

TROTTER CONTROLS FORT WORTH, TEXAS	TEST SPECIFICATION  REPORT ORDER		NUMBER	REVISION
			TS-0001	<b>B</b> 05/02/07
TITLE  Encoder Upgrade Bench Test Procedure	BY	CHK'D	MODEL	
	Carey Gray	VT	5025-0001	
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### Summary

This procedure outlines the methods used to test part number 5025-0001 before shipment. This procedure must be followed to insure that the unit will work properly when installed.

### Basic System Specifications

The unit takes input from a hall-effect style absolute SSI serial encoder and outputs an analog voltage that is proportional to the encoder count. This allows the unit to emulate potentiometer performance while using a more reliable encoder.

### Power Requirements

Input Voltage: 4.5Vdc ~ 5.1Vdc  
Input Current: 125ma max

### PWM Analog Output Characteristics

- PWM output voltage is proportional to the input voltage to the unit.
- Minimum Possible Output voltage:  $0.050V \pm 0.30$
- Minimum Output under program control:  $0.050V \pm 0.030$
- Maximum Output voltage:  $4.0V \pm 0.1V$  (@ supply voltage=5.000V)
- D/A resolution under program control: 10 bit
- Output Voltage Resolution: 0.0039mV

### Connections

All external connections are via the 3 pin MS style connector on the canister.

- Pin A - +5.000 Volts DC @ 0.2 amps
- Pin B - Analog Signal out
- Pin C - DC Ground

Also verify that the encoder is connected to the unit via its' MS connector.

Connect a voltmeter between Pin B and Pin C of the 3 pin MS connector to monitor the output voltage of the unit.

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**Test Sequence**

Final Setup & Programming:

The home position of the encoder now needs to be set. Three buttons and three LED's inside the electronics enclosure are used to set the home position for the system. Please refer to SIL-80 when following the procedures below:

The setup procedure for the system is detailed below:

1. Connect the existing 3 position MS connector as described in the connections section.
2. Using a Phillips screwdriver, remove the cover from the electronics enclosure.
3. Apply 5.000 VDC power to the unit. LED #5 should illuminate and stay on. LED #2, #3 and LED #4 are the indicators used for set up.
4. Now we need to reset the system and enter setup mode.
5. Press and hold SW3 (reset) and SW1 simultaneously.
6. Release SW3 (reset) while continuing to hold SW1.
7. All three LED's will flash while holding SW1 indicating setup mode. Verify that all three LED's flash.
8. Release SW1.
9. LED #3 next to SW1 should be lit.
10. When LED #3 illuminates, press SW1 for one to two seconds.
11. LED #4 next to SW2 should illuminate next.
12. When LED #4 illuminates, press SW2 for one to two seconds.
13. The center LED (LED #3) should start flashing.
14. Press SW1 for one second.
15. The LED's will sequence to indicate that the current position has been stored.
16. When LED #2 and LED #3 come on steady, the system is ready for hydraulic pressure. On an actual system the unit will control the position of the actuators. For the bench test, we will manually move the encoder to simulate the hydraulic actuator.

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17. D/A output range test. The voltage on Pin B with respect to Pin C will do the following:

- As soon as LED's #2 & #3 come on in step 16 the voltage will be 0.75V  $\pm$ 0.1V (repeat steps to get to this point as needed when monitoring the voltage).
- The voltage will decrease by about 0.010 Volt increments until a minimum voltage of 0.05V  $\pm$ 0.030V is reached. This is the minimum output possible from the D/A PWM output.
- The voltage will go to 4.0V  $\pm$ 0.1V and remain steady. This is the maximum output possible from the D/A PWM output.

18. Now repeat steps 1 through 16 and proceed to step 19. We are now going to move the encoder to verify that the proper sequence is followed by the unit and that the encoder is working properly.

19. The encoder upgrade will go through the following sequence:

- Wait for about 2 seconds after LED's #2 & #3 comes on in step 16.
- The voltage will be decreasing on Pin B. LED's #2 & #3 are still on.
- Slowly rotate the encoder clockwise until only the center LED (LED #3) is on. Now the voltage will start increasing.
- Slowly rotate the encoder counterclockwise about 5 ~ 10 degrees then stop rotation.
- Once the encoder rotation stops, the system will dwell for a few seconds to verify that the hard stop has been found.
- LED's #3 & #4 will come on at this time.
- VERY slowly rotate the encoder clockwise.
- Once the actuator has moved to the correct position, the location is stored. The center LED (LED #3) will come on steady indicating that the home position has been found and stored. LED #2 will begin to flash continuously at 1 second intervals to indicate a healthy, correctly running system. The voltage on Pin B (signal) should now remain steady.

20. The installation is complete.

21. Test operation as follows:

Rotate the encoder CCW. The voltage should decrease to a minimum of about 0.050 volts and then switch to 4.0 volts  $\pm$ 0.1V. Rotating the encoder CW will produce a voltage that varies from about 0.050 volts to 4.0V  $\pm$ 0.1V.

Brownout Reset Test:

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The success of the brownout configuration should be checked by varying the main power voltage to the unit. It should automatically reset at a voltage between 3.6 & 4 volts.

Watchdog Timer Test:

The success of the watchdog should be checked by pressing and holding buttons 1 & 2 after the unit has successfully powered up and has servo control (heartbeat active).

The unit should lock up when both buttons are held in and then should automatically reset from the start (since the watchdog doesn't get reloaded during lockup condition).

Temperature Test:

Problems with oscillator startup were experienced on some production units. This was attributed to leakage on the oscillator capacitors. After replacement, units were tested by heating and cooling the capacitors to extreme temperatures with no startup failures.

Low Temperature:

1. Set the incoming voltage to 4.4 volts.
2. Cool the oscillator crystal and timing capacitors (near crystal) to approximately 32°F.
3. Cycle power several times and verify that the unit starts up normally.

High Temperature:

1. Set the incoming voltage to 4.4 volts.
2. Heat the oscillator crystal and timing capacitors (near crystal) to approximately 140°F.
3. Cycle power several times and verify that the unit starts up normally.