



High Country Tek, Inc.

## Hydraulic Fan System Controller - HFS 4

Electronic Controller Solutions for the  
Mobile, Industrial & Marine Fluid Power Industry

### High Country Tek, Inc. ( HCT )

Introduces the latest in a range of cost effective proportional driver products.

This self contained fan system controller is designed to control single valve coils, of either 12 or 24VDC and can interface directly with the PWM signal generated by the engine ECU / DCO to give fan speed.

Simple analog technology, full CE compliance and HCT's signature potting process makes these very physically robust and ideal for use in valve stack or manifold applications.



Each controller comes pre-wired with 4 core color coded cable on the input side and a pre-fitted Deutsch DT06-2S-P012 socket for watertight connection to the chosen valve coil.



### Application Examples:

- Single coil proportional pressure , flow or screw-in cartridge control valves.
- System load / Unload valves - 'bumpless' decompression.
- Pump stroker ( single side operation )
- Mobile applications where 'CHASSIS' or 'EXTERNALLY' mounted.
- High Vibration and /or 'G' force applications.
- High Humidity applications and/or marine usage.
- Cost conscious applications.

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### Application Guidelines:

- ALWAYS** - Take a few minutes to **FULLY** read **THESE** information / data sheets **BEFORE** starting.
  - ALWAYS** - Keep High Voltage AC cables separate from Low Voltage DC signal and supply cables.
  - ALWAYS** - Make sure the unit supply voltage is the same as the coils on the valve being driven !
  - ALWAYS** - Ensure that you are aware of the available adjustments and consequences on the electronics and hydraulics.
  - ALWAYS** - Make sure you have the correct tools to do the intended job ( i.e. P.C., software ) e.t.c.
  - ALWAYS** - 'Isolate' this unit from all other equipment **BEFORE** any form of welding takes place.
  - ALWAYS** - Check **ALL** connections to and from this unit to ensure **NO** short or OPEN circuits.
  - ALWAYS** - Check the units supply voltage is **CORRECT**, ' **ELECTRICALLY CLEAN** ' and **STABLE**.
  - ALWAYS** - Operate the units within specified operating temperature for best & reliable performance.
  - ALWAYS** - Ensure that any unused wires / terminals are terminated safely and **not shorted together**.
  - ALWAYS** - Isolate the controller if ANY form of battery charging or battery boosting takes place on the vehicle.
  - ALWAYS** - Ensure ALL valve connectors are wired correctly, secure, locked and connected to correct coils.
  - ALWAYS** - Use screened wires wherever possible to avoid electrical noise that may be present.
  - ALWAYS** - Make sure the cable screen **IS** connected to GND at one end only - typically the user power supply terminal.
  - ALWAYS** - Use a wire gage that is rated for the voltage and current associated with this units operations
  - ALWAYS** - Observe the set-up procedures in this manual for best operational results.
  - ALWAYS** - Follow and abide by local and country health and safety standards – protect yourself and others !
- 
- NEVER** - Arc Weld or Charge Batteries with this driver unit connected as damage can occur.
  - NEVER** - Attempt to use this unit if you are unsure of electrical OR hydraulic connections or expected operation.
  - NEVER** - Attempt to use this unit in Areas where other AC or DC coils **HAVE NOT** been fully suppressed.
  - NEVER** - Use a power supply that is not rated for the correct required O/P current under full load.
  - NEVER** - Allow wires TO or FROM the unit to short circuit ( to each other or chassis/cabinet e.t.c. ).
  - NEVER** - Attempt to use this unit in areas of intense RF without adequate screening measures.
  - NEVER** - Disconnect or connect wires to or from this unit unless it isolated from the power supply.
  - NEVER** - Use this unit in temperatures that exceed those specified as operation may be effected.
  - NEVER** - Start this unit without ensuring ALL work areas are clear of personnel !

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*It shall not be copied or transmitted by any format to any third parties without our knowledge and express written permission.*

*HCT reserves the right to improve this product at any time without notice.*

*Please check our website [www.highcountrytek.com](http://www.highcountrytek.com) for latest versions of this manual.*



## Plug Top Driver Overview:

The High Country Tek, HFS 4 is designed to control a hydraulic fan speed based on the PWM signal input from an engine ECU / DCU.

This version of the fan controller is designed to be extremely robust and mount to a bulkhead or flat surface.



Three potentiometers are all that is needed to set this unit up to control the minimum and maximum fan speeds relative to the input signal and a third adjustment to optimize the valves control by altering the dither frequency to suit any OEM requirements.



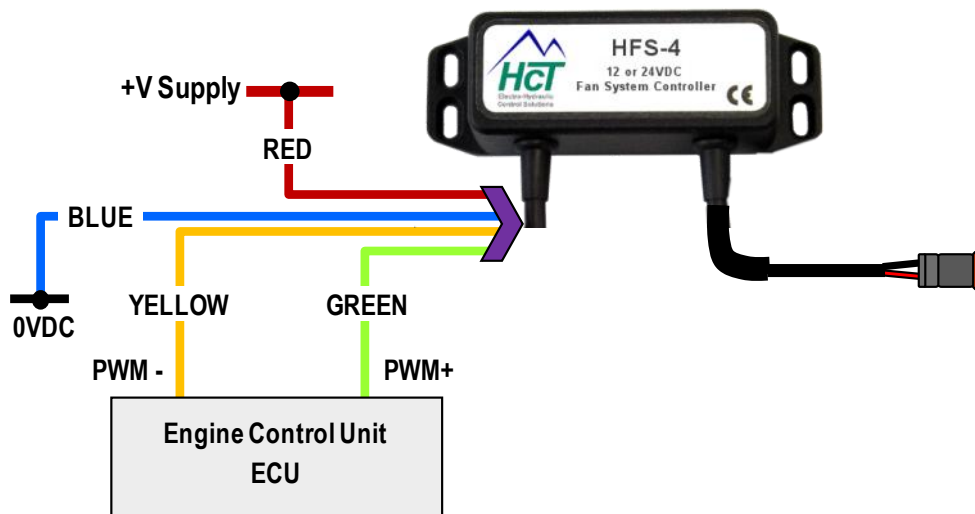
## Technical Specifications::

- ◆ **Housing Type:-** HCT unique 'encapsulated' block.
- ◆ **Input Supply Voltage:** 10VDC to 32VDC ( Absolute Maximum )
- ◆ **Input Supply Current:** Valve Current Setting + 200mA Quiescent (Max)
- ◆ **Command Input Type:** PWM from engine ECU / DCU
- ◆ **Command Input Value:** 8V-30V ( 10% to 90% PWM )
- ◆ **CMD I/P Frequency:** 20 to 125Hz
- ◆ **Input resistance:** 1200 Ohms
- ◆ **Ramp Times:** <300mS with I max at 100%
- ◆ **Dither Frequency :** Adjustable, ~100 to ~250Hz ( ± 20%)
- ◆ **Housing Material:-** Die-cast aluminum
- ◆ **Wire Connections:-** Input cable = 18 inches pre-connected color coded cable
- ◆ Output cable = 12 inches pre-connected color coded cable
- ◆ **Encapsulation:-** Flameproof epoxy resin filled
- ◆ **Mounting:-** Bulkhead / flat surface
- ◆ **Temperature range:-** -20 to +70 °C ( operational )
- ◆ **NEMA/IP Rating:** NEMA 6P/67 when assembled and mounted to coil correctly

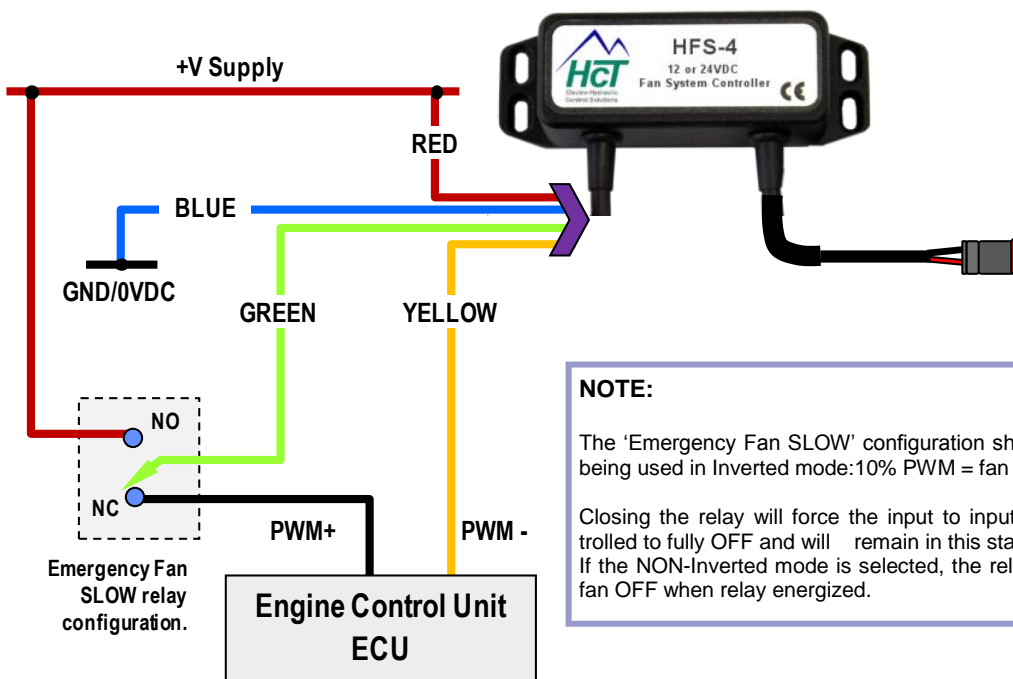
## Adjustment and Link Locations:



## Standard Connection detail:



## Connection detail with emergency fan slow:

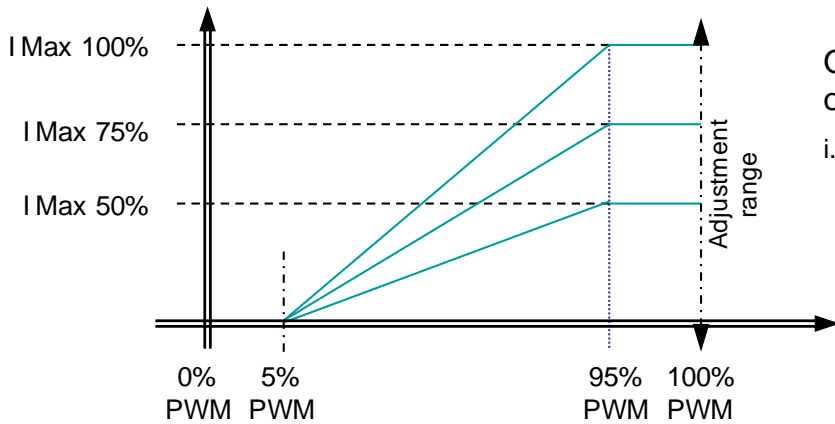


### NOTE:

The 'Emergency Fan SLOW' configuration shown below assumes that the controller is being used in Inverted mode: 10% PWM = fan full on, 90% PWM = fan full off.

Closing the relay will force the input to input supply voltage and the fan will be controlled to fully OFF and will remain in this state until the relay is released. If the NON-Inverted mode is selected, the relay should be connected to 0V to achieve fan OFF when relay energized.

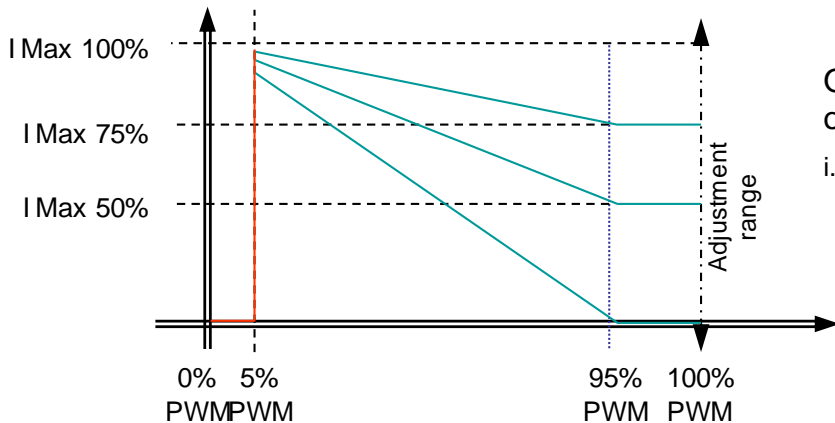
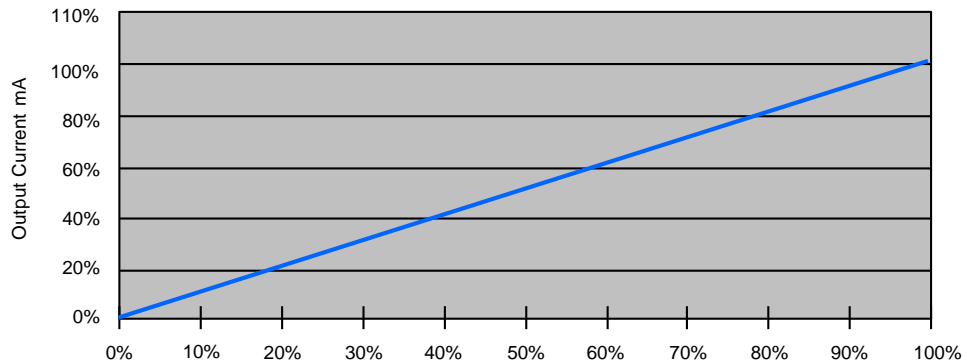
## Controller Logic Guide:



Output Characteristics: **Positive Logic** operation.

i.e. 5% PWM = Min O/P  
100% PWM = Max O/P

Typical input / output current linearity graph of this controller.

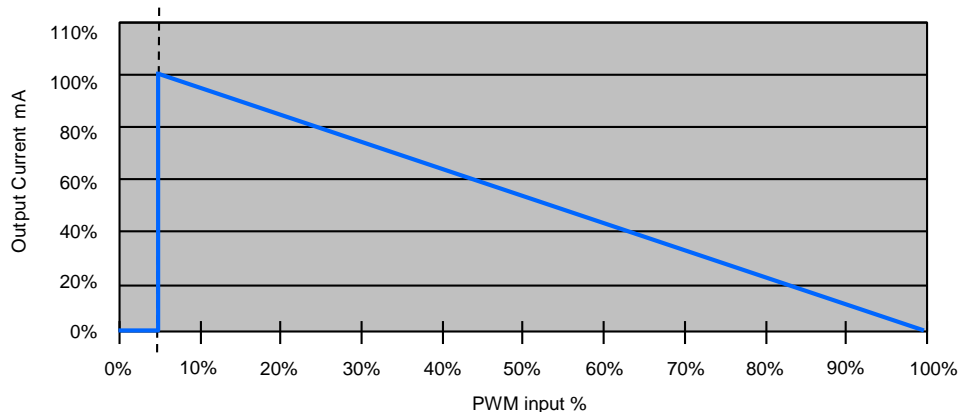


Output Characteristics: **Negative Logic** operation.

i.e. 0 PWM = Min O/P  
5% PWM = Max O/P  
100% PWM = Min O/P

**NOTE:**

For operational safety, if the input PWM signal is below approx. 5%, the output to the valve is OFF.



## Adjustment Guide:

Adjustment Guide: - Controller **Positive Logic operation**. ( Default setting ).

### **NOTE:-**

***At all times during the set-up procedure, it is assumed that a INVERSE ACTING pressure control valve is being used.***

***For other logic or valve types, please ensure the input output logic is correct before connection and operation.***

**Positive Logic operation means** that the output current follows the input command signal.

i.e. 5% PWM = Min current O/P and 95% PWM = Max current O/P

This option is intended for use when the input PWM signal is conforming to positive logic as above.

In this configuration, if the power supply fails, the fan unit will default to the Maximum speed ( see note below ).

For this option to be activated, the user must **leave** link 'A' fitted,

1. Ensure command PWM signal is set to zero.
2. Check 12V coil is selected for 12V system
3. Check 24V coil is selected for 24V system.
4. Connect driver unit onto valve coil to be driven ( check connector is secure ).
5. Ensure that all other controller wire connections are correct and secure.
6. Turn I Min potentiometer 20 turn Anti-Clockwise ( Minimum ).
7. Turn I Max potentiometer 20 turns Clockwise ( Maximum ).
8. 'Dither frequency' potentiometer is pre-set to 200Hz to suit common valve specifications.
9. Apply supply power voltage to the controller.
10. Slowly increase command to approx 10% of maximum PWM.
11. Use the I Min adjustment to give MAXIMUM motor speed required.
12. Slowly Increase command signal PWM to maximum ( 95% ) setting.
13. Adjust I Max until desired motor MINIMUM speed is achieved
14. Check that 'Output ON' led is functioning proportionally by varying the command signal.
15. Set command to maximum PWM %
16. Isolate the controller from the power. Controller is now set and ready for operation.
17. Attach the lid to the main controller unit carefully ensuring that seal is maintained.
18. Replace securing screws and tighten ( Do not over tighten ).
19. Mount re-assembled controller to bulkhead / panel.
20. Unit is now ready for continuous application use.

## Adjustment Guide:

### Adjustment Guide: - Controller **Negative Logic operation**

#### **NOTE:-**

***At all times during the set-up procedure, it is assumed that a INVERSE ACTING pressure control valve is being used.***

**For other logic or valve types, please ensure the input output logic is correct before connection and operation.**

**Negative Logic operation means** that the output current is inverse to the input command signal.

i.e. 5% PWM = Max current O/P and 95% PWM = Min current O/P

This option is intended for use when the input PWM signal is conforming to Negative logic as above.

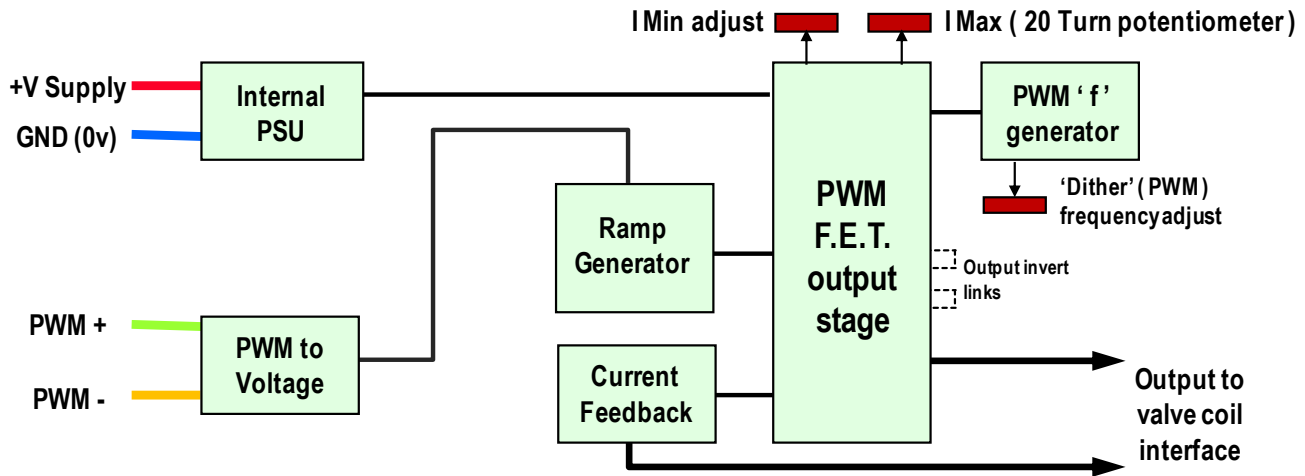
In this configuration, if the power supply fails, the fan unit will default to the Minimum speed ( see note below ).

For this option to be activated, the user must **Remove** link A, the location of which is shown on page 7 of this manual.

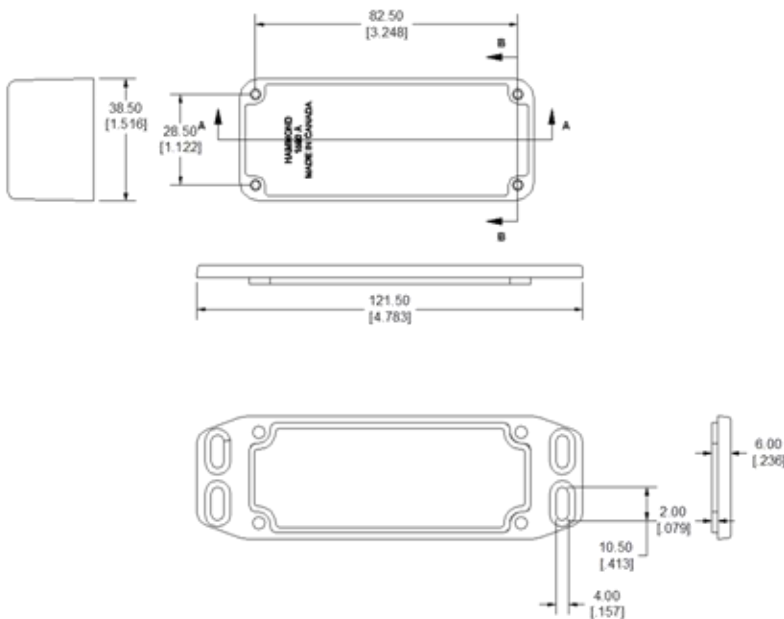
**CAUTION:- - The 'A' link, once removed, CANNOT be replaced easily.**

1. Ensure command PWM signal is set to zero.
2. Remove / cut link 'A' to get inverted function
3. Check 12V coil is selected for 12V system
4. Check 24V coil is selected for 24V system.
5. Connect driver unit onto valve coil to be driven ( check connector is secure ).
6. Ensure that all other controller wire connections are correct and secure.
7. Turn I Min potentiometer 20 turn Anti-Clockwise ( Minimum ).
8. Turn I Max potentiometer 20 turns Clockwise ( Maximum ).
9. 'Dither frequency' potentiometer is pre-set to 200Hz to suit common valve specifications.
10. Apply supply power voltage to the controller.
11. Slowly increase command to approx 95% of maximum PWM.
12. Use the I Min adjustment to give MAXIMUM motor speed required.
13. Slowly decrease command signal PWM to approx. 10% of maximum setting.
14. Adjust I Max until desired motor MINIMUM speed is achieved
15. Check that 'Output ON' led is functioning proportionally by varying the command signal.
16. Set command to minimum PWM %
17. Isolate the controller from the power. Controller is now set and ready for operation.
18. Attach the lid to the main controller unit carefully ensuring that seal is maintained.
19. Replace securing screws and tighten ( Do not over tighten ).
20. Mount re-assembled controller to bulkhead / panel.
21. Unit is now ready for continuous application use.

## Block Diagram:



## Mechanical Data:



### Mounting Note:

Once settings have been made and the fan speed is as expected, do the following:

1. Screw the lid of the HFS-4 to the main unit body using the 4 machined screws supplied.
2. Secure the HFS-4 controller to any bulkhead or surface that is NOT subjected to heat that is outside the operational limits if the unit using 4 x self tapping screws or other fittings as required.
3. Ensure all cables to and from the HFS-4 are not touching hot surfaces and will not become entangled with moving parts during operation and driving.

- Housing Type:- 2 part, inverted ( mount by lid ).
- Housing Material:- High strength, lightweight Aluminum alloy
- Housing Colour:- Eggshell black.
- Surface Finish:- Powder coated
- Unit size:- See above size detail drawings.
- Unit Weight:- Approx.... 400 grams ( including Encapsulation material & Cable )
- Wire entry:- Sealed to PCB by encapsulant
- Encapsulation:- Flame Resistant, Black , Two Part Epoxy Resin.
- Wire length:- O/P: Approx..... 012inches automotive grade cable  
I/P Approx..... 18 inches automotive grade cable
- Wire specification:- 4 core, 16/02 with PVC outer protection to Def Standard 16-12 Part 5 ( Screened ) 2.5 Amps/core @ 70°C Max Operating Temperature.



## ***Troubleshooting Guide:***

### **There is Not enough pressure or flow at maximum command input:**

- 1) Increase the 'I Max' setting until the required levels are achieved.

### **There is very little control at the lower end of the command signal:**

- 1) Increase the 'I Min' setting until the required levels are achieved.

### **Cannot achieve full flow or pressure at full command and full 'I Max' adjustment:**

- 1) Check supply voltage is at nominal levels and is stable ( not collapsing ) under full load conditions.
- 2) Ensure that the coil fitted to the valve is correct for the supply voltage( I.e. 12V coil for 12V supply ).
- 3) Check that the command signal used is achieving expected maximum level at the input wire.

NOTE: Remember, if the supply voltage is reduced, the output current to the coil will also be reduced resulting in the valve not being able to achieve full displacement.

### **The unit does not respond to an external PWM command voltage:**

- 1) Ensure that the external command ( ECU ) source's GND (0V) is connected to the controllers PWM- wire.
- 2) Check continuity of command cables between source and driver unit.

### **The output from the driver goes between zero and full on only with no proportionality:**

- 1) Ensure that there is a correct coil connected to the controller output.
- 2) Check that the coil is not open circuit.
- 3) Check the command voltage is proportional.

### **The unit is completely dead :**

- 1) Check that the supply voltage is present & correct
- 2) Check the supply input fuse for continuity and correct fitting.
- 3) Check that there is a command connected and correct to the controller
- 4) The unit is damaged and needs to be replaced.

### **The valve appears to have large hysteresis and does not respond correctly:**

- 1) Adjust the driver units 'Dither Frequency' settings to get required response.

For more information on application of these plug top drivers, visit our website or contact our customer service department, details on how to reach them are on the back page of this information manual.



The electronic controller unit described here **MUST** be used and mounted in the manner described in this Information sheet to fall in line with current regulations on EMC.

By issuing this document, High Country Tek, Inc are showing their commitment and due diligence to the rules concerning EMC from a global perspective.

A reduced supply voltage will directly effect the valves maximum achievable performance figures regarding flow or pressure. **ALWAYS** ensure that the controller is supplied with the nominal supply voltage as recommended by this literature and the valve coil manufacturer to get the best results and full control range from the hydraulic product being controlled.

**ALWAYS** follow connection, application and usage instructions provided with this electronic unit.

**ALWAYS** ensure that ANY Earth connection is to clean, bare metal and **NOT** a paint finish.

**ALWAYS** ensure that NO High Power RF is used near or inside an open enclosure.

**ALWAYS** mount this unit such that any collected moisture or liquid will be able to escape.

This unit is CE compliant, flame proof but **NOT** intrinsically safe rated.

Use a Switch Mode Power Supply (SMPS) where possible for the supply voltage on these plug top drivers as they are designed to work from multiple line voltages/frequencies ( 50 or 60Hz), can supply the high instantaneous current demands created by PWM control of valve coils and have integrated filters for electrical noise.

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