User Manual

Allen-Bradley

EtherNet/IP and ControlNet to FOUNDATION Fieldbus Linking Devices

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Trademarks not belonging to Rockwell Automation are property of their respective companies.

Introduction

This user manual describes the installation and operation of the 1788-EN2FFR and 1788-CN2FFR linking devices.

About the Linking Devices

The 1788-EN2FFR linking device provides a gateway between an EtherNet/IP network and a single segment FOUNDATION Fieldbus H1 layer.

The 1788-CN2FFR linking device provides a gateway between a ControlNet network and a FOUNDATION Fieldbus network.

In this manual, both modules are referred to as the linking device.

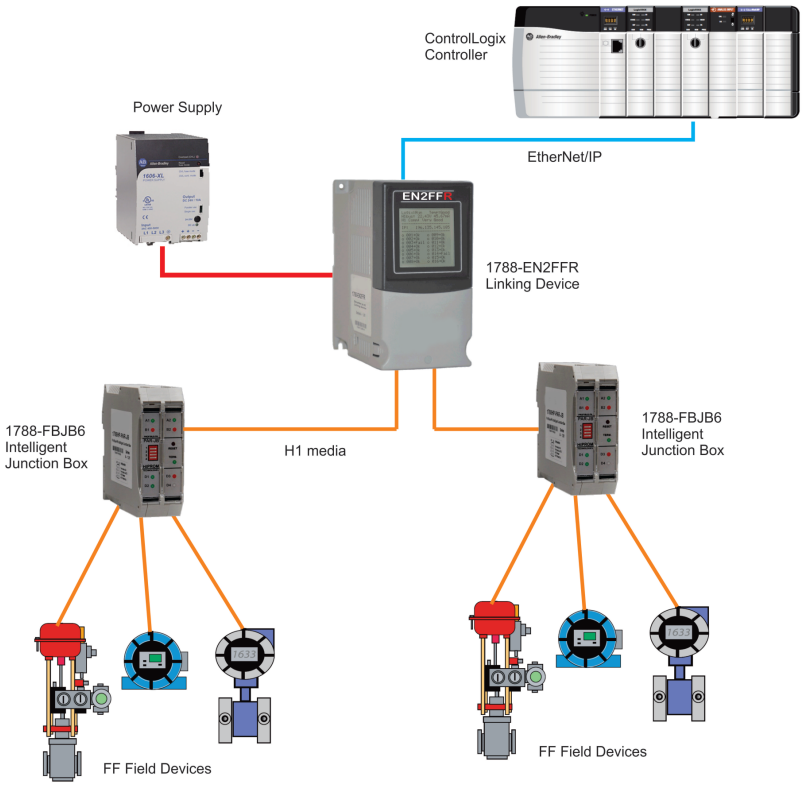
The linking device can support up to16 field devices. It is configurable through the Studio 5000® Logix Designer™ application by use of a dedicated Add-on Profile (AOP). Multiple levels of media redundancy are supported, including ring, split, and redundant trunk, plus options for H1 media, redundant linking devices, redundant controllers, and redundant ControlNet media.

The linking device has full FOUNDATION fieldbus host capability, including link active scheduler (LAS) capability.

Network Diagrams

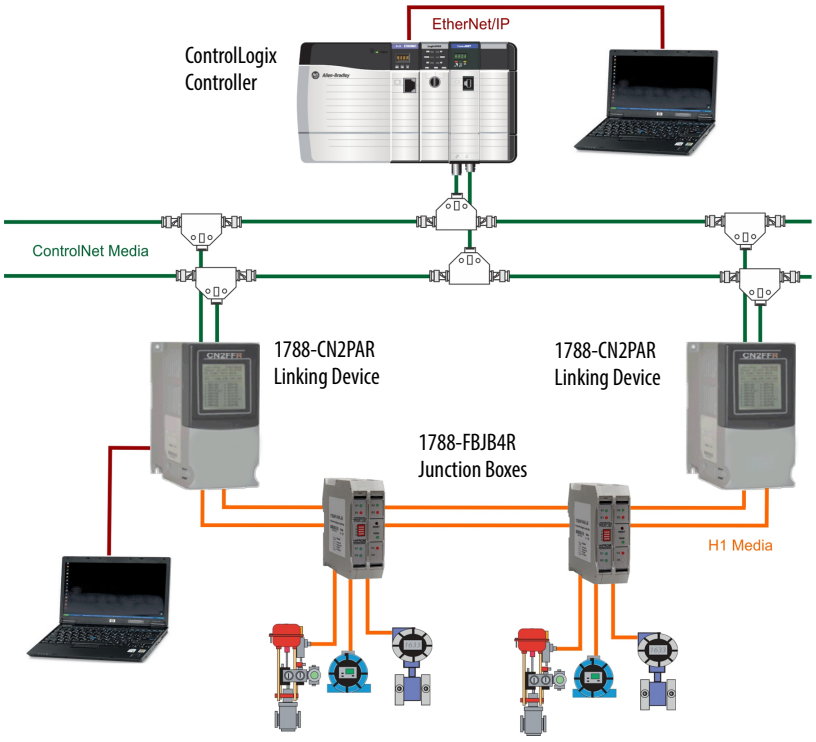
1788-EN2FFR EtherNet/IP Network

The diagram below is an example of how a 1788-EN2FFR linking device could be used with an EtherNet/IP network..



1788-CN2FFR ControlNet Network

This diagram shows an example of how a 1788-EN2FFR linking device could be used with a ControlNet network.



Features

The AOP provides an intuitive graphical interface to configure devices. A predefined data structure for each field device provides eight input process variables (PVs), eight output PVs, and eight PVs for inter-device communication for full distributed control.

The linking device uses four controller connections. The data for the 16 field devices is distributed over the four CIP connections. Connection A has the data for the linking device and four field devices. Connection B, C, and D have the data of four field devices each. The minimum requested packet interval (RPI) is 100 ms, and the maximum is 3,000 ms.

The HSProcessUtility is used to manage and register the field device description (DD) files. The utility is launched from the AOP in the Studio 5000 Logix Designer application, or directly in the Microsoft Windows operating system.

Field Device Tool/Device Type Manager (FDT/DTM) technology is supported. This allows access to field device configuration and diagnostics via FDT Frames such as FactoryTalk® AssetCentre. In addition, the Rockwell Automation FDT ThinFrame (read only) can be launched from a FactoryTalk View or via the AOP providing access to each field devices status and extended diagnostics.

Built-in power conditioners and protection are provided, which helps to minimize installation space requirements. The H1 segment is divided between two physical ports (A and B) with individual protection and a supply of 500 mA per port. See H1 Network Connections on page 14.

The basic diagnostics of the linking device and the field devices, is found in the input assemblies. Advanced configuration is found only through the AOP.

To assist with troubleshooting, a 128 x 128 pixel display provides access to the status of the linking device. Information available includes network voltages and currents, internal temperature, and communication quality to each field device.

A built-in web server provides remote access to network and field device data.

Safety Precautions

Read and understand all precautions before using the linking device.

Prevent Electrostatic Discharge

ATTENTION: Prevent Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

Environment and Enclosure

ATTENTION: Environment and Enclosure

- This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.
- This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.
- This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.
- In addition to this publication, see the following:
- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for additional installation requirements.
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

European Hazardous Location Approval

ATTENTION: Do not place the module in direct sunlight. Prolonged exposure to direct sunlight could degrade the LCD.

European Hazardous Location Approval

The following applies when the product bears the marking.

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in Zone 2 potentially explosive atmospheres, given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.

ATTENTION: This equipment is not resistant to sunlight or other sources of UV radiation.

WARNING: This equipment shall be mounted in an ATEX-certified enclosure with a minimum ingress protection rating of at least IP54 (as defined in IEC60529) and used in an environment of not more than Pollution Degree 2 (as defined in IEC 60664-1) when applied in Zone 2 environments. The enclosure must have a tool-removable cover or door.

WARNING: This equipment shall be used within its specified ratings defined by Rockwell Automation.

WARNING: Should the unit be installed in an environment where induced transients could exceed 44V, then external transient/surge arrestors should be installed.

WARNING: Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.

WARNING: Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

WARNING: Devices shall be used in an environment of not more than Pollution Degree 2.

NNorth American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations.

The following information applies when operating this equipment in hazardous locations:	Informations sur l'utilisation de cet équipement en environnements dangereux:
Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation	Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.
WARNING: EXPLOSION HAZARD • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous	**AVERTISSEMENT: RISQUE D'EXPLOSION** • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

WARNING: If you connect or disconnect the communications cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

WARNING: Temperature rating of conductors must be higher than 82 °C (179.6 °F).

WARNING: If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Additional Resources

These documents contain more information about related products from Rockwell Automation®.

Resource	Description
FOUNDATION Fieldbus Linking Devices Technical Data, publication 1788-TD001	Provides technical data and specifications for the FOUNDATION Fieldbus linking devices.
FOUNDATION Fieldbus Junction Boxes Installation Instructions, publication 1788-IN006	Provides installation instructions and technical information about the FOUNDATION Fieldbus junction boxes (1788-FBJB4R, 1788-FBJB6)
ControlLogix® Enhanced Redundancy System User Manual, publication 1756-UM535	Provides information specific to enhanced redundancy systems including design and planning considerations, installation procedures, configuration procedures, and maintenance and troubleshooting methods.
ControlLogix EtherNet/IP Module Installation Instructions, publication 1756-IN603	Provides hardware installation instructions for the ControlLogix EtherNet/IP module.
EtherNet/IP Network Configuration User Manual, publication ENET-UM001	Describes how you can use EtherNet/IP communication modules with your Logix5000 controller and communicate with various devices on the Ethernet network.
RSNetWorx™ for ControlNet Getting Results Guide, publication CNET-GR001	Provides information on how to install and navigate the RSNetWorx for ControlNet software. It explains how to use RSNetWorx for ControlNet software and how to access and navigate the online help.
RSNetWorx for EtherNet/IP Getting Results Guide, publication ENET-GR001	Provides information on how to install and navigate the RSNetWorx for EtherNet/IP software. It explains how to use the RSNetWorx for EtherNet/IP software and how to access and navigate the online help.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

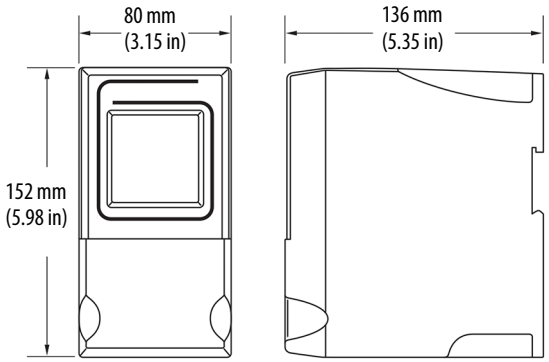
You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation sales representative.

Installation

Hardware

ATTENTION: Do not wire more than one conductor on any single terminal.

Dimensions

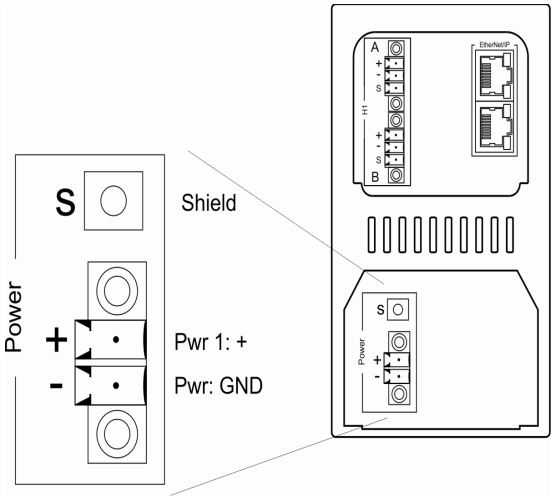


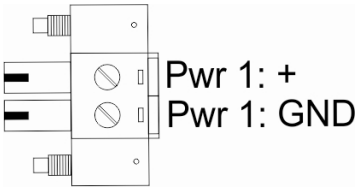
Power Connection

To comply with the CE Low Voltage Directive (LVD), this equipment must be powered from a source compliant with Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

To comply with UL restrictions, this equipment must be powered from a source compliant with Class 2 or Limited Voltage/Current.

We recommend a 24…32V DC power supply for the linking device to operate correctly. No additional power supplies or power conditioners are required. The power supply connection is described here. Tighten DC Power connections to a torque of 0.22...0.25Nm (2...2.2 lb-in).

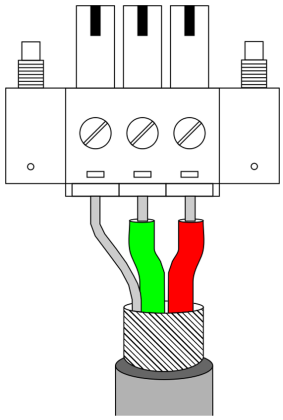




IMPORTANT Do not use additional power supplies or power conditioners with the 1788-EN2FFR and 1788-CN2FFR linking devices.

H1 Network Connections

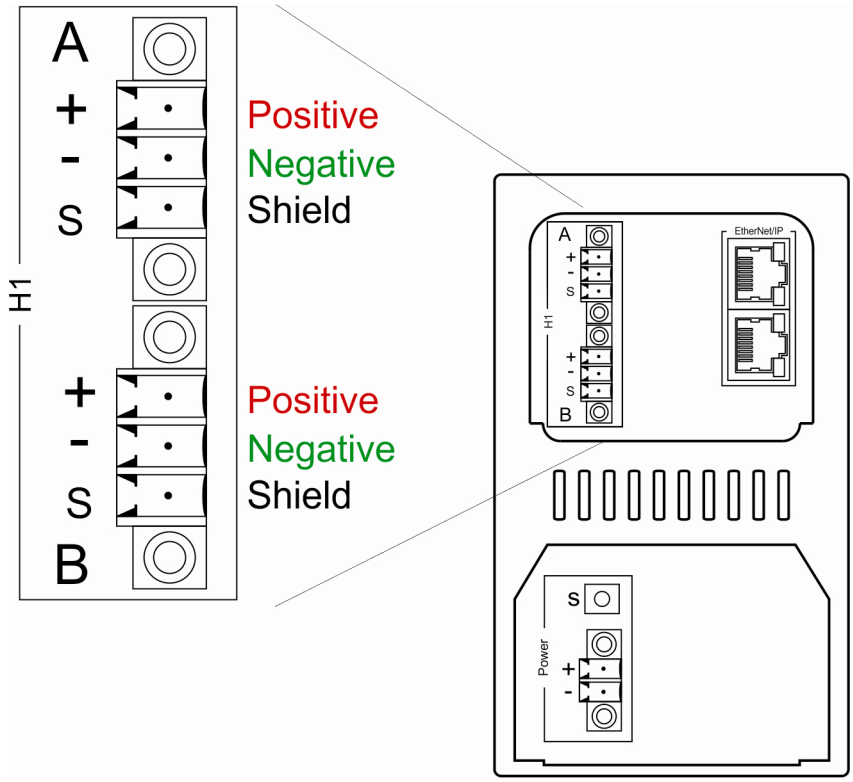
The H1 network must be connected via the H1 terminal on the linking device. The H1 network connection and pinout is described here.



Pin	Description
Right/Top (red)	FF +
Middle (green)	FF -
Left/Bottom	Shield

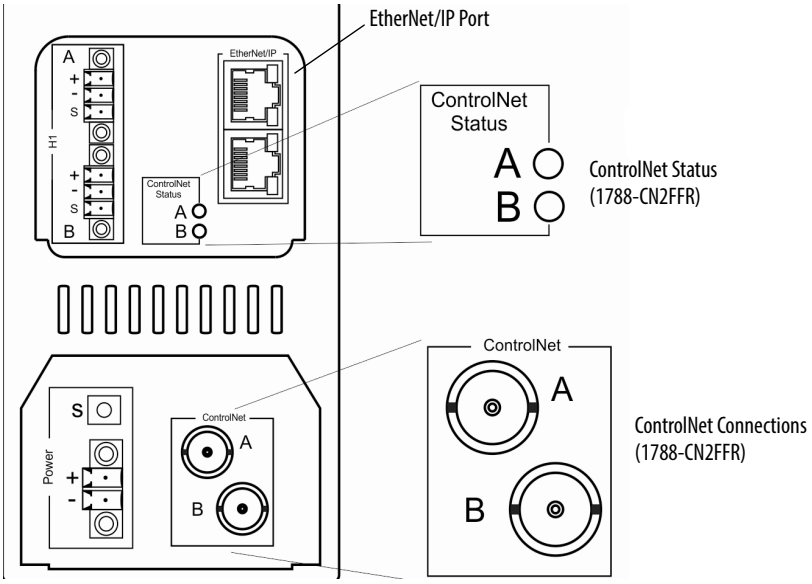
Make Fieldbus connections to a torque of 0.5...0.6 Nm (4.4...5.3 lb-in)

The H1 Segment is split between two physical ports, A and B.


A
+
-
S
H1
+
-
S
B
Positive
Negative
Shield
Positive
Negative
Shield
EtherNet/IP
A
+
-
S
H1
+
-
S
B
S
Power
+
-

ControlNet and EtherNet/IP Connections

Two BNC connectors on the base of the 1788-CN2FFR linking device provide connections for single or dual ControlNet media. The 1788-EN2FFR linking device uses an RJ45 connector to connect to an EtherNet/IP network. The dual port EtherNet/IP switch on the 1788-EN2FFR linking device provides connections for multiple Ethernet topologies, including device level ring (DLR). The EtherNet/IP port can also be used as a connection point in the field to access the web server or asset management tools.

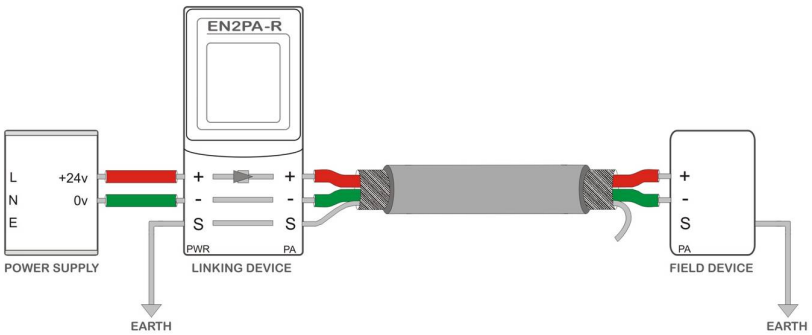


Shielding

Ground the linking device shield connection to a clean earth connection.

Connect the shield to the H1 media so that connectivity runs through all junction boxes, but is not connected to the field device shield or grounded at the device.

Do not attach the H1 media shield to the field device. Tape the media shield back to avoid accidental contact with other conductors or ground.

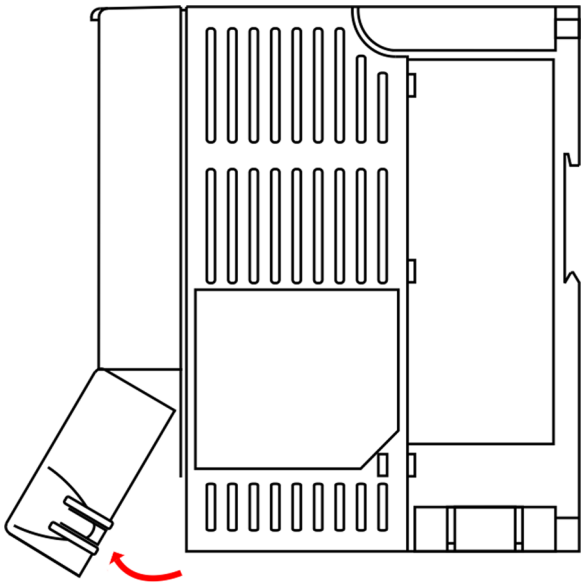


Set the Linking Device Network Address

This section describes the network address switches.

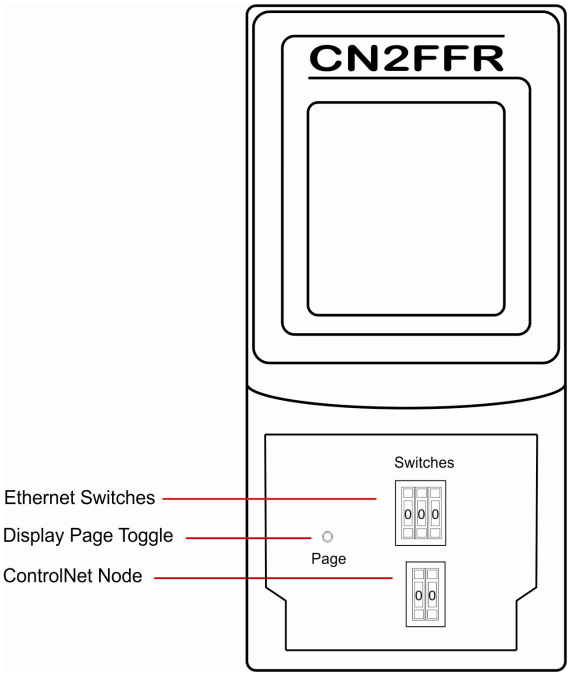
Hardware Switches Location

The hardware switches are located under the front cover of the linking device. Use the Page button to toggle between different diagnostics on the display.



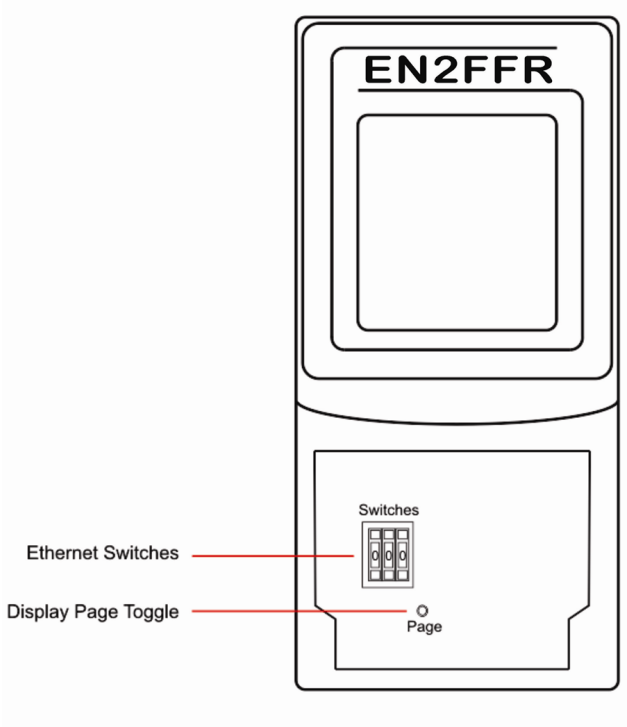
Set the ControlNet Node Address

To set the ControlNet node address of the 1788-CN2FFR linking device, use the hardware switches behind the front cover.



Set the EtherNet/IP Address

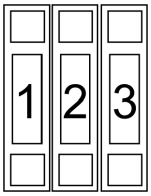
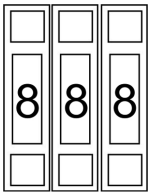
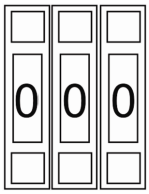
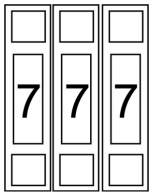
The linking device ships with BOOTP enabled. To set the IP address of the 1788-EN2FFR linking device, use a BOOTP server or use the hardware switches.



IMPORTANT Power down the linking device before changing the Ethernet switch settings. The IP address is set during powerup.

Ethernet Switch Settings

This table describes the Ethernet switch settings.

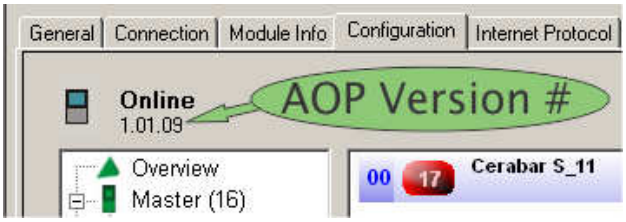
Ethernet Switch Setting	Description
	To set the IP address of the linking device to the 192.168.1.xxx sub net, set the switches to the required last three digits. In this example, the linking device will start up with IP address: 192.168.1.123.
	To set the IP address of the linking device via a BOOTP server, set the switches to 888 (factory default setting). Power up the linking device and set the IP address by using any BOOTP server. Once the new IP address has been set, power down the linking device, return the switches to 000, and power up the linking device.
	Normal setting after setting IP address with BOOTP. The 000 setting disables BOOTP and holds the IP address.
	The linking device can run the firmware with which it was originally shipped. If power was cycled while upgrading the firmware, the firmware can be corrupted and prevent the linking device from starting up. Set the switches to 777 to set the linking device into Safe mode and upgrade the firmware again.

Software Installation

You need the AOP for the Studio 5000 Logix Designer application to configure and manage the linking device. The installation of the AOP includes the HSProcessUtility that is used to manage DTMs and DD service libraries. See Appendix B.

For the latest compatible software information and to download the AOP, see the Product Compatibility and Download Center at http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page#/tab2.

The AOP version of the linking device is located on the display during the start up process, or via the web server.



TIP You can also click the upper-left corner of the profile window and click About Module Profile to view the AOP version.

Firmware Version

The firmware version is printed on the linking device and displayed on the screen during power-up.

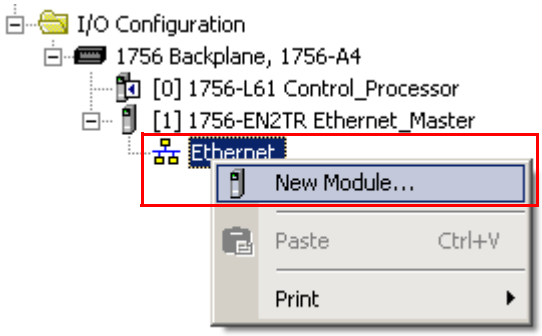
Set Up in the Studio 5000 Logix Designer Application

Add the 1788-EN2FFR Linking Device to the I/O Tree

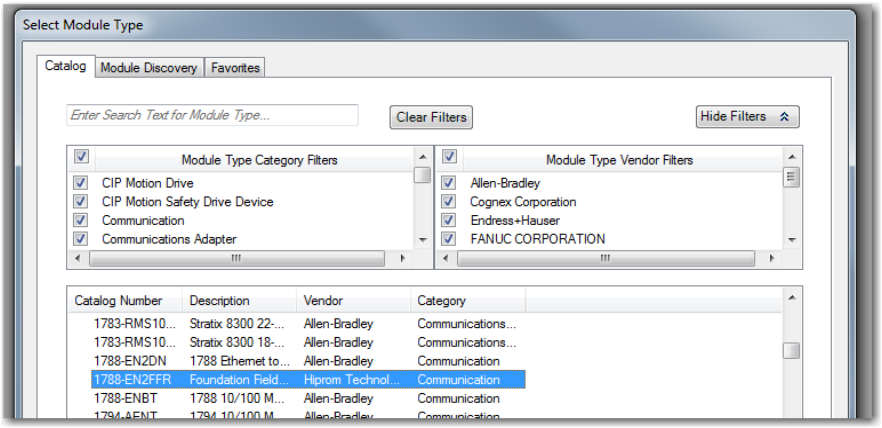
The 1788-EN2FFR linking device must be added to the I/O tree of the Logix controller. The linking device must be added to an Ethernet bridge, such as an Allen-Bradley® 1756-EN2T or 1756-EN2TR module.

Follow these steps to add the linking device to the I/O tree of the Logix controller. This example uses the 1756-EN2TR module.

1. Right-click the Ethernet bridge and choose New Module.



2. Select the linking device that you want to add to the Ethernet bridge.



3. Click the General tab and set the name, description, and IP address.

4. Set the RPI for the linking device.

IMPORTANT	The recommended RPI is 1/2 the macrocycle time. Calculate the macrocycle by calculating the total response time of all field devices on the segment and then add 100…200 ms for class 2 (DTM message) data. If the RPI is too low, class 1 data (PVs and status) does not update each cycle, and class 2 data responses can be slow.

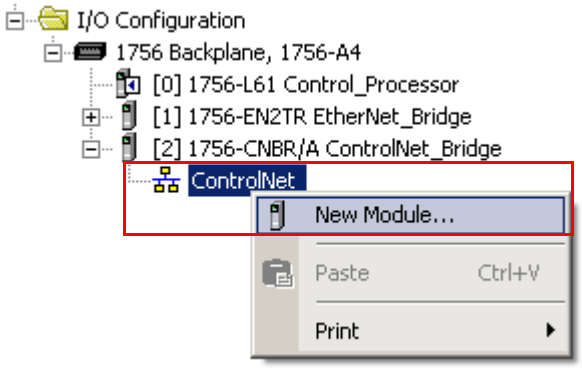
5. Click OK to add the linking device to the I/O tree.

Add the 1788-CN2FFR Linking Device to the I/O Tree

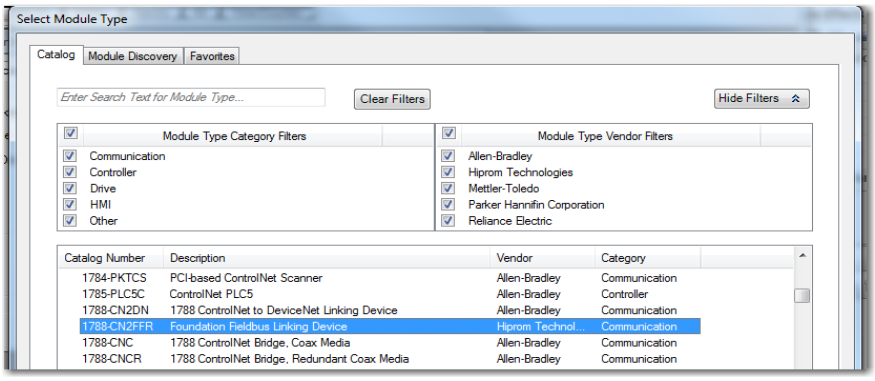
The 1788-CN2FFR linking device must be added to the I/O tree of the Logix controller. The linking device must be added to a ControlNet bridge, such as an Allen-Bradley 1756-CNB or 1756-CNBR module.

Follow these steps to add the linking device to the I/O tree of the Logix controller. This example uses the 1756-CNBR/A module.

1. Right-click the ControlNet bridge and choose New Module.



2. Select the linking device to add to the ControlNet bridge.



3. Click the General tab and set the name, description, and ControlNet node address.

4. Set the RPI for the linking device.

IMPORTANT The recommended RPI is 1/2 the macrocycle time. Calculate the macrocycle by calculating the total response time of all field devices on the segment and then add 100…200 ms for class 2 (DTM message) data. If the RPI is too low, class 1 data (PVs and status) does not update each cycle, and class 2 data responses can be slow.

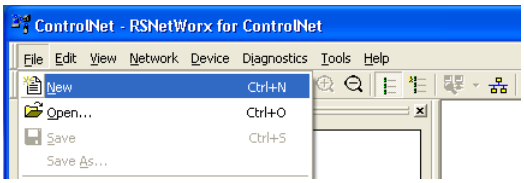
5. Click OK to add the linking device to the I/O tree.

RSNetWorx for ControlNet Configuration

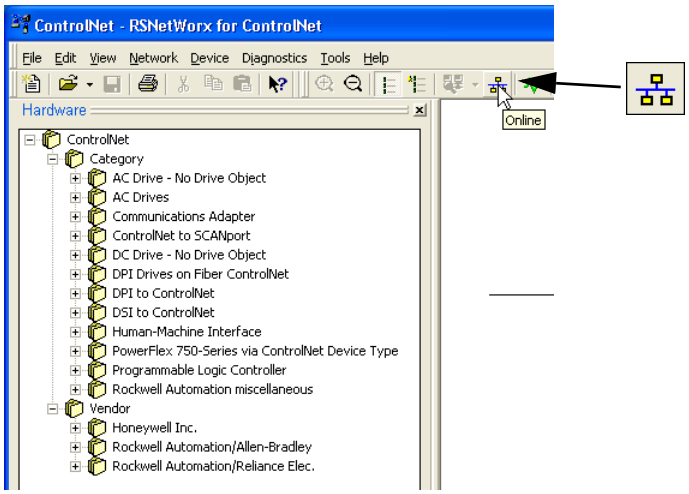
See the RSNetWorx for ControlNet Getting Results Guide, publication CNET-GR001, for more details.

Follow these steps to configure the ControlNet network.

1. Launch RSNetWorx™ for ControlNet and create a file.

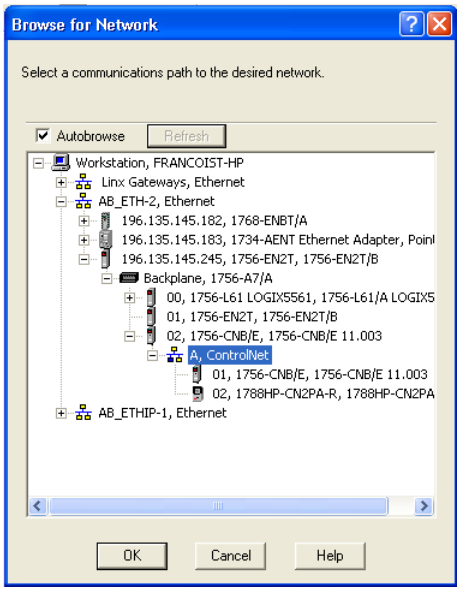


2. Click the Online button.

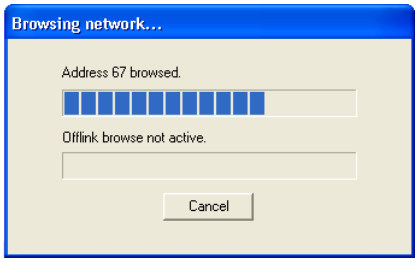


The Browse for Network window appears with the drivers you have installed on your system.

3. Select the communication path to the ControlNet network, select the ControlNet port, and click OK.

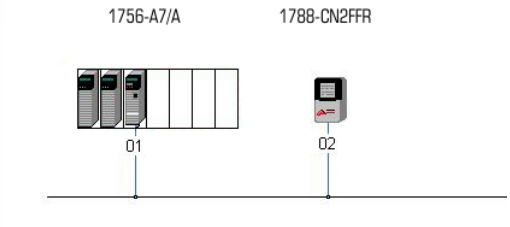


The following pop-up window appears while RSNetWorx browses the network.



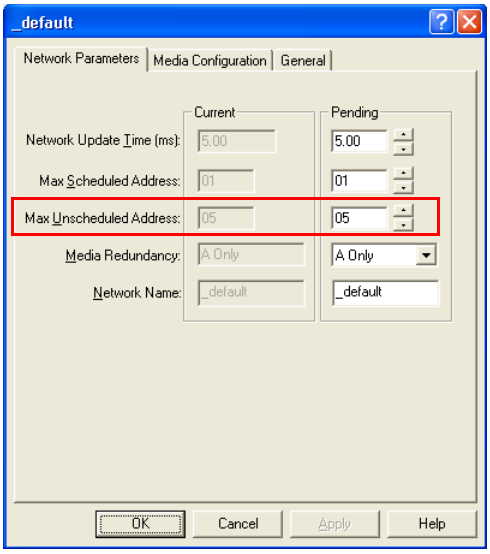
Once complete, all devices on the network are displayed in the graphic window on the right side of the window.

4. Right-click any white space around the graphics and select Enable Edits.

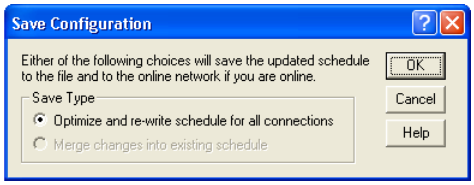


5. Right-click any white space around the graphics and select Properties.

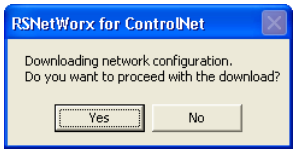
6. On the Networks Parameters Tab, update the Max Unscheduled Address if you are sure that the allocated range is less than 99.



7. Click OK.
8. Right-click any white space around the graphics and choose Download to Network.
9. Select the correct save option for your configuration and click OK.



10. Enter a suitable file name.
11. Click Yes to download the configuration.



The ControlNet network is now scheduled and the graphics display green plus signs.

Linking Device Configuration Using the AOP

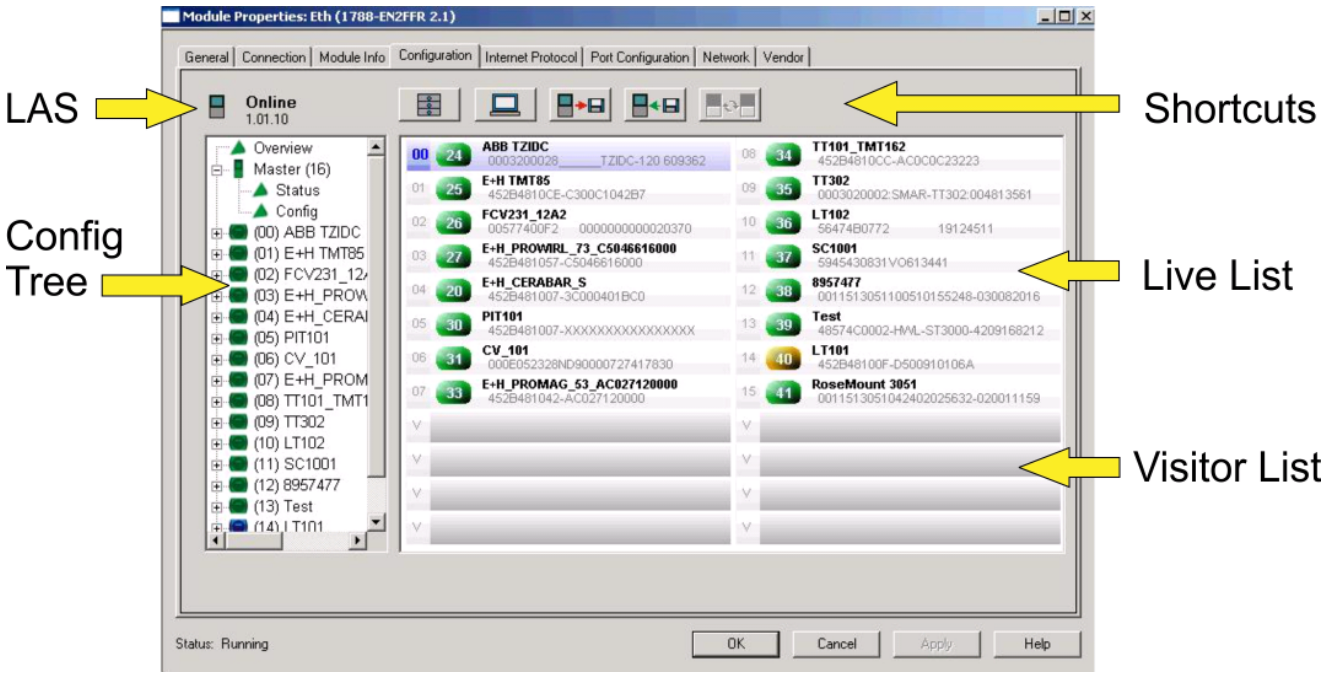
Once the linking device has been added to the config tree, you can access the property settings. Right-click the linking device and select Properties. Then click the Configuration tab as shown in Figure 1.

Once the linking device is connected to the controller, you can see the linking device in the Configuration tab.

- Master **green** in the config tree = linking device is **online**
- Master **gray** in the config tree = linking device is **offline**

The layout of the Configuration tab is shown in Figure 1.

Figure 1 - Module Properties Configuration Tab



Live List

Once a field device is found and has an address between 16 (0x10) and 247 (0xF7), the device appears in the live list. You can configure this device.

Visitor List

Once a field device is found and has an address above 247 (0xF7), the device appears in the visitor list. You cannot configure this device until an address between 16 (0x10) and 247 (0xF7) is given to the field device. See Live List.

LAS

The LAS icon indicates if the master is the LAS that requests and receives live data from each field device, or if the master is the back-up LAS. (The back-up LAS has a red X over the icon.) See Redundant Master Setup on page 43 for more information.

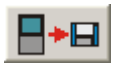
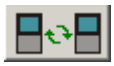
Config Tree

Once you have configured the slot for a device (even if not downloaded yet), the device appears in the config tree. Use the config tree to navigate between configuration and status pages for each master and field device.

Shortcuts

These shortcuts are located above the live list on the configuration tab.

Table 1 - Configuration Tab Shortcuts

Shortcut Button	Description
	Used to open the HSProcessUtility, or to refresh the device catalog.
	The Overview page displays a list of configured and attached field devices.
	Export configuration for entire linking device, (including all field devices that are configured under linking device).
	Import configuration for entire linking device, (including all field devices that are configured under linking device).
	Used to synchronize the back-up link active scheduler (LAS) to the current LAS. You must first export the project from the LAS AOP. Note that this button is only available to the back-up LAS and is disabled on the LAS.

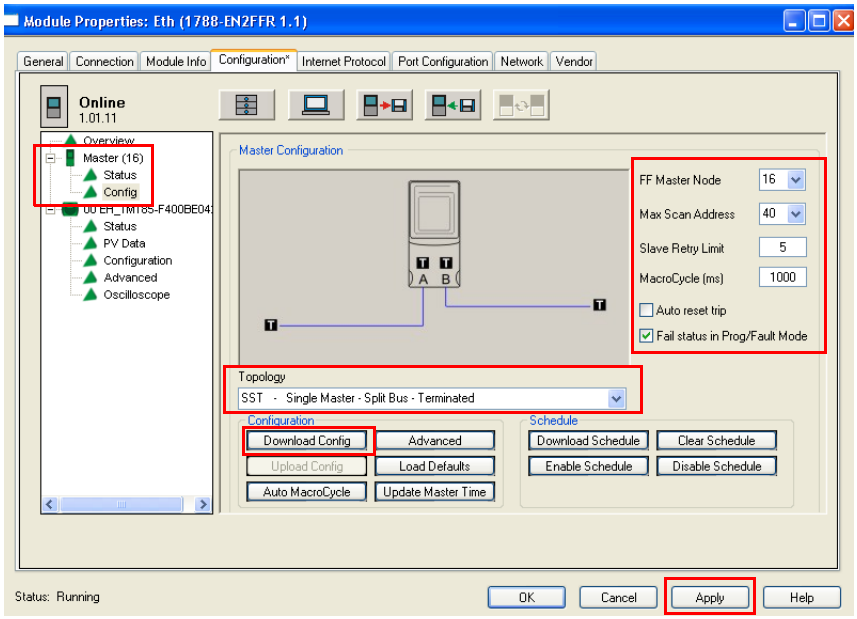
You can export or import the configuration for either a field device or linking device (with all field devices connected).

TIP If you want to replicate the configuration to many devices, the synchronize shortcut can speed up the process.

Master Configuration

1. Open the master configuration page from the config tree to access the linking device master configuration settings.
2. Choose the Topology for the master linking device.
3. Enter the configuration values.
4. Click the Download Config button to download the settings to the linking device.

   The settings are stored in nonvolatile memory in the linking device.
5. Click the Apply button to store the configuration in the project file.



Topology

Choose the correct Topology mode for the application. The graphical representation must be used to match the topology. See Appendix D for available options. Use this setting to configure redundant linking devices, redundant H1 media, and the internal H1 segment terminators.

FF Master Node

The H1 Master (linking device) needs a node number to operate on the H1 network. The default is node number 16 (0x10).

IMPORTANT	Do not modify the default node number; doing so can result in loss of communication.

Max Scan Address

When the linking device is operating, a background scan constantly probes each unused node number to see if any new field devices were connected. The background scan runs to the max scan address, then restarts at one.

Slave Retry Limit

The slave retry limit sets the number of times the H1 Master re-requests data before dropping the connection. The default setting is 5.

IMPORTANT Do not modify the default setting. A limit above 5 can slow down communication.

MacroCycle (ms)

The amount of time between data compels (process variables). Too low a number can cause poor performance when downloading and going online with a field device.

Auto Reset Trip

Selects the option to reset H1 bus trips due to over-current.

- If the checkbox is selected, the trip automatically resets. The linking device resets the trip each 5 seconds. If the trip is still persistent, the bus will trip again.
- If the checkbox is not selected, reset the bus via the reset button on the master status page.

Fail Status in Prog/Fault Mode

The fail status is used when field devices use output blocks (AO or DO) that are receiving data from the Logix controller via the linking device. When the linking device loses connection to the Logix controller, or the Logix controller goes into Program mode or Fault mode, you can choose one of two operations:

- If the checkbox is selected, the linking device detects that there is a comms fault on the Ethernet network and forces all output PV status to Bad:NoComms. If the field device is configured correctly, the field device goes to fail-safe value.
- If the checkbox is not selected, the linking device continues to send the last received data.

TIP When Logix is in Prog/Fault mode, you can still go into the tags and change values as the linking device is still connected.

Upload Config

Uploads the configuration store on the attached linking device.

Auto MacroCycle

Calculates the Macro Cycle based on the configured field devices and the number of PVs configured. A window is also added for class II data communication.

Advanced

Opens the Advanced Settings window.

Load Defaults

Resets the configuration settings to their default values.

Update Master Time

Update the master time to local computer time.

Download Schedule

Download schedule to linking device.

TIP This task is performed automatically when field devices are added or edited.

Enable Schedule

The default is enabled. Used only when the Disable Schedule Function disables the schedule.

Clear Schedule

Clear the schedule from the linking device and the AOP.

IMPORTANT This action causes the module to stop compelling data.

Disable Schedule

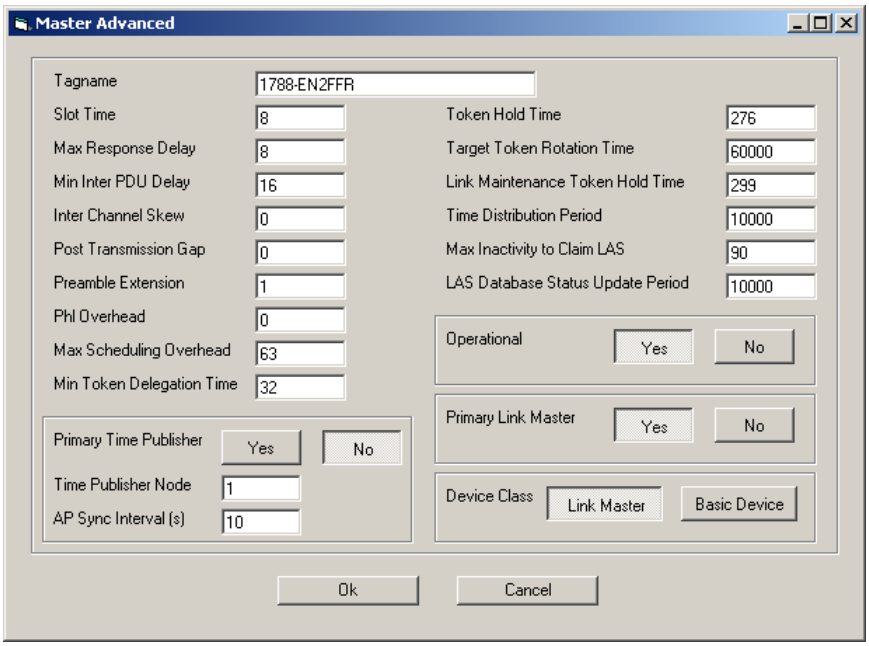
Disable the schedule from executing in the linking device.

Advanced

The Advanced button on the master configuration page launches the Master Advanced configuration dialog box (see Master Configuration on page 28).

IMPORTANT We recommend that you do not alter these settings; doing so can cause loss of communication.

Figure 2 - Master Advanced Configuration Screen



Auto MacroCycle

Click the Auto MacroCycle button on the master configuration page to calculate the recommended MacroCycle for the current linking device (see Master Configuration on page 28).

Auto MacroCycle Calculation

Macrocycle = [(time for request + receive) x (configured field devices) x (configured PVs for each field device)] + [(configured field devices) x (time for one token exchange)] + [fixed amount of unscheduled time].

IMPORTANT The Auto MacroCycle only takes effect after you download it to the master and field devices.

Add and Manage Device Description Files

Before field devices can be added to the 1788-CN2FFR/1788-EN2FFR linking device, add a copy of the DD file to the field device catalog by using the HSProcessUtility as described in Appendix B.

The DD file defines the capabilities and configuration parameters of the field device.

Field Device Configuration

The overview page on the configuration tab displays the field device live list with colored icons that depict the status of each field device (see page 26). If the Studio 5000 Logix Designer application is online with the 1788-CN2FFR/1788-EN2FFR link master correctly configured, the attached field devices appear in the live list.

The field device index (00→15) provides a unique index for each of the 16 field devices that can be connected to the linking device. This index corresponds with the index in the linking device data structure that is located in the controller tags.

The H1 node address and physical tag are also displayed together with the device ID and serial number of the field device.

A right-click menu in the overview page displays functions for addition, configuration, and diagnostics of field devices.

Figure 3 - Overview Page on the Configuration Tab

Field Device Status

The icon color indicates the status of the field device.

Table 2 - Field Device Status Icons

Icon	Description
	Green – Field device is online, allocated to a field device index and configured, producing process variables.
	Yellow – Field device is online, not allocated to a field device index and not configured.
	Blue – Field device is online, allocated but not configured or producing process variables.
	Red – Field device is not online.
	Light blue – Field device identification mismatch (occurs when the field device identity [ident] that is downloaded to the linking device is different than the actual field device).

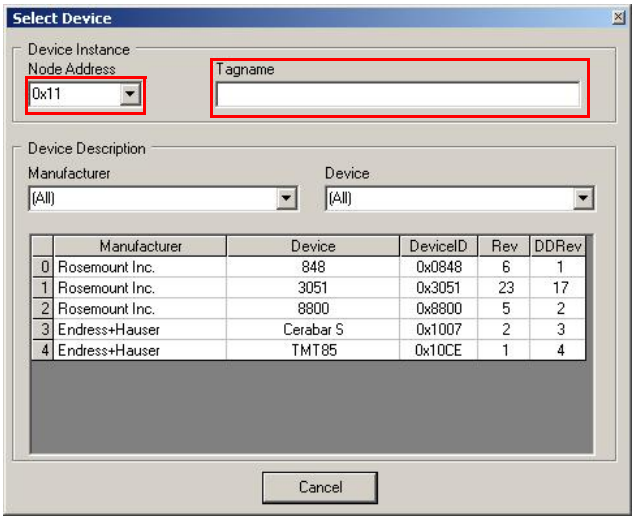
The color of the text indicates if the online device has the same node address and tag as the offline configured device.

- If the text is **black**, the online and offline node address and tag name match.
- If the text is **red**, the online and offline node address and tag name do not match.

Add New

Use this function to add field devices when the linking device is not connected to the field device. The Select Device dialog box displays a list of devices from the field device catalog. Set the H1 Node Address and Tagname.

Figure 4 - Select Device Dialog Box



Configure

Launches the field device block configuration screen that is used to configure each field device.

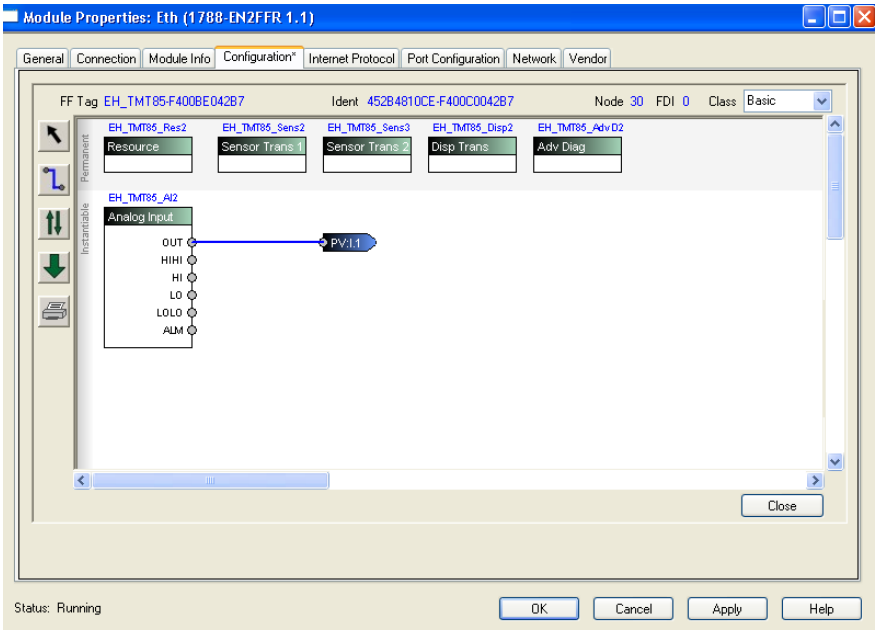
Auto Configure Online

IMPORTANT Requires the field device to be online.

You can right-click on a device (of which the DD files are registered) and choose the Auto Configure Online option. A configuration is applied for basic operation of the field device.

- The AOP adds a resource block and sets the target mode to auto.
- A transducer block is added and the mode block is set to auto.
- An analog input block (if available) is added with the target mode set to auto.
- The channel is set to 1 (in most cases the primary value).

Figure 5 - Field Device Configuration Screen



Advanced Configuration

Used to assign DTM to the field device and to launch the Thin-Frame DTM viewer.

Oscilloscope

Displays an oscilloscope trace of the response message from the field device.

Copy and Paste

After the device configuration is done, you can copy and paste the configuration to speed up the configuration process.

Move

You can move a device in the live list to another field device index even if the devices have been configured and are providing process variables.

Remove

A device configuration can also be removed (deleted).

IMPORTANT If a configuration is stored in the linking device at the specific field device index, it is also removed (deleted).

Set H1 Node Address

Used to change the H1 node address on the field device. We recommend that you set the node address from 17 through 247. The linking device uses 16, and node addresses above 247 are placed in the visitor List.

Set H1 Physical Tag

Use to change the tag name that is stored in the field device.

Merge Online and Offline

The device merge option is used when you want to merge an online device with the offline configuration of a certain device index. Use this option when performing a device exchange for a faulty device.

Mapping Report

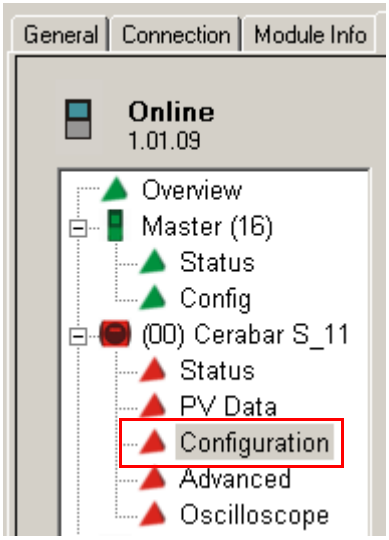
Produces a report that describes in detail the configuration of the field device.

Export Device and Import Device

A device configuration can be exported to a file which can later be imported again. This option helps when you have multiple devices with the same configuration.

Field Device Block Configuration

You can configure the field device blocks from the block configuration view. Choose the Configuration option of the device in the config tree, or from the right-click menu in the live list.



Configuration is device-centric and performed in a graphical view using blocks, wires, and connectors (see Figure 5 on page 34). The graphical interface also provides access to parameters for each block for detailed configuration of each device.

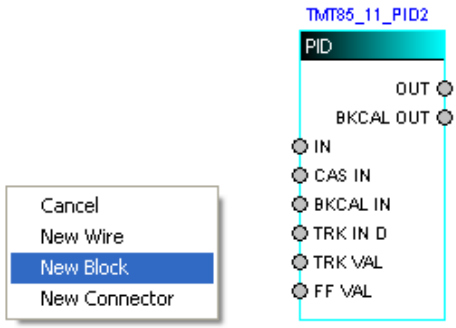
See Appendix C, Field Device Block Configuration Examples on page 69 for detailed information about how to configure AO and DO function blocks.

Table 3 - Field Device Configuration Tools

Icon	Description
	Select and move objects.
	Draw wire.
	Go online with device.
	Download configuration to device.
	Print.

Add a Block

Blocks are defined by the field device manufacturer and described in the DD files.



There are three classes of blocks:

R – Resource Block

T – Transducer Block

F – Function Block

Only function blocks have ports that are used to transfer data to and from the block:

- Ports on the left of the function blocks are inputs.
- Ports on the right of the function blocks are outputs.

For detailed descriptions and uses of each block, refer to the user manual of the field device.

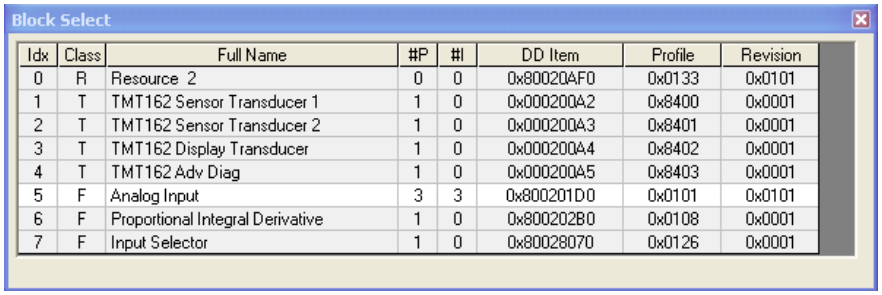
Follow these steps to add a block.

1. To add (instantiate) a block, right-click in the window and choose New Block.

   A list of all available blocks for the specific device appears.

2. Choose the block that you want to use.

   The block appears on the screen.



Idx	Class	Full Name	#P	#I	DD Item	Profile	Revision
0	R	Resource 2	0	0	0x80020AF0	0x0133	0x0101
1	T	TMT162 Sensor Transducer 1	1	0	0x000200A2	0x8400	0x0001
2	T	TMT162 Sensor Transducer 2	1	0	0x000200A3	0x8401	0x0001
3	T	TMT162 Display Transducer	1	0	0x000200A4	0x8402	0x0001
4	T	TMT162 Adv Diag	1	0	0x000200A5	0x8403	0x0001
5	F	Analog Input	3	3	0x800201D0	0x0101	0x0101
6	F	Proportional Integral Derivative	1	0	0x800202B0	0x0108	0x0001
7	F	Input Selector	1	0	0x80028070	0x0126	0x0001

Adjust Block Parameters

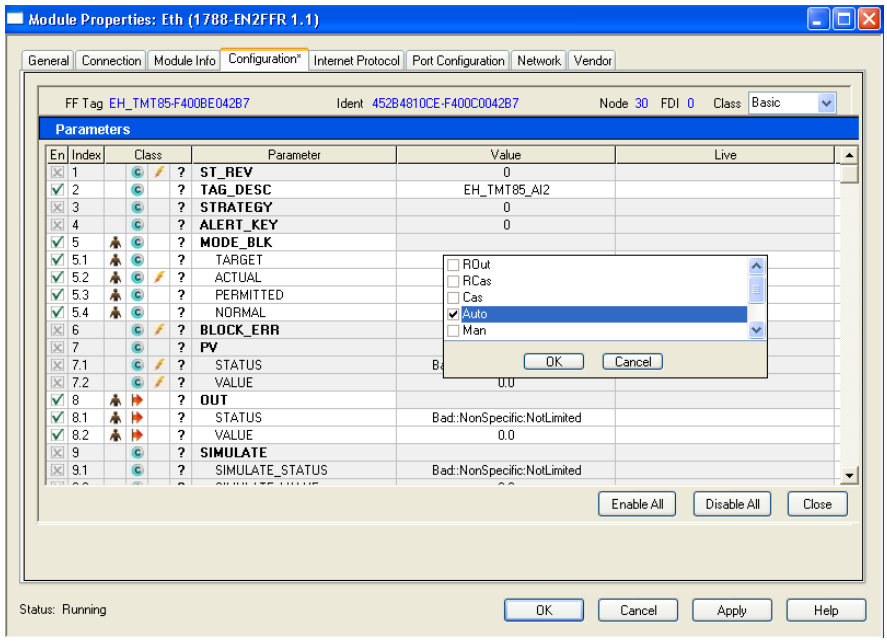
To change the parameters of a block, right-click the title portion of the block and choose Parameters.

To enable a parameter for editing, click the box in the En column. A green check mark indicates the parameter is enabled for editing. Different parameters will have different classes as shown in Table 4.

Table 4 - Parameter Class Descriptions

Icon	Parameter Class Description
	Configurable parameter but non output
	Input port
	Read-only
	Tune
	Output port
	Alarm
	Parameter help (provides information about the parameter)

1. Click a parameter that is enabled for editing to display a list of options to choose from.
2. Select a new value in the pop-up dialog box and click OK.

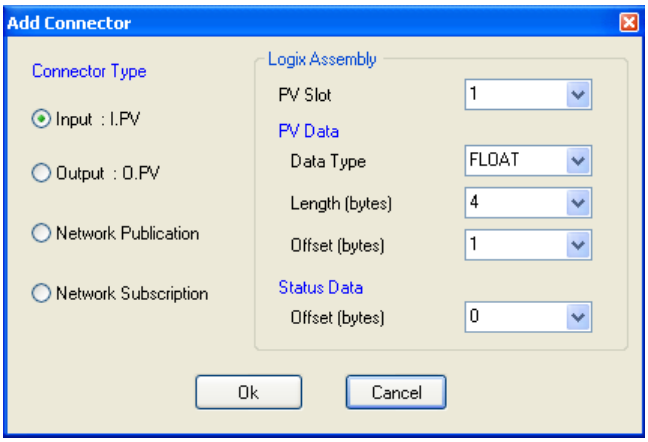


Add a Connector

A connector enables transfer of data between the block of the field device and the data structure in the controller, or between field device blocks on the same segment. Data transfers between segments are performed via the controller.

Follow these steps to add a connector.

1. To add a connector, right-click in the window and choose New Connector.
2. Set the desired options in the Add Connector dialog box to configure the connector, and click OK.



TIP The configuration of input and output connectors requires the definition of the data being transferred. See the user manual of the field device for data type, length, offset, and number of status bytes. The default is the most common.

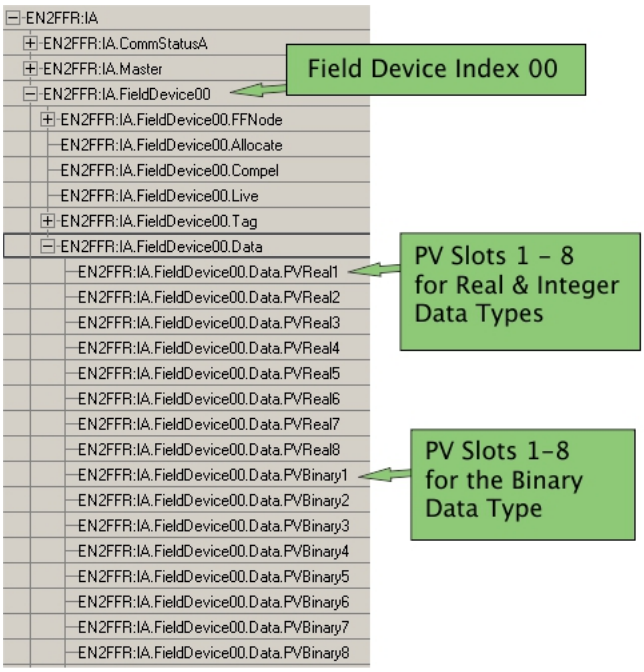
Table 5 describes the four types of connectors.

Table 5 - Connector Types

Connector Type	Data Transfer Use	Icon
Input : I.PV	From a field device to the controller.	
Output : O.PV	From the controller to the field device.	
Network Publication	From a field device to another field device on the same segment.	
Network Subscription	From another field device on the same segment to the field device.	

The field device index, PV slot, and data type define where the connector points to in the data structure of the controller tags.

Figure 6 - Example of a Field Device Index



- For **Input : I.PV** connectors, the data types of float and integer both connect to PVReal in the input image, while binary data types connect to PVBinary.
- For **Output : O.PV** connectors, the output image of the linking device provides separate data types for float, integer, and binary.
- **Network Publication** and **Network Subscription** are used for control in the field where data is sent from one field device to another without any intervention from the LAS (master).

  Each Network Publication connector must be given a unique name that is used as the reference for the Network Subscription connectors.

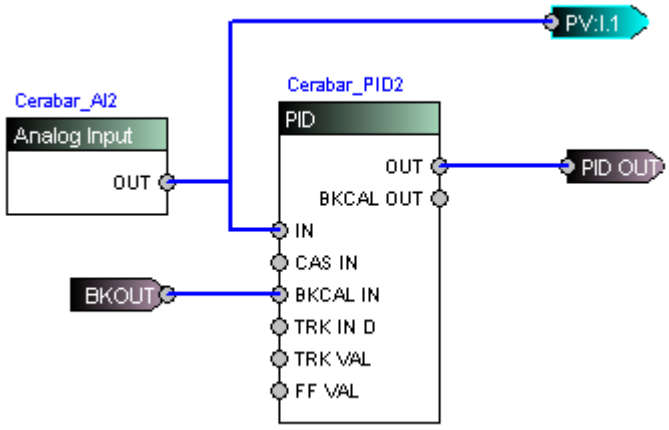
IMPORTANT Network Publication connectors must be defined first.

Add Wires

Wires are used to connect input and output ports on the blocks to other ports or connectors.

Follow these steps to add a wire.

1. To add a wire, right-click in the window and choose New Wire.
2. Drag the ends of the wires to the docking points on the block and the connectors.



Download the Configuration

When the configuration is complete, click the Download button to download the configuration to the field device. The download status is displayed in the progress bar.

IMPORTANT The first configuration download for a device requires more time than subsequent downloads due to extra data required for configuring the communication links (virtual communication relationship [VCR]).

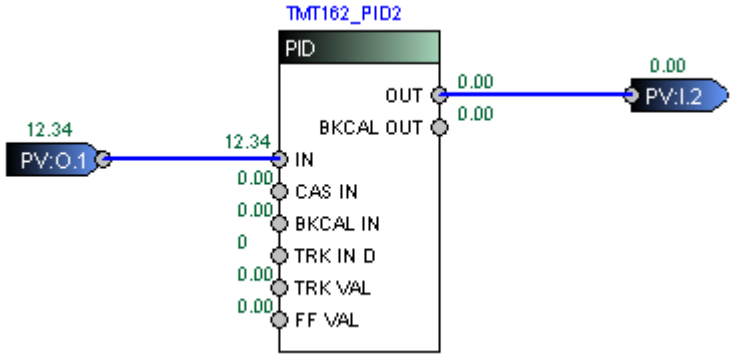
After the communication links are created, configuration downloads are quicker.

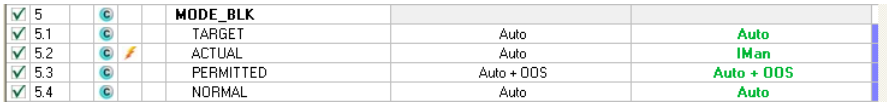
Once the download is done and the device is providing process variables, the device will be **green** in the configuration tree and the live list.

If the device is not producing data (for example, incorrect configuration) the device will be **blue** in the configuration tree and the live list.

Go Online

Click the Go Online button to see process variables and change parameters in real time.





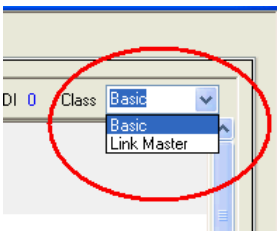
5		MODE_BLK		
5.1		TARGET	Auto	Auto
5.2		ACTUAL	Auto	IMan
5.3		PERMITTED	Auto + OOS	Auto + OOS
5.4		NORMAL	Auto	Auto

Click a parameter to change it in real time. If the block is in Auto mode, you are prompted to change the mode to Out of Service (OOS). Some parameters cannot be changed while the block is in Auto mode.

See Appendix C, Field Device Block Configuration Examples on page 69 for detailed information about how to configure AO and DO function blocks.

Field Device Class

A field device can have one of two classes. It can be a basic device (normal operation) or it can be a link master (LAS capability). Choose Basic or Link Master on the block configuration screen. Power cycle the field device for the changes to take effect.

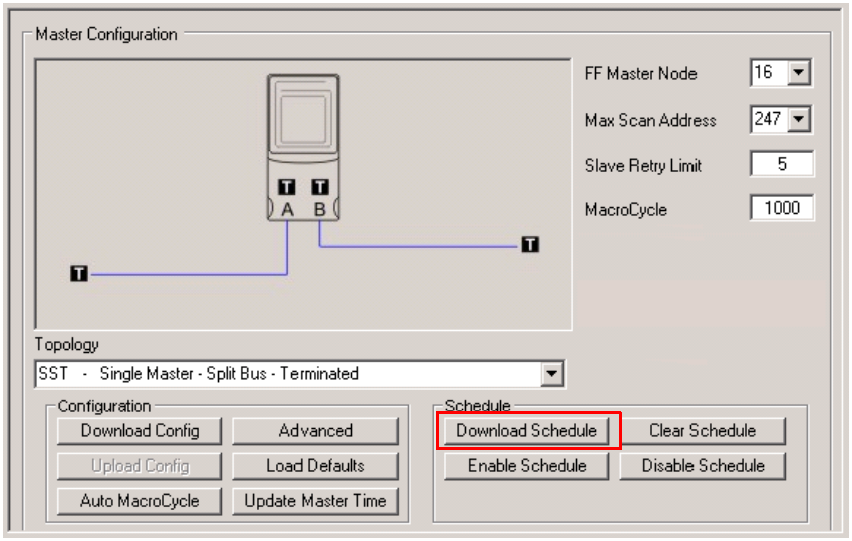


IMPORTANT We recommend that you set up all field devices as basic (default).

Scheduling and the LAS

The 1788-CN2FFR/1788-EN2FFR linking device generates the LAS schedule, which determines when each function block executes and transmits data. Newly added field devices are automatically added to the schedule, and removed from the schedule when removed from the live list.

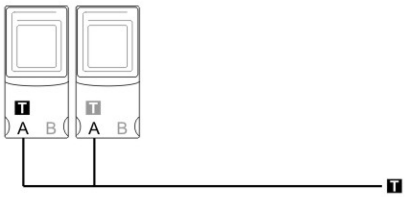
Figure 7 - Master Configuration Dialog Box



The Download Schedule function is only needed when the 1788-CN2FFR/1788-EN2FFR linking device has been replaced.

Redundant Master Setup

You can configure a second 1788-CN2FFR/1788-EN2FFR linking device to act as a backup. You can choose from various architectures (see Appendix D). The figure shows an example of MultiMaster architecture, A bus only, with a shared termination.



IMPORTANT	When connecting to running linking devices, you must follow the procedures in MultiMaster Connecting Procedures on page 46 to avoid losing the connection to certain devices.

IMPORTANT	You must not have any other back-up LAS devices. Be sure that the field devices have been configured with the class set to basic. See Field Device Class on page 42.

IMPORTANT	Test and verify that the specific field devices that are connected to the MultiMaster operate correctly when one of the linking devices fails.

We recommend you use the given AOI when using redundant masters. The AOI swaps between masters when one fails and automatically updates the destination PV with the back-up master data.

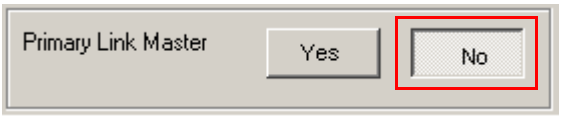
Only one of the masters is the LAS that requests and receives live data from each field device.

- If the device is the **LAS**, the device icon is displayed without a cross (see page 26).

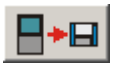
- If the device is the **back-up LAS**, the device icon is displayed with a cross.

Follow these steps to configure one master to take priority as the primary master.

1. Set the back-up master Primary Link Master to No in the Master Advanced options (see Figure 2 on page 31).

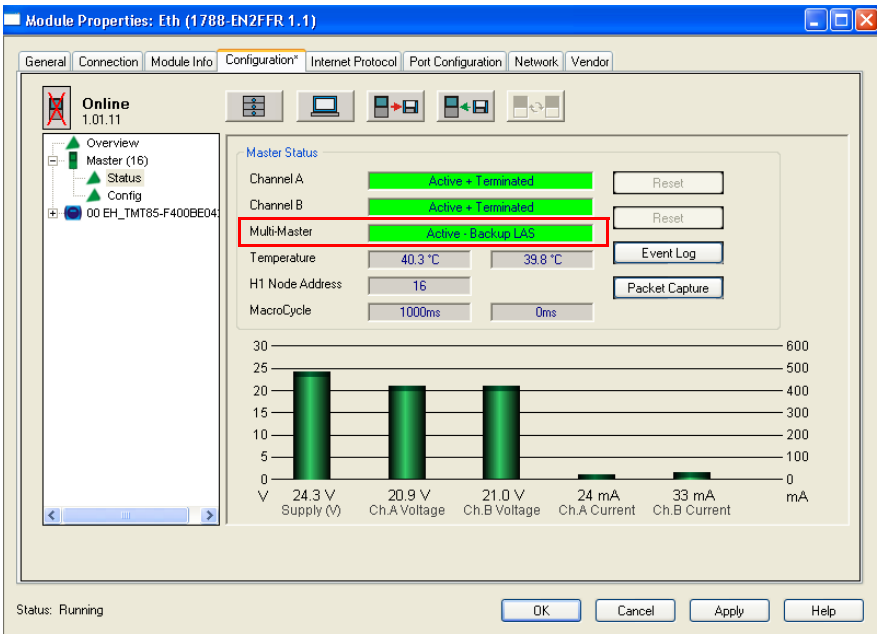


2. Create the network on the LAS.
3. Click the Export button to export the bridge configuration.



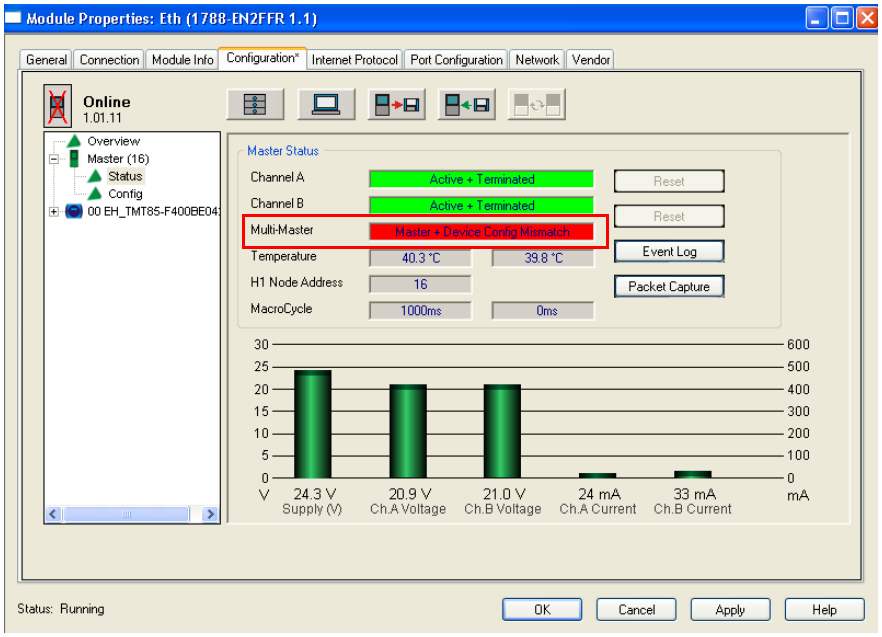
4. On the back-up LAS, click the Sync Masters button and choose the file that was exported.

All scheduled configurations are downloaded to the back-up LAS. Once this download is done, the status indicates **Active - Backup LAS** as shown.



Redundant Master Mismatch

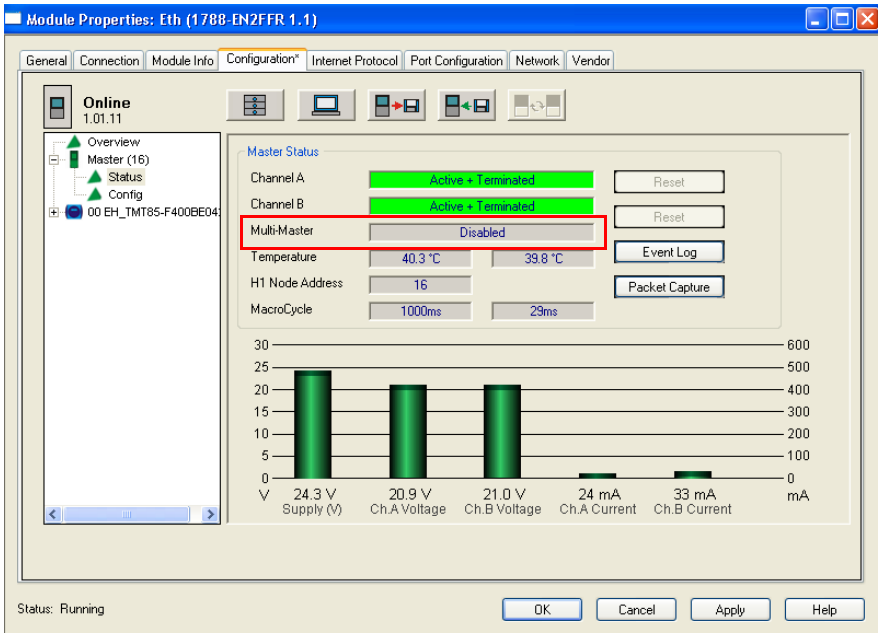
If the two masters are not synchronized (for example, there is a configuration mismatch) one of the following errors on the back-up LAS is displayed.



- **Master + Device Config Mismatch** indicates that there is a difference between the LAS and back-up LAS master configuration.
- **Device Config Mismatch** indicates that there is a difference in at least one of the field devices between the LAS and back-up LAS configuration.

Redundant Master Disabled

If a redundant master is not in use, the Multi-Master status is disabled.



MultiMaster Connecting Procedures

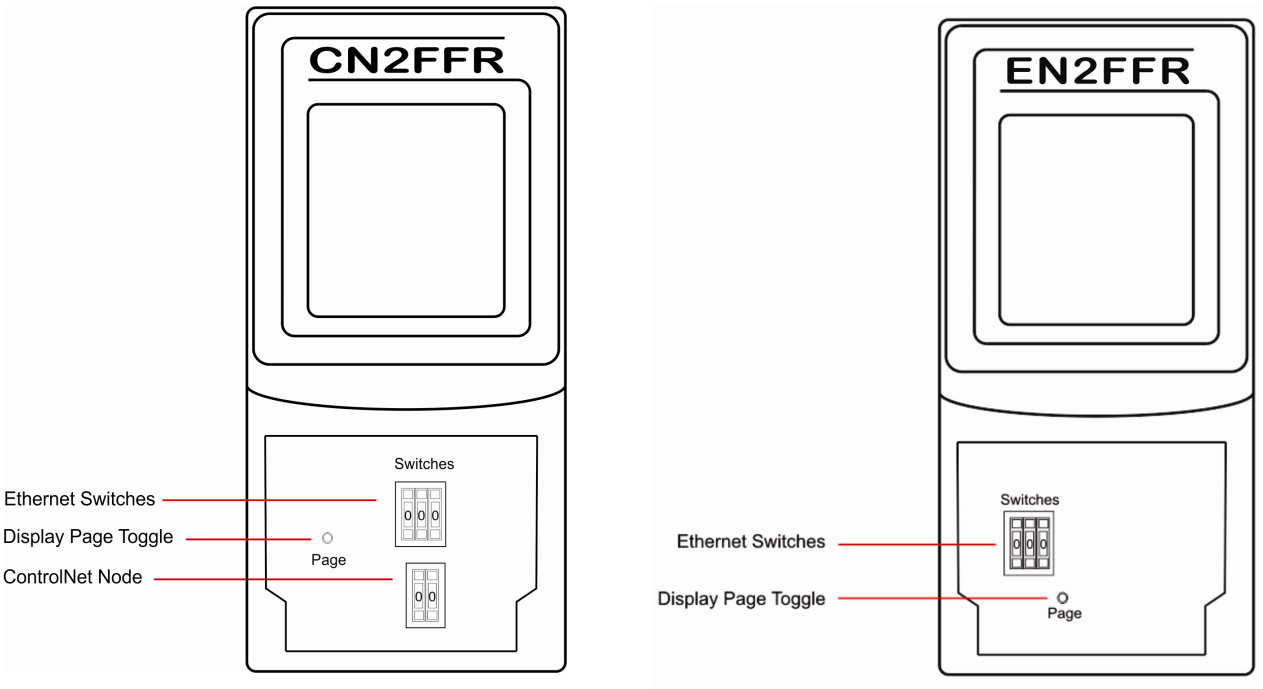
To avoid communication loss, or a field device going to the visitor address range, follow the MultiMaster connection procedures in this section.

Connect Safe Mode

The Connect Safe mode is used in the Reconnect Two Separate Running LAS Devices on page 47 and Swap Out Linking Devices on page 47 procedures.

To enter the **Connect Safe mode,** hold the Page button for at least 5 seconds. The LCD displays the time until communication is re-established to the linking device (10 seconds).

Figure 8 - Location of the Page Button for Connect Safe Mode



Start the Back-up LAS Master (Already Configured)

Follow these steps to start the Back-up LAS master.

1. Plug in all communication connectors (H1, EtherNet/IP or ControlNet cables), but not the power.
2. Once all communication connectors are plugged in, connect the power to the linking device.

   The linking device starts in Back-up LAS mode and does not disturb communication.

Reconnect Two Separate Running LAS Devices

If two masters are configured on a network (one on each end) and the cable between them is broken, some devices will be connected to one master, and the remaining devices will be connected to the other master.

See master modes 9, 12, and 15 in Appendix D.

Follow these steps to connect the two H1 segments.

1. Hold the Page button for 5 seconds to put one of the masters into **Connect Safe mode** (see Connect Safe Mode on page 46).

   You have 10 seconds to reconnect the segments.

IMPORTANT	Failure to enter Connect Safe mode can result in a loss of communication, or devices going to the visitor range.

2. Reconnect the cable between the masters.

Swap Out Linking Devices

Follow these steps to swap out a linking device.

1. Plug in all communication and power connectors, but not the H1 segment.
2. Once the linking device is connected to Logix, change the node address to anything other than the node address of the running master.
3. Hold the Page button for 5 seconds to put the linking device into **Connect Safe mode** (see Connect Safe Mode on page 46).

   You have 10 seconds to reconnect the segments.

IMPORTANT	Failure to enter Connect Safe mode can result in a loss of communication, or devices going to the visitor range.

4. Click the Master Sync button in the overview window to synchronize the new master with the current running master (see Redundant Master Setup on page 43)

Logix Assemblies

Input

The linking device uses four CIP connections for the 16 field devices. Connection A has the master instance and four field devices. The other connections (B, C, and D) have only the four field devices. All device assemblies are identical.

Figure 9 - Example of Linking Device Connections Tag Data Structure

FFR:IA	{...}	{..		HT:1788HP_EN2FFR_0_3:IA:0
FFR:IA.CommStatusA	16#0000_0000		Hex	DINT
FFR:IA.Master	{...}	{..		HT:1788HP_EN2FFR_MasterIma
FFR:IA.FieldDevice00	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IA.FieldDevice01	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IA.FieldDevice02	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IA.FieldDevice03	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IB	{...}	{..		HT:1788HP_EN2FFR_4_7:IB:0
FFR:IB.CommStatusB	16#0000_0000		Hex	DINT
FFR:IB.FieldDevice04	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IB.FieldDevice05	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IB.FieldDevice06	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IB.FieldDevice07	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IC	{...}	{..		HT:1788HP_EN2FFR_8_11:IC:0
FFR:IC.CommStatusC	16#0000_0000		Hex	DINT
FFR:IC.FieldDevice08	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IC.FieldDevice09	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IC.FieldDevice10	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:IC.FieldDevice11	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:ID	{...}	{..		HT:1788HP_EN2FFR_12_15:ID:
FFR:ID.CommStatusD	16#0000_0000		Hex	DINT
FFR:ID.FieldDevice12	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:ID.FieldDevice13	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:ID.FieldDevice14	{...}	{..		HT:1788HP_EN2FFR_DeviceIm
FFR:ID.FieldDevice15	{...}	{..		HT:1788HP_EN2FFR_DeviceIm

Master Device Tag Structure

This section describes the values on the elements in the master device status tag structure.

Scope: TestnewADP Show: All Tags

Name	Value	Force Mask	Style	Data Type
FFR01:IA	{...}	{...}		HT:1788HP_EN2...
FFR01:IA.CommStatusA	16#0000_0000		Hex	DINT
FFR01:IA.Master	{...}	{...}		HT:1788HP_EN2...
FFR01:IA.Master.FFBusVoltageA	0.0		Float	REAL
FFR01:IA.Master.FFBusCurrentA	0.0		Float	REAL
FFR01:IA.Master.FFBusVoltageB	0.0		Float	REAL
FFR01:IA.Master.FFBusCurrentB	0.0		Float	REAL
FFR01:IA.Master.ExternalVoltage	0.0		Float	REAL
FFR01:IA.Master.Temperature	0.0		Float	REAL
FFR01:IA.Master.BusAEnabled	0		Decimal	BOOL
FFR01:IA.Master.BusBEnabled	0		Decimal	BOOL
FFR01:IA.Master.BusATripped	0		Decimal	BOOL
FFR01:IA.Master.BusBTripped	0		Decimal	BOOL
FFR01:IA.Master.BusATerminated	0		Decimal	BOOL
FFR01:IA.Master.BusBTerminated	0		Decimal	BOOL
FFR01:IA.Master.NewFieldDevice	0		Decimal	BOOL
FFR01:IA.Master.LinkActiveScheduler	0		Decimal	BOOL
FFR01:IA.Master.MasterMode	0		Decimal	SINT
FFR01:IA.Master.RedundantMediaOK	0		Decimal	BOOL
FFR01:IA.Master.ConnectionStatus	2#0000_0000_0000_0000_0000_0000_0000_0000		Binary	DINT

Bus A/BTripped

If too much current (> 500 mA) is drawn on Bus A or Bus B, a trip occurs and the bus is no longer functional. The trip is indicated in the input image.

NewFieldDevice

If a new field device is found which is not in the configuration of the H1 master, a new field device bit is set.

LinkActiveScheduler

This bit indicates if the current device is the LAS or the back-up LAS (set indicating that the linking device is the LAS).

MasterMode

N/A

LinkingDeviceStatus

This is currently reserved.

ConnectionStatus

If a field device is online and running (exchanging cyclic data), its field device index bit (in the connection status) is set. If the device goes offline, the bit is cleared.

FFBusVoltageA/B

The voltage on the H1 bus as measured at port A and port B on the linking device.

FFBusCurrentA/B

The current being drawn by the H1 bus through port A and port B.

ExternalVoltage

The voltage of the external power supply.

Temperature

The internal temperature of the linking device.

BusA/BEnabled

The master mode setting enables and disables the H1 ports A and B. For example, if the master mode setting is Master Mode 0 - Single Master, A Bus Only, then A is enabled and B is disabled (see page 85).

BusA/BTerminated

The master mode setting sets the termination for H1 ports A and B. For example, if the mode setting is Master Mode 0 - Single Master, A Bus Only, then A is enabled and terminated (see page 85).

Field Device Tag Structure

This section describes the elements of the field device tag structure.

− EN2H1R01:IA.FieldDevice00	{...}	{..	
+ EN2H1R01:IA.FieldDevice00.FFNode	24		Decimal
EN2H1R01:IA.FieldDevice00.Allocate	1		Decimal
EN2H1R01:IA.FieldDevice00.Compel	1		Decimal
EN2H1R01:IA.FieldDevice00.Live	1		Decimal
+ EN2H1R01:IA.FieldDevice00.Tag	{...}	{..	

FFNode

The node value specifies the number of the field device.

Allocate

Indicates that this field device index has been allocated for a specific field device and another device cannot use it.

Compel

If this bit is set, the linking device is requesting process variable data from the field device.

Live

A connection has been established to the field device and the linking device is receiving live data.

Tag

This element specifies the tag name of the field device.

PVReal1…PVReal8

This element contains the process variable (PV) float or integer value from the field device. Each field device can have a maximum of eight real PVs.

EN2H1R01:IA.FieldDevice00.Data.PVReal1	50.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal2	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal3	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal4	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal5	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal6	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal7	0.0		Float
EN2H1R01:IA.FieldDevice00.Data.PVReal8	0.0		Float

PVBinary1…PVBinary8

This element contains the process variable (PV) Boolean value from the field device. Each field device can have a maximum of eight binary PVs.

EN2H1R01:IA.FieldDevice00.Data.PVBinary1	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary2	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary3	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary4	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary5	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary6	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary7	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PVBinary8	0		Decimal

PVStatus

The PV status indicates these quality values:

- Bad
- Uncertain
- GoodNonCascade
- GoodCascade

The PV status indicates these limit values:

- NotLimited
- LowLimited
- HighLimited
- Constant

EN2H1R01:IA.FieldDevice00.Data.PV1_Bad	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_Uncertain	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_GoodNonCascade	1		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_GoodCascade	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_NotLimited	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_LowLimited	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_HighLimited	0		Decimal
EN2H1R01:IA.FieldDevice00.Data.PV1_Constant	1		Decimal

PVDiagnostics

This tag contains the diagnostics information that is associated with each PV.

FFR01:IA.FieldDevice00.Data.PV1Diagnostics	{...}	{...}		HT:178
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.Bad_NonSpecific	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.ConfigurationError	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.NotConnected	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.DeviceFailure	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.SensorFailure	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.NoCommWithLastUsableValue	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.NoCommWithNoLastUsableValue	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.OutOfService	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.Bad_TransducerInManual	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.Uncertain_NonSpecific	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.LastUsableValue	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.Substitute	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.IntialValue	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.SensorConvNotAccurate	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.EngUnitRangeViolation	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.SubNormal	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.Uncertain_TransducerInManual	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.ActiveBlockAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.ActiveAdvisoryAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.ActiveCriticalAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.UnAckBlockAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.UnAckAdvisoryAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.UnAckCriticalAlarm	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.GoodNonCasade_IntialFaultState	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.GoodCasade_NonSpecific	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.InitAcknowledge	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.InitRequest	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.NotInvited	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.NotSelected	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.LocalOverride	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.FaultStateActive	0		Decimal	BOOL
FFR01:IA.FieldDevice00.Data.PV1Diagnostics.GoodCasade_IntialFaultState	0		Decimal	BOOL

Output

This section describes the values on the field device output status screen.

Field Device Output Values

PVReal1…PVReal8

For a field device that requires an output, the data must be updated in the output image of that field device. If the data type for the connector is set to **Float**, then the data for that connector is read from the real value in the output image.

PVInt1…PVInt8

For a field device that requires an output, the data must be updated in the output image of that field device. If the data type for the connector is set to **Integer**, then the data for that connector is read from the integer value in the output image.

PVBinary1…PVBinary8

For a field device that requires an output, the data must be updated in the output image of that field device. If the data type for the connector is set to **Boolean**, then the data for that connector is read from the binary value in the output image.

PVStatus1…PVStatus8

If the connector for the PV output is set to have a status, you must put a status in the output image that will be sent with the process variable.

PV Status	Status
PVStatus ≥ 0x80	Green = good
0x40 ≤ PVStatus < 0x80	Orange = uncertain
PVStatus < 0x40	Red = bad

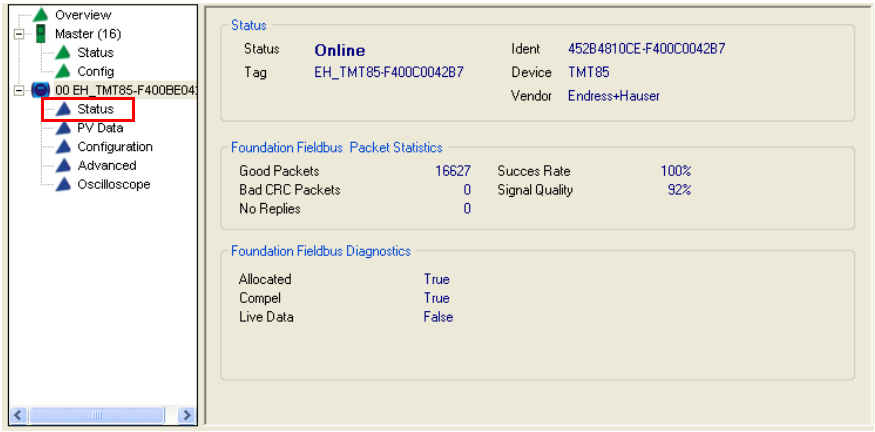
Figure 10 - Example of Field Device Output Screen

FFR01:0A.FieldDevice00	{...}	{...}		HT:178
FFR01:0A.FieldDevice00.PVReal1	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal2	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal3	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal4	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal5	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal6	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal7	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVReal8	0.0		Float	REAL
FFR01:0A.FieldDevice00.PVInt1	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt2	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt3	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt4	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt5	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt6	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt7	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVInt8	0		Decimal	DINT
FFR01:0A.FieldDevice00.PVBinary1	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary2	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary3	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary4	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary5	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary6	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary7	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PVBinary8	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_Bad	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_Uncertain	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_GoodNonCascade	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_GoodCascade	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_NotLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_LowLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_HighLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_Constant	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_SubStatus	0		Decimal	SINT

Diagnostics

Status Screen

The diagnostic status provides basic device data and statistics. Click Status in the config tree to view basic data and statistics for the device.



Status

The connectivity status of the linking device.

Value	Description
80…100	Good
41…79	Uncertain
0…40	Bad

Tag

The tag name that is stored in the field device.

Ident

The identity of field device.

Device

The field device type.

Vendor

The field device vendor.

Good Packets

The count of good quality reply packets that are received from the field device. (Cyclic Redundant Code [CRC] check passed.)

Bad CRC Packets

The count of reply packets that are received from the field device that were rejected because the CRC check failed.

No Replies

The count of communication request to which the field device did not respond.

Success Rate

The rate of good replies to the number of requests for the last 100 requests.

Signal Quality

Displays the quality of the waveform for the field device by evaluating slew rate, amplitude, distortion, noise, and balance.

Value	Description
0…33	Bad
34…66	Poor
67…100	Good

Allocated

True if the field device has been allocated a field device index of 00 through 15. If a field device is in the visitor list, it has not been allocated.

Compel

True if the field device has been allocated and configured to compel data. The field device is also included in the schedule.

Live Data

True if the field device is allocated and configured, and is currently producing live data.

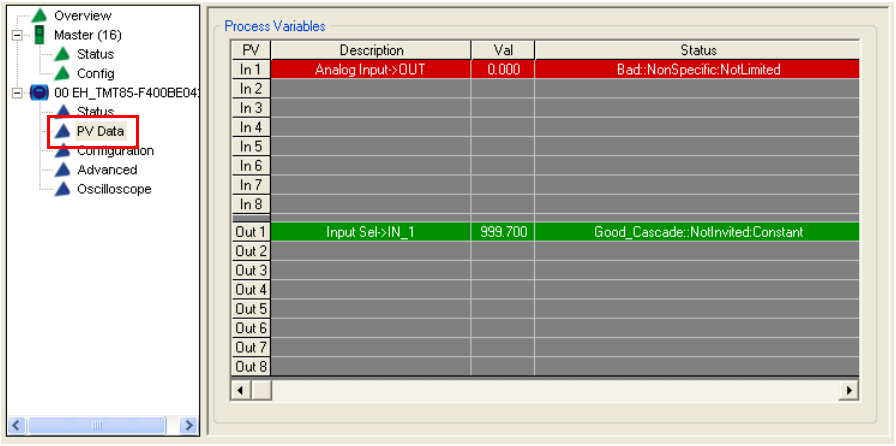
PV Data Screen

If a field device has been configured and scheduled, its scheduled PV values are displayed here. The name of the function block parameter that produces or consumes the data is also displayed.

Table 6 - PV Status Colors

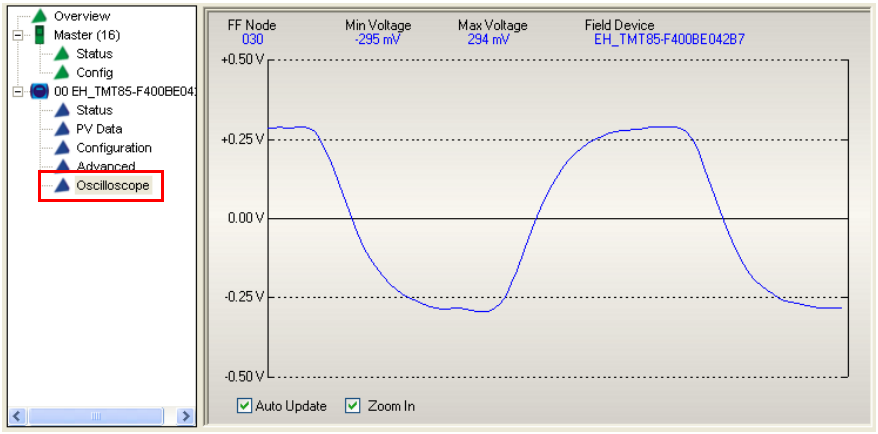
PV Status	Status Color
PVStatus ≥ 0x80	Green = good
0x40 ≤ PVStatus < 0x80	Orange = uncertain
PVStatus < 0x40	Red = bad

Click PV Data in the config tree to view the PV data for the device.



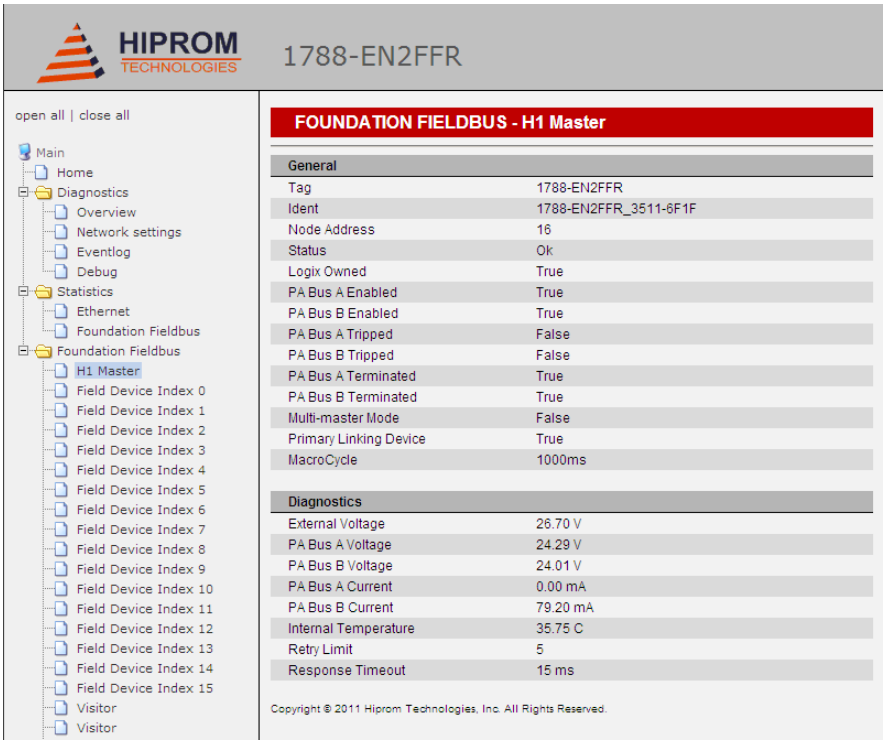
Oscilloscope Screen

The last packet received (good or bad) is displayed in the oscilloscope trace. Click Oscilloscope in the config tree to view the last packet that is received for the device.



The Web Server

To view detailed status and diagnostic information for the device in the web server, enter the IP address of the device into the address field of a web browser and press Enter.



IMPORTANT If data is not being updated, turn off page caching or try a different web browser.

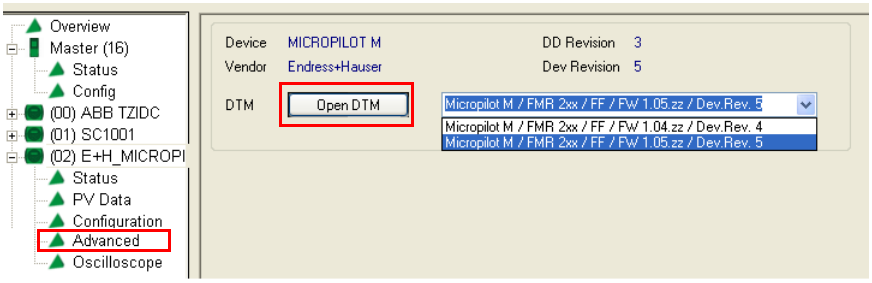
Device Type Manager (DTM)

Use the HSThinFrame to open the device DTM in the Studio 5000 Logix Designer application. The DTM is read-only when opened in the Studio 5000 Logix Designer application.

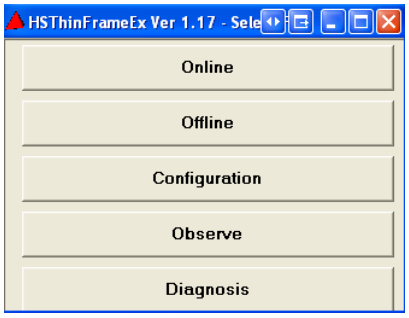
IMPORTANT The correct DTM must be installed and the HSProcessUtility DTM Catalog must be updated for the correct DTM to display in the pull-down list.

Follow these steps to open the DTM.

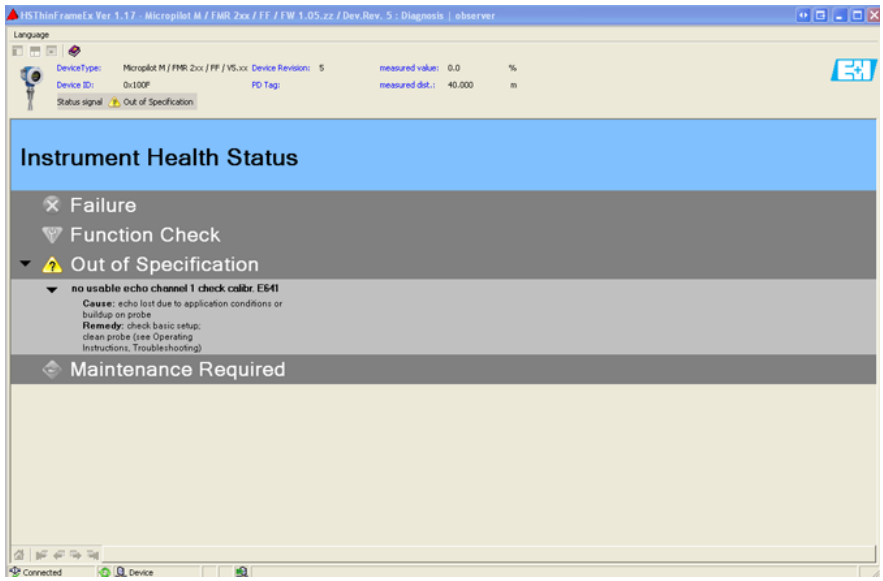
1. Click Advanced in the config tree.
2. Choose the DD revision from the pull-down list.
3. Click Open DTM.



4. Choose the device information that you want to view.



5. View the selected device information.

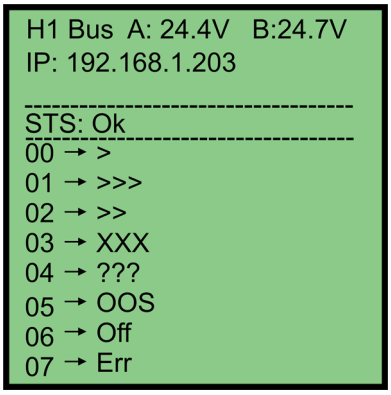


Linking Device Display Status

The display of the linking device provides status and diagnostic data in one of three page formats: main page, H1 master page, or field device page. Use the display Page button behind the front cover to scroll through the pages (see Figure 8 on page 46 for location of the Page button).

Main Page

The main page is the default display, and the linking device returns to this page after 10 seconds.



H1Bus A/B: Displays the bus voltages on each port.

IP: Displays the current IP address or BOOTP if enabled.

STS: Displays the status (see Table 7).

Table 7 - STS Status Descriptions

Status	Description
Ok	No events
New device found	New device on the bus
Redundancy ok	Masters are synchronized
Redundancy err	Masters out of sync
Bus A Tripped	Bus A over current trip
Bus B Tripped	Bus B over current trip
SAFE MODE	linking device set to Safe mode

The lower portion of the main page shows the communication quality to each field device as the percentage of data packets sent compared to data packets received for each field device index (see Table 8).

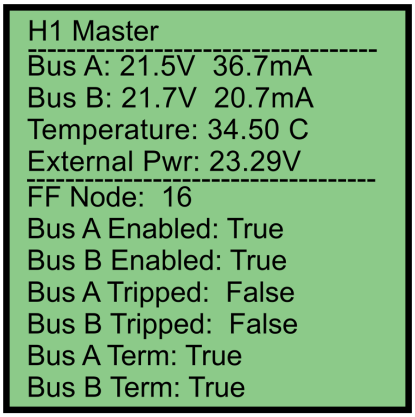
Table 8 - Field Device Communication Quality

Display	Communication Quality
>>>	95+
>>	80+
>	60+
XXX	Below 60

Display	Communication Quality
???	Unknown
OOS	Allocated, On-line, not Compelling Data
Off	Allocated, Off-line
Err	Allocated, On-line, not producing Compelled Data

H1 Master Page

The next page that is accessed by the Page button is the H1 Master page.



Bus A/B: Displays the bus voltages, currents, and bus status.

Temperature: Displays the internal temperature of the linking device.

External Pwr: Displays the power supply voltage.

FF Node: Displays the H1 node address for the master (default 16).

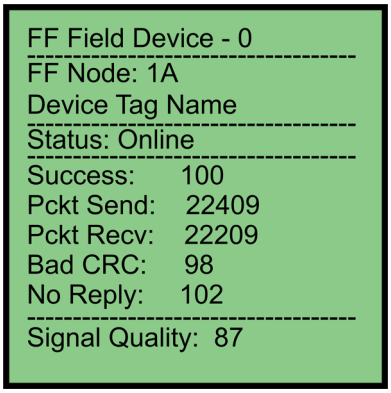
BusA/B Enabled: H1 Bus A or H1 Bus B is enabled for communication.

BusA/B Tripped: H1 Bus A or H1 Bus B has tripped indicating that there was an over-current on either port.

BusA/B Term: The linking device is configured to terminate H1 Bus A or H1 Bus B.

Field Device Page

The next 16 FF Field Device pages display the status of each of the field device indices.



FF Node: Displays the H1 node address.

Device Tag Name: The tag name of the device.

Status: Displays the field device status (see Table 9.)

Table 9 - Field Device Status

Status	Description
Not Connected	Device cannot be seen
Online	Online - not configured
ConfigRunning	Device is configured and running

Success: Displays the data packets that are received as a percentage of packets that are sent for the previous 100 packets.

Pckt Send: Displays the total number of data packets that are sent from the field device.

Pckt Recv: Displays the total number of data packets that are received from the field device.

Bad CRC: Displays the total number of bad CRC packets received.

No Reply: Displays the total number of data requests to which the field device did not respond.

Signal Quality: Displays the quality of the waveform for the field device by evaluating slew rate, amplitude, distortion, noise, and balance.

Value	Description
0…33	Bad
34…66	Poor
67…100	Good

Notes:

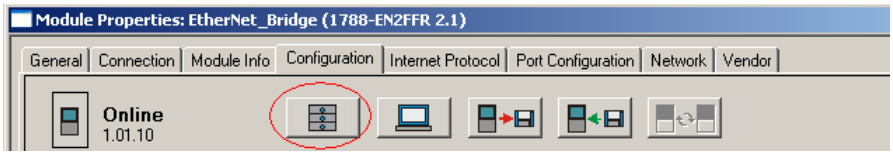
HSProcessUtility

Use the HSProcessUtility

Follow these steps to use the HSProcessUtility to add a device description to a field device.

1. Click the HSProcessUtility icon in the AOP and click Launch HSProcessUtility.

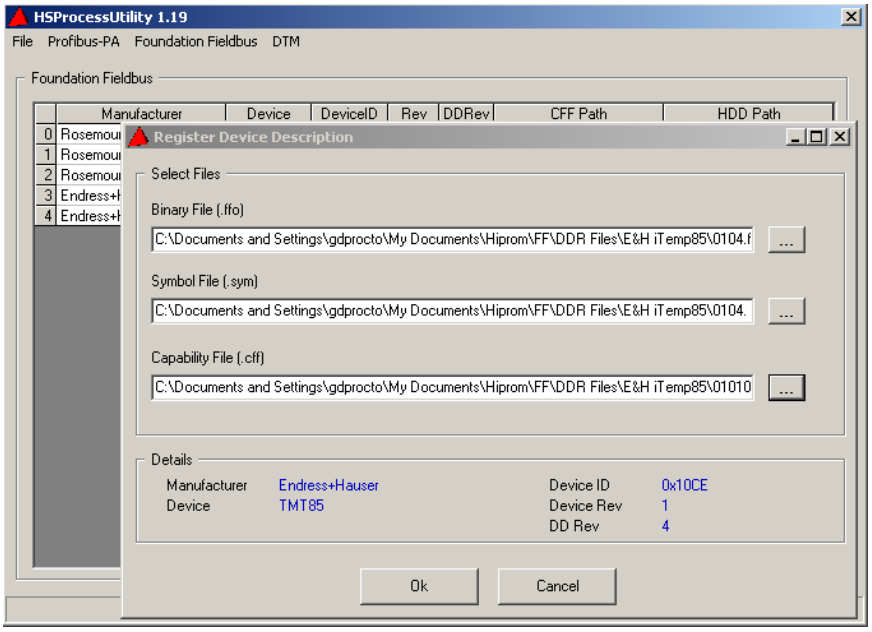
   TIP You can also click the refresh catalog option to refresh the device catalog once a DD file has been added.



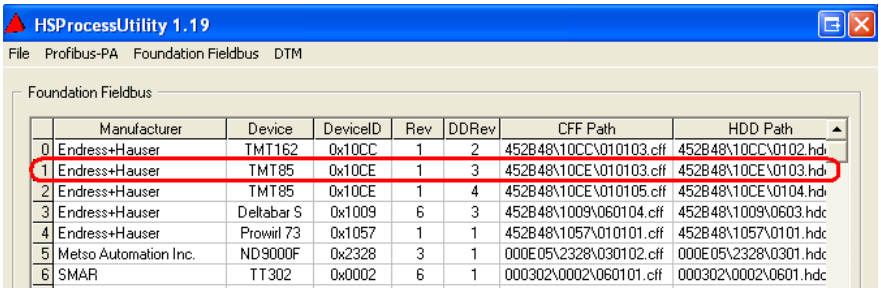
   The HSProcessUtility opens. Because the same utility is used to register GSD files (PROFIBUS PA) and DTMs, these options are still in the menu bar.

2. Select the FOUNDATION Fieldbus option and choose Add Device Description. Three files are required to update the library:
   - Binary file (.ffo)
   - Symbol file (.sym)
   - Capability file (.cff)

3. Select the binary file, the appropriate symbol file, and the correct version of the capability file.

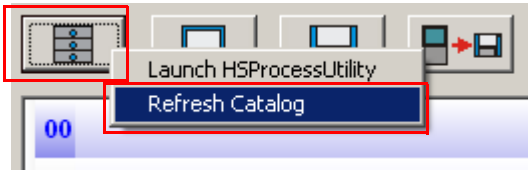


A new file is generated and the library directory is updated.

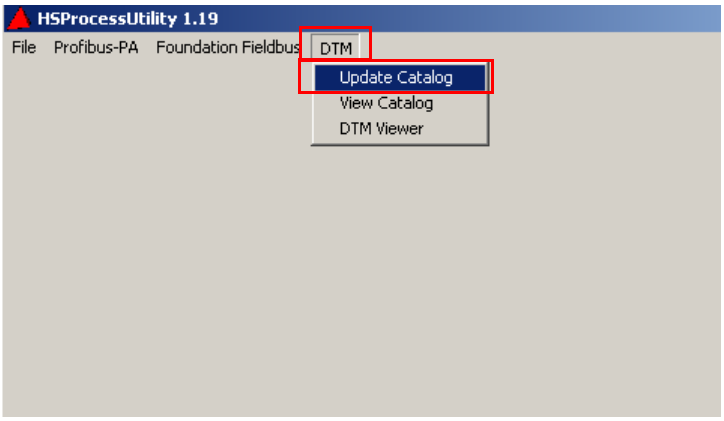


TIP Before the field device can be configured in the AOP, the catalog must be refreshed.

4. Click the HSProcessUtility icon and choose Refresh Catalog.



5. Install the device DTMs from the vendors, then go to the DTM tab in HSProcessUtility and click Update Catalog.



Notes:

Field Device Block Configuration Examples

Overview

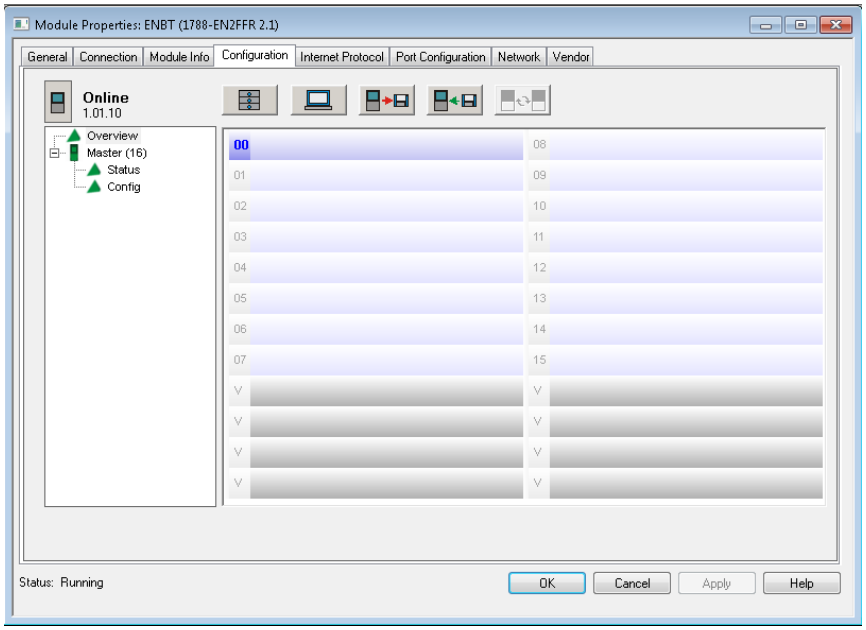
This appendix provides examples of how to use field bus output devices with the linking device.

Each example starts from an empty live list, adds the device to the network, and configures an analog output (AO) or discreet output (DO) function.

The purpose of these examples is to place the AO or DO function block in the Cas mode, so the values entered in CAS_IN are processed into the SET_POINT value.

See Field Device Block Configuration on page 36 for general field device block configuration information.

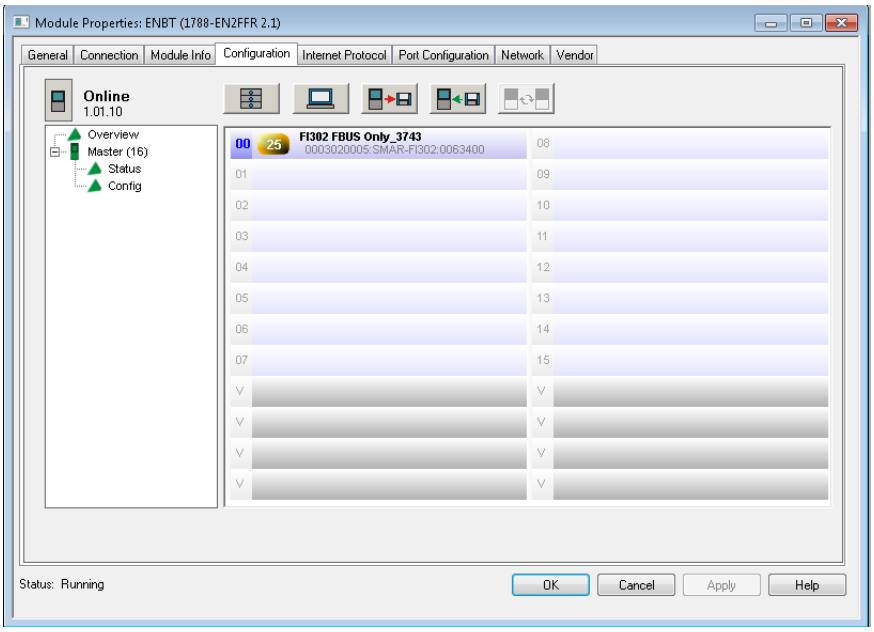
Figure 11 - Empty Live List



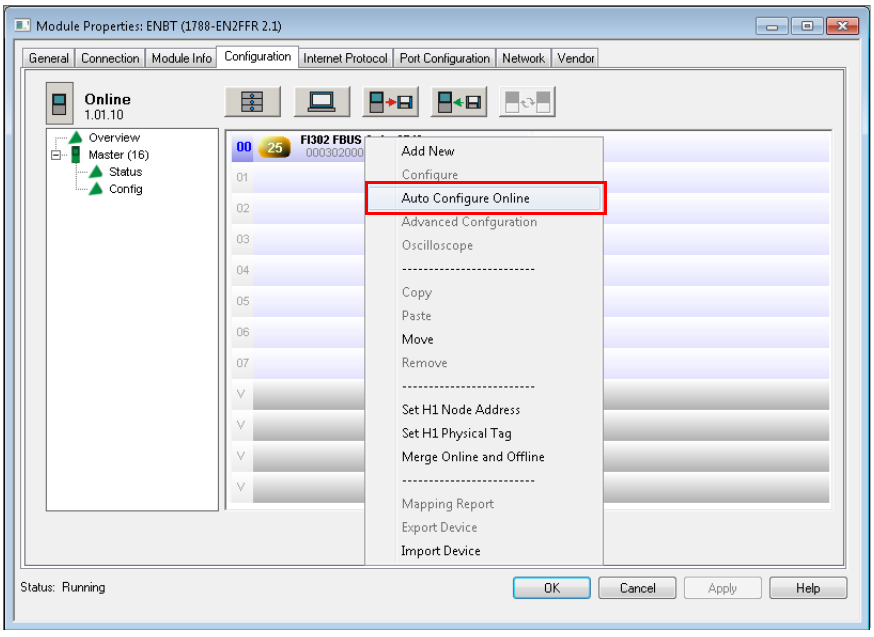
AO Function Block Example

This example describes the steps that are used to configure an AO function block for the linking device. The linking device tag name in this example is SMAR FI302.

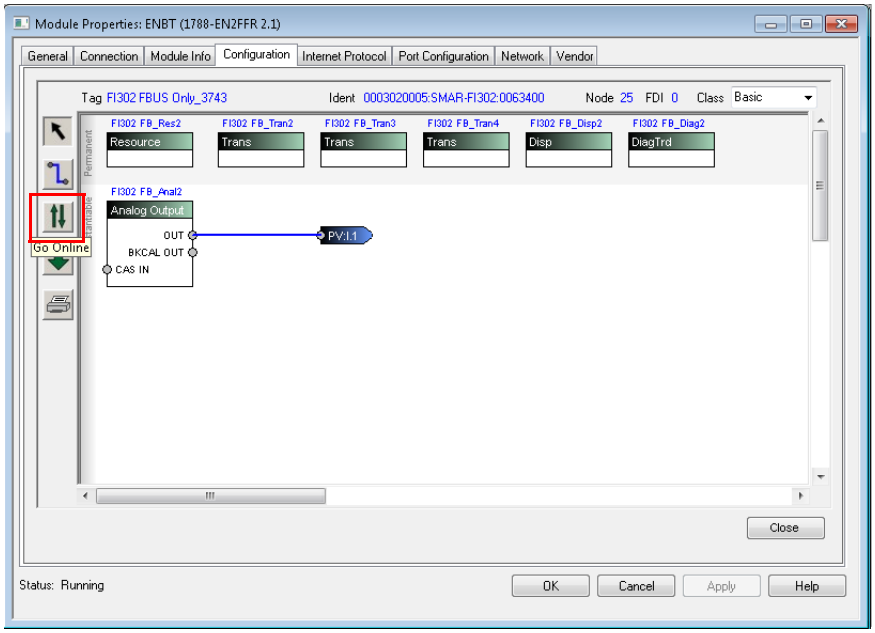
1. Add the linking device to the field bus network.



2. Right-click the linking device and choose Auto Configure Online.



3. Click the Go Online button.



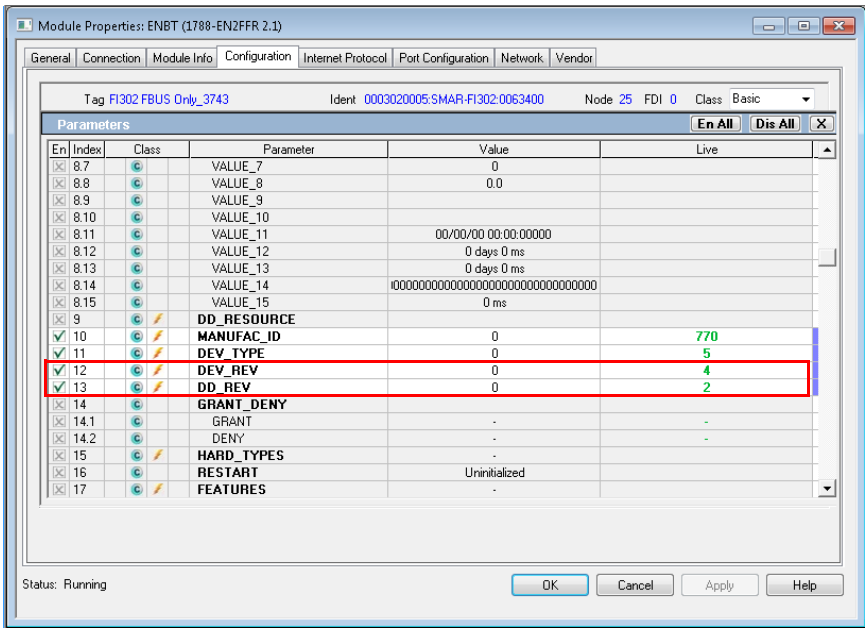
4. Right-click the resource function block and choose Parameters.

   Verify that the correct DD files were enabled.

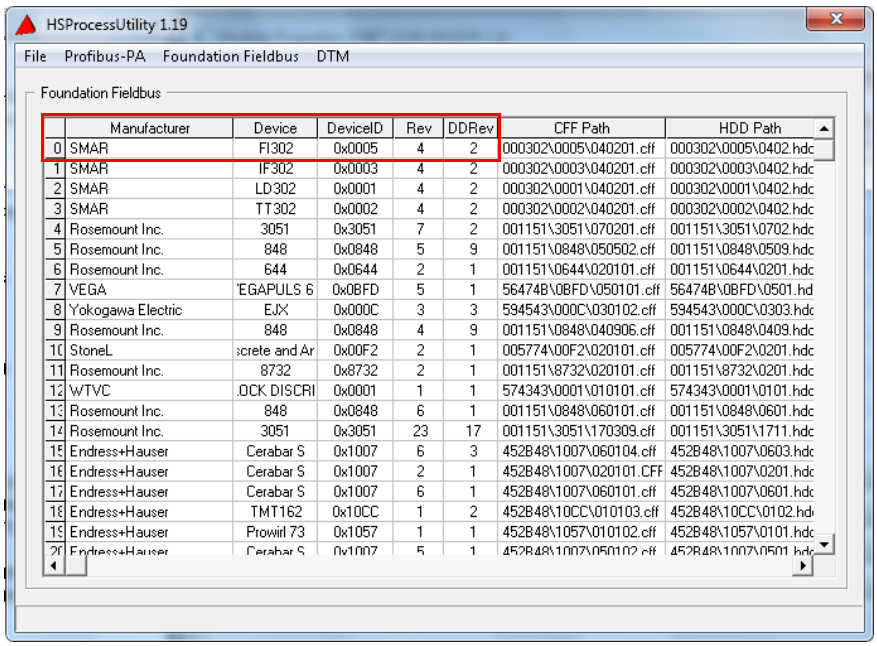
5. Scroll down to Index rows 10, 11, 12, and 13.

6. Check the **En** column for Index rows 10, 11, 12, and 13.

   A green check displays in the box.

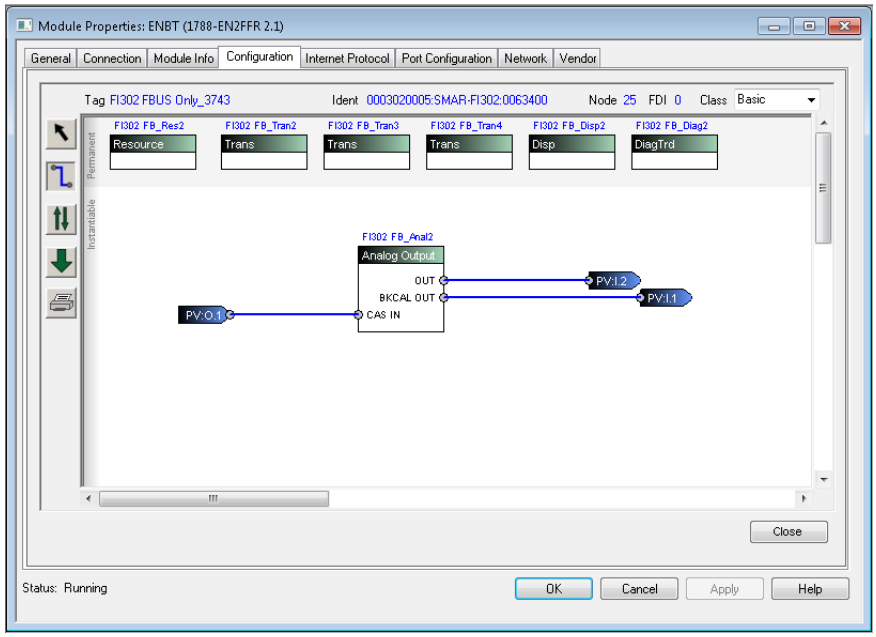


7. Verify that the Dev_Rev and DD_REV in the Parameters screen matches the Rev and DDRev revisions in the HSProcessUtility (compare Figure and Figure 7).

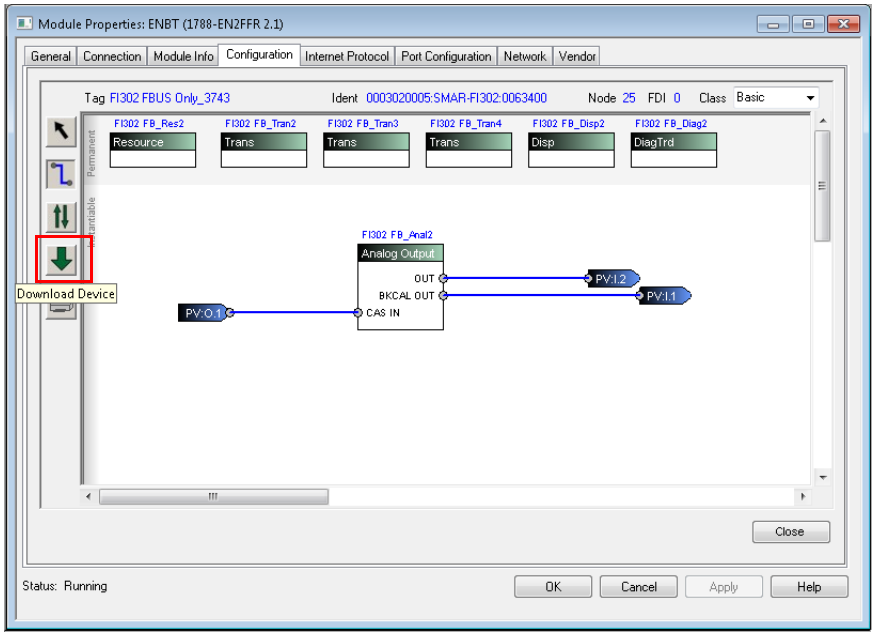


8. Use the tools in the Configuration screen to build the configuration as shown in Figure .

   See Field Device Block Configuration on page 36 for general field device block configuration information.

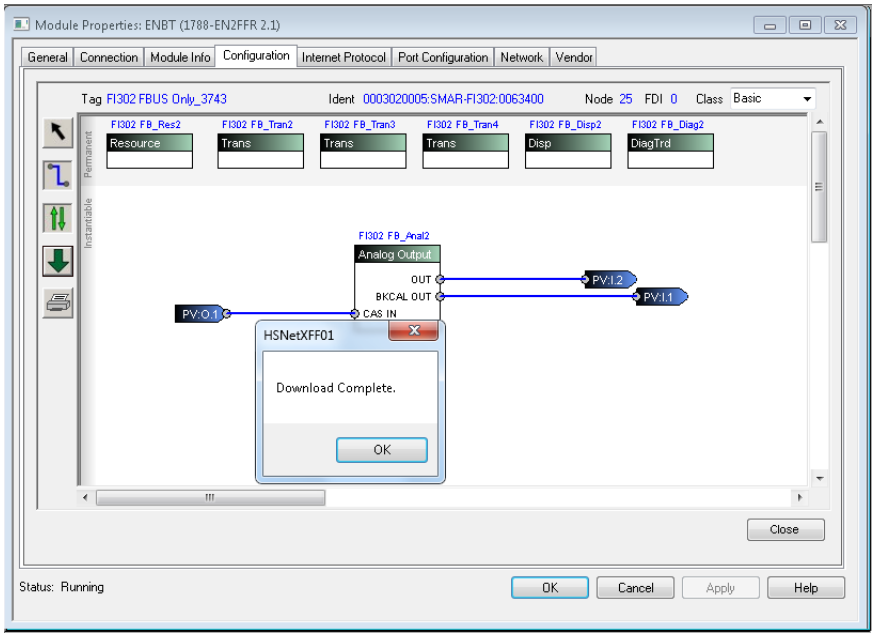


9. Click the download button to download the AO function block to the linking device.

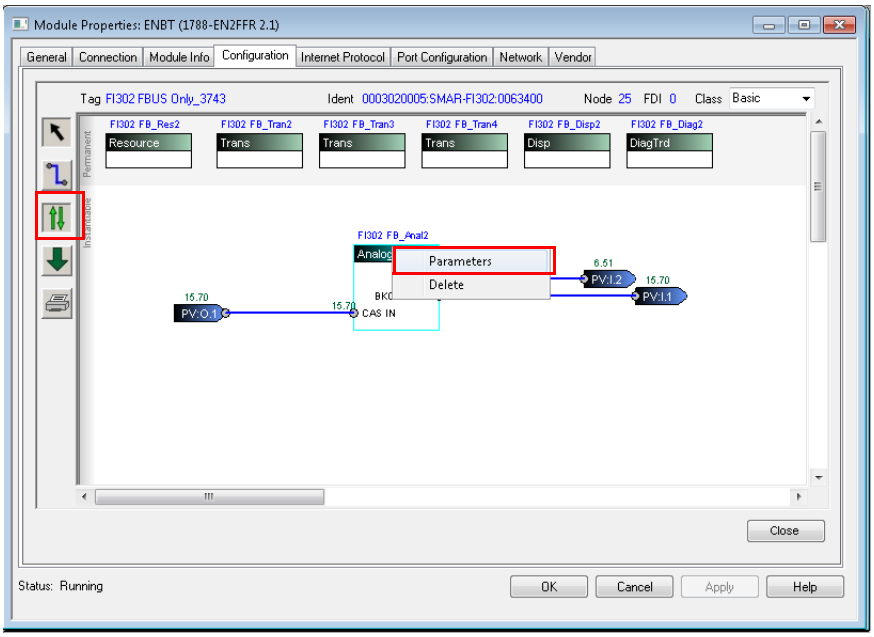


The download operation completes without errors.

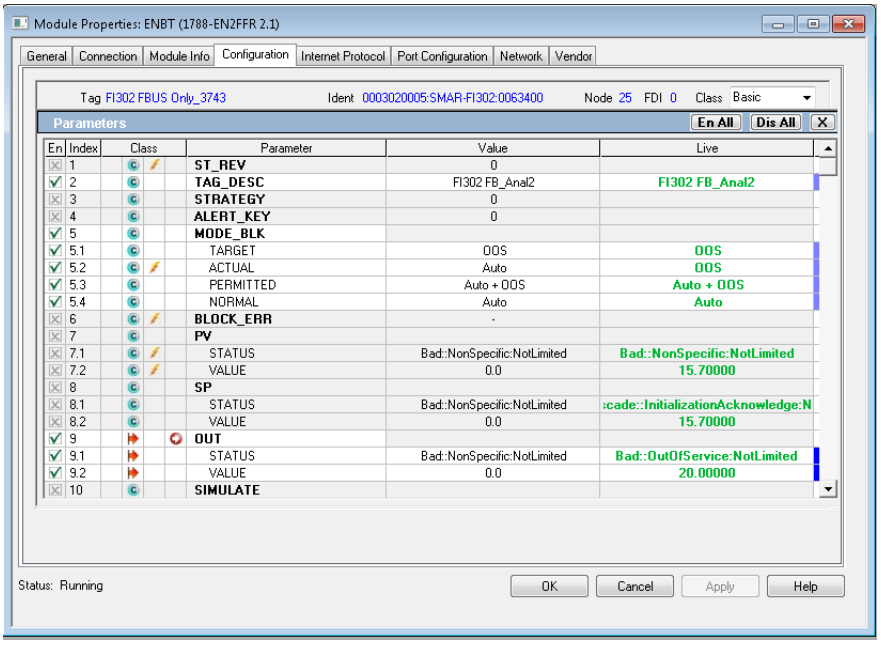
10. Click OK.



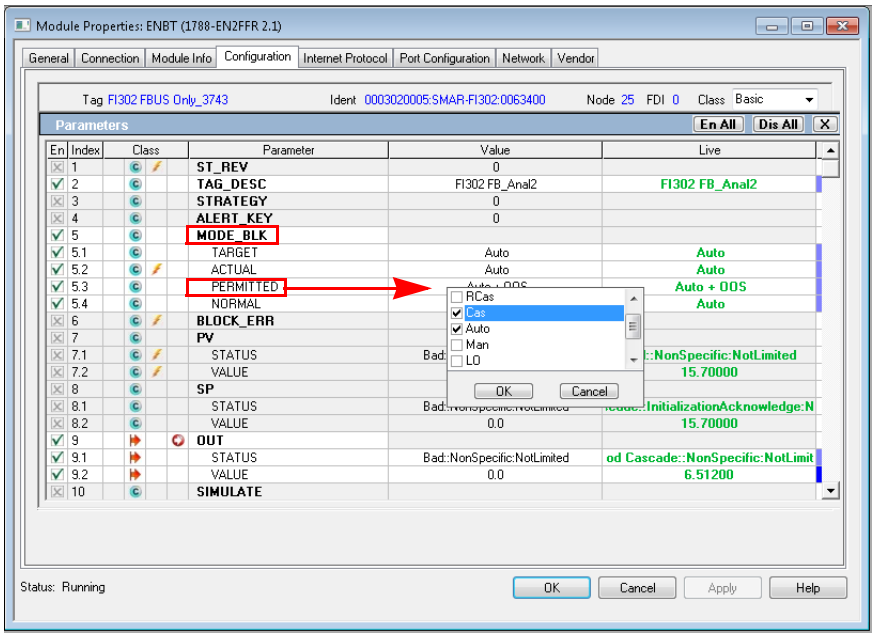
11. Click the Go Online button.
12. Right-click the Analog Output function block.
13. Choose Parameters.



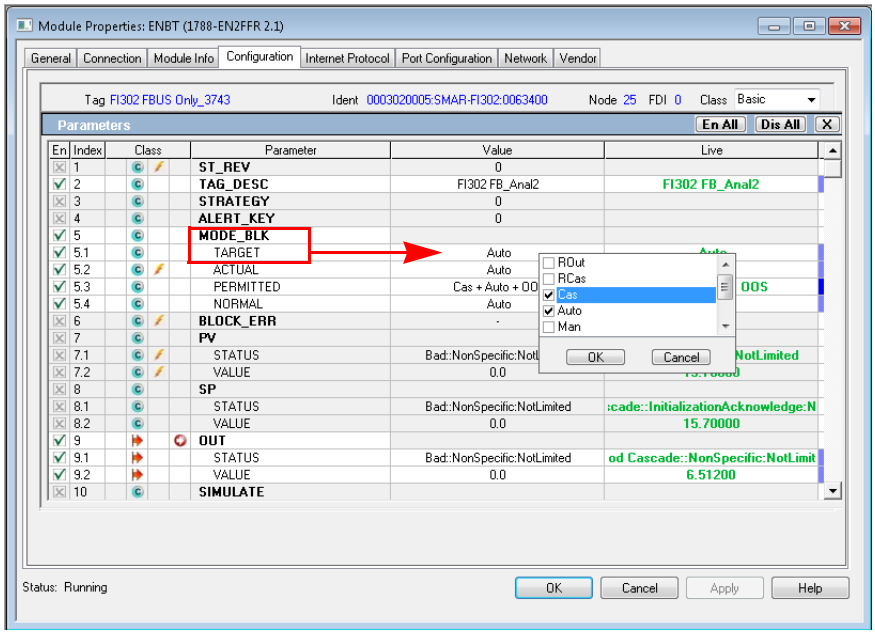
The linking device parameters are displayed.



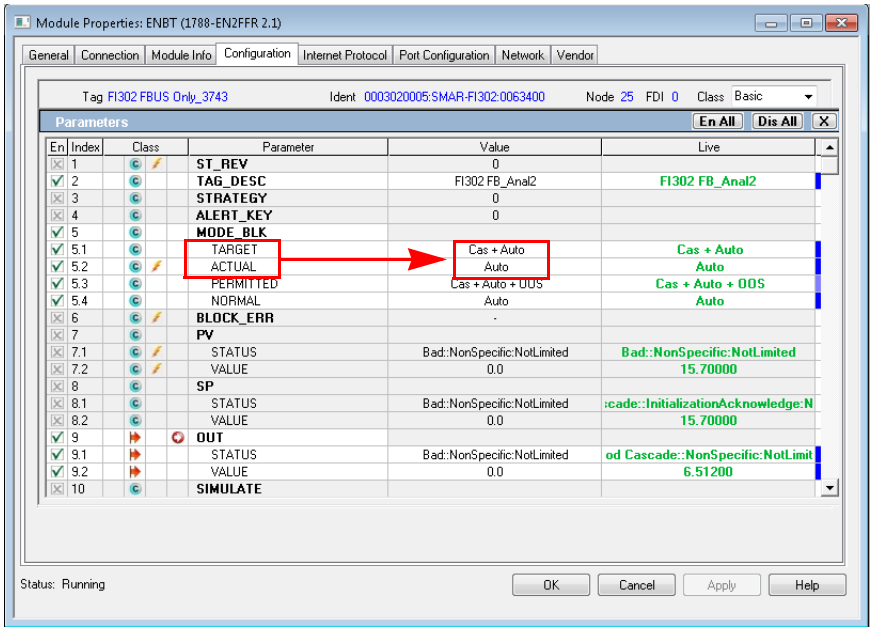
14. Under MODE_BLK > PERMITTED, right-click the Value column and select Cas.
15. Click OK to add the Cas mode.



16. Under MODE_BLK > TARGET, right-click the Value column and select **Cas** and **Auto**.
17. Click OK to add the Cas+Auto mode.



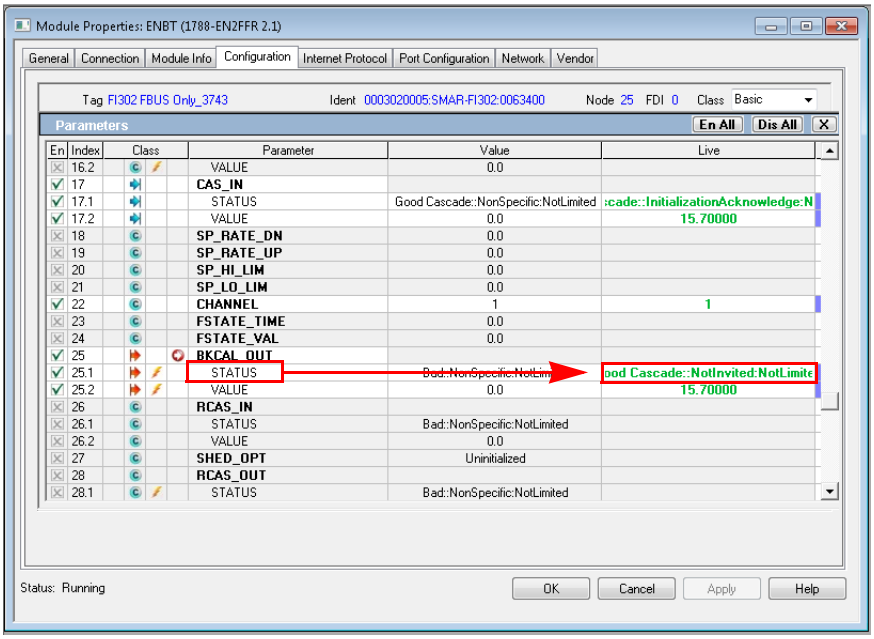
18. Verify that the MODE_BLK > TARGET value is Cas + Auto and the MODE_BLK > ACTUAL value is Auto.



19. In the parameter screen, scroll down to parameters CAS_IN and BKCAL_OUT.

20. Verify that the BKCAL_OUT > STATUS in the Live column indicates a NotInvited condition.

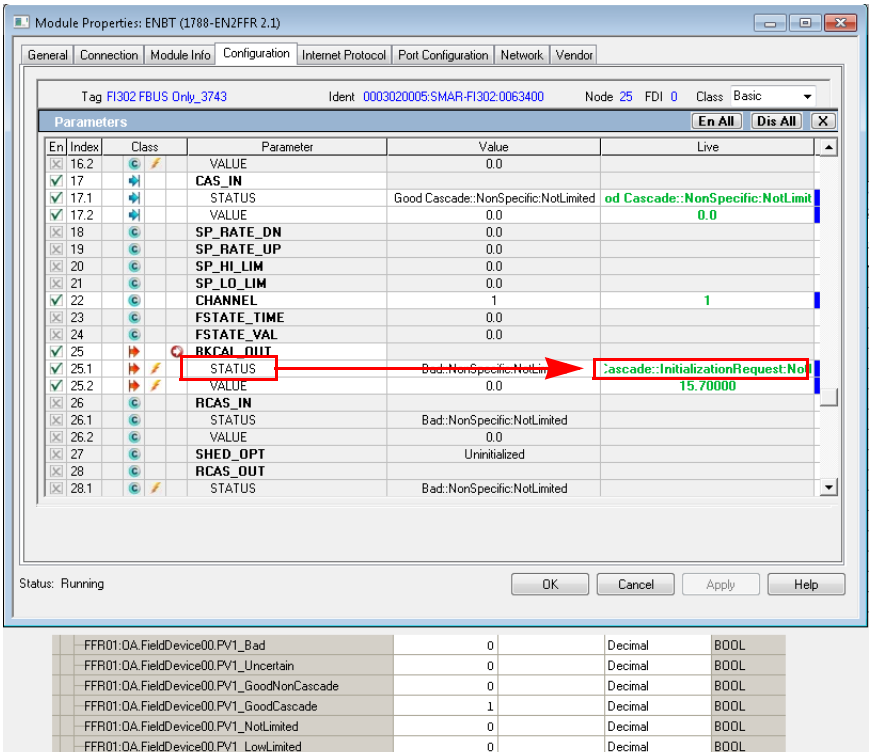
    Before the output control loop can be initialized, the NotInvited condition must be cleared.



21. Set the value of the controller tag that is associated with the quality of CAS_IN (connector PV:O.1) status parameter (PVx_GoodCascade) to the value 1.

FFR01:0A.FieldDevice00.PV1_Bad	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_Uncertain	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_GoodNonCascade	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_GoodCascade	1		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_NotLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_LowLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_HighLimited	0		Decimal	BOOL
FFR01:0A.FieldDevice00.PV1_Constant	0		Decimal	BOOL
+ FFR01:0A.FieldDevice00.PV1_SubStatus	0		Decimal	SINT

22. Verify that the NotInvited status has been replaced by the new status, InitializationRequest.

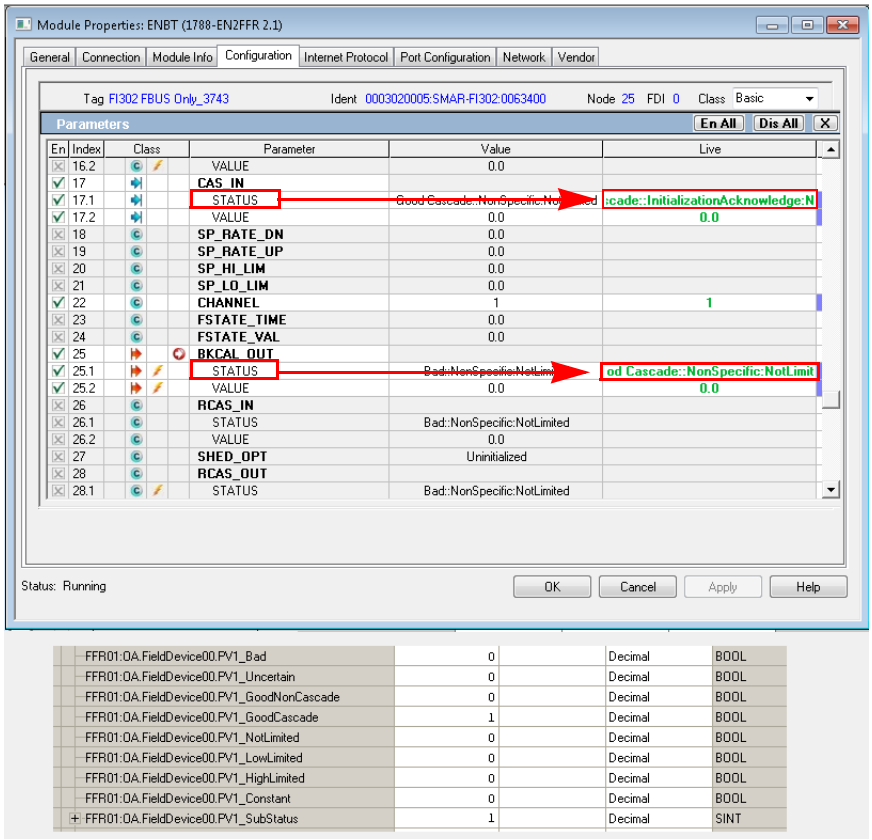


The InitializationRequested must receive a response.

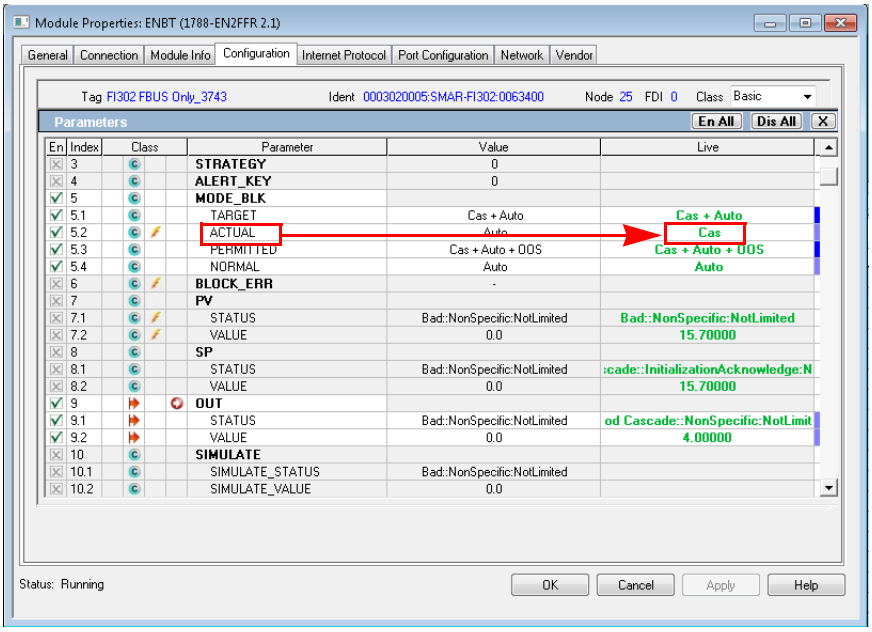
23. Set the value of the Controller Tag associated with the substatus of CAS_IN (connector PV:O.1) status parameter (PV1_SubStatus) to the value 1, which is InitializationAcknowledge.

The InitializationRequested status in BKCAL_OUT > STATUS > Live column is cleared and replaced by the value, NonSpecific.

The CAS_IN > STATUS > Live column displays a status of InitializationAcknowledge.

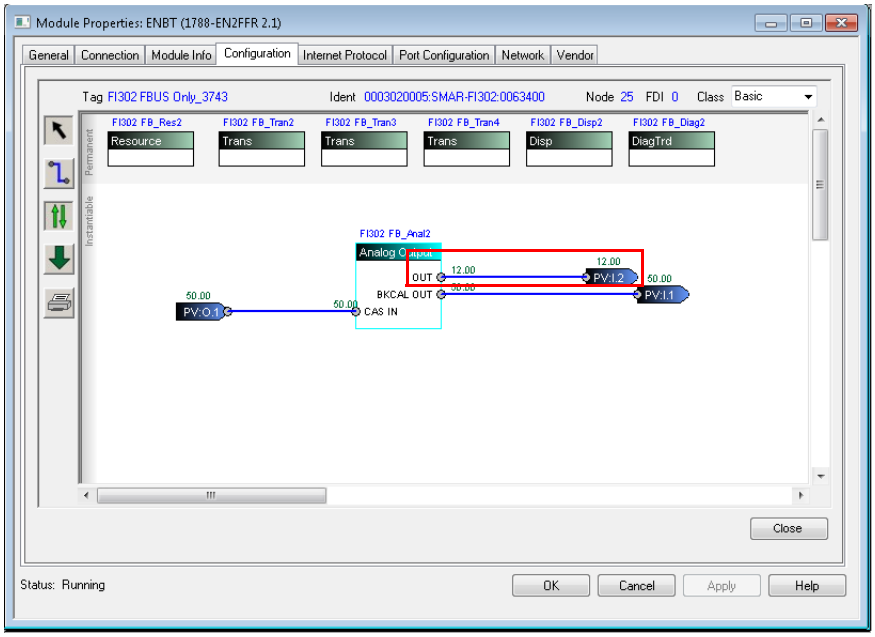


24. Verify that the AO function block MODE_BLK > ACTUAL > Live column displays Cas.



25. Set the CAS_IN (PV:O.1) value to 50%.

26. Verify that the BKCAL_OUT (PV:I.1) and OUT (PV:I.2) values change as required (50% equals 12 mA at the OUT parameter).

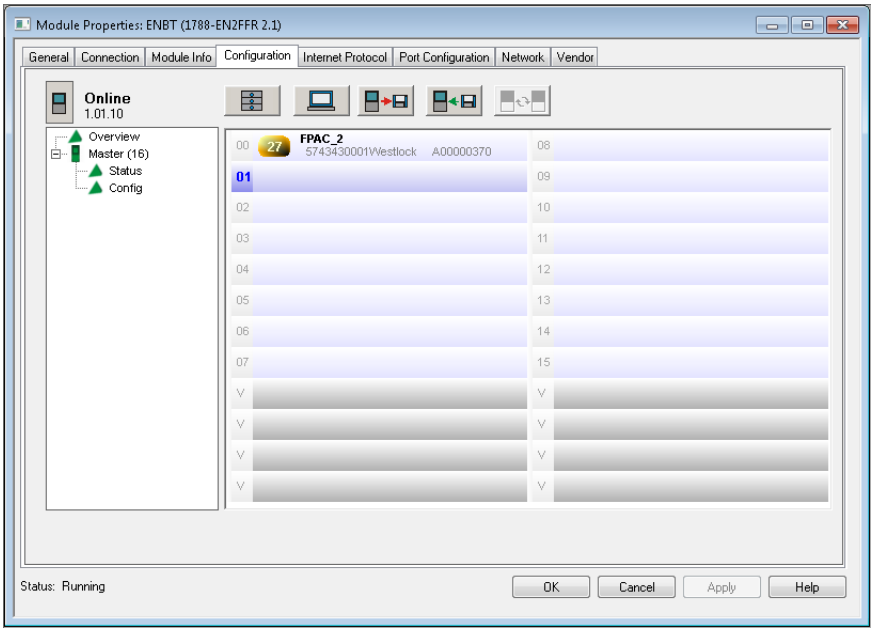


The AO function block is now created, initialized, and operating correctly.

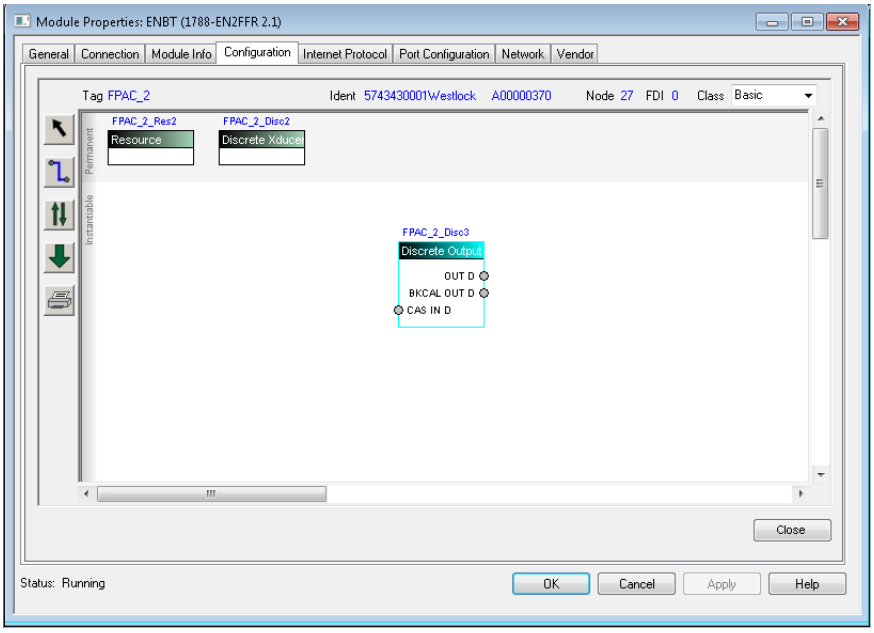
DO Function Block Example

This example describes the how to configure a DO function block for the linking device. The device that is used in this example is FPAC_2.

1. Add the linking device to the field bus network.

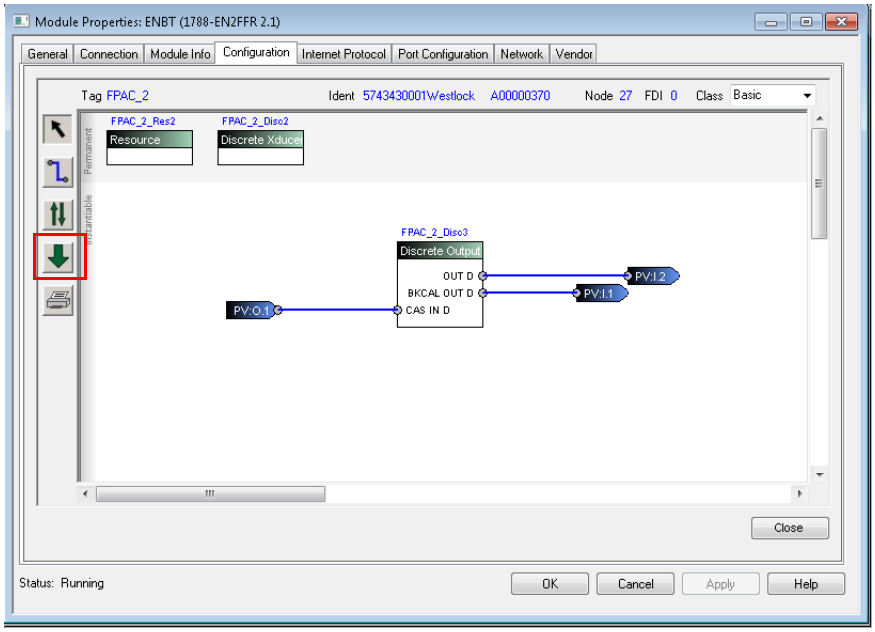


2. Add a DO function block to the configuration.



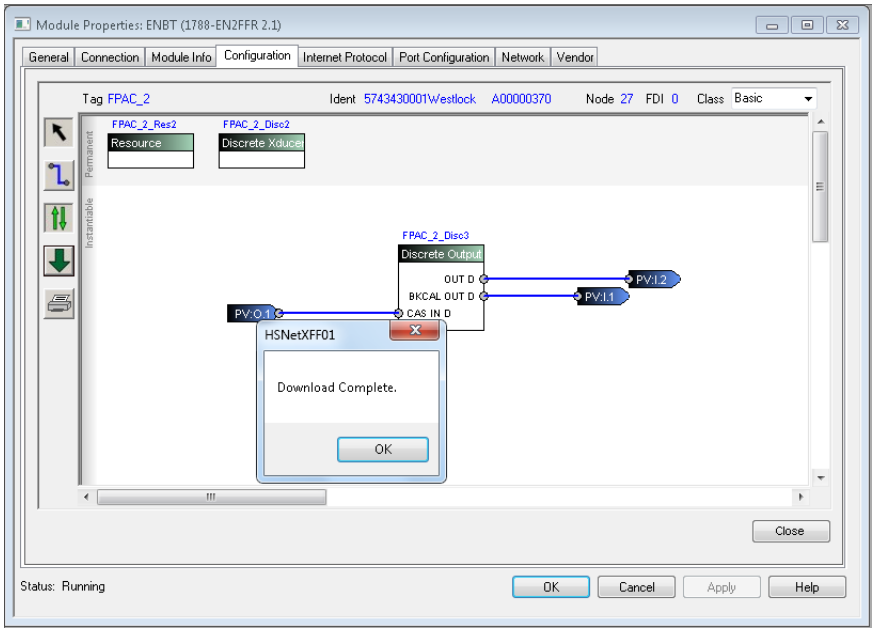
TIP You can delete other function blocks and connections.

3. Make connections to CAS_IN_D, OUT_D, and BKCAL_OUT_D.
4. Click the Download button to download the DO function block to the linking device.

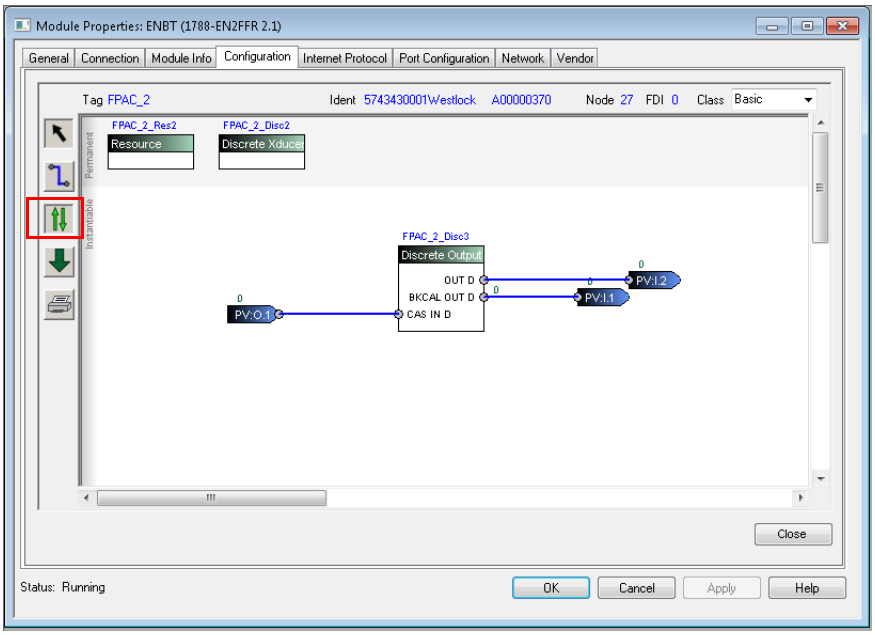


The download operation completes without errors.

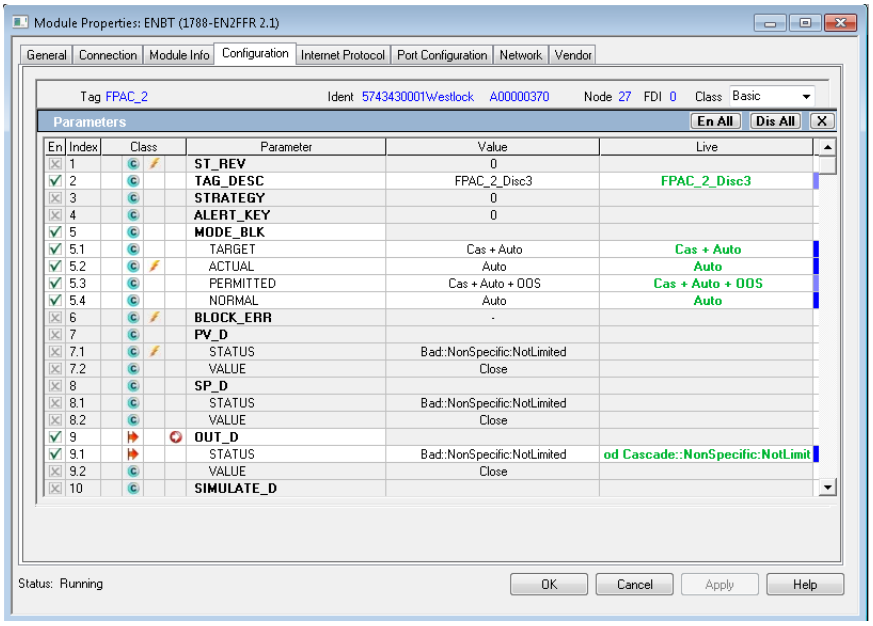
5. Click OK.



6. Click the Go Online button.
7. Right-click the Discreet Output function block.
8. Choose Parameters.



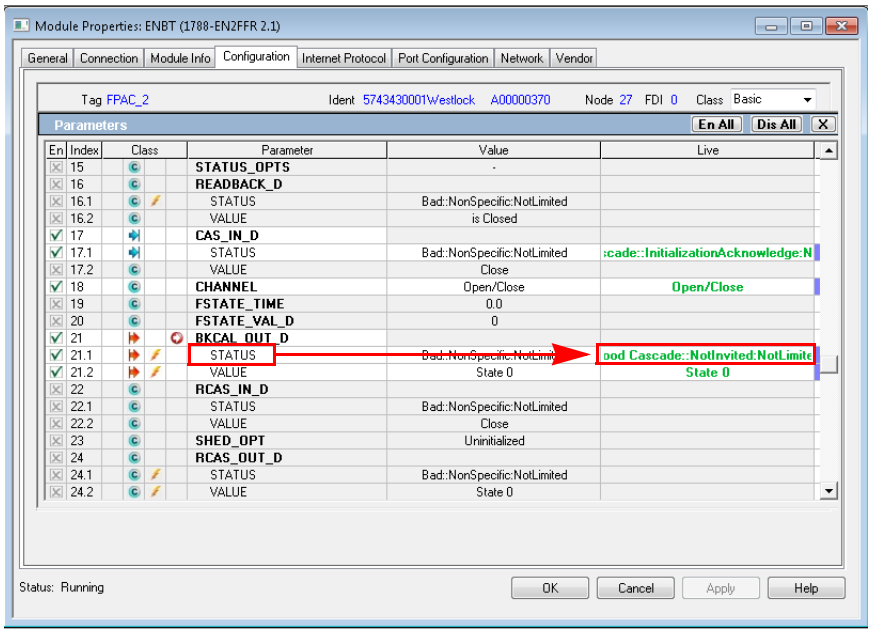
The linking device parameters are displayed.



9. In the Parameters screen, scroll down to parameters CAS_IN_D and BKCAL_OUT_D.

10. Verify that the BKCAL_OUT_D > STATUS in the Live column indicates a NotInvited condition.

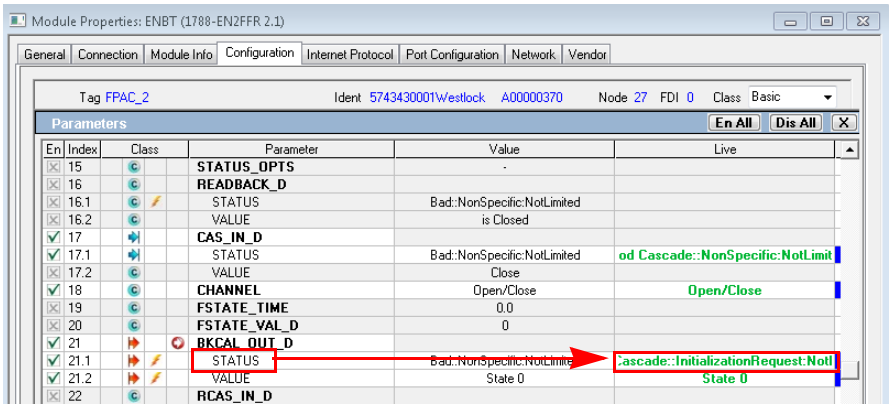
    Before the output control loop can be initialized, the NotInvited condition must be cleared.



11. Set the value of the controller tag that is associated with the quality of BKCAL_OUT_D (connector PV:O.1) status parameter (PVx_GoodCascade) to the value 1.

FFR01:OA.FieldDevice00.PV1_Bad	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_Uncertain	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_GoodNonCascade	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_GoodCascade	1		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_NotLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_LowLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_HighLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_Constant	0		Decimal	BOOL
+ FFR01:OA.FieldDevice00.PV1_SubStatus	0		Decimal	SINT

12. Verify that the NotInvited status has been replaced by the new status, InitializationRequest.

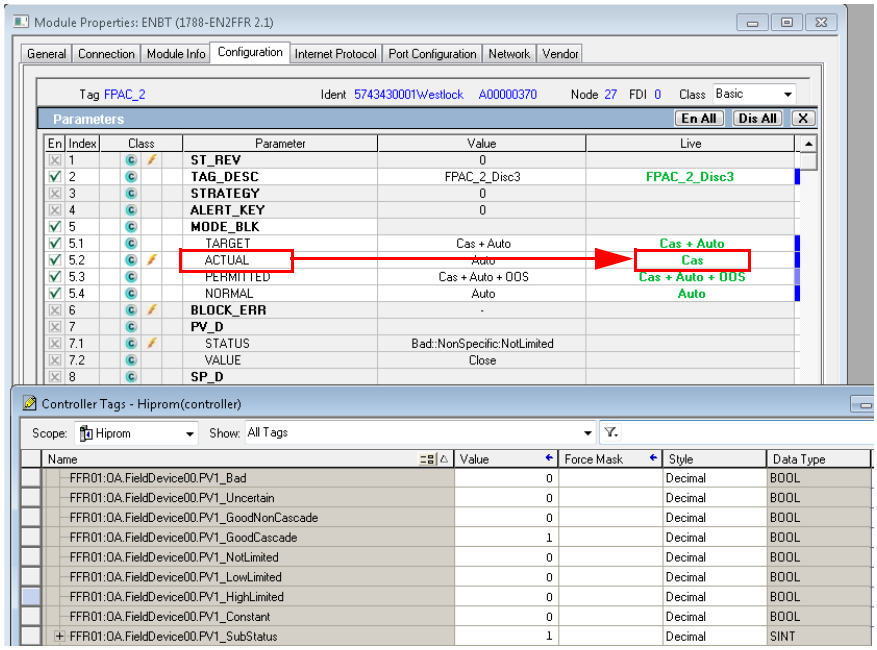


The InitializationRequest must receive a response.

13. Set the value of the Controller Tag associated with the substatus of CAS_IN_D (connector PV:O.1) status parameter (PV1_SubStatus) to the value 1, which is InitializationAcknowledge.

FFR01:OA.FieldDevice00.PV1_Bad	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_Uncertain	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_GoodNonCascade	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_GoodCascade	1		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_NotLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_LowLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_HighLimited	0		Decimal	BOOL
FFR01:OA.FieldDevice00.PV1_Constant	0		Decimal	BOOL
+ FFR01:OA.FieldDevice00.PV1_SubStatus	1		Decimal	SINT

14. Verify that the DO function block MODE_BLK > ACTUAL > Live column displays Cas.



The DO function block is now created, initialized, and operating correctly.

H1 Topology

Master Mode 0

Single Master

A Bus Only

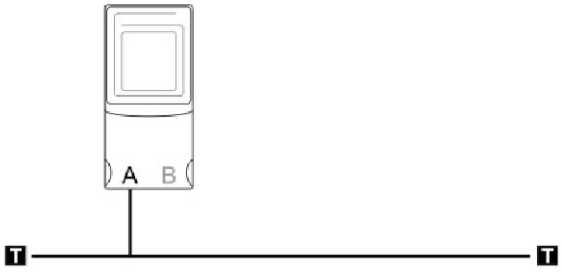
Terminated at the linking device.

Master Mode 1

Single Master

A Bus Only

Not terminated at the linking device.



Master Mode 2

Single Master

B Bus Only

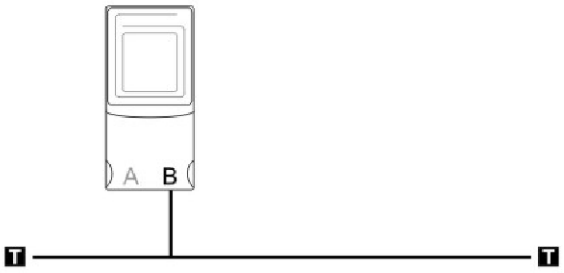
Terminated at the linking device.

Master Mode 3

Single Master

B Bus Only

Not terminated at the linking device.

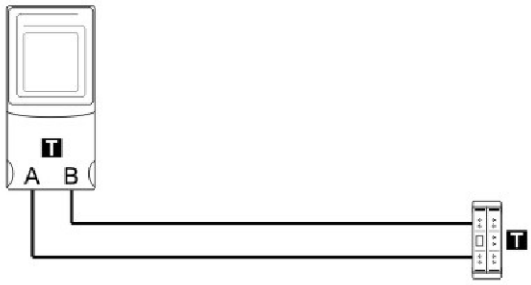


Master Mode 4

Single Master

Dual Bus

Terminated at the linking device.

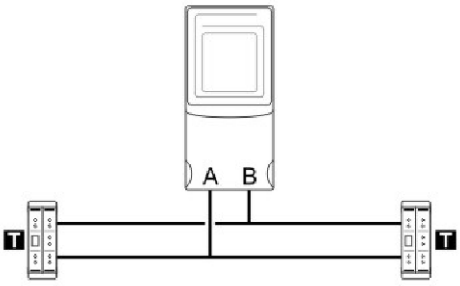


Master Mode 5

Single Master

Dual Bus

Not terminated at the linking device.

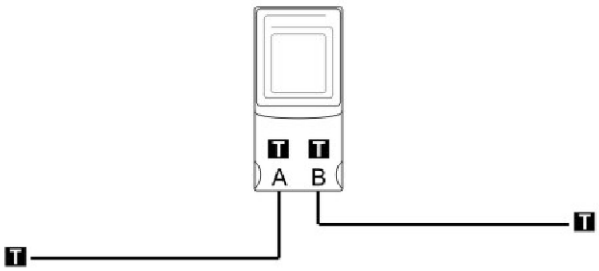


Master Mode 6

Single Master

Split Bus

Terminated at the linking device.

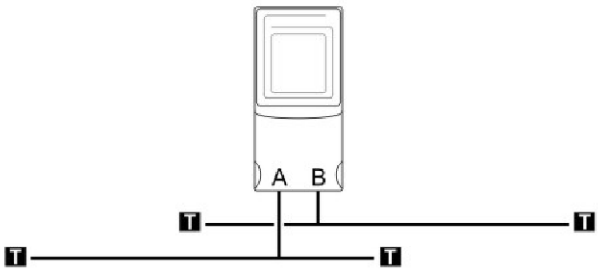


Master Mode 7

Single Master

Split Bus

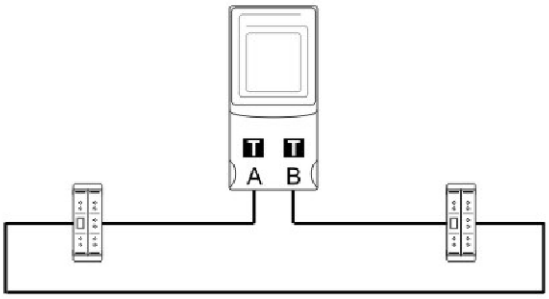
Not terminated at the linking device.



Master Mode 8

Single Master

Ring Bus



Master Mode 9

MultiMaster

A Bus Only

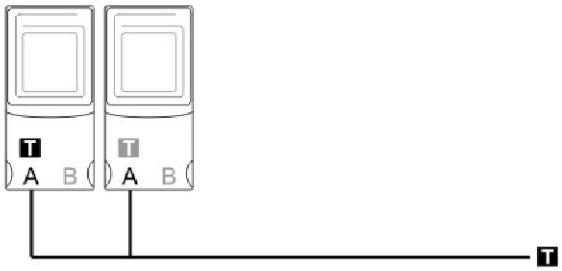
Terminated at the linking devices.

Master Mode 10

MultiMaster

A Bus Only

Shared termination at the linking devices.

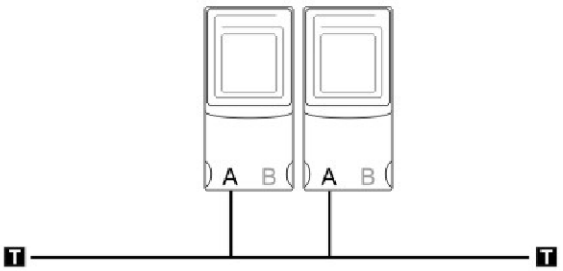


Master Mode 11

MultiMaster

A Bus Only

Not terminated at the linking devices.



Master Mode 12

MultiMaster

B Bus Only

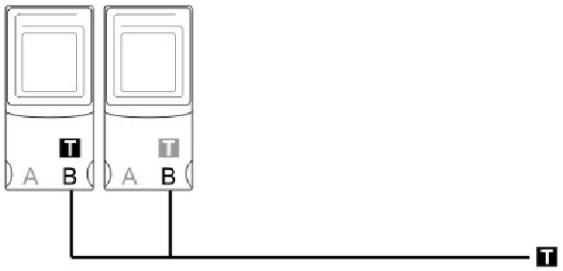
Terminated at the linking devices.

Master Mode 13

MultiMaster

B Bus Only

Shared termination at the linking devices.

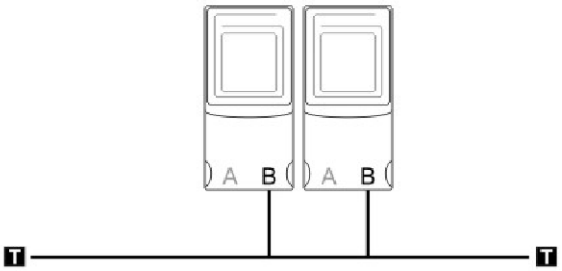


Master Mode 14

MultiMaster

B Bus Only

Not terminated at the linking devices.

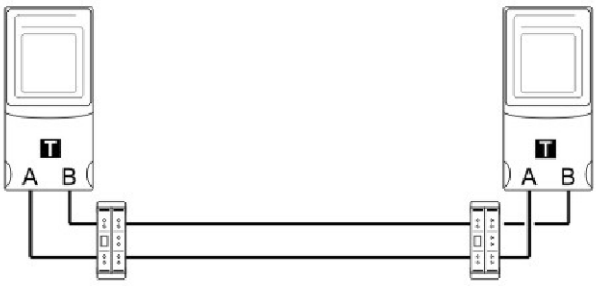


Master Mode 15

MultiMaster

Dual Bus

Terminated at the linking devices.

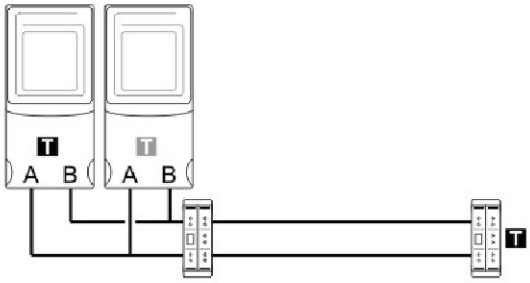


Master Mode 16

MultiMaster

Dual Bus

Shared termination at the linking devices.



Notes:

The following terms and abbreviations are used throughout this manual. For definitions of terms not listed here, refer to the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

1788-EN2FFR linking device Provides a gateway between EtherNet/IP and a single segment FOUNDATION Fieldbus H1 layer.

1788-CN2FFR linking device Provides a gateway between ControlNet and FOUNDATION Fieldbus (FF).

AO Abbreviation for an analog output; signal is generated by the host system and transmitted to a field device.

AOP Abbreviation for Add-on Profile; provides an intuitive graphical interface for configuring devices.

basic device A device that can communicate on the fieldbus, but cannot become the LAS.

block See function block, resource block (RES), and transducer block.

BOOTP A protocol to boot a diskless workstation and receive the boot information from a server.

bridge An interface in a fieldbus network that interconnects two or more H1 networks.

bus An H1 fieldbus cable between a Host and field devices connected to multiple segments, sometimes through the use of repeaters.

CAS Abbreviation for Cascade.

channel A path for a signal.

CIP Acronym for Common Industrial Protocol; a communication protocol, or language, between industrial devices. CIP provides seamless communication for devices on DeviceNet, ControlNet, and EtherNet/IP networks.

configurable Capability to select and connect standard hardware modules to create a system; or the capability to change functionality or sizing of software functions by changing parameters without having to modify or regenerate software.

configuration Physical installation of hardware modules to satisfy system requirements; or the selection of software options to satisfy system requirements.

connector Coupling device used to connect the wire medium to a fieldbus device or to another segment of wire.

control loop Group of function blocks that execute at a specified rate within a FOUNDATION Fieldbus device or distributed across the fieldbus network.

ControlNet network An open control network that uses the producer/consumer model to combine the functionality of an I/O network and peer-to-peer network, while providing high-speed performance for both functions.

cycle Scanning of inputs, execution of algorithms and transmission of output values to devices.

device description (DD) Abbreviated as DD, this is a set of files (CFF, SYM, and FFO) that describes the parameter capabilities of a fieldbus device. The file information on these block parameters includes names, data types, and specifications.

device The term in this manual refers to the instruments that make up the fieldbus system.

device ID An identifier for a device that the manufacturer assigns. Device IDs must be unique to the device; no two devices can have the same device ID.

device tag A character string name that uniquely identifies a device on a fieldbus network.

DO Abbreviation for discrete output; signal is generated by the host system and transmitted to a field device.

Ethernet Physical and data link layer defined by IEEE 802 standards used by EtherNet/IP.

EtherNet/IP An open, industrial networking standard that supports both real-time I/O messaging and message exchange.

fieldbus A digital, two-way, multi-drop communication link among intelligent measurement and control devices. It serves as a Local Area Network (LAN) for advanced process control, remote input/output, and high-speed factory automation applications.

FOUNDATION Fieldbus The communication network that the Fieldbus Foundation created.

function block A named block consisting of one or more input, output, and contained parameters. The block performs some control function as its algorithm. Function blocks are the core components with which you control a system. The Fieldbus Foundation defines standard sets of function blocks.

gateway Translates another protocol to FOUNDATION fieldbus or vice versa, for example HART to FOUNDATION fieldbus or Modbus to FOUNDATION fieldbus.

H1 A FOUNDATION fieldbus segment that operates at 31.25 Kbps.

host Control system that has FOUNDATION fieldbus capabilities to configure and operate FOUNDATION fieldbus segments. There are several classes of Host systems:

- Class 61 - Integrated Host - Primary, or process Host that manages the communication and application configuration of all devices on the network.
- Class 62 - Visitor Host - Temporary, on process Host with limited access to device parameterization.
- Class 63 - Bench Host - Primary, off process Host for configuration and setup of a non-commissioned device.
- Class 64 - Bench host - Primary, off process Host with limited access to device parameterization of an off-line, commissioned device.
- Class 71 - Safety Integrated Host - Primary, on-process Host that manages the communication and application configuration of all safety and control and monitoring devices on a network.

LAS See link active scheduler.

link A logical link is a connection between function blocks; a physical link is a connection between fieldbus devices.

linking device As a bridge, enables peer-to-peer communication between H1 devices without the need for host system intervention. As a gateway, connects the H1 network to other plant control and information networks, such as EtherNet/IP and ControlNet.

link active scheduler Abbreviated as LAS, this scheduler is responsible for coordinating all communication on the fieldbus; maintaining a list of transmission times for all data buffers in all devices that need to be cyclically transmitted. The LAS circulates tokens, distributes time, probes for new devices, and removes non-responsive devices from the link.

link master An LM is a device that contains LAS functionality that can control communication on a FOUNDATION fieldbus H1 fieldbus link. There must be at least one LM on the H1 link; one of those LM devices is chosen as the LAS.

macrocycle A calculated time for a fieldbus device to send and receive data. The AOP can automatically generate the value, or the value can be manually entered. The LAS is responsible for scheduling of the segment macrocycle.

mode Control block operational condition, such as manual, automatic, or cascade.

network A network as applied in this document is the termination of one or more fieldbus segments into an interface card of the Host system.

node The connection point at which media access is provided.

offline Perform tasks while the Host system is not communicating with the field devices.

online Perform tasks, such as configuration, while the Host system is communicating with the field devices.

PV Acronym for Process Variable, which is the primary value.

resource block (RES) This block controls the linking device. It contains data specific to the linking device's hardware. All data is modeled as contained, so there are no links in this block.

redundancy The duplication of devices for the purpose of enhancing the reliability or continuity of operations in the event of a failure without loss of a system function.

ring bus A network where signals are transmitted from one station and replayed through each subsequent station in the network. Signal can travel in either direction of the ring so it creates network redundancy; if the ring breaks in one place the nodes can still communicate.

RSLogix Software that provides a programming environment for sequential, process, drive, and motion control programming. The RSLogix environment provides an IEC 61131-3 compliant interface for controls programming.

segment A physical link (cable) between fieldbus devices and a pair of terminators on an H1 channel. Segments can be linked by repeaters to form a longer H1 fieldbus. A fully loaded (maximum number of connected devices) 31.25 Kbps voltage-mode fieldbus segment should have a total cable length, including spurs, between any two devices of up to 1900 m. There cannot be a non-redundant segment between two redundant systems.

signal The event or electrical quantity that conveys information from one point to another.

tag Unique alphanumeric code assigned to inputs, outputs, equipment items, and control blocks.

terminator Impedance-matching module used at or near each end of a transmission line that has the same characteristic impedance of the line. Terminators are used to minimize signal distortion, which can cause data errors. H1 terminators convert the current signal transmitted by one device to a voltage signal that can be received by all devices on the network.

topology The shape and design of the fieldbus network.

transducer block The transducer block decouples function blocks from the local input/output (I/O) function required to read sensors and command output hardware. Transducer blocks contain information, such as calibration date and sensor type. There is usually one transducer block for each input or output of a function block.

trunk The main communication highway between devices on an H1 fieldbus network. The trunk acts as a source of main supply to spurs on the network.

VCR Acronym for Virtual Communication Relationship. Configured application layer channels that provide for the transfer of data between applications. FOUNDATION Fieldbus describes three types of VCRs: Publisher/Subscriber, Client/Server, and Source/Sink.

Notes:

Numerics

A

B

C

D

E

F

G

H

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

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