Multi-Device Interface Option Board for PowerFlex® 700S Drives

⚠ **ATTENTION:** To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

⚠ **ATTENTION:** To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the DC+ & DC- terminals. The voltage must be zero.

⚠ **ATTENTION:** HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

⚠ **ATTENTION:** This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, "Guarding Against Electrostatic Damage" or any other applicable ESD protection handbook.

⚠ **ATTENTION:** Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into SynchLink fiber-optic ports or SynchLink fiber-optic cable connectors.

⚠ **ATTENTION:** The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes in contact with the assembly.

What This Kit Contains

Verify that your kit contains the items listed in the following table. If your kit does not contain the correct items, contact your Rockwell Automation sales representative.

Quantity:	Description
1	MDI Option circuit board
2	"Stacker" connectors
1	Screw
3	Stand-offs

Tools That You Need

- Phillips® screwdriver for M3 screws
- POZIDRIV® screwdriver for M4 screws (for high power drives only)
- Nut driver or wrench for M3 hex nut
- Nut driver or wrench for M5 hex nut

Phillips® is a registered trademark of Phillips Screw Company
POZIDRIV® is a registered trademark of Phillips Screw Company

What You Need to Do

To remove the MDI option board from the PowerFlex 700S drive:

❐ Step 1: Remove power from drive

❐ Step 2: Remove drive cover(s)

❐ Step 3: Remove Control Assembly from Phase I drive (if necessary)

❐ Step 4: Remove Phase II Control Cassette covers

❐ Step 5: Remove existing MDI option board

To install the new MDI option board on the PowerFlex 700S drive:

❐ Step 6: Install new MDI option board

❐ Step 7: Install Control Assembly on Phase I drive (if removed in step 3)

❐ Step 8: Wire MDI option board

❐ Step 9: Install Phase II control cassette covers

❐ Step 10: Document revision changes

❐ Step 11: Install drive cover(s)

To return replaced MDI option board, use packing material from the new MDI option board.

Step 1: Remove Power from the Drive

> ⚠ **ATTENTION:** To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC & –DC terminals of the Power Terminal Block (DC+ & DC- in high power drives). The voltage must be zero.

1. Turn off and lock out input power. Wait five minutes.

2. Verify that there is no voltage at the drive's input power terminals.

3. Measure the DC bus voltage at the DC+ & DC- terminals on the Power Terminal Block. The voltage must be zero.
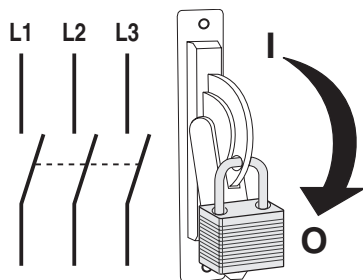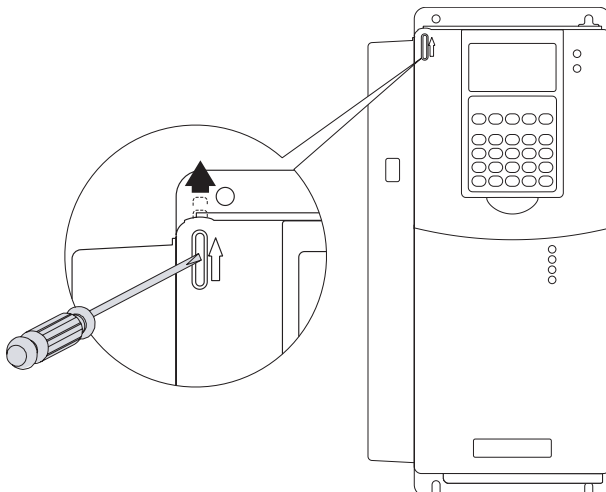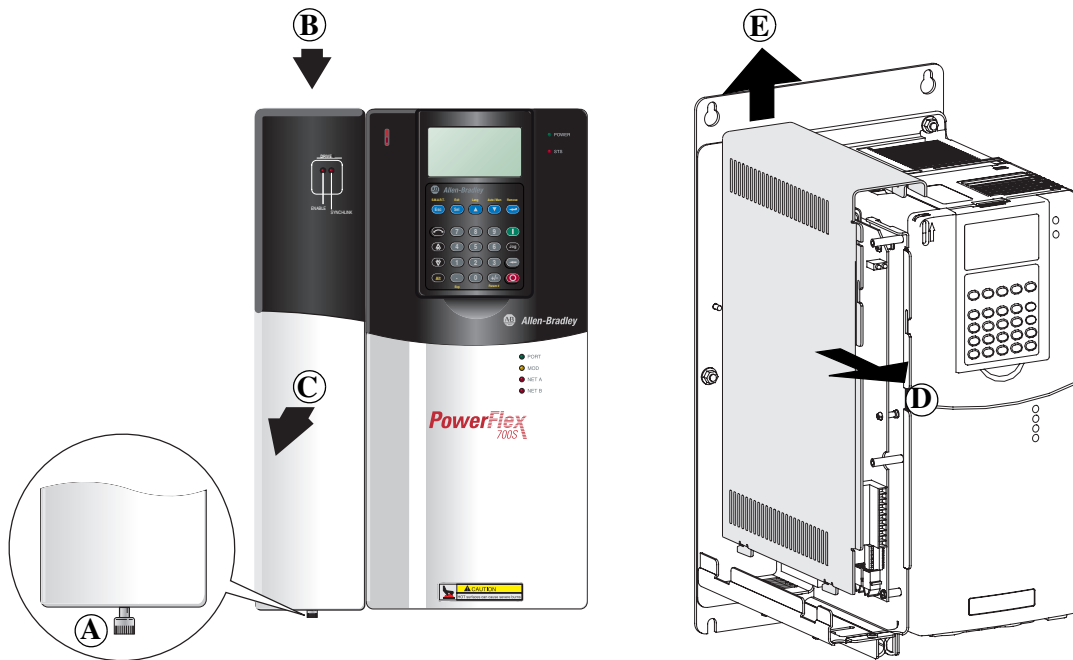
Step 2: Remove the Drive Cover(s)

Frame 1 - 6 Size Drives
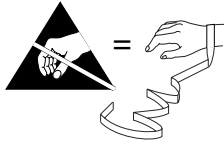
Phase I Control

Task	Action
Ⓐ	Loosen the captive screw.
Ⓑ	Push down on the front cover.
Ⓒ	Pull the front cover away from the assembly.
Ⓓ	Pull the side cover forward.
Ⓔ	Lift the side cover off of the control assembly.

Phase II Control

| Action |
|--------|
| **Frames 1-4**
 Locate the slot in the upper left corner of the drive cover. Slide the locking tab up and swing the cover open. Special hinges allow cover to move away from drive and lay on top of an adjacent drive (if present). |
| **Frame 5**
 Slide the locking tab up, loosen the right-hand cover screw and remove the cover. |
| **Frame 6**
 Loosen the two screws at the bottom of the drive cover. Carefully slide the bottom cover down and out. Loosen the two screws at the top of the cover and remove the cover. |

Frame 9 Size Drives

Task	Action
Ⓐ	Remove the eight screws that secure the top cover to the drive frame using a POZIDRIV screwdriver.
Ⓑ	Remove the top (power) cover.

The proper tightening torque for reassembly is 20 lb.•in.

8 Screws
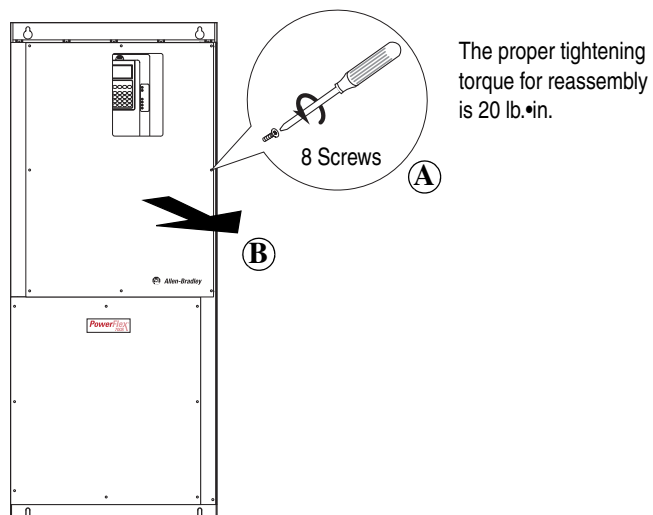
Frame 10 - 13 Size Drives

Open the door of the drive enclosure containing the control frame.

Step 3: Remove the Control Assembly from Phase I Drive (if necessary)

This step is necessary only when another drive or panel component blocks access to the control assembly on Phase I drives. Avoid removing it if possible.

Task	Description
Ⓐ	Unplug any I/O and SynchLink cables from the main control board, unplug the feedback wiring from MDI Option board, and unplug any communication cables from the DriveLogix controller.
Ⓑ	Unplug the ribbon cable.
Ⓒ	Remove the three M5 nuts that secure the control assembly to the drive frame.
Ⓓ	Remove the control assembly from the drive.

Proper tightening torque for reassembly is 18 lb.•in.
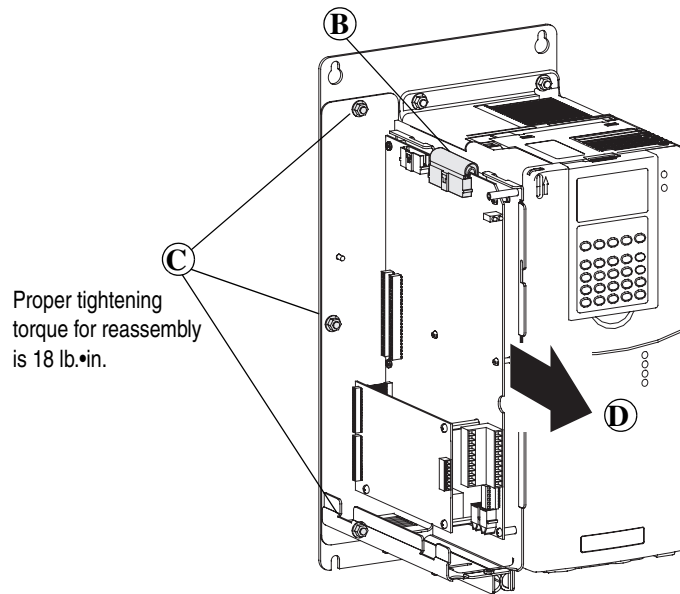
## Step 4:   Remove the Phase II Control Cassette Covers

It is necessary to remove the cassette from the drive before removing the cassette covers for Phase II control.

Remove the Phase II Control Cassette from the Drive
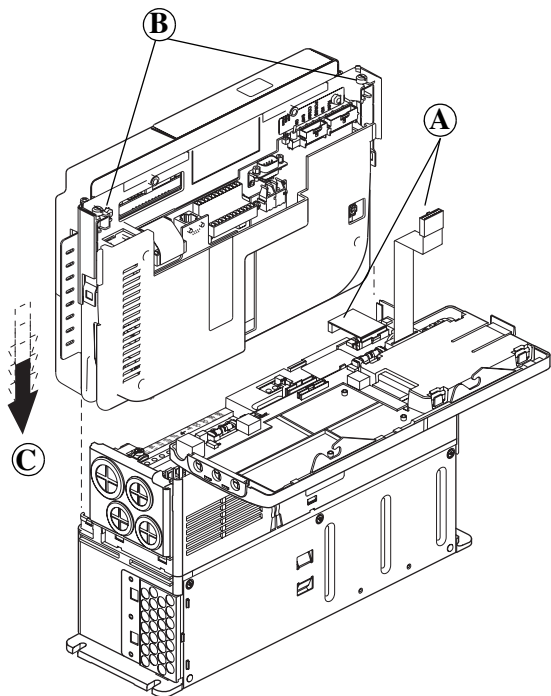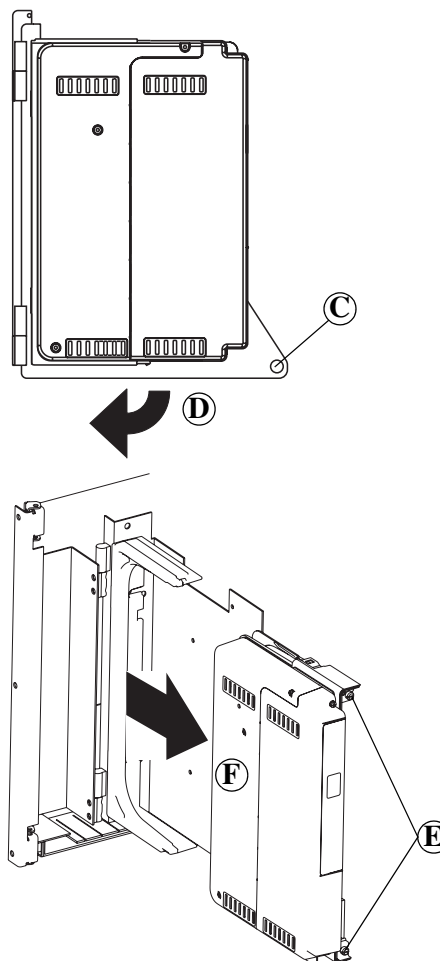

Frame 1 - 6 Size Drives

Task	Action
A	Disconnect the cables at the ends that connect to the Main Control board.
B	Loosen the screws on the face of the cassette.
C	Remove the cassette from the drive.
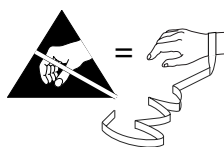
Frame 9 - 13 Size Drives

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.
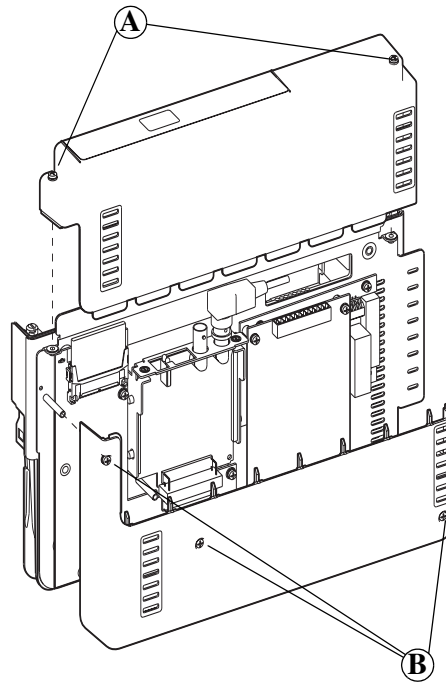
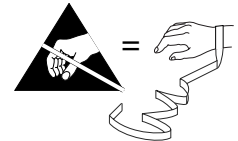| Task	Description
A	Unplug any fiber optic ControlNet and SynchLink cables from the Control Assembly.
	Important: Minimum inside bend radius for SynchLink and ControlNet fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.
	Attention: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.
B	Unplug any remaining I/O and communications cables from the Control Assembly and set them aside.
C	Loosen the captive screw .
D	Swing the Control Assembly away from the control frame.
E	Loosen the screws on the face of the cassette.
F	Remove the cassette from the drive.

Remove the Phase II Cassette Covers (All Drive Sizes)

Removing the Side Covers

Task	Description
Ⓐ	Loosen the screws on the front cover and remove the cover.
Ⓑ	Loosen the screws on the side of the rear cover and remove the cover.

Proper tightening torque for reassembly is 6 lb.•in.

Step 5: Remove the Existing MDI Option Board
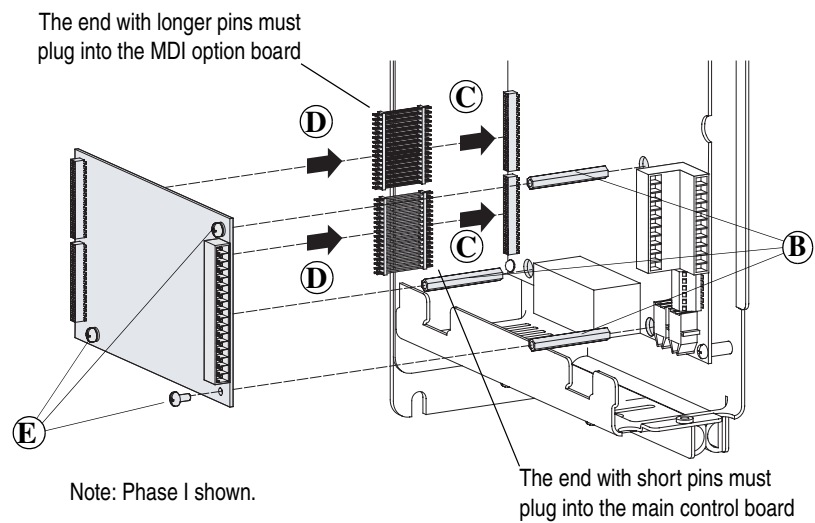
Task	Description
Ⓐ	Remove the screw that secures the board to the control frame.
Ⓑ	Loosen the captive screws.
Ⓒ	Remove the MDI Option board, through-board pin connectors and insulating washer from main Control board.
Ⓓ	Remove the stand-offs from main Control board (on Phase I drives only).
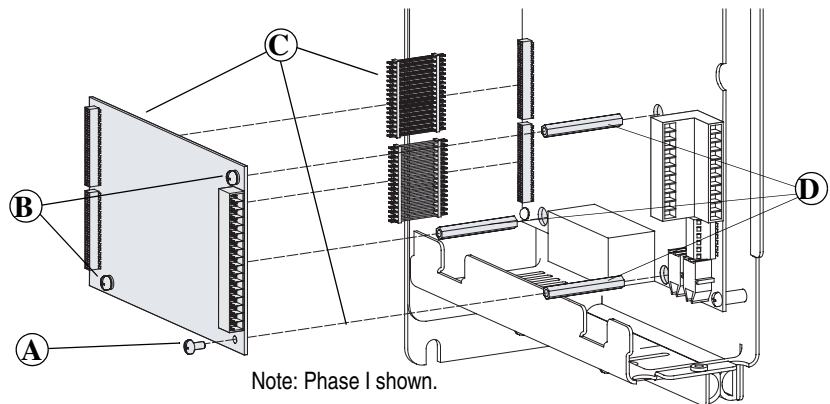
Note: Phase I shown.

Step 6:   Install the New MDI Option Board

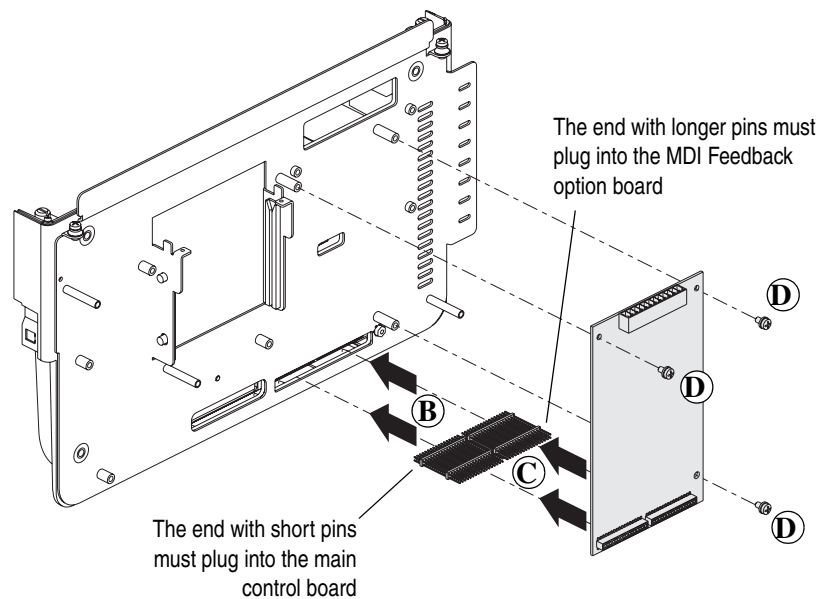### Phase I Drives

Task	Description
Ⓐ	Remove terminal block P1 from the Resolver Feedback option board. It is much easier to remove before the board is installed.
Ⓑ	Install and tighten the stand-offs (min/max 7 in•lb / 10 in•lb).
Ⓒ	Insert the short pins of the through-board pin connectors into the mating connectors on the main Control board. The end with the short pins must plug into the main Control board.
Ⓓ	Plug the mating connectors of the MDI Feedback option board onto the long pins of through-board pin connectors. The end with the longer pins must plug into the MDI Feedback option board.
Ⓔ	Secure the board to the stand-offs, using the screw (supplied with this kit) and the captive screws on the circuit board. Tighten the screws using a phillips screwdriver (min/max 6 in.•lb. / 8 in.•lb.).

The end with longer pins must plug into the MDI option board

The end with short pins must plug into the main control board

Note: Phase I shown.

Important: Do not use a screwdriver to pry the P1 terminal block from the circuit board. This may damage the terminal block.

Phase II Drives

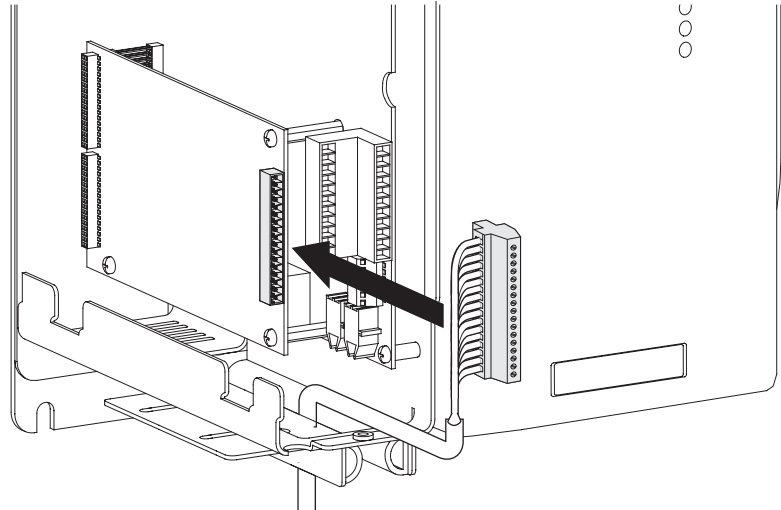| Task	Description
Ⓐ	Remove the P1 terminal block from the MDI Feedback option board. It is much easier to remove before the board is installed.
Ⓑ	Insert the short pins of the through-board pin connectors into the mating connectors on the main Control board. The end with the short pins must plug into the main Control board.
Ⓒ	Plug the mating connectors of the MDI Feedback option board onto the long pins of the through-board pin connectors. The end with longer pins must plug into the MDI Feedback option board.
Ⓓ	Secure the board to the stand-offs, using the screw supplied with this kit and the captive screws on the circuit board. Tighten the screws using a phillips screwdriver (min/max 6 in.•lb. / 8 in.•lb.).

The end with longer pins must plug into the MDI Feedback option board

The end with short pins must plug into the main control board

Important: Do not use a screwdriver to pry the P1 terminal block from the circuit board. This may damage the terminal block.

Step 7: Install the Control Assembly on a Phase I Drive (if removed in Step 3)
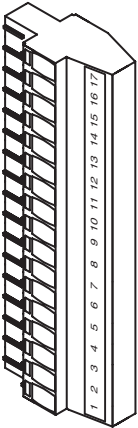
The procedure for installing the Control Assembly is the reverse of removal. Refer to .

Step 8:   Wire the MDI Option Board

Terminal block P1 contains connection points for a linear sensor, rotary encoder and registration strobe. This terminal block resides on the MDI Option board.

▶ **TIP:** On Phase I drives, remember to route wires through the sliding access panel at the bottom of the Control Assembly.

|	Terminal	Signal	Description
	17	Rotary Encoder POWER COMMON	Power supply for Rotary Encoder interface
	16	Rotary Encoder POWER	
	15	Rotary Encoder REFSIN	Positive Sine signal for Rotary Encoder interface
	14	Rotary Encoder +SIN	Negative Sine signal for Rotary Encoder interface
	13	Rotary Encoder REFCOS	Negative Cosine signal for Rotary Encoder interface
	12	Rotary Encoder +COS	Positive Cosine signal for Rotary Encoder interface
	11	Rotary Encoder DATA+ (RS485)	Positive DH485 terminal for Rotary Encoder interface
	10	Rotary Encoder DATA- (RS485)	Negative DH485 terminal for Rotary Encoder interface
	9	Linear Sensor CLOCK+	Positive Clock terminal for Linear Sensor interface
	8	Linear Sensor CLOCK-	Negative Clock terminal for Linear Sensor interface
	7	Linear Sensor DATA+	Positive SSI terminal for Linear Sensor interface
	6	Linear Sensor DATA-	Negative SSI terminal for Linear Sensor interface
	5	Rotary Encoder REGISTRATION+	Positive terminal for Rotary Encoder registration strobe
	4	Rotary Encoder REGISTRATION-	Negative terminal for Rotary Encoder registration strobe
	3	Linear Sensor REGISTRATION+	Positive terminal for Linear Sensor registration strobe
	2	Linear Sensor REGISTRATION-	Negative terminal for Linear Sensor registration strobe
	1	CHASSIS GND	Connection point for cable shields

Recommended Cables

| If you are using this motor and feedback device:	Use this cable:	See this wiring diagram:
Temposonics R-Series Linear sensors with MTS part numbers ending in 1S2G1102	Mating MTS molded extension cable for RG connector or integral P cable	Figure 1 on page -11
Allen-Bradley 1326AB-BXXXX-M2L, -M2KXL, -S2L, and -S2KXL motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-CDNFDMP-SXX	Figure 2 on page -12
Allen-Bradley MPL-A5xx and MPL-Bxxx motors motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-CDNFDMP-SXX	Figure 2 on page -12
Allen-Bradley 1326AB-BXXXX-M2L, -M2KXL, -S2L, and -S2KXL motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-XXNFMP-SXX	Figure 3 on page -12
Allen-Bradley MPL-A5xx and MPL-Bxxx motors motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-XXNFMP-SXX	Figure 3 on page -12
Allen-Bradley MPL-A3xx - MPL-A45xx and all MPG series motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-XXNFMP-SXX	Figure 4 on page -12
Allen-Bradley MPL-A3xx - MPL-A45xx and all MPG series motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-UXNFDMP-SXX	Figure 5 on page -13
HPK-Series motors with embedded Stegmann rotary encoder	Allen-Bradley 2090-XXNFMF-SXX	Figure 6 on page -13
Any other motor with external Stegmann SHS-170 rotary encoder	Stegmann shielded twisted-pair cable with 12-pin DIN style connector	Figure 7 on page -13
Any other motor with external Stegmann SCS-60, SCS-70, SCM-60 or SCM-70, SRS-50, SRS-60, SRM-60, SRM-60, SRS-25 or SRM-25 rotary encoder	Stegmann shielded twisted-pair cable with 10-pin MS style connector	Figure 8 on page -14
Any other motor with external Stegmann SCS-Kit 101 or SCK-Kit 101 rotary encoder	Stegmann shielded twisted-pair cable with 8-pin Berg style connector	Figure 9 on page -14
Any other motor with external Stegmann SRS660 rotary encoder	Is available only with pre-attached Stegmann shielded twisted-pair cable of various lengths	Figure 10 on page -14

Connection Examples

Figure 1   Linear Sensor connections with MDI RG connector or P integral cable
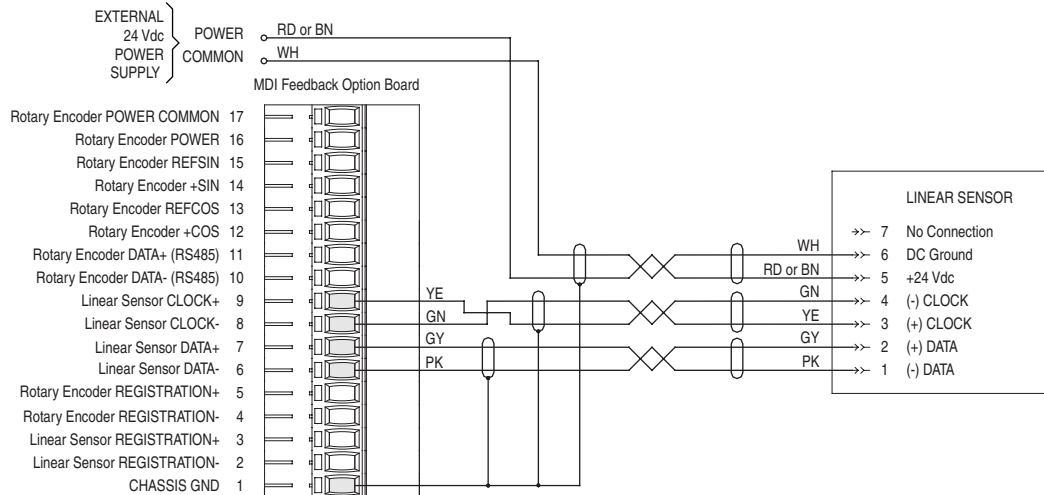
Connection Examples

Figure 2   Rotary Encoder connections for MPL-A5xx and MPL-Bxxx motors or 1326AB-BXXXX-M2L, -M2KXL, -S2L, and -S2KXL motors with 2090-CDNFDMP-SXX cable
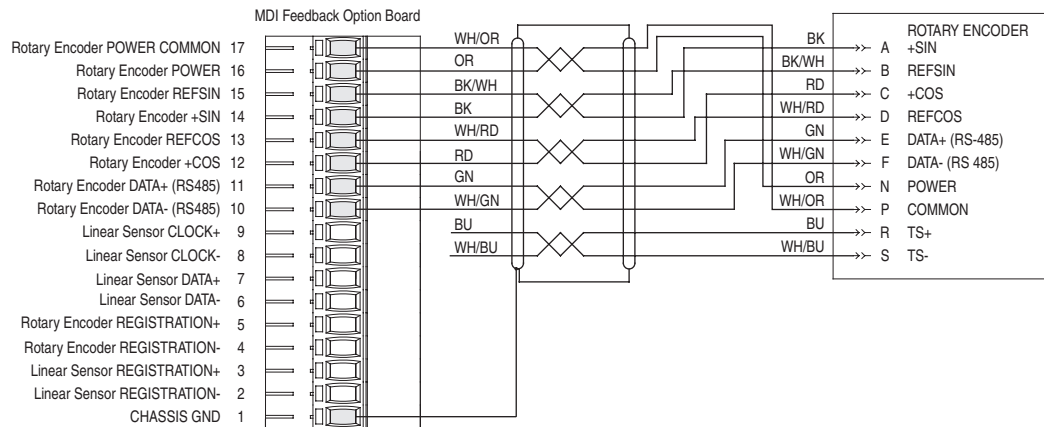
Figure 3   Rotary Encoder connections for MPL-A5xx and MPL-Bxxx motors or 1326AB-BXXXX-M2L, -M2KXL, -S2L, and -S2KXL motors with 2090-XXNFMP-SXX cable
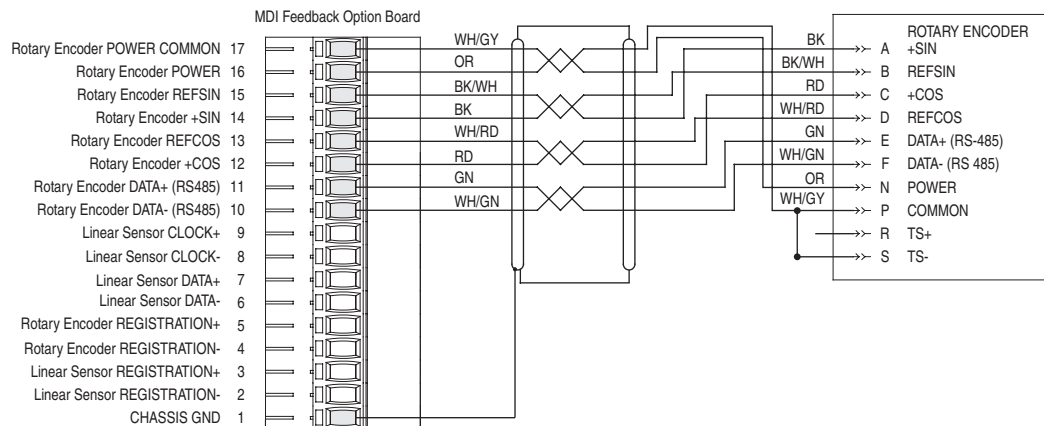
Note: Thermal Switch cannot be accessed using 2090-XXNFMP-SXX cable.

Figure 4   Rotary Encoder connections for MPL-A3xx - MPL-A45xx and all MPG series motors with 2090-XXNFMP-SXX cable
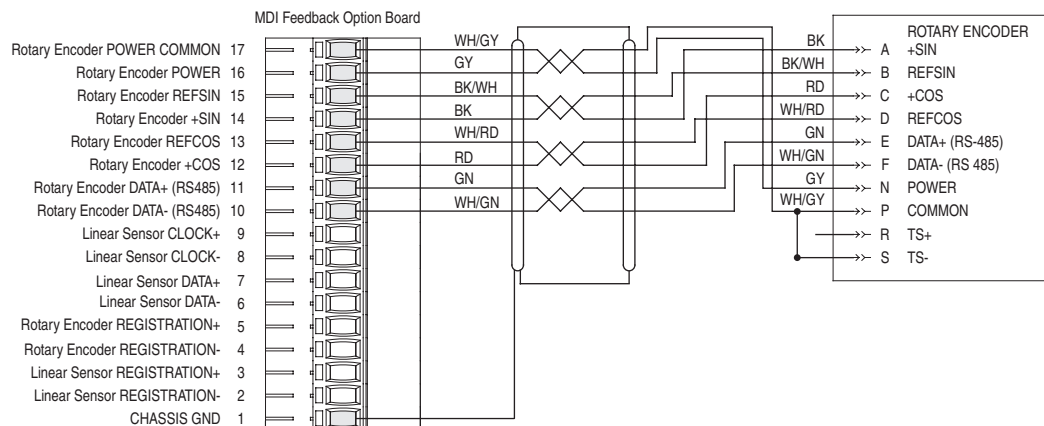
Note: Thermal Switch cannot be accessed using 2090-XXNFMP-SXX cable.

Connection Examples

Figure 5   Rotary Encoder connections for MPL-A3xx - MPL-A45xx and all MPG series motors with 2090-UXNFDMP-SXX cable
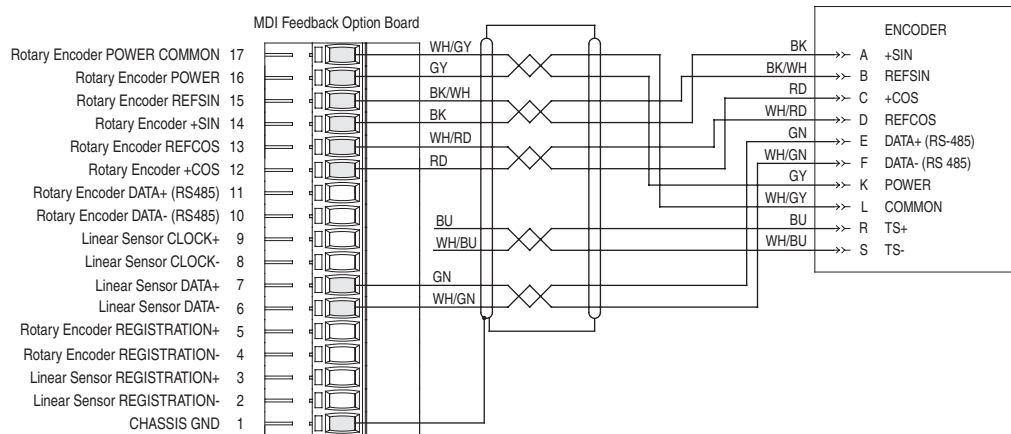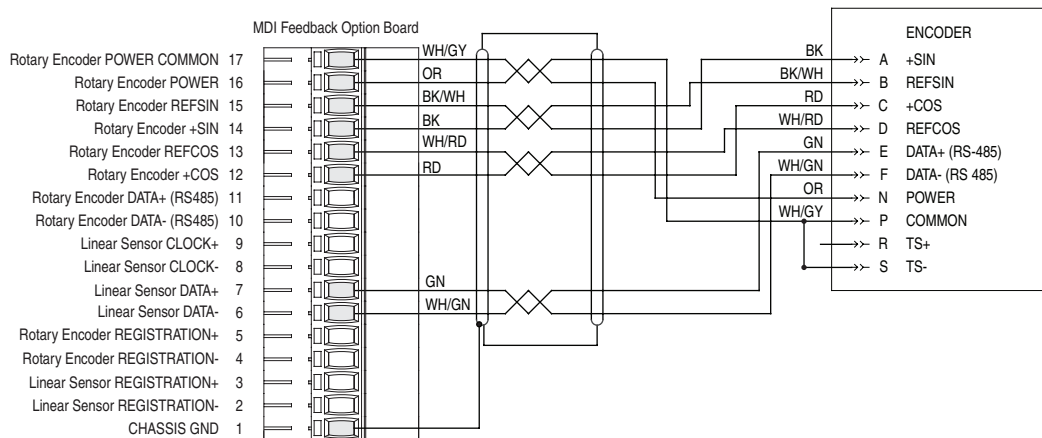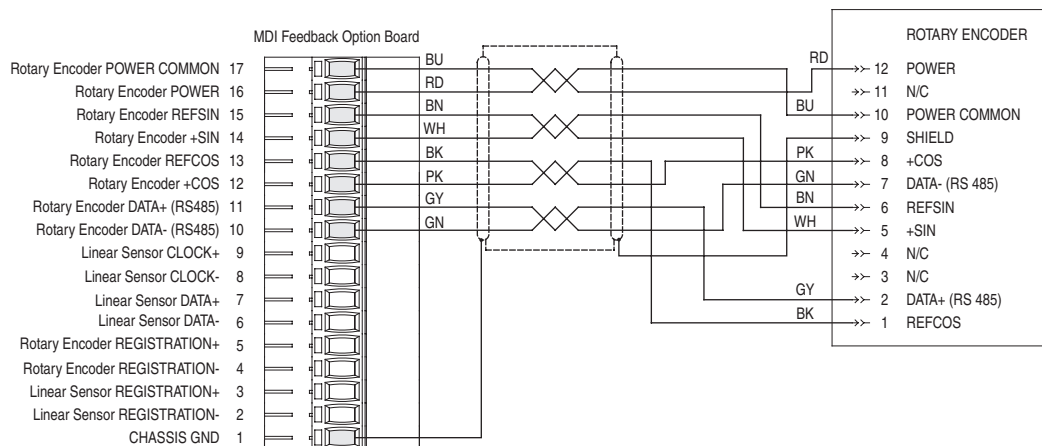

Figure 6   HPK-Series motors with 2090-XXNFMF-SXX cable

Note: Thermal Switch cannot be accessed using 2090-XXNFMP-SXX cable.

Figure 7   Stegmann shielded twisted-pair cable with 12-pin DIN style connector

Connection Examples

Figure 8 Rotary Encoder connections with Stegmann shielded twisted-pair cable and 10-pin MS style connector

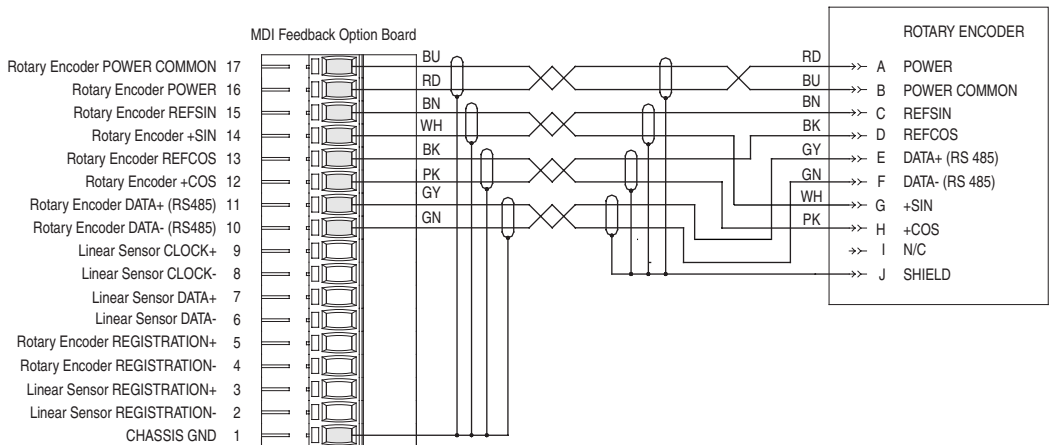| MDI Feedback Option Board		ROTARY ENCODER
Rotary Encoder POWER COMMON 17	BU	RD A POWER
Rotary Encoder POWER 16	RD	BU B POWER COMMON
Rotary Encoder REFSIN 15	BN	BN C REFSIN
Rotary Encoder +SIN 14	WH	BK D REFCOS
Rotary Encoder REFCOS 13	BK	GY E DATA+ (RS 485)
Rotary Encoder +COS 12	PK	GN F DATA- (RS 485)
Rotary Encoder DATA+ (RS485) 11	GY	WH G +SIN
Rotary Encoder DATA- (RS485) 10	GN	PK H +COS
Linear Sensor CLOCK+ 9		I N/C
Linear Sensor CLOCK- 8		J SHIELD
Linear Sensor DATA+ 7		
Linear Sensor DATA- 6		
Rotary Encoder REGISTRATION+ 5		
Rotary Encoder REGISTRATION- 4		
Linear Sensor REGISTRATION+ 3		
Linear Sensor REGISTRATION- 2		
CHASSIS GND 1		

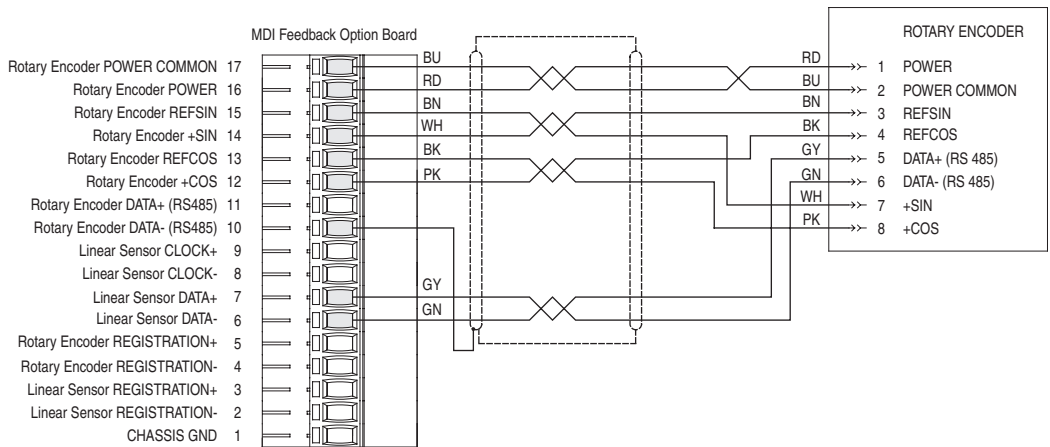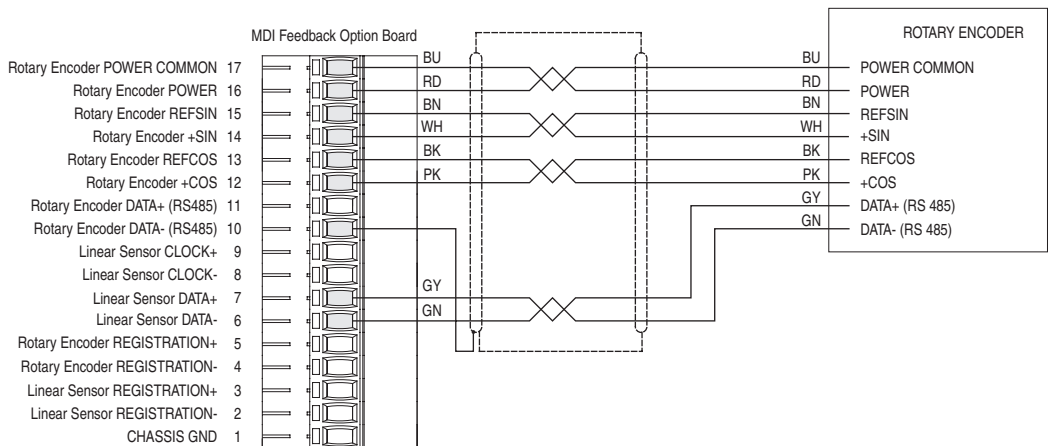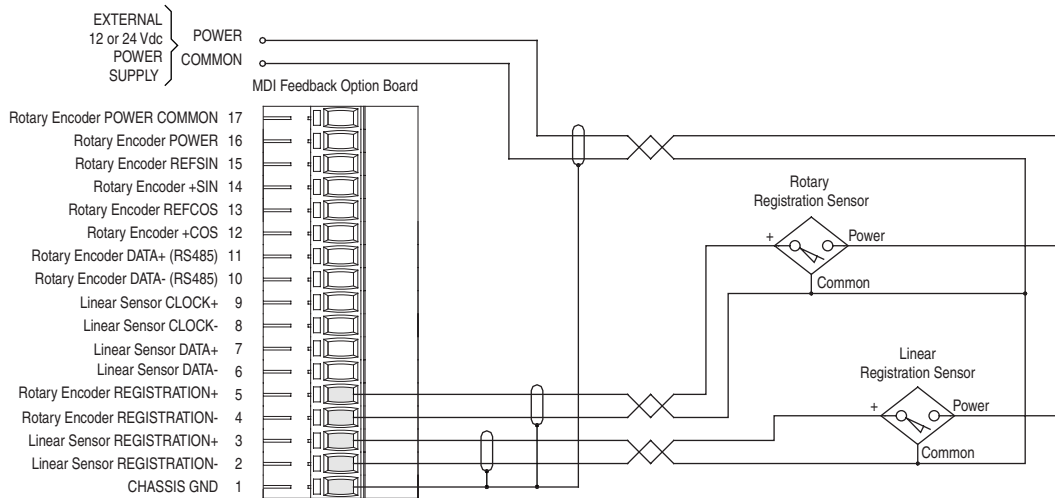**Figure 9 Rotary Encoder connections with Stegmann shielded twisted-pair cable and 8-pin Berg style connector**

MDI Feedback Option Board		ROTARY ENCODER
Rotary Encoder POWER COMMON 17	BU	RD 1 POWER
Rotary Encoder POWER 16	RD	BU 2 POWER COMMON
Rotary Encoder REFSIN 15	BN	BN 3 REFSIN
Rotary Encoder +SIN 14	WH	BK 4 REFCOS
Rotary Encoder REFCOS 13	BK	GY 5 DATA+ (RS 485)
Rotary Encoder +COS 12	PK	GN 6 DATA- (RS 485)
Rotary Encoder DATA+ (RS485) 11		WH 7 +SIN
Rotary Encoder DATA- (RS485) 10		PK 8 +COS
Linear Sensor CLOCK+ 9		
Linear Sensor CLOCK- 8		
Linear Sensor DATA+ 7	GY	
Linear Sensor DATA- 6	GN	
Rotary Encoder REGISTRATION+ 5		
Rotary Encoder REGISTRATION- 4		
Linear Sensor REGISTRATION+ 3		
Linear Sensor REGISTRATION- 2		
CHASSIS GND 1		

Figure 10 Rotary Encoder connections with Stegmann pre-attached shielded twisted-pair cable

MDI Feedback Option Board		ROTARY ENCODER
Rotary Encoder POWER COMMON 17	BU	BU POWER COMMON
Rotary Encoder POWER 16	RD	RD POWER
Rotary Encoder REFSIN 15	BN	BN REFSIN
Rotary Encoder +SIN 14	WH	WH +SIN
Rotary Encoder REFCOS 13	BK	BK REFCOS
Rotary Encoder +COS 12	PK	PK +COS
Rotary Encoder DATA+ (RS485) 11		GY DATA+ (RS 485)
Rotary Encoder DATA- (RS485) 10		GN DATA- (RS 485)
Linear Sensor CLOCK+ 9		
Linear Sensor CLOCK- 8		
Linear Sensor DATA+ 7	GY	
Linear Sensor DATA- 6	GN	
Rotary Encoder REGISTRATION+ 5		
Rotary Encoder REGISTRATION- 4		
Linear Sensor REGISTRATION+ 3		
Linear Sensor REGISTRATION- 2		
CHASSIS GND 1		

Connection Examples

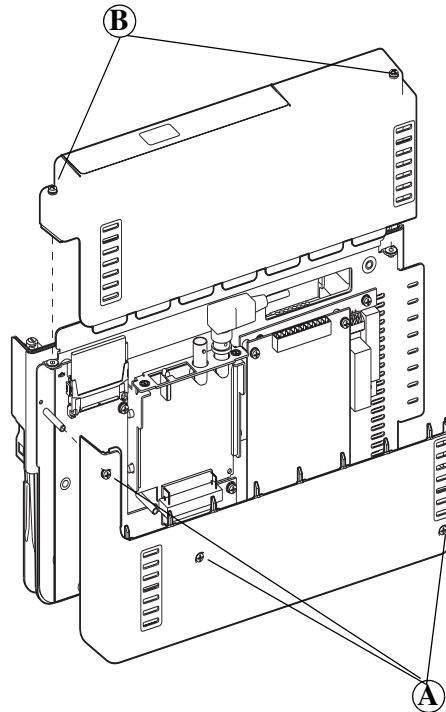**Figure 11   Registration Sensor connection**

Step 9:   Install the Phase II Control Cassette Covers

In order to install the Phase II Control Cassette in the drive, you must first install the covers.
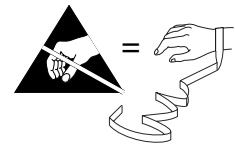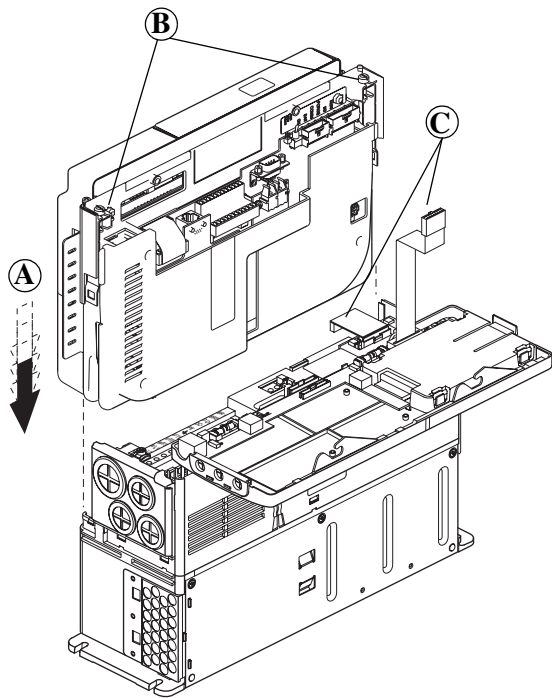
Installing the Phase II Cassette Covers

Proper tightening torque for reassembly is 6 lb.•in.

Installing the Side Covers

Task	Description
A	Secure the rear cover to the cassette with three screws.
B	Secure the front cover to the cassette with two screws.

Install the Phase II Control Cassette

Frame 1 - 6 Size Drives

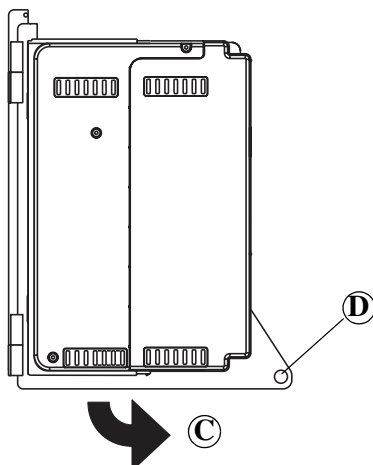| Task	Action
Ⓐ	Slide the control cassette onto the mounting bracket.
Ⓑ	Tighten the screws on the face of the cassette.
Ⓒ	Connect the cables at the ends that connect to the main Control board.
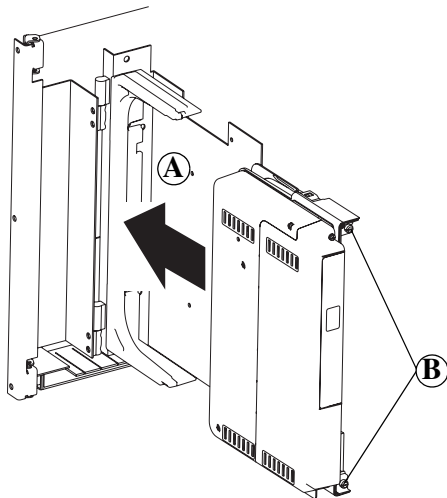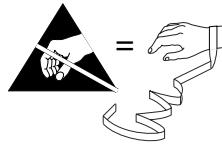
Frame 9 - 13 Size Drives

| Task	Description
Ⓐ	Slide the cassette onto the mounting bracket.
Ⓑ	Tighten the screws on the face of the cassette.
Ⓒ	Swing the Control Assembly in toward the control frame.
Ⓓ	Tighten the captive screw.
Ⓔ	Plug any I/O and communications cables in to the Control Assembly.
	Attention: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.
Ⓕ	**Important**: Minimum inside bend radius for SynchLink and ControlNet fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.
	Unplug any fiber optic ControlNet and SynchLink cables from the Control Assembly.

Step 10: Document the Change

Document the installation of the MDI option board on the Field Installed Options label. Use the blank line if you are installing the MDI option board in a drive that was manufactured without it.

Frame 1 - 6 Size Drives
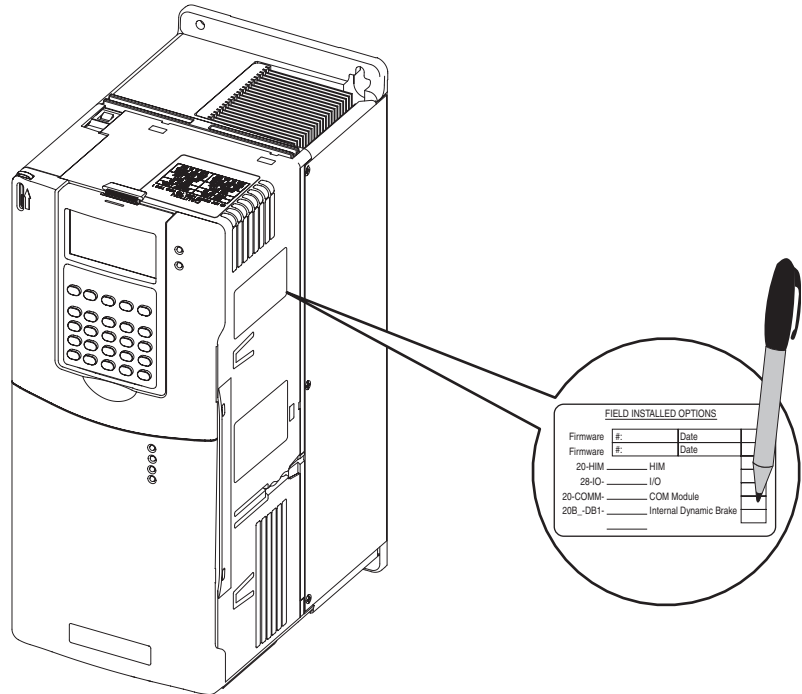
▶ **TIP:** Use packing material from new MDI option board to return the replaced MDI option board

Frame 9 - 13 Size Drives
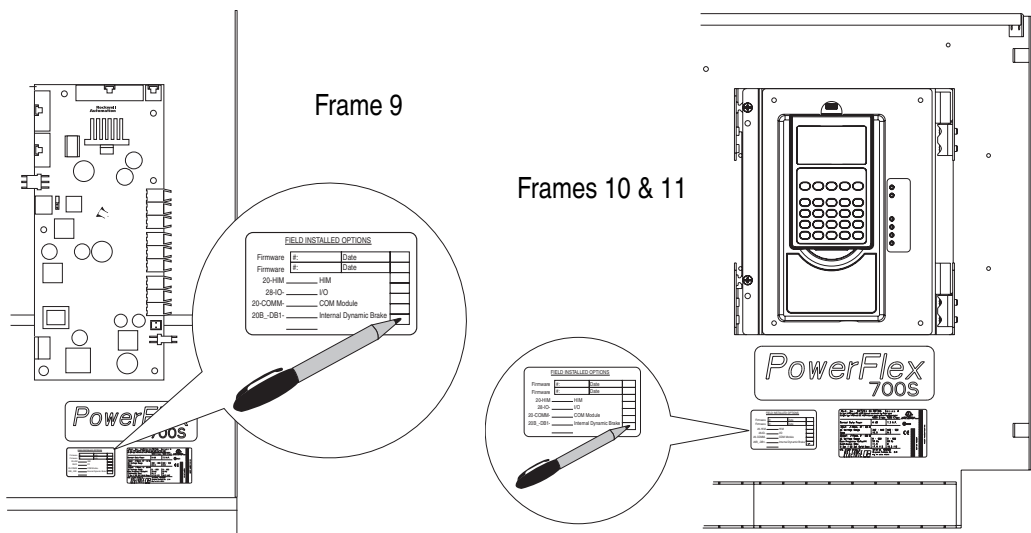
Step 11: Install the Drive Cover(s)

Phase I Drives Frames 1 - 6

The procedure for installing the covers on Phase I drives, frames 1 - 6, is the reverse of removal. Refer to .

Phase II Drives Frames 1 - 6

The procedure for installing the covers on Phase II drives, frames 1 - 6, is the reverse of removal. Refer to .

Frame 9 Size Drives

The procedure for installing covers on frame 9 size drives is the reverse of removal. Refer to .

Frame 10 - 13 Size Drives

The procedure for installing covers on frame 10 - 13 size drives is the reverse of removal. Refer to .

Specifications

MDI Option Board Specifications

Consideration	Description
Rotary Encoder Voltage Supply	11.5V dc @ 130 mA
Rotary Encoder Hi-Resolution Feedback	Sine/Cosine 1V P-P Offset 2.5
Rotary Encoder Maximum Cable Length	90m (295 ft.)
Rotary Encoder RS-485 Interface	The MDI Option board obtains the following information via the Hiperface RS-485 interface shortly after power-up: • Address • Command Number • Mode • Number of turns • Number of Sine/Cos cycles • Checksum
Registration Inputs	high speed 12-24V dc sinking digital inputs
Customer-I/O plug (P1)	Allen-Bradley PN: S94274917 Weidmuller PN: 67601782

Supported Linear Sensors

Important: Only one Linear Sensor can be installed at a time.

Temposonics Linear Sensors

Temposonics® R-Series Linear sensors with MTS® part numbers ending in 1S2G1102 work with the MDI Option.

Part Number Character	Characteristic
1	Input Voltage = +24V dc
S	SSI output
2	Data Length = 24 Bits
G	Output Format = Gray Code
1	Resolution = 0.005 mm
1	Performance = Standard
02	Scale Orientation = Forward-acting Synchronized

Temposonics® is a registered trademark of MTS Systems Corporation.

Stahltronic Linear Sensor

Stahltronic WCS Position Encoding System works with the MDI Option.

Characteristic
Input Voltage = +24V dc
SSI output
Data Length = 19 Bits
Output Format = Binary or Gray Code
Resolution = 0.80 mm

Supported Rotary Encoders

Please note that encoders must be ordered as "Single Ended". This will ensure that the RS-485 channel has the proper termination network installed at the factory.

Model	Resolution	Comment
SINCOS® SCS-60, SCS-70, SCM-60, and SCM-70	512 sine cycles per revolution.	SCM-60 and SCM-70 have built-in mechanical turns counter.
SINCOS® SCS-KIT-101 and SCM-KIT-101	1024 sine cycles per revolution.	SCM-60 and SCM-70 have built-in mechanical turns counter.
SINCOS® SRS-50, SRS-60, SRM-50, and SRM-60	1024 sine cycles per revolution.	SRM-50 and SRM-60 have built-in mechanical turns counter.
SINCOS® SRS/M 25	1024 sine cycles per revolution	SRS25 and SRM25 have built-in mechanical turns counter. IP65 Protection Class. Size 25 square flange mounting.
SINCOS® SRS660	1024 sine cycles per revolution	Hollow-shaft up to 14 mm diameter
SINCOS® SHS-170	512 sine cycles per revolution.	While the software supports this encoder, the SHS-170 draws excessive current and should only be used with an external power supply.

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