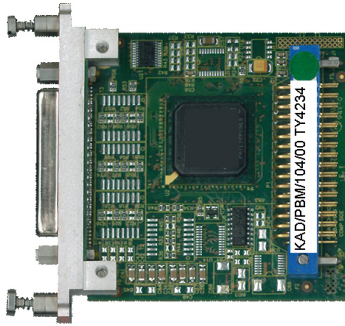


# KAD/PBM/104

4-channel IRIG-106 PCM bus packetizer

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## Overview

The KAD/PBM/104 is a four-channel PCM bus monitor. It can capture four independent PCM streams for storage in Wireshark® Packet CAPture (PCAP) format and for simultaneous transmission via Ethernet.

There is no major frame decommutation.

## Key Features

- Monitors four IRIG-106 PCM streams (16-bit words)
- Accepts NRZ-L code with Data clock
- Aggregate data rate of 20Mbps
- Time tags first bit of packet to one  $\mu$ s (microsecond)
- Aperiodic transmission

## Applications

- Airborne solid-state recorders

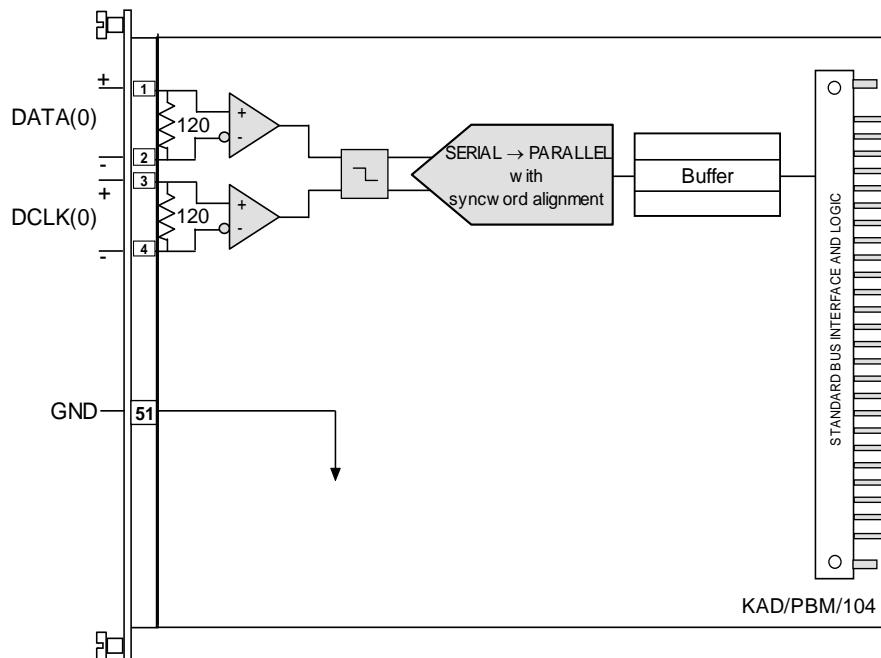


Figure 1: First of four independent PCM bus monitors

## 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		
	–	2.47	–	oz	Design metric is grams.	
Height above chassis					For recommended clearance requirements, see the <i>CON/KAD/002/CP</i> data sheet.	
bare connector	–	–	11	mm		
bare connector	–	–	0.43	in.	Design metric is millimeters.	
Access rate	–	–	2	Msp/s	Maximum combined read rate.	
Power consumption						
+5V	–	–	268	mA		
±7V	0	–	0	mA		
±12V	0	–	0	mA		
total power	–	–	1.34	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 inputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Inputs	–	–	4	–		
Signalling rate						
DATA[3:0]±	0.1	–	20	Mbps		
DCLK[3:0]±	0.1	–	20	MHz		
Input voltage						
operating range	-25	–	25	V	Do not exceed operating range.	
logic 0	–	–	-0.2	V	(130mV hysteresis) $V_{IN+} - V_{IN-}$	
logic 1	0.2	–	–	V	(130mV 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	–	120	–	Ω		

## Setting up the KAD/PBM/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/PBM/104	KAD/PBM/104	The instrument part reference.
SerialNumber	AB1234	AB1234	Unique name for each module.
Channels	-	-	-
PCM-In(3:0) PCM Input	-	-	IRIG-106 PCM input channel.
Settings	-	-	-
Pcm Code	NRZ-L	NRZ-L	Specifies the PCM encoding used.
Clock Phase	0 180	180	Indicates the phase of the data clock in degrees.
Polarity	True False	True	Specifies the polarity used to transmit.
Bit Rate	1000 to 20000000	1000000	Bit rate of input channel.
Packet Size	17 to 729	720	Size of packet buffer in words.
Stream Id	00 to FFFFFFFF	FFFFFFF	iNET-X stream ID for selected channel.
Packetization Enabled	True False	False	Enables packetization on selected channel.
Sync Word	00 to FFFFFFFF	FE6B2840	Indicates 32-bit sync word pattern.
Sync Word Mask	00 to FFFFFFFF	FFFFFFF	Indicates which bits are deemed significant in the sync word and therefore should be matched.
Frame Length	64 to 11472	3200	Indicates minimum number of bits within minor frame.

**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/PBM/104

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

## iNET-X parser-aligned packet structure for PCM bus monitoring in the KAD/PBM/104

The KAD/PBM/104 packetizes parsed minor frames in parser-aligned iNET-X packet structures. As the PCM data stream arrives, the KAD/PBM/104 tracks the incoming bit-stream to identify the minor frame sync word. The complete minor frame is buffered and packetized in an iNET-X parser block structure. The generalized structure of a single PCM parser block is illustrated in the following figure.

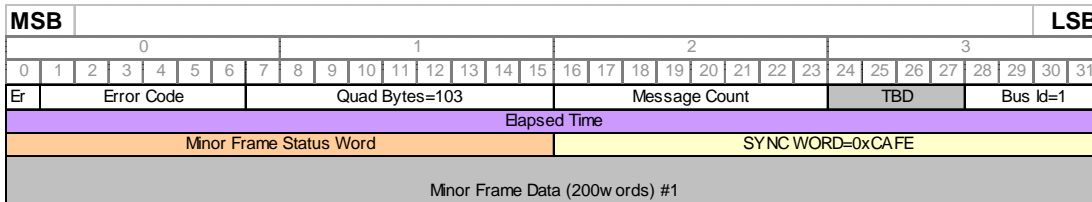


Figure 2: Generalized iNET-X parser block for a PCM minor frame

Common to all parser block structures, the first word is the parser Information Word and is followed by the Elapsed Time tags. This is immediately followed by the minor frame status word and the minor frame data that has been buffered by the KAD/PBM/104.

### Minor frame status word

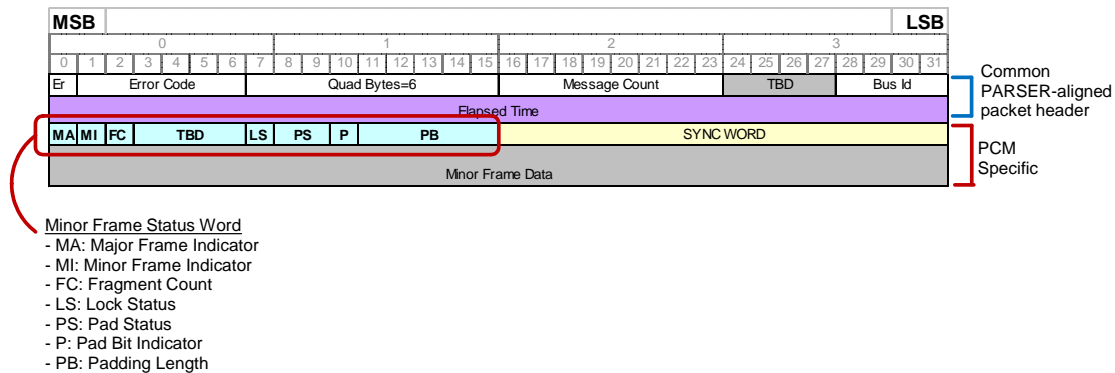


Figure 3: iNET-X parser-aligned PCM minor frame status word

- MA (Bit 0): Major Frame Indicator: indicates that the minor frame contained in this parser block is the first minor frame in the major frame. This feature is not currently supported in the KAD/PBM/104.
- MI (Bit 1): Minor Frame Indicator: indicates that the data contained in this parser block is a complete minor frame in the major frame.
  - + MI=0 implies that the minor frame is fragmented.
  - + MI=1 implies that the parser block contains a complete minor frame. As fragmentation is not currently supported in KAD/PBM/104, MI always read 1.
- FC (Bit 2): Minor Frame Fragment Count: indicates the minor frame fragment. This allows tracking of the minor frame fragments for reassembly. According to the IRIG-106 Chapter 4 standard the maximum sized minor frame (class II) is 2,048 bytes. Therefore no more than two packets are required to carry the maximum allowable sized minor frame of 2,048 bytes. When a minor frame is fragmented across consecutive fragments:
  - + MI=0 indicates that the packet does NOT contain a complete fragment.
  - + FC=0 indicates that the packet contains the first fragment
  - + FC=1 indicates that the packet contains the second fragment. Fragmentation is not currently supported in the KAD/PBM/104.

Thus the first packet would have: MI=0; FC=0 and the second packet has MI=0; FC=1.

- TBD (Bits [3:6]): TBD
- LS (Bit 7): LockStatus: indicates that this is the first minor frame packetized after coming back into lock.
- P (Bit 8): Pad: indicates whether the message has been padded.
- PS (Bits [9:10]): Pad Status: indicates the conditions under which this PCM minor frame has been padded.
  - + 00: Correct length
  - + 01: Too few bits
  - + 10: Too many bits
  - + 11: TBD
- PB (Bits [11:15]): Pad Bits: indicates the number of bits that have been added to the end of the padded minor frame in order to achieve 32-bit alignment. Five bits are used as it is possible that up to 31 bits may be required to pad the message to the 32-bit alignment boundary length.

### iNET-X PCM parser-aligned packet structure padding conditions

#### Without padding

When a minor frame falls on a 32-bit alignment boundary, it need not be padded.

- P=0, PS=00 : where the parsed minor frame is the correct length and naturally falls on a 32-bit alignment boundary and as such no padding is required.
- P=0, PS=01 : where the parsed minor frame has too few bits but naturally falls on a 32-bit alignment boundary and as such no padding is required.
- P=0, PS=10 : where the parsed minor frame has too many bits but naturally falls on a 32-bit alignment boundary and as such no padding is required.

#### With padding

- P=1, PS=00 : where the parsed minor frame is the correct length but the minor frame is an odd number of words long and therefore requires one word of padding in order to fall on a 32-bit alignment boundary.

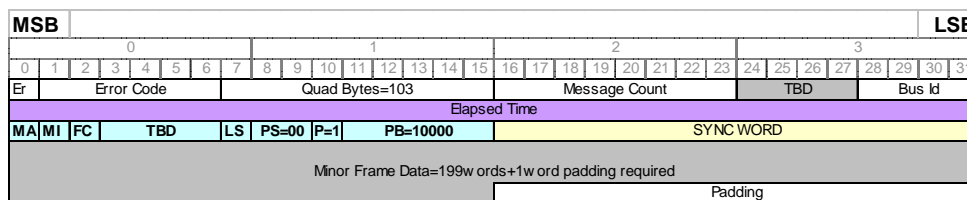


Figure 4: iNET-X parser-aligned PCM minor frame: correct length, requires padding

- P=1, PS=01 : where the parsed minor frame has too few bits (i.e. less than 31 bits) and requires padding at the end of the minor frame to end on a 32-bit alignment boundary.

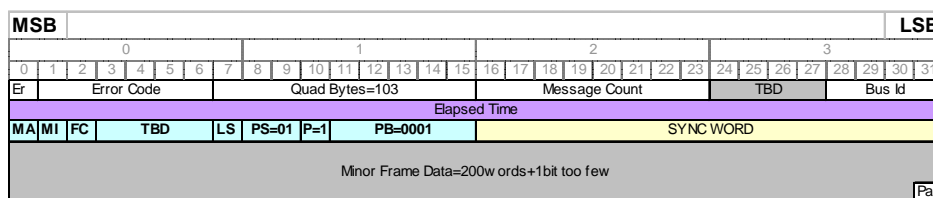


Figure 5: iNET-X parser-aligned PCM minor frame: incorrect length (too few bits), requires padding

- P=1, PS=10 : where the parsed minor frame has too many bits (i.e. up to 31 bits) and requires padding at the end of the minor frame to end on a 32-bit alignment boundary.

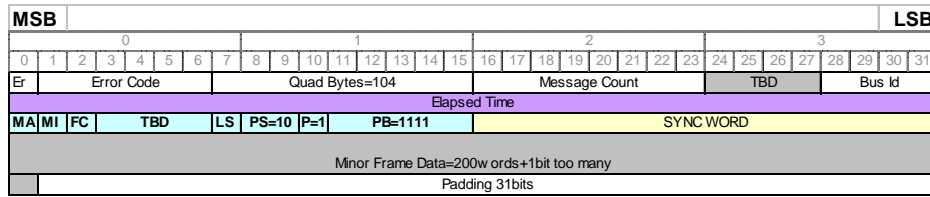


Figure 6: iNET-X parser-aligned PCM minor frame: incorrect length (too many bits), requires padding

### iNET-X PCM parser-aligned packet structure with multiple minor frames

Consider a minor frame comprising 200 words plus the sync word. The total amount of data for a single minor frame packed in a parser block structure is 412 bytes where:

- Parser block header = 4 bytes
- Elapsed Time = 4 bytes
- Minor frame status word = 2 bytes
- Sync word = 2 bytes
- Minor frame data = 400 bytes

Since this falls on a 32-bit alignment boundary there is no padding required. The parser block of quad bytes is 103 bytes long as this length includes the length of the parsed data, padding and parser block header. In this example, the iNET-X parser-aligned packet payload may contain three complete minor frame parser blocks.

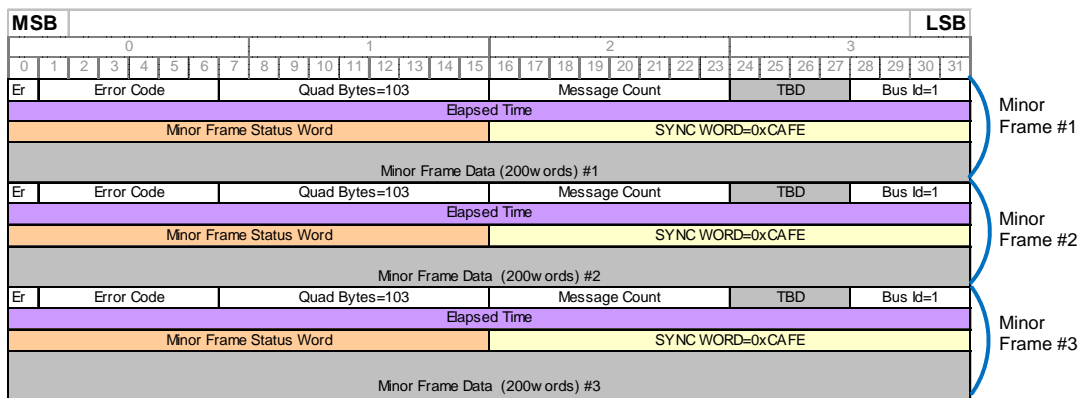


Figure 7: iNET-X parser-aligned packet with multiple PCM minor frames

## Connector pinout of the KAD/PBM/104

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	DATA(0)+	RS-422 inputs	PCM data; first bus
2	DATA(0)-	RS-422 inputs	PCM data; first bus
3	DCLK(0)+	RS-422 inputs	PCM Data clock; first bus
4	DCLK(0)-	RS-422 inputs	PCM Data clock; first bus
5	DATA(1)+	RS-422 inputs	PCM data
6	DATA(1)-	RS-422 inputs	PCM data
7	DCLK(1)+	RS-422 inputs	PCM Data clock
8	DCLK(1)-	RS-422 inputs	PCM Data clock
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(2)+	RS-422 inputs	PCM data
16	DATA(2)-	RS-422 inputs	PCM data
17	DCLK(2)+	RS-422 inputs	PCM Data clock
18	DCLK(2)-	RS-422 inputs	PCM Data clock
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(3)+	RS-422 inputs	PCM data
26	DATA(3)-	RS-422 inputs	PCM data
27	GND	Internal ground	
28	GND	Internal ground	
29	DCLK(3)+	RS-422 inputs	PCM Data clock
30	DCLK(3)-	RS-422 inputs	PCM Data clock
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/PBM/104	4-channel IRIG-106 PCM bus packetizer

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/PBM/104	First release	Recommended for new programs

## 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
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/MAN/018	KSM-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