

General Description



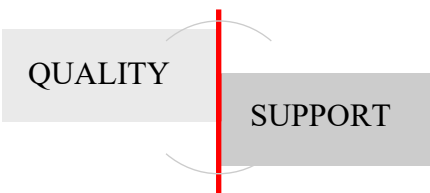
The Kimdu Technologies newly updated Type ‘D’ Serial to Synchro Interface Unit (SSIU-T) contains up to four, isolated, independent, 16-Bit Digital-to-Synchro converters. The serial input data is decoded by the embedded CPU and written to the Synchro Converters. The user defines, via the serial bus, the synchro channel to be updated along with the angle data. In addition, the latest Type ‘D’ version includes extensive BIT testing and status reporting capability. There is an additional, dedicated, RS-232 Serial Port for firmware uploads allowing field-programmable firmware updates. ARINC-429 is an optional serial input to the SSIU-T for ARINC-407 applications. Other optional interfaces include Ethernet 10/100, Mil-Std-1553B, and custom interfaces. Contact Kimdu sales for information. The SSIU-T is supplied with MIL-38999 connectors.

Field-Upgradeable Operation

The SSIU-T allows for uploading firmware upgrades at your site avoiding having to send the unit back to the factory. There is an I/O connector pin that controls the mode; ‘Run’ or ‘Program’. Wire an RS-232 cable to the J2 I/O connector or use an RS-232 to USB dongle adapter along with a free PC-based software utility and upload a Kimdu-supplied Hex file to the SSIU-T.

FEATURES:

- ◆ Up to Four Synchro Channels
- ◆ 90v or 11.8v @400Hz Operation
- ◆ Ruggedized Unit
- ◆ RS-232 or RS-422 Interface
- ◆ 16-bit D/S Converter Resolution
- ◆ Up to 4.5VA Output per channel
- ◆ Optional Interfaces:
 - ARINC- 429
 - Ethernet
 - Mil-Std-1553B
- ◆ MIL-38999 Connectors
- ◆ Mil-Std-704 28vDC Power Supply
- ◆ Designed to meet Mil-Std-704E/461D



AS9100:2016
ISO 9001:2015
CERTIFIED

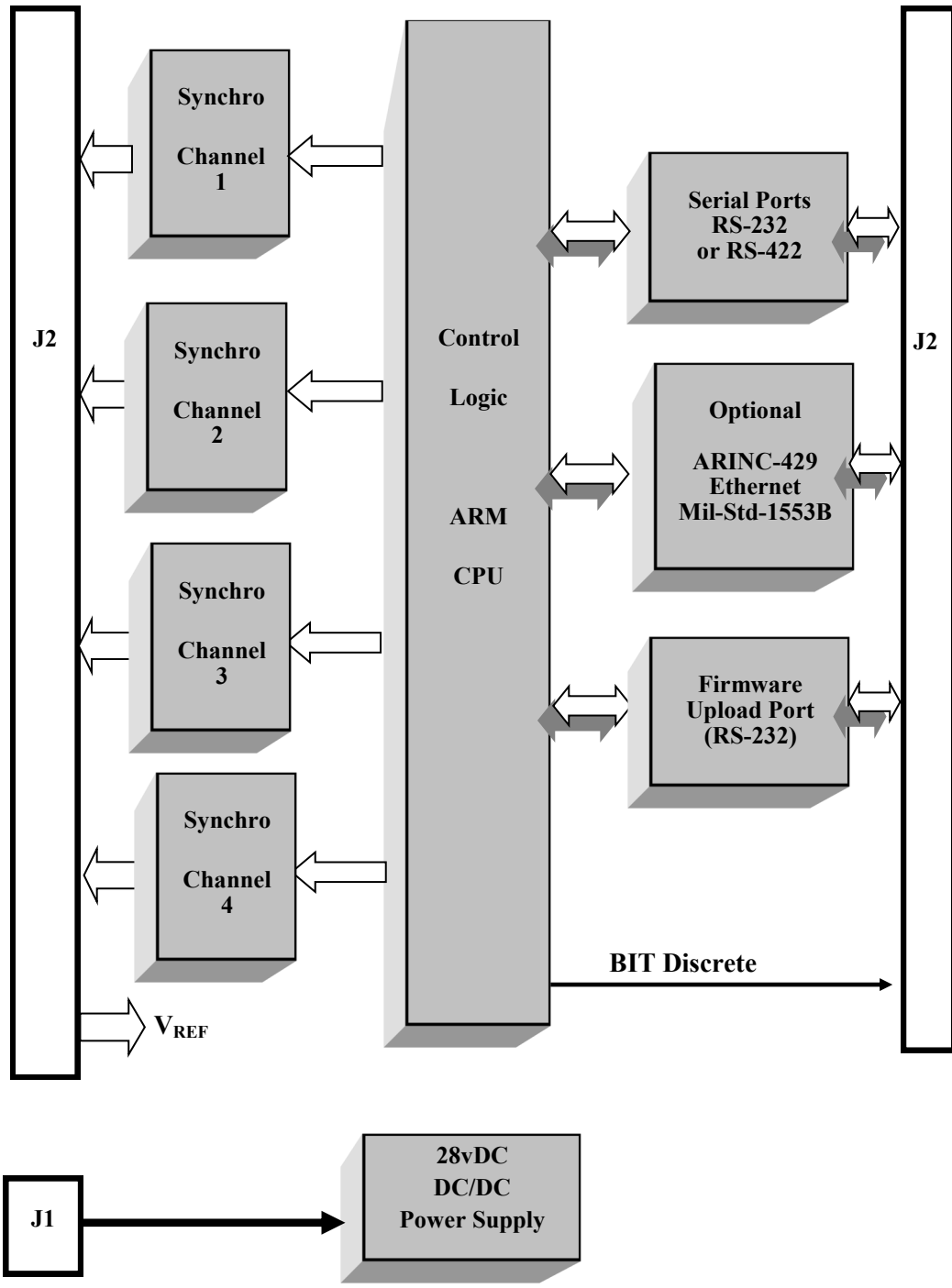
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FUNCTIONAL BLOCK DIAGRAM

SSIU Operation:

The SSIU-T can be ordered with up to four Synchro channels with 4 minute accuracy. Note that the SSIU-T comes with output isolation transformers. These transformers affect the accuracy of the synchro conversion. The SSIU-T has 90v output levels (11.8v is also available). The Reference input requires 115v @ 400hz (or 26v @ 400Hz with option). The four Synchro channels are named: Channel 1 or “CH1”, Channel 2 or “CH2”, Channel 3 or “CH3”, Channel 4 or “CH4”.

SERIAL PORTS

The SSIU-T can be ordered with either RS-422 or RS-232 ports. Other interfaces are available (see Ordering Information at the end of this document for details).

Single Channel Mode:

A channel’s angle is programmed by sending three bytes to the SSIU-T; a command byte defining which channel along with two bytes containing the desired angle. The angle data consists of two bytes and the table below defines its structure. The angle data has a 16-bit resolution. The two data bytes are sent Lo Byte first followed by the Hi Byte.

Four-Channel Mode:

The user sends 12 *contiguous* bytes (Command followed by 2 bytes of angle data *per channel*) to the SSIU-T. Only after receiving all 12 bytes will the SSIU-T update all four synchro outputs concurrently.

NOTE: The 12 bytes must be sent as a *single*, 12-byte string and not as 4 strings of 3 bytes each. The SSIU-T uses an internal timeout function to verify that 12 bytes have been received before updating the angles and therefore extended time between these 12 bytes will be viewed as a transmission error by the SSIU-T.

Resolution Table

Bit weights for the binary inputs are given in the table below. The angle is determined by adding bits that are in the logic 1 state. The synchro resolution is 0.0055 degrees per bit. Bit 0 is the LSB within the word.

	BIT	DEG/BIT Resolution=16)
LSB	0	0.0055
	1	0.011
	2	0.022
	3	0.0439
	4	0.0879
	5	0.1758
	6	0.3516
	7	0.7031
	8	1.406
	9	2.813
	10	5.625
	11	11.25
	12	22.5
	13	45
14	90	
MSB	15	180

Host to SSIU-T Commands:

All commands [with data] sent to the SSIU-T will work only when W=1 and R=0 ('W' signifying "writing" data to the SSIU-T).

Set Angle & Communications Command

The Set Angle command consists of three bytes; Command byte followed by two data bytes containing the angle data (Low Byte followed by Hi byte).

7	6	5	4	3	2	1	0	COMMAND BYTE
7	6	5	4	3	2	1	0	LOW BYTE
7	6	5	4	3	2	1	0	HIGH BYTE

First byte of the Command is shown in the table below where C0, C1 and C2 are: defined as follows:

MSB								LSB	
0	1	0	C0	C1	C2	W	R		

C0	C1	C2	FUNCTION	COMMENT
0	0	0	Channel 1	SET ANGLE FOR CHANNEL 1
0	0	1	Channel 2	SET ANGLE FOR CHANNEL 2
0	1	0	Channel 3	SET ANGLE FOR CHANNEL 3
0	1	1	Channel 4	SET ANGLE FOR CHANNEL 4
1	0	0	INVALID CODE	COMMAND IGNORED
1	0	1	INVALID CODE	COMMAND IGNORED
1	1	0	INVALID CODE	COMMAND IGNORED
1	1	1	Set Communication [parameters]	only works if W=1 and R=0

Set communication parameters

If this is a "Set Communication" command (C0=1, C1=1, C2=1), then the second byte will be as follows (there are only two bytes sent for this command):

B1	B2	B3	B4	P1	P2	S1	0
----	----	----	----	----	----	----	---

B1	B2	B3	B4	Baud Rate		P1	P2	PARITY		S1	STOP BITS
0	0	0	0	9600		0	0	NONE		0	1
0	0	0	1	14400		0	1	EVEN		1	2
0	0	1	0	19200		1	0	ODD			
0	0	1	1	38400		1	1	ILLEGAL			
0	1	0	0	57600							
0	1	0	1	115200							
0	1	1	0	230400							
0	1	1	1	460800							
1	0	0	0	921600							

The default serial port settings are as follows:

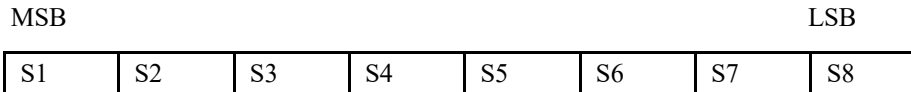
- ◆ Baud rate: 921.6 Kbaud
- ◆ Number of bits: 8
- ◆ Parity: No
- ◆ Number of Stop bits: 1
- ◆ Flow control: None

SSIU to Host messages

Status Response Byte *(For 4-Channel Mode only)*

For each [12-byte] “Set Angle” transmission, the SSIU-T automatically responds with 1-byte message indicating general status of the module and status of each synchro channel. No command byte transmission is required for this operation.

Note: If for any reason, the transmission of “Set Angle” was not valid (ie only part of 12 bytes or more than 12 bytes were sent to the SSIU-T), the status is sent out after a timeout period with S1 bit asserted (see table below).



S1	S2	S3	S4	S5	S6	S7	S8	Status
1	0	0	0	0	0	0	0	Transmission status - Fail
0	1	0	0	0	0	0	0	General Status - Fail
0	0	0	0	0	0	0	1	Synchro Channel 1 - Fail
0	0	0	0	0	0	1	0	Synchro Channel 2 - Fail
0	0	0	0	0	1	0	0	Synchro Channel 3 - Fail
0	0	0	0	1	0	0	0	Synchro Channel 4 - Fail
0	0	0	1	0	0	0	0	RESERVED
0	0	1	0	0	0	0	0	+/-15VDC PSU - Fail

BIT Request

Bit Request consists of one byte sent to the SSIU-T. To initiate BIT request, the Host must send the command byte with W=0 and R=1 ('R'=1 signifying a *read* operation from the SSIU-T). In this case C0, C1 and C2 bit values will be ignored. The SSIU-T will respond as defined below.

Command byte formatted for BIT Request:



BIT response

SSIU-T will respond with BIT results after each BIT request.

The response shall consist of two bytes as defined below. A fault condition is flagged with a logic '1' in the bit location. No fault is represented by a logic '0'.

BYTE 1

BIT POSITION	NAME	NOTE
0	SYNCHRO SHUTDOWN	CAUSED BY +/-15V OR 5V FAULT, OR ANY CHANNEL IN OVER-CURRENT.
1	5v OUT OF RANGE	5V (< 4.5V)
2	3.3V OUT OF RANGE	3.3v (< 3.1v)
3	VIN VOLTAGE OUT OF RANGE	(adjustable with firmware)
4	VIN CURRENT OUT OF RANGE	(adjustable with firmware)
5	CPU FAULT	Internal cpu memory test
6	+15V OUT OF RANGE	+15V (Outside ±10%)
7	-15V OUT OF RANGE	-15V (Outside ±10%)

BYTE 2

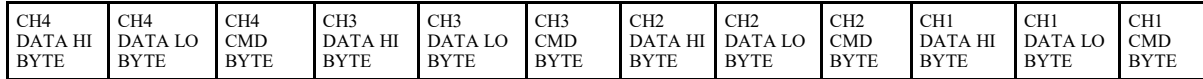
BIT POSITION	NAME	NOTE
0	CH1 +15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
1	CH1 -15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
2	CH2 +15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
3	CH2 -15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
4	CH3 +15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
5	CH3 -15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
6	CH4 +15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)
7	CH4 -15V OVERCURRENT	CURRENT >1A (Adjustable with resistor)

Synchro Update Mode

There are two standard firmware versions available for controlling the SSIU-T.

Four Channel Mode

The Four-Channel mode uses a single 12-byte data string made up of 4, 3-byte, packets. Each 3 byte packet relates to a channel and contains the Channel Number followed by two bytes of synchro data. The ordering is Channel 1 followed by Channel 2, Channel 3 and then Channel 4. The SSIU-T will only update the synchro outputs after *all* 12 bytes are received. Only then will the update occur on all four channel outputs.



Single Channel Mode

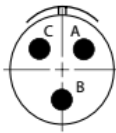
The Single-channel mode uses a single 3-byte string, Command Byte followed by the channel's data Lo byte and then the data Hi byte. Synchro outputs are updated each time a 3-byte string is received. There is no specific order to the strings. A single channel, for example, can be updated multiple times without updating the other channels. For normal synchro data updates, the first byte in the string defines the channel number to update.



Connector Definitions :

Connector Type: MIL-C-38999

J1 POWER
D38999/20FA98PN

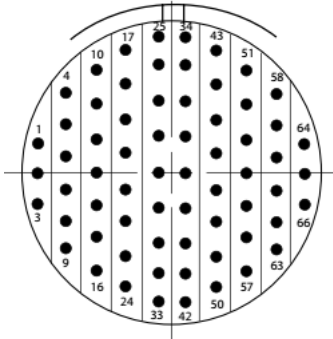


A98

PIN	FUNCTION
A	+28VDC
B	CHASSIS GND
C	28VDC RTN

Mating Connector:
3-Pin
D38999/26FA98SN

J2 I/O
D38999/20FF35PN



F35

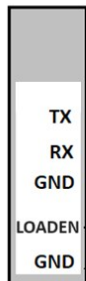
Mating Connector:
66-Pin
D38999/26FF35SN

J2 – SIGNAL I/O

Connector Pin No.	Signal Name
1	CHASSIS GND
2	NO CONNECTION
3	NO CONNECTION
4	RS422 TX1+
5	RS422 TX1-
6	RS422 RX1+
7	RS422 RX1-
8	ISOLATE 422 RTN
9-16	NO CONNECTION
17	CH1_S1
18	CH1_S2
19	CH1_S3
20	NO CONNECTION
21	NO CONNECTION
22	CH2_S1
23	CH2_S2
24	CH2_S3
25	NO CONNECTION
26	NO CONNECTION
27	NO CONNECTION
28	REF HI
29	REF LO
30 - 33	NO CONNECTION
34	CH3_S1
35	CH3_S2
36	CH3_S3
37	NO CONNECTION
38	NO CONNECTION
39	NO CONNECTION
40	CH4_S1
41	CH4_S2
42	CH4_S3
43	NO CONNECTION
44-57	NO CONNECTION
58	232_TX (LOADER)
59	232_RX (LOADER)
60	L_GND (LOADER)
61	NO CONNECTION
62	BIT DISCRETE
63	L_GND
64	NO CONNECTION
65	LOAD_EN
66	L_GND

J2

Upload Cable Drawing



TX	Pin 58	Pin 2
RX	Pin 59	Pin 3
GND	Pin 60	Pin 5
LOADEN	Pin 65	
GND	Pin 66	

SSIU-T
Side

PC
Side



DB-9 Female



NOTE:

All pins labeled L_GND are *sourced* by the SSIU and should be only used to connect external devices for RS-232 Gnd RTN, BIT, and Loader functions. Do not connect these pins to the 28vRTN on J1.

Specifications

Parameter	Value	Units
Synchro Converter Accuracy	±4	Minutes
Synchro Converter output type	Isolated Transformer	
Synchro Output Voltage	90v (11.8v option)	AC
Synchro Output Power (max)	1.5, 3, 4.5 ^(Note 1)	VA RMS
Output Scale Factor	±3.5	%
Variation with Digital Angle (max)	±0.5	%
Reference Voltage Inputs (RH, RL)	115v @ 400Hz (26v @400 option)	AC
Resolution	16	Bits
Serial Port Baud Rate (default)	921.6 ^(Note 2)	kbaud
Serial Input Type (see ordering p/n)	RS-232 or RS-422	-
Serial Data Format	Proprietary	See Definition
ARINC-429 Data Rate (option)	12.5 or 100	Kbps
Power Supply		
- Nominal DC Input Voltage	28V (nominal) +/-20%	Vdc
- Surge Voltage (max)	50v per Mil-Std-704E~F for 28vDC operation	
- 28v Supply Current (Nom) 4-Channel With Reference Voltage, no load	<500	mA
- 28v Supply Current (Nom) 4-Channel With Reference Voltage, 2K load	<1000	mA
- Reference Voltage Current	< 10	ma
- Optional Heater Supply Current (Max) (when operating)	1.5	A
- EMI	Designed to meet Mil-461D	
Enclosure		
- Environmental	IP68	
- Weight (with 4 Synchro Channels);	<2400	gm
Connectors		
- Type	MIL-C-38999	
Operating Temperature	-40 to +71	°C
Storage Temperature	-55 to +125	°C

Notes:

- (1) See ordering information
- (2) Default. Other baud rates can be supplied.
- (3) Operating current for extended temperature range of -55°C ~ 71°C.

Ordering Information

SSIU-T- X - X - X - X - X - X - Dxxx

