HAU – Single Coil Proportional Valve Driver

Description

The HAU Valve Driver is a single coil proportional valve driver that provides precise control of a single coil proportional valve by controlling current through Pulse Width Modulation. The HAU will accept control inputs of –5V to +5V, 0 to +10V, 4 to 20 mA or an external potentiometer. It will accept power supply voltages from 11 to 30 volts DC and is able to drive coils with requirements up to 5 amps. Options include ramping, dither, waterproof potentiometers and WeatherPak connectors.

Indicators

PWR LED – Lights when the power supply voltage is above 10.5V. The unit will not function correctly if this lamp is off or blinking.

PWM% – Indicates the duty cycle to the coil by going from RED (full off) to GREEN (full on). The ratio of red to green gives a relative indication of current flow through the coil as an aid to tuning and troubleshooting.

Wiring

Hook up the unit as shown in Figure 2, using only one of the three control input configurations. Use 16 AWG wire for power and coil wiring. Use shrouded coil connectors. Locate the fuse as close to the power supply as possible to protect the wiring and the valve controller.

Fusing

Use only an ACG-5 fuse for current ranges up to 3.33 amps, or an ACG-10 fuse for 3.34 to 5.00 amp coils.

Failure to properly fuse the unit invalidates the warranty.

Setup Procedure

Compare the part number on your unit to the Part Number Index in Figure 1 for an explanation of options specific to your unit.

This controller is best adjusted by the system response. Coil current can be used, but coil voltage is not accurate. Coil current may be measures by installing a 0.1 or 1.0 ohm resistor in series with the coil and measuring the voltage drop across the resistor using a volt meter. Current may be calculated by I=E/V or current equals the voltage across the resistor divided by the resistance.

INITIAL SETUP

1. Turn the MAX pot 10 turns CCW then 5 turns CW (set to center of pot)
2. Turn the MIN pot 10 turns CCW (off)
3. Turn all RAMP pots 10 turns CCW (off)
4. Turn the DITHER AMP pot 10 turns CCW (off)

MAX / MIN

1. Turn on power supply.
2. Set the control input to its minimum and adjust the MIN pot for the desired response. CW for more current, CCW for less.

High Country Tek • Electronic Solutions for Industry
208 Gold Flat Court • Nevada City, CA 95959 • Tel. (530) 265-3236 • Fax (530) 265-3275
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3. Set the control input to its maximum and adjust the MAX pot for the desired maximum desired response. Do not adjust the unit for more current then is required to fully shift the valve; this reduces the useful range of the controller and may harm the coil.
4. The Min and MAX pots interact with each other and system response may change as the system warms up. Warm the system to normal operating temperatures and repeat steps 2 and 3 until both the MIN and MAX pots are adjusted properly.

RAMP (Optional)

If the unit has one ramp pot it will adjust the ramping function for both directions of control to the same setting. If the unit has two ramp pots, RAMP UP will adjust the ramp time for current increases and RAMP DOWN will adjust for decreases in current.

Ramp is adjusted by quickly switching the control input from minimum to maximum, or maximum to minimum and adjusting the corresponding pot to obtain the desired speed of response. CW adjustment of the pots will increase the lag time of the coil's response.

Dither (Optional)

DITHER AMP

The dither amplitude pot is set fully CCW (off) at the factory; adjust the pot CW for the desired dither amplitude if required then readjust the MAX and MIN pots.

DITHER FREQ

Dither frequency is preset to the value listed in the model number at the factory (See Figure 1 for explanation) and sealed. This feature should not be adjusted.

Troubleshooting

If the set up procedure does not achieve the desired results, double check the wiring and perform the following tests. Record the test results.

Tools required:

A battery operated multi meter and a small screwdriver are required.

Check the power input:

The card will not function correctly unless the +POWER to PWR COM voltage is at least 11 V. If this voltage is more than 30 V the card may be damaged.

Check the control input you are using:

Pot input:

Measure the wiper voltage between the VOLT and SIG COM terminals. With a 10 K ohm pot, the wiper will go from 0 (minimum current) to 9 V. The difference in voltage should be more than 5 V from minimum to maximum. The voltage must not be less than 0 V or more than 10 V.

Current loop input:

Measure the current into the CUR terminal. The difference in current should be at least 10 mA from minimum to maximum. The current must not be negative or more 20 mA. If a current meter is not available, measure the voltage from the CUR terminal to the SIG COM terminal and divide by 150 for an approximate reading.

Voltage input:

The difference in voltage between the VOLT and SIG COM terminals should be greater than 5 V from minimum to maximum. The voltage must not be less than -5 V or more than +10 V.

Only one control input at a time may be hooked up.

Verify the coil is not shorted:

If the +COIL to -COIL is shorted, the valve driver will shut down its output until the short is removed. Disconnect the wires going to the +COIL and -COIL terminals and measure the resistance between the wires. Verify it is correct for the coil being driven.

Check the card at full on and full off:

Do not try the full on test if the power supply is 50% higher than the coil's rated voltage. Temporarily disconnect all wires from the VOLT and CUR inputs. To test the card at full on, turn the MAX and MIN pots 10 turns CW and temporarily connect the VOLT and REF terminals. Measure the voltage from +COIL to -COIL and from +POWER to PWR COM. The voltage difference should be no more than one volt if the card is operating correctly. To check the card at full off, disconnect the VOLT and REF terminals and turn the MAX pot 10 turns CW and the MIN pot 10 turns CCW. The +COIL to -COIL voltage should be zero.

If the valve won't fully shift:

If the card passes the "full on test" above, the problem is in the system. Measure the power supply voltage at the power supply or battery and the voltage across the coil's terminals. Compare these readings to the values taken at the card. If there is excessive voltage drop in any of those wires, they should be shortened or replaced by bigger wires. Bad frame ground connections can cause large voltage drops.

When the coil heats up in use, it increases its resistance. Most coils will still be able to draw sufficient current to fully shift the valve if their rated voltage is supplied to the card and the card causes less than one-volt drop. When this is not the case, you must use a coil rated for less voltage or increase the power supply voltage. The card will have no trouble driving a 12 V coil from a 24 V supply, or a 10 V coil from a 12 V supply for example. You will need a new card if the new coil draws more current than the card is rated for.

If the valve shift is erratic:

Electrical interference on the control lines can also cause erratic behavior if it is strong enough. Try changing the routing of the control wires to see if the problem changes.

Power supply interference or brown outs can also cause erratic behavior. Test for this by running the card off its own fully charged battery.

HAU Part Number Index

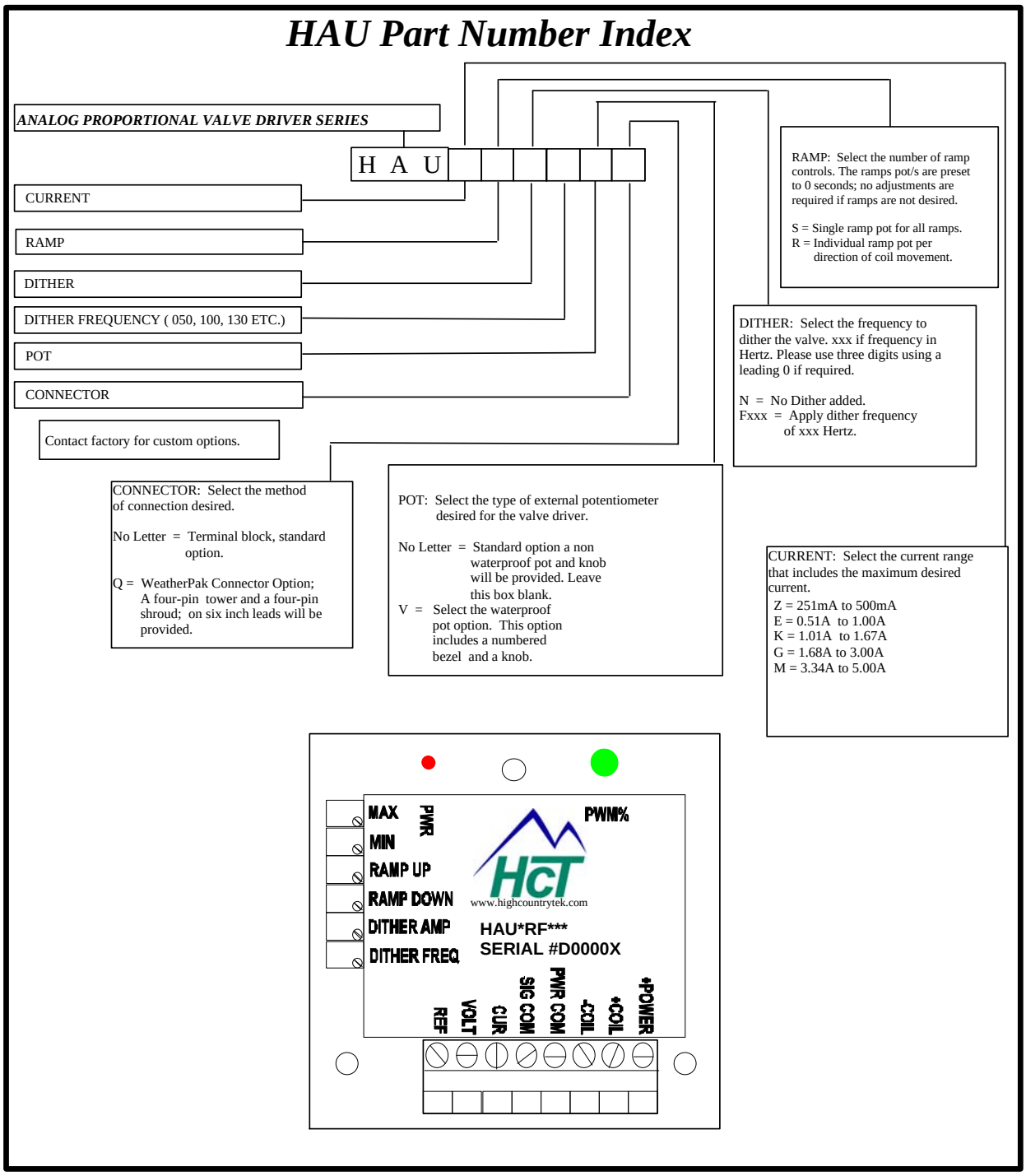
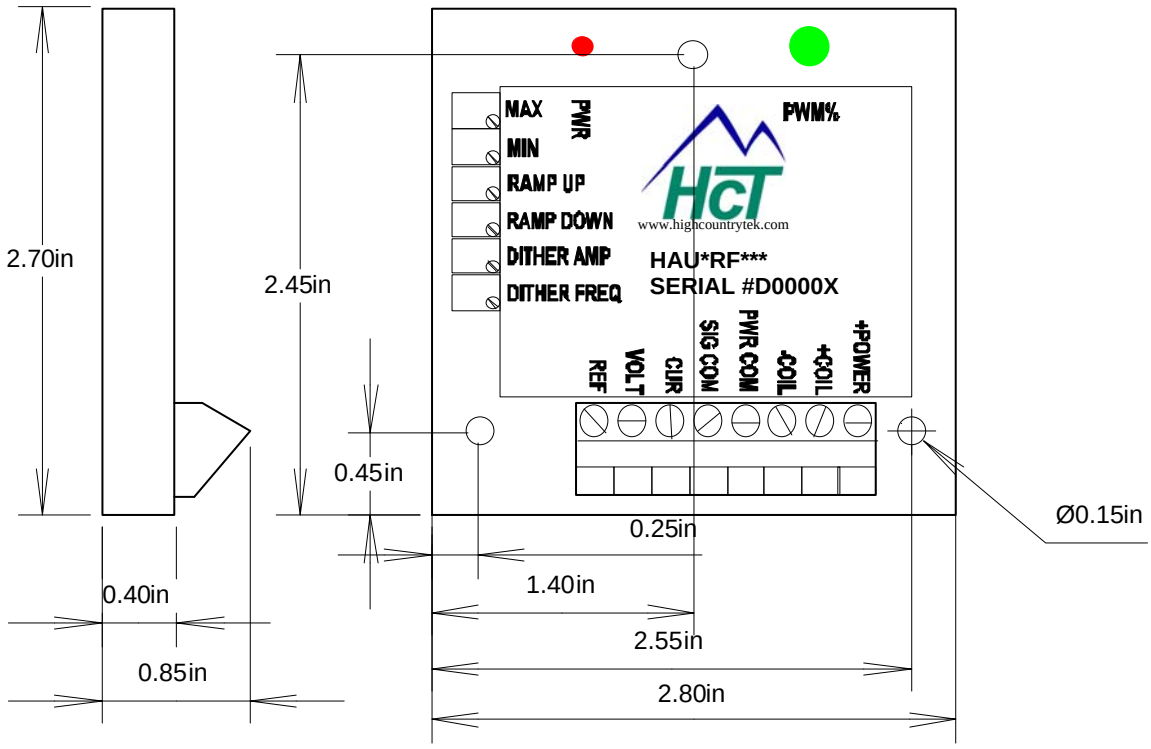


Figure 1



Input Connections

Current Input

+ ------- CUR
- -------- SIG COM

Voltage Control Input

+ ------- VOLT
- -------- SIG COM

External 10K Pot

High ---- REF
Wiper--- VOLT
Low ---- SIG COM

Voltage & Coil Connections

Voltage Input

+ ---- +POWER
- ------ PWR COM

Coil Connection

Coil + --- +COIL
Coil - --- - COIL

Figure 2