

Communication Kits

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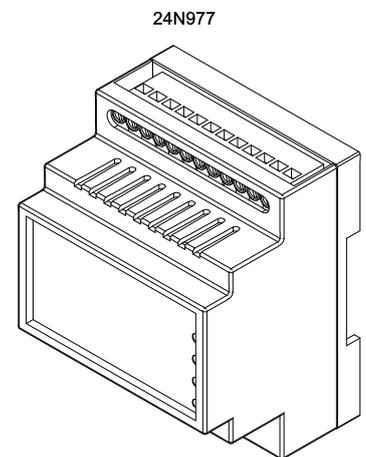
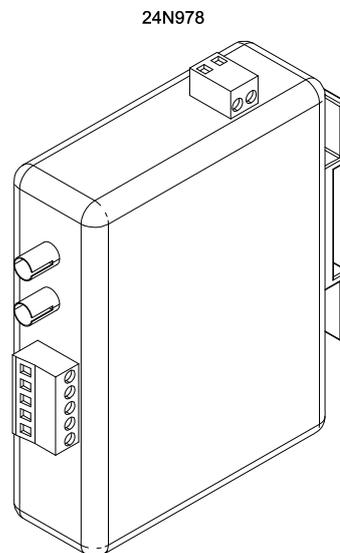
Use to communicate from a Display Control Module (DCM) or Advanced Display Control Module (ADCM) to a Non-Graco Programmable Logic Controller (PLC) or an Advanced Web Interface (AWI).
For professional use only.
Not approved for use in explosive atmospheres or hazardous locations.



Important Safety Instructions

Read all warnings and instructions in this manual and in your system manual. Save these instructions.

Kit 24N978, Fiber Optic Converter (Fiber Optic to Serial Converter)
Kit 24N977, Modbus Gateway (Modbus TCP to Modbus RTU Converter)



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Warnings

The following warnings are for the setup, use, grounding, maintenance and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbol refers to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

 WARNING	
   	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none">• Use equipment only in a well-ventilated area.• Eliminate all ignition sources such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).• Keep work area free of debris, including solvent, rags, and gasoline.• Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.• Ground all equipment in the work area. See Grounding instructions.• Use only grounded hoses.• Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are antistatic or conductive.• Stop operation immediately if static sparking occurs or you feel a shock, Do not use equipment until you identify and correct the problem.• Keep a working fire extinguisher in the work area.
 	<p>ELECTRIC SHOCK HAZARD</p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none">• Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment.• Connect only to grounded power source.• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.



WARNING



EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

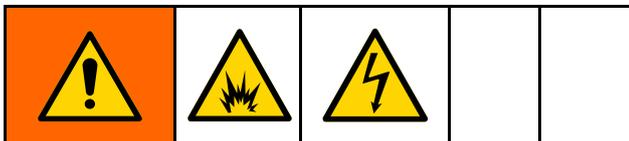


- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request a Safety Data Sheet (SDS) from your distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

Overview

The Fiber Optic (FO) Converter (24N978) allows Modbus RTU communication between multiple Display Control Modules (DCM) or Advanced Display Control Modules (ADCM) and a Programmable Logic Controller (PLC). If used without a Modbus Gateway, the FO Converter is connected directly to the modbus PLC via a serial cable. If your system uses an Advanced Web Interface (AWI), use modbus gateway 24N977 for ethernet communication between the FO Converter and the AWI. See manual 312785 Graco Gateway Assemblies for further information when connection to a PLC is required. Profibus, Ethernet IP, DeviceNet, and many other PLC protocol options are available.

Installation



To avoid electric shock, turn off equipment power and shut off power at main circuit breaker before installing. All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

NOTICE

To avoid damage to the circuit board, wear Part No. 112190 grounding strap and ground appropriately.

Kit 24N978, For Modbus RTU Communication

The FO Converter enables Modbus RTU communication with a user-supplied PLC using a serial cable. Depending on your system requirements, the FO Converter can be installed in an AWI Module (Graco PN 15V337), a Power Supply Module (Graco PN 16M167) or on a user-supplied DIN rail.

Kit 24N978 Parts

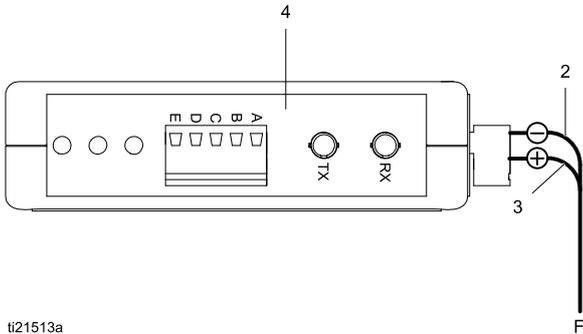
Ref.	Part	Description	Qty.
1	112515	FERRULE, wire, red	8
2	— — —	WIRE, copper, 16 gauge	3 @ 1.5 ft.
3	— — —	WIRE, copper, 16 gauge	3 @ 1.5 ft.
4	16K465	CONVERTER, Fiber Optic to Serial	1
7	125816	TERMINAL BLOCK, 2 level, 4 conductor	2
*	— — —	CABLE, shielded, 24 gauge.	1 @ 2 ft.
*	— — —	CABLE, twisted pair, 18 gauge	1 @ 2 ft.
*	112512	FERRULE, wire, orange	6
*	112514	FERRULE, wire, yellow	4

Items marked — — — are not sold separately.

**For Intelligent Paint Kitchen use only. See the Intelligent Paint Kitchen manual.*

Electrical Connections

Use wires provided (refs. 2 and 3) to connect the +/- terminals on the FO Converter to the +/- terminals on a power supply (F). The FO Converter has an input voltage range of 10 to 48 VDC, with a 0.5 W power consumption.



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Figure 1

If installing in box with a power supply module (16M167 or 24R086), connect the power supply to the fiber optic converter (4) through the terminal blocks. For power supply 16M167, you also must connect the intrinsically safe barrier to the power supply. Connect positive to positive and negative to negative.

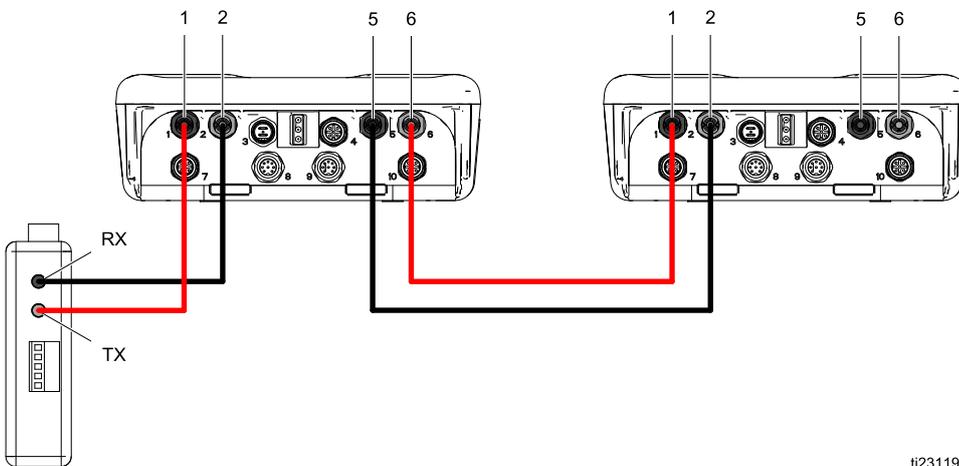
Communication Cable Connections

- Use a fiber optic cable to make a crossover connection from the FO Converter to the Display Control Module (DCM) or the Advanced Display Control Module (ADCM). See [Accessories, page 13](#), for available Graco fiber optic cables.

Typical Color Convention	FO Converter Port	DCM or ADCM Port
Red cable	TX (lighter in color)	1 (darker in color)
Black cable	RX (darker in color)	2 (lighter in color)

- To connect multiple DCM or ADCM in a chain, connect per the following table and Figure 2.

Typical Color Convention	Upstream DCM or ADCM Port	Downstream DCM or ADCM Port
Red cable	6 (lighter in color)	1 (darker in color)
Black cable	5 (darker in color)	2 (lighter in color)



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Figure 2 Connecting multiple DCM or ADCM.

- Use a serial cable (customer supplied) to make an RS-232/RS-485 connection to the PLC, according to the following table.

FO Converter Terminal	RS-232	RS-485 (2-wire)
A	Ground	Ground
B	not used	Data B (+)
C	Rx (IN)	Data A (-)
D	not used	not used
E	Tx (OUT)	not used

Set Up the Fiber Optic Converter

- Set the DIP switches on the bottom of the converter as shown. These settings are correct for either RS-232 or RS-485 2-wire, with a 57.6 K baud rate.

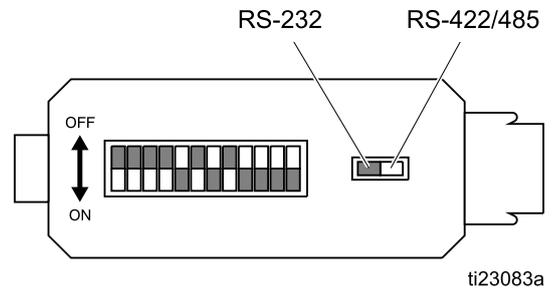
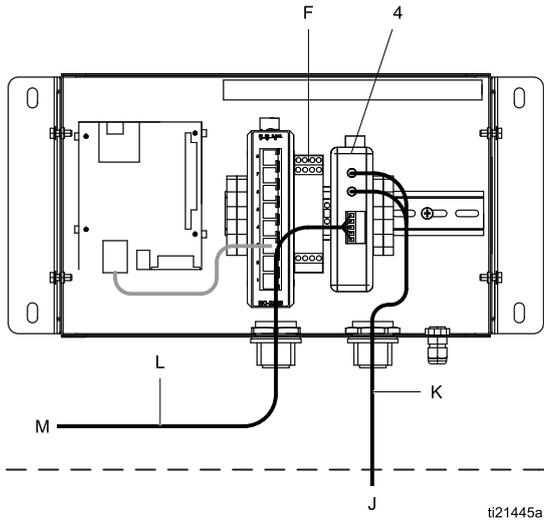


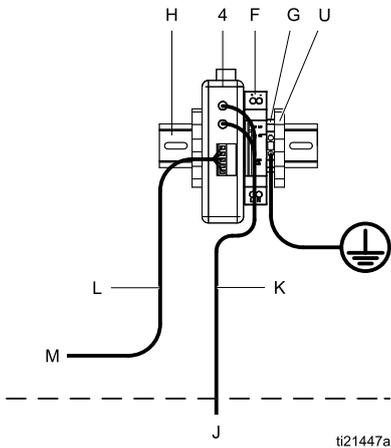
Figure 3

- Set the selector switch to RS-232 or RS-422/485. We strongly recommend RS-485 for all cables over a few feet (a meter or two).

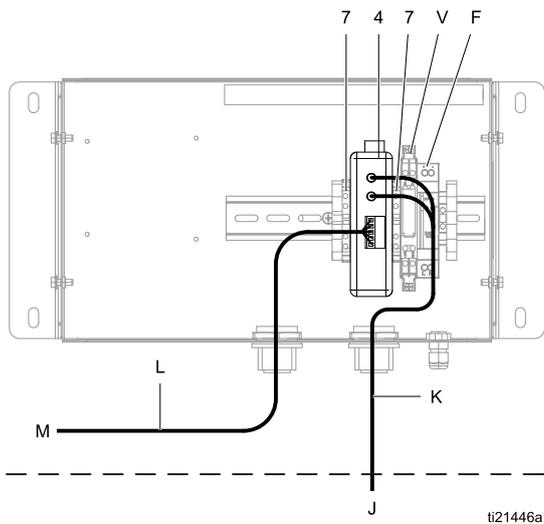
Installed in 15V337 AWI Module



Installed on User-Supplied Din Rail



Installed in 16M167 Power Supply Module



KEY:

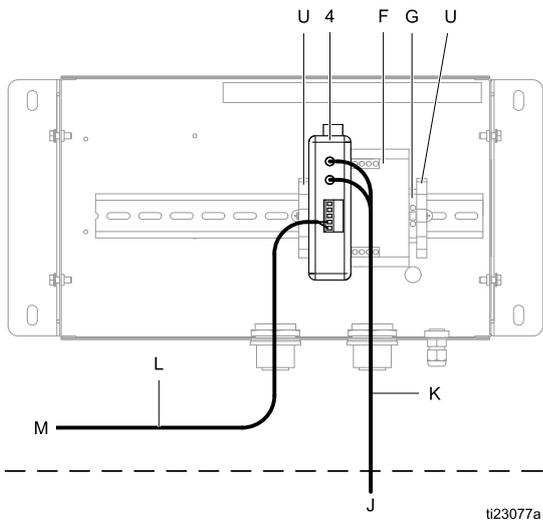
- 4 FO Converter (from Kit 24N978).
- 7 Terminal Block (from Kit 24N978)
- F Power supply. See [Accessories, page 13](#).
- G Ground terminal block (Graco PN 112443). See [Accessories, page 13](#).
- H DIN rail (user supplied), must be grounded.
- J DCM or ADCM (up to 30 in series).
- K Fiber optic cable to connect from DCM/ADCM to FO Converter. See [Accessories, page 13](#).
- L Serial cable, customer supplied, to connect from FO Converter to communication device.
- M Programmable logic controller (PLC); customer supplied.
- U Clamp end blocks (Graco PN 255045). See [Accessories, page 13](#).
- V Existing power barrier (in 16M167).

NOTE:

The area above the dotted line in each illustration is the Non-Hazardous Location.

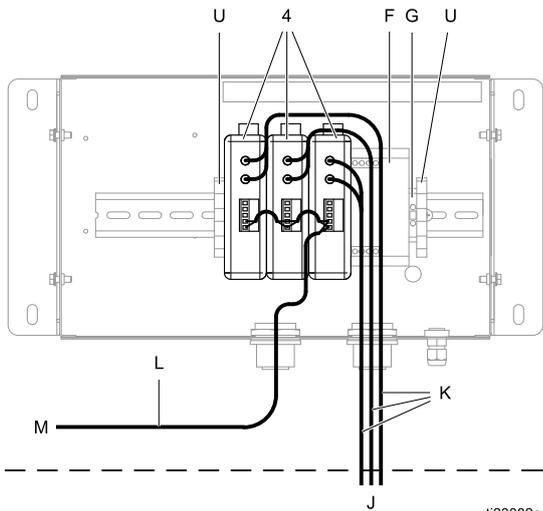
Continued on next page.

Installed in Kit 24R086, with power supply, one converter



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Installed in Kit 24R086, with power supply, more than one converter



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Kit 24N978 and Kit 24N977, for Modbus TCP/AWI Communication

The Modbus Gateway (Kit 24N977) is used with the FO Converter (Kit 24N978) to enable Modbus TCP communication with a user-supplied programmable logic controller (PLC). The Modbus Gateway can be connected to Graco PN 15V337 AWI module to enable communication with a personal computer (PC) using an ethernet cable.

Kit 24N977 Parts

Ref.	Part	Description	Qty.
1	112515	FERRULE, wire, red	10
2	— — —	WIRE, copper, 16 gauge	2@1.5 ft.
3	— — —	WIRE, copper, 16 gauge	3@1.5 ft.
5	16P893	CONVERTER, Modbus TCP to Modbus RTU	1
6	121994	CABLE, CAT 5	1 ft.

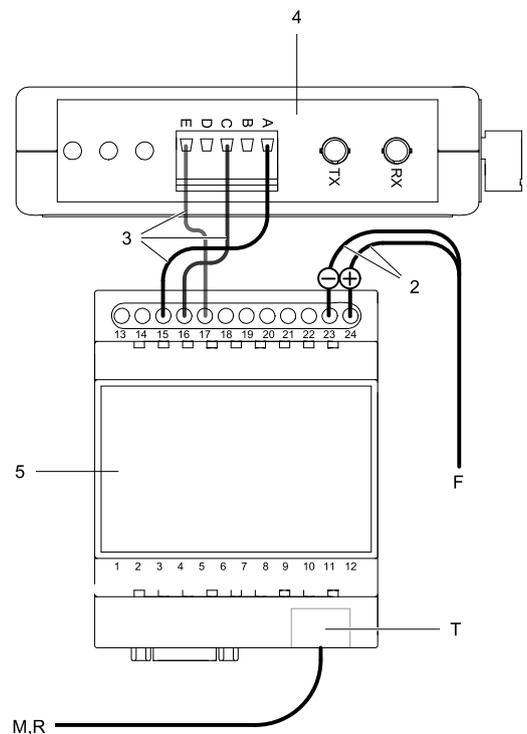
Items marked — — — are not sold separately.

Electrical Connections

1. Use wires provided (ref. 2) to connect power terminals 23 (-) and 24 (+) on the Modbus Gateway to +/- terminals on a power supply. The Modbus Gateway has an input voltage range of 9 to 28 VDC, with a 2.0 W power consumption.

2. Use wires provided (ref. 3) to connect the FO Converter (4) to the Modbus Gateway (5), according to the following table.

FO Converter Terminal	Modbus Gateway Terminal
A	15
B	not used
C	16
D	not used
E	17



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Figure 4
If installing in a box with a power supply module (16M167 or 24R086), connect the power supply to the fiber optic converter (4) through the terminal blocks. For power supply 16M167, you also must connect through the intrinsically safe barrier. Connect positive to positive and negative to negative.

Communication Cable Connections

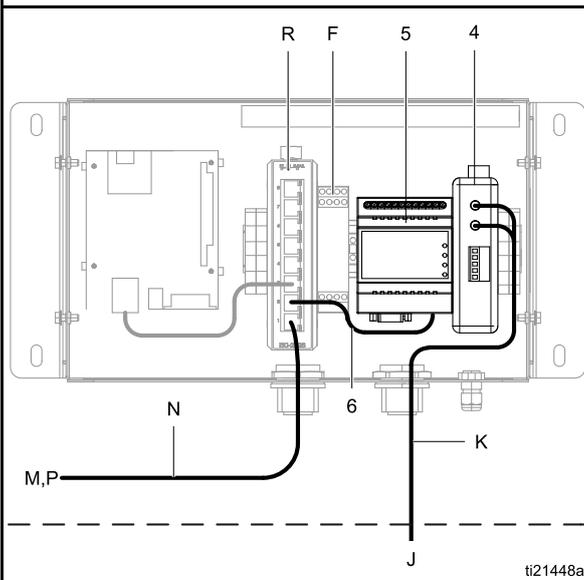
1. Use a fiber optic cable to make a crossover connection from the FO Converter to the Display Control Module (DCM) or the Advanced Display Control Module (ADCM). See [Accessories, page 13](#), for available Graco fiber optic cables.

FO Converter Port	DCM or ADCM Port
TX	1
RX	2

2. **For Modbus TCP Communication with a PLC:** Connect a customer-supplied ethernet (CAT 5, RJ45) cable from the ethernet port (T) on the Modbus Gateway directly to an available ethernet port to the PLC. See [Accessories, page 13](#), for available Graco CAT 5 cables.

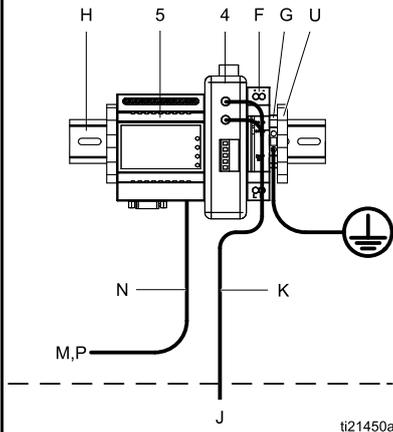
For AWI Communication with a PC: Use the ethernet cable (6) provided to connect the ethernet port (T) on the Modbus Gateway to an available port on the ethernet switch (R) in the AWI Module. Use a second, user-supplied ethernet cable (N) to connect the ethernet switch (R) to the PC.

Installed in 15V337 AWI Module



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Installed on User-Supplied Din Rail



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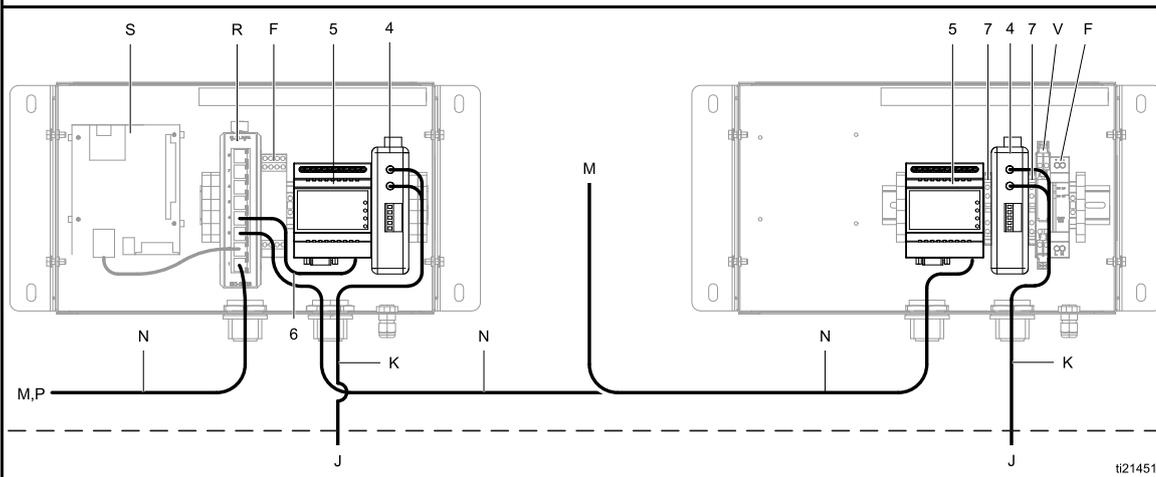
KEY:

- 4 FO Converter (from Kit 24N978)
- 5 Modbus Gateway (from Kit 24N977)
- 6 CAT 5/RJ45 Cable, 1 ft., to connect from Modbus Gateway to ethernet switch.
- 7 Terminal Block (from Kit 24N978)
- F Power supply. See [Accessories, page 13](#), for 15V and 24V options.
- G 112443 Ground terminal block
- H DIN rail (user supplied), must be grounded
- J DCM or ADCM (up to 30 in series)
- K Fiber optic cable to connect from DCM/ADCM to FO Converter. See [Accessories, page 13](#).
- M Programmable logic controller (PLC)
- N Ethernet cable (CAT 5/RJ45) to connect from ethernet switch to communication device. See [Accessories, page 13](#).
- P Personal Computer (PC). Note: See **Modbus Configuration Information** on the next page if you want to communicate directly from the Modbus Gateway to a PC.
- R Ethernet switch (In Graco AWI 15V337)
- S AWI board
- U Clamp end blocks (Graco PN 255045). See [Accessories, page 13](#).
- V Existing power barrier (in 16M167).

NOTE:

The area above the dotted line in each illustration is the Non-Hazardous Location.

Installed in 16M167 Power Supply Module (and/or AWI Module), with ethernet connection to AWI Module



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Modbus Configuration Information

For Network Administrator: The Modbus Gateway is configured at the factory for ethernet communication with a Graco AWI local network. You can reconfigure the device to fit your own networking needs. See the table on this page to restore the device configuration to the factory defaults. Use the OEM Netbiter Config utility found at www.anybus.com to change the device configuration. Also see the Installation Leaflet for the Anybus Modbus Gateway (supplied) for more information.

TCP/IP Settings	
IP Address	192.168.178.205
Subnet Mask	255.255.0.0
Default Gateway	192.168.178.200
Modbus Settings	
Transmission Mode	RTU
Slave Response Timeout	1000 ms
Physical Interface	EIA-232
Baudrate	115,200 bps
Character Format	No parity / 2 Stop Bits
Part Number	502

Accessories

Cables

- 121998, CAT 5, RJ45 Cable, 25 ft (7.6 m)
- 121999, CAT 5, RJ45 Cable, 50 ft (15 m)
- 15V842, CAT 5, RJ45 Cable, 100 ft (30 m)
- 15V843, CAT 5, RJ45 Cable, 200 ft (61 m)
- 16M172, Fiber Optic Cable, 50 ft (15 m)
- 16M173, Fiber Optic Cable, 100 ft (30 m)

Components

- 16N575, Power Supply Unit, 15 VDC, used in 16M167 Power Supply Module
- 120369, Power Supply Unit, 24 VDC, used in 15V337 Advanced Web Interface Module
- 112443, Ground Terminal Block
- 255045, Clamp End Blocks

Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

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Graco Information

For the latest information about Graco products, visit www.graco.com.
For patent information, see www.graco.com/patents.

To place an order, contact your Graco Distributor or call to identify the nearest distributor.

Phone: 612-623-6921 **or Toll Free:** 1-800-328-0211 **Fax:** 612-378-3505

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Graco reserves the right to make changes at any time without notice.
Original Instructions. This manual contains English. MM 332356

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