E-100

24V AC or DC POWERED

ANALOGUE I/O TO INDUSTRIAL ETHERNET CONVERTER

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Industrial Interface

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1. INTRODUCTION

1.1 Hardware Features

The E-100 Ethernet gateway module provides a straightforward method of interfacing analogue and digital process parameters to an RS232, RS485 or Ethernet network. It can accept virtually every type of analogue input signal from millivolts to 40Vdc, mA, thermocouples, RTD's etc with its universal input option, Alternatively it can be fitted to accept two high level inputs. It can produce 2 types of analogue output: voltage and mA source.

A built in display allows local monitoring of the individual inputs and outputs, and displays menu options when the unit is configured.

The unit can be powered by a DC voltage between 16 and 36Vdc or 16 and 32Vac.

The instrument is packaged in a compact 22.5mm wide enclosure which can be mounted on standard TS35 DIN-rail.

The system can be expanded through the use of optional ISO-SLICE slice I/O modules. These modules connect automatically via the DIN rail mounted bus connector, allowing the easy addition and removal of extra I/O.

For datalogging applications the unit can be configured with a large flash memory and realtime clock. This product is called the E-100-LOG.

For applications which require the connection of instruments with an RS232/RS485 port to an Ethernet network the E-PORT variant is available. This has two communications channels and allows any existing instrument with an RS232/RS485 port to act as a slave on an Ethernet network.

1.2 Isolation Details

The E-100 has full 3 port isolation of 1000V between the Input Stage, Output Stage and Power Supply for functional reasons.

2. UNPACKING

The instrument should be carefully inspected for signs of damage which may have occurred in transit. In the unlikely case that damage has been sustained, DO NOT use the instrument, but please retain all packaging for our inspection and contact your supplier immediately.

3.   QUICK START GUIDE

This example shows how easy it is to configure an E-100 with a 4-20mA Input and 0-10V Output and an Isoslice-2 on the Isoslice Bus.

Before starting, make sure power supply, inputs and outputs are disconnected.
Open the E-100 case and slide out the PCB (see pages 6 and 7)
Set up the input switches to the required input type and range (see pages 8 to 14)
For 4-20mA Input, S1: 2,3,9,10,11,12 on and S2: 1,2,7,8 on (S2 closest to display)

Set up the output switch to mA or voltage (see page 19)
For 0-10V Output the switch should be on (yellow switch closest to edge of PCB)

Refit the PCB into the housing and fit the complete unit onto the din rail.
Fit the Isoslice unit (configured as channel 2) to the din rail.
Connect up inputs, outputs and power then switch on (see page 6)

The E-100 will communicate with the Isoslice unit automatically at power up.
The Raise button will cycle through the available channels. Channel 1 is the E-100, channel 2 is the Isoslice-2. The Lower button cycles through the parameters.
Channel 1 parameter 1 is the Input and parameter 3 is the output. The values on screen by default represent 0 to 100 %.

Access the main menu by pushing and holding both buttons until OK is displayed.
Calibrate the E-100 input by following the procedure in section 8.2
Calibrate the E-100 output by following the procedure in section 8.4
The scaling of the display input values can be changed by following the procedure in section 8.5
By default the output will correspond to the input. To change this, follow the procedure in section 8.7.

To access the data remotely, refer to Section 11.

4. CONNECTIONS

The E-100 is housed in a compact DIN rail mounting enclosure, with terminals, arranged in 4 rows. The Communications ports are on the top and the sensor input terminals and the power supply and analogue outputs are on the bottom rows.

The diagram below shows how to connect to an E-100 with a single input, an analogue output and a serial port, either RS232 or RS485.

9	RS232 Receive or RS485 B
8	RS232 Transmit or RS485 A
7	Ground

Serial Port

9 8 7

2 16-36Vdc / 16-32Vac
1 0V
12 +ve
10 - ve   0-10V | 0(4)-20mA

Voltage Source | Current Source

PSU OUTPUT

2 1 10 12

5 +ve
4 - ve   Input: mA, Volts, mV, T/C

2 Wire RTD

125R to 1K
2 Wire Pot

2 Wire
Transmitter
4-20mA Sink

5 4 3 6

3 24V Tx Supply
6

SINGLE INPUT

3 Wire RTD   4 Wire RTD

1K to 100K
3 Wire Pot
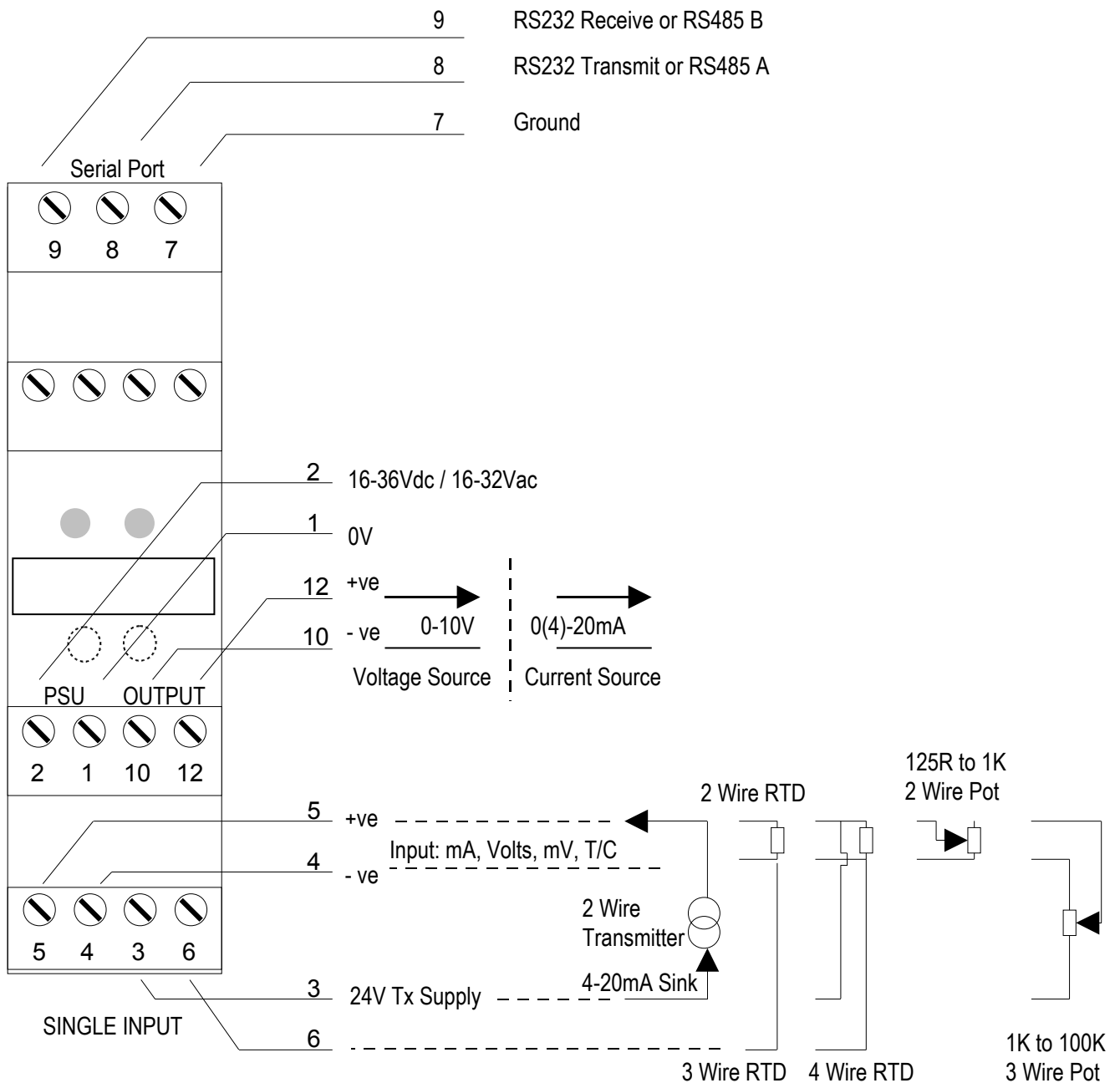
The diagram below shows how to connect to an E-100 with a dual input, an analogue output and an Ethernet port.
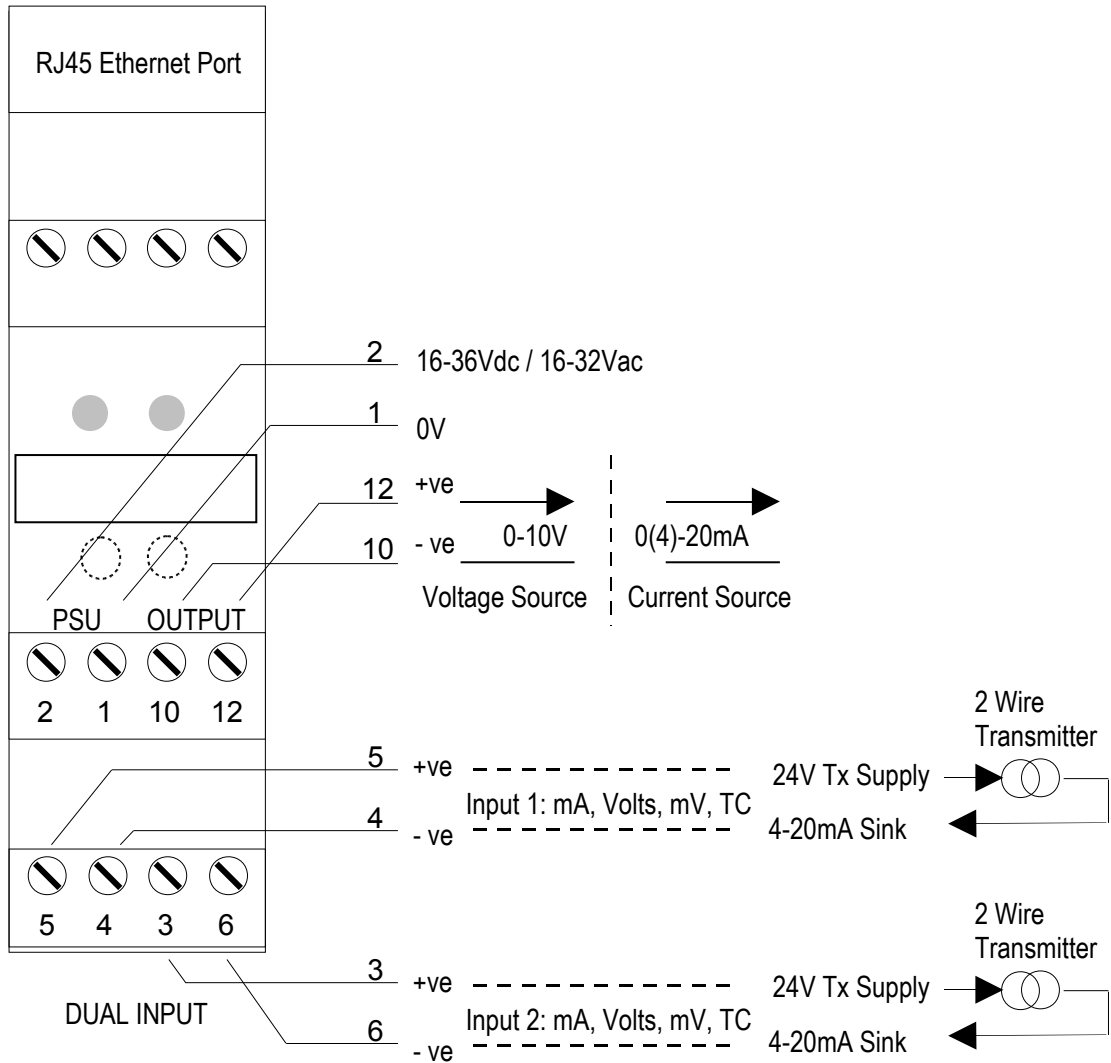
5. CONFIGURING THE SINGLE INPUT E-100 INPUT STAGE

⚠ | **! WARNING !**
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH
POWER SUPPLY, INPUT OR OUTPUT CONNECTED

See Section 6 for details of how to configure the dual input E-100.

The Single Input E-100 is an extremely versatile device which can support many different types of input. The unit is configured by turning the power off, selecting the internal switch settings required and turning the power back on. Further options are chosen using the menu system via the display.

To open the E-100, 2 catches just below the outer terminal blocks must be pushed in gently, one at a time. The front of the case can then be pulled and the unit will come out of the box.
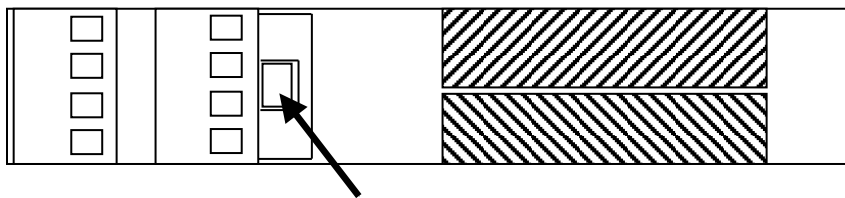
Press here gently

On a single input E-100 there are 2 switch banks, S1 and S2, a link L201 and a single switch S4 located inside the E-100 as shown below:

ON = 1
OFF = 0

Switch 10 is OFF
Switch 11 is ON
Switch 12 is OFF

Switch S2
1   12

Switch S1
1   12

OFF

ON
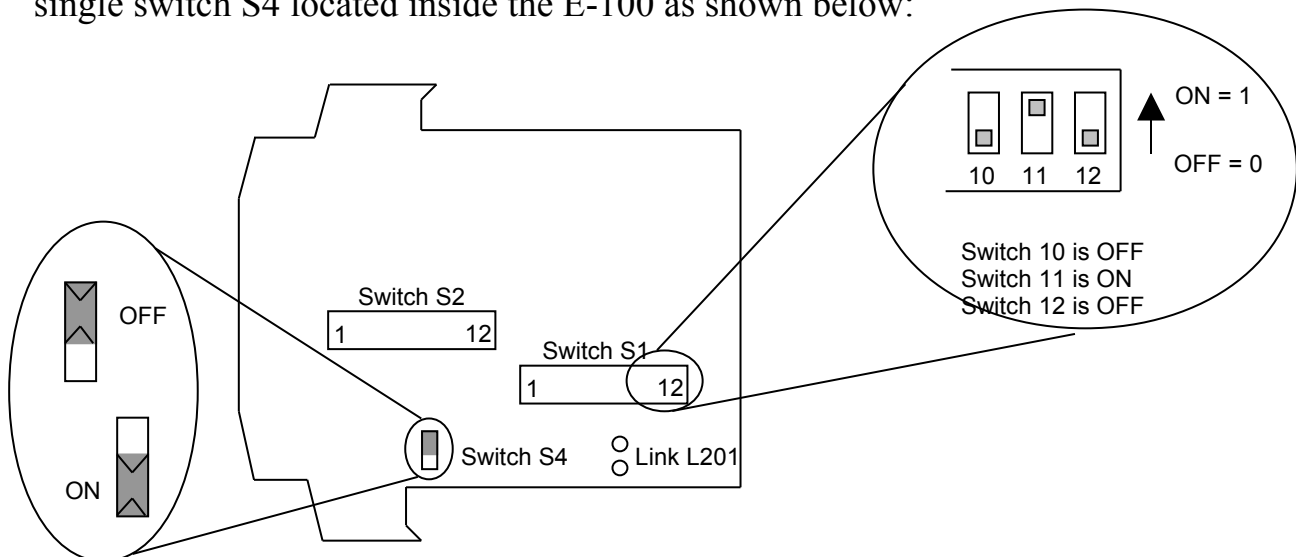
Switch S4   Link L201

Switch S1, S2 and Link L201 configure the input type and range, and switch S4 configures the output type. The switch settings are explained in the next few pages. The diagrams refer to switch positions 0 and 1, with 0 being OFF and 1 being ON. This is illustrated in the picture above.

5.1   Voltage Input:

Select the range from the table below and set Switch S1 to the required values.

Voltage Range	Switch S1											
	1	2	3	4	5	6	7	8	9	10	11	12
0-1V	0	0	0	0	0	1	0	0	1	1	0	0
0-2V	0	0	0	1								0
0-4V	0	0	1	0								0
0-5V	0	1	0	0								0
0-7.5V	1	0	0	0								0
0-8V	0	0	1	1								0
0-10V	0	1	0	1								0
0-15V	1	0	0	1								0
0-20V	0	1	1	0								0
0-30V	1	0	1	0								0
0-40V	0	1	1	1								0
1-5V	0	1	0	0								1
-5 to +5V	1	1	0	0								1
-10 to +10V	1	1	0	1	0	1	0	0	1	1	0	0

Then select the required setting from the table below for switch S2.

Voltage Range	Switch S2											
	1	2	3	4	5	6	7	8	9	10	11	12
0-30V & 0-40V Ranges	0	0	1	1	0	0	1	1	0	0	0	0
All other Ranges Listed Above	0	0	1	0	1	0	1	0	0	0	0	0

! WARNING !
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH POWER SUPPLY, INPUT OR OUTPUT CONNECTED

5.2 Current Input

Select the range from the table below and set Switch S1 to the required values.

mA Range	Switch S1											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-1mA	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**
0-2mA	0	0	0	1								0
0-4mA	0	0	1	0								0
0-5mA	0	1	0	0								0
0-8mA	0	0	1	1								0
0-10mA	0	1	0	1								0
0-15mA	1	0	0	1								0
0-20mA	**0**	**1**	**1**	**0**								**0**
0-30mA	1	0	1	0								0
4-20mA	**0**	**1**	**1**	**0**								**1**
4-40mA	0	1	1	1								1
4-30mA	1	0	1	0								1
-5 to +5mA	1	1	0	0								1
-10 to +10mA	1	1	0	1	0	0	0	0	1	1	1	0

Then select the required setting from the table below for switch S2.

mA Range	Switch S2											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Using Internal 24V Tx Supply for 4 to 20mA transmitter	1	1	0	1	0	0	1	1	0	0	1	0
Unipolar Ranges (e.g. 0-20mA, 4-20mA)	1	1	0	0	0	0	1	1	0	0	0	0
Bipolar Ranges (e.g. -10 to +10mA)	1	1	0	0	1	0	1	0	0	0	0	0

! WARNING !
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5.3   Millivolt (mV) Input

Select the range from the table below and set Switch S1 to the required values.

mV Range	Switch S1											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25mV	0	0	0	0	0	0	0	1	1	1	0	0
0-50mV	0	0	0	1								
0-100mV	**0**	**0**	**1**	**0**								
0-125mV	0	1	0	0								
0-150mV	1	0	0	0								
0-200mV	**0**	**0**	**1**	**1**								
0-250mV	0	1	0	1								
0-300mV	1	0	0	1								
0-500mV	**0**	**1**	**1**	**0**								
0-600mV	1	0	1	0								
0-1000mV	0	1	1	1								
0-1200mV	1	0	1	1								
-125 to +125mV	1	1	0	0								
-125 to +1000mV	1	1	1	1	0	0	0	1	1	1	0	0

And then select the required setting from the table below for switch S2.

mV Range	Switch S2											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
All Unipolar Ranges (e.g. 0-500mV)	0	1	0	0	0	0	1	1	0	0	0	0
Bipolar Ranges (e.g. -125 to +125mV)	0	1	0	0	1	0	1	0	0	0	0	0

! WARNING !
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5.4   Potentiometer Input

Select the range from the table below and set Switch S1 to the required values.

Potentiometer Input	Switch S1											
	1	2	3	4	5	6	7	8	9	10	11	12
2 Wire 0-125R	0	0	0	0	0	0	0	1	1	1	0	1
2 Wire 0-250R	0	0	0	1								
2 Wire 0-500R	**0**	**0**	**1**	**0**								
2 Wire 0-625R	0	1	0	0								
2 Wire 0-750R	1	0	0	0								
2 Wire 0-1K	**0**	**0**	**1**	**1**	0	0	0	1	1	1	0	1
If option fitted:												
3 Wire from												
0-1K to 0-100K	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**0**

Then select the required setting from the table below for switch S2.

Potentiometer Input	Switch S2											
	1	2	3	4	5	6	7	8	9	10	11	12
2 Wire Potentiometer	0	1	0	0	1	0	0	1	0	0	0	1
If option fitted:												
3 Wire Potentiometer	0	0	**ALSO FIT LINK L201**									
	0	0	1	1	0	0	1	1	0	0	1	0

Please note that to use a 3 wire pot input link L201 must be fitted (see diagram on page 8 for its location).

> ! **WARNING** !
> **DO NOT OPEN UNIT OR ADJUST SWITCHES WITH**
> **POWER SUPPLY, INPUT OR OUTPUT CONNECTED**

5.5 Thermocouple Input

Select the range from the table below and set Switch S1 to the required values.

Switch S1 for Thermocouple Input															
Temperature Range in °C			Switch												
K J R S N E	B	T	1	2	3	4	5	6	7	8	9	10	11	12	
0 to 100	400 to 500	0 to 50	0	0	0	0		0	0		0				
0 to 200	400 to 600	0 to 100	0	0	0	1									
0 to 400	400 to 800	0 to 200	0	0	1	0									T/C
0 to 800	400 to 1200	0 to 400	0	0	1	1									Type
0 to 125	400 to 525	-50 to 50	0	1	0	0						0	0	0	K
0 to 250	400 to 650	-50 to 100	0	1	0	1						0	0	1	J
0 to 500	400 to 900	-50 to 200	0	1	1	0						0	1	0	R
0 to 1000	400 to 1400	-50 to 400	0	1	1	1						0	1	1	S
0 to 150	400 to 550	-100 to 50	1	0	0	0						1	0	0	N
0 to 300	400 to 700	-100 to 100	1	0	0	1						1	0	1	E
0 to 600	400 to 1000	-100 to 200	1	0	1	0						1	1	0	B
0 to 1200*	400 to 1600	-100 to 400	1	0	1	1						1	1	1	T
0 to 175	400 to 575	-200 to 50	1	1	0	0									
0 to 350	400 to 750	-200 to 100	1	1	0	1									
0 to 700	400 to 1100	-200 to 200	1	1	1	0									
0 to 1400**	400 to 1800	-200 to 400	1	1	1	1		0	0		0				

Linearisation ON	0	
Linearisation off	1	

CJC ON	0	
CJC off	1	

* n/a for types N and E
** n/a for types K, J, N and E

Then select the required setting from the table below for switch S2.

Thermocouple	Switch S2											
	1	2	3	4	5	6	7	8	9	10	11	12
All Ranges	0	1	0	0	1	1	1	0	0	0	0	0

! WARNING !
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5.6   RTD Input

Select the range from the table below and set Switch S1 to the required values.

Range in °C	Switch S1											
	1	2	3	4	5	6	7	8	9	10	11	12
0 to 100	0	0	0	0		0	0		1	0	0	
0 to 200	0	0	0	1								
0 to 400	0	0	1	0								
0 to 800	0	0	1	1								
-50 to 50	0	1	0	0								
-50 to 150	0	1	0	1								
-50 to 250	0	1	1	0								
-50 to 350	0	1	1	1								
-100 to 50	1	0	0	0								
-100 to 100	1	0	0	1								
-100 to 200	1	0	1	0								
-100 to 400	1	0	1	1								
-200 to 200	1	1	0	0								
-200 to 400	1	1	0	1								
-200 to 600	1	1	1	0								
-200 to 800	1	1	1	1		0	0		1	0	0	

RTD linearisation ON	0	
RTD linearisation off	1	

PT100	0	
PT1000	1	

RTD 2 or 4 wire	0	
RTD 3 wire	1	

And then select the required setting from the table below for switch S2.

RTD	Switch S2											
	1	2	3	4	5	6	7	8	9	10	11	12
2 Wire RTD	0	1	0	0	1	0	0	1	0	0	0	1
3 Wire RTD	0	1	0	0	0	0	0	0	1	0	0	1
4 Wire RTD	0	1	0	0	0	0	0	1	0	1	0	0

⚠

! WARNING !
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH
POWER SUPPLY, INPUT OR OUTPUT CONNECTED

## 6.   CONFIGURING THE DUAL INPUT E-100 INPUT STAGE

> ! WARNING !
> DO NOT OPEN UNIT OR ADJUST SWITCHES WITH
> POWER SUPPLY, INPUT OR OUTPUT CONNECTED

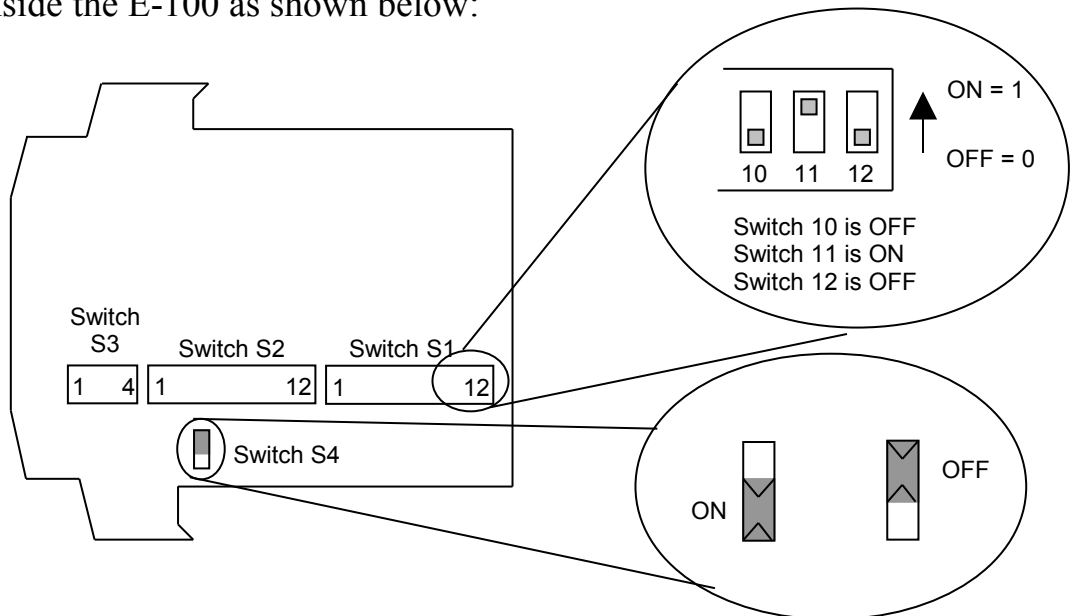See Section 5 for details of how to configure the single input E-100.

The Dual Input E-100 is an extremely versatile device which can support two inputs. The unit is configured by turning the power off, selecting the internal switch settings required and turning the power back on. Further options are chosen using the menu system via the display.

To open the E-100, 2 catches just below the outer terminal blocks must be pushed in gently, one at a time. The front of the case can then be pulled and the unit will come out of the box.
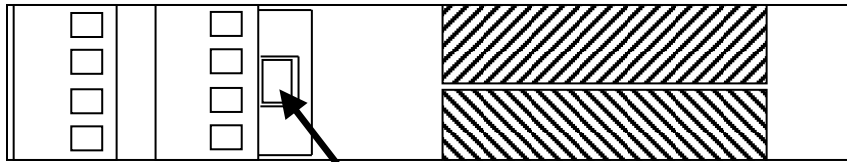
Press here gently

On a dual input E-100 there are 3 switch banks, S3, S2 and S1 and a single switch S4 located inside the E-100 as shown below:

ON = 1
OFF = 0

10 11 12

Switch 10 is OFF
Switch 11 is ON
Switch 12 is OFF

Switch
S3
Switch S2   Switch S1

1   4 1   12 1   12

Switch S4

ON   OFF

Switches S1, S2 and S3 configure the input type and range, and switch S4 configures the output type. The switch settings are explained in the next few pages. The diagrams refer to switch positions 0 and 1, with 0 being OFF and 1 being ON. This is illustrated in the picture above.

6.1 Voltage Input

Select the voltage range from the table below for Input 1 or Input 2 or both and set switches S1, S2 and S3 to the required values.
Note that:
Input 1 is configured with switches 1,3,4,5,6,7 on S1 and switches 1,2,5,6,9,10 on S2 and switches 3,4 on S3
Input 2 is configured with switches 2,8,9,10,11,12 on S1 and switches 3,4,7,8,11,12 on S2 and switches 1,2 on S3

This allows the inputs to be set up independently, so that input 1 could be 0-10V and input 2 could be 4-20mA with Tx supply if required

Voltage Range	Switch S1						Switch S2						Switch S3	
Input 1	1	3	4	5	6	7	1	2	5	6	9	10	3	4
Input 2	2	8	9	10	11	12	3	4	7	8	11	12	1	2
0-1V	0	1	1	1	0	1	1	1	0	0	1	0	0	0
0-2V				1	0	0								
0-2.5V				1	0	0								
0-3V				0	1	1								
0-4V				0	1	1								
0-5V				0	1	1								
0-7.5V				0	1	0								
0-8V				0	1	0								
0-10V				0	1	0								
0-15V				0	0	1								
0-20V				0	0	1								
0-30V				0	0	0								
0-40V				0	0	0								
1-5V				0	1	1								
-2 to +2V	0	0	1	1	0	0	1	1	0	0	0	1	0	0
-5 to +5V				0	1	1								
-7.5 to 7.5V				0	1	0								
-10 to +10V				0	1	0								
-20 to +20V				0	0	1								
-24 to +24V				0	0	0								

For example
Input 1 is 0-10V: S1 has 3,4,6 on, S2 has 1,2,9 on, S3 has 3,4 off
Input 2 is 0-5V: S1 has 8,9,11,12 on, S2 has 3,4,11 on, S3 has 1,2 off

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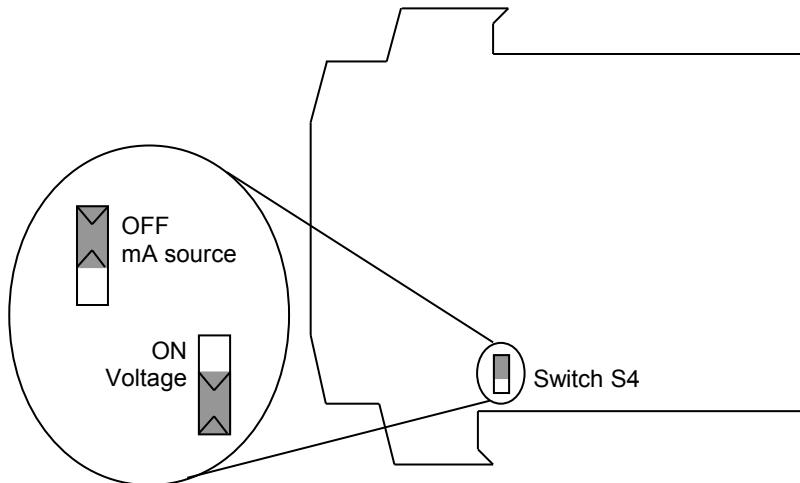**! WARNING !**
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH POWER SUPPLY, INPUT OR OUTPUT CONNECTED

6.2 Current Input

Select the current range from the table below for Input 1 or Input 2 or both and set switches S1, S2 and S3 to the required values.
Note that:
Input 1 is configured with switches 1,3,4,5,6,7 on S1 and switches 1,2,5,6,9,10 on S2 and switches 3,4 on S3
Input 2 is configured with switches 2,8,9,10,11,12 on S1 and switches 3,4,7,8,11,12 on S2 and switches 1,2 on S3

mA Range	Switch S1						Switch S2						Switch S3	
Input 1	1	3	4	5	6	7	1	2	5	6	9	10	3	4
Input 2	2	8	9	10	11	12	3	4	7	8	11	12	1	2
0-1mA	0	1	0	1	1	1	1	1	1	1	1	0	0	0
0-2mA				1	1	0								
0-4mA				1	0	1								
0-5mA				1	0	1								
0-8mA				1	0	0								
0-10mA				1	0	0								
0-15mA				0	1	1								
0-20mA				0	1	1								
0-30mA				0	1	0								
4-20mA				0	1	1								
4-40mA				0	1	1								
4-30mA	↓	↓	↓	0	1	1	↓	↓	↓	↓	↓	↓	↓	↓
-5 to +5mA	1	0	0	1	0	1	1	1	1	1	0	0	0	0
-10 to +10mA	1	0	0	1	0	0	1	1	1	1	0	0	0	0

For current inputs an internal 24V Tx supply is available. Select if this is required from the table below and set switches S1, S2 and S3 to the required values.

24V Tx Supply mA Range	Switch S1						Switch S2						Switch S3	
Input 1	1	3	4	5	6	7	1	2	5	6	9	10	3	4
Input 2	2	8	9	10	11	12	3	4	7	8	11	12	1	2
0-10mA	0	1	0	1	0	0	0	0	1	1	1	0	1	1
0-20mA				0	1	1								
4-20mA				0	1	1								
4-30mA				0	1	1								
4-40mA	↓	↓	↓	0	1	1	↓	↓	↓	↓	↓	↓	↓	↓

For example:
Input 1 is 4-20mA with Tx supply: S1 has 3,6,7 on, S2 5,6,9 on, S3 has 3,4 on
Input 2 is standard 0-20 mA: S1 has 8,11,12 on, S2 has 3,4,7,8,11 on, S3 has 1,2 off

6.3   Millivolt (mV) Input

Select the millivolt range from the table below for Input 1 or Input 2 or both and set switches S1, S2 and S3 to the required values.
Note that:
Input 1 is configured with switches 1,3,4,5,6,7 on S1 and switches 1,2,5,6,9,10 on S2 and switches 3,4 on S3
Input 2 is configured with switches 2,8,9,10,11,12 on S1 and switches 3,4,7,8,11,12 on S2 and switches 1,2 on S3

This allows the inputs to be set up independently, so that input 1 could be 0-100mV and input 2 could be 4-20mA with Tx supply if required

mV Range	Switch S1							Switch S2							Switch S3		
Input 1	1	3	4	5	6	7		1	2	5	6	9	10		3	4	
Input 2	2	8	9	10	11	12		3	4	7	8	11	12		1	2	
0-25mV	0	1	0	1	1	0		1	1	1	0	1	0		0	0	
0-50mV				1	0	1											
0-100mV				1	0	0											
0-125mV				1	0	0											
0-150mV				1	0	0											
0-200mV				0	1	1											
0-250mV				0	1	1											
0-300mV				0	1	1											
0-500mV				0	1	0											
0-600mV				0	1	1											
0-1000mV				0	0	1											
0-1200mV				0	0	1											
-250 to +250mV	1	0	0	0	1	1		1	1	1	0	0	0		0	0	
-250 to +1000mV	1	0	0	0	0	1		1	1	1	0	0	0		0	0	

For example:
Input 1 is 0-50mV: S1 has 3,5,7 on, S2 has 1,2,5,9 on, S3 has 3,4 off
Input 2 is 0-100mV: S1 has 8,10 on, S2 has 3,4,7,11 on, S3 has 1,2 off

⚠

! WARNING !
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH
POWER SUPPLY, INPUT OR OUTPUT CONNECTED

7. CONFIGURING THE E-100 OUTPUT STAGE

If an analogue output is fitted the output type is selected with Switch S4.

Output Type	S4 Position
mA Source	Off
Voltage	On

OFF
mA source

ON
Voltage

Switch S4

	! WARNING !
⚠ !	DO NOT OPEN UNIT OR ADJUST SWITCHES WITH POWER SUPPLY, INPUT OR OUTPUT CONNECTED

8. CALIBRATING THE E-100

When the unit is shipped the E-100 will be calibrated for the input and output types and ranges noted on the side label if they are fitted. If this label is blank then the unit will be calibrated for 4-20mA input(s) and 4-20mA output.

The display is used to show scaled values of the inputs and outputs in the system, or ON and OFF for digital inputs and outputs. The left button scrolls through the available channels, and the right button scrolls through the available parameters. Whilst the button is held down, the channel number is shown on the left of the screen, and the parameter is shown on the right. The led on the display will flash every 3 seconds to indicate to the user that the unit is operating. The display can be configured to remain on all the time, or switch off after 15 minutes.

8.1 Main menu

To access the main menu push and hold both buttons until OK is displayed.
These are the main menu options, use raise and lower buttons to cycle through:

1. IN1 SPAN	*(sec 8.2)*	14. BURNOUT Cc Pp	*(sec 8.9)*
2. IN1 ZERO	*(sec 8.2)*	15. LEVEL level	*(sec 8.9)*
3. IN2 SPAN	*(sec 8.3)*	16. TIME time	*(sec 8.9)*
4. IN2 ZERO	*(sec 8.3)*	17. VIEW BURNOUT	*(sec 8.10)*
5. OUT SPAN	*(sec 8.4)*	18. MODBUS type	*(sec 8.11)*
6. OUT ZERO	*(sec 8.4)*	19. ADDRESS address	*(sec 8.12)*
7. DSV Cc Pp	*(sec 8.5)*	20. BAUD baudrate	*(sec 8.13)*
8. DS span	*(sec 8.5)*	21. PORT port setting	*(sec 8.14)*
9. DZ zero	*(sec 8.5)*	22. CH TIME	*(sec 8.15)*
10. VIEW DSV	*(sec 8.6)*	23. DISPLAY time	*(sec 8.16)*
11. OUT Cc Pp	*(sec 8.7)*	24. AGE age	*(sec 8.17)*
12. LINK Cc Pp	*(sec 8.7)*	25. DEFAULTS	*(sec 8.18)*
13. VIEW LINK	*(sec 8.8)*		

Note: menu options 1,2,3,4,5,6 are only available when the input(s) or output are fitted.

To access the sub menu of one of the main menu options, use raise or lower to cycle to the option required then push and release both buttons. Change the parameter as required.

To return to the main menu, push and release both buttons.

To exit from the main menu and return to run mode, press and hold both buttons for 2 seconds until OK is displayed on the screen.

After two minutes of inactivity from the front buttons when the main menu (or a sub menu) had been accessed, the unit will automatically return to run mode.

8.2 Input 1 Span and Input 1 Zero values (1. IN1 SPAN and 2. IN1 ZERO)

8.3 Input 2 Span and Input 2 Zero values (3. IN2 SPAN and 4. IN2 ZERO)

These menu options allow the E-100 to learn the input span and input zero values for either single or dual inputs.

Menu option	Dual input E-100	Single input E-100	Standard E-100
1.IN1 SPAN	Yes	Yes	No
2.IN1 ZERO	Yes	Yes	No
3.IN2 SPAN	Yes	No	No
4.IN2 ZERO	Yes	No	No

To learn the input calibration values for input 1:

Display	Action
1.IN1 SPAN	Apply full scale input to input 1
	Press and release both buttons together
IS1	Press raise button to make the E-100 learn the input value
IS1✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
1.IN1 SPAN	Push the raise button once to change menu item
2.IN1 ZERO	Apply zero scale input to input 1
	Press and release both buttons together
IZ1	Press raise button to make the E-100 learn the input value
IZ1✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
2.IN1 ZERO	

8.4 Output Span and Output Zero (5. OUT SPAN and 6. OUT ZERO)

The output span and output zero values are learnt in a similar way to the inputs, if there is an output fitted to the E-100.

Display	Action
5.OUT SPAN	Press and release both buttons together
OS	Press raise/lower buttons to adjust output value until correct
OS✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
5.OUT SPAN	Push the raise button once to change menu item
6.OUT ZERO	Press and release both buttons together
OZ	Press raise/lower buttons to adjust output value until correct
OZ✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
6.OUT ZERO	

8.5   Display Scaling Values Adjust (7. DSV Cc Pp, 8. DS span, 9. DZ zero)

The display can show a scaled numerical value for each parameter of each channel. Scaling values can be adjusted between –999 and 9999. The default scaling values are 0 to 100. For all channels, all 8 parameters can be changed even if the channel is not used, or the parameter is an output.

For channels with digital outputs, the display scaling values can be used to configure setpoints if the digital output is linked to follow an analogue input. The setpoints are compared to the analogue input value to switch the digital output on and off. The setpoints are configured as percentage values (0-100%). The span value is the on setpoint and the zero value is the hysteresis. The off setpoint is calculated by adding the span and hysteresis together.

The hysteresis value can be positive or negative. If hysteresis is <u>negative</u>, the digital output switches <u>on</u> (when the analogue value it is following is) <u>above the on setpoint</u> and off below the off setpoint. For example if span is 50% and zero is -10%, output switches on above 50% and off again below 40%.

If hysteresis is <u>positive</u>, the digital output switches <u>on below the on setpoint</u> and off above the off setpoint. For example if span is 50% and zero is 20%, output switches on below 50% and off again above 70%.

Example: To change the scaling of channel 3 parameter 2, from 0 - 100 to 4 - 20:

Display	Action
7.DSV C1 P1	C1 P1 is channel 1 parameter 1
	Press and release both buttons together
01 1	Press lower button to choose channel (on left: 1 to 32)
03 1	Press raise button to choose parameter (on right : 1 to 8)
03 2	Press and release both buttons together
7.DSV C3 P2	C3 P2 is channel 3, parameter 2
	Push the raise button once to change menu item
8.DS 100	Display Span value is 100
	Press and release both buttons together
100	Press raise/lower buttons to adjust display span value
20	Press and release both buttons together
8.DS 20	Display Span value is now 20
	Push the raise button once to change menu item
9.DZ 0	Display Zero value is 0
	Press and release both buttons together
0	Press raise/lower buttons to adjust display zero value
4	Press and release both buttons together
9.DZ 4	Display Zero value is now 4

7.DSV Cc Pp is used to select the channel and parameter that need display values changing, where c represents the channel and p indicates the parameter.
To select a different channel or parameter enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32) and the raise button increases the parameter (1 to 8).

For the channel and parameter chosen in menu 3:
8.DS span indicates what the display span value is (span is –999 to 9999)
To change the display span value enter the sub menu and adjust it.

9.DZ zero indicates what the display zero value is (zero is –999 to 9999)
To change the display zero value enter the sub menu and adjust it.

8.6   View Display Scaling Values (10.VIEW DSV)

To view all eight parameter scaling values of a particular channel, enter this sub menu. The first channel shown will be the one selected in 7.DSV Cc Pp. The scaling values will be shown in a scrolling message in this format:
e.g. for channel 3:

C3.P1 100,0 P2 20,4 P3 100,0 P4 100,0 P5 100,0 P6 100,0 P7 100,0 P8 100,0

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again for a different channel.

8.7   Linking Outputs to other Parameters (11. OUT Cc Pp, 12. LINK Cc Pp)

The E-100 4-20mA or 0-10V output can represent the value of any parameter locally on the E-100 bus. The outputs of local Isoslice units can also represent any parameter locally on the E-100 bus. This is done using a link table, which links the outputs (usually of input devices) to the parameters they must represent.

By default outputs are linked to themselves, so that an output is controlled by a Modbus write to its associated register.

Go to main menu item 11.OUT Cc Pp where c and p show the channel and parameter of the <u>output that needs to be linked to an input value</u>. To select a different output, enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32), the raise button increases the parameter (1 to 8). Once the channel and parameter of an output have been chosen, exit the sub menu.

Go to main menu item 12.LINK Cc Pp where c and p show the channel and parameter that the output chosen in 12 is currently linked to. (Note the distinction: it allows the user to see what parameter an output is linked to without needing to go into the LINK submenu).

Use this submenu to choose the parameter that the output needs to follow. The display will show the channel on the left and the parameter on the right. The left button increases the channel (1 to 32), the right button increases the parameter (1 to 8). Once the channel and parameter of the input or output that the output chosen in 7 is to be linked to has been chosen, exit the sub menu.

The link function typically allows analogue outputs to follow analogue inputs from Isoslice units on the isoslice bus, or allow digital outputs on to follow digital inputs.

Analogue outputs can be linked to digital inputs. If an analogue output is linked to a digital input, it will output 100% if the digital input is On and 0% if it is Off.

Digital outputs can be linked to analogue inputs, with programmable setpoints to control at what analogue input value the digital output is switched on and off. The setpoints are programmed as Display Scaling Values, as described in section 8.5.

The link table only affects output parameters. If an input parameter is linked to follow another, its value will be unaffected by the link table operation.

If an analogue output is linked to a digital parameter, it will output 100% for ON and 0% for OFF. If a digital output links to an analogue parameter it will be ON for values above 50% and off for values below 50%. Note that the parameter linked to could be an output or an input, so that outputs can be duplicated if required.

By default all outputs in the system are configured to be controlled by writes to a Modbus register by a Modbus Master, so they link to themselves by default.

Example:
Channel 1 is the E-100 with 1 analogue output, parameter 1.
Channel 2 is an Isoslice-2 with 8 analogue inputs, parameters 1 to 8.
Channel 3 is an Isoslice-8 with 4 analogue outputs, parameters 1 to 4.

To make the E-100 output 1 follow Isoslice-2 input 1 and
make output 1 on the Isoslice-8 follow input 2 of the Isoslice-2

Display	Action
11.OUT C1 P1	C1 P1 is the E-100 output which needs to be linked
	Push the raise button once to change menu item
12.LINK C1 P1	This shows the E-100 output is under Modbus control
	because it is linked to itself, C1 P1
	Push and release both buttons together
02 1	Press lower button to choose channel 2 (on left: 1 to 32)
	Press and release both buttons together
12.LINK C2 P1	E-100 output is now linked to the Isoslice-2, input 1
	Push the lower button to change menu item
11.OUT C1 P1	C1 P1 is the E-100 output.
	We need to select the Isoslice–8 on channel 3
	Push and release both buttons together
03 1	Push left button to select C3, the Isoslice-8, output 1
	Press and release both buttons together
11.OUT C3 P1	C3 P1 is output 1 of the Isoslice-8 on channel 3
	Push the raise button once to change menu item
12.LINK C3 P1	This shows the Isoslice-8 output 1 is under Modbus control
	because it is linked to itself, C3 P1
	Push and release both buttons together
03 1	We need to link it to the isoslice-2, Channel 2 Parameter 2
02 1	Push lower button to select channel 2 (on left: 1 to 32)
02 2	Push raise button to select parameter 2 (on right: 1 to 8)
	Push the raise button once to change menu item
12.LINK C2 P2	Isoslice-8 output 1 is now linked to Isoslice-2 input 2

8.8   View Link Table (13.VIEW LINK)

To view the parameters that a channel is linked to use the 13.VIEW LINK menu. The channel and parameters that the outputs are linked to can be seen in a scrolling message in this format
e.g. for channel 3:

C3.P1 2,2 P2 3,2 P3 3,3 P4 3,4 P5 3,5 P6 3,6 P7 3,7 P8 3,8

This shows that channel 3 parameter 1 is linked to channel 2, parameter 2, and all the other channel 3 parameters link to themselves and are therefore under modbus control.

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again, for a different channel.

8.9   Burnout Control (14.BURNOUT Cc Pp, 15.LEVEL level, 16.TIME time)

14.BURNOUT is used to select the channel and parameter of an output for menu 15.LEVEL level (where level is HI or LO for that output parameter) and the channel for menu 16.TIME time (where time is the timeout value for that input channel).

Go to main menu item 14.BURNOUT Cc Pp where c and p show the channel and parameter of the output that needs its burnout level to be changed or the input channel that needs its timeout value to be changed. To select a different channel or parameter, enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32), the raise button increases the parameter (1 to 8). Once the channel and parameter have been chosen, exit the sub menu.

Burnout Level Control

When an output is following an input (because it is linked to it via the LINK and OUT menu) at some stage it may need to indicate the value it is following is not valid. This occurs if the input has any error condition (burnout, data not available etc) or has timed out because data has not refreshed recently enough (see Burnout Time Control in the next section).

The Burnout Level menu allows individual outputs to indicate this condition by either going to a HI burnout value (23mA or 11.5V for an analogue output, On for a digital output), or a LO burnout value (0mA or 0V for an analogue output, Off for a digital output).

To change the burnout level of an output first select the correct channel and parameter using menu 14.BURNOUT. Then select menu 15.LEVEL level and in the sub menu choose HI or LO.

The default Burnout Level for all parameters of all channels is HI.

Burnout Time Control

Each channel has an Age parameter associated with it to give an indication of how old the data is. If the device providing that data becomes unable to send any new data, there comes a time when the data held by the E-100 can be considered too old to be valid. It is possible to set a time limit on each channel that will make the E-100 change old data values to a timeout error condition (0xFFFE or E 15 on the display) if the time limit is reached.

To change the timeout value for an input channel first select the correct channel using menu 14.BURNOUT. Then select menu 16.TIME time and in the sub menu choose OFF to disable the timeout, or a value between 1 and 255 inclusive.

The default Burnout Timeout for all channels is OFF.

8.10   View Burnout (17.VIEW BURNOUT)

To view the burnout configuration for each channel use the 17.VIEW BURNOUT menu. The channel burnout time and parameter burnout levels can be seen in a scrolling message.

e.g. for channel 2:
C2 30 P1 HI P2 HI P3 HI P4 HI P5 HI P6 HI P7 HI P8 HI

This shows that if this is an input, its data will become invalid if it is older than 30 seconds (or minutes depending on AGE parameter selected, see section 8.17).

e.g. for channel 3:
C3 OFF P1 HI P2 HI P3 HI P4 HI P5 HI P6 HI P7 HI P8 HI

This shows that if this is an output, all burnout indications are set to HI. If it is an input, data values are not affected by any timeout.

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again, for a different channel.

8.11   Serial Protocol (18.MODBUS type)

The main menu will display type as either RTU or TCP.

This option allows the serial protocol to be selected. If a different serial protocol is available, the name of it will be shown in this sub menu, but it cannot be changed.

MODBUS RTU   (default)
MODBUS TCP

8.12   Slave Address (19.ADDRESS address)

The main menu will display the address or unit identifier after ADDRESS
The Modbus slave address or unit identifier can be changed. Selectable addresses are 1 to 247.
The default slave address is 11.

8.13   Baud Rate (20.BAUD baud)

The main menu will display the current baud rate after BAUD.
The default baud rate is 9600. Selectable baud rate values are:

4800
9600   (default)
19200
38400
57600   (this should be selected if Ethernet port is used)

8.14   Port Settings (21.PORT port setting)

The main menu will display the port setting after PORT.
The default port settings are 8 data bits, no parity, 1 stop bit.
Selectable port settings are:

8N1   8 data bits, no parity, 1 stop bit (default)
8N2   8 data bits, no parity, 2 stop bits
8O1   8 data bits, odd parity, 1 stop bit
8E1   8 data bits, even parity, 1 stop bit

8.15   Character Timeout (22.CH TIME)

This is the time after the last character was received by the E-100 before the E-100
will respond to the message. For a standard Modbus RTU message, this is normally
3.5 character widths, so the values can be set as low as in the table below.

9600 baud 3.64ms
19200 baud 1.82ms
38400 baud 0.91ms
57600 baud 0.61ms

The default value is 3.99ms

If the RS485 master is slow to release the bus lines after sending a data request, this
delay can be increased to compensate so that the data is not sent until the master is
ready.
The value on the display is in ms. It can be adjusted from 0 to 13.06 ms

8.16   Display Timer (23.DISPLAY display)

Choose if the display remains on all the time or switches off 15 minutes after a button was last pressed.

ON   select this to make the display stay on all the time
15   select this to make the display switch off after 15 minutes (default)

8.17   Age Select (24.AGE age)

The age of a parameter can be counted in seconds or minutes. Use this menu to select between.

SEC   select this to count in seconds (default)
MIN   select this to count in minutes

8.18   Restore Defaults (25.DEFAULTS)

All values that can be changed using the menu system can be restored to default values.
Choose to do this by selecting YES

NO   select this to change nothing
YES   select this to restore all menu values to defaults

To select YES, hold down the raise button for about 5 seconds until the display says YES.

If it returns to the main menu when YES was displayed SAVE will be displayed and the red led will come on for a few seconds while default data is restored and saved to eeprom.

9.   ISOSLICE BUS

The Isoslice units are powered from the Din rail mounted bus connectors.

The E-100 will scan the bus when it powers up to find Isoslice units that are attached. Initially the data values of all data registers are 0xFFF0, which indicates there is no data available.

Each Isoslice is read twice a second. Output data is written to the Isoslice as it is received.

If an Isoslice unit needs to be added to the bus, first switch the power off, add the new Isoslice unit and switch the power on again.

In a standard E-100 the maximum number of isoslice units that can be fitted is 31. This gives up to 249 parameters per E-100 if 8 input Isoslices are used, if the E-100 has an output fitted.

Channels are allocated to Isoslice units within the system, the channels must not be duplicated.

Special versions of the E-100 allow more than 32 channels at the expense of having less parameters per channel or provide a combination of channels with different numbers of parameters allocated. Modbus addressing depends on the mode since there is a varying amount of LQI and Age values to contend with. Isoslice units with more parameters than are available for the channel selected can be used, but the higher parameter values are unavailable.

Mode 1	*8 parameters, 32 channels (default)*	*32 Age and LQI*
Mode 2	*4 parameters, 64 channels*	*64 Age and LQI*
Mode 3	*2 parameters, 128 channels*	*128 Age and LQI*
Mode 4	*1 parameters, 256 channels*	*256 Age and LQI*
Mode 5	*8 p, 16 c + 4 p, 32 c*	*48 Age and LQI*
Mode 6	*8 p, 16 c + 2 p, 64 c*	*80 Age and LQI*
Mode 7	*8 p, 16 c + 1 p, 128 c*	*144 Age and LQI*
Mode 8	*8 p, 8 c + 4 p, 16 c + 2 p, 32 c + 1 p, 64 c*	*120 Age and LQI*

10. SERIAL DATA OPTIONS

The E-100 can be fitted with either an RS232, RS485 or Ethernet port to allow access to the data.
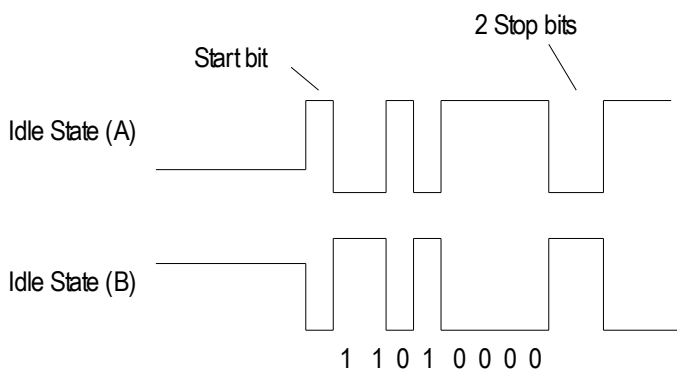
10.1 RS232

Baud rate, port settings and timeout can be changed using menu options 20,21,22. By default the port settings are 9600 baud, 8 data bits, no parity, 1 stop bit.

10.2 RS485

Baud rate, port settings and timeout can be changed using menu options 20,21,22. By default the port settings are 9600 baud, 8 data bits, no parity, 1 stop bit.

A 120 ohm termination resistor may be required across A and B

The A and B connections to the E-100 can be identified by the signals present on them whilst there is activity on the RS485 bus:

In this example first character is 0x0B, and 2 stop bits are used.

10.3   Ethernet

Baud rate, port settings and timeout can be changed using menu options 20,21,22. By default the port settings are 57600 baud, 8 data bits, no parity, 1 stop bit.

The E-100 can be fitted with an ethernet port. A standard network cable can be used to connect it to a router on a network.

The Ethernet port can be configured using the following software, available to download from the Lantronix website.

Device Installer v4.2 available to download at
http://www.lantronix.com/device-networking/utilities-tools/device-installer.html

By default :
• The ip address is obtained automatically, (or might be set to 192.168.0.81)
• The remote port is 502 (local port on the Xport).
• The baud rate is 57600.
• Port settings are 8 data bits, no parity, 1 stop bit, no flow control.

The ethernet port converts ethernet data packets to serial data and vice versa

Note that the ip address will be obtained automatically by default. It will almost always be necessary to allocate a static ip address to the E-100. This is achieved using the above software.

If connected directly to a PC, the E-100 requires a crossover cable and the PC will need to be allocated a static ip address.

11.   ACCESSING THE E-100 DATA

The E-100 acts as a Modbus slave.
Data can be read using Modbus command code 0x03 (or 0x04 if required).
Data can be written using Modbus codes 0x06 (single) and 0x10 (multiple) to registers of outputs (see 8.7) and scaling values and link table if unlocked (11.3).
All commands access the same "table" of registers. A maximum of 40 registers can be read in one request. A maximum of 8 registers can be written in one request.

Offset	Register	Description	Writeable
0 to 319	40001 to 40320	16 bit unsigned integer data	Yes
320 to 831	40321 to 40832	32 bit IEE-754 float	No
832 to 1087	40833 to 41088	16 bit signed integer span	If unlocked
1088 to 1343	41089 to 41344	16 bit signed integer zero	If unlocked
1344 to 1599	41345 to 41600	16 bit unsigned link value	If unlocked
1600 to 1631	41601 to 41632	Device type code	No
1632 to 1663	41633 to 41664	Burnout Level Bits	If unlocked
1664 to 1695	41665 to 41696	Burnout Timeout	If unlocked
1999	42000	Registers locked/unlocked	Yes

11.1   Reading Data Values

The E-100 is channel 1. Other units are channels 2 to 32. The data can be read as a 16 bit integer or as a scaled 32 bit float. Command 0x03 by convention should be used, but the E-100 supports reads to the table of data using command 0x04.

Reading 16 bit unsigned integer values:
Each channel has 10 registers associated with it.
The first 8 registers per channel are data values, followed by LQI then Age.

To calculate the 16 bit unsigned integer register offset:

16 bit Data Values	Offset is : (Channel – 1) x 10 + Parameter – 1	Register Offset + 40001
Channel 1	0 to 9	40001 to 40010
Channel 2	10 to 19	40011 to 40020
up to		
Channel 32	310 to 319	40311 to 40320

Valid data values are between 0x0000 and 0xFFEF.
Data values are calculated using the following formula,

$$\% \text{ Value} = \frac{\{ (\text{Input Value} - 3869) \times (\text{Span point} - \text{Zero point}) \}}{57781} + \text{Zero point}$$

The resulting value is a percentage in the range -6.70% to 106.7% (assuming 0 – 100% scaling).

It can be deduced that 3869 (0x0F1D) is 0.0% and 61650 (0xF0D2) is 100.0%.

A value in the range 0xFFF0 to 0xFFFF indicates data is unavailable.

0xFFF0, 0xFFF7: The input value is not available

0xFFF1 : The eeprom checksum indicates the eeprom is corrupt

0xFFF3 : The input value is currently unavailable

0xFFF4 : The input span value is too close to the (saved) input zero value

0xFFF5 : The input zero value is too close to the (saved) input span value

0xFFFD : Low burnout for an output that is linked to an input with invalid data

0xFFFE : Channel has timed out and data is no longer valid

0xFFFF : Thermocouple or RTD burnout

The Age value is a value in seconds or minutes (see 8.17) since the reading was taken, up to a maximum of 255.

The LQI value is the signal strength between 0 and 255. For a local Isoslice unit, 255 indicates the Isoslice is responding normally, or 0 if the Isoslice is not responding.

Reading 32 bit float scaled input values, IEEE-754 most significant word first:

To calculate the 32 bit float scaled input value register offset:

Floating Point Data Values	Offset is : (Channel – 1) x 16 + (Parameter – 1) x 2 + 320	Register Offset + 40001
Channel 1 Channel 2 up to Channel 32	320 to 335 336 to 351 816 to 831	40321 to 40336 40337 to 40352 40817 to 40832

Floating point values are written out most significant word first. The floating point value is the product of the input value scaled with the scaling values, so it is the same as the value shown on the display.

So for example if for channel 1, parameter 1:

Span point is 150 (0x0096) read from register 40769

Zero point is –20 (0xFFEC) read from register 41025

16 bit integer is 13398 (0x3456) read from register 40001

The value returned from register 40257 and 40258 is calculated by the E-100:

$\{((13398 – 3869) / 57781) \times (150 - -20) \} + -20 = 8.0357$

The value read from register 40257 is 0x4100 and 40258 is 0x922B
Most significant word is first so 0x4100922B converts to 8.0357

A handy tool for converting floating point values can be found here:
http://babbage.cs.qc.edu/IEEE-754/32bit.html

11.2 Reading Scaling and Other Values

The values used to scale the data values (shown on the display and the 32 bit float registers) can be read. They are signed integers.

> 0x0000 is 0
> 0x7FFF is 32767
> 0xFFFF is -1
> 0x8000 is -32768

To work out a value in the range 0x8000 to 0xFFFF (for example 0xFFEC)
Subtract 0xFFEC from 0x10000 = 0x14
Convert to decimal and change the sign = -20

Reading 16 bit Span Point Scaling Values:
To calculate the 16 bit span point register offset

Span Scaling	Offset is : (Channel – 1) x 8 + Parameter – 1 + 832	Register Offset + 40001
Channel 1	832 to 839	40833 to 40840
Channel 2	840 to 847	40841 to 40848
up to		
Channel 32	1080 to 1087	41081 to 41088

Convert the resulting signed integers as shown above.

Reading 16 bit Zero Scaling Point Values:
To calculate the 16 bit zero point registers offset

Zero Scaling	Offset is : (Channel – 1) x 8 + Parameter – 1 + 1088	Register Offset + 40001
Channel 1	1088 to 1095	41089 to 41096
Channel 2	1096 to 1103	41097 to 41104
up to		
Channel 32	1336 to 1343	41337 to 41344

Convert the resulting signed integers as shown above.

Reading 16 bit Output Link Values:
To calculate the 16 bit output link registers offset

Output Link	Offset is : (Channel – 1) x 8 + Parameter – 1 + 1344	Register Offset + 40001
Channel 1	1344 to 1351	41345 to 41352
Channel 2	1352 to 1359	41353 to 41360
up to		
Channel 32	1592 to 1599	41593 to 41600

For outputs on the system, the associated register will have a link value that the output represents. This is best illustrated with an example.

Channel 1 is the E-100 with 1 analogue output, parameter 1.
Channel 2 is an Isoslice-2 with 8 analogue inputs, parameters 1 to 8.
Channel 3 is an Isoslice-8 with 4 analogue outputs, parameters 1 to 4.

Read register 41345 to find out what the E-100 output represents when the E-100 is running. If its link value is 0x0000 it is referencing itself, so its output is under Modbus control. If the link value is 0x0008 it represents the value of parameter 1 of the Isoslice-2 on channel 2.

Read register 41361 to find out what the first analogue output (parameter 1) of the Isoslice-8 on channel 3 represents. If its link value is 0x0010 it is referencing itself, so its output is under Modbus control. If the link value is 0x0009 it represents the value of parameter 2 of the Isoslice-2 on channel 2.

Reading 16 bit Device Types
To calculate the 16 bit Device Type registers offset:

Output Link	Offset is : (Channel – 1) + 1600	Register Offset + 40001
Channel 1	1600	41601
Channel 2	1601	41602
up to		
Channel 32	1631	41632

The device type is a value between 0x00 and 0xFF, used to indicate which channels are valid, how many inputs and outputs they have, whether the inputs or outputs are analogue or digital, and whether the channel is local to the E-100 on the E-100 bus, or remote, with values updated wirelessly

If the device type is 0xFF, the device has no inputs or outputs or does not exist

If bit 4 is clear:

Device type	Bit clear	Bit set
Bit 4	Bit 4 is clear	
Bit 7	Local bus	Remote
Bit 6	Analogue	Digital
Bit 5	Input	Output
	Bit 0 clear	Bit 0 Set
Bit 1 Clear	1 parameter	2 parameters
Bit 1 Set	4 parameters	8 parameters

If bit 4 is set, inputs and outputs are analogue:

Device type	Bit clear	Bit set
Bit 4	Bit 4 is set	
Bit 7	Local bus	Remote
	Bit 0 clear	Bit 0 Set
Bit 1 Clear	1 input, 1 output	1 input, 2 outputs
Bit 1 Set	2 inputs, 1 output	2 inputs, 2 outputs

Isoslice-1	2 universal analogue input	0x01
Isoslice-2	8 HL analogue inputs	0x03
Isoslice-3	4 RTD analogue inputs	0x02
Isoslice-4	4 TC analogue inputs	0x02
Isoslice-5	8 digital inputs	0x43
Isoslice-6	4 digital outputs	0x62

Isoslice-7   1 analogue input and output   0x10
Isoslice-8   4 analogue outputs   0x22
Isoslice-9   4 AC analogue inputs   0x02
E-100 with no I/O   0xFF (effectively does not exist)
E-100 with 1 input   0x00
E-100 with 2 inputs   0x01
E-100 with 1 input, 1 output   0x10
E-100 with 2 inputs, 1 output   0x12
E-100 with 1 output   0x20

When parameters are allocated, the parameter number starts with inputs then outputs, eg 1 input, 1 output: parameter 1 is the input, parameter 2 is the output.

Reading Burnout Level Bits
To calculate the 16 bit burnout level registers offset

Burnout Level	Offset is : (Channel – 1) + 1632	Register Offset + 40001
Channel 1	1632	41633
Channel 2 up to	1633	41634
Channel 32	1663	41664

Each channel has an 8 bit number with each bit representing the HI or LO selection for each parameter. Bit 7 is parameter 8, Bit 0 is parameter 1.

For example: to find out how channel 2 is configured read register 41634.
Result is 250 which is 0x00FA which is 1111 1010 in binary.
Parameter 1 is bit 0 which is 0 so Parameter 1 is LO
Parameter 2 is HI, Parameter 3 is LO, Parameter 4,5,6,7 and 8 are HI.

Reading Burnout Timeout Values
To calculate the 16 bit burnout timeout registers offset

Burnout Timeout	Offset is : (Channel – 1) + 1664	Register Offset + 40001
Channel 1	1664	41665
Channel 2 up to	1665	41666
Channel 32	1695	41696

Each channel has an 8 bit number representing the timeout time for that channel to automatically change its values to 0xFFFE if the age reaches this value

For example to read the timeout for channel 2 read register 41666.
If result is 16, channel 2 will have its values changed to timeout 0xFFFE if the data it has is 16 seconds old or more.

11.3   Writing Output Values

Some registers can be written to using function code 06. These are
* 16 bit data values of analogue or digital outputs
* 16 bit span point scaling values if they are unlocked (see below)
* 16 bit zero point scaling values if they are unlocked (see below)
* 16 bit output link values if they are unlocked (see below)
* 16 bit burnout level values if they are unlocked (see below)
* 16 bit burnout timeout values if they are unlocked (see below)

Multiple writes are also possible, using function code 0x10. A maximum of 8 registers can be written in one command string.

Writing to register 42000 to unlock scaling and link table registers

Write 0x0000 to register 42000 to gain write access to the span and zero scaling values and the link table. Write 0x0001 to lock them again, as they are at power up.

Writing 16 bit Data Values:

16 bit Data Values	Offset is : (Channel – 1) x 10 + Parameter – 1	Register Offset + 40001
Channel 1	0 to 9	40001 to 40010
Channel 2	10 to 19	40011 to 40020
up to		
Channel 32	310 to 319	40311 to 40320

The E-100 output and Isoslice units that have outputs can have values written to them via modbus, provided they have been set up to allow this (see section 8.7).

An isoslice unit with a digital output can have a digital value written to it.
A digital output value is 0x0000 = off, 0x0001 = on.

For analogue outputs, 16 bit data values are written as unsigned integers representing a number between –6.7% and 106.7%. 100% and 0% correspond to the output span and zero points learnt at calibration.

Output value = (%Value x 577.81) + 3869

e.g. 0%   3869d   0x0F1D
     100%   61650d   0xF0D2
     50%   32759d   0x7FF7

Writing 16 bit Span Point Scaling Values:

Span Scaling	Offset is : (Channel – 1) x 8 + Parameter – 1 + 832	Register Offset + 40001
Channel 1	832 to 839	40833 to 40840
Channel 2	840 to 847	40841 to 40848
up to		
Channel 32	1080 to 1087	41081 to 41088

Scaling values are written as unsigned integers.

They will only be changed by the E-100 if the Scaling values are unlocked, by first writing 0x0000 to register 42000

The scaling value must fall in the range –999 to 9999

For positive numbers convert to hexadecimal
e.g. 1000 converts to 0x03E8
For negative numbers change the sign and convert to hexadecimal then subtract from 0x10000
e.g. –50 becomes 50 which converts to 0x0032
0x10000 – 0x0032 = 0xFFCE

Writing 16 bit Zero Point Scaling Values:

To calculate the 16 bit zero point modbus registers offset

Zero Scaling	Offset is : (Channel – 1) x 8 + Parameter – 1 + 1088	Register Offset + 40001
Channel 1	1088 to 1095	41089 to 41096
Channel 2	1096 to 1103	41097 to 41104
up to		
Channel 32	1336 to 1343	41337 to 41344

Conversion is carried out as described in the section above.

Writing 16 bit Output Link Values

To calculate the 16 bit output link registers offset

Output Link	Offset is : (Channel – 1) x 8 + Parameter – 1 + 1344	Register Offset + 40001
Channel 1	1344 to 1351	41345 to 41352
Channel 2	1352 to 1359	41353 to 41360
Up to		
Channel 32	1592 to 1599	41593 to 41600

The link values are written as unsigned integers. For outputs on the system, the associated registers will have a link value that the output represents.

These values can be changed by writing to the associated Modbus register. **They will only be changed by the E-100 if the Link values are unlocked, by first writing 0x0000 to register 42000**

This is best illustrated with an example.

Channel 1 is the E-100 with 1 analogue output, parameter 1.
Channel 2 is an Isoslice-2 with 8 analogue inputs, parameters 1 to 8.
Channel 3 is an Isoslice-8 with 4 analogue outputs, parameters 1 to 4.

Read register 41345 to find out what the E-100 output represents when the E-100 is running. If its link value is 0x0000 it is referencing itself, so its output is under Modbus control.

To change it to represent the value of parameter 1 of the Isoslice-2 on channel 2 change this link value to 0x0008 by writing this value to register 41345.

Read register 41361 to find out what the first analogue output (parameter 1) of the Isoslice-8 on channel 3 represents. If its link value is 0x0010 it is referencing itself, so its output is under Modbus control.

To change it to represent the value of parameter 2 of the Isoslice-2 on channel 2. Change this link value to 0x0009 by writing this value to register 41361.

12. INSTALLATION

The E-100's input and output circuits are classed as Separated Extra Low Voltage (SELV). This means that they must not be externally connected to voltages exceeding 30V ac or 60V dc, nor do they generate voltages above these limits internally. Where a higher voltage input is required a specially designed DIVIDER unit can be used to condition the input signal prior to connection to the process input terminals.

The E-100 unit clips directly onto 'Top Hat' (TS35) symmetrical DIN rail. Ideally, mounting orientation should be vertical. Good airflow around the unit will maximise reliability of the instrument.

The use of bootlace ferrules is recommended on wiring terminations.

Do not exceed terminal torque rating of 0.4 Nm – use an appropriate screwdriver. The unit can be removed from the DIN rail by sliding a small screwdriver into the slot at the rear of the enclosure on the lower face and gently levering the metal clip, whilst lifting the unit from the rail.

13. TROUBLESHOOTING

The E-100 has some built in self diagnostic functions. Errors encountered will be displayed on screen.

E 1	The input value is not available
ERR 2	Eeprom Error: Stored data has been corrupted. Push and release both buttons then recalibrate the output options and values.
ERR3	Link Table Error: Stored data has been corrupted. Push and release both buttons then reprogram the link table values
ERR4	Burnout Table Error: Stored data has been corrupted. Push and release both buttons then reprogram the burnout levels and timeouts
E 4	The input value is currently unavailable
E 5	The input span value is too close to the (saved) input zero value
E 6	The input zero value is too close to the (saved) input span value
E 8	There is no data available
E 14	Low burnout indication on an output
E 15	Timeout Error: An input device value has timed out.
E 16	Burnout Error: Check wiring connections of RTD or TC on an input. High burnout indication on an output

13.1 Incorrect Reading

- Check that Unit is configured for the correct Sensor
- Check that Input Scaling is as required.
- Check that Linearisation has been set correctly.

13.2 Sensor Failure

- Check that sensor wiring is correct.
- Check Thermocouple polarity.
- Check that all RTD leads are connected to correct terminals.
- Check that the E-100 is configured for correct sensor.
- Check that applied voltage is not out of range.
- Check that applied current is not out of range.
- Check that applied millivoltage is not out of range.

14.   SPECIFICATIONS (@ 25°C)

Operating Temperature		0 to 55 °C
Operating Altitude		Sea Level to 2000m
Humidity		0-90% RH
Power Requirements	DC Supply	16 to 30Vdc
	AC Supply	16 to 32Vac
Current Consumption		120 mA @ 24Vdc (20mA in & out)
Transmitter Power Supply		22V to 29V @ up to 24mA
		Dependant on supply voltage and load
Calibration accuracy		±0.05% full scale
Linearity		±0.05% full scale
Temperature Stability		50ppm / °C
Input Impedance:		
Current Input		15 ohms
Voltage Input		1 Mohm
Millivolt Input		Greater Than 10 Mohm
Thermocouple Burn Out Current:		500nA Nominal
Cold junction compensation accuracy		±0.5°C over operating range
Maximum Voltage Output		11.5 V into a minimum of 7Kohm
Maximum Current Output		23.0 mA into a maximum of 1Kohm

Unit has full 3 port Isolation to 1kV between Power Supply, Input and Output.
The unit can also withstand transients of 2.5kV for 50 μsecs.

Dimensions	114.5 mm x 99mm x 22.5mm (H x D x W)
Mounting	DIN Rail TS35
Connections	Screw Clamp with pressure plate
Conductor Size	0.5 to 4.0 mm
Insulation Stripping	12 mm
Maximum Terminal Torque	0.4 Nm
Weight	Approx. 140g
EMC Emissions	BS EN61326
LVD Standards	EN61010-1
Installation Category (IEC 664)	II
Pollution Degree (EN61010-1)	2
Equipment Class (IEC 536)	II