Allen-Bradley

160 SSC Variable Speed Drive to PowerFlex 4/4M/40 Drives

Conversion Guide

Allen-Bradley • Rockwell Software

Rockwell Automation

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Introduction

The purpose of this document is to assist in the retrofit of existing 160 SSC drives to PowerFlex 4-Class drives. The document is broken into four major sections:

Drive Selection
The features of the PowerFlex 4M, 4, and 40 are compared to the 160 SSC. Major differences and in-depth comparison table listed.

Analog Speed Follower
An example of a 160 SSC analog speed follower model is show. Control wiring and parameter comparisons are show for the PowerFlex 4-Class used in this configuration.

Preset
An example of a 160 SSC preset speed model is show. Control wiring and parameter comparisons are show for the PowerFlex 4-Class used in this configuration

DeviceNet
Included in this section are:

- Examples of 160 SSC and PowerFlex 4-Class DeviceNet configurations.
- Procedures to configure the PowerFlex 4-Class drive.
- Procedures configure the DeviceNet scanner are described.
- Examples of ControlLogix and SLC PLC logic.
- Examples of Explicit Messaging in ControlLogix and SLC.

Drive Selection Considerations

Selecting a PowerFlex to use as a replacement in a 160 SSC application needs to take into account some of the differences and features between the PowerFlex 4M, 4, and 40. Listed here are some of the major differences in the PowerFlex 4-Class compared to the 160 SSC. The next section has an in-depth comparison of the PowerFlex 4-Class.

Feed through wiring
The 160 SSC has feed through wiring. The line is connected to the top of the drive and motor is connected to the bottom of the drive. The PowerFlex 4M has feed through wiring. The PowerFlex 4 and 40 terminate the line and motor to the bottom of the drive.

DeviceNet
The 160 SSC could have an optional 160-DNx DeviceNet communication module. This enables the 160 SSC to be controlled and monitored on DeviceNet. The PowerFlex 40 accepts an optional 22COMM-D DeviceNet communication module mounted directly in the drive. For the PowerFlex 4 and 4M to communicate on DeviceNet, a 22COMM-D module is mounted in an external 22XCOMM module and connected to the drives DSI port.

The 160 SSC has configurable Input and Output Assemblies for DeviceNet control of drive. The PowerFlex has fixed Input and Output Assemblies. Logic changes may have to be made to control the PowerFlex in the same manner.

Speed Presets
The 160 SSC Preset Speed model has eight preset speeds set by three digital inputs. The PowerFlex 40 has eight preset speeds and the PowerFlex 4 and 4M have four preset speeds.

Sensorless Vector Control
The 160 SSC is a Volts per Hertz drive with adjustments for Boost and Slip Compensation. The PowerFlex 4 and 4M are Volts per Hertz drives as well. The PowerFlex 40 by default is in Sensorless Vector control, which achieves a higher level of torque response and speed accuracy. The PowerFlex 40 can be changed to Volts per Hertz control if need be.

Bipolar Speed Reference
The 160 SSC can accept a Bipolar (+/-10VDC) speed reference. The direction is set by the polarity of the speed reference. This feature is available on the PowerFlex 40 but not the PowerFlex 4 and 4M.

Circuit Protection
When selecting a PowerFlex replacement for a 160 SSC, pay attention to the recommendations for fusing and circuit breakers. Protective device sizing may be different between equivalent 160 SSC and PowerFlex drives.

More information on the PowerFlex fuse and circuit breaker recommended sizes in the following publications at: **http://literature.rockwellautomation.com**

22A-UM001	***PowerFlex 4 User Manual***
22B-UM001	***PowerFlex 40 User Manual***
22F-UM001	***PowerFlex 4M User Manual***

Specifications and Features

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	***160-AAxxxx***	***22F-xxxxxxxx***	***22A-xxxxxxxx***	***22B-xxxxxxx***
Power Ratings	120V	N/A	0.25…1.5 HP (0.2…1.1 kW)	0.25…1.5 HP (0.2…1.1 kW)	0.5…1.5 HP (0.4…1.1 kW)
	240V, 1-Phase	0.5…2 HP (0.37…1.5 kW)	0.25…3 HP (0.2…2.2 kW)	0.25…3 HP (0.2…2.2 kW)	0.5…3 HP (0.4…2.2 kW)
	240V, 3-Phase	0.5…5 HP (0.37…4.0 kW)	0.25…10 HP (0.2…7.5 kW)	0.25…5 HP (0.2…3.7 kW)	0.5…10 HP (0.4…7.5 kW)
	480V	0.5…5 HP (0.37…4.0 kW)	0.5…15 HP (0.4…11 kW)	0.5…5 HP (0.4…3.7 kW)	0.5…15 HP (0.4…11 kW)
	575V	N/A	N/A	N/A	1…15 HP (0.75…11 kW)
	Normal Duty Overload				
	Continuous	N/A	N/A	N/A	N/A
	1 Minute	N/A	N/A	N/A	N/A
	3 Seconds	N/A	N/A	N/A	N/A
	Heavy Duty Overload				
	Continuous	100%	100%	100%	100%
	1 Minute	150%	150%	150%	150%
	3 Seconds	200% for 30 Sec.	200% for 3 Sec.	200% for 3 Sec.	200%
	Power Wiring	Feed through	Feed through	Bottom Fed	Bottom Fed

Specifications and Features *(continued)*

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	***160-AAxxxx***	***22F-xxxxxxxx***	***22A-xxxxxxxx***	***22B-xxxxxxx***
Specifications	Frequency Control	240 Hz Max.	400 Hz Max	240 Hz Max.	400 Hz Max.
	PWM Frequency	2…8 kHz	2…10 kHz	2…16 kHz	2…16 kHz
	Enclosures Types	Open, Type IP20, Type 12/4/4X IP40/54/65 all Frames Heatsink Out the Back	Open, Type IP20	Open, Type IP20, Type 1 IP30 (with kit), Type 1/12/4/4X IP40/54/65 all Frames Heatsink Out the Back	Open, Type IP20, Type 1 IP30 (with kit), Type 1/12/4/4X IP40/54/65 C Frame Heatsink Out the Back
	Ambient Temp	0…50 °C Open 0…40 °C IP66 (NEMA 12/4/4X)	–10…50 °C	–10…50 °C	–10…50 °C
	Torque Control				
	Open Loop Accuracy	N/A			
	Closed Loop Accuracy	N/A			
	Speed Control				
	Open Loop Accuracy	1% - 40:1	±2% across 40:1 Speed Range, with Slip Comp.	±2% across 40:1 Speed Range, with Slip Comp.	1% across 80:1 Speed Range, with Slip Comp.
	Closed Loop Accuracy	N/A	N/A	N/A	N/A
	HP w/DC Link Choke	N/A	N/A	N/A	15 Hp
	HP w/AC line Choke	N/A	N/A	N/A	N/A
	Volt Tolerance	±10%			
	Frequency Tolerance	47…63 Hz			
	Compliance Marks	CE, UL, cUL, C-Tick			
	Maximum Altitude	1000 m			

Specifications and Features *(continued)*

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	***160-AAxxxx***	***22F-xxxxxxxx***	***22A-xxxxxxxx***	***22B-xxxxxxx***
Hardware	EMC Filtering	External - 1ø, External - 3ø	Internal - 1ø & 3ø, External - 3ø	Internal - 1ø, External - 3ø	Internal - 1ø 230V only, External - 3ø
	Heatsink Out the Back	Yes, All Frames	No	Yes, All Frames	Yes, All Frames
	Zero Stacking	Yes	Yes	Yes	Yes
	Internal DB Transistor	Yes, all Frames	C frame only (7.5 HP and higher)	0.5…5 Hp	0.5-15 HP
	Internal DB Resistor Option	No	N/A	N/A	N/A
	Encoder Input Standard	N/A	N/A	N/A	N/A
	Additional Feedback Options	N/A	N/A	N/A	No
	Number of Comms. Supported Simultaneously in Drive	1	0	0	1
	Removable MOV to Ground	No	Yes	Yes	Yes
	Safe-Off	No	No	No	N/A
	Max. Short Circuit Rating	100,000A	100,000A	100,000A	100,000A
Inputs/Outputs	Standard Discrete Inputs	12V Internal Supply only. (Start/Stop function set by Input Mode)	5…24V Sink/Source (3 - Start/Stop/Reverse, 2 - Fully Prog.)	5…24V Sink/Source (3 - Start/Stop/Reverse, 2 - Fully Prog.)	7…24V Sink/Source (3 - Start/Stop/Reverse, 4 - Fully Prog.)
	Analog Inputs	1 - (Bipolar 0-10 V or Unipolar 4-20 mA)	1 Unipolar (0-10 V or 4-20 mA)	1 Unipolar (0-10V or 4-20 mA)	1 Bipolar, ±10V or 4-20 mA, 1 Unipolar 4-20mA
	Discrete Outputs	1 - Form C Relay	1 - Form C Relay	1 - Form C Relay	1 - Form C Relay, 2-optos
	Analog Outputs	No	No	No	1 - (0-10V or 4-20 mA)
	Pulse Output	No	No	No	No
	Optional I/O Voltage	115V	N/A	N/A	N/A
	PTC Input	No	No	No	Yes (Analog In)
	Encoder Input	No	No	No	No
	Pulse Input	No	No	No	No
	Additional I/O	N/A	N/A	N/A	No
	Input Timer / Counter Functions	No	No	No	Yes
	Output Timer / Counter Functions	No	No	No	No
	Encoder Output	No	No	No	No

Specifications and Features *(continued)*

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	*160-AAxxxx*	*22F-xxxxxxxx*	*22A-xxxxxxxx*	*22B-xxxxxxx*
Input/Output Specifications	Digital Input Scan Time (Not Through Put Time)	10 ms	2 ms	2 ms	1 ms
	Analog Input Resolution	10 Bit	10 Bit	10 Bit	10 Bit
	Analog Input Scan Time (Not Through Put Time)	8 ms	12 ms	12 ms	10 ms
	Analog Output Resolution	N/A	N/A	N/A	10 Bit
	Analog Output Scan Time (Not Through Put Time)	N/A	N/A	N/A	10 ms
HIM Information	HIM - Local LCD	No			
	HIM - Remote LCD	Yes			
	HIM - Hand-held	Yes			
	HIM - CopyCat function	Yes			
	HIM - Languages	(1) Remote HIM	(7) Remote HIM	(7) Remote HIM	(7) Remote HIM
	HIM - Local LED	Yes, including pot and control keys	Yes, including pot and control keys	Yes, including pot and control keys	Yes, including pot and control keys
	HIM - Auto/ Manual function	No	No (Yes - Remote HIM)	No (Yes - Remote HIM)	No (Yes - Remote HIM)

Specifications and Features *(continued)*

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	*160-AAxxxx*	*22F-xxxxxxxx*	*22A-xxxxxxxx*	*22B-xxxxxxx*
Features	Motor Control Type	V/Hz	V/Hz	V/Hz	V/Hz and Sensorless Vector
	Flying Start	No	Yes	Yes	Yes
	Bus Regulator	Yes	Yes	Yes	Yes
	S - Curve	Yes	Yes	Yes	Yes
	Drive Overload Protection	Yes	Yes	Yes	Yes
	Advanced Diagnostics	No			
	Input Phase Loss	No			
	User Sets	No			
	Preset Speeds	8	4	4	8
	Process Control Loop	Yes	No	No	PID
	Fast Flux Up	No			
	Fast Brake to Stop	No			
	Flux Braking	No			
	Feedback Loss Switchover	No			
	Battery Back-up	No			
	Multi-Motor Parameters	No			

	Drive Model	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
	Catalog Number	*160-AAxxxx*	*22F-xxxxxxxx*	*22A-xxxxxxxx*	*22B-xxxxxxx*
Application Features	SynchLink	No			
	Motion Controller	No			
	Inertia Adaptation	No			
	Power Up Time	0.8 Sec.	1.5…2.5 Sec.	1.5…2.5 Sec.	1.5…2.5 Sec.
	Speed Profiles	No	No	No	Step Logic
	Position Control	No	No	No	No
	P-jump (traverse function)	No			
	Lifting Application	No			
	Winder Application	No			
	Electronic Gearing/Line Shaft	No			

Dimensions

160 SSC				PowerFlex 4M			
Frame/Hp	**Height** *mm*	**Width** *mm*	**Depth** *mm*	**Frame/Hp**	**Height** *mm*	**Width** *mm*	**Depth** *mm*
A/0.5…3	152	80	165.4	A/0.5…2	174	72	136
B/5	192.5	92	193.3	B/3…5	174	100	136
				C/7.5…10	260	130	180

PowerFlex 4				PowerFlex 40			
Frame/HP	**Height** *mm*	**Width** *mm*	**Depth** *mm*	**Frame/HP**	**Height** *mm*	**Width** *mm*	**Depth** *mm*
A/0.5…2	152	80	136	B/0.5…5	180	100	136
B/3…5	180	100	136	C/7.5…15	260	130	180

Terminal Comparison

Description	Terminal Designation			
				
	160 SSC	**PowerFlex 4M**	**PowerFlex 4**	**PowerFlex 40**
Input AC Line – R/L1	R/L1	R/L1	R/L1	R/L1
Input AC Line – S/L2	S/L2	S/L2	S/L2	S/L2
Input AC Line – T/L3	T/L3	T/L3	T/L3	T/L3
Motor – U/T1	U/T1	U/T1	U/T1	U/T1
Motor – V/T2	V/T2	V/T2	V/T2	V/T2
Motor – W/T3	W/T3	W/T3	W/T3	W/T3
Brake Resistor	BR+	BR+ (C Frame only)	BR+	BR+
Brake Resistor	BR–	BR– (C Frame Only)	BR–	BR–
DC Bus –	DC–	DC–		DC–
DC Bus +	DC+	DC+		DC+
DC Bus Inductor Connection		P2 (C Frame Only		P2 (C Frame Only)
DC Bus Inductor Connection		P1 (C Frame Only		P1 (C Frame Only)
Motor Ground	PE	PE	PE	PE
Drive Ground	PE	PE	PE	PE
Analog Input 1 Comm.	3	14	14	14
Analog Input 1 (+/–)	2 - (0…10V)	13	13	13
Shield				19
Analog Input 2 Comm.	3			
Analog Input 2 (+/-)	4 - (4…20 mA)			
Analog Input 3 (NTC-) Com.				
Analog Input 3 (NTC+)				
Shield				
Analog Output 1 (–)				
Analog Output 1 (+)				
Analog Common				
Analog Output 2 (–)				
Analog Output 2 (+)				
+10v Reference	1	12	12	12
Reference Common	3	14	14	14
–10V Reference				
Encoder A				
Encoder A (Not)				
Encoder B				
Encoder B (Not)				
Encoder Z				
Encoder Z (Not)				

Terminal Comparison *(continued)*

Description	Terminal Designation			
				
	160 SSC	**PowerFlex 4M**	**PowerFlex 4**	**PowerFlex 40**
Encoder Reference (+)				
Encoder Reference (–)				
Encoder Shield				
24V DC Common (–)	7			
24V DC Source (+)		11	11	11
Digital/Relay Output 1(N.O)	11	R1	R1	R1
Digital/Relay Output 1Com.	10	R2	R2	R2
Digital/Relay Output 1(N.C)	9	R3	R3	R3
Digital/Relay Output 2 (N.O)				
Digital/Relay Output 2 Com.				
Digital/Relay Output 2 (N.C)				17
Digital/Relay Output 3 (NC)				18
Digital/Relay Output 3 Com.				
Digital/Relay Output 3 (NO)				
Digital/Relay Output 4 (NC)				
Digital/Relay Output 4 Com.				
Digital/Relay Output 4 (NO)				
Digital Input 1-3 Comm.	7	4	4	4
Digital Input 1	5	1	1	1
Digital Input 2	6	2	2	2
Digital Input 3	8	3	3	3
Digital Input 4-6 Comm.		4	4	4
Digital Input 4		5	5	5
Digital Input 5		6	6	6
Digital Input 6				7
Digital Input 7				8
Digital Input 8				
Digital Input 9				
Digital Input 10				
48V Control Power Supply				
+24V User Output				
Drive Enable (Secure Disable Function)	Enabled could be terminal #8			Enabled could be terminal #1
HW PTC Input 1				
HW PTC Input 2				

Communications

Product Model Number	160 SSC	PowerFlex 4M	PowerFlex 4	PowerFlex 40
DF1	Yes	Yes (with SCM adapter)	Yes (with SCM adapter)	Yes (with SCM adapter)
AS-i	No	No	No	No
BACnet	No	Yes (with X-Comm)	Yes (with X-Comm)	Yes
CANopen	No	No	No	No
CC-Link	No	No	No	No
ControlNet	No	Yes (with X-Comm)	Yes (with X-Comm)	Yes
Data Highway	No	No	No	No
DeviceNet	Yes	Yes (with X-Comm)	Yes (with X-Comm)	Yes
Ethernet	No	No	No	No
EtherNet/IP	No	Yes (with X-Comm)	Yes (with X-Comm)	Yes
FIP I/O	No	No	No	No
Foundation Fieldbus	No	No	No	No
Interbus	Yes	No	No	No
LonWorks	No	Yes (with X-Comm)	Yes (with X-Comm)	Yes
Metasys N2	No	No	No	No
Modbus ASCII	No	No	No	No
Modbus Plus	No	No	No	No
Modbus RTU	No	Yes (Standard)	Yes (Standard)	Yes (Standard)
Modbus TCP/IP	No	No	No	No
PROFIBUS DP	Yes	Yes (with X-Comm)	Yes (with X-Comm)	Yes
PROFINET	No	No	No	No
Remote I/O	No	No	No	No
SERCOS	No	No	No	No
Siemens P1	No	No	No	No
Uni-Telway	No	No	No	No
USB	No	Yes (with USB converter)	Yes (with USB converter)	Yes (with USB converter)

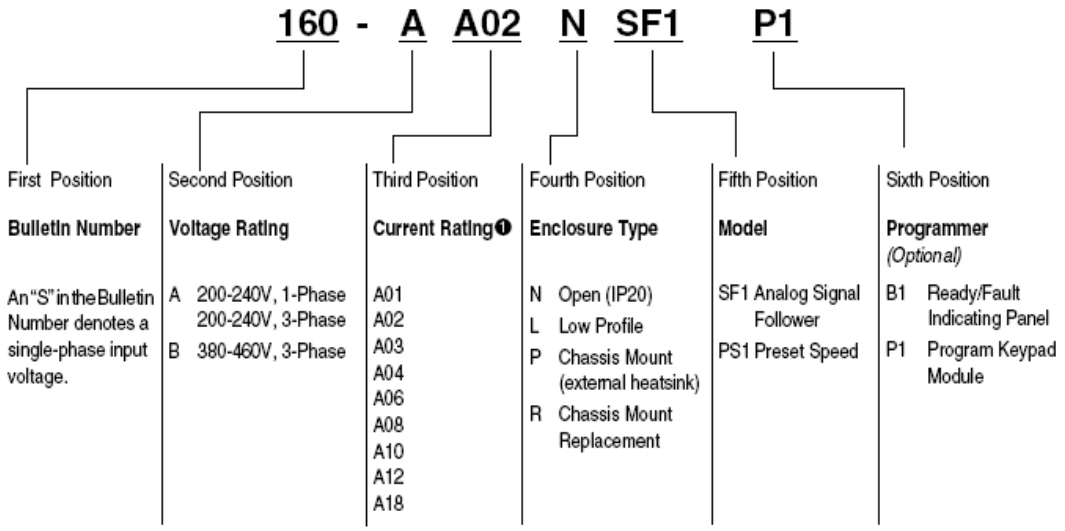
Software

Description	Software Feature	DriveTools SP/DriveExplorer
Software Versions	Full version	Yes
	'Lite' version	Yes (freeware)
	Pocket PC version	Yes
	Palm version	No
Connectivity	Serial Point-to-Point	Yes
	Serial Multi-drop	Yes
	Ethernet Direct	Yes
	ControlNet	Yes
	DeviceNet	Yes
	Profibus DP	No
	Bluetooth	Yes
	WiFi	Yes
	Other / Proprietary	Yes
Select Features	Offline capability	Yes
	Setup Wizards	Yes
	Diagram Views	Yes
	User-created Views	Yes
	I/O Terminal Configuration	No
	Control	Yes
	Oscilloscope / Graph	Yes
	Project Management	No
	Flash	Yes
	File Conversion Tool	Yes
	On-line Help	Yes
	Multi-language	English only
Used With …		PowerFlex 7-Class, PowerFlex 4-Class, 160(with DF1 160-RS1 adapter)

Drive Catalog Numbers

Following are part number explanations for the 160 SSC, PowerFlex 4M, PowerFlex 4, and PowerFlex 40.

160 SSC Catalog Number



❶ Amperage ratings vary based on voltage.

Input Voltage Rating	Drive Ratings			IP 20 (Open Style)	
	kW	HP	Output Current Rating	Analog Signal Follower Model Catalog Number	Preset Speed Model Catalog Number
200-240V 50/60 Hz Single-Phase	0.37	0.5	2.3A	160S - AA02NSF1	160S - AA02NPS1
	0.55	0.75	3.0A	160S - AA03NSF1	160S - AA03NPS1
	0.75	1	4.5A	160S - AA04NSF1	160S - AA04NPS1
	1.5	2	8.0A	160S - AA08NSF1	160S - AA08NPS1
200-240V 50/60 Hz Three-Phase	0.37	0.5	2.3A	160 - AA02NSF1	160 - AA02NPS1
	0.55	0.75	3.0A	160 - AA03NSF1	160 - AA03NPS1
	0.75	1	4.5A	160 - AA04NSF1	160 - AA04NPS1
	1.5	2	8.0A	160 - AA08NSF1	160 - AA08NPS1
	2.2	3	12.0A	160 - AA12NSF1	160 - AA12NPS1
	4.0	5	18.0A	160 - AA18NSF1	160 - AA18NPS1
380-460V 50/60 Hz Three-Phase	0.37	0.5	1.2A	160 - BA01NSF1	160 - BA01NPS1
	0.55	0.75	1.7A	160 - BA02NSF1	160 - BA02NPS1
	0.75	1	2.3A	160 - BA03NSF1	160 - BA03NPS1
	1.5	2	4.0A	160 - BA04NSF1	160 - BA04NPS1
	2.2	3	6.0A	160 - BA06NSF1	160 - BA06NPS1
	4.0	5	10.5A	160 - BA10NSF1	160 - BA10NPS1

More information on the 160 SSC in the following publication at:
http://literature.rockwellautomation.com

160-UM009 ***160-SSC Variable Speed Drive User Manual***

PowerFlex 4 Catalog Number

1-3	4	5	6-8	9	10	11	12 (1)	13-14
22A	-	A	1P5	N	1	1	4	AA
Drive	Dash	Voltage Rating	Rating	Enclosure	HIM	Emission Class	Type	Optional

Code	
22A	PowerFlex 4

Code	Voltage	Ph.
V	120V AC	1
A	240V AC	1
B	240V AC	3
D	480V AC	3

Code	Rating
0	Not Filtered
1	Filtered

Code	Version
3	No Brake IGBT
4	Standard

Code	Interface Module
1	Fixed Keypad

Code	Purpose
AA thru ZZ	Reserved for custom firmware

Code	Enclosure
N	Panel Mount - IP 20 (NEMA Type Open)
F	Flange Mount - IP 20 (NEMA Type Open)
H	Replacement Plate Drive - IP 20 (NEMA Type Open) - *Contact factory for ordering information.*

Output Current @ 100-120V Input

Code	Amps	kW (HP)
1P5	1.5	0.2 (0.25)
2P3	2.3	0.4 (0.5)
4P5	4.5	0.75 (1.0)
6P0	6.0	1.1 (1.5)

Output Current @ 200-240V Input, NO BRAKE

Code	Amps	kW (HP)
1P4	1.4	0.2 (0.25)
2P1	2.1	0.4 (0.5)
3P6	3.6	0.75 (1.0)
6P8	6.8	1.5 (2.0)
9P6	9.6	2.2 (3.0)

Output Current @ 200-240V Input

Code	Amps	kW (HP)
1P5	1.5	0.2 (0.25)
2P3	2.3	0.4 (0.5)
4P5	4.5	0.75 (1.0)
8P0	8.0	1.5 (2.0)
012	12.0	2.2 (3.0)
017	17.5	3.7 (5.0)

Output Current @ 380-480V Input

Code	Amps	kW (HP)
1P4	1.4	0.4 (0.5)
2P3	2.3	0.75 (1.0)
4P0	4.0	1.5 (2.0)
6P0	6.0	2.2 (3.0)
8P7	8.7	3.7 (5.0)

(1) Position 12 of the Catalog Number now indicates drive type. All PowerFlex 4 drives are equipped with RS485 communication.

More information on the PowerFlex 4 in the following publication at:
http://literature.rockwellautomation.com

22A-UM001 ***PowerFlex 4 User Manual***

PowerFlex 4M Catalog Number

1-3	4	5	6-8	9	10	11	12	13-14
22F	-	D	8P7	N	1	1	3	AA
Drive	Dash	Voltage Rating	Rating	Enclosure	HIM	Emission Class	Type	Optional

Code	
22F	PowerFlex 4M

Code	Version
3	No Brake IGBT
4	Standard

Code	Voltage	Ph.
V	120V AC	1
A	240V AC	1
B	240V AC	3
D	480V AC	3

Code	Rating
0	Not Filtered
1	Filtered

Code	Interface Module
1	Fixed Keypad

Code	Purpose
AA thru ZZ	Reserved for custom firmware

Code	Enclosure
N	Panel Mount - IP 20 (NEMA Type Open)

Output Current @ 100-120V Input

Code	Amps	kW (HP)
1P6	1.6	0.2 (0.25)
2P5	2.5	0.4 (0.5)
4P5	4.5	0.75 (1.0)
6P0	6.0	1.1 (1.5)

Output Current @ 200-240V Input

Code	Amps	kW (HP)
1P6	1.6	0.2 (0.25)
2P5	2.5	0.4 (0.5)
4P2	4.2	0.75 (1.0)
8P0	8.0	1.5 (2.0)
011	11.0	2.2 (3.0)
012	12.0	2.2 (3.0)
017	17.5	3.7 (5.0)
025	25.0	5.5 (7.5)
033	33.0	7.5 (10.0)

Output Current @ 380-480V Input

Code	Amps	kW (HP)
1P5	1.5	0.4 (0.5)
2P5	2.5	0.75 (1.0)
4P2	4.2	1.5 (2.0)
6P0	6.0	2.2 (3.0)
8P7	8.7	3.7 (5.0)
013	13.0	5.5 (7.5)
018	18.0	7.5 (10.0)
024	24.0	10.0 (15.0)

More information on the PowerFlex 4M in the following publication at:
http://literature.rockwellautomation.com

22F-UM001 ***PowerFlex 4M User Manual***

PowerFlex 40 Catalog Number

1-3	4	5	6-8	9	10	11	12 (1)	13-14
22B	-	A	1P5	N	1	1	4	AA
Drive	Dash	Voltage Rating	Rating	Enclosure	HIM	Emission Class	Type	Optional

Code	PowerFlex 40
22B	

Code	Voltage	Ph.
V	120V AC	1
A	240V AC	1
B	240V AC	3
D	480V AC	3
E	600V AC	3

Code	Interface Module
1	Fixed Keypad

Code	Rating
0	Not Filtered
1	Filtered

Code	Version
3	No Brake IGBT
4	Standard

Code	Purpose
AA thru ZZ	Reserved for custom firmware

Code	Enclosure
N	Panel Mount - IP20, NEMA/UL Type Open
C	Panel Mount - IP66, NEMA/UL Type 4X
F	Flange Mount - IP20, NEMA/UL Type Open
H	Replacement Plate Drive - IP20, NEMA/UL Type Open - *Contact factory for ordering information.*

Output Current @ 100-120V 50/60 Hz Input

Code	Amps	kW (HP)
2P3	2.3	0.4 (0.5)
5P0	5.0	0.75 (1.0)
6P0	6.0	1.1 (1.5)

Output Current @ 200-240V 50/60 Hz Input

Code	Amps	kW (HP)
2P3	2.3	0.4 (0.5)
5P0	5.0	0.75 (1.0)
8P0	8.0	1.5 (2.0)
012	12	2.2 (3.0)
017	17.5	3.7 (5.0)
024	24	5.5 (7.5)
033	33	7.5 (10)

Output Current @ 380-480V 50/60 Hz Input

Code	Amps	kW (HP)
1P4	1.4	0.4 (0.5)
2P3	2.3	0.75 (1.0)
4P0	4.0	1.5 (2.0)
6P0	6.0	2.2 (3.0)
010	10.5	4.0 (5.0)
012	12	5.5 (7.5)
017	17	7.5 (10)
024	24	11 (15)

Output Current @ 500-600V 50/60 Hz Input

Code	Amps	kW (HP)
1P7	1.7	0.75 (1.0)
3P0	3.0	1.5 (2.0)
4P2	4.2	2.2 (3.0)
6P6	6.6	4.0 (5.0)
9P9	9.9	5.5 (7.5)
012	12.2	7.5 (10)
019	19	11 (15)

(1) Position 12 of the Catalog Number now indicates drive type. All PowerFlex 40 drives are equipped with RS485 communication.

More information on the PowerFlex 40 in the following publication at:
http://literature.rockwellautomation.com

22B-UM001 ***PowerFlex 40 User Manual***

Drive Configuration

The 160 SSC drive will be an Analog Speed Follower or a Preset Speed module and possibly have a DN2 DeviceNet option module. Because of this, the following examples put the 160 SSC to PowerFlex conversions into three broad categories:

Analog Speed Follower
Preset Speed
DeviceNet

The remainder of this document is broken into these three sections.

General Notes

The points apply to the PowerFlex drive whether it's being used as an Analog Speed Follower, Preset Speed, or DeviceNet

SNK/SRC DIP Switch
The PowerFlex digital inputs can operate in Sink or Source. To replicate 160 SSC functionality, the SNK/SRC DIP Switch is set to SRC so digital devices are applying a +24VDC to inputs.

PowerFlex +24VDC power
The PowerFlex drive digital I/O has the ability to use internal or external +24VDC supply. To replicate the wiring of the 160 SSC, the wiring diagrams will show the PowerFlex drive using internal +24VDC supply.

Motor Rotation
The output phasing of a 160 SSC series A and B drive is different than the output phasing of a 160 SSC series C and PowerFlex. Replacing a 160 SSC series A or B with a PowerFlex using the same U, V, and W (T1, T2, and T3) connections will reverse the motor rotation. To keep the same direction of rotation, switch any 2 of the output wires connected to U, V, or W (T1, T2, or T3) to the motor.

Analog Speed Follower

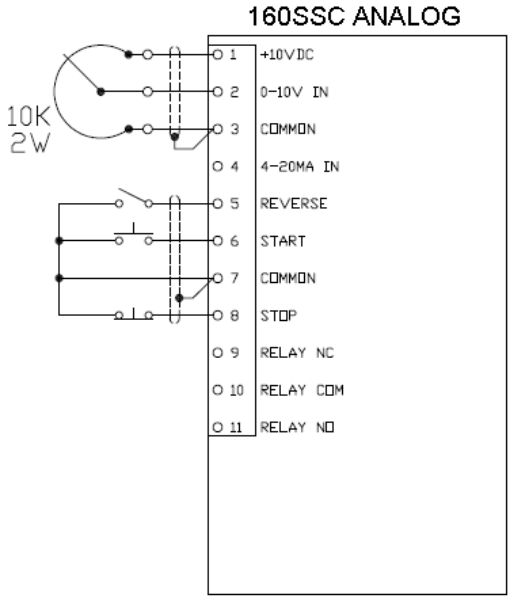
The 160 SSC Analog Speed Follower model accepts a speed reference from a potentiometer, +/- 10VDC source, 0-10VDC source, or 4-20 mA source. The 160 SSC can be configured to accept various methods of Start/Stop/Direction control.

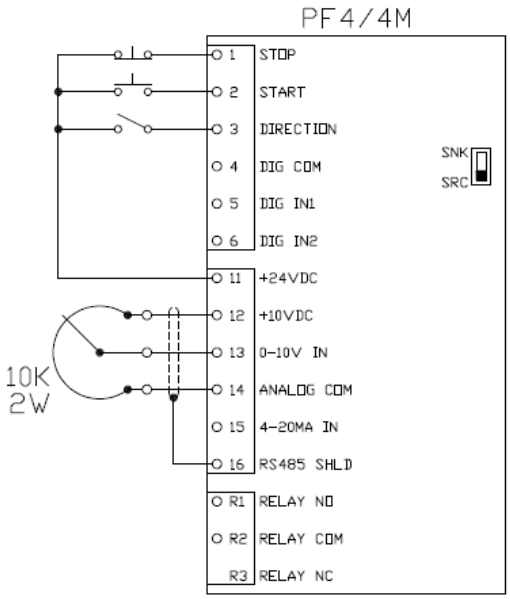
Three examples show the 160 SSC configured to use different speed reference inputs and Start/Stop/Direction control and equivalent PowerFlex configurations.

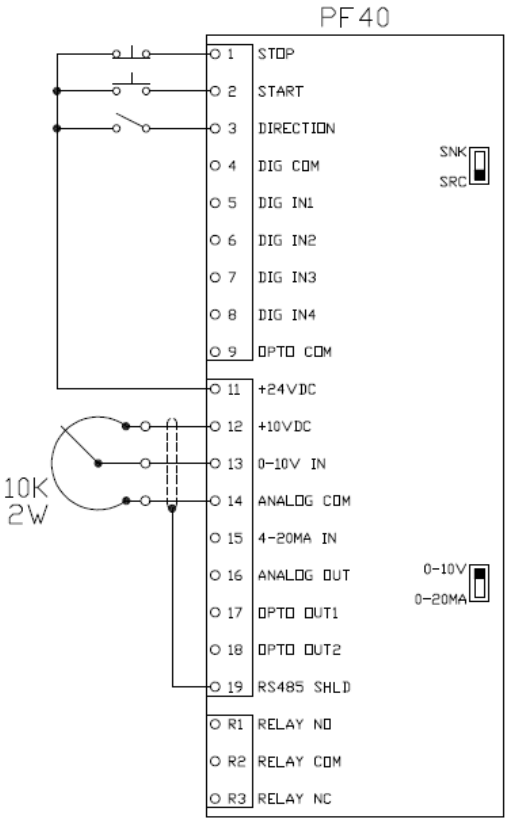
3 Wire Control, Pot Speed Reference

The control method is 3 Wire Start/Stop/Direction (Factory Default). The speed reference for the 160 SSC Analog Speed Follower comes from a 10K Ohm 2W potentiometer wired to the drive's 10VDC power supply.

Wiring Examples







Parameter Comparison

The following parameters are the minimum required to configure the PowerFlex for the motor attributes and to control it with a 3 Wire Start/Stop/Direction method. The table shows a cross reference to the 160 SSC parameters.

NOTE: This example uses a 5HP, 460VAC, 6.0FLA, 60Hz motor. PowerFlex Parameters 31, 32, 33, 34, and 35, are dependant on your motor and application. PowerFlex Parameters 37, 39, and 40 are dependant on your applications stop mode and Accel/decel rates.

	160 SSC analog			PowerFlex 40	
No.	**Parameter**	**Value**	**No.**	**Parameter**	**Value**
36	Base Voltage	460 V	31	Motor NP Volts	460 V
35	Base Frequency	60 Hz	32	Motor NP Hertz	60 Hz
42	Motor OL Current	6.0 A	33	Motor OL Current	6.0 A
32	Minimum Frequency	0 Hz	34	Minimum Frequency	0 Hz
33	Maximum Frequency	60 Hz	35	Maximum Frequency	60 Hz
46	Input Mode	0 – 3 Wire Control	36	Start Source	1 – 3 Wire
34	Stop Mode Select	0 - Ramp to Stop	37	Stop Mode	0 – Ramp CF
59	Frequency Select	0 – TB3 Freq Input	38	Speed Reference	2 – 0-10V Input
74	Analog Select	0 - Unipolar	123	Analog Select	0 - Unipolar
30	Accel Time 1	10.0 Sec	39	Accel Time 1	10.0 Sec
31	Decel Time 1	10.0 Sec	40	Decel Time 1	10.0 Sec

160 SSC Notes:

- Changing the Input Mode requires a power cycle or an entry of “2” Reset Input Mode on Parameter 56.

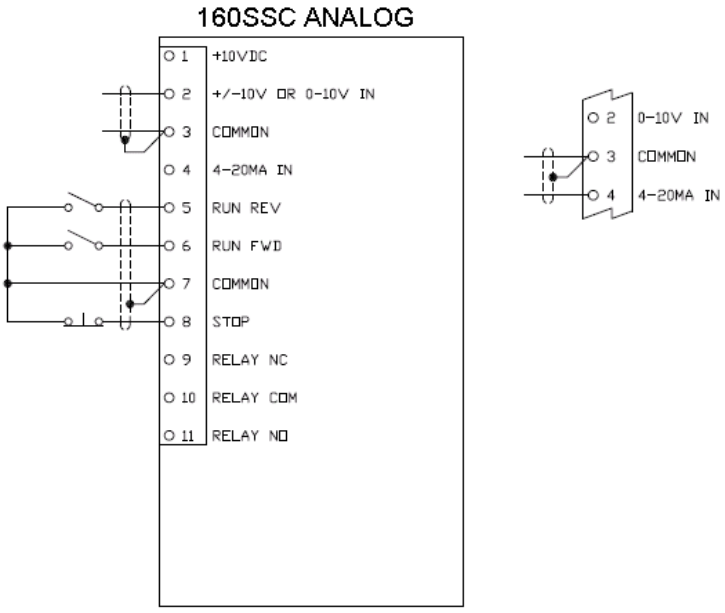
PowerFlex Notes:

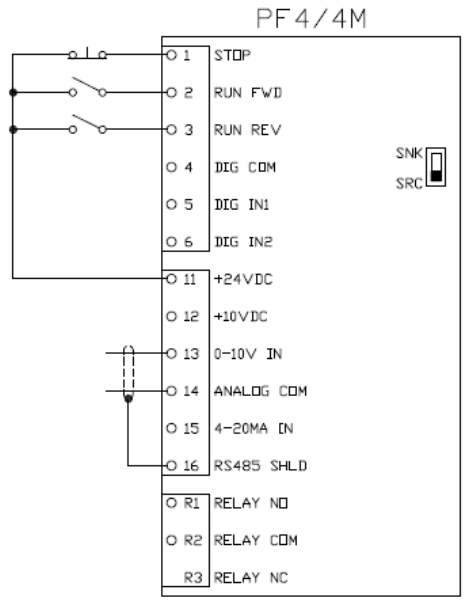
- By default the PowerFlex 40 is in Sensorless Vector control mode. It can be changed to Volts/Hertz with Parameter 125.
- The ENBL jumper on the PowerFlex 40 determines the Stop Mode. If the jumper is installed the Stop Mode is as programmed in Parameter 37. If the jumper is removed the stop is always a Coast Stop.
- Parameter 123 Analog Select is available on the PowerFlex 40 only. PowerFlex 4M and 4 are Unipolar only.

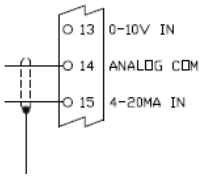
2 Wire Control, Analog Input Speed Reference

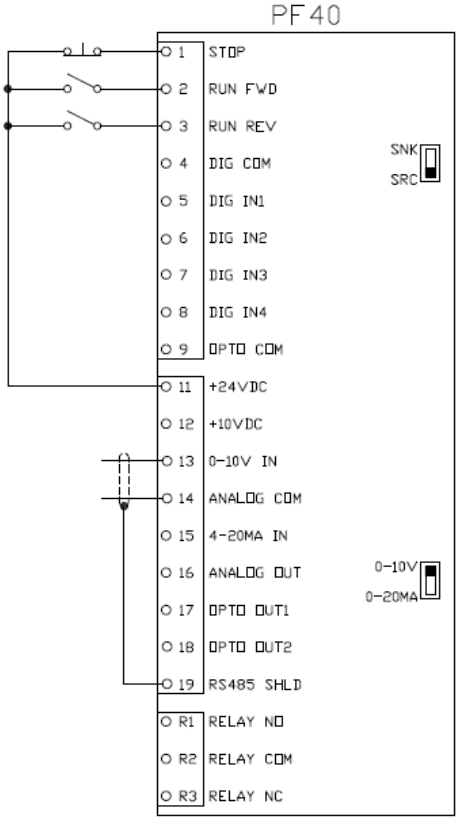
The control method is 2 Wire Run Fwd/Run Rev. The speed reference for the 160 SSC Analog Speed Follower comes from a 4-20mA, 0-10VDC or +/-10VDC(PowerFlex 40 only) input. The Stop Pushbutton shown in the examples is not required. The drives run while a Run Fwd or Run Rev input is on. To eliminate the Stop Pushbutton connect terminal 7 and 8 on the 160 SSC and terminal 1 and 11 on the PowerFlex.

Wiring Examples









Parameter Comparison

The following parameters are the minimum required to configure the PowerFlex for the motor attributes and to control it with a 2 Wire Run Fwd/Run Rev method. The table shows a cross reference to the 160 SSC parameters.

NOTE: This example uses a 5HP, 460VAC, 6.0FLA, 60Hz motor. PowerFlex Parameters 31, 32, 33, 34, and 35, are dependant on your motor and application. PowerFlex Parameters 37, 39, and 40 are dependant on your applications stop mode and Accel/decel rates.

	160 SSC analog				PowerFlex 40	
No.	**Parameter**	**Value**		**No.**	**Parameter**	**Value**
36	Base Voltage	460 V		31	Motor NP Volts	460 V
35	Base Frequency	60 Hz		32	Motor NP Hertz	60 Hz
42	Motor OL Current	6.0 A		33	Motor OL Current	6.0 A
32	Minimum Frequency	0 Hz		34	Minimum Frequency	0 Hz
33	Maximum Frequency	60 Hz		35	Maximum Frequency	60 Hz
46	Input Mode	1 – 2 Wire Control		36	Start Source	2 – 2 Wire
34	Stop Mode Select	0 - Ramp to Stop		37	Stop Mode	0 – Ramp CF
59	Frequency Select	0 – TB3 Freq Input		38	Speed Reference	2 – 0-10V Input
74	Analog Select	0 - Unipolar		123	Analog Select	0 - Unipolar
30	Accel Time 1	10.0 Sec		39	Accel Time 1	10.0 Sec
31	Decel Time 1	10.0 Sec		40	Decel Time 1	10.0 Sec

160 SSC Notes:

- Changing the Input Mode requires a power cycle or an entry of “2” Reset Input Mode on Parameter 56
- If Parameter 46 set to “1” 2 Wire Control the drive will ramp to stop if terminal 8 is open. If Parameter 46 set to “5” 2 Wire Control With Enable the drive will coast stop if terminal 8 is open

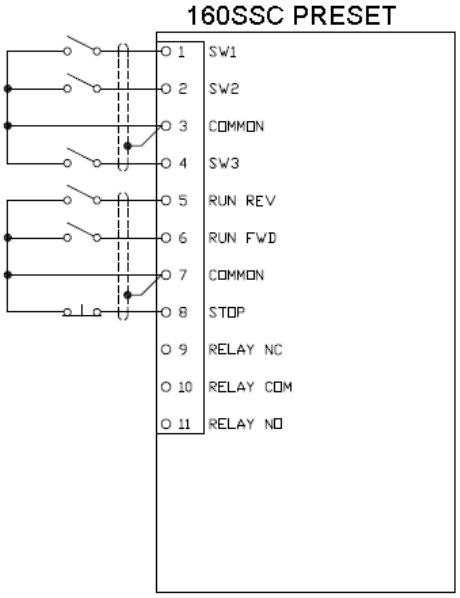
PowerFlex Notes:

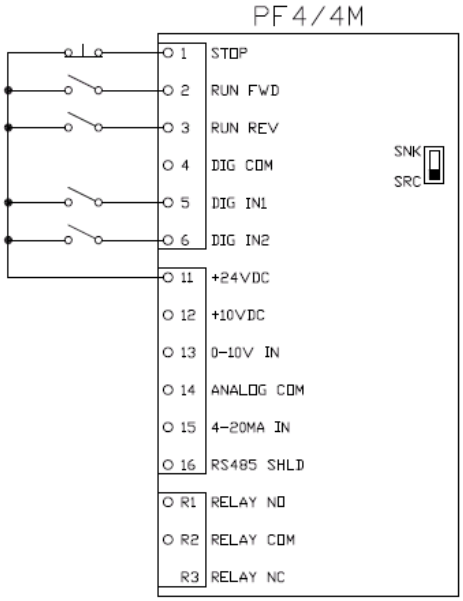
- By default the PowerFlex 40 is in Sensorless Vector control mode. It can be changed to Volts/Hertz with Parameter 125.
- The ENBL jumper on the PowerFlex 40 determines the Stop Mode. If the jumper is installed the Stop Mode is as programmed in Parameter 37. If the jumper is removed the stop is always a Coast Stop if terminal 8 is open.
- Parameter 123 Analog Select is available on the PowerFlex 40 only. PowerFlex 4M and 4 are Unipolar only.
- In this mode of operation, Parameter 37 controls the stop mode when the Run Fwd or Run Rev switch is opened
- Parameter 38 should be set to “3” 4-20 mA Input if using 4-20mA speed reference.

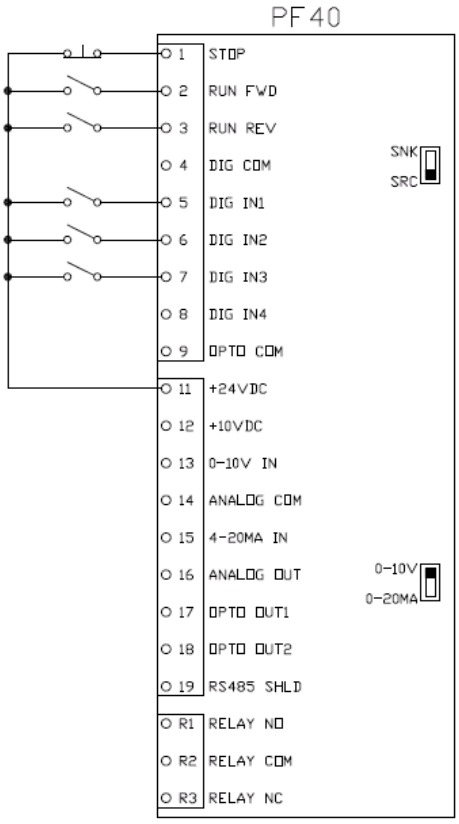
Preset Speed

The control method is 2 Wire Run Fwd/Run Rev. The speed reference for the 160 SSC Preset Speed model is selected with 3 digital inputs. The 160 SSC and PowerFlex 40 are capable of eight preset speeds and the PowerFlex 4M and 4 are capable of four preset speeds.

Wiring Examples







Parameter Comparison

The following parameters are the minimum required to configure the PowerFlex for the motor attributes and to control it with a 2 Wire Run Fwd/Run Rev method. The table shows a cross reference to the 160 SSC parameters.

NOTE: This example uses a 5HP, 460VAC, 6.0FLA, 60Hz motor. PowerFlex Parameters 31, 32, 33, 34, and 35, are dependant on your motor and application. PowerFlex Parameters 37, 39, and 40 are dependant on your applications stop mode and Accel/decel rates.

	160 SSC preset				PowerFlex 40	
No.	**Parameter**	**Value**		**No.**	**Parameter**	**Value**
36	Base Voltage	460 V		31	Motor NP Volts	460 V
35	Base Frequency	60 Hz		32	Motor NP Hertz	60 Hz
42	Motor OL Current	6.0 A		33	Motor OL Current	6.0 A
32	Minimum Frequency	0 Hz		34	Minimum Frequency	0 Hz
33	Maximum Frequency	60 Hz		35	Maximum Frequency	60 Hz
46	Input Mode	1 – 2 Wire Control		36	Start Source	2 – 2 Wire
34	Stop Mode Select	0 - Ramp to Stop		37	Stop Mode	0 – Ramp CF
59	Frequency Select	1 – Internal		38	Speed Reference	4 – Preset Freq
30	Accel Time 1	10.0 Sec		39	Accel Time 1	10.0 Sec
31	Decel Time 1	10.0 Sec		40	Decel Time 1	10.0 Sec
61	Preset Freq 0	3.0 Hz		70	Preset Freq 0	0.0 Hz
62	Preset Freq 1	5.0 Hz		71	Preset Freq 1	5.0 Hz
63	Preset Freq 2	10.0 Hz		72	Preset Freq 2	10.0 Hz
64	Preset Freq 3	20.0 Hz		73	Preset Freq 3	20.0 Hz
65	Preset Freq 4	30.0 Hz		74	Preset Freq 4	30.0 Hz
66	Preset Freq 5	40.0 Hz		75	Preset Freq 5	40.0 Hz
67	Preset Freq 6	50.0 Hz		76	Preset Freq 6	50.0 Hz
68	Preset Freq 7	60.0 Hz		77	Preset Freq 7	60.0 Hz
				51	Digital In 1 Sel	4 – 2 Preset Freq
				52	Digital In 2 Sel	4 – 2 Preset Freq
				53	Digital In 3 Sel	4 – 2 Preset Freq

160 SSC Notes:

- Changing the Input Mode requires a power cycle or an entry of “2” Reset Input Mode on Parameter 56
- If Parameter 46 set to “1” 2 Wire Control the drive will ramp to stop if terminal 8 is open. If Parameter 46 set to “5” 2 Wire Control With Enable the drive will coast stop if terminal 8 is open

PowerFlex Notes:

- By default the PowerFlex 40 is in Sensorless Vector control mode. It can be changed to Volts/Hertz with Parameter 125.
- The ENBL jumper on the PowerFlex 40 determines the Stop Mode. If the jumper is installed the Stop Mode is as programmed in Parameter 37. If the jumper is removed the stop is always a Coast Stop if terminal 8 is open.
- In this mode of operation, Parameter 37 controls the stop mode when the Run Fwd or Run Rev switch is opened.
- The PowerFlex 40 has eight speed presets and the PowerFlex 4M and 4 have four speed presets. Parameters 74-77 and 53 are not on PowerFlex 4M or 4.

DeviceNet

General

A 160 SSC with a DN2 DeviceNet option can be replaced with a PowerFlex 4/4M or PowerFlex 40 Drive. The PowerFlex 4/4M drive requires a 22-XCOMM base and a 22-COMM-D communication adapter to connect the DSI port to DeviceNet. The PowerFlex 40 drive requires a 22-COMM-D communication adapter and adapter cover (22B-CCB or 22B-CCC) to communicate on DeviceNet.

The intent of the following procedure is to “Replace” the 160 SSC with a new PowerFlex drive. The new PowerFlex drive will occupy the 160 SSC’s address on DeviceNet, Input/Output space in the DeviceNet scanner, and use the control logic in the PLC.

The following are the steps to replace a 160 SSC with a PowerFlex.

- **Save existing network configuration.** Save the network prior to replacing the 160 SSC. Print a report for reference. The network configuration containing the 160 SSC needs to be referenced for PowerFlex drive and Scanner configuration.

- **Install and configure new PowerFlex drive.** Edit the PowerFlex drive parameters for motor size and control over DeviceNet.

- **Configure DeviceNet Scanner.** Use existing 160 SSC Input/Output mapping in Scanner for PowerFlex Input/Output.

- **Edit PLC logic.** Control logic for the 160 SSC needs to be edited because the Command and Status for the PowerFlex may be different. Examples for ControlLogix, and SLC are given.

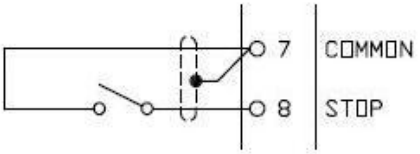
Software Versions

RSNetworx for DeviceNet is used to configure the DeviceNet and the PowerFlex drive. RSNetworx v7.00 or higher is recommended. RSNetworx v 9.00 was used for this document.

Hardwired Drive Enable

When the 160 SSC is being controlled over DeviceNet, hardwired devices wired to the Start, Direction, or Stop are not required. However, when Parameter 46 (Input Mode) is set to 2 (Network Control), Terminal TB3-8 is configured as an Enable. Terminal TB3-8 has to be high to start or run. Terminal TB3-8 may be jumped to TB3-7 Common or connected through a hardware enable circuit such as a guard or safety circuit.

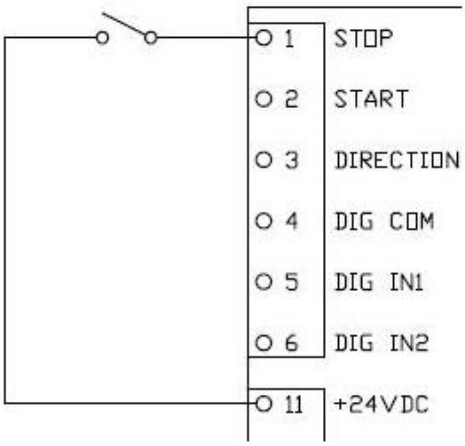
160SSC Enable



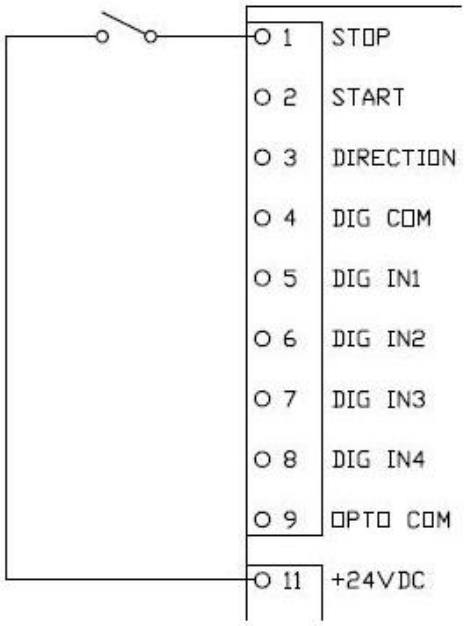
This function can be replicated with the PowerFlex 4/4M and the PowerFlex 40. By default, Terminal 1 is configured as Coast to Stop and shipped with a jumper between Terminal 1 and Terminal 11 (+24VDC). If the 160 SSC has a hardware enable circuit wired between TB3-7 and TB3-8, the same circuit can be wired between Terminal 1 and Terminal 11 on the PowerFlex 4M, 4, and 40

The type of stop the 160 SSC performs when terminal 7 and 8 are opened up is determined by Parameter 34. The type of stop the PowerFlex performs when terminal 1 and 11 when configured for network control is always a Coast Stop.

PowerFlex 4/4M Enable



PowerFlex 40 Enable



ENBL Jumper

NOTE: The PowerFlex 40 has an enable (ENBL) jumper. If the enable jumper is removed Terminal 1 will always act as a hardware enable regardless of software configuration.

Save Existing Network

The existing network and drive configuration containing the 160 SSC needs to be referenced for PowerFlex drive and Scanner configuration. Save the Network prior to replacing the 160 SSC.

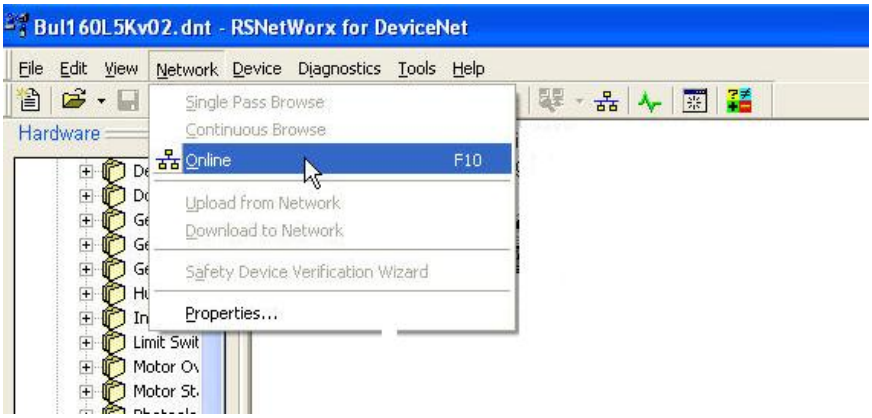
NOTE: Be sure to have the EDS file for the 160 SSC installed on PC. EDS file for 160 SSC can be downloaded at: **http://www.rockwellautomation.com/resources/eds/**
An EDS file can be created for the 160 SSC or PowerFlex. See the procedures in the following publications at: **http://literature.rockwellautomation.com**

160-UM002 ***160-DN2 Device Net Comm Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

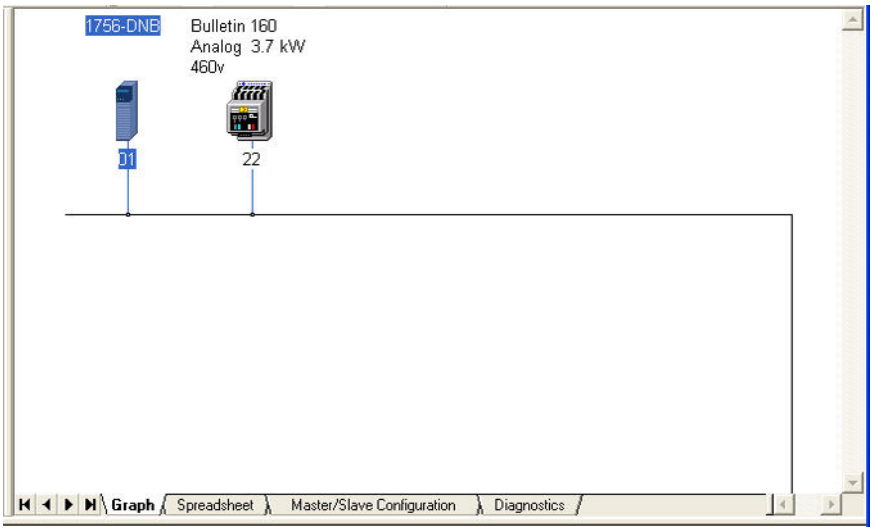
Go online with DeviceNet.

Start RSNetworx for DeviceNet
Set Online Path to Network.
Select **Network>Properties**
Click **Set Online Path**
Browse the RSLinx path to the DeviceNet Network
Select the DeviceNet Network
Click **Ok**

Go online with DeviceNet Network.
Select **Network>Online**

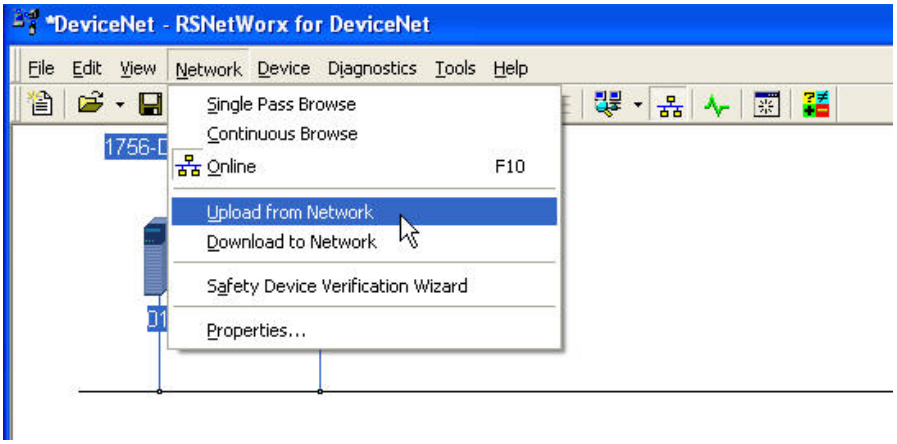


When online, RSNetworx will browse and display the devices on the network.



Upload entire Network.

Select **Network>Upload from Network**
Click **Ok**



The scanner and device parameters will be uploaded.

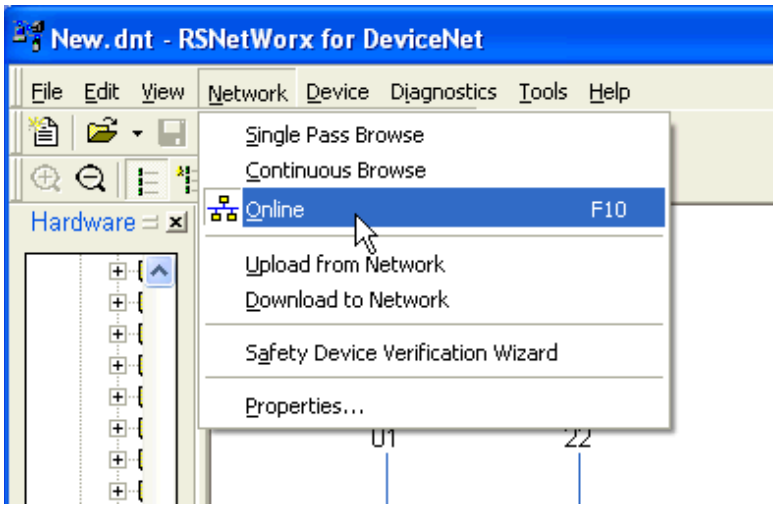
Save the DeviceNet project.

Select **File>Save As**
Enter a unique project name.
Click **Save**.

This saves the existing DeviceNet project and allows us to generate a report.

Go offline.

Select **Network>Online.**



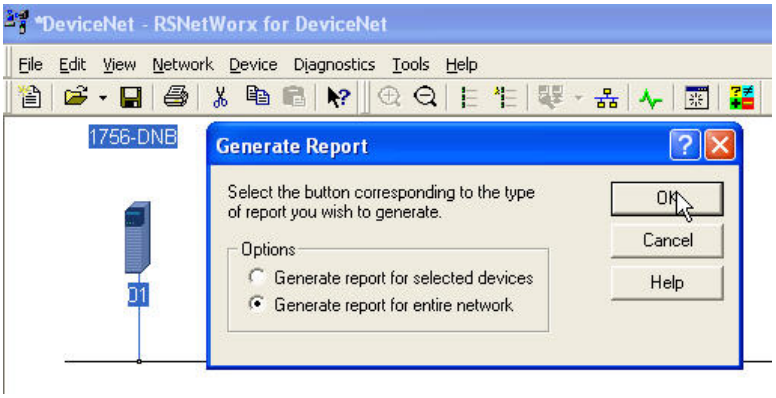
RSNetworx will go offline

Generate Network Report.

Select **File>Generate Report**

Select **Generate report for entire network**

Click **Ok**



RSNetworx will generate a report in html format for the entire network. It will contain the configuration for the Scanner and the 160 SSC drive. The file has an .html extension and is saved in the same folder as the DeviceNet project (.dnt) file. It can be viewed and printed.

The current Scanner and the 160 SSC configuration will be needed in later steps. The DeviceNet project file (.dnt) saved in this step can be opened up offline or the .html report generated in this step can be viewed offline.

Following is a sample of the information contained in the report:

Scanlist Summary

Node	Active	Key	Input Size	Input Mapped	Output Size	Output Mapped
01, 'Slave Mode'	No	No	0	No	0	No
22, 160 SSC Analog 3....	Yes	Yes	4	Yes	4	Yes

Input Memory

Assembly Data

Memory Offset	Bit Length	Node	Message Type
1:I.Data[10].0	32	22, 160 SSC Analog 3....	Polled

Output Memory

Assembly Data

Memory Offset	Bit Length	Node	Message Type
1:O.Data[10].0	32	22, 160 SSC Analog 3....	Polled

The Scanner configuration in the report shows that the 160 SSC drive is address 22. Four bytes are mapped to input word 10 and four bytes are mapped to output word 10.

The report for the 160 SSC (address 22) configuration shows all the parameters of the drive. The parameters needed to configure the new PowerFlex are highlighted.

Parameters

ID	Name	Value
1	Output Frequency	0.0 Hz
2	Output Voltage	0 Volt
3	Output Current	0.00 Amps
4	Output Power	0.00 kW
5	Bus Voltage	669 Volt
6	Cmd Frequency	0.0 Hz
7	Present Fault	No Fault
8	Heatsink Temp	69 Deg
9	Drive Status	XXXXXXXX 10000010
10	Drive Type	38
11	Firmware Version	7.06
12	Input Status	XXXXXXXX XXXX0010
13	Power Factor Ang	0.0 Deg
14	Memory Probe	40960
15	Preset Status	XXXXXXXX XXXXXX00
16	Analog Input	0.0
17	Fault Buffer 0	Under Volt Fault
18	Fault Buffer 1	Motor OL Fault
19	Fault Buffer 2	Under Volt Fault
20	Reserved	0
21	Reserved	0
22	Reserved	0
23	Reserved	0
24	Reserved	0
25	Reserved	0
26	Reserved	0
27	Reserved	0
28	Reserved	0

29	Reserved	0
30	Accel Time 1	10.0 Sec
31	Decel Time 1	10.0 Sec
32	Minimum Freq	0 Hz
33	Maximum Freq	60 Hz
34	Stop Mode Select	Ramp to Stop
35	Base Frequency	60 Hz
36	Base Voltage	460 Volt
37	Maximum Voltage	460 Volt
38	Boost Select	5.0%
39	Skip Frequency	240 Hz
40	Skip Freq Band	0 Hz
41	Overload Select	No Derating
42	Motor Overload	6.00 Amps
43	Current Limit	150 %
44	DC Hold Time	0.0 Sec
45	DC Hold Voltage	0 Volt
46	Input Mode	Network Control
47	Output Configure	Ready/Faulted
48	Output Threshold	0
49	PWM Frequency	4.0 kHz
50	Restart Tries	0
51	Restart Time	10.0 Sec
52	DB Enable	0
53	S-Curve	0%
54	Clear Fault	No Action
55	Probe Address	24574
56	Reset Functions	No Action
57	Program Lock	Unlocked
59	Freq Select	Internal Freq
60	Zero Offset	0.0 %
61	Preset Freq 0	3.0 Hz
62	Preset Freq 1	20.0 Hz
63	Reserved	0
64	Reserved	0
65	Preset Freq 4	45.0 Hz
66	Preset Freq 5	50.0 Hz
67	Reserved	0
68	Reserved	0
69	Accel Time 2	20.0 Sec
70	Decel Time 2	20.0 Sec
71	IR Compensation	50 %
72	Slip Comp	2.0 Hz
73	Reverse Disable	Not Disabled
74	Analog Select	Unipolar
75	Analog Minimum	0.0 %
76	Analog Maximum	100.0 %
77	Reserved	0
78	Compensation	No Action
79	Current Trip	0 %

80	Stall Disable	Normal Stall
81	Proc Kp Gain	0.01
82	Proc Ki Gain	0.01
83	Proc Reference	0.0 %
84	Proc Invert	0.0 %
85	Reserved	0
86	Reserved	0
87	Reserved	0
88	Reserved	0
89	Reserved	0
90	Reserved	0
91	Reserved	0
92	Reserved	0
93	Reserved	0
94	Reserved	0
95	Reserved	0
96	Reserved	0
97	Reserved	0
98	Reserved	0
99	Reserved	0
100	Reserved	0
101	Switches MAC ID	22
102	Switches Baud	125K Baud
103	NV MAC ID	63
104	NV Baud Rate	125K Baud
105	Bus Off Error	Hold Error State
106	Bus Off Count	0
107	Output Assembly	103
108	Input Assembly	104
113	DN Fault Mode	Fault and Stop
114	Motor Base RPM	1778 RPM
115	DN Idle Mode	Stop Drive
116	DN SW Version	3.002
117	COS Mask	11111111 11111111
118	Local Return Md	3 Wire Control

DeviceNet Parameters on Report.
Parameter 101 MAC ID is the DeviceNet address and Parameter 102 is the DeviceNet baud. These values will be use later in the PowerFlex DeviceNet configuration.

Parameter 107 Output Assembly and 108 Input Assembly are the I/O Assemblies used to control the drive over DeviceNet. They are needed later to configure the data size in the DeviceNet Scanner and the method of control for the ladder logic.

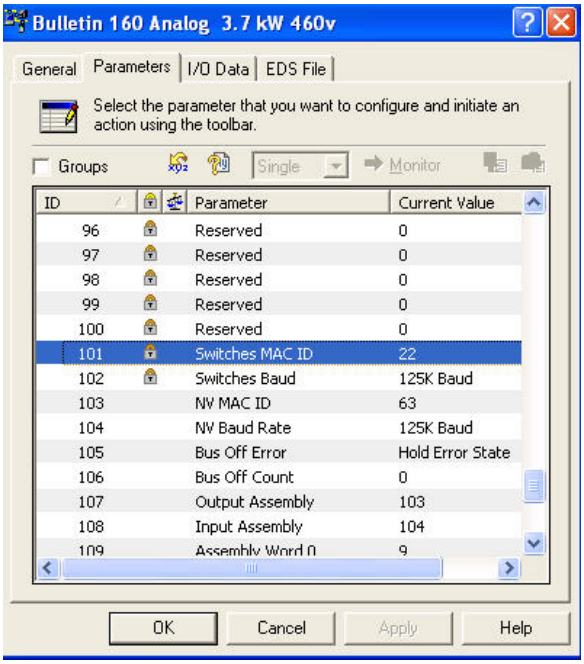
Configure PowerFlex Drive

Determine Address and Baud from 160 SSC

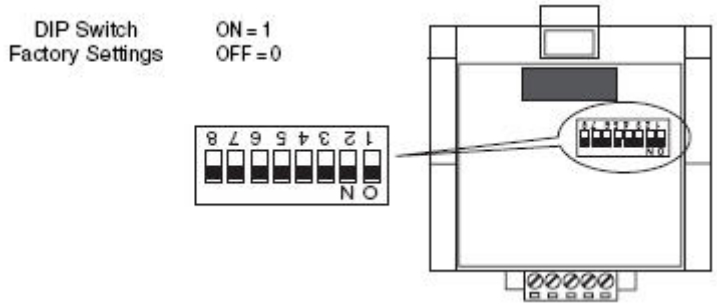
The new PowerFlex will replace the 160 SSC at the same address on the DeviceNet.

The address and baud rate can be determined by viewing the 160 SSC parameters. These can be viewed by opening up the saved DeviceNet project with the 160 SSC or the report generated from this project.

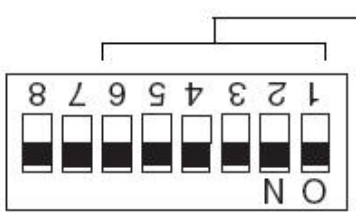
Parameter 101 – Switches MAC ID
Parameter 102 – Switches Baud



The address and the baud rate of the 160 SSC can also be determined from the DIP switches on the back of the 160-DN2 DeviceNet Communication module.



DIP switches 6 through 1 set the module's address. Factory default setting is 63. Note that when switches 7 and 8 are ON, the address is set to the value in Parameter 103 – NV MAC ID.

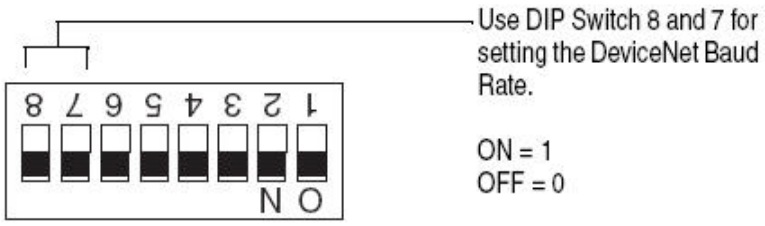


DeviceNet Address
000000 - 111111 (0 to 63)

ON = 1
OFF = 0

DeviceNet Address	Switch Settings 6 <-- 1	DeviceNet Address	Switch Settings 6 <-- 1	DeviceNet Address	Switch Settings 6 <-- 1	DeviceNet Address	Switch Settings 6 <-- 1
0	000000	16	010000	32	100000	48	110000
1	000001	17	010001	33	100001	49	110001
2	000010	18	010010	34	100010	50	110010
3	000011	19	010011	35	100011	51	110011
4	000100	20	010100	36	100100	52	110100
5	000101	21	010101	37	100101	53	110101
6	000110	22	010110	38	100110	54	110110
7	000111	23	010111	39	100111	55	110111
8	001000	24	011000	40	101000	56	111000
9	001001	25	011001	41	101001	57	111001
10	001010	26	011010	42	101010	58	111010
11	001011	27	011011	43	101011	59	111011
12	001100	28	011100	44	101100	60	111100
13	001101	29	011101	45	101101	61	111101
14	001110	30	011110	46	101110	62	111110
15	001111	31	011111	47	101111	63	111111

DIP switches 7 and 8 set the module's baud rate. Factory default setting is 125 kbps. Note that when switches 7 and 8 are ON, the baud rate is set to the value in **Parameter 104 – NV Baud Rate.**



Baud Rate	Switch Setting 8	Switch Setting 7
125 kbps	0	0
250 kbps	0	1
500 kbps	1	0
Set by module parameter P104	1	1

For more on address and baud rate DIP settings reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comm Module User Manual***

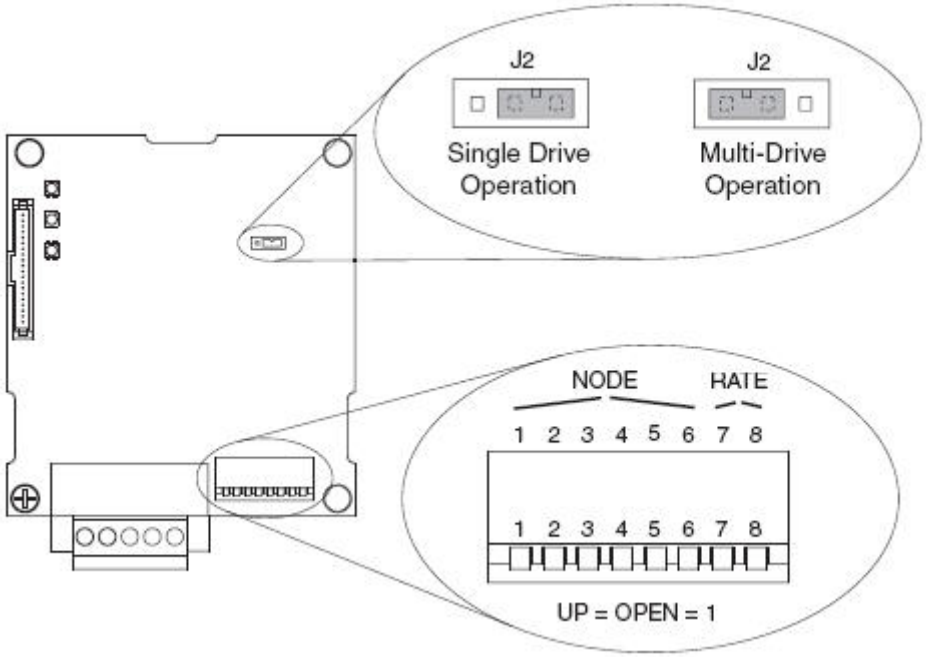
Install DeviceNet Comms Adapter in PowerFlex Drive
Install 22-COMM-D adapter in PowerFlex 40 or 22-XCOMM for PowerFlex 4/4M per the following publications at: **http://literature.rockwellautomation.com**

22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***
22COMM-IN001 ***22-XCOMM External Comms Installation Manual***

Set DIP switches on Communication Adapter

Set address and baud rate on the PowerFlex communication adapter the same as the 160 SSC.

Set Single/Multi Drive Operation jumper (J2) to Single Drive Operation.



Switches	Description	Default	
SW 1	Least Significant Bit (LSB) of Node Address	1	Node 63
SW 2	Bit 1 of Node Address	1	
SW 3	Bit 2 of Node Address	1	
SW 4	Bit 3 of Node Address	1	
SW 5	Bit 4 of Node Address	1	
SW 6	Most Significant Bit (MSB) of Node Address	1	
SW 7	Least Significant Bit (LSB) of Data Rate	1	Autobaud
SW 8	Most Significant Bit (MSB) of Data Rate	1	

.

DIP switches 1 through 6 set the address and switches 7 and 8 set the baud rate. Note that when all switches are CLOSED (0), the address is set to the value in **Parameter 2 – DN Addr Cfg** and the Baud is set to the value in **Parameter 4 – DN Rate Cfg**

Switch Setting						Node	Switch Setting						Node
SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	Address	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	Address
0	0	0	0	0	0	0	1	0	1	1	0	0	13
1	0	0	0	0	0	1	0	1	1	1	0	0	14
0	1	0	0	0	0	2	1	1	1	1	0	0	15
1	1	0	0	0	0	3	0	0	0	0	1	0	16
0	0	1	0	0	0	4	1	0	0	0	1	0	17
1	0	1	0	0	0	5	0	1	0	0	1	0	18
0	1	1	0	0	0	6	1	1	0	0	1	0	19
1	1	1	0	0	0	7	0	0	1	0	1	0	20
0	0	0	1	0	0	8	1	0	1	0	1	0	21
1	0	0	1	0	0	9	0	1	1	0	1	0	22
0	1	0	1	0	0	10	1	1	1	0	1	0	23
1	1	0	1	0	0	11	0	0	0	1	1	0	24
0	0	1	1	0	0	12	1	0	0	1	1	0	25

Switch Setting						Node	Switch Setting						Node
SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	Address	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	Address
0	1	0	1	1	0	26	1	0	1	1	0	1	45
1	1	0	1	1	0	27	0	1	1	1	0	1	46
0	0	1	1	1	0	28	1	1	1	1	0	1	47
1	0	1	1	1	0	29	0	0	0	0	1	1	48
0	1	1	1	1	0	30	1	0	0	0	1	1	49
1	1	1	1	1	0	31	0	1	0	0	1	1	50
0	0	0	0	0	1	32	1	1	0	0	1	1	51
1	0	0	0	0	1	33	0	0	1	0	1	1	52
0	1	0	0	0	1	34	1	0	1	0	1	1	53
1	1	0	0	0	1	35	0	1	1	0	1	1	54
0	0	1	0	0	1	36	1	1	1	0	1	1	55
1	0	1	0	0	1	37	0	0	0	1	1	1	56
0	1	1	0	0	1	38	1	0	0	1	1	1	57
1	1	1	0	0	1	39	0	1	0	1	1	1	58
0	0	0	1	0	1	40	1	1	0	1	1	1	59
1	0	0	1	0	1	41	0	0	1	1	1	1	60
0	1	0	1	0	1	42	1	0	1	1	1	1	61
1	1	0	1	0	1	43	0	1	1	1	1	1	62
0	0	1	1	0	1	44	1	1	1	1	1	1	63

Switch Setting		Data
SW 7	SW 8	Rate
0	0	125 kbps
1	0	250 kbps
0	1	500 kbps
1	1	Autobaud

Install and Configure PowerFlex drive.

NOTE: It's recommended that the PLC be in program mode for this step. The new PowerFlex drive is taking the place of the 160 SSC on the DeviceNet network. The existing PLC logic for the 160 SSC could inadvertently start the PowerFlex drive. It is also recommended that the hardware enable to the PowerFlex drive (terminals 1 and 11) be open.

Install the PowerFlex 4/4M/40 per the recommendations in the following publications at: http://literature.rockwellautomation.com

22A-UM001 ***PowerFlex 4 User Manual***
22B-UM001 ***PowerFlex 40 User Manual***
22F-UM001 ***PowerFlex 4M User Manual***

Configure PowerFlex Drive.
It is possible to configure the PowerFlex many ways.
- Drive Explorer
- Drive Executive
- HIM
- RSNetworx – DeviceNet

The following description uses RSNetworx to set parameters in the PowerFlex drive and configure the scanner online.

NOTE: Be sure to have the EDS file for the PowerFlex drive installed on PC. EDS file for PowerFlex can be downloaded at: http://www.rockwellautomation.com/resources/eds/
An EDS file can be created for the PowerFlex. See the procedures in the following publications at: http://literature.rockwellautomation.com

22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

The PowerFlex drive and DeviceNet need to be powered up.

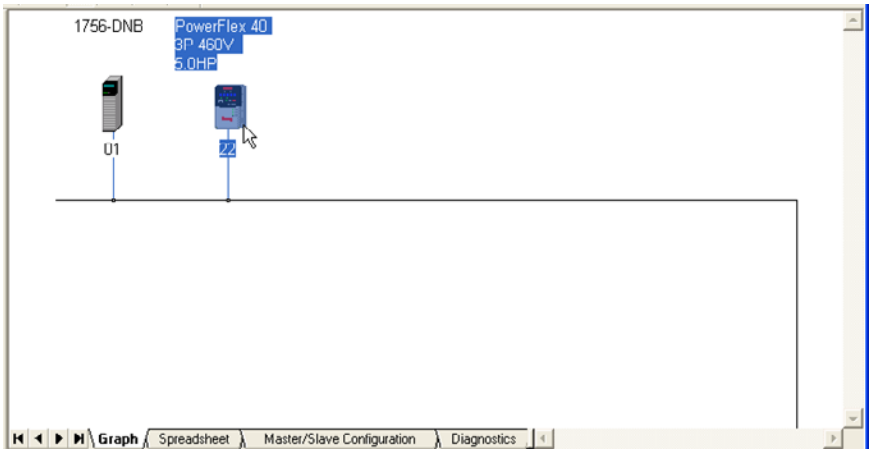
Go online with DeviceNet.
Start RSNetworx for DeviceNet
Set Online Path to Network.
- Select **Network>Properties**
- Click **Set Online Path**
- Browse the RSLinx path to the DeviceNet Network
- Select the DeviceNet Network
- Click **Ok**

Go online with DeviceNet Network.
- Select **Network>Online**

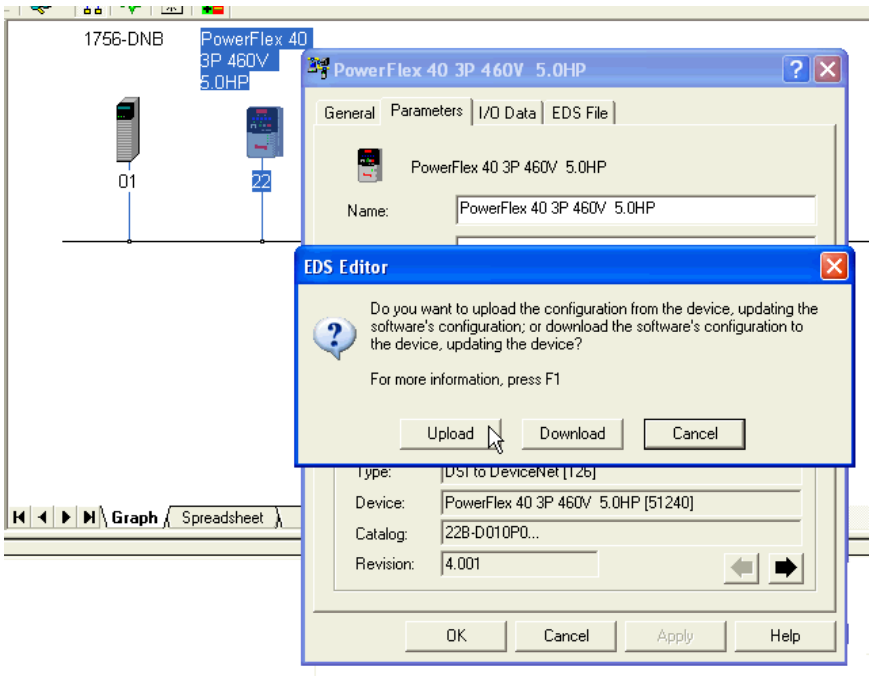
RSNetworx will do a single pass browse and the new PowerFlex drive should show up on the network at the address of the 160 SSC.

Set PowerFlex drive parameters.

Double click on PowerFlex Drive.

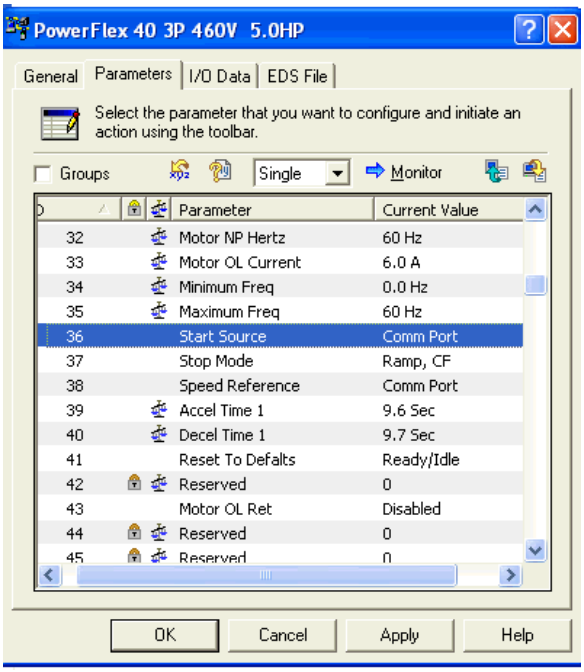


The PowerFlex Properties is displayed.



Select the **Parameters** tab
Click on **Upload** parameters.

PowerFlex parameters are displayed.

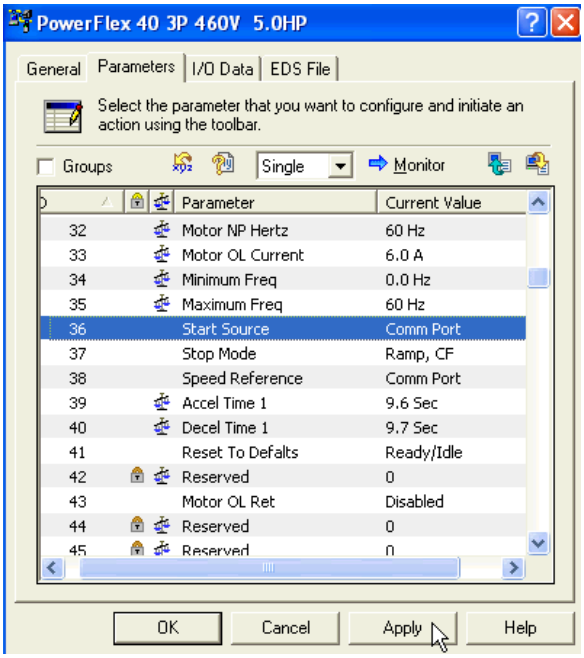


Edit Parameters
The following parameters are the minimum required to configure the PowerFlex for the motor attributes and to accept commands over DeviceNet. The table shows a cross reference to the 160 SSC parameters that can be seen in the Offline DeviceNet file or the report generated in the previous step.

NOTE: This example uses a 5HP, 460VAC, 6.0FLA, 60Hz motor. PowerFlex Parameters 31, 32, 33, 34, and 35, are dependant on your motor and application. PowerFlex Parameters 37, 39, and 40 are dependant on your applications stop mode and Accel/Decel rates.

	160 SSC analog			PowerFlex 40	
No.	**Parameter**	**Value**	**No.**	**Parameter**	**Value**
36	Base Voltage	460 V	31	Motor NP Volts	460 V
35	Base Frequency	60 Hz	32	Motor NP Hertz	60 Hz
42	Motor OL Current	6.0 A	33	Motor OL Current	6.0 A
32	Minimum Frequency	0 Hz	34	Minimum Frequency	0 Hz
33	Maximum Frequency	60 Hz	35	Maximum Frequency	60 Hz
46	Input Mode	2 - Network Control	36	Start Source	5 – Comm Port
34	Stop Mode Select	0 - Ramp to Stop	37	Stop Mode	0 – Ramp CF
59	Frequency Select	1 – Internal	38	Speed Reference	5 – Comm Port
30	Accel Time 1	10.0 Sec	39	Accel Time 1	10.0 Sec
31	Decel Time 1	10.0 Sec	40	Decel Time 1	10.0 Sec

NOTE: PowerFlex 40 on DeviceNet. Parameter 164 may need to be edited if doing explicit messaging over DeviceNet. See the information on this parameter in the sections for ControlLogix Explicit Messaging and SLC Explicit Messaging.



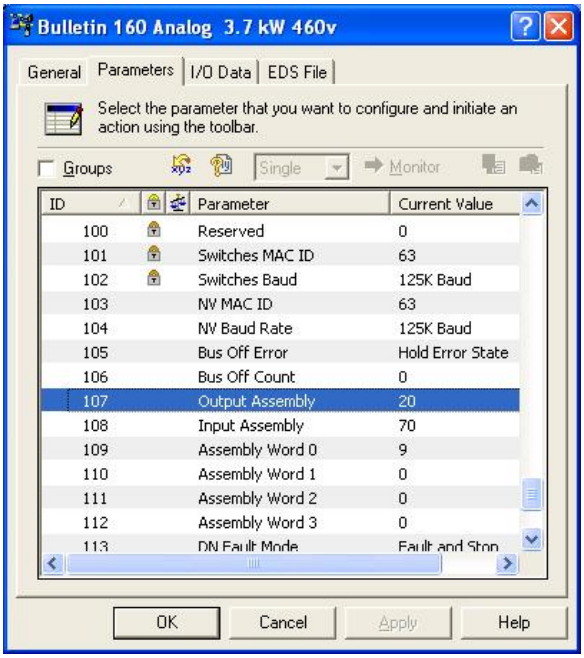
Click **Apply**.
Click **Ok** to close the properties.

Configure DeviceNet Scanner

Before configuring the DeviceNet scanner for the new PowerFlex drive, we need to know how the 160 SSC is mapped into the Input/Output of the scanner. The 160 SSC is mapped in the Scanlist with Output Assemblies of one to four bytes, and Input Assemblies from one to eight bytes.

The size in bytes of the data mapped to the 160 SSC is dependant on the configurable Input/Output Assemblies used for DeviceNet. The size in bytes of the data mapped to the PowerFlex is dependant on the fixed Input/Output Assemblies used for DeviceNet.

The Input/Output Assemblies used by the 160 SSC are determined by values in Parameter 107 Output Assembly and 108 Input Assembly. These can be viewed by opening up the saved DeviceNet project with the 160 SSC or the report generated from this project. A typical example of Output Assembly 20 and Input Assembly 70 would be mapped in the scanner as four bytes out and four bytes in.



160 SSC Output Assembly 20 and Input Assembly 70 example.

Instance 20 Data Format (Basic Speed Control Output Assembly)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Fault Reset		RunFwd
1								
2 ①	Speed Reference RPM (Low Byte) ②							
3 ①	Speed Reference RPM (High Byte) ②							

Instance 70 Data Format (Basic Speed Control Input Assembly)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Running1		Faulted
1								
2	Speed Actual RPM (Low Byte)							
3	Speed Actual RPM (High Byte)							

For an explanation of the Input/Output Assemblies for 160 SSC, reference the following manual at: **http://literature.rockwellautomation.com**

160-UM002 ***160-DN2 Device Net Communication Module User Manual***

The PowerFlex drive Input and Output Assemblies are fixed at four bytes in and four bytes out.

PowerFlex40 Output Assembly								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	MOP inc		Dir	Dir	Clear Flt	Jog	Start	Stop
1	MOP dec	Ref Sel3	Ref Sel2	Ref Sel1	Decel1	Decel0	Accel	Accel
2	Commanded Frequency (0.1Hz) (Low Byte)							
3	Commanded Frequency (0.1Hz) (High Byte)							

PowerFlex40 Input Assembly								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Fault	Alarm	Decel	Accel	Acr Dir	Cmd Dir	Active	Ready
1	DigInp4	DigInp3	DigInp2	DigInp1	Locked	Logic Comm	Freq Comm	At Speed
2	Speed Feedback (0.1Hz) (Low Byte)							
3	Speed Feedback (0.1Hz) (High Byte)							

For an explanation of the Input/Output Assemblies for PowerFlex 4, reference the following manual at: **http://literature.rockwellautomation.com**

22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

If the 160 SSC used one byte Output Assemblies 1…5 or Input Assemblies 50…54 then we need to verify that the space in the scanner that the 160 SSC occupied is large enough for the four bytes of the PowerFlex.

Go online with DeviceNet.

Start RSNetworx for DeviceNet

Set Online Path to Network.

Select **Network>Properties**

Click **Set Online Path**

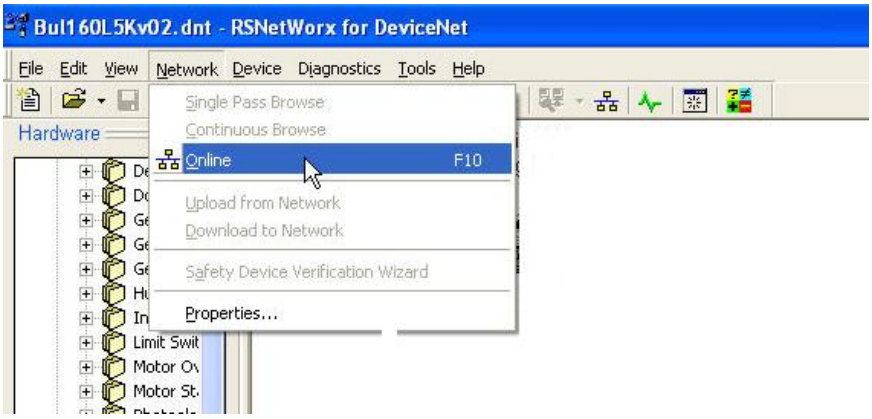
Browse the RSLinx path to the DeviceNet Network

Select the DeviceNet Network

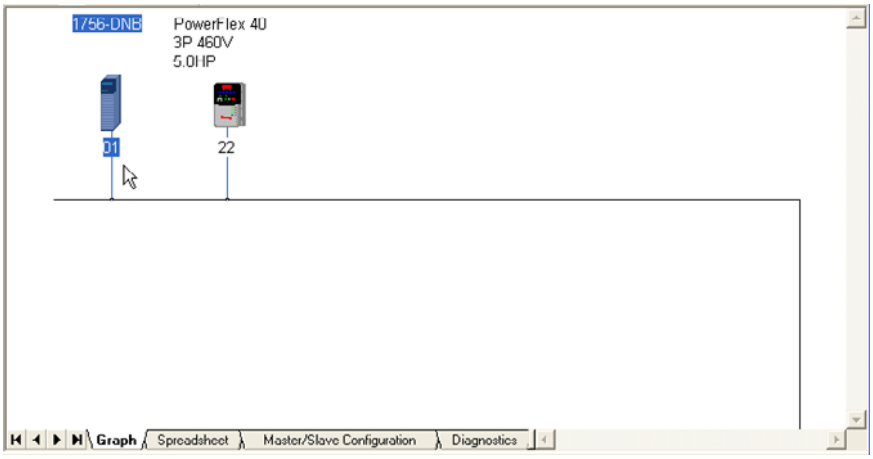
Click **Ok**

Go online with DeviceNet Network.

Select **Network>Online**



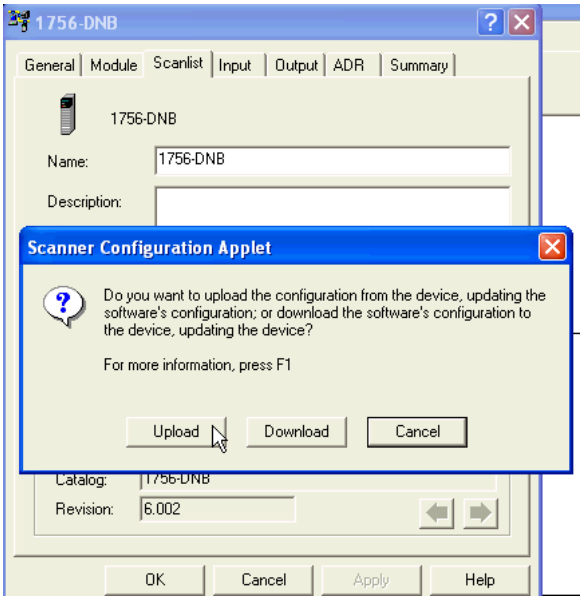
When online, RSNetworx will browse and display the devices on the network.



Edit Scanlist.

In the following example, the 1756-DNB scanner is shown. Editing other scanners is similar.

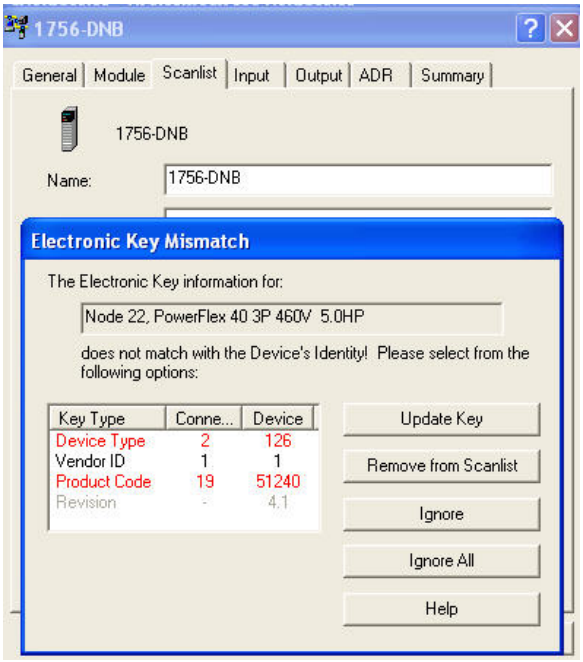
Double-Click on DeviceNet Scanner.



Select **Scanlist** tab and **Upload**.

The Scanlist will upload.

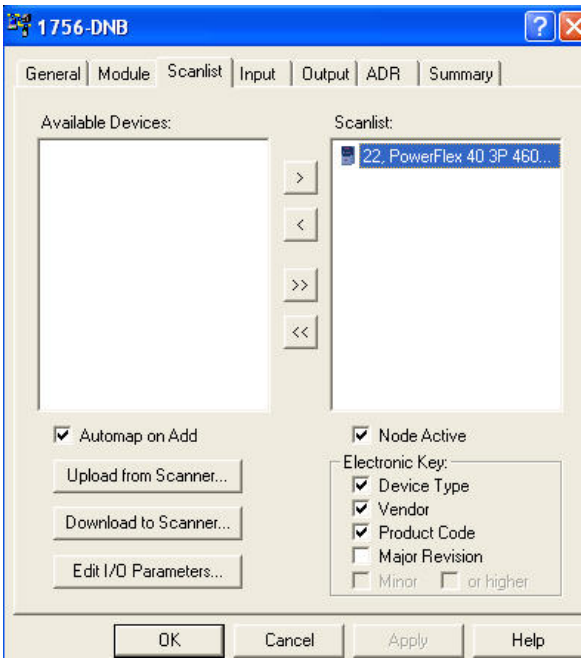
Scanlist will show an error because of the key mismatch between the 160 SSC drive in the configuration and the new PowerFlex Drive connected to the network at the same address.



Click **Update Key**.

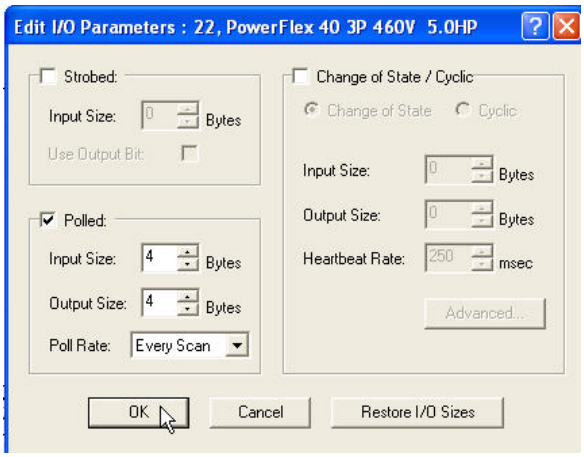
This will replace the 160 SSC with the PowerFlex in the Scanlist. It is possible the I/O sizes are different. We need to verify the mapping and sizes.

The Scanlist will be displayed including the new PowerFlex.



Select the PowerFlex drive in the Scanlist
Click **Edit I/O Parameters**
This will allow us to change the Input and Output size to 4 bytes.

The I/O Parameters will be displayed.

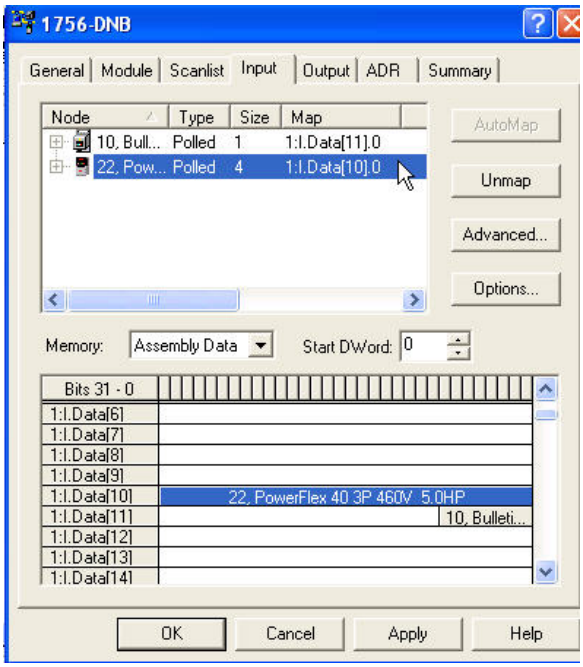


Check the **Polled** check box.
Set Input size to 4 bytes.
Set Output size to 4 bytes.
Select Poll rate as **Every Scan**
Click **OK** and (Yes to Unmap and Yes to Automap if the size changed)

View Input/Output Mapping.

This procedure replaced the 160 SSC Input/Output mapping with the PowerFlex map. As stated earlier the PowerFlex Input/Output Assemblies are fixed at 4 bytes in and 4 bytes out. The 160 SSC Input/Output Assemblies are configurable depending on the values in drive parameters 107 and 108. If Input or Output Assemblies for the 160 SSC were less than 4 bytes, the new PowerFlex mapping may overlap and existing device. Follow the next steps to verify the mapping and possibly move the PowerFlex.

Click on **Input** tab



Select the PowerFlex

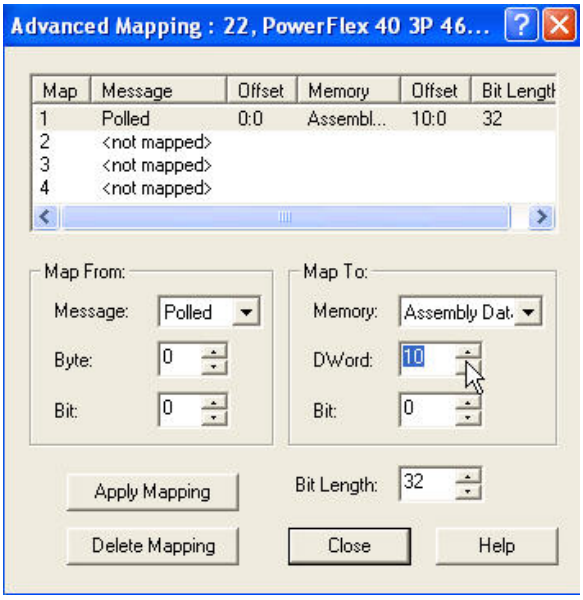
The display will show the location in the Scanner's Input table that the 4 bytes from the PowerFlex are mapped to. In this example, word 10. Also, this example uses a 1756-DNB. If a 1747-SDN or a 1771-1771-SDN is used the mapping will display in 16 bit words. Notice in this example another device has 1 byte located at word 11.

If it needs to be moved or is overlapping with another device complete the following steps. Click on **Advanced…**

If the mapping is correct and does not overlap another device then click on **Output** tab

The Advanced Input mapping will be displayed

NOTE: Complete this step if it needs to be moved or is overlapping with another device.



Select **Memory:**

Select memory location from the pull down depending on the type of DeviceNet scanner being used.

Type of Scanner	Memory Locations
1747-SDN	Discrete of M-File
1756-DNB	Assembly Data
1771-SDN	Block Xfer 62-57

Enter **Word** or **DWord** to map Input assembly to.

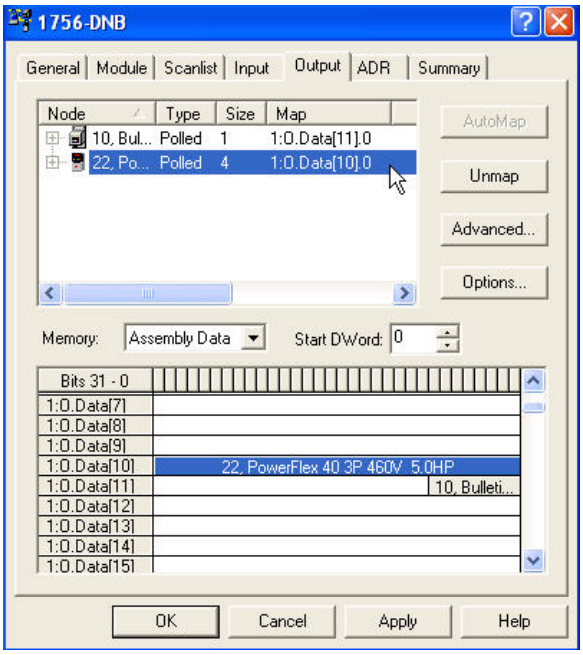
In this example, a 1756-DNB is used so 32 bits (4 bytes) are mapped to Dword 10. If you are using a 17xx-SDN, it will show 32 bits (4 bytes) mapped to Word 10, and 11

Click **Apply Mapping**

Click **Close**

The inputs should be mapped to the proper location on the **Input** tab.

Click on **Output** tab.



Select the PowerFlex

The display will show the location in the Scanner's Output table that the four bytes to the PowerFlex are mapped to. In this example, word 10. Also, this example uses a 1756-DNB. If a 1747-SDN or a 1771-1771-SDN is used the mapping will display in 16 bit words. Notice in this example another device has one byte located at word 11.

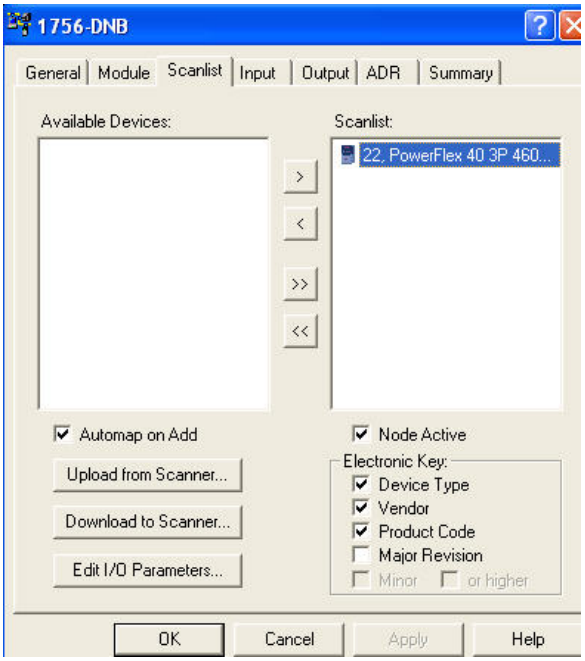
NOTE: If it needs to be moved or is overlapping with another device go to the Advanced mapping as described for inputs in the previous step. Otherwise go on to next step.

If it needs to be moved or is overlapping with another device complete the following steps. Click on **Advanced…**

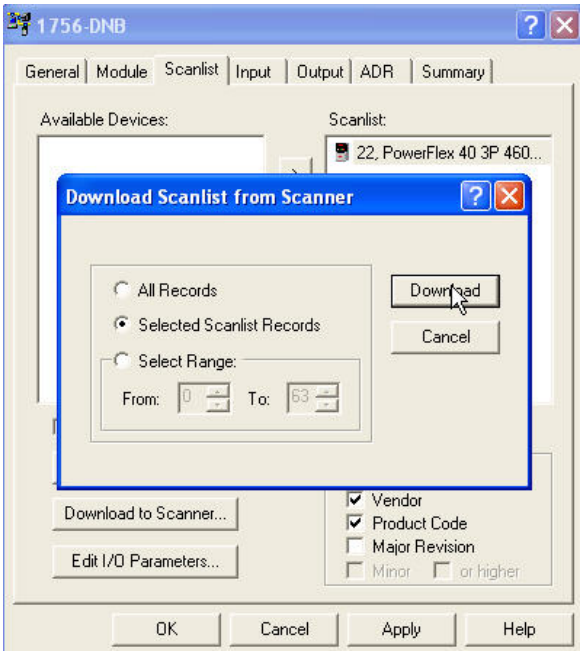
If the mapping is correct and does not overlap another device then go on to the next step to download to the scanner.

Download to Scanner.

NOTE: The PLC needs to be in program mode for this step. The new PowerFlex drive is taking the place of the 160 SSC on the DeviceNet network. It is also recommended that the hardware enable to the PowerFlex drive (terminals 1 and 11) be open.



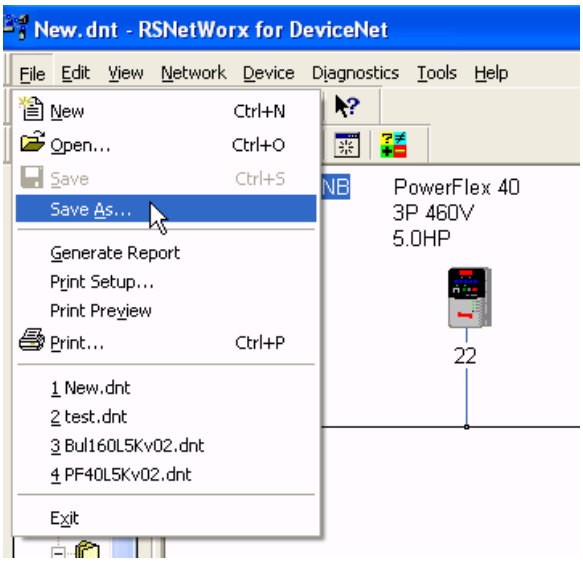
Select the **Scanlist** Tab
Select the PowerFlex drive in the Scanlist
Click **Download to Sanner**



Select the **Selected Scanlist Records** radio button.
Click **Download**
This will download the changes for the PowerFlex replacement of the 160 SSC to the Scanner.
When the download is complete, click **OK** to close the Scanner dialog.

Save the DeviceNet project.

Select **File>Save As**



Enter a unique project name.

Click **Save**.

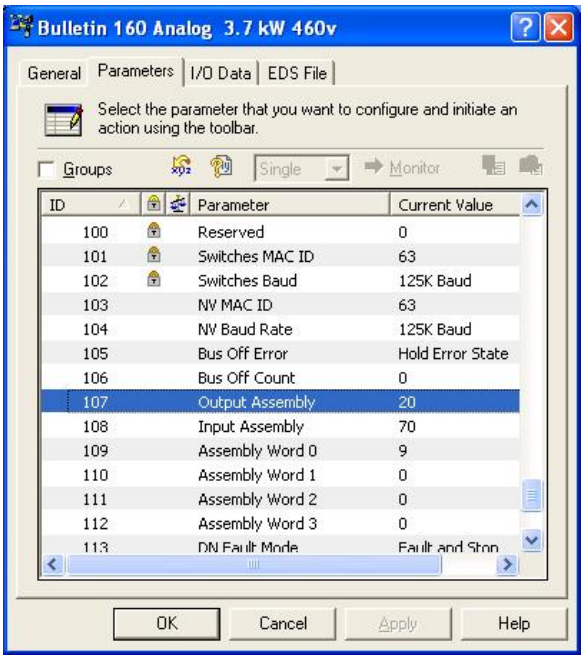
This saves the new DeviceNet project which includes the PowerFlex drive.

Example Ladder Logic

The DeviceNet configuration has been aimed at placing the new PowerFlex in the same Input/Output space as the 160 SSC. The logic examples provided are to replace the 160 SSC with a new PowerFlex with minimal changes to the control logic.

The ladder logic of the 160 SSC is dependant on the data mapping of the configurable Input/Output Assemblies used for DeviceNet. The ladder logic for the PowerFlex is dependant on the fixed Input/Output Assemblies used for DeviceNet.

The Input/Output Assemblies used 160 SSC are determined by values in Parameter 107 Output Assembly and 108 Input Assembly. These can be viewed by opening up the saved DeviceNet project of the 160 SSC or the report generated from this project.



The following tables show the data mapping for two of the most common 160 SSC Input/Output Assemblies and the PowerFlex Input/Output Assemblies.

160 SSC Output Assembly 20 and Input Assembly 70
160 SSC Output Assembly 103 and Input Assembly 104
PowerFlex Output Assembly and Input Assembly

Logic examples for ControlLogix, and SLC500 are shown for the two common 160 SSC assemblies and equivalent logic to control a PowerFlex in the same manner. The 160 SSC logic can vary depending on Input/Output Assemblies. The logic for the PowerFlex attempts to use the same bits and method of control by minor edits to the commands to the drive and status from the drive while keeping the original command and status logic intact.

If the 160 SSC used Customizable Input Assemblies 102 or 105, the configurable parameters being read from the drive will have to be cross-referenced to the PowerFlex and possibly be transferred using an explicit message.

NOTE: Preset Speed Model.
The example logic sends a speed reference to the drives and assumes it is configured as a speed follower. The 160 SSC could be a Preset model and use Output Assembly 103 to select Preset speed. This can also be accomplished with the PowerFlex fixed output assembly.

160 SSC Output Assembly 20 and Input Assembly 70

Default and common configuration.

Instance 20 Data Format (Basic Speed Control Output Assembly)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Fault Reset		RunFwd
1								
2 ①	Speed Reference RPM (Low Byte) ②							
3 ①	Speed Reference RPM (High Byte) ②							

Instance 70 Data Format (Basic Speed Control Input Assembly)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Running1		Faulted
1								
2	Speed Actual RPM (Low Byte)							
3	Speed Actual RPM (High Byte)							

160 SSC Output Assembly 103 and Input Assembly 104

Instance 103 Allen-Bradley Drive Output Assembly This output assembly mirrors the 1305/1336 IO format.								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	N/A	N/A	Direction ④	Direction ④	Clear Faults	N/A	Start	Stop
1	N/A	Reference Select ⑤	Reference Select ⑤	Reference Select ⑤	N/A	N/A	N/A	N/A
2	Scale Speed Reference (Low Byte) ⑥							
3	Scale Speed Reference (High Byte) ⑥							

① Net Ref has higher priority than Net Control. Therefore, if Net Ref is set, presets are ignored.

② For Preset Speed Units: Net Ref determines if speed reference comes from the network or preset speeds.

③ Preset Speed

TB3-4 (SW3)	TB3-2 (SW2)	TB3-1 (SW1)	
0	0	0	Preset 0
0	0	1	Preset 1
0	1	0	Preset 2
0	1	1	Preset 3
1	0	0	Preset 4
1	0	1	Preset 5
1	1	0	Preset 6
1	1	1	Preset 7

④ Direction

Bit 5	Bit 4	
0	0	No Command
0	1	Forward Command
1	0	Reverse Command
1	1	Hold Direction Cmd

⑤ Reference Select

Bit 14	Bit 13	Bit 12	
0	0	0	No Command Select
0	0	1	TB3 Control
0	1	0	Network Control
0	1	1	Preset 3
1	0	0	Preset 4
1	0	1	Preset 5
1	1	0	Preset 6
1	1	1	Preset 7

⑥ 0 = 0 Hz, 32767 = Maximum Frequency (Hz)

Instance 104: Allen-Bradley Input Assembly This input assembly mirrors the Bulletin 1305 I/O Format.								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Fault	N/A	Decel	Accel	Rot Dir ①	Cmd Dir ①	Running	Enabled
1	Freq Source ③	Freq Source ③	Freq Source ③	Freq Source ③	Local ②	Local ②	Local ②	At Speed
2	Actual Speed Scale 0-32767 ④							
3	Actual Speed Scale 0-32767 ④							

① 1 = forward, 0 = reverse

② Local

Bit 11	Bit 10	Bit 9	Definition
0	0	0	TB3 Control
0	0	1	Network Control

③ Frequency Source

Bit 15	Bit 14	Bit 13	Bit 12	Definition
0	0	0	0	Preset 0
0	0	0	1	Preset 1
0	0	1	0	Preset 2
0	0	1	1	Preset 3
0	1	0	0	Preset 4
0	1	0	1	Preset 5
0	1	1	0	Preset 6
0	1	1	1	Preset 7
1	0	0	0	TB3
1	0	0	1	Network
1	0	1	0	Not defined
1	1	1	1	Not defined

④ 0 = 0 Hz, 32767 = Maximum Frequency

PowerFlex 40 Output and Input Assembly

PowerFlex40 Output Assembly								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	MOP inc		Dir	Dir	Clear Flt	Jog	Start	Stop
1	MOP dec	Ref Sel3	Ref Sel2	Ref Sel1	Decel1	Decel0	Accel	Accel
2	Commanded Frequency (0.1Hz) (Low Byte)							
3	Commanded Frequency (0.1Hz) (High Byte)							

PowerFlex40 Input Assembly								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Fault	Alarm	Decel	Accel	Acr Dir	Cmd Dir	Active	Ready
1	DigInp4	DigInp3	DigInp2	DigInp1	Locked	Logic Comm	Freq Comm	At Speed
2	Speed Feedback (0.1Hz) (Low Byte)							
3	Speed Feedback (0.1Hz) (High Byte)							

For Input/Output Assemblies not shown in these examples or for a more in-depth discussion reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comm Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

ControlLogix I/O Messaging Examples

In this example, DeviceNet is configured for the drive Outputs to start at Slot 1 Output Word 10 (Local:1:O.Data[10]) and drive Inputs to start at Slot 1 Input Word 10 (Local:1:I.Data[10]) in the 1756-DNB Scanner.

Tags for Example Program

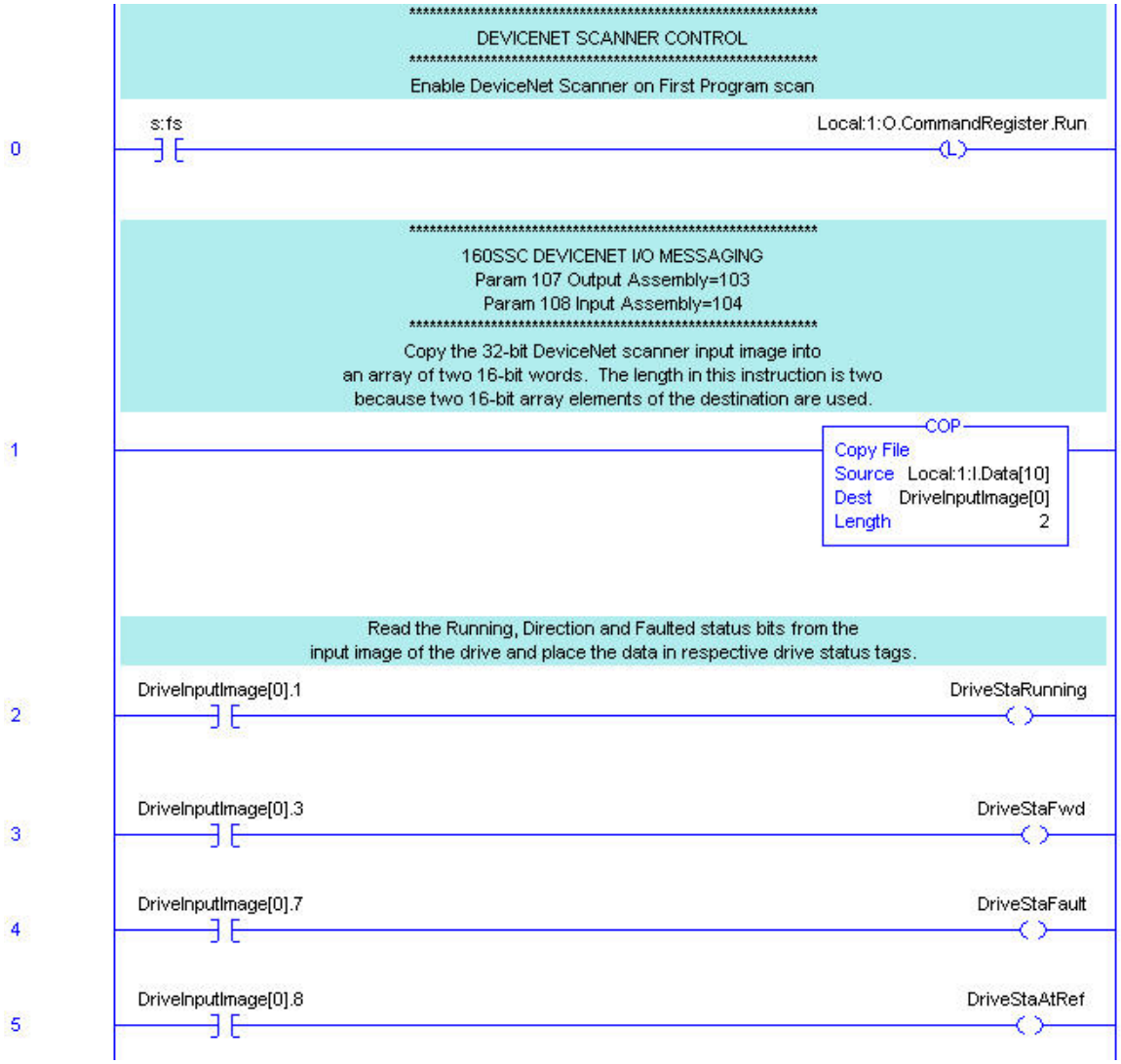
Tag Name	Type	Description
Local:1:I.Data[10]	Dint[]	Local I/O Slot 1 Input
Local:1:O.Data[10]	Dint[]	Local I/O Slot 1 Output
DriveInputImage	Int[2]	Drive Input Dint to Int conversion
DriveOutputImage	Int[2]	Drive Output Int to Dint conversion
DriveSpdFbk	Int	Speed Feedback from drive +/- 0-32767
DriveSpdRef	Int	Speed Reference to drive 0-32767
DriveStaReady	Bool	Drive Status to user logic – Ready
DriveStaRunning	Bool	Drive Status to user logic – Running
DriveStaFwd	Bool	Drive Status to user logic – Forward Direction
DriveStaFault	Bool	Drive Status to user logic – Faulted
DriveStaAtRef	Bool	Drive Status to user logic – Running at speed reference
DriveCmdStop	Bool	Drive Command from user logic – Stop
DriveCmdStart	Bool	Drive Command from user logic – Start
DriveCmdRunFwd	Bool	Drive Command from user logic – Run Forward
DriveCmdJog	Bool	Drive Command from user logic – Jog
DriveCmdClrFault	Bool	Drive Command from user logic – Clear Fault (reset)
DriveCmdFwd	Bool	Drive Command from user logic – Fwd/Rev Direction

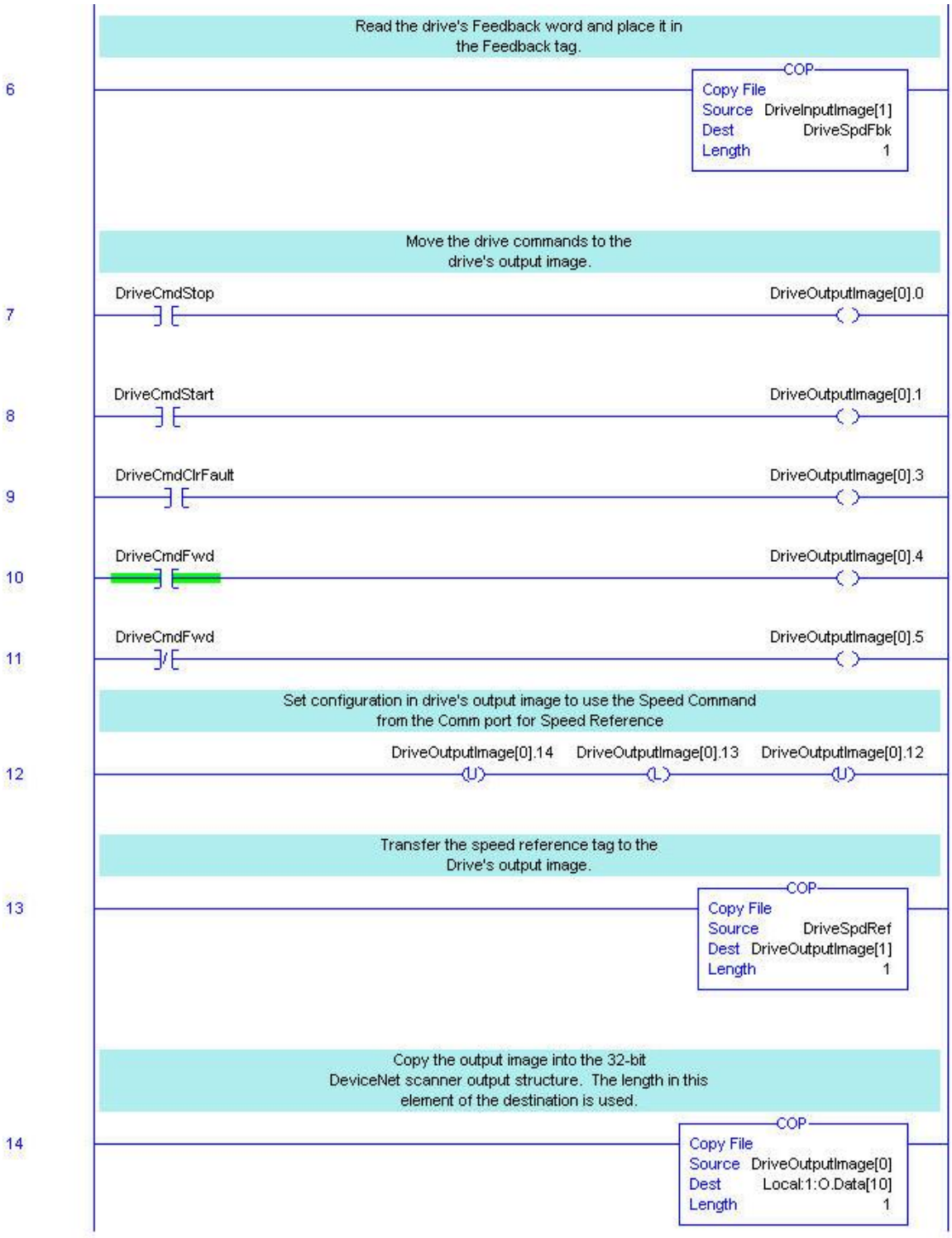
ControlLogix

160 SSC Control with Output Assembly 103 and Input Assembly 104

Using the Output Assembly 103, the 160 SSC is started with a momentary DriveCmdStart bit and stopped with a momentary DriveCmdStop bit.

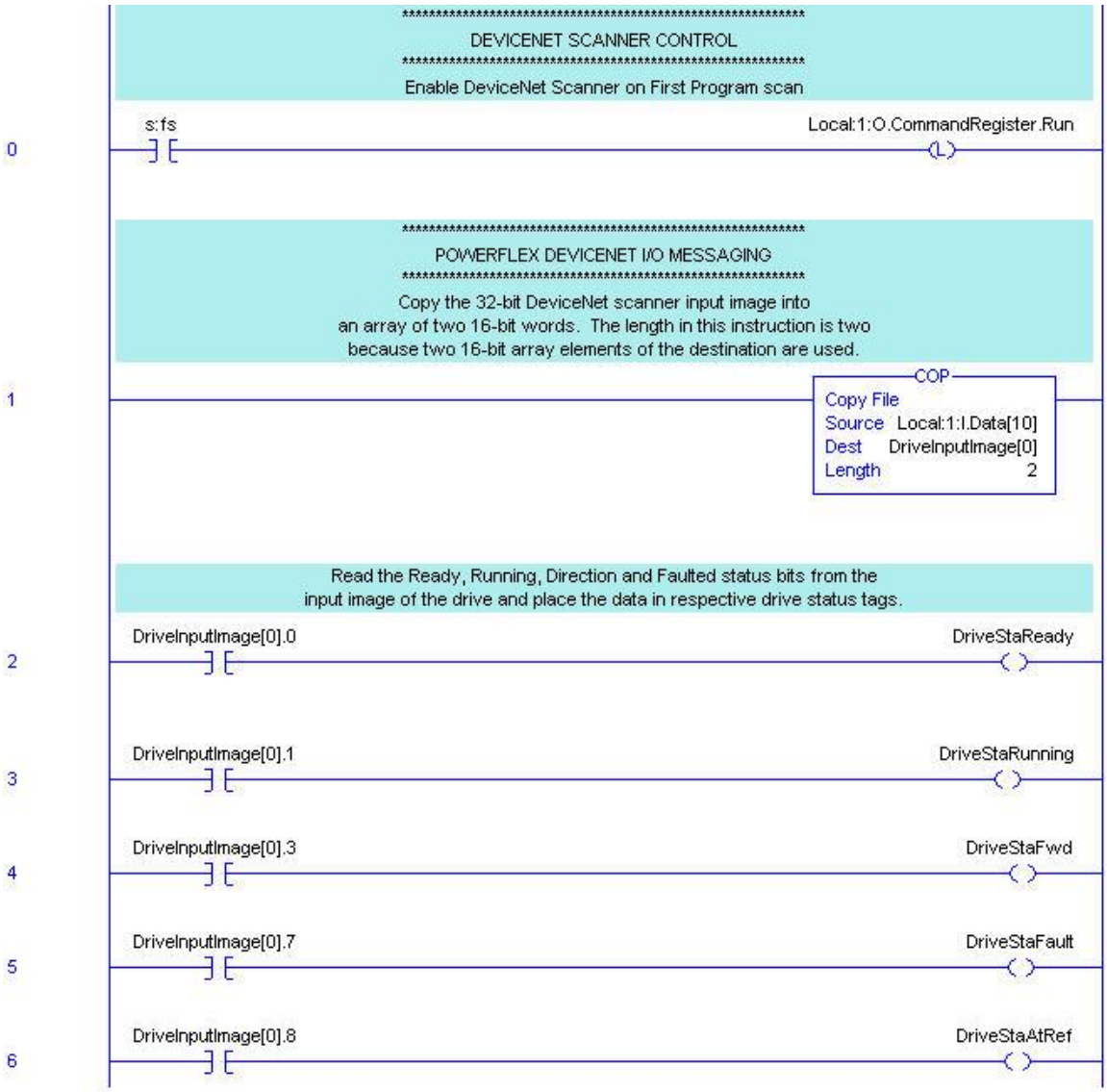
Speed Reference is 0-32767 (32767 = Maximum frequency).

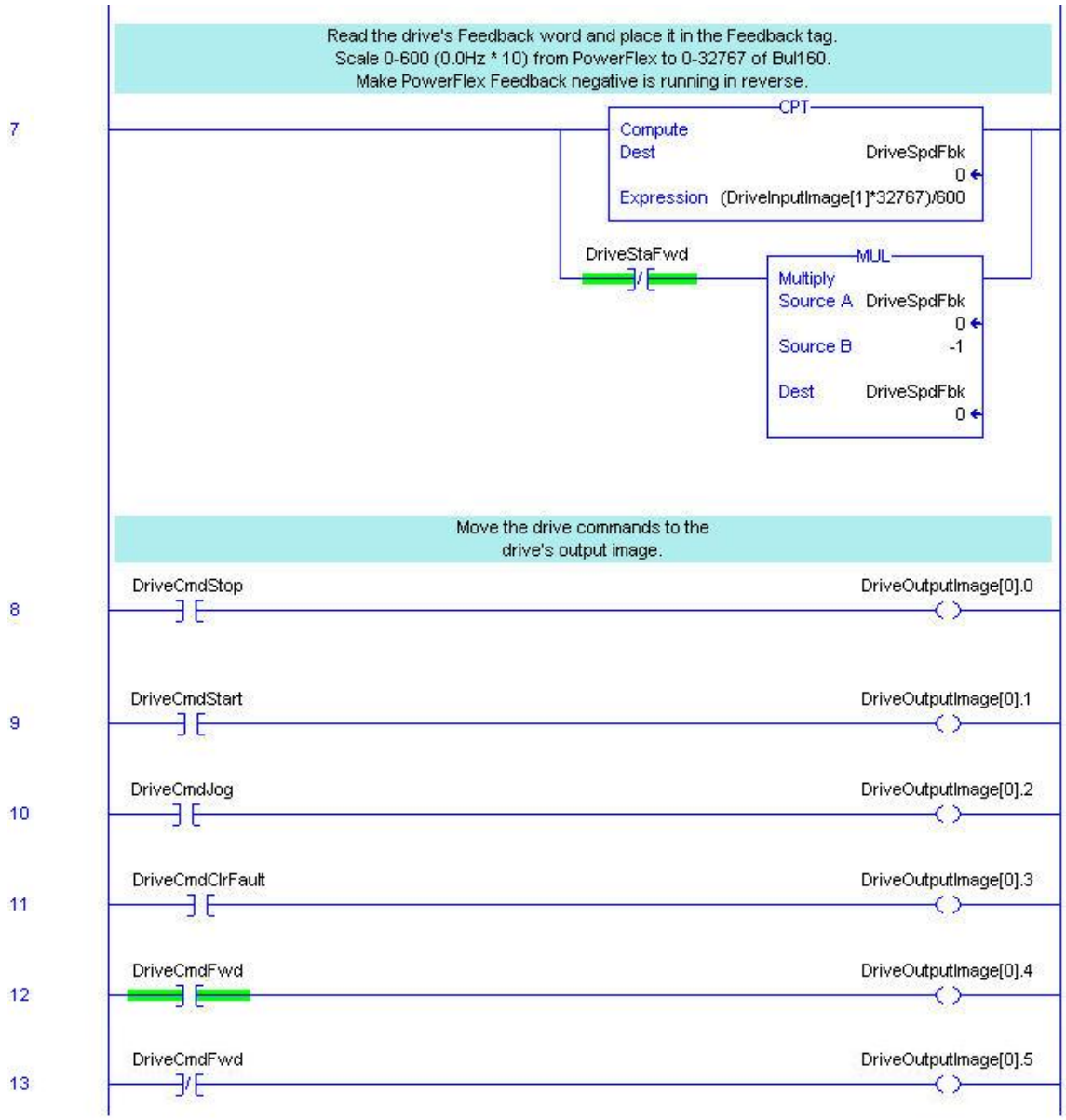


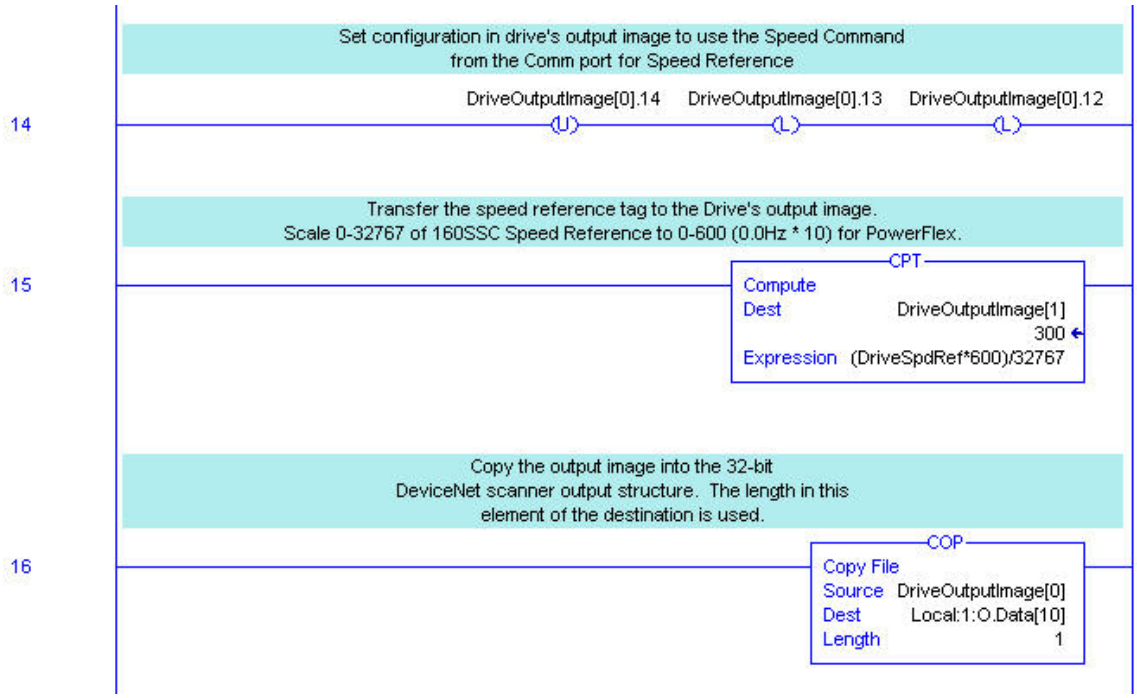

Read the drive's Feedback word and place it in the Feedback tag.
6
COP
Copy File
Source DriveInputImage[1]
Dest DriveSpdFbk
Length 1
Move the drive commands to the drive's output image.
7
DriveCmdStop
DriveOutputImage[0].0
8
DriveCmdStart
DriveOutputImage[0].1
9
DriveCmdClrFault
DriveOutputImage[0].3
10
DriveCmdFwd
DriveOutputImage[0].4
11
DriveCmdFwd
DriveOutputImage[0].5
Set configuration in drive's output image to use the Speed Command from the Comm port for Speed Reference
12
DriveOutputImage[0].14
DriveOutputImage[0].13
DriveOutputImage[0].12
Transfer the speed reference tag to the Drive's output image.
13
COP
Copy File
Source DriveSpdRef
Dest DriveOutputImage[1]
Length 1
Copy the output image into the 32-bit DeviceNet scanner output structure. The length in this element of the destination is used.
14
COP
Copy File
Source DriveOutputImage[0]
Dest Local:1:O.Data[10]
Length 1

ControlLogix
Equivalent PowerFlex Control for Output Assembly 103 and Input Assembly 104
The PowerFlex is started with a momentary DriveCmdStart bit and stopped with a momentary DriveCmdStop bit.

The 160 SSC Speed Reference was 0-32767 (32767 = Maximum frequency). The PowerFlex Speed Reference is 0-600 (0.0Hz *10). The speed reference from the user logic has to be scaled for the PowerFlex 0-600.




Read the drive's Feedback word and place it in the Feedback tag.
Scale 0-600 (0.0Hz * 10) from PowerFlex to 0-32767 of Bul160.
Make PowerFlex Feedback negative is running in reverse.
7
CPT
Compute
Dest
DriveSpdFbk
0
Expression
(DriveInputImage[1]*32767)/600
DriveStaFwd
MUL
Multiply
Source A
DriveSpdFbk
0
Source B
-1
Dest
DriveSpdFbk
0
Move the drive commands to the
drive's output image.
8
DriveCmdStop
DriveOutputImage[0].0
9
DriveCmdStart
DriveOutputImage[0].1
10
DriveCmdJog
DriveOutputImage[0].2
11
DriveCmdClrFault
DriveOutputImage[0].3
12
DriveCmdFwd
DriveOutputImage[0].4
13
DriveCmdFwd
DriveOutputImage[0].5

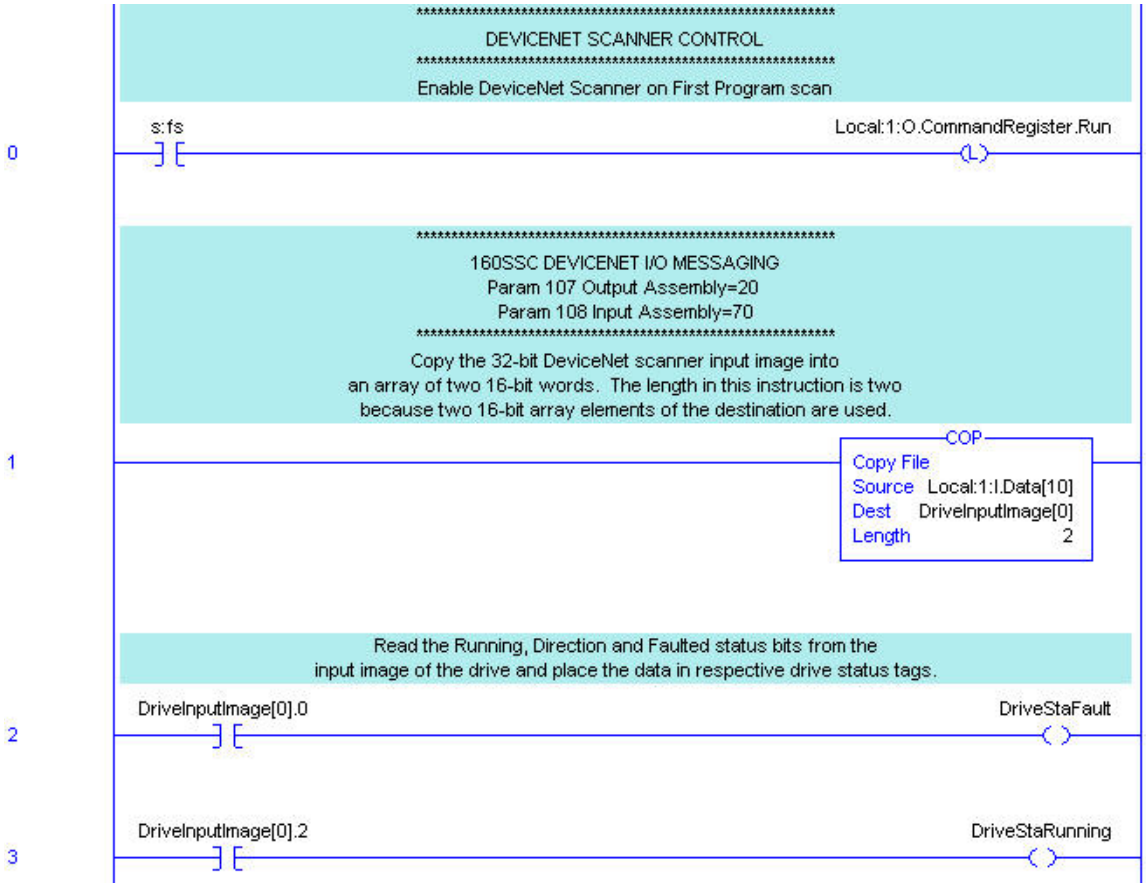

Set configuration in drive's output image to use the Speed Command
from the Comm port for Speed Reference
DriveOutputImage[0].14
DriveOutputImage[0].13
DriveOutputImage[0].12
14
(U)
(L)
(L)
Transfer the speed reference tag to the Drive's output image.
Scale 0-32767 of 160SSC Speed Reference to 0-600 (0.0Hz * 10) for PowerFlex.
15
CPT
Compute
Dest
DriveOutputImage[1]
300
Expression
(DriveSpdRef*600)/32767
Copy the output image into the 32-bit
DeviceNet scanner output structure. The length in this
element of the destination is used.
16
COP
Copy File
Source
DriveOutputImage[0]
Dest
Local:1:O.Data[10]
Length
1

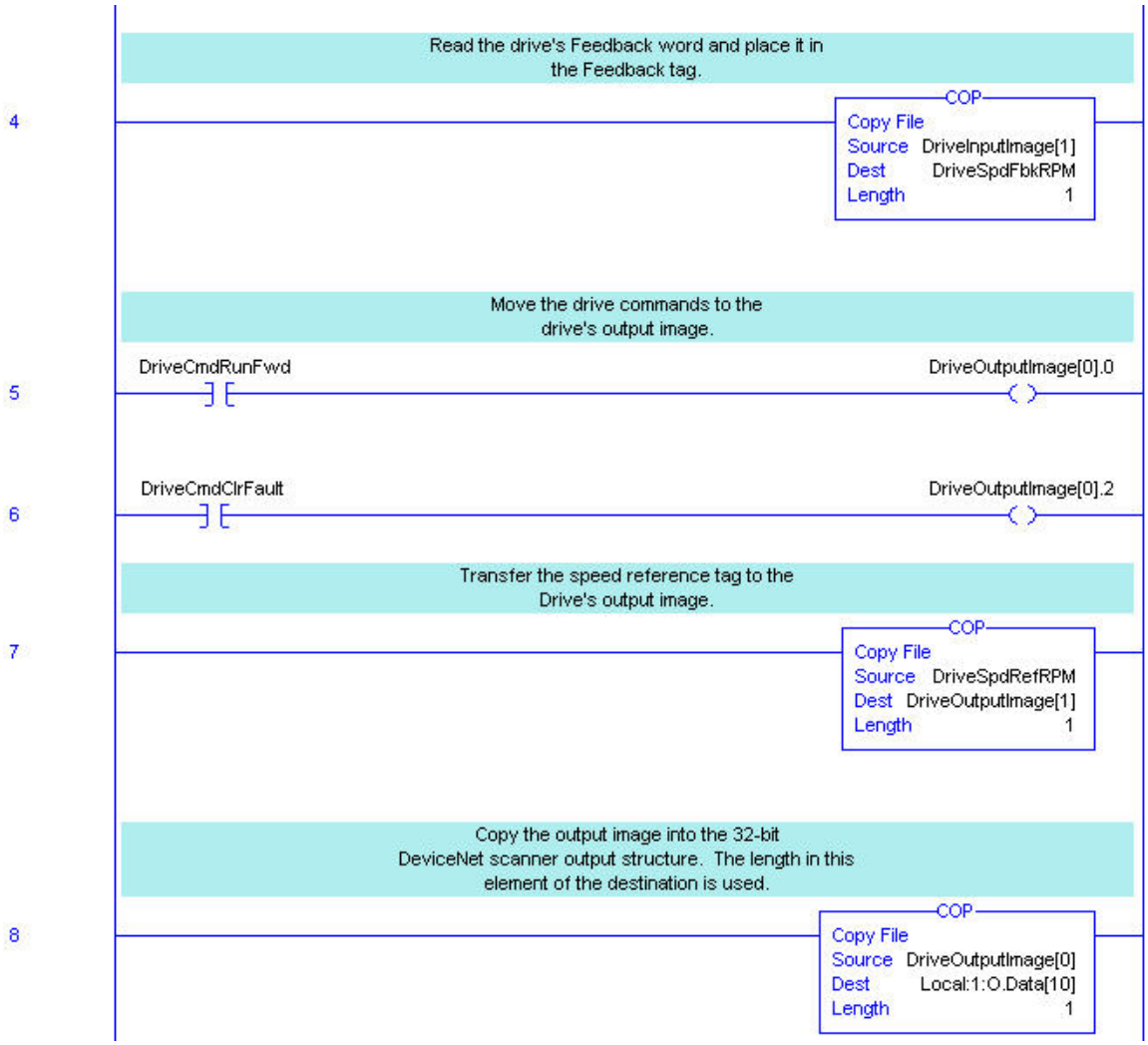
ControlLogix

160 SSC Control with Output Assembly 20 and Input Assembly 70

Using the Output Assembly 70, the 160 SSC is started with DriveCmdRunFwd bit being held high and stopped when DriveCmdRunFwd goes low.

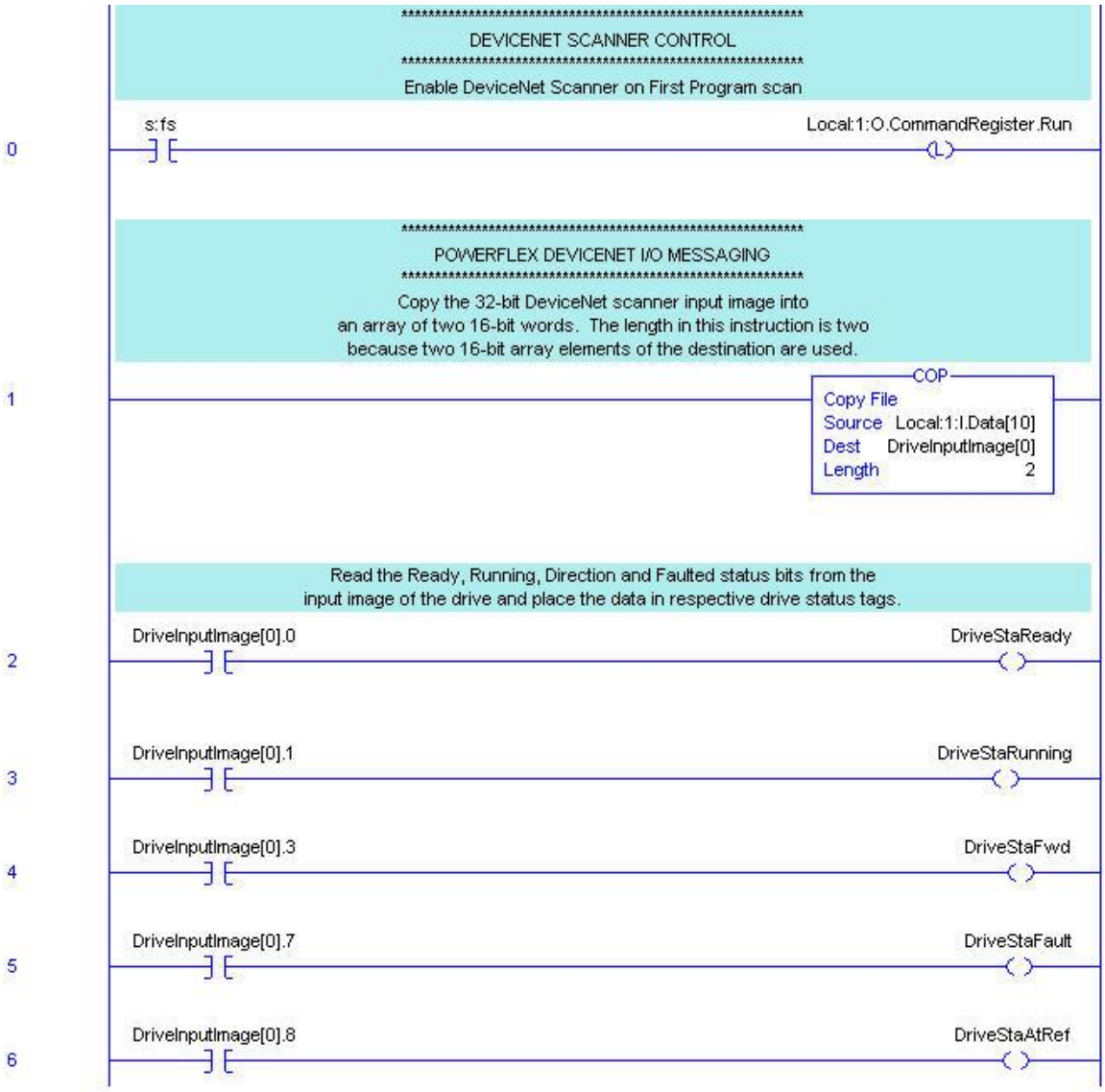
Speed Reference is 0-1750 RPM.

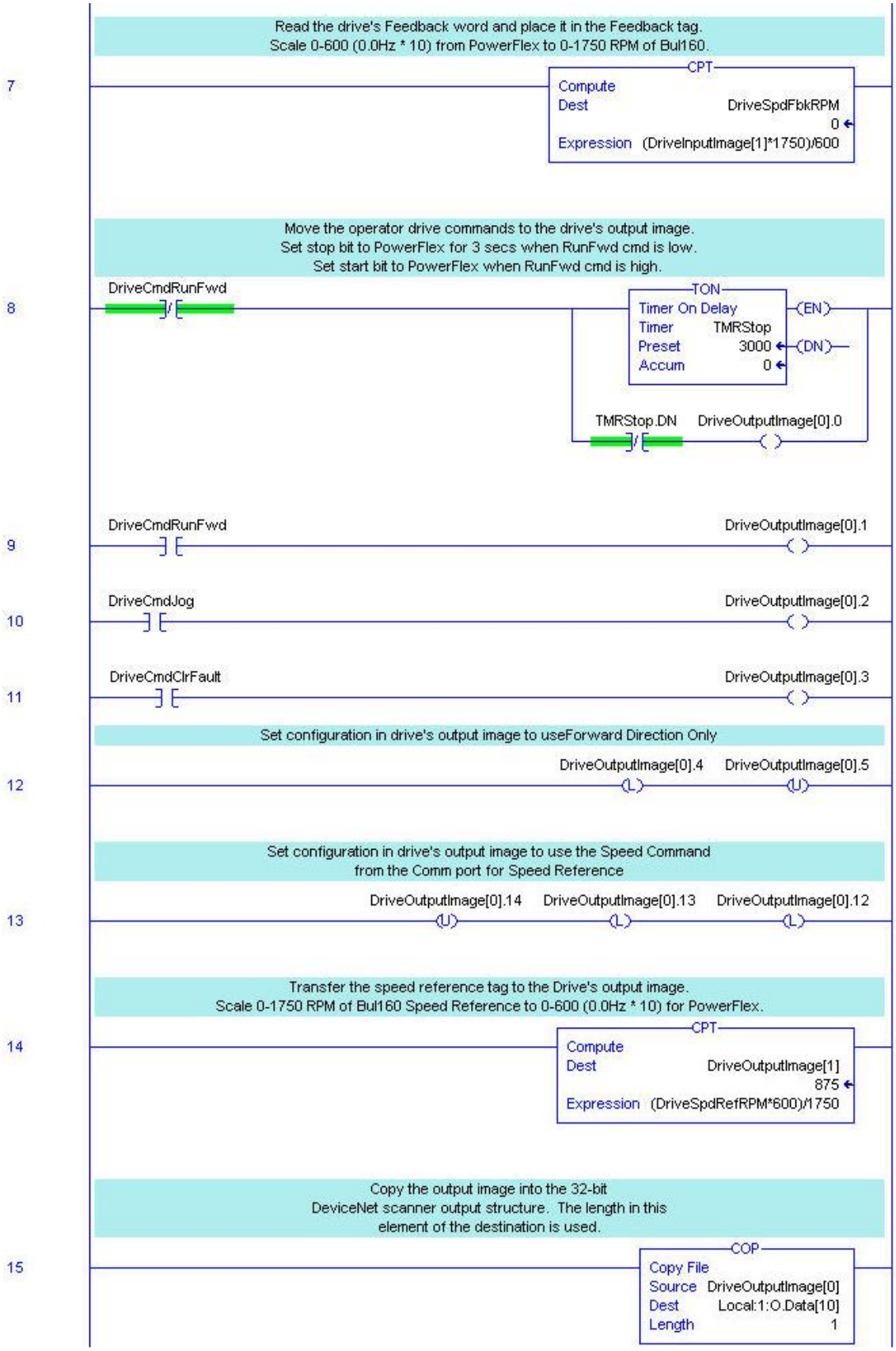



Read the drive's Feedback word and place it in
the Feedback tag.
4
COP
Copy File
Source DriveInputImage[1]
Dest DriveSpdFbkRPM
Length 1
Move the drive commands to the
drive's output image.
DriveCmdRunFwd
DriveOutputImage[0].0
5
DriveCmdClrFault
DriveOutputImage[0].2
6
Transfer the speed reference tag to the
Drive's output image.
7
COP
Copy File
Source DriveSpdRefRPM
Dest DriveOutputImage[1]
Length 1
Copy the output image into the 32-bit
DeviceNet scanner output structure. The length in this
element of the destination is used.
8
COP
Copy File
Source DriveOutputImage[0]
Dest Local:1:O.Data[10]
Length 1

ControlLogix
Equivalent PowerFlex Control for Output Assembly 20 and Input Assembly 70
The 160 SSC is started with DriveCmdRunFwd bit being held high and stopped when DriveCmdRunFwd goes low. The PowerFlex is started with a momentary start bit and stopped with a momentary stop bit. Logic has to be added to start the Powerflex when the DriveCmdRunFwd bit goes high and stop the PowerFlex when the DriveCmdRunFwd bit goes low.

The 160 SSC Speed Reference was 0-1750RPM. The PowerFlex Speed Reference is 0-600 (0.0Hz *10). The speed reference from the user logic has to be scaled for the PowerFlex 0-600.




Read the drive's Feedback word and place it in the Feedback tag.
Scale 0-600 (0.0Hz * 10) from PowerFlex to 0-1750 RPM of Bul160.
7
CPT
Compute
Dest DriveSpdFbkRPM
0
Expression (DriveInputImage[1]*1750)/600
Move the operator drive commands to the drive's output image.
Set stop bit to PowerFlex for 3 secs when RunFwd cmd is low.
Set start bit to PowerFlex when RunFwd cmd is high.
8
DriveCmdRunFwd
TON
Timer On Delay
Timer TMRStop
Preset 3000
Accum 0
EN
DN
TMRStop.DN
DriveOutputImage[0].0
9
DriveCmdRunFwd
DriveOutputImage[0].1
10
DriveCmdJog
DriveOutputImage[0].2
11
DriveCmdClrFault
DriveOutputImage[0].3
Set configuration in drive's output image to useForward Direction Only
12
DriveOutputImage[0].4
DriveOutputImage[0].5
L
U
Set configuration in drive's output image to use the Speed Command
from the Comm port for Speed Reference
13
DriveOutputImage[0].14
DriveOutputImage[0].13
DriveOutputImage[0].12
U
L
L
Transfer the speed reference tag to the Drive's output image.
Scale 0-1750 RPM of Bul160 Speed Reference to 0-600 (0.0Hz * 10) for PowerFlex.
14
CPT
Compute
Dest DriveOutputImage[1]
875
Expression (DriveSpdRefRPM*600)/1750
Copy the output image into the 32-bit
DeviceNet scanner output structure. The length in this
element of the destination is used.
15
COP
Copy File
Source DriveOutputImage[0]
Dest Local:1:O.Data[10]
Length 1

ControlLogix Explicit Messaging Examples

Explicit Messaging is used to transfer data that does not require continuous updates. It can also be configured to read or write parameters not included in the fixed Input and Output Assemblies. Two examples are shown for 160 SSC and equivalent for PowerFlex. One example reads the Output current from the drive and the other writes Accel Rate to the drive.

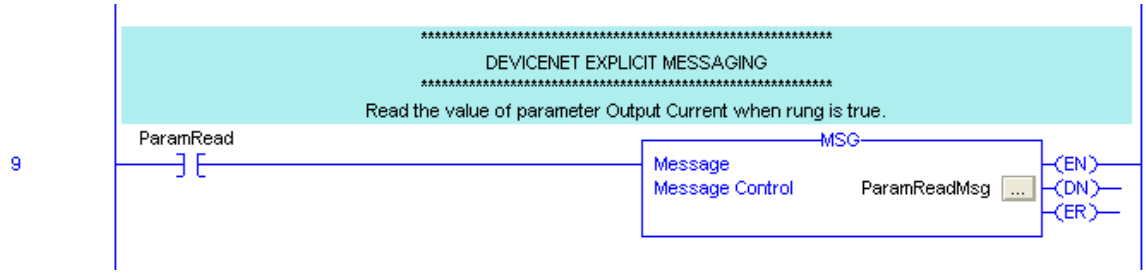
NOTE: PowerFlex 40 Explicit Messaging. Writing parameter data to the PowerFlex 40 over the communications port can be stored to RAM only or Non-Volatile Storage (NVS) depending on Parameter A164 (Comm Write Mode). If stored in RAM, the values will be lost at power down. However, if they are stored in NVS, and the controller is programmed to write parameter data frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction.

Parameter A164 (Comm Write Mode)

0 – Save (default)

1 – RAM Only

Read Output Current, ParamReadMsg Rungs.
The following rung triggers the message to read the Output Current from the drive when bit ParamRead goes from OFF to ON. Bit ParamRead is the result of user's logic.

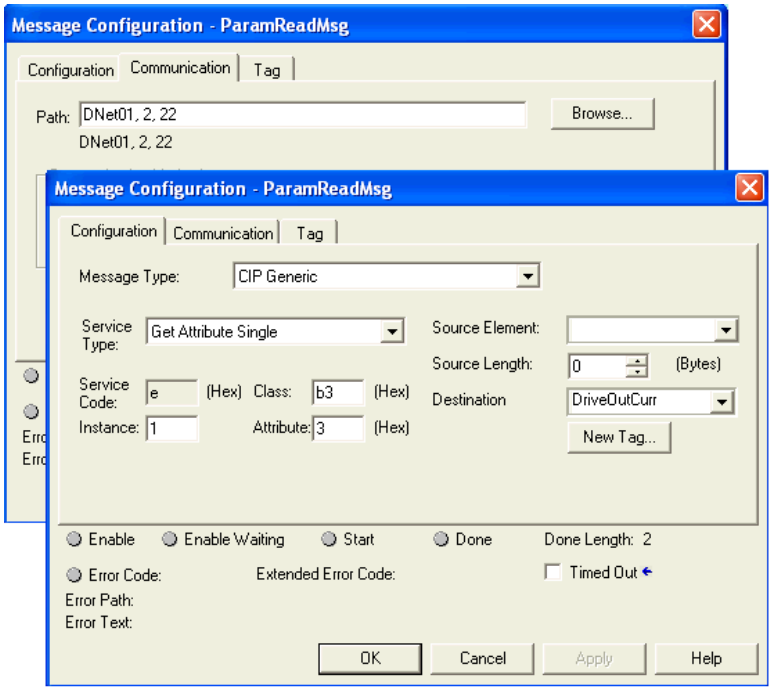


Read Output Current, ParamReadMsg Configuration.
The message control rungs for reading a value from the 160 SSC and the PowerFlex could be same, but the message configuration is different. The DeviceNet objects differ between the 160 SSC and Powerflex. Following shows the message configuration differences to read the Output Current from a PowerFlex compared to a 160 SSC.

For a complete list of DeviceNet objects reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comm Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

For a cross reference of 160 SSC parameters to PowerFlex parameters see the Parameter Cross Reference section at the end.



Message Configuration
The message type must be CIP Generic.
160 SSC – **CIP Generic**
PowerFlex – **CIP Generic**

Service Type
The service type is the requested DeviceNet service. Available services depend on the class and instance that you are using.
160 SSC – **Get Attribute Single** (Service Code – e)
PowerFlex – **Get Attribute Single** (Service Code – e)

Class
The object type is a DeviceNet class.
160 SSC – **b3** (Parameter Table Object)
PowerFlex – **f** (Parameter Object)

Instance
The object ID is an instance of a DeviceNet class.
160 SSC – **1** (Parameter Value)
PowerFlex – **3** (Parameter #)

Attribute
The attribute is a class or instance attribute.
160 SSC – **3** (Parameter #3 Output Current)
PowerFlex – **1** (Parameter Value)

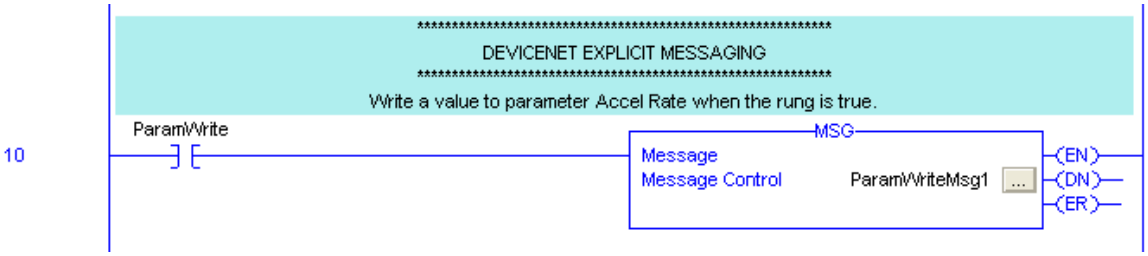
Source Element
The Source Element is the name of the tag for any data to be sent from the scanner to the drive. A tag must be specified even if it is not used.
160 SSC – blank
PowerFlex – blank

Source Length
The number of bytes of service data to be sent of received in the message.
160 SSC – **0**
PowerFlex – **0**

Destination
The Destination is the name of the tag that will receive service response data from the drive. A tag must be specified even if it is not used.
160 SSC – **DriveOutCurr** (Int Tag)
PowerFlex – **DriveOutCurr** (Int Tag)

Path
The path includes the following:
Name of DeviceNet scanner - **DNET01**
Communication port on the front of the 1756-DNB scanner. - Always **2**.
Node address of the DeviceNet adapter on drive – **22**

Write Accel Rate, ParamWriteMsg1 Rungs.
The following rung triggers the message to write the Accel Rate to the drive when bit ParamWrite goes from OFF to ON. Bit ParamWrite is the result of user's logic.

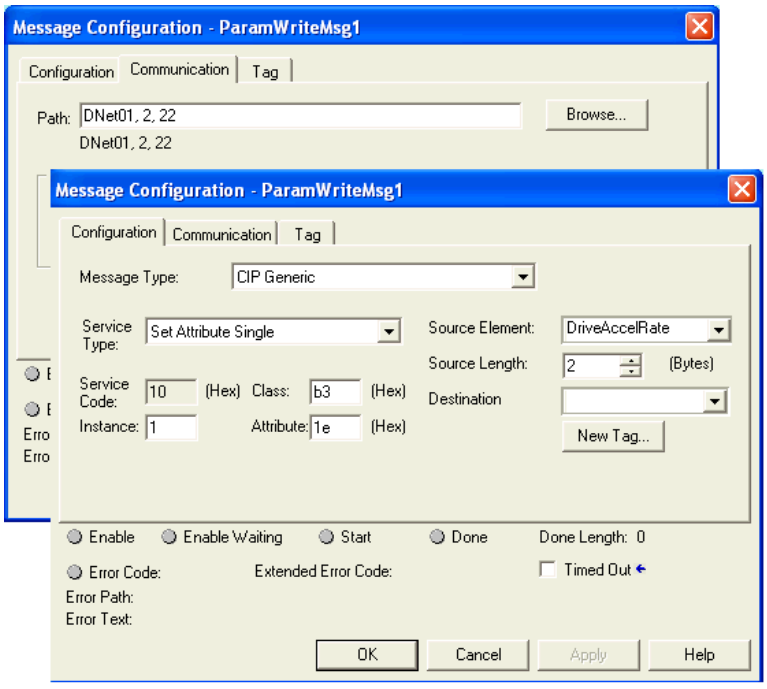


Write Accel Rate, ParamWriteMsg1 Configuration.
The message control rungs for writing a value to the 160 SSC and the PowerFlex could be same, but the message configuration is different. The DeviceNet objects differ between the 160 SSC and Powerflex. Following shows the message configuration differences to write an Accel Rate to a PowerFlex compared to a 160 SSC.

For a complete list of DeviceNet objects reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comm Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

For a cross reference of 160 SSC parameters to PowerFlex parameters see the Parameter Cross Reference section at the end.



Message Configuration
The message type must be CIP Generic.
160 SSC – **CIP Generic**
PowerFlex – **CIP Generic**

Service Type
The service type is the requested DeviceNet service. Available services depend on the class and instance that you are using.
160 SSC – **Set Single Attribute** (Service Code – 10)
PowerFlex – **Set Single Attribute** (Service Code – 10)

Class
The object type is a DeviceNet class.
160 SSC – **b3** (Parameter Table Object)
PowerFlex – **f** (Parameter Object)

Instance
The object ID is an instance of a DeviceNet class.
160 SSC – **1** (Parameter Value)
PowerFlex – **39** (Parameter #)

Attribute
The attribute is a class or instance attribute.
160 SSC – **1e** (30 decimal) (Parameter #30 Accel Rate)
PowerFlex – **1** (Parameter Value)

Source Element
The Source Element is the name of the tag for any data to be sent from the scanner to the drive. A tag must be specified even if it is not used.
160 SSC – **DriveAccelRate** (Int Tag)
PowerFlex – **DriveAccelRate** (Int Tag)

Source Length
The number of bytes of service data to be sent of received in the message.
160 SSC – **2**
PowerFlex – **2**

Destination
The Destination is the name of the tag that will receive service response data from the drive. A tag must be specified even if it is not used.
160 SSC – blank
PowerFlex – blank

Path
The path includes the following:
Name of DeviceNet scanner - **DNET01**
Communication port on the front of the 1756-DNB scanner. - Always **2**.
Node address of the DeviceNet adapter on drive – **22**

SLC 500 I/O Messaging Examples

In this example, the DeviceNet is configured for the drive Outputs to start at Slot 2 Output Word 10 (O:2.10) and drive Inputs to start at Slot 2 Input Word 10 (I:2.10) in the 1747-SDN Scanner.

Data Table Elements for Example Program

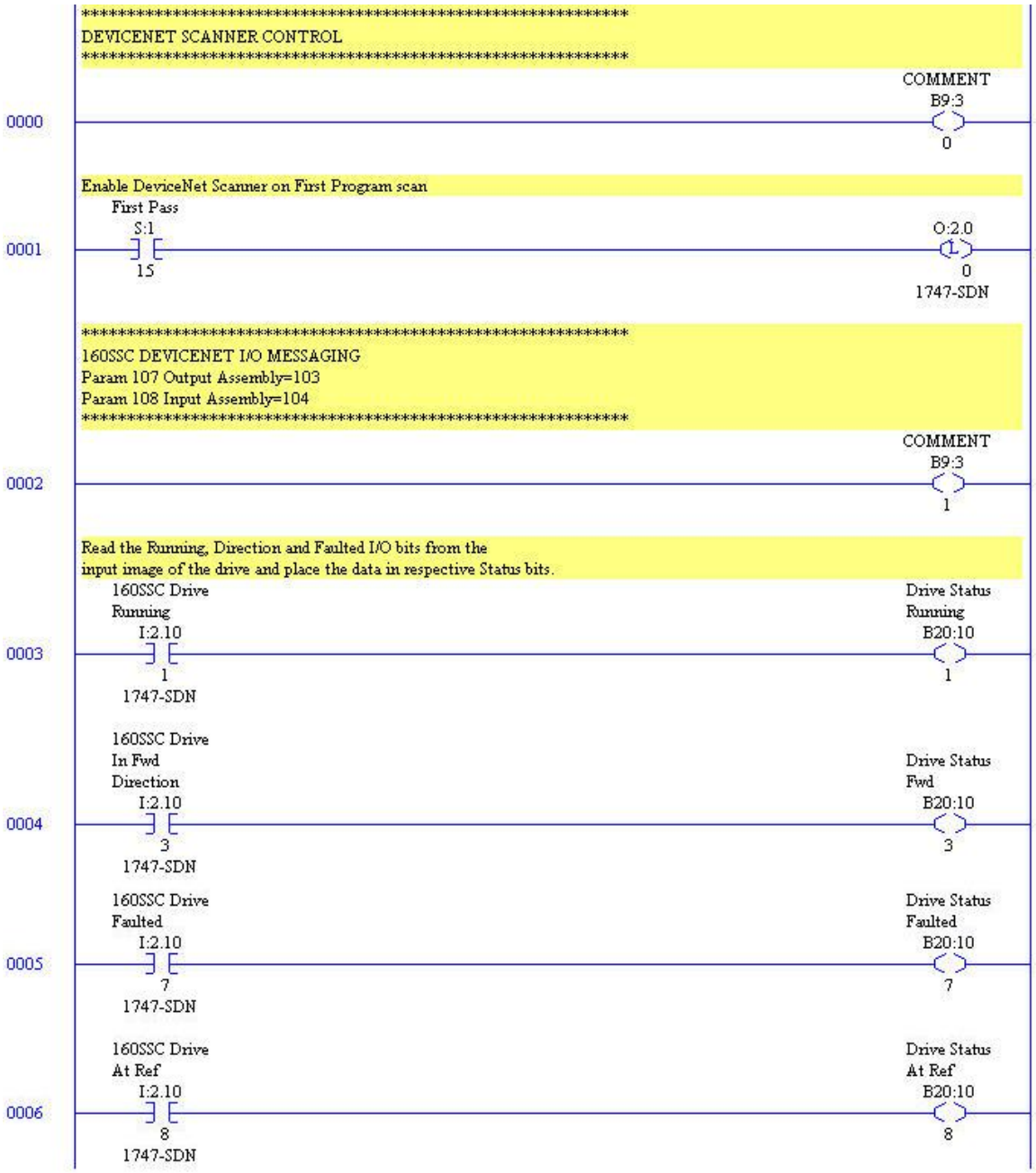
Address	Description
N23:10	Speed Feedback from drive +/- 0-32767
N22:10	Speed Reference to drive 0-32767
I:2.11	160 SSC Speed Feedback from DeviceNet
O:2.11	160 SSC Speed Reference to DeviceNet
B20:10/0	Drive Status to user logic – Ready
B20:10/1	Drive Status to user logic – Running
B20:10/3	Drive Status to user logic – Forward Direction
B20:10/7	Drive Status to user logic – Faulted
B20:10/8	Drive Status to user logic – Running at speed reference
I:2.10/0	160 SSC Status from DeviceNet – Ready
I:2.10/1	160 SSC Status from DeviceNet – Running
I:2.10/3	160 SSC Status from DeviceNet – Forward Direction
I:2.10/7	160 SSC Status from DeviceNet – Faulted
I:2.10/8	160 SSC Status from DeviceNet – Running at speed reference
B21:10/0	Drive Command from user logic – Stop
B21:10/1	Drive Command from user logic – Start
B21:10/2	Drive Command from user logic – Jog
B21:10/3	Drive Command from user logic – Clear Fault (reset)
B21:10/4	Drive Command from user logic – Run Forward
B21:10/5	Drive Command from user logic – Fwd/Rev Direction
O:2.10/0	160 SSC Command to DeviceNet – Stop
O:2.10/1	160 SSC Command to DeviceNet – Start
O:2.10/2	160 SSC Command to DeviceNet – Jog
O:2.10/3	160 SSC Command to DeviceNet – Clear Fault (reset)
O:2.10/4	160 SSC Command to DeviceNet – Run Forward
O:2.10/5	160 SSC Command to DeviceNet – Fwd/Rev Direction

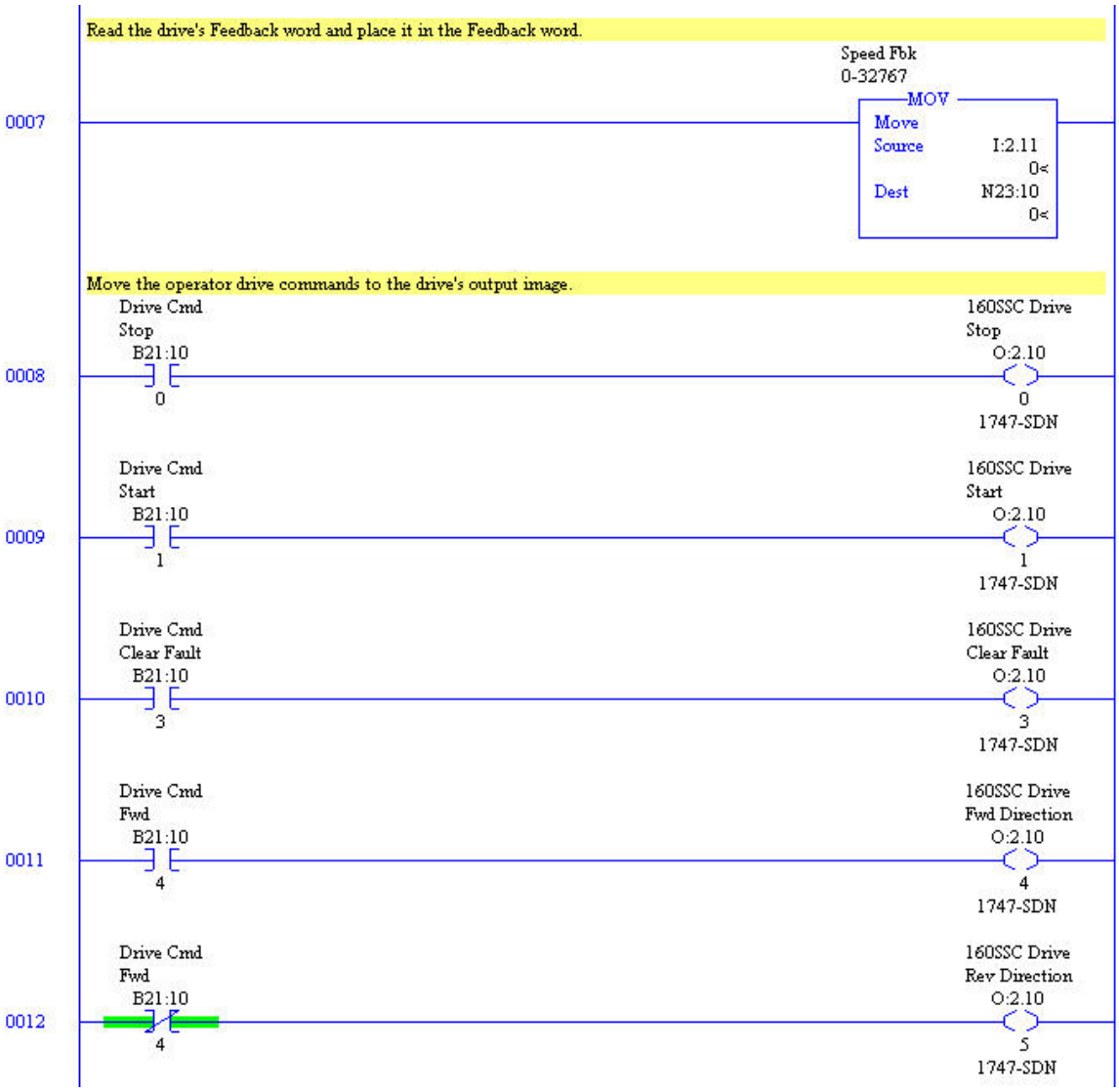
SLC500

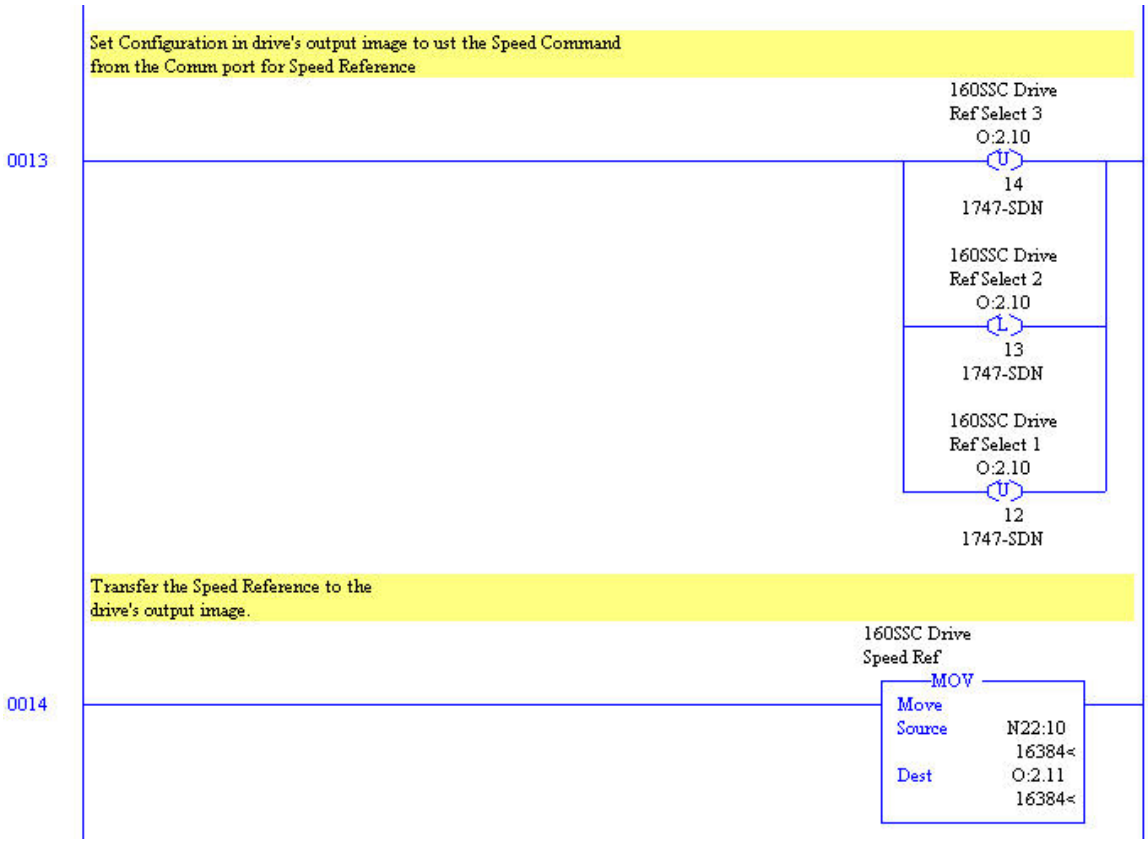
160 SSC Control with Output Assembly 103 and Input Assembly 104

Using the Output Assembly 103, the 160 SSC is started with a momentary Start (O:2.10/1) bit and stopped with a momentary Stop (O:2.10/0) bit.

Speed Reference is 0-32767 (32767 = Maximum frequency).




Read the drive's Feedback word and place it in the Feedback word.
Speed Fbk
0-32767
0007
MOV
Move
Source I:2.11
0
Dest N23:10
0
Move the operator drive commands to the drive's output image.
Drive Cmd
Stop
B21:10
0
0008
160SSC Drive
Stop
O:2.10
0
1747-SDN
Drive Cmd
Start
B21:10
1
0009
160SSC Drive
Start
O:2.10
1
1747-SDN
Drive Cmd
Clear Fault
B21:10
3
0010
160SSC Drive
Clear Fault
O:2.10
3
1747-SDN
Drive Cmd
Fwd
B21:10
4
0011
160SSC Drive
Fwd Direction
O:2.10
4
1747-SDN
Drive Cmd
Fwd
B21:10
4
0012
160SSC Drive
Rev Direction
O:2.10
5
1747-SDN

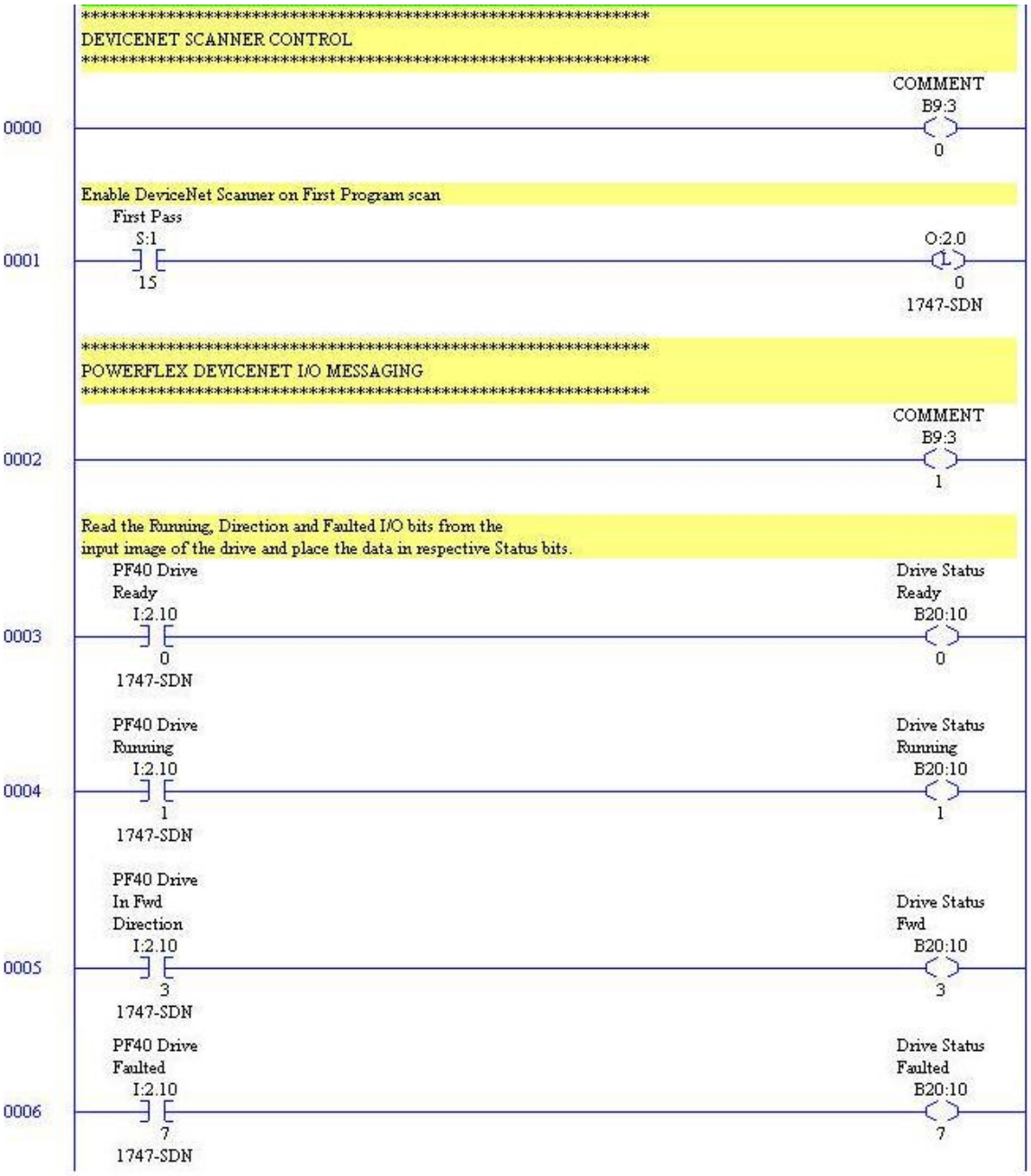

Set Configuration in drive's output image to ust the Speed Command
from the Comm port for Speed Reference
160SSC Drive
Ref Select 3
O:2.10
0013
U
14
1747-SDN
160SSC Drive
Ref Select 2
O:2.10
L
13
1747-SDN
160SSC Drive
Ref Select 1
O:2.10
U
12
1747-SDN
Transfer the Speed Reference to the
drive's output image.
160SSC Drive
Speed Ref
MOV
Move
Source N22:10
16384<
Dest O:2.11
16384<
0014

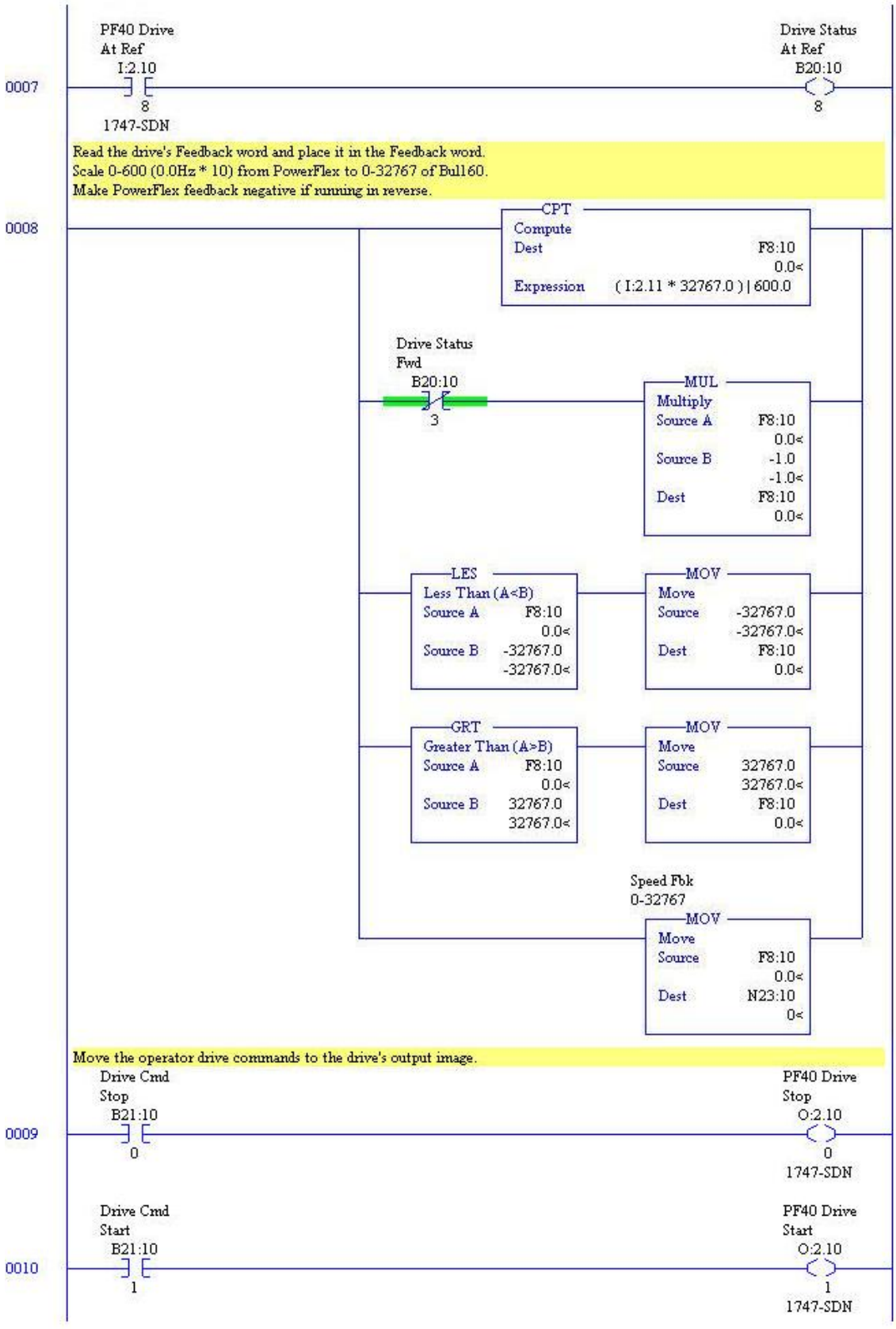
SLC500

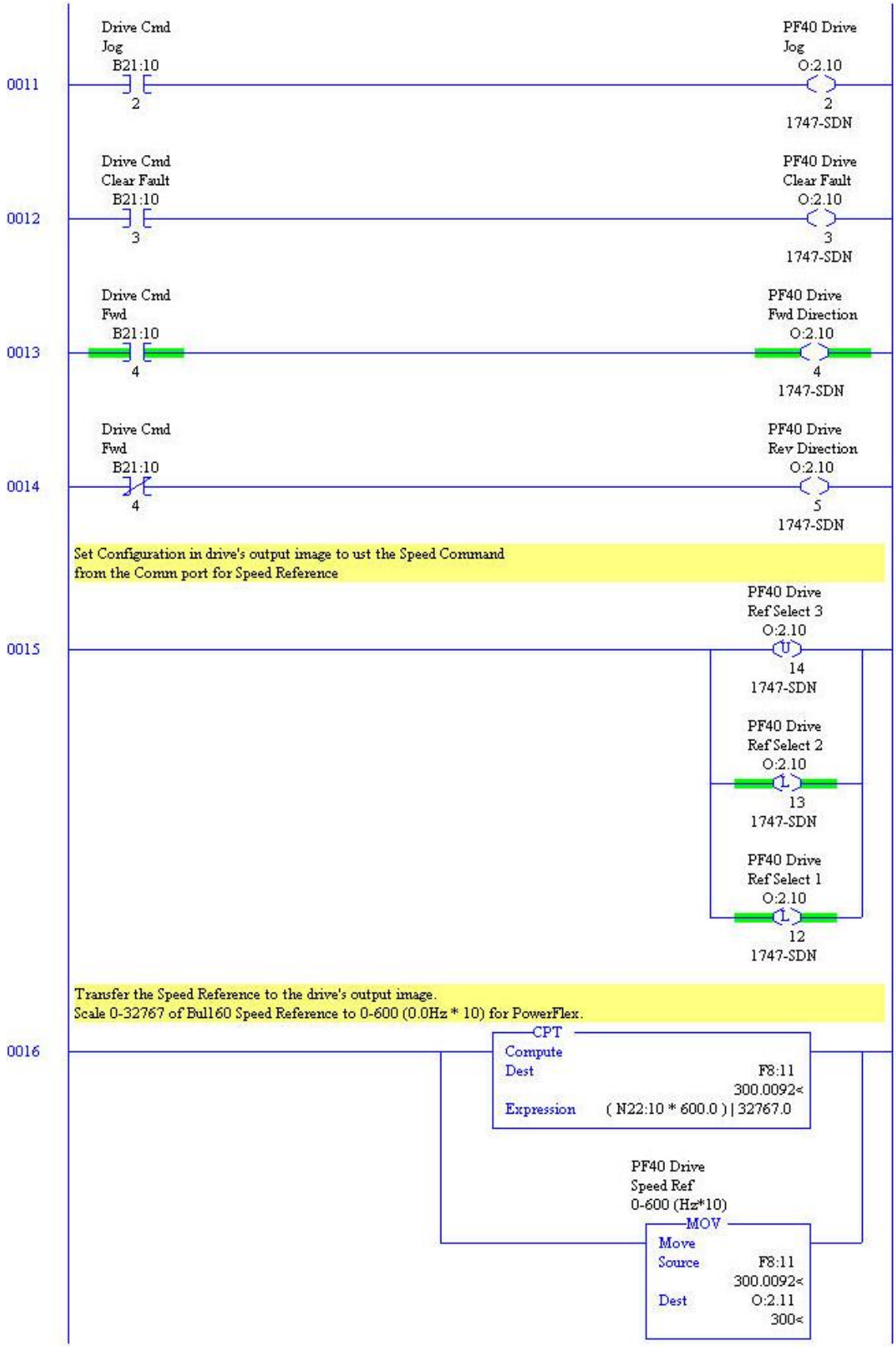
Equivalent PowerFlex Control for Output Assembly 103 and Input Assembly 104

The PowerFlex is started with a momentary Start (O:2.10/1) bit and stopped with a momentary Stop (O:2.10/0) bit.

The 160 SSC Speed Reference was 0-32767 (32767 = Maximum frequency). The PowerFlex Speed Reference is 0-600 (0.0Hz *10). The speed reference from the user logic has to be scaled for the PowerFlex 0-600.




0007
PF40 Drive
At Ref
I:2.10
8
1747-SDN
Drive Status
At Ref
B20:10
8
Read the drive's Feedback word and place it in the Feedback word.
Scale 0-600 (0.0Hz * 10) from PowerFlex to 0-32767 of Bul160.
Make PowerFlex feedback negative if running in reverse.
0008
CPT
Compute
Dest F8:10 0.0<
Expression (I:2.11 * 32767.0) | 600.0
Drive Status
Fwd
B20:10
3
MUL
Multiply
Source A F8:10 0.0<
Source B -1.0 -1.0<
Dest F8:10 0.0<
LES
Less Than (A<B)
Source A F8:10 0.0<
Source B -32767.0 -32767.0<
MOV
Move
Source -32767.0 -32767.0<
Dest F8:10 0.0<
GRT
Greater Than (A>B)
Source A F8:10 0.0<
Source B 32767.0 32767.0<
MOV
Move
Source 32767.0 32767.0<
Dest F8:10 0.0<
Speed Fbk
0-32767
MOV
Move
Source F8:10 0.0<
Dest N23:10 0<
Move the operator drive commands to the drive's output image.
0009
Drive Cmd
Stop
B21:10
0
PF40 Drive
Stop
O:2.10
0
1747-SDN
0010
Drive Cmd
Start
B21:10
1
PF40 Drive
Start
O:2.10
1
1747-SDN

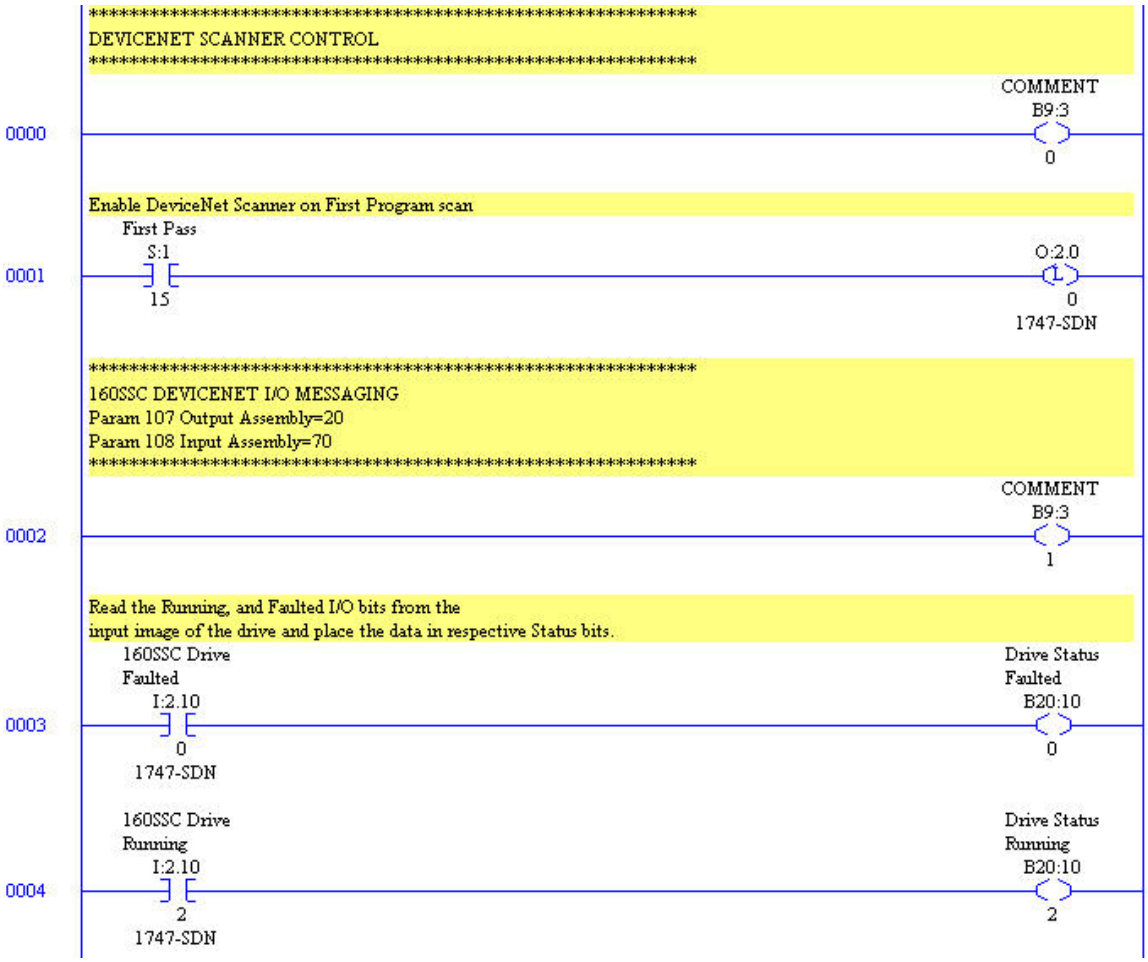

0011
Drive Cmd
Jog
B21:10
2
PF40 Drive
Jog
O:2.10
2
1747-SDN
0012
Drive Cmd
Clear Fault
B21:10
3
PF40 Drive
Clear Fault
O:2.10
3
1747-SDN
0013
Drive Cmd
Fwd
B21:10
4
PF40 Drive
Fwd Direction
O:2.10
4
1747-SDN
0014
Drive Cmd
Fwd
B21:10
4
PF40 Drive
Rev Direction
O:2.10
5
1747-SDN
Set Configuration in drive's output image to ust the Speed Command
from the Comm port for Speed Reference
0015
PF40 Drive
Ref Select 3
O:2.10
U
14
1747-SDN
PF40 Drive
Ref Select 2
O:2.10
L
13
1747-SDN
PF40 Drive
Ref Select 1
O:2.10
L
12
1747-SDN
Transfer the Speed Reference to the drive's output image.
Scale 0-32767 of Bull60 Speed Reference to 0-600 (0.0Hz * 10) for PowerFlex.
0016
CPT
Compute
Dest
F8:11
300.0092<
Expression
(N22:10 * 600.0) | 32767.0
PF40 Drive
Speed Ref
0-600 (Hz*10)
MOV
Move
Source
F8:11
300.0092<
Dest
O:2.11
300<

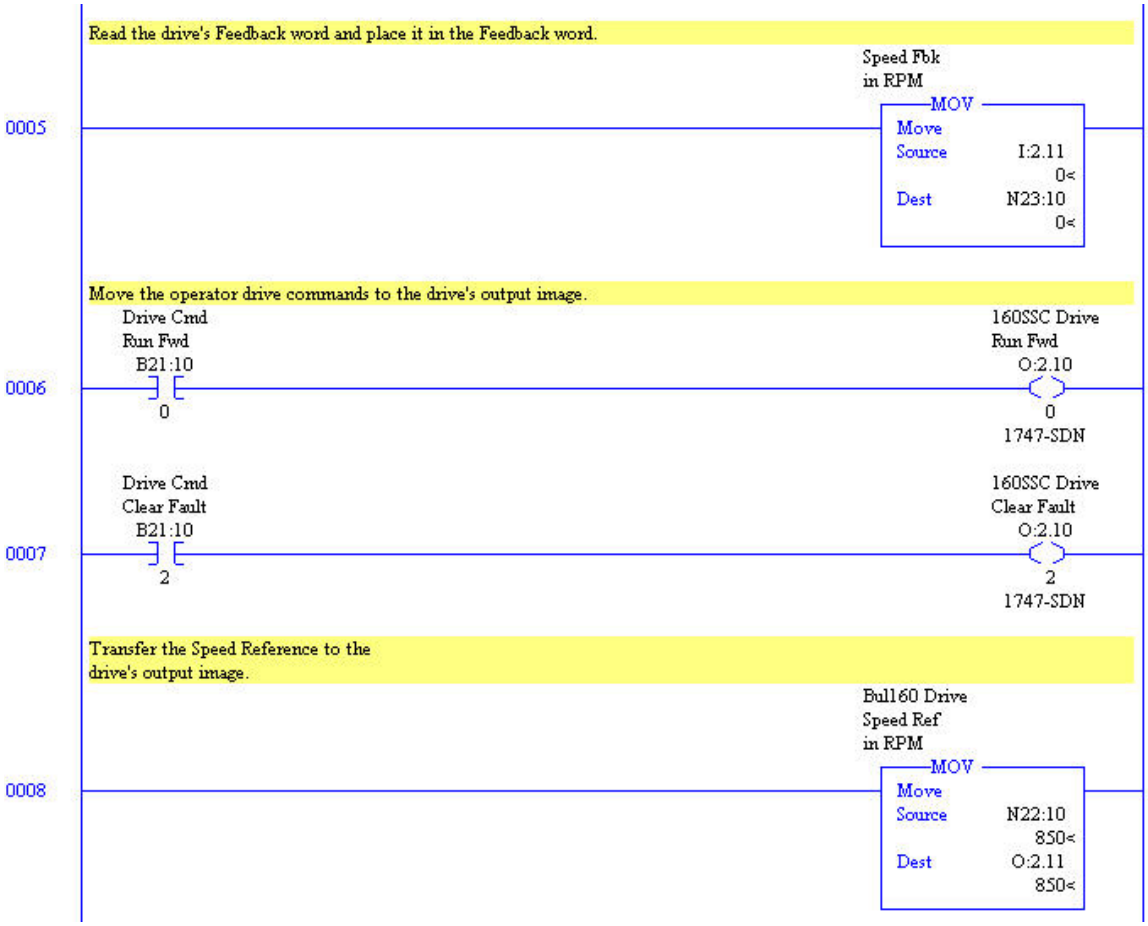
SLC500

160 SSC Control with Output Assembly 20 and Input Assembly 70

Using the Output Assembly 70, the 160 SSC is started with RunFwd (O:2.10/0) bit being held high and stopped when RunFwd (O:2.10/0) bit goes low.

Speed Reference is 0-1750 RPM.



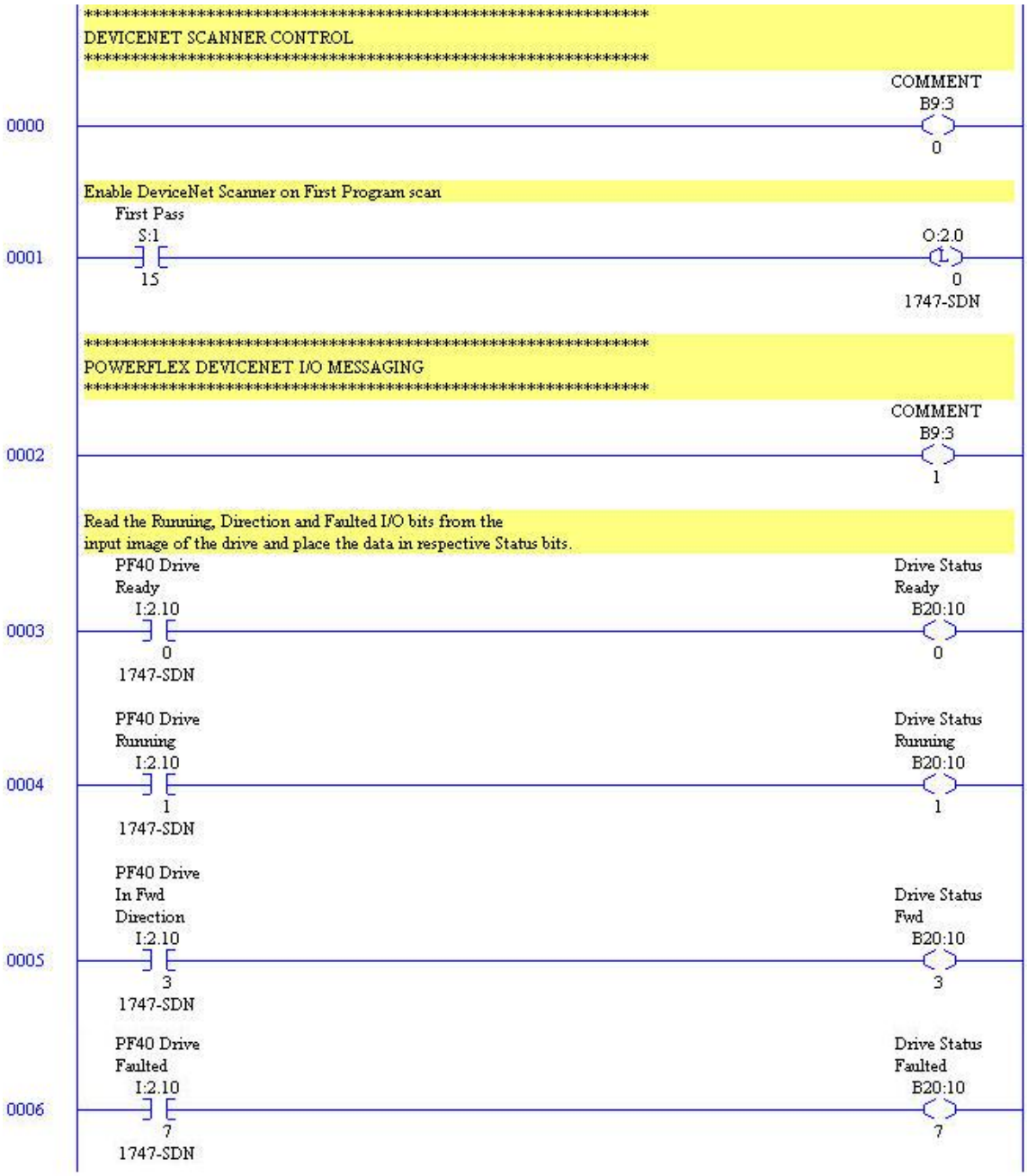

Read the drive's Feedback word and place it in the Feedback word.
Speed Fbk
in RPM
0005
MOV
Move
Source I:2.11
0
Dest N23:10
0
Move the operator drive commands to the drive's output image.
Drive Cmd
Run Fwd
B21:10
0
160SSC Drive
Run Fwd
O:2.10
0
1747-SDN
0006
Drive Cmd
Clear Fault
B21:10
2
160SSC Drive
Clear Fault
O:2.10
2
1747-SDN
0007
Transfer the Speed Reference to the
drive's output image.
Bull60 Drive
Speed Ref
in RPM
0008
MOV
Move
Source N22:10
850
Dest O:2.11
850

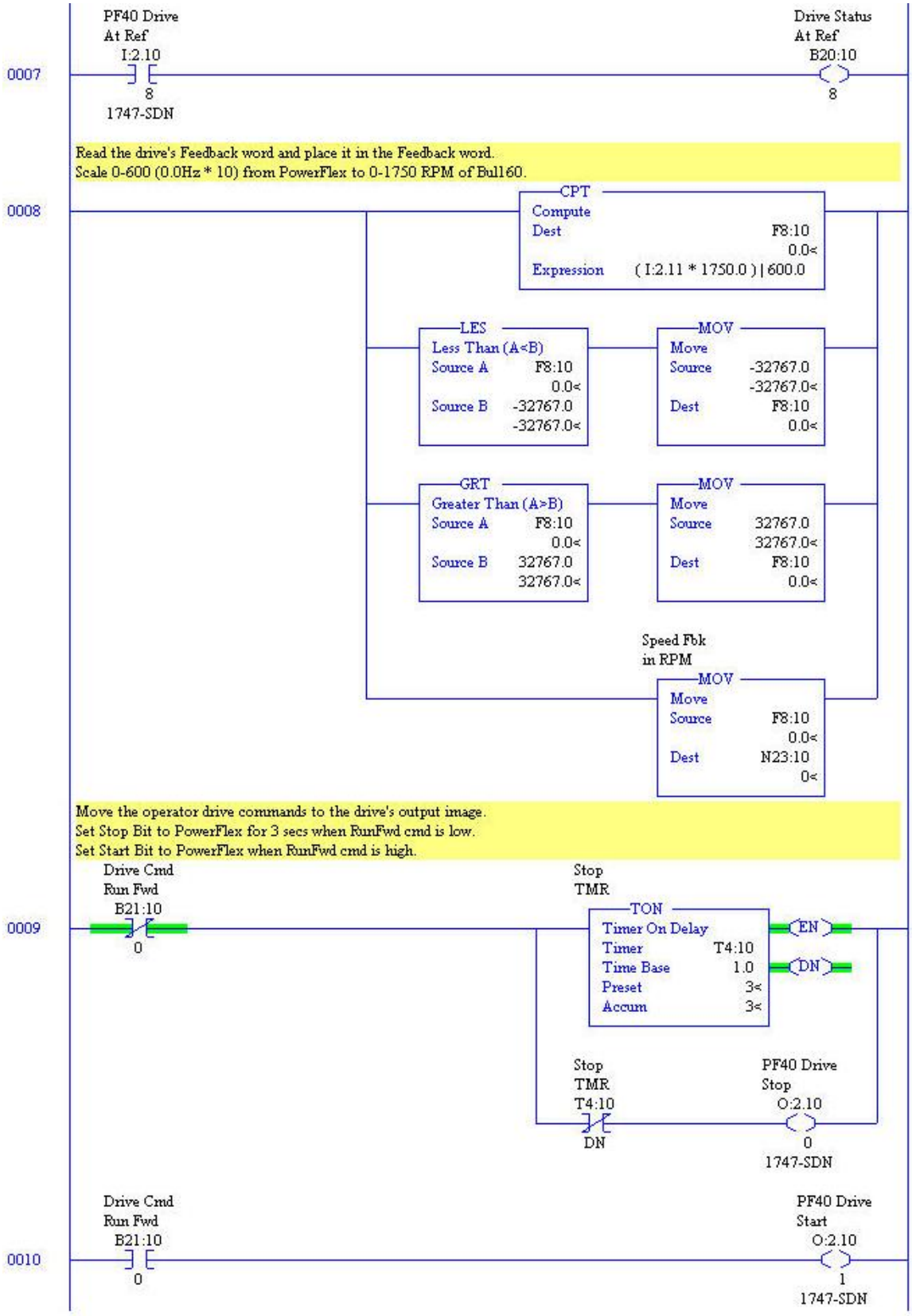
SLC500

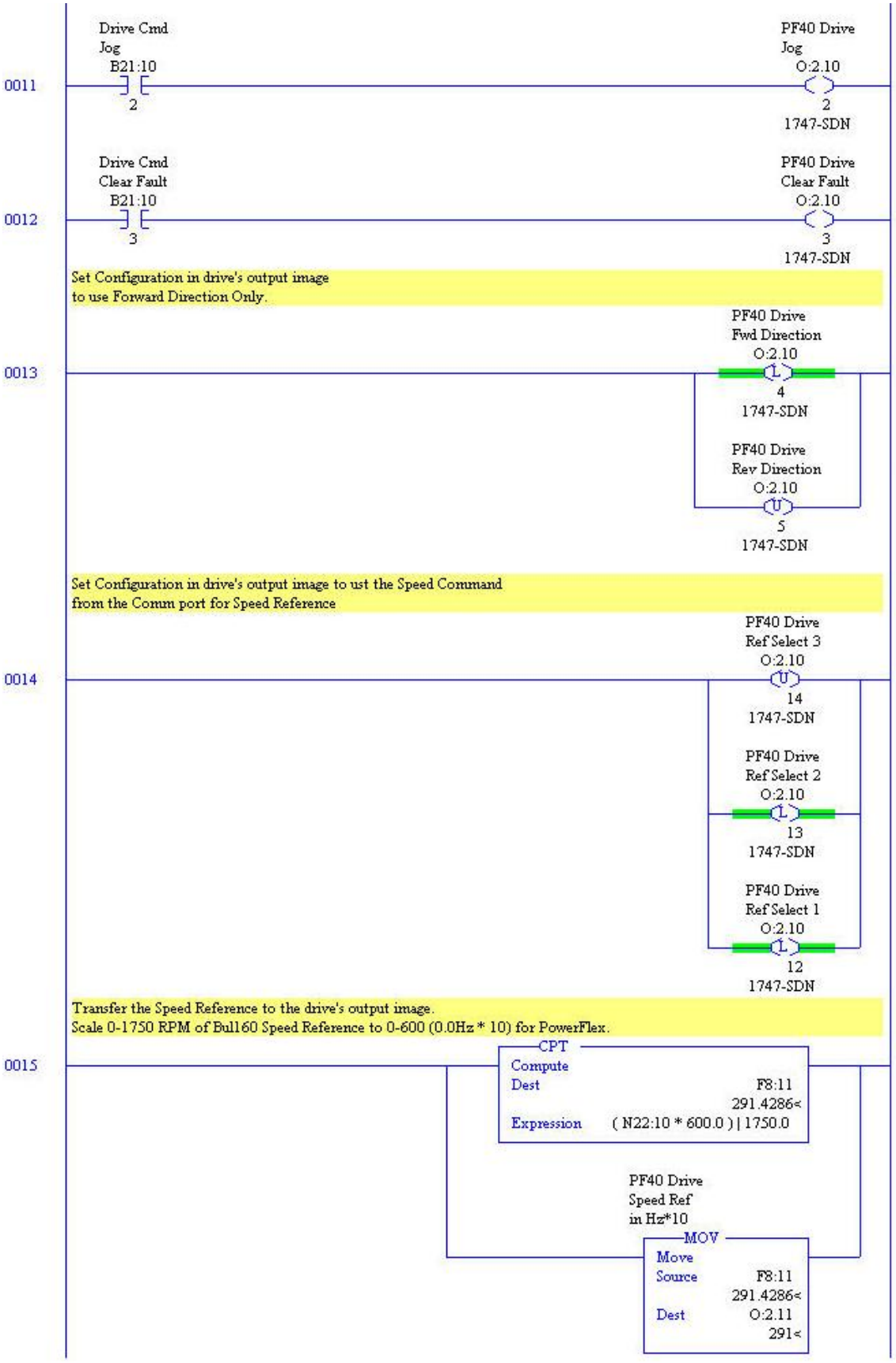
Equivalent Control for Output Assembly 20 and Input Assembly 70

Using the Output Assembly 70, the 160 SSC is started with RunFwd (O:2.10/0) bit being held high and stopped when RunFwd (O:2.10/0) bit goes low. The PowerFlex is started with a momentary start bit and stopped with a momentary stop bit. Logic has to be added to start the Powerflex when the RunFwd (O:2.10/0) bit goes high and stop the PowerFlex when the RunFwd (O:2.10/0) bit goes low.

The 160 SSC Speed Reference was 0-1750RPM. The PowerFlex Speed Reference is 0-600 (0.0Hz *10). The speed reference from the user logic has to be scaled for the PowerFlex 0-600.




PF40 Drive
At Ref
I:2.10
8
1747-SDN
Drive Status
At Ref
B20:10
8
0007
Read the drive's Feedback word and place it in the Feedback word.
Scale 0-600 (0.0Hz * 10) from PowerFlex to 0-1750 RPM of Bull60.
0008
CPT
Compute
Dest F8:10 0.0<
Expression (I:2.11 * 1750.0) | 600.0
LES
Less Than (A<B)
Source A F8:10 0.0<
Source B -32767.0 -32767.0<
MOV
Move
Source -32767.0 -32767.0<
Dest F8:10 0.0<
GRT
Greater Than (A>B)
Source A F8:10 0.0<
Source B 32767.0 32767.0<
MOV
Move
Source 32767.0 32767.0<
Dest F8:10 0.0<
Speed Fbk
in RPM
MOV
Move
Source F8:10 0.0<
Dest N23:10 0<
Move the operator drive commands to the drive's output image.
Set Stop Bit to PowerFlex for 3 secs when RunFwd cmd is low.
Set Start Bit to PowerFlex when RunFwd cmd is high.
Drive Cmd
Run Fwd
B21:10
0
0009
Stop
TMR
TON
Timer On Delay
Timer T4:10
Time Base 1.0
Preset 3<
Accum 3<
EN
DN
Stop
TMR
T4:10
DN
PF40 Drive
Stop
O:2.10
0
1747-SDN
Drive Cmd
Run Fwd
B21:10
0
0010
PF40 Drive
Start
O:2.10
1
1747-SDN


0011
Drive Cmd
Jog
B21:10
2
PF40 Drive
Jog
O:2.10
2
1747-SDN
0012
Drive Cmd
Clear Fault
B21:10
3
PF40 Drive
Clear Fault
O:2.10
3
1747-SDN
Set Configuration in drive's output image
to use Forward Direction Only.
0013
PF40 Drive
Fwd Direction
O:2.10
4
1747-SDN
PF40 Drive
Rev Direction
O:2.10
5
1747-SDN
Set Configuration in drive's output image to ust the Speed Command
from the Comm port for Speed Reference
0014
PF40 Drive
Ref Select 3
O:2.10
14
1747-SDN
PF40 Drive
Ref Select 2
O:2.10
13
1747-SDN
PF40 Drive
Ref Select 1
O:2.10
12
1747-SDN
Transfer the Speed Reference to the drive's output image.
Scale 0-1750 RPM of Bull60 Speed Reference to 0-600 (0.0Hz * 10) for PowerFlex.
0015
CPT
Compute
Dest
F8:11
291.4286<
Expression
(N22:10 * 600.0) | 1750.0
PF40 Drive
Speed Ref
in Hz*10
MOV
Move
Source
F8:11
291.4286<
Dest
O:2.11
291<

SLC 500 Explicit Messaging Examples

Explicit Messaging is used to transfer data that does not require continuous updates. It can also be configured to read or write parameters not included in the fixed Input and Output Assemblies. There are two methods of explicit messaging in the SLC 500. One method uses the DEM instruction and the other uses the Module files (M0 and M1) of the DeviceNet scanner. The DEM instruction simplifies programming and configuration. However it requires RSLogix 500 ver 7.10 or later, and a SLC 503,504, or 505 firmware level Series C, FRN 10 or later. The examples are given with the Module file method because it is more difficult but also more common.

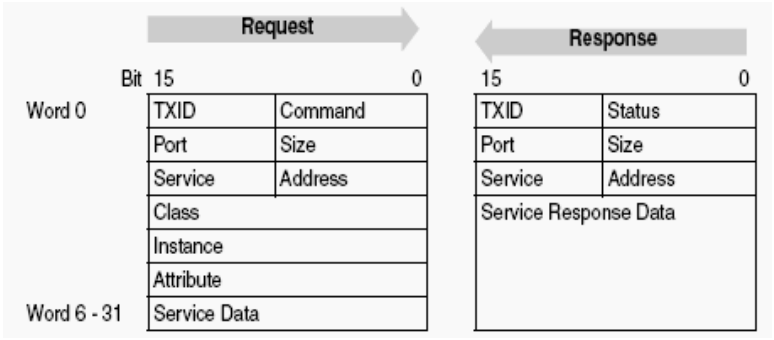
Two examples are shown for 160 SSC and equivalent for PowerFlex. One example reads the Output current from the drive and the other writes Accel Rate to the drive.

NOTE: PowerFlex 40 Explicit Messaging. Writing parameter data to the PowerFlex 40 over the communications port can be stored to RAM only or Non-Volatile Storage (NVS) depending on Parameter A164 (Comm Write Mode). If they are stored in RAM, the values will be lost at power down. However, if they are stored in NVS, and the controller is programmed to write parameter data frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction.

Parameter A164 (Comm Write Mode)
- 0 – Save (default)
- 1 – RAM Only

SLC Message Format

The example uses N10:0 as the message request file and N11:0 as the message response file. The request file and the response file need to be formatted as shown:



The N10 and N11 files are sent to and received from the M0 and M1 files of the 1747-SDN DeviceNet scanner to control the explicit messaging. The M0 and M1 files are data files that reside in the module. M0 file is a module output file and the M1 is a module input file.

The addressing format for the M0 and M1 files

Mf : S . w / b
M = module
f = file (0 or 1)
S = slot (1 - 30)
w = word (0 – Max of the module)
b = bit (0 - 15)

In this example the 1747-SDN DeviceNet scanner resides in slot 2 so **S** = 2.

SLC Explicit Message Requests

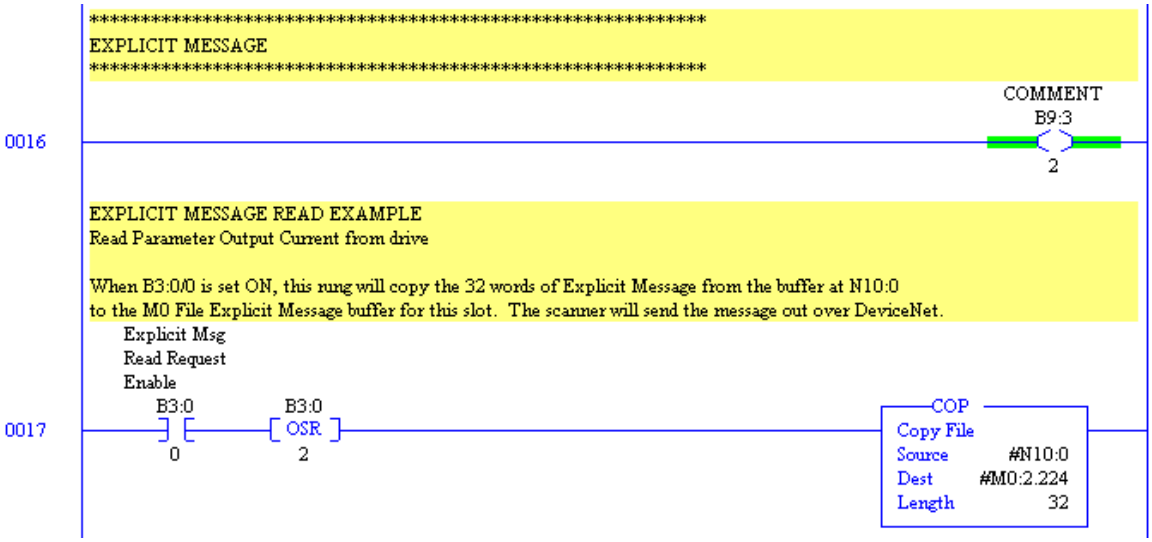
Word	Description
0	**Command** (Least Significant Byte) The Command is a code that instructs the scanner how to administer the request during each download. 00 = Ignore transaction block (empty) 01 = Execute this transaction block 02 = Get status of transaction TXID 03 = Reset all client/server transactions 04 = Delete this transaction block (available only for SLC) 05 – 255 = Reserved
	TXID (Most Significant Byte) The Transaction ID is a 1-byte integer between 1 and 255. It is assigned in the ladder logic program when the processor creates and downloads a request to the scanner. The scanner uses it to track the transaction to completion. It returns this value with the response that matches the request downloaded by the processor.
1	**Size** (Least Significant Byte) The size of the service data is in bytes. Service data includes the words for the class, instance, attribute, and any data. The maximum size is 58 bytes (29 words).
	Port (Most Significant Byte) The port that is used by the message is always zero (Channel A) on an SLC scanner. It is zero (Channel A) or one (Channel B) for a PLC scanner.
2	**Address** (Least Significant Byte) The node address of the slave device to which the transaction is sent. For the Explicit Message to be successful, the slave device must be in the scanlist of the scanner, and it must be online.
	Service (Most Significant Byte) Available services depend on the class and instance that you are using.
3	**Class**
4	**Instance**
5	**Attribute**
6 – 31	**Request Data** This is data used for the message. For example, it may be the value written to a parameter.

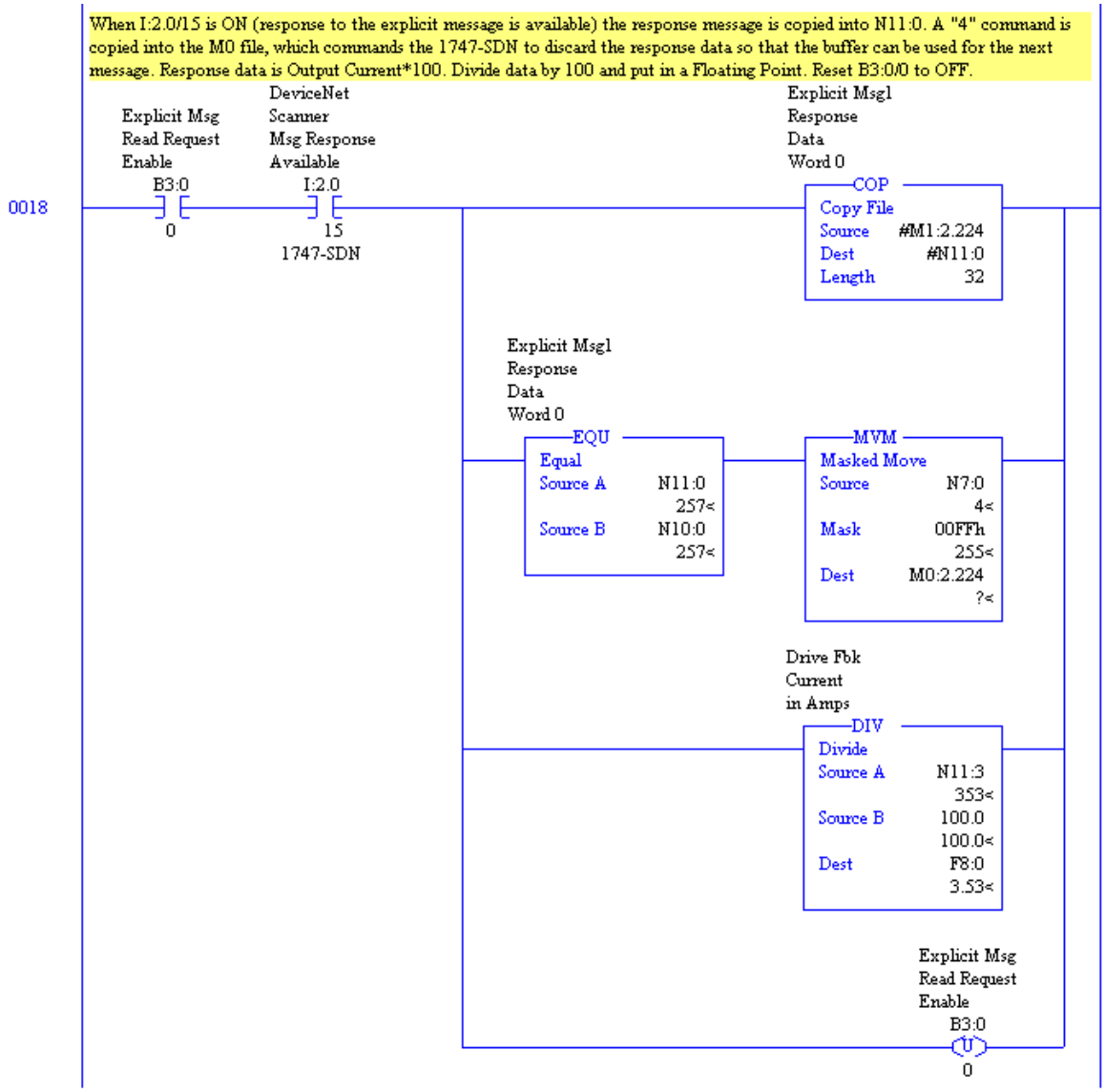
PLC / SLC Explicit Message Responses

Word	Description
0	**Status** (Least Significant Byte) One of the following status codes is provided during each upload: 00 = Ignore transaction block (empty) 01 = Transaction completed successfully 02 = Transaction in progress (not ready) 03 = Slave not in scan list 04 = Slave offline 05 = DeviceNet port disabled or offline 06 = Transaction TXID unknown 08 = Invalid command code 09 = Scanner out of buffers 10 = Other client/server transaction in progress 11 = Could not connect to slave device 12 = Response data too large for block 13 = Invalid port 14 = Invalid size specified 15 = Connection busy 16 – 255 = Reserved
	TXID (Most Significant Byte) The transaction ID is a 1-byte integer in word 31 with a range of 1 to 255. It is assigned in the ladder logic program when the processor creates and downloads a request to the scanner. The scanner uses it to track the transaction to completion. It returns this value with the response that matches the request downloaded by the processor.
1	**Size** (Least Significant Byte) The size of the service data is in bytes. The service data includes words used for the response data. The maximum size is 58 bytes (29 words).
	Port (Most Significant Byte) The port that is used by the message is always zero (Channel A) on an SLC scanner. It is zero (Channel A) or one (Channel B) for a PLC scanner.
2	**Address** (Least Significant Byte) The node address of the slave device to which the transaction is sent. For the Explicit Message to be successful, the slave device must be in the scanlist of the scanner, and it must be online.
	Service (Most Significant Byte) If the message was successful, 0x80 is added to the service. If it is unsuccessful, 0x94 is returned.
3 – 31	**Response Data** This is data used for the message. For example, it may be the value read from a parameter.

Read Output Current, Message Rungs.

The following rung triggers the message to read the Output Current from the drive when bit B3:0/0 goes from OFF to ON. The message request configuration in N10:0 is copied to M0:2.224 to start the message. The scanner notifies the processor that it has a response from the drive by setting I:2.0/15 ON and the ladder the copies the response data from M1:2.224 to N11:0. The Output Current is in word 3 of the response data and is divided by 100.




When I:2.0/15 is ON (response to the explicit message is available) the response message is copied into N11:0. A "4" command is copied into the M0 file, which commands the 1747-SDN to discard the response data so that the buffer can be used for the next message. Response data is Output Current*100. Divide data by 100 and put in a Floating Point. Reset B3:0/0 to OFF.
0018
Explicit Msg Read Request Enable
B3:0
0
DeviceNet Scanner Msg Response Available
I:2.0
15
1747-SDN
Explicit Msgl Response Data Word 0
COP
Copy File
Source #M1:2.224
Dest #N11:0
Length 32
Explicit Msgl Response Data Word 0
EQU
Equal
Source A N11:0
257<
Source B N10:0
257<
MVM
Masked Move
Source N7:0
4<
Mask 00FFh
255<
Dest M0:2.224
?<
Drive Fbk Current in Amps
DIV
Divide
Source A N11:3
353<
Source B 100.0
100.0<
Dest F8:0
3.53<
Explicit Msg Read Request Enable
B3:0
U
0

Read Output Current, Message Configuration.
The message control rungs for reading a value from the 160 SSC and the PowerFlex could be same, but the message configuration is different. The DeviceNet objects differ between the 160 SSC and PowerFlex. Following shows the message configuration differences to read the Output Current from a PowerFlex compared to a 160 SSC.

For a complete list of DeviceNet objects reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comm Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

For a cross reference of 160 SSC parameters to PowerFlex parameters see the Parameter Cross Reference section at the end.

N10:0 (Least Significant Byte) **Command**
160 SSC – **01h** (Execute)
PowerFlex – **01h** (Execute)

N10:0 (Most Significant Byte) **TXID**
160 SSC – **01h** (ID = 1)
PowerFlex – **01h** (ID = 1)

N10:1 (Least Significant Byte) **Size**
160 SSC – **06h** (6 bytes)
PowerFlex – **06h** (6 bytes)

N10:1 (Most Significant Byte) **Port**
160 SSC – **00h** (Scanner port 0)
PowerFlex – **00h** (Scanner port 0)

N10:2 (Least Significant Byte) **Address**
160 SSC – **16h** (DeviceNet address 22d)
PowerFlex – **16h** (DeviceNet address 22d)

N10:2 (Most Significant Byte) **Service**
The service type is the requested DeviceNet service. Available services depend on the class and instance that you are using
160 SSC – **0Eh (**Get Single Attribute)
PowerFlex – **0Eh (**Get Single Attribute)

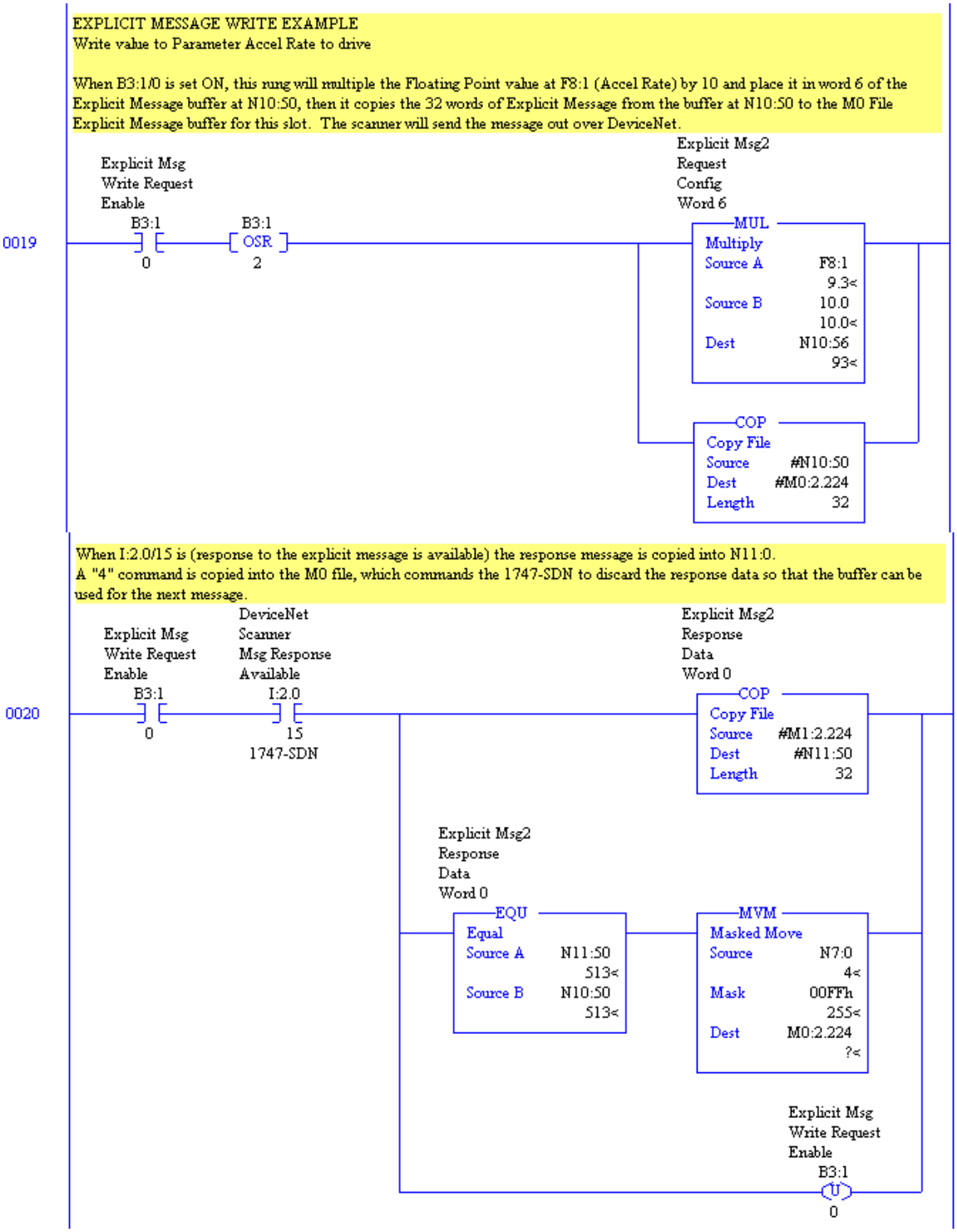
N10:3 Class
The object type is a DeviceNet class.
160 SSC – **B3h** (Parameter Table Object)
PowerFlex – **0Fh** (Parameter Object)

N10:4 Instance
The object ID is an instance of a DeviceNet class.
160 SSC – **01h** (Parameter Value)
PowerFlex – **03h** (Parameter #3 Output Current)

N10:5 Attribute
The attribute is a class or instance attribute.
160 SSC – **03h** (30 decimal) (Parameter #3 Output Current)
PowerFlex – **01h** (Parameter Value)

Write Accel Rate, Message Rungs.

The following rung triggers the message to write Accel Rate to the drive when bit B3:1/0 goes from OFF to ON. The Accel Rate is in Floating Point F8:1. It is multiplied by 10 and put in word 6 (N10:56) of the request configuration. The message request configuration in N10:50 is copied to M0:2.224 to start the message. The scanner notifies the processor that it has a response from the drive by setting I:2.0/15 ON and the ladder the copies the response data from M1:2.224 to N11:50.



Write Accel Rate, Message Configuration.
The message control rungs for writing a value to the 160 SSC and the PowerFlex could be same, but the message configuration is different. The DeviceNet objects differ between the 160 SSC and PowerFlex. Following shows the message configuration differences to write the Accel Rate to a PowerFlex compared to a 160 SSC.

For a complete list of DeviceNet objects reference the following publications at:
http://literature.rockwellautomation.com

160-UM002 ***160-DN2 Device Net Comms Module User Manual***
22COMM-UM003 ***22-COMM-D DeviceNet Adapter User Manual***

For a cross reference of 160 SSC parameters to PowerFlex parameters see the Parameter Cross Reference section at the end.

N10:50 (Least Significant Byte) **Command**
160 SSC – **01h** (Execute)
PowerFlex – **01h** (Execute)

N10:50 (Most Significant Byte) **TXID**
160 SSC – **02h** (ID = 1)
PowerFlex – **02h** (ID = 1)

N10:51 (Least Significant Byte) **Size**
160 SSC – **08h** (6 bytes)
PowerFlex – **08h** (6 bytes)

N10:51 (Most Significant Byte) **Port**
160 SSC – **00h** (Scanner port 0)
PowerFlex – **00h** (Scanner port 0)

N10:52 (Least Significant Byte) **Address**
160 SSC – **16h** (DeviceNet address 22d)
PowerFlex – **16h** (DeviceNet address 22d)

N10:52 (Most Significant Byte) **Service**
The service type is the requested DeviceNet service. Available services depend on the class and instance that you are using
160 SSC – **10h (**Get Single Attribute)
PowerFlex – **10h (**Get Single Attribute)

N10:53 Class
The object type is a DeviceNet class.
160 SSC – **B3h** (Parameter Table Object)
PowerFlex – **0Fh** (Parameter Object)

N10:54 Instance
The object ID is an instance of a DeviceNet class.
160 SSC – **01h** (Parameter Value)
PowerFlex – **27h** (Parameter #39 Accel Rate)

N10:55 Attribute
The attribute is a class or instance attribute.
160 SSC – **1Eh** (30 decimal) (Parameter #30 Accel Rate)
PowerFlex – **01h** (Parameter Value)

N10:56 Value
Value to be written to drive.
160 SSC – **60h** (96 decimal) (Value)
PowerFlex – **5Bh** (91 decimal) (Value)

Parameter Cross Reference

The following table cross references 160 SSC parameters to equivalent PowerFlex 40 parameters.

	160 SSC Firmware 7.03 and higher		**PowerFlex 40** Firmware 5.x and higher	Comments
No.	**Parameter**	**No.**	**Parameter**	
01	Output Frequency	01	Output Frequency	
02	Output Voltage	04	Output Voltage	
03	Output Current	03	Output Current	
04	Output Power	22	Output Power	
05	Bus Voltage	05	DC Bus Voltage	
06	Frequency Command	02	Commanded Freq	
07	Active Fault	07	Fault Code 1	
08	Heatsink Temperature	24	Drive Temp	
09	Drive Status	06	Drive Status	
10	Drive Type	17	Drive Type	
11	Firmware Version	16	Control SW Ver	
12	Input Status	13	Contrl In Status	
13	Power Factor Angle	23	Output Pwr Fctr	
14	Memory Probe Display	19	Testpoint Sata	
15	Preset Status	14	Dig In Status	
16	Analog Input	20	Analog In 0-10V	Depending on input used
		21	Analog In 4-20mA	
17	Fault Buffer 0	07	Fault Code 1	
18	Fault Buffer 1	08	Fault Code 2	
19	Fault Buffer 2	09	Fault Code 3	
30	Accel Time 1	39	Accel Time 1	
31	Decel Time 1	40	Decel Time 1	
32	Minimum Frequency	34	Minimum Frequency	
33	Maximum Frequency	35	Maximum Frequency	
34	Stop Mode Select	37	Stop Mode	
35	Base Frequency	32	Motor NP Hertz	
36	Base Voltage	31	Motor NP Volts	
37	Maximum Voltage	88	Maximum Voltage	
38	Boost Select	84	Boost Select	
39	Skip Frequency	119	Skip Frequency	
40	Skip Frequency Band	120	Skip Freq Band	
41	Motor Overload Select	90	Motor OL Select	
42	Motor Overload Current	33	Motor OL Current	
43	Current Limit	89	Current Limit 1	
44	DC Hold Time	80	DC Brake Time	
45	DC Hold Voltage	81	DC Brake Level	
46	Input Mode	36	Start Source	
47	Output Configure	55	Relay Out sel	Additional OPTO Out 1/2 available

48	Output Threshold	56	Relay Our level	
49	PWM Frequency	91	PWM Frequency	
50	Restart Tries	92	Auto Rstrt Tries	
51	Restart Time	93	Auto Rstrt Delay	
52	DB Enable	82	DB Resistor Sel	
53	S-Curve	83	S Curve %	
54	Clear Fault	100	Fault Clear	
55	Memory Probe Address	19	Testpoint Data	
56	Reset Functions	41	Reset to Defaults	
57	Program Lock	101	Program Lock	
58	Internal Frequency	69	Internal Freq	
59	Frequency Select	38	Speed Reference	
60	Zero Offset			Not applicable
61	Preset Frequency 0	70	Preset Frequency 0	
62	Preset Frequency 1	71	Preset Frequency 1	
63	Preset Frequency 2	72	Preset Frequency 2	
64	Preset Frequency 3	73	Preset Frequency 3	
65	Preset Frequency 4	74	Preset Frequency 4	
66	Preset Frequency 5	75	Preset Frequency 5	
67	Preset Frequency 6	76	Preset Frequency 6	
68	Preset Frequency 7	77	Preset Frequency 7	
69	Accel Time 2	67	Accel Time 2	
70	Decel Time 2	68	Decel Time 2	
71	IR Compensation	128	IR Voltage Drop	
72	Slip Compensation	114	Slip Hertz @ FLA	
73	Reverse Disable	95	Reverse Disable	
74	Analog Select	132	10V Bipolar Enbl	
75	Analog Input Minimum	110	Analog In 0-10V Lo	Depending on input used
		112	Analog In 4-20mA Lo	
76	Analog Input Maximum	111	Analog In 0-10V Hi	Depending on input used
		113	Analog In 4-20mA Hi	
78	Compensation	97	Compensation	
79	Software Current Trip	98	SW Current Trip	
80	Stall Fault Time	121	Stall Fault Time	
81	PI Proportional Gain	134	PID Prop Gain	
82	PI Integral Gain	135	PID Integ Time	
83	PI Process Reference	137	PID Setpoint	
84	PI Deadband	138	PID Deadband	

Notes:

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