

VEGA

MODEL 2796503



RESOLVER TO ENCODER CONVERTER FOR MOTORS WITH THERMAL SWITCHES

*** 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



RESOLVER TO DIGITAL INTERFACE

- Works with Harowe/Danaher, Tamagawa, Kerfott, Singer, AMCI or most any Synchro/Resolver
- Incremental encoder and simulated hall output signals
- Makes resolvers as easy to use as an encoder
- 13 Bit Resolution (8000 Decimal or 8192 Binary) A-quad-B with Index and complements
- Jumper Selectable Excitation Frequency including 2.5, 5.0 and 10.0 kHz
- Removable Screw Terminals

With the VEGA 2796503 converter you can have both the ruggedness of a resolver and the digital simplicity of an encoder interface. The 2796503 can be used with almost any resolver. The INDEX/MARKER pulse (Channel Z) will occur once per transducer cycle at the zero degree position.

2796503 SPECIFICATIONS

Excitation:	2.5, 5, or 10 kHz @ 3.6 vpp
Resolver Input:	0.8 to 18 vpp
Power Requirements:	5 vDC @ 250 mA (2796503-05) 24 vDC @ 150 mA (2796503-24)
Drive Capacity:	200 mA Peak
Mechanical:	4.10 x 0.75 x 5.00
Accuracy:	+/- 3 arc minutes typical

SIMULATED HALL EFFECT OUTPUTS

The 2796503 Resolver to Digital Converter uses the resolver signals to produce three Hall type signals at TTL levels to duplicate the signals required by drives using Hall effect sensors to determine the shaft position for commutation purposes. This makes the 2796503 IDEAL for retrofitting Drives for AC Servomotors requiring indicators of motor shaft position in order to properly

*** ADVANCED FEATURES ***

- Incremental Encoder Output (*Absolute within 1 Resolver cycle)
- Non-Phase Locked Loop Design for Faster Loop Closure (Less than 50 uSec @ 10 kHz)
- High Resolution and Highly Accurate
- Tuned Filter for Noise Immunity
- A-Quad-B, Index and Complements
- TTL/Line Driver Outputs
- Quadrature encoder signals to 4 mHz
- Single vDC Supply Operation
- Loss of Phase Detection
- Fault Signal Output (Line Driver, 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
- Compact Design Only 17.5 mm wide

* Tracking limited to +/- 0.25 Resolver cycle with power off

CONVERTER ACCURACY AND TRACKING RATE

The tracking rate is a function of the excitation frequency and quadrature counts. With a 2.5 kHz excitation and 8000 quadrature counts the tracking rate would be 4,800 rpm. With a 10.0 kHz excitation and 8000 quadrature counts the tracking rate would be 19,200 rpm. Reducing the counts will increase the tracking rate proportionately.

PART NUMBER AND DESCRIPTION

Model	Description
2796503.05	+5 vDC Resolver to Digital Converter
2796503.24	+24 vDC Resolver to Digital Converter

Mating Connectors Included.

2796503_Rev4

PEOPLE IN CONTROL OF MOTION

VEGA 2796503 RESOLVER TO ENCODER SPECIFICATIONS AND CONNECTIONS

P1 POWER CONNECTOR

PIN#	FUNCTION	COLOR
1	+5 vDC IN (2796503.05 Only)	RED
2	DC Ground	BLK
3	No Connection	N/A
4	No Connection	N/A
5	No Connection	N/A
6	Thermal Out	GRN
7	Thermal In	GRN/WHT
8	!Fault Output	ORG
9	I/O vDC IN	BLU/WHT
10	+24 vDC IN (2796503.24 Only)	BLU

P2 ENCODER CONNECTOR

PIN#	FUNCTION	COLOR
1	Channel A+	BLK
2	Channel A-	WHT/BLK
3	Channel B+	RED
4	Channel B-	WHT/RED
5	Channel Z+	GRN
6	Channel Z-	WHT/GRN
7	Shield Out	SHLD
8	Hall A+	WHT/BLU
9	Hall A-	N/C
10	Hall B+	YEL
11	Hall B-	N/C
12	Hall C+	WHT/YEL
13	Hall C-	N/C

P4 RESOLVER CONNECTOR

PIN#	FUNCTION	COLOR
1	Feedback LO (R2)	White
2	Feedback HI (R1)	Black
3	Shield Out	SHLD
4	Cosine LO (S4)	Black
5	Cosine HI (S2)	Green
6	Shield Out	SHLD
7	Sine LO (S1)	Black
8	Sine HI (S3)	Red
9	Shield Out	SHLD
10	Thermal (-)	Org
11	Thermal (+)	Org/Wht

FAULT SIGNAL INTERFACE

TRI-STATE A-QUAD-B FAULT SIGNAL

The 2796 board will Tri-State the A-Quad-B signals during a Fault condition. This allows receiving devices with A-Quad-B level detection to detect feedback faults without additional fault circuitry.

FAULT SIGNAL OUTPUT (P1-8)

The 2796 will open the contacts of the solid state relay between P1-8 and P1-9 to indicate a fault has occurred. The relay can drive 600 mAmps. The source voltage must be provided on P1-9 and can range from 5-25 vDC.

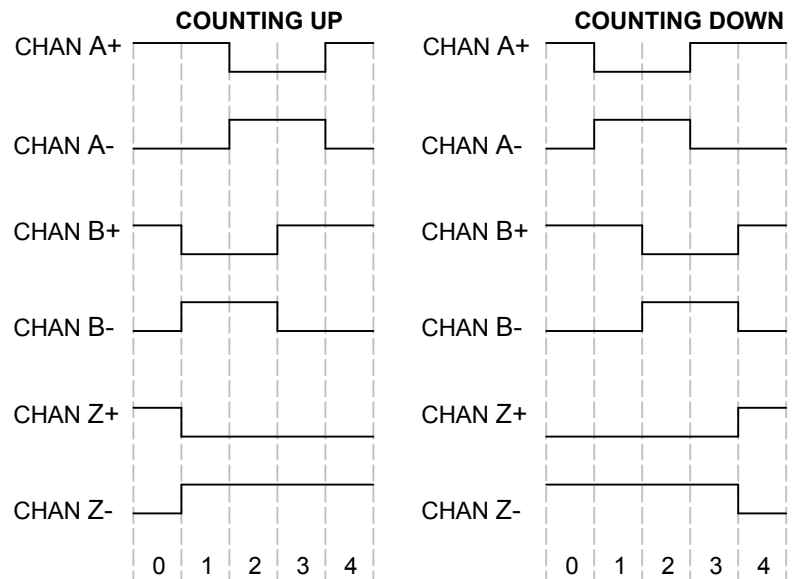
QUADRATURE OUTPUT

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.

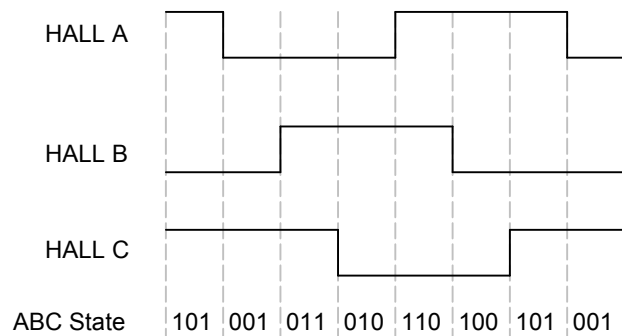
QUADRATURE OUTPUT FORMAT



HALL EFFECT OUTPUT

Motors with Hall Effect Sensors and magnet are arranged to provide an output from the sensors to which the magnet is adjacent. The magnet may be adjacent to one sensor or between two sensors. When it is between two sensors, both sensors output a signal. This permits the detection circuitry to resolve the motor shaft position into 6 different sectors. The 2796503 produces signals that emulate the Hall Effect sensors for a seamless interface. The 2796 series supports up to 10 hall cycles per resolver cycle with differential hall signal outputs.

HALL EFFECT OUTPUT FORMAT



JUMPER SETTINGS (JB1)

FREQUENCY SELECTION (JB1-1)

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

DECIMAL/BINARY SELECTION (JB1-3)

Installing JB1-3 jumper selects binary counting mode to provide 4096 line counts. Removing jumper JB1-3 selects the decimal counting mode to 4000 line counts.

QUADRATURE SELECTION (JB1-4 thru JB1-5)

JB1-4 and JB1-5 select the number of quadrature counts per resolver cycle. See Figure 1.0 for jumper chart below.

HALL CYCLE SELECTION (JB1-6 thru JB1-8)

JB1-6 thru JB1-8 select the number of hall cycles per resolver cycle. See Figure 1.0 for jumper chart below.

QUADRATURE POLARITY (JB1-9)

Installing JB1-9 will reverse the polarity of the quadrature output.

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

THEROY OF OPERATION

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

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), 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 and then starts the Sine and Cosine excitations.
- 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 and sets the corresponding hall states.
- 4) The 2796 then closes the fault contacts between P1-9 and P1-7 and starts tracking the resolver position.

FUNCTION	1	2	3	4	5	6	7	8	9	10	11	12	QUADRATURE COUNTS
2.5 kHz Excitation	0	0											
5 kHz Excitation	1	0											
10 kHz Excitation	0	1											
Reserved	1	1											
Decimal Count			0										
Binary Count			1										
250/256 Lines				0	0								1000/1024 Counts
500/512 Lines				1	0								2000/2048 Counts
1000/1024 Lines				0	1								4000/4096 Counts
2000/2048 Lines				1	1								8000/8192 Counts
1 Hall Cycle						0	0	0					
2 Hall Cycles						1	0	0					
3 Hall Cycles						0	1	0					
4 Hall Cycles						1	1	0					
5 Hall Cycles						0	0	1					
6 Hall Cycles						1	0	1					
8 Hall Cycles						0	1	1					
10 Hall Cycles						1	1	1					
Quadrature+ = CW									0				
Quadrature- = CW									1				
5.0, 10.0 kHz LPF										0			
2.5 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

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). 10.0 kHz is the DEFAULT setting with Jumper JB1-1 removed and JB1-2 installed.
- 3) Select the counting style of Binary or Decimal by setting JB1-3 (see jumper table Fig. 1.0). Binary is the DEFAULT setting with the JB1-3 installed.
- 4) Select the line count per revolution by setting JB1-4 and JB1-5 (see jumper table Fig. 1.0). 2048 lines per revolution (8192 quadrature counts per revolution) is the DEFAULT setting with JB1-4 installed and JB1-5 installed.
- 5) Select the number of hall cycles per resolver cycle by setting jumpers JB1-6, JB1-7, and JB1-8. The DEFAULT setting is one hall cycle with JB1-6 through JB1-8 removed. The number of hall cycles required by a motor can be calculated by dividing the motor pole pairs by the resolver pole pairs. Such that a 4 pole motor using a 2 pole resolver will require 2 hall cycles.
- 6) 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.
- 7) 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).
- 8) 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).
- 9) 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).
- 10) 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.
- 11) The amplitude balance is factory adjusted and should not require further adjustments. 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+.

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

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)

TROUBLE SHOOTING

SYMPTOM	CHECKS	SOLUTION
No Power LED	Check +5 vDC on 2796503.05 or +24 vDC on 2796503.24	vDC Present → Check fuse F4 and F5 on 2796503.24 and F5 on 2796503.05
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 9 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 9 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	Move wire from P4-6 to P4-7 and move wire from P4-7 to P4-6

DISASSEMBLY



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

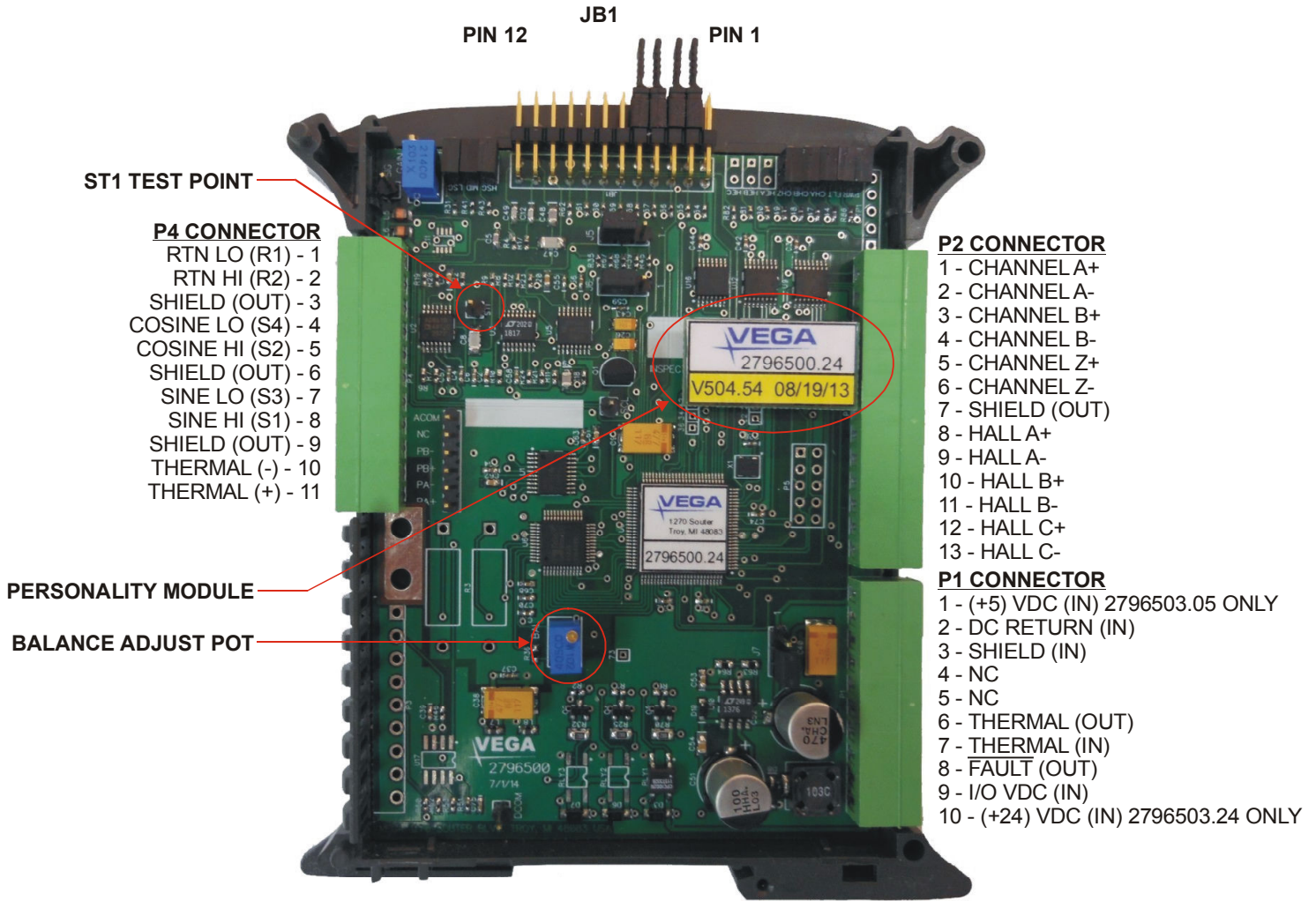
NOTE: Use caution not to drop the spring under the latch hook.



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

NOTE: Use caution to avoid breaking the cover hooks.

MECHANICAL LAYOUT



ELECTRICAL

POWER REQUIREMENTS

The 2796503-05 converter requires +5 vDC supply @ 250 mA for operation. The 2796503-24 converter requires +24 vDC supply @ 150 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 (6) Twisted Pair with Drain Wire
- Belden #8106 or equivalent

REPAIR and TECHNICAL SUPPORT



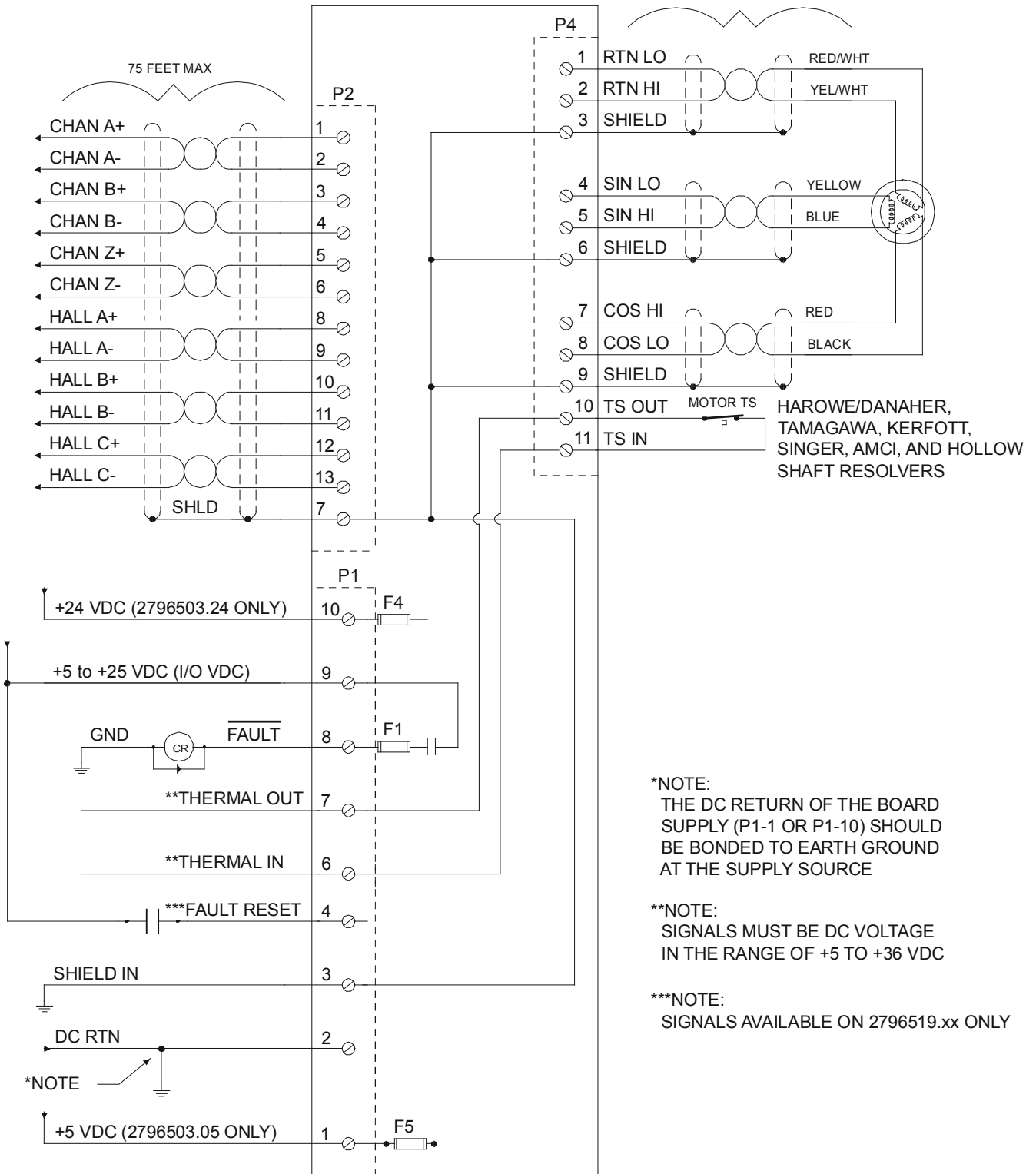
12974 Jewell Circle NE
Blaine, MN 55449
248.585.3600

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

APPLICATION DRAWING

VEGA 2796503.xx
RESOLVER CONVERTER

RECOMENDED CABLE:
BELDON 8103 OR EQUIVALENT
300 FEET MAX



UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS 2 PLACES .010 & PLACES .005 ± ANGLE 2° BREAK ALL SHARP EDGES .005 REMOVE ALL BURS	
FINISH	
MATERIAL	

VEGA INC
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Blaine, MN 55449

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SCALE	N/A
DRAWN	CODY
CHECKED	CODY
ENGINEER	WLH
DATE	9-9-23
W.O.#	2796
SHEET NO.	1 OF 1

NAME: 2796503.XX Resolver to Digital Converter w/Halls	
DRAWING NUMBER	CHANGE
2796503.XX	1