

# Using the KAD/EBM/101

TEC/NOT/046

**CURTISS -  
WRIGHT**

The KAD/EBM/101 is a Fast Ethernet (10/100Mbps), single-port bus monitor that filters and parses Ethernet traffic. It monitors all network traffic or only traffic that is specifically addressed (or broadcast) to it.

This paper discusses the following topics:

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- “22.2 Ethernet packet structure” on page 3
- “22.3 Using kSetup to configure the KAD/EBM/101” on page 5
- “22.4 Using DAS Studio 3 to configure the KAD/EBM/101” on page 8
- “22.5 Configuring and testing the network” on page 11

## 22.1 Connecting the KAD/EBM/101 to a network

### 22.1.1 IP address overview

All nodes on an Ethernet network have an IP (Internet Protocol) address. The KAD/EBM/101 requires an IP address primarily to work in non-promiscuous mode, when data is being sent directly to it. The IP address is also used to ping the KAD/EBM/101 to verify its existence on the network (see “22.5.2 Testing the connection between PC and the KAD/EBM/101” on page 12).

IP addresses beginning with 192.168.X.X are reserved worldwide for private networks so this range is a good one to use.

Almost any other option is available, and the best solution depends on the network that you are connecting the KAD/EBM/101 to. For example, if an IP address of 192.168.0.103 is to be assigned, in hexadecimal, the address 192.168.0.103 reads as: C0 A8 00 67. In binary, this address is: 11000000 10101000 00000000 1100111.

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**NOTE:** As IP and MAC addresses are stored internal to the KAD/EBM/101 after system programming, a hard-wired IP address is not required for the KAD/EBM/101. For more information, see “22.2 Ethernet packet structure” on page 3.

### 22.1.2 Wiring the KAD/EBM/101 connector interface

The following figure shows the location of the pins on a KAD/EBM/101 module.

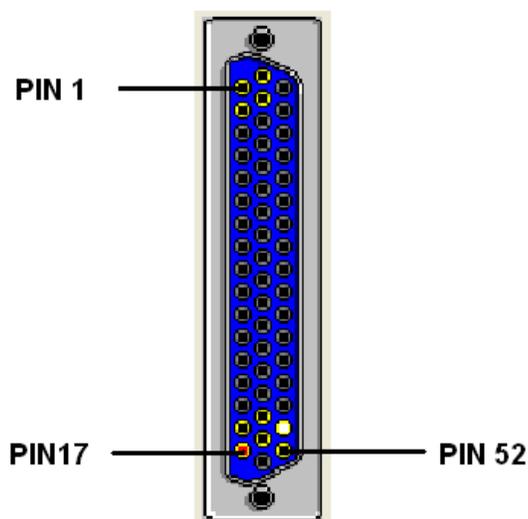


Figure 22-1: KAD/EBM/101 connector pin locations

### 22.1.3 Wiring the PC Ethernet interface

The KAD/EBM/101 is designed to interface to a standard 100BaseT Ethernet connection. The following figure shows the standard connections for an RJ-45 Ethernet connector.

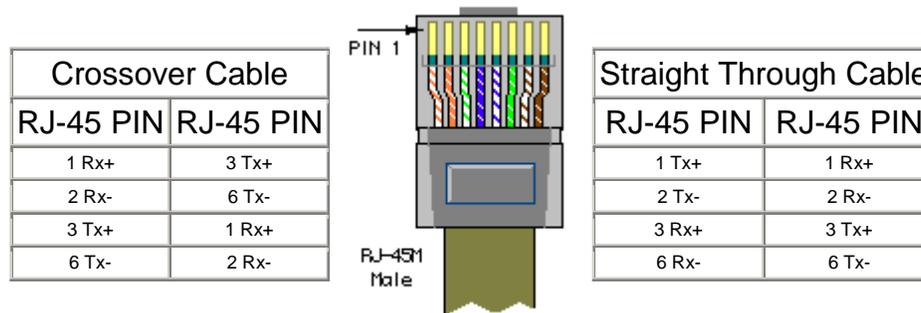


Figure 22-2: Standard Ethernet cable connections

The corresponding pins on the KAD/EBM/101 are shown in the following table.

Table 22-1: KAD/EBM/101 receive/transmit pins

Pin	Name	Comment
1	RX A+	Receive for Ethernet bus
2	RX A-	Receive for Ethernet bus
18	TX_A+	Transmit for Ethernet bus
19	TX_A-	Transmit for Ethernet bus

**NOTE:** The KAD/EBM/101 has a single Ethernet bus.

You can connect the KAD/EBM/101 directly to a PC or switch using a crossover cable, or to a hub using a straight-through cable. The corresponding pin connections are shown in the following table.

Table 22-2: Pin connections for connecting to a PC

Crossover		Straight-through	
KAD/EBM/101 pin	RJ-45 pin	KAD/EBM/101 pin	RJ-45 pin
1	3	1	1
2	6	2	2
18	1	18	3
19	2	19	6

**NOTE:** This document focuses on wiring the KAD/EBM/101 to a network. For a comprehensive guide on wiring an Acra KAM-500 system, see the *Acra KAM-500 Databook*.

## 22.2 Ethernet packet structure

Before the KAD/EBM/101 can effectively capture traffic from the network, you must classify parser flows in the software configuration. The KAD/EBM/101 extracts packets from the bus containing user-defined criteria in the form of data word offsets from the beginning of the Ethernet packet. The 16-bit word offsets contain information such as IP or MAC addresses, port numbers, TCP or UDP protocol, and length.

It is essential that you understand the structure of the Ethernet packet to fully comprehend how the KAD/EBM/101 parses the packets.

The KAD/EBM/101 parser enables you to extract specific data words from the captured packet similar to a MIL-STD-1553 message. All protocol layer information is parsed and presented as 16-bit parameters, starting from data word zero (0). The Ethernet Preamble and the Start Frame Delimiter is discarded. Typically, data of interest lies in the proprietary layer (see the following figure).

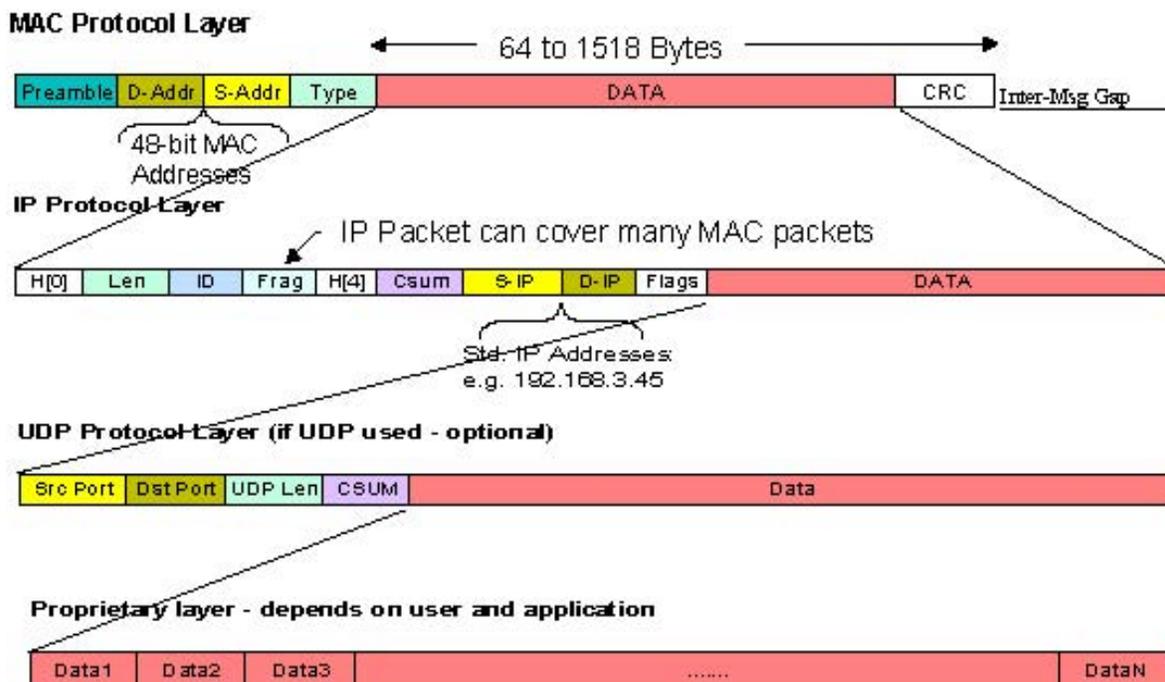


Figure 22-3: Ethernet frame Structure

The KAD/EBM/101 uses information in the protocol layers (see the previous figure), to place specific packets into the designated parser slot. The proprietary layer contains a flexible payload, the size of which can be set by you or the application.

If the KAD/EBM/101 monitors a general Ethernet packet, the parser splits the data into 16-bit data words following the Ethernet preamble (see the following table).

Table 22-3: KAD/EBM/101 data word offsets

Data word #	Description	Comments
0	Destination MAC address, Word 0 (MSW)	
1	Destination MAC address, Word 1	
2	Destination MAC address, Word 2 (LSW)	
3	Source MAC address, Word 0 (MSW)	
4	Source MAC address, Word 1	
5	Source MAC address, Word 2 (LSW)	
6	Protocol type	IP = 0800h

**Table 22-3: KAD/EBM/101 data word offsets (continued)**

Data word #	Description	Comments
	IP header	
7	Bytes in data payload or type of payload	Depends if 802.3 or Ethernet II packet
8	Total packet length	
9	Packet ID #	
10	Fragment offset	Only for fragmented packets
11	Time to live (1 byte) / IP protocol (1 byte)	xx11h for UDP and xx06h for TCP
12	Header checksum	
13	Source IP address, Word 0 (MSW)	
14	Source IP address, Word 1 (LSW)	
15	Destination IP address, Word 0 (MSW)	
16	Destination IP address, Word 1 (LSW)	
17	Source port	
18	Destination port	
19	Length of header in bytes	
20	Checksum	
	Data payload	
21	Data 0: (IENA Key)	Typically 001Fh
22	Data 1: (IENA Size)	Number of words in IENA data payload
23	Data 2: (IENA Time Word 0)	Straight binary microseconds
24	Data 3: (IENA Time Word 1)	Straight binary microseconds
25	Data 4: (IENA Time Word 2)	Straight binary microseconds
26	Data 5: (IENA Status)	Fixed at 7F00h
27	Data 6: (IENA Sequence)	Continuously increments
28	Data 7: (IENA Data Word 0)	
29	Data 8: (IENA Data Word 1)	
30	Data 9: (IENA Data Word 2)	
	...	
n	Data n - 21: (IENA Data Word m)	
n+1	Data n - 20: (IENA End)	Typically FFFFh
n+2	CRC Word 0	
n+3	CRC Word 1	

For example: A UDP packet from a KAD/ETH/001, KAD/ETH/101 or KAD/BCU/105 module contains an IENA transport data payload in the proprietary layer. The IENA packet structure (see the following figure) can be correlated with data word 21 and higher (see Table 22-3 on page 3).

KEY	SIZE	TIME	STATUS	SEQ_NUM	DATA	END
(1 word)	(1 word)	(3 words)	(1 word)	(1 word)	(1 to 65,527 words)	(1 word)

Figure 22-4: IENA packet structure

## 22.3 Using kSetup to configure the KAD/EBM/101

To configure the KAD/EBM/101, you can use kSetup (version 1.2.2 or higher). kSetup is included in the KSM-500 suite of tools.

### 22.3.1 Defining KAD/EBM/101 module settings

After creating a task in kSetup and adding the appropriate hardware for the application, select the KAD/EBM/101 module from the hardware hierarchy.

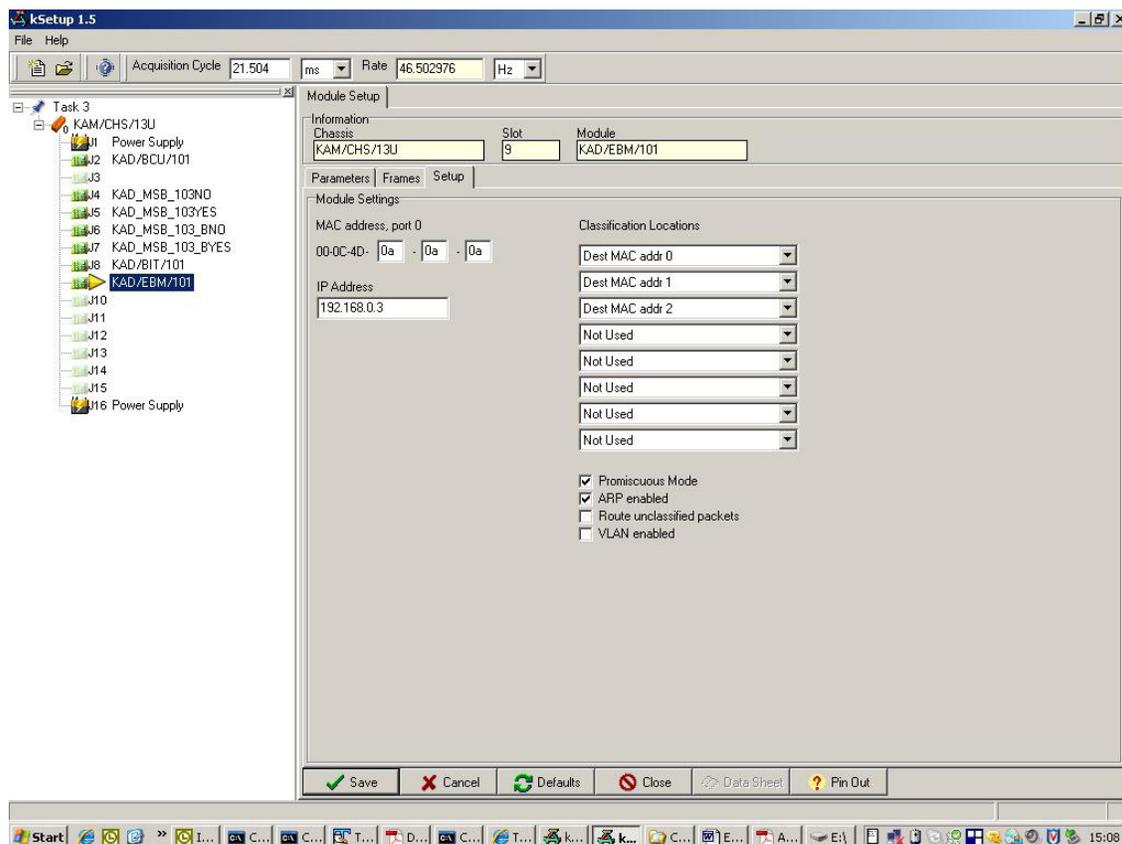


Figure 22-5: KAD/EBM/101 module Setup tab

#### 22.3.1.1 Defining IP and MAC addresses

The KAD/EBM/101 requires the designation of an IP and MAC address. These are defined on the Setup tab of the KAD/EBM/101 module.

In the **IP Address** field, define an IP address for the KAD/EBM/101; 192.168.0.103 is used in the example displayed in Figure 22-5 on page 5.

Curtiss-Wright's EBM modules have been designated the first 6 hex numbers (3 bytes) of the MAC address (00-0C-4D). On the Setup tab, in the **MAC address, port #** field, insert the last 6 hex numbers (3 bytes) of the MAC address.

**NOTE:** Word 0 (see Table 22-3 on page 3), is the prefix of an IP or MAC address. For example, if we wanted to parse packets from the 48-bit MAC address 01-02-03-04-05-06, the 16-bit words would be broken down by the parser according to the following:  
MAC 01-23-45-67-89-AB:

- 01-23 › MAC addr word 0
- 45-67 › MAC addr word 1
- 89-AB › MAC addr word 2.

**22.3.1.2 Specifying classification locations**

You can also use the Setup tab to define classification locations. The purpose of these classification locations is to set filtering criteria for the packets. Using drop-down menus, you can select any 8 of the 16-bit data words in the protocol layer to define filtering criteria for a single flow.

The classification schema are based on the 16-bit data words available in the protocol layers of the Ethernet packets (see Table 22-3 on page 3).

**NOTE:** The KAD/EBM/101 module can also be used as part of a Multi-Chassis Scheduler on a networked Acra KAM-500 systems. For details of this configuration, refer to *TEC/NOT/068 - Network MCS in KSM-500*.

**22.3.2 Other settings on the Setup tab**

Other settings located on the Setup tab include:

- **Promiscuous Mode.** If this field is selected, the KAD/EBM/101 monitors all traffic on the port regardless of MAC address destinations. If not selected, all traffic is discarded, other than the traffic addressed to the KAD/EBM/101's MAC address, including broadcast traffic.
- **ARP enabled.** If this field is selected, the KAD/EBM/101 responds to ARP/PING packets. If not selected, the KAD/EBM/101 is transparent on the bus even though the ARP/PING packet is captured.
- **Route unclassified packets.** If this field is selected, all unparsed (unclassified) packets are available in parser slot 254. If not selected, all unparsed packets are discarded.
- **VLAN enabled.** If this field is selected, the parser skips over Virtual Local Area Network packet headers to classify the IP protocol. Typically, VLAN enabled is not selected on UDP networks.

**22.3.3 Defining flows and payloads**

You can configure up to 254 unique flows per KAD/EBM/101. A flow is defined to be a parser slot that captures packets based on user-defined criteria for each classification location. For example, if two classification locations are defined as Source IP Addr 0 and Source Port Number, the first flow can capture all packets with an IP address 192.168.x.x coming from IP port 0x03FF (1023 dec) while the second flow captures all packets from source port 0x0402 (1026 dec) regardless of IP address. This example is illustrated in the following figure.

Parameters Frames Setup						
Bus	Flow	Frame Name	Source IP Addr 0	Source Port no	Not Used	Not Used
0	254	Frm_0_J15_0				
1	255	Frm_0_J15_1				
0	0	Example_Flow_1	192.168	03FF	xxxxxxxxxxxx	xxxxxxxxxxxx
0	1	Example_Flow_2	x.x	0402	xxxxxxxxxxxx	xxxxxxxxxxxx

Figure 22-6: Sample flows

**NOTE:** Classification locations are shown at the header of each column and the default flow 254 is available for a capture all operation. Flow 255 on Port 1 is unavailable at this time for the KAD/EBM/101.

**22.3.3.1 Adding flows**

After specifying classification locations, you can define a flow (parser slot) on the Frames tab (see the previous figure).

To add a flow, right-click the **Frames** tab and select **Add Frame** as shown in the following figure. To remove a flow, right-click on the **Frame** and select **Remove Frame**.

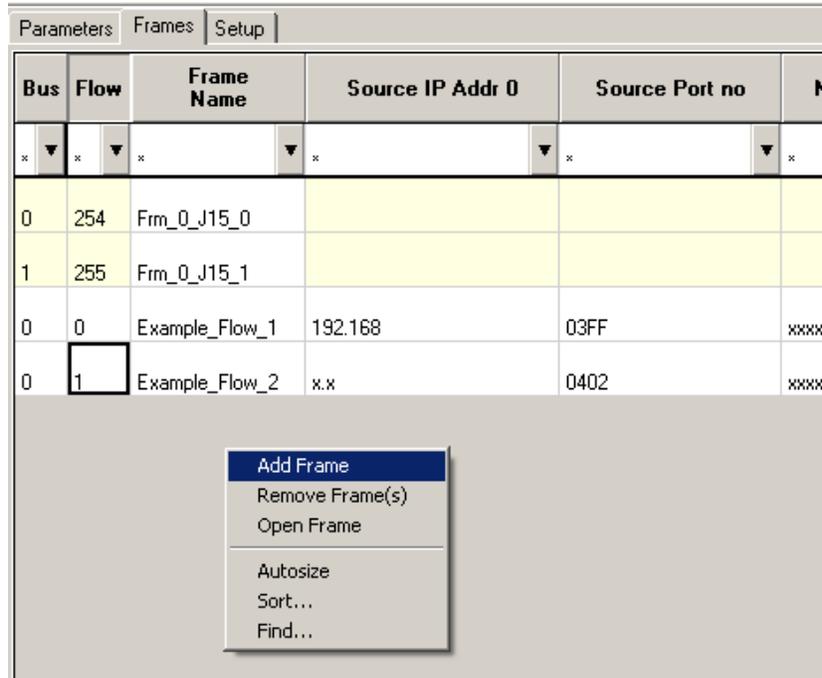


Figure 22-7: Adding a flow

After adding a flow, designate a quantity to at least one classification location; use x for don't care. Then, complete the flow number (Flow) and the flow name (Frame Name).

### 22.3.3.2 Defining payloads

To specify the data payload for a flow, click **Edit** (on the right of the flow). When you click **Edit**, the data payload window populates. To add payload data words, right-click in the data payload window and select **Add Datawords**.

**NOTE:** The index starts at zero and correlates to the first 16-bit word after the preamble of the Ethernet packet, see Table 22-3 on page 3.

A timestamp is given for each packet arriving on the bus for each data flow. This timestamp occurs at the beginning of the first received bit of the packet.

Also included is the Info register, which informs you whether the parser buffer has been updated with a new packet according to the flow specification: a Stale and Skipped bit, which are standard on all Curtiss-Wright bus monitors.

To populate the parameters for PCM placement or other Acra KAM-500 sinks, click **OK**, and then click **Save** at the bottom of the Setup tab.

## 22.4 Using DAS Studio 3 to configure the KAD/EBM/101

In this example, the configuration consists of a chassis, a KAD/BCU/140 controller, and a KAD/EBM/101 module. With the KAD/EBM/101 module in context, click the **Settings** tab to show the following screen.

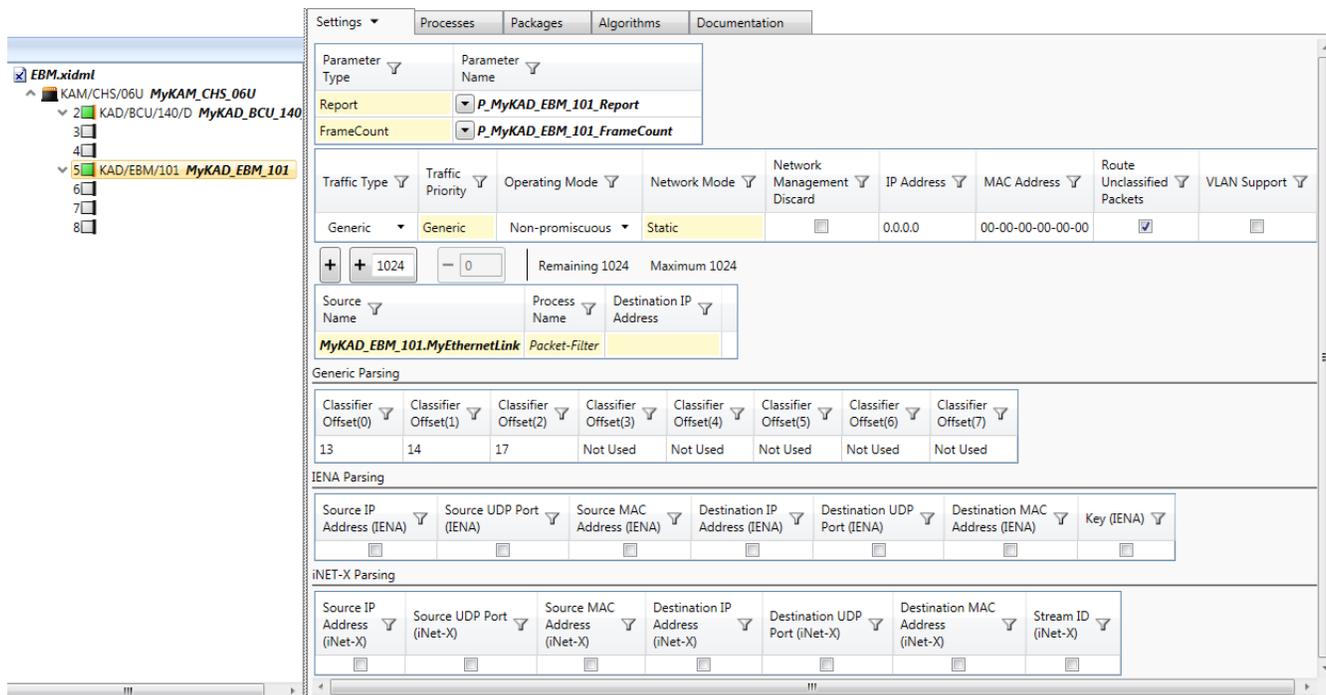


Figure 22-8: Settings tab with KAD/EBM/101 in context

Table 22-4: Settings tab descriptions

Setting	Description
Parameter Type: Report	Use this parameter to know if the KAD/EBM/101 is connected to an Ethernet link. Refer to the <i>KAD/EBM/101</i> data sheet for further details.
Parameter Type: Frame Count	Use this parameter to know if the KAD/EBM/101 is parsing Ethernet frames on the Ethernet link. Refer to the <i>KAD/EBM/101</i> data sheet for further details.
Traffic Type	Use Generic when parsing 3rd party Ethernet traffic. This technical note only covers the Generic option. The other options are used for a Multi-Chassis Scheduler (MCS) on a networked Acra KAM-500 system. Refer to the <i>DAS Studio 3 User Manual</i> for further details.
Traffic Priority	Enables you to select IENA or INET-X for the MCS while also using the same KAD/EBM/101 to parse 3rd party Ethernet traffic.
Operating Mode	If Promiscuous is selected, the KAD/EBM/101 monitors all traffic on the port regardless of MAC address destinations. If Non-promiscuous is selected, all traffic is discarded, other than the traffic addressed to the KAD/EBM/101's MAC address, including broadcast traffic.
Network Management Discard	Disable this setting if you want to ping/ARP the module. When selected, the KAD/EBM/101 requires the designation of an IP and MAC address.
IP Address	Enables you to define an IP address for the KAD/EBM/101.
MAC Address	Enables you to define a MAC address for the KAD/EBM/101.
Route Unclassified Packets	If selected, all unparsed (unclassified) packets are available in parser slot 254. If not selected, all unparsed packets are discarded.

Table 22-4: Settings tab descriptions (continued)

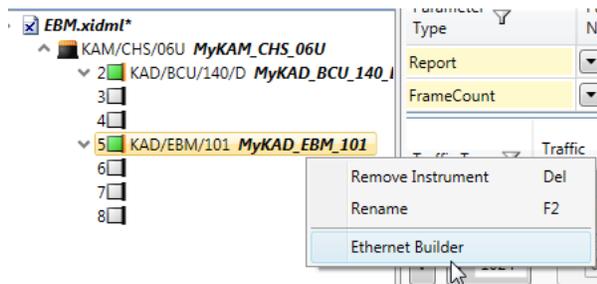
Setting	Description
VLAN Support	If selected, the parser skips over Virtual Local Area Network packet headers to classify the IP protocol. Typically, this setting is not enabled on UDP networks.

The other fields (see the following figure) in the Settings tab are used for a MCS on a networked Acra KAM-500 system (refer to the *DAS Studio 3 User Manual* for details). The settings in the Generic Parsing pane are automatically populated when using Ethernet Builder (see the following section).

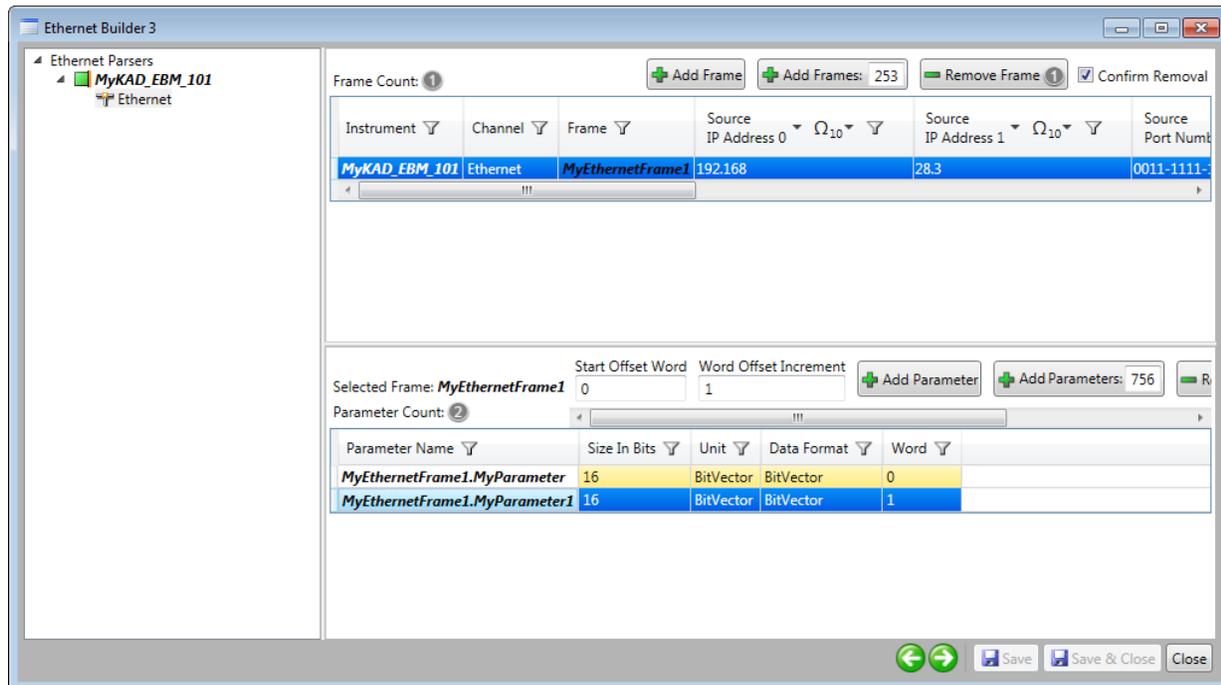
### 22.4.1 Using the Ethernet Builder application

Ethernet Builder is used to configure the classifications and flows when a 3rd party Ethernet frame is required to be parsed.

- To start the application, right-click the **KAD/EBM/101** node in the Navigator and click **Ethernet Builder**.



The **Ethernet Builder 3** dialog box opens.

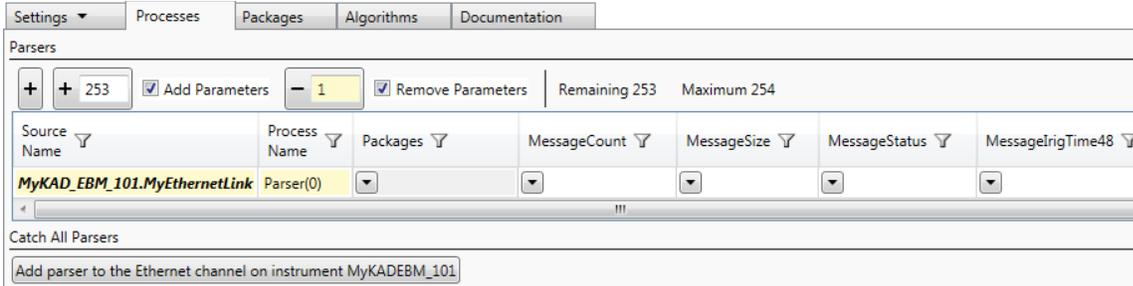


- For more information, see “Ethernet Builder” in the “Applications” chapter of the *DAS Studio 3 User Manual*.

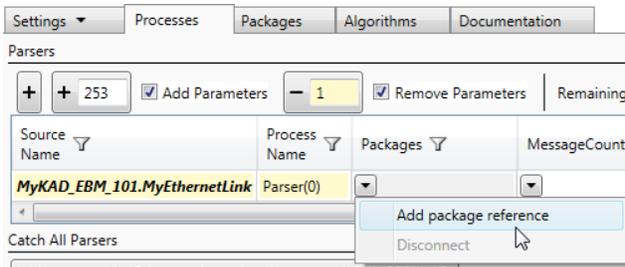
## 22.4.2 Creating a parser process

Use the Processes tab to read package tags. Package tags are associated information such as microsecond time of sync bit transition, message count, response time and package errors. To read a package tag, you must first create a new parser process.

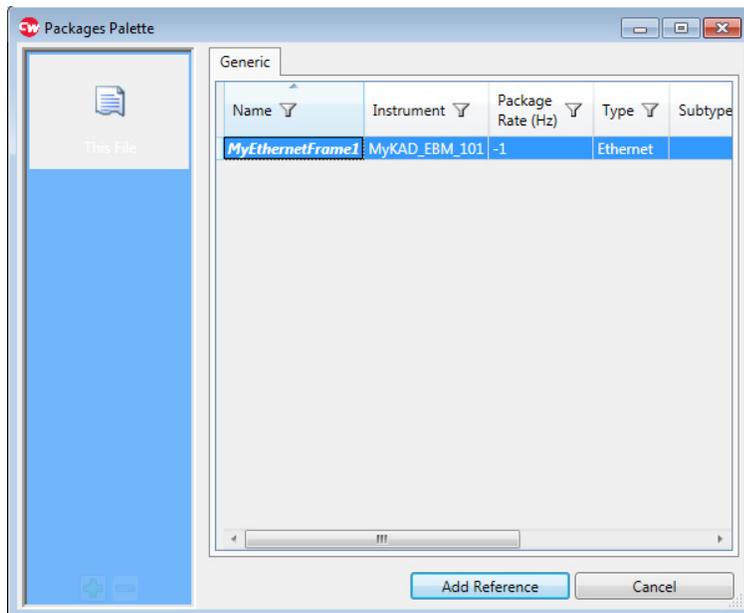
1. With the **KAD/EBM/101** module in context, click the **Processes** tab.



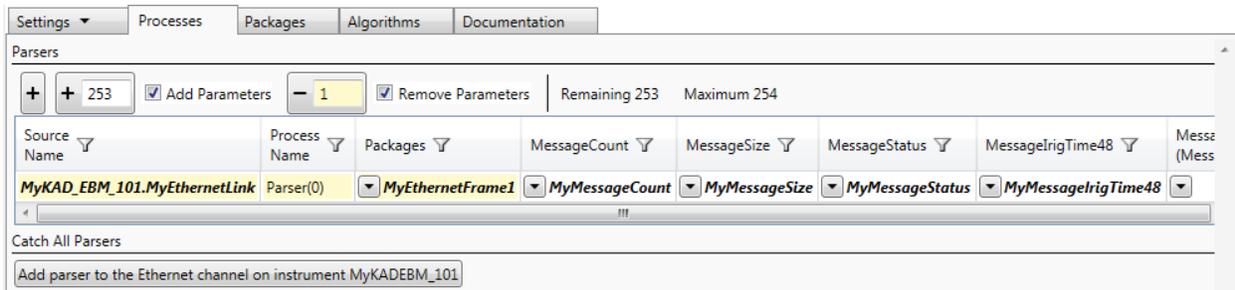
2. In the **Packages** drop-down menu, click **Add package reference**.



The **Packages Palette** dialog box opens.



3. Select **MyEthernetFrame1** and the click **Add Reference**.



All the tag parameter fields are now populated. Refer to the *KAD/EBM/101* data sheet for parameter definitions.

**NOTE:** A timestamp is given for each packet arriving on the bus for each data flow. This timestamp occurs at the beginning of the first received bit of the packet. Also included is the Message Info register, which informs you whether the parser buffer has been updated with a new packet according to the flow specification: a Stale and Skipped bit, which are standard on all Curtiss-Wright bus monitors.

## 22.5 Configuring and testing the network

This section describes setting up and testing network connections on a Windows XP operating system. The steps for other Windows operating systems are similar to the procedures shown here.

### 22.5.1 Setting up the PC on the network

If ARP is enabled on the KAD/EBM/101 in kSetup (see Figure 22-5 on page 5), the KAD/EBM/101 responds to ARP and PING packets.

Likewise, if Network Management Discard in DAS Studio 3 is not selected, the KAD/EBM/101 responds to ARP and PING packets.

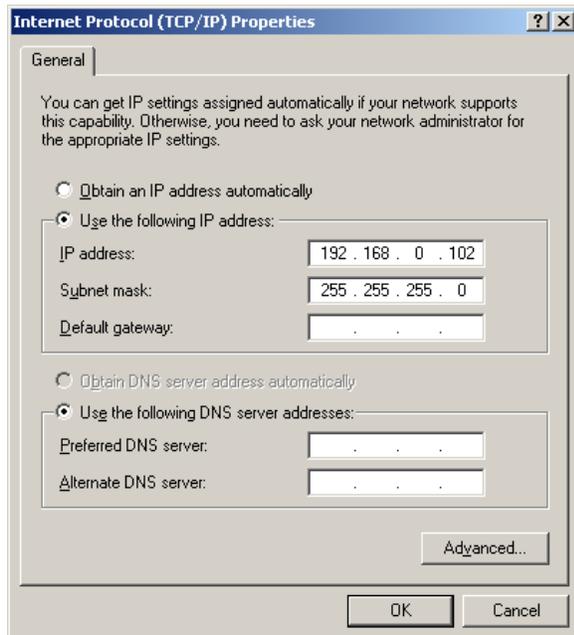
To "see" the KAD/EBM/101, the PC must be on the same network as the Acra KAM-500. Not only must they be physically connected through the switch or hub, but they must share the same network address section of their IP, which you must manually configure.

Also, make sure the KAD/EBM/101 port is connected to the uplink port when using a hub; smart switches might need software configuration to enable the KAD/EBM/101 to see all packets moving through the switch on its particular port.

Do the following to configure an IP address:

1. Click **Start, Control Panel**.
2. Open **Network Connections**.
3. Under **LAN or High-Speed Internet**, double-click the **Local Area Connection** that the Acra KAM-500 is connected to.
4. Click **Properties**.  
The Local Area Connection Properties window opens.

5. Select **Internet Protocol (TCP/IP)** and then click **Properties**.  
The Internet Protocol (TCP/IP) Properties window opens.



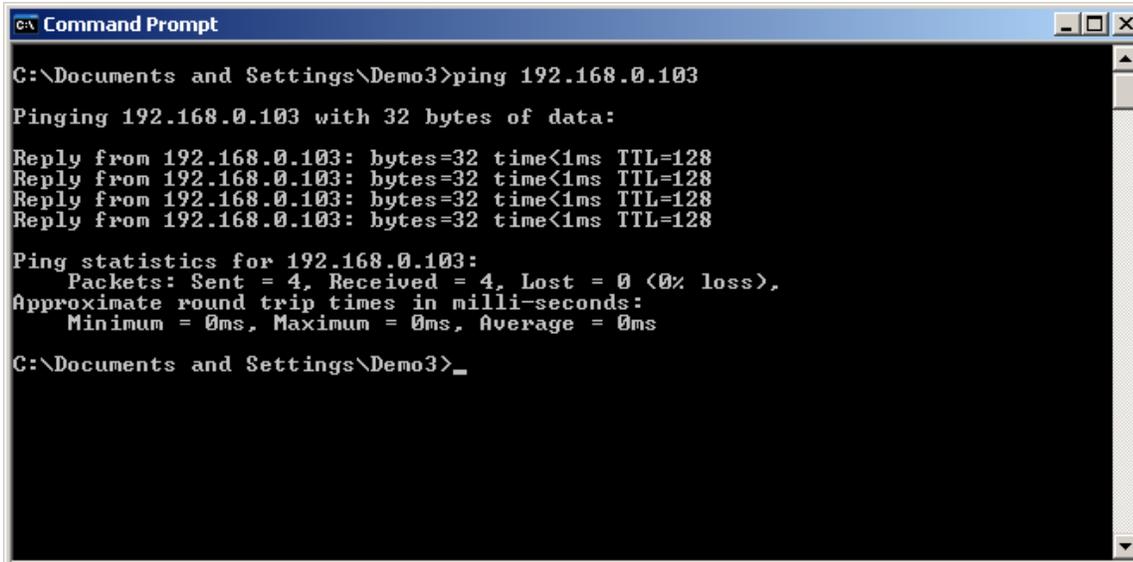
6. Select the **Use the following IP address:** radio button.
7. In the **IP address** field, insert an appropriate IP address.  
This IP address must have the same network address as the KAD/EBM/101. Typically, the network address is determined by the first two or three bytes of the IP address. Using the earlier example where the KAD/EBM/101 was set up for IP address 192.168.0.103, then the network address for this could be 192.168.0. The node address must be unique (that is, the one or two bytes that are not the network address). So in this example we could set the PC address to 192.168.0.102.
8. In the **Subnet mask** field, insert details for the network address.  
If only the first two bytes are the network address, then the mask would be 255.255.0.0. If the first three are the network address then the mask would be 255.255.255.0.
9. Click **OK**.  
If required, re-boot the PC.

### 22.5.2 Testing the connection between PC and the KAD/EBM/101

If the KAD/EBM/101 is not parsing correctly after it has been configured, check whether the KAD/EBM/101 is receiving packets. Do this by pinging the KAD/EBM/101 through a switch/hub via a PC NIC.

To ping the KAD/EBM/101:

1. Click **Start, Run**.
2. Type **cmd** and click **OK**.
3. At the C:\ prompt, type ping, followed by the IP address of the KAD/EBM/101.  
If the PC is able to connect to the KAD/EBM/101, you get a response similar to that displayed in the following figure.

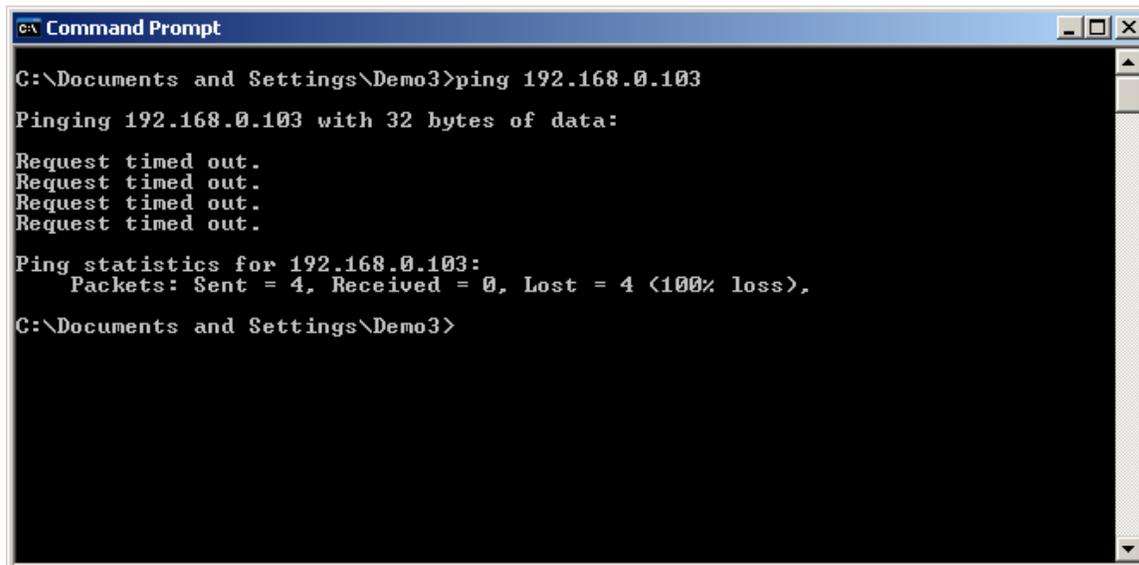


```
Command Prompt
C:\Documents and Settings\Demo3>ping 192.168.0.103
Pinging 192.168.0.103 with 32 bytes of data:
Reply from 192.168.0.103: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\Documents and Settings\Demo3>_
```

If the ping determines that the PC can communicate with the KAD/EBM/101, the KAD/EBM/101 has been successfully configured and is able to receive packets.

### 22.5.3 Troubleshooting

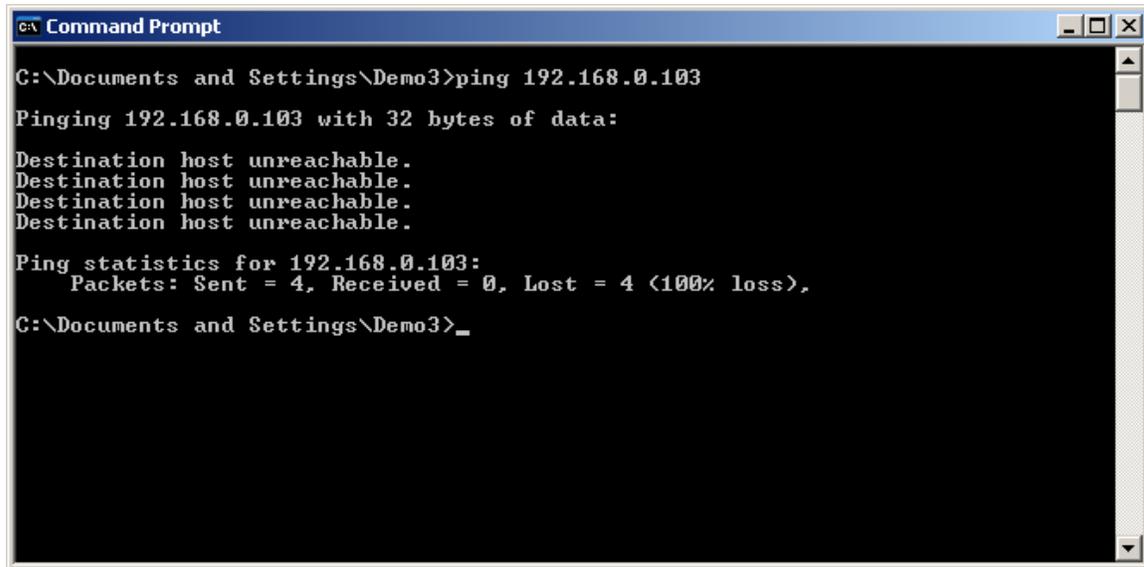
If the PC is unable to communicate with the KAD/EBM/101, you get a response similar to that displayed in the following figure.



```
Command Prompt
C:\Documents and Settings\Demo3>ping 192.168.0.103
Pinging 192.168.0.103 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Documents and Settings\Demo3>
```

*Figure 22-9: Example of unsuccessful ping*

If the PC cannot communicate with the KAD/EBM/101, check the wiring and power to the KAM-500. If there is a problem with the network configuration, you get a response similar to that displayed in the following figure.

A screenshot of a Windows Command Prompt window. The title bar reads "C:\ Command Prompt". The command prompt shows the following text:

```
C:\Documents and Settings\Demo3>ping 192.168.0.103
Pinging 192.168.0.103 with 32 bytes of data:

Destination host unreachable.
Destination host unreachable.
Destination host unreachable.
Destination host unreachable.

Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings\Demo3>_
```

*Figure 22-10: Example of unsuccessful ping*

The response displayed in the previous figure suggests that the PC and the hardware are not on the same network by subnet reference. Check for errors or typos in the configuration of both.