

Version : 1.0  
Date : 05 Aug 96  
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**Model 88-T**  
**Temperature Process Controller**

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Congratulations ! You have purchased the latest in Instrumentation for industrial process measurement and control of TEMPERATURE. We hope that your new Model 88-T Controller will provide you with many years of reliable service.

To help with correct installation and operation, please read this manual carefully.

If at any stage we can be of assistance, please contact either your local T.P.S. representative or the TPS factory in Brisbane.

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## 1. Introduction

The T.P.S. 88-T Temperature Controller instantaneously measures and controls the temperature of industrial processes. The system consists of two parts:

- (a) Temperature sensor
- (b) Controller/readout section.

From this latter section signals are available for voltage or current accessories. In addition there are relay contact closures for control purposes.

## 2. Controls

### 2.1 Calibrate Controls

**ISO** This is the PRIMARY calibration control and compensates for variations in the electrode offset.

**SPAN** This is the SECONDARY calibration control and sets the temperature increment.

### 2.2 Limit Controls

**LOWER** This sets the trip point of the Lower relay contacts. It represents a LOW limit to reach. The LOW LIMIT lamp lights when the signal goes BELOW this value.

**UPPER** This sets the trip point of the Upper relay contacts. It represents a HIGH limit to reach. The HIGH LIMIT lamp lights when the signal goes ABOVE this value.

### 2.3 Output Controls

**RECDR. ZERO** This sets the zero of the optional recorder output.

**RECDR. SPAN** This sets the span of the optional recorder output. (Adjusts full scale voltage).

**LOOP 4mA** This sets the output value of the optional current loop at low end of the data.

**LOOP 20mA** This sets the output value of the optional current loop at the high end of the data.

## 2.4 Display Function Switch

The four position switch is labelled:

- (a) **LOWER**      The display INDICATES DIRECTLY, the setting of the LOWER limit. See section 2.2 *Limit Controls*, above. Voltage and current outputs are still maintained and are proportional to the displayed setting.
- (b) **UPPER**      The display INDICATES DIRECTLY, the setting of the UPPER limit. See 2.2 *Limit Controls*, above. Voltage and current outputs are still maintained and are proportional to the displayed setting.
- (c) **STANDBY**    The display indicates the Temperature data from the sensor, BUT relays are inhibited (off state). The voltage/current outputs are maintained. Voltage and current outputs are still maintained and are proportional to the displayed reading.
- (d) **AUTO**        The display indicates the Temperature data from the sensor, AND the LOWER/UPPER relays outputs are enabled under the controller's action.

**NOTES:** The function switch should not be left in the (a) or (b) position as it is NOT indicating the Temperature data from the sensor at all!

In (a), (b) and (c) positions the COLON ":" is displayed to show that the controller is NOT controlling the relays.

## 3. Cables and Wiring

### 3.1 Sensor Connections

Terminal Block	Terminal No	Connection	
J-2	1	No connection	
J-2	2	No connection	
J-2	3	No connection	
J-2	4	Clear or White core	Positive signal from sensor
J-2	5	BRAID	Usually covered with green insulation
J-2	6	Black core	Negative signal from sensor

### 3.2 Power and Relay Output Connections

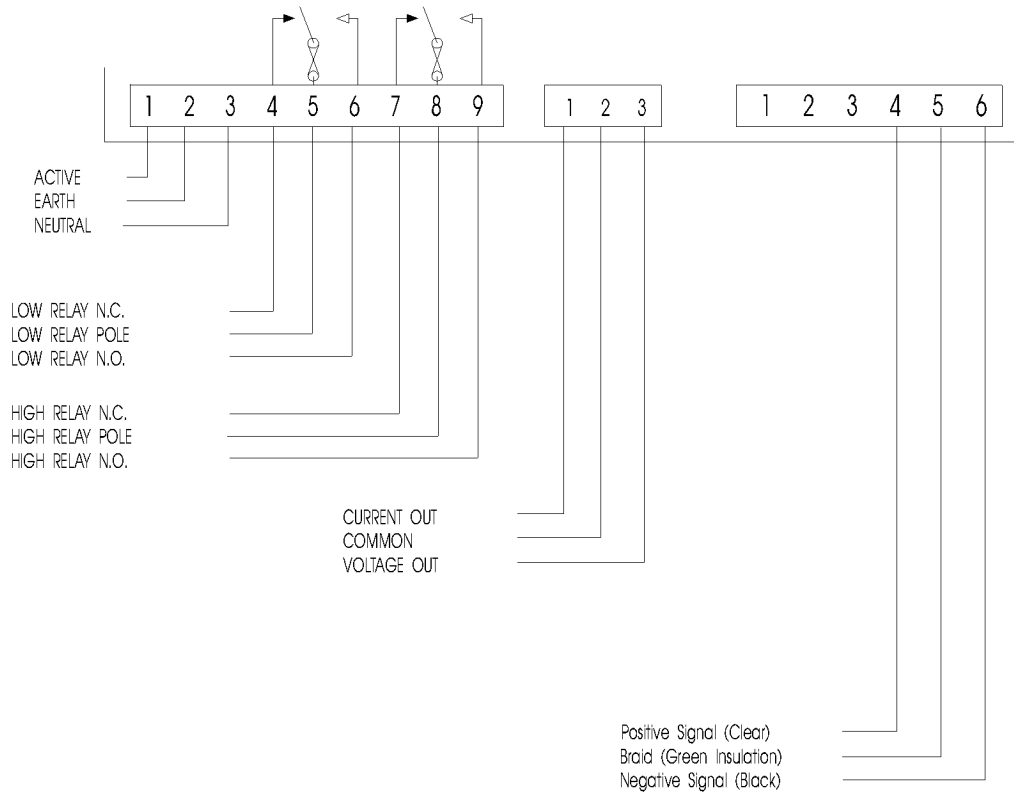
Terminal Block	Terminal No	Connection
J-1	1	Active 240 Vac IN
J-1	2	Earth (mains)
J-1	3	Neutral 240 Vac IN
J-1	4	Lower Relay NC (normally closed)
J-1	5	Lower Relay COM (common)
J-1	6	Lower Relay NO (normally open)
J-1	7	Upper Relay NC (normally closed)
J-1	8	Upper Relay COM (common)
J-1	9	Upper Relay NO (normally open)

**NOTES:** Relay contacts are undedicated change-over type capable of 1-2A (MAX) at 240V AC. The use of external contactors for higher currents and reduced interference is recommended. DO NOT run heaters directly on the 88-T relay contacts.

### 3.3 Recorder and 4-20mA Output Connections

Terminal Block	Terminal No	Connection
J-3	1	+ve Current Output, 4-20mA (Not Isolated) - (Optional) <b>NOTE:</b> Voltage compliance is 12 volts.
J-3	2	Common
J-3	3	Recorder Output, 0 to 1V DC <b>NOTE:</b> Impedance is 100 ohms and so 0-10mA is delivered into a low impedance device if required.

### 3.4 Connection Diagram



## 4. Calibration

1. Set to **STANDBY** to disable the Relay functions.
2. Turn the **88-T** on with the Sensor wired in. Allow at least 1 minute for the sensor to stabilise.

### 3. Zero Calibration

Zero calibration is the main calibration. A zero calibration should be performed when the controller is used for the first time. Subsequent re-calibration is not required unless the temperature sensor is replaced.

- (a) Make up an ice and water bath. Ensure that the ice and water are mixed well for uniform temperature.
- (b) Place the temperature sensor into this solution, alongside a good quality 0.1 °C mercury thermometer. Stir the sensor and thermometer together for optimum accuracy. Allow the reading to stabilise at or very near to 0.0 °C. (can take up to 2-3 minutes).
- (c) Set the **ISO** control (See section 2.1, Calibrate Controls) until the display reads the same temperature as the thermometer.

### 4. Span Calibration

A span calibration should be performed once near the expected temperature of the sample. Subsequent re-calibration is not required unless the temperature sensor is replaced.

- (a) Place the temperature sensor into a water bath near the expected operating temperature, alongside a good quality 0.1 °C mercury thermometer. Stir the sensor and thermometer together for optimum accuracy. Allow the reading to stabilise (can take up to 2-3 minutes).
- (b) Set the **SPAN** control (See section 2.1, Calibrate Controls) until the display reads the same temperature as the thermometer.

5. The 88-T is now calibrated. The 4-20mA output may also need to be calibrated. See section 6.

## 5. Setting the Limits

### 5.1 Lower Limit

1. Switch the Function Switch to **LOWER** (see section 2.4, Display Function Switch)  
Note that the output control relays are disabled in this mode. Voltage and current outputs are maintained, as a function of the digits on the display.
2. Adjust the **LOWER** Limit control (see section 2.2, Limit Controls) until the display shows the "TOO LOW" value at which you wish to raise the temperature, or activate an alarm.
3. Switch the Function Switch back to **STANDBY** or **AUTO**, as required (see section 2.4, Display Function Switch).

### 5.2 Upper Limit

1. Switch the Function Switch to **UPPER** (see section 2.4, Display Function Switch)  
Note that the output control relays are disabled in this mode. Voltage and current outputs are maintained, as a function of the digits on the display.
2. Adjust the **UPPER** Limit control (see section 2.2, Limit Controls) until the display shows the "TOO HIGH" value at which you wish to lower the temperature, or activate an alarm.
3. Switch the Function Switch back to **STANDBY** or **AUTO**, as required (see section 2.4, Display Function Switch).

## 6. 4-20 mA Current Output Option

This is a current output, proportional to the DISPLAY, positive with respect to common and is NOT isolated.

This option is normally set up as 4-20mA for 0 to Full Scale (eg: 0 to 100.0 °C)

The **88-T** has two adjustments to fine-tune the current output:

1. **LOOP ZERO** ( 4mA adjustment) Range at 4mA = +/- 20%
2. **LOOP SPAN** (20mA adjustment) Range at 16mA (ie: 20mA - 4mA) = +/- 10%

**This unit configured as 4-20mA for \_\_\_\_\_ to \_\_\_\_\_**

## 7. Recorder Output Option

This is a voltage output proportional to the DISPLAY and is NOT isolated.

This option is normally set up as 0-1 Volt for 0 to Full (eg: 0 to 100.0 °C)

The **88-T** has two adjustments to fine-tune the voltage output:

1. **RECDR. ZERO** (Zero adjustment) Range +/- 10%
2. **RECDR. SPAN** (Span adjustment) Range +/- 10%

**This unit configured as 0-1 Volt for \_\_\_\_\_ to \_\_\_\_\_**

## 8. Troubleshooting

NOISY READINGS:	1. Check terminal wiring is correctly fitted.
Reads '-1.' (Overrange)	1. Sensor is not connected. 2. Sensor is shorted. 3. Temperature reading is over 120 °C.
CANNOT ZERO CALIBRATE:	1. Check sensor connections. 2. Replace the sensor.
CANNOT SPAN CALIBRATE:	1. Check sensor connections. 2. Replace the sensor.
READING UNSTABLE:	1. Sensor faulty ? 2. Electronics faulty ?

## 9. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the Factory, or Authorised Service Station, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on electrodes is three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

### **PLEASE NOTE:**

A guarantee card is packed with the instrument or electrode. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

### **PROCEDURE FOR SERVICE**

If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the electrode simply requires cleaning or replacement. TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

To obtain this service, please follow this procedure:

Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)**  
(note: "Please Repair" does NOT describe a fault.)
- **either \$12 for return freight for units under warranty,**
- **or \$20 to cover inspection costs and return freight.**

(These amounts are not applicable to full-account customers.)

For out-of-warranty units, a repair cost will be calculated from parts and labor costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**

If you did not receive a Warranty Card, please photocopy or tear off the bottom half of this page, fill in the details and send to:

T.P.S. PTY. LTD.  
4 JAMBEROO STREET,  
SPRINGWOOD, BRISBANE,  
AUSTRALIA, 4127.

Fill in purchase details for your reference. (Retain this section).

Model No: \_\_\_\_\_ Serial No: \_\_\_\_\_

Purchase Date: \_\_\_\_\_ Dealer: \_\_\_\_\_

✂ -----

Send this section to TPS

Customer: \_\_\_\_\_ Position: \_\_\_\_\_

Company/Division: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

Post Code: \_\_\_\_\_ Country \_\_\_\_\_

Phone No: \_\_\_\_\_ Fax No: \_\_\_\_\_

Model No: \_\_\_\_\_ Serial No: \_\_\_\_\_

Purchase Date: \_\_\_\_\_ Dealer: \_\_\_\_\_

Comments: \_\_\_\_\_

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