Setting up sensors on an ITC5

How to change the set-up

In order to set up a sensor on an ITC you must carry out four simple procedures:

- Connecting the sensor to the ITC
- Configuring the hardware
- Configuring the memory
- Calibrating the sensor.

The procedure is summarised here. For full information, refer to the ITC and ObjectBench manuals.

Note: If you received your ITC as part of a complete system then it will already have been set up correctly.

Connecting a sensor

Sensors are connected to one of the 9-way D-sockets on the rear panel of the ITC. For full details read the section on heater and sensor connections in the ITC manual.

Hardware configuration

The ITC carries a set of switches on its input board which must be set appropriately for the particular sensor that you are using. To set these switches the top cover of the ITC must be removed. Read the safety information in the ITC manual. Remove the four screws securing the top cover and lift it clear of the casing.

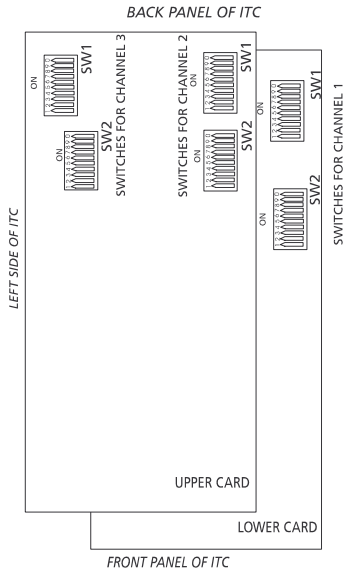

Figure 1

In Figure 1 on the left-hand side of the instrument you will see the sensor interface board upon which are mounted the necessary switches. If the ITC is fitted with more than one channel then a second interface board is fitted above the channel 1 board. The channel 1 switches are still accessible. Each channel has two switches, SWn01 and SWn02 where n is an integer, (abbreviated to SW1 and SW2 in this leaflet).

To set the switches correctly for a particular sensor proceed as follows:

- Identify the switches for the channel that you want to set-up
- Find the sensor that you are using in the Range Data table on page 5
- Set SW1 and SW2 to the values given in the table. (A "1" indicates a switch in the "ON" position which is nearer the left side of the instrument).

Memory configuration

Having correctly set up the hardware you now need to select the appropriate linearisation data table from the firmware of the ITC. This can either be done from the front panel of the instrument, or if you are using an ITC503, via ObjectBench. In either case you should look up the identification code for the sensor that you are using in the Range Data table.

If you are not using ObjectBench

- On the DISPLAY panel press SENSOR until the lamp shows the channel that you want to configure
- Hold down the RAISE and LOWER buttons together and press the LOC/REM button. The message '*tESt*' will appear, followed shortly by '*t 00*'
- Press LOWER and release to display '*t 07*'
- Press LOC/REM. The display will show the message '*LOAd*' followed by '*Lin*'. This is the first code shown in the Range Data table
- By pressing RAISE you can cycle through the codes until you reach the one corresponding to your sensor
- Press LOC/REM and the chosen data table will be assigned to the chosen channel. The instrument will then resume normal operation
- To store the new settings into the memory of the ITC, hold in the recessed LIMIT button and press the LOC/REM button. The display will show the message '*Stor*'
- Now read the section on calibration.

If you are using an ITC503 and ObjectBench

In this section it will be assumed that you are familiar with using ObjectBench to connect to the ITC503 and to control it remotely. If this is not the case consult the relevant sections of the ObjectBench manual.

Proceed as follows:

- Open the ITC503 window and connect to the instrument

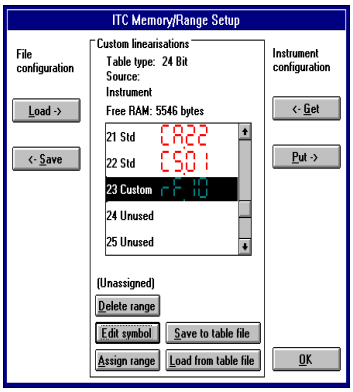

Figure 2

- Choose the menu item "Setup"/"Memory" to bring up a dialog box like Figure 2.
- Click on the "Get" button. (note the warning and take action if necessary). After a few seconds delay the instrument's RAM will be loaded into the dialog. The codes that appear in the central box are the same as those in the Range Data table
- Click on the code corresponding to your sensor and then click on the "Assign range" button. Choose the channel that you want to configure and then click on "OK"
- Click on the "Put" button which will send the new settings to the instrument
- To store the new settings into the memory of the ITC, disconnect from the instrument, hold in the recessed LIMIT button and press the LOC/REM button
- Now read the section on calibration.

Calibration

Once the ITC has been configured for a particular sensor you will need to calibrate that sensor. This can either be done by using known temperatures (such as liquid nitrogen and melting ice) or by simulating a change in temperature using a resistance box, capacitance box or voltage source. If you know the output of your sensor at two temperatures then you should use the latter ('equivalent input') method since it is usually more accurate. Calibration must be carried out near the two ends of the working range and is achieved by means of the recessed CAL button:

- Use SENSOR to display the channel that you want to calibrate
- Cool the sensor to a known temperature near the bottom of the range or apply an equivalent input
- Press CAL. The display will show '*Lo*' followed by the current value of the lower calibration point
- While holding CAL use RAISE and LOWER to set the correct temperature
- Now warm the sensor to a known temperature near the top of the range or apply an equivalent input
- Press CAL. The display will show '*Hi*' followed by the current value of the upper calibration point
- While holding CAL use RAISE and LOWER to set the correct temperature
- The whole process may need to be repeated a few times before an accurate and stable calibration is achieved
- To store the new calibration data into the memory of the ITC hold down LIMIT and press the LOC/REM button.

Designing a custom range using ObjectBench

It is possible to design a custom range using ObjectBench. If you are using a sensor which is not included in the range data table you will first have to create a new data file. This file must have a column for temperature and a column for sensor data like the one shown in Figure 5. If such data was supplied with your sensor then creating the file will be easy. If not, you will have to calibrate the sensor at a number of different temperatures. Design a custom range as follows:

- Open the ITC window and connect to the instrument
- Choose the item "Setup"/"Create Range" to bring up a dialog box like Figure 3

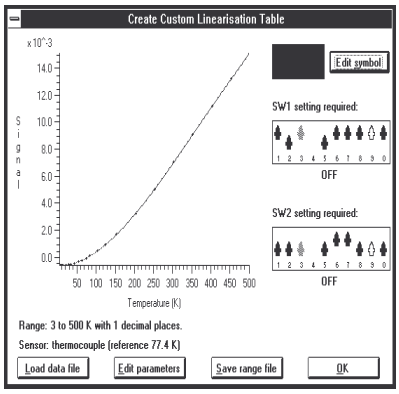

Figure 3

- Click on "Load data file" and open the 'sensors' folder (which is contained within the 'data' folder) where you will find a list of standard data files with the format '*sensor code*.dat'. If you are using your own data file, locate this one instead
- Click on the file corresponding to the sensor which you are using and click on "OK". A new dialog box, similar to Figure 4 will now appear

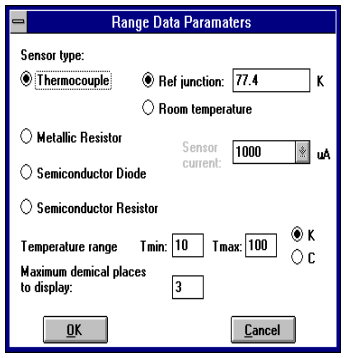

Figure 4

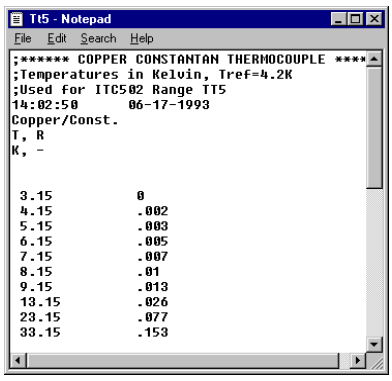

Figure 5

- In this dialog box, make the appropriate choices for your sensor
- A graph giving the temperature dependence of the signal for the type of sensor you are using will now appear. To the right of this graph is a diagram showing the correct pattern on the switches SW1 and SW2. ObjectBench automatically chooses the appropriate pattern for the parameters that you have requested. You should now set the instrument's switches to reflect the given pattern
- Click on "Edit Symbol" and create a symbol of your choice in order to identify the custom range which you have designed
- Click on "Save range file", type in a memorable file name and click on "OK"
- Leave the 'linearisation table' dialog by clicking on "OK".

Having correctly set up the hardware you will now need to send your custom range to the instrument's memory.

- Choose the menu item "Setup"/"Memory" to bring up a dialog box like Figure 2.
- Click on the "Get" button (note the warning and take action if necessary). The instrument's RAM will be loaded into the dialog. If you are using an ITC503 the table will include a number of standard ranges followed by a few custom or unused entries. If you are using an ITC502 only the custom or unused entries will be loaded
- Click on one of the unused entries and then click on "Load from table file". Choose the file that you saved earlier and click on "OK". The symbol for your custom range will appear in the table. Click on it
- Click on "Assign range" and choose the channel that you want to configure
- Click on the "Put" button to send the new settings to the instrument
- To store the new settings into the memory of the ITC, disconnect from the instrument, press and hold in the LIMIT button and press LOC/REM
- If you want to save these new settings to disc click on the "Save" button
- Now read the section on calibration.

Range Data Table

The following table is a list of the most common sensors in use at the time of printing - refer to the ITC manual for the current list. It gives the range and reference temperature used by the ITC for each sensor, and the associated switch settings. If you want to use a different range or reference temperature to that given in the table, or if your sensor is not in the table, follow the instructions on designing a custom range on page 4.

Code	Sensor	Range		Tref	SW2	SW1
		Lower	Upper		(Front Switch)	(Rear Switch)
Lin	Linear Range	0.000	1677.7	(As required)		
Null	Centre Zero	-838.9	+838.9	(As required		
Con 1	Conductance	0.000	20.00		01001 01010	00001 11110
TG 5	AuFe 0.03/Chr	2.00K	500.0K	4.2K	00000 11000	11000 11111
TG 5	AuFe 0.03/Chr	2.00K	500.0K	77K	00000 11000	11000 11100
TG 5	AuFe 0.03/Chr	2.00K	500.0K	273K	00000 11000	11000 10100
TG 57	AuFe 0.07/Chr	2.00K	500.0K	(Tref and switches as for AuFe 0.03)		
CN 3	Cernox Resistor	1.500K	300.0K		01001 01010	01100 11010
TT 5	Copper/Const.	20.00K	500.0K	77K	00000 11000	10100 11111
TT 5	Copper/Const.	20.00K	500.0K	RT	00000 10100	10100 11111
TT 4.	Copper/Const.	-250.0C	+400.0C	77K	00000 11000	10001 10111
TT 4.	Copper/Const.	-250.0C	+400.0C	RT	00000 10100	10001 11100
TK 10	Chromel/Alumel	0.0C	+1000.0C	0C	00000 11000	01111 10111
TK 10	Chromel/Alumel	0.0C	+1000.0C	RT	00000 10100	01111 10111
TK 13.	Chromel/Alumel	-200.0C	+1370.0C	0C	00000 11000	01110 10100
TK 13.	Chromel/Alumel	-200.0C	+1370.0C	RT	00000 11000	01110 11111
CR 1 or11	RuO_2	0.250K	10K		00101 01000	00100 10010
RF 52	RhFe Resistor	1.500K	500.0K		10010 10000	01111 11111
RP 1.	Plat Resistor	-200.0C	+100.0C		01010 10100	10110 11111
RP 5	Plat Resistor	20.00K	500.0K	(Pure)	01010 11000	10010 11111
RP 51	Plat Resistor	50.00K	500.0K	(Ballasted	01010 11000	10010 11111
RL 3	CLTS	2.00K	300.0K		10111 01111	10111 01111
DS 32	Si Diode (OI)	2.000K	300.0K		00110 11000	00010 00000
DS 31	Si Diode (LS)	2.000K	300.0K		00110 11000	00010 00000
CC 35 or 36	C-Glass CR500	2.000K	300.0K	(Typ only)	10001 01010	00001 11011
CA 21	100R Allen Brad	4.000K	250.0K		01001 01010	00111 11000
CA 22	270R Allen Brad	4.000K	250.0K		01001 01010	00011 10010
CS 01	470R Speer	0.250K	9.999K		00101 01010	00011 11010

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