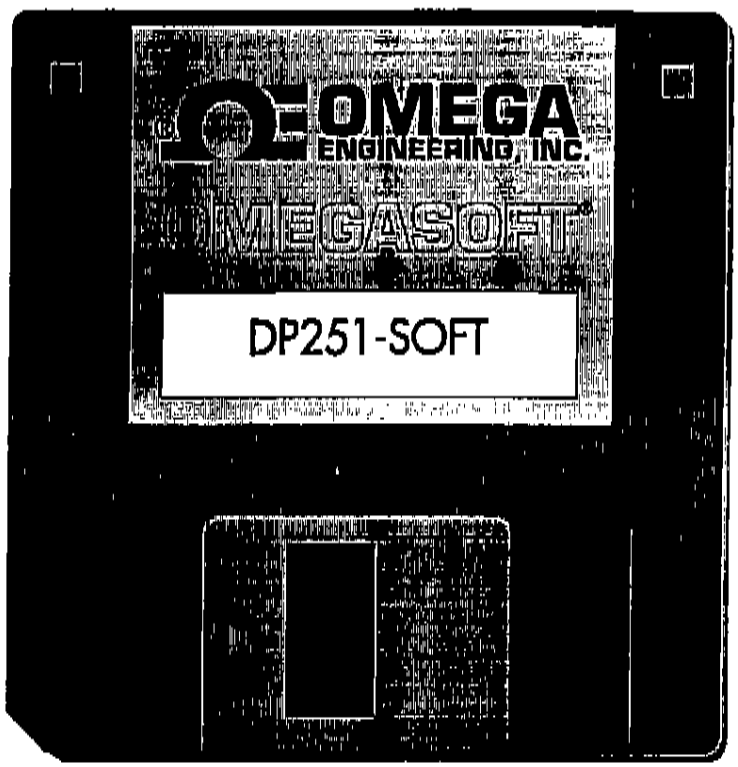
DP251-SOFT

LabWindows Software for DP251 RTD Thermometer



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Operator's Manual

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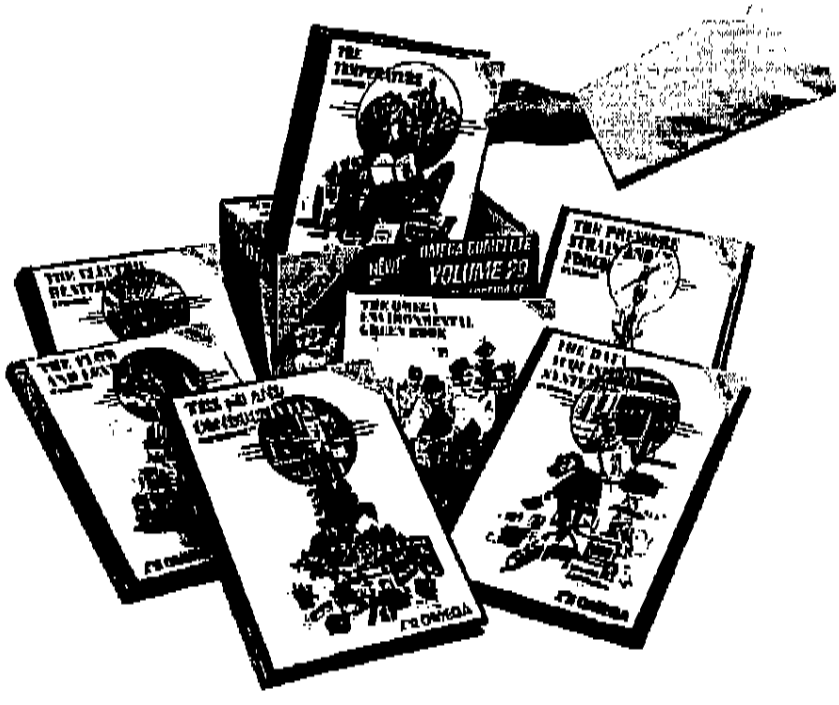

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1. Introduction

The DP-251 Software is a complete program designed specifically to be used with the DP251 Precision Thermometer.

It will enable the operator to control the DP251 remotely from a PC, to display readings recorded by the DP251, and to print out or log readings to a disc file in a controlled program of temperature monitoring.

The program will allow control of up to 32 channels of data via Multiplexers. It will also allow the use of an unlimited number of calibrated temperature probes using individual probe coefficient data files stored on disc. Temperature may be calculated according to either the Callender van Dusen standard (including the DIN (IEC751) and the proposed DIN90 standards) or the ITS-90 standard.

2. Conventions used in this Handbook

Keys on the computer keyboard are shown in square brackets, e.g. [A] is key A

Where keys needs to be pressed at the same time, the keys are shown with a "+" sign connecting them. e.g. [CTRL] + [A] means press the Control and A keys at the same time.

Screen controls are shown enclosed in { }, e.g. the graph control is shown as {GRAPH}

3. Minimum System Requirements

Personal computer (IBM PC or compatible) with 640K RAM

1 floppy disc drive ($3^1/_2$ inch)

1 hard disc drive (recommended)

Printer (optional)

One PC RS232 port or IEEE-488 card for instrument communication

One PC RS232 port for mouse (optional).

DP251 interface card (RS232 or IEEE-488)

Communication cable (RS232 - full "null modem" cable required)
(IEEE - standard IEEE-488 cable)

DOS 3.0 or later

VGA graphics capability

4. Setting Up The System

4.1 Operating System

The DP251 Temperature Monitoring and Control System is designed to run in a DOS environment. It will also run successfully in a DOS window in the Microsoft Windows (™) environment, provided that a full screen is assigned to it to enable proper access to the controls. If an RS232 interface is used, high priority should be assigned to the program to ensure accurate timing when logging to disc or printer.

4.2 Hardware Installation

Connect the power cable to the DP251. If communication is to be via an RS232 interface, connect the cable to the RS232 connector on the PC and to the 25-way plug on the rear of the DP251 (Refer to Chapter 13 for details of the RS232 connector). If communication is to be via an IEEE-488 interface, the IEEE card must first be installed in the computer, refer to the manufacturer's instructions. Refer to Chapter 14 for instructions on configuring the device handler for use with the DP251. Connect the IEEE cable to the connector on the PC and to the IEEE connector on the rear panel of the DP251.

If the DP251 interface card has been supplied separately for retro-fitting to the DP251 or if the card supplied has both RS232 and IEEE interfaces and the card is being changed round to use the alternative interface, refer to the instructions for installation in the DP251 Operator's Manual.

Every Temperature Monitoring and Control System program supplied by OMEGA for the DP251 will have the instrument serial number (or the first and last serial number of a range of instruments) written into the program. This means that the supplied program may only be used with that specific instrument, or range of instruments, but that several back up copies may be made and the program may be installed on several different PCs.

4.3 Software Installation

It is a good idea to back up the program files in case of file corruption or loss. Copy the files on the supplied disc to a second back up disc. To install the program to hard disc, follow the instructions given below. It is recommended that a new sub-directory be made for the DP251 Temperature Monitoring and Control System. One program disc is provided with the package. This disc contains the following files:

INSTALL. BAT	TMCS.EXE
SETUP.BAT	TMCS.UIR
ADAPTER.EXE	HCSELECT.EXE
ADAPTER.PRO	HARDCOPY.PRO
PRINTER.DAT	TEMPMON.BAT

4.3.1 Initial use:

i) Insert the program disk into the floppy drive

ii) Change the drive letter to the floppy drive. For example, if the disc is in drive A, type [A]: <ENTER>, prompt should be A:>.

iii) Type INSTALL [ENTER]. The install program will now run and a message similar to the following will be displayed.

Installing Temperature Monitoring

And Control System

iv) Enter the destination drive and directory for the program e.g. C: or C:\TEMPMON. If the directory does not exist, it will be created.

v) The install program will now copy all the files to the chosen destination.

vi) The program will next run ADAPTER.EXE to set the type of display adapter that is being used. The standard adapter profile is set to color VGA. If this is correct type [g] to quit this part of the installation and continue. If this is not correct type [n] and follow the screen prompts.

vii) Next, HCSELECT.EXE will be run, this is to select the type of hardcopy device you have.

viii) Select graphics printer, plotter or plot file

ix) Choose the destination, orientation etc. at top of the window marked "Graphics Printer Configuration", the current graphics printer/plotter is shown, to change this choose the box marked "Select a new printer", and select from the list of printers shown.

x) Select "OK" to save the hardcopy configuration file.

xi) The install program will now ask if you wish to run the Temperature Monitoring and Control System program. Type [r] for run or [q] for quit.

WARNING:

If you are using the IEEE interface for communications, do not name the sub-directory from which you are running the program wih the same name as the device name in the IEEE device handler file (GPIB.COM). If you do, all access to the sub-directory will be denied. A sub-directory name such as "TEMPMON" will present no problems. Refer to Chapter 14 Using the IEEE Interface for more information.

4.3.2 To Start Package Already Installed

Change to the required drive and type TEMPMON, then press <ENTER>. The Temperature Monitoring and Control System Program will be loaded and run.

4.3.3 Installation Faults

If the adapter is set and then the screen goes blank it is likely that the wrong display adapter has been set. To return to DOS, type <ALT> + <C>, and press <ENTER>. Then type ADAPTER.EXE <ENTER> to reset adapter.

4.4 Changing the Printer or Display Adapter Type

To change the printer characteristics or the printer driver, execute the program called HCSELECT.EXE this will allow you to change the printer configuration file HARDCOPY.PRO. Select your printer from the list and save the configuration.

To change the display adapter type, execute the program called ADAPTER.EXE. Again save the configuration file.

To check or change both printer characteristics and display adapter type, such as when transferring the program to a different computer, run the DOS batch file named SETUP.BAT by typing SETUP <ENTER>. This will run ADAPTER.EXE, HCSELECT.EXE, then load the Temperature Monitoring and Control System Program, TMCS.EXE.

4.5 Using Software Controls

You may use the keyboard or a mouse to operate the controls.

Note: Where data is input from the keyboard, press the [RETURN] or [ENTER] key to indicate to the program that the entry is complete.

Shortcut Keys are defined for many of the controls, which enable fast operation similar to using a mouse. A full list of Shortcut keys is given in Appendix A.

5. The Controls

The controls are designed to imitate real switches, buttons and selection lists

5.1 Cursor Movement

Keyboard	Mouse
Press [TAB] to step the cursor through the operable controls in order	Click on the control required. Automatically switches panel, if the control is in a different panel from the last control operated.
Pressing [SHIFT] [TAB] together, will step the cursor backwards through the controls.	
Pressing [ALT] [TAB] will move the cursor between panels, e.g.: from the main panel to the Multiplexer panel.	
Pressing [ALT] and the first letter of the control will position the cursor, e.g.: [ALT] +[L] for LOG control.	
Press the [ENTER] key to operate the control.	

5.2 The Menu Bar

Keyboard	Mouse
Use [ALT] + the initial letter of the menu title to select, then press the [ENTER] key.	Place cursor on menu title and click the left button
To select an item from a menu, type the initial letter of the menu item or use the cursor keys to select, then press [ENTER].	To select a menu item, place the mouse pointer on menu item and click the left button
To remove a menu without making a selection, press [ESC]	To remove a menu without making a selection, click anywhere outside the menu box.

5.3 Push-button Operation

e.g.:

Keyboard	Mouse
Position "Cursor" on button by pressing [TAB] or [ALT] + the first letter of the control. The button will show Press [ENTER] to operate.	Position cursor on button, click left button of mouse

5.4 Binary Switch Control

e.g.:

Keyboard	Mouse
Press [↑] (up cursor key) or home to switch to "manual" Press [↓] (down cursor key) or [END] to switch to "auto". Press [SPACEBAR] to toggle switch state.	Click on the required setting

5.5 Radio Button

These are small buttons usually accompanied by a label

e.g.:

Keyboard	Mouse
Highlight label & switch using the [TAB] key and change its state with [↑] cursor up or [HOME] [↓] cursor down or [END] or press [SPACEBAR] to toggle radio button state. Button is illuminated when ON e.g.:	Click on the button to toggle its setting.

5.6 Numeric/String Entry

e.g.:

Keyboard	Mouse
When active, the cursor appears in control. [←] [→] to move cursor, [HOME] to the beginning, [END] to the end. [CTRL] [D] to erase from current position to end. [DEL] to erase character under cursor. [F10] to toggle between insert and overwrite. Press [ENTER] to accept the input and continue. On initial selection typing first character of new entry will erase previous entry.	Click on the control required and use keyboard as detailed left. Also click on cursor position.

5.7 Ring Controls

e.g.:

Keyboard	Mouse
[↑] to select previous item [↓]] to select next [HOME] to select first [END] to select last Alternatively, press the [SPACEBAR] to display the selection in a pop-up panel and make a selection as above.	Click on up for previous item. Click on down for next item. Alternatively, click inside the item box to display all selections in a pop-up panel and then click on the required item.

5.8 Slide Controls

e.g.:

Keyboard	Mouse
Move the cursor keys up [↑] or down [↓] to select the required setting. Press [HOME] to move the slider to the top. Press [END} to move the slider o the bottom.	Click on the required setting or push the slider by placing the cursor on the slider, holding the left button down and moving the cursor. Release the mouse button when the required setting is reached.

6. The Welcome Panel

Figure 6-1. The Welcome Panel

To run the Temperature Monitoring and Control System program, type TEMPMON, and press the ENTER key. Once the program has loaded, the screen will be cleared and the Welcome Panel will be displayed, headed by the main system menu on the top line of the screen.

From this point in the program, you may access any item from the menu to set up the system to your particular requirements. If you have previously saved a system configuration, then you may now load this configuration to set up the system and the DP251 as soon as the RUN menu is selected.

7. The Program Menu

The program menu consists of six items:

Configuration

Interface

Multiplexer

Print

Temperature

Run

Exit

7.1 Configuration

The operator may save the current system configuration at any time by selecting {Save} from this menu. The parameters saved include all main display panel settings, Multiplexer panel settings, graph set-up panel settings, log panel settings, interface panel settings, and temperature standard in use.

Once this configuration has been saved, it may be recalled at any subsequent time by selecting {Load}. If the configuration is recalled while the program is in "Run" mode, communication must be restarted by again operating the {Run} button.

The configuration may be cleared back to the initial, or default, configuration of the system by selecting {Set Default}. However, critical settings such as communications parameters and multiplexer settings will be retained. This selection will also clear or reset (restart) the DP251. When saving or loading configuration files, files with the extension .CFG will be displayed.

When saving the configuration to a new file name, the extension .CFG must be used. If the configuration is to be saved to an existing file name, a prompt will be given to overwrite the previous file of that name.

System configuration details may also be viewed or printed out directly from the PC operating system environment by using the DOS commands "type (configfile). CFG" or "print (configfile). CFG".

7.2 Interface

Select {Define} to display the Interface set up panel. The operator may choose either RS232 or IEEE communication. If RS232 is selected (the standard selection) the IEEE device name and address number controls will be dimmed and cannot be altered. Conversely, if IEEE is selected, RS232 port number and baud rate control will be dimmed and cannot be altered.

The standard RS232 settings for the program are 19200 baud, 8 data bits, 2 stop bits, no parity. These are the standard settings for the DP251 Interface card also, as set by the 8-way DIP switch on the card (all switches set to ON).

Three baud rate settings are offered by the program: 19200, 9600 and 4800. If a non-standard setting is selected, the operator must refer to the DP251 Operator's Manual for advice on changing the RS232 baud

rate settings on the Interface card. The operator may choose any one of four serial communication ports (COM1 through COM4) for RS232 communication with the DP251. The standard setting is COM1. If a mouse is being used on COM1, another port setting must be chosen.

The standard IEEE settings are: device name: {DP251}, device address: 3. The device name must be the same as that set in the IEEE device handler file (GPIB.COM) for the address used (standard address setting is 3). If the standard IEEE device name is not found in the IEEE device handler file, the default IEEE device name DEV3 will be selected. When a non-standard IEEE address is to be used, this must be set within the program (in the control box entitled "IEEE address"), in the IEEE device handler file (GPIB.COM) and on the IEEE address switch accessible on the rear panel of the DP251 Interface card. Addresses 1-7 may be set. The address setting on the interface card of the DP251 is also displayed on the main display of the thermometer on start up or instrument clear.

The DP251 may be reset and current settings cleared to standard values by operating the {Open Device} button. Operating this button will also check and display the instrument serial number. This may be done even when the program is running in demonstration mode.

If a Multiplexer selection has been made, or a system configuration loaded, which includes the operation of a Multiplexer, then the Multiplexer(s) will be checked to ensure that they are present. If the Multiplexer check fails because no Multiplexer is present, you may enter [C] to continue in response to the prompt and the program will continue without Multiplexers.

The {Default Settings} button, will clear the program interface settings back to the standard values as defined above.

Refer to Chapter 13 Using the RS232 Interface and Chapter 14 Using the IEEE Interface.

7.3 Multiplexer

Menu Selection	Action
No Multiplexer:	Deselects any Multiplexer currently in use and removes the Multiplexer panel from the display.
Use Multiplexer A:	Selects use of a Multiplexer attached to probe input A only. Displays the Multiplexer panel below the main panel display.
Use Multiplexer B:	Selects use of a Multiplexer attached to probe input B only. Displays the Multiplexer panel below the main panel display
Multiplexers A & B:	Selects use of Multiplexers attached to both input probes A and B. Displays the Multiplexer panel below the main panel display.

When the {RUN} button is operated on the main panel, Multiplexer channels will automatically be scanned in sequence at the time intervals set from the logging controls panel display. When both Multiplexers A and B are selected, the channels on Multiplexer A will be scanned first followed by the channels on Multiplexer B.

Refer also to Chapter 9, The Multiplexer Panel Display.

7.4 Print

The following selections are available:

Screen

Graph (large)

Graph (small)

7.4.1 Screen

The entire displayed screen will be printed out. The screen is first redrawn in monochrome, after which printing will start. All the monitoring/logging operations will pause until printing is complete.

7.4.2 Graph (large)

The graph will be redrawn to full screen size before printing.

7.4.3 Graph (small)

The graph will be printed out at the actual size at which it is displayed on the screen.

7.5 Temperature

The following temperature calculation standards may be selected:

Temperature Standard	Shortcut Key
ITS-90	[CTRL] + [I]
DIN (IEC751/BSI904)/Callender van Dusen	[CTRL] + [D]
DIN90	

These may be selected only when the {External Coefficients} button on the main display is set to ON (highlighted button). Otherwise, the display will reflect readings taken according to the temperature calculation standard set via the {CAL} facility key switch on the front panel of the DP251.

ITS-90 is the International Temperature Scale of 1990, employing the use of calibration coefficients and a value of resistance at the Triple Point of Water (0.01° Celsius).

DIN is the common nomenclature for the IEC751/BS1904 standard, which uses two fixed coefficients (A and B) for calculating temperatures at or above 0° Celsius, and a third fixed coefficient (C) in addition for calculating temperatures below 0° Celsius It assumes a resistance value of 100 ohms at 0° Celsius and a temperature coefficient value alpha for the platinum resistance element of $0.00385°C^{-1}$. The IEC751 standard uses the Callender van Dusen method of converting resistance to temperature.

Selecting DIN also allows Callender van Dusen coefficients other than those conforming to the IEC751 standard to be used.

DIN90 is the standard proposed by Messrs L.Crovini, A.Actis, G.Coggiola and A.Mangano of the Istituto di Metrologia Torino Italy to replace IEC751, it being based on the ITS-90 standard, but having an alpha of 0.00385055°C^{-1}. The recommended values of the coefficients are:

A_{90} = 3.9083×10^{-3} °C^{-1}

B_{90} = - 5.775×10^{-7} °C^{-2}

C_{90} = - 4.183×10^{-12} °C^{-4}

Refer to Chapter 12,"Using External Probe Coefficients" for further information.

7.6 Run

Menu Selection	Action
Operate DP251:	Sets the program in real-time operation mode, resets the DP251, checks the instrument serial number with the recorded program number and initializes all instrument and program settings to the values of the configuration file (if a configuration has been loaded).
Demonstration:	This setting is useful in allowing the operator to familiarize themselves with all aspects of the Temperature Monitoring and Control System without the need actually to communicate with an DP251. However, if an DP251 is "on line", it is still possible to read its serial number by operating the "Open Device" button on the interface panel (Refer to Section 7.2).

Figure 7-2. The Demonstration Waveform Panel

When running a display in the main panel, an alternative choice of waveform may be set, a ramp waveform, or a waveform randomly varying between approximately 105 ohms and 110 ohms, or its equivalent temperature in the units selected.

7.7 Exit

Press [ALT] + [E] or click the mouse button on {Exit} to exit the program. All currently open files will be closed. The DP251 will be reset and cleared to its standard initial settings, if the program is in real-time operation mode.

8. The Main Display

Figure 8-1. The Main Display

The main panel display broadly resembles the front panel of the DP251 with push-button control operation and indicator LED's, but including a graphical plot of the last 100 readings recorded and a date and time monitor. The menu, displayed on the top line of the screen is accessed by pressing [ALT] + the first letter of the menu title or by clicking on the required menu title with the left mouse button.

If a Multiplexer has been selected, the Multiplexer panel will be displayed below the main display.

On entry to the main display, run status will be STOPPED, indicated by the small text box below the main reading display. When the run status is STOPPED, no measurement readings will be requested from the DP251. However, the DP251 remains on line and all controls are operable and all facilities remain available to the program.

8.1 Operating the Controls

To access the controls, use the [TAB] key to more forward or [SHIFT] [TAB] to move backwards, then press [ENTER] to operate the control, if you are using the keyboard. Alternatively, the following Shortcut Keys may be used to operate controls directly no matter which control is currently selected:

Action Required	Shortcut keys
Change to probe A	[CTRL]+[A]
Change to probe B	[CTRL]+[B]
Set high/low resolution(toggle)	[CTRL]+[H]
Access graph set-up panel	[CTRL]+[G]
Access log set-up panel	[CTRL]+[L]
Change(advance) temperature units	[CTRL]+[U]
Set to RUNNING status (start taking readings)	[CTRL]+[R]
Set to STOPPED status (stop taking readings)	[CTRL]+[S]

Provided that the {External Coeffs} button has been set (highlighted in the center), the following Shortcut Keys also may be used:

Action Required	Shortcut keys
Access calibration facility (entry of coefficients etc.)	[CTRL]+[C]
Change temperature standard to ITS-90	[CTRL]+[I]
Change temperature standard to DIN (IEC751)	[CTRL]+[D]

Controls may also be accessed , though not activated by using the [ALT] key and the initial letter of the control. Activate the control by pressing the [ENTER] key.

If you are using a mouse, place the cursor on the required control and click the left mouse button to activate the control.

8.2 Controlling the DP251

Probe selection, zero setting, resolution and units may be changed by operating the pushbuttons in a similar manner to operating the keys on the front panel of the DP251.

When taking readings with a multiplexer, the reading cycle may be restarted from channel position 0 at any time by reselecting the current probe, e.g. if current probe is A, press [CTRL] + [A] (or click the mouse button with the mouse pointer on {A}) to restart channel reading from position 0.

Note however, that setting zero will cause the zero LED to flash on the display and will zero the reading, but the DP251 itself will not be zeroed. For more information on zero setting, Refer to Chapter 9, The Multiplexer Panel Display.

Begin taking readings from the DP251 by operating the {RUN} button. Stop taking readings from the DP251 by operating the {STOP} button.

When run status is RUNNING the DP251 operates in local lockout mode, i.e. none of the front panel controls are available to the operator, all control operations are governed by the PC program.

When the run status is STOPPED, the DP251 front panel controls are not locked out and may be used by the operator. However, caution must be exercised because changes made to DP251 parameters by direc operation of the front panel controls are not monitored by the program. If measurement is restarted with the controls on the front panel of the DP251 set to a different state to those on screen, the program will detect the difference and will not display any measurement readings. If this occurs, select {Set Defaults} from the configuration menu to restart the system from a known state.

It is permissible to enter new PRT calibrations into the DP251 via the front panel of the instrument by setting the Run/Cal key switch to Cal, while program run status is STOPPED. The Run/Cal key switch must be returned to the Run position before restarting temperature measurement.

It is important to allow the calibration process to finish before beginning to take readings from the DP251 by operating the {Run} button. Communication with the DP251 interrupts whatever process may be in operation within the DP251 and when generating a calibration table, it is important to ensure the integrity of the calibration data by allowing the calibration process to complete before starting any other operation.

To set up logging to disc, graph plotting, and to use external (i.e. stored on disc) probe coefficients, please refer to Chapters 10, 11 and 12 respectively.

9. The Multiplexer Panel Display

Figure 9-1. The Multiplexer Panel

Load the required Multiplexer via the menu item {Multiplexer}. If a previous configuration which included a Multiplexer has been saved, loading this configuration will automatically set up the Multiplexer panel. Where a system configuration is loaded which includes a multiplexer, the multiplexer(s) will be checked when the program is initialized by operating the {Run},{Operate} menu item, or restarted by operating the {Configuration},{Set Defaults} menu item. If the multiplexer check fails because no multiplexer is present, you may enter {C} to continue, in response to the prompt "Retry/Exit/Continue?", and the program will continue without multiplexers.

If the multiplexer check fails even though the multiplexer(s) are present, check that the connectors on the ribbon cable which connects the DP251 expansion port to the multiplexer control inputs are firmly pressed into their respective sockets.

9.1 Accessing the Multiplexer Panel

To change the control access between the main panel and the Multiplexer panel, press [ALT] + [TAB], then move between the controls in the normal way. If a mouse is being used, click the mouse button anywhere inside the panel or click on the required control on the Multiplexer panel.

9.2 Operating the Multiplexer Panel Controls

Once the Multiplexer panel has been loaded onto the display, it can be switched between a Multiplexer A display and a Multiplexer B display by operating the Multiplexer ring control at the upper right of the Multiplexer panel. If a change to select both Multiplexers i.e. a Multiplexer attached to probe A and a second Multiplexer attached to probe B, is required, this change must be selected from the Multiplexer menu on the top line of the screen.

When both Multiplexers A and B are selected, only one Multiplexer panel is displayed, but the readings taken will alternate between the channels on A and the channels on B, i.e. the program will scan channels 0-15 on A, then 0-15 on B. The condition of the probe LED on both main panel and Multiplexer panel will indicate which Multiplexer is being scanned.

{Channel to view} controls the Multiplexer channel reading which is displayed on the main panel and which is plotted to the main panel graph. The channel to view may be selected from 0-15 plus ALL, the latter being a function which averages the values of all selected channels and displays this value in the main

panel reading box and plots this on the graph. Use of the ALL function may be useful when carrying out environmental chamber monitoring.

Note: All the individual channel readings will still be displayed and may be logged when using the ALL function. When logging, the average value reading will be recorded to disc or printer after logging the readings of individual channels.
Note also that while the channel reading to be plotted on the main panel graph is selected by the Channel to view control, the probe, A or B, to be plotted on the main panel graph is selected from the Graph Configure panel which is accessed via the Graph button on the main panel (Refer to Chapter 11, The Graph Set-up Panel).

9.3 Multiplexer Channel Reading Sequence

The standard sequence of taking Multiplexer channel readings is from 0-15. However, the sequence may be changed. Place the cursor over the channel number to be changed and enter the channel number required. Now press the [ENTER] key to indicate to the program that the new channel number is to be accepted.

9.4 Deselecting Multiplexer Channels

To deselect a channel when it is not required to be scanned, enter a negative number, such as -1 into the channel number box and press [ENTER]. This channel position will now be skipped when scanning the Multiplexer.

9.5 Reading Update Rate

When a sufficiently long time interval between reading the channels is selected from the Logging Controls panel (accessed via the {Log} button on the main panel), the reading on the Multiplexer panel display will be updated to reflect the latest value measured by the DP251.

9.6 Starting the Reading Display

Operating the {RUN} control on the main panel will cause the program to read the Multiplexer and display the returned readings on the Multiplexer panel display in the sequence 0-15 of the numbered channel positions.

9.7 Setting the Reading Interval

Time between readings and time between complete scans is set from the "Logging Controls" panel accessed via the "Log" control in the main panel (see Section 8 "The Logging Panel").

9.8 Zero Setting

Any Multiplexer channel reading may be individually zeroed to enable variation from a given temperature to be observed. At least one reading must have been taken from that channel before the reading may be set to zero.

Setting a channel reading to zero is best accomplished by first pausing the reading sequence by operating the {STOP} button as soon as the program selects the channel which is to be zeroed. Now operate the {ZERO} button. The LED below the zero button will now flash, indicating zero selection and the reading display of the selected channel will be set to zero. Restart the reading sequence by operating the {RUN} button.

The zero LED will flash only when a zeroed channel is selected. At other times, the zero LED will remain illuminated to indicate that a zero setting has been made for one or more of the channels selected for reading.

Deselect zero in the same manner as selection by pausing the reading sequence at the correct channel, operating the zero button, then restarting the reading sequence. Providing that the channel being deselected from zero reading is the only channel for which a zero selection is currently in operation, the zero LED will be extinguished.

Note that the reading on the front panel of the DP251 will not be zeroed. Operating the zero button on the front panel of the DP251 will zero the reading of the channel currently selected only whilst that channel is selected and no other channel selection is made.

10. The Logging Panel

Figure 10-1 The Logging Panel

Select the logging panel by operating the {Log} button on the main display. The panel is displayed as an overlay over the main screen display.

After completing the required settings, operate the {OK} button to return to the main display.

10.1 Clear settings

Operate this button to re-initialize timing and device settings. It is especially important to reset the stop time before setting up a new logging session.

10.2 Logging with Start and Stop times

{Start Time} for logging may be set so that the system may be left and logging be started automatically on the clock reaching the specified start time. Alternatively, operate the {Start NOW} button to start logging as soon as the next reading is received from the DP251.

{Stop Time} for logging may also be set so that the system will terminate the logging process at the specified time. Alternatively, operate the {Stop NOW} button to terminate logging.

Both {Start Time} and {Stop Time} values need to be entered into the program by pressing the [ENTER] key to confirm acceptance of those values.

On re-entry to this panel after previously setting a start time (including setting with the {Start NOW} button), the start time previously set will be displayed.

Start and stop times are valid during the same 24 hour day.

It is especially important, after a previous logging session has completed, to reset the stop time before starting a new logging session.

It is not essential to set a stop time for logging. To log indefinitely set the stop time to a value greater than "24:00:00" and number of readings to 0. Stop logging by operating the {Stop NOW} button.

10.3 Logging a Set Number of Readings

When a specified number of readings is required to be logged, enter the required value in the box and press the [ENTER] key to confirm the value.

Logging will terminate automatically as soon as the required number of readings has been logged. A Start Time may be entered together with a specified number of readings. Alternatively, press the {Start Now} button when ready to start logging. If a Stop Time is set in such a way that this time is reached before the requisite number of readings have been logged, logging will cease even though the required number of readings has not been logged.

10.4 Logging Interval

The logging interval is the time between the selection of one channel of the Multiplexer and the selection of the next channel. It is also the minimum time interval between logging readings to disc or printer. The logging interval is initialized on start up to one second for low resolution and two seconds for high resolution. These are the minimum logging intervals permitted.

When one of these respective minimum logging intervals is set, toggling the resolution setting by operating the {HI-RES} control on the main display will automatically reset the logging interval to the minimum value appropriate for the resolution setting.

If the logging interval is set to a greater value than the minimum value for the resolution being used, this value will be retained if the resolution setting is changed. Once logging has commenced and run status is RUNNING, it will not be possible to change the logging interval. To change the logging interval, stop measurement by operating the {stop} button, re-enter the logging interval value then re-start by operating the {Run} button. To change the logging interval, enter the required value in the form "HH:MM:SS" (hours: minutes: seconds) and press the [ENTER] key.

10.5 Scan Interval

The scan interval is the time period between one selection and reading of the first channel of the Multiplexer and the next selection and reading of the first channel of the Multiplexer.

When using both Multiplexers A and B, the scan interval is the time period between one selection and reading of the first channel on Multiplexer A and the next selection and reading of the first channel on Multiplexer A.

The scan interval is initialized, on start up, to zero.

To change the scan interval, enter the required value in the form "HH: MM: SS:" (hours: minutes: seconds:) and press the [ENTER] key.

The scan interval operates only when logging to disc or printer is in progress.

10.6 Output Device

The Output Device can be disc, printer or disc and printer. Make a selection as required. To start logging to disc or printer, it will be necessary to operate the {Open Device} control and if no start time is defined by the operator it will be necessary also to operate the {Start Now} button in order to start the logging process.

Note that if a slow disc drive and, or printer is being used for logging data from 2 multiplexers it may be necessary to extend the logging interval above the standard value to allow time for the latest reading to be read from the communication buffer and displayed correctly while DP251 is switching probes.

10.7 Logging to Disc File

To open a disc file for logging, operate the {Open Device} control. This will present the operator with a list of current data files and a prompt to enter a new file name or to select an existing file name from those on display.

If a list of current data files on a disc drive other than the current drive is required click the mouse control on the required drive, or use the [TAB] and cursor keys to select the required drive, then press [ENTER]. Failure to press the [ENTER] key to select the new drive letter will result in logged data being stored to the current drive.

All data file names must employ the extension .DAT. When a new file name is selected, both the file name and the extension must be entered by the operator. Where an existing file name has been selected to which to store new data, the operator will be prompted to specify whether the file is to have the new data appended to the end of the existing file, whether to overwrite all existing data with the new data, or whether to cancel the selection.

After making a selection or entering a new file name, press the [ENTER] key to confirm the selection or operate the {Select} key. Alternatively, cancel the selection by pressing the [ESC] key or by operating the {Cancel} key.

If a mouse is being used an existing file name may be selected by placing the cursor over the required file name and double-clicking the left mouse button.

10.8 Logging to printer

When logging to a printer, operating the {Open Device} button will present the operator with the opportunity to specify the printer port(LPT1 to LPT3, or COM1 to COM2).

Operate the {OK} button when all the settings are made as required.

10.9 Start Now

Operating this button sets the start time for logging to the current time and initiates an immediate start to logging operations as soon as the next reading is received from the DP251. Control returns automatically to the main display.

10.10 Stop Now

This button enables the operator to terminate logging operations immediately.

If a restart is required, operate the {Open Device} button to re-specify disc file name or printer port and reset the stop time.

10.11 Last Logged Reading

This indicator box gives the time and value of the last recorded reading logged to disc or printer. It will give confirmation of the completion of logging when a stop time or a given number of readings has been specified.

10.12 Disc File Problems

If a problem is detected on writing to disc file, the operator will be alerted to this and offered the opportunity to rectify the error by means of automatic entry to the logging panel. Make the necessary corrections, then use the {OK} button to exit. Loading a system configuration file which was saved while logging was in progress, then beginning the temperature measurement without re-opening the disk file can give rise to a warning of this nature.

10.13 Printer Problems

Problems occurring with writing to a printer are most likely to be due to: no printer connected; printer off line; printer out of paper; print configuration not set up. (This is most likely to occur when a system configuration has been loaded which was previously saved, while logging was in progress, but the printer control has not been re-opened by operating the {Open Device} control).

11. The Graph Configure Panel

Access to the Graph Configure is via the {Graph} button on the main panel display.

11.1 Scale

11.1.1 Setting the Scale Manually

Figure 11-1. The Graph Configure Panel (Manual Setting)

When {Scale} is set to Manual, the operator may specify maximum and minimum values for the Y-axis. On entry to this panel the current maximum and minimum values will be displayed.

To change these values enter the required maximum and minimum values, in each case pressing the [ENTER] key to confirm the entered values.

11.1.2 Auto-Setting the Scale

Figure 11-2. The Graph Configure Panel (Auto Setting)

When {Scale} is set to Auto (the standard setting), the user may set the sensitivity of the scaling, but not Y-max or Y-min.

The approximate span of the Y-scale for a given reading sensitivity is as follows:

Sensitivity	Span
x 1	200/1000 of currently selected units
x 10	20/1000 of currently selected units
x100	5/1000 of currently selected units

The span is approximate and is calculated by an algorithm which takes into account both the amplitude of and the variation in the last three readings recorded from the channel to view.

Figure 11-3. The Graph Display

11.2 Probe

It is important to set the {Probe to Display} when the probe setting or Multiplexer has been changed from the standard initial setting (Probe or Multiplexer A), in order to plot readings to the graph.

Select the {Probe to Display} in accordance with the setting of the main display panel probe selection button.

When both Multiplexers A and B have been selected via the Multiplexer menu, the operator may elect to view one channel number (by means of the Multiplexer {Channel to view} control) on both Multiplexer A and Multiplexer B. Select {A & B} to plot a graph of the readings received from the selected channel from both Multiplexer A and Multiplexer B. Readings from Multiplexer A will be shown by a yellow trace, readings from Multiplexer B will be shown by a cyan trace.

When scanning both Multiplexers A and B in sequence, the operator may also view a trace for A and a trace for B as described above and in addition a trace displaying the difference value A-B. Select {A-B} from the {Probe to display} selection.

11.3 Default Settings

Operating this button will change all settings back to the standard initial values, except that the {Y-max} and {Y-min} boxes will simply be cleared. The maximum and minimum settings for Y will remain unchanged unless specifically changed by the operator after setting the {Scale} control to {Manual}.

When all the graph settings have been made, operate the {OK} button to remove the graph set up panel. Removing this panel will cause the graph currently displayed to be cleared and the scale to be reset, if appropriate.

Up to 100 readings divided into five sections may be displayed at any one time on the graph display. If, for example, one channel only is being scanned at intervals of six seconds, a complete graph will represent ten minutes worth of readings.

If ten channels are being scanned at the same time interval, a full graph will represent one hour and forty minutes of readings of the selected channel. When the graph trace reaches the right hand side of the graph frame, the graph display, complete with sub-divisions, will scroll left every four readings.

11.4 Reset Graph on Exit

If the current graph configuration is merely being checked, the operator may choose not to reset the graph plot on exit from the configuration panel so as to preserve the existing graph of logged data. If graph parameters are changed, in most instances it is necessary to reset the graph.

12. Using External Probe Coefficients

A useful feature of the Temperature Monitoring and Control System program is the ability to store an unlimited number of sets of probe coefficient data on disk file. Changing probes on the DP251 and maintaining accurate measurements becomes a quick and simple matter. Resistance to temperature conversions are carried out by the program rather than within the DP251 itself.

In addition to viewing the coefficients from the program itself, the file of coefficient data may also be viewed or printed out directly from the PC operating system environment.

12.1 Temperature Conversion Standards

Three temperature conversion standards are offered by the program : ITS-90, DIN (IEC751/BS1904) - Callender van Dusen coefficients - and the proposed DIN 90 standard.

12.2 Selecting External Coefficients

To select external coefficients, operate the {External Coeffs} button on the right hand side of the main panel display. Instantly it may be seen that the {Cal} button above is now clear, not dimmed, the {Temperature} menu item on the top line of the screen is now clear, not dimmed, and the units displayed on the DP251 itself are now changed so as to display and output the measurement readings in Ohms.

External coefficients may not be selected when the units selection is already set to read resistance in Ohms.

12.3 Selecting the Temperature Conversion Standard

The default, or standard, temperature conversion standard used by the program is DIN (IEC751/BS1904), Callender van Dusen coefficients. To change from this setting, select the {Temperature} menu on the top line of the screen and make a different choice as required.

12.4 Probe Coefficient Data Entry

To enter new probe coefficients or to check existing probe coefficients, operate the {Cal} button immediately above the {External Coeffs} button on the main panel display. The coefficient panel display will now be presented on the screen.

Five controls are common to all three probe coefficient data screens : {Channel No.}, {Multiplexer No.}, {Save coefficients}, {Load coefficients}, and probe serial number. One set of probe coefficient data must be unique to one Platinum Resistance Thermometer, hence the serial number of the probe should be entered and the channel number of the Multiplexer and the designation of the Multiplexer (A or B) to which the probe is attached must be specified. If no Multiplexer is being used, the {Channel No.} and {Multiplexer No.} controls will be dimmed and inaccessible.

{Save coefficients} enables probe coefficient data to be saved to a named disk file. This file name must have the extension .TCD for ITS-90 calibration files and .CCD for Callender van Dusen (DIN) coefficient files. When the {Save coefficients} control is operated a list of the current probe coefficient data files are displayed. If a new file name is required, enter the file name with the appropriate extension and press the [ENTER] key or operate the {Select} button. Coefficient data will now be stored to this named file. If an existing file name is to be used, select the file name from the displayed list, using [TAB] and cursor keys or by double clicking the left mouse button or by highlighting the required file name with one click and operating the {Select} button with another click. A warning message will now be displayed to indicate that selection will overwrite existing probe coefficient data. Select {YES} to confirm or {NO} to abort the selection. If the selection is confirmed, the coefficient data will now be saved to the named file, and control will return to the main coefficient data display panel.

{Load coefficients} enables previously saved probe coefficient data to be loaded for the channel and Multiplexer selected. Select a filename from the displayed list of files by means of [TAB] and cursor keys, then press [ENTER] or operate the {Select} button to load the probe coefficient data for the specified channel and Multiplexer. If a mouse is being used, double click on the required file name or click once to highlight the name and click on the {Select} button to load the data.

To escape without action from either the {Save coefficients} or {Load coefficients} file displays, press the [ESC] key or operate the {cancel} button.

12.5 DIN (IEC 751/BS 1904) - Callender van Dusen coefficients

Figure 12-1. The DIN (IEC 751/BS1904) Temperature Standard Display)

Enter R0 (ice point resistance value) in Ohms and the values of coefficients A, B and C. If temperatures to be measured are above 0°Celsius (32° Fahrenheit) and no value is available for coefficient C, leave the value of C at its default or standard setting. Coefficient C is not required when calculating temperatures above 0° Celsius.

If standard IEC751.BS1904 (DIN) probes are being used, leave the coefficients A, B and C at their defaults, or standard, values.

IEC 751/BS1904 defines the temperature coefficient alpha, as 0.00385 $°C^{-1}$

The value of the constants A, B and C are as follows

A = 3.90802 $x10^{-3}$

B = -5.802 $x10^{-7}$

C = -4.2735 $x10^{-12}$

The temperature/resistance relationships used are :

For the range - 200°C to 0°C :

$$Rt = R0 (1 + At + Bt^2 + C(1-100°C)t^3 \quad (1)$$

For the range 0°C to 850°C :

$$Rt = R0 (1 + At + Bt^2) \quad (2)$$

Please refer to the appropriate standards document for further information.

12.6 ITS-90

Figure 12-2. The ITS-90 Coefficients Display

The International Temperature Scale of 1990 provides for a value of resistance at the Triple Point of Water (0.01°C) to be specified and employs up to two temperature coefficients below 0°C and up to four temperature coefficients above 0°C to cover eight temperature sub-ranges between -189.3442°C and 961.78°C. The number of temperature coefficients employed is dependent on the range of the temperature measurement. For full information on ITS-90, consult your national standards institution.

Enter the value of resistance at the Triple Point of Water, Rtpw, and the values of coefficients as recorded on the calibration certificate for the probe to be used. If the probe is to be used above 660.323°C, W, the resistance ratio at this temperature, must also be entered. Coefficients not used should be left unchanged at their default values. After entering each value, press the [ENTER] key to confirm the entry.
Enter the probe serial number and press [ENTER] to confirm, check the entries then operate the "Save Coefficients" button to store their values to a named disk file.

Previously stored probe coefficients may be loaded for any channel of either Multiplexer by operating the {Load Coefficients} button. Select the required file of coefficient data from the displayed list.

Changing the channel number or Multiplexer after entering new probe coefficient data will cause the prompt "The coefficients are not saved. Save them ?" to be displayed. Operate the {Yes} button to save them and specify the file name or {NO} to lose the entered values and continue with the next channel/Multiplexer. If no Multiplexer is being used, the {Channel No.} and {Multiplexer No.} controls will be dimmed and inaccessible.

Once coefficient data has been loaded into the program and assigned to a specific channel, it will be retained until overwritten by loading or entering a different set of data or terminating the program.

On start up, all coefficients are initialized to zero and the Rtpw value set to 100.0.

The {Default values} button resets probe coefficients to zero, Rtpw to 100.0 and clears the probe serial number box.

The probe serial number entry may be any combination of alphabetic/numeric characters up to 10 characters in length.

Note that there is no warning given that the temperature being calculated is outside the ITS-90 range for the temperature coefficients recorded on the calibration certificate and entered into the program. It is up to the operator to ensure that temperatures being measured fall within the range of the calibration.

12.7 DIN90

This is the standard proposed to replace IEC 751 by Messrs. L Crovini, A Actis, G Coggiola and A Mangano of the Instituto of Metrologia, Torino, Italy and is designed to follow more closely the resistance/temperature relationship of the International Temperature Scale of 1990.

Equations (1) and (2) (refer to Section 12.5) are retained, but with recommended values for the coefficients as follows :

A = 3.9083×10^{-3}

B = -5.775×10^{-7}

C = -4.183×10^{-12}

13. Using the RS232 Interface

Figure 13-1. The RS232/IEEE Interface Display (RS232 setting)

Select RS232 interface operation by setting the two-position control entitled {Type} in the top left-hand corner of the screen to RS232. The RS232 port and RS232 baud rate controls will now be displayed clearly, and will be accessible to the operator, while the IEEE device name and IEEE address controls will be dimmed and inaccessible to the user.

13.1 Hardware Configuration

One RS232 port is needed to communicate with the DP251. A second RS232 port is needed if a mouse is to be used (unless the PC has a special mouse port). For a detailed description of the RS232 cable required, see below.

13.1.1 RS232 Connector

The DP251, when fitted with RS232C option, communicates via the 25-way, male, D-type connector on the back panel, as shown in Figure 13-2 RS232 Connector

Figure 13-2 RS232 Connector

13.1.2 Pin Connections

Computer			DP251		
Function	25-Pin Connector	9-Pin Connector	Function	25-Pin Connector	Connections
Tx	2	3	Rx	3	
Rx	3	2	Tx	2	
RTS	4	7	CTS	6	To 6
CTS	5	8	RTS	4	To 20
DSR	6	6	DTR	20	To 4
GND	7	5	GND	7	
DTR	20	4	DSR	6	To 5

13.2 Software Configuration

13.2.1 Standard RS232 Settings

The standard settings for the RS232 interface card are 19200 baud, no parity, 8 data bits, 2 stop bits. For these settings, all switches on the DIP switch on the RS232 interface card must be set ON, i.e. all switches pointing down or towards the circuit board. These are also the standard settings of the TMCS program.

13.2.2 RS232 Port Setting

The TMCS program uses RS232 port 1 (COM1) as standard for communication with the DP251. If there is more than one RS232 port on the PC, this setting may be changed by changing the slide switch which sets the port number. Set the slide switch to the required choice of port number. If a mouse is to be used for operating the controls, ensure that the port setting for communications with the DP251 is different from the port setting for the mouse, otherwise a conflict will occur resulting in neither communication with the DP251 nor mouse operation.

13.2.3 RS232 Baud Rate Setting

The choice of baud rate settings is: 19200, 9600 and 4800. The standard setting for both the DP251 and the TMCS program is 19200. This setting causes the minimum interruption to the DP251 balance cycle. If very long RS232 cables are being used with the effect that the signal attenuation results in characters being received incorrectly, an improvement may be achieved by setting the baud rate to a lower figure. Ensure that the baud rate settings for both the TMCS program and the DP251 are identical. Refer to the DP251 manual for information about setting the baud rate on the DP251 interface card.

13.2.4 Setting Parity and Data Bits

Settings for parity, number of data bits and number of stop bits are fixed within the TMCS program to the standard factory setting of the interface card.

The probe serial number entry may be any combination of alphabetic/numeric characters up to 10 characters in length.

Note that there is no warning given that the temperature being calculated is outside the ITS-90 range for the temperature coefficients recorded on the calibration certificate and entered into the program. It is up to the operator to ensure that temperatures being measured fall within the range of the calibration.

12.7 DIN90

This is the standard proposed to replace IEC 751 by Messrs. L Crovini, A Actis, G Coggiola and A Mangano of the Instituto of Metrologia, Torino, Italy and is designed to follow more closely the resistance/temperature relationship of the International Temperature Scale of 1990.

Equations (1) and (2) (refer to Section 12.5) are retained, but with recommended values for the coefficients as follows :

A = 3.9083×10^{-3}

B = -5.775×10^{-7}

C = -4.183×10^{-12}

14. Using the IEEE488 Interface

Figure 14-1. The RS232/IEEE Interface Display (IEEE setting)

14.1 Hardware Configuration

i) Ensure that the computer is installed with an IEEE interface card. Follow the instructions supplied with the interface for installation.

ii) Ensure that the hardware configurations for the computer interface, the device handler file (GPIB.COM, see below) and the OMEGA interface are matched; for example, both have the same IEEE address. For details of the computer interface hardware specifications consult the respective manual.

iii) Connect the OMEGA interface to the computer interface with the supplied interface cables.

iv) Ensure that the DP251 interface card is fitted with the IEEE connector facing the rear of the instrument.

14.2 IEEE Bus Configuration Details

The IEEE address for the DP251 is selected using a rotary hardware switch accessible via the rear panel of the interface. The software uses a variable to represent the address. In this case:

Instrument	Default IEEE address	Variable Name
DP251	3	DP251

Table 14-1 IEEE Bus Configuration

If, on initialization, the program cannot find the variable name ("DP251") which represents the IEEE address in the device handler file (GPIB.COM), the default name ("DEV3") will be adopted. If the default name cannot be found, an error message will be displayed.

WARNING

Do not name the sub-directory from which you are running the program DP251 nor any of the files you create DP251 plus any extension, if the device name in the IEEE instrument handler file (GBIB.COM) is also named DP251 (this is the recommended name, Refer to device map below). If the IEEE device name is the same as that of any sub-directory or file, all access to the sub-directory or file of that name will be denied until such time as the IEEE device named is changed.

14.3 Configuring the IEEE Device Handler

National Instruments (™) control software is used by the program. All references within this manual will be to Nationals Instruments (™) device handler files and utility programs. IEEE interface cards and device handler files which are 100% compatible with the National Instruments (™) versions may also be used, although configuration details may vary.

The IEEE device configuration program (IBCONF.EXE) will have been distributed to you by your IEEE interface card supplier. It should be used to edit the description contained in the instruments handler file (GPIB.COM). In the following examples, the IEEE card has the description "GPIB0".

You may edit the device map so as to change the device name to that illustrated on the diagram below:-

GPIB0

–> DEV1	–> DEV5	–>DEV 9	–> DEV13
–> DEV2	–> DEV6	–> DEV10	–> DEV14
–> DP251	–> DEV7	–> DEV11	–> DEV15
–> DEV4	–> DEV8	–> DEV12	–> DEV16

Table 14-2 IEEE Device Map

Next the IEEE interface board characteristics should be set up for the IEEE interface to be used.

Board: GPIB0

Characteristic	Setting
Primary GPIB Address	0
Secondary GPIB Address	NONE
Timeout setting	T10s
EOS byte	0AH
Terminate Read on EOS	yes
Set EOI with EOS on Write	no
Type on compare of EOS	8-bit
Set EOI w/last byte of Write	yes
BPIB-PC Model	PC2A
Board is System Controller	yes
Local Lockout on all devices	no
Disable Auto Serial Polling	no
High-speed timing	no
Interrupt jumper setting	7
Base I/O Address	02E1H
DMA channel	1
Internal Clock Freq (in MHz)	5

Table 14-3 IEEE Interface Board Characteristics

Now the specific devices to be addressed should be selected and their characteristics defined.

Device: DP251	Access: GPIB0
Primary GPIB Address	3 (The DP251 is defined at address 3 in the map above)
Secondary GPIB Address	NONE
Timeout setting	T10s
EOS byte	0AH
Terminate read on EOS	yes
Set EOI with EOS on write	no
Type of compare on EOS	8-bit
Set EOI w/last byte of write	yes

Table 14-4 IEEE Devices and Characteristics

Save the changes on exit from IBCONF. These will be saved to the GPIB.COM file. Finally, ensure that the GPIB.COM file is resident in the correct drive/sub-directory accessed by the computer on boot up and that the command DEVICE = <DRIVE>:<PATH> GPIB.COM. Is included in the CONFIG.SYS file in the root directory. To enable the IEEE interface board and device parameter changes to be implemented, it will be necessary to reboot the computer from a warm start by pressing the CTRL, ALT and DEL keys simultaneously.

14.4 IEEE Address Range

The range of IEEE addresses which may be used by the DP251 is numbered from address 1 to address 7. This address is set by a small numbered rotary switch accessible through the rear panel of the interface

card. Note that address 0 is used to indicate that an RS232 interface is connected. For full instructions on the installation and use of an interface card refer to the DP251 Operator's Manual.

On switching on the DP251 and on sending a device clear to reset the instrument, the DP251 will perform a series of self tests and in addition display the current IEEE address number which will be flashed up briefly on the front panel display.

14.5 IEEE Problems

Failure in IEEE communication can be due to any one or a combination of the following causes :

i) RS232 interface selected program (Refer to Section 7.2). In this instance, to avoid the necessity to exit from, then reload the program, enter [D] for demonstration in response to the prompt "Retry/Demonstration/Exit" then select {Interface},{Define} from the menu and change the program interface type to IEEE. Now select {Operate} from the {Run} menu to re-initiallze the program.

ii) IEEE cables not installed correctly.

iii) IEEE interface card not installed correctly.

iv) IEEE address number is not the same on DP251, in instrument handler file (GPIB.COM) and in TMCS program (Refer to Section 7.2).

v) IEEE device name in instrument handler file (GPIB.COM) does not match name in TMCS program.

vi) IEEE device is not installed in CONFIG.SYS file in root directory of PC (e.g. DEVICE = <DRIVE> : <PATH> GPIB.COM, or PC has not been restarted following a change to the CONFIG.SYS entry.

vii) IEEE board or device configuration is not set up correctly in instrument handler file (Refer to Section 14.3).

Appendix 1 Shortcut Keys

The following Shortcut Keys may be used to select controls or functions from the main panel display:

Function	Shortcut Key
Change to probe or (Multiplexer) A	[CTRL] + [A]
Change to probe (or Multiplexer) B	[CTRL] + [B]
Set high/low resolution (toggle)	[CTRL] + [H]
Access graph set up panel	[CTRL] + [G]
Access logging set up panel	[CTRL] + [L]
Change (advance) temperature units	[CTRL] + [U]
Set status to Running (take readings)	[CTRL] + [R]
Set Status to Stopped (stop taking readings)	[CTRL] + [S]

When the {External Coeffs} button has been set (highlighted in the center), the following Shortcut Keys may also be used:

Function	Shortcut Key
Access calibration facility (for entry of coefficients etc.)	[CTRL] + [C]
Change temperature conversion standard to ITS-90	[CTRL] + [I]
Change temperature conversion standard to DIN (IEC751/BSI904)	[CTRL] + [D]

Appendix 2 File Extensions

File Type	Extension
Batch files	.BAT
Executable files	.EXE
User interface resource files	.UIR
System configuration files	.CFG
ITS90 Temperature coefficient data files	.TCD
Callender van Dusen (DIN) temperature coefficient data files	.CCD
Output data files (also printer set up list file)	.DAT
Display and printer profile files	.PRO

NOTES

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- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition and Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments