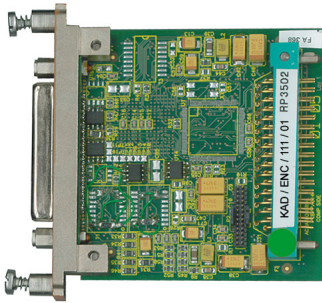


KAD/ENC/111

CCSDS encoder (Ethernet interface, internal 64MB memory buffer)



Overview

The KAD/ENC/111 is a CCSDS encoder with an Ethernet interface and a 64MB internal memory buffer. It is used to wrap UDP packets received over Ethernet into CCSDS frames of fixed length of 1,279 bytes.

The KAD/ENC/111 has two modes of operation, which can be controlled from the Acra KAM-500 backplane. In the first mode, the module interleaves real-time data received over Ethernet with idle data generated by the module. In the second mode, the module interleaves real-time data received over Ethernet with data read from the internal memory buffer.

There are two ways to switch the KAD/ENC/111 between modes, either by the internal timer (default) or by command from another Acra KAM-500 module through the backplane. The module has four RS-422/485 outputs which are buffered copies of the single CCSDS channel.

Key Features

- Receives data over Ethernet and generates CCSDS frames
- Filters packets using stream ID
- 64MB memory buffer
- Four RS-422/485 outputs
- Programmable bit-rate from 250kbps to 4Mbps
- CCSDS frames of fixed length of 1,279 bytes
- Reed Solomon (255,223) and Randomizer according to ECSS-E-ST-50-01C

Applications

- RF data links

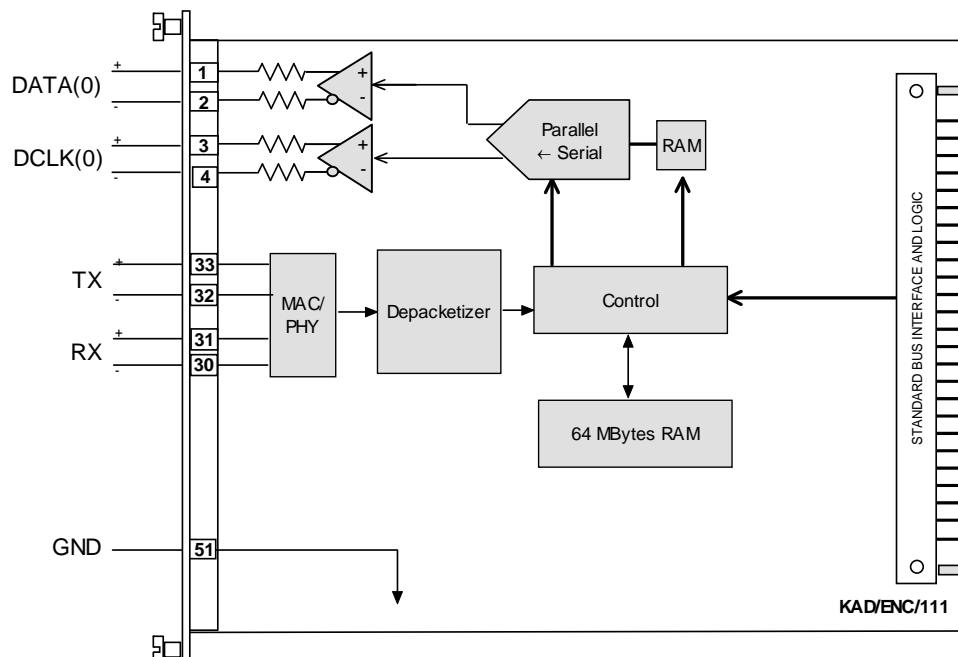


Figure 1: Ethernet interface and first of four CCSDS outputs

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						
	–	73	–	g		
	–	2.57	–	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	Mbps	Maximum combined access rate for read and write.	
Power consumption						
+5V	353	–	418	mA		
±7V	0	–	0	mA		
±12V	0	–	0	mA		
total power	1.77	–	2.09	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 outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Outputs	–	–	8	–		
Signaling rate						
DATA[3:0]	0.25	–	4	Mbps	NRZ-L.	
DCLK[3:0]	0.25	–	4	MHz		
Output voltage						
operating range	-15	–	20	V		
logic 0	–	–	-2	V	$V_{0+} - V_{0-}$; $R_{LOAD} = 100\Omega$.	
logic 1	2	–	–	V	$V_{0+} - V_{0-}$; $R_{LOAD} = 100\Omega$.	
short circuit current	–	–	250	mA		
short circuit duration	90	–	–	s	Only one output may be shorted at a time.	
overvoltage protection	-27	–	27	V		
ESD protection	-5	–	5	kV	Human Body Model.	
Output resistance	–	65	–	Ω	$R_{LOAD} = 100\Omega$.	

TABLE 3 Ethernet interface

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Inputs/outputs	-	-	1	-	IEEE 802.3 compatible; 100BaseTX only.

Setting up the KAD/ENC/111

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/ENC/111	KAD/ENC/111	The instrument part reference.
SerialNumber	AB1234	AB1234	Unique name for each module.
Settings	-	-	-
Version Number	0 to 3	0	CCSDS transfer frame version number field.
Spacecraft ID	0 to 3FF	24A	Spacecraft ID.
Real Time VCID	0 to 7	3	Virtual channel ID for real time data.
Stored VCID	0 to 7	4	Virtual channel ID for stored data.
Idle VCID	0 to 7	7	Virtual channel ID for idle data.
Bit Rate	250000 to 4000000	1000000	This is the bit rate of the CCSDS output.
Frame Data Field Status	0000 to FFFF	1800	CCSDS frame data field status bits. Least significant 11 bits are not user settable and are filled by the First Header Pointer.
Start Storing Command Value	0000 to FFFF	1111	Value of the CmdRegister to start storing data.
Stop Storing Command Value	0000 to FFFF	2222	Value of the CmdRegister to stop storing data.
Start Reading Command Value	0000 to FFFF	3333	Value of the CmdRegister to start reading data.
Stop Reading Command Value	0000 to FFFF	4444	Value of the CmdRegister to stop reading data.
Reset Pointer Command Value	0000 to FFFF	5555	Value of the CmdRegister to reset buffer pointer.
Settings CCSDS Operational Control Field	-	-	CCSDS Operation control field settings.
OCF enable	True False	False	CCSDS transfer frame operational control flag.
OCF value	0 to FFFFFFFF	10	CCSDS transfer frame operational control field.
Settings Read/Record Time	-	-	-
Start Recording Time	0 to FFFFFFFFFFFFFFFF	0000000000000000	Time in PTP format to start recording.
Stop Recording Time	0 to FFFFFFFFFFFFFFFF	0000000000000000	Time in PTP format to stop recording.

SETUP DATA	CHOICE	DEFAULT	NOTES
Start Reading Time	0 to FFFFFFFF	0000000000000000	Time in PTP format to start reading from buffer.
Stop Reading Time	0 to FFFFFFFF	0000000000000000	Time in PTP format to stop reading from buffer.
Processes	-	-	-
Command	-	-	-
Channels	-	-	-
CCSDS-OUT(3:0) PCM Output Settings	-	-	IRIG 106 Chapter 4 PCM output.
Clock Phase	0 180	0	Specifies the phase of the data clock in degrees.
Polarity	True False	True	Specifies the polarity of the data.
CCSDS Enable	True False	True	Enables transmission of CCSDS on this channel.
Ethernet-In Ethernet Input Settings	-	-	Represents a typical Ethernet channel on a networked device.
IP Address	0.0.0.0 to 255.255.255.255	192.168.2.1	Specifies the IP Address of the instrument.
Stream Id Filter	00000000000000000000000000000000 00 to 11111111111111111111111111111111 11	11111111111111111111111111111111 11	Mask for value of iNET-X IDs to be included into CCSDS stream.

Parameter definitions

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
Global Parameters				
Status Register with status of the module. This register can be read through the Acra KAM-500 backplane.	BitVector	BitVector	16	R[15:0] R(0) StoreMode - Indicates that the module is operating in store mode. 1: Module is storing data to buffer. R(1) ReadMode - Indicates that the module is operating in read mode. 1: Module is reading data from buffer. R(2) BufferFull - Indicates that either or both of the iNetX packet buffer pointer table and the buffer itself is full. R(3) PointerTableFull - Indicates that the iNetX packet buffer pointer table is full. R(4) PointerError - Indicates that an iNetX packet buffer pointer table error has occurred since the previous read of Status. R(5) PointerReset - Indicates that an iNetX packet buffer pointer reset has occurred since the previous read of Status. R[15:6] Reserved - Reserved

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
BufferReadPointer Current value of read pointer. It is 25 bits in length. The upper 7 bits are reserved and hence undefined.	BitVector	BitVector	32	R[31:0] R[31:25] Reserved - Reserved R[24:0] BufferReadPointer - Current value of read pointer.
BufferWritePointer Current value of write pointer. It is 25 bits in length. The upper 7 bits are reserved and hence undefined.	BitVector	BitVector	32	R[31:0] R[31:25] Reserved - Reserved R[24:0] BufferWritePointer - Current value of write pointer.
Command Read the CommandRegister value	BitVector	BitVector	16	R[15:0]
Command Parameters				
CommandRegister Register to start/stop storing data, start/stop reading data and resetting memory buffer pointers. Please refer to the Command values in the Instrument settings.	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/ENC/111

The CCSDS frame structure is shown in the following figure.

Sync Word	Transfer frame													
	Header													
	Frame identification				Master Channel Frame Count	Virtual Channel Frame Count	Frame data field status						Operational Control Field	Reed Solomon Check Symbol
	Version number	SC ID	Virtual Channel ID	Oper. Control Field Flag			Sec Header Flag	Synch Flag	Packet Order Flag	Segment Length Flag	First Header Pointer	iNET-X Packets		
	2 bits	10 bits	3 bits	1 bit			1 bit	1 bit	1 bit	2 bits	11 bits			
2 bytes				1 byte	1 byte	2 bytes								
4 bytes	6 bytes										1105 bytes	4 bytes	160 bytes	

Figure 2: CCSDS frame structure

All fields, except Master Channel Frame Count, Virtual Channel Frame Count, First Header Pointer, and Reed Solomon Check Symbol are static and can be programmed from the Graphical User Interface (GUI).

Connector pinout of the KAD/ENC/111

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	DATA(0)+	RS-422 outputs	CCSDS output 0; internally terminated
2	DATA(0)-	RS-422 outputs	CCSDS output 0; internally terminated
3	DCLK(0)+	RS-422 outputs	Bit clock for CCSDS output 0; internally terminated
4	DCLK(0)-	RS-422 outputs	Bit clock for CCSDS output 0; internally terminated
5	DATA(1)+	RS-422 outputs	CCSDS output 1; internally terminated
6	DATA(1)-	RS-422 outputs	CCSDS output 1; internally terminated
7	DNC		Do not connect
8	DNC		Do not connect
9	DNC		Do not connect
10	DNC		Do not connect
11	GND	Internal ground	
12	GND	Internal ground	
13	GND	Internal ground	
14	DNC		Do not connect
15	DNC		Do not connect
16	DNC		Do not connect
17	DNC		Do not connect
18	DCLK(1)+	RS-422 outputs	Bit clock for CCSDS output 1; internally terminated
19	DCLK(1)-	RS-422 outputs	Bit clock for CCSDS output 1; internally terminated
20	DATA(2)+	RS-422 outputs	CCSDS output 2; internally terminated
21	DATA(2)-	RS-422 outputs	CCSDS output 2; internally terminated
22	DCLK(2)+	RS-422 outputs	Bit clock for CCSDS output 2; internally terminated
23	DCLK(2)-	RS-422 outputs	Bit clock for CCSDS output 2; internally terminated
24	DNC		Do not connect
25	DNC		Do not connect
26	DNC		Do not connect
27	GND	Internal ground	
28	GND	Internal ground	
29	DNC		Do not connect
30	RX-	Ethernet interface	
31	RX+	Ethernet interface	
32	TX-	Ethernet interface	
33	TX+	Ethernet interface	
34	DNC		Do not connect
35	DNC		Do not connect
36	DATA(3)+	RS-422 outputs	CCSDS output 3; internally terminated
37	DATA(3)-	RS-422 outputs	CCSDS output 3; internally terminated
38	DCLK(3)+	RS-422 outputs	Bit clock for CCSDS output 3; internally terminated
39	DCLK(3)-	RS-422 outputs	Bit clock for CCSDS output 3; internally terminated
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	DNC		Do not connect
51	GND	Internal ground	
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	DESCRIPTION
KAD/ENC/111	CCSDS encoder (Ethernet interface, internal 64MB memory buffer)

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/ENC/111	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/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