

AN-X-ABCAPT

**Data Highway Plus and
Remote I/O**

Capture 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-ABCAPT

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AN-X-ABCAPT Module Overview

The AN-X-ABCAPT capture module captures frames from an Allen-Bradley Data Highway Plus or 1771 remote I/O network. The Windows utility supplied transfers the network frames captured by AN-X to a computer over Ethernet.

The module passively monitors network traffic and captures all network frames, with timestamps to microsecond precision. It does not occupy a node on the network or affect network traffic in any way.

You can choose to store network frames to one continuous file, or you can have AN-X act as a ring buffer, storing only the data for the previous user-specified number of minutes.

Post-capture filtering lets you select specific frames to store to a text file, based on the criteria you supply.

Filtered network data can be viewed with any text editor.

The module firmware can be updated over Ethernet using the Windows utility supplied. Refer to page 51 for details.

Hardware Features



The module has:

- LEDs to indicate the status of the connection to the Ethernet, its own internal state, and the state of the connection to the network
- an Ethernet connector
- a Phoenix Combicon connector to connect to the network
- a power connector

Package Contents

- AN-X-ABCAPT module
- CD containing software and documentation

Other Requirements

To transfer data over Ethernet requires:

- 100 Mbit/second Ethernet network and hardware
- Ethernet network should use switches, not hubs

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.

Installation

Prevent Electrostatic Discharge

The module is sensitive to electrostatic discharge.

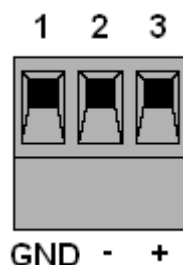
Electrostatic discharge can damage integrated circuits or semiconductors. Follow these guidelines when you handle the module:

WARNING!

- 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 internally is 300 mA @ 12VDC or 150 mA @ 24VDC.

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

Cabling and Termination

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

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

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



Ethernet Cabling

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

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

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

Reference

For information about Data Highway Plus protocol, refer to Allen-Bradley publication "DF1 Protocol and Command Set", publication number 1770-6.5.16, October 1996.

Quick Start

Use the following steps to start capturing:

| Step | | Page |
|------|---|------|
| 1 | Install AN-X software | 5 |
| 2 | Connect AN-X to Ethernet | 5 |
| 3 | Run AnxInit and set the IP address | 7 |
| 4 | Connect AN-X to Data Highway Plus or remote I/O | 4 |
| 5 | Run AnxAbCapt | 17 |
| 6 | Select Acquire to capture frames | 17 |
| 7 | Dump the frames to a test file to view them | 19 |

Basic Configuration

The AN-X-ABCAPT module captures frames from an Allen-Bradley Data Highway Plus or 1771 remote I/O network and transfers them to a computer over Ethernet.

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

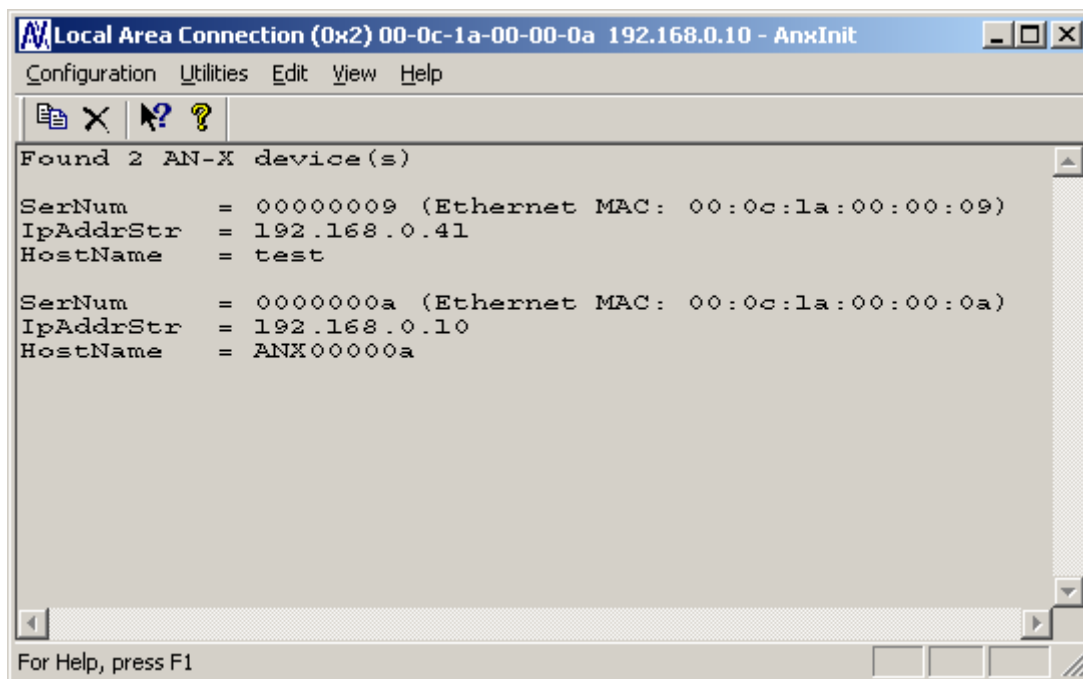
No configuration is required on the Allen-Bradley network.

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 want to 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.



```
Local Area Connection (0x2) 00-0c-1a-00-00-0a 192.168.0.10 - AnxInit
Configuration Utilities Edit View Help
Found 2 AN-X device(s)
SerNum      = 00000009 (Ethernet MAC: 00:0c:1a:00:00:09)
IpAddrStr   = 192.168.0.41
HostName    = test
SerNum      = 0000000a (Ethernet MAC: 00:0c:1a:00:00:0a)
IpAddrStr   = 192.168.0.10
HostName    = ANX00000a
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 three times followed by a pause.

IMPORTANT!

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

If you are using multiple AN-X modules, configure 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 information about how you should configure AN-X and to obtain a static IP address for AN-X.

IMPORTANT!

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

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

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-00-00-09

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

192 . 168 . 0 . 9

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.

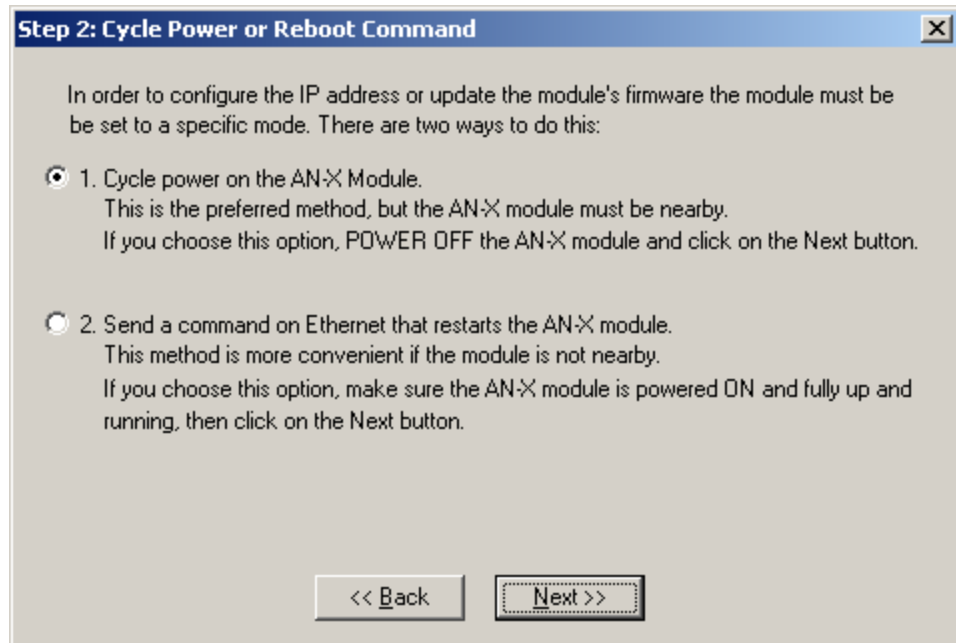
2. Enter the MAC address of the AN-X you are configuring. This is printed on the AN-X label. It consists of six pairs of hexadecimal digits, separated by hyphens. In the example above, it's 00-0c-1a-00-00-09.

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.

Step 2

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

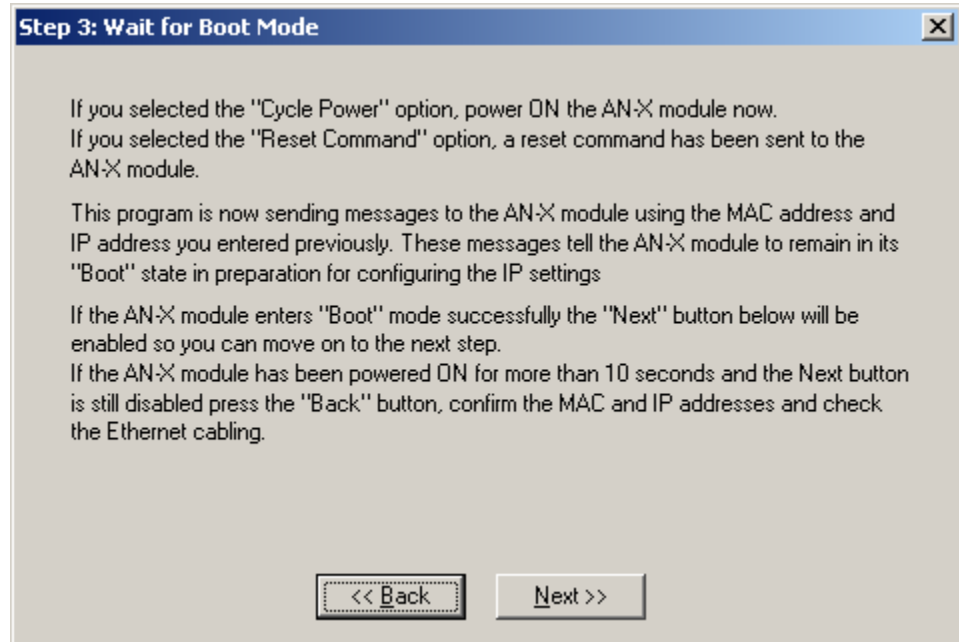


The preferred method is to cycle power on the AN-X. Select the first option on the screen and click the *Next >>* button.

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.

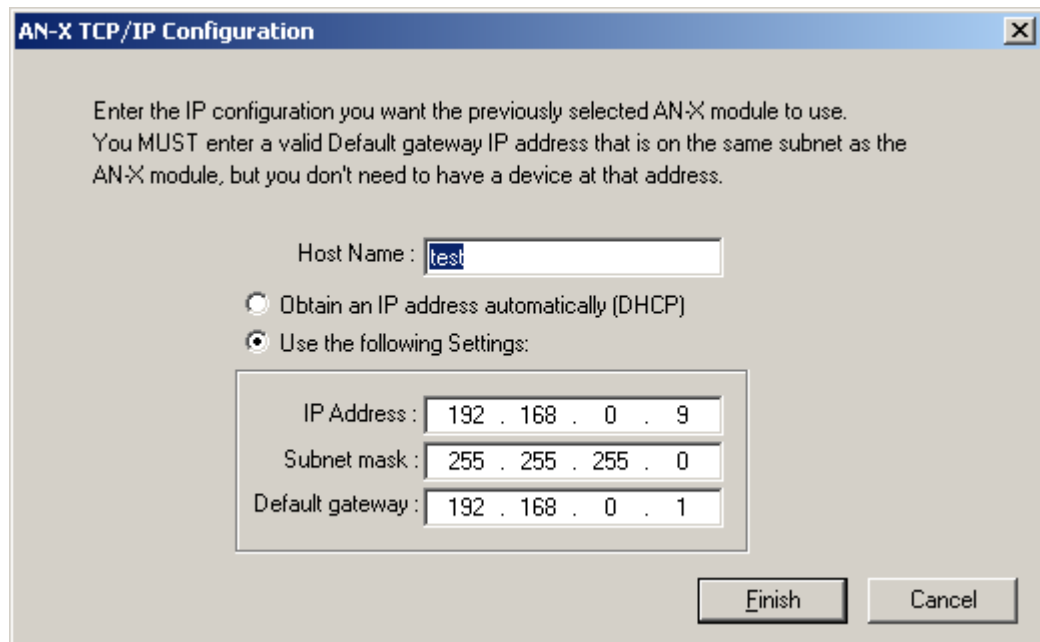
Step 3:

Wait for AN-X to enter boot mode. While AnxInit is waiting, the *Next>>* button will be disabled. When AN-X is in boot mode, the *Next>>* button will be 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. 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 desired IP address for the AN-X.
- the Subnet mask 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.

Click OK to complete the configuration.

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

Example: Standalone Computer

A typical example is a laptop computer capturing network frames and connecting directly to an AN-X.

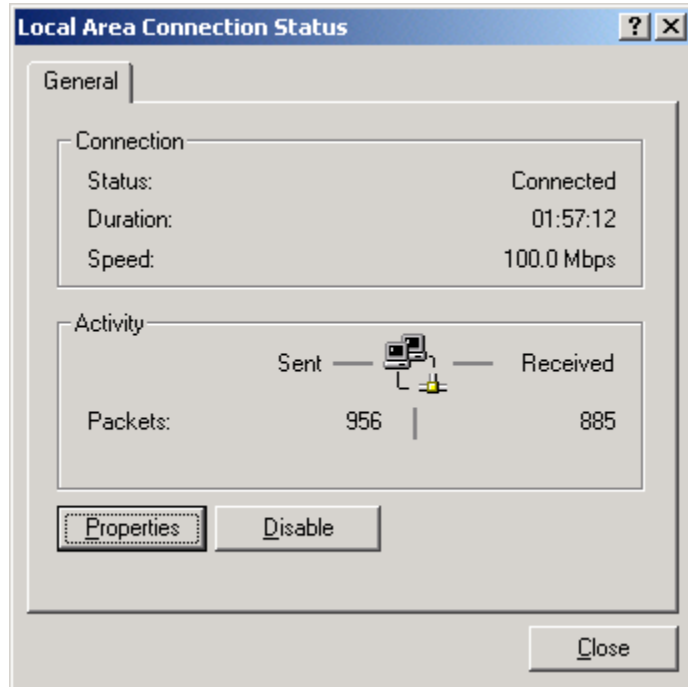
Since you are connecting directly from the computer to AN-X, use a crossover Ethernet cable.

The following instructions assume Windows 2000. The procedure for Windows NT and Windows XP is very similar. They also assume that an Ethernet network card has been installed in the computer and that AnxInit has been installed on the computer.

TIP

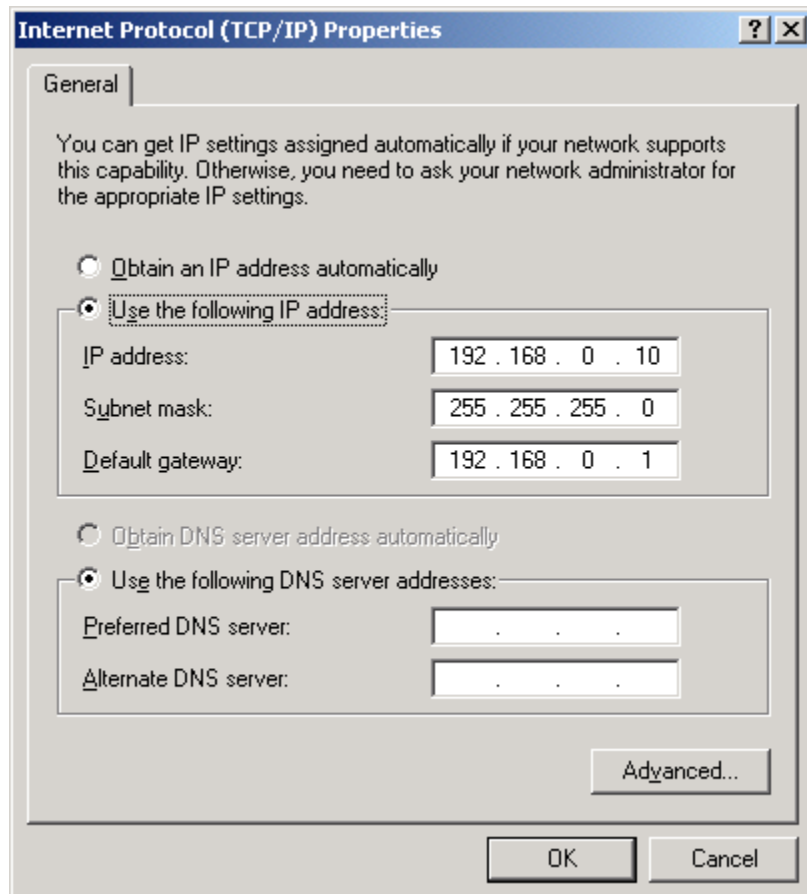
The parameters in this example will work when you set up any standalone computer to work with AN-X.

First configure the computer to use a static IP address. From the Start menu, select *Start/Settings/Network and Dialup Connections*. Double click on *Local Area Connection*.



Click the *Properties* button.

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



In this example, we will assign the computer an IP address of 192.168.0.10

Set the Subnet mask to 255.255.255.0 (standard mask for the Class C network address of 192.168.0.x).

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).

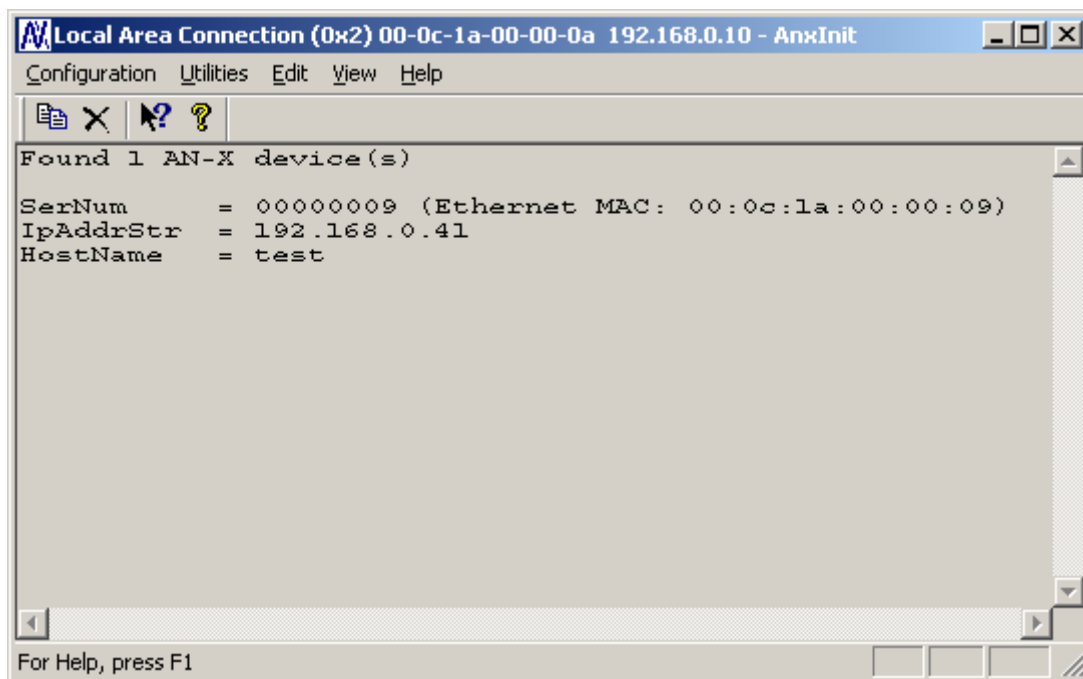
Click OK to accept the settings

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 will flash the SYS LED red three times followed by a pause repeatedly.

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



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

Set Ethernet & IP Address

Adapter : Local Area Connection

Ethernet MAC Address : 00-0c-1a-00-00-09

IP Address : 192 . 168 . 0 . 41

OK Cancel

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 : test

Obtain an IP address automatically (DHCP)

Use the following Settings:

IP Address : 192 . 168 . 0 . 20

Subnet mask : 255 . 255 . 255 . 0

Default gateway : 192 . 168 . 0 . 1

Finish Cancel

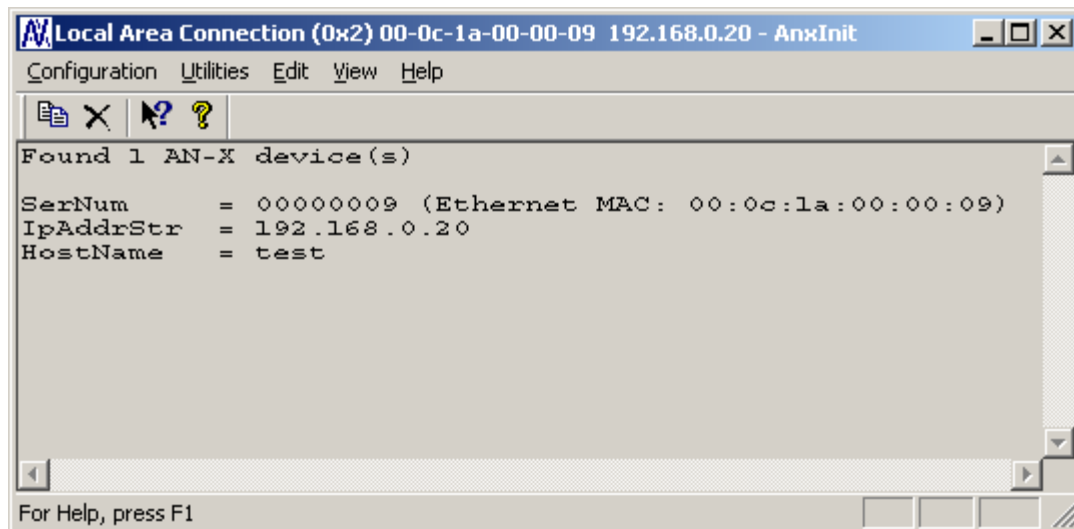
Enter an IP Address. In this case we chose 192.168.0.20

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.

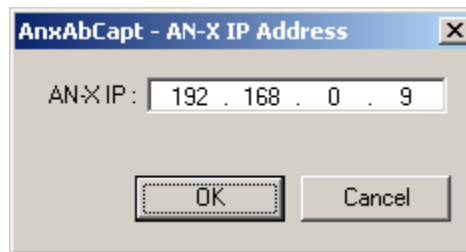
Capturing and Displaying Network Data

Use the Windows AnxAbCapt utility to capture network frames, transfer them from the AN-X to the computer, store them to hard disk, and view them.

Setting the AN-X IP Address

Select *Config/Set AN-X IP Address*.

AnxAbCapt displays the AN-X-IP Address dialog.



Enter the IP address of the AN-X module that you wish to use to capture Allen-Bradley network data.

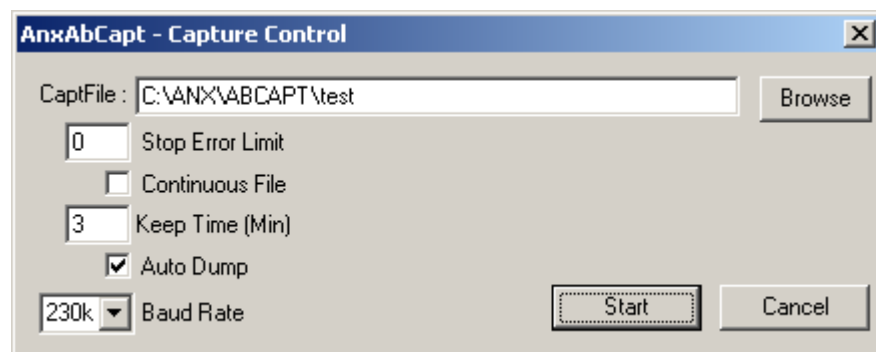
Refer to page 7 for information on setting the AN-X IP address.

Capturing Network Frames

Select *Capture/Acquire* or click on the Capture button.



AnxAbCapt displays the Capture Control dialog.



Type or browse in the capture file (*CaptFile*) name.

Enter a value for the *Stop Error Limit*. The stop error limit is the number of network errors that can occur in the current file before the capture stops automatically. A value of 1 means that the capture stops on the

first error. The default value of 0 causes the capture to continue if there are network errors. If you are using the ring buffer method of capture, and the error limit is not 0, the error count is reset to 0 each time a new file is opened.

TIP

You can use the Stop Error Limit to trap a transient or rarely occurring error. Uncheck *Continuous File*, set the *Keep Time* to 2 minutes and set the *Stop Error Limit* to 1. The capture will capture network frames until the first error occurs, then stop.

You can also use the Stop Error limit to capture bursts of errors. Set the Stop Error Limit to the threshold value, for example 5 or 10, and run the capture as in the previous example.

If you check *Continuous File*, the network data is stored in one continuous file.

If *Continuous File* is unchecked, AnxAbCapt acts as a ring buffer, creating new files and deleting old ones. It creates a new file for each minute the capture is running, naming the file based on the name you supply and the current time. For example, if you supply the name Test and the current time is 14:53 (2:53 P.M.), it starts storing data in a file called Test.1453.AbCapt. The next file is called Test.1454.AbCapt, and so on.

TIP

For captures over long periods of time, use ring buffer mode. Continuous capture is better suited for short captures. If you use continuous capture and the computer is turned off or anything goes wrong, all captured data could be lost. Using ring buffer mode, if the computer is turned off, only data for the last minute could be lost.

If *Continuous File* is unchecked, you must enter a value for *Keep Time (min)*. The keep time is the number of minutes of data that will be stored. The default is 2. As it creates each new file, it deletes the file older than the keep time. The value of Keep Time can range from 2 to 1439 minutes.

TIP

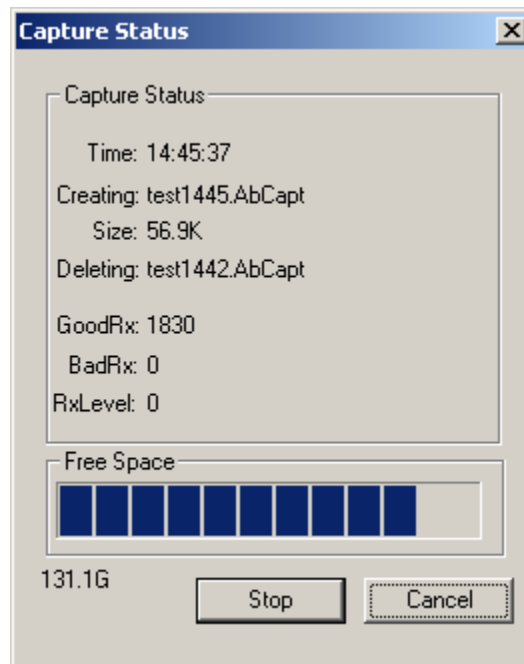
If you want to preserve a capture file, move it to another directory, since otherwise a later capture could inadvertently delete it.

If *Auto Dump* is checked, AnxAbCapt automatically executes a *Capture/Dump* command when the capture ends.

Select the *Baud Rate* to match the network baud rate.

Click *Start* to begin capturing network frames.

AnxAbCapt displays the *Capture Status* dialog box.



It shows the current time, the file currently being used to store the capture data, the file size, the file being deleted (ring buffer mode only), the number of good frames received, and the number of bad frames received.

GoodRx is the number of frames with good status that have been captured.

BadRx is the number of frames with bad status (CRC error, abort, overrun, or noise) that have been captured in the current file. If you are using the ring buffer method of capture and the stop error limit is non-zero, BadRx is reset each time a new file opens.

The Free Space progress bar shows the amount of free space remaining on the disk drive.

To stop the capture, click *Stop*.

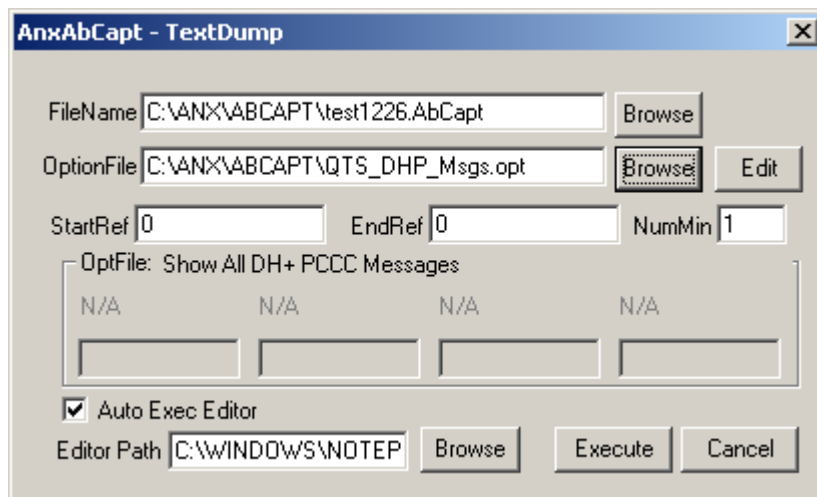
To cancel the capture, click *Cancel*. This stops the capture but does not delete any captured data files. If AutoDump was checked, the Dump command is not executed.

Selecting Frames of Interest

Select *Capture/Dump* or click the *Dump to Text* button.



AnxAbCapt displays the TextDump dialog.



Browse or type the capture file name into the *FileName* box.

AnxAbCapt appends the option file name to the name you supply, and then appends the extension “.txt”. For example, if the capture file is Test1413.AbCapt and the option file is QTS_DHP_All.opt, the text file created is Test1413_QTS_DHP_All.txt

Browse or type the Option File name into the *OptionFile* box. Option files control which frames are selected from the capture file, and the format they are saved in. To display all messages, select either the QTS_DHP_All.opt or QTS_ABRIIO_All option file. For detailed information on option files, refer to page 21.

Click *Edit* to edit the option file. If you make changes to the option file, you may need to browse it in again in order for the changes to take effect.

If you want to select just a portion of the file, enter starting (*StartRef*) and ending (*EndRef*) reference numbers. Leave both as 0 if you want to include all the network frames. Normally you locate the event of interest, then use the starting and ending reference numbers to display frames around that event.

If you obtained the capture using the ring buffer method, *NumMin* determines the number of consecutive capture files from which frames are to be extracted. If the capture was obtained using the continuous file method, set *NumMin* to 1.

After AnxAbCapt stores the selected frames to a text file, you can have it automatically open the file in your text editor. Check *Auto Exec Editor* and browse or type the path to the editor in the *Editor Path* box.

Click *Execute* to dump the selected frames to the text file.

Option Files

Option files are used to define which frames are extracted from captured data. Option files consist of various option lines that control which frames are selected.

Comments

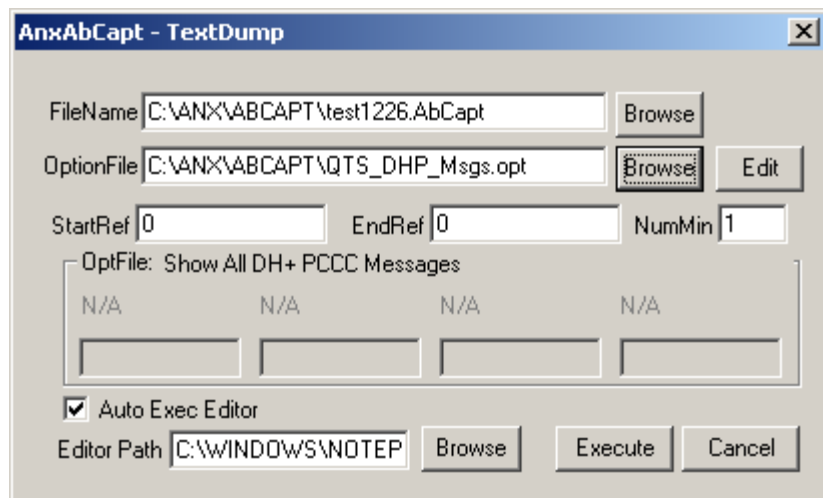
Lines beginning with a semicolon are comments and are ignored.

Description

Use the Descrip= option line to display a description in AnxAmsCapt. “Descrip=” is followed by the text to be displayed. For example,

Descrip=Show All DH+ PCCC Messages

causes the description to appear as shown:



The description can be up to 55 characters long.

Reference Numbers

Each frame has an associated reference number, which can be used to uniquely identify that frame.

To suppress the inclusion of reference numbers, include the NoRef option line.

Example:

NoRef

Frames with Bad Status

Frames with bad status are shown with an asterisk before the frame data. For example,

```
2298: a 2.444,042 *010< 01^ 003> 077-
```

To suppress the selection of frames with bad status, include the NoBad option line.

However, if frames are very badly formed, they are automatically displayed, whether they are selected by the contents of the option file or not, along with some indication of the cause of the problem. For example,

```
2310: a 2.586,106 ..a.FrmLen?(0)
```

See also Detailed Status on page 25.

Timestamps

The TmeAbs option line sets the format of the frame timestamp. It specifies the units used to display the timestamp. Possible values are:

hr – hours

mn – minutes

sc – seconds

ms – milliseconds

us – microseconds

Any character after the unit is displayed. For example, hr:mn causes the time to be displayed as 12:37, with a colon between the hours and the minutes.

Example:

```
TimeAbs hr:mn:sc.ms,us
```

The frame timestamp can be identified by a leading ‘a’ in the captured data. For example, in this frame, the timestamp is 0.016493 ms.

```
17: a 0.016,493 003< 05^ 077> 00 4f 00 2a e4 21 70
```

Two other times can be displayed using the same format.

The TimeGap option line displays the gap time, which is the time from the end of the previous frame to the start of the current frame.

Example:

```
TimeGap ms.us
```

The gap time can be identified by a leading ‘g’ in the capture. For example, in this frame, the gap time is 0.259 ms.

```
17: a 0.016,493 g 0.259 003< 05^ 077> 00 4f 00 2a e4 21 70
```

The TmeDelta option line displays the delta time, which is the time from the start of the previous frame selected by the option file contents to the start of the current frame.

Example:

```
TmeDelta ms.us
```

The delta time can be identified by a leading 'd' in the capture. For example, in this frame, the delta time is 16.493 ms.

```
17: a 0.016,493 d 16.493 003< 05^ 077> 00 4f 00 2a e4 21 70
```

Text Graphs

The gap time and the delta time can be displayed as a text graph in the frame data.

The GrphGap option line sets the format of the gap time graph. The parameters are the full scale width, in characters, and the full scale time, using the time units described previously. Times are shown graphically using period '.' characters.

Example: The following option line reserves 20 character spaces, corresponding to a full scale of 5 ms

```
GrphGap 20 5ms
```

The gap time graph can be identified by a leading 'g'. The end of the graph can be identified by a '|' character.

Example of a gap graph, showing the gap times and gap graph, produced using GrphGap 20,500us

```

17: a 0.016,493 g 0.259 g..... |
50: a 0.045,934 g 0.343 g..... |
71: a 0.063,245 g 0.258 g..... |
74: a 0.065,208 g 0.343 g..... |
93: a 0.082,147 g 0.258 g..... |
114: a 0.101,840 g 0.343 g..... |
136: a 0.120,437 g 0.258 g..... |
139: a 0.123,945 g 0.343 g..... |
152: a 0.135,937 g 0.258 g..... |
167: a 0.148,250 g 0.343 g..... |
186: a 0.165,137 g 0.258 g..... |
192: a 0.170,346 g 0.352 g..... |
208: a 0.184,567 g 0.258 g..... |
214: a 0.189,820 g 0.356 g..... |

```

```

239: a 0.212,489 g 0.258 g..... |
254: a 0.225,811 g 0.352 g..... |
270: a 0.239,032 g 0.257 g..... |

```

If the gap time graph overflows the given scale, the beginning and end of the graph are shown as asterisks, for example,

```

17: a 0.016,493 g 0.259 g* *

```

The GrphDelta option line sets the format of the delta time graph. The parameters are the full scale width, in characters, and the full scale time, using the time units described previously. Times are shown graphically using period '.' characters.

Example:

```
GrphDelta 20 30ms
```

The delta time graph can be identified by a leading 'd'. The end of the graph can be identified by a '|' character.

Example of a delta time graph, showing the delta times and delta time graph:

```

17: a 0.016,493 d 16.493 d..... |
50: a 0.045,934 d 29.441 d..... |
71: a 0.063,245 d 17.311 d..... |
74: a 0.065,208 d 2.499 d. |
93: a 0.082,147 d 16.939 d..... |
114: a 0.101,840 d 18.693 d..... |
136: a 0.120,437 d 19.597 d..... |
139: a 0.123,945 d 2.508 d. |
152: a 0.135,937 d 11.528 d..... |
167: a 0.148,250 d 13.313 d..... |
186: a 0.165,137 d 16.887 d..... |
192: a 0.170,346 d 5.209 d... |
208: a 0.184,567 d 14.221 d..... |
214: a 0.189,820 d 5.253 d... |
239: a 0.212,489 d 22.205 d..... |
254: a 0.225,811 d 13.322 d..... |
270: a 0.239,032 d 14.221 d..... |
285: a 0.252,651 d 12.619 d..... |
303: a 0.267,391 d 15.276 d..... |

```

```

306: a 0.270,885 d 2.494 d. |
325: a 0.286,807 d 16.922 d..... |
331: a 0.292,052 d 5.245 d... |
347: a 0.306,233 d 14.181 d..... |
380: a 0.335,133 d 29.436 d..... |

```

If the delta time graph overflows the given scale, the beginning and end of the graph are shown as asterisks, for example,

```
50: a 0.045,934 d 29.441 d* *
```

Frame Data

Detailed Status

If the DetailSts option line is present, detailed status information is displayed for each frame.

Immediately before the frame data are four columns, one each for CRC error, noise error, abort error and overrun error. If the column contains a period, there has been no error of the corresponding type in the frame.

Example:

Frame 489 has no errors, frame 493 has an abort error, frame 591 has CRC and noise errors, etc.

```

489: a20.889,655 ...003< 00^ 077>
490: a20.889,310 ...035< 01^ 003> 077-
491: a20.891,792 cn..FrmLen?(3)3f 80 03
492: a20.955,322 ...377< 02^ 077>
493: a21.005,096 ..a.FrmLen?(0)
494: a21.007,800 cn..FrmLen?(2)25 01
495: a21.007,961 .n..FrmLen?(1)fa
496: a21.009,535 ...046< 81^ 003> 003-
497: a21.010,129 ...047< 01^ 003> 003-
498: a21.012,713 ...050< 81^ 003> 003-

```

If DetailedSts is not present, frames with bad status are shown with an asterisk in place of the detailed status information.

CRC

To include the frame CRC, use the ShowCrc option line.

CRCs are shown at the end of the frame, enclosed in square brackets.

Example:

```
17: a 0.016,493 003< 05^ 077> 00 4f 00 2a e4 21 70 [763a]
```

Raw Data

To display frame data in raw format, use the option line command `Rio`. Use this command when capturing from a remote I/O network.

Equations

You can create an equation to control which frames are stored and displayed. The beginning of the equation is marked by the option line `showonly`. The end of the equation is marked by the option line consisting of the '#' character. There can be only one equation in an option file.

Example:

```
showonly
```

```
#
```

Equations consists of keywords, parameters, and constants, connected by operators.

Most keywords are for use with Data Highway Plus only and not for remote I/O.

Keywords

The equation can include the following keywords, which are described in detail below.

| Keyword | Description |
|---------|---|
| FrmSts | Frame status |
| Len | Frame length (included the 3 byte header but not the CRC) |
| Dst | Frame destination |
| Ctl | Frame control |
| Src | Frame source |
| Rem | Remote (offlink) value |
| Cmd | PCCC command |
| Sts | PCCC status |
| Tns | PCCC transaction number |

| Keyword | Description |
|---------------|---|
| Fnc | PCCC function |
| DataByte[ofs] | Data byte at offset 'ofs' into the frame data |
| DataWord[ofs] | Data word at offset 'ofs' into the frame data |
| CmdArg[num] | Passed parameters, see page 32 |
| GapTme | Gap time, see page 22 |

Frame Status, FrmSts

The frame status is the status of the frame itself and should not be confused with the PCCC status (sts).

The frame status can be one of the following:

| Value | Symbolic name | Description |
|-------|---------------|---|
| 0x00 | STSOK | Good status |
| 0x01 | STSCRC | CRC error |
| 0x02 | STSNOISE | Noise error |
| 0x04 | STSABORT | Status abort, frame did not complete |
| 0x80 | STSOVERUN | Overrun error, frame did not terminate properly |

Since multiple bits may be set in STS, mask STS with the bit you wish to examine before you make any comparisons.

Example: The following equation selects frames with CRC errors.

showonly

$(\text{FrmSts} \& \text{STSCRC}) = \text{STSCRC}$

#

Example: The following equation selects all frames with errors.

showonly

$\text{FrmSts} \langle \rangle 0$

#

Frame Length, Len

The frame length, in bytes, includes the three byte header but does not include the CRC bytes.

Example: The following equation selects frames with only a header.

```
showonly
Len <= 3
#
```

Frame Destination, Dst

The first byte of the frame is the destination.

Example: The following equation selects frames with destination 77 octal.

```
showonly
Dst = 0o77
#
```

Frame Control, Ctl

The second byte of the frame is the frame control, Ctl, which identifies the type of frame. Possible values are:

| Value | Symbolic name | Description |
|-------|---------------|------------------|
| 0x00 | CTL_TOK | Token pass frame |
| 0x01 | CTL_SOL | Solicit frame |
| 0x05 | CTL_MSG | Message |
| 0x08 | CTL_ACK | ACK or NAK |

Use the symbolic names in the equation.

Mask off the upper bits of the CTL byte with CTL_MSK (0x0f) before using them in comparisons.

Example: The following equation selects PCCC message frames.

```
showonly
(CTL & CTL_MSK) = CTL_MSG
#
```

Frame Source, Src

The source is the station that sent the message. For example, the following equation selects frames from station 77 octal.

```
showonly
```

Src = 0o77

#

Remote Byte, Rem

If the remote byte is non-zero, the frame is to be sent to a remote ata Highway Plus network using a link such as a Data Highway network.

The following equation selects frames where Rem is non-zero.

showonly

Rem <> 0

#

Frames with Rem non-zero have an additional 11 bytes of routing data between the Rem and Cmd bytes. For example

592: a 0.529,131 003< 85^ 077> 01 24 01 00 03 00 80 00 00 3f 00 00 0f 00 e1 08 68 00 00 0a 00 07 00 07 00 0a 00

If rem is non-zero, Cmd, Sts, Tns and Fnc are not valid. Use Databyte and dataword instead.

PCCC Command, Cmd

The PCCC command byte identifies the type of command being executed.

Use the Ctl value to select frames that are messages in conjunction with the Cmd value

The following equation selects privileged commands (Cmd=6) from the basic command set

showonly

(Ctl & CTL_MSK) = CTL_MSG

&&

Cmd = 6

#

PCCC Status, Sts

Each PCCC message contains a status. The status is 0 on commands. In replies, a status of 0 indicates success and a non-zero status indicates an error.

Use the Ctl value to select frames that are messages in conjunction with the Sts value

The following equation selects frames with non-zero PCCC status

showonly

$(\text{Ctl} \& \text{CTL_MSK}) = \text{CTL_MSG}$

&&

Sts <> STSOK

#

PCCC Transaction Number, Tns

Each PCCC command is sent with a 16-bit transaction number. Stations increment the transaction number each time they send a message.

Byte order is low byte-high byte.

Use the Ctl value to select frames that are messages in conjunction with the Tns value

For example, to select the following frame,

7792: a 6.938,801 077< 05^ 003> 00 06 00 c0 19 03

use the equation

showonly

$(\text{Ctl} \& \text{CTL_MSK}) = \text{CTL_MSG}$

&&

tns=0x19c0

#

PCCC Function, Fnc

Some PCCC commands have a function value in addition to the command.

Use the Ctl value to select frames that are messages in conjunction with the Fnc value

For example, the following equation selects frames that perform a diagnostic status (Cmd = 6 Fnc = 3)

showonly

$(\text{Ctl} \& \text{CTL_MSK}) = \text{CTL_MSG}$

&&

Cmd = 6

&&

Fnc = 3

#

with a typical selected frame

1316: a 1.176,172 d 1.176.172 077< 85^ 003> 00 06 00 2a 44 03

Data Values, DataByte[ofs] and DataWord[ofs]

You can use DataByte[offset] and DataWord[offset] to search for specific values within frames.

Offsets start from 0 and are always byte offsets, for both DataBytes and DataWords.

For DataWords, byte order is low byte-high byte.

In the following frame, DataByte[6] is 2b hexadecimal (or 0x2b), DataWord[6] is e42b hexadecimal (or 0xe42b).

50: a 0.045,934 077< 05^ 003> 00 0f 00 2b e4 00 00 00 01 00 00 24 4e
31 35 3a 30 00 22 70**Parameters**

If you have passed in one or more parameters, you can access them using CmdArg[0], CmdArg[1], CmdArg[2], or CmdArg[3].

Example: The following equation, from the option file QTS_DHP_MsgsToFromStation.opt, selects frames that are PCCC messages, and that have source or destination station matching the value passed in as the first parameter.

showonly

((Ctl & CTL_MSK) = CTL_MSG)

&&

((Dst=CmdArg[0]) || (Src=CmdArg[0]))

#

See page 32 for information on how to pass in parameters.

GapTme

The gap time, GapTme, is the time in microseconds between the end of the previous frame and the start of the current frame.

Example: The following equation selects frames with gap times greater than 10 milliseconds (10000 microseconds)

showonly

GapTme > 10000

#

Constants

Constants can be entered in the following formats:

| Format | Data range |
|----------------|---------------------|
| Signed integer | -32768 to 32767 |
| Hexadecimal | 0x0000 to 0xFFFF |
| Octal | 0o00000 to 0o177777 |

Passing Parameters to AnxAbCapt

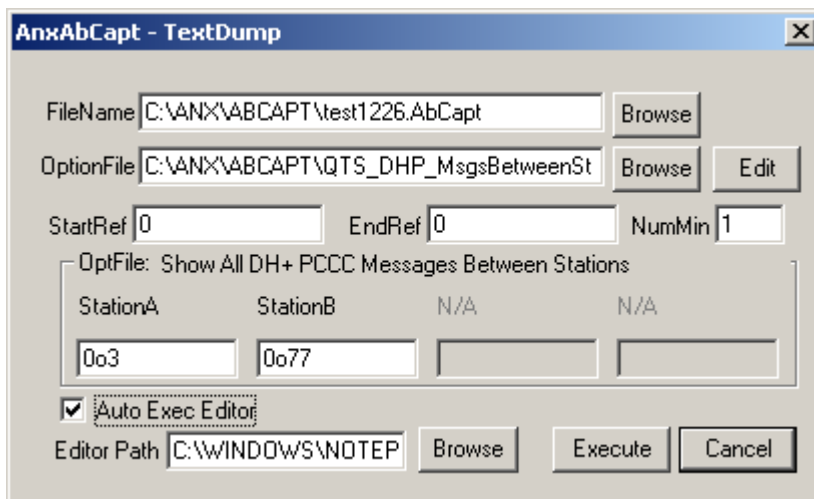
You can pass in up to four parameters to be used in the equation. Parameters are defined by the keywords “ArgName0=”, “ArgName1=”, “ArgName2=”, “ArgName3=”

followed by the parameter description, for example,

ArgName0=StationA

ArgName2=StationB

AnxAbCapt displays the description and lets you enter a value, as shown.



Operators

You can use the following operators to define the equation.

| Operator | Description |
|----------|-------------|
|----------|-------------|

| Operator | Description |
|----------|-----------------------|
| <> | not equal |
| != | not equal |
| <= | less than or equal |
| >= | greater than or equal |
| == | equal |
| = | equal |
| > | greater than |
| < | less than |
| && | logical AND |
| AND | logical AND |
| | logical OR |
| OR | logical OR |
| ! | logical NOT |
| & | bitwise AND |
| | bitwise OR |
| ^ | bitwise exclusive OR |
| * | multiply |
| / | divide |
| % | modulus |
| + | add |
| - | subtract |
| ~ | complement |
| (| left parenthesis |
|) | right parenthesis |

Sample Option Files

The sample option files provided with the AN-X module include:

| Option File | Description |
|-------------------|--------------------------------------|
| QTS_DHP_All.opt | Selects all Data Highway Plus frames |
| QTS_ABRIO_All.opt | Selects all remote I/O frames |

| Option File | Description |
|---------------------------------|--|
| QTS_DHP_Msgs.opt | Selects Data Highway Plus messages |
| QTS_DHP_MsgsBetweenStations.opt | Selects messages between specific stations |
| QTS_DHP_MsgsCmds.opt | Selects Data Highway Plus command messages |
| QTS_DHP_MsgsRsp.opt | Selects Data Highway Plus response messages |
| QTS_DHP_MsgsToFromStation.opt | Selects Data Highway Plus messages to or from a specific station |

Typically you create a new option file by editing and modifying one of the sample option files.

Captured Data Format

The following sample output shows a capture from Data Highway Plus, selected using the sample option file QTS_DHP_All.opt. The network consists of stations 3 and 77 octal.

```

2662: a 2.382,850 077< 00^ 003>
2663: a 2.382,364 003< 00^ 077>
2664: a 2.383,218 077< 85^ 003> 00 06 00 d9 46 01
2665: a 2.384,732 003< 08^ 077>
2666: a 2.384,379 065< 01^ 003> 077-
2667: a 2.386,915 077< 80^ 003>
2668: a 2.386,429 003< 00^ 077>
2669: a 2.387,076 066< 01^ 003> 077-
2670: a 2.388,621 077< 80^ 003>
2671: a 2.389,134 003< 00^ 077>
2672: a 2.390,773 067< 01^ 003> 077-
2673: a 2.391,309 077< 80^ 003>
2674: a 2.392,822 003< 00^ 077>
2675: a 2.392,461 070< 01^ 003> 077-
2676: a 2.394,006 077< 80^ 003>
2677: a 2.399,640 003< 05^ 077> 00 46 00 d9 46 82 00 1b 00 1b 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
2678: a 2.400,335 077< 08^ 003>
2679: a 2.401,849 003< 00^ 077>

```

Each line starts with a reference number. For example, the first line shown has a reference number of 2662.

Next is the frame timestamp. The first frame has a timestamp of 2.382850 seconds.

The next three bytes are the frame header.

The first byte of the header is the destination, in octal. The first frame has a destination of 77 octal

The second byte of the header is the Ctl byte. It indicates the frame type.

The third byte of the header is the source. The first frame has a source of 3 octal.

After the header is the frame data. The frame with reference number 2664 is a PCCC message with destination 77 octal, Ctl = 5 (after with mask 0x85 with CTL_MSK), source 3 octal. The remote byte, Rem, is 0. The Cmd is 6, the PCCC sts is 0, the transaction number is 0x46d9, and the function, Fnc, is 1.

```
2664: a 2.383,218 077< 85^ 003> 00 06 00 d9 46 01
```

This command reads the diagnostic counters from the destination

The frame with reference number 2677 contains the reply from station 77 octal to station 3.

```
2677: a 2.399,640 003< 05^ 077> 00 46 00 d9 46 82 00 1b 00 1b 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 1b 00 00 00 00 00 00 00 00 00 00 00 1b 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 ae 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00
```

The reply contains the same transaction number as the command.

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 network parameters for an AN-X
- Restart an AN-X
- 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:

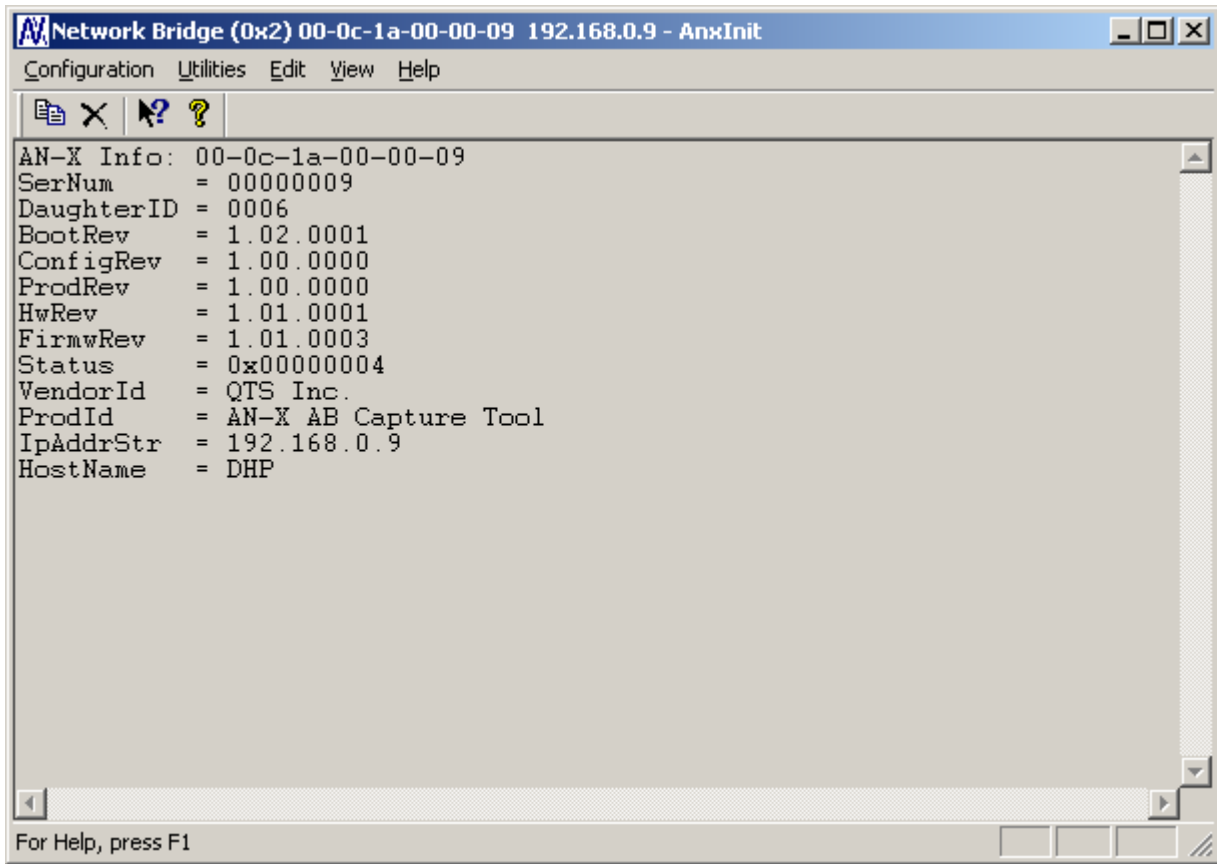
- clear the AnxInit log
- copy the contents of the log to the clipboard for use by another application. This is often useful for technical support

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*.



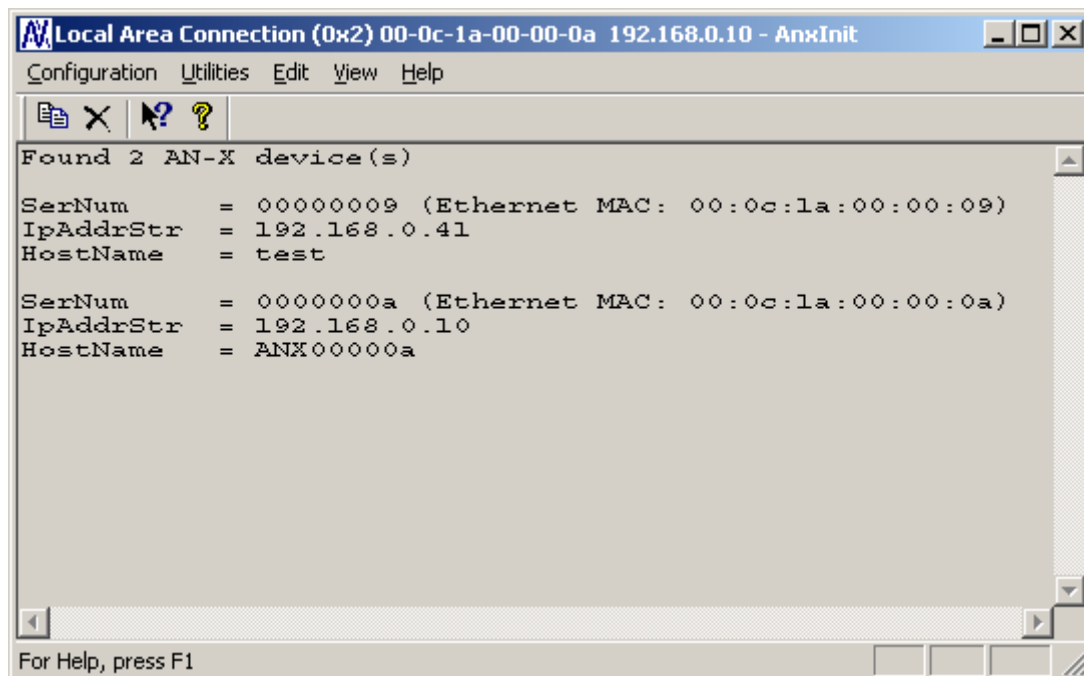
AN-X Log

Locating Available AN-X Modules

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

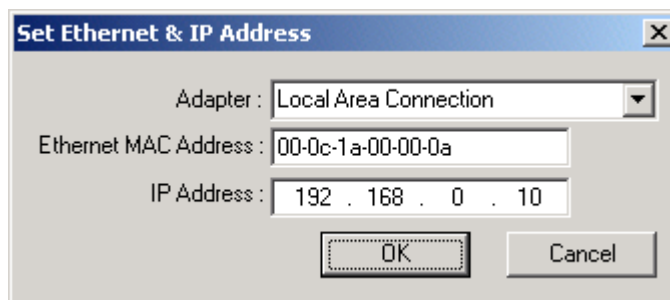
AnxInit displays a list of the AN-X modules it finds, showing their MAC IDs, IP addresses and host names.

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 it. 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 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 you wish to select. 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

Utilities/AN-X IP Configuration sets the AN-X IP address and hostname.

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. 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 valid default gateway address even if there is no device at the gateway address on the network.

Click OK to complete the configuration.

Utilities/AN-X IP Configuration resets the selected AN-X. 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 the boot code. 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.

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, 6 for AN-X-ABCAPT |
| 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 | IP address assigned using <i>Utilities/AN-X IP Configuration</i> |
| HostName | Name assigned using <i>Utilities/AN-X IP Configuration</i> |

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

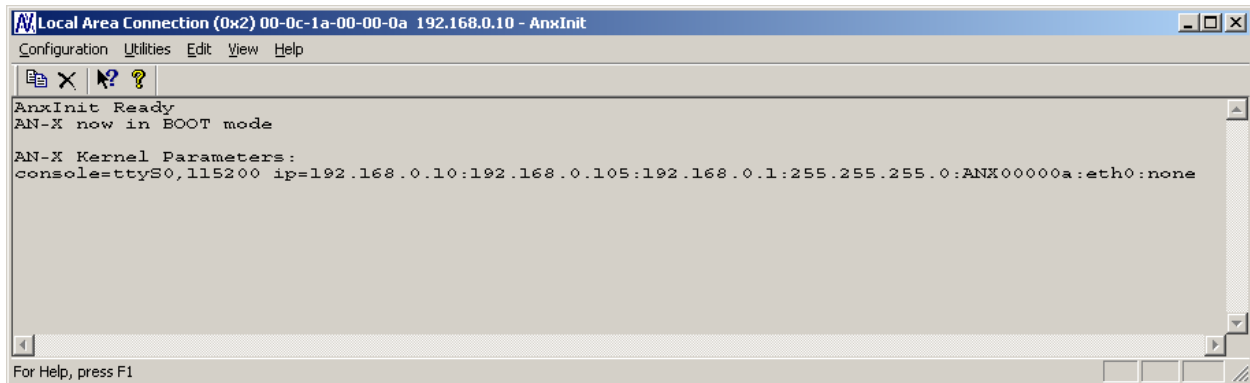
Possible status values are:

| 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.

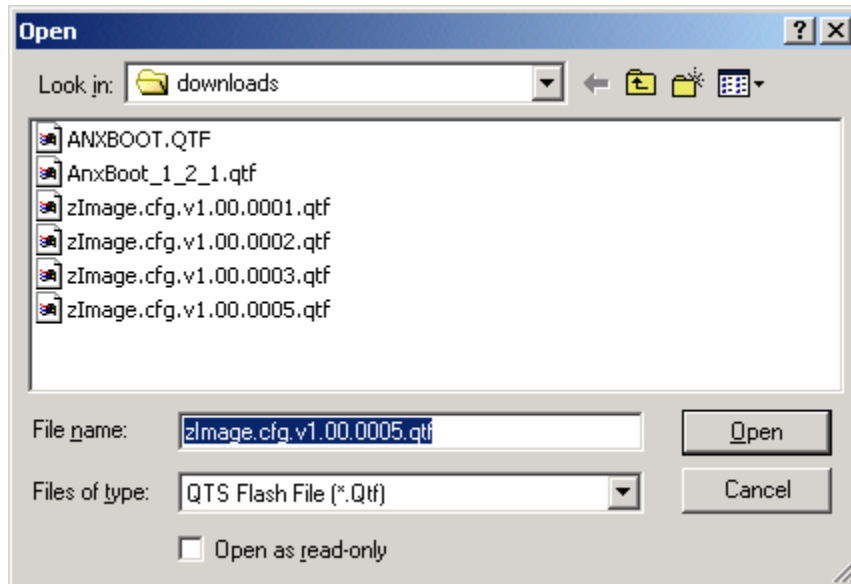
Update AN-X Flash

The *Utilities/Update AN-X Flash* command updates the low-level firmware (boot code, configuration kernel, production kernel).

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-00-00-09

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

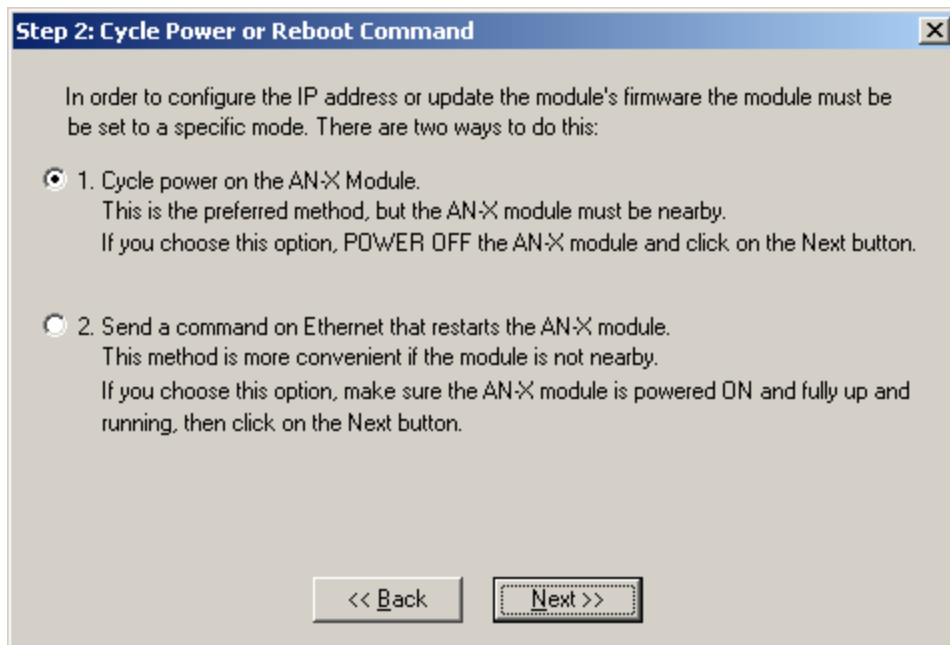
192 . 168 . 0 . 9

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-00-00-09.
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.

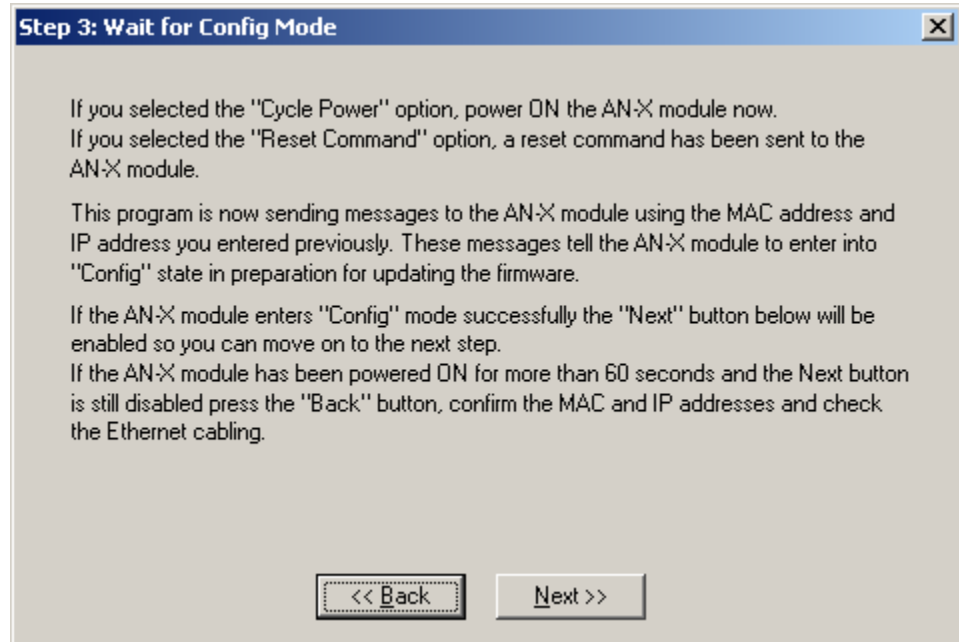


The preferred method is to cycle power on the AN-X. Select the first option on the screen and click the *Next >>* button.

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.

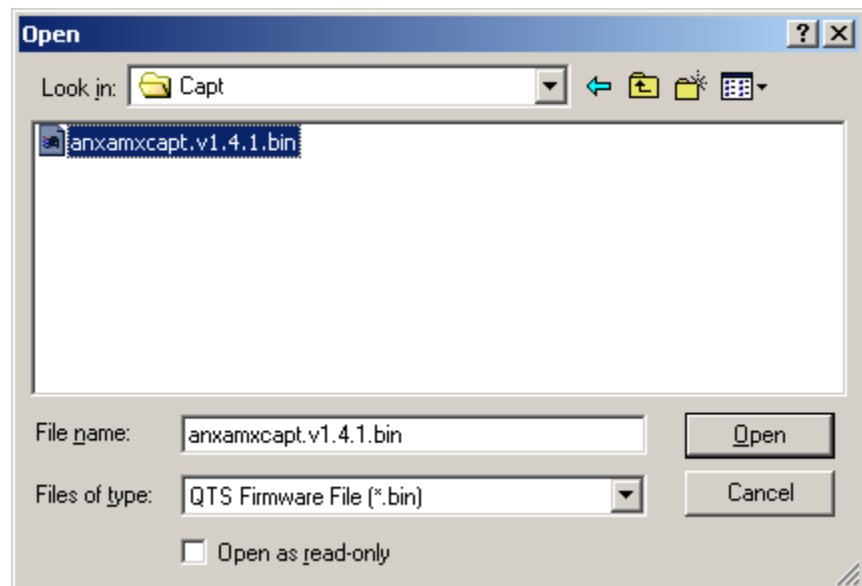
Step 3:

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

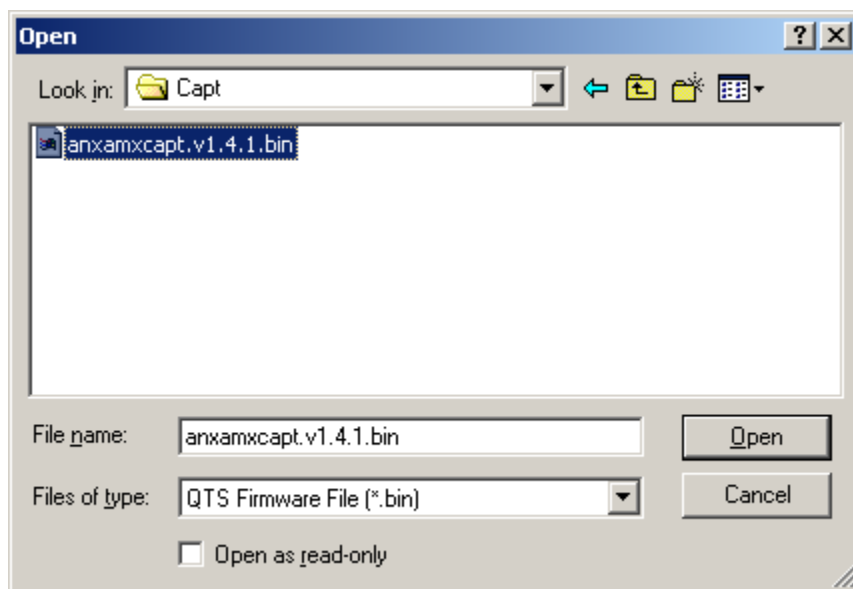
Update Firmware Command

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*.

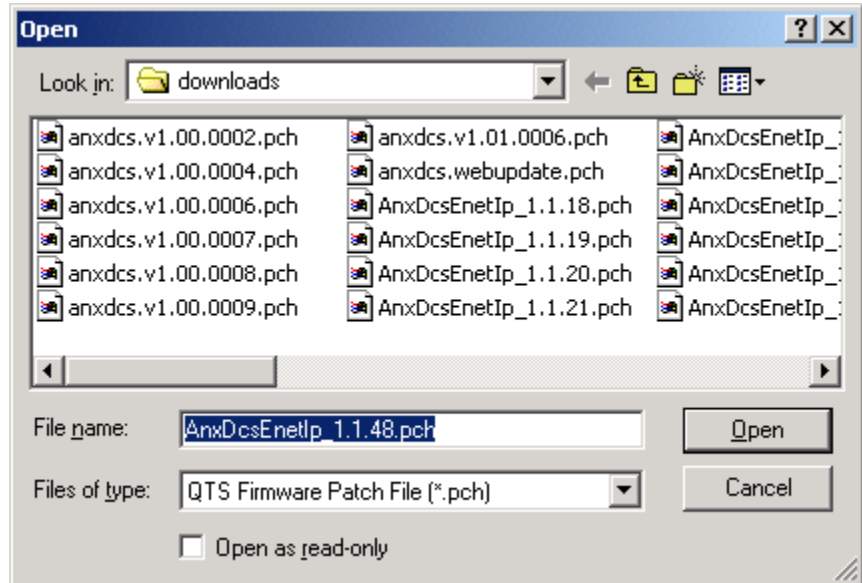


AnxInit transfers the firmware file and restarts the AN-X.

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 or Netscape.

The web interface on AN-X-ABCAPT is used for viewing AN-X logs.

To use the web interface, you need to know the IP address of the AN-X. Run AnxInit and use the *Utilities/Locate All AN-X Devices* command to find all AN-X devices 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.

Log Files

AN-X maintains various logs to record diagnostic and error messages. Use the Utilities 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.

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 view and edit files on AN-X. It is password protected and is used only for AN-X technical support.

Troubleshooting

LEDs

The AN-X-ABCAPT has LEDs that indicate the state of the Ethernet connection, the overall module state, and the network state

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 Mbits/second 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.

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

In the following, red 3 means three red flashes followed by a pause, 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 |
| 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 indicates the status of the connected network. It operates only while the capture is running. When no capture is running, the NET LED is off.

| Colour | Meaning |
|--------|--|
| Green | Have received a good frame within the last 3 ms |
| Yellow | Have not received a frame in the last 3 ms |
| Red | Have received a frame with bad status. Stays on for about 1 second |

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 capture

The boot code and 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 41 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 42 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 46 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) |

Obtaining the Latest Software

Version numbers and software for the most recent AN-X releases are available from the QTS website, www.qtsusa.com

Data Highway Plus

Data Highway Plus is an Allen-Bradley local area network designed to provide simple communication between PLCs, SLCs and computers.

A network can consist of up to 64 nodes, although the recommended maximum is 15 per link. By convention, nodes are numbered in octal. Valid node numbers are 0 to 77 octal. 0 is not recommended since it is more prone to network errors.

Nodes can be connected using a trunkline-dropline or daisy-chain topology. Maximum length of the network trunkline is 10000 feet, with a maximum dropline length of 100 feet at 57.6 Kbaud. The network uses shielded twinaxial cable.

There are three network baud rates, 57.7, 115.2 and 230.4 Kbaud, although not all devices support the higher baud rates.

Nodes use a token passing scheme to access the network. Each node that acquires the token transmits a message it has to send, then passes the token to its successor. Nodes also solicit for new nodes coming on the network.

There are several types of network frames:

- token pass, the node passes the token to its successor, which then has the right to transmit
- solicit, nodes solicit for new nodes coming on to the network
- messages
- acknowledge, a node that receives a message immediately sends an ACK to signify that it received the message or a NAK to indicate that it could not accept the message. It later sends a reply to the message

The basic frame format consists of a three-byte header, followed by the frame contents. The header consists of destination node, frame control, and source node.

PCCC message frames have the following format:

| | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|------|
| DST | CTL | SRC | REM | CMD | STS | TNS | FNC | data |
|-----|-----|-----|-----|-----|-----|-----|-----|------|

where:

DST – frame destination

CTL – identifies the frame type

SRC – frame source

REM – remote byte, identifies offlink frames

CMD – PCCC command

STS – PCCC status
TRS – transaction number
FNC – function
data - remaining frame data

Specifications

| Parameter | Specification |
|---------------------------|---|
| Function | Captures frames from an Allen-Bradley Data Highway Plus or remote I/O network |
| Description | Processor: 100MHz IDT MIPS FLASH memory: 64M RAM: 64M |
| 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

Technical support is available from Quest Technical Solutions.

Quest Technical Solutions
4110 Mourning Dove Court
Melbourne FL 32934
321 757-8483

website: www.qtsusa.com

email: support@qtsusa.com

If you need to make a return, contact QTS to obtain a return authorization number.