OPTOELECTRONICS
MODEL CX12 OPTOLINX
PC-RADIO UNIVERSAL INTERFACE
OPERATORS MANUAL
March 6, 1996

INTRODUCTION

This document describes the operation of the Optoelectronics, Inc. OptoLinx PC-Radio Universal Interface. The OptoLinx adapts a wide variety of Radios, Scanners, Decoders, Frequency Counters, GPS receivers and other devices for connection to an RS-232C personal computer serial port in a star network configuration.

Both full and half duplex devices can be connected simultaneously using software to switch between them. Switching between full and half duplex can be done either through software or manually using a switch on the rear panel.

The OptoLinx also has special provisions for connecting an RS-232C personal computer serial port to the AOR AR3000, AR2700, and AR8000 scanning receivers, or a NMEA 0183 compatible GPS or LORAN receiver. An external tape recorder or other device can also be controlled by a PC through the OptoLinx.

An Audio input with circuitry acting as a Data Slicer is included for future use to permit software decoding of FSK or AFSK modulated carriers. An optional rechargeable battery pack is available for portable applications.

A 9 pin miniature DIN connector brings all inputs together to enable the user to construct custom cabling for specific applications. Unique to the OptoLinx is the FFC-7 connector and cable used for connection to the AR8000 and AR2700 hand held scanners.

Optoelectronics Inc does not specify or recommend any particular software for use with the OptoLinx. Anyone wishing to develop software to support any device to be connected to the OptoLinx is free to do so but please be advised that Optoelectronics will not provide any technical support.

CONNECTIONS

The OptoLinx has two connections located on the rear panel, and eight connections located on the front panel. The functions of each of the interfaces are briefly described below. A more detailed discussion is given in the OPERATION section.

POWER

DC power is supplied to the OPTOLINX through the POWER connector, a standard 2.1 mm coaxial DC power jack located on the rear panel. The connections are as follows.

Pin	Signal
Center	+ 9 - 16 VDC, 100 mA max.
Shield	Ground

RS-232C

The RS-232C connector, located on the rear panel, is a DB-9S (9-pin female) connector used to connect the OPTOLINX to a personal computer serial port. The connector pinout is such that a "straight-through" cable is required for the connection (i.e., connection does not require a null modem adapter). The connections are as follows:

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	Ground
6	DSR
7	RTS
8	CTS
9	RI

TAPE

The Tape connector is a standard 2.5 mm phone jack which provides a pair of normally-open relay contacts for controlling the tape pause function of an external tape recorder. However, the relay contacts can be used for any function.

GPS

The connections are as follows:

Pin	Signal
Tip	NMEA-0183-A
Shield	NMEA-0183-B

AUX

The connections are as follows:

Pin	Signal
Tip	Audio
Ring	Squelch
Shield	Ground

SERIAL DATA

There are three identical serial data connectors, labeled A, B, and C, located on the front panel. These miniature stereo phone jacks are used to connect up to three Optoelectronics or other CI-V compatible devices to the OPTOLINX. The "TIP" carries TTL transmit data from the OPTOLINX, the "RING" carries TTL receive data to the OPTOLINX, and the "SHIELD" provides the return for both. This pinout convention is such that a standard stereo audio patch cable can be used to connect the OPTOLINX to other Optoelectronics devices equipped with serial ports. The connections are as follows:

Pin	Signal
Tip	TTL TXD (or CI-V) from OPTOLINX
Ring	TTL RXD to OPTOLINX
Shield	Ground

AR8000/AR2700
The connections are as follows:

Pin	Signal
1	Squelch
2	Audio
3	Ground
4	Ground
5	TTL TXD from OPTOLINX
6	TTL RXD to OPTOLINX
7	N.C.

APPLICATION: CONNECTION TO AR8000/AR2700

The AOR AR8000 is connected to the OptoLinx using the 12" long FFC (flat flexible cable) cable supplied. Note the white plastic backing on one end of the cable that is designed to help when plugging into the radio. When plugged into the radio correctly (holding the AR8000 antenna up) the white plastic stiffener is down. To plug correctly into the OptoLinx, twist the FFC cable 180 degrees so that it plugs in with the blue backing tape down.

The orientation of the FFC cable when plugging into the AR2700 Radio is exactly opposite so the white stiffener will be up and there will be no twist in the cable.

CUSTOM INPUT

The connections are as follows:

Pin	Signal
1	RS-232 TXD from OPTOLINX
2	RS-232 RXD to OPTOLINX
3	TTL TXD from OPTOLINX
4	TTL RXD to OPTOLINX
5	RTS from OPTOLINX
6	CTS to OPTOLINX
7	CI-V
8	Audio
9	Squelch
Shield	Ground

CUSTOM INPUT APPLICATION: AR3000A

The Mini Din 9 connector contains all active input signal connections. The purpose of this "Custom Input" is to permit a single cable connection to virtually any radio with a data port. As an example application, the table below shows the connections for an AOR AR3000A. It should be noted that the AR3000A can be connected directly to a PC and that there is currently no application for its use with the OptoLinx. Because of the Remote mode switching capability built into the AR3000A, it is anticipated that there will be software support to operate the OptoLinx together with the DC440 decoder or with another radio. It is possible to configure a Mini Din 9 plug and cable for other radio's using the appropriate connections. The connections are as follows:

Mini Din 9 Pin Number	Signal Name	AR3000A DB25	AR3000A DB9
1	RS-232 TXD from OPTOLINX	2	3
2	RS-232 RXD to OPTOLINX	3	2
3	TTL TXD from OPTOLINX	x	x
4	TTL RXD to OPTOLINX	x	x
5	RTS from OPTOLINX	4	7
6	CTS to OPTOLINX	5	8
7	CI-V	x	x
8	Audio	See Note 1	See Note 1
9	Squelch	x	x
Shield	Ground	1& 7	5 & Shield

x = Not used for AR3000A

Note 1: Audio from the AR3000A or preferably discriminator audio can be brought in through any unused conductor in the cable. The DC440 Decoder Owner's Manual has discriminator audio and squelch connections for the AR3000A.

CONTROLS

The OptoLinx has two controls, located on the rear panel. The functions of each of the controls are briefly described below. A more detailed discussion is given in the OPERATION section.

POWER

The POWER switch, located on the rear panel, turns the unit on and off, provided that the correct DC voltage is supplied through the POWER connector, or an optional internal rechargeable battery pack is installed and charged.

CONFIGURATION

A four-position piano-type DIP switch, located on the rear panel, configures the OPTOLINX in its various operating modes.

INDICATORS

The OptoLinx has five Light-Emitting Diode (LED) indicators, one located on the rear panel, and four located on the front panel. The functions of each of the indicators are briefly described below. A more detailed discussion is given in the OPERATION section.

PWR

The PWR indicator, located on the rear panel, illuminates whenever DC power is supplied to the unit, and the internal voltage regulator is maintaining the proper voltage.

REMOTE

The REMOTE indicator, located on the front panel, illuminates whenever the unit is in REMOTE mode.

HALF DUPLEX
The HALF DUPLEX indicator, located on the front panel, illuminates whenever the unit is in HALF DUPLEX mode.

FULL DUPLEX
The FULL DUPLEX indicator, located on the front panel, illuminates whenever the unit is in FULL DUPLEX mode.

AR3000
The AR3000 indicator, located on the front panel, illuminates whenever the unit is in AR3000 mode.

OPERATION

In this section, connection and operation of the OptoLinx are described in detail.

RS-232C Serial Ports

Most personal computers are equipped with at least one, and usually two, RS-232C asynchronous serial ports. In the case of IBM PC compatibles, these RS-232C ports are usually referred to as COM1 and COM2. Often, a mouse is connected to one of these ports. Although this type of personal computer is most common, the OPTOLINX can be connected to any computer with an RS-232C port. For more information see section at the end of the manual "About the PC Serial Interface Port."

TTL serial ports

Many Optoelectronics products are equipped with a TTL asynchronous serial interface which allows the unit to be connected to a personal computer for the purpose of remote control and/or automatic data logging. This three-wire interface has different voltage levels and data polarity than the standard RS-232C interface. The OPTOLINX can connect to as many as four different Optoelectronics devices equipped with serial ports.

TTL INPUT APPLICATION: Connection of an M1 Handi Counter

To connect an Optoelectronics M1 equipped with a TTL serial port to a personal computer equipped with an RS-232C serial port, perform the following steps:

1. Connect the male end of the supplied RS-232C cable to the RS-232C connector located on the rear panel of the OptoLinx.

2. Connect the female end of the RS-232C cable to the RS-232C connector on your personal computer. Consult your personal computer manual if necessary.

3. Connect one end of the supplied miniature serial data cable to one of the three serial data connectors (labeled A, B, or C) located on the front panel of the OptoLinx.

4. Connect the other end of the miniature serial data cable to the serial data connector on the Optoelectronics product.

5. If more than one device is to be connected to the OptoLinx, repeat steps 3 and 4 above for each additional device using optional miniature serial data cables. Up to three devices can be connected to the OptoLinx.

6. Connect the cable plug of the supplied AC adapter to the POWER jack on the rear panel of the OptoLinx.

7. Plug the AC adapter into a working 120V AC outlet. Slide the power switch to the ON position. The PWR indicator on the rear panel of the OptoLinx should be illuminated.

8. Set the Configuration switches for Local, Full Duplex and Normal Mode. The OptoLinx is now ready for use.

Configuration
The various operating modes of the OptoLinx are selected by a four-position piano-type DIP switch, located on the rear panel. The four switch positions are assigned as follows:

1 LOCAL/REMOTE mode selection
2 HALF/FULL DUPLEX mode selection
3 NORMAL/AR3000 mode selection
4 Spare (unused)

Since the OPTOLINX can perform many different complex interfacing functions, the three configuration switches interact with one another differently depending upon the modes selected. First, we will define the various modes listed above. Then, all six possible configurations, and their operation, will be detailed in Table 1.

LOCAL Mode
LOCAL mode is selected by placing configuration switch 1 in the OFF (UP) position. In this mode, configuration switch 2 is used to select between HALF DUPLEX and FULL DUPLEX modes. HALF DUPLEX mode is selected by placing switch 2 in the OFF (UP) position. FULL DUPLEX mode is selected by placing switch 2 in the ON (DOWN) position.

REMOTE Mode
REMOTE mode is selected by placing configuration switch 1 in the ON (DOWN) position. In this mode, configuration switch 2 is ignored, and an RS-232C interface signal from the computer selects between HALF DUPLEX and FULL DUPLEX modes. The interface signal used depends upon the setting of configuration switch 3.

HALF DUPLEX Mode
In HALF DUPLEX mode, data is transmitted to and received from various devices on a single data line. Therefore, transmission and reception cannot occur simultaneously. In this mode, the TXD signals on the DIN connector and FFC connector are disabled. Half duplex interfaces are sometimes referred to as two-wire interfaces. The CI-V interface standard, used on newer Optoelectronics products, as well as ICOM receivers and transceivers, is an example of a half duplex interface.

FULL DUPLEX Mode
In FULL DUPLEX mode, separate data lines are provided for transmit and receive data. Therefore, transmission and reception can occur simultaneously. In this mode, the TXD signals on the DIN connector and FFC connector are enabled. Full duplex interfaces are sometimes referred to as three-wire interfaces. Some older Optoelectronics products such as the M1 Handi-Counter, as well as the AOR AR2700 and AR8000 receivers are examples of full duplex interfaces.

Table 1. OptoLinx Operating Modes.

Switch 1	Switch 2	Switch 3	Operation
OFF	OFF	OFF	LOCAL/HALF DUPLEX/NORMAL Mode: 1. REMOTE indicator OFF. 2. HALF DUPLEX indicator ON. 3. FULL DUPLEX indicator OFF. 4. AR3000 indicator OFF. 5. Tape relay controlled by DTR signal. 6. DIN connector TXD signals (pins 1,3) disabled. 7. FFC connector TXD signal (pin 5) disabled. 8. A, B, and C connector RXD signals (ring) disabled. 9. TXD to RXD loopback enabled. 10. CTS signal always asserted. 11. Squelch indication on DCD and RI signals. 12. Audio zero crossings on DSR signal.
OFF	ON	OFF	LOCAL/FULL DUPLEX/NORMAL Mode: 1. REMOTE indicator OFF. 2. HALF DUPLEX indicator OFF. 3. FULL DUPLEX indicator ON. 4. AR3000 indicator OFF. 5. Tape relay controlled by DTR signal. 6. DIN connector TXD signals (pins 1,3) enabled. 7. FFC connector TXD signal (pin 5) enabled. 8. A, B, and C connector RXD signals (ring) enabled. 9. TXD to RXD loopback disabled. 10. CTS signal always asserted. 11. Squelch indication on DCD and RI signals. 12. Audio zero crossings on DSR signal.
OFF	OFF	ON	LOCAL/HALF DUPLEX/AR3000 Mode: 1. REMOTE indicator OFF. 2. HALF DUPLEX indicator ON. 3. FULL DUPLEX indicator OFF. 4. AR3000 indicator ON. 5. Tape relay controlled by DTR signal. 6. DIN connector TXD signals (pins 1,3) disabled. 7. FFC connector TXD signal (pin 5) disabled. 8. A, B, and C connector RXD signals (ring) disabled. 9. TXD to RXD loopback enabled. 10. CTS signal controlled by DIN connector CTS signal (pin 6). 11. Squelch indication on DCD and RI signals. 12. Audio zero crossings on DSR signal.

OFF	ON	ON	LOCAL/FULL DUPLEX/AR3000 Mode: 1. REMOTE indicator OFF. 2. HALF DUPLEX indicator OFF. 3. FULL DUPLEX indicator ON. 4. AR3000 indicator ON. 5. Tape relay controlled by DTR signal. 6. DIN connector TXD signals (pins 1,3) enabled. 7. FFC connector TXD signal (pin 5) enabled. 8. A, B, and C connector RXD signals (ring) enabled. 9. TXD to RXD loopback disabled. 10. CTS signal controlled by DIN connector CTS signal (pin 6). 11. Squelch indication on DCD and RI signals. 12. Audio zero crossings on DSR signal.
ON	UNUSED	OFF	REMOTE/NORMAL Mode: 1. REMOTE indicator ON. 2. HALF DUPLEX indicator controlled by RTS signal. 3. FULL DUPLEX indicator controlled by RTS signal. 4. AR3000 indicator OFF. 5. Tape relay controlled by DTR signal. 6. HALF/FULL DUPLEX mode controlled by RTS signal. 7. DIN connector TXD signals (pins 1,3) enabled or disabled by RTS signal. 8. FFC connector TXD signal (pin 5) enabled or disabled by RTS signal. 9. A, B, and C connector RXD signals (ring) enabled or disabled by RTS signal. 10. TXD to RXD loopback enabled or disabled by RTS signal. 11. CTS signal always asserted. 12. Squelch indication on DCD and RI signals. 13. Audio zero crossings on DSR signal.
ON	UNUSED	ON	REMOTE/AR3000 Mode: 1. REMOTE indicator ON. 2. HALF DUPLEX indicator controlled by DTR signal. 3. FULL DUPLEX indicator controlled by DTR signal. 4. AR3000 indicator ON. 5. Tape relay disabled. 6. HALF/FULL DUPLEX mode controlled by DTR signal. 7. DIN connector TXD signals (pins 1,3) enabled or disabled by DTR signal. 8. FFC connector TXD signal (pin 5) enabled or disabled by DTR signal. 9. A, B, and C connector RXD signals (ring) enabled or disabled by DTR signal. 10. TXD to RXD loopback enabled or disabled by DTR signal. 11. CTS signal controlled by DIN connector CTS signal (pin 6). 12. Squelch indication on DCD and RI signals. 13. Audio zero crossings on DSR signal.

ELECTRICAL SPECIFICATIONS

Since products manufactured by other companies often provide TTL asynchronous serial interfaces, the electrical specifications of the OptoLinx TTL serial ports are provided to assist users in connecting the OptoLinx to these devices. To avoid possible damage to the OptoLinx, consult the manual of the product in question to determine whether or not the interfaces are compatible. Connector types and pin outs may vary, so use caution. Damage to the OptoLinx due to improper connection to a third party device will void the warranty.

The following electrical parameters are for each of the four TTL serial ports, and are specified relative to Signal Ground (SHIELD).

Transmit Data from OptoLinx (TIP)

LOGIC "0": 0 - 0.4 Vdc (0.7 mA max. sink current)
LOGIC "1": 3.5 - 5.0 VDC (0.2 mA max. source current)

Receive Data to OptoLinx (RING)

LOGIC "0": 0 - 0.7 Vdc (0.7 mA max. load current)
LOGIC "1": 2.0 - 5.0 VDC (0.1 mA max. load current)

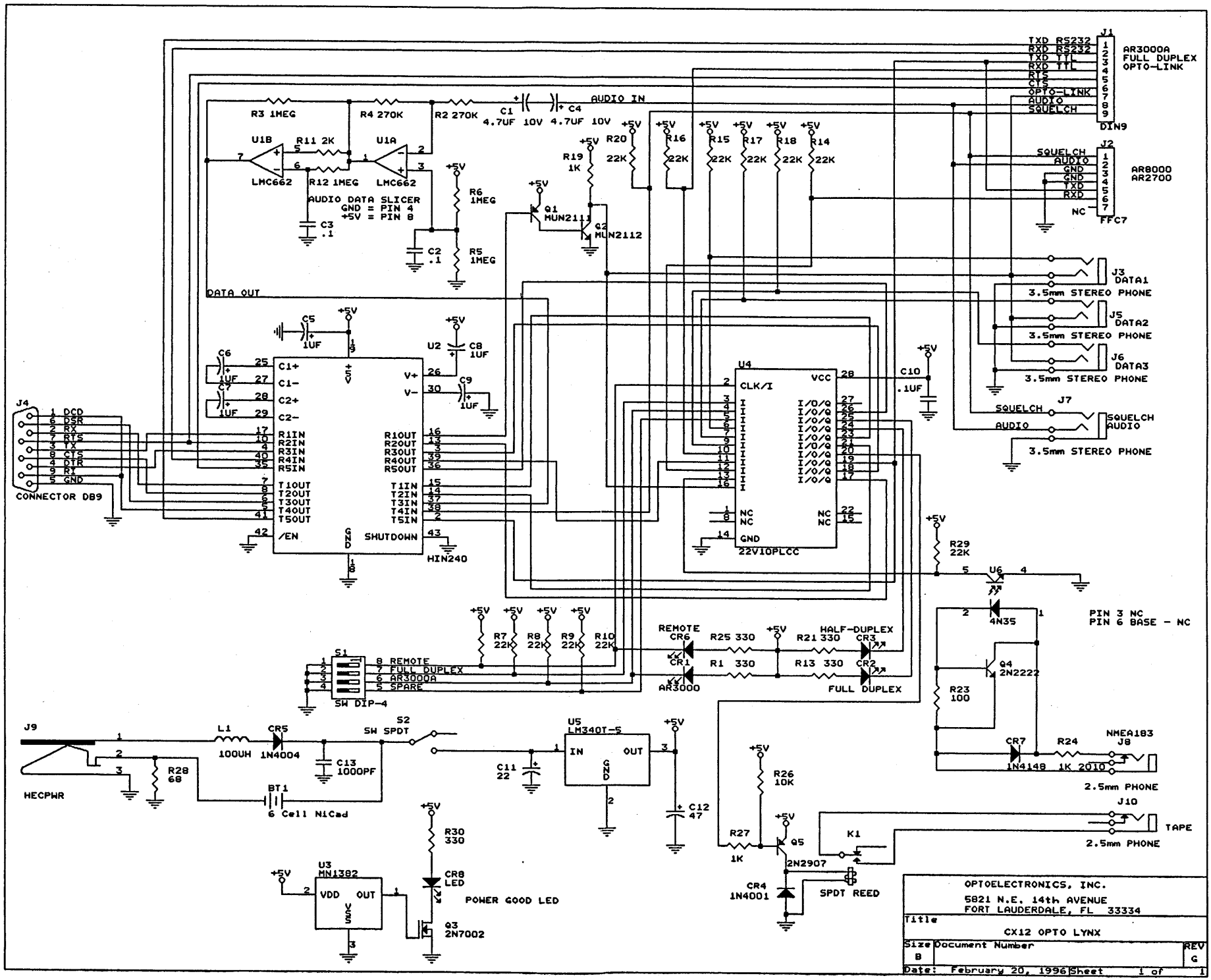
ABOUT THE PC SERIAL INTERFACE PORT

A serial interface port (may be referred to as an RS-232C or asynchronous communications port) can connect modems, mice or other peripheral devices to your personal computer. Data is transferred back and forth between the peripheral device and the computer.

Peripheral devices other than modems and mice that employ microprocessors and TTL level logic circuitry are not able to directly connect to the RS-232C port on a PC. They must have their TTL logic levels converted to meet the RS-232C specification. Fortunately this has become much more convenient and less expensive due to dedicated converter ICs that are available now. The OptoLinx and its predecessor the CX12AR use converter ICs to convert TTL logic levels to RS-232C.

Considerations other than logic level are whether the data flow is half duplex or full duplex and to what use the other data and control lines included in the interface are used with the peripheral device. The OptoLinx is designed to switch between half and full duplex both manually using a switch and electronically using one of the control lines in the interface. OptoLinx connectors are designed to provide for flexibility in connecting Radios, Scanners, and similar peripherals.

Older PCs may have DB25 (25 pin connectors) while newer PCs may use DB9 connectors exclusively. The OptoLinx uses a DB9 connector and is supplied with a DB9 Male to DB9 Female cable for connection to a PC. Both types of connectors can be accommodated by using adapters. To help sort out some compatibility issues the table below should be useful.


J1
AR3000A
FULL DUPLEX
OPTO-LINK
TXD RS232
RXD RS232
TXD TTL
RXD TTL
RTS
CTS
OPTO-LINK
AUDIO
SQUELCH
DIN9
J2
AR8000
AR2700
FFC7
NC
J3
DATA1
3.5mm STEREO PHONE
J5
DATA2
3.5mm STEREO PHONE
J6
DATA3
3.5mm STEREO PHONE
J7
SQUELCH
AUDIO
3.5mm STEREO PHONE
AUDIO IN
R1 1MEG
R2 270K
R3 1MEG
R4 270K
C1 4.7UF 10V
C4 4.7UF 10V
U1B
U1A
LMC662
R11 2K
R12 1MEG
AUDIO DATA SLICER
GND = PIN 4
+5V = PIN 8
C3 .1
C2 .1
R5 1MEG
R6 1MEG
DATA OUT
R19 1K
R20 22K
Q1 MUN2111
Q2 MUN2112
R16 22K
R15 22K
R17 22K
R18 22K
R14 22K
J4
CONNECTOR DB9
1 DCD
6 DSR
2 RX
7 RTS
3 TX
8 CTS
4 DTR
9 RI
5 GND
U2
HIN240
C5 1UF
C6 1UF
C7 1UF
C8 1UF
C9 1UF
C1+
C1-
C2+
C2-
V+
V-
R1IN
R2IN
R3IN
R4IN
R5IN
T1OUT
T2OUT
T3OUT
T4OUT
T5OUT
/EN
SHUTDOWN
R1OUT
R2OUT
R3OUT
R4OUT
R5OUT
T1IN
T2IN
T3IN
T4IN
T5IN
U4
22V10PLCC
CLK/I
VCC
GND
NC
C10 .1UF
R29 22K
U6
4N35
PIN 3 NC
PIN 6 BASE - NC
Q4 2N2222
R23 100
CR7 1N4148
R24 1K
NMEA183
J8
2.5mm PHONE
J10
TAPE
2.5mm PHONE
R7 22K
R8 22K
R9 22K
R10 22K
S1
SW DIP-4
8 REMOTE
7 FULL DUPLEX
6 AR3000A
5 SPARE
REMOTE
CR6
CR1
AR3000
R25 330
R1 330
HALF-DUPLEX
R21 330
R13 330
CR3
CR2
FULL DUPLEX
J9
HECPWR
L1 100UH
CR5 1N4004
C13 1000PF
R28 68
S2
SW SPDT
BT1
6 Cell NiCad
U5
LM340T-5
IN
OUT
GND
C11 22
C12 47
R26 10K
R27 1K
Q5 2N2907
K1
CR4 1N4001
SPDT REED
U3
MN1382
VDD
OUT
VSS
R30 330
CR8 LED
POWER GOOD LED
Q3 2N7002
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CX12 OPTO LYNX
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Sheet 1 of 1

Serial Interface Port Signals and Connector Pinouts

Signal	Name	DB9 pin	DB25 pin
DCD	Data Carrier Detect	1	8
RX	Receive Data	2	3
TX	Transmit Data	3	2
DTR	Data Terminal Ready	4	20
GND	Signal Ground	5	7
DSR	Data Set Ready	6	6
RTS	Request to Send	7	4
CTS	Clear to Send	8	5
RI	Ring Indicator	9	22

PRODUCT WARRANTY

Optoelectronics, Inc. warrants the OptoLinx for one (1) year against defects in materials and workmanship to the original purchaser. Products returned for warranty service will be repaired or replaced at Optoelectronics' option.

Specifically excluded are any products returned under this warranty that, upon examination, have been modified, have suffered damage to the input circuitry from the application of an excessive input signal, have suffered damage to the charging circuitry or internal batteries from the application of excessive voltage, or show other evidence of misuse or abuse. Optoelectronics reserves sole right to make this determination.

No other warranties are expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Optoelectronics, Inc. is not liable for consequential damages. Optoelectronics reserves the right to make engineering changes and updates without the obligation to update units previously sold.

FACTORY SERVICE

Warranty: Products under warranty must be returned, transportation prepaid, to Optoelectronics' Fort Lauderdale Service Center. All parts replaced and labor performed under warranty is at no charge to the customer.

Non-Warranty: Products not under warranty must be returned, transportation prepaid, to Optoelectronics' Fort Lauderdale Service Center. Factory service will be performed on a time and materials basis at the service rate in effect at the time of repair. A repair estimate prior to commencement of service may be requested. Return shipping will be added to the service invoice and is to be paid by the customer.

Return Policy

The Optoelectronics Service Department will provide rapid turnaround of your repair. No return authorization is required. Do not cause delays. Enclose complete information as follows:

1. Copy of sales receipt if under warranty.
2. Detailed description of problem(s).
3. Complete return address and phone number (UPS street address for USA).
4. Proper packaging (insurance recommended). Note: Carriers will not pay for damage if items are improperly packaged.
5. Proper remittance including return shipping, if applicable (Visa, Master Card number with expiration date, Money Order, etc.).

Address all items to:

Optoelectronics, Inc.
Service Department
5821 NE. 14th Avenue
Fort Lauderdale, FL 33334

If in question, contact the factory for assistance: Service Department (954) 771-2050

OPTOELECTRONICS, INC. • **5821 NE. 14th AVENUE** • **FORT LAUDERDALE, FL 33334**
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