Hydrogen Sensor
Operation Instructions

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Overview:
The Hydrogen sensor produces an output that is a function of the thermal conductivity of the gas surrounding its sensor. It requires a 24V DC power supply, and it provides output via RS232 communications.

Specifications:

Power Requirements:	24V DC +/- 5%; 10W
Dimensions:	Approximately 6.25” long x 3.5” wide x 2.5” tall
Plumbing Connections:	0.25” Outside Diameter Tubing
Operating Temperature:	14 to 122°F (-10 to 50°C)
Communications:	RS232
Operating Range:	0-100% Hydrogen
Response Time (T90):	30 Seconds
Accuracy:	+/- 1% of Span
Sample Flow Rate:	1.5 to 3.0 SCFH

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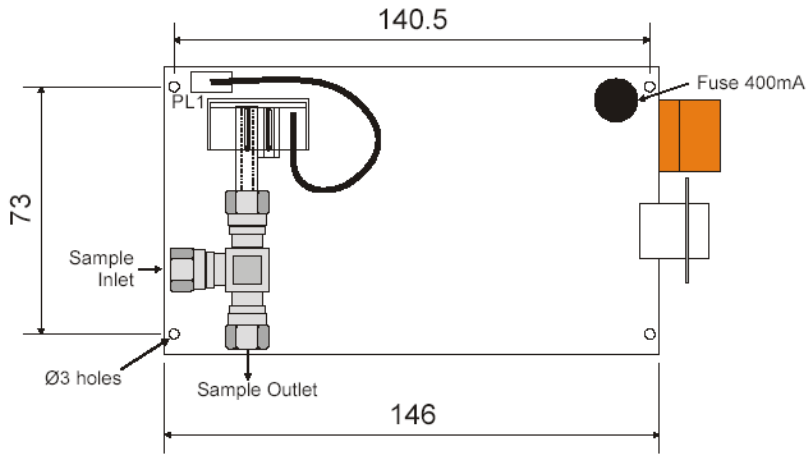
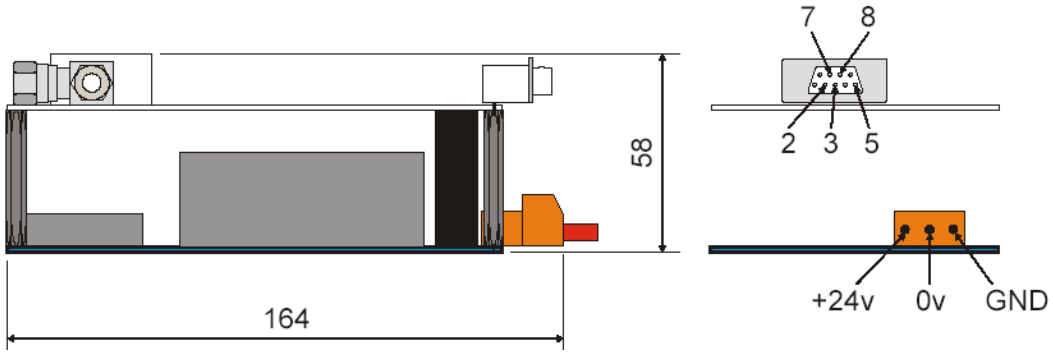
Mechanical Layout:



DTE Male 9w	
PIN	NAME
3	TX (out)
2	RX (in)
7	RTS (out)
8	CTS (in)
5	GND



Communication Cable Description (For Calibration):

The cable that connects the sensor to a computer for calibration uses standard 9-pin connectors. If a cable has not been supplied, one can be manufactured using the following specifications:

DB9 Male Connector (To Hydrogen Sensor)	
Pin #	Color
1	-
2	RED
3	WHITE
4	-
5	BLACK
6	-
7	BARE
8	BARE
9	-

Jumper Pins 7&8

DB9 Female Connector (To Computer)	
Color	Pin #
-	1
WHITE	2
RED	3
-	4
BLACK	5
-	6
-	7
-	8
-	9

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Communications Setup:

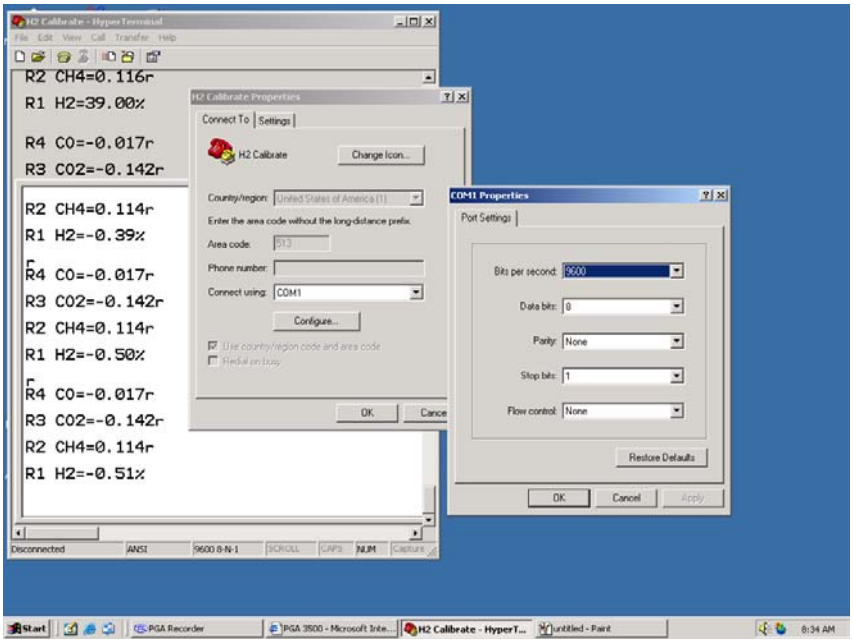
To communicate with the sensor, HyperTerminal is used. HyperTerminal is a communications program that is included with every Windows-based computer. To open HyperTerminal, go to "Start" menu, then select "All Programs". Select "Accessories" from the drop-down menu list, and you will see "Communications". You will find HyperTerminal inside this list.

Open HyperTerminal, and it will ask you to create a name for your connection. An appropriate name could be "H2 Calibrate" or anything else that you prefer. By naming the connection, you will be able to save all of the settings, which will prevent you from having to set it up each time.
When in HyperTerminal, go to "File" and select "Properties". In the tab labeled "Connect To", select the drop down menu next to the label "Connect Using:" to select the appropriate COM port on your computer. Once this has been set, select "Configure…" to establish the port settings.

The Port Settings should be as follows:

- Bits per second: **9600**
- Data bits: **8**
- Parity: **None**
- Stop bits: **1**
- Flow Control: **None**

When these setups have been entered, the screen should resemble this picture:



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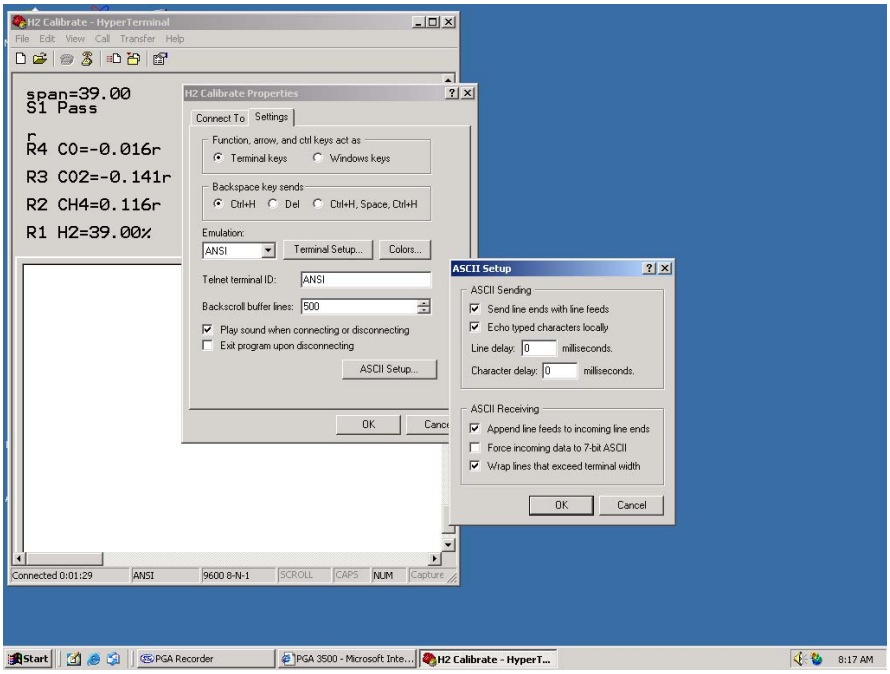
Next, select the "Settings" tab at the top of the Properties menu. Complete these settings, as well as the settings under the "ASCII Setup" button, to match those in the following picture:



Once the setups have been finished, press "OK" to close all of the Properties screens. A message in the bottom left corner of the HyperTerminal screen will show if it is connected. If it displays "Disconnected", go to the "Call" menu and select "Call", or press the yellow telephone icon. This will establish a connection. If the message at the bottom of the screen already says "Connected" then proceed with testing the connection.

To test the connection, type "R" and press Enter. The screen should display four numbers:

R4 CO = 0.016r
R3 CO2=-0.141r
R2 CH4=0.116r
R1 H2=39.00%

The exact values are not important for the purpose of this communications test. If the display shows values similar to those shown above, go to "File" and select "Save". This will prevent you from having to enter all of the setup parameters next time. If there is no response to your typing, try the following troubleshooting steps:

1. Verify that the HyperTerminal settings are correct (see above).
2. Make sure that the cable connecting the computer and the sensor has been made correctly (see Communication Cable Description).

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3. Make sure that the correct communication port on the computer has been selected in HyperTerminal (COM1, COM2, COM3, etc.)
4. Make sure that 24V DC power is connected to the sensor.
5. Make sure that the 9-pin plugs are fully connected to the computer and the sensor.

Calibration:

Zero Calibration

After the communications have been successfully tested, the zero calibration can be performed. It is recommended that the zero calibration be performed before the span calibration. An appropriate zero calibration gas would be Nitrogen or Argon. Begin the flow of gas at a rate of 1.5 to 3.0 SCFH. The Hydrogen value can be viewed by pressing "R" and Enter. Many values will be displayed, but the only one that we are interested in the R1 Value, which is Hydrogen. As the Zero gas is flowing, the Hydrogen value will be dropping. This can be seen by repeatedly pressing "R" and Enter and noting the changes in the H2 value.
Once the H2 value has stabilized (approximately 1 minute), press "Z" and Enter. The message "Z1 Pass" will appear on the screen and the zero calibration will be complete. This can be verified by pressing "R" and Enter to see that the H2 value is 0.00%.

Span Calibration

After the zero calibration has been completed, tun off the zero gas and begin the flow of span gas to the sensor at a rate of 1.5 to 3.0 SCFH. An appropriate span gas would have a composition similar to the composition of the process that the sensor will be measuring. The amount of Hydrogen in the calibration gas must be known.
Once the H2 readings have stabilized (approximately 1 minute), enter "span=XX.XX" and press Enter. "XX.XX" should be equal to the concentration of Hydrogen in the calibration gas. For example, if the cylinder of gas that you are using for calibration has 39.68% H2, you would need to type "span=39.68" to perform a span calibration. The message "S1 Pass" will appear on the screen and the span calibration will be complete. This can be verified by pressing "R" and Enter to see that the H2 value is equal to the quantity of Hydrogen in the calibration cylinder.

Sensor Cleaning:

If the sensor becomes contaminated, it can be removed for cleaning by following these steps:

1. Remove the sensor from the "T" fitting and unplug the electrical plug that connects it to the circuit board.

2. Wash the sensor in de-ionized water by repeatedly filling and flushing the sensor tube (the part that was in the "T" fitting). Cleaning can be enhanced via gentle agitation.

3. Drying can be achieved by

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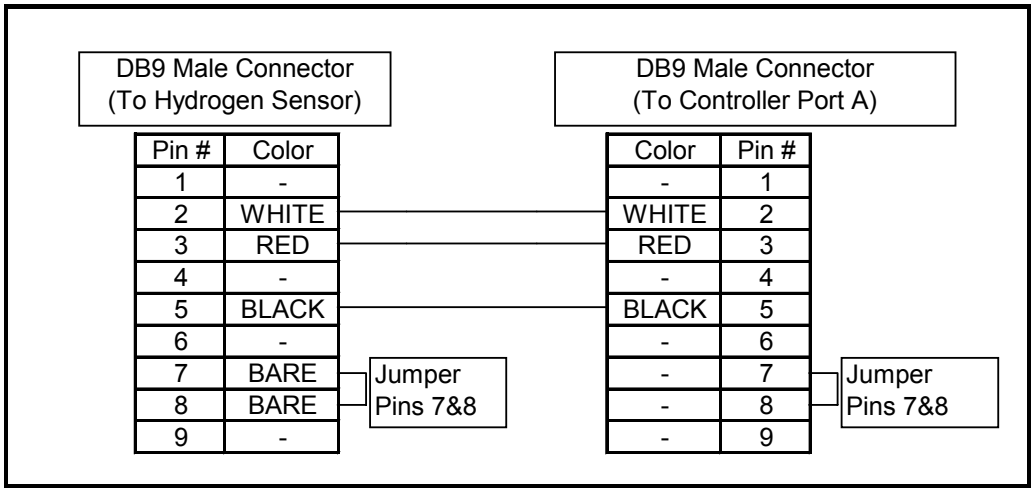
- Washing the sensor with isopropanol (IPA) and drying immediately with dry air (air can be heated up to 130°F / 60°C)
- Passing dry gas through the sensor for 12 hours (time can be reduced by heating (maximum 130°F / 60°C).

4. Refit sensor into "T" fitting and allow readings to stabilize before performing calibrations.

Connections to other Super Systems instruments:

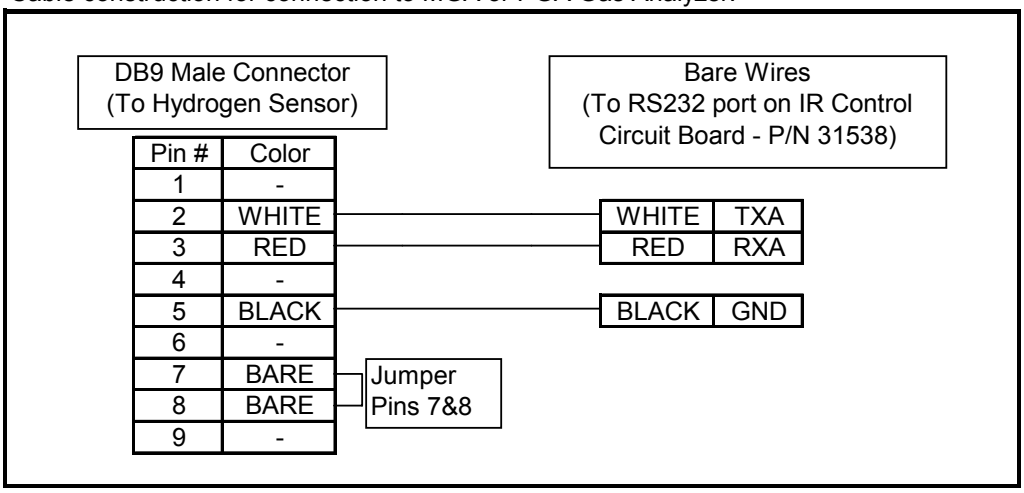
The following is the wiring diagram for establishing communications from the Hydrogen sensor to other SSI devices:

Cable construction for connection to 9210 or 9120 instrument:



** NOTE: For the 9120 with firmware V.113 and higher, Port B can be used if wires 2 and 3 are reversed and the connector is changed from male to female.

Cable construction for connection to MGA or PGA Gas Analyzer:



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Revision History

Rev.	Description	Date	MCO #
-	Initial Release	2/6/2008	N/A
A	Added connections to other instruments; Added table of contents; Added title page; Rearranged the sections of the manual	9/22/08	2068