CAUTION: The DSG-1601DU, DSG-1601DUP and DSG-1601DUS digital setpoint gauges are suitable for use in Class I, Group D, Division 1 and 2 hazardous locations when installed in accordance with these instructions.

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

1.0 DESCRIPTION

1.1 The Altronic DSG-1601DU/DUP/DUS digital setpoint gauge is an electronic instrument designed to monitor pressure or temperature using industry standard transducers. Although the gauge is designed for monitoring pressure or temperature, virtually any transducer with an amplified output voltage 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. An LCD display is used to display the numeric value, engineering units, state of the output switches, and a bargraph. In addition, the monitored signal is continuously compared against two adjustable setpoints set by the operator from the front keypad of the gauge.

1.2 The Altronic DSG-1601 digital setpoint gauge is designed to be simple to use with features such as pre-set factory settings for both pressure and temperature and an escape key for programming mistakes. The gauge is also very versatile with features such as programmable input range, units, decimal point, and setpoint configuration. In addition, the LCD display contains a bargraph that can be programmed for bar mode, single bar between two selected points, or single bar between the setpoints. A programmable software display filter is also incorporated to stabilize readings where the input signal is fluctuating. Calibration can be performed using the front panel keypad.

1.3 A 4-20 mA current loop output is provided in model DSG-1601DUP. The 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 is provided in model DSG-1601DUS. This allows the gauge to communicate to other instruments, PC's or PLC's via the two serial RS-485 communication wires.

1.5 The power requirement for the DSG-1601DU/DUP/DUS gauge is 12 to 36 Vdc, 50 mA max.

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

2.0 TRANSDUCERS

2.1 The DSG-1601 series gauge is designed to accept virtually any transducer with an amplified output in the range of 0 to 5 Vdc or 0 to 25 mA. Two series of transducers are available from Altronic: pressure transducer 691201-x and temperature transducers 691202/203-x and 691212/213-x.

2.2 PRESSURE TRANSDUCER - The pressure transducer, Altronic P/N 691201-x, is packaged in a rugged sealed case with a 1/8"-27 NPT pressure port, a stainless steel media cavity, and a Packard Electric "Metri-Pack" connector. The ranges available are 0-100, 300, 500, 1000, 2000, and 5000 PSIS, all of which have an overload rating of 1.5 times rating without damage. 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-1601 gauge using cable assembly P/N 693008-x.

2.3 TEMPERATURE TRANSDUCERS - The temperature transducers, Altronic P/N 691202-300, 691203-300 with a temperature measurement range of +5 to 300°F and the 691212-450, 691213-450 with a temperature range of -40 to +450°F 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 10.3) the standard calibration for the 691202/203-300 sensor is selected as "dEG1" and the standard calibration for the 691212/213-450 is selected by choosing "dEG2". The three wires from the transducer are: +5 volt excitation, temperature output voltage, and minus return. These wires connect directly to the back of the DSG using cable assembly P/N 693008-x.

3.0 MOUNTING

3.1 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. NOTE: Avoid mounting gauge with the LCD display facing direct sunlight. The display temperature range is -40°F to +175°F (-40°C to +80°C).

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.).

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; pick 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.

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 transducer, so to ensure accurate readings the tip of the probe should be surrounded by the media.

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 - Connect the power input wires to terminals 5(−) and 6(+); power requirement is 12 to 36 Vdc. The minus terminal (−) is connected 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 - Select a transducer, either an Altronic pressure or temperature transducer listed above or one that outputs a signal in the range of 0 to 5 Vdc or 0 to 25 mA, and mount as described above. 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 OUTPUT SWITCH WIRING - A fault condition will cause one or both of the user programmable output switches to turn ON/OFF to their common. 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.

4.4 OUTPUT CURRENT LOOP WIRING - Model DSG-1601DUP has a 4-20 mA current loop 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 20 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. Refer to the wiring diagrams for typical hook-up.

4.5 RS-485 COMMUNICATIONS WIRING - Model DSG-1601DUS has RS-485 serial communications available and 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 RS-485 "A" and "B". Connect to the other communication device "A" to "A"(−) and "B" to "B"(+). Connect the shield wire to the master device only.

4.6 HAZARDOUS AREA OPERATION - The DSG-1601DU/DUP/DUS device is CSA-certified for CLASS I, DIVISION 2, GROUP D areas when mounted in a suitable enclosure. The device may be operated as CLASS I, DIVISION 1, GROUP D intrinsically safe, if the following conditions are met:

A. The gauge is powered from a CSA-certified zener barrier rated 30 volts max., 120 ohms min. A suitable barrier is a Stahl part no. 9001/01-280-165-10; follow the installation instructions supplied with the barrier.
B. The switch outputs, if used, are connected to the sensor inputs of an Altronic DA or DD annunciator system with the 690 series power supply.
C. DSG-1601DUP: The current loop output is connected to an intrinsically-safe transmitter mounted in a Division 1 area or through a CSA-certified zener barrier rated 30 volts max, 120 ohms min.
D. DSG-1601DUS: The RS-485 communications must be connected through a CSA-certified zener barrier rated 30 volts max., 120 ohms min. A suitable barrier is a Stahl part no. 9001/01-280-165-10; follow the installation instructions supplied with the barrier.

In addition, the following requirements must be met (see NFPA standard no. 493):

1. The intrinsically-safe gauge wires within the panel enclosure must be kept at least two (2) inches away from other wiring. Run transducer wires leaving the panel in a separate conduit from all other wiring and keep separate throughout the installation.
2. Wiring to the sensors must have a grade of insulation capable of withstanding an AC voltage of 500 volts RMS.
3. Sensor wires must be run in separate conduits and junction boxes from high voltage wires such as Ignition, fuel valve, and other high voltage wiring.

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND/OR SUITABILITY FOR CLASS I, DIV. 2.

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

5.0 NORMAL OPERATION

5.1 When the DSG-1601 gauge is in the "normal" mode, it displays the numeric value, units, and a bargraph of the sensed media. If a setpoint value is exceeded, the output switch turns on and the display indicates "L" or "H" (low or high setpoint) and "1" or "2" (switch 1 or 2 has tripped). NOTE: The units and the bargraph can be turned off.

6.0 KEYPAD DESCRIPTION

6.1 The DSG-1601 gauge contains a six-key front keypad which is used to view or change the setpoint values, configure the gauge, and to calibrate the gauge. The six front panel keys are MODE, ENTER, SETPTS, ESC, and ▲, ▼ (up and down arrow keys). Only one key should be pressed at a time.

6.2 MODE - The MODE key is used to enter setup mode and to scroll through the gauge setup menu.

6.3 ENTER - The ENTER key is used in the setup mode to proceed through the configuration and to accept the data. It is used in the setpoint mode to accept and save the new setpoint value. At the end of a configuration when a new setup has been entered, press ENTER and the display will read "SAVE", then "donE", and the new data or configuration will be stored in the nonvolatile memory.

6.4 SETPTS - The SETPTS (setpoints) key is used to view or change each setpoint value and configuration. When in the normal mode, press the SETPTS key; the value and configuration for setpoint no. 1 are displayed. Press the SETPTS key again; the value and configuration for setpoint no. 2 are displayed. Press SETPTS key one more time to return to the normal mode.

6.5 ESC - The ESC (escape) key can be used at any time during the setup or setpoint mode to return to the normal mode. When the ESC key is pressed 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 normal reading.

6.6 ▲ ▼ - The up and down arrow keys are used to scroll through the selections in the setup mode and to increase or decrease values in the setup, setpoint, and calibration mode. These two keys when held will rapidly increase or decrease display values.

7.0 DEFAULT FACTORY SETTINGS

7.1 The DSG-1601 series gauge contains several default settings that are available to the user anytime during the life of the gauge. Upon receipt, the gauge is set to one of these settings. These default settings can be used as a starting point when custom-configuring the gauge as all parameters are set to known values.

7.2 SELECTING A DEFAULT SETTING - From the normal mode, press the MODE key until the display reads "tyPE" and press ENTER. Use the ▲ and ▼ keys to select a transducer type and press ENTER. All of the configuration parameters will automatically be set to the factory settings for that transducer type. The factory preset transducer types are 100, 300, 500, 1000, 2000, and 5000 psi, dEG1 and dEG2 (degrees) °F.

7.3 DEFAULT SETTINGS - Listed below are the factory default settings stored in permanent memory.

UNITS:	The UNITS for pressure are "psi", for temperature "°F".
SETPOINT CONFIGURATION:	SETPOINT 1 - Low, with the setpoint value at 10% of the transducer range or full scale value. SETPOINT 2 - High, with the setpoint value at 90% of full scale value. Example: For 100 psi transducer, SETPOINT (1) would be 10 psi and SETPOINT (2) would be 90 psi.
BARGRAPH:	The bargraph is set for a single bar scaled proportionally between the setpoints.
OUTPUT CURRENT LOOP: (DSG-1601DUP)	4 mA point is set at zero 20 mA point is set at full scale. Example: For a 100 psi transducer, 4 mA = 0 psi, 20 mA = 100 psi.
COMMUNICATIONS NODE: (DSG-1601DUS)	01, Checksum disabled
SETPOINT HYSTERESIS:	2% of full scale. Example: For 100 psi transducer, High setpoint set at 90 psi, the measured value would have to go below 88 psi before the output switch would clear.
DISPLAY FILTER:	The display filter is set for 128 out of 255, which provides a moderate amount of dampening.

8.0 INITIAL OPERATION

8.1 UPON RECEIPT OF GAUGE, TRANSDUCER TYPE - When received, the gauge will be set to one of the pre-configured factory settings so initial installation is simple. Mount and wire the gauge as described above. Upon power-up all segments of the display will turn on for a display check. The display will then proceed to read the value for the transducer type set at the factory. To check what transducer type the gauge was configured for, press the MODE key until the display reads "tyPE", press ENTER and the factory pre-configured transducer type will be displayed. If the transducer type matches the one that you have installed, press the ESC key and move on to setting the setpoints described below. To change the gauge transducer type, press the ▲ or ▼ (up or down arrow keys) to scroll through the factory preset transducer types. The choices available are: 100, 300, 500, 1000, 2000, 5000, psi; dEG1, dEG2 and SPEC. To select one, display it and press ENTER. The gauge will now be reading the correct numeric value for that transducer. NOTE: The preset factory settings for the transducer type are set for Altronic pressure transducers 691201-x for 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), see specification sheet; no additional calibration of these transducers is required.

8.2 SETPOINTS - Next check the setpoint values by pressing the SETPTS key, the setpoint value, "1", and "L" - indicating switch 1, Low setpoint - will be shown on the display. Press the SETPTS key again to view the status of switch 2. See Section 9.0 to adjust the setpoints.

9.0 ADJUSTING SETPOINTS

9.1 There are two adjustable setpoints which can be set anywhere within the range of the gauge. To view or change the setpoint values, press the SETPTS key one time to view the first setpoint; press it again to view the second setpoint. The LCD indicators "1" or "2" and "L" or "H" will come on to indicate which setpoint switch and what type of setpoint is being displayed. To adjust the displayed value, press ▲ or ▼ (the up or down arrow key) to increase or decrease the value until the desired trip point for that switch is reached. Press ENTER to accept and save the new value. The new setpoint value will change only if the ENTER key is pressed; it will not be changed if either the SETPTS key or the ESC key is pressed.

NOTE: When in the setpoints mode, the previous setpoint values are monitored, and the new value is monitored only when the ENTER key is pressed. If no key is pressed for 15 seconds, the display will return to the normal mode and the configuration will revert back to the previous parameters.

10.0 GAUGE CONFIGURATION

10.1 The following are the headings for each configuration menu of the gauge. Press the MODE key to reach any of these configuration headings from the normal display mode. After a selection has been made and configuration performed, press the ENTER key; the display will read "SAVE/donE". It is at this time the new data is saved. The ESC (escape) key can be used at any time to abort the configuration mode and return to the normal reading. During configuration, the gauge allows 15 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 normal mode without making any changes. The new information is saved only if the ENTER key is pressed and the gauge reads "SAVE/donE". A flowchart is provided that shows step-by-step progression through the gauge configuration procedure.

10.2 CALIBRATION - For calibration procedures, see Section 11.0 on calibration.

10.3 TYPE - The "type" configuration mode is used to select the transducer type. To view or change the transducer type, press the MODE key until the display reads "tyPE" and press ENTER. Use the ▲ or ▼ arrow keys to select a transducer type, and press ENTER to accept and save the new transducer type. NOTE: For the transducer type "SPEC" (SPECIAL), see Advanced Configuration, Section 12.0.

10.4 UNITS - The available unit indicators are: psi, KPa, Hg, bar, °F, and °C. The 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 unit indicator, press the MODE key until the display reads "Unit"; the previously programmed unit indicator will appear. Use the ▲ or ▼ keys to select one of the available indicators, and press ENTER to accept and save the change. The display will read "SAVE/donE" and return to the normal mode displaying the new unit indicator selected and the numeric value converted to the selected units. NOTE: The range of the gauge (9999) may be exceeded when selecting units KPa and Hg with 2000 and 5000 type transducers.

10.5 SETPOINT CONFIGURATION - The setpoint configuration allows the user to select each output switch as either a Low or High setpoint. To change the setpoint configuration, press the MODE key until the display reads "SP.CF", press ENTER and the display will read "SP-1" or "SP≡1", "L" or "H", indicating the outputs are in the shelf state or fail-safe state when the gauge is powered; setpoint 1 is set to either a Low or High setpoint. The previous setup will appear. Use the MODE key to place the outputs in either shelf-state (outputs are in same condition when powered), or fail-safe (outputs are in opposite state when powered); switch 1 and 2 are configured the same. Use the ▲ or ▼ arrow keys to select either L or H. Press ENTER to accept the selected configuration for switch 1, the display will then read "SP-2", "L" or "H", repeat the same procedure and press ENTER to accept the configuration. The display will enter the bargraph configuration mode; follow the instructions for configuring the bargraph described below.

10.6 BARGRAPH - The bargraph appears across the bottom of the display and can be configured in four different modes. The selections are:

"On.SP I I I"	Single bar between the setpoints
"On IIIIII"	Bar mode between two points
"On I I I"	Single bar between two points
"OFF"	No bargraph displayed

To change bargraph modes, press the MODE key until the display reads "bAr" and press ENTER. Use the ▲ or ▼ arrow keys to select a bargraph mode. A description follows:

"On.SP I I I" - On between the setpoints: press ENTER and the display will return to the normal mode with the bar set between the setpoints. If the setpoint values are changed, the two bargraph end-points will change accordingly. NOTE: If both setpoints are configured the same, either Low or High, the single bar between the setpoints is not available.

"On IIIIII" - Bar mode between two points: press ENTER and the display will read the Low bar value. Use the ▲ or ▼ arrow keys to adjust the low bar value. Press ENTER and the High bar value will be displayed; follow the same procedure to adjust this value. Press ENTER to return to the normal display mode with the new bargraph configuration.

"On I I I" - Single bar mode between two points: press ENTER and the display will show the Low bar value. Use the ▲ or ▼ arrow keys to adjust the low bar value. Press ENTER and the High bar value will be displayed, follow the same procedure to adjust this value. Press ENTER to return to the normal display mode with the new bargraph configuration.

"OFF" - No bargraph: press ENTER and the display will return to the normal mode and the bargraph will be off.

10.7 OUTPUT CURRENT LOOP (DSG-1601DUP ONLY) - The 4-20 mA current loop output allows the user to output a signal proportional to the parameter being measured and displayed. To configure the current loop, press the MODE key until the display reads "LOOP" and press ENTER. The display will read the value for the previously set 4 mA point, "L", and the unit indicator the gauge is configured for. Use the ▲ or ▼ arrow keys to increase or decrease the numeric value for the 4 mA point. Press ENTER and the numeric value for the 20 mA point will be displayed along with "H" and the unit indicator. Again use the ▲ or ▼ arrow keys to adjust the desired 20 mA numeric value. Press ENTER to save the new 4-20 mA configuration and return to the normal reading. NOTE: The 4-20 mA current loop can be configured for reverse action. Simply configure the "L" or low point with the 20 mA value and the "H" or high point with the 4 mA value.

10.8 RS-485 COMMUNICATIONS NODE NUMBER "nodE" (DSG-1601DUS ONLY) - For RS-485 serial communications each unit must be assigned a node or identification number so that a gauge or monitor can be identified by the device communicating with it. Any unique number from 01 to 99 may be used.

10.9 HYSTERESIS - Hysteresis sometimes is referred to as a deadband value. It is a numeric value that is added to a low setpoint value and subtracted from a high setpoint value before the switch returns to the normal condition (clears). The hysteresis is common to both setpoints. To set the hysteresis value, press the MODE key until the display reads "HySt" and press ENTER. The display will read the value for the previously set hysteresis. Use the ▲ or ▼ arrow keys to increase or decrease the hysteresis value and press ENTER to save the new value. The hysteresis value is displayed in the units that the gauge is configured for. The hysteresis value range is 0 to 9999. NOTE: If the hysteresis value is set for a number greater than the range of the gauge, the gauge will have to be powered-down to clear the switch. This can be used to determine if a high or low limit was ever reached (in effect, a latching output).

10.10 DISPLAY 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 press the MODE key until the display reads "FILt" 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.	.33	.33	.50	.65	.80	1.0	1.5	4.0	6.0	8.0	11.0	22.0

11.0 CALIBRATION

11.1 If a standard Altronic transducer is used, no initial calibration is required. However if a non-standard transducer is used or after some operation time, the gauge system may require calibration. Calibration may be performed many times over the life of the gauge. The calibration mode is used to calibrate the zero and span values of the gauge. Calibration can be performed from the front keypad without disassembling the gauge. To calibrate the gauge, use the same transducer that will be used in operation. Use a dead weight tester or a test gauge as a calibration standard with an accuracy which is significantly better than that of the transducer and gauge to be calibrated. NOTE: During calibration, the gauge allows 2 minutes between keystrokes to change or save a new calibration. If 2 minutes lapse without a keystroke, the gauge will automatically return to the normal mode without making any changes. The new calibration information is saved only if the ENTER key is pressed and the gauge reads "SAVE/donE".

11.2 CALIBRATION PROCEDURE - To calibrate the gauge, press the MODE key until the display reads "CAL" and press ENTER; the display will read "CAL.1" and "L" for the low or zero calibration value. Adjust the standard for a reading at or near zero and press ENTER. Use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the reading of the standard and press ENTER; the display will read "CAL.2" and "H" for the high or span calibration value. Adjust the standard for a reading at or near full scale and press ENTER. Again use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the standard and press ENTER. The display will read "SAVE/donE" and return to the normal reading with the new calibration values stored in permanent memory. NOTE: Be sure that the units of the calibrator match the units of the instrument before performing a calibration.

11.3 The DSG-1601 series 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. NOTE: This type of adjustment will invalidate calibration settings resulting from the procedures in section 11.2.

A. ZERO ADJUSTMENT ONLY - To make a small adjustment on the zero calibration value of the gauge, enter the calibration mode by pressing the MODE key until the display reads "CAL" and press ENTER; the display will read "CAL.1" and "L" for the low or zero calibration value. With the standard at or near zero, press ENTER and use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the standard and press ENTER. The display will read "CAL.2"; press the MODE key and the display will read "SAVE/donE" and will return to the normal reading with the new zero calibration value stored in permanent memory.

B. SPAN ADJUSTMENT ONLY - To make a small adjustment on the span point of the gauge, enter the calibration mode by pressing the MODE key until the display reads "CAL" and press ENTER; the display will read "CAL.1". Press the MODE key and the display will read "CAL.2" and "H" for the high or span calibration value. With the standard at or near the desired span value press ENTER and use the ▲ or ▼ arrow keys to increase or decrease the display reading to match the standard and press ENTER. The display will read "SAVE/donE" and will return to the normal reading with the new span calibration value stored in permanent memory.

12.0 ADVANCED CONFIGURATION

12.1 As previously mentioned, the DSG-1601 series gauge is designed to accept many different types of transducers as inputs. It can be configured to read any engineering value from −999 to 9999 as long as the transducers' output is somewhere between 0 and 5 volts DC. If the desired units are not available on the LCD display, the unit indicators can be turned off and a separate label can be used as an indicator of the desired units.

12.2 CONFIGURE NON-STANDARD TRANSDUCER - To configure the gauge for a non-standard transducer, press the MODE key until the display reads "tyPE" and press ENTER. The display will read the previous transducer type. Use the ▲ or ▼ arrow keys until the display reads "SPEC" and press ENTER; the display will read "dPnt". Use the ▲ or ▼ arrow keys to select the desired decimal point position and press ENTER. The display will then read the previous absolute lowest display value; use the ▲ or ▼ arrow keys to adjust the new desired absolute lowest display value for the configured transducer and press ENTER. The display will then read the previous absolute highest display value; use the ▲ or ▼ arrow keys to select the new desired absolute highest display value, and press ENTER to save the new configuration. The display will read "SAVE/donE" and will return to the normal mode with the new configuration stored in permanent memory. NOTE: Calibration may be required - see Section 11.0.

12.3 CONFIGURE FOR NO UNIT INDICATORS ON LCD DISPLAY - To configure the LCD display for no unit indicators, "SPEC" (special) transducer type must first be configured as described above. Press the MODE key until the display reads "Unit" and press ENTER; the display will read the previously chosen unit indicator. Use the ▲ or ▼ arrow keys to select no unit indicator, and press ENTER to save the new configuration. The display will read "SAVE/donE" and return to the normal mode with no unit indicator displayed.

13.0 RS-485 COMMUNICATIONS

13.1 The DSG-1601DUS series gauge is part of a system that has been carefully designed to easily interface to popular computers, terminals, programmable controllers and future Altronic instruments. The data and status as well as the setpoint values can be read remotely. The setpoints can also be adjusted remotely.

13.2 MASTER/SLAVE OPERATION - The RS-485 communication system in the DSG gauge 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.

13.3 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 01 to 99 although only 32 devices can be served on a single communications port. This number range (01 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.

13.4 ASCII COMMUNICATION - All communication to and from the monitors is performed using ASCII characters. This allows the information to be processed with the "string" functions common to high level computer languages such as BASIC and C. For computers that support standard serial port interfaces, no special machine language software drivers are required. The use of the ASCII format also allows for the connection of these devices to an auto answer modem for long distance operation without the need for a local supervisory computer. The ASCII characters also make system debugging easy using standard terminal emulation software.

13.5 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 visa-versa.

13.6 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.

13.7 COMMUNICATIONS PARAMETERS - The following must be set by the master to communicate with the slaves:

Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None

13.8 COMMUNICATIONS WIRING - The RS-485 wiring diagram 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.

13.9 RX, TX INDICATORS - An RX and TX (receive and transmit) LED is visible on the back of the DSG-1601DUS unit to indicate when the unit is either receiving or transmitting data.

13.10 CONNECTING TO A PC - When connecting the DSG-1601DUS gauge to the RS-232 port on a PC, an RS-232 to RS-485 converter must be used for the communication interface. See wiring diagram for details.

13.11 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, −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 DSG units = (4000) / (ft of wire used)
For 20 AWG wire No. of DSG units = (3600) / (ft of wire used)
For 22 AWG wire No. of DSG units = (2400) / (ft of wire used)

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

13.12 COMMAND STRUCTURE - The DSG gauges operate with a simple command/response protocol to control all functions. A command must be transmitted to the unit by the master (computer or PLC) before the slave can respond with useful data. A slave unit can never initiate a communications sequence. A variety of commands exist to fully exploit the functionality of the individual units.

Communication of functions to the DSG is performed with two character ASCII command codes. The general format used for the commands is illustrated below using the READ DATA command as an example. The hexadecimal values for the characters are shown only as a reference for those using low level (assembly language) decoding and will not appear on the communications terminal screen. All of the characters used in the communications protocol are standard ASCII characters and appear on the computer keyboard as shown with the exception of the "not acknowledge" (NAK) which is the industry standard "control U".

	header	**start**	**node**	**space**	**command**	**space**	**end**
ASCII	>	(	0 1		R D		)
HEX	3Eh	28h	30h 31h	20h	52h 44h	20h	29h

Command Header ">" (3Eh) - Each command must begin with the command header sometimes referred to as a prompt character. The ASCII character used is the ">" which means that a command message will be sent from the master to the slave.

Start of Text "(" (28h) - The command header must be followed by the start of text indicator.

Node Number 01 - 99 - The node number or address of the device being contacted is next. A two digit number from 01 to 99 can be used.

Space (20h) - Following the node number is an ASCII space character (not printable, value 20h) to act as a delimiter between the node number and the two character command word. For the balance of this document the space character will be shown normally without a specific description of each occurrence.

Command Word "RD" (52h, 44h) - The command words are standard two letter (upper case) commands sent by the master for gathering specific information about the status of a slave. The commands are listed under STANDARD COMMANDS below.

Space (20h) - Following the command word is another ASCII space character to act as a delimiter between the command word and the channel number.

End of Text ")" (29h) - The end of text indicator says this is the end of the command.

STANDARD COMMANDS - The standard commands available are:

RD for **R**ead **D**ata	>(01 RD)	Read the value for the unit at node 01.
RS for **R**ead **S**etpoint 01 value	>(02 RS 01)	Read setpoint 01 for the unit at node 02.
RS for **R**ead **S**etpoint 02 value	>(15 RS 02)	Read setpoint 02 for the unit at node 15.
SP for **S**et**P**oint 01 adjustment	>(02 SP 01 sxxxx.)	Send new value for setpoint 01 for unit at node 02.
SP for **S**et**P**oint 02 adjustment	>(15 SP 02 sxxxx.)	Send new value for setpoint 02 for unit at node 15.

NOTES: For the SP 01 and SP 02 setpoint adjustment commands, the variable data is of the form: sign (+/−) followed by the four most significant digits and a decimal point. Decimal point position must agree with the transducer programming, that is the decimal point position must be the same as that returned in a read response. It is recommended that the gauge always be read immediately prior to adjusting setpoints via the RS-485 link. Digits to the left of the most significant non-zero number must be filled with zero's for place holders (Ex: +0325.). A plus sign must be used for a setpoint value of zero (Ex: +0000.).

STANDARD RESPONSES - The standard responses to the commands above are:

<(01 1601 sxxxx. Psi OK OK)	Node 01, unit type 1601, x value, Psi units, setpoint 01 status indicator, setpoint 02 status indicator.
<(02 sxxxx. DegF LS)	Setpoint 01 at node 02 has a setpoint value of x amount, DegF units and is set for a low setpoint.
<(15 sxxxx. Psi HS)	Setpoint 02 at node 15 has a setpoint value of x amount, Psi units and is set for a high setpoint.
<(02 SP 01)	Made setpoint 01 adjustment at node 02.
<(15 SP 02)	Made setpoint 02 adjustment at node 15.

SETPOINT STATUS INDICATORS FOR THE READ RESPONSE - Setpoint status indicators consist of two ASCII characters. The first is setpoint 01's indicator, the second is setpoint 02's indicator. The valid status indicators are:

OK	No faults detected
HI	Measured value is above its setpoint value
LO	Measured value is below its setpoint value

VALID RESPONSE - A command/response sequence is not complete until a valid response is received. When a slave unit receives a valid command, it interprets the command, performs the desired function and then communicates the response to the master within the specified time. The master may not initiate a new command until the response from a previous command is completed.

A valid response can occur in three ways:
1) a normal response indicated by a "< " header and "( )" beginning and end of text
2) an error response indicated by a "§" NAK (not acknowledged)
3) a communications time-out error

Each command has an associated delay time before a response can be made from the slave unit. If the response does not occur within the time specified for the commands as given, a communications time-out error occurs. This error is usually caused by an improper command header or possibly an improper or non-existent node sent by the master. The commands and their associated maximum response delay times are listed below.

RD, RS, CD, CE commands	20 msec. max.
SP command	100 msec. max.

An NAK error response will be sent by the DSG-1601DUS gauge when it has received a command with an error in the message. All commands must be of the format above. The header, start-and-end of text characters, a valid node number and spaces must be sent and correct to receive an NAK; if not, no response will be sent.

13.13 CHECKSUMS - Two additional commands are provided so that the user may enable or disable the communication checksum routines. When enabled, the messages include an error-checking checksum that is based upon an Exclusive-OR, Modulo 100 conversion sum of the characters in the message string between and including the start of text "(" character and the end of text ")" character. The checksum number is a decimal number that is appended to the message. The slave unit calculates the checksum of the message and compares the calculated value to the actual value it received from the master in the checksum field. If the two values are not equal, an error results and no response is sent.

CE for **C**hecksum **E**nabled >(01 CE)	checksum enabled for node 01
CD for **C**hecksum **D**isabled >(01 CD)	checksum disabled for node 01

To calculate the Exclusive-OR, Modulo 100 checksum, take the binary value of the 8 bit ASCII character "(" and XOR it with the next binary value of the ASCII character in the string. Take the result and XOR it with the next. Continue these calculations until the end of text ")" character and that is the checksum value. If the decimal number of any of the calculations are greater than 99, use Modulo 100 math. For example, for decimal 154, use 54.

The Exclusive-OR is a binary Boolean operator. The XOR truth table is as follows:

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

XOR EXAMPLE FOR "(" XORed WITH "0":

```
00101000
00110000
00011000  =  24 (DECIMAL)
```

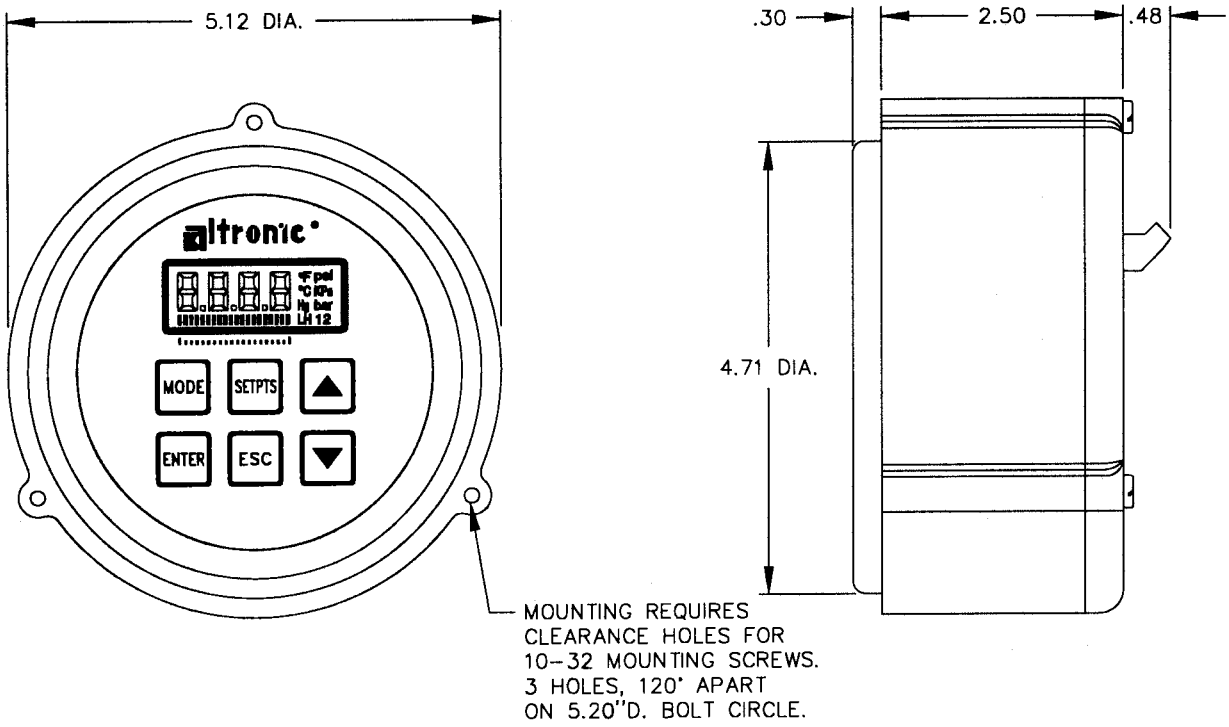
An example of the calculation of the checksum is below:
Command: >(01 RD)

ASCII CHAR	BINARY EQUIV.	CHECKSUM (DECIMAL)
>	Not used	---
(	00101000	---
0	00110000	24
1	00110001	41
SPACE	00100000	9
R	01010010	91
D	01000100	31
SPACE	00100000	63
)	00101001	22

The checksum value will be sent at the end of the command, so the command will look like: >(01 RD)22

FIGURES SECTION:

MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER REQUIRED: 12–36 VDC 50mA MAX.

SENSOR INPUT: 0 TO 5 VDC, REFERENCED TO NEGATIVE
0 TO 25mA (INTERNAL 200Ω RESISTOR).

SENSOR SUPPLY: 5 VDC, 20mA MAX. (INTERNAL SUPPLY)

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

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

AMBIENT TEMPERATURE RANGE: –40° TO 175°F (–40° TO +80°C)

DISPLAY: .4" 4 DIGIT LCD WITH DISPLAY INDICATORS AND 20 SEGMENT BARGRAPH.

DISPLAY RATE: 3 UPDATES PER SECOND NOMINAL.

DISPLAY RANGE: –999 TO 9999, SELECTABLE DECIMAL POINT.

SWITCH RESPONSE TIME: TIED TO DISPLAY READING.

DISPLAY INDICATORS: PSI, KPA, HG, BAR, °F, °C.

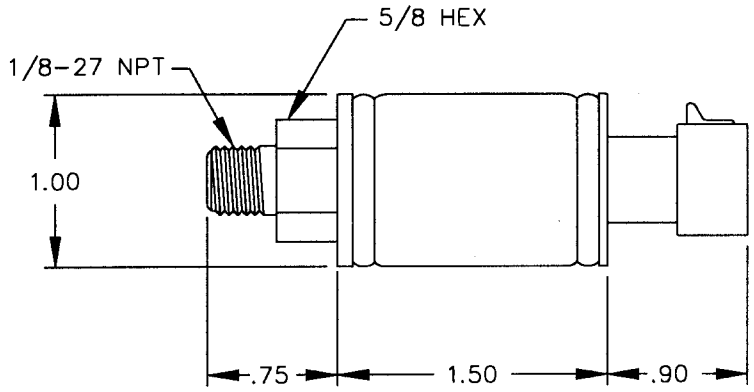
INSTRUMENT ACCURACY: ±.5% OF SPAN OVER TEMPERATURE RANGE
EXCLUSIVE OF TRANSDUCER ERROR.

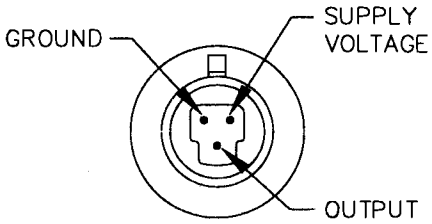
LOOP ACCURACY: ±.5% OF SPAN (DSG–1601DUP)

RS–485 COMMUNICATIONS: 9600 BAUD, HALF DUPLEX (DSG–1601DUS)

HAZARDOUS AREA CLASSIFICATION: CLASS I, GROUP D, DIV. 2
CLASS I, GROUP D, DIV. I WHEN POWERED
FROM A CSA CERTIFIED ZENER BARRIER
RATED 30 VOLTS MAX., 120Ω MIN.

PRESSURE TRANSDUCER
P/N 691 201-X





OUTPUT CONNECTOR
MATES WITH PACKARD
METRI-PACK #12065287

SPECIFICATIONS:

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

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

NULL OFFSET: .50V

TRANSDUCER TYPE: SEALED GAUGE

MATERIAL IN CONTACT WITH MEDIA: 300 SERIES STAINLESS STEEL, NICKEL PLATED CARBON STEEL, BRAZE COMPOUND.

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

CASE MATERIAL: PLATED STEEL

ACCURACY: ±1% OF SPAN FROM BEST FIT STRAIGHT LINE INCLUDES EFFECTS OF NON-LINEARITY, HYSTERESIS AND REPEATABILITY.

COMPENSATED TEMPERATURE RANGE: 0° TO 180°F (-18° TO 82°C)

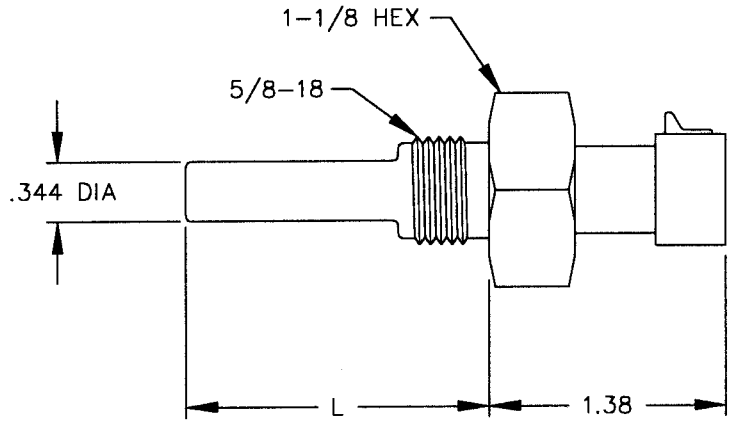
OPERATING AND STORAGE TEMPERATURE RANGE: -40° TO 221°F (-40 TO 105°C)

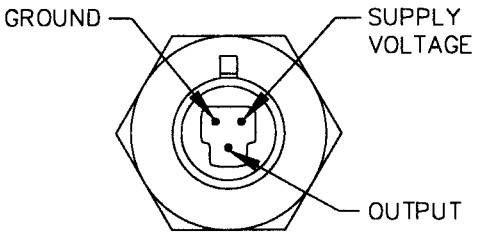
TOTAL ERROR: ±4% OF FULL SCALE INCLUDES THE EFFECTS OF TEMPERATURE, NON-LINEARITY, HYSTERESIS AND REPEATABILITY.

INSTALLATION: Use a 5/8" 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.

TEMPERATURE TRANSDUCER
P/N 691202-300 / 691203-300





OUTPUT CONNECTOR
MATES WITH PACKARD
METRI-PACK #12065287

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

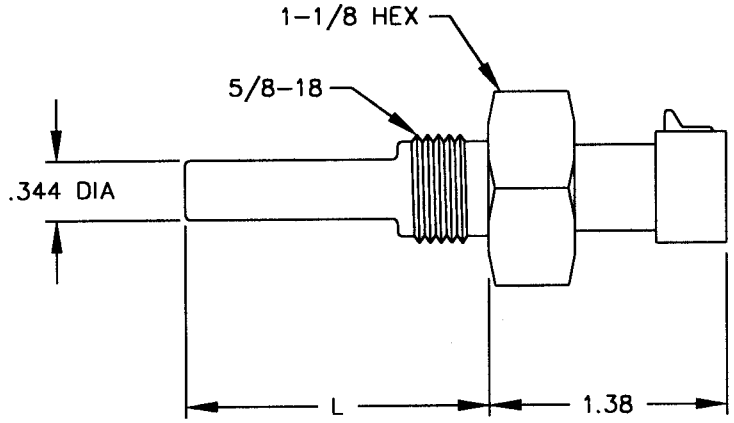
OPERATING TEMPERATURE: -40 TO 300°F (-40 TO 149°C)

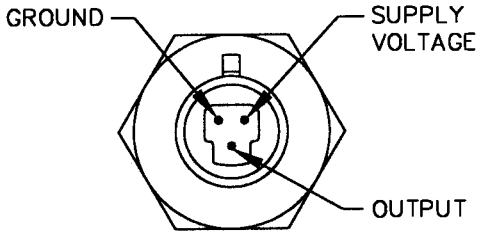
STORAGE TEMPERATURE: -75 TO 350°F (-59 TO 180°C)

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.

TEMPERATURE TRANSDUCER
P/N 691212-450 / 691213-450





OUTPUT CONNECTOR
MATES WITH PACKARD
METRI-PACK #12065287

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: -40 TO 572°F (-40 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, exhaust temperatures may exceed the maximum temperature rating.

DSG 1601 - CONFIGURATION WORKSHEET

SITE:_____

MODEL# DSG-1601DU__ **SERIAL#** _____

TYPE

__ 100psi __ 300psi __ 500psi
__ 1000psi __ 2000psi __ 5000psi
__ DEG1 __ DEG2
__ SPEC _ d.P n t _ d P.n t _ d P n.t _ d P n t

min display (0 volts)	_____	(-999 to 9999)
max display (5 volts)	_____	(-999 to 9999)

UNIT

__ psi __ °F
__ Kpa __ °C
__ bar
__ Hg __ none

SP.CF

Shelf Mode		Fail Safe Mode	
__ SP-1 L	__ SP-1 H	__ SP≡1 L	__ SP≡1 H
__ SP-2 L	__ SP-2 H	__ SP≡2 L	__ SP≡2 H

BAR

__ OFF __ ON.SP (between setpoints)

__ ON __ ON (between bar-L,bar-H)
bar-L _____ bar-H _____

LOOP _____ L (4 ma) _____ H (20 ma) (in display units)

RS-485 COMMUNICATIONS NODE NUMBER: _____

HYST _____ (in display units, default = 2% of range for predefined types)

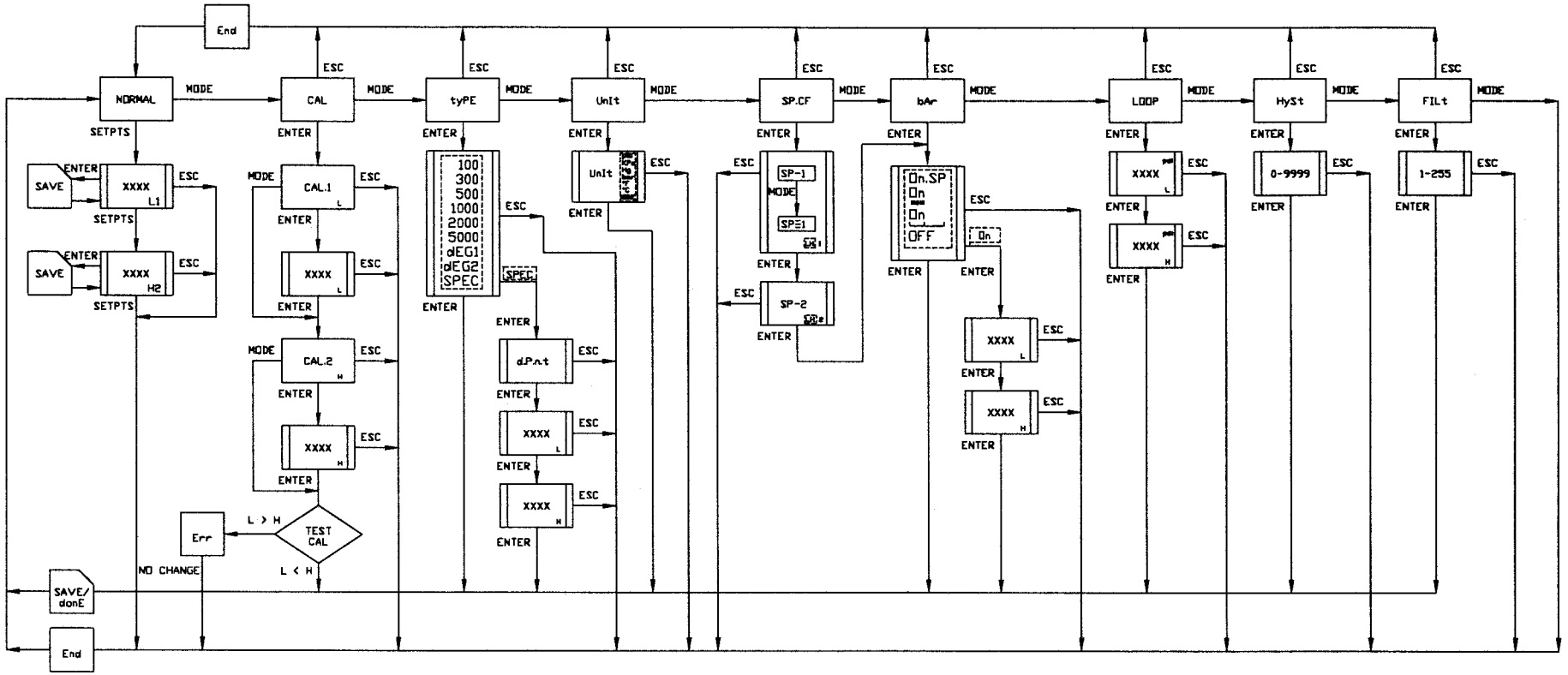
FILT _____ (1=min filtering, 255=max filtering, default = 128)

SETPOINTS

#1 _____ (in display units)

#2 _____ (in display units)

DSG-1601DU/DUP – FLOWCHART



FOR DEFAULT SETTINGS, SELECT A TRANSDUCER TYPE

TYPE
100
300
500
1000
2000
5000
dEG1
dEG2

UNITS
PSI
°F

SETPOINT CONFIG.
SETPNT 1 - LOW 10%
SETPNT 2 - HIGH 90%

BARGRAPH
SINGLE BAR
BETWEEN SETPNTS

CURRENT LOOP
4 mA - ZERO
20 mA - FULL SCALE

HYSTERESIS
2% FULL SCALE

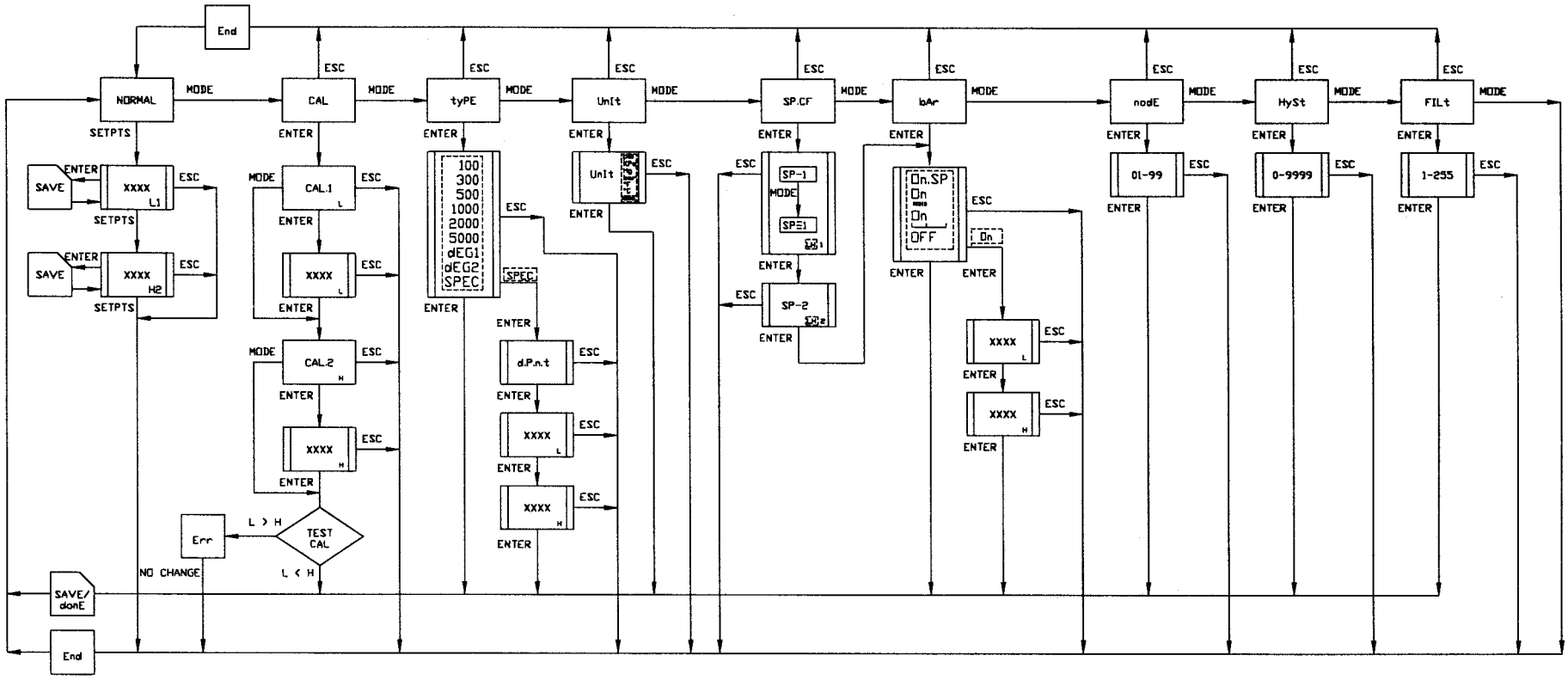
FILTER
128/255

SETPOINT CONFIGURATION
SP-1 OUTPUTS - SHELF STATE
SP≡1 OUTPUTS - FAIL SAFE

△ DOUBLE BARS- USE UP AND ▽ DOWN ARROW KEYS TO SCROLL

DASHED LINES- MAKE SELECTION

DSG-1601DUS – FLOWCHART



FOR DEFAULT SETTINGS, SELECT A TRANSDUCER TYPE

TYPE
100
300
500
1000
2000
5000
dEG1
dEG2

UNITS
PSI
°F

SETPOINT CONFIG.
SETPNT 1 – LOW 10%
SETPNT 2 – HIGH 90%

BARGRAPH
SINGLE BAR
BETWEEN SETPNTS

RS-485 NODE
01

HYSTERESIS
2% FULL SCALE

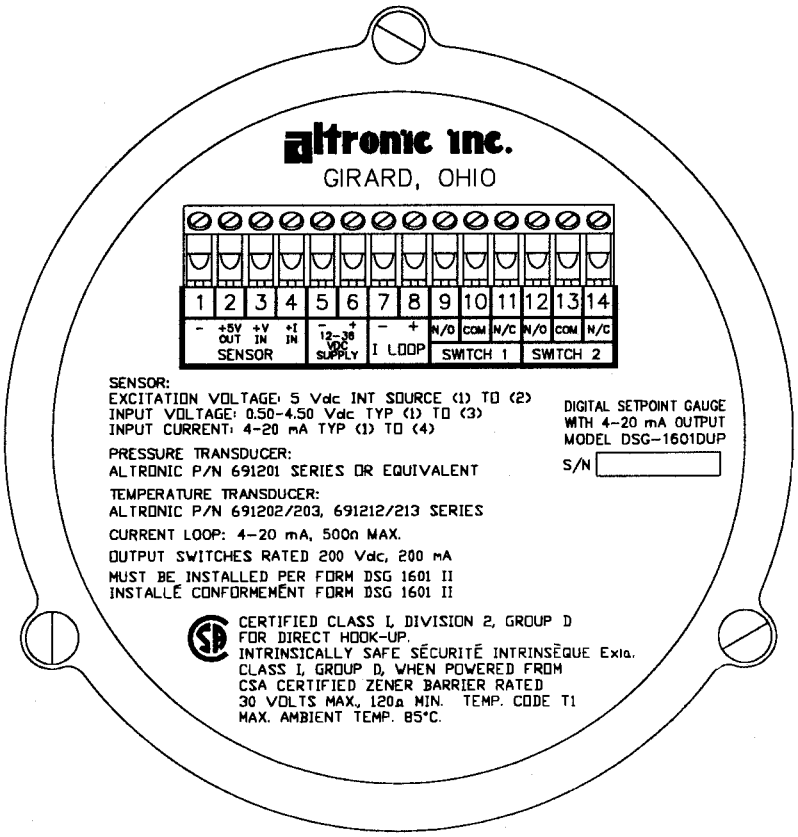
FILTER
128/255

SETPOINT CONFIGURATION
SP-1 OUTPUTS – SHELF STATE
SPE1 OUTPUTS – FAIL SAFE

XXXX H — △ ▽ DOUBLE BARS- USE UP AND DOWN ARROW KEYS TO SCROLL

DASHED LINES- MAKE SELECTION

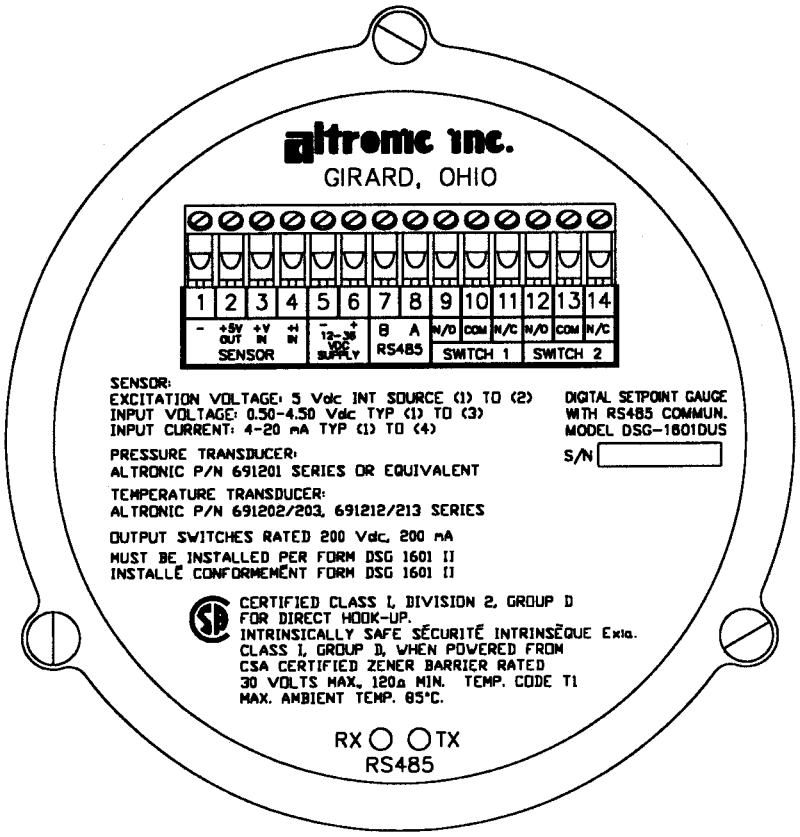
GENERAL ELECTRICAL CONNECTIONS
MODEL DSG-1601DU/DUP



TERMINAL		DESCRIPTION
SENSOR INPUT	1	SENSOR MINUS
	2	+5VDC SUPPLY OUTPUT FOR SENSOR
	3	0-5VDC VOLTAGE SIGNAL INPUT FROM SENSOR
	4	0-25mA CURRENT SIGNAL INPUT FROM SENSOR
POWER SUPPLY INPUT	5	SUPPLY MINUS
	6	+12-36VDC POWER INPUT, 50mA 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

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

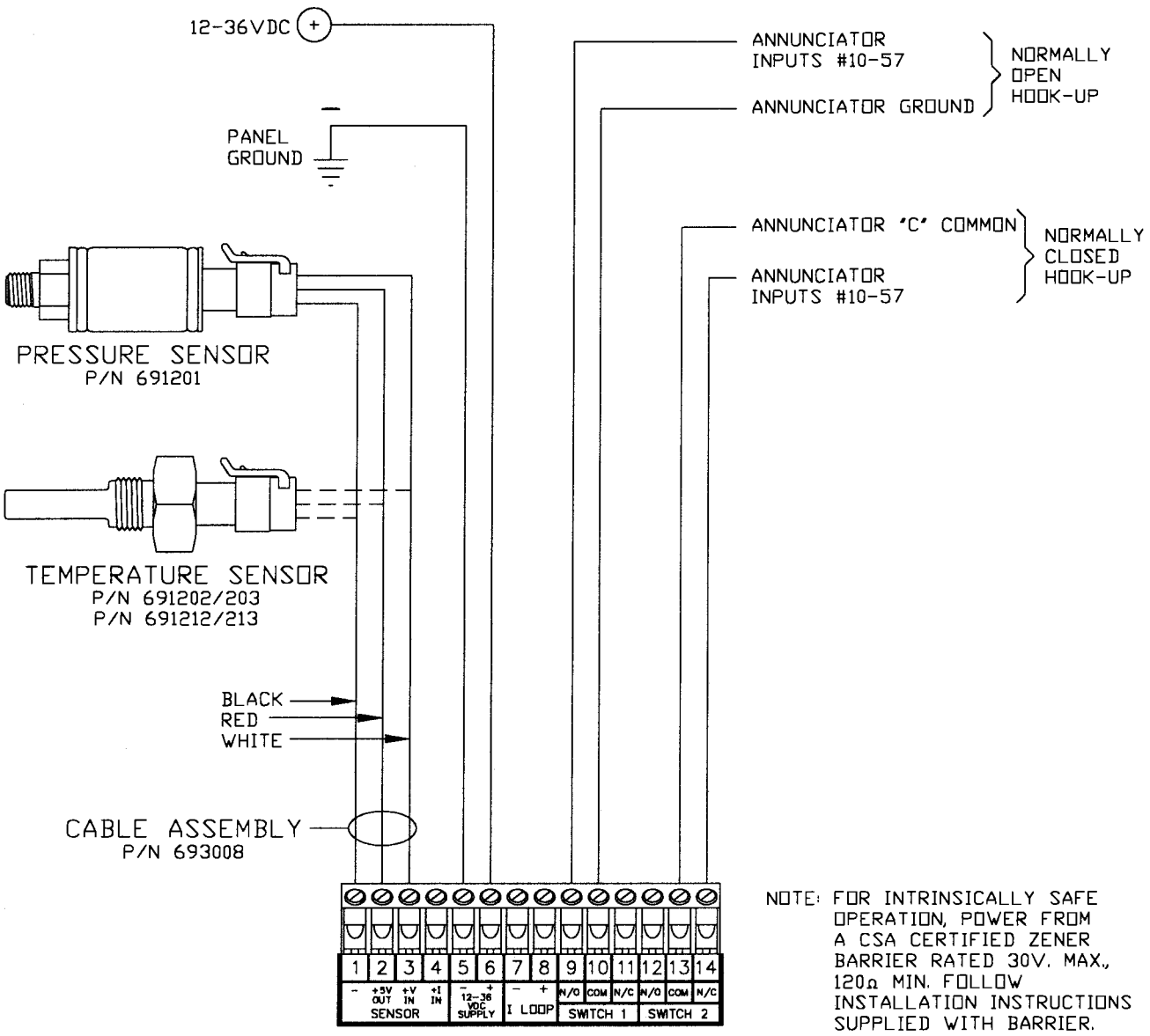
GENERAL ELECTRICAL CONNECTIONS
MODEL DSG-1601DUS



TERMINAL		DESCRIPTION
SENSOR INPUT	1	SENSOR MINUS
	2	+5VDC SUPPLY OUTPUT FOR SENSOR
	3	0-5VDC VOLTAGE SIGNAL INPUT FROM SENSOR
	4	0-25mA CURRENT SIGNAL INPUT FROM SENSOR
POWER SUPPLY INPUT	5	SUPPLY MINUS
	6	+12-36VDC POWER INPUT, 50mA MAX.
RS-485 COMMUNICATIONS	7	B
	8	A
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

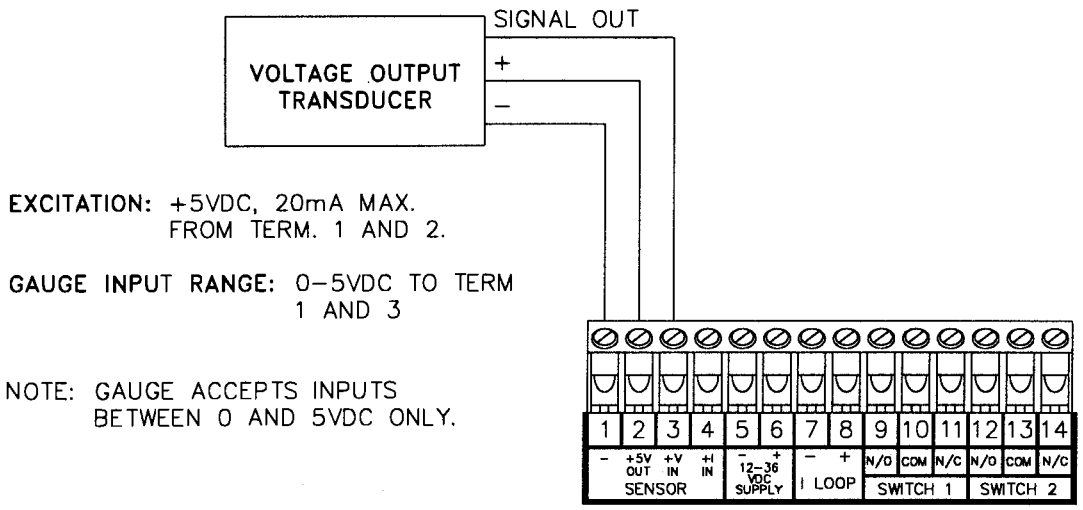
OUTPUT SWITCHES ARE CLASS "C" RATED 200VDC, 200mA CONTINUOUS OPERATION.
EACH SWITCH TURNS ON TO A SEPARATE COMMON WHICH IS ISOLATED FROM GROUND.

WIRING DIAGRAM
ALTRONIC ANNUNCIATOR SYSTEMS



NOTE: FOR INTRINSICALLY SAFE OPERATION, POWER FROM A CSA CERTIFIED ZENER BARRIER RATED 30V. MAX., 120Ω MIN. FOLLOW INSTALLATION INSTRUCTIONS SUPPLIED WITH BARRIER.

WIRING DIAGRAM – VOLTAGE SENSOR INPUT

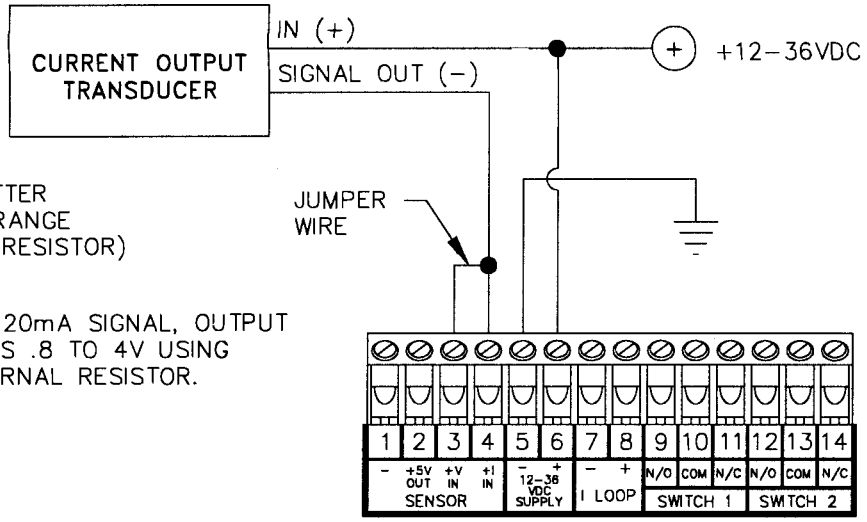


EXCITATION: +5VDC, 20mA MAX.
FROM TERM. 1 AND 2.

GAUGE INPUT RANGE: 0–5VDC TO TERM
1 AND 3

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

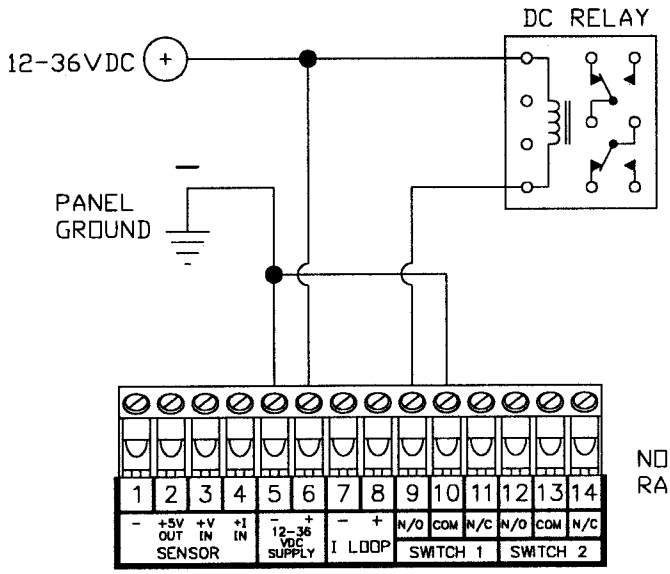
WIRING DIAGRAM – CURRENT SENSOR INPUT



2 WIRE TRANSMITTER
0–25mA INPUT RANGE
(INTERNAL 200Ω RESISTOR)

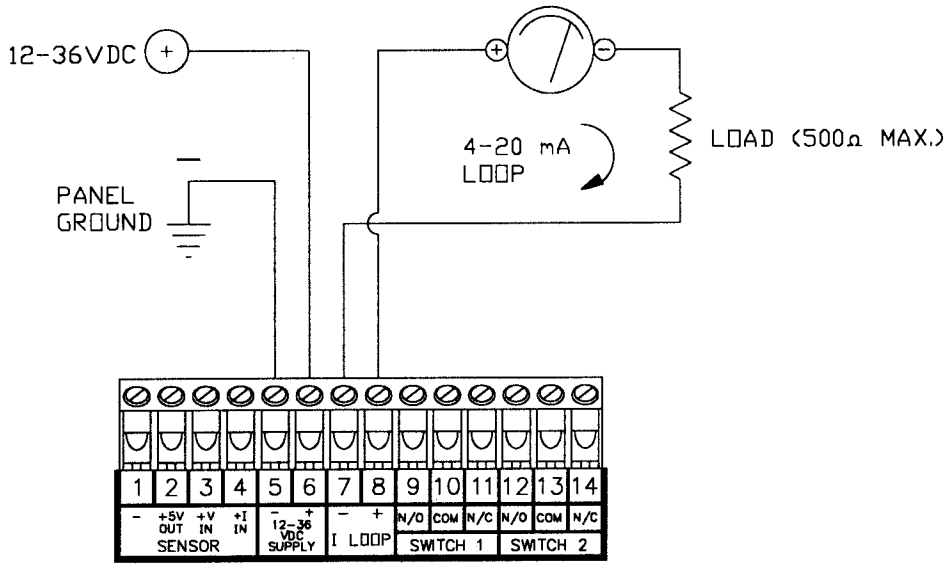
NOTE: FOR A 4–20mA SIGNAL, OUTPUT
VOLTAGE IS .8 TO 4V USING
200Ω INTERNAL RESISTOR.

WIRING DIAGRAM – DC RELAY

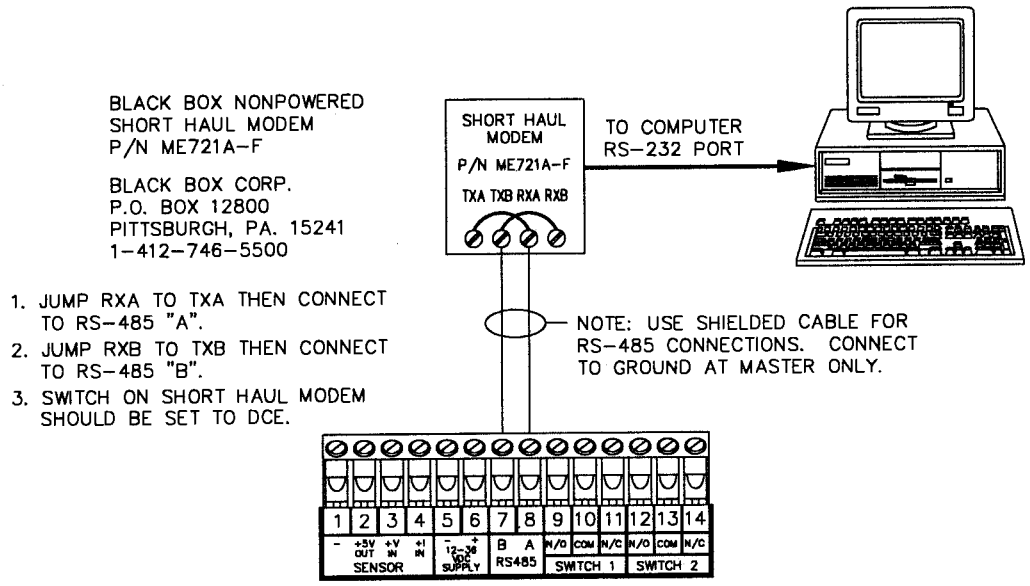


NOTE: OUTPUT SWITCHES
RATED 200VDC, 200mA MAX.

WIRING DIAGRAM – CURRENT LOOP OUTPUT



RS-485 COMMUNICATIONS (PC HOOK-UP)



RS-485 COMMUNICATIONS (MULTIPLE SLAVE UNITS)