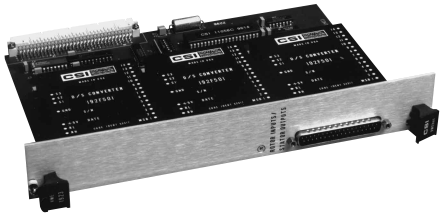
digital to synchro converter
VMEbus 14 bit
series VME1923



FEATURES

- **Up to 3 channels**
- **4 arc minute accuracy**
- **4.5VA output @ 400Hz**
- **1.5VA output @ 60Hz**
- **Drives most CT and CDX loads**
- **Short circuit protection**
- **Thermal cutoff**
- **No external DC power required**
- **VME P1 bus slave**
- **VME 6U double card slot**

GENERAL DATA

The series VME1923 is a double-slot VMEbus card that incorporates up to three 14 bit digital to synchro converters. The converters are powered from the reference excitation; no external DC power is required. No external output transformers are required even with 60Hz excitation.

The 400Hz converters are high-power devices capable of delivering up to 4.5VA. The 60Hz converters are moderate-power devices capable of delivering up to 1.5VA. Outputs are protected against overloads, short circuits and overheating. Angular accuracies of ±4 minutes are maintained from no load to full load. The converters exhibit very low scale factor variations with digital input angle, providing amplitude conformity of ±0.1%.

ON-BOARD DEVICES AND FUNCTIONS

The VMEbus card contains the following devices and functions:

- Up to 3 digital to synchro converters
- Test Register

Digital to Synchro Converters

The digital to synchro converters require two inputs: an AC reference excitation of sufficient power to drive the synchro load and a 14 bit parallel binary angle (BAMs), where the MSB = 180° and the LSB = 0.022°.

Each converter is accessed via the VMEbus by writing to its address offset. The output is a 3-wire synchro angle equal to the binary input angle. The output synchro signals are described by the following equations:

$$E_{S1\text{-}S3} = KE_{RL\text{-}RH}\sin\Theta$$

$$E_{S3\text{-}S2} = KE_{RL\text{-}RH}\sin(\Theta + 120°)$$

$$E_{S2\text{-}S1} = KE_{RL\text{-}RH}\sin(\Theta + 240°)$$

Where: K = D/S transformation ratio
Θ = binary input angle in degrees

Test Register

This is a byte addressable word-wide port built from two octal read-back latches. It may be accessed via the VMEbus by reading or writing to the Test Register address offset. The Test Register is provided as a dual-purpose device. The primary role is as a diagnostic aid used to verify the functionality of the card's VMEbus interface circuitry and local bus integrity. As a secondary role, the read-back latch capability can be used at power-up to establish a level of confidence in the system's VMEbus.

SPECIFICATIONS

Parameter	Value
Resolution	14 bits (0.022°)
Accuracy[1]	±4 arc minutes (0.067°)
Reference Input[2][3]	
Type	Solid state differential
Isolation	0.4MΩ to gnd
Voltage	
Operating	26V or 115Vrms
Maximum	30V or 138Vrms
Frequency	60Hz or 400Hz
Current	
No Load	
60Hz	40mA
400Hz	25mA
Additional with Load	1mA per mA of load current
Stator Outputs[2][3]	
Type	Transformer isolated 3-wire synchro (S1-S2-S3)
Voltage	11.8V or 90V L-L
Load	
60Hz	1.5VA max.
400Hz	4.5VA max.
Phase Shift (ref/stator)	5° max.
Output Scale Factor	±2%, tracks reference input
Scale Factor Variation with Input Angle	±0.1% max.
Output Quadrature	±0.3% max.
Protection	Short circuit and thermal
Power Supply[4]	
Voltage	+5Vdc
Current	500mA max.
Temperature Ranges	
Operating	0° to +70°C (standard) -40° to +85°C (IT option)
Storage	-55° to +105°C

NOTES:

1. Accuracy applies for:
   a) ±10% reference amplitude and frequency variation.
   b) 10% reference harmonic distortion.
   c) ±5% power supply variation.
   d) over operating temperature range.
2. Reference inputs and stator outputs are accessed via a front panel DC37P connector (J1).
3. See Ordering Information for specific voltage and frequency options.
4. The +5V power is provided via the VMEbus P1 connector.

I/O CONFIGURATION

The VMEbus interface is configured as an A24:D16 slave. All data transfers to and from the card are via the VMEbus P1 connector. The card monitors all Address Modifiers (AM5-AM0) and may access via any of the following standard (A24) addressing modes:

Standard supervisory program access (3E)
Standard supervisory data access (3D)
Standard non-privileged program access (3A)
Standard non-privileged data access (39)

The interface does not implement interrupt functions but will only transfer data if IACK* is HIGH. The interrupt daisy chain is jumpered on the card. After DSO* or DS1* goes LOW, DTACK* will be driven LOW within 6 cycles of SYSCLK.

Base Address Selection

The VMEbus card base address is derived by partially decoding the VMEbus A24 address bus. Only the upper eight lines (A23-A16) are monitored during VMEbus cycles. The board may be configured to respond to any one of 256 possible base addresses using the on-board 8-position base address dip switch. This corresponds to the following VMEbus standard mode address range:

00xxxx hex to FFxxxx hex

Note: x = Don't care

Each of the eight address select switches on the card correspond to each of the monitored address lines as follows:

VMEbus Address	CSI VMEbus Card Base Address Switch
A23	S1-8
A22	S1-7
A21	S1-6
A20	S1-5
A19	S1-4
A18	S1-3
A17	S1-2
A16	S1-1

The base address of the card may be set by placing each switch in the ON or OFF position to specify a particular address. The state of each switch corresponds as follows:

Switch State	Binary Value	Boolean State
ON	0	FALSE
OFF	1	TRUE

Offset Address Selection

Each I/O device on the card may be accessed via a unique VMEbus address. The address for each I/O device is derived from the base address on the card and an address offset value that is unique to each I/O device. The address offset value is combined with the card's base address to generate the VMEbus address used to access a particular I/O device. The typical method used in the combination process begins by setting the "Don't care" bits in the base address to zero. Next, the desired offset value is simply added to the base address. This address offset value and access mode for each I/O device located on the CSI VMEbus card is summarized in the Address Offset Table below.

ADDRESS OFFSET TABLE

I/O Device or Function	Offset Hex	Data Width	Port Size	Access Type
D/S Chan 1	00	14 bit	word	write
D/S Chan 2	02	14 bit	word	write
D/S Chan 3	04	14 bit	word	write
Test Register	0C	16 bit	word/	read
Test Register	0C	16 bit	byte	write

Programming Note

When writing the software that determines how the digital data is generated, follow the rules listed below:

1. When incrementing the D/S converter registers by one LSB at a time, the update rates should be limited to 330 kilosamples per second for 400Hz converters and 50 kilosamples per second for 60Hz converters.

2. The software should never allow the digital input angle to change in steps of 179° or more. In synchro systems a false null occurs 180° away from the true null. The D/S converter can alter its output angle so fast that the load may not respond causing a false null condition.

DATA LINES

The CSI VMEbus card accepts 16 data lines configured as a D16 slave. The table below shows the format of the digital to synchro converter devices onboard the VMEbus card.

DATA LINE FORMAT TABLE

Data Line	D/S Data Bits	Data Line	D/S Data Bits
D15	180.000°	D7	0.703°
D14	90.000°	D6	0.352°
D13	45.000°	D5	0.176°
D12	22.500°	D4	0.088°
D11	11.250°	D3	0.044°
D10	5.625°	D2	0.022°
D9	2.813°	D1	not used
D8	1.406°	D0	not used

REFERENCE IN/SYNCHRO OUTPUT CONNECTOR

The analog reference inputs and the synchro outputs are accessed via a DC-37P front panel connector (J1); see pin assignment table below.

Pin #	Ident
1	Chan 3 Ref Lo
2	n/c
3	Chan 3 Stator S2
4	n/c
5	n/c
6	n/c
7	n/c
8	Chan 2 Ref Lo
9	n/c
10	Chan 2 Stator S2
11	n/c
12	n/c
13	n/c
14	n/c
15	Chan 1 Ref Hi
16	Chan 1 Stator S3
17	Chan 1 Stator S1
18	n/c
19	n/c
20	Chan 3 Ref Hi
21	Chan 3 Stator S3
22	Chan 3 Stator S1
23	n/c
24	n/c
25	n/c
26	n/c
27	Chan 2 Ref Hi
28	Chan 2 Stator S3
29	Chan 2 Stator S1
30	n/c
31	n/c
32	n/c
33	Chan 1 Ref Lo
34	n/c
35	Chan 1 Stator S2
36	n/c
37	n/c

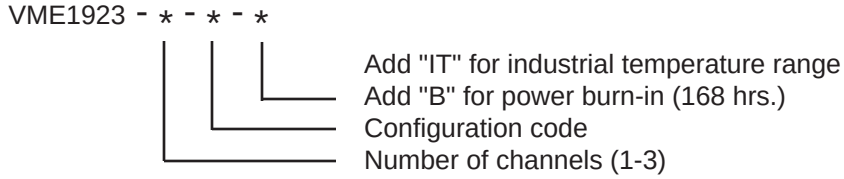
ORDERING INFORMATION

CONFIGURATION TABLE			
Code	Reference Voltage	Reference Frequency	Stator Voltage
01	26Vrms	360-440Hz	11.8V
02	115Vrms	360-440Hz	11.8V
03	115Vrms	360-440Hz	90.0V
04	115Vrms	54-66Hz	90.0V

NOTES:

1. This is only a partial listing of configurations available.
2. Models may be supplied with a mix of D/S converters. Consult factory for special requirements.
3. The CSI VME1923 uses the 192F500 series D/S converters. Refer to those data sheets for additional specific information.
4. The part numbering designation system shown below may be used only when all converters on a card are identical.

PART NUMBER DESIGNATION



WARRANTY

All units are warranted against defects in materials and workmanship for 1 year from the date of shipment. Liability is expressly limited to servicing, adjusting, or replacing any CSI product returned to our factory with delivery charges prepaid. In no case shall our liability exceed the original purchase price.