

Field Manual

TBC-24 Conveyor

Installation Procedures,
Maintenance, and Spare Parts



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Section G – Installation Procedures

Introduction

Accepting Shipment

Immediately upon delivery, check that all equipment received agrees with the bill of lading or carrier's freight bill.

Note

Do not sign the freight bill before checking the equipment for completeness and for damage.

Lost Shipments

Report lost shipments to the Manufacturer's Shipping Department.

Shortages or Errors

Before signing the freight bill, note any shortages or errors clearly on the freight bill. Report any shortages or errors to the Manufacturer's Customer Service Department in writing within ten (10) days after receipt of shipment.

Damaged Shipment

If shipping damage is evident upon receipt of the shipment, proceed as follows:

- Before signing the freight bill, note the extent of the damage clearly on the freight bill.
- Immediately contact the transportation carrier to request an inspection.
- Do not destroy the crating or packing materials until the carrier's agent has inspected them.
- If possible, take photographs of the damage in order to document negligence on the part of the carrier.

Returns

Unless authorized in writing by the Manufacturer, equipment furnished in accordance with the Manufacturer's Agreement is not returnable for any reason. If a return is authorized, please note that a restocking charge may apply. When requesting a return authorization, be sure to include the following information:

- Job number;
 - Customer name;
 - Contact person's name;
 - Phone number of contact person;
 - Part number, select number and description for each item to be returned;
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- Quantity;
- Reason for return;
- Condition of material; and
- Color of material.

After receiving the information, the Manufacturer will determine which items may be returned. If a request to return is approved, the Manufacturer's Customer Service Department will issue to the Purchaser (End User) a Return Goods Authorization (RGA) number. Be sure to mark the RGA number clearly and prominently on all packages returned. The Purchaser (End User) shall be liable for all freight charges.

Codes and Standards

The conveyor equipment is designed and manufactured to comply with the American National Standard Institute's *Safety Standards For Conveyors And Related Equipment* (ANSI B20.1) and with the National Electrical Code (ANSI/NFPA70).

The Purchaser or Operator shall be familiar with, and responsible for, compliance with all codes and regulations having jurisdiction regarding the installation, use, and maintenance of this equipment. Appropriate lock-out and tag-out policy and procedures shall comply with the minimum safety requirements outlined in the American National Standard Institute's current publication (ANSI Z244.1).

Safety

Signs and Labels

Safety signs and labels posted on or near the conveyor equipment shall not be removed, painted over, or altered at any time. All safety devices, warning lights, and alarms associated with the conveyor system should be regularly tested for proper operation and serviced as needed. If the original safety item(s) become defective or damaged, refer to the conveyor parts list(s) of bill(s)-of-materials for replacement part numbers.

Safety Precautions

- Do not turn off conveyor power source(s) and affix appropriate lockout and tag-out devices to the operating controls before servicing the equipment. Only trained and qualified personnel who are aware of the safety hazards should perform equipment adjustments or required maintenance while the conveyor is in operation.
 - Observe all warning signs, lights, and alarms associated with the conveyor operation and maintenance, and be alert at all times to automatic operation(s) of adjacent equipment.
 - Use extreme caution near moving conveyor parts to avoid the hazard of hands, hair, and clothing being caught.
 - Do not sit on, stand on, walk, ride, or cross over or under the conveyor at any time except where suitable catwalks, gates, or bridges are provided for personnel travel.
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- Do not attempt to repair any equipment while the conveyor is running, replace any conveyor component without appropriate replacement parts, or modify the conveyor system without prior approval by the manufacturer.
- Do not operate the conveyor until all safety guards are securely in place, all tools and objects other than product are removed from or near the conveying surfaces, and all personnel are in safe positions.
- Do not remove or modify any safety devices provided on or with the conveyor.
- Do not clear jams or reach into any unit before first turning off the equipment power sources and affixing appropriate lock-out and tag-out devices.

Parts Replacement

Spare Parts

To minimize production downtime, selected parts have been designated as “spare parts” because they are crucial for proper operation, and they are prone to failure. These parts are identified in Section I, “Spare Parts.” To minimize down time, maintain a reserve stock of designated spare parts at the quantities recommended in the spare parts proposal. For further information, contact the Customer One Protection (COP) department.

Replacement Parts

Parts not designated as spare parts may be replaced if necessary. To identify parts not designated as spare parts, refer to the bills of material for the equipment provided.

Factory Assistance

For assistance with installation, operation, or maintenance, contact Field Service.

For replacement parts, contact Customer One Protection (COP).

Conveyor Installation

Preparation

Mark the conveyor centerlines on the floor using a chalk line (or equivalent method), measuring from the base lines according to the project layout drawings.

Before installing the conveyor, determine the locations for installing all power supplies required for the TBC-24 system. Note that each power supply has two power outputs, and that each power output is capable of supporting up to eight drive rollers. Standard 10-foot straight modules have four drive rollers. The drive roller in each electrical slave module must also be included in the determination. As an example, one power supply is capable of supporting two sets of two independent straight modules, with each module containing four zones.

Each independent module is furnished with a power harness, which provides power to the module, and with a pass-through power harness, which routes power to an adjacent module. Power harnesses and pass-through power harnesses are designed to be connected in series between one module and another as necessary.

Determine which modules are to be powered by which power supply. A power supply should be located at the junction of adjacent modules. It may be located at the infeed end or at the discharge end of the group of modules that it powers, or it may be located at a middle junction of the group of modules that it powers.

Make certain that a 120 VAC electrical outlet is located within 8 feet of each power-supply location and that the each power supply can be plugged in without routing the power cord across any walkways. The use of an extension cord between an electrical outlet and a power-supply power cord is not recommended.

Arranging Modules

Each module is identified by the conveyor number, which is shown on a label affixed to the module. Though modules may appear identical, they cannot be assumed to be interchangeable. The programming of the programmable logic controller (PLC) may vary from module to module, and each PLC is assigned a unique address (see Figure G.1). Cross-check the conveyor number for each module against the project layout drawings, and arrange the modules and supports near their respective installation locations. Make certain that all components, supports, and hardware necessary for installation are present and complete.

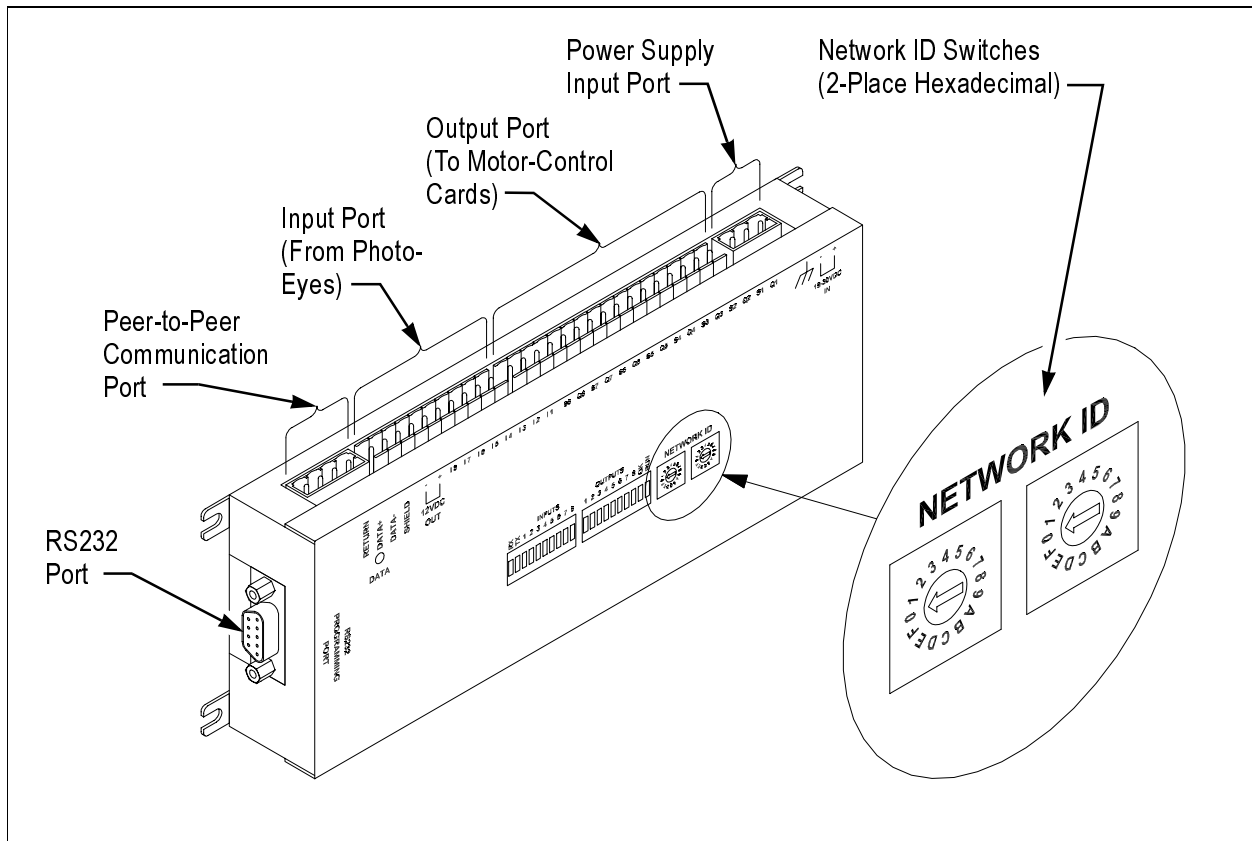


Figure G.1 – Programmable Logic Controller (PLC)

Determine the infeed end and discharge end of each module of conveyor. Note that a photo-eye is located closer to the discharge end of each zone of an independent module than to the infeed end. Note also that the gender of the connectors at the ends of the wiring harnesses extending from the ends of the module are as follows:

- Male connectors – infeed end; and
- Female connectors – discharge end.

Installing Modules

Before installing each module of conveyor, remove the shipping end caps from the module side rails. Attach all slave modules to the designated independent modules using 1/2-13 x 1" hex bolts, flat washers, lock washers and hex nuts as follows:

- Attach tall side rails together using a connector flat (part number 370118). Insert the hex nuts in the channel on the inside at the bottom of the side rail.
- Attach short side rails together using a connector angle (long angle part number 370112; short angle part number 370113). Insert the hex nuts in the channel along the underside of the side rail

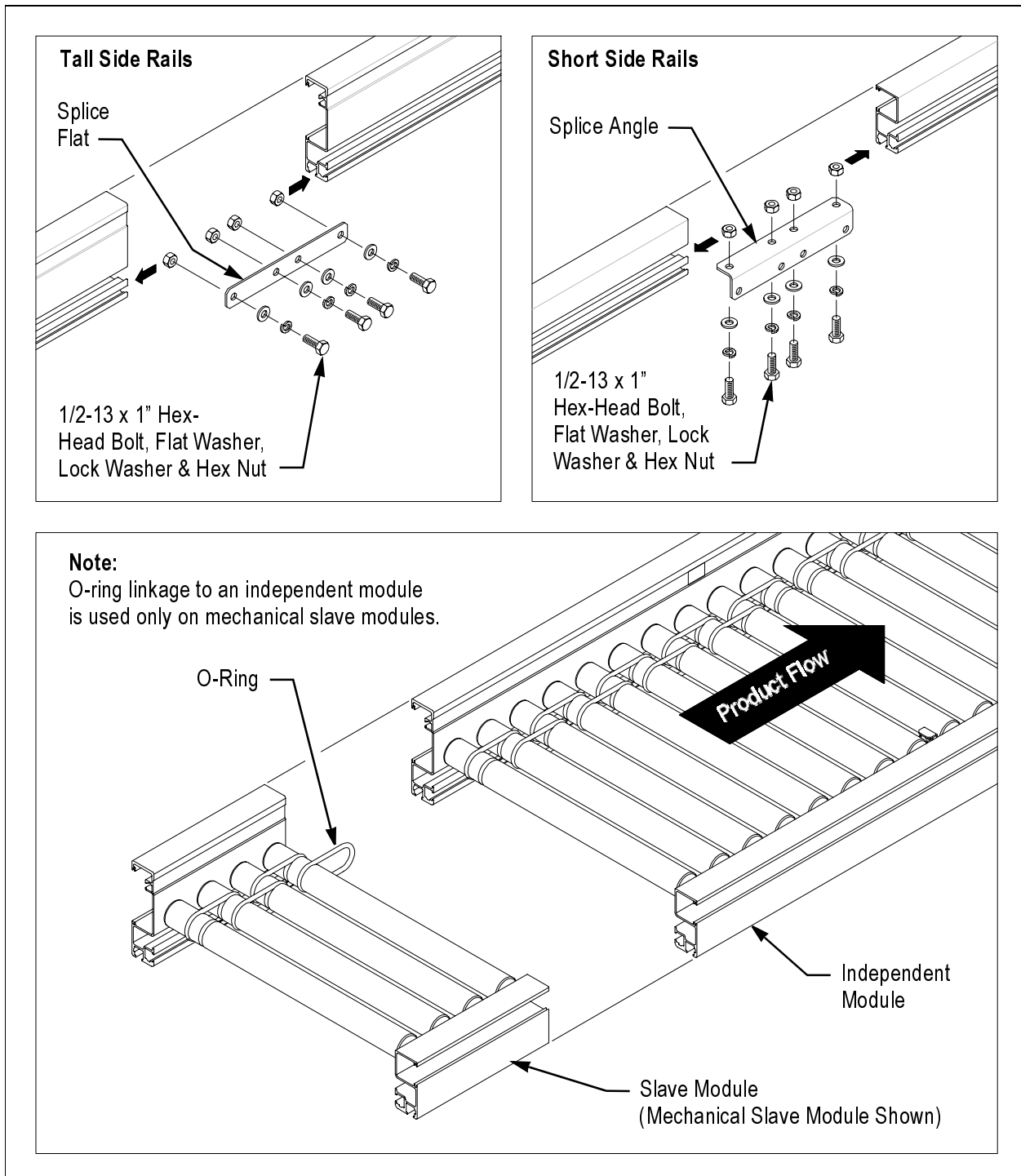


Figure G.2 – Attaching a Slave Module to an Independent Module

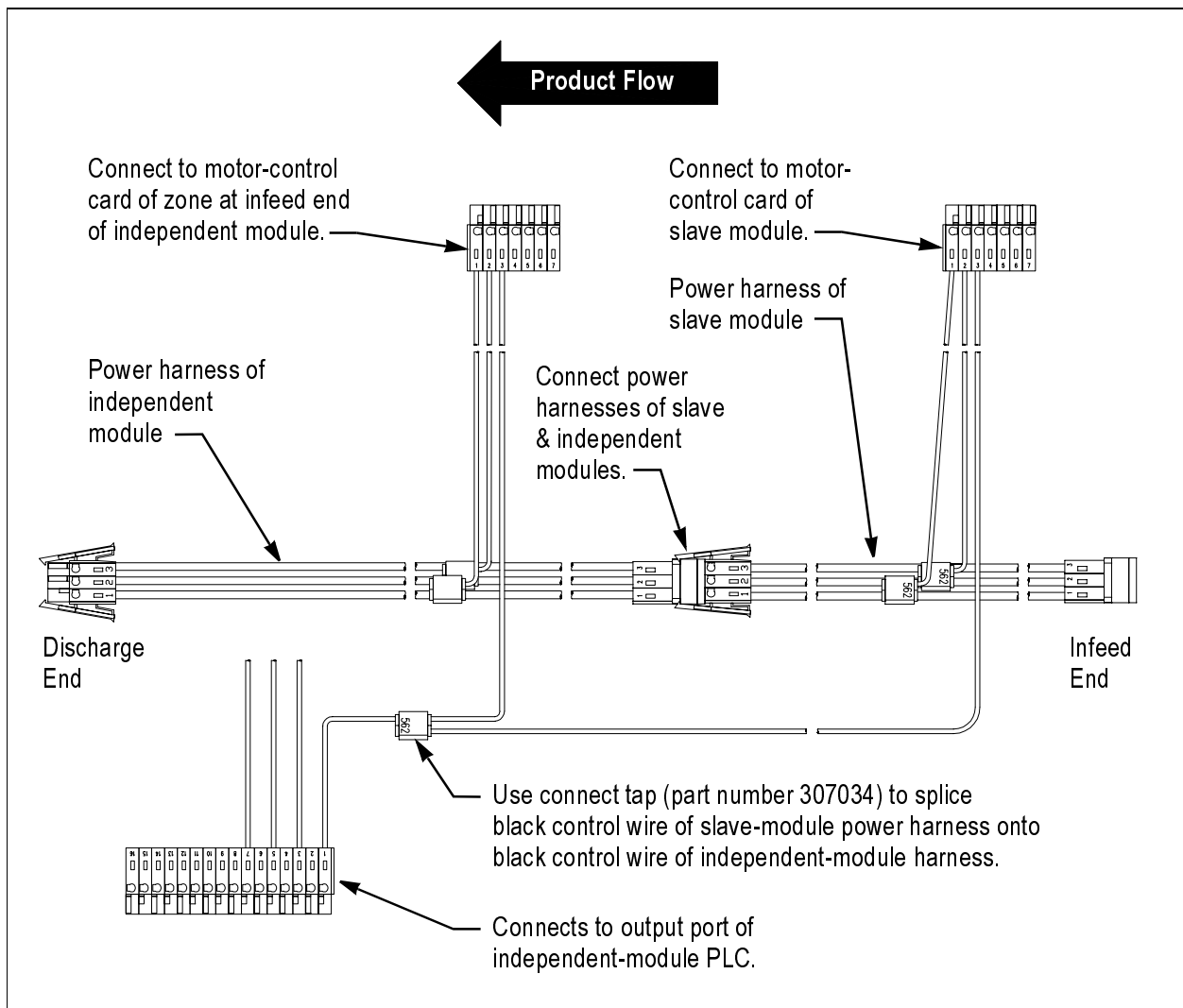


Figure G.3 – Wiring an Electrical Slave Module

Installing Supports

Attach supports to the underside of each section of conveyor using 1/2-13 x 1" hex bolts, flat washers, lock washers and hex nuts (see Figure G.4). Abut the support top to the underside of the side rail. Insert the hex nuts inside the channel along the underside of the side rail.

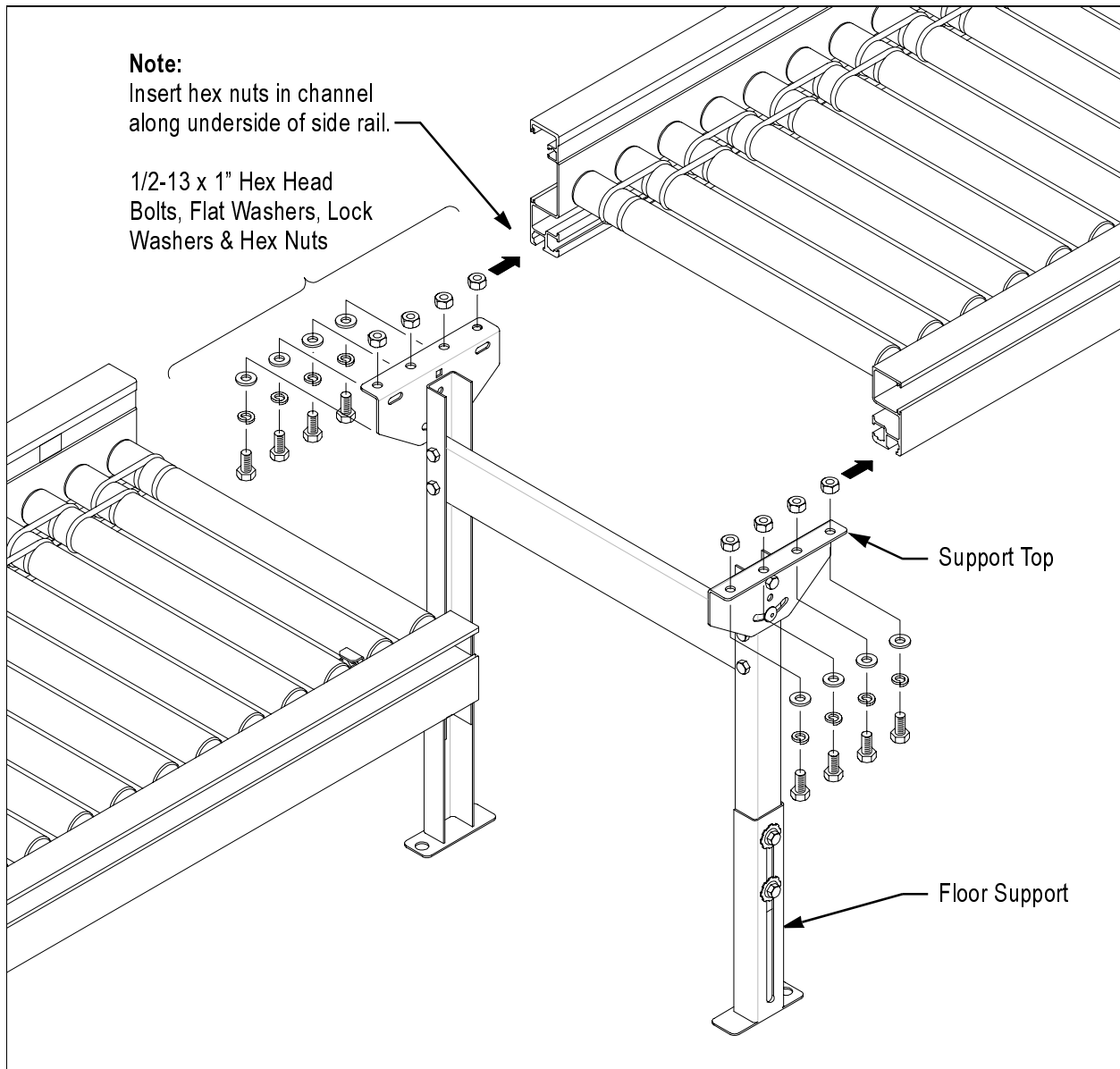


Figure G.4 – Installing a Floor Support

Place the first section of conveyor in its correct location according to the project layout drawings. Center the support feet on the chalk centerline, and anchor the support feet to the floor. For more complete information about installing supports, refer to Section G, "Installation Procedures" in the manual entitled *Floor Supports and Ceiling Hangers* (CS5310).

Locate modules sequentially according to the project layout, and anchor the support feet of the floor supports. Make certain to align each module with the adjacent module. Level the conveyor. A laser leveling method is recommended.

Providing Power

Note that a power supply (see Figure G.5) may be oriented in any position (right side up, upside down, on its side, etc.) without jeopardizing safety or proper operation. A power supply may be placed on the floor, mounted on a wall, to bracketry, or to the cross brace of a floor support.

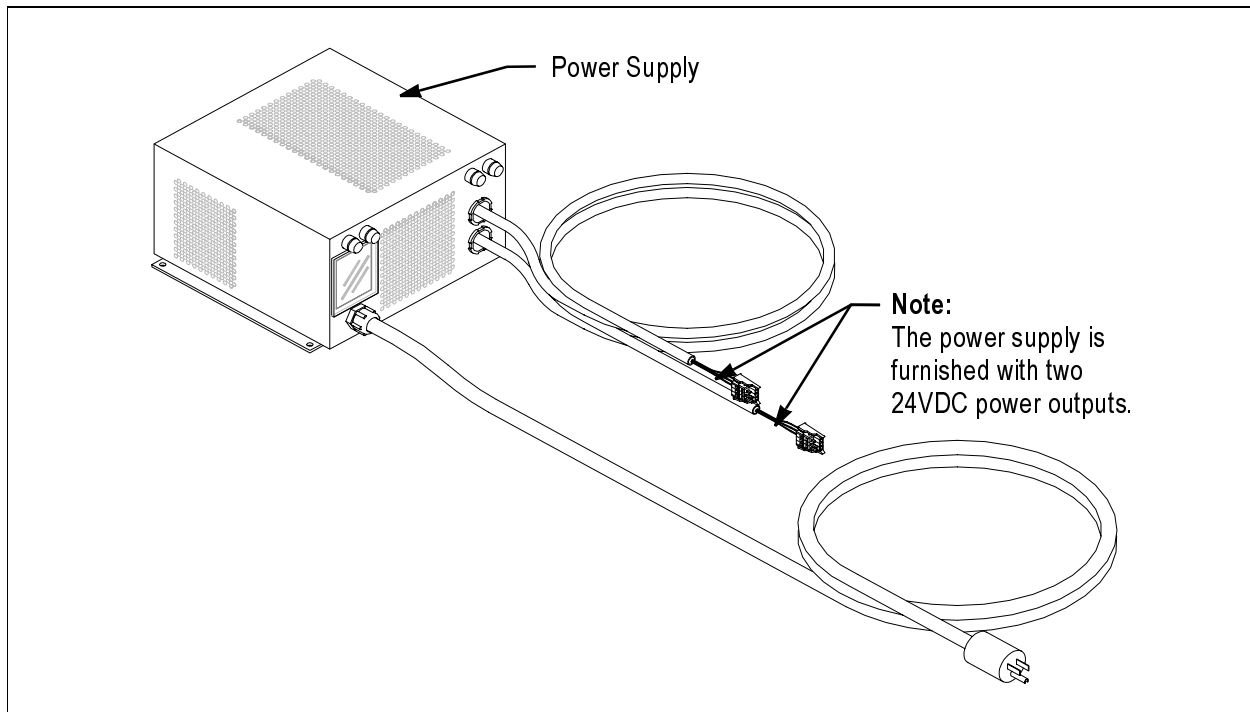


Figure G.5 – 24VDC Power Supply

Connect Power Harnesses

Connect the power harnesses (with grey, three-pin connectors) of contiguous modules together, and connect the power harness at one end to one of the power-supply outputs (see Figure G.6). Do not exceed eight drive rollers powered by a single power-supply output (maximum 16 drive rollers per power supply). Use the pass-through harnesses (with orange, three-pin connectors) of the modules closer to the power supply to provide power to a remote set of modules.

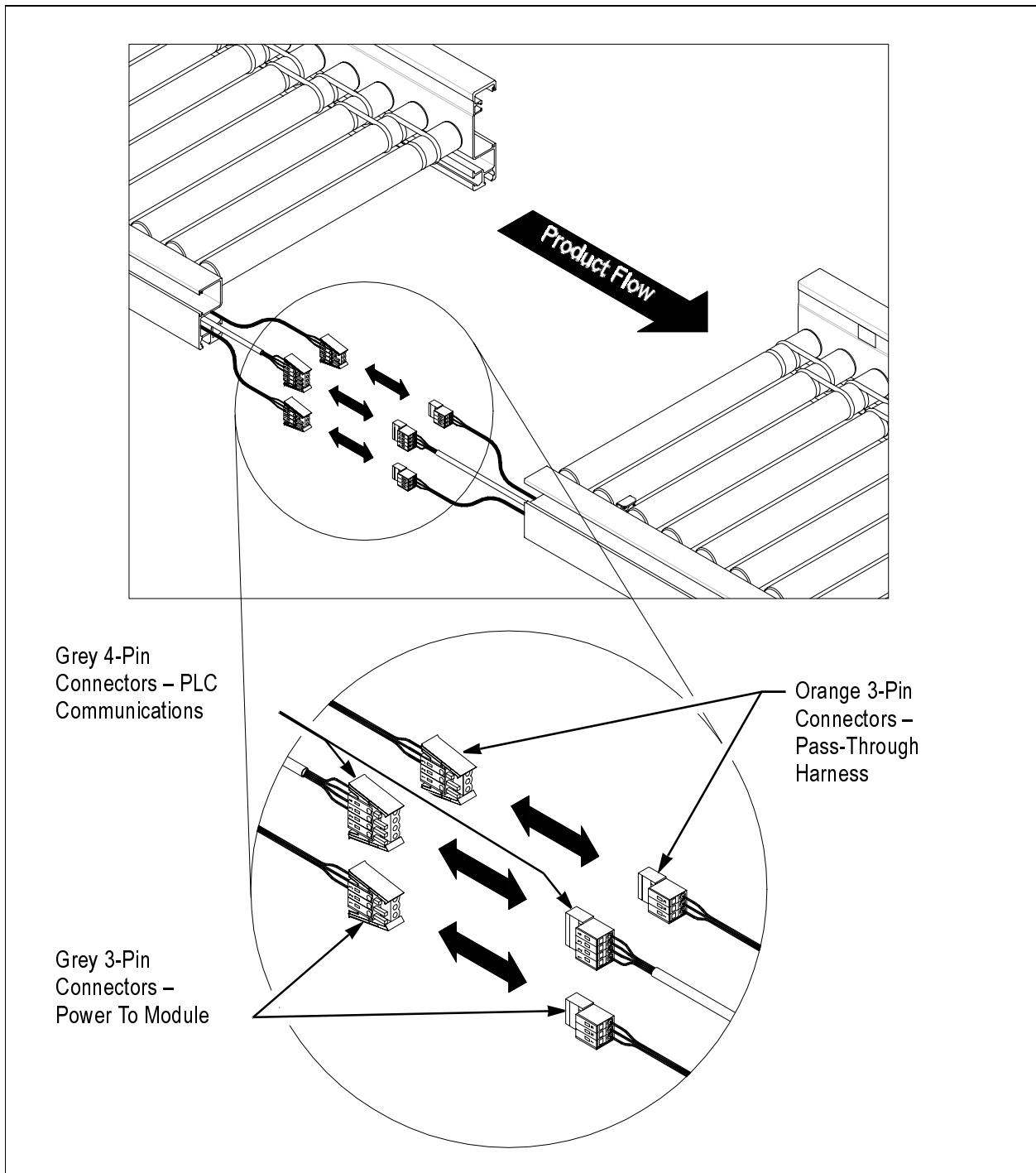


Figure G.6 – Connecting Harnesses Between Modules

Connect the Power Supply

A power supply may be connected either at the infeed end or at the discharge end (see Figure G.7)

Connect a power supply at the infeed end of a group of four four-zone modules as follows:

1. Locate the power supply at the infeed end and secure it as necessary.
2. Connect the power harnesses of modules 1 and 2 together.
3. Connect the power harness of module 1 to one power-supply output.
4. Connect the pass-through harnesses of modules 1 and 2 together.
5. Connect the power harnesses of modules 3 and 4 together.
6. Connect the power harness of module 3 to the pass-through power harness of module 2.
7. Connect the pass-through harness of module 1 to the second power-supply output.
8. It is not necessary to connect the pass-through harnesses of modules 3 and 4 together.
9. When all harnesses are connected, tuck all loose harness ends up behind the conveyor side rails and secure them as necessary.
10. Plug in the power-supply power cord.

Connect a power supply at the discharge end of a group of four four-zone modules as follows:

1. Replace the female connectors on the power-supply output cables with male connectors (part number 307000) (see Figure G.8).
 2. Locate the power supply at the discharge end and secure it as necessary.
 3. Connect the power harnesses of modules 3 and 4 together.
 4. Connect the power harness of module 4 to one power-supply output.
 5. Connect the power harnesses of modules 1 and 2 together.
 6. Connect the pass-through harnesses of modules 3 and 4 together.
 7. Connect the power harness of module 2 to the pass-through power harness of module 3.
 8. Connect the pass-through harness of module 4 to the second power-supply output.
 9. It is not necessary to connect the pass-through harnesses of modules 1 and 2 together.
 10. When all harnesses are connected, tuck all loose harness ends up behind the conveyor side rails and secure them as necessary.
 11. Plug in the power-supply power cord.
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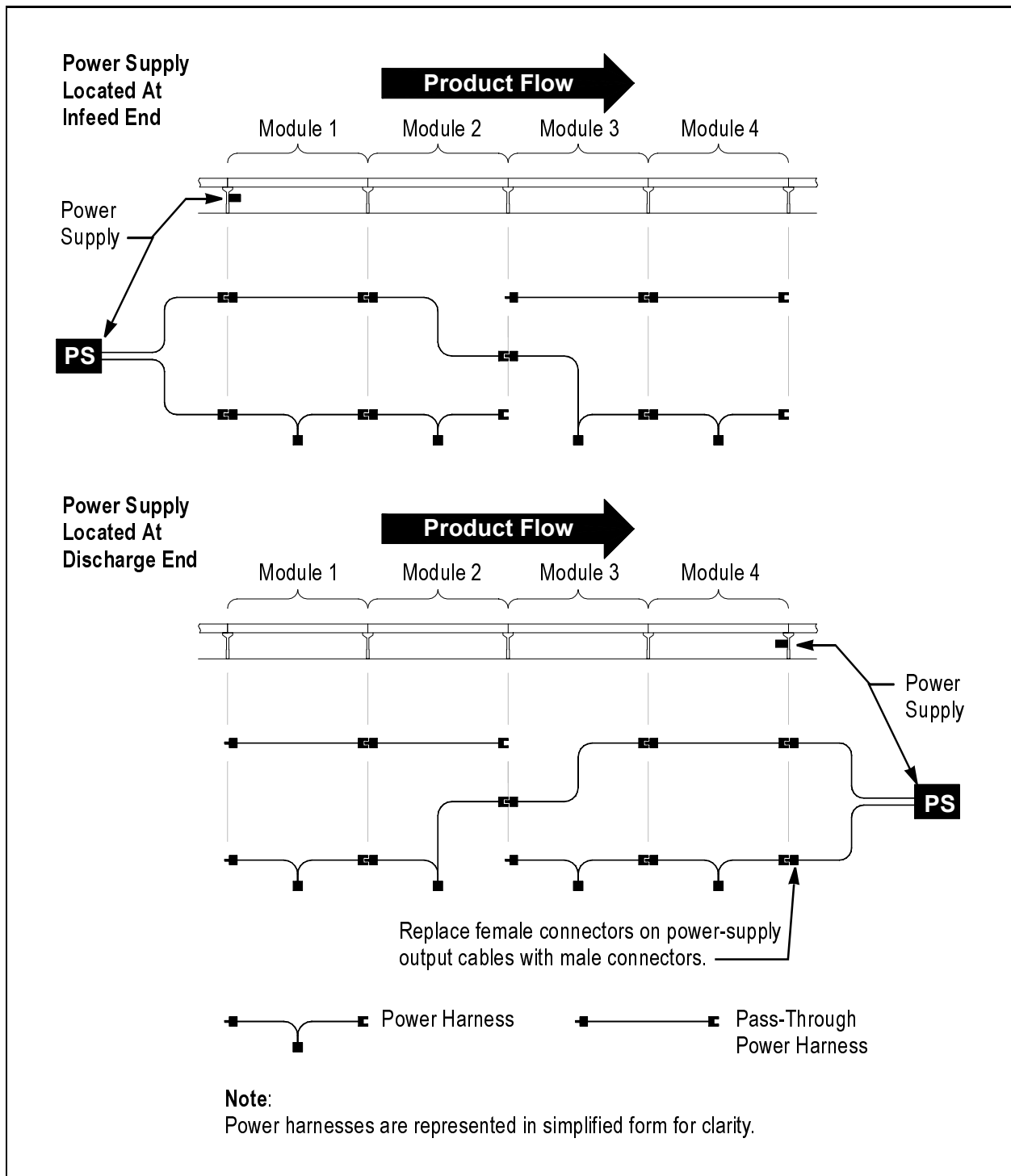


Figure G.7 – Connecting a Power Supply to a Group of Modules

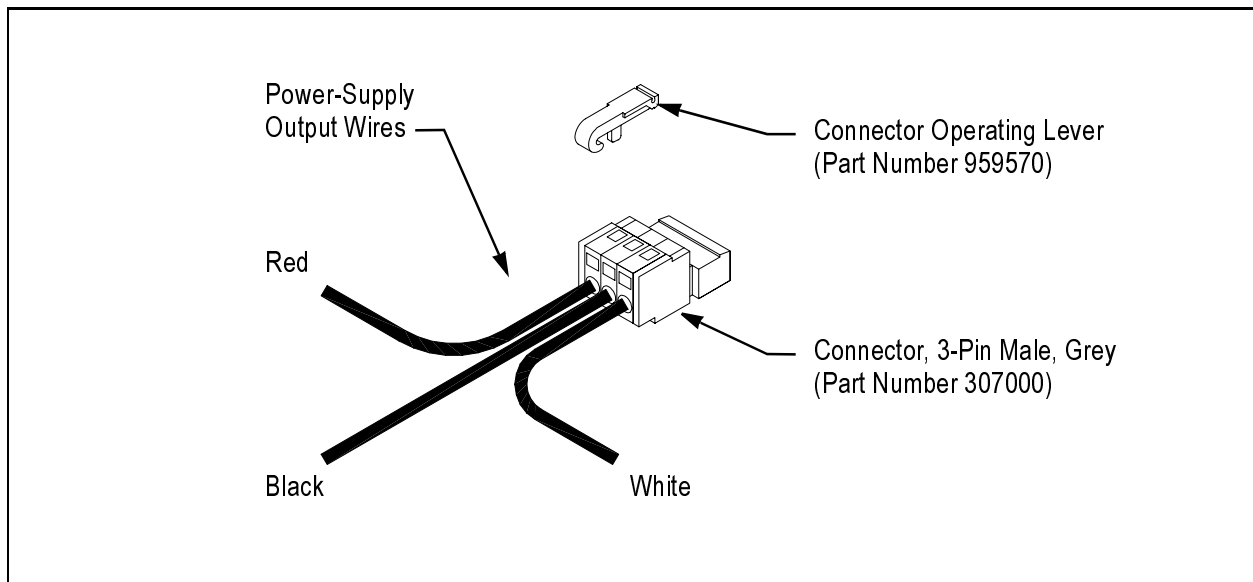


Figure G.8 – Wiring a Male Connector to a Power-Supply Output Cable

Changing PLC Location

If an independent module is furnished with the PLC on the left-hand side, and it is necessary to relocate it to the right-hand side, or vice versa, a cross-over harness must be used. A cross-over harness is a set of four wiring harnesses fastened at one end to a mounting plate, and extending across the conveyor to the PLC located on the opposite side.

Install the cross-over harness as follows (see Figure G.9):

- Mount the spreader channel to the inside of both side rails and above the PLC;
- Attach the cross-over harness mounting plate to the inside of the same side rail that contains the wiring harnesses, and adjacent to the spreader channel;
- Connect each of the four wiring harnesses that are normally connected to the PLC (power-to-module harness, photo-eye harness, output-to-motor-control harness, and peer-to-peer communication harness) to the corresponding cross-over harness connectors located on the mounting plate;
- Connect the free end of each of the cross-over harnesses to the corresponding port of the PLC; and
- Install the plastic spreader-channel cover, and secure it with cable ties.

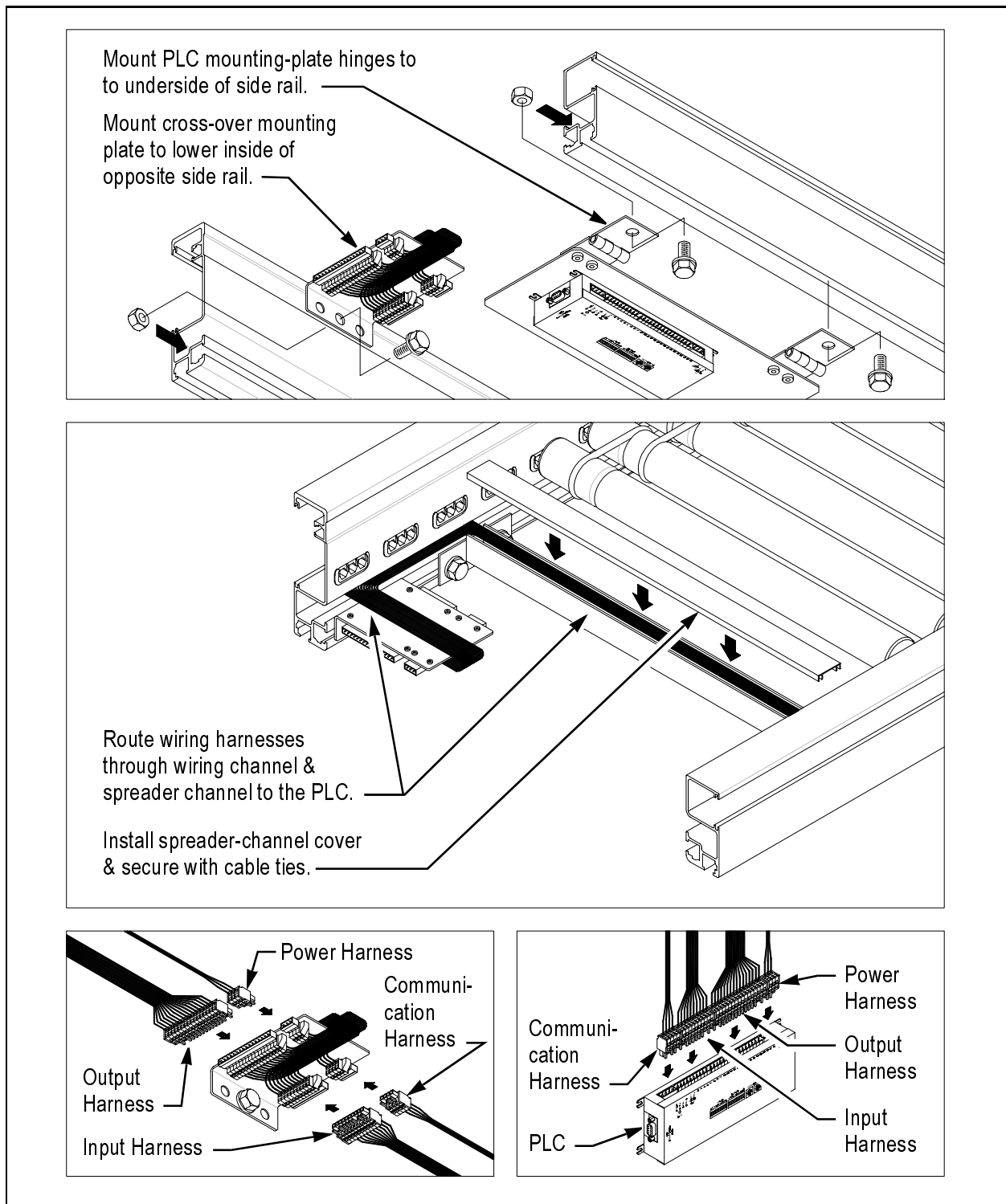


Figure G.9 – Installing a Cross-Over Harness

Connecting PLC Communication Harnesses

Pay special attention to the order in which PLC communication harnesses (with grey, four-pin connectors) are to be connected to the nodes throughout the system, especially at junction modules. A communication layout drawing generated for each project shows the correct arrangement of communication harnesses. Be certain to connect communication harnesses according to the layout drawing.

Caution!

Failure to connect communication harnesses according to the layout drawing may cause substantial delays in system installation.

A network of PLC communication harnesses must be connected together in a single, continuous string. Where two straight modules are abutted in-line, the PLC communication harness of one module is normally connected to the PLC communication harness of the adjacent straight module. At a junction, however, the continuity of PLC communication harnesses may proceed from the mainline conveyor, through the junction, and then return to the mainline conveyor. Special communication harnesses are typically made to accommodate such arrangements. Check the communication layout drawing to identify the part numbers and locations of all special communication harnesses.

Both terminal ends of the PLC communication network are free. In order for the network to operate properly, install the appropriate connector at each terminal end, and insert a resistor, as follows (see Figure G.10):

- At the infeed end of the network, add a female, 4-pin, grey connector.
- At the discharge end of the network, add a male, 4-pin, grey connector.
- Insert a 1/4-watt, 100-ohm resistor across pins #2 and #3 in each of the added connectors.

To open the spring clips enclosed within the connectors, use a lead-insertion tool. Insert the resistor leads as far as possible to locate the resistor directly against the connector surface. If necessary, trim the resistor leads. If necessary, wrap electrical tape over the resistor to

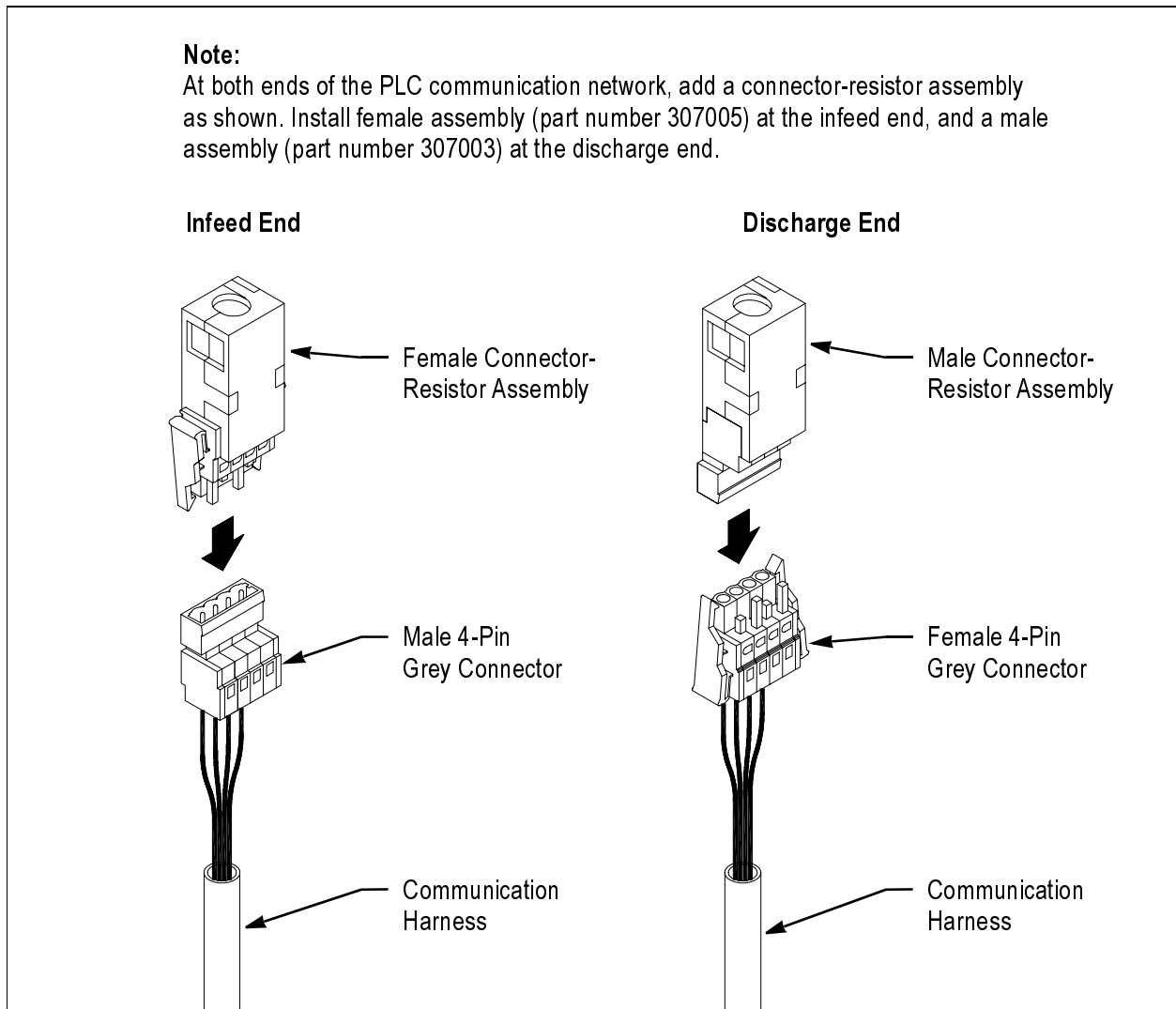


Figure G.10 – Installing Resistors at Terminal Ends of PLC Communication Network

Repeater (Signal Booster)

A network containing more than 64 nodes requires that a repeater (signal booster) be installed. The quantity and location of each repeater will be noted on the communication layout drawing. Be certain to install the repeaters in the locations shown on the drawing.

Checking Out Independent Modules – Straight & Curved

The following procedure applies to modules consisting of multiple zones in which the programmable logic controller (PLC) is programmed for ordinary, one-directional operation. Module configuration and PLC programming may vary according to project requirements. If questions about proper operation arise, consult the Controls Engineer for the project.

To check out independently operating modules, simulate a product moving along the conveyor. Block each of the photo-eyes in the same sequence as a product moving along the conveyor, from the infeed end of the module to the discharge end. To observe all the functions described, it may be necessary to repeat the steps several times.

Check the operation of independent modules by performing the following steps:

1. Ensure that power is applied to the system, and check that both the OK and the Run LEDs on the PLC light up.
 2. Block the photo-eye in the first zone at the infeed end of the module for approximately three seconds. Then unblock the photo-eye in the first zone and block the photo-eye in the second zone (the next zone downstream) for the same duration.
 3. Observe the following roller responses. Note that if a slaved module is linked to the independent zone being tested, either mechanically or electrically, the response will be the same for all rollers.
 - Rollers in a zone rotate as long as the photo-eye for that zone is blocked. Note that if the photo-eye is blocked longer than approximately four seconds, a timer in the PLC will shut off the rollers in that zone.
 - Rollers in a zone continue to rotate for a few seconds after the photo-eye for that zone becomes unblocked, and then they stop rotating.
 - The rollers in second zone (the next zone downstream) rotate and continue rotating until the photo-eye in the second zone is blocked and then unblocked.
 4. Observe the PLC Input and Output LED indicator responses.
 - The Input LED for the first zone lights up and remains on as long as photo-eye is blocked.
 - The Output LEDs for the blocked zone and for the next zone downstream light up as long as the corresponding rollers are rotating.
 - The Output LED for a zone goes off when the rollers stop in that zone stop rotating.
 - The Output LED for the a zone goes off a few seconds after the photo-eye for that zone becomes unblocked. The Output LED for the next zone downstream remain lit for a few seconds after the photo-eye in the second zone is blocked and then unblocked.
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5. If the independent module contains additional zones, repeat steps 2 through four for the remaining zones. Test overlapping pairs in sequence. For example, after checking out zones 1 and 2; then check out zones 2 and 3; then check out zones 3 and 4; and so on.
 6. After checking out the zones in one independent module, check out the pair of zones that straddle one module and the adjacent module downstream.
 7. After checking out adjacent zones across modules, check out the zones within the next independent module downstream.
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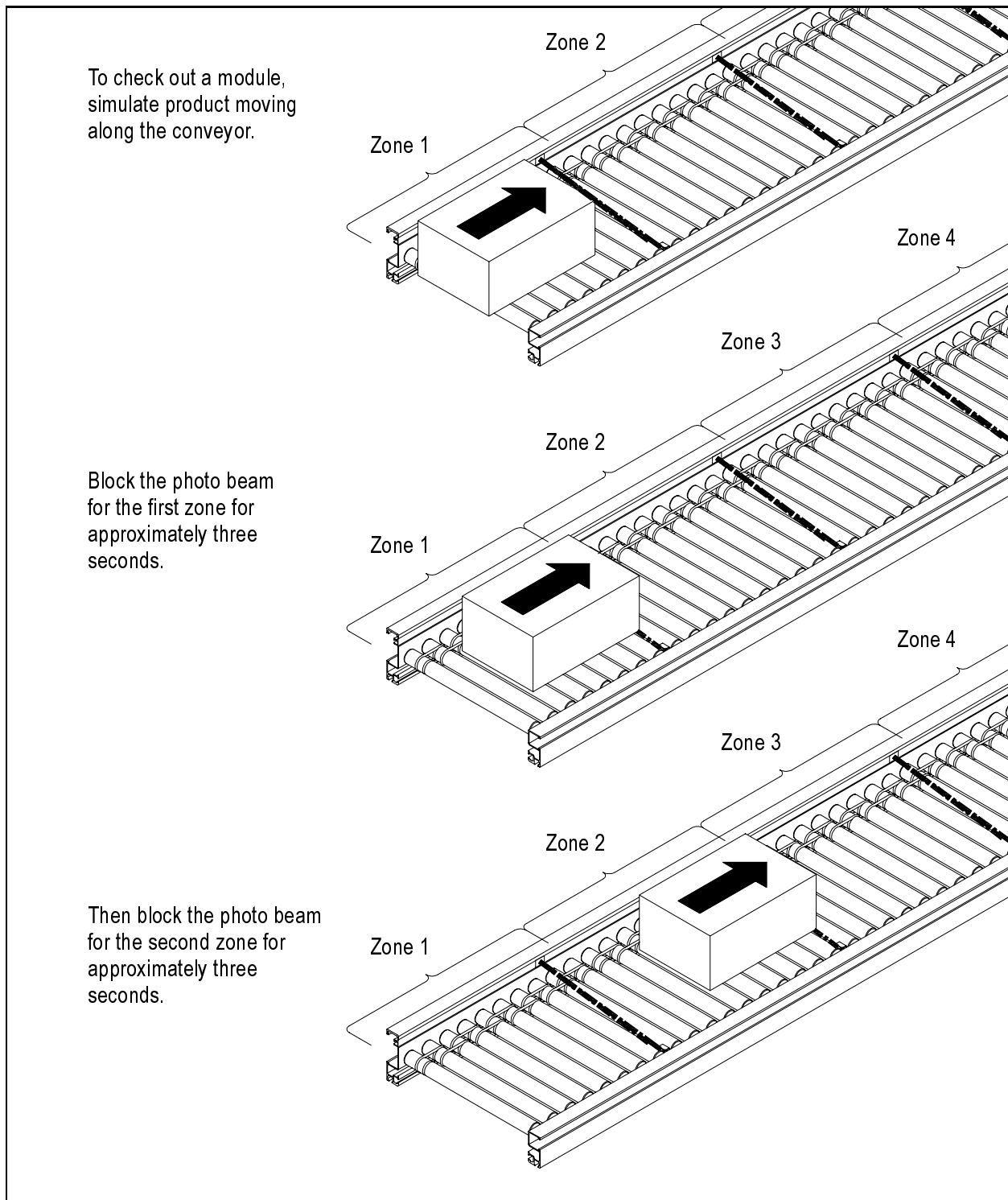


Figure G.11 – Checking Out a Module

TBC-24 Conveyor

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Section H – Maintenance

Introduction

Warning Signs

Warning signs and labels posted on or near the conveyor equipment shall not be removed, painted over, or altered at any time. All safety devices, warning lights, and alarms associated with the conveyor system should be regularly tested for proper operation and serviced as needed. If any original safety item becomes defective or damaged, refer to the conveyor parts lists and bills-of-material for replacement part numbers.

Safety Precautions

- Turn off conveyor power sources and affix appropriate lock-out and tag-out devices to operating controls before servicing the equipment. Only trained and qualified personnel who are aware of the safety hazards should perform equipment adjustments or required maintenance while the conveyor is in operation.
 - Observe all warning signs, lights, and alarms associated with the conveyor operation and maintenance, and be alert at all times to automatic operation of adjacent equipment.
 - Use extreme caution near moving conveyor parts to avoid the hazard of hands, hair, and clothing being caught.
 - Do not sit on, stand on, walk, ride, or cross (over or under) the conveyor at any time except where suitable catwalks, gates, or bridges are provided for personnel travel.
 - Do not attempt to repair any equipment while the conveyor is running, replace any conveyor component without appropriate replacement parts, or modify the conveyor system without prior approval by the manufacturer.
 - Do not operate the conveyor until all safety guards are securely in place, all tools and non-product materials are removed from or near the conveying surfaces, and all personnel are in safe positions.
 - Do not remove or modify any safety devices provided on or with the conveyor.
 - Do not clear jams or reach into any unit before first turning off the equipment power sources and affixing appropriate lockout and tag-out devices.
 - Frequently check safety guards, warning signs, lights, and alarms, and keep them in good condition to ensure the safety of all personnel.
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Parts Replacement

Spare Parts

To minimize production downtime, selected parts have been designated as “spare parts” because they are crucial for proper operation, and they are prone to failure. These parts are identified in Section I, “Spare Parts.” To minimize down time, maintain a reserve stock of designated spare parts at the quantities recommended in the spare parts proposal. For further information, contact the Customer One Protection (COP) department.

Replacement Parts

Parts not designated as spare parts may be replaced if necessary. To identify parts not designated as spare parts, refer to the bills of material for the equipment provided.

Factory Assistance

Contact Field Service for installation, operation, or maintenance assistance, or Customer One Protection (COP) for replacement parts.

Scheduled Maintenance

The schedule for recommended service checks and equipment maintenance presented herein are provided as a guide (see Table H.1). These recommendations apply to typical, intermittent-duty (8 hours per day, 5 days per week) operation, above freezing temperature (40°F to 110°F). Continuous-duty operation or extreme environmental conditions may require more frequent maintenance. The ideal maintenance schedule may best be determined by performing maintenance more frequently than recommended when the combiner is first put into operation, and then lengthening the intervals based on experience. In any case, the intervals should not exceed those recommended herein.

Initial Startup & Run-In Period

Before operating the TBC-24 conveyor for the first time, make certain that the system has passed all inspections and checks associated with installation. Make certain that tools, rags and other foreign objects have been removed.

Check that all electrical connections are intact. Make certain that all safety devices are in their proper position and that all fasteners are tight.

All newly installed equipment should be inspected frequently and serviced as needed during the first 40 hours of operation. Thereafter the most appropriate maintenance program should be determined and followed.

Table H.1 – Scheduled Maintenance Summary

Interval	Components	Unusual Noises	Cleanliness	Obstructions	Tension	Physical Condition	Proper Position	Alignment	Fasteners	Operation
Daily (8 Hours)	TBC-24 System	X								X
	Photo Eyes		X	X						
Weekly (40 Hours)	O-Rings				X	X				
	Photo-Eyes							X		
	Rollers					X				X
	General Structure					X	X		X	
	Guards & Safety Devices					X	X		X	
	Supports					X			X	

Daily Inspections

Conduct a walk-through inspection daily. For continuous-duty operation, conduct inspections once each shift. Become familiar with the normal behavior of the conveyor, especially with the sounds of normal operation. This familiarity will serve as an invaluable frame of reference for detecting unusual noises that may occur. Report any unusual noise or operational problems immediately, and correct any faulty conditions promptly.

Check the operation of photo-eyes. Remove any foreign objects lodged between photo-eyes, mounting brackets and other features. Wipe photo-eyes and reflective tape as necessary with a clean, soft cloth. For additional maintenance information, refer to the instructions provided by the photo-eye manufacturer.

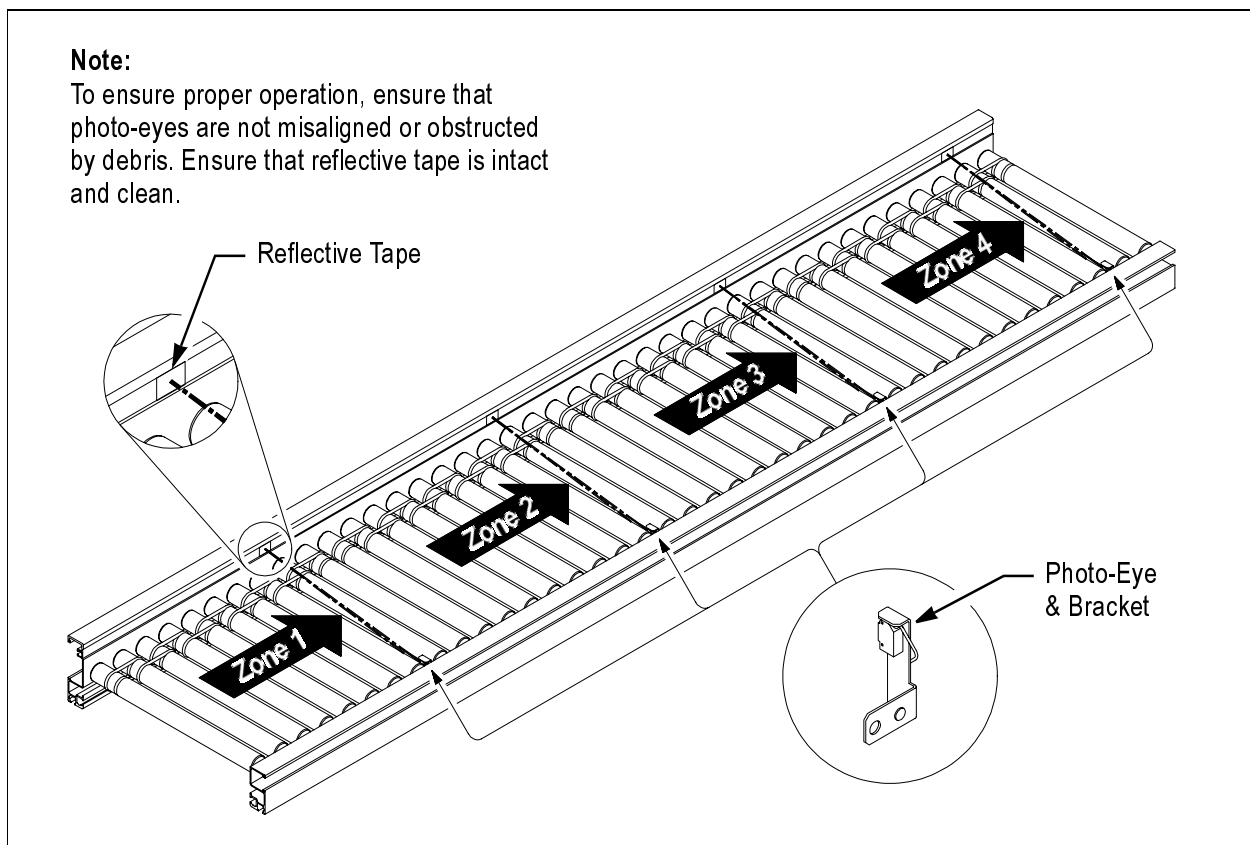


Figure H.1 – Photo-Eyes & Reflective Tape

Weekly Inspections

Check the physical condition and tension of the O-rings. O-rings should be clear (transparent) and pliable, but not loose. If an O-ring is “milky” in color, its surface is scuffed and worn, and it may need to be replaced. Also check O-rings by pressing against them. If an O-ring is not pliable, or if it is loose, replace it.

Check rollers for proper operation. If rollers move erratically, or if roller axles rattle in isolator inserts, inspect to determine the cause, and take corrective action accordingly. If the rattling is due to worn isolator inserts, replace the inserts. To determine whether rollers are operating at the proper speed, use a tachometer.

Check the general structure of the conveyor is sound. Make certain that the supports are stable and secure and that all guards and safety devices are in good condition.

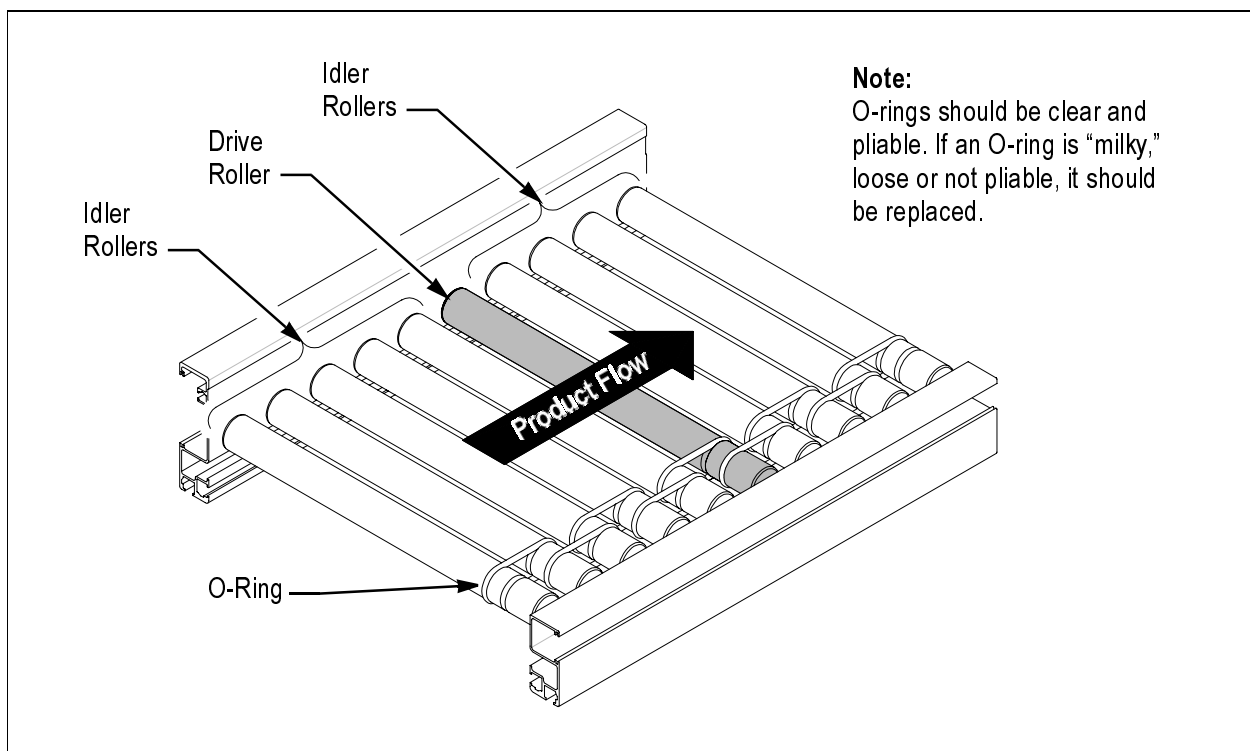


Figure H.2 – Checking O-Rings

Troubleshooting

Troubleshooting for straight modules is outlined in Table H.2. Refer to Figure H.14 and Figure H.15.

Table H.2 – Troubleshooting

Problem	Possible Causes	Corrective Action
The PLC OK & RUN LEDs do not light up when power is applied.	No 24 VDC input to the PLC. The PLC is defective.	<ol style="list-style-type: none"> 1. Ensure that the PLC power-input connector is connected firmly. 2. Check for 24 VDC between pins 1(+) and 2(-) on the 24 VDC input jack to the PLC. <ul style="list-style-type: none"> • If 24 VDC is present, replace the PLC. • If 24 VDC is not present, proceed to step 4. 3. Check the power source for proper output and connections. <ul style="list-style-type: none"> • If power-source connections are incorrect, repair or replace the power source. • If power-source connections are correct, check all wiring harnesses and connectors between the power source and the PLC. 4. Repair or replace the connector as required.
Rollers do not rotate in the zone with the blocked photo-eye or in next zone downstream. PLC input and output LEDs do not light up.	The photo-eye is defective. Wiring between the photo-eye and the PLC is defective. The PLC is defective.	<ol style="list-style-type: none"> 1. Check that the photo-eye light is on. <ul style="list-style-type: none"> • If the photo-eye light is not on, perform step 2. • If the photo-eye is on, proceed to step 3. 2. Using a multimeter, check for 12 VDC between pins 9(+) and 10(-) on PLC input connector. <ul style="list-style-type: none"> • If voltage is not present, replace the PLC. • If voltage is present, check for 12 VDC between pins 2(+) and 3(-) on the photo eye-connector. If voltage is present, replace the photo-eye. If voltage is not present, repair the wiring between the PLC and the photo-eye.

Problem	Possible Causes	Corrective Action
		<ol style="list-style-type: none"> 3. Check for 12 VDC between pins 1(+) and 3(-) on the photo-eye connector. <ul style="list-style-type: none"> • If voltage is present, replace the photo-eye. • If voltage is not present, proceed to step 4. 4. Check for 12 VDC between PLC pin 10(-) and input pins 1, 2, 3, or 4(+), depending on which zone is defective. <ul style="list-style-type: none"> • If voltage present, replace the PLC. • If voltage is not present, repair the wiring between the PLC and the photo-eye.
<p>Rollers in a zone with the photo-eye blocked do not rotate. Rollers in the downstream zone rotate. All PLC indicator lights have correct indication.</p>	<p>Defective wiring between the motor-control card and the PLC.</p> <p>Defective wiring between the power supply and the motor-control card.</p> <p>Defective PLC.</p> <p>Defective motor control card for the affected zone.</p> <p>Defective drive rollers.</p>	<ol style="list-style-type: none"> 1. Check whether the green LED on the motor-control card is on. <ul style="list-style-type: none"> • If the green LED is not on, proceed to step 2. • If the green LED is on, proceed to step 3. 2. Remove power from the motor-control card, and check the motor-control card fuse. <ul style="list-style-type: none"> • If the fuse is blown, proceed to step 3. • If the fuse is not blown, proceed to step 4. 3. Disconnect the drive-motor connector from the motor-control card. Replace the motor-control fuse and apply power to motor-control card. <ul style="list-style-type: none"> • If the motor-control fuse blows, replace the motor-control card. • If the motor-control fuse does not blow, replace the drive roller. 4. Check for 24 VDC between pins 1(+) and 2(-). <ul style="list-style-type: none"> • If voltage is present, proceed to step 5. • If voltage is not present, repair defective wiring between the power input connector at the infeed end of the conveyor and the motor-control card connector. 5. Check for a low (sink) between PLC output connector pin 1 of the PLC 24 VDC power input connector and pin 1, 3, 5, or 7, as applicable. <ul style="list-style-type: none"> • If low output is present, proceed to step 6. • If voltage is not present, replace the PLC.

Problem	Possible Causes	Corrective Action
		<ol style="list-style-type: none"> 6. Check for low (sink) output between motor-control card connector pins 3 and 2. <ul style="list-style-type: none"> • If low (sink) output is present, proceed to step 7. • If low (sink) output is not present, repair the defective wiring harness between the PLC input connector and the motor-control card connector. 7. Temporarily replace the motor-control card with a motor-control card known to be good. <ul style="list-style-type: none"> • If the drive roller rotates, replace the defective motor-control card. • If the drive roller does not rotate, replace the defective drive roller.
<p>Rollers in the zone with the blocked photo-eye do rotate, but rollers in the next zone downstream do not rotate. The next zone downstream is in the same module as the zone with the blocked photo-eye.</p>	<p>Defective wiring, defective PLC.</p> <p>Defective motor-control card.</p> <p>Defective drive roller.</p>	<ol style="list-style-type: none"> 1. Perform a checkout of the affected zone.
<p>Rollers in the zone with the blocked photo-eye do rotate, but rollers in the next zone downstream do not rotate. The next zone downstream is in the adjacent module.</p>	<p>Defective data cable.</p> <p>Defective wiring.</p> <p>Defective PLC.</p> <p>Defective motor-control card.</p> <p>Defective drive roller.</p>	<ol style="list-style-type: none"> 1. Check all connectors between the data inputs to both PLCs. If all connections are intact, proceed to step 2. 2. Check cable continuity. <ul style="list-style-type: none"> • If continuity is incorrect, repair or replace as necessary. • If continuity is correct, perform a checkout of the affected zone.

Problem	Possible Causes	Corrective Action
Rollers in a zone rotate too slowly.	Defective bearings in an idler roller. Defective drive roller. Voltage regulator on motor-control card set too low.	<ol style="list-style-type: none"><li data-bbox="753 369 1419 760">1. Use a tachometer to check roller speed. Remove the O-rings between the drive roller and the adjacent idler rollers and check the speed of the drive roller alone.<ul style="list-style-type: none"><li data-bbox="808 489 1419 583">• If the drive roller operates at the proper speed, check the idler rollers, and replace any idler roller that has defective bearings.<li data-bbox="808 600 1419 760">• If the drive roller operates too slowly, increase the setting of the voltage regulator on the motor-control card. If the problem persists, recheck using a motor-control card known to be good. If the problem persists, replace the drive roller.

Selected Maintenance Procedures

Servicing the Motor-Control Card

Each motor-control card is furnished with a five-amp fuse located within the rectangular recess in the card housing (see Figure H.3). To replace the fuse, pry out the old fuse gently with a flat screwdriver, and snap in the replacement.

The motor-control card has two light-emitting diodes (LEDs), one green and the other red. When the green LED is lit, it indicates that the power is “On.” When the red LED is lit, it indicates an output error.

The motor-control card is furnished with two DIP switches, identified as “1” and “2,” and with a voltage regulator. Setting DIP switch #1 to “On” enables the voltage regulator. The voltage regulator adjusts the operating speed of the drive roller. Drive-roller speed is set at the factory, and adjustment is normally not necessary. Setting DIP switch #1 to “Off” disables the voltage regulator. Toggling DIP switch #2 between “On” and “Off” alternates the direction of drive-roller rotation.

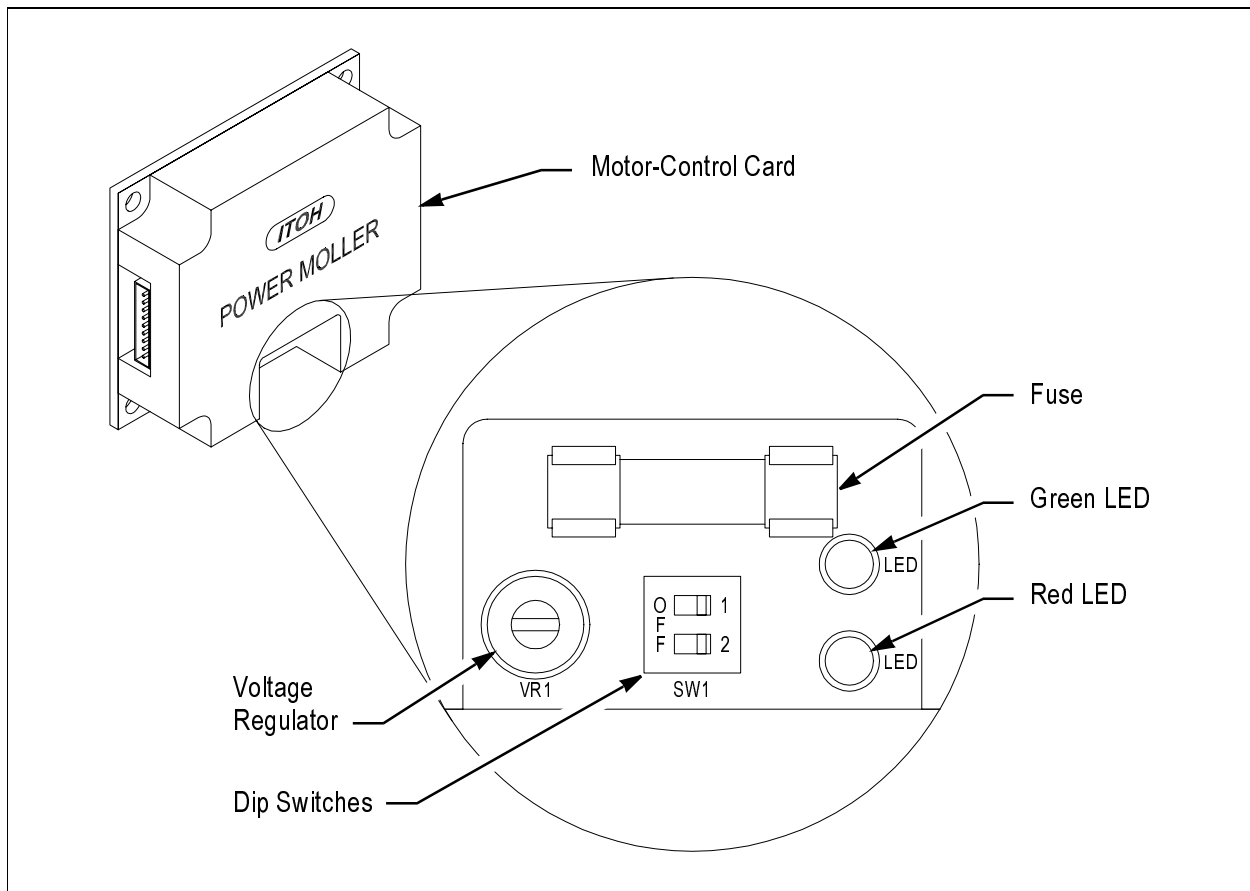


Figure H.3 – Motor-Control Card

Replacing Drive Rollers

If necessary, a drive roller may be replaced easily (see Figure H.4 and Figure H.5).

To remove the old drive roller, unplug the power cable from the motor-control card. Remove the power cable from the cable clip, and gently pull the power cable out through the hex hole in the isolator insert. At the end of the roller opposite the power cable, depress the spring-loaded axle and lift the end out of the isolator insert and above the conveyor side rail. Remove the O-rings linking the drive roller to the adjacent idler rollers. Withdraw the roller end with the power cable from the isolator insert. To keep the wiring to the connector intact, draw the cable through the hex hole in the isolator insert gently.

To install a new drive roller, insert the power cable, connector first, through the center hex hole in the isolator insert. (If the rollers are to be skewed, one of the side hex holes may be used instead.) When handling the power cable, take care not to disconnect any or the wires from the connector. Guide the roller axle into the isolator insert. Install the O-rings connected to the adjacent idler rollers. At the end of the roller opposite the power cable, depress the spring-loaded axle and guide the axle into the isolator insert. Route the power cable through the side hole closer to the cable clip, and connect the power-cable connector into the output port of the motor-control card. Be certain to secure the power cable in the cable clip adjacent to the roller.

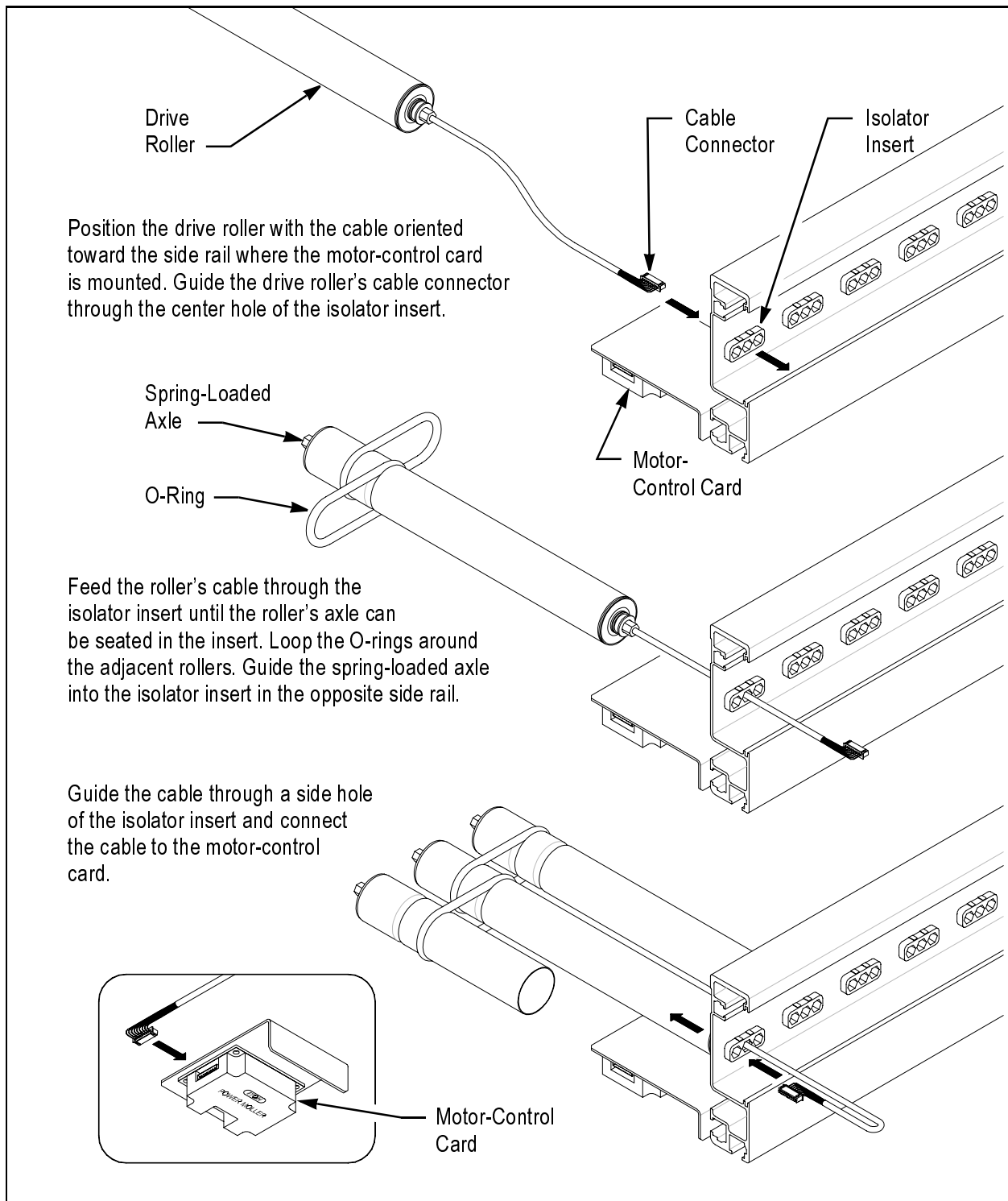


Figure H.4 – Installing A Drive Roller

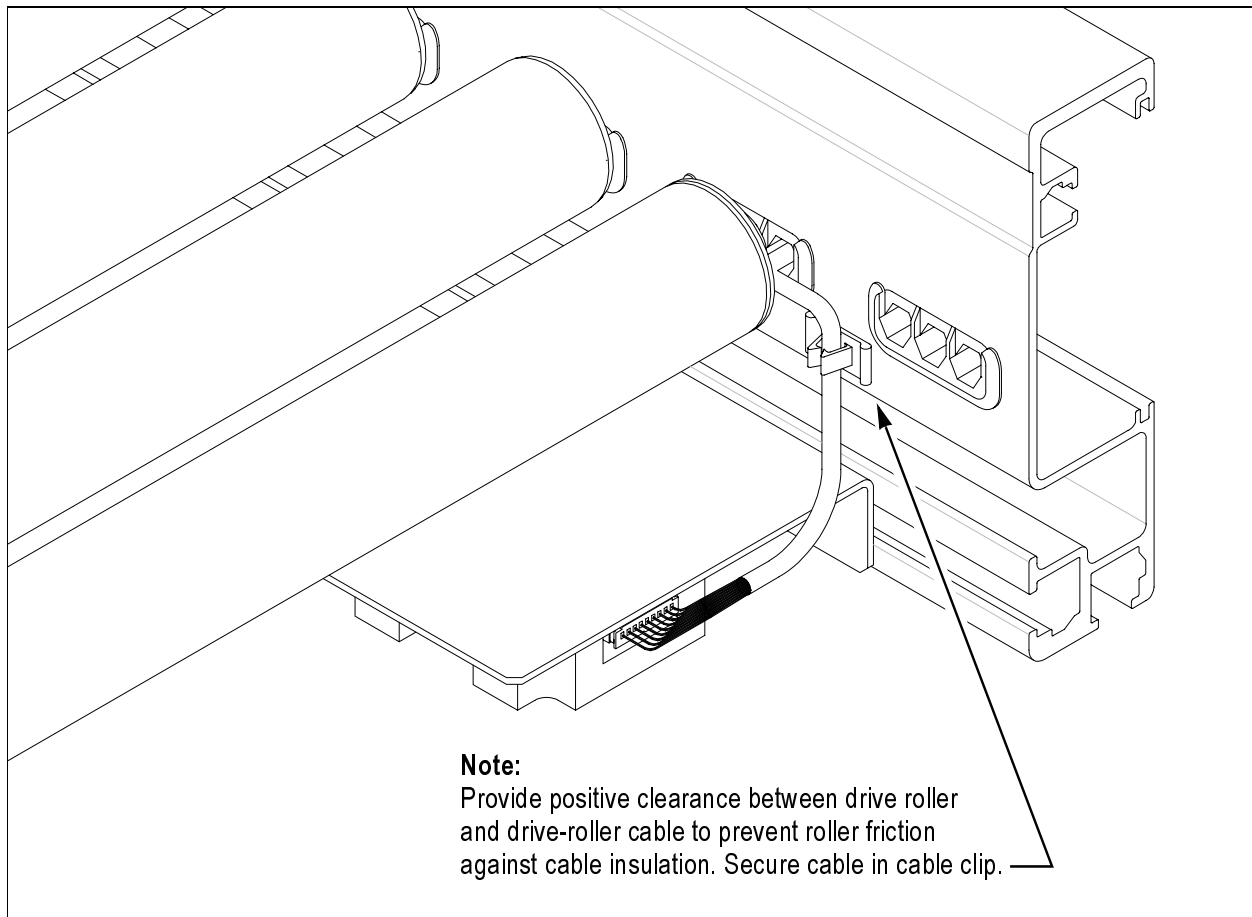


Figure H.5 – Securing the Drive-Roller Cable

Rewiring Harness Connectors

If a connector must be replaced, it will be necessary to wire the new connector. Diagrams are provided for the four principal wiring harnesses used in the TBC-24:

- Power Harness (see Figure H.6),
- Pass-Through Power Harness (see Figure H.7),
- Communication Harness (see Figure H.8), and
- Photo-Eye Harness (see Figure H.9)

The diagrams show which wire color is to be routed to each pin of the connectors. Exact configurations of some harnesses vary according to the quantity of zones. Illustrations of complete harnesses are shown in Section I, "Spare Parts."

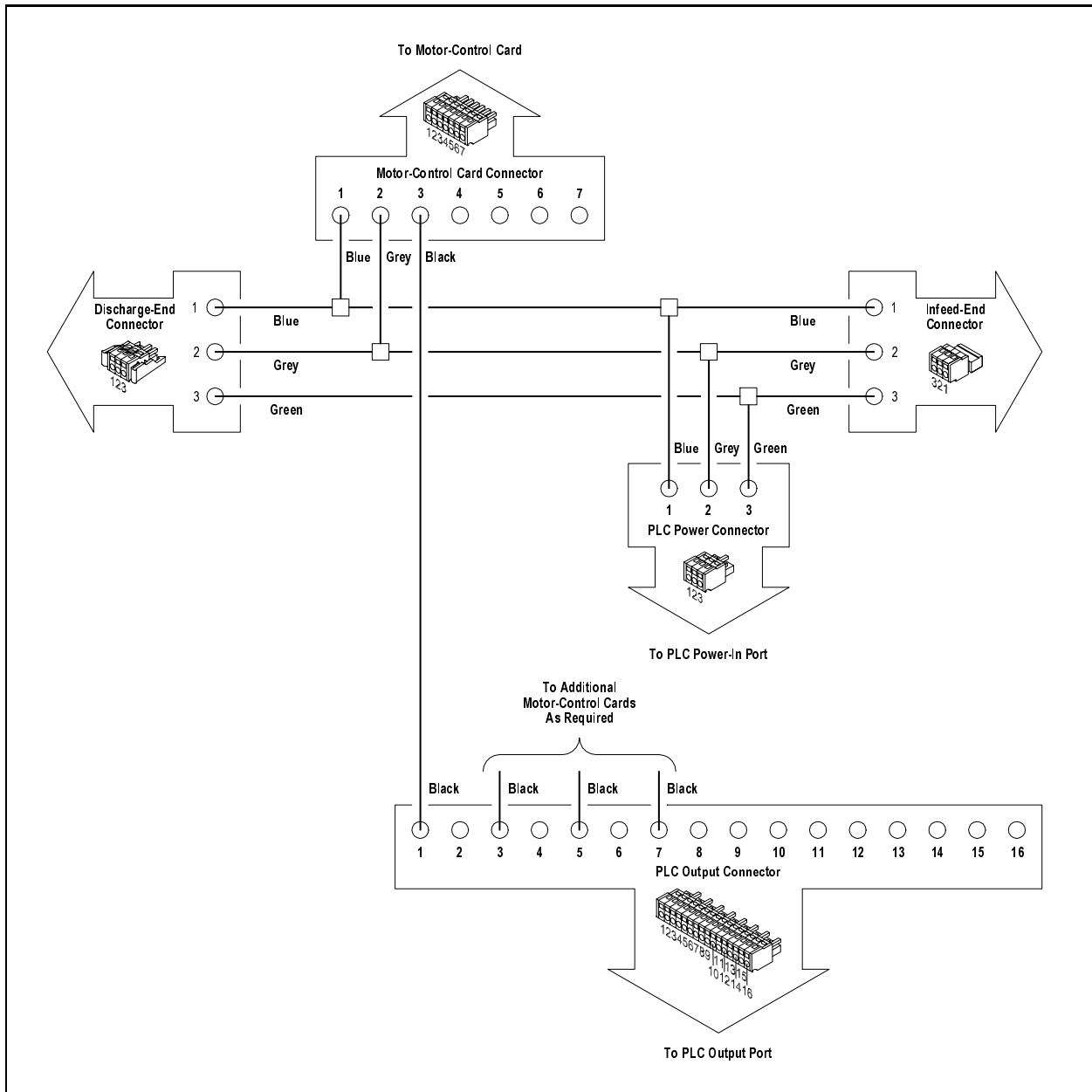


Figure H.6 – Wiring Connectors on a Power Harness

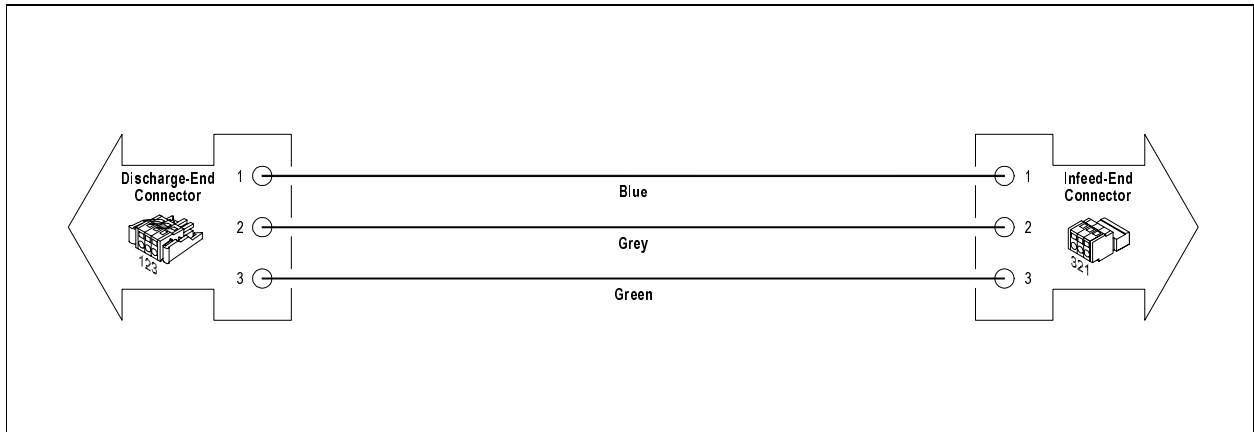


Figure H.7 – Wiring Connectors on a Pass-Through Power Harness

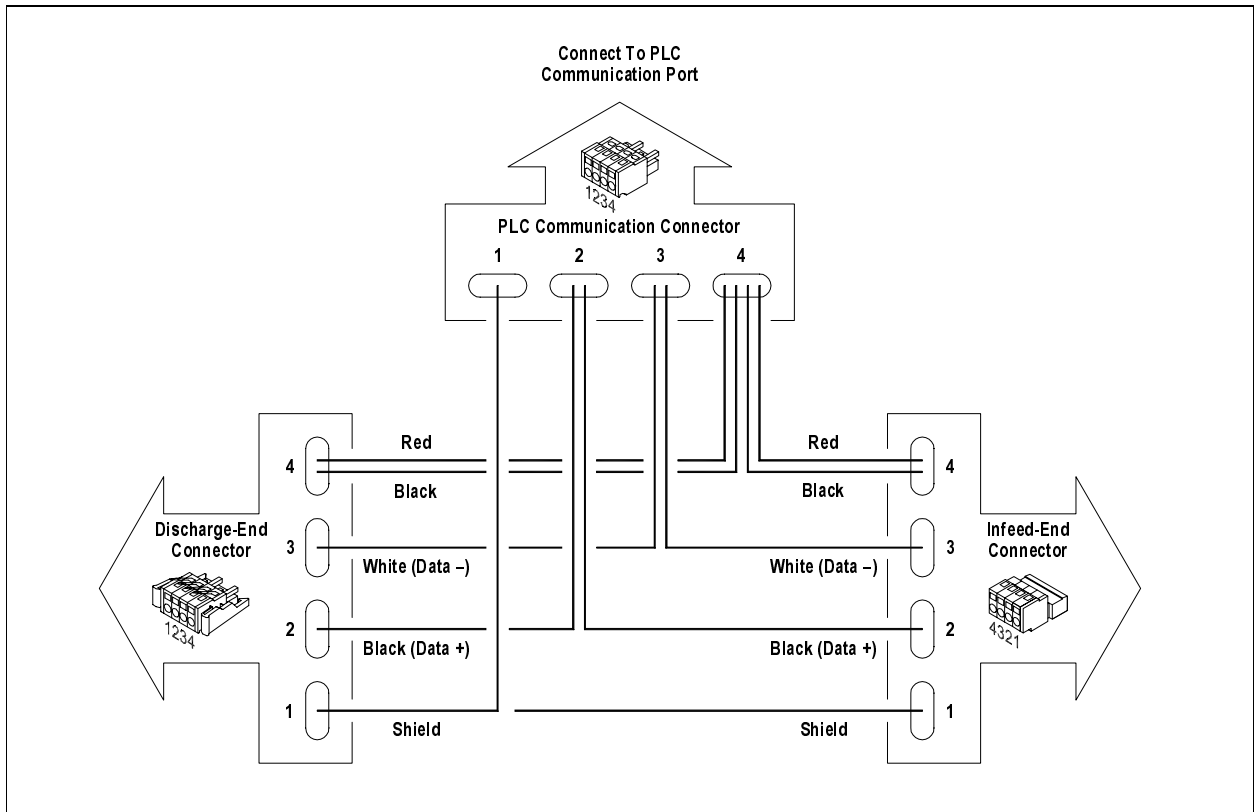


Figure H.8 – Wiring Connectors on a PLC Communication Harness

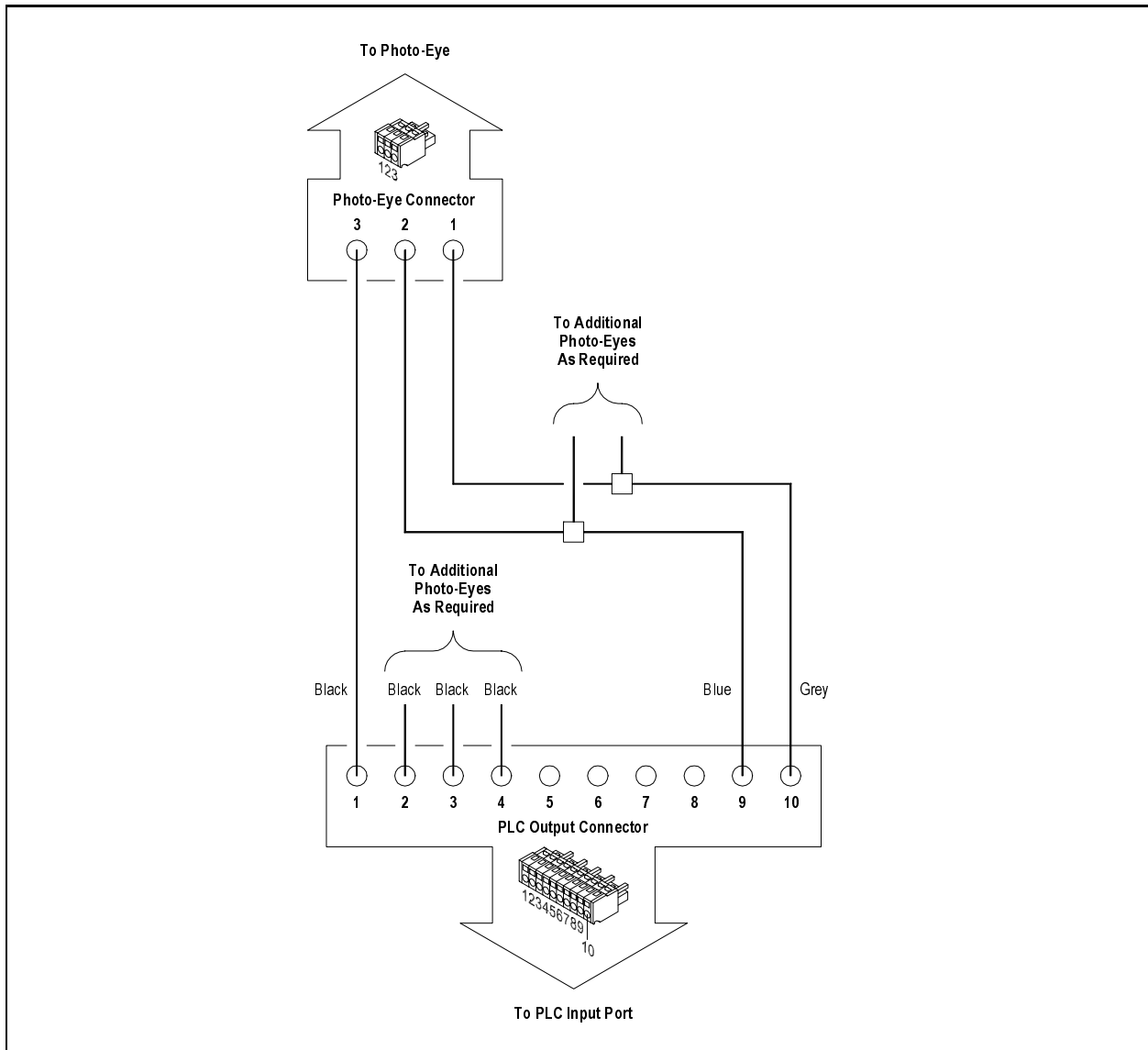


Figure H.9 – Wiring Connectors on a Photo-Eye Harness

Section I – Spare Parts

Introduction

Selected parts have been designated as “spare parts” because they are crucial for proper operation, and they are subjected to wear. To minimize down time, maintain a reserve stock of designated spare parts at the quantities recommended in the spare parts proposal. For further information, contact the Customer One Protection (COP) department. Be certain to replenish spare-part stock as spare parts are used.

In addition to spare parts, the illustrations that follow show many related parts that are not classified as “spare parts.” Callouts are keyed to tables that follow the illustrations. The tables list part numbers and descriptions and indicate whether each part is classified as a spare part.

Mechanical Components

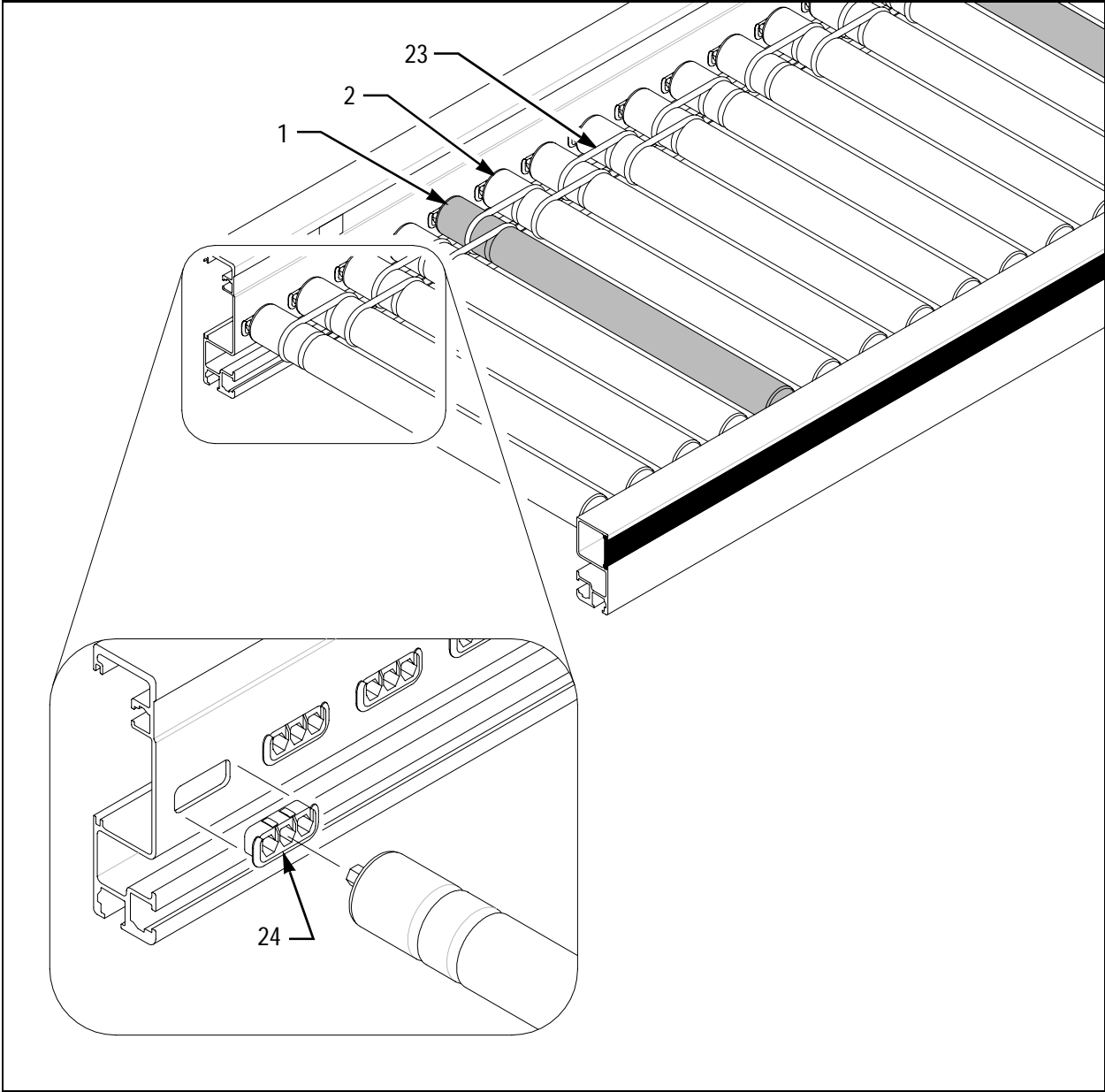


Figure I.1 – Drive & Idler Rollers – Straight Modules

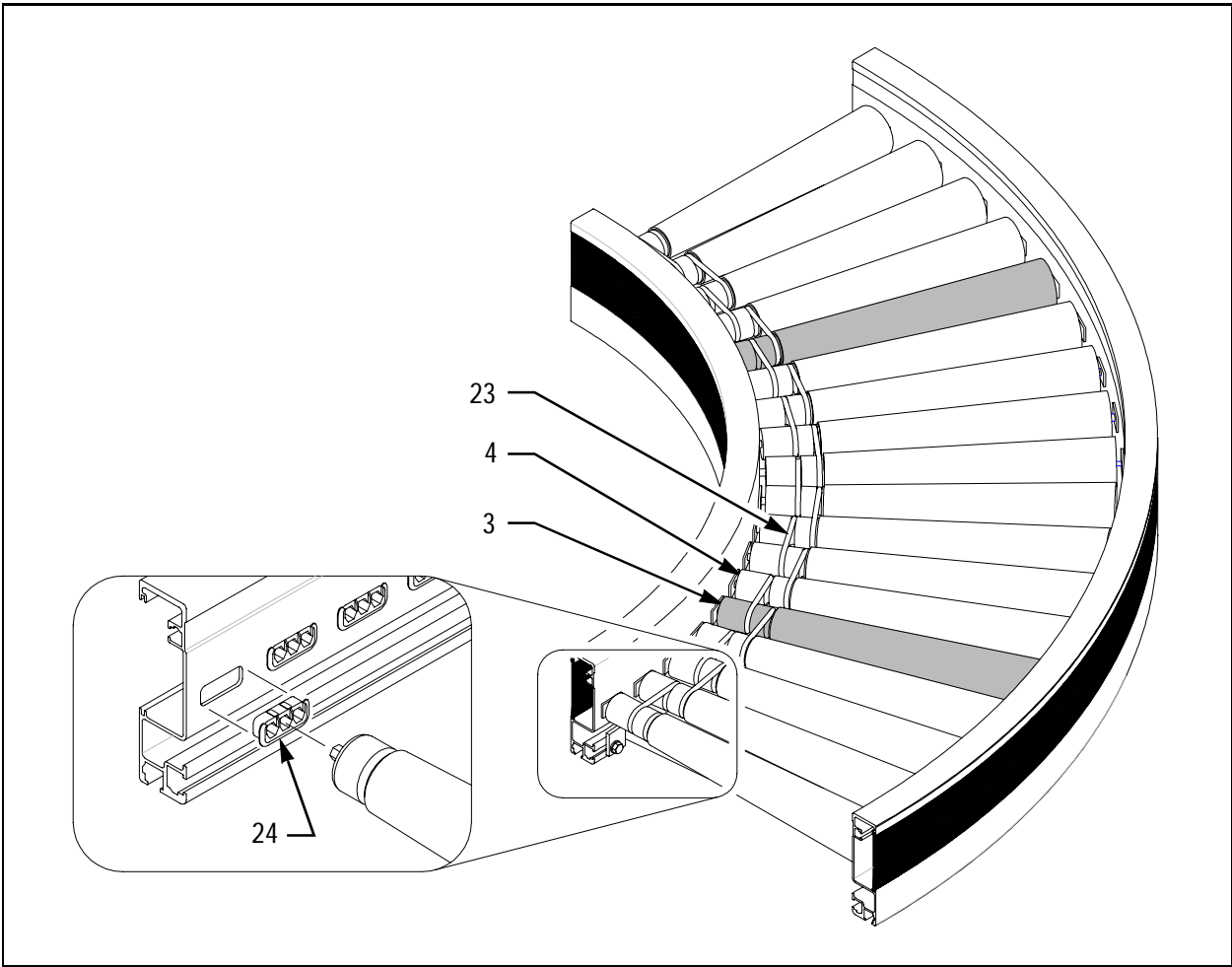


Figure I.2 – Drive & Idler Rollers – Curved Modules (90° Curve Shown)

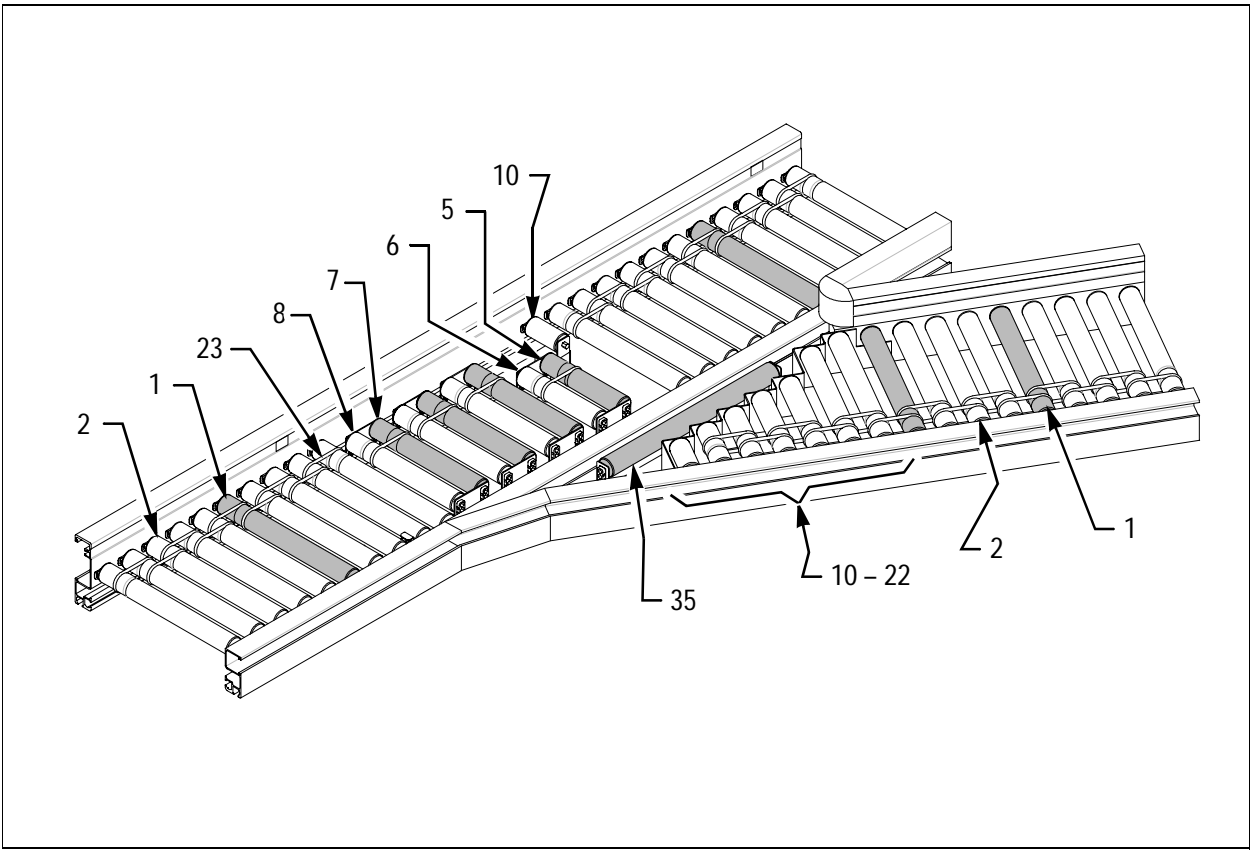


Figure I.3 – Drive & Idler Rollers – Divert Module

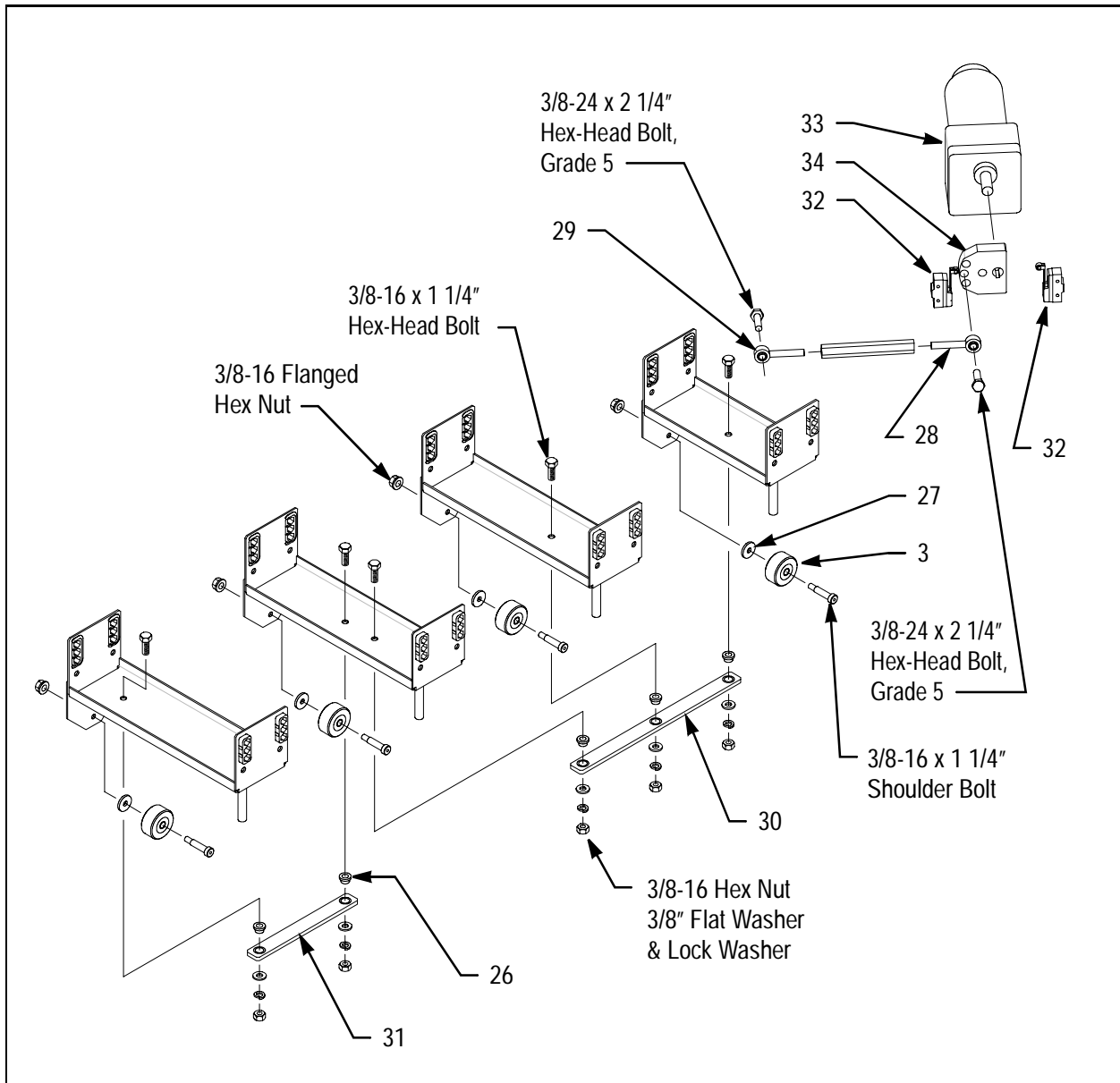


Figure I.4 – Divert Module – Swivel Mechanism (Shown With Rollers Removed)

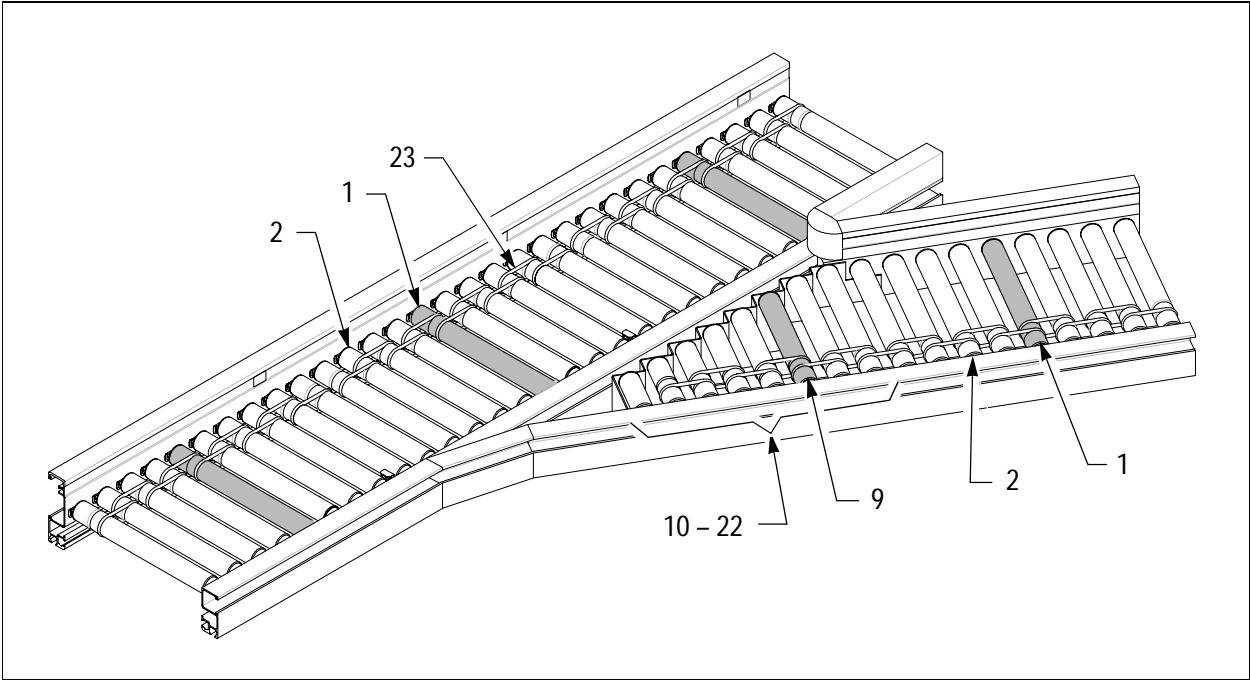


Figure I.5 – Merge Module

Table B.1 – Width-Related Parts

Key	Description	Spare Part	Conveyor Width (Dimension "W" in Inches)					
			16	17	22	28	30	34
1	Drive Roller, Straight Module	Yes	499236	499231	499237	499238	499232	499239
2	Idler Roller, G196AB, Straight Module	Yes	499206	499200	499207	499203	499203	499208
3	Drive Roller, Tapered, 196AH	Yes	499465	499466	499467	499468	—	499469
4	Idler Roller, Tapered, G304AB, BV-G2	Yes	502086	502087	502088	502090	—	502092
5	Drive Roller, Divert Swivel Assembly, 196AB09, 750IT-G0	Yes	—	499434	—	—	—	—
6	Idler Roller, Divert Swivel Assembly, G196AB9, 750-BU-GS-G2	Yes	—	499441	—	—	—	—
7	Drive Roller, Divert Swivel Assembly, 196AB, 13.250-G2	Yes	—	499428	—	—	—	—
8	Idler Roller, Divert Swivel Assembly, G196AB13.250-BU-GS	Yes	—	499444	—	—	—	—
9	Drive Roller, Merge Transition, 196AB, 17 7/8" Long, G2	Yes	—	—	499237	—	—	—

Table B.2 – Transition Idler Rollers – Divert & Merge Modules

Key	Description	Spare Part	Part Number
10	Roller, G196AB, 4" Long, BU-GS-G1	Yes	499461
11	Roller, G196AB, 4" Long, BU-GS-G1	Yes	499408
12	Roller, G196AB, 5 3/4" Long, BU-GS-G2	Yes	499407
13	Roller, G196AB, 7 1/2" Long, BU-GS-G2	Yes	499406
14	Roller, G196AB, 9 3/16" Long, BU-GS-G2	Yes	499401
15	Roller, G196AB, 9 3/16" Long, BU-GS	Yes	499405
16	Roller, G196AB, 11" Long, BU-GS-G2	Yes	499404
17	Roller, G196AB, 12 5/8" Long, BU-GS-G2	Yes	499403
18	Roller, G196AB, 14 3/8" Long, BU-GS-G2	Yes	499402
19	Roller, G196AB, 16 1/2" Long, BU-GS-G2	Yes	499200
20	Roller, G196AB, 17 7/8" Long, BU-GS-G2	Yes	499409
21	Roller, G196AB, 19 5/8" Long, BU-GS-G2	Yes	499410
22	Roller, G196AB, 21 1/2" Long, BU-GS-G2	Yes	499207

Table B.3 – Parts Not Related To Width

Key	Description	Spare Part	Part Number
23	O-Ring, 1/4" Urethane Cord, 83A R25A	Yes	000045
24	Roller Isolator Insert, 24B 250	Yes	499230
25	Wheel, Divert Pivot Assembly	Yes	340440
26	Bushing, Bronze, Flanged, .377" x .502" x .37" Long	Yes	350923
27	Bushing, Bronze, Flanged, .502" x .753" x .50"	Yes	350922
28	Rod End With Ball Bearing, Right-Hand Thread	Yes	210228
29	Rod End With Ball Bearing, Left-Hand Thread	Yes	210231
30	Linkage Assembly, Pivot Frame, 17" Wide Divert	No	467479
31	Linkage Assembly, Rear Pivot	No	467480
32	Limit Switch, Omron,	Yes	888730
33	Motor With Gear Reducer, Baldor, .11 HP, 24V, 35 RPM	Yes	331430
34	Motor Crank	Yes	467461

Power & Control Components

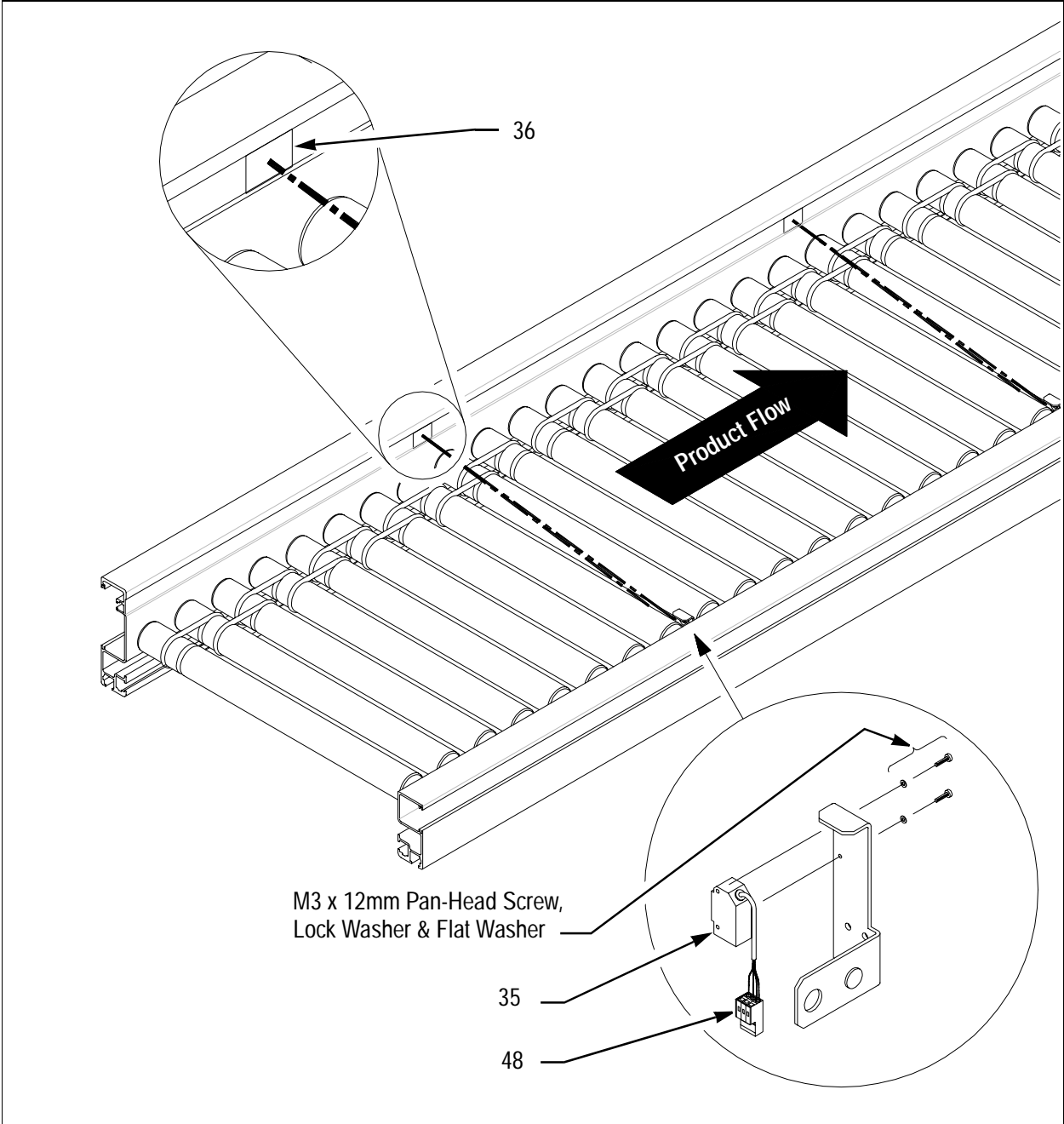


Figure I.6 – Photo-Eyes & Reflective Tape (All Independent Modules)

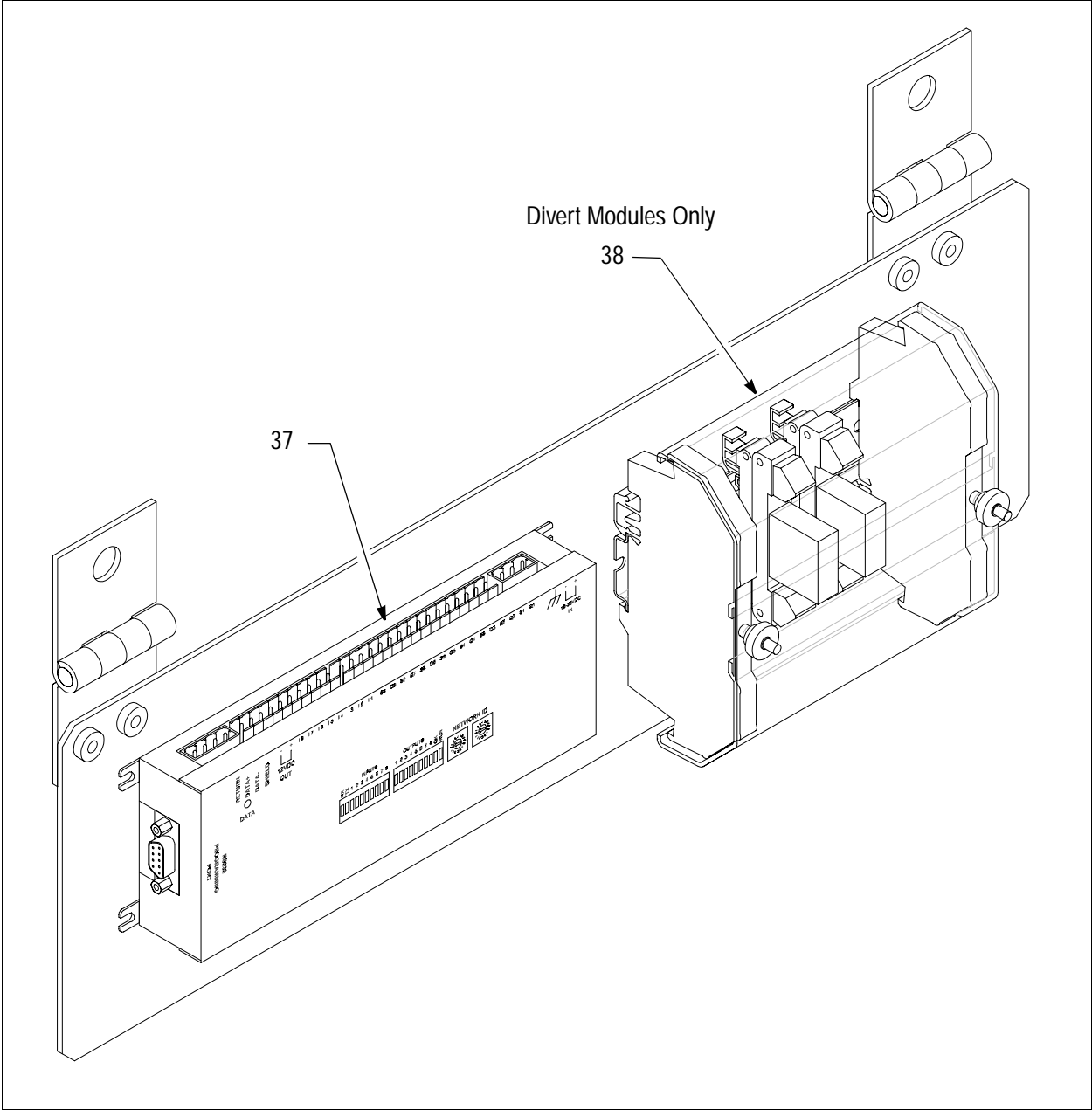


Figure I.7 – Programmable Logic Controller (PLC) – Independent Modules

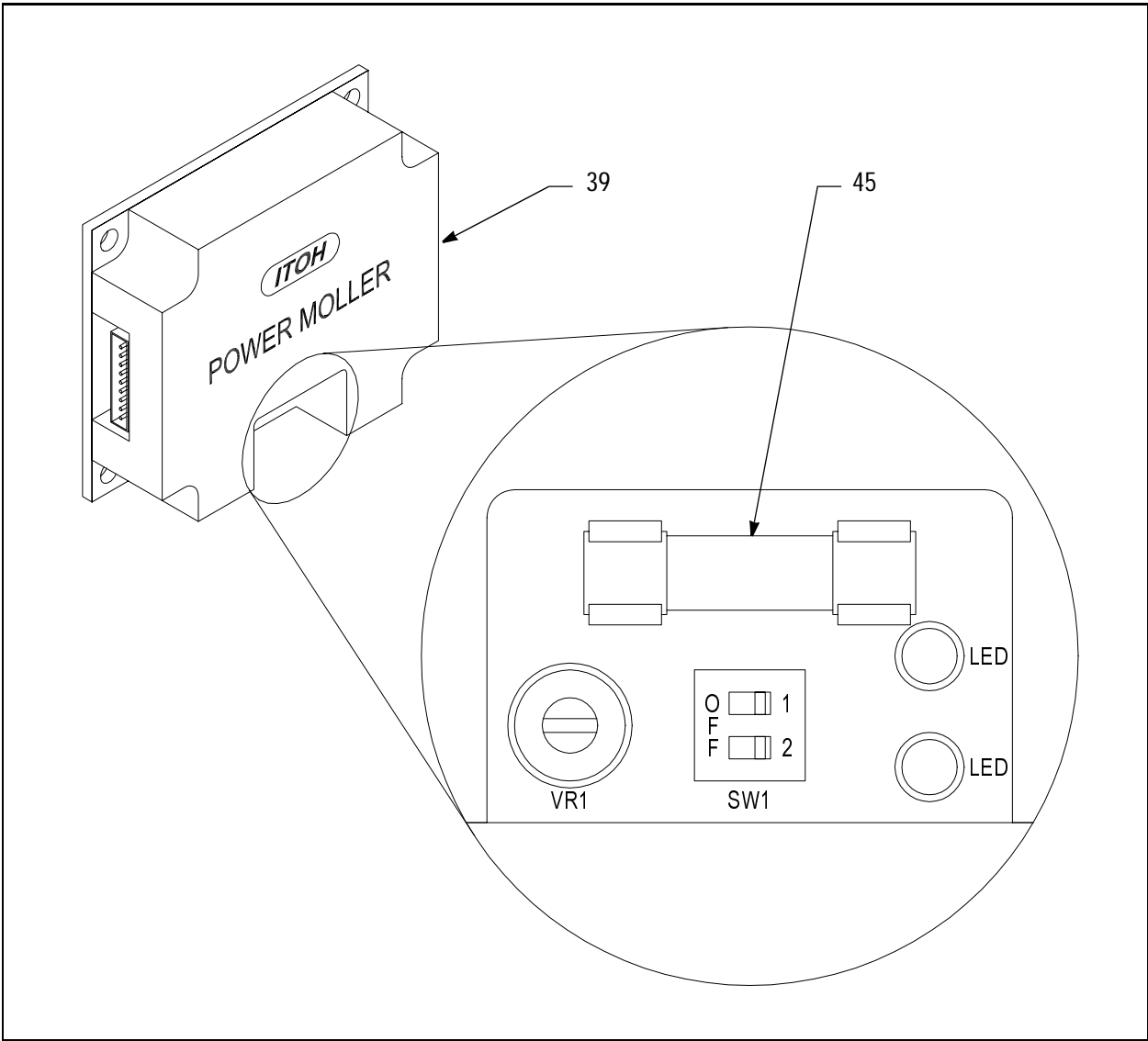


Figure I.8 – Motor Control Card – All Modules With Drive Rollers

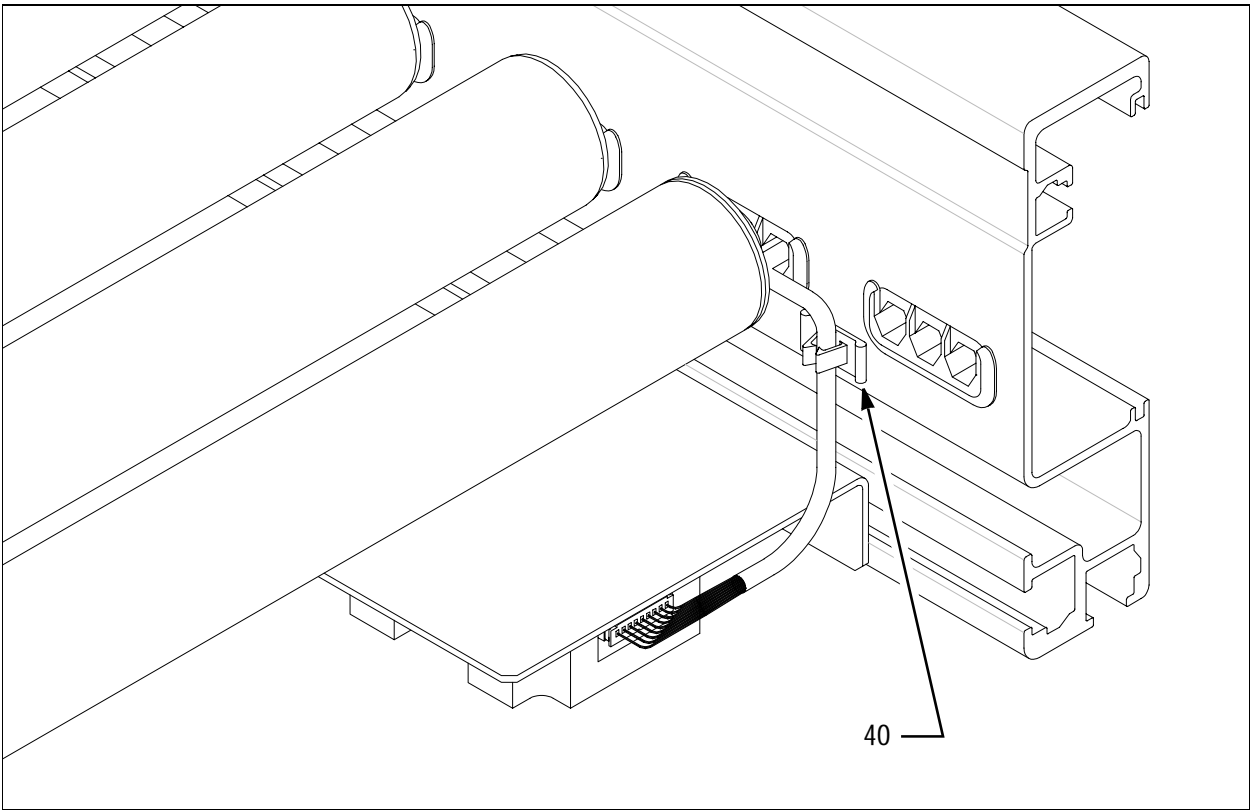


Figure H.9 – Wire Retaining Clip

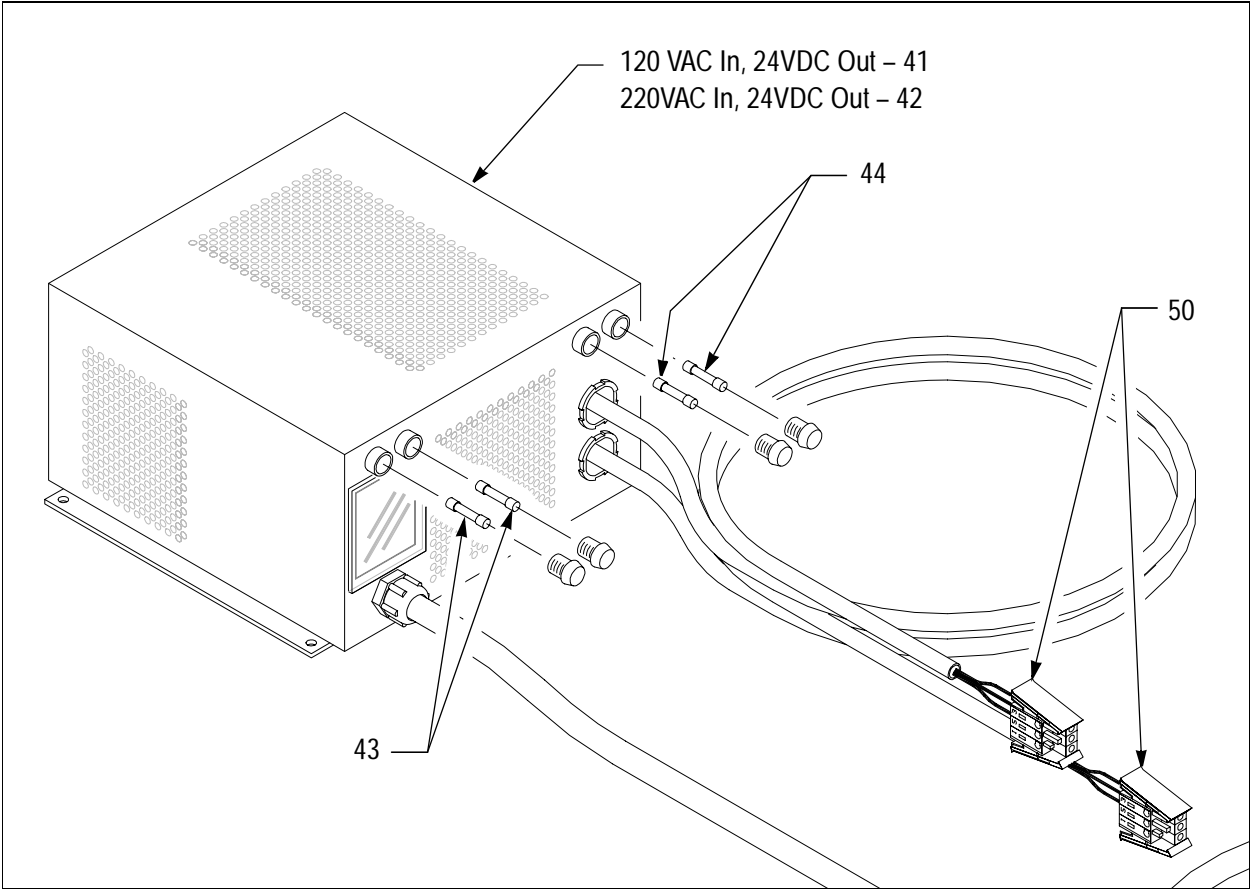


Figure I.10 – Power Supply

Table B.4 – Electrical & Control Components

Key	Description	Spare Part	Part Number
35	Photo-Eye, Retroreflective, 12-24V, Omron	Yes	301421
36	Reflective Tape, Per Foot	Yes	301415
37	Programmable Logic Controller (PLC), Horner HE200PLC300	Yes	301401
38	PLC Relay Module, 2-Relay, Includes Enclosure With Cover	Yes	301433
39	Drive Motor Control Card	Yes	301420
40	Wire Retaining Clip	Yes	221516
41	Power Supply, 120VAC In, 24VDC Out	Yes	303022
42	Power Supply, 220VAC In, 24VDC Out	Yes	303023
43	Fuse, 10 Amp, 1/4" Diameter x 1 1/4" Long	Yes	309972
44	Fuse, 15 Amp, 1/4" Diameter x 1 1/4" Long	Yes	309973
45	Fuse, 5 Amp, 5mm Diameter x 20mm Long	Yes	309971

Wiring Harnesses

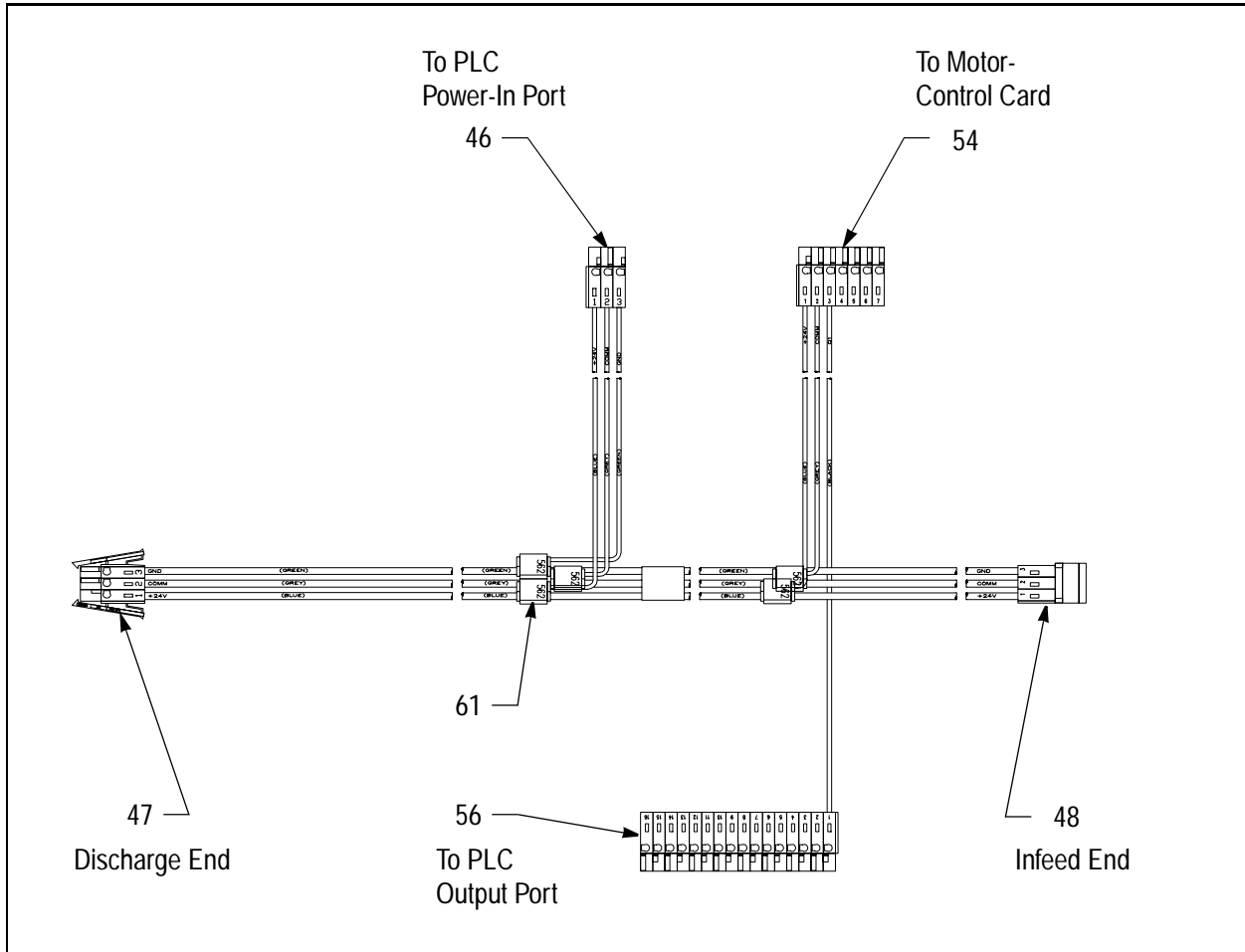


Figure I.11 – Power Harness – 1-Zone

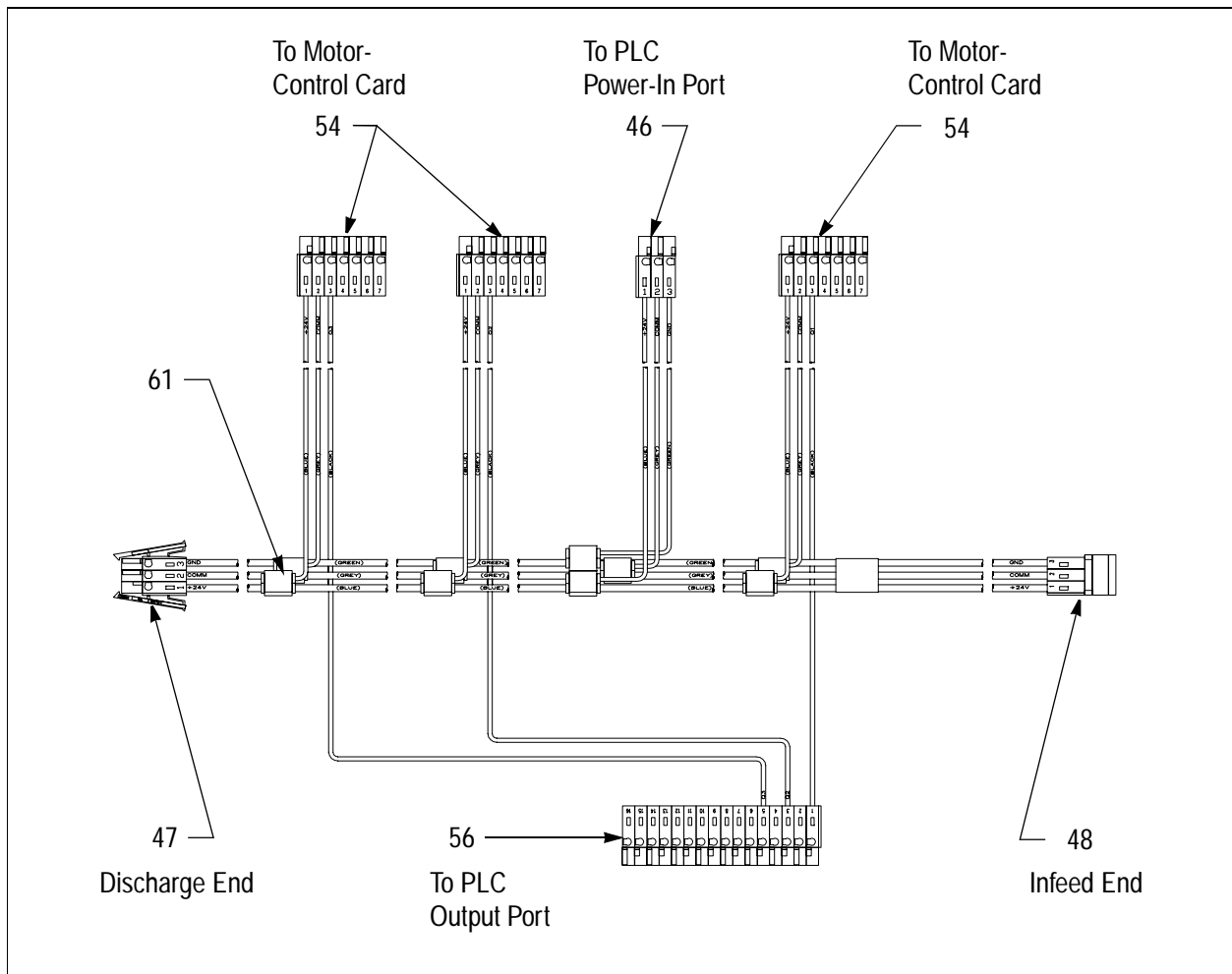


Figure I.13 – Power Harness – 3-Zone

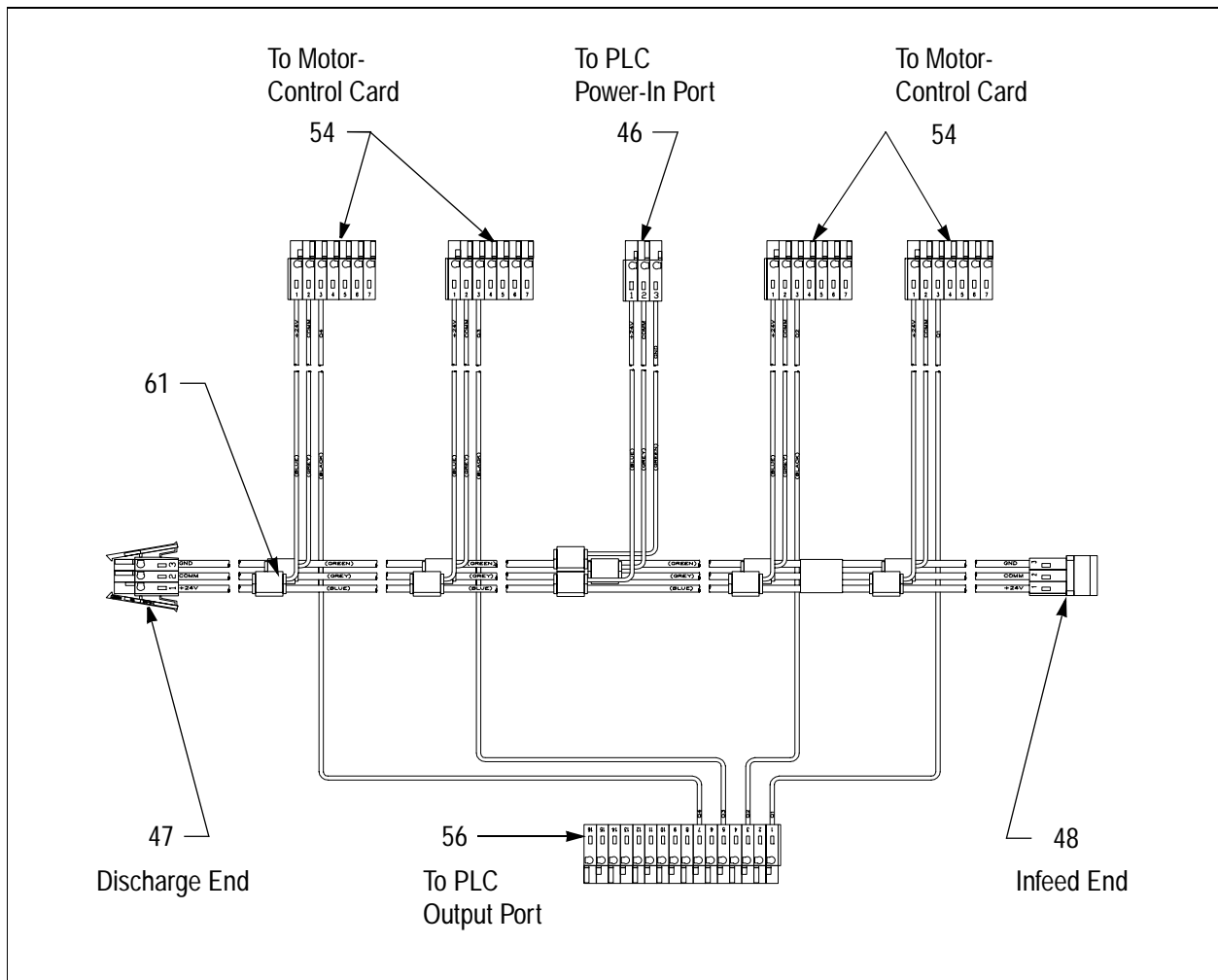


Figure I.14 – Power Harness – 4-Zone

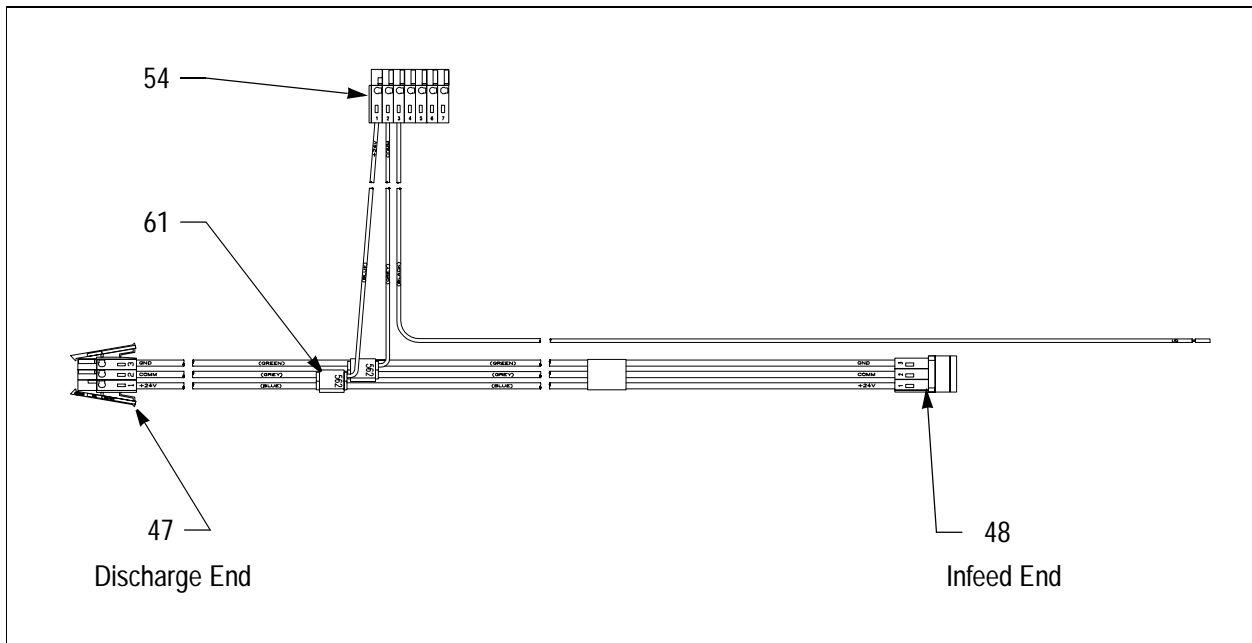


Figure I.15 – Power Harness – Electrical Slave Module

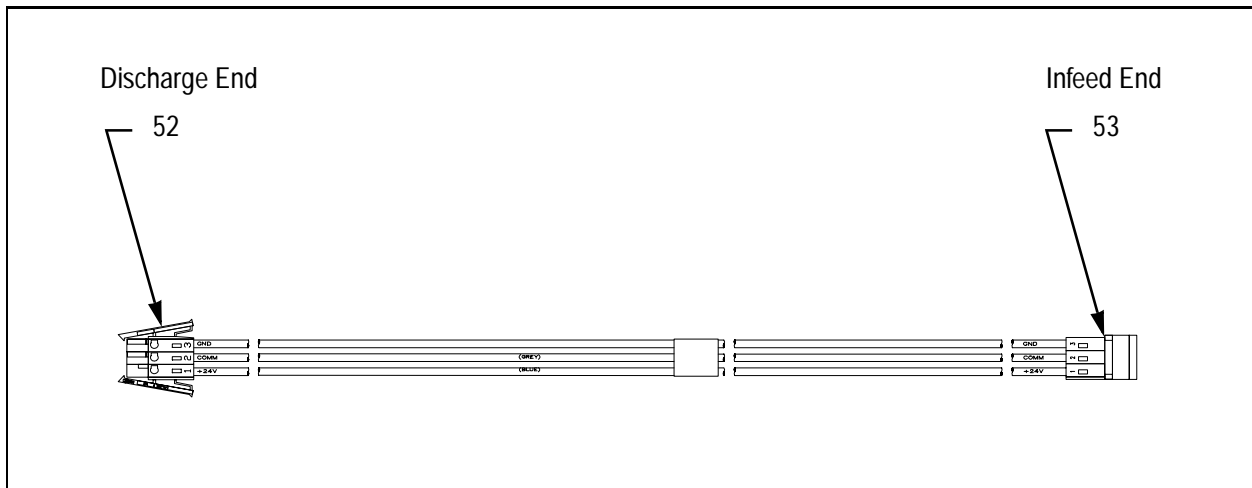


Figure I.16 – Pass-Through Power Harness

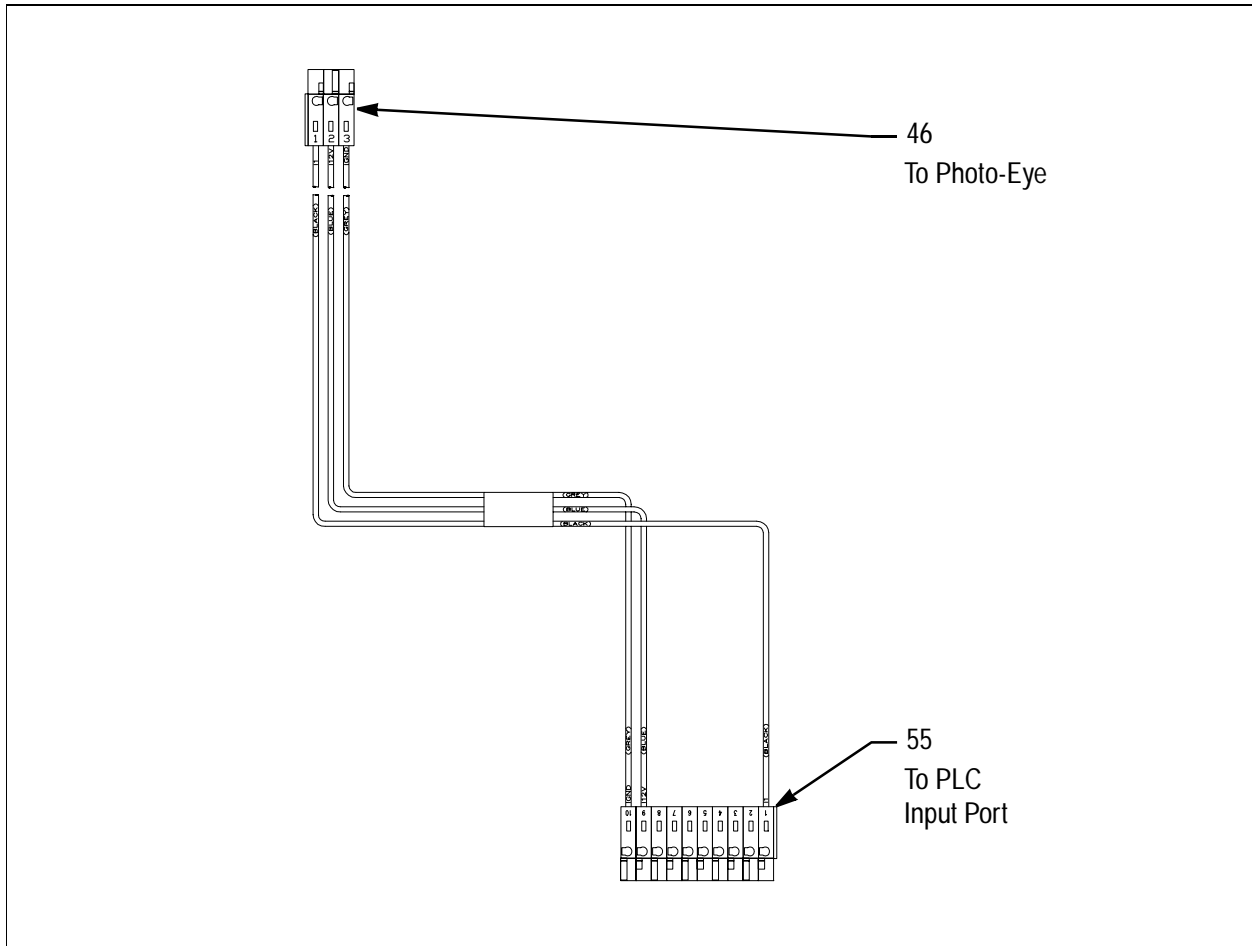


Figure I.17 – Photo-Eye Harness – 1-Zone

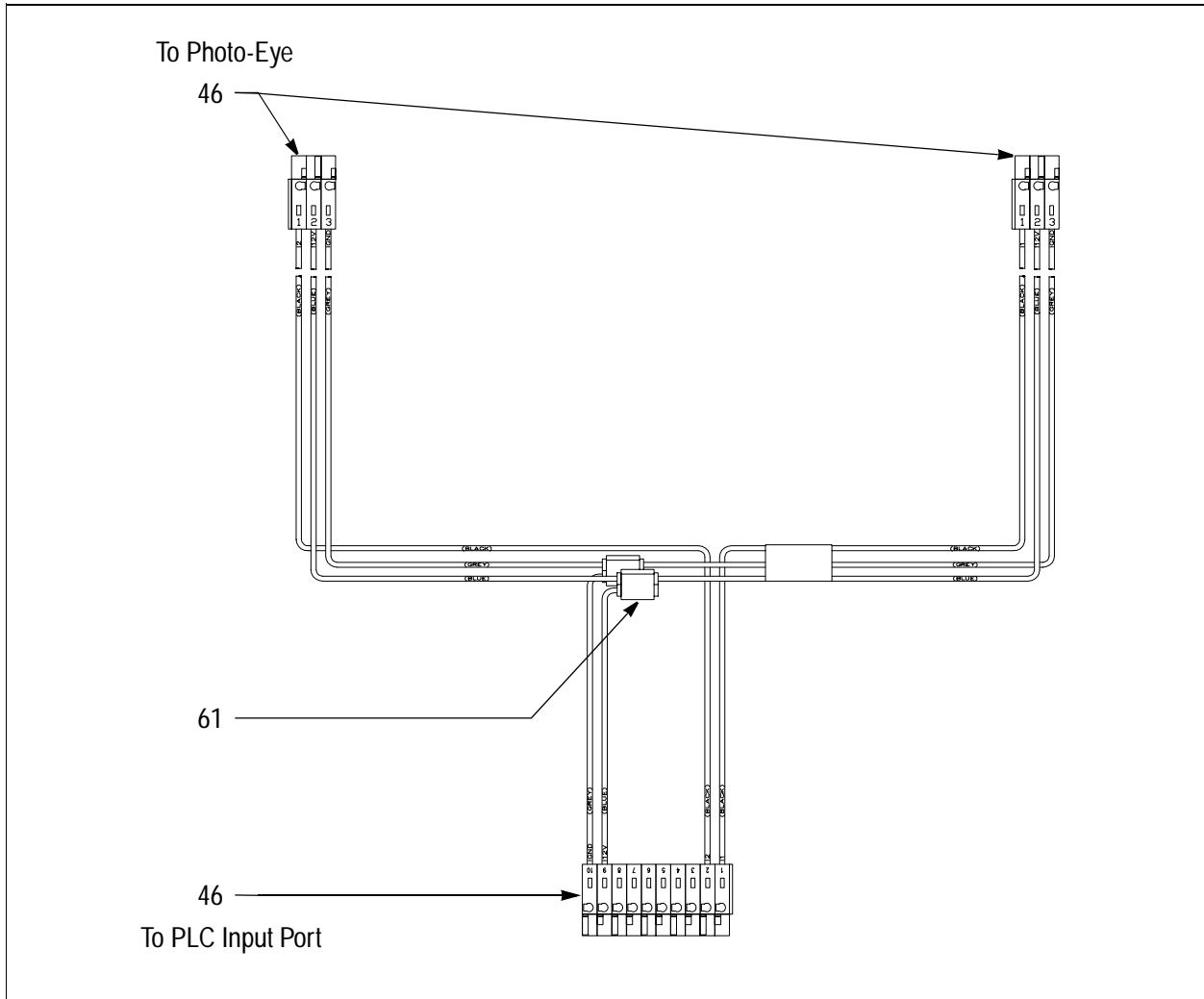


Figure I.18 – Photo-Eye Harness – 2-Zone

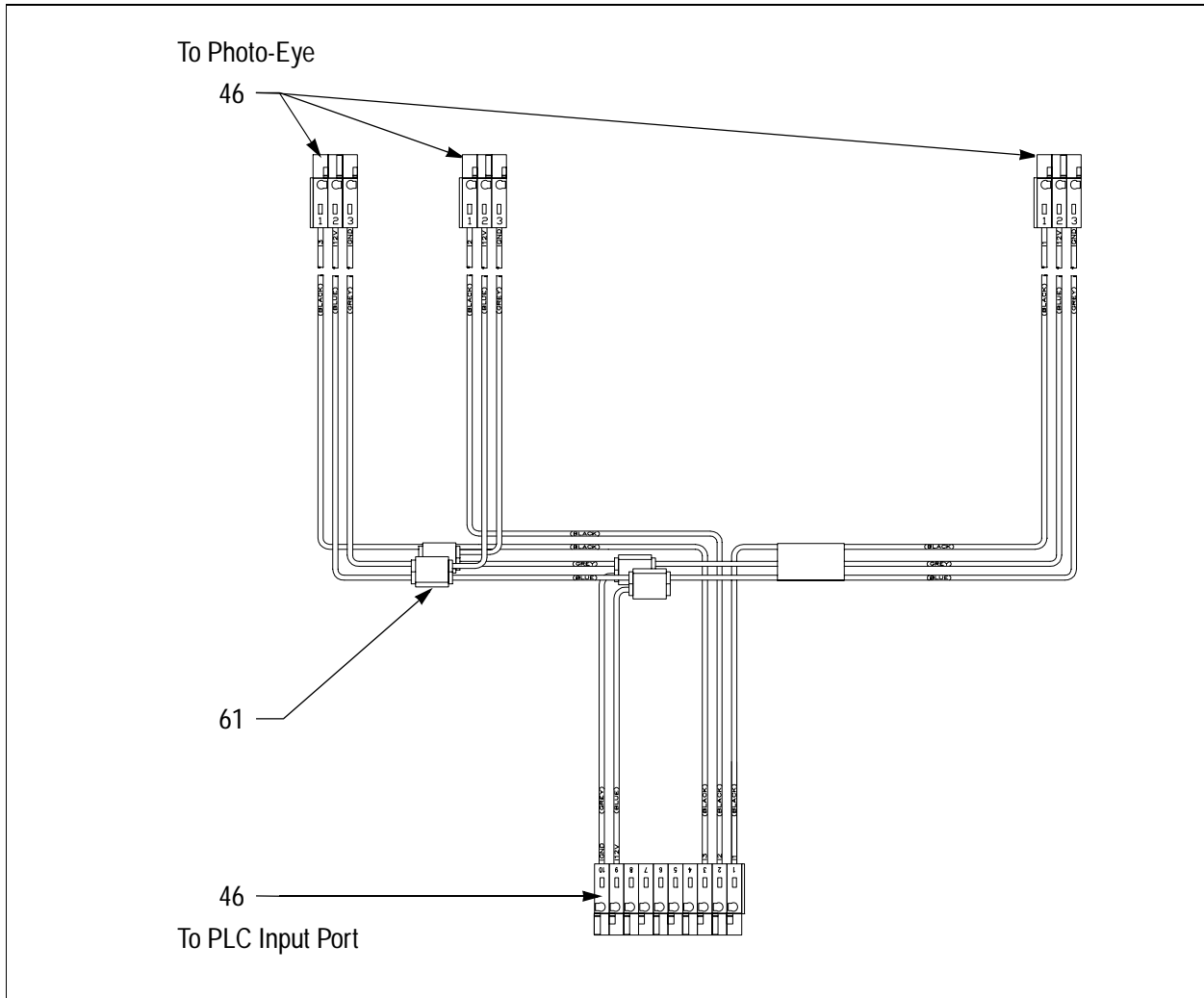


Figure I.19 – Photo-Eye Harness – 3-Zone

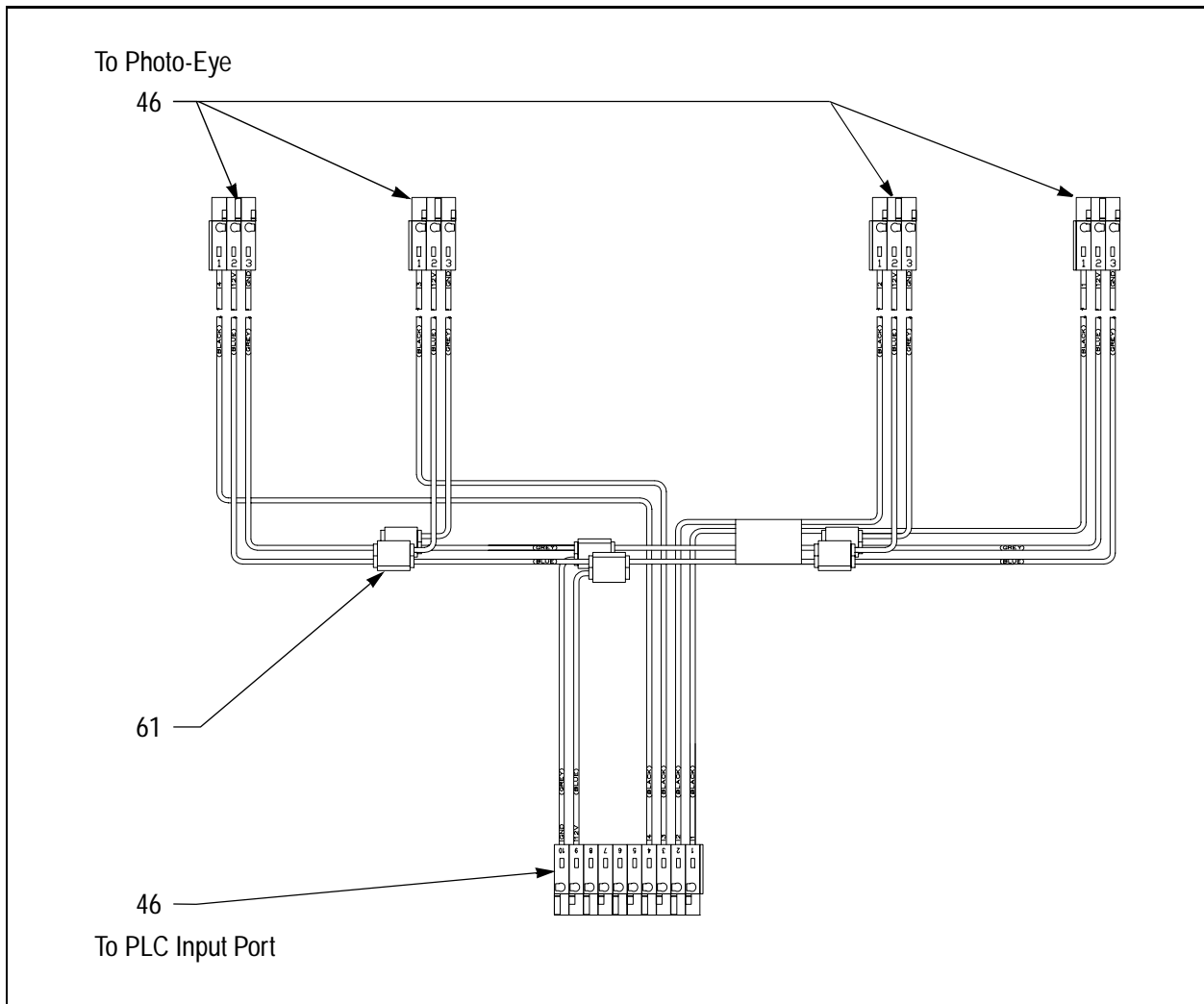


Figure I.20 – Photo-Eye Harness – 4-Zone

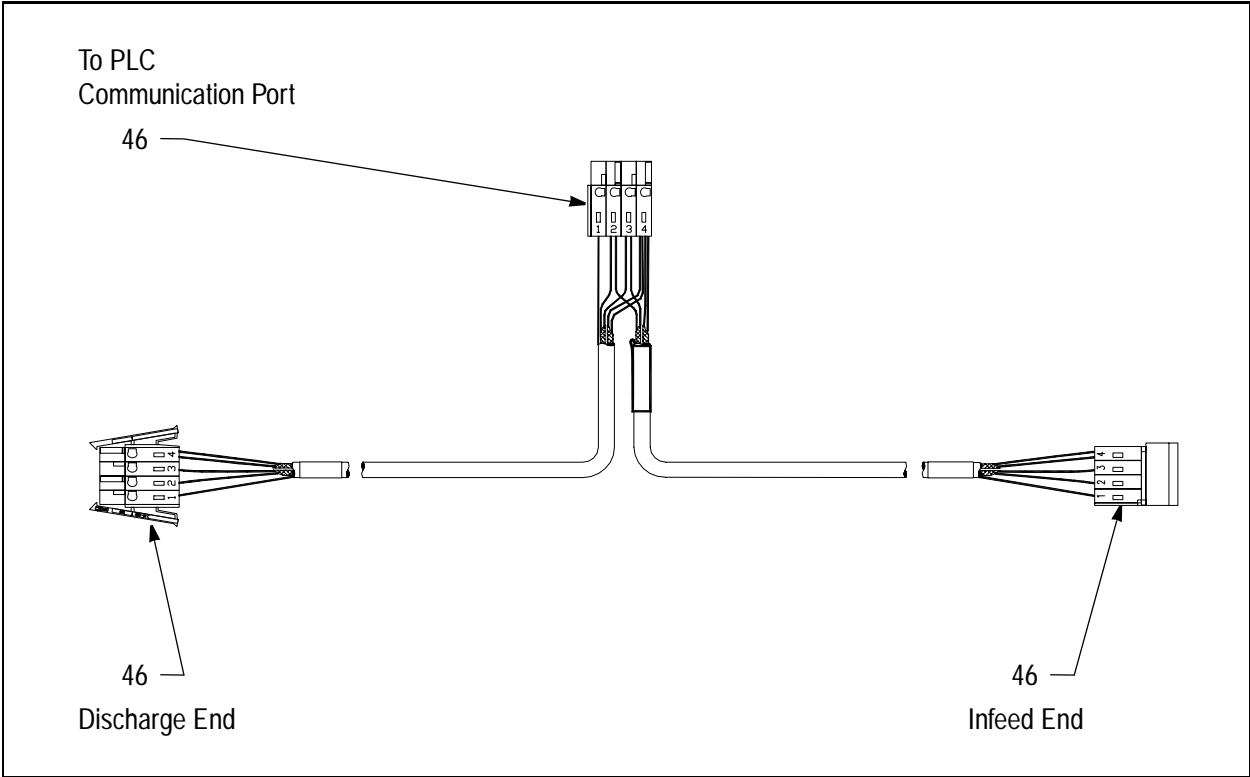


Figure I.21 – Communication Harness

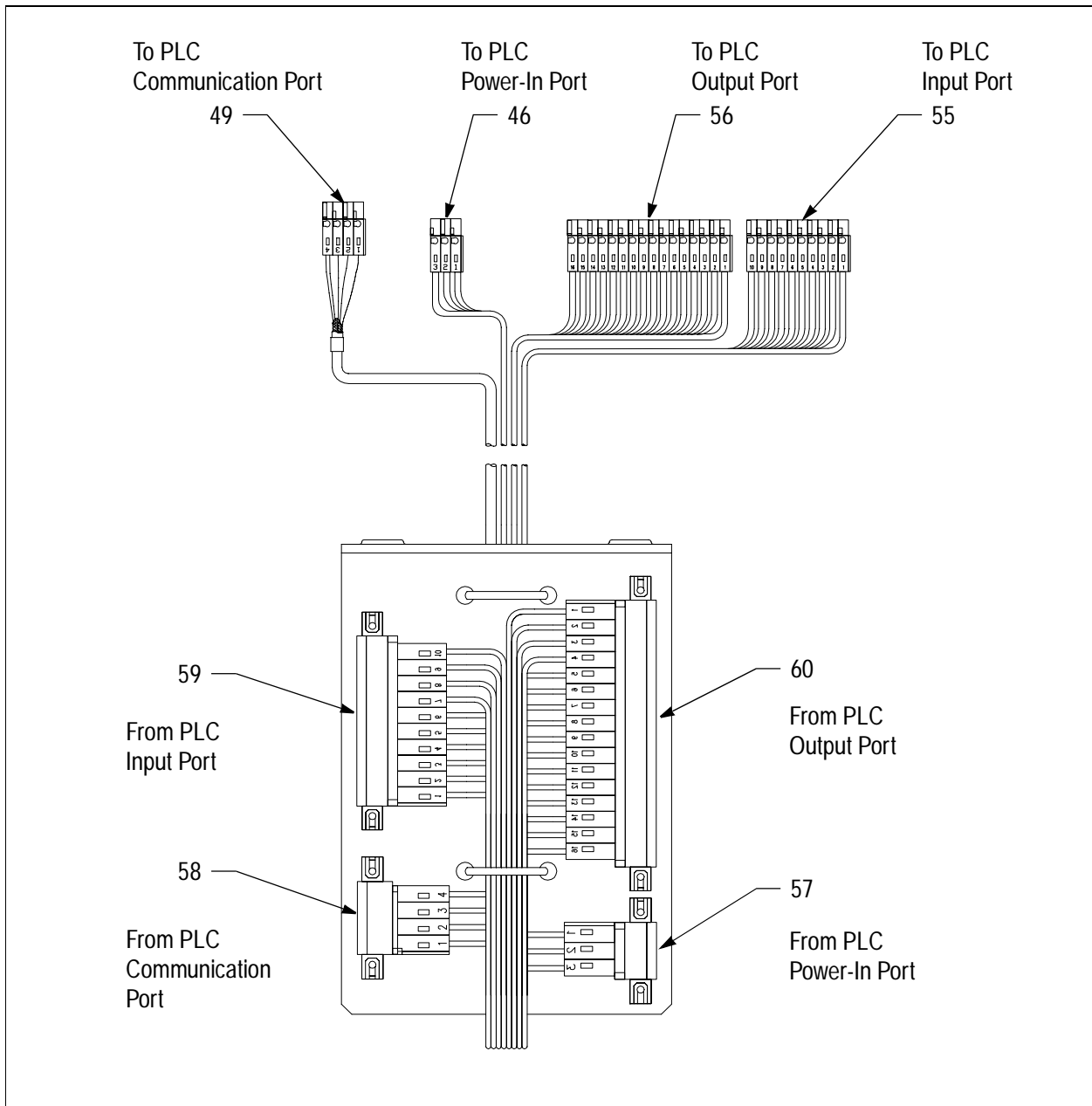


Figure I.22 – Cross-Over Harness Assembly

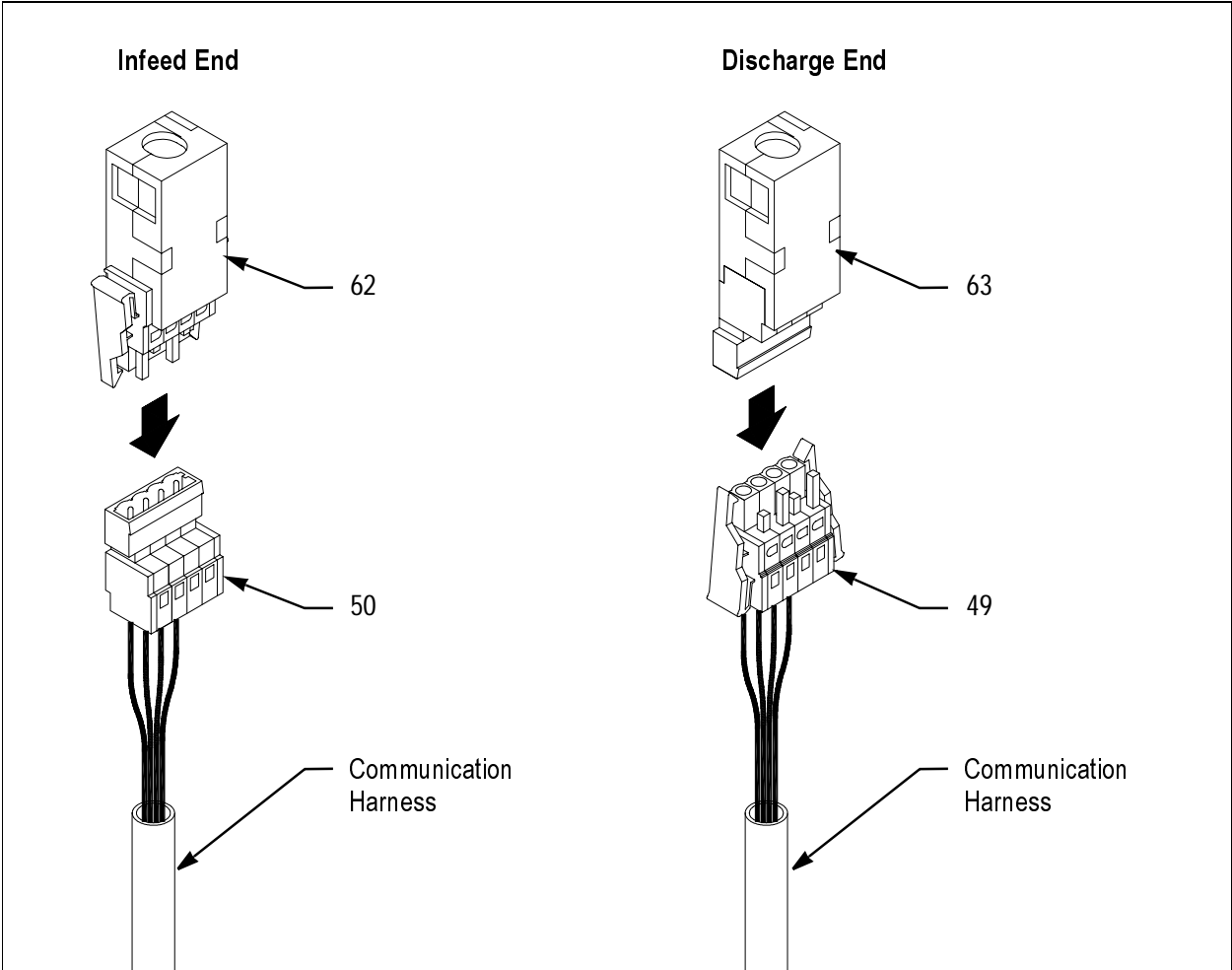


Figure G.23 – Terminal Ends of PLC Communication Network

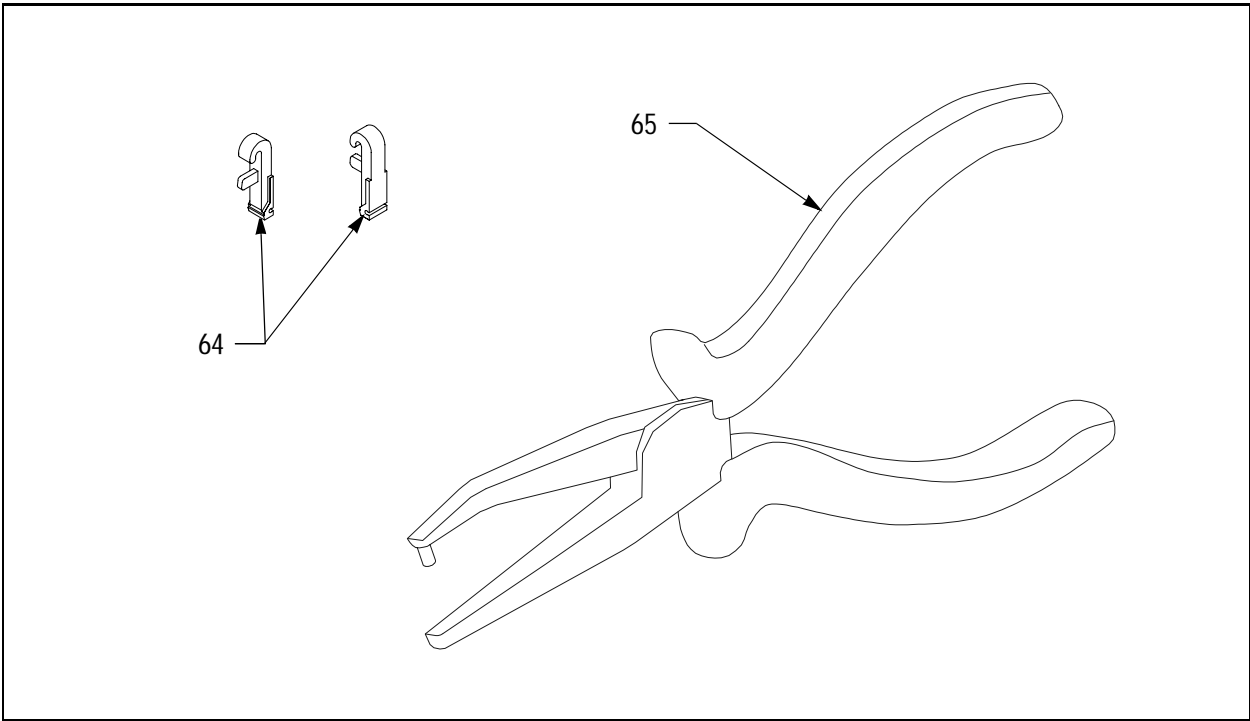


Figure G.24 – Connector Operating Pliers

Key	Description	Spare Part	Part Number
46	Connector, .197 Spacing, Female 3-Pin, Grey	Yes	307001
47	Connector, .197 Spacing, Female 3-Pin Locking, Grey	Yes	307002
48	Connector, .197 Spacing, Male 3-Pin, Grey	Yes	307000
49	Connector, .197 Spacing, Female, 4-Pin, Grey	Yes	307004
50	Connector, .197 Spacing, Female 4-Pin Locking, Grey	Yes	307005
51	Connector, .197 Spacing, Male 4-Pin, Grey	Yes	307003
52	Connector, .200 Spacing, Female 3-Pin Locking, Orange	Yes	307010
53	Connector, .200 Spacing, Male 3-Pin, Orange	Yes	307009
54	Connector, .197 Spacing, Female 7-Pin, Grey	Yes	307006
55	Connector, .197 Spacing, Female 10-Pin, Grey	Yes	307007
56	Connector, .197 Spacing, Female 16-Pin, Grey	Yes	307008
57	Connector, .197 Spacing, Male, 3-Pin, Grey, Fixed	Yes	307011
58	Connector, .197 Spacing, Male, 4-Pin, Grey, Fixed	Yes	307012
59	Connector, .197 Spacing, Male, 10-Pin, Grey, Fixed	Yes	307013
60	Connector, .197 Spacing, Male, 16-Pin, Grey, Fixed	Yes	307014
61	Connect (Splice) Tap, 12-14 AWG, 3M #562	Yes	307034
62	End Resistor Plug, Female, 4-Pin, .197 Spacing	Yes	307005
63	End Resistor Plug, Male, 4-Pin, .197 Spacing	Yes	307003
64	Connector Operating Lever, With Cage Clamp	Yes	959570
65	Connector Operating Pliers, With Cage Clamp	No	959571
