

AN-X-AB-DHRIO-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-ABRIO-SCAN

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AN-X-ABRIO-SCAN Module Overview



The AN-X-ABRIO-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-X-ABRIO-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 updated over Ethernet using the Windows utility AnxInit. Refer to page 80 for details.

Hardware Features



The module has:

- LEDs to indicate the status of the connection to the Ethernet (100 and Link/Act)
- a LED to indicate the module's internal state and the state of communication with the ControlLogix (SYS)
- a LED to indicate the state of communications on the Remote I/O network (NET)
- 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-ABRIO-SCAN module
- CD containing software and documentation
- rubber feet for desktop use



Modes of Operation

There are three AN-X modes of operation:

- Boot mode. The AN-X is running its low level startup firmware.
- Configuration mode. This is the mode when you are updating the firmware in the AN-X.
- 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.

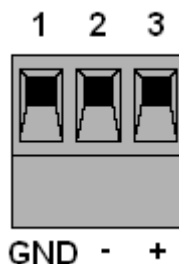
WARNING!

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 300 mA @ 12VDC or 150 mA @ 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.

From left to right on the AN-X module, the network connections should be line 1, shield, line 2.



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.

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

If you are connecting directly to the AN-X module, use a crossover cable.



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 to remove the old version.

Insert the CD supplied with the AN-X module and run the program setup.exe on the CD to install common AN-X components.

Run the program AnxAbRioSetup.msi in the ABARIO folder to install the components for the AN-X-ABRIO-SCAN



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Quick Start

Step	Operation	See page
1	Install the AN-X Windows software	6
2	Power up the AN-X, connect it to Ethernet and use AnxInit to assign it an IP address	8
3	Connect AN-X to the Remote I/O network	4
4	Use the AN-X Windows utility to autoconfigure the remote I/O network and ControlLogix configuration	23
5	Configure the AN-X in RSLogix 5000	39
6	Scan I/O, read inputs and write outputs	
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9	Use the aliases to access data	



Ethernet Configuration

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

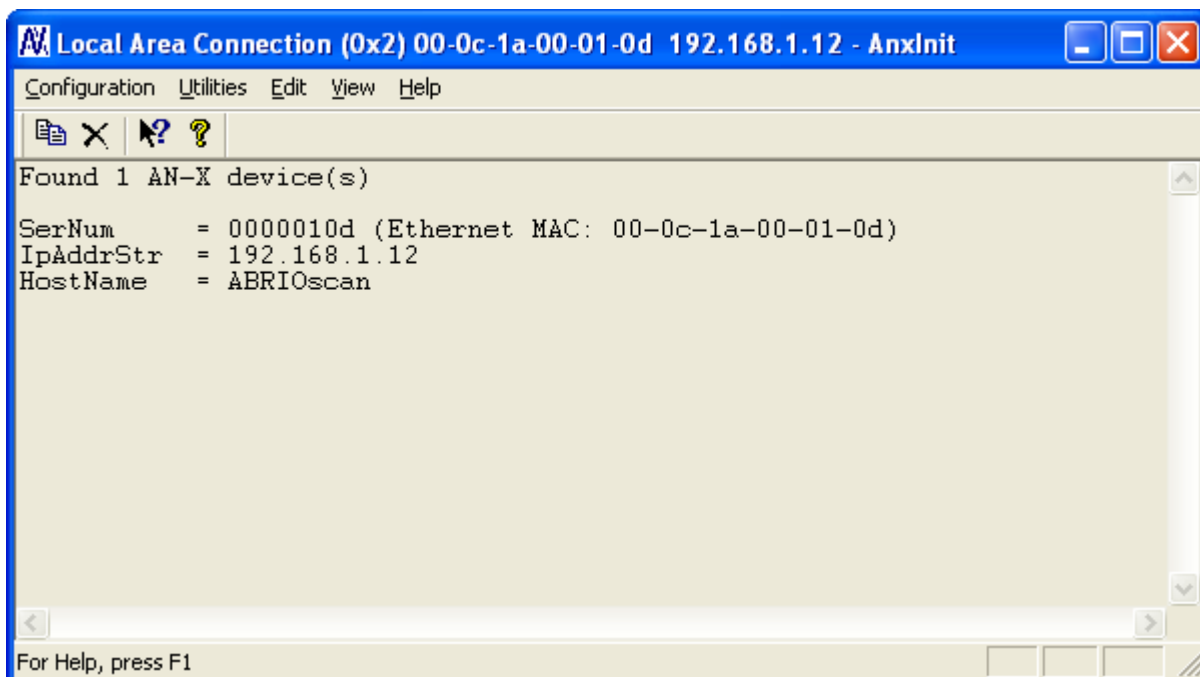
Before you can use the AN-X-ABRIO-SCAN, you must configure its network properties on Ethernet.

Ethernet Configuration

AN-X can be configured to use a static (unchanging) IP address or it can be configured to obtain its IP address from a DHCP server.

Unless you have control of the DHCP server, in most applications you will configure AN-X to use 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.

AN-X is shipped with DHCP enabled. If it finds a DHCP server on the network, the DHCP server assigns it an IP address. You can use the utility AnxInit to find the IP address that the DHCP server has assigned. Select *Utilities/Locate All AN-X Modules* and AnxInit will locate the AN-X and display its IP address.



The screenshot shows a Windows-style window titled "Local Area Connection (0x2) 00-0c-1a-00-01-0d 192.168.1.12 - AnxInit". The window has a menu bar with "Configuration", "Utilities", "Edit", "View", and "Help". Below the menu bar is a toolbar with icons for file operations and help. The main content area displays the following text:

```
Found 1 AN-X device(s)

SerNum      = 0000010d (Ethernet MAC: 00-0c-1a-00-01-0d)
IpAddrStr   = 192.168.1.12
HostName    = ABRIOscan
```

At the bottom of the window, there is a status bar that says "For Help, press F1".

If AN-X does not find a DHCP server within about three minutes of starting up, it reverts to a temporary static IP address of 192.168.0.41. If AN-X is using this temporary IP address, it repeatedly flashes the SYS



LED red three times followed by a pause. If your computer is on the same subnet, you can use the web interface to change the IP address of the AN-X.

IMPORTANT!

Use this temporary IP address only for initial setup of AN-X. AN-X will not function correctly for its intended purpose at the temporary IP address.

If you are using multiple AN-X modules, configure them one at a time, especially if there is no DHCP server on the network, since they will all revert to the same temporary IP address when they fail to find a DHCP server.

IMPORTANT!

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

IMPORTANT!

The AN-X must be on the local Ethernet (same subnet as your computer) when you set its IP address.

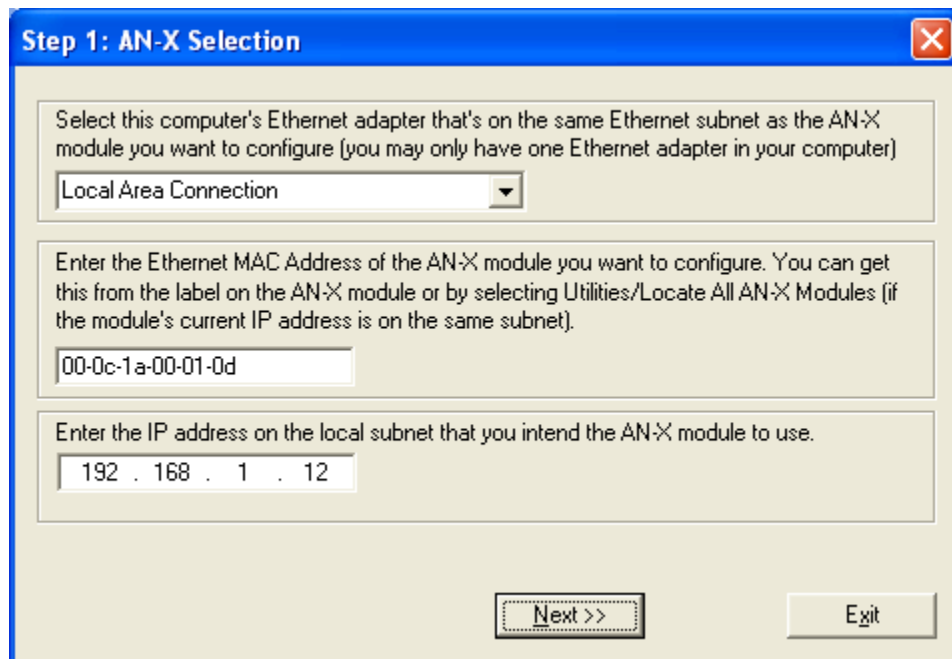
You configure the Ethernet properties using the Windows utility AnxInit supplied with AN-X or the AN-X web interface.

In AnxInit, use the *Configuration/AN-X IP Settings* command to start the AN-X IP configuration wizard, which takes you step by step through the IP configuration process.

Step 1

In step 1, you identify the AN-X you are configuring.





Step 1: AN-X Selection

Select this computer's Ethernet adapter that's on the same Ethernet subnet as the AN-X module you want to configure (you may only have one Ethernet adapter in your computer)

Local Area Connection

Enter the Ethernet MAC Address of the AN-X module you want to configure. You can get this from the label on the AN-X module or by selecting Utilities/Locate All AN-X Modules (if the module's current IP address is on the same subnet).

00-0c-1a-00-01-0d

Enter the IP address on the local subnet that you intend the AN-X module to use.

192 . 168 . 1 . 12

Next >> Exit

1. Select the Ethernet adapter that is connected to the AN-X. In most cases there will be just one Ethernet adapter in the computer. The AN-X must be on the same subnet as the computer.

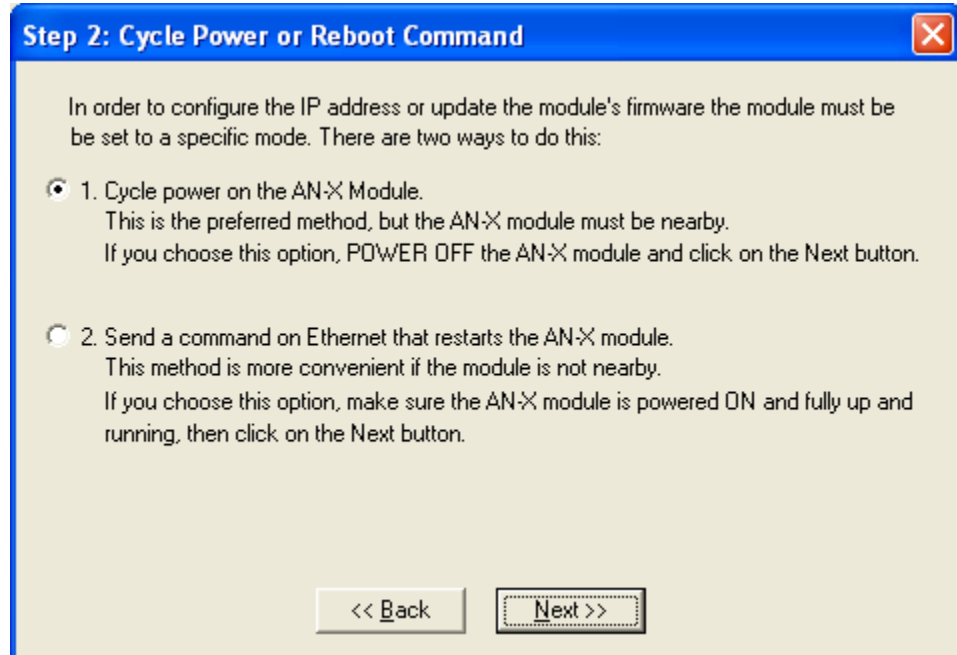
2. Enter the MAC address of the AN-X you are configuring. This is printed on the AN-X label. It consists of six pairs of hexadecimal digits, separated by hyphens. In the example above, it's 00-0c-1a-00-01-0d

If the AN-X is already online, you can obtain its MAC address using the *Utilities/Locate All AN-X Modules* command.

3. Enter the IP address you intend the AN-X to use. In the example shown, it's 192.168.1.12

Step 2

In step 2, you choose a method of restarting AN-X to put it in boot mode.

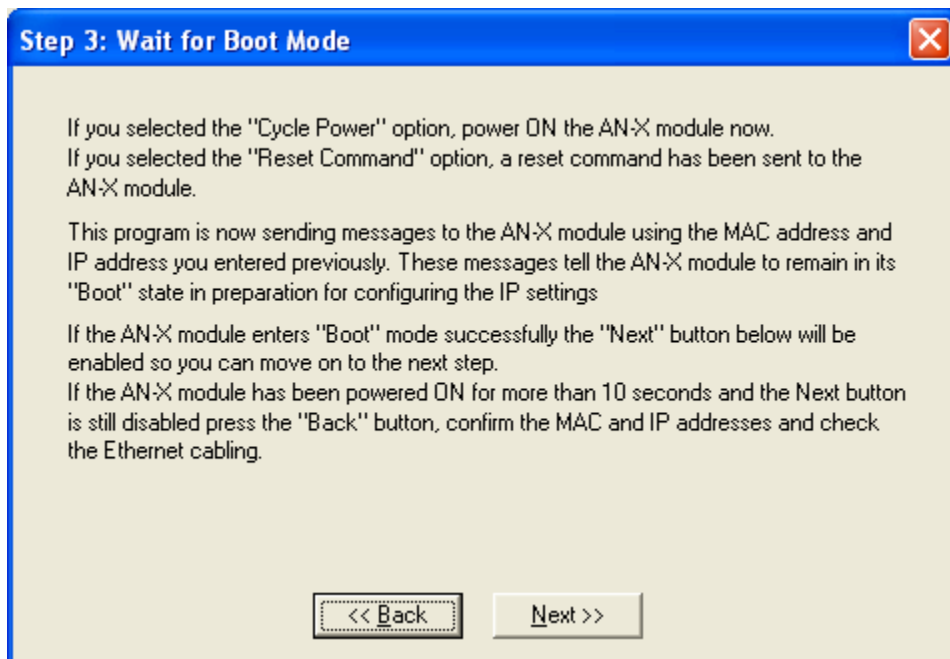


The preferred method is to cycle power on the AN-X. Select the first option on the screen and click the *Next >>* button.

An alternative method, useful if the AN-X is not easily accessible, is to send it a command over Ethernet. The AN-X must be powered on and completely running for this method to work. For example, if this is the first time you are configuring a new AN-X, allow sufficient time for it to acquire an IP address from a DHCP server or to time out and use its default IP address (about 3 minutes). Select the second option on the screen and click the *Next >>* button.

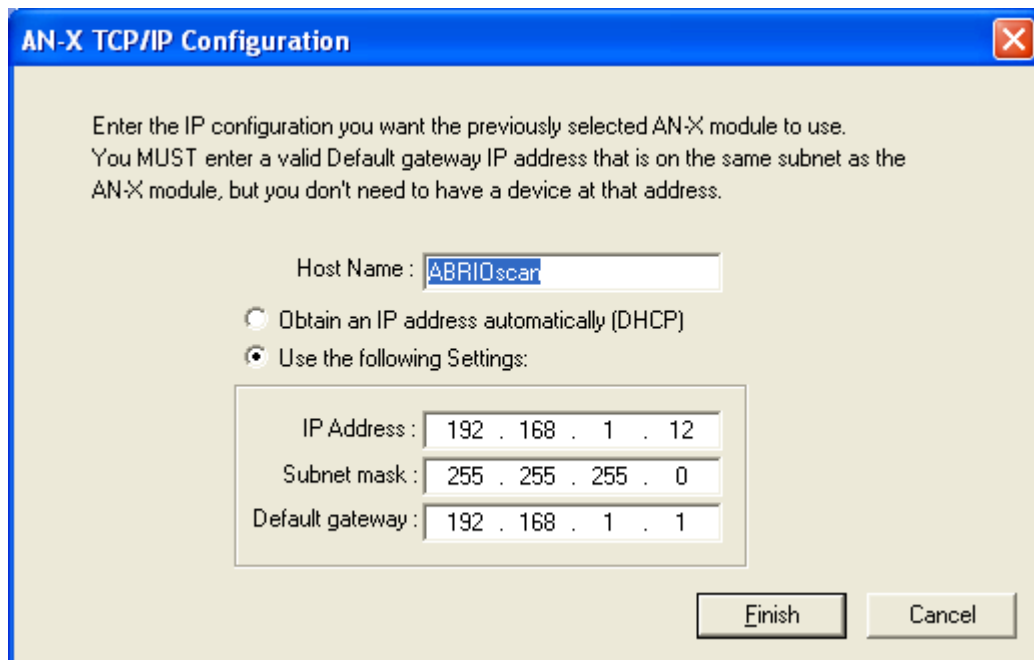
Step 3:

Wait for AN-X to enter boot mode. While AnxInit is waiting, the *Next>>* button is disabled. When AN-X is in boot mode, the *Next>>* button is enabled.



If the AN-X does not enter boot mode within about 10 seconds, return to the previous screens and check the entries.

The AN-X TCP/IP Configuration dialog appears.



Enter a *Host Name* for the AN-X. AN-X uses this name when it creates aliases so give the AN-X a meaningful name that is unique on your

network. This name is also 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 31 characters long. It can contain alphanumeric characters and a hyphen.

To configure the AN-X to obtain its IP address from a DHCP server on the network, select *Obtain an IP address automatically (DHCP)*

To configure the AN-X to use a static IP address, select *Use the following Settings* and enter:

- the desired IP address for the AN-X.
- the Subnet mask for the AN-X
- the default gateway for your network.

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

Click OK to complete the configuration.

If you click *Cancel*, AN-X is left running the boot code. Use the *Utilities/Restart AN-X* command to restart the AN-X in production mode.

Standalone Computer

Since you are connecting directly from the computer to AN-X, use a crossover Ethernet cable.

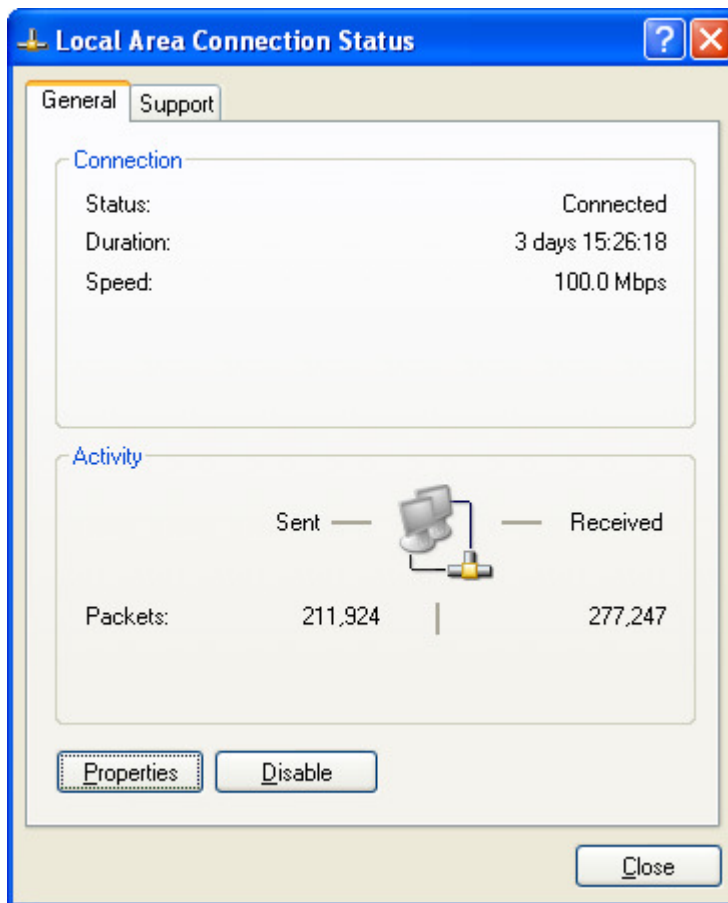
The following instructions assume Windows XP. They also assume that an Ethernet network card has been installed in the computer and that AnxInit has been installed on the computer.

TIP

The parameters in this example will work when you set up any standalone computer to work with AN-X.

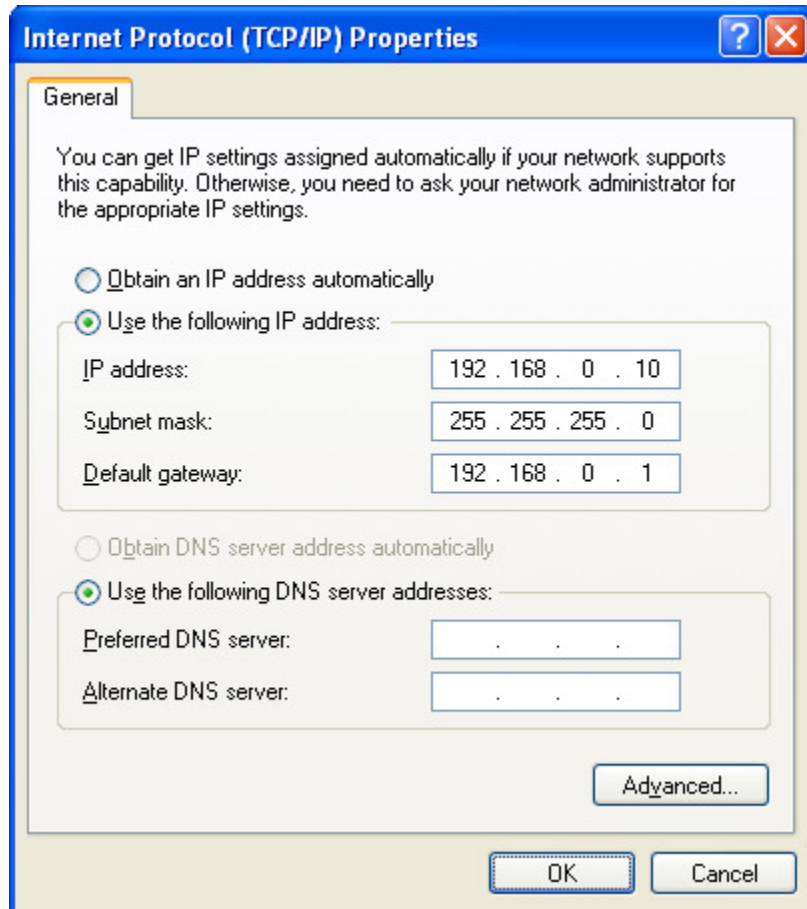
First configure the computer to use a static IP address. From the Control Panel, select *Network Connections*. Double click on *Local Area Connection* (or whatever connection is being used for the AN-X)





Click the *Properties* button.

Double click on *Internet Protocol (TCP/IP)*.



In this example, we assigned the computer an IP address of 192.168.0.10
 We set the Subnet mask to 255.255.255.0 (standard mask for the Class C network address of 192.168.0.x).

We set the Default gateway to 192.168.0.1 (this address does not exist on the Ethernet network but AN-X requires a valid default gateway entry).

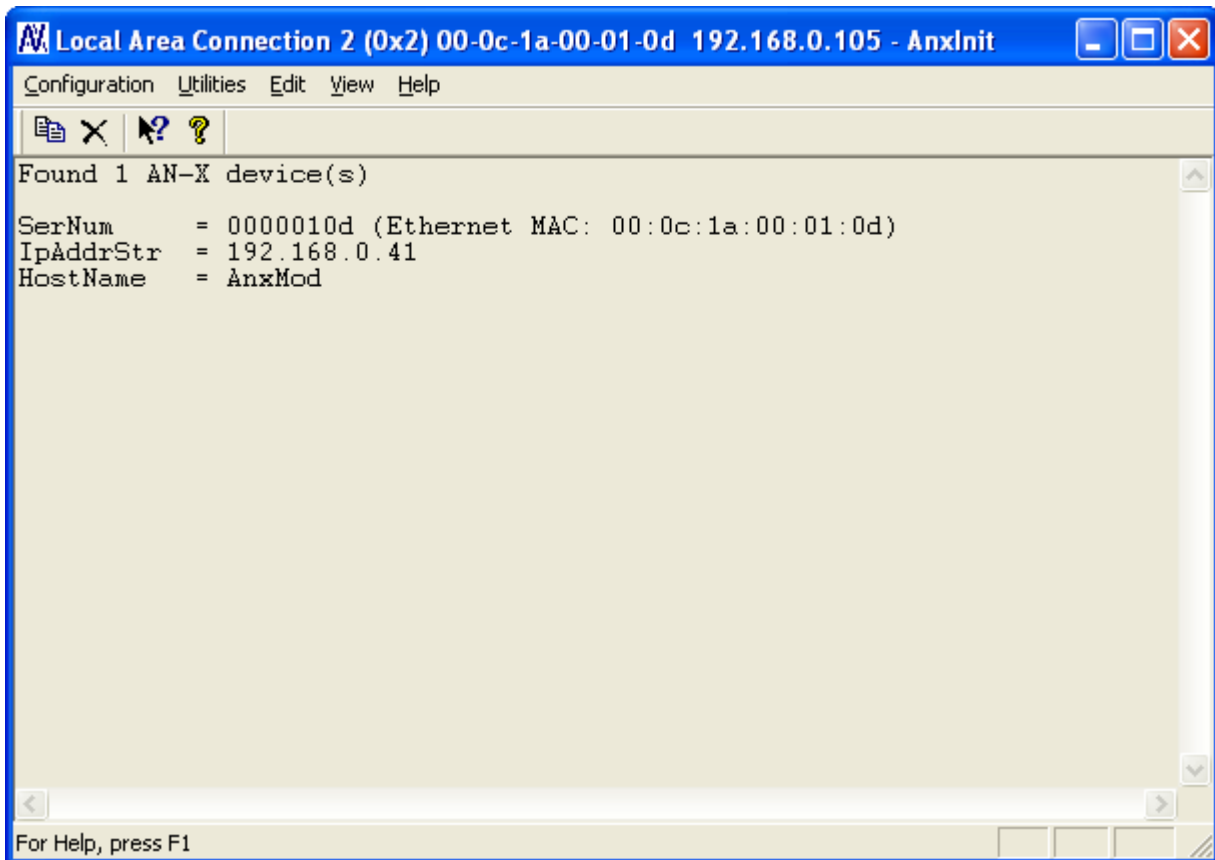
Click OK to accept the settings

Connect the computer to AN-X using the crossover cable.

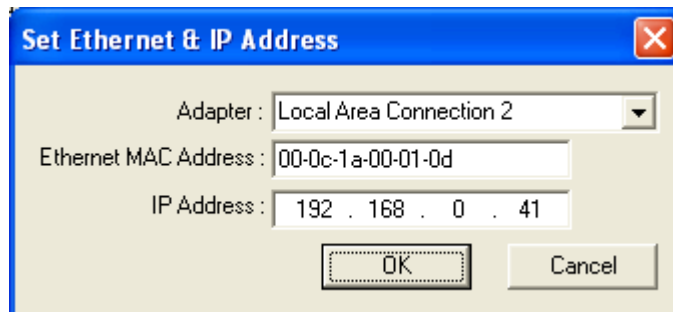
If this is the first time you have used the AN-X module, it will look for a DHCP server on the network. It waits about three minutes, then reverts to a default IP address of 192.168.0.41

Power up the AN-X and wait for the search for a DHCP server to time out. When the search for a DHCP server times out, AN-X repeatedly flashes the SYS LED red three times followed by a pause.

Run AnxInit. Select *Utilities/Locate All AN-X Modules* and confirm that it finds the AN-X.



Select *Utilities/Select An AN-X* and enter the MAC Address and IP address.



Click *OK* to accept the setting.

Select *Utilities/AN-X IP Configuration*.

AN-X TCP/IP Configuration

Enter the IP configuration you want the previously selected AN-X module to use.
You MUST enter a valid Default gateway IP address that is on the same subnet as the AN-X module, but you don't need to have a device at that address.

Host Name : AnxMod

Obtain an IP address automatically (DHCP)

Use the following Settings:

IP Address : 192 . 168 . 0 . 105

Subnet mask : 255 . 255 . 255 . 0

Default gateway : 192 . 168 . 0 . 1

Finish Cancel

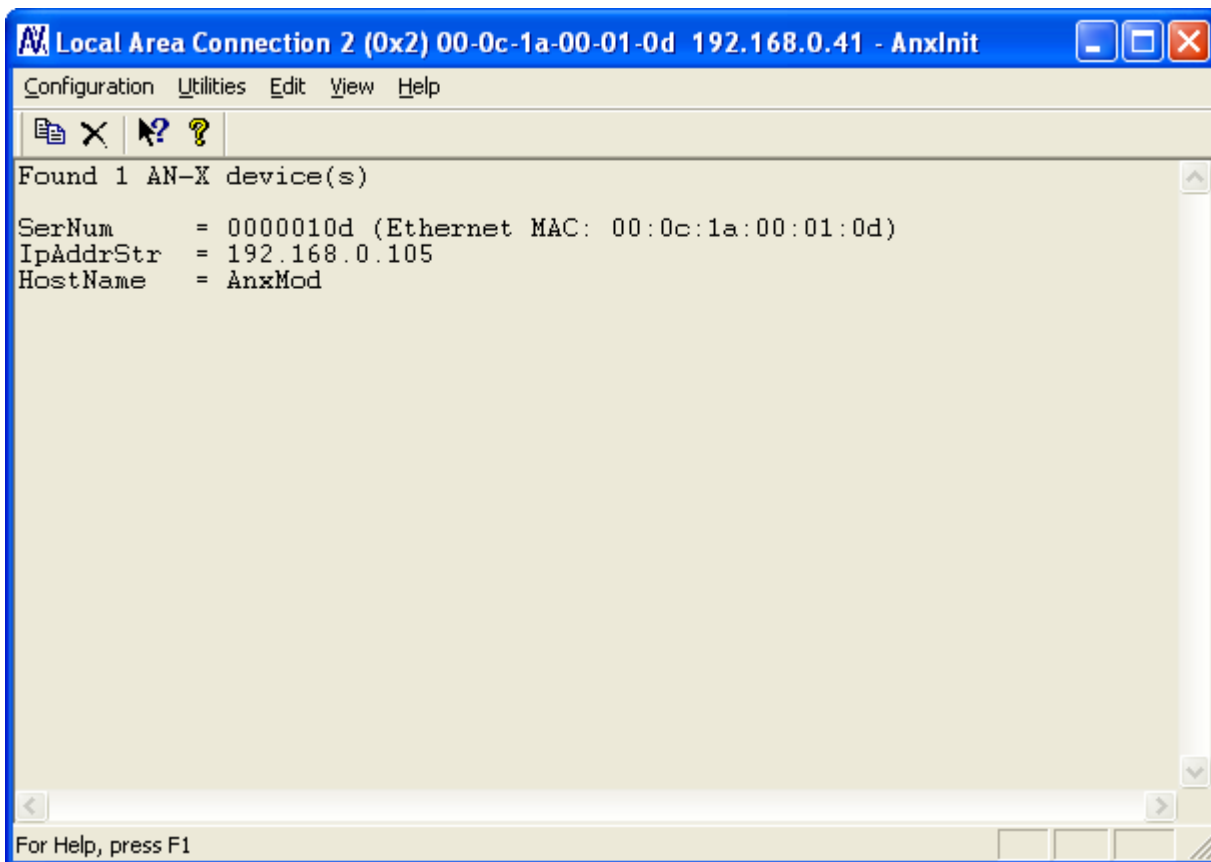
Enter an IP Address. In this case we chose 192.168.0.105

Enter the same Subnet mask and Default gateway that you entered for the computer. The default gateway address does not exist on the network but AN-X requires that the field have a valid entry.

Click *Finish* to accept the settings.

Select *Utilities/Restart AN-X* to restart AN-X with the new parameters.

When the AN-X has restarted (SYS LED is solid green), select *Utilities/Locate All AN-X Modules* and confirm that the AN-X is found with the new parameters.



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. To reconfigure it to a known state, run the command *Configuration/AN-X IP Settings* to start the AN-X IP Configuration Wizard and reconfigure AN-X.

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-X-AB-RIO-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

Configuring a Remote I/O Network

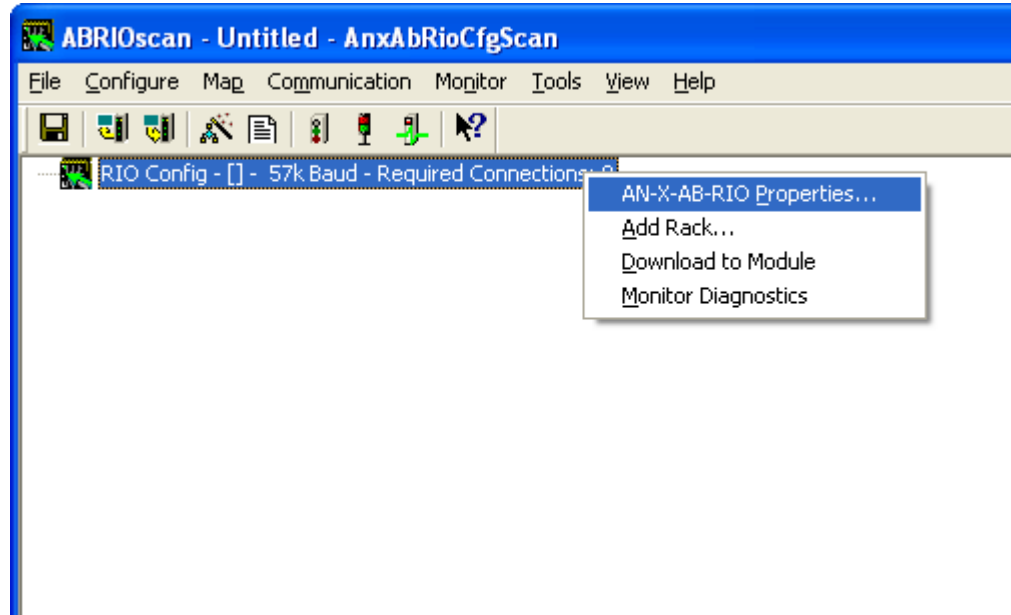
Use the following steps to configure the AN-X-AB-RIO-SCAN:

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-X-AB-RIO.

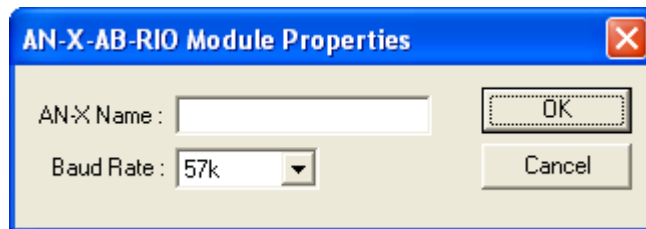
Baud Rate

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-RIO 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-X-AB-RIO automatically detects the baud rate from an attached network.

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

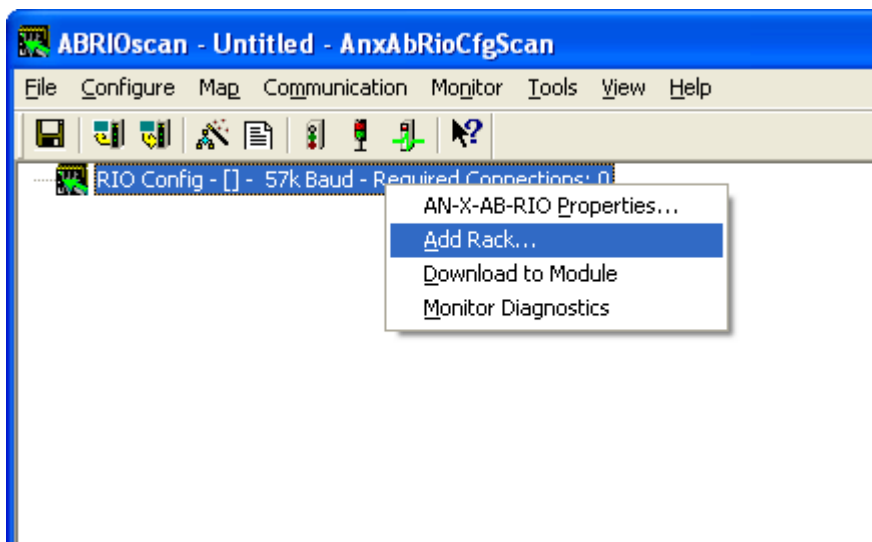
Configuring Racks

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

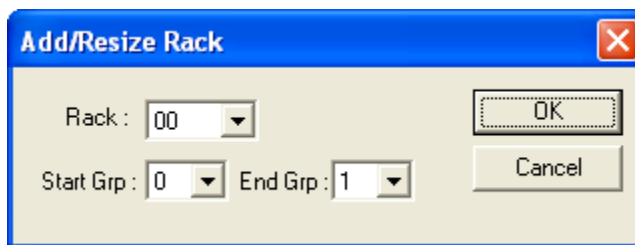


Manually Adding Racks

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

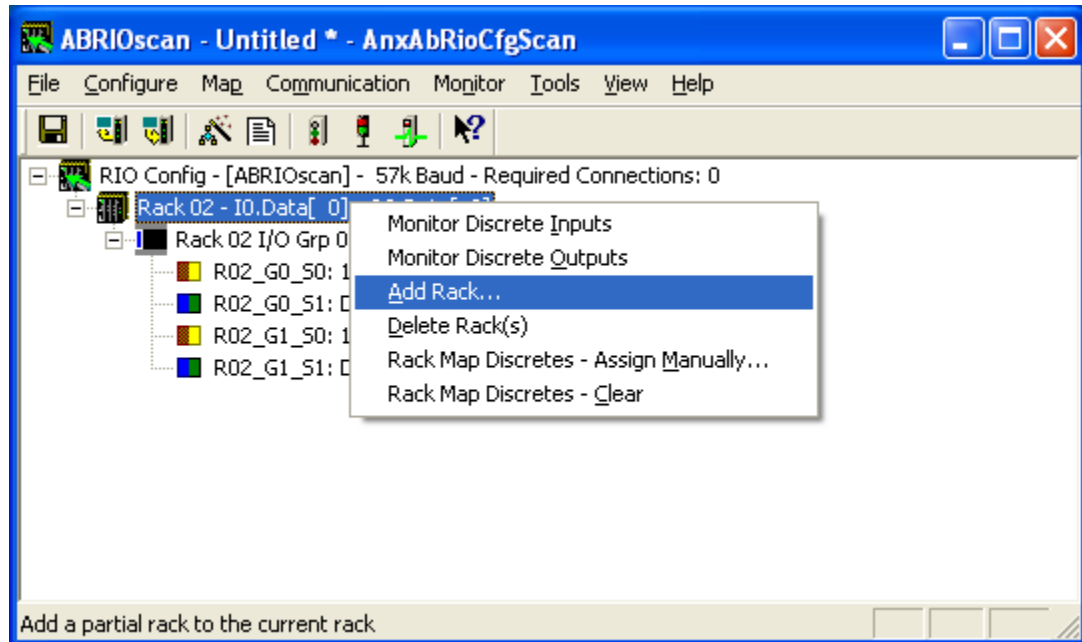


Select *Add Rack* to display the Add/Resize Rack dialog box.

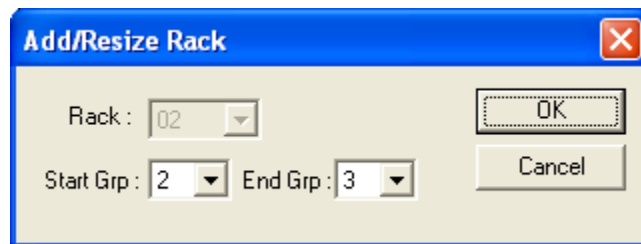


Select the *Rack* number (in octal), the Start I/O Group and the End I/O Group for the rack you are adding and click OK.

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-X-AB-RIO 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-X-AB-RIO must be in program mode when you perform an autoconfiguration.

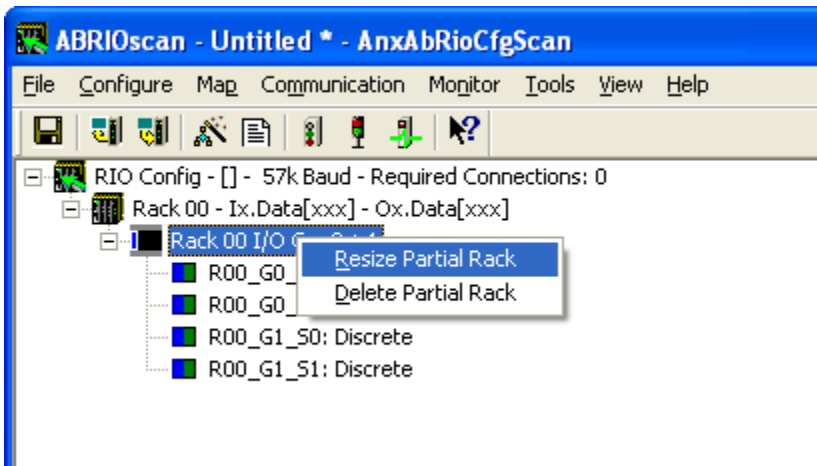
To autoconfigure, select *Configure/Autoconfigure*

The AN-X-AB-RIO 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.

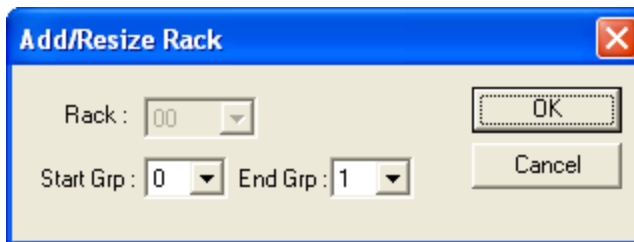
Any configuration previously stored in the AN-X-AB-RIO is overwritten by the data from the autoconfiguration.

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.

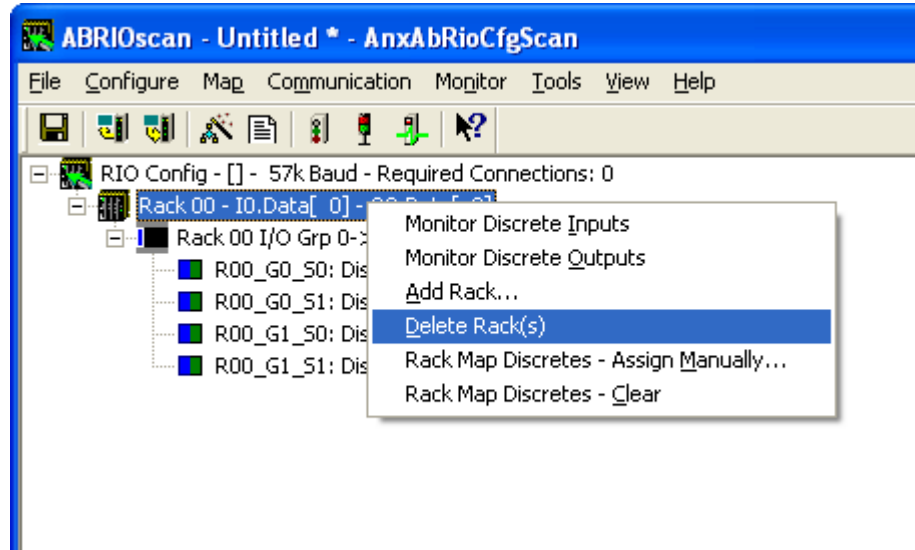
Select the Start I/O Group and the End I/O Group and click OK.

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

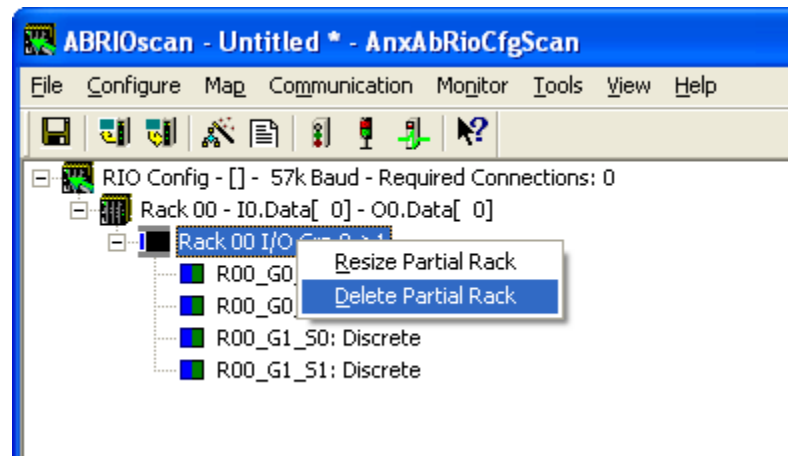
If resizing the rack results in deleting block transfer modules, you will be given the option of cancelling or proceeding with the resize and deleting the block transfer modules.

Deleting Racks

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



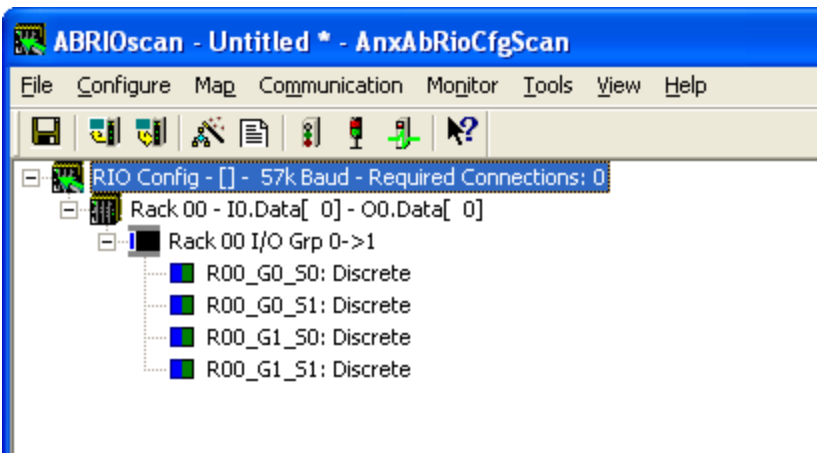
To delete a partial rack, right click on it in the network tree and select Delete Partial Rack.



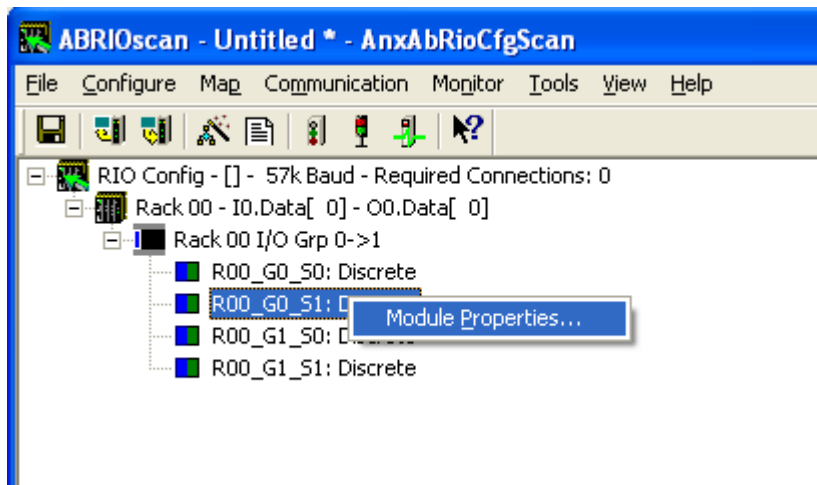
The program asks for confirmation before deleting.

Block Transfer Modules

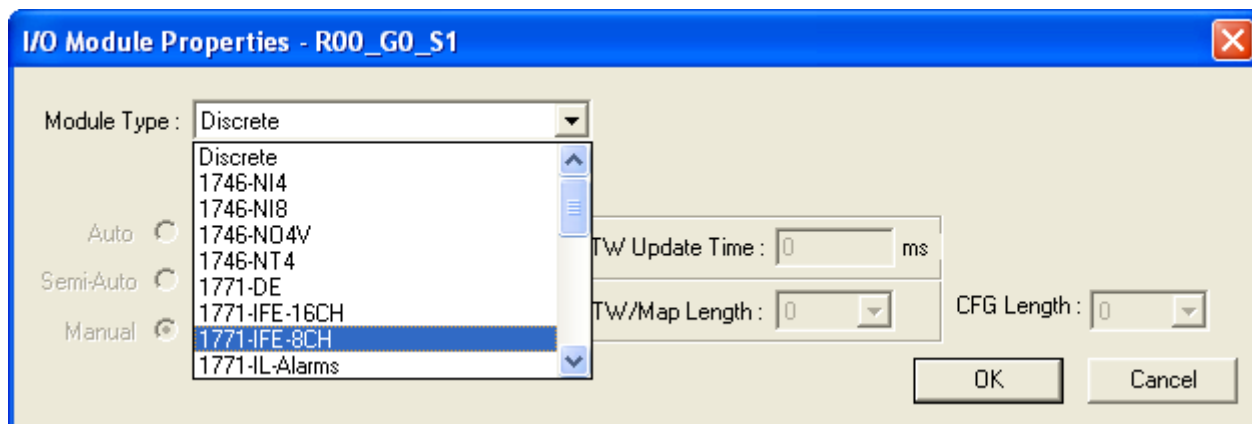
To add a block transfer module, first expand the network tree to show the location where you want to add the module.



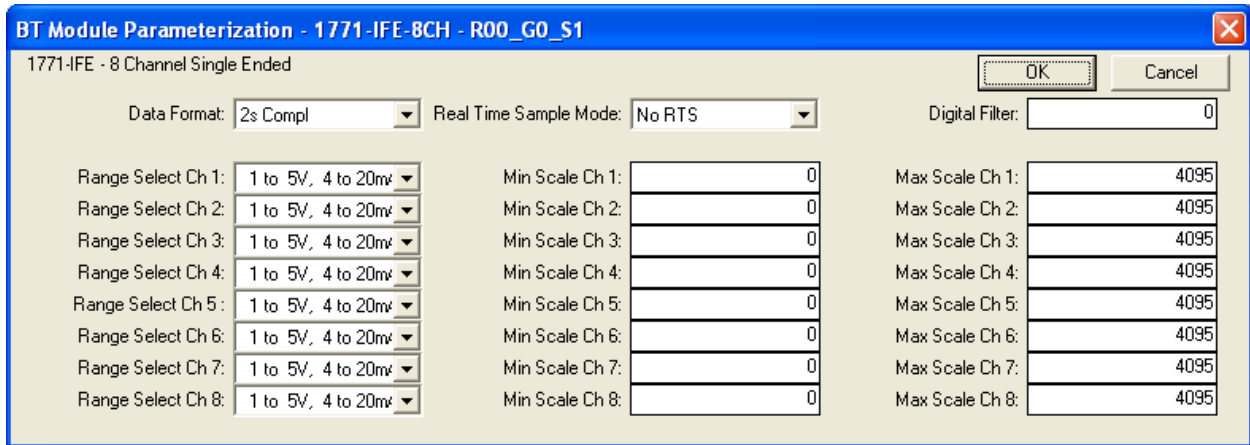
Right click on the location where you want to add the module and select *Module Properties*.



Select the *Module Type* from the list



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-X-AB-RIO controls block transfer update I/O module configuration data comes from AN-X configuration tool
Semi-automatic	AN-X-AB-RIO 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-X-AB-RIO will update 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.

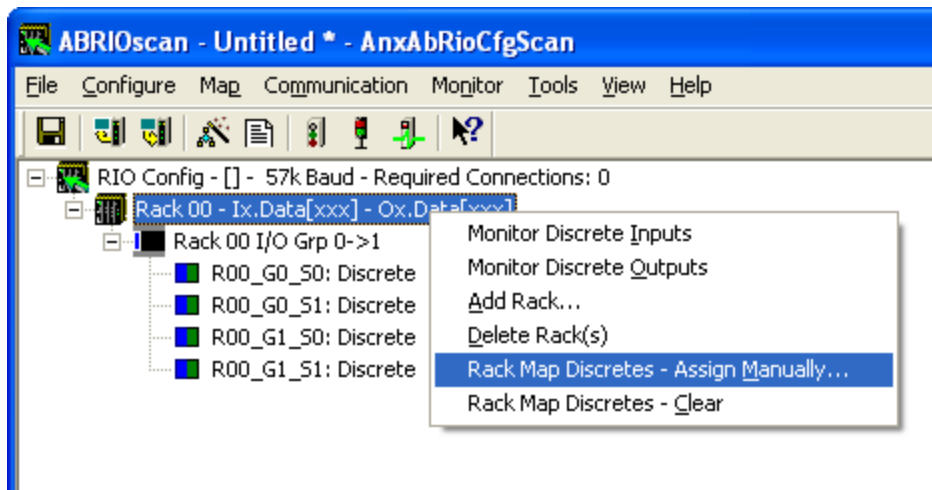
Automatic Mapping

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.

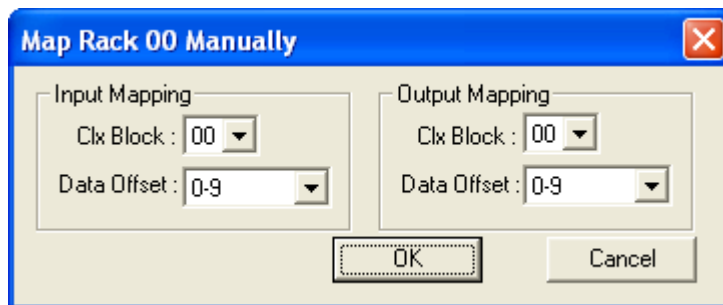
To remap all data, select *Map/Re-Map All*. You are asked for confirmation before the mappings are reassigned.

Manual Mapping

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



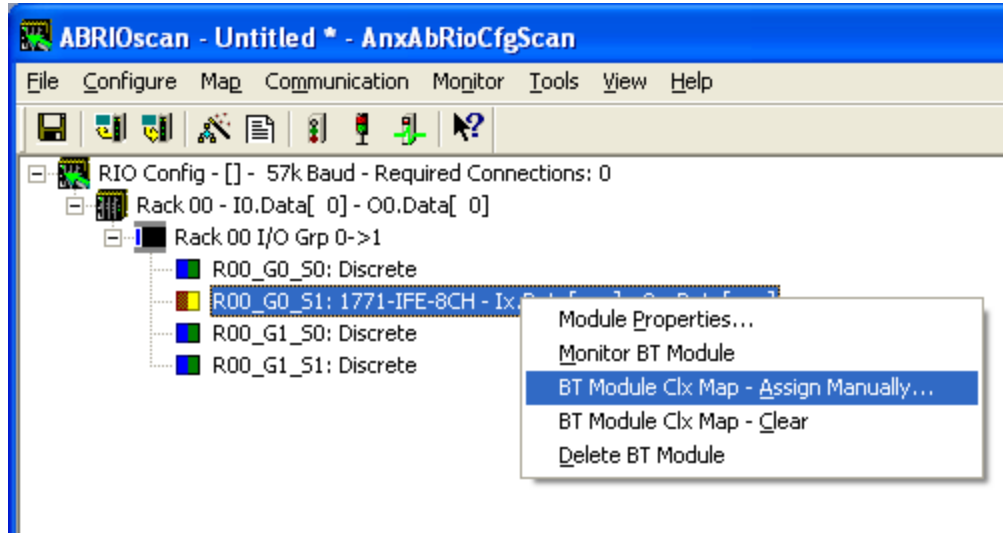
For the inputs and outputs, select the ControlLogix scheduled block and the offset within the block.



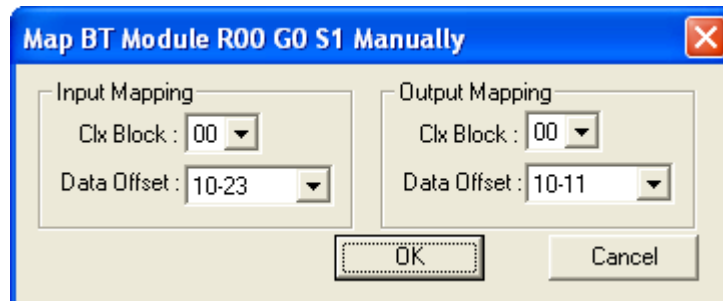
Click OK to accept the mapping.

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.

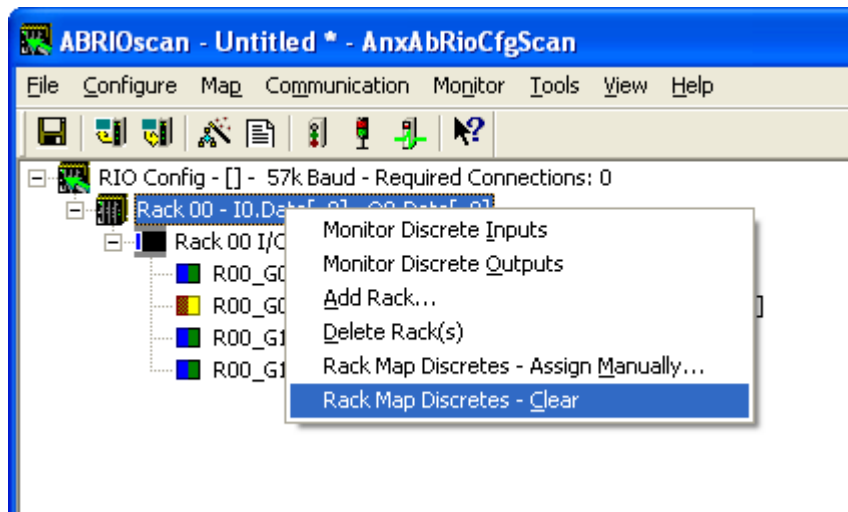
The configuration tool checks for overlaps with previously mapped data and gives an error if it finds an overlap.

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

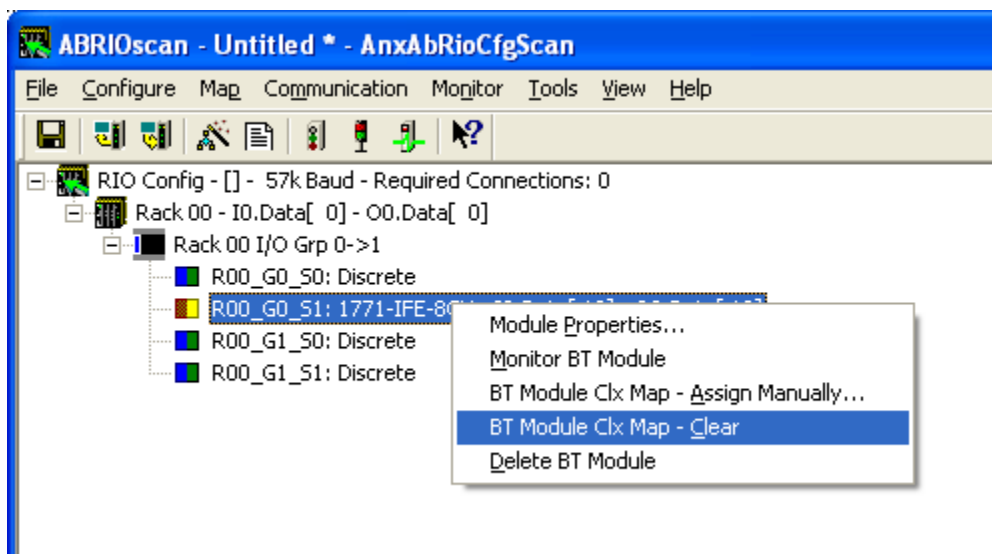
To clear all assigned mappings, select *Map/Clear All Mappings*.

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 ¼ rack), words 3 and 4 contain the data for I/O groups 2 and 3 (second ¼ rack), and so on.

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



Offset	Bit	Description
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 ¼ rack), words 3 and 4 contain the data for I/O groups 2 and 3 (second ¼ 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
	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



Offset	Bit	Description
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-X-AB-RIO and its RPI, the controller may see this value increment by more than 1 count per program scan.

The AN-X-AB-RIO 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-X-AB-RIO 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-X-AB-RIO and its RPI, the controller may see this value increment by more than 1 count per program scan.

The AN-X-AB-RIO 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-X-AB-RIO 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)



Offset	Bit	Description
	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:

- ❑ 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-X-AB-RIO re-enables block transfer reads when they have executed successfully
- ❑ 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-X-AB-RIO 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
2	Block Transfer state mismatch
3-6	Reserved, not currently used



Error Code	Description
7	Block transfer disabled

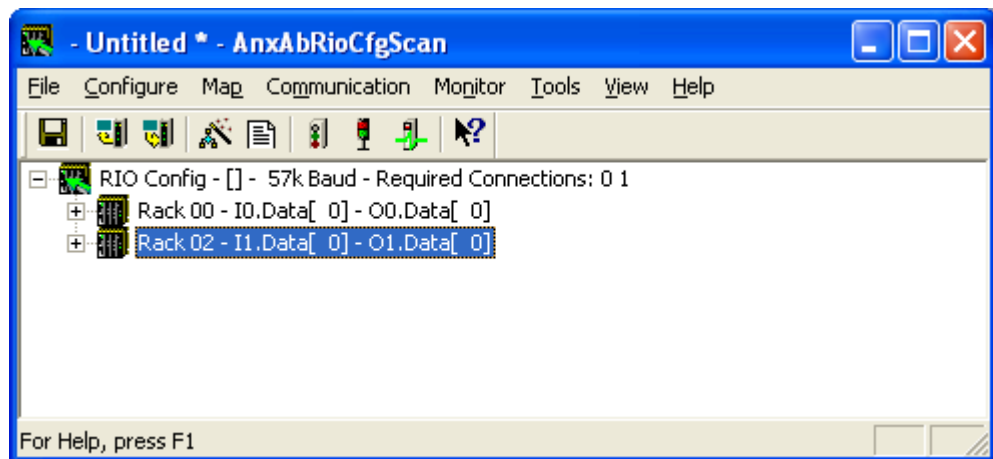
Required Connections

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 39.

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-X-AB-RIO to scan I/O.



Uploading and Downloading Configurations

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

To upload a configuration from the AN-X-AB-RIO, select *Communication/Upload Configuration* or use the *Upload Configuration from Module* button on the toolbar

Saving Configurations

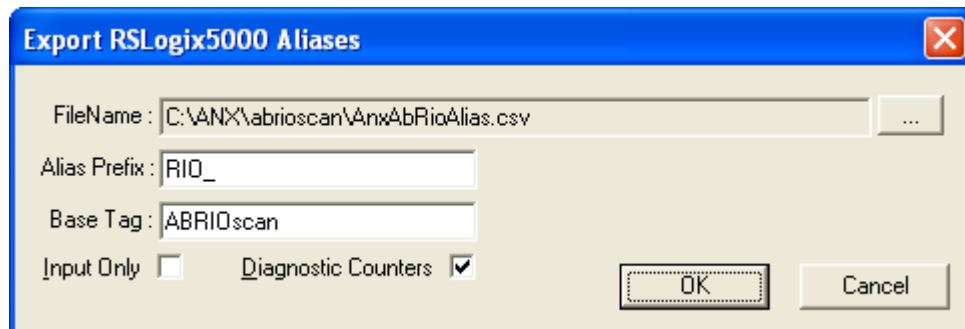
To save a configuration to disk, select *File/Save* or *File/Save As*.

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-X-AB-RIO modules. If you have more than one AN-X-AB-RIO 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

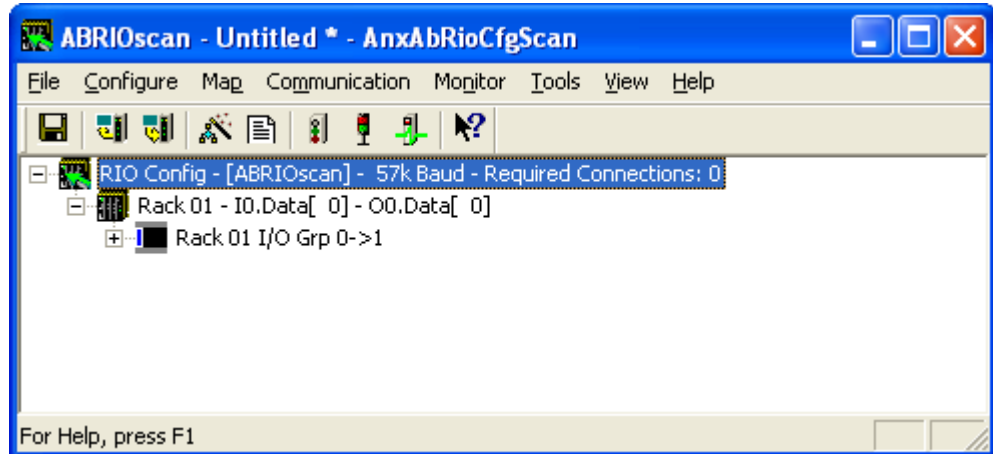
Check the Input Only box if you want aliases only for input data.

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

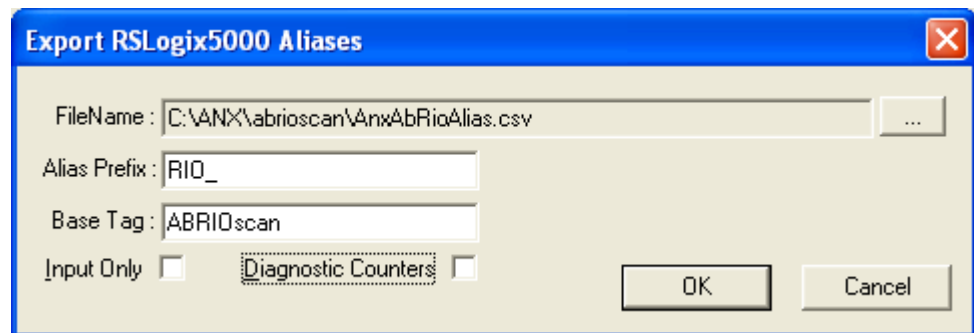
Click OK to create the alias file.

Alias Example

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



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.

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.



Configuring the AN-X Module in RSLogix 5000

The AN-X-AB-RIO emulates a 17-slot 1756 chassis with an ENBT/A in slot 16 and 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 54).

To configure the AN-X-ABRIO-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 *Comm Format* 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.

2. Add Generic modules for each required connection. The configuration tool shows which connections are required (see page

28). Right click on the backplane and select New Module. From the Other category, select 1756-MODULE.

The 'New Module' dialog box is shown with the following configuration:

- Type: 1756-MODULE Generic 1756 Module
- Parent: ABRIOscan
- Name: AnxSlot0
- Description: (empty)
- 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:		

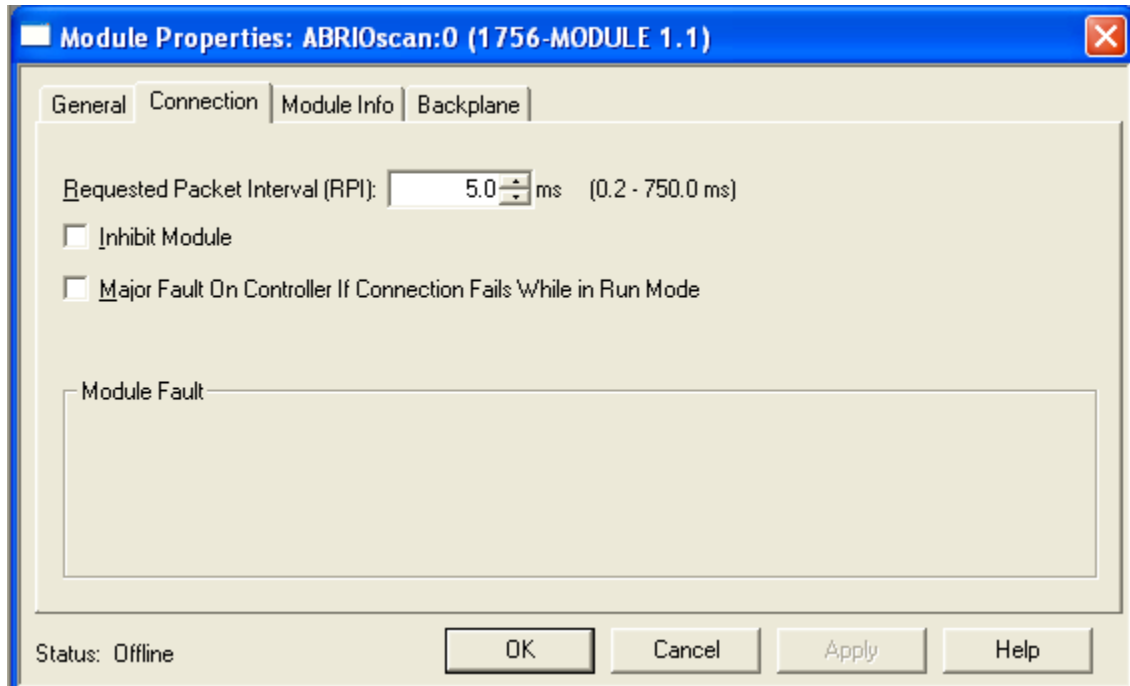
At the bottom of the dialog, there is a checked checkbox for 'Open Module Properties' and three buttons: 'OK', 'Cancel', and 'Help'.

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.



AN-X supports RPIs from 5 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 52) to obtain the remote I/O network scan time.

IMPORTANT!

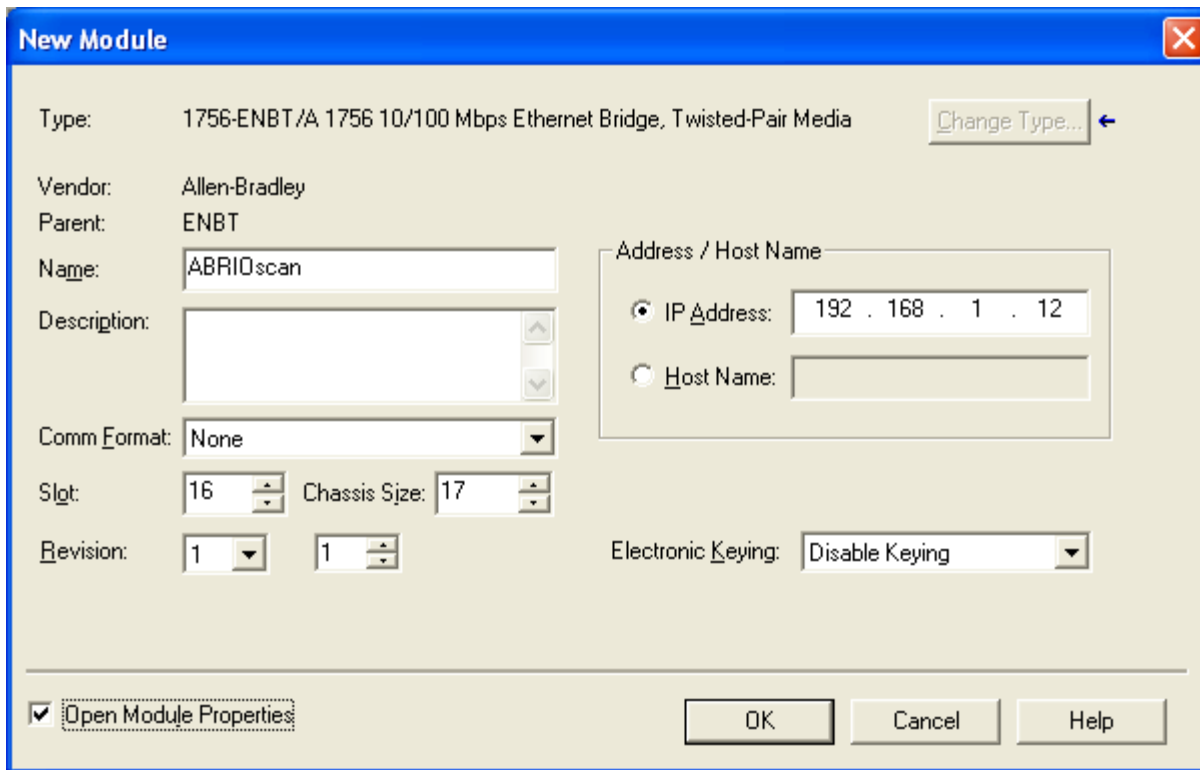
Ensure that any check box that refers to Unicast connections is unchecked.

Input Only Connections

The AN-X-ABRIO-SCAN supports one input only connection 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-X-ABRIO-SCAN.

To configure the input only connection to the AN-X-ABRIO-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

New Module

Type: 1756-MODULE Generic 1756 Module
 Parent: ABRIOscan

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

Connection Parameters	
Assembly Instance	Size
Input: 1	250 (16-bit)
Output: 3	0 (8-bit)
Configuration: 4	
Status Input:	
Status Output:	

Open Module Properties

OK Cancel Help

Set the parameters as shown.

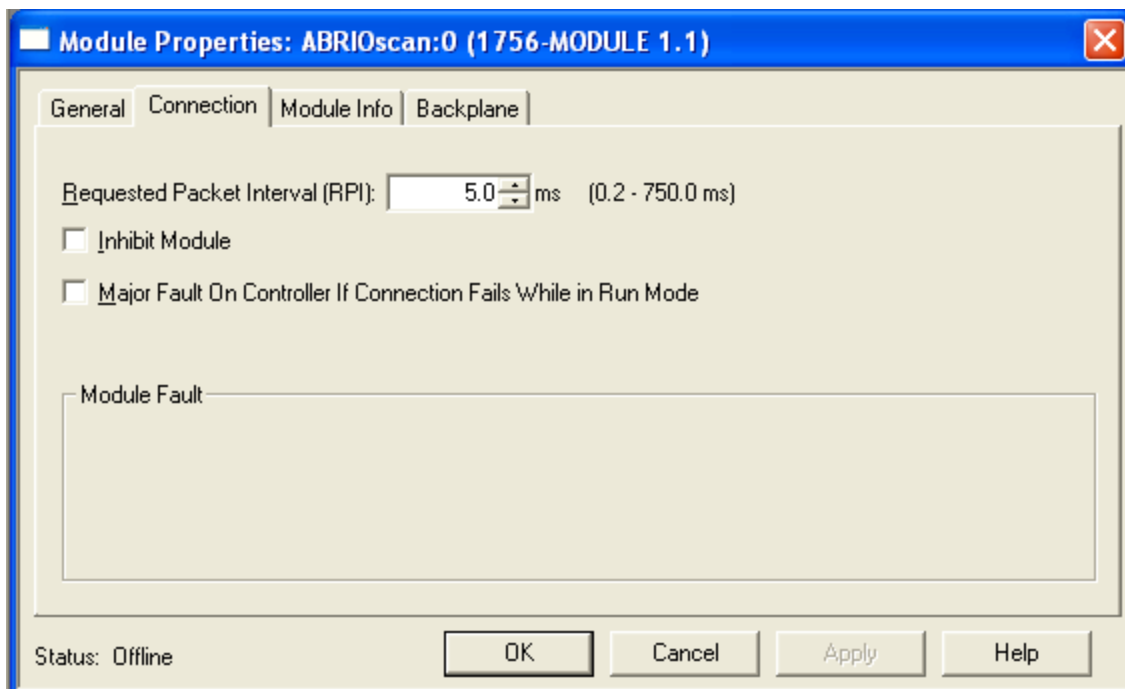
Set the Comm Format to Input Data – INT.

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.

IMPORTANT!

Ensure that any check box that refers to Unicast connections is unchecked.



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!

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 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.



Scanning Remote I/O

Required Connections

The AN-X-AB-RIO 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 the AN-X-AB-RIO.

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

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

In test mode, the AN-X-AB-RIO 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.

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

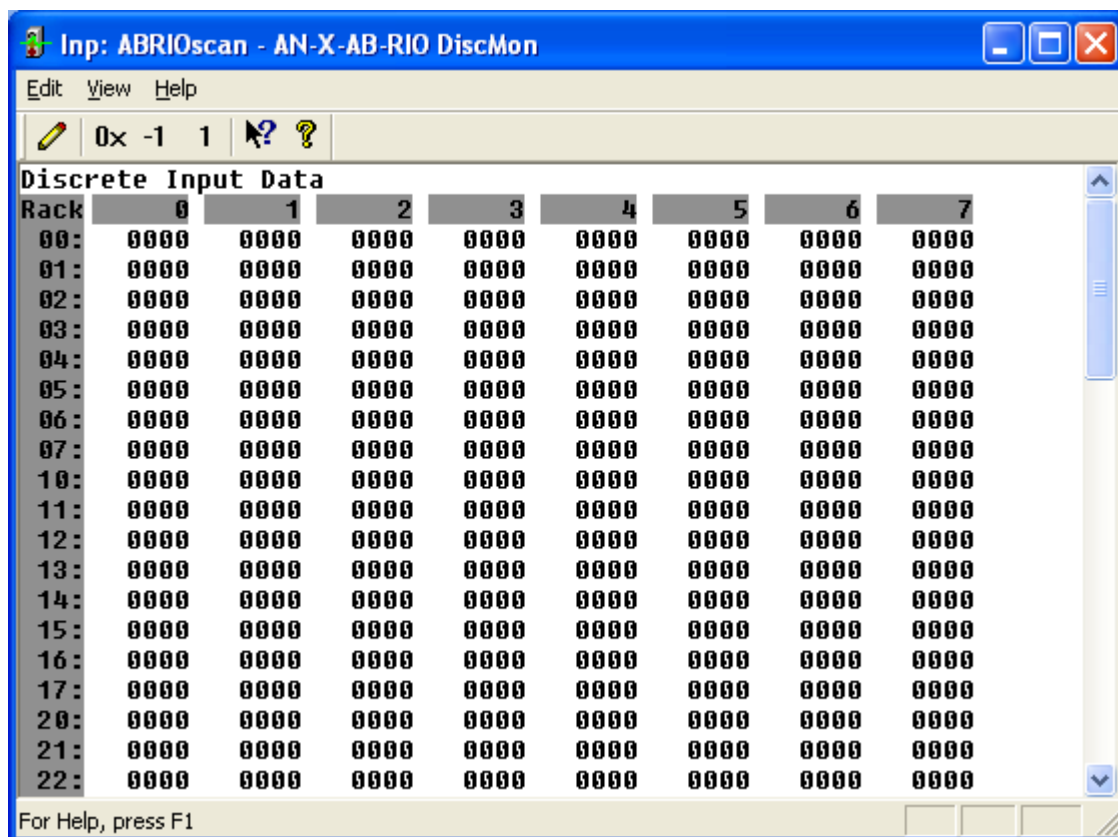
Discrete Inputs and Outputs

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.



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

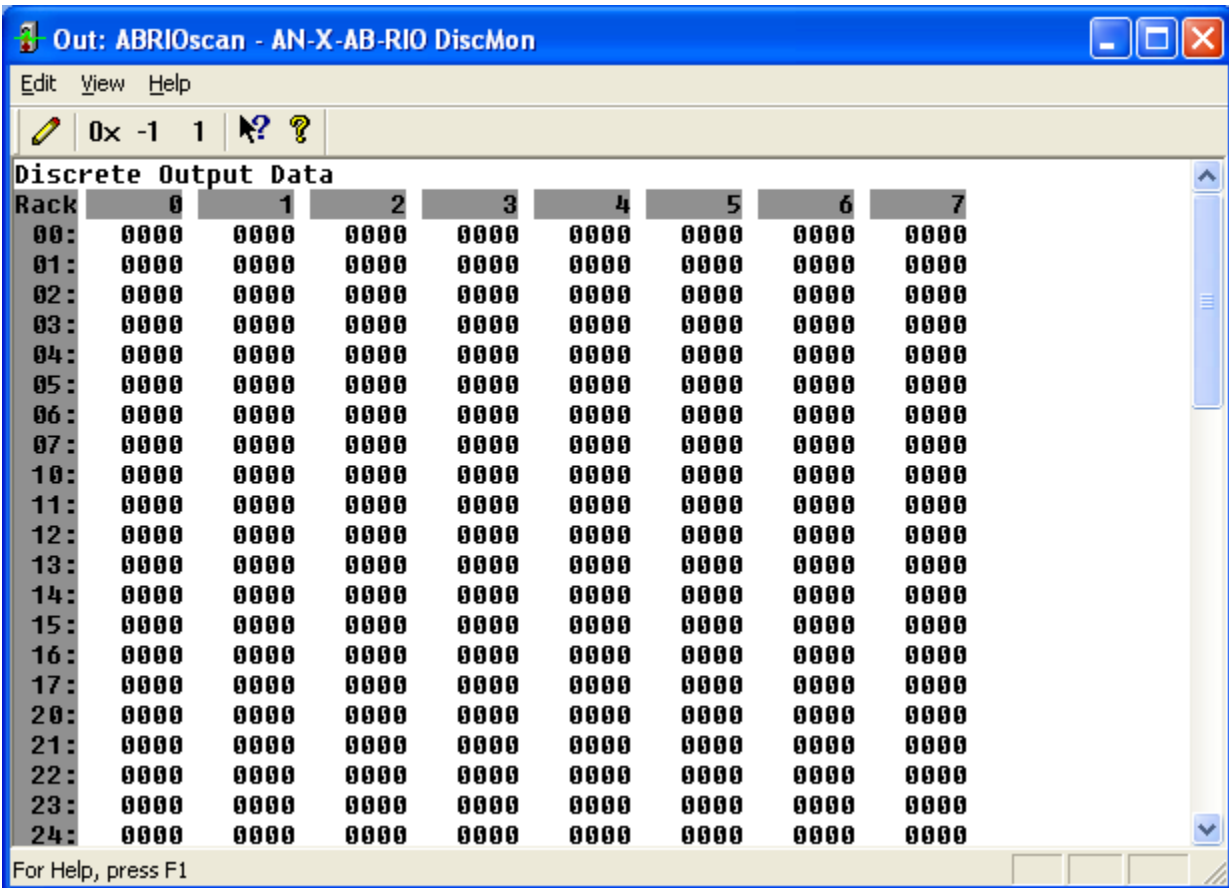
Data can be displayed in several formats:

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.



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

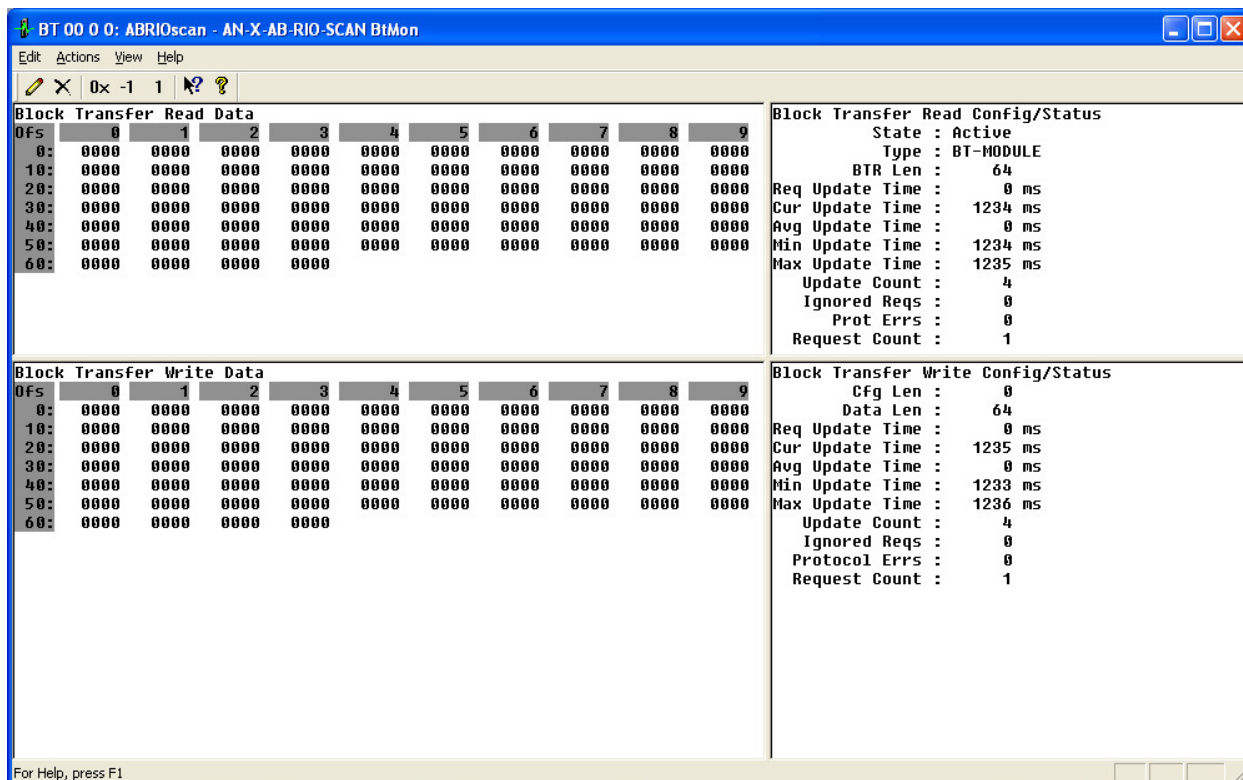
Data can be displayed in several formats:

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.



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.
Min Update Time	Minimum update time for this block transfer read,



Counter	Description
	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 transfer write

Rack Status and Diagnostic Counters

The AN-X-AB-RIO 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 contains three main sections of diagnostic data:

- Active Racks:** A binary representation of active racks across 7 racks (0-6) and 7 I/O groups (0-6). The data is shown as a grid of 1s and 0s.
- Global Diag Counters:** A list of system-wide statistics including 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), and UpdMax (620).
- Rack Diag Counters:** A table showing per-rack statistics for racks 0 through 13. The table has columns for Qtr, Rx, Crc, Tout, and Prtcl, repeated for each rack.

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.



Global Diagnostic Counters

The global diagnostic counters consist of:

Counter	Description
TxCount	This counter increments each time the AN-X-AB-RIO transmits a packet.
RxGood	This counter increments when the AN-X-AB-RIO receives a good packet.
RxTout	This counter increments when the AN-X-AB-RIO sends a packet but does not receive a reply.
RxBadCRC	This counter increments when the AN-X-AB-RIO receives a packet with a bad CRC. Check cabling and termination on the RIO network.
RxNoise	This counter increments when the AN-X-AB-RIO hears a carrier without receiving a packet. Check cabling and termination on the RIO network.
RxAbort	This counter increments when the AN-X-AB-RIO receives an opening flag, then the packet ends without a closing flag.
PrtclErr	This counter increments when the AN-X-AB-RIO 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-X-AB-RIO receives



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

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.

You cannot map individual diagnostic counters.

The diagnostic counters consist of:

Offset	Description
0-17	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 scan time, ms
30	Minimum scan time, ms
31	Maximum scan time, ms
40-49	Slot 0 connection statistics
40	CLX->AN-X Average Update time * 100 us

Offset	Description
41	CLX->AN-X Minimum Update time * 100 us
42	CLX->AN-X Maximum Update time * 100 us
43	CLX->AN-X Running average Update time * 100 us
45	AN-X->CLX Average Update time * 100 us
46	AN-X->CLX Minimum Update time * 100 us
47	AN-X->CLX Maximum Update time * 100 us
48	AN-X->CLX Running Average Update time * 100 us
50-59	Slot 1 Connection statistics
60-69	Slot 2 Connection statistics
70-79	Slot 3 Connection statistics
80-89	Slot 4 Connection statistics
90-99	Slot 5 Connection statistics
100-109	Slot 6 Connection statistics
110-119	Slot 7 Connection statistics
120-129	Slot 8 Connection statistics
130-139	Slot 9 Connection statistics
140-149	Slot 10 Connection statistics
150-159	Slot 11 Connection statistics
160-169	Slot 12 Connection statistics
170-179	Slot 13 Connection statistics
180-189	Slot 14 Connection statistics
190-199	Slot 15 Connection statistics

Module Logs

The scanner logs contain messages from the firmware running on the AN-X-AB-RIO, 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 73 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-X-AB-RIO 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-X-AB-RIO 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

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.



Using AnxInit

AnxInit is a 32-bit Windows application supplied with AN-X to perform the following functions:

- Locate and identify AN-X modules on the Ethernet network
- Select a specific AN-X for configuration
- Set the IP address and other Ethernet parameters for an AN-X
- Restart an AN-X in production mode
- Display information about the selected AN-X
- Read the kernel parameters for the selected AN-X
- Update the flash (low level firmware) on the selected AN-X
- Update the firmware on the selected AN-X
- Patch the firmware on the selected AN-X

In addition, it can be used to:

- clear the AnxInit log
- copy the contents of the log to the clipboard for use by another application. This is often useful for technical support

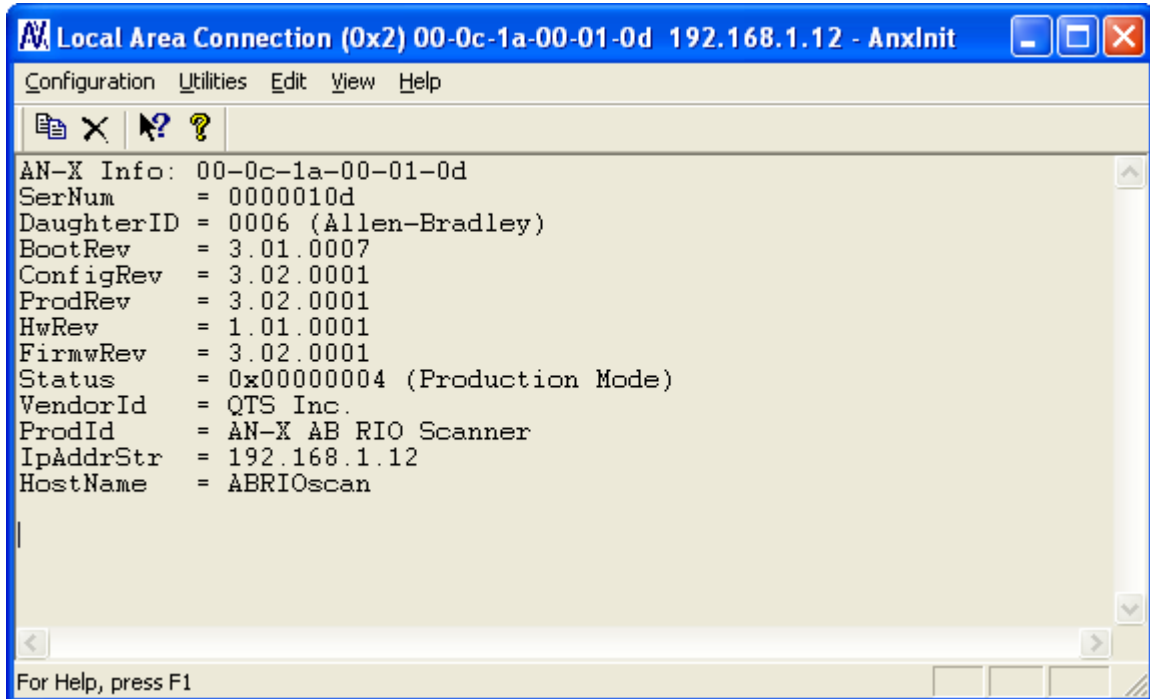
AnxInit Log

AnxInit logs messages in its main window. These messages are often useful for determining the cause of errors or for technical support.

To clear the log, select *Edit/ClearLog*.

To copy the contents of the Log to the Windows clipboard so that they can be pasted into another application, select *Edit/Copy*.





The screenshot shows a window titled "Local Area Connection (0x2) 00-0c-1a-00-01-0d 192.168.1.12 - AnxInit". The window contains a menu bar with "Configuration", "Utilities", "Edit", "View", and "Help". Below the menu bar is a toolbar with icons for file operations and help. The main content area displays the following information:

```
AN-X Info: 00-0c-1a-00-01-0d
SerNum    = 0000010d
DaughterID = 0006 (Allen-Bradley)
BootRev   = 3.01.0007
ConfigRev  = 3.02.0001
ProdRev   = 3.02.0001
HwRev     = 1.01.0001
FirmwRev  = 3.02.0001
Status    = 0x00000004 (Production Mode)
VendorId  = QTS Inc.
ProdId    = AN-X AB RIO Scanner
IpAddrStr = 192.168.1.12
HostName  = ABRIOscan
```

At the bottom of the window, it says "For Help, press F1".

AN-X Log

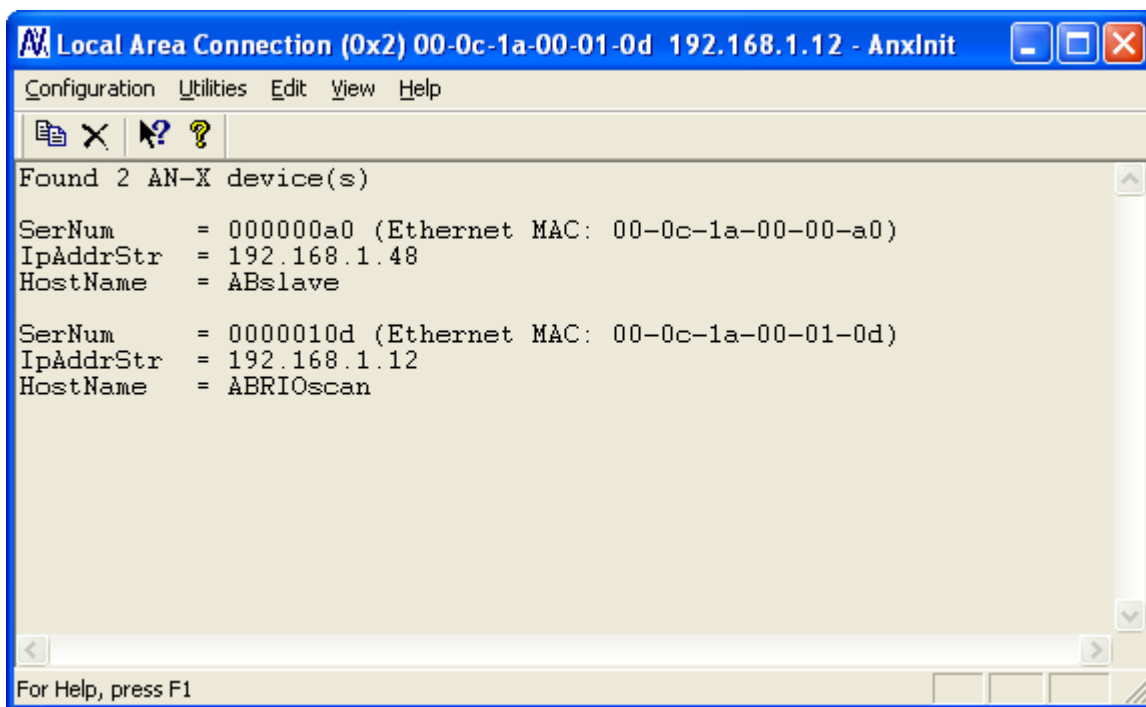
Locating Available AN-X Modules

To locate all accessible AN-X modules on the Ethernet network, select *Utilities/Locate All AN-X Modules*.

AnxInit displays a list of the AN-X modules it finds, showing their MAC IDs, IP addresses and host names.

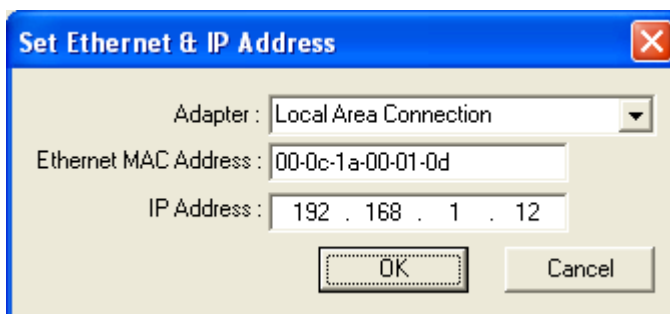
This command is useful for determining IP addresses when they have been set by a DHCP server or for confirming that an AN-X is accessible.





Selecting an AN-X

Before you can perform an operation on an AN-X, you must select which AN-X you want the operation performed on. Choose *Utilities/Select An AN-X* to select a specific AN-X.



From the Adapter list, select the network adapter that connects to the Ethernet network that contains the AN-X.

In the *Ethernet MAC Address* field, enter the MAC Address of the AN-X you wish to select. It can be found on the AN-X label or by using the *Locate All AN-X Modules* command. The format is as shown above, six pairs of hexadecimal digits separated by hyphens.

In the *IP Address* field, enter the Ethernet IP address of the AN-X. It can be found using the *Locate All AN-X Modules* command. The format is as shown above, four decimal numbers, each in the range 0 to 255.

Both MAC address and IP address must match the settings on the AN-X in order for communication to occur.

Click OK to select the AN-X.

The title bar of AnxInit shows the MAC Address and IP Address of the currently selected AN-X.

Set AN-X IP Configuration

The AN-X must be on the local Ethernet to set its IP address.

First select the AN-X using the *Utilities/Select An AN-X* command.

Next select *Utilities/AN-X IP Configuration*. The *AN-X TCP/IP Configuration* dialog appears.

Enter a *Host Name* for the AN-X. AN-X uses the host name to create ControlLogix tags, so give the AN-X a meaningful host name. 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 31 characters long.

To configure the AN-X to obtain its IP address from a DHCP server on the network, select *Obtain an IP address automatically (DHCP)*

To configure the AN-X to use a static IP address, select *Use the following Settings* and enter the following:

- the desired IP address for the AN-X.
- the Subnet mask for the AN-X
- the default gateway for your network.

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

Click OK to complete the configuration.

Use the *Utilities/Restart AN-X* to restart the AN-X in production mode.

If you Cancel the *Utilities/AN-X IP Configuration* command, AN-X is left running in boot mode. Use the *Utilities/Restart AN-X* command to restart the AN-X.

Restart an AN-X

Use the *Utilities/Restart AN-X* command to restart the currently selected AN-X in production mode.

AN-X Info

The *Utilities/AN-X Info* command provides information about the currently selected AN-X in the log window.

The information shown:

AN-X Info	Ethernet MAC address
SerNum	Serial number
DaughterID	Daughterboard ID, 2 for AN-X-ABRIO-SCAN
BootRev	Boot code version
ConfigRev	Configuration kernel version
ProdRev	Production kernel version
HwRev	Hardware version
FirmwRev	Firmware release version (depends on current operating mode)
Status	see below
VendorId	Vendor ID
ProdId	Product ID
IpAddrStr	AN-X IP address
HostName	AN-X host name

In boot mode, FirmwRev, Vendor ID and Product ID are not valid, and IpAddrStr and HostName are not shown.



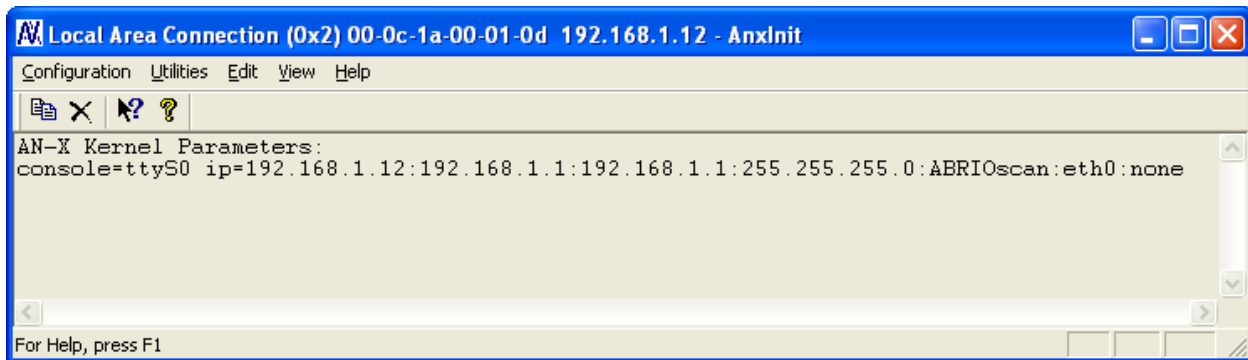
Possible status values are:

Value	Meaning
1	Boot mode
2	Configuration mode
4	Production mode

Read Kernel Parameters

The *Utilities/Read Kernel Parameters* command displays various communications parameters for the currently selected AN-X

This command resets the AN-X. You will be warned and given the opportunity to cancel the command.



The *Utilities/Read Kernel Parameters* command leaves the AN-X running the boot code. Use the *Utilities/Restart AN-X* command to restart the AN-X in production mode.

Run Config Mode

The *Utilities/Run Config Mode* command is used to restart the currently selected AN-X in configuration mode (normally used internally for updating firmware).

This command is not used in normal operation but may be required for technical support.

The AN-X is in configuration mode when the SYS LED flashes red twice, followed by a pause.

To exit configuration mode, use the *Utilities/Restart AN-X* command to restart AN-X in production mode.

Update AN-X Flash

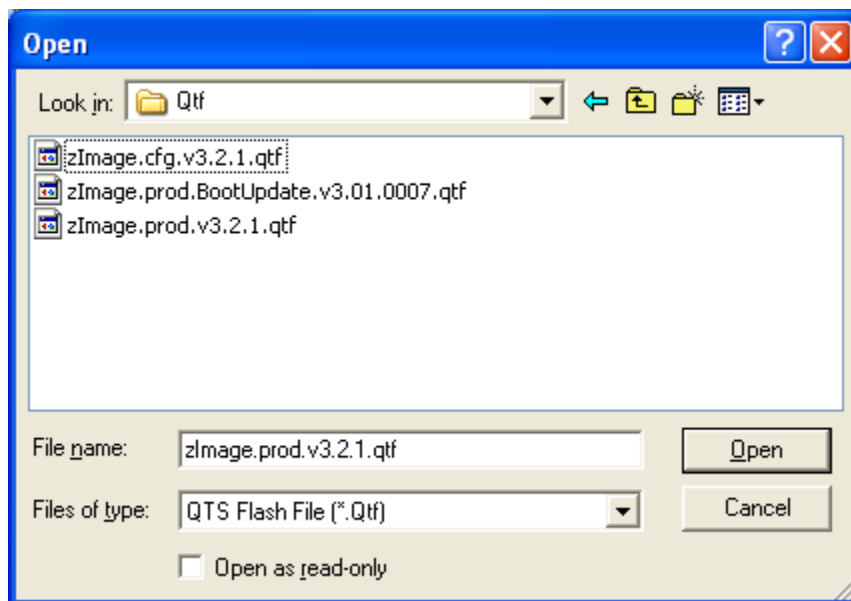
The *Utilities/Update AN-X Flash* command updates the low-level firmware (configuration and production kernels).



Files have extension qtf.

This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

If you cancel at the filename dialog, the AN-X has already been reset and is in boot mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.



Update Firmware

There are two ways to update all the firmware in an AN-X module.

1. The *Configuration/Firmware Update* command starts the firmware update wizard, which takes you step by step through the firmware update process.
2. The *Utilities/Update Firmware* command updates all the firmware on an AN-X you have selected using the *Utilities/Select An AN-X* command.

Firmware files have extension *bin*.

Firmware Update Wizard

Select the *Configuration/Firmware Update* command to start the firmware update wizard.

Step 1:

In step 1, you identify the AN-X you are configuring.

Step 1: AN-X Selection

Select this computer's Ethernet adapter that's on the same Ethernet subnet as the AN-X module you want to configure (you may only have one Ethernet adapter in your computer)

Local Area Connection

Enter the Ethernet MAC Address of the AN-X module you want to configure. You can get this from the label on the AN-X module or by selecting Utilities/Locate All AN-X Modules (if the module's current IP address is on the same subnet).

00-0c-1a-00-01-0d

Enter the IP address on the local subnet that you intend the AN-X module to use.

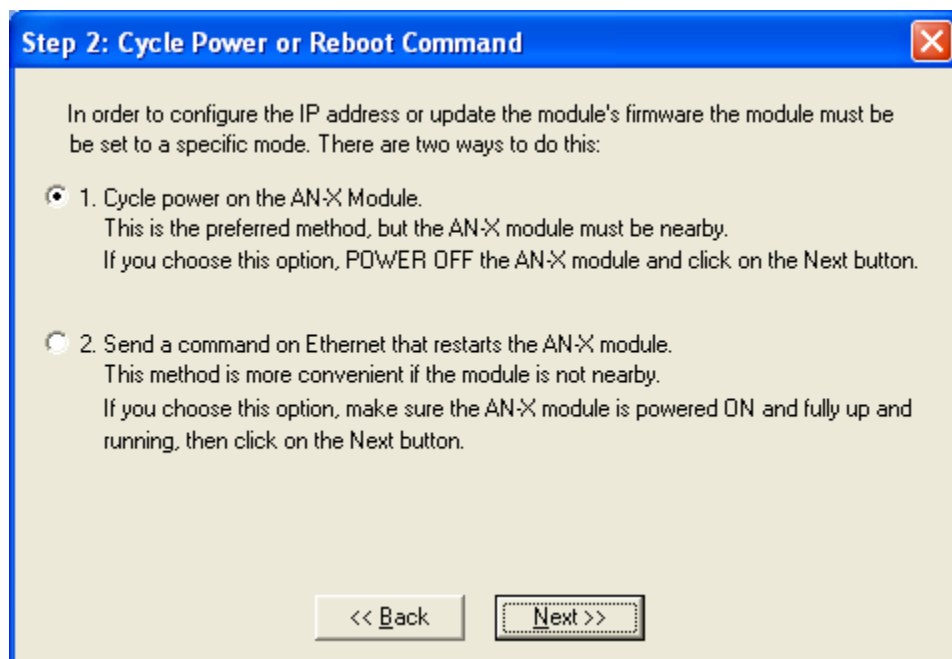
192 . 168 . 1 . 12

Next >> Exit

1. Select the Ethernet adapter that's connected to the AN-X. In most cases there will be just one Ethernet adapter in the computer. The AN-X must be on the same subnet as the computer.
2. Enter the MAC address of the AN-X you are updating. This is printed on the AN-X label. It consists of six pairs of hexadecimal digits, separated by hyphens. In the example above, it's 00-0c-1a-00-01-0d. If the AN-X is already online, you can obtain its MAC address using the *Utilities/Locate All AN-X Modules* command.
3. Enter the IP address of the AN-X you want to update

Step 2

In step 2, you choose a method of restarting AN-X to put it in config mode.

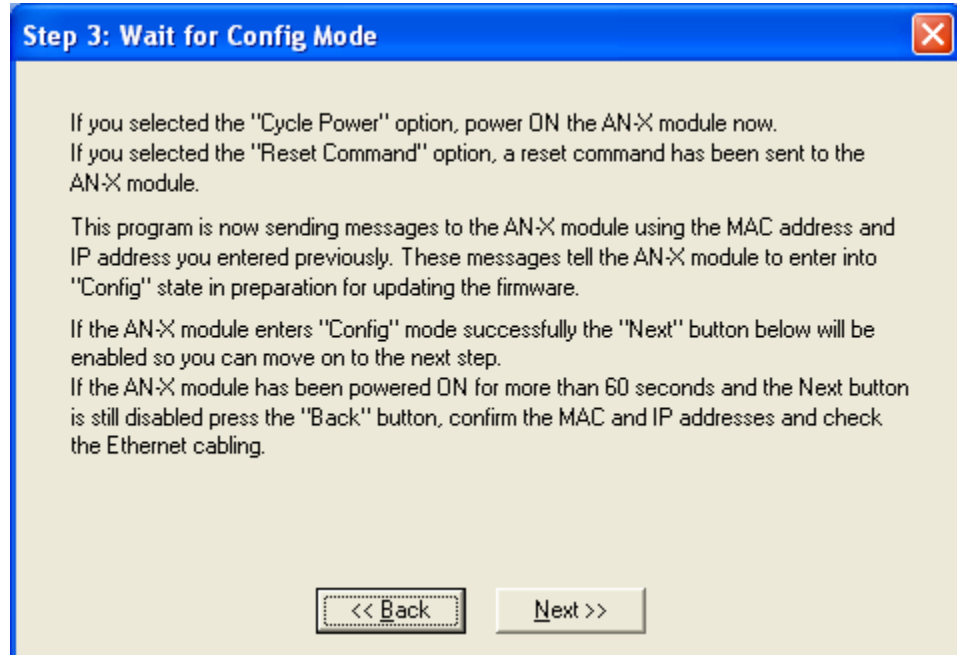


The preferred method is to cycle power on the AN-X. Select the first option on the screen and click the *Next >>* button.

The second method, useful if the AN-X is not easily accessible, is to send it a command over Ethernet. The AN-X must be powered on and completely running for this method to work. For example, if this is the first time you are configuring a new AN-X, allow sufficient time for it to acquire an IP address from a DHCP server or to time out and use its default IP address (about 3 minutes). Select the second option on the screen and click the *Next >>* button.

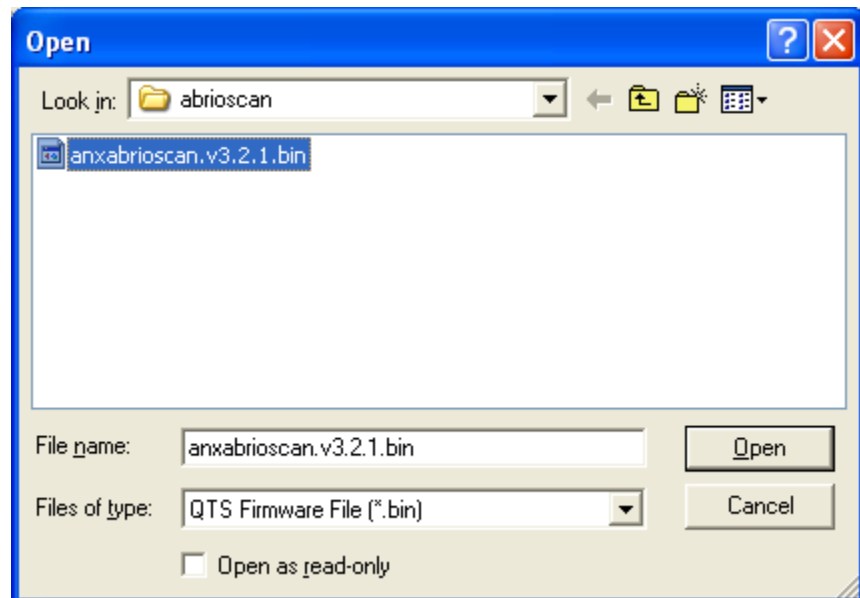
Step 3:

Wait for AN-X to enter config mode. While AnxInit is waiting, the *Next>>* button is disabled. When AN-X is in boot mode, the *Next>>* button is enabled.



If the AN-X does not enter config mode within about 60 seconds, return to the previous screens and check the entries.

Click the *Next*>> button, and select the firmware file you want to download and click *Open*.



AnxInit transfers the firmware file and restarts the AN-X.

After you run update the firmware, you must reconfigure the AN-X.

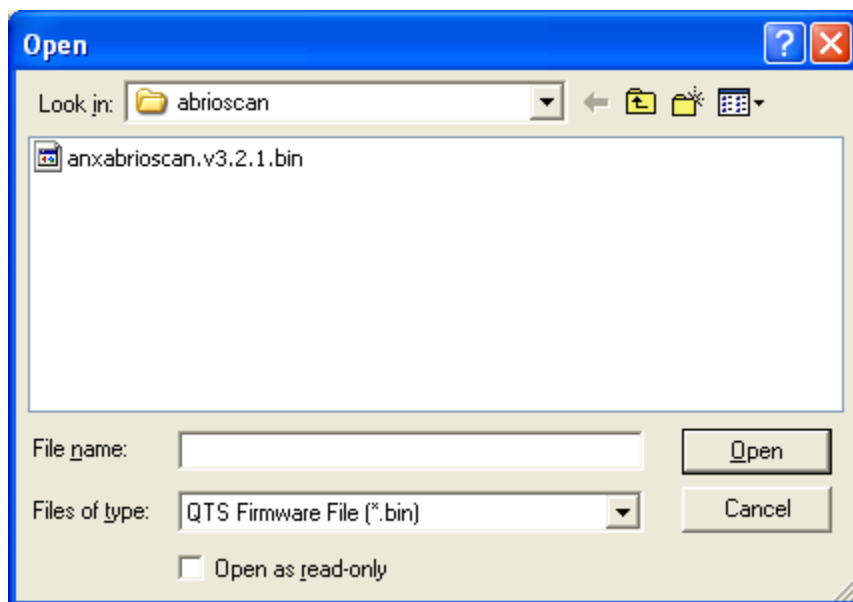
Update Firmware Command

The *Utilities/Update Firmware* command updates all the firmware on an AN-X you have previously selected using the *Utilities/Select An AN-X* command.

This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

If you cancel at the filename dialog, the AN-X has already been reset and is in configuration mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.

Click the *Next>>* button, and select the firmware file you want to download and click *Open*.



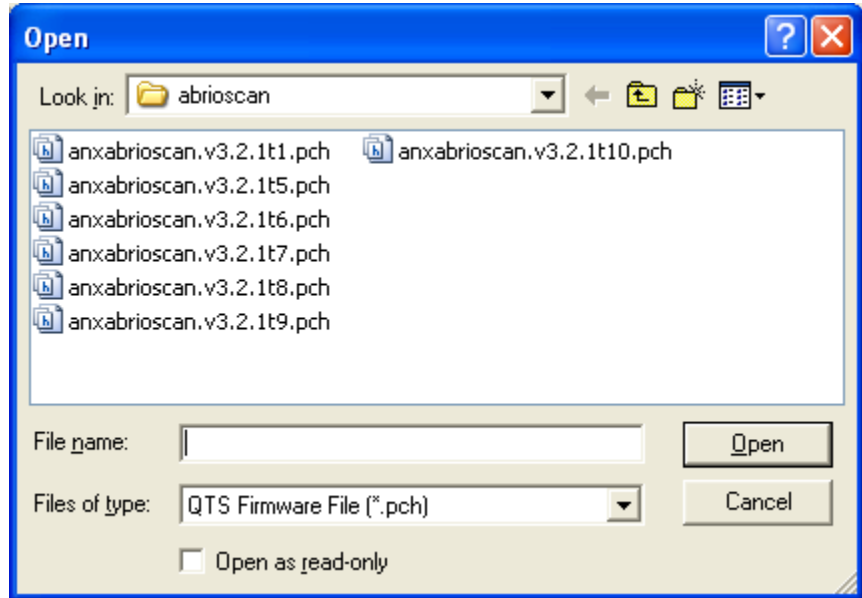
AnxInit transfers the firmware file and restarts the AN-X.

After you run update the firmware, you must reconfigure the AN-X.

Patch Firmware

The *Utilities/Patch Firmware* command applies small patches to the firmware running on the AN-X.

These patch files have extension *pch*.



This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

You do not have to reconfigure the AN-X after applying a patch. All configuration information will be left intact.

When the patch has been applied, AnxInit restarts the AN-X in production mode.

If you cancel at the filename dialog, the AN-X has already been reset and is in configuration mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.

Using the Web Interface

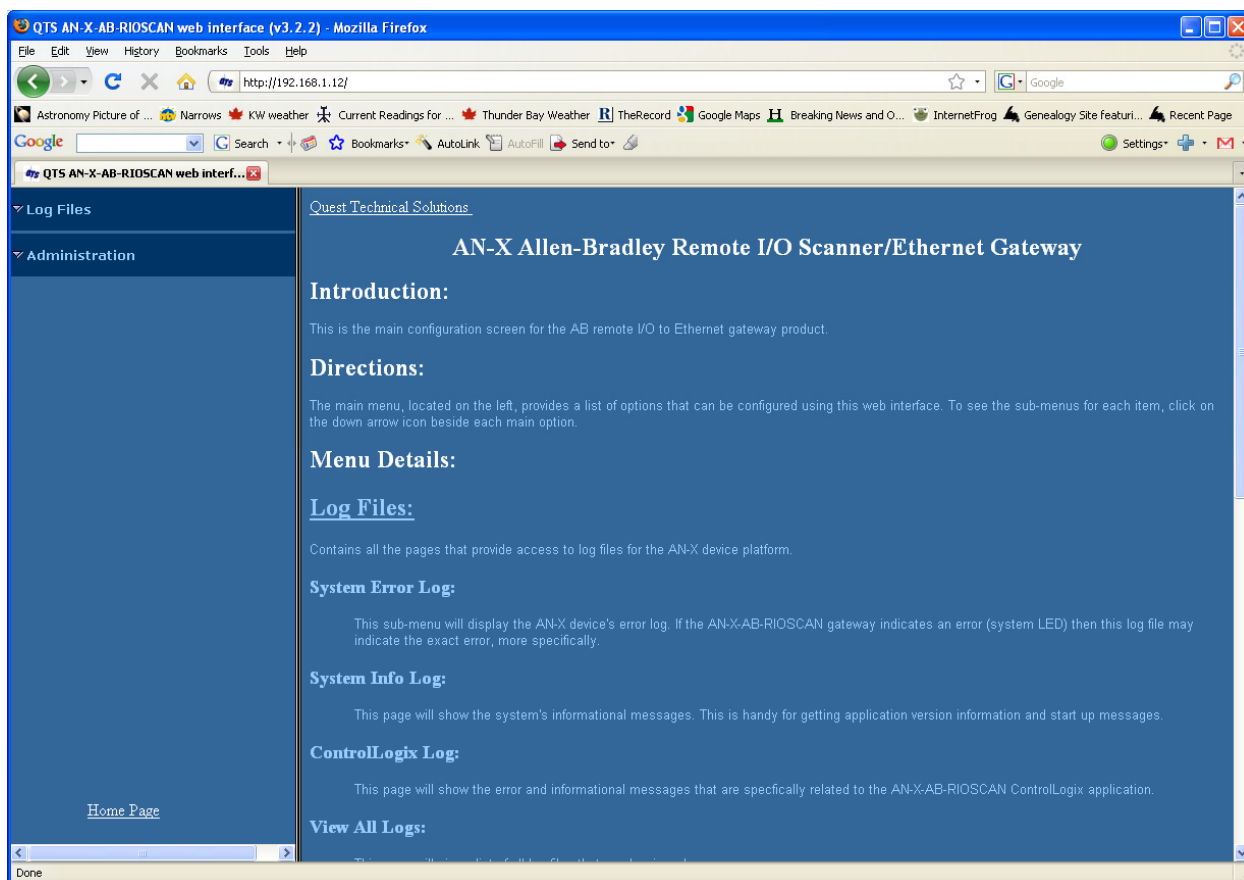
The AN-X module contains a webserver capable of communicating with standard web browsers such as Internet Explorer.

Use the web interface to:

- view AN-X logs
- perform administrative functions

To use the web interface, you must know the IP address of the AN-X. Use the *Utilities/Locate All AN-X Modules* command in AnxInit to find all AN-X modules on the Ethernet network.

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.



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.

System Error Log

The System Error log records errors that occur during AN-X operation. This log is normally empty.

System Info Log

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

ControlLogix Log

The Ethernet/IP log shows messages and errors associated with the ControlLogix scheduled data 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.

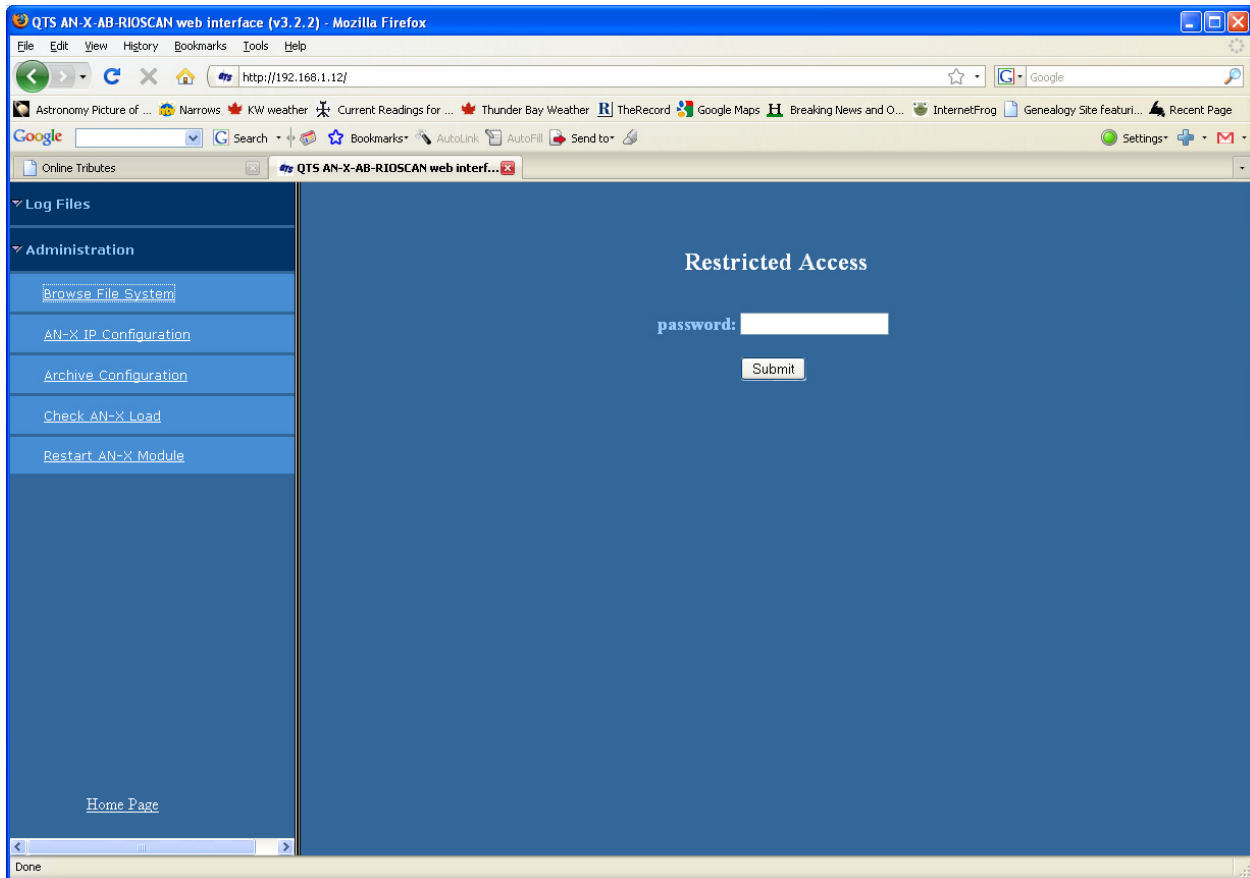
Administration Menu

The Administration Menu is used to set the AN-X IP address and to view and edit files on AN-X. The file edit function is password protected and is used only for AN-X technical support.

Browse File System

If you are required by technical support to examine files on the AN-X, select *Administration/Browse File System*.





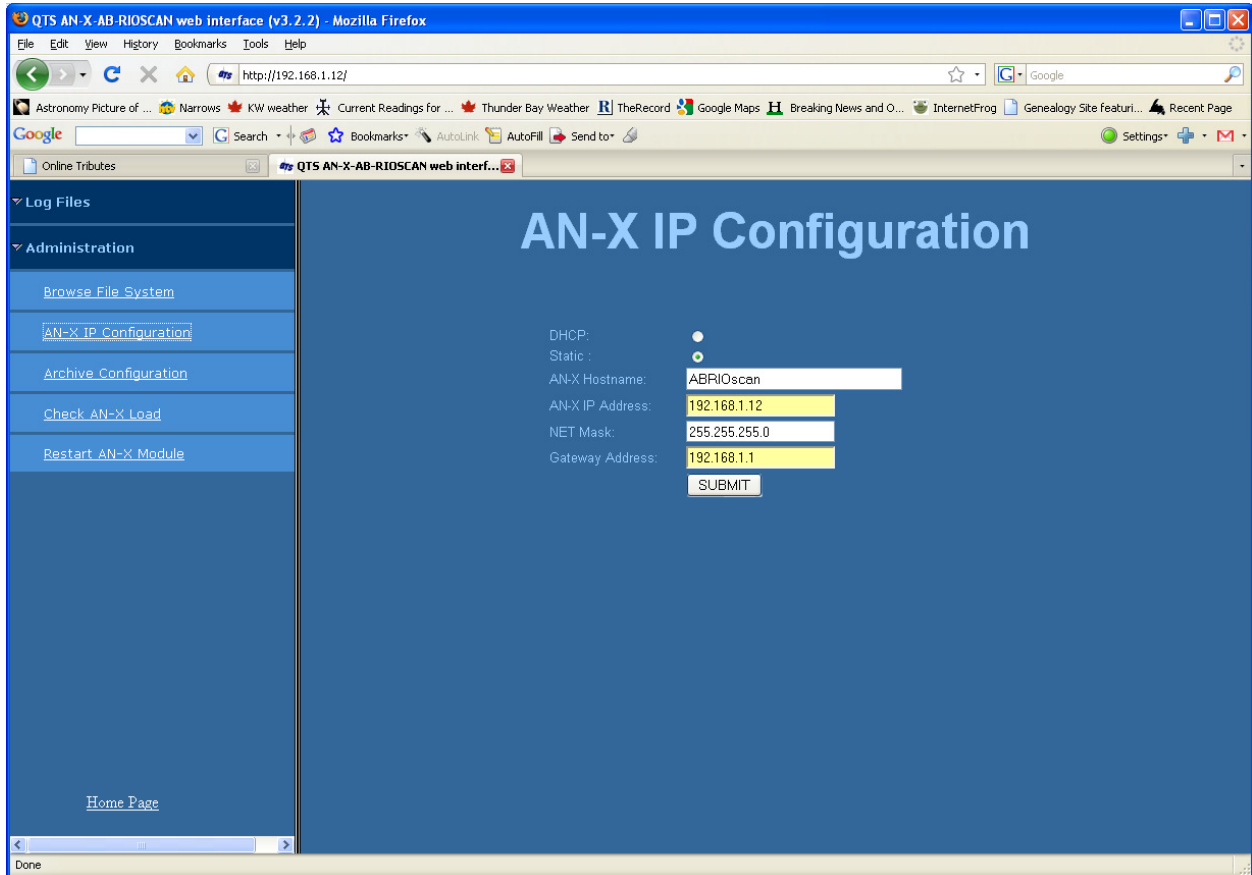
Technical support will provide the password and supply detailed information on any further steps.

AN-X IP Configuration

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

Select *Administration/AN-X IP Configuration*.





You can configure the AN-X to use DHCP or to use a static IP address.

The host name can contain alphanumeric characters and a hyphen.

Click SUBMIT to set the parameters.

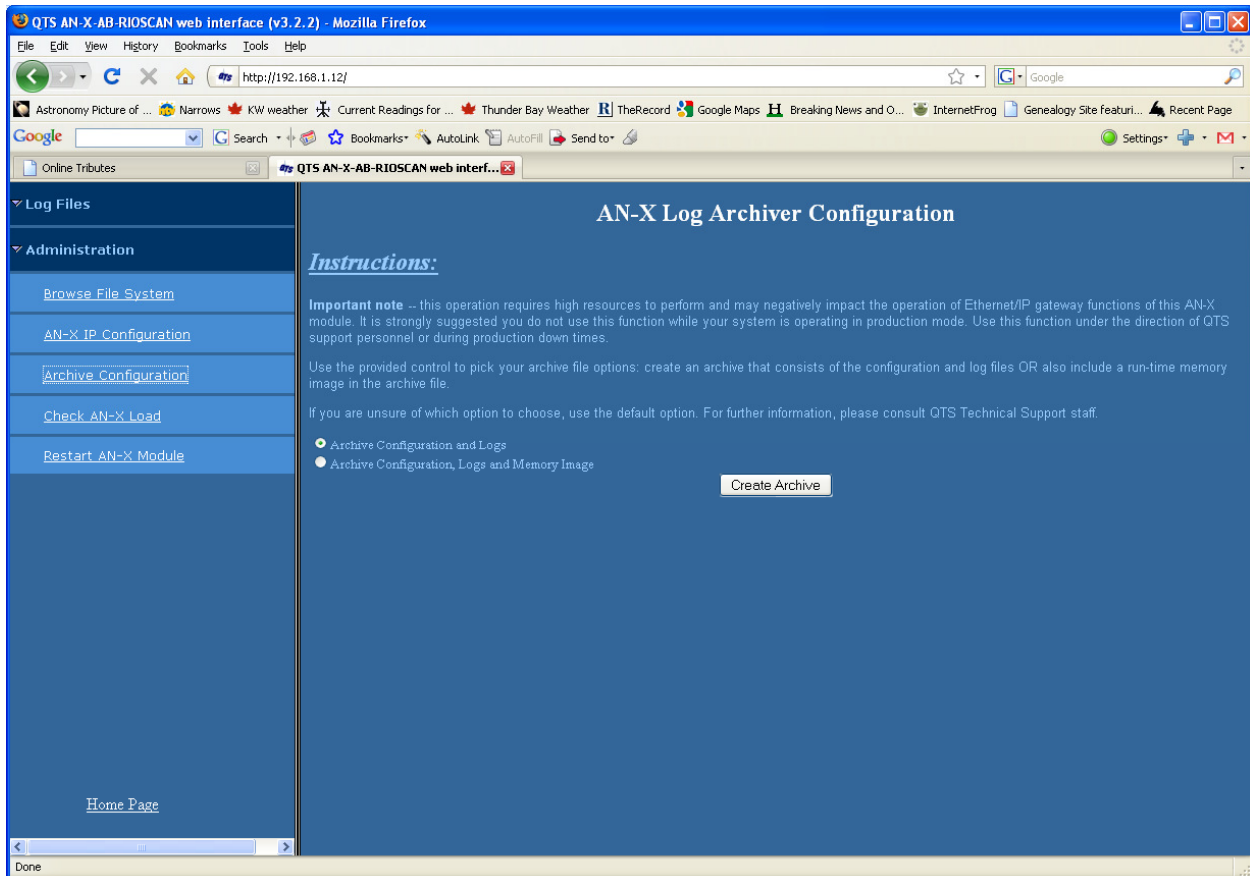
When prompted, click CONTINUE to reboot the AN-X with the new parameters.

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*.



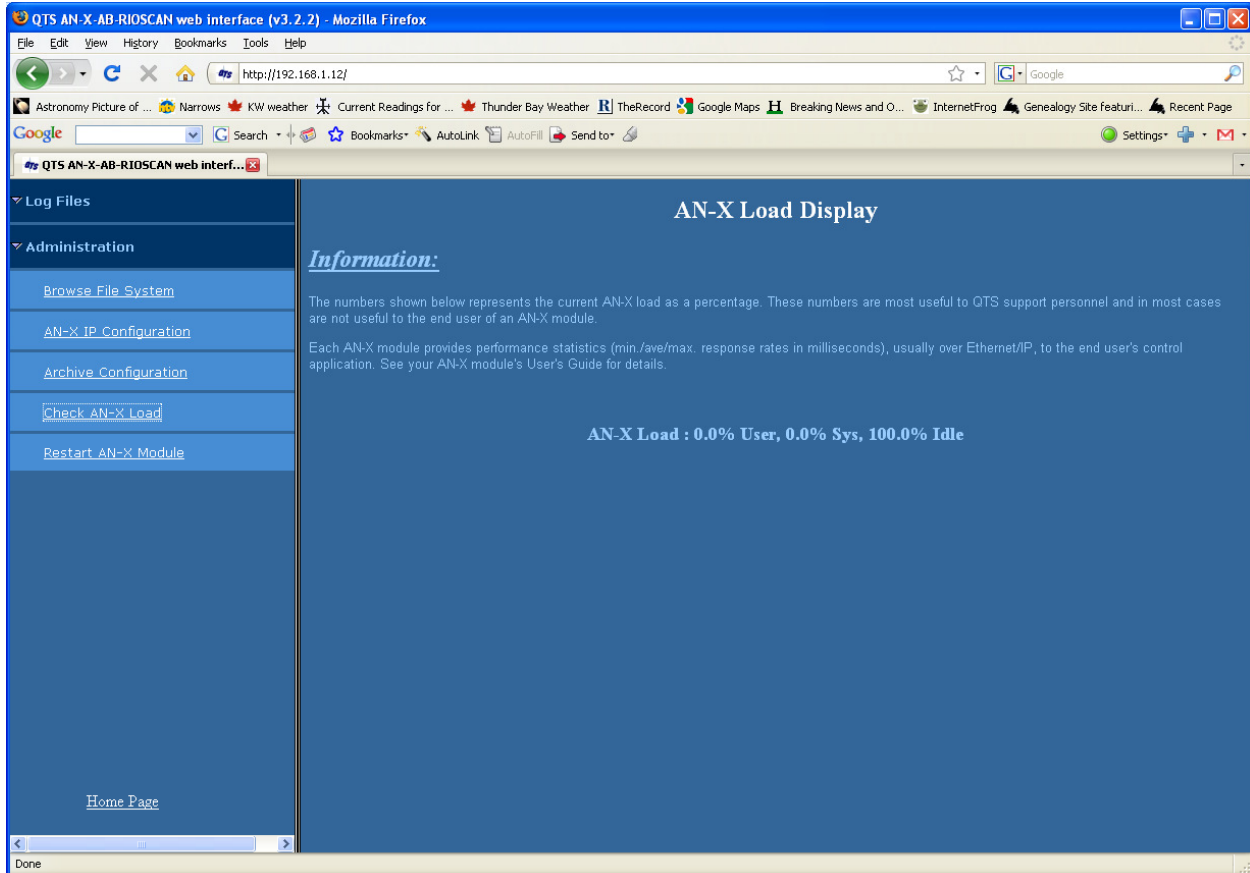


Click on the Archive File link and save the file. Select the destination where the file will be stored.



Check AN-X Load

This function shows performance information about the AN-X and is intended for technical support only.



The screenshot shows a Mozilla Firefox browser window displaying the QTS AN-X-AB-RIOSCAN web interface (v3.2.2). The address bar shows the URL <http://192.168.1.12/>. The interface has a blue theme and a sidebar on the left with navigation links: Log Files, Administration, Browse File System, AN-X IP Configuration, Archive Configuration, Check AN-X Load (highlighted), and Restart AN-X Module. A Home Page link is also visible at the bottom of the sidebar.

The main content area is titled "AN-X Load Display" and contains the following information:

Information:

The numbers shown below represents the current AN-X load as a percentage. These numbers are most useful to QTS support personnel and in most cases are not useful to the end user of an AN-X module.

Each AN-X module provides performance statistics (min /ave/max. response rates in milliseconds), usually over Ethernet/IP, to the end user's control application. See your AN-X module's User's Guide for details.

AN-X Load : 0.0% User, 0.0% Sys, 100.0% Idle

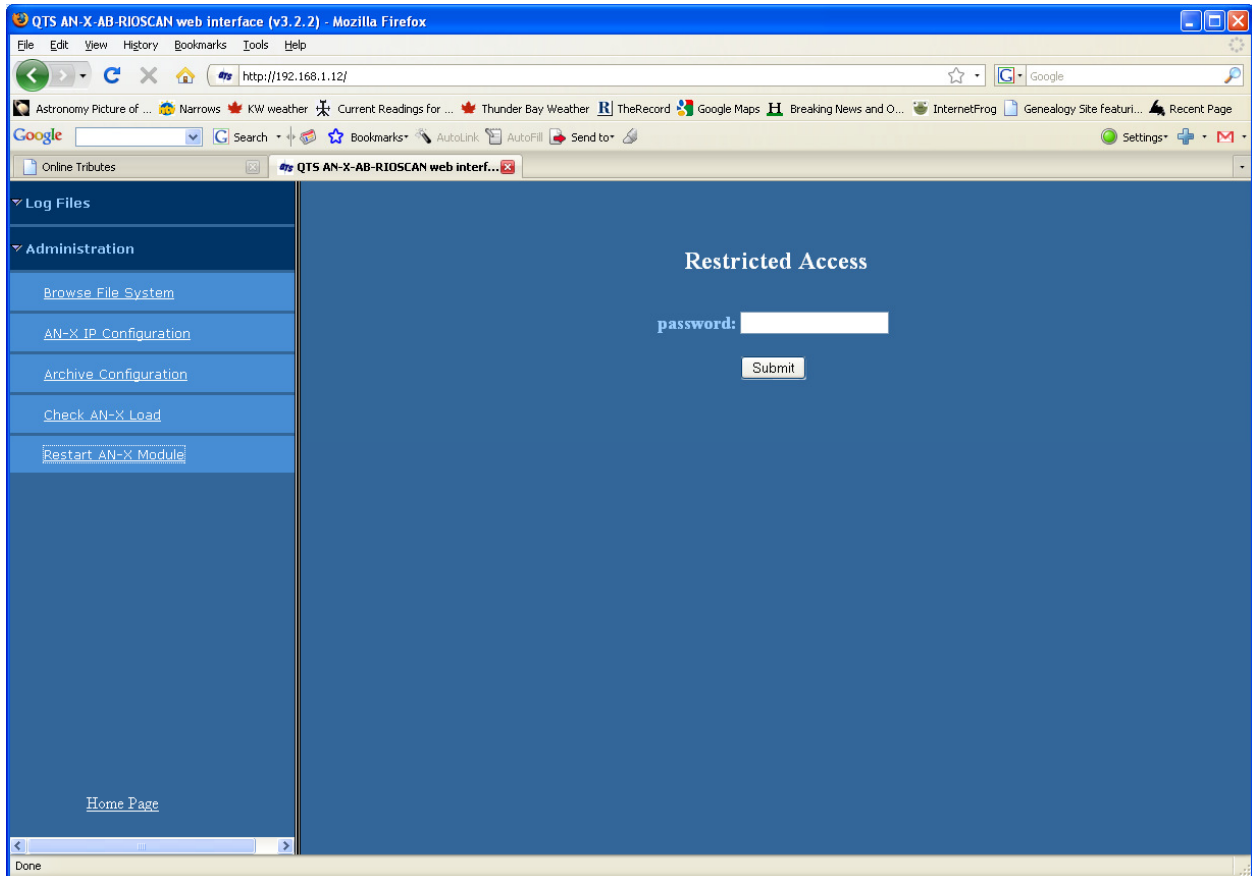


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Restart AN-X Module

The Restart AN-X Module is password protected and is intended for technical support.



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Troubleshooting

LEDs

The AN-X-ABRIO-SCAN 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 orange LED, labelled 100, is on if the link is running at 100 Mb/s and is off otherwise.

The 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.

SYS LED

The SYS LED is used by the AN-X operating system and software to indicate the state of operations and errors. Errors or status indication in boot mode cause the LED to flash yellow. Otherwise, the LED flashes red.

The SYS LED 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, and so on.

SYS LED State	Possible cause
Red 2	AN-X is in config mode
Red 3	DHCP configuration failed
Red 4	Fatal application error, check logs for cause
Red 5	Application memory access violation, check logs
Red 6	Application failed, illegal instruction, check logs
Red 7	Application crashed, unknown cause, check logs
Fast red flash	Reconfiguration failed
Single red flash	Unscheduled messaging, addressing or connection problem
Slow red flash	Script or application problem during startup

At startup, the SYS LED sequence is:

- boot code starts – fast flashing red
- boot code loads a kernel – solid red
- if the configuration kernel is loaded, 2 red flashes followed by a pause
- if the production kernel loads with no errors, solid green

NET LED – Network Status

The NET 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



Updating the Firmware

The AN-X operating software consists of several parts:

- boot code, runs at startup
- configuration kernel, runs when you update firmware
- production kernel, runs in normal operation
- application software, for network communication and scheduled messaging

The kernels are supplied in file with extension *qtf* and are updated using the AnxInit utility. Run the command *Utilities/Update AN-X Flash* and select the file you wish to download. Refer to page 65 for details.

Firmware files contain the application programs for AN-X and have extension *bin*. They are downloaded using the command *Configuration/Firmware Update* or *Utilities/Update Firmware* in AnxInit. Refer to page 66 for details.

Occasionally individual patch files are released. They have extension *pch* and are downloaded using the *Utilities/Patch Firmware* command in AnxInit. Refer to page 70 for details.

Reading Version Numbers

To read the version numbers of the various software components:

Boot code	AnxInit – AN-X Info
Configuration kernel	AnxInit – AN-X Info
Production kernel	AnxInit – AN-X Info
Firmware	AnxInit – AN-X Info (version depends on current mode, boot, configuration or production)
Individual applications	
	Web interface, System Info Log



Appendix: Scanner Configuration File Format

A scanner configuration file consists of:

Scanner file ID

Keyword AN-X-AB-RIO-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.

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-X-AB-RIO-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



Specifications

Parameter	Specification
Function	Bridge between Ethernet and Remote I/O network
Typical Power Consumption	300 mA @ 12 VDC or 150 mA @ 24 VDC
Maximum Power dissipation	3.6W
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



Support

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