TEXMATE INC

Fits Tiger 320 Series

QUAD THERMOCOUPLE INPUT

On-board Digital Signal Processor.
Choice of type J or K thermocouples.
10Hz Averaged output.

Terminal Reference Junction.
On-board Reference Junction Sensor.

8-pin Input Connector.
Quad J or K Thermocouple.

State-of-the-art Electromagnetic Noise
Suppression Circuitry.
Ensures signal integrity even in harsh EMC environments.

Interface to Tiger Meter.

Crystal Controlled Line
Frequency Rejection.
50 / 60Hz line frequency rejection.

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 μV / count maximum.
Zero Drift	±40 nV / °C typical.
Span Drift	±5 ppm / °C full scale maximum.
Non-linearity	±0.003% 5of 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 that 0.1 °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

QUAD THERMOCOUPLE INPUT

Connector Pinouts

J Type: (TC+) Iron
(TC−) Copper-nickel.
Commonly used in the
plastic moulding industry.
Good in dry and reducing
atmospheres.

K Type: (TC+)Nickel-chromium
(TC−) Nickel-aluminum.
Most commonly used
thermocouple with wide
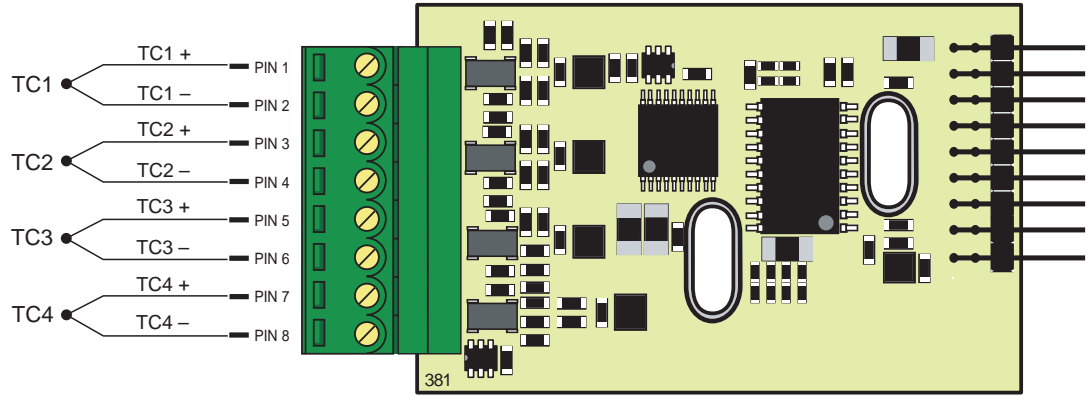temperature range. Good
in oxidizing atmospheres.

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.

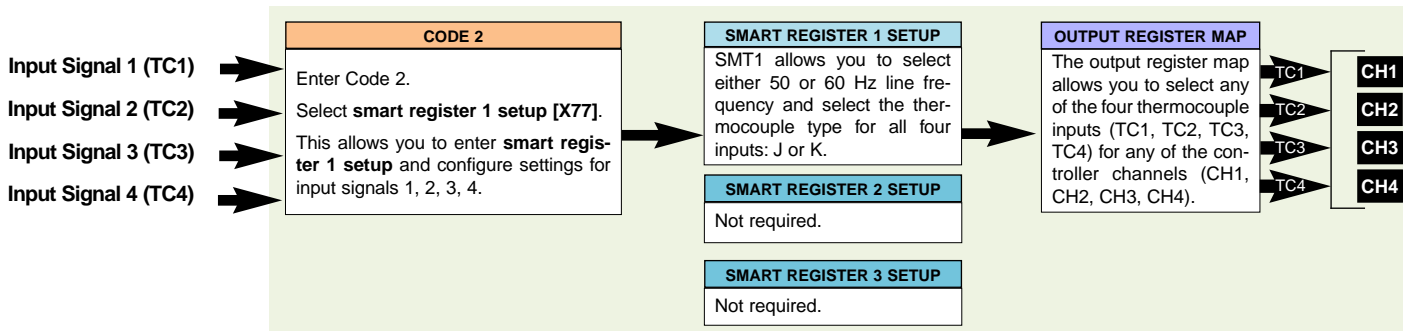**Note: The same thermocouple signal can be selected for two or more channels.**

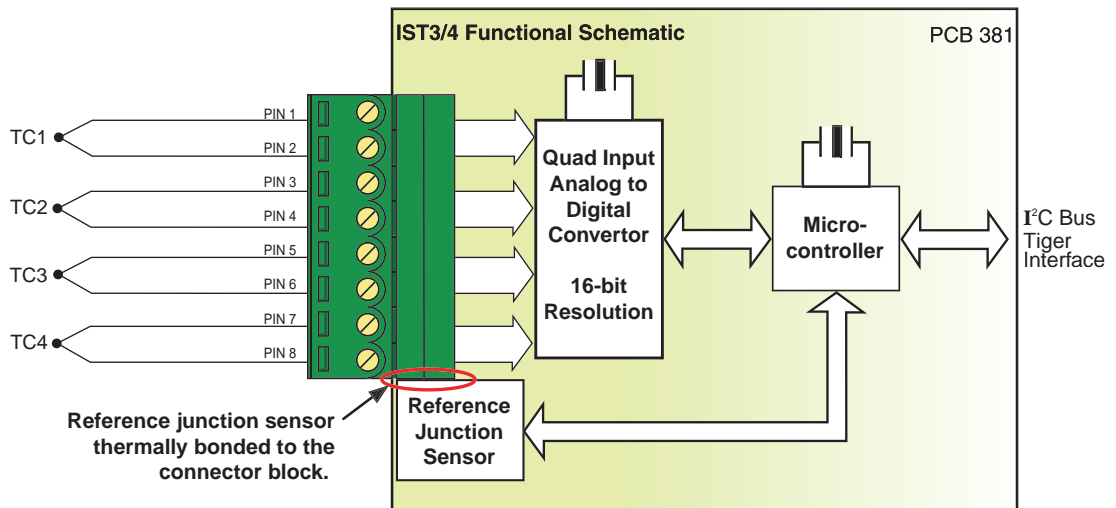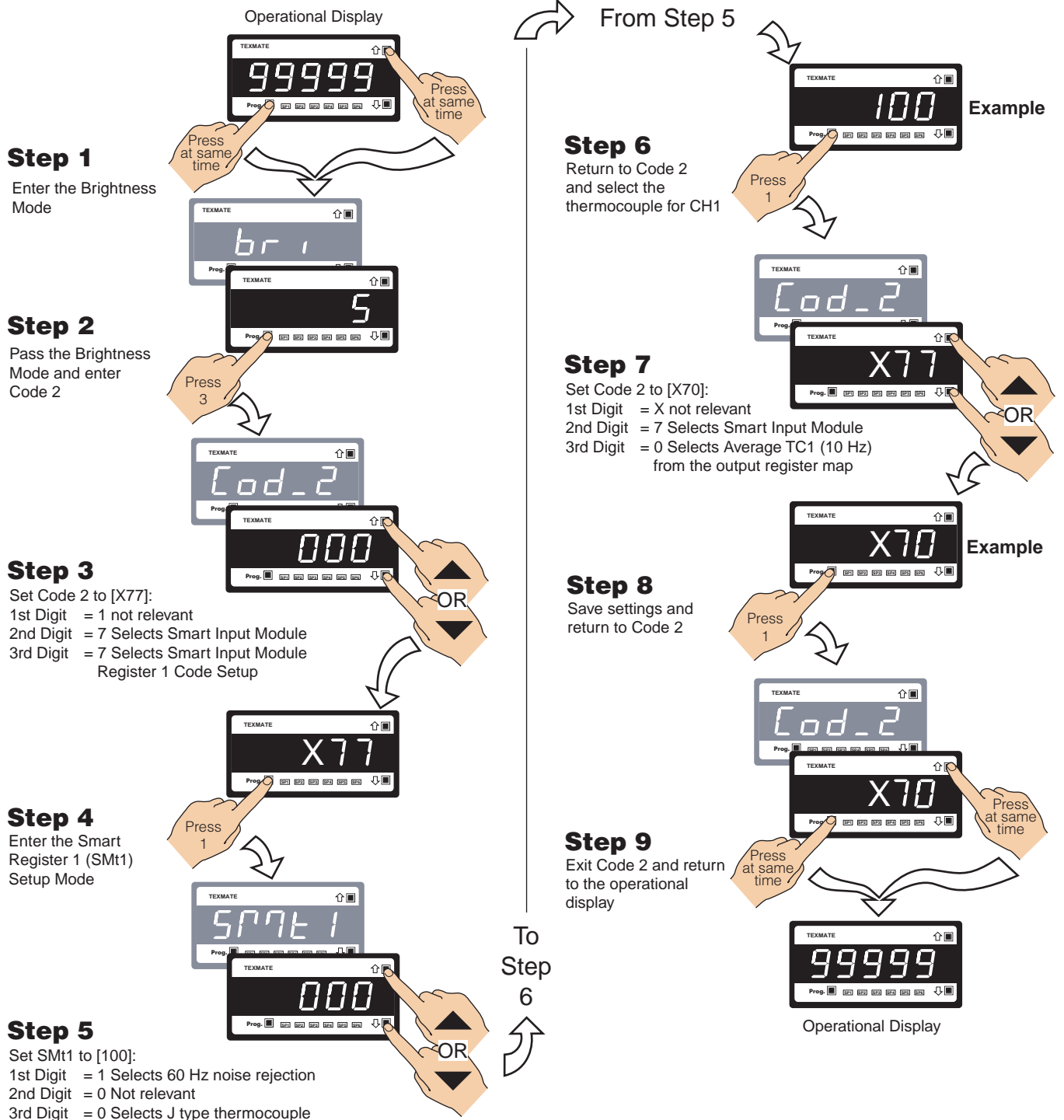**Figure 2 – IST3/IST4 Smart Setup Registers Operational Flow Diagram**

Figure 3 – IST3/IST4 Quad Thermocouple Functional Schematic Diagram

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.

Operational Display

From Step 5

Step 1

Enter the Brightness Mode

Step 2

Pass the Brightness Mode and enter Code 2

Step 3

Set Code 2 to [X77]:
1st Digit = 1 not relevant
2nd Digit = 7 Selects Smart Input Module
3rd Digit = 7 Selects Smart Input Module Register 1 Code Setup

Step 4

Enter the Smart Register 1 (SMt1) Setup Mode

Step 5

Set SMt1 to [100]:
1st Digit = 1 Selects 60 Hz noise rejection
2nd Digit = 0 Not relevant
3rd Digit = 0 Selects J type thermocouple

To Step 6

Step 6

Return to Code 2 and select the thermocouple for CH1

Example

Step 7

Set Code 2 to [X70]:
1st Digit = X not relevant
2nd Digit = 7 Selects Smart Input Module
3rd Digit = 0 Selects Average TC1 (10 Hz) from the output register map

Example

Step 8

Save settings and return to Code 2

Step 9

Exit Code 2 and return to the operational display

Operational Display

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	SECOND DIGIT	THIRD DIGIT
TIGER PROCESSING RATE	**MEASUREMENT TASK**	**OUTPUT REGISTER MAP**
0 10 Hz	0 **Voltage, Current**	**0 Averaged TC1 (10 Hz)**
1 10 Hz	1 TC (3rd digit selects type of TC)	1 Averaged TC2 (10 Hz)
2 100 Hz	2 RTD 3-wire (3rd digit selects type of RTD)	2 Averaged TC3 (10 Hz)
3 100 Hz	3 RTD 2- or 4-wire (3rd digit selects type of RTD)	3 Averaged TC4 (10 Hz)
	4 Frequency	4 -
	5 Period	5 -
	6 Counter	6 -
	7 Smart Input Module	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.

`SMt1    000`

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

FIRST DIGIT	SECOND DIGIT	THIRD DIGIT
FREQUENCY SELECT	**NOT USED**	**THERMOCOUPLE TYPE**
0 -	0 -	**0 J type**
1 60 Hz rejection	1 -	1 K type
2 -	2 -	2 -
3 50 Hz rejection	3 -	3 -
	4 -	4 -
	5 -	5 -
	6 -	6 -
	7 -	7 -

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

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).

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) Internal 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. `Cod_2    X7X`

Note: Leaving the 3rd digit as 7 means the display constantly cycles between [Cod_2] and [SMt1].

7 Press the `P` and `↑` buttons at the same time to return to the operational display.
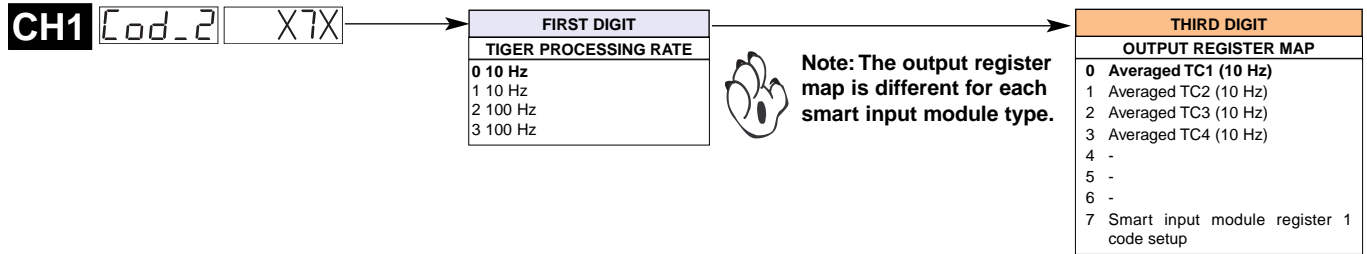
Select a Channel

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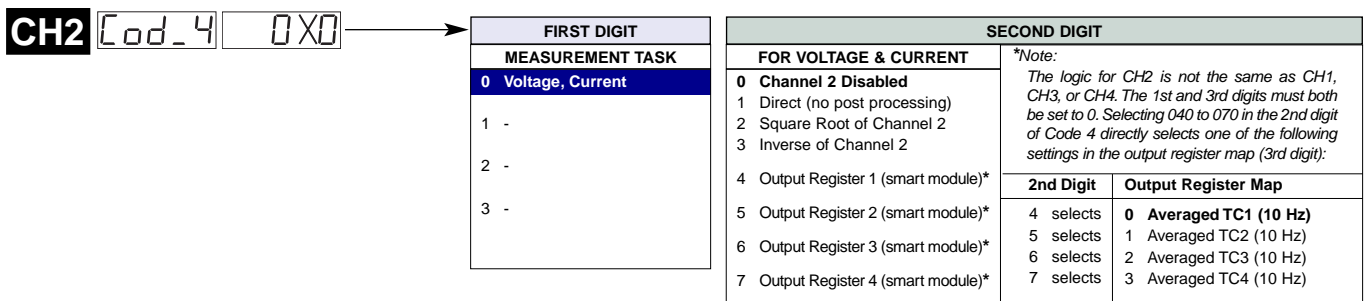
9 Set Code 2 to [X7X]. Select the required processing rate for **CH1** in the 1st digit and the required register map settings in the 3rd digit.

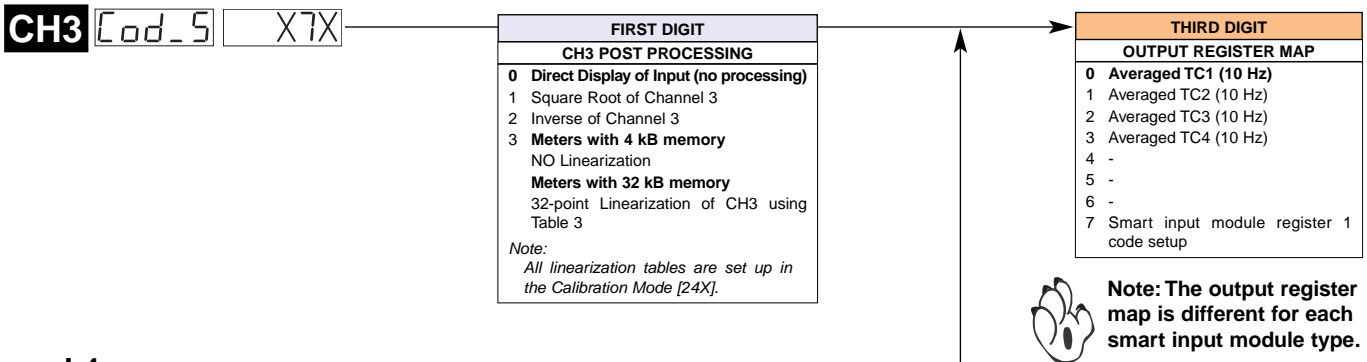2nd digit settings are not relevant and should be left at zero (0).

CH1 `Cod_2` `X7X`

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

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

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

Channel 2

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

CH2 `Cod_4` `0X0`

FIRST DIGIT
MEASUREMENT TASK
0 Voltage, Current
1 -
2 -
3 -

SECOND DIGIT		
FOR VOLTAGE & CURRENT	*Note:*	
0 Channel 2 Disabled	*The logic for CH2 is not the same as CH1, CH3, or CH4. The 1st and 3rd digits must both be set to 0. Selecting 040 to 070 in the 2nd digit of Code 4 directly selects one of the following settings in the output register map (3rd digit):*	
1 Direct (no post processing)		
2 Square Root of Channel 2		
3 Inverse of Channel 2		
4 Output Register 1 (smart module)*	**2nd Digit**	**Output Register Map**
5 Output Register 2 (smart module)*	4 selects	**0 Averaged TC1 (10 Hz)**
6 Output Register 3 (smart module)*	5 selects	1 Averaged TC2 (10 Hz)
7 Output Register 4 (smart module)*	6 selects	2 Averaged TC3 (10 Hz)
	7 selects	3 Averaged TC4 (10 Hz)

Channel 3

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

CH3 `Cod_5` `X7X`

FIRST DIGIT
CH3 POST PROCESSING
0 Direct Display of Input (no processing)
1 Square Root of Channel 3
2 Inverse of Channel 3
3 Meters with 4 kB memory
NO Linearization
Meters with 32 kB memory
32-point Linearization of CH3 using Table 3
Note:
All linearization tables are set up in the Calibration Mode [24X].

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 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.

CH4 `Cod_6` `X7X`
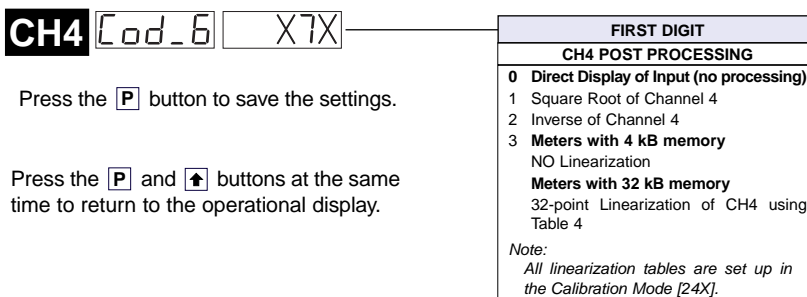
Press the P button to save the settings.

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

FIRST DIGIT
CH4 POST PROCESSING
0 Direct Display of Input (no processing)
1 Square Root of Channel 4
2 Inverse of Channel 4
3 Meters with 4 kB memory
NO Linearization
Meters with 32 kB memory
32-point Linearization of CH4 using Table 4
Note:
All linearization tables are set up in the Calibration Mode [24X].

As the calibration procedure requires a calibration source that can output stable µV 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.
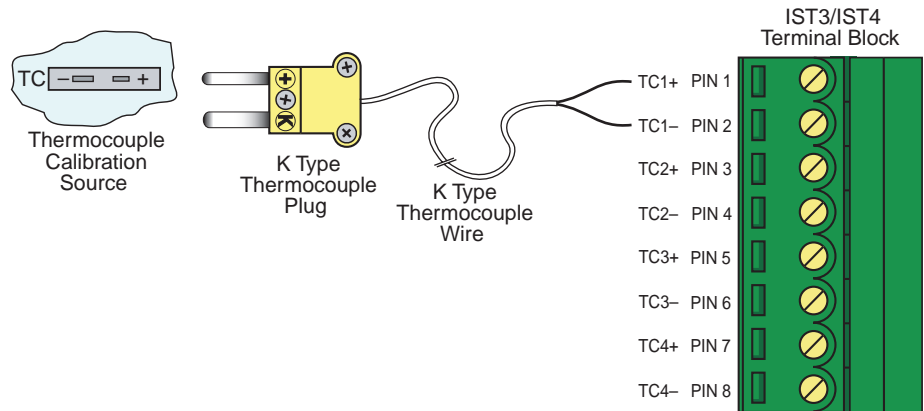
4 Set the Low Setting

a) Set the calibration source to 0 °C.
b) Enter [CAL] [111] and set to [ZEro] setting.

5 Set the High Setting

a) Set the calibration source to 100 °C.
b) 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.

From Step 6

START HERE

2-point Calibration Mode Example

TEXMATE
99999

Press at same time

Press at same time

Step 1

Enter the brightness mode
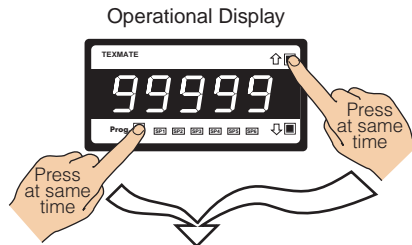
Step 2

Pass the brightness mode and the enter calibration mode

TEXMATE
br ı

TEXMATE
5

Press 1
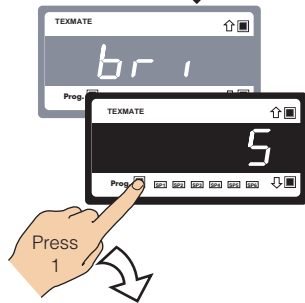
Step 3

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

TEXMATE
CAL

TEXMATE
000

OR

TEXMATE
111

[111] for CH1
[112] for CH2
[113] for CH3
[114] for CH4

Press 1
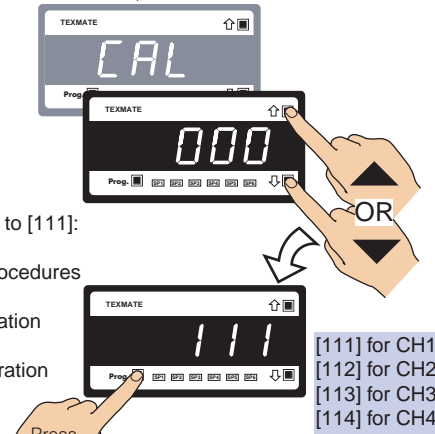
Step 4

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

TEXMATE
2Ero

LOW Signal

TEXMATE
0

OR
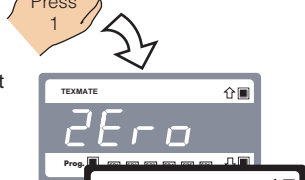
Step 5

5.1. Adjust display to desired reading for zero input

5.2. Apply the LOW input signal

TEXMATE
0

Example
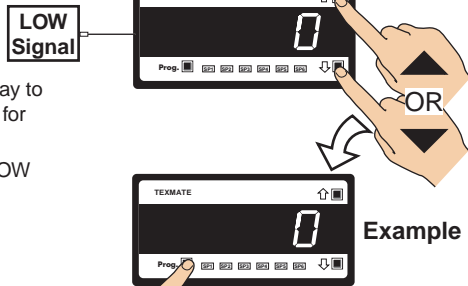
Step 6

Set reading for zero load into meter and enter span mode

Press 1

To Step 7

TEXMATE
SPAn

HIGH Signal

TEXMATE
10000

OR

Step 7

7.1. Adjust display to desired reading for span input

7.2. Apply the HIGH input signal

TEXMATE
20000

Example

Press 1
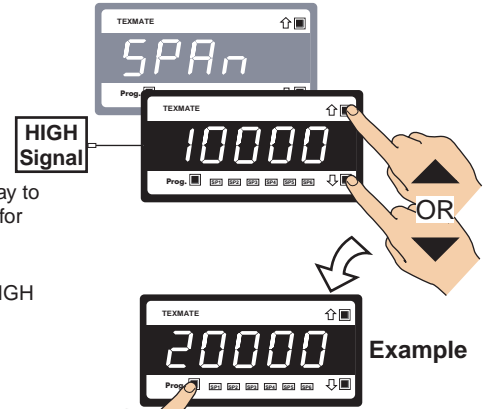
Step 8

Save zero and span settings and re-enter calibration mode

TEXMATE
CAL

TEXMATE
111

OR
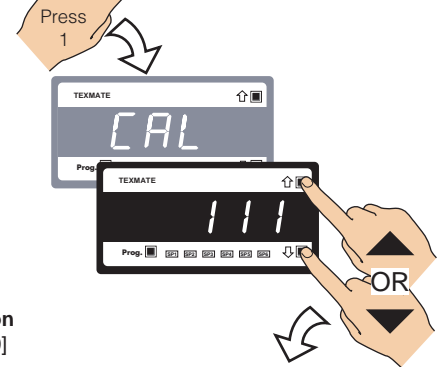
Step 9

Select the **no function** calibration mode [000]

TEXMATE
000

Step 10

Save calibration mode [000] setting and enter Code 1

Press 1

TEXMATE
Cod_1

TEXMATE
000

Press at same time

Press at same time
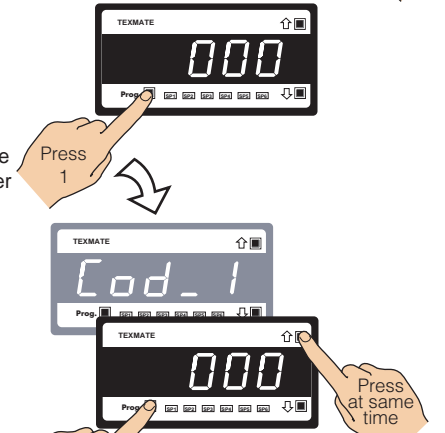
Step 11

Exit Code 1 and return to the operational display

TEXMATE
99999

Operational Display
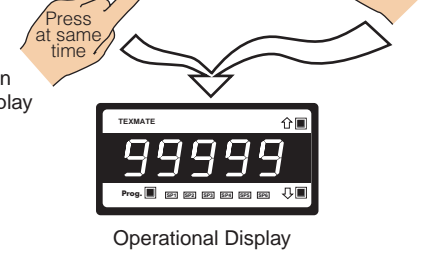
Customer Configuration Settings:

		1st Digit	2nd Digit	3rd Digit
	`SmtI`	____	____	____

		1st Digit	2nd Digit	3rd Digit
CH1	`Cod_2`	____	____	____

		1st Digit	2nd Digit	3rd Digit
CH2	`Cod_4`	0	____	0

		1st Digit	2nd Digit	3rd Digit
CH3	`Cod_5`	____	7	____

		1st Digit	2nd Digit	3rd Digit
CH4	`Cod_6`	____	7	____

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Texmate has facilities in Japan, New Zealand, Taiwan, and Thailand. We also have authorized distributors throughout the USA and in 28 other countries.

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