C55

Digital Display

solartron metrology

CE

user and installation manual

Index

1.0 Index (cont.)

2.0 Safety Summary

Terms in this Manual

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 indicates where applicable cautionary or other information is to be found.

This Equipment

This equipment is designed as Safety Class 1 apparatus to comply with EN61010-1.

Service Safety

This equipment has been designed and tested to meet the requirements of the Low Voltage Directive (1997) and has been supplied in a safe condition. This manual contains information and warnings that must be followed by the user to ensure safe operation and to retain the apparatus in a safe condition.

Power Source

Apply no more than 265 V rms (AC) between supply conductors or conductor and ground.

2.0 Safety Summary (cont.)

Warnings

WARNING: Do not operate in an explosive atmosphere

WARNING: Do not remove covers or panels
To avoid personal injury, do not remove covers and panels. Do not operate the equipment without the covers and panels fitted. There are no internal adjustments required during commissioning the equipment.

WARNING: Danger arising from loss of ground
During a fault condition and upon loss of protective ground (earth) connection, all accessible conducting parts, including controls that might appear to be insulated, can render an electric shock.

WARNING: Do not cover vents
During operation of the unit, do not cover or restrict the air flow around the vents situated on the top and side of the unit.

Cautions

CAUTION: Use correct fuse
To avoid a fire hazard, use the correct fuse type, voltage and current rating as specified for the equipment. Refer fuse replacement to a qualified service personnel.

Grounding the Equipment

The unit is grounded through the mains lead. To avoid electric shock, plug the power lead into a properly wired receptacle before connecting to the input or output terminals. A protective ground connection, by the way of the grounding conductor in the power lead, is essential for safe operation.

3.0 Service and Repair

Service and Repair

This equipment contains no user serviceable parts other than the fuse. This equipment must be returned to your Solartron dealer for all other service and repair.

The C55 is designed to be maintenance free. Contact with solvents should be avoided. Any attempt to dismantle the C55 will invalidate the warranty.

The C55 is a precision instrument and should be handled with care.

Replacing the Fuse

Remove the fuse from its holder (located at the rear of the C55 unit) and replace it with a fuse of the same 20 mm type and value.

4.0 Installation into a Panel

4.1 Panel Mounting

- Ensure that there is sufficient space behind the relevant instrument panel for the C55 and its cabling (refer to section 4.2 for dimensions).
- Cut out the panel aperture to the dimensions shown.
- 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.

WARNING: On installing or removing the C55, you must be aware of any hazardous equipment or materials in the vicinity. Make sure that any equipment into which the C55 system is to be installed is switched off and made safe.

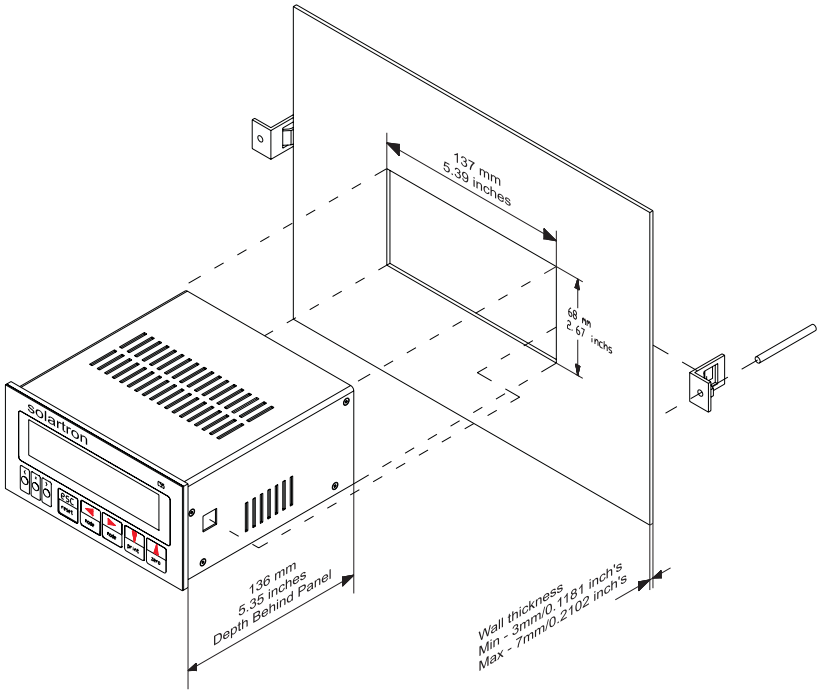
CAUTION: Avoid installing the C55 close to switch gear, contactors or motor starters.

CAUTION: Do not place signal and power supply wiring in the same loom as the C55 wiring.

CAUTION: Use screened cables for all leads, with the screen earthed at one end only.

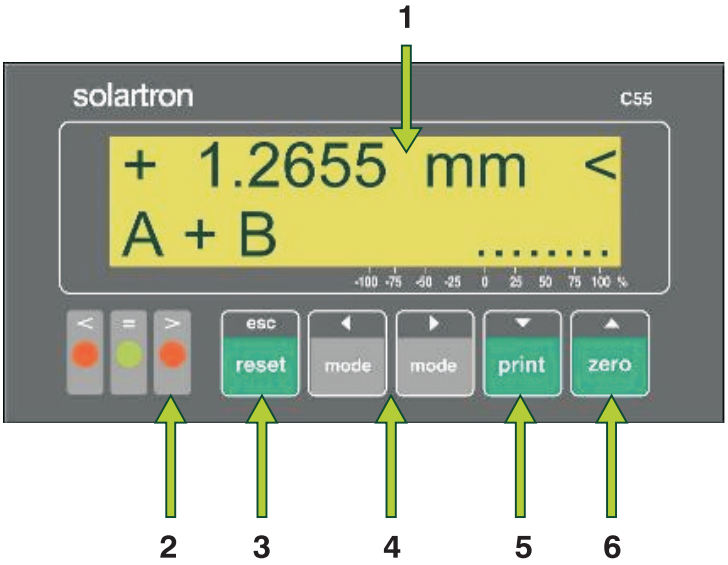
4.0 Installation into a Panel (cont.)

4.2 Dimensions



5.0 Display Panel

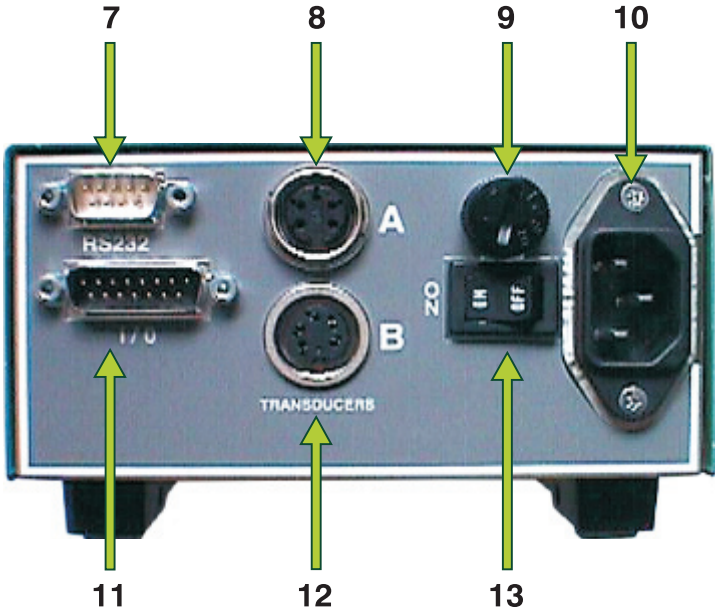
5.1 Layout of Front Panel



1	16 character x 2 line digital display
2	Range lamps
3	RESET / ESCAPE key
4	MODE / SELECT key
5	PRINT / DOWN scroll key
6	ZERO / UP scroll key

5.0 Display Panel (cont.)

5.2 Layout of Back Panel



7	RS232 connection
8	LVDT / Half Bridge channel A input
9	Fuse holder
10	Mains socket
11	Input/Output connection
12	LVDT / Half Bridge channel B input
13	Mains ON/OFF switch

6.0 Set-Up Options

6.1 Plug and Go

The C55 be can supplied and used in several ways:

- Purchased fully calibrated with transducer(s) from Solartron Metrology.

Calibrated and setup at Solartron Metrology. When the C55 is supplied for ‘plug and go’, a setting certificate is also supplied by Solartron with the system.

- Supplied with transducer(s) with known sensitivity (mV/V/mm).

To calibrate the C55 with a transducer with a known sensitivity, follow the procedure in section 6.2

- Supplied with transducer(s) with an unknown sensitivity (mV/V/mm).

To calibrate the C55 with a transducer with an unknown sensitivity, refer to the procedure in section 6.3

6.0 Set-Up Options (cont.)

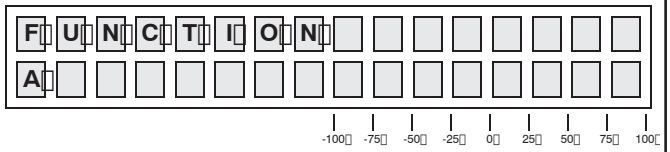
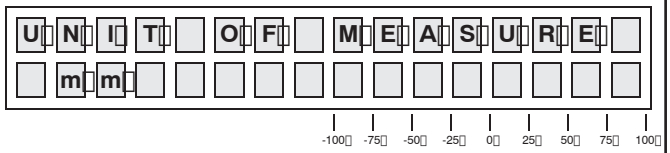
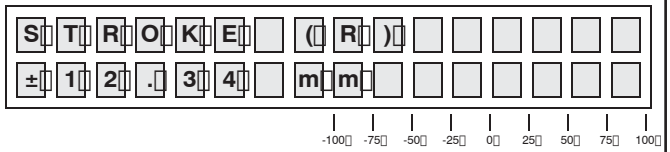
6.2 Calibration of the C55 with a known sensitivity

The following procedure describes how to calibrate a C55 with a transducer of known sensitivity.

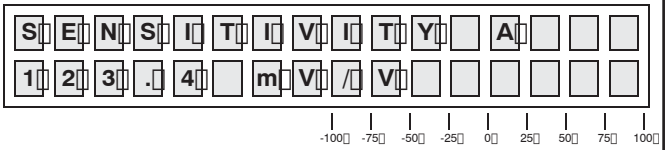
In the following example, the C55 will be set-up with a plugged gauging transducer of sensitivity 200 mV/V/mm displaying a reading of +1.00 mm to -1.00 mm.

Note: The reading will be positive when the transducer is moved inwards from the null position, and negative when moved outward from the null.

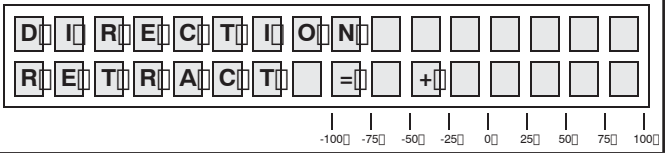
6.0 Set-Up Options (cont.)

Step	Button	Action	Display
1	▶	Press and release until the display shows:	
2	▲ or ▼	Press and release to scroll through the options until **A** is displayed.	
3	▶	Press and release until the display shows:	
4	▲ or ▼	Press and release to scroll through the options until **mm** is displayed.	
5	▶	Press and release until the display shows:	

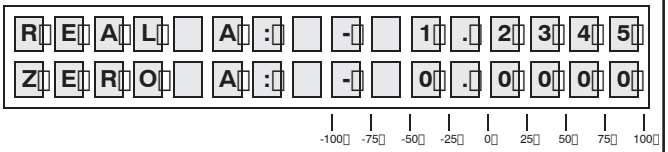
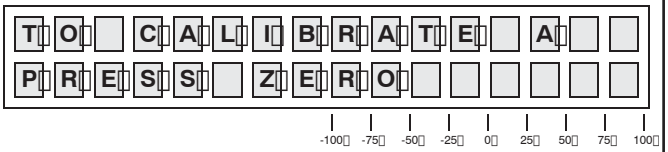
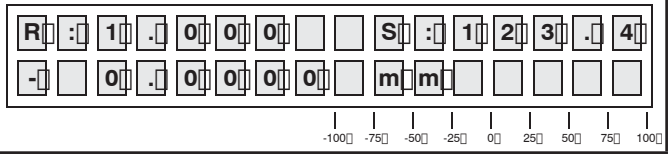
6.0 Set-Up Options (cont.)

Step	Button	Action	Display
6	▲ or ▼	Press and hold. The number will automatically scroll through. Continue until **±1.00 mm** is displayed.	
7	▶	Press and release until the display shows:	
8	▲ or ▼	Press and hold. The number will automatically scroll through. Continue until the required mV/V is displayed.	

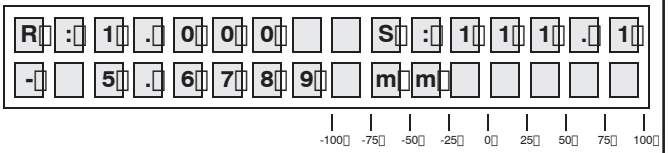
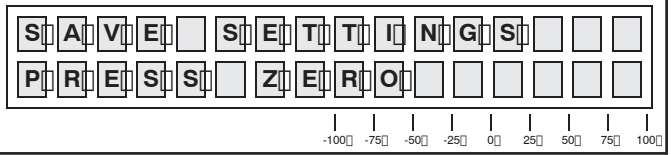
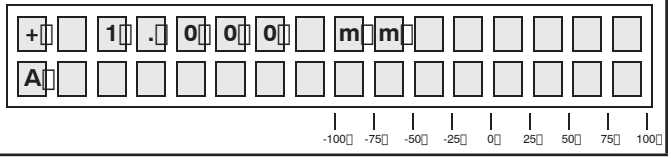
Note: To obtain the mV/V, multipy the mV/V/mm by the measurement range.
For example: transducer sensitivity 200 mV/V/mm ±0.5% with a measurement range of ±1 mm.
The sensitivity to be entered on the C55 is 200 mV/V/mm x 1 mm = 200 mV/V ±0.5%.
Fine adjustments may be required in the calibration procedure (refer to step 13).

9	▶	Press and release until the display shows:	
10	▲ or ▼	Press and release to scroll through the options until **RETRACT = +** is displayed.	

6.0 Set-Up Options (cont.)

Step	Button	Action	Display
11	▶	Press and release until the display shows:	
12		Position the transducer for the display to show **REAL A: +0.000** (transducer's null position).	
13	ZERO	Press and release. This will zero the display to show **0.000** for a null reading.	
14	▶	Press and release until the display shows:	
15	ZERO	Press and release. R is the transducer range (selected at step 4 & 5). S is the sensitivity in mV/V (exact sensitivity unknown at the moment). Bottom row of the display -**0.0000** is the probe measurement reading.	

6.0 Set-Up Options (cont.)

Step	Button	Action	Display
16		Move the transducer tip inwards 1.000 mm from the NULL position.	
17	▲ or ▼	Increase or decrease the sensitivity mV/V to change the transducer position reading. Adjust the reading until the transducer position reading is set to **+1.000 mm**.	
18		Move the transducer tip back to the NULL position and repeat steps 12 to 18, if required.	
19		Move the transducer tip outwards 1.000 mm and check the -1.000 mm reading.	
20	▶	Press and release until the display shows:	
21	ZERO	Press and release. This will save all settings and the C55 will revert back to the main measurement display.	

6.0 Set-Up Options (cont.)

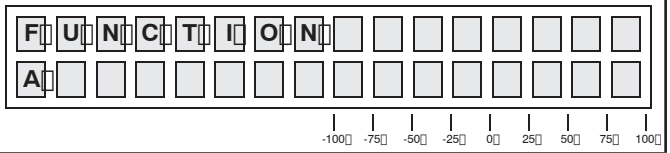
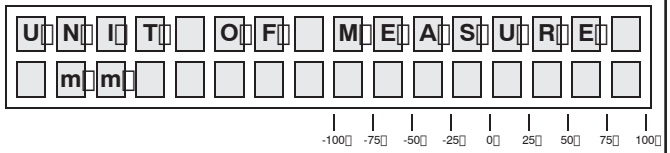
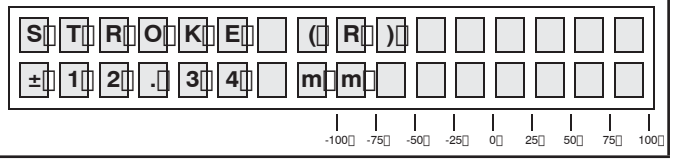
6.3 Calibration of the C55 with an unknown sensitivity

The following procedure describes how to calibrate a C55 with a transducer of unknown sensitivity.

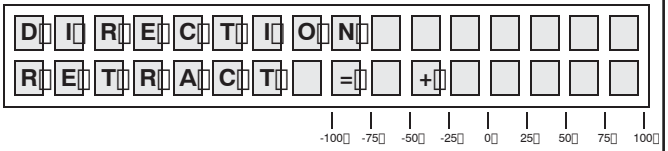
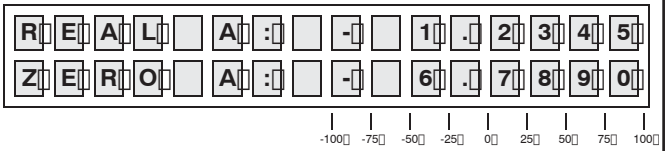
In this example the C55 will be set-up with a plugged gauging transducer (Solartron Metrology AX/1/S) displaying a reading of +1.00 mm to -1.00 mm.

Note: The reading will be positive when the transducer is moved inwards from the null position, and negative when moved outward from the null.

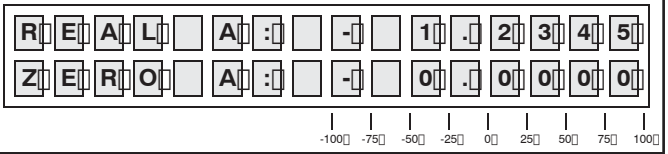
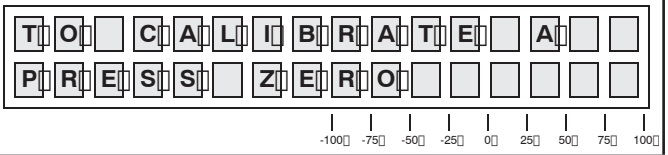
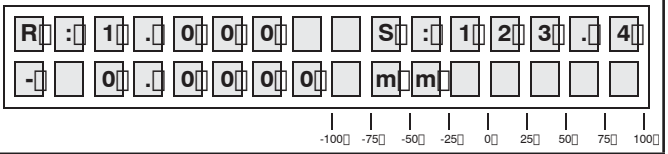
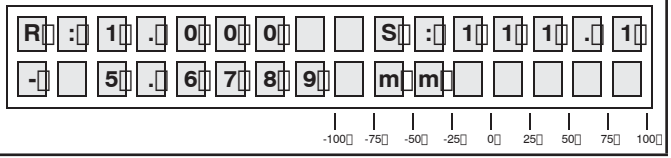
6.0 Set-Up Options (cont.)

Step	Button	Action	Display
1	▶	Press and release until the display shows:	
2	▲ or ▼	Press and release to scroll through the options until **A** is displayed.	
3	▶	Press and release until the display shows:	
4	▲ or ▼	Press and release to scroll through the options until **mm** is displayed.	
5	▶	Press and release until the display shows:	

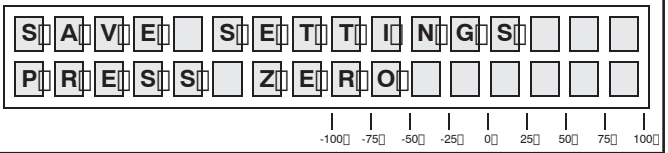
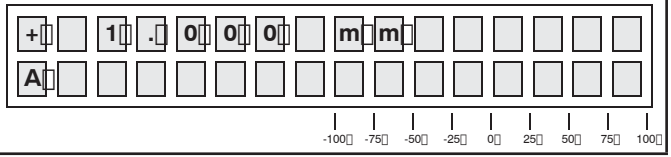
6.0 Set-Up Options (cont.)

Step	Button	Action	Display
6	▲ or ▼	Press and hold. The number will automatically scroll through. Continue until **±1.00 mm** is displayed.	
7	▶	Press and release until the display shows:	
8	▲ or ▼	Press and release to scroll through the options until **RETRACT = +** is displayed.	
9	▶	Press and release until the display shows:	
10		Position the transducer for the display to show **REAL A: +0.000** (transducer's null position).	

6.0 Set-Up Options (cont.)

Step	Button	Action	Display
11	ZERO	Press and release. This will zero the display to show **0.000** for a null reading.	
12	▶	Press and release until the display shows:	
13	ZERO	Press and release. R is the transducer range (selected at step 4 & 5). S is the sensitivity in mV/V (exact sensitivity unknown at the moment). Bottom row of the display **-0.0000** is the probe measurement reading.	
14		Move the transducer tip inwards 1.000 mm from the null position.	
15	▲ or ▼	Increase or decrease the sensitivity mV/V to change the transducer position reading. Adjust the reading until the transducer position reading is set to **+1.000 mm**	

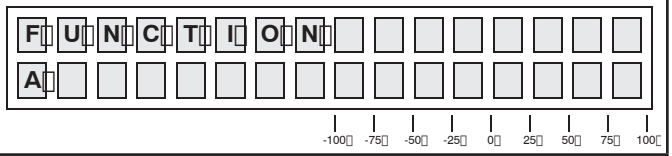
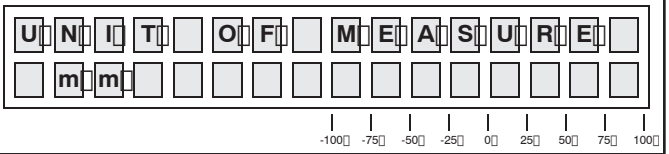
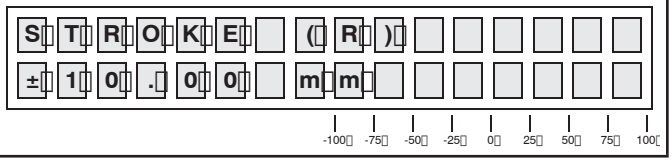
6.0 Set-Up Options (cont.)

Step	Button	Action	Display
16		Move the transducer tip back to the null position and repeat steps 10 to 16, if required.	
17		Move the transducer tip outwards 1.000 mm and check the -1.000 mm reading. Steps 10 to 17 may be repeated to obtain the maximised reading accuracy.	
18	▶	Press and release until the display shows:	
19	ZERO	Press and release. This will save all settings and the C55 will revert back to the main measurement display.	

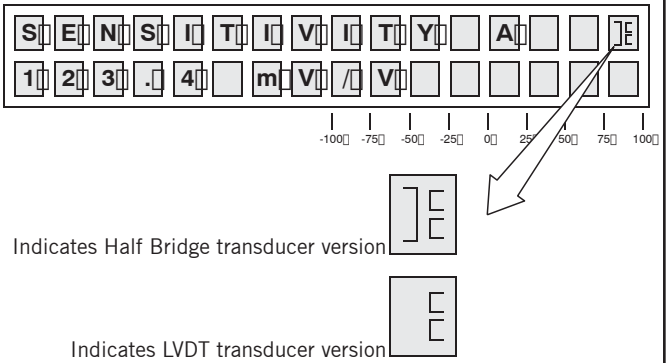
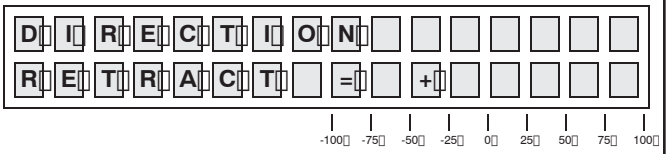
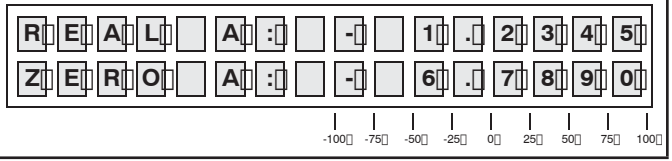
7.0 Functions

Description of C55 Functions

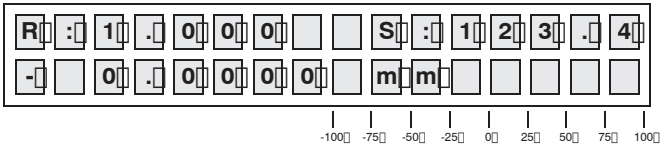
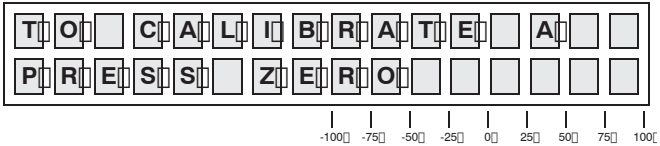
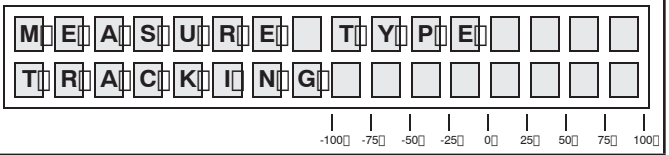
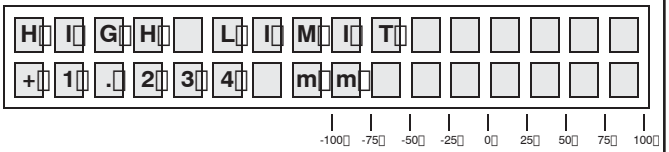
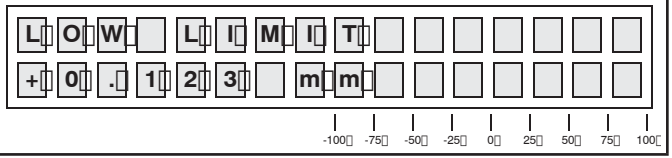
Note: When accessing the menu of the C55, the analogue voltage and current outputs will be switched off and the alarm relays will be set to 'normally closed' (N/C).

Function	Display
The C55 has available 2 channels; A and B. The reading from these inputs can be displayed using the following functions: Selection: A, B, A+B, A-B, (A+B)/2, (A-B)/2	
Allows the user to select the displayed measurement units. **Note**: No arithmetic conversion is carried out. The units are for display only. Selection: mm, inch, mil, no units	
Allows the stroke of the transducer to be entered as a value. Range ±0.1000 to ±999.9	

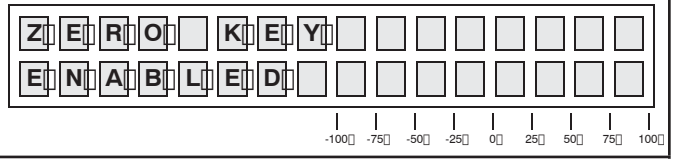
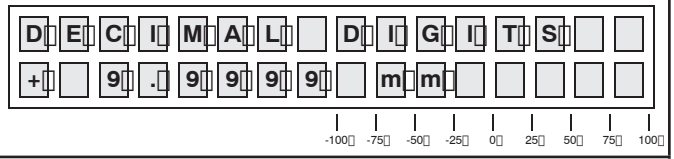
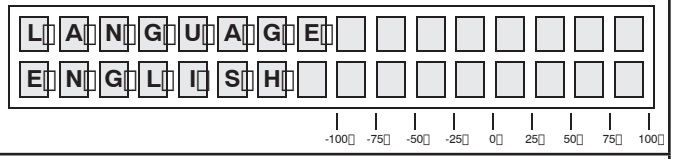
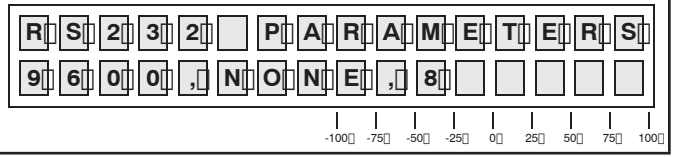
7.0 Functions (cont.)

Function	Display
Used to set the electrical sensitivity of the transducer in mV/V. **Note**: If the transducer sensitivity is stated in mV/V/mm, this will need to be converted into mV/V. Example: Solartron AX/1/S plugged standardised transducer sensitivity 200 mV/V/mm ±0.5% with a measurement range of ±1 mm. The sensitivity to be entered on the C55 is 200 mV/V/mm x 1 mm = 200 mV/V ±0.5%.	
Allows the user to select the positive reading for the direction of the transducer tip. Selection: Extend = +, Retract = +	
Displays the *actual* reading of the transducer and the digital display value. **REAL**: the actual reading from the transducer with no scaling. **ZERO**: the display reading scaled.	

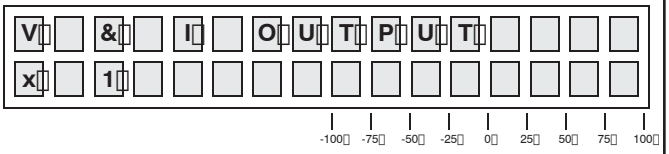
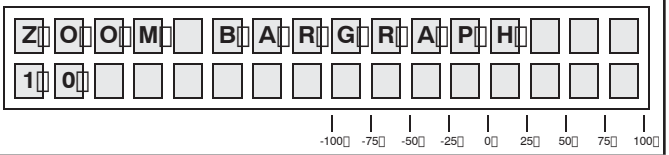
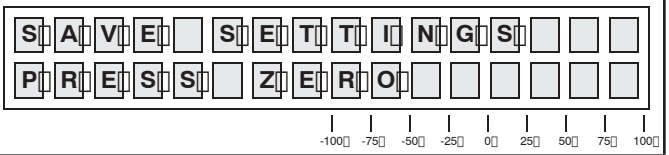
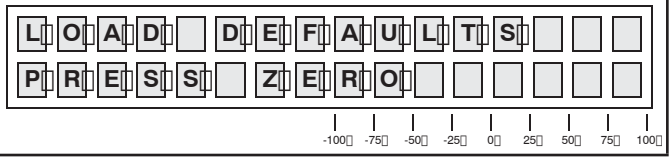
7.0 Functions (cont.)

Function	Display
Used in the procedure for calibrating the transducer with the C55 (see section 6.2 & 6.3). Pressing the **ZERO** key takes the operator to the calibration screen. 	
The C55 can be set to display real time readings or peak measurement. For real time display, select **TRACKING**. Refer to section 8.0 for a description of this function.	
The C55 display has in-built HIGH, LOW and IN RANGE LIMIT lights as well as 2 relay outputs; HIGH and LOW (refer to section 9.4 for relay details). High and low limits are set by using either the ▲ or ▼ key to increase or decrease the limits. If the measured value is within the high and low limits, the in range lamp '=' will light and both alarm relay outputs will be 'normally open' (N/O).	 

7.0 Functions (cont.)

Function	Display
Allows the user to enable or disable the **ZERO** key on the front panel when in the main measurement display. The external zero input is permanently enabled.	
Allows the position of the decimal point to be fixed. The decimal point allows the following displays: X.X / X.XX/ X.XXX / X.XXXX / X.XXXXX	
Select the display language. Options: English, German, Italian or French	
Allows setting of the RS232 protocol for the C55 unit. Refer to section 9.6 for further details.	

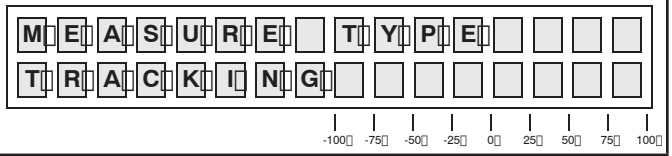
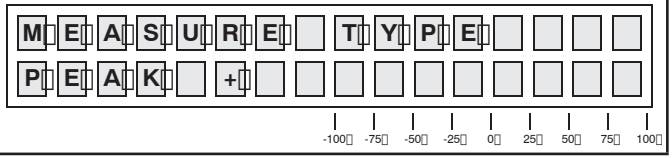
7.0 Functions (cont.)

Function	Display
Enables the user to select the required output range. Refer to Section 9.1 for a description of this function.	
Select the magnification of the bargraph on the main display using either of the ▲ or ▼ keys. Selection: 01 to 10	
Allows the user to save all settings on the C55 Digital Display. Press and release the **ZERO** key to save all settings. The display will revert back the the main display.	
Allows the unit to revert back to its factory default setting.	

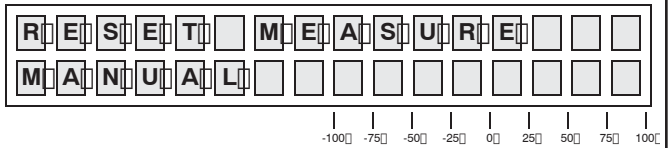
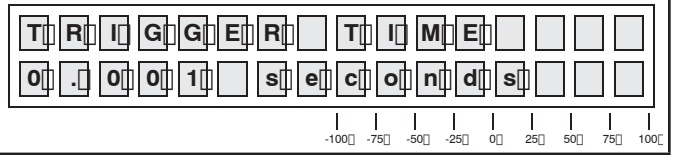
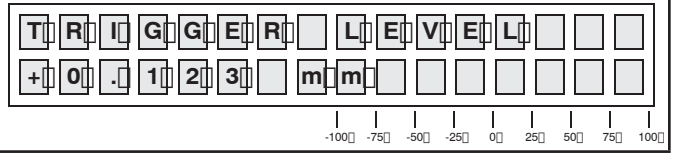
8.0 Tracking and Peak Function

The C55 allows the user to select the type of measurement display:

- **TRACKING** shows the real time measurement at the speed of the unit (as described in section 12.0 Technical Specification).
- **PEAK +** or **PEAK** - will detect the peak value (positive or negative respectively) that the unit has measured.

Function	Display
At the measure type menu, use the ▲ or ▼ key or to select option **TRACKING, PEAK +** or **PEAK** -.	
Selecting **PEAK +** or **PEAK** - will activate the following sub-menus (please see next page).	

8.0 Tracking and Peak Function (cont.)

Function	Display
RESET MEASURE has two options. **MANUAL**: If the transducer measurement is activated and measuring below the peak reading, pressing the **RESET** key will display the new peak value or 0.000 if the probe reading is below the trigger level setting. **AUTOMATIC**: The peak reading from the transducer is displayed. This reading will be reset if the probe reading goes below the trigger level setting.	
TRIGGER TIME is the period of time from when a new peak value has been detected and when the C55 unit will change the measurement display. Options: 0.001 to 1.000 seconds.	
TRIGGER LEVEL is the defined level at which the peak detection starts to work. Once the trigger level has been reached, the trigger time will delay by the amount set and the peak reading will be displayed.	

9.0 External Functions

9.1 High Speed Analogue Outputs

A retransmission of the display reading is available via the high speed analogue outputs; both voltage and current are available simultaneously.

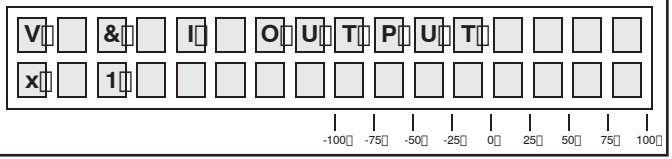
The analogue output is activated when the C55 is in display mode. When accessing the menu, the analogue output is de-activated automatically. The setting of the analogue output is carried out by setting the gain in the V & I Output menu (refer below). The analogue gain setting required will depend upon the transducers measurement range, sensitivity and channel function.

Various output are available using the different gain settings; ±10 VDC, ±5 VDC and 4-20 mA.

Note: Not all analogue output ranges are available for all combinations of transducer measurement range, sensitivity and channel function.

Connection to the high speed outputs is via a 15-way D-type connector. Refer to section 11.0 Interface Connections.

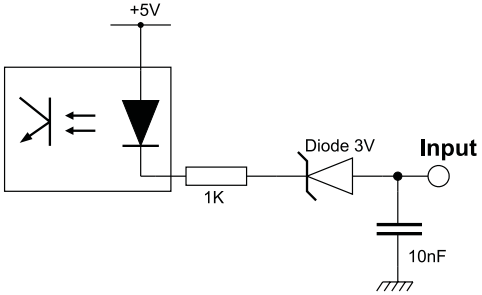
For specification of the high speed analogue outputs, please refer to section 12.0 Technical Specification.

Function	Display
To adjust the analogue gain setting. Use the ▲ or ▼ key to select gain option x1 or x2.	

9.0 External Functions (cont.)

9.2 Input Schematic

3 inputs are available for the user to control the following: **PEAK RESET**, **PRINT** and **ZERO**.
These inputs perform the same function as pressing the respective front panel key.



9.3 Input Specification

Active Low, edge triggered.
TTL/Relay contact compatible.
Maximum input current 4 mA.

Only one input may be active at a time. If a series of functions are being processed, the key response time of 30 ms may be exceeded.

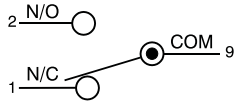
9.4 Relay Schematic

The C55 Digital Display has in-built high and low limits which are available externally via the relays (see below).

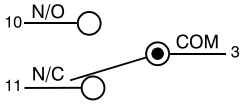
In normal operation, when display reading is within range limits, the relay contacts are 'normally open' (N/O). When a range limit is exceeded, the associated relay contact is closed.

When accessing the menu, the relays both default to the alarm condition, 'normally closed' (N/C).

Low Limit
Relay Connections



High Limit
Relay Connections



9.5 External 5 volts

A +5 VDC, 10 mA maximum output is available on Pin 12 of the I/O connector for user interface circuitry.

9.0 External Functions (cont.)

9.6 RS232 Communication

The C55 can output the measurement display to the RS232 port in the form of a data string. For pin connection, please refer to section 11.0 Interface Connections.

9.7 RS232 Data Format

Baud Rate	1200, 2400, 9600, 19200
Nº. of Bits	7, 8
Parity	Odd, Even, None
Stop Bit	1

Note: Baud rate and data format options are defined in the RS232 menu. Ensure settings are the same as those on the connected serial device.

9.8 Request to Print

The C55 can be triggered to send an RS232 data string in the following ways:

• **Key Press:** By pressing the **PRINT** key on the front panel, the C55 will send out a single reading for every single key press.

• **External Input**: The print command can be externally triggered via an input pin (refer to section 9.2 Input Schematic for connection to this pin). For a single reading, the external input print pin should be held low for a maximum period of 30 ms. Continuous transmission is achieved by holding the print pin low for a minimum of 30 ms.

9.0 External Functions (cont.)

9.9 RS232 Ouput Characteristics

Delay time, from the request to print			3 to 50 ms (variable)	
RS232 output burst with the following baud rates:				
baud rate	1200	2400	9600	19200
ms	170	80	20	11
Continuous transmission speed with external print held low with the following baud rates:				
baud rate	1200	2400	9600	19200
print / second	5	9	20	26
Note: Maximum reading update rate: 20 readings/second				

9.10 RS232 Output Format (20 Characters 0-19)

0	1 to 10	11	12 to 16	17	18	19
Sign	Reading	Space	U	R	LF	CR

Note: Message terminated by [carriage return] [line feed]

Key	
Sign	ASCII text sign + or -
Reading	ASCII representation of the reading. Leading zeros replaced by spaces XXXX.XXXXXX
U	Units inch, mm, mil, none (**Note**: byte 16 space)
R	Range Lamps '>' out of tolerance - high '=' in tolerance '<' out of tolerance - low '!' unit over range

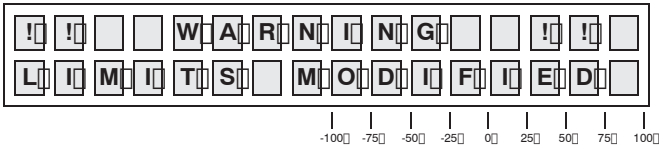
10.0 Messages

10.1 Error Messages

The following warning is displayed when there is a decade range change on the **STROKE (R)** menu after a **MODE** key is pressed.

For example: changing from 9.999 to 10.00.

The next **MODE** key action allows the high and low limits to be set as required.



10.2 Alarm Messages

When the output signal from the transducer exceeds the input specification of the C55, the main display reading flashes and displays the over range symbol '**!**'.

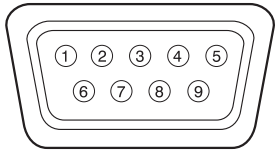
This will also occur within the menu in the following menu options:

- **REAL** and **ZERO**
- **CALIBRATION**
- **DECIMAL DIGITS**

11.0 Interface Connections

11.1 RS232

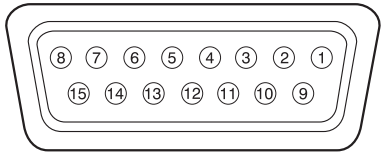
9-way D-type (female)	
PIN 3	RS232 Tx
PIN 5	RS232 Gnd



RS232

11.2 I/O Connector

15-way D-type (male)	
PIN 1	Low limit - normally closed (N/C)
PIN 2	Low limit - normally open (N/O)
PIN 3	High limit common (COM)
PIN 4	Gnd (0 Volts)
PIN 5	Analogue current output
PIN 6	Gnd (0 Volts)
PIN 7	Print request Input
PIN 8	Not connected
PIN 9	Low limit common (COM)
PIN 10	High limit - normally open (N/O)
PIN 11	High limit - normally closed (N/C)
PIN 12	+5 Volt (10 mA maximum)
PIN 13	Analogue voltage output
PIN 14	Peak reset key input
PIN 15	Zero key input

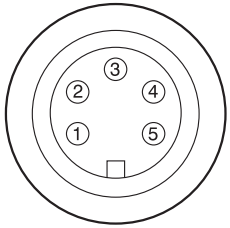


I/O Connector

11.0 Interface Connections (cont.)

11.3 LVDT Channel A & B

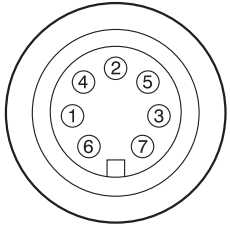
5 Pin DIN 270°	
PIN 1	Primary (energising) red
PIN 2	Primary (energising) blue
PIN 3	Not connected
PIN 4	Secondary white
PIN 5	Secondary green
CASE	Cable screen
Note: Red and white: In phase for inward displacement	



Channel A

11.4 Half Bridge Channel A & B

5 Pin DIN 270°	
PIN 1	Primary (energising) red
PIN 2	Cable screen
PIN 3	Signal yellow
PIN 4	Not connected
PIN 5	Primary (energising) blue
Note: Red and yellow: In phase for inward displacement	



Channel B

12.0 Technical Specification

Supply

Voltage	95 - 264 VAC / 50 - 60 Hz
Power	20 W max.
Fuse Rating	1 Amp 20 mm, Time delay

Operating Conditions

Operating Temperature	0°C to +40°C
Storage Temperature	-10°C to +70°C
Humidity	10% to 95% non-condensing

IP Rating

Front panel	IP55 (when panel mounted using appropriate gasket)
Main case	IP50

Dimensions (nominal)

Size	(w) 144 mm x (h) 72 mm (85 mm inc. feet) x (d) 145 mm
Weight	1.2 kg

Output Characteristics

Voltage	3 VAC rms
Frequency	2.5 kHz, 5 kHz, 10 kHz or 13 kHz factory set
Temperature Drift	<100 ppm/°C

12.0 Technical Specification (cont.)

Input Characteristics

ADC	2 off 16bit conversion
Resolution	±32768 counts
Frequency of Acquisition	100 kHz max.
Input Impedance	2 kΩ, 10 kΩ, 100 kΩ factory set

Analogue Output

Ranges	±10 VDC, 4-20 mA available on the I/O connector
Response	100% within 10 ms
Update Rate	<200 µs
Response	Output filter -3 dB @ 1 kHz