Series 3000 Thermometer

Operating Instructions

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Limited Warranty & Limitation of Liability
CROPICO guarantees this product for a period of 1 year. The period of warranty will be effective at the day of delivery.
Disposal of Old Product

This product has been designed and manufactured with high quality materials and components that can be recycled and reused.

When the crossed out wheelie bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. The correct disposal of this product will help prevent potential negative consequences for the environment and human health.

User Note:
These Operating Instructions are intended for the use of Competent Personnel.
Contents

Installation 4

Technical Specification- 6

Operation 8

Technical Support, Service and Calibration 18

Additional Products from Cropico 21
SUPPLIED ACCESSORIES

1 Mains Cord
1 Operating Instructions (English)

When unpacked, inspect for physical damage and report any defects immediately in writing, retaining packaging materials for inspection. Before placing into service, ensure mains voltage is correct. Instruments are normally supplied for 240Volt 50Hz. Other voltages may also be selected according to the chart in the Maintenance section. Be sure to also change the fuse to the correct type and rating.

SAFETY

This apparatus is designated Safety Class 1 as defined in EN 61010-1:2001

CE MARKING

This apparatus complies with the CE marking directive, 93/68/EEC, and is also compliant with the following standards:

Generic Emission Standard
  Conducted Emissions
  Radiated Emissions

Generic Immunity Standard
  Electrical Fast Transient (Power Lines)
  Conducted Immunity (Signal Lines)
  Radiated Field Immunity
  Electrostatic Discharge
  Surge
  Voltage Dips
  Harmonics
  Flicker

Electrical Safety Standard
  Measurement Category
  Pollution Category

INSTALLATION

The Series 3000 Thermometers are designed to be either free bench-standing, or rack-mounted. If rack-mounting is required, then the mounting kit should be ordered and the instructions supplied with the kit should be followed. The 3000 series are half 19" wide, 2.5U high.

Before connecting to the mains supply, ensure that the correct voltage is set, and the fuse is of the correct rating. Use only the mains cord provided, and only connect to a mains supply with a suitable protective earth.
Generally no maintenance is required other than cleaning with a moist cloth. Avoid aggressive detergents or solvents.

**CAUTION:** Before any maintenance, repair, or exchange of parts or fuses, the instrument must be disconnected from the mains supply and all other power sources. In the event of a fault occurring, the instrument should be returned to our factory, or Agent, for rectification. A mains fuse is fitted to the mains inlet socket on the rear panel, and should be replaced if necessary. The instrument should only be serviced or repaired by a competent engineer and only design approved replacement parts used.

**CAUTION:** Disconnect the mains lead and all connecting leads, before removing the fuse holder. Replace only with the correct fuse type, according to the following chart.

<table>
<thead>
<tr>
<th>Line Voltage Selection</th>
<th>Range Vac 47-63Hz</th>
<th>Fuse (250V) IEC 127 5 x 20 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>100V</td>
<td>90-110V</td>
<td>630mA (T)</td>
</tr>
<tr>
<td>120V</td>
<td>108-132V</td>
<td>630mA (T)</td>
</tr>
<tr>
<td>220V</td>
<td>198-244V</td>
<td>315mA (T)</td>
</tr>
<tr>
<td>240V</td>
<td>216-264V</td>
<td>315mA (T)</td>
</tr>
</tbody>
</table>

Maximum Input Power: 25VA

**BATTERIES**

The instrument may be used either connected to the mains supply or, for portable applications, run from the internal batteries. Approximately 8 hours continuous operation from a full battery charge is possible, and up to 14 hours if the display backlight is turned off (via the **OPT** menu). The battery chargers are built into the instrument and charging commences immediately when the mains supply is connected, illuminating the LINE LED on the front panel. The batteries are of the sealed lead acid type; continuous trickle charging causes no harm to the batteries and we always recommend running from the mains supply when possible, thus ensuring the batteries are always fully charged and ready for portable applications. The charger will automatically switch to trickle charge or fast charge mode depending upon the battery state.

LOW BATTERY indication is displayed when the batteries have approximately 10% charge left. When this indication appears, the instrument should be connected to a mains supply as soon as convenient, as only approximately 50 minutes operating time remains.
## TECHNICAL SPECIFICATION

**DISPLAY:**
LCD Graphics Panel, 240 x 64 dot, with LED backlight Contrast control via front panel keyboard

**RTD INPUTS:**
2 channels for PRTs via 6 pin Lemo type sockets
LEMO part number for input plug: FGG1B.306.CLAD52

- **Input Resistance:** > 10MΩ
- **Max. Input Voltage:** ± 40Vdc, 28Vrms
- **Max. Common Mode Voltage:** 50Vrms

The inputs are linearised to the following selectable standards:

**EN60751:** $R_0=100\Omega, \alpha=3851$

**USER:**
Up to 20 probes may be configured to customer entered constants, A B, C, and $R_0$ values. For IPRT (CVD) and ITS90 coefficients for S-PRT.

A standby current is always passed through the sensors.

## PRT UNCERTAINTY OF MEASUREMENT

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Range °C</th>
<th>Resistance Ω</th>
<th>Current</th>
<th>Resolution °C, °F, K</th>
<th>Uncertainty @ 20°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt25</td>
<td>-200 to -100</td>
<td>2.5 to 15</td>
<td>1 mA</td>
<td>0.001</td>
<td>0.02 °C</td>
</tr>
<tr>
<td>Pt25</td>
<td>-100 to +500</td>
<td>15 to 75</td>
<td>1 mA</td>
<td>0.001</td>
<td>0.01 °C</td>
</tr>
<tr>
<td>Pt25</td>
<td>+500 to +670</td>
<td>75 to 115</td>
<td>1 mA</td>
<td>0.001</td>
<td>0.02 °C</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200 to -100</td>
<td>10 to 60</td>
<td>0.5 mA</td>
<td>0.001</td>
<td>0.02 °C</td>
</tr>
<tr>
<td>Pt100</td>
<td>-100 to +500</td>
<td>60 to 280</td>
<td>0.5 mA</td>
<td>0.001</td>
<td>0.01 °C</td>
</tr>
<tr>
<td>Pt100</td>
<td>+500 to +670</td>
<td>280 to 460</td>
<td>0.5 mA</td>
<td>0.001</td>
<td>0.02 °C</td>
</tr>
</tbody>
</table>

## T/C INPUTS:
2 channels for thermocouples (Models 3000 and 3001) via 4mm copper sockets. A range of thermocouple plugs with binding posts is available as accessories, see price list.

The inputs are linearised for the following Standards:

- Types B, E, J, K, N, R, S, T: to NIST 175 (ITS-90)
- Types C & D: to ASTM E988 (IPTS-68)
- Types L & U: to DIN 43710:1985 (IPTS-68)
- Type P: to Engelhard: Platinel (ITS-90)
- Type Au/Pt: to NIST: Burns (ITS-90)

Reference Junction compensation may be selected for the following modes:

- **Automatic:** Internal Reference Junction range 0 to +40°C
- **External:** Via Pt100 sensor connected to channel A or B Range 0 to +100°C
- **Off:** Turns the Reference Junction OFF = 0°C
# THERMOCOUPLE UNCERTAINTY OF MEASUREMENT

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature Range °C</th>
<th>Display Resolution °C °F or K</th>
<th>Uncertainty 1 Year Ta = +20°C ± 5°C</th>
<th>Uncertainty 60 Days Ta = +20°C ± 5°C</th>
<th>Temperature Coefficient ppm/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>+250 to +1820</td>
<td>0.01 1</td>
<td>± (0.025% Rdg + 0.006% FS)*</td>
<td>± (0.020% Rdg + 0.006% FS)*</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>C</td>
<td>0 to +2315</td>
<td>0.01 1</td>
<td>± (0.075% Rdg + 0.005% FS)</td>
<td>± (0.050% Rdg + 0.005% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>D</td>
<td>0 to +2315</td>
<td>0.01 1</td>
<td>± (0.075% Rdg + 0.005% FS)</td>
<td>± (0.050% Rdg + 0.005% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>E</td>
<td>-200 to +1000</td>
<td>0.01 1</td>
<td>± (0.026% Rdg + 0.004% FS)</td>
<td>± (0.010% Rdg + 0.004% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>J</td>
<td>-210 to +1200</td>
<td>0.01 1</td>
<td>± (0.030% Rdg + 0.005% FS)</td>
<td>± (0.008% Rdg + 0.005% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>K</td>
<td>-200 to +1372</td>
<td>0.01 1</td>
<td>± (0.035% Rdg + 0.006% FS)</td>
<td>± (0.010% Rdg + 0.006% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>L</td>
<td>-200 to +500</td>
<td>0.01 1</td>
<td>± (0.030% Rdg + 0.005% FS)</td>
<td>± (0.008% Rdg + 0.005% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>N</td>
<td>-200 to +1300</td>
<td>0.01 1</td>
<td>± (0.035% Rdg + 0.005% FS)</td>
<td>± (0.010% Rdg + 0.005% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>P</td>
<td>0 to +1395</td>
<td>0.01 1</td>
<td>± (0.035% Rdg + 0.006% FS)</td>
<td>± (0.010% Rdg + 0.006% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>R</td>
<td>-50 to +1768</td>
<td>0.01 1</td>
<td>± (0.020% Rdg + 0.015% FS)</td>
<td>± (0.005% Rdg + 0.015% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>S</td>
<td>-50 to +1768</td>
<td>0.01 1</td>
<td>± (0.020% Rdg + 0.015% FS)</td>
<td>± (0.005% Rdg + 0.015% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>T</td>
<td>-200 to +400</td>
<td>0.01 1</td>
<td>± (0.025% Rdg + 0.015% FS)</td>
<td>± (0.005% Rdg + 0.015% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>U</td>
<td>-200 to +600</td>
<td>0.01 1</td>
<td>± (0.025% Rdg + 0.015% FS)</td>
<td>± (0.005% Rdg + 0.015% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
<tr>
<td>Au/Ph</td>
<td>0 to +1000</td>
<td>0.01 1</td>
<td>± (0.020% Rdg + 0.015% FS)</td>
<td>± (0.005% Rdg + 0.015% FS)</td>
<td>7 ppm Rdg + 6 ppm FS</td>
</tr>
</tbody>
</table>

* Applies to readings above +600°C

The above figures apply to measurements with the Reference Junction switched off.

Reference Junction uncertainty when used in automatic mode (INT) is better than 0.1°C at +20°C with a deviation of typically 0.01°C/°C over the range 0 to +100°C.

**CALIBRATION:** Protected by digital security code. Default code is 9252

**BATTERIES:**
- 6V, 2.8AH sealed lead acid battery for digital circuits and display
- 6V, 1.2AH sealed lead acid battery for analogue circuits
- T068AA lithium battery for data logging memory

Operating time after full charge:
- 8 hours with backlight ON
- 14 hours with backlight OFF

**WORKING TEMPERATURE:**
- 0...50°C with relative humidity less than 90% non-condensing

**STORAGE TEMPERATURE:**
- -20...+55°C

**MAINS SUPPLY:**
- 100/120/220/240 Volt +10% -13%
- 47...63Hz. 80VA

**DATA LOGGING:**
- Up to 4000 values, with date and time

**MATHS:**
- Max/Min, Mean, Peak to Peak, and Standard Deviation
- Computed from values stored in the data log

**ANALOGUE O/P:**
- Factory fitted option. Single BNC socket on rear panel
- The output voltage refers to the value on the display
- 12-bit D/A converter
- Output scaled 1mV/°C, with a resolution of 0.1°C
- Accuracy ± (0.5% Rdg + 0.5%FS)
- This option is designed for following trends and is not intended for accurate measurement
GENERAL

The Series 3000 Thermometers are ready for immediate use, with rechargeable batteries and built-in chargers.

The instruments are switched on and off using the left hand buttons, marked appropriately. Connecting the mains supply automatically enables the battery charging circuits which charge the batteries at the appropriate rates. The "LINE" LED will illuminate to show that mains power has been connected to the instrument, and the "FAST" LED will illuminate when the battery chargers are charging at a high rate. The chargers will automatically reduce the charging currents to trickle currents as the batteries reach approximately 80% of full capacity. Continuous trickle charging will not affect the batteries, and we recommend that the Series 3000 Thermometers are used with the mains supply connected whenever possible.

To measure temperature, a suitable probe should be connected to input A or B. The measured temperature will be displayed in large characters and the measured resistance or voltage will be displayed in smaller characters below, together with the measuring mode selected. In addition, the probe configuration and channel details will be displayed along the top of the display.

FRONT PANEL KEYS
DISPLAY CONTRAST: To adjust the display contrast, press and hold either the ↑ or ↓ key; the contrast can be set for optimum viewing. It may be desirable to adjust the contrast from time to time as your reading position changes.

A  Selects channel A to display
B  Selects channel B to display
A-B Displays the difference between probe A and probe B
The voltage/resistance reading will not be shown

SENS  The following sensors may be configured depending upon the model

<table>
<thead>
<tr>
<th>Model</th>
<th>3000</th>
<th>3001</th>
<th>3002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt25</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pt100</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Thermocouples</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Select SENS

<table>
<thead>
<tr>
<th>A0 SPRT-4W</th>
<th>User-1</th>
<th>RwLp=25.5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- -- -- --</td>
<td>0 °C</td>
<td></td>
</tr>
</tbody>
</table>

Sensor Type?

T/C  PRT  Quit

To configure for thermocouples select T/C

<table>
<thead>
<tr>
<th>A0 SPRT-4W</th>
<th>User-1</th>
<th>RwLp=25.5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- -- -- --</td>
<td>0 °C</td>
<td></td>
</tr>
</tbody>
</table>

Thermocouple Type?

B  C  D  E  J >> Quit OK

Now select one of the thermocouple types and press OK. The next screen will help you configure the reference junction

<table>
<thead>
<tr>
<th>A0 TC Type K</th>
<th>RJ Mode = Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- --</td>
<td>0 °C</td>
</tr>
</tbody>
</table>

RJ mode?

Off  Int  Ext  Quit  OK
From this screen you can choose from 3 Reference Junction modes:

**Off** switches the RJ Off

**Int** selects the internal RJ and automatically compensates for ambient temperature

**Ext** switches to the external RJ mode. A PRT should be connected to the RTD input of the channel being configured; this PRT can then be used to accurately measure the reference junction temperature away from the instrument. A choice of PRT types is available.

<table>
<thead>
<tr>
<th>AO TC Type K</th>
<th>RJ Mode = Ext EN60751</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- -- -- -- -- -- C</td>
<td></td>
</tr>
</tbody>
</table>

**Sensor Type?**

<table>
<thead>
<tr>
<th>EN-60751</th>
<th>User</th>
<th>Quit</th>
<th>OK</th>
</tr>
</thead>
</table>

Return to the **SENS** screen

To configure PRTs, select **PRT**

<table>
<thead>
<tr>
<th>AO TC Type K</th>
<th>RJ Mode = Ext EN60751</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- -- -- -- -- -- C</td>
<td></td>
</tr>
</tbody>
</table>

**Sensor Type?**

<table>
<thead>
<tr>
<th>EN-60751</th>
<th>User</th>
<th>Quit</th>
<th>OK</th>
</tr>
</thead>
</table>

Select EN-60751 for Pt100 Industrial PRT linearisation. The coefficients may be reviewed by pressing the **Rev** Key, but they cannot be changed.

<table>
<thead>
<tr>
<th>AO</th>
<th>IPRT-4W</th>
<th>EN60751</th>
<th>R0=100.000</th>
<th>a=3851</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

**Sensor Type?**

<table>
<thead>
<tr>
<th>Rev</th>
<th>EN-60751</th>
<th>User</th>
<th>Quit</th>
<th>OK</th>
</tr>
</thead>
</table>

To select other coefficients or to configure for Pt25, press the **User** key

<table>
<thead>
<tr>
<th>AO TC Type K</th>
<th>RJ Mode = Ext EN60751</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- -- -- -- -- -- -- -- -- -- -- -- -- -- C</td>
<td></td>
</tr>
</tbody>
</table>

**Enter Probe # (1-20)**

<table>
<thead>
<tr>
<th>Enter Probe # (1-20)</th>
<th>Quit</th>
<th>OK</th>
</tr>
</thead>
</table>

Enter the probe number and press **OK**. If you select a probe number that has no coefficients assigned to it, then you will be prompted to enter them. Press **Quit** to return to the main measurement menu.

<table>
<thead>
<tr>
<th>RO: 0.0000 Ohm</th>
<th>User - 1 is empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: +0.000000e+00</td>
<td>Enter new Coefficients</td>
</tr>
<tr>
<td>B: +0.000000e+00</td>
<td></td>
</tr>
<tr>
<td>C: -0.000000e+00</td>
<td></td>
</tr>
</tbody>
</table>

**I-PRT**

**CvD**

**S-PRT**

**ITS90**

**Quit**
To enter probe coefficients a choice of either **CvD** (Calendar van Duesen) or **ITS90** coefficients is available

Select **I-PRT CvD** and enter the coefficients in the following screen

```
R0 : 0.0000 Ohm
A: +0.00000e+00
B: +0.00000e+00
C: +0.00000e+00
```

Alternatively, select **S-PRT ITS90** and enter the coefficients in the following screen

```
Rwtp: 25.50000 Ohm  An: +0.000000e+00
Ap: +3.908300e-03  Bn: +0.000000e+00
Bp: -5.775000e-07  Cn: -4.133000e-12
```

Once a probe’s coefficients have been entered, they can be recalled from the **SENS** menu, and edited if required, using the **Rev** option

**AN IMPORTANT** feature of the 3000 Series Thermometers is that each channel may be configured with any sensor type so, for example, a PRT may be compared against a thermocouple, or a Pt25 against Pt100 etc

**UNIT** Sets the units of the temperature display. Pressing **UNIT** will cycle the units in the order °C, °F, K

**RESN** Sets the resolution of the temperature display. Pressing **RESN** will cycle the resolution in the order 0, 0.1, 0.01, 0.001

**MATH** This enables you to select and review the statistics of the stored data log values. Press **Log Stats** and the following values will be displayed: **Number of Samples**, **Max & Min, Mean, Peak to Peak (Ptp)**, and **Standard Deviation (SD)**

```
Analysis of current log (A0 Deg C)

<table>
<thead>
<tr>
<th>Number of samples</th>
<th>(A0)</th>
<th>(Deg C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min: 841.156</td>
<td>max: 841.210</td>
<td></td>
</tr>
<tr>
<td>Mean: 841.179</td>
<td>Ptp: 0.054</td>
<td></td>
</tr>
<tr>
<td>SD: 0.0236</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**WARNING:** **STATS** are only calculated from values stored in the data log, and will only be displayed if the stored values are all from the same channel. If readings from different channels have been stored, the **STATS** will be invalid, as indicated by a warning message. Also be aware that changing the probe settings during logging will also invalidate any **STATS** displayed. A minimum of 2 stored readings are required to calculate the **STATS**.
SCAN  This enables the scanner to be configured and values logged

Press SCAN. This screen enables you to turn the scan sequence ON or OFF and to select one of the 4 available scanning sequence lists, SL1 to SL4; the scanning lists may also be edited

To select a scanning list, press SL1 to SL4. To turn off scanning, press Off. With a scanning list selected, it can be edited by pressing the Edit key

The channels included in the scanning sequence can now be selected by pressing the Add key, or deleted with the Del key; the highlighted channel will be added or deleted. To select a different channel use the < > keys

NOTE: If scanner cards are fitted then an additional 4 channels will be available per scanner card

Press OK to return to previous screen

From the SCAN menu, select TIMER to set the cycle and time intervals

To select the parameter to change, use the < > keys and the selected parameter will flash. Press Clear to clear current value set, and Edit to change the selected parameter

To set the number of scan cycles, press Edit and then key in the number of cycles required, 1 to 9999. To set as continuous scan press Clear. Using the > key select Delay and Edit, key in the required delay time between scans in hh:mm:ss format. This will also be the delay time before the first scan starts. Press OK to confirm set time and > to select the reading rate. Press Edit and key in the reading rate in hh:mm:ss format. This will be the time between each measurement.
**Series 3000 Thermometer**

Note: Allow sufficient time for temperature to be measured and have regard for the stabilisation time of measured sample. Press **OK** to confirm, and **Quit** to exit to the main measurement screen.

![Operating Instructions](image)

The instrument is now set in the Hold mode and the scan sequence is started by pressing the **TRIG** key. A timer will show in place of Hold, and will count down to the measurement scan start.

**DATA LOGGING**

To configure data logging from the main measurement screen, select **SCAN** and **Mem**.

![Mem](image)

To set up a new log, press **New** and confirm that you wish to clear the current log. Press **On** to activate the logging function, press **OK** to confirm, and **Quit** to return to measurement screen. The instrument will be in the measurement Hold state. To trigger the measurement start, press the **Trig** key. All measured values will now be stored in the data log. The logging function can also be used in conjunction with scanner sequence lists.

To review the logged values, press **SCAN** and **Rev**.

<table>
<thead>
<tr>
<th>Log#</th>
<th>Ch#</th>
<th>Temp(degC)</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A0</td>
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<td>19/08/05</td>
<td>11:00:00</td>
</tr>
<tr>
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<td>19/08/05</td>
<td>11:01:00</td>
</tr>
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<td>19/08/05</td>
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</tr>
<tr>
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<td>19/08/05</td>
<td>11:03:00</td>
</tr>
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<td>5</td>
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<td>19/08/05</td>
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</tr>
<tr>
<td>6</td>
<td>B0</td>
<td>213.043</td>
<td>19/08/05</td>
<td>11:05:00</td>
</tr>
</tbody>
</table>

The values can be scrolled Up and Down using the ↑ and ↓ keys.

To exit this screen, press **OK** (CAL ) key

"Hold Samples = 0/20"

ZERO  This zeros the displayed value, and "Zero" appears in the bottom left hand corner of the display.

**NOTE:** This function is cancelled if the measuring channel or sensor configuration is changed, or on entering the calibration menu.

TRIG  In the default "Run" mode, the **TRIG** key toggles the Run/Hold function. "Run" or "Hold" is displayed above the key, and the flashing "Busy" legend is blanked in Hold mode.
The Trigger mode can be set to “single shot” using the OPT menu. In this mode, pressing the TRIG key triggers one measurement only, the value held on the display. The “Busy” legend flashes just once. It should also be noted that even for large changes in temperature, each new measurement will be valid, the specially designed measurement circuit ensures that the A/D converter is fully zeroed and stabilised before a new measurement is displayed.

When used in conjunction with the data logging function, the TRIG key is used to start logging. Pressing the TRIG key again puts the instrument into a Hold state and the measurement channels may now be changed. Restarting the measurement by pressing the TRIG key also resumes the data logging; the newly selected measurement channel now being stored. It is possible to store readings from channels A, B, or A-B. When in “single shot” mode, the instrument is normally in the Hold state. Pressing the TRIG key triggers just one measurement, the value being stored in the data log. The instrument then returns to the Hold state.

+1 For PRT measurement, selects the positive measuring current. The measuring time is 1.8s for channels A and B, and 3s for A-B.

-1 For PRT measurement, selects the negative measuring current. Measuring times as above.

AVE Automatically switches the PRT measuring current alternately from positive to negative direction, and displays the average of the 2 readings. This eliminates thermal emf errors. Measuring time is 5.2s for channels A and B, and 10.2s for A-B.

√2 For PRT measurement, this reduces the measuring current to √2 of the normal value (half power), enabling probe self heating errors to be determined. A suggested method is to first select normal current and allow the sensor to reach a steady temperature. Now, select √2 current and immediately press ZERO. Allow the reading to stabilise again, the temperature value now displayed will be the change due to halving the probe power. For large, well designed probes this will be very small and may not be noticeable, but small, lightweight sensors may have significant errors.
**Operating Instructions**

**Series 3000 Thermometer**

<table>
<thead>
<tr>
<th>OPT</th>
<th>Selects the various instrument configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image-url" alt="Image" /> + 841.566 °C</td>
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<tr>
<td></td>
<td>Options?</td>
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<tr>
<td></td>
<td>Sys Conf</td>
</tr>
<tr>
<td></td>
<td>A0 SPRT-4W</td>
</tr>
</tbody>
</table>

**Sys Conf**
Displays the instrument configuration

**Set Up**

**BACKLIGHT**
Select on/off - press **OK** to confirm setting

**BEEPER**
Select on/off - press **OK** to confirm setting

**TIME**
The current time is displayed. To change, press **Chg** and enter the new time in hours/minutes/seconds format. Press **OK** to confirm setting

**DATE**
The current date format is displayed. To change, press **Chg** to toggle between dd/mm/yy and mm/dd/yy formats. Press **OK** to confirm setting

The current date is now displayed. To change, press **Chg** and enter the new date in the format selected above. Press **OK** to confirm settings

**Rem I/F**
If an interface card is fitted, this key will display the various settings available to that interface i.e. Baud rates, address etc. If no interface is fitted, the “No Option Available” message is displayed

**Trg:**
The trigger mode can be changed; selecting **Sng** enables the **TRIG** key to be used as a single trigger. Only one measurement will be made and held on the display. Selecting **Run** enables the Run/Hold mode. Pressing the **TRIG** key holds the reading with the current value held on the display. Press **TRIG** again and the measurement is in **Run** mode with continuous measurements being displayed

**Ver**
Displays the instrument model number and software version
PRT INPUTS

There are 2 LEMO type sockets for PRT inputs, the connections are shown below. For best performance we recommend 4-wire sensors, but the 3000 Series Thermometers are able to measure with 2, 3, and 4-wire sensors. The sensors may be plugged into either channel A or B. The connection plug for the PRT sensors is LEMO type FGG.1B.306.CLAD52

Connections

4 wire PRT

3 Wire PRT

2 Wire PRT

Link pins at plug
THERMOCOUPLE INPUTS

When using thermocouples (Models 3000 & 3001), care should be taken to achieve the best results. The inputs are 4mm copper sockets placed behind the front panel to avoid the effects of external draughts. A range of thermocouple plugs is available for connection.

The reference junction may be set in three different modes:

INT: Internal mode uses Pt100 sensors, attached internally to each of the input sockets to monitor their temperatures. These automatically correct for junction temperature. Accuracy is ±0.3°C

EXT: For more accurate results, an external reference junction may be used, often temperature controlled. An external Pt100 sensor is connected to the PRT socket of the same T/C channel and this is used to measure the external reference temperature. The accuracy of this is as for Pt100 measurement, ±0.01°C

OFF: The reference junction compensation may be switched off (OFF) and in this mode the instrument uses a reference junction temperature of 0°C. This mode of operation is useful when an external electronic reference junction is used

CAUTION

When measuring thermocouples with the 3000 Series Thermometers it should be remembered that the temperature may be read to 0.01°C, and this is equivalent to approximately 0.4μV per digit with a type K thermocouple. Care must therefore be taken to avoid exposing the instrument inputs to draughts or a heat source such as sun shining on the front panel. To obtain the best results the instrument should be placed in a temperature controlled room and switched on for at least 30 minutes before measurements are made. Running on battery power without the mains supply connected will also be of benefit. If charging flat batteries from the mains, some additional heat will be generated inside the instrument, and it is best to let the batteries fully charge and the temperature stabilise before using to full accuracy. Great care should also be taken to ensure that the correct materials are used when making connections and avoid unnecessary joints of different materials as these again will cause errors.

We offer a range of thermocouple connectors for use with the 3000 Series Thermometers as well as a range of automatic reference junctions and an external reference enclosure with integral Pt100 sensor; please ask our sales staff for more information.
CALIBRATION

The 3000 Series Thermometers have been designed to give long service and permanence of calibration, together with a low cost of ownership. Attention to detail in the design stage has produced an instrument that is quick and simple to recalibrate with the minimum of equipment. Prior to calibration the unit should be placed in a temperature controlled environment for a minimum of 4 hours. Care should be taken to use good quality test leads, to avoid thermal emf errors, together with resistance standards of known value.

To select the Cal option, press MEM and select the Cal option from the menu. The calibration counter number will be displayed. A second menu choice will be given - Cal or Prt. The Prt option will print the calibration constants to the screen. This is used as a diagnostic tool to ensure that there is no corruption of the stored calibration constants. Select the Cal option and enter the passcode - the factory default setting is 9252. Press OK. You now have the option to change the passcode to one of your choosing. If you select Yes, enter your chosen number via the keypad and press OK (don’t forget to make a secure note of your passcode!). Any number between 0 and 9999 is valid. You will then be asked to confirm your number. Once this is accepted, the calibration counter will increment by 1. The display will then give a choice of calibrating RTD, T/C, RJA, RJB - it is preferable to calibrate the RTD ranges first.

RTD Calibration

Press RTD, select Pt100. You will be prompted to connect a 100Ω resistance standard to channel A. When connected, press OK and you will be prompted to enter the exact value of the standard. Enter this value, press OK, then confirm by pressing OK again. The instrument will then measure and store the value of the standard. You will now be prompted to connect a 400Ω resistance standard and repeat the above. Finally, you will be prompted to connect a 250Ω resistance standard and repeat the above. Once these measurements are complete, the instrument will calculate the calibration constants, storing them in the internal, secure memory and the display will return to the main menu.

For Model 3000 you now have the option to calibrate the Pt25 range. Follow the display instructions using 100Ω, 25.5Ω, and 62.5Ω resistance standards.

Thermocouple Calibration

Press T/C. Connect a mV calibration source to the thermocouple input of channel A using low thermal copper leads and connectors. You will prompted to set the apply 0mVDC. When set, press OK. Next, apply +75mVDC and press OK. Finally, apply -75mVdc and press OK. Once these measurements are complete, the instrument will calculate the calibration constants, storing them in the internal, secure memory and the display will return to the main menu.
RJ Calibration

The reference junctions of both channel A and channel B should be calibrated. Select **RJA**. Insert a Standards quality Pt100 probe into the negative (lower) 4mm input socket of channel A, and allow the temperature to stabilise; it is necessary to use a sensor that fits securely into this socket. Once a steady temperature reading has been obtained, enter the temperature into the instrument. Confirm the value and press **OK**. Repeat this procedure for channel B, moving the sensor to the negative input socket of channel B.

Once both channels have been calibrated you may exit the calibration menu with the **QUIT** key.

**Calibration Equipment Required**

1. Resistance Standard Type RS3/100 Value 100 Ohm
2. Resistance Standard Type RS3/250 Value 250 Ohm
3. Resistance Standard Type RS3/400 Value 400 Ohm

1. Resistance Standard Type RS3/25.5 Value 25.5 Ohm } 3000 model
2. Resistance Standard Type RS3/62.5 Value 62.5 Ohm } only

1. mV source -75 ... 0 ... +75 mV
2. Standards quality Pt100 sensor and measuring instrument
3. Calibration Lead Type TS01

The values of the resistance standards should be known with an uncertainty ±5ppm or better. Suitable resistance standards are available for calibration together with a calibration connection lead - please consult our sales staff.

**ENVIRONMENT**

We expect the 3000 Series Thermometers to give long and trouble free service but, as with everything, there will come a time when you wish to replace it. CROPICO will continue to develop new instruments and to update the design of existing models and, therefore, will be able to offer an instrument suitable for your needs.

When disposing of the batteries care should be taken to comply with current legislation concerning their disposal. If in doubt, the batteries can be returned to our factory for safe disposal. In addition to the two sealed lead acid batteries there is also a lithium battery which powers the data log memory.

**WARNING**

- DO NOT DISPOSE OF BATTERIES IN FIRE
- DO NOT SHORT CIRCUIT
- DO NOT PUNCTURE, OPEN, DISMANTLE OR OTHERWISE MECHANICALLY INTERFERE WITH THE BATTERIES.
- DO NOT SWALLOW
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