Using the KAD/CBM/102

TEC/NOT/056

The KAD/CBM/102 is a CAN (Controller Area Network) bus monitor, a coherent message parser and an error-detection function within a single module. This paper explains how to set up the KAD/CBM/102 for CAN bus monitoring and is divided into the following sections:

- "31.1 Introducing CAN bus traffic" on page 1
- "31.2 Features of the KAD/CBM/102 in relation to CAN bus monitoring" on page 2
- "31.3 Using kSetup to configure the KAD/CBM/102" on page 3
- "31.4 Using DAS Studio 3 to configure the KAD/CBM/102" on page 6
- "31.5 Troubleshooting" on page 9

31.1 Introducing CAN bus traffic

It is essential to understand the structure of CAN bus traffic to fully comprehend how the KAD/CBM/102 monitors it.

31.1.1 The physical layer

The physical layer is a differential two-wire interface with CANH and CANL wires for each bus. Bit encoding used is Non-Return to Zero (NRZ) encoding (with bit-stuffing).

The use of NRZ encoding ensures compact messages with a minimum number of transitions and high resilience to external disturbance. Cable length depends on the data rate used (40 meters for 1 Mbps).

The CAN bus uses the following drive voltages:

- High - 2.75 to 4.5 volts
- Low - 0.5 to 2.25 volts
- Differential - 1.5v to 3.0 volts

31.1.2 Word definition

A CAN network can be configured to work with two different message (frame) formats: CAN 2.0 A (standard/base frame format) or CAN 2.0 B (extended frame format). The following two figures show the structure of the two formats.

The only difference between the two formats is the bit length supported for the identifier (ID). CAN 2.0 A supports a length of 11 bits for the ID; CAN 2.0 B supports a length of 29 bits for the ID—this comprises the 11-bit ID and an 18-bit extension (IDE). The IDE bit is transmitted as dominant in the case of an 11-bit frame, and transmitted as recessive in the case of a 29-bit frame.

CAN controllers that support CAN 2.0 B messages are also able to send and receive messages in CAN 2.0 A. All frames begin with a Start-Of-Frame (SOF) bit which denotes the start of the frame transmission. For definitions of fields shown in the following two figures, see Table 31-1 on page 2.
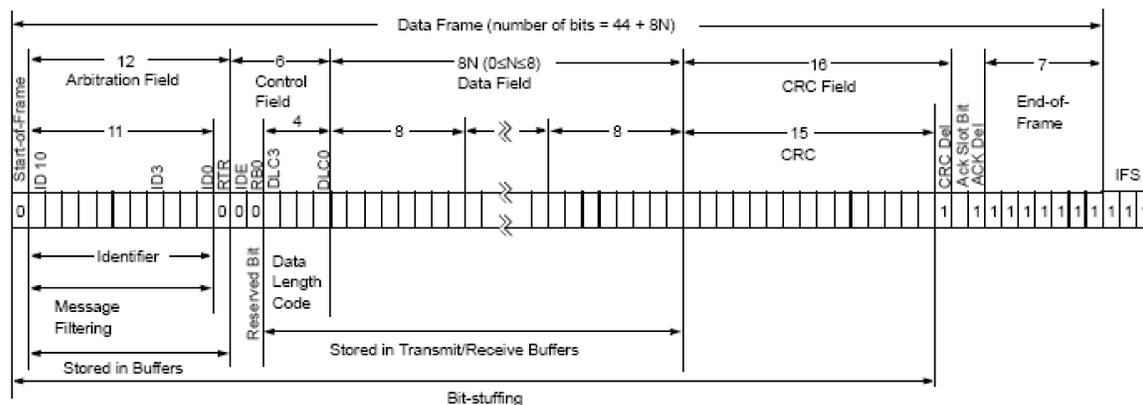
Figure 31-1: CAN 2.0 A
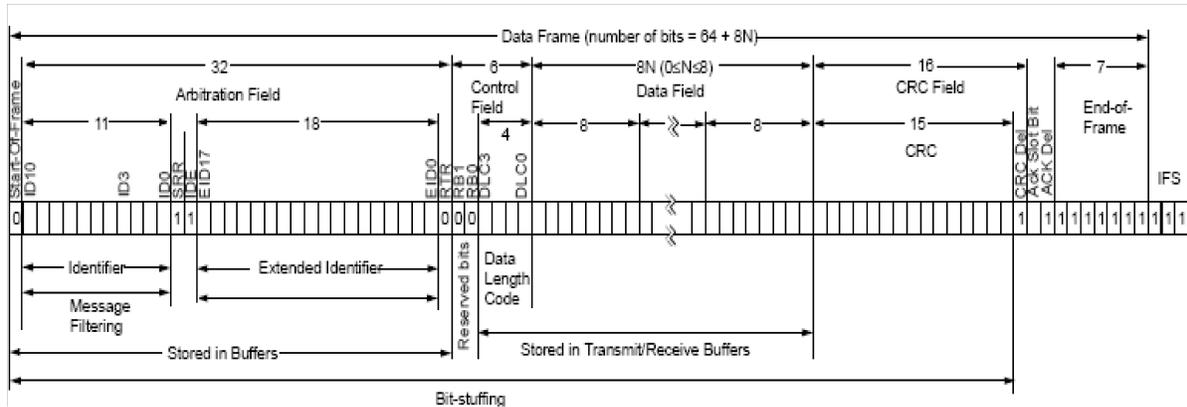
Figure 31-2: CAN 2.0 B

Table 31-1: Frame format fields

Frame format field	Description
ID (Identifier) / IDE (Extended IDentifier)	CAN2.0 A—11 bits; CAN2.0 B—29 bits
SSR	Substitute remote request - CAN2.0 B (masked by default)
RTR	Remote transmission request - CAN 2.0 A
DLC (Data Length Code)	Number of data bytes to be transmitted (0 to 8 bytes)
Data field	Data to be transmitted

31.2 Features of the KAD/CBM/102 in relation to CAN bus monitoring

31.2.1 Parsing

Like other Curtiss-Wright bus monitors, the KAD/CBM/102 uses a triple buffer for parsing. The following figure shows the triple buffering of words and tags used for each bus in the KAD/CBM/102 parser.
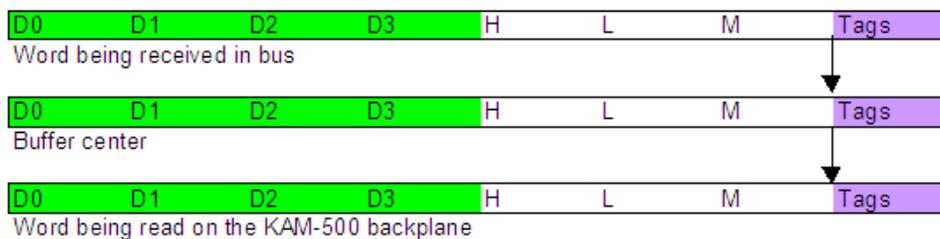
Figure 31-3: Triple buffering of traffic and associated tags (abbreviations defined in table below)

Table 31-2: Traffic definitions

Abbreviation	Definition
D0, D1, D2, D3	Traffic
H	High time
L	Low time
M	Micro time

31.2.2 Skipped and Stale flag settings

Time tags and a word count are added to each word received and stored in separate buffers for each of the four busses. As soon as a message is received with no errors, the complete buffer is transferred to the center buffer. If the data in the center buffer has not been transferred to a read buffer, a Skipped flag is set and the message is lost.

As soon as the last parameter of interest has been read from the buffer being read by the backplane, the content of the center buffer (if new) is transferred to the read buffer. If no new message has been received, the Stale flag is set. A center and read buffer exist for every message.

31.3 Using kSetup to configure the KAD/CBM/102

The KAD/CBM/102 has four busses and can coherently parse traffic and tags for up to 126 complete messages per bus. You can use kSetup software to configure the KAD/CBM/102 according to your requirements. kSetup is included in the KSM-500 suite of tools.

31.3.1 Setting parameters

To set parameters for the KAD/CBM/102, select the module in the Task Explorer pane of kSetup. On the Parameters tab (see the following figure), complete the fields described in Table 31-3 on page 3.

For more information on using kSetup, contact Curtiss-Wright support (acra-support@curtisswright.com).

Parameter Name	Register	Protocols	Comment
✕ ▼	✕ ▼	✕ ▼	✕ ▼
CBM102_0_J9_HI_TIME	HI_TIME	None	
CBM102_0_J9_LO_TIME	LO_TIME	None	
CBM102_0_J9_MICRO_TIME	MICRO_TIME	None	
CBM102_0_J9_REPORT	REPORT	None	

Figure 31-4: Standard parameter settings on the Parameters tab of kSetup

Table 31-3: Parameter settings

Field name	Description
Parameter Name	Name of the parameter
Register	The Report register is useful to transmit when monitoring message problems; for details of register definitions, see the *KAD/CBM/102* data sheet
Protocols	When the parameter is placed in a PCM frame, click on the Package button to display transmission details
Comment	User-defined text relating to the parameter

31.3.2 Defining messages

The first four default messages parse any messages received on a bus (similar to a snarfer). If they're used as transmitted parameters, the corresponding parameter must be sampled fast enough to ensure that all messages in the bus are parsed. Also, the ground station should have the ability of decommutating such a parameter.

You can edit message characteristics or add new messages on the Messages tab (see the following figure).

Figure 31-5: Adding messages

To add a new message, do the following:

1. Right-click the spreadsheet and select **Add Message** (see the previous figure).
2. In the **Name** column, select the name of a bus.
3. Complete the fields described in the following table.

Table 31-4: Message settings

Field name	Description
Name	Name of the bus; package corresponding in the XidML® file will be changed accordingly
Bus	Bus number from 0 to 3
Parser	Parser identifier; must be unique across all messages and within the following ranges: Bus 0: 0 to 126 Bus 1: 128 to 254 Bus 2: 256 to 382 Bus 3: 384 to 510
Extended	If No is selected, the message to be parsed must be CAN2.0A (11 bits CAN ID) If Yes is selected, the message to be parsed must be CAN2.0B (29 bits CAN ID)
ID	CAN ID in hexadecimal
DLC	Data Length Code corresponds to the number of data bytes to be transmitted (0 to 8 bytes or ALL) ALL is a wildcard on the DLC; if the ALL wildcard is used, any message with the same CAN ID is parsed
Payload	Message DataWords and tags (see "31.3.2.1 Defining payload settings" on page 4)

31.3.2.1 Defining payload settings

To edit DataWords for a message, click Edit (on the right of the message). After clicking Edit, the DataWords tab displays default DataWords (see the following figure). Double-click any DataWord to edit the name.

Figure 31-6: DataWord settings

NOTE: The CAN bus is described in bytes. The KAD/CBM/102 concatenates two bytes in one 16-bit parameter.

On the Tags tab, default parameter names are displayed. Double-click to edit any tag parameter name.

Figure 31-7: Tag settings

Values in the Mode column are read-only. For details of parameter descriptions, see the *KAD/CBM/102* data sheet.

31.3.3 Setting baud rates

On the Setup tab (see the following figure), you can set CAN bus baud rates for each bus.

Figure 31-8: Setting baud rates

For information on baud rates supported, see the *KAD/CBM/102* data sheet.

31.4 Using DAS Studio 3 to configure the KAD/CBM/102

The KAD/CBM/102 has four busses and can coherently parse traffic and tags for up to 126 complete messages per bus. You can use DAS Studio 3 software to configure the KAD/CBM/102 according to your requirements.

31.4.1 Adding messages with the CAN-Bus Builder

In the following example, the configuration consists of a chassis, a KAD/BCU/140 controller, and a KAD/CBM/102 module.

1. With the **KAD/CBM/102** module in context, click the **Settings** tab.
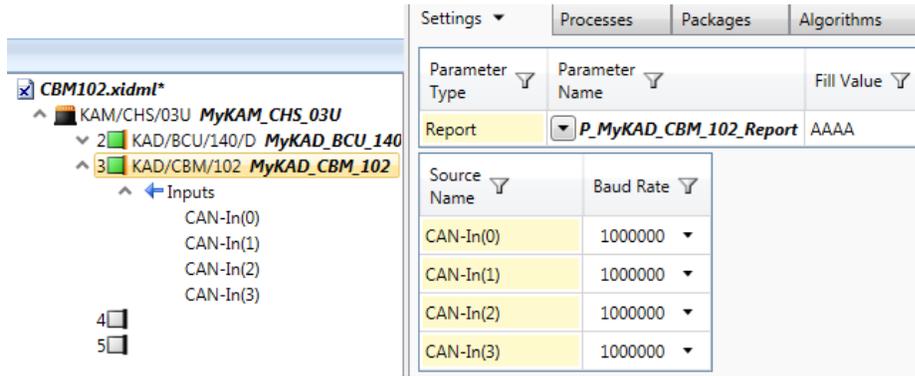
The **Settings** tab contains the **Report** parameter, the fill value, and the configuration of the baud rate for each of the four buses. Refer to the *KAD/CBM/102* datasheet for further details on these fields.

2. Right-click one of the **CAN-In** busses and then click **CAN-Bus Builder**.
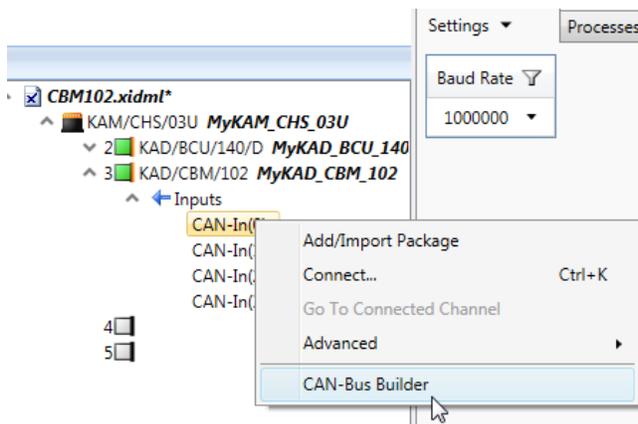
The **CAN-Bus Builder 3** dialog box opens.
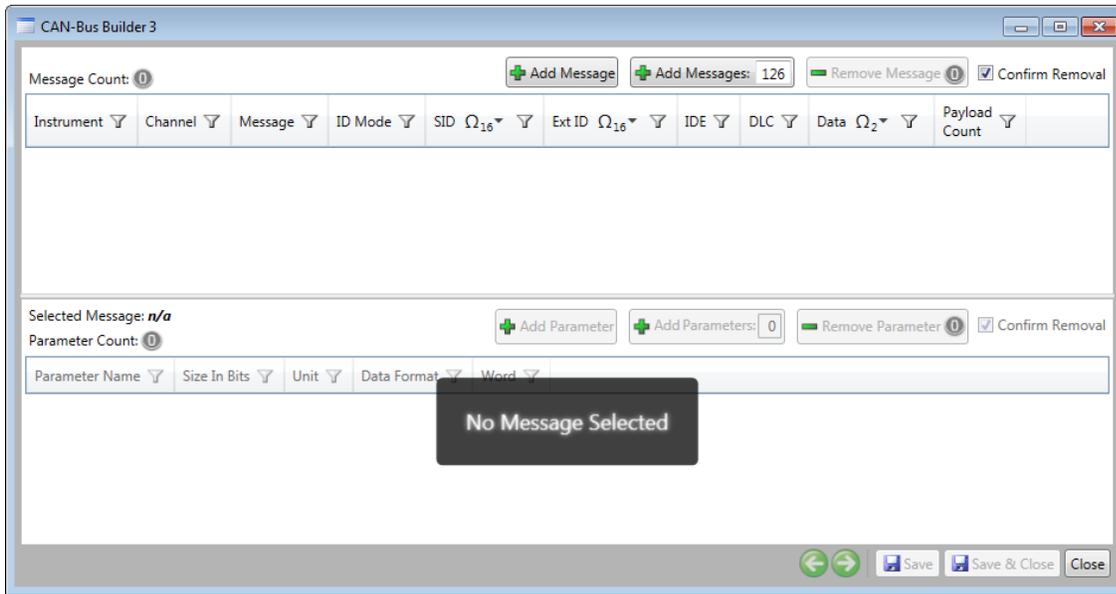
3. To add messages for parsing, type the number of messages in the **Add Messages** field and then click **Add Messages**.
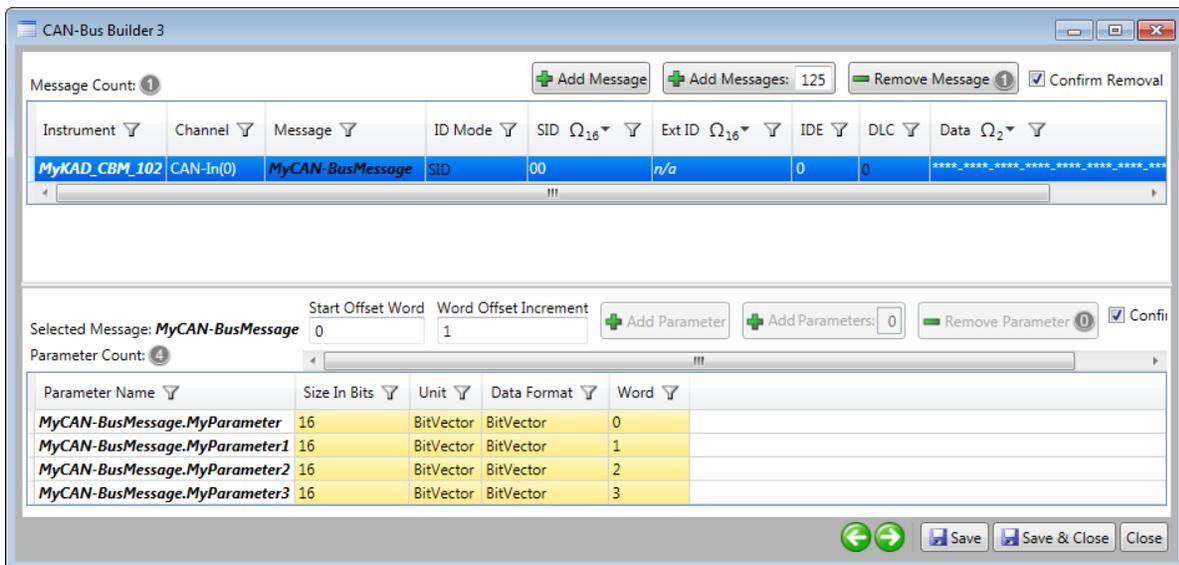
4. To add parameters to a message, type the number of parameters in the **Add Parameters** field and then click **Add Parameters**.
    For more information, see "CAN-Bus Builder" in the "Applications" chapter of the *DAS Studio 3 User Manual*.

31.4.2 Creating a parser process

Use the Processes tab to read package tags. Package tags are associated information such as message count and time when the last bit of the message was received by the module. To read a package tag, you must first create a new parser process.

1. With the **KAD/CBM/102** module in context, click the **Processes** tab.
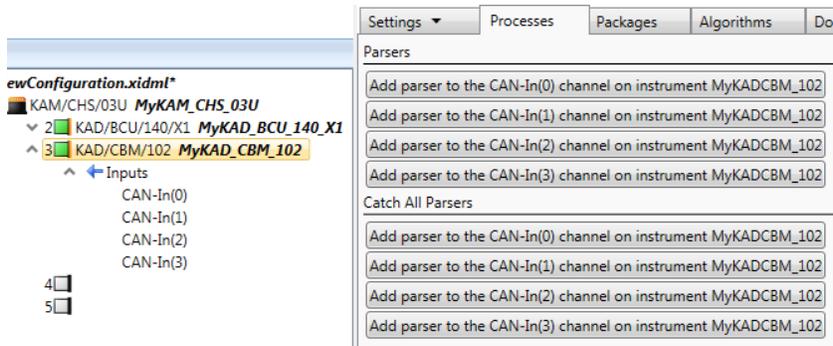
2. In the **Parsers** pane, click **Add parser to the CAN-In(0) channel on...** button to show all supported parser parameters. Refer to the *KAD/CBM/102* data sheet for the bit definitions of each parameter.
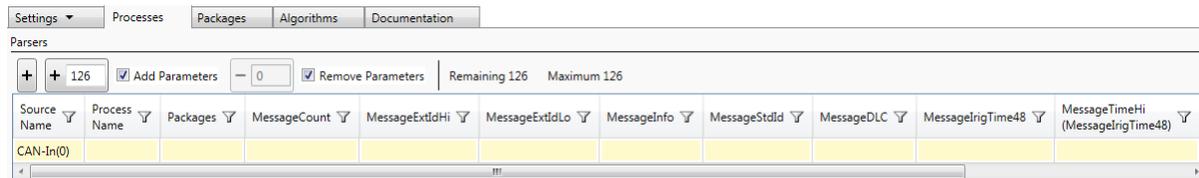
3. In the **Packages** drop-down menu, click **Add package reference**.
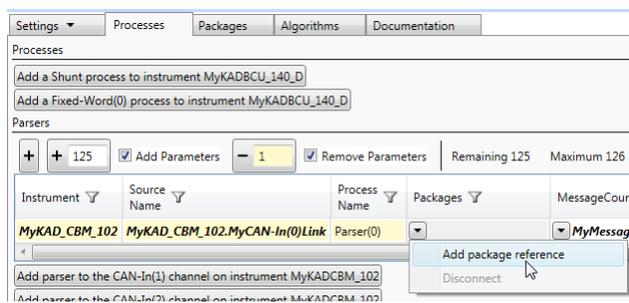
4. In the **Packages Palette** dialog box, select the message to which the parser parameters will be added and then click **Add Reference**.
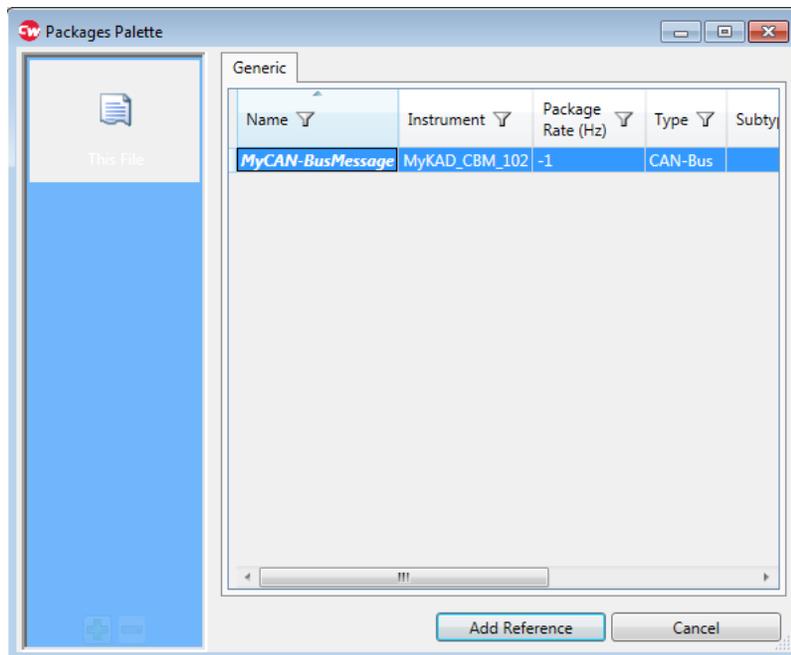
5. In the **MessageCount** drop-down menu, click **Add new parameter**.

The message count parameter for the message defined is now available to be transmitted to any sink modules.

For more information, see the "Processes tab" chapter of the *DAS Studio 3 User Manual*.

31.5 Troubleshooting

31.5.1 The module is not parsing as expected

1. Ensure CANH is correctly wired to DATA+ and CANL is correctly wired to DATA- as shown in the following figure.
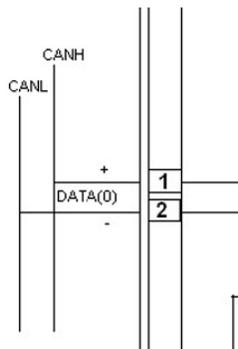
2. Ensure the baud rate is set appropriately (see "31.3.3 Setting baud rates" on page 5 for details).
3. Ensure the CAN bus ground is connected to the Acra KAM-500 ground (GND). See *TEC/NOT/063 - Grounding and shielding of the Acra KAM-500*.
4. Ensure the CAN bus being monitored does not require an acknowledgment before transmitting CAN data.
   The KAD/CBM/102 is silent, meaning it only monitors and does not transmit or acknowledge.

NOTE: 120-ohms termination is not needed as the KAD/CBM/102 monitors only CAN bus traffic.

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