

AN-X2-AB-SCAN

Remote I/O

Scanner

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-X-AB-SCAN

IMPORTANT!

In firmware versions 4.2.1 and above, the behavior of the LEDs on the AN-X2 module has changed, to ensure compliance with the Ethernet/IP specification. This also requires configuration program 4.3.1 or above.

See page 65 for details.

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AN-X2-AB-SCAN Module Overview



The AN-X2-AB-SCAN communications module connects a ControlLogix PLC or other device to an Allen-Bradley remote I/O network.

The module acts as a scanner on the remote I/O network, reading inputs and writing outputs.

It supports up to 32 adapters, rack numbers from 0 to 76 octal, any combination of partial racks and all remote I/O baud rates.

It also supports block transfer reads and writes at all possible locations on these racks.

A ControlLogix processor communicates with the module using scheduled connections over Ethernet, to read inputs from the remote I/O network and write outputs.

The module is supplied with a Windows utility, AnxAbRioScanCfg, for configuring and monitoring the remote I/O network and mapping the remote I/O data to ControlLogix scheduled data

The AN-X2-AB-SCAN module also has a web interface for monitoring logs and performing administrative functions. You can communicate with the module using any standard web browser such as Internet Explorer.

The module firmware can be selected and updated using the web interface. Refer to page 63 for details.

Hardware Features



The module has:

- two LEDs to indicate the status of the connection to the Ethernet (100 and Link/Act)
- LEDs to indicate the module's internal state (MS) and the state of communication (NS). In previous versions of the hardware, these LEDs were labeled SYS and NET.

Important! In version 4.2 and above of the firmware, there are two possible behaviors of the MS and NS LEDs. Refer to page 65 for details.

- an Ethernet connector
- a power connector
- a 3-pin Phoenix connector to connect to the remote I/O network

A watchdog timer is implemented in the module's hardware. If the firmware does not kick the watchdog within the timeout period the watchdog times out and places the module into a safe fatal failure state.

A jabber inhibit timer is implemented in the module's hardware. If the network transmitter is on longer than 150% of the longest network frame time, the transmitter is forced off and the module is placed into a safe fatal failure state.

Package Contents

- AN-X module
- microSD to SD card adapter
- CD containing software and documentation
- rubber feet for desktop use



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Using the MicroSD Card

The AN-X microSD card stores configuration data and firmware.

There are no restrictions on the size or speed of the card. The format must be FAT-16 or FAT-32.

An adapter is provided so you can insert the microSD card in an SD slot in your computer.

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

WARNING! Do not remove the card while the AN-X is powered on!

If the AN-X is inaccessible from Ethernet because of its settings, you can remove the card and edit the file config.txt. Refer to page 13 for details.

Reinsert the card in the slot at the back of the AN-X, with the pins facing up.

WARNING! If you remove the card to edit the configuration file, push the card in straight or the card might fall inside the case and you will have to disassemble the AN-X to retrieve it .

AN-X Modes of Operation

There are two AN-X modes of operation:

- Maintenance mode. The AN-X runs the maintenance firmware at startup. It performs diagnostics (memory tests, etc), copies any changes from the microSD card. If there are no errors, it starts the AN-X in production mode.
- Production mode. This is the normal runtime mode of operation.



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Installation

Prevent Electrostatic Discharge

The module is sensitive to electrostatic discharge.

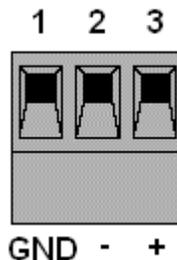
WARNING!

Electrostatic discharge can damage integrated circuits or 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 a DC power input of anywhere from 12 to 24 VDC.



Left to right the pins on the power connector are chassis ground, negative voltage and positive voltage.

The chassis ground should be connected.

Power consumption is 200 mA @ 12VDC or 100mA @ 24VDC.

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

Contact us if you need a suitable wall adapter.

Cabling and Termination

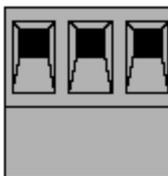
Follow Allen-Bradley cabling recommendations for remote I/O. Refer to Approved Vendor List for DH, DH+, DH-485, and Remote I/O Cables, publication ICCG-2.2, February 1996.

On the AN-X module, the connections should be line 1, shield, line 2.



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1 sh 2

Line 1 on the AN-X is closest to the power connector.

Check the wiring to ensure that line 1 on the AN-X is connected to line 1 on the PLC, and so on.

Terminate both ends of a remote I/O network by using external resistors attached to the physical ends of the network. There should be two and only two terminators on the network.

Use 82 ohm resistors if the network operates at 230.4 kbps or if the network operates at 57.6 kbps or 115.2 kbps and none of the devices in the table below are present. The maximum number of physical devices on the network is 32.

Use 150 ohm resistors if the network contains any of the devices in the table below, or if the network operates at 57.6 kbps or 115.2 kbps and you do not require the network to support more than 16 physical devices.

Device Type	Catalog Number	Series
Adapters	1771-AS	All
	1771-ASB	Series A and B
	1771-DCM	All
Miscellaneous	1771-AF	All
	1771-AF1	All

Baud Rate	Maximum Cable Length
57.6 Kbaud	10000 ft
115.2 Kbaud	5000 ft
230.4 Kbaud	2500 ft

Ethernet Cabling

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



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

If you are connecting directly between a computer and AN-X, use a crossover cable.

TIP

Depending on your Ethernet hardware, a crossover cable may not be required.

Software Installation

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 in the AB\RIO folder to install the components for the AN-X2-AB-SCAN



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CE Installations

If you are installing the AN-X in a location which requires CE, install the following ferrites or their equivalents on the cables:

Steward 28A2024-0A2 on Ethernet cable close to module, one loop

Steward 28A2024-0A2 on power cable

Steward 28A2025-0A2 on DH+/RIO Cable



Quick Start

Step	Operation	See page
1	Install the AN-X Windows software	7
2	Power up the AN-X, connect it to Ethernet and assign it an IP address	10
3	Connect AN-X to the Remote I/O network	5
4	Use the AN-X Windows utility to autoconfigure the remote I/O network and ControlLogix configuration	20
5	Configure the AN-X in RSLogix 5000	36
6	Scan I/O, read inputs and write outputs	
7	Create aliases for RSLogix 5000	41
8	Import the aliases into RSLogix 5000	41
9	Use the aliases to access data	



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Ethernet Configuration

The AN-X2-AB-SCAN module connects a device such as a ControlLogix processor on Ethernet to scan an Allen-Bradley remote I/O network.

Before you can use the AN-X2-AB-SCAN, you must configure its network properties on Ethernet.

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 fixed link-local address 169.254.42.84

AN-X modules are shipped with the link-local address 169.254.42.84.

Unless you have control of the DHCP server, in most applications you will assign the AN-X a static IP address. Otherwise the DHCP server may assign a different IP address each time 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 one at a time, since initially they will all be set to the same link-local IP address.

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 using the web interface.

Start a web browser and enter the address 169.254.42.84

TIP

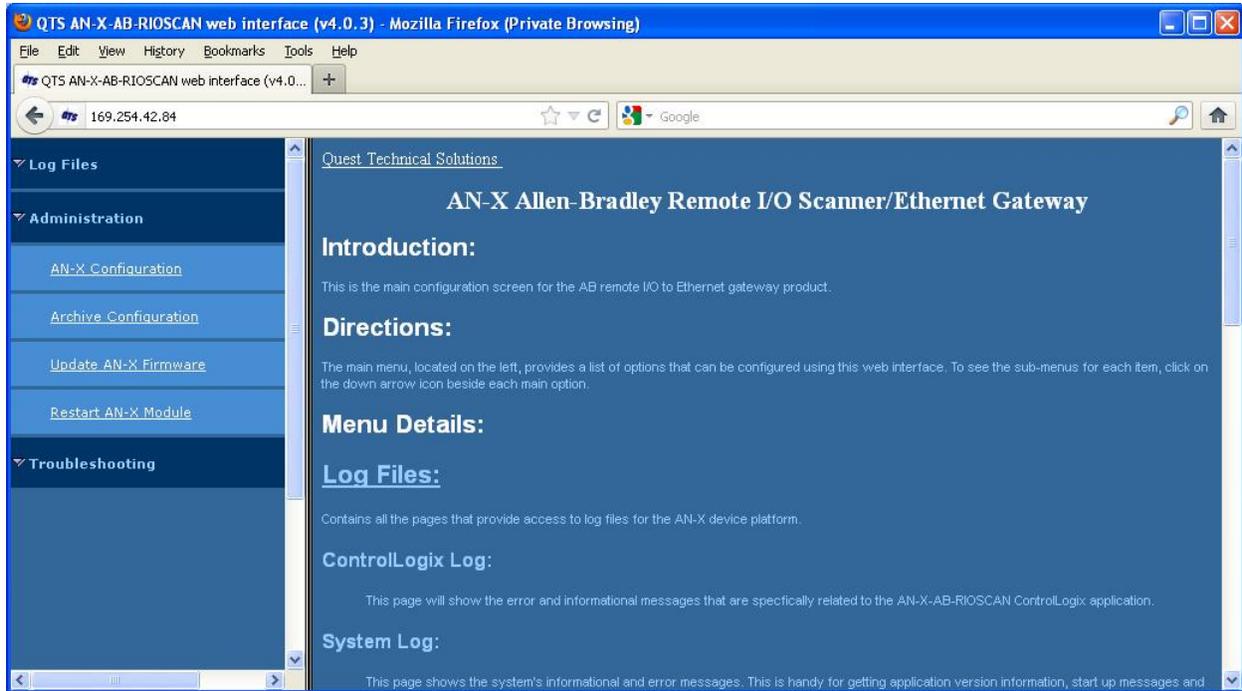
The AN-X must be on the same subnet as the computer to use the link-local IP address. It cannot be connected through a router.

Select *Administration/AN-X Configuration*.

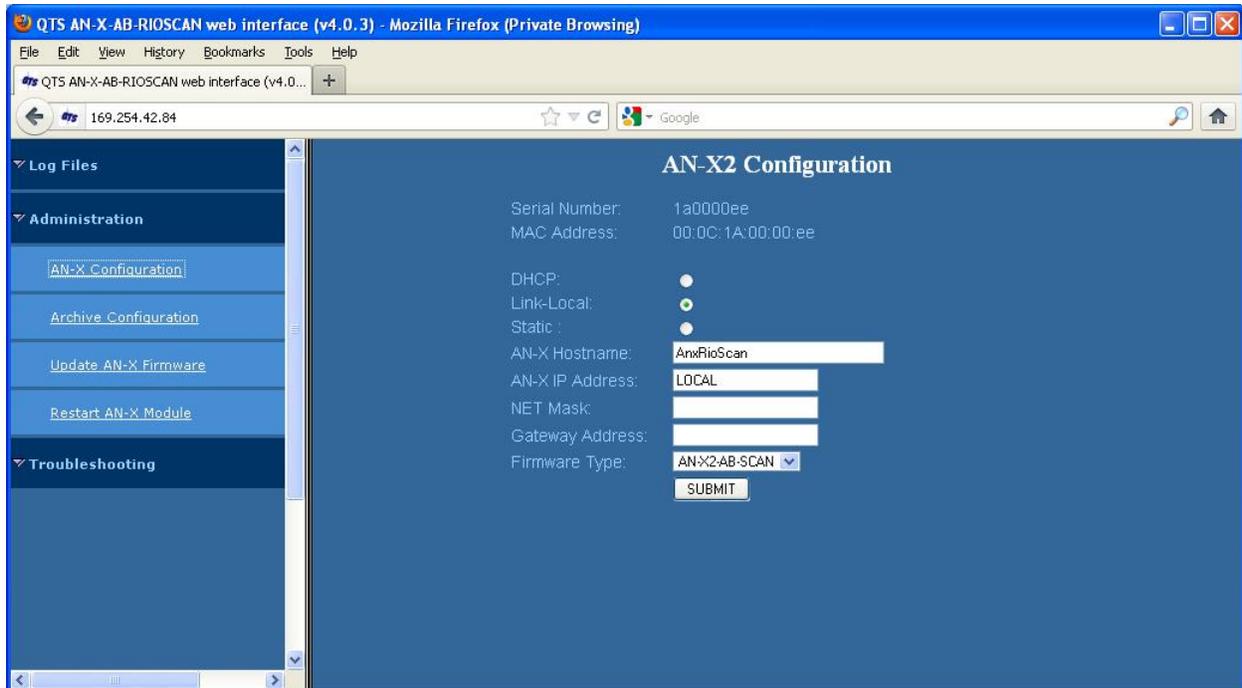


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The AN-X2 Configuration page appears.



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



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Check either DHCP or Static.

DHCP

If the AN-X 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, you have to look at the DHCP server.

When you submit the changes, if the AN-X does not find a DHCP server, it reverts to the default link local address 169.254.42.84 and repeatedly flashes the MS LED 3 times red followed by a pause.

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.

Hostname

Enter a *Hostname* for the AN-X. 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

Firmware

Select the firmware the AN-X is to load from the list provided. AN-X builds the list from the firmware files on the microSD card that are compatible with the AN-X hardware.

Submitting the Configuration

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

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



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Click *Continue* to restart the AN-X, then wait until the AN-X has completely restarted before continuing.

If you have changed the IP address, you will have to 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 been previously configured with an IP address that causes it to be inaccessible on the current Ethernet network or the IP address is unknown.

Remove the microSD card and edit the file config.txt using a text editor such as Windows Notepad to set the AN-X to the desired configuration.

The Configuration File

The Ethernet configuration and the name of the production firmware file to load are stored in the file config.txt on the microSD card.

The file config.txt is a text file that contains the Ethernet configuration and the name of the firmware file to load.

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

Each line consists of a keyword followed by a colon and then a value.



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Example:

IP: 192.168.1.12

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

Keyword	Possible Values
IP	LOCAL DHCP static IP address
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
Firmware	Firmware file to run at startup, must be present on microSD card

If you edit the file and AN-X finds an error during startup, it flashes an error code on the MS LED, see page 65.

Example config.txt files

Example: Link- Local IP address

```
IP: LOCAL
Hostname: ANX2RioScan
Firmware: AN-X2-AB-SCAN
```

Example: DHCP

```
IP: DHCP
Hostname: ANX2RioScan
Firmware: AN-X2-AB-SCAN
```

Example: static IP address

```
IP: 192.168.1.14
NetMask: 255.255.255.0
DefGtwy: 192.168.1.1
HostName: ANX2RioScan
Firmware: AN-X2-AB-SCAN
```



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If the link-local address is not accessible...

Addresses 169.254.1.0 to 169.254.254.255 are reserved for use on a local network. AN-X2 modules are shipped set to the address 169.254.42.84 for initial configuration. This address is almost always accessible from a computer on the same local Ethernet as the AN-X.

If you cannot access the AN-X2 at address 169.254.42.84 using a web browser, open a command prompt window and type

```
route print
```

The routing table appears

```
=====
Interface List
0x1 ..... MS TCP Loopback interface
0x2 ...00 18 8b c5 9d f7 ..... Broadcom 440x 10/100 Integrated Controller -
Packet Scheduler Miniport
=====
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
0.0.0.0                    0.0.0.0          10.10.0.1        10.10.0.20       20
10.10.0.0                  255.255.255.0    10.10.0.20       10.10.0.20       20
10.10.0.20                 255.255.255.255  127.0.0.1        127.0.0.1        20
10.255.255.255            255.255.255.255  10.10.0.20       10.10.0.20       20
64.215.255.122            255.255.255.255  10.10.0.1        10.10.0.20       20
127.0.0.0                 255.0.0.0        127.0.0.1        127.0.0.1        1
169.254.0.0             255.255.0.0     10.10.0.20      10.10.0.20     20
224.0.0.0                 240.0.0.0        10.10.0.20       10.10.0.20       20
255.255.255.255          255.255.255.255  10.10.0.20       10.10.0.20       1
Default Gateway:          10.10.0.1
=====
Persistent Routes:
None
```

If there is no entry in the network destination column that starts with 169.254.0.0 (highlighted above), add a route using

```
route add 169.254.0.0 mask 255.255.0.0 10.10.0.20 metric 20
```



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where 10.10.0.20 is replaced with the IP address of the interface in your computer that is connected to the AN-X.

Repeat the route print command and confirm that the table now has an entry similar to the one shown.

Now try pinging the AN-X at 169.254.42.84. You should now be able to access it using a browser to set the desired Ethernet configuration.

A Note on AN-X Names

You assign a name to the AN-X module in several places:

- Ethernet hostname
- name assigned to the ENBT module that the AN-X emulates in RSLogix 5000
- base tag name when exporting aliases from the configuration tool for import into RSLogix 5000
- name in the Module Properties dialog in the configuration tool

The first three names should all be the same. The name is first set when you configure the Ethernet properties of the AN-X.

The name in the Module Properties dialog is not used elsewhere and does not have to match the other names.



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Configuring the Remote I/O Scanner

AnxAbioCfgScan Software

The AN-X2-AB-SCAN module is supplied with a Windows configuration utility.

Use this configuration tool to:

- Set the baud rate
- Autoconfigure from an attached 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

The configuration utility must be version 4.1.4 or above for use with the AN-X2-AB-SCAN module.

Configuring a Remote I/O Network

Use the following steps to configure the AN-X2-AB-SCAN:

1. Set the baud rate
2. Configure the racks, either manually or automatically
3. Add and configure block transfer modules.
4. Map the remote I/O modules to ControlLogix scheduled data
5. Download the configuration to the AN-X2-AB-SCAN.

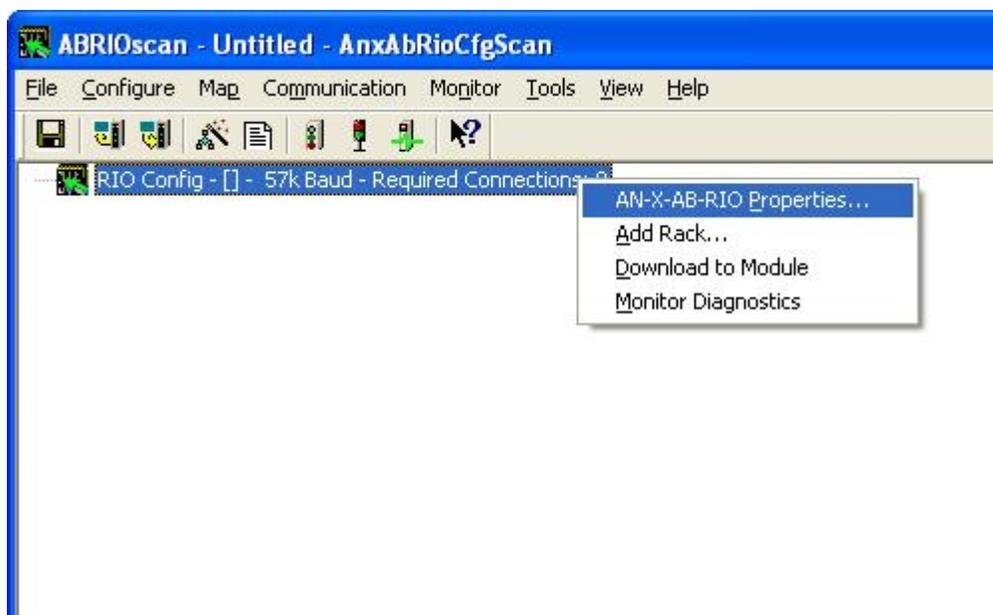
Baud Rate

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

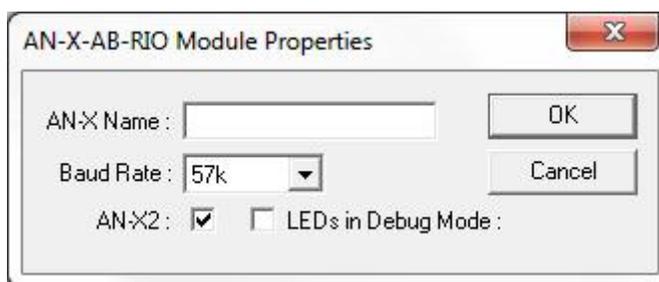


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Select *AN-X2-AB-SCAN Properties* to display the AN-X2-AB-SCAN Module Properties dialog box.



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

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

The default baud rate is 57.6 Kbits/second.

Note: If you perform an autoconfiguration, the AN-X2-AB-SCAN automatically detects the baud rate from the attached network.

The AN-X Name can be from 0 to 15 characters long. It is not used elsewhere.

The AN-X2 checkbox is used when exporting aliases for import into RSLogix 5000 (see page 33). It is checked automatically when you perform any online operation with an AN-X2. If you export aliases offline, first make sure that it is checked.



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The *LEDs in Debug Mode* checkbox (configuration program 4.3.1 or above) determines the behavior of the MS and NS LEDs. If checked, the LEDs operate as they did in firmware versions prior to 4.2.

The default is unchecked.

TIP

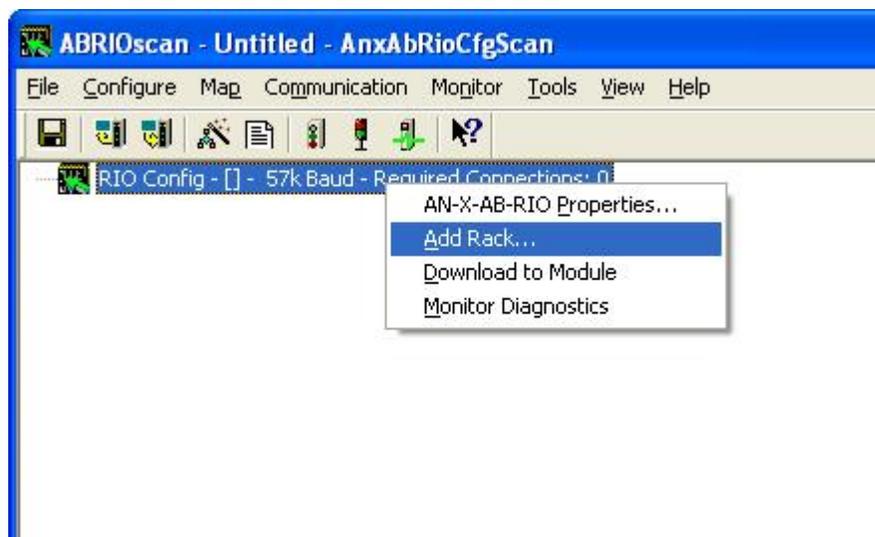
If you have saved a configuration in a previous version of the configuration program and you want the LEDs to operate as they did, open the configuration file and check the LEDs in Debug Mode checkbox.

Configuring Racks

You can add racks manually or by autoconfiguring from an attached 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.



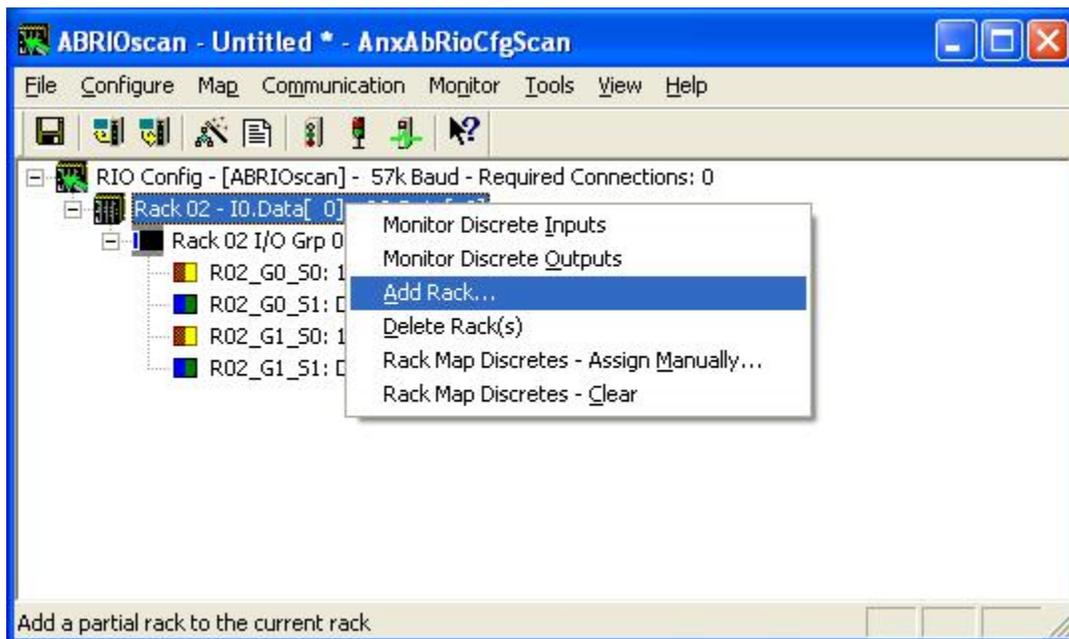
Select the *Rack* number (in octal), the Start I/O Group and the End I/O Group for the rack you are adding and click OK.



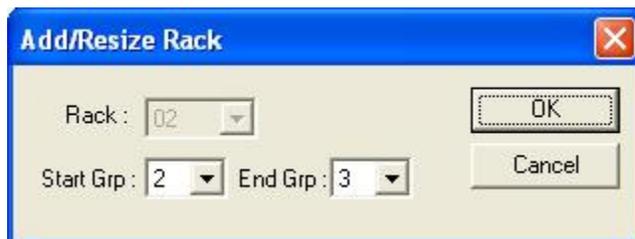
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To add a partial rack to an existing rack number, right click on the rack and select *Add Rack*.



The *Add/Resize Rack* dialog appears, with the rack number set.



Select the the Start I/O Group and the End I/O Group for the rack you are adding and click OK.

Autoconfiguration

The AN-X2-AB-SCAN supports autoconfiguration, which automatically detects the network baud rate and configures the racks on an attached remote I/O network. You still have to add and configure block transfer modules.

The controller with the connection to the AN-X2-AB-SCAN must be in program mode when you perform an autoconfiguration.

To autoconfigure, select *Configure/Autoconfigure*

The AN-X2-AB-SCAN first detects the network baud rate, then sends messages to all possible racks, builds a network configuration from the replies it receives, and displays the network configuration.



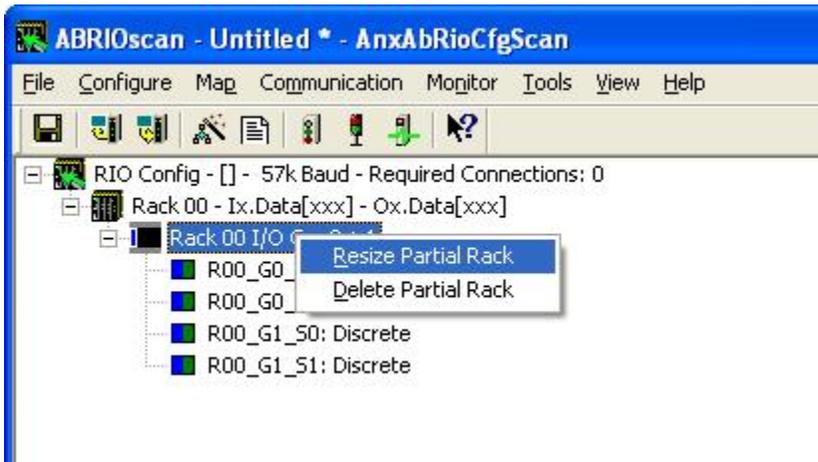
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Any configuration previously stored in the AN-X2-AB-SCAN is overwritten by the data from the autoconfiguration.

Resizing Racks

To resize a rack, first right click on the rack in network tree.



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



You cannot change the rack number when you resize a rack.

Select the *Start I/O Group* and the *End I/O Group* and click OK.

If resizing the rack results in an overlap with another rack, the resize will fail and you will get an error message.

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

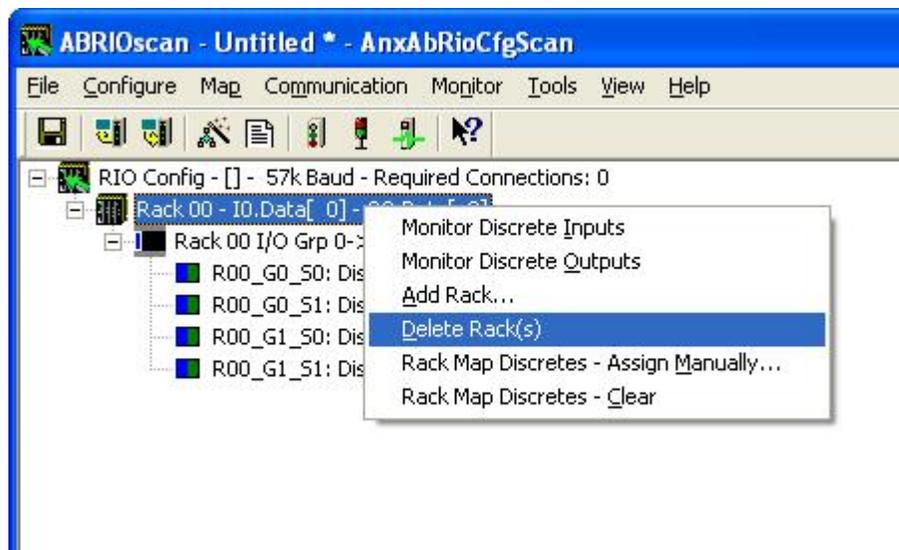
Deleting Racks

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

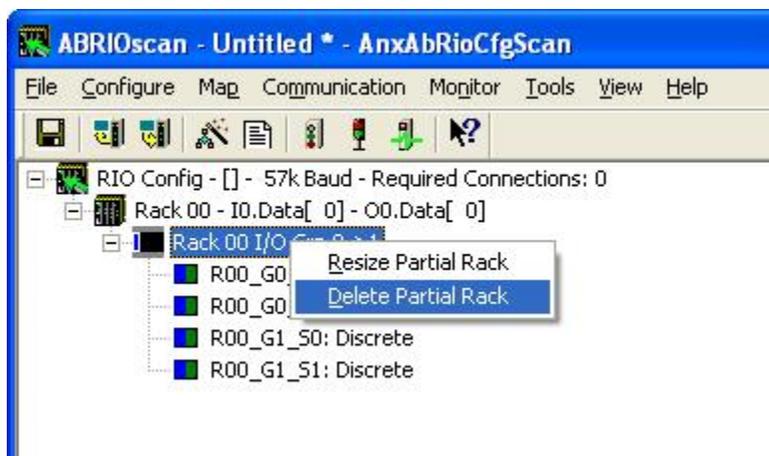


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To delete a partial rack, right click on it in the network tree and select *Delete Partial Rack*.



The program asks for confirmation before deleting.

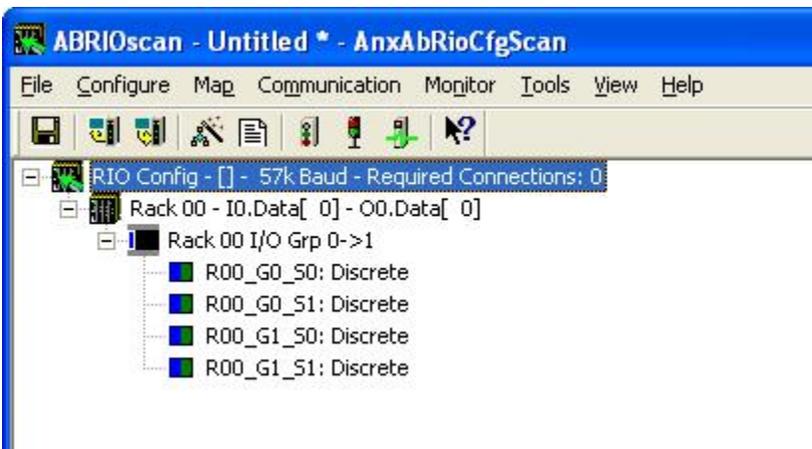
Block Transfer Modules

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

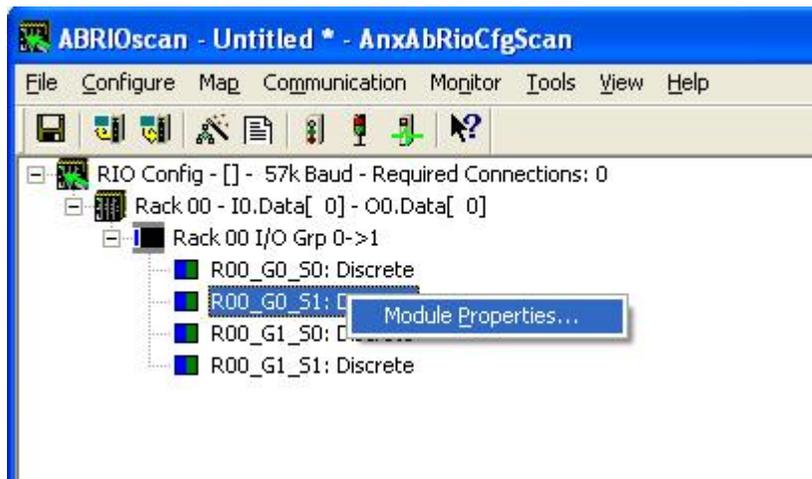


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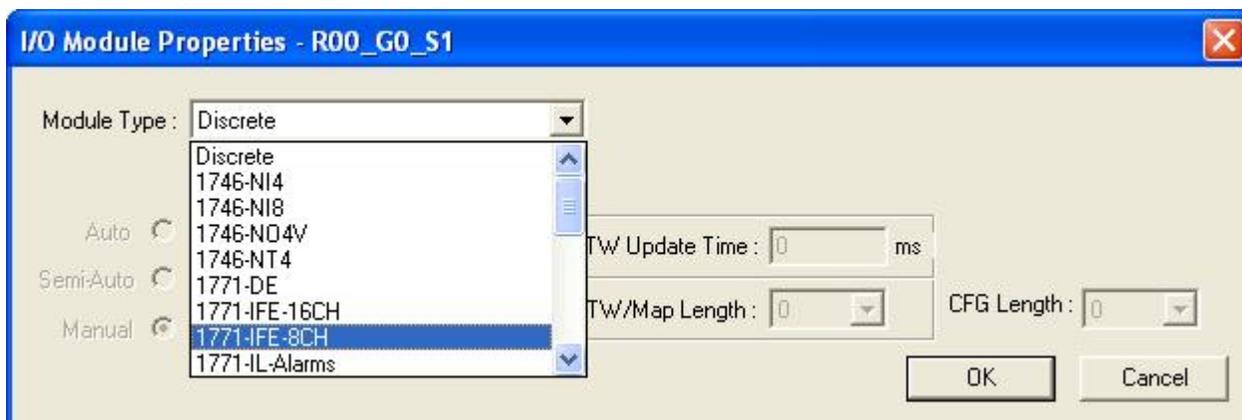




Right click on the location where you want to add the module and select *Module Properties*.



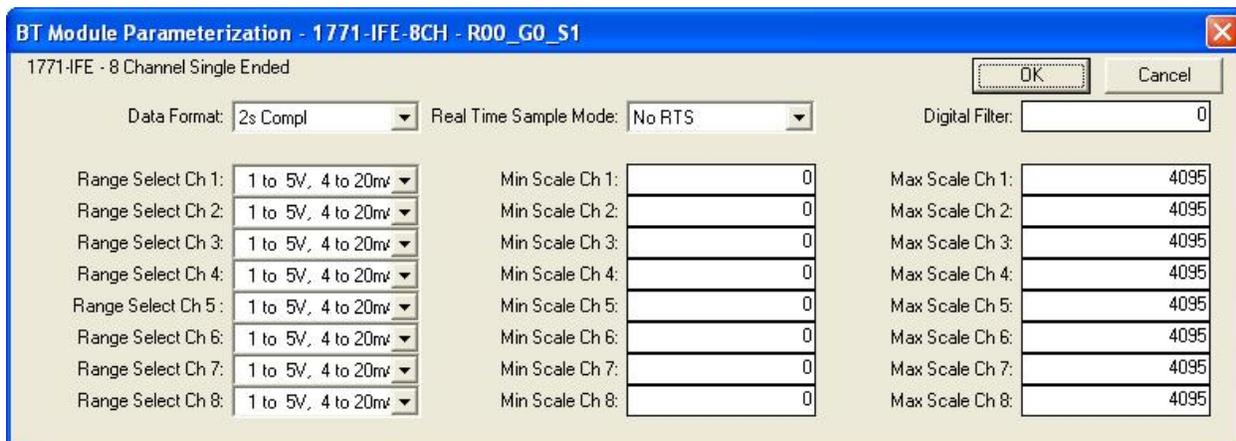
Select the *Module Type* from the list



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Most block transfer modules have parameters that you can select. Click the *Configure* button to display a dialog box to configure the module. For example, here is the configuration dialog for an 8-channel 1771-IFE module.



Enter the configuration data and click OK.

Select how you want the block transfer to update. There are three update modes: automatic, semi-automatic and manual.

Mode	Description
Automatic	AN-X2-AB-SCAN controls block transfer update I/O module configuration data comes from AN-X configuration tool
Semi-automatic	AN-X2-AB-SCAN controls block transfer update I/O module configuration data comes from the ControlLogix
Manual	ControlLogix controls block transfer update I/O module configuration data comes from the ControlLogix

For automatic and semi-automatic modes, enter the block transfer read and write update rates, from 0 to 16383 ms. A rate of 0 means the AN-X2-AB-SCAN updates the block transfer as fast as the remote I/O network and the block transfer module allow.

For manual mode, enter the lengths of the block transfer read and write data mapped to the ControlLogix.



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 scan the remote I/O network.

Unassigned I/O addresses are shown as xxxx in the network tree.

IMPORTANT!

Only mapped locations have valid data. Unmapped locations in the ControlLogix connection data may contain non-zero values.

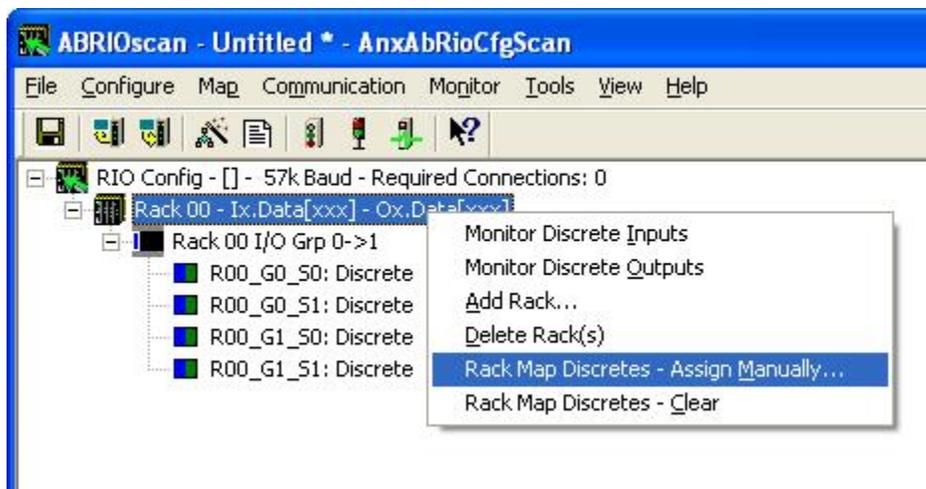
Automatic Mapping

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

To remap all data, select *Map/Re-Map All*. You are asked for confirmation before the mappings are reassigned.

Manual Mapping

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

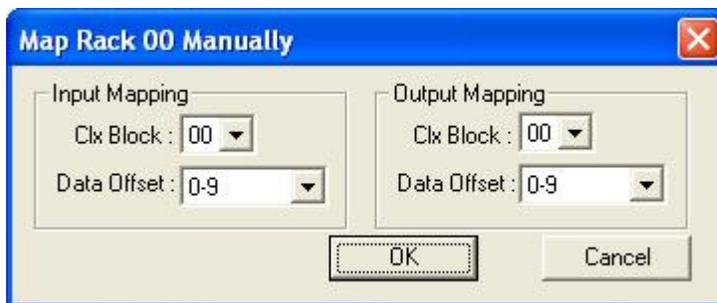


For the inputs and outputs, select the ControlLogix scheduled block and the offset within the block.



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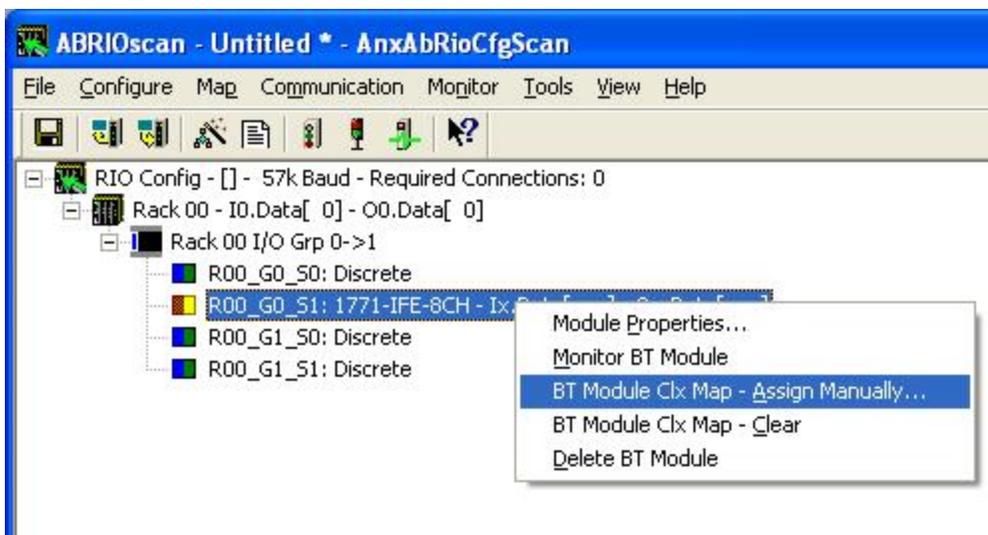




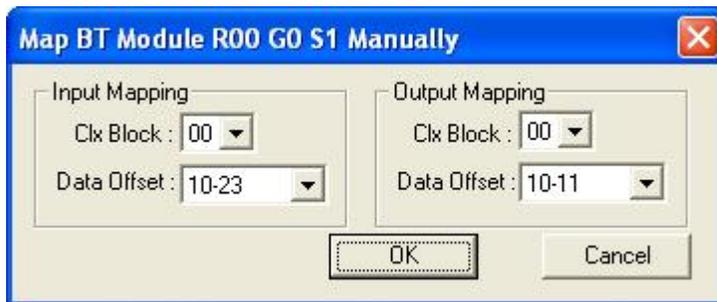
Click OK to accept the mapping.

The configuration tool checks for overlaps with previously mapped data and gives an error if it finds an overlap.

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



Click OK to accept the mapping.

The configuration tool checks for overlaps with previously mapped data and gives an error if it finds an overlap.

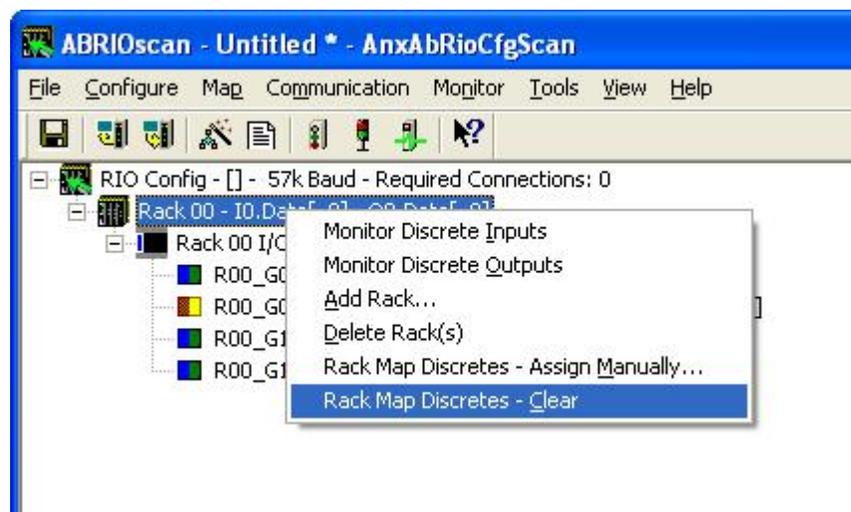


If there is insufficient space in the current block to map the data, the Data Offset is blank and the OK button is grayed out. Change the block number and select an offset.

Clearing Mappings

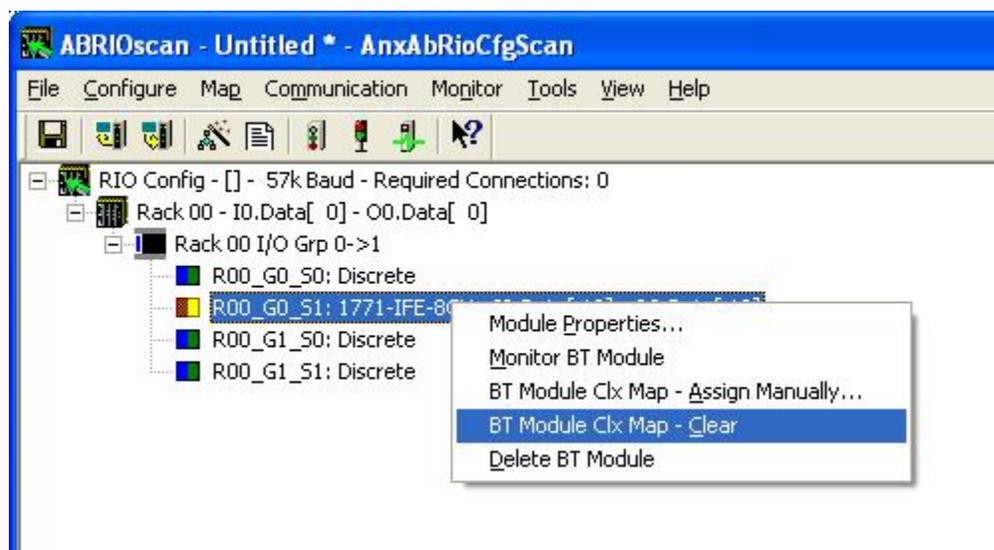
To clear all assigned mappings, select *Map/Clear All Mappings*.

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



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

What gets mapped

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

Rack Discrete Data

The tables show the input and output data that gets mapped when you map a rack.

When you map any part of a rack to scheduled data, the structure that gets mapped contains the data for the entire rack number. For example, if rack 1 consists of just I/O groups 0 and 1 (a quarter rack), the entire structure shown below is mapped when you map the rack. Similarly, if a rack is made up of several partial racks, mapping any one of those partial racks maps the structure for the entire rack; you do not need to map each partial rack.

Discrete Input Data

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	0-15	Reserved (Pad for 32 bit alignment)
2-9	0-15	Discrete input data

The discrete read structure for a rack consists of 2 status words and 8 words of 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 error bit is 1 if there's an error scanning the rack or if the rack is inhibited, and is 0 otherwise.

Words 2-9 contain the discrete input data for the rack. Words 2 and 3 contain the data for I/O groups 0 and 1 (first $\frac{1}{4}$ rack), words 3 and 4 contain the data for I/O groups 2 and 3 (second $\frac{1}{4}$ rack), and so on.



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Discrete Output Data

Offset	Bit	Description
0	0	Inhibit rack that starts at first quarter (I/O Group 0-1)
	1	Inhibit rack that starts at second quarter (I/O Group 2-3)
	2	Inhibit rack that starts at third quarter (I/O Group 4-5)
	3	Inhibit rack that starts at fourth quarter (I/O Group 6-7)
	4-15	Reserved
1	0-15	Reserved (Pad for 32 bit alignment)
2-9	0-15	Discrete output data

The discrete write structure for a rack consists of 2 control words and 8 words of discrete output data.

Bits 0-3 of the first word of control data are used to inhibit racks. Set bit 0 to inhibit the scan of the rack starting at I/O group 0; set bit 1 to inhibit the scan of the rack starting at I/O group 2; and so on. Inhibiting a rack stops all communications with that rack and all outputs revert to their programed Last State.

Only the bit for the starting I/O group need to be set to inhibit the rack. For example, if a rack is a full rack starting at I/O group 0, only bit 0 needs to be set to inhibit the scan of the rack.

Words 2-9 contain the discrete output data for the rack. Words 2 and 3 contain the data for I/O groups 0 and 1 (first $\frac{1}{4}$ rack), words 3 and 4 contain the data for I/O groups 2 and 3 (second $\frac{1}{4}$ rack), and so on.

Block Transfer Modules

The tables show the structures that get mapped to ControlLogix scheduled input or output data when you map a block transfer module.

Even if a module has only a block transfer read or a block transfer write, you should always map the module to both scheduled input and output data, so that the control and status data gets mapped.

BT Control Read Structure

Offset	Bit	Description
0	0-7	BTR Update Counter (increments each time BTR executes, range 0-255)
	8-10	BTR Error Code
	11	BTR.ERR, block transfer read error bit, see table of error codes



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Offset	Bit	Description
	12	BTR.DN, block transfer read done (manual mode only)
	13-15	Reserved
1	0-7	BTW Update Counter (increments each time BTW executes, range 0-255)
	8-10	BTW Error Code, see table of error codes
	11	BTW.ERR, block transfer write error bit
	12	BTW.DN, block transfer write done (manual mode only)
	13-15	Reserved
2-n	0-15	BTR Data (64 INTs max)

Offset 0 bits 0-7 contain a counter that increments each time a block transfer read executes successfully on the remote I/O network. Based on the configuration of the AN-X2-AB-SCAN and its RPI, the controller may see this value increment by more than 1 count per program scan.

The AN-X2-AB-SCAN 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 is reset in the corresponding BT Control Write Structure.

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

When you execute a block transfer read in manual mode, the AN-X2-AB-SCAN sets the done bit, offset 0 bit 12, to indicate that the block transfer read executed successfully. It resets the bit when the corresponding BTR.EN bit is reset in the BT write control file.

Offset 1 bits 0-7 contain a counter that increments each time a block transfer write executes successfully on the RIO network. Based on the configuration of the AN-X2-AB-SCAN and its RPI, the controller may see this value increment by more than 1 count per program scan.

The AN-X2-AB-SCAN sets the BTW error bit, offset 1 bit 11, when an error occurs executing a block transfer write. It clears the bit when the block transfer write enable bit is reset in the corresponding BT Control Write Structure.

When a block transfer write error occurs, offset 1 bits 8-10 contain an error code (see table below).

When you execute a block transfer write in manual mode, the AN-X2-AB-SCAN sets the done bit, offset 1 bit 12, to indicate that the block transfer write executed successfully. It resets the bit when the corresponding BTW.EN bit is reset in the BT write control file.

Word offsets 2-n contain the read data returned by the block transfer module.



BT Control Write Structure

Offset	Bit	Description
0	0-5	BTR Length (1-63 word, 0 means BT Module decides)
	6-7	Reserved
	8	BTR.EN, block transfer read enable (manual mode only)
	9	BTR.CONT (manual mode only) BT Inhibit (Automatic modes – inhibits config BTW, data BTW and data BTR)
	10-15	Reserved
1	0-5	BTW Length (1-63 word, 0 means BT Module decides)
	6-7	Reserved
	8	BTW.EN, block transfer write enable (manual mode only)
	9	BTW.CONT, continuous mode (manual mode only)
	10-15	Reserved
2-n	0-15	BTW Data (64 INTs max)

Offset 0 bits 0-5 contain the block transfer read length for manual mode

Offset 0 bit 8 contains the block transfer read enable bit for manual mode block transfers.

Offset 0 bit 9 is used in two different ways:

- q in manual mode, this bit is the block transfer read continuous bit. If this bit is set and the block transfer read enable bit is set, the AN-X2-AB-SCAN re-enables block transfer reads when they have executed successfully
- q in automatic and semi-automatic modes, this bit is used to inhibit all block transfers to the I/O module

Offset 1 bits 0-5 contain the block transfer write length for manual mode.

Offset 1 bit 8 contains the block transfer write enable bit for manual mode block transfers.

Offset 1 bit 9 is the block transfer write continuous bit for manual mode. If this bit is set and the block transfer write enable bit is set, the AN-X2-AB-SCAN re-enables block transfer writes when they have executed successfully.

Word offsets 2-n contain the write data sent to the block transfer write module.

Error Codes

Error Code	Description
0	OK
1	BTR/BTW request ignored by block transfer module



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Error Code	Description
2	Block Transfer state mismatch
3-6	Reserved, not currently used
7	Block transfer disabled

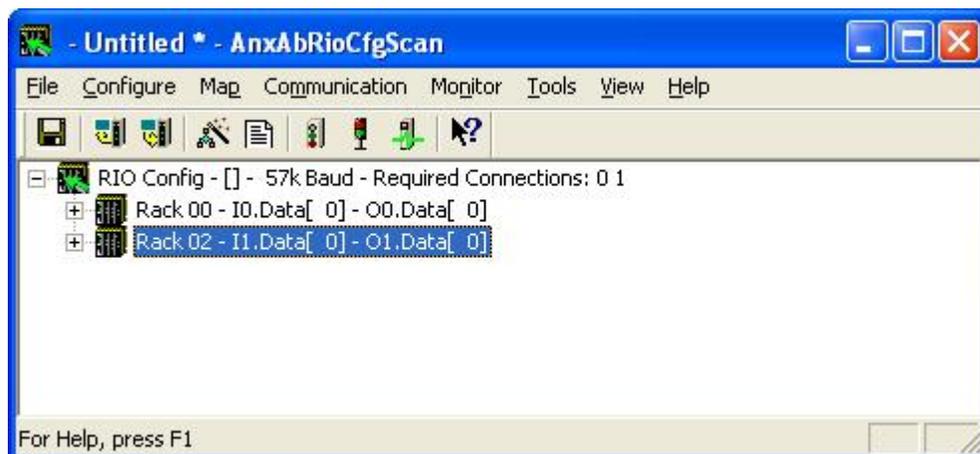
Required Connections

The configuration tool shows the ControlLogix connections to which data has been mapped at the root of the network tree.

For each required connection, you must create a Generic module in the ControlLogix configuration with that slot number. See page 36.

Required connections need not be contiguous.

In the example shown, data has been mapped to blocks 0 and 1 and so connections 0 and 1 must exist in the ControlLogix in order for the AN-X2-AB-SCAN to scan I/O.



Uploading and Downloading Configurations

To download a configuration to the AN-X2-AB-SCAN, select *Communication/Download Configuration* or use the *Download Configuration to Module* button on the toolbar

To upload a configuration from the AN-X2-AB-SCAN, 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* or *File/Save As*.



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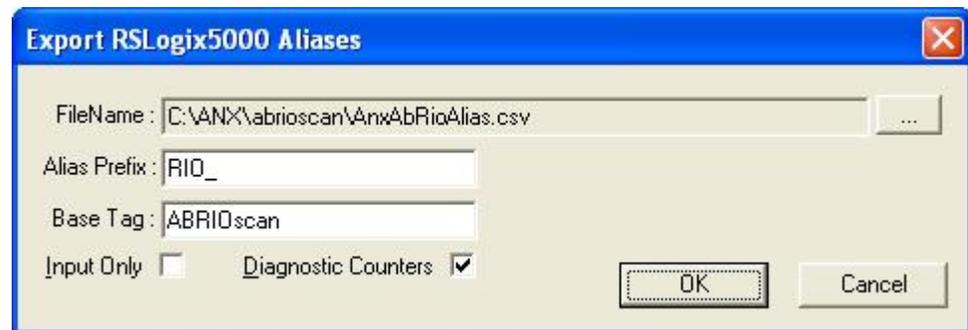


Aliases

The configuration tool exports aliases for discrete and block transfer data that can be imported into RSLogix 5000.

You should write control 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 control program will point to the new data locations.

To export aliases, select *Tools/Export Alias File...*



Use the browse button to change the file location.

The *Alias Prefix* is used to distinguish between aliases for different AN-X2-AB-SCAN modules. If you have more than one AN-X2-AB-SCAN in the RSLogix configuration, assign each one a different Alias Prefix so that the aliases for each module are unique.

The Base Tag identifies the AN-X the aliases are being created for. It should match the name you give the emulated ENBT module in the ControlLogix chassis. Refer to the Tags section in RSLogix 5000 to find the format of the Base Tag

Check the Input Only box if you want aliases only for input data.

Check the Diagnostic Counters box if you want descriptions for diagnostic counters to be included in the file. They contain only comments; they do not contain alias names.

The descriptions for the AN-X are slightly different from those for the original AN-X. Before you export aliases, right click on the root of the network tree and confirm that the AN-X2 box is checked.

Click OK to create the alias file.

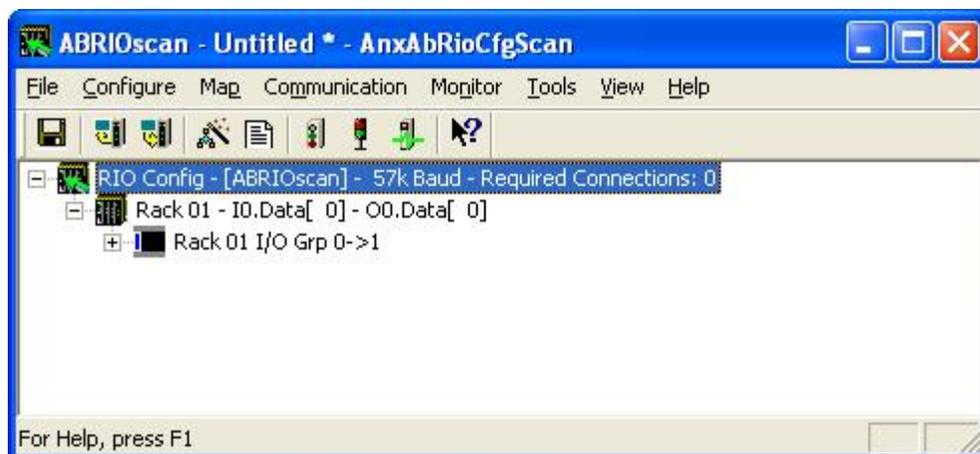
Alias Example

The remote I/O configuration contains a single quarter rack, rack 1, starting I/O group 0.

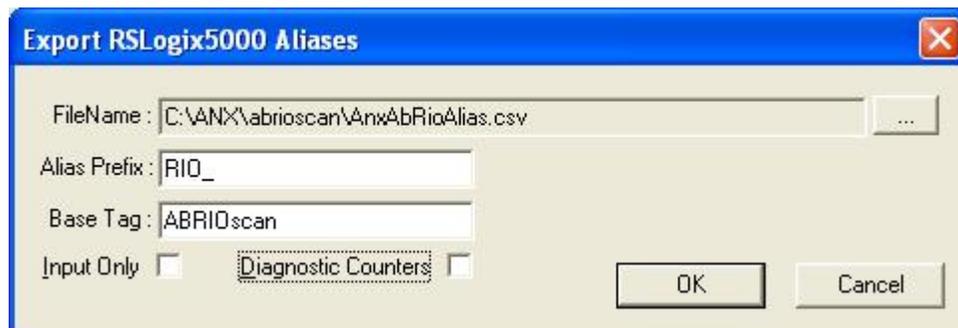


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We export aliases from the configuration tool using the Alias Prefix RIO_ and base tag ABRIOscan



The aliases that are created are:

Alias Name	Comment	Address
RIO_R01_STS	Rack-01 Status	ABRIOscan:0:I.Data[0]
RIO_R01_CTL	Rack-01 Control	ABRIOscan:0:O.Data[0]
RIO_I010	Rack-01 Grp-0 Discrete Input	ABRIOscan:0:I.Data[2]
RIO_O010	Rack-01 Grp-0 Discrete Output	ABRIOscan:0:O.Data[2]
RIO_I011	Rack-01 Grp-1 Discrete Input	ABRIOscan:0:I.Data[3]
RIO_O011	Rack-01 Grp-1 Discrete Output	ABRIOscan:0:O.Data[3]

The name is built from the Alias Prefix and the I/O address. The data address is built from the Base tag and the data mapping. The configuration tool creates comments that describe the data.



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If we check the Diagnostic Counters box in the Export RSLogix 5000 aliases dialog, the alias file also includes comments that are attached to the diagnostic data in connection 15.

These comments are displayed when you view the connection 15 data in RSLogix 5000 and help identify the data.

Some examples:

Address	Comment
ABRIOscan:15:I.Data[2]	RIO_ Active Rack Table - Racks 00-03, Start Mod Group 0,2,4,6
ABRIOscan:15:I.Data[18]	RIO_ Receive - Good Frames
ABRIOscan:15:I.Data[29]	RIO_ Scan Time Average (ms)

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 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.



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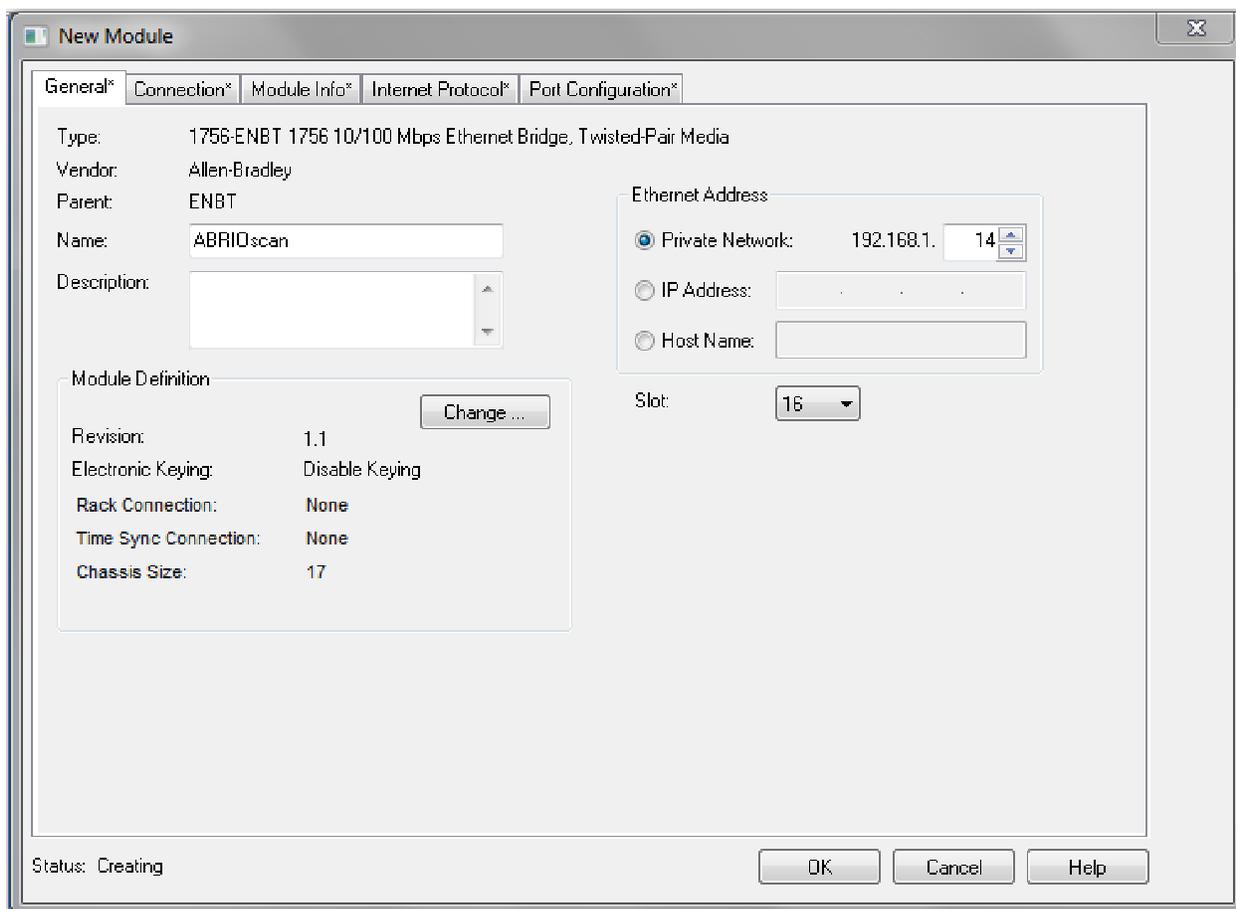
Configuring the AN-X Module in RSLogix 5000

The AN-X2-AB-SCAN emulates a 17-slot 1756 chassis with an 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 51).

To configure the AN-X2-AB-SCAN in RSLogix 5000:

1. Right click on the ControlLogix Ethernet bridge module that will be communicating 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*.



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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. The AN-X configuration tool shows which connections are required (see page 25). Right click on the backplane and select *New Module*. From the *Other* category, select 1756-MODULE and click OK.

New Module

Type: 1756-MODULE Generic 1756 Module
 Parent: ABRIDscan

Name: AnxSlot0
 Description:
 Comm Format: Data - INT
 Slot: 0

Connection Parameters

	Assembly Instance:	Size:	
Input:	1	250	(16-bit)
Output:	2	248	(16-bit)
Configuration:	4	0	(8-bit)
Status Input:			
Status Output:			

Open Module Properties

OK Cancel Help

Set the Name and Description as desired.

Set the Comm Format to Data – INT.

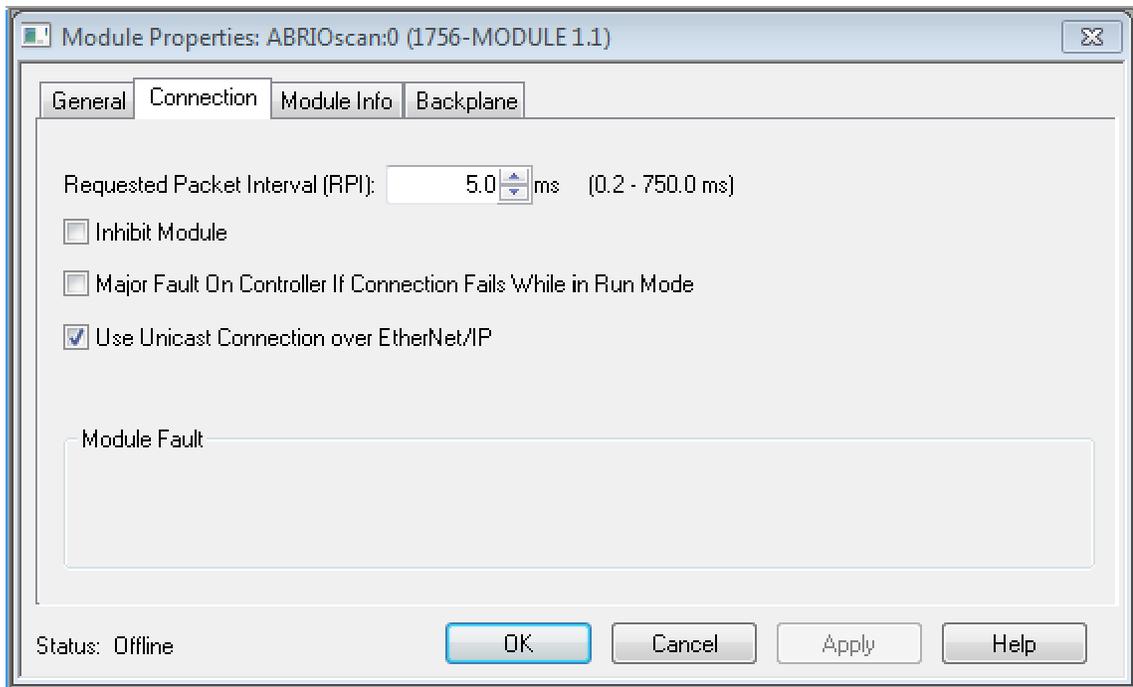
Set the other parameters as shown. Set the Slot to 0 for connection 0, 1 for connection 1, and so on.

3. Set the RPI for each connection.



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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 49) to obtain the remote I/O network scan time.

TIP The AN-X-AB-SCAN supports Unicast connections from the ControlLogix.

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

Listen Only Connections

The AN-X2-AB-SCAN supports listen only connections from a ControlLogix processor. The ControlLogix will be able to read the same input data as the ControlLogix processor with the exclusive owner connection to the AN-X2-AB-SCAN.

The AN-X-AB-SCAN uses listen only connections.

TIP Important points:

- listen only connections require an owning exclusive owner connection. The owning connection must be multicast, not



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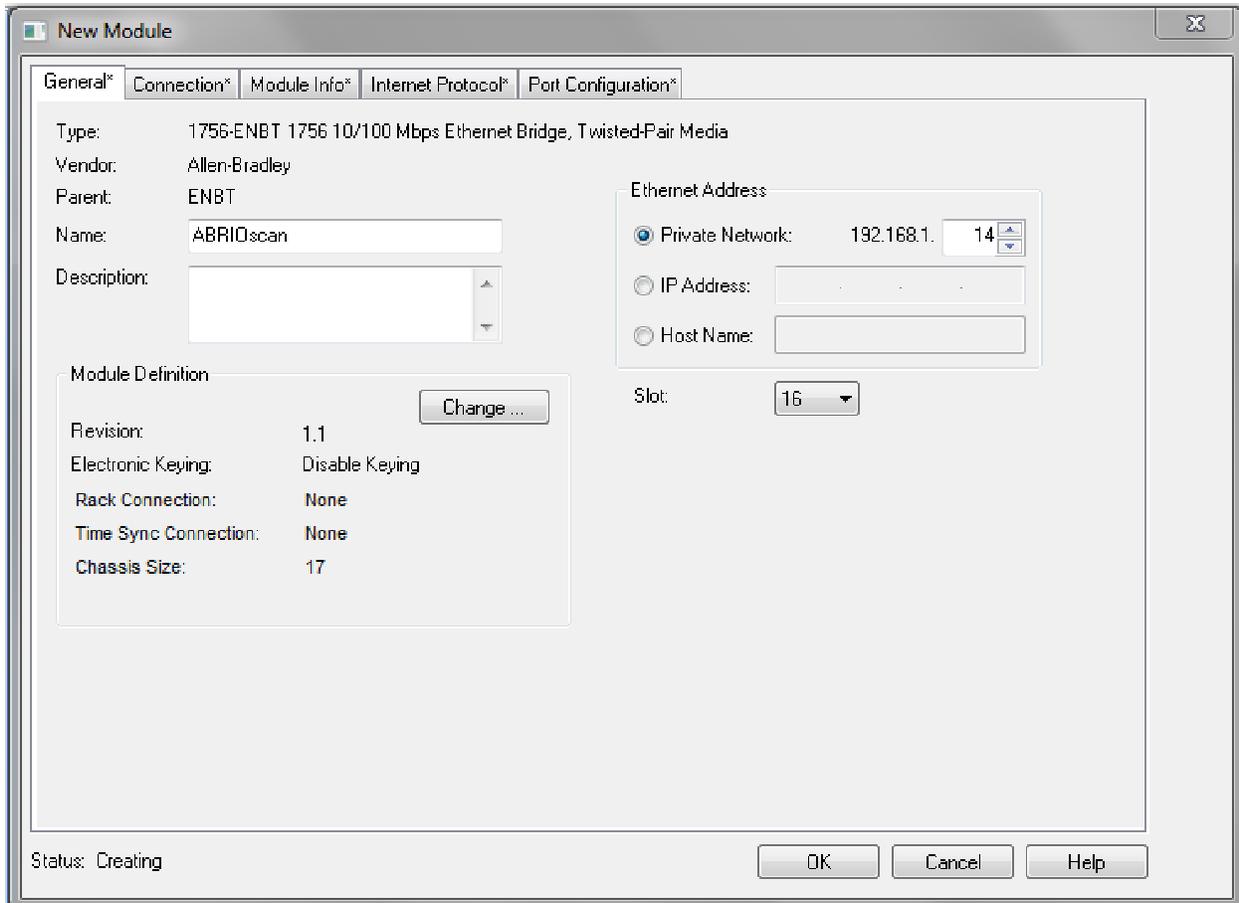


unicast.

- there can be multiple listen only connections to the same AN-X

To configure a listen only connection to the AN-X2-AB-SCAN in RSLogix 5000:

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



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

Set the *Comm Format* to None.

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

Set *Electronic Keying* to *Disable Keying*.

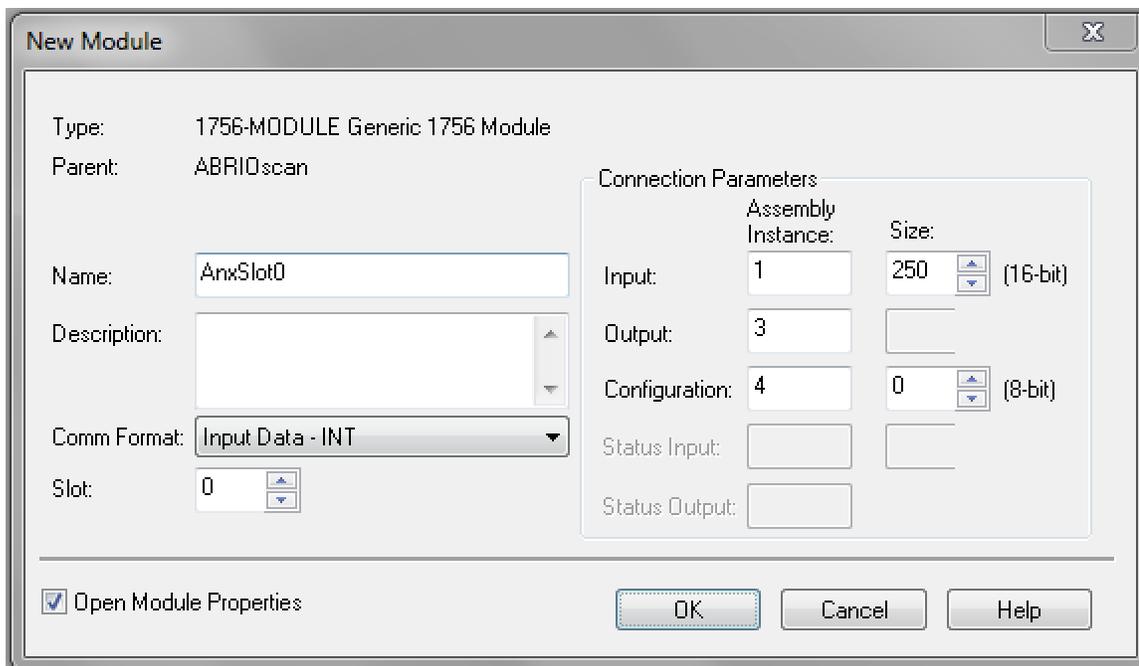
Record the *Name* as you will use it if you create aliases to access the data.

2. Add Generic modules for each required connection



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Set the parameters as shown.

Set the Comm Format to Input Data – INT.

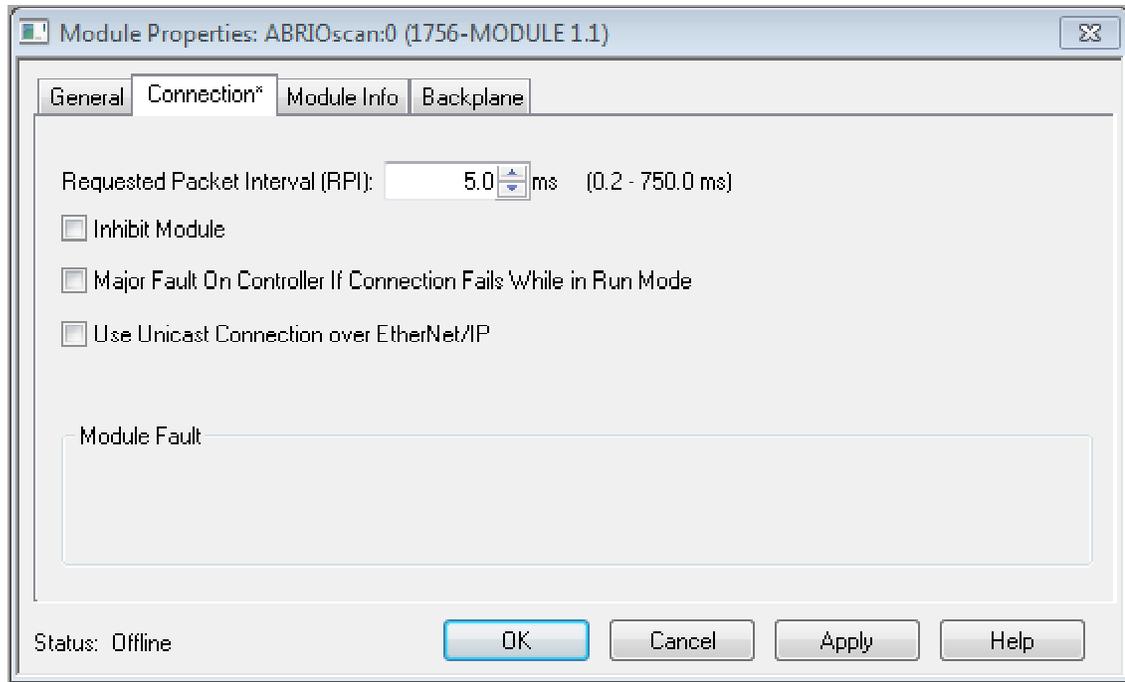
Set the Slot to 0 for the first connection, 1 for the second connection, and so on.

3. Set the RPI for each connection to match the RPI of the exclusive owner connection.



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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.



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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 ControlLogix Log

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

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



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Scanning Remote I/O

Required Connections

The AN-X2-AB-SCAN does not scan the remote I/O network unless all required ControlLogix connections are present.

Scan Mode: program/run

The remote I/O scan mode (program or run) is determined by the mode of the controller with the exclusive owner connection to slot 0 of the AN-X2-AB-SCAN.

In run mode, the AN-X2-AB-SCAN scans remote racks, reads discrete inputs and writes discrete outputs, and updates block transfers.

In program mode, the AN-X2-AB-SCAN scans remote racks, reads discrete inputs but does not write discrete outputs or update block transfers.

In test mode, the AN-X2-AB-SCAN behaves the same as it does in program mode.

Executing Block Transfers

Automatic

An automatic block transfer performs a configuration block transfer write once and then performs timed data block transfer read and write updates using the BTR and BTW data lengths and update times from the configuration tool.

Automatic block transfers begin as soon as the processor is in run mode; they do not have to be triggered.

Errors in block transfer execution are indicated by non-zero values in the BTR/BTW Error Code.

In automatic mode, the I/O module configuration data values come from the configuration tool, either as default values or from user parameters. The size of the configuration block transfer write is the data BTW length, BtwLen, plus the Config BTW Length, CfgLen, from the template. The data block transfer write length is BtwLen from the template and this is the length mapped to CLX scheduled output data.

The size of the data block transfer read is set by the configuration tool.

Semi-Automatic

A semi-automatic block transfer performs a configuration block transfer write once and then performs timed data block transfer read and write updates using the BTR and BTW data lengths and update times from the configuration tool.

Semi-automatic block transfers begin as soon as the processor is in run mode; they do not have to be triggered.



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Any errors in BT execution are indicated by non-zero values in the BTR/BTW Error Code.

In semi-automatic mode, the module configuration data values come from ControlLogix scheduled output data. The size of the configuration block transfer write is the data BTW length, BtwLen, plus the Config BTW Length, CfgLen, from the template, and this is the length mapped to ControlLogix scheduled output data. The data block transfer write length is BtwLen from the template.

The size of the data block transfer read is set by the configuration tool.

If you are using a semi-automatic block transfer, ensure that the configuration data is set in the ControlLogix data table before the program starts.

Manual

To execute block transfers in manual mode:

- Fill in the BTR and/or BTW length and BTW data in the control block for the module
- Set the BTR.EN and/or BTW.EN bits (BTR.CONT/BTW.CONT for continuous execution)
- Check the BTR.DN/BTW.DN bits that indicate BT execution is complete (BTR data is available at that time)
- Check the BTR.ERR/BTW.ERR bits. If set, read the error code to determine the cause of the problem.

Inhibiting Automatic Block Transfers

To inhibit a running automatic or semiautomatic block transfer, set bit 9 in offset 0 of the mapped block transfer output data for the module.

Monitoring operation

Discrete Inputs and Outputs

To monitor discrete inputs, do one of the following:

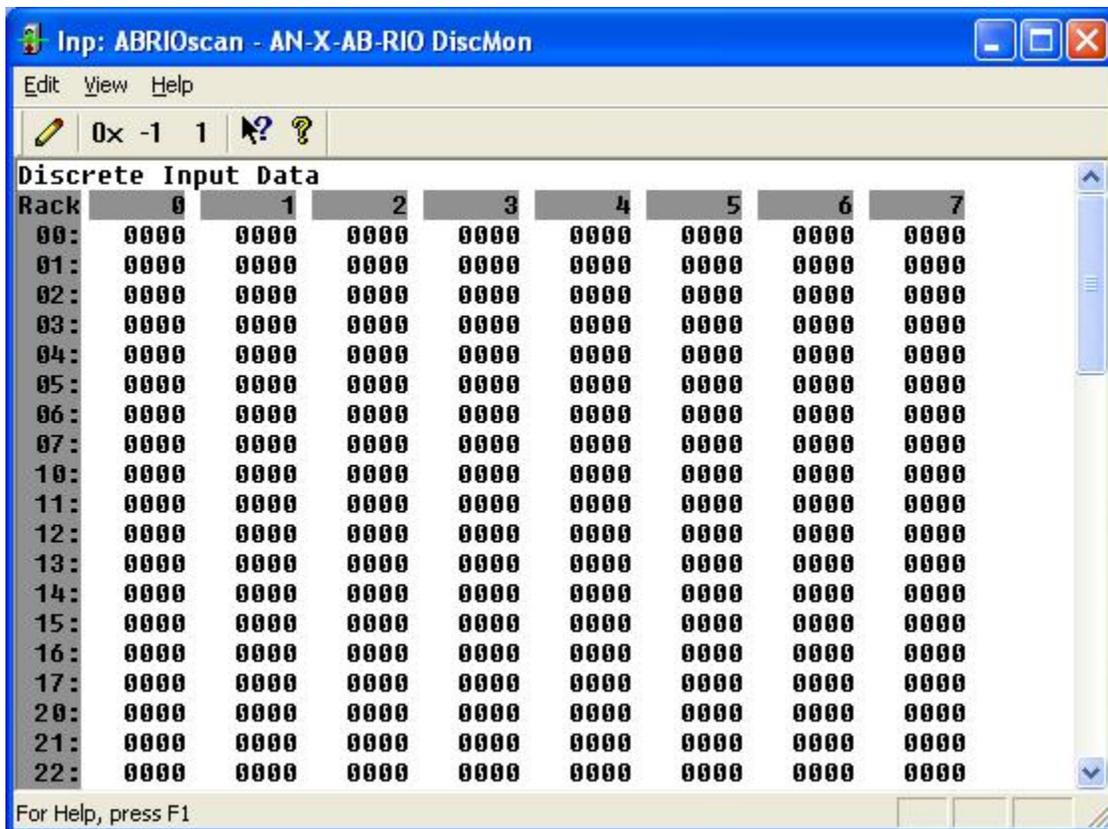
- from the main menu, select *Monitor/Discrete Inputs*
- right click on a rack and select *Monitor Discrete Inputs*
- use the *Monitor Discrete Inputs* button on the toolbar

The Discrete Input monitor window appears.



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Each row corresponds to a rack. Rack numbers are given in octal. Each row shows the 8 words 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

To monitor discrete outputs, do one of the following:

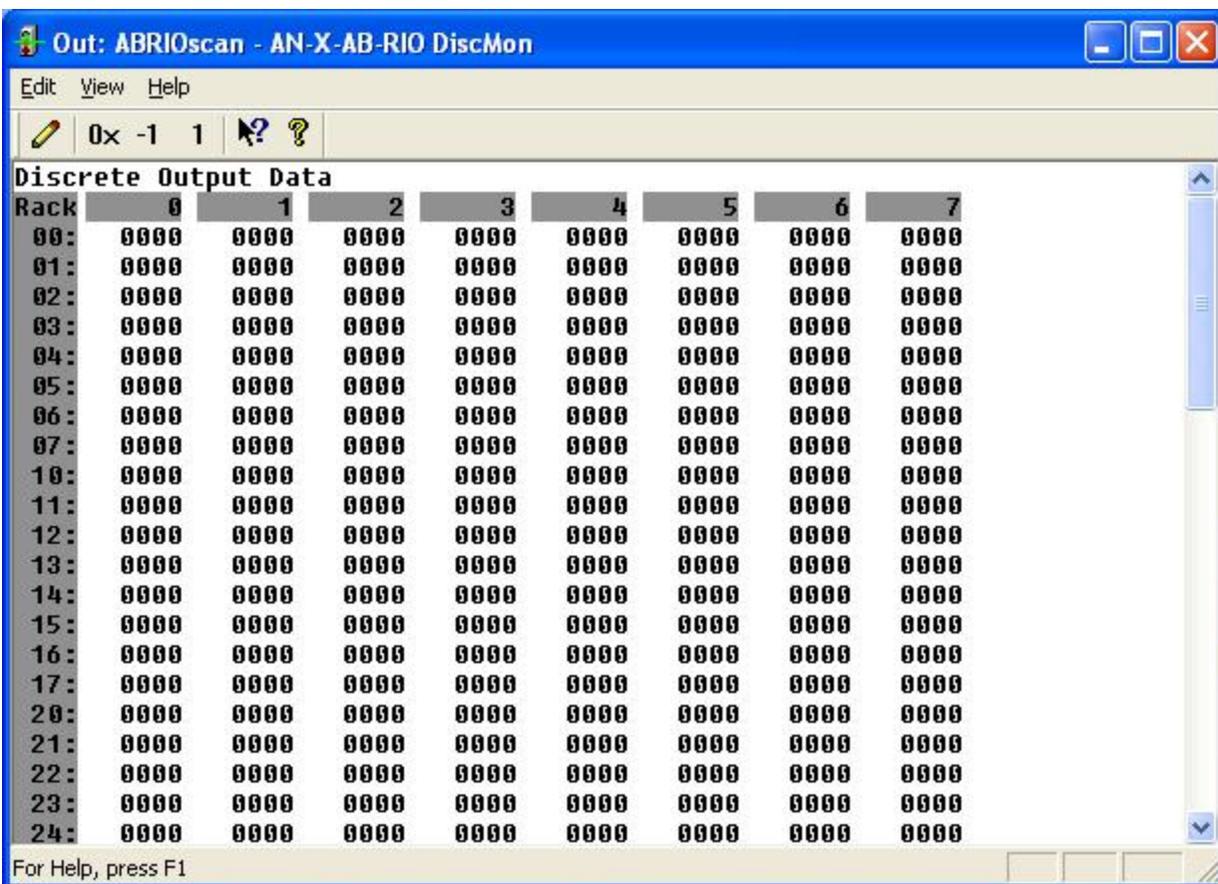
- from the main menu, select *Monitor/Discrete Outputs*
- right click on a rack and select *Monitor Discrete Outputs*
- use the *Monitor Discrete Outputs* button on the toolbar

The Discrete Output monitor window appears.



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Each row corresponds to a rack. Rack numbers are given in octal. Each row shows the 8 words 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

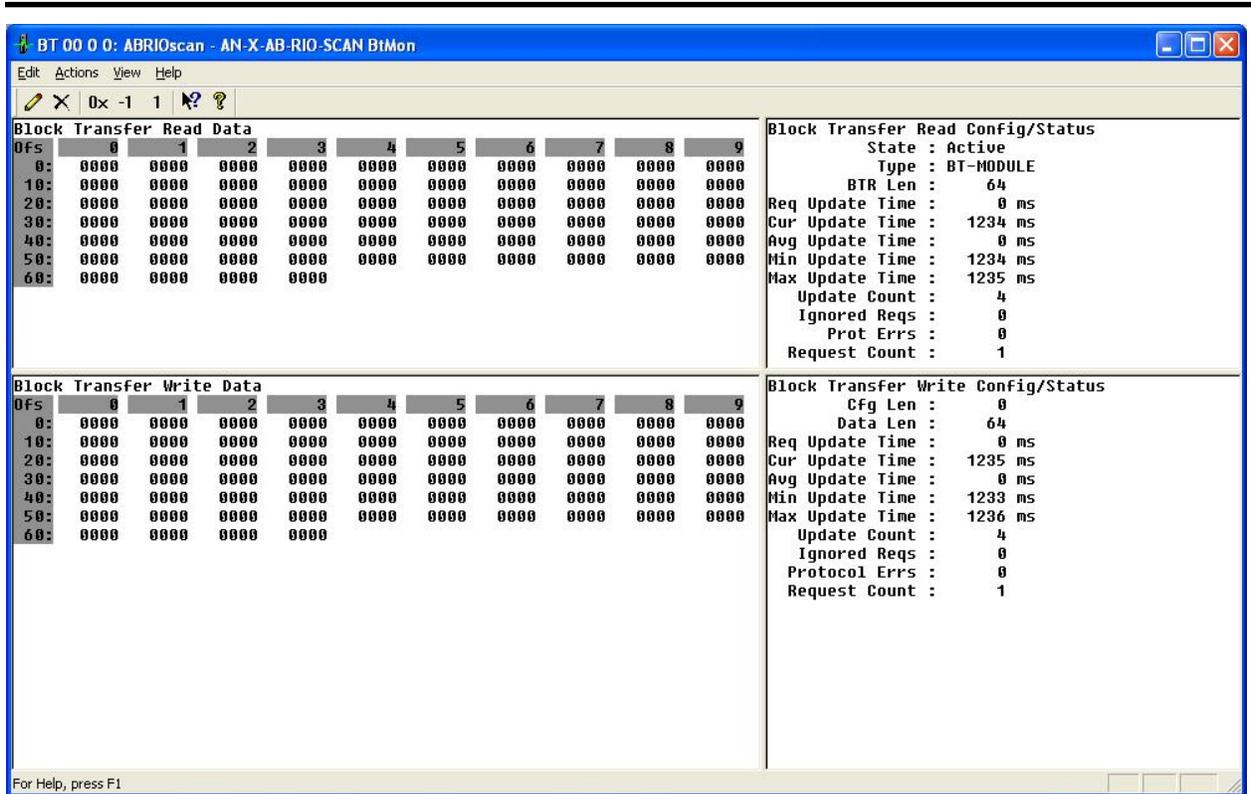
To monitor a block transfer module, right click on the module in the tree and select *Monitor BT Module*. The block transfer module window appears.

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



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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
State	Config/Active/Inactive
Type	Module type, from the module template
BTR Len	Block transfer read length
Req Update Time	Requested update time in the module configuration, in ms
Avg Update Time	Average update time for this block transfer read, in ms. This is the average of the previous 8 updates.



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Counter	Description
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
Ignored Req	Running count of update requests ignored by the block transfer module.
Prot Errors	Running count of protocol errors for this block transfer read. If this counter is incrementing, the module isn't responding correctly. Possible causes are length mismatch, invalid reply.
Request Count	Count of the number of times on successive scans this block transfer was requested. If this number is consistently greater than 1, increase the requested update time - the module cannot respond quickly enough at the current requested time. The counter applies to both the BTR and BTW for this module.

Block Transfer Write Diagnostics

Counter	Description
CFG len	Length of the configuration data for this module
BTW data len	Data length
Req Update Time	Requested update time in module configuration, in ms
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.
Ignored Req	Running count of update requests ignored by the block transfer module
Prot Errs	Running count of protocol errors for this block



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	transfer write
--	----------------

Rack Status and Diagnostic Counters

The AN-X2-AB-SCAN 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.

The screenshot shows the 'ABRIOScan - AN-X-AB-RIO-SCAN DiagMon' application window. It features a menu bar (Actions, View, Help) and a toolbar with icons for exit, refresh, and help. The main display area is divided into three sections:

- Active Racks:** A grid of bits representing rack status. The top row shows a sequence of bits: 11111111222222223333333344444444555555556666666677777777. Below this, a grid shows bits for starting I/O groups 0, 1, 2, 4, and 6. For example, group 0 has bits set for racks 0, 1, 2, 3, 4, 5, 6, 7, 10, 11, and 12.
- Global Diag Counters:** A list of system-wide statistics:
 - TxCount : 19823
 - RxGood : 19823
 - RxTout : 0
 - RxBadCrc : 0
 - RxNoise : 0
 - RxAbort : 0
 - PrtclErr : 0
 - PrtclTyp : 00
 - PrtclArg : 00
 - ErrRack : Rack:00 Start Group:0
 - ErrBtMod : Group:0 Slot:0
 - UpdCur : 617
 - UpdAvg : 617
 - UpdMin : 616
 - UpdMax : 620
- Rack Diag Counters:** A table showing per-rack statistics for racks 0 through 13. The columns are grouped by starting I/O group (0, 2, 4, 6). Each group has columns for Rx, Crc, Tout, and Prtcl.

Qtr	0				2				4				6			
Rck	Rx	Crc	Tout	Prtcl												
0:	14676	0	0	0												
1:					14676	0	0	0								
2:									14676	0	0	0				
3:													14676	0	0	0
4:	14676	0	0	0	7338	0	0	0								
5:	14676	0	0	0					7338	0	0	0				
6:	14676	0	0	0									7338	0	0	0
7:					14676	0	0	0	7338	0	0	0				
10:					14676	0	0	0					7338	0	0	0
11:									14676	0	0	0	7338	0	0	0
12:	14676	0	0	0	14674	0	0	0	14674	0	0	0				
13:	14674	0	0	0	14674	0	0	0					14674	0	0	0

Active Rack List

The active rack list shows where the active 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.



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Global Diagnostic Counters

The global diagnostic counters consist of:

Counter	Description
TxCount	This counter increments each time the AN-X2-AB-SCAN transmits a packet.
RxGood	This counter increments when the AN-X2-AB-SCAN receives a good packet.
RxTout	This counter increments when the AN-X2-AB-SCAN sends a packet but does not receive a reply.
RxBadCRC	This counter increments when the AN-X2-AB-SCAN receives a packet with a bad CRC. Check cabling and termination on the RIO network.
RxNoise	This counter increments when the AN-X2-AB-SCAN hears a carrier without receiving a packet. Check cabling and termination on the RIO network.
RxAbort	This counter increments when the AN-X2-AB-SCAN receives an opening flag, then the packet ends without a closing flag.
PrtclErr	This counter increments when the AN-X2-AB-SCAN receives a packet that makes no sense in terms of the protocol.
PrtclTyp	Protocol error type
PrtclArg	Protocol error argument
ErrRack	Rack error location
ErrBtMod	Block transfer error location
UpdCur	Current update time for all configured racks.
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.

Rack Diagnostic Counters

The rack diagnostic counters consist of the following counters for each partial rack.

Counter	Description
Rx	This counter increments when the AN-X2-AB-SCAN receives a



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Counter	Description
	packet from this rack.
Crc	This counter increments when the AN-X2-AB-SCAN receives a packet with a bad CRC from this rack.
Tout	This counter increments when the AN-X2-AB-SCAN sends a packet to this rack and does not receive a reply within the time-out period.
Prtcl	This counter increments when the AN-X2-AB-SCAN receives a packet from this rack that does not make sense in terms of the protocol.

Mapping Diagnostic Counters

The scheduled I/O diagnostic counters for the AN-X are slightly different from the counters for the original AN-X.

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
2-17	Rack status
18	Good frames received
19	Timeouts
20	Frames with CRC errors
21	Frames received with noise errors
22	Abort errors
23	Transmitted frames
24	Protocol errors
25	Low byte- protocol error type, high byte - error argument
26	Low byte – Error rack, high byte block transfer I/O group
28	Current remote I/O scan time, ms
29	Average remote I/O scan time, ms
30	Minimum remote I/O scan time, ms
31	Maximum remote I/O scan time, ms



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Offset	Description
35-38	Scheduled I/O Diagnostics (support use only)
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
40-49	Slot 0 Scheduled Connection statistics
40	Average Update time * 100 us
41	Reserved
42	Minimum Update time * 100 us
43	Reserved
44	Maximum Update time * 100 us
45-49	Reserved
50-59	Slot 1 Scheduled Connection statistics
60-69	Slot 2 Scheduled Connection statistics
70-79	Slot 3 Scheduled Connection statistics
80-89	Slot 4 Scheduled Connection statistics
90-99	Slot 5 Scheduled Connection statistics
100-109	Slot 6 Scheduled Connection statistics
110-119	Slot 7 Scheduled Connection statistics
120-129	Slot 8 Scheduled Connection statistics
130-139	Slot 9 Scheduled Connection statistics
140-149	Slot 10 Scheduled Connection statistics
150-159	Slot 11 Scheduled Connection statistics
160-169	Slot 12 Scheduled Connection statistics
170-179	Slot 13 Scheduled Connection statistics
180-189	Slot 14 Scheduled Connection statistics
190-199	Slot 15 Scheduled Connection statistics



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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.

IMPORTANT!

Scheduled connection statistics are valid only for connections that exist.

Scheduled Connection statistics for unused connections may contain meaningless non-zero values, and they are not cleared when you clear counters.

Module Logs

The scanner logs contain messages from the firmware running on the AN-X2-AB-SCAN, showing its normal operation and error messages. They may be useful in tracking down errors and for Technical Support.

Access the scanner logs from the web interface. See page 60 for more information.



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Block Transfer Module Templates

The properties of block transfer modules are defined in files in the subdirectory 'Templates' of the directory where the AN-X2-AB-SCAN 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-X2-AB-SCAN 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.



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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'.



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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

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 BinUns), 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



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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 module contains a webserver capable of communicating with standard web browsers such as Internet Explorer.

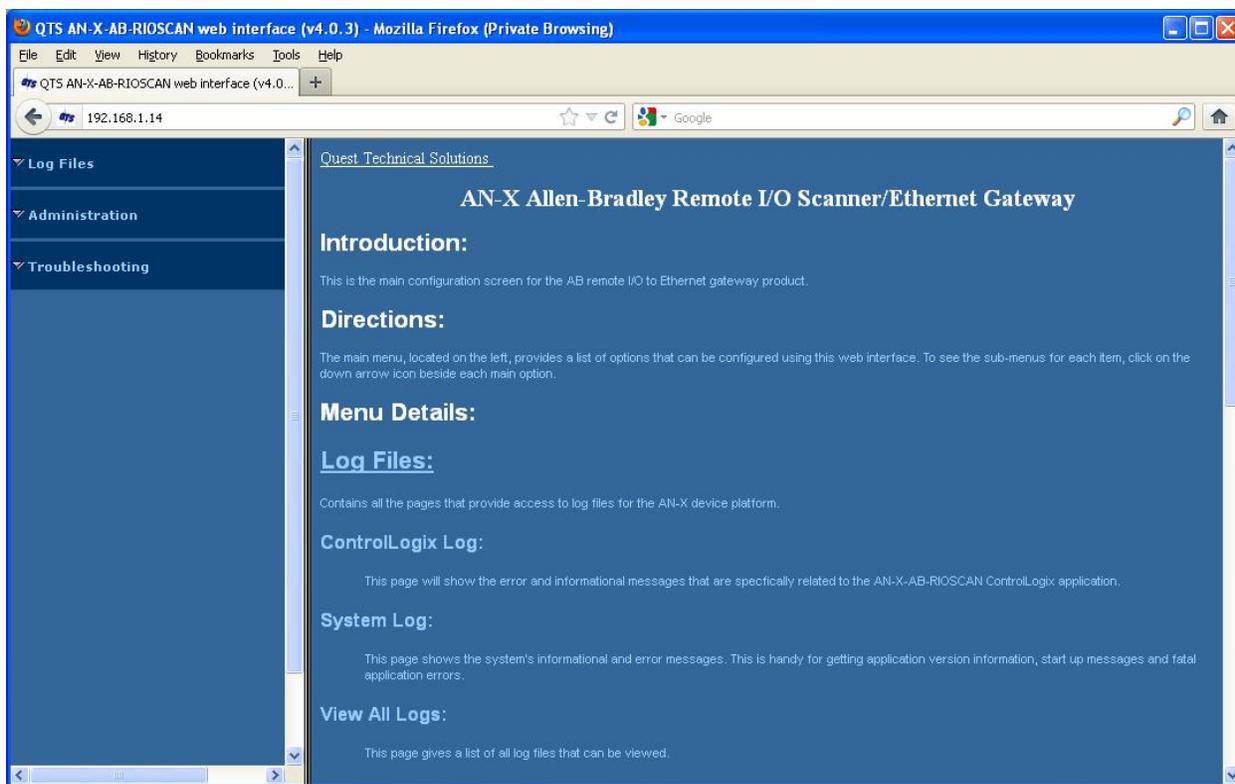
Use the web interface to:

- configure the Ethernet settings and select firmware
- archive the AN-X configuration
- update the AN-X firmware
- restart the AN-X
- view AN-X logs

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 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.



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Browsers may display cached data rather than rereading data that has changed on the AN-X.

TIP

If you run into a problem where data appears not to have changed, flush the cache in the browser or run the browser in the mode where it doesn't cache data (incognito in Chrome, Private browsing in Firefox and Safari, etc.)



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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.

ControlLogix Log

The ControlLogix log shows messages and errors associated with the ControlLogix scheduled data operation.

System Info Log

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

View All Logs

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

Administration Menu

The Administration Menu is used to set the AN-X IP address and to view and edit files on AN-X.

AN-X IP Configuration

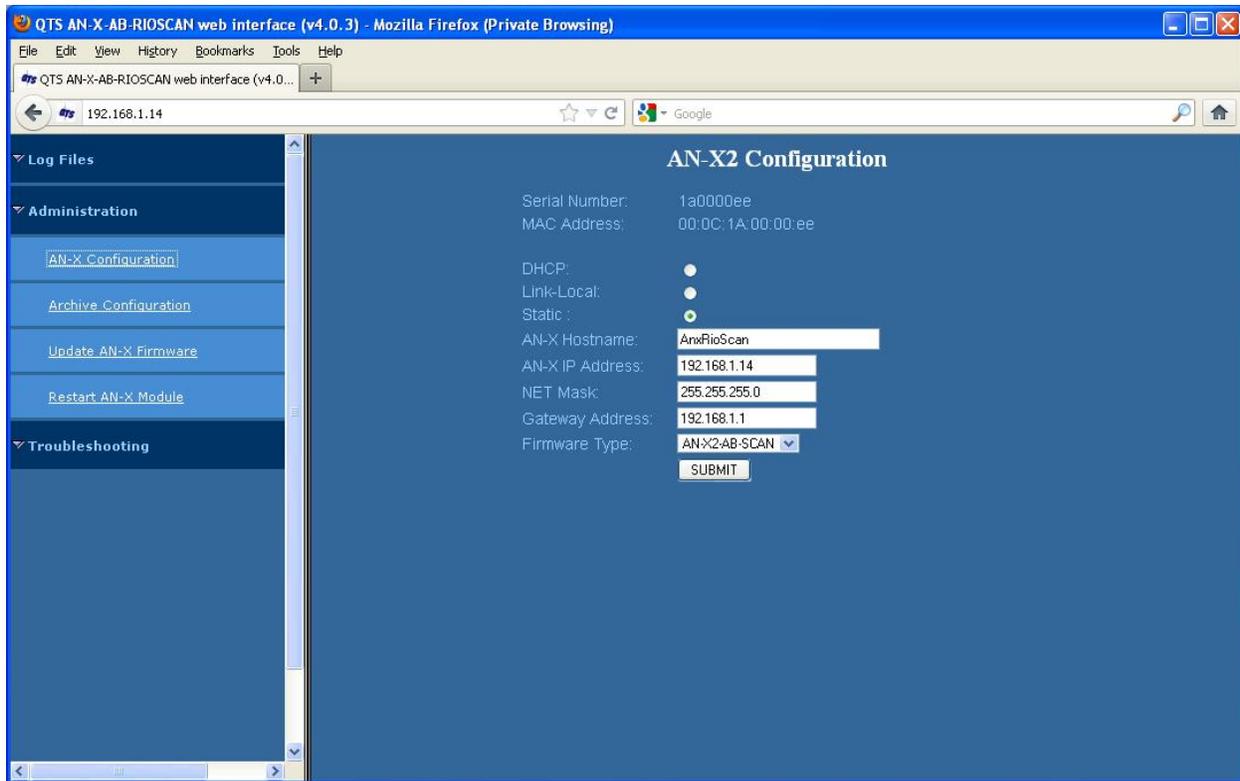
You can change the AN-X IP configuration from the web interface. This requires that you know the current IP address and can use it to access the web interface.

Select *Administration/AN-X IP Configuration*.



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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-X 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, you have to look at DHCP server.

When you submit the changes, if the AN-X does not find a DHCP server, it reverts to the default link local address 169.254.42.84 and repeatedly flashes the MS LED 3 times red followed by a pause.

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.



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Hostname

Enter a *Hostname* for the AN-X. 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

Firmware

Select the firmware the AN-X is to load from the list provided. AN-X builds the list from the firmware files on the microSD card that are compatible with the AN-X hardware.

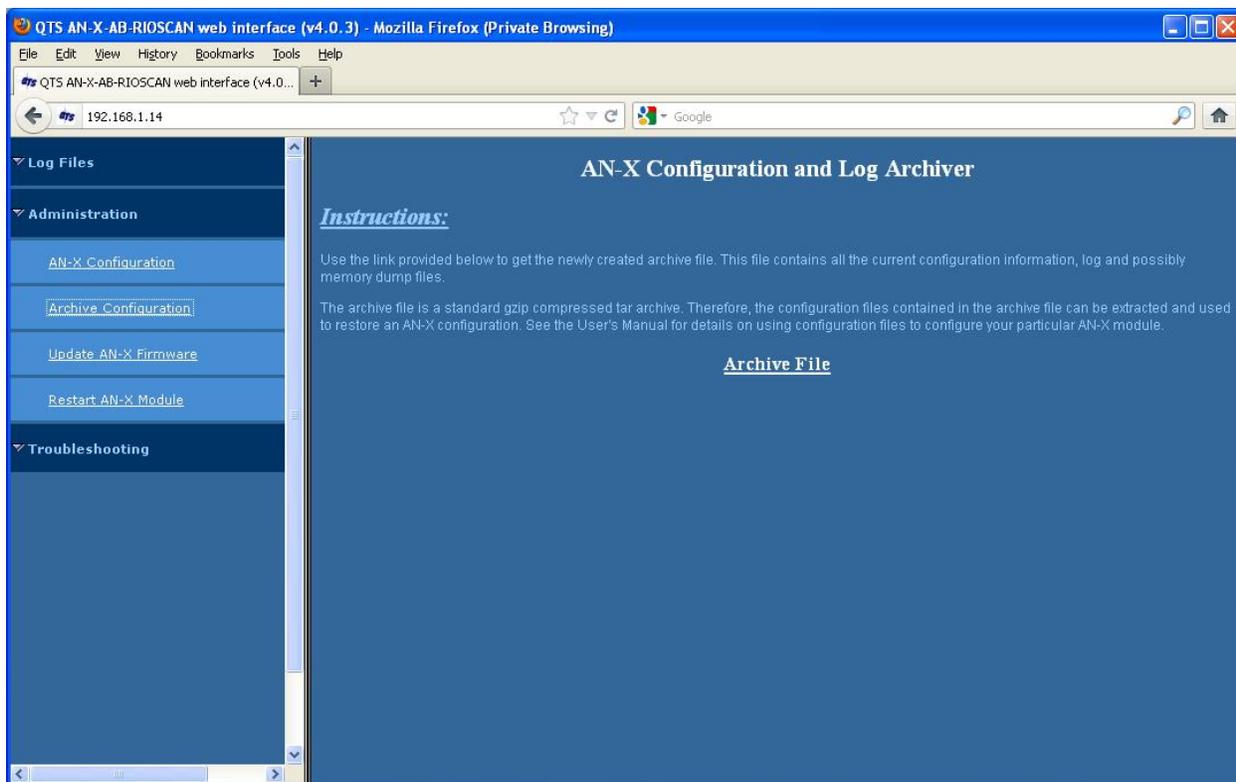
Submitting the Configuration

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

Archive Configuration

You can archive all the current AN-X configuration files and log files from the web interface. The archive file is a standard gzip compressed tar archive. It intended for technical support only.

Select *Administration/Archive Configuration*.



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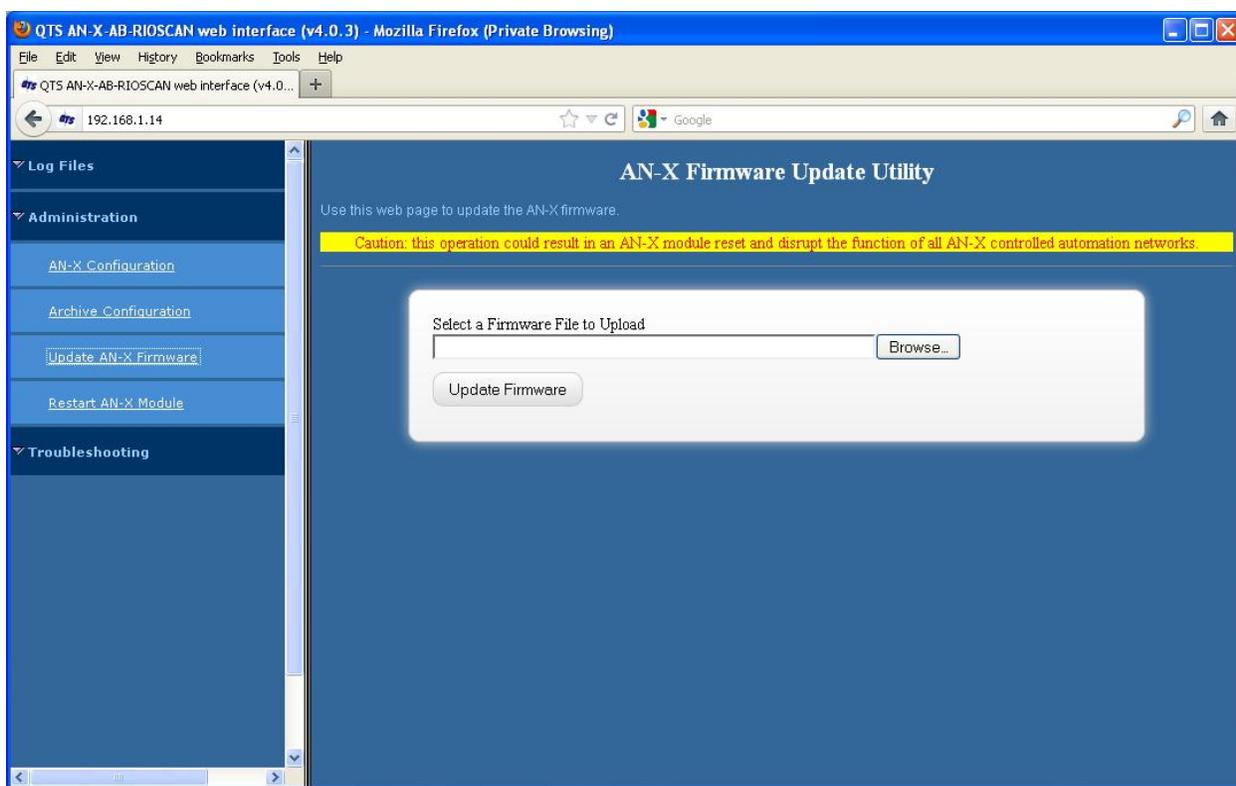
Click the *Archive File* link and save the file. Select the destination where the file will be stored.

Update AN-X Firmware

Use *Update AN-X Firmware* to download a firmware file to the microSD card on the AN-X. Firmware files for the AN-X have names that begin with AN-X and have extension *.qtf.

WARNING!

Do not download firmware to the AN-X while applications that use the AN-X are running.



Browse to select the file, then click the *Update Firmware* button to transfer the file.

It is essential that you do not disrupt power while downloading firmware, especially maintenance firmware, to the AN-X or while the AN-X is restarting following a firmware download.

WARNING!

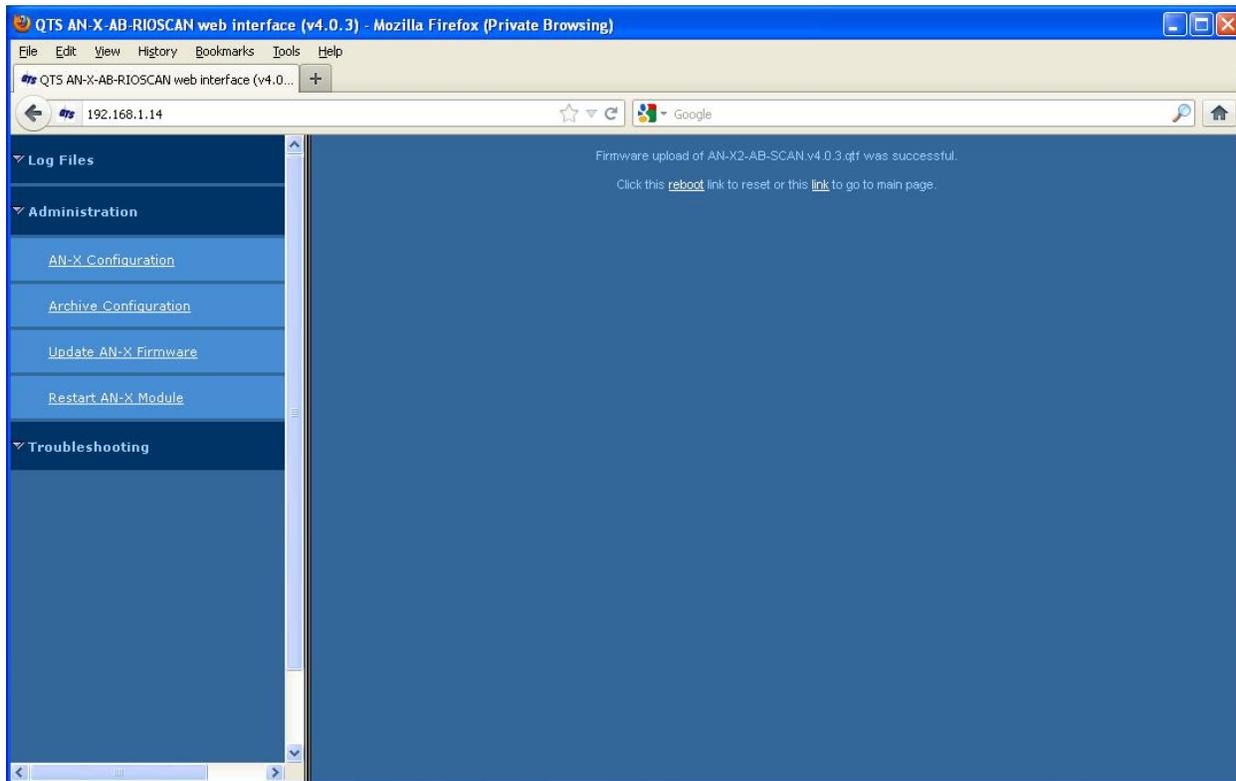
Interrupting power at some points in the update process could render the AN-X inoperative and it will have to be returned to the factory for reinitialization.



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AN-X displays status messages in the lower left corner of the page. When the download is complete, AN-X displays a message that indicates the success or failure of the download.



If you have other files to download, return to the main page and continue. Otherwise, restart the AN-X in order to run the downloaded firmware.

Restart AN-X Module

Use the *Restart AN-X Module* command to restart the AN-X module, for example, after changing Ethernet parameters or after downloading firmware.

Troubleshooting Menu

The troubleshooting menu contains information that is specific to an automation network, as well as support information.



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Troubleshooting

LEDs

The AN-X2-AB-SCAN has LEDs that indicate the state of the Ethernet connection and the overall module state.

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 and NS LEDs: Modes of Operation

Firmware version 4.2.x or above of the firmware supports two possible LED modes.

IMPORTANT!

Selection of the mode requires version 4.3.1 or above of the configuration program. See page 17. If you save a configuration with version 4.3.1 or above of the configuration program with Debug mode selected and load the file with an earlier version of the configuration program, you will receive an error.

Debug mode was the mode used in earlier versions of the firmware.

Standard mode is the new default mode and is compliant with the Ethernet/IP specification.

MS and NS LEDs: Standard Mode

The MS and NS LEDs are used by the AN-X operating system and software to indicate the state of operations and errors.

In standard mode, the MS and NS LEDs should be used in conjunction with the logs to locate the cause of problems.

Condition	LEDs
All OK	MS Solid Green, NS Solid Green
Missing connections	MS Solid Green, NS Flashing Green



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Condition	LEDs
Error event	MS Solid Green, NS Pulses Red
Bad Config	MS Flash Red, NS Flash Green

Error Events:

- Connection Timeout
- Returned error to connection request

MS and NS LEDs: Debug Mode

Debug mode provides additional information about the state of the Ethernet and remote I/O networks. Firmware versions prior to 4.2.1 used only debug mode.

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-X2 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-X2 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.



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MS LED State	Possible cause
Green	Everything operating correctly
	Note that this has the highest priority and may occur in combination with other error indications
Fast flash green and off	Not all scheduled connections are open
Fast red flash and off	Errors in configuration file

NS LED – Network Status

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

In order of priority, highest first, these are:

Color	Meaning
Red	A frame receive error has been received in the last second (CRC error, abort, or timeout), stays red for 1 second after the error occurs One or more racks is in error
Flashing Red/Off	At least one rack which is being scanned (not inhibited) is in error, one or more racks is inhibited
Yellow	No racks configured
Flashing Yellow/Off	All configured racks are inhibited
Flashing Green/Off	No racks being scanned (not inhibited) is in error, but one or more racks is inhibited
Green	All active racks are being scanned with no errors and no racks are inhibited

“Railroading” – MS and NS LEDs

AN-X alternates (railroads) flashing the MS and NS LEDs to indicate its state.

It railroads the LEDs yellow while it is copying new maintenance or production firmware files from the microSD card to flash memory.

It railroads the LEDs green for 20 to 30 seconds as it starts production mode.



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Fatal Errors

AN-X monitors its operation for “impossible” conditions and generates a fatal error if it detects one. It generates a fatal error code on the MS LED by flashing 8 bits followed by a pause. The least significant bit is first, with green for 1 and red for 0.

If a fatal error occurs, record the LED sequence and contact technical support.



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Updating the Firmware

The AN-X operating software consists of the maintenance firmware and the runtime firmware.

The maintenance firmware runs at startup. It performs diagnostics, updates any firmware that has been downloaded, and starts the runtime firmware.

The firmware files are supplied in files that begin with AN-X and have extension *qtf*. They are updated using the web interface. Run the command *Administration/Update AN-X Firmware* and select the file you wish to download.

WARNING! Do not download firmware to the AN-X while applications that use the AN-X are running.

The web page displays the download progress at the bottom left of the page.

You must restart the AN-X to run the firmware that you downloaded.

WARNING! It is essential that you do not disrupt power while downloading firmware, especially maintenance firmware, to the AN-X or while the AN-X is restarting following a firmware download.

Interrupting power at some points in the update process could render the AN-X inoperative and it would have to be returned to the factory for reinitialization.

The web interface displays the version of the firmware the AN-X is running on the tab at the top of the page.

You can also update the firmware by copying *qtf* files to the microSD card from a computer. If you do, make sure that there is only one version of each *qtf* file on the microSD card.



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Appendix: Scanner Configuration File Format

A scanner configuration file consists of:

Scanner file ID

Keyword AN-X2-AB-SCANNER

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.

LED Mode

Keyword “LedDebugMode” selects debug mode for the MS and NS LEDs. Requires firmware version 4.2.1 or above and configuration program 4.32 or above.

Rack definitions

Keyword “Rack”, comma, 0orr 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 various other elements separated by commas.

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

Next is the Mode, either Auto, SemiAuto or Manual, for example, Mode=Auto

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

Data block transfer lengths

Update times

Finally, the definition contains the configuration data length and default configuration data.

Data mappings

Discrete data mappings start with keyword MapRackInp or MapRackOut. This is followed by the rack number in the form 0orr 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 MapBtModInp or MapBtModOut. This is followed by the rack number in the form 0orr 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 Scanner Configuration File

```
AN-X2-AB-SCANner
AnxName, "ABRIOscan"

Baud, 57k

Rack, 0o01, 0, 7

BtMod, 0o01, 0, 0, Mode=Auto, Type="1771-IFE-8CH", BtrLen=12,
BtwLen= 0, BtrTme= 0, BtwTme= 0, CfgLen=21, 0x0000 0x0000 0x0500
0x0000 0x0000 0x0000 0x4095 0x0000 0x4095 0x0000 0x4095 0x0000 0x4095
0x0000 0x4095 0x0000 0x4095 0x0000 0x4095 0x0000 0x4095

BtMod, 0o01, 0, 1, Mode=Auto, Type="1771-OFE-Diag", BtrLen= 5,
BtwLen= 4, BtrTme= 0, BtwTme= 0, CfgLen= 9, 0x8000 0xf001 0x0fff
0xf001 0x0fff 0xf001 0x0fff 0xf001 0x0fff

MapRackInp, 0o01, 0, 0
MapRackOut, 0o01, 0, 0

MapBtModInp, 0o01, 0, 0, 0, 10 ; Len= 14 words
MapBtModInp, 0o01, 0, 1, 0, 24 ; Len= 7 words
MapBtModOut, 0o01, 0, 0, 0, 10 ; Len= 2 words
MapBtModOut, 0o01, 0, 1, 0, 12 ; Len= 6 words
```



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Specifications

Parameter	Specification
Function	Bridge between Ethernet and Remote I/O network
Maximum Power Consumption	200 mA @ 12 VDC or 100 mA @ 24 VDC
Maximum Power dissipation	2.4W
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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