HFS-J

Hydraulic Fan Drive
System 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 that provide solutions for specific everyday functions as well as our 'DVC family' of fully adaptable user programmable units that can be integrated together to enable large area networked system solutions.
The modules are typically used in mobile, industrial and marine applications, but are also applied successfully in several other growing global market segments.

Because High Country Tek has an industry unique non-repairable product protection system, with every module encapsulated in solid flame resistant material for maximum durability, electrical integrity and complete environmental security, we have to deliberately select the highest quality components from our suppliers at all times, ensuring our 100% operating shipped product.

HCT is also a market leader in many application arenas, including hydraulic generator and hydraulic fan system controls where significant fuel, emission and operational savings can be realized by using one of the aforementioned specialty units to optimize the applications operation.

HCT's market neutrality and flexible product configuration approach offers dependable integration with virtually 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.

www.highcountrytek.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 to discuss arranging a course specific to your company needs.

Thank you for using High Country Tek Inc. Products*.*

Manual Index:

Welcome to the High Country Tek Inc. (HCT) HFS-J Hydraulic Fan Drive system controller user guide, and thank you for selecting this HCT controller to use in your application
The following information is designed to allow you to connect, set-up and optimize the HFS-J module.
If you have used HCT products before, you will recognize some of the instructions and settings. For those of you that are new to HCT, please read the directions with care and be sure that if you have any questions regarding this industry unique controller, then please contact us one of the numbers given on the back page of this manual.
We value our customers, their experience and abilities and ask that if you would like to see any additions, subtractions or find any errors in this publication, that you contact HCT's customer service so that we can correct the information and make sure that our programming community is using the latest information.

If you require urgent support, more information or would like specific programming areas clarified, you can contact us on the customer support number at 1 530 265 3236 or E-mail us through our website at www.highcountrytek.com, giving details of your issue and how we can contact you.

Introduction:

This manual is designed to provide information needed for the installation and use of the HFS-J Hydraulic Fan System Controller. Its intended user is qualified trained service personnel that understand the hazards involved in an electromechanical environment. It is recommended that this manual be read in its entirety before installation is begun with particular attention paid to caution and safety information.

Cautions:

Changing setup values and limits under computer control while the machine is operating may cause sudden machine movement, which may lead to possible **injury** or **death**. It is strongly recommended that any moving parts are disabled prior to any alignment procedure whenever possible. In any case, caution should be exercised during any procedure and work should be completed only by qualified trained personnel.

Warranty Information:

High Country Tek Guarantees this product to be free of defects in materials and workmanship for a period of one year extending from the date the unit was 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. If necessary, contact the factory for return authorization by phone (530) 265-3236, Fax (530) 265-3275, E-Mail info@highcountrytek.com or by writing our service department at, High Country Tek, Service Dept., 208 Gold Flat Court, Nevada City, CA 95959. To help us serve you better, please have the units full Model / Part Number and Serial Number available when contacting the factory for any reason. Do not return products to the factory without prior authorization and a RMA number attached.

Controller Updates:

HCT continuously improve the controllers and make additional information and/or features available.
Please check on-line at www.highcountrytek.com for the latest products, updated software and controller information.

'HFS-J' Hydraulic Fan System Controller:

The HFS-J is the latest addition to the **High Country Tek (HCT)** family of hydraulic fan control modules. The highly cost effective HFS-J has enough processing power and input output functionality when operating as a single control module to support a wide range of hydraulic fan system applications. As with all of the HCT modules, the HFS-J is packaged in a small rugged enclosure and encapsulated in flame resistant resin to withstand extreme conditions in the harsh mobile operating environment.

The HFS-J module is ideally suited for today's hydraulic OEM, distributor or system builder. With both mechanical and electrical robustness paramount in the design priority, Windows™ compatible easy to use set-up software and full CE compliance means this one product can through, the many configurations and features available, be used across multiple platforms, markets and applications.
This units cost effectiveness will become quickly apparent through the reduction in inventory costs and stocking needs as well as in the reduced costly engineering time taken usually associated with the design to delivery cycle.

Programming of the controller parameters and all diagnostics is done through the RS232 connector pendant. This is a separate connector from the main power, signal and output connector so that optimization or operational observation can be carried out without disturbing the cooling system operation. When programming, changes or observation of the module function is required, connection can be made through a standard computer serial connection, either directly via a 9 way 'D' type connector or through one of the many available USB to serial cables along with the software program HFS-J and the HCT programming interface cable (**Part No: 999 - 10154**) is required for communication from the controller to a Windows™ based PC.

The HFS-J is designed to make the fan system set-up easy to configure and control. The hardware contains the framework software where the parameters can be changed depending on the user's needs via the PC graphical user interface (GUI).

The GUI has been organized into various user screens that are logical and simple to understand. Terminology has been used that is commonplace through the mechanical, hydraulic, mobile and fan drive industry to allow easy configuration, set-up and running and is intended to cater for a wide range of users with varying levels of computer familiarity.

This new version of proven controller hardware is ideally suited to equipment upgrades as well as fitment by OEM's at machine build time and offers all the necessary features required by today's modern engines that use the J1939 communications standard.

The controller will take information directly from the J1939 bus for the common temperatures broadcast such as Engine RPM, Water, Charge air and Transmission temperature making system integration very quick and easy. The controller allows the user to also have up to 2 additional external inputs from thermistor or temperature switches as the same time if required, these can be used as fan speed overrides if for example, the engine retarder or air/conditioning is selected in the vehicle increasing the heat load needing to be cooled.

The HFS-J product is backed by **High Country Tek's** industry leading product reliability, easy to use software design and market leading customer service and technical support as well as on-time delivery while the well designed and intuitive graphical user Interface (GUI), allows you to program multiple configurable modes of operation available within the one module.

Product Overview

- *NO software experience needed to apply this controller successfully.*

- Pre-written 'Fan Drive' software for easy, fast system configuration, development and production.

- Intuitive Graphical User Interface (GUI) runs on any PC with Windows® XP or newer software (.net compatible).

- 10 – 30VDC operation with full reverse polarity and **SAE J1455 protection**.

- Extended -40ºC (-40ºF) to +85ºC (+185ºF) controller operational temperature range.

- **CE approved** to latest international test standards.

- **J1939 CAN Bus communications** for engine and temperature zone data Inputs

- ******J1939 temperature data hard coded for :

  - ❖ **Engine water/coolant at PGN 65262,**
  - ❖ **Transmission Oil temperature at PGN 65272**
  - ❖ **Intake manifold/charge air Temperature at PGN 65270**

- All inputs and outputs protected from shorting to ground or the power supply.

- Diagnostic LED display shows I/O status and module operation at a glance.

- 'Blinking' error code LED for fast on-site 'health check'.

- System wiring and coil fault detection and alarms.

- Alarm output for integration into host system.

- **IP68 (NEMA 6P)** rating on module for harsh environment reliability (connector IP rating may differ).

- Single Deutsch Metri-pack 150 series I/O 12 way connector for easy system wiring.

- Separate RS232 communications connector for programming, monitoring and diagnostics.

- Rugged encapsulated product withstands harsh environments found in mobile applications.

- Non Volatile Memory maintains ALL settings without power

- Completely user configurable for setting confidentiality.

- *Compatible with all manufacturers fan system hydraulic valve and pump control products.*

**J1939 Temperature Data NOTE:-

If the J1939 PGN data for temperature is NOT correct for a particular engine, HCT can change the PGN number to one that is correct and re-issue the program code to you. Please use the contact numbers on the back page of this manual to discuss this with our customer support personel.

Product Application Guidelines:

ALWAYS do the following:

- Take a few minutes to FULLY read THESE information / data sheets BEFORE starting.
- Keep High Voltage AC cables separate from Low Voltage DC signal and supply cables.
- Make sure the unit supply voltage is the same as the coils on the valve being driven !
- Ensure that you are aware of the adjustments and consequences on the electronics and hydraulics.
- Make sure you have the correct tools to do the intended job (i.e. P.C., software) e.t.c.
- 'Isolate' this unit from all other equipment BEFORE any form of welding takes place.
- Check ALL connections to and from this unit to ensure NO short or OPEN circuits.
- Check the units supply voltage is CORRECT, ' ELECTRICALLY CLEAN ' and STABLE.
- Operate the units within specified operating temperature for best & reliable performance.
- Ensure that any unused wires / terminals are terminated safely and not shorted together.
- Isolate the controller if ANY form of battery charging or battery boosting takes place on the vehicle.
- Ensure ALL valve connectors are wired correctly, secure, locked and connected to correct coils.
- Observe the set-up procedures in this manual for best operational results.
- Follow and abide by local and country health & safety standards – protect yourself and others !

NEVER do the following:

- Arc Weld or Charge Batteries with this driver unit connected as damage can occur.
- Attempt to use this unit if you are unsure of electrical OR hydraulic connections or expected operation.
- Attempt to use this unit in Areas where other AC or DC coils HAVE NOT been fully suppressed.
- Use a power supply that is not rated for the correct required O/P current under full load.
- Allow wires TO or FROM the unit to short circuit (to each other or chassis/cabinet e.t.c.).
- Attempt to use this unit in areas of intense RF without adequate screening measures.
- Disconnect or connect wires to or from this unit unless it isolated from the power supply.
- Use this unit in temperatures that exceed those specified as operation may be effected.
- Start this unit without ensuring ALL work areas are clear of personnel !

Software Safety:

The software has been carefully written to give the user the maximum system configuration flexibility while being transparent in operation and easy to use, even for novice system builders and operators.

To ensure safety when using the software and to prevent accidental connection to another module that is not a HFS-J, rules have been written into the software to ensure correct operation at all times:

When the PC running the GUI is first connected to a powered HFS-J, and before any data exchange can be allowed, a 'Handshake' takes place that confirms the HFS-J internal software (BIOS) is compatible, the serial number and the HFS-J part number. The GUI then checks to ensure that its own revision is compatible with the module software and only then allows the PC and the module to communicate and share data.

If at any point during the process above an error or miss-match is detected, the GUI software will NOT allow communications and will inform the user of the problem via a clear message in the 'Status' window.

Module Familiarity:

Controller 'STATUS' led – Bi-color, indicates what the module is doing at any given time.

Bi-color, Controller Fault 'Blink' code and Fan reverse cycle indicator LED

Flame retardent epoxy resin material for complete IP68 (NEMA 6P) rating

RS232 Communication and programming 4 way plug

Full CE to latest test standards, J1455 (load Dump) and J1939 compliance

FAN CONTROLLER
J1939 Compatable

HFS-J
S/N: A00001

HcT
Highcountrytek.com

CE   MADE IN U.S.A   RS232

STATUS
REV. / ERROR

3 x # 8 (5mm) mounting holes

Heavy duty cables used for programming harness

Industry standard 12 way sealed Deutsch main I/O connector
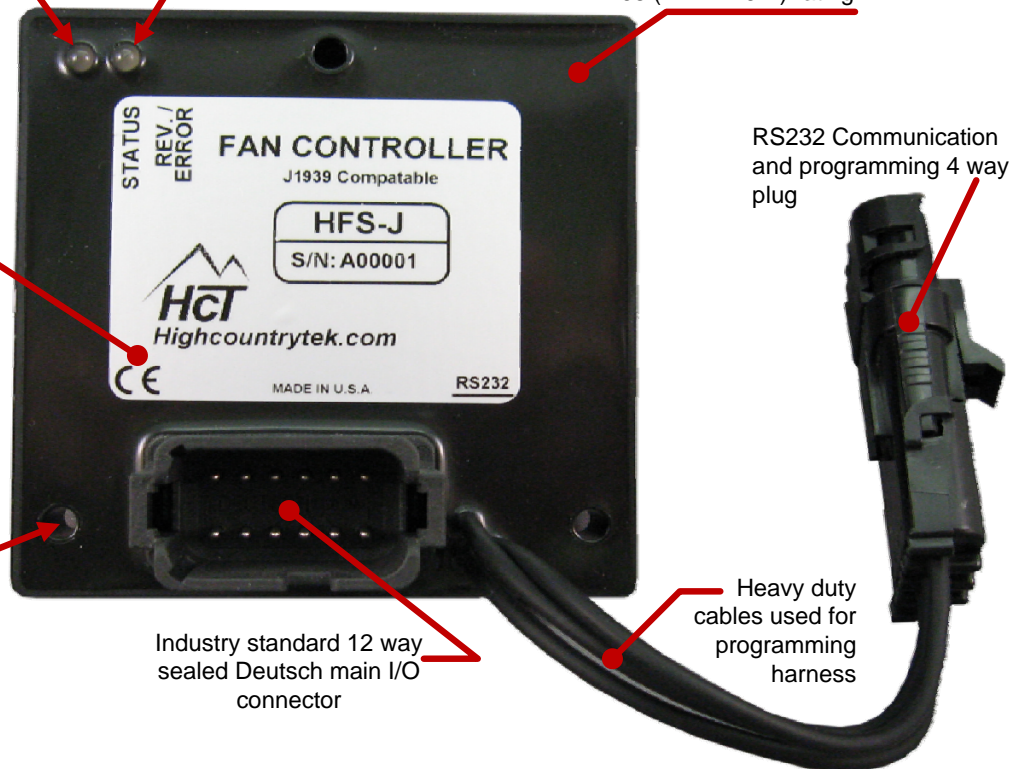
NOTE:

This module has local diagnostic capabilities by way of the two Bi-Color (Red / Green) LED's mounted on the front of the unit. These LED's are used to show the user a variety of 'Blink' codes that equate to the precise issue or error being seen by the controller, so locating and fixing an issue will be quick and effective. This feature is especially useful in the field where test equipment may not be available.

Electrical Specification Overview:

1) Board Style: High Country Tek unique size and mounting.
2) Connector Type: 12 way male Deutsch DT series
3) Comms. I/O connector: 4 way Packard MALE (Tower) connector on 6 inch, 4 core umbilical cable.
4) Comms. Type: Serial data at 57.6K Baud through PC USB/Serial port.
5) Input Supply Voltage: 10 – 30VDC (absolute maximums)
6) Input supply current: ~200mA quiescent + valve currents
7) Input supply protection: SAE J 1455 & User supplied in-line fuse (AGC5)
8) Command Input types: SAE J1939 & 2 x external discrete thermistor/switch contact
9) Thermistor types: 2 wire Resistance variety only (see table)
10) Thermistor Protection: Open and short circuit detection
11) Proportional valve current range: ~0 – 3000mA (with current feedback circuit)
12) Directional valve current range: ~0 – 3000mA.
13) Output Protection: Open and short circuit detection
14) Alarm output current: ~0 – 3000mA.
15) 'Reverse' input signal value range: >+2.5VDC to +V module supply
16) 'Reverse' input signal impedance: >100K Ohm
17) Digital Input De-Bounce: 150mS (triggered on rising edge)
18) Industry Compliance: **CE** certification to latest standards
19) Environmental: Totally encapsulated unit for mechanical protection.
20) IP rating: IP68 (Module only - derate for connectors as required)
21) NEMA rating: 6P (Module only - derate for connectors as required)
22) Humidity: 95 – 100% Non condensing
23) Storage Temp range: -60 to + 90 Deg C (Max)
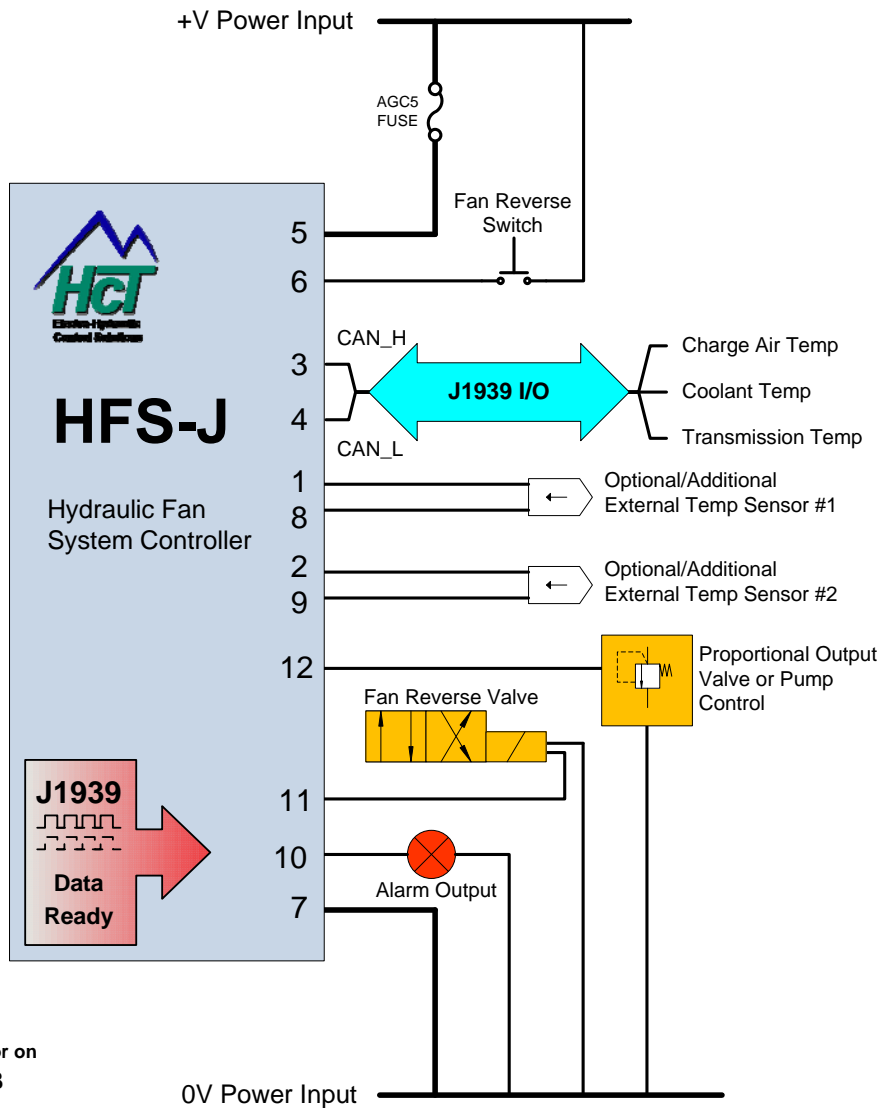24) Operating temp range: -40 to + 80 Deg C (max)

Note:

ALL controller and system response adjustments are made through graphical user interface software,
See 'HFS-J   Software' section in this manual for full details.

Application Examples:

+V Power Input

AGC5 FUSE

5

6

Fan Reverse Switch

NOTE:-

Controller MUST have in-line fuse fitted by user in +V Power Input for system protection.

HFS-J

Hydraulic Fan System Controller

CAN_H

3

J1939 I/O

4

CAN_L

- Charge Air Temp
- Coolant Temp
- Transmission Temp

1

8

Optional/Additional External Temp Sensor #1

2

9

Optional/Additional External Temp Sensor #2

12

Proportional Output Valve or Pump Control

Fan Reverse Valve

J1939

11

Data Ready

10

7

Alarm Output

NOTE:-
View looking at 12 way male connector on
HFS - J controller - DTF15-12PB

0V Power Input

Pin 1:- Thermistor #1 +signal input.
Pin 2:- Thermistor #2 +signal input.
Pin 3:- CAN_H Input (**J1939**)
Pin 4:- CAN_L Input (**J1939**)
Pin 5:- +Vin - 10 – 30VDC Power supply Input
Pin 6:- Reverse fan input (Momentary)
Pin 7:- 0V power input (Common)
Pin 8:- 0V—Signal common #1
Pin 9:- 0V—Signal common #2
Pin 10:- Alarm output drive (3A max sourcing)
Pin 11:- Reverse valve output drive (3A max sourcing)
Pin 12:- Proportional valve output (3A max sourcing)

1 2 3 4 5 6
12 11 10 9 8 7
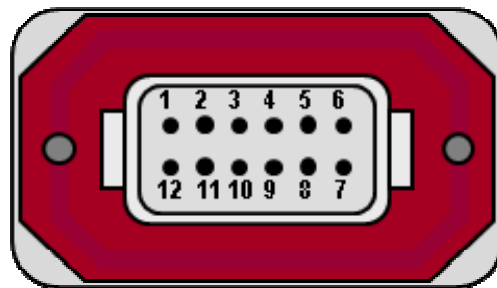
Error LED code descriptions:

Status LED	Reverse / Error LED	Discription	Alarm Output	Fan Output	Reverse Output	NOTE
OFF	OFF	Power Supply < 9.3 VDC	OFF	OFF	OFF	1
OFF	OFF	Power Supply > 30 VDC	OFF	OFF	OFF	1
ON	OFF	Normal Operation	OFF	As Demanded	As Demanded	2
ON	OFF	J1939 RPM Timeout	OFF	Min Current	As Demanded	3
ON	OFF	Reverse Sequence Active	OFF	Reverse SPD %	ON	2
ON	Flashing	J1939 Engine Coolant Timeout	ON	Min Current	As Demanded	3
ON	Flashing	J1939 Transmission Temp Timeout	ON	Min Current	As Demanded	3
ON	Flashing	J1939 Intake Man. Temp. Timeout	ON	Min Current	As Demanded	3
Code = 1	Flashing	J1939 Engine Coolant Over Temp	ON	Min Current	As Demanded	3, 7
Code = 2	Flashing	J1939 Intake Man. Over Temp	ON	Min Current	As Demanded	3, 7
Code = 3	Flashing	J1939 Transmission Over Temp	ON	Min Current	As Demanded	3, 7
Code = 1	Flashing	PWM Output Open	ON	Min Current	OFF	4
Code = 2	Flashing	PWM Output Short	ON	Min Current	OFF	4
Code = 3	Flashing	Alarm Output Short	OFF	Min Current	OFF	3
Code = 5	Flashing	Reverse Output Short	ON	Min Current	OFF	3
Code = 1	Flashing	**Unit Temp >80°C**	**OFF**	**OFF**	**OFF**	5
Code = 3	Flashing	Thermistor 1 Short	ON	Min Current	OFF	6
Code = 4	Flashing	Thermistor 1 Open	ON	Min Current	OFF	6
Code = 5	Flashing	Thermistor 1 Over Temp	ON	Min Current	OFF	6, 8
Code = 6	Flashing	Thermistor 2 Short	ON	Min Current	OFF	6
Code = 7	Flashing	Thermistor 2 Open	ON	Min Current	OFF	6
Code = 8	Flashing	Thermistor 2 Over Temp	ON	Min Current	OFF	6, 8

NOTES:	
1	Wait for Correct Power
2	Normal Operation
3	Fan Output min current until corrected (Max Fan SPD)
4	Attempt to drive min current to fan until corrected
5	Wait until unit temp < 70°C
6	Fan Output min current until corrected (Max Fan SPD) Reverse Sequence Cancled
7	Reverse Cycle Operates Normaly
8	Reverse Cycle Normal If Reverse Input Switch is used and Overtemp Condition is present before start of cycle

Module Connection Descriptor:

Thermistor #1 Input (Connector terminal 1):

This input is designed to accept a standard NTC thermistor OR a bi-metallic temperature switch. This input should be used in conjunction with the 0V pin # 8 on the connector; the choice is made via the GUI.
If the switch input is selected through the GUI will allow the user to select either HI to LO OR Lo to HI operation.
If this input is NOT used, it should be de-selected by the GUI to avoid false input commands.

Thermistor #2 Input (Connector terminal 2):

This input is designed to accept a standard NTC thermistor OR a bi-metallic temperature switch. This input should be used in conjunction with the 0V pin # 9 on the connector; the choice is made via the GUI.
If the switch input is selected through the GUI will allow the user to select either HI to LO OR Lo to HI operation.
If this input is NOT used, it should be de-selected by the GUI to avoid false input commands.

CAN HI Input (Connector terminal 3):

This is one wire of a twisted pair that connects the controller to the applications J1939 Bus. The cable should be suitable for this type of data connection. Please observe Bus protocol rules and fit termination resistors if required by your configuration

CAN LO Input (Connector terminal 4):

This is the second wire of a twisted pair that connects the controller to the applications J1939 Bus. The cable should be suitable for this type of data connection. Please observe Bus protocol rules and fit termination resistors if required by your configuration

Fan Reverse select Input (Connector terminal 5):

This is a momentary signal input and only required that the input be pulled to +Power Supply for approx. 500mS to initiate the reverse sequence settings, This input is de-bounced in the module software to avoid false triggers.

+Power Supply Input (Connector terminal 6):

This terminal is the **MAIN +Supply** Voltage input on the controller. To provide the best possible noise resistance and current capability, this input should be taken directly to battery Positive or power supply +V output using a large current capacity cable.

NOTE:
Make sure the unit has an in-line fuse fitted to protect the system, the module and the warranty.

Power Common Input (Connector terminal 7):

This terminal is the **MAIN 0V** or Power Common input on the card. To provide the best possible noise resistance and current capability, this input should be taken directly to battery negative or power supply 0V (GND) output using a large current capacity cable.

Signal Common Input (Connector terminal 8):

This input should be used in conjunction with the thermistor input # 1and is _internally connected_ to Power Common (Terminal 7) on the card. To provide the best possible noise resistance Sig Com should be used as the only ground for the temperature sensors.

Signal Common Input (Connector terminal 9):

This input should be used in conjunction with the thermistor input # 2 and is _internally connected_ to Power Common (Terminal 7) on the card. To provide the best possible noise resistance Sig Com should be used as the only ground for the temperature sensors.

Alarm Output (Connector terminal 10):

This output can SOURCE up to 3 amps at supply voltage and can be used to connect to an audio device or light indicator to show the systems alarm condition. This output is reverse polarity, short and open circuit protected and monitored for short circuits to ground connection by the controller GUI software.

NOTE:

If this output is used with an inductive load unless a correct 'flyback' device is used to protect the controller from back EMF.

Because of the open and short monitoring feature, there is a minimal current present at all times, even when the output is OFF.

Reverse Valve Output (Connector terminal 11):

This output can SOURCE up to 3 amps at supply voltage and can be used to connect to the directional valve or stroker polarity relay used to reverse the fan motor flow direction when the purge or De-ice feature is used. This is a normally OFF output that goes to supply voltage when energized.
This output is reverse polarity, short and open circuit protected and fully monitored by the controller GUI software.

Proportional Valve Output (Connector terminal 12):

This output can SINK up to 3 amps at supply voltage and can be used to directly control the proportional valve or pump stroker used for fan speed control. This output is reverse polarity, short and open circuit protected and fully monitored by the controller GUI software.

Serial Communications:

HFS-J monitoring, health checks, diagnostics and set-up can be accessed through the supplied GUI. This program will operate on PC using a based Windows® operating system and is password protected to maintain module parameter integrity by only allowing authorized users to access different levels of the controller settings.

The interface is designed to be simple to use and follows the familiar Windows® menu format with drop down option screens to select the various options available at the user level allowed.

Explanations of the screens are covered in detail, later in this guide.

Once the PC has been connected to a 'live' HFS-J, and the GUI program started, a free communications port will be either automatically allocated (Windows® XP) or will have to be manually chosen from a menu that will be displayed. Users running a computer without a 9 pin serial port MUST use one of the following RS232/USB adaptors:-

Manufacturer	Part Number	Notes
CommFront	USB-232-1	CE certified RoHS compliant
AAXEON.com	UTS-1448A	CE certified RoHS compliant

After communications have been established, the user will be presented with the initial information screen that will give all the basic information needed to assess the health of the system.

Real time graphing is available here to monitor a wide range of items (selectable from a drop down and select list) and for remote diagnostics, a 'Data Log' button will start a Windows Excel file that can be used as a monitor for comparison to other logged charts during the system's life or can be E-mailed to an engineering source if there is a problem for diagnosis.

Passwords protect the settings of the module at all times and are needed to make any changes to the operational parameters.

RS232 Serial Connection Cable: Part No- 999-10075 (see page 32 of this manual)
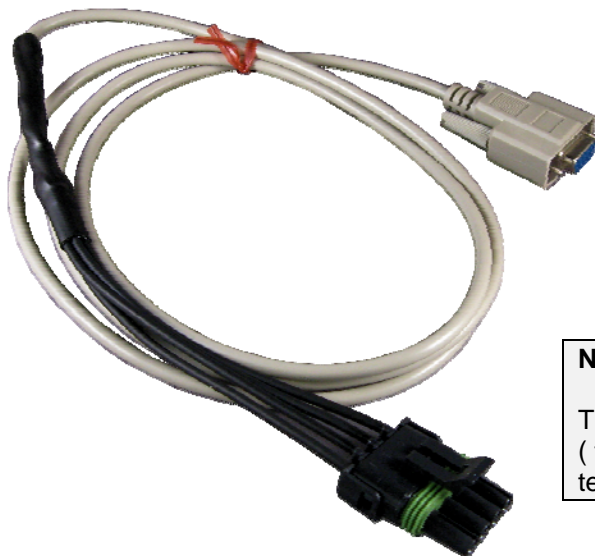
Pin	Function
A	Received data
B	Signal ground (Common)
C	Transmit data

NOTE:

The Weatherpack connector from the controller has MALE (tower) pins, therefore the mating cable needs to terminate in a FEMALE (shroud) Weatherpack connector.

Loading the HFS-J GUI onto Host PC:

The PC Graphical User Interface (GUI) is a self extracting and installing program that will reside on the chosen host PC hard drive. It is recommended that the user allow the defaults to be used for easy future update installation, but the option is given to allow the user to choose where the program should be located.

It is NOT recommended that this program be run from a network as it needs access to certain files available only in the Windows directories.

To start the installation process, insert the CD ROM or if this does not work, search for the executable (*.EXE) file on the CD and 'run'.

HFS-J Software:

System Requirements
Windows XP
256MB or greater
Serial Port RS232 or USB Adapter
RS232 Serial Cable PN: 999-10075
Closed Loop Controller software.

Note:
This module and software is compatible with Windows XP only. For other operating system compatibility information, please contact HCT's customer service.
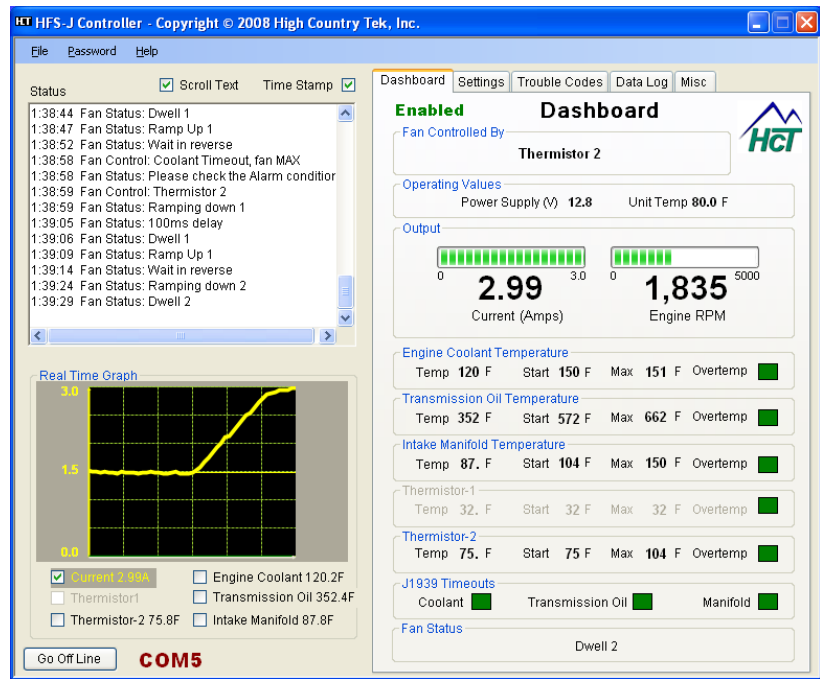

Figure 1, Main Screen (Dashboard)

Installing the HFS-J Software

- The HFS-J Graphical User Interface part number is:- P/N: **023-00218**

- Ensure you have the latest version of software for this module (the HCT website www.highcountrytek.com has a 'Downloads' area that has any updates you may need if you are unsure.

- Run Setup.exe from the install CD.

- Follow the instructions as you are prompted.

File (Memory Options):

-> **Load and Save settings to file**

The user has two simple options available:

1) **Load settings from file.**

   This option allows the user to search for and find preciously saved settings files (*.DAT) and to load them into a new controller or to reset a controller to a previous version e.t.c.

2) **Save settings to file.**

   This option allows the user to save the current settings displayed on the GUI while connected to a controller to a file name and destination of choice for retrieval at a later time.
   These *.DAT files may also be E-mailed if required to other users to duplicate settings that may have been optimized or changed.

Password Protection

Passwords will be asked for when the user attempts to enter a mode that requires authorization. Once the password has been entered once during a session it will not be requested again unless a higher level password is needed to proceed to an advanced option outside the current access level.

Password entry is started by clicking the 'Password' option **in the top bar of the GUI screen. This will open a box requesting you enter the passwords.**
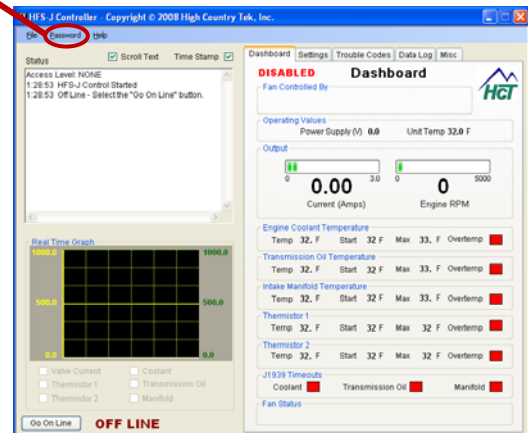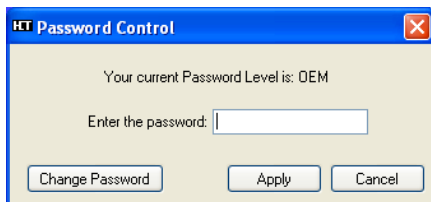
Passwords are '**cAsE SeNsitivE**' so ensure you have the 'Caps Lock' off if required.

The controller operational settings are protected to allow different levels of access:

Level 1) - NO Password:
If the GUI software is distributed by the OEM, simply connecting the PC running the software to the HFS-J controller will (if all the 'Hand shake' checks are correct) allow the user to view current operation and observe only how the unit is operating. Access is granted to the graphing screen and the user can 'data log' if required to monitor health of the system at periodic services e.t.c.

Level 2) – OEM password: (Contact Factory for this information).
Access at this level gives the user full viewing as above and **also allows changing of all of the system settable parameters** of the controller but does NOT allow resetting of highest value information considered module warranty information by HCT.
NOTE: For the OEM level password only, the HFS-J controller must be powered 'ON' and correctly connected to the host PC, which must have the HFS-J Graphical User Interface (GUI) open and running.

Level 3) – High Country Tek Inc. (Safety Reset) Password:
This level of password overrides all other password levels and allows HCT authorized personnel to access the module and the software when required. HCT personnel must contact division for information.

Contact and Password Information:-
High Country Tek Inc.
208 Gold Flat Court, Nevada City, CA, 95959
Phone:- 1 530 265 3236 – Ask for Customer support Dept.

Help:

When this menu is selected, a drop down menu displays two options:-

1) **HFS-J 'Help':**

This option calls and opens a PDF file that is part of the installation package. The help file contains useful information on application, set-up and diagnostics.

2) **About HFS-J:**

This option will contain information relative to the controller such as GUI software revision and contact information e.t.c. This is the information that a user would need to have ready of calling into HCT or a distributor for technical help.
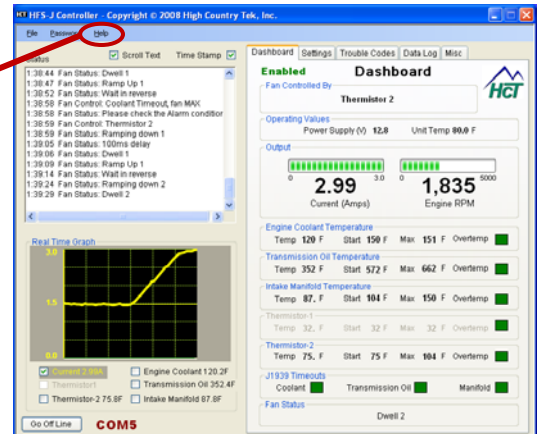
GUI software – Main screen (Dashboard)

The software has been designed such that there is NO nesting of menus so that it is easy to navigate around the different screens without getting lost or having multiple windows open at any one time. The five main screens are available via 'Click Tabs' from the 'Dashboard' and are:

The '**Dashboard**' tab provides a quick user overview of the controller operation, system status and condition of the J1939 data Bus.

It also can be used for system de-bugging by using the real-time graphing feature located in the bottom left corner of the page.

Large bargraphs display output current and engine RPMs as well as on-screen indicators that turn from Green (OK) to red (error or alarm) in the event of a fault or limit being exceeded.

Options on this tab allow the user to customize the view that ripples through the GUI.
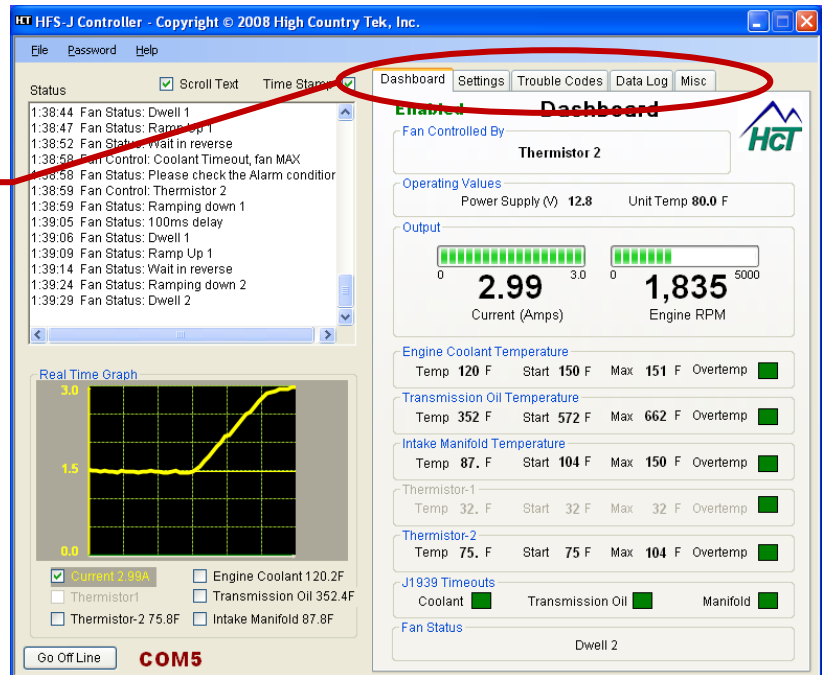
- **Scroll Text:**

Selecting this button allows continuous updates of all changes in module operation as they happen with them being listed in the 'Status' window. If this option is unchecked, the user must use the scroll bar to navigate the operation list.

- **Time Stamp:**

The time is taken from the connected PC running the GUI. If the PC clock is wrong, the time stamp will be wrong. If this option is clicked, the time the event occurred is logged with the change in status. This feature is also useful to check timed events such as reverse cycles e.t.c.. Unchecking this button turns OFF the time stamp on the event displayed in the 'Status' window.

- **Real time Graph:**

This feature is available on all tab pages with expanded views on the 'Data Logging' tab. The graph is self scaling where two parameters can be selected and displayed at a time to keep clarity of the data being displayed. Each signal displayed will have a color coded individual scale on the 'Y' axis.

- **'Go Off Line' button:**

This button allows the user to manually isolate the controller and stop communicating through the RS232 port if there is an emergency or the port needs to be refreshed. Once clicked, the button text will change to 'Go ON Line'.

When connected and communicating, the COM port selected (COM5 here) will be displayed adjacent to the button for information.

- **'Fan Status':**

This sub-window tells the user which parameter or input is controlling the fan speed and direction at any time.

The user can also view the controller operation via the graph window as well as note any change on state or error that is presented by observing the 'Status' window text if the scroll option is turned ON, selecting it from the top of the page.

Controller Set-up:

Selection Tab -> **Settings**

This page gives the user access to all of the modules operational settings.

- **Valve Mode:**

Select Proportional OR ON/OFF valve type. If ON/OFF is selected, the min and max settings will still apply but there will be NO proportionality or ramps between the values

- **Min Valve Cur %:**

This sets the minimum drive current to the valve coil and should be set to reduce the valve dead-band and get smooth, accurate operation.
Input -10% to 100% (100% = 3Amps). value.

Min Valve Current % IMPORTANT NOTE:

*HCT has determined that some cooling system designs, typically using **FORWARD ACTING VALVES** may require some offset for zero current. To offer this feature, the adjustment range in the I Minimum Valve Current % will allow the user to set a negative value to a maximum of -10%.*

If the user cannot achieve Minimum fan speed (with respect to normal hydraulic across-valve leakage) on a forward acting system or Maximum fan speed on a reverse acting system, the user may adjust the "Min Valve Cur %" to below zero (i.e. '-2' to achieve the desired result.

CAUTION: Adjusting the "Min Cur %" too far below 0 (zero) can induce deadband into the system that must be overcome before real change is seen at the fan speed, and this may appear as the system being slow to react to changes from the 'fan start temperature' setting.

- **Max Valve Cur %:**

This sets the maximum drive current to the valve coil and should always be above Min current
Input 0 to 100% (100% = 3Amps).

- **Minimum RPM:**

This value is the engine RPM needed before the fan controller will start to operate above the minimum system speed set by the motor pressure drop – this reduces the load on the starter motor.
NOTE: Information for this feature is taken from the J1939 Bus and cannot be used if not connected.
Input – 50 to 4000 RPM.

- **Start Up Delay:**

This is set in seconds and is only actioned when power is applied to the module i.e. at key ON engine start time. This feature is designed to reduce the load on the starter motor by holding off fan operation until the time set has expired.
Input 0 to 30 seconds

- **Ramp UP & Down:**

These are set in seconds and affect the rate of change of output current to the coil. These should be set to give smooth operation but not too long or performance will be affected by slowing down fan speed response.
Input – 0 to 30 seconds (*It is reccomended that ±0.5 seconds be always set to give best output current regulation*)
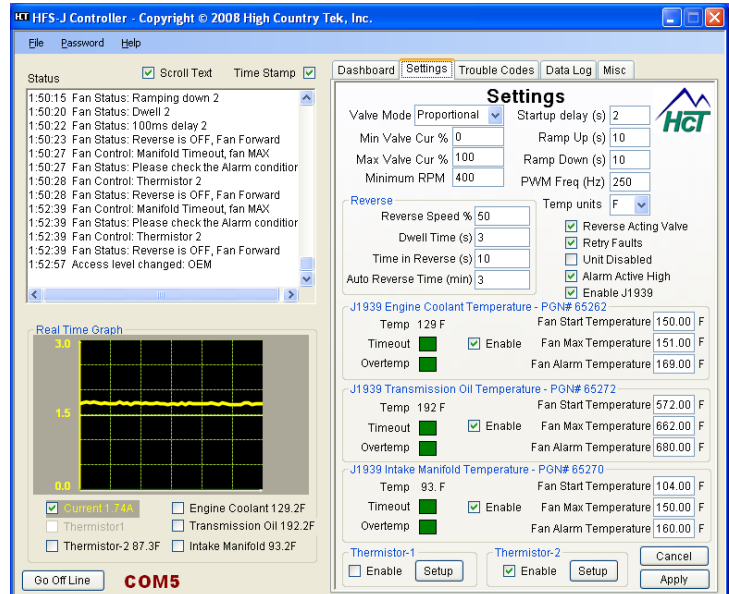
Controller Set-up Cont:

- **PWM Freq (Hz):**
This is the 'dither' frequency that will be applied to the fan speed control valve and should be selected to suit the manufacturers data for the valve type and size selected for the system. Input 33Hz to 500Hz

- **Temp Units:**
This setting selects either Degrees Farenhieght or Degrees Centigrade and ripples through all the settings that deal with temperature.

- **Reverse Speed:**
This window allows the user to set a fixed speed when the fan goes into reverse (purge or de-ice) mode
Input 0 to 100% of forward fan speed set by I Max & I Min.

- **Dwell Time:**
Set in Seconds, this is the time that the controller allows for the fan to get to minimum speed before changing direction when entering or leaving the reverse mode.
Input 0 – 60 Seconds.

- **Time in Reverse:**
This is set in seconds and the time the fan will spend in the reverse mode.
Input 0 to 120 seconds

- **Auto Reverse Time (min):**
These are set in minutes and is the period between fan reverse cycles. *Set this to zero (0m) to turn OFF the fan AUTOMATIC reverse feature.*
Input – 0 to 1440 minutes.

- **Reverse acting valve:**
Select this button if you choose to use an inverse operating valve that defaults to full pressure with NO drive current. If you have a valve that defaults to zero with NO drive current, de-select this option.

- **Retry all faults:**
Selecting this option will allow the controller to continue with normal operation after an intermittent fault has occurred and cleared itself. During the fault condition, the fan will be driven to full speed, returning to desired speed when the fault is cleared. If this option is NOT selected, the fan will go to full speed and remain there even if the fault clears, until the power to the unit is cycled.

- **Unit Disabled:**
The controller is shipped in a disabled state and should be enabled by the OEM or user by using the GUI. Once this button is selected, the date from the enabling PC is taken and used as the 'Born Date' when warranty starts.

- **Alarm Active High:**
This sets the default state of the alarm output to allow normally OFF or normally ON devices to be driven.
When enabled, the output is HIGH when alarm condition exists and LOW with NO alarm condition.
When NOT enabled, the output is LOW when an alarm condition exists and HIGH with NO alarm condition
e.g. If the user uses a interlock system for alarms, then they can power the interlock system with the alarm in ACTIVE LOW, Otherwise, ACTIVE HIGH means that voltage is supplied when there is an alarm condition

- **Enable J1939:**
This option MUST be clicked if the unit is to understand the J19349 Bus information. If this button is NOT clicked, all J1939 features are disabled in the controller.
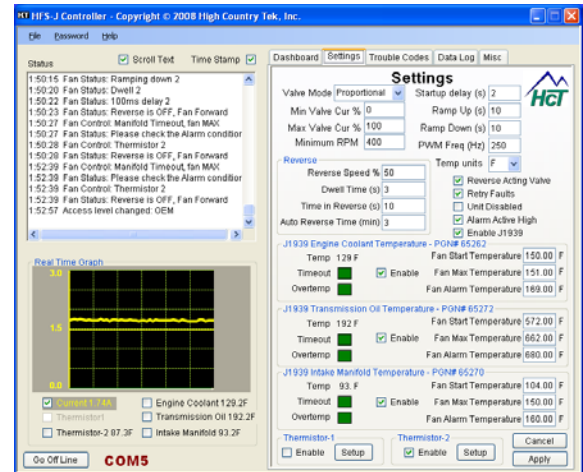
Controller Set-up Cont:

- **Temperature settings:**

There are up to five (5) temperature inputs into the HFS-J that can be individually enabled or disabled as required, three (3) come directly from the J1939 Bus, and are :

➢ **Engine coolant at PGN 65262,**
➢ **Transmission Oil temperature at PGN 65272** and
➢ **Intake manifold Temperature at PGN 65270** and do not need any external sensors for information.

Output current to the fan speed control valve is controlled between '**Fan Start Temperature**' and '**Fan max temperature**' and is a linear line between these two user set values.

Each J1939 input has two on-screen indicators that are green when within limits and red when there is an issue. The first indicator is called '*Timeout*'. This is monitoring the health of the J1939 Bus and in particular, the message associated with the PGN number being used. If the Bus data is corrupted or late, this indicator turns red to indicate a data or timing fault and can be used for diagnostics.

The second indicator shows when the temperature being measured exceeds the '*Fan Alarm Temperature*' setting. This is a visual aid intended to show the user that there is an issue with the cooling on the associated channel.

The state of these indicators is connected to the alarm output such that any red status will trigger the output to drive an external alarm annunciator if connected.

There are an additional two (2) external inputs provided that can be selected to be either a recognized sensor or a temperature switch. Instructions on how to use these become available when the user clicks the 'Setup' button associated with these features.
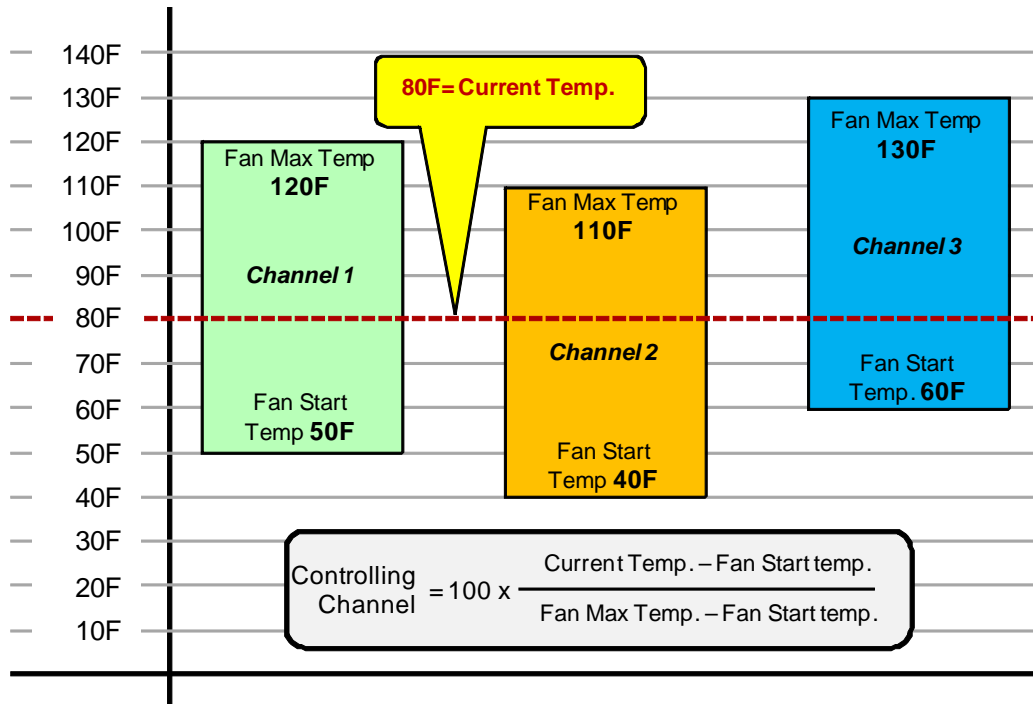

➢ **NOTE:**

After ANY change is made to the settings that need to be kept, the 'Apply' button MUST be clicked to allow the module to accept the new values. Clicking 'Cancel' or selecting a new TAB will void any changes made.
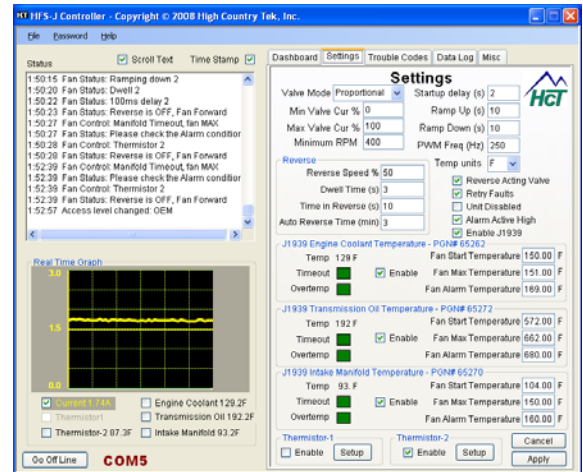
The user can also view the controller operation via the graph window as well as note any change on state or error that is presented by observing the 'Status' window text if the scroll option is turned ON.
While in this tab, the user can switch to any other tab by selecting it from the top of the page.

Channel controlling fan speed:

80F= Current Temp.

Fan Max Temp
120F

Channel 1

Fan Start
Temp **50F**

Fan Max Temp
110F

Channel 2

Fan Start
Temp **40F**

Fan Max Temp
130F

Channel 3

Fan Start
Temp. **60F**

$$\text{Controlling Channel} = 100 \times \frac{\text{Current Temp.} - \text{Fan Start temp.}}{\text{Fan Max Temp.} - \text{Fan Start temp.}}$$

Controlling channel = largest percentage value

In this example – Channel 2 would control fan speed

Channel 1 % $= 100 \times \dfrac{80f - 50f}{120f - 50f} = \dfrac{30f}{70f} = 0.4285 \times 100 = $ **42.85%**

Channel 2 % $= 100 \times \dfrac{80f - 40f}{110f - 40f} = \dfrac{40f}{70f} = 0.5714 \times 100 = $ **57.14%**

Channel 3 % $= 100 \times \dfrac{80f - 60f}{130f - 60f} = \dfrac{20f}{70f} = 0.2857 \times 100 = $ **28.57%**

Error Information Log:

Selection Tab -> **Trouble Codes**

This page shows the user information that will help to track and where necessary, fix intermittent opens and short circuits on any of the wires used to connect to the sensors, switches or the coils in the system.

The program shows where the error has been seen, even if the error has cleared itself.
The information can be cleared by the user with the appropriate password level by clicking the 'Clear Opens and Shorts' button.

This page also shows the user the maximum values seen on several key areas including the module health. These values are only overwritten by higher values, are stored permanently in the modules memory and cannot be reset by the user.

The user can also view the controller operation via the graph window as well as note any change on state or error that is presented by observing the 'Status' window text if the scroll option is turned ON.
While in this tab, the user can switch to any other tab by selecting it from the top of the page.
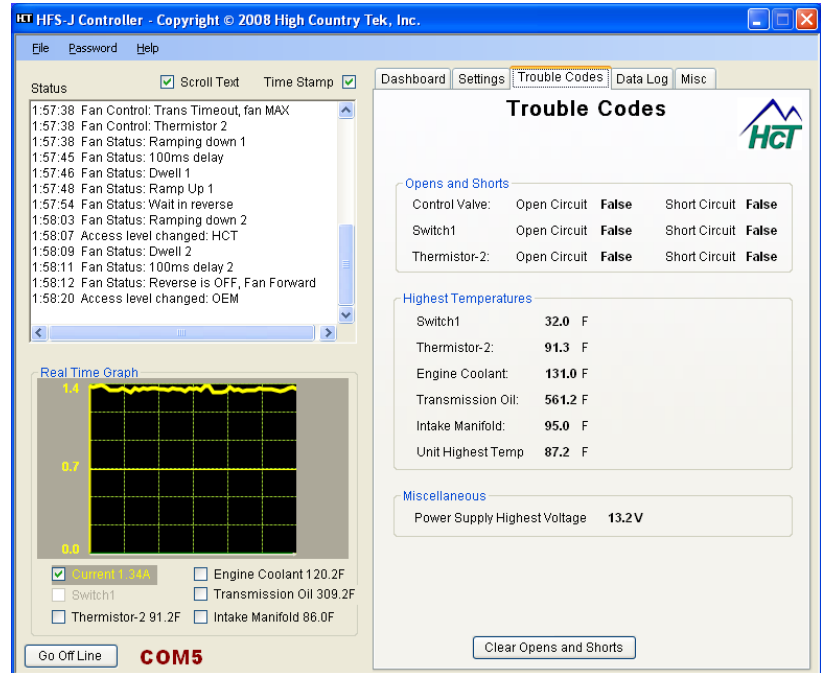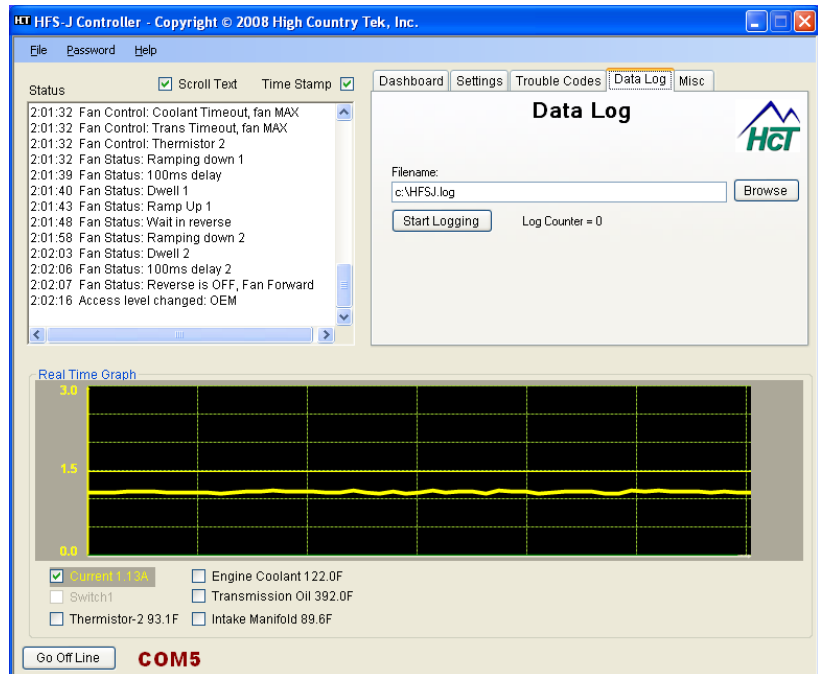
Data Logging:

Selection Tab -> **Data Log**

This page allows the user access to a data logger feature that will operate only when a PC running the GUI is connected and available to the controller.

The Data logger will record several key pieces of information that can be used as a data point after commissioning or sent as a file to help with remote fault diagnosis.

The window offers the user an opportunity to select a filename and storage path for the log file for convenience.

The Data Log is started by the user clicking the 'Start Logging' button.

The data logger will continue to run until the user clicks the '**Start Logging'** button once more. At this point, the file will be closed.

The user also has an enlarged and extended resolution graphing window on this tab that can be used for looking in detail at particular trends or measurements within the controller.

The file type will be saves as *.LOG and may be viewed by any text editor or copied directly into Excel for examination.

The user should be cautious when using this LOG function as the files can become very large if logging is left to continue for long periods, making the files difficult to read and manage.

Experience has shown us that several smaller logs over adjacent periods are easier to manipulate and view as graphical data.

The user can also view the controller operation via the graph window as well as note any change on state or error that is presented by observing the 'Status' window text if the scroll option is turned ON.
While in this tab, the user can switch to any other tab by selecting it from the top of the page.

The logger will store the following data parameters:

- Log Counter Number
- Module Input Voltage
- Module Internal Temperature
- Proportional Valve Current
- Thermistor #1 Temp I/P (Actual)
- Thermistor #2 Temp I/P (Actual)
- J1939 Coolant Temperature (Actual)
- J1939 Inlet Manifold Temperature (Actual)
- J1939 Transmission oil Temperature (Actual)
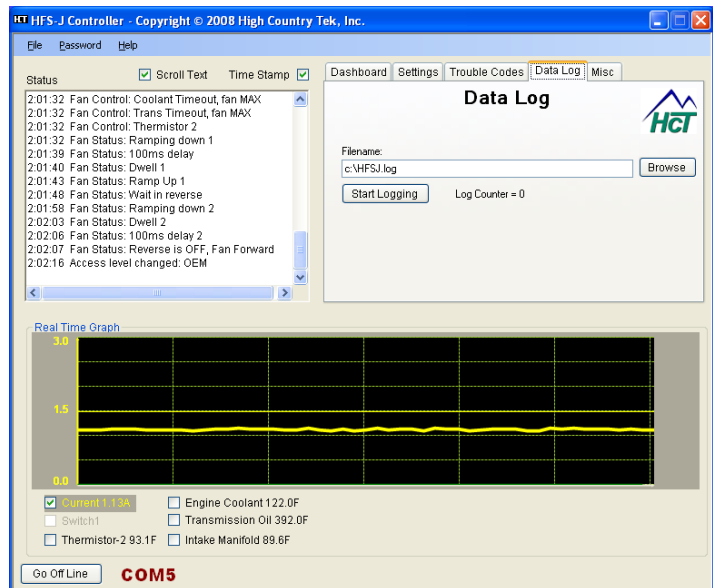
Miscellaneous Information:

Selection Tab -> **Misc**

This page allows the user to view information concerning the controller serial number, GUI Part number, BIOS and Graphical user Interface (GUI) software versions as well as the 'Born Date' which is taken from the local PC used to activate the module.

This information should always be available when requesting support so that HCT personel know what level of controller you are working with.

The user can also view the controller operation via the graph window as well as note any change on state or error that is presented by observing the 'Status' window text if the scroll option is turned ON.
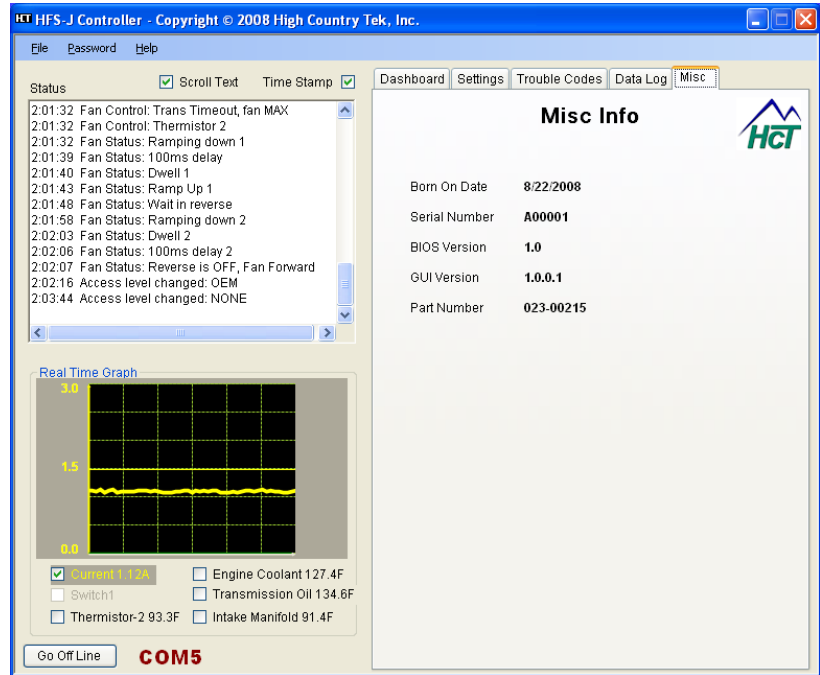
While in this tab, the user can switch to any other tab by selecting it from the top of the page.

Software Controls:

Quit
Use the standard Windows® 'X' in the top right corner to Exit / leave / quit the program.

NOTE:
Always use this method of terminating the HFS-J PC program. This method cleanly exits the program.

Temperature Sensor Information:

This information is intended as a guide only and should not be used for final system design or calculations. It is the users responsibility to check and confirm Latest information, accuracy, part Numbers And component availability.

Supplier / Manufacturer:	Coolant Temperature Sensors:		Air Temperature Sensors:	
	Part Number:	Notes:	Part Number:	Notes:
NAPA Autoparts	ECHTSC200	-	ECHTSC300	-
AutoZone	47131	-	-	-
AC Delco	213-928	-	213-190	-
GM	15326386	Was 12146312	25036751	Was 12110446
Stanard	TX3	-	AX1	-
GP Sorensen	TSU81	-	779-19001	-
Niehoff	DR134AK	-	TS83631	Was DR-136W
Wells	SU109	Includes connector	SU107	-
MSD	2310	Includes connector	2320	Includes connector
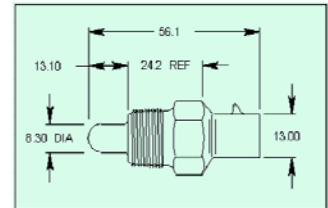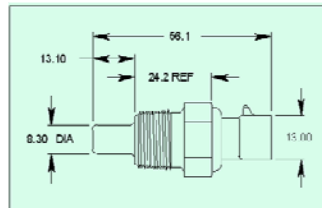
Connector Information:

Main I/O connector:

Mating connector Parts information:-

Deutsch # DT06-12SB-P012
Deutsch # W12S – Lock
Deutsch # 0462-201-16141 – Socket pins
Deutsch distributor U.S.:
Ladd Industrial sales – 1-800-223-1236

Complete connector kits can be supplied by HCT – see below for part number information.

System Accessories:

Item Description:	HCT P/No:
RS232 Communications Cable - Weatherpack	999 - 10075
HFS-J Main Mating I/O connector Kit	999 - 10155
HFS-J Graphical User Interface (GUI) replacement Disk	023 – 00218
HFS-J Operating Manual	021 – 00155 (see website for latest version)

On Site Testing:
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 PC running Windows XP and the correct HFS-J software are required for initial set-up, programming or observation of the controllers operation through the RS232 port (directly or via a USB to serial converter cable) .
The PC can also be used for uploading the configured program to new HFS-J modules for series production.
A battery operated multi meter is always a good idea for measuring and confirming analog signals and an oscilloscope would be useful for looking at fast moving or digital signals on the system.

Check the power input:
The module will not function correctly unless the +POWER supply is at least 10 VDC when driving the coils.
If the supply voltage is below 10VDC, there is a risk of:
a) Module shutting down, b) Module continuously trying to reset or c) Low drive current to valves.

If the supply voltage is more than 30 VDC there is a risk of:
a) Blown in-line AGC5 fuse, b) Module internal damaged or c) Coil damage due to excessive drive voltage.

Check the control inputs:
Verify any analog control inputs are the correct polarity and are hooked up correctly and to the correct module terminals by monitoring their status with the HFS-J software or testing with a voltmeter or oscilloscope.
Ensure the J139 Bus is terminated correctly (120 ohm resistors) and that the engine is running to ensure good data.
Ensure that any external control or command inputs have their respective sources 0V or GND connected to the modules power supply 0V or GND terminal.

Verify the coil is not shorted or open:
Disconnect the wires going to the +COIL and -COIL terminals and measure the resistance between the wires. Verify it is in the expected Ohmic range for the type and voltage of coil being driven. Verify that there is no voltage between either wire and power or ground (indicating a short circuit to either power or ground).

NOTE:
If a +COIL or -COIL is short circuited or open circuited while being driven, the controller will shut down its outputs until the user carries out a 'Power-on-reset' or disables the module.

Valve not being driven to maximum:

Note 1:
Ohms Law says that when a coil heats up in use, it increases Ohmic resistance which de-creases the current flow. Most manufacturers coils, even when hot should still are able to fully shift the valve 100% if their rated voltage is supplied to them.
In some instances, a voltage slightly greater than the coils rated is needed to maintain the valve 100% position. On a mobile application, nominal system voltage is quoted as being 12VDC. When the alternator is running, the fully charged battery voltage should be in the 13.8 – 14.3VDC region. This extra voltage should be sufficient to enable the valve to drive to 100%.
When an increased supply voltage is not a possible option, you must use a coil rated for less voltage. The controller 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.

If the valve shift is erratic
Electrical interference on the control lines can also cause erratic behavior if it is strong enough. Observe the control inputs on the PC. If noise greater than a few percent is noticed on an unchanging PULSE IN or COMMAND IN input, or if the digital inputs are toggling, 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. Observe the power supply on the graph on the PC. If large dips are noticed, test for a poor supply by running the card off its own fully charged battery.

Further information:

Visit our website **www.highcountrytek.com** for additional documentation and assistance.

HFS-J Dimensional Information:

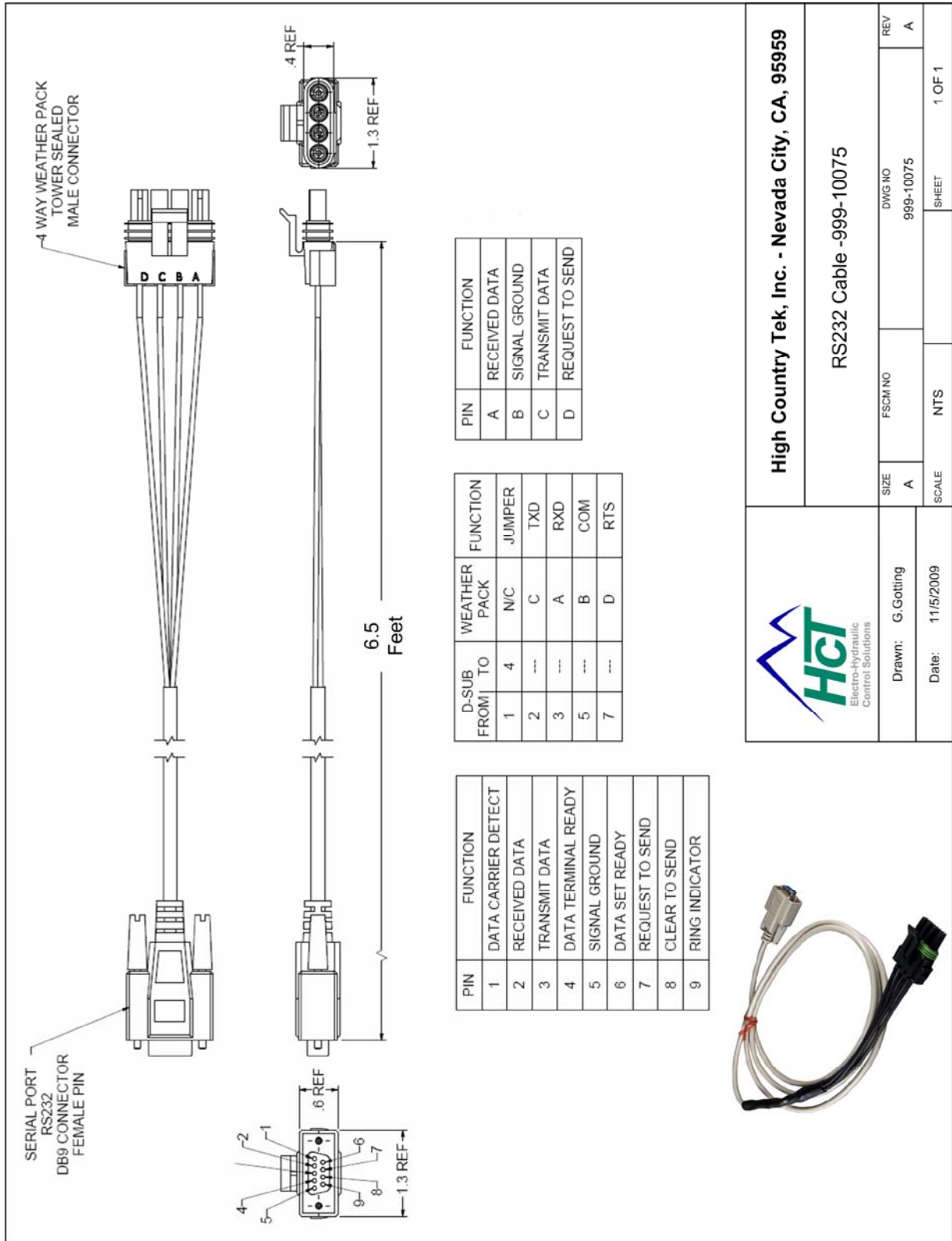| Label	Inches	Millimeters
A	3.77	96.0
B	1.625	41.3
C	Ø 0.186	4.7
D	3.82	97.0
E	3.10	78.7
F	0.46	11.7
G	3.25	82.6
H	1.75	44.95
I	0.64	16.3
J	0.26	6.6
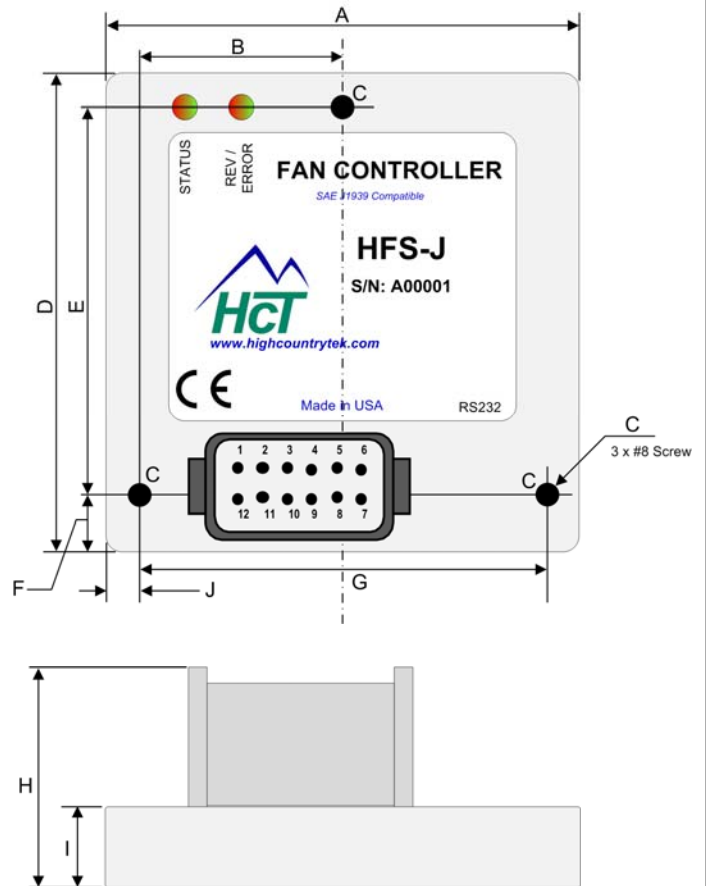
Notes:

- Unit weight is approx. 250 grams
- RS232 cable removed for clarity
- RS232 cable is approx 6" long
- Not to scale, please contact HCT for exact dimensions

NOTE:- ALWAYS Mount HFS-J controller with I/O connector facing Forwards OR downwards to avoid debris collection.

Housing Type:-	High Country Tek unique 'encapsulated' block.
Housing Material:-	None, solid, flameproof epoxy resin block.
Housing Color:-	Black / dark Grey.
Surface Finish:-	Smooth Gloss
Housing Thickness:-	16.5mm (main module) ~41.5mm incl. Connectors.
Unit size:-	See above size detail drawings.
Unit Weight:-	Approx.… 250 grams (including Encapsulation material)
Wire entry:-	Industry standard 12 way Deutsch, sealed connector
Encapsulation:-	Flame Resistant, Black , Two Part Epoxy Resin.
Mounting:-	Via through holed (3) suitable for No. 8 (**5mm**) screw .
Temperature range:-	- 40 to +85 degrees Centigrade (operational)

Connector Pin Function Table:

PIN	FUNCTION
A	RECEIVED DATA
B	SIGNAL GROUND
C	TRANSMIT DATA
D	REQUEST TO SEND

D-Sub to Weather Pack Table:

D-SUB FROM	TO	WEATHER PACK	FUNCTION
1	4	N/C	JUMPER
2	---	C	TXD
3	---	A	RXD
5	---	B	COM
7	---	D	RTS

DB9 Pin Function Table:

PIN	FUNCTION
1	DATA CARRIER DETECT
2	RECEIVED DATA
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	SIGNAL GROUND
6	DATA SET READY
7	REQUEST TO SEND
8	CLEAR TO SEND
9	RING INDICATOR

4 WAY WEATHER PACK TOWER SEALED MALE CONNECTOR

SERIAL PORT RS232 DB9 CONNECTOR FEMALE PIN

6.5 Feet

.4 REF
1.3 REF
.6 REF
1.3 REF

High Country Tek, Inc. - Nevada City, CA, 95959

RS232 Cable -999-10075

Drawn:	G.Gotting
Date:	11/5/2009

FSCM NO

SIZE: A
SCALE: NTS
DWG NO: 999-10075
REV: A
SHEET: 1 OF 1

Electro-Hydraulic Solutions for Mobile, Industrial & Marine Applications

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- ♦ **Integrated OEM**
- ♦ **Military**
- ♦ **Special Use**
- ♦ **Power Generation**
- ♦ **Emission Control**

Need More Information ?

The easiest way to reach **HCT is via E-mail** at **info@highcountrytek.com**.

This single point of contact is the best route to initiating a project, inquire about HCT's products, get technical help or place an order - **OR**

Contact our Customer Support and Service personel:

High Country Tek, Inc.
208 Gold Flat Court
Nevada City, CA, 95959.

Tel: (1) 530 265 3236
Fax: (1) 530 265 3275

For latest information:

www.highcountrytek.com