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DPL53 Digital Display



user manual

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

1.0: Index

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2.0: Safety Summary

Terms in this Handbook

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

Symbols in this manual



This symbol identifies where cautionary or other safety related information is to be found.

WARNINGS:

Do not operate in an explosive atmosphere

To avoid explosion, do not operate this equipment in an explosive atmosphere.

Installation and Removal

The DPL53 is designed for installation in an enclosure which provides adequate precaution against electric shock. Access to power terminals should be restricted to authorised skilled personnel only.

Application of supply voltages higher than those for which the instrument is intended may compromise safety and cause permanent damage.

NOTES:

This equipment contains no user serviceable parts

This equipment must be returned to your Omega dealer for all servicing and repair.

3.0: Handling and Maintenance

The DPL53 is a precision instrument and should be handled with care.

The DPL53 is designed to be maintenance free. Contacts with solvents should be avoided. Any attempt to dismantle the DPL53 or the LVDT transducer will invalidate the warranty.

There are no user accessible points.

4.0: Installation into a Panel

4.1 Installation Instructions

Warnings



1. On installing or removing the DPL53 you must be aware of any hazardous equipments or materials in the vicinity. Make sure that any equipment into which the DPL53 system is to be installed is switched off and made safe.
2. All connections to the terminal should be made using ferrules to give reliability and prevent short circuits between adjacent terminals.

Cautions



1. Avoid installing the DPL53 close to switch gear, contactors or motor starters.
2. Do not place signal and power supply wiring in the same loom as the DPL53 wiring.
3. Use screened cables for all leads, with the screen earthed at one end only.

Panel Mounting

- Ensure that there is sufficient space behind the relevant instrument panel for the DPL53 and its cabling (see section 4.2 for dimensions).
- Cut out the panel aperture to the dimensions shown.
- Slide the rubber seal over the unit, and push it forward until it sits behind the front lip of the unit.
- Working from behind the panel, with the box fully located, fit the side brackets to the studs and slide them forward toward the panel until they lock into place.
- Screw the brackets to the panel.

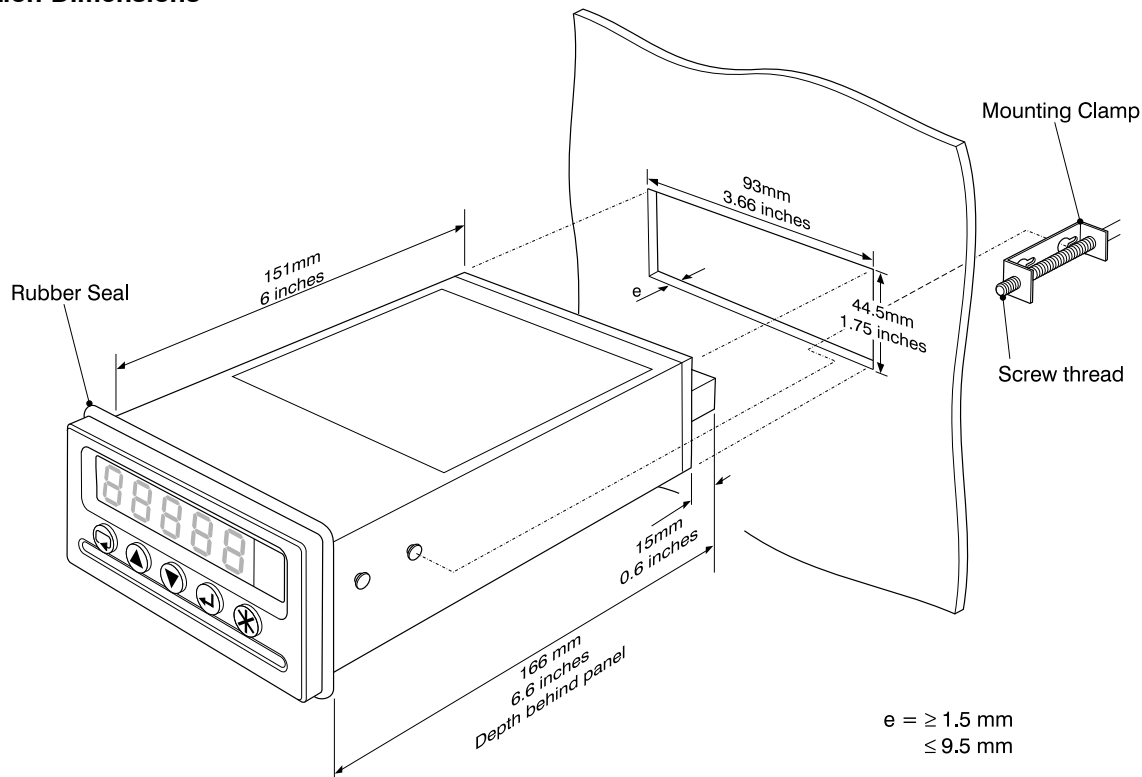
Caution



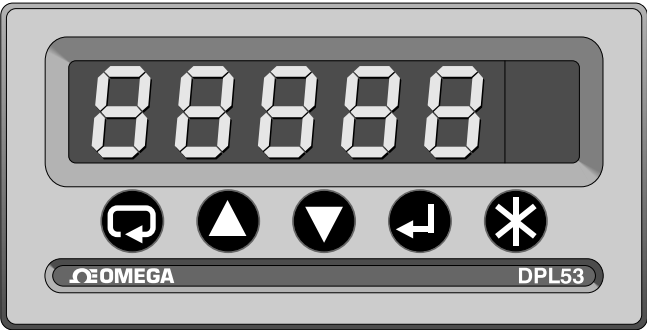
Do not overtighten the screws as this may damage the case of the instrument.

4.0: Installation into a Panel (Continued)

4.2 Installation Dimensions



5.0: Using the Button Controls



KEY TO BUTTONS:-

 NEXT

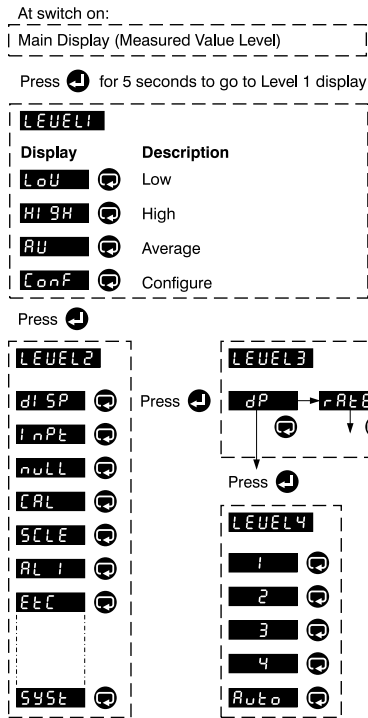
 UP

 DOWN

 ENTER

 RESET

There are FOUR levels of button control



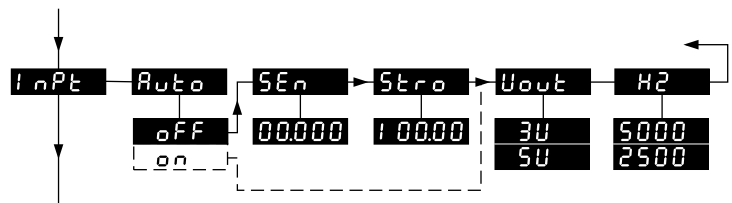
The complete chart showing all button indications is shown in Appendix A.

6.0: Setup Options

6.2 LVDT Sensitivity, Stroke Length, Excitation Voltage and Frequency

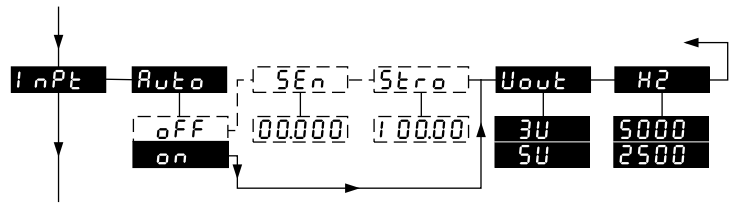
The process for LVDT sensitivity and stroke length depends on the availability of data.

- A. If the sensitivity and stroke length are known (for example, supplied with the system on data sheets) then the data is entered as shown in sub-menu A.



Sub-Menu A - If sensitivity and stroke length are known.

- B. If the sensitivity and stroke length are unknown then the Auto-on option is selected as shown in sub-menu B.














Sub-Menu B - If sensitivity and stroke length are unknown.

6.0: Setup Options

6.2 Setting the LVDT Sensitivity, Stroke Length, Excitation Voltage and Frequency





















With reference to “Using the Button Controls” (section 5) and to the full menu in Appendix B, proceed to set the sensitivity, stroke length, excitation voltage and frequency as follows:-

Action Number	Button	Action	Display	Additional Display Information
1.		Press and hold for 5 seconds	LoU	
2.		Press three times	ConF	
3.		Press and release	dI SP	
4.		Press and release	l nPt	
5.		Press and release	Auto	
A	If the sensitivity and stroke length are known.			
		Press and release	oFF	: Go to action number 6
B	If the sensitivity and stroke length are unknown			
		Press and release	oFF	Note:  Toggles between On and OFF setting
		Press and release	on	
		Press and release	Auto	
		Press and release	Uout	
				: Go to action number 18

6.0: Setup Options











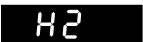



6.2 Setting the LVDT Sensitivity, Stroke Length, Excitation Voltage and Frequency cont'd

To change the setting to a different Sensitivity, (for example, a transducer, at 200 mV/V/mm).

Action Number	Button	Action	Display	Additional Display Information
6.		Press and release		
7.		Press and release		
8.		Press and release		Example figure only (with right hand figure flashing moves flashing figure to the left reduces flashing number from 4 to 2 decimal point flashes moves the decimal point one place to the right
9.		Press and release four times		
10.		Press and release two times		
11.		Press and release once		
12.		Press and release once		
13.		Press and release once		
14.		Press and release		
15.		Press and release		default stroke setting
16.	Repeat actions 11 to 14 to input the transducer stroke length setting.			

6.0: Setup Options

6.2 Setting the LVDT Sensitivity, Stroke Length, Excitation Voltage and Frequency cont'd




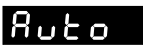

Action Number	Button	Action	Display	Additional Display Information
17.		Press and release		
Excitation Voltage				
18.		Press and release		
19.		Press and release		The two options are 3V AC and 5V AC The default is 3V. To obtain 5V press 
20.		Press and release		
Excitation Frequency				
21.		Press and release		
22.		Press and release		The two options are 2.5KHz and 5KHz The default is 2.5KHz. To obtain 5KHz press 

6.0: Setup Options

6.2 Setting the LVDT Sensitivity, Stroke Length, Excitation Voltage and Frequency cont'd

Action Number	Button	Action	Display	Additional Display Information
---------------	--------	--------	---------	--------------------------------

Return to Level 1

23.		Press and release		
24.		Press and release		
25.		Press and release three times		Returns to main display

6.0: Setup Options

6.3 Calibration

Calibration is the registering of the LVDT transducer minimum and maximum displacement position into the DPL53 display unit.

Before proceeding with the calibration, leave the power on for 30 minutes.








The procedure given is for an example of a step gauge, with low and high settings of 0.00 mm and 10.0 mm respectively.

With reference to the Indicator Chart in Section 5 and Appendix B, calibrate the LVDT transducer as in the following table.



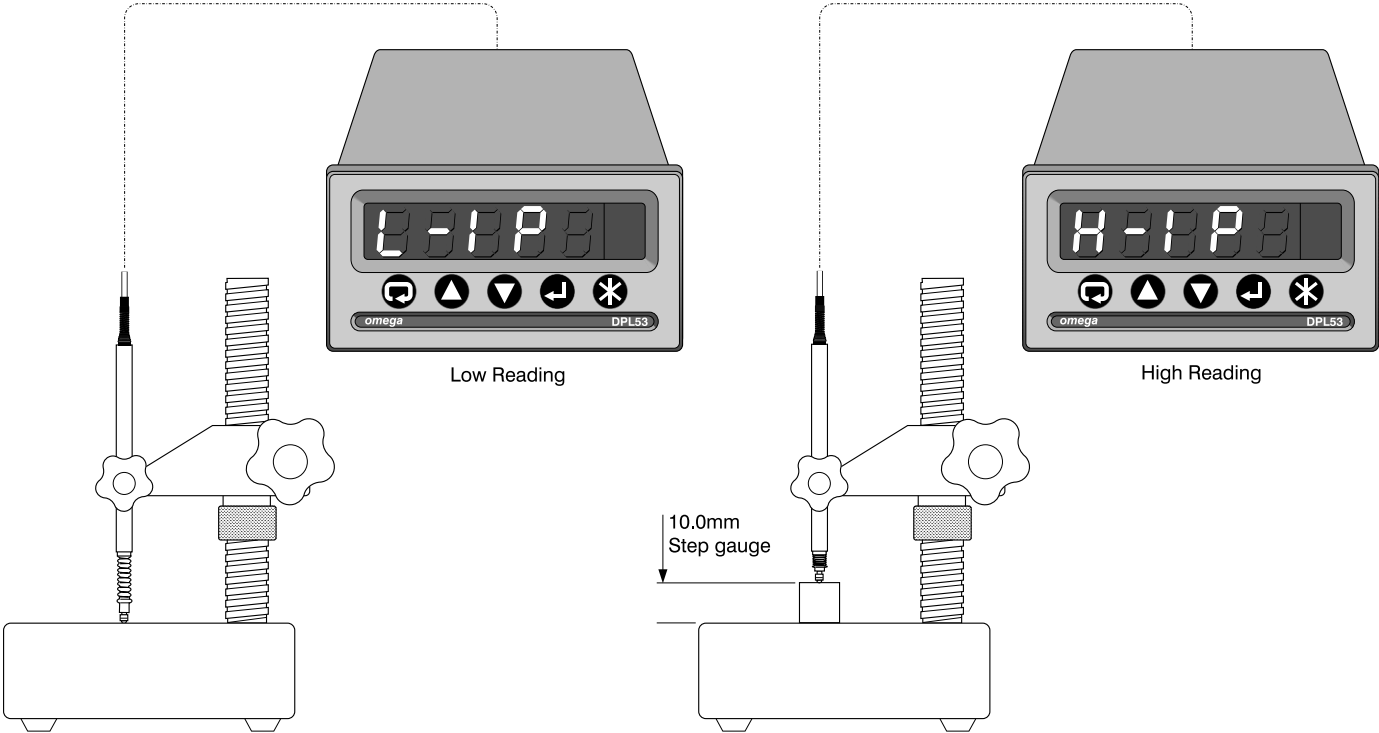
6.0: Setup Options

6.3 Calibration cont'd

Action Number	Button/ Step gauge	Action	Display	Additional Display Information
1.		Press and hold for 5 seconds	LoU	
2.		Press three times	Conf	
3.		Press and release	diSP	
4.		Press and release 3 times	CAL	
5.		Press and release	L-IP	
6	Step gauge	Set to zero (page 15)		
7		Press and release	WAIt H-IP	for three seconds then
8	Step gauge	Set to high point (eg; 10 mm) (page 15)	WAIt CAL	for three seconds then
9		Press and release twice		returns to main display

6.0: Setup Options

6.3 Calibration cont'd



6.0: Setup Options

6.3 Calibration cont'd

Calibration Error Codes



The instrument has detected an error during calibration caused by the output of the LVDT being greater than the maximum positive input level of the instrument at the specified sensitivity.



The instrument has detected an error during calibration caused by the output of the LVDT being lower than the specified sensitivity.

















The instrument measured the same output from the LVDT at both calibration points. (High = Low).

6.0: Setup Options

6.4 Scaling












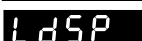

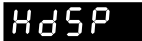







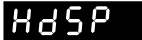

Scaling is to set the display to show the correct displacement for your LVDT, the LOW and HIGH display values need to be defined. The procedure given is for an example of scaling of between a minimum of 95 mm and a maximum of 105 mm.

With reference to the Indicator Chart shown in Section 5 (Using Button Controls) and Appendix B, scale the LVDT transducer as in the example table below:-

Action Number	Button/ Micrometer	Action	Display	Additional Display Information
1		Press and hold for 5 seconds		
2		Press three times		
3		Press and release once		
4		Press and release four times		
5		Press and release once		
6		Press and release once		
		assumed example		with right hand number flashing
To set the lower figure (for example 95)				
7		Press and release four times		moves flashing number to the left

6.0: Setup Options





6.4 Scaling cont'd

Action Number	Button/ Micrometer	Action	Display	Additional Display Information
8		Press and release eight times		increases the flashing number from 1 to 9
9		Press and release four times		moves flashing number to second left
10		Press and release five times		increases flashing number from 0 to 5
11		Press and release 'n' times until		decimal point flashes
12		Press and release once		moves decimal point one place to the right
13		Press and release once		
To set the upper figure (for example 105)				
14		Press and release once		
15		Press and release once		
16	  	Press the buttons in a similar manner to actions 7 to 13 to obtain		
17		Press and release once		
18		Press and release 3 times		returns to main display

7.0: Description of the DPL53 Functions






This chapter describes the functions which the DPL53 can carry out. Each section is headed with Level 2 menu option (Refer to 5.0 Using the Button Controls).

7.1 Configuring the Display

Display	Function	Description
	Decimal Point Position	Allows the position of the decimal point to be fixed or auto ranging. The decimal point may be fixed to give 0, 1, 2, 3 or 4 digits after the decimal point. The default is 1 decimal point.
	Display Update Rate	Allows the update rate of the display to be set from every 0.1 seconds to 0.5 seconds. The options are 2, 4 or 10Hz, the default setting is 2Hz.
	Display Filtering	Used to set up filtering of displayed values. The time constant of the filter entered in seconds. The default value is zero (no display filtering).
	Least Significant Digit Zero	When set to ON the right hand digit only displays zero during normal running. The default is OFF.

7.0: Description of the DPL53 Functions

7.1 Configuring the Display. cont'd

Display	Function	Description
	Display Negative Numbers	Allows the display of negative numbers to be enabled (ON) or disabled (OFF). The default setting is negative numbers ON.
	Leading Zero Suppression	Allows leading zeros to be displayed. When ON the leading zeros are not displayed. The default is ON.
	Brilliance	Allows the brightness of the display to be adjusted in the range 1 to 4. The default setting is 4 (highest intensity setting).
	Font	One of two fonts for the display of numerals may be selected to allow compatibility with some older instruments. The default font is 1.
	Test	Performs a display test which illuminates all display digits and segments (8.8.8.8.8.) when the enter button is pressed.

7.0: Description of the DPL53 Functions

7.2 **Input** LVDT Configuration

Before any calibration or scaling operations are performed some operating parameters related to the use of the particular LVDT need to be set. These parameters are all set up from the input menu

Display	Function	Description
Auto	Automatic Gain Selection	Allows the instrument to set its gain automatically by determining the sensitivity of the attached LVDT during Calibration. The options are Automatic Gain Selection Enabled (ON) or disabled (OFF), this is the default state. Note: When the AUTO option is set to ON. The sesitivity and stroke options will not be accessible.
SEn	Sensitivity	Value is entered to allow the gain of the measurement input of the instrument to be determined from the specified sensitivity of the LVDT. Details of the sensitivity of your LVDT should be in the documentation supplied.
Stro	Stroke	Allows the stroke of the LVDT to be entered as a value directly in mm. In order to determine the appropriate gain setting. The default stroke setting is 100.0mm.

7.0: Description of the DPL53 Functions

7.2 **1 nPt** LVDT Configuration cont'd

Display	Function	Description
Uout	Excitation Voltage	Selects the correct output voltage for excitation for the LVDT. The appropriate voltage to use will be specified in the LVDT documentation. There are two options 3V AC and 5V AC (rms.), the default setting is 3V.
H2	Excitation Frequency	Sets the correct excitation frequency as specified in the LVDT documentation. The options are 2.5KHz or 5KHz. The default is 2.5KHz.

7.0: Description of the DPL53 Functions

7.3 **NULL** Null Position

This function allows the user to locate the midpoint of the LVDT's measurement range (Null Point).

Display	Function	Description
-99.99 +99.99	Null Position	The value will be displayed 'FLASHING'. The closer the value to zero, the nearer the LVDT is to its 'NULL POSITION'.

7.4 **CAL** Calibration

This menu option is described in more detail in Section 6.3 Calibration.

Display	Function	Description
L-I P	Low Input	Allows unit to calibrate to the minimum displacement position of the LVDT.
WAI t	Wait	While the low and high input positions are being calibrated, 'wait' is displayed.
H-I P	High Input	When wait elapses 'high input' is displayed and the LVDT is set to its maximum displacement position.
H=L	High=Low	The instrument measured the same output from the LVDT at both calibration points.

7.0: Description of the DPL53 Functions

7.5 **SCALE** Scaling Option

This menu option is described in more detail in Section 6.4 Scaling.

Display	Function	Description
LdSP	Low (Zero) Display	The minimum displacement display which corresponds to the Low calibration point (L - i P). Default is zero.
HdSP	High Scale Display	The maximum displacement display which corresponds to the High calibration point (H - i P). Default is 100.0.

7.6 **AL-1** to **AL-4** Configuring Alarms

There are four Alarms; each can be configured separately. All Alarms default to OFF. **Note 1:** Only relay outputs can be activated by the Alarms. **Note 2:** The alarms are not affected by the analogue output.

Display	Function	Description
tYPE	Alarm Type	Options are none (OFF), high, low and deviation. Alarm 1 and 3 default to high and Alarm 2 and 4 default to low.
SP-1 SP-2 SP-3 SP-4	Setpoint	There are four setpoints, one for each of the four alarms. Each set point may be set to any value within the display range of the instrument i.e. -19999 to 99999. The default setpoints are 99999 for Alarm 1 and Alarm 3 and -19999 for Alarm 2 and Alarm 4.

7.0: Description of the DPL53 Functions

7.6 **AL-1** to **AL-4** cont'd

Display	Function	Description
DEUH DEUL	Deviation Setpoints	This allows the difference between the alarm setpoint and the high and low deviation levels to be defined. The default setting for both is zero. These menu options are only displayed (and valid) when the alarm type is set to deviation.
LECH	Latching	All alarms may be set to latched (ON) or non-latched (OFF). When alarms are set to latched then the alarm indication and any associated output will remain in the active state even when the alarm condition has cleared. Latched alarms must be acknowledged to clear indications and outputs to their inactive (non-alarms) states. To acknowledge an alarm; either press the UP and DOWN arrow keys together or configure one of the two status inputs as an alarm acknowledge (ACK). The default setting is OFF (non-latching). The alarm condition must be cleared before the alarm can be acknowledged.
OPP	Output	Allows you to specify which output is activated when the alarm condition is valid. The dual relay options are OP-1 (Relay 1) or OP-2 (Relay 2).

7.0: Description of the DPL53 Functions

7.6 **AL-1** to **AL-4** cont'd

Display	Function	Description
onDL oFDL	Delay	Allow the on and off delay times for each of the alarms to be defined. The on delay defines the time that the alarm condition must be present before the alarm is activated. The off delay defines the time, that the alarm condition is cleared before the alarm is deactivated. The default setting for both the on and off delay is zero.
onHY oFHY	Hysteresis	Define the difference between the set point and the point at which the alarm is activated or deactivated. The on and off Hysteresis may be specified separately above and below the setpoint.
Edi t	Front Panel Edit	When this facility is ON the operator may access the alarm setpoints from the front panel by pressing the DOWN arrow key and without having to enter the configuration menus. The default is ON.
di SP	Message Display	This parameter allows you to define whether alarm messages are displayed (ON) or not (OFF). The default setting is ON.

7.0: Description of the DPL53 Functions

7.7 **Rout** Analogue Output

Display	Function	Description
L-SP	Linked Setpoints (Alarm menu 3 and 4 only)	This allows you to link setpoint 3 to setpoint 1, and setpoint 4 to setpoint 2. When setpoints are linked, setpoint 1 will automatically change to setpoint 3 values. Changing setpoint 2 will change setpoint 4. The default is OFF (No setpoint linking).
TYPE	Output Type	Allows the output to be set to 0-10V, 0-20mA or 4-20mA. The default setting is 4-20mA.
Src	Signal Source	Defines the source of the values to be output. The source can be selected from the display value (inPt), maximum or peak value (High), minimum value (LOU), average value (Av) or a value received from the communications interface (Conn). The default is inPt.
LOU	Low Scaling Point	Defines the display value at which the output will reach its minimum level ie: 4mA (4-20mA), 0mA (0-20mA) or 0V (0-10V) dependent on analogue output type selected above. The default value is 0%.

7.0: Description of the DPL53 Functions

7.7 **Route** Analogue Output cont'd

Display	Function	Description
H, 9H	High Scaling Point	Defines the display value at which the output will reach its maximum level ie: 20mA (0 or 4-20mA) or 10V (0-10V) dependent on analogue output type selected above. The default value is 100%.
dAMP	Damping	Output damping defines the time constant in seconds for damping the output. This parameter is used to limit the rate of change of the output and may be adjusted in the range 0 to 999 seconds. The default is 0.

7.0: Description of the DPL53 Functions

7.8 **Conn** Configuring Serial Communications

The DPL53 can communicate with a master device via an RS232 interface. For more detailed information refer to 8.0 RS 232 Communication.

Display	Function	Description
Addr	Instrument Address	Defines the instrument address when using the instrument in a multidrop system. The range of valid addresses is 1 - 247. The default is 1.
bAud	Baud Rate	Allows the baud rate to be selected. The options are 1200, 2400, 4800 and 9600. The default is 9600.
Prot	Protection	Allows the instrument parameter settings to be protected against change from the serial interface (write protection ON). The default is OFF.
Prty	Parity	Defines parity for all communications. The options are even, odd or no parity. The default is Even.
Stop	Stop Bits	Defines the number of stop bits, 1 or 2. The default is 1.
delY	Transmit Delay	Add a delay, in milliseconds, before the DPL53 responds to any received commands.

7.0: Description of the DPL53 Functions

7.9 **StA1** **StA2** Status Logic Inputs

The DPL53 provides two status (logic) inputs which can be assigned to perform one or more functions when activated. All functions are started when there is a low on the status input i.e. placing a short across the input (from a switch or relay). The calibration function is started when there is a transition from in-active to active state on the input.

Display	Function	Description
ACK	Alarm Acknowledge	Clears all latched alarms which are no longer in an alarm condition. The default is OFF.
Adbl	Alarm Disable	Disables all alarms when the status inputs is active. The default is OFF.
diSP	Displays	Allows any one of the following to be displayed whilst the status input is active: Lamp test, the average, low or high values, or display hold. When the status input is inactive the normal measured value is displayed. The default for this is NONE.
rSEt	Reset	This resets the High (peak), Low (minimum) and Average values to the current measured value. The default for this option is OFF.

7.0: Description of the DPL53 Functions

7.9 **StA1** **StA2** Status Logic Inputs cont'd

Display	Function	Description
LoCk	Front Panel Keypad Disable	Disables the front panel keys, the default state is OFF.
AHLd	Analogue Output Hold	This allows the analogue output to be held at a (Frozen) level. The default state is OFF.
CAL	Auto Fast Calibration	This is used to initiate the automatic calibration process. The process is started when the status input is activated. The default for this option is OFF.
ZEro	Zeroing	This sets the measured and displayed values to Zero (0.000) permanently (or until the instrument is defaulted), removing any offset errors from the system.
tArE	Tare	This tares the measured value subtracting a fixed amount from all subsequent measurements. The default is ON.



7.0: Description of the DPL53 Functions




7.9 **StA1** **StA2** Status Logic Inputs cont'd

Display	Function	Description
SdSP	Status Message Display	This enables or disables the display of messages related to the status input function. When ON messages are displayed alternately with value being displayed ie: if the unit is displaying the high value, then the high value is displayed flashing with the message 'HiGH'. This indicates to the user that the current input value was not being displayed. The default is ON.

7.0: Description of the DPL53 Functions



7.10 Configuring Function Keys

There are 2 function keys which can be configured. Function Key 1  and Function Key 2 . The following functions may be assigned to either or both keys unless stated.

Display	Function	Description
	Reset	If ON, the function button will reset the High (Maximum), Low (minimum) and Average values to the current measured value. The default is OFF.
	Auto Fast Calibration	When ON then the function key 1 or 2 will initiate the automatic calibration process. When pressed the display will flash the message 'CAL'. The key must be pressed again whilst the display is flashing to perform the function. The default state is OFF.
	Tare	Tares the measured value, subtracting a fixed amount from all subsequent measurements. The value subtracted is the current value when the key is pressed. When the function is assigned to a function key, pressing the key once will activate the tare (relative displacement) measurement. Pressing the key again while tare is active will deactivate the function. Default is ON.

7.0: Description of the DPL53 Functions

7.10 Configuring Function Keys cont'd

Display	Function	Description
	Zeroing	This sets the measured and displayed values to Zero (0.000) permanently (or until the instrument is defaulted or calibrated), removing any offset errors from the system. When assigned to a function key pressing the key once will cause the DPL53 to display 'Zero' flashing. To perform the 'Zero' the function key must be pressed again, to confirm the operation, (the display will flash for approximately 5 seconds). Once confirmed, the 'Zero' will be performed immediately. The default is OFF.
	Displays	Allows any one of the following to be displayed whilst the Function key is pressed: Lamp test, the average, low or high values, or display hold. When the key is released normal display is returned. The default is NONE (no display function).

7.0: Description of the DPL53 Functions

7.11 **545t** System Options

Display	Function	Description
PASS	Password	Enter any value between 1 and 99999. When enabled the configuration menu cannot be accessed without first entering the password number. The default value is 0. (No Password).
AUT.	Averaging Time	This average value is not a true arithmetic average. The default is 1 (second).
DFLT	Default	Allows the unit to reset back to its factory default settings. Select ON to default the instrument. It will automatically revert to OFF when the instrument is defaulted.

7.0: Description of the DPL53 Functions

7.11 **545t** System Options cont'd

Display	Function	Description
tout	Time-out	This defines the time that the unit will remain in configuration mode when there is no key activity. If there are no key presses within the specified time period the unit will return to normal operation. the default time-out is 60 seconds and is adjustable between 30 to 300 seconds. This is disabled during the Calibration sequence.
rSet	Reset	Allows the unit to be reset. The reset process, when activated, will display Wait and start the sequence. The unit will reset back to its factory default settings, and go through the power-up sequence.
tYPE	Type	Shows the type of readout ie: DPL53.
UEr	Version	Shows the version of the DPL53.

8.0: RS232 Communications with DPL53

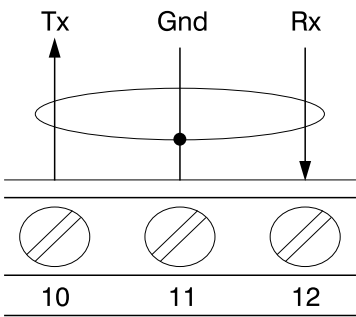
8.1 Overview

This language has been developed for communication between the DPL53 and the master device via an RS232 communications interface. The master device could be a computer, which would be able to read from and write to, memory locations within the DPL53.

There are two types of memory locations, analogue and logic. Analogue memory locations can be set to any value within a specified range. Logic locations can be set to either ON or OFF. A full list of the memory location within the DPL53 are listed in Appendix D. Memory Locations.

8.2 DPL53 Connections to RS232 communication

The connections required to interface the DPL53 to a RS232 interface are shown below.



RS232 connection to a Master device (Computer).

8.0: RS232 Communications with DPL53

A screened twisted pair cable should be used for all applications requiring cable lengths greater than 3m. The screen of the cable should be connected to the Frame Ground or Ground connection of the Master device.

Several DPL53's can be connected to a computer, each DPL53 with its own identification number.

8.3 DPL53 Settings for RS232 communication

The default setting for the DPL53 are as follows:

Parameter	Default Settings
Communications Address	1
Baud Rate	9600
Write Protect	Off
Parity	Even
Stop Bits	1 Bit

Note: The data length for the RS232 is set to 7 bits and can not be changed.

The parameters Communications address, Baud rate, Write Protect, Parity and Stop Bits can be changed. Refer to section 7.8 Configuring Serial Communications.

8.0: RS232 Communications with DPL53

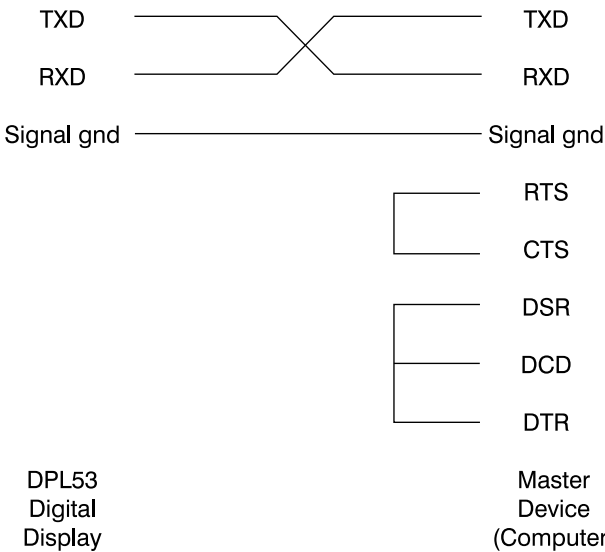
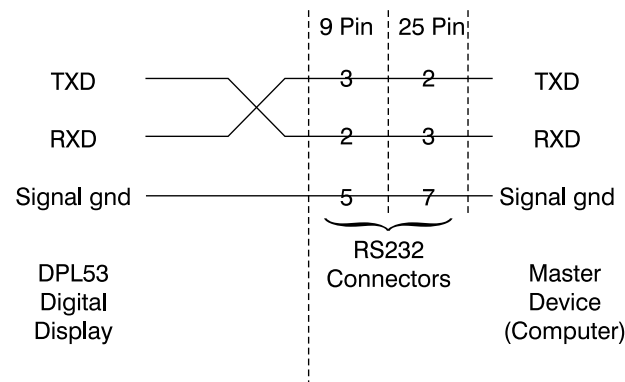
APPLICATION NOTE:

Simple connection between DPL53 Digital Display and Master device. (Computer).

Connection between DPL53 Digital Display and Master device. (Computer).

(Using NO flow control between Master device (i.e. PC)).

(Setting Master device which has flow control signals).



8.0: RS232 Communications with DPL53

8.4 General format of commands

All commands sent to the DPL53 must be written in upper case.

The syntax for a command to the DPL53 is as follows:

`;E_[address]_[command]_[location]_[data]<CR><LF>`

where:

;
must start every command. If there is a ";" in the middle of a command, the DPL53 will ignore everything before the ";". You can abandon a command by typing ";" at the end of it.

E
is optional. This will cause the DPL53 to echo the command before responding.

indicates a SPACE.

[address]
is the communications address of the DPL53, in the range 1 to 247.

[command]
is a DPL53 command.

[location]
is the DPL53 internal analogue or logic location.

[data]
for read commands (RA and RL) this parameter specifies how many analogue or logic locations are to be read. For write commands (SA and SL), defines how many to be written to the specified analogue or logic location.

<CR>
is a carriage return.

<LR>
is a line feed.

8.0: RS232 Communications with DPL53

8.5 Commands

8.5.1 RA command

Description.

Read an analogue location within the DPL53.

Example Command. ;E_001_RA_2_1<CR><LF>

Part	Description
;E	starts the message and requests the DPL53 to echo the command before replying.
001	is the communications address of the DPL53.
RA_2_1	is the command to read the value from 1 analogue location 2.
<CR><LF>	marks the end of the command.

Reply.

;E_001_RA_2_1_+123.45<CR><LF>

Part	Description
;E_001_RA_2_1	is the echo of the original command.
+123.45	is the value from location 2.

8.0: RS232 Communications with DPL53

8.5.2 SA Command

Description.

Set an analogue location within the DPL53.

Example Command. ;001_SA_63_100<CR> <LF>

Part	Description
;001	is the communications address of the DPL53.
SA_63_100	is the command to set the value of analogue location 63 to 100.
<CR> <LF>	marks the end of the command.

Reply. OK<CR> <LF>

Part	Description
;	due to there being no ;E, the echo of the original command.
OK	message reply from DPL53, saying message was received and understood.

8.0: RS232 Communications with DPL53

8.5.3 RL Command

Description.

Read the state of a logic location within the DPL53.

Example Command. ;E_001_RL_48_1<CR><LF>

Part	Description
;E	starts the message and requests the DPL53 to echo the command before replying.
001	is the communications address of the DPL53.
RL_48_1	is the command to read the values from location 48.
<CR><LF>	marks the end of the command.

Reply. ;E_001_RL_48_1_ON<CR><LF>

Part	Description
;E_001_RL_48_1	is the echo of the original command.
ON	is the value from location 48.

8.0: RS232 Communications with DPL53

8.5.4 SL Command

Description.

Sets the state of a logic location within the DPL53.

Example Command. ;001_SL_140_ON<CR><LF>

Part	Description
;001	is the communications address of the DPL53.
SL_140_ON	is the command to set the logic locations state to ON at location 140.
<CR><LF>	marks the end of the command.

Reply. OK<CR><LF>

Part	Description
;	due to there being no ;E, the echo of the original command.
OK	message reply from DPL53, saying message was received and understood.

8.0: RS232 Communications with DPL53

8.6 Error Messages

If the command is incorrect, the DPL53 returns a # followed by an error code. The error codes are as follows.

Error Code	Meaning	Example/Explanation
1	Invalid message	;E_001_RS_31_3<CR><LF> "RS" is not a valid command.
2	Invalid/Read only location	;E_001_SL_33ON<CR><LF> Logic location 33 is read only location.
3	Non existent location	;E_001_RA_310_1<CR><LF> Analogue location 310 does not exist.
4	Invalid value	;E_001_RA_21_ON<CR><LF> ON is not a valid value for analogue location 21.
5	Unaccepted value	The DPL53 is inside a Configuration Menu.
6	Instrument error	The DPL53 is not operating correctly.
7	Reserved location	;E_001_SA_91_100<CR><LF> Analogue location 92 is a reserved location.
8	Too many data requests	The DPL53 is still busy dealing with previous commands.
9	Too many arguments	;E_001_RA_SA_31_3<CR><LF> There are two commands present, "RA" and "SA".

9.0: DPL53 Messages

9.1 Error Messages

Err1 Err2

Err3 These messages indicate that an error has been detected in one of the instruments internal memory areas as part of power up self test sequence.

AdEr

This indicates that the instrument has detected a fault in its measurement circuitry.

uCAL

The instrument has detected a problem or error in its non volatile memory resulting in a loss of calibration data.

Note: For any of the above error messages return the instrument to the supplier.

brk

The instrument has detected a problem with the sensor resulting in an open circuit input, this may be caused by a break in one of the leads from the transducer or a fault in one of the transducer elements.

Over

The measured value is too large positively to be displayed, or is above the specified input range.

undr

The measured value is too low negatively to be displayed, or is below the specified minimum input for the selected range.

Note: For any of the above messages check instrument settings.

9.0: DPL53 Messages

9.2 Alarm Messages

Alarm messages will be displayed alternately with the normal display only one alarm message will be displayed at any time.

LoA1	LoA2
LoA3	LoA4

Low alarm has been triggered on the indicated alarm.

eg: LoA3 = Low Alarm, Alarm 3.

H, A1	H, A2
H, A3	H, A4

High alarm has been triggered on the indicated alarm.

Lod1	Lod2
Lod3	Lod4

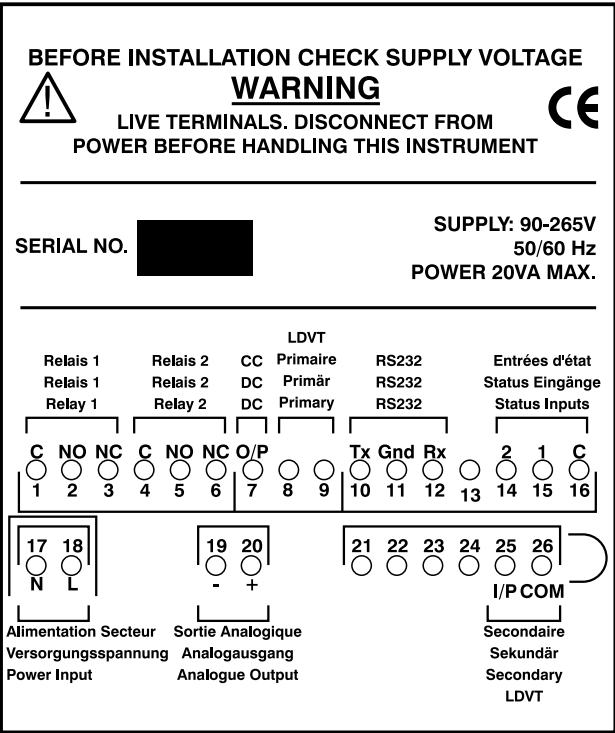
Deviation type alarm has been triggered on the indicated alarm at the low deviation setpoint.

eg: Lod4 = Low Deviation Alarm, Alarm 4.

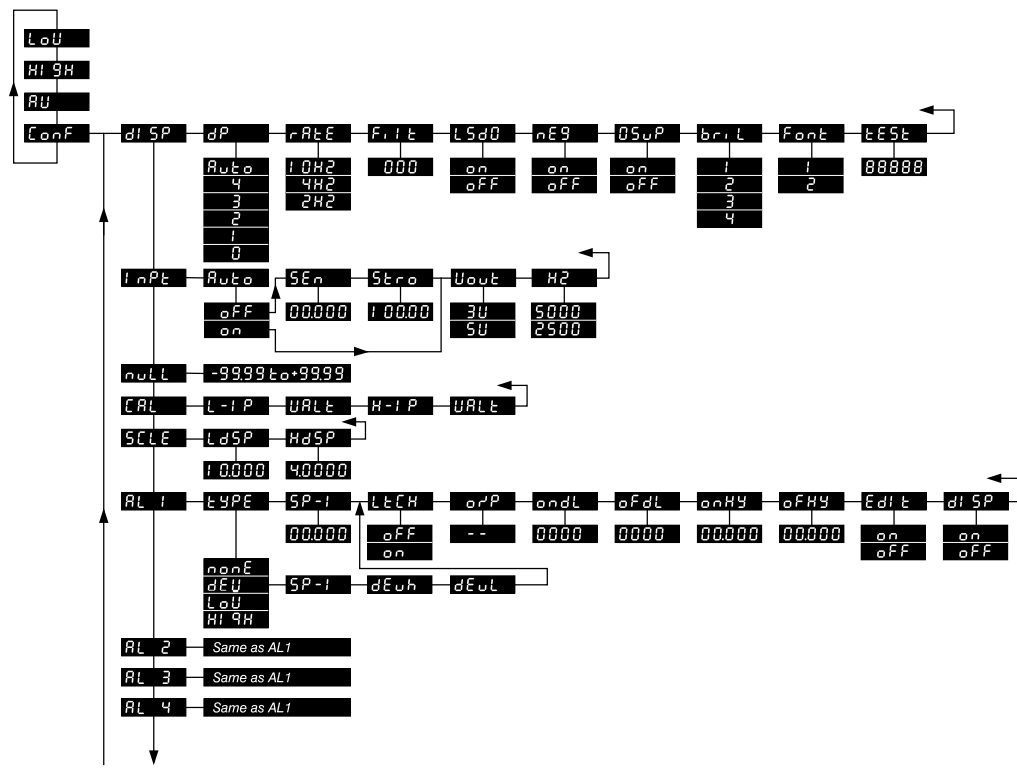
H, d1	H, d2
H, d3	H, d4

Deviation type alarm has been triggered on the indicated alarm at the high deviation setpoint.

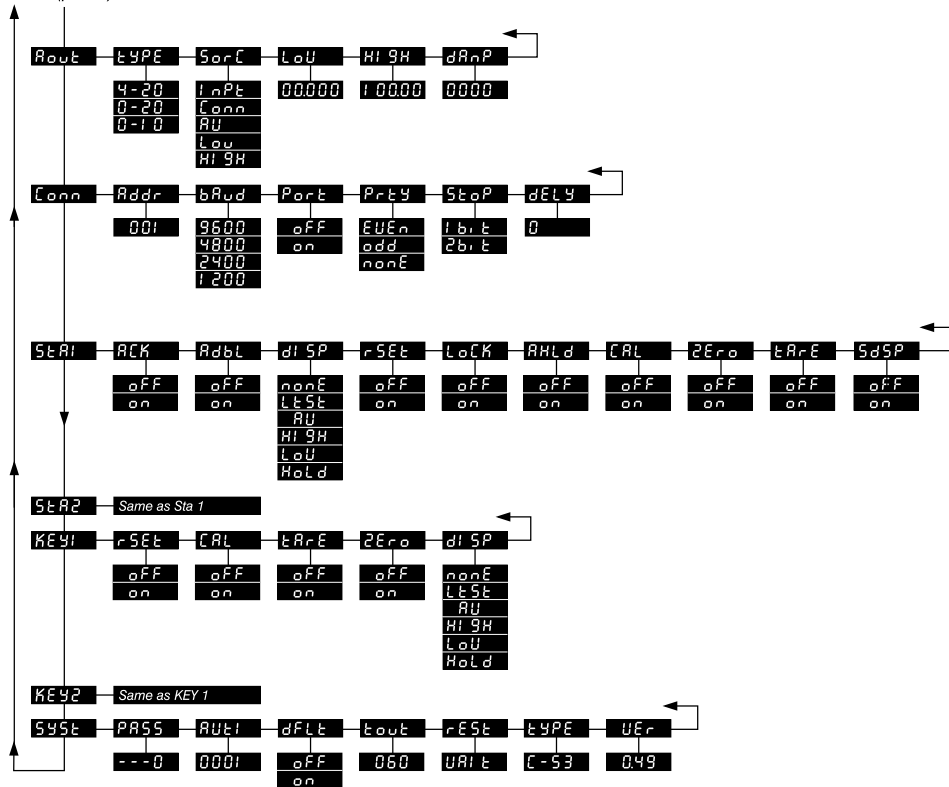
Appendix A: Control Panel Connections



Appendix B: DPL53 Menu Options (Part 1)



Appendix B (part 2)



Appendix C: Specification for DPL53

Excitation

Voltage	3V AC rms. or 5V AC rms. selectable
Frequency	2.5kHz or 5kHz selectable
Temperature drill	(amplitude) <100ppm/°C (frequency) <100ppm/°C

High Speed Analogue O/P

Output	±10V maximum
Response	Output filter -3dB @ 125Hz

Analogue Output

Ranges	0-10V, 0-20mA or 4-20mA selectable
Accuracy	0.2% of span
Temperature drift	<100ppm/°C
Response	100% within 400mS
Resolution	0.05% (5mV or 0.01mA)

Supply

90 - 265V AC
50 - 60Hz
20VA max.

Operating Conditions

Ambient Temperature	Storage	-10°C to 70°C (14° to 158°F)
	Operating	10°C to 50°C (50° to 122°F)
Humidity		10% to 95% Non-condensing

Input

ADC	High precision Sigma Delta
Input range	0.05V rms. - 5V rms.
Resolution	18bit
Non Linearity	<0.02%
Temperature drift	<50PPM 1°C (<50PPM 33.8°F)
Stability	<0.01% FSO after 15 minutes
Input Impedance	100k Ω
Common mode rejection	>150dB
Series mode rejection	>70dB @ 50/60Hz

Appendix D: Memory locations

A.1 Analogue Memory Locations.

(RW) = Read / Write (RO) = Read Only

(WO) = Write Only

Easy Recall

0	(RO) Instrument Type e.g. DPL53
1	(RO) Measured Value, Unfiltered
2	(RO) Display Value, Filtered
3	(WO) Comms Display Value

Factory info

4	(RO) Factory Options
5	(RO) Number of Relays o/p fitted
6	Reserved
7	(RO) First Four digits of Serial (datecode)e.g.0398
8	(RO) Last Four digits of Serial code
9	(RO) Firmware version (Format 99.99 or 9.99)
10	(RO) Firmware creation date (Year)
11	(RO) Firmware creation date (Month)
12	(RO) Firmware creation date (Day)
13	(RO) Firmware creation date (Hour)
14	(RO) Firmware creation date (Minute)

15	(RO) Firmware creation date (Second)
16	(WO) Comms display value
17	(RO) Stack Percentage used

Factory Test

18	(RO) reason for reset: 0=power 1=cop2=com 3-13=error 14=syst/com
19	(RO) memory Leak record: 255=no error
20	(RO) MCU portA - analog o/p v/I selection, load cell gain applied
21	(RO) MCU portD
22	(RO) MCU portE - keys and status inputs
23	(RO) MCU portG - relay/ttl outputs
24	(RO) raw load cell input mV/V
25	Reserved
26	Reserved
27	(RO) channel A as a 0..1 ratio of span
28	(RO) channel B as a 0..1 ratio of span
29	(RO) zero offset applied when activated by Zero function key/autozero
30	(RO) tare offset applied when activated by Tare function key
31	(RO) null value: %FSD distance from null point
32	(RO) timer. Incremented every 20mS. Rolls over at 32767 to 0

Appendix D: Memory locations

Realtime

33	(RO) analogue level on status1 (default 0 to 5000mV)
34	(RO) analogue level on status2 (default 0 to 5000mV)
35	(RO) Low Value
36	(RO) High Value
37	(RO) Average Value
38	(RO) unfiltered measured value
39	(RO) filtered displayed value
40	Reserved
↓	
50	Reserved

Display setup

51	Reserved
52	Reserved
53	(RW) sorc: display source: 0=inpt,1=high,2=low,3=av,4=comm
54	(RW) dp: digits to right of decimal point; 0 to 4 or 5=auto

55	(RW) rate: display update rate;0=2Hz,1=4Hz,2=10Hz
56	(RW) filt: display filter time; 0 to 999 sec (will be 0.0 to 99.9s)
57	(RW) bril: display Brilliance; 0 to 3, 3=brightest
58	Reserved
↓	
61	Reserved

Input Setup

62	Reserved
63	(RW) sen: sensitivity mV/V/length_of_unit
64	(RW) stroke: in the same units of length used in sensitivity
65	(RO) gain: load cell i/p GAIN; 0=x,1=x5,2=x10,3=x100
66	Reserved
↓	
71	Reserved

Appendix D: Memory locations

Scaling - for load cell input

72	Reserved (for user linearisation points)
73	(RW) Ldsp: Low Cal point display value (in units of weight)
74	(RW) L-iP: Low Cal Point input value in mV/V
75	(RW) Hdsp: High Cal point display value (in units of weight)
76	(RW) H-iP: High Cal point input value in mV/V
77 - 99	Reserved (for User linearisation Cal. Points)

Analog Scaling setup

Sta1	Sta2	
100	101	(RW) high cal point scaled level
		(0_5000) default=5000 (for mV)
102	103	(RW) low cal point scaled level
		(0_5000) default=0 (for mV)
104	105	(RW) high cal point input level (0 to 255) default=255 (255=5V)
106	107	Low cal point input level (0 to 255)
		0=default (0=0V)
108		Reserved
109		Reserved

Alarm Number

1	2	3	4	
110	125	140	155	(RW) type: 0=high 1-=low 2=dev 3=none
111	126	141	156	(RW) sp: septpoint -19999 to 99999
112	127	142	157	(RW) devh: deviation above sp -19999 to 99999
113	128	143	158	(RW) devL: deviation below sp -19999 to 99999
114	129	144	159	(RW) ondL: on delay 0 to 9999 s
115	130	145	160	(RW) ofdL: off delay 0 to 9999 s
116	131	146	161	(RW) onhy: on hysteresis - 19999 to 99999
117	132	147	162	(RW) ofhy: off hysteresis - 19999 to 99999
118	133	148	163	Reserved
↓	↓	↓	↓	
124	139	154	169	Reserved

Appendix D: Memory locations

Analog Output setup

170	(RW) type: 0=0_10V 1=0_20mA (Low_high cal point) default=2
171	(RW) sorc: 0=inpt 1=high 2=low 3=av 4=comm(a175) default=0
172	(RW) low: display value corresp.to low aout cal point. Default=0
173	(RW) high: display value corresp.to high aout cal point. Default=100
174	(RW) Damp: damping filter 0_999 s (to be: 0.0 to 99.9) default=0
175	(RW) REALTIME source of analog o/p when type=4(=comm(a175))
176	Reserved
↓	
181	Reserved
182	(RO) addr: instrument address 1_247 default=1
183	(RO) baud: baud rate 0=1200 1=2400 2=4800 3=9600 default=3
184	(RO) prty: Parity 0=odd 1=even 2=none default = 1
185	Reserved
↓	
196	Reserved

Status Input Number

1	2	
197	201	(RW) disp: 0=none 1=hold 2=low 3=high 4=av 6=Ltst default=0
198	202	Reserved
↓	↓	
200	204	Reserved
205		Reserved

Function Key Action setup

1	2	
206	210	(RW) disp: 0=none 1=hold 2=low 3=high 4=av 5=Ltst
207	211	Reserved
↓	↓	
209	213	Reserved

214	(RW) Avti: Period in seconds over which average is taken default=1
215	(RW) tout: keypad inactivity timeout to Conf mode exit default=60
216	Reserved
↓	

Appendix D: Memory locations

218	Reserved
-----	----------

Relay/TTL O/p - setup

219	221	223	225	(RW) puls:dely 0.1 to 4.9
				secs default=0.5s
220	222	224	226	Reserved

D.2. Logic Memory Locations.

(RW) = Read / Write (RO) = Read Only

(WO) = Write Only

Factory Info

0	(RO) Config. Status: ON=in Config. Mode
1	(RO) Calibration Mode: ON=in Calibration Mode
2	(RO) Calibrated: ON=Calibration done or defaulted
3	Reserved
↓	
5	Reserved

Realtime Info

6	(RO) function key1 (leftmost) state: ON=Pressed
7	(RO) funtion key2 (rightmost) state: ON=Pressed
8	(RO) status input1 state: ON=connected
9	(RO) status input2 state: ON=connected
10	(RO) alarm1 state: ON=activated
11	(RO) alarm2 state: ON=activated
12	(RO) alarm3 state: ON=activated
13	(RO) alarm4 state: ON=activated
14	(RO) output1 relay state: ON=closed/activated
15	(RO) output2 relay state: ON=closed/activated
16	(RO) output3 relay state: ON=closed/activated
17	(RO) output4 relay state: ON=closed/activated
18	Reserved
↓	
23	Reserved
24	(RO) calibration in progress: ON=busy

Appendix D: Memory locations

Runtime Control

25	(RW) ON=Do FastCal. Repeat when clear while L24 ON.
26	(RW) ON=Alarm Acknowledge
27	(RW) ON=Reset high, Low,av,control SP's, Pick SP's
28	(RW) ON=Reset High display value only
29	(RW) ON=Reset Low display value only
30	(RW) ON=Reset Average display value only
31	(RW) ON=Perform Zero
32	(RW) ON=Undo Zero
33	(RW) ON=Perform Tare
34	(RW) ON=Un-Tare
35	Reserved
↓	
41	Reserved

Scaling Control

42	(RW) ON=read L-iP (reads OFF when done -see also L44)
43	(RW) ON=read H-iP (reads OFF when done - see also L44)

44	(RW) ON=re-scale. Do when L-iP, H-iP,Hdsp and Ldsp are ALL as required
45	Reserved (for User linearisation)
46	Reserved

Display setup

47	(RW) font:ON=Display font2, OFF=Display font1 default=OFF
48	(RW) 0sup: ON=Leading zeros blank OFF=Leading zeros on default=ON
49	(RW) Lsd0: ON=Least signif. digit 0 OFF=normal default=OFF
50	(RW) neg: ON=neg display enable OFF=neg values show 0 default=ON
51	Reserved
↓	
54	Reserved

Input Setup

55	(RW) Hz: excitation frequency OFF=2.5kHz, On=10kHz default=OFF
56	(RW) rms: excitation voltage OFF=1V, ON=3V default=OFF

Appendix D: Memory locations

57	(RW) Auto: ON=autogain on OFF=autogain off default=OFF
58	(RW) ON=calculate new gain now based on new L-iP &/or H-iP
59	Reserved
60	Reserved

Alarm setup

AI-1	AI-2	AI-3	AI-4	Function
61	71	81	91	(RW) O/P:1---: ON=relay O/p1 set by alarm Default=OFF
62	72	82	92	(RW) O/P:-2--: ON=relay O/p1 set by alarm Default=OFF
63	73	83	93	Reserved
64	74	84	94	Reserved
65	75	85	95	(RW) LtcH: ON=Latching Default=OFF
66	76	86	96	(RW) Edit: ON=Panel Key edit enabled Default=OFF
67	77	87	97	(RW) disp: ON=Warning Message Default=ON
68	78			Reserved
		88	98	(RW) L-SP: ON=Linked to Alarm minus 2 default=OFF

69	79	89	99	Reserved
70	80	90	100	Reserved

Comms setup

101	(RW) ON=7 digits values from instrument OFF=5 digits Default=OFF
102	(RW) Prot: ON=all analog/logic locations write protected Default=OFF
103	(RO) StoP: ON=2 stop bits OFF=1 stop bit
104	Reserved
↓	
111	Reserved

Status Input setup

112	125	(RW) tAre: ON=tare display Default=OFF
113	126	(RW) Ack: ON=acknowledge all latched alarms Default=OFF
114	127	(RW) Adbl: ON=disable alarms
115	128	(RW) rSEt: ON=reset high/low/av/Control SP's Default=OFF

Appendix D: Memory locations

116	129	(RW) Lock: ON=disable front panel keys Default=OFF
117	130	(RW) hOLD: ON=hold the analogue output value Default=OFF
118	131	(RW) ZerO: ON=zero display Default=OFF
119	132	(RW) disP: ON=show STA? Display Default=OFF
120	133	(RW) CAL: ON=begin fast cal (need>1 Activation Default=OFF
121	134	Reserved
↓	↓	
124	137	Reserved

Function Key Setup

1 (?)	2 (*)	Function
138	146	(RW) rSEt: ON=reset high/low/av/Control SP's default=OFF
139	147	(RW) tARe: ON=tare display
140	148	(RW) ZerO: ON=zero display
141	149	(RW) CAL: ON=do fastcal (need more than 1 activation) default=OFF
142	150	Reserved
↓	↓	

145	153	Reserved
-----	-----	----------

System setup

154	(RW) dFLt: ON=default instrument setup
155	(RW) rSEt: ON=Reset instrument (as on power up)
156	Reserved
↓	
159	Reserved

Relay Output Setup

160	165	170	175	(RW) tYPE: ON=true OFF=false(inverted) Default=ON
161	166	171	176	(RW) PuLS.EnAb: ON=pulsed OFF=normal Default=OFF
162	167	172	177	Reserved
163	168	173	178	Reserved
164	169	174	179	Reserved

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).** The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available **BEFORE** contacting OMEGA:

1. Purchase Order number under which the product was **PURCHASED**,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available **BEFORE** contacting OMEGA:

1. Purchase Order number to cover the **COST** of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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