KAD/MBM/101

Dual redundant MIL-STD-1553 bus monitor with parser-packetizer

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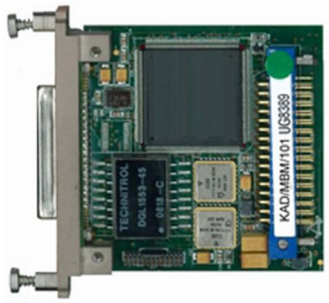

Key Features

- Monitors one dual redundant MIL-STD-1553 bus using Direct or Transformer coupled operation
- Coherently parses traffic and tags for up to 1,024 parser ID; parser ID based on 16-bit commands; RT-RT messages treated as one parser ID
- Aperiodic transmission of packetized MIL-STD-1553 messages including tags as iNET-X payload structure per channel

Optional recording of messages with time-out status reply

Applications

- MIL-STD-1553 traffic monitoring and recording

Overview

The KAD/MBM/101 is a MIL-STD-1553 dual redundant bus monitor which combines the capabilities of a coherent message parser, with the flexibility of a iNET-X packetizer. It also provides message counting, and extensive error detection functions on a single module.

The KAD/MBM/101's parser, triple buffers up to 1,024 messages (including one catchall), and their associated tags, in buffers up to 43 words wide. The Info tag associated with each message has a stale bit (message read before), a skipped bit (buffer overwritten) and an empty bit (no message received since power-up)—all of which can be included as discrete parameters for transmission or logging.

Moreover, all MIL-STD-1553 messages are encapsulated as iNET-X parser-aligned payload structures. These parser-aligned packets may be transmitted aperiodically to optimize network bandwidth utilization and memory usage when recording the MIL-STD-1553 bus. Aperiodic packet transmission ensures that no messages are lost, since the Acra KAM-500 controller oversamples the KAD/MBM/101 and generates only a packet for transmission when the buffer is not empty, that is, when at least one new message has been captured from the bus.

Two message counters increment on receipt of a valid message. The REPORT word has a fresh error flag with a 6-bit error code to indicate the type of error caught and the bus on which it occurred. Errors are also time stamped and recorded in the iNET-X packet.

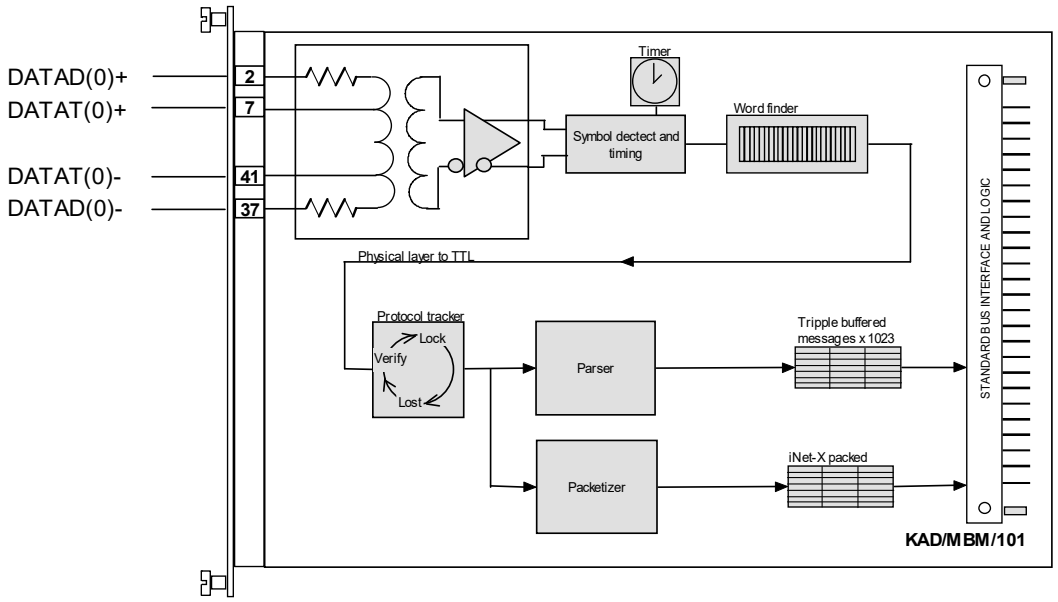

Figure 1: Primary bus packetizer on the KAD/MBM/101

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		2.82			
	–	80	–	g	
	–	2.82	–	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	111	–	122	mA	
±7V	0	–	0	mA	
±12V	0	–	0	mA	
total power	0.56	–	0.61	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	MIL-STD-1553				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Inputs	–	–	1	–	Dual redundant. MIL-STD-1553-B compatible.
Sampling rate	–	–	2	Msps	Maximum data rate of MIL-STD-1553 is 36kwps (72ksps).
Input voltage					
operating range	1.3	–	20	V_{p-p}	Applies to both transformer and direct coupled connection methods.
Connection methods					
transformer coupled	–	–	–	–	
direct coupled	–	–	–	–	

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Setting up the KAD/MBM/101

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/MBM/101	KAD/MBM/101	The instrument part reference.
SerialNumber	FA2342	FA2342	Unique name for each module.
Settings	-	-	-
Fill Value	0000 to FFFF	AAAA	Specifies the value that should be stored when the bus monitor is not receiving data.
Processes	-	-	-
Parser(1022:0)	-	-	One of 1023 selective parser slots.
Catchall-Parser	-	-	Any message that is not parsed goes to this final parser slot.
Channels	-	-	-
MIL-STD-1553-In-Primary MIL-STD-1553 Input	-	-	Represents a typical MIL-STD-1553 bus monitor channels configuration.
Settings	-	-	-
Maximum Response Time	1 to 31	12	Maximum permitted response time for RT in micro seconds.
Accept Rx Message With No Status	True False	False	Receive messages with no status response are stored when set to True.
Accept Tx Message With No Status	True False	False	Transmit messages with no status response are stored when set to True.
Settings Mode Code 17	-	-	Mode Code 17 messages are used to extend the Sub Address range for RT by providing a Sub-sub Addressing.
Load Map From	SSA Cycle	SSA	This element is used to specify which bits from the data word of the Mode Code 17 message are used for the map index. The allowed values are "SSA" and "Cycle".
Time Bit First	True False	False	This element is used to specify if the Time Bit in a mode code 17 message is the least significant bit (True) or the most significant bit (False).
Ignore Fresh Bit	False True	False	This element is used to control updating of the map index depending on the fresh bit value in the mode code 17 data word. A value of "True" means the fresh bit is ignored and a value of "False" means it is not ignored.
Ignore Time Bit	True False	False	This element is used to control updating of the map index depending on the time bit value in the mode code 17 data word. A value of "True" means the time bit is ignored and a value of "False" means it is not ignored.
Default Map On Power Up	00 to 7F	00	This element can be used to specify the default extended sub-address mapping when the bus monitor first powers up. The value expected is a hexadecimal value.
Settings Packetizer	-	-	-

SETUP DATA	CHOICE	DEFAULT	NOTES
Stream Id	00 to FFFFFFFF	FFFFFFFF	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 722	722	Size of packet buffer in words.
Packet Timeout	10 to 1500	50	Generate a packet when the oldest data recorded is this old (ms).
MIL-STD-1553-In-Secondary MIL-STD-1553 Input	-	-	Represents a typical MIL-STD-1553 bus monitor channels configuration.
Settings Packetizer	-	-	-
Stream Id	00 to FFFFFFFF	FFFFFFFF	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 722	722	Size of packet buffer in words.
Packet Timeout	10 to 1500	50	Generate 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 Reports the status of the module	BitVector	BitVector	16	R[15:0] R(15) ErrorSinceLastRead - 1 indicates error occurred since last read. R(14) ErrorOnSecondaryBus - 1 indicates the last error occurred on secondary bus. R[13:6] Reserved - Reserved for future use. R[5:0] ErrorCodes - Indicates the error that occurred last (See “Error codes” in Getting the most from).
ErrorCount A count of errors detected on both busses	BitVector	BitVector	16	R[15:0] R[15:0] ErrorCount - A count of errors detected on both busses.
Parser(1022:0) Parameters				
MessageCount Message counter value when the word was received.	Count	OffsetBinary	16	R[15:0] R[15:0] MessageCount
MessageCommand1 First command word in message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageCommand1
MessageStatus1 First status word stored in message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageStatus1

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
MessageResponseTime1 First status word's response time in microseconds.	Second	OffsetBinary	16	R[15:0] R[15:0] MessageResponseTime1
MessageCommand2 Second command word of an RT-RT message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageCommand2
MessageStatus2 Second status word of an RT-RT message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageStatus2
MessageResponseTime2 Second status word's response time in microseconds of an RT-RT message.	Second	OffsetBinary	16	R[15:0] R[15:0] MessageResponseTime2
MessageInfo Stale/skipped indication for this parsed message.	BitVector	BitVector	16	R[15:0] R(15) Empty - 1 indicates this parser slot is empty. 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.
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.	Second	BCD	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.
Catchall-Parser Parameters				
MessageCount Message counter value when the word was received.	Count	OffsetBinary	16	R[15:0] R[15:0] MessageCount
MessageCommand1 First command word in mes-sage.	BitVector	BitVector	16	R[15:0] R[15:0] MessageCommand1
MessageStatus1 First status word stored in mes-sage.	BitVector	BitVector	16	R[15:0] R[15:0] MessageStatus1
MessageResponseTime1 First status word's response time in microseconds.	Second	OffsetBinary	16	R[15:0] R[15:0] MessageResponseTime1
MessageData(31:0) MIL-1553 message data	BitVector	BitVector	16	R[15:0] R[15:0] MessageData
MessageCommand2 Second command word of an RT-RT message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageCommand2

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
MessageStatus2 Second status word of an RT-RT message.	BitVector	BitVector	16	R[15:0] R[15:0] MessageStatus2
MessageResponseTime2 Second status word's response time in microseconds of an RT-RT message.	Second	OffsetBinary	16	R[15:0] R[15:0] MessageResponseTime2
MessageInfo Stale/skipped indication for this parsed message.	BitVector	BitVector	16	R[15:0] R(15) Empty - 1 indicates this parser slot is empty. 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.
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.	Second	BCD	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.
MIL-STD-1553-In-Primary Parameters				
MessageCountPrimary Count of all good messages on the bus.	Count	OffsetBinary	16	R[15:0] R[15:0] MessageCountPrimary
MIL-STD-1553-In-Secondary Parameters				
MessageCountSecondary Count of all good messages on the bus.	Count	OffsetBinary	16	R[15:0] R[15:0] MessageCountSecondary

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/MBM/101

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

iNET-X parser-aligned packet format

There is a diverse range of avionic bus technologies for which traffic may be captured, for example, MIL-STD-1553, PCM, or ARINC-429. The generalized iNET-X payload structure for parser-aligned packets is shown in the following figure.

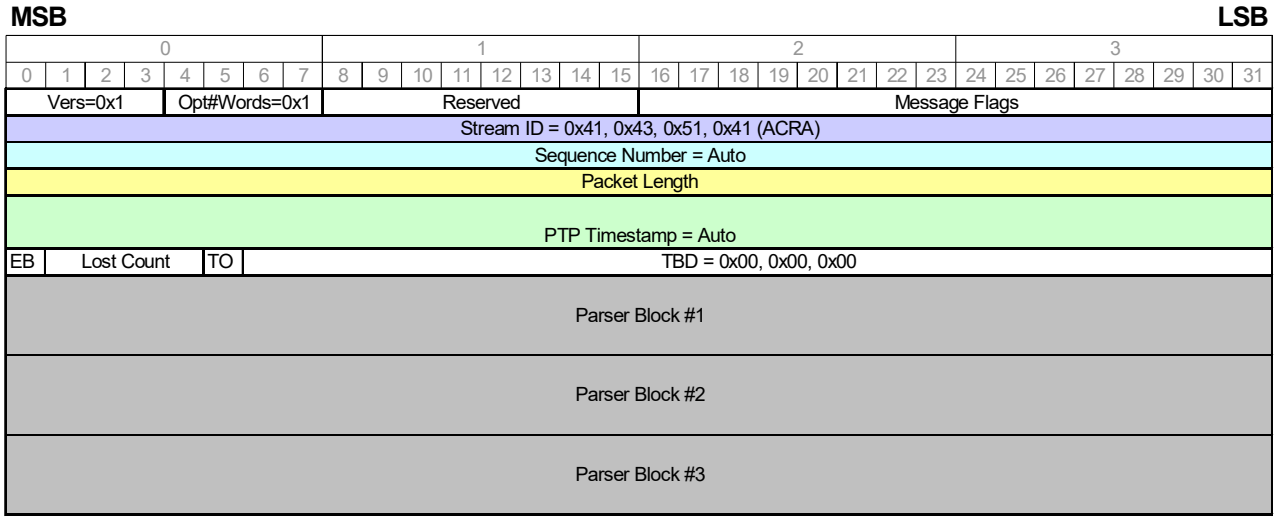

Figure 2: Generalized parser-aligned iNET-X packet

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

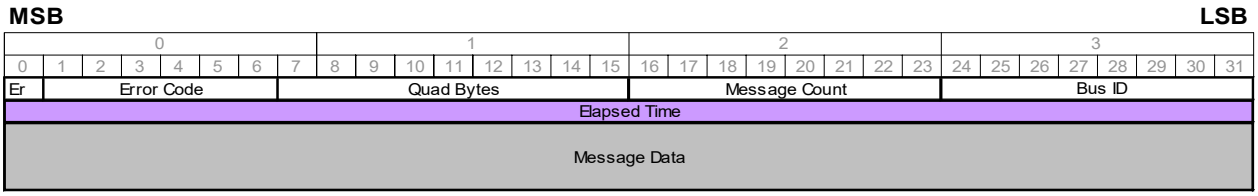

Figure 3: iNET-X parser block

A parser block consists of the following fields:

- Parser information word (4 bytes): metadata providing information about the health and status of the message.
  - Er (Bit 0): indicates that an error occurred.
  - Bits [1:6]: Reserved.
  - Quad bytes (Bits [7:15]): number of quad bytes. This relates to the length of the parser information 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 that includes 4 bytes parser information word, 4 bytes elapsed time, and 4 bytes bus message data.
  - Message count (Bits [16:23]): message counter. This is a message counter that relates to the messages contained in the payload. The message counter increments for each message contained in the packet payload and continues to increment across consecutive packets. The message counter resets and wraps around to 0 once it has reached the maximum message count of 0xFF.
  - Bus ID (Bits [24:31]): bus number.
- Elapsed time (4 bytes): time tag as an unsigned offset in nanoseconds that is added to the base PTP timestamp in the iNET-X

header.

- Message data (N x 4 bytes): captured bus traffic, padded if necessary to end on 4-byte boundary.

iNET-X parser-aligned packet structure for MIL-STD-1553 bus monitoring

As MIL-STD-1553 messages arrive, the MIL-STD-1553 protocol tracker logic identifies them and maps them to corresponding transaction identifier codes, as in the following table. The KAD/MBM/101 module creates an independent packet stream for each of the primary and secondary buses. Bus ID is fixed to 0 for Bus A packets and 1 for Bus B packets.

TABLE 3	Transaction identifier codes	
MESSAGE TYPE	MNEMONIC	TRANSACTION ID
Bus Controller to Remote Terminal	BC -> RT	0x00
Remote Terminal to Bus Controller	RT -> BC	0x01
Remote Terminal to Remote Terminal	RT -> RT	0x02
Mode Code without Data	M -> S	0x03
Mode Code with Data (R)	MD -> S	0x04
Mode Code with Data (T)	M -> SD	0x05
BROADCAST		
Bus Controller to Remote Terminals	BC -> RTS	0x06
Remote Terminal to Remote Terminals	RT -> RTS	0x07
Mode Code without Data	M	0x08
Mode Code with Data (R)	MD	0x09
MESSAGES WITHOUT STATUS REPLY		
Bus Controller to Remote Terminal	BC -> RT	0x10
Remote Terminal to Bus Controller	RT -> BC	0x11
Remote Terminal to Remote Terminal	RT -> RT	0x12
Mode Code without Data	M -> S	0x13
Mode Code with Data (R)	MD -> S	0x14
Mode Code with Data (T)	M -> SD	0x15
Remote Terminal to Remote Terminal	RT -> RTS	0x17

Only valid MIL-STD-1553 transactions are stored in the packet (see the following figure). If an error occurs, only the parser information word and elapsed time tag are written to the iNET-X packet; the message is then dumped. The error bit and error code (see the previous table), which are set in the parser information word, indicate the cause of the error.

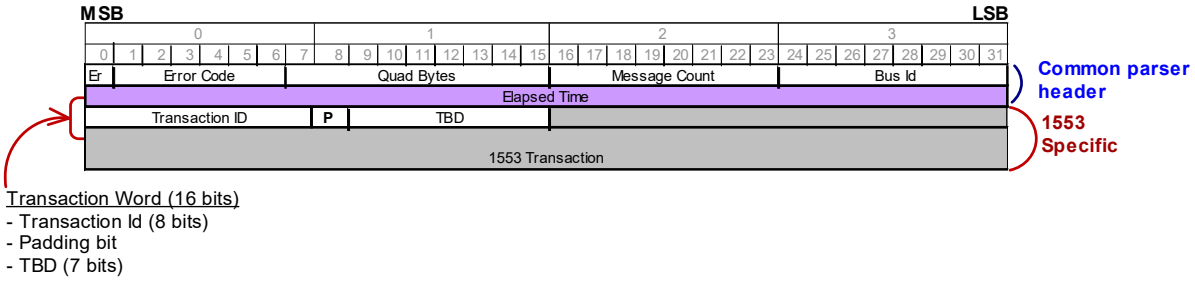

Figure 4: MIL-STD-1553 transaction iNET-X parser-aligned packet

In the case where a remote terminal is off-line but it is still desirable to capture data sent to it, you can set options to include Accept Rx Message With No Status and Accept Tx Message With No Status. In such a scenario, the parser information word

indicates an error but the 1553 traffic is still captured.

The transaction identifier may be used to indicate when response times are carried in the iNET-X parser-aligned block. The MIL-STD-1553 standard specifies a minimum response time of 4µs and a maximum response time of 12µs. However, the bus controller waits up to 20µs before determining a timeout has occurred. The granularity of response time on the 8MHz bus can be measured to a resolution of 125ns. When a timeout occurs, the response time is set to 0xFF.

In order to facilitate the decoding and decommutation of the MIL-STD-1553 parser-aligned iNET-X packets, the first word of a MIL-STD-1553 transaction is the transaction word where:

- Transaction word (2 bytes): metadata providing protocol tracking information, health, and status of the message.
  - Transaction ID (Bits [0:7]): see Table 1 on page 1
  - P (Bit 8): bit to indicate if the parser message has been padded to fall on a 4-byte boundary
  - TBD (Bits [9:15]): TBD

Where a MIL-STD-1553 transaction does not fall on a 32-bit boundary, the MIL-STD-1553 parser-aligned message is padded. In MIL-STD-1553 the maximum number of padding words (16-bit) possible in a single transaction is one. Therefore a single bit is sufficient to indicate if a transaction message has been padded. Figure 2 on page 2 and Figure 3 on page 2 illustrate individual MIL-STD-1553 BC -> RT transactions, with and without padding.

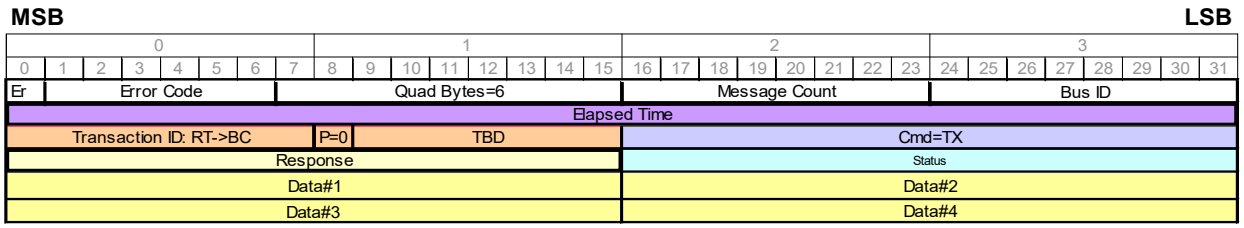

Figure 5: MIL-STD-1553 transaction iNET-X parser-aligned message without padding

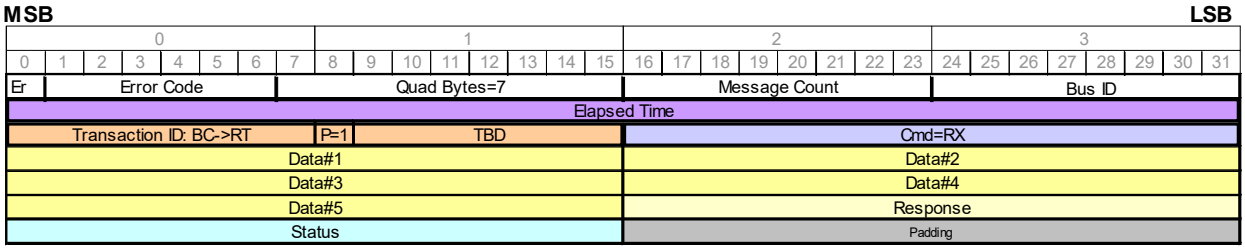

Figure 6: MIL-STD-1553 transaction iNET-X parser-aligned message with padding

Figure 4 on page 3 demonstrates the iNET-X parser-aligned payload structure for MIL-STD-1553 with the following three parsed MIL-STD-1553 transactions in the payload:

- BC -> RT: With four data words transferred.
- RT -> RT: With five data words transferred.
- RT -> BC: With four data words transferred.

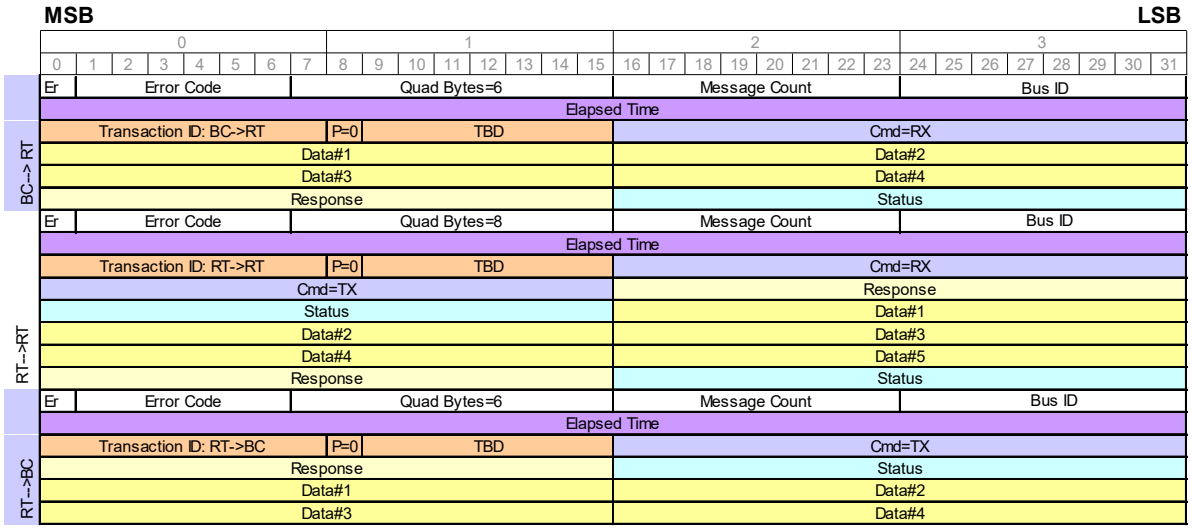

Figure 7: iNET-X parser-aligned payload for multiple MIL-STD-1553 transactions

For example, the MIL-STD-1553 bus has a peak bit-rate of 1Mbps. However, the messages and transactions transmitted are variable in length and asynchronous. If it is assumed that the mean MIL-STD-1553 transaction is 14 bytes long (comprising of a command, response, data words, and a status word), the iNET-X parser block structure encapsulating this transaction is therefore 24 bytes (including the MIL-STD-1553 transaction ID, parser information word and the elapsed time). In this case, each iNET-X parser-aligned packet may contain up to 60 parser blocks in the payload (that is, 60 parser blocks x 24 bytes per block which results in 1440 bytes of payload, or 840 bytes of MIL-STD-1553 bus data). To ensure that no data is lost on the bus, packets are generated at a rate of 150 packets per second.

The transmission properties for a 1Mbps MIL-STD-1553 bus are summarized in the following table.

TABLE 4	MyMIL-STD-1553 packet transmission properties
TRANSMISSION PROPERTY	VALUE
MIL-STD-1553 packet payload size (bytes)	1440 bytes (60 MIL-STD-1553 parser blocks of 24 bytes per block where each block contains 14 bytes of MIL-STD-1553 bus data)
Total Ethernet frame length (bytes)	1514 bytes (MAC header 14 bytes + IP 20 bytes + UDP 8 bytes + iNET-X 28 bytes + MIL-STD-1553 data + MAC FCS 4 bytes)
Packet rate (packets per second)	150
Total number of MIL-STD-1553 transactions per packet	60 transactions assuming 14 bytes per transaction
Total bit-rate (kbps)	1816.8

TABLE 5	Error codes		
ERROR CODE	DESCRIPTION	ERROR CODE	DESCRIPTION
0_{16}	Reserved for future use.	20_{16}	Expected STS was a data word.
1_{16}	Data word did not have enough bits.	21_{16}	Expected STS was invalid.
2_{16}	Data word had bit error.	22_{16}	Expected STS had incorrect RT.
3_{16}	Data word had parity error.	23_{16}	Expected STS had contiguous traffic.
4_{16}	Non-data word did not have enough bits.	24_{16}	Expected STS timed out.
5_{16}	Non-data word had bit error.	25_{16}	Expected STS had no contiguous data word.
6_{16}	Non-data word had parity error.	26_{16}	Reserved for future use.

TABLE 5	Error codes		
ERROR CODE	DESCRIPTION	ERROR CODE	DESCRIPTION
7_{16}	Reserved for future use.	27_{16}	Reserved for future use.
8_{16}	Expected data word was non-data word.	28_{16}	Reserved for future use.
9_{16}	Expected data word did not have contiguous word.	29_{16}	Reserved for future use.
A_{16}	Expected last data word was not last.	$2A_{16}$	Reserved for future use.
B_{16}	Expected mode data word was non-data word.	$2B_{16}$	Expected Tx CMD of RT to RT(s) had different number of words than Rx CMD.
C_{16}	Expected mode data word has contiguous traffic.	$2C_{16}$	Expected Tx CMD of RT to RT(s) had same RT as Rx CMD.
D_{16}	Reserved for future use.	$2D_{16}$	Expected Tx CMD of RT to RT(s) had contiguous traffic.
E_{16}	Reserved for future use.	$2E_{16}$	Second CMD in RT-RT was not a TX.
F_{16}	Reserved for future use.	$2F_{16}$	Reserved for future use.
10_{16}	Expected first CMD was a data word.	30_{16}	Reserved for future use.
11_{16}	Reserved for future use.	31_{16}	Reserved for future use.
12_{16}	Reserved for future use.	32_{16}	Reserved for future use.
13_{16}	Reserved for future use.	33_{16}	Reserved for future use.
14_{16}	Reserved for future use.	34_{16}	Reserved for future use.
15_{16}	Expected first CMD had contiguous traffic.	35_{16}	Reserved for future use.
16_{16}	Expected first CMD was Rx with no contiguous data word.	36_{16}	Reserved for future use.
17_{16}	Expected first CMD was Mode with no contiguous data.	37_{16}	Reserved for future use.
18_{16}	Expected second STS of RT to RT was data word.	38_{16}	Reserved for future use.
19_{16}	Expected second STS of RT to RT had incorrect RT.	39_{16}	Reserved for future use.
$1A_{16}$	Expected second STS of RT to RT had contiguous traffic.	$3A_{16}$	Reserved for future use.
$1B_{16}$	Expected second STS of RT to RT timed out.	$3B_{16}$	Reserved for future use.
$1C_{16}$	Reserved for future use.	$3C_{16}$	Reserved for future use.
$1D_{16}$	Reserved for future use.	$3D_{16}$	Reserved for future use.
$1E_{16}$	Reserved for future use.	$3E_{16}$	Reserved for future use.
$1F_{16}$	Reserved for future use.	$3F_{16}$	Reset occurred since last read.

Tx = transmit; STS = status; CMD = command.

Detecting messages when a remote terminal is off-line

When a MIL-STD-1553 remote terminal is off-line, it does not respond (with a STATUS word) to bus controller Rx commands. When a MIL-STD-1553 remote terminal is off-line, it does not respond (with a STATUS word followed by data) to bus controller Tx commands.

To acquire data from MIL-STD-1553 messages, which have been sent from the bus controller to off-line remote terminals, see “Message capture settings” on page 12. To determine, via telemetry, if a remote terminal is off-line, see “Detecting when a Tx remote terminal is off-line” on page 12.

Message capture settings

The following settings can be used to capture messages when the remote terminal is off-line:

- AcceptRxMessageWithNoStatus
- AcceptTxMessageWithNoStatus

NOTE: The message counter on the KAD/MBM/101 counts all messages that go into the parser (two dedicated counters for bus primary/secondary), which are defined by either AcceptRxMessageWithNoStatus or AcceptTxMessageWithNoStatus.

AcceptRxMessageWithNoStatus

If any remote terminals monitoring the MIL-STD-1553 bus are likely to be off-line, set AcceptRxMessageWithNoStatus to YES. When AcceptRxMessageWithNoStatus is set to YES, the KAD/MBM/101 captures data from Rx command messages, where the remote terminal does not respond with a STATUS word. In this scenario, the STATUS word in the parser is hex FFFF.

If AcceptRxMessageWithNoStatus is set to NO, then only complete messages, where a remote terminal responds, are captured.

AcceptTxMessageWithNoStatus

When AcceptTxMessageWithNoStatus is set to YES, the KAD/MBM/101 accepts Tx command messages where the remote terminal does not respond. In this scenario, only the Tx command appears on the MIL-STD-1553 bus, the KAD/MBM/101 parser data is invalid, the STATUS word in the parser is hex FFFF and time stamps record any occurrence of the COMMAND word.

The AcceptTxMessageWithNoStatus setting enables the capture of messages when the remote terminal is off-line. However, for this setting to have an effect, AcceptRxMessageWithNoStatus must be set to YES.

When AcceptTxMessageWithNoStatus is set to NO, the KAD/MBM/101 rejects Tx command messages where the remote terminal does not respond. The effect on the parser is that the last valid message with the last valid data and time stamps remain.

Detecting when a Tx remote terminal is off-line

To detect when a Tx remote terminal is off-line, set AcceptTxMessageWithNoStatus to YES. The parser STATUS word must be sent to detect this and then be processed in the ground station. If the STATUS word is hex FFFF, the ground station must deal with the invalid data in the parser. Otherwise, the data shows FFFFh.

Response time

One feature of the KAD/MBM/101 is the ability to program the response timeout. This value should reflect the actual response timeout on the MIL-STD-1553 bus. Under normal circumstances a remote terminal responds within 4 to 12 microseconds. However a remote terminal should wait a minimum of 14 microseconds before considering that the remote terminal has timed out. Some implementations of MIL-STD-1553 have deviated from the standard and have their own response times. For this reason, the expected response time is configurable on the KAD/MBM/101.

It is important that the KAD/MBM/101 has response time configured correctly because there may be confusion over which MIL-STD-1553 messages certain control words belong to. In MIL-STD-1553, the COMMAND word and STATUS word have the same signature. For example, if the response time is set too high, and if there is no response from a particular RT, the next COMMAND word may belong to that message as a STATUS word. This may cause issues parsing the next message. If the response time is set too low, then the KAD/MBM/101 may consider that a valid message has timed out due to no response. The status of this message appears as the next command. This may cause issues parsing the next message and so on.

Parser sample rate

The KAD/MBM/101 parser is triple buffered. If there is a burst of more than three messages between parser sampling intervals, the triple buffer can be saturated. Therefore, if it is necessary that all messages get captured, the parser data must be sampled at the speed of the burst if this is above the aggregate rate.

Variable sized messages

By default, the KAD/MBM/101 is configured to parse any number of data words for a particular message. It is also possible to parse messages of particular sizes.

In cases where there are variable sized messages and when word count is set to All, care must be taken when processing the data. The parser only updates the data words that appear on the MIL-STD-1553 bus. The other words are not valid. This means that the ground station or post processing must use the number of data words indicated in the command word to identify which data words are valid. The other option is to parse particular message sizes individually.

Connector pinout of the KAD/MBM/101

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	DNC		Do not connect
2	DATAD(0)+	MIL-STD-1553	Direct coupled primary bus
3	DNC		Do not connect
4	DNC		Do not connect
5	DNC		Do not connect
6	DNC		Do not connect
7	DATAT(0)+	MIL-STD-1553	Transformer coupled primary bus
8	DNC		Do not connect
9	DNC		Do not connect
10	DNC		Do not connect
11	DNC		Do not connect
12	DATAT(1)+	MIL-STD-1553	Transformer coupled secondary bus
13	DNC		Do not connect
14	DNC		Do not connect
15	DNC		Do not connect
16	DNC		Do not connect
17	DATAD(1)+	MIL-STD-1553	Direct coupled secondary bus
18	DNC		Do not connect
19	DNC		Do not connect
20	DNC		Do not connect
21	DNC		Do not connect
22	GND	Internal ground	
23	DNC		Do not connect
24	DNC		Do not connect
25	DNC		Do not connect
26	DNC		Do not connect
27	DNC		Do not connect
28	DNC		Do not connect
29	DNC		Do not connect
30	DNC		Do not connect
31	DNC		Do not connect
32	GND	Internal ground	
33	DNC		Do not connect
34	DNC		Do not connect
35	DNC		Do not connect
36	DNC		Do not connect
37	DATAD(0)-	MIL-STD-1553	Direct coupled primary bus
38	DNC		Do not connect
39	DNC		Do not connect
40	DNC		Do not connect
41	DATAT(0)-	MIL-STD-1553	Transformer coupled primary bus
42	DNC		Do not connect
43	DNC		Do not connect
44	DNC		Do not connect
45	DNC		Do not connect
46	DATAT(1)-	MIL-STD-1553	Transformer coupled secondary bus
47	DNC		Do not connect
48	DNC		Do not connect
49	DNC		Do not connect
50	DATAD(1)-	MIL-STD-1553	Direct coupled secondary bus
51	DNC		Do not connect
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	DESCRIPTION
KAD/MBM/101	Dual redundant MIL-STD-1553 bus monitor with parser-packetizer

When ordering, specify which connector (ASD/MSB/001/TC for transformer coupled; or ASD/MSB/001/DC for direct coupled) is preferred. Its part number will be added to the Confirmation of Order unless an alternative option is specified (see the *Cables* data sheet). For details of the version of this module with Mode Code 17 support, contact Curtiss-Wright support (acra-support@curtisswright.com). Additional items must be ordered separately; refer to Related products for options.

Revision history

REVISION	DIFFERENCES	STATUS
KAD/MBM/101	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

Related products

SOFTWARE	DETAILS
ASD/MSB/001/TCC	KAM MIL-STD-1553 interface cable (45cm long) terminated with two Twinax TRB connectors for applications with transformer coupling (shield connected to chassis)
ASD/MSB/001/DCC	KAM MIL-STD-1553 interface cable (45cm long) terminated with two Twinax TRB connectors for applications with direct coupling (shield connected to chassis)

Related documentation

DOCUMENT	DETAILS
DOC/DBK/001	Acra KAM-500 Databook
DOC/HBK/002	Environmental Qualification Handbook
DOC/MAN/030	DAS Studio 3 User Manual
TEC/NOT/004	MIL-STD-1553
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

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