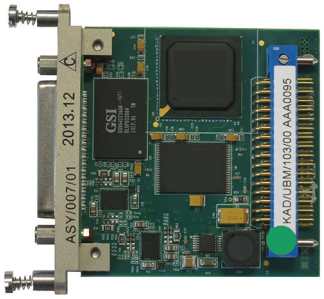
KAD/UBM/103

RS-232, RS-422 or RS-485 serial bus parser/packetizer - 16ch

CURTISSWRIGHTDS.COM



Key Features

- Monitors up to 16 RS-422/485/232 busses
- Coherently parses traffic and tags for up to 511 messages from 4 to1024 bytes
- Aperiodic transmission of packetized serial messages including tags as iNET-X parser-aligned payload structure
- Bit-rates from 300bps to 1,000,000bps
- 7/8 bits per word with odd, even or no parity
- Programmable start sequence (1 to 8 bytes), stop sequence (1 byte or by fixed length) and idle time

Applications

- Interfacing with serial data links

Overview

The KAD/UBM/103 is used to monitor up to 16 RS-232/422/485 channels. The module can parse (coherently extract specific bytes) and/or packetize (insert messages in packets for Ethernet transmission) each channel at the same time.

The signal type (RS-232/422/485), bits per word, and parity are programmable on a channel-by-channel basis.

In the parser, a total of up to 511 complete messages are triple buffered so that the stale indication is message-wide. Each message can be up to 1,024 characters (bytes) long (including start and stop characters). Each message is tagged to 0.1ms resolution; a message is considered found when a start sequence of up to eight specific bytes is received. The end-of-message delimiter is determined by a user-defined stop character or after a specific number of words are received. A message is not updated if any sequence is incorrect.

Independently of the parser, an iNET-X packet stream is generated for each channel. All received bytes are encapsulated in an iNET-X parser-aligned payload structure. A programmable gap time allows the module to split the incoming bytes into shorter timestamped sequences. A block header attached to each sequence stores the channel index, length, and the time of reception of each message. These parser-aligned packets may be transmitted aperiodically to optimize network bandwidth utilization and memory usage when recording serial traffic.

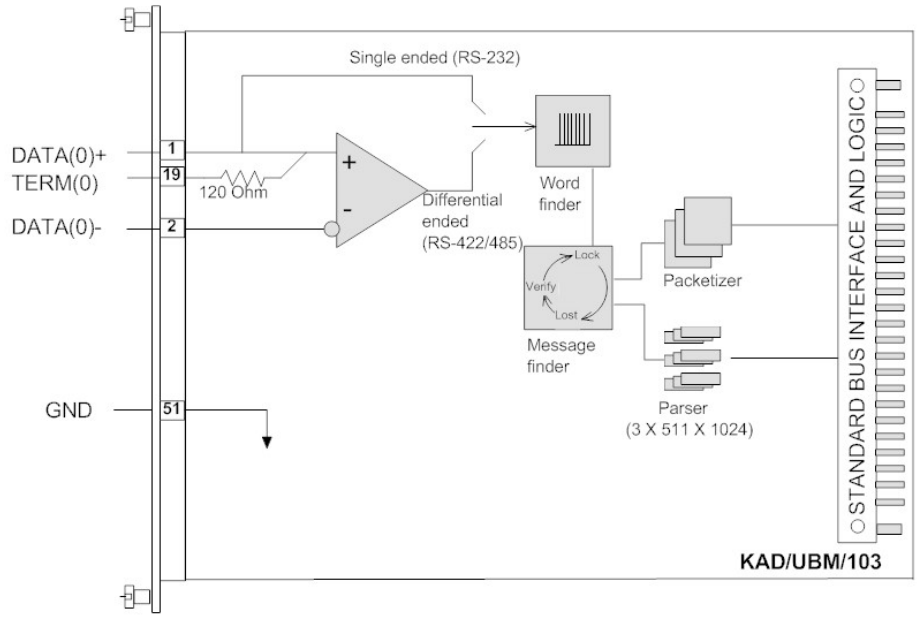


Figure 1: First of 16 channels of the KAD/UBM/103

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					
	–	75	–	g	
	–	2.64	–	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	Msps	Maximum combined access rate for read and write.
Power consumption					
+5V	275	–	300	mA	
±7V	0	–	0	mA	
±12V	0	–	0	mA	
total power	1.375	–	1.50	W	Particular combinations of chassis and Acra KAM-500 modules may have power or current limitations. For details, see *TEC/NOT/016 - Power dissipation, TEC/NOT/049 - Power estimation*, and the relevant chassis data sheet.
Environmental ratings					See *Environmental Qualification Handbook*.
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	–	–	16	–	
Signalling rate					
DATA	0.0003	–	1	Mbps	NRZ-L.
Input voltage					
operating range	-15	–	15	V	Do not exceed operating range.
logic 0	–	–	0.2	V	(190mV hysteresis) V_{IN+} - V_{IN-}.
logic 1	0.2	–	–	V	(190mV hysteresis) V_{IN+} - V_{IN-}.
common mode voltage	-7	–	12	V	
overvoltage protection	-15	–	15	V	Voltage in excess of these values can damage input.
ESD protection	–	16	–	kV	Human Body Model.
Input resistance					
between inputs	–	250	–	kΩ	Module powered up and no input termination.
between inputs	–	260	–	kΩ	Module powered down and no input termination.
between inputs	–	120	–	Ω	Module powered up and inputs terminated with external or internal termination resistor.
between inputs	–	120	–	Ω	Module powered down and inputs terminated with external termination resistor.

TABLE 3	RS-232 inputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Inputs	–	–	16	–	
Signaling rate					
DATA[15:0]	0.0003	–	1	Mbps	
Input voltage					
operating range	-15	–	15	V	Do not exceed operating range.
logic 0	2.5	–		V	
logic 1		–	0.6	V	
overvoltage protection	-15	–	15	V	Voltages outside of this range can damage input.
ESD protection	16	–	16	kV	Human Body Model.
Input resistance					
each input to GND	–	5	–	kΩ	Module powered up.
each input to GND	–	130	–	kΩ	Module powered down.

Setting up the KAD/UBM/103

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/103	KAD/UBM/103	The instrument part reference.
SerialNumber	AB1234	AB1234	Unique name for each module.
Settings	-	-	-
Parser Data Endianness	First byte at low end of word First byte at high end of word One word per byte	First byte at low end of word	Select byte order in data field of parser slot. If one word per byte is selected, the lower byte of each word is padded with zero.
Fill Value	0000 to FFFF	AAAA	The value returned by Parser Parameters (excluding MessageInfo) when MessageInfo indicates the parser is empty.
Processes	-	-	-
Parser(510:0)	-	-	-
Channels	-	-	-
Serial-In(15:0) *Serial Input*	-	-	Connection between the module channel and RS-232/422/485 data bus.
Settings *Serial Interface*	-	-	-
Signal Type	RS-232 RS-422 RS-485	RS-232	Type of data stream.
Baud Rate	300 to 1000000	9600	Specifies the number of symbols transmitted per second.
Data Bits Per Word	7 8	8	Bits per incoming data word. Two incoming words are packed into a single 16-bit output word.
Parity	No Parity Even Parity Odd Parity	No Parity	Configure whether parity bit is present in incoming data.
Parity Check	Not checked Report failure Report failure and offset	Not checked	Configure whether and how parity failures are reported. Note: failure offset is only available in packetizer output.
Gap Between Messages	0 to 10000	10	Time gap between consecutive characters required before starting new message. Value expressed in unit of character periods at configured bit rate. Set to 0 to ignore all gaps.
Programmable Termination	Disabled Enabled	Disabled	Enable internal 120-ohm termination resistance. (Note: not active when power is disabled. Use wiring selectable termination instead if termination is required at all times.)
Settings *Packetizer*	-	-	-
Packetizer Format	iNET-X IENA iNET-X Hybrid	iNET-X	Selects the packetizer header format for all channels.

SETUP DATA	CHOICE	DEFAULT	NOTES
Stream Id	00 to FFFFFFFF	FFFFFFFF	iNET-X stream identifier for selected channel if a packet is generated via the assertion of Packetization Enabled. This is a conditional setting and is only active when the Packetizer Format is set to iNET-X.
Packetization Enabled	True False	False	Enables the transmission of a packetizer packet containing the contents of this channel if a packetizer transmitter or memory module is present in the chassis.
Packet Size	200 to 511	511	Size of packet buffer in words.
Packet Timeout	10 to 999	50	Generate a packet when the oldest data recorded is this old (ms).
Utilization	0.01 to 1.00	1.00	Can be used to schedule less packets when incoming message rates are known to be less than maximum. Expressed as a decimal that is, 1.00 = 100% utilization.
IENA Key	0 to FFFF	0	IENA Key for selected channel if a packet is generated via the assertion of Packetization Enabled. This is a conditional setting and is active when the Packetizer Format is not set to iNET-X.
One Message Per Packet	True False	False	Set to True to limit packets to one parserblock. After each gap, the next message starts a new packet. Only use this setting if the number of packets scheduled exceeds the number of messages expected and the maximum size message is less than the Packet Size.
Packetization Sink	All Controller Only Slot 1 Slot 2 Slot 3 Slot 4 Slot 5 Slot 6 Slot 7 Slot 8 Slot 9 Slot 10 Slot 11 Slot 12 Slot 13 Slot 14 Slot 15	All	Selects which modules the packetizer package is sent to for transmission or storage.

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[14:11] BusNumber - The bus the error occurred on. R[10:4] Reserved - Reserved for future use. R[3:0] ErrorCodes - Each bit set indicates that particular error occurred since report word last read. After the report word has been read, further reads will return the last non-zero error code with the ErrorIndicator bit not set. 0001: Parity error. 0010: Bad stop bit. 0100: Too many data words. Stop character not found in 1024 characters. Other: Reserved for future use.
ModuleMessageCount Count of messages received (all channels). Increments by one each time the parser logic detects a complete message. Reads as 0 before first message received.	BitVector	BitVector	16	R[15:0]
Parser(510:0) Parameters				
MessageSize Number of received bytes (including start bytes. For example, 1+8 = 9 bytes in a message). Minimum length of message is 2 bytes (1 byte of start sequence plus one stop byte or at least one byte in case of fixed length message).	Count	OffsetBinary	16	R[15:0]
MessageIrigTime48 48-bit wide IRIG time word.	BitVector	BitVector	48	R[47:0]
MessageTimeHi Hours and minutes time midway through first transmitted bit.	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 midway through first transmitted bit.	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 Microsecond time midway through first transmitted bit.	Second	BCD	16	**R[15:0]** R[15:0] Microseconds - BCD Microseconds 0 to 9999.
MessageCount Received message count.	Count	OffsetBinary	16	R[15:0]

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
MessageInfo Stale/skipped indication for this parsed message.	BitVector	BitVector	16	**R[15:0]** R(15) Empty - ID is empty (no message received). R(14) Stale - 1 indicates this message was read before. R(13) Skipped - 1 indicates this message overwrote another. R[12:0] Reserved - Reserved for future use.
Serial-In(15:0) Parameters				
ChannelMessageCount Index of received message. First message received is given value 0. Increments by 1 each time the parser logic detects a valid message on this channel. Reads as Fill Value before first message received.	BitVector	BitVector	16	R[15:0]
ChannelByteCount Count of bytes received on this bus.	Count	OffsetBinary	16	R[15:0]
ChannelErrCount Count of errors detected on this bus.	BitVector	BitVector	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/103

Each of the 16 bus connections can be independently selected as RS-232, RS-422 or RS-485. For RS-232 (single ended), use a DATA(x)+ pin and leave the corresponding DATA(x)- pin unconnected. Both data pins are required when a differential mode is selected (RS-422 or RS-485).

The following figure shows how to optionally terminate the RS-422 and RS-485 receivers by using the internal termination resistor provided on the module (TERM[x] pin). It is important to ground each source of RS-232, RS-422 or RS-485. Star grounding provides optimal noise rejection. For details on grounding, see *TEC/NOT/063 - Grounding and shielding of the Axon and Acra KAM-500*.

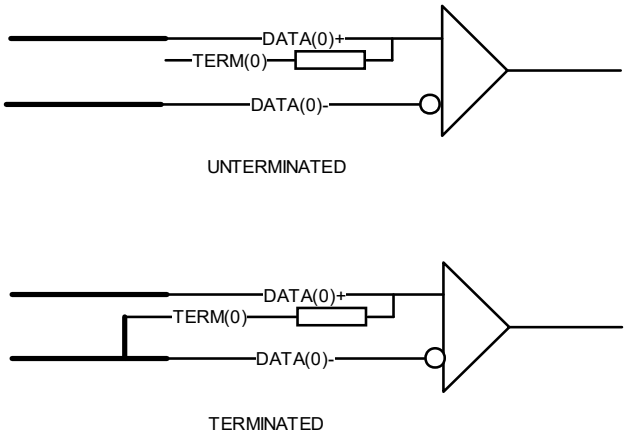


Figure 2: Optional RS-422/RS-485 third pin termination

Maximum message length

The maximum message length is 1,024 bytes. This length includes the bytes used for the start pattern and the end byte (if an end byte is used).

Timestamps for parser/packetizer and idle time for parser

For information on using timestamps for parser/packetizer and idle time (gap between messages) for parser, contact Curtiss-Wright support (acra-support@curtisswright.com).

Parser Data Endianness example

With ABCD characters being transmitted, setting Parser Data Endianness to:

First byte at low end of word:
the module outputs DW0=AB and DW1=CD

First byte at high end of word:
the module outputs DW0=BA and DW1=DC

One word per byte:
the module outputs DW0=A0, DW1=B0, DW2=C0 and DW3=D0

Error codes

Code[1]	DESCRIPTION
1_{16}	Parity error.
2_{16}	Bad stop bit.
4_{16}	Last character not found in 1.024 characters (in report word only; not in packetizer error code).
0_{16}, 3_{16}, 5_{16}, 6_{16}, 7_{16}	Reserved for future use.

1. Error codes are in hexadecimal.

Packetizer format

The KAD/UBM/103 recognizes bytes as having a start bit, data bits (seven or eight, programmable), a parity bit (optional), and a stop bit. The KAD/UBM/103 gathers groups of bytes into standard iNET-X parser-aligned blocks. Each output packet can contain multiple blocks. If configured to receive 7-bit bytes, each byte is padded to 8 bits using a zero at the most significant bit before saving.The generalized iNET-X payload structure for parser-aligned packets is shown in Figure 3 on page 9 and examples of parser block formats are shown in Figure 4 on page 10.

A parser block is created for each logical message, based on the gaps between sequences of bytes. A new parser block is created at the start of each iNET-X packet and also when the time gap between successive bytes exceeds a programmable threshold.

The gap time threshold is programmed in characters. By setting the threshold value to just under the minimum gap time allowable between messages (under the protocol being used), it is possible to correctly split the bytes of the incoming stream into individual messages, as required. If multiple messages are received back-to-back, in a burst with no such gap, they are packetized as a single message. Conversely, if a single message continues past the end of one packet with no gap, the succeeding bytes are packetized in a new parser block in the next packet. A bit in the header of the first parser block, in the following packet, is set to indicate that this block is a continuation of the message in the final block of the previous packet. The location of this continuation bit is marked Cn in the example parser blocks in Figure 4 on page 10.

If a 0µs threshold is set, gaps are not detected, and in the absence of errors, each iNET-X packet contains a single parser block whose length is controlled by the packet timeout and size settings selected.

The Error Code field for the parser block indicates whether any error was detected.

If parity error detection is enabled, the parity bit for each byte is checked but not recorded. If error reporting is enabled, the error code is reported in the parser block header, and optionally, an extra quadbyte can be suffixed to the parser block indicating the byte offset of the first error. There may be additional errors at locations past this offset.

NOTE: Additional packetized messages that contain one zero value byte can occur when there is noise on the incoming signal lines. These may be marked as errors, depending on the parity and error detection settings.

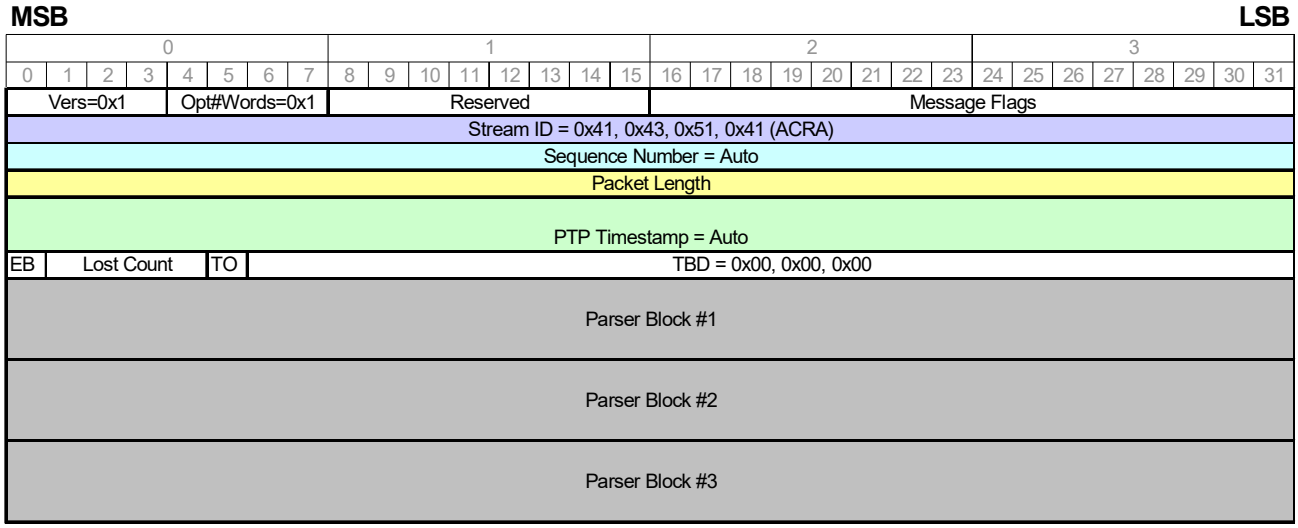


Figure 3: Generalized parser-aligned iNET-X packet

Parser blocks example

UART message parser block (10 characters of data)

MSB **LSB**

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Er	Error Code							Quad Bytes=5								Message Count								TBD						Bus ID	
Elapsed Time																															
TBD		Cn	P=0					TBD								Data #1								Data #2							
Data #3								Data #4								Data #5								Data #6							
Data #7								Data #8								Data #9								Data #10							

UART message parser block (5 characters of data with 1 byte padding)

MSB **LSB**

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Er	Error Code							Quad Bytes=4								Message Count								TBD						Bus ID	
Elapsed Time																															
TBD		Cn	P=1					TBD								Data #1								Data #2							
Data #3								Data #4								Data #5								Padding							

UART Message Parser Block (8 characters of data with 2 bytes padding)

MSB **LSB**

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Er	Error Code							Quad Bytes=5								Message Count								TBD						Bus ID	
Elapsed Time																															
TBD		Cn	P=2					TBD								Data #1								Data #2							
Data #3								Data #4								Data #5								Data #6							
Data #7								Data #8								Padding								Padding							

UART Message Parser Block (13 characters of data (7 bits per character), 1 byte padding)

MSB **LSB**

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Er	Error Code							Quad Bytes=6								Message Count								TBD						Bus ID	
Elapsed Time																															
TBD		Cn	P=1					TBD								Data #1								Data #2							
	Data #3								Data #4								Data #5								Data #6						
	Data #7								Data #8								Data #9								Data #10						
	Data #11								Data #12								Data #13								Padding						

UART message parser block (6 characters of data, parity error in second byte; location reported by adding extra quadword)

MSB **LSB**

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Error Code							Quad Bytes=5								Message Count								TBD						Bus ID	
Elapsed Time																															
TBD		Cn	P=0					TBD								Data #1								Data #2 (error)							
Data #3								Data #4								Data #5								Data #6							
Reserved = 0								Error Offset = 1								Reserved = 0															

P = Number of padding bytes added to complete final quadbyte to 32 bits
Cn = Continuation Indicator (1 = this block continues the block that ended the previous packet.)

Figure 4: Parser block formats used in packetizer

UART = Universal Asynchronous Receiver Transmitter)

Connector pinout of the KAD/UBM/103

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	DATA(0)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
2	DATA(0)-	RS-422/RS-485 inputs	Data in; connect to pin 19 for 120Ω termination
3	DATA(1)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
4	DATA(1)-	RS-422/RS-485 inputs	Data in; connect to pin 21 for 120Ω termination
5	DATA(2)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
6	DATA(2)-	RS-422/RS-485 inputs	Data in; connect to pin 23 for 120Ω termination
7	DATA(3)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
8	DATA(3)-	RS-422/RS-485 inputs	Data in; connect to pin 25 for 120Ω termination
9	DATA(4)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
10	DATA(4)-	RS-422/RS-485 inputs	Data in; connect to pin 27 for 120Ω termination
11	DATA(5)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
12	DATA(5)-	RS-422/RS-485 inputs	Data in; connect to pin 29 for 120Ω termination
13	DATA(6)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
14	DATA(6)-	RS-422/RS-485 inputs	Data in; connect to pin 31 for 120Ω termination
15	TERM(7)	RS-422/RS-485 inputs	Connect to pin 16 for 120Ω termination
16	DATA(7)-	RS-422/RS-485 inputs	Data in; connect to pin 15 for 120Ω termination
17	DATA(8)-	RS-422/RS-485 inputs	Data in; connect to pin 34 for 120Ω termination
18	GND	Internal ground	
19	TERM(0)	RS-422/RS-485 inputs	Connect to pin 2 for 120Ω termination
20	TERM(9)	RS-422/RS-485 inputs	Connect to pin 38 for 120Ω termination
21	TERM(1)	RS-422/RS-485 inputs	Connect to pin 4 for 120Ω termination
22	TERM(10)	RS-422/RS-485 inputs	Connect to pin 40 for 120Ω termination
23	TERM(2)	RS-422/RS-485 inputs	Connect to pin 6 for 120Ω termination
24	TERM(11)	RS-422/RS-485 inputs	Connect to pin 42 for 120Ω termination
25	TERM(3)	RS-422/RS-485 inputs	Connect to pin 8 for 120Ω termination
26	TERM(12)	RS-422/RS-485 inputs	Connect to pin 44 for 120Ω termination
27	TERM(4)	RS-422/RS-485 inputs	Connect to pin 10 for 120Ω termination
28	TERM(13)	RS-422/RS-485 inputs	Connect to pin 46 for 120Ω termination
29	TERM(5)	RS-422/RS-485 inputs	Connect to pin 12 for 120Ω termination
30	TERM(14)	RS-422/RS-485 inputs	Connect to pin 48 for 120Ω termination
31	TERM(6)	RS-422/RS-485 inputs	Connect to pin 14 for 120Ω termination
32	TERM(15)	RS-422/RS-485 inputs	Connect to pin 50 for 120Ω termination
33	DATA(7)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
34	TERM(8)	RS-422/RS-485 inputs	Connect to pin 17 for 120Ω termination
35	DATA(8)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
36	GND	Internal ground	
37	DATA(9)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
38	DATA(9)-	RS-422/RS-485 inputs	Connect to pin 20 for 120Ω termination
39	DATA(10)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
40	DATA(10)-	RS-422/RS-485 inputs	Connect to pin 22 for 120Ω termination
41	DATA(11)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
42	DATA(11)-	RS-422/RS-485 inputs	Connect to pin 24 for 120Ω termination
43	DATA(12)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
44	DATA(12)-	RS-422/RS-485 inputs	Connect to pin 26 for 120Ω termination
45	DATA(13)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
46	DATA(13)-	RS-422/RS-485 inputs	Connect to pin 28 for 120Ω termination
47	DATA(14)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
48	DATA(14)-	RS-422/RS-485 inputs	Connect to pin 30 for 120Ω termination
49	DATA(15)+	RS-422/RS-485 inputs, RS-232 inputs	Data in
50	DATA(15)-	RS-422/RS-485 inputs	Connect to pin 32 for 120Ω termination
51	GND	Internal ground	
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	DESCRIPTION
KAD/UBM/103	RS-232, RS-422 or RS-485 serial bus parser/packetizer - 16ch

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/103	First release	Recommended for new programs

Supporting software

SOFTWARE	DIFFERENCES
DAS Studio 3	User interface for setup and management of data acquisition, network switches, recorders and ground stations in an integrated environment
KSM-500	This module is supported by the KSM-500 suite of software tools

Related documentation

DOCUMENT	DETAILS
DOC/DBK/001	Acra KAM-500 Databook
DOC/HBK/002	Environmental Qualification Handbook
DOC/MAN/018	KSM-500 Databook
DOC/MAN/030	DAS Studio 3 User Manual
TEC/NOT/016	Power dissipation
TEC/NOT/049	Power estimation
TEC/NOT/063	Grounding and shielding of the Axon and Acra KAM-500
TEC/NOT/079	Using the KAD/UBM/103