

**AN-X4-AB-DHRIO  
Allen-Bradley  
Remote I/O Adapter  
Module**

# ***User Manual***



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

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

These warnings help to:

**WARNING!**

- identify a hazard
- avoid the hazard
- recognize the consequences

**IMPORTANT!**

Identifies information that is especially important for successful application and understanding of the product.

**TIP**

Identifies information that explains the best way to use the AN-X4-AB-DHRIO Gateway

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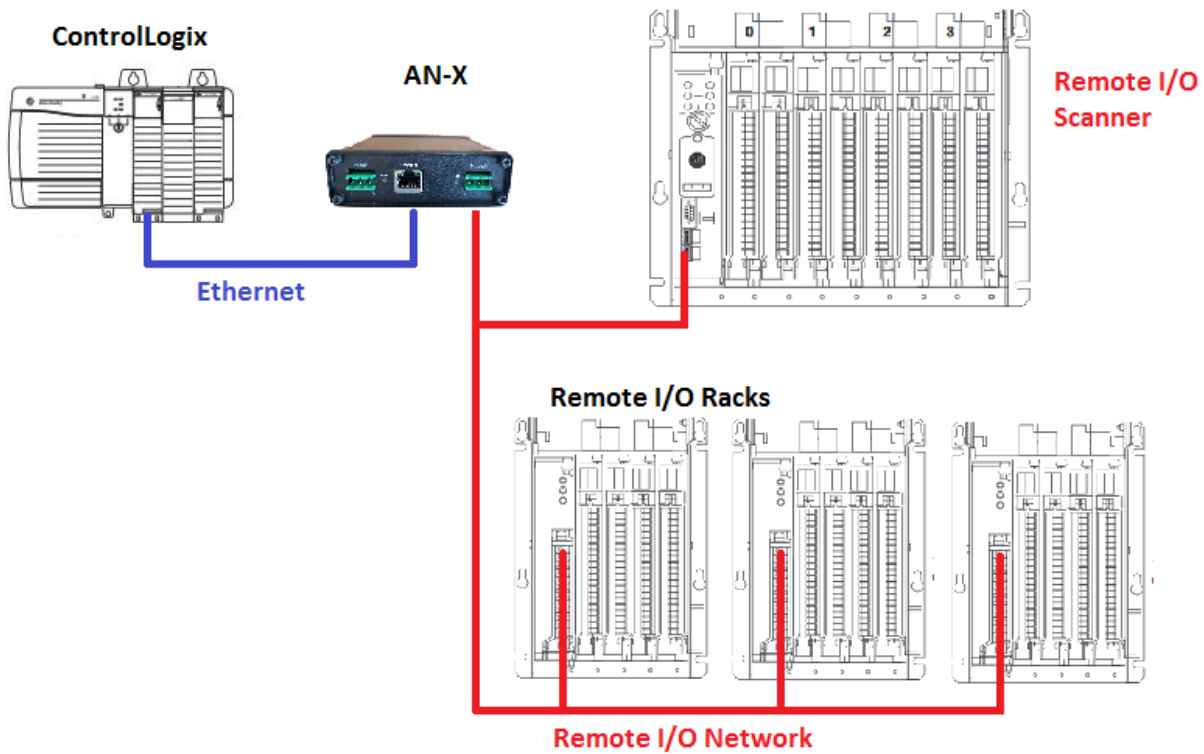
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# Module Overview



The RIO-ADPT communications module connects a ControlLogix PLC or other device to an Allen-Bradley remote I/O network.

As an adapter, the module:

- has one remote I/O channel
- supports all remote I/O baud rates: 57.6, 115.2, 230.4 kbaud
- monitors discrete I/O and block transfer reads and writes on the same remote I/O network
- emulates one or more racks and block transfers on those racks
- supports rack numbers from 0 to 76 octal
- supports all combinations of partial racks
- supports block transfers at all possible locations
- updates all I/O via scheduled connections over Ethernet/IP

The AN-X4-AB-DHRIO communicates with the ControlLogix processor using scheduled connections over Ethernet. The configuration program maps remote I/O data into the ControlLogix scheduled input and output data.

On monitored racks, a ControlLogix processor reads remote I/O inputs and outputs, and data from block transfer reads and writes on those racks on the remote I/O network. All remote I/O data is mapped to scheduled inputs in the ControlLogix.

On emulated (active) racks, a ControlLogix processor writes remote I/O inputs and block transfer read data and reads remote I/O outputs and block transfer write data from the remote I/O scanner.

The AN-X4-AB-DHRIO module has a web interface for monitoring data and logs and for performing administrative functions. You can communicate with the module using any standard web browser.

The AN-X4-AB-DHRIO module is supplied with a Windows utility, AnxAbRioCfgAdpt, for configuring and monitoring the remote I/O network and mapping the remote I/O data to ControlLogix scheduled data.

The module firmware can be selected and updated using the web interface. Refer to page 64 for details.

Current firmware and Ethernet device templates can be found at

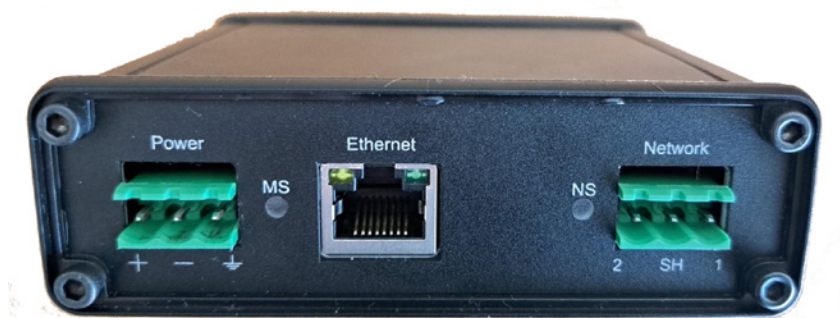
<http://qtsusa.com/dist/AN-X4/AB/RIO-ADPT>



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## Hardware Features



The module has:

- LEDs to indicate the status of the connection to the Ethernet, its own internal state (MS), and the state of the connection to the remote I/O network (NS)
- an Ethernet connector
- a 3-pin Phoenix connector to connect to the remote I/O network
- a 3-pin Phoenix power connector
- a microSD card for storage of configuration data and firmware

The wiring on the power and the remote I/O connectors match those on the AN-X2, but the connectors are rotated 180 degrees. Cables for the AN-X2 can be connected to the AN-X4 without change.

## Package Contents

- AN-X4-AB-DHRIO module
- rubber feet for desktop use

## Using the microSD Card

The microSD card stores configuration data and firmware.

There are no restrictions on the size or speed of the card.

The microSD card must be present while the AN-X4 is running.

**WARNING!** Do not remove the microSD card while the AN-X4 is powered on.

There are several configuration files on the SD card.

Function	File
Ethernet configuration	IPCfg\IPConfig.txt
Firmware to run	Firmware\FirmwareCfg.txt

If the AN-X4 is inaccessible from Ethernet because of its settings, or is in an unknown state, you can power down the AN-X4, remove the microSD card and edit the file IPConfig.txt. Refer to page 19 for details.

Use a plain text editor such as Windows Notepad to create or edit these files.

When you have finished editing the file, reinsert the card in the slot at the back of the AN-X4 and restart the AN-X4.

**WARNING!** If you remove the card to edit the configuration files, push the card in straight or the card might fall inside the case and you will have to disassemble the AN-X4 to retrieve it (requires a 7/64 inch Allen wrench)



## Comparison with the AN-X2

If you are familiar with the AN-X2, or are replacing an AN-X2 with an AN-X4, you should be aware of the following:

### Adapter

- The power and remote I/O cables are the same, but the connectors on the AN-X4 are rotated 180 degrees.
- The web interface is improved, it now has data displays for discrete and block transfer data, remote I/O and Ethernet status, as well as live data updates
- The AN-X4 uses the same Windows configuration program, the same template files and the same configuration files as the AN-X2. A configuration file for the AN-X2 will work with the AN-X4.
- LEDs support only debug mode
- The Ethernet diagnostics mapped to connection 15 in the ControlLogix have changed

### General

- The status and errors displayed on the LEDs have changed
- It does not support listen-only connections
- You can run different versions of the same firmware, e.g., remote I/O adapter firmware, for testing and debugging
- As shipped, at startup the AN-X waits 10 seconds for a DHCP server to assign it an IP address, then reverts to static IP address 192.168.0.246
- The case is smaller



## Installation

### Prevent Electrostatic Discharge

The module is sensitive to electrostatic discharge.

#### WARNING!

Electrostatic discharge can damage integrated circuits and semiconductors. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential
- Do not touch the connector pins

### Power

AN-X requires DC power input of anywhere from 12 to 24 VDC



The pins on the power connector are chassis ground, negative voltage and positive voltage. Pin 1 is closest to the Ethernet connector.

Power consumption is 240 mA @ 12VDC or 120 mA @ 24VDC.

The part number for the power connector is Phoenix MSTB 2.5/3-ST-5.08 (1757022)

The power connector is the same as the AN-X2 but is rotated 180 degrees.

### Remote I/O Cabling and Termination

Follow Allen-Bradley cabling recommendations for remote I/O. Refer to *Approved Vendor List for DH, DH+, DH-485, and Remote I/O Cables*, publication ICCG-2.2, February 1996.

The network cable must be terminated with terminating resistors attached to the physical ends of the network, usually 82 ohm, but refer to Allen-Bradley documentation since some devices require 150 ohm terminators. There should be two and only two terminators on the remote I/O network.



On the AN-X module, the remote I/O connections should be as shown. The wiring in the connector is that same as for the AN-X2 but the connector is rotated 180 degrees on the AN-X4. A remote I/O cable for the AN-X2 can be used without change on the AN-X4.

Line 2 on the AN-X4 is closest to the Ethernet connector and the NS LED.

Check the wiring to ensure that line 1 on the AN-X is connected to line 1 on the PLCs, and other devices.

The part number for the connector is Phoenix MSTB 2.5/3-ST-5.08 (1757022)

The most common causes of remote I/O connection errors are:

- wiring reversed (lines 1 and 2)
- incorrect baud rate
- other cabling and termination problems
- terminating resistors shorted to shield wires
- duplicate racks

Usually, but not always, the wire colors are:

	Data Highway Plus	Remote I/O
Line 1	Clear	Blue
Line 2	Blue	Clear

## Ethernet Cabling

AN-X has a standard RJ-45 connector for connecting to Ethernet.

If you are connecting AN-X to an existing network through a router or switch, use a standard Ethernet cable.

## Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D hazardous locations or non-hazardous locations.

Device is to be mounted inside an environmentally suitable enclosure that requires a tool to access.

Device is for indoor use only.



## Quick Start

Step	Operation	See page
1	Install the AN-X Windows software	21
2	Power up the AN-X, connect it to Ethernet and assign it an IP address	17
3	Connect AN-X to the Remote I/O network	14
4	Use the AN-X Windows utility to autoconfigure the remote I/O network and ControlLogix configuration	21
5	Configure the AN-X in RSLogix 5000	35
6	Verify operation on the remote I/O network	
7	Create aliases for RSLogix 5000	32
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9	Use the aliases to access data	



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## Ethernet Configuration

Before you can use the AN-X, you must configure it on Ethernet.

### IMPORTANT!

The AN-X is shipped with the factory default setting, where AN-X waits for 10 seconds for a DHCP server to assign it an IP address. If it does not obtain an IP address within 10 seconds, it reverts to a static address of 192.168.0.246.

The AN-X must be configured to use DHCP or a static IP address before you can use it on remote I/O.

### Initial Ethernet Configuration

AN-X can be configured:

- to use a static (unchanging) IP address
- to obtain its IP address from a DHCP server
- to use the factory default setting, where AN-X waits for 10 seconds for a DHCP server to assign it an IP address. If it does not obtain an IP address within 10 seconds, it reverts to a static address of 192.168.0.246.

AN-X4 modules are shipped with the factory default setting.

Unless you have control of the DHCP server, in most applications you will assign it a static IP address. Otherwise the DHCP server may assign a different IP address when the AN-X powers up, and any software that accesses the AN-X module would have to be reconfigured.

If you are using multiple AN-X modules, connect and configure them one at a time.

### IMPORTANT!

If you are connecting AN-X to an existing Ethernet network, consult the network administrator to obtain information about how you should configure AN-X or to obtain a static IP address for AN-X.

You configure the Ethernet properties by either:

- using the web interface
- editing files on the microSD card

To use the web interface, you must know the IP address of the AN-X, either the address assigned by the DHCP server or the default address of 192.168.0.246. If the address was assigned by a DHCP server, you can look at the DHCP server configuration or logs to determine the IP address assigned.

Enter the IP address in the address bar of your browser.

Select *Administration/AN-X IP Configuration*. The *AN-X IP Configuration* page appears.



Home Page	AN-X IP Configuration
Automation Network	Serial Number: 008019 MAC Address: 00:0C:1A:00:80:19
Log Files	DHCP: <input type="radio"/>
Administration	Static: <input checked="" type="radio"/>
AN-X IP Configuration	Factory: <input checked="" type="radio"/> (Try DHCP for 10 sec, then 192.168.0.246)
AN-X Firmware Select	AN-X Hostname: ANX4scanner
AN-X Firmware Upload	AN-X IP Address: 192.168.1.93
AN-X Firmware Remove	NET Mask: 255.255.255.0
AN-X Diagnostic Capture	Gateway Address: 192.168.1.1
AN-X Kernel Page	<input type="button" value="SUBMIT"/>
AN-X Kernel Update	
AN-X Module REBOOT	
Support	

The top of the screen shows the serial number and MAC address of the AN-X being configured.

Check either DHCP or Static.

## DHCP

If the AN-X4 finds a DHCP server on the network, it obtains an IP address and other network parameters (netmask and default gateway) from the DHCP server.

To find the address assigned, look at the DHCP server or use a network tool that displays devices on the network.

If the AN-X has been configured for DHCP and it does not find a DHCP server, it waits indefinitely for a DHCP server and repeatedly flashes the MS LED yellow 2 times followed by a pause. The NS LED will be solid red.

## Static IP Address

If you select static IP address, enter:

- the IP address for the AN-X
- the netmask for the AN-X
- the default gateway for your network.

You must enter a valid default gateway address even if there is no device at the gateway address on the network.

## Factory Default Setting

The AN-X is shipped with a factory default setting that looks for a DHCP server for 10 seconds, then reverts to an IP address of 192.168.0.246. Note that if the AN-X is later able to obtain an IP address from a DHCP server, it will take the DHCP assigned address.

The network must be set to DHCP or a static IP address before you can use the AN-X for a remote I/O application.



## Hostname

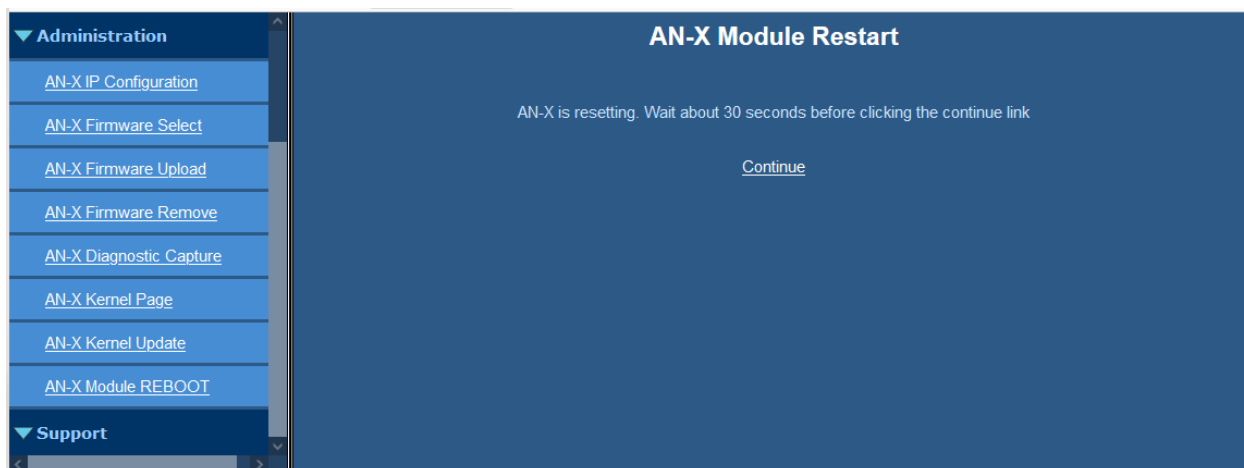
Enter a *Hostname* for the AN-X4. This name is used internally by AN-X and may be used to identify the AN-X if you have a DNS server on your network. The name can be from 1 to 30 characters long.

The default hostname is ANXxxxxxx, where xxxxxx is the serial number of the AN-X module.

## Submitting the Configuration

Once you have entered all required parameters, click **SUBMIT** to write the configuration to the file IPCfg\IPConfig.txt on the microSD card. The changes do not take effect until the AN-X restarts.

The following page appears when you click **REBOOT**.



Wait until the AN-X has completely restarted, then click *Continue*.

If you have changed the IP address, enter the new IP address in the browser's address field.

## Reconfiguring an AN-X from an Unknown State

It sometimes happens that an AN-X has previously been configured with an IP address that causes it to be inaccessible on the current Ethernet network or that the IP address is unknown.

Remove the microSD card and edit the file IPCfg\IPConfig.txt, using a plain text editor such as Windows Notepad, to set the AN-X4 to the desired Ethernet configuration.

## The Configuration File IPCfg\IPConfig.txt

The Ethernet configuration is stored in the file IPCfg\IPConfig.txt on the microSD card.

When you perform the *Administration/AN-X Configuration* command from the web interface, the AN-X writes the results to that file.

Each line consists of a keyword followed by a value.

Example:

IP: 192.168.1.14



NetMask: 255.255.255.0

DefGtwy: 192.168.1.1

Anything after a semicolon on a line is treated as a comment.

Keyword	Possible Values
IP:	Factory DHCP static IP address, e.g., 192.168.1.187
Netmask:	Ethernet netmask, used only if IP is a static IP address
DefGtwy:	default gateway, used only if IP is a static IP address
Hostname:	Ethernet host name, from 1 to 30 characters

If you edit the file and AN-X finds an error in the file contents during startup, it flashes an error code on the MS LED, see page 67.

### Example IPCfgIPConfig.txt files

Example: Factory default

IP: Factory

Hostname: ANX4

Example: DHCP

IP: DHCP

Hostname: ANX4

Example: Static IP address

IP: 192.168.1.14

NetMask: 255.255.255.0

DefGtwy: 192.168.1.1

HostName: ANX4

## Firmware to Run

In addition to the Ethernet configuration, you may also need to edit the file *Firmware\FirmwareCfg.txt* to select the firmware file to run. The contents of the file must exactly match the name of one of the firmware files on the AN-X or the AN-X will not start up.

Example:

AN-X4-ABRIO-ADPT.v4.05.01.qtf



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## Configuring the Remote I/O Network

### AnxAbioCfgAdpt Software

The AN-X4-AB-DHRIO module is supplied with a Windows configuration utility.

Use this configuration tool to:

- Set the baud rate
- Autoconfigure from an attached and running remote I/O network
- Manually configure racks
- Add and configure block transfer modules
- Map I/O data to ControlLogix scheduled connections
- Save and load configuration files
- Download and upload configurations
- Archive block transfer templates
- Monitor diagnostics, rack status, block transfers and discrete data

You can download the Windows installation file from

<http://qtsusa.com/dist/AN-X4/AB/RIO-ADPT>

You must uninstall any previous version of the software before you can install a new version. Use the Windows Control Panel *Add and Remove Programs* or *Programs and Features* to remove the old version.

Run the program AnxAbRioSetup.msi to install the configuration and monitoring software.

### Configuring a Remote I/O Network

Use the following steps to configure the AN-X4-AB-DHRIO as an adapter on a remote I/O network:

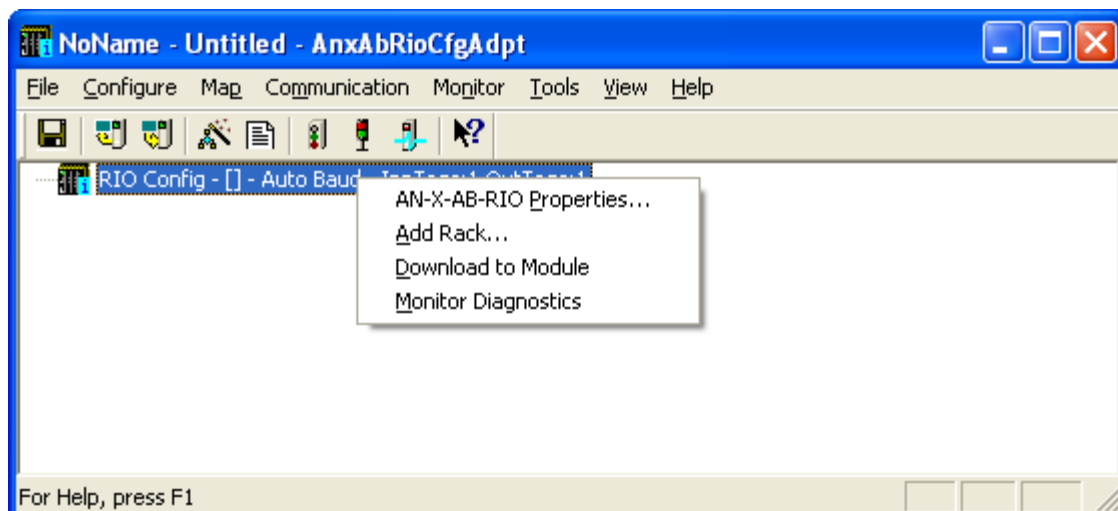
1. Set the baud rate
2. Configure racks
3. Add and configure block transfer modules
4. Map the remote I/O data to ControlLogix scheduled data
5. Download the configuration to the AN-X4-AB-DHRIO.

You can also autoconfigure the AN-X4-AB-DHRIO if you are using it to monitor an existing remote I/O network. See page 23 for details.

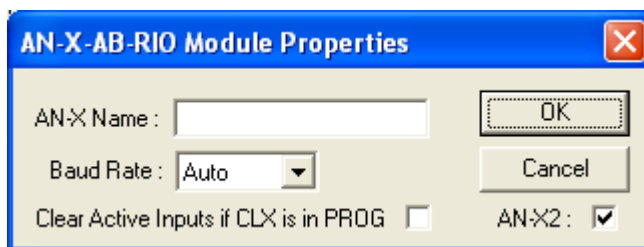
### Baud Rate

To set the network baud rate, first right click on the root of the network tree.





Select *AN-X-AB-RIO Properties* to display the *AN-X-AB-DHRIO Modules Properties* dialog box.



Select the *Baud Rate* from the list. Choices are:

Selection	Baud Rate, kbits/second
57k	57.6
115k	115.2
230k	230.4
Auto	Automatic detection

The default baud rate is Auto (automatic baud rate detection).

The *AN-X Name* can be from 0 to 31 characters long. It is not used elsewhere.

The *AN-X2* checkbox is used when exporting aliases for import into RSLogix 5000 (see page 32). It is checked automatically when you perform any online operation with an AN-X4. If you export aliases offline, first make sure that it is checked.

The *Clear Active Inputs if CLX is in PROG* checkbox determines what discrete input data AN-X sends from active racks when the remote I/O scanner is in program mode. If the box is checked, AN-X sends 0 for input data. If the box is unchecked, AN-X sends whatever values it receives from the ControlLogix outputs mapped to the discrete inputs.

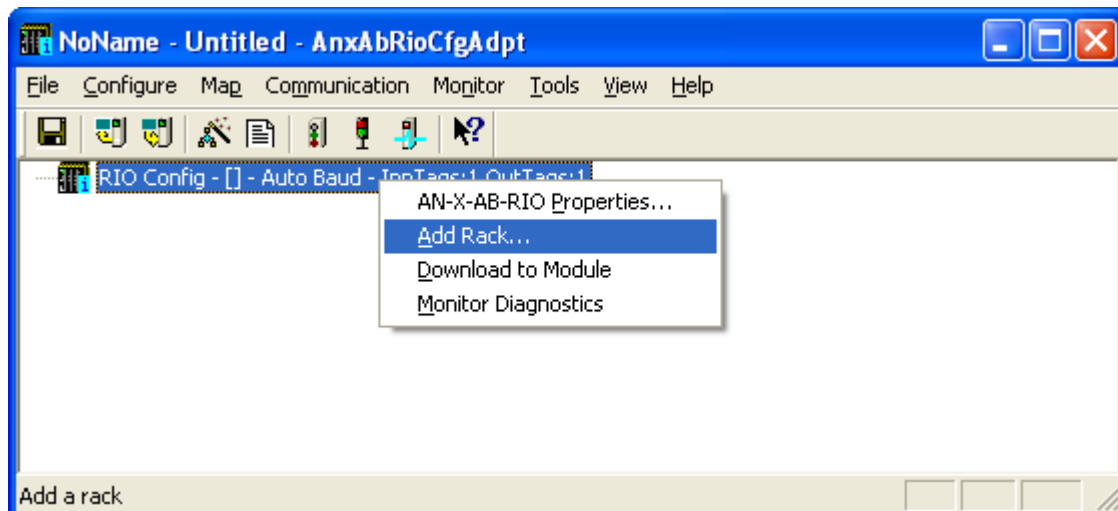
## Configuring Racks

You can add racks manually or by autoconfiguring from an attached remote I/O network.

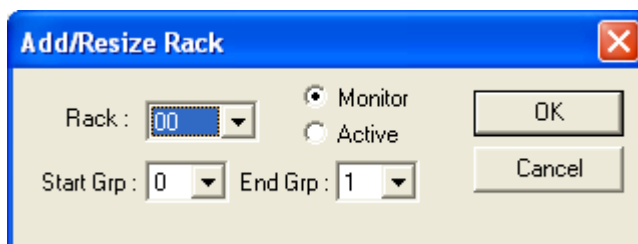
Racks can be either active (emulated by the AN-X4-AB-DHRIO) or monitored (real racks on the same remote I/O network).

### Manually Adding Racks

To add a rack manually to the remote I/O configuration, first right click on the root of the network tree.



Select *Add Rack* to display the *Add/Resize Rack* dialog box.



Select the *Rack* number (in octal), the Start I/O Group and the End I/O Group for the rack you are adding. Select the rack mode, Active or Monitor. Click OK.

## Autoconfiguration

The AN-X4-AB-DHRIO supports autoconfiguration.

The AN-X4-AB-DHRIO first detects the network baud rate, then monitors messages to and from racks on the network, builds a network configuration from the observed network traffic, and displays the network configuration.

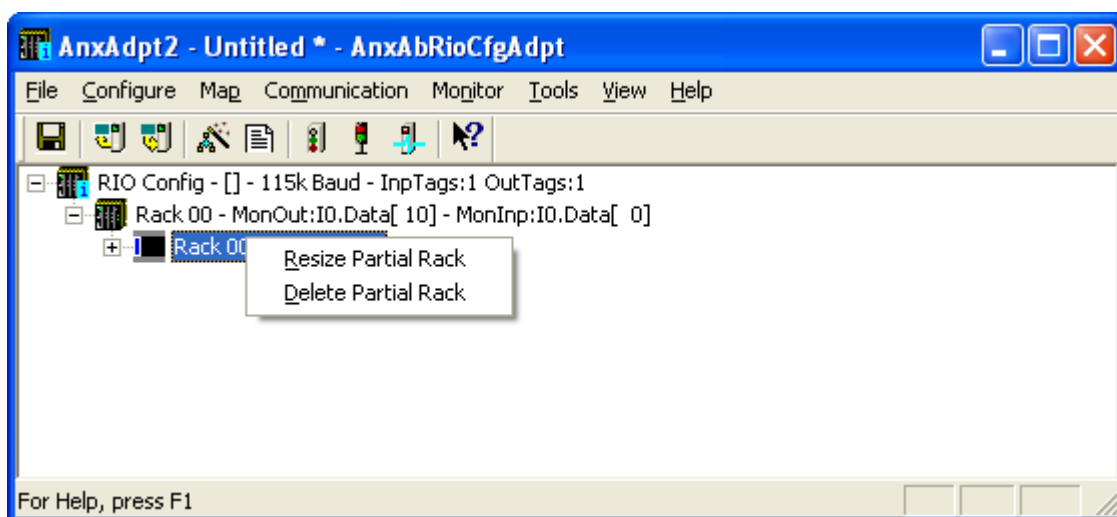
The AN-X4-AB-DHRIO also adds block transfer modules from observed block transfer updates. The AN-X4-AB-DHRIO cannot detect the type of block transfer module; it adds modules of the generic type BT-MODULE.

To autoconfigure:

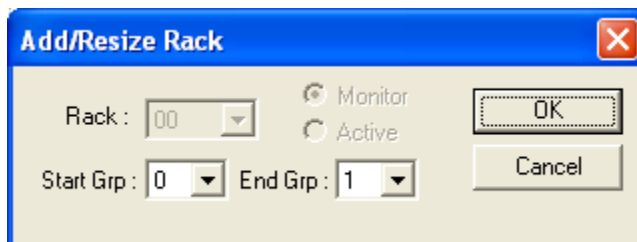
1. Clear the old configuration. Select *File/New* to create a new, empty configuration file and set the baud rate to automatic (that's the default for a new configuration).
2. Put the remote I/O scanner in program mode, then select *Configure/Download Configuration* to download the empty configuration to the AN-X4-AB-DHRIO.
3. If you want to automatically add block transfers, put the remote I/O scanner in run mode and wait until all the block transfers have executed. Put the scanner back in program mode.
4. Select *Configure/Autoconfig* to build a configuration from the observed network traffic.

## Resizing Racks

To resize a rack, right click on the rack in the network tree and select *Resize Partial Rack*.



The *Add/Resize Rack* dialog appears



When you resize a rack, you cannot change the rack number or the rack type (active or monitored).

Select the Start I/O Group and the End I/O Group.

If resizing the rack results in an overlap with an existing rack, the resize fails and displays an error message.

If resizing the rack results in deleting block transfer modules, you will be given the option of cancelling the resize or proceeding and deleting the block transfer modules.



## Deleting Racks

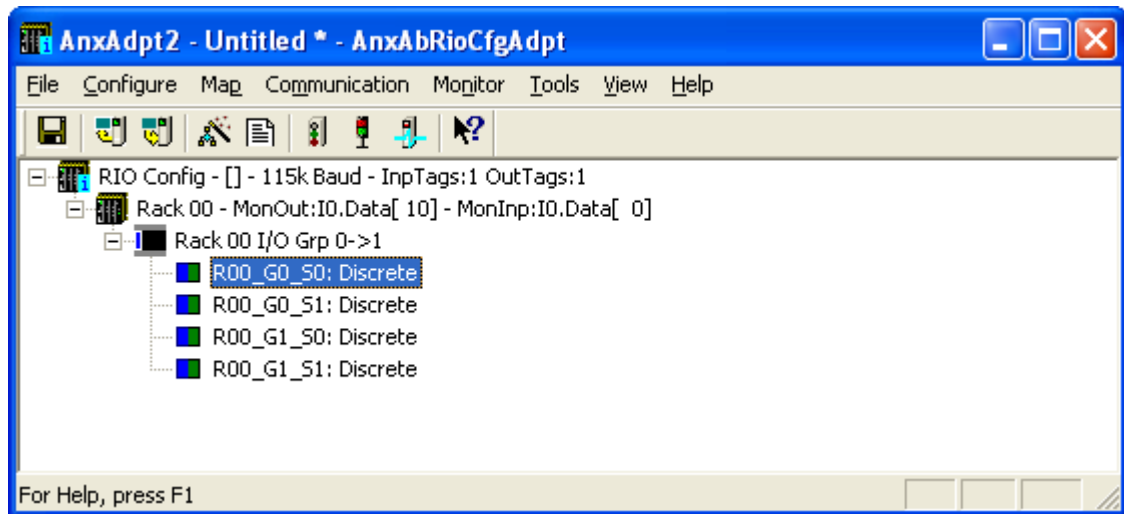
To delete a rack, right click on it in the network tree and select *Delete Rack(s)* or *Delete Partial Rack*.

## Block Transfer Modules

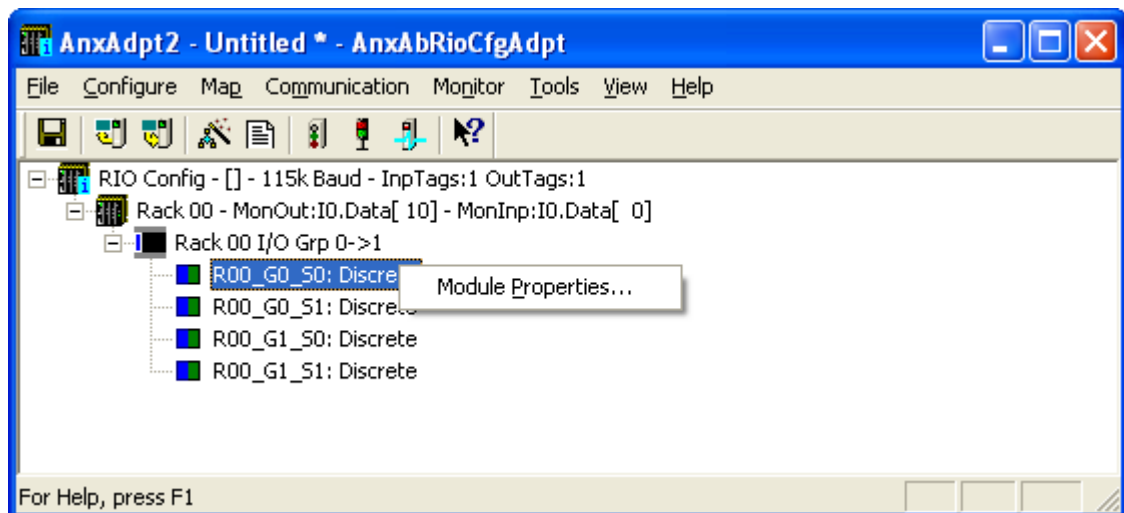
TIP

Refer to page 46 for detailed information on block transfer module templates.

To add a block transfer module, first expand the network tree to show the location where you want to add the module.

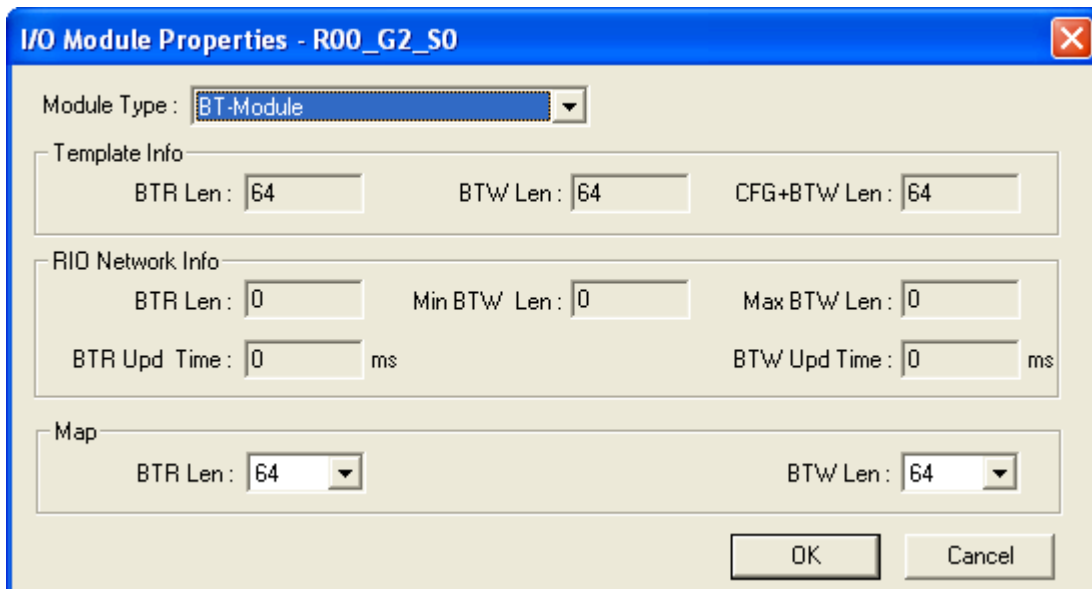


Right click on the location where you want to add the module and select *Module Properties*.



### Active Racks

On active racks, the only available block transfer module type is BT-MODULE.

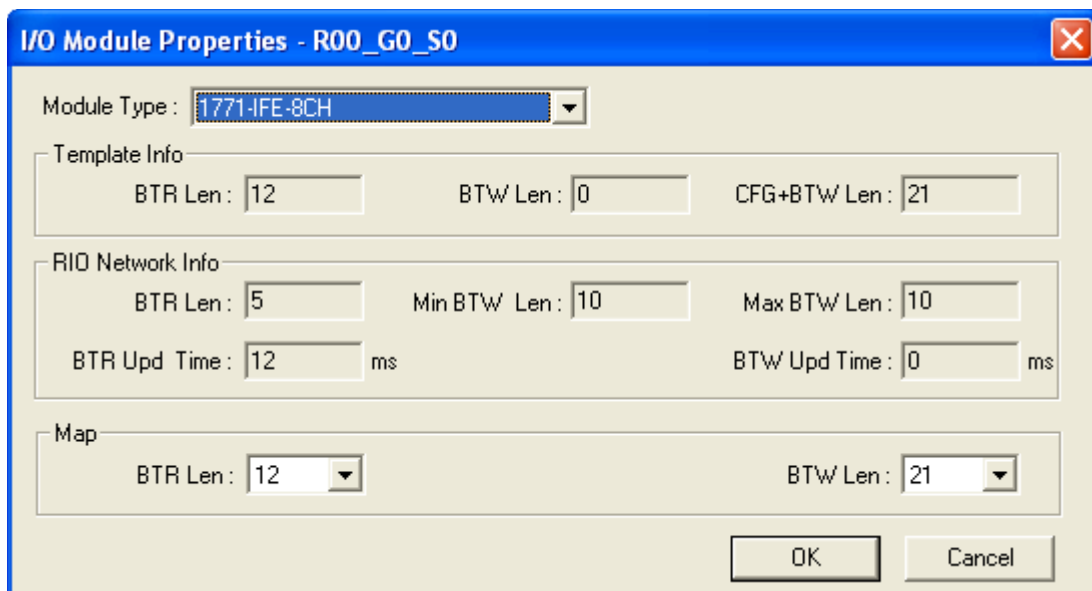


Select the BTR and BTW mapped lengths and click OK.

### Monitored Racks

On monitored racks, there are many block transfer types to choose from.

Select the *Module Type* from the list.



Select the BTR and BTW mapped lengths and click OK.



## Mapping the I/O Data

You must map the I/O data to locations in the ControlLogix scheduled input and output data before you can access the remote I/O network.

Unassigned I/O is shown with address xxxx in the network tree.

### WARNING!

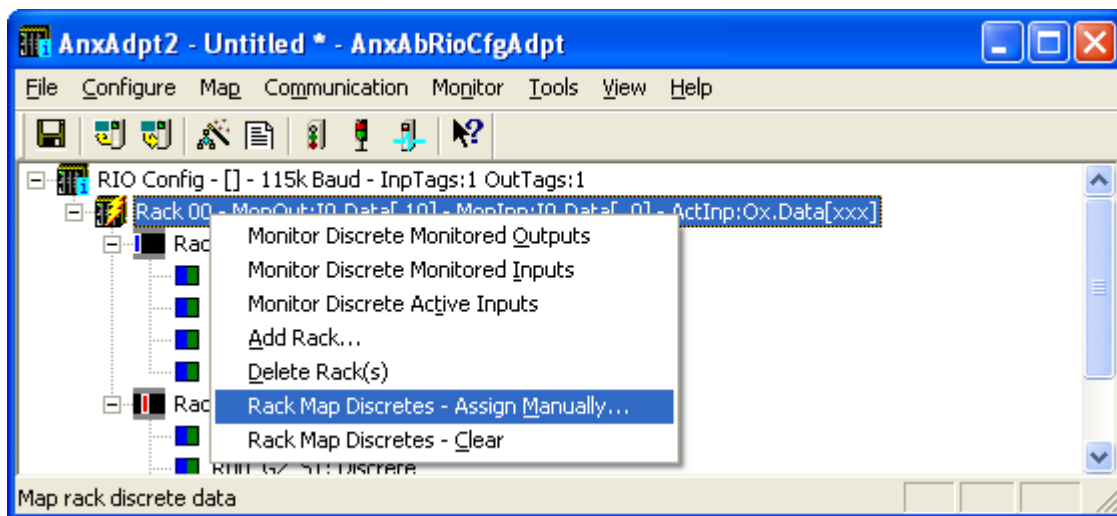
If you change mappings, make sure you clear the output table in the ControlLogix to prevent inadvertently writing to an incorrect location.

## Automatic Mapping

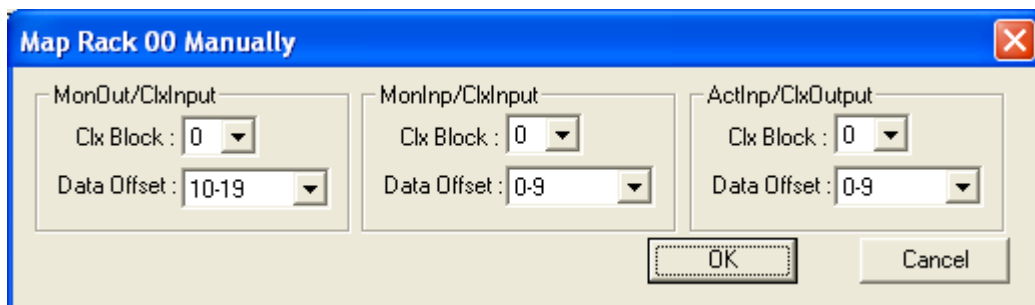
To automatically map all the data, select *Map/Auto-map Any Unassigned*. The configuration program maps all unassigned I/O to scheduled inputs and outputs. It leaves any previously assigned addresses unchanged.

## Manual Mapping

To manually map discrete(rack) data, right click on the rack and select *Rack Map Discretes – Assign Manually*



For the inputs and outputs, select the ControlLogix scheduled block and the offset within the block.



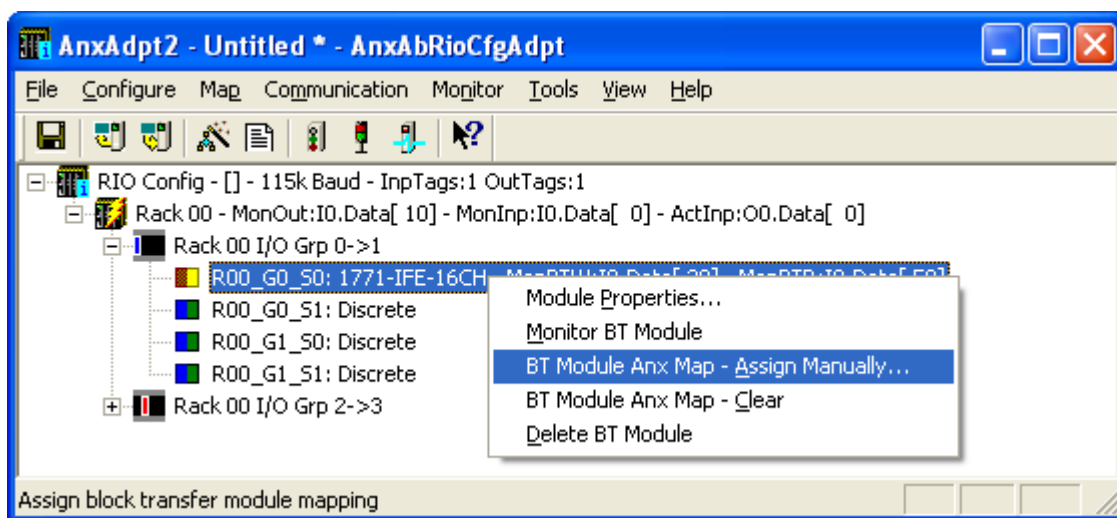
On active racks, remote I/O inputs are mapped to ControlLogix outputs (the ControlLogix writes the data which the AN-X4-AB-DHRIO sends to the remote I/O scanner as remote I/O inputs). Remote I/O outputs are mapped to ControlLogix inputs.

On monitored racks, both remote I/O inputs and outputs are mapped to ControlLogix inputs.

If the rack number consists of active and monitored partial racks, monitored inputs and outputs are mapped to ControlLogix inputs, and active inputs are mapped to ControlLogix outputs. You cannot map partial racks separately; the mapping applies to the entire rack.

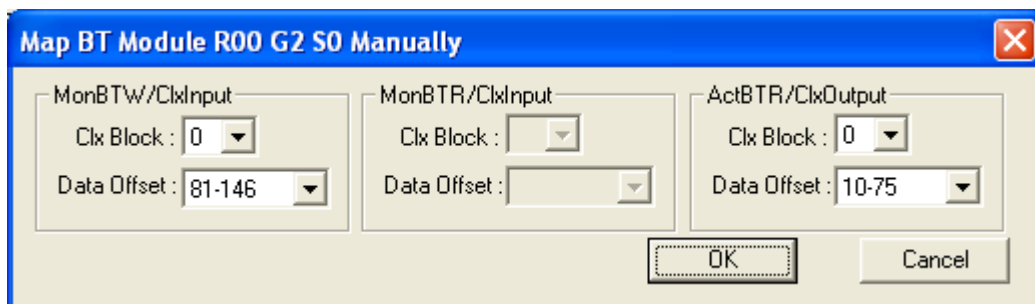
Click OK to accept the mapping.

To manually map the data for a block transfer module, right click on the module and select *BT Module Clx Map – Assign Manually*.

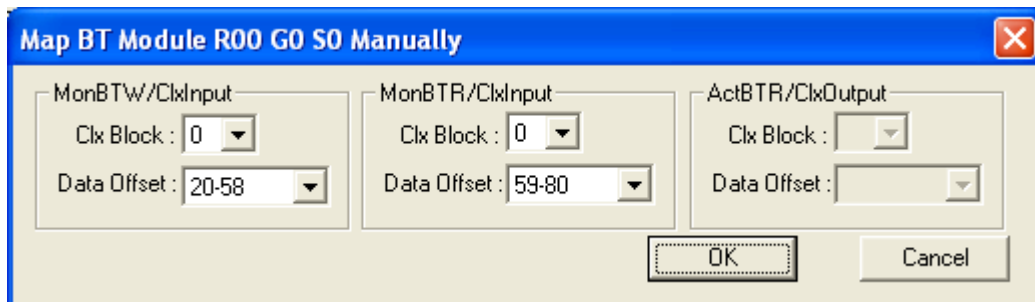


For the block transfer read and write data, select the ControlLogix scheduled block and the offset within the block.

On active racks, block transfer read data is mapped to ControlLogix outputs (the ControlLogix writes the data which the AN-X4-AB-DHRIO sends to the remote I/O scanner). Block transfer write data is mapped to ControlLogix inputs.



On monitored racks, both block transfer read and write data is mapped to ControlLogix inputs.

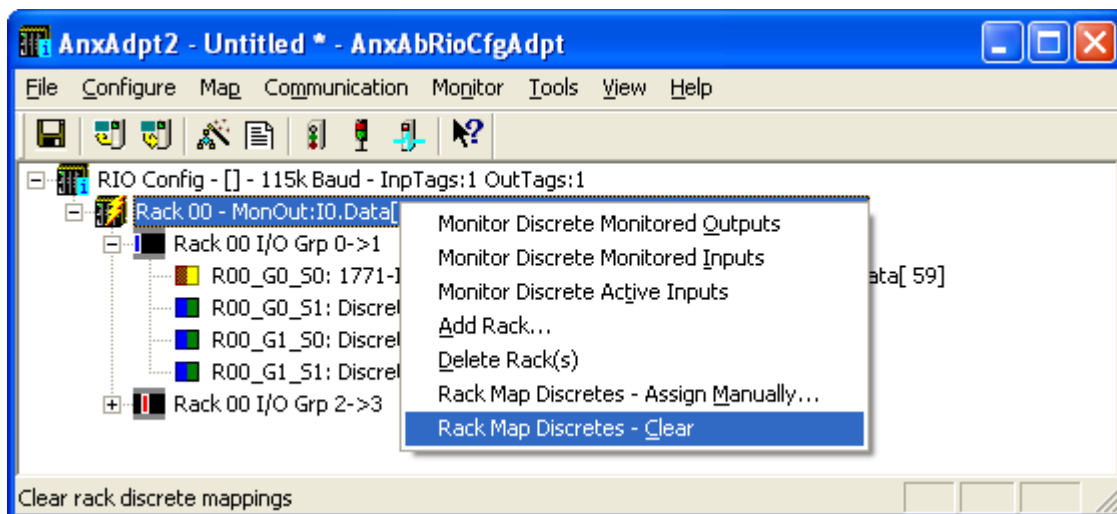


Click OK to accept the mapping.

### Clearing Mappings

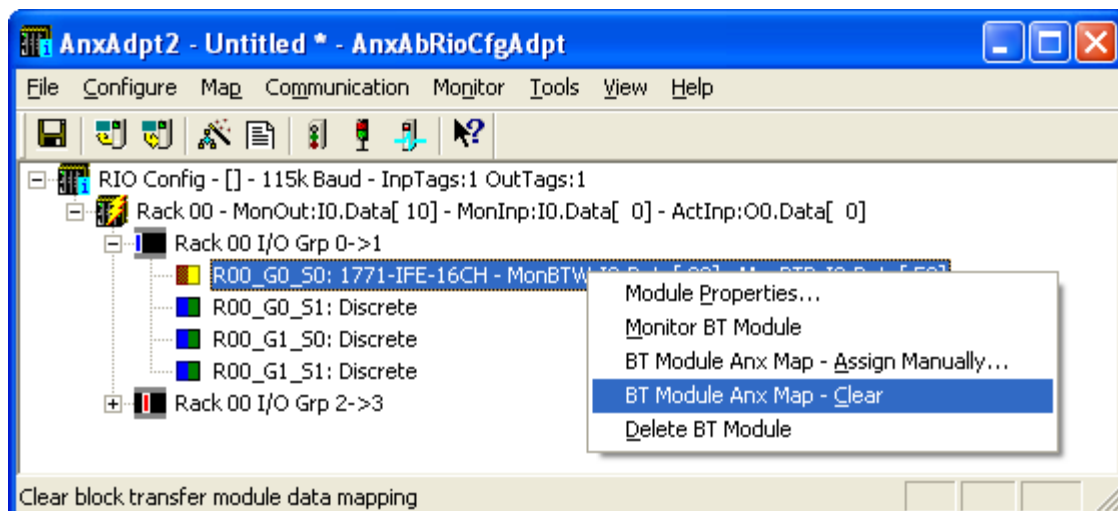
To clear all assigned mappings, select *Map/Clear All Mappings*.

To clear the mapping of the discrete data for a rack, right click on the rack and select *Rack Map Discretes – Clear*.



The configuration program asks for confirmation before it clears the mapping.

To clear the mapping for a block transfer module, right click on the block transfer module and select *BT Module Clx Map – Clear*.



The configuration program asks for confirmation before it clears the mapping.

### What gets mapped

The following sections describe that data that gets mapped to ControlLogix scheduled data.

#### Rack Data

When you map any part of a rack to scheduled data, the structure that gets mapped is the structure for the entire rack number.

On monitored racks, both remote I/O inputs and outputs are mapped to ControlLogix inputs.

On active racks, remote I/O inputs are mapped to ControlLogix outputs. Remote I/O outputs are mapped to ControlLogix inputs.

The data structure mapped for discrete outputs on monitored or active racks consists of:

Offset	Bit	Description
0	0-15	Reserved
1	0-15	Reserved
2-9	0-15	Discrete output data

The data structure mapped for discrete inputs on monitored racks consists of:

Offset	Bit	Description
0	0	Communication Error first quarter (I/O Group 0-1)
	1	Communication Error second quarter (I/O Group 2-3)
	2	Communication Error third quarter (I/O Group 4-5)
	3	Communication Error fourth quarter (I/O Group 6-7)
	4-15	Reserved
	1	Reserved (Pad for 32 bit alignment)
2-9	0-15	Discrete input data



Only bits 0 to 3 of the first word of status data are used. They consist of error bits that are set if there is a communication error with a partial rack. Bit 0 corresponds to a rack that starts at I/O group 0, bit 1 corresponds to a rack that starts at I/O group 2, and so on. The bit is set if there's an error scanning the rack and is 0 otherwise.

The data structure mapped for discrete inputs on active racks consists of:

Offset	Bit	Description
0	0-15	Reserved
1	0-15	Reserved
2-9	0-15	Discrete input data

There are no status bits on active racks.

### Block Transfer Modules

On monitored racks, both block transfer read and block transfer write data is mapped to ControlLogix inputs.

On active racks, block transfer read data is mapped to ControlLogix output data. Block transfer write data is mapped to ControlLogix input data.

The data mapped for block transfer writes on monitored or active racks consists of:

Offset	Bit	Description
0	0-7	BTR Update Counter (increments each time BTR executes, 0-255)
	8-10	BTR Error Code
	11	BTR.ERR, block transfer read error, see table
	12-15	Reserved
1	0-7	BTW Update Counter (increments each time BTW executes, 0-255)
	8-10	BTW Error Code, see table???
	11	BTW.ERR, block transfer write error
	12-15	Reserved
2-n	0-15	BTW Data (64 INTs max)

Offset 0 bits 0-7 contain a free-running counter that increments each time a block transfer read executes successfully.

The AN-X4-AB-DHRIO sets the BTR error bit, offset 0 bit 11, when an error occurs executing a block transfer read. It clears the bit when the block transfer read enable bit.

When a block transfer read error occurs, offset 0 bits 8-10 contain an error code (see table below).



Block transfer reads on monitored racks are mapped to ControlLogix inputs. Block transfer reads on active racks are mapped to ControlLogix outputs.

The data mapped for block transfer reads on active or monitored racks consists of:

Offset	Description
0	Reserved, always 0
1	Reserved, always 0
2-n	Up to 64 words of BTR Data

## Uploading and Downloading

To transfer a configuration to the AN-X4-AB-DHRIO, select *Communication/Download Configuration* or use the *Download Configuration to Module* button on the toolbar

To transfer a configuration from the AN-X4-AB-DHRIO, select *Communication/Upload Configuration* or use the *Upload Configuration from Module* button on the toolbar

## Saving Configurations

To save a configuration to disk, select *File/Save*

## Archiving Configurations

### File/Archive Templates

The *File/Archive Templates* command copies any block transfer module templates used in the current configuration file into the directory where the configuration file is stored.

### File/Archive Template Check

The *File/Archive Template Check* command checks whether any block transfer module templates used in the current configuration file are not stored in the directory where the configuration is stored.

## Aliases

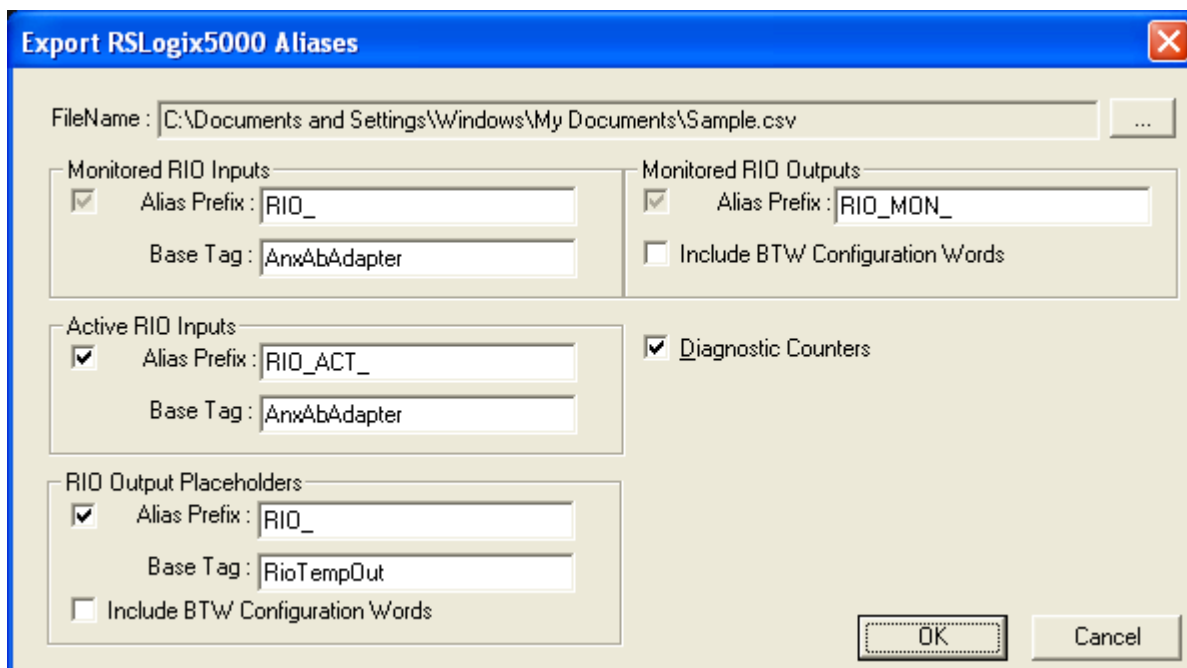
The configuration program exports aliases for discrete and block transfer data that can be imported into RSLogix 5000. Each alias points to the corresponding location within the ControlLogix scheduled data blocks.

Write programs in terms of these aliases rather than using absolute addresses. If the mapping of the I/O data changes, simply reimport the new aliases and the program will point to the new data locations.

To export aliases, select *Tools/Export Aliases...*







Use the browse button (three dots...) to change the file location.

The *Alias Prefixes* are used to distinguish between aliases for different AN-X4-AB-DHRIO modules and to help identify groups of data items. If you have more than one AN-X4-AB-DHRIO in the RSLogix configuration, assign each one a different Alias Prefix so that the tags for each one are unique.

The *Base Tags* identify the AN-X4-AB-DHRIO in RSLogix 5000. Refer to the Tags section in RSLogix 5000 to find the format of the Base Tag. For example, if the emulated ENBT on the AN-X module is named Anxadapt12, set the base tags for I/O data to the same thing.

The program also exports another set of tags for use with Ghost Mode (see page 34). These output placeholders are aliases that point monitored remote I/O output data to a ControlLogix internal array. If you are using ghost mode, you can write your new application to write to this placeholder array and compare the monitored outputs to the outputs written by the new control program.

You can choose to include aliases for block transfer write configuration data by checking the appropriate checkbox.

## Exporting a Scanner Configuration

The adapter configuration program can export a configuration file that can be loaded by the AN-X4-AB-DHRIO scanner.

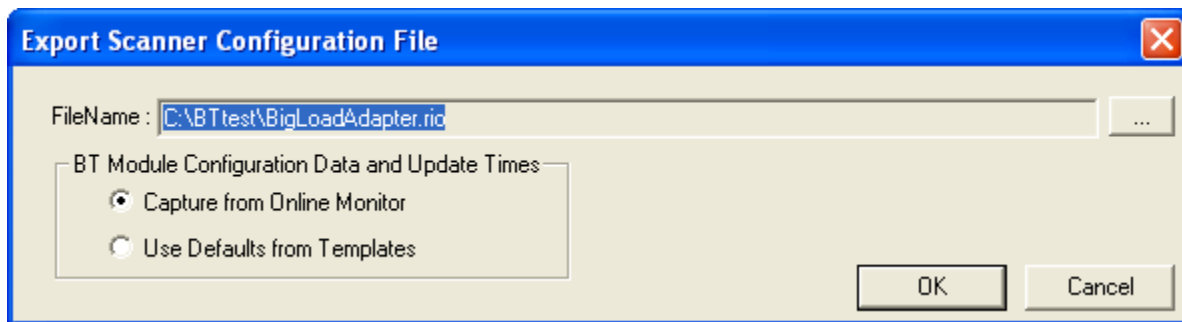
It consists of:

- baud rate
- monitored racks
- block transfers on monitored racks

It does not contain active racks, block transfers on active racks or mappings.



To export a scanner configuration, select *Tools/Export Scanner Configuration File...*



The configuration data for block transfers can be based on the default configuration data from the block transfer module templates or on the configuration data the adapter has observed on the network.

If you are using the AN-X4-AB-DHRIO in a ghost mode application (see below), you can monitor the existing system to capture block transfer timing and configuration data, then export a scanner configuration that contains that data. Convert the AN-X4-AB-DHRIO to scanner mode and load the exported configuration to scan the remote I/O network.

## Ghost Mode

The AN-X4-AB-DHRIO provides tools to upgrade an existing remote I/O application to ControlLogix with a minimum of downtime and startup time. This process is sometimes referred to as “Ghost Mode”.

To use ghost mode:

1. Use the AN-X4-AB-DHRIO in adapter mode to monitor data and timing on the existing system.
2. Create the new application and compare the data and timing on the new system with the still-running old system.
3. When you are satisfied that the new system accurately duplicates the behaviour of the existing system, replace the old application with the new one, using the AN-X4-AB-DHRIO as the remote I/O scanner.

The replacement will have been tested before the switchover. It will use the same field wiring as the old system. Best of all, if unanticipated problems arise, you can switch back to the old system in minutes.

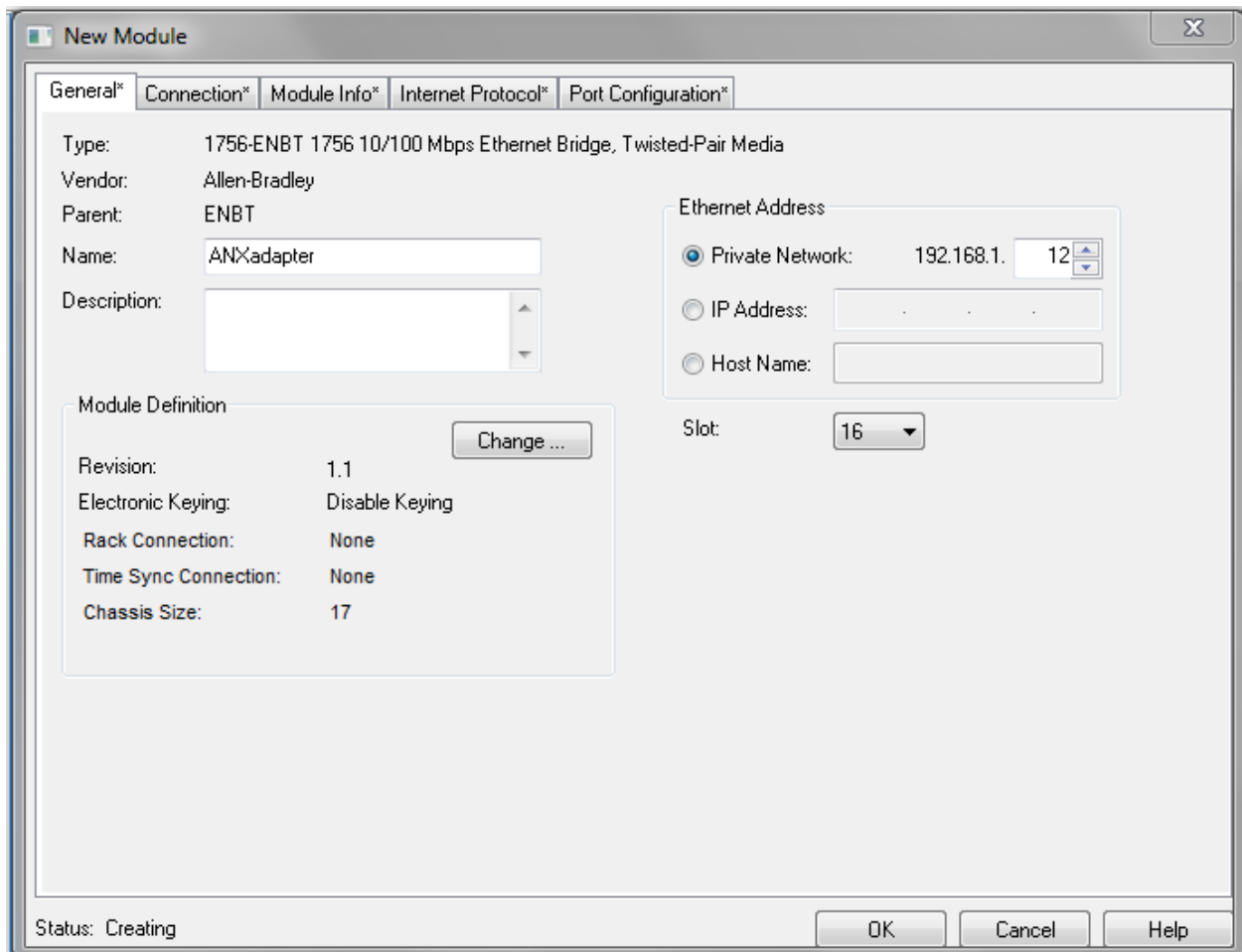
## Configuring the AN-X Module in RSLogix 5000

The AN-X4-ABDHRIO emulates a 17-slot 1756 chassis with a 1756-ENBT/A in slot 16 and up to 16 generic modules in slots 0 to 15.

Connections to slots 0 to 14 are used for I/O data; the connection to slot 15 is reserved for diagnostic data (see page 44).

To configure the AN-X4-ABDHRIO in RSLogix 5000:

1. Right click on the ControlLogix Ethernet bridge module that will communicate with the AN-X and select *Add Module*. Add a 1756-ENBT/A module. Set the Major Rev to 1.



Enter the *Name*. Use the host name you assigned to AN-X when you configured its IP properties.

Set the Slot to 16. Set the chassis size to 17.

Set the *Rack Connection* to None.

Set the IP address to match the AN-X module.

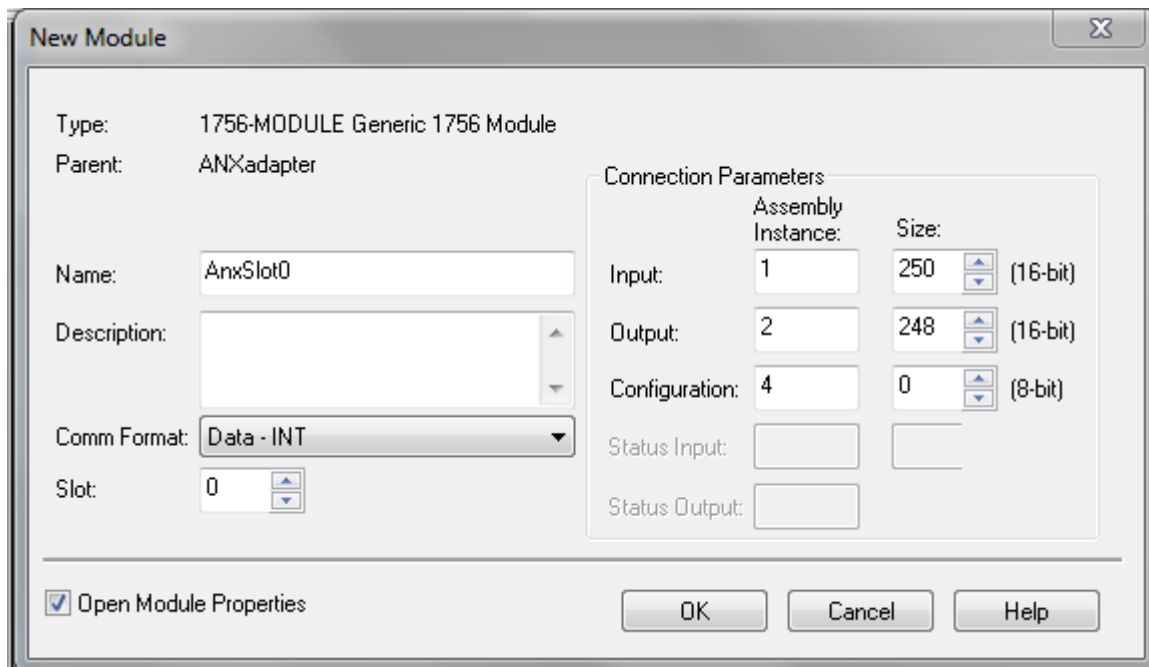
Set *Electronic Keying* to *Disable Keying*.



Record the *Name* as it is used to create aliases to access the data.

Click OK to accept the module.

2. Add Generic modules for each required connection, usually at least slot 0 for data and slot 15 for diagnostics. Right click on the backplane and select *New Module*. From the *Other* category, select 1756-MODULE and click OK.

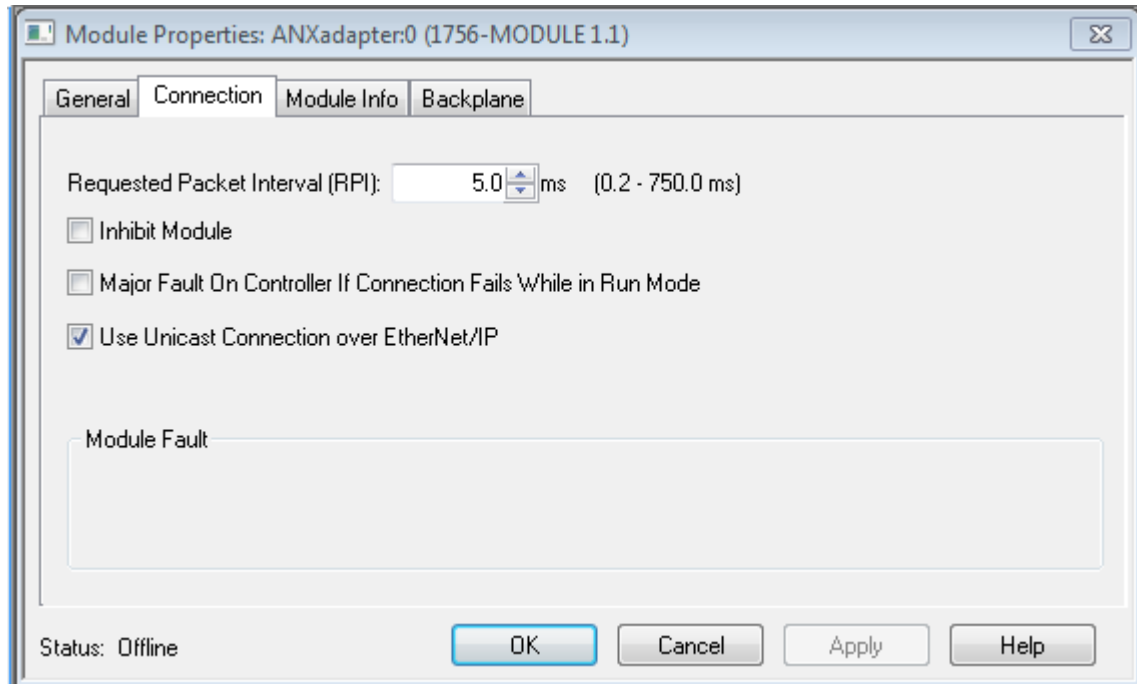


Set the Name and Description as desired.

Set the Comm Format to Data – INT.

Set the other parameters as shown. Set the Slot to 0 for connection 0, 1 for connection 1, and so on.

3. Set the RPI for each connection.



AN-X accepts RPIs from 1 to 750 ms.

Select an RPI appropriate to the remote I/O network scan time and to your application. You can use the diagnostic counters (see page 58) to obtain the remote I/O network scan time.

Typically you set the RPI for slot 15 (diagnostic counters) to a longer time, for example 500 ms., since the diagnostic data does not need to be updated as often.

#### TIP

Use the web interface of the ENBT module that connects to the AN-X to view the loading of the ENBT module.

## ControlLogix Aliases

AN-X uses the Ethernet/IP configuration to create aliases that can be imported into RSLogix 5000. Use these aliases in your RSLogix 5000 program to access the data on the AN-X. Even if the ControlLogix address for an I/O address changes, all you have to do is re-import the aliases.

#### WARNING!

Before you export aliases, right click on the root of the network tree and select *AN-X-AB-RIO Properties...*

Make sure that the AN-X2 checkbox is checked.

#### WARNING!

If you change the remote I/O or ControlLogix configuration, re-import aliases so that the ControlLogix processor uses the correct addresses.



In the configuration tool, select *Tools/Export Alias File...*

The alias name is built from the Alias Prefix and the remote I/O address.

The ControlLogix address is built from the Base Tag and the data mapping.

### Importing Aliases in RSLogix 5000

To import the alias file into RSLogix 5000, you must be offline. Select *Tools/Import...* and import the alias file.

#### Alias Format

AN-X builds each alias from the Alias Prefix, Base Tag, and data mapping, for example,

```
ALIAS, "", "RIO_I000", "Rack-00 Grp-0 Discrete Input", "", "ANX:0:I.Data[2]"
```

In this example, the alias name is RIO\_I000. The name is made up of the Alias Prefix (RIO\_) and the I/O address, input data, rack 00, I/O group 0

The ControlLogix data address is ANX:0:I.Data[2]. The address is made up of the Base Tag and the data location from the data mapping.

#### Comments

The alias file also contains comments for data points for which there are no aliases, such as the diagnostic counters. If you view the data points in RSLogix 5000, the comments are displayed.

## Using the RIO-ADPT Log

If there are problems with scheduled connections to the AN-X, use the RIO-ADPT log to identify the cause.

From the AN-X web interface, select *Log Files/RIO-ADPT Log* to display the log. Look for error messages that describe in detail the cause of any problem with the current configuration.



## Remote I/O Operation

### Required Connections

The AN-X-ABDHRIO does not require that all mapped ControlLogix connections are present. However, it holds inputs on active racks at 0 until the corresponding connections are made.

### Monitoring operation

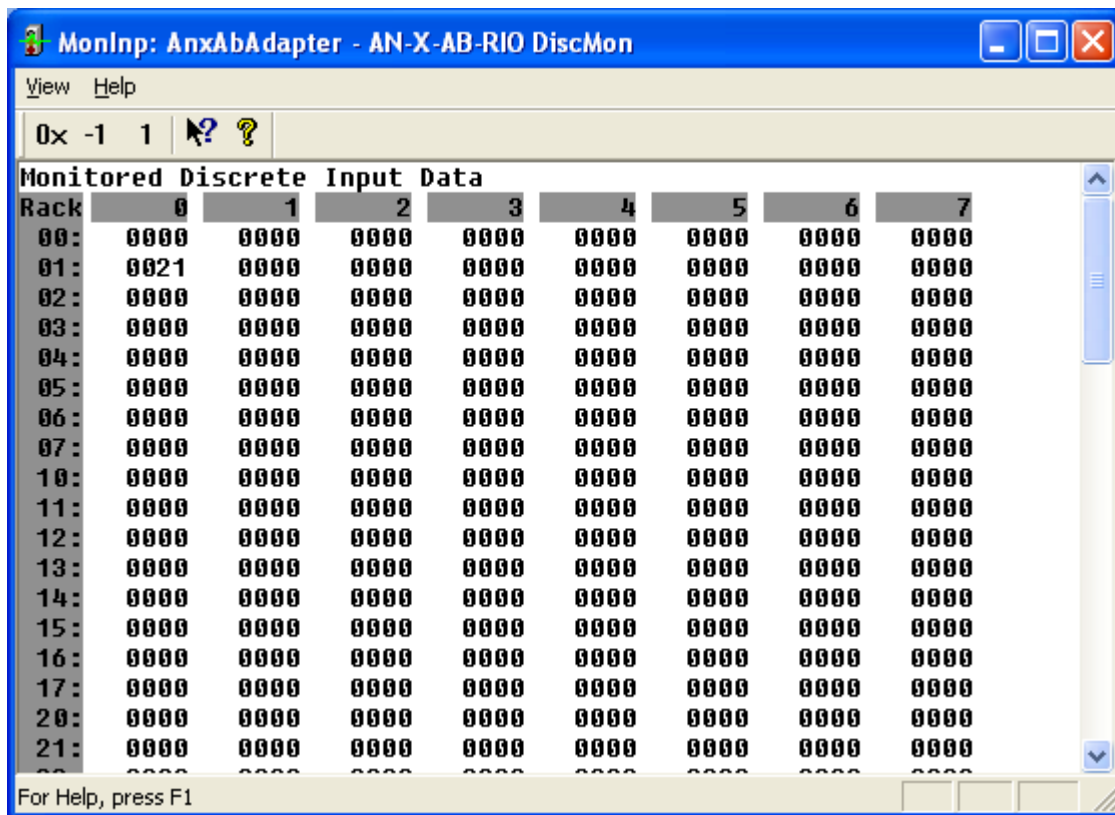
You can monitor the AN-X from the Windows configuration program or from the web interface.

### Discrete Inputs and Outputs on Monitored Racks, Configuration Program

To monitor discrete inputs or outputs on monitored racks, do one of the following:

- from the main menu, select *Monitor/Discrete Monitored Inputs* or *Monitor/Discrete Monitored Outputs*
- right click on a rack and select *Monitor Discrete Monitored Inputs* or *Monitor Discrete Monitored Outputs*
- use the *Monitor Discrete Monitored Inputs* or *Monitor Discrete Monitored Outputs* button on the toolbar

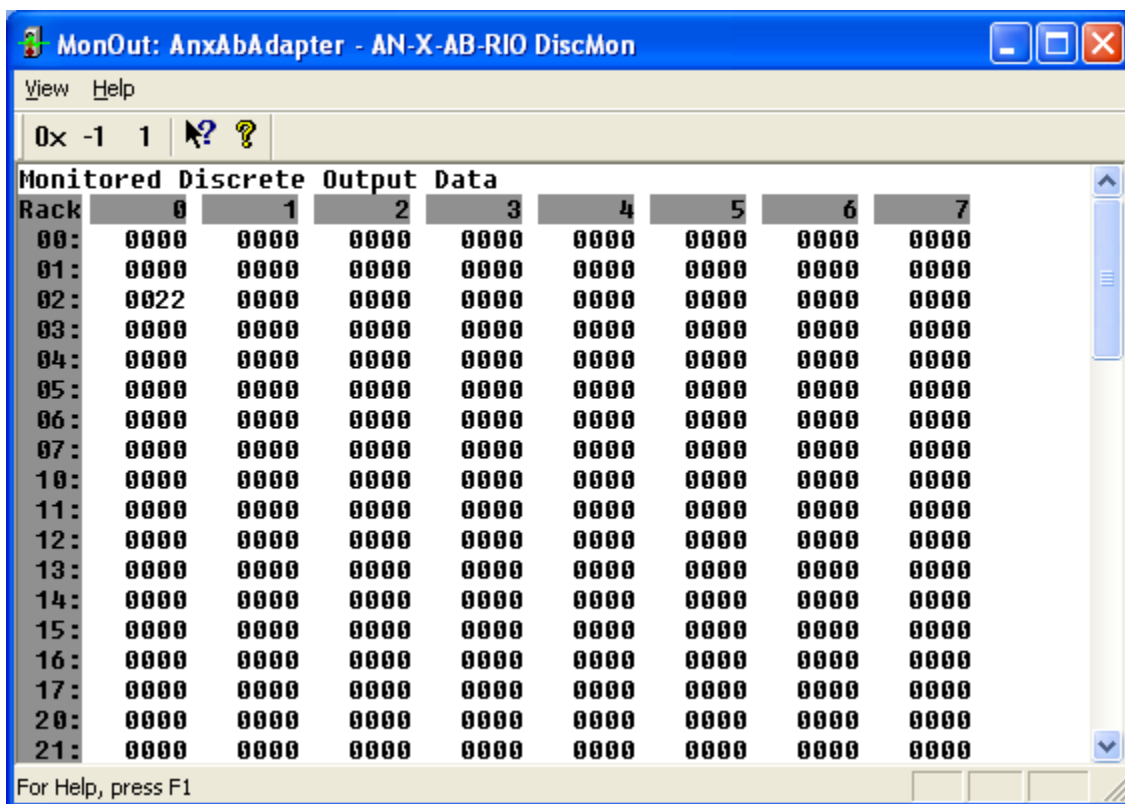
The Discrete Input or Discrete Output monitor window appears.



Each row corresponds to a rack. Rack numbers are given in octal. Each row shows the 8 words of discrete inputs for the rack number.

Data can be displayed in several formats:

Format	From menu...	From Toolbar
Hexadecimal	View/Hex	0x button
Signed decimal	View/Unsigned	1 button
Unsigned decimal	View/Signed	-1 button



### Discrete Inputs and Outputs on Active Racks, Configuration Program

Discrete outputs on active racks are just like outputs on monitored racks.

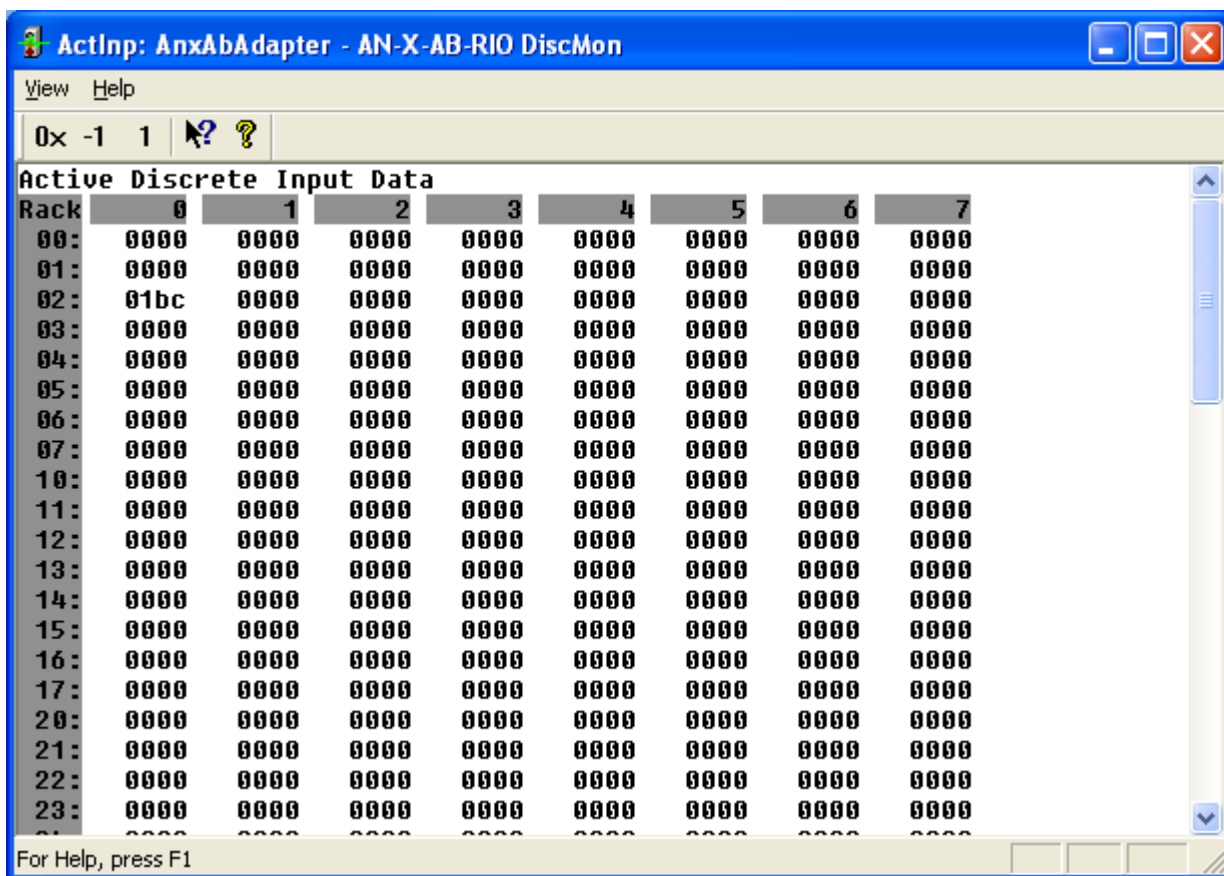
To monitor discrete inputs on active racks, do one of the following:

- from the main menu, select *Monitor/DiscreteActive Inputs*
- right click on a rack and select *Monitor Discrete Active Inputs*

The Discrete Active Input monitor window appears.







Each row corresponds to a rack. Rack numbers are given in octal. Each row shows the 8 words of discrete inputs for the rack number.

Data can be displayed in several formats:

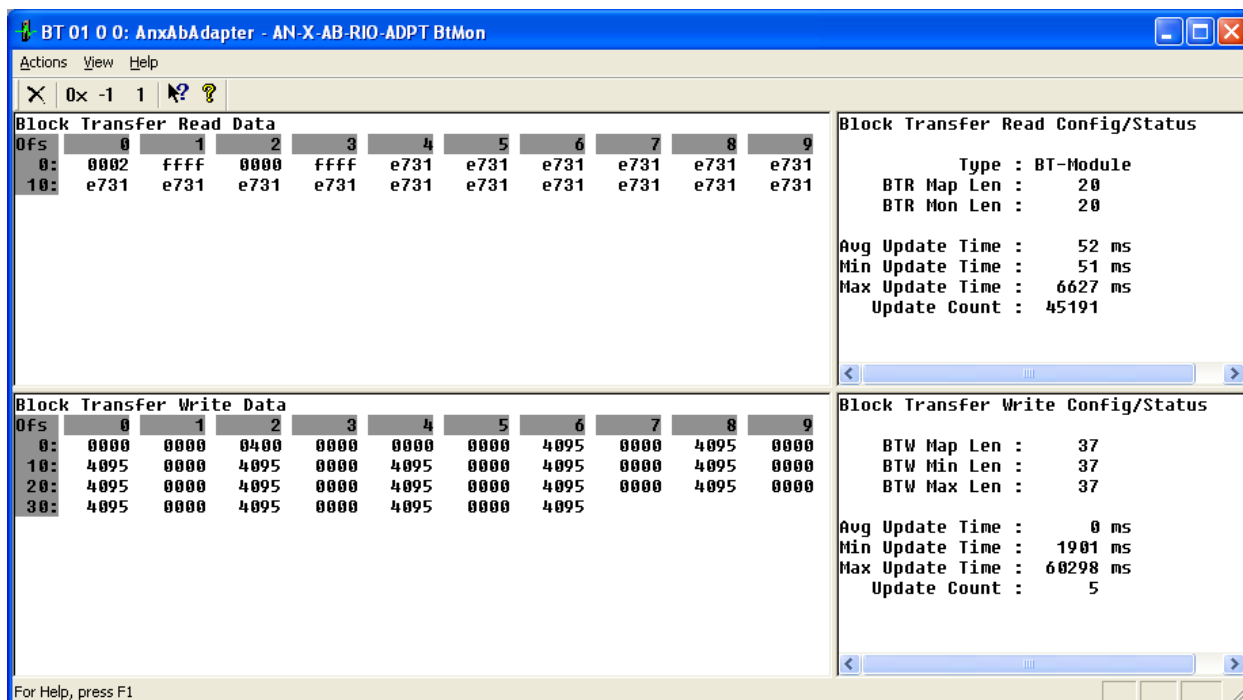
Format	From menu...	From Toolbar
Hexadecimal	View/Hex	0x button
Signed decimal	View/Unsigned	1 button
Unsigned decimal	View/Signed	-1 button

### Block Transfers, Configuration Program

To monitor a block transfer module, right click on the module in the tree and select *Monitor BT Module*. The block transfer module window appears.

The block transfer monitor displays the raw data for the block transfer and some diagnostic information.





The raw data can be displayed as hexadecimal, signed or unsigned integer. The default for block transfer data is hexadecimal.

Format	From menu...	From Toolbar
Hexadecimal	View/Hex	0x button
Signed decimal	View/Unsigned	1 button
Unsigned decimal	View/Signed	-1 button

### Block Transfer Read Diagnostics

Counter	Description
Type	Module type, from the module template
BTR Map Len	Block transfer read mapped length length
BTR Mon Len	Block transfer read observed length
Avg Update Time	Average update time for this block transfer read, in ms. This is the average of the previous 8 updates.
Min Update Time	Minimum update time for this block transfer read, in ms
Max Update Time	Maximum update time for this block transfer read, in ms
Update Count	Running count of updates for this block transfer read



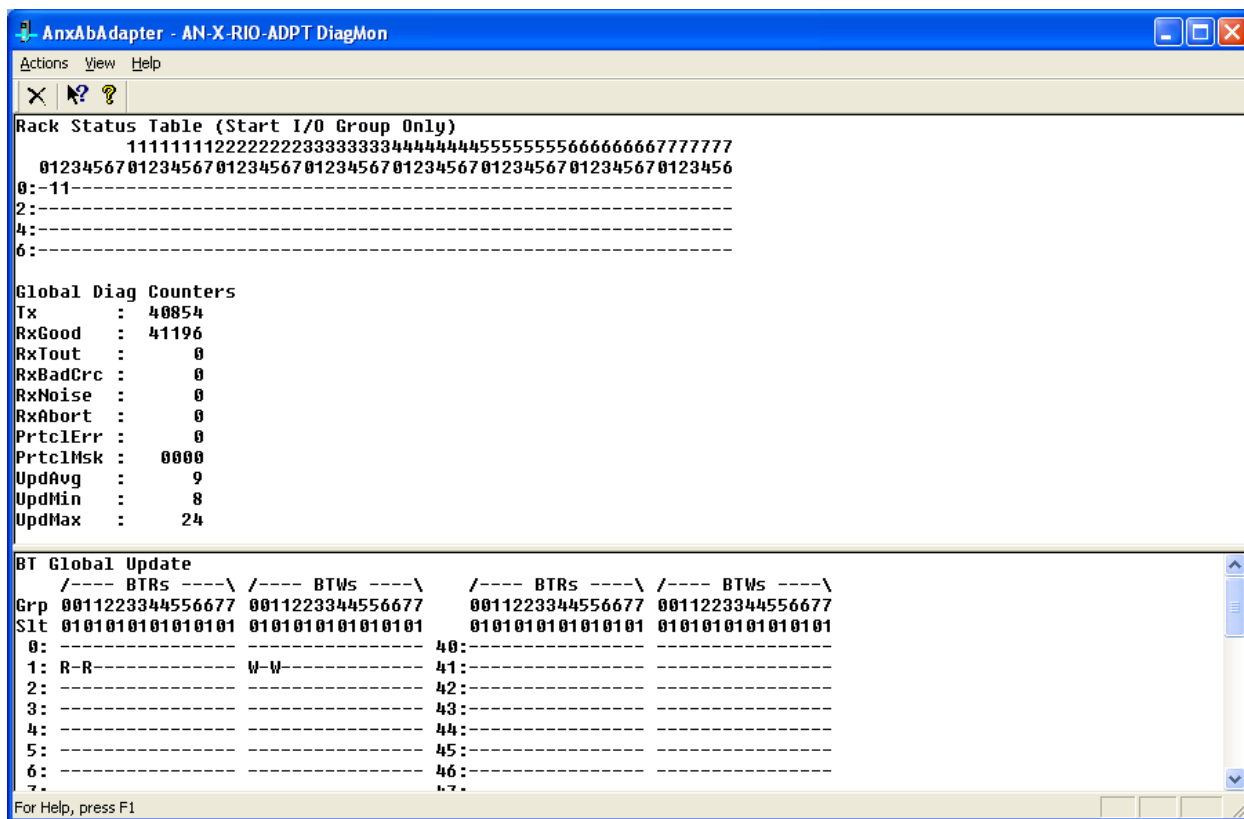
### Block Transfer Write Diagnostics

Counter	Description
BTW Map Len	Length of mapped BTW data
BTW Min Len	Minimum observed length
BTW Max Len	Maximum observed length
Avg Update Time	Average update time for this block transfer write, in ms. This is the average of the previous 8 updates.
Min Update Time	Minimum update time for this block transfer write, in ms
Max Update Time	Maximum update time for this block transfer write, in ms
Update Count	Running count of updates for this block transfer write.

### Rack Status and Diagnostic Counters

The AN-X maintains diagnostic counters that indicate the state of communication on the entire RIO network, as well as counters related to each rack. It also maintains an active rack list.

To monitor the diagnostic counters, select *Monitor/Diagnostic Counters* from the main menu or use the *Monitor Diagnostic Counters* button on the toolbar.



### Rack Status Table

The rack status table shows where the racks are located. Columns represent racks, rows represent starting I/O groups. Racks are numbered in octal.

If the bit for a rack and starting I/O group is set, there is a rack at that location. The table does not show rack size.

### Global Diagnostic Counters

The global diagnostic counters consist of:

Counter	Description
Tx	This counter increments each time the AN-X4-AB-DHRIO transmits a packet.
RxGood	This counter increments when the AN-X4-AB-DHRIO receives a good packet.
RxTout	This counter increments when the AN-X4-AB-DHRIO sends a packet but does not receive a reply.
RxBadCRC	This counter increments when the AN-X4-AB-DHRIO receives a packet with a bad CRC. Check cabling and termination on the RIO network.
RxNoise	This counter increments when the AN-X4-AB-DHRIO hears a carrier without receiving a packet. Check cabling and termination on the RIO network.
RxAbort	This counter increments when the AN-X4-AB-DHRIO receives an opening flag, then the packet ends without a closing flag.
PrtclErr	This counter increments when the AN-X4-AB-DHRIO receives a packet that makes no sense in terms of the protocol.
PrtclMsk	Protocol error type
PrtclArg	Protocol error argument
UpdAvg	Average update time for all configured racks. This is the average of the previous 64 updates.
UpdMin	Minimum update time for all configured racks.
UpdMax	Maximum update time for all configured racks.

### BT Global Update Table

The BT Global Update Table shows where block transfers are occurring.

## Mapping Diagnostic Counters

To map the diagnostic counters to ControlLogix scheduled data, add a connection to slot 15.



Since the diagnostic counters do not need to update frequently, set the RPI to a large number, such as 500 ms.

You cannot map individual diagnostic counters.

The diagnostic counters consist of:

Offset	Description
2	Good frames received
3	Timeouts
4	Frames with CRC errors
5	Frames received with noise errors
6	Abort errors
7	Transmitted frames
8	Protocol errors
9	Low byte- protocol error type, high byte - error argument
10-25	Rack status table
26	Current remote I/O scan time, ms
27	Average remote I/O scan time, ms
28	Minimum remote I/O scan time, ms
29	Maximum remote I/O scan time, ms
35	Scheduled I/O Tx count
36	Scheduled I/O Rx count
37	Lo Byte: Ethernet Error Counter Hi Byte: Ethernet Error Type
38	Lo Byte: UDP or Ethernet/IP Protocol Error Counter Hi Byte, Lo Nibble: Protocol Error Type Hi Byte, Hi Nibble: Protocol Error Slot

To clear the diagnostic counters from the ControlLogix, set bit 0 of offset 0 of the outputs for connection 15. The counters are cleared on the transition of this bit from 0 to 1.

Clearing the diagnostic counters does not clear counters with offsets 35 to 38.

In addition, the web interface shows diagnostics for scheduled Ethernet connections. See page 59.

## Module Logs

The logs contain messages from the firmware running on the AN-X-ABDHRIO, showing its normal operation and error messages. They may be useful in tracking down errors and for Technical Support.

Access the logs from the web interface. See page 62 for more information.



## Block Transfer Module Templates

The properties of block transfer modules are defined in files in the subdirectory 'Templates' of the directory where the AN-X4-AB-DHRIO software is installed. Template files have extension BtModTpl.

Template files are simple text files that define the properties of the block transfer module.

Anything after a semicolon on a line is treated as a comment and is ignored.

The following information is supplied so that you can create templates for block transfer modules that the AN-X4-AB-DHRIO does not support.

**TIP** If you create a new template, base it on an existing template that's similar to the module you want to create the new template for. Copy the existing template file to a new file and rename it.

For block transfer modules which do not have a specific profile, you can also use the generic profile, BT-MODULE, in automatic, semiautomatic or manual mode.

### Description

A profile usually contains a description record, which consists of the keyword Desc, followed by an equals sign and then up to 79 characters of text enclosed in quotes.

The description text is displayed in the configuration dialog box for any modules created from the template.

#### Examples

```
Desc="1771-IFE - 8 Channel Single Ended"
```

```
Desc="1771-OFE - Binary Format, No BTR"
```

### Note

A note record, which consists of the keyword Note, followed by an equals sign and then up to 79 characters of text enclosed in quotes, is used to convey information that a user needs when creating a module from this template.

The note text is displayed in the configuration dialog box for any modules created from the template.

#### Example:

```
Note="Always set mapped output data word 0 to 8880 hexadecimal in the ControlLogix"
```



## Block Transfer Lengths

A block transfer has three lengths associated with it.

The configuration length, CfgLen, is the length of the additional configuration block transfer write data sent to the block transfer module to initialize it.

The block transfer write length, BtwLen, is the length of the block transfer write sent to the module during normal data update.

The block transfer read length, BtrLen, is the length of the block transfer write sent to the module during normal data update.

Therefore, the initial configuration block transfer write has a total length of BtwLen+CfgLen

BtwLen (I/O data)	CfgLen (Configuration data)
-------------------	-----------------------------

## Default Configuration Data

The template usually contains default values for the configuration block transfer write.

Each value consists of the keyword CfgData, an offset enclosed in square brackets, an equals sign, and the data value.

For example

```
CfgData[8]=0x0fff
```

The offset is an offset into the configuration block transfer write and ranges from 0 to (BtwLen + CfgLen - 1).

The data value can be expressed in decimal or hexadecimal (leading 0x, as shown above).

The default data definition is often followed by a comment (leading semicolon) to indicate what the value means.

The configuration tool uses the default configuration data to select the initial values when you create a block transfer module from the template.

Examples

```
CfgData[4]=0x8000; 0-3:DataPol, 4 6 8 10:MinScaPol,5 7 9 11:MaxScaPol,
15:BinFmt
```

```
CfgData[5]=0x0000 ; Min Scale ch 1
```

## Parameters

Parameters let you assign values to the configuration data different from the default values for a specific module created from a standard template.

Parameters appear in the configuration dialog for any modules created from the template.

Parameter definitions begin with the keyword 'ParmDesc' and end with the keyword 'ParmEnd'.

Parameter definitions contain:

- a description to display in the module dialog



- the location in the dialog box
- the location in the configuration data
- data value

### Parameter Description

Parameter definitions begin with the keyword 'ParmDesc', which is followed by an equals sign and then up to 39 characters of text to be displayed in the dialog box.

### Location in Dialog Box

The screen location in terms of row (Row=0-63) and column (Col=0-2) where the parameter will be displayed in the dialog box.

### Location in the Configuration Data

The location of the parameter in the configuration block transfer is defined in terms of offset, data mask and bit shift.

The offset is the offset into the configuration block transfer, from 0 to 63. It is specified by the keyword 'Ofs', and equals sign, and the offset value.

The shift is the number of bits the value you enter is shifted left, from 0 to 15. It is specified by the keyword 'Shift', and equals sign, and the shift value.

The mask is used to select bits in the value you enter. It is specified by the keyword 'Mask', and equals sign, and the mask value, usually in hexadecimal.

The value you enter is logically ANDed with the mask, shifted left by the shift value, and ORed into the configuration word given by the offset.

### Example

```
Ofs= 8 Mask=0x00ff Shift=2
```

### Data Value

Data values can be defined as a numerical value or from a selection list. Numerical values are defined in terms of a format (BcdSgn, BcdUns, BinSgn or BinSgn), the corresponding data value, mask and shift values, and minimum and maximum values. Selection lists can contain up to 256 selection values. The configuration dialog for a module created from the template displays the names of the selection values.

### Parameter Examples

#### Example 1: Numeric value

```
; Min Scale
ParmDesc="Min Scale Ch 1 :" Col=0 Row=0 Ofs=5 Mask=0xffff Shift=0
      BinSgn MinVal=-4095 MaxVal=4095
ParmEnd
```

#### Example 2: Selection

```
; Channel 1
ParmDesc="Range Select Ch 1:" Col=0 Row= 2 Ofs=0 Mask=0x0003 Shift=0
```





```
Select=" 1 to 5V, 4 to 20mA", 0
Select=" 0 to 5V, 0 to 20mA", 1
Select=" -5 to 5V,-20 to 20mA", 2
Select="-10 to 10V, 0 to 10V" , 3
```

ParmEnd

## Aliases

Aliases define the names and descriptions exported from the configuration tool and imported into RSLogix 5000. They begin with keyword 'AliasInp' or 'AliasOut', an offset enclosed in square brackets, a name consisting of up to 15 characters enclosed in quotes, and a description consisting of up to 79 characters enclosed in quotes.



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## Using the Web Interface

The AN-X contains a webserver capable of communicating with standard web browsers.

Use the web interface to:

- view remote I/O discrete and block transfer data
- monitor remote I/O and Ethernet diagnostic and error counters
- view AN-X logs
- perform administrative functions such as assigning the IP parameters, uploading or selecting firmware, updating the kernel, and so on

It also contains contact information for support.

To use the web interface, you must know the IP address of the AN-X. To access the web interface, start your web browser and type the AN-X IP address where you normally enter web addresses in the browser.

The screenshot shows the web interface for the AN-X-ABRIO-ADPT A-B Remote I/O Adapter (v4.1.30). The interface is divided into two main panes. The left pane is a navigation menu with the following sections: Home Page, Automation Network (expanded), Log Files, Administration, and Support. Under the Automation Network section, there are four sub-items: RIO Discrete Data, RIO Block Transfers, RIO Diagnostics, and Ethernet/IP Diagnostics. The right pane displays the main content area, which includes the title 'AN-X-ABRIO-ADPT A-B Remote I/O Adapter (v4.1.30)'. Below the title, there are sections for Introduction, Directions, Menu Details, and Automation Network. Under the Automation Network section, there are three sub-sections: Configuration, RIO Discrete Data, and RIO Block Transfers.

The left pane contains commands. Click on the arrows at the left of the main headings to expand or contract the sections.

The contents of the right pane depend on the current command being executed.

## Automation Network

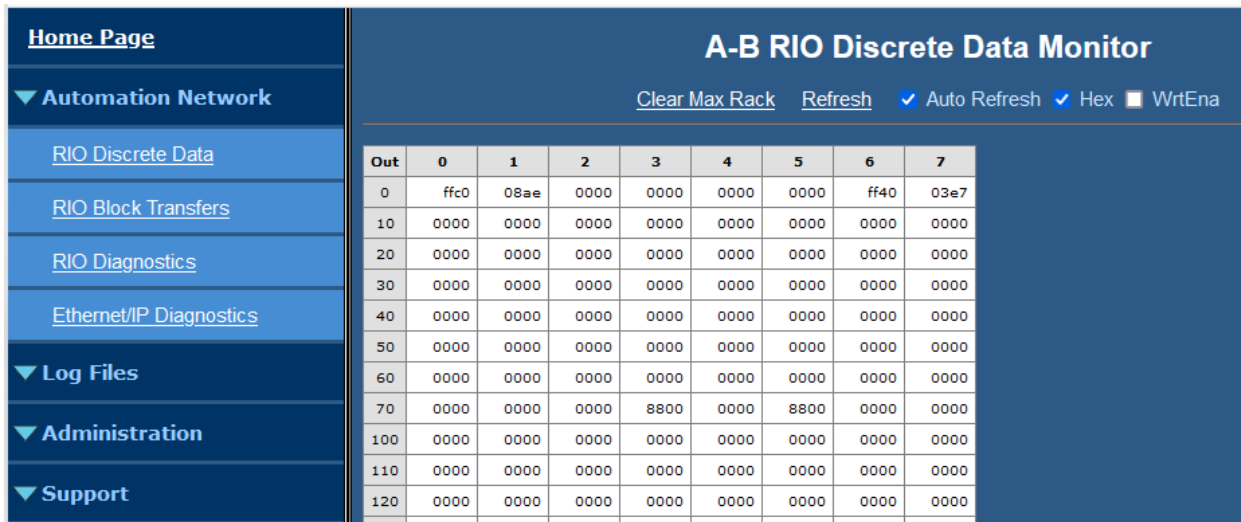
### Configuration

The AN-X-ABRIO-ADPT is configured using a Windows Configuration tool and not from the web interface.



## RIO Discrete Data

Use *Automation Network/RIO Discrete Data* to display the discrete data on all racks.



Out	0	1	2	3	4	5	6	7
0	ffc0	08ae	0000	0000	0000	0000	ff40	03e7
10	0000	0000	0000	0000	0000	0000	0000	0000
20	0000	0000	0000	0000	0000	0000	0000	0000
30	0000	0000	0000	0000	0000	0000	0000	0000
40	0000	0000	0000	0000	0000	0000	0000	0000
50	0000	0000	0000	0000	0000	0000	0000	0000
60	0000	0000	0000	0000	0000	0000	0000	0000
70	0000	0000	0000	8800	0000	8800	0000	0000
100	0000	0000	0000	0000	0000	0000	0000	0000
110	0000	0000	0000	0000	0000	0000	0000	0000
120	0000	0000	0000	0000	0000	0000	0000	0000

By default, the display shows the data in hexadecimal. Uncheck Hex to change the display to decimal.

If Auto Refresh is on, the display refreshes once a second.

You can refresh the screen at any time by clicking Refresh Counters or by clicking anywhere on the table.

If values change, they are shown with a light green background for one display update after they have changed.

Check WrtEna to write RIO I/O data directly.

**WARNING!** WrtEna is meant to be used for commissioning and testing by qualified personnel only.

Note: If you enter I/O data here, it may be overwritten by:

- RIO Outputs from the remote I/O scanner
- RIO Inputs from monitored remote I/O racks

When WrtEna is on, select a location to edit data and an edit box opens at the top of the screen. Type the new value in the edit box, and press:

- enter to accept the value, clear the edit window and remain at the same place
- shift-enter to accept the value, leave the value in the edit box and move to the next editable space



- ctrl-enter to accept the value, increment the value in the edit box, and move to the next editable space

The size of the display is based on configured racks.

## RIO Block Transfers

Use *Automation Network/RIO Block Transfers* to display a table of all possible block transfer locations, organized by rack, I/O group and slot, and whether the block transfer is a read or write.

Home Page		A-B RIO Block Transfers																											
Automation Network		Clear Counters & Max Rack Refresh <input checked="" type="checkbox"/> Auto Refresh Click on any BT Location to Monitor																											
RIO Discrete Data																													
RIO Block Transfers																													
RIO Diagnostics																													
Ethernet/IP Diagnostics																													
Log Files																													
Administration																													
Grp	0			1			2			3			4			5			6			7							
Slot	0	1		0	1		0	1		0	1		0	1		0	1		0	1		0	1						
Rack	W	R		W	R		W	R		W	R		W	R		W	R		W	R		W	R		W	R			
0	2	2																	1	2									
1																													
2																													
3																													
4																													
5																													
6																													
7																													

Any cell in the table with a number indicates a location where a block transfer has been defined on a rack. The numbers are counters, from 0-63, that indicate how many times the block transfer has been updated. The counters wrap around to 0 after they reach 63.

If *Auto Refresh* is on, the display refreshes once a second.

You can refresh the screen at any time by clicking *Refresh*.

If values change, they are shown with a light green background for one display update after they have changed. The first time you open the window, all values are regarded as new and are displayed with a green background.

The size of the display is based on the maximum rack configured or monitored.

Click on any location in the table to display the Block Transfer Monitor web page for that location. If *Auto Refresh* is on, you may have to click several times if the screen is being updated at the time you click.



## A-B RIO Rack:0 Grp:0 Slot:0 Block Transfer Monitor

[Clear Counters](#)   [Refresh](#)    Auto Refresh    Hex    WrtEna

BTR	0	1	2	3	4	5	6	7	8	9			
0	92	0	0	0	0	0	0	0	0	0	BTR Len	64	
10	0	0	0	0	0	0	0	0	0	0	Max Len	64	
20	0	0	0	0	0	0	0	0	0	0	BTR Upd	546	
30	0	0	0	0	0	0	0	0	0	0	Upd Cur	849	
40	0	0	0	0	0	0	0	0	0	0	Upd Min	0	
50	0	0	0	0	0	0	0	0	0	0	Upd Max	849	
60	0	0	0	155	Undef								

BTW	0	1	2	3	4	5	6	7	8	9			
0	158	0	0	0	0	0	0	0	0	0	BTW Len	64	
10	0	0	0	0	0	0	0	0	0	0	Max Len	64	
20	0	0	0	0	0	0	0	0	0	0	BTW Upd	546	
30	0	0	0	0	0	0	0	0	0	0	Upd Cur	849	
40	0	0	0	0	0	0	0	0	0	0	Upd Min	0	
50	0	0	0	0	0	0	0	0	0	0	Upd Max	1015	
60	0	0	0	221	Undef								

The screen shows the block transfer read and write data for the selected location (rack, I/O group and slot). The last data field always shows Undef.

By default, the display shows the data in decimal. Check Hex to change the display to hexadecimal.

If *Auto Refresh* is on, the display refreshes once a second.

You can refresh the screen at any time by clicking *Refresh*.

If values change, they are shown with a light green background for one display update after they have changed. The first time you open the window, all values are regarded as new and are displayed with a green background.

Check WrtEna to write RIO I/O data directly.

**WARNING!** WrtEna is meant to be used for commissioning and testing by qualified personnel only.

When WrtEna is on, select a location to edit data and an edit box opens at the top of the screen. Type the new value in the edit box, and press:

- enter to accept the value, clear the edit window and remain at the same place



- shift-enter to accept the value, leave the value in the edit box and move to the next editable space
- ctrl-enter to accept the value, increment the value in the edit box, and move to the next editable space

Note: If you enter I/O data here, it may be overwritten by block transfer reads or writes on the remote I/O network.

The screen shows statistics for the block transfer reads and writes at that location (rack, I/O group and slot).

The statistics consist of:

Item	Description
BTR Len	Length of the most recent block transfer read
Max Len	Maximum BTR length observed
BTR Upd	Count of BTR updates
Upd Cur	The current update time, in ms
Upd Min	The minimum update time, in ms, since the last reset
Upd Max	The maximum update time, in ms, since the last reset
BTW Len	Length of the most recent block transfer write
Max Len	Maximum BTW length observed
BTW Upd	Count of BTw updates
Upd Cur	The current update time, in ms
Upd Min	The minimum update time, in ms, since the last reset
Upd Max	The maximum update time, in ms, since the last reset

The minimum update time is set to 65535 when you clear the counters.



## RIO Diagnostics

Use *Automation Network/RIO Diagnostics* to display:

- the IO Group Status table
- the diagnostic counters for the currently selected rack
- the Network Diagnostic counters

If *Auto Refresh* is checked, the display refreshes once a second..

You can update the counters at any time by clicking Refresh Counters.

Click Clear Counters to reset the counters. Clear the counters when you first open the screen.

### IO Group Status Table

The IO Group status table shows the current rack numbers and the rack structure.

	IO Group Status			
Rack	0	2	4	6
1	RUN		---	---
2	RUN	---	---	---

The states shown in the table are:

State displayed	Explanation
RUN	Active rack - Good Status - Run Mode
PROG	Active rack - Good Status - Program Mode
MRUN	Monitored rack - Good Status - Run Mode
MPROG	Monitored rack - Good Status - Program Mode



State displayed	Explanation
INH	Active rack is inhibited
*TOUT	Active or Monitored Rack Not being scanned
*RST*	Scanner sending reset (may be configuration mismatch)
*DUP	Active Rack is inhibited, but duplicates another rack
*MERR	Monitored Rack - Scanner sending reset
---	Empty Rack Location

If *Auto Refresh* is on, the display refreshes once a second.

You can refresh the screen at any time by clicking *Refresh*.

If values change, they are shown with a light green background for one display update after they have changed. The first time you open the window, all values are regarded as new and are displayed with a green background.

Click on any rack or partial rack to select it in the diagnostic counters table. If *Auto Refresh* is on, you may have to click several times if the screen is being updated when you click.

### Diagnostic Counters for the Selected Rack

This table shows the counters for the currently selected rack. The rack number and starting I/O group are shown in the table heading.

The counters increment for discrete input and output packets, and do not include block transfer packets.

Rack 00 Grp 0 Counters	
Out Rx	7381
Inp Rx	7381
Rack Upd Cur	425
Rack Upd Min	0
Rack Upd Max	590

The counters displayed are:

Counter	Description
Out Rx	Count of output packets to active and monitored racks
Inp Rx	Count of
Rack Upd Cur	Most recent update time, in ms
Rack Upd Min	Minimum update time, in ms





---

Counter	Description
Rack Upd Max	Maximum update time, in ms

If *Auto Refresh* is on, the display refreshes once a second.

You can refresh the screen at any time by clicking *Refresh*.

If values change, they are shown with a light green background for one display update after they have changed.

Click *Clear Counters* to reset the counters.



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## Network Diagnostic Counters

The network diagnostic counters are diagnostic and error counters for the entire remote I/O network.

Network Diagnostic Counters			
Tx Frames	16023	Net Upd Cur	425
Rx Frames	57079	Net Upd Avg	424
Crc Errors	0	Net Upd Min	0
Abort Errors	0	Net Upd Max	590
Noise Errors	0	Prot Errors	0
Timeouts	1	Baud	57k6
Prot Err Mask	0000		
Prot Desc	None		

The counters are:

Counter	Description
Tx Frames	Count of frames transmitted by the AN-X
Rx Frames	Count of frames received by the AN-X
Crc Errors	Count of frames with CRC errors
Abort Errors	Count of frames with abort errors
Noise Errors	Count of frames with noise errors
Timeouts	Count of timeout errors
Prot Err Mask	Bits indicate the type of protocol errors
Prot Desc	Brief description of the???? Protocol error
Net Upd Cur	Most recent network update time, in ms
Net Upd Avg	Average network update time, in ms
Net Upd Min	Minimum network update time, in ms
Net Upd Max	Maximum network update time, in ms
Prot Errors	Count of protocol errors since the last reset
Baud	Network baud rate, 57k, 115k or 230k



If values change, they are shown with a light green background for one display update after they have changed. The first time you open the window, all values are regarded as new and are displayed with a green background.

## Ethernet/IP Diagnostics

Use *Automation Network/Ethernet/IP Diagnostics* to display:

- Scheduled Ethernet Counters
- Statistics for each connection

Clear the counters when you first open the screen.

The Scheduled Ethernet Counters consist of:

Scheduled Ethernet Counters			
Tx Frames	44322	Rx Frames	56240
Tx Errors	0	Rx Errors	0
Tx ErrMask	0000	Rx ErrMask	0000
Tx Ovrruns	0		

Counter	Description
TX Frames	Count of transmitted frames
RX frames	Count of received frames
Tx Errors	Count of Ethernet transmit errors
Rx Errors	Count of Ethernet receive errors
Tx ErrMask	Transmit error mask, bits set to indicate type of transmit error
RxErrMask	Receive error mask, bits set to indicate type of receive error
Tx Ovrruns	Count of transmit overruns

Transmit Error Mask	Bit	Description
TX_ERR_BAD_START	0	Internal State error
TX_ERR_OPER_INV	1	TX Copy table operation invalid

Receive Error Mask	Bit	Description
RX_ERR_CID_MISM	0	Connection ID Mismatch - Could happen if we



Receive Error Mask	Bit	Description
		close a connection, then receive more data
RX_ERR_LEN_MISM	1	The length of the RX UDP packet doesn't match what we expect
RX_ERR_OPER_INV	2	RX Copy table operation invalid

The Scheduled Ethernet Connections table contains information for each connection:

Scheduled Ethernet Connections											
Connection				Tx Tme		Rx Tme		Tx Count		Rx Count	
Num	Name	State	RPI	Cur	Max	Cur	Max	Good	Bad	Good	Bad
0		Act/RUN	10.0	10.0	6553.5	10.4	6553.5	47223	0	10673	0
1		Act/RUN	10.0	10.0	6553.5	10.5	6553.5	47221	0	10387	0
2		Act/RUN	10.0	10.0	6553.5	10.2	6553.5	47221	0	10127	0
3		Act/RUN	10.0	10.0	6553.5	10.1	6553.5	47219	0	9954	0
4		Act/RUN	10.0	10.0	6553.5	10.1	6553.5	47222	0	9577	0
15		Act/RUN	500.0	500.1	6553.5	500.3	6553.5	44200	0	44090	0

Counter	Description
Num	Connection number, 0 to 15
Name	Always blank
State	Active or Idle, run or program
RPI	The configured RPI for the connection
Cur Tx Time	The most recent transmit time
Max Tx Time	The maximum transmit time since the last counters reset
Cur Rx Time	The most recent receive time
Max Rx Time	The maximum receive time since the last counters reset
Tx Count Good	Count of good transmit frames
Tx Count Bad	Count of transmit frames with errors
Rx Count Good	Count of good receive frames
Rx Count Bad	Count of receive frames with errors

Statistics are initially invalid. Clear the counters to reset them.



If values change, they are shown with a light green background for one display update after they have changed. The first time you open the window, all values are regarded as new and are displayed with a green background.



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## Log Files

AN-X maintains various logs to record diagnostic and error messages. Use the *Log Files* menu in the web interface to view these logs.

### RIO-ADPT Log

The RIO-ADPT log shows messages and errors associated with the Ethernet/IP communication.

When the current log file becomes full, AN-X renames it so you can access it as the previous log file.

Click the *Refresh Log* button to refresh the display.

If Auto Refresh is checked, the log refreshes once a second and displays the most recent events at the end of the log. If you select Previous Log, AN-X turns off Auto Refresh.

### System Info Log

The System Info log records informational messages during startup and normal operation.

When the current log file becomes full, AN-X renames it so you can access it as the previous log file.

Click the *Refresh Log* button to refresh the display.

If Auto Refresh is checked, the log refreshes once a second and displays the most recent events at the end of the log. If you select Previous Log, AN-X turns off Auto Refresh.

### View All Logs

Use *View All Logs* to list and view all the AN-X logs. To view a log file, click on the file name.

## Administration Menu

The *Administration* menu contains items used to configure, control and update the AN-X.

### AN-X IP Configuration

Use *Administration/AN-X IP Configuration* to set the AN-X Ethernet properties.



The top of the screen shows the serial number and MAC Address of the AN-X4 being configured. To configure Ethernet on the AN-X, check DHCP, Static or Factory.

### DHCP

If the AN-X4 finds a DHCP server on the network, it obtains an IP address, netmask and default gateway from the DHCP server.

To find the address assigned, look at the DHCP server or use a network tool that displays devices on the network.

If the AN-X has been configured for DHCP and it does not find a DHCP server, it waits forever for a DHCP server and repeatedly flashes the MS LED yellow 2 times followed by a pause. The NS LED will be solid red.

### Static IP Address

If you select static IP address, enter:

- the IP address for the AN-X.
- the netmask for the AN-X
- the default gateway for your network.

You must enter a valid default gateway address even if there is no device at the gateway address on the network.

### Factory

Select Factory to return AN-X to its initial state as shipped. In Factory mode, the AN-X waits 10 seconds for a DHCP server to assign it an IP address. If it fails to obtain an IP address, it reverts to a static IP address of 192.168.0.246.

If, after AN-X has reverted to the static address and a DHCP server comes online, AN-X obtains an IP address from the DHCP server.

You cannot use the AN-X in factory mode. It must be set to a static IP address or to DHCP before you can use it for remote I/O applications.



## Hostname

Enter a *Hostname* for the AN-X4. This name is used internally by AN-X and may be used to identify the AN-X if you have a DNS server on your network. The name can be from 1 to 30 characters long. The default hostname is ANXxxxxxx, where xxxxxx is the serial number of the AN-X module.

## AN-X Firmware Select

Use *Administration/AN-X Firmware Select* to select a firmware (\*.qtf) file the AN-X is to run from the list. AN-X builds the list from the firmware files on the microSD card that are compatible with the current AN-X hardware.

Click SUBMIT to run the firmware you have selected. You must REBOOT the AN-X to run the firmware you selected.

## AN-X Firmware Upload

Use *Administration/AN-X Firmware Upload* to upload a firmware (\*.qtf) file to the AN-X. Uploading a qtf file automatically selects the file. You must REBOOT the AN-X to run the firmware you uploaded.

**WARNING!** Updating the AN-X firmware disrupts RIO and Ethernet communication. Make sure your process is in a safe state.

## AN-X Firmware Remove

Use *Administration/AN-X Firmware Remove* to remove a firmware (\*.qtf) file from the AN-X. You cannot remove the file that is currently running on the AN-X.

## AN-X Diagnostic Capture

Use *Administration/AN-X Diagnostic Capture* to create a compressed zip file that contains the current AN-X configuration and logs, for use by technical support.





Click the CREATE CAPTURE button to create the file. There is a slight delay while AN-X builds the file.

Once AN-X has built the file it displays a second web page. Click the *Download Capture File* button to save the file to your computer.

### AN-X Kernel Page

Use *Administration.AN-X Kernel Page* to display the version of the Linux kernel on the AN-X.

This page is also displayed if the AN-X fails to load firmware at startup. If that happens, use *Administration/Firmware Select* to select a firmware file, then REBOOT the AN-X.



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## AN-X Kernel Update

Occasionally we release a new version of the Linux kernel for the AN-X. Use *Administration/AN-X Kernel Update* to send the kernel (\*.qtk) file to the AN-X.

Click the Browse button to select the file, then click Send Kernel to transfer the file.



AN-X displays a progress bar as the file is transferred. When the transfer is complete, the AN-X copies the kernel file to the microSD card. When the file copy is complete, the AN-X displays a message to indicate that the file was copied successfully. Stay on this web page until AN-X indicates that the file has been written to the microSD card, then click the REBOOT button to restart the AN-X.

## AN-X Module REBOOT

Use the *Administration/AN-X Module REBOOT* to restart the AN-X module.

## Support Menu

### Contact Information

The contact information contains information and links if you need support for the AN-X.



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## Troubleshooting

### LEDs

The AN-X4-AB-DHRIO has LEDs that indicate the state of the Ethernet connection, the overall module state and the connection to the remote I/O network.

### Ethernet LEDs

There are two LEDs that indicate the state of the Ethernet connection.

The upper, yellow LED, labelled 100, is on if the link is running at 100 Mbits/second and is off otherwise.

The lower green Link/Act LED is off if the link is inactive and is on if the link is active. If activity is detected, the link blinks at 30 ms intervals and continues blinking as long as activity is present.

If the AN-X is not connected to Ethernet, the 10/100 LED is on.

### MS LED

The MS LED is used by the AN-X operating system and software to indicate the state of operations and errors.

It should be used in conjunction with the logs to locate the cause of problems.

In the following, red 3 means three red flashes followed by a pause.

MS LED State	Possible cause
Green	Everything operating correctly
Red 3	DHCP configuration failed
Red 4, 5, 6	Internal error, contact technical support
Yellow 2	microSD card not present
Yellow 3	AN-X Maintenance firmware file not found on microSD card
Yellow 4	config.txt file not found on microSD card or error parsing file
Yellow 5	Production firmware filename was not specified in config.txt
Yellow 6	AN-X production firmware file not found on microSD card
Yellow 7	Production firmware file invalid or error programming to flash
Yellow 8	Daughterboard mismatch
Single red flash	AN-X has returned an error to a ControlLogix request. Check scheduled I/O configuration, etc.  Note that this has the highest priority and may occur in combination with other error indications



MS LED State	Possible cause
Fast red flash and off	Errors in configuration file
MS GREEN Fast Flash	Not all Ethernet/IP connections are open

### NS LED – Network Status

The NS LED shows the status of remote I/O communication.

NS LED	Meaning
GREEN	All Active racks are being scanned
YELLOW	Receiving good packets, but not all active racks are being scanned
RED	Receive packet error, or not receiving any good packets
RED/YELLOW alternating	RIO watchdog

The LED doesn't show the status of monitored racks. As long as all the active racks are being updated correctly, the LED will be green. If there are no active racks, it will be green unless there's a packet error.



---

## Updating the Firmware

The AN-X4 firmware files have names that begin with AN-X4 and have extension *qtf*.

AN-X4 can have multiple versions of the same firmware, for example, different versions of the AN-X4-ABRIO-ADPT\*.qtf. You can use the web interface to:

- download firmware files to the AN-X4
- select which version is to run
- remove firmware files

### WARNING!

Updating the AN-X firmware disrupts RIO and Ethernet communication. Make sure your process is in a safe state.

Run the command *Administration/Firmware Upload* to upload a qtf file to the AN-X. Uploading a file automatically selects that file.

To change the firmware the AN-X is running, run the command *Administration/Select AN-X Firmware* to select the file you wish to run.

You must restart the AN-X4 to run the firmware that you selected or transferred to the AN-X.

You can also copy firmware files to the directory */Firmware* on the microSD card using a card reader in your computer. If you do so, you will also need to update the file *FirmwareCfg.txt* in the same directory to run the file you copied over. The contents of *FirmwareCfg.txt* must match exactly the name of one of the firmware files on the AN-X, including the version.

### Example

```
AN-X4-ABRIO-ADPT.v4.05.01.qtf
```

In addition, it is occasionally necessary to update the kernel on the AN-X. Kernel files have extension \*.gtk. Refer to page 66 for information on how to update the kernel.

You can obtain latest firmware from <http://qtsusa.com/dist/AN-X4/AB/>



## ***Appendix: Adapter Configuration File Format***

A configuration file consists of:

### **File ID**

Keyword “AN-X-AB-RIO-Adapter”

### **Baud rate**

Keyword “Baud”, comma, then one of 57k, 115k, 230k

### **AN-X Name**

Keyword “AnxName”, comma, up to 15 characters of text, enclosed in quotes.

### **Clear Active Inputs in program mode option**

Keyword “ClrActInpOnClxPrg”

### **Rack definitions**

Keyword “MonRack” or “ActRack”, comma, 0rrr where rr is the rack number in octal, from 00 to 76, comma, starting I/O group, comma, ending I/O group

### **Block transfer module definitions**

Block transfer module definitions start with keyword BtMod, followed by:

the location in the rack, given as rack, I/O group and slot

the Type: the name of the template from which the module is constructed, with the name in quotes, for example, Type=”BT-Module”

block transfer data lengths, BtrLen and BtwLen

### **Data mappings**

Discrete data mappings start with keyword MapRackMonInp, RackMapActInp or MapRackMonOut. This is followed by the rack number in the form 0rrr where rr is the rack number in octal, from 00 to 76, then the connection and offset, all separated by commas.

Block transfer module mappings start with keyword MapMonBtw, MapMonBtr or MapActBtr. This is followed by the rack number in the form 0rrr where rr is the rack number in octal, from 00 to 76, the I/O group and slot, then the connection and offset, all separated by commas.

### **Comments**

Anything after a semicolon, either at the end of a line or on a separate line, is treated as a comment and is ignored.

### **Example Configuration File**

```
AN-X-AB-RIO-Adapter
```

```
AnxName, "AnxAbAdapter"
```

```
Baud, 57k
```

```
ClrActInpOnClxPrg
```



MonRack, 0o01, 0, 1  
ActRack, 0o02, 0, 1  
BtMod, 0o01, 0, 0, Type="1771-IFE-16CH" , BtrLen=20, BtwLen=37  
BtMod, 0o01, 1, 0, Type="1771-OFE-Diag" , BtrLen= 5, BtwLen=13  
BtMod, 0o02, 0, 1, Type="BT-Module" , BtrLen= 5, BtwLen=10  
BtMod, 0o02, 1, 1, Type="BT-Module" , BtrLen=64, BtwLen=64  
MapRackMonInp, 0o01, 0, 0  
MapRackMonOut, 0o01, 0, 10  
MapRackMonOut, 0o02, 0, 103  
MapRackActInp, 0o02, 0, 0  
MapMonBtw, 0o01, 0, 0, 0, 20 ; Len= 39 words  
MapMonBtw, 0o01, 1, 0, 0, 81 ; Len= 15 words  
MapMonBtw, 0o02, 0, 1, 0, 113 ; Len= 12 words  
MapMonBtw, 0o02, 1, 1, 0, 125 ; Len= 66 words  
MapMonBtr, 0o01, 0, 0, 0, 59 ; Len= 22 words  
MapMonBtr, 0o01, 1, 0, 0, 96 ; Len= 7 words  
MapActBtr, 0o02, 0, 1, 0, 10 ; Len= 7 words  
MapActBtr, 0o02, 1, 1, 0, 17 ; Len= 66 words



## Specifications

Parameter	Specification
Function	Bridge between Ethernet and Remote I/O network
Typical Power Consumption	240 mA @ 12 VDC or 120 mA @ 24 VDC
Maximum Power dissipation	2.9W
Environmental Conditions:	
Operational Temperature	0-50°C (32-122°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5-95% without condensation



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### How to Contact Us: Sales and Support

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#### Europe – Middle East – Africa

Languages Spoken: French, English

+33.5.34.36.87.20, [support.EMEA@prosoft-technology.com](mailto:support.EMEA@prosoft-technology.com)

#### North America

Languages Spoken: English, Spanish

+1.661.716.5100, [support@prosoft-technology.com](mailto:support@prosoft-technology.com)

#### Latin America (Brasil)

Languages Spoken: Portuguese, English

55.11.5084.5178, [support.la@prosoft-technology.com](mailto:support.la@prosoft-technology.com)

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