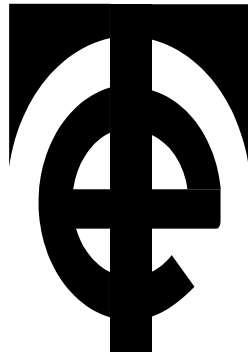


1089

THERMOCOUPLE

SIMULATOR/CALIBRATOR



TECHNICAL MANUAL

**1089**

**THERMOCOUPLE  
SIMULATOR / CALIBRATOR**

**All Time Electronics' instruments are subject to continuous development and improvement and in consequence may contain minor detail changes from the information contained herein.**

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## **ADDENDUM TO 1088/1089 MANUAL**

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Page 16 of the 1088 manual or page 19 of the 1089 manual.

### **STORING VALUES IN THE MEMORY**

To store a value in the memory, select the required function and the required output value. Do not press the 'ENT' key. Press the 'STORE' key and then enter the memory location, (0-9). The value is then stored in the memory and the display returns to the normal mode.

The value may be recalled using the normal procedure.

# 1089 TECHNICAL MANUAL

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## 1089 TECHNICAL MANUAL CONTENTS

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## 1089 TECHNICAL MANUAL

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### GENERAL DESCRIPTION

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The 1089 is a portable battery powered instrument capable of reading or simulating 7 types of thermocouple, micro or millivolts, milliamps and simulating a PT100 platinum resistance thermometer element.

Thermocouple temperatures, voltages, currents and PRT elements required are entered on the splashproof keyboard and displayed on a 16 character L.C.D. dot matrix display.

The thermocouple voltage can be displayed as either a temperature in Centigrade or Fahrenheit or converted into its equivalent voltage.

Increment and decrement keys enable the output to be ramped up or down in 0.1°C, 0.1°F or 1uV steps. This feature is especially useful for calibrating thermostat type controllers with hysteresis.

Automatic or manual cold junction compensation can be selected and applied.

Frequently used values may be stored in the non volatile memory to speed up repetitive testing. These values may then be stepped through either manually or automatically with the addition of an autostep feature.

The unit is powered from 6 'AA' type cells (preferably Ni-Cad cells) which give approximately 12 hours operation. Recharging of the Ni-Cad cells is possible without removal from the carry case.

## 1089 TECHNICAL MANUAL

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### 1088 SPECIFICATIONS

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ACCURACY – MEASURE :

THERMO. TYPE	TEMPERATURE RANGE °C	ACCURACY °C
J	-210 to 590	0.4
K	-270 to -150	2.5
	-150 to 780	0.5
T	-200 to 400	0.4
R	-50 to 400	1.5
	400 to 1750	1.0
S	-50 to 100	2.0
	100 to 1750	1.0
B	50 to 1000	2.5
	1000 to 1800	1.0
N	-270 to 890	0.4

Resolution = 0.1 °C

## 1089 TECHNICAL MANUAL

### ACCURACY – SOURCE:

<b>THERMO. TYPE</b>	<b>TEMPERATURE RANGE °C</b>	<b>ACCURACY °C</b>
<b>J</b>	<b>-210 to 150</b>	<b>0.05</b>
	<b>150 to 1200</b>	<b>0.30</b>
<b>K</b>	<b>-270 to 200</b>	<b>0.10</b>
	<b>200 to 1250</b>	<b>0.35</b>
<b>T</b>	<b>-200 to 400</b>	<b>0.20</b>
<b>R</b>	<b>-50 to 800</b>	<b>0.20</b>
	<b>800 to 1750</b>	<b>1.00</b>
<b>S</b>	<b>-50 to 850</b>	<b>0.30</b>
	<b>850 to 1750</b>	<b>1.40</b>
<b>B</b>	<b>100 to 1200</b>	<b>0.50</b>
	<b>1200 to 1800</b>	<b>1.30</b>
<b>N</b>	<b>-270 to 260</b>	<b>0.10</b>
	<b>260 to 1300</b>	<b>0.40</b>

Resolution 0.1°C

### **COLD JUNCTION TEMPERATURE COMPENSATION**

0.02°C/°C + 0.1°C

## 1089 TECHNICAL MANUAL

### MILLIVOLT OUTPUT SPECIFICATIONS

#### 0 to +/- 8.192mV

Resolution .....	2uV
Accuracy of Setting .....	0.05%
Accuracy of Range .....	0.02%

#### 8.192mV to 81.92mV

Resolution .....	20uV
Accuracy of Setting .....	0.05%
Accuracy of Range .....	0.02%

### MILLIAMP OUTPUT SPECIFICATIONS

#### 0 to +/- 8.192mA (Max.Load 250R)

Resolution .....	2uA
Accuracy of Setting .....	0.05%
Accuracy of Range .....	0.02%

#### 8.192mA to 81.92mA (Max.Load 80R)

Resolution .....	20uA
Accuracy of Setting .....	0.05%
Accuracy of Range .....	0.02%

### MILLIVOLT MEASURE SPECIFICATIONS

#### 0 to +/- 32mV

Resolution .....	8uV
Accuracy .....	0.05% +/- 8uV

### MILLIAMP MEASURE SPECIFICATIONS

#### 0 to +/- 32mA

Resolution .....	8uA
Accuracy .....	0.1% +/- 16uA

All accuracies are +/- 1uV or +/- uA



# **1089 TECHNICAL MANUAL**

## **P.R.T. SIMULATION**

14 Set temperatures of -

-100, -50, -20, 0, 20, 50, 100, 200, 300, 400, 500, 600, 700, 800°C.

Specification is +/- 0.1% of DIN 43760 on all settings.

## **OPERATING TEMPERATURE**

0°C to 40°C.

## **CONNECTIONS**

4 off 4mm Terminals.

- 1) GREEN/YELLOW .....CASE
- 2) RED/BLACK .....INPUT
- 3) BLACK .....COMMON
- 4) RED .....OUTPUT

## **POWER REQUIREMENTS**

The 1089 is powered by 6 X 'AA' size batteries.

Rechargeable batteries may also be used with a suitable mains charger via the charging socket on the end of the unit.

## **CONSTRUCTION**

The case is of metal construction finished in two tone blue and black.

## **1089 TECHNICAL MANUAL**

### **CARRY CASE**

The 1089 is supplied in a robust carry case with an internal pocket for instruction manual and test leads etc. Full operation, including recharging of the batteries, is possible without removal from the case. The lid is reversible to facilitate operation.

### **DIMENSIONS (in the carry case)**

235 X 150 X 75mm, 1.3Kgs.

## 1089 TECHNICAL MANUAL

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### GENERAL OPERATION NOTES

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When using the 1089 to calibrate direct reading temperature measuring instruments, it is important to remember that the measuring instrument will in most cases automatically apply cold junction compensation.

Cold junction temperature compensation enables absolute temperature measurements to be made when the connection end of the thermocouple (Cold Junction) is not at 0°C.

For accurate calibration, the cold junction temperature used by the 1089 must be the same as the value being applied by the measuring instrument.

The 1089 can automatically apply cold junction compensation using its own internal temperature sensor. This temperature, which can be displayed by pressing the 'AUTO C.J.' key, may differ from the measuring instruments cold junction temperature. In these circumstances a manual cold junction temperature must be used. (See section 4, Entering a Manual Cold Junction Temperature.)

The temperature measuring instrument can be made to display its own cold junction temperature by shorting the thermocouple input connections.

# 1089 TECHNICAL MANUAL

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## 1088 OPERATING INSTRUCTIONS

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### **SIMULATING A THERMOCOUPLE.**

When the unit is turned on, it displays the PROM version number and then displays :

**TYPE Ka      °C**

This indicates that the 1089 is ready to simulate a type 'K' thermocouple in °C and apply automatic cold junction compensation.

Connect the 1089 to the temperature measuring instrument with thermocouple leads or compensation cables.

Check to see if manual cold junction compensation is required. Usually this is if the measuring device is at a different temperature from the 1089. See section on 'Entering a Manual Cold Junction Temperature'.

### **SELECTING A DIFFERENT THERMOCOUPLE TYPE.**

a) Press 'SHIFT' key – display shows :

**FUNCTION      °C:**

b) Press the required thermocouple type key (in red).

Example : TYPE J – display shows :

**TYPE Ja      °C**

### **SELECTING °F OPERATION (IF REQUIRED).**

a) Press 'SHIFT' key – display shows :

**FUNCTION      °C**

b) Press (°C/°F) : display shows :

**TYPE Ja      °F**

## 1089 TECHNICAL MANUAL

### ENTERING A MANUAL COLD JUNCTION TEMPERATURE. (If Required).

a) Press 'SHIFT' - display shows :

**FUNCTION °C**

b) Press 'MAN CJ' - display shows :

**NEW CJ 0.0°C**

c) Enter the C.J.C. (Cold junction compensation) temperature required and press 'ENTER'. Display shows :

**CJ TEMP NN.N°C**

(Where NN.N is entered value). The new value is now compensating for the cold junction temperature of the measuring instrument.

To return to automatic C.J.C press the AUTO C.J. key. The display shows :

**CJ TEMP NN.N°C**

Where NN.N°C is the current value for C.J.C. that the 1089 is using.

The letter after the thermocouple type on the display shows the type of compensation selected. Either 'a' for automatic or 'm' for manual compensation.

### SIMULATING A THERMOCOUPLE OUTPUT.

a) Enter the temperature required.

Note : Display changes when the first digit is pressed.

**LOAD Ja N°C**

(N is digit pressed).

b) When the value on the display is correct, press (ENT). Incorrect values can be removed by pressing (CLR). Display shows:

**OUT>Ja N.NN°C**

(N.NN is value entered) or

**OVERRANGE °C**

If the value was out of the instruments range.

## 1089 TECHNICAL MANUAL

### DISPLAYING THE OUTPUT IN uVOLTS (If Required).

a) Press 'CONVERT'. The display shows :

**OUT > Km      NNNNuV**

(Where NNNN is the output in uV).

b) Press 'CONVERT' to return to the original display.

### SETTING MICROVOLT OUTPUTS.

a) Press 'SHIFT'. Display shows :

**FUNCTION      °C**

b) Press 'uV'. Display shows :

**TYPE u**

c) Enter the required output in uV.

Note : The display changes when the first digit is pressed to :

**LOAD u    NuV**

Where N is digit pressed.

d) When the value required is on the display, press 'ENT'. Incorrect values can be cleared with the 'CLR' key. The display shows :

**OUT> u    NNNuV**

Where NNN is the entered value or :

**OVERRANGE**

If the maximum output of 81900uV is exceeded.

### SETTING A mV OUTPUT.

Follow the previous steps, substituting the mV key in place of the uV key. Output is now in mV.

## **1089 TECHNICAL MANUAL**

### **SETTING A mA OUTPUT.**

a) Press 'AHIFT'. Display shows:

**FUNCTION °C**

b) Press 'mA'. Display shows :

**TYPE i**

c) Enter the required output in mA.

Note – The display changes when the first digit is pressed to :

**LOAD i N.NNNmA**

Where N.NNN are the digits pressed.

d) When the value required is on the display, press 'ENT'. Incorrect values can be cleared with the 'CLR' key. Display shows :

**OUT> i NN.NNNmA**

Where NN.NNN is the output value or :

**OVERRANGE**

If the maximum output of 25mA is exceeded.

Note : Negative current outputs cannot be selected.

### **SELECTING PRT SIMULATION MODE.**

a) Press 'SHIFT' . Display shows:

**FUNCTION °C**

b) Press 'PRT'. Display shows :

**PT100 : -100°C**

Use the up and down arrows to select the correct value.

To select a different mode press the 'SHIFT' key and select the next operation.

## **1089 TECHNICAL MANUAL**

### **STORING AND RECALLING TEMPERATURES, uV, mV AND mA VALUES IN MEMORY.**

#### **STORING VALUES**

- a) Follow previous instructions for generating temperature, uV, mV or mA outputs.
- b) Press the 'STORE' key when the required value is being displayed. The display shows:

**LOCATION ?**

- c) Press a digit between 0 and 9 to select a memory location. The value is now stored in that memory location. The display returns to normal mode.

#### **RECALLING VALUES.**

- a) Press 'RECALL'. Display shows :

**LOCATION ?**

- b) Press a digit between 0 and 9 to recall a value stored in the memory location. The display shows :

**OUT>    NNNN**

Where NNNN is the stored value.

If no value has been stored in that location the default output of 0°C for a type K thermocouple will be recalled. Recalled values are output immediately.

#### **STEPPING THROUGH THE MEMORY LOCATIONS.**

- a) Recall the first value required as described above.
- b) Press 'STEP' to select next memory location. An ERROR will be displayed if a memory location greater than 9 is selected.
- c) Alternatively you may select the autostep function. Press 'SHIFT' and then press the 'A/STEP' key. The display shows :

**DELAY ? 00s   °C**

Enter a delay, in seconds, before the unit sets to the next stored value in the memory. Press the 'ENT' key to enter the delay. The 1089 will then automatically step through the memory locations setting the stored outputs.



## **1089 TECHNICAL MANUAL**

### **MEASURING A THERMOCOUPLE OUTPUT.**

#### **MEASURING AS A TEMPERATURE**

- a) Select the appropriate thermocouple type.
- b) Press 'MEASURE' key. Display shows :

**MEASURE °C**

When measurements begin the display shows :

**IN> Ja NN.N°C**

If the value is out of the 1089 range the display shows :

**OVERRANGE °C**

- c) To exit from measure mode hold the 'SHIFT' key down until display shows:

**FUNCTION °C**

Then select the next operation.

#### **MEASURING IN uVOLTS.**

Select the uV mode and then select 'MEASURE'. The display shows :

**MEASURE**

When measurements begin the display shows :

**IN> u NNNNuV**

Where NNNN is reading in uV.

If the value is out of the 1089 range (Maximum input voltage 32760uV) the display shows :

## **1089 TECHNICAL MANUAL**

### **OVERRANGE**

#### **MEASURING IN mVOLTS.**

Select mV mode and select measure as above.

#### **MEASURING CURRENT IN mA**

- a) Press the shift key and select mA range.
- b) Press the measure key and the display reads :

**IN > i      NN.NNNmA**

Where 'i' indicates current and NN.NNN indicates the current reading in milliamps.

#### **EXITING FROM THE MEASURE MODE**

Hold down the 'SHIFT' key until the display shows :

**FUNCTION**

Then select the next operation.

#### **GENERAL NOTE**

If :

#### **BATTERY LOW**

flashes on the display whilst using the 1089, it indicates that there is an hour or so life left before the unit needs new batteries or recharging, or :

#### **BATTERY FLAT**

indicates that new batteries must be fitted or recharged before any more operations are permitted.

## **1089 TECHNICAL MANUAL**

### **RECHARGING NI-CAD BATTERIES**

**NOTE : Only Ni-Cad batteries can be recharged.**

This should be performed with the instrument turned off and takes about 12 hours for a full recharge. The unit may however be left on charge for up to a week without damage to the internal rechargeable cells. A short charge for an hour will usually give a couple of hours operation.

The 1089 can also be recharged from the 'cigar lighter' in a car using a special recharger lead.

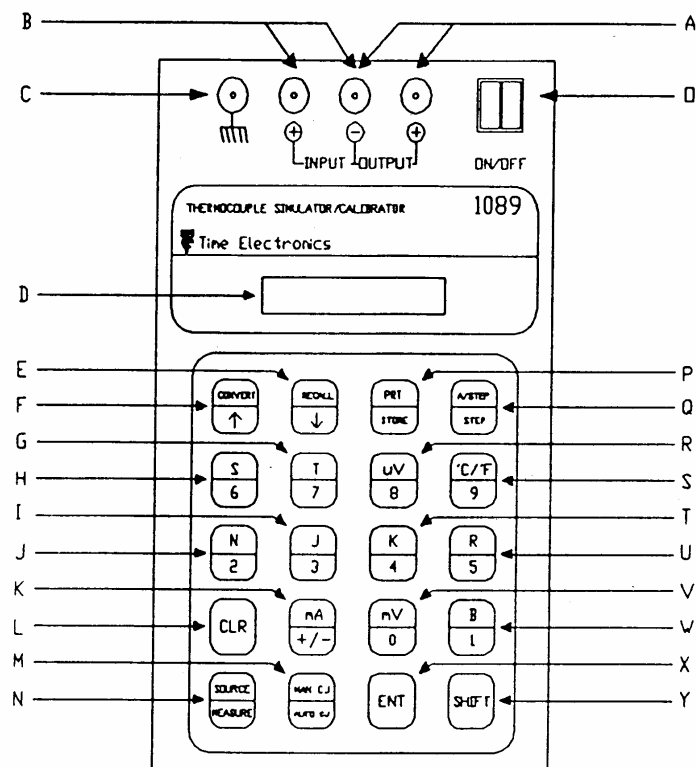
Operation of the 1089 is permitted whilst charging the batteries.

# 1089 TECHNICAL MANUAL

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## 1089 FRONT PANEL CONTROL

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- A) Output Terminals.
- B) Input Terminals.
- C) Chassis connection.
- D) 16 digit Liquid Crystal Display.
- E) Deviates the output down in 0.1°C or 1uV steps. In the PRT mode will set the output down a range. When shifted it recalls a previously stored value from the memory.

## 1089 TECHNICAL MANUAL

- F) Deviates the output up in 0.1°C or 1uV steps. In the PRT mode it will select the next highest setting. When shifted it will convert the set output temperature into the equivalent uV value.
- G) When shifted selects a type T thermocouple.
- H) When shifted selects a type S thermocouple.
- I) When shifted selects a type J thermocouple.
- J) When shifted selects a type N thermocouple.
- K) This selects either positive or negative outputs or when shifted will select the current mode.
- L) Clears a value entered on the keypad.
- M) Selects either Manual Cold Junction compensation or Automatic Cold Junction compensation.
- N) Selects either Source mode or Measure mode if shifted.
- O) This rocker switch turns the 1089 on and off.
- P) Stores an output value in the memory for future use. When shifted will select the PRT mode of operation.
- Q) Steps to the next value stored in the memory and sets the output. Will select the Autostep feature when shifted.
- R) Selects uV output mode when shifted.
- S) Toggles the temperature unit between Centigrade and Fahrenheit when shifted.
- T) Selects type K thermocouple when shifted.
- U) Selects type R thermocouple when shifted.
- V) Selects the mV mode when shifted.
- W) Selects type B thermocouple when shifted.
- X) Enters a value for output.
- Y) Shift selects functions on keypad in red.

## 1089 TECHNICAL MANUAL

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### BATTERY REPLACEMENT

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When turning the unit on, the display will show :

**TYPE      Ka°C**

If the batteries need replacing or recharging the display will show :

**BATTERY LOW**

indicating that only an hours life is left in the batteries or :

**BATTERY FLAT**

indicating that the batteries can no longer be used.

Remove the 1089 from the carry case and unscrew the three screws in each side of the case. Remove the case, access is now given to the battery holders. Batteries can now be replaced observing polarity.

It is recommended that rechargeable batteries are used in this unit.

The batteries used are 6 X AA size 1.5V.

## 1089 TECHNICAL MANUAL

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### 1089 CALIBRATION

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The 1089 has an automatic calibration mode which will set the correct output for each test.

This mode is selected by pressing the 'STORE' key when turning the power on. The 1089 will display :

#### TEST MODE

Press 'SHIFT' and then 'RECALL' and enter location zero. The unit will then display :

**OUT > u 0uV**

Pressing the 'STEP' key will step to the next calibration point and pressing the 'STORE' key will return to the previous calibration point.

The first adjustment to be made is to set the zero. Refer to the diagram on the following page for adjustment points.

When the output is set to 0uV in the source mode, adjust VR6 to give an output of 0uV.

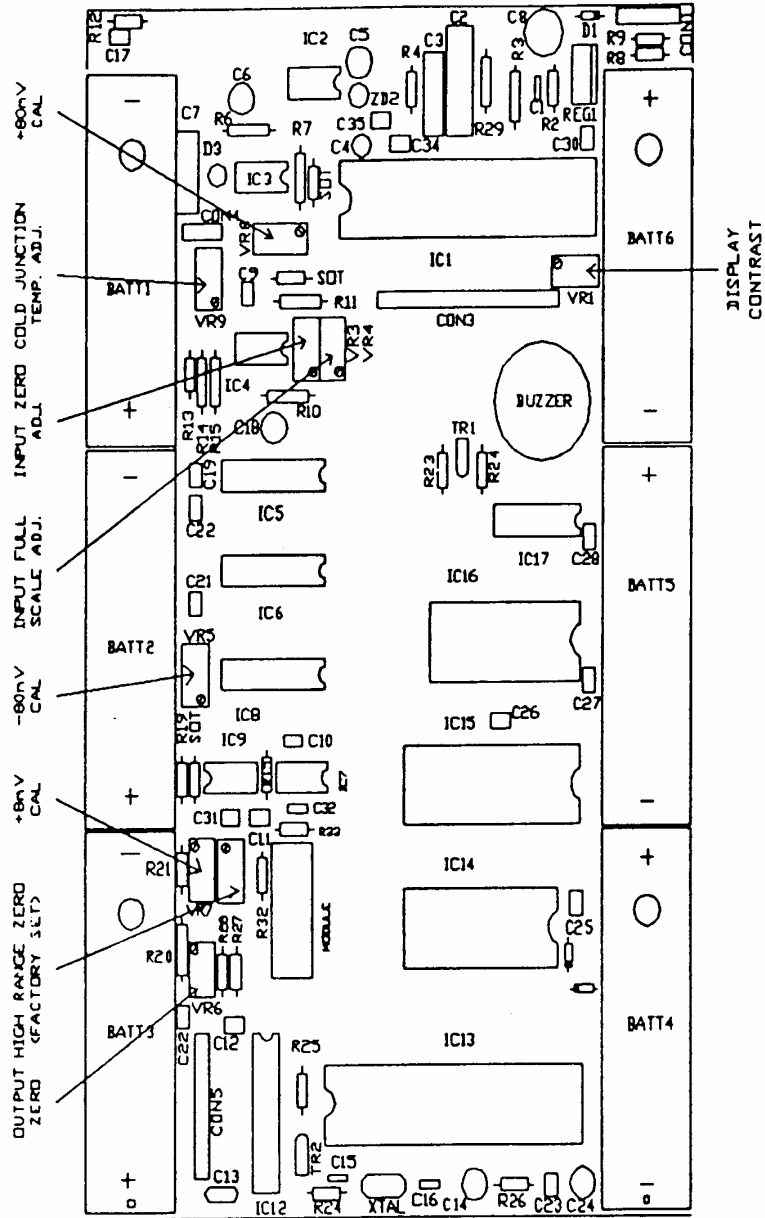
Press 'STEP'. The output is now set to -80000 uV. Adjust VR5 to give -80000uV output

Press 'STEP'. The output is now set to +80000 uV. Adjust VR8 to give 80000 uV.

Press 'STEP'. The output is now set to +8000 uV. Adjust VR7 to give the correct output.

The unit will then step through a linearity test which tests 20 points ranging from +80000 uV to -80000uV.

# 1089 TECHNICAL MANUAL



Once the linearity has been checked, the 1089 will then step through all the thermocouple types, setting the output to various points. This will enable the thermocouple simulation to be checked using the appropriate conversion tables.

The mV/uV measure mode must now be calibrated.

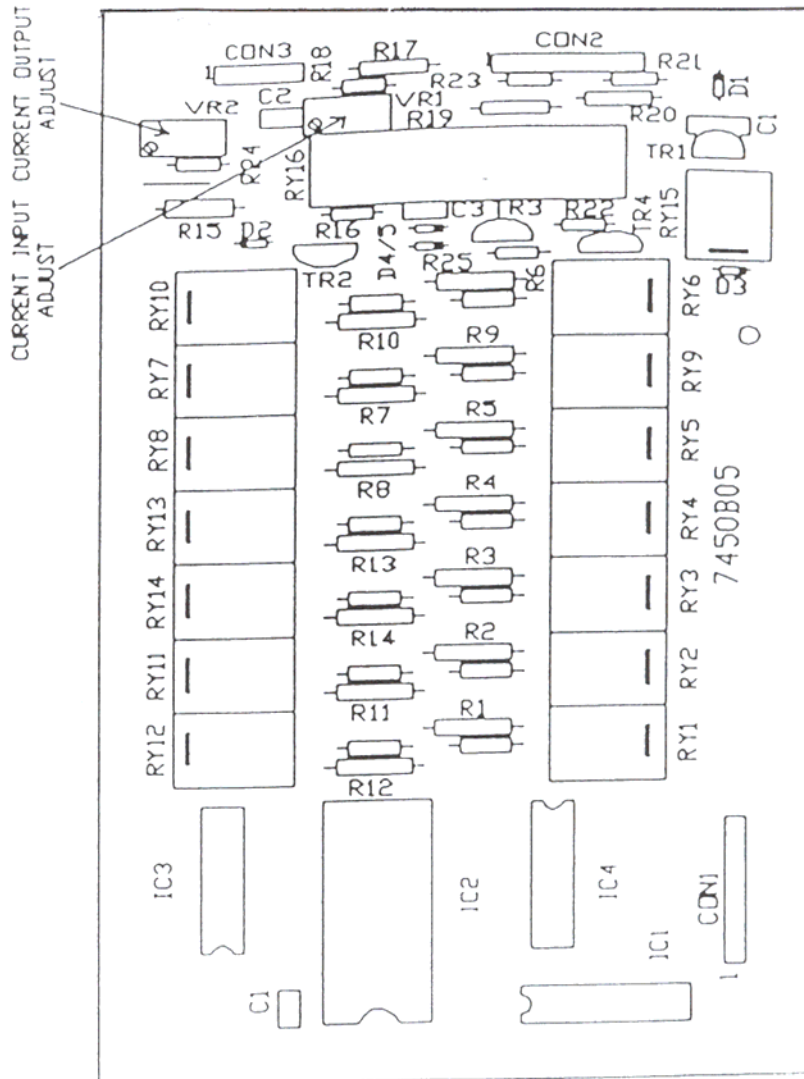


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Select the microvolt measure mode and short circuit the input terminals. Adjust VR3 to read 0uV on the display.

Remove the short and connect a voltage calibrator set to 30mV across the input terminals and adjust VR4 for a reading of 30000uV. The mV/uV measure mode calibration is now complete.

The current range is set up in two adjustments, full scale on measure and full scale on source. The current and PRT board is located on the rear panel of unit and is part number 7450B05. As pictured below



## 1089 TECHNICAL MANUAL

Firstly check the current zero readings on source and measure. If the zero is out of specifications, either the voltage range zero is high or fault exists in the unit. In the latter case the unit must be returned for repair.

Select the current range and source mode. Set the output to 25mA. Adjust the output to read 25mA on a DMM using VR1.

Select the current measure mode and connect a current source to the input terminals. Set the calibrators output to 30mA. Adjust VR2 so that the display reads 30mA.

Do not adjust VR1 and VR2 on the main board.

If the PRT simulation is out of specification the unit must be returned for repair.

The cold junction temperature compensation must now be set up. Remove the current calibrator and select the source mode. Press the 'AUTO C.J.' key and read the display. Adjust the reading displayed to correspond with a standardised thermometer using VR9 on the main board. After each adjustment of VR9 press the 'AUTO C.J.' key to display the new reading.

Finally the displays contrast may be adjusted with VR1.

## **1089 TECHNICAL MANUAL**

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### **GUARANTEE**

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The 1089 is guaranteed for a period of 12 months from its delivery date to the purchaser, covering replacement of defective parts.

We maintain comprehensive after sales facilities and the instrument can, if necessary, be returned to our factory for servicing. The type and serial number of the instrument should always be quoted together with full details of any fault and the service required. The service department can also provide maintenance and servicing information by telephone, fax or letter.

Equipment returned to us for servicing or repair must be adequately packed, preferably in the box supplied, and shipped with transportation charges prepaid.

**WE CAN NOT ACCEPT RESPONSIBILITY FOR INSTRUMENTS ARRIVING DAMAGED.**

Should the cause of failure during the guarantee period be due to misuse or abuse to the instrument or if the guarantee has expired, the repair will be put in hand without delay and charged unless other instructions are received.

# 1089 TECHNICAL MANUAL

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## SPARE PARTS LIST

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<u>PART NO</u>	<u>ORDER CODE</u>
FRONT PANEL SWITCH LABEL.....	2595
1089 TECHNICAL MANUAL.....	2744
TERMINALS – 2 RED .....	6209
TERMINALS – 1GREEN.....	6210
TERMINALS – 1BLACK .....	6211
RECHARGE SOCKET.....	6231
ON/OFF SWITCH .....	6398
LCD DISPLAY .....	7223
RECHARGEABLE BATTERIES .....	7625
CARRY CASE.....	9003
MODULE.....	9527