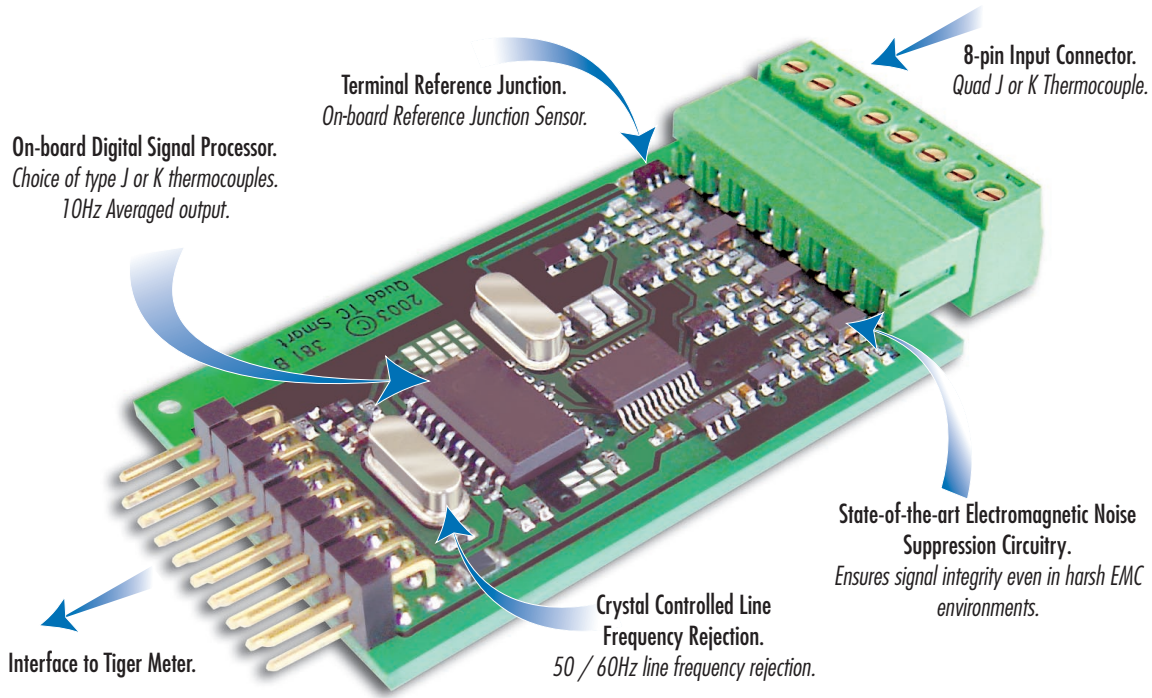


## QUAD THERMOCOUPLE INPUT

# QUAD THERMOCOUPLE INPUT



Multiple inputs processed with powerful signal conditioning.

Ideal for multi-temperature control systems, IST3 and IST4 monitor up to four individual thermocouple sensors at 10 Hz averaged output rate. A choice of industry J or K type thermocouples with an on-board temperature sensor for reference junction compensation provide a versatile interface for temperature measurement tasks.

### Input Module Order Code Suffix

IST3 (50 Hz Rejection)

IST4 (60 Hz Rejection)



| Hardware Module Specifications |   |
|--------------------------------|---|
| Input Channels                 | Four independent channels, zero X-talk and 16-bit resolution.   |
| Thermocouple Type              | Industry standard J or K type (software selectable).  |
| Input Sensitivity              | 0.08 $\mu\text{V}$ / count maximum.   |
| Zero Drift                     | $\pm 40$ nV / $^{\circ}\text{C}$ typical.   |
| Span Drift                     | $\pm 5$ ppm / $^{\circ}\text{C}$ full scale maximum.  |
| Non-linearity                  | $\pm 0.003\%$ 5 $\sigma$ full scale maximum.  |
| Input Noise                    | 160 nV p-p typical.   |
| Signal Processing Rate         | 10 Hz averaged output rate on all channels.   |
| Reference Junction             | On-board solid state sensor referenced thermal connection to terminal block socket. Resolution better than 0.1 $^{\circ}\text{C}$ . |

| Software Module Specifications |  |
|--------------------------------|--|
| Output Rate                    | Fixed 10 Hz averaged per channel.  |
| Sensor Selection               | Choice of J or K, software selectable.   |
| Line Frequency Rejection       | 50/60 Hz, software selectable.   |
| Broken Thermocouple            | [OVER] on display indicates broken thermocouple. Software senses a broken thermocouple and causes the display to flash [OVER]. Note, only seen if that display is the current display. Otherwise, it can be checked through the view mode. |

INPUTS

TEMPERATURE

## Connector Pinouts

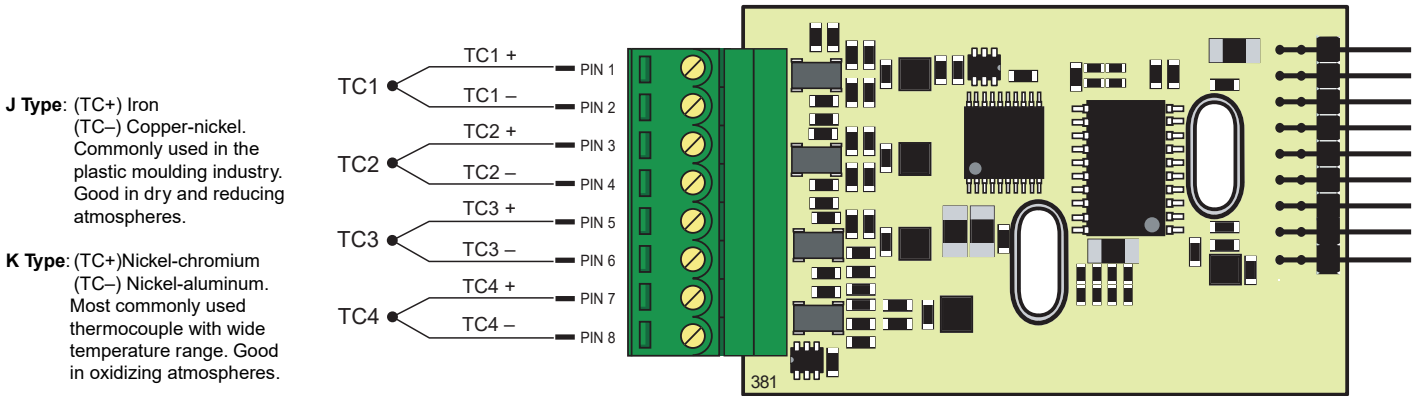


Figure 1 – IST3/IST4 Quad Thermocouple Smart Input Module

## Smart Setup Registers

The Tiger controller uses three smart setup registers to configure all smart input modules. Line frequency rejection (50 / 60 Hz) and thermocouple type are configured in **smart register 1** (SMT1). See Figure 2.

Thermocouple signals, TC1, TC2, TC3, and TC4, are then individually software selected for the four input channels. Either signal can be selected for CH1 via Code 2, CH2 via Code 4, CH3 via Code 5, and CH4 via Code 6.

**Note:** Once selected, the thermocouple type is the same for all four channels.

**Note:** The same thermocouple signal can be selected for two or more channels.

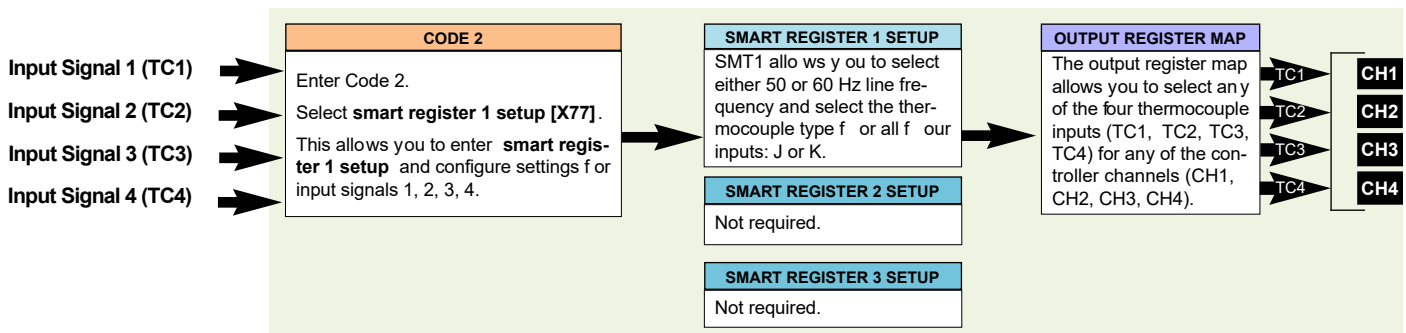


Figure 2 – IST3/IST4 Smart Setup Registers Operational Flow Diagram

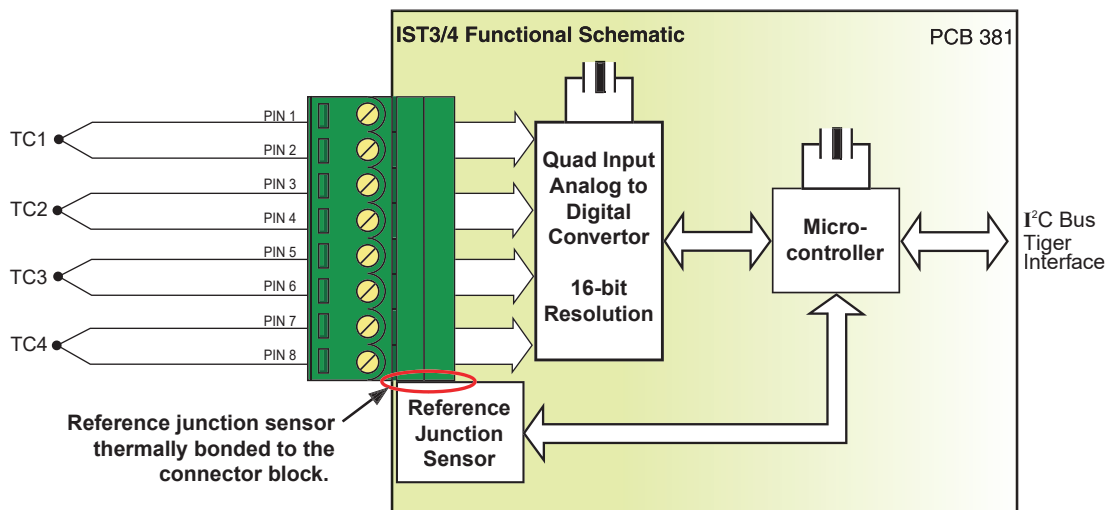


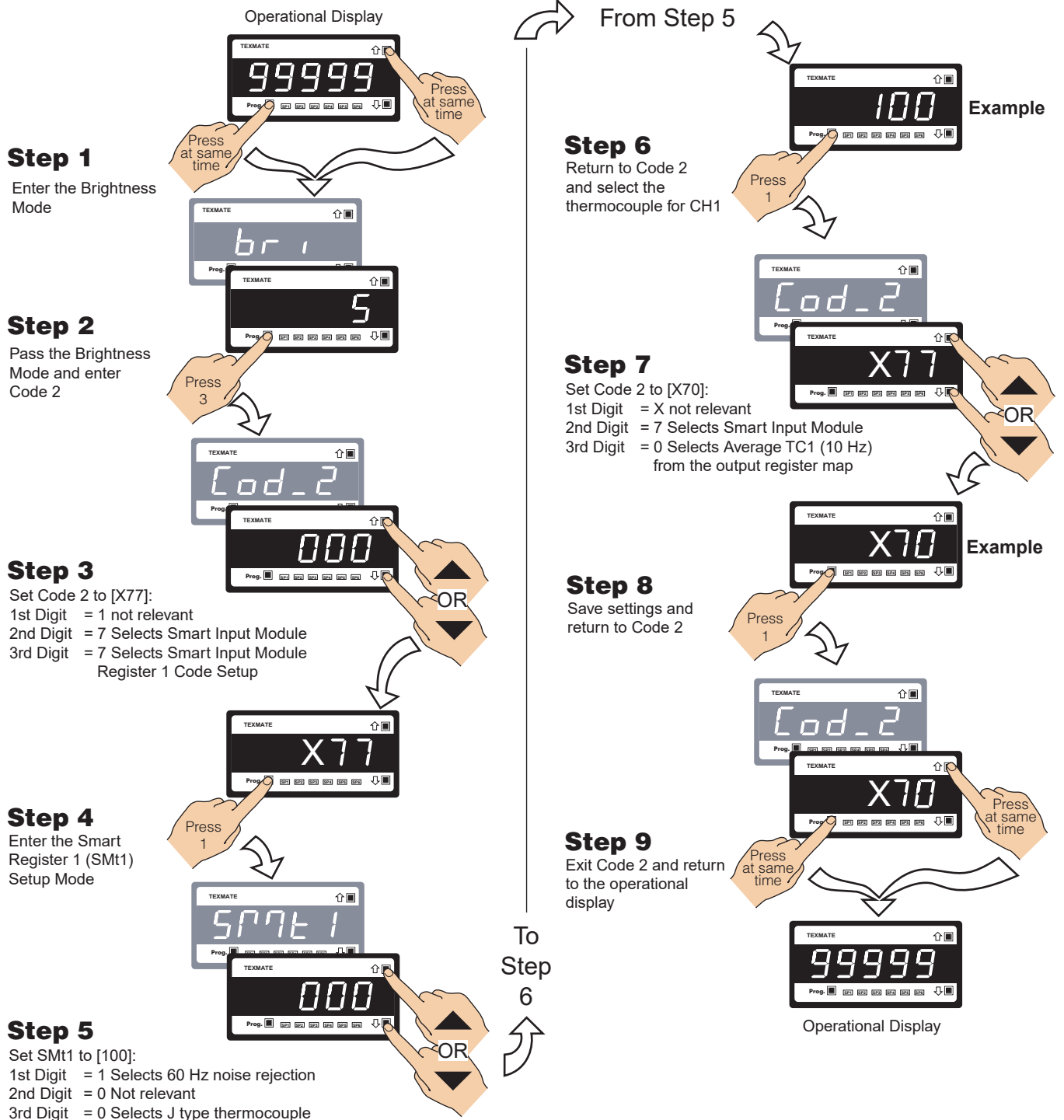
Figure 3 – IST3/IST4 Quad Thermocouple Functional Schematic Diagram

# Standard Setup Quick Start Guide

This section describes the procedures to enter the controller's code structure and configure the input module for the following standard settings:

- **60 Hz** Line Frequency (suitable for areas operating on 60 Hz power supplies).
- **J Type** Thermocouple.
- Thermocouple **TC1 selected for channel 1 (CH1)**.

All other configuration settings are described in the following pages.



## Programming Tip

The following procedure uses a DI-50 display. The readings shown may differ for other display versions.

## Programming Procedures

The following programming procedures cover all the steps required to configure smart input module IST3/IST4. Steps 1 to 5 describe how to select the **line frequency** and the **thermocouple type** through smart register 1 (SMT1).

Steps 7 to 12 describe how to select a specific thermocouple from the output registers for channels 1, 2, 3, or 4 as required.

- 1 Press the **P** and **↑** buttons at the same time to enter the main programming mode.

- 2 Press the **P** button three times to enter Code 2. Set Code 2 to [X77].

[Cod\_2] [X77]

This setting enters the **smart register 1** code setup menu.

| FIRST DIGIT           |
|-----------------------|
| TIGER PROCESSING RATE |
| 0 10 Hz               |
| 1 10 Hz               |
| 2 100 Hz              |
| 3 100 Hz              |

| SECOND DIGIT                                       |
|--|
| MEASUREMENT TASK                                   |
| 0 Voltage, Current                                 |
| 1 TC (3rd digit selects type of TC)                |
| 2 RTD 3-wire (3rd digit selects type of RTD)       |
| 3 RTD 2- or 4-wire (3rd digit selects type of RTD) |
| 4 Frequency  |
| 5 Period   |
| 6 Counter  |
| 7 Smart Input Module                               |

| THIRD DIGIT                                |
|--|
| OUTPUT REGISTER MAP                        |
| 0 Averaged TC1 (10 Hz)                     |
| 1 Averaged TC2 (10 Hz)                     |
| 2 Averaged TC3 (10 Hz)                     |
| 3 Averaged TC4 (10 Hz)                     |
| 4 -  |
| 5 -  |
| 6 -  |
| 7 Smart input module register 1 code setup |



**Note: The output registers in the 3rd digit are specific to the Quad Thermocouple input module. These registers vary for each different smart input module.**

- 3 Press the **P** button.

5P7E 1 000

This menu provides settings unique to **smart register 1** of input module IST3/4.

| FIRST DIGIT       |
|-------------------|
| FREQUENCY SELECT  |
| 0 -               |
| 1 60 Hz rejection |
| 2 -               |
| 3 50 Hz rejection |

| SECOND DIGIT |
|--------------|
| NOT USED     |
| 0 -          |
| 1 -          |
| 2 -          |
| 3 -          |
| 4 -          |
| 5 -          |
| 6 -          |
| 7 -          |

| THIRD DIGIT       |
|-------------------|
| THERMOCOUPLE TYPE |
| 0 J type          |
| 1 K type          |
| 2 -               |
| 3 -               |
| 4 -               |
| 5 -               |
| 6 -               |
| 7 -               |

- 4 Using the **↑**/**↓** buttons, select either **50 or 60 Hz line frequency rejection** in the 1st digit and the **thermocouple type** in the 3rd digit.

2nd digit settings are not relevant and should be left at zero (0).



**Note: 10 Hz is the average output for all four thermocouple inputs.**

| Operational Temperature Range |                 |
|-------------------------------|-----------------|
| J Type Thermocouple           | 0 °C to 700 °C  |
| K Type Thermocouple           | 0 °C to 1100 °C |

Approximate continuous working temperature range of measuring junction. Not related to wire diameters and conducted insulation.

Refer IEC 584.2, 1982 (BS EN 60584.2, 1993) International Standards for Thermocouple Characteristics.

- 5 Press the **P** button. The display returns to [Cod\_2] [X77]. [Cod\_2] [X77]

- 6 Using the **↓** button, reset the 3rd digit to zero [X70] to leave the smart register 1 menu.

Note: Leaving the 3rd digit as 7 means the display constantly cycles between [Cod\_2] and [SMT1].

[Cod\_2] [X7X]

- 7 Press the **P** and **↑** buttons at the same time to return to the operational display.

## Select a Channel

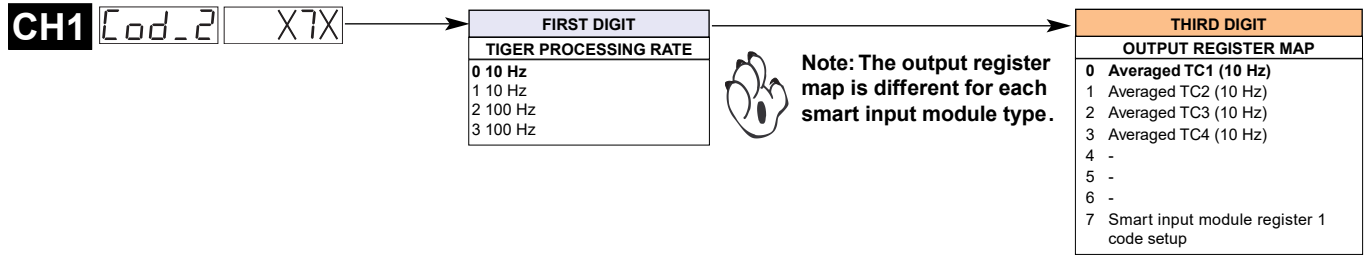
Select a thermocouple output from the output register map of the required channel

### Channel 1

- 8 Press the **P** and **↑** buttons at the same time again to re-enter the main programming mode, then press the **P** button three times to enter Code 2.

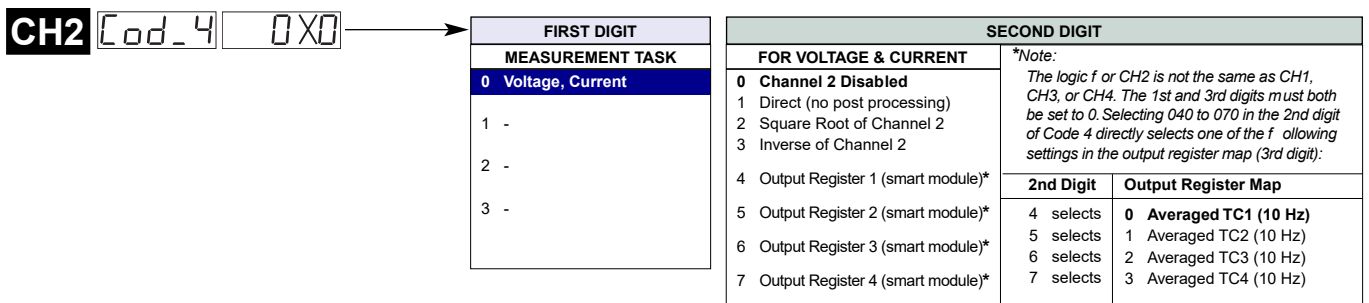
- 9 Set Code 2 to [X7X]. Select the required processing rate for **CH1** in the 1st digit and the required register map settings in the 3rd digit.

2nd digit settings are not relevant and should be left at zero (0).



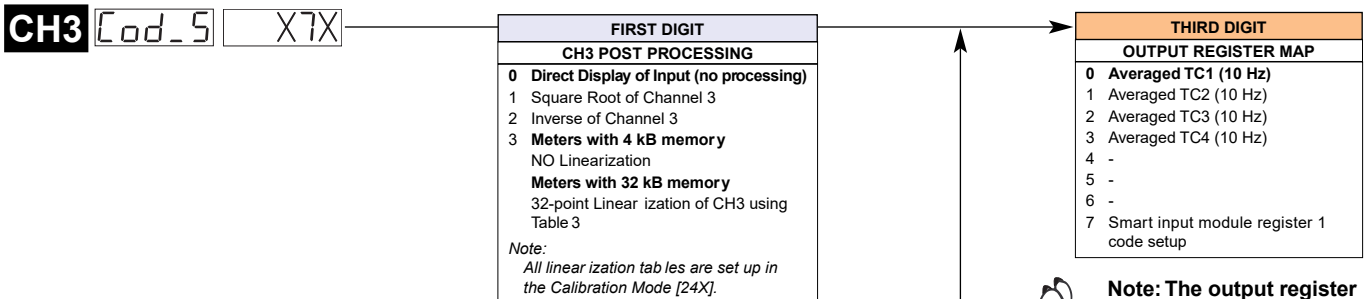
## Channel 2

- 10 Set Code 4 to [0X0]. Select the required register map settings for **CH2** in the 2nd digit.



## Channel 3

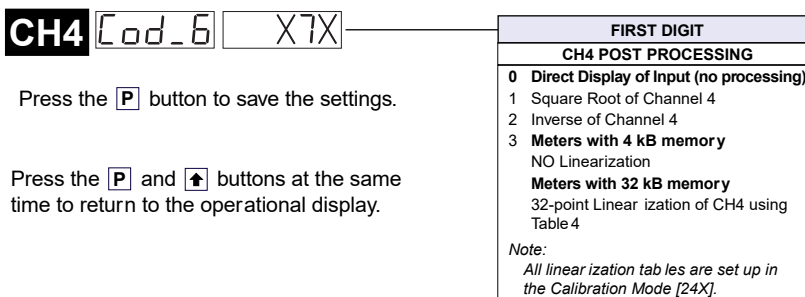
- 11 Enter Code 5 and select the required register map settings for **CH3** in the 3rd digit.



**Note: The output register map is different for each smart input module type.**

## Channel 4

- 11 Enter Code 6 and select the required register map settings for **CH4** in the 3rd digit.



Press the **P** button to save the settings.

- 12 Press the **P** and **↑** buttons at the same time to return to the operational display.

As the calibration procedure requires a calibration source that can output stable  $\mu\text{V}$  signals, calibration of the four channels is normally done in the factory prior to shipping.

## Calibrating 4 Channels for K Type Thermocouple

If user calibration is required, the following procedure should be followed. It is assumed that the user has a thermocouple calibration source available. When the controller is switched on, allow a few minutes warm-up time to let the reference junction stabilize to the connector terminal block temperature.

### 1 Setup Smart Register 1 (SMT1)

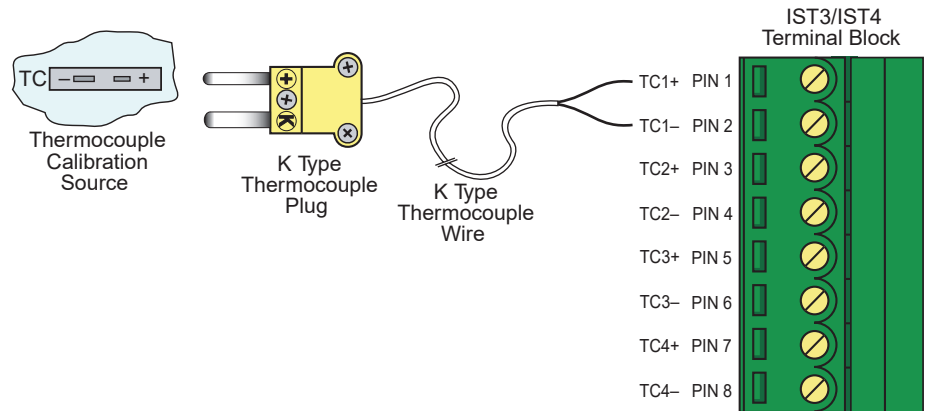
See Page 4 and carry out Steps 1 to 7 to select the required line frequency and thermocouple type.

### 2 Connect to the Calibrated Source

Connect a standard K type thermocouple plug to the calibration source.

### 3 Connect to the Input Module

Connect the standard K type thermocouple cable to the relevant pins on the input module of the thermocouple input to be calibrated.



### 4 Set the Low Setting

- Set the calibration source to  $0\text{ }^{\circ}\text{C}$ .
- Enter [CAL] [111] and set to [ZEro] setting.

### 5 Set the High Setting

- Set the calibration source to  $100\text{ }^{\circ}\text{C}$ .
- Set to [SPAn] setting to 100.0.

### 6 Repeat Steps

Repeat Steps 2 to 4 for all required thermocouples and channels.

See **2-point Calibration Mode Example** on Page 7 for a step-by-step calibration procedure.



#### Note:

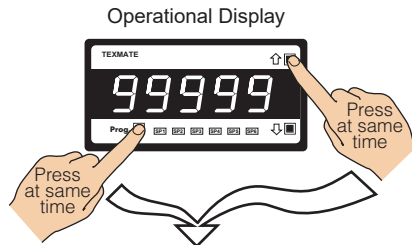
One thermocouple can be assigned to one or more channels (e.g. TC1 assigned to CH1 to CH4), but each channel can accept only one thermocouple input.

**START HERE**

**2-point Calibration Mode Example**

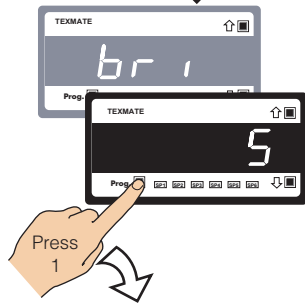
**Step 1**

Enter the brightness mode



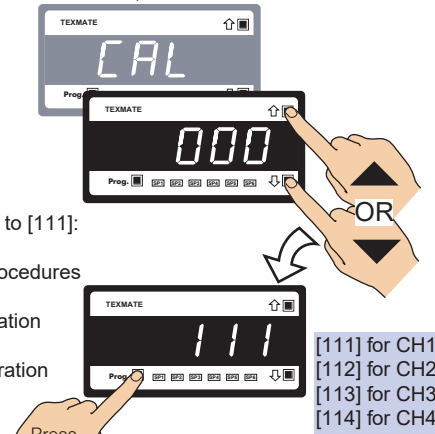
**Step 2**

Pass the brightness mode and the enter calibration mode



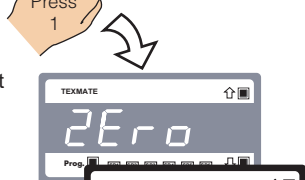
**Step 3**

Set calibration mode to [111]:  
1st Digit = 1  
Selects calibration procedures  
2nd Digit = 1  
Selects 2-point calibration  
3rd Digit = 1  
Selects CH1 for calibration



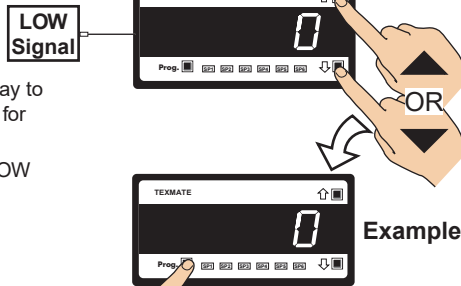
**Step 4**

Enter calibration mode [111] for 2-point calibration of CH1



**Step 5**

5.1. Adjust display to desired reading for zero input  
5.2. Apply the LOW input signal



**Step 6**

Set reading for zero load into meter and enter span mode

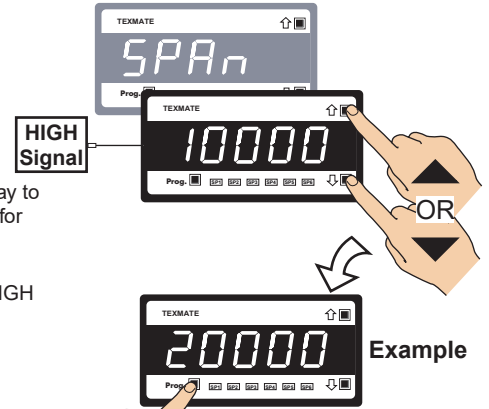


From Step 6

**Step 7**

7.1. Adjust display to desired reading for span input

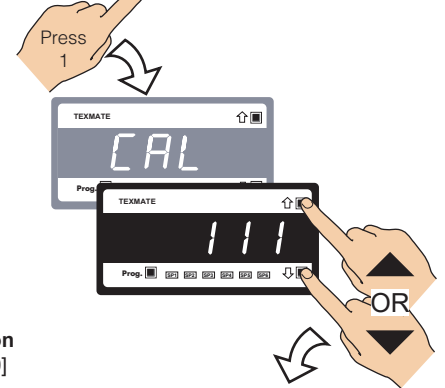
7.2. Apply the HIGH input signal



Example

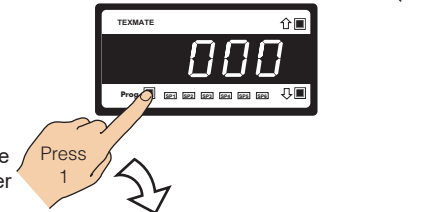
**Step 8**

Save zero and span settings and re-enter calibration mode



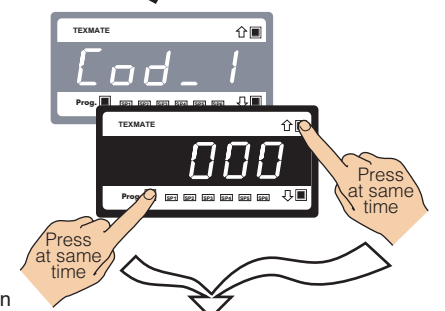
**Step 9**

Select the no function calibration mode [000]



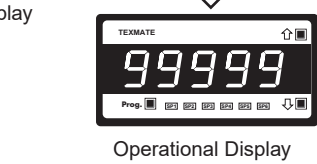
**Step 10**

Save calibration mode [000] setting and enter Code 1



**Step 11**

Exit Code 1 and return to the operational display



Operational Display

To Step 7

## Customer Configuration Settings:

|            | 1st Digit | 2nd Digit | 3rd Digit |
|------------|-----------|-----------|-----------|
|            | 5         | 7         | 1         |
| <b>CH1</b> | Cod_2     |           |           |
| <b>CH2</b> | Cod_4     | 0         | 0         |

|            | 1st Digit | 2nd Digit | 3rd Digit |
|------------|-----------|-----------|-----------|
| <b>CH3</b> | Cod_5     | 7         |           |
| <b>CH4</b> | Cod_6     | 7         |           |

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