SPA DESIGN MICROPROCESSOR DUAL GAUGE
INSTALLATION AND OPERATING MANUAL

INSTRUMENT FEATURES

MAXIMUM VALUES STORED AND RECALLED FROM MEMORY.

INDEPENDENT EXTERNAL & INTERNAL TEMPERATURE WARNINGS*

INDEPENDENT EXTERNAL & INTERNAL UNDER PRESSURE WARNINGS*

LOW BATTERY WARNING

SENSOR FAULT WARNING

SELECTABLE DISPLAY UNITS FOR PRESSURE AND TEMPERATURE

PRECALIBRATED SOLID STAINLESS PRESSURE SENSORS.

THERMOCOUPLE OPTION AVAILABLE

DIGITAL CALIBRATION, NO ADJUSTMENTS TO VIBRATE OUT.

SETTINGS AND MAXIMUMS STORED INDEFINITELY IN EEPROM MEMORY.

MENU SYSTEM HIGHLIGHTS:-

RESETTING MAXIMUMS STORED IN MEMORY.

SETTING THE TEMPERATURE AND PRESSURE UNITS

SETTING THE PRESSURE SENSOR RANGE

SETTING THE DISPLAY AVERAGING TIME FOR PRESSURE READINGS *

SETTING THE LOW PRESSURE SET POINT *

SETTING THE OVER TEMPERATURE SET POINT(S) *

SETTING THE LOW BATTERY SET POINT.

* ACCORDING TO MODEL.

OPERATING INSTRUCTIONS:-

Please note that some of the features and menu items in this manual may not apply, or vary slightly according to your model.

When the instrument is first switched on after SPA DG4 has been displayed, pressure and temperature measurements are displayed, and pressing the red button recalls stored maximums.

As supplied the pressure measurements, which are taken every 0.1 Sec, are averaged out over a period of 0.4 Sec and then displayed on the LCD. The display is always updated every 0.4 Sec, but the pressure measurements may be averaged out over any period between 0.1 Sec (spot measurement) to 19.9 Sec via the menu system. This facility has been provided to allow averaging out of pressure readings on systems which fluctuate or pulse the pressure greatly. Maximum pressure however is always detected and stored at the 0.1 Sec rate thus showing true peaks.

The SPA Microprocessor Dual Gauge is factory set to standard parameters, but may be adjusted to your requirements using a menu system which will be explained further on. All settings and maximums are stored in EEPROM memory, which will store them for many years without any power needed. IE you will not lose any settings or stored maximums when the gauge is switched off.

A low battery warning message is given if the battery voltage falls below a the low battery set point.
As supplied, Over temperature warning is set to 105^{o}C,under pressure warning is set to 25 PSI and low battery set to 11.0 volts. The warnings are accompanied by flashing LED’s and can drive external LED’s or other equipment. For further details on these and how to change them, see sections MENU SYSTEM and WARNING MESSAGES.

MENU SYSTEM:-

To access the menu, hold down the red button and then switch on the instrument. On the display you will see **bL**
on
indicating that the backlight is on (unless you have switched it off previously), you now release the button. If you now press the red button momentarily again you will see it increment to the next menu option, keep doing this to familiarise yourself with them. The sequence of displays and there meaning is shown below:-

bl = **B**ack**l**ight on or, **bL** = **B**ack**l**ight off
on **oFF**

rt = **R**eset **P**eaks, IE reset stored maximums to zero
PE

-- = Zero **Pr**essure, IE re-zero the pressure sensor to
Pr normal atmospheric pressure.

At = Set **A**verage **T**ime routine.

LP = **L**ow **P**ressure set point routine **OR**
tb = **t**urbo **b**oost set point for turbo boost gauge model **OR**
ot1= **O**ver **T**emperature set point **1** routine for dual temp model

ELP = **L**ow **P**ressure set point routine **OR**
Etb = **E**xternal **t**urbo **b**oost set point for turbo boost model **OR**
Et1= **E**xternal over **T**emperature set point **1** routine for dual

temp model

ot = **O**ver **T**emperature set point routine **OR**
ot2= **O**ver **T**emperature set point **2** routine for dual temp model

Eot = **E**xternal **O**ver **T**emperature set point routine **OR**
Et2 = **E**xternal over **T**emperature set point **2** routine for dual temp model

EFL = **E**xternal **FL**ash or, **EFL** = **E**xternal **FL**ash **oFF**.
on **oFF**

thr = the**r**mocouple option **on** or **oFF OR**
oFF
th1 thermocouple**1** option **on** or **oFF** for dual temp model
oFF
th2 thermocouple**2** option **on** or **oFF** for dual temp model.
oFF

Lb = **L**ow **b**attery set point routine

Uni = Set **Unit**s for pressure display.
t

dEg = Set **deg**rees for temperature display.

rAn = Set the gauge to the pressure **ran**ge of the sensor used.

CAL= For engineering access only (code protected)

The display then scrolls back round to backlight on/off.
To activate any option or routine, press and hold the red button for 2 seconds. A more detailed breakdown of each menu option is detailed as follows:-

Bl
on (**B**ack**l**ight **on**/**off**):- Press and hold down the red button, after 2 seconds display changes to the desired option.

rt
PE (**R**ese**t** **Pe**aks):- Press and hold down the red button, after 2 seconds the display increments to the next menu item. This should be done before any new maximums are to be stored. It should also be done if either of the sensors are disconnected, even momentarily while the instrument is switched on, as this could send an erroneously high burst of signal which would then be stored.

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Pr (Zero **Pr**essure):- Press and hold down the red button, after 2 seconds the display increments to the next menu item. This should be done if the sensor no longer reads Zero when at normal atmospheric pressure, or when the calibration number has been changed without the pressure sensor connected or at atmospheric pressure. In either case the instrument may read abnormally high when at zero pressure, before using this option.

At (Set **A**verage **T**ime):- Press and hold down the red button, after 2 seconds the current average time will be displayed in seconds. To change the number, press the red button momentarily to increment it one at a time, or press and hold down and the display will count up quickly. When the display reaches 19.9 it will scroll back round to 0.1. To exit the routine simply switch off the instrument.

LP(Set **L**ow **P**ressure set point) or
tb(Set **t**urbo **b**oost set point, for turbo gauge) or
ot1(set **o**ver **t**emperature set point **1**, for dual temp gauge)

Press and hold down the red button, after 2 seconds the current set point will be displayed. To change the number, press the red button momentarily to increment it one at a time, or press and hold down and the display will count up quickly. When the display reaches 1999 (199 deg C or 500 deg F for **ot1**) it will scroll back round to 000. If you set the set point 000 it switches off the warning light. To exit the routine simply switch off the instrument.

ELP (set **E**xternal **L**ow **P**ressure set point) or
Etb (set **E**xternal **t**urbo **b**oost Pressure set point for turbo gauge)or
Et1 (set **E**xternal over **t**emperature set point **1**)
Set the same way as previous menu option:- Set Low pressure set point.

ot(Set **O**ver **T**emperature set point) or
ot2(Set **O**ver **T**emperature set point **2**, for dual temp gauge)

Press and hold down the red button, after 2 seconds the current set point will be displayed. To change the number, press the red button momentarily to increment it one at a time, or press and hold down and the display will count up quickly. When the display reaches 199 (500 if deg F is selected) it will scroll back round to 000. If you set the set point 000 it switches off the Over Temperature warning. To exit the routine simply switch off the instrument.

Eot(Set **External O**ver **T**emperature set point) or
Et2(Set **E**xternal over **T**emperature set point **2**, for dual temp gauge)
Set the same way as previous menu option:- set over temperature set point.

EFL
on (**E**xternal flash **on**/**off**):- Press and hold down the red button, after 2 seconds display changes to the desired option.
Use this to switch off external flashing if you wish to have the external warnings activate but without flashing.

thr
oFF (**th**e**r**mocouple option **on**/**oFF**) or
th1
oFF (**th**ermocouple**1** option **on**/**oFF**) or
th2
oFF (**th**ermocouple**2** option **on**/**oFF**):- Press and hold down the red button, after 2 seconds display changes to the desired option. Select this option to **on** if you are using the optional thermocouple interface to measure temperatures up to 255 deg C using a standard K type thermocouple sensor.

Lb (Set **L**ow **b**attery set point):- Press and hold down the red button, after 2 seconds the current set point will be displayed. To change the number, press the red button momentarily to increment it one at a time, or press and hold down and the display will count up quickly. When the display reaches 19.9 Volts it will scroll back round to 8.0 Volts. To exit the routine simply switch off the instrument.

Uni
t (Set **Unit**s for pressure display):- To change the units (KG/CM2, PSI or BAR), press and hold down the red button and the displays unit symbols will increment to the next unit selection. After changing the units, you will need to redo your pressure warning set points as they wil be reset to zero.

dEg (Set **deg**rees for temperature display):- To change the degrees (C or F), press and hold down the red button and the displays degrees symbols will increment to the next degrees selection. After changing the degrees, you will need to redo your temperature warning set points as they wil be reset to zero.

ran (Set the gauge to the **ran**ge for pressure sensor):- The gauge is normally supplied with a standard 16 BAR sensor, but the gauge can be set to use others, although only 1.6, 16 and 200 BAR sensors are recommended. To change the range for a different sensor (1.6,4,8,16,40,200,360), press and hold down the red button and the displayed range will increment to the next sensor selection. After changing the range, you will need to redo your pressure warning set points as they wil be reset to zero.

CAL= For engineering access only (code protected)

FLASHING SYMBOLS:-

oil can = Low Pressure. The pressure is at or below the programmed set point. This is not displayed on the turbo boost model.

hot temp = Over Temperature. The temperature is at or above the programmed set point.

battery = Low Battery volts.The Instrument supply voltage is below the low battery set point. If the supply goes below 7.5 volts the instrument resets itself.

WARNING MESSAGES :-

FL = **F**au**L**t. The sensor has become unplugged, damaged, or wiring to the sensor is disconnected or faulty.

FLASHING 1 (left digit) = positive overange. The display is trying to show a number that is greater than 1999 (regardless of decimal points)

FLASHING - (minus sign) = negative overange. The display is trying to show a number that is greater than -99 (regardless of decimal points)

All warning messages for pressure are accompanied by an internal flashing red LED except the turbo boost which lights the red LED continuously showing over boost.

All warning messages for temperature are accompanied by a flashing yellow LED.

The warning lights are also available externaly via the socket.(see wiring diagram) External LEDs or relays can be connected, and these can be programmed to activate independently of the internal LEDs, and programmed for flash or direct drive.

SPECIFICATIONS:-

INPUT VOLTAGE 8.5-16 VOLTS (pressure sensors need 10v min)
CONSUMPTION 16 mA @ 12 VOLTS (48 mA BACKLIT)

ACCURACY:-
PRESSURE +/- 1 PSI over 0-200 PSI (1 PSI = 0.069 BAR)
TEMPERATURE +/- 1 °C @25°C
VOLTAGE +/- 0.1v over 9-16 volts.

CALIBRATION:- DIGITAL
DATA STORAGE:- EEPROM
WEIGHT:- 325g INCLUDING SENSORS,CABLES,ETC
SIZE:- 50mm DIA x 30mm (BEZEL 67mm DIA)

SENSORS FIXING THREADS:-
TEMPERATURE: 1/8 NPT or M16x1.5 all 12.7mm long
PRESSURE: 1/8 BSP x 12.7mm (WILL FIT 1/8 NPT)

CABLE LENGTHS:- PRESSURE & TEMPERATURE - 108"
POWER SUPPLY - 12"
SWITCH LEAD - 24"

ABSOLUTE MAXIMUM RATINGS:-
INPUT VOLTAGE - 25 VOLTS
MAX PRESSURE -23.2 PSI (for 1.6 BAR sensor)
232 PSI (for 16 BAR sensor)
2900 PSI (for 200 BAR sensor)
PROOF PRESSURE = 2 times max rating
TEMPERATURE - 155°C CONTINUOUS, 255°C THERMOCOUPLE OPTION
INSTRUMENT TEMPERATURE 0 - 50°C

CABLE INSTALLATION, DO'S & DON'TS :-

DO'S

DO ensure that the black screened cables do not run next to power cables, especially if they are ignition power cables. Ideally, run all screened cables next to the chassis (earth).

DO ensure that any exposed plugs that are likely to get water spray are protected with rubber boots.

DONT'S

DO NOT allow cables to run through sharp edged apertures without protection.

DO NOT fix the cables next to or onto any surface likely to exceed 80 degrees Centigrade.

INSTRUMENT INSTALLATION DO'S AND DONT'S :-

DO'S

DO ensure that the sensors are screwed into metal that is connected to earth (chassis). If it is not, connect the metal to chassis with a short length of wire.

DO ensure that the instrument is directly facing, or below the drivers head for the clearest view.

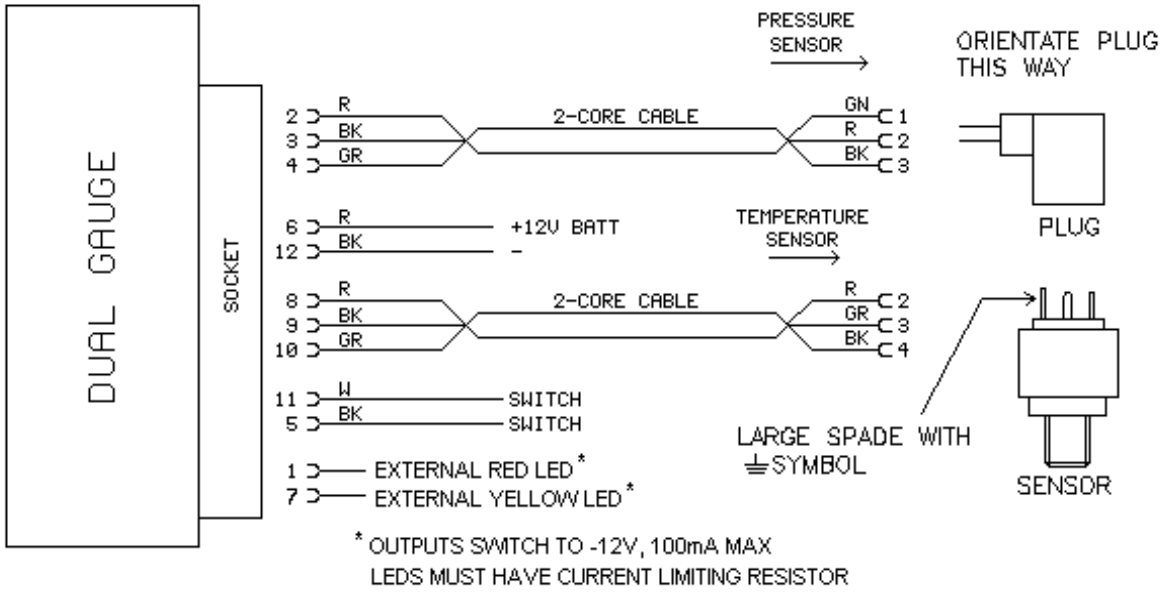
DO ensure that the back of the instrument is protected from any water spray that may occur.

DONT'S

DO NOT use a strong Nut-lock adhesive on the screw threads, use only a very light one, or silicone sealant.

INSTALLATION SCHEMATIC FOR PRESSURE/TEMP MODEL

WIRING DATA FOR PRESSURE/TEMP MODEL



WIRING DATA FOR DUAL TEMP MODEL