Ethernet-Serial Passthrough Application Guide

Contents

List of tables

Additional information

Additional free publications are available for download at www.abb.com/upstream.

Table 0-1: Related documentation

Documents	Document number
XIO User Manual	2106424
XIO Interface Application Guide	2107011
Network Communication Guide	2107013
RMC User Manual	2105552

1   Overview

The XIO Ethernet-Serial Passthrough capability handles serial communication data traffic between an XIO and a remote controller over TCP/IP connections. TCP/IP-based communication between XIOs and remote controllers is possible when the devices have valid IP configurations and connect through a network.

The purpose of this XIO capability is to support the extension of a remote controller's serial port capacity. Applications running on a controller can communicate with or obtain data from devices attached to serial ports on an XIO as if they were attached directly to the controller.

When the XIO is configured for Ethernet-Serial passthrough, it supports the following modes:

— It acts as an Ethernet-Serial converter or adapter between the controller and the attached device. From the controller's and peripheral's point of view, the XIO is transparent and it serves only as a communication link. The XIO simply relays data traffic between the controller and the serial device.
— It acts as a TCP Gateway. The Passthrough function (server) supports Modbus TCP clients. The passthrough grants connections to Modbus TCP clients and processes communication packets for transmission of serial data traffic over the TCP connection.

The XIO has the flexibility to support Ethernet-Serial passthrough on a per COM port basis. Enabling this capability does not mean that the XIO can only serve as an Ethernet-Serial converter. The XIO supports concurrent passthrough services and XIO [Read or Write] services for the XIO Interface, the native communication interface on the ABB Totalflow remote controllers. The two types of services can co-exist and be active at the same time on different ports.

> **i** **IMPORTANT NOTE:** As an Ethernet-Serial converter using standard TCP/IP protocol, the XIO can connect to third-party remote controllers with standard protocol and Ethernet interface support or Modbus TCP client functionality.

1.1   Principle of operation

Ethernet-Serial passthrough provides several layers of functionality. At the network layer, it supports standard TCP/IP connections. Other functions are also supported, such as communication packet processing when acting as an TCP gateway. Once TCP connections are successfully established, the passthrough function provides monitoring capability on both the TCP end and the COM port end. The following sections give details on how the passthrough implementation works.

1.1.1   TCP/IP-based connections (network layer)

The Ethernet-Serial passthrough function supports standard link and network layer protocols to establish the remote controller-XIO connections. The connections are TCP/IP based. Both the remote controller and XIO must have valid IP configurations and be connected to the same network for connection to take place. Using TCP as the protocol allows multiple logical connections over the same physical connection: Ethernet.

1.1.2   RMC comm app – remote device communication

The following sections provide an overview of the key aspects of making the communication between the controller application and the remote device possible.

1.1.2.1   Client-server based

Figure 1-1 depicts a high-level view of Ethernet-Serial passthrough implementation. The remote controller (RMC on the left) shows communication applications instantiated locally. The XIO (in the center) shows peripherals directly attached to its COM ports. Ethernet-Serial passthrough has been activated for each of those ports (each port with its own passthrough instance). The communication applications on the RMC correspond to the type of device attached.

Figure 1-1: Ethernet-Serial Passthrough implementation
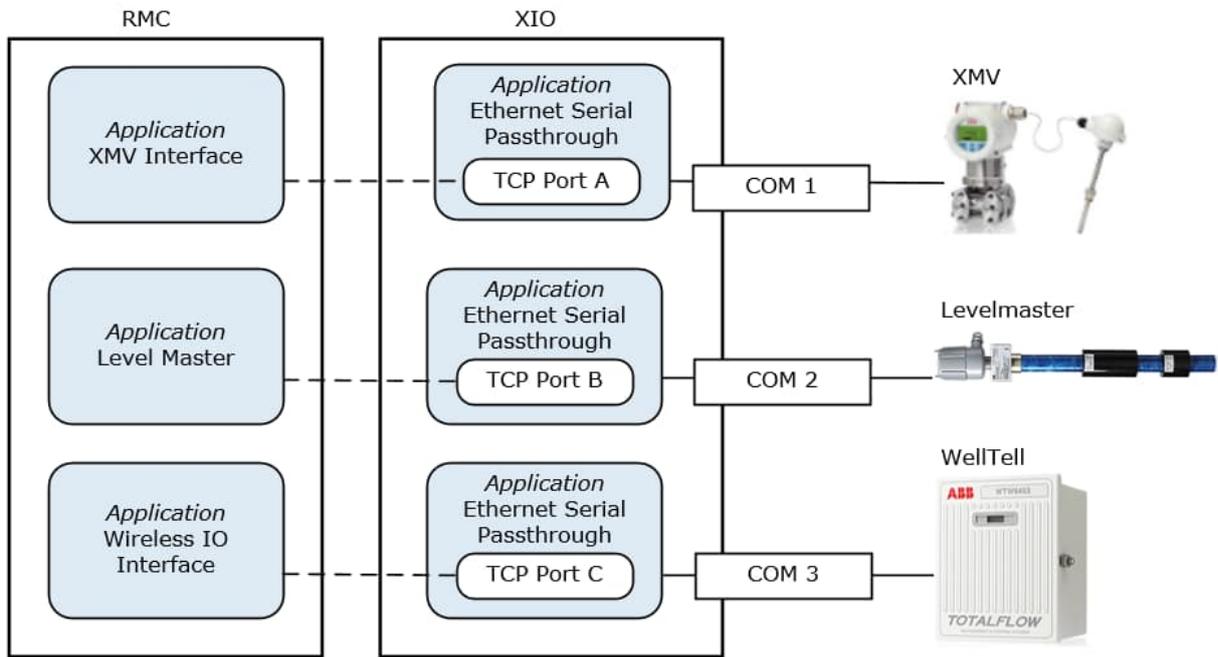
The connection between each communication application and its corresponding remote device is client-server based. The communication application on the RMC performs the client role and the Ethernet-Serial passthrough on the XIO performs the server role. As clients, the communication applications initiate connection requests to the passthrough instances. Once connection is successfully established, the application interacts with the device as designed for the device type.

Measurement applications on the RMC (not shown) are programmed to use remote device data obtained through the local communication application. They function as if the devices were wired directly to the RMC.

1.1.2.2   Establishing connections (TCP ports per connections)

During XIO configuration, a unique (unused) TCP port is assigned to the passthrough instance associated with a COM port. The passthrough service listens to this TCP port for communication requests and flow from the corresponding application on the RMC.

On the RMC side, each communication application must be configured with the same TCP port number as the one assigned to the passthrough instance for the corresponding port on the XIO. The application must also be configured to use the network port to send and receive data (instead of a local serial port). Figure 1-2 shows the communication application on the RMC (left) configured with the same TCP port as the passthrough instance on the remote XIO.

Figure 1-2: Remote application configuration for TCP connection with passthrough instance
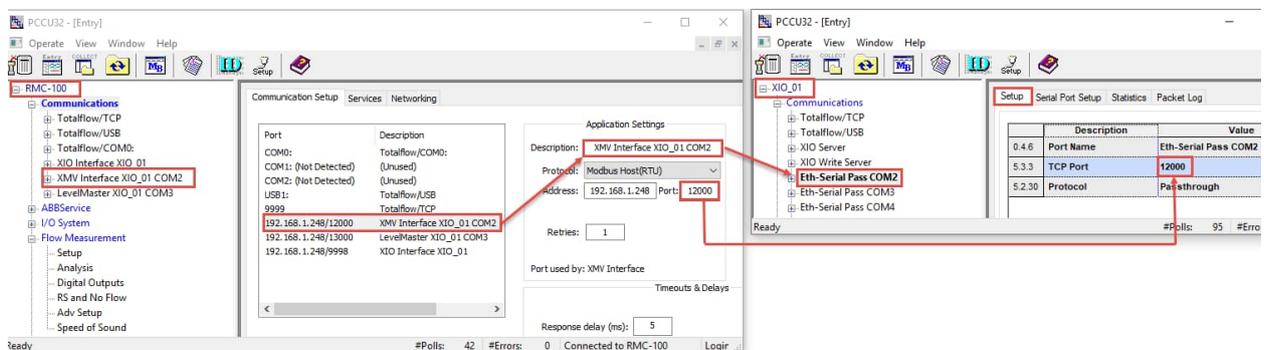
Once configured, the communication application requests and maintains a connection using the target XIO TCP port and IP address. In Figure 1-2 above, the XMV interface requests and maintains a

connection on TCP port 12000, the port assigned to the passthrough instance handling communication with the multivariable (XMV) wired to COM2.

Passthrough capability can be enabled on all XIO COM ports with one passthrough instance per COM port. Each instance handles a TCP connection. Applications on the RMC establish separate connections for communication on each COM port.

> **IMPORTANT NOTE:** The connections shown in the high-level diagram (Figure 1-1, on TCP ports A, B, and C) are logical connections only. All these connections may be supported over the same physical interface (such as Ethernet) on both devices. The devices may be connected directly or through the field network equipment.
>
> The unique XIO-IP/TCP combination on connection requests ensures that communication apps on the RMC connect with the correct XIO and device.

## 1.2 Passthrough provisioning facilitated by Auto Discovery

The Auto Discovery feature is a service running on ABB Totalflow devices that allows them to detect, advertise services, and respond to each other to facilitate the provisioning of the Ethernet-Serial Passthrough application.

Figure 1-3 shows a simplified diagram of the role Auto Discovery plays on the XIO. In the example below, an RMC and XIO are connected to a common network. The XIO advertises its services (Ethernet-Serial Passthrough), device ID, and other information such as its IP address on that network. The RMC detects this information and "learns" or processes the presence of the XIO. When configuring communications with the XIO, the XIO service options display on the RMC, making configuration easier and less error-prone. If Ethernet-Serial passthrough instances are added to an XIO, they are advertised as services. The RMC detects them as remote services on the network. Once detected, the service can then be assigned to the communication application.

> **IMPORTANT NOTE:** Auto Discovery is supported for XSeries[G5], RMC and XIO. For simplicity here, it is only shown in the XIO_01. The RMC, or another ABB Totalflow device on the same network, also has the capability to advertise information when its Auto Discovery service is enabled. The XIO advertises those services that are active and enabled.

Figure 1-3: Role of Auto Discovery in the XIO
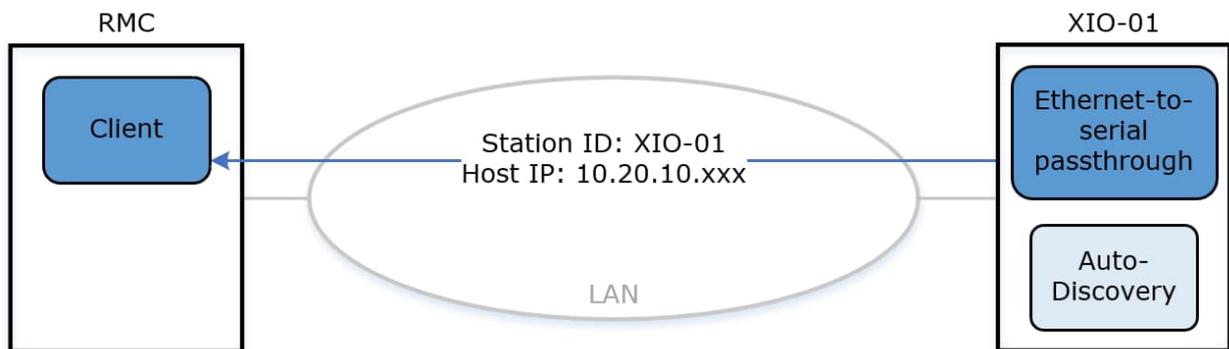
1.2.1 Passthrough services in multi-XIO installations

In multi-XIO installations, the RMC may detect passthrough services from several XIOs. Each advertised passthrough instance is detected as a remote service and is uniquely identified by the XIO Station ID. Note that there may be several service instances advertised for each XIO. When assigning a service to an RMC communication application, be sure to locate the correct instance per XIO ID.

> **IMPORTANT NOTE:** Auto Discovery only works if each device on the network has correct Station ID and IP configurations. At first-time installation, remember to configure valid and unique IP parameters and unique XIO IDs.

1.3 Available application screens and configuration options

The screens described in this section are available for each passthrough instance. Select the appropriate instance on the navigation tree to display or configure the correct instance.

— **Setup**: Configure the passthrough instance description/name, TCP port and protocol used to support each serial device.
— **Serial Port Setup**: Configure the parameters for the COM port that the passthrough instance is assigned to. COM parameters must match those of the serial device. The screen provides the option to select the type of serial device and then auto-configures optimal communication parameters for the selected type.
— **Statistics**: Track values for key parameters to monitor the health of passthrough communication or to help troubleshoot.
— **Packet log**: Monitor communication packet traffic on the TCP and COM port that the passthrough instance relays communication for.

2 Startup procedures

Configure the Ethernet-Serial passthrough on the XIO to support serial port expansion for a remote controller. The following procedures describe how to configure the XIO to support passthrough for an RMC-100. The configuration for both devices is included in this section.

The procedures in this section describe steps to configure passthrough for the communication between the RMC-100 and an ABB multivariable transmitter (XMV). This type of device requires the XMV Interface application as the communication interface between the RMC and the transmitter. For other device types, adapt the steps in these sections and use configurations applicable to the type of device.

2.1 Configure the XIO

This procedure configures the XIO Ethernet port to act as a passthrough for the specified serial port. It also configures the serial port for communication with the attached peripheral.

The serial port on the XIO can connect external devices such as XMVs and other transmitters while the corresponding interface application (for example, the XMV Interface) runs on the RMC.

Use any of the serial (COM) ports on the XIO to connect with any external serial device, such as radios and measurement transmitters. This scenario describes a single ABB multivariable transmitter (XMV) connected to the XIO. Other scenarios might include multiple XMVs on the same COM port or on multiple COM ports. If configuring multiple passthrough instances, review section 2.1.1 Name passthrough instances.

It is assumed that basic XIO configuration has been completed. The XIO must have a unique ID and IP address.

2.1.1 Name passthrough instances

When an XIO has several passthrough instances, each is advertised separately. It is important to take this into consideration when naming the instance on the XIO. A name identifying the associated COM port helps identify the instance needed. This can prevent errors such as assigning a communication application to the wrong remote COM port passthrough instance.

Figure 2-1 shows XIO_01 passthrough instances detected by the RMC. The instances have the default name the passthrough application had when added. Notice that while the application number is unique, there is no way to tell what COM port number the instance is assigned to.

Figure 2-1: Detected generic-named passthrough instances
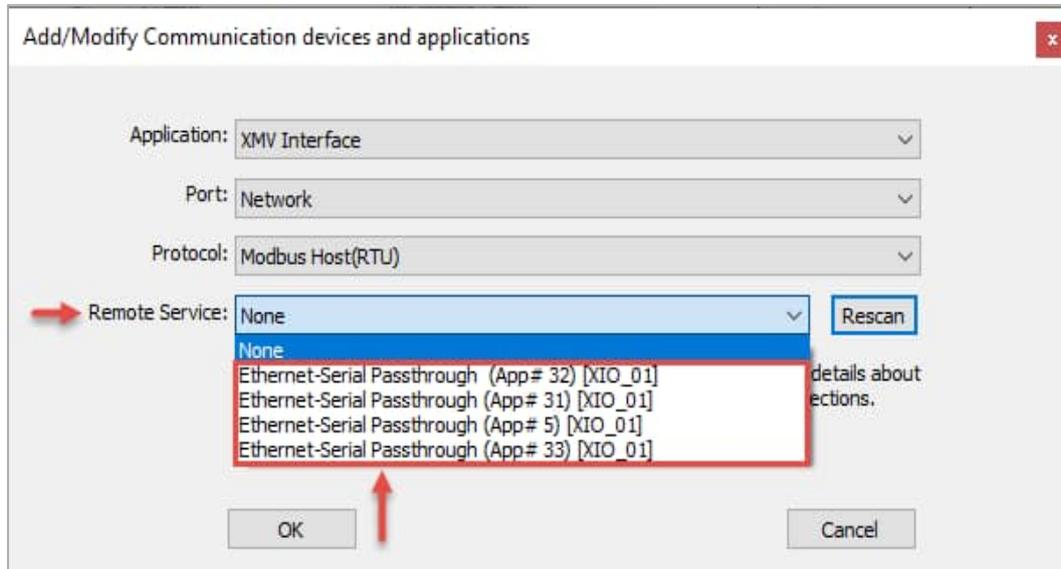
In Figure 2-2 the passthrough instances on XIO_01 have the assigned port in the instance name, making it possible to select the appropriate instance for the required port. The default passthrough name was changed after the application was added to make port identification easy. Use naming conventions appropriate for field requirements and company guidelines.

Figure 2-2: Detected passthrough instances named to identify associated COM ports
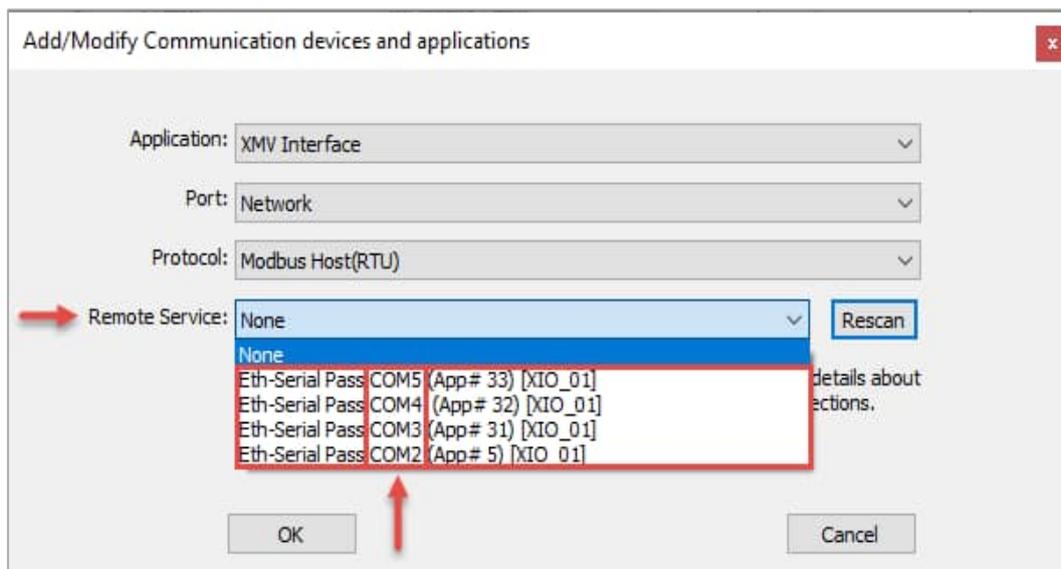
2.1.2   Add passthrough instance and assign COM port

To configure Ethernet-serial passthrough for an XIO COM port:

1. On the Navigation tree, select **Communications**. The Communication Setup screen displays.
2. Click **Add New Device/Application**.
3. Select **Ethernet-Serial Passthrough** from the **Application** drop-down list (Figure 2-3).

Figure 2-3: Add Ethernet-Serial Passthrough instance from Communication Setup
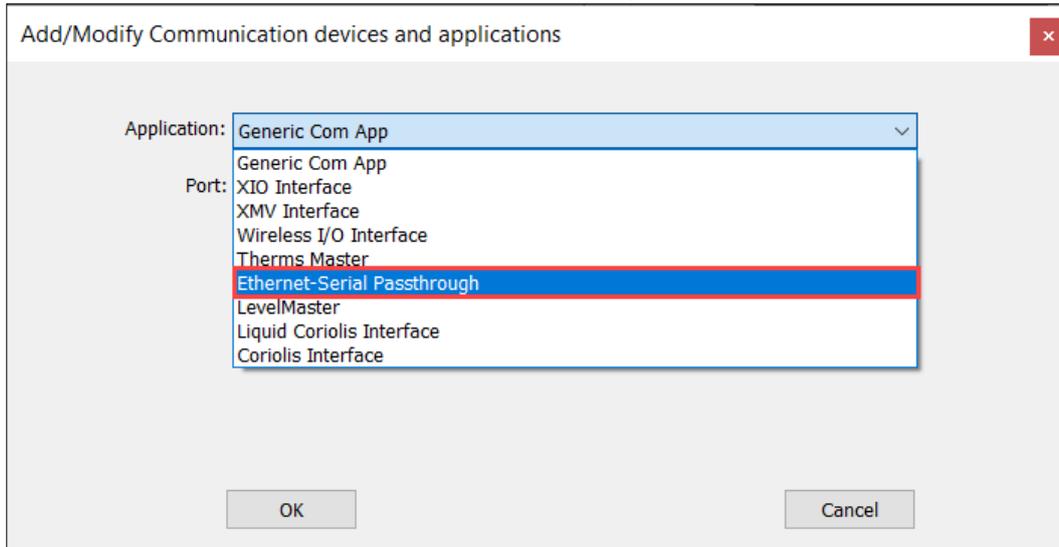
4. Select the required COM port from the **Port** drop-down list.

Figure 2-4: Assign COM port
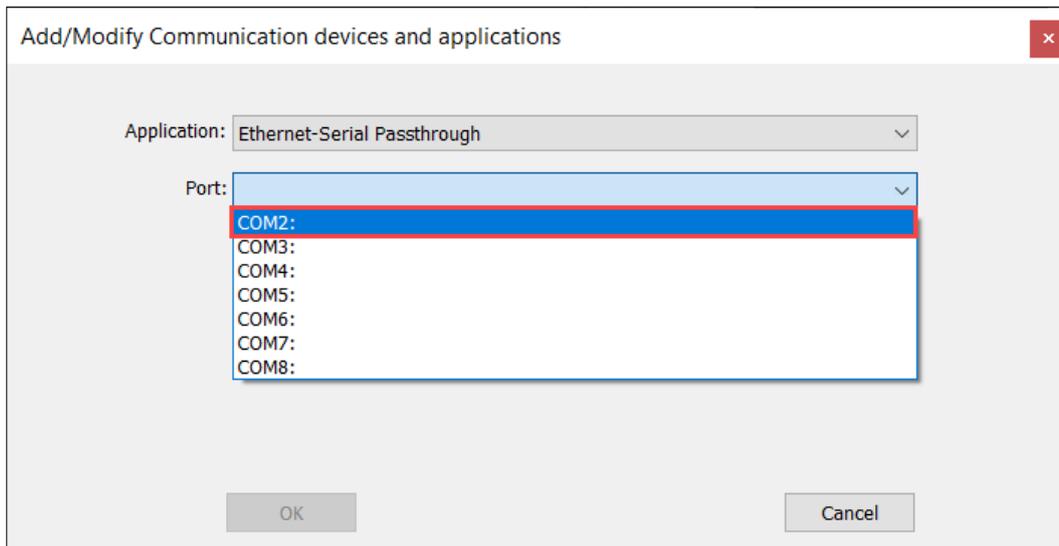
5. Select the required protocol from the **Protocol** drop-down list (Figure 2-5).

Figure 2-5: Select protocol
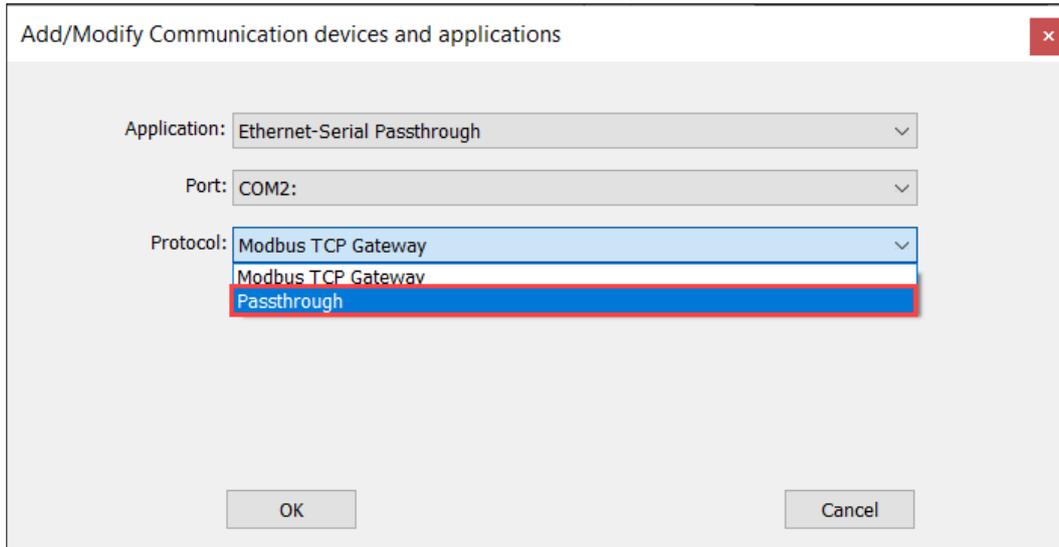
6. Click **OK** to complete selections and return to the **Communication Setup** screen (Figure 2-6).

> **IMPORTANT NOTE:** The serial port, to which the Ethernet-serial passthrough is applied, displays in the port list (Figure 2-6). The port shows as COM2:None. "None" indicates that the port and application do not have a TCP port assigned yet. The field Port (in the Application Settings section on the right) is the TCP port and the default is: None. Configure the port in the next steps. A unique TCP port is a required parameter for each Ethernet-Serial Passthrough instance.

Figure 2-6: Default passthrough instance name
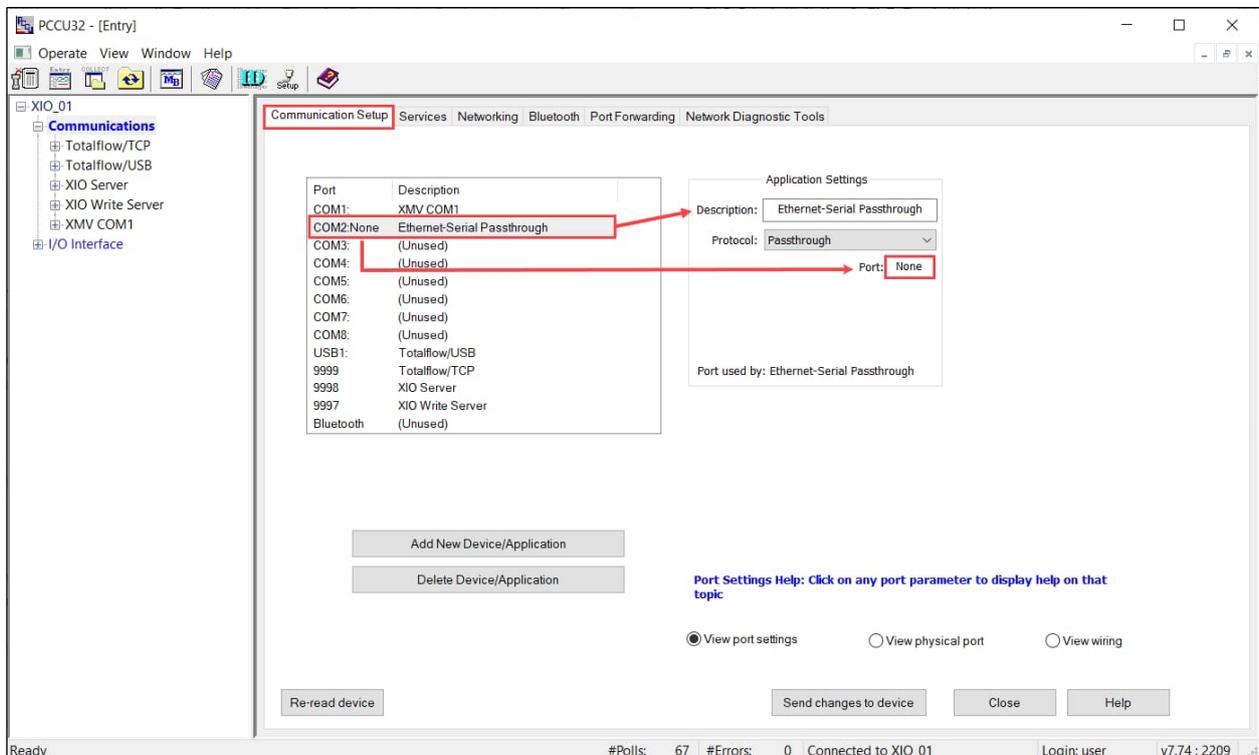
7. Configure Application Settings (Figure 2-7):
   a. Configure a new description that identifies the assigned COM port (recommended). recommended).

b. Configure the TCP port in the Port field. Type a number from the valid TCP range of 0-32768 (excluding ports already in use).

Figure 2-7: Configure passthrough instance settings
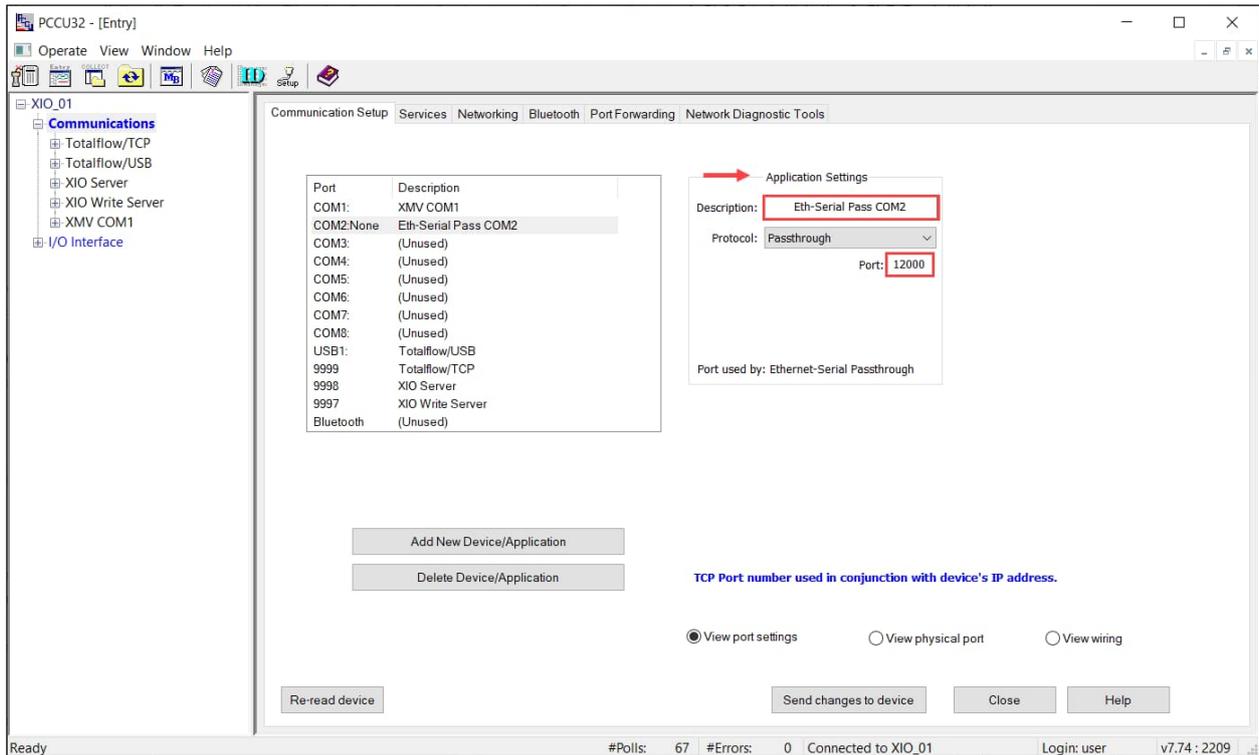
8. Click **Send changes to device**. The Ethernet-Serial Passthrough application displays on the navigation tree (Figure 2-8).

Figure 2-8: Added Passthrough instance displays on PCCU navigation tree
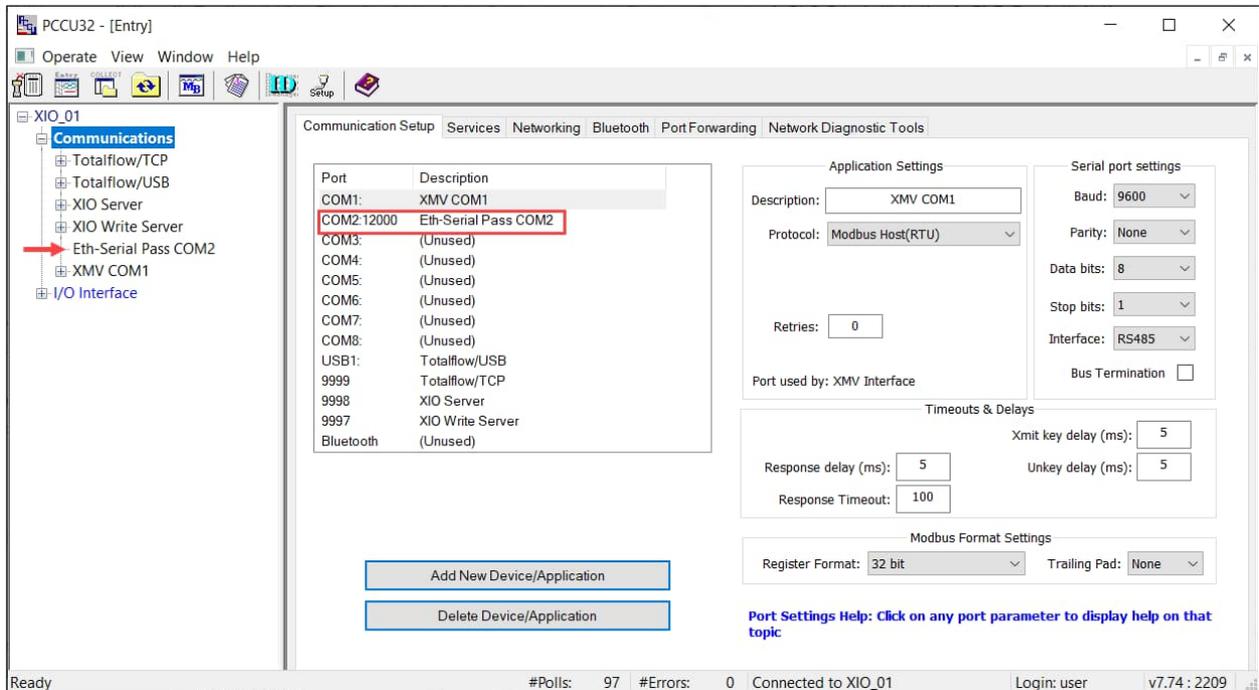
9. On the Navigation tree, select the Ethernet-Serial Passthrough instance created above. The **Setup** tab displays (Figure 2-9). Verify configuration, if needed:
a. Verify that the correct TCP port displays as configured in step 7.

b. Verify that the protocol selected at the time the application was added is correct. Change the protocol if required.

Figure 2-9: Passthrough instance Setup
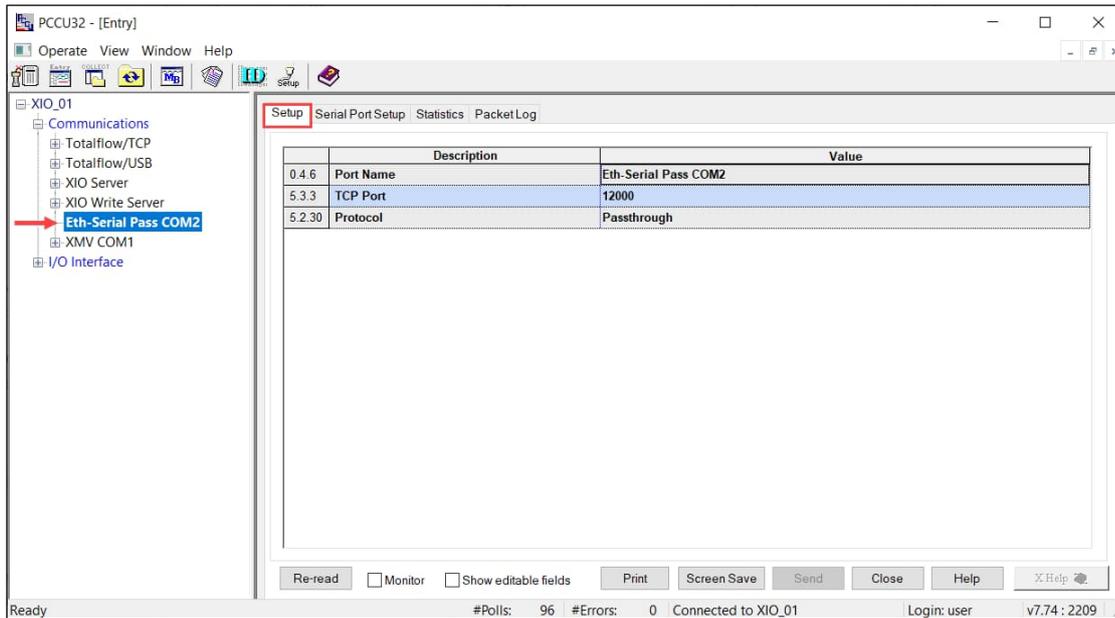
c. Click **Send** if configuration updates were done. Configuration updates display.
d. Click **Re-read** or refresh the navigation tree if there were configuration updates for the application name. The new port (passthrough application instance) name displays on the navigation tree.

2.1.3 Configure COM port

The COM port can be configured from the **Communication Setup** screen or the **Serial Port Setup** screen of the passthrough instance. Note that changes in one of these screens must be reflected on the other.

To configure the COM port from the Passthrough instance Serial Port Setup:

1. Select the passthrough instance on the navigation tree.
2. Select the **Serial Port Setup** tab (Figure 2-10).

Figure 2-10: Passthrough instance Serial Port Setup tab
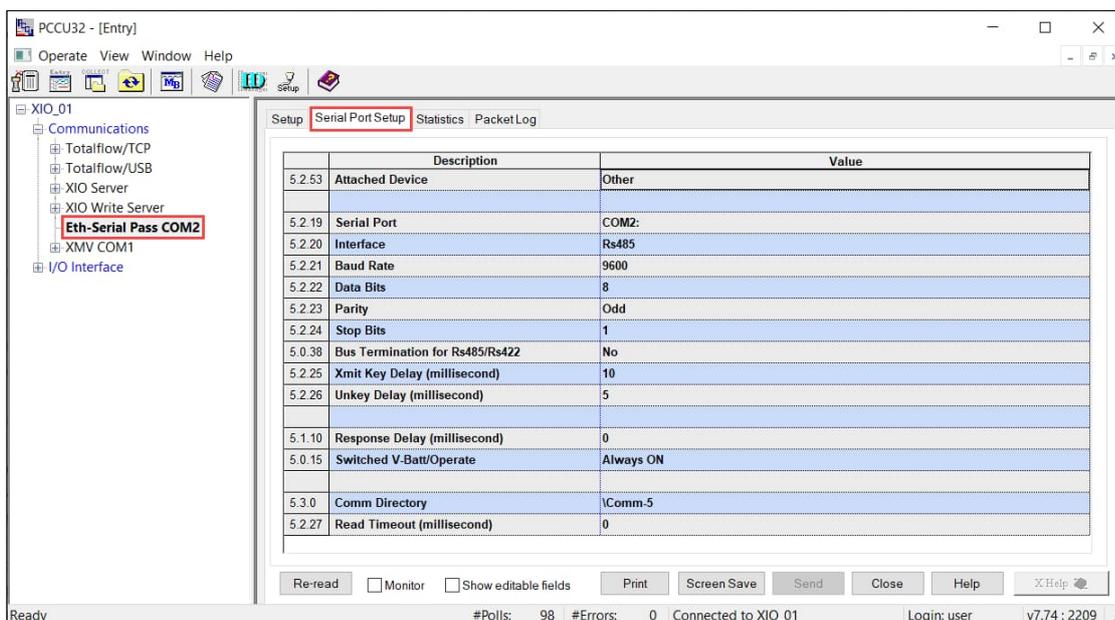
3. Select the type of device connected to the COM port from the **Attached Device** drop-down list ([Figure 2-11](#)). When selecting an ABB device type, default parameters provide optimal values for that type.

Figure 2-11: Select device type attached to COM port
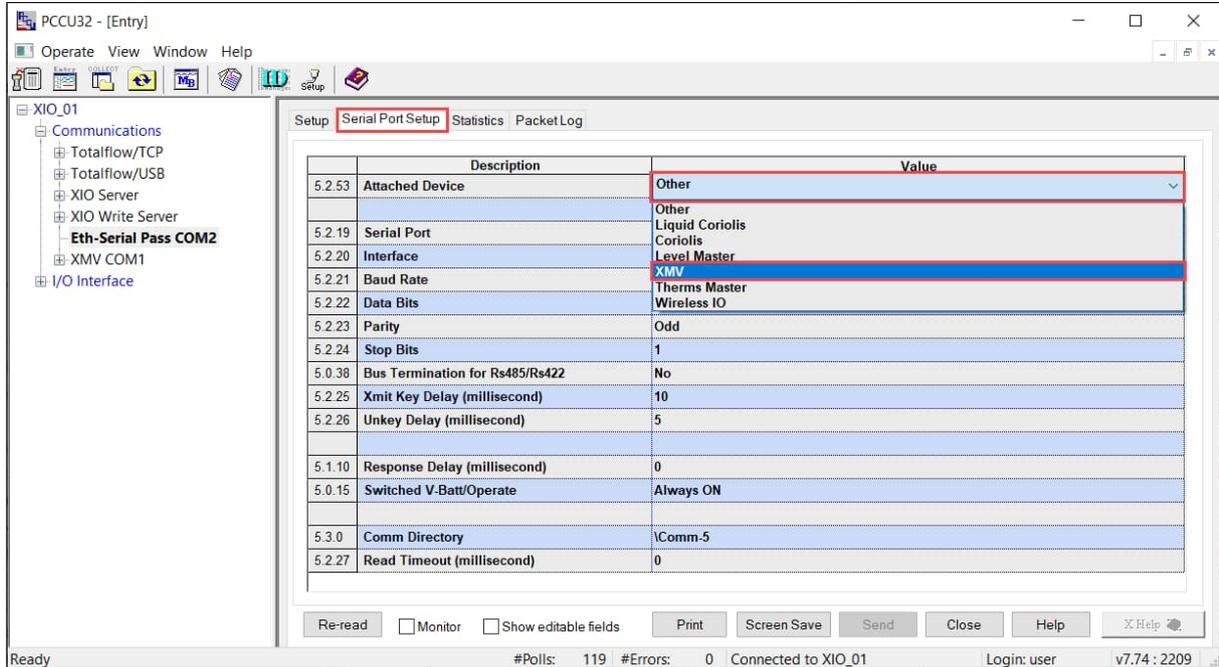
4. When fine-tuning default values or connecting to a third-party serial device, configure communication parameters to match those required by the attached device. These parameters must also match those configured on the application on the RMC ([Figure 2-12](#)).
5. Click **Send**.

Figure 2-12: Default serial port configuration for the ABB XMV
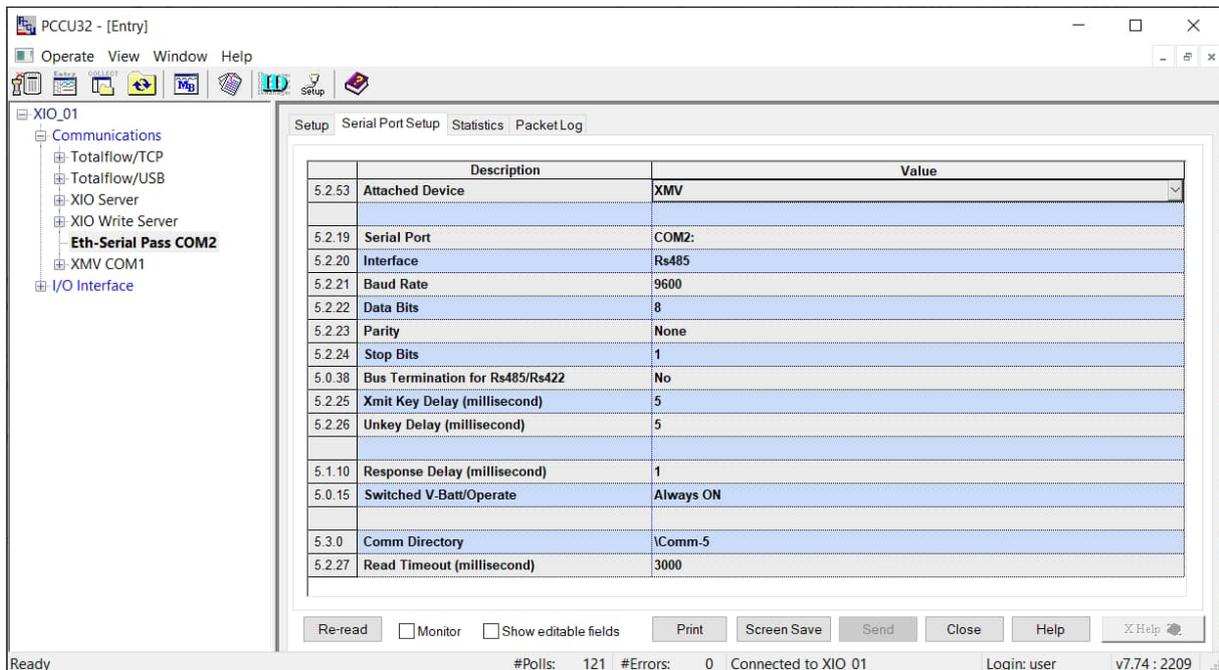
6. Configure additional parameters from the **Communication Setup** tab.
   a. Select **Communications** from the navigation tree to display the **Communication Setup** tab.
   b. Configure additional parameters available in the **Timeouts & Delays** section ([Figure 2-13](#)).

Figure 2-13: Serial port settings from the Communication Setup tab
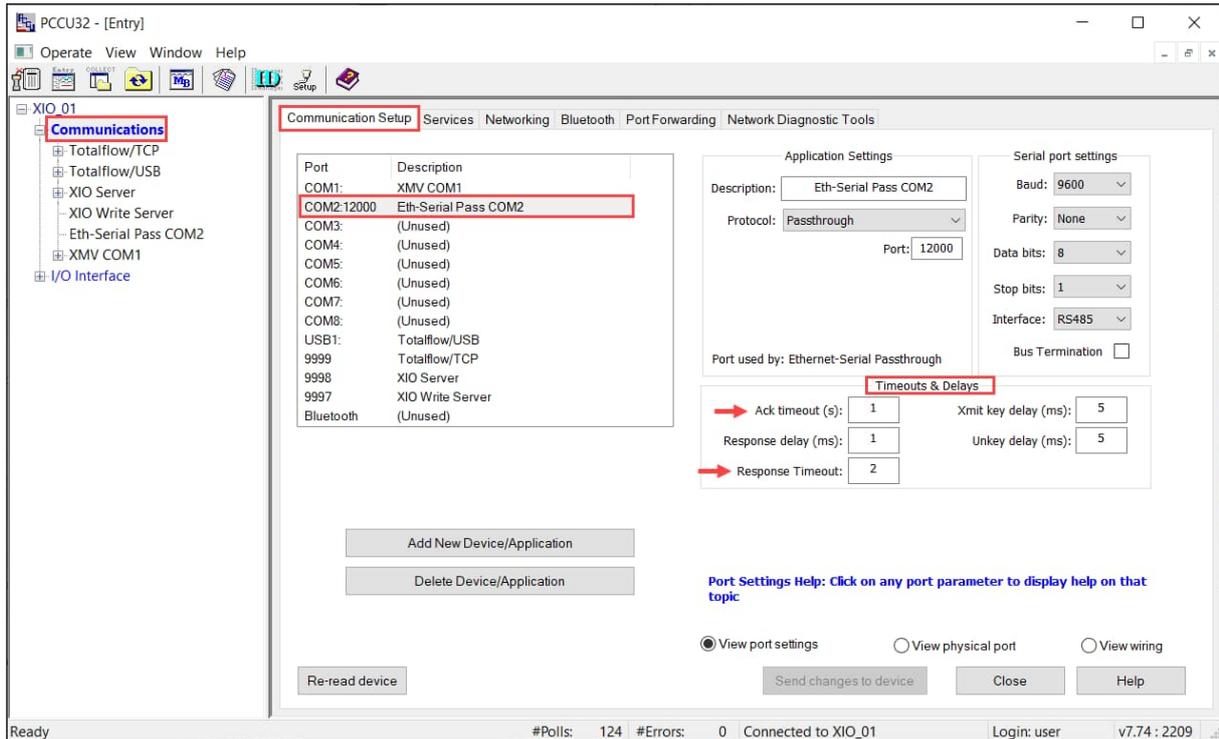
7. Click **Send changes to device**. Verify all configuration is as required.
8. If configuring multiple ports for passthrough, repeat the steps in this section for each required port.
9. Once all passthrough ports are configured, proceed to configure the communication application on the remote controller.

2.2   Configure the RMC

The RMC detects the Ethernet-Serial passthrough application instance(s) when instantiated on the XIO. The passthrough instance is automatically advertised by the XIO. This procedure takes advantage of the Auto Discovery feature to assign a local communication application to a remote COM port on the XIO.

2.2.1   Detecting passthrough services on remote COM ports

Figure 2-14 shows the passthrough instances the RMC detects (listed as remote services). These passthrough instances are advertised by the same XIO: [XIO_01].

Figure 2-14: RMC detects XIO passthrough instances as Remote Services
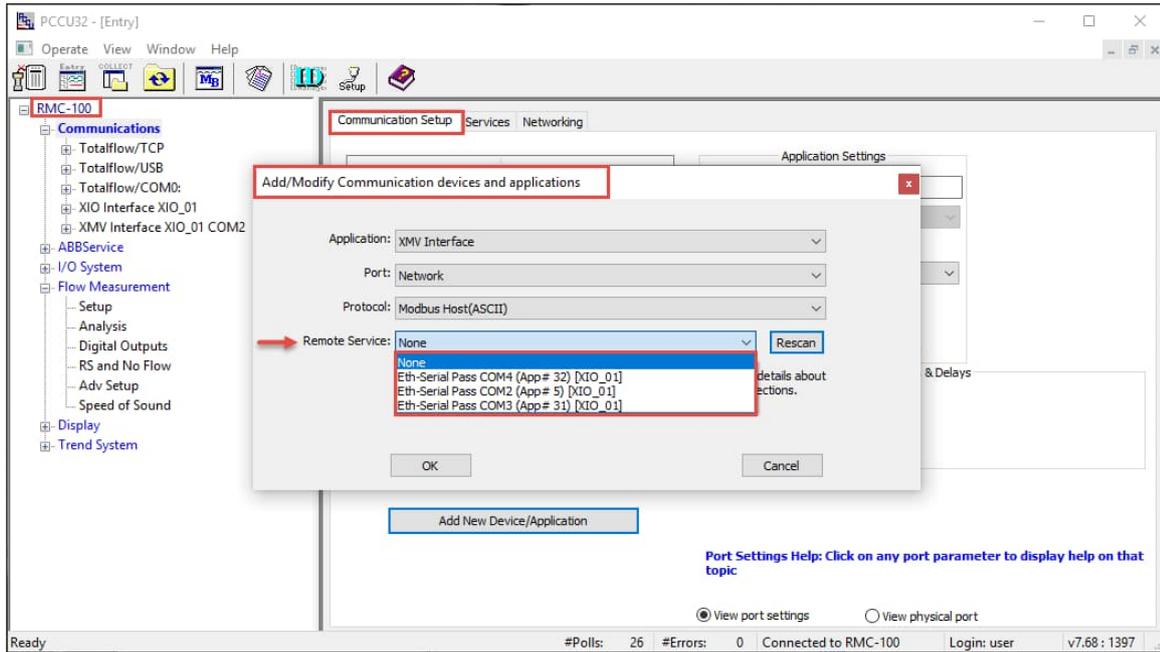
When the RMC detects passthrough services, it automatically determines the XIO ID, IP configuration, and passthrough instance TCP port assignment. These parameters are required by the communication application to establish connection with the passthrough instance assigned to the remote device. In Figure 2-15 the XIO IP address and TCP ports are autodetected after the communication application is assigned to a passthrough instance. The communication application is named: XMV Interface XIO_01 COM2. The IP/TCP information is in the port list and under the Application Settings section.

Figure 2-15: Automatically detected XIO connection parameters for passthrough instance
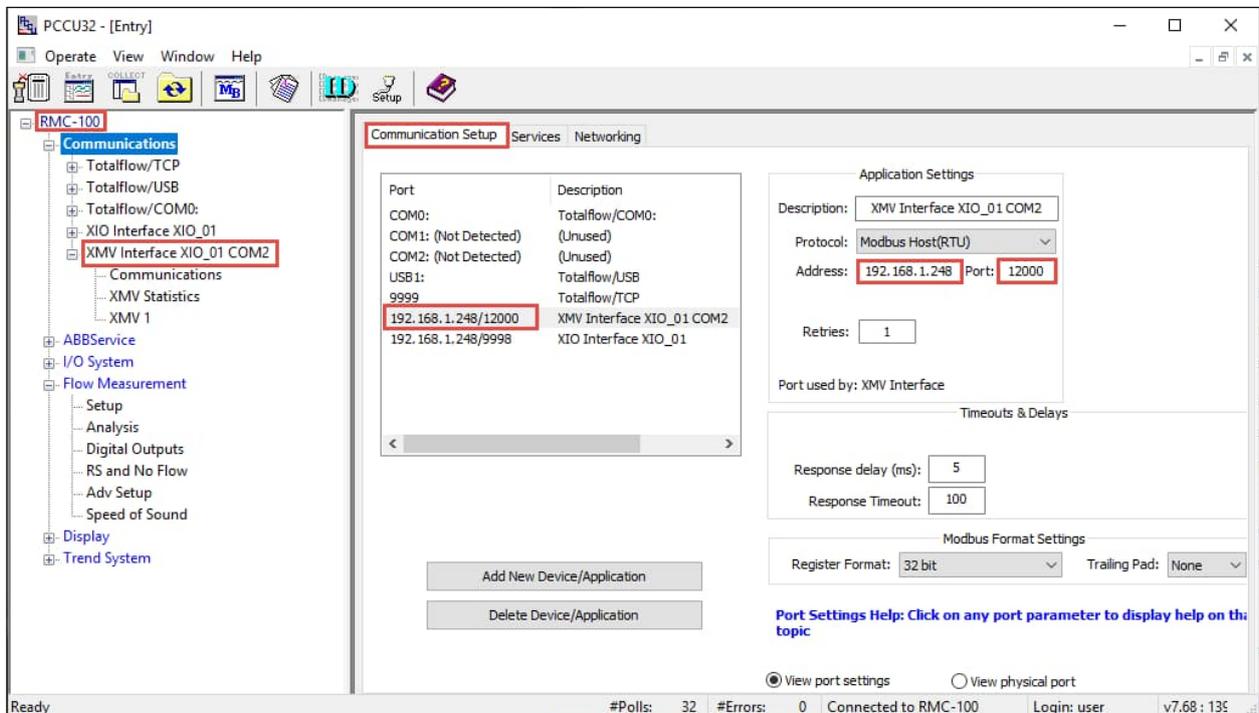
2.2.2   Add application and assign remote COM port

To configure a serial communication application on the RMC for an XIO COM port:

1. On the Navigation tree, select **Communications**. The Communication Setup tab displays.

2. Click **Add New Device/Application**. The Add/Modify Communication devices and applications window displays.

3. Select the serial communication application required from the **Application** drop-down list ([Figure 2-16](#)). For example, the XMV Interface application is selected for an XMV connected to the XIO.

Figure 2-16: Add serial communication app (example: XMV Interface)
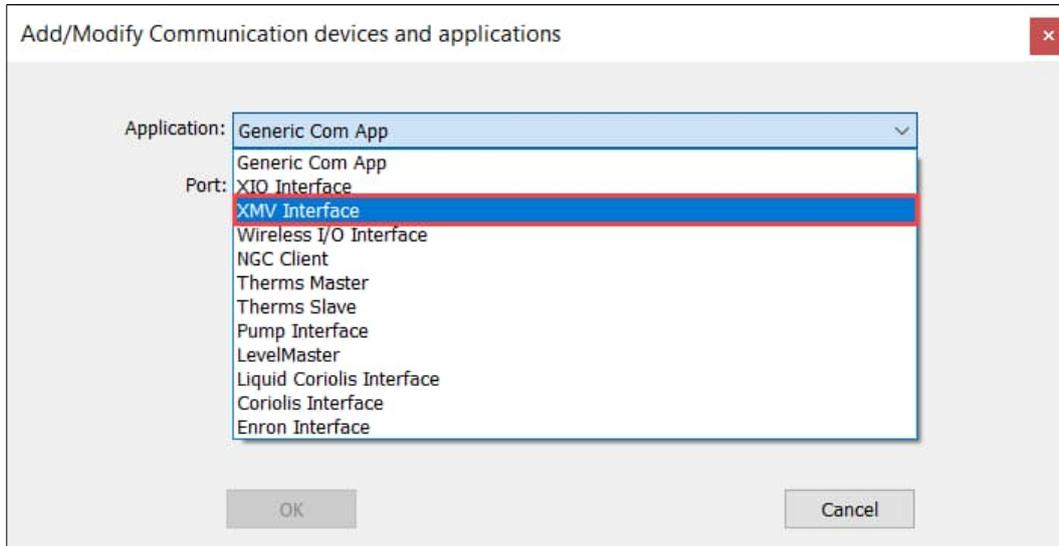
4. Select **Network** from the Port drop-down list ([Figure 2-17](#)). The network port here refers to the Ethernet port.

Figure 2-17: Select Network (Ethernet) port
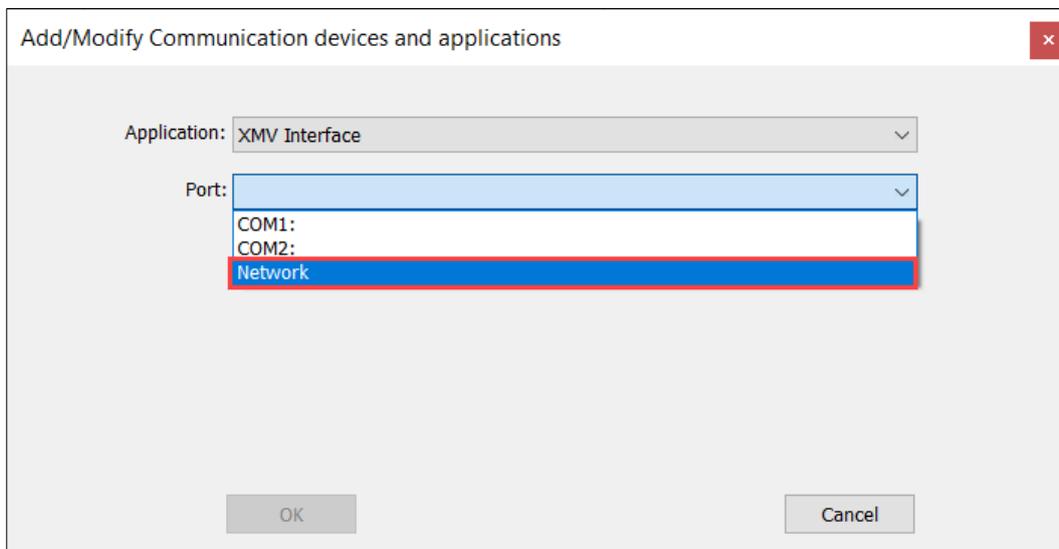
5. Select the required protocol from the **Protocol** drop-down list ([Figure 2-18](#)). This protocol is the serial protocol required for communication with the peripheral attached to the XIO COM port. Select the protocol that applies to the peripheral and type of communication.

Figure 2-18: Select protocol
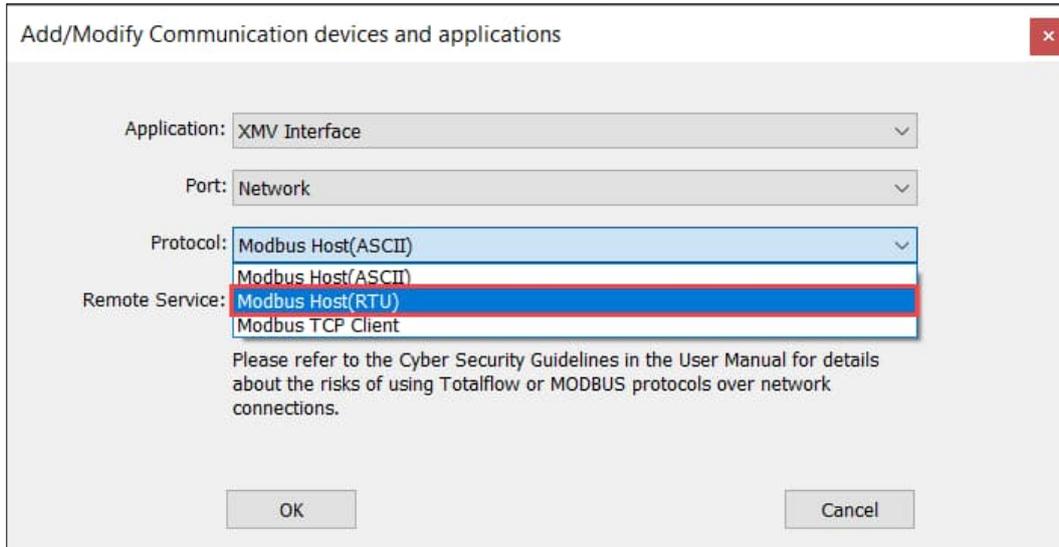
6. Select the XIO Ethernet-Serial Passthrough instance from the **Remote Service** drop-down list (Figure 2-19). The XIOs with the active Ethernet-serial passthrough function display automatically (they are detected by the RMC Auto Discovery feature). If you have changed the default Ethernet-Serial passthrough description as recommended, each instance uniquely identifies the associated port. The slot number assigned to the Ethernet-Serial Passthrough application on the XIO displays also.

Figure 2-19: Select the remote passthrough instance for the required XIO COM port
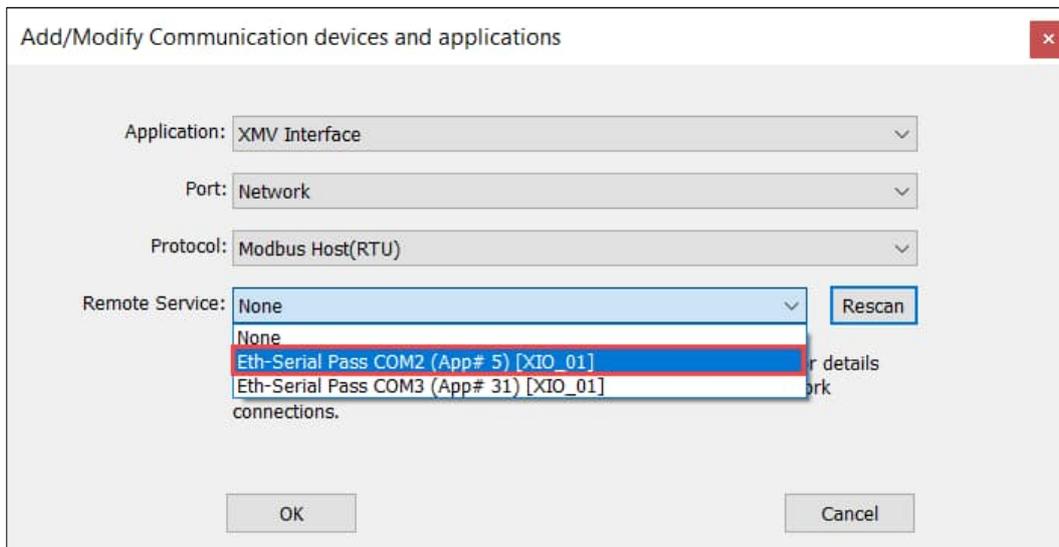
7. Click **OK** to complete selections and return to the **Communication Setup** screen. A new port displays in the port list with the associated application (XMV Interface in this example) (Figure 2-20). The port is the destination's logical port on the XIO: the combination of the XIO's IP address and the specific TCP port used to handle the communication to the associated serial port. The RMC automatically detects the TCP port assigned on the XIO.

Figure 2-20: Remote XIO COM port mapped to the RMC Network port
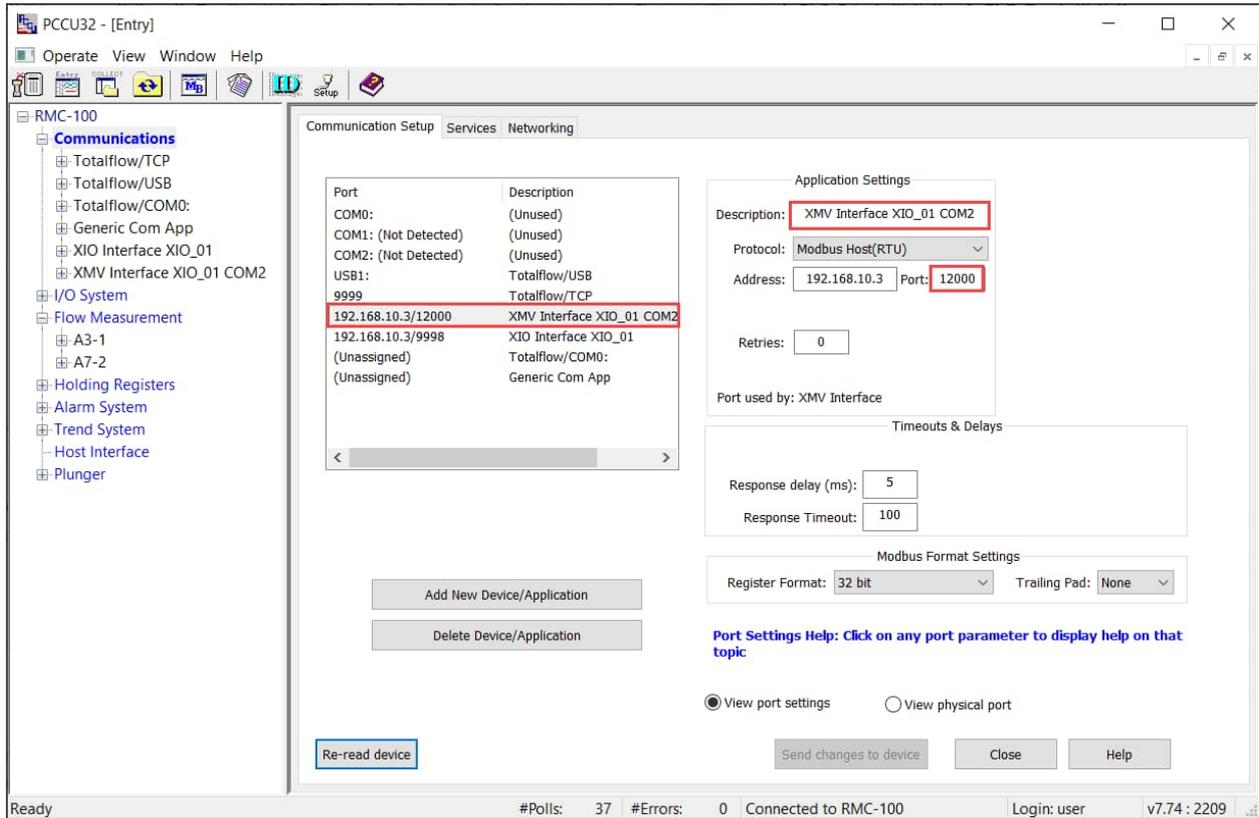
8. Verify Application settings and their default configuration. If you named the remote XIO passthrough instance identifying the XIO and the COM port, the description of the port should be unique. This helps identify the serial communication application uniquely if there are more than one.
9. Click **Send changes to device**.

> **IMPORTANT NOTE:** The description of the port reflects the user-given name under the Application Settings section. This name is also displayed on the navigation tree. Additional configuration parameters display on the Communication Setup screen: The Retries field under Application Settings, Timeout & Delays, and Modbus Format settings. For ABB serial devices, these parameters have optimal default values for the device type. If fine-tuning or configuration update is still required, then configure application, communication or format parameters in this screen or from the application-specific screens in the next steps.

2.2.3   Configure the Communication application

To configure the communication application:

1. On the navigation tree, select the application instance, then the **Setup** tab.
2. Configure the number of XMVs (if more than 1) (Figure 2-21). When multiple XMVs connect to the port, each of the XMVs must display on the navigation tree for individual configuration and management.
3. Verify that the Port, Port Type and Protocol parameters reflect the values selected when the application was added in the **Communication Setup** screen. Change parameter values if needed.

> **IMPORTANT NOTE:** The values for parameters must match those configured in the XIO where applicable. The values must also match the values on the corresponding passthrough instance Serial Port Setup tab.

Figure 2-21: Configure the number of XMVs if multiple connect
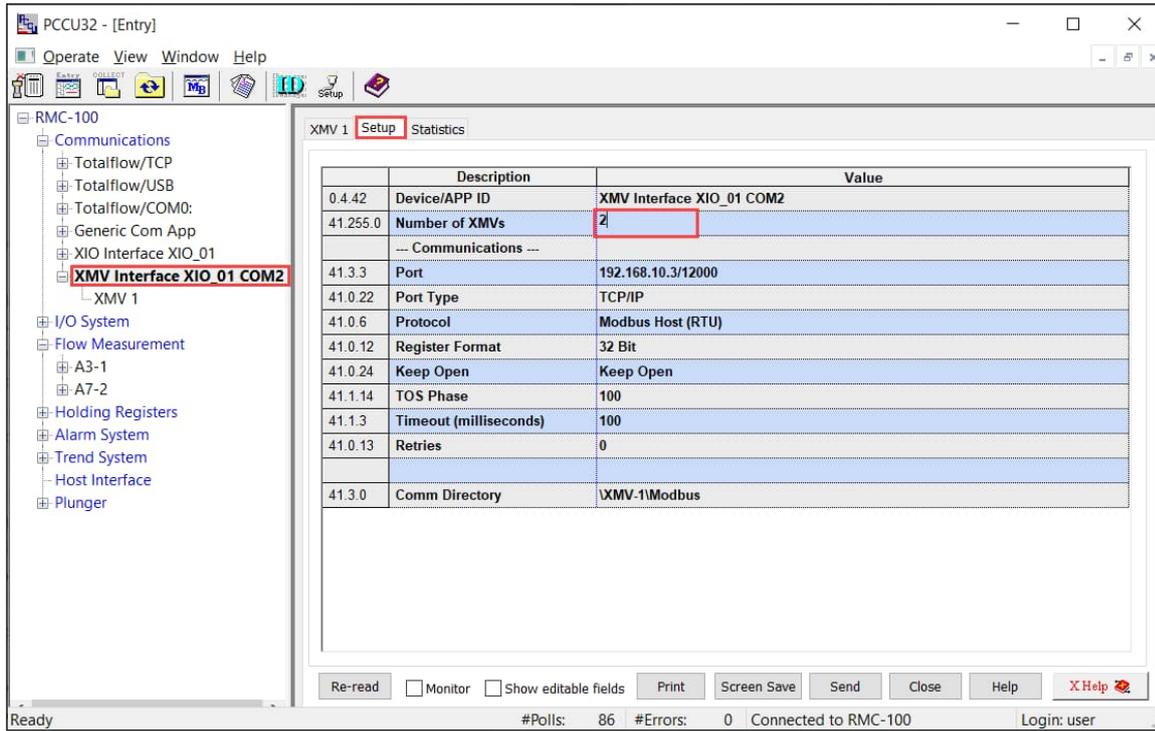
4. Click **Send**.
5. Configure the peripheral [XMV(s)] next.

2.2.4　Configure the peripheral

For ABB Totalflow peripherals, the controllers or flow computers may support peripheral configuration options within the applications assigned to those peripherals. In this example, the XMV Interface application on the RMC supports the XMV configuration of the multivariable connected to the XIO COM port. Configure the peripheral from the controller, if available. If the controller does not support the peripheral, configure from the peripheral HMI. For third-party peripherals, consult vendor documentation. For additional details and troubleshooting tips for the XMV, see the XMV User Manual.

To configure the XMV:

1. On navigation tree, select the XMV to configure. The **Values** tab displays. No values display until the XMV configuration is complete (Figure 2-22).

Figure 2-22: XMV instance values tab
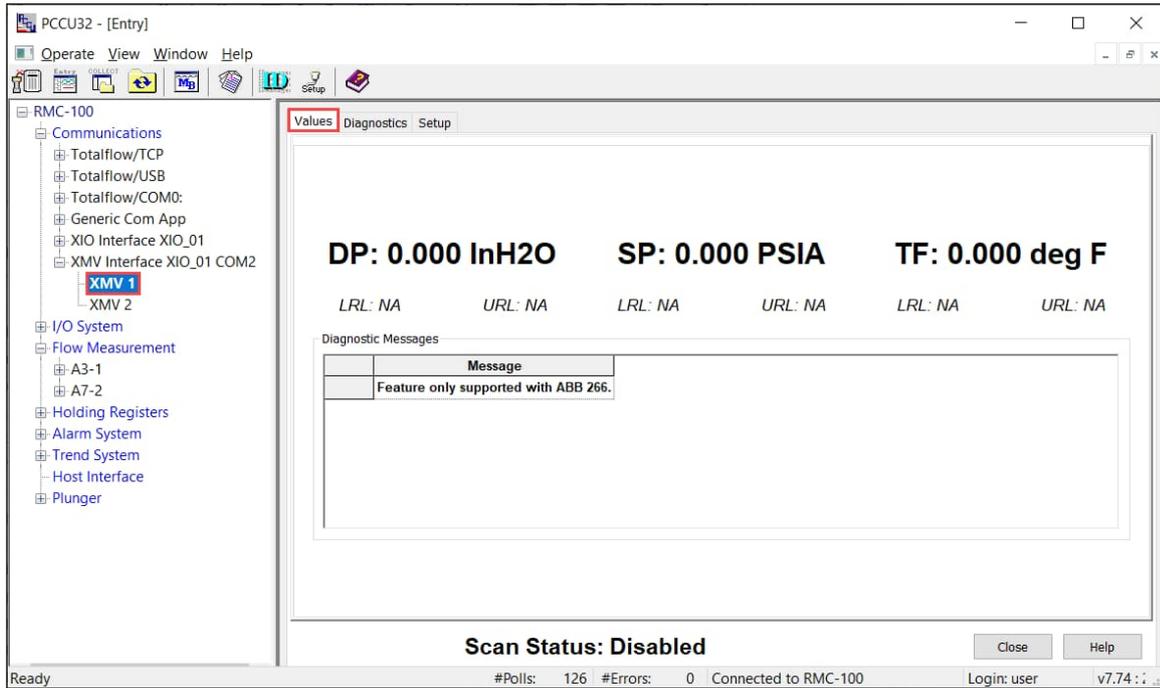
2. Select the **Setup** tab (Figure 2-23).
3. Configure XMV parameters:
    a. Under XMV Displays, if **Scan** is enabled, change to **Disabled** (Figure 2-23).
    b. Click **Send**. This activates parameter fields for configuration.

Figure 2-23: Set XMV Scan to disable to activate configuration parameter fields
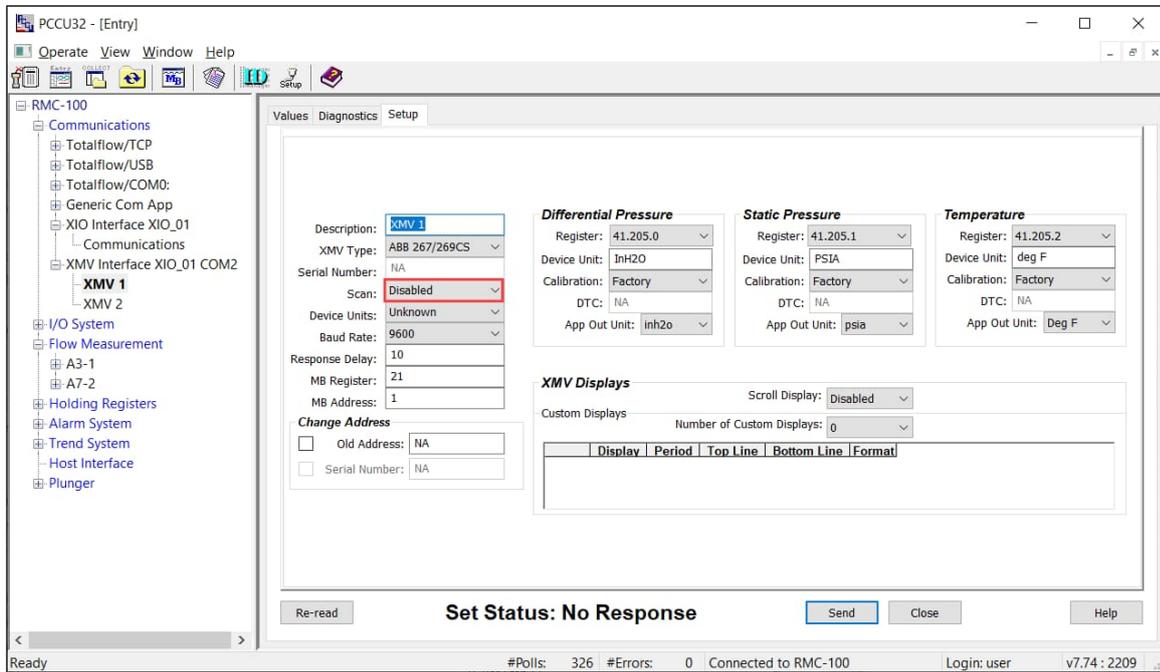
c. Configure the required parameters: Device Units, Baud Rate, etc.
d. Select **Enable** in the **Scan** drop-down list (Figure 2-24).
e. Click **Send**.

Figure 2-24: Enable XMV
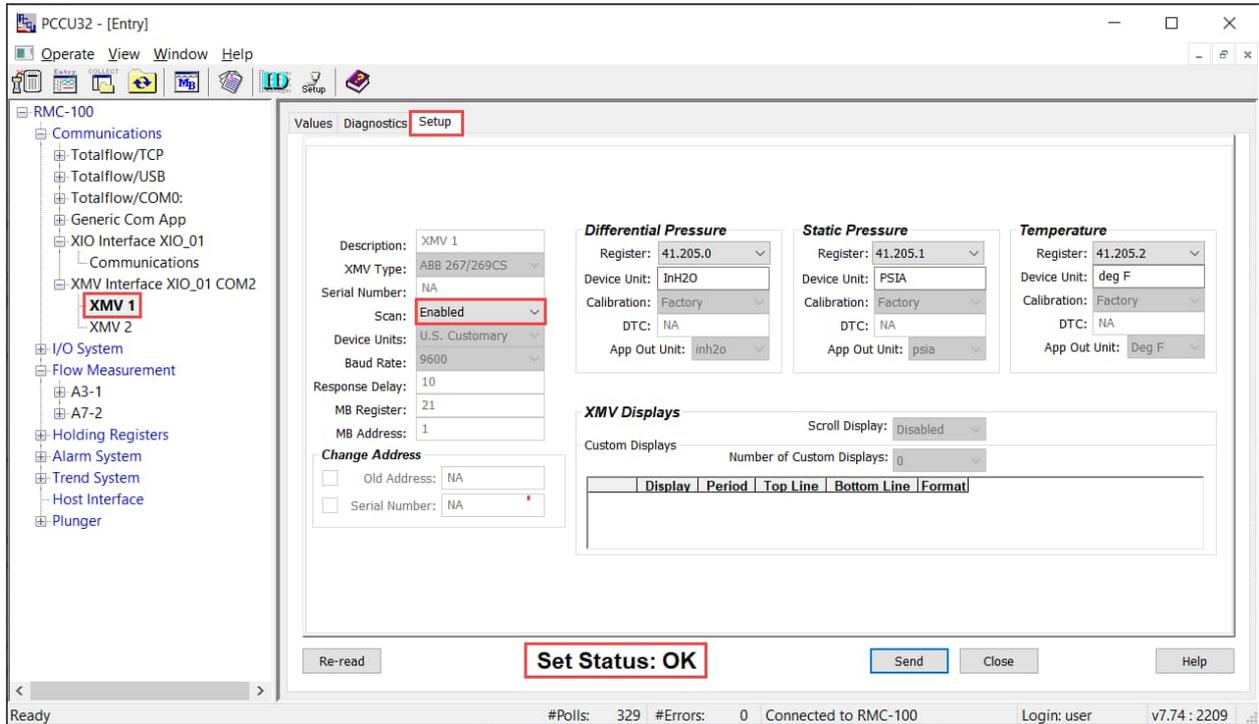
4. Verify that the Set Status displays: OK.
5. Select the **Values** tab.
6. Verify that the XMV measurement values (DP, SP, TF) display and that the message "Scan Status: OK" displays.

2.2.5 Configure measurement applications to use XIO values

Configuring a measurement or control application to obtain values from the communication application assigned to a remote serial device is the same as if the serial device was directly connected to the remote controller. The following procedure provides the example of configuring an AGA3 application instance to use the measurement values captured by the XMV Interface application on the RMC.

To configure measurement applications with the remote XMV measurement values:

1. Obtain the register values used by the RMC communication application. In this example, the XMV application stores the remote peripheral values in local RMC registers.
   a. On the navigation tree, select the XMV Interface instance assigned to the remote device, then select the specific XMV instance.
   b. Select the **Setup** tab (Figure 2-25).
   c. Take note of the Register numbers for the measured variables.

Figure 2-25: Registers for an XMV instance measurement values
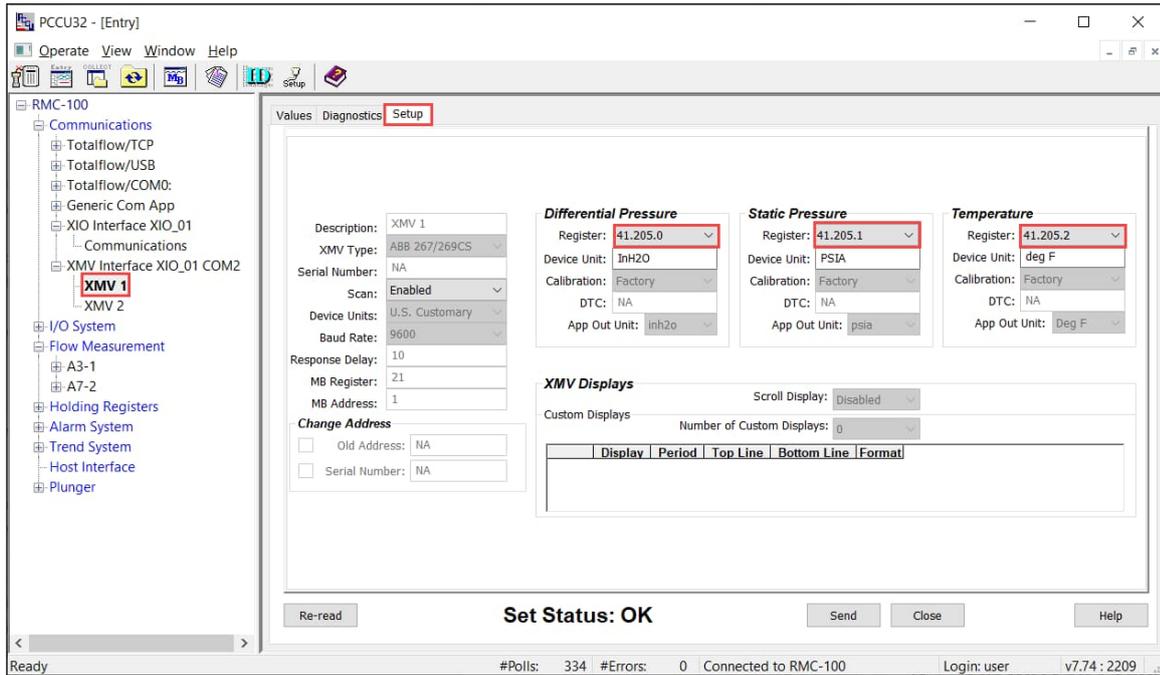
2. On the navigation tree, expand the desired measurement application instance (in this example AGA3), and then select **Adv Setup**. The **Setup** screen displays (Figure 2-26).
3. Configure register values obtained in step 1 for each of the variables.

Figure 2-26: Configure XMV value registers into the measurement application
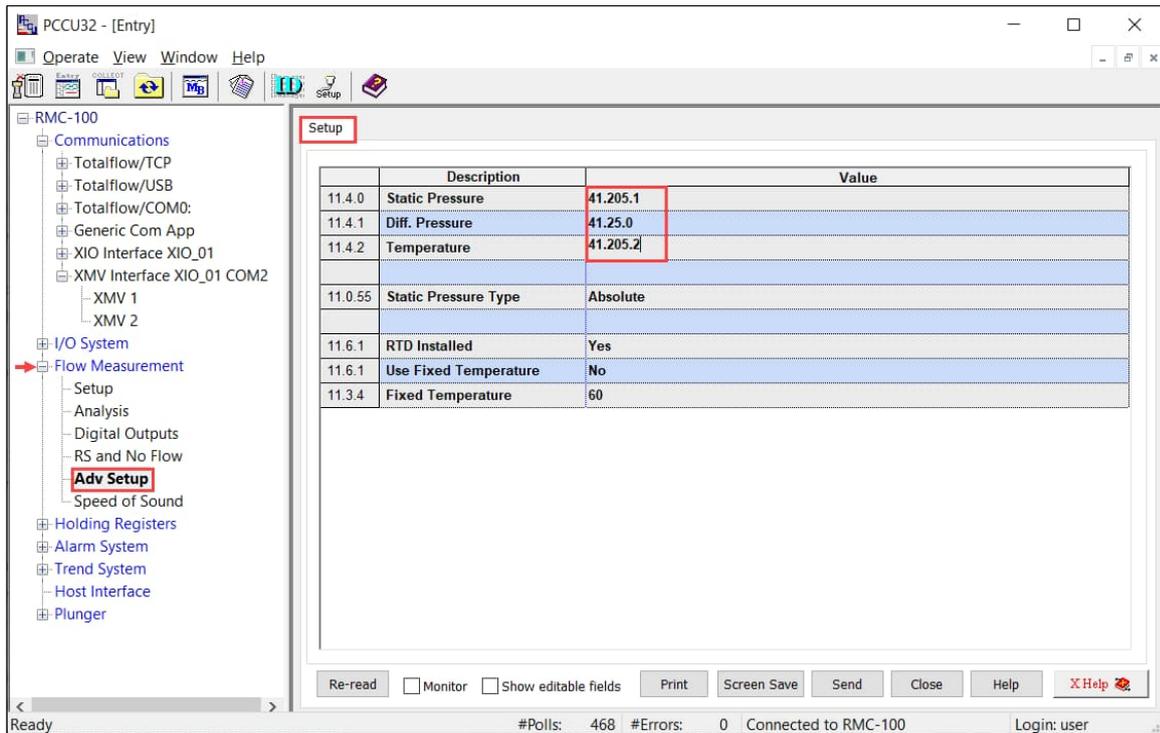
4. Click **Send**. The measurement application instance can use the remote peripheral values in the calculations as required.

Additional application configuration is beyond the scope of this document. Click **Help** on the application screens for more specific information.

3 Troubleshooting

The Ethernet-Serial Passthrough Statistics and Packet Log tabs provide valuable information to identify errors in communication or failure.

To troubleshoot passthrough instances, it is important to focus on isolating the issue first on the XIO-serial device connection, then on RMC-XIO connection.

— Always check for incorrect or loose wiring.
— If the problem is narrowed down to being between the XIO and serial device, instantiate a local communication application and verify that the XIO and serial device can communicate when the communication application runs locally on the XIO. If this works, then the wiring is correct, and the serial device is functioning properly. Try communicating with the remote communication application again if the device configuration was updated or wiring corrected.
— Check for communication loop times. Excessive loop times can indicate a problem with the RMC-XIO connection. This can be due to faulty network connection or a busy network. Verify physical connections and network utilization on network ports.

3.1 Monitor errors in communication

The first indication of problems with communication is an excessive or increasing number of errors displayed on the Statistics screen.

To monitor for errors:

1. On the navigation tree, select the passthrough instance of interest.
2. Select the **Statistics** tab ([Figure 3-1](#)).
3. Select **Monitor** at the bottom of the screen.
4. Verify the number of Polls and Errors. No errors and an increasing number of polls indicate that communication is taking place. If there is a small number of errors that does not increase, these may have been logged during initial connection or configuration.

Figure 3-1: Statistics – monitoring polls and number of errors

5. If errors display, reset statistics:
   a. Locate the Reset Statistics function and select the field.
   b. Select **Now** from the drop-down list, then click **Send** to reset.
6. Monitor the number of errors again. If the error count is increasing and the poll count does not, communication through the passthrough has failed.
7. Verify the wiring of the external device.

3.1.1 Verify communication loop times

Excessive packet loop times may indicate issues with the RMC-XIO connection. The passthrough function calculates loop times for each request and displays them on the Statistics screen. On the RMC, the communication application reflects loop time performance issues with the late counts.

To monitor loop times on the XIO:

1. On the navigation tree, select the passthrough instance of interest.
2. Select the **Statistics** tab ([Figure 3-2](#)).
3. Select **Monitor** at the bottom of the screen.
4. Verify the loop times. Loop times should be less than 100 milliseconds for optimal communication.

Figure 3-2: Statistics – monitor poll loop times
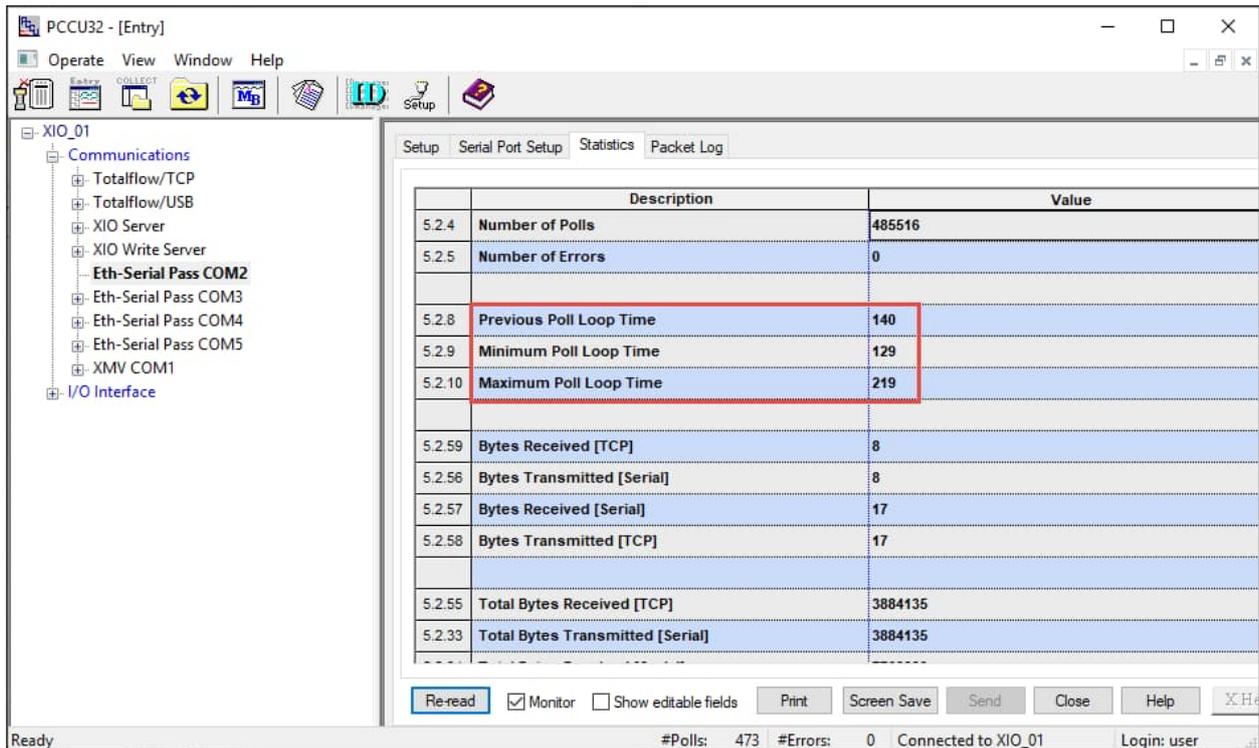
4 Reference information

The information included in this chapter provides detailed parameter descriptions for each of the XIO Ethernet-Serial Passthrough screens.

> **IMPORTANT NOTE:** Help topics are available for each of the screens. Click **Help** to display the topic. Online topics contain the most up-to-date information.

4.1 Setup

The Ethernet-Serial Passthrough Setup screen provides configuration options to name a passthrough instance and provide required parameters for successful TCP connection. On this screen:

— Define a unique name for an Ethernet-Serial Passthrough instance assigned to an XIO COM port.
— Assign a unique TCP port to support connections with the remote controller.
— Select the protocol that the XIO uses to process communication flow between the remote controller and the device(s) attached to the associated XIO COM port.

Figure 4-1: Ethernet-Serial Passthrough – Setup Screen
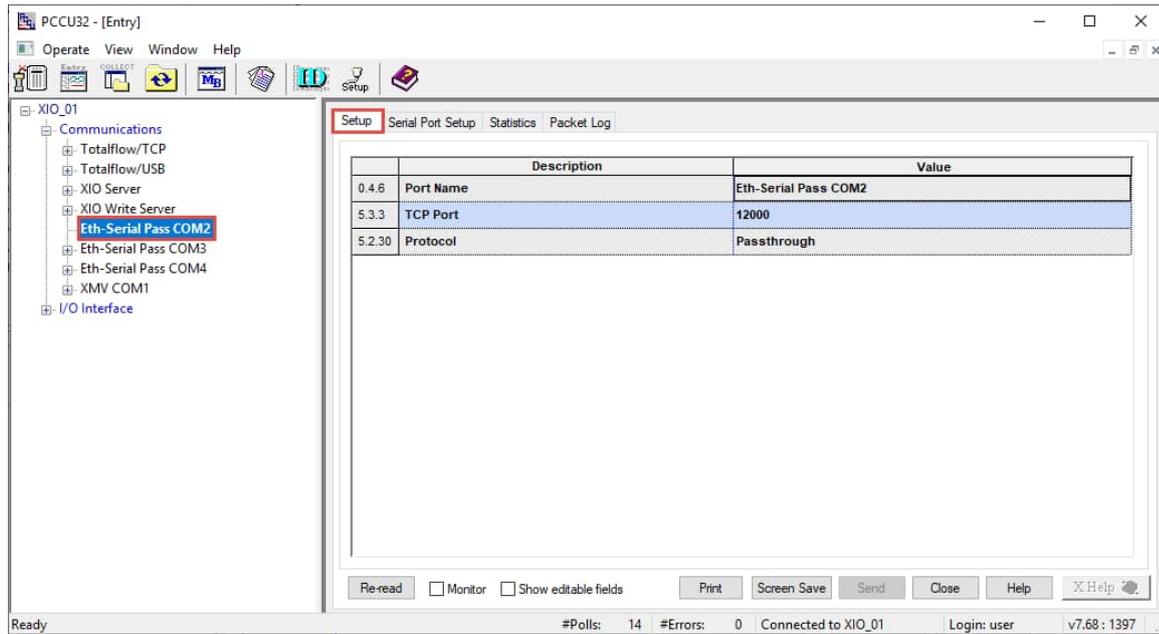
The XIO Ethernet-Serial passthrough capability requires successful TCP connections. The remote controller must successfully establish these connections with an XIO before it can communicate to serial devices attached to the XIO.

The Setup screen is available only after an Ethernet-Serial Passthrough instance is added. The XIO factory configuration does not have any passthrough instances configured by default.

A single passthrough instance supports only a single COM port and a single connection with the remote controller. If passthrough is required for multiple COM ports on an XIO, instantiate a passthrough instance for each port. Configure each instance from its corresponding Setup tab.

4.1.1   Parameter description

The table below provides parameter or function description for the Setup screen.

Table 4-1: Ethernet-Serial Passthrough – Setup parameter description

Parameter/ Function	Description	Values
Port Name	Name of the Ethernet-Serial Passthrough application instance assigned to an XIO COM port. The name is the same as the one displayed in the Application Settings Description field in the Communication Setup tab. The name displays on the XIO navigation tree view.	A generic application name is automatically assigned when the instance is added on the XIO. If multiple instances are added, the name may also have an instance number to help distinguish them. Change the default/generic name to help identify which COM port the instance is associated with. Default (generic): <Ethernet-Serial Passthrough–[n]>. Where n is the instance number. User-defined (recommended): Type up to 31 characters for a new name. **Note:** the name may also be changed from the Communication setup tab.
TCP Port	Logical port the Ethernet-Serial passthrough instance listens to for connection requests from a communication application on a remote controller. The port must be unique and not in use by any other XIO application. The remote controller must "know" this port to establish a connection with the XIO. The port can be auto detected	User-defined Type a valid and unique TCP port number. Select from the following range: 0-32768 (excluding ports already in use). **Note:** Manage TCP port assignments carefully. Ensure that the TCP port is not in use by another passthrough instance.

Parameter/ Function	Description	Values
	during auto discovery or manually configured on the controller. The TCP port configured for the remote application must match this port configured in this screen.	
Protocol	Mode of operation of the passthrough instance. It determines how it handles communication packets from the remote application.	Select a protocol from the drop-down list: – Passthrough (Default): Select for transparent communication packet relay. The XIO transmits and receives communication packets between the remote application and the attached device without modification of the packets. The XIO simply relays traffic and acts as a transparent medium between the controller and the device. – Modbus TCP gateway: Select when the communication application running on the remote controller uses Modbus TCP client as the protocol. The XIO processes communication between the remote application and the attached device by managing the Modbus TCP protocol packet headers. The passthrough strips incoming packets of their headers to extract serial data and forwards to the serial device.

4.2 Serial Port Setup

The Serial Port Setup screen displays configuration parameters for the XIO COM port. XIO COM ports support standard RS232/RS485/RS422 serial interface parameters.

Figure 4-2: Ethernet-Serial Passthrough – Serial Port Setup
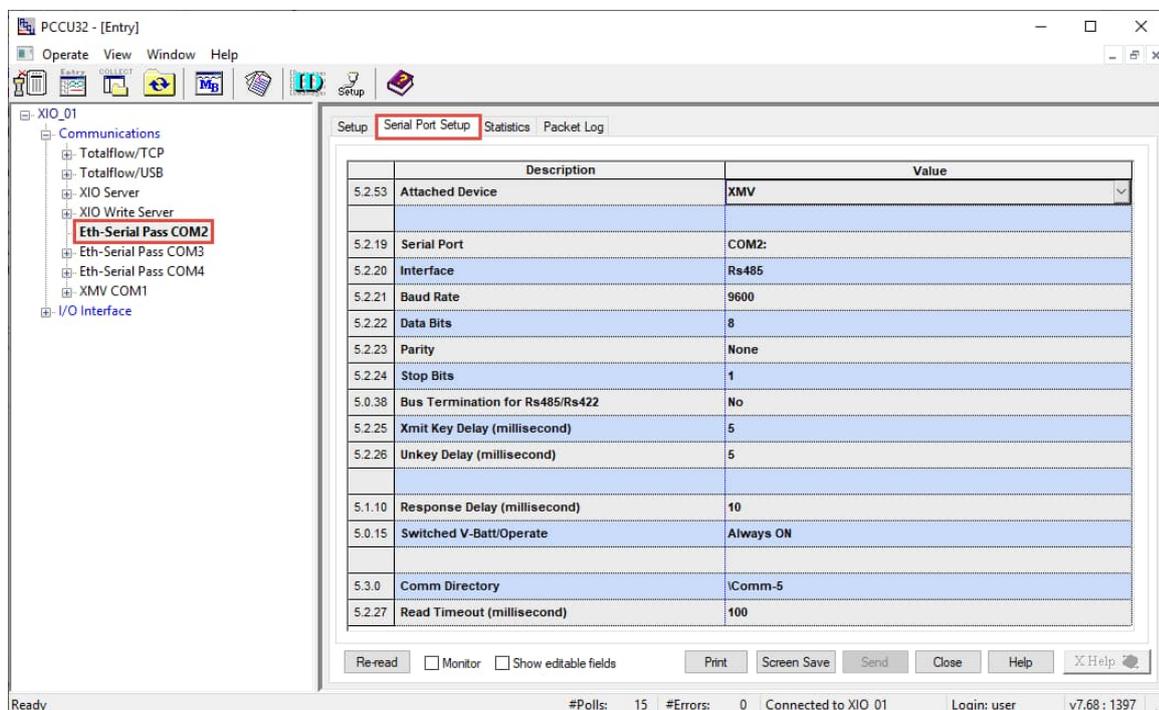
4.2.1 Optimal parameters for ABB serial devices

The screen provides the option to select the type of device connected to the COM port:

— Specific ABB Totalflow device types (Liquid Coriolis meter, Coriolis meter, Level Master liquid level sensor, XMV (multivariable transmitter), Therms Master, Wireless IO.
— Other (third-party devices)

When selecting ABB Totalflow devices, the screen automatically populates with configuration parameter values that are applicable and optimal for that type of device. See section 4.2.3 Parameter description.

> **IMPORTANT NOTE:** Some of the parameter values must match those on the communication application handling the device from the remote controller. Take note of the parameter values configured in this screen when verifying communication application settings.

For additional information on parameters specific to each device type and their associated application, refer to the help topics available on the specific communication application screens.

4.2.2 Support for non-ABB serial devices

When the device type is not an ABB Totalflow device, select **Other** as the **Attached Device** (See parameter description in Table 4-2) and consult the vendor documentation for appropriate parameter configuration. The parameters configured on the XIO COM port must match the serial device setup for the interface type (RS232, RS485, or RS422).

4.2.3 Parameter description

The table below provides parameter or function description for the Serial Port Setup screen.

> **IMPORTANT NOTE:** Parameters displayed, and their default values, depend on the selected device type. Default values for ABB devices are optimal for most configurations and have been tested to minimize reconfiguration at initial installation. Verify communication with the serial device with default values first. Fine tune configuration if initial communication attempts result in errors. For third-party serial devices, consult vendor documentation for recommended values.

Table 4-2: Ethernet-Serial Passthrough – Serial Port Setup parameter description

Parameter/ Function	Description	Values
Attached Device	Type of the serial device or peripheral connected to the XIO COM port. Attached devices can be ABB devices or third-party devices.	Select from the drop-down list: – Other (default): Select to support a third-party device – Liquid Coriolis – Coriolis – Level Master – XMV – Therms Master – Wireless IO
Serial Port	XIO COM port configured for passthrough. This port is assigned to the passthrough instance	Select from the drop-down list: – None (default) or – COM1 to COM8
Interface	Physical layer specification for serial communication ports.	Select from the drop-down-list: – RS-232: Select to support point-to-point communication with an RS-232 device (for example radios). – RS-485: (Default) Select to support point-to-point or multipoint (bus) communication with RS-485 device(s). – RS-422: Select to support point-to-point or multipoint (bus) communication with RS-422 device(s). **Note:** When selecting RS-485 or RS-422 as the

Parameter/ Function	Description	Values
		interface, set the bus termination.
Baud Rate	Communication rate in Bits per second between the device and the serial device attached to the COM port. The baud rate of the COM port and the external device must match for communication to succeed. If there are multiple devices wired to the COM port, the baud rate must be the same for all devices.	Baud rate selection depends on the device type and number of devices attached. The baud rate must be optimal to support successful polling every 1 second. Select from the drop-down-list (in Bits per second): – 1200 – 2400 – 4800 – 9600 (Default) – 19200 – 38400 – 57600 – 115200
Data Bits	The number of bits used to represent one character of data.	Select from the drop-down-list: – 7 – 8 (default)
Parity	Bit that provides simple error checking for the transmitted data.	Default value depends on the type of device selected. For example, the default parity for the XMV is Nnone, for the Coriolis meter is Odd, and for the LevelMaster is Even. Keep defaults for ABB devices. For other devices, select from the drop-down list: – None – Odd – Even
Stop Bits	Number of bits that indicates when the data byte has been transferred. In serial communications, a stop bit is one or two extra bits to mark the end of a transmission unit. The stop bit is at the end of the data, after any parity bit.	Default values depend on the serial device type selected. Keep defaults for ABB devices or select the appropriate value for the specific field conditions or third-party devices from the drop-down list: – 1 (Default) – 2
Bus Termination for RS485/RS422	Applicable only for RS485 or RS422 interfaces. Indicates the position of the flow computer or remote controller in the communication bus.	Select from the drop-down list: – Yes: If the flow computer or remote controller is the last device in the communication bus. – No (default): If the flow computer or remote controller is not the last, but the first or an intermediate device in the communication bus.
Xmit Key delay (millisecond)	Delay time to allow a serial device or communication's interface to stabilize after being turned on before data is transmitted.	User-defined Default values depend on the serial device type selected. Keep defaults for ABB devices or type values appropriate for the specific field conditions or third-party devices. Typically, 5 or 10 milliseconds works well for XMV transmitters.
Unkey Delay (millisecond)	Delay time to keep a serial device or communication's interface turned on after the last data bit is transmitted.	User-defined Default values depend on the serial device type selected. Keep defaults for ABB devices or type values appropriate for the specific field conditions or third-party devices. Typically, 5 milliseconds works well for XMV transmitters. The UnKey Delay should never be more than the Response Delay on the individual XMV Setup screens. Unkey Delay may also need to be tweaked to operate with any baud rate other than the default

Parameter/ Function	Description	Values
		of 9600.
Response Delay (millisecond)	Delay on the front end of communications between devices. It can be used by the device initiating a request and/or by the device responding to the request. Either way, it delays the start of communication to another device.	User-defined Default values depend on the serial device type selected. Keep defaults for ABB devices or type values appropriate for the specific field conditions or third-party devices. Set to zero for no delay. In the case of polling multiple XMVs, there may need to be a short delay to allow one XMV to respond before polling another XMV. Typically, a value of 10 milliseconds works well when polling multiple XMV transmitters at 9600 baud.
Switched V-Batt/Operate	Selects the mode of operation of the Switched V-Batt/Operate functions. Most ABB Totalflow devices have a V-Batt and Operate signal, except for the XFC6200EX, which has Com1sw for Comm Port 1 and Com2sw for Comm Port 2. Com1sw and Com2sw are FET outputs which are either open or switched to ground. V-Batt and Operate are switched voltage outputs with the exception that Operate has an on-board 500-ohm current limiting resistor in series with it.	Select from the drop-down list: – Enable: Allows the outputs to switch on and off with the Listen Cycle time and to be controlled by the communication schedule. – Disable: Disables the outputs but does not prohibit the other port from controlling the outputs. – Always ON: Causes the outputs to be on all the time. – Always OFF: Causes the outputs to be off all the time
Comm Directory	Directory/path in the device file system for Request Block files. Typically, it is located under the directory associated with the communication port being used. The default directory is created based on the Protocol selected on this Setup tab.	Depends on COM port, application assigned to the COM port (if any), and protocol used. For example: – \XMV-1\Modbus – \Comm-5
Read Timeout (millisecond)	Maximum time tolerated between a request and a response from the serial device, or the largest gap tolerated between characters within a packet. If the Timeout time expires, any partial packet is discarded, and the protocol looks for the beginning of a new packet.	User-defined Values depend on the serial device type selected. Keep defaults for ABB devices or type values appropriate for specific field conditions or third-party devices.

4.3 Statistics

The Ethernet-Serial Passthrough Statistics screen displays detailed statistical information on several monitored parameters applicable to the communication between the serial device on an XIO COM port and the corresponding application on the remote controller. Statistical values in this screen can help troubleshoot communication or performance issues.

Figure 4-3: Ethernet-Serial Passthrough – Statistics Screen
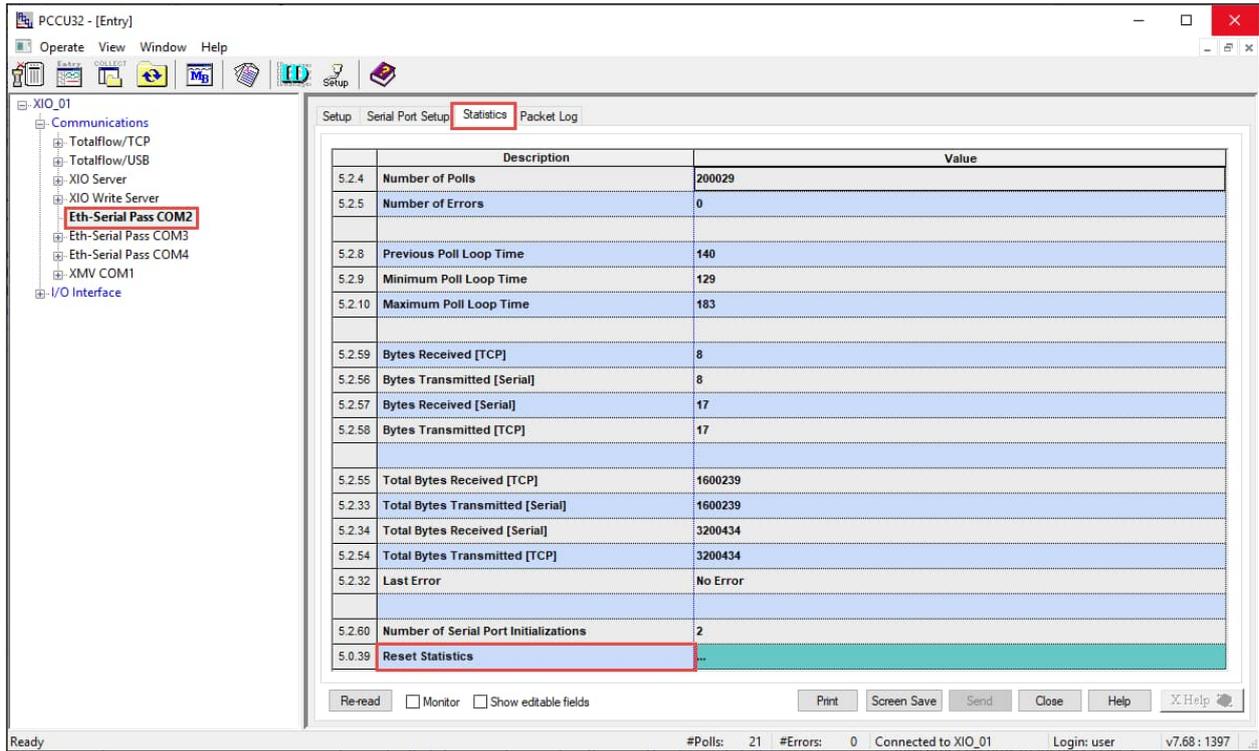
The XIO specifically monitors the processing of the communication packets sent and received from/to the TCP ports and COM ports. The XIO keeps track of the following:

— The number of poll requests, errors, poll loop times, and bytes that the serial port or TCP port transmits and receives
— Error conditions

It is important to understand the end points of the communication flow to interpret the displayed statistics. Separate TCP and COM port statistics help narrow down the side where problems may be. Review the following sections for additional details on what the statistics on this screen reflect.

4.3.1 Communication end points

The ultimate end points for passthrough communication are the communication application on the remote controller, and the serial device on the XIO. The passthrough is merely the facilitator application between these two end points.

The passthrough statistics screen displays monitored values from the perspective of the passthrough. The image below shows the communication flow of a poll issued from the client app on the RMC. A poll is a complete data loop: it includes a request to and a response back from the end device.

Figure 4-4: Poll communication flow between comm app and remote serial device
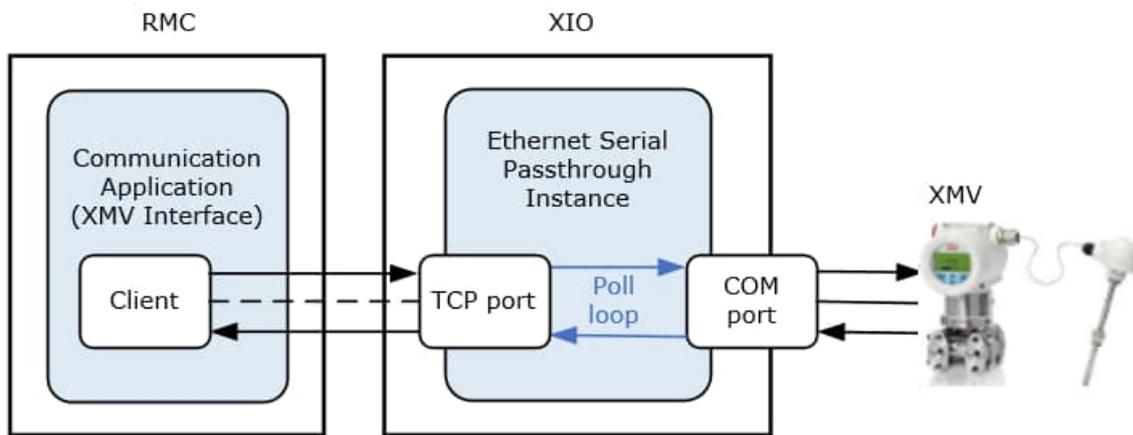
The passthrough monitors:

— Poll loop time
— Data traffic on the TCP port, the point of connection with the remote application
— Data traffic on the COM port, the point of connection with the directly attached external serial device

4.3.2 Monitoring poll loop time

The passthrough function keeps track of the loop time for each poll. The loop time is the amount of time in milliseconds from receipt of a request on the TCP port to the response out on the TCP port.

The maximum loop time requirement may vary per communication application and serial device type. Poll times exceeding the maximum required by the device is reflected as late counts on the remote application side. Late counts indicate that loops did not complete in one second.

Loop time statistics include Previous, Minimum, and Maximum loop times per request. You can compare loop times displayed on this screen with those displayed on the remote controller (remote application statistics screens). Excessive differences (of 100 milliseconds or more) in loop times indicate delays introduced by the network (a sign of excessive network traffic). If loop times consistently display higher than the required time or excessive differences, check network connections, configuration, performance, and topology. Excessive network traffic or delays can be introduced by faulty Ethernet interfaces or malicious network intrusion/attacks.

See section 4.4 Packet Log to visualize poll loops. The packet log records every packet processed by the passthrough instance.

4.3.3 Monitoring on the TCP port

The remote communication application on the RMC acts as a client to the passthrough instance for the associated COM port. The passthrough instance is a server application. The remote application requests and establishes a connection with the passthrough instance using the TCP port assigned to the passthrough.

After communication is established, the passthrough instance listens to that TCP port for communication packets (carrying poll requests) coming from the remote application. Depending on the mode, the passthrough either relays the received requests directly to the serial device or it processes the packets as a TCP gateway prior to sending the packets to the serial device. The passthrough also processes the poll responses from the serial device to the remote application. It sends serial traffic through the TCP connection back to the controller.

TCP-related statistics reflect the passthrough activity on the TCP connection with the remote application. These include received and transmitted byte counts on the logical port (indicated by [TCP]). If communication is healthy, then TCP port counts should increase at periodic intervals. If packets do not increase or stay at zero after statistic reset, it could be an indication of XIO-Remote controller connection failure. Check network operation/configuration, Ethernet interfaces, cabling, or connections.

Both per-request and total byte counts are available for the TCP port.

4.3.4 Monitoring on the COM port

The passthrough instance passes or processes polls from the remote communication to the serial device on the associated COM port.

Serial-port related statistics include received and transmitted byte count on the associated COM port (indicated by [Serial]). If communication is healthy, then counts should increase at periodic intervals. If counts do not increase, it could be an indication of XIO-serial device communication failure. Check for incorrect wiring, serial device failure or incorrect configuration, etc.

Both per-request and total byte counts are available for the serial port.

4.3.5 Monitoring poll and error numbers

The passthrough keeps track of polls processed successfully and polls resulting in error (failure). Polls are issued by the remote communication application to the serial device at periodic intervals to read device data. The device responds as required with requested values. Poll number and type depends on the communication application, device type and programming. When the serial device is not communicating correctly, the error count increases, and the poll count remains the same.

4.3.6 Statistics Reset

This screen provides a reset option to clear accumulated values and start over. Use the Reset Statistics function at the bottom of the screen to trigger reset.

4.3.7 Parameter description

The table below provides parameter or function description for the Statistics screen.

Table 4-3: Ethernet-Serial Passthrough – Statistics parameter description

Parameter/ Function	Description	Values
Number of Polls	The number of requests a client makes over Ethernet	Read-only Valid Values: depends on the device type
Number of Errors	The number of client requests that resulted in an error	Read-only Valid Values: 0-4294967295
Previous Poll Loop Time	The amount of time in milliseconds from receipt of the last request on the TCP port to the response out on the TCP port	Read-only Valid Values: depends on the device type
Minimum Poll Loop Time	The minimum amount of time in milliseconds from receipt of all requests on the TCP port to the responses out on the TCP port	Read-only Valid Values: depends on the device type
Maximum Poll Loop Time	The maximum amount of time in milliseconds from receipt of all requests on the TCP port to the response out on the TCP port	Read-only Valid Values: depends on the device type
Bytes Received [TCP]	The number of bytes the TCP port received from the client for the last request	Read-only Valid Values: 0-4294967295
Bytes Transmitted [Serial]	The number of bytes transmitted for the last request to the device attached to the serial port	Read-only Valid Values: 0-4294967295
Bytes Received [Serial]	The number of bytes the device attached to the serial port received for the last request	Read-only Valid Values: 0-4294967295
Bytes Transmitted [TCP]	The number of bytes the client transmitted over TCP for the last request	Read-only Valid Values: 0-4294967295
Total Bytes Received [TCP]	The total number of bytes the TCP port received from the client	Read-only Valid Values: 0-4294967295
Total Bytes Transmitted [Serial]	The total number of bytes transmitted to the device attached to the serial port	Read-only Valid Values: 0-4294967295
Total Bytes Received [Serial]	The total number of bytes received from the device attached to the serial port	Read-only Valid Values: 0-4294967295
Total Bytes Transmitted [TCP]	The total number of bytes transmitted to the client over TCP	Read-only Valid Values: 0-4294967295
Last Error	The status of the last request	Read-only No error: poll successful
Number of Serial Port	Number of times the COM port is	Read-only

Parameter/ Function	Description	Values
Initializations	reinitialized. The COM port is kept open but may need to be reinitialized after an error occurs. An excessive number of reinitializations may indicate incorrect parameter configuration or incorrect/bad wiring.	Note: At installation time, this field may display a small number to indicate the port has opened for first-time connection. An increasing amount indicates a problem.
Reset Statistics	Function to reset all statistics displayed on the screen.	Trigger reset for all statistics on screen: Select **Reset Statistics** drop-down list. Select **Now**, then click **Send**.

4.4   Packet Log

The Ethernet-Serial Passthrough Packet Log screen displays logs reflecting real-time packet flow to/from the COM port and to/from the TCP port. Each log has a time stamp to indicate time and date of occurrence. Packet data is represented in HEX notation.

The packet log is useful for troubleshooting. ABB Customer Service representatives might request information from this screen to help troubleshoot or monitor a connection.

4.4.1   Log description

The passthrough instance's function is to relay data traffic between the serial device (on an XIO COM port) and the remote controller. The logs indicate the direction of this data traffic as follows:

— Logs showing the right arrow (->) indicate data sent by the passthrough instance. It can either be data sent to the TCP port [connection] or to the associated COM port.
— Logs showing the left arrow (<-) indicate data received by the passthrough instance. It can either be data received on the TCP port or on the COM port. Data received from the COM port will display the port number.

Communication to or from the serial ports is identified by the XIO COM port number. Logs not specifically indicating COM port are for data received or sent on the TCP port. This is data from or to the communication application on the remote controller (data is transmitted or received over the TCP connection established by the remote application).

Figure 4-5: Ethernet-Serial Passthrough – Packet Log screen
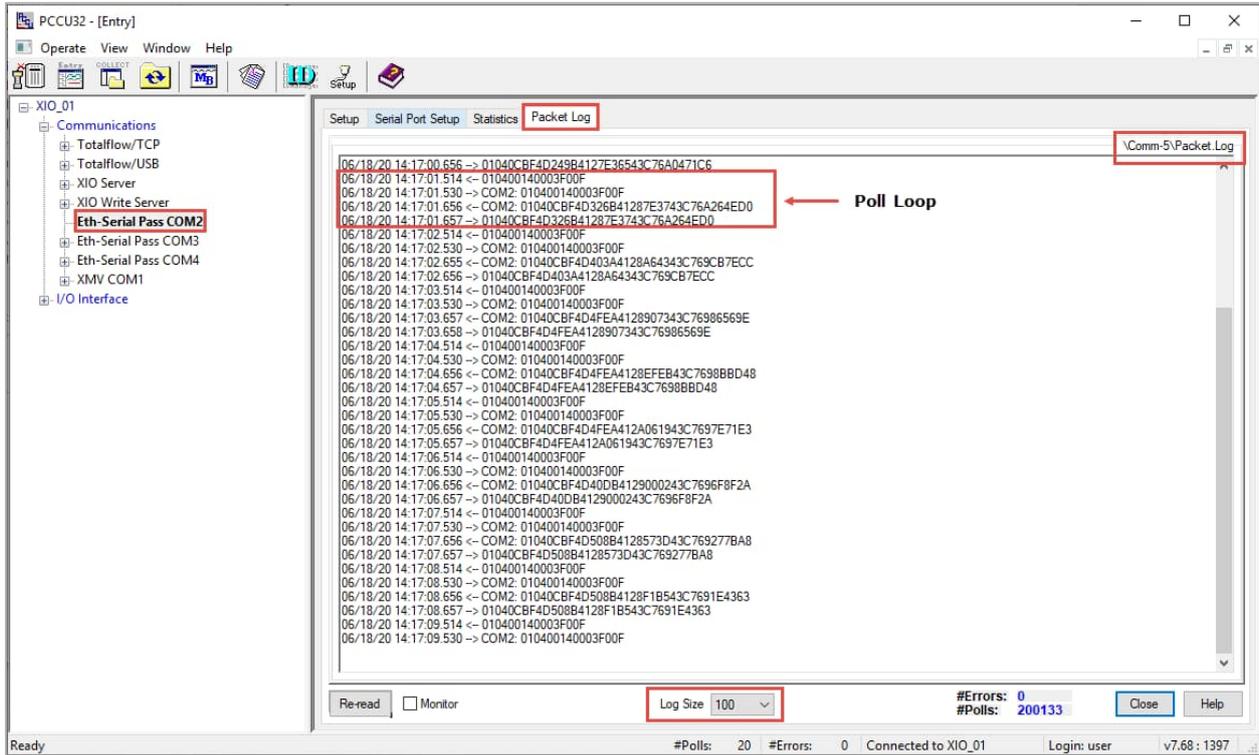
The capture above shows an example of logs for the passthrough instance assigned to XIO COM2. Several logs display at the respective time stamps.

The highlighted logs show a poll loop (repeated in the capture below for detail, Figure 4-6). The first log on this loop shows the data received by the passthrough instance (request) on the TCP port. The second log shows the passthrough instance relaying that request to COM2 port. The third log shows the passthrough receiving data (response) from the device on COM2. The fourth log shows the passthrough sending that response out on the TCP port.

The time elapsed from the time of request receipt on the TCP port to the time the response is sent out on the TCP port is referred to as the Loop Time. In this example, subtracting the milliseconds on the time stamp of the first log from the milliseconds on the time stamp on the last loop log, provides the loop time for this request (657 ms - 514 ms = 143 ms). For additional information on Loop Time tracking, see section 4.3.2 Monitoring poll loop time.

Figure 4-6: Identifying a poll loop in the packet log
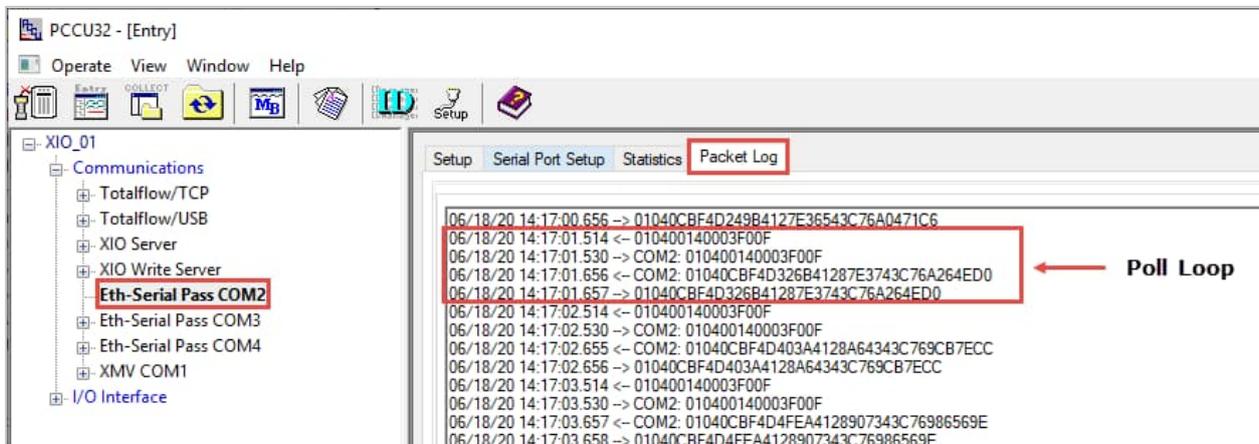
4.4.2   Log display and storage

The displayed logs are saved on a file stored in the XIO internal file system. On the top right corner, the screen displays the directory location and name of the log file. In the example in the capture above, the logs are kept in \Comm-5\Packet Log.

Define the number of logs kept in the file by selecting an option from the **Log Size** drop-down list at the bottom of the screen. The default log size is 0 (no logs displayed).

4.4.3   Parameter description

The table below provides parameter or function description for the Packet Log screen.
Note: Logs display only if a non-zero log size is selected in the **Log Size** drop down list. If logs fail to display even after selecting a non-zero log size, then there is communication failure. Verify the network connection or serial (COM) connection. Verify that the external device is still operational.

Table 4-4: Ethernet-Serial Passthrough – Packet Log parameter description

Parameter/ Function	Description	Values
Log Size	Drop-down list to select the number of displayed entries from the log file	Select from the drop-down list: – 0 (default), 25, 50, 100, 200 – Non-zero values are required for logs to display. When the log size is zero, no logs display.
#Errors	Number of errors that have occurred in data transmission	Read-only 0-65534
#Polls	Number of successful polls that have been transmitted	Read-only 0-65534
Monitor	Function that allows continuous monitoring of logs to view new logs as they update	Checkbox: – Select to monitor the displayed values continuously – Clear to disable continuous monitoring To select frequency of monitoring and value refresh: Right click next to the check box to select the refresh rate in seconds. Available values: 1, 3, 5, 10, 15, 20, 30, or 60 seconds

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ABB Inc.

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Ph: +1 713 587 8000

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