1 from the top connector, and 24 VDC for actuator 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark green identification stripe, indicating an analog output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB ACO 1210 LED Indicators

Purpose

The two LEDs on the STB ACO 1210 provide visual indications of the module's operating status. Their location and meanings are described below.

Location

The LEDs are located on the top of the front bezel of the module, directly below the model number:

Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	ERR	Meaning	What to Do
off	off	The module is either not receiving logic power or has failed.	Check power
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
on	on	The watchdog has timed out.	Cycle power, restart the communications
blink 1**		The module is either in pre-operational mode or in its fallback state.	
	flicker*	Field power absent or a PDM short circuit detected.	Check power
	blink 1**	A nonfatal error has been detected.	Cycle power, restart the communications
	blink 2***	The island bus is not running.	Check network connections, replace NIM
blink 3****		The output channels on this module are operational while the rest of the island modules are in their fallback states. This condition could occur if the module is used in a reflex action.	
* flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.			
** blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.			
*** blink 2—the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.			
**** blink 3—the LED blinks on for 200 ms, off for 200 ms, on for 200 ms, off for 200 ms, on again for 200 ms then off for 1 s. This pattern is repeated until the causal condition changes.			

STB ACO 1210 Field Wiring

Summary

The STB ACO 1210 module uses two six-terminal field wiring connectors. Analog actuator 1 is wired to the top connector, and the analog actuator 2 is wired to the bottom connector. The choices of connectors and field wire types are described below, and some field wiring options are presented.

Connector Types

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB ACO 1210 module handles analog output data from two 0 ... 20 mA single-ended analog field actuators. Data on each channel has a resolution of 12 bits. The module is designed to support high duty cycles and to control continuous-operation equipment.

The module allows you to connect to two-, three- and four-wire devices that can draw current up to:

- 100 mA/channel at 30 degrees C
- 50 mA/channel at 60 degrees C

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's actuator bus, you can make connections only to a two-wire device.

Field Wiring Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair wire is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinouts

The top connector supports analog actuator 1, and the bottom connector supports analog actuator 2. Four field wires may be used on each connector—on pins 1, 2, 4 and 6.

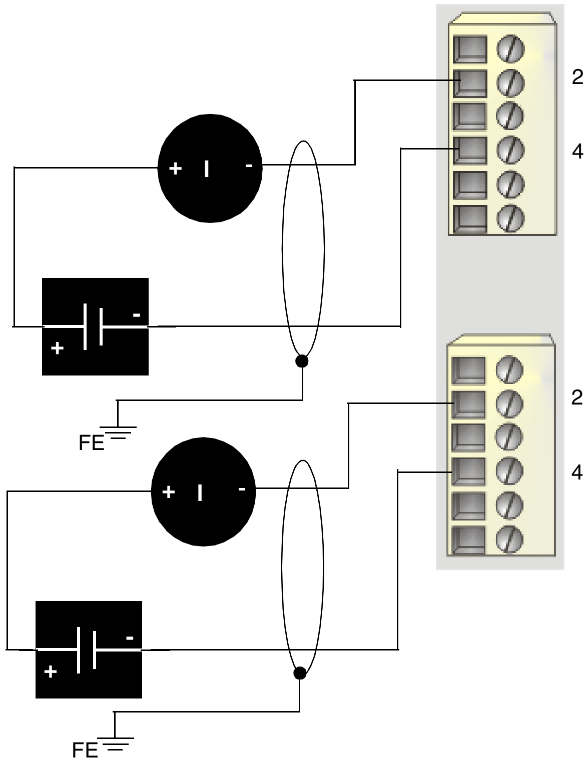
The connections on pin 1 and pin 6 are optional, and using these pins will defeat the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 3 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
2	output to actuator 1	output to actuator 2
3	no connection	no connection
4	analog output return	analog output return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

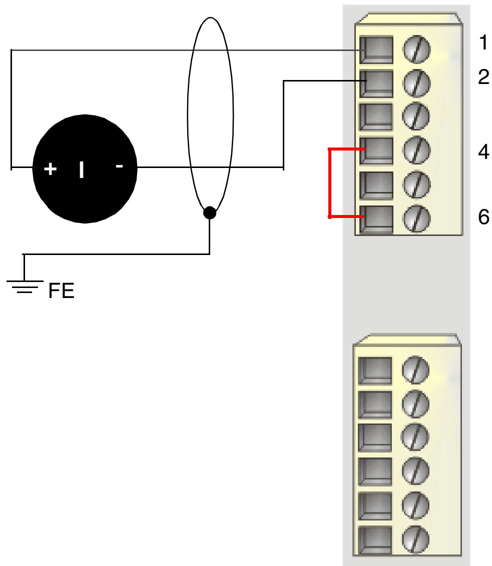
Sample Wiring Diagrams

The following field wiring example shows how two isolated single-ended analog actuators can be wired to the STB ACO 1210 module. Two separate external power supplies are needed to make sure that the proper current is delivered to each actuator:



2 outputs to actuator 1 (top) and actuator 2 (bottom)
4 field power returns from actuator 1 (top) and actuator 2 (bottom)

If you want to use 24 VDC from the island's actuator bus to power a single-ended analog field device, this power can be delivered through the output module. To do this, use pins 1 and 6 as follows



1 +24 VDC for actuator 1
2 output to actuator 1
4 and 6 close the power loop by sending the field power return to the module return

Remember that using pins 1 and 6 will defeat the built-in isolation between the analog portion of the module and the island's actuator bus.

STB ACO 1210 Functional Description

Functional Characteristics

The STB ACO 1210 module is a two-channel analog output module that sends data to two field actuators. The following operating parameters are user-configurable:

- the module's analog output period
- the fallback states of the two analog output channels

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the following parameter:

- Analog Output Period

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

> **Note:** Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Analog Output Period

If the data to an analog output channel is not updated by the fieldbus master in a specified number of milliseconds, the module will refresh the old data held by the channel. The purpose of this update is to prevent the analog value from drifting in the event that there is a long interval between data updates. The interval between refreshes is defined as the *analog output period*. This period is user-configurable in the range 5 to 255 ms.

The analog output period is configurable as a decimal or hexadecimal value in the range 5 to 255 (0x5 to 0xFF). By default, the analog output period is 10 (0xA). If you want to configure a different period, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB ACO 1210 module you want to configure in the island editor.	The selected STB ACO 1210 module opens in the software module editor.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	In the **Value** column of the **Analog Output Period** row, enter the desired value.	Notice that when you select the **Analog Output Period** value, the max/min values of the range appear at the bottom of the module editor screen.

The analog output period is set at the module level—you cannot configure different channels to refresh at different intervals.

This parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0x10
Index (high byte)	0x23
Sub-index	0
Data Byte 1	5 to 255

Fallback Modes

When communications are lost between the output module and the fieldbus master, the module's output channels must go to a known state where they will remain until communications are restored. This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, which may be any value in the valid range. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is a *predefined state*. If you want to change the fallback mode to *hold last value*, you need to use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB ACO 1210 module you want to configure in the island editor.	The selected STB ACO 1210 module opens in the software module editor.
2	Expand the **+ Fallback Mode** row by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
3	From the pull-down menu in the **Value** column of the **Channel 1** and/or **Channel 1** row, select the desired fallback mode setting.	Two choices appear in the pull-down menus—**Predefined** and **Hod Last Value**.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to go to any value in the range 0 to 32 000 (0 to 0x7D00), where 0 represents 0 mA and 32 000 represents 20 mA.

By default, both channels are configured to go to 0 VDC as their predefined fallback state.

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you assign its fallback state parameter will be ignored.

The data resolves to 12 bits. This means that the decimal or hexadecimal value returned to you will be an increment of 8. If you enter a value that is not an increment of 8, the system will round down to the next increment of 8. For example, if you enter a value of 35 (0x23), the module will resolve to a value of 32 (0x20).

If you enter a value less than 0, the output will be set to 0 and an under-current error will be returned (see *p. 545*).

To modify a fallback state from its default setting or to revert back to the default from an on setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** value for the channel you want to configure is *predefined state*.	If the **Fallback Mode** value for the channel is *hold last value*, any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or unchecking the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Predefined Fallback Value Settings** fields by clicking on the **+** sign.	Rows for **Channel 1** and **Channel 2** appear.
4	Double click on the channel value(s) you want to change, then type in the desired value(s). -32 000 to +32 000 (0x8300 to 0x7D00)	The software displays the max/min values of the range at the bottom of the module editor screen.

STB ACO 1210 Data and Status in the Process Image

Representing the Analog Output Data

The NIM keeps a record of output data in one block of registers in the process image and a record of output status in another block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output module. The information in the status block is provided by the module itself.

This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific registers used by the STB ACO 1210 module are based on its physical location on the island bus.

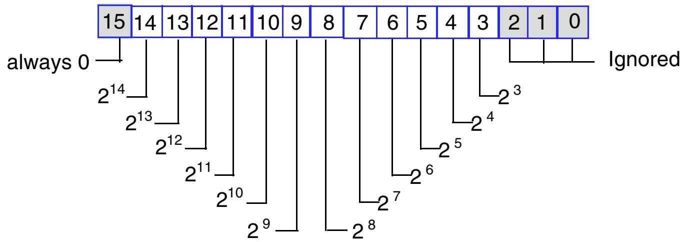
> **Note:** The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Registers

The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. Each output module on the island bus is represented in this data block. The STB ACO 1210 uses two contiguous registers in the output data block—the first for the data in channel 1 and the second for the data in channel 2.

The STB ACO 1210's two output data registers represent the channel data in the IEC data format. The data has 12-bit resolution. The bit structure in each of the two data words is as follows:

STB ACO 1210 Data Register Format



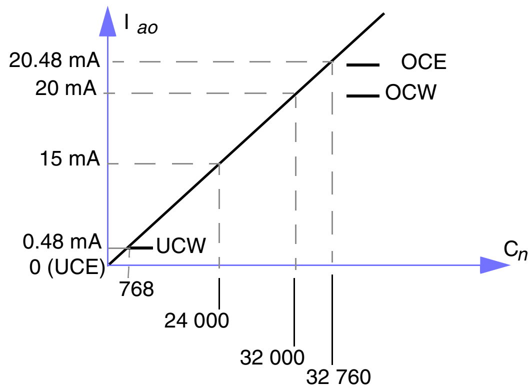
There are 12 significant bits in each data word—bits 14 through 3. They allow you to represent current data with integer values ranging from 0 to 32,760 in increments of eight.

The value 32 000 results in a 20 mA output. If the value exceeds 32 000, the output channel reports an over-current warning (OCW). If the value reaches 32 760, an over-current error (OCE) is reported. If the value drops below 768, the output channel reports an under-current warning (UCW), and if the value goes to 0 the channel reports an under-current error (UCE).

Linear current representations can be interpreted using the formula:

$$C_n = I_{ao} \times 1600$$

where C*n* is the numerical count and I*ao* is the analog output current.

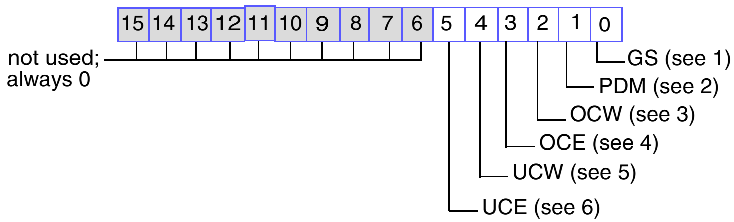


Output Status Registers

The input data and I/O status process image is a reserved block of 4096 16-bit registers (in the range 45 392 through 49 487) that represent the status of all the I/O modules (along with the data for the input modules) on the island bus.

The STB ACO 1210 is represented by two contiguous registers—the first shows output status for channel 1 and the second shows output status for channel 2. The six LSBs in each register represent the status of each input channel:

STB ACO 1210 1230 Status Register Format



1 Bit 0 is the global status (GS) bit for the output channel. It has a value of 0 when no errors have been detected. It has a value of 1 when bit 1 has a value of 1.

2 Bit 1 represents the status of PDM voltage on the island's actuator bus. It has a value of 0 when no PDM voltage errors are detected. It has a value of 1 if actuator power has been shorted. A PDM short turns on the GS bit (bit 0).

3 Bit 2 represents the presence or absence of an OCW. It has a value of 0 when the current is less than or equal to a numerical count of 32 000. It has a value of 1 when the current is greater than 32 000. An OCW in the STB ACO 1210 does not turn on the GS bit (bit 0).

4 Bit 3 represents the presence or absence of an OCE. It has a value of 0 when the current is less than a numerical count of 32 760 and a value of 1 when the current is set to 32 760. An OCE in the STB ACO 1210 does not turn on the GS bit (bit 0).

5 Bit 4 represents the presence or absence of an UCW. It has a value of 0 when the current is greater than or equal to a numerical count of 768 and a value of 1 when the current is less than 768. An OCE in the STB ACO 1210 does not turn on the GS bit (bit 0).

6 Bit 5 represents the presence or absence of an UCE. It has a value of 0 when the current is greater than 0 and a value of 1 when the current is 0. An OCE in the STB ACO 1210 does not turn on the GS bit (bit 0).

STB ACO 1210 Specifications

Table of Technical Specifications

description		two single-ended analog current output channels
analog current range		0 ... 20 mA
resolution		12 bits
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		80 mA
nominal actuator bus current consumption		50 mA, with no load
maximum output current		20 mA/channel
hot swapping supported		NIM-dependent*
reflex actions supported		two maximum**
settling time		900 µs to +/- 0.1% of the final value
output response time	nominal	3.0 ms plus settling time both channels
short-circuit protection on the outputs		yes
fault detection		none
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-actuator bus	500 VAC rms (when actuator bus is not used for field power
integral linearity		+/- 0.1% of full scale typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
external loop supply		19.2 ... 30 VDC (from the 24 VDC PDM)
fallback mode	default	predefined
	user-configurable setting**	hold last value
fallback states (when *predefined* is the fallback mode)	default	0 mA on both channels
	user-configurable settings**	integer values between 0 ... 32 000 on each channel, representing a state between 0 ... 20 mA

addressing requirement	two words for output data plus one for the *power-down state* configuration parameter
actuator bus power for accessories	100 mA/channel @ 30 degrees C
	50 mA/channel @ 60 degrees C
over-current protection for accessory power	yes
field power requirements	from a 24 VDC PDM
power protection	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.	
** Requires the Advantys configuration software.	

Note: The field actuators or inputs driven by these nonisolated output channels must be independent (isolated). Cross-channel errors can be generated if nonisolated inputs or actuators are used.

7.5 STB ACO 1225 Analog Current Output Module (two-channel, 10-bit, 4 ... 20 mA)

At a Glance

Overview

This section provides a detailed description of the STB ACO 1225 analog output module—its functions, physical design, technical specifications and field wiring requirements.

What's in this Section?

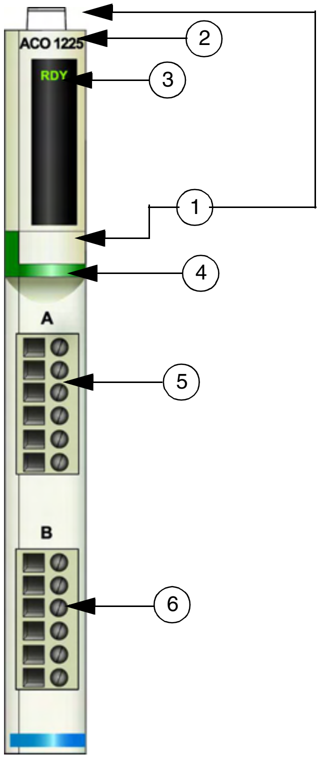
This section contains the following topics:

STB ACO 1225 Physical Description

Summary

The STB ACO 1225 is a basic Advantys STB two-channel analog current output module that writes outputs to analog actuators that operate over a range of 4 to 20 mA. The analog portion of the module is isolated from the island's actuator bus to improve performance. To take advantage of this internal isolation feature, power the actuators from an external power supply. If isolation is not required, you can use the module to deliver field power to the actuators—24 VDC for actuator 1 from the top connector, and 24 VDC for actuator 2 from the bottom connector.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark green identification stripe, indicating an analog output module
5 actuator 1 connects to the top field wiring connector
6 actuator 2 connects to the bottom field wiring connector

Module Accessories

Required

- an STB XBA 1000 (see *p. 808*) I/O base
- a pair of six-terminal field wiring connectors, either STB XTS 1100 screw type connectors or STB XTS 2100 spring clamp connectors

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module
- to meet CE compliance, use a grounding bar such as the one in the STB XSP 3000 EMC kit with you island installation

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	13.9 mm (0.58 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)

STB ACO 1225 LED Indicator

Purpose

The LED on the STB ACO 1225 provides a visual indication of the module's operating status.

Location

The LED is located on the top of the front bezel of the module, directly below the model number:

Indications

RDY	Meaning	What to Do
off	The module is either not receiving logic power or has failed.	Check power
flicker*	Auto-addressing is in progress.	
on	The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational	
blink 1**	The module is either in pre-operational mode or in its fallback state.	
*	flicker—the LED flickers when it is repeatedly on for 50 ms then off for 50 ms.	
**	blink 1—the LED blinks on for 200 ms then off for 200 ms. This pattern is repeated until the causal condition changes.	

STB ACO 1225 Field Wiring

Summary

The STB ACO 1225 module uses two six-terminal field wiring connectors. Analog actuator 1 is wired to the top connector, and the analog actuator 2 is wired to the bottom connector.

Connector Types

Use a set of either:

- two STB XTS 1100 *screw type* field wiring connectors (available in a kit of 20)
- two STB XTS 2100 *spring clamp* field wiring connectors (available in a kit of 20)

These field wiring connectors each have six connection terminals, with a 3.8 mm (0.15 in) pitch between each pin.

Field Actuators

The STB ACO 1225 module handles analog output data from two 4 to 20 mA single-ended analog field actuators. Data on each channel has a resolution of 10 bits. The module allows you to connect to two-, three- and four-wire devices that can draw current up to 100 mA/module.

If you want to maintain the module's built-in isolation between the analog portion of the module and the island's actuator bus, you can make only two-wire connections.

Field Wire Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.5 ... 1.5 mm^2 (24 ... 16 AWG).

Shielded twisted-pair wire is recommended. The shield should be tied to an external clamp that is tied to functional earth.

We recommend that you strip at least 9 mm from the wire's jacket for the module connection.

Field Wiring Pinout

The top connector supports analog actuator 1, and the bottom connector supports analog actuator 2. Four field wires may be used on each connector—on pins 1, 3, 4 and 6.

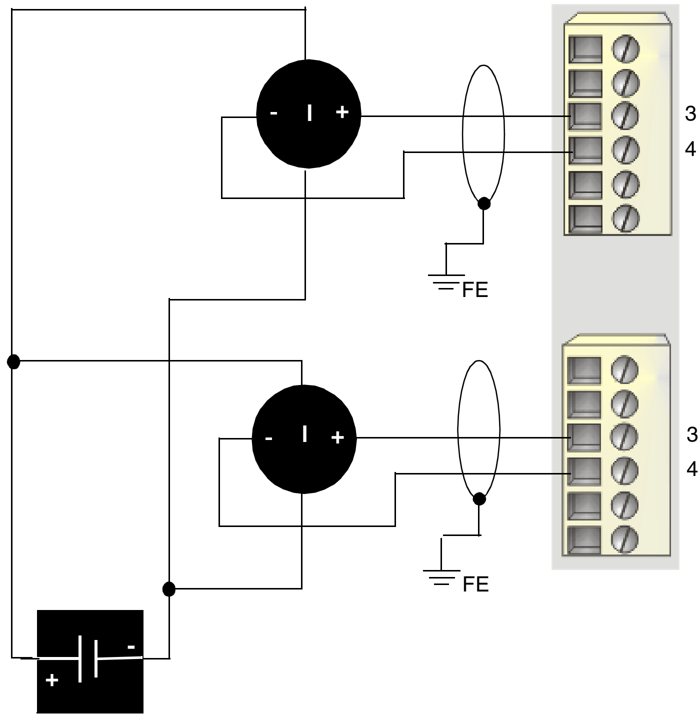
The connections on pin 1 and pin 6 are optional, and using them defeats the built-in isolation between the analog portion of the module and the island's sensor bus. No connections are made on pins 2 and 5 of either connector:

Pin	Top Connections	Bottom Connections
1	+24 VDC from actuator bus for field device accessories	+24 VDC from actuator bus for field device accessories
2	no connection	no connection
3	output to actuator 1	output to actuator 2
4	output channel return	output channel return
5	no connection	no connection
6	field power return (to the module)	field power return (to the module)

The analog returns (pin 4) for each channel are internally connected—therefore there is no channel-to-channel isolation.

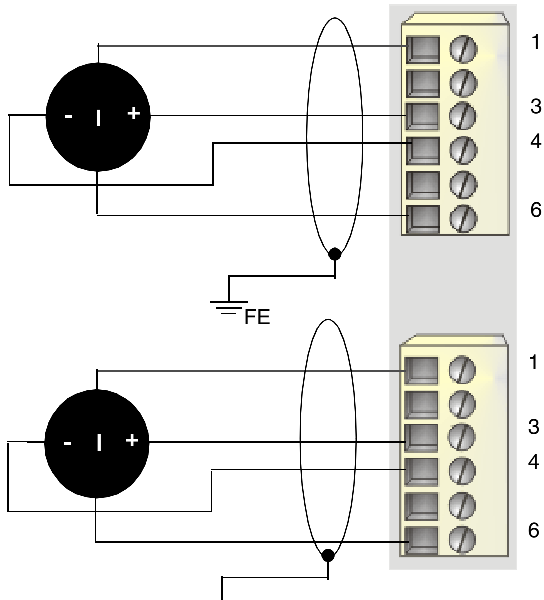
Sample Wiring Diagrams

The following field wiring example shows how two isolated single-ended analog actuators can be wired to the STB ACO 1225 module. An external power supply is required to power the actuators:



3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 field power returns from actuator 1 (top) and actuator 2 (bottom)

If you want to use 24 VDC from the island's actuator bus to power the single-ended analog field devices, this power can be delivered through the output module. To do this, use pins 1 and 6 as follows:



1 +24 VDC for actuator 1 (top) and for actuator 2 (bottom)
3 outputs to actuator 1 (top) and actuator 2 (bottom)
4 returns from actuator 1 (top) and actuator 2 (bottom)
6 field power return from actuator 1 (top) and actuator 2 (bottom)

Remember that using pins 1 and 6 defeats the built-in isolation between the analog portion of the module and the island's actuator bus.

STB ACO 1225 Functional Description

Functional Characteristics

The STB ACO 1225 module is a two-channel analog output module that sends data to two current field actuators. It does not support user-configurable operating parameters or reflex actions.

Operating Parameters

The current range of the module is 4 to 20 mA, with 10-bit resolution.

Note: At startup before the module becomes operational, the outputs are at 0 mA.

When communications are lost between the output module and the fieldbus master, the module's output channels go to a known state where they remain until communications are restored. This is known as the channel's *fallback state*. Both output channels go to a predefined fallback state of 4 mA.

STB ACO 1225 Data in the Process Image

Representing the Analog Output Data

The NIM keeps a record of output data in one block of registers in the process image. Information in the output data block is written to the NIM by the fieldbus master and is used to update the output modules. This information can be monitored by the fieldbus master. If you are not using a basic NIM, the information may also be monitored by an HMI panel connected to the NIM's CFG port.

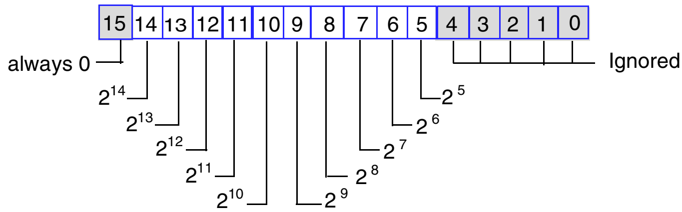
The output data process image is a reserved block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. An STB ACO 1225 is represented by two contiguous registers in the output data block. The specific registers used by an STB ACO 1225 module are based on its physical location on the island bus.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

Output Data Registers

Each STB ACO 1225 output data register represents the output data in the IEC data format. The data has 10-bit resolution:

STB ACO 1225 Data Register Format

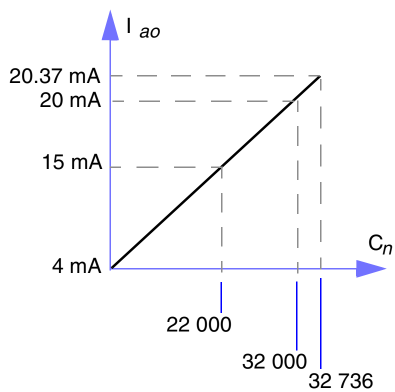


The value of each data word is represented in bits 14 through 5. The bits represent current data as integer values in the range 0 to 32,736 in increments of 32. A value 32 000 results in a 20 mA output, and a value of 0 results in a 4 mA output.

Linear current representations can be interpreted using the formula:

$$C_n = (2000 \times I_{ao}) - 8000$$

where C*n* is the numerical count and I*ao* is the analog output current.



Values greater than 32 000 do not produce over-range indications.

STB ACO 1225 Specifications

Table of Technical Specifications

description		two single-ended nonisolated analog current output channels
analog current range		4 ... 20 mA
resolution		10 bits
returned data format		IEC
module width		13.9 mm (0.58 in)
I/O base		STB XBA 1000 (see *p. 808*)
nominal logic bus current consumption		80 mA
nominal field power bus current consumption		50 mA, with no load
maximum output current		20 mA/channel
hot swapping supported		NIM-dependent*
reflex actions supported		no
settling time		900 µs to +/- 0.1% of the final value
output response time	nominal	3.0 ms plus settling time both channels
short-circuit protection on the outputs		yes
fault detection		none
isolation	field-to-bus	1500 VDC for 1 min
	analog module-to-actuator bus	500 VAC rms (when actuator bus is not used for field power
integral linearity		+/- 0.1% of full scale typical
differential linearity		monotonic
absolute accuracy		+/- 0.5% of full scale @ 25°C
temperature drift		typically +/- 0.01% of full scale/ °C
external loop supply		19.2 ... 30 VDC (from the 24 VDC PDM)
fallback mode		predefined
fallback states		4 mA on both channels
addressing requirement		two words for output data
actuator bus power for accessories		100 mA/module

over-current protection for accessory power	yes
field power requirements	from a 24 VDC PDM
power protection	time-lag fuse on the PDM
* Basic NIMs do not allow you to hot swap I/O modules.	

Note: The field actuators or inputs driven by these nonisolated output channels must be independent (isolated). Cross-channel errors can be generated if nonisolated inputs or actuators are used.

The Advantys STB Special Modules

8

At a Glance

Overview

This chapter describes in detail the features of the special modules in the Advantys STB family.

What's in this Chapter?

This chapter contains the following sections:

8.1 STB EPI 1145 Tego Power Parallel Interface (16 in/8 out)

At a Glance

Overview

This section provides you with a detailed description of the Advantys STB EPI 1145 interface to Tego Power motor drives. The module's functions, physical design, technical specifications, field wiring requirements, and configuration options are described.

What's in this Section?

This section contains the following topics:

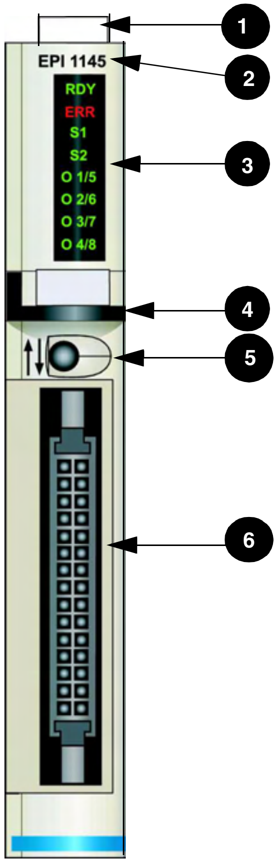
STB EPI 1145 Physical Description

Physical Characteristics

The STB EPI 1145 is a special-purpose Advantys STB module that functions as the parallel interface between an island of Advantys distributed I/O and a Tego Power application. This high-density module features eight outputs and sixteen inputs, and is able to remotely control up to eight Tego Power motor starters, or four reversible motor starters.

The STB EPI 1145 fits into a size 2 I/O base. It is equipped with an HE10 30-pin connector, and links to the Tego Power system through an STB XCA 3002 or STB XCA 3003 cable.

Front Panel View



1 location for the STB XMP 6700 user-customizable label
2 model reference number
3 LED array denoting various states of the motor starters
4 black identification stripe, indicating a special module
5 SHIFT button, indicated by a pair of Up/Down arrows. This button shifts the display of LEDs between outputs 1-4 and outputs 5-8.
6 HE10 30-pin connector used to link the STB EPI 1145 to a Tego Power system, using one of the STB XCA 3002/3003 dedicated cables

Module Accessories

Required

- an STB XBA 2000 I/O base (see *p. 812*)
- either an STB XCA 3002 or an STB XCA 3003 cable (1 and 2 m, respectively)

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For detail, refer to the *Advantys Planning and Installation Guide* (890 USE 171).

Tego Power itself requires separate components, such as the APP 2R2E or APP 2R4E splitters, and a 24 VDC power supply. For information on Tego Power components, refer to the *Motor Starters, Control Components and Power Protection* section of the Schneider Electric catalog.

Dimensions

width	**module on a base**	**18.4 mm (0.72 in)**
height	module only	120 mm (4.74 in)
	on a base	125 mm (4.92 in)
depth	module only	70 mm (2.76 in)
	on a base, with connectors	102.7 mm (4.04 in)

STB EPI 1145 LED Indicators

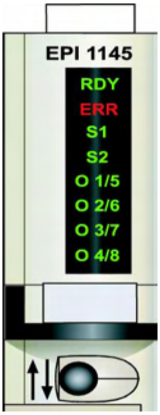
Overview

The eight LEDs on the STB EPI 1145 module are visual indicators of the operating status of the module and of its outputs (in this case, motor starters). The top two LEDs indicate the operating status of the module. The remaining six LEDs indicate the status of the outputs. The LEDs do not indicate the status of the module's inputs.

The module makes use of a special SHIFT button in conjunction with the LEDs to allow the display of all eight outputs.

Location

The eight LEDs are positioned in a column in the upper section of the bezel, along its right edge. The figure below shows their location.



The following table provides the color and legend for each LED, as well as a brief indication to their meaning.

LED	color	meaning
RDY	green	module is ready to operate on the island bus
ERR	red	an error condition has been detected
S1	green	on = status for first series of outputs (1 to 4) displayed
S2	green	on = status for second series of outputs (5 to 8) displayed
O 1/5	green	output 1 status when S1 is on; output 5 status when S2 is on
O 2/6	green	output 2 status when S1 is on; output 6 status when S2 is on
O 3/7	green	output 3 status when S1 is on; output 7 status when S2 is on
O 4/8	green	output 4 status when S1 is on; output 8 status when S2 is on

Using the SHIFT Button with the LEDs

After module initialization, the SHIFT button controls the display of the mutually exclusive S1 and S2 LEDs. At power up, the default is always S1 on and S2 off, where:

- the O 1/5 LED indicates the status of output 1
- the O 2/6 LED indicates the status of output 2
- the O 3/7 LED indicates the status of output 3
- the O 4/8 LED indicates the status of output 4

If you push the SHIFT button, S1 turns off and S2 turns on. When S2 is on:

- the O 1/5 LED indicates the status of output 5
- the O 2/6 LED indicates the status of output 6
- the O 3/7 LED indicates the status of output 7
- the O 4/8 LED indicates the status of output 8

The status of an output is either active (24 V present), in which case the corresponding LED is on, or inactive (0 V present), in which case the corresponding LED is off.

RDY and ERR Indications

The two top LEDs reflect the module's status on the network:

LED		Meaning	What to Do
RDY	**ERR**		
off	off	Either the module is not receiving logic power or it has failed.	Check power.
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: ● it has power ● it has passed the confidence tests ● it is operational	Check LEDs 3 to 8 for specific output status.
on	on	The watchdog has timed out.	Cycle power, restart communications.
blink 1**		The module is in pre-operational mode or in its fallback state.	
	flicker*	Field power absent or a short circuit detected at the actuator.	Check power.
	blink 1**	A nonfatal field error has been detected.	Cycle power, restart communications.
	blink 2***	The island bus is not running.	Check network connections, replace NIM.
* flicker—-the LED flickers when it is repeatedly on for 50 ms, then off for 50 ms.			
** blink 1—-the LED blinks on for 200 ms, then off for 200 ms. This pattern is repeated until the causal condition changes.			
*** blink 2—-the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms, then off for 1 s. This pattern is repeated until the causal condition changes.			

STB EPI 1145 Field Wiring

Summary

The STB EPI 1145 module uses a single HE10 30-pin connector to link to your Tego Power application.

The STB EPI 1145 parallel interface module is designed to work exclusively with Tego Power motor starter applications.

Connector and Cables

Use one of the Advantys Tego Power cables to connect an STB EPI 1145 module to your Tego Power system. Two cables are available:

- STB XCA 3002 1 m cable
- STB XCA 3003 2 m cable

These are the only cables recommended and approved by Schneider Electric for this module.

Both available cables have a 30-pin HE10 connector on each end. One connector plugs into the field wiring connector on the STB EPI 1145 module, and the other fits into the 30-pin receptacle on the left side of the splitter, on top of the Tego Power system. Both connections have the same pinout.

The following table provides the pinout for each connection:

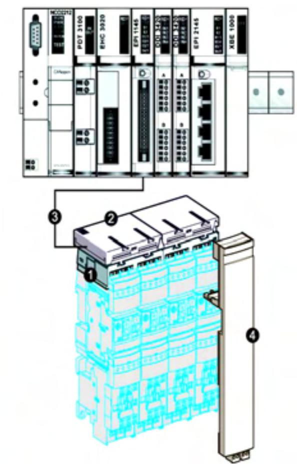
Pin	Function	Pin	Function
1	**IN 1 breaker**	**2**	**IN 2 breaker**
3	**IN 3 breaker**	**4**	**IN 4 breaker**
5	**IN 5 breaker**	**6**	**IN 6 breaker**
7	**IN 7 breaker**	**8**	**IN 8 breaker**
9	**IN 9 contactor**	**10**	**IN 10 contactor**
11	**IN 11 contactor**	**12**	**IN 12 contactor**
13	**IN 13 contactor**	**14**	**IN 14 contactor**
15	**IN 15 contactor**	**16**	**IN 16 contactor**
17	**OUT 1 command contactor**	**18**	**OUT 2 command contactor**
19	**OUT 3 command contactor**	**20**	**OUT 4 command contactor**
21	**OUT 5 command contactor**	**22**	**OUT 6 command contactor**
23	**OUT 7 command contactor**	**24**	**OUT 8 command contactor**
25	+24 V IN	26	0 V IN
27	+24 V OUT	28	0 V OUT
29	+24 V OUT	30	0 V OUT

The Tego Power System

Tego Power is a modular busbar system used to install Tego Power motor starters with power ratings of up to 15 kW/400 V, by letting you pre-wire the logic and power circuits.

For more information on Tego Power applications, contact your Telemecanique representative.

The figure below shows a sample Tego Power application, connected to the Advantys STB EPI 1145 parallel interface module:



1 (Tego Power) power distribution box
2 control distribution box
3 connecting cable
4 connection control module

STB EPI 1145 Functional Description

Functional Characteristics

The STB EPI 1145 module is a special-purpose 8 outputs, 16 inputs module designed to connect to Tego Power, a modular system for the installation of up to eight Tego Power motor starters (or four reversible motor starters). Using the Advantys configuration software, you can customize the following operating parameters:

- the module's responses to fault recovery
- *logic normal* or *logic reverse* input and output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect a short circuit on the actuator bus or an overcurrent fault on an output channel when the channel is turned on. If a fault is detected on any channel, the module will do one of the following:

- automatically latch off that channel, or
- automatically recover and resume operation on the channel when the fault is eliminated

The factory default setting is *latched off*, where the module turns off the output channel when a short circuit or overcurrent condition is detected on that channel. The channel will remain off until you reset it explicitly.

If you want to set the module to *auto-recover* when the fault is corrected, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB EPI 1145 module you want to configure in the island editor.	The selected STB EPI 1145 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu—**Latched Off** and **Auto Recovery**.

Resetting a Latched Off Output

If an output channel has been latched off because of fault detection, it will not recover until two events take place:

- the error has been corrected
- you explicitly reset the channel

To reset a latched off output channel, you must send it a value of 0. The 0 value resets the channel to a standard off condition and restores its ability to respond to control logic (turn on and off). You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel that previously turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. No user intervention is required to reset the channel. If the fault was transient, the channel may reactivate without leaving any history of the short circuit having occurred.

Input Polarity

By default, the polarity on all 16 input channels is *logic normal*, where:

- an input value of 0 indicates that the physical sensor is off (or the input signal is low)
- an input value of 1 indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an input value of 1 indicates that the physical sensor is off (or the input signal is low)
- an input value of 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from *logic normal*, or back to normal from *logic reverse*, you need to use the Advantys configuration software.

You may configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB EPI 1145 module you want to configure in the island editor.	The selected STB EPI 1145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Input Polarity Settings** fields by clicking on the + sign.	A top level row appears. It leads to two groups: **+ Input Polarity (First 8 channels**, containing circuit-breaker information for input channels 1 through 8, and **+ Input Polarity (Last 8 channels)**, providing contactor information for channels 9 through 16.
4	Expand either of the **+ Input Polarity** fields by clicking on the + sign.	For instance, if you click on **First 8 channels**, the corresponding rows for input channels 1 through 8 appear.

Step	Action	Result
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row. Enter a decimal integer in the range 0 to 255, or 0 to 0xFF in hexadecimal notation, where 0 means all inputs have *normal* polarity and 0xFF means that the first eight input channels have *reverse* polarity.	When you select the **Input Polarity** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 0x2F, channels 5, 7 & 8 will have *normal* polarity, while other input channels will have *reverse* polarity.
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 2 and 3 to *Reverse* and leave the other channels on *Normal*, the **Input Polarity** value changes to 0x06.

Output Polarity

By default, the polarity on all eight output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from *logic normal*, or back to normal from *logic reverse*, use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB EPI 1145 module you want to configure in the island editor.	The selected STB EPI 1145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Output Polarity Settings** fields by clicking on the + sign.	A single row appear for all output channels.
4	Expand either of the **+ Output Polarity** fields by clicking on the + sign.	Rows for output channels 1 through 8 appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row. Enter a decimal integer in the range 0 to 255, or 0 to 0xFF in hexadecimal notation, where 0 means all outputs have *normal* polarity and 0xFF means that all eight output channels have *reverse* polarity.	When you select the **Output Polarity** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 0x2F, channels 5, 7 & 8 will have *normal* polarity, while other output channels will have *reverse* polarity.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channels 2 and 3 to *Reverse* and leave the other channels on *Normal*, the **Output Polarity** value changes to 0x06.

Fallback Modes

When communication is lost between the module and the fieldbus master, the module's outputs must go to a known state where they remain until communications are restored. This is known as the output's *fallback state*. You may configure fallback values for each output individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each output
- then (if necessary) by configuring the fallback states

When an output has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When an output has *hold last value* as its fallback mode, it stays at its last known state when communication is lost—it cannot be configured with a predefined fallback state.

By default, the fallback mode for all outputs is a *predefined state*. To change the fallback mode to *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB EPI 1145 module you want to configure in the island editor.	The selected STB EPI 1145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** box at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Fallback Mode Settings** fields by clicking on the + sign.	A single row called **+ Fallback Mode (Output)** appears.
4	Expand the **+ Fallback Mode (Output)** row further by clicking on the + sign.	Rows for output channels 1 through 8 appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode (Output)** row. Enter a hexadecimal or decimal value in the range 0 to 255, where 0 means all outputs hold their last values, and 255 means that all outputs go to a predefined state.	When you select the **Fallback Mode** value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode (Output)**, the values associated with the channels change. For example, if you choose an fallback mode value of 2, then channel 2 goes to *predefined state* and all other channels go to *hold last value*.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode (Output)** row changes. For example, if you set channel 2 to *predefined state* and all other channels to *hold last value*, the **Fallback Mode** value changes to 2.

Note: In the event of a module hardware failure, all output channels turn off.

Fallback States

If a module's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, all channels are configured to go to 0 as their fallback state:

- 0 indicates that the predefined fallback state of the module is *de-energized*
- 1 indicates that the predefined fallback state of the module is *energized*

Note: If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a *predefined fallback value* will be ignored.

To modify a fallback state from *hold last value* (default), or to revert back to the default from the ON setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** for the STB EPI 1145 module you want to configure is 1 (*predefined state*).	If the Fallback Mode value is 0 (*hold last value*), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or clearing the **Hexadecimal** box at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Click on the + sign to expand the **+ Predefined Fallback Value Settings** fields.	A row called **+ Predefined Fallback Value** appears.
4	Expand the **+ Predefined Fallback Value** row further by clicking on the + sign.	Rows for output **Channels 1 to 8** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row. Enter a hexadecimal or decimal value in the range 0 to 255 (0 to 0xFF), where 0 means all outputs have 0 as their predefined fallback value, and 255 means that all outputs adopt 1 as their predefined fallback value.	When you select the value associated with **+ Predefined Fallback Value**, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose an fallback state value of 2, then **Channel 2** adopts 1 as its predefined fallback value, while all other channels will have 0 as their predefined fallback value.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. You may configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes. For example, if you set **Channel 2** to 1 and all other channels to 0, the **Predefined Fallback Value** changes to 2.

STB EPI 1145 Data for the Process Image

Representing I/O Data and Status

The NIM keeps a record of output data in one block of registers in the process image, and a record of input data and status in another block of registers in the process image. Output data is written to the output data block by the fieldbus master, and is used to update the outputs.

The information in the input and status block is provided by the module itself. This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG (configuration) port. The specific registers used by the STB EPI 1145 module are based on its physical location on the island bus.

Note: The data format illustrated in this section is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master, in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. A separate guide is available for each supported fieldbus.

Input Data Image

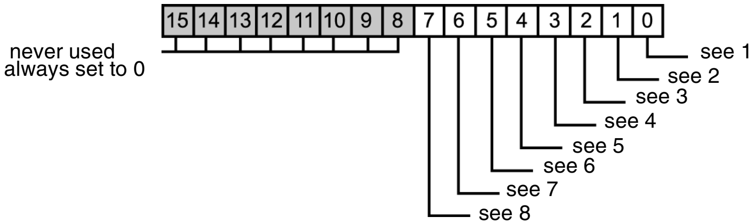
The input data image is part of a block of 4096 16-bit registers (in the range 45392 through 49487) that represents the data returned to the fieldbus master. In this block, six contiguous registers represent the input data for the STB EPI 1145 module.

These registers are discussed individually below. If specific bit values (0 or 1) are provided in the following discussion, it is understood that polarity is *logic normal* for all channels, i.e. that polarity has not been explicitly reconfigured to *logic reverse*.

- Register 1: reads motor starter circuit breaker information
- Register 2: provides motor starter circuit breaker status
- Register 3: reads motor starter contactor information
- Register 4: provides motor starter contactor status
- Register 5: echo output data
- Register 6: provides status of outputs

Register 1: Circuit Breaker Information from Motor Starters

The first input/status register provides circuit breaker information from the various motor starters.



1 bit 0 indicates the status of channel 1 (the circuit breaker for motor starter 1), where 0 = tripped and 1 = on

2 bit 1 indicates the status of channel 2 (the circuit breaker for motor starter 2), where 0 = tripped and 1 = on

3 bit 2 indicates the status of channel 3 (the circuit breaker for motor starter 3), where 0 = tripped and 1 = on

4 bit 3 indicates the status of channel 4 (the circuit breaker for motor starter 4), where 0 = tripped and 1 = on

5 bit 4 indicates the status of channel 5 (the circuit breaker for motor starter 5), where 0 = tripped and 1 = on

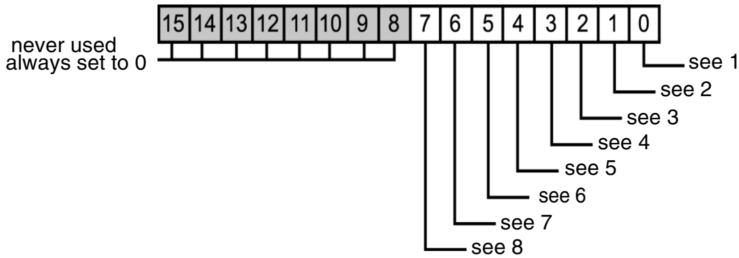
6 bit 5 indicates the status of channel 6 (the circuit breaker for motor starter 6), where 0 = tripped and 1 = on

7 bit 6 indicates the status of channel 7 (the circuit breaker for motor starter 7), where 0 = tripped and 1 = on

8 bit 7 indicates the status of channel 8 (the circuit breaker for motor starter 8), where 0 = tripped and 1 = on

Register 2: Circuit Breaker Status from Motor Starters

The second input/status register denotes the status of each input in Register 1. If any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one the following causes: field power missing, short circuit on the field power.



1 bit 0 denotes the status of channel 1 (motor starter 1 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

2 bit 1 denotes the status of channel 2 (motor starter 2 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

3 bit 2 denotes the status of channel 3 (motor starter 3 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

4 bit 3 denotes the status of channel 4 (motor starter 4 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

5 bit 4 denotes the status of channel 5 (motor starter 5 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

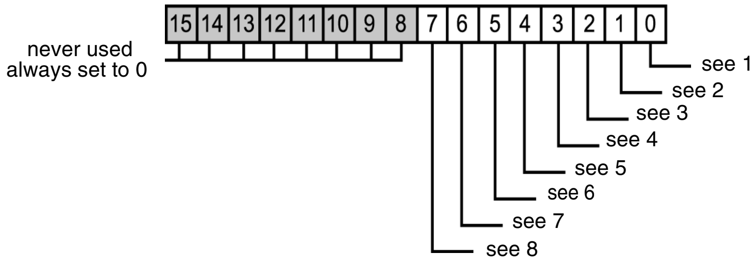
6 bit 5 denotes the status of channel 6 (motor starter 6 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

7 bit 6 denotes the status of channel 7 (motor starter 7 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

8 bit 7 denotes the status of channel 8 (motor starter 8 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

Register 3: Contactor Information from Motor Starters

The third input/status register provides contactor information from the various motor starters.



1 bit 0 indicates whether channel 1 (motor starter 1 contactor) is energized, where 1 = energized and 0 = de-energized

2 bit 1 indicates whether channel 2 (motor starter 2 contactor) is energized, where 1 = energized and 0 = de-energized

3 bit 2 indicates whether channel 3 (motor starter 3 contactor) is energized, where 1 = energized and 0 = de-energized

4 bit 3 indicates whether channel 4 (motor starter 4 contactor) is energized, where 1 = energized and 0 = de-energized

5 bit 4 indicates whether channel 5 (motor starter 5 contactor) is energized, where 1 = energized and 0 = de-energized

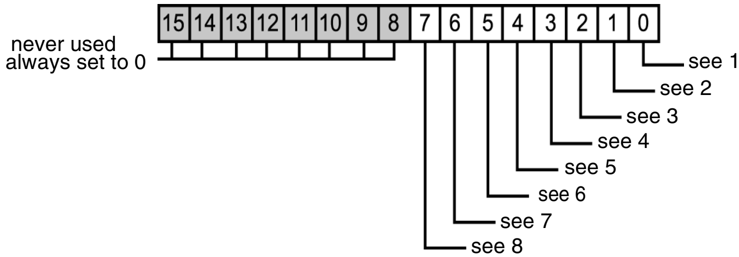
6 bit 5 indicates whether channel 6 (motor starter 6 contactor) is energized, where 1 = energized and 0 = de-energized

7 bit 6 indicates whether channel 7 (motor starter 7 contactor) is energized, where 1 = energized and 0 = de-energized

4 bit 7 indicates whether channel 8 (motor starter 8 contactor) is energized, where 1 = energized and 0 = de-energized

Register 4: Status of Contactor Inputs

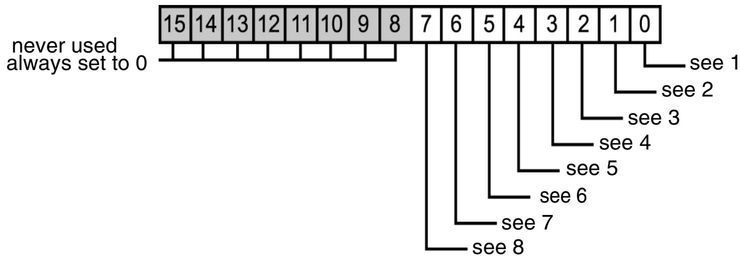
The fourth input/status register denotes the status of each input in Register 3. If any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one of the following causes: field power missing, or short circuit on the field power.



1 bit 0 denotes the status of channel 1 (motor starter 1 contactor); bit = 0: no fault detected; bit = 1: fault detected
2 bit 1 denotes the status of channel 2 (motor starter 2 contactor); bit = 0: no fault detected; bit = 1: fault detected
3 bit 2 denotes the status of channel 3 (motor starter 3 contactor); bit = 0: no fault detected; bit = 1: fault detected
4 bit 3 denotes the status of channel 4 (motor starter 4 contactor); bit = 0: no fault detected; bit = 1: fault detected
5 bit 4 denotes the status of channel 5 (motor starter 5 contactor); bit = 0: no fault detected; bit = 1: fault detected
6 bit 5 denotes the status of channel 6 (motor starter 6 contactor); bit = 0: no fault detected; bit = 1: fault detected
7 bit 6 denotes the status of channel 7 (motor starter 7 contactor); bit = 0: no fault detected; bit = 1: fault detected
8 bit 7 denotes the status of channel 8 (motor starter 8 contactor); bit = 0: no fault detected; bit = 1: fault detected

Register 5: Echo Output Data

The fifth register in the I/O status block is the module's echo output data register. This register represents the data that has just been sent to the motor starters by the STB EPI 1145 module.

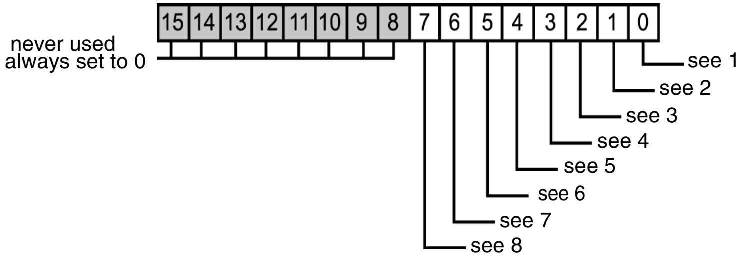


1 bit 0 indicates the state of output 1 (motor starter 1)
2 bit 1 indicates the state of output 2 (motor starter 2)
3 bit 2 indicates the state of output 3 (motor starter 3)
4 bit 3 indicates the state of output 4 (motor starter 4)
5 bit 4 indicates the state of output 5 (motor starter 5)
6 bit 5 indicates the state of output 6 (motor starter 6)
7 bit 6 indicates the state of output 7 (motor starter 7)
8 bit 7 indicates the state of output 8 (motor starter 8)

Under most normal operating conditions, the bit values should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the EPI 1145 module, instead of by the fieldbus master.

Register 6: Status of Outputs

The sixth input/status register is the STB EPI 1145's output status register. If any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one of the following causes: field power missing, short circuit on the field power, or output overload.

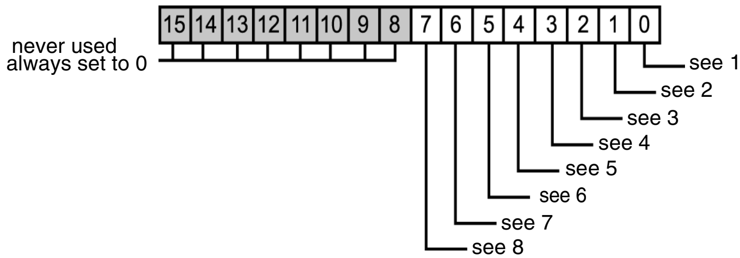


1 bit 0 denotes the status of output 1 (motor starter 1); bit = 0: no fault detected; bit = 1: fault detected
2 bit 1 denotes the status of output 2 (motor starter 2); bit = 0: no fault detected; bit = 1: fault detected
3 bit 2 denotes the status of output 3 (motor starter 3); bit = 0: no fault detected; bit = 1: fault detected
4 bit 3 denotes the status of output 4 (motor starter 4); bit = 0: no fault detected; bit = 1: fault detected
5 bit 4 denotes the status of output 5 (motor starter 5); bit = 0: no fault detected; bit = 1: fault detected
6 bit 5 denotes the status of output 6 (motor starter 6); bit = 0: no fault detected; bit = 1: fault detected
7 bit 6 denotes the status of output 7 (motor starter 7); bit = 0: no fault detected; bit = 1: fault detected
8 bit 7 denotes the status of output 8 (motor starter 8); bit = 0: no fault detected; bit = 1: fault detected

Output Data and Status

The output data process image is part of a block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. The STB EPI 1145 uses one register in the output data block to control the on/off states of the module's eight outputs.

The figure below represents the output data register. The fieldbus master writes these values to the island bus:



1 bit 0 indicates the state of output 1 (motor starter 1)
2 bit 1 indicates the state of output 2 (motor starter 2)
3 bit 2 indicates the state of output 3 (motor starter 3)
4 bit 3 indicates the state of output 4 (motor starter 4)
5 bit 4 indicates the state of output 5 (motor starter 5)
6 bit 5 indicates the state of output 6 (motor starter 6)
7 bit 6 indicates the state of output 7 (motor starter 7)
8 bit 7 indicates the state of output 8 (motor starter 8)

STB EPI 1145 Specifications

Table of Technical Specifications

The STB EPI 1145 module's technical specifications are described in the following table.

description		Tego Power 16 inputs/8 outputs parallel interface (100 mA, HE10 connector)
number of input channels		16
number of output channels		8
module width		18.4 mm (0.72 in)
I/O base		STB XBA 2000 (see *p. 808*)
hot swapping supported		yes
reflex actions supported	input channels	for reflex inputs only
	output channels	maximum of two
nominal logic bus current consumption		110 mA
nominal actuator bus current consumption		150 mA
input protection		resistor-limited
isolation voltage	bus-to-field	1500 V DC
	actuator to sensor bus	500 V DC
reverse polarity protection from miswired PDM		the module is internally protected from damage
input response time	on to off	2 ms max.
	off to on	2 ms max.
absolute maximum load current	each channel	0.1 A resistive load
	per module	0.850 mA
short circuit protection		per channel
short circuit protection on actuator bus		5 A fuse inside the module, not field replaceable
short circuit protection on sensor bus		1 A fuse internal to module, not field-replaceable
short circuit feedback (diagnostics)		per channel
PDM power available (diagnostics)		fuse on PDM module
overheating protection		yes, by built-in thermal shut-down
fault status if overheating		yes

fallback mode	default	predefined fallback values on all channels
	user-configurable settings*	hold last value
		predefined fallback value on one or more channels
fallback states (when *predefined* is the fallback mode)	default	all channels go to 0
	user-configurable settings*	each channel configurable for 1 or 0
polarity on individual outputs and inputs	default	*logic normal* on all channels
	user-configurable settings*	*logic reverse* on one or more channels
		logic normal on one or more channels
* Requires the Advantys configuration software.		

8.2 STB EPI 2145 Parallel Interface for TeSys Model U Starter Applications (12 in/8 out prewiring module)

At a Glance

Overview

This section provides you with a detailed description of the Advantys EPI 2145 parallel interface module for TeSys model U controller starter applications—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

This section contains the following topics:

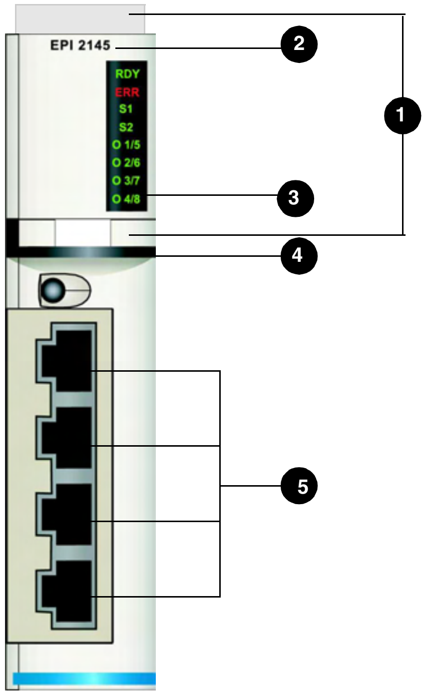
STB EPI 2145 Physical Description

Physical Characteristics

The STB EPI 2145 is a special-purpose Advantys STB module that functions as the parallel interface between an island of Advantys STB I/O and a TeSys model U application. This motor-starter interface includes eight outputs and twelve inputs, and is able to remotely connect to four direct or reversible TeSys model U controller-starters.

The STB EPI 2145 fits into a size 3 I/O base. It is equipped with four RJ45 connectors, and links to the TeSys model U system using dedicated cables with RJ45 connectors at both ends. Each of the STB EPI 2145's four channels features two outputs (starter control and reverse direction control), and three inputs (circuit breaker status, contactor status, and fault status).

Front Panel View



1 location for the STB XMP 6700 user-customizable label
2 model reference number
3 LED array denoting various states of the module's outputs
4 black identification stripe, indicating a special module
5 four RJ45 connectors used to link the STB EPI 2145 to the control unit (LUC B/D/C/MxxBL) for a TeSys model U system, using one of three cables with an RJ45 connector at both ends (LU9 R03, LU9 R10, and LU9 R30). The STB EPI 2145 is provided with four caps (J1 ... J4, not shown) for the RJ45 connector receptacles.

Note: The STB EPI 2145 has four plastic caps (not mounted on bezel, and not shown above). These caps are designed to keep foreign solids from penetrating unused RJ45 receptacles during normal operation of the module.

Module Accessories

Required

- an STB XBA 3000 I/O base (see *p. 817*)
- a dedicated LU9 R03 (0.3 m), LU9 R10 (1 m) or LU9 R30 (3 m) cable with RJ45 connectors at both ends

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base

For detail, refer to the *Advantys Planning and Installation Guide* (890 USE 171).

For further information on TeSys model U components, refer to the *Starters and Basic TeSys model U Equipment* section of the Schneider Electric catalog.

Dimensions

width	**module on a base**	**28.1 mm (1.12 in)**
height	module only	120 mm (4.74 in)
	on a base	125 mm (4.92 in)
depth	module only	70 mm (2.76 in)
	on a base, with connectors	102.7 mm (4.04 in)

STB EPI 2145 LED Indicators

Overview

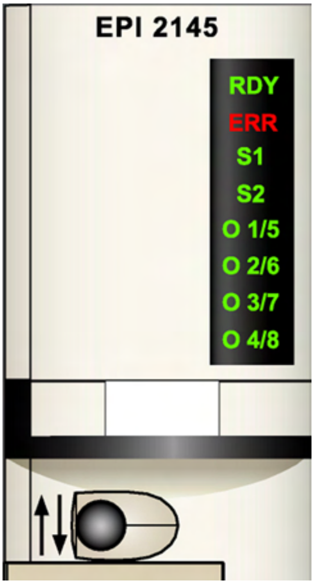
The eight LEDs on the STB EPI 2145 module are visual indicators of the operating status of the module and of its outputs (in this case, controller-starters). The top two LEDs indicate the operating status of the module. The remaining six LEDs indicate the status of the outputs. The LEDs do not indicate the status of the module's inputs.

The module makes use of a special SHIFT button in conjunction with the LEDs to allow all eight outputs to be displayed.

Location

The eight LEDs are positioned in a column in the upper section of the bezel, along its right edge. The figure below shows their location.

The SHIFT button, which is identified by a pair of vertical (up and down) arrows, is located below the LEDs.



The following table provides the color and legend for each LED, as well as a brief indication to their meaning.

LED	color	meaning
RDY	green	module is ready to operate on the island bus
ERR	red	an error condition has been detected
S1	green	on = status for first series of outputs (1 to 4) displayed
S2	green	on = status for second series of outputs (5 to 8) displayed
O 1/5	green	output 1 status when S1 is on; output 5 status when S2 is on
O 2/6	green	output 2 status when S1 is on; output 6 status when S2 is on
O 3/7	green	output 3 status when S1 is on; output 7 status when S2 is on
O 4/8	green	output 4 status when S1 is on; output 8 status when S2 is on

Using the SHIFT Button with the LEDs

After module initialization, the SHIFT button controls the display of the mutually exclusive S1 and S2 LEDs. The default at power up is always S1 on and S2 off, where:

- the O 1/5 LED indicates the status of output 1
- the O 2/6 LED indicates the status of output 2
- the O 3/7 LED indicates the status of output 3
- the O 4/8 LED indicates the status of output 4

If you push the SHIFT button, S1 turns off and S2 turns on. When S2 is on:

- the O 1/5 LED indicates the status of output 5
- the O 2/6 LED indicates the status of output 6
- the O 3/7 LED indicates the status of output 7
- the O 4/8 LED indicates the status of output 8

The status of a controller-starter is either active (24 V present), in which case the corresponding LED is on, or inactive (0 V present), in which case the corresponding LED is off.

RDY and ERR Indications

The two top LEDs reflect the module's status on the network:

LED		Meaning	What to Do
RDY	**ERR**		
off	off	Either the module is not receiving logic power or it has failed.	Check power.
flicker*	off	Auto-addressing is in progress.	
on	off	The module has achieved all of the following: • it has power • it has passed the confidence tests • it is operational	Check LEDs 3 to 8 for specific output status.
on	on	The watchdog has timed out.	Cycle power, restart communications.
blink 1**		The module is in pre-operational mode or in its fallback state.	
	flicker*	Field power absent or a short circuit detected at the actuator.	Check power.
	blink 1**	A nonfatal field error has been detected.	Cycle power, restart communications.
	blink 2***	The island bus is not running.	Check network connections, replace NIM.
* flicker—-the LED flickers when it is repeatedly on for 50 ms, then off for 50 ms.			
** blink 1—-the LED blinks on for 200 ms, then off for 200 ms. This pattern is repeated until the causal condition changes.			
*** blink 2—-the LED blinks on for 200 ms, off for 200 ms, on again for 200 ms, then off for 1 s. This pattern is repeated until the causal condition changes.			

STB EPI 2145 Field Wiring

Summary

The STB EPI 2145 module uses four RJ45 connectors allowing you to connect to up to four separate TeSys model U controller-starters. The choices of connector types and field wire types are described below.

The STB EPI 2145 parallel interface module is designed to work exclusively with TeSys model U controller-starter applications.

Connector and Cables

Use one of the TeSys model U cables to connect an STB EPI 2145 module to your TeSys model U system. Three cables are available:

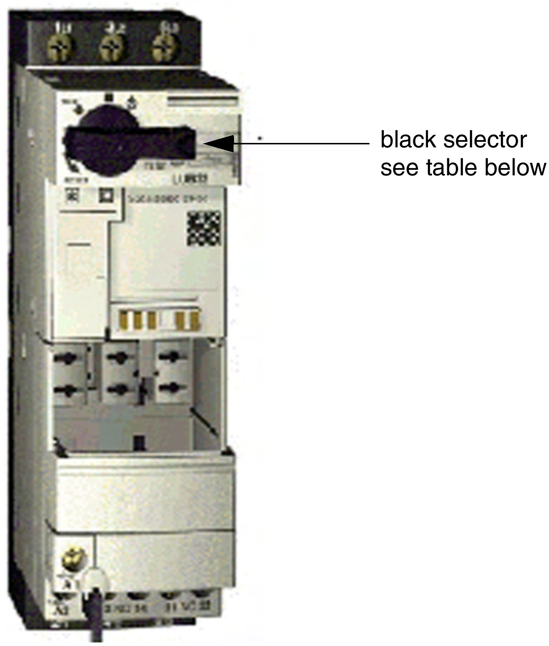
- a LU9 R03 0.3 m cable
- a LU9 R10 1 m cable
- a LU9 R30 3 m cable

All three cables feature an RJ45 connector on both ends. One connector plugs into the field wiring connector on the STB EPI 2145 module, and the other is directly connected to the RJ45 receptacle on the LUF C00 module (parallel link) included in the TeSys model U system. Both connections have the same pinout.

The TeSys model U System

TeSys model U is an integrated, modular power management system for motor starters. The complete TeSys model U parallel wiring system consists of a power base, a contactor, a thermal overload protection device, and a control unit for controller-starters, providing motor starter overload protection and control functions.

The figure below indicates the selector positions on theTeSys model U power base.



The following legend briefly explains each selector position.

selector	black selector in vertical position, puts controller-starter in READY state, so that it is able to respond to inputs (commands are parsed)
TRIP	corresponds to the fault state (a fault has been detected; commands are no longer parsed)
OFF	the TeSys model U application is not running (commands are presently not parsed)
RESET	resets the error status; necessary step prior to returning to READY position

For more information on TeSys model U applications, contact your Telemecanique representative.

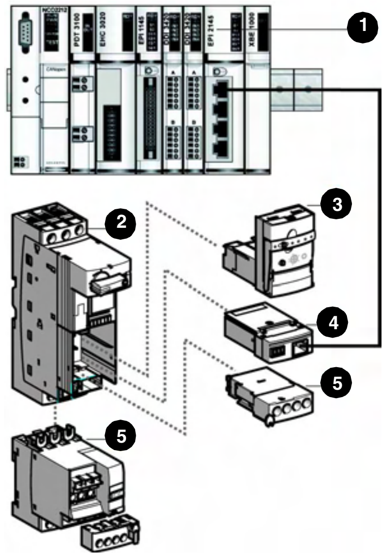
STB EPI 2145 Pinout

The Advantys STB EPI 2145 module connects to the parallel wiring module included in the TeSys model U solution. This parallel wiring module provides the status and command information for each controller-starter. It must be used with an LUCx xxBL control unit.

The following table provides the pinout for the Advantys STB EPI 2145 module. It applies to each individual contactor.

Pin	Signal Name	Signal Type	Description
1	Out1	output	this 24 V output drives the direct (forward) command of the motor
2	Out2	output	this 24 V output drives the reverse (backward) command of the motor
3	0 V out	output common	common for the 2 outputs above (pins 1 & 2)
4	READY	input	this input is active if the selector is in the ON position
5	contactor status	input	this input denotes the status of the contactor
6	unused		
7	TRIP	input	this input is active if the selector is in the TRIP position (i.e. a fault has been detected on the TeSys model U motor starter)
8	24 V in	input common	common for the above inputs (pins 4, 5 & 7)

The following illustration shows a sample connection between the Advantys STB EPI 2145 and a TeSys model U motor starter application.



1 Advantys STB EPI2145 module
2 TeSys model U power base
3 24 V control unit (LUC B/D/C/MxxL) for 0.09 to 15 kW motors
4 parallel link communication module (LUF C00)
5 options (additional contacts, inverter blocks)

STB EPI 2145 Functional Description

Functional Characteristics

The STB EPI 2145 module is a special-purpose 8 outputs, 12 inputs module that handles digital input data from the actuator bus, sends digital output data to the control unit of the TeSys model U system, and handles status information from the outputs. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's responses to fault recovery
- *logic normal* or *logic reverse* input and output polarity for each channel on the module
- a fallback state for each channel on the module

Fault Recovery Responses

The module can detect a short circuit on the actuator bus or an overcurrent fault on an output channel when the channel is turned on. If a fault detected on any channel, the module will do one of the following:

- automatically latch off that channel, or
- automatically recover and resume operation on the channel when the fault is eliminated

The factory default setting is *latched off*, where the module turns off the output channel when a short circuit or overcurrent condition is detected on that channel. The channel will remain off until you reset it explicitly.

If you want to set the module to *auto-recover* when the fault is corrected, use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB EPI 2145 module you want to configure in the island editor.	The selected STB EPI 2145 module opens in the software module editor.
2	From the pull-down menu in the **Value** column of the **Fault Recovery Response** row, select the desired response mode.	Two choices appear in the pull-down menu: **Latched Off** and **Auto Recovery**.

Resetting a Latched Off Output

When an output channel has been latched off because of fault detection, it will not recover until two events take place:

- the error has been corrected
- you explicitly reset the channel

To reset a latched off output channel, you must send it a value of 0. The 0 value resets the channel to a standard off condition and restores its ability to respond to control logic (turn on and off). You need to provide the reset logic in your application program.

Auto-recovery

When the module is configured to auto-recover, a channel that has been turned off because of a short circuit will start operating again as soon as the faulty channel is corrected. No user intervention is required to reset the channel. If the fault was transient, the channel may reactivate without leaving any history of the short circuit.

Input Polarity

By default, the polarity on all 12 input channels is *logic normal*, where:

- an input value of 0 indicates that the physical sensor is off (or the input signal is low)
- an input value of 1 indicates that the physical sensor is on (or the input signal is high)

The input polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an input value of 1 indicates that the physical sensor is off (or the input signal is low)
- an input value of 0 indicates that the physical sensor is on (or the input signal is high)

To change an input polarity parameter from *logic normal*, or back to normal from *logic reverse*, use the Advantys configuration software.

You may configure input polarity values independently for each input channel:

Step	Action	Result
1	Double click on the STB EPI 2145 module you want to configure in the island editor.	The selected STB EPI 2145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Input Polarity Settings** fields by clicking on the + sign.	A top level row appears. It reveals two groups for the first 8 input channels and the last 4 input channels.
4	Expand either of the **+ Input Polarity** fields by clicking on the + sign.	For instance, if you click on **First 8 channels**, the corresponding rows for input channels 1 through 8 appear.

Step	Action	Result
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Input Polarity** row. Enter a decimal integer in the range 0 to 255, or 0 to 0xFF in hexadecimal notation, where 0 means all inputs have *normal* polarity and 0xFF means that the first eight input channels have *reverse* polarity.	When you select the **Input Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Input Polarity**, the values associated with the channels change. For example, if you choose an input polarity value of 0x2F, channels 5, 7 & 8 will have normal polarity, while other input channels will have reverse polarity.
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Input Polarity** row changes. For example, if you set channel 2 and 3 to *Reverse* (1), and leave the other channels on *Normal* (0), the **Input Polarity** value changes to 0x06.

Output Polarity

By default, the polarity on all eight output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or more of the channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from *logic normal*, or back to normal from *logic reverse*, use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double click on the STB EPI 2145 module you want to configure in the island editor.	The selected STB EPI 2145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Output Polarity Settings** fields by clicking on the + sign.	A single row appear for all output channels.
4	Expand either of the **+ Output Polarity** fields by clicking on the + sign.	Rows for output channels 1 through 8 appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Output Polarity** row. Enter a decimal integer in the range 0 to 255, or 0 to 0xFF in hexadecimal notation, where 0 means all outputs have *normal* polarity and 0xFF means that the all eight output channels have *reverse* polarity.	When you select the **Output Polarity** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Output Polarity**, the values associated with the channels change. For example, if you choose an output polarity value of 0x2F, channels 5, 7 & 8 will have *normal* polarity, while other output channels will have *reverse* polarity.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Output Polarity** row changes. For example, if you set channels 2 and 3 to *Reverse*, and leave the other channels on *Normal*, the **Output Polarity** value changes to 0x06.

Fallback Modes

When communication is lost between the module and the fieldbus master, the module's outputs must go to a known state where they remain until communications are restored. This is known as the output's *fallback state*. You may configure fallback values for each output individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each output
- then (if necessary) by configuring the fallback states

When an output has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When an output has *hold last value* as its fallback mode, it stays at its last known state when communication is lost - it cannot be configured with a predefined fallback state.

By default, the fallback mode for all outputs is *predefined state* (1). If you want to change the fallback mode to *hold last value* (0), use the Advantys configuration software:

Step	Action	Result
1	Double click on the STB EPI 2145 module you want to configure in the island editor.	The selected STB EPI 2145 module opens in the software module editor.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Expand the **+ Fallback Mode Settings** fields by clicking on the + sign.	A single row called **+ Fallback Mode (Output)** appears.
4	Expand the **+ Fallback Mode (Output)** row further by clicking on the + sign.	Rows for output channels 1 through 8 appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode (Output)** row. Enter a hexadecimal or decimal value in the range 0 to 255, where 0 means all outputs hold their last values, and 255 means that all outputs go to a predefined state.	When you select the **Fallback Mode** value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for **Fallback Mode (Output)**, the values associated with the channels change. For example, if you choose a fallback mode value of 2, then channel 2 goes to a *predefined state*, while all other channels go to *hold last value*.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the **Fallback Mode (Output)** row changes. For example, if you set channel 2 to *Predefined*, and all other channels to *Hold last value*, the **Fallback Mode** value changes to 2.

Note: In the event of a hardware failure in the module, all output channels turn off

Fallback States

If a module's fallback mode is predefined state, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, all channels are configured to go to 0 as their fallback state:

- 0 indicates that the predefined fallback state of the module is *de-energized*
- 1 indicates that the predefined fallback state of the module is *energized*

> **Note:** If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a **Predefined Fallback Value** will be ignored.

To modify a fallback state from its default setting or to revert back to the default from the ON setting, you need to use the Advantys configuration software:

Step	Action	Result
1	Make sure that the **Fallback Mode** for the STB EPI 2145 module you want to configure is 1 (*predefined state*).	If the Fallback Mode value is 0 (hold last value), any value entered in the associated **Predefined Fallback Value** row will be ignored.
2	Choose the data display format by either checking or clearing the **Hexadecimal** checkbox at the top right of the editor.	Hexadecimal values will appear in the editor if the box is checked; decimal values will appear if the box is unchecked.
3	Click on the + sign to expand the **+ Predefined Fallback Value Settings** fields.	A row called **+ Predefined Fallback Value** appears.
4	Expand the **+ Predefined Fallback Value** row further by clicking on the + sign.	Rows for output **Channels 1 to 8** appear.
5a	To change the settings *at the module level*, select the integer that appears in the **Value** column of the **Fallback Mode** row. Enter a hexadecimal or decimal value in the range 0 to 255 (0 to 0xFF), where 0 means all outputs have 0 as their predefined fallback value, and 255 means that all outputs adopt 1 as their predefined fallback value.	When you select the value associated with **+ Predefined Fallback Value**, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new **Predefined Fallback Value**, the values associated with the channels change. For example, if you choose an fallback state value of 2, then **Channel 2** adopts 1 as its predefined fallback value, while all other channels will have 0 as their predefined fallback value.

Step	Action	Result
5b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu. You may configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the **Predefined Fallback Value** row changes.For example, if you set **Channel 2** to 1 and all other channels to 0, the **Predefined Fallback Value** changes to 2.

STB EPI 2145 Data for the Process Image

Representing I/O Data and Status

The NIM keeps a record of output data in one block of registers in the process image, and a record of input data and status in another block of registers in the process image. Output data is written to the output data block by the fieldbus master, and is used to update the controller-starter outputs. The information in the input and status block is provided by the module itself. This process image information can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG (configuration) port. The specific registers used by the STB EPI 2145 module are based on its physical location on the island bus.

> **Note:** The data format illustrated in this section is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master, in a filedbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. A separate guide is available for each supported fieldbus.

Input Data Image

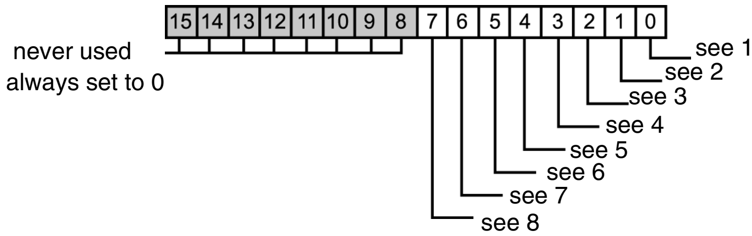
The input data image is part of a block of 4096 16-bit registers (in the range 45392 through 49487) that represents the data returned to the fieldbus master. The input data for the STB EPI 2145 module is represented by six contiguous registers in this block.

These registers are discussed individually below. If specific bit values (0 or 1) are provided in the following discussion, it is understood that polarity is *logic normal* for all channels, i.e. that polarity has not been explicitly reconfigured to *logic reverse*.

- Register 1: reads input information from the motor starter
- Register 2: status of motor starter inputs
- Register 3: reads input information from the motor starter
- Register 4: status of motor starter inputs
- Register 5: provides echo data from outputs
- Register 6: status of motor starter outputs

Register 1: Input Information from Motor Starters

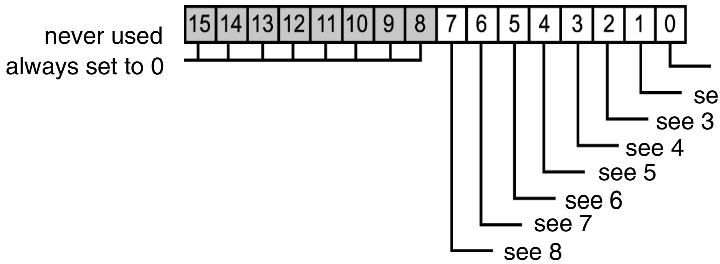
The first input/status register provides information from the various motor starters.



1 bit 0 indicates whether channel 1 (motor starter 1 switch) is set to ready, where 1 = ready and 0 = not ready
2 bit 1 indicates whether channel 2 (motor starter 1 contactor) is energized, where 1 = energized and 0 = de-energized
3 bit 2 indicates whether channel 3 (motor starter 1 circuit breaker) is tripped, where 1 = tripped and 0 = not tripped
4 bit 3 indicates whether channel 4 (motor starter 2 switch) is set to ready, where 1 = ready and 0 = not ready
5 bit 4 indicates whether channel 5 (motor starter 2 contactor) is energized, where 1 = energized and 0 = de-energized
6 bit 5 indicates whether channel 6 (motor starter 2 circuit breaker) is tripped, where 1 = tripped and 0 = not tripped
7 bit 6 indicates whether channel 7 (motor starter 3 switch) is set to ready, where 1 = ready and 0 = not ready
8 bit 7 indicates whether channel 8 (motor starter 3 contactor) is energized, where 1 = energized and 0 = de-energized

Register 2: Status of Motor Starter Inputs

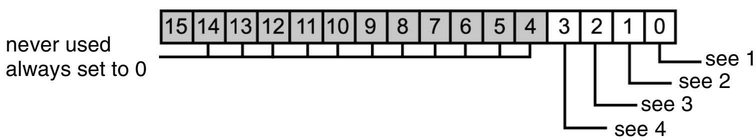
The second input/status register denotes the status of each input in Register 1. When any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one of two causes-either the field power is missing or there is a short circuit on the field power.



1 bit 0 denotes the status of channel 1 (motor starter 1 switch); bit = 0: no fault detected; bit = 1: fault detected
2 bit 1 denotes the status of channel 2 (motor starter 1 contactor); bit = 0: no fault detected; bit = 1: fault detected
3 bit 2 denotes the status of channel 3 (motor starter 1 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected
4 bit 3 denotes the status of channel 4 (motor starter 2 switch); bit = 0: no fault detected; bit = 1: fault detected
5 bit 4 denotes the status of channel 5 (motor starter 2 contactor); bit = 0: no fault detected; bit = 1: fault detected
6 bit 5 denotes the status of channel 6 (motor starter 2 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected
7 bit 6 denotes the status of channel 7 (motor starter 3 switch); bit = 0: no fault detected; bit = 1: fault detected
8 bit 7 denotes the status of channel 8 (motor starter 3 contactor); bit = 0: no fault detected; bit = 1: fault detected

Register 3: Input Information from Motor Starters

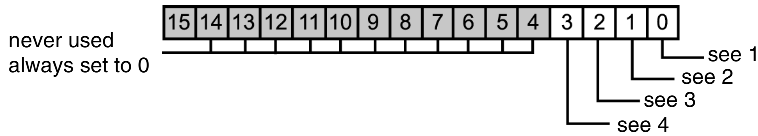
The third input/status register provides information from the various motor starters.



1 bit 0 indicates whether channel 1 (motor starter 3 circuit breaker) is tripped, where 1 = tripped and 0 = not tripped
2 bit 1 indicates whether channel 2 (motor starter 4 switch) is set to ready, where 1 = ready and 0 = not ready
3 bit 2 indicates whether channel 3 (motor starter 4 contactor) is energized, where 1 = energized and 0 = de-energized
4 bit 3 indicates whether channel 4 (motor starter 4 circuit breaker) is tripped, where 1 = tripped and 0 = not tripped

Register 4: Status of Motor Starter Inputs

The fourth input/status register denotes the status of each input in Register 3. When any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one of two causes—either the field power is missing or there is a short circuit on the field power.



1 bit 0 denotes the status of channel 1 (motor starter 3 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected
2 bit 1 denotes the status of channel 2 (motor starter 4 switch); bit = 0: no fault detected; bit = 1: fault detected
3 bit 2 denotes the status of channel 3 (motor starter 4 contactor); bit = 0: no fault detected; bit = 1: fault detected
4 bit 3 denotes the status of channel 4 (motor starter 4 circuit breaker); bit = 0: no fault detected; bit = 1: fault detected

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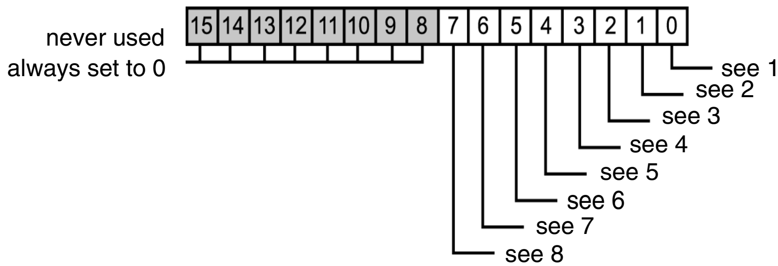
Register 5: Echo Output Data

The fifth register in the I/O status block is the module's echo output data register. This register represents the data that has just been sent to the controller-starters by the STB EPI 2145 module.

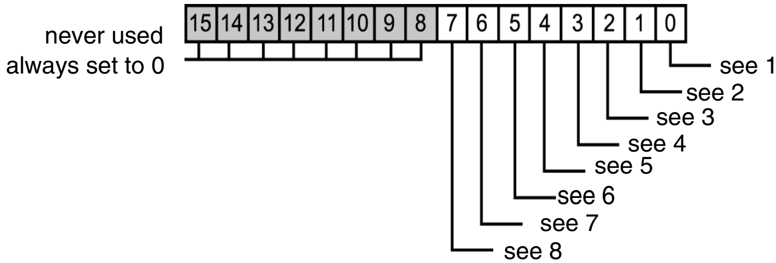


1 bit 0 denotes the state of output 1 (motor-starter 1 forward direction)
2 bit 1 denotes the state of output 2 (motor-starter 1 reverse direction)
3 bit 2 denotes the state of output 3 (motor-starter 2 forward direction)
4 bit 3 denotes the state of output 4 (motor-starter 2 reverse direction)
5 bit 4 denotes the state of output 5 (motor-starter 3 forward direction)
6 bit 5 denotes the state of output 6 (motor-starter 3 reverse direction)
7 bit 6 denotes the state of output 7 (motor-starter 4 forward direction)
8 bit 7 denotes the state of output 8 (motor-starter 4 reverse direction)

Under most normal operating conditions, the bit values should be an exact replica of the bits in the output data register. A difference between the bit values in the output data register and the echo register could result from an output channel used for a reflex action, where the channel is updated directly by the EPI 2145 module, instead of by the fieldbus master.

Register 6: Status of Outputs

The sixth input/status register is the STB EPI 2145's output status register. When any bit in this register is set to 0, no fault has been detected; if a bit is set to 1, a fault has been detected. A fault always derives from one of the following causes: field power missing, short circuit on the field power, or output thermal overload.



1 bit 0 denotes the status of output 1 (motor starter 1 forward direction); bit = 0: no fault detected; bit = 1: fault detected

2 bit 1 denotes the status of output 2 (motor starter 1 reverse direction); bit = 0: no fault detected; bit = 1: fault detected

3 bit 2 denotes the status of output 3 (motor starter 2 forward direction); bit = 0: no fault detected; bit = 1: fault detected

4 bit 3 denotes the status of output 4 (motor starter 2 reverse direction); bit = 0: no fault detected; bit = 1: fault detected

5 bit 4 denotes the status of output 5 (motor starter 3 forward direction); bit = 0: no fault detected; bit = 1: fault detected

6 bit 5 denotes the status of output 6 (motor starter 3 reverse direction); bit = 0: no fault detected; bit = 1: fault detected

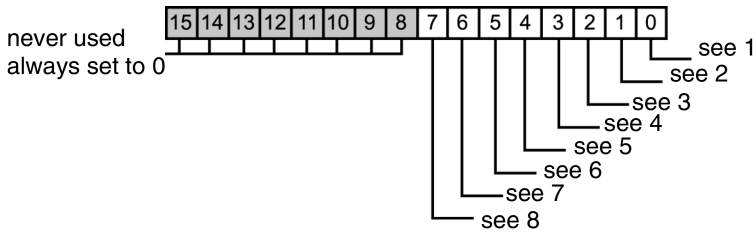
7 bit 6 denotes the status of output 7 (motor starter 4 forward direction); bit = 0: no fault detected; bit = 1: fault detected

8 bit 7 denotes the status of output 8 (motor starter 4 reverse direction); bit = 0: no fault detected; bit = 1: fault detected

Output Data

The output data image is part of a block of 4096 16-bit registers (in the range 40001 through 44096) that represents the data returned by the fieldbus master. The STB EPI 2145 uses one register in the output data block to control the on/off states of the module's eight outputs.

The figure below represents the output data register. The fieldbus master writes these values to the island bus:



1 bit 0 indicates the state of output 1 (motor starter 1 forward direction)
2 bit 1 indicates the state of output 2 (motor starter 1 reverse direction)
3 bit 2 indicates the state of output 3 (motor starter 2 forward direction)
4 bit 3 indicates the state of output 4 (motor starter 2 reverse direction)
5 bit 4 indicates the state of output 5 (motor starter 3 forward direction)
6 bit 5 indicates the state of output 6 (motor starter 3 reverse direction)
7 bit 6 indicates the state of output 7 (motor starter 4 forward direction)
8 bit 7 indicates the state of output 8 (motor starter 4 reverse direction)

STB EPI 2145 Specifications

Table of Technical Specifications

The STB EPI 2145 module's technical specifications are described in the following table.

description		parallel interface pre-wiring module for TeSys model U (12 inputs/8 outputs)
number of input channels		12
number of output channels		8
module width		28.1 mm (1.12 in)
I/O base		STB XBA 3000 (see *p. 808*)
hot swapping supported		yes
reflex actions supported	input channels	for reflex inputs only
	output channels	maximum of two
nominal logic bus current consumption		110 mA
nominal actuator bus current consumption		150 mA
input protection		resistor-limited
isolation voltage	bus-to-field	1500 V DC
	actuator to sensor bus	500 V DC
reverse polarity protection from miswired PDM		the module is internally protected from damage
input response time	on to off	2 ms max.
	off to on	2 ms max.
absolute maximum load current	each channel	0.1 A resistive load
	per module	0.850 mA
short circuit protection		per channel
short circuit protection on actuator bus		5 A fuse inside the module, not field replaceable
short circuit protection on sensor bus		1 A fuse internal to module, not field-replaceable
short circuit feedback (diagnostics)		per channel
PDM power available (diagnostics)		fuse on PDM module
overheating protection		by built-in thermal shut-down
fault status if overheating		yes

fallback mode	default	predefined fallback values on all channels
	user-configurable settings*	hold last value
		predefined fallback value on one or more channels
fallback states (when *predefined* is the fallback mode)	default	all channels go to 0
	user-configurable settings*	each channel configurable for 1 or 0
polarity on individual outputs and inputs	default	*logic normal* on all channels
	user-configurable settings*	*logic reverse* on one or more channels
		logic normal on one or more channels
* Requires the Advantys configuration software.		

The STB EHC 3020 40 kHz Counter Module

9

At a Glance

Introduction

This chapter provides you with a detailed description of the Advantys STB EHC 3020 40 kHz counter module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Chapter?

This chapter contains the following sections:

9.1 STB EHC 3020 Physical Description

At a Glance

Introduction

This section describes the Advantys STB EHC 3020 counter module's external features, displays, connections, dimensions, and wiring requirements.

What's in this Section?

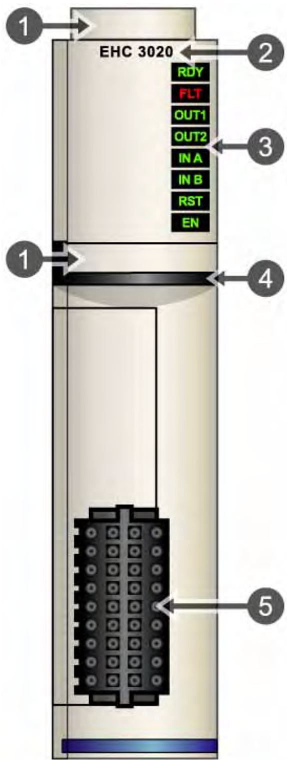
This section contains the following topics:

STB EHC 3020 Physical Description

Physical Characteristics

The STB EHC 3020 is an Advantys STB 40 kHz counter module. The module provides four 24 VDC digital inputs and two 24 VDC outputs and contains programmable compare blocks (see *p. 644*). The module operates in one of six user-configurable modes, which may be selected using the Advantys configuration software. (By default, it operates as a frequency counter (see *p. 648*).)

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 black identification stripe, indicating an intelligent STB I/O module
5 field wiring clamp connector (power to input and output devices)

The Module and Its Accessories

Required
- an STB XBA 3000 I/O base (see *p. 817*)

- field connections (see *p. 630*) via an 18-terminal STB XTS 2150 spring clamp connector

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the field wiring connectors into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	module on a base	27.8 mm (1.09 in)
height	module only	125 mm (4.92 in)
	on a base	128.3 mm (5.05 in)
depth	module only	64.1 mm (2.52 in)
	on a base with connectors	75.5 mm (2.97 in) worst case (with spring clamp connectors)

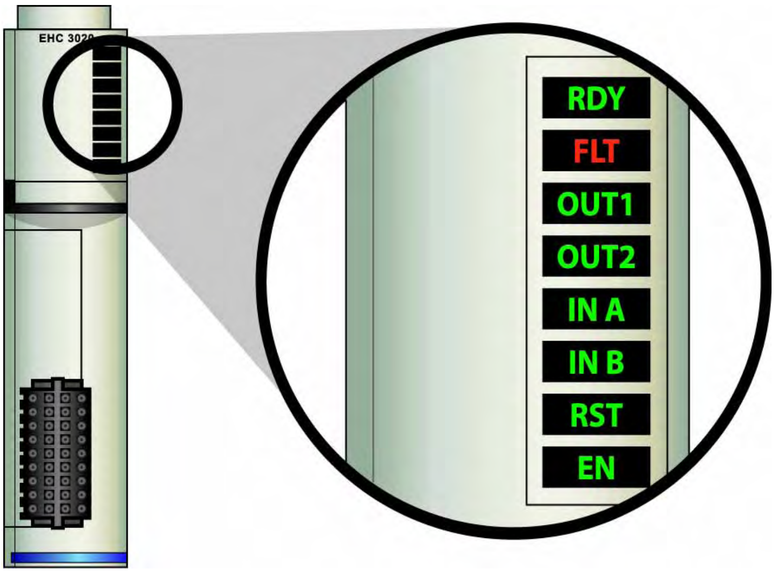
STB EHC 3020 LED Indicators

Purpose

The eight LEDs on the STB EHC 3020 counter module are visual indications of the operating status of the module, its two output channels, and its four input channels. The LED locations and their meanings are described below.

Location

The eight LEDs are positioned in a column at the top of the module. The figure below shows their locations:



Indications

The following table defines the meaning of the eight LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

RDY	FLT	OUT1	OUT2	IN A	IN B	RST	EN	Meaning
off	off	off						The module is either not receiving power or has failed.
on	off	normal						The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
on	flickering			blinking				Sensor bus has failed.
		blinking						Actuator bus has failed.
		flickering						Short circuit detected on OUT1.
			flickering					Short circuit detected on OUT2.
off	on	normal						The island bus is off.
	blink							There is an island bus controller error
flickering	off	off						Auto-addressing is in progress.
blinking		off						The module is either in pre-operational mode or in its fallback state.
on	off							The module has achieved all of the following: ● it has power ● it has passed its confidence tests ● it is operational
		on						Voltage is present on OUT1.
		off						Voltage is absent on OUT1.
			on					Voltage is present on OUT2.
			off					Voltage is absent on OUT2.
				on				Voltage is present on IN A.
				off				Voltage is absent on IN A.
					on			Voltage is present on IN B.
					off			Voltage is absent on IN B.
						on		Voltage is present on RST.
						off		Voltage is absent on RST.
							on	Voltage is present on EN.
							off	Voltage is absent on EN.
on	on	on						The watchdog has timed out.

RDY	**FLT**	**OUT1**	**OUT2**	**IN A**	**IN B**	**RST**	**EN**	**Meaning**
on or blinking	flickering							A sensor bus failure, an actuator bus failure, a short circuit on OUT1 and/or OUT2.
blinking								The island bus is not running.
normal—the LED is on if there is 24 VDC on the input or if the output is active.								
flickering—the LED is on for 50 ms then off for 50 ms.								
blinking—the LED is on for 200 ms then off for 200 ms.								
blink—the LED is on 200 ms then off for 1 s.								

STB EHC 3020 Field Wiring

Summary

The STB EHC 3020 module utilizes one 18-terminal field wiring connector. Connector pinouts and field wiring examples are presented below.

Field Sensors

The module has IEC type 3 inputs that support sensor signals from mechanical switching devices (operating in normal environmental conditions) such as relay contacts, limit switches, push buttons, and three-wire and two-wire proximity switches that have:

- a voltage drop of no more than 8 V
- a minimum operating current capability less than or equal to 2 mA
- a maximum off-state current less than or equal to 1.5 mA

Field Actuators

It supports field wiring to two-wire actuators such as solenoids, contacts, relays, alarms or panel lamps.

Outputs OUT1 and OUT2 are limited by a maximum current of 0.5 A each. Output sensor power from the PDM is short-circuit limited and thermal protected.

The Connector

The STB EHC 3020 module requires one 18-terminal STB XTS 2150 clamp style connector (sold separately). The connector has 18 terminals. Terminals 1 through 12 support inputs, and terminals 13 through 16 support outputs. Terminals 17 and 18 provide shield connections.

Field Wiring Requirements

Individual connector terminals accept one field wire. Use wire sizes in the range 0.51 ... 1.29 mm (24 ... 16 AWG).

We recommend that you strip 9 mm from the wire’s jacket for the module connection.

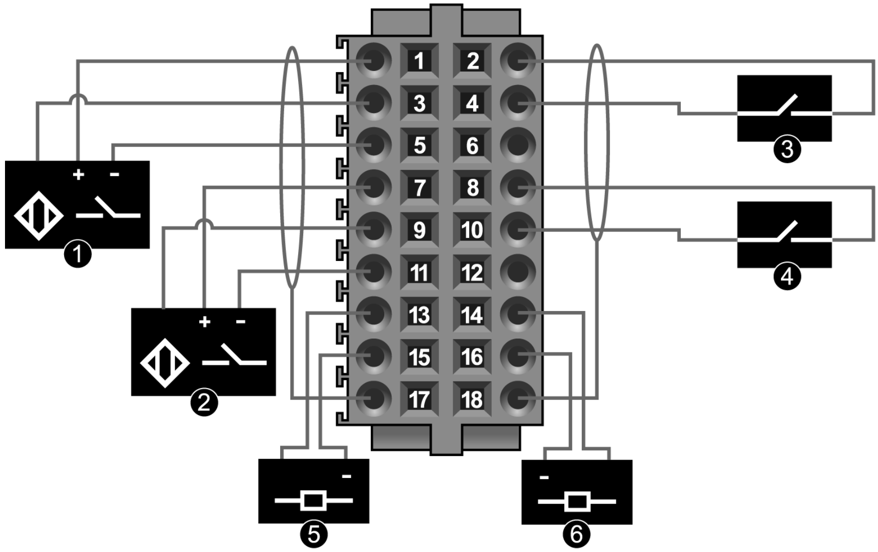
Field Wiring Pinout

The input terminals provide three-wire connections for inputs IN A, IN B, RST, and EN. If you choose to used shielded wire, shield connections are provided on pins 17 and 18. The output terminals provide two-wire connections for outputs OUT1 and OUT2.

Pin	Function	Pin	Function
1	+24 VDC field power (from the PDM) for input IN A	2	+24 VDC field power (from the PDM) for the input EN
3	input IN A	4	input EN
5	field power return for input IN A	6	field power return for input EN
7	+24 VDC field power (from the PDM) for input IN B	8	+24 VDC field power (from the PDM) for input RST
9	input IN B	10	input RST
11	field power return for input IN B	12	field power return for input RST
13	output OUT1	14	output OUT2
15	output OUT1 return	16	output OUT2 return
17	shield connection for input IN A and input IN B.	18	shield connection for input EN and input RST.

Sample Wiring Diagram

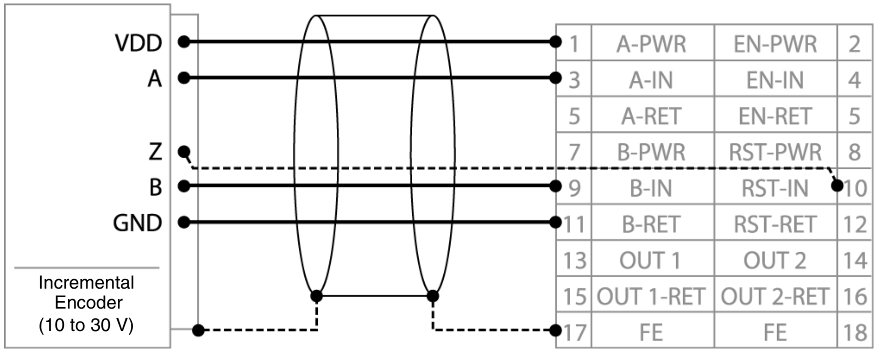
The following field wiring example shows three-wire input devices used on inputs IN A and IN B, two-wire devices used on inputs EN and RST, and two-wire output devices used on outputs OUT1 and OUT2. The four input devices use shielded cables tied to pins 17 and 18:



1 input IN A
2 input IN B
3 input EN
4 input RST
5 output OUT1
6 output OUT2

Note: To insert and remove wires from the connector, use a 2.5 x 0.4 mm screwdriver to open the round receptacle by *pushing* on the corresponding plate, numbers 1 to 18 in the figure above. Push the flexible plate down on the outside (the side closest to the corresponding receptacle). A screwing (rotating) or bending motion is not required.

The pin-out for the incremental encoder (10 to 30 V only) should be according to the following figure (pin numbers correspond to the callouts in the figure above):



Note: This is only a suggested wiring diagram. Consult the manufacturer's documentation for the wiring most appropriate to your encoder.

Requirements

Shielded, twisted pair cable is recommended. The shield should be tied to the shield (FE) terminal on the connector. For high-noise environments or when you connect the encoder, we recommend using the EMC kit (STB XSP 3000).

Note: See the Advantys STB System Planning and Installation Guide (890 USE 171) for further information on system field wiring requirements.

Input Filters

Each input uses an analog filter:

Input	Minimum Filter	Minimum Pulse	Maximum Frequency
IN A, IN B	2.5 µs	10 µs	40 kHz
EN, RST	25 µs	100 µs	4 kHz

These analog filters are always active.

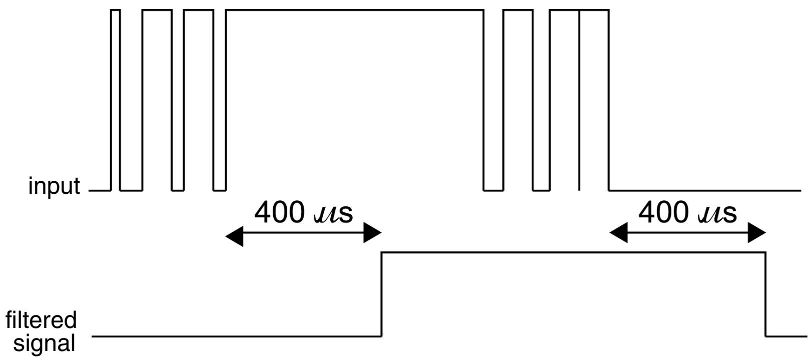
Bounce Filter

The counter module provides a configurable numerical bounce filter for inputs IN A and IN B. This filter allows you to limit unwanted noise on these input signals. It is possible to disable (the default setting) or enable the bounce filter independently on either channel. However, the filter time-constant is common to both inputs.

The following table shows the input characteristics with and without the numerical bounce filter:

Condition	Filter Minimum	Minimum Pulse (Without Bounce)	Frequency Maximum
without filter (default)	2.5 µs	10 µs	40 kHz
with filter (400 µs)	405 µs	410 µs	1 kHz
with filter (1.2 ms)	1.2 ms	1.25 ms	400 Hz

Bounce filter operation is shown in the figure below:



As the figure shows, the filtered signal is not on until the input has been consistently high for the configured time (400 µs). Likewise, the filtered signal is off when the input is consistently low for the configured time.

STB EHC 3020 Module Specifications

Technical Specifications

The STB EHC 3020 module’s technical specifications are described in the following tables.

General Specifications

The STB EHC 3020 module’s general specifications are described in the following tables.

General Specifications			
description	maximum input frequency		40 kHz
I/O channels	number of digital input channels		four
	number of digital output channels		two
dimensions	width	module on a base	27.8 mm (1.09 in)
	height	module only	125 mm (4.92 in)
		on a base	128.3 mm (5.05 in)
	depth	module only	64.1 mm (2.52 in)
		on a base with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)
I/O base	STB XBA 3000 (size 3 base)		
hot swapping supported	yes, with limitations—The module can be removed and inserted from its base while the island remains under power, but the counter may have to be reenabled when it is reinserted in its base. For mode-specific hot swapping information, see the discussion of the individual counting modes (see *p. 647*).		
reverse polarity protection	yes		
encoder compliance	yes (up and down mode only)		
fault recovery response	default		channels latched off—requires user to reset
	user-configurable settings*		latch off
			autorecovery
*Requires the Advantys configuration software.			

The STB EHC 3020 module’s power bus specifications are described in the following table.

Advantys Power Bus		
island power bus	5 VDC bus current	< 60 mA typical at 5.2 VDC (+2 %, -4 %)
		< 100 mA maximum
isolation voltage	field-to-bus	1500 VDC for 1 min

The STB EHC 3020 module's power bus specifications are described in the following table.

Field Power Bus	
sensor power voltage	19.2 to 30.0 VDC
field power bus	33 mA maximum
actuator power current (24 VDC)	.5 A per channel, 1 A per module
max. power dissipation	1.8 W

Note: All counter values are reset when sensor power is lost.

Digital Input Specifications

The following table lists the digital input specifications for the STB EHC 3020 counter module:

<table>
<tr><th colspan="4">Digital Input Specifications</th></tr>
<tr><td>number of input channels</td><td colspan="3">four</td></tr>
<tr><td rowspan="6">digital Inputs
• IN A
• IN B
• EN
• RST</td><td>maximum input voltage</td><td colspan="2">30 VDC continuous</td></tr>
<tr><td>on input voltage</td><td>+11 to +30 VDC</td><td></td></tr>
<tr><td>off input voltage</td><td colspan="2">up to +5 VDC</td></tr>
<tr><td>off input current</td><td colspan="2">up to 1.5 mA</td></tr>
<tr><td>nominal input current (24 VDC)</td><td colspan="2">6 mA</td></tr>
<tr><td>current at 11 VDC</td><td colspan="2">> 2 mA</td></tr>
<tr><td>input response time</td><td colspan="3">Refer to the input filter (see p. 633) and bounce filter (see p. 634) tables.</td></tr>
</table>

Digital Output Specifications

The following table lists the digital output specifications for the STB EHC 3020 counter module:

Digital Output Specifications		
number of output channels	two	
output voltage	19.2 . . . 30.0 VDC	
minimum load current	none	
maximum load current	each point	0.5 A
	per module	1.0 A
	off state leakage/point	-0.1 mA max.
	on state output v. drop (max.)	3.0 VDC
	short circuit output current (each point)	1.5 A maximum
surge current maximum	self limiting per channel	
maximum load capacitance	50 μF	
load inductance maximum	0.5 Henry at 4 Hz switch frequency $L = 0.5/I^2 \times F$	where: • L = load inductance (Henry) • I = load current (A) • F = switching frequency (Hz)
maximum response time	< 1 s	frequency mode—when the frequency move in (0.2 kHz)
	< 0.2 s	frequency mode—when the frequency move in (2 kHz, 40 kHz)
	< 0.5 ms after measurement	event counting and period measurement modes
	< 0.5 ms after measurement	
	< 5 ms	up and down mode
output protection (internal)	transient voltage suppression	
short circuit protection/status	per channel	
fallback value (output channels)	default	predefined fallback values on both channels
	user-configurable settings*	hold last value
		predefined fallback value on one or both channels
fallback states for output channels (when *predefined* is the fallback mode)	default	both channels go to 0
	user-configurable settings*	each channel configurable for 1 or 0
polarity on individual output channels	default	logic normal on both channels
	user-configurable settings*	logic reverse on one or both channels
		logic normal on one or both channels
*Requires the Advantys configuration software.		

9.2 STB EHC 3020 Overview

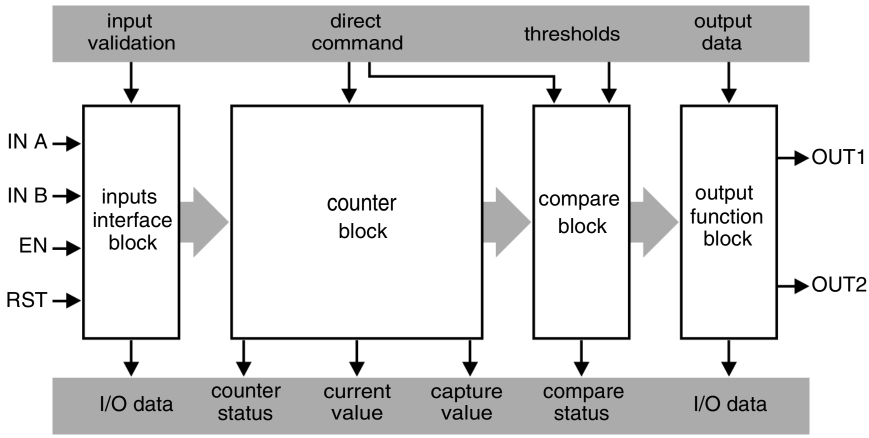
STB EHC 3020 Functional Overview

Introduction

The STB EHC 3020 is an industrial class I/O module designed to handle high duty cycles and to control continuous-operation equipment. It can be configured to operate in any of six modes (see *p. 647*) that support various measuring and counting operations.

Overview Diagram

The figure below illustrates the functionality of the STB EHC 3020 40 kHz counter module:



The module's onboard counter uses up to four digital inputs to produce a 16-bit *current value* result.

Input IN A is always a physical input brought into the counter module through a field wire connected to pin 3 (see *p. 631*). The other three inputs (input IN B, input EN, and input RST) may or may not be used, depending on the counter's operating mode. These three inputs may be physical or they may be controlled by the fieldbus master.

The 16-bit counter's current value is reported to the process image in the current value register (see *p. 703*), which can be read by the fieldbus master.

This internal 16-bit value is also sent to an onboard compare block (discussed later in this topic), which compares it against a pair of thresholds. These upper threshold and lower threshold values are user-configurable. The compare block reports the status of the current value relative to the thresholds to the process image in the compare status register (see *p. 703*).

If you want the module to produce outputs, you may also send this 16-bit value along with the upper threshold and/or lower threshold values to a pair of output functions. These output functions analyze the current value against the threshold value(s) in any one of 12 different ways and then produce a digital output based on that analysis.

Example

Based on the overview diagram (above), suppose the counter block produces a current value of 140. This value is sent to the current value register (see *p. 703*) in the process image and is simultaneously sent to the module's compare block. Suppose you have configured the compare block with a lower threshold value of 125 and an upper threshold value of 150. In the compare status register (see *p. 703*) of the process image, the compare block reports that the current value is between the lower threshold value and the upper threshold value.

Now suppose that output function 1 is configured to see if the current value is in the window defined by the lower threshold and upper threshold, and that output function 2 is configured to pulse when the current value is greater than the upper threshold value. The output function 1 analysis validates that the current value is within the threshold window, and the output function sends a value of 1 to output OUT1. The output function 2 analysis validates that the current value is not greater than the upper threshold value, and the output function does not send a pulse to output OUT2.

Counter Block

The counter block inside the module receives up to four inputs. The exact number of inputs depends on the selected operational mode. The counter block produces a 16-bit result that is put in the current value register (see *p. 703*) of the process image, which can be read by the fieldbus master.

The six user-configurable counting modes are:
- frequency counting (see *p. 648*)—speed and flow metering
- event counting (see *p. 652*)—event monitoring, counting spread events up to 65535 during a defined period
- period evaluation (see *p. 657*)—measures the interval between events (pulse delay evaluation, from 100 µs to 65 s)
- one-shot counting (see *p. 662*)—grouping process
- modulo (loop) counting (see *p. 667*)—packaging and labeling processes, flow rate regulation
- up/down counting (see *p. 674*)—accumulating

Counter adjustments are parameters that you can configure with the Advantys configuration software that apply to particular counter modes.

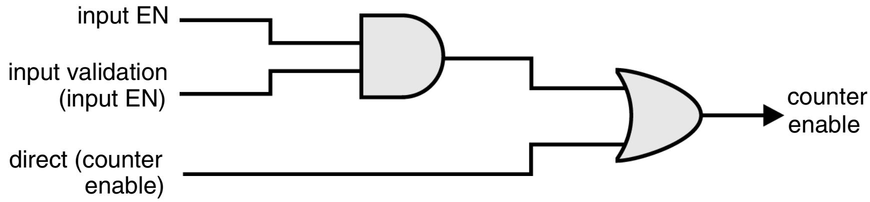
Items in the following list will direct you to the counter adjustment description for the six different counting modes:
- frequency counting mode adjustments (see *p. 649*)
- event counting mode adjustments (see *p. 654*)
- period evaluation mode adjustments (see *p. 659*)
- one-shot counting mode adjustments (see *p. 664*)
- modulo (loop) mode adjustments (see *p. 670*)
- up and down counter mode adjustments (see *p. 678*)

Counter Inputs

There are four inputs to this module. Input IN A is always directly controlled by a hardware sensor. The remaining inputs (IN B, EN, RST) can be controlled either by a sensor or by the fieldbus master. Input IN A is always used. Other inputs are mode-dependent.

There are two ways in which inputs IN B, EN, and RST can be controlled:
- through a physical input (when its corresponding input validation bit is set)
- set directly by the fieldbus master

The following diagram demonstrates how this is achieved:



As the figure shows, if the input validation bit is on, the counter enable can be controlled by the input EN. If the input validation bit is off, the counter enable can be controlled by the fieldbus master (the direct register in the process image (see *p. 705*).

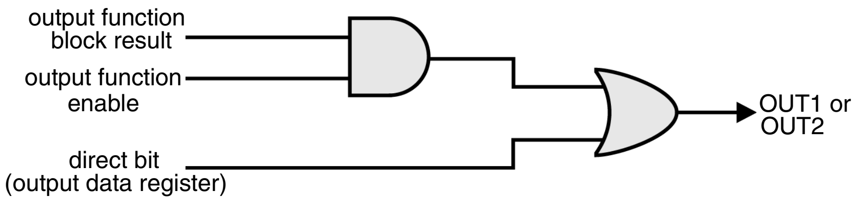
Note: The validation bit must be set if the input is controlled by the hardware input. The bit must not be set if the input is controlled by the fieldbus master.

Note: Input IN B can be configured to detect either the rising edge, falling edge, or both rising and falling edges. RST is rising edge only. EN is level triggered only.

Counter Outputs

There are two output channels on this module. Each output may be driven directly from the fieldbus master through the output data register (see *p. 704*) or from an output function block (see *p. 692*) result.

The following logic diagram describes how the counter module can control the physical output.



As stated, you can drive the output in one of two ways:
- directly, from the fieldbus master—Set the output function enable bit to off (0). The output will then match the state of the output bit in the output data register (see *p. 704*).
- from the output function block—Set the output bit in the output data register (see *p. 704*) to off (0). Then, set the corresponding output function enable bit. The output will then match the state of the output bit in the output function block result.

> **Note:** When using the output blocks, make sure that the fieldbus master is not currently controlling the outputs in the output data register (see *p. 704*).

Input Data Registers

The input data for the STB EHC 3020 module is represented by six contiguous registers in the input process image (see *p. 700*) block:
- I/O data—the state of all inputs, outputs, and output function block results
- I/O status—counter module I/O error information
- counter status—various bits indicating the status of the counter operation (sometimes mode-specific)
- compare status—various bits indicating the status of compare operations with respect to user-defined thresholds
- current value—16-bit value the contains the actual current value
- capture value—This represents the current value at synchronization (modulo mode (see *p. 667*) only)

Output Data Registers

The output data for the STB EHC 3020 module is represented by five contiguous registers in the output process image (see *p. 703*) block:
- output data—output values and output function enable values
- input validation—input validation bits for inputs IN B, EN, and RST
- direct—bits that can be set by the fieldbus master to control counter operation
- *upper threshold*—threshold used for compare operations

- *lower threshold*—threshold used for compare operations

Compare Block

The compare block receives the 16-bit current value as input and evaluates the status of the current value relative to two user-defined threshold values.

The upper threshold and lower threshold values are represented by unsigned integers in the 0 to 65535 range. There are two ways to set the thresholds:
- *dynamically* (by output data)—over the fieldbus (default setting)
- *statically*—with the Advantys configuration software

For all modes, the value of the lower threshold should be set lower than the value of the upper threshold. If the upper threshold value is lower than the lower threshold value, the lower threshold value is ignored.

The compare enable bit (in the direct register (see *p. 705*) of the process image) needs to be set to enable compare block functionality.

The following status information is reported:
- current value register is less than the lower threshold
- current value register is greater than or equal to the lower threshold and less than or equal to upper threshold
- current value register is greater than the upper threshold
- capture value register is greater than or equal to the lower threshold and less than or equal to upper threshold
- capture value register is greater than or equal to the lower threshold and less than or equal to upper threshold

The status of the module's compare function is written to the compare status register (see *p. 703*) in the input block of the process image. The fieldbus master can read this register from the process image.

Output Function Blocks

This module supports two programmable output blocks that can control two digital outputs. Each of these blocks operates on the 16-bit current value in the current value register (see *p. 703*) of the process image. Output function block 1 dictates the behavior of output OUT1 while output function block 2 dictates the behavior of output OUT2.

To implement either output function block, its corresponding enable bit must be set by the fieldbus master.

Each output function behaves in one of 12 ways that you can select with the Advantys configuration software. The output value is set when the certain conditions are met:
- No direct action. The function block is not enabled.
- The function block output is set when the current value is less than the lower threshold value.
- The function block output is set when the current value is greater than or equal to the lower threshold and less than or equal to the upper threshold.
- The function block output is set when the current value is greater than the upper threshold value.
- The function block output generates a pulse when the current value is decreasing and becomes less than the lower threshold value.
- The function block output generates a pulse when the current value is increasing and becomes greater than or equal to the lower threshold value.
- The function block output generates a pulse when the current value is decreasing and becomes less than or equal to the upper threshold value.
- The function block output generates a pulse when the current value is increasing and becomes greater than the upper threshold value.
- The function block output is set when the counter stop bit in the counter status register is set (one-shot (see *p. 662*) mode).
- The function block output is set when the counter run bit in the counter status register is set (one-shot (see *p. 662*) mode).
- The function block output is set when the capture value is less than the lower threshold value (modulo mode (see *p. 667*) only).
- The function block output is set when the capture value is greater than or equal to the lower threshold and less than or equal to the upper threshold (modulo mode (see *p. 667*) only).

For operational modes in which the block generates a pulse, you can use the Advantys configuration software to independently configure the pulse width for each output (see below). The default pulse width is 10 ms.

Pulse Widths

If you choose one of the pulse generating blocks, you can independently configure the pulse width (see *p. 694*) for each output. The minimum pulse width value is 1 (1 ms) and the maximum pulse width value is 65535 (in 1 ms increments).

Each pulse width corresponds to one output:
- pulse width 1—applied to output OUT1 (default = 10 ms)
- pulse width 2—applied to output OUT2 (default = 10 ms)

9.3 STB EHC 3020 Counting Modes

At a Glance

Introduction

This section describes the six counting modes for the STB EHC 3020 counter module.

The *frequency* mode is the default operating mode for the counter module.

What's in this Section?

This section contains the following topics:

STB EHC 3020 Frequency Counting Mode

Summary

Use the counter's frequency mode to measure the frequency, speed, or the rate or flow of events. Frequency is presented as events per second (Hz). In this single-input mode (only IN A is required), the counter evaluates the rate of pulses applied to IN A at time-based intervals of either 10 ms or 100 ms. The interval is chosen automatically to optimize counter accuracy within the measurement period. The current value register (see *p. 703*) is updated at the end of each time base with the frequency (in Hz) of the pulses applied to IN A.

The frequency mode is the default mode for the STB EHC 3020 counter module.

Inputs

The following table lists the input(s) (IN A only) used in the frequency counting mode:

Input	Description	Source	
		Fieldbus Master	**Hardware**
IN A	count input	no	yes

Adjustments

The counter adjustments for the frequency counting mode are described in the following table:

Name	Valid Values	Source	
		Advantys	Fieldbus Master
scaling factor (see *p. 684*)	1 (default) to 255	yes	no
frequency: calibration factor (see *p. 684*)	1 to 200 (90.1 % to 110 % (default = 100)	yes	no
bounce numerical filter (see *p. 691*)	inactive (default), 400 µs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
note 1: when communication mode is set to *by output data*			
note 2: when communication mode is set to *by setting*			
note 3: The compare enable bit (Output/Direct/Channel4) must be set to active low (0) by the fieldbus master when changing threshold values if the communication mode is set to *by output data*.			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

Status information for the counter is reported in the counter status register (see *p. 702*) and the compare status register (see *p. 703*). Both registers are in the input block of the process image. The table below shows the applicable bits that are set in this mode when the listed conditions are met:

Register	Bit	Channel	Condition(s)
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.
counter status	4	5	upper limit count bit—set when the current value register exceeds the 16-bit limit (input frequency is greater than 65535 Hz)
compare status	0	1	counter low bit—set when the current value register is less than the lower threshold
compare status	1	2	counter in window bit—set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold
compare status	2	3	counter high bit—set when current value register is greater than the upper threshold value

Output Functions

Each output can be individually controlled by the result of a user-selectable output function or directly by the fieldbus master. The following table describes the available output functions for the frequency counting mode:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	yes
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	yes
pulse = greater than UT	yes
counter stop	no
counter run	no
capture low	no
capture in window	no
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swapping

Hot swapping is supported by this module in this mode. However, the user has to check the state of the validity bit (see *p. 702*) in the application during module power-up and initialization. The compare status register (see *p. 703*) and current value register (see *p. 703*) information is only valid when the validity bit is high. The user should ignore any data from the compare status and current value register when the validity bit is low.

Limitations

The maximum input frequency that the counter module can measure in this mode is 40 kHz (with a duty cycle of 40 to 60 percent).

STB EHC 3020 Event Counting Mode

Summary

In event counting mode, the module accumulates a number of events that are received over a user-configurable time base. You can configure the accumulation of events for every 0.1 s, 1 s, 10 s, or 1 min.

The current value register (see *p. 703*) is updated at the end of each configured time base with the number of pulses received during the time base interval.

Inputs

The following table lists the inputs used in this mode and the possible sources for those inputs:

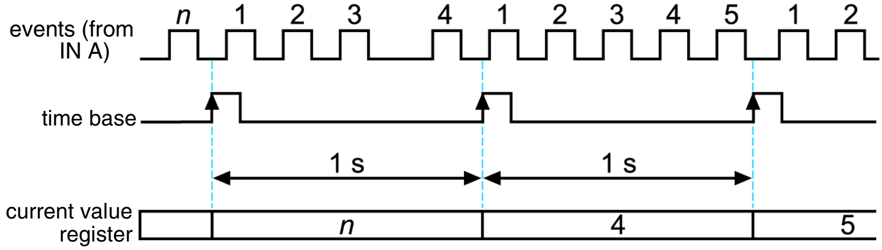
Input	Description	Source	
		Fieldbus Master	**Hardware**
IN A	count input	no	yes
IN B	sync input (note 1)	yes	yes
note 1: If IN B is configured as a logic input in the fieldbus master using the counter sync (direct register (see *Direct, p. 705*)) bit, only rising edges are detected. However, if IN B is configured as a hardware input, either the rising edge, falling edge, or both falling and rising edges can be detected, based on the sync mode adjustment.			

IN A is the only required input in this mode. Optionally, the sync input (IN B) can reset the internal current value and restart the internal time base. IN B can be hard-wired (provided that the corresponding input validation bit is set) or the fieldbus master can directly control it.

Functional Characteristics

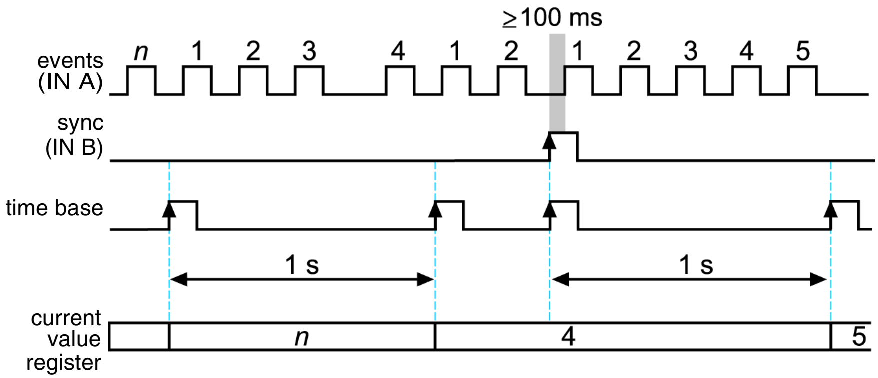
In event counting mode, the module accumulates a number of events over a user-configurable period. Pulses applied to IN A are counted. The output (current value register (see *p. 703*)) is the number of counts accumulated over one period.

The following timing diagram shows a simple example of an event counter with a 1 s time base:



As shown in the figure, the counter current value represents the number of events accumulated during the previous 1 s interval (time base). That is, the count of the last event from IN A (*n*) is reported as output to the current value register (see *p. 703*) while events in the next 1 s interval are counted. After the four events in that interval are counted, a 4 is placed in the current value while events in the next interval are counted.

IN B is available to be used as an optional synchronization pulse. When IN B sends a pulse to the counter it restarts the time base to 0 and restarts the event accumulation:



In the above figure, notice how the sync pulse can establish an interval between counting operations. The events that occur during that interval are not accumulated in the current value.

Note: If the number of events exceeds 65535 during a time base, the current value is immediately set to 65535 and the upper limit count bit is set.

Adjustments

The following table describes the adjustment parameters that can be applied in the event counting mode and the possible sources for those adjustments:

Name	Valid Values	Source	
		Advantys	**Fieldbus Master**
event counting time (see *p. 685*)	0.1 s, 1 s (default), 10 s, 1 m	yes	no
sync mode (see *p. 687*)	rising edge on IN B (default), falling edge on IN B, both edges on IN B	yes	no
bounce numerical filter (see *p. 691*)	inactive (default), 400 µs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
note 1: when communication mode is set to *by output data*			
note 2: when communication mode is set to *by setting*			
note 3: The compare enable bit (Output/Direct/Channel4) must be set to active low (0) by the fieldbus master when changing threshold values if the communication mode is set to *by output data*.			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

Status information for the counter is reported in the counter status register (see *p. 702*) and the compare status register (see *p. 703*) in the input block of the process image. The table below shows the applicable bits that are set in this mode when the listed conditions are met:

Register	Bit	Channel (Advantys I/O Image)	Condition(s)
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.
counter status	4	5	upper limit count bit—Set when the counter value would exceed the 16-bit register limit (greater than 65535). Set for the duration of a time base and the current value is set to 65535.
compare status	0	1	counter low bit—Set when the current value register is less than the lower threshold value.
compare status	1	2	counter in window bit—set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold
compare status	2	3	counter high bit—set when current value register is greater than the upper threshold value

Output Functions

Each output can be individually driven by the result of a user-selectable output function or directly by the fieldbus master. The following table shows the output functions (see *p. 692*) available in this mode:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	yes
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	yes
pulse = greater than UT	yes
counter stop	no
counter run	no
capture low	no
capture in window	no
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swapping

Hot swapping is supported by this module in this mode. However, the user has to check the state of the validity bit (see *p. 702*) in the application during module power-up and initialization. The compare status register (see *p. 703*) and current value register (see *p. 703*) information is only valid when the validity bit is high. The user should ignore any data reported back from the compare status and current value registers when the validity bit is off.

Limitations

Any input required by this mode must be recognized for at least 10 µs if the bounce filter has not been activated.

The module counts pulses applied to IN A whenever the pulse is at least 10 µs long (400 µs or 1.2 ms long when the bounce filter is applied). The first countable pulse applied to IN A is not detected until 100 ms after each sync input. Pulses within 100 ms of the sync input are lost.

STB EHC 3020 Period Measuring Mode

Summary

In period measuring mode, the module measures the time that elapses during an event or between events. This duration is measured in units defined by the user. The user-defined duration can be 10 μs, 100 μs, or 1 ms.

The output data register is updated based on the time interval you select.

Inputs

Input IN A is the only available input in this mode. That is, pulses applied to IN A indicate the period to be measured. IN A, as it applies to the period measuring mode, is described in the following table:

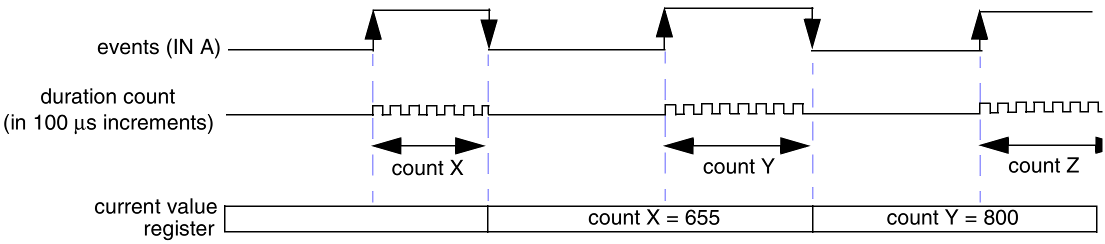
Inputs	Description	Source	
		Fieldbus Master	Hardware
IN A	count input	yes	no

Functional Characteristics

The measurement period begins at the rising edge of a pulse applied to IN A and may be measured either to the falling edge of that same pulse (*edge-to-opposite*) or to the rising edge of the next pulse (*edge-to-edge*). In either case, there must be a 5 ms interval between any two individual rising edges.

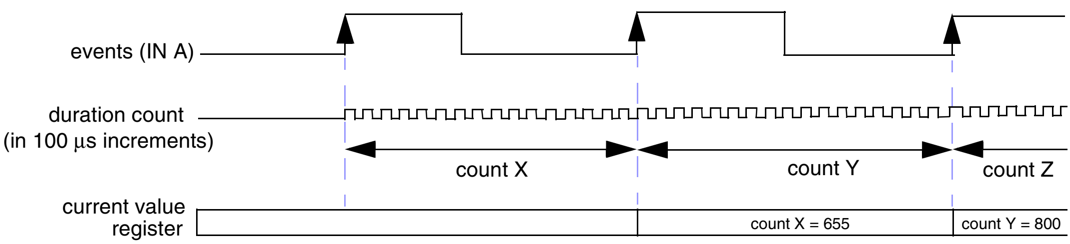
The shortest measurable length for a single pulse is 500 μs. The maximum size of a pulse you can measure in this mode is 65535 * time base.

By setting the mode to *edge-to-opposite*, the time period during the event can be measured. The following figure shows the application of this mode with the implementation of a 100 μs period measurement value:



As the figure shows, the duration in edge-to-opposite mode is measured from the rising edge of an event to the falling edge of the same event. The measurement is reported as soon as the falling edge is detected:
- count X—*655* indicates a measurement of 65.5 ms
- count Y—*800* indicates a measurement of 80 ms

By setting the mode to *edge-to-edge* (the default), the time period between two events can be measured:



As shown above, the duration in edge-to-edge mode is measured from the rising edge of one event to the rising edge of the next event.

Adjustments

The counter adjustments for the period measuring mode are described in the following table:

Name	Valid Values	Source	
		Advantys	**Fieldbus Master**
period measuring resolution (see *p. 685*)	10 µs, 100 µs, 1 ms	yes	no
bounce numerical filter (see *p. 691*)	inactive (default), 400 µs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
note 1: when communication mode is set to *by output data*			
note 2: when communication mode is set to *by setting*			
note 3: The compare enable bit (Output/Direct/Channel4) must be set to active low (0) by the fieldbus master when changing threshold values if the communication mode is set to *by output data*.			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

The status information for the period measuring mode are described in the following table:

Register	Bit	Channel	Description
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.
counter status	4	5	upper limit count bit—Set when the counter value is higher than 65535.
counter status	5	6	lower limit count bit—Set when IN A changes at a frequency greater than 200 Hz or has a pulse width less than 500 µs.
compare status	0	1	count low bit—Set when the current value register is less than the lower threshold value.
compare status	1	2	counter in window bit—Set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold.
compare status	2	2	counter high bit—Set when the current value register is greater than the upper threshold value.

Output Functions

The output functions for the period measuring mode are described in the following table:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	yes
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	yes
pulse = greater than UT	yes
counter stop	no
counter run	no
capture low	no
capture in window	no
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swapping

Hot swapping is supported by this module in this mode. However, the user has to check the state of the validity bit in the application during module power-up and initialization. The compare status register (see *p. 703*) and current value register (see *p. 703*) information is only valid when the validity bit is high. The user should ignore any data reported back from the compare status and current value registers when the validity bit is off.

Limitations

The maximum frequency of IN A is 200 Hz. That is, the minimum interval between two measurements is 5 ms.

In the edge-to-opposite mode, the minimum pulse width for IN A is 500 µs.

STB EHC 3020 One-Shot Counting Mode

Summary

The one-shot counting mode is conducive to grouping operations. In this mode, the current value is decremented (from a user-defined threshold) for each pulse applied to IN A until the counter reaches a value of 0. When the counter reaches 0, an output can be driven to signal the completion of the counting operation. The user-defined threshold parameter defines the number of parts to count (up to 65535) and is loaded automatically when the counter starts.

Note: If there are more than 10 I/O modules in your island configuration, you must prioritize the STB EHC 3020 module for one-shot counting operations. Refer to your NIM user manual for details.

Inputs

The three inputs used in the one-shot mode are described in the following table:

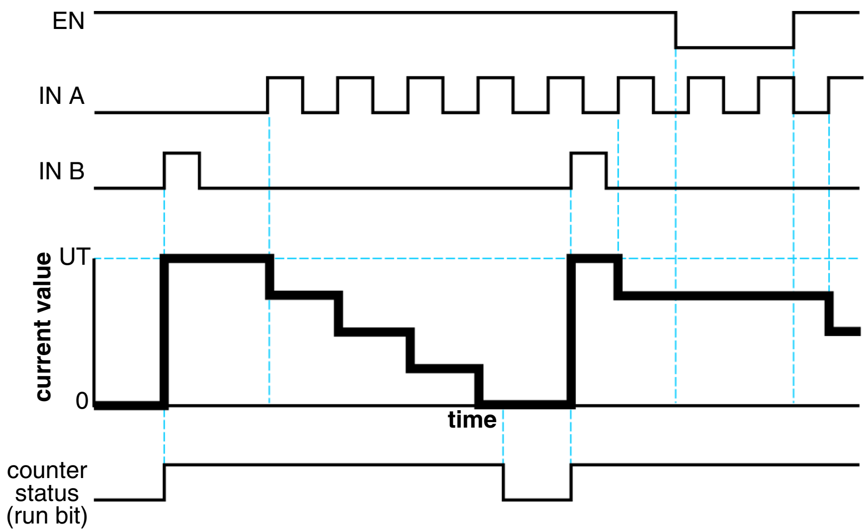
Inputs	**Description**	**Source**	
		Fieldbus Master	**Hardware**
IN A	count input	no	yes
IN B	sync input (note 1)	yes	yes (note 2)
EN	counter enable	yes	yes (note 2)
note 1: If IN B is configured as a logic input in the fieldbus master using the counter sync (direct register (see *p. 705*)), only rising edges are detected. However, if IN B is configured as a hardware input, either the rising edge, falling edge, or both falling and rising edges can be detected based on the sync mode adjustment.			
note 2: The corresponding validation bit must be set if either IN B or EN is controlled by the hardware input. The bit must not be set if either input is under the control of the fieldbus master.			

Input EN must be set in order to count pulses applied to IN A. On the active edge of IN B, the current value is set to the user-defined threshold value and the counter starts counting. Inputs IN B and EN can be hard-wired (providing that the corresponding input validation bit is set) or directly controlled by the fieldbus master.

Functional Characteristics

In one-shot counting mode, the module begins counting pulses applied to IN A after detecting an active edge on the sync input (IN B). It counts down from a user-configurable upper threshold value until the count reaches 0. The counter run bit is set to 1 while counting. It turns off (0) when the current value reaches 0. The counter stops and waits until it is restarted by another sync applied to IN B. The module also has an *enable* input (EN). This input must be set for the counter to count pulses applied to IN A. IN B and EN can be hard-wired (providing that the corresponding input validation bit is set) or directly controlled by the fieldbus master.

The one-shot counting mode uses the user-configured upper threshold (UT) value as a preset value to indicate the number of parts to be grouped:



The counter begins operating at the active edge on the sync input (IN B). The counter loads the preset with the upper threshold (UT) value and decrements the current value upon the detection of each subsequent pulse applied to IN A. When the current value reaches 0, the counter waits for a new sync input (IN B). Additional pulses applied to IN A have no effect on the value once it has reached 0.

Input EN must be high during counting operations. When this input goes low, the last reported current value is held and the counter ignores subsequent pulses applied to IN A. It does not, however, ignore the sync input on IN B. When input EN goes high again, the counter resumes counting operations.

Each time the counter starts, the run bit in the counter status register (see *p. 702*) is set. The bit goes low when the current value reaches 0.

If the sync input pulse (IN B) occurs while the counter is counting (prior to the current value reaching 0), the counter current value is preset with the threshold value and resumes counting from the preset value.

Adjustments

The counter adjustments for the one-shot mode are described in the following table:

Name	Valid Values	Source	
		Advantys	**Fieldbus Master**
scaling factor (see *p. 684*)	1 (default) to 255	yes	no
sync mode (see *p. 687*)	rising edge on IN B (default), falling edge on IN B, both edges on IN B	yes	no
bounce numerical filter (see *p. 691*)	inactive (default), 400 µs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 to 65535	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 to 65535	yes (note 2)	yes (note 1)
note 1: when communication mode is set to *by output data*			
note 2: when communication mode is set to *by setting*			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

Status information for the counter is reported in the counter status register (see *p. 702*) and the compare status register (see *p. 703*) in the input block of the process image. The table below shows the applicable bits that are set in this mode when the listed conditions are met:

Register	Bit	Channel (Advantys I/O Image)	Condition(s)
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.

Register	Bit	Channel (Advantys I/O Image)	Condition(s)
counter status	0	1	run bit—On while counter is running. Off when current value reaches 0. While off, waits for an active edge to be applied to sync input (IN B).
counter status	2	3	sync event bit—Set on active edge of B. Bit can be reset using reset sync and modulo bit in the direct register (see *p. 705*).
compare status	0	1	counter low bit—Set when current value register (see *p. 703*) is less than the lower threshold.
compare status	1	2	counter in window bit—Set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold.

Output Functions

Each output can be individually driven by the result of a user-selectable output function or directly with the fieldbus master. The following table shows the output functions (see *p. 692*) available in this mode:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	no
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	no
pulse = greater than UT	no
counter stop	yes
counter run	yes
capture low	no
capture in window	no
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swap

Electrically, the counter module may be hot swapped while power is applied. Be aware that data in the current value register will be lost when the module is removed from the island in this mode.

When the module is reinserted on the island, the state of IN B (sync) dictates the course of counting operations:

- IN B low—The counter will not begin counting until a rising edge applied to IN B is detected.
- IN B high—The counter will be preset with the user-defined value and will begin counting.

In either case, the validation bit will not be set until the data registers in the process image contain valid information.

Limitations

The following limitations apply to the one-shot counting mode:

- The maximum threshold value is mode is 65535.
- The minimum upper threshold value is 1.
- The minimum elapsed time between two rising edges on IN B (sync) or sync direct is 5 ms.

STB EHC 3020 Modulo (Loop) Counting Mode

Summary

The modulo counting mode is useful in packaging and labeling application in which a single action is performed repeatedly on a series of moving parts. In this mode, the counter repeatedly counts from 0 to a user-defined upper threshold (*UT*) or *modulo* value, minus 1. The current value never reaches the UT value, but one less than the threshold value.

Note: If you attempt to change the UT value while the counter is modulo counting, the new UT value is ignored and the counter uses the original UT value until the counter is re-initialized.

Note: If there are more than 10 I/O modules in your island configuration, you must prioritize the STB EHC 3020 module for modulo counting operations. Refer to your NIM user manual for details.

Inputs

The modulo mode uses three inputs. Input EN must be set in order to count the pulses applied to IN A. On the active edge of IN B, the current value is set to 0 and the counter starts counting. IN B and input EN can be hard-wired (providing that the corresponding input validation bit is set) or the fieldbus master can directly control them.

The inputs used in the modulo mode are described in the following table:

Inputs	Description	Source	
		Fieldbus Master	**Hardware**
IN A	count input	no	yes
IN B	sync input (note 2)	yes	yes (note 1)
EN	counter enable	yes	yes (note 1)
note 1: The corresponding validation bit must be set if IN B or EN is controlled by the hardware input. This bit must not be set if either input is controlled by the fieldbus master.			
note 2: If IN B is configured as a logic input in the fieldbus master using the counter sync (direct register (see *p. 705*)) bit, only the rising edges are detected. However, if IN B is configured as a hardware input, either the rising edge, falling edge, or both rising and falling edges can be detected based on the sync mode adjustment.			

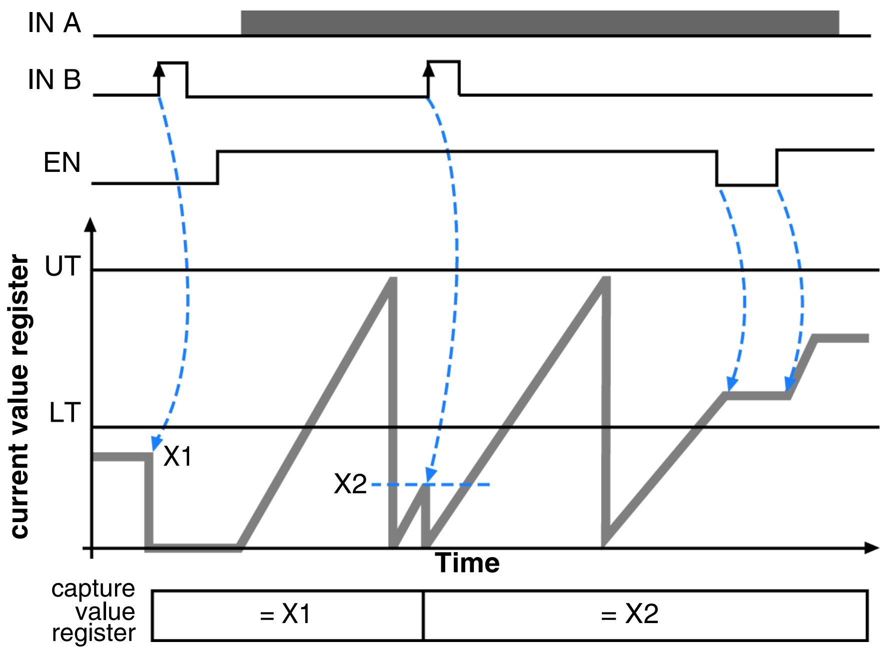
Functional Characteristics

The modulo counter mode uses the user-configured upper threshold (UT) value as the modulo limit.

In this counting mode, the module begins counting pulses from IN A after detecting an active edge on the sync input (IN B). It counts up from 0 until the count reaches the user-defined threshold value. The modulo event bit is set to 1 when the current value reaches the threshold. Unlike one-shot counting mode (see *p. 662*), in which the counter stops and waits until it is restarted by another sync on IN B, the current value is reset to 0 and counting continues.

The counter module also has an enable input (EN). This input must be set in order for the counter to count pulses applied to IN A. Input EN and IN B can be hard-wired (providing that the corresponding input validation bit is set) or the fieldbus master can directly control them.

The following timing diagram shows a typical application of the modulo counting mode in the default condition (rising edge on B):



As the figure shows, the counter begins operating at the active edge on the sync input (IN B), which also sets the capture value register (see *p. 703*) value to X1 and resets the current value register (see *p. 703*) to 0 and sets the sync event bit. Pulses applied to IN A are counted when EN is high. If one of these pulses pushes the current value to the upper threshold, the counter is reset to 0 and the modulo event bit is set to 1. The sync event bit and the modulo event bit can be reset using the *reset sync and modulo* bit in the direct register (see *p. 705*).

Any valid edge on IN B during counting operations results in:
- the counter's capture value register being set to the current value register value (X2)
- the current value register is reset to 0

As stated above, EN must be high during counting operations. When this input goes low, the last reported current value is held and the counter ignores subsequent pulses applied to IN A. It does not, however, ignore the sync input on IN B. When EN goes high again, the counter resumes counting operations.

Adjustments

The following table describes the adjustment parameters that can be applied in the modulo counting mode:

Name	Valid Values	Source	
		Advantys	**Fieldbus Master**
scaling factor (see *p. 684*)	1 (default) to 255	yes	no
sync mode (see *p. 687*)	rising edge on IN B (default), falling edge on IN B, both edges on IN B	yes	no
bounce numerical filter (see *p. 691*)	inactive,* 400 μs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 (default) to 65535 (note 3)	yes (note 2)	yes (note 1)
note 1: when communication mode is set to *by output data*			
note 2: when communication mode is set to *by setting*			
note 3: The compare enable bit (Output/Direct/Channel4) must be set to active low (0) by the fieldbus master when changing threshold values if the communication mode is set to *by output data*. Changed threshold values are effective immediately.			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

Status information for the counter is reported in the counter status register (see *p. 702*) and the compare status register (see *p. 703*) in the input block of the process image. The table below shows the applicable bits that are set in this mode when the listed conditions are met:

Register	Bit	Channel	Condition(s)
counter status	1	2	modulo event—Set when the counter current value reaches the modulo (upper threshold) value, setting the current value (see *p. 703*) value to 0. Can be reset by setting the *reset sync and modulo* bit in the direct register (see *p. 705*).
counter status	2	3	sync event bit—Set on active edge of B. Bit can be reset using the *reset sync and modulo* bit in the direct register (see *p. 705*).
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.
compare status	0	1	counter low bit—Set when current value register (see *p. 703*) value is less than the lower threshold.
compare status	1	2	counter in window bit—Set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold.
compare status	3	4	capture low bit—Set when the capture value register (see *p. 703*) is less than the lower threshold value.
compare status	4	5	capture window bit—Set when the capture value register is greater than or equal to the lower threshold and less than or equal to the upper threshold.

Output Functions

Each output can be individually be driven by the result of a user-selectable output function or directly through the fieldbus master. The following table shows the available output functions in this mode:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	no
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	no
pulse = greater than UT	no
counter stop	no
counter run	no
capture low	yes
capture in window	yes
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swap

Electrically, the counter module may be hot swapped while power is applied. Be aware that data in the current value register will be lost when the module is removed from the island in this mode.

When the module is reinserted on the island, the state of IN B (sync) dictates the course of counting operations:
- IN B low—The counter will not begin counting until a rising edge applied to IN B is detected.
- IN B high—The counter will be preset to 0 and the user-defined value and will begin counting.

In either case, the validation bit will not be set until the data registers in the process image contain valid information.

Limitations

The minimum configurable modulo values depend on the IN A frequency according to the following table:

Counting Frequency	Configurable Modulo Values
up to 1 kHz	greater than 5
up to 5 kHz	greater than 25
up to 10 kHz	greater than 50
up to 40 kHz	greater than 200

If IN B is high when the modulo event occurs, the upper threshold is stored in the capture value (see *p. 703*) register.

Other limitations in this mode are:
- the minimum upper threshold value is 1
- the minimum elapsed time between two rising edges on IN B (sync) is 5 ms
- the minimum pulse on IN B is 500 µs

STB EHC 3020 Up and Down Counting Mode

Summary

In the up and down counter mode, the module behaves like a standard up/down counter. Depending on your application requirements, the counter can be configured in four different up/down submodes:

- differential counting
- up/down counting with directional signal
- quadrature direct mode
- quadrature reverse mode

Inputs

In all submodes, the reception of a rising edge on RST:

- resets the upper and lower limit count bits (if they have already been set by overflow or underflow conditions)
- presets the counter to a user-defined preset value (default = 0)
- starts counting operations

Input IN EN must also be set in order to count pulses. The inputs EN and RST can be hard-wired (providing that the corresponding input validation bit is set) or the fieldbus master can directly control them.

The inputs used in the up and down mode are described in the following table:

Input	**Description**				**Source**	
					Fieldbus Master	**Hardware**
Mode	**A = up B = down**	**A = impulse B = direction**	**Quadrature Direct**	**Quadrature Reverse**		
IN A	pulse count up	pulse count depends on IN B	count up when IN A leads IN B	count up when IN A lags IN B	yes	yes
IN B (note 1)	pulse count down	1 = count up 0 = count down	count down when IN A lags IN B	count down when IN A leads IN B	no	yes
EN	counter enable				yes	yes (note 2)
RST	counter reset				yes	yes (note 2)
note 1: The input validation be is not used for input IN B.						
note 2: The corresponding validation bit must be set if EN or RST is controlled by the hardware input. This bit must not be set if EN or RST is controlled by the fieldbus master.						

Functional Characteristics (Submodes)

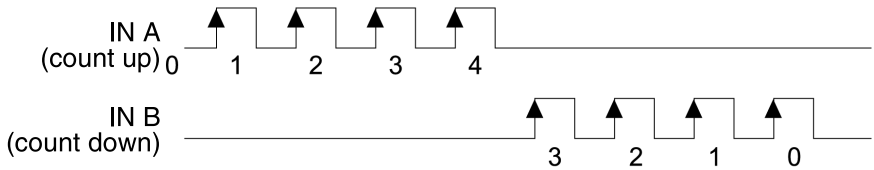
The counter module operates in one of four submodes:
- differential counter (A = up, B = down)
- up/down counter with directional signal (A = impulse, B = direction)
- incremental encoder measurements (quadrature direct and quadrature reverse submodes)

The functional characteristics of the four submodes are discussed individually below.

Submode: Differential Counter

In the differential counter (A = up, B = down) submode, all pulses applied to IN A cause the counter to increment, while all pulses applied to IN B cause the counter to decrement. Input EN must be *on* in order to count pulses applied to IN A and IN B. (A valid rising edge on RST must also have been received.)

A timing diagram for this submode is shown below:

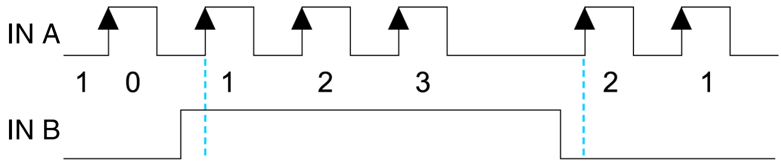


If the current value (see *p. 703*) exceeds 65535, the upper limit count bit is set in the counter status register (see *p. 702*). In this case, the counter stops and the current value remains at 65535. If the current value decreases below 0, the lower limit count bit is set in the counter status register. In this case, the counter stops and the current value remains at 0. In both cases, the counter waits for a rising edge on RST before it resumes counting. The rising edge of RST also resets the upper and lower limit count bits and presets the counter to the user-defined preset value.

Submode: Up/ Down Counter with Directional Signal

In the up/down counter with directional signal (A = pulse, B = direction) submode, all pulses applied to IN A cause the counter to increment if IN B is high. If IN B is low, pulses applied to IN A cause the counter to decrement. Input EN must be *on* in order to count pulses applied to IN A. (A valid rising edge on RST must also have been received.)

A timing diagram for this submode is shown below:

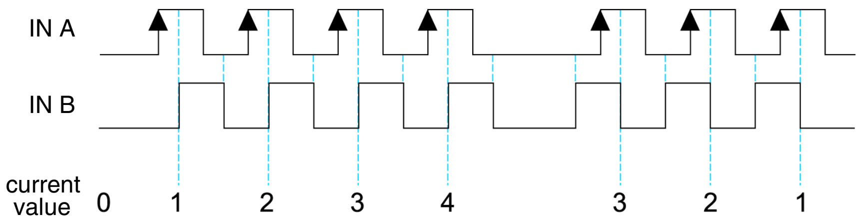


If the current value (see *p. 703*) exceeds 65535, the upper limit count bit is set in the counter status register (see *p. 702*). In this case, the counter stops and the current value remains at 65535. If the current value decreases below 0, the lower limit count bit is set in the counter status register. In this case, the counter stops and the current value remains at 0. In both cases, the counter waits for a rising edge on RST before it resumes counting. The rising edge of RST also resets the upper and lower limit count bits and presets the counter to the user-defined preset value.

Submodes: Encoder Measurements

The encoder measurements (quadrature direct and quadrature reverse submodes) are used for incremental encoder inputs in which the two input signals are 90 degrees out of phase with each other. The STB EHC 3020 counter module can measure two incoming, phased pulses applied to IN A and IN B.

The following figure shows the effect of the relative pulses applied to IN A and IN B have on the counter current value with a direct quadrature implementation:



As the figure shows, the current value register is incremented when a pulse applied to IN A is followed by a pulse applied to IN B. A pulse applied to IN A decreases the current value when it follows a pulse applied to IN B. Input EN must be *on* in order to count pulses applied to IN A. (A valid rising edge on RST must also have been received.)

The following table shows the characteristics of the two methods by which you can implement encoder measurements:

Quadrature Implementation	Scenario	Effect on Current Value Register
direct	IN B lags IN A	increment
	IN B leads IN A	decrement
reverse	IN B leads IN A	increment
	IN B lags IN A	decrement

If the current value (see *p. 703*) exceeds 65535, the upper limit count bit is set in the counter status register (see *p. 702*). In this case, the counter stops and the current value remains at 65535. If the current value decreases to less than 0, the lower limit count bit is set in the counter status register. In this case, the counter stops and the current value remains at 0. In both cases, the counter waits for a rising edge on RST before it resumes counting. The rising edge of RST also resets the upper and lower limit count bits and presets the counter to the user-defined preset value.

Adjustments

The following table describes the adjustment parameters that can be applied in the up/down counting mode and the possible sources for those adjustments:

Name	Valid Values	Source	
		Advantys	**Fieldbus Master**
up and down: submode (see *p. 686*)	A = up, B = down (default) A = impulse, B = direction quadrature direct quadrature reverse	yes	no
up and down: preset (see *p. 687*) (note 1)	0 (default) to 65535	yes	no
bounce numerical filter (see *p. 691*)	inactive (default), 400 µs, 1.2 ms	yes	no
communication mode (see *p. 688*)	by setting, by output data (default)	yes	no
upper threshold (see *p. 689*)	0 to 65535) (note 3)	yes (note 2)	yes (note 1)
lower threshold (see *p. 689*)	0 to 65535 (note 3)	yes (note 2)	yes (note 1)
note 1: value is loaded into the current value output register (see *p. 703*) on the rising edge of RST			
note 2: when communication mode is set to *by setting*			
note 3: The corresponding validation bit must be set if EN or RST is controlled by the hardware input. This bit must not be set if EN or RST is controlled by the fieldbus master.			

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

Status Information

Status information for the current value is reported in the counter status register (see p. 702) and the compare status register (see *p. 703*) in the input block of the process image. The table below shows the applicable bits that are set in this mode when the listed conditions are met:

Register	Bit	Channel	Condition(s)
counter status	3	4	validity bit—The validity bit is used to indicate that the counter current value register and compare status register contain valid data. A *1* indicates valid data and a *0* indicates invalid data.
counter status	4	5	upper limit count bit—set when the counter value is greater than 65535 (see note)
counter status	5	6	lower limit count bit—set when the counter value is less than 0 (see note)
compare status	0	1	counter low bit—set when current value register is less than the lower threshold
compare status	1	2	counter window bit—set when the current value register is greater than or equal to the lower threshold and less than or equal to the upper threshold
compare status	2	3	counter bit high—set when the current value register is greater than the upper threshold
note: When the upper or lower limit count bit is set, the counter stops and counter input pulses are ignored.			

Output Functions

Each output function can be driven by the result of a user-selectable output function or directly with the fieldbus master. The following table describes the available output functions for the up and down counting mode:

Name	Available
off	yes
counter low (note 1)	yes
counter in window (note 2)	yes
counter high	yes
pulse = less than LT	yes
pulse = greater than LT	yes
pulse = less than UT	yes
pulse = greater than UT	yes
counter stop	no
counter run	no
capture low	no
capture in window	no
note 1: default (output function 2)	
note 2: default (output function 1)	

Hot Swap

Electrically, the counter module may be hot swapped while power is applied. Be aware that data in the current value register will be lost when the module is removed from the island in this mode.

When the module is reinserted on the island, the state of input RST dictates the course of counting operations:
- RST low—The counter will not begin counting until a rising edge applied to RST is detected.
- RST high—The counter will be preset with the user-defined value and will begin counting.

In either case, the validation bit will not be set until the data registers in the process image contain valid information.

Limitations

The input frequency limit is 40 kHz in this mode. The first countable pulse after a reset is delayed by 1 ms.

9.4 STB EHC 3020 Configurable Parameters

At a Glance

Introduction

This section describes the parameter sets that can be configured for use with the STB EHC 3020 counter module.

Note: Refer to the Advantys STB Configuration Software Quickstart User Guide (890 USE 180) for instructions for configuring parameters for Advantys STB I/O modules.

What's in this Section?

This section contains the following topics:

STB EHC 3020 Counter Settings

Functional Characteristics

Items in the *Counter settings* parameters set are used to configure one of six counter operating modes and the parameters associated with each.

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of each parameter in the *Counter settings* parameters set.

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Counting Function

The STB EHC 3020 counter module can operate in any one of six counting modes:

- Frequency (see *p. 648*) (default)—speed and flow metering
- Event Counting (see *p. 652*)—monitor events and count spread events up to 65535 during a defined period
- Period Measuring (see *p. 657*)—measure the interval between events (pulse delay evaluation, from 100 µs to 65 s)
- One-Shot Counting (see *p. 662*)—grouping process
- Modulo (see *p. 667*)—packaging and labeling processes and flow rate regulation
- Up and Down (see *p. 674*)—accumulating

To access the counting function parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	1
Data Byte 1	0 for Frequency 1 for Event Counting 2 for Period Measuring 3 for One-Shot Counting 4 for Modulo 5 for Up and Down

Scaling Factor

This value indicates the number of pulses applied to IN A that are required to change the current value. The range for this parameter is 1 (default) to 255. For example, if the scaling factor of 5 is configured, five pulses applied to IN A must be reported to change the current value by 1.

The scaling factor can be used in the frequency counting (see *p. 648*), one-shot counting (see *p. 662*), and modulo counting (see *p. 667*) modes. In other modes, the scaling factor is ignored.

The scaling factor parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	2
Data Byte 1	1 to 255

Frequency: Calibration Factor

The frequency calibration factor (used in frequency counting (see *p. 648*) mode) calibrates the current value from 90.1 % to 110 % in 0.1 % increments The range for this parameter is 1 to 200, with a default of 100. For example, if a calibration factor of 1 is configured, the current value is 90.1 % of the measured value. If the default calibration factor of 100 is used, the current value is 100 % of the measured value (equal to the measured value). If a calibration factor of 200 is configured, the current value is 110 % of the measured value.

The frequency calibration factor parameter is represented as an unsigned 8-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	3
Data Byte 1	1 to 200

Event Counting: Time

The event counting time parameter indicates the interval at which the current value will be reported. This parameter is used in the event counting mode (see *p. 652*) only.

The *event counting time* parameter is used to configure one of four values to indicate the time period for event accumulation. Available resolutions are:
- 0.1 s
- 1 s (default)
- 10 s
- 1 min

To access the event counting time parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	4
Data Byte 1	0 for 0.1 s 1 for 1 s 2 for 10 s 3 for 1 min

Period Measuring: Resolution

In Period Measuring (see *p. 657*) mode, the module measures the time that elapses during an event or between events. This duration is measured in units defined by the user in the *Period measuring: resolution* parameter.

The available periods are:
- *10 µs*—maximum value of period to measure = .655 s
- *100 µs* (default)—maximum value of period to measure = 6.55 s
- *1 ms*—maximum value of period to measure = 65.5 s

To access the period measuring resolution parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	5
Data Byte 1	0 for 10 µs 1 for 100 µs 2 for 1 ms

Period Measuring: Mode

In Period Measuring (see *p. 657*) mode, the *Period measuring: mode* parameter indicates the manner in which the duration of an event or period between events is measured. Available options are:
- *edge to edge on IN A* (default)—rising to rising gap measuring
- *edge to opposite on IN A*—pulse measuring (minimum pulse = 500 µs)

To access the period measuring mode parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	6
Data Byte 1	0 for edge to edge on IN A 1 for edge to opposite on IN A

Up and Down: Mode

The up and down parameter operates when the module is configured as an up and down counter:
- *A = UP, B = DOWN* (default)—standard differential counter
- *A = impulse, B = direction*—direction monitored by IN B at pulse applied to IN A
- *quadrature*—IN A, IN B, for incremental encoder (two methods for implementing encoder measurements):
  - *quadrature direct*
  - *quadrature reverse*

To access the up and down mode parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	7
Data Byte 1	0 for A=UP, B=DOWN 1 for A=impulse, B= direction 2 for quadrature direct 3 for quadrature reverse

Sync: Mode

The sync mode settings parameter indicates the edge on IN B that is recognized:

- *rising edge IN B* (default)—IN B recognized rising edge on pulse
- *falling edge IN B*—IN B recognized falling edge on pulse
- *both edges IN B*—IN B recognized both edges (rising/falling) on pulse

The sync mode parameter is applied only to the hardware IN B, not to the direct bit (set by the fieldbus master). This parameter can be used in the event counting (see *p. 652*), one-shot counting (see *p. 662*), and modulo (loop) counting (see *p. 667*) modes. In other modes, the sync mode is ignored.

To access the sync mode parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	9
Data Byte 1	0 for rising edge IN B 1 for falling edge IN B 2 for both edges IN B

Up and Down: Preset

The up and down parameter is used as a preset value in the up and down mode. At a reset signal, the preset value is loaded in to the current value. The range for this parameter is 0 (default) to 65535.

This parameter can be used only in the up and down mode. In other modes, the up and down parameter is ignored.

The up and down preset parameter is represented as an unsigned 16-bit number. To access this parameter using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0xA0
Index (high byte)	0x24
Sub-index	8
Data Byte 1	0 to 65535

STB EHC 3020 Compare Settings

Functional Characteristics

The 16-bit current value is sent to an onboard compare block that compares the value with a range defined by upper and lower threshold values.

Items in the *Compare settings* parameter set are:
- *communication mode*—The mode selection indicates whether the thresholds are set at run time (*By output data*) or at configuration time (*By setting*).
- *upper and lower threshold values*—Thresholds are applicable only when the selected communications mode is *By setting*.

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of each parameter in the *Compare settings* parameters set.

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Communication Mode

The counter will implement threshold values sent from the fieldbus master or those configured by the user, according to the selected communication mode:
- *By output data* (default)—When selected, the module uses the threshold values set by the fieldbus master. These values are stored in the upper and lower threshold registers of the process image. Threshold values set in this manner are *flexible*, meaning the user can change the values while the counter module is running.
- *By setting*—When selected, the module uses the user-configured values for the upper and lower thresholds. Values set at configuration can not be changed while the counter is running.

To access the communications mode parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA1
Index (high byte)	0x24
Sub-index	1
Data Byte 1	0 for By setting 1 for By output data

Threshold Values

The upper threshold and lower threshold values used by the output function blocks are represented by unsigned integers in the 0 (default) to 65535 range. The module will use the user-defined values set in these parameters when the selected communication mode is *By setting*. The parameters are:
- upper threshold value
- lower threshold value

> **Note:** The *upper threshold value* has other functions in the one-shot (see *p. 662*) and modulo (see *p. 667*) modes. Refer to the discussion about those modes for further information.

The threshold value parameters are represented as an unsigned 16-bit number. To access these parameters using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0xA1
Index (high byte)	0x24
Sub-index	2 for upper threshold value 3 for lower threshold value
Data Byte 1	0 to 65535

STB EHC 3020 Input Settings

Functional Characteristics

Items in the *Input settings* parameter set are used to configure the characteristics of the bounce numerical filter for inputs IN A and IN B.

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of each parameter in the *Input settings* parameters set.

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

Note: Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Bounce Numerical Filter

Inputs IN A and IN B can be independently configured to have an input bounce filter (see *p. 634*) for contact closure inputs.

You can set the bounce numerical parameter with the Advantys configuration software. The bounce filter time is the same for both channels. Note that setting the bounce filter time alone does not enable the filter.

There are two available values for the bounce filter time:
- 400 µs
- 1.2 ms

To access the bounce numerical filter parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA2
Index (high byte)	0x24
Sub-index	1
Data Byte 1	0 for 400 µs 1 for 1.2 ms

You can independently activate or deactivate the bounce filter for IN A or IN B. There are two available states for each input:
- *Active*—bounce filter enabled for the input
- *Inactive* (default)—bounce filter disabled for the input

To access the Input A and Input B filter parameters using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA2
Index (high byte)	0x24
Sub-index	2 for IN A 3 for IN B
Data Byte 1	0 for Inactive 1 for Active

STB EHC 3020 Output Function Block Settings

Functional Characteristics

The configurable parameters in the *Output function settings* block are used to control the module's two digital outputs.

Each of the two output function blocks (see *p. 645*) operates on the 16-bit current value. Output function block 1 controls output OUT1 while output function block 2 controls output OUT2.

Using the Run-time Parameters (see *p. 859*) (RTP) feature in your NIM, you can access the value of the output function and pulse width parameters.

Refer to the Advanced Configuration chapter in your NIM manual for general information on RTP.

> **Note:** Standard NIMs with firmware version 2.0 or higher support RTP. RTP is not available in Basic NIMs.

Output Functions

Each output function behaves in one of 12 ways that you can select with the Advantys configuration software:

- *Off*—No direct action. The function block is not enabled.
- *Counter low*—The function block output is set when the current value is less than the lower threshold value.
- *Counter in window*—The function block output is set when the current value is greater than or equal to the lower threshold and less than or equal to the upper threshold
- *Counter high*—The function block output is set when the current value is greater than the upper threshold value.
- *Pulse=Less than LT*—The function block output generates a pulse when the current value is decreasing and becomes less than the lower threshold value.
- *Pulse=Greater than LT*—The function block output generates a pulse when the current value is increasing and becomes greater than or equal to the lower threshold value.
- *Pulse=Less than UT*—The function block output generates a pulse when the current value is decreasing and becomes less than or equal to the upper threshold value.
- *Pulse=Greater than UT*—The function block output generates a pulse when the current value is increasing and becomes greater than the upper threshold value.
- *Counter stop*—The function block output is set when the counter run bit in the counter status register is not set (one-shot mode (see *p. 662*) only).
- *Counter run*—The function block output is set when the counter run bit in the counter status register is set (one-shot mode (see *p. 662*) only).
- *Capture low*—The function block output is set when the capture value is less than the lower threshold value (modulo mode (see *p. 667*) only).

- *Capture in window*—The function block output is set when the capture value is greater than or equal to the lower threshold and less than or equal to the upper threshold (modulo mode (see *p. 667*) only).

To access an output function parameter using RTP, write the following values to the RTP request block:

Length	1
Index (low byte)	0xA3
Index (high byte)	0x24
Sub-index	1 for OUT1 3 for OUT2
Data Byte 1	0 for Off 1 for Counter Low 2 for Counter in Window 3 for Counter High 4 for Pulse=Less than LT 5 for Pulse=Greater than LT 6 for Pulse=Less than UT 7 for Pulse= Greater than UT 8 for Counter stop 9 for Counter run 10 for Capture low 11 for Capture in window

Pulse Width

If you choose one of the pulse generating blocks, you can independently configure the pulse width for each output. The minimum pulse width is 1 (1 ms) and the maximum pulse width value is 65535 (in 1 ms increments).

Your selection independently controls the pulse width of one of the output function blocks:
- pulse width 1—applied to output OUT1 (default = 10 ms)
- pulse width 2—applied to output OUT2 (default = 10 ms)

These parameters apply when you select an output function in which the result is a pulse output (Pulse = Less than LT, Pulse = Greater than LT, Pulse = Less than UT, Pulse = Greater than UT).

The pulse width parameter is represented as an unsigned 16-bit number. To access it using RTP, write the following values to the RTP request block:

Length	2
Index (low byte)	0xA3
Index (high byte)	0x24
Sub-index	2 for OUT1 4 for OUT2
Data Byte 1	1 to 65535

STB EHC 3020 Output Settings

Functional Characteristics

The STB EHC 3020 counter module supports the transmission of output data to two 24 VDC field actuators. Using the Advantys configuration software, you can customize the following operating parameters:

- the module's response to fault recovery
- *logic normal* or *logic reverse* output polarity for each channel on the module
- a fallback mode and state for each channel on the module

Fault Recovery Responses

If a short circuit is detected on one of the output channels, the module will do one of the following:

- automatically latch off the channel, or
- latch off and attempt to automatically recover and resume operation on the channel when the fault is corrected

The factory default setting is *latched off*, where the module latches off an output channel that is on if it detects a fault. A latched off output channel remains off until you reset it explicitly.

If you want to set the module to *auto-recover* when the fault is corrected, you need to use the Advantys configuration software to set this parameter to *auto-recover*.

The fault recovery mode is set at the module level; you cannot configure one channel to *latched off* and the other to *auto-recover*. Once the module is operational, an output channel on which a fault has been detected implements the specified recovery mode. The other healthy channel continues to operate.

Resetting a Latched-off Output

When an output channel has been latched off because of fault detection, it does not recover until two things happen:

- the error has been corrected
- you explicitly reset the channel

To reset a latched-off output channel, you must send it a value of 0. The 0 value resets the channel to a standard off condition and restores its ability to respond to control logic (turn on and off). If the output channel polarity is configured for logic reverse, you must send a value of 1 to perform this reset action. Provide the reset logic in your application program.

> **Note:** When resetting a latched-off output, a minimum delay of 10 seconds occurs before the fault is cleared.

Auto-recovery

When the module is configured to auto-recover, a channel that has been turned off because of fault detection starts operating again as soon as the fault is corrected. No user intervention is required to reset the channels. If the fault was transient, the channel may reactivate itself without leaving any history of the short circuit having occurred.

Note: During auto-recovery, a minimum delay of 10 seconds occurs before the fault is cleared.

Output Polarity

By default, the polarity on both output channels is *logic normal*, where:

- an output value of 0 indicates that the physical actuator is off (or the output signal is low)
- an output value of 1 indicates that the physical actuator is on (or the output signal is high)

The output polarity on one or both channels may optionally be configured for *logic reverse*, where:

- an output value of 1 indicates that the physical actuator is off (or the output signal is low)
- an output value of 0 indicates that the physical actuator is on (or the output signal is high)

To change an output polarity parameter from the default to reverse or back to the normal from reverse, you need to use the Advantys configuration software.

You can configure the output polarity on each output channel independently:

Step	Action	Result
1	Double-click on the STB EHC 3020 module you want to configure in the island editor.	The selected STB EHC 3020 module opens in the software module editor.
2	Expand the settings by clicking on the + sign next to *Output settings* in the *Parameter name* column.	*Polarity* is now visible under *Output settings*.
3	Expand the settings by clicking on the + sign next to *Polarity* in the *Parameter name* column.	Rows for *Channel 1* and *Channel 2* appear under *Polarity*.
4a	To change the settings at the module level, select the integer that appears in the *Value* column of the *Polarity* row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have *logic normal* polarity and 3 means that both channels have *logic reverse* polarity.	When you select the *Polarity* value, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new value for *Polarity*, the values associated with the channels change. For example, if you choose an output polarity value of 2, *Channel 1* has logic normal polarity and *Channel 2* has logic reverse polarity.
4b	To change the settings at the channel level, double-click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the *Polarity* row changes. For example, if you set channel 1 to *Normal* and channel 2 to *Reverse*, the *Polarity* value changes to 2.

Fallback Modes

The output channels have a predefined, known state to which they go when the module goes out of service (for example, when communications are lost). This is known as the channel's *fallback state*. You may configure fallback states for each channel individually. Fallback configuration is accomplished in two steps:

- first by configuring fallback modes for each channel
- then (if necessary) configuring the fallback states

All output channels have a fallback mode—either *predefined state* or *hold last value*. When a channel has *predefined state* as its fallback mode, it can be configured with a fallback state, either 1 or 0. When a channel has *hold last value* as its fallback mode, it stays at its last known state when communication is lost— it cannot be configured with a predefined fallback state.

By default, the fallback mode for both channels is the *predefined state*. To change the fallback mode to *hold last value*, use the Advantys configuration software:

Step	Action	Result
1	Double-click on the STB EHC 3020 module you want to configure in the island editor.	The selected STB EHC 3020 module opens in the software module editor.
2	Expand the *+ Output settings* fields by clicking on the + sign.	*Fallback mode* is now visible under *Output settings*.
3	Expand the *+ Fallback mode* row further by clicking on the + sign.	Rows for *Channel 1* and *Channel 2* appear under *Fallback mode*.
4a	To change the settings *at the module level*, select the integer that appears in the *Value* column of the *Fallback mode* row and enter a hexadecimal or decimal integer in range 0 to 3, where 0 means both channels adopt the *hold last value* setting, and 3 means that both channels go to a *predefined state*.	When you select the *Fallback mode* value, the max./min. values of the range appear at the bottom of the module editor screen. When you accept a new value for *Fallback mode*, the values associated with the channels change. For example, if you configure a fallback mode value of 2, *Channel 1* is *hold last value* and *Channel 2* is *predefined state*.
4b	To change the settings *at the channel level*, double click on the channel values you want to change, then select the desired settings from the pull-down menu.	When you accept a new value for a channel setting, the value for the module in the *Fallback mode* row changes. For example, if you set *Channel 1* to *hold last value* and *Channel 2* to *predefined*, the *Fallback mode* value changes to 2.

Fallback States

If an output channel's fallback mode is *predefined state*, you may configure that channel to either turn on or turn off when communication between the module and the fieldbus master is lost. By default, both channels are configured to go to 0 as their fallback states:

- If the output polarity of a channel is *logic normal*, 0 indicates that the predefined fallback state of the output is *off*.
- If the output polarity of a channel is *logic reverse*, 0 indicates that the predefined fallback state of the output is *on*.

> **Note:** If an output channel has been configured with *hold last value* as its fallback mode, any value that you try to configure as a *Predefined Fallback Value* is ignored.

To modify a fallback state from the *hold last value* setting, or to revert back to the default from an on setting, use the Advantys configuration software:

Step	Action	Result
1	Make sure that the *+ Fallback mode* value for the channel you want to configure is *1* (*Predefined state*).	If the *+ Fallback mode* value for the channel is *0* (hold last value), any value entered in the associated *Predefined fallback* value row is ignored.
2	Expand the *+ Predefined fallback* value row further by clicking on the + sign.	Rows for channel 1 and channel 2 appear.
3a	To change a setting *at the module level*, select the integer that appears in the *Value* column of the *Fallback mode* row and enter a hexadecimal or decimal integer in the range 0 to 3, where 0 means both channels have 0 as their predefined fallback value and 3 means that both channels have 1 as their predefined fallback value.	When you select the value associated with *Predefined fallback value*, the max/min values of the range appear at the bottom of the module editor screen. When you accept a new *Predefined fallback value*, the values associated with the channels change. For example, suppose that the fallback mode for both channels is *predefined state* and the polarity setting for each channel is *logic normal*. If you configure a value of 2 as the *Predefined fallback value*, *Channel 2* will have a fallback state of 1 (actuator on) and *Channel 1* will have a fallback state of 0 (actuator off).
3b	To change a setting *at the channel level*, double click on the channel values you want to change, then select the desired setting from the pull-down menu. You can configure a fallback state of either 0 or 1 for each channel on the module.	When you accept a new value for a channel setting, the value for the module in the *Fallback mode* row changes. For example, if you configure channel 2 to 1 and leave channel 1 on 0, the *Predefined fallback* value changes from 0 to 2.

9.5 STB EHC 3020 Process Image

STB EHC 3020 Data and Status for the Process Image

Representing Input and Output Data

The STB EHC 3020 sends a representation of its operating state to the NIM. The NIM stores this information in 16-bit Modbus registers. The NIM keeps a record of input and output data for the STB EHC 3020 in separate blocks in the process image. This information indicates the operating state of the module. The data used to update the module is written to and read from the NIM by the fieldbus master. The information in the input and output status blocks is provided by the module itself.

The information in the process image can be monitored by the fieldbus master or, if you are not using a basic NIM, by an HMI panel connected to the NIM's CFG port. The specific Modbus registers used by the STB EHC 3020 module are based on its physical location on the island bus.

Input Process Image Data Registers

The input data process image is part of a block of 4096 Modbus registers (in the range 45392 through 49487) reserved in the NIM's memory. Each input module on the island bus is represented in this data block.

The input data for the STB EHC 3020 module is represented by six contiguous registers in this block:
- I/O data
- I/O status
- counter status
- compare status
- current value
- capture value

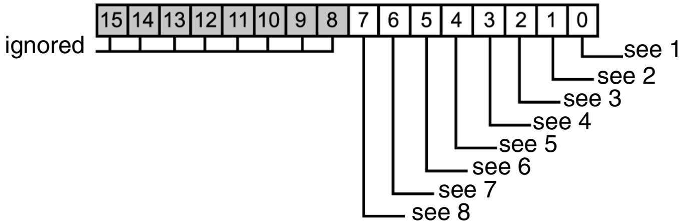
These registers are discussed individually below.

Note: The data format illustrated below is common across the island bus, regardless of the fieldbus on which the island is operating. The data is also transferred to and from the master in a fieldbus-specific format. For fieldbus-specific descriptions, refer to one of the Advantys STB Network Interface Module Application Guides. Separate guides are available for each supported fieldbus.

I/O Data

The first STB EHC 3020 register in the input block of the process image is the I/O data register. The four least significant bits (LSBs) in this register indicate the status of the physical inputs to the module. The next 4 bits represent an echo of the output data:

STB EHC 3020 I/O Data Register



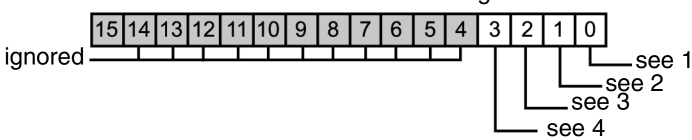
1 input IN A—Input IN A is on when this bit is set.
2 input IN B—Input IN B is on when this bit is set.
3 input EN—Input EN is on when this bit is set.
4 input RST—Input RST is on when this bit is set.
5 echo output 1—Output OUT1 is on when this bit is set (echo data).
6 echo output 2—Output OUT2 is on when this bit is set (echo data).
7 output function 1 result—the result of the function when the function enable bit is set (otherwise 0)
8 output function 2 result—the result of the function when the function enable bit is set (otherwise 0)

Note: If reverse polarity is on, the output will be the opposite of the echo bits. These bits can come from the direct bits (see direct bit) or from the outputs of a function block.

I/O Status

The second STB EHC 3020 register in the input block of the process image is the I/O status register. The four LSBs indicate whether a fault has been reported in the module's onboard error input filtering and short-circuit power protection. The fault might be field power absent or a short circuit on the island's sensor bus:

STB EHC 3020 I/O Status Register

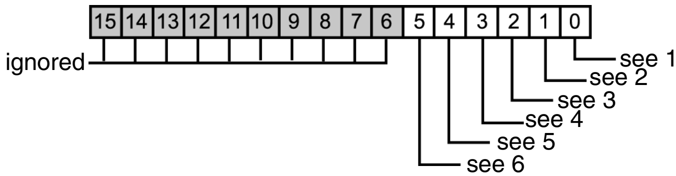


1 There is a short circuit in OUT1 when this bit is set.
2 There is a short circuit in OUT2 when this bit is set.
3 sensor power fault—24 VDC power is off or shorted when this bit is set.
4 actuator power fault—24 VDC power is off or shorted when this bit is set.

Counter Status

The third STB EHC 3020 register in the input block of the process image is the counter status register. The six LSBs in this register indicate the status of the counting function of the module:

STB EHC 3020 Counter Status Register



1 run—The counter is running when this bit is set (one-shot counting mode only)

2 modulo event—A modulo event has occurred when this bit is set. This bit remains set until it is explicitly reset by the user using Reset Sync and modulo bit in the direct register (modulo (loop) counting mode only). (See the direct register elsewhere in this topic.)

3 sync event—A sync event has occurred when this bit is set. This bit remains set until it is explicitly reset by the user using Reset Sync and modulo bit. (See the direct register elsewhere in this topic.) This bit is available only in the one-shot and module counting modes.

4 validity bit—The counter value is valid when this bit is set. In all modes, the validity bit turns off when sensor power is off. Refer to the functional description for a particular counting mode for more information about the behavior of the validity bit. (See note below.)

5 upper limit count—This bit is set when current value is above 65535 (16-bit register limit overflow). This bit is used in frequency, event counting, period evaluation, and up and down counting modes.

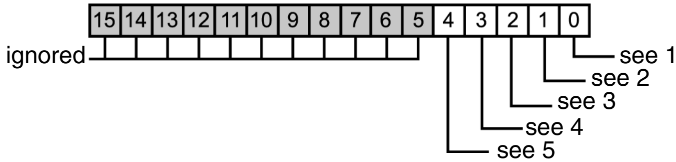
6 lower limit count—This bit is set when current value is below 0. This bit is only used in the up and down counting mode.

> **Note:** When the validity bit is high, data in the current value and compare status registers have valid values. Capture could be done in modulo mode using the sync input. Your application program should not use the counter current value and the compare status register values when the validity bit is low.

Compare Status

The fourth STB EHC 3020 register in the input block of the process image is the compare status register. The five LSBs in this register indicate the status of the compare function of the module:

STB EHC 3020 Compare Status Register



1 counter low—The current value is below the lower threshold value when this bit is set.
2 counter in window—The counter value is greater than or equal to the lower threshold and less than or equal to the upper threshold when this bit is set.
3 counter high—The current value is above the upper threshold value when this bit is set.
4 capture low—The capture value is below the lower threshold value when this bit is set (modulo mode only).
5 capture in window—The capture value is greater than or equal to the lower threshold and less than or equal to the upper threshold when this bit is set (modulo mode only).

Current Value

The fifth STB EHC 3020 register in the input block of the process image is the current value register. The current value is stored in this 16-bit unsigned data register. The updating of this register is dependent upon the selected counting mode.

Capture Value

The sixth STB EHC 3020 register in the input block of the process image is the capture value register. This 16-bit unsigned value represents the counter value at synchronization. This value is always sent to the process image, but is only applicable in the modulo (loop) counting (see *p. 667*) mode.

Output Process Image Data Registers

The NIM keeps a record of output data in a separate block of registers in the process image. The output data process image is part of a block of 4096 Modbus registers (in the range 40001 through 44096) that represent the data returned by the fieldbus master. Each output module on the island bus is represented in this data block.

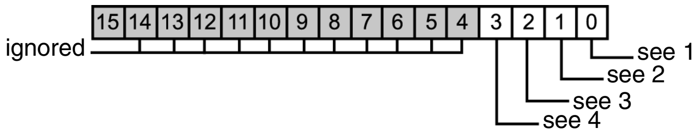
The output data for the STB EHC 3020 module is represented by five contiguous registers in this block:
- output data
- input validation
- direct
- upper threshold
- lower threshold

These registers are discussed individually below.

Output Data

The first STB EHC 3020 register in the output block of the process image is the output data register. The four LSBs indicate the most current on/off states of the module's two output channels and their corresponding enable bits:

STB EHC 3020 Output Data Register



1 output 1—Output OUT1 is on when the fieldbus master sets this bit.
2 output 2—Output OUT2 is on when the fieldbus master sets this bit.
3 output function 1 enable—Output function 1 is enabled when the fieldbus master sets this bit.
4 output function 2 enable—Output function 2 is enabled when the fieldbus master sets this bit.

> **Note:** If reverse polarity is configured, outputs OUT1 and OUT2 are off (or disabled) when the corresponding bit is set.

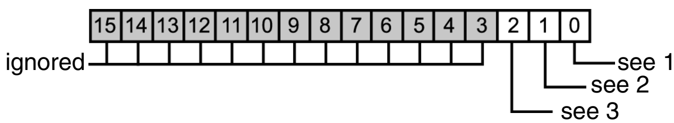
> **Note:** When using the output blocks, make sure that the fieldbus master is not currently controlling the outputs in the output data register (see *p. 704*).

Input Validation

The second STB EHC 3020 register in the output block of the process image is the input validation register. When a physical input is used for IN B, EN, or RST, the fieldbus master must set a corresponding input validation bit in this register. Do not set the corresponding direct bit if you set the validation bit.

The three LSBs indicate the most current on/off states of three of the module's four input channels:

STB EHC 3020 Input Validation Register

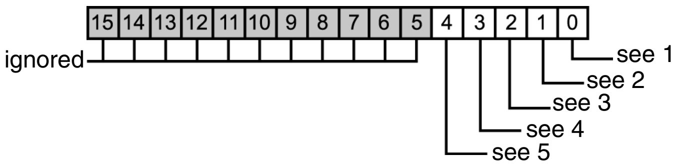


1 input validation IN B (sync)—input validation bit for input IN B (sync) (this bit is not required for the up-down counting mode)
2 input validation enable—input validation bit for input EN
3 input validation reset—input validation bit for input RST

Direct

The third STB EHC 3020 register in the output block of the process image is the direct register. Data in this register is sent by the fieldbus master. The first three bits correspond to the input bits IN B, EN, and RST. You can use these three bits if you want to control IN B (sync), EN, and RST with the fieldbus master instead of with the input channel. Do not set the corresponding validation bit if you use the direct bit. The four LSBs are defined as follows:

STB EHC 3020 Direct Register



1 counter sync—The counter is synchronized on the rising edge of this bit. Unlike the hardware input IN B, this bit only operates on the rising edge.
2 counter enable—The counter is enabled while this bit is high.
3 counter reset—In up and down counting mode, the current value is set to a preset value and the counter starts counting. Upper and lower limit count bits are also reset on the rising edge of this bit.
4 compare enable—The output functions are enabled when the fieldbus master sets this bit and disabled when this bit is not set.
5 reset sync and modulo—On the rising edge of this bit, the sync and modulo event bits are reset.

Upper Threshold

The fourth STB EHC 3020 register in the output block of the process image holds the upper threshold value. It is a 16-bit unsigned value that is controlled by the fieldbus master. In order for the counter to use this value, the communication mode must be set to *by output data*. This word has a different meaning in the one-shot (see *p. 663*) and modulo (see *p. 667*) counting modes

Lower Threshold

The last STB EHC 3020 register in the output block of the process image holds the lower threshold value. It is a 16-bit unsigned value that is controlled by the fieldbus master. In order for the counter to use this value, the communication mode must be set to *by output data*.

Advantys STB Bus Extension Modules

10

At a Glance

Overview

This chapter provides a overview of the bus extension capabilites of an Advantys STB island bus and detailed descriptions of the extension modules that support these capabilities. Extension cables are also described.

What's in this Chapter?

This chapter contains the following sections:

10.1 The STB XBE 1000 End of Segment Module

At a Glance

Introduction

To place I/O modules in Advantys STB segments, you must extend the island bus between the segments. The island bus extension cable runs from the end of segment (EOS) module at the end of one segment to the beginning of segment (BOS) module at the beginning of the next segment.

This section provides you with a detailed description of the Advantys STB XBE 1000 end of segment (EOS) module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

This section contains the following topics:

STB XBE 1000 Physical Description

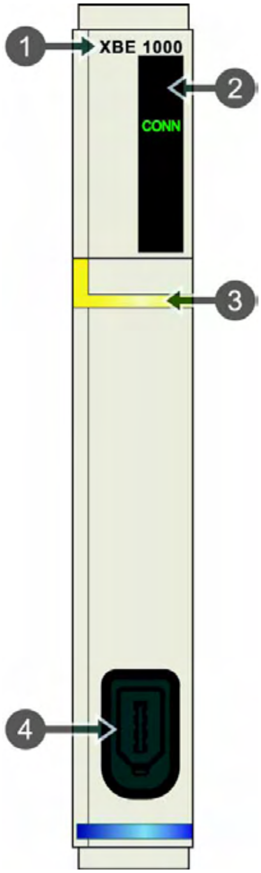
Physical Characteristics

The STB XBE 1000 island bus extension module is designed to mount in the last position in an island segment. The EOS module is connected to the next segment (or to a preferred module) via an STB XCA island bus extension cable.

The yellow stripe below the LED array on the front panel indicates that it is an STB *island bus communications* module.

Front Panel View

The following figure shows a front view of the module mounted on an I/O base:



1 model name
2 LED array
3 yellow identification stripe, indicating an STB island bus communications module
4 island bus communications output connection

Module Dimensions

The STB XBE 1000 EOS module has the following dimensions:

width	on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with extension cable inserted)

The STB XBE 1000 EOS module mounts in the STB XBA 2400 size 2 base.

Note: The STB XBA 2400 size 2 base is specifically designed for use with the EOS module only. Do not attempt to use any other size 2 Advantys modules (like I/O, PDM, or B0S modules) with the STB XBA 2400 base.

Extension Cables

Cables that extend the island bus between the EOS and the BOS are available in five lengths:

Cable Model	**Cable Length**
STB XCA 1001	0.3 m (1 ft)
STB XCA 1002	1.0 m (3.3 ft)
STB XCA 1003	4.5 m (14.8 ft)
STB XCA 1004	10 m (33 ft)
STB XCA 1005	14 m (46 ft)

An island bus extension cable carries the island bus communications signals and the bus addressing line.

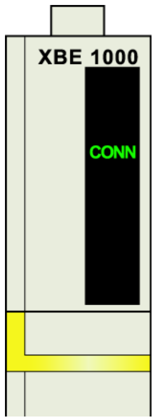
STB XBE 1000 LED Indicators

Purpose

The CONN LED on the STB XBE 1000 end of segment module is a visual indication of the operating status of the module. The LED location and its meanings are described below.

Location

The CONN LED is positioned at the top of the module. The figure below shows its location:



Indications

The following table defines the meaning of the CONN LED:

CONN (green)	Meaning
on	healthy connection between the BOS and either an EOS or a preferred module
off	bad connection between the BOS and either an EOS or a preferred module

STB XBE 1000 Functional Description

Introduction

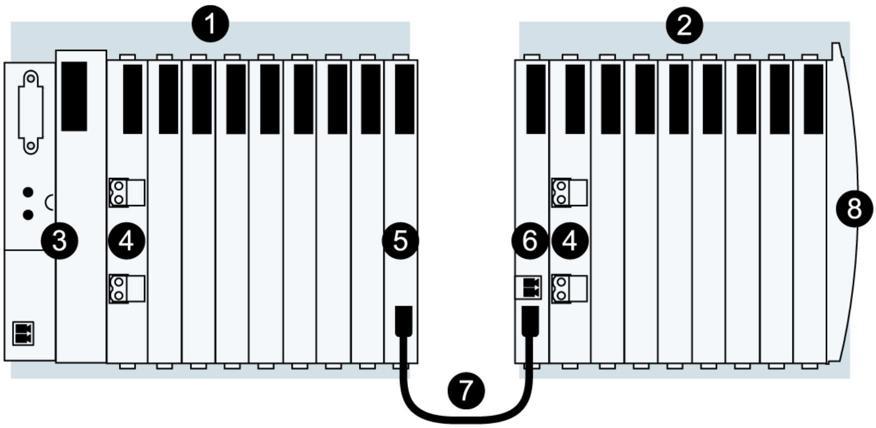
This topic covers the functional characteristics of the STB XBE 1000 EOS module.

Island Bus Addresses

The EOS and BOS modules are not addressable. They simply pass data and addressing information along the island bus. That is, island bus addresses are assigned sequentially to all addressable STB I/O modules on the island bus as if they were on the same segment.

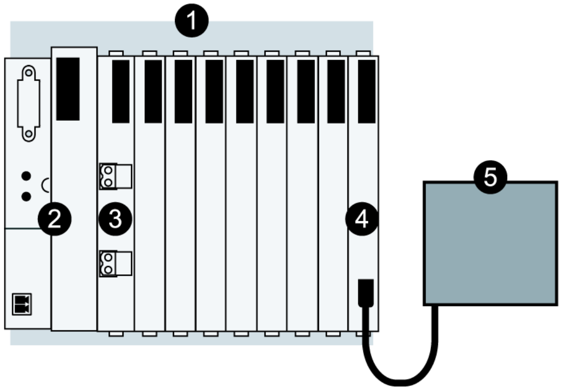
Communications Connection

The STB XCA 100*x* island bus extension cable connects two STB island segments. One end of the cable plugs in to the island bus communications output port on the front panel of the EOS module (at the end of one island segment). The other end of the extension cable plugs in to the island bus communications input port on the front panel of the BOS module (at the beginning of the next segment):



1 primary island segment
2 extension segment
3 network interface module (NIM)
4 power distribution module (PDM)
5 STB XBE 1000 EOS module
6 STB XBE 1200 BOS module
7 STB XCA 100x extension cable
8 island bus termination plate

The STB XBE 1000 EOS module can also be connected to a preferred module:



1 island segment
2 network interface module
3 power distribution module
4 STB XBE 1000 EOS module
5 preferred module

Note: Power for the preferred module must be supplied in accordance with the manufacturer's specifications. If the preferred device is the last module on the island bus, the island bus must be terminated at the device.

Configurable Parameters

There are no configurable parameters for the STB XBE 1000 EOS module.

STB XBE 1000 Module Specifications

General Specifications

The STB XBE 1000 module's general specifications are described in the following table.

General Specifications		
dimensions	width (on a base)	18.4 mm (0.72 in)
	height (unassembled)	125 mm (4.92 in)
	height (on a base*)	128.25 mm (5.05 in)
	depth (unassembled)	65.1 mm (2.56 in)
	depth (on a base*)	75.5 mm (2.97 in) worst case (with screw clamp connectors)
base	STB XBA 2400	
interface connection	island bus extension output port (with card edge connections)	
hot swapping support	none	
nominal logic power current consumption	25 mA	

10.2 The STB XBE 1200 Beginning of Segment Module

At a Glance

Introduction

To place I/O modules in Advantys STB segments, you must extend the island bus between the segments. The island bus extension cable runs from the end of segment (EOS) module at the end of one segment to the beginning of segment (BOS) module at the beginning of the next segment.

This section provides you with a detailed description of the Advantys STB XBE 1200 beginning of segment (BOS) module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

This section contains the following topics:

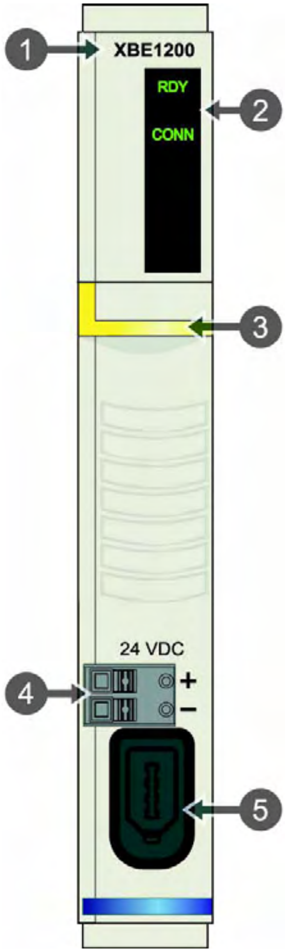
STB XBE 1200 Physical Description

Physical Characteristics

The STB XBE 1200 beginning of segment (BOS) module is designed to mount in the first position in an extension segment. The module is connected to the previous segment (or to a preferred module) via an STB XCA island bus extension cable. The STB XBE 1200 BOS module contains a built-in power supply that produces 5 VDC logic power for the modules in the extension segment.

The yellow stripe below the LED array on the front panel indicates that the BOS module is an *STB island bus communications* module.

Front Panel View The following figure shows a front view of the module mounted on an I/O base:



1 model name
2 LED array
3 yellow identification stripe, indicating an STB island bus communications module
4 power supply interface
5 island bus communications input connection

Module Dimensions

The STB XBE 1200 BOS module has the following dimensions:

width	on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with extension cable inserted)

The STB XBE 1200 BOS module mounts in the STB XBA 2300 size 2 base.

Note: The STB XBA 2300 size 2 base is specifically designed for use with the BOS module only. Do not attempt to use any other size 2 Advantys modules (like I/O, PDM, or E0S modules) with the STB XBA 2300 base.

Extension Cables

Cables that extend the island bus between the EOS and the BOS (or preferred module) are available in five lengths:

Cable Model	Cable Length
STB XCA 1001	0.3 m (1 ft)
STB XCA 1002	1.0 m (3.3 ft)
STB XCA 1003	4.5 m (14.8 ft)
STB XCA 1004	10 m (33 ft)
STB XCA 1005	14 m (46 ft)

An island bus extension cable carries the island bus communications signals and the bus addressing line.

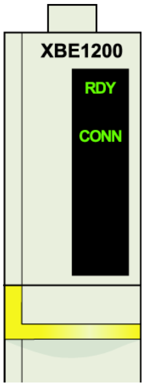
STB XBE 1200 LED Indicators

Purpose

The two LEDs on the STB XBE 1200 beginning of segment module are visual indications of the operating status of the module. The LED locations and their meanings are described below.

Location

The two LEDs are positioned at the top of the module. The figure below shows their locations:



Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern for the associated LED doesn't matter):

RDY (green)	CONN (green)	Meaning
on		logic power OK
off		logic power not OK
	on	healthy connection between the BOS and either an EOS or a preferred module
	off	bad connection between the BOS and either an EOS or a preferred module

STB XBE 1200 Functional Description

Introduction

This topic covers the functional characteristics of the STB XBE 1200 BOS module.

Integrated Power Supply

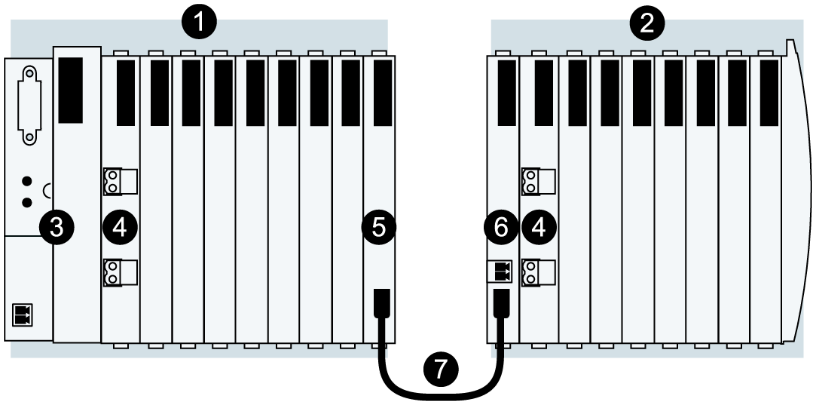
The BOS has a built-in 24-to-5 VDC power supply that provides logic power only to the I/O modules on the extension segment of the island bus. The power supply requires a 24 VDC external power source. It converts the 24 VDC to 5 V of logic power, providing 1.2 A of current to the island. Individual STB I/O modules in an island segment generally draw a current load of between 50 and 90 mA. If the current drawn by the I/O modules on the extension segment totals more than 1.2 A, additional STB power supplies need to be installed to support the load.

Island Bus Addresses

The EOS and BOS are not addressable. They simply pass data and addressing information along the island bus. That is, island bus addresses are assigned sequentially to all addressable STB I/O modules on the island bus as if they were on the same segment.

Communications Connection

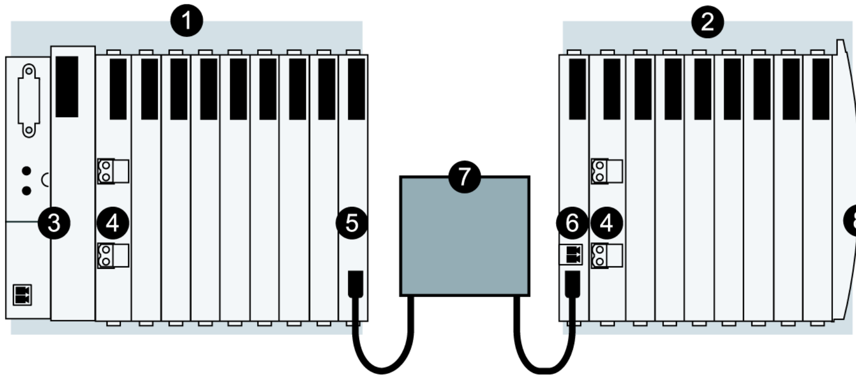
The STB XCA 100*x* island bus extension cable connects two STB island segments. One end of the cable plugs in to the island bus communications output port on the front panel of the EOS module (at the end of one island segment). The other end of the extension cable plugs in to the island bus communications input port on the front panel of the BOS module (at the beginning of the next segment):



1 primary island segment
2 extension segment
3 network interface module (NIM)
4 power distribution module (PDM)
5 STB XBE 1000 EOS module
6 STB XBE 1200 BOS module
7 STB XCA 100x extension cable

Note: As the figure shows, you must install a PDM module to the right of the BOS module for each island bus extension segment.

The STB XBE 1200 BOS module can also be connected to the island bus through a preferred module:



1 primary island segment
2 extension segment
3 network interface module
4 power distribution module
5 STB XBE 1000 EOS module
6 STB XBE 1200 BOS module
7 preferred module
8 island bus termination plate

> **Note:** As the figure shows, you must install a PDM module to the right of the BOS module for each island bus extension segment. Power for the preferred module must be supplied in accordance with the manufacturer's specifications.

Configurable Parameters

There are no configurable parameters for the STB XBE 1200 BOS module.

STB XBE 1200 Module Specifications

General Specifications

The STB XBE 1200 module's general specifications are described in the following table.

General Specifications		
dimensions	width (on a base*)	18.4 mm (0.72 in)
	height (unassembled)	125 mm (4.92 in)
	height (on a base*)	128.25 mm (5.05 in)
	depth (unassembled)	65.1 mm (2.56 in)
	depth (on a base*)	75.5 mm (2.97 in) worst case (with screw clamp connectors)
base	STB XBA 2300	
interface connections	island bus extension input port (with card edge connections)	
	to the external 24 VDC power supply	two-receptacle
built-in power supply	input voltage	24 VDC nominal
	input power range	19.2 ... 30 VDC
	internal current supply	400 mA @ 24 VDC, consumptive
	output voltage to the island bus	5 VDC
		2% variation due to temperature drift, intolerance, or line regulation
		1% load regulation
		$\leq$50 mΩ output impedance up to 100 kHz
	output current rating	1.2 A @ 5 VDC
	isolation	The BOS provides isolation (500 VAC test voltage) between the 24V DC and the Island internal 5V.
hot swapping support	none	

10.3 STB XBE 2100 CANopen Extension Module

At a Glance

Overview

This section provides a detailed description of the Advantys STB XBE 2100 CANopen extension module—its functions, physical design, technical specifications, field wiring requirements, and configuration options.

What's in this Section?

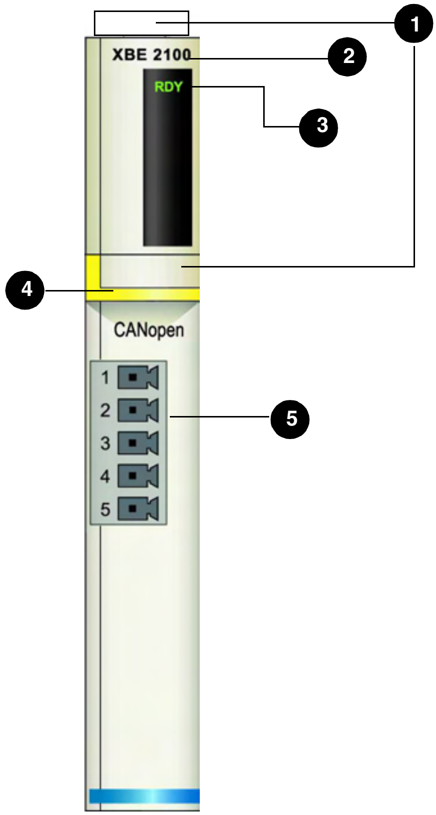
This section contains the following topics:

STB XBE 2100 Physical Description

Physical Characteristics

The STB XBE 2100 is an Advantys STB island bus extension module that lets you add standard CANopen devices to your island configuration. If you want to use standard V4 CANopen devices, you need to use one STB XBE 2100 module in the last STB module on the last segment of the island bus followed by an STB XMP 1100 terminator plate. The module mounts in a size 2 I/O base. A five-terminal connection receptacle is provided to support a CANopen cable connection to the standard CANopen devices.

Front Panel View



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED indicator
4 yellow identification stripe, indicating a bus extension module
5 five-pin connection for the CANopen extension cable

Module Accessories

Required

- an STB XBA 2000 I/O base
- one five-terminal connector, either an STB XTS 1110 screw type connector or an STB XTS 2110 spring clamp connector
- a standard CANopen cable that connects the STB XBE 2100 module to the CANopen devices

Optional

Also available as options are two keying pin kits. You may use keying pins to facilitate the installation of modules into the correct bases, and connectors into the correct receptacles. The keying kits are:

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit for inserting the module into the base
- the STB XMP 7800 keying pin kit for inserting the cable connector into the module

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Special Termination Considerations

A CANopen extension is treated as a sub-net on the island bus, and it must be terminated on both ends. CANopen sub-net termination is independent of the island's normal termination. The STB XBE 2100 module has built-in termination, and needs to be used at one end of the extension sub-net. You must provide termination at the last standard CANopen device on the extension.

Module Dimensions

width	module on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base	75.5 mm (2.97 in)

STB XBE 2100 LED Indicator

Purpose

The LED on the STB XBE 2100 module provides a visual indication of the operating status of the module. The LED location and its meaning is described below.

Location

The LED is positioned on the top front of the STB XBE 2100 module, as shown in the figure below:

Indications

When the LED is off, the module is either not receiving logic power from the NIM or the BOS module or it has failed.

When the LED is on, the module has power and is operational.

Making the CANopen Cable Connection

Summary

The STB XBE 2100 module provides one five-terminal connector for the CANopen extension cable. You are responsible for the extension cable. The choices of connector types and field wire types are described below, and some cable design and connection considerations are presented.

Connectors

Use either an STB XTS 1110 screw type connector (available in a kit of 20) or an STB XTS 2110 spring clamp connector (also available in a kit of 20) as the connection for the CANopen extension cable and the STB XBE 2100 module. These connectors each have five connection terminals, with a 5.08 mm (0.2 in) pitch between each pin.

You need to make a connection on the other end of the extension cable that matches the connector on your standard CANopen device.

CANopen Device Requirements

The STB XBE 2100 module supports a maximum of 12 standard CANopen devices on an island bus. The required characteristics of the standard CANopen devices are described on *p. 736*.

You must provide separate power sources as required to support the standard CANopen devices. These devices must operate at 500 kbaud, and you must make sure that their baud settings as well as their node addresses are set correctly on the physical devices. These operating values cannot be set via the Advantys configuration software.

> **Note:** When you use a CANopen extension, make sure that you do not auto-configure the island. Standard CANopen devices are not recognized in an auto-configured system. Auto-configuration also resets the baud rate to 800 kbaud, and an island bus with a CANopen extension must operate at 500 kbaud.

Cable Requirements

The cable between the STB XBE 2100 extension module and a standard CANopen device, or between two CANopen extension devices, must meet the recommendations defined in CiA specification DR303-1. Cable with a resistance of 70 mW/m and a cross section of 0.25 ... 0.34 mm is recommended.

Note: A CANopen extension on an island bus must be separately terminated at the beginning and at the end. The STB XBE 2100 CANopen extension module has built-in termination for the beginning of the CANopen extension. You must provide termination at the last CANopen device on the extension. Make sure that you connect your cables in a way that assures that the STB XBE 2100 is always the first module on the extension sub-net.

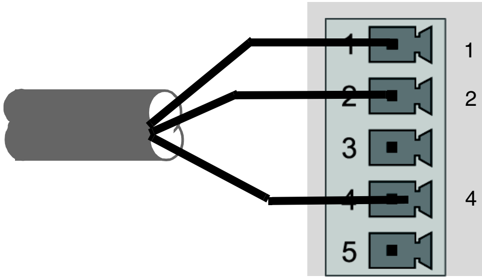
Cable Pinout

The following table describes the pinout of the five-terminal connector that plugs into the STB XBE 2100 module. Three signals are required to connect this module to a standard CANopen device. An optional shield connection is also provided:

Pin	Connection
1	CAN ground (0 V)
2	CAN low bus signal
3	cable shield (optional)
4	CAN high bus signal
5	no connection

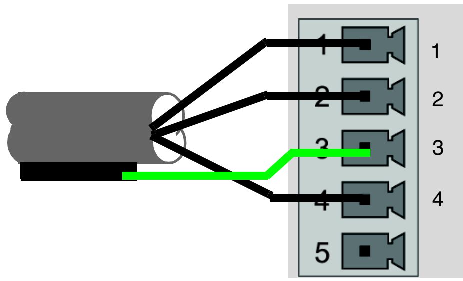
Sample Cabling Diagrams

Cable connections are always made on pins 1, 2 and 4 of the five-terminal connector:



1 CAN ground
2 CAN low
4 CAN high

If a shielded cable is used, the cable shield may be connected to pin 3:



1 CAN ground
2 CAN low
3 cable shield
4 CAN high

Note: In high noise environments, we recommend that you tie the cable shield directly to the functional earth connection. See the *Advantys STB System Planning and Installation Guide* (890 USE 171) for details.

STB XBE 2100 Functional Description

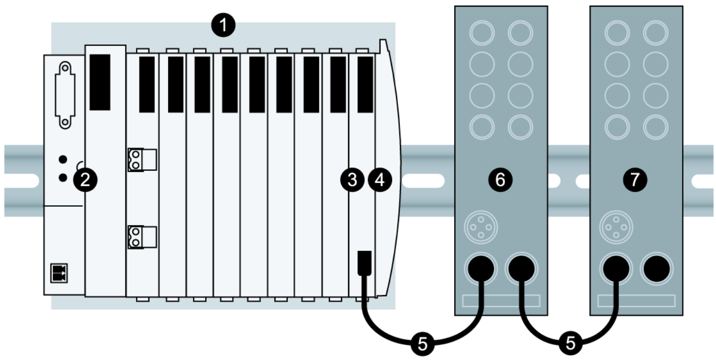
Functional Characteristics

The STB XBE 2100 module is essentially a repeater that lets you establish a CANopen extension bus on the Advantys island bus. The module isolates the island bus from the CANopen extension bus. The overall length of the island bus, including the CANopen extension, is constrained by this isolation and by the speed at which it is operating.

Isolation

The STB XBE 2100 module provides 500 VDC optical isolation between the island bus and the CANopen extension bus. The isolation provides some protection to the island bus from external wiring or electrical faults.

You need to place an STB XMP 1100 termination plate immediately after the CANopen extension module in the rightmost position in the island segment, and you must provide an additional 120 Ω of termination on the last standard CANopen device in the CANopen extension bus.



1 Advantys STB segment
2 NIM
3 STB XBE 2100 CANopen extension module
4 STB XMP 1100 termination plate
5 standard CANopen cable
6 a standard CANopen device
7 the last device on the island bus, which must be terminated with a 120 Ω resistor

The optical isolation adds some propagation delay to the CANopen signals. As a result, an island bus that implements a CANopen extension bus has a shorter maximum length.

Bus Speed

When an STB XBE 2100 CANopen extension module is used in an island bus configuration, the island's operating speed is limited to 500 kbaud. The total island bus length, including the CANopen extension bus, is limited to 15 m (49.2 ft). This maximum length must not be exceeded.

The factory default baud rate setting is 800 kbaud. When you use an STB XBE 2100 CANopen extension module, you need to set the rate to 500 kbaud. To change the baud rate, use the Advantys configuration software:

Step	Action	Result
1	From the **Island** pull-down menu, select **Baud Rate Tuning**.	A **Baud Rate Tuning** dialog appears.
2	If the value in the **Baud Rate Tuning** dialog is the default (800 kbaud), use the drop-down list box to select a value of 500 kbaud.	If the value is already set to 500 kbaud, go to step 3.
3a	Click **OK**.	If you do not change the baud rate value in the **Baud Rate Tuning** dialog, the old bud rate remains in effect. If you change the baud rate value in the dialog, a message appears letting you know that your system performance may be affected by changing the baud rate.
3b	If the message box appears and you accept the possible change in system performance, push **OK**.	The new baud rate for the island bus is now set to the selected value.

Power Requirements

The STB XBE 2100 module uses the 5 V logic power signal on the island bus. It has no external power supply requirements. It draws a nominal 120 mA from the logic power supply.

Standard CANopen Device Requirements

An STB XBE 2100 module can support up to 12 standard CANopen devices.

In order to be recognized as a valid island module by the Advantys configuration software, the profile of the standard CANopen device must appear in the Advantys configuration software—i.e., it must appear in the catalog browser in the software. You can drag and drop standard CANopen devices from the catalog browser into the logical island configuration similarly to regular STB I/O modules, but they must be placed at the end of the island bus and they must be preceded by an STB XBE 2100 CANopen extension module in the last position of the last segment on the island bus.

If you want to use a standard CANopen device that does not appear in the Advantys configuration software, contact your local Schneider Electric representative. Schneider Electric is able to integrate many standard CANopen devices into the STB catalog upon request.

Note: Make sure that you follow vendor instructions when you install, configure and operate standard CANopen devices on an Advantys STB island.

Addressing Standard CANopen Devices on the Island Bus

Standard CANopen devices are not auto-addressed by the island bus—they need to be manually addressed using physical switches on the devices. However, you do need to provide the CANopen module addresses to the configuration in the Advantys configuration software. The standard CANopen devices must be the last devices on the island bus, and they cannot use any addresses used by auto-addressed modules. The address range for standard CANopen devices is between the *last auto-address + 1* and 32.

By default, the Advantys configuration software assigns the CANopen device that you drop into the last position on the island bus an address of 32. As you continue to drop additional CANopen devices to the end of the island bus, the most recently added device takes address 32.

For example, if you have three CANopen devices (A, B and C) that you want to add to the island bus configuration, do the following:

Step	Action	Result
1	In the Advantys configuration software, select the STB XBE 2100 CANopen extension module in the island editor. Then drag device A from the catalog browser and drop it into the island editor.	An image of device A appears in the island editor below the STB XBE 2100 module with an address of 32.
2	Select device A in the island editor. Then drag device B from the catalog browser and drop it into the island editor.	An image of device B appears in the island editor to the right of device A. Device B now takes address 32, and device A takes address 31.
3	Select device B in the island editor. Then drag device C from the catalog browser and drop it into the island editor.	An image of device C appears in the island editor to the right of device B. Device C now takes address 32, device B takes address 31, and device A takes address 30.

You may also drop standard CANopen devices between two other devices on the CANopen extension bus. For example, if you want to drop a fourth device (D) into the extension bus described above and you want to reside at address 31:

Step	Action	Result
4	In the Advantys configuration software, select standard CANopen device B, which resides at island buss address 31. Then drag device D from the catalog browser and drop it into the island editor.	An image of device D appears in the island editor to the right of device B. Device D now takes address 31. Device B takes address 30 and device A takes address 29. Device C remains at address 32.

Changing the Default Maximum Address

The Advantys configuration software also lets you change the default address to a value less than 32. For example, say you have 12 STB modules auto-addressed on the island bus and you want to add five standard CANopen devices. You want to define the addresses of the CANopen devices as addresses 13 ... 17.

To change the default address assignment from 32 to a lower value (such as 17), double click on the NIM in the island editor of the Advantys configuration software. This will open the module editor for the NIM. In the top right corner of the module editor is a field called **Max node ID on the CANopen Extension**. The default value is 32. Using the down arrow, you can decrement the value down to the desired maximum address value.

STB XBE 2100 Specifications

Table of Technical Specifications

description	island bus extension module for standard CANopen devices
module width	18.4 mm (0.72 in)
module base	STB XBA 2000
island bus operational speed	500 kbaud
island bus length	15 m (49.2 ft) maximum
nominal logic bus current consumption	100 mA
isolation between external CANopen extension and internal island bus	500 VDC

10.4 The STB CPS 2111 Auxiliary Power Supply

At a Glance

Overview

This section provides a detailed description of the Advantys STB CPS 2111 auxiliary power supply—its functions, physical design, technical specifications, and field wiring requirements.

What's in this Section?

This section contains the following topics:

STB CPS 2111 Physical Description

Physical Characteristics

The STB CPS 2111 auxiliary power supply mounts in a dedicated size 2 base, the STB XBA 2100 base (see *p. 836*).

Caution

REDUCED POWER SUPPLY LIFE EXPECTANCY

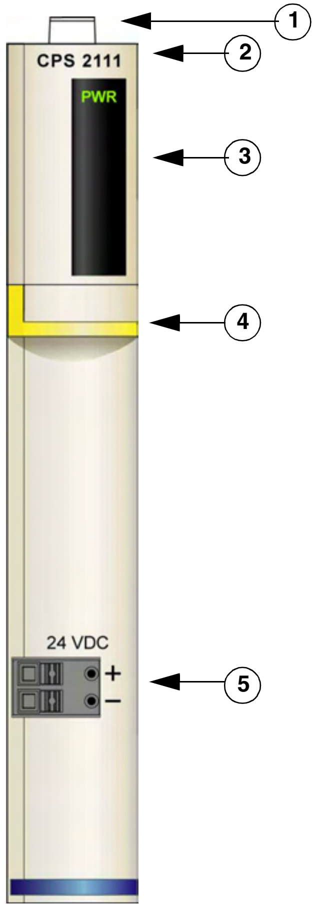
Always use the STB XBA 2100 base for the auxiliary power supply module. Using a different size 2 base will short multiple power supply outputs together. The system may continue to operate, but the following can occur:

- When you turn off a logic power supply, power may not be removed from the intended portion of the island segment
- the life expectancy of all the logic power supplies in the segment is reduced

Failure to follow this instruction can result in injury or equipment damage.

The yellow color stripe beneath the LED display at the top of the module indicates that the STB_CPS_2111 is a power supply module.

Front Panel View



1 area for user-customizable label
2 model name
3 LED array
4 yellow module identification stripe
5 incoming 24 VDC power connection

Module Accessories

Required

- dedicated STB XBA 2100 size 2 base
- a connector to wire in 24 VDC external power supply, either the STB XTS 2120 spring-type connector or the STB XTS 1120 screw-type connector

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of the island assembly plan
- the STB XMP 7800 keying pin kit to prevent installation of the STB CPS 2111 in any module base other than the STB XBA 2100

> **Note:** You should use of a module-to-base keying scheme to reduce the risk of accidentally inserting the auxiliary power supply in the wrong type 2 base. For more information on keying schemes, refer to the keying considerations discussion in the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Module Dimensions

width	on a base	18.4 mm (0.72 in)
height	module only	125 mm (4.92 in)
	on a base	128.25 mm (5.05 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connector	75,5 mm (2.97 in)

STB CPS 2111 LED Indicator

Purpose

The single green LED on the STB CPS 2111 auxiliary power supply is a visual indication of the module's operating status. The LED's location and meanings are described below.

Location

Indications

PWR	Meaning
on	logic power OK
off	logic power not OK

STB CPS 2111 Functional Description

Integrated Power Supply

The STB CPS 2111 auxiliary power supply provides 5 VDC logic power to the modules installed to its right in an Advantys STB island segment. It works together with the NIM (in the primary segment) or with a BOS module (in an extension segment) to provide logic power when the I/O modules in the segment draw current in excess of 1.2 A.

The module convertd 24 VDC from an external power source to an isolated 5 VDC of logic power, providing up to 1.2 A of current to the modules to its right.

Island Bus Addresses

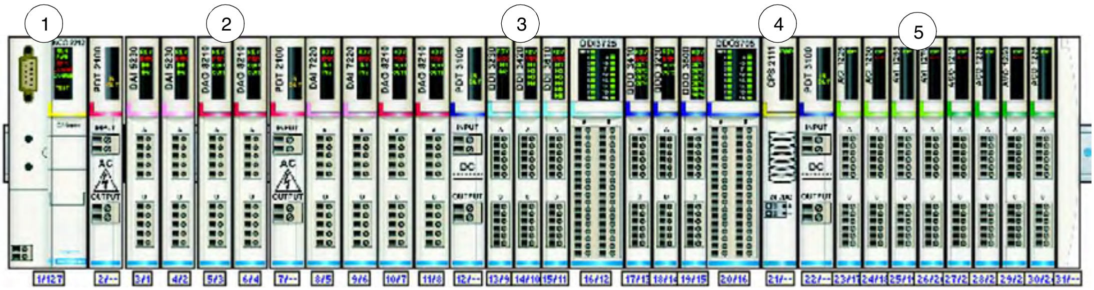
The auxiliary power supply is not addressable. It simply passes data and addressing information along the island bus.

Configurable Parameters

The STB CPS 2111 auxiliary power supply has no configurable operating parameters.

Installation Examples

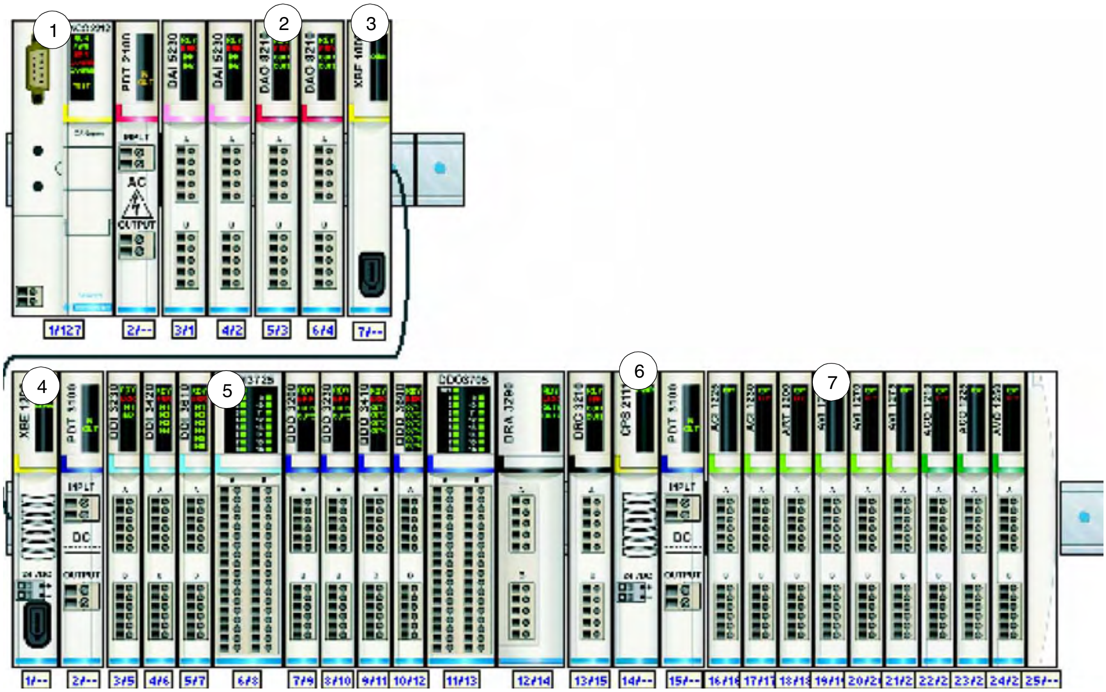
The following illustration shows how an auxiliary power supply can support addional I/O modules in the primary segment of an Advantys STB island.



1 an STB NCO 2212 CANopen NIM
2 two voltage groups of AC I/O modules
3 a voltage group of DC digital I/O modules
4 an STB CPS 2111 auxiliary power supply
5 voltage group of DC analog I/O modules

In this configuration, the logic power supply in the NIM supports the first 16 I/O modules. The STB CPS 2111 auxiliary power supply provides logic power to the last eight I/O modules.

You may also use an STB CPS 2111 auxiliary power supply in one or more extension segment:. In the following example, the primary segment is used to support a small set of AC I/O modules, and the extension segment supports a large set of DC I/O modules. The BOS module provides logic power to the first 11 I/O modules in the extension segment, and the STB CPS 2111 auxiliary power supply provides logic power to the last 9 I/O modules in the segment.



1 an STB NCO 2212 CANopen NIM
2 a voltage group of AC I/O modules
3 an EOS module at the end of the primary segment
4 a BOS module at the beginning of the extension segment
5 a voltage group of DC digital I/O modules
6 an STB CPS 2111 auxiliary power supply
7 voltage group of DC analog I/O modules

STB CPS 2111 Auxiliary Power Supply Specifications

General Specifications

General Specifications		
Input Requirements	input voltage	19.2 ... 30 VDC
	input current	310 mA @ 24 VDC/full load
		375 mA/absolute maximum
	input power interruption	10 ms @ 24 VDC
Output to Bus	maximum current	1.2 A
	protection	over current, over voltage
General	internal power dissipation	2 W @ 24 VDC/full load
	isolation	500 VAC
	hot swapping support	none
	base	STB XBA 2100
dimensions	width (on a base*)	18.4 mm (0.72 in)
	height (unassembled)	125 mm (4.92 in)
	height (on a base*)	128.25 mm (5.05 in)
	depth (unassembled)	65.1 mm (2.56 in)
	depth (on a base*)	75.5 mm (2.97 in) worst case (with screw clamp connector)

Advantys Power Distribution Modules

11

At a Glance

Overview

The island bus uses special-purpose PDMs to distribute field power to the I/O modules in its segment(s). There are two classes of PDMs, those that distribute:

- 24 VDC power to digital and analog I/O that operate with DC-powered field devices
- 115 or 230 VAC to digital I/O modules that operate with AC-power field devices

All PDMs distribute sensor and actuator power, provide PE resistance for the I/O modules they support and provide over-current protection. Within each class are standard and basic PDM models.

What's in this Chapter?

This chapter contains the following sections:

11.1 STB PDT 3100 24 VDC Power Distribution Module

At a Glance

Overview

This section provides you with a detailed description of the STB PDT 3100 PDM—its functions, physical design, technical specifications, and power wiring requirements.

What's in this Section?

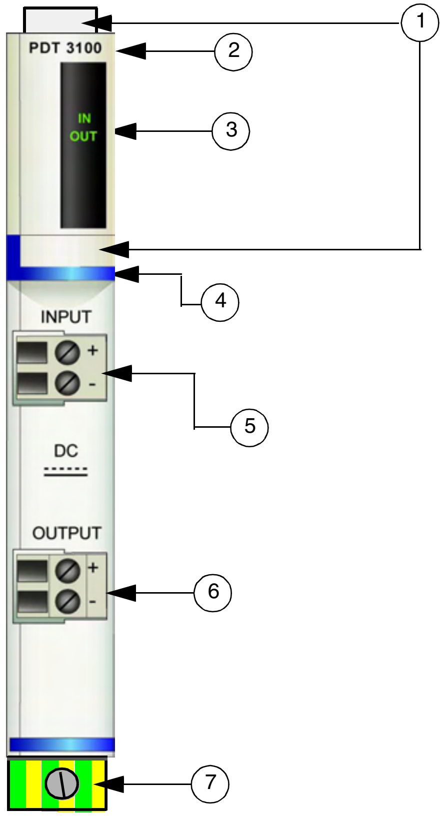
This section contains the following topics:

STB PDT 3100 Physical Description

Physical Characteristics

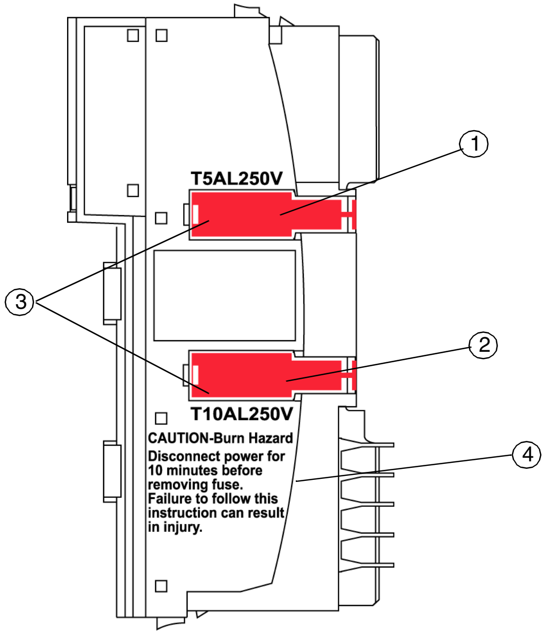
The STB PDT 3100 is a standard module that distributes field power independently over the island's sensor bus to the input modules and over the island's actuator bus to the output modules. This PDM requires two DC power inputs from an external power source. 24 VDC source power signals are brought into the PDM via a pair of two-pin power connectors, one for sensor power and one for actuator power. The module also houses two user-replaceable fuses that independently protect the island's sensor power bus and actuator power bus.

Front and Side Panel Views



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 dark blue identification stripe, indicating a DC PDM
5 input field power connection receptacle (for the sensor bus)
6 output field power connection receptacle (for the actuator bus)
7 PE captive screw clamp on the PDM base

The fuses for the sensor power and actuator power are housed in slots on the right side of the module:



1 housing door for the 5 A sensor power fuse
2 housing door for the 10 A actuator power fuse
3 notches in the two doors
4 burn hazard statement

The two red plastic doors house a pair of fuses:

- a 5 A fuse protects the input modules on the island's sensor bus
- a 10 A protects the output modules on the island's actuator bus

The marking on the side of the module describes a simple precaution you need to take before replacing a fuse (see *p. 762*) to prevent burns:

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Module Accessories

Required

- an STB XBA 2200 PDM base
- a pair of STB XTS 1130 screw type connectors or STB XTS 2130 spring clamp connectors
- a 5 A, 250 V time-lag, low-breaking-capacity (glass) fuse to protect the input modules on the island's sensor bus
- a 10 A, 250 V time-lag, glass fuse to protect the output modules on the island's actuator bus

Two fuses ship with the PDM.

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit to make sure that an AC PDM (see *p. 778*) is not inadvertently placed on the island where an STB PDT 3100 PDM belongs
- the STB XMP 7800 keying pin kit to define the top and bottom power wire-to-power receptacle connections
- the STB XMP 5600 fuse kit, which contains five 5 A replacement fuses and five 10 A replacement fuses

For detail, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	18.4 mm (0.72 in
height	module only	125 mm (4.92 in)
	on a base*	138 mm (5.43 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)
* PDMs are the tallest modules in an Advantys STB island segment. The 138 mm height dimension includes the added height imposed by the PE captive screw clamp on the bottom of the STB XBA 2200 base.		

STB PDT 3100 LED Indicators

Overview

The two LEDs on the STB PDT 3100 are visual indications of the presence of sensor power and actuator power. The LED locations and their meanings are described below.

Location

The two LEDs are located on the top front bezel of the module, directly below the model number:

Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

IN	OUT	Meaning
on		sensor (input) field power is present
off		The module either: ● is not receiving sensor field power ● has a blown fuse ● has failed
	on	actuator (output) field power is present
	off	The module either: ● is not receiving sensor field power ● has a blown fuse ● has failed

Note: The power required to illuminate these LEDs comes from the 24 VDC power supplies that provide the sensor bus and actuator bus power. These LED indicators operate regardless of whether or not the NIM is transmitting logic power.

STB PDT 3100 Source Power Wiring

Summary

The STB PDT 3100 uses two two-pin source power connectors that let you connect the PDM to one or two 24 VDC field power source(s). Source power for the sensor bus is connected to the top connector, and source power for the actuator bus is connected to the bottom connector. The choices of connector types and wire types are described below, and a power wiring example is presented.

Connectors

Use a set of either:

- Two STB XTS 1130 *screw type* field wiring connectors
- Two STB XTS 2130 *spring clamp* field wiring connectors

Both connector types are provided in kits of 10 connectors/kit.

These power wiring connectors each have two connection terminals, with a 5.08 mm (0.2 in) pitch between pins.

Power Wire Requirements

Individual connector terminals can accept one power wire in the range 1.29 ... 2.03 mm^2 (16 ... 12 AWG). When 1.29 mm^2 (16 AWG) power wire is used, two wires can be connected to a terminal.

We recommend that you strip at least 10 mm from the wire jackets to make the connections.

Safety Keying

> **Note:** The same screw type and spring clamp connectors are used to deliver power to the STB PDT 3100 PDM and to the STB PDT 2100 PDM. To avoid accidentally connecting VAC power to a VDC module or vice versa, Schneider offers an optional STB XMP 7810 safety keying pin kit for the PDMs.
> Refer the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of keying strategies.

Power Wiring Pinout

The top connector receives 24 VDC source power for the sensor bus, and the bottom connector receives 24 VDC source power for the actuator bus.

Pin	Top Connector	Bottom Connector
1	+24 VDC for the sensor bus	+24 VDC for the sensor bus
2	-24 VDC sensor power return	-24 VDC actuator power return

Source Power

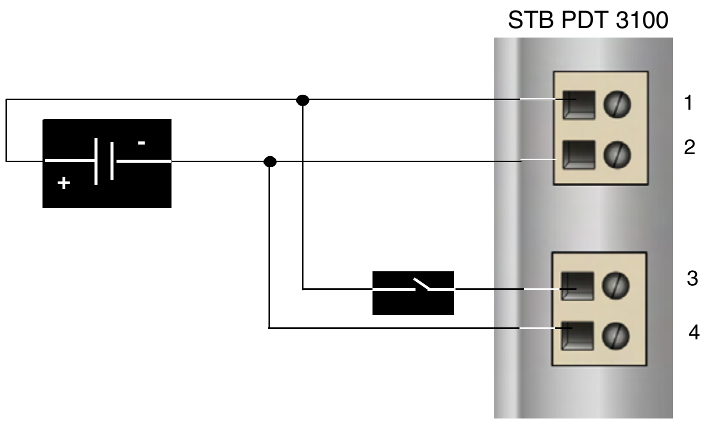
The STB PDT 3100 PDM requires source power from at least one independent, SELV-rated 19.2 ... 30 VDC power supply.

Sensor power and actuator power are isolated from one another on the island. You may provide source power to these two buses via a single power supply or by two separate power supplies.

Refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of external power supply selection considerations.

Sample Wiring Diagrams

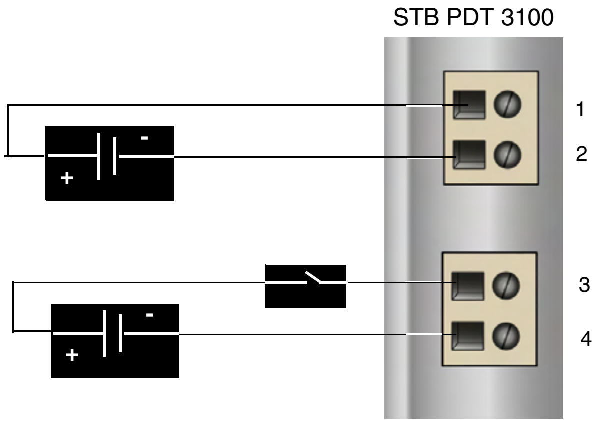
This example shows the field power connections to both the sensor bus and the actuator bus coming from a single 24 VDC SELV power supply.



1 +24 VDC sensor bus power
2 -24 VDC sensor power return
3 +24 VDC actuator bus power
4 -24 VDC actuator power return

The diagram above shows a protection relay, which you may optionally place on the +24 VDC power wire to the actuator bus connector. A protection relay enables you to disable the output devices receiving power from the actuator bus while you test the input devices that receive power from the sensor bus. For a detailed discussion and some recommendations, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

This example shows field power for the sensor bus and field power for the actuator bus being derived from separate SELV power supply sources.



1 +24 VDC sensor bus power
2 24 VDC sensor power return
3 +24 VDC actuator bus power
4 -24 VDC actuator power return

An optional protection relay is shown on the +24 VDC power wire to the actuator bus connector.

STB PDT 3100 Field Power Over-current Protection

Fuse Requirements

Input modules on the sensor bus and output modules on the actuator bus are protected by fuses in the STB PDT 3100 PDM. The sensor bus is protected by a 5 A fuse and the actuator bus is protected by an 10 A fuse. These fuses are accessible and replaceable via two side panels on the PDM.

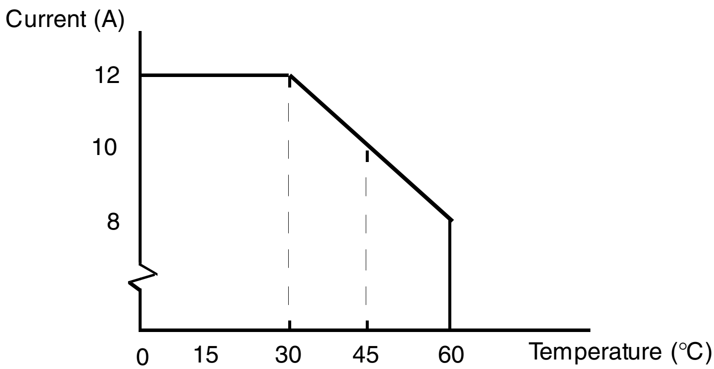
Recommended Fuses

- Overcurrent protection for the input modules on the sensor bus needs to be provided by a 5 A time-lag fuse such as the Wickmann 1951500000.
- Overcurrent protection for the output modules on the actuator bus needs to be provided by a 10 A time-lag fuse such as the Wickmann 1952100000.

Performance Considerations

The maximum combined module current - the sum of actuator current and sensor current - depends upon the island's ambient temperature, as displayed in the following diagram:

Maximum Current (A) to Temperature (°C)



For example:

- At 60 °C, total maximum combined module current is 8 A.
- At 45 °C, total maximum combined module current is 10 A.
- At 30 °C, total maximum combined module current is 12 A.

At any temperature, the maximum actuator current is 8 A, and the maximum sensor current is 4 A.

Accessing the Fuse Panels

The two panels that house the actuator bus protection fuse and the sensor bus protection fuse are located on the right side of the PDM housing (see *p. 752*). The panels are red doors with fuse holders inside them. The 5 A sensor power fuse is in the top door. The 10 A actuator power fuse is in the bottom door.

Replacing a Fuse

Before you replace a fuse in the STB PDT 3100, remove the power sources to the actuator bus and sensor bus.

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Step	Action	Notes
1	After you have removed the power connectors from the module and let the unit cool down for 10 minutes, pull the PDM from its base. Push the release buttons at the top and bottom of the PDM and pull it from the base.	
2	Insert a small flathead screwdriver in the slot on the left of the fuse panel door and use it to pop the door open.	The slot is molded to protect the tip of the screwdriver from accidentally touching the fuse.
3	Remove the old fuse from the fuse holder inside the panel door, and replace it with another fuse or with a fuse bypass plug.	Make sure that the new fuse is the same type as the old one.
4	Optionally, you may repeat steps 3 and 4 to replace the fuse in the other panel.	
5	Snap the panel door(s) shut and plug the PDM back into its base. Then plug the connectors back into the receptacles, close the cabinet and reapply field power.	

The Protective Earth Connection

PE Contact for the Island

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of protective earth (PE) to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the island bus. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 4.2 mm^2 (10 gage) or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.

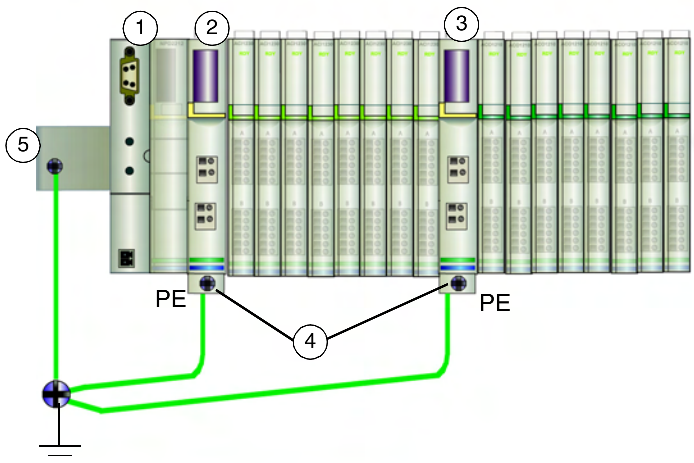
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

> **Note:** Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

STB PDT 3100 Specifications

Table of Technical Specifications

The STB PDT 3100 module's technical specifications are described in the following table.

<table>
<tr><td colspan="2">description</td><td>24 VDC power distribution module</td></tr>
<tr><td colspan="2">module width</td><td>18.4 mm (0.72 in)</td></tr>
<tr><td colspan="2">module height in its base</td><td>137.9 mm (5.43 in)</td></tr>
<tr><td colspan="2">PDM base</td><td>STB XBA 2200</td></tr>
<tr><td colspan="2">hot swapping supported</td><td>no</td></tr>
<tr><td colspan="2">nominal logic power current consumption</td><td>0 mA</td></tr>
<tr><td colspan="2">sensor/actuator bus voltage range</td><td>19.2 ... 30 VDC</td></tr>
<tr><td colspan="2">reverse polarity protection</td><td>yes, on the actuator bus</td></tr>
<tr><td rowspan="4">module current field</td><td rowspan="2">for outputs</td><td>8 A rms max @ 30° C (86° F)</td></tr>
<tr><td>5 A rms max @ 60° C (140° F)</td></tr>
<tr><td rowspan="2">for inputs</td><td>4 A rms max @ 30° C (86° F)</td></tr>
<tr><td>2.5 A rms max @ 60° C (140° F)</td></tr>
<tr><td rowspan="2">overcurrent protection</td><td>for inputs</td><td>user-replaceable 5 A time-lag fuse from an STB XMP 5600 fuse kit</td></tr>
<tr><td>for outputs</td><td>user-replaceable 10 A time-lag fuse from an STB XMP 5600 fuse kit</td></tr>
<tr><td colspan="2">bus current</td><td>0 mA</td></tr>
<tr><td colspan="2">voltage surge protection</td><td>yes</td></tr>
<tr><td colspan="2">PE current</td><td>30 A for 2 min</td></tr>
<tr><td rowspan="2">status reporting</td><td rowspan="2">to the two green LEDs</td><td>sensor bus power present</td></tr>
<tr><td>actuator bus power present</td></tr>
<tr><td rowspan="2">voltage-detect threshold</td><td>LED turns on</td><td>at 15 VDC (+/- 1 VDC)</td></tr>
<tr><td>LED turns off</td><td>less than15 VDC (+/- 1 VDC)</td></tr>
</table>

11.2 STB PDT 3105 24 VDC Basic Power Distribution Module

At a Glance

Overview

This section provides you with a detailed description of the STB PDT 3105 PDM—its functions, physical design, technical specifications, and power wiring requirements.

What's in this Section?

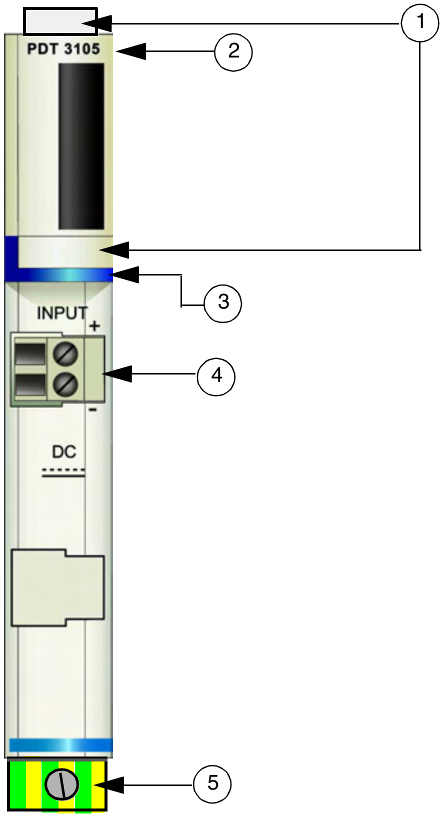
This section contains the following topics:

STB PDT 3105 Physical Description

Physical Characteristics

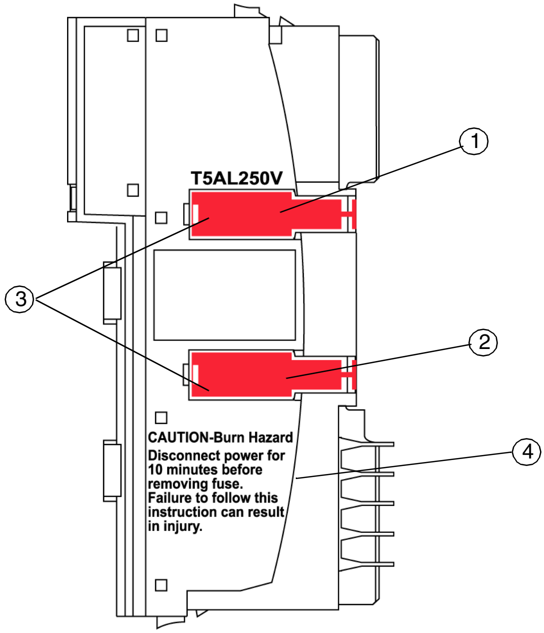
The STB PDT 3105 is a basic Advantys STB module that distributes sensor power and actuator power over a single power bus to the I/O modules in a segment. This PDM mounts in a special size 2 base. It requires a 24 VDC source power input from an external power source, which is brought into the PDM via a two-pin power connector. The module also houses a user-replaceable fuse that protects the island's I/O power bus.

Front and Side Panel Views



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 dark blue identification stripe, indicating a DC PDM
4 I/O field power connection
5 PE captive screw clamp on the PDM base

The following illustration shows the right side of the module, where the user-replaceable fuse is housed:



1 housing door for the 5 A fuse
2 this slot is not used
3 notches in the two doors
4 burn hazard statement

The marking on the side of the module describes a simple precaution you need to take before replacing a fuse (see *p. 762*) to prevent burns:

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Module Accessories

Required

- an STB XBA 2200 PDM base
- a STB XTS 1130 screw type connector or STB XTS 2130 spring clamp connector
- one 5 A, 250 V time-lag, low-breaking-capacity (glass) fuse to protect the input and output modules

One 5 A fuse ships with the PDM.

Optional

- STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 kit for inserting the module into the base (to make sure that an AC PDM (see *p. 778*) is not inadvertently placed on the island where an STB PDT 3105 PDM belongs)
- the STB XMP 7800 kit for inserting the field wiring connectors into the module
- the STB XMP 5600 fuse kit, which contains five 5 A replacement fuses and five 10 A replacement fuses

Note: Do not use a 10 A fuse in the STB PDT 3105 module.

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	18.4 mm (0.72 in
height	module only	125 mm (4.92 in)
	on a base*	138 mm (5.43 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)
* PDMs are the tallest modules in an Advantys STB island segment. The 138 mm height dimension includes the added height imposed by the PE captive screw clamp on the bottom of the STB XBA 2200 base.		

STB PDT 3105 Source Power Wiring

Summary

The STB PDT 3105 uses a two-pin source power connector that let you connect the PDM to a 24 VDC field power source. The choices of connector types and wire types are described below, and a power wiring example is presented.

Connectors

Use either:

- an STB XTS 1130 *screw type* field wiring connector
- an STB XTS 2130 *spring clamp* field wiring connector

Both connector types are provided in kits of 10 connectors/kit.

These power wiring connectors each have two connection terminals, with a 5.08 mm (0.2 in) pitch between pins.

Power Wire Requirements

Individual connector terminals can accept one power wire in the range 1.29 ... 2.03 mm^2 (16 ... 12 AWG). When 1.29 mm^2 (16 AWG) power wire is used, two wires can be connected to a terminal.

We recommend that you strip at least 10 mm from the wire jackets to make the connections.

Safety Keying

Note: The same screw type and spring clamp connectors are used to deliver power to the STB PDT 3105 PDM and to the STB PDT 2100 and STB PDT 2105 PDMs. To avoid accidentally connecting VAC power to a VDC module or vice versa, Schneider offers an optional STB XMP 7810 safety keying pin kit for the PDMs. Refer the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of keying strategies.

Power Wiring Pinout

The connector receives 24 VDC source power for the sensor bus, and the bottom connector receives 24 VDC source power for the actuator bus.

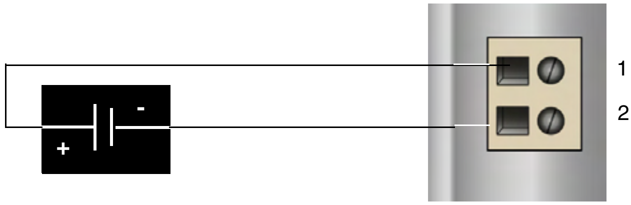
Pin	Connection
1	+24 VDC I/O power
2	-24 VDC return

Source Power

The STB PDT 3105 PDM requires source power from an independent, SELV-rated 19.2 ... 30 VDC power supply. Refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of external power supply selection considerations.

Sample Wiring Diagrams

This example shows the field power connections to both the sensor bus and the actuator bus coming from a single 24 VDC SELV power supply.



1 +24 VDC I/O power
2 -24 VDC return

For a detailed discussion and some recommendations, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

STB PDT 3105 Field Power Over-current Protection

Fuse Requirements

I/O modules are protected by a 5 A fuse in the STB PDT 3105 PDM. The fuse is accessible and replaceable via a side panel on the PDM.

Recommended Fuses

Overcurrent protection for the input and output modules on the island bus needs to be provided by a 5 A time-lag fuse such as the Wickmann 1951500000.

Performance Considerations

When the island is operating at an ambient temperature of 60 degrees C (140 degrees F), the fuse can pass 4 A continuously.

Accessing the Fuse Panels

Two panels are located on the right side of the PDM housing (see *p. 768*). The top panel houses the active protection fuse and the other is not used. The top panel has a fuse holder inside it.

Replacing a Fuse Before you replace a fuse in the STB PDT 3105, remove the power source.

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Step	Action	Notes
1	After you have removed the power connector from the module and let the unit cool down for 10 minutes, pull the PDM from its base. Push the release buttons at the top and bottom of the PDM and pull it from the base.	
2	Insert a small flathead screwdriver in the slot on the left of the fuse panel door and use it to pop the door open.	The slot is molded to protect the tip of the screwdriver from accidentally touching the fuse.
3	Remove the old fuse from the fuse holder inside the panel door, and replace it with another fuse.	Make sure that the new fuse is a 5 A fuse. **Note** 10 A fuses are provided in the fuse kit, but they should not be used with an STB PDT 3105 module.
4	Snap the panel door(s) shut and plug the PDM back into its base. Then plug the connectors back into the receptacles, close the cabinet and reapply field power.	

STB PDT 3105 Protective Earth Connection

PE Contact for the Island Bus

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of PE to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the DIN rail. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 4.2 mm^2 (10 gauge) or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.

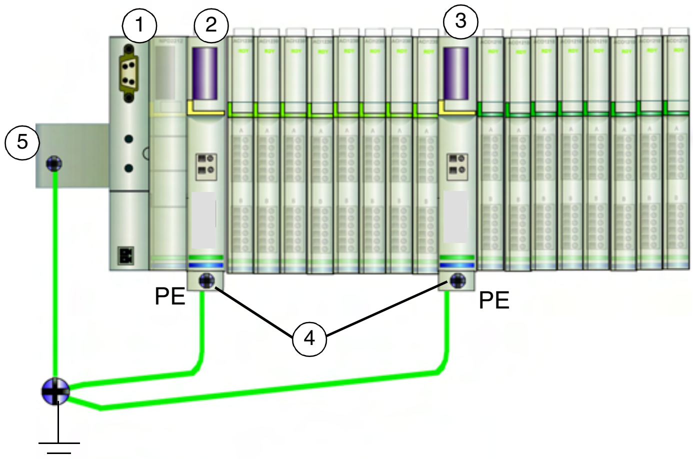
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

> **Note:** Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

STB PDT 3105 Specifications

Table of Technical Specifications

description	basic 24 VDC power distribution module
module width	18.4 mm (0.72 in)
module height in its base	137.9 mm (5.43 in)
PDM base	STB XBA 2200
hot swapping supported	no
nominal logic power current consumption	0 mA
I/O power bus voltage range	19.2 ... 30 VDC
reverse polarity protection	on the outputs only
module current field	4 A max
overcurrent protection for sensor and actuator power	user-replaceable 5 A time-lag fuse
	one fuse ships with the PDM; replacements are available in an STB XMP 5600 fuse kit
bus current	0 mA
voltage surge protection	yes
PE current	30 A for 2 min

11.3 STB PDT 2100 Standard 115/230 VAC Power Distribution Module

At a Glance

Overview

This section provides you with a detailed description of the STB PDT 2100 PDM—its functions, physical design, technical specifications, and power wiring requirements.

What's in this Section?

This section contains the following topics:

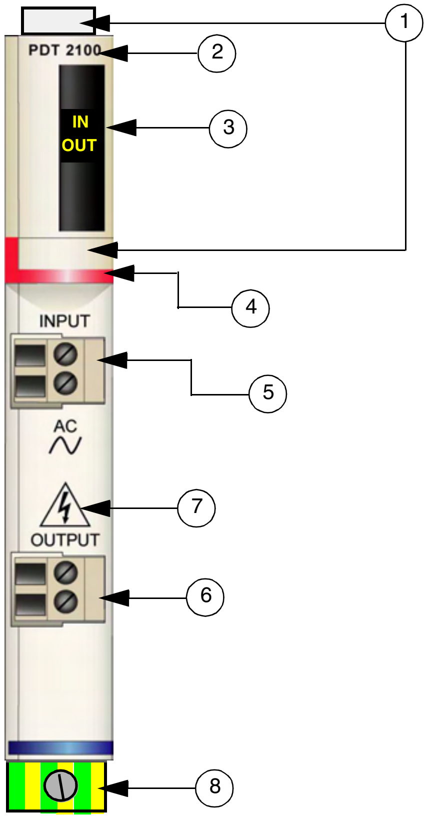
STB PDT 2100 Physical Description

Physical Characteristics

The STB PDT 2100 is a standard module that distributes field power independently over the island's sensor bus to the input modules and over the island's actuator bus to the output modules. This PDM mounts in a special size 2 base. It requires two AC power inputs from external power source. Source power signals (either 115 VAC or 230 VAC) are brought into the PDM via a pair of two-pin power connectors, one for sensor power and one for actuator power. The module also houses two user-replaceable fuses that independently protect the island's sensor power bus and actuator power bus.

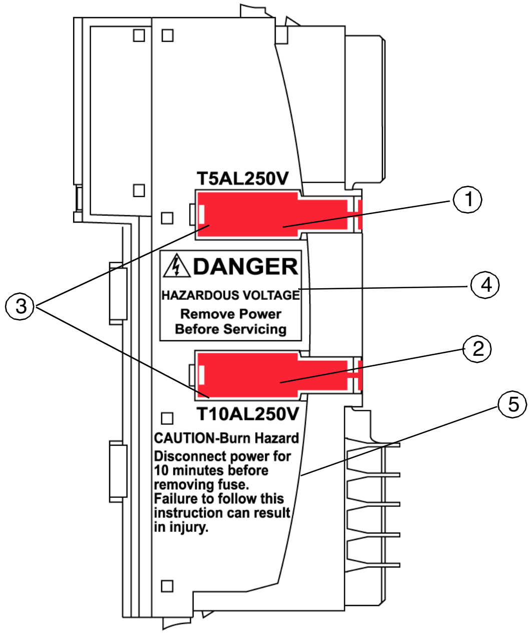
Note: If there is a mix of 115 VAC and 230 VAC modules in a segment, each voltage group needs to be supported by a separate STB PDT 2100 PDM.

Front and Side Panel Views



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 LED array
4 red identification stripe, indicating an AC PDM
5 input field power connection receptacle (for the sensor bus)
6 output field power connection receptacle (for the actuator bus)
7 electric shock hazard symbol
8 PE captive screw clamp on the PDM base

The fuses for the sensor power and actuator power are housed in slots on the right side of the module:



1 housing door for the 5 A sensor power fuse
2 housing door for the 10 A actuator power fuse
3 notches in the two doors
4 electric shock hazard statement
5 burn hazard statement

The two red plastic doors house a pair of fuses:

- a 5 A fuse protects the input modules on the island's sensor bus
- a 10 A protects the output modules on the island's actuator bus

If a fuse is blown, it can be replaced with a fuse from the STB XMP 5600 fuse kit.

Danger

HAZARDOUS VOLTAGE

Remove power before servicing.

Failure to follow this instruction will result in death or serious injury.

The marking on the side of the module describes a simple precaution you need to take before replacing a fuse (see *p. 762*) to prevent burns:

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Module Accessories

Required

- an STB XBA 2200 PDM base
- a pair of STB XTS 1130 screw type connectors or STB XTS 2130 spring clamp connectors
- a 5 A, 250 V time-lag, low-breaking-capacity (glass) fuse to protect the input modules on the island's sensor bus
- a 10 A, 250 V time-lag, glass fuse to protect the output modules on the island's actuator bus

Two fuses are shipped with the PDM.

Optional

- the STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 keying pin kit to make sure that a DC PDM (see *p. 750*) is not inadvertently placed on the island where an STB PDT 2100 PDM belongs
- the STB XMP 7800 keying pin kit to define the top and bottom power wire-to-power receptacle connections
- the STB XMP 5600 fuse kit, which contains five 5 A replacement fuses and five 10 A replacement fuses

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	18.4 mm (0.72 in
height	module only	125 mm (4.92 in)
	on a base*	138 mm (5.43 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)
* PDMs are the tallest modules in an Advantys STB island segment. The 138 mm height dimension includes the added height imposed by the PE captive screw clamp on the bottom of the STB XBA 2200 base.		

STB PDT 2100 LED Indicators

Overview

The two LEDs on the STB PDT 2100 are visual indications of the presence of sensor power and actuator power. The LED locations and their meanings are described below.

Location

Two yellow LEDs are located on the top front bezel of the module, directly below the model number:

Indications

The following table defines the meaning of the two LEDs (where an empty cell indicates that the pattern on the associated LED doesn't matter):

IN	OUT	Meaning
on		turns on at 70 VAC, indicating power for the sensor bus
off		The module either: ● receiving less than 50 VAC ● has a blown fuse ● has failed
	on	turns on at 70 VAC, indicating power for the actuator bus
	off	The module either: ● receiving less than 50 VAC ● has a blown fuse ● has failed

Note: The power required to illuminate these LEDs comes from the AC power supplies that provide the sensor bus and actuator bus power. These LED indicators operate regardless of whether or not the NIM is transmitting logic power.

STB PDT 2100 Source Power Wiring

Summary

The STB PDT 2100 uses two two-pin power entry connectors that let you connect the PDM to one or two AC field power source(s). Field power may be either 115 or 230 VAC. Source power for the sensor bus is connected to the top connector, and source power for the actuator bus is connected to the bottom connector. The choices of connector types and wire types are described below, and a power wiring example is presented.

Connectors

Use a set of either:

- Two STB XTS 1130 *screw type* field wiring connectors
- Two STB XTS 2130 *spring clamp* field wiring connectors

Both connector types are provided in kits of 10 connectors/kit.

These power wiring connectors each have two connection terminals, with a 5.08 mm (0.2 in) pitch between pins.

Power Wire Requirements

Individual connector terminals can accept one power wire in the range 1.29 ... 2.03 mm^2 (16 ... 12 AWG). When 1.29 mm^2 (16 AWG) power wire is used, two wires can be connected to a terminal.

We recommend that you strip at least 10 mm from the wire jackets to make the connections.

Safety Keying

> **Note:** The same screw type and spring clamp connectors are used to deliver power to the STB PDT 3100 PDM and to the STB PDT 2100 PDM. To avoid accidentally connecting VAC power to a VDC module or vice versa, Schneider offers a kit of optional safety keying pins.

Refer the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of keying strategies.

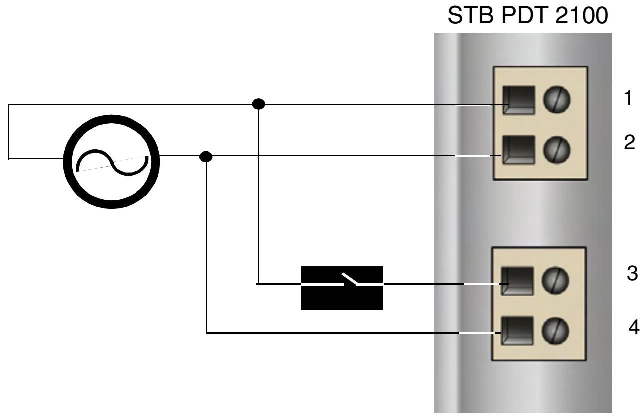
Power Wiring Pinout

The top connector receives AC source power for the sensor bus, and the bottom connector receives AC source power for the actuator bus.

Pin	Top Connector	Bottom Connector
1	+115/230 VAC for the sensor bus	+115/230 VAC for the actuator bus
2	-115/230 VAC sensor power return	-115/230 VAC actuator power return

Sample Wiring Diagram

This example shows the field power connections to both the sensor bus and the actuator bus coming from an AC power source:



1 +AC sensor bus power
2 -AC sensor power return
3 +AC actuator bus power
4 -AC actuator power return

The diagram above shows a protection relay, which you may optionally place on the +AC power wire to the actuator bus connector. A protection relay enables you to disable the output devices receiving power from the actuator bus while you test the input devices that receive power from the sensor bus. For a detailed discussion and some recommendations, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

STB PDT 2100 Field Power Over-current Protection

Fuse Requirements

Input modules on the sensor bus and output modules on the actuator bus are protected by fuses in the STB PDT 2100 PDM. The sensor bus is protected by a 5 A fuse and the actuator bus is protected by a 10 A fuse. These fuses are accessible and replaceable via two side panels on the PDM.

Recommended Fuses

- Overcurrent protection for the input modules on the sensor bus needs to be provided by a 5 A lag-time fuse such as the Wickmann 1951500000.
- Overcurrent protection for the output modules on the actuator bus needs to be provided by a 10 A lag-time fuse such as the Wickmann 1952100000.

Performance Considerations

When the island is operating at an ambient temperature of 30 degrees C (86 degrees F), the fuses can pass 10 A continuously on the actuator bus and 5 A continuously on the sensor bus.

When the island is operating at an ambient temperature of 60 degrees C (140 degrees F), the fuses can pass 5 A continuously on the actuator bus and 2.5 A continuously on the sensor bus.

Accessing the Fuse Panels

Danger

HAZARDOUS VOLTAGE

Remove power before servicing.

Failure to follow this instruction will result in death or serious injury.

The two panels that house the actuator bus protection fuse and the sensor bus protection fuse are located on the right side of the PDM housing (see *p. 780*). The panels are red doors with fuse holders inside them. The 5 A sensor power fuse is in the top door. The 10 A actuator power fuse is in the bottom door.

Replacing a Fuse

Before you replace a fuse in the STB PDT 2100, you need to remove the power sources to the actuator bus and sensor bus.

Caution

BURN HAZARD - HOT FUSE

Disconnect power for 10 minutes before removing fuse.

Failure to follow this instruction can result in injury or equipment damage.

Step	Action	Notes
1	After you have removed the power connectors from the module and let the unit cool down for 10 minutes, pull the PDM from its base. Push the release buttons at the top and bottom of the PDM and pull it from the base.	
2	Insert a small flathead screwdriver in the slot on the left side of the fuse panel door and use it to pop the door open.	The slot is molded to protect the tip of the screwdriver from accidentally touching the fuse.
3	Remove the old fuse from the fuse holder inside the panel door, and replace it with another fuse or with a fuse bypass plug.	If you are replacing one fuse with another, make sure that the new fuse is the same type as the old one.
4	Optionally, you may repeat steps 3 and 4 to replace the fuse in the other panel.	
5	Snap the panel door(s) shut and plug the PDM back into its base. Then plug the connectors back into the receptacles, close the cabinet and reapply field power.	

Protective Earth Connection

PE Contact for the Island Bus

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of PE to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the DIN rail. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 4.2 mm^2 (10 gage) or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.

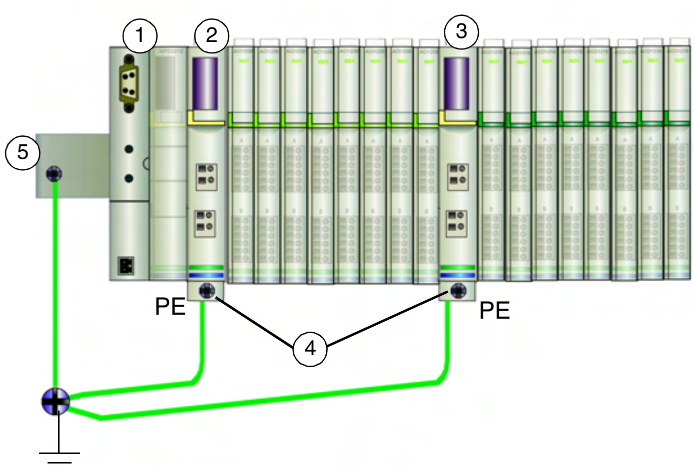
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

> **Note:** Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

STB PDT 2100 Specifications

Table of Technical Specifications

The STB PDT 2100 module's technical specifications are described in the following table.

description		115 or 230 VAC power distribution module
module width		18.4 mm (0.72 in)
module height in its base		137.9 mm (5.43 in)
PDM base		STB XBA 2200
hot swapping supported		no
nominal logic power current consumption		0 mA
sensor/actuator bus voltage range		85 ... 264 VAC
		AC sources should be the same phase reference
reverse polarity protection		yes, on the actuator bus
module current field	for outputs	10 A rms max @ 30° C (86° F)
		5 A rms max @ 60° C (140° F)
	for inputs	5 A rms max @ 30° C (86° F)
		2.5 A rms max @ 60° C (140° F)
overcurrent protection	for inputs	user-replaceable 5 A time-lag fuse from an STB XMP 5600 fuse kit
	for outputs	user-replaceable 10 A time-lag fuse from an STB XMP 5600 fuse kit
PE current		30 A for 2 min
voltage surge protection		yes
status reporting	to the two yellow LEDs	sensor bus power present
		actuator bus power present
voltage-detect threshold	LED turns on	70 VAC (+/- 5 VAC)
	LED turns off	50 VAC (+/- 5 VAC)

11.4 STB PDT 2105 Basic 115/230 VAC Power Distribution Module

At a Glance

Overview

This section provides you with a detailed description of the STB PDT 2105 PDM—its functions, physical design, technical specifications, and power wiring requirements.

What's in this Section?

This section contains the following topics:

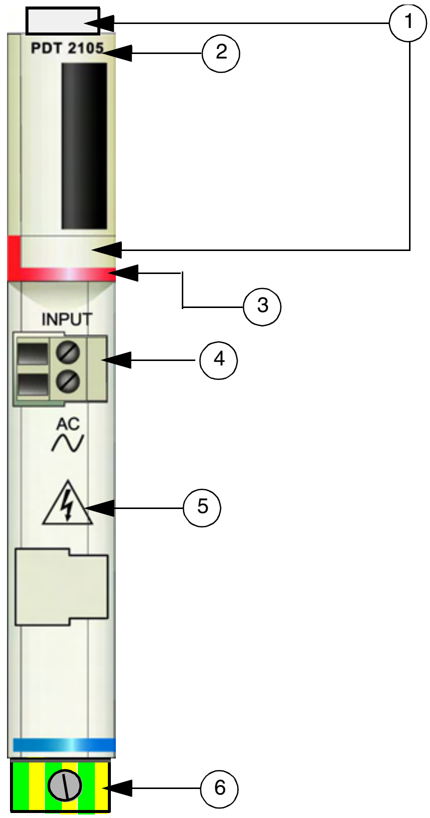
STB PDT 2105 Physical Description

Physical Characteristics

The STB PDT 2105 is a basic module that distributes sensor power to the input modules and actuator power to the output modules over a single power bus. This PDM mounts in a special size 2 base. It requires an AC power input from external 115 VAC or 230 VAC source, which is brought into the PDM via a two-pin power connector. The module also houses a user-replaceable fuse that protects the island's I/O power bus.

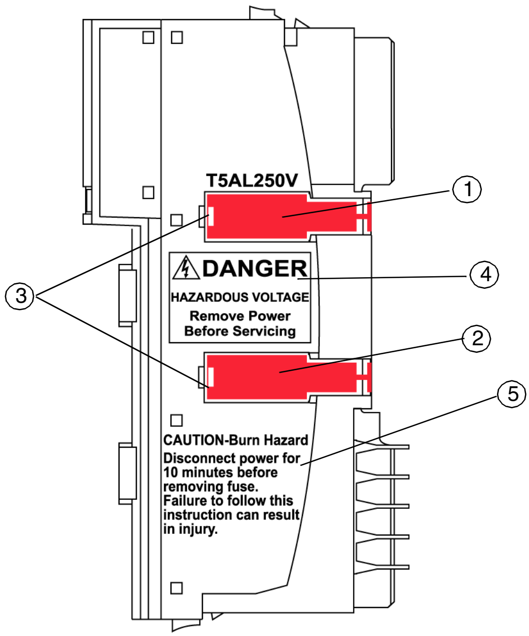
Note: If there is a mix of 115 VAC and 230 VAC modules in a segment, each voltage group needs to be supported by a separate AC power distribution module (either an STB PDT 2100 or another STB PDT 2105).

Front and Side Panel Views



1 locations for the STB XMP 6700 user-customizable labels
2 model name
3 red identification stripe, indicating an AC PDM
4 I/O field power connection
5 electric shock hazard symbol
6 PE captive screw clamp on the PDM base

The fuse for sensor and actuator power is housed in a slot on the right side of the module:



1 housing door for the 5 A fuse
2 this slot is not used
3 notches in the two doors
4 electric shock hazard statement
5 burn hazard statement

The 5 A fuse protects both the input and output modules. If the fuse blows, it can be replaced with a fuse from the STB XMP 5600 fuse kit.

Danger

HAZARDOUS VOLTAGE

Remove power before servicing.

Failure to follow this instruction will result in death or serious injury.

The marking on the side of the module describes a simple precaution you need to take before replacing a fuse (see *p. 762*) to prevent burns:

Caution
BURN HAZARD - HOT FUSE
Disconnect power for 10 minutes before removing fuse.
Failure to follow this instruction can result in injury or equipment damage.

Module Accessories

Required

- an STB XBA 2200 PDM base
- one STB XTS 1130 screw type connector or STB XTS 2130 spring clamp connector
- a 5 A, 250 V time-lag, low-breaking-capacity (glass) fuse to protect the input and output modules

One fuse ships with the PDM.

Optional

- STB XMP 6700 user-customizable label kit, which may be applied to the module and the base as part of your island assembly plan
- the STB XMP 7700 kit for inserting the module into the base (to make sure that a DC PDM is not inadvertently placed on the island where an STB PDT 2105 PDM belongs)
- the STB XMP 5600 fuse kit, which contains five 5 A replacement fuses and five 10 A replacement fuses

Note: Do not use a 10 A fuse in the STB P_DT 3105 module.

For details, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

Dimensions

width	module on a base	18.4 mm (0.72 in
height	module only	125 mm (4.92 in)
	on a base*	138 mm (5.43 in)
depth	module only	65.1 mm (2.56 in)
	on a base, with connectors	75.5 mm (2.97 in) worst case (with screw clamp connectors)
* PDMs are the tallest modules in an Advantys STB island segment. The 138 mm height dimension includes the added height imposed by the PE captive screw clamp on the bottom of the STB XBA 2200 base.		

STB PDT 2105 Source Power Wiring

Summary

The STB PDT 2105 uses a two-pin power entry connector that let you connect the PDM to an AC field power source. Field power may be either 115 or 230 VAC. The choices of connector types and wire types are described below, and a power wiring example is presented.

Connectors

Use either:

- an STB XTS 1130 *screw type* field wiring connector
- an STB XTS 2130 *spring clamp* field wiring connector

Both connector types are provided in kits of 10 connectors/kit.

These power wiring connectors each have two connection terminals, with a 5.08 mm (0.2 in) pitch between pins.

Power Wire Requirements

Individual connector terminals can accept one power wire in the range 1.29 ... 2.03 mm^2 (16 ... 12 AWG). When 1.29 mm^2 (16 AWG) power wire is used, two wires can be connected to a terminal.

We recommend that you strip at least 10 mm from the wire jackets to make the connections.

Safety Keying

Note: The same screw type and spring clamp connectors are used to deliver power to a 24 VDC PDM (an STB PDT 3100 or anSTB_PDT 3105) and to the STB PDT 2105 PDM. To avoid accidentally connecting AC power to a DC module or vice versa, Schneider offers a kit of optional safety keying pins.

Refer the *Advantys STB System Planning and Installation Guide* (890 USE 171) for a detailed discussion of keying strategies.

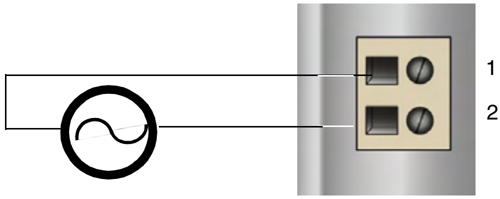
Power Wiring Pinout

The connector receives AC source power for the sensor bus, and the bottom connector receives AC source power for the actuator bus.

Pin	Connection
1	+115/230 VAC field power
2	-115/230 VAC return

Sample Wiring Diagram

This example shows the field power connection coming from an AC power source:



1 +AC sensor bus power
2 -AC sensor power return

For a detailed discussion and some recommendations, refer to the *Advantys STB System Planning and Installation Guide* (890 USE 171).

STB PDT 2105 Protective Earth Connection

PE Contact for the Island Bus

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of PE to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the DIN rail. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 4.2 mm^2 (10 gauge) or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.

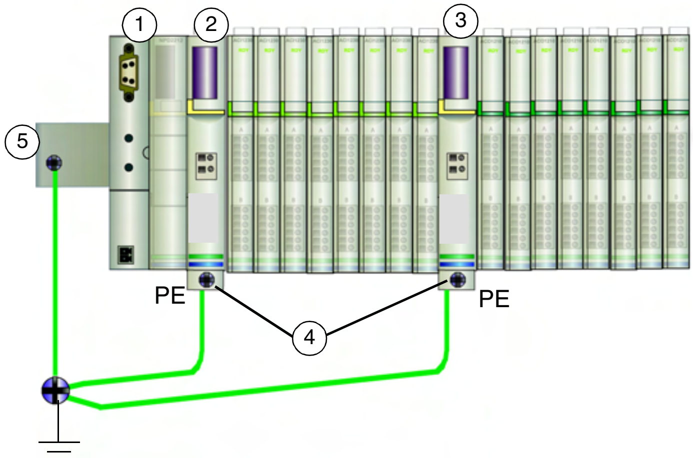
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

Note: Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

STB PDT 2105 Specifications

Table of Technical Specifications

description	115 or 230 VAC power distribution module
module width	18.4 mm (0.72 in)
module height in its base	137.9 mm (5.43 in)
PDM base	STB XBA 2200
hot swapping supported	no
nominal logic power current consumption	0 mA
I/O power bus voltage range	85 ... 265 VAC
	AC sources should be the same phase reference
reverse polarity protection	yes
module current field	4 A max
overcurrent protection for sensor and actuator power	user-replaceable 5 A time-lag fuse
	one fuse ships with the PDM; replacements are available in an STB XMP 5600 fuse kit
PE current	30 A for 2 min
voltage surge protection	yes

STB Module Bases

12

At a Glance

Overview

The physical communications bus that supports the island is constructed by interconnecting a series of base units and snapping them on a DIN rail. Different Advantys modules require different types of bases, and it is important that you install bases in the proper sequence as you construct the island bus. This chapter provides you with a description of each base type.

What's in this Chapter?

This chapter contains the following topics:

Advantys Bases

Summary

There are six different base units. When interconnected on a DIN rail, these bases form the physical backplane onto which the Advantys modules are mounted. This physical backplane also supports the transmission of power, communications and PE across the island bus.

Base Models

The table below lists the bases by model number, size and types of Advantys modules that they support.

Base Model	Width	Modules Supported
STB XBA 1000 (see *p. 808*)	13.9 mm (0.58 in)	size 1 Advantys input and output modules
STB XBA 2000 (see *p. 812*)	18.4 mm (0.72 in)	size 2 Advantys input and output modules and the STB XBE 2100 CANopen extension module
STB XBA 2200 (see *p. 820*)	18.4 mm (0.72 in)	All Advantys PDM modules
STB XBA 2300 (see *p. 828*)	18.4 mm (0.72 in)	STB XBE 1200 BOS island bus extension modules
STB XBA 2400	18.4 mm (0.72 in)	STB XBE 1000 EOS island bus extension modules
STB XBA 3000 (see *p. 817*)	27.8 mm (1.09 in)	size 3 Advantys specialty modules

Note: You must insert the correct base in each location on the island bus to support the desired module type. Notice that there are three different size 2 (18.4 mm) bases. Make sure that you choose and install the correct one at each position on the island bus.

STB XBA 1000 I/O Base

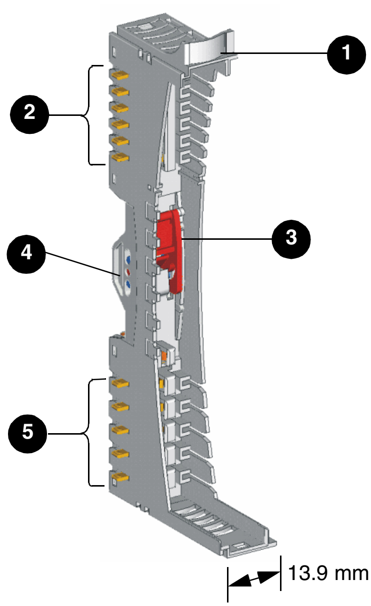
Summary

The STB XBA 1000 I/O base is 13.9 mm (0.58 in) wide. It provides the physical connections for a size 1 input or output module on the island bus. These connections let you communicate with the NIM over the island bus and hot swap the module when the island bus is operational. They also enable the module to receive:

- logic power from the NIM or from a BOS module
- sensor power (for inputs) or actuator power (for outputs) from the PDM

Physical Overview

The following illustration shows some of the key components an STB XBA 1000 base:



1 user-customizable label tab
2 six island bus contacts
3 DIN rail lock/release latch
4 DIN rail contact
5 five field power distribution contacts

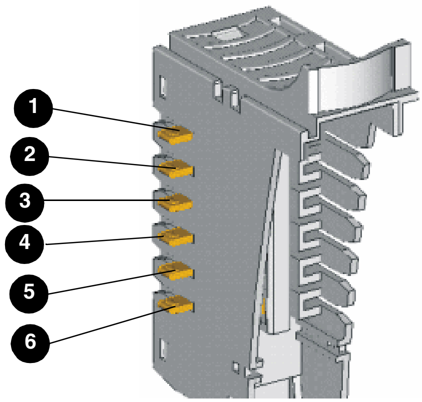
The Label Tab

A label can be positioned on the tab shown above in item 1. The label helps identify the specific module that will reside at this base unit's island bus location. A similar label can be placed on the module itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered from your Schneider Electric service provider.

The Island Bus Contacts

The six contacts located at the top left side of the STB XBA 1000 base provide logic power and island bus communications connections between the module and the island bus:



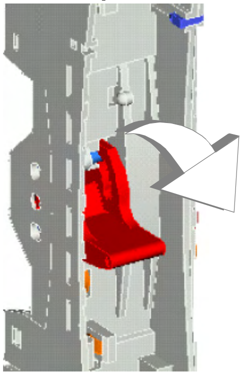
In the primary segment of the island bus, the signals that make these contacts come from the NIM. In extension segments, these signals come from an STB XBE 1000 BOS extension module:

Contacts	Signals
1	not used
2	the common ground contact
3	the 5 VDC logic power signal generated by the power supply in either the NIM (in the primary segment) or a BOS module (in an extension segment)
4 and 5	used for communications across the island bus between the I/O and the NIM—contact 4 is positive (+ve), and contact 5 is negative (-ve).
6	connects the module in the base to the island's address line. The NIM uses the address line to validate that the expected module is located at each physical address.

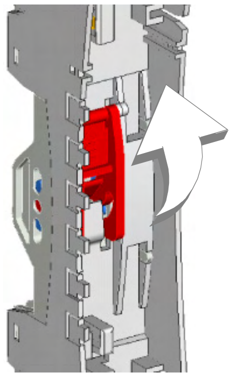
The Lock/ Release Latch

The latch in the center front of the STB XBA 1000 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

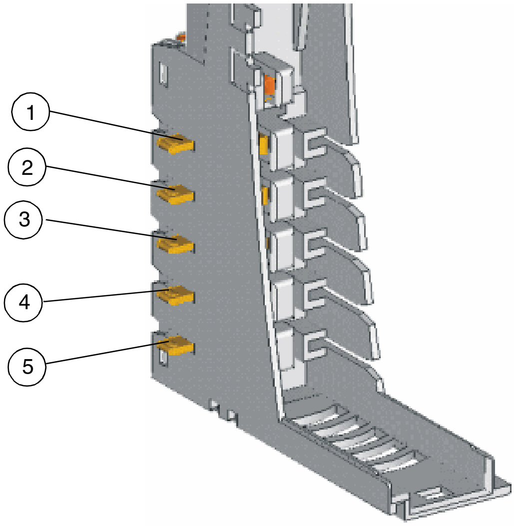
The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an I/O base is snapped onto the DIN rail, two contacts on the back of the rail provide the earth ground connection between the rail and the I/O module that will be seated on the base.

The Field Power Distribution Contacts

The five contacts located in a column at the bottom of the STB XBA 1000 I/O base provide field power and a protective earth (PE) connections to the I/O module:



Field power (sensor power for inputs and actuator power for outputs) is distributed across the island bus to the STB XBA 1000 bases by a PDM:

Contacts	Signals
1 and 2	when the module inserted in the base has input channels, contacts 1 and 2 deliver sensor bus power to the module
3 and 4	when the module inserted in the base has output channels, contacts 3 and 4 deliver actuator bus power to the module
5	PE is established via a captive screw on the PDM base units (see *p. 826*) and is delivered to the Advantys STB I/O module via contact 5

If the module in the STB XBA 1000 base supports only input channels, contacts 3 and 4 are not used. If the module in the STB XBA 1000 base supports only output channels, contacts 1 and 2 are not used.

STB XBA 2000 I/O Base

Summary

The STB XBA 2000 I/O base is 18.4 mm (0.72 in) wide. It provides the physical connections for a size 2 input or output module on the island bus. These connections let you communicate with the NIM over the island bus and hot swap the module when the island bus is operational. They also enable the module to receive:

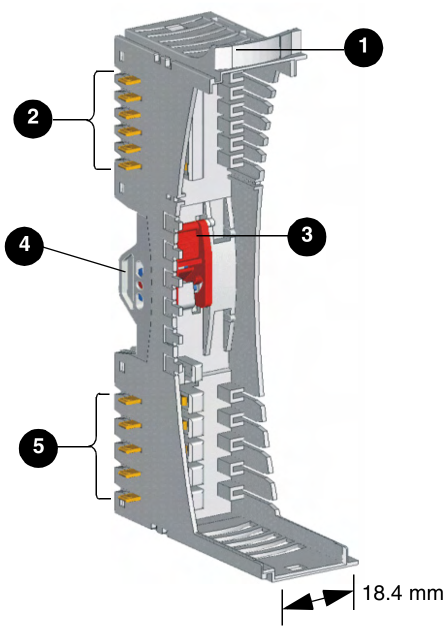
- logic power from the NIM or from a BOS module
- sensor power (for inputs) or actuator power (for outputs) from the PDM

The base also support an STB XBE 2100 CANopen extension module on the island bus.

> **Note:** The STB XBA 2000 is designed only for the size 2 modules described above. Do not use this base for other size 2 Advantys modules such as the PDMs, EOS modules or BOS modules.

Physical Overview

The following illustration shows some of the key components an STB XBA 2000 base:



1 user-customizable label tab
2 six island bus contacts
3 DIN rail lock/release latch
4 DIN rail contact
5 five field power distribution contacts

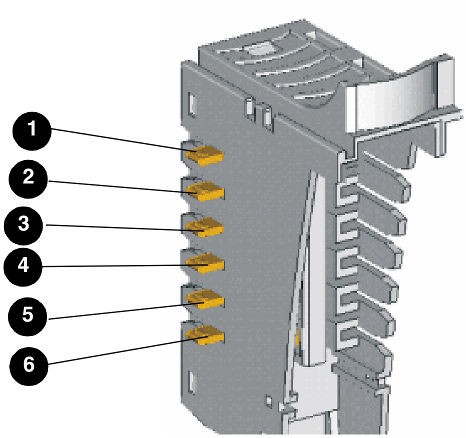
The Label Tab

A label can be positioned on the tab shown above in item 1. The label helps identify the specific module that will reside at this base unit's island bus location. A similar label can be placed on the module itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered from your Schneider Electric service provider.

The Island Bus Contacts

The six contacts located in a column at the top of the I/O base provide logic power and island bus communications connections between the module and the island bus:



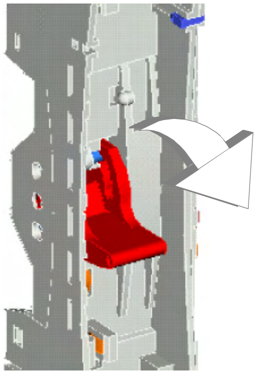
In the primary segment of the island bus, the signals that make these contacts come from the NIM. In extension segments, these signals come from an STB XBE 1000 BOS extension module:

Contacts	Signals
1	not used
2	the common ground contact
3	the 5 VDC logic power signal generated by the power supply in either the NIM (in the primary segment) or a BOS module (in an extension segment)
4 and 5	used for communications across the island bus between the I/O and the NIM—contact 4 is positive (+ve), and contact 5 is negative (-ve).
6	connects the module in the base to the island's address line. The NIM uses the address line to validate that the expected module is located at each physical address.

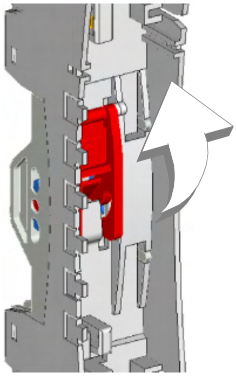
The Lock/ Release Latch

The latch in the center front of the STB XBA 2000 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

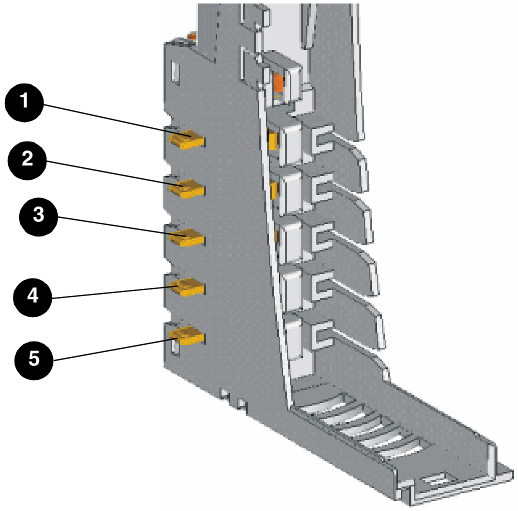
The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an I/O base is snapped onto the DIN rail, two contacts on the back of the rail provide the earth ground connection between the rail and the I/O module that will be seated on the base.

The Field Power Distribution Contacts

The five contacts located in a column at the bottom of the STB XBA 2000 base provide AC or DC field power and a protective earth (PE) connections to the I/O module. They are as follows:



Field power (sensor power for inputs and actuator power for outputs) is distributed across the island bus to the STB PDT 2100 PDM:

Contacts	Signals
1 and 2	when the module inserted in the base has input channels, contacts 1 and 2 deliver sensor bus power to the module
3 and 4	when the module inserted in the base has output channels, contacts 3 and 4 deliver actuator bus power to the module
5	PE is established via a captive screw on the PDM base units (see *p. 826*) and is delivered to the Advantys STB I/O module via contact 5

If the module in the STB XBA 2000 base supports only input channels, contacts 3 and 4 are not used. If the module in the STB XBA 1000 base supports only output channels, contacts 1 and 2 are not used.

STB XBA 3000 I/O Base

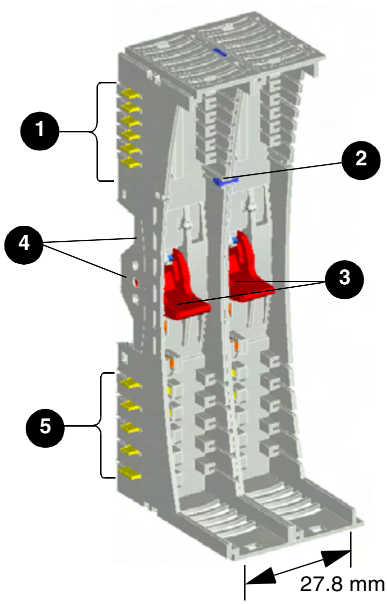
Summary

The STB XBA 3000 I/O base is 27.8 mm (1.1 in) wide. provides the physical connections for a size 3 input and output module on the island bus. These connections let you communicate with the NIM over the island bus and hot swap the module when the island bus is operational. They also enable the module to receive:

- logic power from the NIM or from a BOS module
- sensor power (for inputs) or actuator power (for outputs) from the PDM

Physical Overview

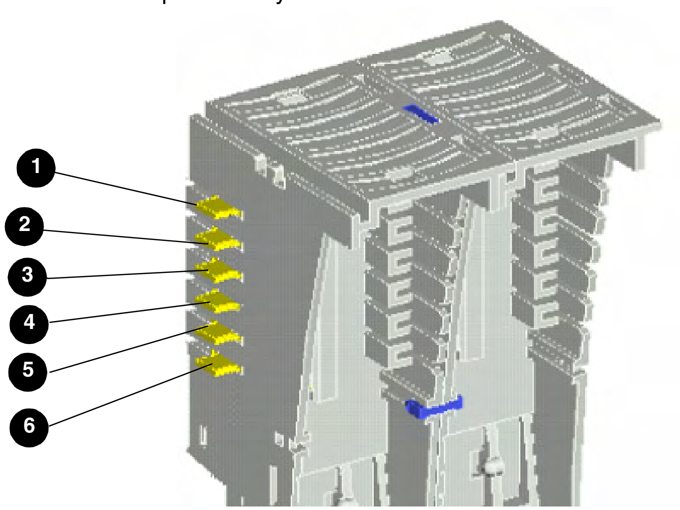
The following illustration shows some of the key components an STB XBA 3000 base:



1 six island bus contacts
2 size 3 security pin
3 DIN rail lock/release latches
4 DIN rail contacts
5 five field power distribution contacts

The Island Bus Contacts

The six contacts located in a column at the top of the I/O base provide logic power (see *p. 27*) and island bus communications connections between the module and the island backplane. They are as follows:



In the primary segment of the island bus, the signals that make these contacts come from the NIM. In extension segments, these signals come from an STB XBE 1000 BOS extension module:

Contacts	Signals
1	not used
2	the common ground contact
3	the 5 VDC logic power signal generated by the power supply in either the NIM (in the primary segment) or a BOS module (in an extension segment)
4 and 5	used for communications across the island bus between the I/O and the NIM—contact 4 is positive (+ve), and contact 5 is negative (-ve).
6	connects the module in the base to the island's address line. The NIM uses the address line to validate that the expected module is located at each physical address.

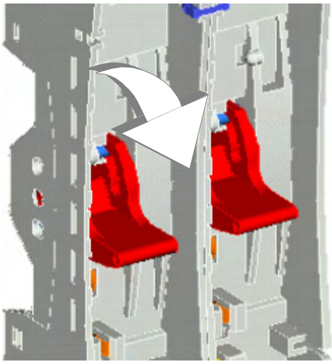
The Size 3 Module Security Pin

The STB XBA 3000 I/O base looks very much like a pair of interlocked STB XBA 1000 I/O bases. It is designed, however, to house only size 3 I/O modules. The security pin located in the center front of the base above the two lock/release latches prevents you from inadvertently installing two size 1 modules in the base.

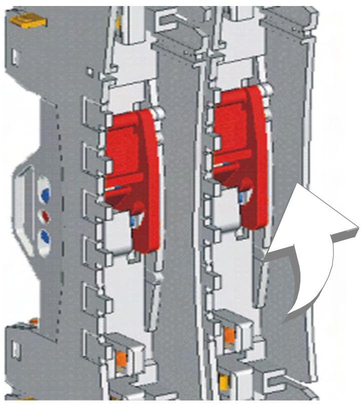
The Lock/ Release Latch

Two latches in the center front of the STB XBA 3000 base each have two positions, as shown below:

Release positions



Lock positions



The latches need to be in their release positions while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. They need to be in their lock positions when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

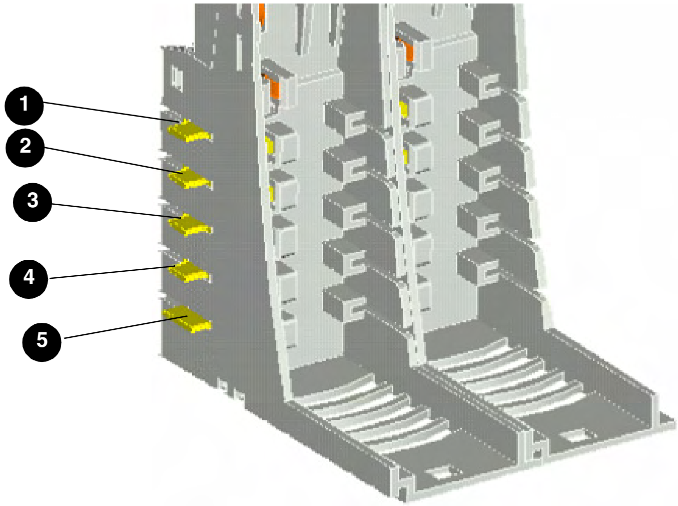
The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an STB XBA 3000 I/O base is snapped onto the DIN rail, four contacts on the back of the rail provide functional ground connections between the rail and the I/O module that will be seated on the base.

The Field Power Distribution Contacts

The five contacts located in a column at the bottom of the STB XBA 3000 base provide field power and protective earth (PE) connections to the I/O module. They are as follows:



Field power (sensor power for inputs and actuator power for outputs) is distributed across the island bus to the STB XBA 3000 bases by a PDM:

Contacts	Signals
1 and 2	when the module inserted in the base has input channels, contacts 1 and 2 deliver sensor bus power to the module
3 and 4	when the module inserted in the base has output channels, contacts 3 and 4 deliver actuator bus power to the module
5	PE is established via a captive screw on the PDM base units (see *p. 826*) and is delivered to the Advantys STB I/O module via contact 5

If the module in the STB XBA 3000 base supports only input channels, contacts 3 and 4 are not used. If the module in the STB XBA 1000 base supports only output channels, contacts 1 and 2 are not used.

STB XBA 2200 PDM Base

Summary

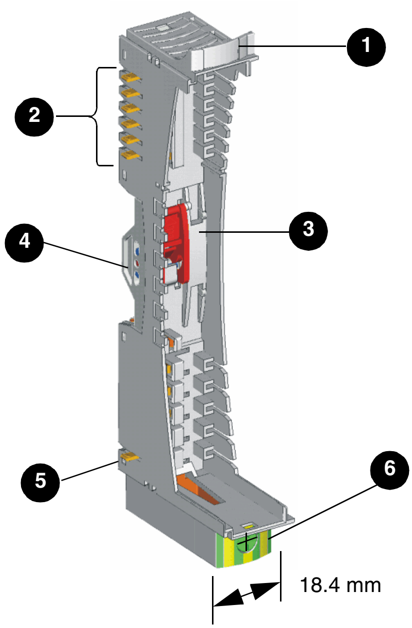
The STB XBA 2200 PDM base is 18.4 mm (0.72 in) wide. It is the mounting connection for any PDM(s) on the island bus. It allows you to easily remove and replace the module from the island for maintenance. It also enables the PDM to distribute sensor bus power to input modules and actuator power to output modules in the voltage group of I/O modules supported by that NIM.

A plastic block at the bottom of the base houses a PE captive screw (see *p. 826*), which should be used to make protective earth connections for the island. This captive screw block gives the PDM an added height dimension of 138 mm (5.44 in). As a result, the PDMs are always the tallest Advantys modules in an island segment.

Note: The STB XBA 2200 is designed only for PDMs. Do not attempt to use this base for other size 2 Advantys modules such as STB I/O modules or island bus extension modules.

Physical Overview

The following illustration shows an STB XBA 2200 PDM base and highlights some of its key physical components.



1 user-customizable label
2 six island bus contacts
3 DIN rail lock/release latch
4 DIN rail contact
5 PE contact
6 PE captive screw

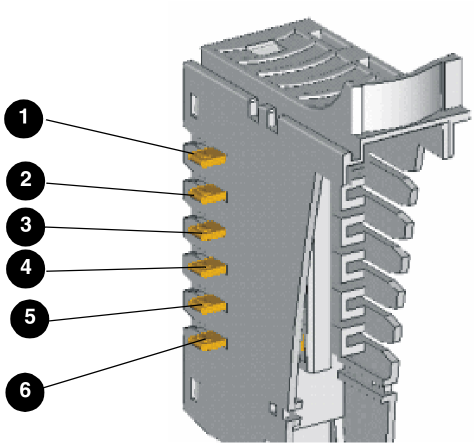
The Label Tab

A label can be positioned on the tab shown above in item 1 to help identify the module that will reside at this base unit's island bus location. A similar label can be placed on the PDM itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered at no charge from your Scneider Electric service provider.

The Island Bus Contacts

The six contacts located in a column at the top of the I/O base allow island bus logic power and communication signals flow through the PDM downstream to the I/O modules:



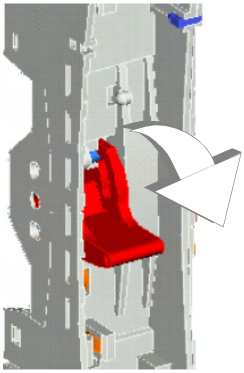
1 not used
2 common ground contact
3 5 VDC logic power contact
4 island bus communications + contact
5 island bus communications - contact
6 address line contact

The STB PDT 3100 and STB PDT 2100 PDMs are non-addressable modules, and they do not use the island's logic power or communication buses. The six island bus contacts at the top of the base are used for 5 V ground and for LED power.

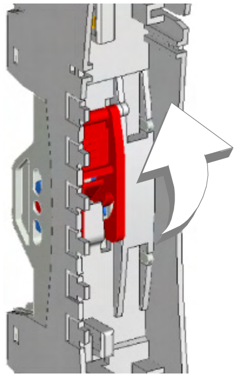
The Lock/ Release Latch

The latch in the center front of the STB XBA 2200 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

The DIN Rail Contacts

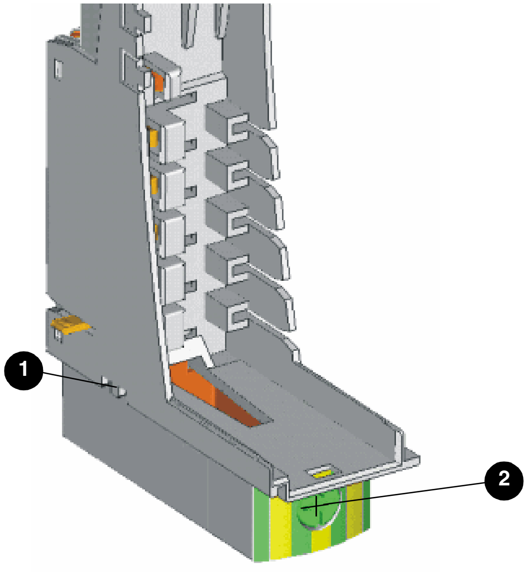
One of the roles of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When a PDM base is snapped onto the DIN rail, two contacts on the back of the rail provide the functional ground connection between the rail and the PDM that will be seated on the base.

Protective Earth

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of protective earth to the island. PE is essentially a return line across the bus for fault currents generated at a sensor or actuator device in the control system.

A captive screw at the bottom of the STB XBA 2200 base secures a PE wire to the island:



1 The PE contact
2 The PE captive screw

PE is brought to the island by an insulated ground conductor, usually a copper wire that is tied to a single grounding point on the cabinet. The ground conductor is secured by the PE captive screw.

The STB XBA 2200 base distributes PE to the island via a single contact located at the bottom left side of the base (item 2 above). The PDM base distributes PE to its right and left along the island bus.

The single contact on the bottom left of the base is one of the ways to discriminate the STB XBA 2200 from other size 2 bases. The PDM base does not need the four field power contacts on its bottom left side—the PDM takes field power from an external power supply via two power connectors on the front of the module and distributes that power downstream to the I/O modules it supports.

The Protective Earth Connection

PE Contact for the Island

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of protective earth (PE) to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the island bus. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 6 mm^2 or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.

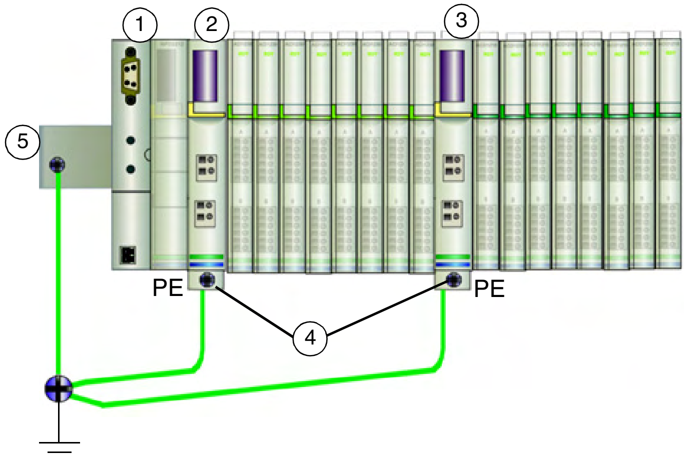
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

> **Note:** Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

STB XBA 2300 Beginning-of-Segment Base

Summary

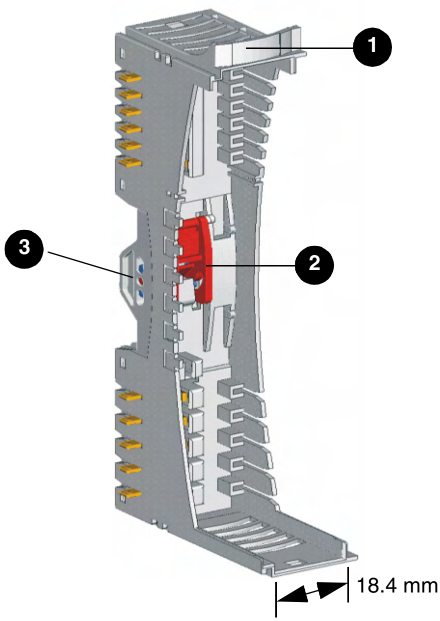
The STB XBA 2300 base is 18.4 mm (0.72 in) wide. It provides the physical connections for an STB XBE 1200 BOS extension module. The base provides the physical connection point for a module on the island bus and allows you to easily remove and replace the module for maintenance.

This base must be installed in the first (leftmost) position of an extension segment. It enables the BOS module to send logic power to the I/O modules in the extension segment, and it supports island bus communications between the I/O modules in the extension segment and the NIM in the primary segment.

Note: The STB XBA 2000 is designed only for STB XBE 1000 BOS modules. Do not attempt to use this base for other size 2 Advantys modules such as the PDMs, EOS modules or I/O modules.

Physical Overview

The following illustration shows some of the key components an STB XBA 2300 base:



1 user-customizable label tab
2 DIN rail lock/release latch
3 DIN rail contact

> **Note:** Notice the absence of logic and field power contacts along the left side of the STB XBA 2300 base. This is one way you can discriminate between an STB XBA 2300 base and other size 2 bases. Because a BOS module mounts in the leftmost location on an extension segment, it does not use any left-side contacts.

The Label Tab

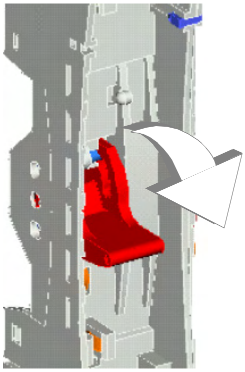
A label can be positioned on the tab shown above in item 1 to help identify the specific Advantys I/O module that will reside at this base unit's island bus location. A similar label can be placed on the module itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered at no charge from your Schneider Electric service provider.

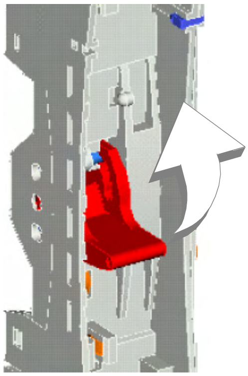
The Lock/ Release Latch

The latch in the center front of the STB XBA 2300 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an I/O base is snapped onto the DIN rail, two contacts on the back of the rail provide the functional ground connection between the rail and the I/O module that will be seated on the base.

STB XBA 2400 End-of-segment Base

Summary

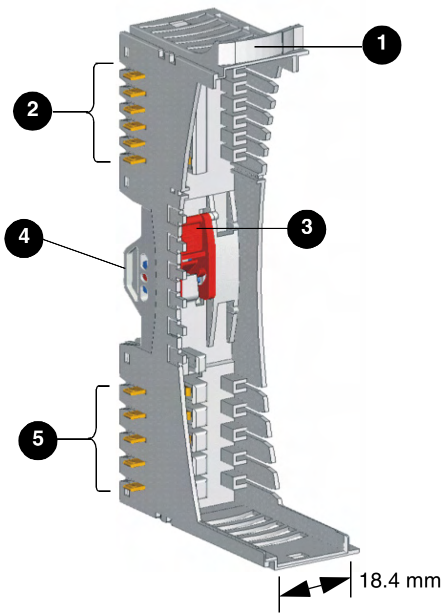
The STB XBA 2400 EOS base is 18.4 mm (0.72 in) wide. It provides the physical connections for a any EOS modules used on the island bus. If this base is used, it is always the last (rightmost) base in a segment. By definition, this segment is not at the end of the island bus, so the terminator plate is never connected to it.

The base has two set of contacts on its left side. These contacts receive logic power from the NIM or BOS module at the beginning of the segment and allow the EOS module to pass island bus communication signals to the next segment or preferred module on the island bus. The base does not make any contacts on its right side.

Note: The STB XBA 2400 is designed only for EOS modules. Do not attempt to use this base for other size 2 Advantys modules such as I/O, PDMs or BOS modules.

Physical Overview

The following illustration shows some of the key components an STB XBA 2400 base:



1 user-customizable label tab
2 six island bus contacts
3 DIN rail lock/release latch
4 DIN rail contact
5 five field power contacts

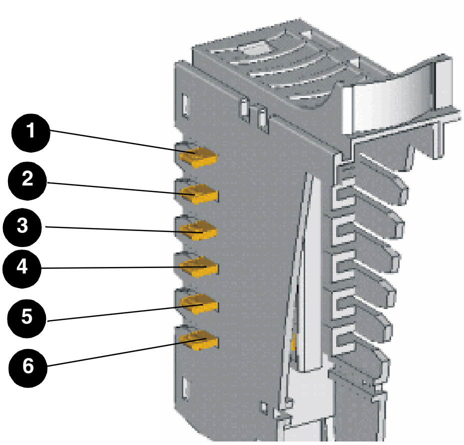
The Label Tab

A label can be positioned on the tab shown above in item 1. The label helps identify the specific module that will reside at this base unit's island bus location. A similar label can be placed on the module itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered from your Schneider Electric service provider.

The Island Bus Contacts

The six contacts located in a column at the top of the EOS base provide logic power and island bus communications connections between the module and the island bus:



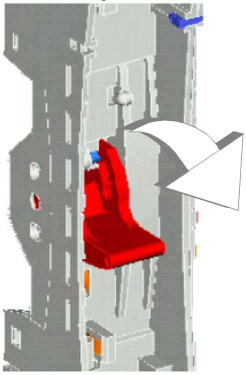
In the primary segment of the island bus, the signals that make these contacts come from the NIM. In extension segments, these signals come from an STB XBE 1000 BOS extension module:

Contacts	Signals
1	not used
2	the common ground contact
3	the 5 VDC logic power signal generated by the power supply in either the NIM (in the primary segment) or a BOS module (in an extension segment)
4 and 5	used to pass island bus communications between the NIM and the EOS module. The EOS module then passes communications to/from the next segment or preferred module on the island—contact 4 is positive (+ve), and contact 5 is negative (-ve).
6	passes the address line to the next segment or preferred module on the island bus

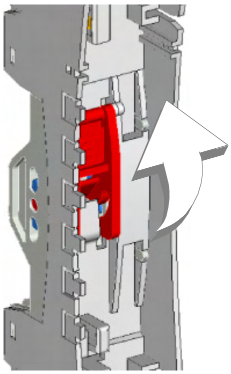
The Lock/ Release Latch

The latch in the center front of the STB XBA 2400 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

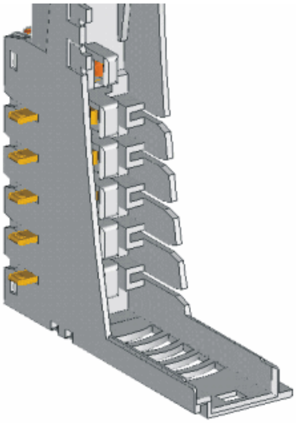
The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an I/O base is snapped onto the DIN rail, two contacts on the back of the rail provide the earth ground connection between the rail and the I/O module that will be seated on the base.

The Field Power Distribution Contacts

The five contacts located at the bottom of the STB XBA 2400 base are not used:



Field power (sensor power for inputs and actuator power for outputs) is distributed across the island bus to the STB PDT 2100 PDM:

Contacts	Signals
1, 2 3 and 4	not used
5	PE is established via a captive screw on the PDM base units (see *p. 826*) and is delivered to the Advantys STB I/O module via contact 5

STB XBA 2100 Auxiliary Power Supply Base

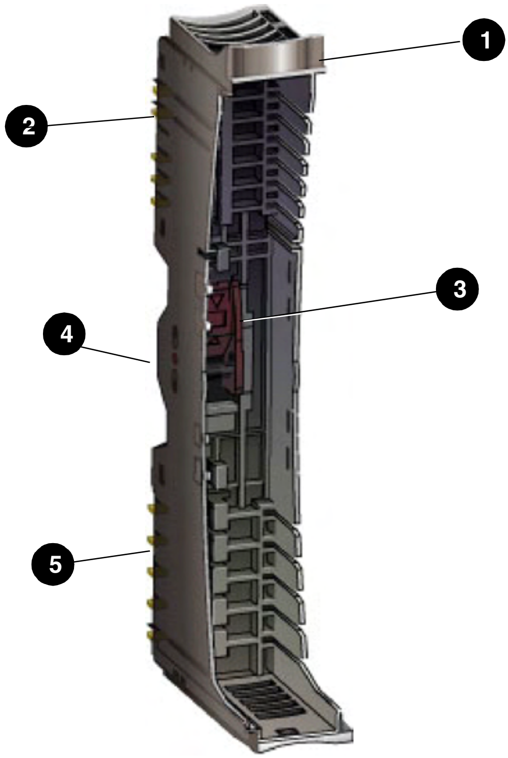
Summary

The STB XBA 2100 dedicated auxiliary power supply base is 18.4 mm (0.72 in) wide. It provides the physical connections for an auxiliary power supply on the island bus. The STB XBA 2100 base passes the CAN lines, and allows auto-addressing. Used jointly, the STB XBA 2100 base and the STB CPS 2111 auxiliary power supply (see *p. 740*) enable the user to generate a new, additional 5 V logic power supply when needed.

Note: The STB XBA 2100 is designed only for the STB CPS 2111 auxiliary power supply described above. Do not use this base for other size 2 Advantys module such as a PDM, I/O, EOS or BOS module.

Physical Overview

The following illustration shows some of the key components of the STB XBA 2100 base:



1 user-customizable label tab
2 five island bus contacts, on left side (the right side of the base has six contacts)
3 DIN rail lock/release latch
4 DIN rail contact
5 five field power distribution contacts

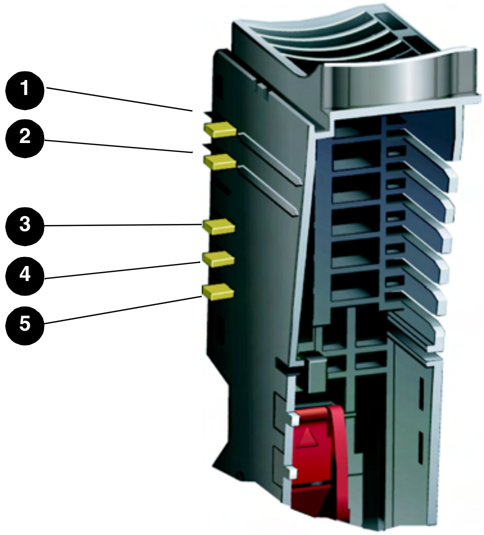
The Label Tab

A label can be positioned on the tab shown above in item 1. The label helps identify the specific module that will reside at this base unit's island bus location. A similar label can be placed on the module itself so that they can be matched up properly during the island installation.

Labels are provided on an STB XMP 6700 marking label sheet, which can be ordered from your Schneider Electric service provider.

The Island Bus Contacts

On the left side of the STB XBA 2100 auxiliary power supply base, five contacts provide ground and island bus communications connections between the module and the island bus:



In the primary segment of the island bus, the signals that make these contacts come from the NIM. In extension segments, these signals come from an STB XBE 1200 BOS extension module. The following table describes each of the five contacts on the left side of the STB XBA_2111 auxiliary power supply:

Contacts	Signals
1	reserved
2	the common ground contact
3 and 4	used for communications across the island bus between the I/O and the NIM—contact 4 is positive (+ve), and contact 5 is negative (-ve).
5	connects the module in the base to the island's address line. The NIM uses the address line to validate that the expected module is located at each physical address.

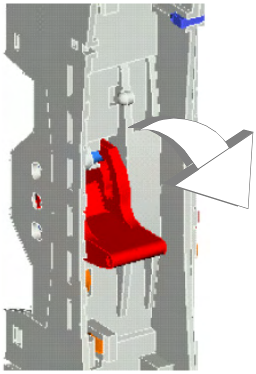
The right side of the STB XBA 2100 auxiliary power supply base presents six contacts, as do all Advantys module bases. The following table describes each of the six contacts on the right side of the STB XBA_2100 auxiliary power supply:

Contacts	Signals
1	reserved
2	the common ground contact
3	the 5 VDC logic power signal generated by the STB CPS 2100 auxiliary power supply
4 and 5	used for communications across the island bus between the I/O and the NIM—contact 4 is positive (+ve), and contact 5 is negative (-ve).
6	connects the module in the base to the island's address line. The NIM uses the address line to validate that the expected module is located at each physical address.

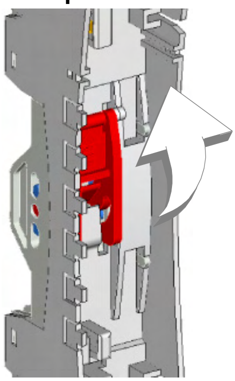
The Lock/ Release Latch

The latch in the center front of the STB XBA 2100 base has two positions, as shown below:

Release position



Lock position



The latch needs to be in release position while the base is being inserted on the DIN rail and when it is being removed from the DIN rail. It needs to be in lock position when the base has been pushed and snapped into place on the rail before the module is inserted into the base.

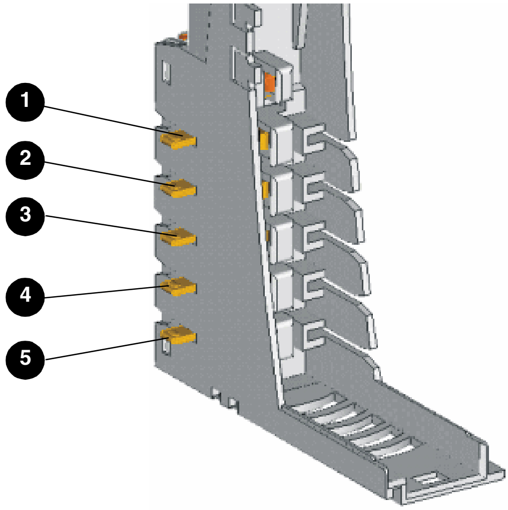
The DIN Rail Contacts

One of the functions of the DIN rail is to provide the island with functional earth. Functional earth provides the island with noise immunity control and RFI/EMI protection.

When an Advantys STB module is snapped onto the DIN rail, two contacts on the back of the rail provide the earth ground connection between the rail and the module that will be seated on the base.

The Field Power Distribution Contacts

The five contacts located in a column at the bottom of the STB XBA 2100 base provide AC or DC field power and a protective earth (PE) connections to the STB XBA 2100 auxiliary power supply. They are as follows:

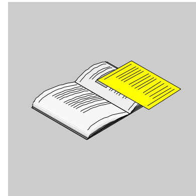


Field power (sensor power for inputs and actuator power for outputs) from the PDM passes through the STB XBA 2100 base. However, with this base only, the STB CPS 2111 auxiliary power supply uses neither sensor power, nor actuator power.

Contacts	Signals
1 and 2	not used by the STB CPS 2111 auxiliary power supply, when inserted in its intended base
3 and 4	not used by the STB CPS 2111 auxiliary power supply, when inserted in its intended base
5	PE is established via a captive screw on the PDM base units (see *p. 826*) and is delivered to the Advantys STB module via contact 5

The STB CPS 2111 auxiliary power supply inserted in its dedicated base (STB XBA 2100) does not use any of the contacts described in the preceding table.

Appendices



Overview

IEC Symbols

This appendix illustrates the IEC symbols used in the field wiring examples in this book and some of the installation examples in the *Advantys STB Planning and Installation Guide* (890 USE 171).

What's in this Appendix?

The appendix contains the following chapters:

IEC Symbols

A

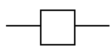
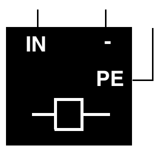
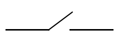
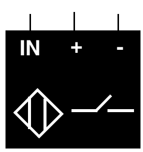
IEC Symbols

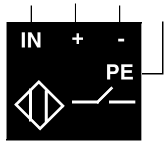
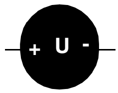
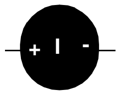
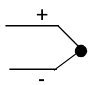
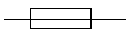
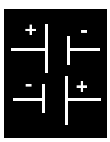
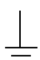
Introduction

The following table contains illustrations and definitions of the common IEC symbols used in describing the Advantys STB modules and system.

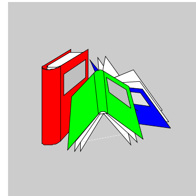
List of Symbols

Here are some common IEC symbols used in the field wiring examples throughout this book:

Symbol	Definition
	two-wire actuator/output
	three-wire actuator/output
	two-wire digital sensor/input
	three-wire digital sensor/input

Symbol	Definition
	four-wire digital sensor/input
	analog voltage sensor
	analog current sensor
	thermocouple element
	fuse
	VAC power
	VDC power
	earth ground

Glossary



!

10Base-T An adaptation of the IEEE 802.3 (Ethernet) standard, the 10Base-T standard uses twisted-pair wiring with a maximum segment length of 100 m (328 ft) and terminates with an RJ-45 connector. A 10Base-T network is a baseband network capable of transmitting data at a maximum speed of 10 Mbit/s.

802.3 frame A frame format, specified in the IEEE 802.3 (Ethernet) standard, in which the header specifies the data packet length.

A

agent **1.** SNMP—the SNMP application that runs on a network device. **2.** Fipio—a slave device on a network.

analog input A module that contains circuits that convert analog DC input signals to digital values that can be manipulated by the processor. By implication, these analog inputs are usually direct—i.e., a data table value directly reflects the analog signal value.

analog output A module that contains circuits that transmit an analog DC signal proportional to a digital value input to the module from the processor. By implication, these analog outputs are usually direct—i.e., a data table value directly controls the analog signal value.

application object In CAN-based networks, application objects represent device-specific functionality, such as the state of input or output data.

ARP — *address resolution protocol.* The IP network layer protocol, which uses ARP to map an IP address to a MAC (hardware) address.

auto baud — The automatic assignment and detection of a common baud rate as well as the ability of a device on a network to adapt to that rate.

auto-addressing — The assignment of an address to each island bus I/O module and preferred device.

auto-configuration — The ability of island modules to operate with predefined default parameters. A configuration of the island bus based completely on the actual assembly of I/O modules.

B

basic I/O — Low-cost Advantys STB input/output modules that use a fixed set of operating parameters. A basic I/O module cannot be reconfigured with the Advantys configuration software and cannot be used in reflex actions.

basic network interface — A low-cost Advantys STB network interface module that supports a single segment of up to 12 Advantys STB I/O modules. A basic NIM does not support the Advantys configuration software, reflex actions, island bus extensions, nor the use of an HMI panel.

basic power distribution module — A low-cost Advantys STB PDM that distributes sensor power and actuator power over a single field power bus on the island. The bus provides a maximum of 4 A total power. A basic PDM requires one 5 A fuse to protect the I/O.

BootP — *bootstrap protocol.* A UDP/IP protocol that allows an internet node to obtain its IP parameters based on its MAC address.

BOS — *beginning of segment.* When more than one segment of I/O modules is used in an island, a beginning of segment module is installed in the first position in each extension segment. Its job is to pass island bus communications to and generate logic power for the extension segment.

bus arbitrator — A master on a Fipio network.

C

CAN *controller area network.* The CAN protocol (ISO 11898) for serial bus networks is designed for the interconnection of smart devices (from multiple manufacturers) in smart systems for real-time industrial applications. CAN multi-master systems ensure high data integrity through the implementation of broadcast messaging and advanced error mechanisms. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

CANopen protocol An open industry standard protocol used on the internal communication bus. The protocol allows the connection of any standard CANopen device to the island bus.

CI *command interface.*

CiA *CAN in Automation*. CiA is a non-profit group of manufacturers and users dedicated to developing and supporting CAN-based higher layer protocols.

COB *communication object.* A communication object is a unit of transportation (a message) in a CAN-based network. Communication objects indicate a particular functionality in a device. They are specified in the CANopen communication profile.

COMS *island bus scanner.*

configuration The arrangement and interconnection of hardware components within a system and the hardware and software selections that determine the operating characteristics of the system.

CRC *cyclic redundancy check.* Messages that implement this error checking mechanism have a CRC field that is calculated by the transmitter according to the message's content. Receiving nodes recalculate the field. Disagreement in the two codes indicates a difference between the transmitted message and the one received.

D

DeviceNet protocol DeviceNet is a low-level, connection-based network that is based on CAN, a serial bus system without a defined application layer. DeviceNet, therefore, defines a layer for the industrial application of CAN.

DHCP *dynamic host configuration protocol.* A TCP/IP protocol that allows a server to assign an IP address based on a role name (host name) to a network node.

differential input A type of input design where two wires (+ and -) are run from each signal source to the data acquisition interface. The voltage between the input and the interface ground are measured by two high-impedance amplifiers, and the outputs from the two amplifiers are subtracted by a third amplifier to yield the difference between the + and - inputs. Voltage common to both wires is thereby removed. Differential design solves the problem of ground differences found in single-ended connections, and it also reduces the cross-channel noise problem.

digital I/O An input or output that has an individual circuit connection at the module corresponding directly to a data table bit or word that stores the value of the signal at that I/O circuit. It allows the control logic to have discrete access to the I/O values.

DIN *Deutsche industrial norms.* A German agency that sets engineering and dimensional standards and now has worldwide recognition.

E

economy segment A special type of STB I/O segment created when an STB NCO 1113 economy CANopen NIM is used in the first location. In this implementation, the NIM acts as a simple gateway between the I/O modules in the segment and a CANopen master. Each I/O module in an economy segment acts as a independent node on the CANopen network. An economy segment cannot be extended to other STB I/O segments, preferred modules or standard CANopen devices.

EDS *electronic data sheet.* The EDS is a standardized ASCII file that contains information about a network device's communications functionality and the contents of its object dictionary. The EDS also defines device-specific and manufacturer-specific objects.

EIA *Electronic Industries Association.* An organization that establishes electrical/ electronic and data communication standards.

EMC *electromagnetic compatibility.* Devices that meet EMC requirements can operate within a system's expected electromagnetic limits without error.

EMI *electromagnetic interference.* EMI can cause an interruption, malfunction, or disturbance in the performance of electronic equipment. It occurs when a source electronically transmits a signal that interferes with other equipment.

EOS — *end of segment.* When more than one segment of I/O modules is used in an island, an end of segment module is installed in the last position in every segment that has an extension after it. The EOS module is also used to connect a preferred module to the island bus extension that precedes it. The EOS module extends island bus communications to the next segment or preferred module.

Ethernet — A LAN cabling and signaling specification used to connect devices within a defined area, e.g., a building. Ethernet uses a bus or a star topology to connect different nodes on a network.0

Ethernet II — A frame format in which the header specifies the packet type, Ethernet II is the default frame format for STB NIP 2212 communications.

F

fallback state — A safe state to which an Advantys STB I/O module can return in the event that its communication connection fails.

fallback value — The value that a device assumes during fallback. Typically, the fallback value is either configurable or the last stored value for the device.

FED_P — *Fipio extended device profile.* On a Fipio network, the standard device profile type for agents whose data length is more than eight words and equal to or less than thirty-two words.

Fipio — *Fieldbus Interface Protocol (FIP).* An open fieldbus standard and protocol that conforms to the FIP/World FIP standard. Fipio is designed to provide low-level configuration, parameterization, data exchange, and diagnostic services.

Flash memory — Flash memory is nonvolatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

FRD_P — *Fipio reduced device profile.* On a Fipio network, the standard device profile type for agents whose data length is two words or less.

FSD_P — *Fipio standard device profile.* On a Fipio network, the standard device profile type for agents whose data length is more than two words and equal to or less than eight words.

full scale — The maximum level in a specific range—e.g., in an analog input circuit the maximum allowable voltage or current level is at full scale when any increase beyond that level is over-range.

function block A function block performs a specific automation function, such as speed control. A function block comprises configuration data and a set of operating parameters.

function code A function code is an instruction set commanding one or more slave devices at a specified address(es) to perform a type of action, e.g., read a set of data registers and respond with the content.

G

gateway A program or /hardware that passes data between networks.

global_ID *global_identifier.* A 16-bit integer that uniquely identifies a device's location on a network. A global_ID is a symbolic address that is universally recognized by all other devices on the network.

GSD *generic slave data* (file). A device description file, supplied by the device's manufacturer, that defines a device's functionality on a Profibus DP network.

H

HMI *human-machine interface* An operator interface, usually graphical, for industrial equipment.

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hot swapping Replacing a component with a like component while the system remains operational. When the replacement component is installed, it begins to function automatically.

HTTP *hypertext transfer protocol.* The protocol that a web server and a client browser use to communicate with one another.

I

I/O base A mounting device, designed to seat an Advantys STB I/O module, hang it on a DIN rail, and connect it to the island bus. It provides the connection point where the module can receive either 24 VDC or 115/230 VAC from the input or output power bus distributed by a PDM.

I/O module In a programmable controller system, an I/O module interfaces directly to the sensors and actuators of the machine/process. This module is the component that mounts in an I/O base and provides electrical connections between the controller and the field devices. Normal I/O module capacities are offered in a variety of signal levels and capacities.

I/O scanning The continuous polling of the Advantys STB I/O modules performed by the COMS to collect data bits, status, error, and diagnostics information.

IEC *International Electrotechnical Commission Carrier.* Founded in 1884 to focus on advancing the theory and practice of electrical, electronics, and computer engineering, and computer science. IEC 1131 is the specification that deals with industrial automation equipment.

IEC type 1 input Type 1 digital inputs support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

IEC type 2 input Type 2 digital inputs support sensor signals from solid state devices or mechanical contact switching devices such as relay contacts, push buttons (in normal or harsh environmental conditions), and two- or three-wire proximity switches.

IEC type 3 input Type 3 digital inputs support sensor signals from mechanical switching devices such as relay contacts, push buttons (in normal-to-moderate environmental conditions), three-wire proximity switches and two-wire proximity switches that have:
- a voltage drop of no more than 8 V
- a minimum operating current capability less than or equal to 2.5 mA
- a maximum off-state current less than or equal to 1.5 mA

IEEE *Institute of Electrical and Electronics Engineers, Inc.* The international standards and conformity assessment body for all fields of electrotechnology, including electricity and electronics.

industrial I/O An Advantys STB I/O module designed at a moderate cost for typical continuous, high-duty-cycle applications. Modules of this type often feature standard IEC threshold ratings, usually providing user-configurable parameter options, on-board protection, good resolution, and field wiring options. They are designed to operate in moderate-to-high temperature ranges.

input filtering The amount of time that a sensor must hold its signal on or off before the input module detects the change of state.

input polarity An input channel's polarity determines when the input module sends a 1 and when it sends a 0 to the master controller. If the polarity is *normal*, an input channel will send a 1 to the controller when its field sensor turns on. If the polarity is *reverse*, an input channel will send a 0 to the controller when its field sensor turns on.

input response time The time it takes for an input channel to receive a signal from the field sensor and put it on the island bus.

INTERBUS protocol The INTERBUS fieldbus protocol observes a master/slave network model with an active ring topology, having all devices integrated in a closed transmission path.

IP *internet protocol.* That part of the TCP/IP protocol family that tracks the internet addresses of nodes, routes outgoing messages, and recognizes incoming messages.

L

LAN *local area network.* A short-distance data communications network.

light industrial I/O An Advantys STB I/O module designed at a low cost for less rigorous (e.g., intermittent, low-duty-cycle) operating environments. Modules of this type operate in lower temperature ranges with lower qualification and agency requirements and limited on-board protection; they usually have limited or no user-configuration options.

linearity A measure of how closely a characteristic follows a straight-line function.

LSB *least significant bit, least significant byte.* The part of a number, address, or field that is written as the rightmost single value in conventional hexadecimal or binary notation.

M

MAC address *media access control address.* A 48-bit number, unique on a network, that is programmed into each network card or device when it is manufactured.

mandatory module When an Advantys STB I/O module is configured to be mandatory, it must be present and healthy in the island configuration for the island to be operational. If a mandatory module fails or is removed from its location on the island bus, the island will go into a pre-operational state. By default, all I/O modules are not mandatory. You must use the Advantys configuration software to set this parameter.

master/slave model The direction of control in a network that implements the master/slave model is always from the master to the slave devices.

Modbus Modbus is an application layer messaging protocol. Modbus provides client and server communications between devices connected on different types of buses or networks. Modbus offers many services specified by function codes.

MOV *metal oxide varistor*. A two-electrode semiconductor device with a voltage-dependant nonlinear resistance that drops markedly as the applied voltage is increased. It is used to suppress transient voltage surges.

MSB *most significant bit, most significant byte.* The part of a number, address, or field that is written as the leftmost single value in conventional hexadecimal or binary notation.

N

N.C. contact *normally closed* contact. A relay contact pair that is closed when the relay coil is de-energized and open when the coil is energized.

N.O. contact *normally open.* contact. A relay contact pair that is open when the relay coil is de-energized and closed when the coil is energized.

NEMA *National Electrical Manufacturers Association.*

network cycle time The time that a master requires to complete a single scan of all of the configured I/O modules on a network device; typically expressed in microseconds.

NIM *network interface module.* This module is the interface between an island bus and the fieldbus network of which the island is a part. A NIM enables all the I/O on the island to be treated as a single node on the fieldbus. The NIM also provides 5 V of logic power to the Advantys STB I/O modules in the same segment as the NIM.

NMT *network management.* NMT protocols provide services for network initialization, error control, and device status control.

O

object dictionary (aka *object directory*) Part of the CANopen device model that provides a map to the internal structure of CANopen devices (according to CANopen profile DS-401). A device's object dictionary is a lookup table that describes the data types, communications objects, and application objects the device uses. By accessing a particular device's object dictionary through the CANopen fieldbus, you can predict its network behavior and build a distributed application.

open industrial communication network A distributed communication network for industrial environments based on open standards (EN 50235, EN50254, and EN50170, and others) that allows the exchange of data between devices from different manufacturers.

output filtering The amount that it takes an output channel to send change-of-state information to an actuator after the output module has received updated data from the NIM.

output polarity An output channel's polarity determines when the output module turns its field actuator on and when it turns the actuator off. If the polarity is *normal*, an output channel will turn its actuator on when the master controller sends it a 1. If the polarity is *reverse*, an output channel will turn its actuator on when the master controller sends it a 0.

output response time The time it takes for an output module to take an output signal from the island bus and send it to its field actuator.

P

parameterize To supply the required value for an attribute of a device at run-time.

PDM
power distribution module. A module that distributes either AC or DC field power to a cluster of I/O modules directly to its right on the island bus. A PDM delivers field power to the input modules and the output modules. It is important that all the I/O clustered directly to the right of a PDM be in the same voltage group—either 24 VDC, 115 VAC, or 230 VAC.

PDO
process data object. In CAN-based networks, PDOs are transmitted as unconfirmed broadcast messages or sent from a producer device to a consumer device. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

PE
protective earth. A return line across the bus for fault currents generated at a sensor or actuator device in the control system.

peer-to-peer communications
In peer-to-peer communications, there is no master/slave or client/server relationship. Messages are exchanged between entities of comparable or equivalent levels of functionality, without having to go through a third party (like a master device).

PLC
programmable logic controller. The PLC is the brain of an industrial manufacturing process. It automates a process as opposed to relay control systems. PLCs are computers suited to survive the harsh conditions of the industrial environment.

preferred module
An I/O module that functions as an auto-addressable node on an Advantys STB island but is not in the same form factor as a standard Advantys STB I/O module and therefore does not fit in an I/O base. A preferred device connects to the island bus via an STB XBE 1000 EOS module and a length of STB XCA 100*x* bus extension cable. It can be extended to another preferred module or back into a standard island segment. If it is the last device on the island, it must be terminated with a 120 Ω terminator.

premium network interface
An Advantys STB network interface module designed at a relatively high cost to support high module densities, high transport data capacity (e.g., for web servers), and more diagnostics on the island bus.

prioritization
An optional feature on a standard NIM that allows you to selectively identify digital input modules to be scanned more frequently during a the NIM’s logic scan.

process I/O
An Advantys STB I/O module designed for operation at extended temperature ranges in conformance with IEC type 2 thresholds. Modules of this type often feature high levels of on-board diagnostics, high resolution, user-configurable parameter options, and higher levels of agency approval.

process image A part of the NIM firmware that serves as a real-time data area for the data exchange process. The process image includes an input buffer that contains current data and status information from the island bus and an output buffer that contains the current outputs for the island bus, from the fieldbus master.

producer/ consumer model In networks that observe the producer/consumer model, data packets are identified according to their data content rather than by their physical location. All nodes *listen* on the network and consume those data packets that have appropriate identifiers.

Profibus DP *Profibus Decentralized Peripheral.* An open bus system that uses an electrical network based on a shielded two-wire line or an optical network based on a fiber-optic cable. DP transmission allows for high-speed, cyclic exchange of data between the controller CPU and the distributed I/O devices.

R

reflex action A simple, logical command function configured locally on an island bus I/O module. Reflex actions are executed by island bus modules on data from various island locations, like input and output modules or the NIM. Examples of reflex actions include compare and copy operations.

repeater An interconnection device that extends the permissible length of a bus.

reverse polarity protection Use of a diode in a circuit to protect against damage and unintended operation in the event that the polarity of the applied power is accidentally reversed.

rms *root mean square.* The effective value of an alternating current, corresponding to the DC value that produces the same heating effect. The rms value is computed as the square root of the average of the squares of the instantaneous amplitude for one complete cycle. For a sine wave, the rms value is 0.707 times the peak value.

role name A customer-driven, unique logical personal identifier for an Ethernet Modbus TCP/IP NIM. A role name is created either as a combination of a numeric rotary switch setting and the STB NIP 2212 part number or by modifying text on the Configure Role Name web page. After the STB NIP 2212 is configured with a valid role name, the DHCP server will use it to identify the island at power up.

RTD *resistive temperature detect.* An RTD device is a temperature transducer composed of conductive wire elements typically made of platinum, nickel, copper, or nickel-iron. An RTD device provides a variable resistance across a specified temperature range.

RTP *run-time parameters.* RTP lets you monitor and modify selected I/O parameters and island bus status registers of the NIM, while the Advantys STB island is running. The RTP feature is implemented using standard Modbus commands to write to five reserved words in the NIM's output data process image (the RTP request block), and read the values of four reserved words in the NIM's input data process image (the RTP response block). Available only in standard NIMs running firmware version 2.0 or higher.

Rx *reception.* For example, in a CAN-based network, a PDO is described as an RxPDO of the device that receives it.

S

SAP *service access point.* The point at which the services of one communications layer, as defined by the ISO OSI reference model, is made available to the next layer.

SCADA *supervisory control and data acquisition.* Typically accomplished in industrial settings by means of microcomputers.

SDO *service data object.* In CAN-based networks, SDO messages are used by the fieldbus master to access (read/write) the object directories of network nodes.

segment A group of interconnected I/O and power modules on an island bus. An island must have at least one segment and, depending on the type of NIM used, may have as many as seven segments. The first (leftmost) module in a segment needs to provide logic power and island bus communications to the I/O modules on its right. In the primary or basic segment, that function is filled by a NIM. In an extension segment, that function is filled by an STB XBE 1200 BOS module. (An island running with a basic NIM does not support extension segments.)

SELV *safety extra low voltage.* A secondary circuit designed and protected so that the voltage between any two accessible parts (or between one accessible part and the PE terminal for Class 1 equipment) does not exceed a specified value under normal conditions or under single-fault conditions.

SIM *subscriber identification module.* Originally intended for authenticating users of mobile communications, SIMs now have multiple applications. In Advantys STB, configuration data created or modified with the Advantys configuration software can be stored on a SIM and then written to the NIM's Flash memory.

single-ended inputs An analog input design technique whereby a wire from each signal source is connected to the data acquisition interface, and the difference between the signal and ground is measured. Two conditions are imperative to the success of this design technique—the signal source must be grounded, and the signal ground and data acquisition interface ground (the PDM lead) must have the same potential.

sink load An output that, when turned on, receives DC current from its load.

size 1 base A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the island bus. It is 13.9 mm wide and 128.25 mm high.

size 2 base A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the island bus. It is 18.4 mm wide and 128.25 mm high.

size 3 base A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the island bus. It is 28.1 mm wide and 128.25 mm high.

slice I/O An I/O module design that combines a small number of channels (usually between two and six) in a small package. The idea is to allow a system developer to purchase just the right amount of I/O and to be able to distribute it around the machine in an efficient, mechatronics way.

SM_MPS *state management_message periodic services.* The applications and network management services used for process control, data exchange, error reporting, and device status notification on a Fipio network.

SNMP *simple network management protocol.* The UDP/IP standard protocol used to manage nodes on an IP network.

snubber A circuit generally used to suppress inductive loads—it consists of a resistor in series with a capacitor (in the case of an RC snubber) and/or a metal-oxide varistor placed across the AC load.

source load A load with a current directed into its input; must be driven by a current source.

standard I/O Any of a subset of Advantys STB input/output modules designed at a moderate cost to operate with user-configurable parameters. A standard I/O module may be reconfigured with the Advantys configuration software and, in most cases, may be used in reflex actions.

standard network interface An Advantys STB network interface module designed at moderate cost to support the configuration capabilities, multi-segment design and throughput capacity suitable for most standard applications on the island bus. An island run by a standard NIM can support up to 32 addressable Advantys STB and/or preferred I/O modules, up to six of which may be standard CANopen devices.

standard power distribution module An Advantys STB module that distributes sensor power to the input modules and actuator power to the output modules over two separate power buses on the island. The bus provides a maximum of 4 A to the input modules and 8 A to the output modules. A standard PDM requires a 5 A fuse to protect the input modules and an 8 A fuse to protect the outputs.

STD_P *standard profile.* On a Fipio network, a standard profile is a fixed set of configuration and operating parameters for an agent device, based on the number of modules that the device contains and the device's total data length. Three types of standard profiles are available—Fipio reduced device profile (FRD_P), Fipio standard device profile (FSD_P), and the Fipio extended device profile (FED_P).

stepper motor A specialized DC motor that allows discrete positioning without feedback.

subnet A part of a network that shares a network address with the other parts of a network. A subnet may be physically and/or logically independent of the rest of the network. A part of an internet address called a subnet number, which is ignored in IP routing, distinguishes the subnet.

surge suppression The process of absorbing and clipping voltage transients on an incoming AC line or control circuit. Metal-oxide varistors and specially designed RC networks are frequently used as surge suppression mechanisms.

T

TC *thermocouple.* A TC device is a bimetallic temperature transducer that provides a temperature value by measuring the voltage differential caused by joining together two different metals at different temperatures.

TCP *transmission control protocol.* A connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is part of the TCP/IP suite of protocols.

telegram A data packet used in serial communication.

TFE *transparent factory Ethernet.* Schneider Electric's open automation framework based on TCP/IP.

Tx *transmission.* For example, in a CAN-based network, a PDO is described as a TxPDO of the device that transmits it.

U

UDP *user datagram protocol.* A connectionless mode protocol in which messages are delivered in a datagram to a destination computer. The UDP protocol is typically bundled with the Internet Protocol (UPD/IP).

V

varistor A two-electrode semiconductor device with a voltage-dependant nonlinear resistance that drops markedly as the applied voltage is increased. It is used to suppress transient voltage surges.

voltage group A grouping of Advantys STB I/O modules, all with the same voltage requirement, installed directly to the right of the appropriate power distribution module (PDM) and separated from modules with different voltage requirements. Never mix modules with different voltage requirements in the same voltage group.

W

watchdog timer A timer that monitors a cyclical process and is cleared at the conclusion of each cycle. If the watchdog runs past its programmed time period, it generates a fault.

Index

E

F

K

L

M

O

P

R

S

T

U

W