

AXN/HSS/401

High-speed serial interface - 4ch

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Key Features

- Four Synchronous Serial LVDS Channels
- Eight programmable outputs
- Up to 50 Mbps
- 8 to 16 bit words

Applications

- Scientific Instruments

Overview

The AXN/HSS/401 is a high speed synchronous serial module with four input channels. It interfaces to scientific instruments at up to 50 Mbps. Each channels is made up of four signals: Load Enable, Gate Clock Out, Gated Clock In (echo), and Serial Data In. All signals are Low Voltage Differential Signals (LVDS). Additionally there are eight programmable LVDS outputs, which can be assigned one of four, functions: Major Frame, Minor Frame, Word Pulse, and Bit Clock.

An internal PLL maintains synchronization between the AXN/HSS/401 internal acquisition cycle and the acquisition cycles of the Axon chassis so that sampled data can be redistributed via PCM using an Axon encoder module (such as an AXN/ENC/402) in a synchronous manner.

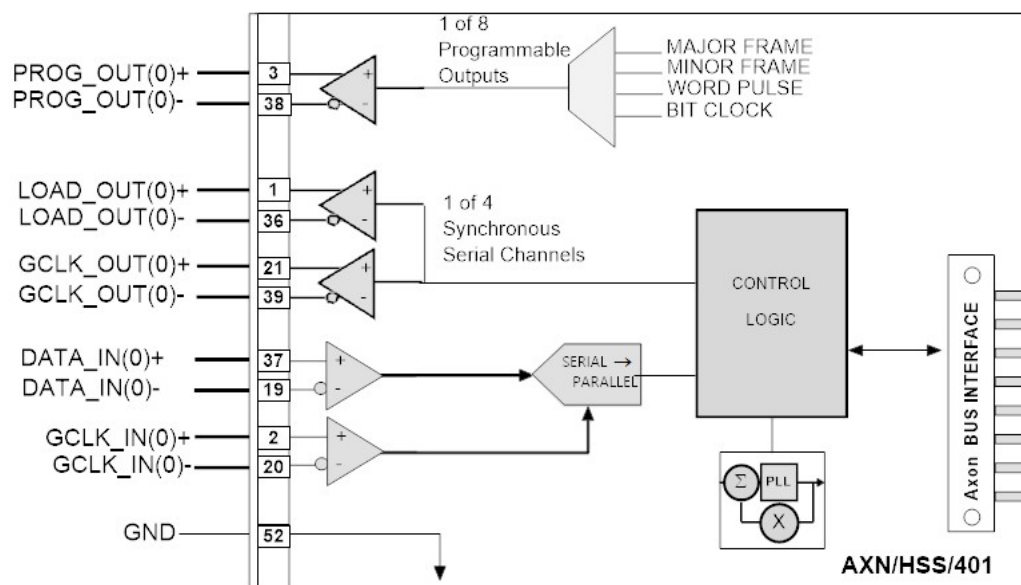


Figure 1: First of four channels of the AXN/HSS/401

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						
	-	45	-	g		
	-	1.59	-	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.	
Power consumption						
+15V	-	81	90	mA		
total power	-	1.22	1.35	W	Particular combinations of Axon chassis and modules may have power limitations. For details, contact Curtiss-Wright support (acra-support@curtisswright.com).	
Environmental ratings					See <i>Environmental Qualification Handbook for Axon Products</i> .	
operating temperature	-40	-	85	°C	Chassis base/side plate temperature.	
storage temperature	-55	-	105	°C		

TABLE 2		LVDS outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Outputs	-	-	16	-		
Signaling rate						
GCLK_OUT	-	-	50	MHz		
LOAD_OUT			6.25	MHz		
PROG_OUT			50	MHz	When operating as bit clock	
Output voltage						
logic 0	-250	-310	-450	mV	V0+ - V0- ; RLOAD = 100Ω.	
logic 1	250	310	450	mV	V0+ - V0- ; RLOAD = 100Ω.	
common mode voltage	1.125	1.17	1.375	V		
short circuit current	-	-	3.5	mA		
short circuit duration	∞	-	-	s	Only one output may be shorted at a time.	
overvoltage protection	-0.3	-	3.3	V	Voltages outside of this range can damage input.	
ESD protection	±1.2	-	-	kV	Human Body Model.	

TABLE 3		LVDS inputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS	
Inputs	-	-	8	-		
Signaling rate						
GCLK_IN	-	-	50	MHz		
DATA_IN	-	-	50	Mbps		
Input voltage						
operating range	-0.3	-	3.3	V	Do not exceed operating range.	
logic 0	-100	-	-	mV	VIN+ - VIN-.	
logic 1	100	-	-	mV	VIN+ - VIN-.	
common mode voltage	0.1	-	2.3	V		
overvoltage protection	0.3	-	3.3	V	Voltages outside of this range can damage input.	
ESD protection	±10	-	-	kV	Human Body Model.	
Input resistance						
between inputs	-	100	-	Ω	Module powered on. Inputs are fitted with an onboard 100Ω termination resistor.	
between inputs	-	100	-	Ω	Module powered off.	
each input to GND	-	50	-	MΩ	Module powered on.	
each input to GND	-	550	-	kΩ	Module powered off.	

Setting up the AXN/HSS/401

All module setup can be defined in XML using XidML® schemas (see <http://www.xidml.org>).

Instrument settings

SETUP DATA	CHOICE	DEFAULT	NOTES
<i>Manufacturer</i>	-	-	-
Name	ACRA CONTROL	ACRA CONTROL	Name of manufacturer.
PartReference	AXN/HSS/401	AXN/HSS/401	The instrument part reference.
SerialNumber	AAA1234	AAA1234	Unique name for each module.
Settings	-	-	-
Fill Value	0000 to FFFF	AAAA	Data parameters will display this value when there is no received serial data to be read for a channel.
Channels	-	-	-
Serial-In(3:0) <i>Serial-In Input</i>	-	-	-
ProgOut(7:0) <i>ProgOut Output</i>	-	-	Programmable LVDS output.
Settings	-	-	-
Function	Off Major Frame Minor Frame Word Pulse Bit Clock	Off	Defines the output function. Pulse timing is aligned to the sampling frame.

Parameter definitions

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
<i>Global Parameters</i>				
Report Reports the status of the module	BitVector	BitVector	16	R[15:0] R(15) Event - Fresh Error R(14) PIUnlocked - Sampling frame is out of lock with the acquisition cycle. This could lead to missed and/or duplicate samples at the encoder output. 1: The PI loop cannot lock to the data acquisition cycle. 0: The PI Loop remains locked to the data acquisition cycle. R[13:0] Reserved - Reserved for future use.
ModuleTemperature Temperature of the module in steps of 0.00275 C. 0x0000 = -55C, 0xFFFF = 125C.	Celsius	OffsetBinary	16	R[15:0]
MinorFrameIrigTime48 48-bit wide IRIG time word at the start of each sampling minor frame.	BitVector	BitVector	48	R[47:0]
MinorFrameTimeHi Hours and minutes at the start of the sampling minor frame cycle.	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.

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
MinorFrameTimeLo Seconds and centiseconds at the start of the sampling minor frame cycle.	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.
MinorFrameTimeMicro Microseconds at the start of the sampling minor frame cycle.	Second	BCD	16	R[15:0] R[15:0] Microseconds - BCD Microseconds 0 to 9999.
Serial-In(3:0) Parameters				
Data Serial Data read from the output FIFO, if words size less than 16 bits the data is MSB justified.	BitVector	BitVector	16	R[15:0]

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

Getting the most from the AXN/HSS/401

The AXN/HSS/401 is a high speed synchronous serial receiver designed to interface to scientific instruments used on sounding rockets. It has four high speed LVDS channels as well as eight programmable outputs, which can be assigned four functions: Major Frame, Minor Frame, Word Pulse, or a continuous Bit Clock at the same frequency as one of the channel's Gated Clock.

The following figures show a single data word transfer and two words transfer. One of the programmable outputs is generating BIT CLK.

NOTE: LOAD OUT is driven low for half a bit clock period which loads the instrument's output register.

At each rising edge of GCLK OUT a new bit is clocked out of the instrument. However, the signals must travel down twisted pair cables, which delays by approximately 1 ns for every 15 cm (6 inches). The data must make the return trip down a similar length of cable. Delays in the instrument's electrical interface must also be included. At high speeds, (50 MHz = 20 ns) these delays can add up to more than one bit clock cycle.

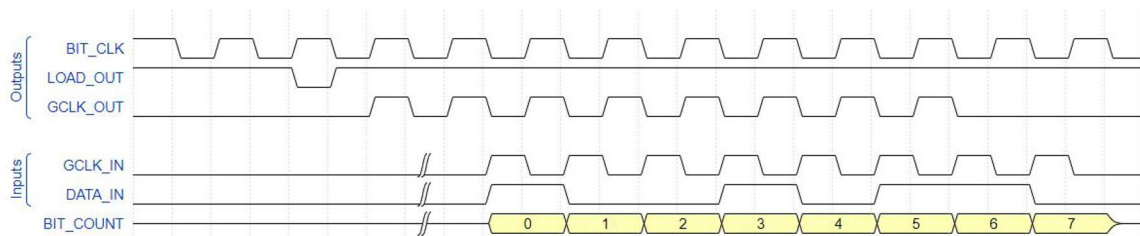


Figure 2: Single word transfer

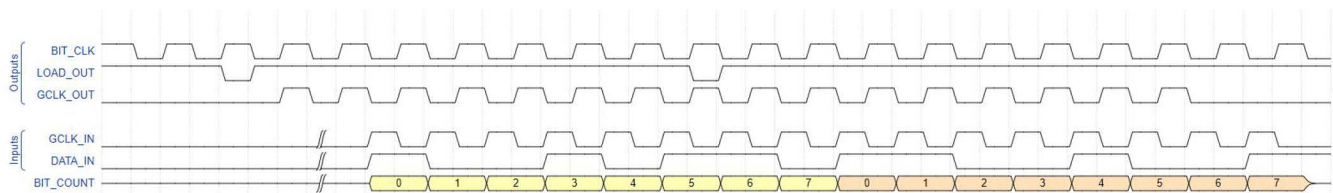
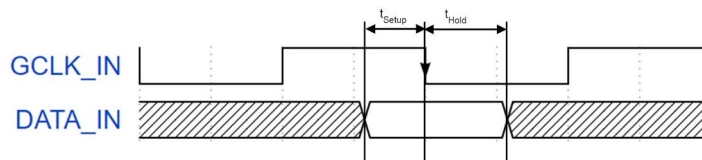


Figure 3: Two words transfer

To compensate for this, the instrument returns the bit clock with the serial data. Data is captured by the falling edge of GCLK IN, while the following Setup Time and Hold Time must be respected.

Setup Time (t_{Setup}) Data valid to GCLK_IN Falling edge	> 5nS
Hold Time (t_{Hold}) Data valid after CGLK_IN falling edge	> 5nS



The ANX/HSS/401's programmable outputs can be used to output BIT_CLK, MAJOR_FRAME, MINOR_FRAME and WORD_PULSE all of which can be used to synchronize the instrument interfacing with the ANX/HSS/401. In order to acquire the data in time for transmission across the backplane to the AXN/ENC/402's PCM frame, the AXN/HSS/401 operates an internal sampling frame that is in lock step with the ANX/ENC/402's output frame but starts ahead of it. The BIT_CLK MAJOR_FRAME, MINOR_FRAME and WORD_PULSE output from the AXN/HSS/401 are aligned with the AXN/HSS/401 sampling frame.

There can be only one AXN/ENC/402 in the system as multiple AXN/ENC/402 modules are not supported by the software.

Word sizing and PCM transmission

The AXN/HSS/401 takes the word size from the AXN/ENC/402 PCM frame definition. By default, it receives data from the serial device—most significant bit (MSB) first—and stores this in the MSB of the received register. Where a word size less than 16 bits is received, the receive register store the data left justified where the MSB is placed in D15.

AXN/HSS/401 WORD PACKING		
Words Size	MSB	LSB
16 Bits	D15	D0
15 Bits	D15	D1
14 Bits	D15	D2
13 Bits	D15	D3
12 Bits	D15	D4
11 Bits	D15	D5
10 Bits	D15	D6
9 Bits	D15	D7
8 Bits	D15	D8

When setting up PCM frames with word sizes smaller than 16 bits, use Transmission Assistant at the bottom of the AXN/ENC/402’s Packages tab. Set **Tx Start Bit** according to the LSB in the table above, leave the **Tx Stop Bit** unchanged at 15. The sample rate must also be set from a drop-down menu (see the following 12-bit example). For details on the use of Transmission Assistant, see the *DAS Studio 3 User Manual*.

Is Placed	Can Place	Is Locked	Name	Value	Sample Rate (Hz)	Commutation	Word Offset	Minor Frame	Size In Bits	Tx Start Bit	Tx Stop Bit	Tx Bits	Fragmentation	Par Cat
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_HSS_401_MinorFrameInTime48	n/a	Not Placed	Not Placed	n/a	n/a	48	0	47	48	48	Stan
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_HSS_401_Serial-In(0)_Data	n/a	1000	1:1	n/a	n/a	16	4	15	12	12	Stan
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_HSS_401_Serial-In(1)_Data	n/a	1000	1:1	n/a	n/a	16	4	15	12	12	Stan
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_HSS_401_Serial-In(2)_Data	n/a	1000	1:1	n/a	n/a	16	4	15	12	12	Stan
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_HSS_401_Serial-In(3)_Data	n/a	1000	1:1	n/a	n/a	16	4	15	12	12	Stan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_ENC_401_Time48	n/a	Not Placed	Not Placed	n/a	n/a	48	0	47	48	48	Stan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_ENC_401_Status	n/a	Not Placed	Not Placed	n/a	n/a	16	0	15	16	16	Stan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_ENC_401_Temperature	n/a	Not Placed	Not Placed	n/a	n/a	16	0	15	16	16	Stan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P_MyAXN_ENC_401_FrameCount	n/a	Not Placed	Not Placed	n/a	n/a	32	0	31	32	32	Stan

Figure 4: Setting up PCM frames in Transmission Assistant

Pin 52 GND

Pin 52 is commonly used as CHASSIS for Axon modules. Because all the pins are used, the ANX/HSS/401 uses this pin as GND to make grounding connection easier for the user when the four channels need to be monitored. If shield connection is required, it must be connected to the connector.

Low temperature power-on

At temperatures below -30°C, the AXN/HSS/401 can occasionally take up to 30 seconds to power on and achieve lock with the acquisition cycle before it returns valid data.

Connector pinout of the AXN/HSS/401

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	LOAD_OUT(0)+	LVDS outputs	
2	GCLK_IN(0)-	LVDS inputs	
3	PROG_OUT(0)+	LVDS outputs	
4	PROG_OUT(1)-	LVDS outputs	
5	LOAD_OUT(1)+	LVDS outputs	
6	GCLK_IN(1)-	LVDS inputs	
7	PROG_OUT(2)+	LVDS outputs	
8	PROG_OUT(3)-	LVDS outputs	
9	GND	Internal ground	
10	GCLK_IN(2)-	LVDS inputs	
11	LOAD_OUT(2)+	LVDS outputs	
12	PROG_OUT(4)-	LVDS outputs	
13	PROG_OUT(5)+	LVDS outputs	
14	GCLK_IN(3)-	LVDS inputs	
15	LOAD_OUT(3)+	LVDS outputs	
16	PROG_OUT(6)-	LVDS outputs	
17	PROG_OUT(7)-	LVDS outputs	
18	GND	Internal ground	
19	DATA_IN(0)-	LVDS inputs	
20	GCLK_IN(0)+	LVDS inputs	
21	GCLK_OUT(0)-	LVDS outputs	
22	PROG_OUT(1)+	LVDS outputs	
23	DATA_IN(1)-	LVDS inputs	
24	GCLK_IN(1)+	LVDS inputs	
25	GCLK_OUT(1)-	LVDS outputs	
26	PROG_OUT(3)+	LVDS outputs	
27	DATA_IN(2)-	LVDS inputs	
28	GCLK_IN(2)+	LVDS inputs	
29	GCLK_OUT(2)-	LVDS outputs	
30	PROG_OUT(4)+	LVDS outputs	
31	DATA_IN(3)-	LVDS inputs	
32	GCLK_IN(3)+	LVDS inputs	
33	GCLK_OUT(3)-	LVDS outputs	
34	PROG_OUT(6)+	LVDS outputs	
35	PROG_OUT(7)+	LVDS outputs	
36	LOAD_OUT(0)-	LVDS outputs	
37	DATA_IN(0)+	LVDS inputs	
38	PROG_OUT(0)-	LVDS outputs	
39	GCLK_OUT(0)+	LVDS outputs	
40	LOAD_OUT(1)-	LVDS outputs	
41	DATA_IN(1)+	LVDS inputs	
42	PROG_OUT(2)-	LVDS outputs	
43	GCLK_OUT(1)+	LVDS outputs	
44	GND	Internal ground	
45	DATA_IN(2)+	LVDS inputs	
46	LOAD_OUT(2)-	LVDS outputs	
47	GCLK_OUT(2)+	LVDS outputs	
48	PROG_OUT(5)-	LVDS outputs	
49	DATA_IN(3)+	LVDS inputs	
50	LOAD_OUT(3)-	LVDS outputs	
51	GCLK_OUT(3)+	LVDS outputs	
52	GND	Internal ground	

Ordering information

PART NUMBER	DESCRIPTION
AXN/HSS/401	High-speed serial interface - 4ch

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). The AXN/HSS/401 requires an ANX/ENC/4xx encoder for its operation; the encoder must be ordered separately (refer to Related products for options).

Revision history

REVISION	DIFFERENCES	STATUS
AXN/HSS/401	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

MODULE	DETAILS
AXN/ENC/401	IRIG-106 PCM encoder (PMF output)
AXN/ENC/402	IRIG-106 PCM encoder (PMF output) with Chapter 7
GS Works 9	Real-time and post-test data visualization and analysis software

Related documentation

DOCUMENT	DETAILS
DOC/DBK/011	AXN Databook
DOC/MAN/030	DAS Studio 3 User Manual
DOC/GBK/008	Environmental Qualification Handbook for Axon Products

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