

VEGA

MODEL 2796504



RESOLVER TO SSI INTERFACE

- Works with Harowe/Danaher, Tamagawa, Kerfott, Singer, AMCI or most any Synchro/Resolver
- Makes resolvers as easy to use as an encoder
- SSI Output with 12 Bits of Turn Counts (4096), 12 Bits of Shaft Position, and Fault Status Bit
- Jumper Selectable Excitation Frequency including 2.5, 5.0, and 10 kHz
- Removable Screw Terminals

With the VEGA 2796504 converter you can have both the ruggedness of a resolver and the digital simplicity of an encoder interface. The 2796504 can be used with almost any resolver. The INDEX/MARKER pulse (Channel Z) will occur once per transducer cycle at the zero degree position.

2796504 SPECIFICATIONS

Excitation:	2.5, 5, or 10 kHz @ 3.6 vpp
Resolver Input:	0.8 to 18 vpp
Power Requirements:	5 vDC @ 250 mA (2796504.05) 24 vDC @ 125 mA (2796504.24)
Drive Capacity:	200 mA Peak
Mechanical:	4.10 x 0.75 x 5.00
Accuracy:	+/- 3 arc minutes

CONVERTER TRACKING RATE

The tracking rate is a function of the excitation frequency. With a 2.5 kHz excitation the tracking rate would be 9,600 rpm. With a 5.0 kHz excitation the tracking rate would be 19,200 rpm. With a 10.0 kHz excitation the tracking rate would be 38,400 rpm.

RESOLVER TO SSI CONVERTER WITH 12 BIT TURN COUNTER, 12 BIT RESOLUTION, AND FAULT BIT

*** APPLICATIONS ***

- Ideal For Closed Loop Positioning Systems
- Machine Tools
- Nuclear Applications
- PLC Positioning Control
- Index/Rotary Tables
- Tracking/Telescope/Telemetry Systems
- Transfer Lines
- Positioning Systems
- Robotic Applications
- Dispensing Systems



*** ADVANCED FEATURES ***

- Easy to Use and Easy to Set Up
- *Absolute Multi-Turn Position Feedback
- 12 Bit Resolution with 12 Bit Turn Count and Fault Status Bit
- Position recovery on Power Up
- Counter Reset Input
- Compatible with Galil Controllers
- Not Sensitive to Controller Reset
- Fast Non-Phase Locked Loop Design (No Lag)
- Highly Accurate
- Tuned Filter for Noise Immunity
- Differential TTL/Line Driver Outputs
- Single +5 vDC or +24 vDC Supply Options
- Loss of Signal Detection
- Fault Signal Output (Line Driver, Open Collector, and Active Pull-Up)
- Status LED's for Power, A, B, Z, Signal HI, Signal MID, and Fault
- Configurable Fault signal conditioning for Fail-Safe operations

- * Tracking limited to +/- 0.25 resolver cycle with power off
- * Absolute Multi-Turn position on SSI interface only

SSI (Synchronous Serial Interface)

The 2796504 Resolver to Digital Converter has a differential SSI interface for applications requiring serial interface. This makes the 2796504 IDEAL for applications where absolute multi-turn resolver feedback is required.

PART NUMBER AND DESCRIPTION

Model	Description
2796504.05	+5 vDC Resolver to SSI Converter
2796504.24	+24 vDC Resolver to SSI Converter

Mating Connectors Included.

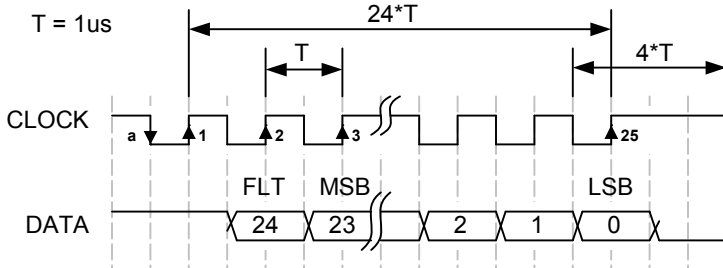
PEOPLE IN CONTROL OF MOTION

SSI (Synchronous Serial Interface) OUTPUT

The 2796504 board's SSI interface provides serial transmission of absolute position data in binary form from the resolver based on a timed clock pulse train from the host device. The SSI differential interface provides a high degree of noise immunity. For each sequential clock pulse from the host device, the 2796504 board transmits one data bit from the shift registers of the tracking circuit.

Applying 5-25 vDC to P3-9 or momentarily install a jumper on JB1 pin 3 will preset the SSI turn counter to 2048 and the low order data will reflect the current shaft position of the resolver.

SSI TIMING DIAGRAM



- 1) The 2796504 SSI Format is set up for 25 bit transfers.
- 2) The 2796504 uses the least significant 12 bits for positional data (4096 counts per rev), and the next 12 most significant bits are used for the turn counter. The most significant bit is the Fault status bit, and will be set to 1 to indicate a fault has occurred. The contacts of the solid state relay between P1-8 and P1-9 will also be opened.
- 3) Data is available less than 100ns after the down clock transition and well ahead of the up clock transition at 1mhz clock frequency. The data should be sampled at the up transition of the clock.
- 4) The 2796504 is normally interrogated 1000 times/sec.
- 5) The Galil motion control board setup string would be: **SIX=1,25,12,-1<-10>1.**
- 6) The Galil command **MG_SIX** will sample the Fault status bit.

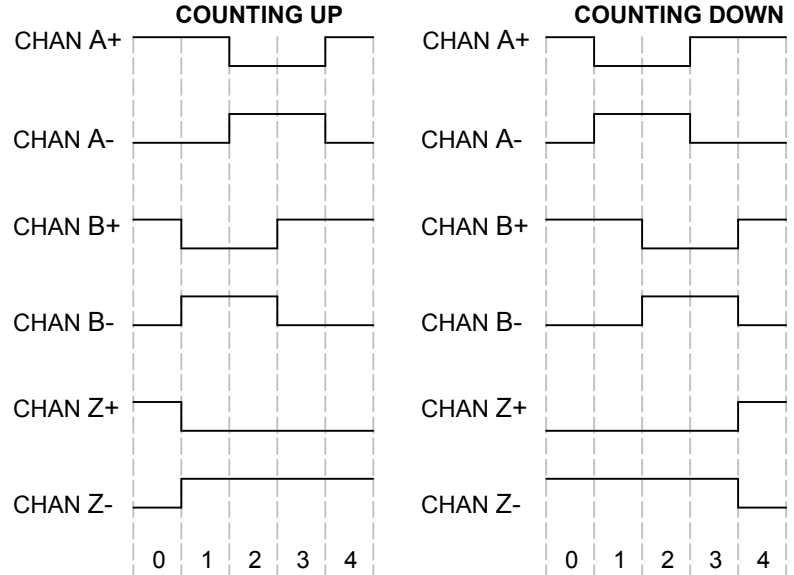
QUADRATURE OUTPUT

The VEGA 2796 series of converter boards use RS-422-A differential drivers to provide 40 mA into a 100 ohm differential load. These outputs are also TTL compatible.

The output latency is dependent on the excitation frequency. At 2.5 kHz the response will be less than 200 uSec and at 10.0 kHz the response will be less than 50 uSec.

Quadrature is provided via Channel A+, Channel A-, Channel B+ and Channel B-. A count is considered to occur whenever there is a transition in either the Channel A or Channel B output signals. The Channel Z (Index) occurs once per resolver cycle. The phase relationship of the two signals indicates the direction of motion as shown in the figure below.

QUADRATURE OUTPUT FORMAT



P1 POWER CONNECTOR

PIN#	FUNCTION	COLOR
1	+5 vDC IN (2796504-05 Only)	RED
2	DC Ground	BLK
3	Shield In	SHLD
4	No Connection	N/A
5	No Connection	N/A
6	No Connection	N/A
7	No Connection	N/A
8	!Fault Output	ORG
9	I/O vDC IN	BLU/WHT
10	+24 vDC IN (2796504-24 Only)	BLU

P2 ENCODER CONNECTOR

PIN#	FUNCTION	COLOR
1	Channel A+	Grey
2	Channel A-	Violet
3	Channel B+	Yellow
4	Channel B-	Orange
5	Channel Z+	Blue
6	Channel Z-	Green
7	Shield Out	SHLD
8	No Connection	N/A
9	No Connection	N/A
10	No Connection	N/A
11	No Connection	N/A
12	No Connection	N/A
13	No Connection	N/A

P3 SSI CONNECTOR

PIN#	FUNCTION	COLOR
1	No Connection	N/A
2	No Connection	N/A
3	Shield Out	SHLD
4	DC Ground OUT	N/A
5	SSI Clock-	RED/WHT
6	SSI Clock+	RED
7	SSI Data-	BLUE/WHT
8	SSI Data+	BLUE
9	SSI Preset	YELLOW

P4 RESOLVER CONNECTOR

PIN#	FUNCTION	COLOR
1	Feedback LO	YEL/WHT
2	Feedback HI	RED/WHT
3	Shield Out	SHLD
4	Sine LO	BLACK
5	Sine HI	RED
6	Shield Out	SHLD
7	Cosine HI	YELLOW
8	Cosine LO	BLUE
9	Shield Out	SHLD
10	DC Ground OUT	N/A
11	+5 vDC OUT	N/A

JUMPER SETTINGS (JB1)

FREQUENCY SELECTION (JB1-1 & JB1-2)

The 2796 converters provide selectable excitation frequencies of 2.5, 5.0 and 10.0 kHz via JB1-1 and JB1-2 jumpers.

SSI PRESET (JB1-3)

Momentarily installing a jumper will preset the turn counter to the midway point (2048). The low order value of the SSI will be the absolute shaft position of the resolver.

RESERVED (JB1-4 thru JB1-8)

On the 2796504 converter board Jumpers JB1-6 thru JB1-9 are reserved and should have all jumpers removed.

COUNTING DIRECTION (JB1-9)

Jumper JB1-9 controls the direction of the counting for the SSI and quadrature output. Install a jumper on JB1-9 will reverse the direction of counting.

ACTIVE FILTER SELECTION (JB1-10)

The 2796 also provides jumper selection of the active filter network for the return signal to provide the maximum noise immunity at the selected frequency. For the typical Resolver application operating at 2.5 kHz JB1-10 jumper should be installed. For excitation frequencies above 2.5 kHz JB1-10 jumper should be removed.

INTERNAL GAIN SELECTION (JB1-11 & 12)

The 2796 series of converters provide selectable gain selection via JB1 jumpers 11 and 12. Installing a jumper on JB1-11 selects a gain of x0.25 Installing a jumper on JB1-12 selects a gain of x1.0 and removing the jumpers JB1-11 and JB1-12 selects a gain of x4.0

See Figure 1.0 for JB1 Jumper Chart Below.

THEROY OF OPERATION

The return signal is internally amplified coarse gain selection (JB1-11 & JB1-12). It is then passed thru an active filter network to reduce noise. The advanced tracking algorithm tracks return signal and interpolates A-Quad-B pulses based on the return signal.

The return signal level is monitored for high (HI LED), and low (LO LED) signal level. During fault detection or loss of power to the board the fault relay contacts will open (P1-8 and P1-9), and the A-Quad-B outputs will be tri-stated.

The Z channel (Marker Pulse) will occur once per resolver cycle (resolver pole pair).

POWER UP SEQUENCE

- 1) The 2796 allows 50 mSec for the power to stabilize
- 2) The 2796 will then initialize the A-Quad-B outputs with channel A, B, and Z (index/marker) to active (high state).
- 3) The 2796 then interpolates out the absolute position in A-Quad-B pulses to the nearest resolver null.

FAULT SIGNAL INTERFACE

The return signal level is monitored for high signal level (HI LED), and low signal level (LO LED). During a low level detection or loss of power to the board the fault relay contacts will open (P1-8 and P1-9). The relay can drive 600 mAmps. The source voltage must be provided on P1-9 and can range from 5-25 vDC.

During fault detection the A-Quad-B outputs will also be tri-stated, and the SSI fault bit will be set to a high level.

FUNCTION	1	2	3	4	5	6	7	8	9	0	1	1	1	QUADRATURE COUNTS
2.5 kHz Excitation	0	0												
5 kHz Excitation	1	0												
10 kHz Excitation	0	1												
Reserved	1	1												
*SSI Preset			0											
Reserved				0	0	0	0	0						
Direction+ = CW									0					
Direction+ = CCW									1					
10.0 kHz LPF										0				
2.5-5.0 kHz LPF										1				
x 4.0 Gain Select											0	0		
x 0.25 Gain Select											1	0		
x 1.0 Gain Select											0	1		
Reserved											1	1		

Figure 1.0

Indicates Default

*Momentarily install a jumper on JB1-3 will preset the turn count to 2048

RESOLVER SET-UP PROCEDURE

- 1) With the power turned off. Install the 2796 board as described in the application drawing and complete the following steps.
- 2) Select the excitation frequency by setting JB1-1 and JB-2 jumpers as described in the JUMPER SETTINGS (see jumper table Fig. 1.0). 2.5 KHZ is the DEFAULT setting with Jumper JB1-1 and JB1-2 removed.
- 3) Jumpers JB1-5, JB1-5, JB1-6, JB1-7, JB1-8, and JB1-9 are reserved on the 2796504 board and should be removed
- 4) Select the passive filter setting by JB1-10 for the corresponding frequency setting. The DEFAULT setting is set to 10.0 KHZ and JB1-10 is removed.
- 5) Select the Internal Gain Selection by setting the JB1-11 and JB1-12 jumpers as described in the JUMPER SETTINGS section. The DEFAULT setting is for a board set to x1 Gain JB1-12 installed (See step 8 for detailed set-up instructions).
- 6) Starting with the JB1-11 jumper removed and the JB1-12 jumper installed (x1.0 Gain Selection). Turn the ADJ Potentiometer fully counter-clockwise (12 turn Pot). Observing the LO, MID and HI LEDs apply power to the board.
NOTE: If the MID or HE LEDs are turned on, remove JB1-12 and install JB1-11 (x0.25 Gain Selection).
- 7) Turn the ADJ potentiometer clock-wise until the (Green) MID LED turns on and the LO LED turns off. Continue turning the ADJ clock-wise until the HI LED turns on. Now turn the ADJ potentiometer counter-clockwise to position the ADJ in the middle of the MID LED band.
NOTE: If you are unable to get the MID or HI LED to turn on, remove both JB1-11 and JB1-12 jumpers (x4.0 Gain Selection).
- 8) Turn the ADJ potentiometer clock-wise until the (Green) MID LED turns on and the LO LED turns off. Continue turning the ADJ clock-wise until the HI LED turns on. Now turn the ADJ potentiometer counter-clockwise to position the ADJ in the middle of the MID LED band.
NOTE: If you are unable to get the MID or HI LED to turn on, remove both JB1-11 and JB1-12 jumpers (x4.0 Gain Selection).
Phase the position loop if necessary by reversing the Sine HI and Sine LO wires to reverse the count direction. At this point the basic set-up is complete and the position loop can now be closed.
- 9) The amplitude balance of the 2796 has been factory adjusted and should not require further adjustment. To adjust the amplitude balance of the 2796 board, use an AC RMS meter and record the value of PB- to PB+. Then measure the value of PA- to PA+ and adjust the balance pot (BAL) on the 2796 to match the value recorded for PB- to PB+.

TEST POINTS

- ACOM** = Analog Ground
PA+ = Sine HI (3.6 vDC Peak to Peak)
PA- = Sine LO (3.6 vDC Peak to Peak)
PB+ = Cosine HI (3.6 vDC Peak to Peak)
PB- = Cosine LO (3.6 vDC Peak to Peak)
SIG = Signal Return (0.8-18.0 vDC Peak to Peak)
ST1 = Stage 1 Signal (3.8 vDC Peak to Peak)

LED STATUS INDICATORS

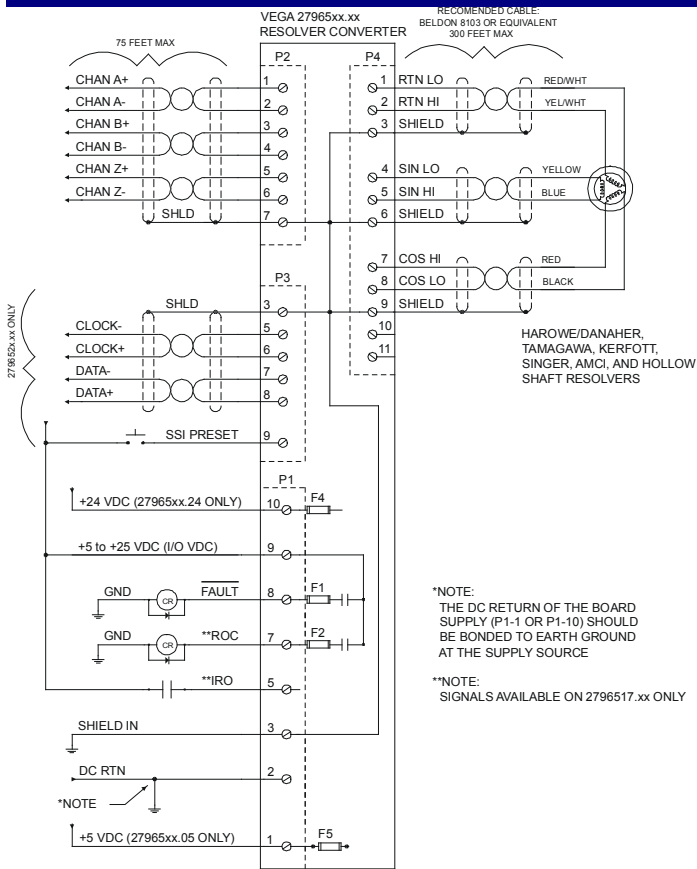
- CHA** = Channel A State Indicator
CHB = Channel B State Indicator
CHZ = Channel Z (Index/Marker) Indicator
PWR = Power Status Indicator
- FLT** = 1 Flash = Low Signal Continuous
2 Flash = High Signal Continuous
3 Flash 2796512 Only
PUPV Fault (Power Up Position Valid)
Power up position detected +/- 15 Counts of Error
4 Flash = Low Signal Intermittent
5 Flash = High Signal Intermittent
- LO** = Loss of Signal Indicator
MID = Return Signal Proper Indicator
HSG = High Signal Indicator



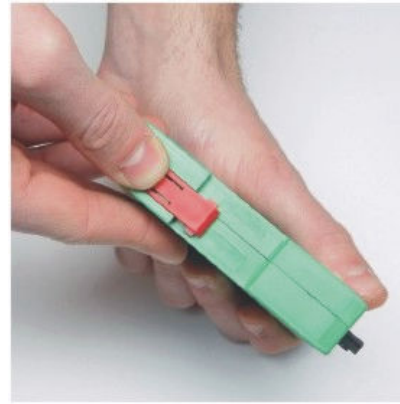
TROUBLE SHOOTING

SYMPTOM	CHECKS	SOLUTION
No Power LED	Check +5 vDC on 2796504-05 or +24 vDC on 2796504-24	vDC Present → Check F4 & F5 fuse
LO LED (Low Signal) Continuous	Remove power and disconnect P4 from the board. Ohm the wires on P4-1 and P4-2 and note value.	Resistance values are less than 30 ohms – Check for shorts between P4-1 and P4-2 as well as ground.
	Remove power and disconnect P4 from the board. Ohm the wires on P4-4 and P4-5 and note value. Ohm the wires on P4-7 and P4-8 note value.	Resistance values are less than 30 ohms – Check for shorts between P4-4 and P4-5 as well as ground. Check for shorts between P4-7 and P4-8 as well as ground.
	Apply power and measure between P4-4 and P4-5 for 2.9 vRMS	Signal not present → Board Failure – Replace board
	Apply power and measure between P4-7 and P4-8 for 2.9 vRMS	Signal not present → Board Failure – Replace board
	Check “ST1” test point for 3.6 volts peak to peak	Repeat Step 11 of the Resolver Set-Up Procedure
LO LED (Low Signal) Intermittent	Remove power and disconnect P4 from the board. Ohm the wires on P4-4 and P4-5 and note value. Ohm the wires on P4-7 and P4-8 note value.	Resistance values differ by more than 3 ohms of each other → Check resolver windings – Replace cables and/or resolver
	Check “ST1” test point for bounce	Repeat step 11 of the Resolver Set-Up Procedure
Cyclic Error	Check “ST1” test point for bounce	Repeat step 11 of the Resolver Set-Up Procedure
	Remove power and disconnect P4 from the board. Ohm the wires on P4-4 and P4-5 and note value. Ohm the wires on P4-7 and P4-8 note value.	Resistance values are less than 30 ohms – Check for shorts between P4-4 and P4-5 as well as ground. Check for shorts between P4-7 and P4-8 as well as ground.
	Remove power and disconnect P4 from the board. Ohm the wires on P4-4 and P4-5 and note value. Ohm the wires on P4-7 and P4-8 note value.	Resistance values differ by more than 3 ohms of each other → Check resolver windings – Replace cables and/or resolver
HSG LED (High Signal) Continuous	Check “ST1” test point for 3.6 volts peak to peak	Repeat Step 11 of the Resolver Set-Up Procedure
HSG LED (High Signal) Intermittent	Check “ST1” test point for 3.6 volts peak to peak	Follow procedures described in the LO LED (Low Signal) Intermittent section
MID LED (Signal Midpoint) Continuous	Signal Proper	No Problem... Life is Good
MID LED (Signal Midpoint) Intermittent	Check “ST1” test point for bounce	Repeat step 11 of the Resolver Set-Up Procedure
Feedback Polarity is Reversed	None	Installing a jumper on JB1-9 will reverse the feedback polarity

APPLICATION INTERFACE

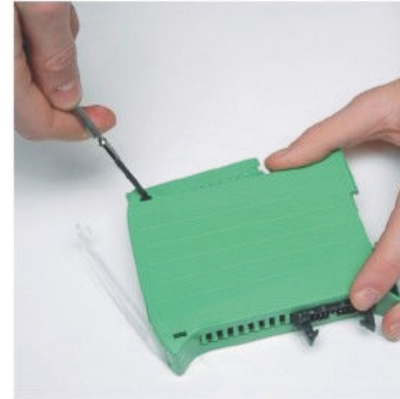


DISASSEMBLY



Firmly press the center of the latch hook down and slide towards the center of the enclosure.

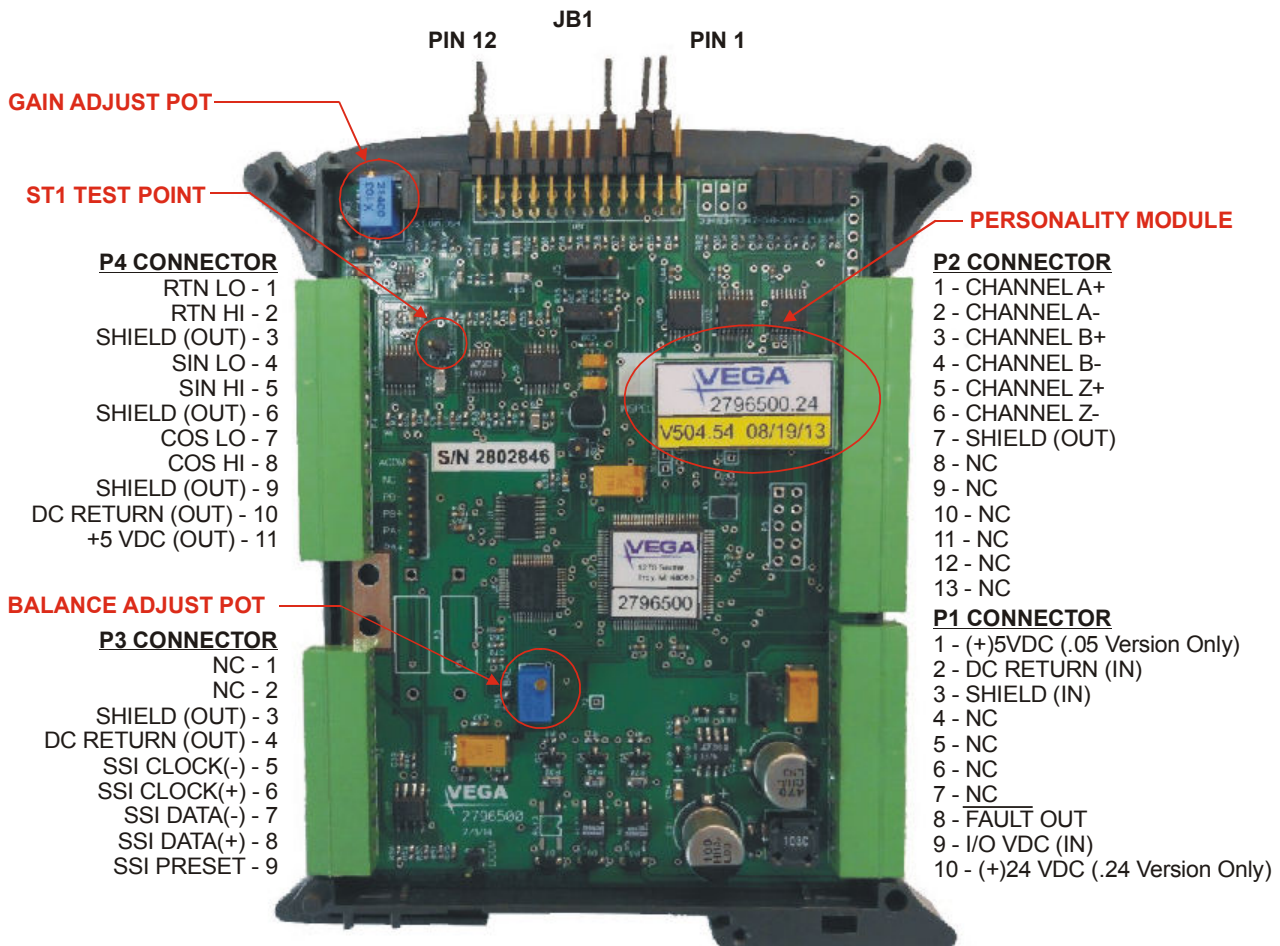
NOTE: Use caution not to drop the spring under the latch hook.



Using a small flat head screwdriver release all four of the enclosure cover hooks.

NOTE: Use caution to avoid breaking the cover hooks.

MECHANICAL



POWER REQUIREMENTS

The 2796504-05 converter requires +5 vDC supply @ 250 mA for operation. The 2796504-24 converter requires +24 vDC supply @ 125 mA for operation. The supplied power should have less than 50 mVolts of noise and drift.

Recommended Power Supplies (If Required)

TDK DSP30-5 (+5 vDC @ 3 Amps)

TDK DSP60-24 (+24 vDC @ 2.5 Amps)

CABLE SPECIFICATIONS

The 2796 series of converters provide stable and precise sine and cosine excitations. These signals and the return signal are analog and proper routing and shielding techniques should be observed. Shielded twisted pair cables should be used for all interface signals.

Recommended Cable

Shielded (3) Twisted Pair with Drain Wire

Belden #8103 or equivalent

**12974 Jewell Circle NE****Blaine, MN 55449****248.585.3600**

Monday-Friday 8:00am to 6:00pm Eastern