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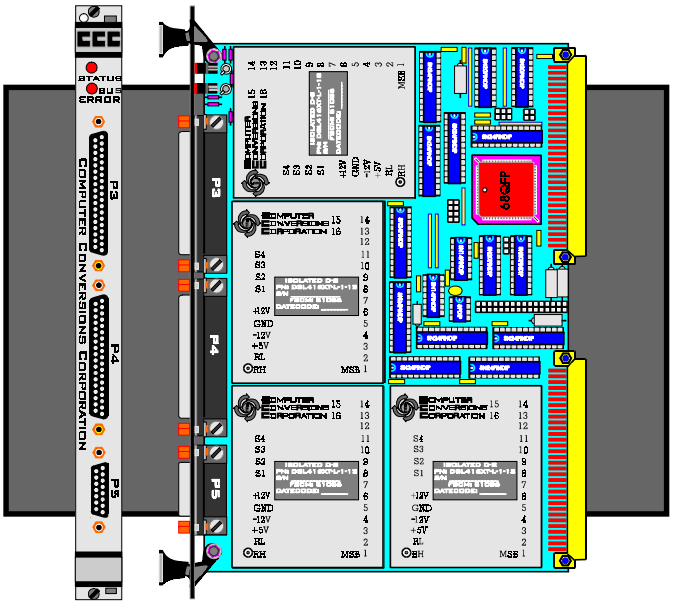
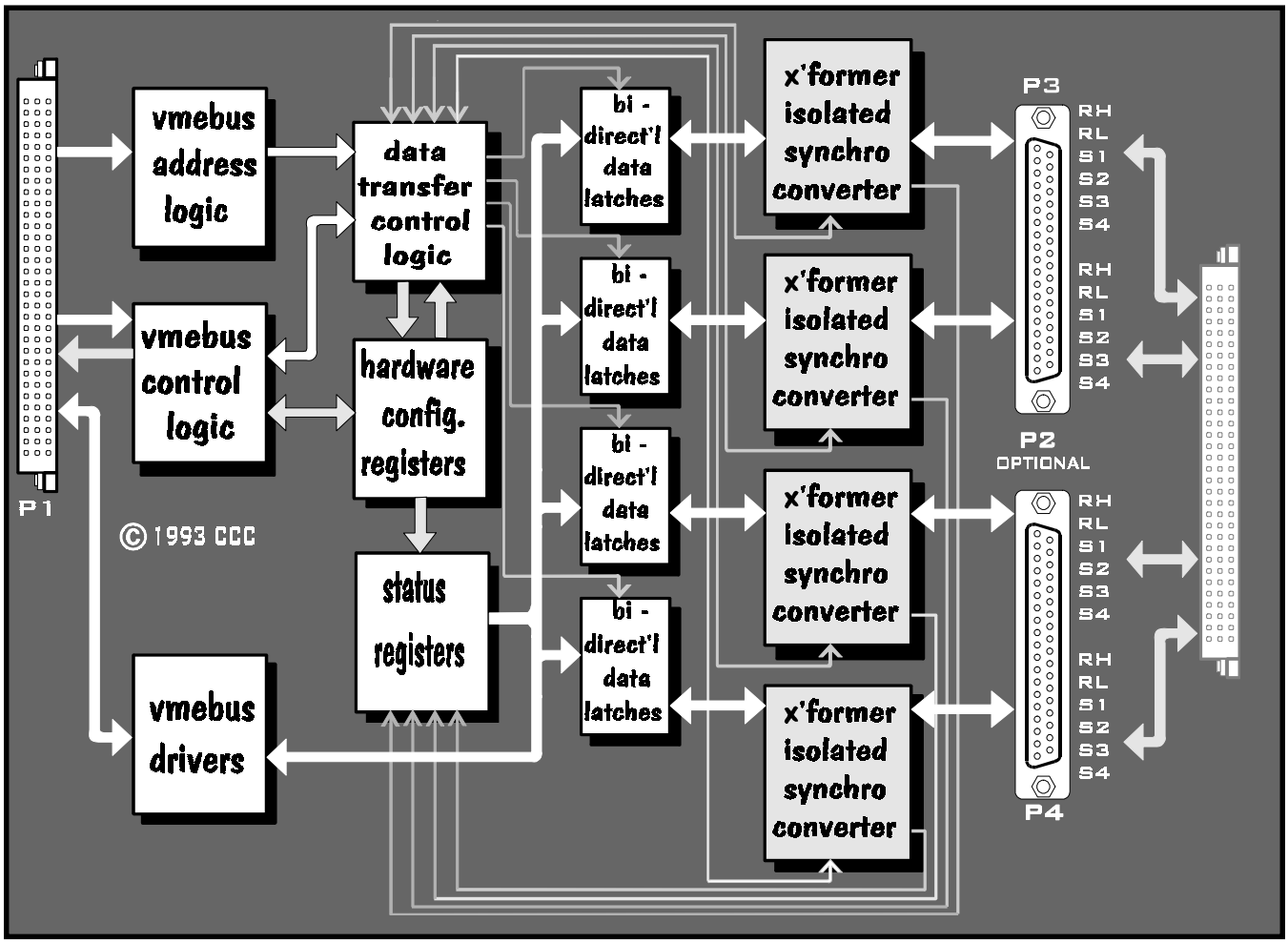
VB SERIES
SYNCHRO-RESOLVER-ENCODER
VME CARD OVERVIEW
VBR,VBW,VBE,VBB,VBT,VBDT Series Introduction

~~~ FEATURES ~~~

- *Up to 8 Isolated Input Channels/Card*
- *Synchro, Resolver and LVDT I/O*
- *Independent Tracking Converters*
- *Mix-Match upto 8 Converters/Card*
- *100% Transformer Isolated I/O units*
- *Loop-Back Testing Cards Available*
- *Self-Test Models w/Continuous Flt.*
- *Proven "Industry Std. Converters"*
- *Reliable Register Based "LSI" Logic*
- *Quadrature Incremental Encoder Outputs for Motion Controllers' Input*
- *On-Board Reference Supplies*
- *Absolute Multi-Speed/Multiturn I/O*



Overview

The "VB Series" products line contains VME compatible synchro/resolver converters and absolute encoder systems. These particular cards are ideal for any rotary motion and related process, control, or simulator type application with any VME compatible system.

The ***VB Series*** provide up to ***eight channels*** of resolver or synchro conversion on a single-width, standard 6U height VME card.

The ***VBE Series*** Resolver/Encoder systems feature up to 6 axis of shaft angle position encoding with a choice of single or multiturn resolvers used as the sensor inputs.

CCC's full line of "Industry Standard" Synchro/Resolver converters, and Absolute Encoder products, are used to populate standard multi-function VME decoder cards. Differing converters may be mixed to minimize real estate for a particular application.

Both ***industrial and military grade*** (extended) temperature range versions are available, with forced air or conduction cooled models having thermal layers and expansion wedge style card locks. Accuracy applies over the operating temperature range, and 883 level B/38510 parts/processing is available on all units.

Transformer isolation is offered for all inputs and outputs, eliminating concerns for ground loops, differing potentials and high voltage field transients affecting the card itself and the VME Bus backplane.

All input cards feature Built-In Fault Detect, Self-Test command angle is optioned, and models with True Wrap Around Test (VBT's).

Maximum versatility has been employed on all "VB" products to assure universal compatibility in addressing, timing, system, and microcomputer independence.

All VB Series converter cards are configured as ***A24:D16 DTB Slaves***. They will respond to address modifier codes "3D" or 39 for standard addressing, and "2D" or "29" when selected for short I/O type addressing.

The VME interface is a very straight-forward register based design; simply address the channel and read or write the data.

Status registers are used to provide card configuration data, and on a per channel basis, to provide channel config. and fault status.

The high speed register based interface allows these cards to operate reliably in any software environment, with uninhibited ***Real-Time*** performance.

Buffered latches are provided on all data lines to assure stable read and write cycles as commanded by the host. Address and control lines feature single point terminations to minimize any loading of the backplane. All signal output converters are provided with ***inherent read-back*** ability.

BUS CONVERTER SELECTIONS:

- Synchro/Resolver to Digital
- Absolute Encoder/Resolver Systems
- Digital to Synchro/Resolver
- Multispeed & Multiturn Converters
- Multifunction Dynamic Rotators
- DC Sine/Cos. Vector Generators
- 2 & 3 Wire LVDT/RVDT to Digital
- Digital to LVDT/RVDT Simulators
- Active CDX Control Differentials
- Active CT Control Transformers
- Active Incremental Outputs & Ref.
- Isolated D-A,s and Tracking A-D's
- Built-In Fault Detect, Forced-Test and True IsolatedWrap-Around Test.
- Programmable Reference Supplies
~~~



No external Power Supplies are required, every card is available as powered with standard ***± 12 an +5V VME Bus standard*** supplies.

Power source jumpers are provided to select the ±12VDC power input source, via the external connector port, or the VME BUS P1 backplane.

CCC's VB cards include two 25 pin polarized "D" style subminiature connectors on the ***front panel*** for all external I/O, ***and/or the P2*** connector I/O is available as an option.

The availability of Self-Test Command Angle options (-WS), and True Wrap-Around loop back-test boards (VBT and VBDT Series), allow the user to configure automatic self test and simulation type programs at any level.

Because the VB Series uses ***proven, and reliable "whole" converter products***, coupled with the use of leading edge LSI interface technology, the VB Series cards offer quick availability, ***competitive pricing and the best density*** verses performance ratio available in the marketplace.

VBR,VBW,VBE, & VBB SERIES ADDRESS MAP

HEX Select	Address Bits A4	A3	A2	A1	Converter Function	Chan
00h	0	0	0	0	Read/Write Chan.	0
02h	0	0	0	1		1
04h	0	0	1	0		2
06h	0	0	1	1		3
08h	0	1	0	0	Read-Back Chan.	0
0Ah	0	1	0	1		1
0Ch	0	1	1	0		2
0Eh	0	1	1	1		3
10h	1	0	0	0	*Read Status Chan.	0
12h	1	0	0	1		1
14h	1	0	1	0		2
16h	1	0	1	1		3

*-WS Units, Write Command Self-Test Angle

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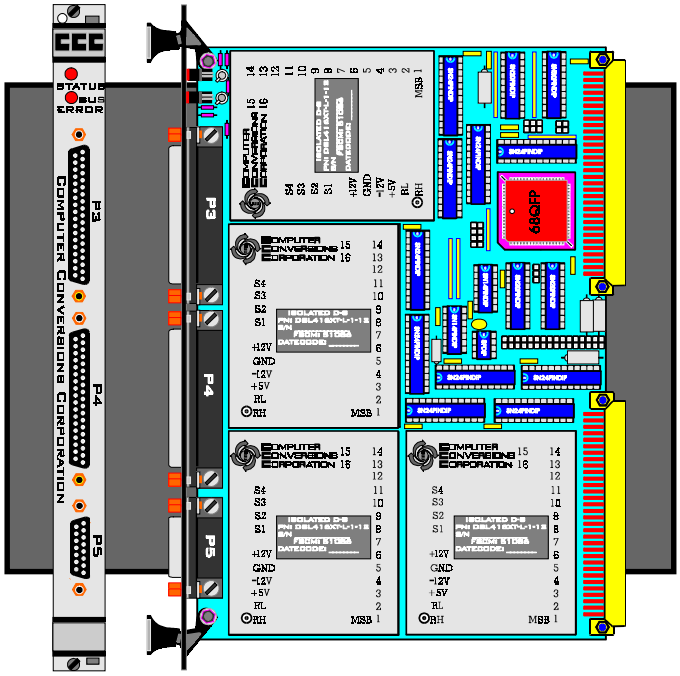
VBR SERIES
SYNCHRO & RESOLVER TO DIGITAL VME BUS INPUT CARDS

AVAILABLE FEATURES

- ❑ *Resolution 10 to 18 Bits*
- ❑ *Transformer Isolated Inputs*
- ❑ *Ratiometric Tracking Converters*
- ❑ *Tracking Rates to 50 RPS*
- ❑ *Velocity & Incremental Outputs*
- ❑ *Insensitive to Frequency & Amplitude Variations*
- ❑ *IND.TEMP/ Mil Spec./Hi Rel Options*
- ❑ *1 to 4 Channels Per Card, VBD for 8*
- ❑ *Proven "Industry StandardConverters"*
- ❑ *On-Board Reference Supplies*



Description

The VB S/R series are 1-4 channel continuously tracking synchro or resolver to VME card converters, employing a type 2 ratiometric conversion loop for high speed/high performance applications. They will accept any of 4 individual, or paired 3-wire ***synchro*** or 4-wire ***resolver*** inputs over a frequency range of 50 to 10KHZ., and convert them simultaneously into 10-16 bit words of natural binary data. Data is addressable in a single word 16 bit format over the VME backplane.

Data made available to the bus is continuously updated (tracking) without interruption; output ***data is stable, accurate, and always fresh*** up to the maximum tracking rate of the converter. When address and control variables are set, all data bits are latched simultaneously into separate buffered registers to prevent false reads.

Isolation

No external transformers, modules or signal conditioning is required. The synchro/resolver converters used feature internal solid-state or transformer Scott T's that accept ***direct field voltage inputs***.

Transformer isolated units are completely isolated from each other and the backplane for all the reference and signal lines. This completely ***isolates the card and effectively the whole computer from all field wiring***, eliminating concerns over troublesome ***ground loops***, differing potentials, ground interjected spikes, ***or ghostly field noise*** that so frequently takes down entire systems.

Multispeed/Multiturn

The VBR Hardware ***inherently supports*** four channels of discreet S-D/R-D conversion, two channels of ***multispeed/multiturn*** S-D/R-D conversion, or a combination of both.

The Firmware supports simultaneous two channel store-to-read configuraiton required to properly interrogate multispeed/multiturn resolvers and synchro's. Furthermore, precombined converters can be supplied as an option.

Bus Powered

Power required is ±15 and +5VDC as standard; ±12VDC is optioned, and the source for the ±12 or ±15V input is strap selectable for ***power sourcing via the backplane or externally*** powered via the I/O connector.

Built-In-Test/Self-Test

All units include a continuous built-in-test, converter and I/O fault detect, and -WS option units include a command to 30 degree test angle for self-test.

Options currently available include DC velocity output, a ***built-in test*** output representing the tracking mode, internal reference supplies, quadrature ***incremental pulse train outputs***, mil-grade ***extended temperatures***, and 883 level B processing.

APPLICATIONS:

- ❑ **Antenna Monitoring**
- ❑ **Closed Loop Servo Controls**
- ❑ **Fire Control Systems**
- ❑ **Avionic & Naval Systems**
- ❑ **Conveyor Controls**
- ❑ **Wind Speed Indicators**
- ❑ **Machine Control Systems**
- ❑ **Shaft Angle Encoding**
- ❑ **Engine Test Stands**
- ❑ **Material Handling Systems**

Specifications

		10 Bits	12 Bits	14 Bits	16 Bits	18 Bits
Accuracy		+/-30'	+/-8.5'	+/-4'+1LSB	+/-4'	+/-1'
				+/-4.5'+1LSB		
-HA models		+/-21'		+/-2.7'	*+/-2.6'	+/-10sec.
Tracking Rate	60Hz.	12.5	10	2.5	0.625	0.25
(RPS)	400Hz.	40	40	10	2.5	1
		100	80	30	5	1.2
-HS models		200	200	50	10	
Acceleration	60Hz.	770	295	20		
(for a 1 LSB lag	400Hz.	12600	4500	610	124	
	2,5KHz.	2500	9000	1620		
-HS models		1400	350	70		
	400Hz.	22000	5500	1100		
	2,5KHz.	160K	40000	8100		
Step Responce	60Hz.	200ms.	360ms.	800ms.	1200ms.	
	2.5KHz.	95ms.	95ms.	150ms.	600ms.	2000ms.
Frequency Range	60Hz.units 47-1000Hz.			400Hz.units 360 - 2000Hz.		
	2.5KHz.units 2000 - 4800Hz.			Higher Frequencies Available		
Reference Inputs	26VRMS into 90K ohms					
	115VRMS into 360K ohms					
Signal Inputs	11.8VRMS L-L into 26K ohms Minimum L-L Balanced					
	26VRMS L-L into 26K ohms Minimum L-L Balanced					
	90VRMS L-L into 200K ohms Minimum L-L Balanced					
Breakdown (volts)	500 VDC Minimum to Ground on Transformer Units					
Common Mode	80 Db. Minimum on Solid State Units					
Power Supplies	+5VDC @ .8 Amp. typical, + 125 ma./channel					
+12VDC @ 35 ma./channel, -12VDC @ 45 ma./channel (-12 units) , -WR units add 450 ma. ea. +						
or, +15VDC @ 25 ma./channel, -15VDC @35 ma./channel , -WR units add 400 ma. ea.						
Temperature	0C to +55C on card level units, 0C to+70C on conv., (-1 units)					
	-40C to +75C on card level, units -40C to +85C on conv. (-3 units)					
(operating)	-55C to +85C on card level units, -55C to+105C on conv., (-2 units)					
Storage	-55C to +125C					

Notes: 1) ALL UNITS AVAILABLE WITH SOLID STATE OR TRANSFORMER ISOLATED SIGNAL & REF. INPUTS

2) Accuracy applies over the operating temp. range, +/-10% amplitude& frequency ,+/-5% power

3) Different input voltages and frequencies available, Fixed and Programmable Reference Supplies

4) For units with solid state inputs, any one input line may be grounded. Common mode up to max. L -L input is acceptable, and 80 Db. common mode std.

5) Higher accuracy, faster settling times and higher rates available

6) 883 Level B/38510 WA High Rel. available on select units.

. * 7) 16 Bit units with accuracy of +/- 20 arc. seconds & 20 Bit units available.

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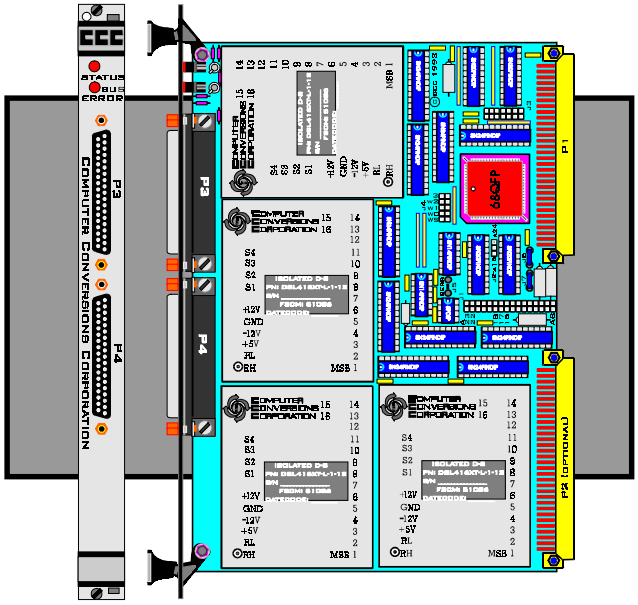
VBW SERIES

VME BUS TO SYNCHRO, RESOLVER OR DC SIN/COS OUTPUT CARDS

FEATURES

- ❑ *Simulates Synchros and Resolvers*
- ❑ *DC Sine Cosine Models Available*
- ❑ *Transformer Isolated I/O*
- ❑ *Choice of 12 to 18 Bit Resolution*
- ❑ *Up to 4 Channels Per VME Card*
- ❑ *No External Power Supplies Required*
- ❑ *Mil Temp. and 883ER/38510 Available*
- ❑ *Fast 5 USec. Throughout (With Settling)*
- ❑ *Inherent Readback Access*



DESCRIPTION

The ***VBW Series*** are complete VME Bus to Synchro and Resolver output converters used for ***self-test, simulation and control***, in military and industrial applications.

The VBW card is populated with digital to: synchro, resolver, or DC sine/cosine converters mixed as specified for the application.

The converters are ***continuously updating***, allowing the speed response to be dictated by the software, clock and the CPU.

All of these synchro and resolver converters feature virtually ***indestructible short-circuit proof outputs***, over-voltage and transient protection, ***internal heat sinks***, current limiting, and ***automatic thermal cutoff***.

Complete ***transformer isolation*** is offered for all reference inputs and signal outputs to ***eliminate ground loops***, differing potentials, and ***to keep any high voltage transients from affecting the VME bus backplane***.

Both ***low cost*** "DSL/DRL Series", and "DSP Series" ***reference powered converters*** are offered to ***drive on-board loads of up to 5VA***, and external "booster amplifiers" are available to drive **loads up to 300VA**.

VME BUS

The VBW series consists of up to ***4 channels*** digital of synchro or resolver converters in a ***single slot width***, 6U size, standard VME Bus module. Only the DSP Converters require a double width slot because of their .82" height modules.

Configured as a ***A24:D16 DTB Slave***, these cards will respond to address modifier codes "3D or 39" for standard addressing, and "2D or 29" when selected for short I/O type addressing. The D00 through D15 data lines are used for the command input, whereby D15 represents the most significant bit.

FUNCTIONS

- ❑ *Digital to Synchro/Resolver Converters*
- ❑ *Digital Vector Generators (DC Sine/Cos)*
- ❑ *Solid State Control Transformers*
- ❑ *Dual Channel Synchro Amplifiers*
- ❑ *Isolated Digital to Analog*
- ❑ *Mix/Match w/ S-D & R-D's On-Board*
- ❑ *Control Differential Transformers*
- ❑ *Reference Powered D-S Converters*

Applications

- ❑ *Fire Control Systems*
- ❑ *Aircraft Simulators & Trainers*
- ❑ *Naval Trainers*
- ❑ *Navigational Tools & GPS Systems*
- ❑ *Gyro & Wind Speed Simulation*
- ❑ *Test Stands & Instrumentation*
- ❑ *Automated Test Equipment*

VBW cards are provided with ***inherent Read-Back*** functionality, and *Loop-Back/Wrap-around testing* features can be provided as an option (see VBT Series, data sheet).

Because the DSL/DRL series converters are offered with ***VME Bus standard ±12V and +5VDC supplies***, and the DSP series are completely ***"Reference Powered" units***,
No external power supplies are required.

These features make the VBW VDSL Series the ***highest performance***, easiest to use and ***most accurate complete units available*** in the marketplace.

DSL/DRL TYPE

The DSL/DRL converters are ***highly reliable, very low cost***, digital to synchro/resolver converters that are powered from ±15VDC or ***Bus-powered ±12volt supplies***. The DC supply source may be field ***selected as sourced by an external input or, powered from the VME Bus backplane.***

Frequencies of 400Hz and higher require ***no external components***, and two different types of output transformers are offered for the 60Hz units.

The internal; reference and signal transformers, rugged power amplifiers, and ***large internal heat sinks***, provide complete output drive with the best density verses heat dissapation per square inch, available for DC powered converters in the marketplace.

DSP TYPE

The DSP converters ***derive the output power from the reference (RH, RL) input***, and require ***No ±15 or ±12VDC supplies***. This series features a ***very efficient, internal pulsating power supply,*** that converts the reference input into a high-power, angle-weighted synchro output format.

Because these units convert the AC reference input directly into AC modified outputs; they are more like a translator then amplifier, they effectively ***transfer the AC power rather then amplify*** DC sources. This allows the DSP series converters the inherent ability to provide ***superior efficiency and 2-3 times better thermal heat dissapation over DC powered units***, in addition to the ability to provide high voltage 60 Hz. signals direct, without any external transformers.

400Hz DSP units ***drive up to a full 4.5VA load***, and ***60Hz units*** drive a full 1.5VA load ***direct without requiring external output trans formers.***

Synchro/Resolver ***active Control Transformers***, active Control ***Differentials***, units with ***Isolated D-A*** (Digital to Analog), or ***LVDT/RVDT***, Multispeed Conversion, ***Demods' active Vector Generators*** etc. can be configured by requesting:"VBW Series Extended Model Selection guide".

DSL/DRL Units; Model Type, Drive/Load Verses Power Supply Load

DC Power Supplies	+/-15VDC SUPPLIES .External +/-18VMax.						+/-12VDC SUPPLIES .Bus-Powered or Ext.					
Frequency	60 Hz. Units			400 Hz. Units			60 Hz. Units			400 Hz. Units		
Model Type	**N	Std.	-3L	Std.	-3L	*-5	**N	Std.	-3L	Std.	-3L	*-5
Drive (VA)	0.02	**1.5**	**2.2**	**1.5**	**2.9**	**5**	0.02	**1.2**	**1.7**	**1.2**	**2**	**3.4**
90V. Synchro in Kohms		4	2.7	4	2	1.2		5	3.5	5	3	1.78
11.8V. Syn in ohms				70	36					87	52	
11.8V. Res in ohms				93	48					116	70	
Avg. DC Current (ma.)	120	150		150			150	220		200		
Avg.Peak Current(ma.)	120	330		330			150	485		440		
Foldback (ma.)	120	600		600		2000	180	600		600		2000

Notes 1)** These units used to power external power amplifiers to upto 300VA., +/-15V units are 7V , . +/-12V. units are 6 V.L-L. . 2)* These units require a double slot assembly for module height and Thermal considerations, . 3) All units should have sufficient forced air cooling. Internal Thermal cut-off is at 125C and is . automatically restored. . 4) 60 Hz, units require an external transformer shown below, P/N DSC60-15 for +/-15V units, . . P/N DSC60-12 for +/- 12V. units . 5) The +/- 12 or +/-15VDC Power supplies should feature foldback/current limitting to enable . . . supplies to gradually increase the voltage with the load surge caused during power-on . (turn-on short circuit current).Most reasonable supplies (including switchers) feature this. . 6) Both the + and - supplies should power-up simultaneously to minimize turn-on surges (typical . of all Class B amp's.) Tracking supplies should be considered where practical.

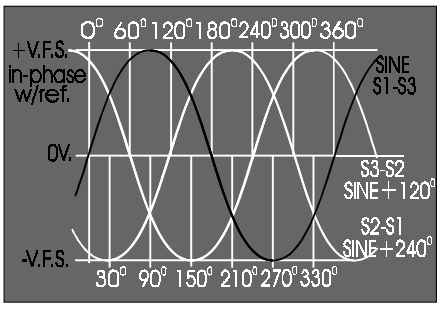
DSP type converters drive upto 1.33K ohms @ 400 Hz., 4.0K ohms @ 60 Hz.
Reference Current:DSL; 2ma., DSP; 40ma.@400Hz, 50ma.@60Hz./chan.

Standard Synchro Loads

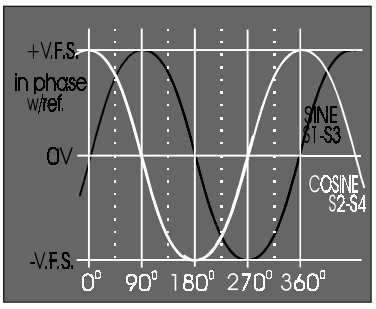
MIL-STD Class MIL-S-20708	IMPEDENC ZSO	Load VA
26V 08 CT 4c	100 + j490	0.2784
26V 11 CT 4d	21.0 + j132	1.0417
11 CT 4e	838 + j4955	1.6118
15 CT 4b, & c	1600 + j9300	0.8584
15 CT 6b, & c	1170 + j6780	1.1773
18 CT 4b, & c	1420 + j13260	0.6074
18 CT 6b, & d	1730 + j510	4.491
23 CT 4, & a	1460 + j11050	0.7267
23 CT 4b, & c	1950 + j14000	0.573
23 CT 6, & a	1250 + j3980	1.9417
23 CT 6c & d	1350 + j4300	1.7972

Notes: 1) 6 = 60 Hz., 4 = 400 Hz. units . 2) 26V = 26Vsystem,11.8VL-L signals . else; 115Vsystem, 90VL-L signals typ

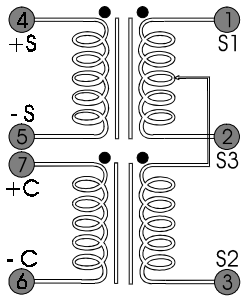
Accuracy:
12 bit Units ±15 arc minutes
14 bit Units ±4 arc minutes,
DSP type: 1 LSB Differential Linearity.



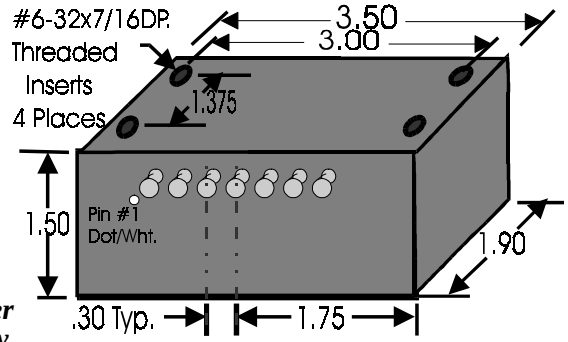
Synchro Format



Resolver Sin/Cos Format



DSC60N, 60 Hz. Transformer For DSL 50/60 Hz. units only



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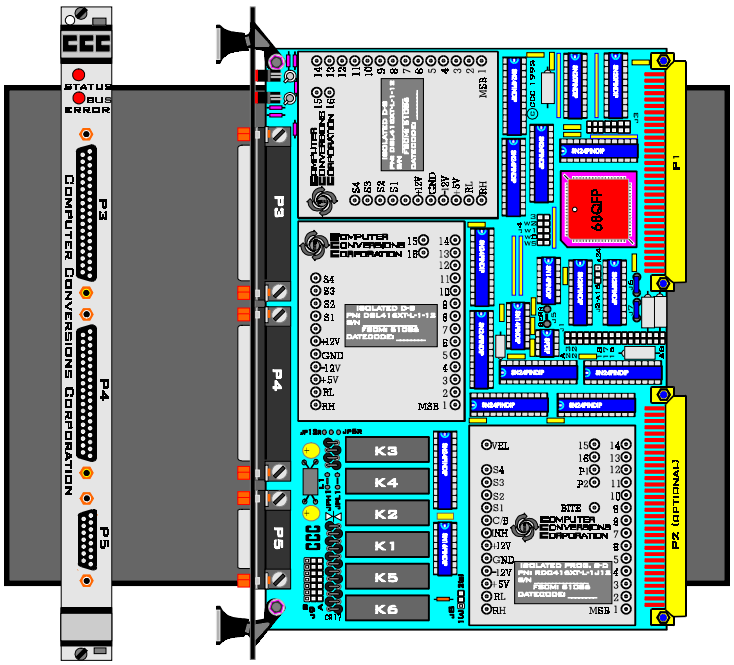
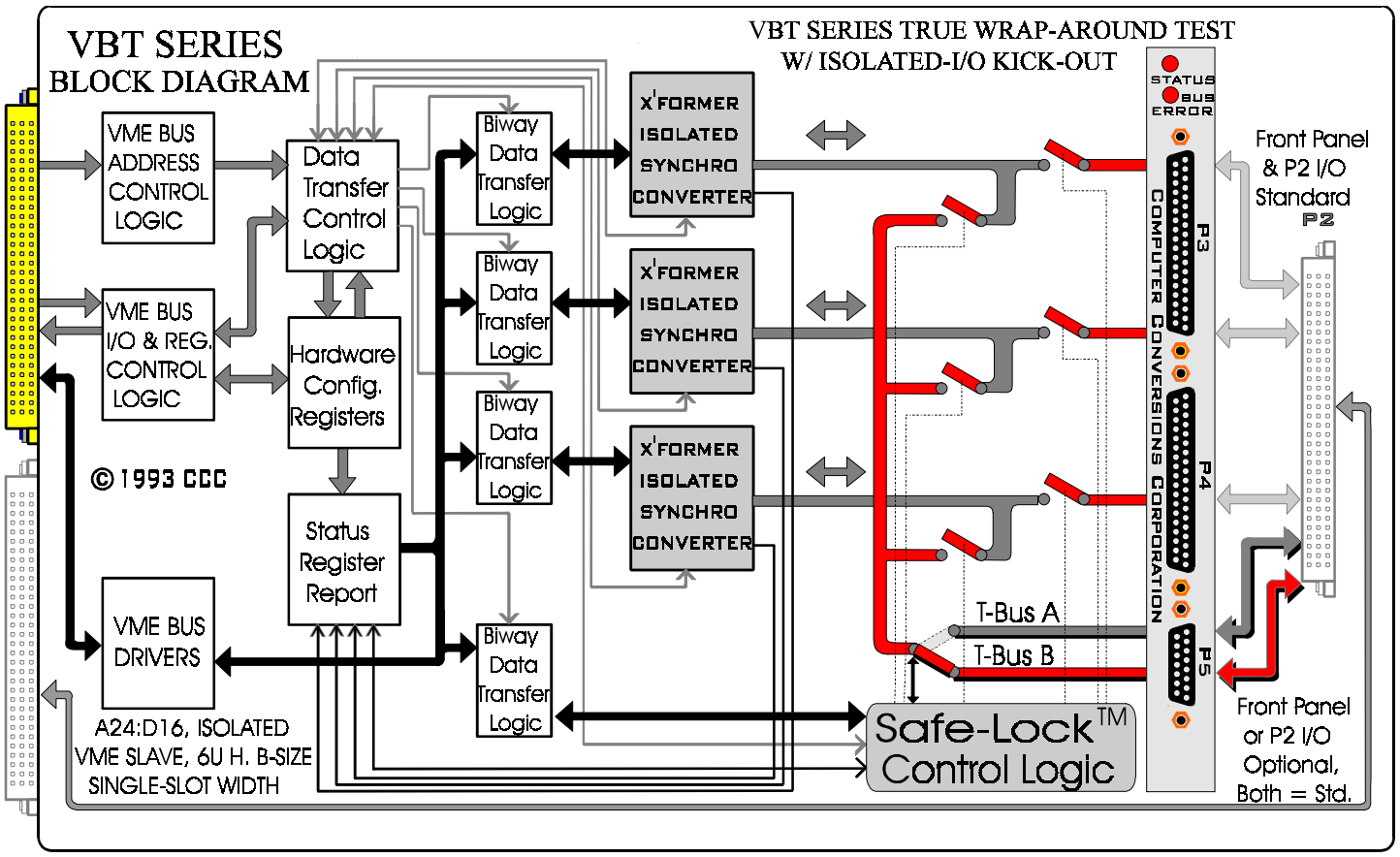
VBT & VBDT SERIES

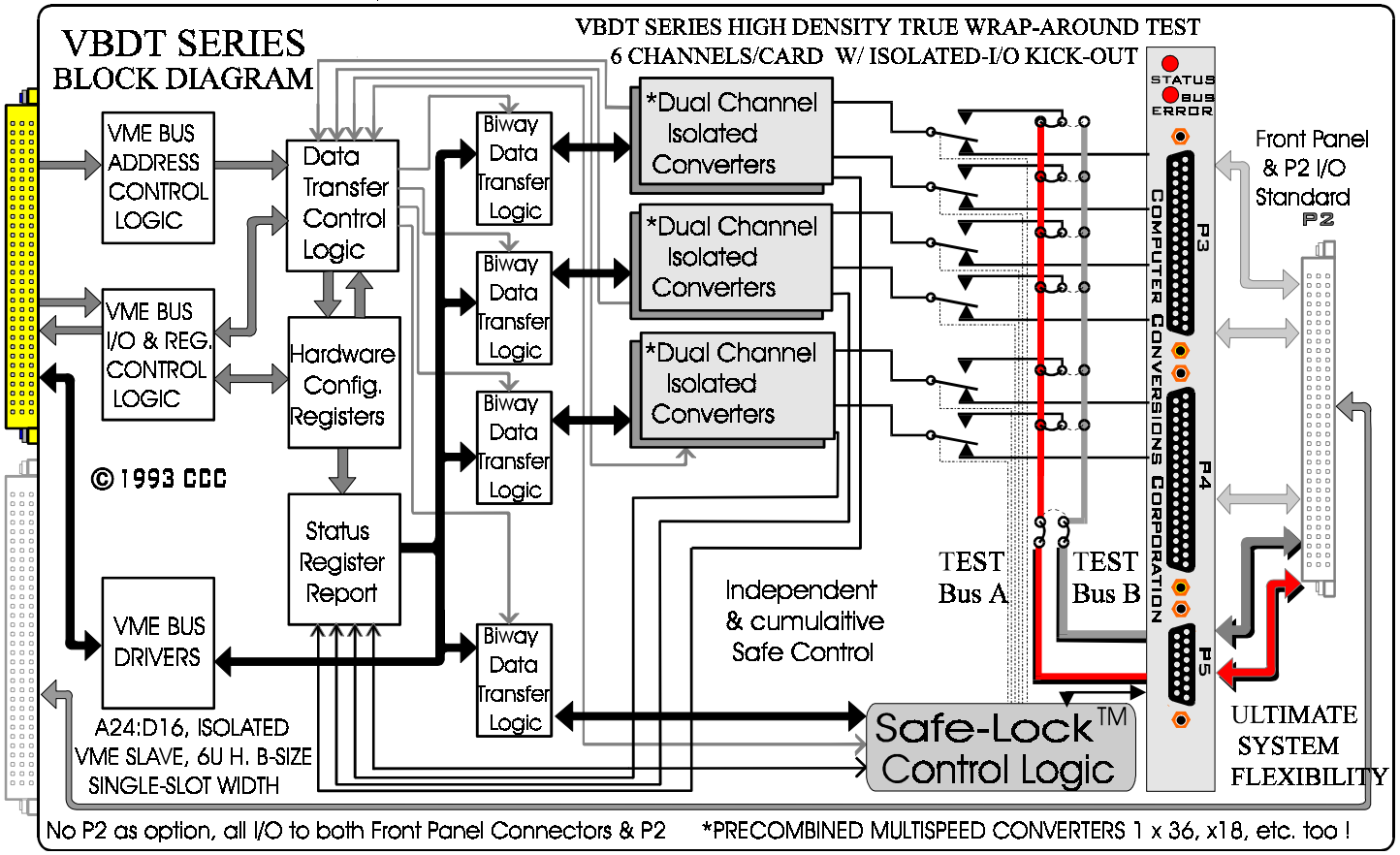
VME BUS W/BUILT-IN TEST BUS SYNCHRO/RESOLVER CONVERTERS

~~~ FEATURES ~~~

- ❑ *True Wrap-Around Converter Testing*
- ❑ *On and Off Card Loop-Back Testing*
- ❑ *Expandable Off-Card Test Bus'*
- ❑ *Isolation Through-Out Implementation*
- ❑ *Real-Time and Off-Line Testing*
- ❑ *I/O Can Be Disconnected/Module*
- ❑ *Verification of On Verses Off Card Faults*
- ❑ *Intelligent Test Bus Routing Logic*
- ❑ *Dual Off-Card Buses Per Card*
- ❑ *Elaborate Backplanes Not Required*
- ❑ *Upto 6 Isolated Channels/Card*



Overview

The VBT and VBDT Cards are full function 3 and 6 channel VME Bus cards with added support logic for CCC's ***"Advanced Random Signal Test Bus ™" (ARS T-Bus ™).***

The "***ARS T-Bus™***' uses a ***interlocked relay switching matrix***, that allows all the signal lines ***from one converter*** module to be selectively routed ***to any other compatible converter*** modules, that reside ***on the same card, or any other VBT or VBDT Card tied into the system***.

Compatible modules on any board are allowed to be tied between, or to, each other for loopback, Wrap-around testing and real time systems test.

The***ARS T-Bus™*** facilities ***Real-Time on-line (live) and off-line testing***, and program controlled automatic testing ***down to the component converter level.***

Because the ARS T-Bus™ allows the program to run "live" (real-time testing) or, selectively disconnect the actual field wired signal lines in route to each converter;

Automatic System Debug, can easily discern converter verses field wiring or sensor faults in the overall system, and evaluate the differences between loaded and unloaded converter performance.

Multiple Inter-Board Test Paths

The on-board ***ARS T-Bus™*** may be user strapped for routing to any one of ***twodifferent and distinct inter-card test buses*** that are daisy chained between boards via the ***P2*** expansion port ***or the Front Panel*** (T-Bus™) connector ports.

The use of two-***different inter-card test buses*** allows the user to run ***separate high voltage synchro, and low voltage synchro buses within the same system***. Furthermore, the two different ***Inter-card buses can be staggered for expansion into a third*** RVDT/LVDT test bus, ***or*** even a ***fourth or fifth multichannel*** A-D/D-A ***test bus*** etc.

Test Bus Integrity

Unlike other test methods that employ stepping up/down signal voltages for testing, or fixed step changes to verify limited functionality; the "***ARS T-Bus™***" ***routes the real (true voltage) signal lines as they enter the circuit card, this permits 100% true testing ability.***

The use of real (true-voltage) signal lines, and a ***true isolated test bus*** for Loop-Back allows the program to ***discern positively, (with confidence) whether a failure is an on-board or field fault.*** .

(Request full VBT/VBDT Data Sheets, Block Diagrams on following page)

Safe-Lock™ control logic

The***ARS T-Bus™*** uses a unique register based control structure employing the use of CCC's "***Safe-Lock ™ control logic***". A single ***Safe-Lock™ Command Register is provided to request the desired routing of signals***, and a ***Safe-Lock™ Status Register is provided to confirm if and when the commanded routing is set***.

All the ***ARS T-Bus™***; interlock, non-contention, bus-busy, time-out and signal compatibility checking logic, is transparent to the user, and ***automatically controlled with the on-board Safe-Lock™ control logic***.

Application Testing

Loop-back testing is primarily used immediately following power-ups, to step the converters through a user programmed exercise.

Real-time testing is performed by monitoring the signals and converters while in operation, and/or comparing the actual performance with another channel in the system (running concurrent to the live channel being tested), or a simulation of the expected.

The use of 100% transformer-isolated converters and a physically isolated test bus switching matrix; allows users to integrate Automatic Test Systems with guaranteed confidence and 100% assured performance.
~~~

VBT and VBDT Block Diagrams, Extensive True Wrap-Around Self-Test , Request VBT/VBDT Data Sheets



NOTE: FOR INPUT CONVERTERS; COMPLIMENTRY OUTPUT CONVERTERS OR FIXED ANGLE TEST PLUGS CAN ALSO BE USED.



No P2 as option, all I/O to both Front Panel Connectors & P2 *PRECOMBINED MULTISPEED CONVERTERS 1 x 36, x18, etc. too !

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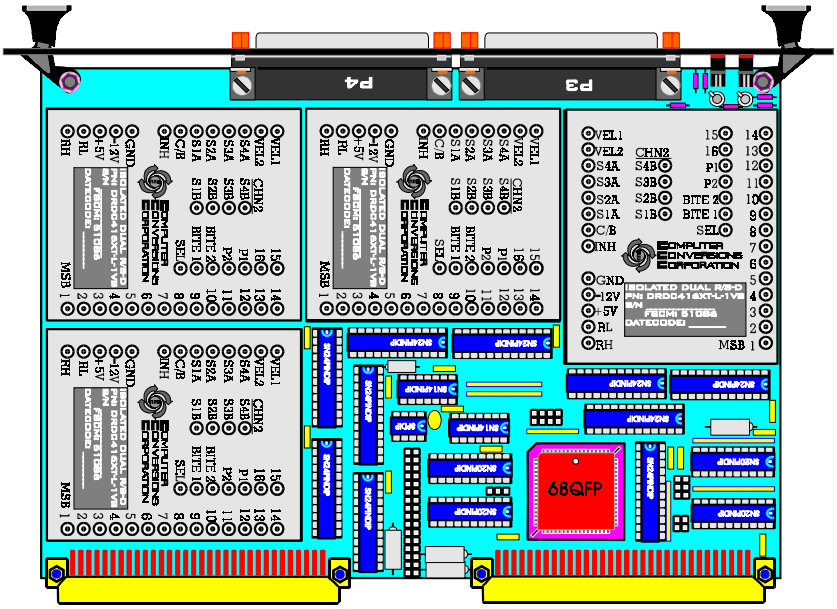
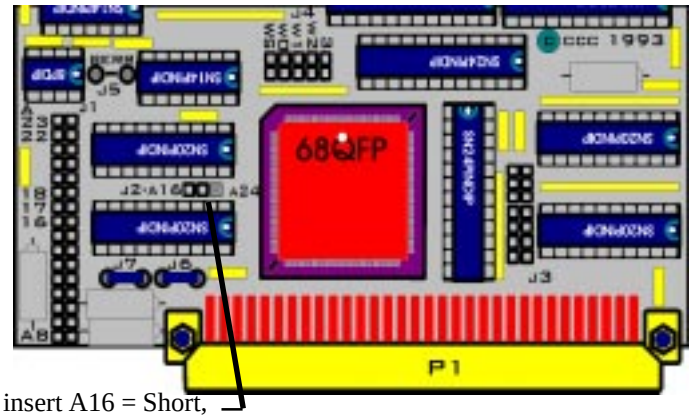
VBD SERIES
ULTRA-HIGH DENSITY
VME S/R CONVERTER CARDS

~~~ FEATURES ~~~

- ❑ *High Density, many configurations*
- ❑ *Up To 8 Channels of Tracking S-D/R-D Conversion/Card*
- ❑ *Up To 6 Channels of Complete D-S/ D-R Conversion/Card*
- ❑ *Transformer Isolated Signal & Reference Lines (Option)*
- ❑ *Multispeed S-D and D-S Cards*
- ❑ *Up To 8 Different Reference Source inputs per Card*
- ❑ *Single Slot 6U Height Models*
- ❑ *Self-Test Command Angle (option)*
- ❑ *Reference Suppiy output options*



Description

Computer Conversions ***VBD Series*** are ultra ***high density Synchro & Resolver Converter*** Cards designed specifically for VME Bus applications where density, isolation, and cost is of paramount importance.

Up to a full ***8 channels of Synchro/Resolver to Digital or 6 channels of Digital to Synchro/*** Resolver conversion are provided on a single slot width, 6U size, VME Bus Card.

Even with this high a density; the VBD cards are offered with a selection of solid-state or on-board ***Transformer Isolated I/O***.

Isolation

Transformer isolated units are completely isolated from each other and the backplane for each converters set of signal lines, and the reference inputs are transformer isolated separately for each pair of converters, or optionally individual; allowing the user to run 8 different reference input sources, levels, or frequencies, into the same VME Converter Card.

This completely isolates the card and effectively the whole computer from all field wiring, eliminating concerns over troublesome ground loops, differing potentials, ground interjected spikes, ghostly or field noise that so frequently takes down entire systems.

Each pair of two Converters shares a ***Status Register*** having i***ndividual converter fault bits for each channel***, ±12 or ±15V power ***loss detection***, and converter ***configuration details***.

All the S-D/R-D Converters are complete ratiometric, continuously updating tracking converters employing the use of internal type-twofsolid state servo-loops for high-speed closed loop performance. They are ***insensitive to amplitude, and frequency variations***, providing a lag free virtually ***dynamic response*** all the way up to their maximum specified tracking rate..

Built-In-Test/Self-Test

All units include a continuous built-in-test, converter and I/O fault detect, and -WS option units include a command to 30 degree test angle for self-test.

D-S/D-R Output Channels:

All the ***D-S/D-R*** Converters provide a fast 5 microsecond throughput, featuring ***continuous outputs*** and hybrid power short circuit protected amplifiers that will drive loads from 1.2 to 4.5VA.

D-S/D-R Converters with a 400 Hz. frequency drive 26 or 90 V.L-L signal outputs direct.

Two different external output transformers are available for 50 or 60 Hz. applications, and external power boosters can be provided.

Inherent Multiturn/Multispeed Support

VBD Series Hardware supports both eight channels of discreet S-D/R-D conversion and/ or ***four channels of multispeed/multiturn*** S-D/R-D conversion.

The standard Firmware supports simultaneous two channel store-to-read configuration required to properly interrogate multispeed/multiturn synchro's or resolvers.

Multispeed Specific Models

VBDM style Cards are offered with up to four channels of ***specifically pre-combined*** Multispeed Synchro/Resolver to Digital, or up to 2 full channels of Digital to Multispeed Synchro/ Resolver Converters on a double slot width 6U size card. The VBDM Converter Cards feature ***pre-combined data***, using ***a single*** linear non-ambiguous ***16 bit data word*** for each multispeed channel. High Resolution single-slot width pre-combined units available too. Ratios of 1 & 36, 2 & 36, 1 & 32, 1 & 10, 1 & 8, etc. are standard available selections.

The primary advantages in using ***natural multispeed converter*** are: the single word 16 bit data handling, ***no software overhead for combining***, and a ***very powerful R-D/S-D built-in test bit*** that automatically ***tests*** both that the Converter is a) tracking the input, and b) whether the ***fine/coarse alignment error*** is or goes out of synch as a result of mis-alignment or broken wires
~~~

VBD SERIES ADDRESS MAP

HEX Select	Address Bits A4 A3 A2 A1	Input Channels (S-D, R-D etc.) Function	Chan#	Output Channels (D-S, D-R etc.) Function	Chan#
00h	0 0 0 0	Read/Write Chan.	0	Write Chan.	0
02h	0 0 0 1		1		1
04h	0 0 1 0		2		2
06h	0 0 1 1		3		3
08h	0 1 0 0		4	Readback Channel	0
0Ah	0 1 0 1		5		1
0Ch	0 1 1 0		6		2
0Eh	0 1 1 1		7		3
*10h	1 0 0 0	Read Status Chan.	0 & 4	*-WS Units, Any Word here to Write 30 Degree Self-Test Angle for whole card	
12h	1 0 0 1		1 & 5		
14h	1 0 1 0		2 & 6		
16h	1 0 1 1		3 & 7		



J2: insert A16 = Short,
insert A24 = Std.

Base Address Select, J1 Jumpers = A0 - A23 Address Bits, in = 0, out = 1

A		5		A		5		0	0
1 0	1 0	0 1	0 1	1 0	1 0	0 1	0 1	0000	0
23 22	21 20	19 18	17 16	15 14	13 12	11 10	9 8	A7-A0	Base

PIN TERMINATIONS: VBR,VBW,VBD Series Units Front Panel Connectors P3 & P4

Disregard unused channels if not in your part number.

P2 Pins	P3 Pins	VBD SERIES High Density		VBW/VBR Units * = QM Option		P4 Pins	VBD SERIES High Density		VBR/VBW Units * = QM Option		P2 Pins
C6	9	RH	**Reference**	-8 units RH/RL 0	RH	9	RH	**Reference**	-8 units RH/RL 2	RH	C18
A6	28	RL			RL	28	RL			RL	A18
A5	10	S1	**Signals Channel** 0	**If used as** Multispeed:, chan.'s 0, 4 are Fine, Pair with chan.'s 2,5 = coarse & Read or Write In Succession	S1	10	S1	**Signals Channel** 2	**If used as** Multispeed:, chan.'s 2, 6 are Fine, Pair with chan.'s 3,7 = coarse & Read or Write In Succession	S1	A17
A2	13	S2			S2	13	S2			S2	A14
C5	29	S3			S3	29	S3			S3	C17
C2	32	S4			S4	32	S4			S4	C14
C4	30	S1	**Signals Channel** 4		*B-	30	S1	**Signals Channel** 6		*B-	C16
C3	31	S2			*B+	31	S2			*B+	C15
A4	11	S3			*A-	11	S3			*A-	A16
A3	12	S4			*A+	12	S4			*A+	A15
A1	15	OPT.	Vel.0 or RL4	-8 units RH/RL 4	*M+	15	OPT.	Vel.2 or RL6	-8 units RH/RL 6	*M+	A13
C1	34		Vel.4 or RH4		*M-	34		Vel.6 or RH6		*M-	C13
C12	1	RH	**Reference**	-8 units RH/RL 1	RH	1	RH	**Reference**	-8 units RH/RL 3	RH	C24
A12	20	RL			RL	20	RL			RL	A24
A11	2	S1	**Signals Channel** 1	**If used as** Multispeed:, chan.'s 0, 4 are Fine, Pair with chan.'s 2,5 = coarse & Read or Write In Succession	S1	2	S1	**Signals Channel** 3	**If used as** Multispeed:, chan.'s 2, 6 are Fine, Pair with chan.'s 3,7 = coarse & Read or Write In Succession	S1	A23
A8	5	S2			S2	5	S2			S2	A20
C11	21	S3			S3	21	S3			S3	C23
C8	24	S4			S4	24	S4			S4	C20
C10	22	S1	**Signals Channel** 5		*B-	22	S1	**Signals Channel** 7		*B-	C22
C9	23	S2			*B+	23	S2			*B+	C21
A10	3	S3			*A-	3	S3			*A-	A22
A9	4	S4			*A+	4	S4			*A+	A21
A7	7	OPT.	Vel.1 or RL5	-8 units RH/RL 5	*M+	7	OPT.	Vel.3 or RL7	-8 units RH/RL 7	*M+	A19
C7	26		Vel.5 or RH5		*M-	26		Vel.7 or RH7		*M-	C19
P2	18	+12V	If ext. supplies	-12 units are +/- 12VDC Bus or Ext., Otherwise +/-15 VDC Ext.		18	+12V	If ext. supplies	-12 units are +/- 12VDC Bus or Ext., Otherwise +/-15 VDC Ext.		P2
	36,37	GND	Power Ground			36,37	GND	Power Ground			
	19	-12V	If ext. supplies			19	-12V	If ext. supplies			
	6,25,14, & 33 DC COMMON		DC Common			6,25,14, & 33 DC COMMON		DC Common			

P3 & P4 Connector AMP #745784-4, Mates: TRW/CINCH # DC-37P Included

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VME BUS I/O Cards

Addressing, Status Word and Control word Details

ADDRESSING

The physical module address is decoded by setting Address Select Jumpers for the desired AM code (address modifier) and base address (board select). Jumper plug installed equals logic "0".

ADDRESSING RANGE

CCC VME Modules are configured for the A24 standard addressing over a 16M byte range, two shunt jumpers are provided to permit A16 short addressing over a 64K byte range.

A24 MODE:

Uses address lines A01-A023. Jumper (J2) is inserted in the A24 position and jumper A16 (J3) is removed to allow standard addressing over a full 16M byte range.

Client may use the following Am codes (address modifiers):

"3D" Standard supervisory Data Access or,

"39" Standard Non-Privileged Data Access

A16 MODE:

Uses address lines A01-A015. Jumper (J2) is inserted in the A16 position and jumper A16 (J3) is installed to allow short addressing over a 64K byte range. Client may use the following AM codes:

"2D" short supervisory I/O Access or,

"29" short Non-Privileged I/O Access.

The base address may be set up via reliable shunt plugs anywhere on the 256 byte boundaries.

NOTES:

1) **READ BACK:** If channel zero is a primarily write converter function (ie: Digital to Synchro); then "00" in Hex is the address to Write the New Command Word, and "08" in Hex is the address to "READ-BACK' the Command Word for verification.

2) **READ STATUS:** This is a separate status register used for each module for fault and VME I/O Card configuration information.

On **High Density "VBD"** modules one status register is used for every two converters; they are paired per status register as channels 0 & 4, 1 & 5, 2 & 6, 3 & 7. all status bits apply equally to each channel with individual Fault/Bite Status bits for each respective channel.

3) **DTACK:** The CCC DTACK response is less then 9 VME Bus clock cycles for standard units, less then 14 for channels 4-7.

4) All CCC VME Bus cards are register based A24:D16 slave devices. All converters used are independent (not multiplexed) continuously tracking signal input converters, and independent continuously updated signal output converters.

These independent channels can be addressed and either written to, or read from, without any special timing considerations, specialized timing algorithms, or interrupts. The user simply addresses the channel, and reads or writes the data.

STATUS WORD & CONTROL WORD DETAILS

Status Word, Lower Byte (Higher Byte Not Used)								
	ST	PF	F1	F2	F3	MP	W	R
Bits	D7	D6	D5	D4	D3	D2	D1	D0

Status Word (Read Functions):

1 status word per channel upto 4 channel units,

1 status word per every 2 channels on VBD units.

Bit D0: 0 = Read Channel:

This channel is configured for a Read Command.
ex: Synchro to Digital or A to D.

Bit D1: 0 = Write Channel:

This channel is configured for a write command.
ex: Digital to Synchro or D to A

*If both bits D0 and D1 are logic 1, this indicates no active module.
*If both bits D0 and D1 are logic 0, = configuration - Jumper error.

Bit D2 : 0 = Multi-Pair:

This channel is paired with adjacent channel for a multispeed or Multiturn operation.
Channels 0 and 1, (4 and 5 Hi-Den)= Multi-pair #0,1
Channels 2 and 3, (6 and 7 Hi-Den)= Multi-pair #2,3
The paired channels should be read in succession.
Not used on boards with multispeed converters.

Bit D3 : 1 = Converter Busy, (F3 Fault) not required to be polled, all cards insure valid data is always read by the bus.

Bit D4 : [1]Converter Fault Channels 0,1,2, and 3

Bit D5 : [1]Converter Fault Channels 4,5,6, and 7 (VBD units)

[1]Loss of Reference, Loss of Signal, overspeed/accel. & conv. fault. If converter is given a large simulated step input stays untill settled.

Bit D6 : 0 = Power Fail , loss of +/-15 or +/-l2VDC supplies.

Bit D7 : 1 = In Self Test Mode, all input converters should be reading 30^{O} test angle +/-.15^{O}. (-WS models only, else ignore).

Control Word (Write Self Test): (-WS Models Only)
Control words compliment the status word address locations. Activating or de-activating the self-test mode by setting Bit D7 high = 1in any of these locations will put the card into (or out of) the self test mode.

Bit D7 : 1 = Force into Self Test Mode, all input converters will internally disconnect their input signals and instead switch to read an anolog simulated 30^{O} test angle for a confirmation test.
When activated look at the converter fault bits indicating when ready to read, if not settled (unfaulted) within 2 seconds = failed.
Proceed by comparing the data read on each channel to 30^{O} +/- .15^{O}.
When done set to 0 to activate the run mode, again check fault bits in the status word to make sure the converters are settled.

Bit D7 : 1 = Force into Run Mode, normal operation.

MODEL SELECTION GUIDE

ex. **VBM** **B 4** **B 4** **K 4** **K 4** **-X**

a b (CH1) a b (CH2) a b (CH3) a b (CH4) options

SELECT STYLE CARD

VBW = OUTPUT CARD
VBR = INPUT CARD
VBM = BOTH
VBT = INCLUDES LOOP-BACK TEST BUS

VBD = HIGH DENSITY CARD
VBDT = HD CARD W/LOOP-BACK TEST BUS

-WS models include forced angle self-test

SELECT ONE CONVERTER FOR EACH CHANNEL OR INSERT A #0 (EMPTY SPOT).

NOTES: 1) VBT CARDS ONLY USE 3 CHANNELS, VBDT CARDS USE ONLY 6 CHANNELS.
2) VBD CARDS SELECT CONVERTER STYLE FOR EACH PAIR OF "INPUT" CONVERTERS.

a) **SELECT CONVERTER RESOLUTION:** b) **SELECT SIGNALS** (INSERT CODE #):

SYNCHRO TO DIGITAL	REFERENCE	SIGNALS	FREQUENCY	CODE
16 = **A**, 14 = **B**, 12 = **C**, 10 = **D**	26VAC	11.8V.L-L	400Hz.	**1**
RESOLVER TO DIGITAL	26VAC	11.8V.L-L	2.6KHz.	**2**
16 = **E**, 14 = **F**, 12 = **G**, 10 = **H**	26VAC	26V.L-L	400Hz.	**3**
DIGITAL TO SYNCHRO (DSL)	115VAC	90V.L-L	400Hz.	**4**
16 = **J**, 14 = **K**, 12 = **M**, 10 = **N**	115VAC	90V.L-L	60Hz.	**5**
DIGITAL TO SYNCHRO (DSP)	*115VAC	7V. L-L	400Hz.	**6**
14 BITS = **P** , 16 Bits = Q	*115VAC	7V. L-L	60Hz.	**7**
DIGITAL TO RESOLVER	*26VAC	7V. L-L	400Hz.	**8**
16 = **R**, 14 = **S**, 12 = **T**, 10 = **U**				

*These converters typically used to drive power amplifiers 6 V.L-L with +/- 12VDC Bus Power.
ALL OTHER CONVERTERS REQUEST EXTENDED SELECTION GUIDE

OPTIONS

ADD:
- **X** FOR TRANSFORMER ISOLATED SIGNAL & REFERENCE LINES
- **3** FOR EXT'D. OPERATING TEMP. -40 to 75 degrees C convection/air cooled
- **3C** FOR EXT'D. OPERATING TEMP. -40 to 75 degrees C conduction cooled
- **V** FOR VELOCITY OUTPUTS
- **12** FOR ±12V INSTEAD OF ±15V SUPPLIES.
- **M** FOR MULTISPEED UNITS.
- **P2** FOR P2 I/O VERSES FRONT PANEL, OR B FOR BOTH
- **883** FOR HIGH RELIABILITY 38510/883 LEVEL B PARTS/PROCESSING
- **-8** FOR INDEPENDENCE REFERENCES/NOT PAIRED ON VBD MODELS
- **Q** FOR QUADRATURE INCREMENTAL ENCODER OUTPUTS, add Z for marker.
- **-WS** FOR UNITS WITH ON-BOARD SELF-TEST (Input Channels)
- **-RS** FOR WITH REFERENCE SUPPLY, Upto 5VA
- **-SR** FOR WITH MULTIPLE REFERENCE SUPPLIES
  Note: multiple reference supplies avail. 4 channel units can have upto 1 reference supply/channel, 8 Channel VBD type units can have upto 4 paired reference supply outputs/card, 1VA ea.
- **-F** FOR WITH EXTERNAL FREEZE INPUT CONTROL LINES.

LVDT/RVDT I/O, SCDX Differentials, SCT's, Dynamic Rotators, and 100's of other converter options avail.

QUALITY NOTE: **CCC quality assurance program conforms to MIL-I-45208.**
All CCC products manufactured in U.S.A..
All Units Shipped with Printed Test Data, and Certificate of Compliance.

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