

AN-X2-SQD-MAS
Square D Remote I/O
Scanner Module

User Manual



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

WARNING!

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

These warnings help to:

- 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-X2-SQD-MAS gateway

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Module Overview



The AN-X2-SQD-MAS communications module connects to a ControlLogix PLC over Ethernet/IP and acts as a scanner on the Square D remote I/O network. It connects to CRM-220/222 adapter modules, NOT Passport I/O.

IMPORTANT! Unlike Square D scanners, AN-X has only one I/O channel.

The module supports scheduled connections with a ControlLogix processor so the ControlLogix processor can read inputs from the remote I/O network and write outputs. The AN-X2-SQD-MAS module has a web interface for configuration, for monitoring logs, and for performing other 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 web interface. Refer to page 42 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 (SYS or MS)
- a LED to indicate the state of communications on the remote I/O network (NET or NS)
- an Ethernet connector
- a power connector
- a connector to connect to the Square D 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-X2-SQD-MAS module
- CD containing software and documentation
- microSD to SD card adapter
- rubber feet for desktop use



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Using the MicroSD Card

The AN-X2 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-X2 is running.

WARNING! Do not remove the card while the AN-X2 is powered on!

If the AN-X2 is inaccessible from Ethernet because of its settings, you can remove the card and edit the file config.txt. Refer to page 11 for details.

Insert the card in the slot at the back of the AN-X2, 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-X2 to retrieve it .

AN-X2 Modes of Operation

There are two AN-X2 modes of operation:

- Maintenance mode. The AN-X2 runs the maintenance firmware at startup. It performs diagnostics (memory tests, etc), and copies any changes from the microSD card. If there are no errors, it starts the AN-X2 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.

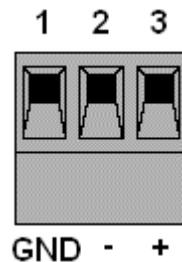
WARNING!

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 DC power input from 12 to 24 VDC



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

The chassis ground should be connected.

Power consumption internally is 225 mA @ 12VDC or 110 mA @ 24VDC.

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

Remote I/O Cabling and Termination

Refer to the Square D Instruction Bulletin # 30598-247-01D2 Local/Remote Interface Class 8030 Types CRM-210, 211, 220, 222 for detailed information on remote I/O cabling and installation.

The module has a 5-pin Phoenix connector for connection to the remote I/O network.

The part number for the remote I/O connector is Phoenix Contact MSTB 2.5/5-ST-5.08



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Pin	Assignment
1	RIO 2
2	RIO 1
3	shield
4	RIO 4
5	RIO 3

Ensure that the physical ends of the remote I/O network are properly terminated. The AN-X module does not have any internal termination.

A Square D scanner has a 220 ohm resistor built in across RIO1 & RIO2 (rx). Since the AN-X does not have a built-in terminator, add a 220 ohm resistor externally if it is being used as a scanner.

Square D adapters connect a 220 ohm resistor across RIO3 & RIO4 when the switch is turned on. If the AN-X is a monitor, add a 220 ohm resistor if it is at the end of the network, and shut off the switch for the node that was previously at the end.

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

There is no required software installation for the AN-X2-SQD-MAS. All configuration is done using the web interface.



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Quick Start

Step		See page
1	Power up the AN-X, connect it to Ethernet and assign it an IP address	6
2	Connect AN-X to the Remote I/O network	4
3	Use the AN-X web interface to autoconfigure the Remote I/O network and ControlLogix configuration	14
4	Configure the AN-X in RSLogix 5000	24
5	Use the web interface to obtain aliases for RSLogix 5000	27
6	Import the aliases into RSLogix 5000	27
7	Use the aliases to access data	



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Ethernet Configuration

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

Initial Ethernet Configuration

AN-X can be configured:

- to use a static (unchanging) IP address
- to obtain its IP address from a DHCP server
- to use the 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

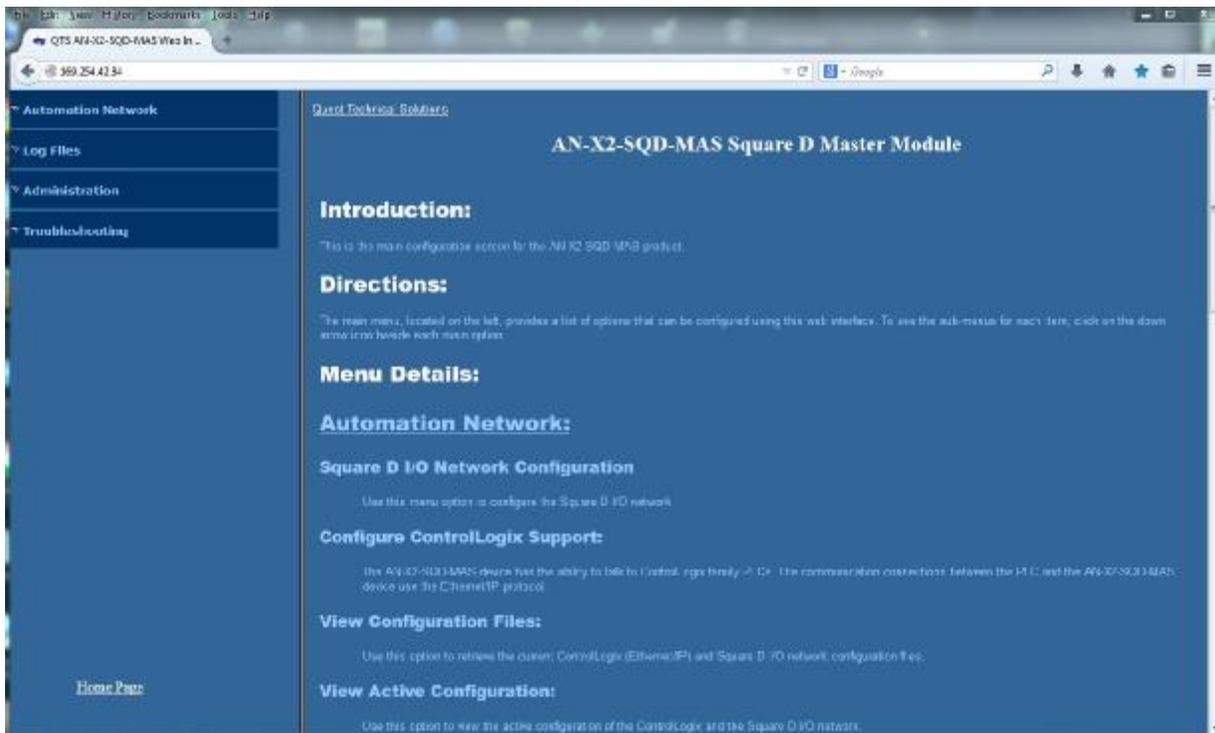
The AN-X2 must be on the same subnet as the computer to use the link-local IP address. It cannot be connected through a router.



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Select *Administration/AN-X Configuration*.

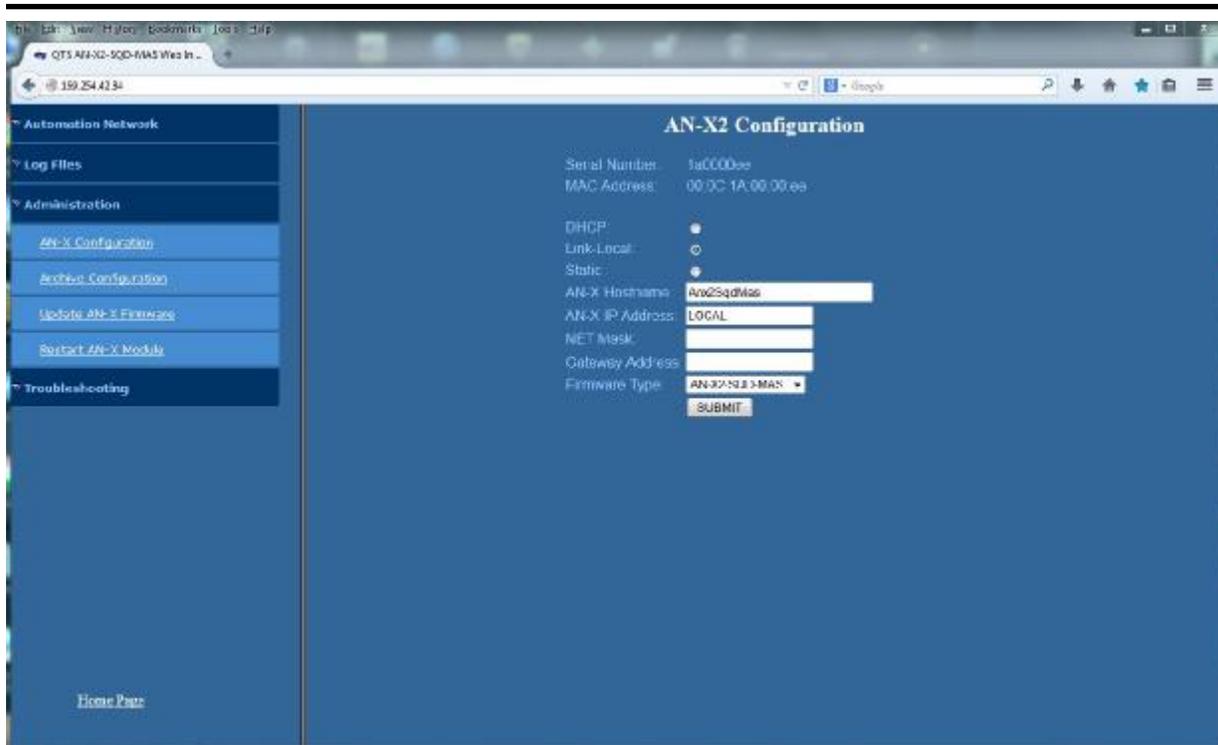


The *AN-X2 Configuration* page appears.



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

Check either DHCP or Static.

DHCP

If the AN-X2 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-X2 does not find a DHCP server, it reverts to the default link local address 169.254.42.84 and repeatedly flashes the SYS (or 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-X2. 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

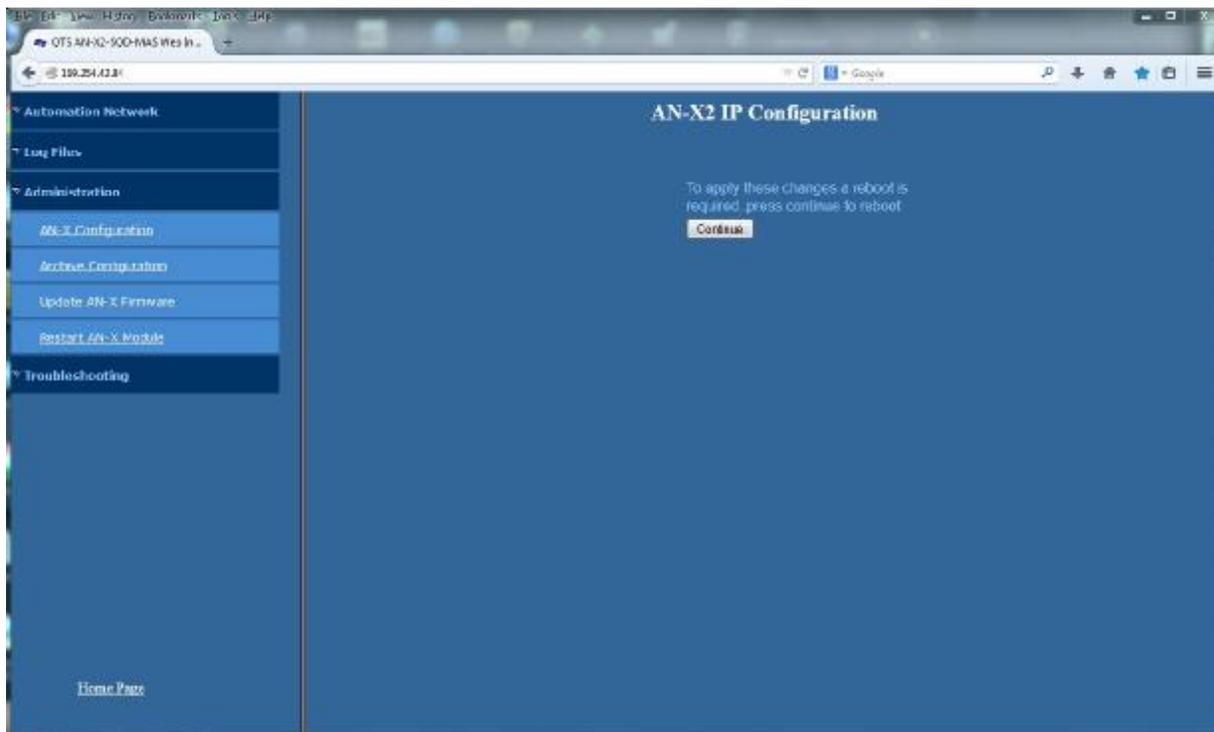
Firmware

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. The firmware file for Square D Remote I/O scanner operation is AN-X2-SQD-MAS.

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**.



Click *Continue* to restart the AN-X2, 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.



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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-X2 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.

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-X2 finds an error during startup, it flashes an error code on the SYS (or MS) LED, see page 41.

Example config.txt files

Example: Link- Local IP address

```
IP: LOCAL
```

```
Hostname: ANX2SqdMas
```

```
Firmware: AN-X2-SQD-MAS
```



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Example: DHCP

```
IP: DHCP
Hostname: ANX2SqdBas
Firmware: AN-X2-SQD-MAS
```

Example: static IP address

```
IP: 192.168.1.14
NetMask: 255.255.255.0
DefGtwy: 192.168.1.1
HostName: ANX2SqdBas
Firmware: AN-X2-SQD-MAS
```

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
```



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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
```

where 10.10.0.20 is replaced with the IP address of the interface in your computer that is connected to the AN-X2.

IMPORTANT! You may need to run this command as administrator

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

Now try pinging the AN-X2 at 169.254.42.84. You should now be able to access it using a browser to set the desired Ethernet configuration.



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Remote I/O Network Configuration

Before you can scan a Square D Remote I/O network, you must configure the network in the AN-X2-SQD-MAS.

Configuring the Remote Network

There are two methods of configuring the Remote I/O that the AN-X2-SQD-MAS is to scan:

- autoconfiguration. The AN-X2-SQD-MAS reads the network contents by sending messages to the attached network.
- manual configuration. You build a configuration file and send it to the AN-X2-SQD-MAS.

You can also use autoconfiguration to build an initial configuration file, edit the file to add features, then perform a manual configuration with the modified file.

Supported Modules

The following modules are supported by the AN-X2-SQD-MAS

Description	Input Registers	Output Registers	Type Code
ROM121 4 OUT ANLG	0	4	0x82
ROM122 4 OUT ANLG	0	4	0x84
ROM131 STEP CNTRLR	4	12	0x8A
ROM141 MPLX OUT BCD	0	16	0x8E
ROM221 16 OUT AC	0	1	0xA0
ROM441 32 OUT DC	0	2	0xA1
ROM421 16 OUT AC	0	1	0xA5
ROM871 64 OUT RELAY	0	4	0xAD
ROM271 16 OUT RELAY	0	1	0xAF
ROM441 32 OUT DC (BF)	0	2	0xBF
RIM121 4/16 IN ANLG	16	0	0xC1
RIM123 8 IN HS ANLG	8	0	0xC3
RIM144 MPLX IN BCD	16	0	0xC6
RIM126 8 IN ANLG TC	10	2	0xC7
RIM131 HS COUNTER	4	12	0xC8
RIM127 12 IN RTD	14	2	0xCD



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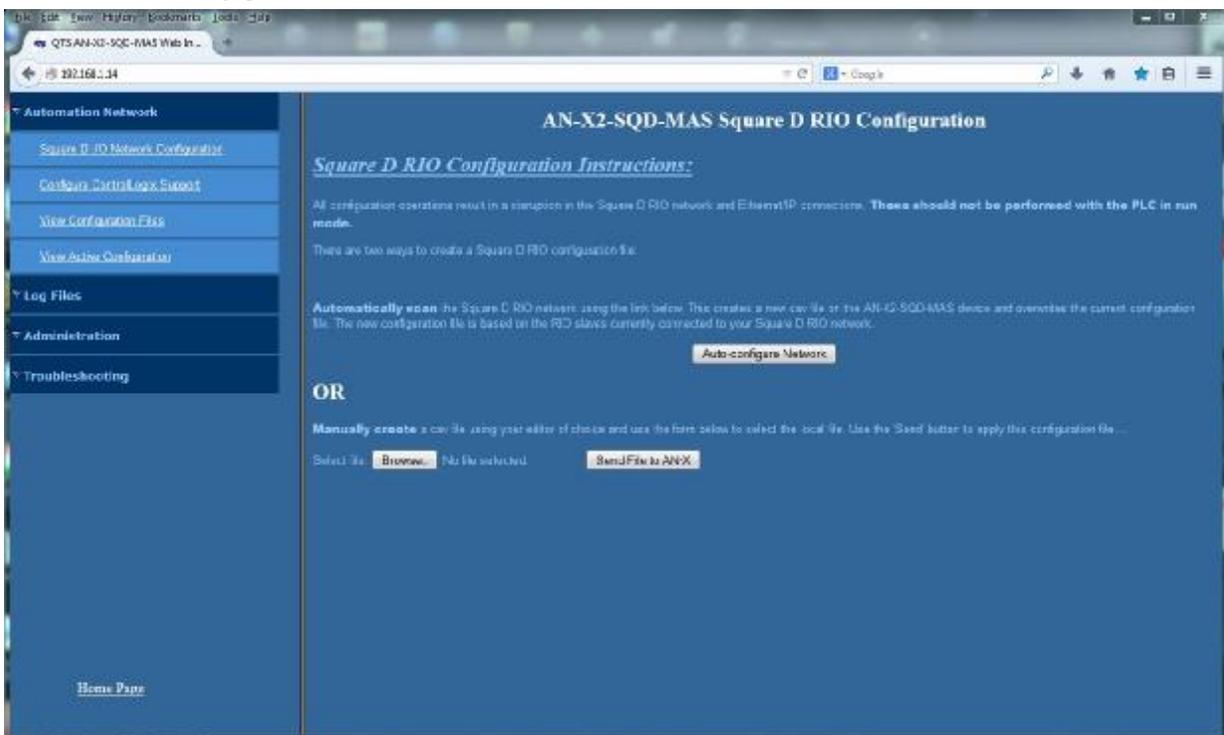


Description	Input Registers	Output Registers	Type Code
RIM331 32 IN DC (D5)	2	0	0xD5
RIM101 16 IN AC/DC	1	0	0xE0
RIM331 32 IN DC	2	0	0xE1
SIM116 16 IN SIM	1	0	0xE3
RIM301 16 IN AC	1	0	0xE5
RIM731 64 IN AC/DC	4	0	0xED

Autoconfiguration

Before you can perform an autoconfiguration, the Remote I/O network must be connected to the AN-X.

From the AN-X web interface, select *Automation Network/Square D I/O Network Configuration*.



Click the *Auto-configure Network* button.

AN-X sends messages to all possible drops and builds a configuration based on the replies it receives. AN-X then displays the configuration it generated.



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AN-X also generates a ControlLogix data mapping configuration based on the I/O it finds (see page 19) and generates aliases for the I/O data that you can import to RSLogix 5000.

See page 18 for information on how to save the configuration to a file and upload it to the AN-X.

Manual Configuration

Manual configuration is useful when the Remote network is not attached to the AN-X or when you need something other than the default configuration.

Create the configuration file using a text editor such as Windows Notepad and save it as a comma separated variable (CSV) file, with extension *csv*. The file format is described on page 16.

To send the configuration to AN-X:

1. From the AN-X web interface, select *Automation Network/Remote Network Configuration*.
2. Type or browse the configuration file name into the *Select file:* area
3. Click the *Send File To AN-X* button to send the file to AN-X.

AN-X parses the file and displays either the current configuration if the configuration was sent successfully or an error message if there was a problem with the file.

Remote I/O Configuration File Format

The Remote I/O configuration file defines the contents of the Remote I/O network to be scanned.

It is a text file, which can be created and edited with a text editor such as Windows Notepad.

Anything after a semicolon on a line is treated as a comment. Comments can be inserted at the end of a line or on a separate line.

The file consists of blocks that define the contents of each drop.

Drop Definitions

Each drop definition begins with a line that defines the drop number of the drop being configured, for example, *Drop=7*. The drop number can be from 1 to 8.

The drop definition consists of lines that define the contents of each slot.

The slot definitions define the contents of the slot. They consist of the slot number (1 to 16), the number of input and output data registers, and a description.

You can find the required values for the number of data registers from the table on page 14.

The description for a module is defined by the keyword *Desc=* and can be from 1 to 95 characters long. The description text must be enclosed in double quotes, for example *Desc="12/24VDC 32 Ckt Source I/O Block"*. AN-X uses the description only for comments. You can put whatever you want in the description.

Each drop definition ends with the keyword *EndDrop*, which is required.



Parameter	Keyword	Valid entries
Drop number	Drop=	1-8
Slot number	Slot=	1-16
Input Registers	InpRegs=	Number of registers, 1 to 127
Output Registers	OutRegs=	Number of registers, 1 to 127
Description	Desc=	Maximum 63 characters, enclosed in double quotes
End of drop definition	EndDrop	

Examples:

```
Slot=4 InpRegs=0 OutRegs=1 Desc="ROM221 16 OUT AC" ; ModType=a0
Slot=9 InpRegs=4 OutRegs=4 Desc="ROM121 4 OUT ANLG" ; ModType=82
```

When AN-X creates a Remote I/O configuration file after an autoconfiguration, it inserts part numbers and descriptions from its internal module database.

Sample Remote Configuration File

```
; QTS AN-X SQD MAS Auto Configuration Utility
; Copyright (c) 2012 Quest Technical Solutions
; Auto Config Sqd Mas File 4.1.3
```

Drop=1

```
Slot=2 InpRegs=1 OutRegs=0 Desc="RIM101 16 IN AC/DC" ; ModType=e0
Slot=3 InpRegs=1 OutRegs=0 Desc="RIM101 16 IN AC/DC" ; ModType=e0
Slot=4 InpRegs=1 OutRegs=0 Desc="RIM101 16 IN AC/DC" ; ModType=e0
EndDrop ; MaxSlot=4 NumInpRegs=3 NumOutRegs=0
```

Drop=8

```
Slot=2 InpRegs=0 OutRegs=1 Desc="ROM221 16 OUT AC" ; ModType=a0
Slot=3 InpRegs=0 OutRegs=1 Desc="ROM221 16 OUT AC" ; ModType=a0
Slot=4 InpRegs=0 OutRegs=1 Desc="ROM221 16 OUT AC" ; ModType=a0
Slot=9 InpRegs=0 OutRegs=4 Desc="ROM121 4 OUT ANLG" ; ModType=82
EndDrop ; MaxSlot=9 NumInpRegs=0 NumOutRegs=7
```



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Viewing the Current Configuration

To view the Remote I/O configuration currently in AN-X, access the web interface and select *Automation Network/View Active Configuration*.

You can also view the configuration file by accessing the web interface and selecting *Automation Network/View Configuration Files*. Click on the *AN-X2-SQD-MAS RIO Network Configuration File* link.

Saving the Current Configuration

To save the configuration currently in AN-X to a file, access the web interface and select *Automation Network/View Configuration Files*.

Right click on the *AN-X2-SQD-MAS Remote Network Configuration File* link and save the file.



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Exchanging Scheduled Data with a ControlLogix

The AN-X2-SQD-MAS supports multiple scheduled connections with a ControlLogix processor over Ethernet.

The AN-X2-SQD-MAS behaves like a 17-slot ControlLogix rack with an ENBT/A module in slot 16 and generic modules in slots 0 to 15. I/O data can be mapped to slots 0 to 14. Slot 15 is reserved for diagnostics.

A ControlLogix processor can open a scheduled connection to each of these 16 generic modules. Each scheduled connection consists of up to 248 words of output data from the ControlLogix processor to the AN-X and up to 250 words of input data from the AN-X to the ControlLogix processor.

Each connection can have a different RPI.

In general, keep the number of connections small. There is significant overhead in opening and maintaining each connection.

You map the inputs and outputs for the Remote I/O blocks to these scheduled connections. AN-X can create the mappings automatically or you can create a mapping configuration manually.

You can let AN-X create a mapping file automatically, then edit the file to better suit your application. For example, in order to make the most efficient use of the available Ethernet bandwidth, you can organize the data so that items that must update quickly are mapped to connections with short RPIs and items that are less time critical are mapped to connections with longer RPIs.

In addition, the AN-X module has diagnostic data that can be mapped to ControlLogix scheduled input data.

Mapping I/O Data

You map input and output data to the ControlLogix scheduled data by creating a comma separated variable file that defines the mappings and sending the file to the AN-X.

The file contains sections for each scheduled connection. Within each scheduled connection are the definitions for the input and output data for that connection. These definitions refer to the drop and slot where the data is to be found.

When you create a mapping, all the input or output data for the drop and slot is mapped; you cannot map individual registers.

AN-X automatically creates a mapping file when you autoconfigure I/O. See page 15 for details.

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

ClxName

The first line in the file identifies the AN-X module. AN-X uses this name in the address portion of the ControlLogix aliases for the Remote data.



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The ClxName consists of a line with the keyword ClxName, followed by a comma and the name you give the emulated ENBT (see page 24)

Example:

```
ClxName, AnxSqdMas
```

ClxPrefix

The ClxPrefix is used in the alias names AN-X creates for import into RSLogix 5000. AN-X prefixes each name with the ClxPrefix. The ClxPrefix can be used to distinguish aliases for the same drop and slot on two different remote I/O networks when the ControlLogix processor has connections to more than one AN-X2-SQD-MAS.

For example, if the ControlLogix has connections to two AN-X2-SQD-MAS modules, each controlling a different network, each network could have a block with the same drop and slot. Using a different ClxPrefix in the configuration file for each AN-X2-SQD-MAS makes the aliases for the two AN-X modules distinct.

The ClxPrefix consists of a line with the keyword ClxPrefix, followed by a comma and the prefix text.

Example:

```
ClxPrefix, SQD_
```

Scheduled Connections

Each scheduled connection to the AN-X begins with a line that consists of the keyword ClxSlot followed by a comma and then a number from 0 to 14.

Example:

```
ClxSlot, 0
```

Each scheduled connection consists of output data and input data.

The section that defines the scheduled outputs from the ControlLogix processor for that connection begin with a line with just the keyword DataOutput.

The section that defines the scheduled inputs to the ControlLogix processor for that connection begin with a line with just the keyword DataInput.

Data definitions consist of lines that define the mapping between the ControlLogix data table and the Remote module.

They consist of lines of the form

```
CLX_offset (optional), Location
```

The CLX_offset is the offset into the data for the connection. You can select the offset where the data is located or you can leave it blank and AN-X will automatically assign the offset.

The Remote_location consists of the drop and slot in the form dxsy where x is the drop number and y is the slot number.



Example:

To map the outputs from drop 1 slot 4 to ControlLogix offset 27, add the following line to the DataOutput section of the connection

```
27, d1s4
```

Example:

To map the inputs from the drop 3 slot 11 to the next available ControlLogix location, add the following line to the DataInput section of the connection

```
, d3s11
```

Other Options and Mapped Data

LED Mode

To set debug mode, enter a line with the keyword LedModeDebug in the ControlLogix configuration file. See page 40 for details.

Drop Error Table

The drop error table consists of 8 bits in one 16-bit word, one bit per drop. Bit 0 corresponds to drop 1, bit 1 corresponds to drop 2, and so on.

If a configured drop is not active on the network, the bit is 1. If a configured drop is active on the network, the bit is 0. The bit is always 0 for an unconfigured drop.

The drop error table is automatically mapped to the first word of input data for ControlLogix connection 0.

Diagnostic Data

In addition to the I/O data, there are other items that are automatically mapped by the AN-X2-SQD-MAS to connection 15.

TIP

If you use connection 15 to monitor diagnostic data, set a long RPI to reduce the Ethernet traffic, since the diagnostics do not need to be updated as frequently as I/O data.

The items are found at the locations shown and are described in detail in the sections that follow.

Starting Offset	Description
0	Diagnostic counters
35	UDP connection diagnostics
40	Connection 0 statistics



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Starting Offset	Description
50	Connection 1 statistics
...	
190	Connection 15 statistics

Diagnostic Counters

The AN-X2-SQD-MAS maintains the following diagnostic counters.

Counter	Offset	Description
Tx Frames	0	Transmitted network frames
Rx Frames Good	1	Received good network frames
Rx Stop Errors	2	Received frames with a stop error
Rx ChkSum Errors	3	Received frames with a checksum error
Rx Loopback Errors	4	Received frames with a loopback error
Rx Timeout Errors	5	Received frames with a timeout error
Rx Protocol Errors/Type	6	Received frames with a protocol error (high byte), and the error type (low byte)
Scan Counter	7	I/O Scans

The diagnostic counters are automatically mapped to connection 15. If you are using the diagnostic counters, set a long RPI for connection 15 since diagnostics don't need to update frequently.

UDP Connection Diagnostics

The AN-X2-SQD-MAS maintains diagnostics related to the UDP traffic to and from the module.

They consist of:

Offset	Counter
0	UDP Tx count
1	UDP Rx count
2	UDP Eth Error, Ctr (lo) Typ (Hi)
3	UDP PrtErr, Ctr (Lo) Typ/Slr (Hi)



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Offset	Counter
4	UDP Tx Busy
5	UDP Rx Busy

Connection Statistics

The AN-X module maintains statistics for each scheduled connection.

The statistics for each connection consists of 10 words of data. Only three words in the ten word block are used.

Offset	Description
0	Average time for last 32 updates
2	Minimum time since the connection statistics were reset
4	Maximum time since the connection statistics were last reset

The units for the times are 0.1 milliseconds. A value of 87 means 8.7 ms.

Values update at a rate equal to 100 times the RPI for the connection. Averages are calculated for the last 100 updates.

Resetting Connection Statistics

To reset the connection statistics, set bit 0 of output word 0 of connection 15. AN-X resets the statistics on the transition from 0 to 1.

This does not reset the UDP diagnostics.

Example Configuration File:

```
;QTS AN-X SQD MAS Auto Configuration Utility
;Copyright (c) 2012 Quest Technical Solutions
;Auto Config Ethernet/IP File
ClxName   Anx2SqdMas
ClxPrefix SQD_
LedModeDebug
ClxSlot 0
DataInput ; Inputs to ControlLogix
2 d1s02; 2->2 ( 1) "RIM101 16 IN AC/DC"
3 d1s03; 3->3 ( 1) "RIM101 16 IN AC/DC"
4 d1s04; 4->4 ( 1) "RIM101 16 IN AC/DC"
5 d8s09; 5->8 ( 4) "ROM121 4 OUT ANLG"
```



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```
DataOutput ; Outputs from ControlLogix
0 d8s02 ; 0->0 ( 1) "ROM221 16 OUT AC"
1 d8s03 ; 1->1 ( 1) "ROM221 16 OUT AC"
2 d8s04 ; 2->2 ( 1) "ROM221 16 OUT AC"
3 d8s09 ; 3->6 ( 4) "ROM121 4 OUT ANLG"
```

Viewing the Current Configuration

To view the ControlLogix configuration currently stored in the AN-X, start the web interface and select *View Active Configuration*.

Click the *Ethernet/IP* link to view the current ControlLogix scheduled data configuration.

Each line begins with a line number, from the original ControlLogix configuration file. Each mapping line shows the offset and length of the data in the ControlLogix data connection.

Saving the Current Configuration

To save the ControlLogix configuration currently stored in the AN-X to a file, start the web interface and select *Automation Network/View Active Configuration*.

Right click the *Ethernet/IP* link and select *Save target* to save the current ControlLogix scheduled data configuration to a file.

You can also save the ControlLogix configuration by selecting *Automation Network/View Configuration Files*. Right click on the AN-X2-SQD-MAS ControlLogix Configuration File link and select *Save target* to save the current ControlLogix scheduled data configuration to a file.

Configuring the AN-X Module in RSLogix 5000

To configure the AN-X in RSLogix 5000:

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



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New Module

General* | Connection* | Module Info* | Internet Protocol* | Port Configuration*

Type: 1756-ENBT 1756 10/100 Mbps Ethernet Bridge, Twisted-Pair Media
 Vendor: Allen-Bradley
 Parent: LocalENBT
 Name: ANX
 Description:

Ethernet Address
 Private Network: 192.168.1.12
 IP Address:
 Host Name:

Slot: 16

Module Definition
 Change ...
 Revision: 1.1
 Electronic Keying: Disable Keying
 Rack Connection: None
 Time Sync Connection: None
 Chassis Size: 17

Status: Creating

OK Cancel Help

Set the *Name* to match the hostname of the AN-X in the Ethernet configuration.

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

Set the revision to 1.1

Set the *Comm Format* or *Rack Connection* to None.

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

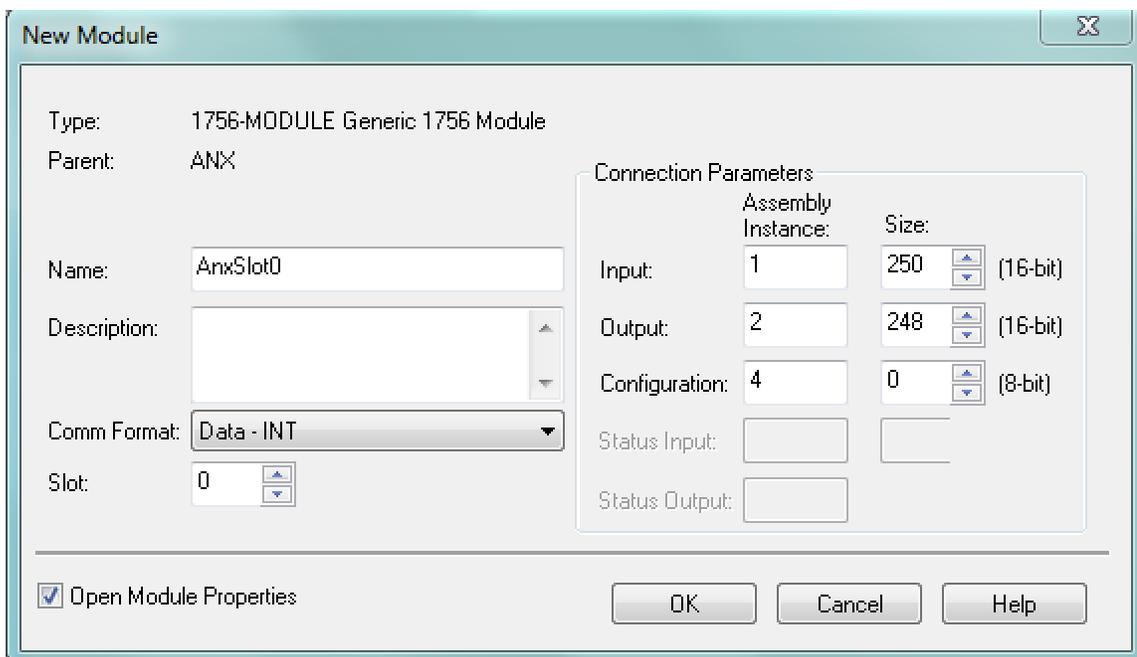
Set *Electronic Keying* to *Disable Keying*.

3. Add Generic modules for each required connection



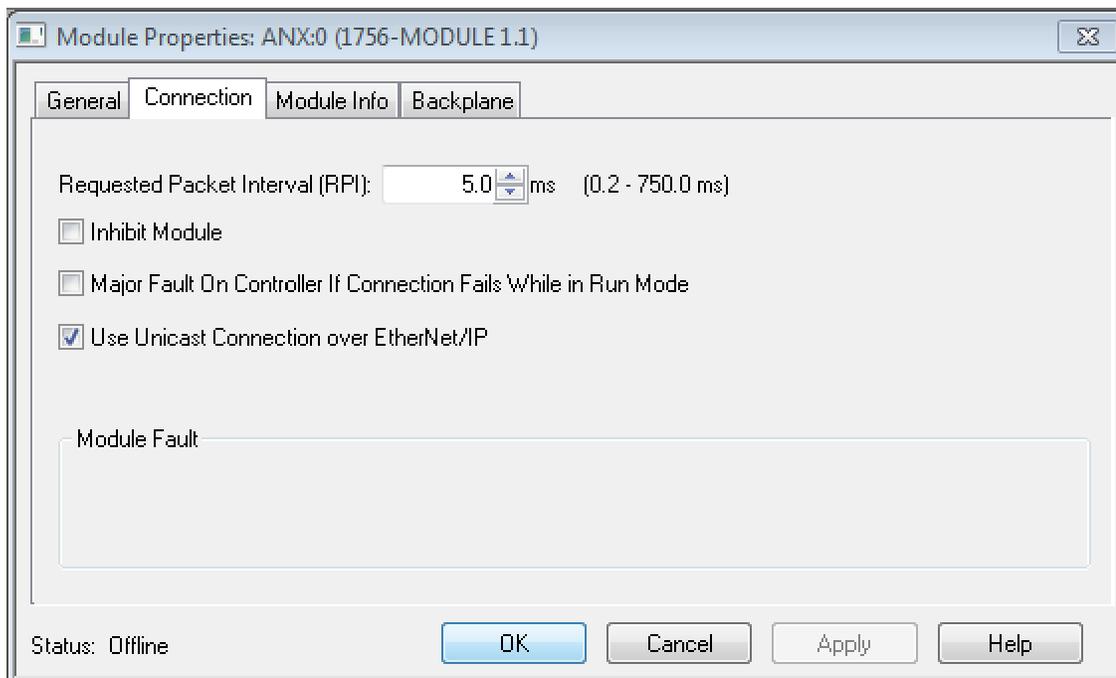
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Set the parameters as shown. Set the Slot to 0 for the first connection, 1 for the second connection, and so on.

4. Set the RPI for each connection.



ControlLogix Aliases

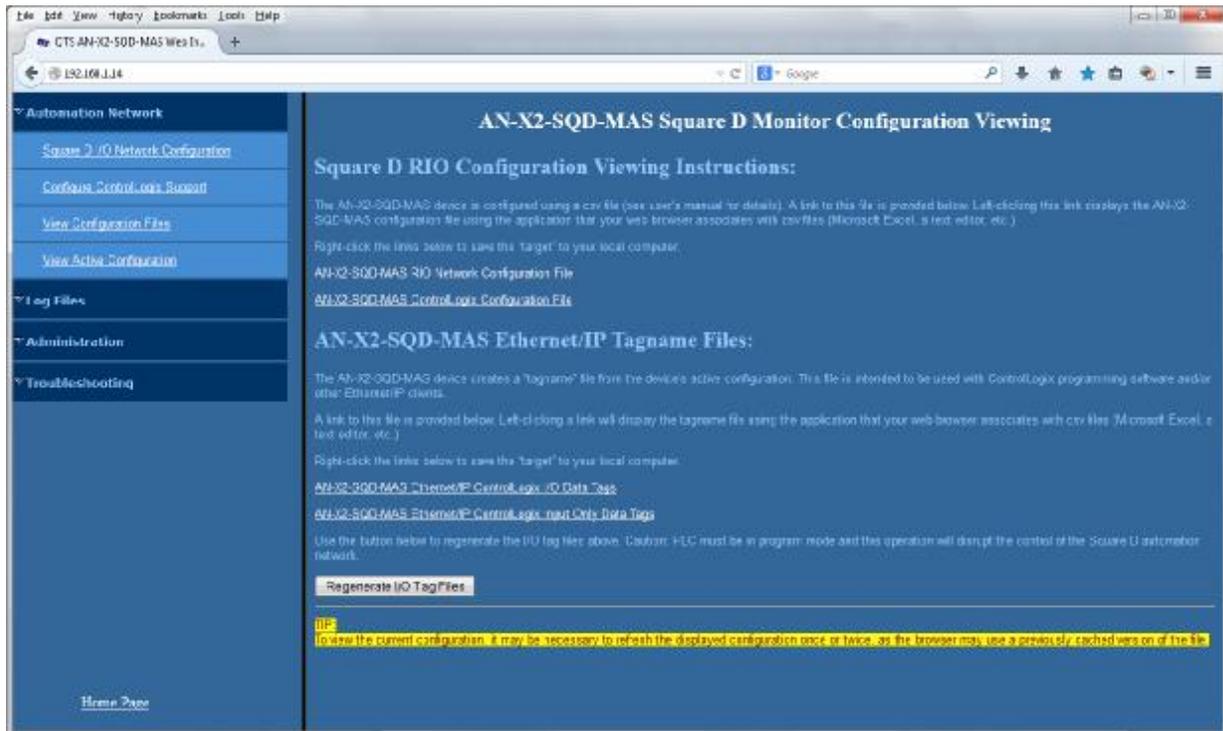
AN-X uses the Ethernet/IP configuration to create aliases that can be imported into RSLogix 5000. Use these alias tags in your RSLogix 5000 program to access the data on the AN-X.

There are two sets of alias files, one for exclusive owner connections and one for listen only connections.

In the web interface, select *Automation Network/View Configuration Files*.

To view the files, click either *AN-X2-SQD-MAS Ethernet/IP ControlLogix I/O Data Tags* or *AN-X2-SQD-MAS Ethernet/IP ControlLogix Input Only Data Tags*.

To save the file to your computer, right click on the link and select *Save Target As...*



Importing Tags in RSLogix 5000

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

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 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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Using the Web Interface

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

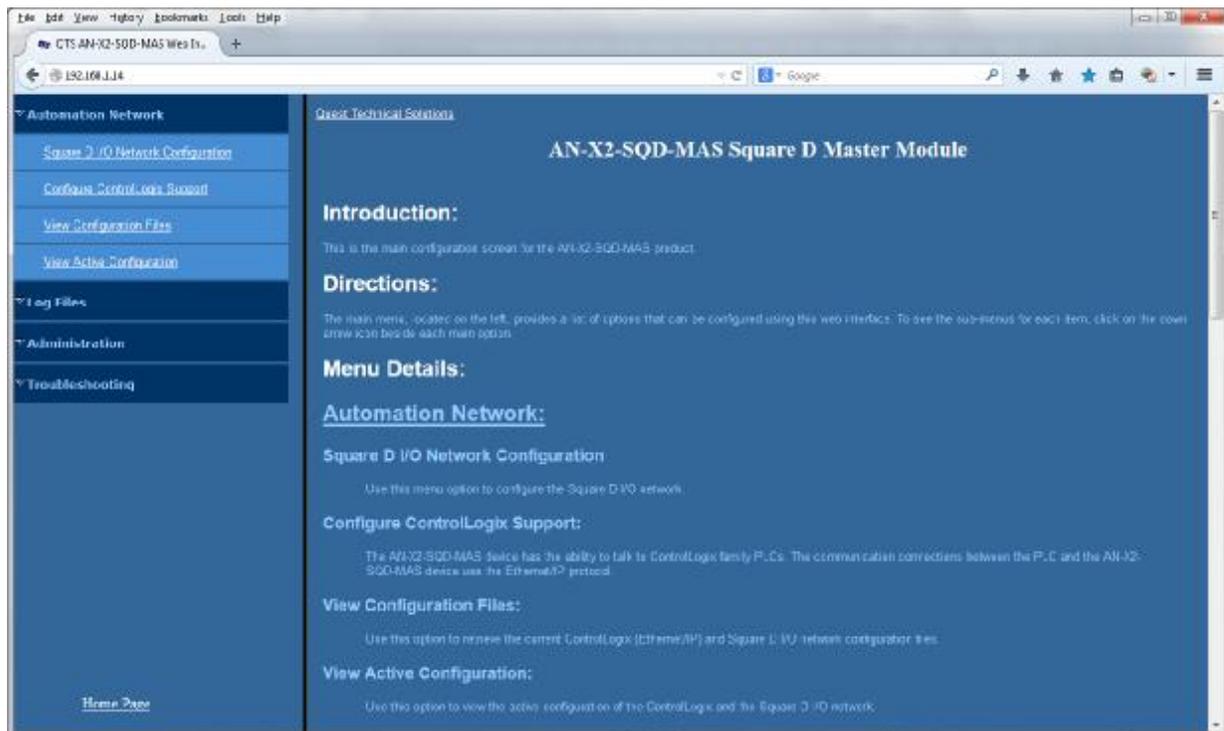
The AN-X module contains a webserver capable of communicating with standard web browsers such as Internet Explorer.

Use the web interface to:

- set the Remote I/O network configuration
- set the ControlLogix scheduled data configuration
- view the current configuration
- 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.

TIP

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

Run the browser in the mode where it doesn't cache data (incognito in



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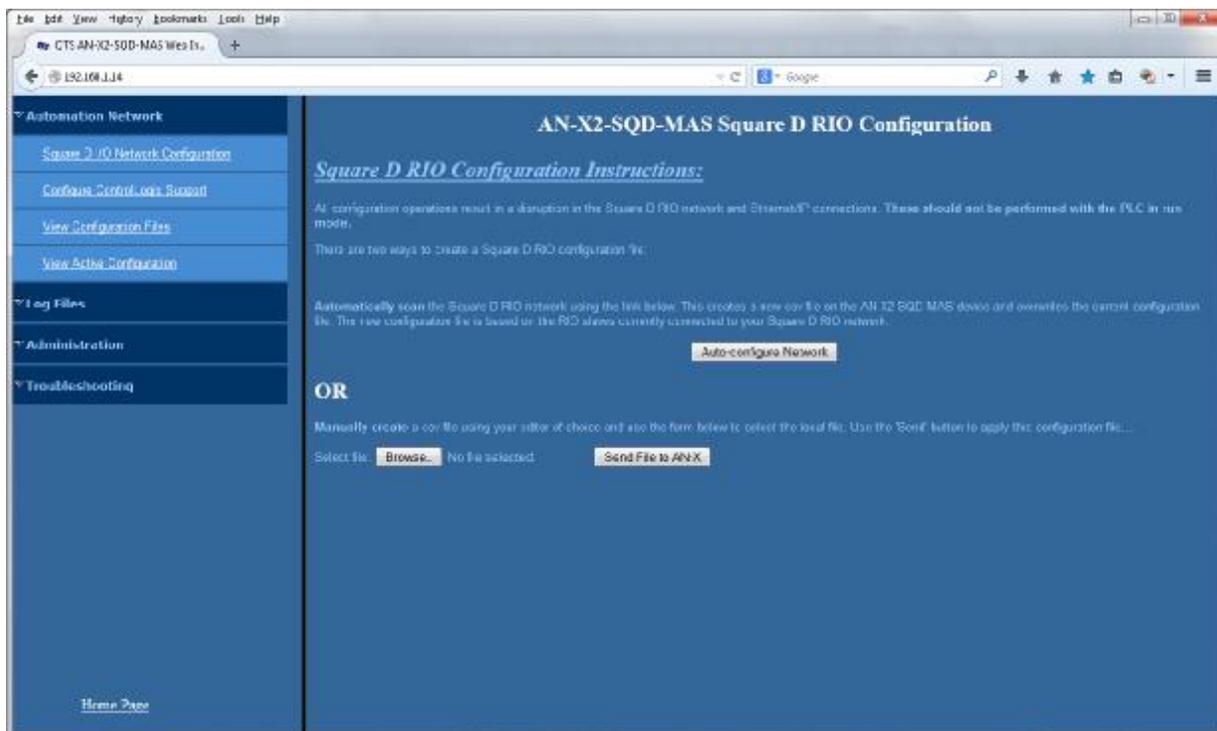


Chrome, Private browsing in Firefox and Safari, etc.)

Automation Network

Remote Network

Select *Automation Network/Remote I/O Network Configuration* to configure the I/O the AN-X2-SQD-MAS is to scan.



Autoconfiguration

To autoconfigure, first connect the Remote network to the AN-X2-SQD-MAS.

To configure just the I/O, check *Auto-configure Remote network*.

Autoconfiguration also generates a ControlLogix configuration on the AN-X.

Manual Configuration

Manual configuration does not require that the network be online.

Create a configuration file. Refer to page 19 for details on the file format.

Browse the file name and click the *Send File to AN-X* button.



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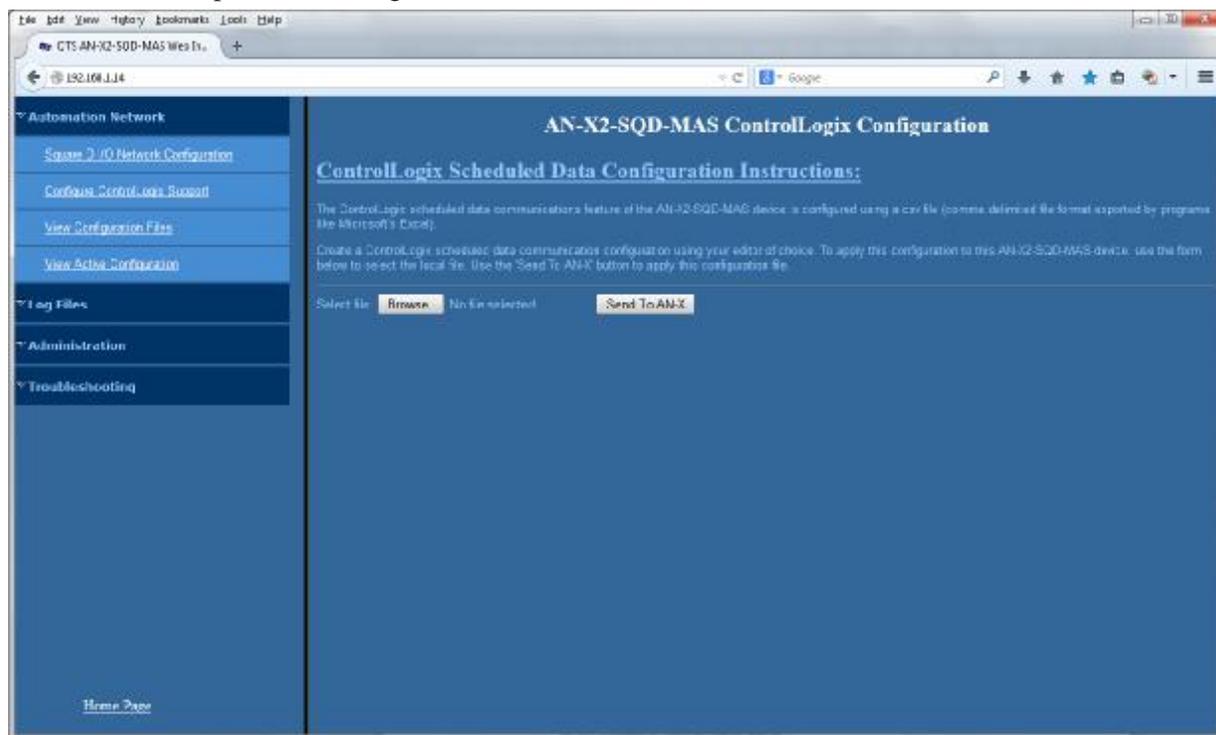
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Configure ControlLogix Support

AN-X exchanges scheduled data with a ControlLogix processor over Ethernet. Refer to section Exchanging Scheduled Data with a ControlLogix on page 19 for information on configuring scheduled data exchange.

Select *Automation Network/Configure ControlLogix Support* in the web interface to upload the configuration.



Type or browse the configuration file name into the *Select file:* area. Then click the *Send To AN-X* button to send the file to AN-X.

Check the ControlLogix Log to determine if there have been any errors with the upload.

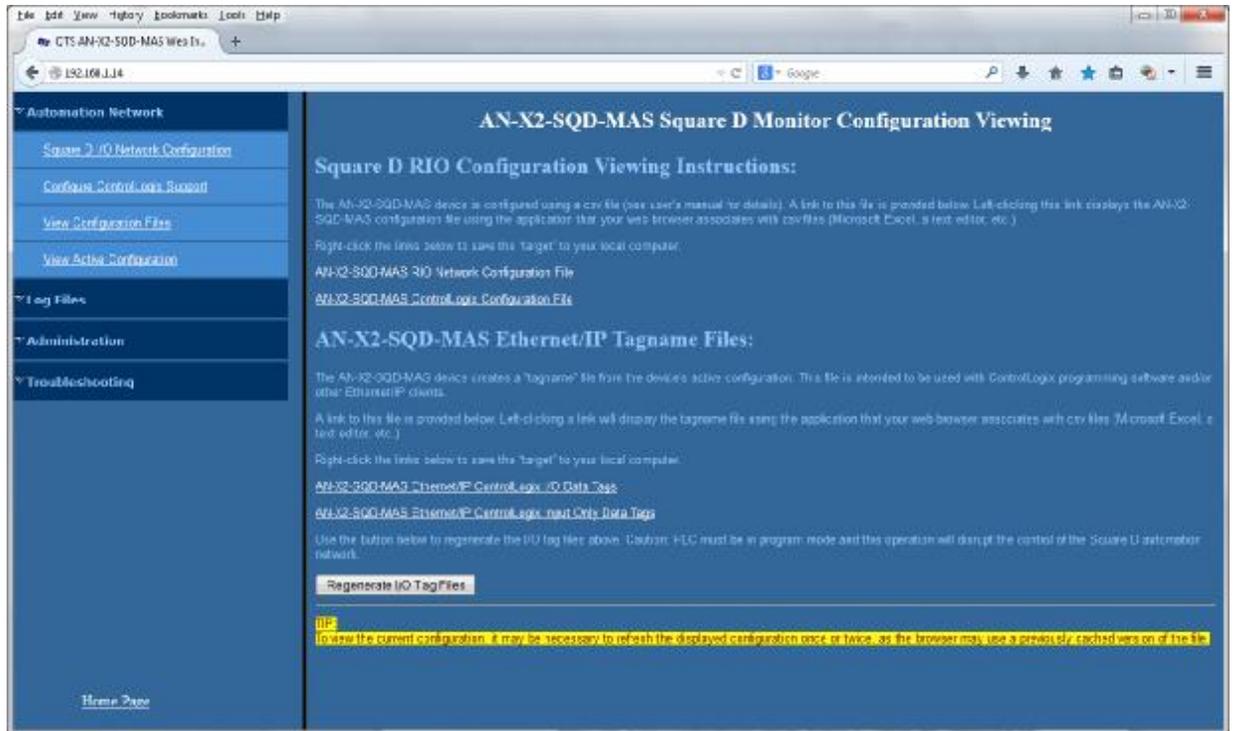
View Configuration Files

Select *View Configuration Files* to view the Remote and ControlLogix configuration files.



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Click on the links to view the files.

Right click on the links to retrieve the files from AN-X and store them on your computer.

View Active Configuration

Select *View Active Configuration* to view the Remote or ControlLogix configuration file in the web browser.

Click the *Square D RIO network* link to view the current Remote I/O network configuration.



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The screenshot shows a web browser window displaying the 'AN-X2-SQD-MAS Active Configuration Log'. The browser address bar shows '192.168.1.14'. The page title is 'AN-X2-SQD-MAS Active Configuration Log'. Below the title, there is a description: 'This page displays the active configuration for the Square D PLC network and the Ethernet/IP (ControlLogix) server'. The main content area contains two sections of configuration logs.

The first section is titled 'AN-X-SQD-MAS Network AutoConfig' and shows the following output:

```
AN-X-SQD-MAS Network AutoConfig
.....SQD Successful
AN-X-SQD-MAS T/O Network Config File: /mnt/www/AnxSqdlasTnCfg.net
.....Parse Successful
```

The second section is titled 'AN-X-SQD-MAS ControlLogix Config File: /mnt/www/AnxSqdlasEthnCfgServer.cav' and shows the following output:

```
1: ClixName: Anx2Sqdlas
6: ClixPrefix: SQD
8: ClixModeDebug
10: ClixSlot: 0
12: DataInput
14: U 1 DIOPTI
16: DataOutput
ClixSlot 0 Min Inp Lens 2
ClixSlot 1K Min Inp Lens 1
ClixSlot 15 Min Inp Lens 198
.....Parse Successful
```

The left sidebar contains the following navigation links: Automation Network, Square D I/O Network Configuration, Configure ControlLogix Support, View Configuration Files, View Active Configuration, Log Files, Administration, and Troubleshooting. A 'Home Page' link is located at the bottom of the sidebar.

Click the *Ethernet/IP* link to view the current ControlLogix configuration.



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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.

Ethernet/IP Log

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

System Info Log

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

View All Logs

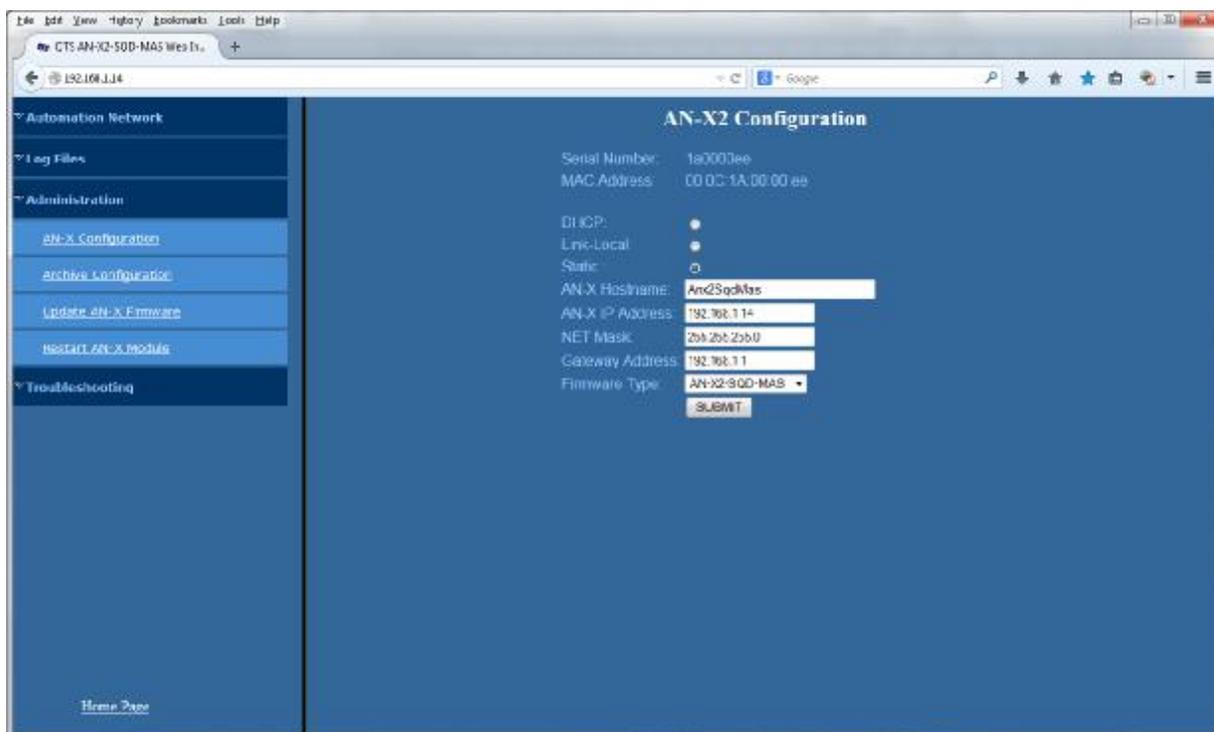
Use *View All Logs* to list and view all the AN-X logs. To view a log file, click on the file name.

Administration Menu

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

AN-X Configuration

Use *AN-X Configuration* to set the AN-X Ethernet properties and to select the firmware the AN-X is to run.



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The top of the screen shows the serial number and MAC Address of the AN-X2 being configured.

Check either DHCP or Static.

DHCP

If the AN-X2 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-X2 does not find a DHCP server, it reverts to the default link local address 169.254.42.84 and repeatedly flashes the SYS (or 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-X2. 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.

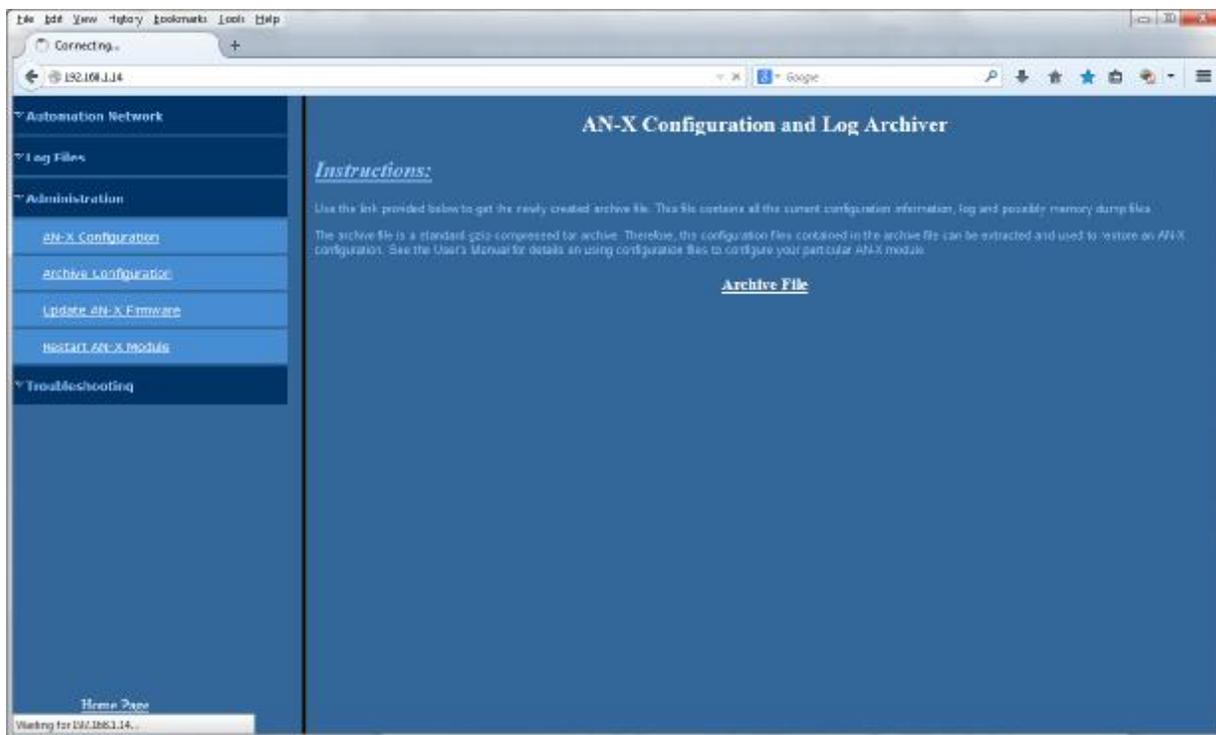
Archive Configuration

Use *Archive Configuration* to create an archive that contains the current AN-X configuration and logs, for use by technical support.



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Click the *Archive File* link and enter a filename and location.

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-X2 have names that begin with AN-X2 and have extension *.qtf.

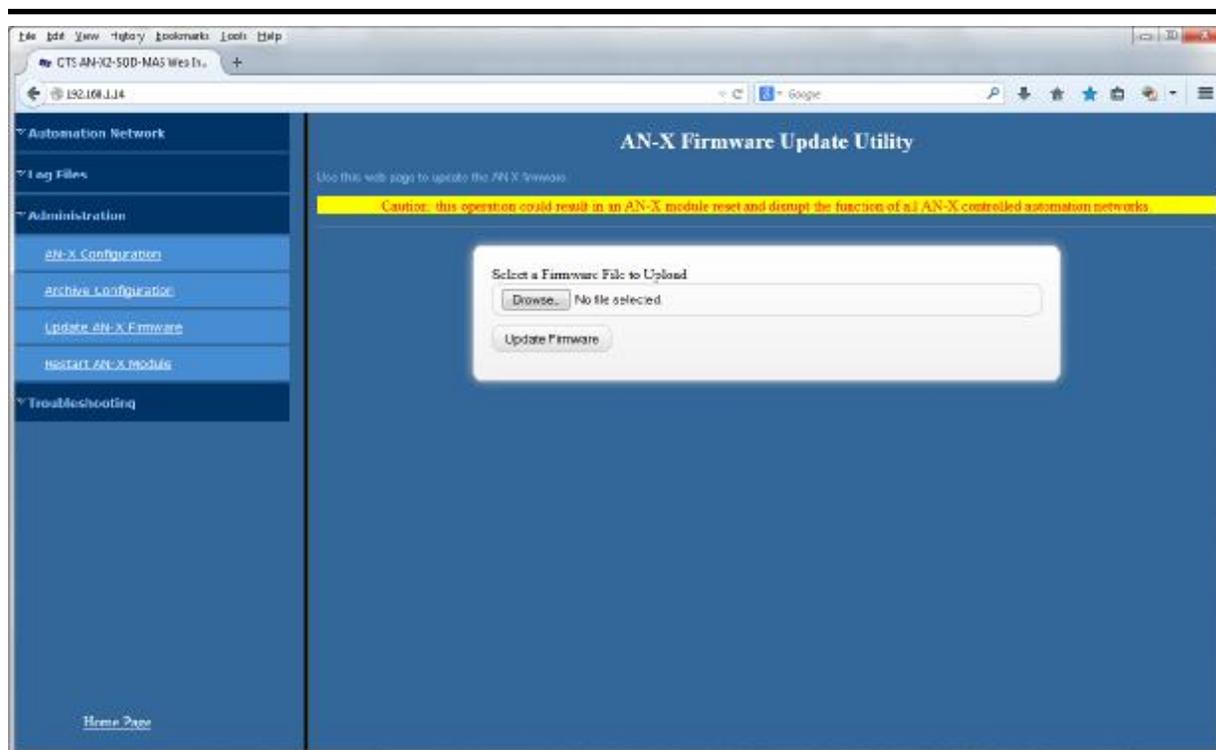
WARNING!

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



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

WARNING!

It is essential that you do not disrupt power while downloading firmware, especially maintenance firmware, to the AN-X2 or while the AN-X2 is restarting following a firmware download.

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.

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.

Restart the AN-X in order to run the downloaded firmware.

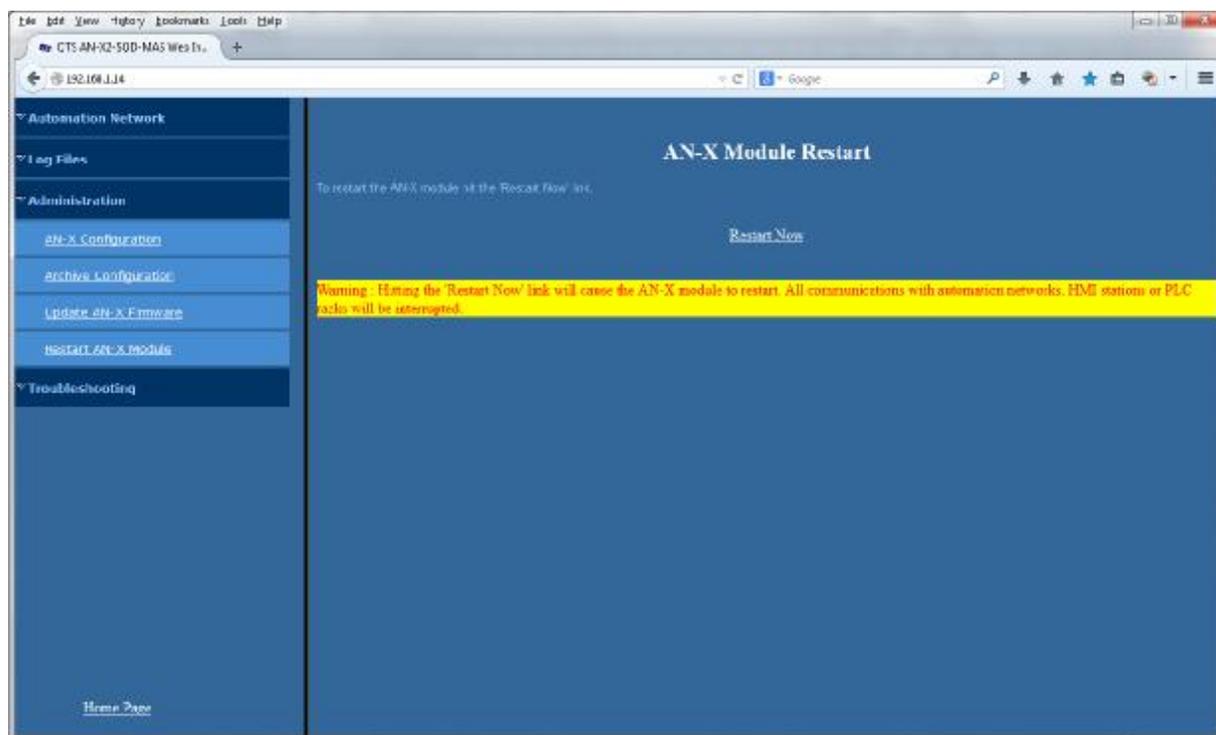
Restart AN-X Module

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



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Click the *Restart Now* link to restart the AN-X.

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-SQD-MAS has LEDs that indicate the state of the Ethernet connection, the overall module state and the connection to the Remote I/O network.

Ethernet LEDs

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

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

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

If the AN-X2 is not connected to Ethernet, the 10/100 LED is on.

MS and NS LEDs: Startup

The SYS or MS 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 or MS 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 (or MS) LED State	Possible cause
Red 3	DHCP configuration failed
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
Flashing red/green	Unscheduled messaging, addressing or connection problem
Flashing red/off	Configuration file problem



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“Railroading” – SYS (or MS) and NET (or NS) LEDs

AN-X alternates (railroads) flashing the SYS (or MS) and NET (or 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.

MS and NS LEDs: Runtime

IMPORTANT!

There are two possible runtime LED modes.

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

Debug mode provides more information about the state of the remote I/O network.

To set debug mode, enter a line with the keyword LedModeDebug in the ControlLogix configuration file.

When you autoconfigure the AN-X, it sets debug mode in the file it creates.

IMPORTANT!

The AN-X enters debug mode only if the ControlLogix configuration succeeds.

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
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



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Debug Mode

SYS or MS LED

The SYS or MS 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 or MS LED should be used in conjunction with the logs to locate the cause of problems.

NET or NS LED – Network Status

The NET (or NS) LED shows the status of Remote I/O communication.

Color	Meaning
Flashing or solid red	One or more configured Remote drops is not active on the network Network error (CRC, stop, abort, etc.)
Yellow	No configured Remote I/O and no Remote network activity
Green	All configured blocks are active on the Remote I/O network
Off	The AN-X2-SQD-MAS scans the network only when the ControlLogix is in run mode

Fatal Errors

AN-X2 monitors its operation for “impossible” conditions and generates a fatal error if it detects one. It generates a fatal error code on the SYS (or 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 SYS Or MS) LED sequence and contact technical support.



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Updating the Firmware

The AN-X2 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-X2 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-X2 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-X2 or while the AN-X2 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-X2 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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Specifications

Parameter	Specification
Function	Bridge between Ethernet and Remote network
Typical Power Consumption	225 mA @ 12 VDC or 110 mA @ 24 VDC
Maximum Power dissipation	2.7W
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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Support

How to Contact Us: Sales and Support

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Languages Spoken: Chinese, English

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Languages Spoken: Portuguese, English

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Latin America (Spanish Speaking Countries)

Languages Spoken: Spanish, English

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Warranty

Quest Technical Solutions warrants its products to be free from defects in workmanship or material under normal use and service for three years after date of shipment. Quest Technical Solutions will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by Quest Technical Solutions personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without Quest Technical Solutions approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables nor to any damage resulting from battery leakage.

In all cases Quest Technical Solutions' responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this Warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above Quest Technical Solutions disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of Quest Technical Solutions for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the Product.



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