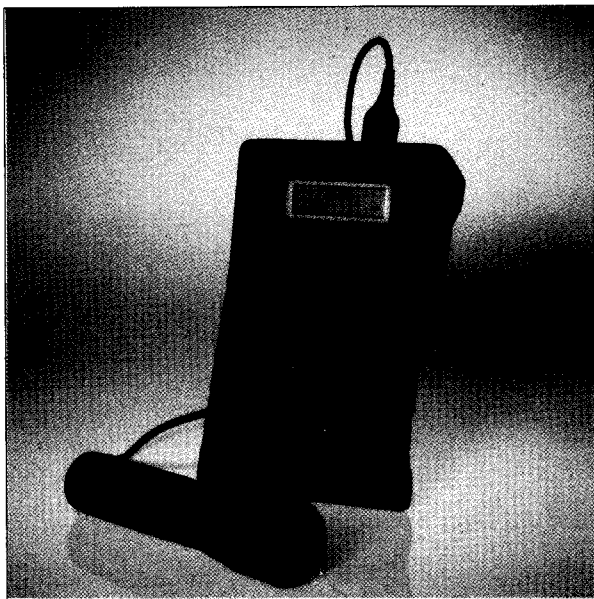


MPM4100

ENVIRONMENTAL MONITORING SYSTEM



USER MANUAL

Solomat
— a NEOTRONICS company —

A member of the Neotronics Technology PLC Group

MPM 4100
ENVIRONMENTAL MONITORING SYSTEM

ADDENDUM TO
USER MANUAL

Issue 2, August 1994

A.1 INTRODUCTION

If your MPM4100 has an EPROM Checksum of 2.100, then changes have been made to the menu structure and some of the functions, as explained below.

A.2 SETUP MENUS

To make the MPM4100 easier to understand and program, the changes have been made to the setup menus, as explained below, and diagrammed in the revised table on page A.3.

Procedure Select Menu

Procedure selection is now separated into two sub-menus. The first sub-menu is **Load Procedure** and the second sub-menu is **Save Procedure**. Load and Save Procedures were previously under a single menu.

Functions Menu

The order that the **Functions** options appear has been rearranged. See the enclosed table for the modified order of the Functions Menu.

Log Setup Option Menu

The order of options has been rearranged to make it quicker to select the most popular options.

Status Menus

Channel Status and **Log Status** have been deleted. **File Review**, which was previously under **Status**, is now the second sub-menu under **File Setup**. The only menu under **Status** is **System Status**.

Channel Setup Menu

Channel Setup has been reorganised into two menus: **Probe Menu** and **Option Menu**. The **Probe Menu** should be used for simple channel setups: this allows you to quickly set the channel number, probe, symbol and socket and set the channel ON or OFF. Many of the features for Channel Setup have been moved to the Options Menu. In other words, if you are setting up simple channels (i.e. without alarms or MX units etc.) then use only the **Probe Menu**. However, if you wish to set Dwell Time and STA, select MX unit, an alternative temperature compensation socket, or alarm HI and Lo points, then you use the Options Menu. This menu separation makes it easier for simple programming of channel setups.

A.3 PROCEDURES

Whereas the manual refers to Proc 0 and Proc 1, they are now termed Proc 1 and Proc 2. What was previously termed Proc 0 is now termed Proc 1 and what was previously termed Proc 1 is now termed Proc 2.

A.4 CALIBRATION SYMBOL

If a channel has not been calibrated, then a * would appear. To simplify the display, this calibration symbol has been removed.

A.5 CALIBRATION

When calibrating a probe/electrode, you were asked "CLEAR CONSTANTS Y/N?" This question has now been moved to the Channel Setup Options sub-menu. If you are having trouble calibrating and are not sure that your calibration is going well, then exit Calibration and enter the Option sub-menu (under Channel Setup) and clear the calibration constants for that channel before continuing with calibration.

A.6 NEW LOGGING MODE

A new logging mode has been introduced: **Continuous Log**. Continuous Log asks you to set a start date only; it will then log at the pre-determined logging interval until you manually stop. The datalogging is similar to Relative Time Log, but without the need for a total log period. This Log Mode is convenient for simple datalogging when you will stop logging manually.

A.7 CS6

The most important modification to CS6 software is that CS6 is now customised as either air quality (MPM4100) or as water quality (WP4007 , WP803) at the time of installation. Should you need, at a later date, to modify your CS6 for the other version, then merely reinstall CS6, following instructions and you will be asked to install as either the air or water version.

Log start from computer has been changed to the F7 key: follow the prompts in your CS6 when being asked to start logging.

A.8 POWER DOWN ENABLE

What was previously termed Power Down Enable is now called Automatic Off (AUTO OFF). This Option was previously available by pressing a set of keys at turn on; AUTO OFF has now been moved to the Functions Menu.

Table 4.2 Setup menus

Set-up requirement	Setup key	Menu options
Set file parameters	FILE SETUP	Two menus available:
	FILE SETUP menu: This file Y/N Edit file name Clear this file	FILE REVIEW menu: This file Y/N (followed by scanning of stored measurements)
Select an MPM4100 'procedure'	PROC SELECT	Two menus available:
	LOAD PROC menu: Select procedure Load Log Procedure	SAVE PROC menu: Select procedure Store Log Procedure
Set MPM4100 functions	FUNCS	FUNCS menu: Sound off Y/N Auto off Y/N Set time Set date Set dwell time Set STA time Fast update Y/N MX/DAC active Y/N Display to RS232 Y/N
Calibrate electrode	CAL	Two menus available:
	CAL menu: Select channel Low cal/High ref cal	CAL POINT menu: Select channel Set low reference Set high reference
Set logging parameters	LOG SETUP	Two menus available:
	TIMING menu: Set start time (real time) Set start date (real time) Set stop time (real time) Set stop date (real time) Set log period (relative) Set log interval (rel./cont.)	OPTION menu: Select log mode (incl. continuous) Power down enable Y/N Warmup Y/N Log to RS232 Y/N Log resume Y/N Select overflow mode
Set output functions	OUTPUT	Three menus available:
	PRINT menu: Select file Log setup Chan setup Min/max/avg Calibration constants	RS232 menu: Baud rate Word length bits Stop bits Parity Y/N
		OPTION menu: Printer width Line feed Y/N Character delay Y/N Setup commands Hangup commands Enable modem Cancel modem
Set channel parameters	CHAN SETUP	Three menus available:
	PROBE menu: Select channel Select probe/symbol/skt Channel on/off	OPTION menu: Select channel Clear cal constants Y/N Last cal date Dwell Y/N STA Y/N Select MX reference Temp comp socket * Max reading * Min reading * User-defined unit Alarm on/off Set alarm high point Set alarm low point
		BLOCK SETUP menu: Set channel upper limit Lower channels on Y/N Lower dwell on Y/N Lower STA on Y/N
		* Custom mode only

END OF APPENDUM

MPM4100 USER INFORMATION

Preliminary Pages

Contents, warnings and a Glossary of terms and abbreviations used in this Manual.

Chapter 1 General Description

Brief details, the specification and a description of the probes that you can use with the MPM4100.

Chapter 2 An Overview of the MPM4100

This chapter provides you with a description of each MPM4100 facility to give you an idea of how it can be useful for your application.

Chapter 3 Making connections to the MPM4100

Refer to this chapter for making connections to external power supplies, alarms and a PC.

Chapter 4 Using the MPM4100

This chapter provides instructions on using the MPM4100 as a portable datalogger. Start here if you are not a first-time user.

Chapter 5 Using the MPM4100 with a PC, Modem or Printer

To analyse the collected measurement data and for easier setting-up procedures, you can use the MPM4100 with a PC.

Chapter 6 Routine Maintenance

Refer to this chapter for the error/fault messages that are displayed on your MPM4100.

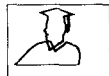
Other Publications

Detailed information is available on probes and on the PC software written for the MPM4100. Contact Solomat for the latest list of other publications.

User Card

A reminder of the main MPM4100 functions. Only refer to the User Card when you are completely familiar with operating your MPM4100.

For a quick introduction to the MPM4100, try the four examples at the start of this Manual.



MPM4100

ENVIRONMENTAL MONITORING SYSTEM

USER MANUAL

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Example 2 Using the MPM4100 menus

Select file **FILE03**, and change the name to **SITE01**



NOTE: The menu options are listed in Chapter 4, Table 4.2.

- (1) If necessary, press **ON (SHIFT and OFF)** to switch On the MPM4100.
- (2) When the Measurement screen is displayed, press **FILE SETUP (SHIFT and PITOT)**.
- (3) On alternate screens, the message **FILE** and **SETUP** is displayed.
- (4) After two seconds, the message **FILE01 THIS FILE? Y/N** is displayed on four consecutive screens.

This message is an invitation to edit the first file, which you don't want, so move to the next one.

- (5) Press **NO** twice to change the prompt to **FILE03 THIS FILE? Y/N**.

NOTE: If you go past the file number you require, press **◀ (SHIFT and NO)** repeatedly until you have **FILE03** selected.

- (6) Press **YES**, and the message **EDIT FILE NAME FILE03** is displayed.
- (7) Press **YES**, and the letter **F** is selected (flashing) for you to edit.
- (8) Press **▶** repeatedly until the letter **F** is changed to **S**.
- (9) Press **YES**, and the letter **I** is selected, but you don't want to change this, so press **YES** again.
- (10) Repeat this procedure until you have changed **FILE03** to **SITE01**.

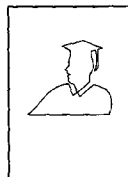
NOTE: To change **3** to **1**, use the **◀** key.

- (11) Press **YES** to accept the entry, and to display the next menu option (**CLEAR FILE**). You don't need to clear the file for this example.
- (12) Return to the Measurement screen by pressing **FILE SETUP (SHIFT and PITOT)**, which is the Setup key that you used to enter the **FILE** menu.

Example 3 Using the MPM4100 in Multi-channel mode

Scan channels 1, 2 and 3 as follows:

- Channel 1 A Pt100 probe is connected to socket A, the temperature is to be displayed in °C, with a low alarm set at 21°C.
- Channel 2 Use the same probe, but set the low alarm at 25°C.
- Channel 3 A 129MS hotwire probe is connected to socket B, and the airspeed is to be displayed in m/s.

**Set channel 1 as follows:**

- (1) If necessary, press **ON (SHIFT and OFF)** to switch On the MPM4100.
- (2) Ensure that the Measurement screen displayed is in Multi-channel mode (press **CHAN MODE (SHIFT and HOLD)** to toggle between Single and Multi-channel modes).
- (3) Press **CHAN SETUP (SHIFT and STORE)** to display **CHAN =**
- (4) Press numeric key **1** and then **ENTER**, to display the current channel/probe/socket definition for channel 1.
- (5) Using, as necessary, the **TEMP**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to Pt100, °C and socket A.
- (6) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 1 to On.
- (7) When **DWELL** is displayed, press **YES**.

NOTE: Although a dwell time is not necessary for a Pt100 probe, the dwell time is switched on so that the temperature measurement remains displayed long enough for it to be read. The dwell time is set from the 'scan' options (*next page*).

- (8) Press **CHAN SETUP** to return to the Measurement screen, and then press **CHAN SETUP** twice to enter the **ALARM** menu with a display of **CHAN =**
- (9) Press numeric key **1** and **ENTER** to display **ALARM ON**. Press **YES** to display **ALM HI**.
- (10) Use the Numeric keys to set the alarm level to **21.0**. Press **ENTER** to accept the entry, and to display **ALM LO**.
- (11) Press **CHAN SETUP** to return to the Measurement screen.

Set channel 2 as follows:

- (1) Press **CHAN SETUP** to display **CHAN =**
- (2) Press numeric key **2** and then **ENTER**, to display the current channel/probe/socket definition for channel 2.
- (3) Using, as necessary, the **TEMP**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to Pt100, °C and socket A.
- (4) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 2 to On.
- (5) When **DWELL** is displayed, press **NO**.

NOTE: As channel 2 is only different by the alarm setting, there is no need for both channels to have the dwell time switched On.

- (6) Press **CHAN SETUP** to return to the Measurement screen, and then press **CHAN SETUP** twice to enter the **ALARM** menu with a display of **CHAN =**

- (7) Press numeric key **2** and **ENTER** to display **ALARM ON**. Press **YES** to display **ALM HI**.
- (8) Use the Numeric keys to set the alarm level to **25.0**. Press **ENTER** to accept the entry.
- (9) Press **CHAN SETUP** to return to the Measurement screen.

Set channel 3 as follows:

- (1) Press **CHAN SETUP** to display **CHAN =**
- (2) Press numeric key **3** and then **ENTER**, to display the current channel/probe/socket definition for channel 3.
- (3) Using, as necessary, the **AIRSPD**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to 127MS, m/s and socket B.
- (4) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 3 to On.
- (5) When **DWELL** is displayed, press **YES**.
- (6) Press **CHAN SETUP** to return to the Measurement screen.

Set the scan options as follows:

- (1) Press the **FUNCS** (**SHIFT** and **RPM**) key, and **SET TIME** is displayed.
- (2) Press **▼** twice, and **DWELL TIME** is displayed.
- (3) Press **YES**, to display the current dwell time (minutes and seconds).
- (4) Use the Numeric keys to set the dwell time to **00:02.0**. You will have to press **YES** to accept the minutes setting before the seconds can be set.
- (5) Press **YES** to accept the entry.
- (6) Press the **FUNCS** key to return to the Measurement screen.

You have now completed the settings for the three channels.

- (1) Press **HOLD** to select Scan On mode and to scan channels 1 to 3 automatically, at the rate (*every two seconds*) that was set in the scan options.

NOTE: If any channels other than 1, 2 and 3 are displayed, use the **CHAN SETUP** menu to switch Off these channels.

- (2) Press **HOLD** again to change to Scan Off mode, and repeatedly press **NEXT CHAN** to step through each channel manually.

Example 4 Using the MPM4100 for datalogging

Use the channel setup described in Example 3, and log Channels 1 to 3 to File 03 every minute for the next five minutes.

**Set the channel options as follows:**

- (1) If necessary, press **ON** (**SHIFT** and **OFF**) to switch On the MPM4100.
- (2) Set the channel options as described in Example 3.

Select and edit the file to be used as follows:

- (1) Press **FILE SETUP** (**SHIFT** and **PITOT**) and repeatedly press **NO** (or the ◀ and ▶ keys) until **FILE03 THIS FILE Y/N** is displayed.
- (2) Press **YES** to select File 03, and to display **EDIT FILE NAME FILE03**.
- (3) Press **NO** to display **CLEAR THIS FILE** and then press **YES** twice to clear File03, and **FILE SETUP** to return to the Measurement screen.

Set the log options as follows:

- (1) Press **LOG SETUP** (**SHIFT** and **AIRSPD**) twice to display the **OPTION** menu. After a short delay, **LOG MODE** is displayed.
- (2) Press **YES** to display one of the Log Mode options. Repeatedly press **NO** to cycle through the Log Mode options available and stop at **REL TIME**. Press **YES** to accept this Log Mode.

NOTE: Two of the options are **REL TIME** (*relative time*) and **REAL TIME**. Ensure that you stop at **REL TIME**.

- (3) Press **LOG SETUP** to return to the measurement screen. Press **LOG SETUP** again to display the **TIMING** menu. After a short time **LOG PERIOD** is displayed. Press **YES** to display the time in hours, minutes and seconds.
- (4) Use the Numeric keys to set the time to **0:05:00**. Press **YES** to accept the entry, and to display **LOG INTVAL**.
- (5) Use the Numeric keys to set the time to **0:01:00**. Press **YES** to accept the entry, and to return to the Measurement screen.

You have completed the settings for the logging options.

- (1) Press **HOLD** to select Scan On mode and to scan channels 1 to 3 automatically.
- (2) Press **LOG START** (**SHIFT** and **%RH/DEWPT**) and then **ENTER** to start logging.

NOTE: A prompt is displayed before logging begins of the number of measurements that can be logged before the MPM4100 memory is full.

- (3) The **LOG** indication should be displayed (steady) in the Warning message area of the display and, every minute for the next five minutes, you will notice that the indicated measurement flashes to show that measurements are being logged.

After five minutes the instrument will power down. The logged data is now available to be down-loaded to a PC, from File 03.

- (4) If necessary, you can check how many readings were logged to File 03 by using the **STATUS** menus. Press **STATUS (SHIFT and PRESSURE)** *twice* to display the **LOG STATUS** menu. After a short delay, **CURRENT FILE03** is displayed. Press **YES** and the number of **RDGS LOGGED** is displayed. The number should be 15 (that is, five logs of the three channels).

NOTE: Invalid indications are not logged.

CONTENTS

	Page
Worked examples	i
Contents list (this page)	vii
Copyright and warranty	xi
Glossary of terms and abbreviations	xii
Useful conversions	xiii

Chapter

1 GENERAL DESCRIPTION

1.1	Introduction	1-1
1.2	Brief description	1-1
	Solomat instrument range	1-1
	MPM4100 instrument	1-2
1.3	Specifications	1-3
	MPM4100 instrument	1-3
	Input/output signals	1-4
	OEM probe signals	1-4
1.4	MPM4100 Accessories	1-5
	Standard accessories	1-5
	Optional accessories	1-5
1.5	Solomat probes available	1-6
	Hygrometer probes	1-6
	Temperature probes	1-6
	Airspeed probes	1-8
	Pressure probes	1-8
	Tachometer probes	1-9
	Gas concentration probes	1-9
	Smart probes	1-9

2 AN OVERVIEW OF THE MPM4100

2.1	Introduction	2-1
	Operational modes	2-2
2.2	Single mode	2-3
	Measure/symbol/socket definition	2-3
	Hold facility	2-3
	Minimum and maximum values	2-3
	Average values	2-3
	Datalogging	2-3
2.3	Multi-channel mode	2-4
	Channel/probe/socket definition	2-4
	Channel options	2-4
	Scan on/off	2-5
	Minimum and maximum values	2-5
	Average values	2-6
	Datalogging	2-6
	All-channel options	2-6
2.4	Display features	2-6

2.5	Keypad features	2-8
2.6	Datalogging facilities	2-11
	File control	2-11
	Displayed LOG symbol	2-11
	Log set-up options	2-12
	STORE and log-trigger facilities	2-12
2.7	Input/output facilities	2-13
	Multiplexed inputs and outputs	2-13
	RS232 connections	2-14
	Alarm outputs	2-14
	Analog outputs	2-14
2.8	Working with a PC	2-14
2.9	Other MPM4100 features	2-14
	Switch-on options	2-14
	Beeper	2-15
	Battery status	2-15
	Instrument status review	2-15
	Keypad disable	2-16
	Instrument setup: storage and retrieval	2-16
	Calibration of Solomat and OEM probes	2-16
	Temperature-compensated measurements	2-16
	User-defined symbols	2-16
2.10	Power supply options	2-16

3 MAKING CONNECTIONS TO THE MPM4100

3.1	Introduction	3-1
3.2	Connector pinouts	3-1
	Connections to sockets A and B	3-2
	Connections to socket C (SMART PROBES USER)	3-2
	Connections to socket D (THERMOCOUPLE)	3-3
	Connections to the COMMS connector	3-3
	Connections to the POWER connector	3-4
3.3	Multiplexed inputs	3-5
	Connecting MX units to the MPM4100	3-5
	Numbering multiplexed channels	3-5
	Description of MX variants	3-7
3.4	Security housing for the MPM4100	3-9

4 USING THE MPM4100

4.1	Introduction	4-1
4.2	Preparation for use	4-1
	Instrument housing	4-1
	Wall mounting	4-2
	Power supply	4-2
	Probe connections	4-2
4.3	Switching on and off	4-3
	Switch-on options	4-5
	Keypad enable/disable	4-5
4.4	Initial settings	4-5
	Selecting an operating mode	4-5
	Selecting an instrument setup ('procedure')	4-5

4.5	Making Single-mode measurements	4-6
	Defining measure/symbol/socket	4-6
	Using the hold, min/max and average facilities	4-6
	Calibrating probes in Single mode	4-8
	Example of a Single-mode measurement	4-9
4.6	Using the menu options	4-10
	Moving within menus	4-10
	Editing setup data	4-11
	Example of using a menu	4-13
	Setting the time and date	4-14
	Setting the bleeper on/off	4-15
4.7	Making Multi-channel mode measurements	4-16
	Defining channel/probe/socket	4-16
	Setting the channel options	4-17
	Setting the scan options	4-19
	Using the channel calibration facilities	4-20
	Example of a Multi-channel mode measurement	4-22
4.8	Using the datalogging facilities	4-24
	Choosing a file	4-24
	Setting the log options	4-25
	Using the STORE key	4-28
	Setting the output options	4-28
	Example of logging multiple channels	4-29
4.9	Additional measurement options	4-30
	Storing an instrument setup	4-30
	Making temperature-compensated measurements	4-30
	Measuring volume flow rate	4-30
	Using the CLEAR key	4-31
4.10	Reviewing the status of the MPM4100	4-32
	Using the Status menus	4-32
	Checking the battery status	4-32
5	USING THE MPM4100 WITH A PC, MODEM OR PRINTER	
5.1	Introduction	5-1
5.2	Connecting to a PC	5-1
	Connector requirements	5-1
	Setting the baud rate and data format	5-1
	CS6 software	5-1
5.3	Connecting to a Printer	5-1
	Connector requirements	5-1
	Setting the baud rate and data format	5-1
5.4	Connecting to a Modem	5-1
	Connector requirements	5-1
	Setting the baud rate and data format	5-2
	Enable, disable and hangup commands	5-2
	CS6 software and modem operation	5-2
6	ROUTINE MAINTENANCE	
6.1	Introduction	6-1
6.2	Preventive maintenance	6-1
6.3	Corrective maintenance	6-2
	Socket and battery end-caps	6-2
	Displayed 'Warning' and 'Fault' messages	6-2

6.4	Battery maintenance	6-3
	Battery-power options	6-3
	Treatment of NiCd batteries	6-3
	Internal 'backup' battery	6-4
	Changing alkaline batteries	6-4
	Charging NiCd batteries	6-5
6.5	Storage	6-5

7 INDEX 7-1

Table

1.1	Environmental measurements using the MPM4100	1-7
2.1	Measure keys	2-2
2.2	Setup keys	2-9
2.3	Function keys	2-9
2.4	Action keys	2-10
3.1	Socket A and B pinouts	3-2
3.2	Socket C (SMART PROBES / USER) pinouts	3-2
3.3	Socket D (THERMOCOUPLE) pinouts	3-3
3.4	COMMS connector pinouts	3-3
3.5	POWER connector pinouts	3-4
3.6	MX unit cables	3-5
3.7	MX address assignment	3-6
4.1	Default measure/symbol/socket displays	4-7
4.2	Setup menus	4-12
4.3	Summary of the MPM4100 datalogging options	4-27
4.4	Volume flow rate menu options	4-31
4.5	MPM4100 status review options	4-33
6.1	Displayed warning messages	6-2

Figure

1.1	Using the MPM4100 with an IBM-compatible computer	1-1
2.1	MPM4100 user facilities	2-1
2.2	MPM4100 display features	2-7
2.3	Typical Single mode display	2-7
2.4	Typical Multi-channel mode display	2-7
2.5	MPM4100 keypad	2-8
2.6	Multiplexed inputs and outputs	2-13
3.1	MPM4100 connectors	3-1
3.2	Alarm output drive	3-4
3.3	MX front panel layout	3-6
3.4	Cable connections to the MPM4100	3-8
4.1	Wall-mounting fixings	4-2
4.2	Defining measure/symbol/socket in Single mode	4-6
4.3	Minimum value displayed	4-8
4.4	Simplified menu diagram	4-10
4.5	Setting the time	4-14
4.6	Setting the date	4-15
4.7	Channel setup selection	4-16
4.8	Setting the dwell time	4-19

If you have any suggestions, corrections, praise or complaints about your instrument or this Manual, please write or fax us at our address on the back cover.

CAUTION: The MPM4100 must be serviced only by qualified personnel trained by Solomat or by a Solomat appointed agent.
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WARRANTY

Solomat warrants each MPM4100 to be free from any defects in workmanship, materials and components for one year from the date of purchase. Any MPM4100 found to be defective by Solomat within the warranty period will be repaired (or replaced at Solomat's discretion) and calibrated without charge, provided that you return the product, shipping prepaid, to Solomat or an authorised Solomat distributor.

MPM4100 failure must not have occurred as a result of operation of the instrument other than in accordance with the instructions furnished with the instrument.

This warranty does not apply if the instrument has been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. This warranty does not cover probes or software. This warranty will not apply if adjustment, repair or parts replacement is required because of accident, hazard, misuse, failure of electric power, air conditioning, humidity control, transportation or causes other than ordinary use; in which case repair will be charged at normal rates. An estimate will be submitted before repair work starts and a purchase order must be supplied before work begins. Any out-of-warranty repairs are warranted 90 days from the date of invoice. The warranty does not apply if any modifications have been made by anyone other than Solomat or an authorised distributor.

The foregoing warranty is in lieu of all other warranties, conditions, terms, undertakings and obligations implied by statute, common law, custom, trade usage, course of dealing, or otherwise, all of which are hereby excluded to the fullest extent permitted by law. This warranty does not affect the statutory rights of a consumer. In such transactions, the rights and obligations of the Buyer and Seller shall be determined by statute.

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Solomat does not give any warranty that the instrument (or probes) is fit for any particular purpose unless the purpose is specifically advised to Solomat in writing by you and Solomat confirms in writing that the instrument can fulfil that particular purpose. Representations and warranties which are inconsistent with the terms of this warranty are not valid unless approved in writing by an officer of Solomat. If you have any questions about this warranty, contact Solomat directly.

GLOSSARY OF TERMS AND ABBREVIATIONS

The following abbreviations and terminology are used throughout this manual:

ac	Alternating current
acfm	Actual cubic feet per minute
Active Log	Time during which data is being logged
Ah	Ampere hour
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
atm	Atmospheric pressure
cfm	Cubic feet per minute
Channel/probe/socket	Definition used in Multi-channel mode operation
Cycle	Sequential selection of three or more functions
Datalog	Store measurements in a data file
dc	Direct current
Delta T	Difference between two temperature sensors
Dewpoint	Temperature at which water-vapour is saturated
DP	Differential pressure
Dwell Time	Optional time delay, used during channel scanning
EMC	Electro magnetic compatibility
EPROM	Electrically programmable read only memory
ERH	Equilibrium relative humidity
File	Group of logged data
fsd	Full scale deflection
ft	Feet
H ₂ O	Water gauge
Hg	Mercury
h	Hour
IAQ	Indoor air quality
in.	Inch
I ² C	2-wire serial communication format
kg	Kilogram
LCD	Liquid crystal display
l	Litre
Log interval	Time interval between logged samples
Log Session	Time during which the log facility is active
mA	Milliamp
mbar	Millibar
Measurement screen	Screen showing measurement information
Measure/symbol/socket	Definition used in Single mode operation
min	Minute
ml	Millilitre
m/s	Metres per second
OEM	Other equipment manufacturer
Pa	Pascal
PC	Personal computer (IBM compatible)
Ps	Static pressure
psi	Pounds per square inch
Procedure	Instrument setup, channel parameters used for logging
Pt	Total (impact) pressure
Pt100	Platinum resistance temperature detector (RTD)
Pv	Velocity pressure
Response time	Time to reach 63% of final value
RFI	Radio frequency interference
RH	Relative humidity
Ro	Resistance value at 0°C for Pt100
rpm	Revolutions per minute
RS232	Bi-directional data communication format
RTD	Resistance temperature detector
scfm	Standard cubic feet per minute (at 70°F, 29.92 in. Hg)
Smart	Solomat probe with digital storage of identity and calibration
sp	Set point (high and low alarm levels)
STA	Short term average (damping)
STP	Standard temperature and pressure (22°C, 1013 mbar)
Toggle	Sequential selection of two functions
Type K	Chromel alumel thermocouple
vfr	Volume flow rate

PRESSURE CONVERSIONS

			Useful approximations
1 Pascal	010 mbar	7.501×10^{-3} mm Hg	0.01 mbar
	0.102 mm H ₂ O	0.1451×10^{-3} psi	0.1 mm H ₂ O
	0.004 in. H ₂ O	9.869×10^{-6} atm	10×10^{-6} atm
1 mbar	100.0 Pa	0.750 mm Hg	100 Pa
	10.20 mm H ₂ O	0.014 psi	10 mm H ₂ O
	0.402 in. H ₂ O	0.9869×10^{-3} atm	0.4 in. H ₂ O
1 mm H₂O	9.806 Pa	0.074 mm Hg	10 Pa
	0.098 mbar	1.423×10^{-3} psi	0.1 mbar
	0.039 in. H ₂ O	96.78×10^{-6} atm	0.04 in. H ₂ O
1 in. H₂O	249.1 Pa	1.868 mm Hg	250 Pa
	2.491 mbar	0.036 psi	2.5 mbar
	25.40 mm H ₂ O	2.458×10^{-3} atm	25 mm H ₂ O
1 mm Hg	133.3 Pa	0.535 in. H ₂ O	0.5 in. H ₂ O
	1.333 mbar	0.019 psi	0.02 psi
	13.60 mm H ₂ O	1.316×10^{-3} atm	133 Pa
1 psi	6892 Pa	27.67 in. H ₂ O	700 mm H ₂ O
	68.92 mbar	51.70 mm Hg	50 mm Hg
	702.8 mm H ₂ O	0.068 atm	0.07 atm
1 atm	101.3 kPa	406.78 in. H ₂ O	400 in. H ₂ O
	1013.2 mbar	760 mm Hg	100 kPa
	10330 mm H ₂ O	14.696 psi	15 psi

VELOCITY CONVERSIONS

1 m/s	196.8 ft/min
1 ft³/min	5.08×10^{-3} m/s

VOLUME FLOW RATE CONVERSIONS

1 m³/s	2.12×10^3 ft ³ /min
	1000 l/s
	0.278×10^{-3} m ³ /h
1 ft³/min	5.08×10^{-3} m ³ /s
	0.47 l/s
	1.698 m ³ /h
1 l/s	13.2 gal/min
	792 gal/h
	3.6 m ³ /h
	1×10^{-3} m ³ /s
1 m³/h	0.598 ft ³ /min
	3600 m ³ /s

HUMIDITY CONVERSIONS

Dewpoint °C	Vapour Pressure Pa	%RH @ 21°C	ppm V	ppm W (air)
-50	3.94	0.16	38.9	23.8
-40	12.85	0.52	126.8	77.7
-30	38.02	1.53	375.4	229.8
-20	103.28	4.15	1020	624.7
-10	259.92	10.45	2572	1575
0	611.21	24.6	6069	3716
10	1227.9	49.4	12267	7510
20	2338	94.0	23625	14464
30	4245	-	43729	26773
40	7381	-	78571	48105
50	12345	-	138736	84941
60	19934	-	244903	149940
70	31177	-	444453	272114

TEMPERATURE CONVERSIONS

°C	°F	°C	°F	°C	°F
-190	-310	60	140	500	932
-150	-238	70	158	550	1022
-100	-148	100	212	600	1112
-50	-58	150	302	700	1292
0	32	200	392	800	1472
10	50	250	482	900	1652
20	68	300	572	1000	1832
30	86	350	662	1100	2012
40	104	400	752	1200	2192
50	122	450	842		

Chapter 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

The MPM4100 is a portable, self-contained instrument that can be used, in conjunction with suitable probes, to measure a wide range of air-quality parameters.

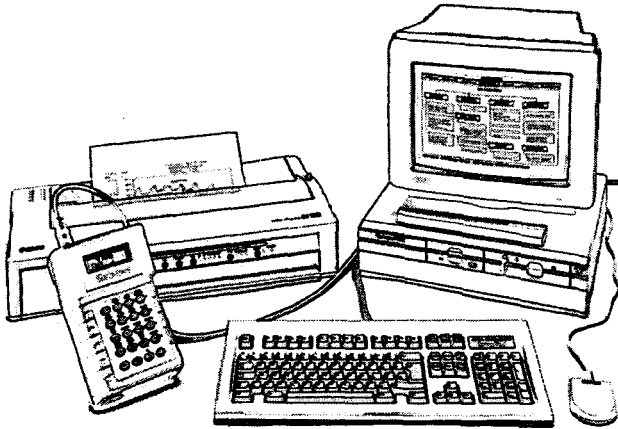


Fig 1.1 Using the MPM4100 with an IBM-compatible computer

1.2 BRIEF DESCRIPTION

1.2.1 Solomat instrument range

Solomat manufactures a wide range of instruments for monitoring air and water-quality parameters. This range includes instruments that are packaged for hand-held operation or ruggedised to be left for long periods under the most severe conditions. Presentation of the monitored data varies from a simple read-out display to multi-channel data-logging and computer-enhanced analysis.

Parameters that can be measured by the MPM4100 are determined by the probes that are available, and Solomat manufactures or supplies a wide range of these probes (Section 1.5) for use with the full range of their environmental instruments.

OEM probes can also be used with the MPM4100, provided they have a compatible specification (Section 1.3.3).

1.2.2 MPM4100 instrument

Measurement signals from a range of environmental probes (Table 1.1) can be connected to the MPM4100 and information from these probes presented, either on the MPM4100 display or logged to the MPM4100 memory for subsequent transfer to an IBM-compatible PC.

Up to 32 channels are available to monitor environmental parameters (for example, temperature, dewpoint, airspeed or CO₂ concentration) and these measurements can be displayed by stepping manually through a selection of probes connected to the MPM4100 or scanned, either at regular time intervals or by using event-triggered signals.

User control is provided by a 20-key keypad, which can be bypassed when the MPM4100 is connected to a PC. MPM4100 power is derived from either an internal battery-pack for hand-held operation, an external battery for long-term field use or an ac supply for semi-permanent locations.

Other features of the MPM4100 include:

- (1) User-selected engineering units for the monitored parameters.
- (2) Calibration of the zero and span points for each of the measurement channels.
- (3) Facility to allow a dwell/warm-up time as probes are scanned.
- (4) Comprehensive battery-life indication, which takes into account the current-drain and battery temperature at the time of the indication.
- (5) Short-term averaging of fluctuating or noisy indications.
- (6) Average, minimum and maximum indications of the MPM4100 measurements.
- (7) Automatic temperature and user-selected static-pressure compensation for volume airflow measurements.
- (8) Output facilities to download data to a printer, PC or a modem.
- (9) Output facilities to trigger an external activity (for example, alarm) when measurements exceed pre-set limits, or to display analog signals (for example, on a chart recorder).
- (10) Triggering of measurement sampling by means of an electrical pulse or an external push-button.

1.3 SPECIFICATIONS

1.3.1 MPM4100 instrument

Dimensions and weight:

Depth	70 mm (2.7 in.)
Width	150 mm (5.9 in.)
Length	233 mm (9.2 in.)
Weight	1.2 kg (2.6 lb), including batteries

Housing:

Material	ABS, moulded plastic
Sealing	Splashproof to IP54
EMC protection	EN 50 082-2

Display:

Type	LCD, with backlight
Dimensions	69.8 mm (2.7 in.) x 30.4 mm (1.2 in.)

Environmental limits:

Operational temperature	-10°C to +55°C (14°F to 131°F)
Storage temperature	-20°C to +60°C (-4°F to 140°F)
Operational humidity	0 to 100% RH
Storage humidity	0 to 100% RH

Real-time clock:

Resolution	0.1 s
Accuracy	1 min/month

Power supply:

Three C-size Alkaline cells	7 Ah capacity
Three C-size NiCd rechargeable cells (optional)	2 Ah capacity
Memory backup	Internal battery (rechargeable) supplies memory and clock backup for 40 days (without C-cell batteries) or one year (with NiCd or alkaline batteries installed).
Battery life (Alkaline type)	100 h (minimum), 150 h (typical) at 20°C low battery indication at 20 h remaining usage
Battery life (NiCd type)	20 h (minimum), 50 h (typical) at 20°C low battery indication at 20 min remaining usage

NOTE: Battery life is reduced if hotwire or tachometer probes are used.

Recharge time	20 h
External supply	7 V to 16 V dc (for example, Solomat DC12 battery) or ac supply via Solomat AA2 or AA3 adaptor

1.3.2 Input/output signals

Input/output signals are connected to the MPM4100 via six connectors, as follows:

Sockets A and B	Except for the type-K thermocouples and the Smart probes, all Solomat probes listed in Table 1.1 are fitted with a 9-pin D-type connector which is suitable for connection to either socket A or B .
Socket C SMART PROBES USER	Suitable for Solomat Smart probes ONLY .
Socket D THERMOCOUPLE	Suitable for the Solomat 200 series and other industry-standard type-K thermocouples.
COMMS socket	RS232 connections for a printer, modem or PC. Also used for 'log trigger' input.
POWER socket	Connections for an external battery, or dc supply via a Solomat ac adaptor. High/low alarm output, suitable for loads up to 30 V, 100 mA which, alternatively, can be used as a serial data link to select MX multiplexer units (Section 2.7.3). Analog output and multi-channel alarm via MX8000 multiplex unit. Connection for external trigger of MPM4100 measurements, using a voltage-free contact closure or digital pulse.

1.3.3 OEM probe signals

Customer's own probes, with output signals within the following specifications can be connected to the MPM4100 sockets **A** or **B**:

- ±800 mV dc (with or without a reference voltage of up to ±400 mV)
- 4 to 20 mA, using an AD50 adaptor
- 0 to 10 V, using an AD50 adaptor
- AC signals, using an AD56 adaptor
- High impedance signals, using an AD51 adaptor
- Frequency signals using an AD55 adaptor (50 mV to 30 V signals)

Customer's own probes, with output signals within the following specifications can be connected to the MPM4100 socket **C**:

- ±50 mV dc

1.4 MPM4100 ACCESSORIES

1.4.1 Standard accessories

Standard accessories provided with the MPM4100 are as follows:

- (1) MPM4100 User Manual and User Card.
- (2) Computer software and User Manual, enabling logged data in the MPM4100 to be analysed and to provide real-time control and programming of the MPM4100 functions (ref. CS6).

1.4.2 Optional accessories

Optional accessories available for use with the MPM4100 are as follows:

- (1) Carrying case for the MPM4100, with space available for a selection of measurement probes (ref. CC23).
- (2) Battery-powered, serial printer (either Epson P40, Datic or Seiko).
- (3) Printer cable, 1.5 m long, to connect the MPM4100 to the Epson P40 serial printer (ref. EX62).
- (4) RS232 cable, 1.5 m long, to connect the MPM4100 to a PC. Terminating in a 9-way D-shell socket (ref. EX60-09) or terminating in a 25-pin D-shell socket (ref. EX60-25).
- (5) Modem cable, 1.5 m long, to connect the MPM4100 to a modem (ref. EX64).
- (6) AC adaptor, to enable the MPM4100 to be used from an ac supply. Reference AA2-11 (110 V ac), AA2-21 (220 V ac), AA2-31 (240 V ac).
- (7) Charger/ac adaptor for multi-channel systems. Reference AA3-11 (110 V ac), AA3-21 (220 V ac), AA3-31 (240 V ac).
- (8) External, rechargeable, battery to provide an extended battery-life in the field (ref DC12). Waterproof version of DC3.
- (9) MPM4100 internal NiCd battery-pack (ref. DC13).
- (10) 12 V to 48 V dc adaptor for high-voltage dc supplies: does not recharge DC3 or DC12 batteries (ref. DC1M).
- (11) AD50, AD51, AD52, AD53, AD54, AD55, AD56 adaptors, for use with customer's own probes.
- (12) Remote log trigger, for connection to the **POWER** socket (ref. EX64-07) or connection to the **COMMS** socket (ref. EX64-04).
- (13) Multiplexing units (refer to Chapter 3 for details): MX4000, MX4002, MX4003, MX8000.
- (14) Multiplexing cables (refer to Chapter 3 for details): EX40-00, EX42-00.
- (15) Waterproof security housing (ref. CC25).
- (16) Wall-mounting pillars (ref. EN44).
- (17) Bench stand (ref. EN43).
- (18) Wall mounting frame for MX units plus battery and AC adaptor (ref. EN42).

1.5 SOLOMAT PROBES AVAILABLE

The probes recommended for use with the MPM4100 are listed in Table 1.1, and described briefly in the following paragraphs.

1.5.1 Hygrometer probes

The Solomat range of hygrometer probes measure relative humidity (%RH), absolute humidity (dewpoint) and equilibrium relative humidity (ERH) with either standard or fast-response times. These probes also contain a Pt100 temperature sensor.

355RH	Fast-response probe for quick spot checks, but also suitable for continuous monitoring
356RH	Fast-response probe with a 475 mm (19 in.) blade, depth-marked for ERH measurements in stacked paper, cardboard, etc
357RH	Fast-response probe with a protected sensor that is designed for insertion into powdered and granular materials
358RH	Fast-response probe with high-temperature protection that allows usage up to 140°C
226RH	Standard-response probe for measuring normal humidity at ambient temperatures

1.5.2 Temperature probes

Two basic types of temperature probe can be used with the MPM4100; the Pt100 and the type-K thermocouple.

The Pt100 is a 100-ohm platinum resistance temperature detector (RTD), and the MPM4100 detects the change in electrical resistance with temperature.

The type-K thermocouple is a pair of dissimilar metal wires, welded together at one end to form the 'hot' junction. A voltage difference is generated between the 'hot' junction and a 'cold' (reference) junction, which is within the MPM4100.

101 series	Pt100 temperature probes, designed for immersion in liquids, semi-solids or granular material, sub-divided as follows:	
	101 I	Standard probe, available in 6 in., 12 in. or 18 in. sheath lengths
	101 IR	Fast-response probe
	101 IH	High-temperature probe
	101 C	Corrosion-resistant probe
	101 CM	Miniature probe, 1.6 mm outside diameter
102 series	Pt100 temperature probes, designed for material penetration, sub-divided as follows:	
	102 P	Standard probe, with pointed, stainless-steel tip
	102 PU	Designed for checking frozen foods
	102 PM	Miniature probe, designed for checking soft fruits and vegetables

Table 1.1 Environmental measurements using the MPM4100

Measurement parameter	Recommended probe (Section 1.5)	Measurement range
Relative humidity	355RH, 356RH, 357RH, 358RH	0 to 100% RH
	226RH	10% to 70% RH
Dewpoint temperature	As above	-35°C to +70°C
NOTE: A Pt100 temperature sensor within the RH probe measures air temperature, which is used to calculate dewpoint temperature		
Temperature	200 series, type-K probe	-80°C to +900°C
	100 series probes (Pt100) (mechanically configured for particular applications)	-190°C to +600°C
Hotwire airspeed probe	127MS or 129MS/GN	0.1 m/s to 12 m/s (0°C to 50°C)
Vane airspeed probe	228MS or 228GN	0.5 m/s to 40 m/s (-10°C to +70°C)
Pitot static tube	50-4, 380, 229MS, 229ML, 229MM	1.5 m/s to 100 m/s
NOTE: You must use a 511LP pressure probe in conjunction with pitot static tubes		
Volume flow rate (vfr)	Pitot static tube, hotwire or vane	Determined by the cross- sectional area of the duct
Temp/humidity/wind speed	Solomat 3-element thermal probe, type 1010TC	-10°C to +70°C, 0 to 100%RH and 0.1 to 12 m/s
Tachometer speed	327TM, 427TM	6 rpm to 20,000 rpm
Frequency	Any frequency or event-time source	0.5 Hz to 1 MHz (see Section 1.3.3)
Air pressure	511LP 512HP 515BP	±30 in. H ₂ O 0 to 150 PSIG 0 to 1.15 bar absolute
Water pressure	513LW 514HW	±150 in. H ₂ O 0 to 300 PSIG
CO ₂ concentration	1201GS	0 to 5000 ppm
CO concentration	1212GS	0 to 500 ppm
Customer's own probe	See Section 1.3.3	

103 series	Pt100 temperature probes, designed for air/gas measurements, sub-divided as follows:	
	103 A	Standard probe, with a perforated radiation shield
	103 AR	Fast-response probe
	103 AD	Rigid probe for single-handed operation
106 series	Sensors without handles, for semi-permanent applications, sub-divided as follows:	
	106 SF	Pt100, flexible patch for use on external surfaces of pipework or ducts
	106 SS	Pt100, surface mount, stainless-steel for use on stator windings
	106 T	Pt100, brass-sheathed probe, intended for oil and liquid measurements up to 280°C
200 series	Type-K thermocouples, with 2 m of pre-fitted cable, terminated in an industry-standard sub-miniature connector suitable for the MPM4100 THERMOCOUPLE socket.	
	Type-number sub-divisions are similar to the Pt100 probes. For example, the 203 A is a standard probe with a perforated radiation shield.	

1.5.3 Airspeed probes

Three basic types of airspeed probe can be used with the MPM4100; the hotwire, vane and pitot static tube.

127MS	Hotwire probe, providing a fast response and low-speed sensitivity
129MS/GN	Hotwire probe, with telescopic or gooseneck handle, suitable for measurements in ducts, registers or grilles
228MS/GN	Vane probe, with telescopic or gooseneck handle, designed for high speed/high accuracy measurements
50-4	Pitot static tube, with extendible handle (up to 51 in.) and pre-fitted tubing, designed for air speeds from 1.5 m/s to 100 m/s.
229 & 380	Pitot static tubes, of different fixed lengths

NOTE: To convert the differential pressure into a suitable electrical signal, pitot static tubes must be used with a 511LP pressure probe.

1.5.4 Pressure probes

Pressure probes are available for use with the MPM4100, to measure air pressure, water pressure and barometric pressure, as follows:

511LP	Air-pressure probe, for low differential pressure measurements. Also used with pitot static tubes.
512HP	Air-pressure probe, for gauge-pressure measurements such as compressed-air lines

515BP	Air-pressure probe, for barometric and vacuum pressure measurements
513LW	Water-pressure probe, for low differential-pressure measurements, such as hydronic balancing, cooling coils and water pumps
514HW	Water-pressure probe, for high gauge-pressure measurements

1.5.5 Tachometer probes

Designed to measure the rotational speed of motors, fans and other rotating machinery, two tachometer probes are available for use with the MPM4100:

327TM	Infra-red sensor, for measuring reflections on rotating machinery. An optional contact adaptor is used to measure wheel or belt speeds.
427TM	Inductive sensor, for high-speed, small mass measurements

1.5.6 Gas concentration probes

For indoor air-quality (IAQ) measurements, probes are available to measure the concentration of carbon monoxide (1201GS) and carbon dioxide (1212GS).

1.5.7 Smart probes

A Smart probe has on-board memory that stores digital recalibration and probe identification information such as the type of probe, its serial number, calibration date and calibration constants.

The only Solomat Smart probe currently available for use with the MPM4100 is the 3-element IAQ probe (1010TC) which provides measurements of temperature, humidity and carbon dioxide.

CAUTION: Only Smart probes can be connected to the SMART PROBES/USER connector on the MPM4100.

515BP	Air-pressure probe, for barometric and vacuum pressure measurements
513LW	Water-pressure probe, for low differential-pressure measurements, such as hydronic balancing, cooling coils and water pumps
514HW	Water-pressure probe, for high gauge-pressure measurements

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Chapter 2

AN OVERVIEW OF THE MPM4100

2.1 INTRODUCTION

This chapter describes briefly each of the MPM4100 facilities and features (Fig 2.1). It is intended to provide you with an overview of how the MPM4100 can be used for your particular application.

Detailed instructions on operating the MPM4100 are provided in Chapter 4.

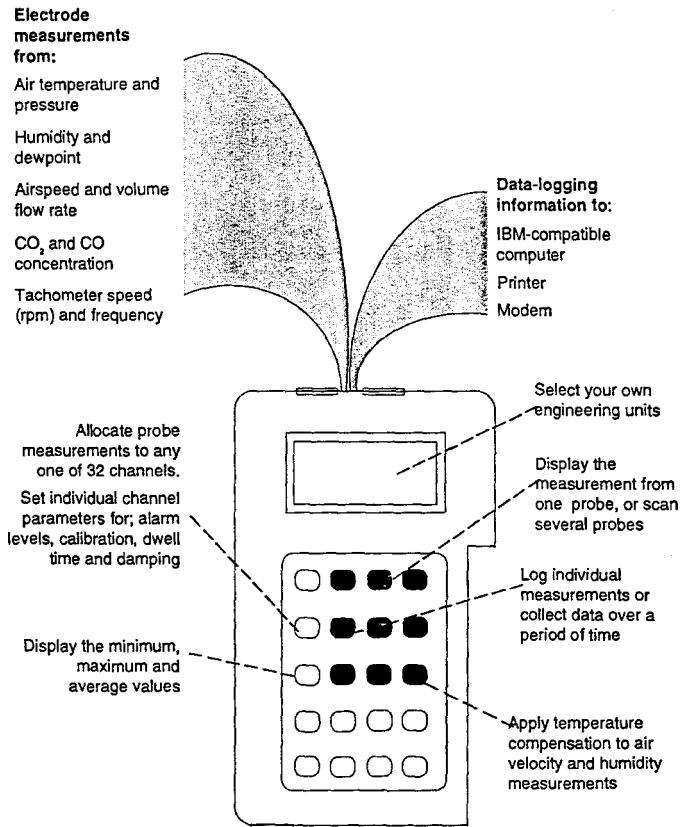


Fig 2.1 MPM4100 user facilities

2.1.1 Operational modes

There are two operational modes in which the MPM4100 can be used, and you can toggle between these modes by pressing the **CHAN MODE** key. At switch-on, the MPM4100 returns to the mode that was in use when it was last switched off.

- (1) **Single mode**, so-called because in this mode the measurement from a single probe is displayed when the associated Measure key (Table 2.1) is pressed.
- (2) **Multi-channel mode**, in which any one, or more, of the available 32 channels can be allocated to the probes that are connected to the MPM4100. Measurement data from these channels can be accessed using the wide range of MPM4100 facilities.

NOTE: MPM4100 functions such as logging, minimum, maximum and averaging, are available for use in either of the operational modes and, if required, all of these functions can be controlled remotely from an IBM-compatible PC (refer to the CS6 Computer Analysis Software User Manual, part no. 059-0232-00).

Table 2.1 Measure keys

Measure key	Used to measure	Comment
%RH/DEWPT	Relative humidity or dewpoint temperature	Humidity probe must be used with a temperature probe to calculate dewpoint
GAS	CO or CO ₂ concentration	Probe to be connected to socket A or B
TEMP	Temperature	Use a Pt100 probe in socket A or B , or a type-K probe in the THERMOCOUPLE socket D
AIRSPPEED	Velocity of air in ventilation ducts, occupied zones, storage areas or outdoors	For measurements using either a hotwire or vane airspeed probe.
PITOT	Velocity of air in ducts	Differential pressure measurements in conjunction with a 511LP pressure probe
VOL FLOW	Volume flow rate (vfr) of air	Provides the option of defining duct measurements, in conjunction with a 'pitot' or 'airspeed' probe, to calculate vfr
AUX	OEM probe measurements. Also, MPM4100 internal measurements.	MPM4100 internal temperature and battery condition. OEM probes to be connected to socket A or B
RPM	Rotational speed, or frequency inputs	Probe to be connected to socket A or B
PRESSURE	Air or water pressure	Probe to be connected to socket A or B

NOTE: If a Solomat 3-element Air Quality probe is connected to the **SMART PROBES USER** socket, the temperature, humidity and wind-speed measurements can be selected by pressing the **TEMP**, **%RH/DEWPT** or **AIRSPPEED** keys respectively.

2.2 SINGLE MODE

In Single mode, measurements from the probe connected directly to any of the MPM4100 sockets can be selected by the Measure keys. However, measurements from probes connected to the MPM4100 via multiplexers (Section 2.7) are not available.

Normally, Single mode is used for a simple series of measurements, using only one probe. For example, airflow could be measured at various points along a ducted ventilation system, and each measurement logged to the MPM4100 memory for subsequent analysis.

2.2.1 Measure/symbol/socket definition

Separate channels cannot be allocated when the MPM4100 is used in Single mode. Effectively, a single channel is made available and the probe that is connected to this channel is determined by a 'measure/symbol/socket' definition. The information from that single channel is cleared as soon as another 'measure/symbol/socket' definition is selected by pressing another Measure key.

The 'measure/symbol/socket' definition is determined by first pressing a Measure key appropriate to a probe in use, defining the socket to which the probe is connected and then choosing the engineering unit (symbol).

2.2.2 Hold facility

In Single mode, the displayed value can be 'frozen' by pressing the **HOLD** key, and the current value re-displayed by again pressing the same key. This facility is useful when making measurements where you must concentrate on positioning the probe and not on looking at the display.

2.2.3 Minimum and maximum values

When a 'measure/symbol/socket' definition has been selected, the minimum and maximum values of the probe measurement are stored and continuously updated. You can display the minimum value by pressing the **MIN MAX (SHIFT and AVG)** key and then the maximum value by pressing the **▼** key.

2.2.4 Average values

While in Single mode, the average calculation of a probe measurement is being carried out continuously by the MPM4100. You can display this average calculation at any time by pressing the **AVG** key, and start a new average calculation by clearing the displayed average (press **▼** and then **YES**).

2.2.5 Datalogging

If the **STORE** key is pressed while Single mode is being used, the displayed value is stored in an MPM4100 Log File (Section 2.6).

2.3 MULTI-CHANNEL MODE

In Multi-channel mode, the full range of MPM4100 features becomes available. Up to 32 channels can be allocated to the probes that are connected to the MPM4100, and each channel individually specified in accordance with the associated probe.

Initially, a 'channel/probe/socket' definition must be selected for each channel, after which additional parameters such as alarm levels, dwell time, short term average (STA) time and calibration can be set-up.

For example, a channel allocated to a pitot static tube can have an STA time specified such that a noise-free measurement is displayed by the MPM4100. Alternatively, if two channels are allocated to a single probe, separate alarm levels can be specified for each channel so that the MPM4100 responds to each alarm level and thereby indicates two different environmental conditions.

Once the channel parameters have been specified, the associated measurements can be stepped through individually or scanned regularly. Also, having specified the channel parameters for a particular set of measurements, the MPM4100 setup (referred to as a 'procedure') for all the channels can be stored for subsequent re-use (Section 2.9.6).

Typically, Multi-channel mode is used for datalogging more than one environmental measurement in a semi-permanent location such as an indoor air quality (IAQ) weekly audit. Under these conditions, environmental parameters can be monitored over long periods and the results down-loaded for subsequent PC-analysis.

NOTE: Even though a probe has been allocated a channel number and the channel parameters have been specified, the associated measurement is still available in Single mode, provided the probe is connected directly to an MPM4100 socket.

2.3.1 Channel/probe/socket definition

When a Channel is to be allocated to a probe, the 'channel/probe/socket' definition is set by first using the **CHAN SETUP** key and selecting a channel number (1 to 32), then the probe is selected by pressing the associated Measure key and finally by specifying to which socket the probe is connected. Channel numbers can also be allocated to probes that are connected to the MPM4100 by means of MX (multiplex) units (Section 2.7).

NOTE: The MPM4100 displays default socket and symbol references that are appropriate to the probe selected by the Measure key. Pressing the **NEXT SKT** or **SYMBOL** keys only changes between other appropriate sockets or symbols.

When a channel number is selected, the current 'channel/probe/socket' definition is displayed. To avoid overwriting this allocation, select another channel. If necessary, channel allocations can be reviewed using the Status facility (Section 2.9).

2.3.2 Channel options

When you have set the 'channel/probe/socket' definition, the following facilities are available for you to set as appropriate

Channel on/off	Even though a channel is set-up, it may not immediately be required for measurement purposes. This options allows the channel to be set-up and switched Off, so that it is ready for use but ignored in any channel scanning or logging procedure.
Dwell time	A single dwell time is set for all channels (Section 2.3.7). This dwell time can be set On or Off for individual channels.

Short term average	A short term average (STA) time is set for all channels (Section 2.3.7). This facility can be set On or Off for individual channels and is used as a damping factor so that momentary fluctuations are averaged.
Temperature compensation	If the associated probe requires temperature compensation (for example, a hygrometer being used to measure dewpoint) a default socket is suggested at which the temperature compensation is available. The default socket can be changed.
Custom full scale	Enables the full scale deflection (fsd) value to be set for an OEM probe. This fsd value applies only to the associated channel measurement.
Custom zero	Similarly, custom zero enables the zero/low value to be set for an OEM probe.
Alarm settings	Enables high and/or low alarm values to be set. If the alarm thresholds are exceeded, the alarm is indicated on the MPM4100 display. Also, if the 'Log-on-alarm' option (Section 2.6) is set, all channels that are switched On are logged. Depending on the POWER socket connections, an alarm output (Section 2.7) may also be provided.
Alarm on/off	Even though the alarm values are set-up, the alarm facility may not immediately be required. This option allows the alarm to be ready for use but ignored in any current procedure.
Block settings	Enables 'blocks' of channels to be switched On or Off.
Calibration	A low and high calibration point can be set for the probe associated with each channel.

2.3.3 Scan on/off

When you have selected the 'channel/probe/socket' definitions and have set the channel options, the associated measurements can be toggled between Scan On and Scan Off by pressing the **HOLD** key.

When the scan facility is set to Scan On, the MPM4100 steps through and displays information from all the channels that are switched On. The rate at which the measurements are scanned is determined by the 'dwell' time set when the channel options were set-up. Channels that are switched Off are ignored.

NOTE: Scan On is also referred to as Channel Cycle mode.

When the scan facility is set to Scan Off, the MPM4100 displays the measurement information associated with the selected channel. Other channel information can be displayed by pressing the **NEXT CHAN** key until the required channel is selected. Only channels that are switched On are available for display.

NOTE: Scan Off is also referred to as Channel Hold mode.

2.3.4 Minimum and maximum values

The **MIN MAX** key can be used in the same way as in Single mode except that the appropriate channel number must be specified.

2.3.5 Average values

The **AVG** key can be used as in Single mode but, as with the **MIN MAX** key, the appropriate channel number must be specified.

2.3.6 Datalogging

When Multi-channel mode is set to Scan On, press the **STORE** key to log all the channels that are being scanned (that is, the channels that are switched On). When set to Scan Off, press the **STORE** key to log the measurement from the selected channel.

2.3.7 All-channel options

Using the **FUNCS** key, you can set the following options, which apply to all channels:

Dwell time	Dwell time is set to provide a warm-up time for specific probes, or a delay time for display purposes. Within each channel setup, this dwell time can be switched On or Off.
Short term average time	Short term average (STA) time is set to damp out unwanted fluctuations of probe measurements. Within each channel setup, this STA option can be switched On or Off.
Fast update	Some measurements, such as humidity, use a temperature probe to compensate for the sensor temperature sensitivity. These corrections are usually quite small and, if the Fast Update option is set On, this correction is ignored in order to provide a faster data-collection rate. Since multiple readings are not averaged with Fast Update, the display will appear "noisier".

The combination of dwell time and STA time also determines the rate at which the channels are scanned when the Scan On option is selected. If these times are set to near zero, the scan rate is approximately two channels per second which is too fast to read the displayed information. Consequently, you may prefer to set the dwell time to, say, three seconds so that the scan rate is reduced even if the probes being used do not require a dwell time.

2.4 DISPLAY FEATURES

Indications on the MPM4100 display are divided into four sections (Fig 2.2):

Measurement data	Sign, leading 1 and four 0-to-9 digits
Symbols	Up to 24 engineering units are available for display. Other symbols are displayed on the 'option message' area of the LCD.
Option messages	Leading 1-or-2, and six alpha-numeric characters to display the date, time, channel number, engineering units and prompts.
Warnings (flags)	High and low set point (sp) alarms, battery warning and log-on indications.

An asterisk (*) after a socket or channel reference, indicates that the associated probe has been calibrated by using the **CAL** facility.

A plus sign (+) after a socket or channel reference, indicates that a compensated measurement (for example, dewpoint) is being displayed and the compensating input is not available. Under these conditions, a default value is used for the compensation.

If required, a backlight to the display can be switched on for one minute each time the **BACKLIGHT** (**SHIFT** and **▲**) key is pressed.

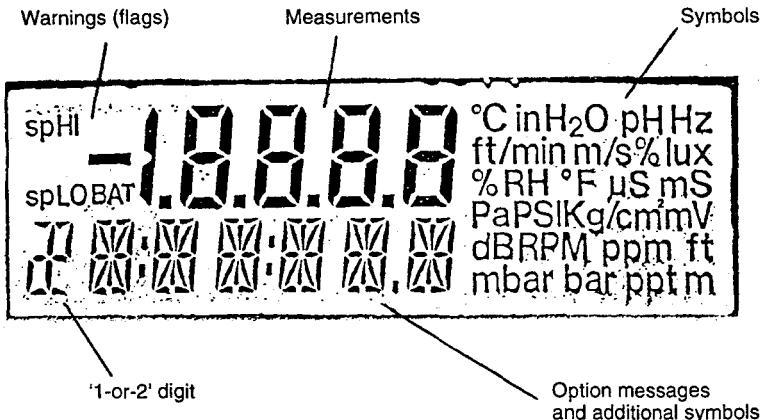


Fig 2.2 MPM4100 display features

When used in Single mode, the display (Fig 2.3) shows the measurement, the engineering units and the socket reference of the probe being used for the displayed measurement. Other information is displayed (for example, warnings and log-on) as necessary.

When used in Multi-channel mode, the display (Fig 2.4) shows the measurement, the engineering units and the number of the channel being addressed. If the engineering unit is alphanumeric (that is, it is displayed in the 'option message' area of the screen) its display alternates with the channel number.

NOTE: In either mode, if the screen is displaying measurement information (as shown in Fig 2.3 and 2.4), it is referred to as a 'Measurement screen'.



Fig 2.3 Typical Single mode display



Fig 2.4 Typical Multi-channel mode display

2.5 KEYPAD FEATURES

There are 20 keys on the MPM4100 keypad (Fig 2.5), 17 of which are dual-function and twelve of the keys have the additional function of entering numerical data.

The key function marked on the key itself is referred to as the Primary key, and the key function marked above the key is referred to as the Secondary key. To use a Secondary key, press the **SHIFT** key at the same time as the Primary key.

The numerical function is marked at the right-hand side of the key and is context-related. That is, when the MPM4100 is expecting you to enter numerical data, you can use the numerical keys as if they were Primary keys.

Use of the MPM4100 keys is divided into four groups:

- | | |
|------------------------------|--|
| Measure keys
(Table 2.1) | These nine Primary keys provide access to all the MPM4100 measurement probes. For example, the TEMP key selects a temperature probe if one is connected to the MPM4100. |
| Set-up keys
(Table 2.2) | These seven Secondary keys are used to set the Channel and/or logging options. For example, the LOG SETUP key provides access to menus which enable you to set the logging parameters. |
| Function keys
(Table 2.3) | These keys are used to change the function of the MPM4100 without changing the set-up parameters. For example, CHAN MODE toggles between Single and Multi-channel modes. |
| Action keys
(Table 2.4) | These keys are one-off direct-action keys that are used in conjunction with keys from one of the other groups. For example, NEXT SKT cycles between available sockets for the selected probe. |

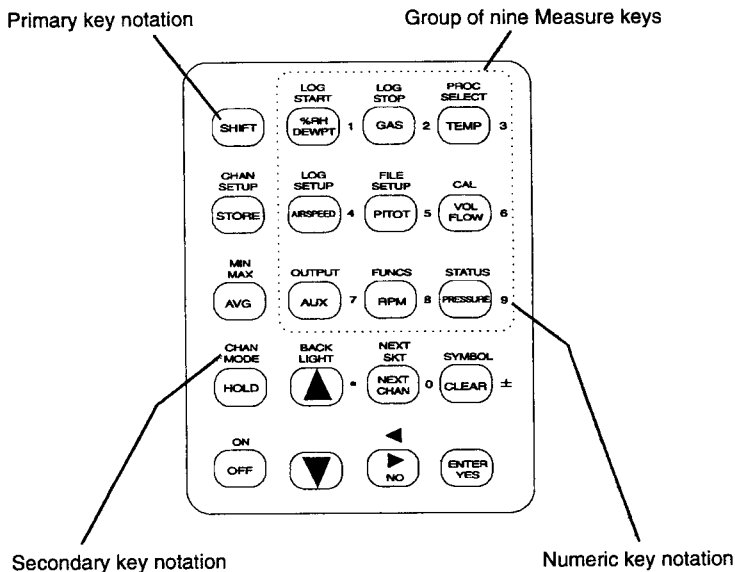


Fig 2.5 MPM4100 keypad

Table 2.2 Setup keys

Setup key	Used to set:	Comment
FILE SETUP	Log file parameters	Select and edit one of the 30 files used to store logged data
PROC SELECT	Instrument configuration	Full configuration of the MPM4100 channels and log setup can be stored or retrieved
FUNCS	MPM4100 functions	Clock, user symbol, dwell time, short-term average time and bleeper on/off can be set from this menu
CAL	Probe calibration points	Two-point calibration can be set for each probe
LOG SETUP	Log parameters	Start/stop times, log type, logging interval and data overflow option can be set from this menu
OUTPUT	Output parameters	RS232 options can be set from this menu
CHAN SETUP	Channel parameters	'Channel/probe/socket', customised calibration, alarm settings and on/off settings for each channel

Table 2.3 Function keys

Function key	Used to:	Comment
LOG START	Start log session	Used in Multi-channel mode to log the data defined during log setup, and in Single mode for simple logging
LOG STOP	End log session	Log session may also be terminated by log setup options
STORE	Logs individual measurements	Used in Single or Multi-channel mode
AVG	Average a measurement over a selected time span	Display the calculated average, with an option to start a new calculation
MIN MAX	Minimum or maximum of displayed measurement	Used in Single or Multi-channel mode
CHAN MODE	Mode changeover	Toggles between Single and Multi-channel mode
HOLD	Depends on mode selected	Freezes display in Single mode or stops scanning in Multi-channel mode
STATUS	Review instrument status	Enables the channel, log, file or instrument status to be reviewed

Table 2.4 Action keys

Action key	Used to initiate:	Comment
ON/OFF	Switch MPM4100 On or Off	Options when switching on are available (Section 2.9)
SHIFT	Select a Secondary key	Press at the same time as the associated Primary key
BACKLIGHT	Brighten display	Switches the backlight on for one minute
NEXT SKT	Select alternative probe	Used to set-up the MPM4100 for Multi-channel mode, or select between similar probes in Single mode
NEXT CHAN	Manual stepping between channels	Used in Channel Scan Off mode or to set channel parameters
SYMBOL	Select alternative engineering units	Cycles between suitable symbols for the selected probe
CLEAR	Clear selected data	Used in Single mode to clear stored minimum, maximum and average data. Also used in conjunction with set-up menus.
ENTER/YES	Respond to displayed prompts	Used in conjunction with Setup and Function keys
NO	Respond to displayed prompts	Used in conjunction with Setup and Function keys
▲ or ▼	Select other menu options	Used in conjunction with Setup and Function keys
◀ or ▶	Select other menu options or nudge displayed data	Used in conjunction with Setup and Function keys

2.6 DATALOGGING FACILITIES

MPM4100 datalogging can be used in either Single or Multi-channel mode, and the logged data can be held in any one of up to 30 separate files. The procedure of entering measurements into a specified file is called a Log Session. In either Single or Multi-channel mode, the full file control (Section 2.6.1) and setup facilities (Section 2.6.2) are available.

NOTE: Measurements logged to a file cannot be recalled to the MPM4100 display, they must be down-loaded to a PC for analysis (Section 2.8).

When you have set-up the log and file parameters, a Log Session is started by pressing the **LOG START** key (or by a log setup parameter) and terminated either by pressing the **LOG STOP** key or the log setup option 'log stop'. Alternatively, you can log a single measurement (in Single mode) or a single scan of all the channels that are switched On (in Multi-channel mode), by pressing the **STORE** key.

During a Log Session, the actual logging of measurements only occurs when the setup parameters are satisfied. For example, a Log Session can be started but logging can be set to take place only when an alarm threshold is crossed. The time during which measurements are actually being logged is called Active Log, and is indicated by the displayed **LOG** symbol (Section 2.6.2).

2.6.1 File control

Before starting a Log Session, you must specify the file into which the measurements are to be logged. Files are identified in the range F01 to F30, but this identification can be changed to a user-specified reference during the setting-up procedure.

The amount of storage available for individual files is flexible, but a total of 50,000 measurements can be logged into the 30 files. If a file is not specified, the MPM4100 automatically logs into the next available file.

Provided the file and channel details specified are the same, it is possible to re-open a file after it is closed, but it is not possible re-open a file in order to store data from a different probe, socket or symbol. For example, if data from a particular probe is logged to a selected file and then the probe type is changed, any further data is logged automatically to a new file.

In Multi-channel mode, multi-probe data can be logged to a single file.

Whether the MPM4100 is being used in Single or Multi-channel mode, as soon as the **FILE SETUP** key is pressed to specify a file, the mode in use is cancelled and all measurements suspended to enable the logging parameters to be set-up.

2.6.2 Displayed LOG symbol

In the 'warning message' area of the MPM4100 display (Fig 2.2), the **LOG** symbol is used to differentiate between the three different states of the log facility during a Log Session:

LOG symbol off	Log facility has not been selected or the Log Session is finished
LOG symbol flashing	Log Session has been programmed but measurements have not yet been logged
LOG symbol on steady	Active Log (that is, measurements are being logged at intervals determined by the log setup).

2.6.3 Log setup options

When you have selected the log file, the conditions under which data is logged to that file can be specified from:

Date/time	The date and/or time at which the log is to be started or stopped
Period	The length of time for which measurements are to be logged after LOG START is pressed. This is an alternative to starting and stopping by the date/time option.
Interval	Time interval between repetitive Active Log sessions, starting when LOG START is pressed

NOTES: In Channel Scan On mode, measurements from all channels that are switched On are logged whenever the Active Log condition is triggered.

In Channel Scan Off mode or in Single mode, only measurements from the displayed channel are logged.

Other options are also available when you set-up the logging facility:

Select mode	Enables you to select the type of triggering for Active Log. For example, alarm thresholds and time interval logging may have both been specified during the setting-up of the Log Session. You can specify the mode (that is, the log-triggering parameter) to be used.
Power down	Enables the MPM4100 power to be switched off, to conserve battery capacity, between Active Log sessions. If this option is selected, a further option allows you to specify a warm-up time for the MPM4100 to be switched on before an Active Log session. When this option is selected, the MPM4100 is referred to as being in 'sleep' mode.
Log to RS232	Enables the logged data to be directed, in parallel, to both the selected file and the RS232 output socket (COMMS).
Overflow	If the log memory becomes full during a Log Session, options can be selected to either; stop logging, remove alternate measurements to compress the data in the log memory, or to start overwriting the earliest data.
Resume log	Provided the log parameters match, successive logs are entered into the same file.

2.6.4 STORE and log-trigger facilities

Pressing the **STORE** key in Single mode (Section 2.2.5) or in Multi-channel mode (Section 2.3.6) can be simulated by using the external 'log-trigger' connection on either the **POWER** or the **COMMS** connector (Chapter 3).

2.7 INPUT/OUTPUT FACILITIES

All inputs to, and outputs from, the MPM4100 are connected via the six sockets on the MPM4100 top panel. Connector details are specified in Section 1.3, and information on making connections to the MPM4100 is provided in Chapter 3.

2.7.1 Multiplexed inputs and outputs

As well as connecting individual probes to the appropriate MPM4100 connector (Section 1.3.2), multiple inputs can be connected via Solomat multiplex (MX) units (Fig 2.6) and selection between these probes made by the setting of the MPM4100 channel options (Section 2.3). MX units can be sited up to 100 m from the MPM4100.

Solomat multiplex units are available as follows:

MX4000	8-socket multiplexer, fitted with 9-pin D-type connectors, which are suitable for most Solomat electrodes (Section 1.5).
MX4002	8-socket multiplexer, fitted with sub-miniature connectors that are suitable for type-K thermocouples.
MX4003	8-socket multiplexer, suitable for frequency/event, 0 to 5 V, 0 to 10 V or 4 mA to 20 mA inputs, producing an output from the MX4003 in the range 0 to 1V.
MX8000	8-channel analog and alarm outputs

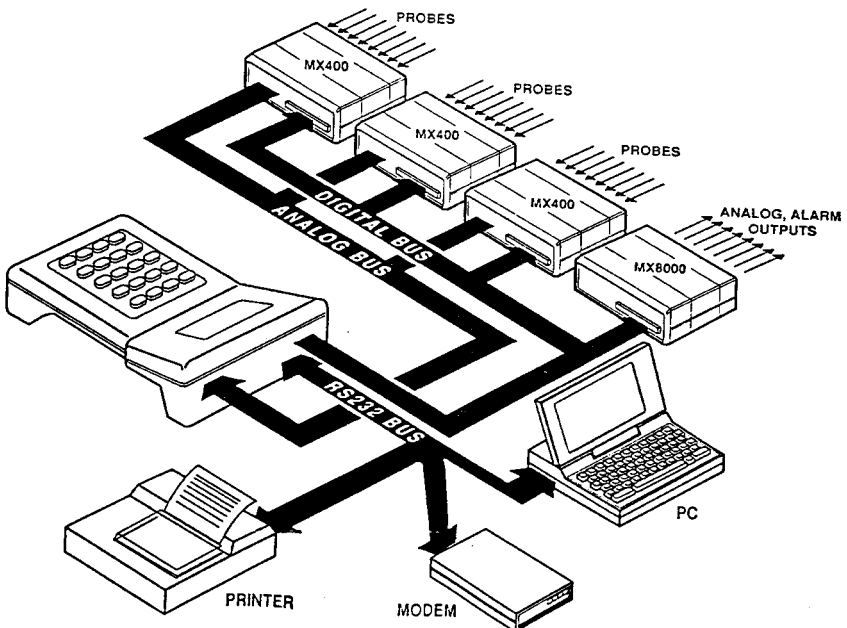


Fig 2.6 Multiplexed inputs and outputs

2.7.2 RS232 connections

Measurements from the probes connected to the MPM4100 can be shown on the MPM4100 display, logged within the MPM4100 or output via the RS232 **COMMS** socket to a printer, modem or IBM-compatible PC.

Using the RS232 facility, a serial printer can be connected to the **COMMS** socket to provide hard-copy of test results, or a PC can be used to analyse data from a complex series of environmental measurements.

The RS232 connector also provides a 2-way communication link allowing the MPM4100 keypad to be bypassed, and parameters such as the log intervals and channel options to be set from a PC, using CS6 software.

2.7.3 Alarm outputs

A single alarm output (Section 1.3.2) is available at the **POWER** connector, in the form of open-collector drives (refer to Chapter 3). Alternatively, MX8000 output multiplexers provide channel-specific high and low alarm outputs for multiple-channel alarm controls.

In Channel Scan On mode, these outputs are switched on if the associated threshold (set as a channel option) is crossed. These outputs are also used to switch between MX units, so Solomat should be consulted for the correct cabling to be used when MX input multiplexers and MX 8000 output multiplexers are to be used at the same time.

Alarms can be monitored on a PC in real time. This requires the installation of a 48 channel I/O card in your PC, and the Solomat CS6 program to be run in realtime mode. This allows simultaneous monitoring of up to 48 high / low alarm controls. Consult the CS6 software user manual (ref. 059-0232-00) for further details.

2.7.4 Analog outputs

Analogue outputs are available via the MX8000 multiplexer. A 9-way DIN socket is used to provide eight channels and a common ground signal.

2.8 WORKING WITH A PC

One advantage of using the RS232 facility is that a PC can be connected to display data that is no longer shown on the MPM4100 display. For example, measurements from 32 channels can be displayed, so providing immediate information on all the channels.

Other advantages of working with a PC include realtime monitoring of measurements, easy channel and log setup procedures, advanced data analysis and report generation.

Refer to Chapter 5 for details of using the MPM4100 with a PC.

2.9 OTHER MPM4100 FEATURES

2.9.1 Switch-on options

In addition to the normal switching-on procedure (that is, pressing the **OFF** and **SHIFT** keys simultaneously), five other options are available at the time of switching on the MPM4100:

CAUTION: Calibration and measurement data will be lost when the 'hard' reset option is used.

Soft reset	By pressing, simultaneously, CLEAR , SHIFT and ON/OFF , all the menu buffers are reset, including STA and dwell times, alarm levels, log intervals, channel setup data and the log start/stop parameters. Data files, setup 'procedures' and the clock are not reset.
------------	--

Hard reset	By pressing, simultaneously, HOLD , CLEAR , SHIFT and ON/OFF , all data buffers are reset, and the RAM, clock and LCD are tested. In addition to the data that is reset during a 'soft' reset, data files and 'procedures' are also reset.
LCD check	By pressing, simultaneously, NO , SHIFT and ON/OFF , all segments of the LCD are illuminated in addition to a 'normal' switch-on.
Log-stop code	By pressing, simultaneously, ▲ , SHIFT and ON/OFF , a code is displayed at switch-on which defines how the last Log Session was stopped.
Auto power-down	By pressing, simultaneously, ▼ , SHIFT and ON/OFF , the MPM4100 is set to power-down if no key is pressed during a ten-minute period.

2.9.2 Bleeper

A bleeper within the MPM4100 is used to provide audible signals to the operator, either as a low pitch (1 kHz) or a high pitch (2 kHz) signal.

NOTE: This bleeper can be switched Off from the **FUNC**S menu (Section 4.6.5).

Key press	Confirmation of each key press is provided by a low pitch, low amplitude signal of approximately 200 ms duration.
Warning	A high pitch, low amplitude signal of approximately 500 ms duration is used to indicate an error condition that can be corrected (or accepted) by user-action (for example, low battery capacity).
Fault	A high pitch, high amplitude signal of approximately 500 ms duration is used to indicate an error condition that requires user action before use of the MPM4100 can be continued (for example, battery is exhausted).
Alarm	A high pitch, high amplitude signal of approximately 1 s duration, repeated every 2 s, is used to indicate an alarm condition (for example, a pre-set alarm threshold has been exceeded).

2.9.3 Battery status

The MPM4100 measures the instantaneous battery voltage and current-drain and the internal temperature of the MPM4100 and, from these measurements, predicts the remaining battery-life. This predicted time can be displayed as part of the instrument status review, the **FUNC**S menu or the **AUX** menu.

Also, the warning **BAT** is displayed when the battery life is below a preset level (20 h for alkaline batteries and 20 min for NiCd).

2.9.4 Instrument status review

By pressing the **STATUS** key, a series of menus are made available from which the following information can be obtained:

Channel status	Options that have been set-up for each channel (for example, alarm thresholds and probe/symbol/socket definitions).
Log status	Details of file control and log set-up (for example, current file name, log interval and log-stop conditions).
Instrument status	Details of the MPM4100 (for example, internal temperature, battery-life remaining and clock settings).
File review	Details of file name and status

2.9.5 Keypad disable

To prevent unwanted key presses, the MPM4100 keypad can be disabled at any time that it is in use by pressing the **▼**, **NO** and **YES** keys simultaneously. Pressing these keys again re-enables the keypad.

2.9.6 Instrument setup: storage and retrieval

After setting the channel options, the instrument setup ('procedure') can be stored, using the **PROC SELECT** key and memory space is available in the MPM4100 to store two such instruments 'procedures'.

After using the MPM4100 for another application, either of the two stored 'procedures' can be retrieved and the channels set ready for immediate re-use on the original application.

2.9.7 Calibration of Solomat and OEM probes

OEM probes require the zero, full-span point, decimal point and engineering units to be defined. These parameters can be set during the normal setting of the options for the appropriate channel and the procedure is referred to as Custom calibration (Section 4.7.4).

Other probes may have a known nominal output characteristic but, for accurate displayed measurements, need to be calibrated under well-defined conditions. For example, a PT100 probe can be immersed in melted ice and the MPM4100 indication set to 32 °F.

Alternatively, known scale factors can be applied so that, for example, a 400 Hz input from a weather station can be displayed as a 100-knot wind-speed indication.

2.9.8 Temperature-compensated measurements

If a temperature measurement is available, the MPM4100 can use this information to compensate pitot air velocity and humidity/dewpoint measurements. The MPM4100 normally expects the temperature information to be available at the same socket. In Multi-channel mode, an alternative socket for the temperature compensation can be defined, but if a temperature measurement is not available, the MPM4100 uses a default value of 25 °C.

2.9.9 User-defined symbols

If required, you can add an engineering unit to those accessed by the **SYMBOL** key. The symbol can comprise up to six alpha-numeric characters and is entered using the **FUNCS** key. For example, airspeed measurements in metres per minute could be identified by the symbol 'm/m'.

2.10 POWER SUPPLY OPTIONS

For hand-held operation, the MPM4100 operates from three internal alkaline or NiCd batteries (see Section 1.3.1 for battery details). However, any 4 V to 16 V dc supply can be used to power the MPM4100. Internal circuitry detects when the supply is over 7 V and, if NiCd batteries are fitted, this supply is used to charge the batteries.

An ac supply can also be used to power the MPM4100 if used in conjunction with the Solomat ac adaptors type AA2 or AA3.

An external dc supply (from 12 V to 48 V) can be used in conjunction with the Solomat waterproof adaptor, type DC1M.

Chapter 3

MAKING CONNECTIONS TO THE MPM4100

3.1 INTRODUCTION

All inputs to, and outputs from, the MPM4100 are connected via the six sockets on the MPM4100 top panel (Fig 3.1). Signal limitations are specified in Section 1.3.

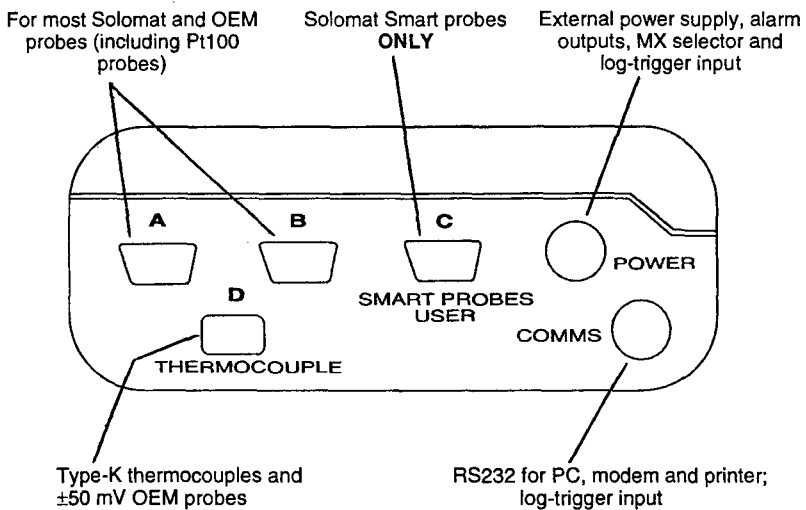


Fig 3.1 MPM4100 connectors

3.2 CONNECTOR PINOUTS

MPM4100 connector types are as follows:

Socket A	9-pin, D-shell
Socket B	9-pin, D-shell
Socket C (SMART PROBES USER)	9-pin, D-shell
Socket D (THERMOCOUPLE)	2-pin, polarised sub-miniature, type-K
POWER socket	7-pin DIN, Binder-type
COMMS socket	4-pin DIN, Binder-type

3.2.1 Connections to sockets A and B

Sockets A and B are used to connect most Solomat probes (refer to Section 1.5).

For OEM probes to be connected to these sockets, they must conform to the pinouts specified in Table 3.1.

Table 3.1 Socket A and B pinouts

Pin	Signal	Comment/limitations
1	+4.7 V	Regulated power supply
2	IN Lo	
3	REF Hi/F in	Probe reference voltage, or frequency probe output
4	0 V/Pt D-	Ground
5	Pt S-	Pt100 sense (negative)
6	-4 V	Regulated power for probes
7	IN Hi	Voltage probe output
8	Pt D+	Pt100 current source
9	Pt S+	Pt100 sense (positive)

3.2.2 Connections to socket C (SMART PROBES USER)

Socket C must only be used for Solomat Smart probes. Connections to this socket are listed in Table 3.2.

Table 3.2 Socket C (SMART PROBES USER) pinouts

Pin	Signal	Comment/limitations
1	+4.7 V	Power to Smart probes
2	IN Lo	Probe measurement voltage (high)
3	REF Hi/F in	Probe reference voltage, user frequency input
4	0 V/Pt D-	Ground, analog and digital
5	SCL	Probe digital interface (I ² C)
6	-4 V	Negative power supply
7	IN Hi	Probe measurement voltage (low)
8	SDA	Probe digital interface (I ² C)
9	DIR	Probe digital interface (I ² C)

3.2.3 Connections to Socket D (THERMOCOUPLE)

Socket D must only be used for thermocouple probes. Connections to this socket are shown in Table 3.3:

Table 3.3 Socket D (THERMOCOUPLE) pinouts

Pin	Signal	Comment/limitations
Pin 1	+ve	Thermocouple positive signal
Pin 2	-ve	Thermocouple negative signal

3.2.4 Connections to the COMMS connector

The **COMMS** connector is used to connect the MPM4100 to a printer, modem or PC. Refer to Chapter 5 for the MPM4100 settings required in conjunction with using this connector.

Use the Solomat RS232 cable (1.5 m long) to connect from the **COMMS** connector to an IBM-compatible PC. This cable is available with a 9-pin D-shell socket (ref. EX60-09) or a 25-pin D-shell socket (ref. EX60-25).

Use the printer cable (ref. EX62) to connect the MPM4100 to a serial printer, or the modem cable (ref. EX61) to connect to a modem.

Connections to this socket are listed in Table 3.4.

Table 3.4 COMMS connector pinouts

Pin	Signal	Comment/limitations
1	TXD	RS232 output
2	RXD	RS232 input
3	TRIG	Switch closure, or negative-going pulse, input to trigger log activity
4	0 V	Ground, shared between RS232 and trigger

3.2.5 Connections to the POWER connector

The **POWER** connector is not normally used in hand-held operation of the MPM4100, but provides the following optional facilities:

- (1) Power to the MPM4100 from an external battery
- (2) Power to the MPM4100 from an ac adaptor
- (3) Input from an external switch to trigger a single log
- (4) Output drive to an alarm device
- (5) Output drive to switch MX units

Connections to this socket are listed in Table 3.5.

Table 3.5 POWER connector pinouts

Pin	Signal	Comment/limitations
1	+4.7 V	Regulated power supply (300 mA max)
2	DC+	Positive input from Solomat ac adaptor, or dc source
3	DC-	Negative input from Solomat ac adaptor, or dc source
4	0 V	Ground, and trigger common
5	SDA	Alarm drive (high), refer to Fig 3.2
6	SCL	Alarm drive (low)
7	TRIG	External trigger input (voltage-free contact closure or negative-going pulse)

NOTE: Pins 5 and 6 (SDA and SCL) must not be used for loads greater than 100 mA at 30 V. This output is also used as a serial data link to select MX units.

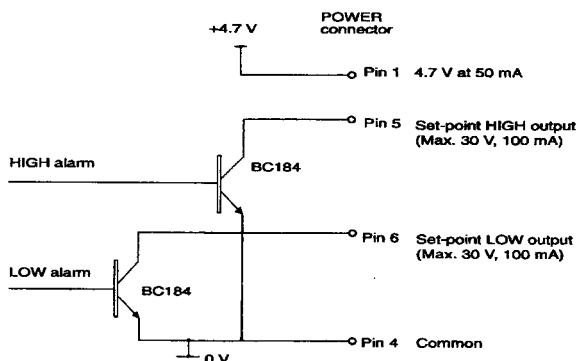


Fig 3.2 Alarm output drive

3.3 MULTIPLEXED INPUTS

As well as connecting individual probes to the appropriate MPM4100 connector, multiple inputs can be connected via MX units and selection between these probes made by the setting of the MPM4100 channel options (Section 4.7.2).

3.3.1 Connecting MX units to the MPM4100

Each MX unit accepts a different family of probes. The MX 4000 is the most universal unit. Multiple MX units stack easily on top of each other, and the EN42 frame holds four MX units plus power adaptors in one rack.

OEM 4-20mA, high impedance, microvolt, ac and 0-10 volt sources can be connected to an MX4000 by using the AD50 to AD56 adaptors. See the Environmental Probes User Manual (part no. 059-0229-00) for details.

The analog cable used to connect to the MPM4100 is specific to the MX (Table 3.6). The short EX4-01 digital strapping cable connects between each unit. Strap together multiple MX units of the same type with the analog strapping cable.

Table 3.6 lists the cables required for each MX unit.

Table 3.6 MX unit cables

MX UNIT	Analog Cable MPM4100	Digital Cable	Strapping Cable	
			Analog	Digital
MX4000	EX40-00	EX61-00	EX40-03	EX4-01
MX4002	EX42-00	EX61-00	EX42-01	EX4-01
MX4003	EX40-00	EX61-00	EX40-03	EX4-01
MX8000	included	included	-	EX61-01

3.3.2 Numbering multiplexed channels

An MPM4100 can handle up to five probes without MX units, and 32 probes with MX units. Each MX unit accepts 8 probes, and the MPM4100 can control up to four MX units.

Each MX unit is shipped with a set of numbering strips so that you can assign MX socket numbers: 1-8, 9-16, 17-24 or 25-32. The MX address, which is set by two DIL switches on the right-hand side of the front panel (Fig 3.3), determines the socket number strip to use. Unpeel the appropriate label and stick it to the case lip just above the faceplate, aligning the numbers with the eight sockets.

The DIL switches can be moved with a pencil or ball point pen. In the **up** position they are Off and in the **down** position they are On. The DIL switch combinations assign the channel numbers listed in Table 3.7.

Table 3.7 MX address assignment

SWITCH 1	SWITCH 2	Channel No.	MX Address
Off	Off	1-8	A
Off	On	9-16	B
On	Off	17-24	C
On	On	25-32	D

DO NOT set the DIL switches on two MX units to have the same MX address unless different sockets are used on each unit. For example, with two MX4000 units, you can use sockets 1-4 on one unit and 5-8 on the other.

It is also acceptable if each MX unit has a separate analog cable to the MPM4100. For example, MX4000 to socket A and MX4003 to socket B can both have the same MX address, so long as the socket is different.

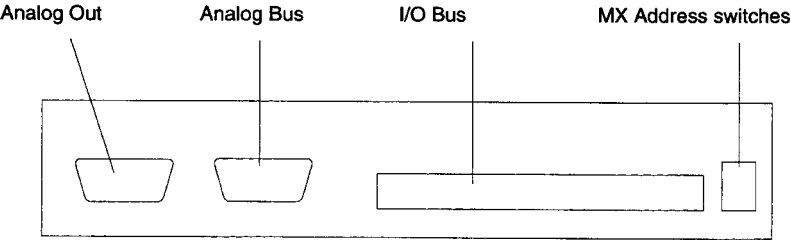


Figure 3.3 Typical MX front panel layout

The left-hand connector is the Analog Output from the MX unit. This socket connects to the MPM4100 using the EX40-00 extension cable. The right-hand analog socket is used to link to MX units of the same type, eliminating the need for multiple analog cables when using the same MX type unit. These two connectors are equivalent and it does not matter whether you use the right or left-hand socket.

If your MX units are of different types (Section 3.3.3), use a separate analog cable from each MX unit to the sockets on your MPM4100. If any of your MX units are of the same type (for example, the MX4000 and MX4003 outputs are compatible), use a single analog cable (Solomat reference EX40-00) to the MPM4100 and an analog strapping cable (Solomat reference EX40-01) between the two MX units.

Digital signals between each MX unit are connected through the 26-way IDC sockets. There are two sockets next to each other; they are equivalent and it does not matter whether you use the right or left-hand socket. Use the digital strapping cable, EX4-01.

A single Smart cable (ref. EX61-00) controls all the MX units via the MPM4100 **COMMS** socket.

Connection Notes

- 1 The analog bus between the MX units must be connected to the MPM4100 with at least one analog cable.
- 2 The MX4003 is the same as the MX4000 except that it can be ordered as 0-10V inputs or 4-20mA inputs.
- 3 The AD50B may be used with the MX4000 if only a few 0-10V or 4-20mA inputs are required.

3.3.3 Description of MX variants**MX4000**

The MX4000 is the general purpose switching box, accepting most Solomat probes except thermocouple, conductivity, dissolved oxygen and high impedance type probes. The MPM4100 first Activates the probes, then Selects the Socket and MX address, selecting socket 1 to 8 and address 1 to 4 of the MX units to select 32 channels. Once the MX unit is Activated, all the probes are switched On, which may mean excessive current drain on your MPM4100.

The regulated power supply in the MPM4100 is limited to 350 mA to stay within specifications. Contact your Solomat service department to check the maximum power requirement for your system.

The MX4000 circuit board can be converted to MX4003 inputs. Contact your Solomat service department for details.

MX4002

This 8-socket type-K thermocouple multiplex unit includes thermocouple wire throughout the input and output stages. The circuitry that switches the different sockets is housed in an isothermal environment to avoid errors. This switching unit consumes so little power that it is left ON at all times.

Use the EX42-01 analog cable to strap together extra MX4002 units along with the EX4-01 for digital connections. Type T and J thermocouples can be used with this MX unit, but avoid temperature differences between the MX4002 and MPM4100: add 0.1°C error for each 1°C difference. Contact Solomat for MX4002 units built for use with B,R,S or N type thermocouples.

MX4003

This switching unit is the same as the MX4000, but includes a resistor divider network on each channel to allow for 0-10 volt or 4-20mA inputs. The output from the MX4003 is 0-800mV so it can be used with sockets **A** or **C**. Use Custom Calibration (Section 4.7.4) to correctly configure your input signals. Use the EX40-03 analog cable and EX4-01 digital cable strap to connect extra MX4000's or MX4003's.

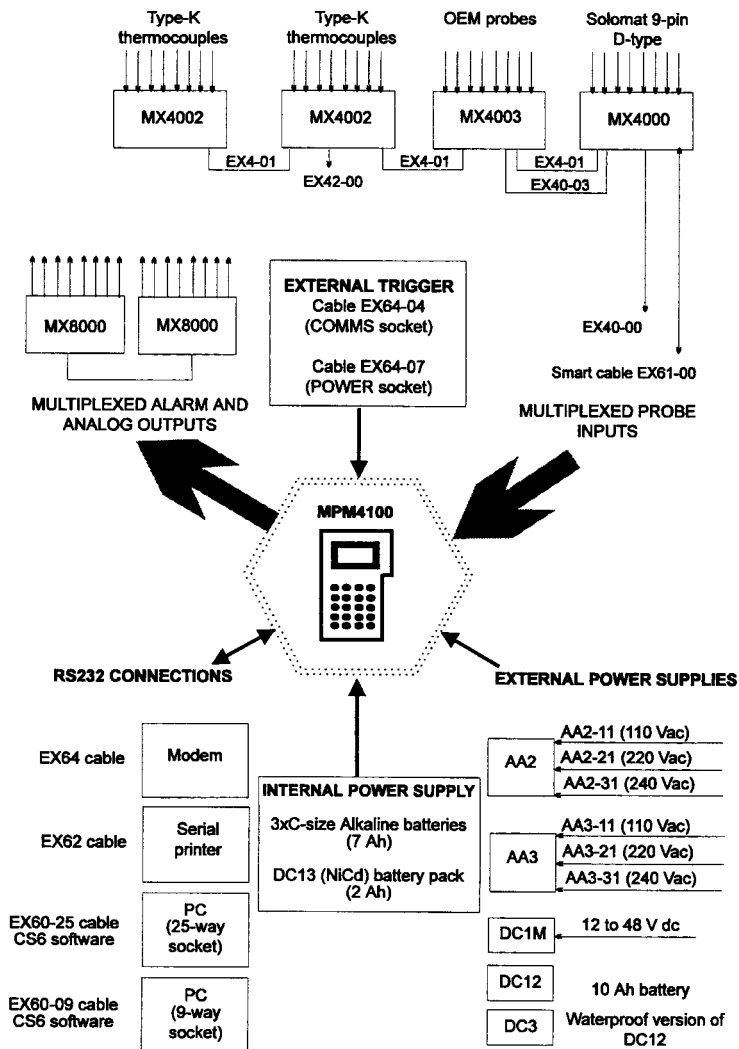


Fig 3.4 Cable connections to the MPM4100

3.4 Security Housing for the MPM4100

The security case for the MPM4100 (ref. CC25) is intended to allow the MPM4100 to be secured to a wall.

The CC25 case uses a rigid foam insert to support the instrument. A cloth strap allows easy removal of the instrument for battery replacement. Note that when using the CC25, the MPM4100 depends on the internal batteries for power. It is possible to connect a DC12 waterproof battery for external battery power but, if you use Power Down during logging, you will get at least 6-8 weeks use from alkaline batteries if datalogging on a 15-minute interval.

To Use the CC25 security case:

- (1) Ensure that you have installed fresh batteries or a fully recharged NiCd battery pack.
- (2) Connect probes as appropriate, removing waterproof dust covers where necessary and securing plug covers where no probe is connected.
- (3) Remove the clear polycarbonate top lid from the security case and fit the MPM4100 into the foam cutout.
- (4) Ensure that the instrument is fully programmed, the correct logging setup and channel setup have been entered. Also ensure that probes have been calibrated. Start logging.
- (5) Replace the clear polycarbonate lid and secure with a key lock.

NOTES: If you wish to bury the instrument, dig a hole at least 200 mm wide and 400 mm long, to a sensible depth. Place the security case and cables into the hole and cover with dirt. For total protection, dig a narrow trench and bury the cables as well.

For wall mounting, you may wish to use the AA2 or AA3 ac adaptor. The EX42 wallmount frame supports an ac adaptor and up to four MX units.

Chapter 4

USING THE MPM4100

4.1 INTRODUCTION

The purpose of this chapter is to explain how to use the MPM4100 without access to a PC. For information on using the MPM4100 with a PC, refer to Chapter 5.

In order that the instructions in this chapter can be as brief as possible, it is assumed that you are familiar with the functions of the MPM4100 (if not, first read Chapter 2) and with the definition of terms in the glossary (Preliminary Page xii). Also, within this chapter:

- The MPM4100 keys are identified in bold capital letters (for example, **CLEAR**) using the title engraved on the key.
- Quotations taken from the MPM4100 screen are shown in bold, capital, italics (for example, **SURE?**).
- Where alternative identities exist in the engraved titles, such as the **ENTER/YES** key, only the appropriate identity is used. For example, to answer the displayed prompt **SURE?**, the **ENTER/YES** key is referred to as the **YES** key and, in describing how to use the setup menus, it is referred to as the **ENTER** key.
- Messages in excess of six characters that are displayed in the 'option message' area of the LCD are divided and displayed on successive screens. For example, **SHORT TERM AVG TIME** is shown on four screens. In this chapter, these messages are described as if they are one complete message.
- Secondary keys are identified by the engraving on the MPM4100 case (for example, **SYMBOL**) with the actual key presses in brackets. In this chapter, this key press is referred to as **SYMBOL (SHIFT and CLEAR)**.

NOTE: When using secondary keys, press the keys in the order in which they appear in the brackets. That is, in this example, first press the **SHIFT** key and hold it pressed while you press the **CLEAR** key. In this way, you avoid any possibility of the **CLEAR** key being recognised on its own.

4.2 PREPARATION FOR USE

If the MPM4100 is to be powered from dry-cell batteries, it is recommended as good working practice always to have replacement batteries available. The MPM4100 uses three C-size alkaline batteries.

If rechargeable batteries are used, ensure that they are fully charged (Chapter 6).

4.2.1 Instrument housing

Ensure that the MPM4100 is housed suitably for the environment in which it is to be used. If necessary, use the Solomat security housing (Section 3.4).

4.2.2 Wall mounting

To use the MPM4100 with the Solomat wall-mounting fixings (Section 1.4.2):

- (1) Remove the four M3 fixing screws (Fig 4.1) at the rear of the MPM4100.
- (2) Fit wall-mounting pillars (ref. EN44) in place of the M3 fixing screws.
- (3) Drill the wall-mounting location to suit the MPM4100 fixing dimensions (Fig 4.1).
- (4) Use the four M3 fixing screws to secure the MPM4100 in position.

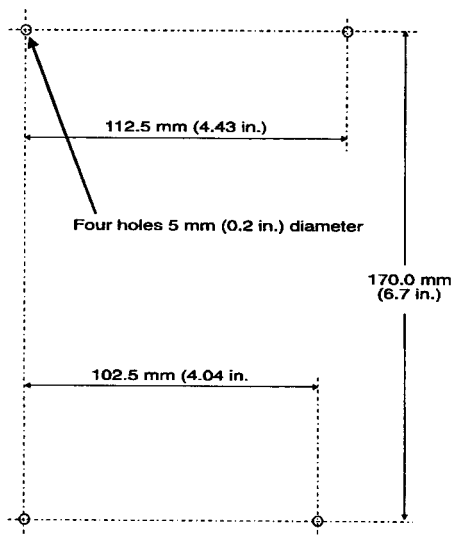


Fig 4.1 Wall-mounting fixings

4.2.3 Power supply

If the power supply for the MPM4100 is to be other than internal batteries, refer to Chapter 3 for the connection details.

4.2.4 Probe connections

Refer to Chapter 3 for details of connecting probes to the MPM4100. In brief:

- Use sockets **A** or **B** for Pt100 probes and, except Smart probes, any of the probes listed in Chapter 1, Table 1.1 that have a 9-pin, D-shell connector.
- **Only** use socket **C** for Solomat Smart probes. Currently, for the MPM4100, the only Smart probe available is the 3-element Air Quality probe, type 1110AQ.

CAUTION: MPM4100 internal circuits may be damaged if socket C is used for any probes other than Solomat Smart probes.

- Use socket **D** for type-K thermocouples and OEM probes measuring ± 50 mV.

4.3 SWITCHING ON AND OFF

- (1) To switch On the MPM4100 press, and hold, the **ON (SHIFT and OFF)** key. Release when the instrument title (**MPM4100**) is displayed.

The instrument title (**MPM4100**) and reference number (for example, **00 10 16**) is displayed.

The date and time stored in the MPM4100 are displayed.

The Measurement screen in use when the MPM4100 was switched Off, is displayed.

NOTES: If the Measurement screen refers to a disconnected socket, the measurement data is most likely to be shown as **0000**.

If an error is detected during the internal checks that are carried out at switch-on, an **ERROR** code is displayed (Section 6.3). Press **YES** to accept the error condition, and the MPM4100 attempts to continue normal operation but, if that is impossible, a **FAULT** code is displayed and the MPM4100 switches off automatically.

Refer to Chapter 6 for a list of the error and fault codes.

- (2) To switch Off the MPM4100 press, and keep pressed, the **OFF** key.

A three-second count-down is started, which is indicated by **OFF 3**, **OFF 2** and **OFF 1**, and then the MPM4100 switches Off.

Release the **OFF** key.

NOTE: The **OFF** key can be used when any screen is displayed.

4.3.1 Switch-on options

For each of the following switch-on options, the startup screens follow each other automatically and the complete sequence takes approximately two seconds. Refer to Section 2.9.1 for effect of these switch-on options.

CAUTION: Calibration and measurement data will be lost when the 'hard' reset option is used.

After using the appropriate switch-on option, refer to:

- Section 4.4, to make initial settings such as selecting the operating mode.
- Section 4.5, to make measurements using Single mode.
- Section 4.6, to use the MPM4100 menus.
- Section 4.7, to make measurements using Multi-channel mode.
- Section 4.8, to use the logging facilities.

Soft reset at switch-on:

- (1) Press, and hold the **SHIFT** and **CLEAR** keys, then press the **OFF** key until the instrument title is displayed. Release the three keys.
- (2) Consecutively, the instrument title (**MPM4100**), date and time are displayed.
- (3) The Measurement screen that was being used when the MPM4100 was last switched Off, is displayed.

Hard reset at switch-on:

- (1) Press, and hold the **SHIFT**, **CLEAR** and **HOLD** keys, then press the **OFF** key until **FULL RESET** is displayed. Release the four keys.
- (2) **FULL RESET** is displayed.
- (3) Page numbers (**PAGE 00** to **47**) are displayed, as the RAM is tested.
- (4) Consecutively, the instrument title (**MPM4100**), date and time are displayed.
- (5) The Pt100 Measurement screen is displayed.

Set Auto Power-down at switch-on:

- (1) Press, and hold the **SHIFT** and **▼** keys, then press the **OFF** key until **PDWN** is displayed. Release the three keys.
- (2) **YES** or **NO** is displayed to indicate the status of the power-down option. Each time this switch-on option is used, the status is changed over.
- (3) Consecutively, the instrument title (**MPM4100**), date and time are displayed.
- (4) The Measurement screen that was being used when the MPM4100 was last switched Off, is displayed.

Display log-stop codes at switch-on:

- (1) Press, and hold the **SHIFT** and **▲** keys, then press the **OFF** key until **LOG STATUS** is displayed. Release the three keys.
- (2) The 'log-stop code' is displayed (at the same time as **LOG STOP FLAG**) as one of the following messages:

NO LOG	No log session
INTVAL	Log interval too short: log aborted
SERCOM	Serial communications stopped log
USEABT	Log session aborted by user
DCFAIL	Log session aborted: DC supply failure
LOWBAT	Log session aborted: low power
OVRFLW	Memory filled
ALL OK	Log session terminated normally

- (3) Consecutively, the instrument title (**MPM4100**), date and time are displayed.
- (4) The Measurement screen that was being used when the MPM4100 was last switched Off, is displayed.

Other diagnostic options are available at switch-on to assist with fault-finding procedures (refer to Section 6.3 for details).

4.3.2 Keypad enable/disable

Whenever a Measurement screen is displayed, unwanted key presses can be prevented by pressing simultaneously the **▼**, **NO** and **YES** keys. The confirmation message **KEY OFF** is displayed for two seconds.

To recover the use of the keypad, press again the **▼**, **NO** and **YES** keys. The confirmation message **KEY ON** is displayed.

4.4 INITIAL SETTINGS

After switch-on, the MPM4100 returns to the operating mode and Measurement screen that was in use when it was last switched Off. You can then change the MPM4100 setup to suit your requirements, as follows:

4.4.1 Selecting an operating mode

Use the **CHAN MODE (SHIFT and HOLD)** key to toggle between the two operating modes of the MPM4100; Single mode and Multi-channel mode.

On the Measurement screen, Single mode can be distinguished by the **socket** number (for example, **SKT A**) in the 'Option message' area of the display, as opposed to the **channel** number (for example, **CHN 1**) which is displayed in Multi-channel mode.

Refer to Section 4.5 to use the MPM4100 in Single mode.

Refer to Section 4.7 to use the MPM4100 in Multi-channel mode.

4.4.2 Selecting an instrument setup ('procedure')

If you know that the MPM4100 channel and log settings have been set-up for a particular application, and that the setup (which is referred to as a 'procedure') has been stored, then the MPM4100 can be returned to those channel and log settings as follows:

NOTE: Selecting an instrument 'procedure' is only appropriate when using the MPM4100 in Multi-channel mode.

- (1) Press the **PROC SELECT (SHIFT and TEMP)** key, to display **PROC P0**.

Two instrument 'procedures' can be stored in the MPM4100 and they are identified as **PROC P0** and **PROC P1**. You need to know which one is the 'procedure' that you are going to use. You can toggle between the two possibilities by pressing the **TEMP** key.

- (2) Select, as appropriate, **PROC P0** or **PROC P1** and press **YES**, to display **LOAD LOG PROC**.
- (3) Press **YES**, to display **OK**.

CAUTION: If you accept this 'procedure', you will overwrite the existing channel and log settings.

- (4) Press **YES**, to accept the stored 'procedure' and to return to the Measurement screen, or **NO** to return direct to the Measurement screen.

NOTE: Refer to Section 4.9 to store an instrument 'procedure'.

4.5 MAKING SINGLE-MODE MEASUREMENTS

In Single mode, measurements from probes connected directly to each of the MPM4100 sockets are available for selection by pressing the associated Measure key. Repeated pressing of the Measure key cycles between available probe types. For example, repeatedly pressing the **TEMP** key cycles between **Pt100**, **K T/C** (type-K thermocouple) and **DELTA T** (temperature difference).

4.5.1 Defining measure/symbol/socket

Before using Single mode, you must set an appropriate measure/symbol/socket definition for the probe connected to the MPM4100 (Table 4.1).

- (1) Press the Measure key appropriate to the probe to be used. The default probe-type is displayed for three seconds. For example, pressing **TEMP** displays **PT100**.
- (2) A Measurement screen is displayed (Fig 4.2) showing a measurement that assumes the default probe is connected to the first of the possible sockets (which is socket **A** for the **TEMP** key).

NOTES: If the probe is connected to an alternative socket, the displayed measurement is meaningless.

At this stage, you have defined the measurement for which the MPM4100 is to be used, but you can change the symbol to be displayed and the socket to which the probe is actually connected.



Fig 4.2 Defining measure/symbol/socket in Single mode

- (3) Press the **NEXT SKT** (**SHIFT** and **NEXT CHAN**) key to cycle between possible sockets to which this type of probe may be connected. For example, if the **TEMP** Measure key has been used, sockets **A**, **B** and **D** are the only possibilities available.
- (4) Press the **SYMBOL** (**SHIFT** and **CLEAR**) key to cycle between the symbols available for this type of measurement. If a Pt100 probe is being used, the available symbols are; **°C**, **°F** and **K**.

NOTE: If the symbol selected is shown in the 'Option message' area, the socket reference alternates with the symbol on consecutive screens.

4.5.2 Using the hold, min/max, and average facilities

Once you have set the measure/symbol/socket definition and the Measurement screen is displayed, the MPM4100 shows the instantaneous measurement from the probe that you have selected.

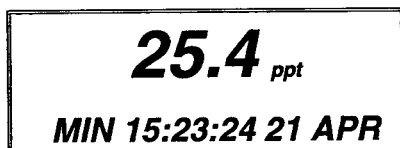
To 'freeze' this instantaneous indication, press the **HOLD** key. To return to the instantaneous indication, press again the **HOLD** key.

Table 4.1 Default measure/symbol/socket displays

Measure key	Used to measure:	Repeatedly pressing the Measure key displays:	Repeatedly pressing the NEXT SKT key displays:	Repeatedly pressing the SYMBOL key displays:
%RH/DEWPT	Humidity and dewpoint temperature	<i>355RH, 355RH NO TCO</i>	<i>SKT A, SKT B, SKT C</i>	<i>%RH, DEWPNT °C, DEWPNT °F</i>
GAS	CO and CO ₂ concentration	<i>CO, CO₂</i>	<i>SKT A, SKT B, SKT C</i>	<i>ppm</i>
TEMP	Temperature	<i>Pt100, K T/C, DELTA T T T/C</i>	<i>SKT A, B, C SKT D SKT D SKT D</i>	<i>°C, °F, K °C, °F, mV (CJC) °C, °F, mV (ABS mV) °C, °F, mV (CJC)</i>
AIRSPEED	Airspeed, using hotwire or vane probes	<i>127, 228</i>	<i>SKT A, SKT B</i>	<i>m/s, ft/min, mph, kph, knots</i>
PITOT	Airspeed, using a pitot static tube	<i>PITOT, PITOT NO T/COMP</i>	<i>SKT A, SKT B</i>	<i>m/s, ft/min, mph, kph, knots</i>
VOL FLOW	Airspeed, volume flow rate	<i>127, 228</i>	<i>SKT A, SKT B</i>	
AUX	OEM ±50 mV OEM ±800 mV	<i>CUSTOM 50 mV CUSTOM 800 mV</i>	<i>SKT D SKT A, SKT B</i>	<i>All symbols available All symbols available</i>
	Ratiometric ±800mV MPM4100 internal conditions	<i>CUSTOM V/V REF BATT LIFE INT TEMP</i>	<i>SKT A, SKT B none none</i>	<i>All symbols available mV, %, mA °C</i>
RPM	Tachometer speed	<i>Tacho</i>	<i>SKT A, SKT B</i>	<i>RPM, Hz, μS, mS</i>
	Mid frequency	<i>Freq 0-100 kHz</i>	<i>SKT A, SKT B</i>	<i>kHz, μS, mS</i>
	High frequency	<i>Freq 0-1 MHz</i>	<i>SKT A, SKT B</i>	<i>MHz, μS</i>
	Pulse counting	<i>Events</i>	<i>SKT A, SKT B</i>	<i>none</i>
	Low frequency	<i>0-100 Hz Freq Custom</i>	<i>SKT A, SKT B SKT A, SKT B</i>	<i>All symbols available All symbols available</i>
		<i>0-10KHz Freq Custom</i>	<i>SKT A, SKT B SKT A, SKT B</i>	<i>All symbols available All symbols available</i>
PRESSURE	Air pressure	<i>511LP</i>	<i>SKT A, SKT B</i>	<i>Pa, PSI, inH₂O, Kg/cm²</i>
	Water pressure	<i>514HW</i>	<i>SKT A, SKT B</i>	<i>bar, PSI, Kg/cm², ft, m</i>
	Air pressure	<i>515BP</i>	<i>SKT A, SKT B</i>	<i>mbar, inHg, mmHg, Kg/cm²</i>
	Air pressure	<i>512H</i>	<i>SKT A, SKT B</i>	<i>bar, PSI, Kg/cm² X10Pa, PSI, inH₂O, Kg/cm², ft, m</i>
	Water pressure	<i>513LW</i>	<i>SKT A, SKT B</i>	

To display the minimum or maximum value:

- (1) With a Measurement screen displayed, press the **MIN MAX** (**SHIFT** and **AVG**) key, to display **MINMAX**.
- (2) After a delay of 3 s, the minimum value (Fig 4.3) that is stored for the probe is shown on the Measurement screen. The current time and date are also displayed.

**Fig 4.3 Minimum value displayed**

- (3) To display the maximum value, press the **▼** key.
- (4) Press **MIN MAX** (**SHIFT** and **AVG**) to return to the Measurement screen.

To clear a minimum and maximum value:

- (1) With the maximum value displayed of the measurement to be cleared, press the **▼** key, to display the prompt **CLEAR**.
- (2) Press **YES**, to display the prompt **SURE?**. Press **YES** again to clear the stored minimum and maximum values and to return to the Measurement screen.
- (3) If necessary, repeat for other individual measurements.

Alternatively, to clear all minimum, maximum or average values, press **CLEAR** when a Measurement screen is displayed. Then press **YES** while the prompt **CLEAR ALL FILES** is displayed and **YES** again to the prompt **SURE?** As appropriate, press **YES** to the prompt **MIN MAX** or **AVG**.

To calculate an average value:

- (1) With a Measurement screen displayed, press **AVG** to display the prompt **AVG**. and then the current calculated average, together with a reminder of the time and date that the average was started.
- (2) Press **▼** display the prompt **START/CLEAR** and then press **YES** to reset the average and to start a new average calculation.
- (3) If necessary, repeat for other individual measurements.

4.5.3 Calibrating probes in Single mode

Refer to the Environmental Probes User Manual (part no. 059-0229-00) for details of recommended calibration setup procedures. Calibration is not normally necessary for the probes used with the MPM4100.

- (1) Set-up the controlled conditions for the probe to indicate zero, or a low reference point.
- (2) Press **CAL** (**SHIFT** and **VOL FLOW**) to display the prompt **CLEAR CONST.**

CAL menu:
Select channel
Clear constants Y/N

- (3) Press **YES** to display the prompt **ZERO**. Press **YES** again, to display the measurement from the probe connected to the channel to be calibrated.

NOTE: The actual prompt is specific to the type of probe.

- (4) Set-up the controlled conditions for the probe to display the high reference value.
- (5) Press **YES** to display the probe measurement.
- (6) Press **ENTER** to accept the calibration and to display the Measurement screen.
- (7) An asterisk (*) is displayed, after the socket reference to show that the probe has been calibrated.

4.5.4 Example of a Single-mode measurement

Connect a Pt100 probe to socket A and display the temperature in °C.
Also, connect a 511LP probe to socket B and display the pressure in Pa.



- (1) Connect the probes as described and, if necessary, press **ON (SHIFT and OFF)** to switch On the MPM4100.
- (2) Ensure that the Measurement screen displayed is in Single mode (press **CHAN MODE (SHIFT and HOLD)** to toggle between Single and Multi-channel modes).
- (3) Press the **TEMP** key, to display a temperature measurement.
- (4) As necessary, press the **NEXT SKT (SHIFT and NEXT CHAN)** key until **SKT A** is displayed in the 'Option message' area.
- (5) As necessary, press the **SYMBOL (SHIFT and CLEAR)** key until **°C** is displayed in the 'symbol' area.

NOTE: The MPM4100 is now ready to display a temperature measurement using the Pt100 probe.

- (6) Press the **PRESSURE** key to display a pressure measurement for the 511LP probe.
- (7) As necessary, press the **NEXT SKT** key until **SKT B** is displayed in the 'Option message' area.
- (8) As necessary, press the **SYMBOL** key until **Pa** is displayed in the 'symbol' area.

NOTE: The MPM4100 is now ready to display a temperature measurement from socket **A** and a pressure measurement from socket **B**.

You can display temperature or pressure by pressing, as required, the **TEMP** or **PRESSURE** key. Each time you change between the two measurements, the default probe-type is displayed (that is, **PT100** and **511LP**).

Use the instructions in Section 4.5.2 to display the minimum and maximum values for each of these measurements, and to calculate the average over a set period. Then, clear these stored values.

4.6 USING THE MENU OPTIONS

Menu screens enable you to set-up the channel and log parameters. Consequently, you need to understand how to use the menu options before you can use the MPM4100 in Multi-channel mode or for datalogging.

NOTE: When a menu option is being used, measurements from the MPM4100 probes are ignored. This means that functions such as min/max and averaging are delayed, and PC information is not updated.

4.6.1 Moving within menus

Menu screens are displayed whenever a Setup key (Table 4.2) is pressed.

For example, when you press **FILE SETUP** (**SHIFT** and **PITOT**) the **FILE SETUP** menu title is displayed. After a short delay, the first of the menu options is available for you to enter data or change/accept the existing data.

Some of the Setup keys provide access to more than one menu. For example, when you press **LOG SETUP** (**SHIFT** and **AIRSPD**), both the **TIMING** and **OPTION** menus are available. To select the second of these menus (**OPTION**), press **LOG SETUP** (**SHIFT** and **AIRSPD**) twice.

NOTES: Similarly, if three menus are available (for example, when you use **CHAN SETUP**), press **CHAN SETUP** three times in quick succession to access the **BLOCK SETUP** menu.

Depending on the Measurement screen that you have displayed when you start using the menu options, not all the options listed in Table 4.2 are necessarily available. Some of the option titles are also different for each type of measurement.

Having selected a menu, select the required menu title by using the **▲** or **▼** keys, and enter the menu program by pressing the **ENTER** (or **NO**) key. A simplified diagram of the menu structure is shown in Figure 4.4.

In general terms; you change your selection vertically by using the **▲** and **▼** keys, and change your selection horizontally by using the **ENTER** (or **NO**) key. An example of using a menu is provided in Section 4.6.3.

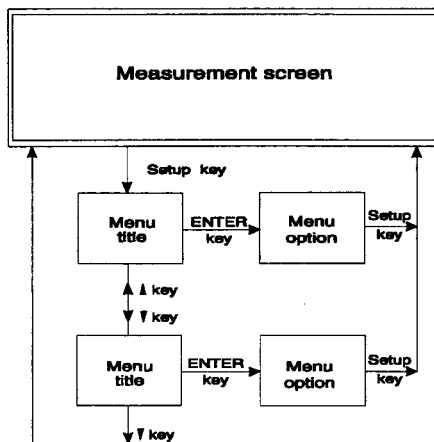


Fig 4.4 Simplified menu diagram

When you have selected a menu option, you can return immediately to the Measurement screen by pressing the same Setup key that you used to leave the Measurement screen. This means that, if at any time you are not sure where you are in the menu structure, you can press the Setup key and start again from the Measurement screen.

Remember, though, to use the Setup key that you used to leave the Measurement screen.

If you are unsure which Setup key to use, repeatedly press the ▼ key and, after displaying all the available menu titles, the Measurement screen is re-displayed.

4.6.2 Editing setup data

When a menu option is selected, the data for editing is displayed in the 'Option message' area. This data is either numeric, alpha or one of the other characters such as '/'.

Numeric characters can be edited by using the numeric keys (0 to 9, . and $\pm$). When numeric data is displayed for editing, the MPM4100 expects you to use the numeric keys. Use them as if they are Primary keys.

Alpha or other characters are not provided on the MPM4100 keypad, but can be edited by using the ► or ◀ keys to scroll through the set of characters. For example, to change the letter F to an H, press the ► key twice.

Data bytes are selected from left to right, and pressing **ENTER** moves the selection to the next data byte. Pressing **ENTER** at the last byte selects the next menu option.

NOTE: The character set includes all the characters seen on a normal typewriter keyboard, including those obtained in upper and lower case.

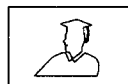
Table 4.2 Setup menus

Set-up requirement	Setup key	Menu options
Set file parameters	FILE SETUP	FILE SETUP menu: This file Y/N Edit file name Clear this file
Select (or store) an instrument 'procedure'	PROC SELECT	PROC menu: Select procedure Load Log Procedure Store Log Procedure
Set MPM4100 functions	FUNCS	FUNCS menu: Set time Set date Set dwell time Set STA time Fast update Y/N MX/DAC active Y/N Battery life Int Temp Sound off Y/N Display to RS232 Y/N
Calibrate probe	CAL	Two menus available: CAL menu: Select channel Clear constants Y/N CAL POINT menu: Select channel Set low reference Set high reference
Set logging parameters	LOG SETUP	Two menus available: TIMING menu: Set start time (real time) Set start date (real time) Set stop time (real time) Set stop date (real time) Set log period (relative) Set log interval (relative) OPTION menu: Select log mode Select overflow mode Log resume Y/N Warmup Y/N Log to RS232 Y/N Power down enable Y/N
Set output functions	OUTPUT	Three menus available: PRINT menu: Select file Log setup Chan setup Min/max/avg Calibration constants RS232 menu: Baud rate Word length bits Stop bits Parity Y/N OPTION menu: Printer width Line feed Y/N Character delay Y/N Setup commands Hangup commands Enable modem Cancel modem
Set channel parameters	CHAN SETUP	Three menus available: PROBE menu: Select channel Select probe/symbol/skt Channel on/off Dwell Y/N Short term average Y/N Select MX reference Tempcomp socket * Maximum reading * Minimum reading * User-defined symbol ALARM menu: Select channel Alarm on/off Set high point Set low point BLOCK SETUP menu: Set channel upper limit Lower channels on Y/N Lower dwell on Y/N Lower STA on Y/N

* Only displayed for Custom options (Section 4.7.2)

4.6.3 Example of using a menu

Select file **FILE03**, and change the name to **SITE01**



NOTE: Refer to Table 4.2 and you can see that, to change this file name, you must first select the **FILE SETUP** menu, then select the **EDIT FILE NAME** option, change the name and return to the Measurement screen.

- (1) If necessary, press **ON (SHIFT and OFF)** to switch On the MPM4100.
- (2) When the Measurement screen is displayed, press **FILE SETUP (SHIFT and PITOT)**.
- (3) On alternate screens, the message **FILE** and **SETUP** is displayed.
- (4) After two seconds, the message **FILE01 THIS FILE? Y/N** is displayed on four consecutive screens.

This message is an invitation to edit the first file, which you don't want, so move to the next one.

- (5) Press **NO** twice to change the prompt to **FILE03 THIS FILE? Y/N**.

NOTE: If you go past the file number you require, press **◀ (SHIFT and NO)** repeatedly until you have **FILE03** selected.

- (6) Press **YES**, and the message **EDIT FILE NAME FILE03** is displayed.
- (7) Press **YES**, and the letter **F** is selected (flashing) for you to edit.
- (8) Press **▶** repeatedly until the letter **F** is changed to **S**.
- (9) Press **YES**, and the letter **I** is selected, but you don't want to change this, so press **YES** again.
- (10) Repeat this procedure until you have changed **FILE03** to **SITE01**.

NOTE: To change **3** to **1**, use the **◀** key.

- (11) Press **YES** to accept the entry, and to display the next menu option (**F3 CLEAR THIS FILE SITE01**). You don't need to clear the file for this example.
- (12) Return to the Measurement screen by pressing **FILE SETUP (SHIFT and PITOT)**, which is the Setup key that you used to enter the **FILE** menu.

4.6.4 Setting the time and date

Whether the MPM4100 is switched on or off, the internal clock is automatically updated. This also applies while the MPM4100 batteries are removed.

It is not necessary to reset the MPM4100 clock for normal calendar changes (that is, number of days in a month) or for changes due to a Leap Year, but it is necessary under the following conditions:

Changes due to Summer Time clock alterations

Time changes due to international travel

When necessary, set the MPM4100 clock as follows:

- (1) Press the **FUNCS (SHIFT and RPM)** key, and **FUNCS** is displayed.
- (2) After a short delay, **SET TIME** is displayed.

You have entered the **FUNCS** menu, and the first option is the one that you want.

NOTE: To find other menu options, press the ▼ key to scroll down through those available or ▲ to scroll up.

FUNCS menu:

Set time
Set date
Set dwell time
Set STA time
Fast update Y/N
MX/DAC Active
Battery life
Int temp
Sound off Y/N
Display reading to RS232

- (4) Press **YES**, and the time is displayed in hours, minutes and seconds (Fig 4.5).
The 'hours' setting is selected (flashing) ready for you to change, if required.

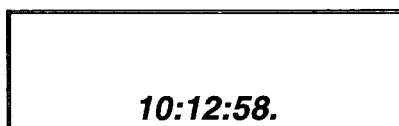


Fig 4.5 Setting the time

- (5) Using the Numeric keys, set the 'hours' as required. The highest number that you can input is **23**.
- (6) Press **ENTER** to accept the 'hours' setting, and the 'minutes' setting is selected.
- (7) Using the Numeric keys, set the 'minutes' as required. The highest number that you can input is **59**.
- (8) Press **ENTER** to accept the 'minutes' setting, and the 'seconds' setting is selected.
- (9) Using the Numeric keys, set the 'seconds' as required.

NOTE: The displayed time is entered into the MPM4100 memory when you next press the **ENTER** key.

- (10) Press the **ENTER** key to accept the time entry. The confirmation message **OK** is displayed, followed by the next menu option (**SET DATE**).

At this point, you have two choices; to go on to edit the 'date' or to return to the Measurement screen.

Press **FUNCS (SHIFT and RPM)** to return to the Measurement screen.

Press **YES**, to select the **SET DATE** option.

When necessary, set the MPM4100 date as follows:

- (1) When **SET DATE** is displayed, press **ENTER** and the date is displayed in 'year', 'day' and 'month' (Fig 4.6).

The 'days' are selected (flashing), ready for you to change, if required.

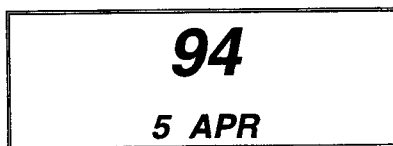


Fig 4.6 Setting the date

- (2) Using the Numeric keys, set the 'days' as required. The highest number that you can input is **31**.
- (3) Press **ENTER**, and the 'month' is selected.
- (4) Edit the 'month' by using the **►** or **◄** keys to scroll through the calendar months.
- (5) Press **ENTER**, and the second part of the 'year' is selected (for example, **93**).
- (6) Press **ENTER** after setting (or accepting) the 'year'. The prompt **OK** is displayed, followed by the next menu option (**DWELL TIME**).
- (7) Press **FUNCS (SHIFT and RPM)** to return to the Measurement screen.

4.6.5 Setting the bleeper on/off

- (1) Press the **FUNCS (SHIFT and RPM)** key, and **FUNCS** is displayed.
- (2) Repeatedly press the **▼** key until **SOUND OFF** is displayed.
- (3) Press **YES** or **NO** as appropriate.
- (4) Press **FUNCS** to return to the Measurement screen.

4.7 MAKING MULTI-CHANNEL MODE MEASUREMENTS

In Multi-channel mode, the full range of MPM4100 features becomes available. Up to 32 channels can be allocated to the probes that are connected to the MPM4100, and each channel individually specified in accordance with the associated probe.

Press **CHAN MODE** (**SHIFT** and **HOLD**) to toggle between Multi-channel mode and Single mode. Multi-channel mode is indicated by the word **MULTI** as it is selected and a channel number displayed (for example, **CHN 1**) instead of a socket number.

Three menus are available to set the channel parameters (Table 4.2):

CHAN SETUP menus:

Probe menu
Alarm menu
Block Setup menu

4.7.1 Defining channel/probe/socket

Before using Multi-channel mode, you must set at least one channel/probe/socket definition for each probe connected to the MPM4100.

Set a channel/probe/socket definition as follows:

- (1) Ensure that the MPM4100 is in Multi-channel mode. If necessary, press the **CHAN MODE** key (**SHIFT** and **HOLD**).
- (2) Press the **CHAN SETUP** (**SHIFT** and **STORE**) key once to display the **PROBE** menu, which is the first of the three menus available for setting the channel options. The prompt **CHAN=** is displayed.

NOTE: To select the second **CHAN SETUP** menu (**ALARM**), press the **CHAN SETUP** key twice in quick succession, and three times to select the third menu (**BLOCK SETUP**).

- (3) Use the Numeric keys to enter the required channel number.
- (4) Press **YES** for the selected channel, and the existing probe/symbol/socket definition is displayed (Fig 4.7).

CAUTION: If you set the parameters for this channel, you will overwrite the existing channel settings.



Fig 4.7 Channel setup selection

- (5) Press the Measure key appropriate to the probe to be used, and a default probe type is displayed for three seconds. For example, pressing **TEMP** displays **PT100**.
- (6) Press the **SYMBOL** (**SHIFT** and **CLEAR**) key to cycle between the symbols available for this type of measurement.

- (7) Press the **NEXT SKT (SHIFT and NEXT CHAN)** key to cycle between possible sockets to which this probe may be connected. Select the appropriate socket reference.

NOTES: If the probe is connected via an MX unit, the socket reference you select is the socket to which the MX unit is connected.

The default probe types, sockets and symbols for all the Measure keys are listed in Table 4.1 (page 4-7).

- (8) Press **▼** to display the next menu option **CHN ON**.

At this stage, you have defined the channel/probe/socket for this channel and you can either proceed with setting the remainder of the channel options, or press **CHAN SETUP (SHIFT and STORE)** to return to the Measurement screen.

NOTE: If necessary, you can set several channel/probe/socket definitions for each probe in order to set channel options for individual environmental conditions. For example, to set two alarm levels for the same probe.

4.7.2 Setting the channel options

You can use this Section either as a continuation of setting the channel/probe/socket definition or you can use these procedures to change the options for a channel that has already been set-up.

NOTE: At any time that a menu option (for example, **DWELL**) is displayed, you can return to the Measurement screen by pressing the **CHAN SETUP (SHIFT and STORE)** key.

- (1) Press the **CHAN SETUP (SHIFT and STORE)** key to display the **PROBE** menu.

PROBE menu: Select probe/symbol/skt Channel on/off Dwell Y/N Short term average Y/N Select MX reference Tempcomp socket Maximum reading Minimum reading User-defined symbol

- (2) When **CHAN=** is displayed, enter the appropriate channel number and press **ENTER**.
- (3) Press **▼**, and accept the displayed channel/probe/socket definition.

You can now set the channel options, in the following order:

- (1) When **CHN ON** is displayed, press **YES** or **NO** as appropriate.
- (2) When **DWELL** is displayed, press **YES** or **NO** as appropriate.
- (3) When **SHORT TERM AVG** is displayed, press **YES** or **NO** as appropriate.

NOTE: Refer to Section 4.9 for details of setting the dwell and STA times.

- (4) When **MX NO=** is displayed, enter the MX reference, if appropriate. Multiplexed probes are addressed first by the MPM4100 connector reference (A = 1, and so on), then the reference of the MX unit (1 to 4) and, finally, the multiplexer socket reference (1 to 8). For example, probe 124 refers to the probe connected to the fourth input of MX unit 2 which, in turn, is connected to MPM4100 socket A.

- (5) When **TEMPCO SKT DEFLT** is displayed, press **YES** or **NO** as appropriate and change the socket reference if required, using the ◀ and ▶ keys. (If you change the socket reference **DEFLT** is changed to the socket letter). Press ▼ to accept the entry.

NOTE: This option is only available if the probe is temperature compensated (for example, pitot static tube or humidity measurements).

- (6) When **CUSTOM FS** is displayed, press **YES** if this channel uses a custom probe and the fsd requires setting. **SET RDG AT FS** is displayed, and you can enter a numerical value and decimal point as required. Press ▼ to accept the entry.
- (7) When **CUSTOM ZERO** is displayed, press **YES** if this channel uses a custom probe and the zero requires setting. **SET RDG AT ZERO** is displayed and you can enter a numerical value and decimal point as required. Press ▼ to accept the entry.

At this stage, you have set all the options that are available from the **PROBE** menu. You can set other channel parameters by using the other **CHAN SETUP** menus (**ALARM** or **BLOCK SETUP**).

Select the **ALARM** menu by pressing **CHAN SETUP (SHIFT and STORE)** twice:

- (1) When the prompt **CHAN=** is displayed, enter the channel number and press **YES**.

ALARM menu: Select channel Alarm on/off Set high point Set low point

- (2) When **ALARM ON** is displayed, press **YES** or **NO** as appropriate.
- (3) When **SET HI** is displayed, use the Numeric keys to enter the appropriate alarm level. Press **ENTER** to accept the entry.
- (4) When **SET LO** is displayed, use the Numeric keys to set the appropriate alarm level. Press **ENTER** to accept the entry and to return to the Measurement screen.

Select the **BLOCK SETUP** menu by pressing **CHAN SETUP (SHIFT and STORE)** three times:

- (1) When the prompt **CHAN=** is displayed, enter the channel number that is the highest number of the 'block' to be set, and press **YES**. For example, if you enter the number 5, then channels 1 to 5 will be affected by the options that you set with this menu.

BLOCK SETUP menu: Set channel upper limit Lower channels on Y/N Lower dwell on Y/N Lower STA on Y/N
--

- (2) When **CHN ON** is displayed, press **YES** or **NO** as appropriate.
- (3) When **DWL ON** is displayed, press **YES** or **NO** as appropriate.
- (4) When **STA ON** is displayed, press **YES** or **NO** as appropriate. The display returns to the Measurement screen.

4.7.3 Setting the scan options

As well as the channel options that have been set, the scan program is determined by:

Setting of the dwell time option

Setting of the short term average (STA) time

Use of the fast update option

If necessary, refer to Section 2.3.7 for a description of these scan options. You can set these options either by following on from setting the channel options or as a separate procedure.

Set the dwell time as follows:

- (1) Press the **FUNCS** (**SHIFT** and **RPM**) key, and **FUNCS** is displayed, followed by the prompt **SET TIME**. This prompt refers to the MPM4100 clock time which rarely needs changing. Similarly, the next option (**SET DATE**) is not often used.

FUNCS menu:

Set time

Set date

Set dwell time

Set STA time

Fast update Y/N

MX/DAC active Y/N

Battery life

Int temp

Sound off Y/N

Display reading to RS232

- (2) Press **▼** twice, and **DWELL TIME** is displayed.
- (3) Press **YES**, to display the current dwell time (minutes, seconds and tenths of seconds) stored in the MPM4100 (Fig 4.8).
- (4) Use the Numeric keys to set the dwell time as required.
- (5) Press **ENTER** to accept the entry.

:02:58.3

Fig 4.8 Setting the dwell time

Set the STA time as follows:

- (1) Immediately after setting (or accepting) the dwell time (as described above), the prompt **SHORT TERM AVG TIME** is displayed.
- (2) Press **YES**, to display the current STA time (minutes, seconds and tenths of seconds) stored in the MPM4100.
- (3) Use the Numeric keys to set the STA time as required.
- (4) Press **ENTER** to accept the entry.

Set the fast update option as follows:

- (1) Immediately after setting (or accepting) the STA time (as described above), the prompt **FAST UPDATE** is displayed.
- (2) Press **YES** or **NO** as appropriate. 'Fast update' allows channels to be scanned without averaging several outputs from the analogue-to-digital circuit.
- (3) The Measurement screen is re-displayed.

Having set-up the channel and scan options, press **HOLD** to start scanning all the channels set to On. As each channel is selected, the instantaneous measurement from the associated probe is displayed, and the time that it is displayed is determined by the dwell and STA times set.

4.7.4 Using the channel calibration facilities**Modifying the calibration of a Solomat probe:**

NOTE: Calibration of the Solomat probes listed in Section 1.5 is factory-set, and it is not usually necessary to use the channel calibration facilities described below, except for humidity and carbon dioxide.

To modify the calibration of a Solomat probe, use the **CAL** menu in conjunction with the settings for the channel in which the probe is used. If the probe is used in more than one channel, each channel must be calibrated separately.

Refer to the Environmental Probes User Manual (part no. 059-0229-00) for details of recommended calibration set-up procedures.

- (1) Set-up the controlled conditions for the probe to indicate zero, or a low reference point.
- (2) Ensure that the MPM4100 is in Multi-channel mode.
- (3) Press **CAL** (**SHIFT** and **VOL FLOW**) to display **CHAN=**.

CAL menu: Select channel Clear constants Y/N

- (4) Enter the number of the channel to be calibrated and press **ENTER**, to display the prompt **CLEAR CONST.**
- (5) Press **YES** to display the prompt **ZERO**. Press **YES** again, to display the measurement from the probe connected to the channel to be calibrated.
- (6) Press **ENTER** to accept the entry and to display **HI REF.**
- (7) Set-up the controlled conditions for the probe to display the high reference value.
- (8) Press **ENTER** to accept the entry and to display the Measurement screen.

NOTE: A channel that has been calibrated is indicated by an asterisk (*) after the channel number.

Setting the calibration points for an OEM probe:

To set the calibration points for an OEM probe, use the Custom facilities in the **FUNCS** menu in conjunction with the settings for the channel in which the probe is used. If the probe is used in more than one channel, each channel must be calibrated.

For example, if the **AUX** key is used as the Measure key in setting a probe/symbol/socket definition, an OEM probe measuring 4-20 mA can be used.

This facility allows voltage, frequency and current inputs to be scaled and engineering units to be selected.

- (1) Set-up the controlled conditions for the probe to indicate full-scale. For example, a 4-20 mA transducer should produce 20 mA.
- (2) Press **CHAN SETUP (SHIFT and STORE)** to enter the **PROBE** menu.
- (3) Enter the appropriate channel number and probe/symbol/socket definition as described in Section 4.7.1. If an OEM (Custom) probe is specified, then the **PROBE** menu becomes slightly different to that used in Section 4.7.1:

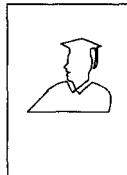
PROBE menu:
Select probe/symbol/skt
Channel on
Dwell Y/N
Short term avg Y/N
Select MX reference
Maximum reading
Minimum reading
User symbol

- (4) Set the Dwell and STA on/off as appropriate and, when the prompt **MAXRDG** is displayed, use the numeric keys to set the full-scale indication, as required.
- (5) Press **ENTER** to accept the entry and to display **MINRDG**.
- (6) Set-up the controlled conditions for the probe to display zero or the low reference point (for example, a 4-20 mA transducer should produce 4 mA) and use the numeric keys to set the full scale as required.
- (7) Press **ENTER** to accept the entry and to display **USER SYMBOL**.
- (8) If required, use the ◀ and ▶ keys to change the displayed **000000** to the symbol reference required. Press **YES** to accept the entry and to return to the measurement screen.

4.7.5 Example of a Multi-Channel mode measurement

Scan channels 1, 2 and 3 as follows:

- Channel 1 A Pt100 probe is connected to socket A, the temperature is to be displayed in °C, with a low alarm set at 21°C.
- Channel 2 Use the same probe, but set the low alarm at 25°C.
- Channel 3 A 127MS hotwire probe is connected to socket B, and the airspeed is to be displayed in m/s.



Set channel 1 as follows:

- (1) If necessary, press **ON** (**SHIFT** and **OFF**) to switch On the MPM4100.
- (2) Ensure that the Measurement screen displayed is in Multi-channel mode (press **CHAN MODE** (**SHIFT** and **HOLD**) to toggle between Single and Multi-channel modes).
- (3) Press **CHAN SETUP** (**SHIFT** and **STORE**) to display **CHAN =**
- (4) Press numeric key **1** and then **ENTER**, to display the current channel/probe/socket definition for channel 1.
- (5) Using, as necessary, the **TEMP**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to Pt100, °C and socket A.
- (6) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 1 to On.
- (7) When **DWELL** is displayed, press **YES**..

NOTE: Although a dwell time is not necessary for a Pt100 probe, the dwell time is switched on so that the temperature measurement remains displayed long enough for it to be read. The dwell time is set from the 'scan' options (*next page*).

- (8) Press **CHAN SETUP** to return to the Measurement screen, and then press **CHAN SETUP** twice to enter the **ALARM** menu with a display of **CHAN =**
- (9) Press numeric key **1** and **ENTER** to display **ALARM ON**. Press **YES** to display **ALM HI**.
- (10) Use the Numeric keys to set the alarm level to **21.0**. Press **ENTER** to accept the entry, and to display **ALM LO**.
- (11) Press **CHAN SETUP** to return to the Measurement screen.

Set channel 2 as follows:

- (1) Press **CHAN SETUP** to display **CHAN =**
- (2) Press numeric key **2** and then **ENTER**, to display the current channel/probe/socket definition for channel 2.
- (3) Using, as necessary, the **TEMP**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to Pt100, °C and socket A.
- (4) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 2 to On.
- (5) When **DWELL** is displayed, press **NO**..

NOTE: As channel 2 is only different by the alarm setting, there is no need for both channels to have the dwell time switched On.

- (6) Press **CHAN SETUP** to return to the Measurement screen, and then press **CHAN SETUP** twice to enter the **ALARM** menu with a display of **CHAN =**

- (7) Press numeric key **2** and **ENTER** to display **ALARM ON**. Press **YES** to display **ALM HI**.
- (8) Use the Numeric keys to set the alarm level to **25.0**. Press **ENTER** to accept the entry.
- (9) Press **CHAN SETUP** to return to the Measurement screen.

Set channel 3 as follows:

- (1) Press **CHAN SETUP** to display **CHAN =**
- (2) Press numeric key **3** and then **ENTER**, to display the current channel/probe/socket definition for channel 3.
- (3) Using, as necessary, the **AIRSPEED**, **SYMBOL** and **NEXT SKT** keys, set the channel/probe/socket definition to 127MS, m/s and socket B.
- (4) Press **ENTER** to display **CHN ON**. Press **YES**, to set channel 3 to On.
- (5) When **DWELL** is displayed, press **YES**.
- (6) Press **CHAN SETUP** to return to the Measurement screen.

Set the scan options as follows:

- (1) Press the **FUNCS** (**SHIFT** and **RPM**) key, and **SET TIME** is displayed.
- (2) Press **▼** twice, and **DWELL TIME** is displayed.
- (3) Press **YES**, to display the current dwell time (minutes and seconds).
- (4) Use the Numeric keys to set the dwell time to **00:02.0**.
- (5) Press **YES** to accept the entry.
- (6) Press the **FUNCS** key to return to the Measurement screen.

You have now completed the settings for the three channels.

- (1) Press **HOLD** to select Scan On mode and to scan channels 1 to 3 automatically, at the rate (*every two seconds*) that was set in the scan options.
NOTE: If any channels other than 1, 2 and 3 are displayed, use the **CHAN SETUP** menu to switch Off these channels.
- (2) Press **HOLD** again to change to Scan Off mode, and repeatedly press **NEXT CHAN** to step through each channel manually.

4.8 USING THE DATALOGGING FACILITIES

MPM4100 datalogging facilities (refer to Section 2.6 for a description) are available for use in either Single or Multi-channel mode, and the logged data can be held in any one of up to 30 separate files. Information logged to a file can be recalled to the MPM4100 display via the Status menu (Section 4.10), down-loaded to a PC for analysis, or to a printer for hard-copy.

To start a Log Session, choose the file to be used (Section 4.8.1) and then set the log options (Section 4.8.2).

After setting-up a complex multi-channel logging procedure, you should consider storing the setup (Section 4.9) as a 'procedure', ready for use on another occasion.

Before storing, or using, a complex logging procedure, review the status (Section 4.10) of the logging parameters to ensure that they are set correctly.

4.8.1 Choosing a file

Select and edit the file to be used in a Log Session, as follows:

NOTE: If you don't choose a file, the MPM4100 automatically selects the next unused file for you to use.

- (1) Press **FILE SETUP** (**SHIFT** and **PITOT**) to enter the **FILE SETUP** menu.

FILE SETUP menu: Select file Edit file name Clear last file

- (2) After a short delay, **FILE01 THIS FILE Y/N** is displayed.
- (3) Press **YES** if you want to use file File 01, or press **NO** until the appropriate file reference is displayed and then press **YES**. If necessary, press **▲** to move back through the file numbers.
- (4) The prompt **EDIT FILE NAME** is displayed. As necessary, use the **◀** and **▶** keys to edit the file name. These keys are also used to edit the numbers in the file name.

NOTE: To clear incorrect editing (before accepting the edited name), press any other key and start the editing again.

- (5) Press **ENTER** to accept the edited name, and to display the option **CLEAR LAST FILE**.

CAUTION: Clearing the file will result in the loss of all data from that file.

- (6) Press **YES**, to display the confirmation message **SURE?** Press **YES** again to clear the previous file. If you wish to clear other files, reselect **CLEAR LAST FILE** and press **YES** when **SURE?** is displayed. Alternatively, select **CLEAR ALL FILES** to clear all stored measurements.

4.8.2 Setting the log options

If necessary, refer to Table 4.3 (page 4-27) for a summary of the logging options.

Two menus are available to set the logging parameters:

LOG SETUP menus: Timing menu Option menu

You can use this Section either as a continuation of choosing a file, or you can use these procedures to change the options for a datalogging procedure that has already been set-up.

NOTES: Use the **OPTION** menu before using the **TIMING** sub-menu.

At any time that a menu option (for example, **START TIME**) is displayed, you can return to the Measurement screen by pressing the **LOG SETUP (SHIFT and AIRSPEED)** key.

- (1) Press **LOG SETUP (SHIFT and AIRSPEED)** twice to display the **OPTION** title.
- (2) After a short delay, the option **LOG MODE** is displayed.

OPTION menu: Set log mode Set overflow mode Log resume Y/N Warmup Y/N Log to RS232 Y/N Power down enable Y/N

- (3) Press **YES** and then select the operating mode for the Log Session from:
 - REL TIME** (using the log period and log interval timing specified in the **TIMING** menu)
 - REAL TIME** (using the start/stop timing specified in the **TIMING** menu),
 - ALARM** (Active Log Session is started when an alarm threshold is exceeded)
 - TRIG W/REF** (Active Log Session is started by an external trigger, and a reference name can be added to the logged data)
 - TRIG ONLY** (Active Log Session is started by an external trigger, or the **STORE** key)

As required, press **YES** for the selected operating mode.
- (4) The option **OVERFLOW MODE** is displayed. Press **YES** and then select the overflow option for the Log Session from **OVWRITE** (overwriting earliest data), **COMPRS** (deleting alternate data entries in all the log files) or **STOP** (ignoring any new data). As required, press **YES** for the selected overflow mode.
- (5) The option **RESUME LOG** is displayed. If selected, this option enters successive logs into the same file. Press **YES** or **NO** as appropriate.
- (6) The option **WARMUP** is displayed. As appropriate, press **YES** or **NO** (MPM4100 is switched on for one minute before an Active Log session).

Note: Log-on-trigger and **STORE** key will always function, even when any other log mode is set.

- (7) The option **LOGGED READING TO RS232** is displayed. As appropriate, press **YES** or **NO** (logged data is output to the **COMMS** connector in parallel with logging to the selected file).
- (8) The option **POWER DOWN ENABLE** is displayed. As appropriate, press **YES** or **NO** (MPM4100 is switched off between Active Log sessions).
- (9) The display returns to the Measurement screen.

You have now completed the settings for the **OPTION** menu. You can continue by setting the logging options from the **TIMING** menu:

- (1) Press the **LOG SETUP (SHIFT and AIRSPEED)** key once, to display the **TIMING** menu title.

TIMING menu:
 Set start time
 Set start date
 Set stop time
 Set stop date
 Set log period
 Set log interval

- (2) After a short delay, the option **START TIME** is displayed.

NOTE: Time and date settings are only available for the **REAL TIME** log option, and the log settings are only available for the **REL TIME** log option. The **TIMING** is not available if the **TRIG W/REF** option has been selected.

- (3) If required, press **YES** and use the numeric keys to set the time at which the Log Session is to start, or press ▼ to display **START DATE**.
- (4) If required, press **YES** and use the numeric keys to set the date at which the Log Session is to start, or press ▼ to display **STOP TIME**.
- (5) If required, press **YES** and use the numeric keys to set the time at which the Log Session is to stop, or press ▼ to display **STOP DATE**.
- (6) If required, press **YES** and use the numeric keys to set the date at which the Log Session is to stop, or press ▼ to display **LOG PERIOD**.
- (7) If required, press **YES** and use the numeric keys to set the time period for which the Log Session is required, or press ▼ to display **LOG INTVAL**.
- (8) If required, press **YES** and use the numeric keys to set the time intervals between Log Sessions within the Log Period.
- (9) The display returns to the Measurement screen.

At this stage, you have set all the options that are available from both of the logging menus (**OPTION** and **TIMING**).

Table 4.3 Summary of the MPM4100 datalogging options

Menu title	Menu option	Comment/Input limitations
TIMING	START TIME	Time, within the next 24 hours, that a Log Session is to start. Used in Real Time mode.
	START DATE	Date, within the next 12 months, that a Log Session is to start.
	STOP TIME	Time of the day that a Log Session is to stop.
	STOP DATE	Date, within the next 12 months that a Log Session is to stop.
	LOG PERIOD	Duration of the Log Session. Used in Relative Time mode.
	LOG INTVAL	Time interval, up to 24 hours, between Active Log.
OPTION	LOG MODE	
	Rel Time	Log Session is set by the log interval/period times, or an external trigger.
	Real Time	Log Session is set by the log start/stop times, or an external trigger.
	Alarm	Log Session started if an alarm level is exceeded, or external trigger is used.
	Trig w/ref	Log Session started by an external trigger. Prompt allows a reference number to be entered.
	Trig Only	Log Session started by an external trigger.
	OVERFLOW MODE	Selection of action to be taken if the log memory becomes full during a Log Session.
	Ovrite	Overwrites earliest data.
	Comprs	Compresses alternate data entries in all log files.
	Stop	Ignores any new data.
	RESUME LOG	Enters successive logs into the same file.
	WARMUP Y/N	If selected, a warmup time of one minute is allowed at the start of each Log Session. Not available if 'log-on-trigger' is selected.
	LOGGED READING TO RS232	Option to output Log Session data to RS232, in parallel with MPM4100 storage.
	POWER DOWN ENABLE	If selected, instrument power is switched off between Log Sessions.

4.8.3 Using the STORE key

In Single mode, press the **STORE** key to log the displayed measurement to the allocated (or next available) file. The prompt **STORE** is displayed, followed by the file number and the **LOG** symbol, which flashes while the data is transferred to the log file.

When Multi-channel mode is set to Scan On, press the **STORE** key to provide a single log of all the channels that are being scanned. When set to Scan Off, press the **STORE** key to log the measurements from the displayed channel. As in Single mode, the prompt **STORE** is displayed, followed by the file number and the **LOG** symbol, which flashes while the data is transferred to the log file.

An external log-trigger, using either a contact closure or a negative-going pulse (see Chapter 3) can be connected to the **POWER** or the **COMMS** socket and used as a remote version of the **STORE** key.

4.8.4 Setting the output options

Menu options are available to set the MPM4100 output characteristics, by pressing the **OUTPUT** (**SHIFT** and **AUX**) key. One press displays the **PRINT** menu, two presses the **RS232** and three presses the **OPTIONS menu**:

OUTPUT menus: Print menu RS232 menu Options menu
--

These options are used when the MPM4100 is used with a PC, printer or modem, and described in detail in Chapter 5.

A summary of these options is shown in Table 4.2 (page 4-12).

4.8.5 Example of logging multiple channels

Use the channel setup described in Section 4.7.5, and log Channels 1 to 3 to File 03 every minute for the next five minutes.



Set the channel options as follows:

- (1) If necessary, press **ON** (**SHIFT** and **OFF**) to switch on the MPM4100.
- (2) Set the channel options as described in Section 4.7.5.

Select and edit the file to be used as follows:

- (1) Press **FILE SETUP** (**SHIFT** and **PITOT**) and repeatedly press **NO** (or the ◀ and ▶ keys) until **FILE03 THIS FILE Y/N** is displayed.
- (2) Press **YES** to select File 03, and to display **EDIT FILE NAME FILE03**.
- (3) Press **NO** to display **CLEAR THIS FILE** and then press **YES** twice to clear File03, and **FILE SETUP** to return to the Measurement screen.

Set the log options as follows:

- (1) Press **LOG SETUP** (**SHIFT** and **AIRSPPEED**) twice to display the **OPTION** menu. After a short delay, **LOG MODE** is displayed.
- (2) Press **YES** to display one of the Log Mode options. Repeatedly press **NO** to cycle through the Log Mode options available and stop at **REL TIME**. Press **YES** to accept this Log Mode.

NOTE: Two of the options are **REL TIME** (*relative time*) and **REAL TIME**. Ensure that you stop at **REL TIME**.

- (3) Press **LOG SETUP** to return to the measurement screen. Press **LOG SETUP** again to display the **TIMING** menu. After a short time **LOG PERIOD** is displayed. Press **YES** to display the time in hours, minutes and seconds.
- (4) Use the Numeric keys to set the time to **0:05:00**. Press **YES** to accept the entry, and to display **LOG INTVAL**.
- (5) Use the Numeric keys to set the time to **0:01:00**. Press **YES** to accept the entry, and to return to the Measurement screen.

You have completed the settings for the logging options.

- (1) Press **HOLD** to select Scan On mode and to scan channels 1 to 3 automatically.
- (2) Press **LOG START** (**SHIFT** and **%RH/DEWPT**) and then **ENTER** to start logging.

NOTE: A prompt is displayed before logging begins of the number of measurements that can be logged before the MPM4100 memory is full.

- (3) The **LOG** indication should be displayed (steady) in the Warning message area of the display and, every minute for the next five minutes, you will notice that the indicated measurement flashes to show that measurements are being logged.

The logged data is now available to be down-loaded to a PC, from File 03.

- (4) If necessary, you can check how many readings were logged to File 03 by using the **STATUS** menus. Press **STATUS** (**SHIFT** and **PRESSURE**) twice to display the **LOG STATUS** menu. After a short delay, **CURRENT FILE03** is displayed. Press **YES** and the number of **RDGS LOGGED** is displayed. The number should be 15 (that is, five logs of the three channels).

NOTE: Invalid indications are not logged.

4.9 ADDITIONAL MEASUREMENT OPTIONS

4.9.1 Storing an instrument setup

After setting the channel and/or logging options, the instrument setup (known as a 'procedure') can be stored by using the **PROC SELECT** menu. Two 'procedures' can be stored, and retrieved for future use.

NOTE: The facility for storing an instrument 'procedure' is not available in Single mode.

- (1) Press the **PROC SELECT** (**SHIFT** and **TEMP**) key, to display **PROC=**.

Two instrument setups can be stored in the MPM4100 and they are identified as **PROC 0** and **PROC 1**. You need to know if either store is being used for a current setup. Use the Numeric keys to select the required procedure.

- (2) Press **ENTER** to accept the selection, and to display the prompt **LOAD LOG PROC**.
- (3) Press **YES** to set the logging parameters to those stored for the selected procedure, or **NO** to display the prompt **STORE PROC**.

CAUTION: If you store the current instrument 'procedure', you will overwrite the existing stored 'procedure'.

- (4) Press **YES**, to store the current log settings under the selected procedure reference, and to return to the Measurement screen.

NOTE: Refer to Section 4.4.2 to retrieve an instrument procedure.

4.9.2 Making temperature-compensated measurements

Temperature compensation can be applied to measurements of air velocity (and volume flow rate) and humidity/dewpoint.

When the associated Measure key is pressed (that is, **PITOT** or **%RH/DEWPT**) the socket used for the main probe is assumed to also be used for the temperature probe. If this is not the case, the socket for the temperature-compensation probe can be specified using the **TEMPCO SKT DEFLT** menu option (Section 4.7.2).

To increase the rate of channel scanning, the temperature compensation can be ignored by using the Fast Update option (Section 4.7.3).

4.9.3 Measuring volume flow rate

To measure volume flow rate (VFR) requires a measurement of airspeed, together with a definition of the cross-sectional area of the duct in which the airspeed is being measured.

Select the airspeed probe, using the **AIRSPEED** or **PITOT** Measure keys, and define the cross-sectional area of the duct as follows:

- (1) Press the appropriate Measure key to display the velocity Measurement screen.
- (2) Press the **VOL FLOW** key, to display the **VOLUME** menu (Table 4.4, *next page*).
- (3) When the prompt **CHAN=** is displayed, enter the appropriate channel number and press **ENTER**.

- (4) After a short delay, the option **VOL/ENERGY CALC?** is displayed. Press **YES** to use the volume flow rate (vfr) option, and then select the duct type from the following:

CIRC TYPE Enter the **DIAMETER**

RECT TYPE Enter the **LENGTH** and **WIDTH**

OTHER Enter the **AREA**

NOTES: The units used to enter the duct dimensions must be the same as those used for the velocity display. For example, if airspeed is displayed in units of m/s, the duct dimensions must be entered in metres (or square metres for **OTHER**).

The maximum dimension that can be entered is 9.999.

- (5) Press **ENTER** to accept the dimensions and to return to the Measurement screen.
- (6) The displayed measurement is now **VFR**. To return the display to a velocity indication, re-select the **VOLUME** menu and set the **VOL/ENERGY CALC** option to **NO**.

Table 4.4 Volume flow rate menu options

Menu title	Menu option	Comment/Input limitations
VOLUME	CHAN=	Select the appropriate channel number
	VOL ON/OFF	Use YES key to select the VFR calculation
	DUCT TYPE	Use the YES key to select the duct type
	Circ Type	Use the Numeric keys to enter duct diameter
	Rect Type	Use the Numeric keys to enter the length and width
	Other	Use the Numeric keys to enter the duct area

4.9.4 Using the CLEAR key

In either single or Multi-channel mode, the **CLEAR** key can be used to clear all file data and minimum, maximum and average data when these options are selected. When used, the prompt **SURE?** is displayed and you should press **YES** to confirm that the data is to be cleared.

Individual files can be deleted using **FILE SETUP** as described in section 4.8.1.

4.10 REVIEWING THE STATUS OF THE MPM4100

4.10.1 Using the Status menus

Referring to Table 4.5 (next page), review the instrument status as follows:

- (1) Ensure that a Measurement screen is displayed and that the MPM4100 is in Single mode or Scan Off mode.
- (2) Press the **STATUS (SHIFT and PRESSURE)** key once to enter the **CHAN STATUS** menu, with a display of **CHAN=**.
- (3) Enter the appropriate channel number and press **ENTER**.
- (4) Press **▼** to display the first menu option (**CHAN ON/OFF**). As necessary, press the **▼** or **▲** to select the menu options shown in Table 4.5. Press **STATUS (SHIFT and DEPTH/PRESSURE)** to return to the Measurement screen.
- (5) Similarly, review the log status information by pressing the **STATUS** key twice to enter the **LOG STATUS** menu, with a display of the file number to which the information refers. Use the **▼** or **▲** keys to select the required menu option, and press the **STATUS** key to return to the Measurement screen.
- (6) Review the system status information by pressing the **STATUS** key three times to enter the **SYSTEM STATUS** menu, with the prompt **DISPLY TIME**. Use the **NO** key to step through the menu options and press **YES** to display the information offered by the menu title. Press the **STATUS** key to return to the Measurement screen.

4.10.2 Checking the battery status

The status of the battery can be checked from three options:

Using the AUX Measure key	Refer to Table 4.1 (page 4-7) and repeatedly press the AUX key until the prompt BATT LIFE is displayed. After a short delay, the battery voltage is displayed.
Using the STATUS menus	Refer to Table 4.4 (page 4-31) and press STATUS (SHIFT and PRESSURE) three times. Repeatedly press the ▼ key until the prompt BATT LIFE is displayed. Press YES and the % battery life, predicted hours and battery voltage are displayed sequentially.
Using the FUNCS menus	Refer to Table 4.2 (page 4-12) and press the FUNCS key, to display the prompt SET TIME . Repeatedly press the ▼ key until the prompt BATT LIFE is displayed. Press YES and the % battery life, predicted hours and battery voltage are sequentially displayed.

Table 4.5 MPM4100 status review options

Menu title	Menu option	Comment/information available
CHAN STATUS	CHAN= CHN ON MX NO SYMBOL/SENSOR/SKT ALARM HI ALARM LO LAST RECAL RESET CUSTOM CAL ZERO CUSTOM CAL FS	Enter appropriate channel number Channel active state MX reference (if used) for selected channel Probe/symbol/socket for selected channel High alarm setting for selected channel Low alarm setting for selected channel Time and date that this channel was calibrated Zero setting if an OEM probe is used FSD setting if an OEM probe is used
LOG STATUS	CURRNT FILE NAME RDGS LOGGED LOG ON/OFF LOG MODE START TIME, START DATE, STOP TIME, STOP DATE LOG PERIOD, LOG INTVAL LOG INTERVAL DWELL TIME ZERO FLOW OPTION POWER DOWN ENABLE Y/N LOG TO RS232 Y/N WARMUP Y/N	File in use for selected channel Number of readings in current file Log Session status Log mode selected for this channel Time and date settings used for a REAL TIME Log Session Period and interval settings used for a REL TIME Log Session Current dwell time Current overflow option Status of power-down option Status of the RS232 output option Status of warm-up option
SYSTEM STATUS	DISPLY TIME DISPLY DATE REMAIN MEMORY CHKSUM BATT LIFE INT TEMP DISPLY READING TO RS232 Y/N	Press YES to display information Current time set into MPM4100 Current date set into MPM4100 Log memory available (number of readings that can be logged) Instrument checksum (service purposes only) Calculated battery life (hours, % and voltage) Internal temperature of MPM4100 Status of this RS232 option

Chapter 5

USING THE MPM4100 WITH A PC, MODEM OR PRINTER

5.1 INTRODUCTION

On the MPM4100, the RS232 port (**COMMS**) can be used to program the instrument either by a local PC or remotely via a suitable modem. The RS232 port can also be used to print stored files, displayed readings or instrument status.

5.2 CONNECTING TO A PC

5.2.1 Connector requirements

If your PC uses a 25-way connector for COM1 or COM2, use an EX60-25 cable to connect to the PC. Use an EX60-09 for a PC with 9-way connectors. These cables use the 4-pin Binder socket labelled 'COMMS' on the MPM4100.

5.2.2 Setting the baud rate and data format

The baud rate and data format for both the MPM4100 and the PC software must match exactly to ensure reliable communications. The default baud rate is 9600, using 8 data bits, 1 stop bit and no parity. These settings can be changed by using the **OUTPUT RS232** menu (Section 4.8.4).

5.2.3 CS6 Software

Solomat CS6 software enables the user to program, download or analyse logged data on the PC. With the exception of the CAL and RS232 modes, most MPM4100 functions can be programmed from the PC. Refer to the CS6 Software Manual (part no. 059-0232-00) for further information.

5.3 CONNECTING TO A PRINTER

5.3.1 Connector Requirements

The printer to be used with an MPM4100, must have an RS232 serial interface (NOT Parallel CENTRONICS) which is usually a 25-way D-socket. Use an EX-62 cable to connect to a printer. Three wires are used to connect to the printer:

Ground, Transmitted Data and a Printer Ready signal (normally DTR or CTS).

Some printers require loop-back of other signals which are not used by the MPM4100. See your printer manual for further details.

5.3.2 Setting the baud rate and data format

The default parameters are as described in Section 5.2.2. These parameters may be changed using the **OUTPUT RS232** menu (Section 4.8.4). To suit individual printers and output formats, printer line widths can be set in the **OUTPUT OPTIONS** menu to either 24, 40, 80 or 132 characters per line .

5.4 CONNECTING TO A MODEM

5.4.1 Connector requirements

Most modems use a 25-way D-socket for RS232 connection. Use an EX64 cable to connect to this type of modem. Some modems require loop-back of other signals which are not used by the MPM4100. See your modem manual for further details.

5.4.2 Setting the baud rate and data format

The default parameters are as described in section 5.2.2. A baud rate of 9600 may be too fast for your modem link unless the modem uses speed buffering. We recommend that you use an error correcting protocol (which must be supported by both modems) such as MNP4/5.

The modem local to the MPM4100 should be configured to auto-answer in order to answer the call from the remote modem.

NOTES: Some modems do not answer the call unless power is applied continuously.
 The MPM4100 is not able to initiate a call to a remote modem.

5.4.3 Enable, disable and hangup commands

We recommend that the modem is pre-configured before being connected to the instrument. Where this is not possible, the MPM4100 can send Hayes-compatible AT commands to the modem. These commands can be set using the **OUTPUT OPTION** menu. Note that these commands are sent once only and may be lost by the modem if it is switched Off, unless they are stored as the Power On settings (profiles).

5.4.4 CS6 software and modem operation

The Solomat CS6 software operates as if the MPM4100 is connected directly to the PC. The telephone number for the remote modem can be set from an option in the CS6 configure menu, and the PC can 'dial' this number when required. The modem local to the PC should not have extended messages set (that is, CONNECT not CONNECT 9600).

Chapter 6

ROUTINE MAINTENANCE

6.1 INTRODUCTION

Routine maintenance of your MPM4100 comprises external care only. Except for the batteries, there are no user-servicable parts inside the instrument

As well as preventive and corrective maintenance of the MPM4100, this chapter provides suggestions for the treatment of NiCd batteries to extend their useful life, and instructions for instrument storage of more than a few days.

6.2 PREVENTIVE MAINTENANCE

Preventive maintenance comprises those actions that must be carried out to ensure continuing correct operation of the MPM4100. These actions are:

- (1) Ensure that the battery end-cap is securely screwed into position, and the waterproof end-caps on the MPM4100 sockets are also tightly screwed into place.
- (2) Ensure that the exteriors of the MPM4100 and probes are kept free of corrosive contaminants.
- (3) If the MPM4100 becomes dirty, wash with warm detergent and rinse with clean water. Allow to dry.
- (4) For instruments fitted with alkaline batteries, renew the batteries (Section 6.4.1) when the battery warning (**BAT**) appears on the display, or at any time that there is any reason to believe that the batteries will have insufficient life for coming period of use.

NOTE: Using alkaline batteries, the **BAT** warning indicates that the maximum available use of the MPM4100 is two hours.

- (5) For instruments fitted with a rechargeable battery pack (ref. DC13), recharge the batteries (Section 6.4.2) when the battery warning (**BAT**) appears.

NOTE: Using rechargeable (NiCd) batteries, the **BAT** warning indicates that the maximum available use of the MPM4100 is 30 minutes.

- (6) Keep the instrument out of direct sunlight, and away from extreme temperatures during storage or use. The MPM4100 environmental specification is:

Operational temperature	-10°C to +55°C (14°F to 131°F)
Storage temperature	-20°C to +60°C (-4°F to 140°F)
Operational humidity	0 to 100% RH
Storage humidity	0 to 100% RH

- (7) On an annual basis, return the instrument and probes to Solomat. Although the instrument does not have user-calibrated settings, it is good policy (consistent with ISO9000) to maintain calibration traceability of all instruments.

NOTE: At switch-on, a warning is displayed when the calibration date has been exceeded.

6.3 CORRECTIVE MAINTENANCE

Corrective maintenance is restricted to attention to the socket and battery end-caps, and responding to the displayed 'Warning' and 'Fault' messages.

6.3.1 Socket and battery end-caps

If the socket end-cap retaining-straps are worn or broken, fit replacement parts (obtainable from the Solomat Service Department).

- (1) Remove the socket end-cap from the screw-on connector. Remove and discard the damaged retaining-strap.
- (2) Fit a replacement retaining-strap to the screw-on connector, replace the socket end-cap and then fit the retaining-strap over the socket end-cap, pushing firmly to ensure that it fits securely.
- (3) Repeat for damaged retaining-straps on any other end-caps.

If the battery end-cap becomes difficult to screw into position, use vaseline or silicone grease to lightly coat the O-ring and brass threads.

6.3.2 Displayed 'Warning' and 'Fault' messages

A 'Warning' condition (Table 6.1) can be accepted by the user and instrument activity continued.

Table 6.1 Displayed warning messages

NOTE: Each of the following warnings is preceded by the displayed prompt **WARN'G**.

Displayed message	Error condition	Suggested remedy
NO PROBE	No probe fitted when a Smart probe (or 803PS) socket is selected	Fit an appropriate probe or use another socket
WRONG PROBE	Incorrect probe fitted when a Smart probe (or 803PS) socket is selected	Fit an appropriate probe or use another socket
NO MX	An MX reference is used without an MX unit being connected	Connect an MX unit or remove the reference (Section 4.7.2)
CAL DATE	Instrument calibration date exceeded	Return the instrument to Solomat for calibration inspection
LOG MEM	Log memory full	Download log data or change the Overflow Mode option (Section 4.8.2)
HI CUR	Excessive current is being taken from the instrument battery	Remove probes until the condition is corrected. Investigate suspect probe.
NO CTS	Printer specified but not available	Connect printer, check printer connections or change output specification, either from log setup (Section 4.8.2) or the display setup (Section 4.6.4)

A 'Fault' condition cannot be accepted by the user. The following fault displays are preceded by the prompt **FAULT**. These conditions are non-recoverable. The instrument must be switched off and returned to Solomat with a note of the displayed fault.

EPROM
RAM
EEPROM
RTC
INT12C
NO CAL

6.4 BATTERY MAINTENANCE

6.4.1 Battery-power options

The MPM4100 is powered by three C-size (LR14) batteries. These batteries can be either separate alkaline batteries or a NiCd battery pack (Solomat ref. DC13).

CAUTION: Do not attempt to use separate NiCd batteries. The MPM4100 battery holder is specifically designed to recognise either separate alkaline batteries or the Solomat NiCd battery pack. You will be unable to charge separate NiCd batteries inside this instrument.

Alkaline batteries can be used from -20°C to +70°C. They have a very long shelf life and can provide up to 150 hours of instrument usage. However, at temperatures below 10°C the battery capacity is greatly reduced. The battery status calculation (Section 4.10.2) provided by the MPM4100 takes into account the instrument temperature. However, if you subsequently take the instrument to a colder environment, the battery life will be less than that predicted.

Even if you use NiCd batteries regularly, it is worthwhile keeping spare alkaline batteries. Then, if you find that you do not have adequate NiCd battery life for a logging session, you can change over to the spare alkaline batteries. The unique design of the instrument battery compartment avoids the danger of alkaline batteries being accidentally charged.

The NiCd battery pack (ref. DC13) is designed specifically for use with the MPM4100. The battery pack includes 2-Ah capacity NiCd cells and has a special metal ring for the positive battery contact. Do not attempt to use separate NiCd cells in this instrument; the calculated battery life will be incorrect and you will be unable to charge the batteries inside the instrument.

An external dc battery (ref. DC12), or a separate 12 V to 48 V dc supply using a Solomat adaptor (ref. DC1M), can also be used to power the MPM4100.

6.4.2 Treatment of NiCd batteries

NiCd batteries can give long life if properly used:

- (1) NiCd batteries rapidly lose capacity if stored above 30°C. At different storage temperatures, NiCd battery capacity is reduced by approximately the following percentages:

Temperature	After 1-month storage	After 2-month storage
60°C	60%	85%
30°C	50%	75%
20°C	30%	35%
0°C	10%	20%
-20°C	5%	10%

- (2) The discharge curve of NiCd batteries is very flat, leading to possible errors in the calculation of remaining battery life. Show caution when estimating whether the NiCd battery pack will provide the required hours for your application. Remember that, if you use the 'Auto Power Down' facility (Section 4.8.2) the NiCd battery life can be extended to several weeks.
- (3) NiCd batteries have a cycle life of between 500 and 1000 cycles before losing significant capacity. The first 20 to 50 cycles will give a longer battery life than the predicted calculation because of the increased initial capacity of NiCd battery packs.
- (4) NiCd batteries can operate to -20°C, but should never be charged below -10°C.
- (5) Although NiCd batteries can be used for short periods up to +60°C, we do not recommend prolonged use above +50°C.
- (6) If you have stored the instrument for more than a month at room temperature, or warmer, we advise that you charge the batteries before use.
- (7) When charged within the instrument, NiCd batteries are charged slowly (at a rate of C/20). This charge-rate prevents damage by overcharging, especially at lower temperatures.
- (8) If the MPM4100 is powered from an external dc battery (ref. DC12) or a separate dc supply using a DC1M adaptor, any NiCd batteries in the MPM4100 are not charged. To charge the NiCd batteries, it is necessary to use an ac adaptor (ref. AA2 or AA3).
- (9) If you leave the MPM4100 powered via an ac adaptor for periods of greater than one month, the NiCd battery pack will slowly reduce its voltage, giving an incorrect (reduced) calculation of expected battery life.
- (10) We recommend that if the MPM4100 is to be powered for extended periods via an ac adaptor, the NiCd batteries should be removed.

6.4.3 Internal 'backup' battery

Within the MPM4100, an in-built NiCd battery is used to retain user-entered data when the instrument power supply is removed. This 'backup' battery will retain data for approximately six weeks before self-discharging and erasing the data. If alkaline or NiCd C-cell batteries are installed, they will provide backup power, giving over one year's battery backup of user-entered data. At elevated temperatures, the 'backup' retention time is reduced and could be as short as one week if stored at 60°C.

This 'backup' battery requires no maintenance and is charged slowly (at a rate of C/100) from the instrument power supply even when the instrument is switched off. Refer to the storage instructions (Section 6.5) if you expect to store the MPM4100 for more than a few days.

If the 'backup' battery discharges due to long storage without the normal batteries fitted, you should recharge using an ac adaptor (ref. AA2 or AA3) for four days to fully recharge the 'backup' battery. Alternatively, you could use the instrument from the normal battery supply during the day but, each night, connect it to an ac adaptor until the backup battery has been charged for a total of 100 hours.

6.4.4 Changing alkaline batteries

To change alkaline batteries, proceed as follows:

- (1) Ensure that the MPM4100 is switched off.
- (2) Using either your fingers or a coin, unscrew the battery cap.
- (3) Raise the top of the instrument and allow the batteries to slide out. Dispose of the batteries in accordance with local health and safety regulations.

- (4) Insert three fresh alkaline batteries with the positive terminal entering the instrument first.
- (5) Ensuring that you do not cross-thread the battery end-cap, screw the battery end-cap into the instrument. Using a coin in the central slot, tighten the battery end-cap.

6.4.5 Charging NiCd batteries

To charge NiCd batteries, proceed as follows:

- (1) Power the MPM4100 via an AA2 or AA3 ac adaptor.
- (2) Leave on charge for 20 hours.
- (3) Switch off the the power to the ac adaptor.

NOTE: Under reduced charging conditions, you can expect approximately two hours of use for every hour of battery charging. This means that if you charge overnight, you will have 15 to 20 hours of use available for the next day.

6.5 STORAGE

When storing the MPM4100 for more than a few days, consider the following:

- (1) Ensure that the instrument is stored in a clean, dry, state, and away from extreme temperatures.
- (2) Store the instrument with the NiCd or alkaline batteries installed. Otherwise, the internal 'backup' battery may discharge. With the batteries installed, the 'backup' battery will remain charged for several months.
- (3) If you are storing the instrument at temperatures above 30°C, store with the alkaline batteries rather than NiCd.

INDEX

Abbreviations.....	xii	Examples	
Accessories		Datalogging	v,4-29
Optional.....	1-5	Menus	ii,4-13
Security Housing.....	3-9	Multi-channel mode	iii,4-22
Standard	1-5	Single mode.....	i,4-9
Airspeed probes	1-8	Fast update	2-6
Alarm output.....	2-14	Fault Messages.....	6-2
Circuit.....	3-4	Gas concentration probes.....	1-9
Analog outputs	2-14	Glossary	xii
Average	2-3,2-6	Hold.....	2-3,4-6
Battery		Humidity	
Alkaline	6-4	Conversion table.....	xiv
Backup	6-4	Hygrometer probe	1-6
Maintenance	6-3	Input/Output	2-13
NiCd	6-3	Instrument setup	4-5,4-30
Charging	6-5	Instrument status	2-15
Options.....	6-3	Keypad disable	2-16,4-4
Status.....	2-15,4-32	Keypad features	2-8
Beeper	2-15	Keys	
Calibration	2-16	Action.....	2-10
Multi-channel mode.....	4-20	CLEAR.....	4-31
OEM Probes	4-21	Function	2-9
Single mode.....	4-8	Measure.....	2-2
Channel		Setup	2-9
Options.....	2-4,2-6,4-17	STORE	4-28
Setting	2-4	Maintenance	6-1
Connectors		Battery	6-3
COMMS	3-3,5-1	Storage	6-5
Modem	5-1	Menus	4-10
Power.....	3-4	Editing setup data	4-11
Printer	5-1	Example.....	4-13
Socket A.....	3-2	Setup	4-12
Socket B.....	3-2	Status	4-32
Socket C (Smart probes)	3-2	Min/Max.....	2-3,2-5,4-6
Socket D (Thermocouple)	3-3	Modem	
Conversion tables		Commands	5-2
Humidity	xiv	Connection	5-1
Pressure.....	xiii	CS6 software	5-2
Temperature	xiv	Multiplexing	
Velocity	xiii	Address assignment	3-6
Volume flow rate	xiii	And alarm output	2-14
Datalogging	4-24	Cables	3-5
Example	4-29	Channel numbers	3-5
Facilities	2-11	Connection	3-5
Files	2-11,4-24	Description.....	2-13,3-7
Log options	2-12,4-25	Operational modes.....	2-2
Log stop codes.....	4-4	Multi-channel mode	2-4,4-16
Output options.....	4-28	Selection.....	4-5
STORE key.....	4-28	Single mode.....	2-3,4-6
Date.....	4-14	PC	
Display features.....	2-6	Connection	5-1
Dwell time	2-6,4-19	CS6 software	5-1

Power supply options	2-16
Pressure	
Conversion table	xiii
Pressure probes	1-8
Printer	
Connection	5-1
Probes	
Airspeed	1-8
Gas concentration	1-9
Hygrometer	1-6
Pressure	1-8
Smart	1-9
Tachometer	1-9
Temperature	1-6
Procedure	4-5,4-30
Reset	
Hard	4-4
Soft	4-3
RS232	2-14,5-1
Baud rate & data format	5-1
Scan facility	2-5
Scan options	4-19
Short Term Average	4-19
Short term average	2-6
Smart probes	1-9
Specifications	1-3
STORE key	2-12
Switch-on options	2-14,4-3
Symbols	
User defined	2-16
Tachometer probes	1-9
Temperature	
Conversion table	xiv
Temperature compensation	2-16,4-30
Temperature probe	1-6
Time	4-14
Velocity	
Conversion table	xiii
Volume flow rate	4-30
Conversion table	xiii
Wall mounting	4-2
Warning Messages	6-2
Warranty	xi