

evc/epc

Electronic Valve Controller

User Guide



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High Country Tek, Inc. (HCT) is North America's foremost independent designer and producer of modular, ruggedized digital and analog electronic controller products for the fluid power industry.

From our factory in California, we build, test and produce 'specialty' controllers for specific functions as well as our 'DVC family' of fully adaptable user programmable units that can be integrated to enable large area networked system solutions.

The modules are used in mobile, industrial and marine applications. They are also applied successfully in other industry segments.

HCT's every module is encapsulated in solid flame resistant material for maximum durability, electrical integrity and complete environmental security. We deliberately select the highest quality components at all times, ensuring 100% operating products.

HCT is a market leader in many application arenas, including hydraulic generator, *e-Fan* and hydraulic fan system controls. These controllers realize significant fuel, emission and operational savings by optimizing the applications.

HCT's market neutrality offers dependable integration with any hydraulic OEM products for easy, simple and accurate control of valves, pumps, sub-systems or systems.

Our best-in-class customer service and product reliability is well known and trusted throughout the fluid power network and we look forward to working with you in the future.

For our latest information, products, updates, guides and accessories, please visit us at:

www.hctcontrols.com

*The information in this publication is intended as a guide only, and **High Country Tek, Inc. (HCT)** takes NO responsibility for usage and implementation in any user entered values into the provided GUI structure.*

HCT strongly suggests that the user attends one of the product training courses to ensure correct and full understanding of this information and to learn further optimized methods of control techniques.

Please contact HCT customer service to book one of the scheduled training dates or discuss arranging a course specific to your company needs.

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Welcome

Welcome to the High Country Tek Inc. (HCT) **evc/epc** user manual.

If you have any questions, requesting new features or finding errors, please contact us @ 530-265-3236 or e-mail at info@hctcontrols.com, giving details of the issues and your contact information.

Introduction

This manual explains the installation and use of the evc/epc Digital Controllers. Users need to understand the hazards in an electromechanical environment. Read this entire manual before installation. Pay particular attention to caution and safety information.

Cautions

Changing setup values or operating modes while the machine is running may cause unintended machine movement. It may lead to possible **injury** or **death**. Any moving parts should be disabled prior to changing setup values or operating modes. In any case, exercise caution and work should be completed only by qualified personnel.

Warranty Information

High Country Tek guarantees this product to be free of defects in materials and workmanship for one year from the date shipped from the factory. Within this time frame, High Country Tek will provide evaluation of warranted items free of charge. Warranty repair or replacement will be at the factory's discretion.

Please have the units full Model / Part Number and Serial Number available when contacting the factory. Do not return products to the factory without a RMA (Return Material Authorization) number.

Controller Updates

HCT continuously improves the controllers and makes additional information and/or features available. Please check on-line at www.hctcontrols.com for the latest products, software update and information.

Product Application Guidelines

ALWAYS do the following

- FULLY read this manual and accompanying data sheets BEFORE starting.
- Isolate this unit from all other equipment BEFORE any form of welding.
- Isolate the controller from ANY form of battery charging or battery boosting.
- Be aware of the adjustments and reactions on the external equipment.
- Operate the units within the temperature range.
- Use the correct tools to do the job (i.e. P.C., software) etc.
- Separate High Voltage AC cables from Low Voltage DC signal and supply cables.
- Check that the units supply voltage is CORRECT, 'ELECTRICALLY CLEAN' and STABLE.
- Make sure the controller output voltage & current is compatible with the equipment!
- All unused wires / terminals should be terminated safely.
- Ensure ALL connectors have no unintended SHORT or OPEN circuits.
- Ensure ALL connectors are wired correctly, secure, locked in place and fully connected.
- Observe all the set-up procedures in this manual.
- Follow and abide by local and country health & safety standards!

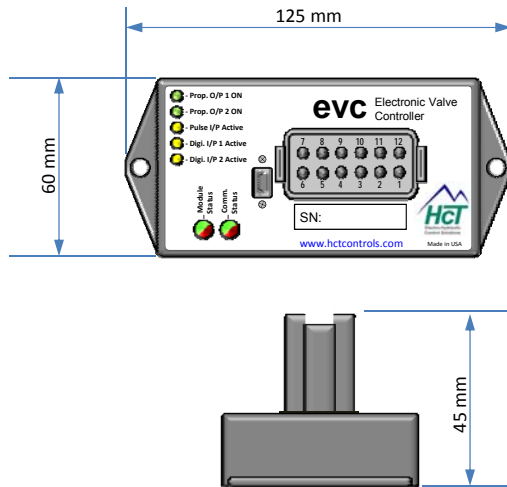
NEVER do the following

- Arc Weld or Charge Batteries with this module connected as damage can/will occur.
- Attempt to use this unit if you are unsure of electrical OR mechanical connections or expected operation.
- Use a power supply that is not rated for the output current under full load.
- Allow wires to or from the unit to short circuit (to each other or chassis/cabinet etc.).
- Use this controller in areas of intense Radio Frequency fields without adequate screening.
- Disconnect or connect wires to or from this unit unless it is isolated from the power supply.
- Use this unit in temperatures that exceed the limits.
- Start or operate this controller without ensuring ALL work areas are clear of personnel!

Software Safety

- The GUI and controller software give the user flexibility and ease of use, even for novice users.
- The GUI is not intended to be connected to a non-evc/epc unit. Care must be taken to use the correct GUI and hardware combination. After program entries, cycle the power to ensure changes are accepted by the unit.
- When the GUI is first connected to a powered controller, a 'Handshake' takes place that confirms the internal software (BIOS) is compatible with the GUI software. Only then the PC and the module are allowed to communicate and exchange data.
- If an error or miss-match is detected, or loss of communication, the GUI software will indicate "OFF LINE" and NOT allow communications until the problem is corrected.

Controller Specification



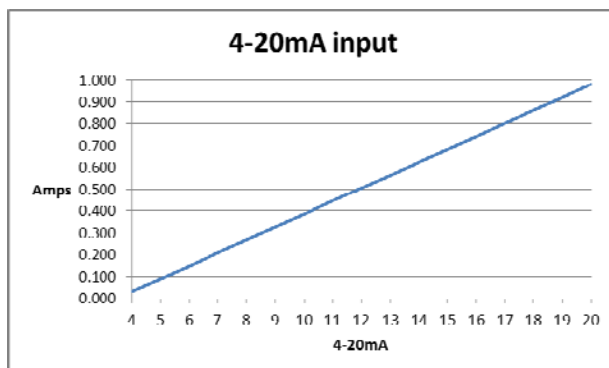
Use 2x M5 (#8) screws or bolts

Housing Type	HCT unique encapsulated block
Power Supply Voltage	9 to 32V _{dc} (Absolute Maximum)
Current Consumption	Valve current + 50mA Quiescent (Max)
Command Inputs	SAE J1939 2x switches (ON/Off) 1x analog input (0-5V, 0-10V, 4-20mA) 1x analog input (0-5V, 0-10V, Pulse or Freq - 3 to 30KHz)
Input Impedance	Voltage inputs = 100kΩ 4-20mA input = 100Ω
Outputs	2x 3A proportional PWM (short circuit protection and open circuit alert) 1x 5V _{dc} ±10% regulated voltage (max 250mA)
PWM Dither Freq	Software adjustable - 33 to 500Hz
Module Connector	DTF15-12PB, 12-way Male
Communication	Mini-B USB standard
Housing Material	Black, Polycarbonate
Encapsulation	Flameproof epoxy resin
Mounting	2x No.8 (5mm) screws
Temperature Range	-40 to +85°C (operational)
NEMA/IP Rating	NEMA 6P/IP67

Controller Mounting Information

1. Mount controller in an easily accessible location.
2. Mount controller to a flat, cool surface.
3. If mounting to a hydraulic product, allow at least a 2mm air gap underneath the unit.
4. Use BOTH mounting holes with correct hardware.
5. DO NOT mount controller with connector facing UP if possible.

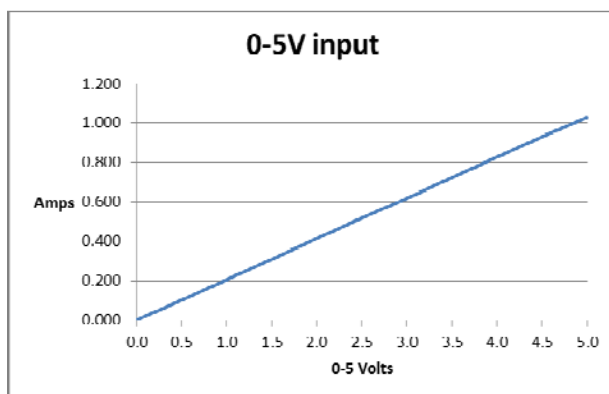
Controller Input vs Output



4-20mA Input:

$$I_{\min} = 0.05A, I_{\max} = 1A$$

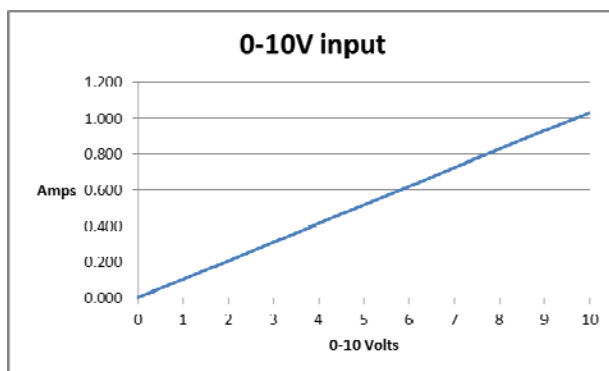
The internal current shunt resistor is 100Ω.



0 to +5V Input:

$$I_{\min} = 0, I_{\max} = 1A$$

The input impedance is 100KΩ.



0 to +10V Input:

$$I_{\min} = 0, I_{\max} = 1A$$

The input impedance is 100KΩ.

NOTE:

All tests conducted at 70F ambient, 24V_{dc} supply with 8Ω coil and I_{\min} set to zero and I_{\max} set to 1A.

Using the evc/epc with your PC

Install the **Graphical User Interface (GUI)** in a host PC. Use the default file locations for easy future update. The user has the option to choose where the program should be located.

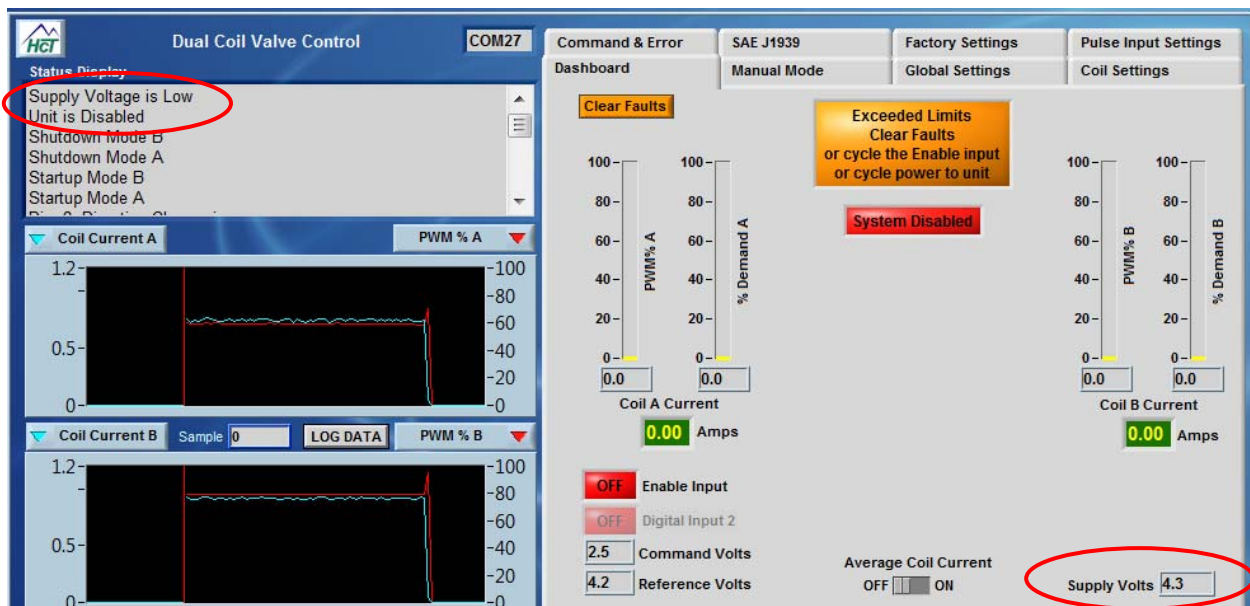
Don't run the GUI from a network as it needs access to certain files only in the Windows directories.

System Requirements

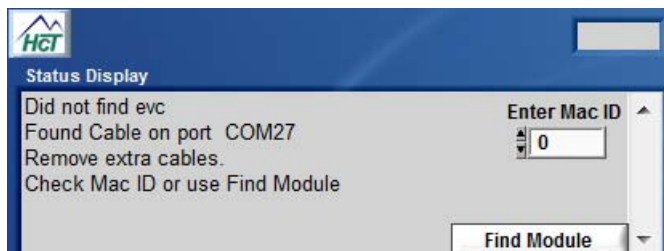
Windows XP, Vista or Windows7, 100MB or greater free disk space.

- Insert the CD into the PC drive and follow the on-screen instructions. This will install the evc/epc GUI, manual and help files.
- Install the Com Port drivers for the evc/epc.
Start ⇒ HCT Products ⇒ Digital Controllers ⇒ evc/epc ⇒ USB Serial Drivers, CDMxxxxx_setup.exe
- To insure a complete install, run the CDMxxxxx twice.

The evc/epc can be powered by +5V USB to allow configuration without connecting to a 12/24V_{dc} system. A message "Supply Voltage is Low" appears on the screen. **You may fully communicate, change, and save settings to the unit. You can not drive the coil(s).**



At start up the GUI searches the PC com ports for the evc/epc controller.

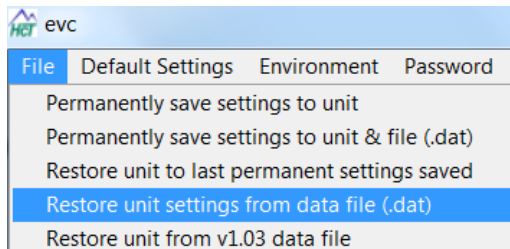


The **default MAC ID is 1**. If the evc/epc has been programmed with a different Mac ID, you can search for the controller by “Find Module” or enter the Mac ID. The “Find Module” will restart the operation when the unit responds with its information and Mac ID.

The **MAC ID** determines the module’s Command and Status PGN addresses on the SAE J1939 bus. The user may command many evc/epc modules on a single J1939 bus. Please see SAE J1939 section.

evc/epc GUI

File



All changes made through the GUI are temporary until saved permanently.

Permanently save settings to unit: Save the settings from the RAM (temporary) memory to the unit's EEPROM (permanent memory).

Permanently save settings to unit & file (.dat): Permanently save the settings to the unit's EEPROM and to a data file that may be loaded later.

Settings will be lost if not permanently saved before power cycle.

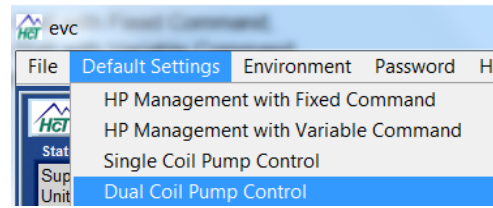
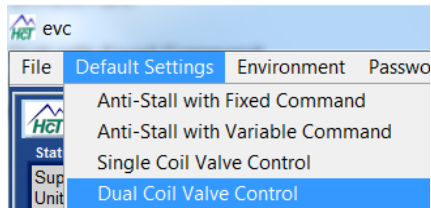
Reset the unit with a power cycle, you must remove both the USB cable and DC power from the unit.

Restore unit to last permanent settings saved: Reload RAM with settings stored in the EEPROM. This will undo all changes made since the last Permanent Save.

Restore unit settings from data file (.dat): Load the data file from the PC to the evc/epc for different modes of operation.

Restore unit from v1.03 data file: Load the previous version data file from the PC to the evc/epc for different modes of operation.

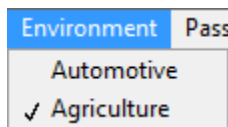
Default Settings



There are four default modes of operation. Other modes of operations can be created using data files.

1. HP Limiting or Anti-Stall with Fixed Command
2. HP Limiting or Anti-Stall with Variable Command
3. Single Coil Pump or Valve Control
4. Dual Coil Pump or Valve Control

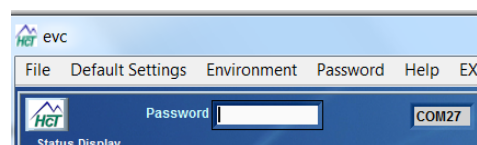
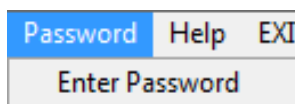
Environment



The Environment Menu selects the terminology for load control.

In the Automotive Environment, load control is called “Anti-Stall” and in the Agriculture environment the same function is called “HP Limiting”.

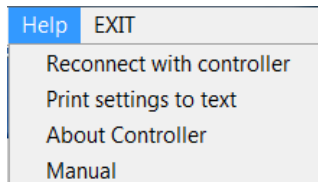
Password



“Enter Password” unlocks certain features of the GUI.

Passwords are 'cAsE SeNsitive'.

Help



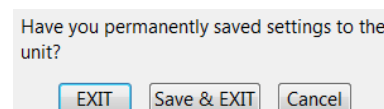
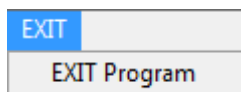
Reconnect with controller: The GUI will reset communication with the module, and re-read and update all variables.

Print Settings to text: Will print all settings to your PC default printer, or print to a text file, tab delimited. The text file may be viewed with Notepad, Word, or Excel.

About Controller: Will display information about the evc/epc, the GUI revision, serial number, contact information etc.

Manual: Will open the folder in C:\HCT products/Digital Controllers, or browse to other locations.

Exit



Exits the evc/epc GUI and frees up the com port and memory used by the application.

You can exit the GUI with or without saving the changes.

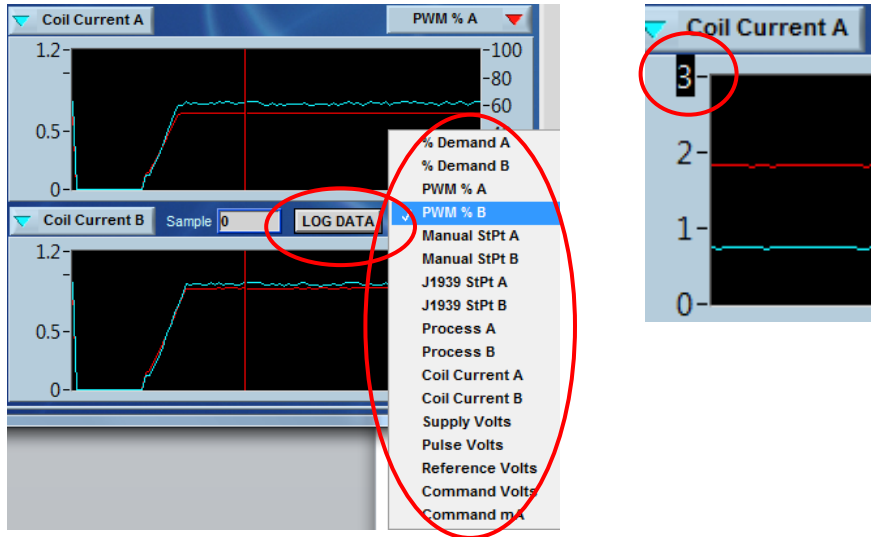
Dashboard, Status and Graphing Windows



They give real time overview of the controller health, operation of the system and condition of inputs, outputs and any alarms.

Each graph tracks two variables that are individually scaled. Select the variable from the **Pull Down Menus**. “Y” axis is automatically scaled to the respective minimum and maximum values.

To customize the scaling, simply select a value on the graph and enter the desired value.

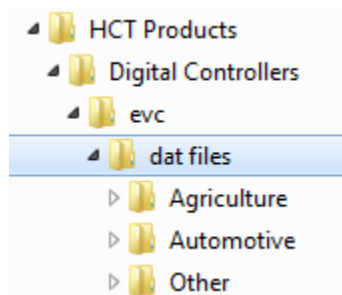


Data Logging

“Log Data” and save it in “.xls” format. The data can be as big as your PC memory capacity.

Each log begins with a list of unit settings and is followed by real time operational information. The sample rate depends on the workload of the PC and the evc/epc at recording. A timestamp scales the logs appropriately. Subsequent logs may be stored in a new file or appended to the original log file by selecting the original file.

The log file may not have all of the Excel formatting. Excel may declare an unknown file format. If it does, select **Open** and the information will display normally.



Example data files are saved to your PC during the installation.

When loading factory default data files, select “**Environment**”, then select the desired default file.

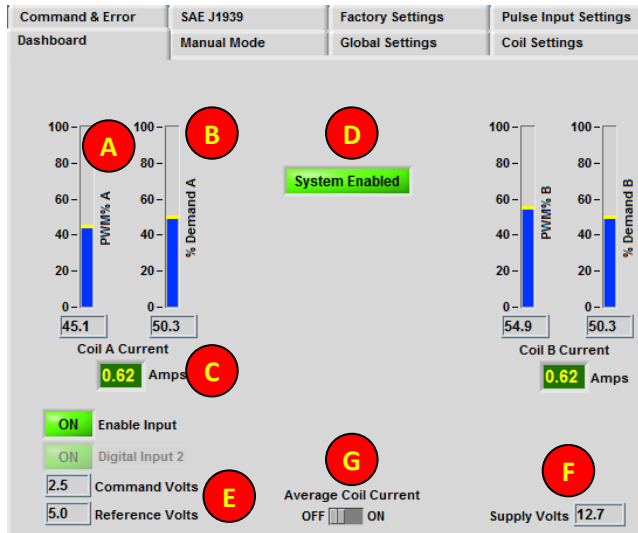
Default Data files will overwrite any settings in the unit.

Adjust the Coil Settings first, then other settings as needed.

In Agriculture or Automotive you will have **Four** files:

1. HP Limiting with Variable Command /Anti-stall with Variable Command.
Monitors RPM, the command in, and adjust the output accordingly.
2. HP Limiting with fixed command/Anti-stall with fixed command.
Monitors RPM and adjusts the output accordingly.
3. Single Coil Pump Control / Valve Control
Controls the single-coil pump/valve.
4. Dual Coil Pump Control / Valve Control
Controls the dual-coil pump(s)/valve(s).

Dashboard



A PWM% A/B – displays the output for coil A and B in the percent of duty cycle. The PWM% B will be “Grayed Out” when Coil B is disabled.

B % Demand A/B – displays the percent of demand for the output with respect to the Maximum and Minimum Current settings. The % Demand B will be “Grayed Out” when Coil B is disabled.

C Coil Current A/B – displays the output current. The Coil B Current will be “Grayed Out” when Coil B is disabled.

D Enabled/Disabled – displays the current state of the enable input connection.

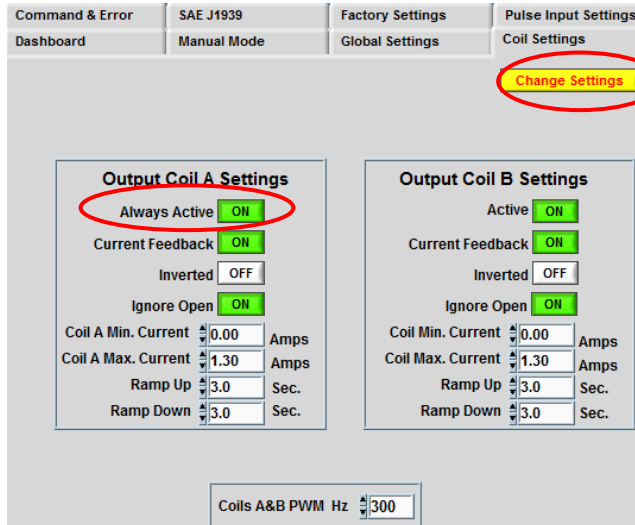
E Command Volts/mAmps – Displays the voltage or current at the Command input - (pin 3).

Reference Volts – Displays the voltage at the User Reference output - (pin 2).

F Supply Volts – Displays the voltage at the main Power Supply Input - (pin 1).

G Average Coil Current – Applies averaging function to the displayed coil current.

Output A or B Coil Settings



Command & Error | SAE J1939 | Factory Settings | Pulse Input Settings
Dashboard | Manual Mode | Global Settings | Coil Settings

Change Settings

Output Coil A Settings

Always Active **ON**

Current Feedback **ON**

Inverted **OFF**

Ignore Open **ON**

Coil A Min. Current 0.00 Amps

Coil A Max. Current 1.30 Amps

Ramp Up 3.0 Sec.

Ramp Down 3.0 Sec.

Output Coil B Settings

Active **ON**

Current Feedback **ON**

Inverted **OFF**

Ignore Open **ON**

Coil Min. Current 0.00 Amps

Coil Max. Current 1.30 Amps

Ramp Up 3.0 Sec.

Ramp Down 3.0 Sec.

Coils A&B PWM Hz 300

- Select Coil B Active for a Dual Coil Valve Control.
- Enter minimum and maximum current, dither frequency according to the valve spec.
- Enter ramp times.
- “Change Settings” to apply the changes to the unit’s temporary memory.
- Fine tune these settings as required.

Always Active (ON) – Output A is always active and cannot be set to OFF.

Coil B – active (ON/OFF) – Enables/Disables Output B.

Current feedback (ON/OFF)

- When Current Feedback is “ON”, coil current output is monitored and adjusted proportionally to the demand within the coil max and min settings.
- Current Feedback compensates the current due to supply voltage and coil temperature changes. When disabled, the output’s waveform is adjusted proportionally to the demand between 0% and 100% PWM Duty Cycle.

Inverted (ON/OFF)

- When Inverted is “ON”, the outputs are inversely proportional to the inputs. This is used with normally closed valves.
- When Inverted is “OFF”, the output is proportional to the input.

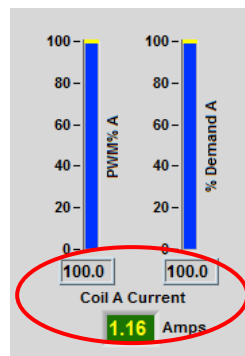
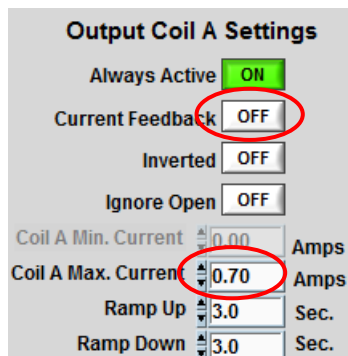
Coil A/B Min Current (0 to 3Amps)

- Determines the min current or duty cycle when the demand is > 0. Fine tune it to balance machine safety and valve responsiveness.

Coil A/B Max Current (0 to 3Amps)

- When Current Feedback is “ON”, it determines the max current.

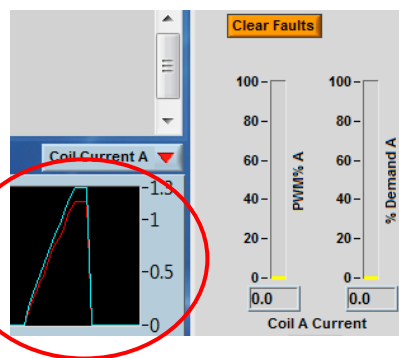
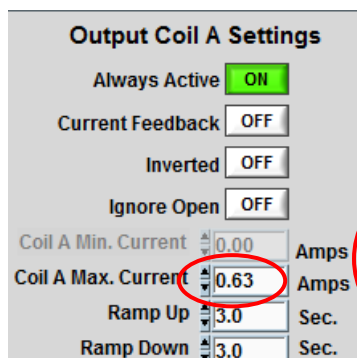
When Current Feedback is “OFF”, the Coil A/B Min Current setting does not apply and is grayed out. The Max Current is used as a reference for the evc/epc to declare a coil short condition when the output current is **0.5A higher** than the max setting.



The output PWM duty cycle matches the percent of demand.

The current will change when supply voltage and/or coil temperature changes.

The evc/epc does not declare an error because the output current 1.16A is **not 0.5A higher** than the max setting 0.7A.



The evc/epc will declare an error because the output current 1.16A is **0.5A higher** than the max setting 0.63A.

Ramp Up (.001 to 65.000 Seconds) – Determines the time for Output A or B to ramp **UP** from minimum to maximum current.

Ramp Down (.001 to 65.000Seconds) – Determines the time for Output A or B to ramp **Down** from maximum to minimum current.

Coil A&B PWM Hz (33 to 500Hz) – This is the PWM or Dither frequency according to the valve spec. (Sun cartridges are 140Hz).

Ignore Open (ON/OFF)

- When Ignore Open is “**ON**” and Current Feedback is “**ON**”, the evc/epc will **not** declare an error when the output duty cycle reaches 100%.
- When Ignore Open is “**OFF**” and Current Feedback is “**ON**”, the evc/epc will declare an error when the output duty cycle reaches 100%.
- When Current Feedback is “**OFF**”, Ignore Open does not have any impact.

Output Coil A Settings

Always Active ☒ ON

Current Feedback ☒ ON

Inverted ☐ OFF

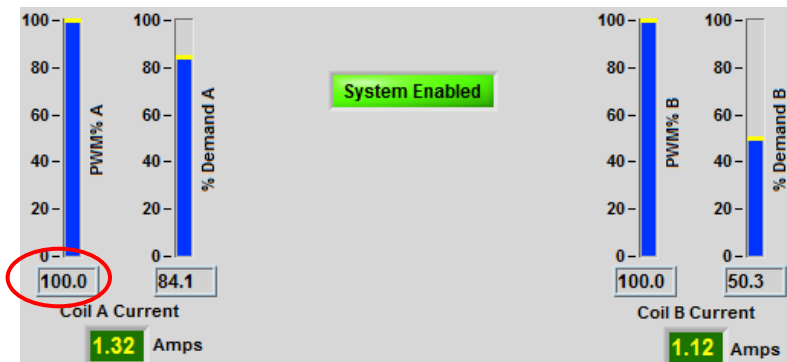
Ignore Open ☒ ON

Coil A Min. Current Amps

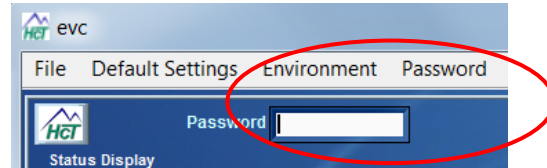
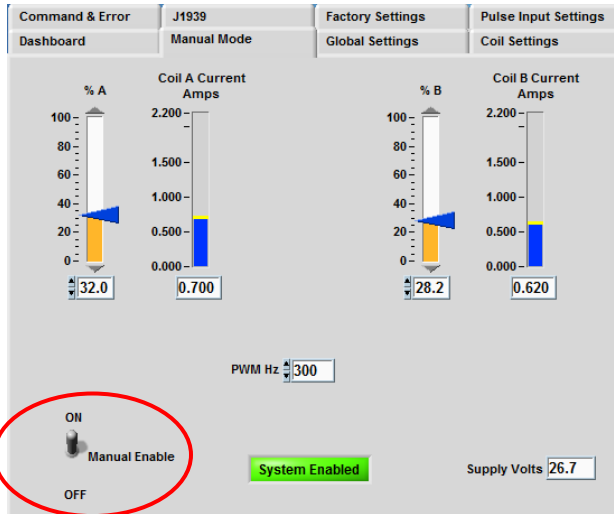
Coil A Max. Current Amps

Ramp Up Sec.

Ramp Down Sec.



Manual Mode



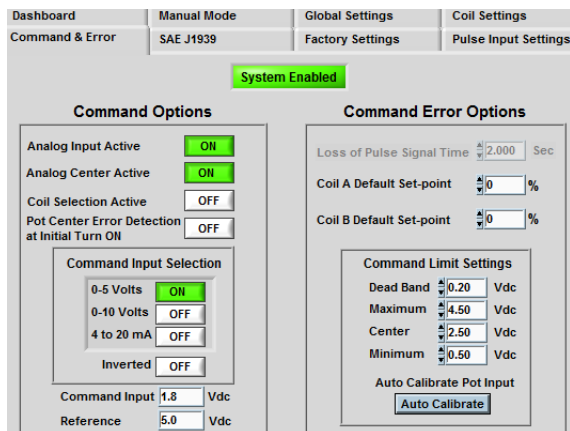
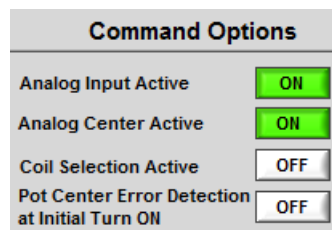
“Manual Mode” provides a quick method of testing the outputs. It can be used to manually verify that the system is working properly and to determine the max coil current for present conditions.

To unlock manual control, enter the **OEM password**. When the GUI is purchased, the OEM password is included. You can reset it, just don't forget it.

Caution

- All settings on this tab are temporary and will immediately affect the outputs.
- In manual mode all limits and controls are bypassed.
- The evc/epc goes back to normal operation when exiting the GUI in manual mode.
- Cycling power on the unit will reset the controller and remove manual override.

Command & Error Settings

Analog Input Active (On/Off) – Enables/Disables the command analog input.

Analog Center Active (On/Off)

- When enabled, the “Pot Center Voltage” becomes the zero demand point. One coil is driven from 0% to 100% on either side of the zero point
- Coil A is driven from the center voltage to the max voltage and coil B is driven from the center voltage to the min voltage
- This setting is used in Dual Coil Valve Control only. The “Coil Selection Active” switch is automatically **OFF** when the Center Active is “**ON**”.

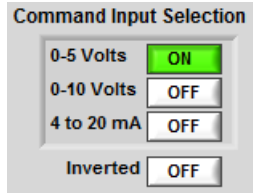
Coil Selection Active (pin 9, On/Off)

- When “**ON**”, the state of the reverse input pin is used to determine which coil will be driven. i.e. When the input is High, (+5V to Supply Volts) coil B is active and when Low (0V to 2.5V) coil A is active.
- This feature allows the full command resolution on coil A and B. It is used in the applications that a reciprocating action is triggered by a single high-low input.

Pot Center Error Detection at Initial Turn On

- When set, the module verifies the analog input is in the center deadband range before enabling the output(s) after the initial power up.
- Once the command is centered, the outputs will be enabled.
- To use this feature, the Analog Center Active has to be “**ON**”.
- This safety feature ensures that the system will NOT immediately go to the previous settings after cycling the power.

Command Input Selection



- 0-5V_{dc}
- 0-10V_{dc}
- 4-20mA

Inverted – When set, will reverse the response of the command input. The min input voltage demands 100% output and the max input voltage demands 0% output.

For industrial applications, the input is $\pm 5V_{dc}$ or $\pm 10V_{dc}$, please use a Command Signal Conditioner with the evc/epc controller.

CSC-0505 – accepts $\pm 5V_{dc}$ and converts to 0-5V.

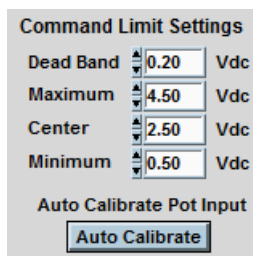
CSC-1005 – accepts $\pm 10V_{dc}$ and converts to 0-5V.

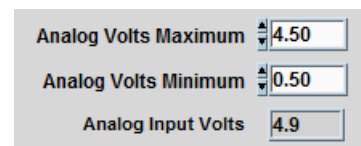


Loss of Pulse Signal Time – (1 mS to 65 Sec) Sets the time delay before a loss of pulse signal causes an error to be declared.

Coil A or B default set-point – (0-100%) When Set, Output A or B will ramp to this value when the limits are exceeded.

Command Limit Settings





Pot Deadband

- The Pot Deadband can only be used when the Analog Center Active is “ON”.
- Deadband is split one half above, one half below the center point.
- 0.2V_{dc} means coil A starts to have output at 2.6V_{dc}, coil B starts to have output at 2.4V_{dc}.

Pot Maximum

- It sets the max command input. This demands 100% output.
- If the command input is > POT Maximum + the Command Margin, the evc/epc will declare an error and the outputs go to the default settings.

Pot Center – Sets the value of the center of the deadband.

Pot Minimum

- It sets the min command value. This demands 0% output.
- If the command input is < POT Minimum - the Command Margin, the evc/epc will declare an error and the outputs go to the default settings.

Command Input	1.8	Vdc
Reference	5.0	Vdc

Reference voltage is 5V @ 250mA.

HCT has a manual command potentiometer – part number 999-10205 that outputs $+0.5V_{dc}$ to $+4.5V_{dc}$ when connected to a $+5V_{dc}$ user voltage.



Auto Calibrate Pot Input

- Calibrate the command limits – i.e. joystick or foot pedal etc.
- When the button is clicked, a box will appear with instructions.
- Adjust the input from full High to full Low, then adjust to the neutral or crossover point.
- “OK” to save the values.

Pulse Input Settings

Dashboard	Manual Mode	Global Settings	Coil Settings
Command & Error	SAE J1939	Factory Settings	Pulse Input Settings

Pulses Per Revolution
Maximum Displayed RPM
RPM Slow
RPM Stop
Analog Volts Maximum
Analog Volts Minimum
Analog Input Volts

Pulse Input Selections

Analog Input Active
0 to 5V
0 to 10V
 $\pm 1V$

Pulse Input Selections (Analog or Pulse) – Selects the pulse input or analog input.

0 to 5V, 0 to 10V & $\pm 1V$ (Enabled/Off) – Match the voltage range to the PPU or analog spec. $\pm 1V$ only applies to Pulse input.

Pulses per revolution *PPR* - (1 to 65535) – Scales the actual RPM from the measured pulse period.

Maximum displayed RPM (1 to 65535) – It scales the RPM gauge on the Dashboard.

Keep this value near the maximum RPM to assure the best resolution and accuracy.

RPM slow Set-Point or Max Load RPM (1 to 65535) – The set-point where coil A current starts to reduce in Anti-Stall or HP limit modes.

RPM stop Set-Point or No Load RPM (1 to 65535) – The set-point where coil A current reaches 0 in Anti-Stall or HP limit modes. If auto-reverse is ON, reverse cycle will start at this rpm.

Global Settings

Command & Error	SAE J1939	Factory Settings	Pulse Input Settings
Dashboard	Manual Mode	Global Settings	Coil Settings

Enable Auto-Reverse	<input type="button" value="ON"/>	Recover From Loss of Signal	<input type="button" value="ON"/>
Reverse time	<input type="text" value="5"/> Sec.	Hard Stop if Disabled	<input type="button" value="ON"/>
Reverse Retry Count	<input type="text" value="3"/>		
Reverse Set-point	<input type="text" value="43.0"/> %		
Fixed Set-point	<input type="text" value="98.0"/> %		
Command Margin	<input type="text" value="1.0"/> Vdc		

Enable Auto-Reverse (On/Off)

- When in HP Management or Anti-Stall mode, if the measured RPM is \leq RPM **Stop or No Load RPM**, after coil A ramps down to 0, coil B will ramp up to the Reverse Set-point.
- The module will try to restart normal operation after the reverse cycle completes.

Reverse Time (0 to 65 Sec) – It sets the time that coil B will remain in reverse during an Auto-Reverse cycle.

Reverse Retry Count (0 to 65535) –The number of times the Auto-Reverse cycle will try to restore normal RPM before declaring a fault and disabling the unit.

Reverse set-point (0 to 100%) – The percentage of the demand for coil B during the reverse cycle.

Fixed set-point (0 to 100%)

- The demand for coil A when the measured RPM is above the RPM slow or Max Load RPM in “anti-stall with fixed command” or “HP management with fixed command”.

Recover from loss of signal

- When “**ON**”, the evc/epc automatically recovers after the pulse input and the analog input(s) are back in range.
- The evc/epc automatically recovers from a SAE J1939 message timeout error.
- The evc/epc automatically recovers when the reference voltages or the supply voltages are outside the limits and recovered.
- The evc/epc will not automatically recover from a coil open or short error.

Hard stop if disabled

- When “**ON**”, coil A or B outputs are immediately set to zero without ramps whenever the enable switch is “**OFF**”.
- When “**OFF**”, the coil A or B outputs ramp down to zero.

Factory Settings

Dashboard	Manual Mode	Global Settings	Coil Settings
Command & Error	SAE J1939	Factory Settings	Pulse Input Settings

System Enabled

Reset to the last permanent saved condition

Reset Unit

Serial Number

A000000257

Start Date

03/20/2013

OEM Password

OEM

Save New Password

Reset Unit

It restores the controller to the last permanently saved configuration.

Serial Number

Specific for this unit, reference to the factory record.

Start Date

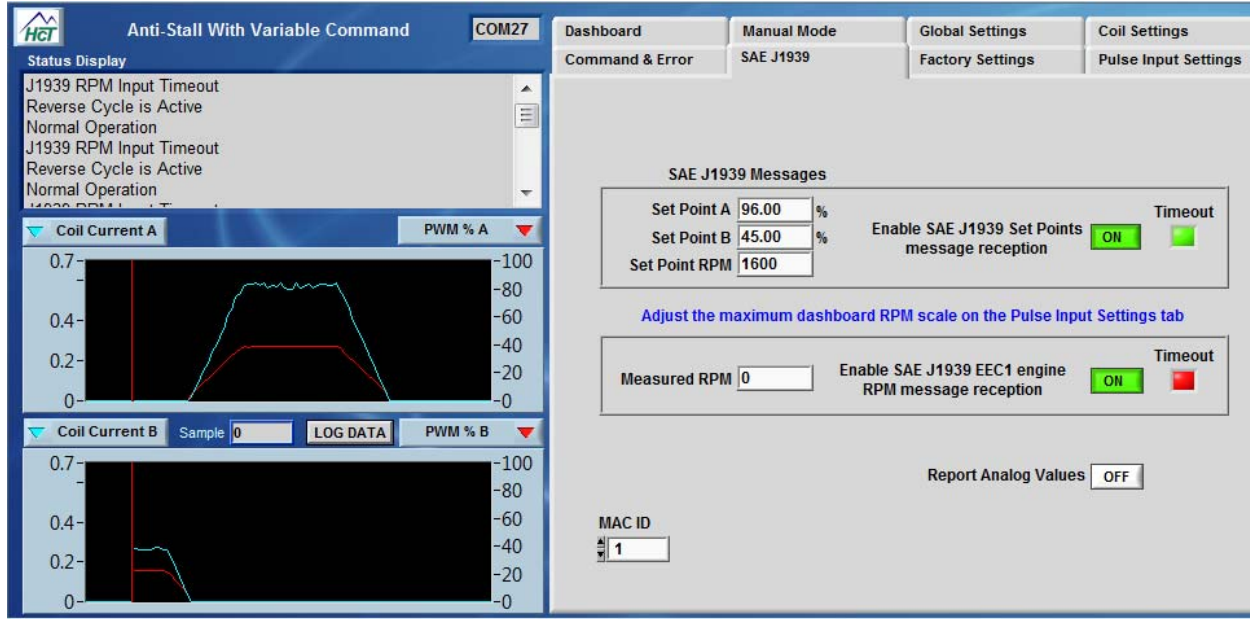
The date when the evc/epc is connected to the GUI for the first time.

OEM Password

Users may change the OEM password. Just don't forget it.

When the GUI is purchased, the initial password is included. If lost, please contact HCT.

SAE J1939



Set Point A or B % and Set Point RPM

- A J1939 message can set the demand for coil A and B. It can also set the commanded rpm.

Measured RPM

evc/epc can receive a J1939 message containing the measured engine RPM on PGN: 0xF004 (61444) SA: 0x00.

Timeout

- The box is red when the message has timed out.
- Outputs will ramp to the default settings when the message timed out. If "Recover from loss of signal" is "ON", the outputs will resume normal operation when the message is received.

MAC ID – Displays and allows changing the MAC ID. It is the network address for this specific evc/epc.

Report Analog Values – When "ON", it does not force to change settings.

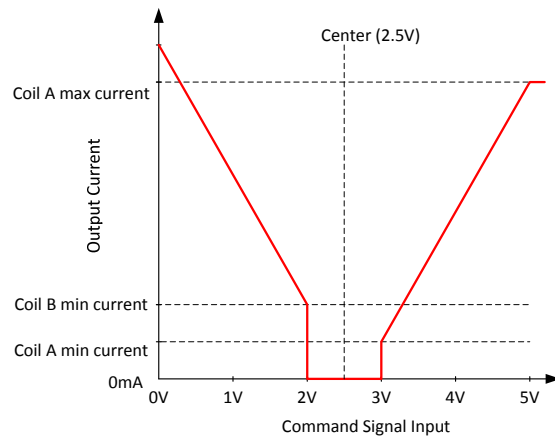
Operational Modes

Hydraulic Valve or Pump Control

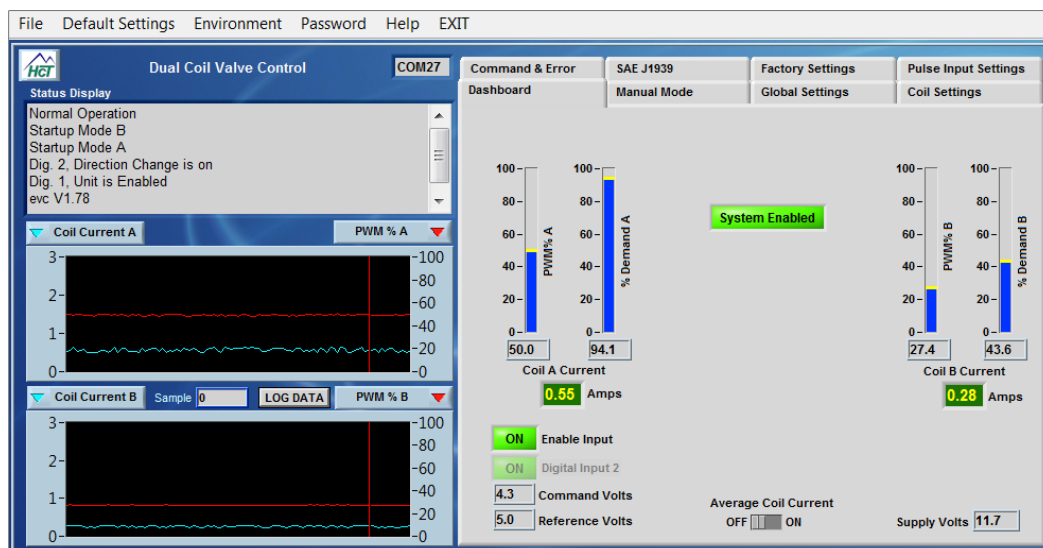
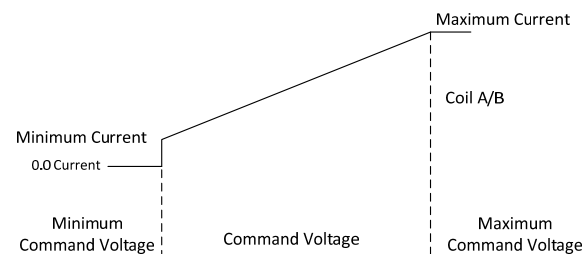
Coil A and B outputs may be driven independently for two Single-Coil valves or for one Dual-Coil Valve.

See **Coil Settings**, **Command & Error**, **Global Settings** sections.

Dual Coil Valve or Pump Control



Single Coil Valve or Pump Control

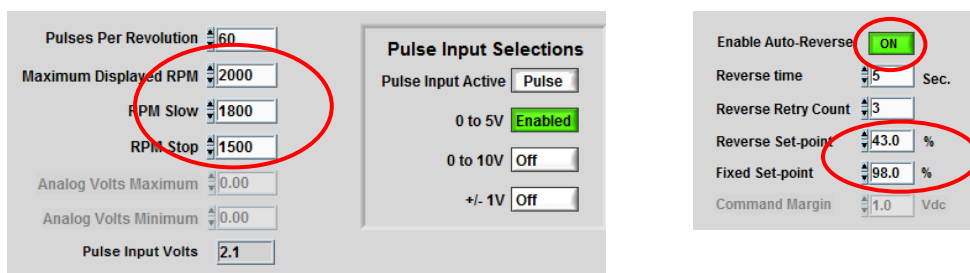


Anti-Stall or Horsepower Management With Fixed Command



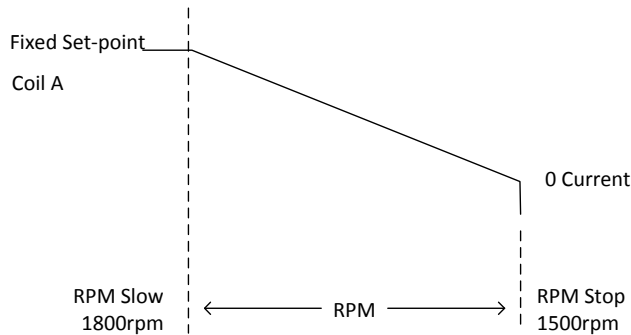
The Anti-Stall function unloads the engine to prevent the engine from stalling during a sudden load increase.

See **Coil Settings**, **Global Settings**, **Pulse Input Settings** sections.

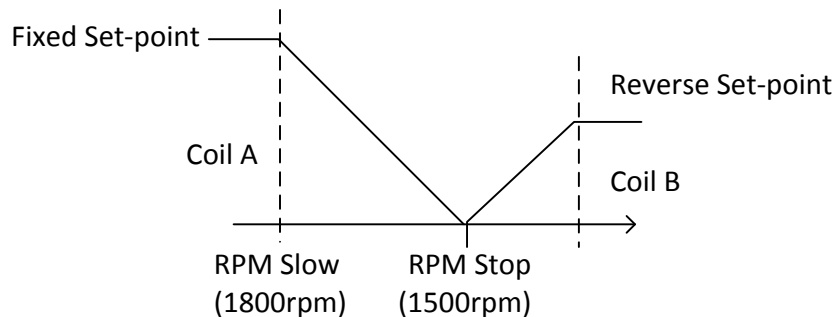


- When the measured RPM is above the “RPM Slow” (1800RPM), Coil A operates at the Fixed Set-point.
- When the measured RPM starts to drop below the “RPM Slow”, Coil A current is reduced proportionally to the measured RPM.
- Coil A current becomes zero when the measured RPM reaches “RPM Stop”. (1500RPM).

- When “Auto-Reverse” is “**OFF**”, Coil A current stays 0 until the RPM increases to above “RPM Stop”, it will increase proportionally to the measured RPM.



- When “Auto-Reverse” is “**ON**”, Coil A current stays at 0 and Coil B current will ramp up to the Reverse Set-point.
- After the reverse cycle is over, if the measured RPM increases to above RPM Stop, Coil A current increases proportionally. If not, the evc/epc will try Reverse Retry Count times, each time remaining in reverse for reverse time.
- If the Reverse Retry Count is depleted and the measured RPM remains below RPM Stop, the evc/epc will declare an error.
- At start-up the measured RPM must initially reach the “RPM Slow” to allow the evc/epc to ramp up Coil A. This ensures that the prime mover has started and is at a stable speed.



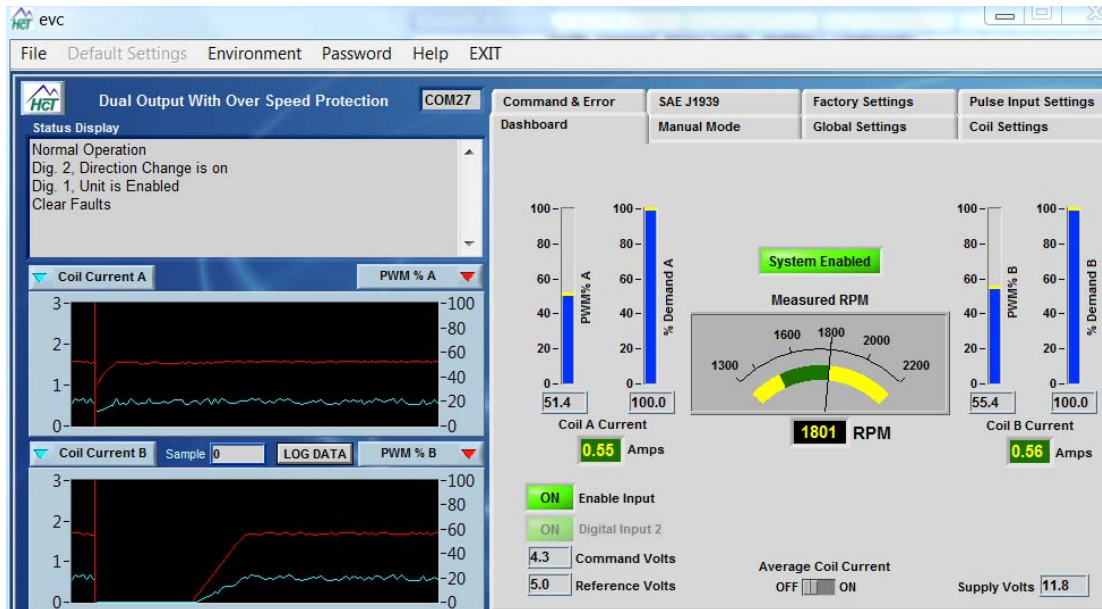
Anti-Stall or Horsepower Management With Variable Command

This mode is similar to the “Anti-stall with Fixed Command” or “Horsepower Management with Fixed Command”. The only difference is that this function allows a variable command input.

The input can be from an external POT, a joystick or a SAE J1939 message. The machine has automatic load reduction that prevents engine from stalling with full range of the input.

See **Coil Settings, Command & Error, Global Settings Tab, Pulse Input Settings** sections.

Dual Output With Over Speed Protection



Dual Output With Over-Speed Protection mode works with dual fixed displacement pumps and switches valves ON or OFF according to the measured RPM.

Pulses Per Revolution

Maximum Displayed RPM

Set-point B RPM

Set-point A RPM

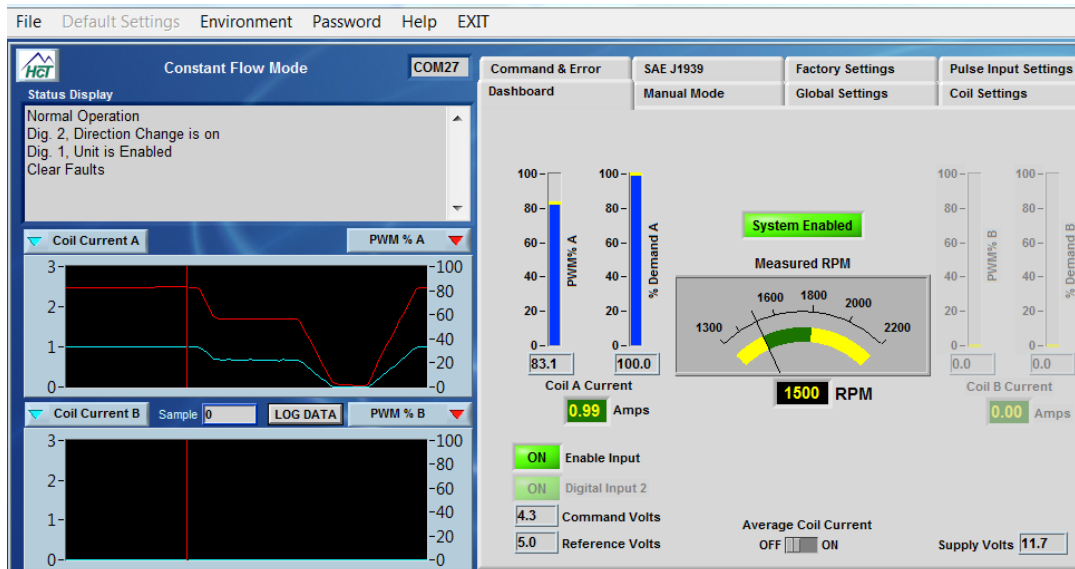
Analog Volts Maximum

Analog Volts Minimum

Pulse Input Volts

- The measured RPM can be from the alternator 'R' terminal or SAE J1939.
- When the measured RPM \geq Set-point A RPM, coil A ramps up to maximum current.
- When the measured RPM \geq Set-point B RPM, coil B ramps up to maximum.

Constant Flow Mode



Constant Flow Mode operates with variable displacement pump. It reduces the output of coil A to reduce the pump displacement when the engine rpm increases. Thus it maintains constant flow of the pump.

Pulses Per Revolution

Maximum Displayed RPM

Set-point B RPM

Set-point A RPM

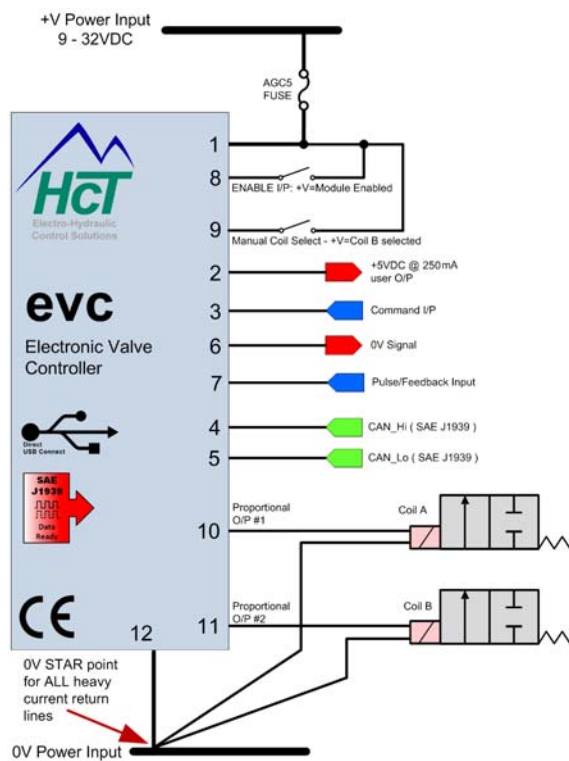
Analog Volts Maximum

Analog Volts Minimum

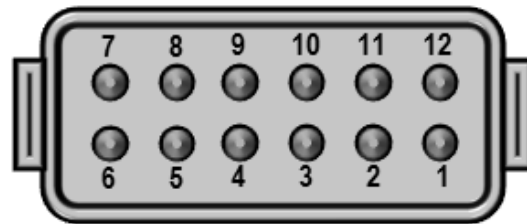
Analog Input Volts

- When the measured RPM is 1500rpm, output A provides max current.
- When the measured RPM is 1800rpm, output A provides 0 current.

Electrical Diagram

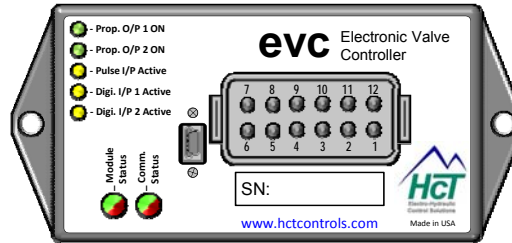


View of 12 way male connector DTF15-12PB



- | | |
|--------|--|
| Pin 1 | +9 to 32V _{dc} supply input |
| Pin 2 | +5V _{dc} @ 250mA regulated O/P |
| Pin 3 | Command Input |
| Pin 4 | CAN_H (J1939) |
| Pin 5 | CAN_L (J1939) |
| Pin 6 | 0V - Signal GND |
| Pin 7 | Pulse Input or analog input 2 |
| Pin 8 | Controller enable input (high = enable) |
| Pin 9 | Manual Selection of Coil A or B |
| Pin 10 | Coil A Proportional output + (sourcing) |
| Pin 11 | Coil B Proportional output + (sourcing) |
| Pin 12 | 0V power GND |

LED flash / Diagnostic Codes



Module Status LED

GREEN steady	Normal operation
RED 1 pulse	Output A short detected
RED 2 pulses	Output B short detected
GREEN 1 pulse	Output A open detected
GREEN 2 pulses	Output B open detected
RED 3 pulses	Input error detected
GREEN 3 pulses	Power supply error
GREEN 4 pulses	Reverse retry fail error
RED 4 pulses	Pot not centered at reset error
ORANGE 1 pulse	State error

Communication Status LED

GREEN steady	Normal operation
GREEN with ORANGE pulses	Serial port (GUI) traffic
ORANGE/ RED pulsing	Receiving SAE J1939 traffic
RED 1 pulse	SAE J1939 set point message timeout
RED 2 pulses	SAE J1939 engine rpm message timeout
RED 3 pulses	Pot not centered at reset error
ORANGE 1 pulse	State error

SAE J1939 CAN Bus

The evc/epc can be controlled by messages received over the SAE J1939 Bus.

The EEC1 (PGN: 61444 SA: 0) engine RPM (SPN: 190) can be monitored for use in anti-stall and closed loop operations.

The proprietary J1939 Command Message (PGN: 65281 through 65407 SA: 34) can be monitored for Coil A, Coil B and RPM Setpoints for various operation modes. This address is adjusted based on the Module ID. The relationship of the Module ID and the Command Message address is defined in a chart at the end of this section.

The evc/epc can transmit its status over the SAE J1939 Bus.

The proprietary J1939 Status Message (PGN: 65409 through 65535 SA: 34) is a multiplexed message with the first data byte indicating message 1 Status or message 2 Analog Values. This address is adjusted based on the Module ID. The relationship of the Module ID and the Status Message address is defined in a chart at the end of this section. When the J1939 Command Message is enabled, the Status Message will be transmitted. If Report Analog Values is enabled on the J1939 tab, the Analog Values will be transmitted. The content of the Status and Analog Values messages are detailed below.

Command Message Format

Transmission Repetition	40mS	
Data Length	8	
Data Page	1	
PDU Format	255	
PDU Specific	Module ID #	
Priority	N/A	
Parameter Group Number	65281 Through 65407	(FF01 Through FF7F)

<u>Start Position</u>	<u>Length</u>	<u>Parameter Name</u>
1	1 Byte	Always = 1
2-3	2 Bytes	Coil A Set point
4-5	2 Bytes	Coil B Set point
6-7	2 Bytes	RPM Set point

Status Message Format

Transmission Cycle Time	100mS	
Data Length	8	
Data Page	1	
PDU Format	255	
PDU Specific	Module ID + 128	
Priority	3	
Parameter Group Number	65409 Through 65535	(FF81 Through FFFF)

Status Message

<u>Start Position</u>	<u>Length</u>	<u>Parameter Name</u>
1	1 Byte	Always = 1 (Status)
2.1	1 bit	Command Input Error
2.2	1 bit	Reference Voltage Error
2.3	1 bit	Pulse Input LOS
2.4	1 bit	Power Supply High
2.5	1 bit	Power Supply Low
2.6	1 bit	Coil A Msg Timeout
2.7	1 bit	Coil B Msg Timeout
2.8	1 bit	RPM Msg Timeout
3.1	1 bit	not used
3.2	1 bit	Reverse Cycle Active
3.3	1 bit	Digital Input 1 State
3.4	1 bit	Digital Input 2 State
3.5	1 bit	Coil A Short
3.6	1 bit	Coil A Open
3.7	1 bit	Coil B Short
3.8	1 bit	Coil B Open
4.1	1 bit	Process A Ramping
4.2	1 bit	Process B Ramping
4.3	1 bit	Command Input Not Centered
4.4	1 bit	Reverse Cycle Retry Timeout
4.5	1 bit	System in Startup Mode
4.6	1 bit	System in Shutdown Mode
4.7	1 bit	not used
4.8	1 bit	not used
5-6	2 Bytes	Coil A Current (mA)
7-8	2 Bytes	Coil B Current (mA)

Analog Values Message

<u>Start Position</u>	<u>Length</u>	<u>Parameter Name</u>
1	1 Byte	Always = 2 (Analog Value)
2-3	2 Bytes	Command Input Value (volts x100 or mA x100)
4	1 Byte	0 = Command Volts, 1 = Command mA
5-6	2 Bytes	Pulse Input volts x100
7	1 Byte	Always = 0
8	1 Byte	Always = 0

Parameter Values

Coil n Set point

Data Length	2 Bytes
Resolution	0.00152903 %/bit, 0 offset
Data Range	0% to 100%
Operational Range	0 to 100%

Coil n Current

Data Length	2 Bytes
Resolution	1mA/bit, 0 offset
Data Range	0 to 65535mA
Operational Range	0 to 3000mA

RPM

Data Length	2 Bytes
Resolution	0.125 rpm/bit, 0 offset
Data Range	0 to 8,031.875 rpm
Operational Range	0 to 8,031.75 rpm

Module Id	Command PGN	Status PGN
1	FF01	FF81
2	FF02	FF82
3	FF03	FF83
4	FF04	FF84
5	FF05	FF85
6	FF06	FF86
7	FF07	FF87
8	FF08	FF88
9	FF09	FF89
10	FF0A	FF8A
11	FF0B	FF8B
12	FF0C	FF8C
13	FF0D	FF8D
14	FF0E	FF8E
15	FF0F	FF8F
16	FF10	FF90
17	FF11	FF91
18	FF12	FF92
19	FF13	FF93
20	FF14	FF94
21	FF15	FF95
22	FF16	FF96
23	FF17	FF97
24	FF18	FF98
25	FF19	FF99
26	FF1A	FF9A
27	FF1B	FF9B
28	FF1C	FF9C
29	FF1D	FF9D
30	FF1E	FF9E
31	FF1F	FF9F
32	FF20	FFA0
33	FF21	FFA1
34	FF22	FFA2
35	FF23	FFA3
36	FF24	FFA4
37	FF25	FFA5
38	FF26	FFA6
39	FF27	FFA7
40	FF28	FFA8
41	FF29	FFA9
42	FF2A	FFAA
43	FF2B	FFAB

Module Id	Command PGN	Status PGN
44	FF2C	FFAC
45	FF2D	FFAD
46	FF2E	FFAE
47	FF2F	FFAF
48	FF30	FFB0
49	FF31	FFB1
50	FF32	FFB2
51	FF33	FFB3
52	FF34	FFB4
53	FF35	FFB5
54	FF36	FFB6
55	FF37	FFB7
56	FF38	FFB8
57	FF39	FFB9
58	FF3A	FFBA
59	FF3B	FFBB
60	FF3C	FFBC
61	FF3D	FFBD
62	FF3E	FFBE
63	FF3F	FFBF
64	FF40	FFC0
65	FF41	FFC1
66	FF42	FFC2
67	FF43	FFC3
68	FF44	FFC4
69	FF45	FFC5
70	FF46	FFC6
71	FF47	FFC7
72	FF48	FFC8
73	FF49	FFC9
74	FF4A	FFCA
75	FF4B	FFCB
76	FF4C	FFCC
77	FF4D	FFCD
78	FF4E	FFCE
79	FF4F	FFCF
80	FF50	FFD0
81	FF51	FFD1
82	FF52	FFD2
83	FF53	FFD3
84	FF54	FFD4
85	FF55	FFD5
86	FF56	FFD6

Module Id	Command PGN	Status PGN
87	FF57	FFD7
88	FF58	FFD8
89	FF59	FFD9
90	FF5A	FFDA
91	FF5B	FFDB
92	FF5C	FFDC
93	FF5D	FFDD
94	FF5E	FFDE
95	FF5F	FFDF
96	FF60	FFE0
97	FF61	FFE1
98	FF62	FFE2
99	FF63	FFE3
100	FF64	FFE4
101	FF65	FFE5
102	FF66	FFE6
103	FF67	FFE7
104	FF68	FFE8
105	FF69	FFE9
106	FF6A	FFEA
107	FF6B	FFEB
108	FF6C	FFEC
109	FF6D	FFED
110	FF6E	FFEE
111	FF6F	FFEF
112	FF70	FFF0
113	FF71	FFF1
114	FF72	FFF2
115	FF73	FFF3
116	FF74	FFF4
117	FF75	FFF5
118	FF76	FFF6
119	FF77	FFF7
120	FF78	FFF8
121	FF79	FFF9
122	FF7A	FFFA
123	FF7B	FFFB
124	FF7C	FFFC
125	FF7D	FFFD
126	FF7E	FFFE
127	FF7F	FFFF

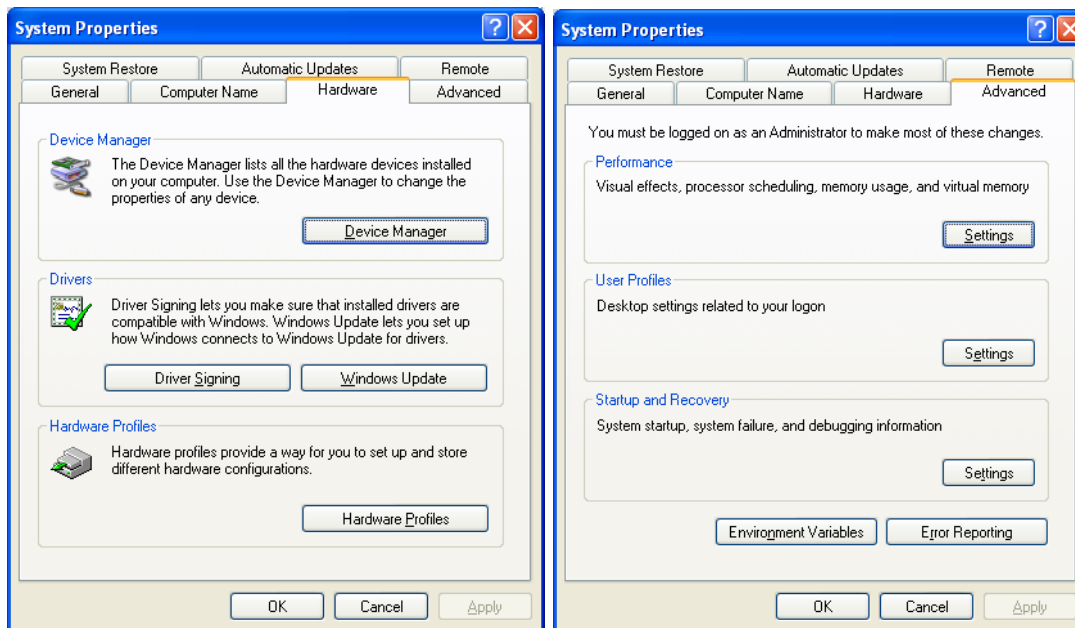
Problems Installing the Com Port Adapters

Windows does not like Com ports with the same name, and some devices might hang onto a com port when not in use. Here is how to clean and remove problem ports.

Option 1

Devices that have been installed but are not currently available are "phantom devices". These devices are not usually displayed in the device manager, but can be made to be displayed.

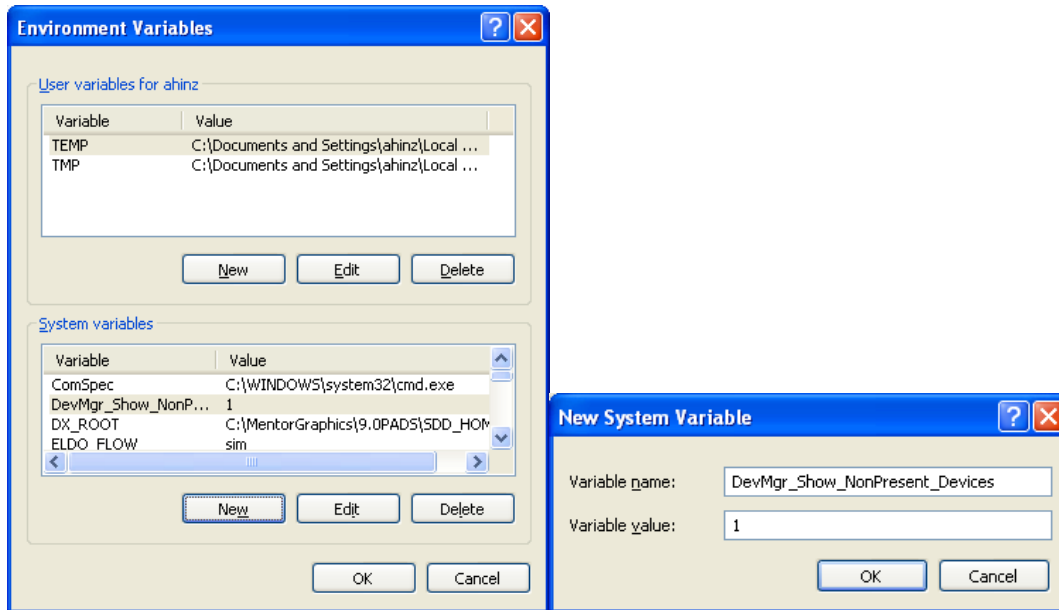
This allows device properties to be changed or devices to be uninstalled even though the device is not physically connected to the PC.



Control Panel ⇒ System Properties

⇒ "Advanced" option and click "Environment Variables"

⇒ In the System Variables sections, click "New"



⇒ "DevMgr_Show_NonPresent_Devices" and set the value to 1, then click OK.

⇒ Close the System Properties panel.

⇒ Open the Device Manager

⇒ "View" ⇒ Show Hidden Devices".

Device Manager will show all hidden and phantom devices.

⇒ Uninstall the phantom devices by right clicking on them, and 'delete'.

⇒ Reboot the PC.

When you connect PC to the unit, give the computer time to find and install the driver.

Option 2

In control panel, "Add or Remove Programs"

Remove old versions of FTDI software.

Remove Windows Driver Package - FTDI CDM Driver Package.

- ❖ Mining & Exploration
- ❖ Agriculture
- ❖ Cranes & lifts
- ❖ Refuse & Recycling
- ❖ Construction
- ❖ Off-Road vehicles
- ❖ Forestry, Wood & Pulp
- ❖ Reclamation & Salvage
- ❖ Oil Field & Sands
- ❖ Demolition Equipment
- ❖ Cooling Solutions
- ❖ Military Apparatus
- ❖ Specialty Use
- ❖ Remote Control
- ❖ Power Generation
- ❖ Emission Controls
- ❖ Integrated Drivers
- ❖ Valve & Pump Controls



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High Country Tek, Inc.

208 Gold Flat Court
Nevada City, CA, 95959
Tel: (1) 530 265 3236
Fax: (1) 530 265 3275