INSTALLATION INSTRUCTIONS

DIGITAL/BARGRAPH SETPOINT GAUGE

FORM DSG1611DUPS II 8-06

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-1611DUPS 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-1611DUPS Digital Bargraph Setpoint Gauge is an electronic instrument 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 20 mA. 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 5 Vdc can be used. An internal 200 ohm resistor also allows an input from current transducers in the range of 0 to 25 mA. 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 switches, and a bargraph. In addition, the monitored signal of each channel and their difference is continuously compared against low and high adjustable setpoints set by the user from the front keypad of the gauge. A front mounted keypad serves as the user interface.

1.2 The Altronic DSG-1611DUPS 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, the gauge 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 A 4-20 mA current loop output can be configured anywhere within the range of the gauge, as well as reverse acting. If the 4-20 mA current loop output is configured for reverse acting, the loop output would decrease or go towards the 4 mA point as the numeric value on the display increases.

1.4 RS-485 serial communication allows data and fault status to be communicated to other devices via Modus 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.

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

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

2.0 TRANSDUCERS

2.1 The DSG-1611DUPS gauge is designed to accept virtually any transducer with an output in the range of 0 to 5 Vdc or 0 to 25 mA. 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 max.

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 psig, and 100, 300, 500, 1000, 2000, and 5000 PSIS.

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-1611DUPS 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 **(SECTION 8.2.1)** 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 **(SECTION 8.2.1)** 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:

DSG-1611DUPS 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" N.P.T. mounting stud. The output is 0 to 2.0 ips over 4-20 mA. The transmitter is a two-wire loop-powered device.

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 450° F (232° 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 36 Vdc, 0.25 A 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 5 Vdc or 0 to 25 mA, 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 insure 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-1611DUPS, there are two output switches, one is typically used for alarms and the other is used for shutdowns. Output switch 1 will trip when the input value exceeds its alarm setpoint value and output switch 2 will trip when the input value exceeds its shutdown setpoint value. These switches are solid state, form C (N/O and N/C), break-before-make contacts and are isolated from the power supply. The switches are rated at 200 V., 200 mA 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. These switches can be wired to an Altronic annunciator system or to pilot-duty relays as shown by the WIRING DIAGRAMS.

4.5 OUTPUT CURRENT LOOP WIRING:

Model DSG-1611DUPS has a 4-20 mA 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 25 mA. 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 36 Vdc. 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 20 mA, the supply voltage must be between 15 and 36 Vdc. At 12 Vdc supply voltage, the maximum load resistor for 20 mA loop output current is 350 ohms. **(FIG. 16)**

4.6 RS-485 COMMUNICATIONS WIRING:

The DSG-1611DUPS 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. **(FIG. 17)**

4.7 HAZARDOUS AREA OPERATION:

The DSG-1611DUPS gauge is CSA-certified for **CLASS I, DIVISION 2, GROUPS C & D** areas. DSG-1611DUPS 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-1611DUPS 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.

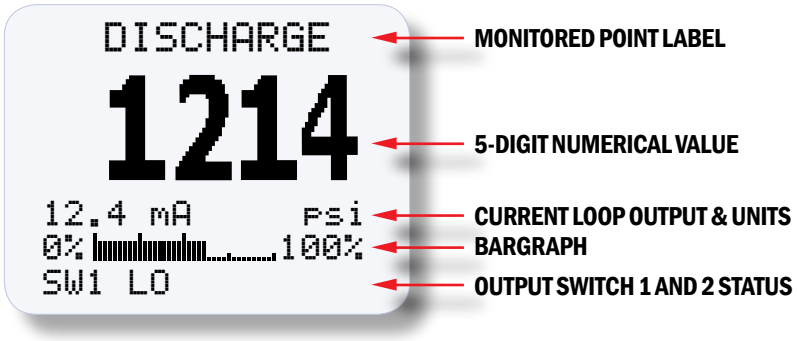
4.8 TESTING SENSOR LEADS:

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-1611DUPS gauge is considered in the **HOME SCREEN** when measuring and displaying monitored data. The gauge displays up to a 5-digit numeric value in 0.5" numbers, units of measure, the monitored point label, and a bargraph of the sensed media. If a set-point value is exceeded, the output switch turns on and the display will indicate **SW1 LO**, **SW1 HI**, **SW2 LO** or **SW2 HI** (low, or high setpoint and switch 1 or 2 has tripped). If desired, the monitored point label, current loop value and bargraph display can be turned off.

TYPICAL HOME SCREEN



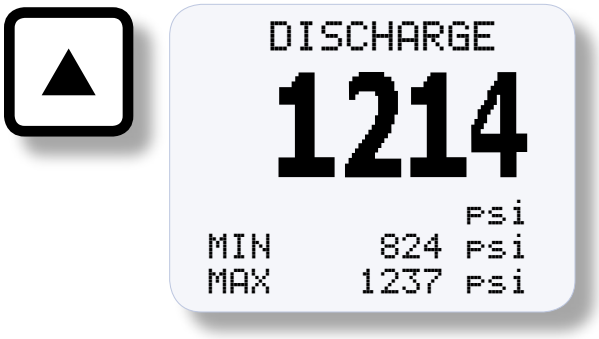
When an input is set to thermocouple, if a thermocouple or its wiring becomes open or disconnected from the gauge, the display will read **THERMOCOUPLE OPEN** in place of the temperature reading on that channel and if configured for a high setpoint, its output switch will activate. For 0 to 5 volt and millivolt inputs, when the displayed reading exceeds the upper limit of the gauge (110% of range) the display will read **INPUT SIGNAL IS HI OUT OF RANGE**, and if configured, its high output switch will activate. If the displayed reading exceeds the lower limit of the gauge, the display will read **INPUT SIGNAL IS LO OUT OF RANGE**, and if configured, its low output switch will activate.

5.2 **USE OF ▲ and ▼ (up and down arrow keys) IN THE HOME SCREEN:**
In the home screen, pressing the up and down ▲ ▼ arrow keys together will display the model number, firmware Rev. Level and date. Pressing either the up ▲ or down ▼ arrow key alone will display the min/max values recorded. **SEE MIN/MAX READING, SECTION 5.3**

5.3 MIN/MAX READING:

Minimum and maximum filtered values are continuously recorded. To view these values from the home screen, press either ▲ or ▼. The display will show the min/max values recorded since reset. These values will replace the bargraph and will be shown on the bottom two lines of the display. They are live values and will remain displayed until power-down. These readings will remain stored until reset even if the gauge is powered down. To reset the min/max values, press the **MENU** key, scroll down to **RESET** and press **ENTER**. Select **RESET: MIN/MAX READINGS** and press **ENTER**, the display will show **RESET!** and the gauge will start recording the current min and max values. In the home screen, press either ▲ or ▼ to return to displaying the bargraph.

PRESS THE UP ▲ OR DOWN ▼ ARROW KEY TO DISPLAY THE MIN/MAX READING.



6.0 KEYPAD DESCRIPTION

6.1 The DSG-1611DUPS gauge has a four-key (**MENU/ESC**, **ENTER**, ▲, ▼) front keypad used to view or change setpoint values, and to configure and calibrate the gauge.

6.2 MENU/ESC:

The **MENU/ESC** (escape) key is used to enter the gauge configuration menu. It 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. 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 menu selections and to increase or decrease values during configuration and calibration. When held, they rapidly increase or decrease display values.

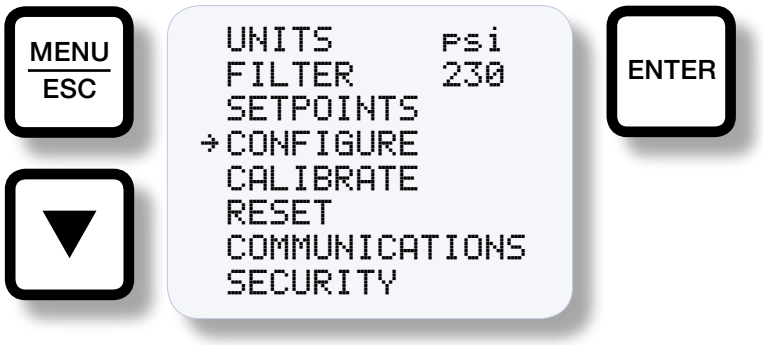
7.0 INITIAL OPERATION

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

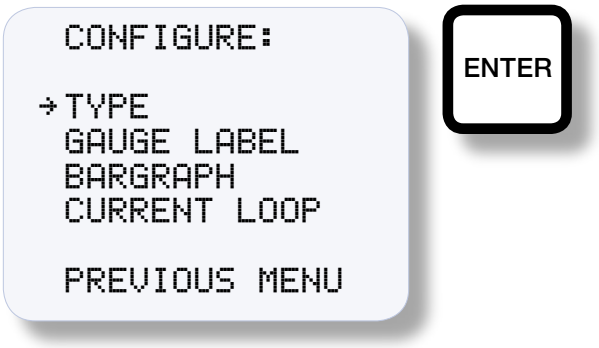
7.1 UPON RECEIPT OF GAUGE:

When received, the gauge will be set to one of the pre-configured factory settings so initial installation is simple. Mount **(SECTION 3.0)** and wire **(SECTION 4.0)** the gauge. Upon power-up the display will show a splash screen showing: Altronic, Inc., DSG-1611DUPS, the firmware Rev. Level and date. The display will then proceed to read the value for the transducer type set at the factory.

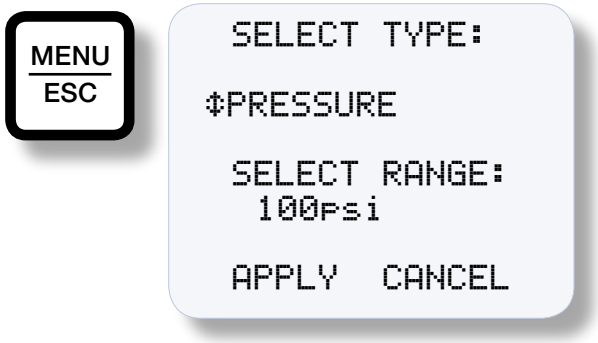
To check the transducer type for which the gauge is configured, press the **MENU** key, use the ▼ key, select **CONFIGURE,** and press **ENTER.**



Select **TYPE** and press **ENTER.**

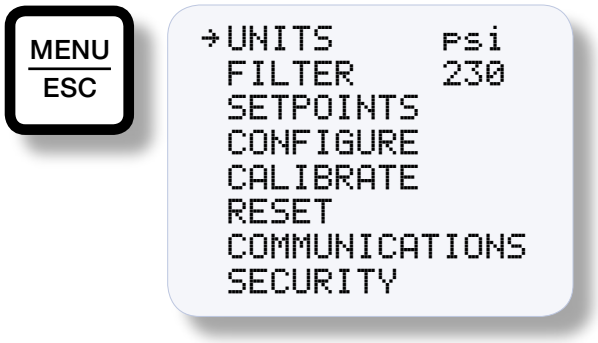


The factory pre-configured transducer type will be displayed.



7.2 To change the gauge transducer type, press **ENTER** and 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 10 mV per ° F, and temperature transducer 691212/213 (DEG2), 691205 vibration transmitter for an output of 4-20 mA, 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. The device is now ready to accurately read the selected transducer.

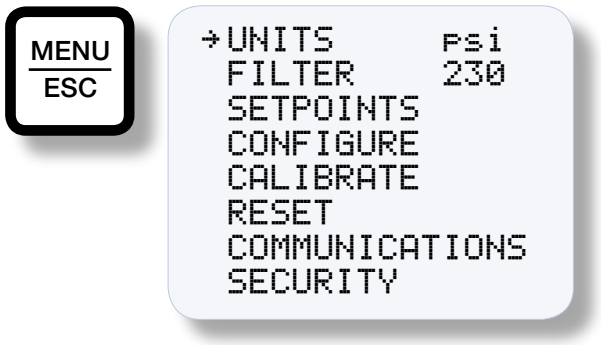
8.0 GAUGE CONFIGURATION

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. 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.

MAIN MENU

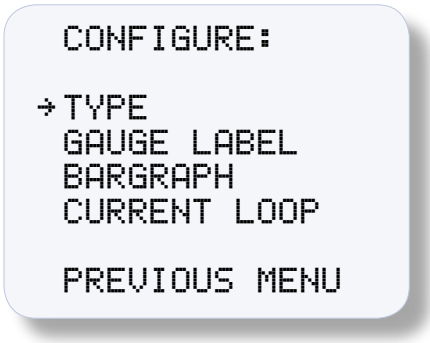


8.2 CONFIGURE:

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

CAUTION: WHEN CHANGING INPUT SENSOR TYPE, THE UNITS, SETPOINTS, BARGRAPH, AND CURRENT LOOP VALUES MUST BE CONFIRMED.

NOTE: Changing input sensor type changes data related to the sensor type back to default values. When configuring the DSG-1611DUPS gauge, always configure the input sensor type first.



8.2.1 SELECT TYPE/SELECT RANGE

The DSG-1611DUPS gauge incorporates several standard types and ranges of transducers that are available from memory. 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 10 mV per °F, and temperature transducer 691212/213 (DEG2), 691205 vibration transmitter for an output of 4-20 mA, 0 to 2.0 ips; no additional calibration for these transducers is required.

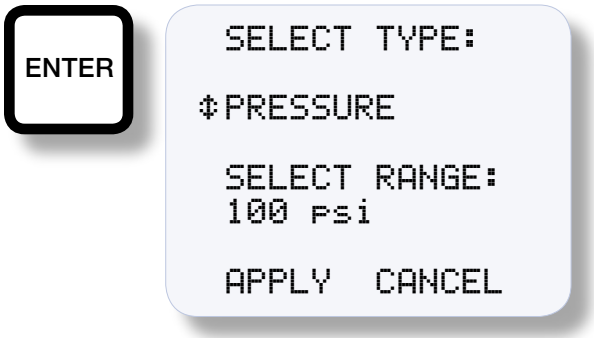


TABLE A

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 20 mA 4 to 20 mA (typ)
VIBRATION (acceleration))	NA NA NA	0 to 10 g's 0 to 20 g's 0 to 30 g's	4 to 20 mA (typ) 4 to 20 mA (typ) 4 to 20 mA (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

8.2.2 CUSTOM:

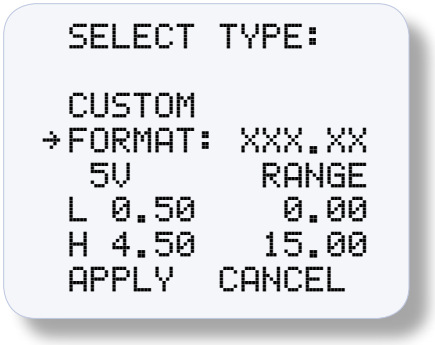
Custom allows the gauge to be configured for a nonstandard transducer. The gauge can display any number within the range from -9999 to 99999. A decimal point can be inserted in a number of positions. The gauge accepts sensors in the range of 0 to 5 Vdc, -160 mV to 160 mV, or -80 mV to 80 mV.

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** (10 thousandths).

Select the voltage range for the transducer type, the choices are: 0 to 5 Vdc, -160 mV to 160 mV, or -80 mV to 80 mV. Note that 0 to 5 Vdc transducers use terminals 3 and 5 **(FIG. 11)** and -160 mV to 160 mV and -80 mV to 80 mV transducers use terminals 1 and 3. **(FIG. 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



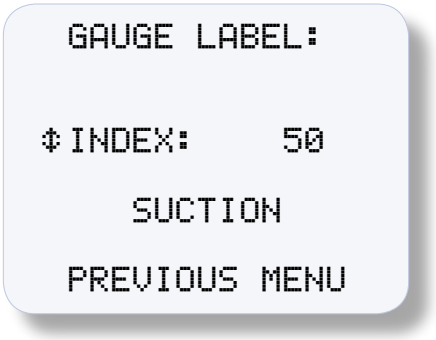
UNITS FOR CUSTOM SENSORS:

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.

8.2.3 GAUGE LABEL:

The DSG-1611DUPS gauge incorporates several common industry standard labels and the ability to add a custom label. The label appears at the top of the home screen and defines the monitored channel. The label can be up to 16 characters long and can contain any standard ASCII character. Use the ▲ or ▼ 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.



8.2.4 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 (either switch 1 or 2), increasing bars between the setpoints (either switch 1 or 2), 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:

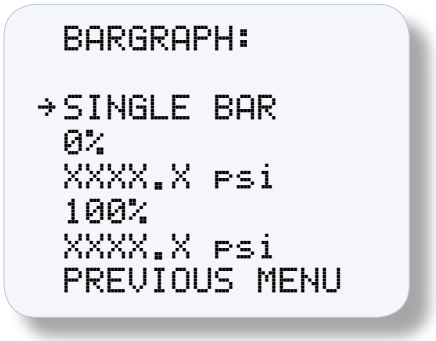
Single bar between two points: For this option, enter a 0% value and a 100% value. A single bar will increase or decrease across the display as the input media goes from one point to the other.

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 the 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 endpoints 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 the 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.

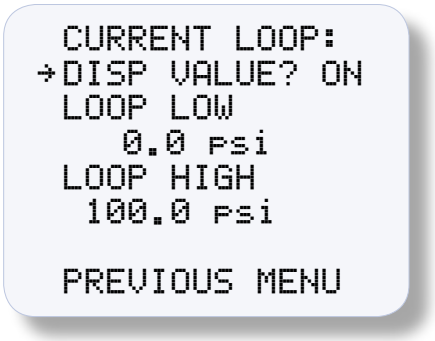


NOTE: The 4-20 mA current loop can be configured for reverse action. Simply configure the LOOP LOW or low point with the 20 mA value and the LOOP HIGH or high point with the 4 mA value.

8.2.5 CURRENT LOOP:

The 4-20 mA current loop output allows the user to output a signal proportional to the media being measured and displayed. To configure the current loop, select **CURRENT LOOP** and press **ENTER**. The display will read the value for the previously set 4 mA point, **LOOP LOW**, and 20mA point, **LOOP HIGH** in units the gauge is configured for. Use the ▲ or ▼ arrow keys to increase or decrease the numeric value for the 4 mA and 20mA points. Press **ENTER** to save the new 4-20 mA configuration.

DISP VALUE? — DISPLAY VALUE set to **ON** displays the current loop value in milliamps on the home screen. If set to **NO**, it is not displayed. Please note that the loop value displayed is the configured loop value and not the loop value seen at the loop terminals.



8.3 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. Note that for pressure inputs, if the combination of the range and type of transducer currently configured exceeds the gauge limit, not all of the unit indicators will be available. Up to 5 digits of a custom units-of-measure can be displayed. It can be configured through Modbus.

8.4 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 an adjustable filter; 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 ▼ arrow key to point to **FILTER** and press **ENTER**. The display will read the previously set filter value. Use the ▲ or ▼ arrow 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

8.5 SETPOINT CONFIGURATION:

There are two switches available in the DSG-1611DUPS gauge. Typically switch 1 is used for alarms and switch 2 for shutdowns. The setpoints menu allows the user to individually set a low and high setpoint value, set the switch to failsafe or shelf state, latching or nonlatching, and set the hysteresis value for each switch. To configure an output switch, press the **MENU** key and use the up or down arrow key to point to **SETPOINTS** and press **ENTER**. Select either switch **1** or **2** and press **ENTER**.

8.5.1 LO, HI:

Each output switch will trip if the sensor input value goes either below the low setpoint or above the high setpoint. 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 ▲ or ▼ arrow keys simultaneously, press **ENTER** to save.

8.5.2 FAILSAFE or SHELF STATE:

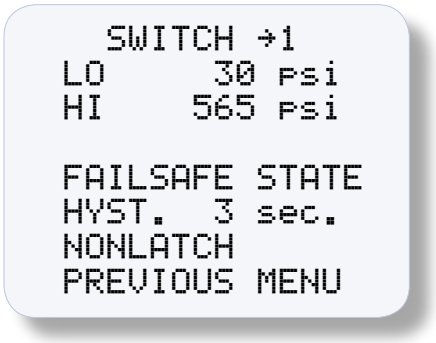
Each switch can be configured for either **FAILSAFE** or **SHELF STATE**. When set to **SHELF STATE**, the output switch is in the same state as in the absence of power, N/O is open and N/C is closed. When set to **FAILSAFE**, the outputs are in the opposite state. If set to **FAILSAFE** and the power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

8.5.3 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. In the DSG-1611DUPS 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. A separate hysteresis value can be set for switch 1 and switch 2 but it is common for **LO** and **HI** setpoints for the same switch. 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 the ▲ or ▼ arrow keys to increase or decrease the hysteresis time to the desired value and press **ENTER** to save the new value.

8.5.4 LATCH/NONLATCH:

Each switch 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 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.



8.6 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. 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 is required to provide a calibration reference.

```
  CALIBRATE:

→FULL CAL
  TWEAK LO ONLY
  TWEAK HI ONLY
  RECALL FACT CAL
  LOOP CAL
  PREVIOUS MENU
```

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.

8.6.1 CALIBRATION PROCEDURE:

Connect the appropriate calibrator or simulator (for thermocouples use the proper type of thermocouple extension wire) to the gauge, 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.

8.6.2 FULL CAL:

To calibrate the gauge, select **CALIBRATE** from the 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.

```
  CALIBRATE:

→FULL CAL
  TWEAK LO ONLY
  TWEAK HI ONLY
  RECALL FACT CAL
  LOOP CAL
  PREVIOUS MENU
```

8.6.3 The DSG-1611DUPS 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. Please note that this type of adjustment will invalidate calibration settings from the **FULL CAL** procedures described above.

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.

8.6.4 **RECALL FACTORY CAL VALUES:**

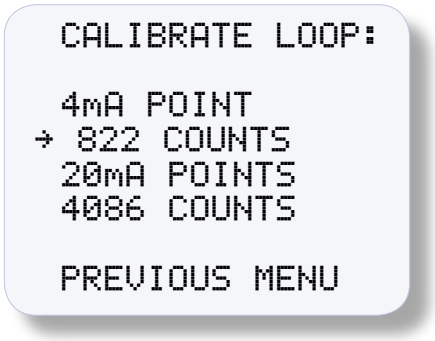
The user can at any time during the life of the gauge reinstate the factory calibration values. Select **CALIBRATE** and press **ENTER**; select **RECALL FACT CAL** and press **ENTER**. The next screen will display the current configuration for the **TYPE** and **RANGE**. Select **APPLY** to confirm 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.

8.6.5 LOOP CAL:

The DSG-1611DUPS gauges' current loop 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. **SEE SECTION 8.2.5 TO CONFIGURE THE LOOP OUTPUT.**

If it is necessary to re-calibrate the 4-20 mA 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 4 mA 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 4.00 mA 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 20.00 mA on the milliamp meter and press **ENTER**. The display will read **SAVE**, and the new 20 mA calibration value will be stored in memory. Press the **MENU/ESC** key to return to the home screen.



8.7 RESET:

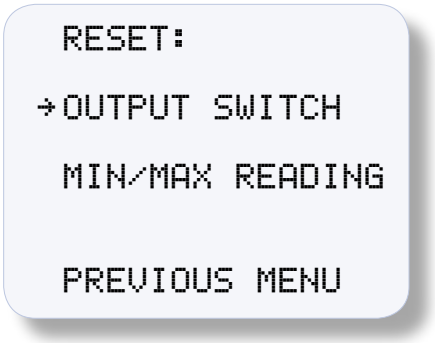
RESET in the menu is used to reset the output switch when set to latching and also to re-zero the min/max reading. To perform a reset, from the main menu, use the ▲ or ▼ arrow key to scroll to **RESET** and press **ENTER**. A reset can also be performed by sending a reset command via the RS-485 Modbus RTU communications register.

8.7.1 OUTPUT SWITCH:

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

8.7.2 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.

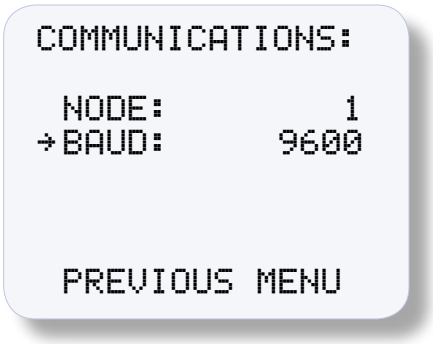


8.8 COMMUNICATIONS:

8.8.1 The DSG-1611DUPS 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-1611DUPS. A Modbus register list with register numbers and descriptions of each register can be found in **SECTION 10.0**. 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 **COMMUNICATIONS** 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.
FOR DETAILED COMMUNICATIONS INFORMATION SEE SECTION 9.0.

8.8.2 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.

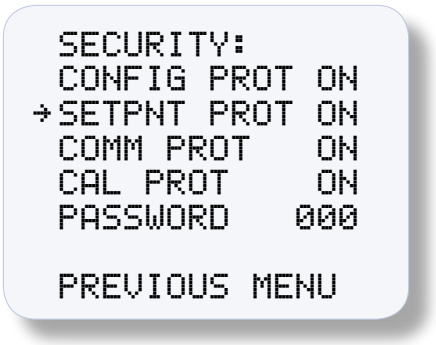
8.8.3 BAUD:
Select the required baud rate and press **ENTER** to save.
SEE SECTION 9.3 FOR AVAILABLE BAUD RATES.



8.9 SECURITY:

8.9.1 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 but 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.



8.9.2 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**.

8.9.3 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.

8.9.4 COMMUNICATIONS PROTECTION:

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

8.9.5 CALIBRATION PROTECTION:

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

8.9.6 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 330.

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.

9.0 RS-485 COMMUNICATIONS

The DSG-1611DUPS 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.

9.1 MASTER/SLAVE OPERATION:

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.

9.2 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.

9.3 BAUD RATE:

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

9.4 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.

9.5 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.

9.6 COMMUNICATIONS PARAMETERS:

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

- Baud Rate: 9600 (**DEFAULT**, others available) **(SECTION 9.3)**
- Data Bits: 8
- Stop Bits: 1
- Parity: None

9.7 COMMUNICATIONS WIRING:

The RS-485 wiring diagram **FIG. 18** 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.

9.8 RX, TX INDICATORS:

An **RX** and **TX** (receive and transmit) **LED** is visible on the back of the gauge to indicate when the unit is either receiving or transmitting data.

9.9 CONNECTING TO A PC:

When connecting the gauge to the RS-232 port on a PC, an RS-232 to RS-485 converter **FIG. 17** must be used for the communication interface.

9.10 LOADING:

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, -7 V to +12 V, 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)**

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

10.0 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. Communications are at 9600 baud (default value), SEE SECTION 9.3 FOR OTHER SPEEDS, 8 Data bits, No Parity, 1 Stop bit (9600 8N1).

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.

10.1 00000 REGISTER DEFINITIONS

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	DISPLAY LOOP Display loop value on home screen	0=OFF	1=ON
00006	RESET MIN/MAX Reset MIN/MAX readings		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	SWITCH 2 STATE	0=SHELF	1=FAILSAFE
00027	SWITCH 2 TYPE	0=NON-LATCH	1=LATCHING
00028 ↓ ↓ 00047	RESERVED		
00048	Config Override – Allow ModBus to override Channel Configuration		

10.2 10000 SERIES REGISTERS

CHANNEL STATUS	10001	CHANNEL signal OK	1=OK
	10002	LOOOR – Channel signal low out of range	1=LOOR
	10003	HIOOR – Channel signal hi out of range	1=HOOR
	10004	TCOPEN – Channel thermocouple open	1=TCOPEN
	10105 ↓ ↓ 10116	RESERVED	
	10017	SWITCH 1 FAULT HI	

ADDRESS	DESCRIPTION OF FUNCTION
10018	SWITCH 1 FAULT LO
10120 ↓ ↓ 10124	RESERVED
10025	SWITCH 2 FAULT HI
10026	SWITCH 2 FAULT LO

10.3 30000 SERIES REGISTERS

30001	CHANNEL STATUS – same as 10001–10016
30002	SWITCH STATUS – same as 10017–10026
30004	Analog Value (float msw)
30005	Analog Value (float lsw)
30010	Ambient Temp. DEGK (float msw)
30011	Ambient Temp. DEGK (float lsw)
30012	Current Loop (4-20ma,400=4mA, 2000=20mA)
30013	SWITCH 1 Hi Hysteresis Timer (0.1 increments)
30014	SWITCH 1 Lo Hysteresis Timer (0.1 increments)
30016	SWITCH 2 Hi Hysteresis Timer (0.1 increments)
30017	SWITCH 2 Lo Hysteresis Timer (0.1 increments)
30019	CHANNEL MAX (float) (msw)
30020	CHANNEL MAX (float) (lsw)
30021	CHANNEL MIN (float) (msw)
30022	CHANNEL MIN (float) (lsw)

10.4 40000 SERIES REGISTERS

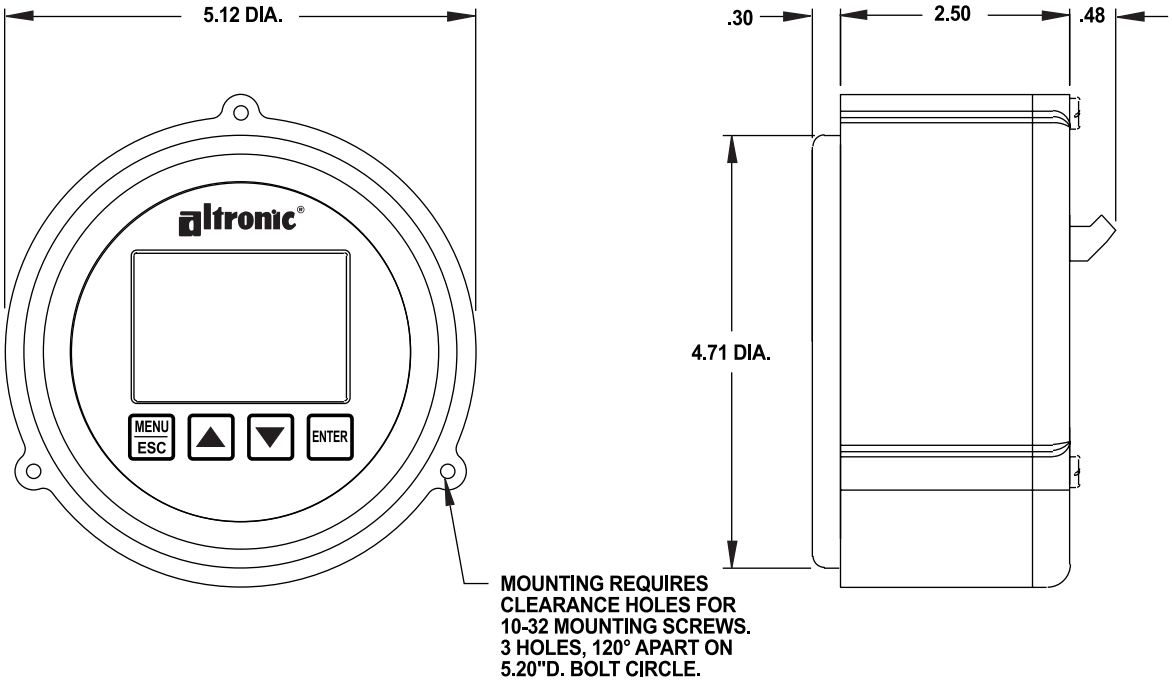
40001	Coils 001-016
40002	Coils 017-032
40003	Coils 033-048
40005	Node Number 1-99
40006	Baud rate Index 0=9.6k 1=19.2k 2=38.4k 3=57.6k 4=115.2k
40007	Security Password 000-999
40009	RESERVED
40010	RESERVED
40011	Lag Filter Gain (1-255)

ADDRESS	DESCRIPTION OF FUNCTION
40012	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	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	A/D Voltage Range 0=5V 1=±160mV 2=±80mV
40015	SENSOR MAX (float) (msw)
40016	SENSOR MAX (float) (lsw)
40017	SENSOR MIN (float) (msw)
40018	SENSOR MIN (float) (lsw)
40019	Range HI (float) (msw)
40020	Range HI (float) (lsw)
40021	Volt HI (float) (msw)
40022	Volt HI (float) (lsw)
40023	Range LO (float)(msw)
40024	Range LO (float) (lsw)
40025	Volt LO (float) (msw)
40026	Volt LO (float) (lsw)
40027	Zero Band (float) (msw)
40028	Zero Band (float) (lsw)
40029	Custom Decimal Place (0-4)
40030	Label Index 0=NONE 1=CUSTOM
40031	Custom Label (char. 1:2)

ADDRESS	DESCRIPTION OF FUNCTION
40032	Custom Label (char. 3:4)
40033	Custom Label (char. 5:6)
40034	Custom Label (char. 7:8)
40035	Custom Label (char. 9:10)
40036	Custom Label (char. 11:12)
40037	Custom Label (char. 13:14)
40038	Custom Label (char. 15:16)
40039	Custom Unit Label Index 0=NONE 1=CUSTOM
40040	Custom Unit Label (char. 1:2)
40041	Custom Unit Label (char. 3:4)
40042	Custom Unit Label (char. 5:–)
40043	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 5=Single bar between setpoints for switch 2 6=Increasing bars between setpoints for switch 2
40044	Bargraph Hi (float) (msw)
40045	Bargraph Hi (float) (lsw)
40046	Bargraph Lo (float) (msw)
40047	Bargraph Lo (float) (lsw)
40048 ↓ ↓ 40054	RESERVED
40092	RESERVED
40098	RESERVED
40099	SWITCH 1 Setpoint Type 0=Off 1=High On 2=Low On 3=High and Low On
40100	SWITCH 1 Hysteresis Time 1-99s
40101	SWITCH 1 Setpoint Hi (float) (msw)
40102	SWITCH 1 Setpoint Hi (float) (lsw)
40103	SWITCH 1 Setpoint Lo (float) (msw)
40104	SWITCH 1 Setpoint Lo (float) (lsw)
40105	SWITCH 1 Setpoint Differential (float) (msw)
40106	SWITCH 1 Setpoint Differential (float) (lsw)

ADDRESS	DESCRIPTION OF FUNCTION
40107	SWITCH 2 Setpoint Type 0=Off 1=High On 2=Low On 3=High and Low On
40108	SWITCH 2 Hysteresis Time 1–99 secs.
40109	SWITCH 2 Setpoint Hi (float) (msw)
40110	SWITCH 2 Setpoint Hi (float) (lsw)
40111	SWITCH 2 Setpoint Lo (float) (msw)
40112	SWITCH 2 Setpoint Lo (float) (lsw)
40113	SWITCH 2 Setpoint Differential (float) (msw)
40114	SWITCH 2 Setpoint Differential (float) (lsw)
40115	Current Loop Hi (20mA) (float) (msw)
40116	Current Loop Hi (20mA) (float) (lsw)
40117	Current Loop Lo (4mA) (float) (msw)
40118	Current Loop Lo (4mA) (float) (lsw)
40119	Current Loop Cal 20ma (AD Cnts)
40120	Current Loop Cal 4ma (AD Cnts)

FIG. 1 DSG-1611DUPS MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER REQUIRED: 12–36 VDC 0.25 AMP MAX.

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

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

LOOP OUTPUT: 4-20mA CURRENT LOOP, 500Ω MAX. LOOP RESISTANCE

OUTPUT SWITCHES: 2 EACH FORM C (N/O AND N/C) RATED 200 VDC 200mA CONTINUOUS

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

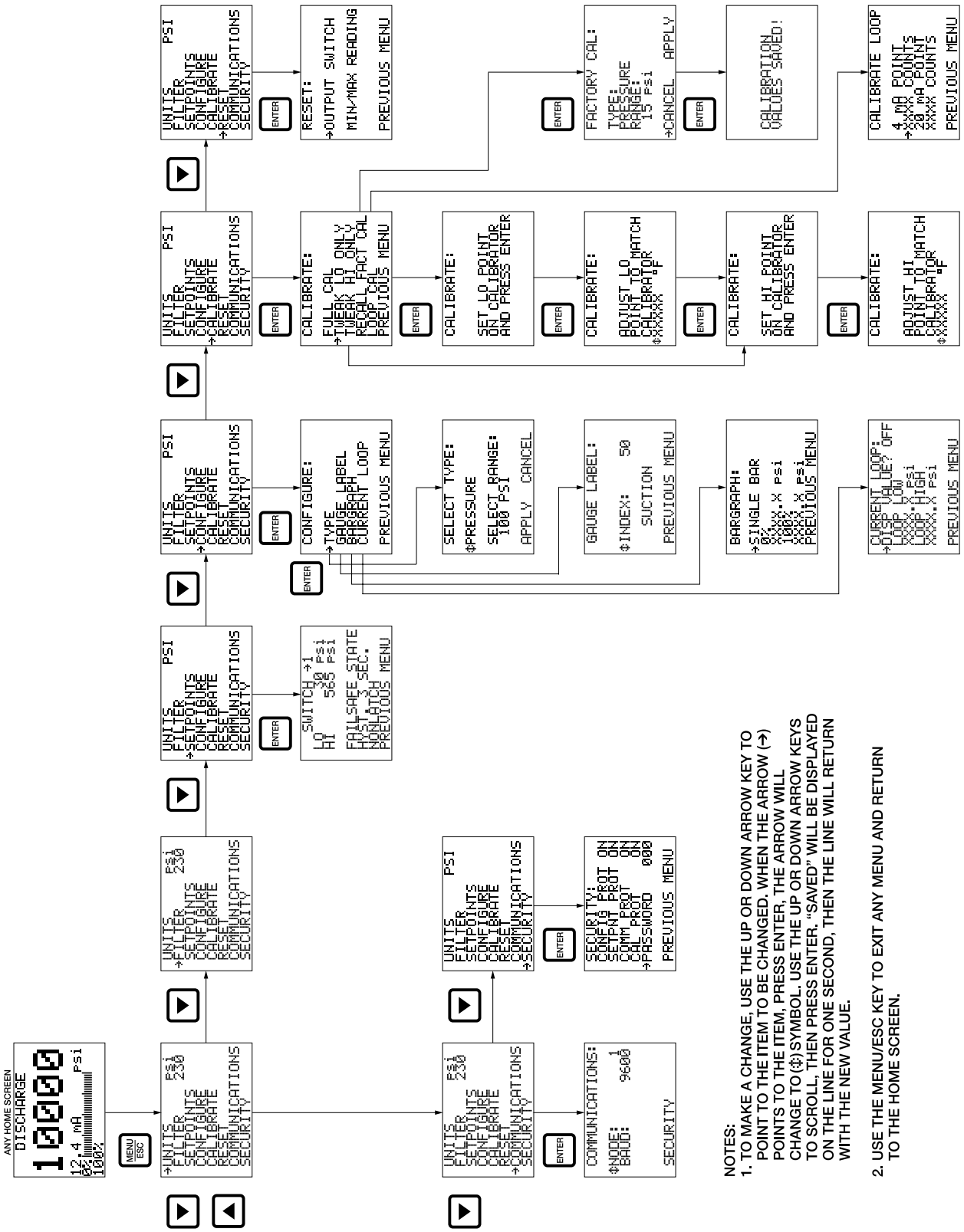
UNITS OF MEASURE: PRESSURE: psi, psig, psia, KPa, bar, mbar, inH_2O, inHg, mmH_2O, mmHg, kg/cm', Torr
TEMPERATURE: °F, °C, and °K
VIBRATION: in/s, mm/s, cm/s, G's, m/s^2, and ft/s^2
VOLTAGE: Volts, mV
PERCENT: %
CUSTOM: UP TO 5-DIGIT THROUGH MODBUS

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, DIV. 2, GROUPS C & D

FIG. 2 DSG-1611DUPS FLOW CHART



NOTES:
1. TO MAKE A CHANGE, USE THE UP OR DOWN ARROW KEY TO POINT TO THE ITEM TO BE CHANGED. WHEN THE ARROW (→) POINTS TO THE ITEM, PRESS ENTER, THE ARROW WILL CHANGE TO (⇳) SYMBOL. USE THE UP OR DOWN ARROW KEYS TO SCROLL, THEN PRESS ENTER. "SAVED" WILL BE DISPLAYED ON THE LINE FOR ONE SECOND, THEN THE LINE WILL RETURN WITH THE NEW VALUE.

2. USE THE MENU/ESC KEY TO EXIT ANY MENU AND RETURN TO THE HOME SCREEN.

FIG. 3 DSG-1611DUPS CONFIGURATION WORKSHEET

SERIAL #: _____ **SITE:** _____

LABEL: _____

UNITS: _____

TRANSDUCER:

TYPE: _____ **RANGE:** _____

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

BARGRAPH:

0% _____ 100% _____

BARGRAPH:

0% _____ 100% _____

SWITCH 1

SETPOINTS:

LO _____ HI _____

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

HYSTERESIS: _____ seconds

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

SWITCH 2

SETPOINTS:

LO _____ HI _____

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

HYSTERESIS: _____ seconds

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

CURRENT LOOP: LOW: _____ HIGH: _____

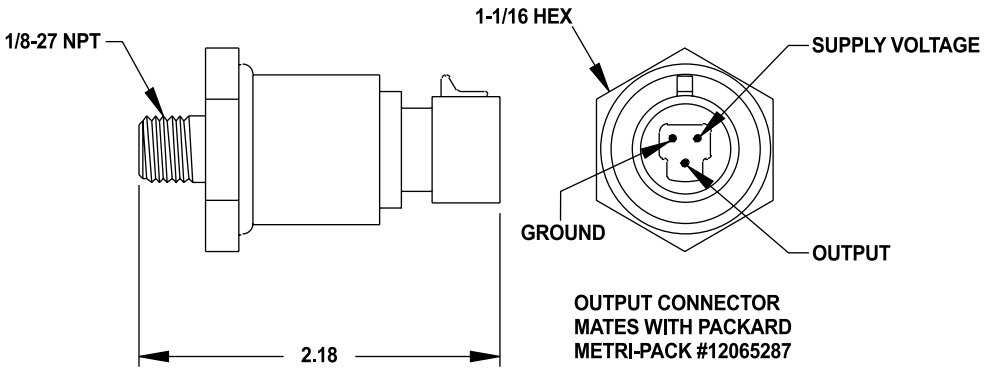
COMMUNICATIONS: NODE: _____ BAUD RATE: _____

SECURITY: ON/OFF

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

PASSWORD: (3-DIGIT) _____ _____ _____

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

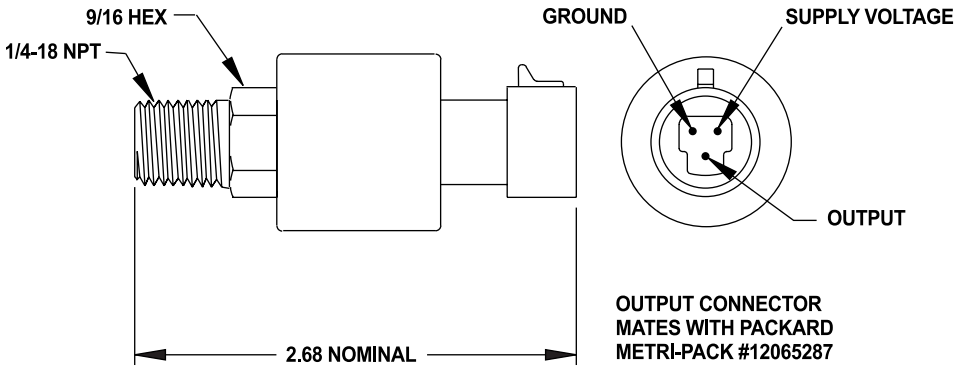
COMPENSATED OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 257°F (-40 TO 125°C)

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)

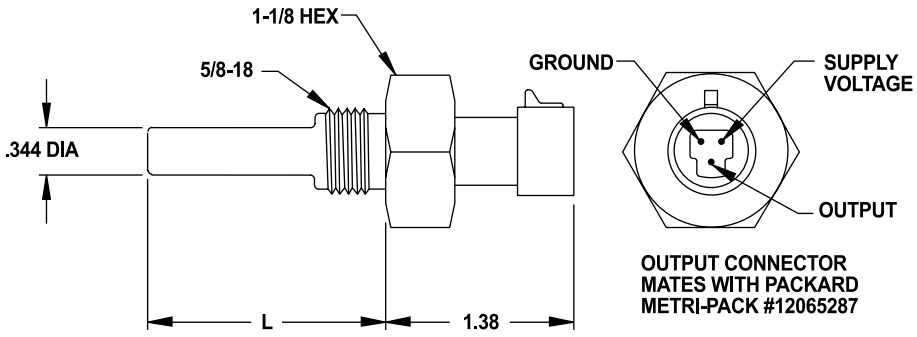
OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 221°F (-40 TO 105°C)

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

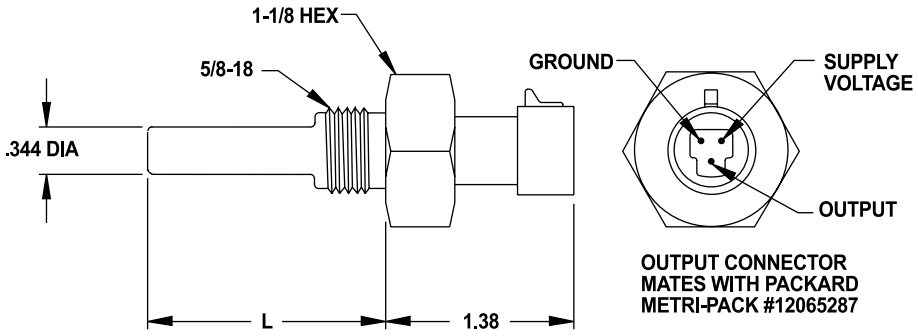
OPERATING TEMPERATURE: -40 TO 300°F (-40 TO 149°C)

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

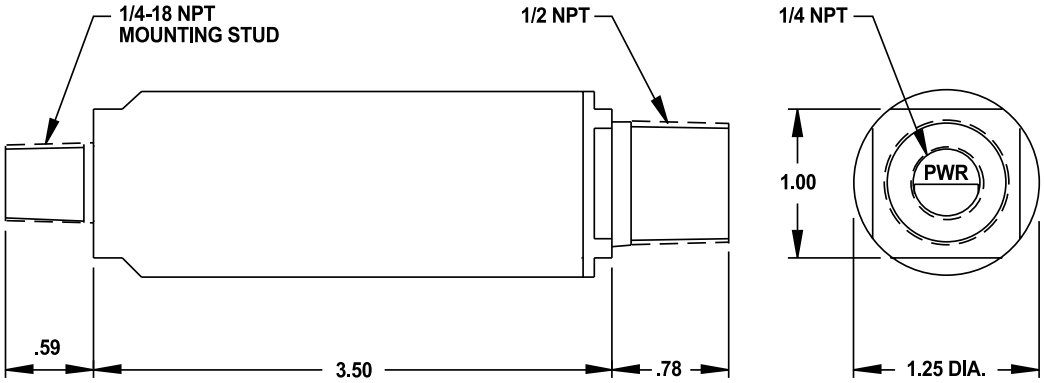
OPERATING TEMPERATURE: -40 TO 450°F (-40 TO 232°C)

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

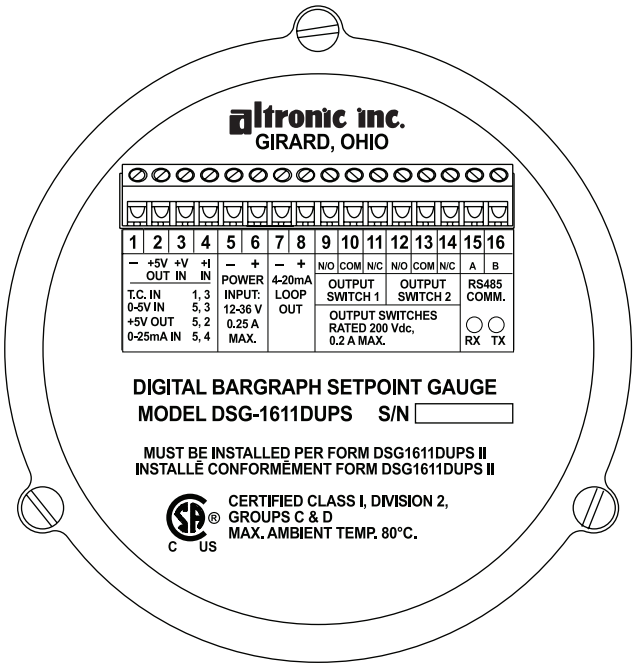
MATERIAL: 300 STAINLESS STEEL

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.

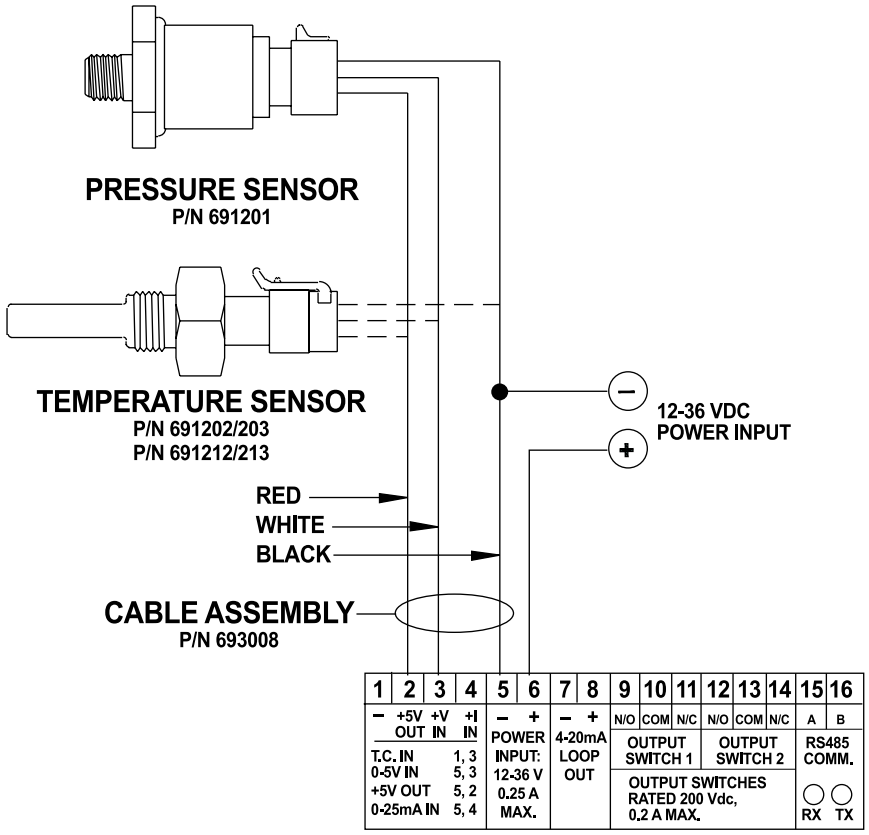
FIG. 9 GENERAL ELECTRICAL CONNECTIONS



TERMINAL		DESCRIPTION
SENSOR INPUT	1	THERMOCOUPLE RED (-), 80mV, 160mV, (-) MINUS INPUT
	2	+5VDC SUPPLY OUTPUT FOR SENSOR
	3	0-5VDC, 80mV, 160mV, THERMOCOUPLE YELOR WH (+) PLUS
	4	INPUT 0-25mA CURRENT SIGNAL INPUT FROM SENSOR
POWER SUPPLY INPUT	5	SUPPLY MINUS, 0-5V SENSOR MINUS
	6	+12-36VDC POWER INPUT, 0.25A MAX.
CURRENT LOOP OUTPUT	7	LOOP MINUS
	8	+4-20mA LOOP OUTPUT
SWITCH 1 OUTPUT	9	NORMALLY OPEN SWITCH
	10	COMMON
	11	NORMALLY CLOSED SWITCH
SWITCH 2 OUTPUT	12	NORMALLY OPEN SWITCH
	13	COMMON
	14	NORMALLY CLOSED SWITCH
RS485 COMS	15	RS485 (A)
	16	RS485 (B)

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

FIG. 10 WIRING DIAGRAM: SENSOR INPUT



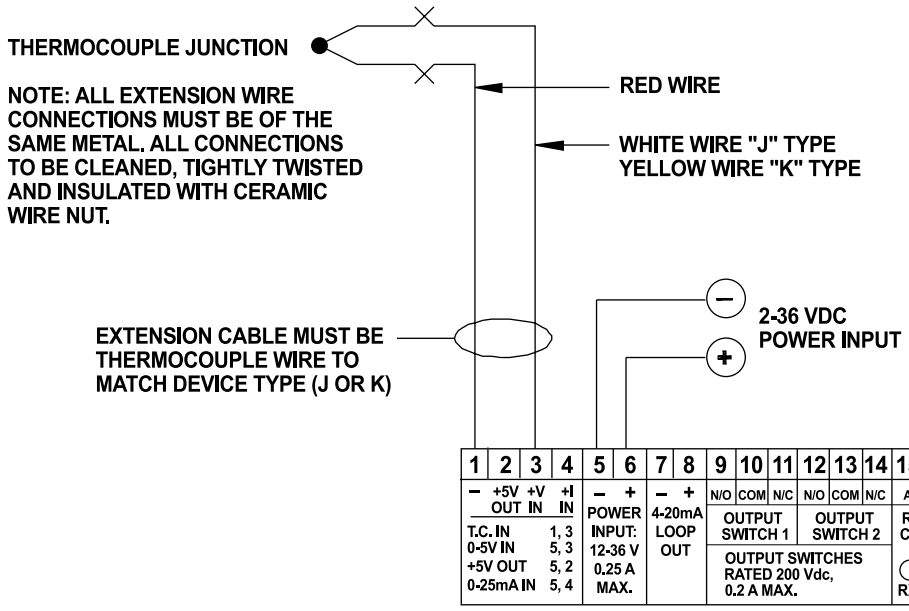


FIG. 11 WIRING DIAGRAM: HIGH-LEVEL VOLTAGE SENSOR INPUT

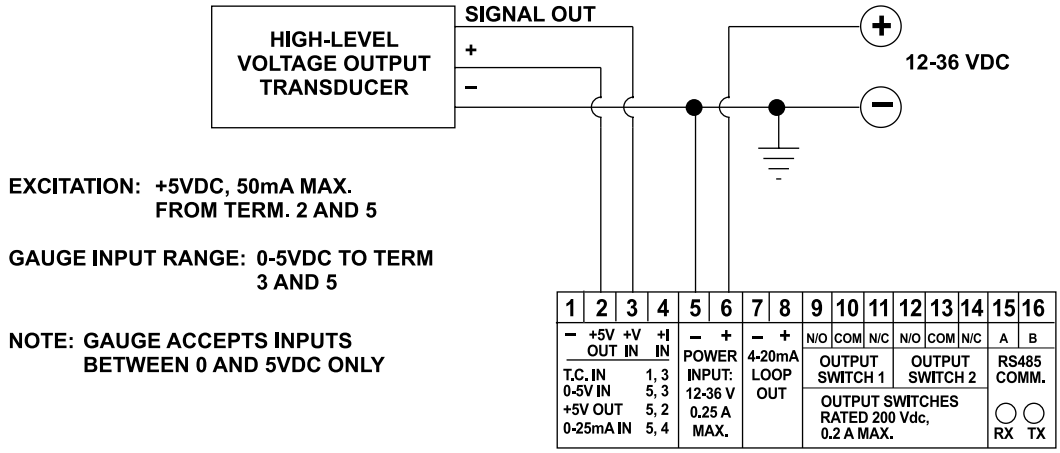


FIG. 12 WIRING DIAGRAM: CURRENT SENSOR INPUT

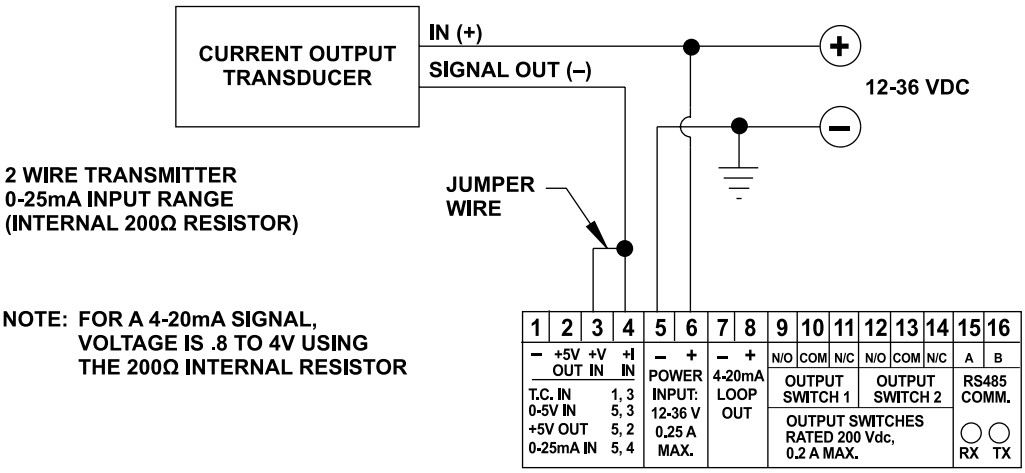


FIG. 13 WIRING DIAGRAM: LOW-LEVEL VOLTAGE SENSOR INPUT

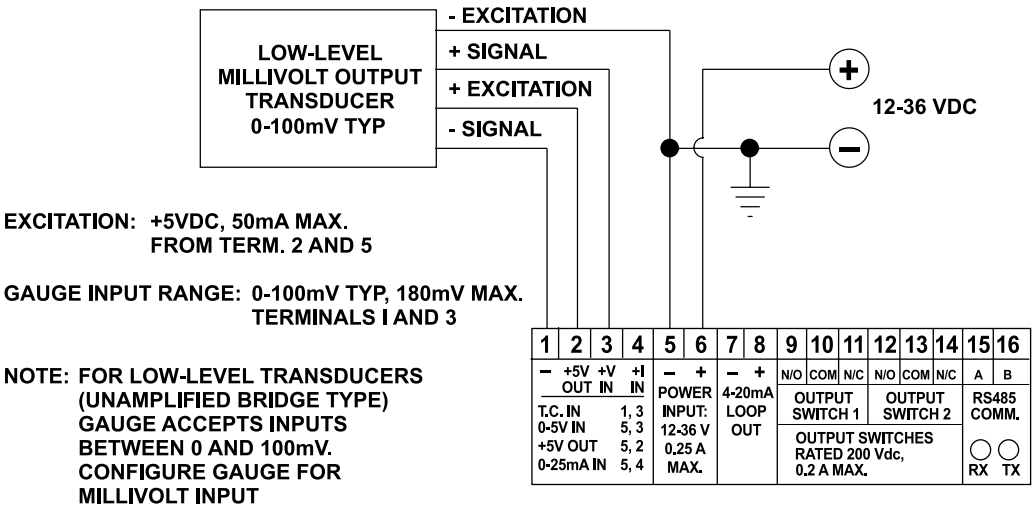


FIG. 14 WIRING DIAGRAM: 4-20 mA VIBRATION TRANSDUCER INPUT

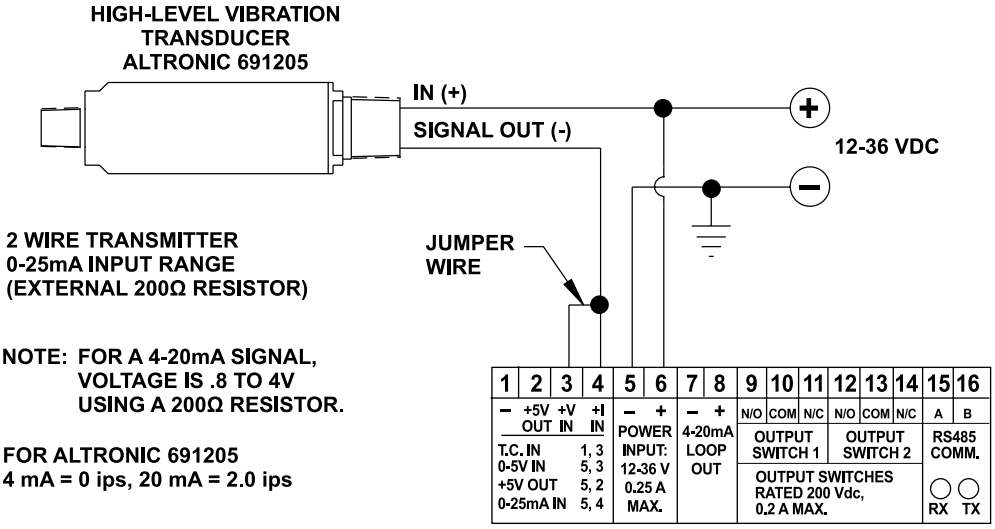
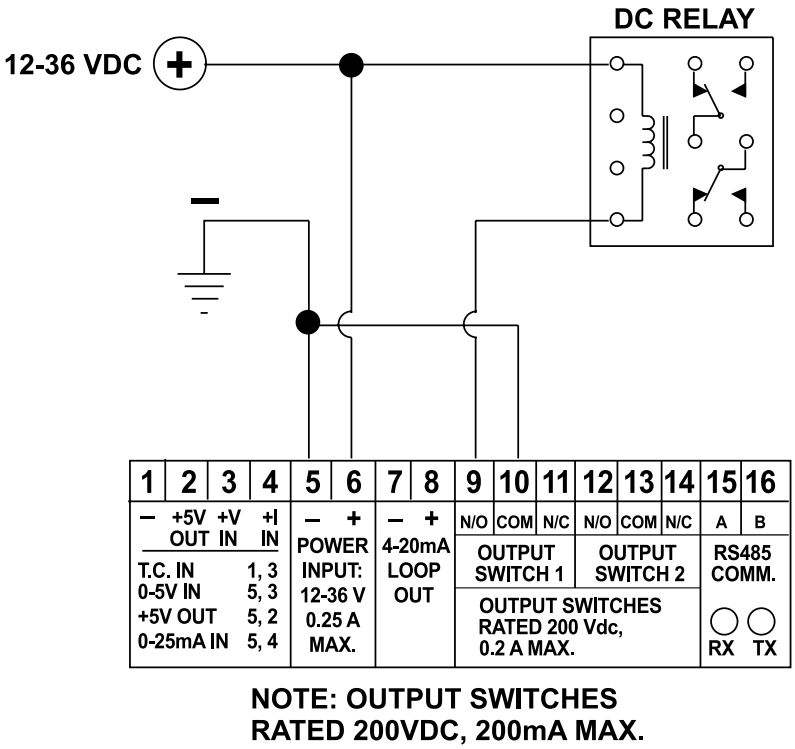


FIG. 15 WIRING DIAGRAM: DC RELAY



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

FIG. 16 WIRING DIAGRAM: CURRENT LOOP OUTPUT

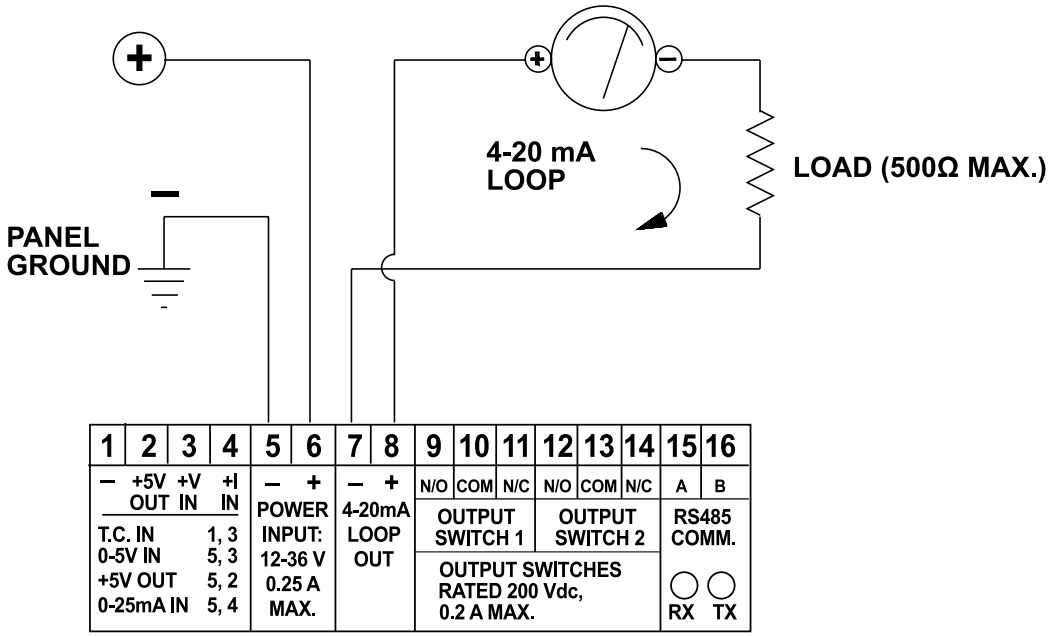
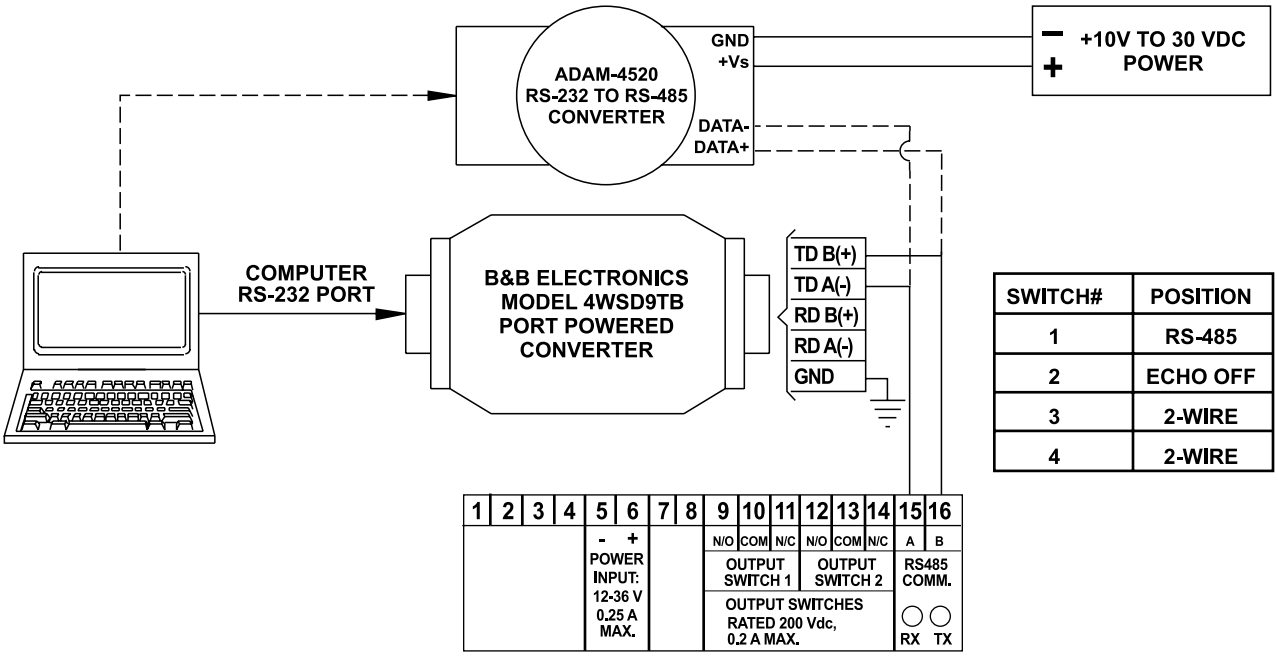


FIG. 17 RS-485 COMMUNICATIONS: PC HOOK-UP



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. 18 RS-485 COMMUNICATIONS: MULTIPLE SLAVE UNITS