

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						
	-	50	-	g		
	-	1.77	-	oz	Design metric is grams.	
Height above chassis						
bare connector	-	-	11	mm		
bare connector	-	-	0.43	in.	Design metric is millimeters.	
Power consumption						
+15V	-	-	165	mA		
total power	-	-	2.475	W	Particular combinations of ADAU chassis and modules may have power or current limitations. For details, contact Curtiss-Wright support.	
Environmental ratings						
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	-		
Signalling rate						
DATA[1:0]	-	-	40	Mbps	RZ, NRZ-L/M/S, RNRZ-L 15	
DATA[1:0]	-	-	8	Mbps	BiØ-L/M/S, DM-M/S.	
DCLK[1:0]	-	-	40	MHz		
Output voltage						
operating range	-20	-	25	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	-	-	100	mA		
short circuit duration	∞	-	-	s	Only one output may be shorted at a time.	
ESD protection	-	-	5	kV	Human Body Model.	
Output resistance	-	33	-	Ω		

TABLE 3		BTTL outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Outputs	-	-	6	-		
Signalling rate						
DATA	-	-	16	Mbps		
DCLK	-	-	16	MHz		
NRZ_L	-	-	16	Mbps		
WORD	-	-	16	MHz	High for last bit of any word.	
MINOR	-	-	4	MHz	High for last word of minor frame.	
MAJOR	-	-	4	MHz	High for last word of major frame.	
Output voltage						
logic 0	-	-	0.44	V	Sinking 24 mA.	
logic 1	3.76	-	-	V	Sourcing 24 mA.	
short circuit protection	-	-	50	mA	Indefinite to GND.	
Output resistance	-	75	-	Ω	75 Ω in series with standard TTL.	

TABLE 4		Premodulation filter outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Amplitude						
PMF	± 0.5	-	± 2	V_p	PMF drives a 75 Ω load; because the output impedance is 75 Ω , setting the output voltage to 2 V_p results in 1 V_p . For other configurations, contact Curtiss-Wright support .	
Filter cutoff	175	-	6,000	kHz	The filter cutoff is defaulted to 0.7 times the bit-rate for non-return to zero codes and to 1.4 times for bi-phase codes. This is in accordance with the <i>IRIG Telemetry Application Handbook</i> recommendations.	
Signaling rate						
RNRZ-L 15, NRZ-L/M/S	250	-	8,000	kbps		
Bi \emptyset -L/M/S	125	-	4,000	kbps		
Total harmonic distortion						
PMF	-	40	-	dBc		
Current output						
short circuit protection PMF	-	40	-	mA	Indefinite to GND.	
Output resistance	-	75	-	Ω	75 Ω in series with the output driver.	
Filter type	-	-	-	-	Bessel (linear phase).	

Setting up the APCM-404A

Instrument settings

SETUP DATA	CHOICE	DEFAULT	NOTES
Manufacturer	-	-	-
Name	CurtissWright	CurtissWright	Name of manufacturer.
PartReference	APCM-404A	APCM-404A	The instrument part reference.
SerialNumber	AAA1234	AAA1234	Unique name for each module.
Settings <i>General</i>	-	-	-
Frame Pulse Enable	True False	True	Enables the word/minor and major pulse (TTL) outputs.
TimeLayout	IRIG_BCD IRIG_Binary ACRA_BCD	ACRA_BCD	Layout of the IRIG 48b time parameter
NRZ-L Enable	True False	True	PCM NRZL can be disabled to reduce power consumption.
Settings <i>Chapter 4</i>	-	-	-
CRC Enable	False True	False	Chapter 4 PCM only. If enabled inserts a 16-bit CRC at the end of every minor frame.
Settings <i>Parsing</i>	-	-	-
Buffer Depth	4 8 16 32 64 128 256	4	Parser Buffer Depth. 256 parser slots with 4 buffers each down to 4 parser slots with 256 buffers each.
Channels	-	-	-
PCM-Out(1:0) <i>PCM Output</i>	-	-	IRIG 106 Chapter 4 PCM output.
Settings <i>PCM Out</i>	-	-	-
Pcm Code	NRZ-L NRZ-M NRZ-S DM-M DM-S Bi-Phase-L Bi-Phase-M Bi-Phase-S RNRZ-L-15 RZ	NRZ-L	Specifies the PCM encoding used.
Clock Phase	0 180	0	Indicates the phase of the data clock in degrees.
Polarity	True False	True	Specifies the polarity used for transmission. When set to True, data is not inverted.
PCM Enable	True False	True	When set to False, DATA and DCLK can be disabled to reduce power consumption.

SETUP DATA	CHOICE	DEFAULT	NOTES
PMF-Out <i>Analog Output</i>	-	-	Programmable premodulation filtered analog output which is suitable for use with a linear FM transmitter for telemetry.
Settings <i>PMF Out</i>	-	-	-
Pcm Code	NRZ-L NRZ-M NRZ-S DM-M DM-S Bi-Phase-L Bi-Phase-M Bi-Phase-S RNRZ-L-15 RZ	NRZ-L	Specifies the PCM encoding used.
Amplitude	0 to 4	4	This value is the pk-pk amplitude, that is, if 3V is specified, the amplitude is set to +/- 1.5V.
Polarity	True False	True	Specifies the polarity used for transmission. When set to True, data is not inverted.
Enabled	True False	False	When set to False, PMF Enable can be disabled to reduce power consumption.
TTL-Out <i>PCM Output</i>	-	-	IRIG 106 Chapter 4 PCM output over TTL (limited to 16 Mbps).
Settings <i>TTL Out</i>	-	-	-
Pcm Code	NRZ-L NRZ-M NRZ-S DM-M DM-S Bi-Phase-L Bi-Phase-M Bi-Phase-S RNRZ-L-15 RZ	NRZ-L	Specifies the PCM encoding used.
Clock Phase	0 180	0	Indicates the phase of the data clock in degrees.
Polarity	True False	True	Specifies the polarity used for transmission. When set to True, data is not inverted.
PCM Enable	True False	True	When set to False, DATA, NRZ-L and DCLK can be disabled to reduce power consumption.
BackplaneEthernet <i>BackplaneEthernet Input</i>	-	-	Provides access to Ethernet traffic routed through the backplane
Settings <i>Backplane Ethernet</i>	-	-	-
VLAN Support	True False	False	Enabling allows parser slot to skip over VLAN packet headers, if present, to classify traffic on basis of IP and UDP/TCP packet header fields.
Settings <i>Generic Parsing</i>	-	-	Selects packet offset locations for generic parsing.

SETUP DATA	CHOICE	DEFAULT	NOTES
Classifier Offset(0)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(1)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(2)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(3)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(4)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(5)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(6)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Classifier Offset(7)	UTF-8 String Regular Expression: $^(?:75[0-8] 7[0-4][0-9][0-6]?[0-9][0-9]? Not\ Used)\$$	Not Used	Word offset into Ethernet frame to use as classifier.
Processes	-	-	-
Parser(255:0)	-	-	Parser slots for classified packages.

Parameter definitions

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
Global Parameters				
Time48 48-bit wide time word; precise bit layout depends on Time Format selected on the module.	BitVector	BitVector	48	R[47:0]

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
TimeHi Hours and minutes at the start of the minor frame.	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.
TimeLo Seconds and centiseconds at the start of the minor frame.	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.
TimeMicro Microseconds at the start of the minor frame.	Second	BCD	16	R[15:0] R[15:0] Microseconds - BCD Microseconds 0 to 9999.
Status Reports the status of the module	BitVector	BitVector	16	R[15:0] R[15:2] Reserved - Reserved for future use. R(1) BISTFail - RAM BIST Failed 1: RAM BIST failed. 0: RAM BIST passed. R(0) Reserved - Reserved for self-test. 1: The PI loop cannot lock to the data acquisition cycle. 0: The PI Loop remains locked to the data acquisition cycle.
Temperature Temperature sensor (top block) offset binary; scaled between -55 and 125 degrees.	BitVector	BitVector	16	R[15:0]
FrameCount 32-bit wide Frame Counter (increments on Read)	BitVector	BitVector	32	R[31:0]
FrameCountHi Most significant 16 bits of the FrameCount	BitVector	BitVector	16	R[15:0]
FrameCountLo Least Significant 16 bits of the FrameCount	BitVector	BitVector	16	R[15:0]
<i>Parser(255:0) Parameters</i>				
MessageCount Received frame count in the parser slot.	Count	OffsetBinary	16	R[15:0]
MessageSize Received frame size in bytes.	Unitless	OffsetBinary	16	R[15:0]
MessageIrigTime48 48-bit wide IRIG time word	BitVector	BitVector	48	R[47:0]
MessageTimeHi Hours and minutes at the start of first received 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 at the start of first received bit.	Second	BCD	16	R[31:16] R(15) Reserved - Reserved for future use R[14:8] Seconds - Seconds 0 to 59 R[7:0] Centiseconds - Centiseconds 0 to 99

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
<p>MessageTimeMicro Microseconds at the start of first received bit.</p>	Second	BCD	16	<p>R[15:0] R[15:0] Microseconds - Microseconds 0 to 9999</p>
<p>MessageInfo Information about parsed message.</p>	BitVector	BitVector	16	<p>R[15:0] R(15) Empty 1: This parser slot has not been written to yet. R(14) Stale 1: The message in this parser slot has been read before. R(13) Skipped 1: The message in this parser slot overwrote another message that had not been read. R[12:0] Reserved</p>
<p>MessagePTPSeconds The current time in PTP Format. PTP Format is the time elapsed since 1st of January 1970. This field indicates the second count.</p>	Second	OffsetBinary	32	R[31:0]
<p>MessagePTPNanoSeconds The current time in PTP Format. PTP Format is the time elapsed since 1st of January 1970. This field indicates the nanosecond count.</p>	Second	OffsetBinary	32	R[31:0]

NOTE: It is recommended that names do not contain any of the following five characters "/><\".

Getting the most from the APCM-404A

Parameters

The APCM-404A can transmit all parameters that are available on the chassis or the external Ethernet input, including chassis information and fixed words.

The external Ethernet feed is only available when using an ABCU-402A or better.

The APCM-404A has a transmission buffer of 32K registers in synchronous mode. The transmission buffer is 16 bits wide. The encoder can concatenate multiple registers to form words up to 64 bits long. When a parameter (or sub-parameter) is placed, there is a minimum word size that must be used with respect to the line rate. At high rates this means small word sizes are not available.

Because data transmission is synchronous with backplane operation, a single register can be used for multiple parameters or multiple instances of a parameter when operating in synchronous mode.

The following table shows the relationship between minimum word size and bit rate for typical rates; TTCWare displays a warning if the word size for DISCRETE and parameters becomes too small.

MINIMUM WORD SIZE	LINE RATE (NRZ)
16 bits	40 Mbps
8 bits	20 Mbps
4 bits	10 Mbps

The origin of each word in the PCM stream must be specified; fill data is used for unspecified locations. The location of the parameter in the buffer is transparent.

For IRIG-106 Ch.4, the only restriction is that an integral number of major frames be transmitted per acquisition cycle.

The APCM-404A contains a 256-slot parser, which is used to select the external Ethernet traffic that is of interest for transmission. Ethernet traffic is input to the ADAU chassis via the controller and passed to the APCM-404A across the backplane. Ensure that the bandwidth of the PCM frame is greater or equal to the required Ethernet traffic payload from the parser.

General

When transmitting PCM data over an RF link using bi-phase codes, there are two dominant frequencies in the data signal; at the bit-rate and at half the bit-rate. When using non-return to zero codes, the highest frequency is at half the bit rate but long chains of 1s or 0s can introduce frequencies down to

DC. Using random codes such as RNRZ-L/15 makes good use of the available bandwidth whilst breaking up long chains of constant bits.

PCM encoder outputs

The APCM-404A has the following PCM encoder outputs:

DATA[1:0] \pm

Differential ended RS-422 output. Differential PCM coded data output.

DCLK[1:0] \pm

Differential ended RS-422 output. Differential data clock, consists of a transition at the start and center of each bit transmitted.

DATA

Single ended BTTL output with 75 Ω resistor in series.

DCLK

Single ended BTTL clock output with 75 Ω resistor in series.

WORD_PULSE

Single ended BTTL output with 75 Ω resistor in series. High for the last bit of each word. Its falling edge is aligned to the end of the last bit of each word.

NOTE: WORD_PULSE+/- is an RS-422 version of this signal.

MINOR_PULSE

Single ended BTTL output with 75 Ω resistor in series. High for the last word of each minor frame. Its falling edge is aligned to the end of the last bit of each minor frame.

NOTE: MINOR_PULSE+/- is an RS-422 version of this signal.

MAJOR_PULSE

Single ended BTTL output with 75 Ω resistor in series. High for the last word of each major frame. Its falling edge is aligned to the end of the last bit of each major frame.

NOTE: MAJOR_PULSE+/- is an RS-422 version of this signal.

Timing, bit-rates and commutation

The following figure shows examples of timing for NRZL and Bi-Phase L (BIØ-L). For maximum bit-rates and supported PCM transmission see "Specifications" on page 2.

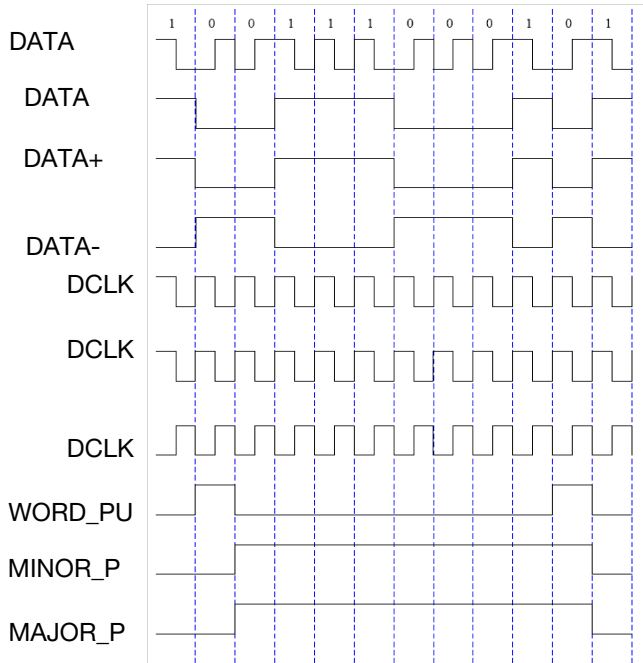


Figure 2: Timing for outputs

The APCM-404A allows variable word lengths and non-standard commutation (that is, samples of a specific parameter not evenly spaced in the PCM frame). However, we recommend using a default word length (for example, 16 bits) and evenly spaced commutation.

The minimum size major frame is 20 parameters per acquisition cycle. If your configuration contains fewer than 20 parameters, TTCWare cannot compile it. The work around is to increase the size of the frame. For example, a frame of 8 words at a given rate can be transformed into a 32-word frame running at 4 times the frame rate.

PMF output

The APCM-404A has one PMF output (PMF, pin 47) for interfacing to FM transmitters. The filter is a programmable sixth order Bessel (linear phase), which is generated digitally and reconstructed using a communications DAC.

The filter cutoff is set at 0.7 times the bit-rate for non-return to zero codes and to 1.4 times the bit-rate for bi-phase code.

The amplitude is user-defined, and should be set to allow for the FM transmitter's deviation sensitivity.

PMF covers $\pm 0.5V$ to $\pm 2V$.

For options such as an additional PMF (electrical copy) or an increased range ($\pm 10V$), contact Curtiss-Wright support.

The PMF output is typically between $\pm 1.65V$ and $\pm 1.75V$ when requesting a $\pm 1.75V$ amplitude.

CRC generation

The APCM-404A supports insertion of CRC at the end of every minor frame. (See the CRC Enable setting in "Instrument settings" on page 4.)

The APCM-404A only supports CRC insertion when using a CRC-CCITT (Comité Consultatif International de Télégraphique et Téléphonique) polynomial with the following specifications:

- Width = 16 bits
- Truncated polynomial = $0x1021$
- Initial value = $0xFFFF$
- Input data is not reflected
- Output CRC is not reflected
- No XOR (eXclusive OR) is performed on the output CRC

Connector pinout of the APCM-404A

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	WORD_PULSE+	RS-422 outputs	High for last bit in word(0)
2	WORD_PULSE-	RS-422 outputs	
3	MINOR_PULSE+	RS-422 outputs	High for last word in minor frame(0)
4	MINOR_PULSE-	RS-422 outputs	
5	MAJOR_PULSE+	RS-422 outputs	High for last word in major frame(0)
6	MAJOR_PULSE-	RS-422 outputs	
7	GND	Internal GND	
8	NRZ-L+	RS-422 outputs	Uncoded PCM output(0)
9	NRZ-L-	RS-422 outputs	Uncoded PCM output(0)
10	WORD_PULSE	BTTL outputs	High for last bit in word(0)
11	MINOR_PULSE	BTTL outputs	High for last word in minor frame(0)
12	MAJOR_PULSE	BTTL outputs	High for last word in major frame(0)
13	DATA	BTTL outputs	Encoded PCM(0)
14	DCLK	BTTL outputs	PCM bit clock(0)
15	NRZ-L	BTTL outputs	Uncoded PCM output(0)
16	DNC		Do not connect
17	DNC		Do not connect
18	DNC		Do not connect
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	DNC		Do not connect
26	DNC		Do not connect
27	DNC		Do not connect
28	GND	Internal GND	
29	DNC		DNC
30	GND	Internal GND	
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	DATA(0)+	RS-422 outputs	Encoded PCM(0)
37	DATA(0)-	RS-422 outputs	
38	DCLK(0)+	RS-422 outputs	PCM clock(0)
39	DCLK(0)-	RS-422 outputs	
40	GND	Internal GND	
41	DATA(1)+	RS-422 outputs	Encoded PCM(1)
42	DATA(1)-	RS-422 outputs	
43	DCLK(1)+	RS-422 outputs	PCM clock (1)
44	DCLK(1)-	RS-422 outputs	
45	GND	Internal GND	
46	GND	Internal GND	
47	PMF_A	Premodulation filter outputs	PMF(0)
48	GND	Internal GND	
49	DNC		Do not connect
50	GND	Internal GND	
51	GND	Internal GND	
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	MODEL NUMBER	DESCRIPTION
702101400-001	APCM-404A-1	IRIG-106 PCM encoder (PMF output)

By default, the standard mating connector, CON-AUSR-1, 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.

Revision history

REVISION	DIFFERENCES	STATUS
APCM-404A-1	First release	Preliminary draft; contact Curtiss-Wright support for details

Supporting software

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

Related products

PART NUMBER	MODEL NUMBER	DESCRIPTION
770000400-001	CON-AUSR-1	Standard Axon module top block mating connector
770000400-002	CON-AUSR-2	Standard Axon module top block mating connector with rubber grommet for increased strain relief
311050202-001	BAC-AUSR-1	Backshell, nickel-plated aluminum straight-through, for Axon connectors
311230202-001	BAC-AUSR-2	Backshell, nickel-plated aluminum 20 degree, for Axon connectors

Related documentation

DOCUMENT	DETAILS
DOC/HBK/008	Environmental Qualification Handbook for Axon Products. (Contact Curtiss-Wright support for availability of this document.)