GRACO®

Gateway Network Communication Kits

312785D

EN

Installation and program setup instructions for use with ProMix® 2KS Electronic Proportioners. For professional use only.

Not approved for use in European explosive atmosphere locations.

See page 3 for kit information.

Important Safety Instructions
Read all warnings and instructions in this manual and in your proportioning system manual. Save these instructions.

TI12933b

CE
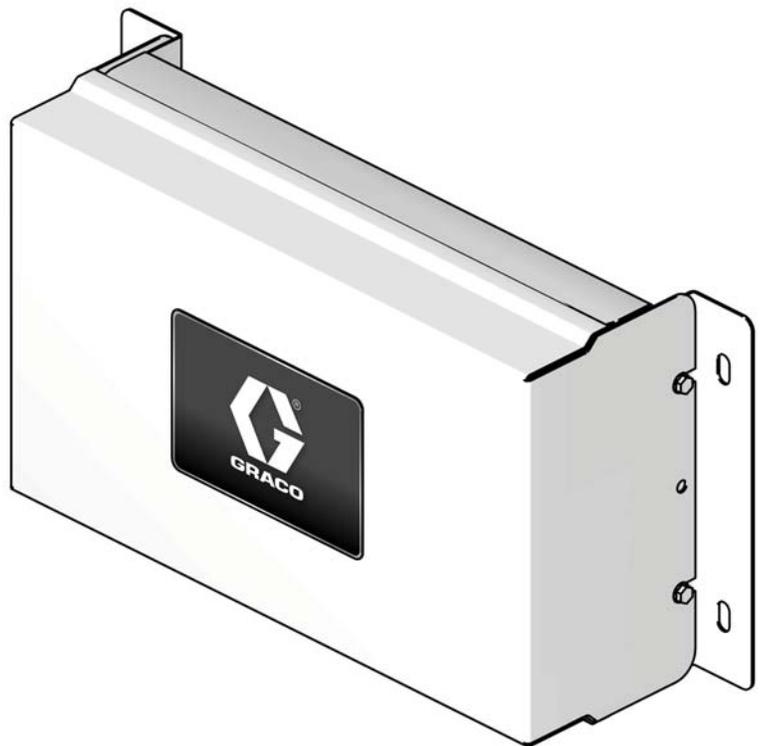
Contents

Graco Gateway Kits

15V331 Gateway Ethernet Kit

Allows communication between ProMix 2KS and a PLC over an ethernet. Enables process equipment to read variables while operating, as well as control the ProMix 2KS and change setup. It does not provide access to job and alarm logs.

15V963 Gateway DeviceNet Kit

Allows communication between ProMix 2KS and a PLC, using DeviceNet process control. Enables process equipment to read variables while operating, as well as control the ProMix 2KS and change setup. It does not provide access to job and alarm logs.

15V964 Gateway Profibus Kit

Allows communication between ProMix 2KS and a PLC, using Profibus process control. Enables process equipment to read variables while operating, as well as control the ProMix 2KS and change setup. It does not provide access to job and alarm logs.

Related Manuals

Component Manuals in English

| Manual	Description
312778	ProMix 2KS Automatic System Installation
312779	ProMix 2KS Automatic System Operation
312780	ProMix 2KS Automatic System Repair-Parts
313386	Basic Web Interface/Advanced Web Interface

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 symbols refer to procedure-specific risks. When these symbols appear in the body of this manual, 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

	FIRE AND EXPLOSION HAZARD
	Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. To help prevent fire and explosion:
	• Use equipment only in well ventilated area.
	• Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).
	• 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.
	• If there is static sparking or you feel a shock, **stop operation immediately.** Do not use equipment until you identify and correct the problem.
	• Keep a working fire extinguisher in the work area.
	ELECTRIC SHOCK HAZARD
	This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.
	• Turn off and disconnect power at main switch before disconnecting any cables and before servicing 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.
	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 Data** in all equipment manuals.
	• Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS forms from distributor or retailer.
	• Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
	• Do not alter or modify equipment.
	• 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.

Graco Gateway Overview

The Graco Gateway enables the ProMix 2KS to network with a programmable logic controller (PLC). Kits are available for Ethernet, DeviceNet, or Profibus protocols. The Graco Gateway will support many other protocols; contact Graco Technical Assistance for information to support your desired protocol.

NOTE: Only persons very familiar with their PLC communication architecture should use this hardware and software. This manual assumes that the person using the Graco Gateway has full understanding of the PLC equipment and related software.

NOTE: Network communications essentially operate with the same rules as Discrete I/O. However, network communications require placing correct values or adjusting appropriate bits within various Modbus registers (for example, see Table 4). These changes should only be made by qualified persons familiar with this type of communication.

The module allows for most PLCs to communicate with the ProMix 2KS via Modbus RTU protocol by bridging the gap between the desired communication protocol and RS485 Modbus RTU. As a result, the PLC has full access to all the registers for monitoring and controlling the ProMix 2KS. It is the responsibility of the integrator or user to ensure proper configuration of the communication hardware on the PLC side.

Install the Gateway Module Hardware

Location

| ⚠	💥					
This equipment is not for use in explosive atmospheres. Do not install equipment approved only for non-hazardous location in a hazardous area.						

Install the Gateway module near the EasyKey™, in a non-hazardous area.

Mounting

1. See **Dimensions**, page 80.

2. Ensure that the wall and mounting hardware are strong enough to support the weight of the equipment, cables, and stress caused during operation.

3. Using the equipment as a template, mark the mounting holes on the wall at a convenient height for the operator and so equipment is easily accessible for maintenance.

4. Drill mounting holes in the wall. Install anchors as needed.

5. Bolt equipment securely.

Grounding

⚠	💥	⚡	⏚			
Your system must be grounded. Read **Warnings**, page 4.						

The Gateway module is grounded through its connection to the EasyKey, which must be connected to a true earth ground. See the system installation manual. A ground wire and clamp, part no. 223547, is available from Graco.

NON-HAZARDOUS AREA

Graco Gateway
Module

USB Cable
(included), for initial
setup only

EasyKey

PLC Communication
Wire/Cable
(protocol dependent)

2-wire twisted
pair cable, with
shield wire

Computer (PC)

Programmable Logic Controller (PLC)
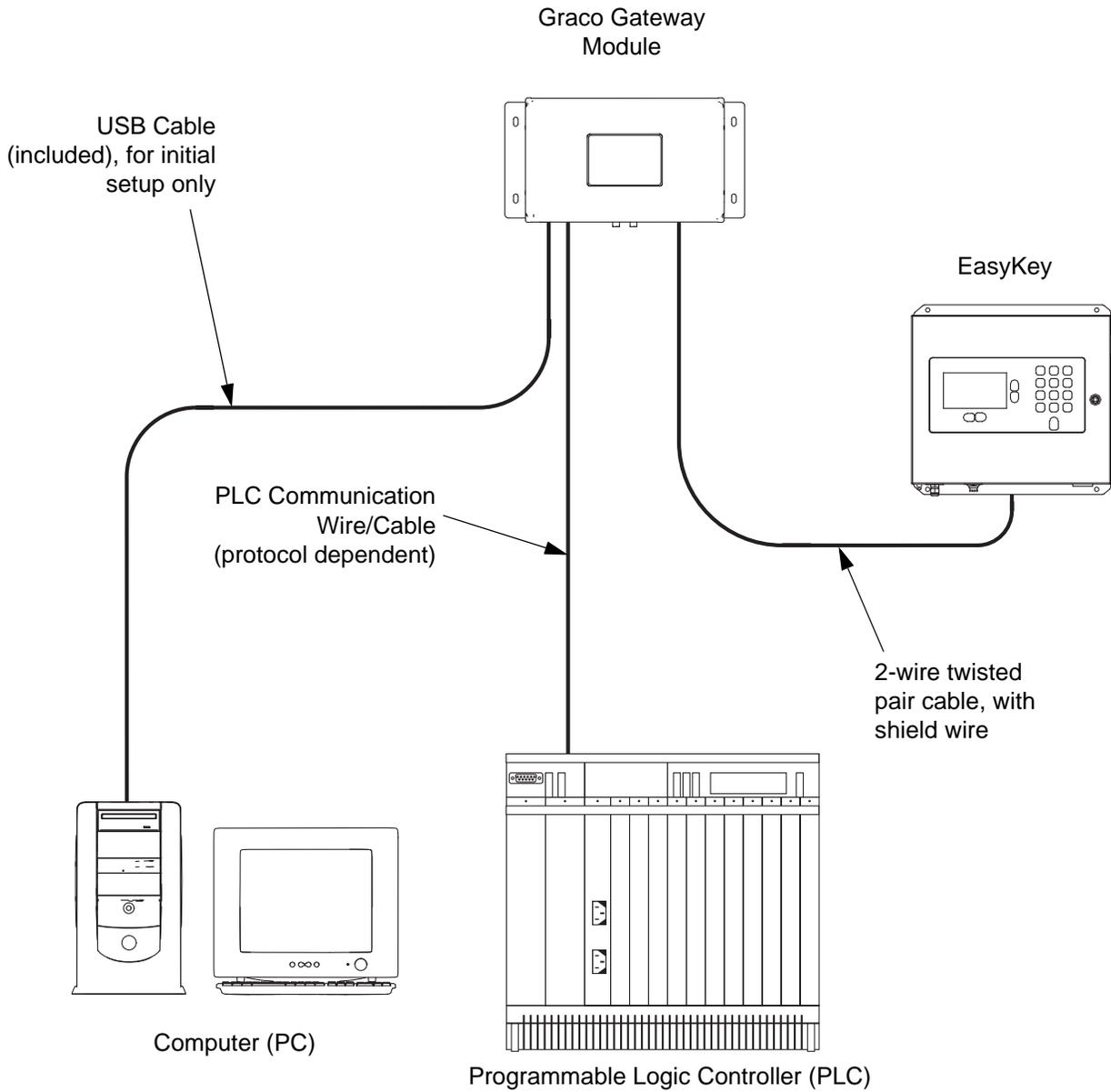
TI13939a

FIG. 1: Graco Gateway Typical Installation

Connect the Module to the EasyKey
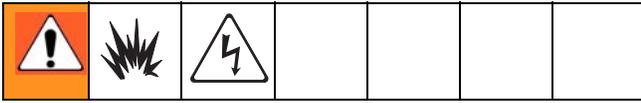
FIG. 1 is only a guide showing installation of the Graco Gateway in a ProMix 2KS System; it is not a complete system design, Contact your Graco distributor for assistance in designing a system to suit your particular needs.

1. Shut off ProMix 2KS power (0 position). FIG. 2. Also shut off power at main circuit breaker.

0 = OFF

TI12657a
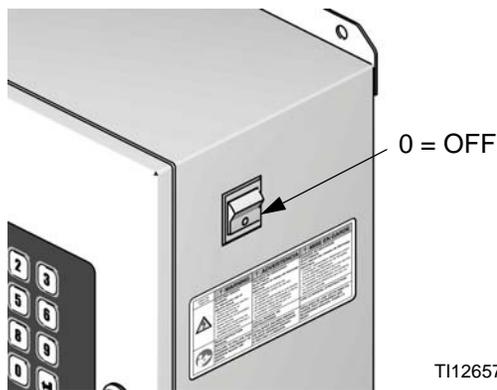
FIG. 2: Power Off

2. Connect a 2-wire twisted pair cable with shield wire from the EasyKey connector to the connector on the Gateway module. Connect a communications wire/cable (protocol dependent) from the Gateway module to the PLC. See FIG. 4.

NOTE: Graco provides expansion cards for DeviceNet and Profibus protocols. DeviceNet setup procedures are on page 43. Profibus setup procedures are on page 58. See page 41 for **Parts**.

NOTE: If using the Graco Gateway in your system, disconnect its cable from the EasyKey before updating the ProMix 2KS software.

Power Connections

1. Shut off ProMix 2KS power (0 position). FIG. 2. Also shut off power at main circuit breaker.

2. Connect the line (L) and neutral (N) wires from a 100-240V, 45-65 Hz, AC power source to the 24V power supply as shown.

3. Use the two lengths of 16 AWG wire (18, provided) to connect the power supply (4) to the gateway (10), as shown.

4. Connect the desired communication cables (see **Cabling Connections**, pages 9-11). After all connections have been made, connect power to the 100-240V AC source.
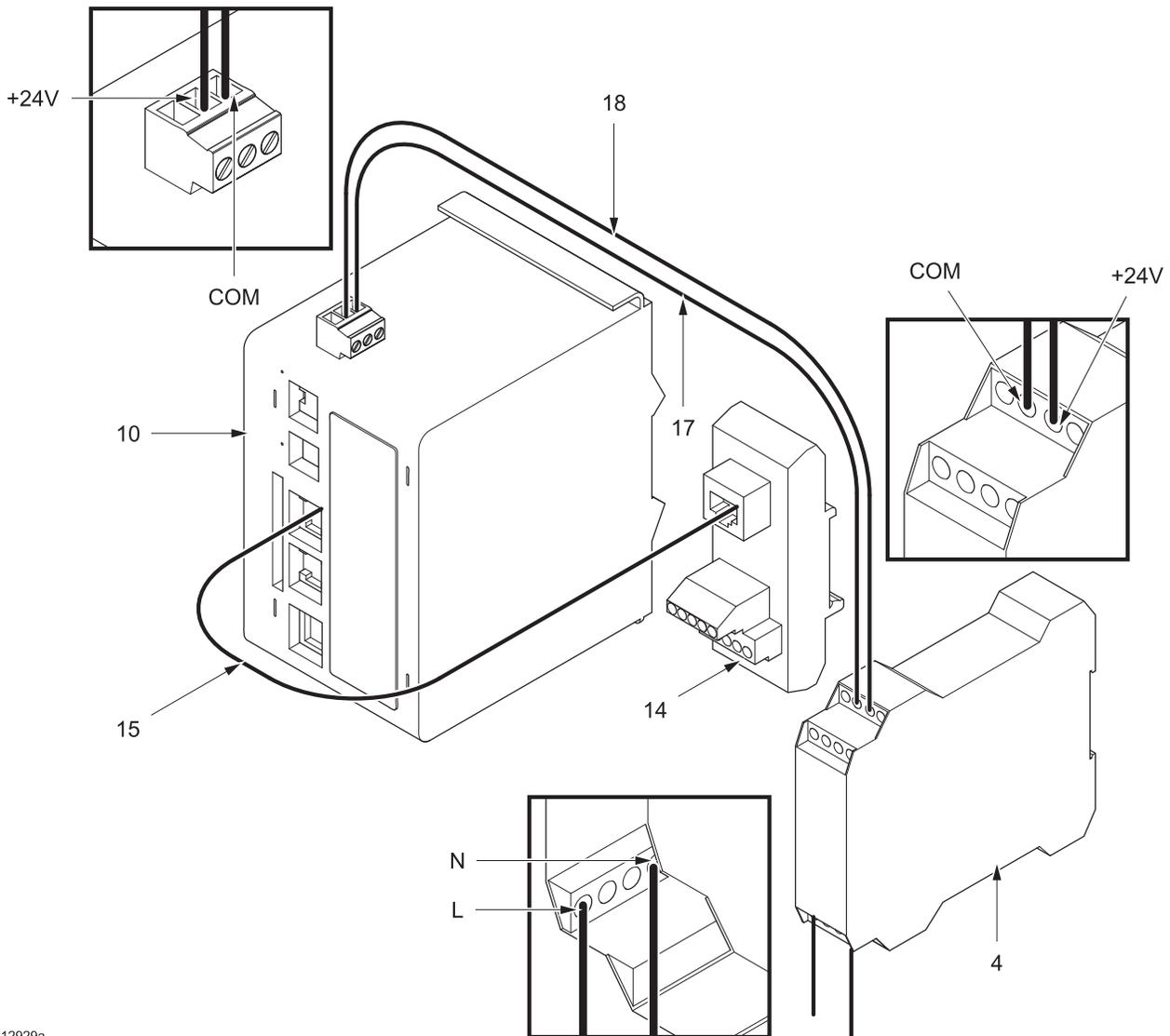

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FIG. 3. Power Connections

Cabling Connections

See FIG. 5 and FIG. 6 for typical cable connections in a ProMix 2KS system.

FIG. 7 through FIG. 10 show other possible cable connections.

EasyKey (Bottom View)

TI12638a
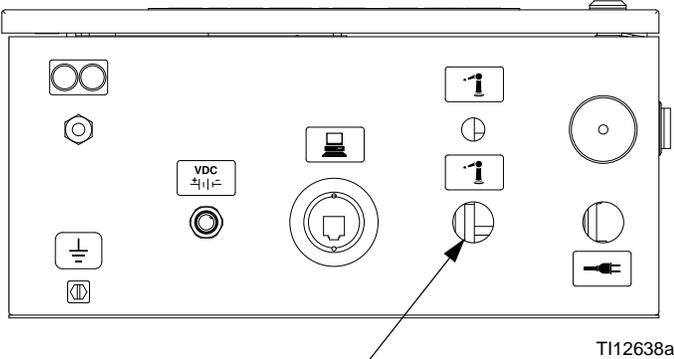
2-wire twisted pair cable, with shield wire (to Gateway Module)

Gateway Module

USB Port

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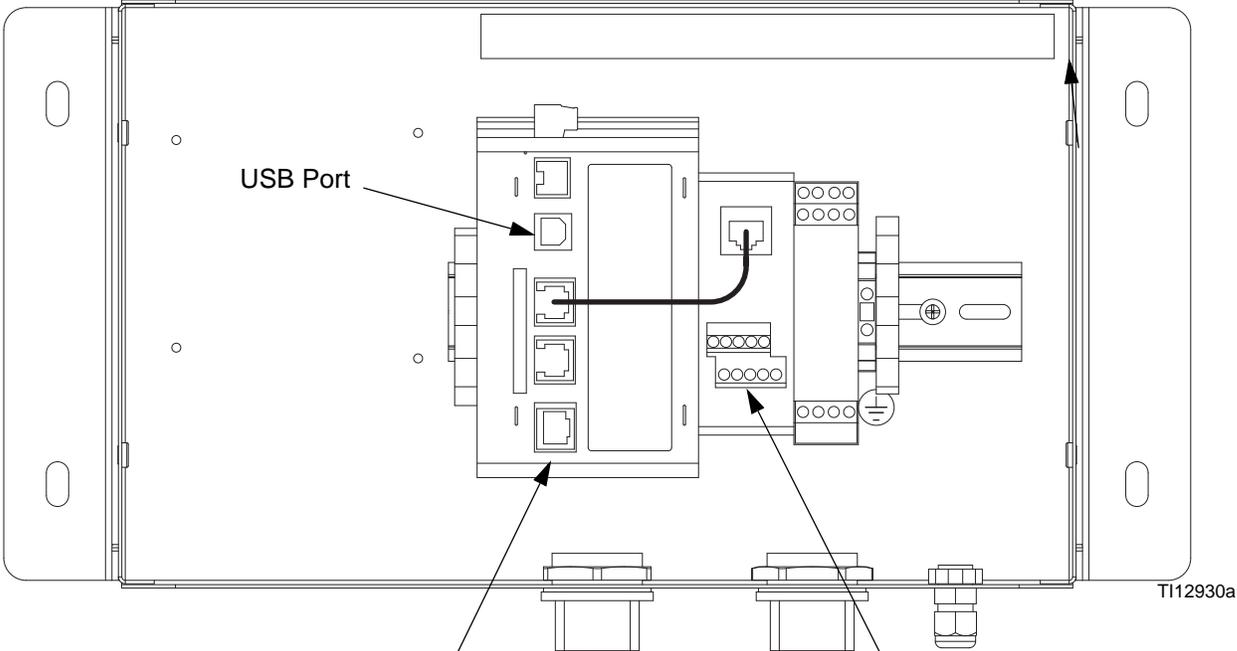
Communication Wire/Cable (to PLC). This connection is protocol dependent.

2-wire twisted pair cable, with shield wire (to EasyKey). See **Wiring Diagrams** on page 42 for pin connections.

FIG. 4: EasyKey and Module Cable Connection Points
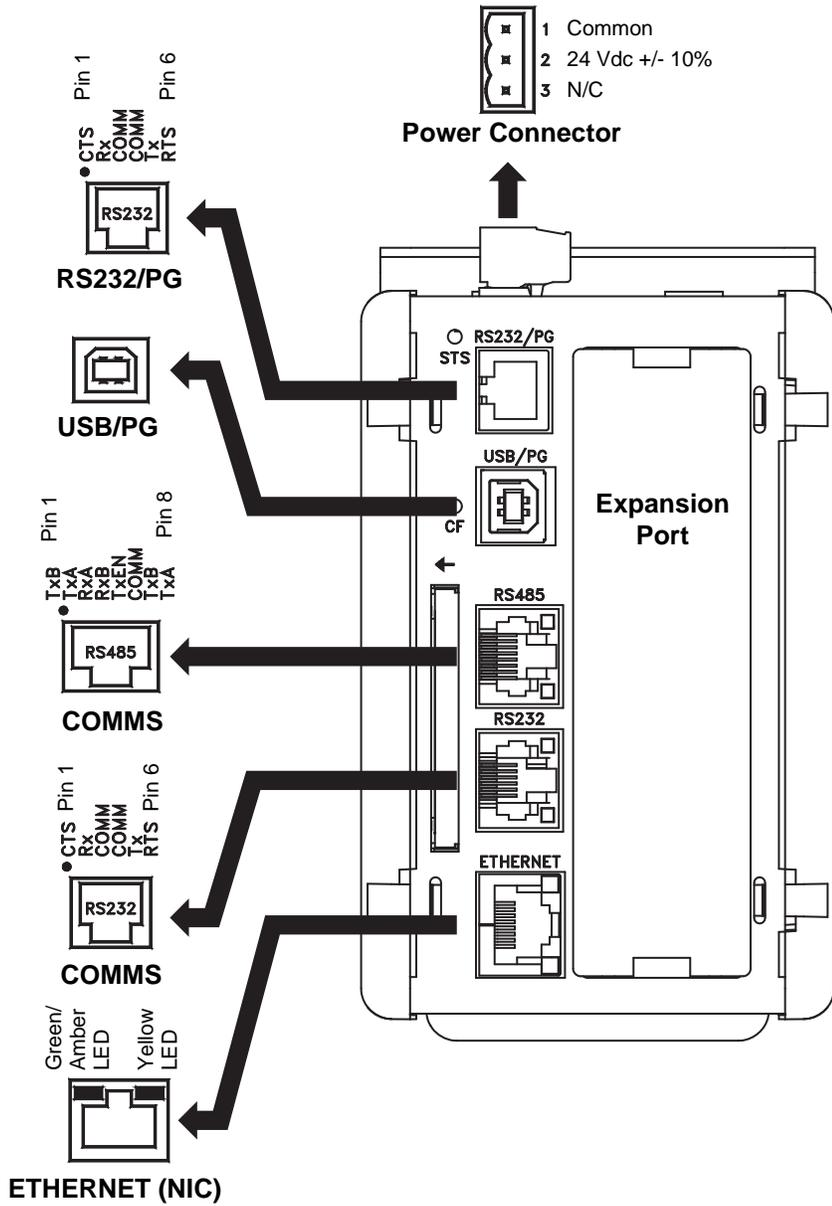
FIG. 5: Graco Gateway Port Pin Outs
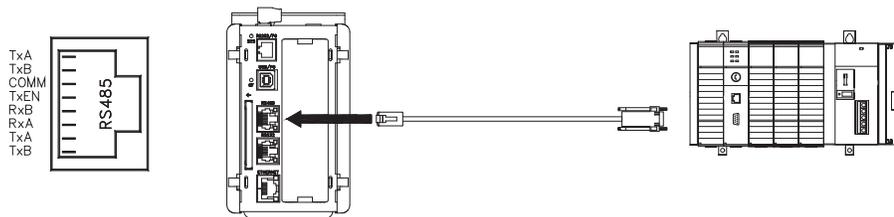
FIG. 6: RS485 Communication Port (Typical ProMix 2KS Connection)

RS232/PG


USB/PG

ETHERNET

Green/Amber LED

Yellow LED

TI13969a
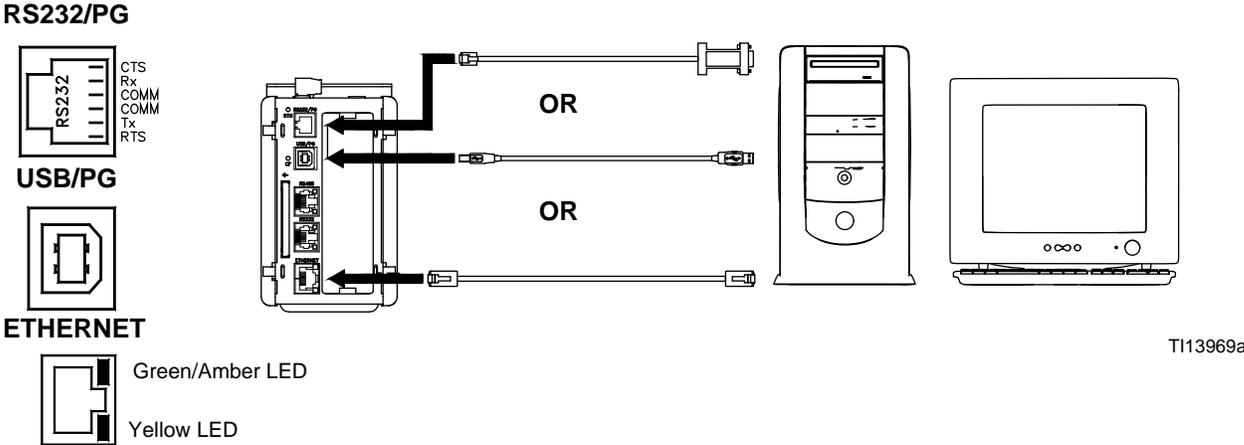
FIG**. 7: Programming Ports**

RS232/PG

OR

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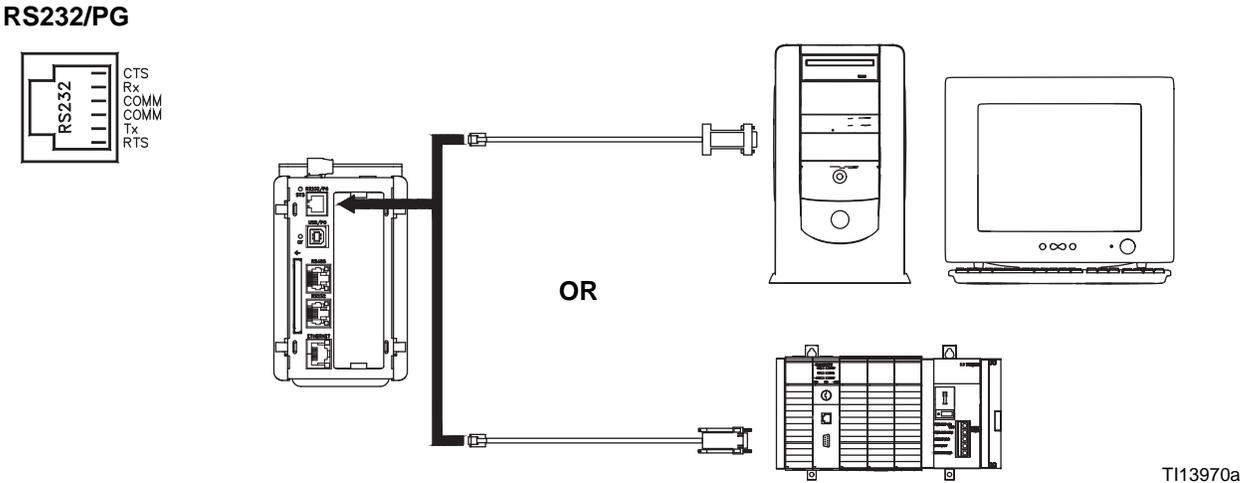
FIG**. 8: RS232/PG Communication Ports**

RS232

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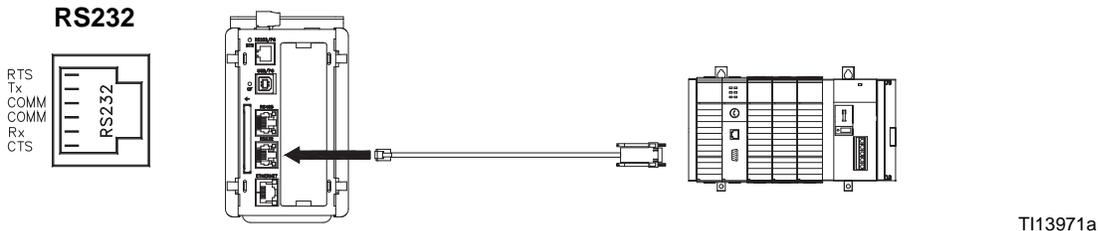
FIG**. 9: RS232 Communication Ports**

ETHERNET

Green/Amber LED

Yellow LED

Standard Ethernet Cable
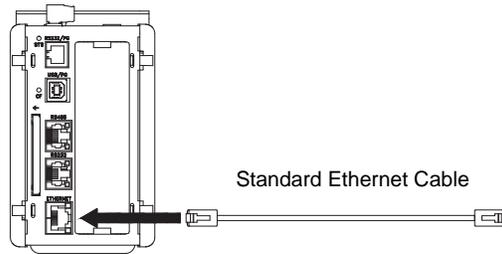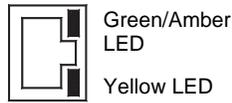
TI13973a

FIG. 10: Ethernet Connection

Mount the Control on DIN Rail

The Gateway control mounts on a DIN rail. Tilt the control and push down onto the DIN rail, then push in. See FIG. 11. A minimum clearance of 1 in. (25 mm) above and below the control is required to ensure adequate ventilation.

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1 in. (25 mm) minimum clearance top and bottom

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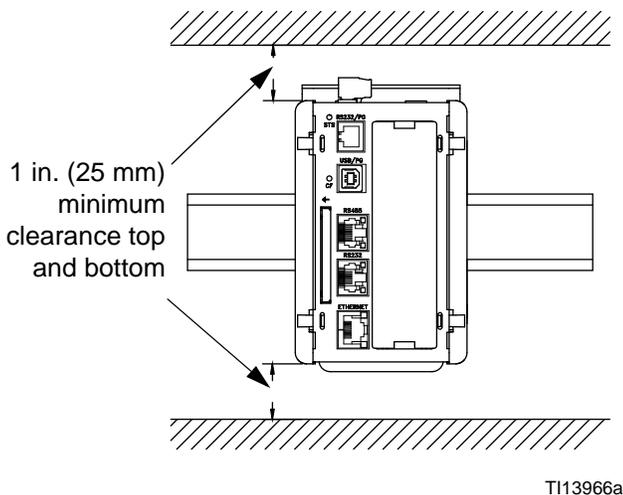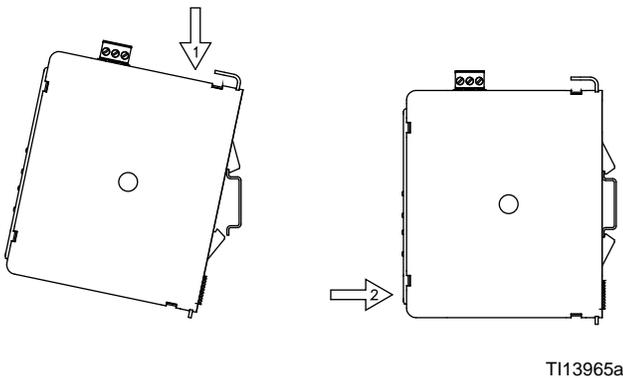
FIG. 11: Mount the Control on a DIN Rail

Install CompactFlash® Card

The CompactFlash socket accepts either Type I or Type II cards. These cards are available at most computer and office supply retailers. Use cards with a minimum of 4 Mbytes and a maximum of 2 Gbytes. Use the CompactFlash card for optional database storage only. See FIG. 12.

Insert card with top side on the left. Do not insert or remove card while power is applied.

TI13967a
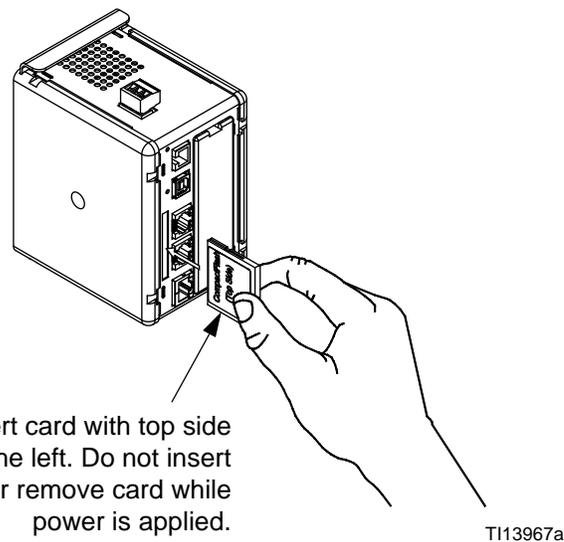
FIG. 12: Install a CompactFlash Card

Install the GracoConfig Software

GracoConfig software provides access to the Graco Gateway module hardware. The CD provided contains the GracoConfig software (GracoConfigXXX.exe, where the XXX represents the version control number). It also includes a preconfigured database which is essentially a setup file for the Gateway. The database file has a .gg2 extension.

The Graco Gateway provides conversions for many protocols, including the following:

- All Allen-Bradley protocols
- DeviceNet
- Ethernet TCP/IP
- Ethernet IP
- Mitsubishi
- Modbus (ASCII, RTU)
- Profibus
- Siemens

NOTE: Graco provides expansion cards for DeviceNet and Profibus protocols. DeviceNet setup procedures are on page 43. Profibus setup procedures are on page 58. See page 41 for **Parts**.

NOTE: Contact your Graco distributor or Graco Technical Assistance for information regarding additional supported protocols.

System Requirements

GracoConfig software will run on PCs with the following specifications:

- A Pentium class processor as required by the chosen operating system.

  NOTE: GracoConfig software will operate with all versions of Microsoft® Windows 98 and above. Windows 2000 or above is recommended for more robust operation.

- RAM and free disk space as required by the chosen operating system.

- An additional 50MB of disk space for software installation.

- A display of at least 800 by 600 pixels, with 256 or more colors.

- USB port for downloading a configured database to the Gateway module.

Load the Software

1. Connect the USB cable (23, supplied) between the USB port on the Gateway module and a USB port on your PC. See FIG. 13.

USB Port

USB Cable Strain Relief

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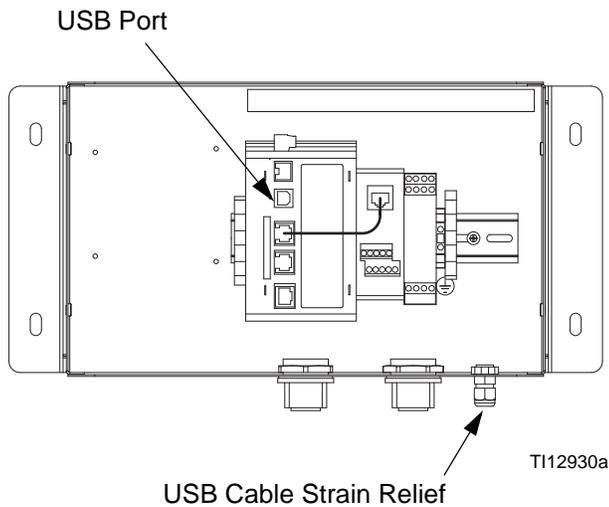
FIG. 13: Gateway Module USB Port

2. FIG. 14 will appear. Select "Yes, this time only", then click Next.

FIG. 14: Found New Hardware Screen

3. FIG. 15 will appear. Insert the CD in your PC's CDROM drive. Select "Install the software from a list or specific location", then click Next. The program location is C:\Program Files\Graco\GracoConfig\Device.

   NOTE: The name of the driver may be different. Just accept the name and proceed by following the instructions on the screen.
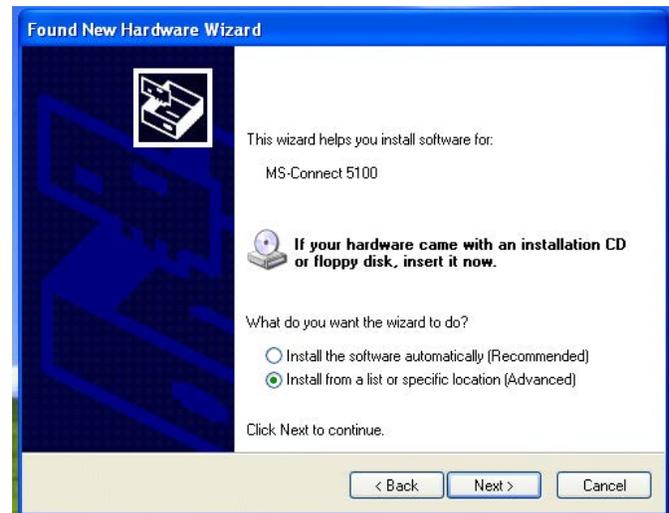

FIG. 15: Load Software from a Specific Location

Software Updates

Contact your distributor or Graco Technical Assistance for software updates.

Download the Preconfigured Database to the Gateway Module

Graco supplies a preconfigured database as a setup file for the Gateway, containing parameters which communicate between the Gateway and the ProMix 2KS. The file name has a .gg2 extension.

GracoConfig files are downloaded to the Gateway module using the Link menu. The programming link between the PC and the Gateway module uses the USB cable. Before downloading, check that the Communications Port is set to USB, as follows.

NOTE: During programming the Gateway module may ask for an updated driver. Follow the instructions on the screen to automatically find and select the drivers.

1. Go to Start>Programs>Graco>GracoConfig and run the program. The GracoConfig main page will appear.

Link Pulldown Menu   Update Symbol
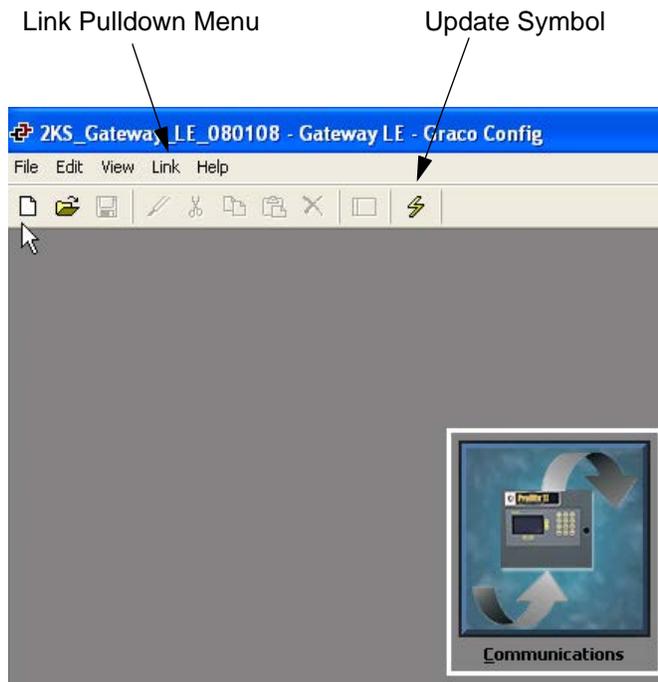
FIG. 16: GracoConfig Main Page

2. Using the Link pulldown menu, select Options to open the Link Options window. Check that the Communications Port is set to USB, and click OK.
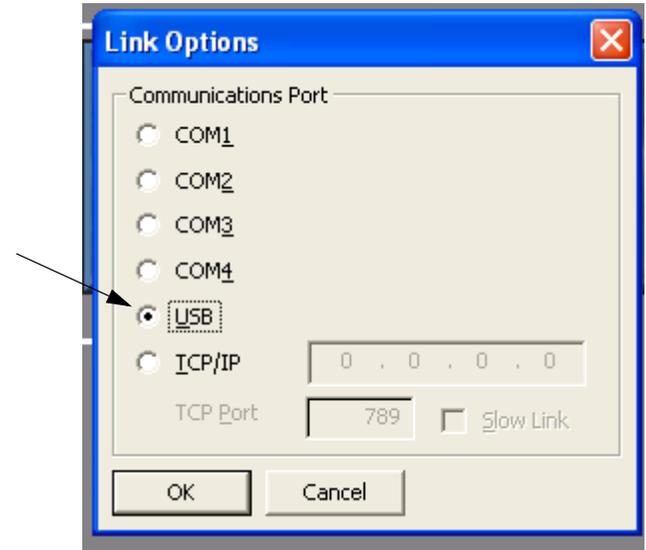
FIG. 17: Set Communications Port to USB

3. Go to File>Open and select the file with the xx.gg2 extension. The file name should appear at the top of the window (FIG. 16) once loaded.

4. Download the database using the Link>Update command. As a shortcut, use the Update symbol on the toolbar. See FIG. 16.

NOTE: Downloading typically takes only a few seconds but may take longer if the software has to update firmware on the Gateway module.

Graco Gateway Network Communications Configuration

Startup

To run GracoConfig, select the icon [icon] from the

Graco folder on the Programs section of your Start Menu. The main page will appear, showing the Communications button.

Communications Button
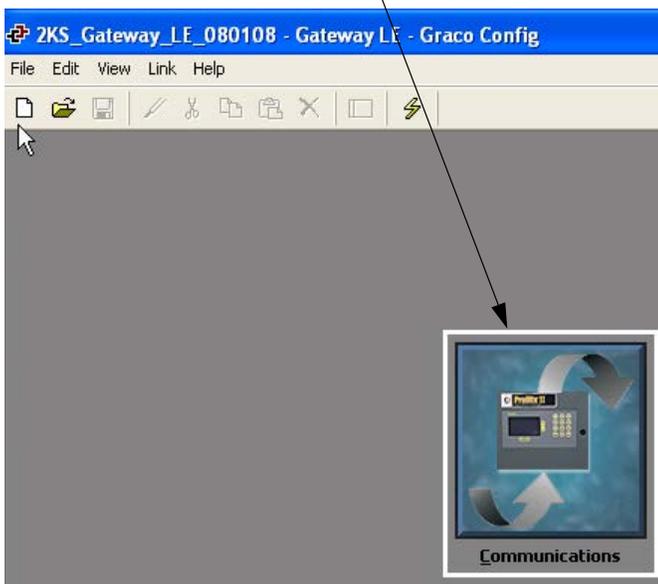
FIG. 18: Communications Button

GracoConfig Main Page

Communications Button

The Communications button provides access to screens used to configure your system and setup parameters, allowing you to:

• Specify which protocols are to be used on the Gateway serial ports and on the Ethernet port.

• If using master protocols (i.e., protocols by which the Gateway initiates data transfer to and from a remote device), you can specify one or more devices to be accessed.

• If using slave protocols (i.e., protocols by which the Gateway receives and responds to requests from remote devices or computer systems), you can set read or write access for specific data items.

• Move data between one remote device and another.

Balloon Help

The Balloon Help feature allows you to see help information for each icon in the main menu, or for each field

in a dialog box or window. It is controlled via the [icon] icon at the right-hand edge of the toolbar. Balloon Help has three user-selectable modes:

• **Do Not Display** disables balloon help

• **When Mouse Over** displays help when the mouse pointer is held over a particular field for a certain period of time

• **When Selected** displays help constantly for the currently selected field.

Setup the Database

1. Double-click on the Communications button to open the preconfigured database (.gg2). The file is already setup for ProMix 2KS. See FIG. 19.
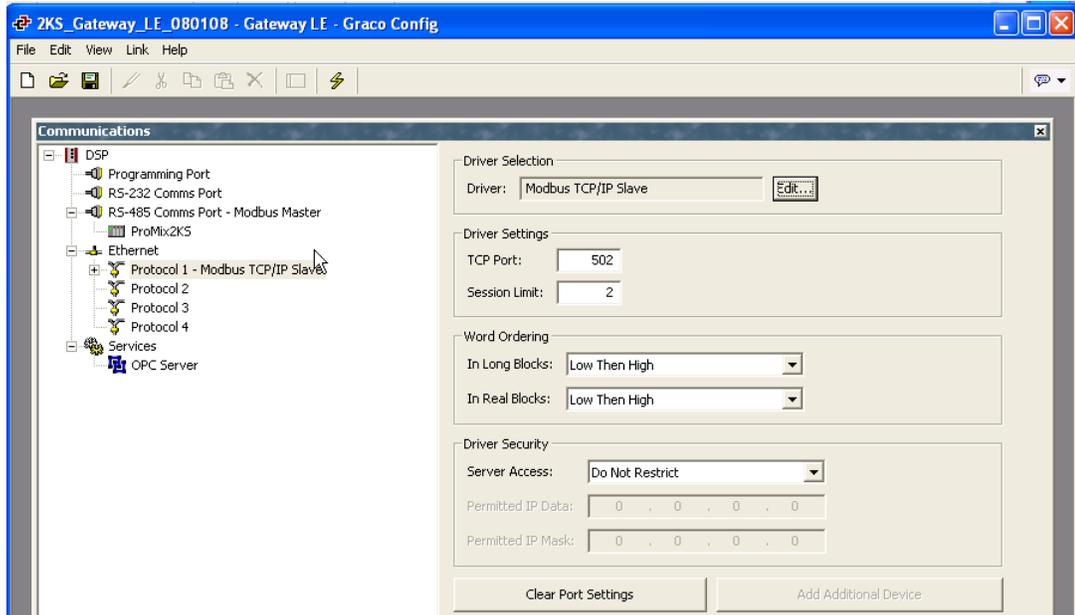
FIG. 19: Preconfigured Database

2. See FIG. 20. Highlight Protocol 1. Click the Edit button on the right side of the window to open the Driver Picker window. Choose a protocol from the lists provided, in this example Modbus and TCP/IP Slave. The system will create device PLC1.
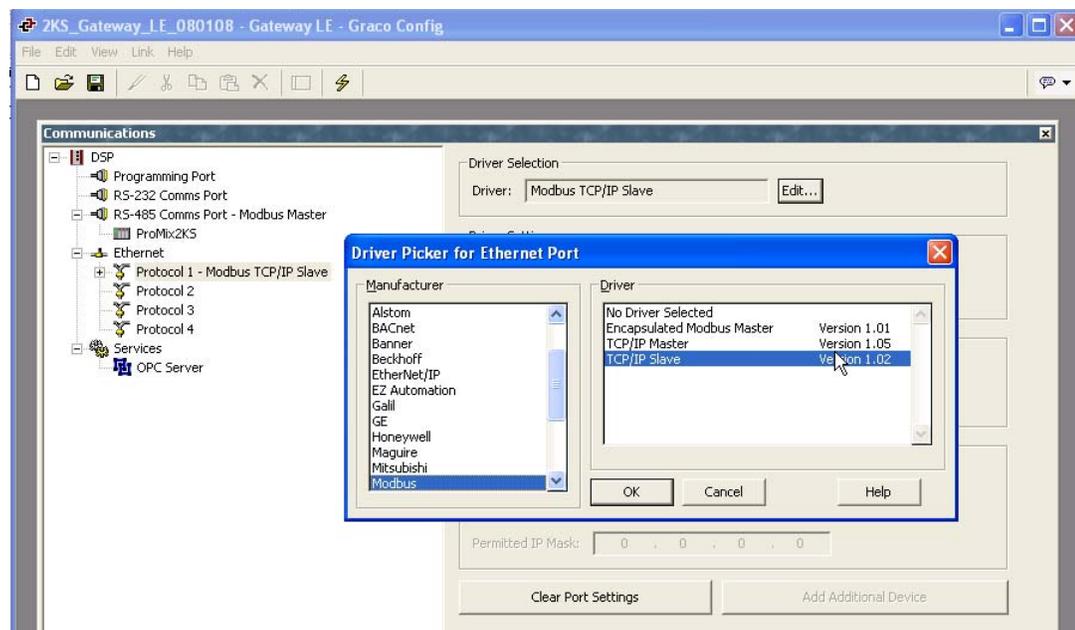
FIG. 20: Select Protocol

3. See F<small>IG</small>. 21. Right click on device PLC1 to rename it to something meaningful for your system.
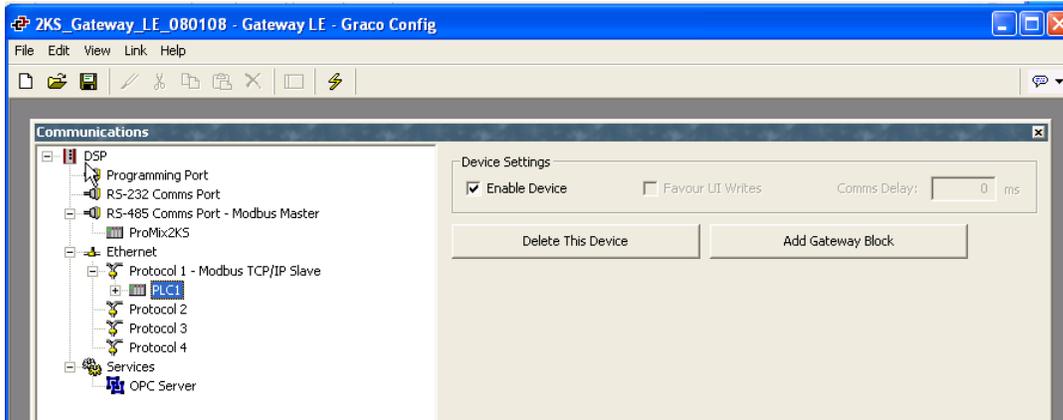

F<small>IG</small>. **21: Rename PLC1**

4. See F<small>IG</small>. 22. Add as many Gateway blocks as desired under each device.
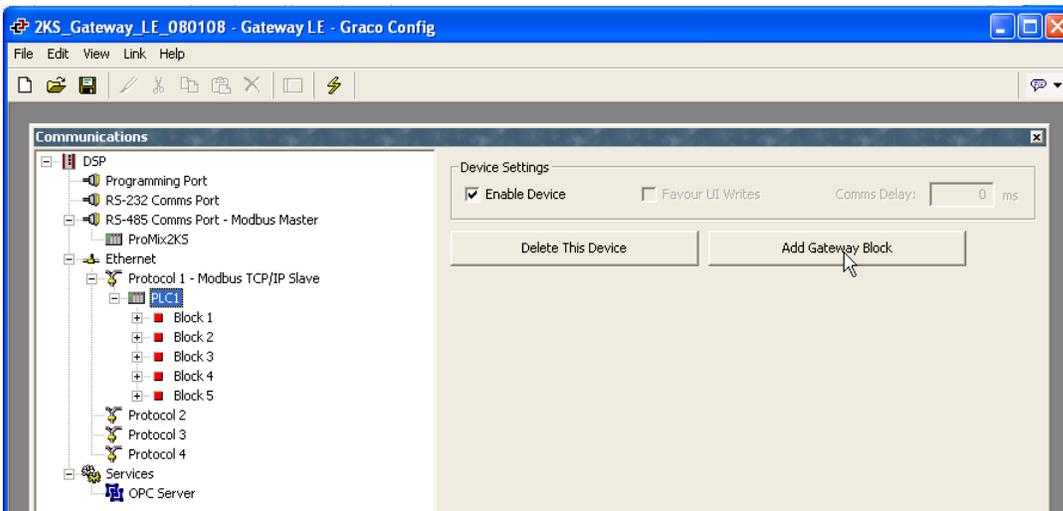
F<small>IG</small>. **22: Add Gateway Blocks**

Map Data

1. See FIG. 23. Select the block for data mapping. Click the Edit button next to the Start Address field on the right side of the window. The Select Address window will open.

2. Refer to Table 4 on page 31 for a Modbus map. Select the desired Modbus register address as a starting point (in this case 40002). Enter the appropriate values in the Select Address window and click OK. The desired register address will populate the Start Address field.
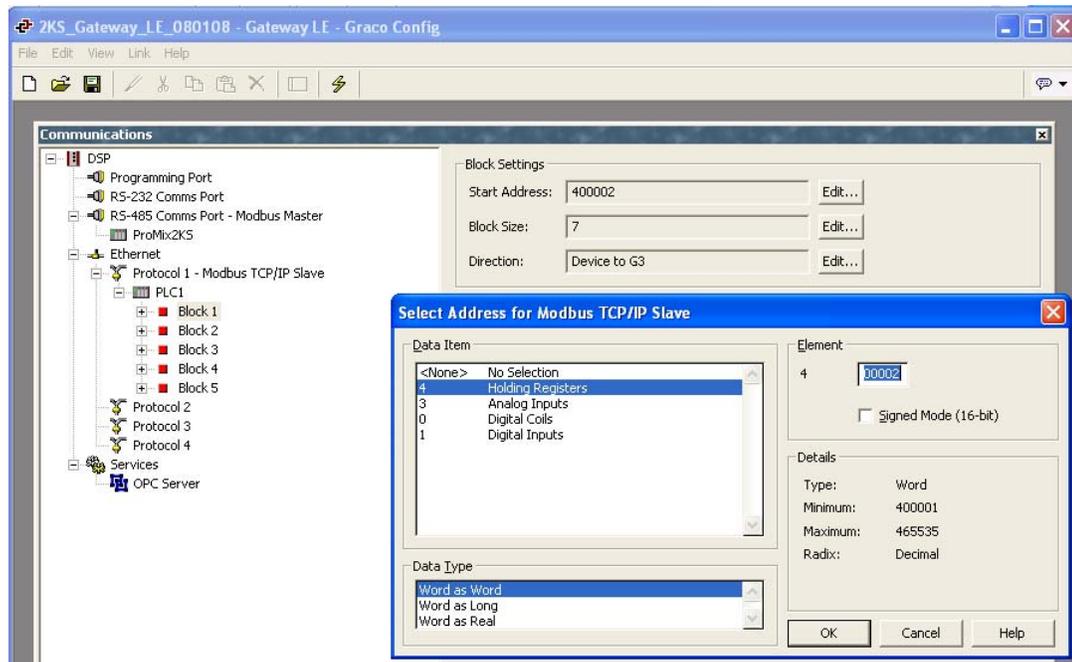
FIG. 23: Mapping Gateway Blocks

3. See FıG. 24. Click the Edit button next to the Block
   Size field on the right side of the window. The Edit
   Value window will open. Enter the number of Mod-
   bus register addresses in the range from the starting
   address entered in step 2 to the desired ending
   address, inclusive. In this example, 7. The
   addresses must be contiguous. This means that
   each address must be available and addressable
   from the ProMix 2KS. If one of the 7 addresses does
   not exist within the ProMix 2KS Modbus structure,
   the complete block will not communicate.
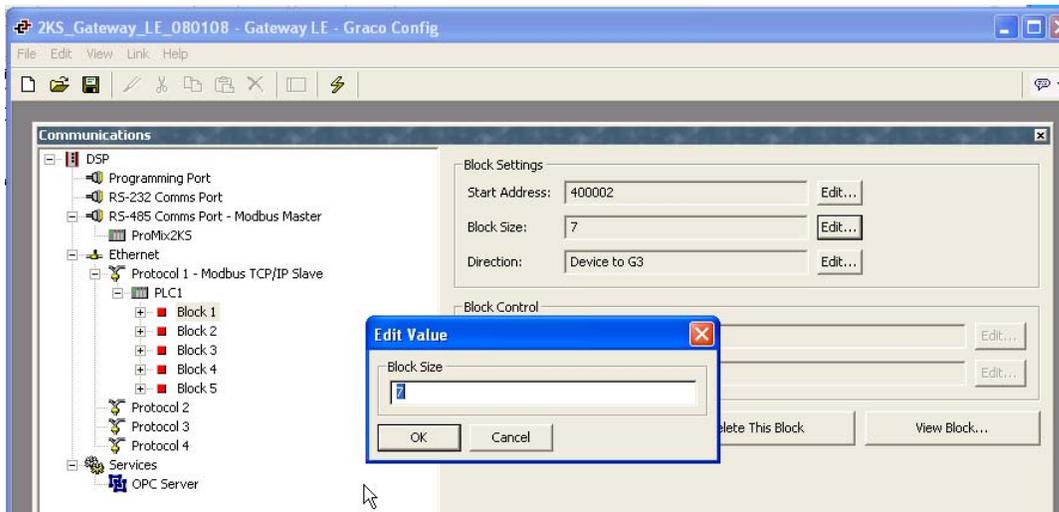
FıG. 24: Setting Block Size

4. See FIG. 25. Click OK. The range of addresses will appear under the appropriate Block on the left side of the window.

NOTE: In this example, a Modbus device master communicating via TCP/IP will have direct access to Modbus registers 40002 through 40008 of the Pro-Mix 2KS.
For example, see Block 1 address line 1:

Modbus address of ProMix 2KS.

Modbus address (command) from TCP/IP master connected to
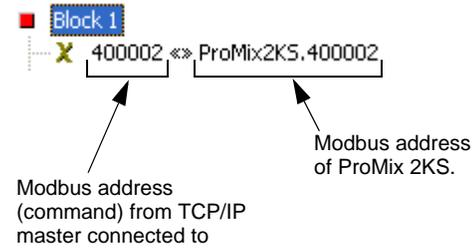
5. The Direction field typically should remain set to Device to G3.
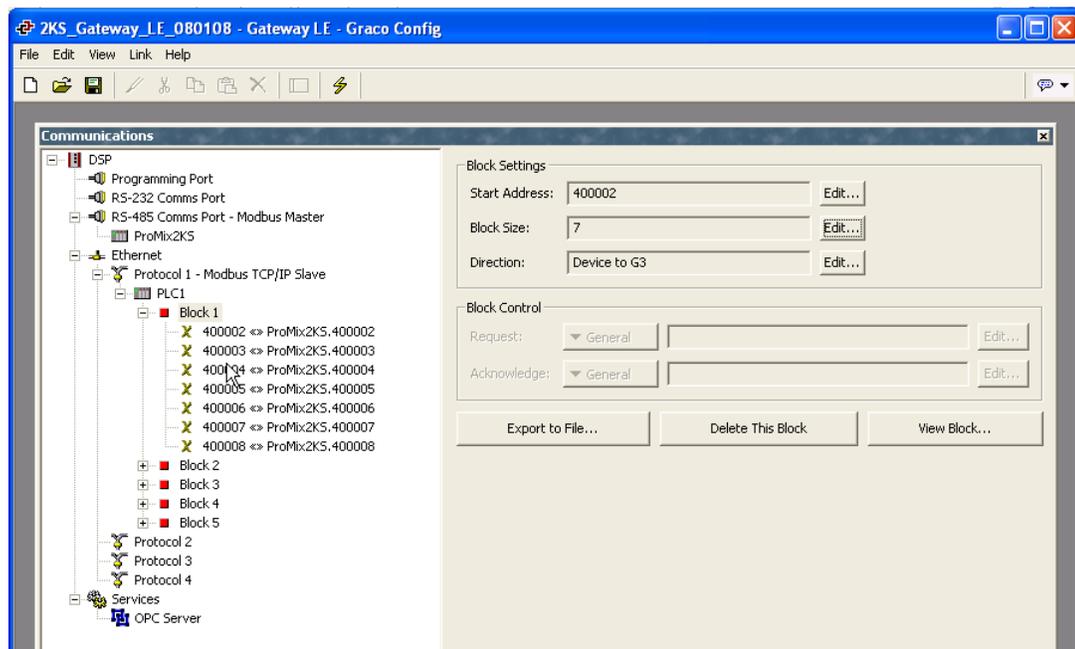
FIG. 25: Block Mapping Data

Modbus and I/O Data

See Table 4 through Table 5 for Modbus register addresses and input/output data.

Reference the Discrete I/O listing of all the inputs and outputs (see page 31). Ensure these are fully understood. The same implementation used for Discrete I/O is used for the Network communication protocol.

For example: The Gun Trigger Input will now be a specific bit of Modbus Register 40040. Monitoring of Modbus Register 40041 for specific output status conditions will be required as explained in the Discrete I/O section of the ProMix 2KS Operation manual. The PLC will have to read the various bits, and in some cases (40040 and 40041 for example) must mask out the various bit positions to determine each of the separate input and output statuses. This requires experience and should not be done on the job site. A full understanding of the color change process as well as the required timing of various inputs and outputs is required.

NOTE: Analog input for flow control set point will now be a dedicated Modbus register. Register 40137 will require the specific flow rate (i.e. 125 cc/min). This is not a voltage reading but the actual flow target.

Start Mix Process

See FIG. 26, Table 1, and Table 2.

1. Verify that the Mix Ready bit (bit 2 of 40041) is on.

2. Turn on the Mix bit (bit 7 of 40040).

3. Verify that the Mix Active bit (bit 1 of 40041) is on, to ensure that the Mix request was received.

Stop Mix Process

See FIG. 27, Table 1, and Table 2.

1. Clear the Mix bit.

2. The Mix Active output should clear and Mix Ready should now be set.

NOTE: The ProMix 2KS will automatically go into Idle mode after 2 minutes of inactivity. A general alarm will be present and Mix Active will remain High. The Alarm bit (40010) will indicate the system Idle alarm. When a new Gun Trigger input is seen, the ProMix 2KS will resume mixing material where it left off. Do not toggle the Mix bit; doing so restarts the Mix process from the beginning.

Color Change Process

See FIG. 29, Table 1, and Table 2.

1. Verify that Mix Ready is set. This ensures that there are no alarms and that the system is ready for the next command.

2. Load ccNewRecipe (Modbus 40046) with a recipe number to color change to.

3. Set color change (40040 bit 6).

4. Verify that Purge_CC_Active is seen (40041 bit 0).

5. Clear color change bit (momentary only).

6. *Do not* change the ccNewRecipe value until a new recipe change is requested.

7. The color change process will stop automatically as programmed. Monitor Purge_CC_Active bit for completion.

Purge Process

See FIG. 28, Table 1, and Table 2.

1. Verify that Mix Ready is set. This ensures that there are no alarms and that the system is ready for the next command.

2. Set purge (40040 bit 8).

3. Verify that Purge_CC_Active is seen (40041 bit 0).

4. When Purge_CC_Active bit clears, clear Purge_Start bit. Clearing this bit in the middle of a purge sequence will abort the purge sequence.

```
                          ╭─────────────────╮
                          │  Start Mix Mode  │
                          │     Process      │
                          ╰─────────────────╯
                                   │
                                   ▼
              NO            ◇ Is Mix Ready ◇            YES
        ┌──────────────────    bit = 1?    ──────────────────┐
        │                                                    │
        ▼                                                    ▼
┌─────────────────┐                              ┌─────────────────┐
│ Must be Alarm   │                              │  Set Mix bit = 1 │
│ Condition or    │                              └─────────────────┘
│ Active Recipe   │                                       │
│ 61. See Alarm   │                                       ▼
│ Processing on   │              NO              ◇ Is Mix Active ◇
│ page 27, or     │◄──────────────────────────     bit = 1?
│ Startup from    │                                       │
│ Recipe 61 (see  │                                      YES
│ NOTE            │                                       │
└─────────────────┘                                       ▼
                                              ┌─────────────────┐
NOTE: At power up the system                  │ ProMix 2KS in Mix │
defaults to Recipe 61, which is               │ Mode (Complete)  │
not a valid recipe number. Initiate           │ Mix Active = 1 while │
a color change to Recipe 0 or a               │ the ProMix 2KS is in │
valid recipe number (1-60).                   │ Mix mode         │
                                              └─────────────────┘
```

FIG. 26. Start Mix Mode Process Flow Chart

Mixing Mode
Process

Mixing Mode is desired.
PLC is polling to ensure
Mixing Mode is main-
tained.

NO

Is Mix Active
bit = 1?

YES

Mixing Process active

Check Alarm
Condition: is Alarm_
General bit = 1?

NO

2KS is in Standby. Go to
Start Mix Process, page
22.

YES

Go to **Alarm Process-
ing**, page 27
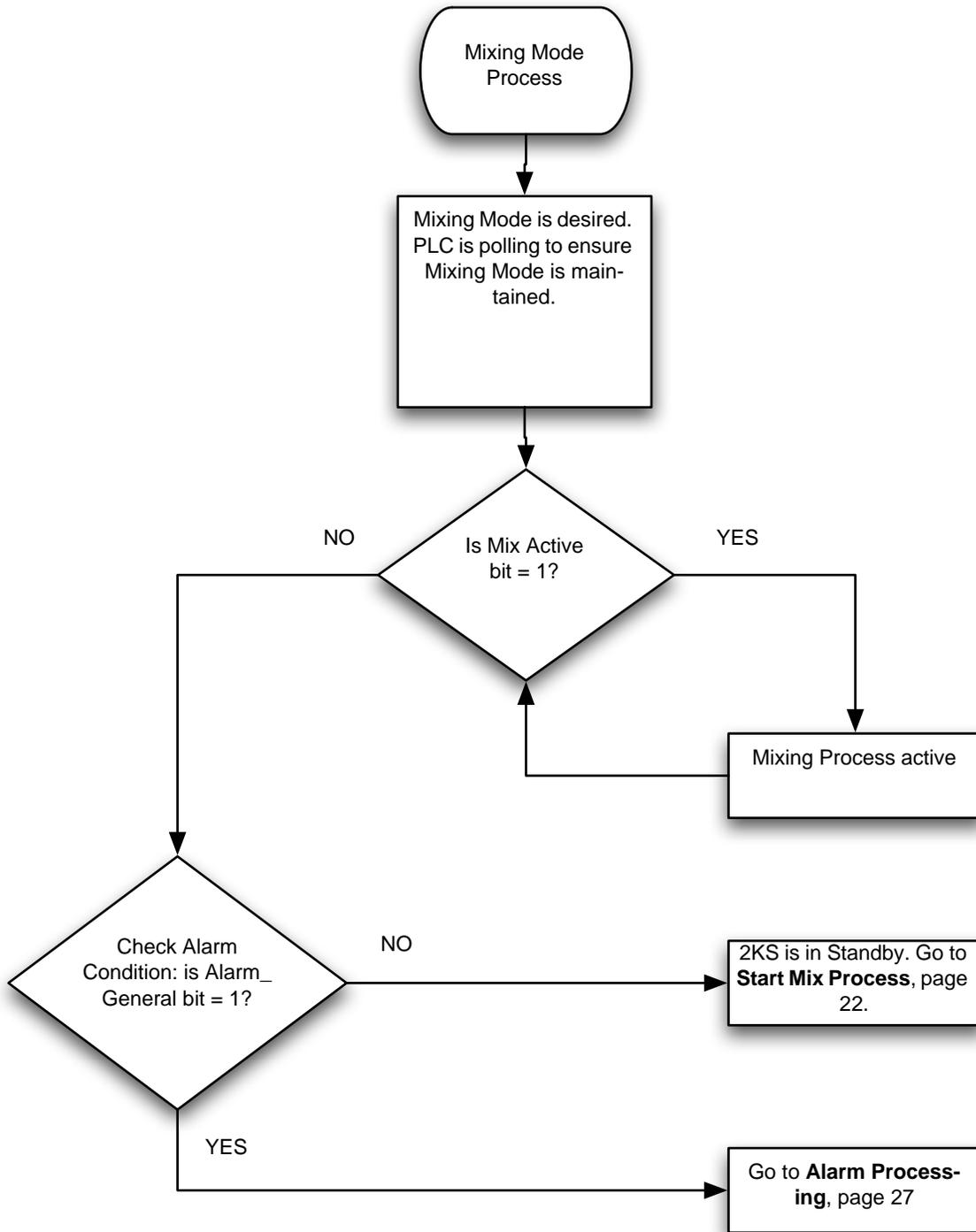
FɪG. 27. Mixing Mode Process Flow Chart

Start

NO — Is Mix Ready bit = 1? — YES

Must be Alarm Condition or Active Recipe 61. See **Alarm Processing** on page 27, or Startup from Recipe 61 (see **NOTE**

Set Purge bit = 1?

Is Purge_CC_Active bit = 1?

NO — YES

ProMix 2KS in Purge_CC Mode (Process Started)

(Wait for Mix Ready)

Is Mix Ready bit = 1?

NO

YES

Set Purge Bit = 0. ProMix 2KS Purge Process (Complete)
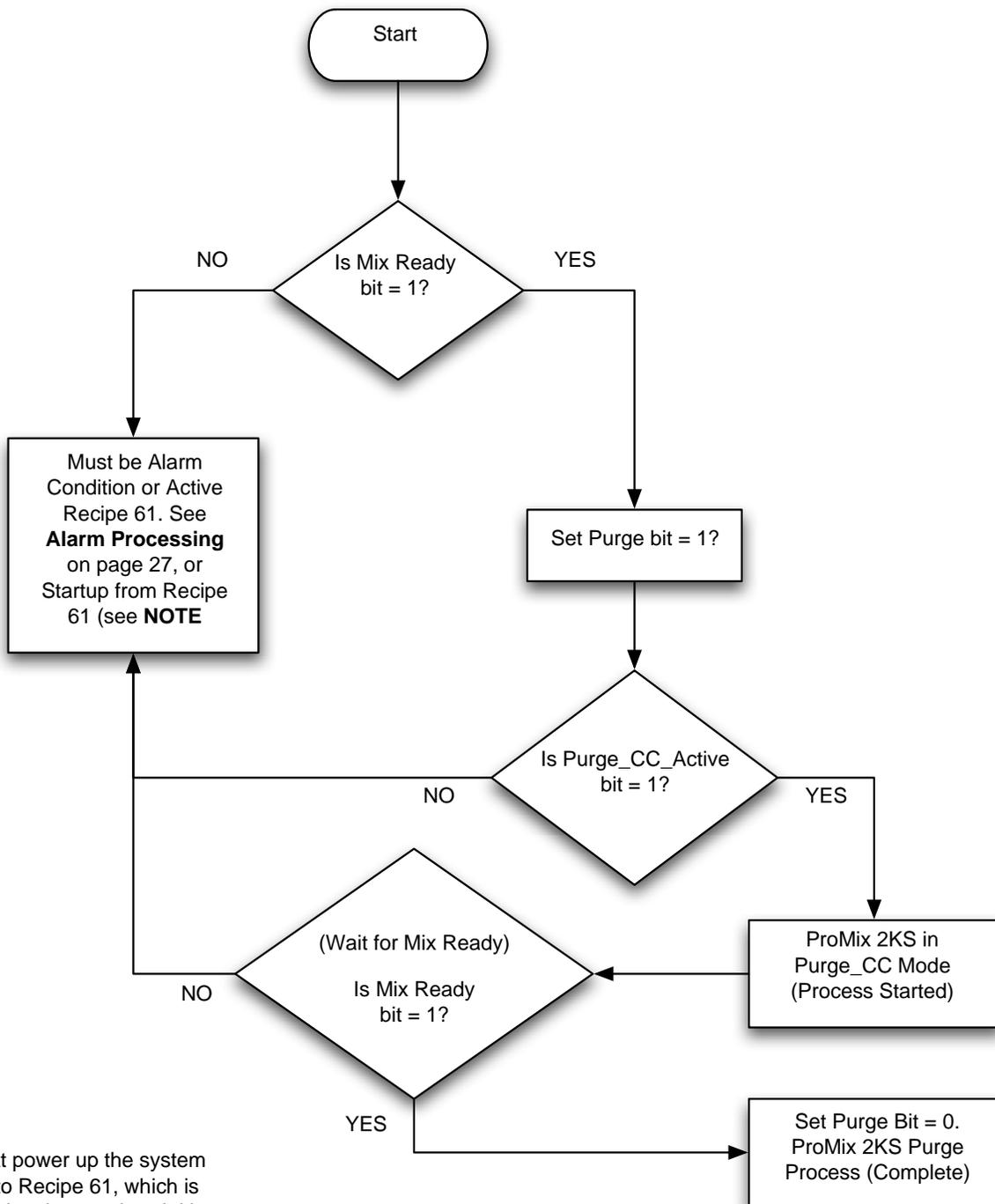
NOTE: At power up the system defaults to Recipe 61, which is not a valid recipe number. Initiate a color change to Recipe 0 or a valid recipe number (1-60).

FIG. 28. Purge Mode Process Flow Chart

```
                                    ┌─────────────┐
                                    │ Color Change│
                                    │   Process   │
                                    │   (basic)   │
                                    └──────┬──────┘
                                           │
                                           ▼
  ┌──────────────┐    YES      ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇      NO
  │ Do nothing.  │◄────────────  Is Active Recipe =   ─────────┐
  │ Spraying at  │             ◇ to desired recipe? ◇          │
  │desired recipe│             ◇ (Register 40005).  ◇          │
  └──────────────┘              ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇              ▼
                                                      ┌──────────────────┐
                                                      │ Load ccNewRecipe │
                                                      │ (Register 40046) │
                                                      │ with recipe      │
                                                      │ number to Color  │
                                                      │ Change to (0     │
                                                      │ through 60 is    │
                                                      │ valid).          │
                                                      └────────┬─────────┘
                                                               │
                              ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇                 ▼
  ┌──────────────┐    NO      ◇ Is Purge_CC_Ac- ◇     ┌──────────────────┐
  │ Ensure Col-  │◄───────────  tive bit = 1?   ◇     │ Set ColorChange  │
  │ orChange bit │            ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◄──────│ (CC) bit = 1.    │
  │ is seen by   │                   │                └──────────────────┘
  │ ProMix       │                   │ YES
  └──────────────┘                   ▼
                                                      ┌──────────────────┐
                                                      │ Clear ColorChange│
                                                      │ (CC) bit         │
                                                      │ (momentary input)│
                                                      │ CC process       │
                                                      │ started.         │
                                                      └────────┬─────────┘
                                                               │
                              ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇              ▼
                  NO         ◇ (Wait for Mix Ready) ◇
                ◄────────────◇                      ◇◄─────────┘
                │            ◇   Is Mix Ready        ◇
                │            ◇   bit = 1?            ◇
                │             ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇
                ▼                    │ YES
   ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇                  ▼
   ◇ Check Alarm   ◇   YES   ┌──────────────────┐
NO ◇ Condition: is ◇─────────│ ProMix 2KS Color │
   ◇ Alarm_        ◇         │ Change Process   │
   ◇ General bit=1?◇         │ (Complete)       │
   ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇           └──────────────────┘
          │ YES
          ▼              ┌──────────────────┐
                         │ Process Alarm.See│
                         │ **Alarm Processing**,│
                         │ page 27.         │
                         └──────────────────┘
```

FIG. 29. Color Change Mode Process Flow Chart

Alarm Processing

See FIG. 30, Table 1, Table 2, and Table 3.

```
                    ┌──────────────────────┐
                    │   Alarm Processing   │
                    └──────────────────────┘
                                │
                                ▼
                    ┌──────────────────────┐
                    │ An Alarm Condition   │
                    │ has been found       │
                    │ previously. Alarm_-  │
                    │ General = 1.         │
                    └──────────────────────┘
                                │
                                ▼
                          ◇ Check if Potlife
            NO ◄──────────  Alarm: is Alarm_  ──────────► YES
                            Potlife bit = 1? ◇
```

Determine the exact alarm from Table 3 on page 30 and solve what caused the alarm, as required.

Reset the alarm. Reset_Alarm = 1.

Is Mix Ready bit = 1?

NO   YES

Go to next process, as desired.

Two options:

• Purge or Color Change to remove mixed material in the line.
• Place in Mix mode and spray the Potlife Volume set in the ProMix 2KS.

NOTE: The Reset key **only** silences the alarm. To clear the alarm you must use one of these two options.

FIG. 30. Alarm Processing Flow Chart

Table 1: ProMix 2KS Digital Inputs (Modbus Register 40040)

Bit	Digital Input Binary																Name	Details
0:5	0	0	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X	Recipe	Binary bits for viewing discrete inputs only.
6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Color Change (CC)	Set bit to "1" to initiate Color Change (momentary)
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Mix	Set bit initiate Mix mode (maintain)
8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Purge	Set bit to "1" to initiate Purge sequence (maintained)
9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Job_Complete	Set bit to "1" to initiate Job Complete input (momentary)
10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	External CC Ready	Set bit to "1" to initiate External Color Change (momentary)
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Not Used	
12	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	FC _Calibrate	Set bit to "1" to initiate a Flow Control Calibrate input (momentary)
13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	Gun_Trigger	Set bit to "1" to indicate the gun is actually triggered (maintain while gun is triggered, remove when gun is closed)
14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Reset_Alarm	Set bit to "1" to clear an active Alarm (momentary)
15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Remote Stop	Set bit to remotely stop unit (momentary)

NOTE: Shaded cells relate to the flow charts on pages 24-27.

Table 2: ProMix 2KS Digital Outputs (Modbus Register 40041)

Bit	Digital Input Binary	Name	Details
0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1	Purge_CC_Active	"1" indicates Purge or Color Change is in progress
1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0	Mix_Active	"1" indicates Mix is in progress
2	0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0	Mix_Ready	"1" indicates No Alarms and OK to Mix
3	0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0	CC_Fill_Active	"1" indicates the Fill portion of a Color Change is in progress
4	0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0	FCalActive	"1" indicates the Flow Control Calibrate routine is in progress
5	0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0	Flow_Rate_Alarm	"1" indicates the Flow Rate Alarm/Warning is active
6	0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0	Special_1	"1" indicates the Special_1 output is on (monitor only)
7	0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0	Special_2	"1" indicates the Special_2 output is on (monitor only)
8	0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0	Special_3	"1" indicates the Special_3 output is on (monitor only)
9	0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	Special_4	"1" indicates the Special_4 output is on (monitor only)
10	0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	Not Used	
11	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0	Not Used	
12	0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	Alarm_General	"1" indicates a General Alarm is in process. (If Mix_Active is still High, then a Warning only.) See **ProMix 2KS Active Alarms (Modbus Register 40010)** on page 30 for details on type.
13	0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	Alarm_Potlife	"1" indicates a Potlife Alarm is in process.

NOTE: Shaded cells relate to the flow charts on pages 24-27.

ProMix 2KS Active Alarms (Modbus Register 40010)

Table 3: ProMix 2KS Active Alarms (Modbus Register 40010)

Bit	Digital Input Binary	Name	Details
Low Byte: 0	0000 0000 0000 0000	No Bits Set	No Active Alarms
Low Byte: 0	0000 0000 0000 0001	Comm_Error	
Low Byte: 0	0000 0000 0000 0010	Potlife_Alarm	
Low Byte: 0	0000 0000 0000 0100	Ratio_High_Alarm	
Low Byte: 0	0000 0000 0000 1000	Ratio_Low_Alarm	
Low Byte: 0	0000 0000 0001 0000	Overdose_A_Alarm	
Low Byte: 0	0000 0000 0010 0000	Overdose_B_Alarm	
Low Byte: 0	0000 0000 0100 0000	Dose_Time_A_Alarm	
Low Byte: 0	0000 0000 1000 0000	Dose_Time_B_Alarm	
Low Byte: 0	0000 0001 0000 0000	Mix_In_Setup_Alarm	
Low Byte: 0	0000 0010 0000 0000	Remote_Stop_Alarm	
Low Byte: 0	0000 0100 0000 0000	Purge_Volume_Alarm	
Low Byte: 0	0000 1000 0000 0000	CC_Comm_Error_Alarm	
Low Byte: 0	0001 0000 0000 0000	High_Flow_Alarm	
Low Byte: 0	0010 0000 0000 0000	Low_Flow_Alarm	
Low Byte: 0	0100 0000 0000 0000	System_Idle_Alarm	
Low Byte: 0	1000 0000 0000 0000	Setup_Change_Alarm	
High Byte: 0	0000 0000 0000 0001	Power_On_Alarm	
High Byte: 0	0000 0000 0000 0010	Defaults_Loaded_Alarm	
High Byte: 0	0000 0000 0000 0100	IO_Alarm	
High Byte: 0	0000 0000 0000 1000	Purge_Initiate_Error	
High Byte: 0	0000 0000 0001 0000	Material_Fill_Alarm	
High Byte: 0	0000 0000 0010 0000	Tank_A_Low_Alarm	
High Byte: 0	0000 0000 0100 0000	Tank_B_Low_Alarm	
High Byte: 0	0000 0000 1000 0000	Tank_S_Low_Alarm	
High Byte: 0	0000 0001 0000 0000	Auto_Dump_Complete	
High Byte: 0	0000 0010 0000 0000	Color/Catalyst_Purge_Alarm	
High Byte: 0	0000 0100 0000 0000	Color/Catalyst_Fill_Alarm	
High Byte: 0	0000 1000 0000 0000	Num_Alarm_Desc	
High Byte: 0	0001 0000 0000 0000	Spare3_Alarm	
High Byte: 0	0010 0000 0000 0000	Spare2_Alarm	
High Byte: 0	0100 0000 0000 0000	Spare1_Alarm	
High Byte: 0	1000 0000 0000 0000	Potlife_Buzzer	

ProMix 2KS Modbus/TCP Variable Map

Table 4: ProMix 2KS Modbus/TCP Variable Map

* Read/Write Status	EasyKey Modbus Register	Description	Size	Units	Low Limit	High Limit
Read Only	40003	Current flow rate	16 Bit	cc/min	0	5000
Read Only	40004	Actual ratio	16 Bit	none	0	9999
Read Only	40005	Active recipe	16 Bit	none	0	60
Read Only	40006	Potlife 1 remaining	16 Bit	sec	0	9999
Read/Write	40007	Job complete	16 Bit	none	0	0xFFFF
Read/Write	40008	Reset job total	16 Bit	none	0	9
Read Only	40009	Potlife 2 remaining	16 Bit	sec	0	9999
Read Only	40010	Active fault	32 Bit	none	0	0xffffffff
Read Only	40032	Control version	32 Bit	none	0	0xffffffff
Read/Write	40040	Robot digital input	16 Bit	none	0x0000	0xFFFF
Read Only	40041	Robot digital output	16 Bit	none	0x0000	0xFFFF
Read/Write	40046	New recipe	16 Bit	none	0	60
Read Only	40048	Current fluid pressure	16 Bit	psi	0	5000
Read Only	40049	V/P percent output	16 Bit	%	0	100
Read Only	**40056	Actual ratio reducer	16 Bit	none	0	9999
Read Only	40114	Flow control option	16 Bit	0=proportioning only 1=1K flow control (future) 2=2K flow control 3=pressure override 4=manual percent override	0	4
Read/Write	40115	Flow setpoint data source	16 Bit	0=discrete 1=network	0	1
Read/Write	40120	Manual override percent opening	16 Bit	%	0	100
Read/Write	40125	Flow control range	16 Bit	0=0-300 cc/min 1=0-600 cc/min 2=0-1200 cc/min	0	2
Read/Write	40126	Flow control tolerance	16 Bit	%	0	99
Read/Write	40127	Flow control proportional gain Kp	16 Bit	default=400	0	9999
Read/Write	40128	Flow control integral gain Ki	16 Bit	default=40	0	9999
Read/Write	40129	Flow control alarm time	16 Bit	sec	0	99
Read/Write	40137	Flow control setpoint	16 Bit	cc/min	0	1200
Read/Write	43123	Flow control override mode	16 Bit	0=off (normal) 1=% open 2=pressure mode	0	2
Read/Write	43141	Flow control enable	16 Bit	0=off 1=on	0	1

* This column represents the rule that must be implemented by automation. Writing to Read Only registers must be avoided.

** For ProMix 3KS Systems only.

ProMix 2KS Recipe Bits

Table 5: ProMix 2KS Recipe Bits

Recipe Bits						Number
5	**4**	**3**	**2**	**1**	**0**	
0	0	0	0	0	0	0
0	0	0	0	0	1	1
0	0	0	0	1	0	2
0	0	0	0	1	1	3
0	0	0	1	0	0	4
0	0	0	1	0	1	5
0	0	0	1	1	0	6
0	0	0	1	1	1	7
0	0	1	0	0	0	8
0	0	1	0	0	1	9
0	0	1	0	1	0	10
0	0	1	0	1	1	11
0	0	1	1	0	0	12
0	0	1	1	0	1	13
0	0	1	1	1	0	14
0	0	1	1	1	1	15
0	1	0	0	0	0	16
0	1	0	0	0	1	17
0	1	0	0	1	0	18
0	1	0	0	1	1	19
0	1	0	1	0	0	20
0	1	0	1	0	1	21
0	1	0	1	1	0	22
0	1	0	1	1	1	23
0	1	1	0	0	0	24
0	1	1	0	0	1	25
0	1	1	0	1	0	26
0	1	1	0	1	1	27
0	1	1	1	0	0	28
0	1	1	1	0	1	29
0	1	1	1	1	0	30
0	1	1	1	1	1	31
1	0	0	0	0	0	32

Recipe Bits						Number
5	**4**	**3**	**2**	**1**	**0**	
1	0	0	0	0	1	33
1	0	0	0	1	0	34
1	0	0	0	1	1	35
1	0	0	1	0	0	36
1	0	0	1	0	1	37
1	0	0	1	1	0	38
1	0	0	1	1	1	39
1	0	1	0	0	0	40
1	0	1	0	0	1	41
1	0	1	0	1	0	42
1	0	1	0	1	1	43
1	0	1	1	0	0	44
1	0	1	1	0	1	45
1	0	1	1	1	0	46
1	0	1	1	1	1	47
1	1	0	0	0	0	48
1	1	0	0	0	1	49
1	1	0	0	1	0	50
1	1	0	0	1	1	51
1	1	0	1	0	0	52
1	1	0	1	0	1	53
1	1	0	1	1	0	54
1	1	0	1	1	1	55
1	1	1	0	0	0	56
1	1	1	0	0	1	57
1	1	1	0	1	0	58
1	1	1	0	1	1	59
1	1	1	1	0	0	60

Troubleshooting

NOTE: This section covers the most common problems encountered while setting up, programming or using the product. Do not forget to always download in the device after changing settings in Graco Gateway.

General Troubleshooting

PROBLEM	CAUSE	SOLUTION
Unit screen is blank and PWR LED is off.	No power applied to the unit.	Check power supply. Units require 24 VDC, ± 10%.
Unit screen is blank and PWR LED is on.	Contrast too low (Graco Gateway only).	Program one of the soft keys with the action as User Defined and the following code in the field On Pressed: dispcontrast++
	No primitives on the display.	Add objects to the User Interface in Graco Gateway.
	Backlight is off.	Push one of the soft keys to turn it back on.
	Backlight tube is broken.	Replace the backlight tube.
Unit continually cycles on and off.	Cross-references between tags, e.g., Var1 uses Var2 as maximum which in turn uses Var1 as minimum.	Remove one of the references or use formula tags for indirect reference, e.g., Form1 is equal to Var1 and used in Var2 minimum instead of Var1.
	Database is corrupted.	Create a new database or send to technical support for debugging.
Unit cycles power after an operation.	Most likely a program going in an endless loop.	Check if the operation launches program containing loops with no exit point.
CF LED flashing slowly.	CF card corrupted or invalid.	Format the card from Graco Gateway using the Link > Format Flash menu.

PROBLEM	CAUSE	SOLUTION
Unit shows "Version Mismatch".	The database currently in the device does not match Graco Gateway's firmware version. (Message occurs after a download with a new version of C2 interrupted before the database was downloaded.)	Download the database from Graco Gateway again.
Unit shows "Invalid Database".	The database in the device is corrupted or there are no databases in the device.	Download a database from Graco Gateway.
Values show "**----**"	No communication with target device.	See **Serial Communication Troubleshooting** (page 37) or **Ethernet Communication Troubleshooting** (page 38).
Value does not update.	The tag on the screen is not linked correctly.	Check the tag mapping making sure the target device (PLC, etc.) register is correct.
		Check the primitive Data Source in the user interface in case the word WAS is displayed. Re-link the tag in this case.
Value shows +BIG or –BIG.	Not enough digits before the decimal point to show the number. For example, data is **1000.5** and format is three digits before the decimal point and one after.	Increase the number of digits before the decimal point in the tag format.
Value deviates by a factor of ten.	The tag format is not correct.	Change the decimal point position in the tag format.
Value is invalid.	Incorrect tag type.	Check if the tag type corresponds to the data type. Is the data a floating point number and thus the tag a real (Pi symbol), and not an integer (X symbol)?
	Incorrect data mapping.	Check if the tag is accessing the correct target device register.
	Incorrect primitive on the display.	Check if the primitive corresponds to the tag type. For example, primitive is a Text Integer so the tag has to be an integer.
	Data received is not what's expected. For example, bytes reversed in the word.	Use the transform property on the tag to modify the data source. You might have to try multiple solutions to solve the issue.

PROBLEM	CAUSE	SOLUTION
Symbol or image leaves a trace when animated.	The background of the image is not refreshed.	Change the primitive Fill Format to Solid color.
		Add the system variable **dispcount** in the background of the image to force the refresh.
Rich Bar Graph or Dial Gauge does not move	Tag minimum and maximum are not setup.	Check the tag's minimum and maximum values. These are used by both primitives for minimum and maximum.
Trend Viewer curve stuck at the bottom.	No minimum and maximum setup on the data tags displayed in the viewer.	Check that all displayed tags in the trend viewer have a Minimum and a Maximum setup.
USB Drivers location for Windows.	Location of the drivers unknown.	The drivers are located under Graco Gateway 2.0\Device installation folder. For example C:\Program Files\Graco Gateway\Device.
USB Driver installation.	The operating system is unable to find the driver or the installation failed.	In your operating system device manager, check if the Graco Gateway is present. If so, uninstall that device. Follow the USB installation guide.
Upgrading Graco Gateway did not upgrade the software version.	The option selected during the upgrade was Modify instead of Repair.	Launch the upgrade again and choose Repair when prompted.

Graco Gateway Messages Troubleshooting

PROBLEM	CAUSE	SOLUTION
Device incompatible with file.	The device you are trying to download into doesn't match the database device.	Create a new database file corresponding to your device (File > New).
Unable to open communication port.	The communication port you try to download with is unavailable:	
	• Cable not connected.	Check if the cable is connected correctly to the PC and the device programming ports (USB or PG Port).
	• Incorrect download communication port.	Check that Graco Gateway is directed to the correct communication port (Link > Options).
	• Port already used.	Check that the communication port is not used by another service or software especially for serial ports.
	• Target device IP address incorrect.	If you download via Ethernet, check the IP address of the target device in Link > Options.
	• No USB Drivers.	Check that the USB drivers were installed successfully. Reinstall Graco Gateway USB driver under the PC device manager if necessary.
No reply from terminal.	Cable is not connected.	Make sure the cable is connected or check above solutions.
	If the message appears while downloading to the device.	Download again with Link > Update or F9.
CompactFlash required for upgrade.	The version of Graco Gateway on the PC is different from the target device firmware version when attempting a download via Ethernet.	Insert a CompactFlash Card in the target device.
		Use another communication port for download: USB or Serial.
The window is too small to allow editing.	The current User interface view is too small to allow editing.	Change the panel view using View > Panel > Display only.
The device returned an unexpected reply code.	The device you are trying to download to is not supported by this version of Graco Gateway.	Update Graco Gateway to the latest version available (contact your Graco distributor or Graco Technical Assistance). Choose Repair when upgrading.

Serial Communication Troubleshooting

This section is used to troubleshoot the communication between two devices linked via serial ports, i.e. RS232 or RS485.

TIP: For communication troubleshooting, it is strongly advised to create a new Graco Gateway database including only one data tag mapped to a known register in the target device.

PROBLEM	CAUSE	SOLUTION
Values show "**----**"	Port settings do not match.	Check that the port settings of the Graco Gateway device match the target device (i.e. Baud, Parity, etc.).
	Incorrect target device address.	Check that the target device address in Graco Gateway (in communications on the PLC symbol) matches the target device address setup.
	Incorrect cable.	Check the cable part number or cabling to match your protocol.
	Incorrect communication port.	Check if the cable is connected to the correct communication port. If the above is correct, check that the protocol settings are on the correct communication port in Graco Gateway.
	Communication port connector pins bent inward.	Although unlikely, check the communication port connector pins on the Graco Gateway in case some are bent inward resulting in a bad contact with the cable.
	Incorrect tag mapping.	Check that the tag is mapped to an existing register in the target device.
Values blink between the data and "**----**"	Incorrect tag mapping on one of the tags on the display.	Delete tags one after another and download in-between. When the values on the screen stop blinking, the last deleted tag was mapped incorrectly or accessed an unknown register in the target device.
	Communications times-out.	Increase the Slave Response or Device Timeout on the communication port or target device in Graco Gateway.

Ethernet Communication Troubleshooting

This section is used to troubleshoot the communication between two devices linked via Ethernet.

TIP: For communication troubleshooting, it is strongly advised to create a new Graco Gateway database including only one data tag mapped to a known register in the target device.

PROBLEM	CAUSE	SOLUTION
Values show "**----**"	Incorrect target device IP address.	Check the target device IP address in Graco Gateway (in communications on the PLC symbol) to match the target device IP address setup.
	Incorrect cable or wrong connection.	Check the LED on the Graco Gateway device Ethernet port. If none are lit, there are no connections. Check the cable or that the Ethernet port is enabled in Graco Gateway, see below.
	Ethernet port disabled.	Check that the Ethernet port in Graco Gateway is enabled.
	Graco Gateway and target devices are in a different address domain:	
	• If no routers are present on the network.	Check that the target device IP address and Graco Gateway device IP address are different but in the same domain. (For example, both start with the same three first numbers; ex: 192.168.2.xxx if the mask is 255.255.255.0).
	• If a router is present on the network.	Check the Graco Gateway device Ethernet port Gateway address to match the router IP address.
	Incorrect tag mapping.	Check that the tag is mapped to an existing register in the target device.
Values blink between the data and "**----**"	Incorrect tag mapping on one of the tags on the display.	Delete tags one after another and download in-between. When the values on the screen stop blinking, the last deleted tag was mapped incorrectly or accessed an unknown register in the target device.
	Communications times-out.	Increase the Slave Response or Device Timeout on the communication port or target device in Graco Gateway.

LED Functions

Status (STS) LED

The green Status LED provides information on the status of the Graco Gateway, including various stages of the startup routine and any errors that occur.

Status	Indication
Rapidly Flashing	Graco Gateway is currently running the boot loader and/or being upgraded.
Steady	Graco Gateway is operating normally.

User Communication Ports - TX/RX LEDs

Status	Indication
Green	Transmitting
Red	Receiving

Ethernet LEDs

Status	Indication
Yellow (Steady)	Link Established
Yellow (Flashing)	Network Activity
Green	10 BASE-T Communications
Amber	10 BASE-TX Communications

CompactFlash (CF) LED

Status	Indication
Off	No CompactFlash card is present.
Steady	Valid CompactFlash card is present.
Rapidly Flashing	CompactFlash card is being checked.
Flickering	Unit is writing to the CompactFlash card, either to store data or because the PC connected via the USB port has locked the drive.*
Slowly Flashing	Incorrectly formatted CompactFlash card is present.

* *Do not turn off power to the unit while this light is flickering. The unit writes data in two minute intervals. Later Microsoft operating systems will not lock the drive unless they need to writer data; Windows 98 may lock the drive any time it is mounted, thereby interfering with logging. Contact Graco Technical Assistance for further information.*

System Electrical Schematic

Non-Hazardous Area

NON-HAZARDOUS AREA

OPERATOR INTERFACE

POWER SUPPLY

DC OK
+24 VDC
COMMON
COMMON

1 L1
2 N   85-250 VAC

L1
N

LINE FILTER

L1
N
GND

L1
N
GND

TERMINAL BLOCK

L1
N
GND

GND N L1
85-250 VAC

1
2
3   GND LUG

1
2
1A
1B
2A
2B

POWER ROCKER SWITCH

OPEN
OPEN

POWER HARNESS

BARRIER BOARD

J1
1 UNUSED
2 UNUSED
3 UNUSED
4 UNUSED
5 UNUSED

HARNESS

J5
1 +12VDC I/S (RED)
2 COM (BLACK)
3 SHIELD

CABLE
(50' STD.)/
(100' OPTION)

J4
1 +24VDC
2 OPEN
3 COMMON

ALARM

MEMBRANE SWITCH WITH RIBBON CABLE

J4
1
2
3
4
5
6
7
8
9
10
11

DISPLAY BOARD

J9
1 +
2 -
3 +
4 -

RJ45 RJ45
J6

POWER DIST. TERMINAL BLOCKS
- +
- +
- +
- +

DISPLAY

J2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

3'

RJ45 RJ45
J2
1 MIX INPUT
2 PURGE INPUT
3 JOB COMPLETE INPUT
4 EXTERNAL CLR CHG READY
5 RESET ALARM INPUT
6 DIGITAL INPUT COMMON

J3
1 DIGITAL INPUT COMMON
2 RECIPE BIT 0 INPUT
3 RECIPE BIT 1 INPUT
4 RECIPE BIT 2 INPUT
5 RECIPE BIT 3 INPUT
6 RECIPE BIT 4 INPUT
7 RECIPE BIT 5 INPUT
8 RECIPE CHANGE INPUT

REMOTE I/O INTEGRATION BOARD

J4
1 DIGITAL OUTPUT COMMON/POWER
2 PURGE/RECIPE CHG ACTIVE OUTPUT
3 MIX ACTIVE OUTPUT
4 MIX READY OUTPUT
5 FILL ACTIVE
6 FLOW CAL. ACTIVE
7 FLOW RATE ALARM OUTPUT
8 DIGITAL OUTPUT COMMON/POWER

J5
1 DIGITAL OUTPUT COMMON/POWER
2 SPECIAL OUTPUT #1
3 SPECIAL OUTPUT #2
4 SPECIAL OUTPUT #3
5 SPECIAL OUTPUT #4
6 DIGITAL OUTPUT COMMON/POWER

SHIELD

J5
1 FLOW CONTROL CAL. (BLK)
2 GUN TRIGGER (WHT)
3 DIGITAL IN COMMON (RED)
4 REMOTE STOP (GRN)
5 ALARM RESET (BRN)
6 ALARM OUTPUT (BLU)
7 DIGITAL OUTPUT COMMON (ORG)
8 POT LIFE (YEL)
9 FLOW RATE ANALOG IN (PUR)
10 FLOW RATE ANALOG COMMON (GRAY)

1
2
3
4
5
6
7
8
9
10

TERMINAL BLOCKS

I/O HARNESSES

J10
1 RS485 INTEGRATION A (WHT/BLU)
2 RS485 INTEGRATION B (BLU/WHT)
3 RS485 INTEGRATION GROUND (SHIELD)
4 RS485 NETWORK A (WHT/ORG)
5 RS485 NETWORK B (ORG/WHT)
6 RS485 NETWORK GROUND (SHIELD)

1
2
3
4
5
6

(+24) YEL
(COM) GRAY
ORG
BRN
RED

BEACON

J7 FO IN (BLK)
J8 FO OUT (BLU)

CABLE

P1 RJ45 RJ45 3'

RJ45
BULKHEAD

3'
(25'-200' OPTIONS)

RJ45
RJ45

WEB SERVER MODULE

Parts

15V331 Gateway Ethernet Kit (shown)

15V963 Gateway DeviceNet Kit

15V964 Gateway Profibus Kit

Ref. No.	Part No.	Description	Qty
1	15V339	PANEL, back	1
2	15T752	COVER	1
3	n/a	DIN RAIL	1
4	120369	POWER SUPPLY, 24 Vdc	1
5	15V345	GROMMET, cable entry	2
6	111987	CONNECTOR, strain relief	1
7	n/a	WIREWAY	1
8▲	186620	LABEL, ground	1
9	n/a	COVER, wireway	1
10		CONTROL BOX, Gateway	
10a	15V966	BOX, DeviceNet; includes items 20a, 23, and 27; used on 15V963 Kit only	1
10b	15V965	BOX, Profibus; includes items 20b, 23, and 27; used on 15V964 Kit only	1
10c	15X492	BOX, ethernet; includes items 23 and 27; used on 15V331 Kit only	1

Ref. No.	Part No.	Description	Qty
11	120838	BLOCK, clamp end	2
12	103833	SCREW, machine	4
13	112443	BLOCK, terminal, ground	1
14	15V344	CONNECTOR	1
15	121994	CABLE, CAT 5	1
16	121700	CABLE, 2 connector	1
17	n/a	WIRE, copper, 16 ga.; 9 in. (230 mm)	1
18	n/a	WIRE, copper, 16 ga; 9 in. (230 mm)	1
20a	15V347	CARD, DeviceNet; 15V963 Kit only	1
20b	15V346	CARD, Profibus; 15V964 Kit only	1
23	15T999	CABLE, USB; not shown	1
25	n/a	SCREW, machine, serrated hex-head	4
27	258527	CD ROM, software, Gateway; not shown	1

▲ *Replacement Danger and Warning labels, tags, and cards are available at no cost.*

Parts labeled n/a are not available separately.

NOTE: *All brand names or marks are used for identification purposes and are trademarks of their respective owners.*

Parts

1, 2

10a, b, or c   20a or b   14   4   13   7, 9, 12

11

12

3

USB Port
(ref item 23)

Screw Location
(item 25)

8

5   5   6
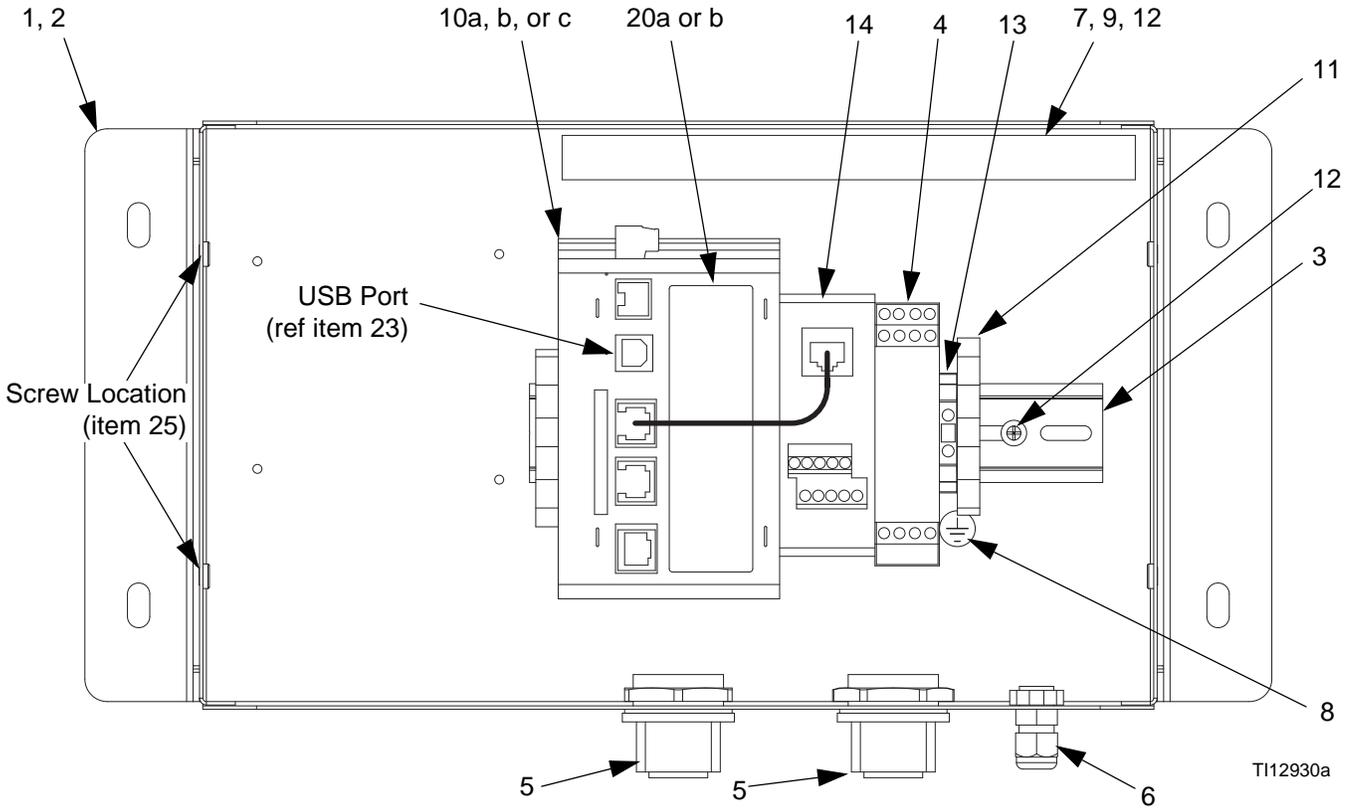
TI12930a

Wiring Diagrams

14

DRRJ45 Network Terminals

①②③④⑤⑥⑦⑧ sh sh

16

①②③
A B SH

ProMix 2KS EasyKey
RS485 Network Terminals

TI12931a

+24V

COM

18

COM   +24V

10

17

15

14

N

L

4
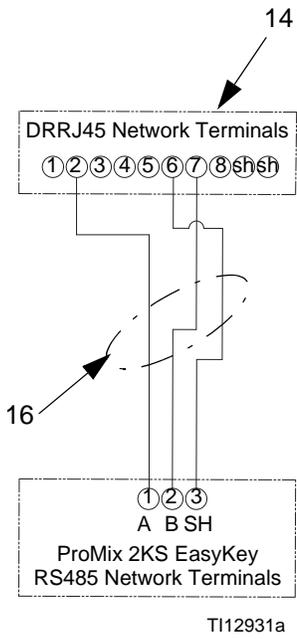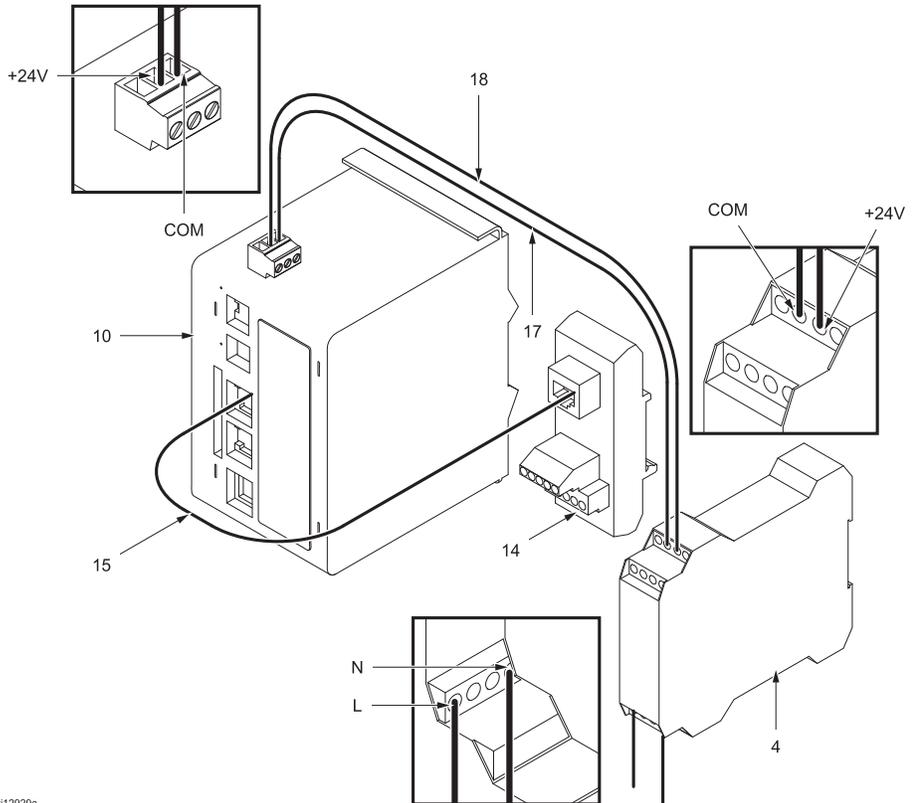
ti12929a

Appendix A: DeviceNet™ Slave Communication

Overview

This appendix describes the Gateway's support for DeviceNet and details the configuration steps necessary to use this feature. It does **not** provide a detailed description of DeviceNet, but only a brief introduction, necessary to define the terms that are used throughout the remainder of this document.

Introduction

DeviceNet is a low-level network using the Controller Area Network (CAN) technology, to provide communication between a range of industrial devices, from simple devices such as sensors and actuators, to high-level devices such as controllers and HMIs.

DeviceNet Port Protocols

The DeviceNet option card has one DeviceNet port. See FIG. 31. The port may be configured for various DeviceNet protocols. Contact Graco Technical Assistance for currently supported protocols.

Also see **Appendix A: DeviceNet™ Slave Communication** on page 43.

DeviceNet Option Card Pin Outs

- **V-**
  Position 1 of the pluggable connector provides a CAN ground connection. This terminal is isolated from the Graco Gateway.

- **CAN_L**
  Position 2 of the pluggable connector provides the CAN_L bus line (active low). This terminal is isolated from the Graco Gateway.

- **DRAIN (optional)**
  Position 3 of the pluggable connector is provided for optional drain connections. This position is available only to tie drain wires together or to earth ground. There is no internal connection to earth ground. The DRAIN position is not connected to any circuitry internal to the DeviceNet option card.

- **CAN_H**
  Position 4 of the pluggable connector provides the CAN_H bus line (active high). This terminal is isolated from the Graco Gateway.

- **V+ (optional 24 Vdc)**
  Position 5 of the pluggable connector is provided for optional 24 Vdc connections. This position is available only to tie 24 Vdc wires together. The DeviceNet option card neither provides or uses 24 Vdc power through this connection. The V+ position is not connected to any circuitry internal to the DeviceNet option card or Graco Gateway.

FIG. 31: DeviceNet Port Pin Outs and PLC Connection

About DeviceNet

DeviceNet is a connection-based network. In this context the term connection refers to a communication path between two or more devices, and not the physical (cable) connection to the DeviceNet network. A connection must be established between two devices in order to transfer data.

There are two types of connection defined by the DeviceNet specification. Each has different characteristics and is suited to a specific type of communication.

- **I/O Connection** – Dedicated data transfer between a producer and one or more consumers. The format of the data is known or implied by the connection.

- **Explicit Messaging** – Generic multi-purpose messaging connection, typically command and response message commands.

Each connection type has an extensive number of parameters, which can affect the characteristics of the communication path. For many Master/Slave communications scenarios, a defined set of connections, together with their respective parameter settings exist under the collective name Predefined Master/Slave Connection Set. Many of the steps involved in creating and configuring a connection have been removed with this connection set, thus simplifying the network configuration.

Predefined Master/Slave Connection Set

The DeviceNet specification details a number of connections that facilitate data transfer between a Master and Slave devices. The following sections detail the connection types supported by the Gateway.

- *I/O Bit-Strobe Connection:* The Bit-Strobe connection is an I/O connection over which Bit-Strobe I/O command and response messages are transferred. The Bit-Strobe command is broadcast by the Master device and is received by all slave devices simultaneously. The command message contains a single bit of information for each slave on the network. Each slave device is required to respond with a Bit-Strobe response message. The response message can contain up to 8 bytes of information.

- *I/O Poll Connection:* The Poll connection is an I/O connection over which Poll command and response messages are transferred. The Poll command is transmitted by the master, and is directed to a single slave device. The slave device in turn responds with a Poll response message. Both the Poll command and Poll response messages can contain any number of bytes.

- *I/O Data Connection:* The I/O Data connection is part of the Predefined Master/Slave Connection Set, but instead is included for devices, which support creating I/O data connections via the UCMM (Unconnected Message Manager).

Level of Support

The Gateway provides Group 2 Server level support: A UCMM capable device that is configured to act as a **Slave** for the Predefined Master/Slave connection set.

Hardware

To use DeviceNet on the Gateway, an option card must first be installed. The option card provides the hardware necessary to support the CAN physical layer specification as required by the DeviceNet standard.

Configuring the option card is a two-stage process; first the option card must be selected in Gateway (DeviceNet Option Card), and then the 'DeviceNet Predefined Group 2 Server Driver' configured to run on the newly created DeviceNet Interface port.

Gateway Configuration

The following example requires use of an Allen Bradley 1756-ControlLogix PLC, along with RSLogix 5000 and RSNetWorx for DeviceNet software and a Gateway.

Configure the Gateway DeviceNet Option Card

Install the Gateway DN0000 option card in the Gateway as per the provided instructions.

Click on File>New to create a new Gateway database and select Gateway Series HMI – Gateway 10.

Enter the Communications section. In the tree on the left, select Gateway from the top of the tree. Select the Edit button at the right, and select the DeviceNet Option Card from the dialog box as shown in FIG. 32. Click OK.
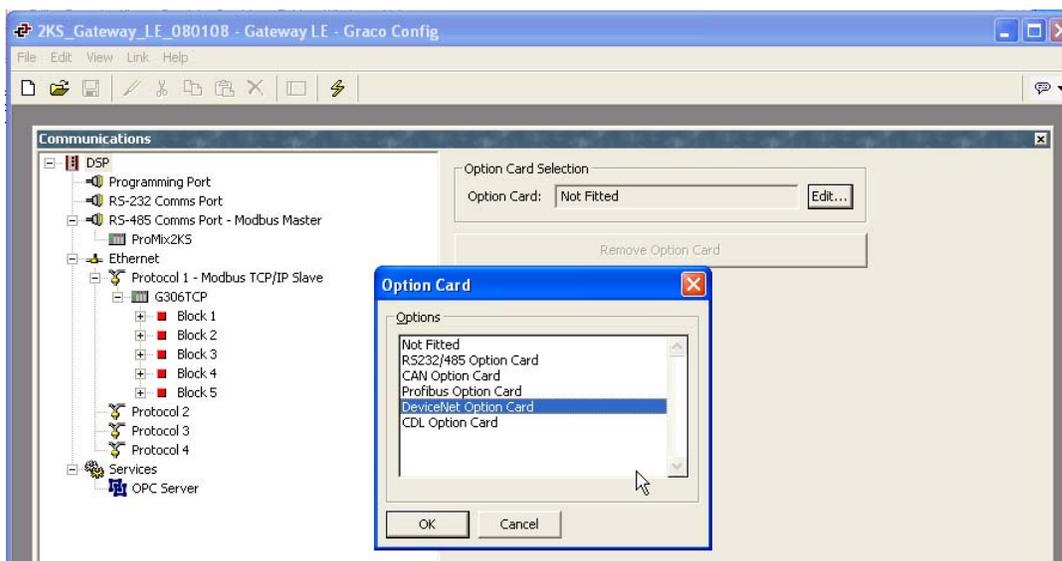
FIG. 32: Select DeviceNet Option Card

The DeviceNet Option card appears at the end of the tree. Select the DeviceNet Interface from under the DeviceNet Option Card item.

On the right hand pane, click on the Edit button to open the driver picker dialog box. Select the DeviceNet Pre-defined Group 2 Server driver. FIG. 33.
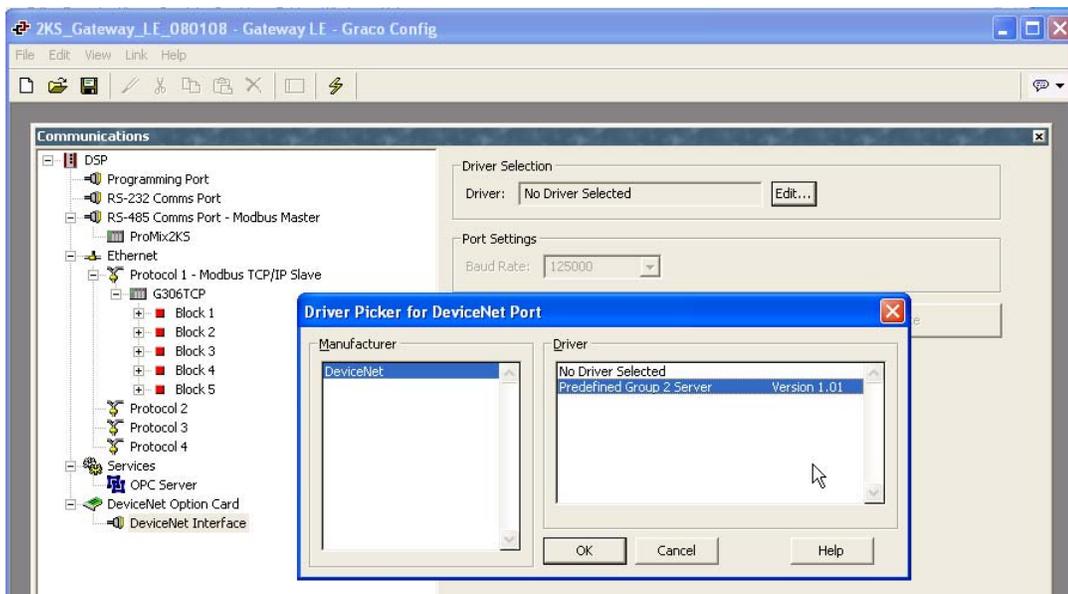
FIG. 33: Select DeviceNet Server

Set the appropriate Station Address, Baud Rate, and I/O Poll Size. Make sure the Data Format Settings are set to Transform: Swap Bytes In Word. FIG. 34.

IMPORTANT NOTE: The I/O Polled Size is determined by the settings in both the DeviceNet Master and the registered .EDS file for the Gateway. To change these settings, see **Automatic Update of the EDS File** on page 52 before setting up the PLC.
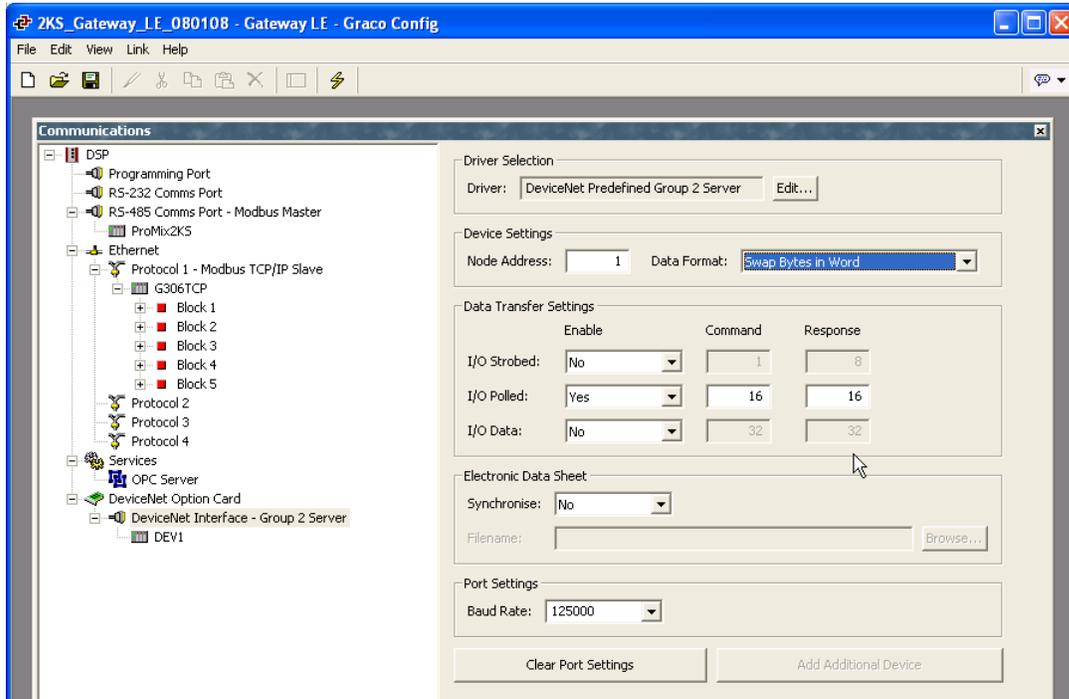
F**IG. 34: Device Settings**

Create Gateway Blocks

Select the DeviceNet device from the tree at the left, and add two Gateway Blocks; one for Read Data and one for Write Data, using the Add Gateway Block button on the right hand pane.
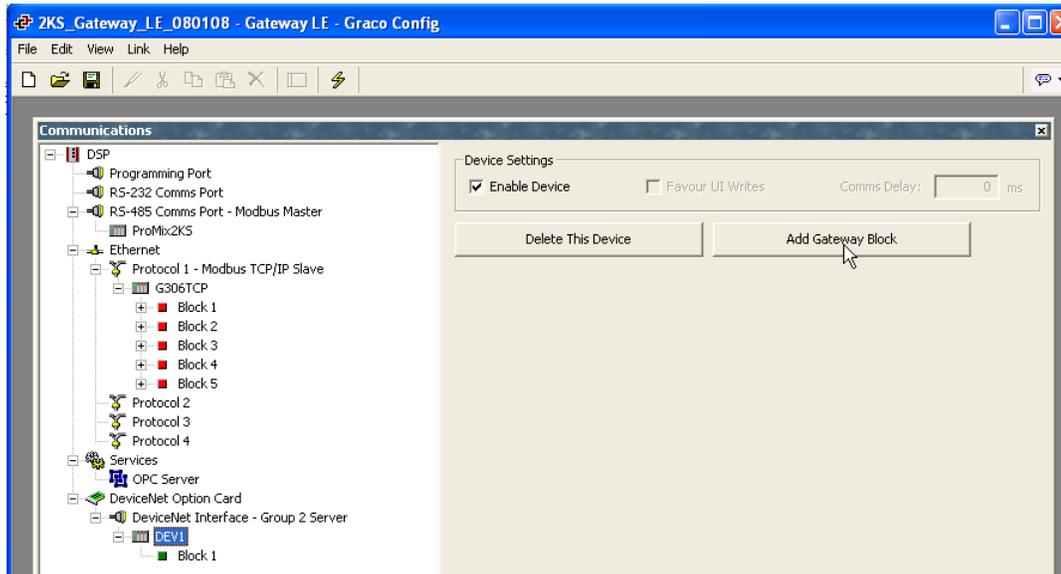
F<small>IG</small>. 35: Add a Gateway Block

Select the first Gateway Block and select the Edit button at the right.

Set the block for I/O Polled Command Data, starting at element PollC 00000. F<small>IG</small>. 36.

NOTE: For 16-bit support, select Word as Word. For 32-bit support, select Word as Long. The latter is recommended as DeviceNet uses 32 bits integer addressing.

Set the block size for 4, and the Direction for: Device To Gateway. This will be the Read Data block.
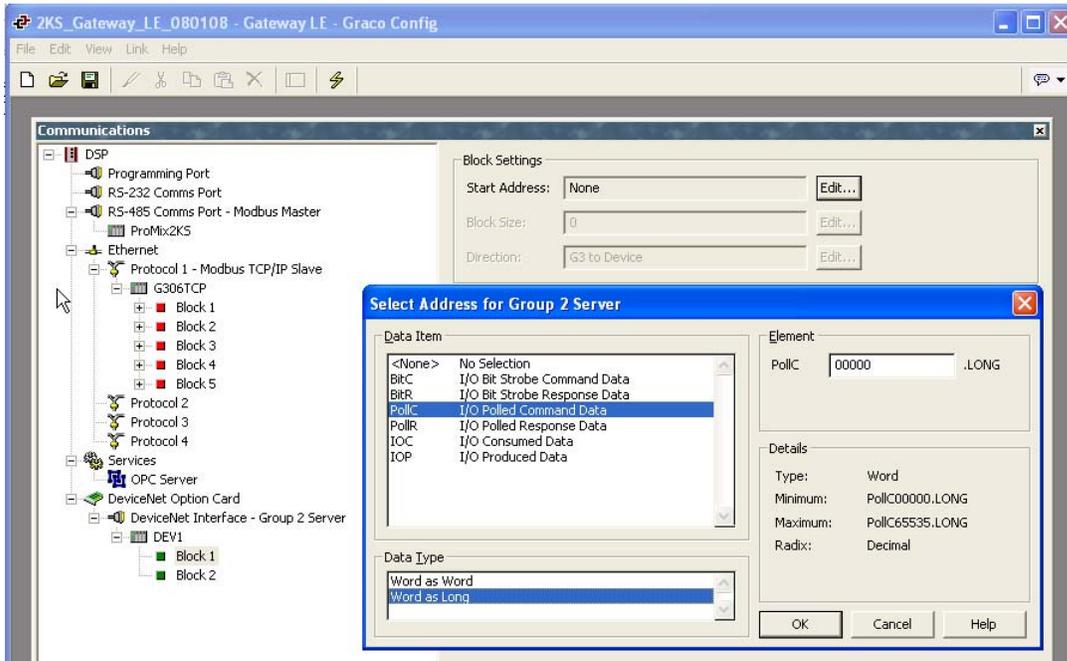
FIG. 36: Select Data Type (Word as Long)

Select the second Gateway Block and set it up for I/O Polled Response Data 00000, with a length of 4, and the Direction Gateway To Device. This will be the Write Data Block. FIG. 37 shows both Gateway blocks once completed.
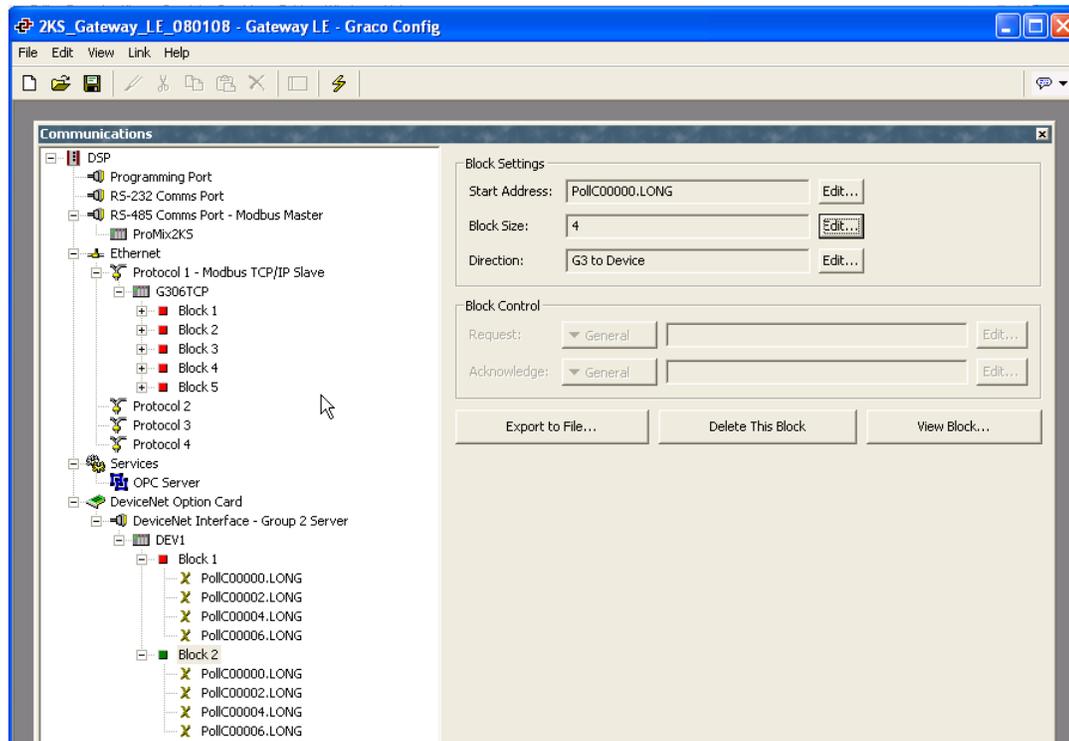
FIG. 37: DeviceNet Block Mapping

NOTE: Read and Write are from the Gateway point of view. This means the master can send data in Block A, so the Gateway can read data. On the other hand, the master can only pull data from Block B, so the Gateway can only write data.

The addressing scheme available is outlined below:

BitC – Identifies the I/O Bit-Strobe command data (Master to Slave).

BitR – Identifies the I/O Bit-Strobe response data (Slave to Master).

PollC – Identifies the I/O Poll command data (Master to Slave).

PollR – Identifies the I/O Poll response data (Slave to Master).

DataC – Identifies the I/O Consumed Data (Master to Slave).

DataP – Identifies the I/O Produced Data (Slave to Master).

Automatic Update of the EDS File

DeviceNet nodes use an EDS (Electronic Data Sheet) to describe the communications parameters available at each device on the DeviceNet network.

By design, each DeviceNet master can handle a maximum of 124 Input words and 123 Output words. In the default EDS file for the Gateway, the Input and Output data sizes are set at 16 bytes each. This equates to four words of data input and four words of data output. These values can be set higher, but it is important to note that if the default values are set higher, they might conflict with other DeviceNet implementations.

Gateway provides an EDS file generator tool to create a file that matches your Gateway settings. This file can therefore be used to configure the Master.

To generate this file, enter the Communications module and select the DeviceNet interface on the left. Under the Electronic Data Sheet, select Yes in Synchronize and choose the path and name where the file should be saved using the Browse button. FIG. 38.
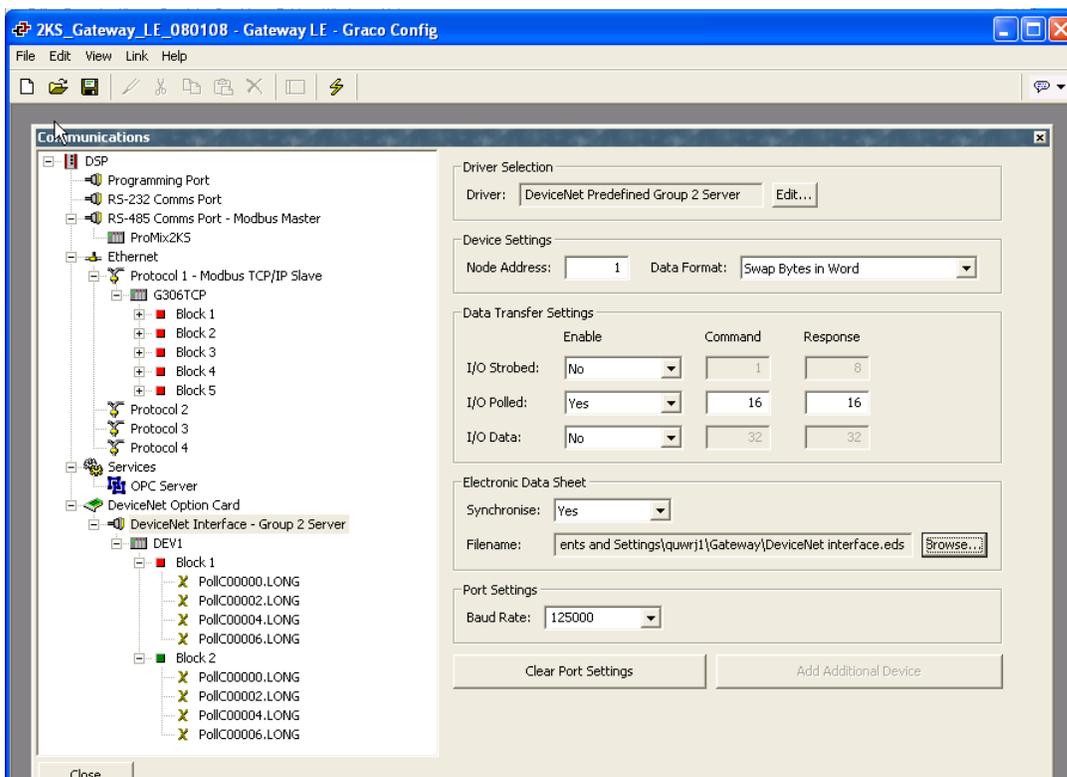
FIG. 38: Automatic EDS Update

Saving the database using the File>Save command will synchronize and therefore update the EDS file.

Each time EDS parameters are modified, the EDS file will need to be re-registered within RSNetWorx for DeviceNet. These changes will also need to be reflected in the following locations:

• RSNetWorx master node Scanlist, Input Table, and Output Table

• ControlLogix PLC DeviceNet Scanner configuration

NOTE: Inputs and Outputs are with respect to the master, therefore inputs refer to data sent from the slave and read by the master.

Configure the RSNetWorx for DeviceNet Software

RSNetWorx for DeviceNet is used to set up and manage a DeviceNet network. To begin the configuration, launch RSNetWorx for DeviceNet from your development PC.

Start a new network by selecting: File>New>DeviceNet Configuration.

Register the EDS file generated by Gateway as shown in the previous section of this document by selecting: Tools>EDS Wizard>Register an EDS file(s).

FIG. 39: Register the EDS File

Select Register a single file, and browse to the location where you saved the Gateway.EDS file.

FIG. 40: Browse to Graco Gateway EDS File

Make sure that the .EDS file validation is successful.
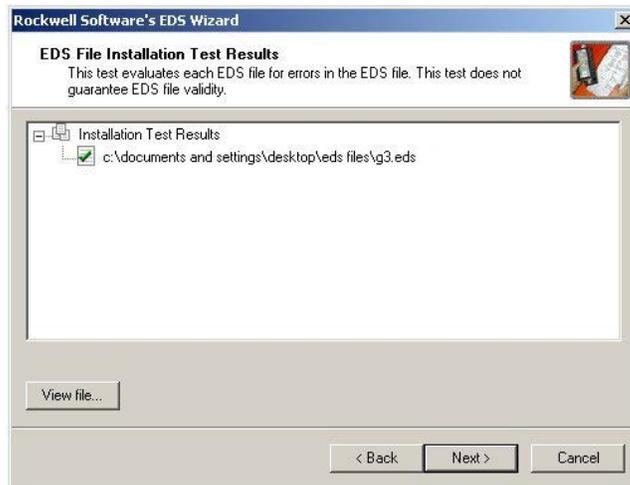
FIG. 41: EDS Validation

If desired, select a new image file to represent the Gateway.

FIG. 42: EDS Image File

Review the EDS registration, and finish the process.
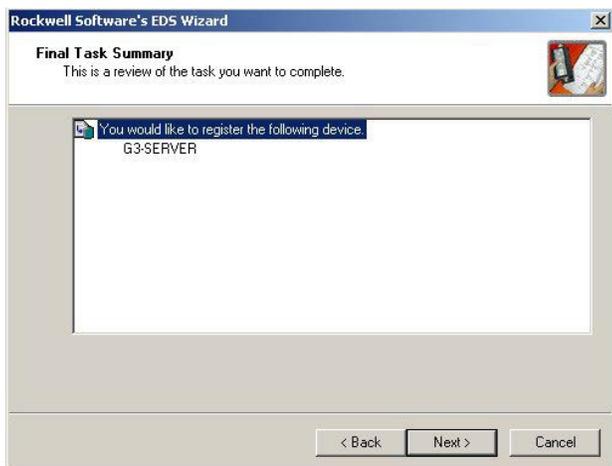
FIG. 43: Review EDS Registration

Select the DeviceNet Master by navigating in the tree on the left hand side. Navigate to: DeviceNet>Category>Communication Adapter>1756-DNB/A. Select the appropriate Major Rev and drag it into the network workspace at the right.

Select the Gateway Slave by navigating in the tree on the left. Navigate to: DeviceNet>Vendor>Graco Controls>Generic Device. Select the Gateway-SERVER and drag it into the network workspace at the right.

Configure the master to add the slave device to the scanlist. Right click the DNB module and select properties.

From the Scanlist tab, select the Gateway-SERVER from the Available Devices pane, and add it to the Scanlist pane. Select the Edit I/O Parameters button.
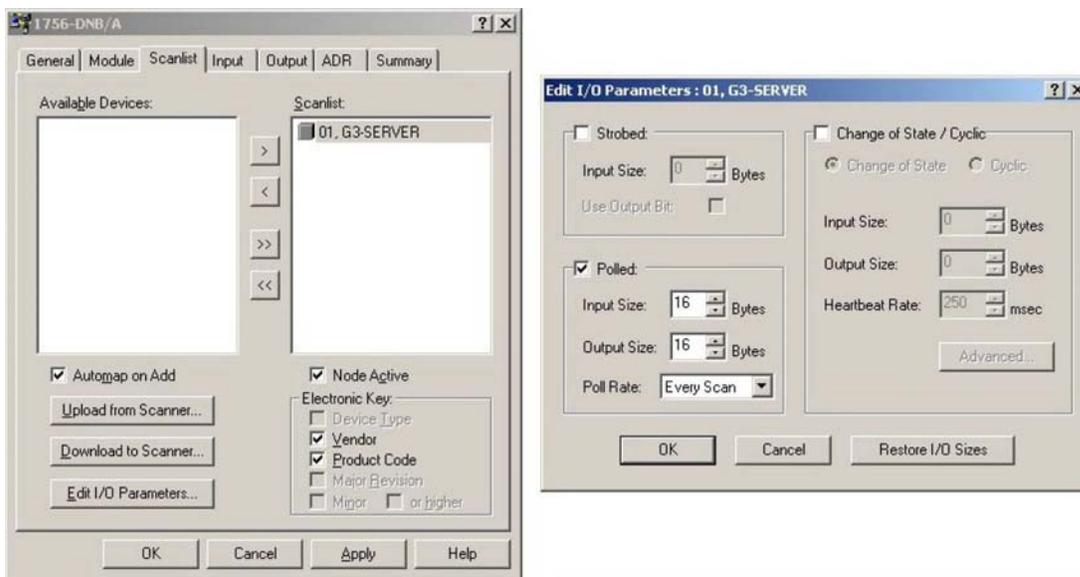
FIG. 44: Configure the DeviceNet Master

Make sure that the Strobed or Change of State boxes are not selected. In the Polled section, verify that the Input and Output sizes are 16 bytes. These must match the I/O Poll Size selections made above in the Gateway. In DeviceNet networks, 4 bytes constitute a full word. Therefore the 16 bytes selection represents 4 full words of addressable 32-bit data.

Select the Input tab. Verify that the four words of Gateway-SERVER data are mapped to YourD-NBSlot:I.Data[0…3]. From the Output tab, verify that the four words are mapped to YourDNBSlot:O.Data[0…3].

Apply the changes, and save your RSNetWorx for DeviceNet configuration.
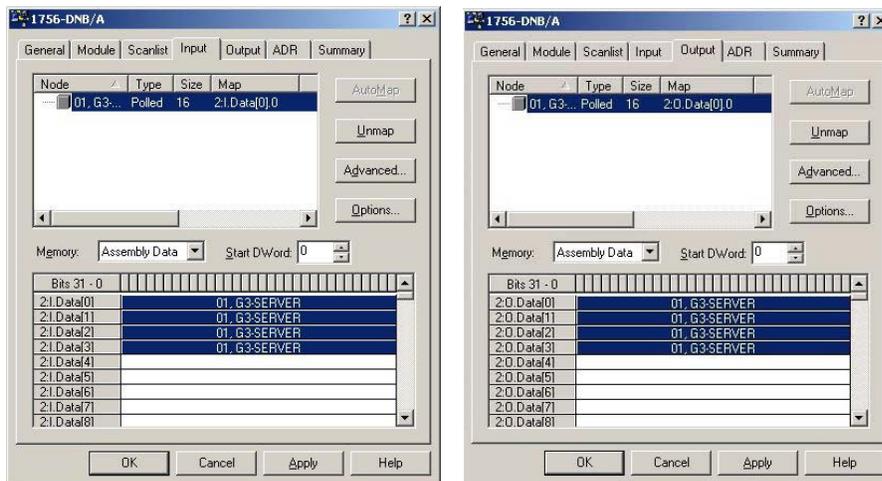
FIG. 45: Apply and Save

Configure the Allen Bradley ControlLogix PLC

Allen Bradley ControlLogix PLCs are programmed with RSLogix 5000 programming software. To begin the DeviceNet configuration, launch RSLogix 5000 from your development PC.

Create a ControlLogix program containing a valid DeviceNet Scanner. In this application a 1756-DNB was used.
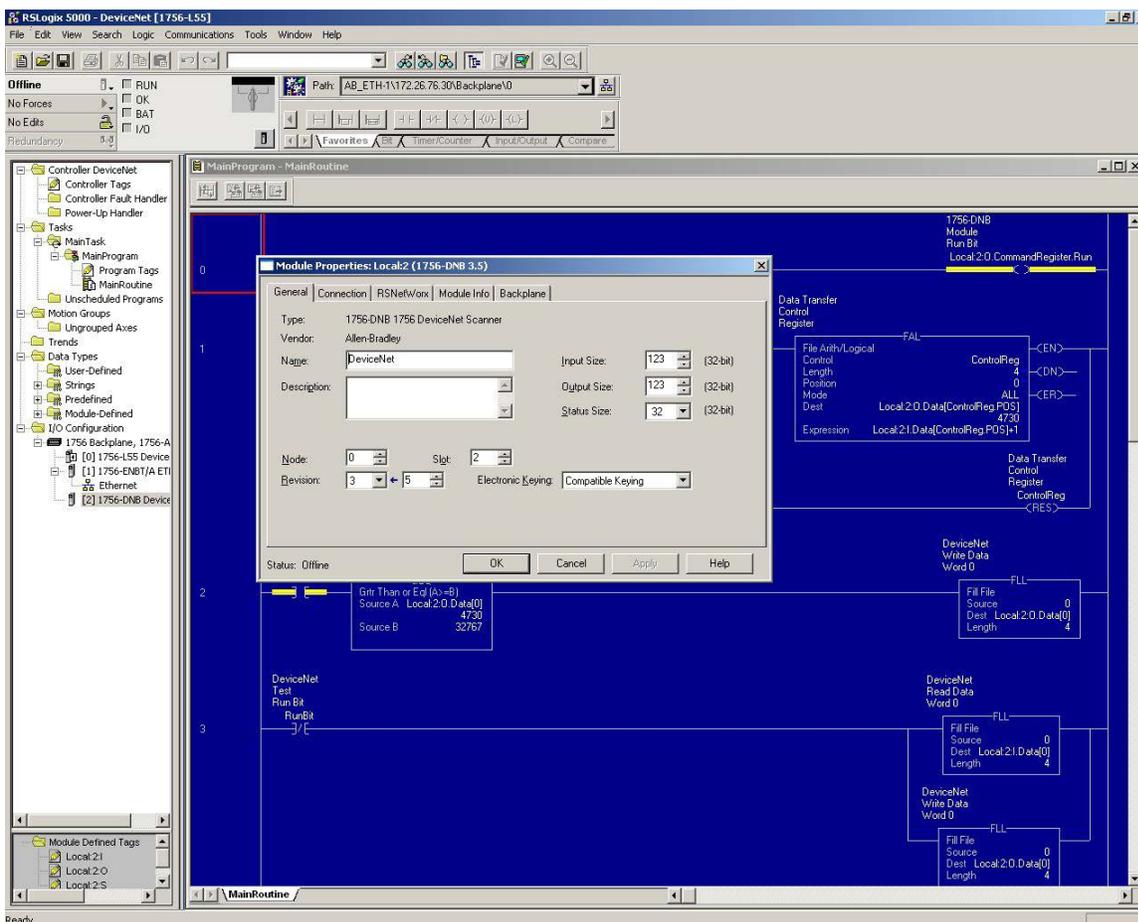
FIG. 46: Create Valid DeviceNet Scanner

Configure the DeviceNet Scanner to be address 0. Make sure to set up the 32-bit Input and Output memory spaces for a size of 32 (to match the configuration made above in both Gateway and RSNetWorx for DeviceNet).

Select the RSNetWorx tab, and navigate to the RSNet-Worx for DeviceNet configuration that you have previously created. Open the configuration from here and download it to the network.
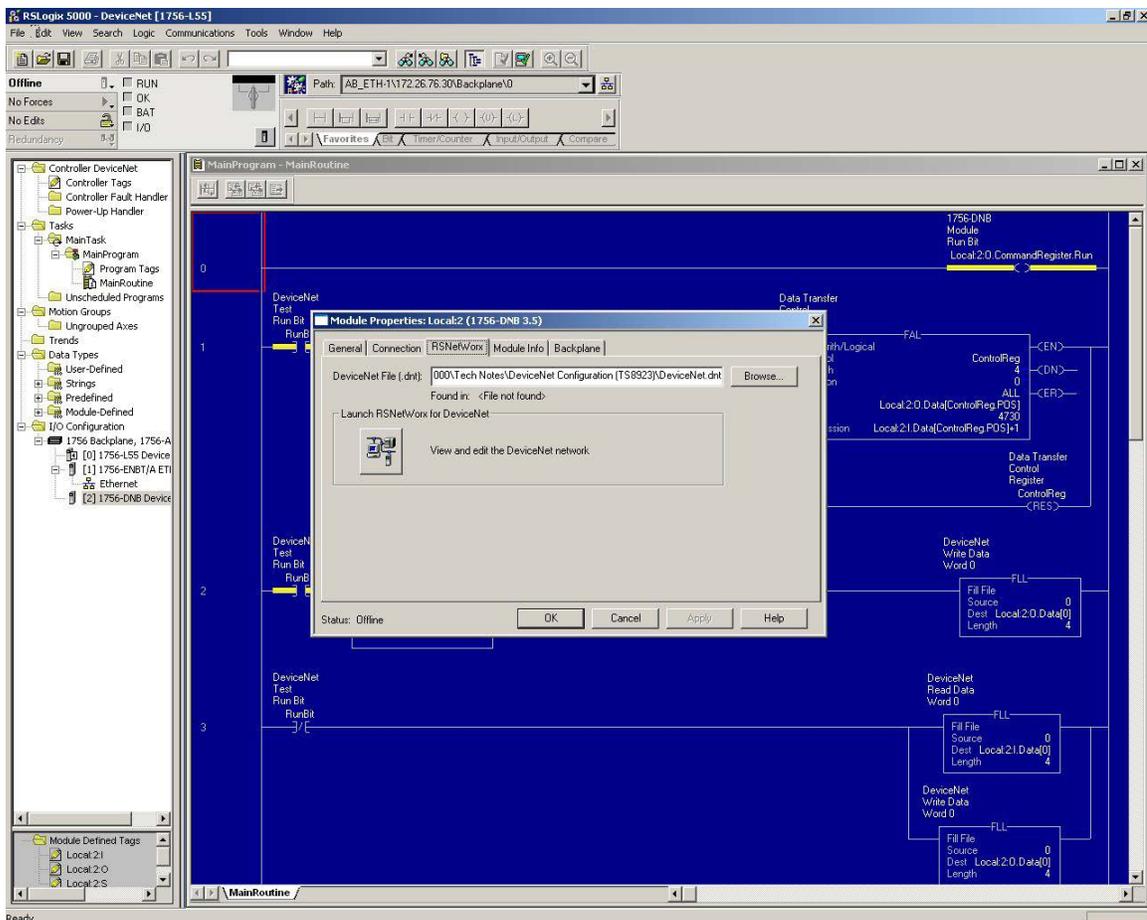
FIG. 47: Main Task Tree

In the Main Task tree, open the Main Routine Ladder Logic file. Create a rung of ladder to enable the DeviceNet network. The required output is always: ***Local:YourDNBSlot:0.CommandRegister.Run***

Create a few rungs by taking the DeviceNet Input data, Local:2:I.Data[0…3], and adding 1 to them. Store the results in Local:2:O.Data[0…3]. Based on the configuration in the Gateway, if values are changed on the Gateway Write tags, the Read tags will display the respective values, plus one.

Save and download this configuration to the ControlLogix PLC.

Wire the DeviceNet Network

All DeviceNet networks require a termination resistor at the two end nodes on the network. Place a ¼ watt 120 ohm resistor between CAN H (White) and CAN L (Blue) of the DeviceNet connection.

Appendix B: Profibus™ DP Slave Communication

Overview

This appendix describes the Gateway's support for Profibus DP and details the configuration steps necessary to set up a Graco Gateway with an S7300 PLC, CPU315-2DP via Profibus. It does **not** provide a detailed description of Profibus, but only a brief introduction, necessary to define the terms that are used throughout the remainder of this document.

Introduction

Profibus DP stands for "Profibus for Decentralized Peripherals". Profibus DP is a device level bus that supports both analog and discrete signals. It has widespread usage for such items as remote I/O systems, motor control centers, and variable speed drives. Profibus DP communicates at speeds from 9.6 Kbps to 12 Mbps over distances from 100 to 1,200 meters.

The protocol supported by the Profibus DP option card is **Profibus DP Slave**. Therefore, the Graco Gateway must be linked to a Profibus network with a PLC.

Profibus Port Protocols

The Profibus option card has one Profibus port. See FIG. 48.

Also see **Appendix B: Profibus™ DP Slave Communication** on page 58.
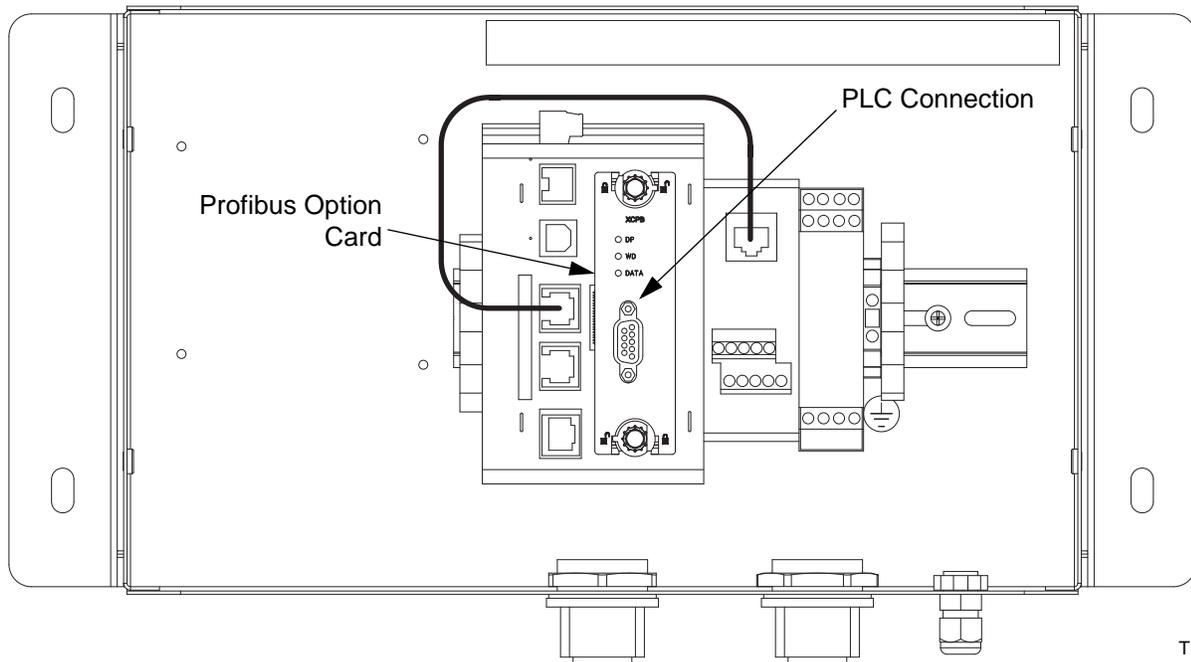
FIG. 48: Profibus PLC Connection

About Profibus DP

Profibus DP communication takes the form of block exchange. Profibus blocks are made of memory bytes where 2 bytes make a word and 4 bytes a double word, or Dword.

A block is a range of consecutive byte addresses and is unidirectional. This means the PLC will exchange data read only and write only blocks with DP slave units. Addresses in each device are independent and only relevant to the device for its own program. For example, the address range for the first block in the master can start at 256 with a 64 words block length and could result in the slave with a range starting from 0 with 64 words length.

However, since blocks are consecutive, this means the first block start address, in the above example 256, will be the slave start address 0. Then, 257 in the master would be 1 in the slave, and so on.

Block length can be defined in bytes, words, or double words. Since start addresses between the master and the slave can be different, one could give its start address and length in bytes, and the other in words.

For example, the master start address is byte 256, with a 64 words block length.

• This results in a range from byte 256 up to byte 383. The slave start address is word 0, with a 64 words block length.

• This results in a range from word 0 to word 63. FIG. 49 illustrates this exchange.

NOTE: Do not forget that the Input block is independent from the Output block, and although the address range is the same, the data are different.

NOTE: FIG. 49 has no connection with the Input Block and Output Block in Graco Gateway. The terminology used in the tags configuration is from the PLC point of view (DP Master). Refer to **Graco Gateway Setup** for more information.

DP Master   **DP Slave**

| Output Block byte 256 to byte 383 | → | Input Block word 0 to word 63 |
| Input Block byte 256 to byte 383 | ← | Output Block word 0 to word 63 |
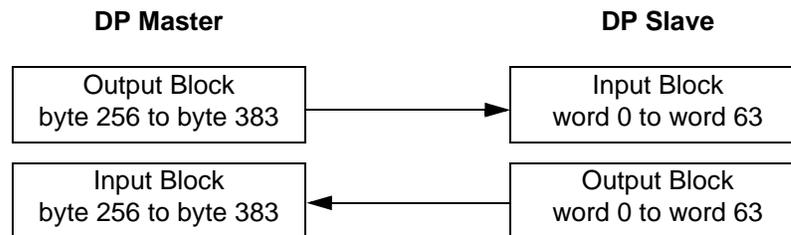
FIG. 49: Master/Slave Exchange

Setup the PLC

The Siemens Simatic Manager software is used to set up the S7300 PLC. The following figures and explanations are extracted from this software.

Install the GSD file

The first step is to install the GSD file so Simatic is able to map data blocks to our device. Contact Graco Technical Assistance for Profibus GSD files.

Start Simatic Manager and open or create a new PLC project. Select the Simatic 300 Station in the navigation pane as shown in FIG. 50.
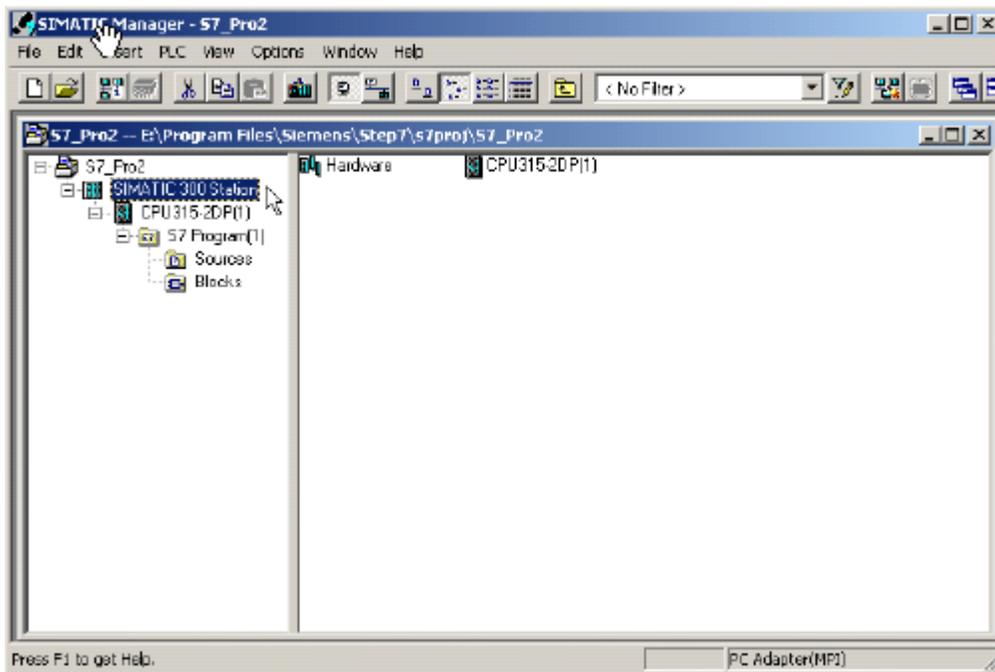
FIG. 50: Select Simatic 300 Station

Double-click Hardware in the right hand window. This will start the HWConfig where most of the work is done. The HWConfig shows the current PLC hardware configuration. Close this configuration (NOT HWConfig) and choose Options>Install GSD File… FIG. 51.

FIG. 51: Install the GSD File

Click Browse to select the folder were the GSD file downloaded previously is, select the file and click Install. FIG. 52.

Once the GSD file is installed successfully, the PLC hardware setup can be opened again by doing Station and selecting the latest opened file which should be number 1.

If this is a new project, configure your PLC with the right modules.
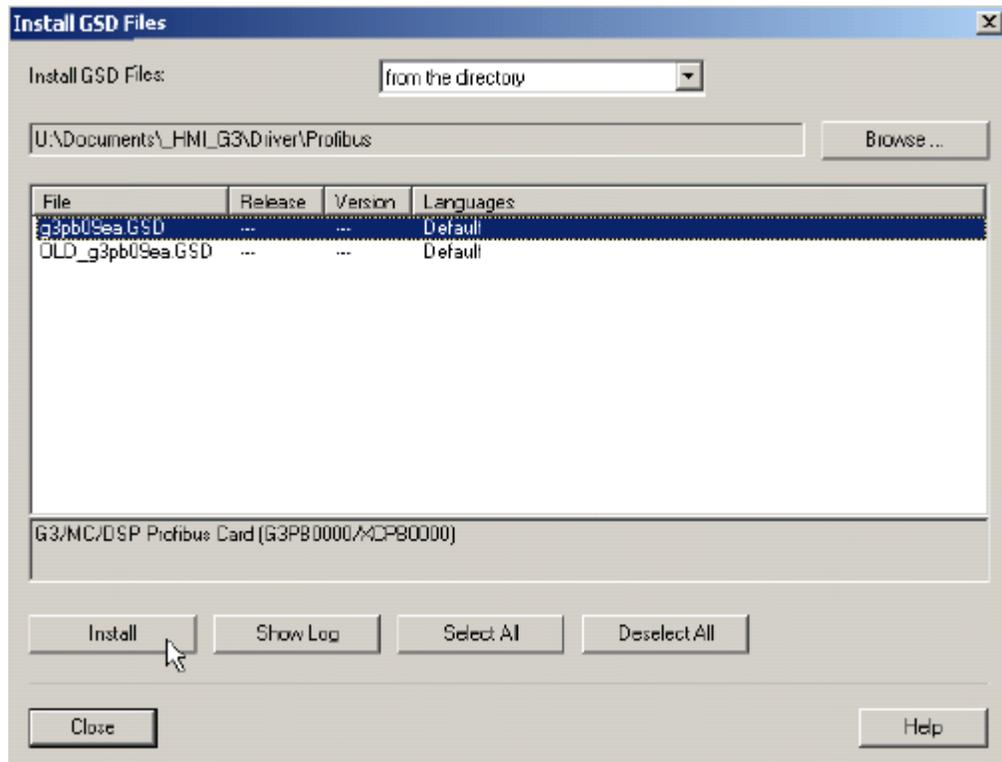
FIG. 52: Browse to GSD File

Setup the Profibus Network

The following steps show how to set up the Profibus DP network. Skip these steps if your PLC application already possesses a Profibus DP network.

In the floating window that represents the PLC, double click the DP area to open the properties window as shown in FIG. 53.
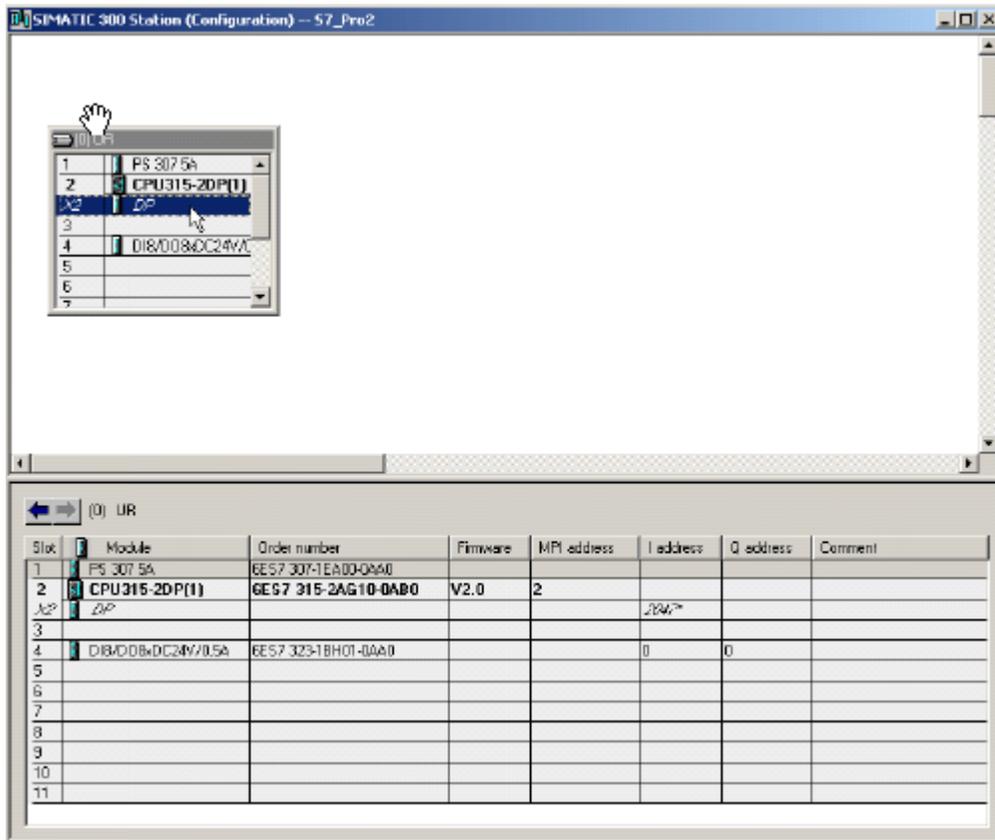
FIG. 53: DP Properties Window

In the General tab, click the properties button to open
the Profibus properties. FIG. 54.
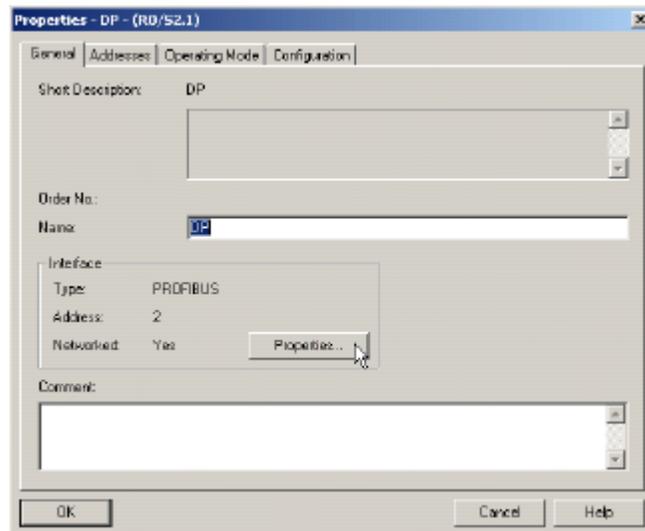
FIG. 54: Open Profibus Properties

In the properties window, go to the Parameters tab and
click on the New button to create a new network. FIG.
55.

FIG. 55: Create a New Profibus Network

Select the Network Settings tab and choose the Trans-
mission Rate that fits the application. In this example, it
will be 12 Mbps. The profile should be DP. FIG. 56.

FIG. 56: Set Transmission Rate

Close the popup windows by clicking OK. HWConfig
should now show the Profibus DP master system next to
the PLC. FIG. 57.
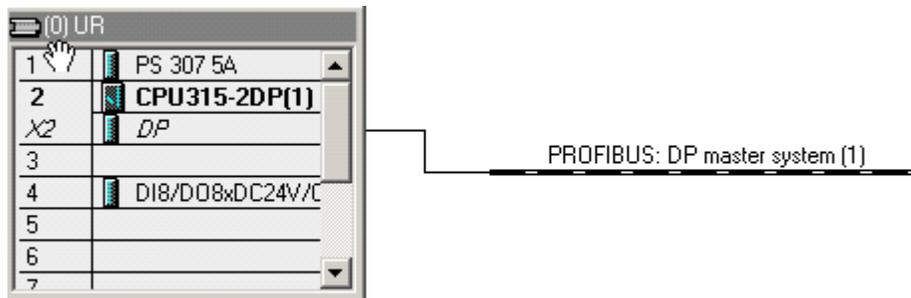
FIG. 57: Profibus DP Master System

Add the Graco Gateway to the Profibus Network

To add the Graco Gateway to the Profibus network, drag the Gateway Profibus Card from the Catalog navigation situated on the right hand side of HWConfig to the Profibus DP Master System. The card is situated under Profibus DP>Additional Field Devices>MMI.

In the properties window that popped up, select the Profibus address the Gateway will take on the network. This address should be unique. In this example, the Gateway will take address 5. FIG. 58. Click OK.
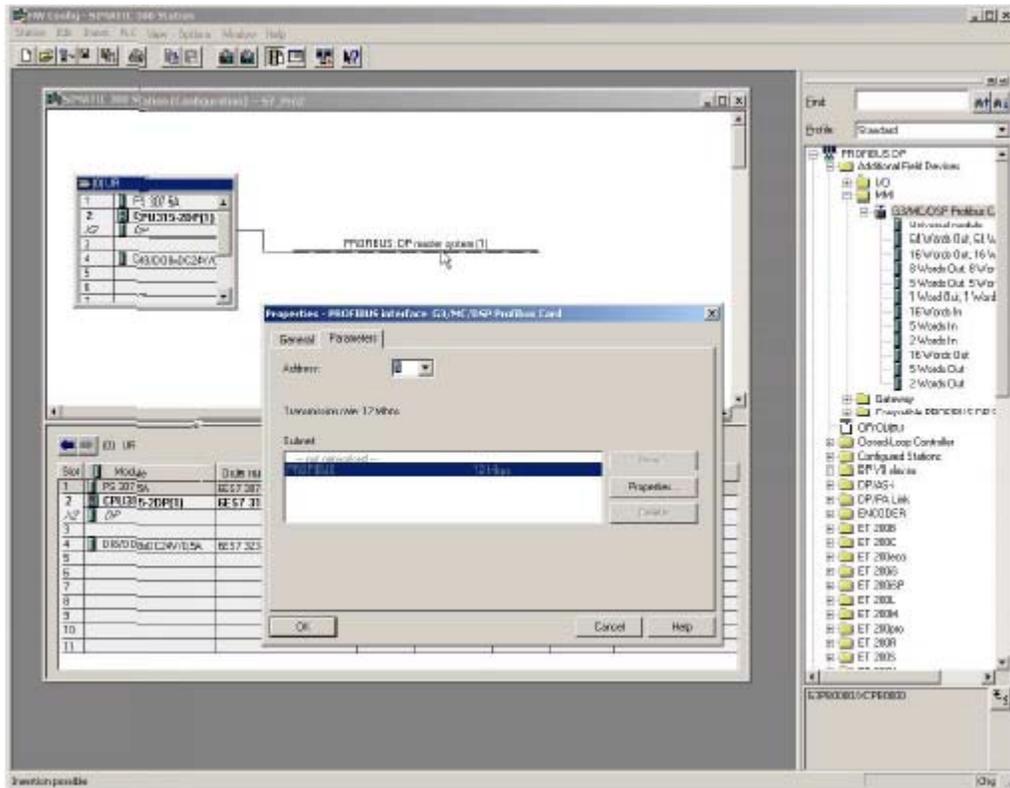
FIG. 58: Add Graco Gateway to Profibus Network

The Gateway is now on the Profibus DP network and selected. HWConfig shows the slots available under the Gateway to configure the data blocks to exchange.

Just drag and drop one of the data blocks available under the Gateway Profibus Card in the slot number 1. Simatic will automatically assign a start address (byte number) in the respective Input and output columns depending of the block type chosen. In this example, 64 words in and 64 words out.

More blocks can be inserted in the following slots to fit your application. FIG. 59 shows an example with a 16 words input block in slot 2 and 5 words output block in slot 3. Addresses are given automatically but can be edited by the user.

NOTE: If the starting address for a block in slot 2 or above changes and creates a gap in the address range, it will not affect the Gateway blocks, as all data are consecutive. It is however advised to keep the addresses consecutive to facilitate development.
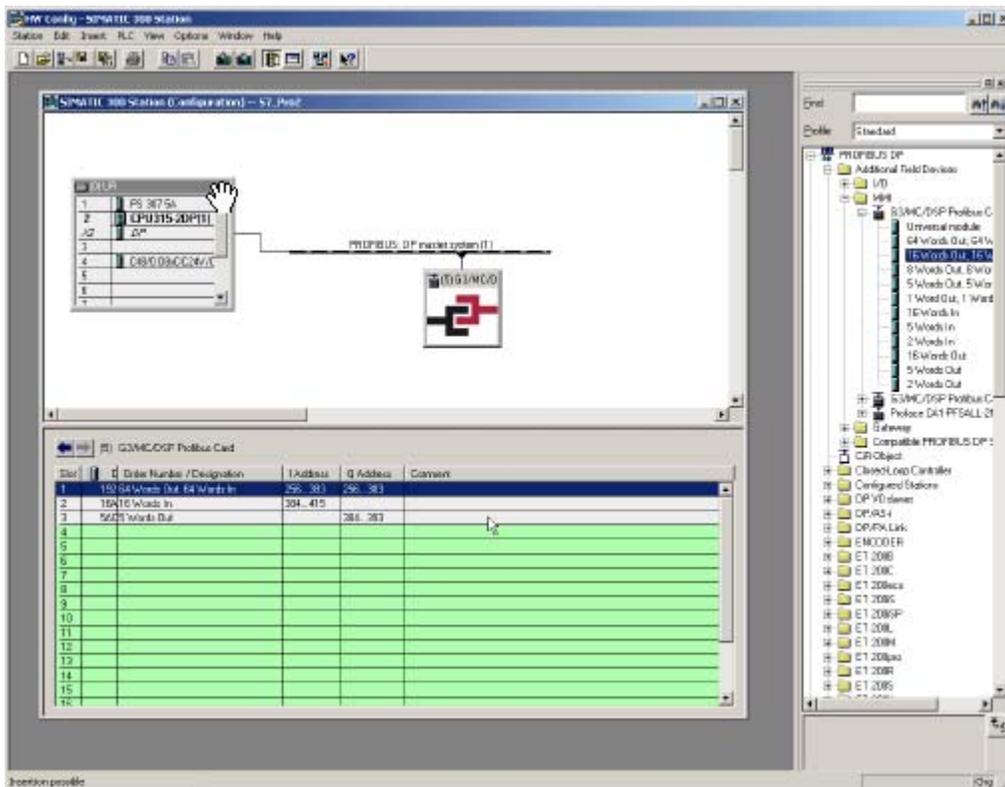
FIG. 59: Configure Data Blocks

Save the configuration and download it to the PLC.

NOTE:

- The maximum number of input bytes allowed is 244.
- The maximum number of output bytes allowed is 244.
- The maximum number of bytes overall is 436.

Graco Gateway Setup

Once the PLC is setup, the Gateway can be programmed to fit its configuration.

NOTE: For a Gateway to communicate on Profibus DP, a Profibus Option card has to be fitted in the unit. Refer to the device manual to find the proper option card and installation procedure.

Setup the Profibus Communication

Enter the communication module and select the Gateway. On the right hand pane, click the Edit button to select the Option card. Select Profibus Option card and click OK. FIG. 60.
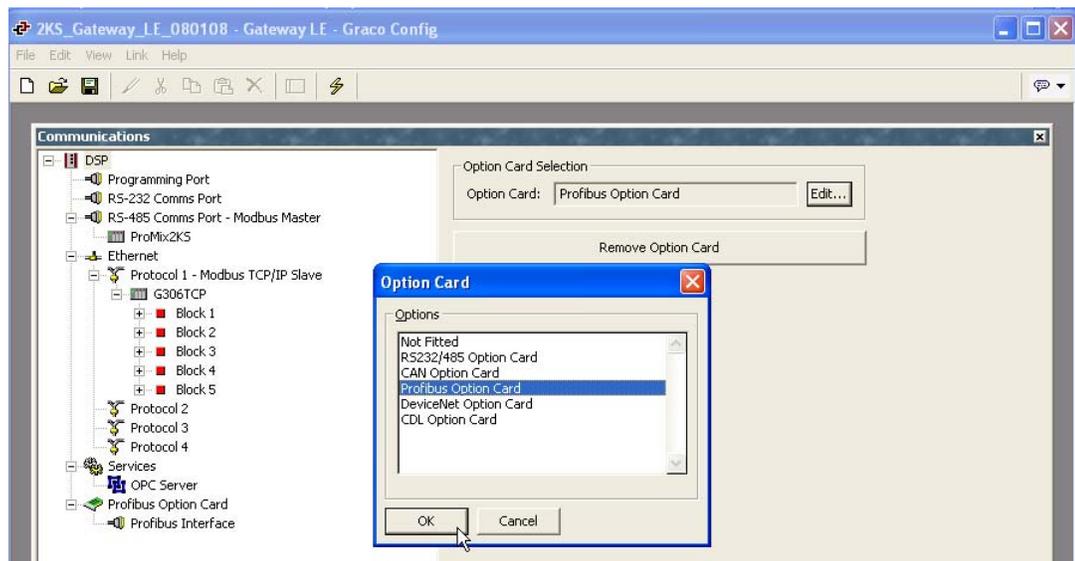
FIG. 60: Select Profibus Option Card

The option card appeared in the communication tree. Select the Profibus Interface and click the Edit button to select a driver. Click OK to pick the Profibus DP driver. FIG. 61.
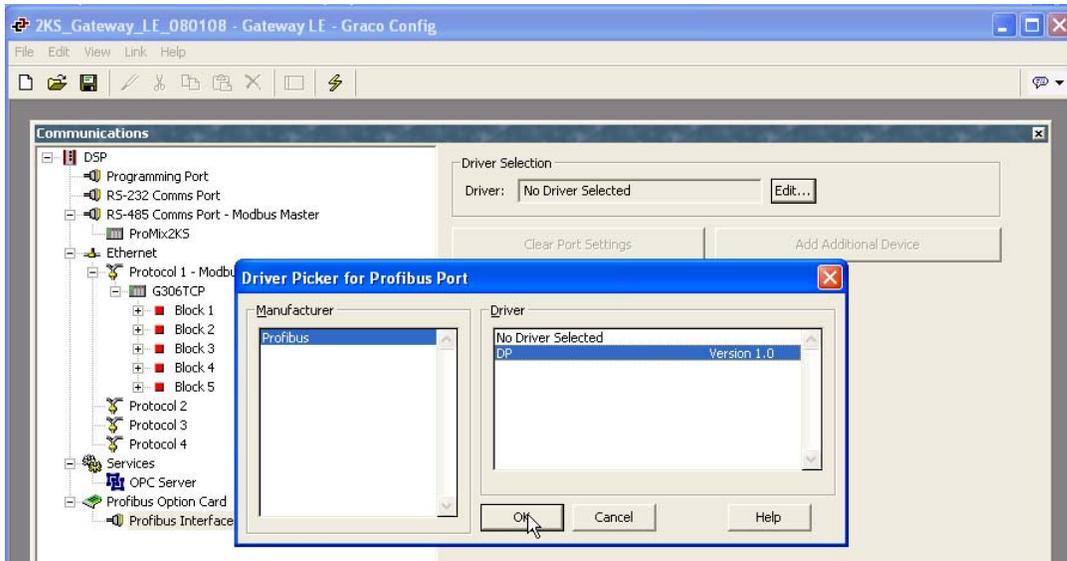
FIG. 61: Select Profibus Server

Graco Gateway now displays the driver settings where the Station Address can be changed. This address is the Gateway address on the Profibus network. In our example, this address is 5 as setup in the PLC earlier.

NOTE: There are no Baud Rate settings as the Profibus option card detects the transmission rate automatically.

A device called PLC1 is now displayed under the Profibus Interface. This device represents the Profibus Master and can be renamed to fit the application. In this example, the name PLC1 remains. FIG. 62.
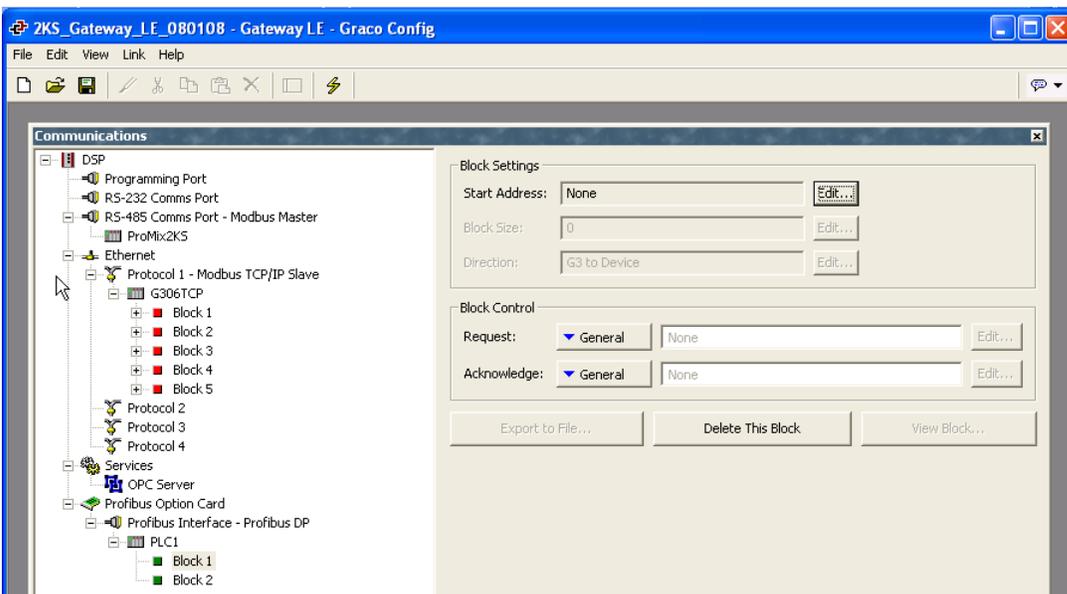
FIG. 62: Block Settings

Setup Tags

Once the communication is set up, tags can be created to access the PLC blocks. This is where the section **Setup the Profibus Communication**, page 67, is important.

First, create a variable that correspond to the data type required. In this example, an integer. FIG. 63.
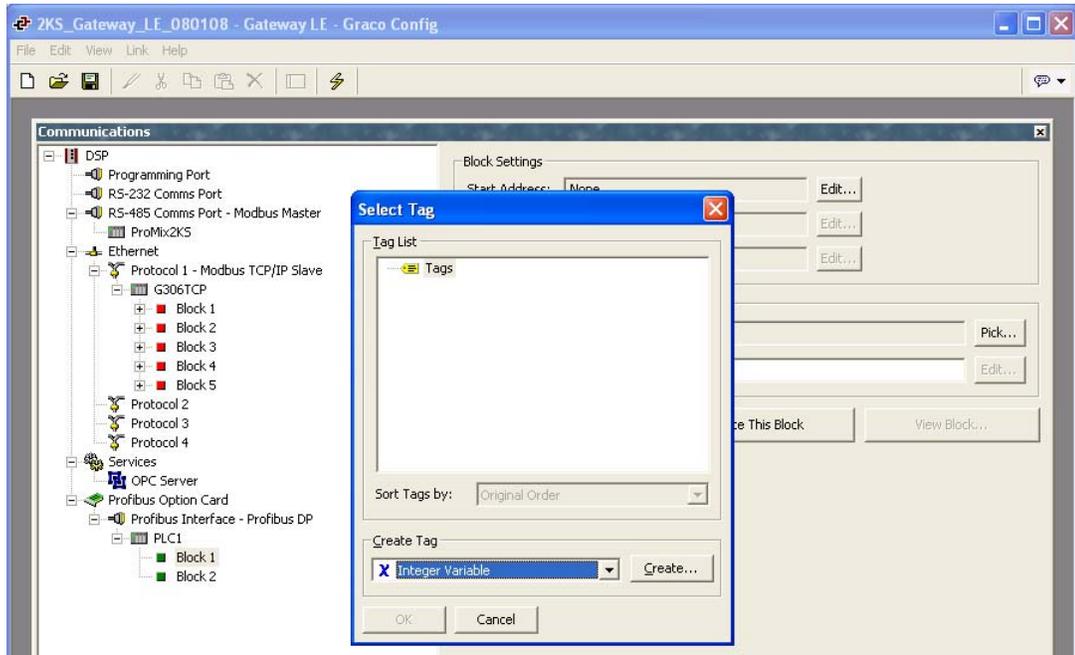
FIG. 63: Create a Variable

Select the variable and rename it eventually. Then, click on Internal next to mapping on the right hand side pane, and select PLC1, which is the Profibus Master. FIG. 64.

Select PLC1 from pulldown menu
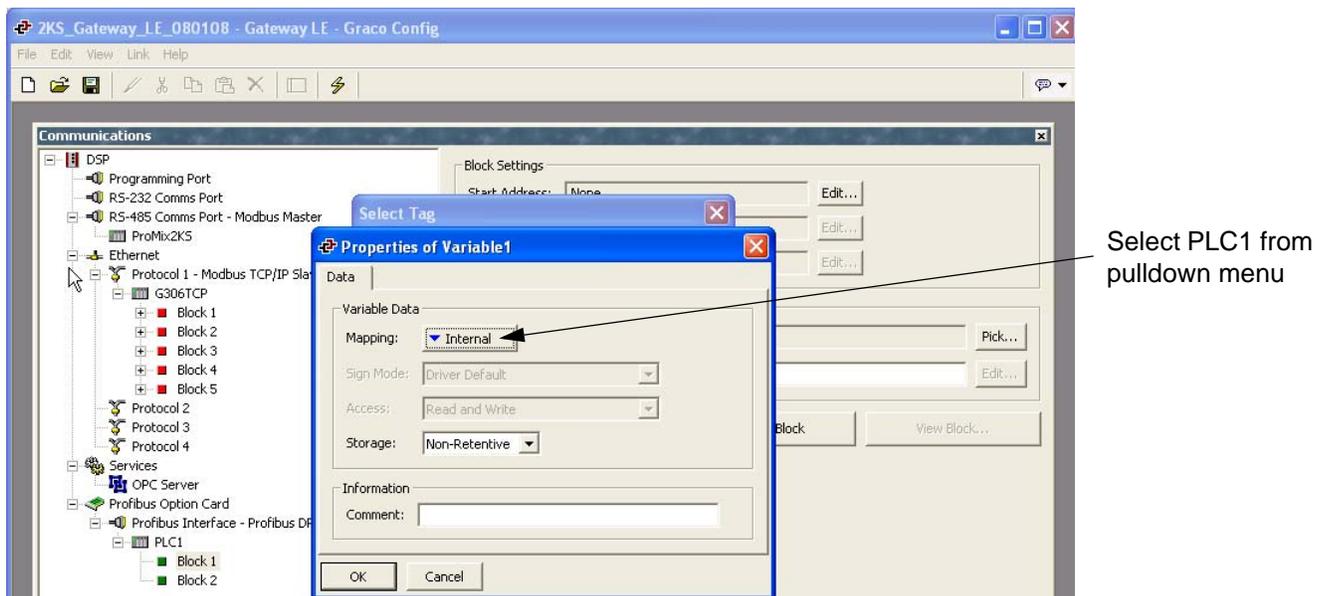
FIG. 64: Variable Properties

In the popup window, select the block type required. Two choices are available:

• Input block: The terminology input is from the Siemens perspective. Therefore this will be a block the Gateway will write to. The tag mapped to an input block has to be set up as Write Only.

• Output block: The terminology output is from the Siemens perspective. Therefore this will be a block the Gateway will read from. The tag mapped to an output block has to be set up as Read Only.

• Select the data offset, which points the address to read or write in the block. Select the data type to read or write. This defines how many bytes to access in the block to get the correct data. In this example we choose **output block**, with data offset **0** (Which points to 256 in the PLC) and as a **Word.** FIG. 65.
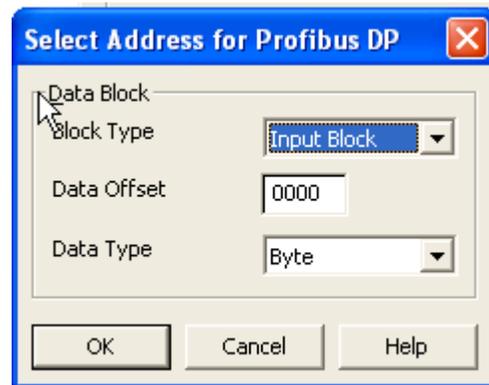
FIG. 65: Select Block Type

NOTE: Since the output block is a reading block from the Gateway standpoint, this variable should be set up as Read Only as shown in Fig. 19. The same rule applies if the block is an input block, it should be set up as Write Only.

To avoid mistakes, the mapping shows with an R or W for output or input block respectively. FIG. 66.
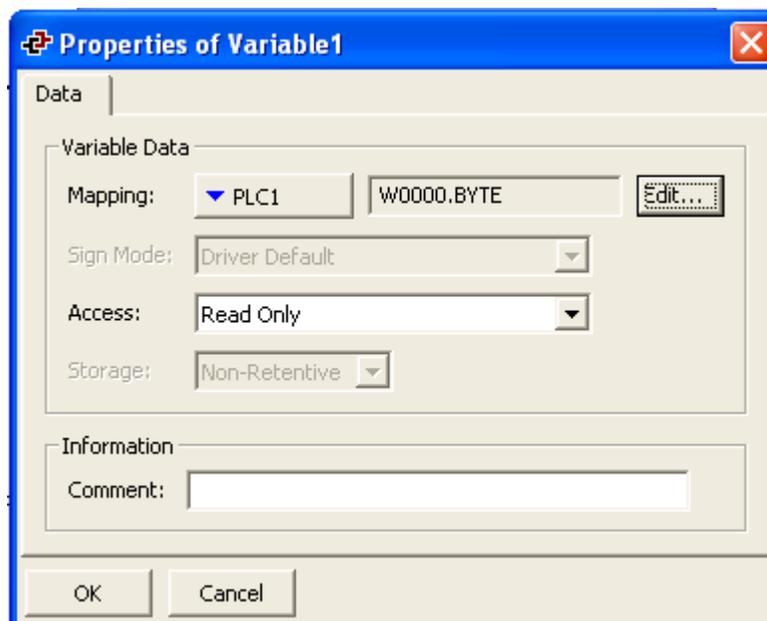
FIG. 66: Properties of Variable

How Addressing Works

PLC addressing is in byte and uses the scheme shown in FIG. 67.
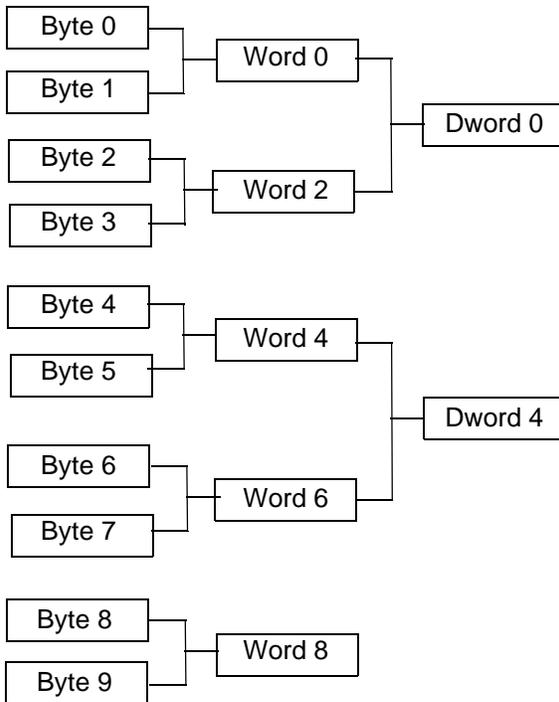
Note how a Dword or word address starts at the address of the first byte included in it.

FIG. 67. PLC Addressing Scheme

The Gateway addressing follows a different scheme, as shown in FIG. 68.

This means that the address number will be different when accessing words or Dwords in the Gateway data tags than the PLC. Table 6 shows the address relationship for integer tags mapped as word in the Gateway.
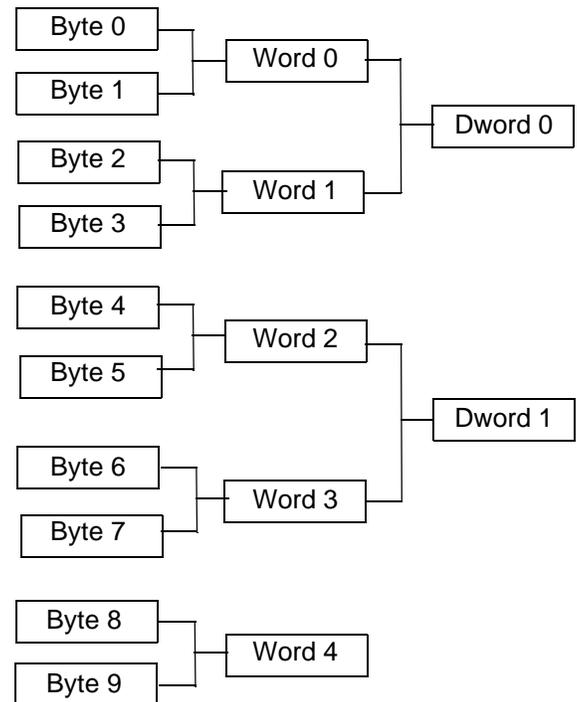
Here, the word or Dword addresses follow the normal numeric increment and are not directly related to the word or bytes they are composed of.

FIG. 68. Gateway Addressing Scheme

Table 6: Addressing Relationship

Block Type	PLC		Gateway	
	Input (bytes)	Output (bytes)	Input (words)	Output (words)
64 words in, 64 words out	256...383	256...383	0...63	0...63
16 words in	384...415	-	64...79	-
5 words out	-	384...393	-	64...68

Useful Formulas

The following formula can be used to find the **byte** number from a **word** address:

ByteAddress = PLCOffset + (WordAddress x 2), where:

- ByteAddress is the address we are looking for in the PLC

- PLCOffset is the first byte number in the complete block mapping in the PLC, here 256

- WordAddress is the address mapped in the Gateway. So, for example, word 77 in the Gateway, would start at byte 410 in the PLC, and so would be composed of byte 410 and 411.

The following formula can be used to find the **byte** number from a **Dword** address:

ByteAddress = PLCOffset + (DWordAddress x 4), where:

- ByteAddress is the address we are looking for in the PLC

- PLCOffset is the first byte number in the complete block mapping in the PLC, here 256

- DwordAddress is the address mapped in the Gateway. So, for example, Dword 14 in the Gateway, would start at byte 312 in the PLC, and so would be composed of byte 312, 313, 314 and 315.

NOTE: For the formula to work, all the blocks in the PLC Profibus configuration for the Gateway have to be consecutive. FIG. 58.

Appendix C: Graco Gateway to ControlLogix via Ethernet IP

Overview

This appendix describes the configuration steps neces-sary to establish a communication path between the Graco Gateway and a ControlLogix unit. You will need either a 1756-ENET/B or a 1756-ENBT/A together with a Logix5550 controller. It may be possible to upgrade a 1756-ENET/A to the required 1756-ENET/B by flashing the firmware; you should check the hardware version with your vendor before hand to ensure its suitability. You will also need Rockwell Software's RSLinx and RSLogix 5000 software configuration utilities.

Introduction

In the following example, the ControlLogix will establish a Class1 connection and I/O data will be exchanged between the ControlLogix and the Graco Gateway ter-minal. The network parameters used in this example will almost certainly not apply to your application. Be sure to consult your network administrator when selecting appropriate values.

TI15057a

Ethernet Connection to PLC
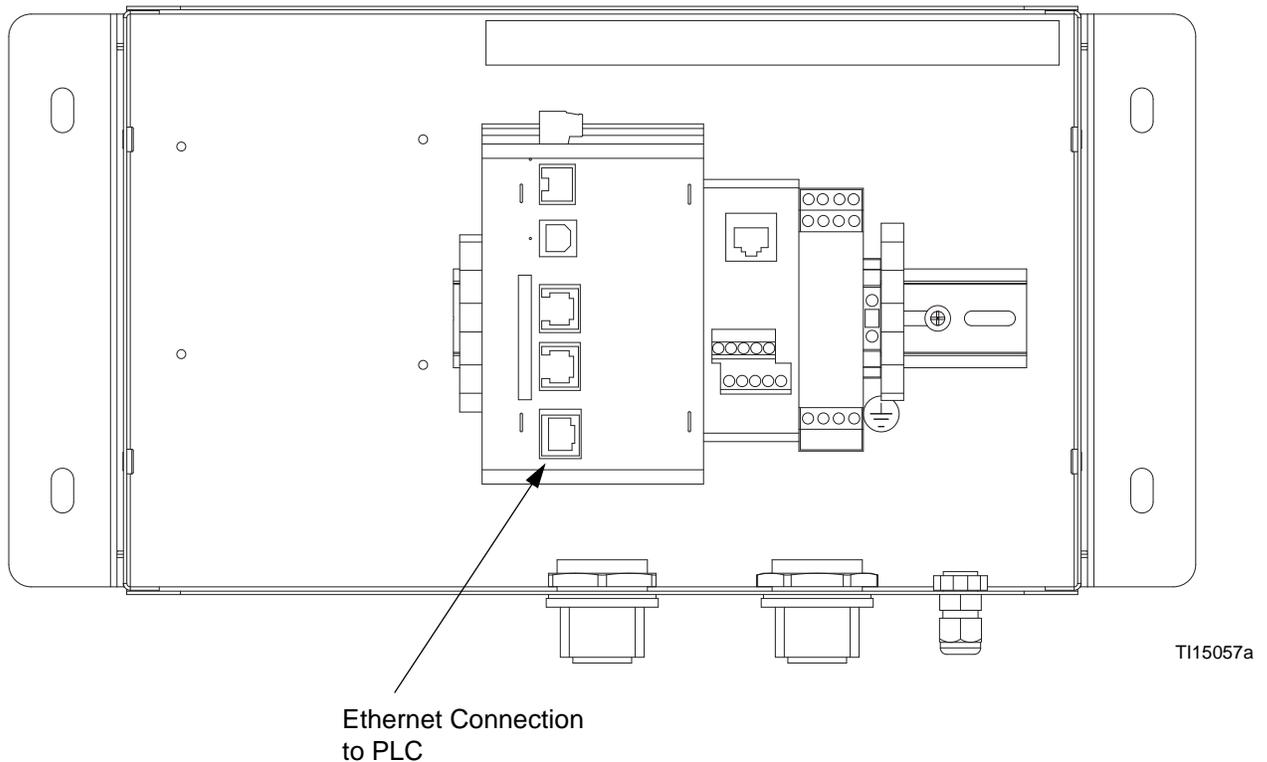
FIG. 69: Ethernet PLC Connection

ControlLogix Configuration

1. Run the RSLogix 5000 program and create a new configuration.

2. Add a 1756-ENET/B or a 1756-ENBT/A to your I/O configuration. You will need to:

   a. Switch to offline mode.

   b. Right click on the I/O Configuration node in the Controller Organizer view and choose Add Module.

   c. In the Select Module Type window, choose 1756-ENET/B or 1756-ENBT/A entry. RSLogix will open the Module Properties window. See FIG. 70.

   d. Enter the IP Address of the ENET/B or ENBT/A interface.

   e. Click Finish to add the interface to your I/O configuration.

   f. Download the configuration.

   g. Switch to online mode and open the 1756-ENET/B or 1756-ENBT/A node properties under the I/O Configuration in the Controller Organizer.

   h. Select the Port Configuration Tab from the Module Properties window. See FIG. 71.

   i. Enter the IP Address and Subnet Mask. The IP Address must match the IP Address entered in the Properties window (FIG. 70).

   j. Apply the settings using the Set button.

   k. You can now verify the network module network communications with your unit using suitable diagnostic tools such as Ping.

3. Add the Graco Gateway to the RSLogix configuration as follows:

   a. Switch to offline mode.

   b. Right click on the 1756-ENET/B or 1756-ENBT/A node under the I/O Configuration in the Controller Organizer view and choose Add Module.

   c. In the Select Module Type window, choose Generic Ethernet Module. See FIG. 72.

   d. Click OK. This will open the Module Properties window. See FIG. 73.
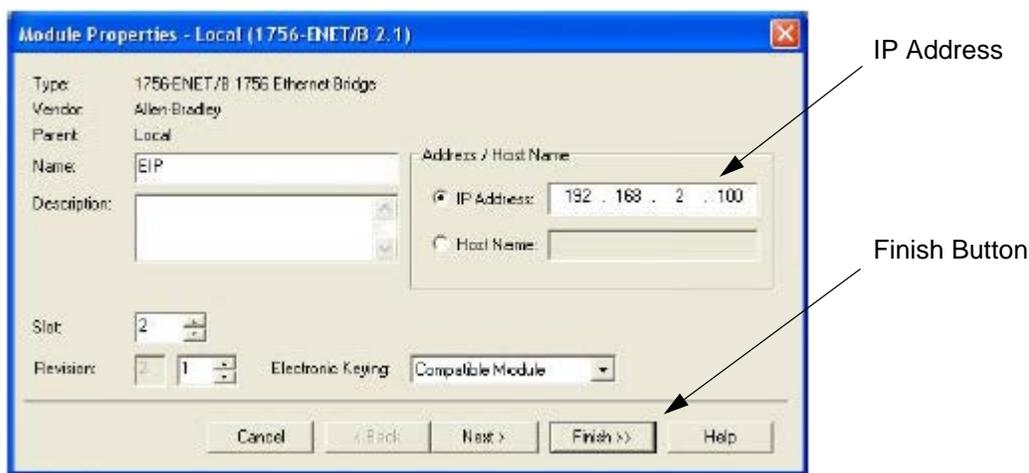
FIG. 70. Ethernet Module Properties
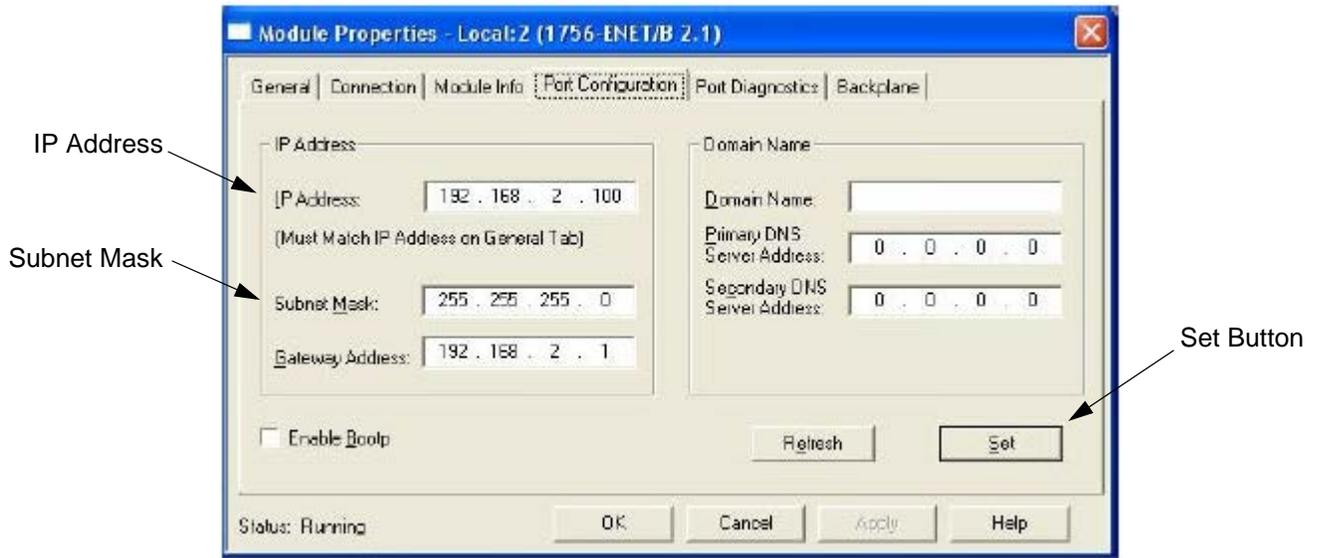
Fɪɢ. 71. Port Configuration Window
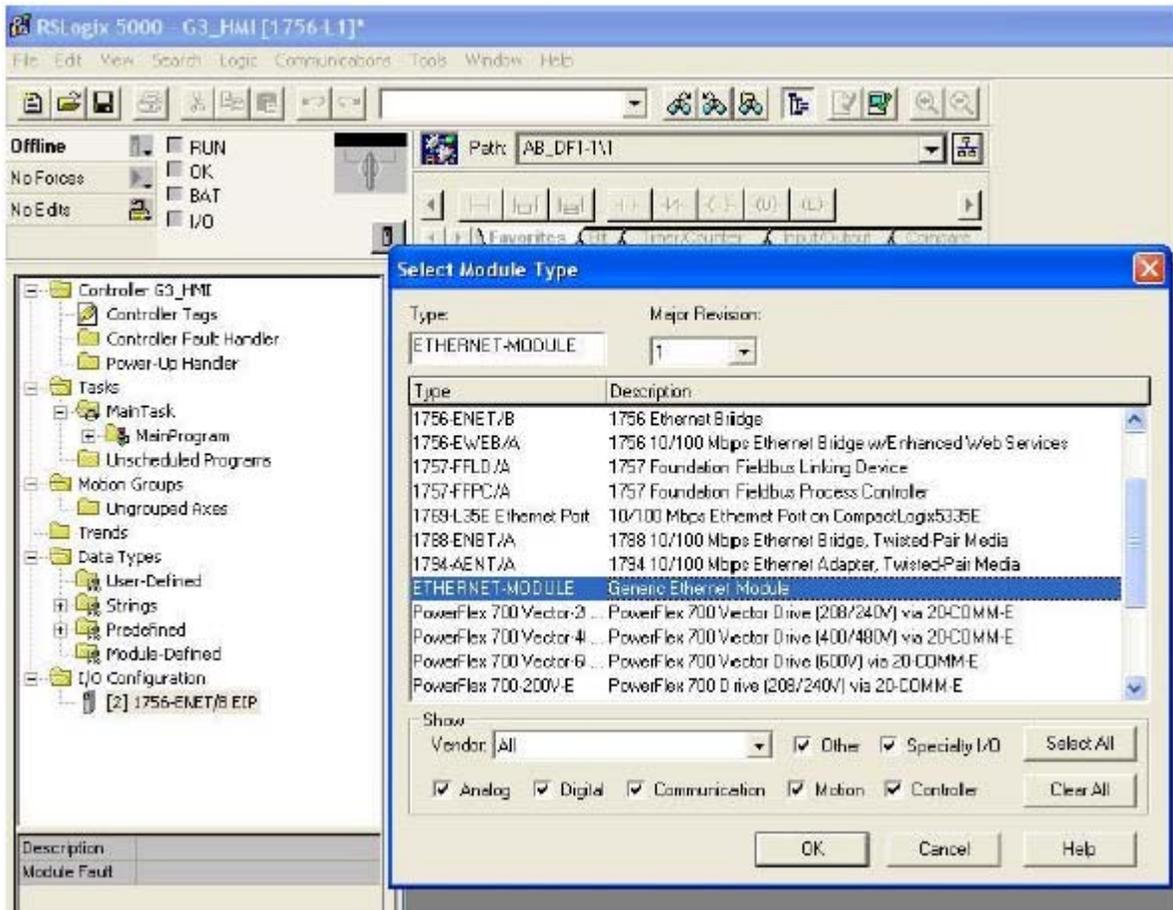
Fɪɢ. 72. Ethernet Module Selection

e. In the Name field, enter a descriptive name to identify the module. See FIG. 73.

f. In the Address/Host Name field, enter the IP Address of the Graco Gateway.

g. Enter 2 in the Input Assembly Connection Point and a size of 2. This will match a read only Slave Gateway block configured in the Gateway, and will be used for reading data from the Gateway to the ControlLogix.

h. Enter 3 in the Output Assembly Connection Point and a size of 2. This will match a read/write Slave Gateway block configured in the Gateway, and will be used for writing data from the ControlLogix to the Gateway.

i. Enter 1 in the Configuration Connection Point and a size of 0. Configuration data is not supported by the Gateway.

j. Press Finish to add the Gateway to the I/O configuration.

The connection points and sizes are arbitrary, as long as the connection point, size, and direction are matched in the configuration of the Gateway.

Connection point direction is always relative to the originator, which in the case of the current Gateway Ethernet/IP implementation is always the device and never the Gateway. An *input* connection therefore specifies data flow from the Gateway to the device, and an *output* connection specifies data flow from the device to the Gateway.
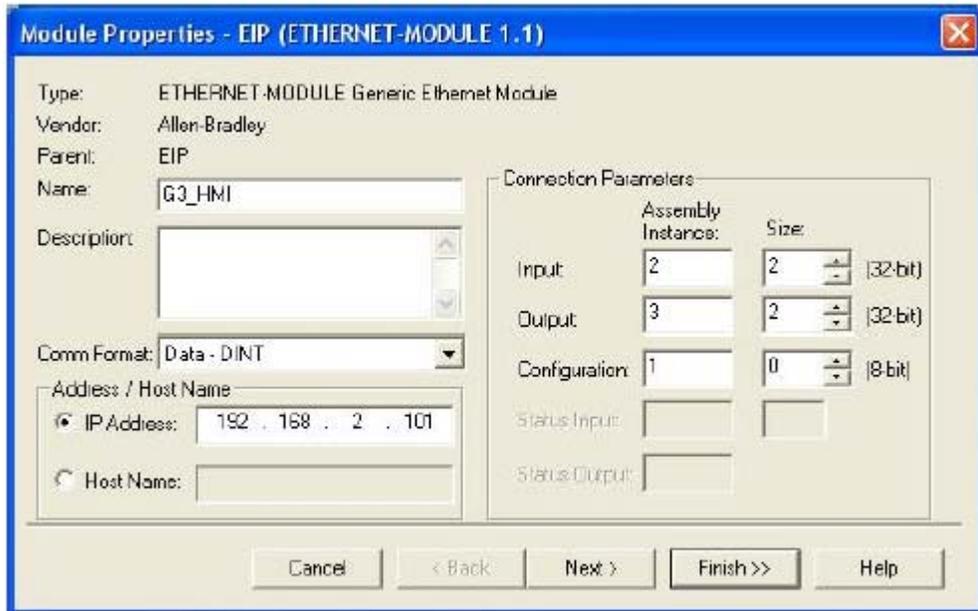
FIG. 73. Ethernet Module Properties

See FIG. 74. You should now see a new ETHER-NET-MODULE Gateway_HMI branch of the 1756-ENET/B node in the I/O Configuration view. You should also see three new entries in the Controller Tags view:

*   Gateway_HMI:I to view the input data
*   Gateway_HMI:O to modify the output data
*   Gateway_HMI:C to view the configuration data

4. Download the new I/O configuration to the controller. Once the download is complete, the controller will automatically establish a new Class1 connection with the Gateway.
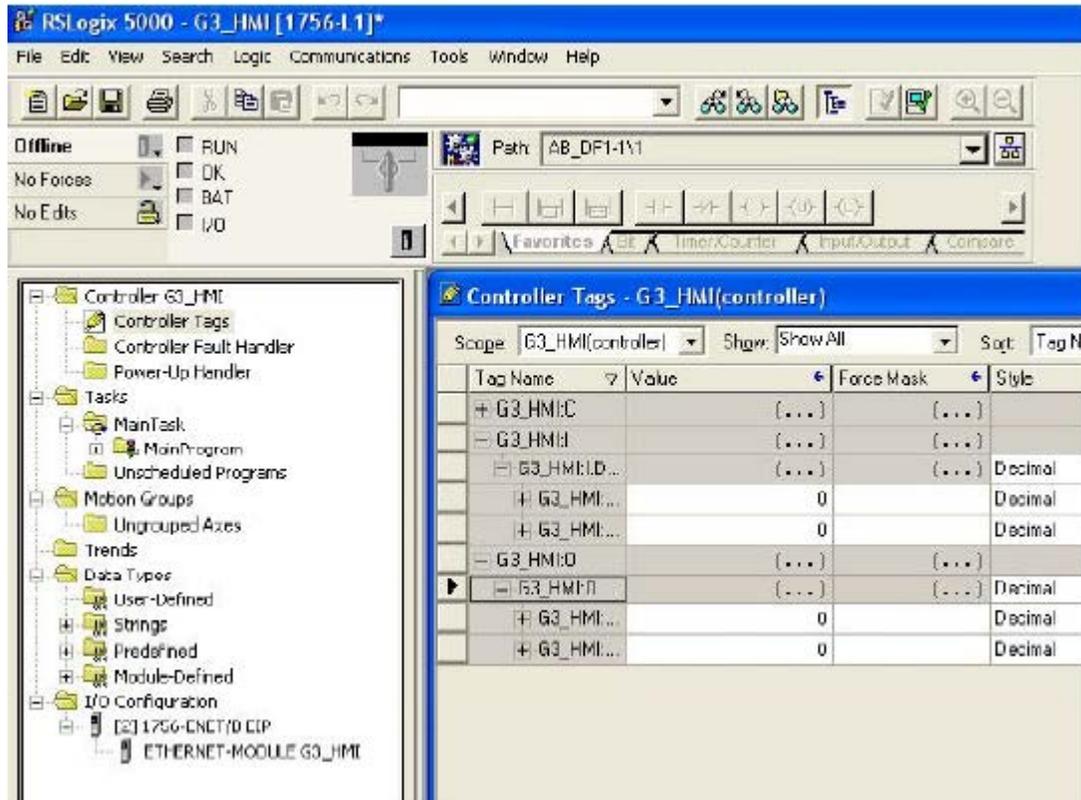
FIG. 74. Ethernet Configuration Data

Graco Gateway Configuration

1. **Ethernet Settings**. Set the IP Address to 192.168.2.101. This should match the Address/Host Name entered in Fɪɢ. 73.

2. **Protocol Settings.** Select the Ethernet/IP Slave Adapter communications driver.

   The ENET/B module prefixes all output data with a header containing status information about the origi-nator's run/idle state. With the Run/Idle Header checked, the communications driver will automati-cally process the header, and data will be ignored if the device is in the Idle state. With the option unchecked, extra space must be allocated in the Gateway block to receive the status information; all data is accepted regardless of the device state.

3. **Device Settings**. A Gateway block must be created for each connection point.

   For the purpose of configuring, the data transfer terms *input* and *output* are relative to the device and not the Gateway. An *input* connection is therefore specified as Gateway to Device, and an *output* con-nection is specified as Device to Gateway.

   Connection point mapping is defined in the Start Address block setting and comprises the connection point instance and a data offset. The instance must match that specified by the originator; the offset can be used to skip over data not required by the Gate-way, useful mainly on shared connection points.
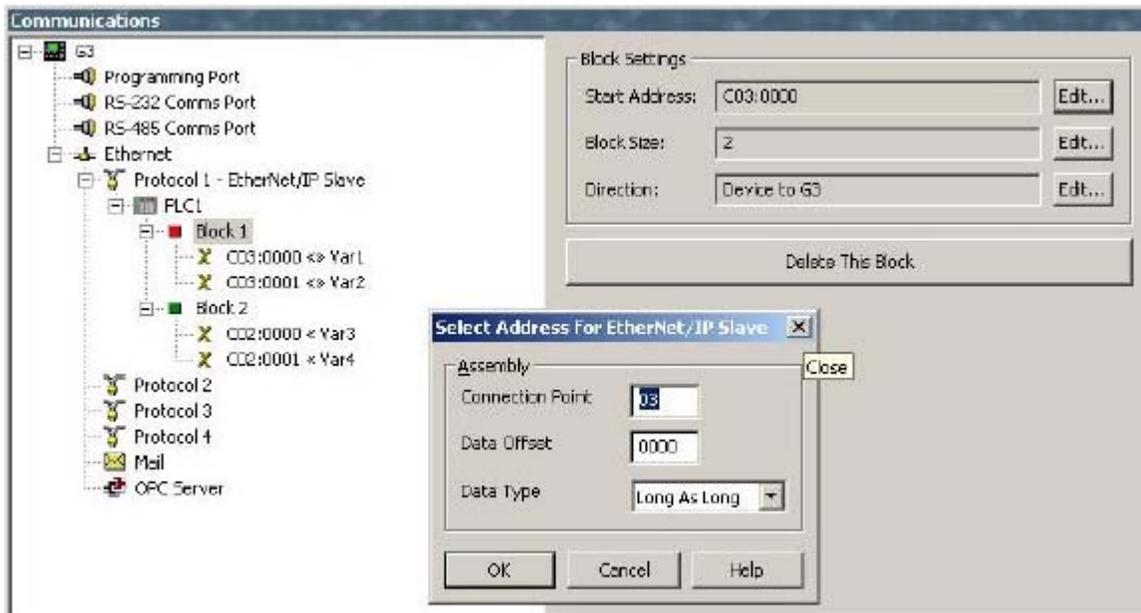
Fɪɢ. 75. Ethernet Block Settings

The following settings mirror the I/O settings of the ControlLogix configuration detailed earlier.

a. **Input Connection Point.** Create a Gateway block configuration (see Table 7).

Table 7: Input Connection Points

Connection Point	2
Data Offset	0000
Data Type	Long as Long
Block Size	2
Direction	Graco Gateway to Device

b. **Output Connection Point.** Create a Gateway block configuration (see Table 8).

Table 8: Output Connection Points

Connection Point	3
Data Offset	0000
Data Type	Long as Long
Block Size	2
Direction	Device to Graco Gateway

4. **Data Mapping.** the connection points are now configured so that:
Gateway_HMI:O >> PLC1:Block1
Gateway_HMI:I << PLC1:Block2

5. **Testing.** Using the RSLogix5000 program, you can modify tags Gateway_HMI:O and verify they are written into Var1 and Var2, and verify changes made in the Gateway to tags Var3 and Var4 are updated in Gateway_HMI:I. Ensure the device is in the Run mode, otherwise the data transfer will be ignored by the Gateway.

Dimensions

16.57 in. (420.9 mm)

15.07 in. (382.8 mm)

5.31in. (134.9 mm)

8.71in. (221.2 mm)

4.52 in. (114.8 mm)

TI12930a

TI12825b
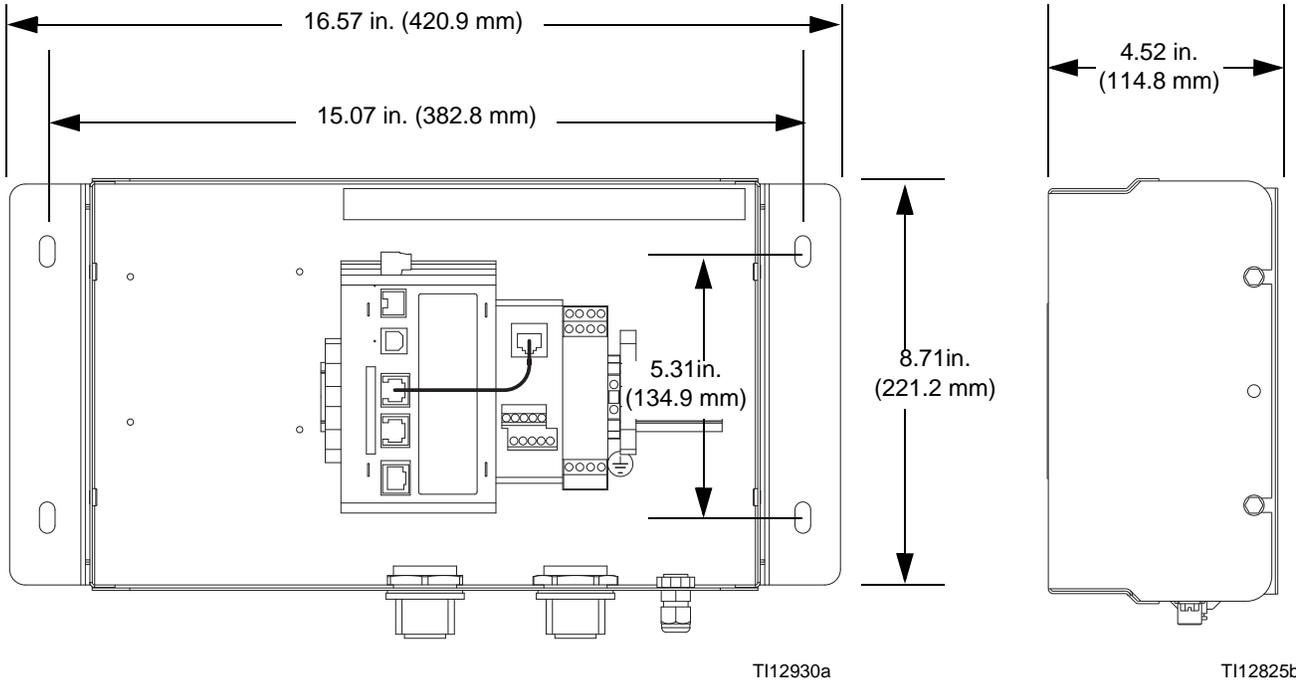
Technical Data

Electrical power	24 Vdc, +/- 10%. 200 mA minimum without expansion card; 1 Amp maximum with expansion card fitted. Requires Class 2 or SELV rated power supply.
Communication ports	
USB/PG Ports	Adheres to USB specification 1.1. Device only using Type B connection.
Serial Ports	Format and Baud rates for each port are individually software programmable up to 115,200 baud.
RS232/PG Port	RS232 port via RJ12.
COMM Ports	RS422/485 port via RJ45, and RS232 port via RJ12.
DH485 TXEN Port	Transmit enable; open collector, V_{OH}=15 Vdc, V_{OL}=0.5 V @ 25 mA maximum.
Ethernet Port	10 BASE-T/100 BASE-TX, RJ45 jack is wired as a NIC (Network Interface Card).
LEDs.	**STS:** Status LED indicates condition of Gateway module. **TX/RX:** Transmit/Receive LEDs show serial activity. **Ethernet:** Link and activity LEDs. **CF:** CompactFlash LED indicates card status and read/write activity.
Memory	
On-board user memory	4 Mbytes of non-volatile Flash memory.
On-board SDRAM	2 Mbytes
Memory card	CompactFlash Type II slot for Type I and Type II cards. Used for optional database storage only.
Real-time clock.	Typical accuracy is less than 1 minute per month drift. Lithium coin cell battery; typical lifetime of 10 years at 25°C. This unit is not field serviceable. All work must be done by a qualified technician.
Environmental conditions	
Operating temperature range.	0 to 50°C
Storage temperature range	-30 to +70°C
Operating and storage humidity.	80% relative humidity, non-condensing, from 0 to 50°C
Vibration according to IEC 68-2-6	Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hr, 2 g's
Shock according to IEC 68-2-27	Operational 30 g, 11 msec in 3 directions
Altitude.	Up to 2000 m
Construction	Carbon steel and stainless steel. Installation category 1, Pollution degree 2.
Power connection.	Removable wire clamp screw terminal block. Wire gage capacity: 24 AWG to 12 AWG. Torque: 4.45-5.34 in-lb (0.5-0.6 N•m).
Mounting.	Snaps onto standard DIN style top hat (T) profile mounting rails according to EN50022 -35 x 7.5 and -35 x 1.5.
Weight (Gateway control box only)	15.1 oz (456.4 g)

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.

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