INSTALLATION INSTRUCTIONS

DIGITAL/BARGRAPH SETPOINT GAUGE

FORM DSG-1682DUPS II 6-09

WARNING: DEVIATION FROM THESE INSTRUCTIONS MAY LEAD TO IMPROPER OPERATION OF THE MACHINE WHICH COULD CAUSE PERSONAL INJURY TO OPERATORS OR OTHER NEARBY PERSONNEL.

CAUTION: THE DSG-1682DUPS DIGITAL BARGRAPH SETPOINT GAUGE IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS C & D HAZARDOUS LOCATIONS WHEN INSTALLED IN ACCORDANCE WITH THESE INSTRUCTIONS.

THE SENSOR INPUT LEADS CONNECTED TO THIS DEVICE OPERATE AT A LOW VOLTAGE AND POWER LEVEL AND MUST NOT CONTACT ANY EXTERNAL VOLTAGE SOURCE. DAMAGE TO THE SYSTEM WILL RESULT FROM CONNECTION BETWEEN THE INPUT SENSOR LEADS AND THE IGNITION SYSTEM OR ANY AC OR DC POWER SOURCE ABOVE 36 VDC.

1.0 DESCRIPTION

1.1 The Altronic **DSG-1682DUPS** Digital Bargraph Setpoint Gauge is a two-channel electronic instrument which can be used in the following modes of operation:

- **PID CONTROLLER**
- **PID CONTROLLER WITH MAPPING**
- **4-20mA PROPORTIONAL TO CHANNEL 1**
- **4-20mA PROPORTIONAL TO THE DIFFERENTIAL**

It is designed to monitor pressures, temperatures, vibration, and other media using industry-standard transducers. Pressure is measured using standard pressure transducers in the range of **0 to 5 volt, .5 to 4.5 volt, or 4 to 20mA**. Temperature is measured using industry standard type J or K thermocouples or amplified temperature transducers. Vibration is measured using standard vibration transmitter/ transducers. Although the gauge is designed for monitoring pressure, temperature, or vibration, virtually any transducer in the range of **0 to 5Vdc** can be used. Input from current transducers in the range of **0 to 25mA** is possible using an external **200 ohm** resistor. Applications using **4-20mA** would typically use a **250** ohm resistor. The gauge uses a microcontroller to process the input signal and a nonvolatile memory to store the gauge setup and the setpoint values. A backlit, **128 x 64** character/graphic LCD display is used to display the numeric value, engineering units, the monitored point label, state of the output switch output switch, **4-20mA** output, and a bargraph. A front-mounted keypad serves as the user interface.

1.2 The Altronic **DSG-1682DUPS** Digital Bargraph Setpoint Gauge is designed to be simple to use with features such as pre-set factory settings for pressure, temperature, and vibration. An escape key is provided to permit the user to exit any menu function and return to the home screen. The gauge is also very versatile with features such as programmable input range, units, decimal point, and setpoint configuration. A security code can be set to restrict changes to either the configuration, setpoint values, calibration values, and/or communication parameters. In addition, each channel displays a bargraph that can be programmed for increasing bars, a single moving bar between two selected points, a single moving bar between the setpoints, or an increasing bar between setpoints. A programmable software display filter is also incorporated to stabilize readings where the input signal is fluctuating. Configuration can be performed using the front panel keypad.

NOTE: If possible, keep the original shipping container. If future transportation or storage of the gauge is necessary, this container will provide the optimum protection.

1.3 **RS-485** serial communication allows data and fault status to be communicated to other devices via ModBus RTU protocol. This allows the gauge to communicate to other instruments, PC's or PLC's via the two serial **RS-485** communication wires. Standard baud rates are selectable from **9600 to 115200** baud.

1.4 The power requirement is **12 to 36Vdc, 0.25amps max**.

1.5 For proper operation, these installation instructions must be adhered to strictly.

2.0 TRANSDUCERS

2.1 The **DSG-1682DUPS** gauge is designed to accept virtually any transducer with an output in the range of **0 to 5Vdc or 0 to 25mA**. The gauge is also designed to accept industry standard, grounded or ungrounded, type J or K thermocouples and low level bridge-type sensors from **± 80 millivolts to ± 160 millivolts**.

2.2 **PRESSURE TRANSDUCERS: ALTRONIC P/N 691201-X AND 691204-X**

Altronic **P/N 691201-x** **(FIG. 4)** is a gauge-type pressure transducer packaged in a rugged sealed case with a **1/8"-27** N.P.T. pressure port, a stainless steel media cavity, and a Packard Electric "Metri-Pack" connector. The ranges available are **0–15, 50, 100, 300, 500, 1000, 2000, and 5000 psig**.

Altronic **P/N 691204-x** **(FIG. 5)** is an absolute pressure transducer packaged in a rugged sealed case with a **1/4"-18** N.P.T. pressure port, a stainless steel media cavity, and a Packard Electric "Metri-Pack" connector. The ranges available are **0–50, 100, 300, and 500 psia**.

The three wires from the transducer are: **+5 volt** excitation, **+0.5 to 4.5 volt** output voltage, and minus. These three wires connect directly to the back of the **DSG-1682DUPS** gauge using cable assembly **P/N 693008-x**. **(FIG. 10)**

2.3 TEMPERATURE TRANSDUCERS: ALTRONIC P/N 691202-300, 691203-300, 691212-450, 691213-450

Temperature transducers **P/N 691202-300** and **691203-300** **(FIG. 6)** have a temperature measurement range of **+5 to 300°F**. The transducers are packaged in a sealed, stainless steel housing with a **5/8"-18 UNF** threaded body, and a Packard Electric "Metri-Pack" connector. During configuration **(SEE SECTION 8.5.1)** the standard calibration for this sensor is selected as **DEG 1**.

Temperature transducers **P/N 691212-450** and **691213-450** **(FIG. 7)** have a temperature range of **-40 to +450°F**. They are packaged in a sealed, stainless steel housing with a **5/8"-18 UNF** threaded body, and a Packard Electric "Metri-Pack" connector. During configuration **(SEE SECTION 8.5.1)** the standard calibration for this sensor is selected as **DEG 2**.

The three wires from the transducers are: **+5 volt** excitation, temperature output voltage, and minus return. These wires connect directly to the back of the **DSG** gauge using cable assembly **P/N 693008-x**. **(FIG. 10)**

2.4 THERMOCOUPLES:

The **DSG-1682DUPS** gauge is designed to accept industry standard, grounded or ungrounded, type J or K thermocouples. Ungrounded thermocouples are recommended where possible. The instrument can read type J thermocouples between **–76°F and +1382°F (–60°C and 750°C)** and type K thermocouples between **–76°F and +1472°F (–60°C and 800°C)**.

2.5 VIBRATION TRANSMITTER: ALTRONIC P/N 691205

Altronic **P/N 691205** **(FIG. 8)** is a **2-wire** seismic vibration transmitter encapsulated in a stainless steel housing with a **1/4" - 18 N.P.T.** mounting stud. The output is **0 to 2.0 ips** over **4-20mA**. The transmitter is a two-wire loop-powered device.

2.6 NORMALLY CLOSED DIGITAL INPUT

Wire this digital input for normal operation of the **4-20mA** output. If this input becomes open, the **4-20mA** output will change to its programmed state. It will display **DEF** for the default current output to the left of the current value. This function overrides the normal mode of operation and may be used as a state for shutdown. Leave the jumper in for normal operation.

3.0 MOUNTING (FIG. 1)

3.1 GAUGE:

Mount the gauge inside a control panel or to a suitable flat surface so that the display is at a convenient viewing height. A drilling template is provided.

3.2 PRESSURE TRANSDUCER:

Mount the pressure transducer in the panel or in a manifold or tube off of the engine. Do not expose the pressure transducer to temperatures above **221°F (105°C)**.

3.3 TEMPERATURE TRANSDUCER:

Mount the temperature transducer in a thermowell on the engine or machine. The actual sensor is located at the bottom of the tube, so to ensure accurate readings the tip of the probe should be surrounded by the media.

3.4 VIBRATION TRANSMITTER:

Mount the vibration transmitter body to the engine or machine surface. For further mounting instructions see the installation instructions supplied with the transmitter.

NOTE: Avoid mounting the gauge with the LCD display facing direct sunlight. The display temperature range is −4°F to +158°F (−20° C to +70° C).

IMPORTANT: Pressure transducers will withstand overloads as high as 1.5 times rated pressure. If the overload rating is exceeded, failure may occur. Pressure fluctuations occur in most systems; select the transducer with a rating high enough to prevent overload by peak pressures of pulsations. It is recommended that a pressure snubber be used which will reduce the peak pressure applied to the transducer. The life of the transducer will be extended with the use of a snubber or pulsation dampener.

IMPORTANT: Do not exceed the absolute maximum rating of the transducers, 350°F (176°C) for the 691202/203-300 or 572°F (300°C) for the 691212/213-450. Care should be taken to protect the wiring and connectors from contact with hot surfaces.

4.0 WIRING (SEE WIRING DIAGRAMS)

4.1 POWER WIRING: (FIG. 9)

Connect the power input wires to terminals **5 (–)** and **6 (+)**; power requirement is **12 to 36Vdc, 0.25A max**. Connect the minus terminal **(–)** to panel ground, which should be the same as engine ground. ***DO NOT*** ground this device directly to the ignition system common coil ground.

4.2 TRANSDUCER WIRING: (FIG. 10)

Select a transducer, either an Altronic pressure, temperature or vibration transducer or one that outputs a signal in the range of **0 to 5Vdc** or **0 to 25mA**, and mount as described. Use cable assembly **693008-x** or similar to wire transducer to gauge. Take care not to damage the insulation and take precautions against damage from vibration, abrasion or liquids in conduits. Also never run sensor wires in the same conduit as the ignition wiring or other high energy wiring such as AC line power, etc. Keep sensor wires at least **12** inches away from all high voltage wiring.

4.3 THERMOCOUPLES AND THERMOCOUPLE EXTENSION WIRE: (FIG. 10)

Grounded or ungrounded type J or K thermocouples may be used. Use thermocouple extension wire of the same type as the thermocouple probe to connect the thermocouple to the gauge. Use stranded thermocouple wire having a good moisture-resistant insulation such as PVC; for higher ambient temperatures, Teflon or B-fibre insulated thermocouple wire is recommended. To ensure an accurate signal is transmitted to the instrument, avoid any added junctions, splices and contact with other metals. Take care not to damage the insulation when installing and take precautions against later damage from vibration, abrasion, or liquids in conduits. In addition, it is essential that the following practices be adhered to:

- **Never run thermocouple wires in the same conduit with ignition wiring or other high energy wiring such as AC line power.**
- **Keep secondary wires to spark plugs and other high voltage wiring at least eight inches (200 mm) away from thermocouples and extension wiring.**

4.4 OUTPUT SWITCH WIRING:

A fault condition will cause the user-programmable output switch to turn **ON/OFF** to its common. On the **DSG-1682DUPS**, the output switch will trip when the input value on either channel (and/or differential if configured) exceeds its setpoint value. This switch is solid state, Form C (N/O and N/C), break-before-make contacts and is isolated from the power supply. The switch is rated at **200V**, **200mA** and the N/O switch has a unique internal overload current protection circuit. If an overload occurs, the internal circuitry limits current to safe levels. When the overload is removed, the relay resumes its normal **ON** characteristics. This switch can be wired to an Altronic annunciator system or to pilot-duty relays as shown by the **WIRING DIAGRAMS**.

4.5 4-20MA CURRENT LOOP OUTPUT WIRING:

Model **DSG-1682DUPS** has a **4-20mA** current loop output available for the control of valves, actuators and other devices commonly used in process control. The current loop output is accessible through terminals **7** and **8**, and is internally limited to **25mA**. The output is protected against open and short circuits. A **250 ohm** loop resistor can be used over the entire supply voltage range from **12 to 36Vdc**. The maximum load resistance that can be tolerated in the loop is determined by the supply voltage. When using the maximum rated loop resistor of **500 ohms** with a desired full-scale loop output of **20mA**, the supply voltage must be between **15** and **36Vdc**. At **12Vdc** supply voltage, the maximum load resistor for 20mA loop output current is **350 ohms**. **(FIG. 17)**

4.6 RS-485 COMMUNICATIONS WIRING:

The **DSG-1682DUPS** gauge can communicate to other instruments, PC's or PLC's via the two serial **RS-485** communication wires. Use a two-conductor shielded cable of fine gauge stranded wire and connect the wires to the terminals marked **RS485 A** and **RS485 B**. Connect to the other communication device **A** to **A(–)** and **B** to **B(+)**. Connect the shield wire to the master device only. **(FIGS. 18 & 19)**

4.7 HAZARDOUS AREA OPERATION:

The **DSG-1682DUPS** gauge is CSA certified for **CLASS I, DIVISION 2, GROUPS C & D** areas. **DSG-1682DUPS** gauge is certified as a component only and is required to be installed in a suitable enclosure where the suitability of the combination is subject to the local inspection authority having jurisdiction. The power connections to the **DSG-1682DUPS** gauge must be in accordance with the **National Electrical Code** and in Canada, the **Canadian Electrical Code**. In addition, the following requirements must be met:

- **Run the sensor wires leaving the panel in a separate conduit from all other wiring and keep them separate throughout the installation.**
- **Power wiring and wiring to the transducers must have a grade of insulation capable of withstanding an AC voltage of 500 volts RMS.**
- **In general, run wires in separate conduits and junction boxes from high voltage wires such as ignition, fuel valve, and other high voltage wiring.**

WARNING: EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT IN DIV. 2 ENVIRONMENT UNLESS POWER IS SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

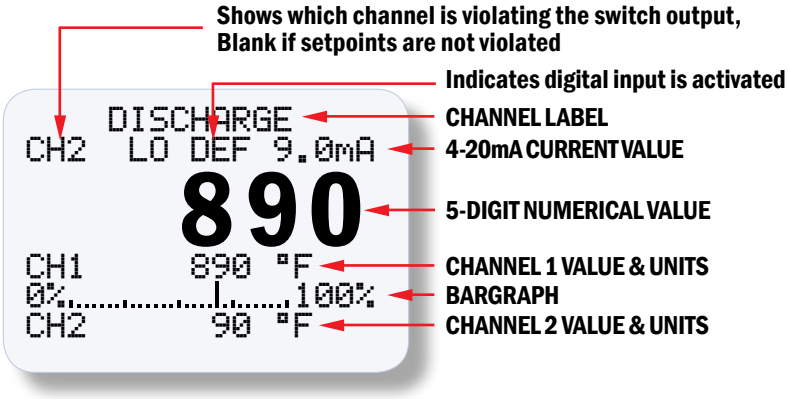
4.8 TESTING SENSOR LEADS:

If it becomes necessary to check sensor to terminal strip wiring with an ohmmeter or other checker, first disconnect the sensor wires from the gauge. This will prevent possible damage to the device's sensitive low voltage detection circuitry.

5.0 HOME SCREEN

5.1 The **DSG-1682DUPS** gauge has **2** sets of **HOME SCREENS** (**3** sets if **PID** is configured). The first two sets of home screens shows the displayed data and other pertinent information. The third set shows the **PID** screens if the **1682** is set up for either the **PID-CH1** or **MAPPING** mode.

5.2 **DISPLAY CHANNEL HOME SCREEN:**
The **DISPLAY CHANNEL HOME SCREEN** shows the displayed data and other pertinent information. This home screen shows the **5-digit** numeric value in **0.5"** numbers, units of measure, the channel label, the **4-20mA** current output, and a bargraph of the sensed media. A differential reading can be displayed instead of the bargraph. It can also show the status of the output switch and displays **CH1 LO, CH1 HI, CH2 LOW, CH2 HIGH or CH1 DIF** (low, high, or differential setpoint has tripped the output switch).

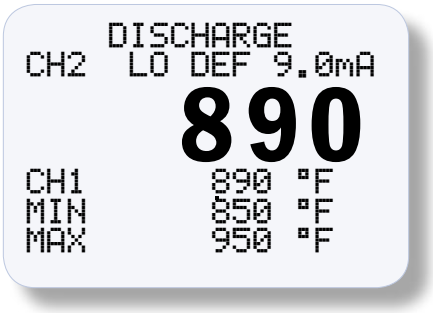


NOTE: If one of the inputs is unused it must be shunted on the unused input to prevent interference from entering the gauge.

When an input is set to thermocouple, if a thermocouple or its wiring becomes open or disconnected from the gauge, the display will read **THERMOCOUPLE OPEN** in place of the temperature reading on that channel and if configured for a high setpoint, its output switch will activate. For **0 to 5 volt** inputs when the input exceeds the upper limit of the gauge **(5.0 volts)** the display will read **INPUT SIGNAL IS HIGH OUT OF RANGE**, and if configured, its high output switch will activate. If a standard transducer in the range of **0.5 to 4.5 volts** reaches **0 volts**, the display will read **INPUT SIGNAL IS LO OUT OF RANGE**, and if configured, its low output switch will activate.

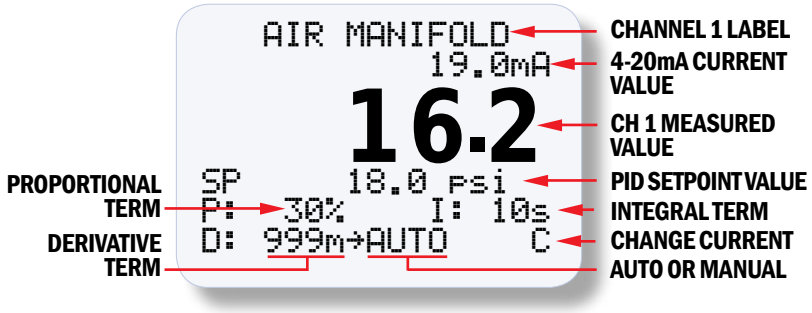
5.3 USE OF ▲ and ▼ IN THE DISPLAY CHANNEL HOME SCREENS:

In the home screen, pressing the up and down ▲ ▼ arrow keys together will display the model number, firmware Rev. Level and date. The ▲ (up arrow key) is used to change the channel being viewed. Pressing ▲ will sequence from channel **1**, to channel **2**, and if configured, to the **PID** screen if the mode is configured for **PID** functions. This sequence will repeat with each press of the up arrow key. Pressing ▼ will display the min/max values recorded. The min/max values will be shown on the bottom two lines of the display. These readings will remain stored until reset even if the gauge is powered down. Reset can be performed via the menu.



5.4 PID HOME SCREEN

The **PID HOME SCREEN** will be displayed if the unit is programmed for either **PID-CH1** or **MAPPING**. This home screen shows the **5-digit** numeric value for channel **1** in **0.5"** numbers, the channel label, the current output, and the **P**, **I** and **D** values. The **P**, **I** and **D** value, along with the setpoint value may be viewed and modified. It can also show the status of the output switch and displays **CH1 LO, CH1 HI, CH2 LOW, CH2 HIGH** or **CH1 DIF** (low, high, or differential setpoint has tripped the channel). In the **MAPPING** mode of operation in the **PID** home screen, the setpoint value may be viewed, but not changed through the keypad. This value is the calculated **PID** setpoint which has been mapped from channel **2**.



5.5 KEY NAVIGATION IN THE PID HOME SCREEN

Use the **MENU/ESC** key to scroll through the setpoint **(SP)**, **P**, **I** and **D** selections. Press the **ENTER** key to change the value, causing the (→) to change to (up and down arrow symbol). Use the **UP** and **DOWN** arrow keys to modify the value and press **ENTER** to save the value. Use the **UP** arrow key when the arrow displays (→) for the display channel home screen. The unit may also be programmed for AUTO and **MANUAL** mode as well. There is also the ability to change the **4-20mA** output through the keypad in manual mode.

6.0 KEYPAD DESCRIPTION

6.1 The **DSG-1682DUPS** gauge contains a four-key front keypad which is used to view or change the setpoint values, configure the gauge, and to calibrate the gauge. The front panel keys are **MENU/ESC**, **ENTER**, and ▲, ▼ (up and down arrow keys).

6.2 **MENU/ESC:**
The **MENU/ESC** key is used to enter the gauge configuration menu. The **MENU/ESC** (escape) key can also be used at any time when in the configuration menu to return to the home screen. When the **MENU/ESC** key is pressed, prior to pressing **ENTER**, in any configuration mode, any changed values are ignored (not stored in memory), the configuration returns to the previous values and the display returns to the home screen.

6.3 **ENTER:**
The **ENTER** key is used throughout the menu to proceed through the configuration and to accept the data to be saved. Throughout configuration when a change has been made and is to be saved to memory, press **ENTER** and the display will read **SAVED**, and the new data or configuration will be stored in the nonvolatile memory.

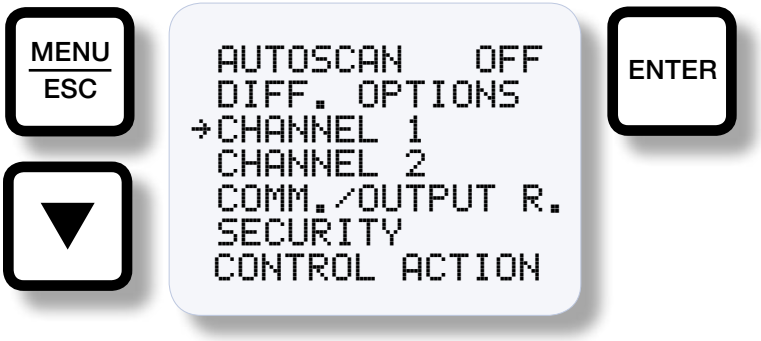
6.4 **▲ AND ▼:**
The up and down arrow keys are used to scroll through the selections in the menu and to increase or decrease values during configuration and calibration. Each key when held will rapidly increase or decrease display values.

7.0 INITIAL OPERATION

7.1 UPON RECEIPT OF GAUGE:

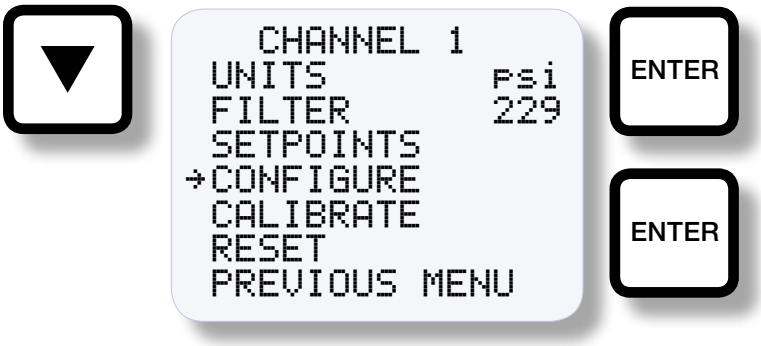
When received, the gauge will be set to one of the pre-configured factory settings so initial installation is simple. Mount **(FIG. 1)** and wire **(FIG. 9)** the gauge. Upon power-up the display will show a splash screen showing: Altronic, Inc., DSG-1682DUPS, the firmware Rev. Level and date. The display will then proceed to read the value for the transducer type set at the factory.

To check the transducer type for which the gauge is configured, press the **MENU** key, select **CHANNEL 1** or **2** and press **ENTER**.

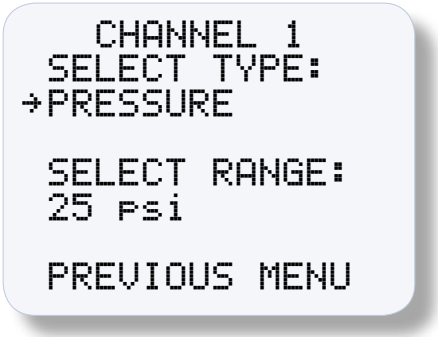


Note: The splash screen can be displayed at any-time from a home screen by pressing both the up and down arrow keys together.

Use the ▼ key to point to **CONFIGURE**, then press **ENTER** twice.

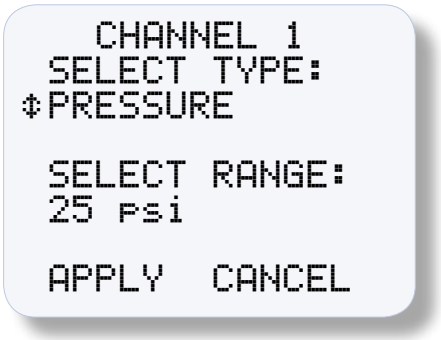


The factory pre-configured transducer type will be displayed.

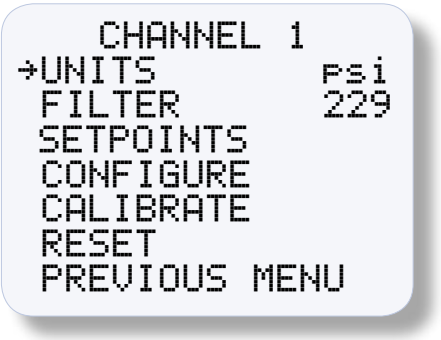


NOTE: The preset factory settings for the transducer type are set for Altronic pressure transducers 691201-x and 691204-x at an output of 0.5 to 4.5 volt, temperature transducer 691202-x/203-x (DEG1) for an output of 10 mV per °F, and temperature transducer 691212/213 (DEG2), 691205 vibration transmitter for an output of 4-20mA, 0 to 2.0 ips; no additional calibration for these transducers is required.

7.2 To change the gauge transducer type, press **ENTER**. The → arrow changes to ⇕. Use ▲ or ▼ to scroll through the factory preset transducer types. The preset factory settings for the transducer type are set for Altronic pressure transducers **691201-x** and **691204-x** at an output of **0.5 to 4.5 volt**, temperature transducer **691202-x/203-x (DEG1)** for an output of **10mV per °F**, and temperature transducer **691212/213 (DEG2)**, **691205** vibration transmitter for an output of **4-20mA**, **0 to 2.0 ips**; no additional calibration for these transducers is required. To select one, display it and press **ENTER**. Next, select the range in the same manner. To apply the sensor configuration, point to **APPLY** and press the **ENTER** key to save the setup. The screen will show **SAVED** and the new configuration will be saved to memory. Point to **CANCEL** to abort the changes. Press **MENU/ESC** to return to the home screen. The gauge will now be reading the correct numeric value for that transducer type.



Next, choose the units. Re-enter the configuration menu by pressing **MENU/ESC**.



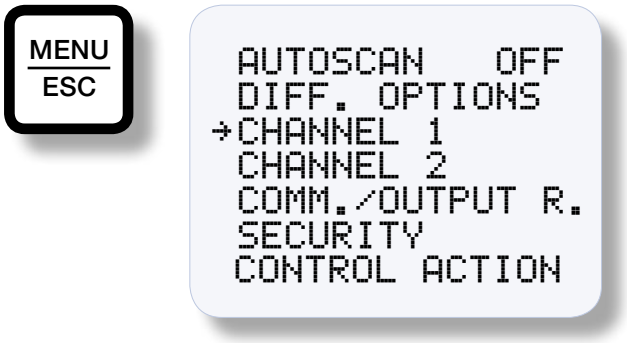
Press **ENTER**, the → (arrow) will change to ⇕. Use ▲ or ▼ to select the desired units and press **ENTER** to accept and save the choice. Press **MENU/ESC** to return to the home screen. Repeat this procedure for channel **2**. The device is now ready to accurately read the selected transducer at each channel.

8.0 GAUGE CONFIGURATION

8.1 This section describes, in detail, how to configure the gauge. Each heading is a menu selection.

GENERAL INFORMATION WHEN NAVIGATING THE MENUS

Press the **MENU/ESC** key to enter the main menu (shown below) from the home screen. In the main menu are submenus for channel **1** and for channel **2**. When navigating the gauge menus, use the ▲ or ▼ arrow keys to point to a menu selection and press **ENTER**, the → (arrow) will change to ⇕. Use the ▲ or ▼ arrow keys to increase or decrease values or to scroll through the selections. After making a change, press the **ENTER** key to save the configuration to memory; the display will read **SAVED**. It is at this time the new data is saved. The **MENU/ESC** (escape) key can be used at any time to abort the menu and return to the home screen. During configuration, the gauge allows **30 seconds** for first level and **2 minutes** for other levels between keystrokes to change or save a new configuration. If the time lapses without a keystroke, the gauge will automatically return to the home screen without making any changes. The new information is saved only if the **ENTER** key is pressed and the gauge reads **SAVED**. A flowchart **(FIG. 2)** is provided that shows step-by-step progression through the gauge configuration procedure.



8.2 **AUTOSCAN — AUTOSCAN 1–30s / OFF:**

Autoscan allows the user to scroll automatically between the three home screens (if configured). Autoscan can be set from **1 to 30 seconds** or **OFF**. With **AUTOSCAN** turned on, when in the home screen, the gauge will display each channel for the selected time before automatically switching to the next channel. The ▲ arrow key can be used to quickly advance to the other channel. With **AUTOSCAN** turned **OFF**, the scanner continually displays one channel at a time. Press ▲ to display the next channel.

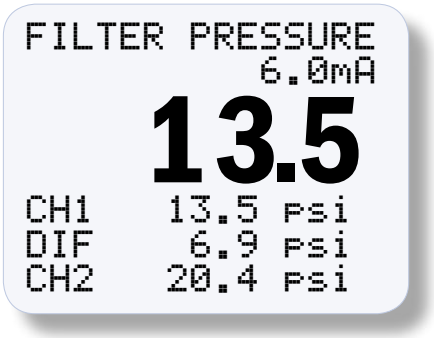
8.3 DIFFERENTIAL OPTIONS

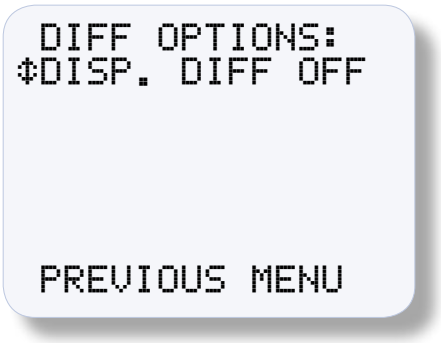
A differential reading screen can be displayed on line **7** (second from the bottom) on the display channel home screen. This value shows the mathematical difference between channel **2** and channel **1**.

The bargraph option will overwrite the differential reading, so it must be disabled to display the differential value.

A differential setpoint value, either high or low, is also available to trip the switch if the reading exceeds the setpoint value.

(SEE SECTION 8.8 TO CONFIGURE THE SETPOINT)

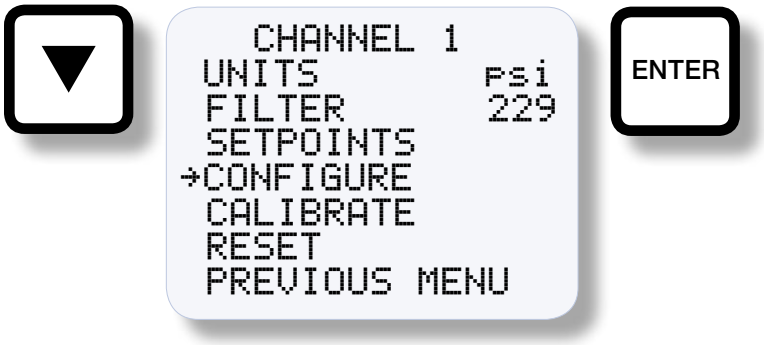




8.4 CHANNEL 1 (2):

Each of the following items: type of units, filter value, setpoint values, input type, calibration and/or the ability to reset the respective output switch, are independent of the other channel. To view or change the listed items for the respective channel, from the main menu, use the ▲ or ▼ arrow key to select channel **1** or **2** and press **ENTER**. Use ▲ or ▼ to point to the item to be viewed or changed and press **ENTER**. Following is a description of each item.

CHANNEL 1 MENU



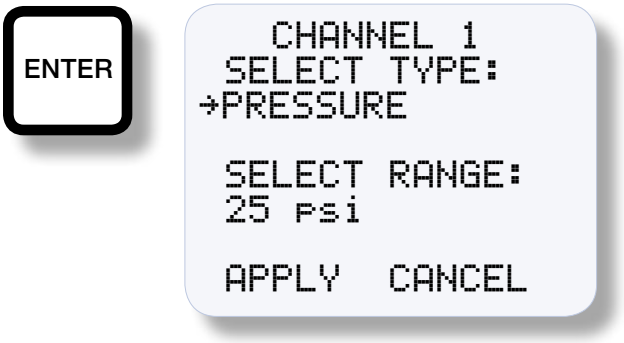
8.5 CONFIGURE:

Configure is used to assign the type of input sensor, select a gauge label, and configure the bargraph. From the main menu, use the down arrow key to select **CONFIGURE** and press **ENTER**.

NOTE: Changing input sensor type reverts data related to the sensor type to the default values. When configuring the DSG-1682DUPS gauge, always configure the input sensor type first.

8.5.1 SELECT TYPE/SELECT RANGE

Several standard types and ranges of transducers are available. This allows easy setup of the input transducers. Select **TYPE** to configure the type of input sensor. First select a sensor type then the range. Only the range related to the sensor type selected will be available. To apply the sensor configuration, point to **APPLY** and press the **ENTER** key to save the setup. The screen will show **SAVED** and the new configuration will be saved to memory.



The factory pre-configured transducer types are set for Altronic pressure transducers **691201-x** and **691204-x** at an output of **0.5 to 4.5 volt**, temperature transducer **691202-x/203-x (DEG1)** for an output of **10mV per °F**, and temperature transducer **691212/213 (DEG2)**, **691205** vibration transmitter for an output of **4-20mA**, **0 to 2.0 ips**; no additional calibration is required.

TABLE A

The type of standard transducers and ranges that are available are:

TYPE	ALTRONIC P/N	SENSOR RANGE	OUTPUT RANGE
PRESSURE	691201-X	15, 25, 50, 100, 300, 500, 1000, 2000, 5000 psig	.5 TO 4.5 volts
PRESSURE	691204-X	50, 100, 300, 500 psia	.5 TO 4.5 volts
TEMPERATURE	NA	"J" type thermocouple -60°C to 750°C -76°F to 1382°F "K" type thermocouple -60°C to 800°C -76°F to 1472°F	millivolts
TEMPERATURE	691202-300 691203-300	DEG 1 5°F to 300°F -15°C to 149°C	10mV/°F
TEMPERATURE	691212-450 691213-450	DEG 2 -40°F to 450°F -40°C to 232°C	1.36 to 3.40 volts
VIBRATION (velocity)	691205 NA	0 to 2 ips velocity 0 to 1 ips velocity	4 to 20mA 4 to 20mA (typ)
VIBRATION (acceleration)	NA NA NA	0 to 10 g's 0 to 20 g's 0 to 30 g's	4 to 20mA (typ) 4 to 20mA (typ) 4 to 20mA (typ)
VOLTAGE	NA NA NA	Volts millivolts millivolts	0 to 5 Vdc -80 mV to 80 mV -160 mV to 160 mV
PERCENT	NA	0 to 100%	0 to 5 Vdc
CUSTOM	NA	-9999 to 99999	0 to 5 Vdc

8.5.2 CUSTOM:

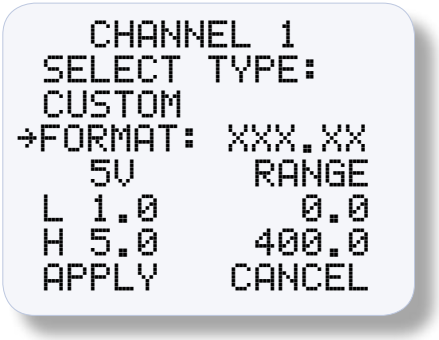
Custom allows the gauge to be configured for a nonstandard transducer. The gauge can display any number within the range from **-9999 to 99999**. A decimal point can be inserted in a number of positions. The gauge accepts sensors in the range of **0 to 5Vdc, -160mV to 160mV, or -80mV to 80mV**.

First, select **FORMAT** to set the decimal point position. The decimal point can be placed anywhere from no decimal point (whole units) to four places to the left **X.XXXX** (ten-thousandths).

Select the voltage range for the transducer type, the choices are: **0 to 5Vdc, -160mV to 160mV, or -80mV to 80mV**. Refer to **FIGS. 11 AND 13**.

Set the voltage value (transducer voltage range), then the range value (transducer span) for both low and high **LO** and **HI**. The gauge will display the numerical range as a straight line from min to max value. As an example, if it is desired to read out in tenths of psi and the transducer is a **1 to 5 volt**, **0 to 400 psi** transducer, set **FORMAT** to **XXXX.X**, then set the **LO** voltage value to **1.0** and the **HI** voltage value to **5.0**. Similarly, set the **LO** range value at **0.0** and the **HI** range value at **400.0**. At **1** volt input the gauge will read **0.0 psi**, at **2.0 volt** input the gauge will read **100.0 psi** etc.

To apply the custom configuration, point to **APPLY** and press the **ENTER** key to save the setup. The screen will show **SAVED** and the new configuration will be saved to memory.



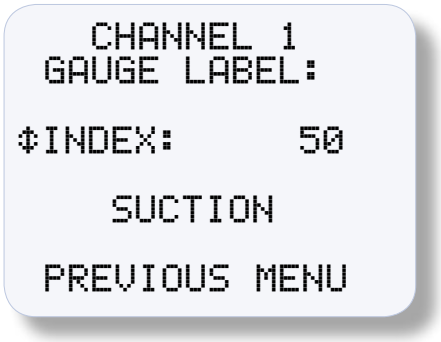
8.5.3 UNITS FOR CUSTOM SENSORS:

Upon completion of configuring a custom sensor type, a units-of-measure should be selected. Press the **MENU/ESC** key and select **UNITS**. All of the standard units-of-measure are available from the **UNITS** menu as well as the ability to create a custom unit label up to 5 characters long. Note that the unit-of-measure selected for a custom transducer type is just a label and is not tied to the transducer type as it is when selecting a standard transducer type. Following are the standard units-of-measure available from the **UNITS** menu: ***NONE*, *CUSTOM*, Amps, Hz, %, Volts, mV, in/s, mm/s, cm/s, g's, m/s², ft/s², psi, psig, psia, KPa, bar, mbar, inH2O, inHg, mmH2O, mmHg, kg/cm², torr, °F, °C, and °K**.

Select ***NONE*** for no unit label. Select ***CUSTOM*** and input a custom label through modbus. See the modbus register list for the register number. Note that **CUSTOM** will not appear on the home screen, it is used as a pointer to the ModBus register.

8.5.4 GAUGE LABEL:

The **DSG-1682DUPS** gauge incorporates several common industry standard labels and the ability to add a custom label for each channel. The label appears at the top of the home screen and defines the monitored channel. The label can be **16** characters long and can contain any standard ASCII character. Use the up or down arrow keys to scroll through the common label list; when a desired label is found, press the **ENTER** key to select it. When it is desired to label the point with a custom label, select ***CUSTOM*** from the list and a custom label can be downloaded via Modbus. If no label is desired, select ***NONE*** from the list.



8.5.5 BARGRAPH:

The configurable bargraph is used to give the user a quick visual indication as to where the sensed media is relative to low and high values and whether it is increasing or decreasing. The bargraph appears near the bottom of the display on the home screen and can be configured to one of five different styles. The style options are: a single bar between two points, increasing bars between two points, single bar between the setpoints, increasing bars between the setpoints, or bargraph off. To configure the bargraph, select **BARGRAPH** and press **ENTER**. Use the ▲ or ▼ arrow keys to select a bargraph style. Then enter the **0%** value and the **100%** value in engineering units. A description of each style is described below:

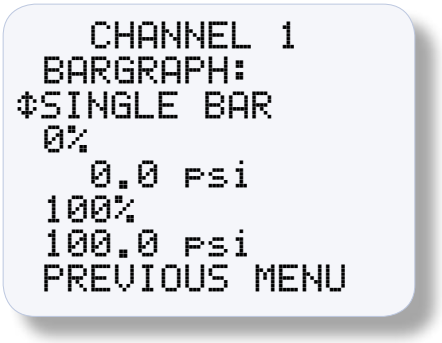
Single bar between two points: For this option, enter a **0%** value and a **100%** value. A single bar will increase or decrease across the display as the input media goes from one point to the other.

Increasing bars between two points: For this option, enter a **0%** value and a **100%** value. The bars will increase or decrease in succession across the display as the input media goes from one point to the other.

Single bar between setpoints: The **0%** point will be the low setpoint value and the **100%** point will be the high setpoint value. A single bar will increase or decrease across the display as the input media changes. If the setpoint values are changed, the two bargraph end-points will change accordingly. If either setpoint is turned off, this option will not be available. Configure both the low and high setpoints in the setpoints menu.

Increasing bars between setpoints: The **0%** point will be the low setpoint value and the **100%** point will be the high setpoint value. The bars will increase or decrease in succession across the display as the input media changes. If the setpoint values are changed, the two bargraph end-points will change accordingly. If either setpoint is turned off, this option will not be available. Configure both the low and high setpoints in the setpoints menu.

OFF, No bargraph: Select off for no bargraph displayed.



8.6 UNITS:

There are several units-of-measure available as standard selections in the gauge. Only the units relevant to the selected input sensor type will be available. Following are the available units for each type of input sensor.

- **Pressure units: psi, psig, psia, KPa, bar, mbar, inH2O, inHg, mmH2O, mmHg, kg/cm², and torr**
- **Temperature units: °F, °C, and °K**
- **Vibration units: in/s, mm/s, cm/s, g's, m/s², and ft/s²**
- **Voltage units: Volts, mV**
- **Percent units: %**

The unit indicators appear on the right side of the display. When changing to a new unit indicator, the displayed numeric value is automatically converted to the new unit value. To change the units, use the ▲ or ▼ key to point to **UNITS** and press the **ENTER** key; the previously programmed unit indicator will appear. Use the ▲ or ▼ key to select one of the available indicators, and press **ENTER** to accept and save the change. The display will read **SAVED**. To return to the home screen press **MENU/ESC**. The new unit indicator selected and the numeric value converted to the selected units will be displayed on the home screen. Up to **5**-digits of a custom units-of-measure can be displayed. It can be configured through Modbus.

8.7 FILTER:

The display filter can be used to stabilize the display reading of a changing input. Filtering is done in both hardware and software. The software filter is adjustable; the rate of change is less for large values. The filter value is read-out in a number from **1** to **255**, **1** being no filter value and **255** being maximum filter value. Below are some typical filter values and their effect on the display reading. Settling values are approximate times in seconds to reach **90%** of new reading. To set the filter value, use the ▲ or ▼ key to point to **FILTER** and press **ENTER**. The display will read the previously set filter value. Use the ▲ or ▼ keys to increase or decrease the filter value and press **ENTER** to save the new filter value.

FILTER VALUE	1	128	200	210	220	230	240	250	252	253	254	255
SETTLING, SEC.	.20	.33	.60	1.0	1.5	2.0	3.0	9.0	14.0	19.0	28.0	55.0

8.8 SETPOINT CONFIGURATION:

The **SETPOINTS** menu allows the user to set a setpoint value for Low, High and Differential, set the switch to failsafe or shelf state, latching or nonlatching, and set the hysteresis value.

8.8.1 LO, HI:

The output switch will trip if the sensor input value on either channel goes either below the low setpoint value (a **LO** setpoint) or above the high setpoint value (a **HI** setpoint).

8.8.2 DIF:

A selectable "high" or "low" differential setpoint is available. The differential setpoint compares the absolute difference between channel **1** and channel **2**. When set to high differential (>) the chosen output switch will trip if the absolute difference in the sensor input values are greater than the setpoint value. When set to low differential (<) the chosen output switch will trip if the absolute difference in the sensor input values are less than the setpoint value. To select either < (low dif), > (high dif), or **OFF**, when in the **SETPOINTS** menu, point to **DF** and press **ENTER**, then press the ▲ and ▼ keys simultaneously to toggle through the selections; press **ENTER** to save.

The setpoints can be set anywhere within the configured range of the gauge, or off. Use the ▲ or ▼ arrow keys to scroll to the desired setpoint value and press **ENTER** to save. To set a setpoint to **OFF**, press the ▲ and ▼ keys simultaneously; press **ENTER** to save.

The differential setpoint is only available through channel **1**.

8.8.3 FAILSAFE OR SHELF STATE:

The switch can be configured for either failsafe or shelf state. When set to **SHELF STATE**, the output switch is in the same state as in the absence of power, N/O is open and N/C is closed. When set to **FAILSAFE**, the outputs are in the opposite state. If set to failsafe and the power is lost to the gauge, the output switch will change states.

This option is only available through channel **1**.

8.8.4 HYSTERESIS:

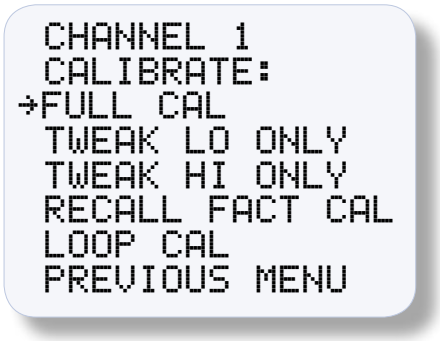
Hysteresis can be used when the output switch is configured as non-latching to prevent the output switch from oscillating or turning on and off around the setpoint. The hysteresis is implemented as a time, in seconds, that begins when the sensor input value returns to within the setpoint value limits. When the input value returns to within the setpoint value limits, the hysteresis timer starts and the switch stays tripped for the configured hysteresis time. If during the hysteresis time the setpoint is violated again, the hysteresis timer starts over. The hysteresis value can be set from **1 to 99 seconds**. To set the hysteresis value, point to **HYST** and press the **ENTER** key. Use ▲ or ▼ to increase or decrease the hysteresis time and press **ENTER** to save the new value.

8.8.5 LATCH/NONLATCH:

Each channel can be configured for latching or nonlatching. When set to **LATCH** the switch will stay tripped continuously until it is either reset manually (using **RESET** in the channel x menu) or by cycling the power. When set to nonlatch the switch will stay tripped outside the setpoint limits but will automatically reset when the input sensor value returns to within the limits plus the hysteresis time set.

8.9 CALIBRATE:

The gauge is calibrated at the factory and should not require additional calibration. However, calibration can be performed in the field many times over the life of the gauge. Each channel is calibrated separately to the type of input transducer selected. The calibration mode is used to calibrate the zero and span values. Calibration can be performed from the front keypad without disassembling the gauge. A calibrator or simulator capable of outputting the correct signal for the type of transducer selected for that channel is required to provide a calibration reference.



NOTE: During calibration, the unit allows 2 minutes between keystrokes to change or save a new calibration. If 2 minutes lapse without a keystroke, the device will automatically return to the home screen with the previous values. The new calibration information is saved only if the ENTER key is pressed and the display reads SAVED.

8.9.1 CALIBRATION PROCEDURE:

Connect the appropriate calibrator or simulator (for thermocouples use the proper type of thermocouple extension wire) to the gauge for channel **1** or **2**, follow the hook-up drawing for that sensor type. Be sure that the sensor type and the engineering units of the calibrator match the type and engineering units of the instrument before performing a calibration.

To calibrate the gauge, select **CALIBRATE** from the channel **1** or **2** menu and press the **ENTER** key. Select **FULL CAL** and press **ENTER**. The display will read **SET LO POINT ON CALIBRATOR AND PRESS ENTER**. Adjust the calibrator/simulator at or near zero or a very low reading and press **ENTER**; the display will show **SAMPLING**, then **ADJUST LO POINT TO MATCH CALIBRATOR**. Use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the setting of the simulator and press **ENTER**. The display will show **SET HI POINT ON CALIBRATOR AND PRESS ENTER**. Adjust the simulator at or near the span value of the transducer or a very high reading and press **ENTER**; the display will show **SAMPLING**, then **ADJUST HI POINT TO MATCH CALIBRATOR**. Again use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the simulator and press **ENTER**. The display will read **CALIBRATION VALUES SAVED!**. The gauge will return to the home screen with the new calibration values stored in memory.

8.9.2 The **DSG-1682DUPS** gauge has a feature that allows a slight adjustment of either the zero or span values individually. This type of calibration can be used to "tweak" the readout to match that of a known value without actually performing a formal calibration procedure. This adjustment is independent for each channel and must be performed on that individual channel. Please note that this type of adjustment will invalidate calibration settings from the **FULL CAL** procedures.

TWEAK LO ONLY:

To make a small adjustment on the zero calibration value of the gauge, enter the calibration mode by selecting **CALIBRATE** and press **ENTER**; select **TWEAK LO ONLY** from the menu and press **ENTER**. The display will show **SET LO POINT ON CALIBRATOR AND PRESS ENTER**. Adjust the calibrator/simulator at or near zero or a very low reading and press **ENTER**; the display will show **SAMPLING**, then **ADJUST LO POINT TO MATCH CALIBRATOR**. Use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the calibrator and press **ENTER**. The display will read **CALIBRATION VALUES SAVED!**. The gauge will return to the home screen with the new zero calibration value stored in memory.

TWEAK HI ONLY:

To make a small adjustment on the span calibration value of the gauge, enter the calibration mode by selecting **CALIBRATE** and press **ENTER**; select **TWEAK HI ONLY** from the menu and press **ENTER**. The display will show **SET HI POINT ON CALIBRATOR AND PRESS ENTER**. Adjust the calibrator/simulator at or near the desired span value and press **ENTER**; the display will show **SAMPLING**, then **ADJUST HI POINT TO MATCH CALIBRATOR**. Use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the calibrator and press **ENTER**. The display will read **CALIBRATION VALUES SAVED!**. The gauge will return to the home screen with the new span calibration value stored in memory.

8.9.3 RECALL FACTORY CAL VALUES:

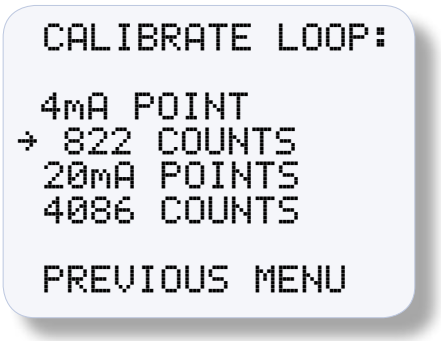
The user can at any time during the life of the gauge reinstate the factory calibration values for channel **1** or **2** independently. Select **CALIBRATE** from the **CHANNEL 1** or **CHANNEL 2** menu and press **ENTER**; select **RECALL FACTORY CAL** and press **ENTER**. The next screen will display the configured type and range of input for the selected channel. Select **APPLY** to confirm or **CANCEL** to decline and press **ENTER**. If **APPLY** is selected, the display will show **CALIBRATION VALUES SAVED!**. The gauge will return to the home screen with the factory default calibration values stored in memory. If **CANCEL** is selected, the gauge will retain the current calibration values. Press the **ESC** key to return to the home screen.

The *calibration values only*, will return to the factory default; all other settings will remain unchanged. If the transducer type or range is incorrect, press the **MENU/ESC** key to abort saving incorrect factory cal values. Configure the gauge for the desired input sensor type and range and then recall the factory cal values.

8.9.4 LOOP CAL:

The current loop of the **DSG-1682DUPS** gauge is factory calibrated and will not typically require field calibration. However, if desired, **LOOP CAL** can be used to calibrate the **4-20mA** current loop output typically to meet the needs of a preselected loop resistor in the receiving device. Please note that **LOOP CAL** calibrates the current loop hardware on the gauge, it is not to be used to configure the current loop output.

If it is necessary to re-calibrate the **4-20mA** output, the following procedure can be used. Connect a digital milliamp meter in series with the loop output. Select **CALIBRATE** from the menu and press the **ENTER** key. Select **LOOP CAL** and press **ENTER**. The **CALIBRATE LOOP** menu is show below. The display will show the **4mA** and **20mA** counts numbers for the digital to analog converter. With the arrow pointing to the 4mA counts value, press **ENTER** and use the ▲ or ▼ arrow key to increase or decrease the displayed counts number until the measured loop current is equal to **4.00mA** on the milliamp meter. Press **ENTER**, the display will show **SAVED** and the new **4mA** value will be stored in memory. Select the **20mA** counts value, press **ENTER** and use the ▲ or ▼ arrow key to increase or decrease the displayed counts number until the measured loop current is equal to **20.00mA** on the milliamp meter and press **ENTER**. The display will read **SAVED**, and the new **20mA** calibration value will be stored in memory. Press the **MENU/ESC** key to return to the home screen.

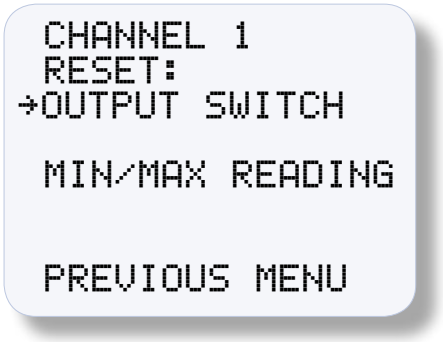


8.10 RESET:

The reset selection in the menu is used to reset the output switch when set to latching and also to re-zero the min/max reading for channel **1** or **2** independently. Since each output switch and the min/max reading is tied to its respective channel, a separate reset can be performed. To perform a reset, select either channel **1** or **2** from the menu, use ▲ or ▼ to scroll to **RESET** and press **ENTER**. Select either **OUTPUT SWITCH** or **MIN/MAX READING**. Press **ENTER** and the display will show **RESET!**. A reset can also be performed by sending a reset command via the **RS-485** Modbus RTU communications register.

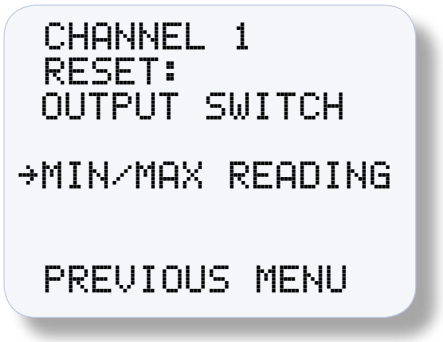
8.10.1 OUTPUT SWITCH:

Use the ▲ or ▼ arrow key to point to **OUTPUT SWITCH** and press **ENTER**; The display will show **RESET!**.



8.10.2 MIN/MAX READING:

Use the ▲ or ▼ arrow key to point to **MIN/MAX READING** and press **ENTER**; The display will show **RESET!**. **RESET** resets both the min and max readings to the current reading.

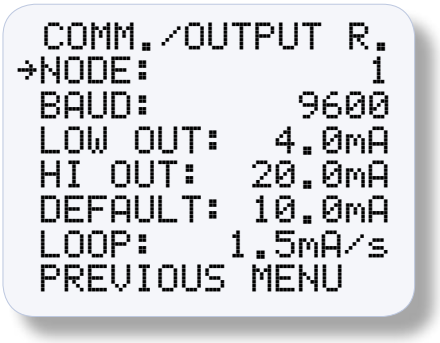


8.11 COMMUNICATIONS/OUTPUT RANGE:

The **DSG-1682DUPS** gauge is part of a system that has been carefully designed to easily interface to popular computers, terminals, programmable controllers and Altronic instruments. Modbus RTU is the protocol used in the **DSG-1682DUPS**. A Modbus register list with register numbers and descriptions of each register can be found in **SECTION 11.0**. The serial communications are compliant to the Modicon Modbus RTU standard and uses **RS-485** for its hardware communication format. To view or adjust the communication parameters, select **COMM/OUTPUT R.** from the main menu and press **ENTER**. Throughout the menu use the ▲ or ▼ arrow keys to make a selection and press **ENTER** to save the changes.

In addition, the **4-20mA** output range is also defined in this menu.

FOR DETAILED COMMUNICATIONS INFORMATION SEE SECTION 10.0.



8.11.1 NODE:

The node number gives each gauge on the communications port an identity. Any node number from **1 to 99** can be used. Use the up and down arrow keys to select a node number and press **ENTER** to save.

8.11.2 BAUD:

Select the required baud rate and press **ENTER** to save.
SEE SECTION 10.3 FOR AVAILABLE BAUD RATES.

8.11.3 LOW OUT:

This displays the lowest **4-20mA** current value that the **DSG-1682DUPS** will send to the **4-20mA** output. This can be helpful in limiting the range for the **4-20mA** output. Use the up and down arrow keys to select the current value and press **ENTER** to save. This value must be lower than the **HI OUT** or an error will occur.

8.11.4 HI OUT:

This displays the highest **4-20mA** current value that the **DSG-1682DUPS** will send to the **4-20mA** output. This can be helpful in narrowing the range for the **4-20mA** output. Use the up and down arrow keys to select the current value and press **ENTER** to save. This value must be higher than the **LOW OUT** or an error will occur.

8.11.5 DEFAULT (CURRENT):

This displays the **4-20mA** current value that will be sent to the **4-20mA** output when the **N/C** digital input has been opened. Use the up and down arrow keys to select the current value and press **ENTER** to save. This value may be anywhere between **4 to 20mA** range. The default current overrides both the **HI** and **LOW OUT** values.

8.11.6 LOOP:

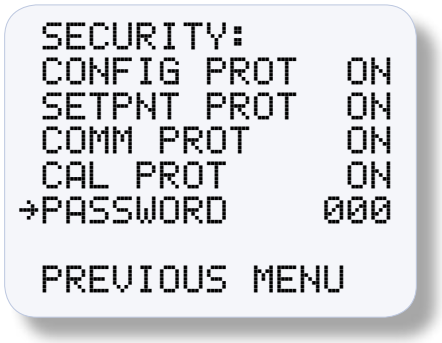
This value requires prior knowledge of **PID** controls in order to fully understand this value. In a typical **PID** control, the **4-20mA** output could swing rail-to-rail depending on the settings of the **PID**. Sometimes a limit to the change in **4-20mA** is desired. This value sets a limit (or not) on the **4-20mA** range that the controller will make to the **4-20mA** output. If the loop is set to **1.5mA/s**, the current output will not change by more than **1.5mA** per second, independent of the **PID** error or the **PID** values. The range can be from **.1mA/s** up to **20.0mA/s** which is the same as the **TRUE PID** setting. Use the up and down arrow keys to select the loop setting and press **ENTER** to save.

8.12 SECURITY:

The security feature allows for a user to lock the gauge to secure chosen areas of the menu from being changed. There are several individual areas in the menu system that can be protected as well as two layers of protection. The menus that can be protected are the **CONFIGURATION** menu settings, the **SETPOINT** values, the ability to make changes via modbus **COMMUNICATIONS**, and **CALIBRATION** protection. When protection is **ON**, the user is able to view the menu values but not able to change them. If an attempt is made to change the values and the **ENTER** key is pressed when protection is on, the display will read **PASSWORD PROTECTED! ENTER PASSWORD**. This prompts the user to enter the password. If the correct password is entered, the requested configuration values can be changed.

To set or change a password, select **SECURITY** from the main menu and press **ENTER**. If the password is set to **000**, the security menu will be available without entering the password. If the password is any number other than **000**, the proper password must be entered to enter the security menu. Each of the security selections can be turned **ON** or **OFF** individually. Use the ▲ or ▼ arrow key to point to the item to be protected and press **ENTER**, the → arrow will change to ⇕. Use the ▲ or ▼ key to select either **ON** or **OFF** and press **ENTER**. The display will show **SAVED** and the change will be saved to memory. When a menu item is protected, the display will read **ON**, not protected will show as **OFF**. To enter a password, point to **PASSWORD** and press **ENTER**. Use the ▲ or ▼ arrow key to increase or decrease each of the **3-digit** password numbers and press **ENTER**. The display will show **SAVED** and the change will be saved to memory. Any number from **000 to 999** can be used. Please note that Autoscan, Units, filter values, and reset cannot be locked out by security protection. Please note

that **SECURITY** protects both channels.



8.12.1 CONFIGURATION PROTECTION:

When set to **ON**, prevents the user from changing items in the **CONFIGURE** menu. Items protected are **TYPE** (input sensor type), **GAUGE LABEL,** and **BARGRAPH**.

8.12.2 SETPOINT PROTECTION:

When set to **ON**, prevents the user from changing the items in the **SETPOINTS** menu. All setpoint values and configurations can be read but not changed.

8.12.3 COMMUNICATIONS PROTECTION:

When set to **ON** prevents the user from changing the Modbus registers via the serial communications. User can read, but not write data. If the user attempts to perform a write, the error message **INVALID FUNCTION CODE** will be sent.

8.12.4 CALIBRATION PROTECTION:

When set to **ON**, prevents user from changing calibration values.

8.12.5 PASSWORD:

The password is the second level of protection. When **PASSWORD** is selected, the user will be prompted to enter a **3-digit** password. To enter a password, point to **PASSWORD** and press **ENTER**, the first digit will be underlined. Use the ▲ or ▼ arrow key to increase or decrease that digit from **0 to 9** and press **ENTER**. The next digit will be highlighted, use the same procedure to continue to enter a **3-digit** password and press **ENTER** to save. Any number from **000** to **999** can be used. The default password is **000**.

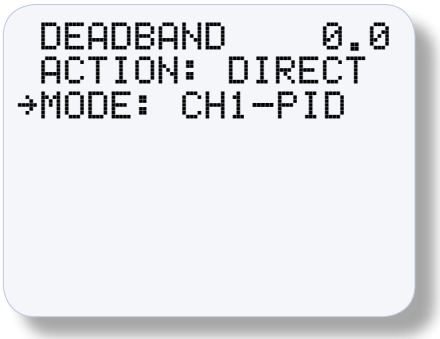
With a password in memory, and the security screen is accessed, the message **PASSWORD PROTECTED! ENTER PASSWORD** will appear. If the proper password is entered, the security screen will be displayed and changes will be allowed. To gain access to the protected menus without having to enter a password, turn protection **OFF**. If the incorrect password is entered, the display will return to the menu denying access to the protected menu.

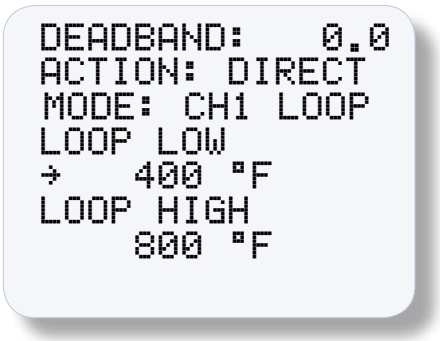
8.13 CONTROL ACTION:

There are four different modes of operation on how the device operates. They are **CH1 LOOP**, **CH2-CH1**, **CH1-PID** and **MAPPING**. These modes determine how the **4-20mA** is setup for this product. As these selections are saved, other values may need to be programmed as well. Use the ▲ or ▼ arrow keys to move to the field to be changed, press **ENTER** and the (▲▼) box will appear. The value may be increased or decreased to the new value. Press **ENTER** to save.

8.13.1 CH1 LOOP:

To configure the **CH1 LOOP**, use the ▲ and ▼ arrow keys to scroll through the selections in **MODE:** and press **ENTER**. The display will read the value for the previously set **4mA** point, **LOOP LOW**, and **20mA** point, **LOOP HIGH** in units the gauge is configured for. Use the ▲ or ▼ arrow keys to scroll to **CH1 LOOP** and press **ENTER** to save the new configuration.

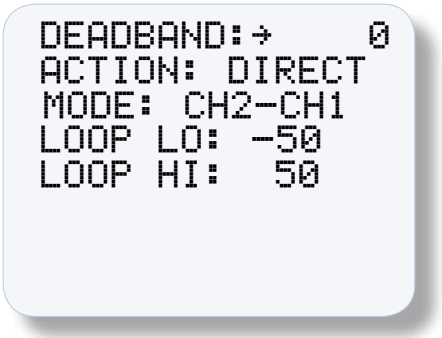


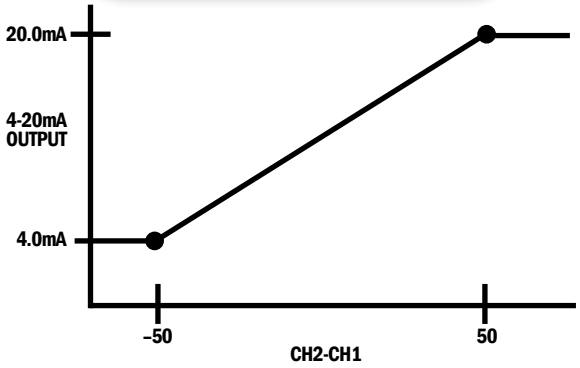


8.13.2 CH2-CH1:

To configure the **CH2-CH1** mode, use the ▲ and ▼ arrow keys to scroll to **CH2-CH1** in **MODE:** and press the **ENTER** key. Use the ▲ and ▼ arrow keys to move to the field to be changed, press **ENTER** and the (▲▼) box will appear. The value may be increased or decreased to the new value. Press **ENTER** to save.

The **LOOP LO:** value represents the **CH2 - CH1** target value for **4mA**. The **LOOP HI:** value represents the **CH2 - CH1** target value for **20mA**.

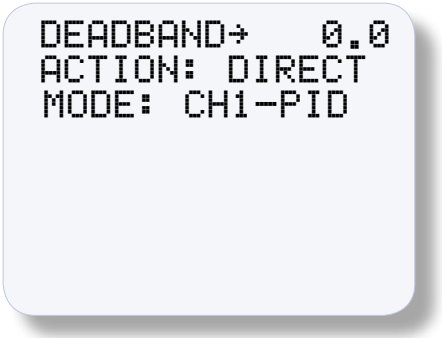




8.13.3 CH1-PID:

This allows channel one to be used as a single point **PID** controller. To configure the **CH1-PID** mode, use the ▲ and ▼ arrow keys to scroll to **CH1-PID** in **MODE:** and press the **ENTER** key. There are no additional fields for this selection..

SECTION 9.5 DESCRIBES THE FUNCTION OF PID IN MORE DETAIL.

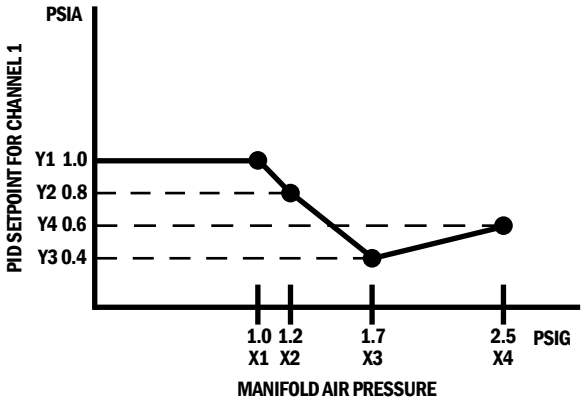


8.13.4 MAPPING:

To configure for **MAPPING** mode, use the ▲ and ▼ arrow keys to scroll to **MAPPING MODE:** and press the **ENTER** key.

Use the ▲ and ▼ arrow keys to move to the field to be changed, press **ENTER** and the (▲▼) box will appear. The value may be increased or decreased to the new value. Press **ENTER** to save.

When changing **X1-X4**, the value will only save if **X1 < X2 < X3 < X4**, otherwise the value will not change and **ERROR** is displayed.



This particular mapping can be done through the keypad as shown:

```
DEADBAND:    0.0
ACTION: INVERSE
MODE:→MAPPING
CH2 PTS CH1 PTS
1   1.0 1   1.0
2   1.2 2   0.8
3   1.7 3   0.4
4   2.5 4   0.6
```

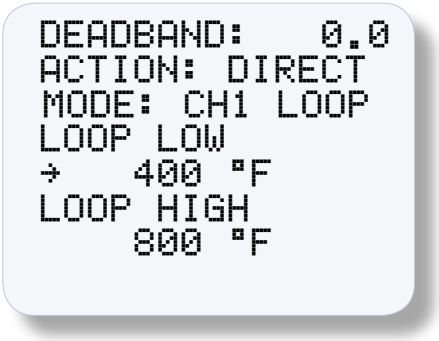
9.0 MODES OF OPERATION

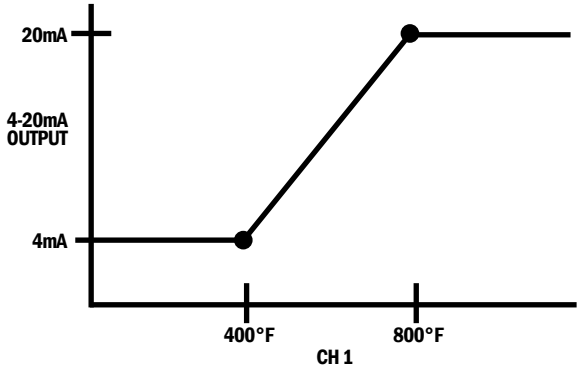
This section describes in detail the modes of operation and how they can be used.

The modes of operation can be used in conjuction with the **HI OUT:/ LOW OUT:** in **SECTION 8.11** (in the **COMM./OUTPUT R.** menu) to limit the current range. Rather than **4-20mA**, the range could be limited to **12-20mA** or **4-12mA**. Optionally, both ranges could be limited, for example, **9-18mA**.

9.1 CH1 LOOP:

The **CH1 LOOP** mode allows the user to output a scalable **4-20mA** proportional to the media being measured. In the example shown below, when the temperature is at **400°F** or below, the current output is at **4mA**. When the temperature is greater than **800°F**, the current output is **20mA**. When the temperature is between **400°F** and **800°F**, the **4-20mA** scales the range from **4mA to 20mA**.





The **4-20mA** current loop can be configured for reverse action. Simply configure the **LOOP LOW** or low point with the **20mA** value and the **LOOP HIGH** or high point with the **4mA** value.

The deadband and action field have no function in this particular mode of operation.

9.2 CH2 - CH1

The **CH2 - CH1** mode allows the user to output a scalable **4-20mA** proportional to the difference between channel **2** and channel **1**. This is similar to the **CH1 LOOP** mode of operation. This creates many possibilities where a differential is needed.

The deadband and action field have no function in this particular mode of operation.

9.3 CH1 PID

The **CH1 PID** mode is for a classic **PID** controller. Once selected, the **PID** home screen becomes available such that the fixed setpoint, **P**, **I** and **D** values may be viewed, modified and tuned for each specific application. Typically, this would control suction, discharge or manifold pressure, although any process which needs to be controlled can be used. **REFER TO SECTION 9.5** for more information regarding the **PID**.

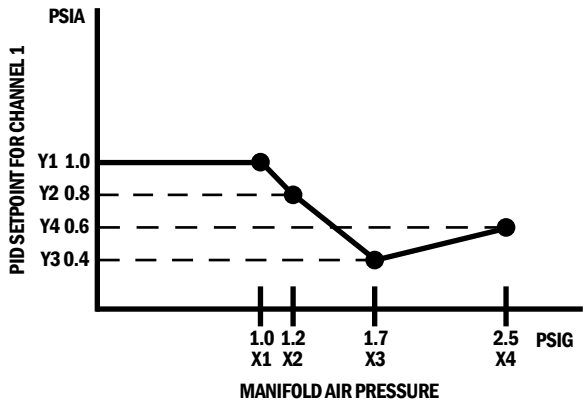
The deadband and action are active in this mode of operation.

9.4 MAPPING

This mode of operation provides a **PID** controller as described above, except that, instead of a fixed setpoint, it uses a variable setpoint based upon channel two. Four points are provided to map the relationship between channel **2** and the **PID** setpoint value.

In this mode of operation in the **PID** home screen, the setpoint value may be viewed, but not changed through the keypad. This value is the calculated **PID** setpoint which has been mapped from channel **2**.

```
DEADBAND:    0.0
ACTION: INVERSE
MODE:→MAPPING
CH2 PTS CH1 PTS
1   4.0 1    60
2   6.0 2    80
3   7.5 3   100
4   8.0 4   120
```



As the field pressure decreases, the control setpoint for the discharge pressure decreases. In this application, the engine continues to run and prevents the well from running dry.

The deadband and action are active in this mode of operation.

9.5 PID CONTROL/OVERVIEW:

A **PID** controller is a common controller used in many industrial control systems. A full description of **PID** control and theory is beyond the scope of this manual. However, there are many good web resources which can be viewed for more understanding.

The **PID** algorithm takes the difference between the control setpoint (value to control to) and the measured value (what is actually displayed) and makes a corrective action (by modifying the **4-20mA**) to achieve the control setpoint.

9.5.1 DEADBAND:

The controller deadband defines a user programmed value both above and below the setpoint for which no corrective action will be taken. Deadband is used to improve control stability by holding the controller output constant in the presence of "noise" or small transient errors on the input.

This function only has meaning in the **PID** mode of operation.

9.5.2 ACTION, DIRECT/INVERSE:

This defines the relationship between the measured **PID** value (channel **1**), the **PID** setpoint, and the effects of whether the **4-20mA** will increase or decrease the current. Refer to the table below for a better understanding of this relationship. This function only has meaning in the **PID** mode of operation.

	MEASURED < CONTROL SETPOINT	MEASURED > CONTROL SETPOINT
DIRECT	CURRENT INCREASES	CURRENT DECREASES
INVERSE	CURRENT DECREASES	CURRENT INCREASES

9.5.3 P TERM, PROPORTIONAL TERM:

This term creates a corrective action (current change) based upon the difference between the measured value and the control setpoint. The smaller the value of **P**, the larger magnitude of its effect can be seen. The range of **P** may be within **1-999 %**.

9.5.4 I TERM, INTEGRAL TERM:

This term determines the rate at which the corrective action (current change) takes place. The smaller the time, the faster the current will change. The range of **I** may be from **1-999** seconds.

9.5.5 D TERM, DERIVATIVE TERM:

This term corrects for quick changes to the error. The higher the number, the less effect it has on the corrective action. The range of **D** may be within **1-999** minutes.

9.5.6 AUTO/MANUAL MODE

This allows the **PID** control to be in either **AUTO** or **MANUAL** mode of operation. In the **AUTO** mode, the instrument automatically performs **PID** functions. In **MANUAL** mode, the **4-20mA** remains at its current value. The current may be manually changed as described in the next section.

9.5.7 C/CHANGE CURRENT

This field allows the user to increment or decrement the **4-20mA** current if the unit is in the **MANUAL** mode. Place the right arrow by the **"C"** and press **ENTER**. Press the ▲ and ▼ arrow keys to increase or decrease the current.

10.0 RS-485 COMMUNICATIONS

The **DSG-1682DUPS** gauge is part of a system that has been carefully designed to easily interface to popular computers, terminals, programmable controllers and Altronic instruments. The gauge communicates in the Modbus RTU protocol.

10.1 MASTER/SLAVE OPERATION: (FIG. 19)

The gauge's **RS-485** communication system is designed as a master/slave system; that is, each unit responds to its own unique address (node number) only after it is interrogated by the master (computer). One master and up to **32** slaves can communicate in the system. The units communicate with the master via a polling system. The master sends a command and only the polled slave responds. The slave modules can never initiate a communications sequence. A simple command/response protocol must be strictly observed.

10.2 NODE NUMBER:

The node number is used in the system to identify the desired slave unit being polled. The node number can be any numeric value from **1 to 99** although only **32** devices can be served on a single communications port. This number range (**1 to 99**) is allowed so that if device grouping by function or application is desired, it can be implemented using the first digit as the group or engine number and the second as the unit number. For example, **53** could be used to identify the number **3** slave unit mounted on engine number **5**.

10.3 BAUD RATE:

Baud rates available are **9600, 19200, 38400, 57600, 115200**.

10.4 HALF-DUPLEX OPERATION:

The **RS-485** system employed uses two wires for communication and cannot send and receive data at the same time over the same two wires making it a half-duplex system. When the master is in the transmit mode, the slave is in the receive mode and vice-versa.

10.5 ELECTRICAL OPERATING RANGE:

RS-485 is a communications standard to satisfy the need for multi-dropped systems that can operate at high speeds over long distances. **RS-485** uses a balanced differential pair of wires switching from **0 to 5** volts to communicate data. **RS-485** drivers can handle common mode voltages from **-7 to +12 volts** without loss of data, making them an excellent choice for industrial environments.

10.6 COMMUNICATIONS PARAMETERS:

The following must be set by the master to communicate with the slaves:

- **Baud Rate:** **9600 (DEFAULT)** **OTHERS AVAILABLE, SEE SECTION 10.3**
- **Data Bits:** **8**
- **Stop Bits:** **1**
- **Parity:** **None**

10.7 COMMUNICATIONS WIRING:

The **RS-485** wiring diagram **(FIG. 19)** illustrates the wiring required for multiple slave unit hookup. Note that every slave unit has a direct connection to the master. This allows any one slave unit to be removed from service without affecting the operation of the other

units. Every unit must be programmed with a unique address or node number, but the addition of new units or nodes can be in any order. To minimize unwanted reflections on the transmission line, the bus should be arranged as a trunk line going from one module to the next. Random structures of the transmission line should be avoided. Special care must be taken with long busses (**500 feet** or more) to ensure error-free operation. Long busses must be terminated with a **120 ohm** resistor between the terminals marked **RS-485 A** and **RS-485 B** at the master only. The use of twisted pair shielded cable will enhance signal fidelity and is recommended. To prevent ground loops the shield should be connected to the shield terminal at the master only.

10.8 RX, TX INDICATORS:

RX and **TX** (receive and transmit) LEDs on the back of the gauge indicate when the unit is receiving or transmitting data.

10.9 CONNECTING TO A PC:

When connecting the gauge to the **RS-232** port on a PC, an **RS-232** to **RS-485** converter **(FIG. 18)** must be used for the communication interface.

10.10 LOADING:

NOTE: The maximum number of units connected in a system is 32.

RS-485 uses a balanced differential pair of wires switching from **0 to 5 volts** to communicate data. In situations where many units (**32 max.**) are connected together on a long run, voltage drop on the communications leads becomes a major problem. Voltage drops on the **RS-485** minus lead appear as a common mode voltage to the receivers. While the receivers are rated to a maximum voltage difference of **±7 volts**, **-7V to +12V**, a practical system should not have a voltage difference exceeding **±3 volts** under normal conditions. The wire gauge used for the connections, therefore, limits the maximum number of units or the maximum length of wire between units in each application. The following formula can be used as a guideline to select the appropriate wire gauge.

- **For 18 AWG wire** — **No. of units = (4000)/(ft. of wire used)**
- **For 20 AWG wire** — **No. of units = (2500)/(ft. of wire used)**
- **For 22 AWG wire** — **No. of units = (1600)/(ft. of wire used)**

11.0 MODBUS REGISTER LISTS:

The maximum number of registers that can be read at one time is limited to **32**. The maximum number of booleans that can be read at one time is limited to **256**. All communications are at **9600 baud** (default), **SEE SECTION 10.3 FOR OTHER SPEEDS** **8 Data bits, No Parity, 1 Stop bit (9600 8N1)**.

11.1 00000 SERIES REGISTERS

ADDRESS	DESCRIPTION OF FUNCTION		
00001	PROTECT CONFIGURATION Protect configuration from being changed by keypad	0=OFF	1=ON
00002	PROTECT SETPOINT Protect setpoints from being changed by keypad	0=OFF	1=ON
00003	PROTECT COMMUNICATIONS Protect against ModBus writes	0=OFF	1=ON
00004	PROTECT CALIBRATION Protect against changing calibration values	0=OFF	1=ON
00005	AUTO/MANUAL MODE	0=MANUAL	1=AUTO
00006	CHANNEL 1 RESET MIN/MAX Reset MIN/MAX readings for CHANNEL 1		1=RESET
00007	CHANNEL 2 RESET MIN/MAX Reset MIN/MAX readings for CHANNEL 2		1=RESET
00008 ↓ ↓ 00016	RESERVED		
00017	SWITCH 1 RESET		1=RESET
00018	SWITCH 1 STATE	0=SHELF	1=FAILSAFE
00019	SWITCH 1 TYPE	0=NON-LATCH	1=LATCHING
00020 ↓ ↓ 00024	RESERVED		
00025	SWITCH 2 RESET		1=RESET
00026	RESERVED		
00027	SWITCH 2 TYPE	0=NON-LATCH	1=LATCHING
00028 ↓ ↓ 00047	RESERVED		
00048	Config Override – Allow ModBus to override Channel Configuration		

Note: All temperatures are stated in 0.1 DEG. Kelvin (for universal compatibility). Therefore a register value of 2730 is 273.0° K, which is 0° C, or 32°F.

11.2 10000 SERIES REGISTERS

	ADDRESS	DESCRIPTION OF FUNCTION	
CHANNEL STATUS	10001	CHANNEL 1 signal OK	1=OK
	10002	CHANNEL 1 signal low out of range	1=LOOR
	10003	CHANNEL 1 signal hi out of range	1=HOOR
	10004	CHANNEL 1 thermocouple open	1=TCOPEN
	10005 ↓ ↓ 10008	RESERVED	
	10009	CHANNEL 2 signal OK	1=OK
	10010	CHANNEL 2 signal low out of range	1=LOOR
	10011	CHANNEL 2 signal hi out of range	1=HOOR
	10012	CHANNEL 2 thermocouple open	1=TCOPEN
	10013 ↓ ↓ 10016	RESERVED	
	10017	CHANNEL 1 FAULT HI	
	10018	CHANNEL 1 FAULT LO	
	10019	CHANNEL 1 FAULT DIFF	
	10020 ↓ ↓ 10024	RESERVED	
	10025	CHANNEL 2 FAULT HI	
	10026	CHANNEL 2 FAULT LO	

11.3 30000 SERIES REGISTERS

30001	CHANNEL STATUS – same as 10001–10016
30002	CHANNEL STATUS – same as 10017–10032
30004	CHANNEL 1 Analog Value (float msw)
30005	CHANNEL 1 Analog Value (float lsw)
30006	CHANNEL 2 Analog Value (float msw)
30007	CHANNEL 2 Analog Value (float lsw)
30008	Differential Value (float msw)
30009	Differential Value (float lsw)
30010	Ambient Temp. DEGK (float msw)
30011	Ambient Temp. DEGK (float lsw)
30012	CURRENT LOOP OUTPUT (4-20mA, 40-200)
30013	CHANNEL 1 Hi Hyst Timer (0.1s)
30014	CHANNEL 1 Lo Hyst Timer (0.1s)
30015	CHANNEL 1 Diff Hyst Timer (0.1s)
30016	CHANNEL 2 Hi Hyst Timer (0.1s)
30017	CHANNEL 2 Lo Hyst Timer (0.1s)

ADDRESS	DESCRIPTION OF FUNCTION
30018	RESERVED
30019	CHANNEL 1 MAX (float) (msw)
30020	CHANNEL 1 MAX (float) (lsw)
30021	CHANNEL 1 MIN (float) (msw)
30022	CHANNEL 1 MIN (float) (lsw)
30023	CHANNEL 2 MAX (float) (msw)
30024	CHANNEL 2 MAX (float) (lsw)
30025	CHANNEL 2 MIN (float) (msw)
30026	CHANNEL 2 MIN (float) (lsw)
30027	CHANNEL 1 DISPLAYED (float) (msw)
30028	CHANNEL 1 DISPLAYED (float) (lsw)
30029	CHANNEL 2 DISPLAYED (float) (msw)
30030	CHANNEL 2 DISPLAYED (float) (lsw)
30031	DIFFERENTIAL DISPLAYED (float) (msw)
30032	DIFFERENTIAL DISPLAYED (float) (lsw)

11.4 40000 SERIES REGISTERS

40001	Coils 001-016
40002	Coils 017-032
40003	Coils 033-048
40004	Autoscan 0-30s
40005	Node Number 1-99
40006	Baud rate Index 0=9.6k 1=19.2k 2=38.4k 3=57.6k 4=115.2k
40007	Security Password 000-999
40008	Diff. Display Options DIFFERENTIAL VALUE BIT 1 0=OFF 1=ON SWITCH 1 DIFFERENTIAL BARGRAPH OPTIONS
40009	LOW CURRENT (4-20mA) (40-200)
40010	HIGH CURRENT (4-20mA) (40-200)
40011	CHANNEL 1 Lag Filter Gain (1-255)

ADDRESS	DESCRIPTION OF FUNCTION
40012	CHANNEL 1 SENSOR TYPE CUSTOM 0=Custom PRESSURE SENSORS 256=15psi 257=25psi 258=50psi 259=100psi 260=300psi 261=500psi 262=1000psi 263=2000psi 264=5000psI 265=10000psi 266=Custom Pressure TEMPERATURE SENSORS 512=JTC 513=KTC 514=DEG1 515=DEG2 516=Custom Temperature VIBRATION SENSORS Velocity 768=1ips 769=2ips 770=Custom Velocity Acceleration 1024=10g 1025=20g 1026=50g 1027=Custom Acceleration PERCENT 1280=0–100% (0–55Vdc) 1281=Custom Percent VOLTAGE 1536=0–5Vdc 1537=±160mVdc 1538=±80mVdc 1539=Custom Voltage
40013	CHANNEL 1 Units Index (class specific) PRESSURE SENSORS 0=psi 1=psig 2=psia 3=Kpa 4=bar 5=mbar 6=inH2O@20C 7=inHg 8=mmH2O 9=mmHg 10=kg/cm2 11=torr TEMPERATURE SENSORS 0=Kelvin 1=Celsius 2=Fahrenheit VIBRATION SENSORS Velocity 0=in/s 1=mm/s 2=cm/s Acceleration 0=G 1=ft/s/s 2=m/s/s
40014	CHANNEL 1 A/D Voltage Range 0=5V 1=±160mV 2=±80mV
40015	CHANNEL 1 SENSOR MAX (float) (msw)
40016	CHANNEL 1 SENSOR MAX (float) (lsw)
40017	CHANNEL 1 SENSOR MIN (float) (msw)
40018	CHANNEL 1 SENSOR MIN (float) (lsw)
40019	CHANNEL 1 Range HI (float) (msw)
40020	CHANNEL 1 Range HI (float) (lsw)
40021	CHANNEL 1 Volt HI (float) (msw)
40022	CHANNEL 1 Volt HI (float) (lsw)
40023	CHANNEL 1 Range LO (float) (msw)
40024	CHANNEL 1 Range LO (float) (lsw)
40025	CHANNEL 1 Volt LO (float) (msw)
40026	CHANNEL 1 Volt LO (float) (lsw)
40027	CHANNEL 1 Zero Band (float) (msw)
40028	CHANNEL 1 Zero Band (float) (lsw)
40029	CHANNEL 1 Custom Decimal Place (0-4)
40030	CHANNEL 1 Label Index 0=NONE 1=CUSTOM
40031	CHANNEL 1 Custom Label (char. 1:2)

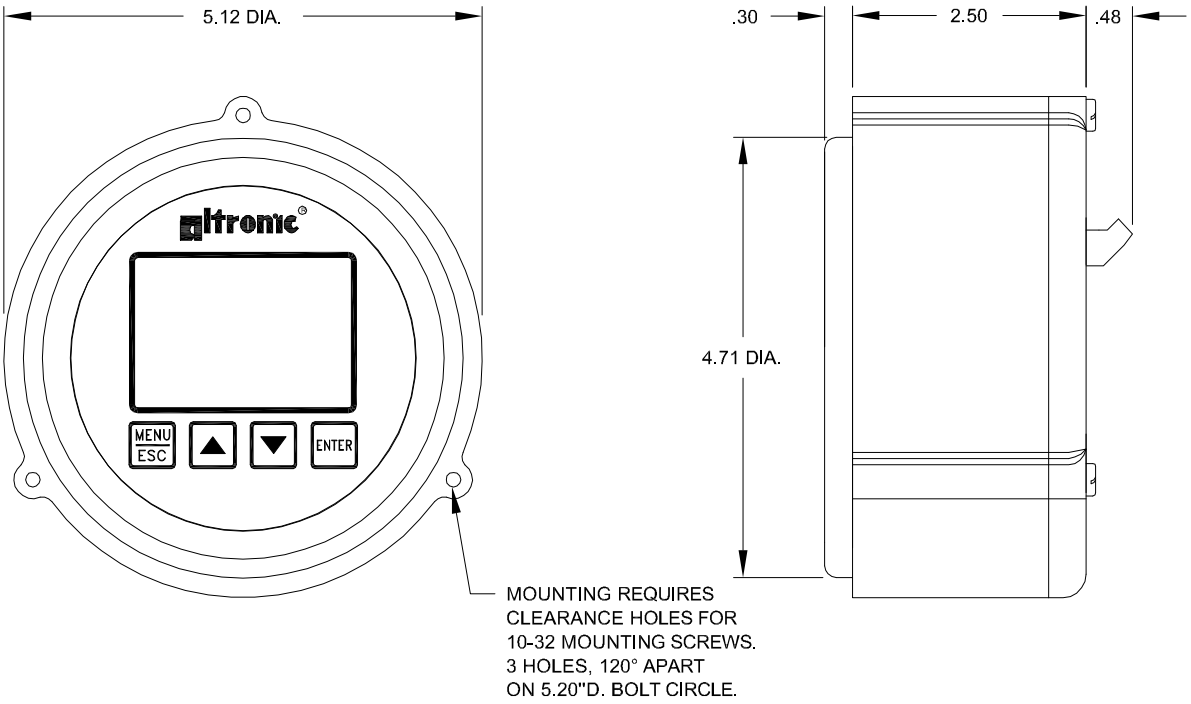
ADDRESS	DESCRIPTION OF FUNCTION
40032	CHANNEL 1 Custom Label (char. 3:4)
40033	CHANNEL 1 Custom Label (char. 5:6)
40034	CHANNEL 1 Custom Label (char. 7:8)
40035	CHANNEL 1 Custom Label(char. 9:10)
40036	CHANNEL 1 Custom Label (char. 11:12)
40037	CHANNEL 1 Custom Label (char. 13:14)
40038	CHANNEL 1 Custom Label (char. 15:16)
40039	CHANNEL 1 Custom Unit Label Index 0=NONE 1=CUSTOM
40040	CHANNEL 1 Custom Unit Label (char. 1:2)
40041	CHANNEL 1 Custom Unit Label (char. 3:4)
40042	CHANNEL 1 Custom Unit Label (char. 5:–)
40043	CHANNEL 1 Bargraph type 0=Off 1=Single bar between low and high 2=Increasing bars between low and high 3=Single bar between setpoints for switch 1 4=Increasing bars between setpoints for switch 1
40044	CHANNEL 1 Bargraph Hi (float) (msw)
40045	CHANNEL 1 Bargraph Hi (float) (lsw)
40046	CHANNEL 1 Bargraph Lo (float) (msw)
40047	CHANNEL 1 Bargraph Lo (float) (lsw)
40048 ↓ ↓ 40054	RESERVED
40055	CHANNEL 2 Lag Filter Gain (1-255)
40056	CHANNEL 2 SENSOR TYPE CUSTOM 0=Custom PRESSURE SENSORS 256=15psi 257=25psi 258=50psi 259=100psi 260=300psi 261=500psi 262=1000psi 263=2000psi 264=5000psI 265=10000psi 266=Custom Pressure TEMPERATURE SENSORS 512=JTC 513=KTC 514=DEG1 515=DEG2 516=Custom Temperature VIBRATION SENSORS Velocity 768=1ips 769=2ips 770=Custom Velocity Acceleration 1024=10g 1025=20g 1026=50g 1027=Custom Acceleration PERCENT 1280=0–100% (0–55Vdc) 1281=Custom Percent VOLTAGE 1536=0–5Vdc 1537=±160mVdc 1538=±80mVdc 1539=Custom Voltage

ADDRESS	DESCRIPTION OF FUNCTION
40057	CHANNEL 2 Units Index (class specific) PRESSURE SENSORS 0=psi 1=psig 2=psia 3=Kpa 4=bar 5=mbar 6=inH2O@20C 7=inHg 8=mmH2O 9=mmHg 10=kg/cm2 11=torr TEMPERATURE SENSORS 0=Kelvin 1=Celsius 2=Fahrenheit VIBRATION SENSORS Velocity 0=in/s 1=mm/s 2=cm/s Acceleration 0=G 1=ft/s/s 2=m/s/s
40058	CHANNEL 2 A/D Voltage Range 0=5V 1=±160mV 2=±80mV
40059	CHANNEL 2 SENSOR MAX (float) (msw)
40060	CHANNEL 2 SENSOR MAX (float) (lsw)
40061	CHANNEL 2 SENSOR MIN (float) (msw)
40062	CHANNEL 2 SENSOR MIN (float) (lsw)
40063	CHANNEL 2 Range HI (float) (msw)
40064	CHANNEL 2 Range HI (float) (lsw)
40065	CHANNEL 2 Volt HI (float) (msw)
40066	CHANNEL 2 Volt HI (float) (lsw)
40067	CHANNEL 2 Range LO (float) (msw)
40068	CHANNEL 2 Range LO (float) (lsw)
40069	CHANNEL 2 Volt LO (float) (msw)
40070	CHANNEL 2 Volt LO (float) (lsw)
40071	CHANNEL 2 Zero Band (float) (msw)
40072	CHANNEL 2 Zero Band (float) (lsw)
40073	CHANNEL 2 Custom Decimal Place (0-4)
40074	CHANNEL 2 Label Index 0=NONE 1=CUSTOM
40075	CHANNEL 2 Custom Label (char. 1:2)
40076	CHANNEL 2 Custom Label (char. 3:4)
40077	CHANNEL 2 Custom Label (char. 5:6)
40078	CHANNEL 2 Custom Label (char. 7:8)
40079	CHANNEL 2 Custom Label(char. 9:10)
40080	CHANNEL 2 Custom Label (char. 11:12)
40081	CHANNEL 2 Custom Label (char. 13:14)
40082	CHANNEL 2 Custom Label (char. 15:16)
40083	CHANNEL 2 Custom Unit Label Index 0=NONE 1=CUSTOM
40084	CHANNEL 2 Cust Unit Label (char. 1:2)
40085	CHANNEL 2 Cust Unit Label (char. 3:4)
40086	CHANNEL 2 Cust Unit Label (char. 5:–)

ADDRESS	DESCRIPTION OF FUNCTION
40087	Bargraph type 0=Off 1=Single bar between low and high 2=Increasing bars between low and high 3=Single bar between setpoints for switch 2 4=Increasing bars between setpoints for switch 2
40088	CHANNEL 2 Bargraph Hi (float) (msw)
40089	CHANNEL 2 Bargraph Hi (float) (lsw)
40090	CHANNEL 2 Bargraph Lo (float) (msw)
40091	CHANNEL 2 Bargraph Lo (float) (lsw)
40092	DEFAULT CURRENT (4-20mA) (40-200)
40093 ↓ ↓ 40098	RESERVED
40099	CHANNEL 1 Setpoint Type 0=Off 1=High On 2=Low On 3=High and Low On
40100	CHANNEL 1 Hysteresis Time 1-99s
40101	CHANNEL 1 Setpoint Hi (float) (msw)
40102	CHANNEL 1 Setpoint Hi (float) (lsw)
40103	CHANNEL 1 Setpoint Lo (float) (msw)
40104	CHANNEL 1 Setpoint Lo (float) (lsw)
40105	CHANNEL 1 Setpoint Diff (float) (msw)
40106	CHANNEL 1 Setpoint Diff (float) (lsw)
40107	CHANNEL 2 Setpoint Type 0=Off 1=High On 2=Low On 3=High and Low On
40108	CHANNEL 2 Hysteresis Time 1-99s
40109	CHANNEL 2 Setpoint Hi (float) (msw)
40110	CHANNEL 2 Setpoint Hi (float) (lsw)
40111	CHANNEL 2 Setpoint Lo (float) (msw)
40112	CHANNEL 2 Setpoint Lo (float) (lsw)
40113	RESERVED
40114	RESERVED
40115	CHANNEL 1 Loop High Setpoint (float) (msw)
40116	CHANNEL 1 Loop High Setpoint (float) (lsw)
40117	CHANNEL 1 Loop Low Setpoint (float) (msw)
40118	CHANNEL 1 Loop Low Setpoint (float) (lsw)

ADDRESS	DESCRIPTION OF FUNCTION
40156	CHANNEL 1 PID Setpoint (float) (msw)
40157	CHANNEL 1 PID Setpoint (float) (lsw)
40158	CHANNEL 1 PID P Value
40159	CHANNEL 1 PID I Value
40160	CHANNEL 1 PID D Value
40161	CHANNEL 1 Dead Band (float) (msw)
40162	CHANNEL 1 Dead Band (float) (lsw)
40163	MAPPING X1 (float) (msw)
40164	MAPPING X1 (float) (lsw)
40165	MAPPING X2 (float) (msw)
40166	MAPPING X2 (float) (lsw)
40167	MAPPING X3 (float) (msw)
40168	MAPPING X3 (float) (lsw)
40169	MAPPING X4 (float) (msw)
40170	MAPPING X4 (float) (lsw)
40171	MAPPING Y1 (float) (msw)
40172	MAPPING Y1 (float) (lsw)
40173	MAPPING Y2 (float) (msw)
40174	MAPPING Y2 (float) (lsw)
40175	MAPPING Y3 (float) (msw)
40176	MAPPING Y3 (float) (lsw)
40177	MAPPING Y4 (float) (msw)
40178	MAPPING Y4 (float) (lsw)
40179	ACTION/MODE PID ACTION = High Byte, 00 = Inverse 01 = Direct MODE = Low Byte 00 = CH1-PID 01 = CH2-CH1 02 = MAPPING 03 = CH1 LOOP
40180	CHANNEL 2-CHANNEL 1 Loop Low (signed int)
40181	CHANNEL 2-CHANNEL 1 Loop High (signed int)
40182	PID Control Loop: (0-200) 0 = no rate control (01-200) .1mA-20.0mA change/second

FIG. 1 DSG-1682DUPS MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER REQUIRED: 12-36 VDC 0.25 AMP MAX.

POINTS: 2 POINTS

SENSOR INPUTS: 0 TO 5 VDC, REFERENCED TO NEGATIVE
0 TO 25mA (EXTERNAL 200Ω RESISTOR).
THERMOCOUPLE TYPE: "J" (IRON-CONSTANTAN) OR "K" (CHROMEL-ALUMEL).

SENSOR SUPPLY: 5 VDC, 50mA MAX. (INTERNAL SUPPLY).

OUTPUT SWITCH: 1 FORM C (N/O AND N/C) RATED 200 VDC 200mA.

ANALOG OUTPUT: 4-20mA.

DIGITAL INPUT: N/C FOR NORMAL OPERATION.

AMBIENT TEMPERATURE RANGE: -40° TO 175°F (-40° TO +80°C), LCD -20°C TO 70°C.

DISPLAY: 128 x 64 GRAPHIC/CHARACTER, .5" 5 DIGIT AND 40 SEGMENT BARGRAPH.

DISPLAY RATE: 5 UPDATES PER SECOND NOMINAL.

DISPLAY RANGE: -9999 TO 99999, SELECTABLE DECIMAL POINT.

SWITCH RESPONSE TIME: TIED TO DISPLAY READING.

UNITS OF MEASURE: PRESSURE: psi, psig, psia, KPa, bar, mbar, inH2O, inHg, mmH2O, mmHg, kg/cm², Torr
TEMPERATURE: °F, °C, and °K
VIBRATION: in/s, mm/s, cm/s, G's, m/s², and ft/s²
VOLTAGE: Volts, mV
PERCENT: %
CUSTOM: UP TO 5 DIGIT THROUGH MODBUS

INSTRUMENT ACCURACY: ±.5% OF SPAN OVER TEMPERATURE RANGE
EXCLUSIVE OF TRANSDUCER ERROR.

RS-485 COMMUNICATIONS: 9600, 19,200, 38,400, 57,600, 115,200 BAUD, HALF DUPLEX

HAZARDOUS AREA CLASSIFICATION: CLASS I, GROUPS C & D, DIV. 2

FIG. 2 DSG-1682DUPS FLOW CHART

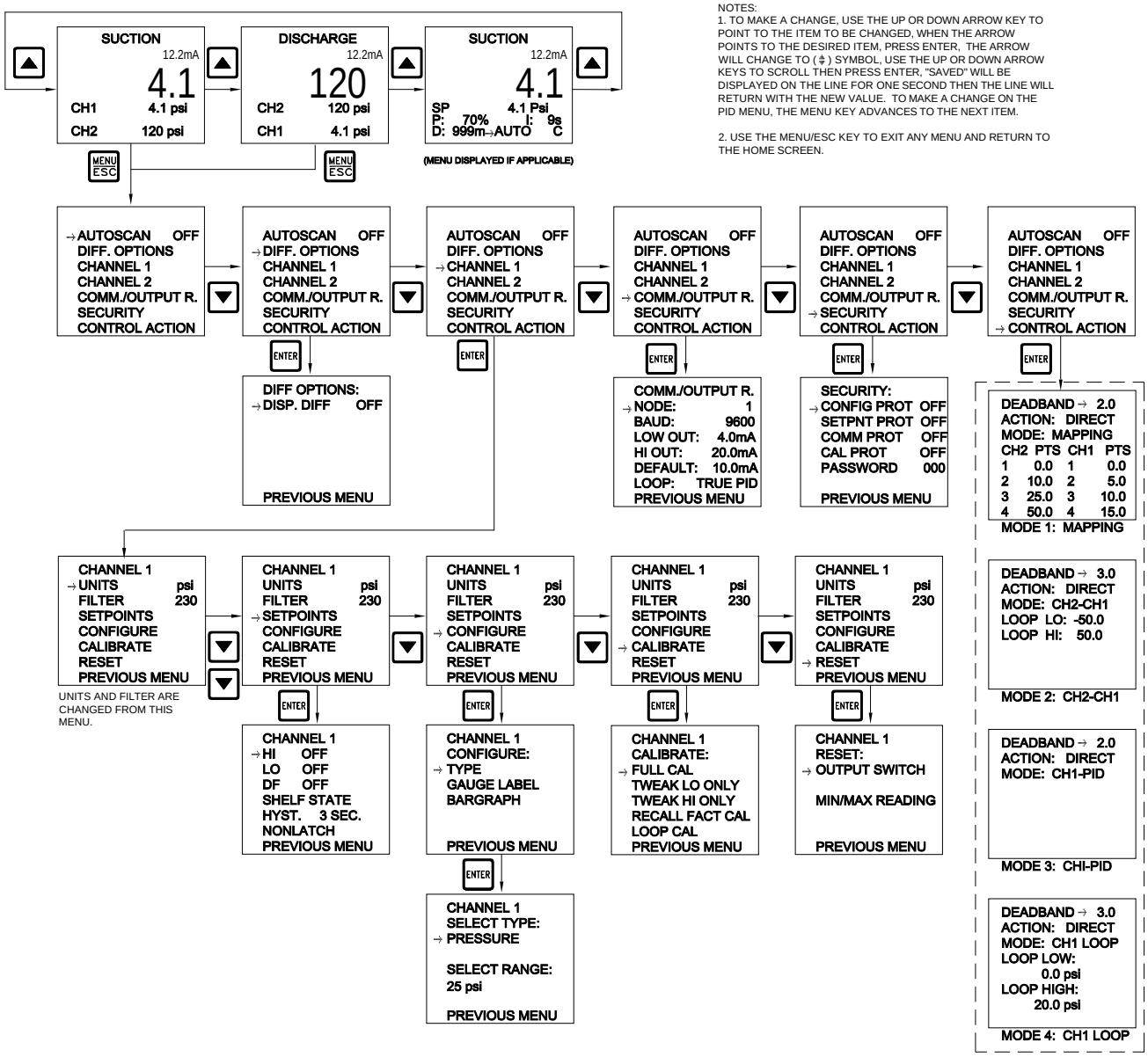


FIG. 3 CONFIGURATION WORKSHEET

SERIAL #: _____ **SITE:** _____

AUTO SCAN: _____ YES/secs. _____ NO **DISPLAY DIFFERENTIAL:** _____

CHANNEL 1

LABEL: _____

UNITS: _____

TRANSDUCER:

TYPE: _____ **RANGE:** _____

FILTER: _____
(1 = min. filtering, 255 = max. filtering, default = 230)

BARGRAPH:

0% _____ 100% _____

SETPOINTS:

LO _____ HI _____ DIF _____

_____ **SHELF** _____ **FAILSAFE**

HYSTERESIS: _____ seconds

_____ **LATCH** _____ **NONLATCH**

CHANNEL 2

LABEL: _____

UNITS: _____

TRANSDUCER:

TYPE: _____ **RANGE:** _____

FILTER: _____
(1 = min. filtering, 255 = max. filtering, default = 230)

BARGRAPH:

0% _____ 100% _____

SETPOINTS:

LO _____ HI _____

HYSTERESIS: _____ seconds

COMMUNICATIONS: NODE: _____ BAUD RATE: _____

LOW OUT: _____ **HI OUT:** _____ **DEFAULT:** _____ **LOOP:** _____

SECURITY: ON/OFF

CONFIG: _____ SETPOINT: _____ COMMS: _____ CALIBRATION: _____

PASSWORD: (3-DIGIT) _____ _____ _____

FIG. 3 CONFIGURATION WORKSHEET (CONTINUED)

CONTROL ACTION: _____

DEADBAND _____

ACTION _____

MODE _____

MAPPING

CH2		CH1	
1	_____	1	_____
2	_____	2	_____
3	_____	3	_____
4	_____	4	_____

CH1 - CH2

LOOP LO: _____

LOOP HI: _____

CH1 LOOP

LOOP LOW: _____

LOOP HIGH: _____

PID

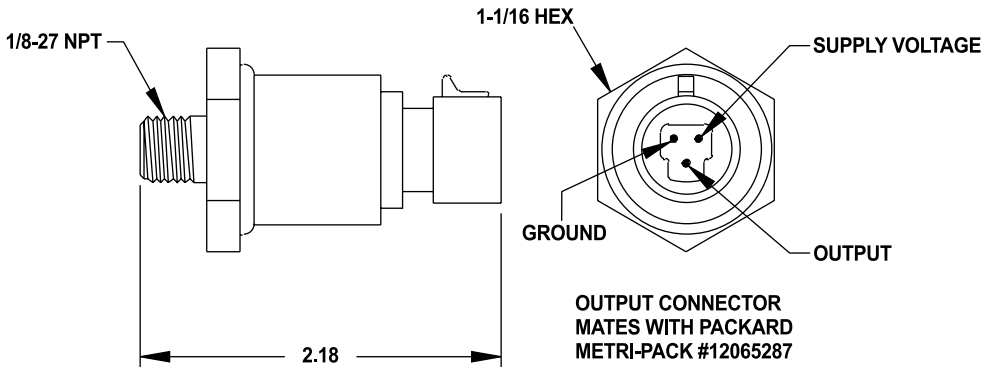
SETPOINT _____

P: _____

I: _____

D: _____

FIG. 4 PRESSURE TRANSDUCER, SEALED GAUGE P/N 691201-X



SPECIFICATIONS:

EXCITATION VOLTAGE: +5VDC ±.25V 20mA MAX (5 mA TYP.)

OUTPUT VOLTAGE: .50 TO 4.50V MIN. TO MAX. PRESSURE, RATIOMETRIC OUTPUT

NULL OFFSET: 0.50V

TRANSDUCER TYPE: SEALED GAUGE

MATERIAL IN CONTACT WITH MEDIA: 300 SERIES STAINLESS STEEL

OVERLOAD: 1.5 X RATED RANGE WITHOUT DAMAGE
10 X RATED RANGE WITHOUT BURSTING

CASE MATERIAL: PLATED STEEL

ACCURACY @ 25°C: ±0.25% OF SPAN FROM BEST FIT STRAIGHT LINE INCLUDES EFFECTS OF NON-LINEARITY, HYSTERESIS AND REPEATABILITY

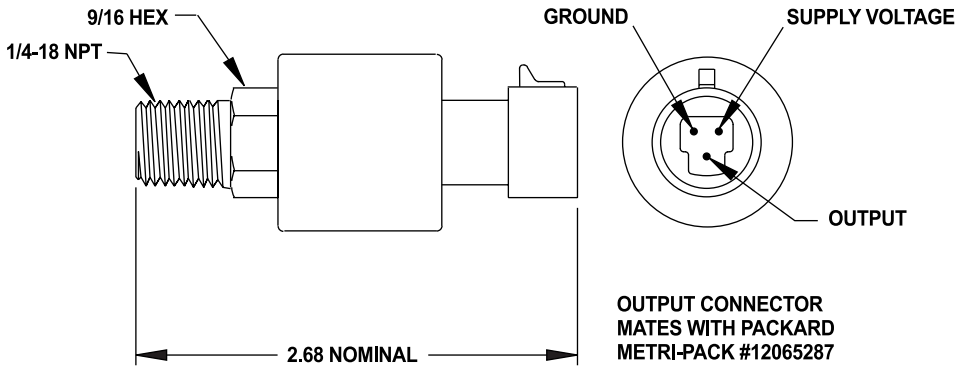
COMPENSATED OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 257°F (-40 TO 125°C)

TOTAL ERROR: ±2% OF FULL SCALE INCLUDES THE EFFECTS OF TEMPERATURE, NON-LINEARITY, HYSTERESIS AND REPEATABILITY

INSTALLATION: Use a 1-1/16" wrench to tighten transducer.
Do not use the case to tighten transducer.

CAUTION: Avoid pressures in excess of full scale pressure or vacuum. Overpressure may cause calibration change or damage to the element. When selecting a pressure transducer range both static and dynamic overloads must be considered. Pressure fluctuations occur in most systems. These fluctuations can have very fast peak pressures, as in water hammer effects. An oscilloscope can be used to determine if high pressure transients exist in a system. Where pressure pulses are expected, select a transducer rating high enough to prevent overload by the peak pressures. Where high pressure transients are unavoidable, use either a higher range transducer or a pulsation dampener or snubber to reduce the peak pressure applied to the transducer.

FIG. 5 PRESSURE TRANSDUCER, ABSOLUTE: P/N 691204-X



SPECIFICATIONS:

EXCITATION VOLTAGE: +5VDC ±.25V 5mA MAX

OUTPUT VOLTAGE: .50 TO 4.50V MIN. TO MAX. PRESSURE, RATIOMETRIC OUTPUT

NULL OFFSET: 0.50V

TRANSDUCER TYPE: ABSOLUTE

MATERIAL IN CONTACT WITH MEDIA: 300 SERIES STAINLESS STEEL

ENVIRONMENTAL SEAL: FLUOROCARBON

OVERLOAD: 3 X RATED RANGE WITHOUT DAMAGE
5 X RATED RANGE WITHOUT BURSTING

CASE MATERIAL: 316 STAINLESS STEEL

ACCURACY @ 25°C: ±0.5% OF SPAN FROM BEST FIT STRAIGHT LINE INCLUDES EFFECTS OF NON-LINEARITY, HYSTERESIS AND REPEATABILITY

COMPENSATED TEMPERATURE RANGE: -4° TO 212°F (-20 TO 100°C)

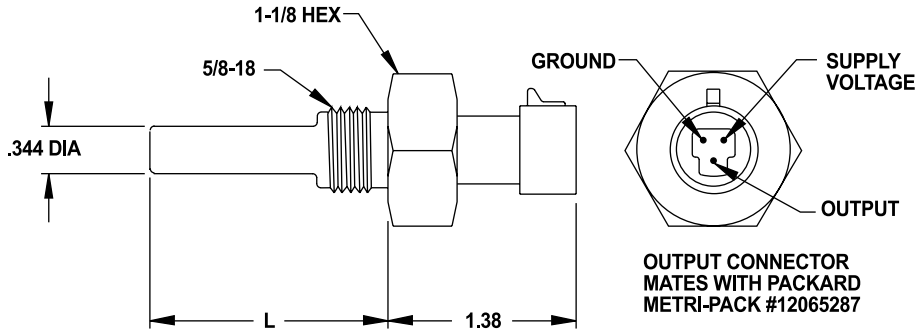
OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 221°F (-40 TO 105°C)

TOTAL ERROR: ±3% OF FULL SCALE INCLUDES THE EFFECTS OF TEMPERATURE, NON-LINEARITY, HYSTERESIS AND REPEATABILITY

INSTALLATION: Use a 9/16" wrench to tighten transducer.
Do not use the case to tighten transducer.

CAUTION: Avoid pressures in excess of full scale pressure or vacuum. Overpressure may cause calibration change or damage to the element. When selecting a pressure transducer range both static and dynamic overloads must be considered. Pressure fluctuations occur in most systems. These fluctuations can have very fast peak pressures, as in water hammer effects. An oscilloscope can be used to determine if high pressure transients exist in a system. Where pressure pulses are expected, select a transducer rating high enough to prevent overload by the peak pressures. Where high pressure transients are unavoidable, use either a higher range transducer or a pulsation dampener or snubber to reduce the peak pressure applied to the transducer.

FIG. 6 TEMPERATURE TRANSDUCER: P/N 691202-300 / 691203-300



L	PART NO.
1.75	691202-300
5.75	691203-300

SPECIFICATIONS:

EXCITATION VOLTAGE: +5VDC TO 24VDC, 5mA MAX.

OUTPUT VOLTAGE: 10mV/°F

OUTPUT RANGE: .05 TO 3.0V (5 TO 300°F)

SENSOR TYPE: INTEGRATED CIRCUIT

CASE MATERIAL: 300 SERIES STAINLESS STEEL

ACCURACY: ±3°F OVER TEMPERATURE RANGE

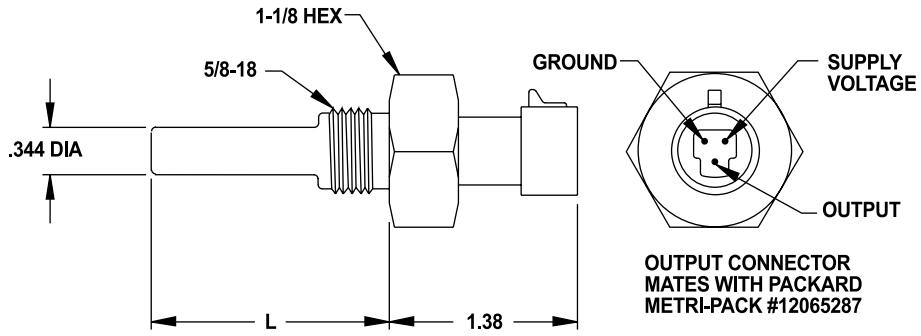
OPERATING TEMPERATURE: -40 TO 300°F (-40 TO 149°C)

STORAGE TEMPERATURE: -75 TO 350°F (-59 TO 180°C)

INSTALLATION: Use a 1-1/8" wrench to tighten the transducer. Mount the temperature transducer in a thermowell on the engine or machine. The actual sensor is located at the bottom of the transducer, so to ensure accurate readings the tip of the probe should be surrounded by the media.

CAUTION: DO NOT exceed the absolute maximum temperature range of the transducer which is 350°F. DO NOT use for exhaust temperature monitoring, most exhaust temperatures exceed the maximum temperature rating.

FIG. 7 TEMPERATURE TRANSDUCER: P/N 691212-450 / 691213-450



L	PART NO.
1.75	691212-450
5.75	691213-450

SPECIFICATIONS:

EXCITATION VOLTAGE: +5VDC ± 0.1V, 5mA MAX.

NOMINAL OUTPUT VOLTAGE RANGE: 1.36 TO 3.40 (-40°F TO 450°F)

SENSOR TYPE: SILICON DIODE

CASE MATERIAL: 300 SERIES STAINLESS STEEL

ACCURACY: ±6°F OVER TEMPERATURE RANGE

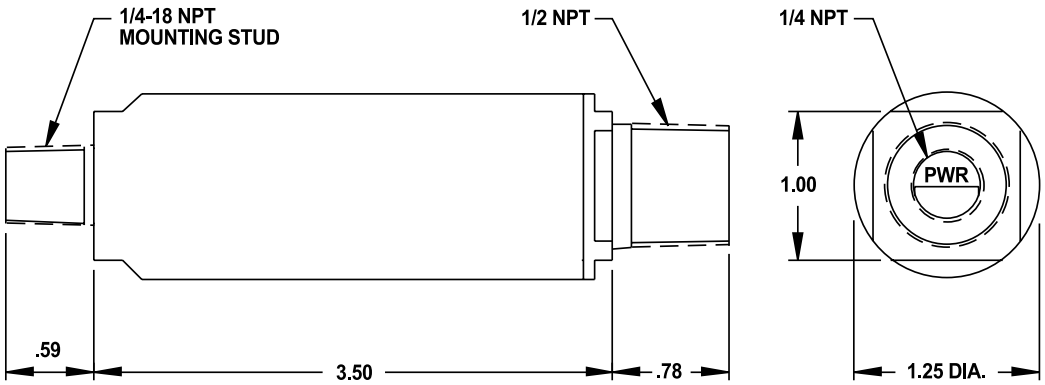
OPERATING TEMPERATURE: -40 TO 450°F (-40 TO 232°C)

STORAGE TEMPERATURE: -67 TO 572°F (-55 TO 300°C)

INSTALLATION: Use a 1-1/8" wrench to tighten the transducer. Mount the temperature transducer in a thermowell on the engine or machine. The actual sensor is located at the bottom of the transducer, so to ensure accurate readings the tip of the probe should be surrounded by the media.

CAUTION: DO NOT exceed the absolute maximum temperature range of the transducer which is 572°F. DO NOT use for exhaust temperature monitoring, most exhaust temperatures exceed the maximum temperature rating.

FIG. 8 VIBRATION TRANSMITTER: P/N 691205



SPECIFICATIONS:

SUPPLY VOLTAGE: MIN 16 VDC (WITH 200Ω RECEIVER RESISTOR), MAX. 30 VDC

OUTPUT: 4-20 mA PROPORTIONAL TO VELOCITY VIBRATION
0 VIBRATION = 4 mA ± 0.1 mA, 2.0 IPS PK = 20 mA ± 0.4 mA

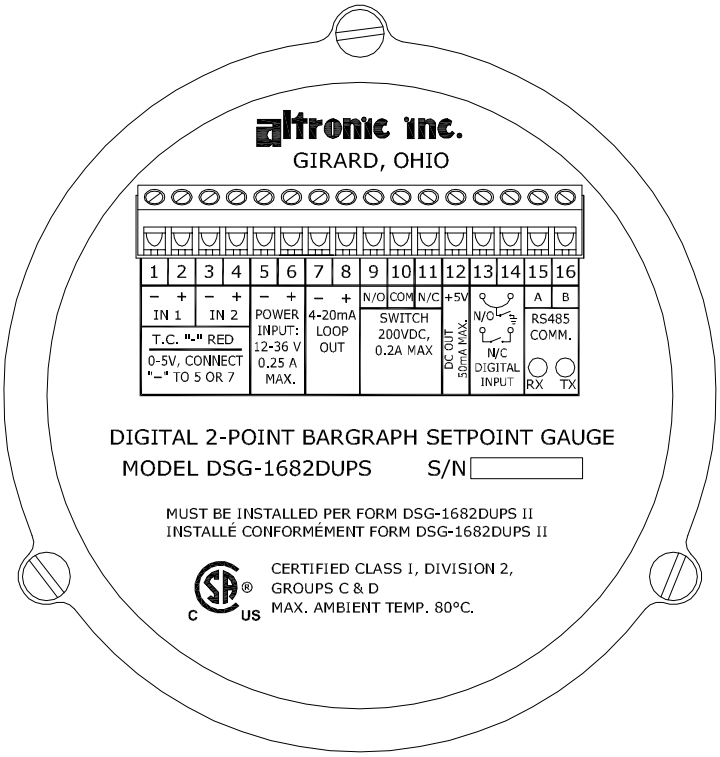
MATERIAL: 300 STAINLESS STEEL

OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 212°F (-40° TO 100°C)

HAZARDOUS AREA RATING: CLASS I, DIV. 1, GROUPS B, C & D.

CLASS II, DIV. 1, GROUPS E, F & G.

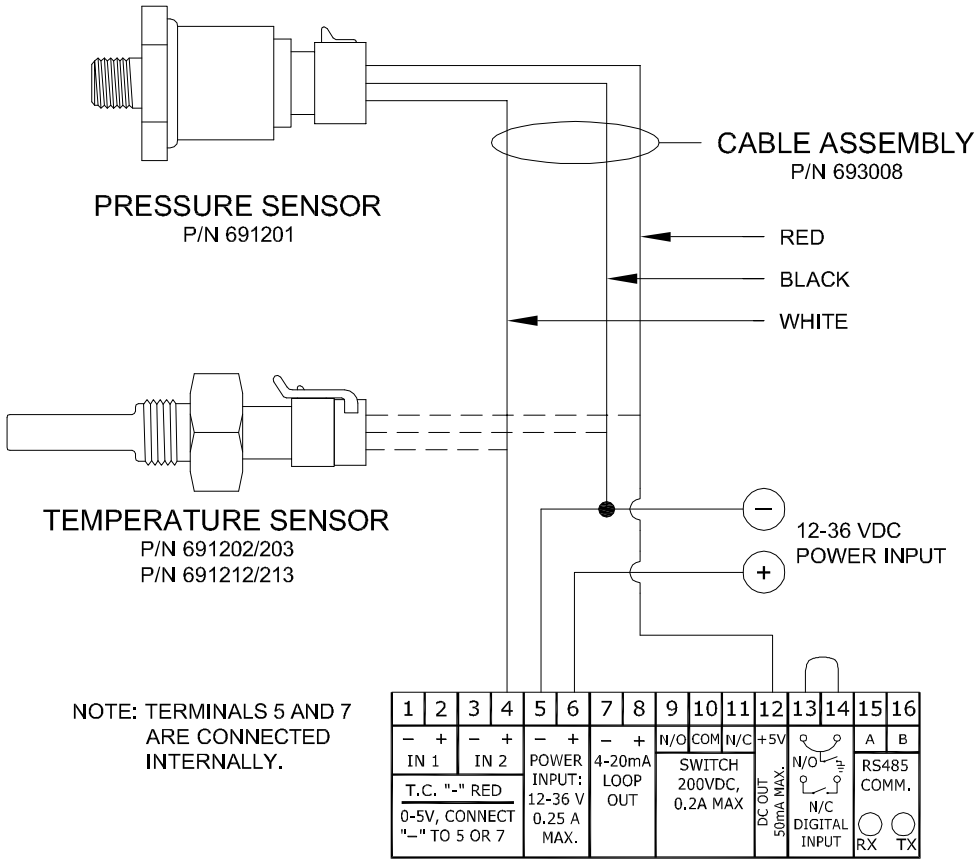
FIG. 9 GENERAL ELECTRICAL CONNECTIONS



TERMINAL			DESCRIPTION	
			0-5 V SENSOR	THERMOCOUPLE
SENSOR INPUT	CH1	1 (-)	PLACE AN EXTERNAL JUMPER FROM 1(-) TO 5(-)	RED(-)
		2 (+)	0-5VDC SIGNAL FROM SENSOR	(+)WHITE "J" TYPE, YELLOW "K" TYPE
	CH2	3 (-)	PLACE AN EXTERNAL JUMPER FROM 1(-) TO 5(-)	RED(-)
		4 (+)	0-5VDC SIGNAL FROM SENSOR	(+)WHITE "J" TYPE, YELLOW "K" TYPE
POWER SUPPLY INPUT		5 (-)	SUPPLY MINUS AND SENSOR MINUS FOR 0-5V INPUTS	
		6 (+)	+12-36VDC POWER INPUT, 0.25A MAX.	
LOOP CURRENT OUTPUT		7 (-)	LOOP MINUS	
		8 (+)	+4-20mA LOOP OUTPUT	
SWITCH 1 (CH1) OUTPUT		9 N/O	NORMALLY OPEN SWITCH	
		10 COM	COMMON	
		11 N/C	NORMALLY CLOSED SWITCH	
+5V OUT		12	+5VDC SUPPLY OUTPUT FOR SENSORS	
N/C DIGITAL INPUT		13	CONNECT TOGETHER FOR NORMAL OPERATION	
		14	OPEN FOR DEFAULT CURRENT	
RS485 COMS		15 (A)	RS485 (A)	
		16 (B)	RS485 (B)	

THE OUTPUT SWITCH IS A FORM "C" CONTACT RATED 200VDC, 200mA CONTINUOUS OPERATION.
THE SWITCH TURNS ON TO A SEPARATE COMMON WHICH IS ISOLATED FROM GROUND.

FIG. 10 WIRING DIAGRAM: SENSOR INPUT



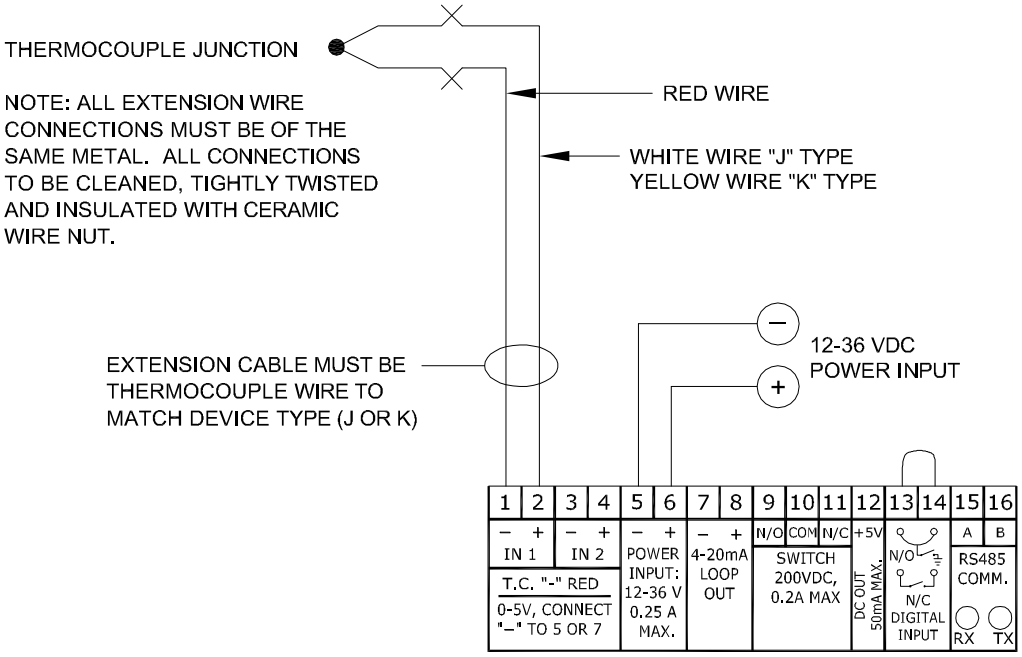
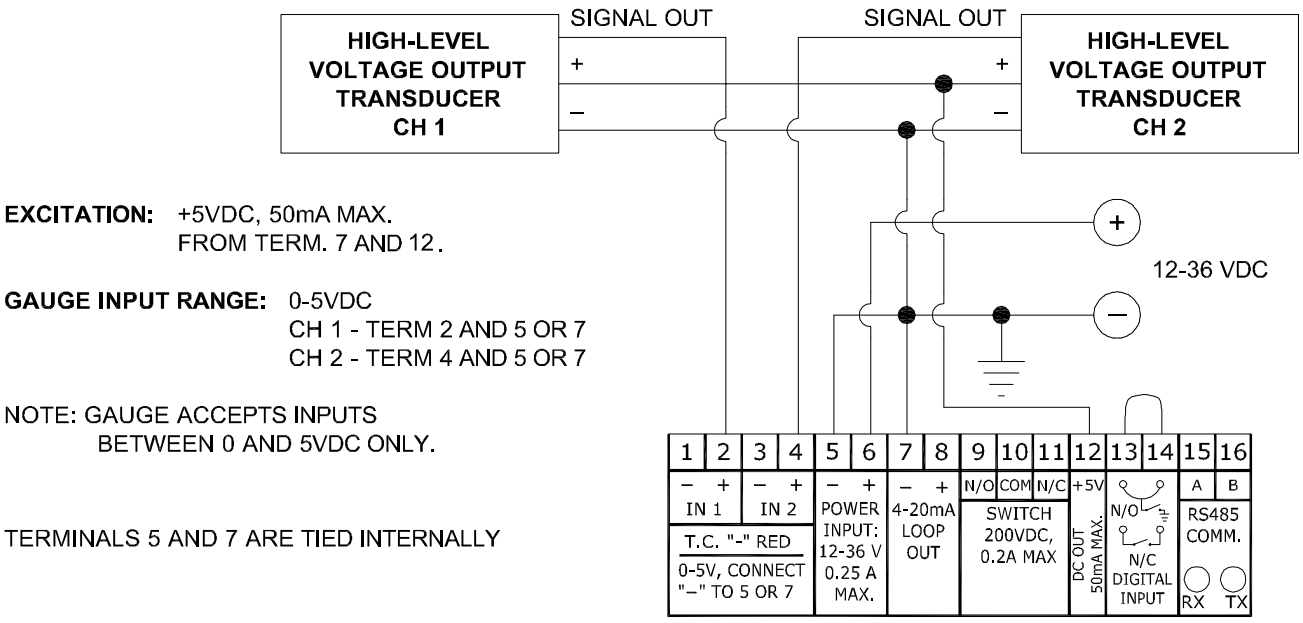


FIG. 11 WIRING DIAGRAM: HIGH-LEVEL VOLTAGE SENSOR INPUT



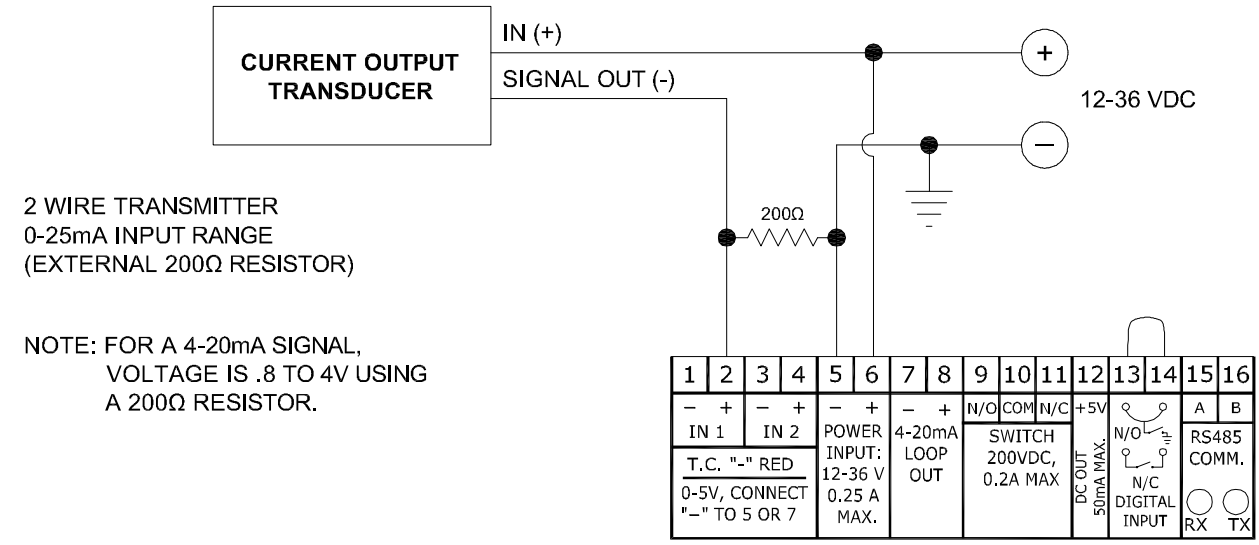
EXCITATION: +5VDC, 50mA MAX.
FROM TERM. 7 AND 12.

GAUGE INPUT RANGE: 0-5VDC
CH 1 - TERM 2 AND 5 OR 7
CH 2 - TERM 4 AND 5 OR 7

NOTE: GAUGE ACCEPTS INPUTS
BETWEEN 0 AND 5VDC ONLY.

TERMINALS 5 AND 7 ARE TIED INTERNALLY

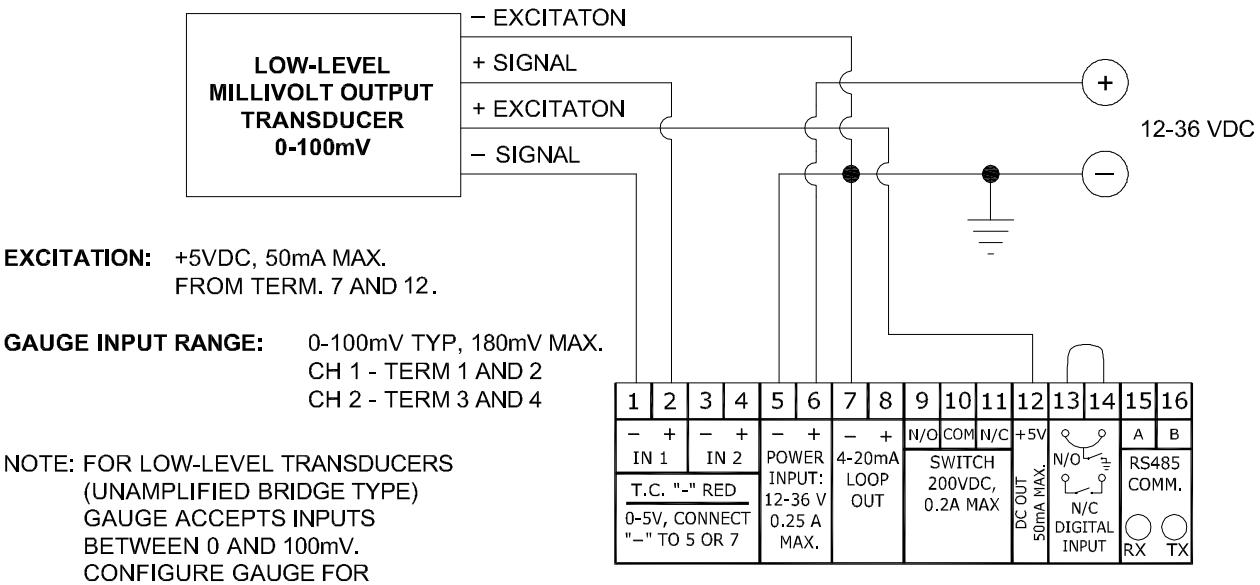
FIG. 12 WIRING DIAGRAM: CURRENT SENSOR INPUT



2 WIRE TRANSMITTER
0-25mA INPUT RANGE
(EXTERNAL 200Ω RESISTOR)

NOTE: FOR A 4-20mA SIGNAL,
VOLTAGE IS .8 TO 4V USING
A 200Ω RESISTOR.

FIG. 13 WIRING DIAGRAM: LOW-LEVEL VOLTAGE SENSOR INPUT



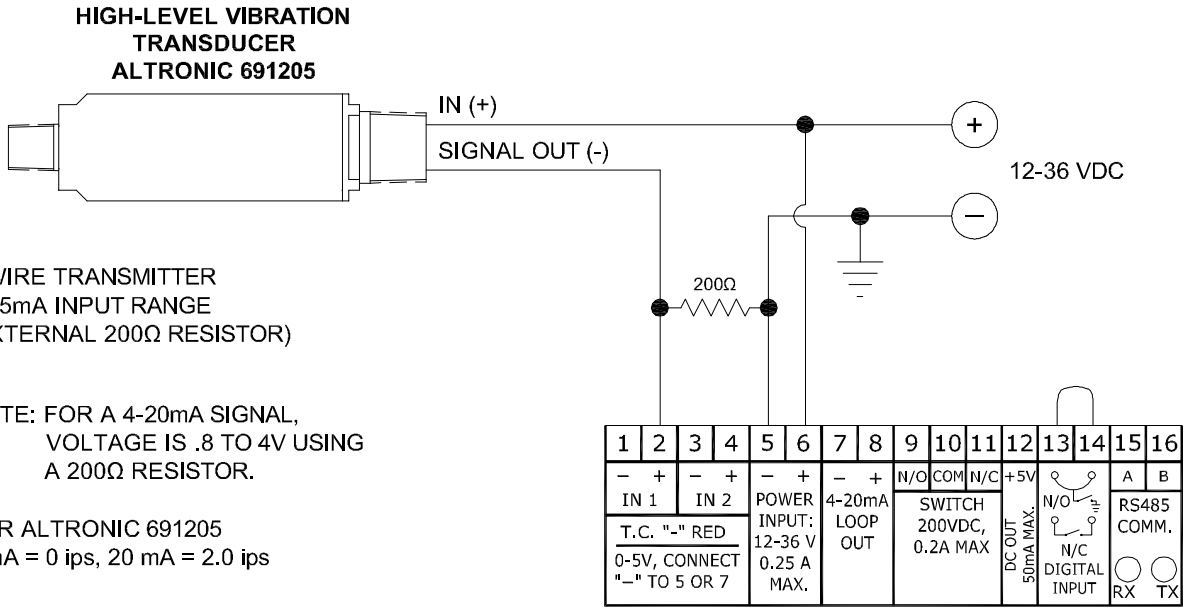
EXCITATION: +5VDC, 50mA MAX.
FROM TERM. 7 AND 12.

GAUGE INPUT RANGE: 0-100mV TYP, 180mV MAX.
CH 1 - TERM 1 AND 2
CH 2 - TERM 3 AND 4

NOTE: FOR LOW-LEVEL TRANSDUCERS (UNAMPLIFIED BRIDGE TYPE) GAUGE ACCEPTS INPUTS BETWEEN 0 AND 100mV. CONFIGURE GAUGE FOR MILLIVOLT INPUT

TERMINALS 5 AND 7 ARE TIED INTERNALLY

FIG. 14 WIRING DIAGRAM: 4-20mA VIBRATION TRANSDUCER INPUT

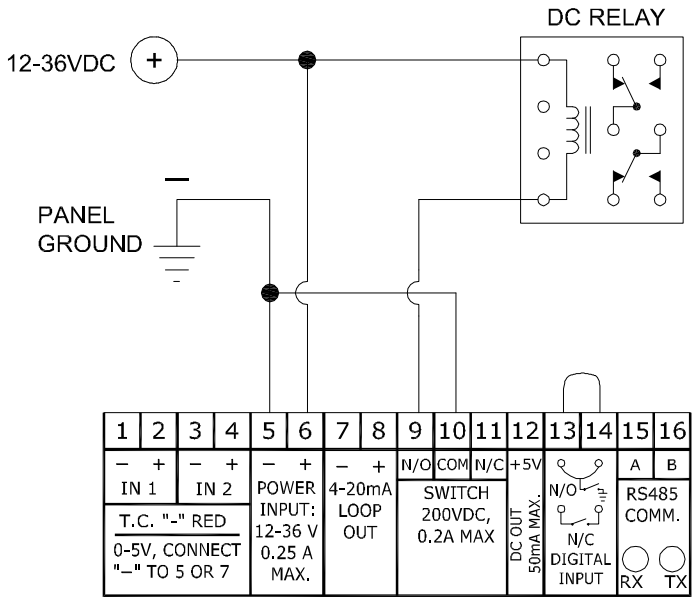


2 WIRE TRANSMITTER
0-25mA INPUT RANGE
(EXTERNAL 200Ω RESISTOR)

NOTE: FOR A 4-20mA SIGNAL, VOLTAGE IS .8 TO 4V USING A 200Ω RESISTOR.

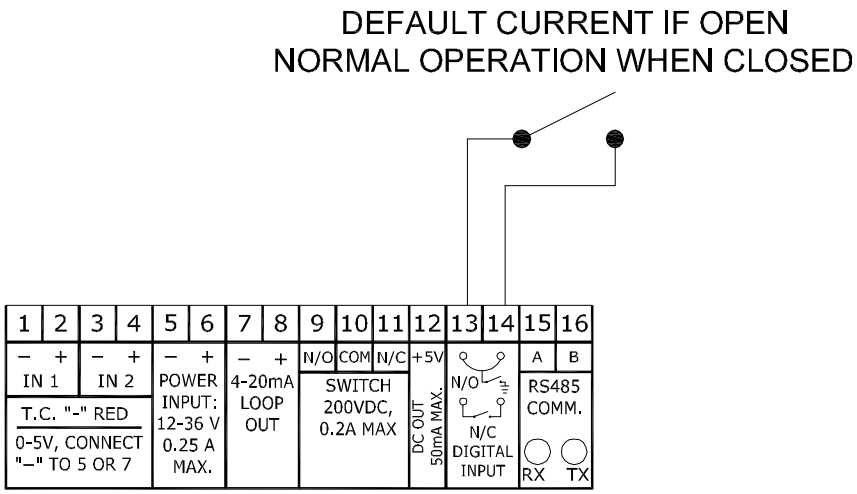
FOR ALTRONIC 691205
4 mA = 0 ips, 20 mA = 2.0 ips

FIG. 15 WIRING DIAGRAM: DC RELAY



NOTE: OUTPUT SWITCHES
RATED 200VDC, 200mA MAX.

FIG. 16 WIRING DIAGRAM: DIGITAL INPUT



NOTE: OUTPUT SWITCHES
RATED 200VDC, 200mA MAX.

FIG. 17 WIRING DIAGRAM: 4-20mA OUTPUT

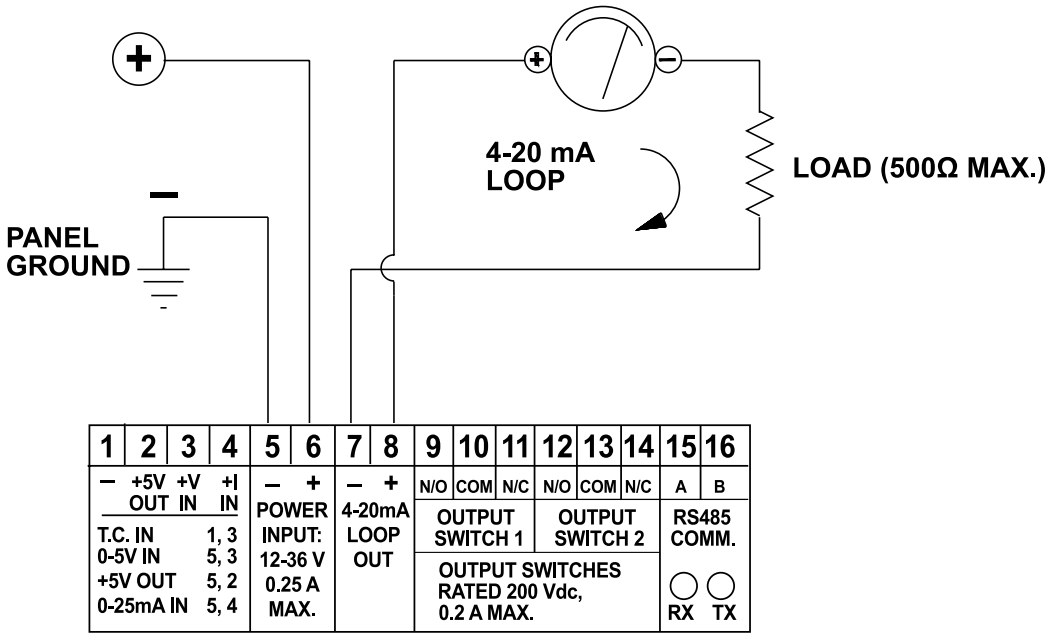
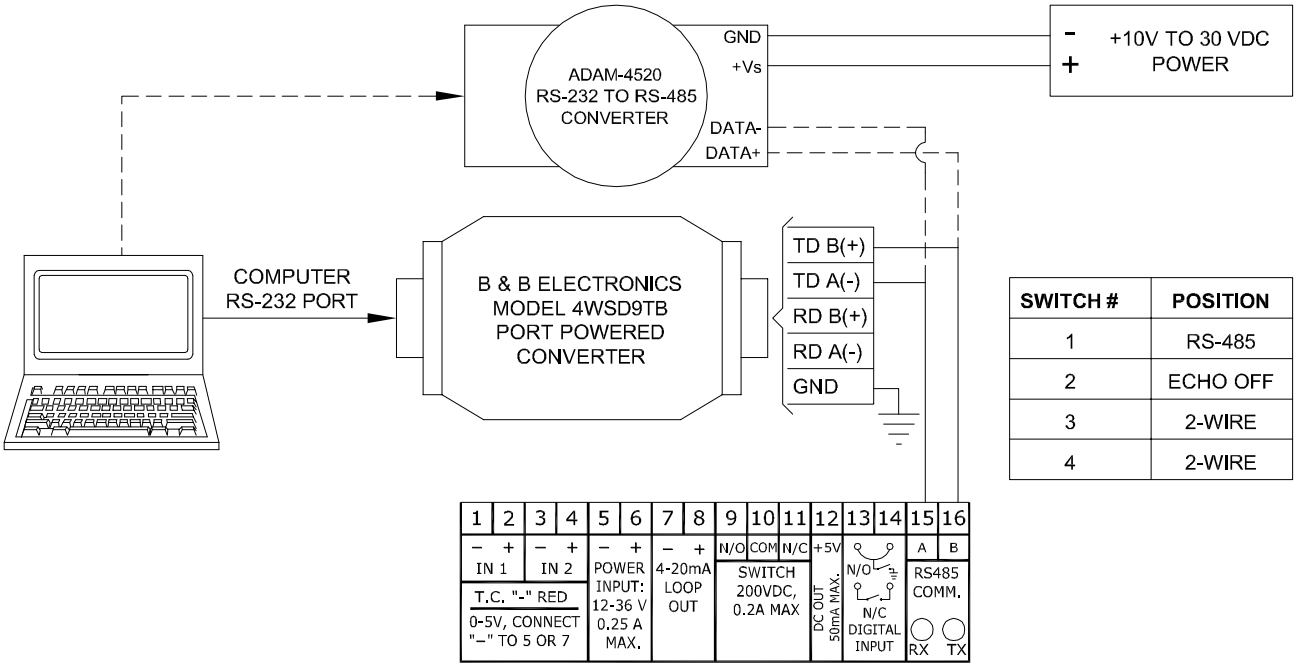


FIG. 18 RS-485 COMMUNICATIONS: PC HOOK-UP



SWITCH #	POSITION
1	RS-485
2	ECHO OFF
3	2-WIRE
4	2-WIRE

RECOMMENDED RS-232 TO RS-485 CONVERTERS:

PORT POWERED B & B ELECTRONICS MODEL: 4WSD9TB
EXTERNAL DC POWERED OPTICALLY ISOLATED ADVANTECH AMERICA P/N: ADAM-4520

FIG. 19 RS-485 COMMUNICATIONS: MULTIPLE SLAVE UNITS