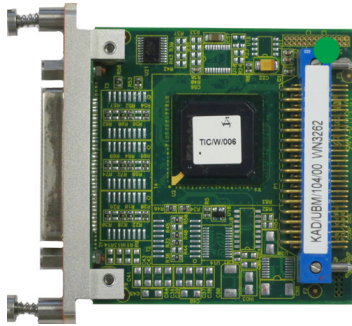


KAD/UBM/104

ABI/ACE-CCDL/ACB serial bus monitor parser/packetizer - 8ch



Key Features

- Monitors up to eight of any one of Actuator Bus Interface (ABI), Actuator Control Equipment-Cross Channel Data Link (ACE-CCDL), or Actuator Control Bus (ACB) busses
- Coherently parses traffic and tags for up to 256 messages
- Bit-rates of 1,000,000bps
- Aperiodic transmission of packetized data
- Detects message errors

Applications

- ABI, ACE-CCDL, or ACB bus monitoring and recording

Overview

The KAD/UBM/104 is an eight-channel serial bus monitor which combines the capabilities of a coherent message parser with the flexibility of an iNET-X packetizer and an error-detection function, on a single module. The module operates in ABI, ACE-CCDL, or ACB bus monitoring modes.

The parser parses up to 256 messages and their associated time and status tags. Each message has a stale bit (word read before) and skipped bit (buffer overwritten). ABI messages can be parsed based on their bus number, frame preamble ID and/or address fields. ACB messages can be parsed based on their bus number, message request function code, and starting address.

Every message received from each of the eight busses is captured and packetized, along with the time tags and a bus tag, with other received messages in a packetized buffer. The packetizer contents can be assembled into Ethernet frames by an iNET-X controller or transmitter, for example the KAD/BCU/140, for transmission over Ethernet.

To ensure efficient use of the bandwidth, the packets are only generated once an iNET-X payload size threshold has been reached. Additionally, a programmable timeout ensures that smaller packets are generated even during periods of low activity on the bus, thereby allowing real-time analysis and processing of the acquired messages. When there is no traffic, no packets are generated.

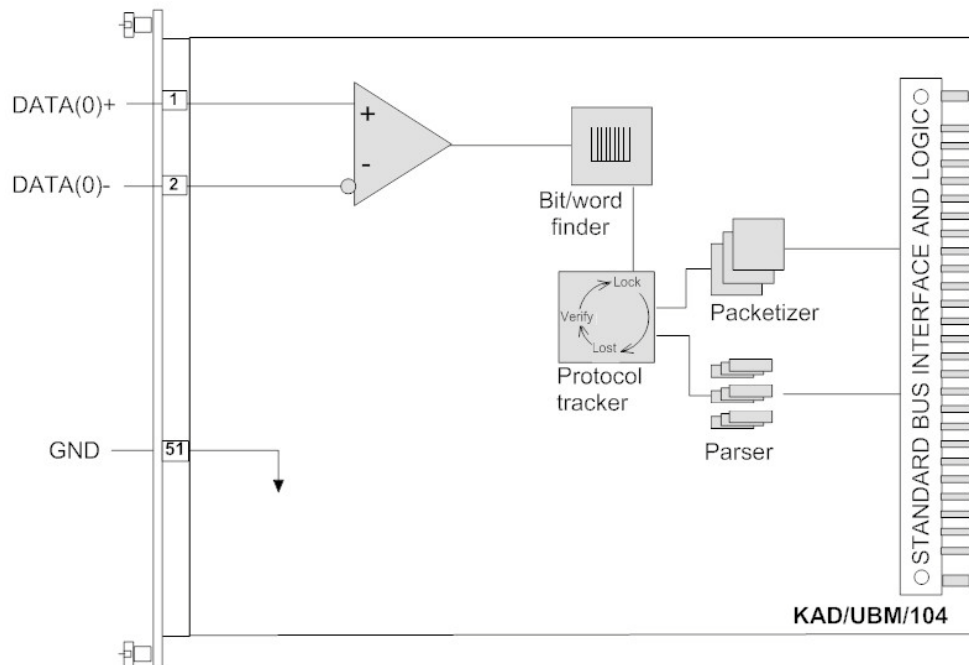


Figure 1: First of eight channels of the KAD/UBM/104

Specifications

All values provided in the following specification tables are valid within the operating temperature range specified under “Environmental ratings” in the “General specifications” table.

TABLE 1		General specifications				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Slots	–	–	1	–	Can be placed in any user-slot in any combination.	
Mass						
	–	70	–	g		
	–	2.5	–	oz	Design metric is grams.	
Height above chassis					For recommended clearance requirements, see the CON/KAD/002/CP data sheet.	
bare connector	–	–	11	mm		
bare connector	–	–	0.43	in.	Design metric is millimeters.	
Access rate	–	–	2	Mbps	Maximum combined access rate for read and write.	
Power consumption						
+5V	–	TBD	–	mA		
±7V	–	0	–	mA		
±12V	–	0	–	mA		
total power	–	TBD	–	W	Particular combinations of chassis and Acra KAM-500 modules may have power or current limitations. For details, see <i>TEC/NOT/016 - Power dissipation</i> , <i>TEC/NOT/049 - Power estimation</i> , and the relevant chassis data sheet.	
Environmental ratings					See <i>Environmental Qualification Handbook</i> .	
operating temperature	-40	–	85	°C	Chassis base/side plate temperature.	
storage temperature	-55	–	105	°C		

TABLE 2		RS-422/RS-485 inputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Inputs	–	–	8	–		
Signalling rate						
DATA[7:0]	–	1	–	Mbps		
Input voltage						
operating range	-25	–	25	V	Do not exceed operating range.	
logic 0	–	–	0.2	V	(50mV hysteresis) $V_{IN+} - V_{IN-}$.	
logic 1	0.2	–	–	V	(50mV hysteresis) $V_{IN+} - V_{IN-}$.	
common mode voltage	-20	–	25	V		
overvoltage protection	-27	–	27	V	Voltage in excess of these values can damage input.	
ESD protection	–	16	–	kV	Human Body Model.	
Input resistance						
between inputs	24	–	–	k Ω	Module powered on.	
between inputs	24	–	–	k Ω	Module powered off.	
each input to GND	12	–	–	k Ω	Module powered on.	
each input to GND	12	–	–	k Ω	Module powered off.	

Setting up the KAD/UBM/104

All module setup can be defined in XML using XidML® schemas (see <http://www.xidml.org>).

Instrument settings

SETUP DATA	CHOICE	DEFAULT	NOTES
Manufacturer	-	-	-
Name	ACRA CONTROL	ACRA CONTROL	Name of manufacturer.
PartReference	KAD/UBM/104	KAD/UBM/104	The instrument part reference.
SerialNumber	AB1234	AB1234	Unique name for each module.
Settings	-	-	-
Module Mode	ABI ACB ACE-CCDL	ABI	Specifies which of three bus protocols the module is set up to receive.
Fill Value	0000 to FFFF	AAAA	Value used to fill empty parser slots.
Processes	-	-	-
Parser(254:0)	-	-	-
Catchall-Parser	-	-	-
Channels	-	-	-
Serial-In(7:0)	-	-	Represents an ABI, ACE-CCDL or ACB serial channel.
Serial Input	-	-	-
Settings	-	-	-
Settings	-	-	-
Packetizer	-	-	-
Stream Id	00000000 to FFFFFFFF	FFFFFFF	iNET-X stream ID for selected channel if a packet is generated via the assertion of Packetization Enabled. This setting is only supported in DAS Studio 3.
Packetization Enabled	True False	False	Enables the transmission of an iNET-X packet containing the contents of this channel if an iNET-X transmitter is present in the chassis. This setting is only supported in DAS Studio 3.
Packet Size	200 to 511	511	Size of packet buffer in words.
Packet Timeout	10 to 999	50	Generates a packet when the oldest data recorded is this old (ms).

Parameter definitions

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
Global Parameters				
Report Indicates the status of the monitor.	BitVector	BitVector	16	R[15:0] R(15) ErrorIndicator - 1 indicates an error occurred since last read. R[14:12] BusNumber - The bus the error occurred on. R[11:7] Reserved - Reserved for future use. R[6:0] ErrorCodes - Error code indicates the error that occurred last. 0000000: No error. 0000001: ACB bus character parity error. 0000010: Character stop bit error. 0000011: Character start bit error. 0000100: No response from slave error. 0000101: Illegal length field error. 0000110: Captured message length is shorter than that of expected message length field. 0000111: Captured message length is longer than that of expected message length field. 0001000: Error in gap between characters in a message. 0001001: Error in gap between the response and request sections in a message. 0001010: Inter message idle time error. 0001011: Message protocol error. 0001100: ID field of the request section of message is invalid. 0001101: ID field of the response section of message is invalid. Other: Reserved for future use.
ModuleMessageCount Count of messages parsed by the module.	Count	OffsetBinary	16	R[15:0]
Parser(254:0) Parameters				
MessageSize Number of received bytes in the message. (Includes message header and data of both request and response.)	Count	OffsetBinary	16	R[15:0]
MessageIrigTime48 48-bit wide IRIG time word.	BitVector	BitVector	48	R[47:0]
MessageTimeHi Hours and minutes time of the first character in message.	BitVector	BitVector	16	R[47:32] R[15:13] Reserved - Reserved for future use. R[12:7] Hours - BCD Hours 0 to 23. R[6:0] Minutes - BCD Minutes 0 to 59.
MessageTimeLo Seconds and centiseconds time of the first character in message.	BitVector	BitVector	16	R[31:16] R(15) Reserved - Reserved for future use. R[14:8] Seconds - BCD Seconds 0 to 59. R[7:0] Centiseconds - BCD Centiseconds 0 to 99.

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
MessageTimeMicro Microseconds time of the first character in message.	Second	BCD	16	R[15:0] R[15:0] Microseconds - BCD Microseconds 0 to 9999.
MessageInfo Indicates status of message.	BitVector	BitVector	16	R[15:0] R(15) Empty - This slot is empty. R(14) Stale - Contents of this slot have already been read. R(13) Skipped - Contents of this slot have been over-written. R[12:0] Reserved - Reserved for future use.
MessageCount Received message count.	Count	OffsetBinary	16	R[15:0]
Catchall-Parser Parameters				
MessageSize Number of received bytes in the message. (Includes message header and data of both request and response.)	Count	OffsetBinary	16	R[15:0]
MessageIrigTime48 48-bit wide IRIG time word.	BitVector	BitVector	48	R[47:0]
MessageTimeHi Hours and minutes time of the first character in message.	BitVector	BitVector	16	R[47:32] R[15:13] Reserved - Reserved for future use. R[12:7] Hours - BCD Hours 0 to 23. R[6:0] Minutes - BCD Minutes 0 to 59.
MessageTimeLo Seconds and centiseconds time of the first character in message.	BitVector	BitVector	16	R[31:16] R(15) Reserved - Reserved for future use. R[14:8] Seconds - BCD Seconds 0 to 59. R[7:0] Centiseconds - BCD Centiseconds 0 to 99.
MessageTimeMicro Microseconds time of the first character in message.	Second	BCD	16	R[15:0] R[15:0] Microseconds - BCD Microseconds 0 to 9999.
MessageData(511:0) The 7/8 bits of a particular byte in serial stream.	BitVector	BitVector	16	R[15:0]
MessageInfo Indicates status of message.	BitVector	BitVector	16	R[15:0] R(15) Empty - This slot is empty. R(14) Stale - Contents of this slot have already been read. R(13) Skipped - Contents of this slot have been over-written. R[12:0] Reserved - Reserved for future use.
MessageCount Received message count.	Count	OffsetBinary	16	R[15:0]

NOTE: It is recommended that names are less than 20 characters, have no white space or contain any of the following five characters "/><\".

Getting the most from the KAD/UBM/104

For a detailed description on iNET-X packets, see *TEC/NOT/067 - IENA and iNET-X packet payload formats*.

KAD/UBM/104 packet formats

The KAD/UBM/104 can output packet payloads formatted for insertion into iNET-X systems.

iNET-X parser-aligned packet format

The generalized iNET-X payload structure for a parser-aligned packet is shown in the following figure.

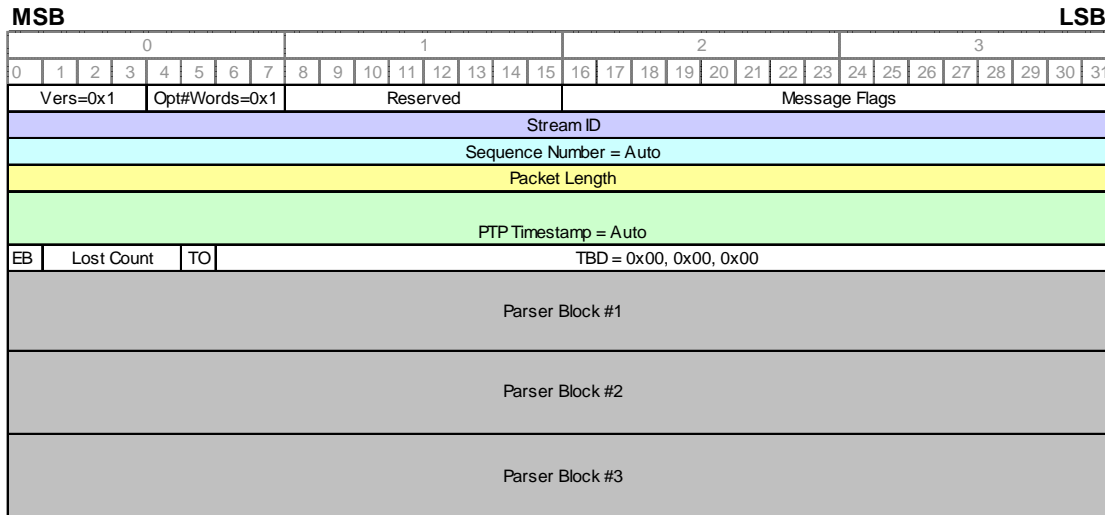


Figure 2: Generalized parser-aligned iNET-X packet

As messages are captured on the bus, they are formatted into a parser block. Each parser block begins with a 4-byte parser info word, followed by a 4-byte elapsed time tag, followed by a 2-byte protocol specific header and the message data shown in the following figure.

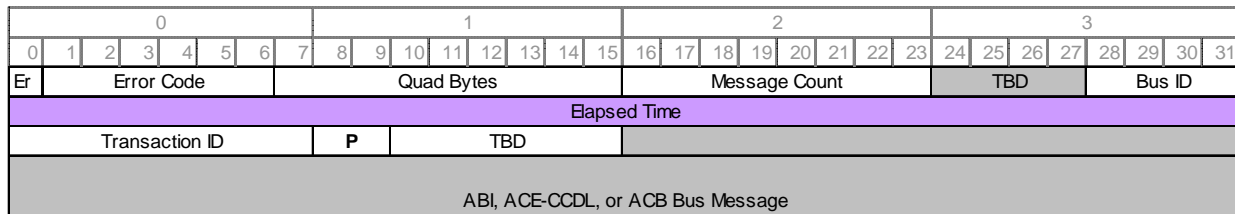


Figure 3: iNET-X parser block for ABI, ACE-CCDL, or ACB messages

A parser block consists of the following fields:

- Parser info word (4 bytes): metadata providing information about the health and status of the message.
 - + Bit (0): indicates that an error occurred.
 - + Bits [1:6]: error codes.
 - + Bits [7:15]: number of quad bytes. This relates to the length of the parser info word, elapsed time tag, and the message data and padding (N x 4 bytes). For example, a 4-byte message captured from a given bus has a quad-byte value of 3, that is 12 bytes, which includes 4 bytes parser info word, 4 bytes elapsed time, and 4 bytes bus message data.
 - + Bits [16:23]: message counter. This is a counter that relates to the messages contained in the payload.
 - + Bits [24:31]: bus ID corresponds to the physical bus number on the module that is from 0 to 7.
- Elapsed time tag (4 bytes): time tag as an unsigned offset in nanoseconds that is added to the base Precision Time Protocol (PTP) timestamp in the iNET-X header.

- Protocol specific header (2 bytes)
 - + Bits [0:7]: transaction ID.
 - + Bits [8:9]: padding bytes count.
 - + Bits [10:15]: TBD.
- Message (N x 4 bytes): captured bus traffic, padded if necessary to end on a 4-byte boundary.

Example iNET-X parser-aligned packet format for the ABI, ACE-CCDL, and ACB busses

The KAD/UBM/104 is an 8-channel ABI, ACE-CCDL, or ACB bus monitor. Traffic captured on each of the channels is placed in an iNET-X parser-aligned packet (see the following figure for the ABI format, Figure 5 on page 8 for the ACB format, and Figure 6 on page 9 for the ACE-CCDL format), where each bus has its own unique stream ID. The bus ID identifies on which bus a message was received.

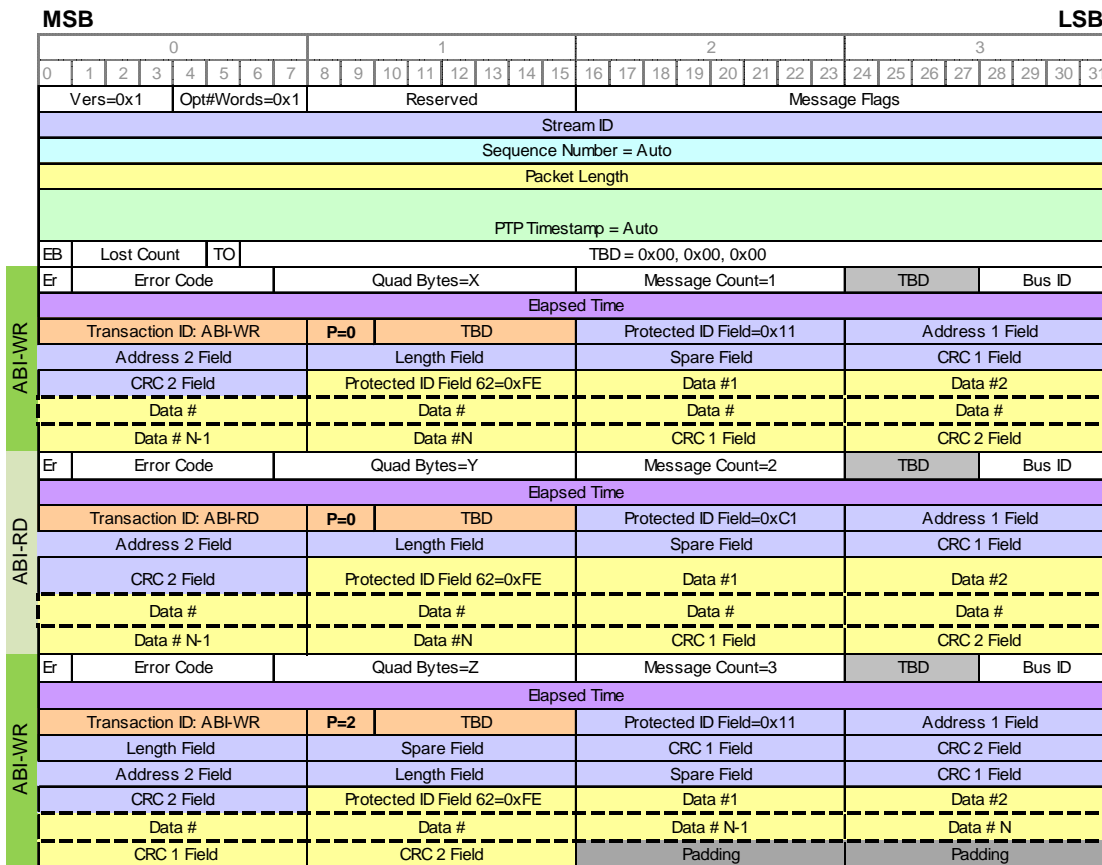


Figure 4: ABI bus iNET-X parser-aligned packet

As ABI, ACE-CCDL, or ACB messages arrive, they are tagged with a 4-byte parser info word and a 4-byte elapsed time word, followed by a 2-byte protocol specific header. The parser info word identifies properties of the ABI, ACE-CCDL, or ACB message (such as the message counter and the ID of the bus on which the message was received) and marks the health of the message using an error bit and an error code.

The PTP timestamp in the iNET-X packet header is fixed when a packet is opened for writing and is used as the base timestamp for the whole packet. The PTP timestamp for each message in the packet can be calculated by adding the elapsed time to this base timestamp.

Directly following the elapsed time field is the 2 bytes of the protocol specific header. The message info word identifies the messages transaction type, and the number of padding bytes. If the message does not finish on a 32-bit boundary, padding bytes are added.

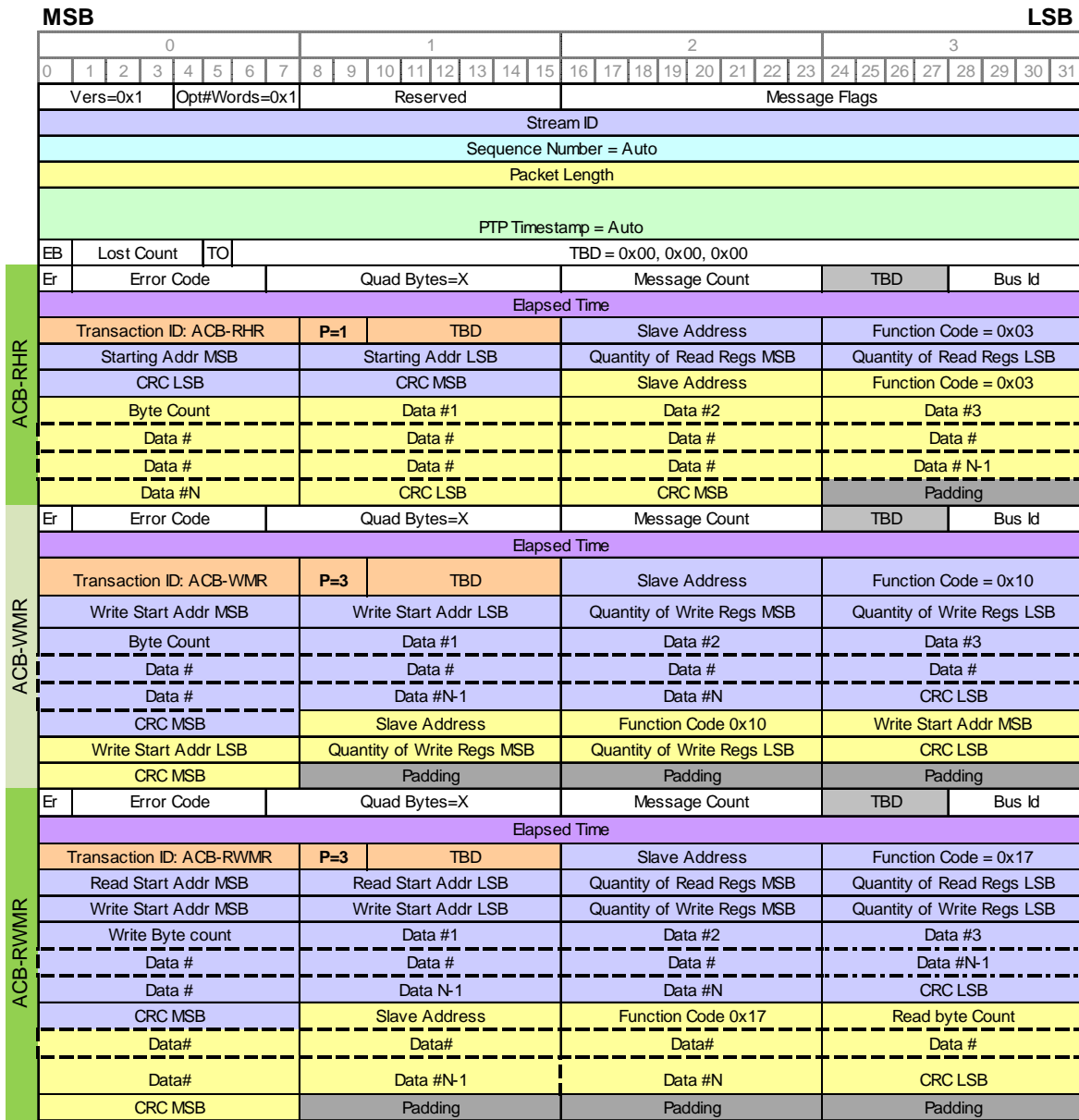


Figure 5: ACB bus iNET-X parser-aligned packet

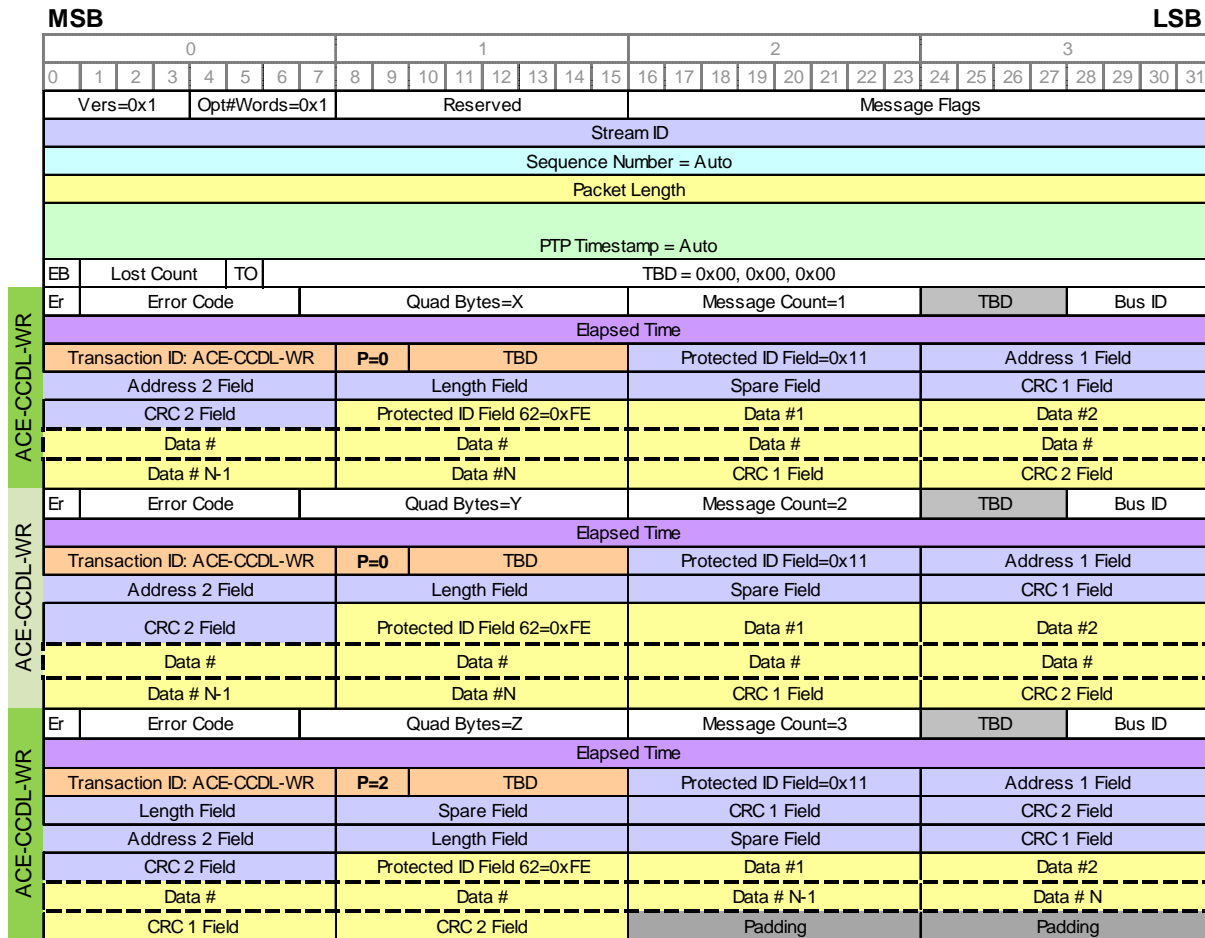


Figure 6: ACE-CCDL bus iNET-X parser-aligned packet

TABLE 3	Transaction ID	
TRANSACTION (MESSAGE) TYPE	DESCRIPTION	VALUE
ABI bus WRite (ABI-WR)	Master write to slave	0x01
ABI bus ReaD (ABI-RD)	Master read from slave	0x02
ACB Read Holding Registers (ACB-RHR)	Master read from slave	0x03
ACB Write Multiple Registers (ACB-WMR)	Master write to slave	0x04
ACB Read/Write Multiple Registers (ACB-RWMMR)	Master read/write from/to slave	0x05
ACE-CCDL Bus Write (ACE-CCDL-WR)	Master write to slave	0x06
Reserved		0x00, 0x07-0xFF

Packetizer error codes for the KAD/UBM/104

An error in the incoming traffic is recorded by setting the error bit and error code in the Most Significant Bit (MSB) location of the iNET-X headers of the packet and message. The error bit—or EB bit—in the iNET-X packet header indicates that at least one of the parser blocks contains an error. The error bit and error code in each parser block can then be used in post-processing to indicate which messages should be filtered or dropped.

The following table lists the error codes that can occur in the Error Code field in the parser info word in the parser block.

TABLE 4		Error codes
CODE ¹	DESCRIPTION	
0x01	ACB bus character parity error	
0x02	Character stop bit error	
0x03	Character start bit error	
0x04	No response from slave error	
0x05	Illegal length field error	
0x06	Captured message length is shorter than that of expected message length field	
0x07	Captured message length is longer than that of expected message length field	
0x08	Error in gap between characters in a message	
0x09	Error in gap between the response and request sections in a message	
0x0a	Inter message idle time error	
0x0b	Message protocol error	
0x0c	ID field of the request section of message is invalid	
0x0d	ID field of the response section of message is invalid	
0x0e -0x3f	Reserved for future use	

1. Error codes are in hexadecimal.

Connector pinout of the KAD/UBM/104

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	DATA(0)+	RS-422/RS-485 inputs	Data in
2	DATA(0)-	RS-422/RS-485 inputs	Data in
3	DATA(1)+	RS-422/RS-485 inputs	Data in
4	DATA(1)-	RS-422/RS-485 inputs	Data in
5	DATA(2)+	RS-422/RS-485 inputs	Data in
6	DATA(2)-	RS-422/RS-485 inputs	Data in
7	DATA(3)+	RS-422/RS-485 inputs	Data in
8	DATA(3)-	RS-422/RS-485 inputs	Data in
9	CHASSIS	Chassis	
10	CHASSIS	Chassis	
11	GND	Internal ground	
12	GND	Internal ground	
13	GND	Internal ground	
14	DNC		Do not connect
15	DATA(4)+	RS-422/RS-485 inputs	Data in
16	DATA(4)-	RS-422/RS-485 inputs	Data in
17	DATA(5)+	RS-422/RS-485 inputs	Data in
18	DATA(5)-	RS-422/RS-485 inputs	Data in
19	DNC		Do not connect
20	DNC		Do not connect
21	DNC		Do not connect
22	DNC		Do not connect
23	DNC		Do not connect
24	DNC		Do not connect
25	DATA(6)+	RS-422/RS-485 inputs	Data in
26	DATA(6)-	RS-422/RS-485 inputs	Data in
27	GND	Internal ground	
28	GND	Internal ground	
29	DATA(7)+	RS-422/RS-485 inputs	Data in
30	DATA(7)-	RS-422/RS-485 inputs	Data in
31	DNC		Do not connect
32	DNC		Do not connect
33	DNC		Do not connect
34	DNC		Do not connect
35	DNC		Do not connect
36	DNC		Do not connect
37	DNC		Do not connect
38	DNC		Do not connect
39	DNC		Do not connect
40	DNC		Do not connect
41	DNC		Do not connect
42	DNC		Do not connect
43	DNC		Do not connect
44	DNC		Do not connect
45	DNC		Do not connect
46	DNC		Do not connect
47	DNC		Do not connect
48	DNC		Do not connect
49	DNC		Do not connect
50	GND	Internal ground	
51	GND	Internal ground	
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	DESCRIPTION
KAD/UBM/104	ABI/ACE-CCDL/ACB serial bus monitor parser/packetizer - 8ch

By default, the standard mating connector, CON/KAD/002/CP, is included with each module in the shipment. Its part number will be added to the Confirmation of Order unless an alternative option is specified (see the Cables data sheet).

Revision history

REVISION	DIFFERENCES	STATUS
KAD/UBM/104	First release	Preliminary draft; contact Curtiss-Wright support (acra-support@curtisswright.com) for details

Supporting software

SOFTWARE	DETAILS
DAS Studio 3	User interface for setup and management of data acquisition, network switches, recorders and ground stations in an integrated environment

Related documentation

DOCUMENT	DETAILS
DOC/DBK/001	Acra KAM-500 Databook
DOC/GBK/002	Environmental Qualification Handbook
DOC/MAN/030	DAS Studio 3 User Manual
TEC/NOT/016	Power dissipation
TEC/NOT/049	Power estimation
TEC/NOT/051	Ethernet frames, Wireshark® and FAT32
TEC/NOT/067	IENA and iNET-X packet payload formats