READERMATE 301
SOFTWARE MANUAL

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RM301 Software Operating Manual
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Palmer Environmental Ltd. reserve the right to alter the specification and contents of the product described in this document at any time without prior notice.

Revision History

Date	Version	Description of Change

Contents

CHAPTER 1

Introduction

This chapter serves as an introduction to the software and to the hardware it is to be used with.

The ReaderMate 301 software is used to read logged information from the LoggerMate and ControlMate range of devices, and to set some of the operational parameters of the devices. Once read, the logged information can be saved to disk, manipulated and presented in a number of tabular or graphical forms. The software can also show a periodically updated reading of the current sensor values.

The software can communicate directly with a LoggerMate or ControlMate using an infra-red or telemetry link, or the logged information can be read into a ReaderMate 201/401 or Psion Organiser for later transfer to a PC running the ReaderMate 301 software.

The software itself runs under Windows and can be controlled using the mouse or keyboard.

The LoggerMate/ControlMate Hardware

These devices are used to periodically measure the state of a number of sensors. Each sensor may be measuring one of several types of parameter (pressure, flow, temperature etc.) and may be internally or externally mounted (i.e. within the case or outside the case of the device). These measurements are stored in the memory of the device, and may be retrieved by a PC running the ReaderMate 301 software.

Every LoggerMate and ControlMate has a small transparent window located on the case to allow the use of an infra-red data connection. Some also have a standard BT phone connector, to allow the use of a Telemetry data connection.

WARNING : All LoggerMates and ControlMates incorporate a magnet next to the infra-red window to hold infra-red probes firmly in place. For this reason items containing magnetic material (e.g. floppy disks and credit cards) should NOT be placed on or close to these devices. Tools made of ferrous material (iron, steel etc.) should not be placed near these devices for long periods of time or they will become magnetised.

Sensor inputs to LoggerMates and ControlMates are grouped into one or more Channel Pairs. Each channel pair has a pulse input, used to measure flow rate, and an ADC or current input, which may represent one of a number of different parameters (dependent on the type of sensor used). Devices may be single channel (has one channel pair) or multichannel (has more than one channel pair). On ControlMates the channel pair 4 is reserved for further control parameters.

Three types of input are available to the loggers.

Pulse - This occupies the first input of a channel pair. Pulse inputs are transducers that produce a short pulse every time a certain amount of fluid has flowed past them (e.g. one pulse every time 10 litres of fluid has flowed past the transducer). If this is put in terms of an audio signal then the transducer would produce a short "beep" every time it counted a certain amount of fluid. As the rate of flow increases, then the transducer would "beep" more often.

The pulse input of a logger is currently used for flow transducers, the number of pulses during a given period of time gives a reading of flow rate and counting the pulses gives the total amount of fluid.

If you wish to connect another type of pulse transducer to this input then contact Palmer Environmental.

ADC - This occupies the second input of a channel pair. ADC inputs measure the voltage applied to the input, producing a corresponding digital number that represents the reading and that the computer can use.

ADC inputs are currently used with pressure or depth transducers, whose output voltage is directly related to the input applied to the transducer. Before use the transducer must be calibrated, effectively telling the logger what value corresponds to a particular input (e.g. what reading the computer will receive when 5 Bars of pressure is applied to the transducer).

If you wish to use another type of transducer that produces a voltage output, then contact Palmer Environmental.

4-20 mA - This is an alternative for the second input of a channel pair. This time however, the input converts an electrical current to the digital signal, so is used where the transducer output is a current rather than a voltage. The 4-20mA input is normally used with external transducers, which are connected to a pair of wires from the logger input.

The advantage of this system is that an input may be used to measure a different type of value (pressure, temperature etc.), simply by changing the external transducer and informing the program what type of transducer is being used. Currently this input may be used to measure Temperature, Depth, Flow, Pressure or an electrical Current, though if you have other requirements, contact Palmer Environmental.

The information stored within the loggers may be read in one of two ways :-

Infra-Red Links

An infra-red interface is plugged into the serial port of the PC, or connected to the ReaderMate/Psion Organiser. This interface is then placed over the transparent window in the LoggerMate/ControlMate, allowing 2 way data communication with the device.

If the data is read into a portable device, e.g. portable PC, ReaderMate or Psion Organiser, then this may be transferred into the main PC at a later date. This allows an engineer to retrieve information from a remotely located LoggerMate/ ControlMate, where it is not feasible to have a telemetry connection, and transfer this information onto the central database when they return.

Telemetry Links

With this type of connection the remote device and the PC are connected to the same PSTN phone network using modems (built in to telemetry loggers). When the PC desires to retrieve the data from the remote LoggerMate/ControlMate then it dials the phone number of the device location, and uses a standard serial data connection to transfer the information.

Power Usage

The LoggerMates and ControlMates operate from an internal power source, used for all operations including communications. Use of both infra-red and telemetry communication represents a large additional power drain, so communication should be carried out promptly and connections should not be unnecessarily left "on" for long periods of time. For this reason persistent telemetry should not be used during normal use, as it keeps the telemetry connection with the remote logger open when returning to the main menu.

For more information on persistent telemetry, see the section on selecting a communications system within Setting up a logger.

Pressure Readings and Ground Level

The pressure transducers used in LoggerMates and ControlMates make pressure readings relative to ambient air pressure, and as such are not affected by varying altitude or weather. This means that the loggers should not require recalibration when moving them to a location at a different altitude, or through changing weather.

In some cases though, when calculating Total Head or to compare data from loggers at different locations for example, the pressure readings may be recalculated relative to sea level. To do

this, after a set of pressure data has been read, a figure for Ground Level may be entered. This figure is the height above sea level that the logger was located at when the readings were taken. Once this figure has been entered, tables of the data and graphs of the data can be displayed as Total Head readings.

For more information on entering figures for ground level, see the section on Changing the stored setup for a data file in the section on Viewing the data (F4 - View Logger Data).

CHAPTER 2

Installation of the software

This chapter covers initial installation of the software onto a hard disk.

The program itself cannot be run directly from the floppy disks provided, it needs to be installed and set up before it is used for the first time. To install the program a basic knowledge of the use of DOS and Windows is required. More information on the use of Windows may be found in the *Windows Tutorial* (found by selecting the *Help* pull-down menu from the *Program Manager* window, and then selecting the item *Windows Tutorial*), whilst further information on the use of DOS should be available within the MS-DOS manual that came with your computer.

During the installation instructions things you should type in using the keyboard are given in bold type - **like this**, and things to look for on the screen are given in italics - *like this*.

Installing the program to a hard disk

1) Start a DOS shell.

When running Windows this is achieved by double-clicking on the *MS-DOS Prompt* icon. This is normally shown by double-clicking on the *Main* icon in the *Program Manager*.

2) Insert the Program Disk in the first floppy disk drive (A:)

3) Type :-

A:

and hit the return key.

4) Type :-

INSTALL C:

and hit the return key. This starts a program to copy the ReaderMate 301 software to the hard disk of the computer.

Following the instructions above will copy the program to your C hard drive within a directory called *LOGRMATE*. Any logger information read by the program will be stored in the *DATA* directory found within the *LOGRMATE* directory.

Installing a Windows Icon

The INSTALL program copies all of the required programs to your hard disk. However an icon to run the program is not created on your Windows desktop. To create an icon you should do the following :-

1) Within Program Manager select the Pull-down menu labelled *File* (or press the ALT and F keys together), then select the option labelled *New* (or press N). A window should pop up labelled *New Program Object*.

2) Select the option *Program Item* and click on OK. Another window now pops up labelled *Program Item Properties*. Click in the box next to *Description* and type **RM301**.

3) Now select the button labelled *Browse*. This is used to select program that is run when you click on the RM301 icon. A new window pops up to allow you to select the program using the mouse. Under the area labelled *Drives* select *C:*, the selected installation drive, then under the *Directories* window select the subdirectory *LOGRMATE*. Under the *File Name* area, the file *RM301.EXE* should appear. Select this then click on *OK*.

4) Finally you have to select the working directory. Click in the box next to *Working Directory* and type **C:\LOGRMATE**, the directory that the program is stored in.

5) Now simply select the OK button on the *Program Item Properties* window.

You should now find that an icon labelled *RM301* should appear on your Windows *Program Manager* window. To run the ReaderMate 301 software, double-click on this icon.

Installing the software to a different drive

If your hard drive is not C:, or you wish to install the software to a different drive, then follow the installation instruction above, but replace any references to C: with the drive letter of your choice (e.g. D:). You should never attempt to install the software to drive A: when following the instructions above.

If your computer is part of a network then it may be an advantage to install the software onto a "shared" drive, as the program could then be accessed by any machine that can use the shared drive. For more information on installing programs onto a network, consult the network documentation or your system administrator.

Can I install the program onto a floppy disk?

Although technically possible to install the program onto a single floppy disk, the access speed and capacity of floppy disks would greatly limit the use of the program, so this form of installation is not recommended.

CHAPTER 3

Using The Software

This chapter describes some of the techniques involved with using the program.

Throughout the program most options may be chosen using either the mouse or the press of a key. The program uses a hierarchical menu system, that is, selecting one of the choices from the main menu will normally present you with another menu of choices related to the option chosen, and each of these choices may lead to more options. The main choices of the menus and sub-menus can normally be chosen by one of the function keys. The function keys are the keys labelled F1 to F12 (or F1 to F10) at the top of the keyboard.

The Escape key (normally labelled ESC) can be used to exit most menus to return to the previous menu. Pressing the ESC key on the main menu exits the program.

Note that to use the keyboard to control the program, the current ReaderMate window must be activated (the title bar of the window should be a different colour from other windows on the screen, to show that it is the active window, if not click in the title bar using the mouse or hold down the ALT key and press the TAB key until the ReaderMate 301 picture appears, then release the ALT key).

All of the program windows can be moved around the screen using their title bar, and have the standard Windows minimise button and close button. The windows used for the data viewer, data table display and graphical data display have scroll bars if the window is smaller than the data to be displayed, maximise buttons, re-size buttons, and incorporate pull down menus. More information on the use of these features may be found in the *Windows Tutorial* (found by selecting the *Help* pull-down menu from the *Program Manager* window, and then selecting the item *Windows Tutorial*).

CHAPTER 4

Initial Software Setup

This chapter describes setting up the software the first time it is used.

The following are instructions for the first installation of the software. They should not be necessary for a system that has already been in use, though you may find it helpful to read this chapter if you are unfamiliar with the software.

Before running the software, you should ensure that the real time clock of your PC is set to the correct time (GMT or BST as currently applicable).

Now double-click on the *RM301* program icon to run the program.

The first time the program is run it will ask for the data drive where the data files are to be located. Into this box you should normally enter the drive letter of the drive that the program was installed to. If you followed the standard installation instructions this will be C, the default, so simply click on the *OK* button. You should not enter the colon in the name (i.e. C:) or any subdirectory information, only a single drive letter (the system will only allow a single letter to be entered into the box, and will beep if you attempt to enter a number or more than one letter).

System Configuration (F9 - Configure System)

Once the data drive has been entered the *Configure System* window will appear, to allow initial configuration of the software.

The options on this page should now be set.

Option F1 - Time Window

It is possible for the program to calculate total water quantity measured over a set period each day (useful for minimum night flow periods). To do this a start and end time must be specified in this option. The default of 00:00 to 00:00 turns off this option (this option is only used for flow data).

To change these times click on the *F1* button (or press the *F1* key). A window now pops up requesting a start time. Enter the new start time in 24 hour format, using a colon to separate the hours from the minutes (e.g. *21:30*), and then click the OK button. A window then pops up requesting an end time. Enter this in the same way as the start time and click the *OK* button.

After setting a valid time range with this option, values are calculated for the *Window Total Litres* column in summary tables for flow data. *See Chapter 9 - Viewing Stored Data* for more information on Summary tables.

Option F2 - Days To Read

This option is used to limit the maximum number of days worth of data that the software will read from a logger. If, for example, the logger has 110 days of information logged, but this value is set to 15, then only the last 15 days of information are read from the logger. The PC will not read beyond the set start date of the logger (so in the above example the logger was started 10 days ago then only 10 days worth of information would be read, even though 15 days to read had been set).

To change the value click the F2 button (or press the F2 key).

A window then pops up showing the current `*days to read*' and allows the value to be changed. Use the + /- keys to increment/decrement the number of days until the desired figure is shown (max. 366) or press *A* to request that all data is downloaded and appended after that available on the data drive, when requested. Now press *Enter*.

Now there are a number of options that can affect the effective time of logged readings, when reading them from the Logger.

Set To PC Time - The Logger's internal clock is set to the same time as the PC's clock before data transfer, and the times of the readings within the Logger are computed relative to this new value (e.g. if the logger time is 08:30 and there is a single logged event at 08.10, but the PC time is 09.30, then this option would cause the logger time to be set to 09:30 and the logged event would be read as 09:10).

Set To PC Time - 1 Hour - As above but the logger is set to the PC time minus one hour (used when the PC is set to BST, the extra hour is subtracted from the PC time before the logger time is set, as the loggers should always be kept at GMT).

Check Against PC Time - Perform a check before data transfer and pop up a warning if the PC time is different to the Logger time by more than three minutes. No data transfer is possible until this situation is changed (either the PC clock or the Logger clock is changed so the clocks are within three minutes of each other, or one of the other options is chosen and the data transfer is attempted again).

Don't Check - Perform the data transfer without comparing the two times.

These options are used to allow for differences between BST and GMT. The Logger's are always maintained at GMT, but the PC's clock may have been set to BST. The normal option is to choose *Set To PC Time*, but with this option the PC should be left on GMT time all year.

Select the desired option by cycling through the various choices with the + or - keys, and press *Enter* when the desired option is shown.

Option F3 - Data Drive

Now check that this option is set to the same drive that the data is stored in (this value was requested when you first ran the program, normally drive C is used). If not click on the *F3* button (or press the key *F3*), replace the letter with the letter of the drive where the data is stored (e.g. C, D, or shared network drive, do not use the colon) and then click on the *OK* button.

Option F4 - Floppy Disk

This option is used to specify which floppy disk drive the computer will use when attempting to access a floppy disk. Normally the default of A: is correct, though to change it simply click on the *F4* button (or press the key *F4*), replace the letter A with the floppy drive of your choice (normally only A or B) and then click the *OK* button.

It is also possible to specify another hard drive for this option, though backups should be made to a device that can be taken to another site, for data security (in case the original files are lost through fire or theft).

Option F5 - Printer

This option has no effect on any part of the Windows program. It is used in the DOS version of the program.

Option F6 - Infra-Red Port

This option is used to specify which serial port the Infra-Red interface is connected to. It defaults to the first serial port (COM1:) but serial ports 2,3 or 4 may be selected (COM2: to COM4:). Each click of the *F6* button (or press of the *F6* key) presents the next option in the list, wrapping round to the first option after the last option.

There is no special option for not using Infra-Red interface - simply do not attempt to use Infra-Red communications.

Option F7 - Modem Port

This option is used to specify which serial port the Modem (used for Telemetry connections) is to be connected to, as well as that used for RM201/RM401 download. This option defaults to the first serial port (COM1:), but a new option may be selected by clicking on the *F7* button (or pressing the *F7* key) in the same way as selecting the Infra-Red communication port (see *F6 - Infra-Red Port* above).

Option F8 - Calibrate

When calibrating pressure sensors at least two reference pressures are required - normal ambient pressure and the maximum pressure that the transducer will measure (a third pressure may be used as a mid-point between the low and high limits to check the linearity of the transducers). This option is used to set the default maximum pressure used for calibration, though this value may be specified for the transducer during the calibration process itself.

Clicking the *F8* button (or pressing the *F8* key) pops up a window that allows you to directly type in the new default maximum calibration pressure, then click on the *OK* button to keep this value.

The value for maximum transducer pressure is initially set to a value of 5000, a pressure of 5 Bar (5000 mBar).

Option F9 - DG2/OP2

This option allows the DG2 and OP2 values to be changed. The OP2 level defaults to 17m pressure, though this may be set to any desired value. The DG2 level defaults to 12m pressure.

When viewing logged pressure data as a table, any values falling below the OP2 setting (but above DG2) are drawn in blue, whilst any values falling below the DG2 level are shown in red. When viewing pressure data as a graph, the DG2 and OP2 levels may be drawn on the graph, for easy indication of when measured pressure falls below either of these values.

Option *F10*

This option is used to convert the default readings of litres/second (l/s) to other user-defined flow units, for display in tables of readings or graphs. To perform the conversion, the conversion factor is required, that is the value that readings of l/s will need to be multiplied by to convert the readings to the new flow rate.

To enter a new flow units and conversion factor click on the *F10* button (or press the *F10* key). A window pops up asking for the new flow units to be used. Enter the label that would normally be used for graphs (e.g. the default is l/s for litres per second). After clicking on the *OK* button to confirm the new value, another window will pop up, asking for the conversion factor. Enter the numeric conversion factor required to convert l/s to the new units.

For example to convert the readings from litres per second to litres per hour press F10, then enter **l/h** and click on *OK*. Then enter a conversion factor of **3600**, as there are 3600 seconds in an hour.

If l/s are entered into the flow units window then this is recognised as the default and no conversion factor is asked for, as a conversion factor is not required to convert l/s to l/s.

After setting all of these options on the page to the correct value, press the escape key (ESC) to return to the main menu.

CHAPTER 5

Setting Up A Logger

Instructions on how to set up and calibrate a logger.
(with additional information on ControlMates)

Before setting up or changing the settings for a logger, the software preferences should have been correctly set. This is covered in detail in *Chapter 4 - Initial Software Setup*.

Selecting the communications system (F8 - Set Communication)

To read from, or write the settings to, a particular logger, the software must communicate with the logger using either the Infra-Red probe or Telemetry system. The correct system should be chosen from the main menu by clicking the button *F8 - Set Communication* (or pressing the key *F8*). This causes a window to appear from which the method of communication can be selected.

If an Infra-Red probe is to be used press the *I* key on the keyboard. This causes the window to disappear and the Infra-Red probe to be selected.

To select a telemetry connection type in the telephone number for the modem to dial and press return. Whilst selecting a phone number the key *X* can be used to select a persistent connection on or off. When the persistent connection is selected, the words *Persistent Tel:* appear before the phone number, under the words *communication channel*. If a persistent connection is switched off then only the word *Tel:* appears.

Persistent Telemetry is an option normally only used when first setting up a logger. With normal telemetry, the program will only connect to the modem when selecting an option that requires the program to talk directly with the modem - such as reading the settings of the logger or reading some logged values. Returning to the main menu breaks the connection with the logger (the computer effectively "hangs up" the phone). Since telemetry represents a large drain on the internal logger power source, this is the most efficient option, minimising the power drain on the logger and the use of the phone connection.

However this behaviour can be annoying when setting up a logger. Unlike normal use, where the user will normally just want to read the logged information, setting up the logger will often involve selecting the setup option, changing some settings, checking the results on the spot values and then perhaps reading some logged values as a test. Since each of these options involves returning to the main menu, the telemetry connection with the logger will be lost after each one, requiring the computer to redial the logger for each option. With the persistent telemetry connection the computer maintains the connection with the logger when returning to the main menu, so it does not have to redial the logger when selecting a number of different options. The logger is responsible for breaking the connection with the computer, which it does if it has not been sent any requests from the computer for longer than a minute. Whilst convenient, this option results in the logger holding the connection open for an extra minute each time it is dialled, a waste of internal power, so this option is NOT recommended for normal use.

The computer will hang up a persistent telemetry connection with a logger if it is asked to dial a different logger (i.e. when the telemetry phone number is changed).

Once the communications system has been selected it should be readied for use, i.e. infra-red probes should be plugged into the PC and placed over the infra-red window in the logger, and telemetry systems should be plugged into the PC and PSTN phone network and switched on.

NOTE:- Probes and telemetry systems should only be connected to PC systems when both they and the PC are switched off.

Setting Logger Parameters (F1 - Setup Logger)

To inspect and/or change some of the options for the logger, select the option *F1 - Setup Logger* from the main menu (or press the *F1* key). The *Logger Setup [Online]* window then appears with a further menu of options for changing aspects of the logger operation. These should be checked in order and corrected if necessary.

Initially the current settings for the logger are automatically read.

If any options are changed then an asterix (*) will appear next to them on the menu. These values will not be written to the logger (and will be lost if the escape key is used to return to the main menu) unless the option *F10 - Setup Logger* is used to write the options to the logger itself.

Option F1 - Read Logger Setup

This option is used to read the current settings from the logger. This should be performed before attempting to change the other options. Simply select the *F1* button (or press the *F1* key) and the information will be read. As this is automatically performed when the *Setup Logger* option is first selected from the main menu, this should only be required when the infra-red probe is moved from one logger to another when the software is still on the *Logger Setup (Online)* window or when errors have been made in editing the parameters.

Option F2 - Logger ID

Each logger is identified by a unique ID, normally consisting of two letters followed by four numbers, though the first part of the ID may consist of up to 2 letters and/or numbers (or may be omitted). The second part of the ID must consist of four numbers and must be entered. Examples of valid ID's are 1234, A1234, AA1234, 1A1234, A11234 but not 1234AA or A123. If an invalid ID is entered then it will be ignored, and the previous ID will be kept (the program will prevent you from entering any letters after the first two characters of the ID by beeping and ignoring the key pressed).

To change the logger ID simply click on the *F2 - Logger ID* button (or press the *F2* key). Type in the new logger ID then click on the *OK* button.

In some cases the logger ID may have been **Locked**, to prevent it from being changed. If the logger ID has been locked, then *(Locked)* appears after the logger ID. If the ID is locked then this will also prevent any changes to the *type* setting for the inputs (see *Option F5 - Pulse Input and Option F6 - ADC Input (or F6 - 0.00 - 20mA)* below for more information).

To allow the current use of the logger to be identified, another option has been provided. For more information see section *F8 - Location*.

Option F3 - Logger (GMT)

This option is used to set the current logger time from the PC clock, therefore before this option is used ensure that the PC clock is correctly set. The loggers should always be set to GMT, though they may be set from a PC set to either GMT or BST.

To update the time in the logger to the current PC time click on the *F3 - Logger (GMT)* button (or press the *F3* key). A window then pops up reminding you that loggers should be set to GMT time, showing you the current time and date as read from the PC and asking if the PC is set to the BST or GMT time system. Simply click on the *F1* button (or press the *F1* key) if the PC is set to BST, or click the *F2* button (or press the *F2* key) if the PC is set to GMT.

The program will then return to the *Logger Setup (Online)* menu, with an asterix next to the *F3* option, to show that the option has been changed. The option text will now also have changed to either *F3 Update Logger - PC Time Is GMT* or *F3 Update Logger - PC Time Is BST*, depending on the option chosen. Selecting the *F3* option again at this point will cancel the changes, removing the asterix and redisplaying the previous value of logger time and date.

Option F4 - Sampling Rate

This option allows selection of the time between measurements for the logger, from a number of set sampling times. The list will depend on the logger being used.

Setting this value to a shorter time will increase the number of readings taken over a set period, providing you with a better picture of fluctuations over time. However, this will also fill the logger memory quicker, reducing the longest period of time that the device can operate without being read, as once the memory is full older readings are lost as they are overwritten by newer readings.

This value should be set to the best compromise between resolution (number of readings per second) and total operating time.

To change the value click the *F4* button (or press the *F4* key) until the desired value is shown. Each click on the button (or keypress) selects the next value in the list, and list will go back to the first value in the list after the last value.

The sampling times available from this list depend on the type of logger being used.

Option F5 - Pulse Input and Option F6 - ADC Input (or F6 - 0.00 - 20mA)

These options are used to set up the two inputs to the current channel pair.

Choosing one of the options causes the *Logger Setup (Online)* window to display the current settings for the channel pair. This has the title *Logger Channels* and the page consists of two rows of information, one for the *Pulse* input and the other for the *Analogue* input. For each item there is two items of additional information - the *Type* of information measured by that input (or none if that input has been turned off) and additional calibration information (the *Parameters*). Use the up and down cursor keys to switch between the two inputs (the current input is highlighted by a black bar) and click on the *F1 - Type* button (or press the *F1* key) to change the *Type* of the current input, or *F2 - Parameters* button to change the parameters for the current input.

Pulse Inputs

Pulse inputs may be switched on (the *Type* reads *Flow*) or off (the *Type* reads *None*), by selecting the *F1 - Type* button. When on the *F2 - Parameters* button may be used to tell the computer how many litres of fluid need to pass before the transducer produces a pulse. This defaults to 10 litres/pulse, though this may be changed by clicking on the *F2* button and entering a new value.

If the use of other pulse transducers has been requested then selecting the *F1 - Type* option may offer more choices than *Flow* and *None* and the *F2 - Parameter* option may offer further choices.

ADC Inputs

ADC inputs are used to measure pressure and may be switched on (the *Type* reads *Pressure*) or off (the *Type* reads *None*) by use of the *F1 - Type* button. When the input is turned on the *Parameters* section reads *User Calibrated*. Calibration is carried out by selecting the *F5 - Calibrate Logger* page from the main menu (See the section *F5 - Calibrate Logger* for more information).

If use of a depth voltage transducer has been requested then selecting *F1* - Type will offer a *Depth* option. Further options may also be available if other transducer types have been requested.

0-20mA Inputs

As mentioned these types of input may be used to read one of several type of information. The type of input and calibration required are both selected from these options. The input *Type* represents the type of information being read and may be one of six values :-

1. *None* - The input is switched off. The *F2 - Parameters* option has no effect.

2. *Flow* - The input is connected to a flow transducer. Selecting the *F2 - Parameters* option asks for two values - what current reading do you get when there is a measured flow of 0 litres/second

(enter the value and then click on *OK*) and how many litres/second does the maximum measurable input of 20mA represent (again, enter a value then click on *OK*)?

3. *Pressure* - The input is being used to measure pressure. Selecting the *F2 - Parameters* option asks for two values - what current reading do you get at 0m pressure and how many metres pressure is represented by a maximum measurable input of 20mA.
4. *Current* - The input is being used to measure electrical current. With this option the input may be being used with another external transducer, so a reading of 20mA to the input may actually represent a much higher or lower value (e.g. 11Amps or 1.6 milliAmps). Selecting the *F2 - parameters* option asks for two values - how many milliAmps does a reading of 0mA represent, and how many milliAmps does a reading of 20mA represent.
5. *Temperature* - The input is used to measure temperature. Selecting the *F2 - Parameters* option asks for two values - what current reading represents a temperature of 0ºC and what temperature reading does an input of 20mA represent.

6. *Depth/Flow* - This type of input may be used to measure the change in depth of a reservoir or can convert this value into a flow of water from the reservoir. To measure the depth use the up/down cursors to select *Depth* and then select *F2 - Parameters*. Two values will then be asked for - how many milliAmps would be measured for a depth of 0m and how many metres depth would a reading of 20mA represent. To convert the depth reading into a flow reading a further parameter is required. Select *Flow* using the up/down cursor keys then select *F2 - Parameters*. The program will then ask for a m^3/mm factor - this is how many cubic metres of water are contained in the reservoir for every 1mm of depth. Entering a value of 0 will prevent a flow file from being produced.

Choosing the *F3 - Save* option remembers any changes and returns back to the previous menu (*Logger Setup (Online)*). It does NOT save it to the logger, to do that you must explicitly use the option *F10 - Setup Logger* from the previous menu.

NOTE - turning off unused inputs (setting the type to *None*) saves memory, as the logger does not have to store readings for these inputs. This increases the time that the logger may be left unattended before it overwrites previous readings.

Option F7 - Register

This is a computerised equivalent of the register found within fixed meters, measuring total volume over time. It is commonly used for one of two tasks.

To check an existing register

The register is set to the same value as the existing register. As the logger measures flow it updates this value, and the reading should remain the same as the physical register. This also may be used as a replacement for an existing register.

To totalise flow over a set period

The register is manually reset at set periods, every month say, and thus represents the total usage during that month.

Choosing this option pops up a new window. The desired meter reading should be entered into the box and then select *OK* button.

(Note that the time window option allows daily totals for a set time period to be calculated - see option *F1 - Time Window* in *Chapter 4 - Initial Software Setup* for more information. Total volume for a particular time period may also be calculated by displaying the desired range on a graph of the logged information. The total volume may then be read from the summary block in the top left hand corner of the graph. See the section on *Viewing the stored data as a graph* in *Chapter 5 - Viewing Stored Data* for more information)

Option F8 - Location

This option is provided to enter a small description about the location of the meter. The description is entirely up to the user, and consists of up to 24 alphanumeric characters (24 letters and/or numbers).

Option F9 - Alarms

Since the use of alarms requires a telemetry logger, the settings for alarms can only be set using a telemetry communication connection. Alarms may be viewed using an infra-red connection, but no values can be changed and only the first nine numbers in the dial back phone number are shown (followed by ...).

One alarm may be set for every valid input on a telemetry logger, so this presents the possibility of two alarms for every channel pair of a multichannel telemetry logger (one alarm per input). For each input a range is specified, if the value exceeds the maximum or goes below the minimum for a certain length of time (set in *Log Intervals* - see below), then the alarm will be triggered. The alarm causes the logger to ring a phone number (the *Dial back phone number* - see later), normally set to a computer running the alarm software. This will then answer the phone and record the logger's ID and the time/date of the call. It will also optionally read a set number of days worth of data from the logger. The connection will then be broken and the alarm for that input may be reset or turned off, depending on the type of logger.

To set an alarm, select the input using the up/down cursor keys (the current input is highlighted with a black bar) and click on the *F1 - Edit* button (or press *F1*). The program than asks for three values (example for flow alarm) :-

Log Intervals till flow Alarm

The alarm is triggered by the reading exceeding a maximum or going below a minimum, but can only be triggered when the logger is reading and storing readings within it's internal memory (logging the data, thus this value is measured in log intervals). The number entered here is the number of consecutive logs that the read value must be outside the set range. For example if the *Log Intervals* is set to 1, then the alarm will be triggered on the first log that the value is outside the set range, but a *Log Intervals* of 3 would require the value to be outside the set range for three consecutive logs.

Please note that because the alarm is only checked/triggered when the logger is logging a set of data, the time that the value must be outside the set range will change with the sampling period (set using *F4 - Sampling Rate*). A log interval of 3 may require the value to exceed the set range for three minutes or three hours - depending if the sampling rate is set to 1 Minute or 1 Hour. Also since the alarm cannot be triggered until the next log, with a long period between samples the alarm may not be triggered for some time, even with a log interval of one.

Enter the desired value into the box and click on the *OK* button. The minimum value that can be used is one log interval.

Enter Low flow Alarm (l/s)

This is the low alarm value. If the value goes below this value for the set number of log intervals then the alarm will be triggered.

Enter the desired value into the box and click on the *OK* button.

Enter High flow Alarm (l/s)

This is the high alarm value. If the value goes above this value for the set number of log intervals then the alarm will be triggered.

Enter the desired value into the box and click on the *OK* button.

Turning the Alarm On/Off

After setting up the log intervals, low value and high value in this way then the alarm is ready, but not necessarily armed (turned on). To switch an alarm on or off, highlight the input using the up/down arrows, then press the *F2 - Arm* to change the armed state of the alarm (turn it on or off).

The Dial Back Telephone number

This is used to set the phone number that the logger will dial when the alarm is triggered. As mentioned this should be set to the phone number of a PC running the appropriate answering program.

To change the dial back phone number, simply click on the *F3 - Phone* button (or press *F3*), enter the phone number, then click on the *OK* button.

Saving the Alarms

After entering the correct alarms, click on the *F4 - Save* button. This returns to the previous menu (*Logger Setup (Online)*, marking *F9 - Alarms* with an asterix to show that values have been changed. The writing after *F9 - Alarms* will also inform you if any alarms have been set as armed. At this point the settings have not yet been changed within the logger itself. To write the changed values back to the logger you must now select *F10 - Setup Logger*.

Option F10 - Setup Logger

Most of the other options on this menu allow some aspects of the logger setup to be changed. However they do not write the changed values to the logger itself. To write the values to the logger, this option must be selected, i.e. click on the *F10 - Setup Logger* button (or press the *F10* key).

When writing the configuration to the logger another window will pop up asking if you wish to change the logging start. The logging start is taken to be the time and date of the first valid or useful information. This is used when reading data from the loggers, as any information stored before the logging start is not read by the software.

An example of the use of the logging start is when a logger is first installed. During the installation the logger has been recording information from any inputs that were switched on. However all information recorded before the logger is correctly installed is likely to be useless. However, after installation is complete the logging start can be set to the current time, and so any information before the logging start will not be read when the information is transferred to a PC.

You have three choices :-

Yes - To chose this option press the Y key on the keyboard. This option will change the logging start to the current time, so only data recorded after the current time will be transferred when the logger data is read.

No - To chose this option press the N key on the keyboard. This option retains the current logging start stored in the logger.

User - To chose this option press the U key on the keyboard. This option can be used to enter any desired logging start time and date. This is useful when the logging start had been set to a month before the current date, but only the information from the last six days onwards is desired. Simply set the logging start to six days before the current date, and a read will retrieve that information onwards (you could have set the days to read to 6 days, read the information from the logger, then reset the days to read to all, but this way is easier for a permanent change to the logging start). It is the responsibility of the user to check that the logging start is not set to a time before the logged data was valid.

Changes made to the options that have not been written to the logger are shown by an asterix next to the option itself.

Changes to the options not saved to the logger are lost when returning to the main menu or by clicking on the *F1 - Read Logger Setup* button.

Differences in setup for a multichannel logger

When using a multichannel logger the setup menu is used to set for the current channel pair.

There are two main indications that a multichannel logger is being setup :-

1) Next to the option *F1 - Read Logger Setup* the phrase *(Page Up/Down)* appears. This refers to the fact that pressing the *Page Up* key on the keyboard is used to select the next channel pair in the sequence, and the *Page Down* key can be used to select the previous channel pair.

2) After the logger ID a dash appears followed by a number. This number is the current channel pair that setup will change. For example the ID AA0001 - 2 would be channel pair number 2 of the logger. Each channel pair MUST have a unique ID to distinguish the individual channels.

Most of the setup options can be changed for each channel pair. However please note that the Logger time and Sampling Rate are global (i.e. they can only hold one value, not one per channel pair) and although a different alarm can be set for each input on each channel pair, only one dial back phone number can be set.

Setting Up A ControlMate (Channel Pair 4)

When setting up a ControlMate the device appears as a multichannel logger, but differences appear on the *Setup Logger* page when channel pair 4 is observed. On the ControlMate range of devices, channel pair 4 is reserved for setting up the control side of the device, with the other channels operating as normal logger channel pairs (the device may have less than 3 other channel pairs but the control channel is always channel 4).

When viewing channel 4 of a ControlMate, the setup menu changes to offer a different range of options to set control parameters within the ControlMate. These options will vary slightly, depending on whether a ControlMate or Economy ControlMate is being set up.

Options for a ControlMate (PRVC)

When using the setup window to view the control channel pair (channel 4) of a ControlMate the following options will be displayed :-

F1 - Read PRVC Setup
F2 - PRVC ID
F3 - PRVC (GMT)
F4 - Sampling Rate
F5 - Table (3)
F6 - PRVC Mode
F7 - Flow Average
F8 - Location
F9 - Alarms
F10 - Setup PRVC

Options F1, F2, F3, F4, F8 and F10 operate in an identical manner to setting up a normal logger channel. Alarms cannot be set for the PRVC control channel, so option F9 does not perform a function for this channel. Options F5, F6 and F7 are used to set the parameters for the PRVC.

Selecting a PRVC mode (F6 - PRVC Mode)

The PRVC offers two distinct modes of operation for automatic control of pressure - *Flow* based control and *Time* based control of an outlet pressure. A PRVC will normally operate in one of these two distinct modes of operation.

As well as the automatic control mode there are two other modes that may be selected - manual and no control. In manual mode the desired (target) outlet pressure is entered and the program will then alter the outlet pressure to try and match the entered desired outlet pressure. Manual mode also has the advantage that it will often reach the target pressure quicker than the automatic modes (more on this can be found in the section on *Using the Spot Reader to view channel*

pair 4 of a ControlMate, in Chapter 6). The final mode, no control, turns off the control signals from the PRVC. This is useful during installation of the device or if some of the system is being changed, to temporally switch off the control.

The PRVC may be freely switched between one of the automatic modes to manual or no control mode and back again at any time (normally carried out in the *Spot Values* screen from the main menu, as this allows the values last read by the control system to be displayed and monitored). As the device is designed to operate in one of the two automatic modes then switching between the automatic modes involves further complications, described later.

To select the mode of operation for the setup, click on *the F6 - PRVC Mode button* (or press the *F6* key). The window will then display buttons for the four modes of operation :-

F1 - Manual
F2 - Flow
F3 - Time
F4 - No Control

Choose the mode of operation by clicking on the button corresponding to the desired mode (or press the correct function key F1 to F4). If manual mode is chosen then a window will appear, requesting the target pressure that the manual mode will attempt to reach at the outlet. Enter the value and then click on the *OK* button and the program will return to the setup menu. Choosing any other mode will return the program to the PRVC setup menu.

On the setup menu, the value in brackets after the selected PRVC mode is the current target value for outlet pressure (with flow and time control this value will change depending on the current flow rate or time). This value will only be updated when the PRVC setup is re-read (option *F1 - Read PRVC Setup*).

The value in brackets after the table label (e.g. *F6 - Table (3)*) indicates the number of entries in the current table. The range of pressures that has been entered in the table is also displayed (e.g. *F6 - Table (3) = 20.0 - 40.0 m* indicates that the lowest pressure used in the table is 20m and the highest is 40m).

Finally, the time value in brackets after the pressure range (e.g. *300ms*) is an indication of total use of the control actuator battery. This value will count up each time a control pulse is sent. Ignore this value, as it is only for use during internal diagnostics at Palmer Environmental.

Description of PRVC flow control

When PRVC flow control is used, three parameters are measured - the inlet pressure to the control valve, the outlet pressure from the valve and the flow. The outlet pressure of the system will be dependant on the currently measured flow. The normal use of this type of control system is to ensure that if demand on a system is low, then the outlet pressure is correspondingly low, to reduce losses from the system after the controller. As demand increases, however, the output pressure of the system is increased to ensure that adequate pressure is maintained at the customer end.

The control system is defined as a table of values, each entry consisting of a measured flow rate with a corresponding pressure that is to be maintained at the outlet for that flow rate.

An example table that could be entered is :-

PRV Switch Settings - Flow (m3/h)	Pressure (m)
10 .0	20.0
50.0	30.0
80.0	40.0
100.0	50.0

Thus if a flow of 80 cubic metres per hour is measured, then the system would alter the outlet pressure until it reaches 35m (assuming adequate inlet pressure). This will not happen instantly, so the pressure readings should incorporate an adequate safety margin. Interpolation is used to create 25 linear steps between each value in the table, so as the measured flow increases from $50m^3$/h to $80m^3$/h, the output pressure will not suddenly change from 30m pressure to 40m pressure, but will pass through 25 output levels in between. Thus for each $1.2m^3$/h of flow above $50m^3$/h ((80-50)÷25 = 1.2) the output pressure will be increased by 0.4m pressure ((40-30)÷25 = 0.4).

In this way it is only necessary to enter the critical values required, as 25 values in between each value in the table will be used.

The first and last entries in the table have special meanings. The last entry in the table represents the highest outlet pressure that will be used, so for any flow above 100m^3/h the outlet pressure will be maintained at 50m. The first entry in the table represents a minimum acceptable value of flow. If the flow reading falls below this value then the PRVC will assume that the flow transducer is not working correctly, and will increase the outlet pressure to the maximum pressure listed in the table. The reason it does this is that if the flow transducer were to fail whilst the system is unattended, then adequate pressure will always be available to customers.

Entering a PRVC flow control table (F5 - Table)

To enter a flow control table using the *F5 - Table* option, the last automatic control mode (flow or time) accessed using the *F6 - PRVC Mode* option must have been Flow (the mode currently selected may be manual or no control, as well as flow, as long as the time option has not been selected since the last time flow was selected).

When entering a flow control table, the window will display the current table of data,

e.g.

PRV Switch Settings - Flow (m3/h)	Pressure (m)
10 .0	20.0
50.0	30.0
100.0	40.0

At the bottom of the window there are also three options *F1 - Edit*, *F2 - Delete* and *F3 - Save*.

There can be up to 10 lines entered in the table. The current entry is highlighted with a black bar. Another entry in the table may be selected by using the up and down cursor keys to highlight the new entry.

To add a new table entry, select a line of the table that does not currently have a value and press *F1 - edit*. A window will pop up requesting a flow value for the entry. Type in the flow value that the system will check for (values between 0 and 32000 may be entered) and click on the *OK* button. Another window will then pop up requesting the target pressure for the flow value entered. Type in the required target pressure (any value up to the upper calibration pressure will be accepted. Entering a value above 195m has a special meaning - see *Appendix 1* for more details) and click on the *OK* button. The table entries are sorted into ascending values of flow, so new entries may be inserted between existing entries if the flow value entered is less than the current highest in the table.

Editing an entry is carried out by highlighting an entry with existing values and pressing *F1 - Edit*. The editing is carried out in an identical manner to entering a new entry, but the previous values for flow and pressure are offered as defaults.

To delete an entry in the table, highlight the entry to be deleted using the cursor keys and click on the *F2 - Delete* button (or press the *F2* key). The line will be removed and the following table entries are moved up by one line to fill the gap.

After entering the desired table of values, click on the *F3 - Save* button to keep the values (or press the *F3* key), or press *ESC* to keep the previous table.

Description of PRVC time control

If the system exhibits a regular daily pattern of use then PRVC time control can be used. With this system the outlet pressure is altered depending on the current time of day (and thus expected

demand for each time of day). Sufficient margins must be used for the outlet pressures, to allow for unexpected sudden demands on the system during the day.

With this form of control, the table consists of a number of times, with a target outlet pressure to be maintained after this time, e.g.

PRV Switch Settings - Time (hh:mm)	Pressure (m)
06:30	60.0
10:30	30.0
15:00	80.0
20:00	20.0

For time control, no interpolation is used between the table entries, so at 10:30 the pressure will be maintained at 30.0m until the time reaches 15:00 when the pressure will rise to 80.0m. The values will wrap over midnight, so a pressure of 20.0m will be maintained from 20:00 till 06:30 the next day.

Since the customers of a system will normally operate to BST then the PRVC may be set to automatically switch to BST on the correct dates. This is performed by entering another table of data, each line containing the start date and end date of BST. Up to four pairs of dates may be entered, representing GMT <-> BST changes for up to four years.

Entering a PRVC time control table (F5 - Table)

To enter a time control table using the *F5 - Table* option, the last automatic control mode (flow or time) accessed using the *F6 - PRVC Mode* option must have been time (the mode currently selected may be manual or no control, as well as time, as long as the flow option has not been selected since the last time the time mode was selected).

When entering a time control table, the window will display the current table of data,

e.g.

PRV Switch Settings - Time (hh:mm)	Pressure (m)
06:30	60.0
10:30	30.0
15:00	80.0
20:00	20.0

At the bottom of the window there are also three options *F1 - Edit*, *F2 - Delete*, *F3 - Save* and *F4 - Dates*.

There are 10 lines in the table, so up to 10 time values can be entered. The current entry is highlighted with a black bar. Another entry in the table may be selected by using the up and down cursor keys to highlight the new entry.

To add a new table entry, select a line of the table that does not currently have a value and press *F1 - edit*. A window will pop up requesting a time value for the entry. Type in the time value that the system will check for (values between 00:00 and 23:59 may be entered) and click on the *OK* button. Another window will then pop up requesting the target pressure for the time value entered. Type in the required target pressure (any value up to the upper calibration pressure will be accepted. Entering a value above 195m has a special meaning - see *Appendix 1* for more details). The table entries are sorted into ascending values of time, so new entries may be inserted between existing entries if the time value entered is less than the current highest in the table.

Editing an existing entry is carried out by highlighting an entry with existing values and pressing *F1 - Edit*. The editing is carried out in an identical manner to entering a new entry, but the previous values for time and pressure are offered as defaults.

To delete an entry in the table, highlight the entry to be deleted using the cursor keys and click on the *F2 - Delete* button (or press the *F2* key). The line will be removed and the following table entries are moved up by one line to fill the gap.

After entering the desired table of values, click on the *F3 - Save* button to keep the values (or press the *F3* key), or press *ESC* to keep the previous table.

The *F4 - Dates* option is used to enter values for automatic BST switching. Clicking on the *F4 - Dates* button (or pressing the *F4* key) will display a new table which may contain up to four pairs of entries. Editing and deleting entries is carried out in the same way as entering values in the table of time/pressure values. However this time the values entered are two dates, the start date of BST for a particular year and the first day of GMT after the BST period for the same year.

The four table lines may be used to enter start/end dates for up to four years (the entries are sorted into ascending order of dates).

After entering the desired table of BST values, click on the *F3 - Save* button to keep the values (or press the *F3* key), or press *ESC* to keep the previous table.

Selecting a flow average (F7 - Flow Average)

This option allows the two values for flow average to be changed. The two values set by this option are :-

Flow Averaging Period - The displayed value of flow is an average flow over a set period of time. For example, setting this value to 15 minutes would result in each flow reading being the average of the flow measurements of the last 15 minutes. This value is, of course, only valid if flow control is currently selected. Valid values for flow averaging period are between 1 and 42 minutes.

Control Interval - This value is the period between each control pulse (or in manual mode, the first pulse in each burst of pulses). Thus setting this value to 10s in time control would result in one control pulse every 10s (if the outlet pressure is more than 1m different to the target pressure). Valid values for control interval are between 10 and 60 seconds.

To enter new values for these parameters, click on the *F7 - Flow Average* button (or press the *F7* key). First type in the new flow averaging period and click on the *OK* button, then type in the new control interval and click on the *OK* button.

Problems when switching between Flow and Time control (and vice versa)

As mentioned, the PRVC will generally only be used in one of the two automatic control modes, flow control or time control of outlet pressure. For this reason, and because the amount of memory to be used for control parameters in the PRVC is limited, the tables for time control and flow control use the same area of internal PRVC memory. Thus entering a table of time control values will overwrite an existing table of flow control values and vice versa. This means that the PRVC cannot be switched between the time and flow control without entering a new valid table (the new mode will be entered but the control table will contain ridiculous values).

The existing data table is not guaranteed to remain intact if the automatic control mode is changed and then changed back again without changing the table values.

Options for an Economy ControlMate (PRVCE)

The Economy ControlMate (PRVCE) works in a very similar fashion to the normal ControlMate (PRVC), except that instead of being able to set a specific outlet pressure, only one of two mechanically fixed pressures may be used, a “high” pressure and a “low” pressure. Thus when tables of data are being entered, where a pressure would normally be entered a window will appear allowing the high or low pressure to be selected (the option is toggled using the + or - keys).

Another difference with the Economy ControlMate system is that, with certain pressure reading valves, there is a possibility of a slight amount of drop of the fixed pressures, so the outlet

pressure could drop over time (this can be corrected by resending the control pulse). When selecting a new control mode for the Economy ControlMate an additional value is requested - a value for *Minimum Pressure*. If the outlet pressure ever reaches this value then it is assumed that the output has drifted and the pressures are re-established by sending the control pulse again.

An Economy ControlMate can easily identified when viewing channel pair 4 on the setup options as the word PRVCE appears instead of PRVC, which is used for a normal ControlMate.

When entering a flow control table for a PRVCE, only two lines of entries are needed.

e.g.
1m3/h	|	Low
50m3/h	|	High

The first entry is a safety check for potential failure of the flow transducer (pulse unit) and the second entry defines the flow above which the pressure is switched to high. Usually the flow value of the first entry should be much lower than expected minimum flow. If the flow drops below this value the controller will assume failure of flow measurement and switch to the high pressure setting.

Logger Calibration (F5 - Calibrate Logger)

To calibrate the ADC pressure inputs on a logger, select option *F5 - Calibrate Logger* from the main menu. This page displays the current pressure reading from the logger, updated every few seconds, and allows various calibration values to be entered. For calibration a precise source of pressure is required.

NOTE:- Before calibrating a ControlMate, ensure the mode is set to “no control”.

In the top left of the window, the location from the logger setup is displayed, with the logger ID in the top right hand side of the window.

The value to be used for calibrating the pressure transducer (the Calibration Pressure) is shown in the middle of the window, with the current pressure reading just below (the calibration pressure was set by one of the Configuration options - see *F9 - Configure System*, but may be changed here). At the bottom of the window there are the options for changing the calibration.

The sequence for calibrating the pressure transducer is as follows :-

Setting the zero point

Remove input hoses from the pressure input (ensuring they are depressurised first). When the reading on the screen is stable at a constant value then click on the *F1 - Zero* button (or press *F1*). This sets the transducer reading for zero (ambient) pressure. The pressure reading should now read 0.00 Bar.

Setting the high point

Firstly check that the figure for Calibration Pressure is set the same as the pressure that is going to be used to calibrate the transducer. If not click on the *F4 - Value* button (or press the *F4* key), then type the new value into the box and click on the *OK* button.

The calibration pressure pump should then be connected to the input of the transducer, and the pressure gradually increased until it is equal to the Calibration Pressure entered earlier. When the pressure reading in the window has stabilised to a constant value click on the *F2 - Hi Pt* button (or press the *F2* key). This tells the logger that the current pressure measured is equal to the calibration pressure value, so the measured pressure in the window should now read equal to the calibration pressure.

Setting the mid point

A third value may now be set, at around mid point between zero and the upper calibration pressure. This is to compensate for non-linearities in the operation of the transducer. To set this value gradually reduce the input pressure until it is half the calibration pressure. Set this value as the new

calibration pressure using *F4* and then click the *F3 - Mid Pt* button (or press the *F3* key). The reading should now be exactly half the calibration pressure and calibration is complete.

Note: The + and - keys may be used for fine adjustment of the calibration pressure to match the applied pressure.

The *Q* key may be used to turn on or off the beeps that are produced each time a reading is made.

Calibrating a multichannel logger

With a multichannel logger, each ADC pressure transducer must be calibrated separately. The current channel pair is indicated for a multichannel logger by a dash and a number after the logger ID number (e.g. AA1234 - 1 would indicate that the pressure transducer on channel pair 1 is currently being measured and calibrated). The *Page Up*/*Page Down* keys on the keyboard are used to select the correct channel to calibrate.

CHAPTER 6

Checking Logger Inputs

How to view the inputs that the logger is currently reading.

Using the Spot Reader (F3 - Spot Values)

The option *F3 - Spot Values* can be used to display measurements of the inputs in the currently selected channel pair, with new measurements being made and displayed every few seconds. The readings shown in this window are not stored in the logger memory in addition to readings already being taken by the logger, nor are they written to a data file on disk.

Before using this option the program should have been correctly configured (covered in the section *Initial Software Setup*), the communications system should have been correctly selected (covered in *Changing The Settings For A Logger*) and the logger should have been set up (covered in *Changing The Settings For A Logger*). For pressure readings to be meaningful then ADC pressure loggers should also have been calibrated (once again this was covered in the section *Changing The Settings For A Logger*).

If the *F3 - Spot Values* button is clicked (or if the *F3* key is pressed) then a new window pops up. The logger location information is displayed in the top left hand corner of the window, and the logger ID is shown in the top right hand corner. If the logger ID is shown followed by a dash and a number (e.g. AB1234 - 2), then the current logger is a multichannel device and the channel pair being read is shown by the number after the dash (in the previous example the logger ID is AB1234 and the program is currently reading channel pair 2). The *Page Up* key can be used to move to the next channel pair, and the *Page Down* key will move to the previous channel pair.

The lower half of the window is used to display the readings from the channel pair. The upper reading is used to display the reading from the ADC or 4-20 mA input, the lower reading is from the pulse input and between the two is a display of the register stored in the logger (which continues to count up with any flow pulses). If either of the channels in the channel pair are not being used (or have been switched off using the setup screen) then a message is displayed where the readings are normally shown. For example if there is no pulse flow channel in the current channel pair then the message *No Pulse Channel* will be displayed where the pulse readings would normally be shown.

The top reading is a direct reading of the value from the ADC or 4-20mA input, converted to appropriate units (e.g. *Flow: 25 l/s* or *Current: 10mA*).

The lower reading, however, is a conversion of the time between pulses into a flow rate. To perform the calculation of flow rate from received pulses then at least two pulses are required to have been received. Thus when the *Real Time Reader* window is first displayed, then the area used for the lower reading displays the message *Waiting For 1st Pulse...* until the logger receives the first pulse. It then displays the message *Waiting For 2nd Pulse...* until the second pulse is received by the logger. The program is then able to convert the time between pulses into a flow rate using the *l/pulse* factor entered in the logger setup page and displays the value on the screen (converting from l/s to the rate specified by the conversion factor specified on the configuration page). For example if the rate is set to be shown in litres per hour (conversion factor of **3600**), then the screen may display *Rate = 1920.0 l/h* after receiving the second pulse. The subsequent pulses from the flow input are used to maintain the flow rate displayed as the *average flow rate*.

New readings are taken every few seconds and redisplayed in the window (the computer produces a short beep every time new readings are shown), until the ESC key is pressed to close the window and return to the main menu.

The *Q* key may be used to turn on or off the beeps that are produced each time a reading is made.

Using the Spot Reader to view Channel Pair 4 of a ControlMate

When viewing channel pair 4 of a ControlMate, all of the parameters that are measured or set during control of the outlet pressure are displayed.

Here is an example of the spot reader displaying the channel pair 4 of a ControlMate :-

Location: Res *ID: NW004 - 4*

Inlet Pressure: 194.7 m *Switches: 3 - 36000 ms*

Outlet Pressure :39.4 m *Current Flow: 17.0m3/h*

Target Pressure: 40.0m *Control : Flow On*

The ID and location information for the logger are displayed on the top line of the window.

The Inlet pressure, Outlet pressure and Flow rate last measured are displayed and periodically updated (the outlet pressure and flow rate are measured using channel pair 1 of the ControlMate, the inlet pressure is measured using channel pair 2).

The current target pressure is shown under the outlet pressure. When the system is being controlled (in one of the automatic modes or the manual mode) then the system will attempt to adjust the outlet pressure until it is ±1m of the target pressure.

The switches value indicates the number of entries in the control table (the time reading after the number of entries should be ignored - it is a measurement of the total time that control pulses have been sent since the unit was commissioned).

At the bottom of the screen are three options :-

F1 - Manual
F2 - Flow
F3 - No Control

Option F2 will either be *Flow* or *Time*, depending on the last automatic control mode used on the setup options. These three options allow the ControlMate to be freely switched between the current automatic control mode, manual control mode or no control. The automatic control mode used cannot be changed from this screen, as changing the automatic mode requires that the control table be altered.

The normal use for this screen is to view the progress of the ControlMate in controlling the output pressure using one of the automatic control modes.

However, in some cases it may be useful to switch to manual mode for a period of time.
If there is a sudden leak then switching to manual mode and selecting a low target pressure can reduce the amount of the leak until it can be repaired.
The manual mode may also reach a target pressure quicker than either of the manual modes. The automatic modes monitor the difference between the outlet pressure and the target pressure, and if the difference is greater than ±1m then they trigger a control pulse every time the *Control Interval* elapses (see the section on *Setting the flow average* in Chapter 5), a maximum rate of once every 10 seconds, until they are within 1 metre difference.

In the manual mode, however, the controller may send bursts of pulses (more than one pulse in rapid succession) during a single control interval, if it senses that the control pulses are not having much effect on the difference between outlet and target pressure. When manual mode is first used, it sends a single control pulse. The change in pressure difference between before the pulse was sent and after the pulse was sent is calculated. If this change is small, relative to the difference between outlet and target pressure, then after the control interval the control will send two control pulses. This will continue (unless the outlet pressure nears the target pressure) until the manual mode is sending a series of ten pulses for each control interval. As the outlet pressure approaches the target pressure then the number of pulses will be reduced, to prevent overshooting the target.
It is useful to use manual mode, therefore, when the difference between outlet and target pressure is great. If it is found to be necessary to use manual mode regularly during normal operation,

to allow the system to “catch up” with the desired target, then it is likely that the table of control values is incorrect (e.g. during time control mode it is advised to set each time to five minutes before the listed pressure is required, to allow the system time to achieve the new pressure), or the control valve has been incorrectly set up.

Using The Step Tester (F6 - Step Tester)

The step tester has been designed for a very specific purpose - to measure the change in flow rate of a system when the valve feeding a certain number of properties is shut off. As such the Step Tester is only of use when dealing with loggers that have flow inputs.

The sequence of events when using the flow tester is as follows :-

1) Communication with the logger is set up, and the step tester option is selected.

2) The number of properties to be excluded by shutting off the value is entered (this is used to calculate an average value for flow per property - otherwise the value 1 can be entered to measure the difference in flow only).

3) The program makes measurements of the flow rate as measured by the logger. The system is left for the measurements to stabilise. The next part of the program is then started.

4) The valve is then shut off. After waiting for the readings to stabilise again, the program is told that the readings are complete.

5) The computer will then calculate a value for the difference in the flow rate, measured in terms of average flow rate per property (or just the total difference in flow rate), caused by the selected value being shut off. The details and results of the test are added to a file on the hard disk of the computer, so that the results of each test may be inspected at a later date.

Both infra-red and telemetry communication systems may be used to take readings from the logger when operating the step tester, though a common method of using the step tester is to operate the logger remotely using the telemetry system from the site where the valve is located.

Operating instructions for the use of the step tester are now given :-

Operating the Step Tester

When the step tester option is first selected (by choosing the *F6 - Step Tester* option from the main menu), the program will establish a connection with the logger using the currently selected communications system. The *Step Tester* window will then appear, and will request a figure for the *Number Of Properties* to be entered. This refers to the number of properties that are fed by the valve that is to be shut off, and is required if the final calculation of flow for the valve is to be given as a *Flow Rate per Property* figure (often using units of litres per hour per property, l/h/p).

If the total number of properties for the valve is unknown, or the final figure is required to be given as the difference in flow, then type **1** and press return, otherwise type in the number of properties fed by the valve (e.g. **60**) and press return (if the step tester has been selected by mistake then simply press the *ESC* key to go back to the main menu).

The Step Tester will then enter the first phase of the operation, taking a reading of average flow before the value is shut off.

In the top left corner of the window the location information stored in the logger is displayed (e.g. *Location: Test Location 1*) with a reading of the number of properties that was entered into the program for the current test (e.g. *Properties: 60*). In the top right corner, the current logger ID is displayed (e.g. *ID: AB1234*).

In the centre of the screen is a reading of the current pressure (if the logger has a pressure input) and a reading of the register stored in the logger. Below this the message *Waiting For 1st Pulse...* initially appears. For the program to calculate the flow rate at the logger it is necessary to count the time between consecutive flow pulses, thus the flow rate cannot be calculated until at least two pulses have been detected. When the first pulse has been detected by the logger then the message will change to

Initial Flow: l/s Duration 00:00

and the duration will start to count up, second by second. The flow rate units will be those entered in the program configuration screen (often l/h rather than l/s). The program is now waiting for the second pulse, before it can calculate the flow rate.

When the second pulse has been received then the calculated flow rate will be displayed, along with an estimated indication of the accuracy of the current reading,

e.g. *Initial Flow: 49.4 l/s +/- 25% Duration 00:27*

The initial accuracy will be plus or minus twenty five percent. With each pulse received the accuracy figure will improve. When it shows < *5%* (less than five percent), the initial flow rate figure is at the highest estimated accuracy, and the next phase of the test should be started.

At the bottom of the window there are two options, *F1 - Restart* and *F2 - Next Phase*. If something has gone wrong with the first reading then this phase of the test may be restarted by clicking on the *F1 - Restart* button (or pressing the *F1* key), the program will then start waiting for the first pulse again. The next phase of the test may be started after the initial flow rate readings have been finalised by clicking on the *F2 - Next Phase* button (or pressing the *F2* key). The program will only let you advance to the next phase of the test when it has made the initial flow rate reading (i.e. after the second pulse has been received) and, for maximum accuracy, you are advised not to go to the next phase until the flow rate figure has settled to less than five percent accuracy (< *5%* displayed).

To quit the step tester at this stage, press the *ESC* key. The reading will be paused and two options will appear at the bottom of the window, *F1 - EXIT* and *F2 - Cancel*. Click on the *F1 - EXIT* button (or press the *F1* key) to confirm the quit or click on the *F2 - Cancel* button (or press the *F2* key) to return to taking readings.

When the next phase of the test has been selected, a message will appear at the bottom of the screen :-

***** Press Space Bar After Closing Valves *****

to remind you that the valves should be shut off before the next phase of the test is carried out. When this has been done, press the space bar on the keyboard.

During the next phase of the test the reading for initial flow (including the information of the accuracy and duration of the first test) will be maintained in the window. On the line below the message *Waiting For 1st Pulse* appears and the computer will wait for the first two pulses again, before it can give a reading for flow rate for the second phase of the test.

After receiving the first pulse for the second phase of the test the message

Reduced Flow: l/s Duration 00:00

appears, as with the initial flow (the second reading is termed *Reduced Flow* as shutting valves which were feeding a number of properties will generally reduce total flow). The program is then waiting for a second pulse, as before.

When the second pulse has been received then two values can be calculated - the *Reduced Flow* and the *Flow Step* (the reading for flow step appears two lines below the reduced flow reading). The *Reduced Flow* value is the actual reading of the new flow rate. The *Flow Step* value is a reading of the difference between the initial and reduced flow rates, with units of flow rate (e.g. *l/h*) if the number of properties is one, or units of flow rate per property if the number of properties was greater than one (e.g. *l/h/p*). The reduced flow duration is a reading of the total time of the second phase of the test and the flow step duration is a reading of the total length of the test (this is initial flow test duration + reduced flow test duration + the time between the two tests, so the time spent shutting the valves and allowing the system to settle is included).

The reduced flow reading also shows a figure for estimated accuracy, as with the initial flow accuracy of the first test, and this will start at +/- 25% and improve as more pulses are received until +/- < 5% is reached.

At the bottom of the window are three options, *F1 - Previous Phase*, *F2 - Restart* and *F3 - Save Results*. If the first phase of the test needs to be repeated then the button *F1 - Previous Phase* may be clicked on (or the *F1* button pressed). If this option is chosen then the message

***** Press Space Bar After Opening Valves *****

will appear - reminding you that the valves were closed for the second phase of the test and will need to be opened again to repeat the first test. After the valves have been opened, press the space bar to restart the first phase of the test.

The second option *F2 - Restart* will restart the second phase of the test, setting the computer waiting for the first pulse again, if the button is clicked on (or the *F2* key is pressed). Restarting the tests will NOT reset the flow step duration reading.

The third option *F3 - Save Results* is used when satisfactory readings have been taken for the second phase of the test (normally when the reduced flow readings are within 5% accuracy, *+/- < 5%*). When this option is chosen (by clicking on the *F3 - Save Results* button or pressing the *F3* key) then the test readings will be halted and the message

***** Press Space Bar After Opening Valves *****

will appear, to remind you that the valves were closed for this test. After the valves have been reopened press the space bar (the flow step duration will continue to count until the space bar has been pressed). The program will then show a message, requesting that you type in a comment (*Enter Comment* appears at the bottom of the screen). Type in a description of the test and then press return (the comment may consist of up to 40 letters and/or numbers, e.g. *Total flow for valve 17A*). The results of the test will be written to the file **STEPTEST.TXT**, located within the *LOGRMATE* directory on the current data drive, and the step tester will be restarted (press *ESC* to return to the main menu).

If the *ESC* key is pressed whilst the step tester is in the second phase of the test (reading and calculating reduced flow), then the options *F1 - EXIT* and *F2 - Cancel* appear at the bottom of the screen, which operate as they did in the first phase.

The STEPTEST.TXT File

As mentioned above, any step test which is successfully completed is added to a file in the data drive LOGRMATE directory, the STEPTEST.TXT file. This file is an ASCII text format file (i.e. it just contains the characters that can be typed on the keyboard) which may be directly loaded into a text editor (such a *Notepad* - which is included with Windows, more information on the use of notepad may be found in your Windows manual) or a word processor (such a Word or WordPerfect). If this file is loaded into a wordprocessor then it should be saved **under a different name**. This is very important, as the wordprocessor will add additional information to the file if it is resaved using the same name, which will cause problems if further step tests are performed.

Each test is added to the end of the file, so the oldest test will appear at the top and the newest at the bottom. An example of the contents of a STEPTEST.TXT file is as follows :-

```
Fri Apr 11 10:23:28 1997
Logger Location: HELLO THERE
Logger ID: ZZ9999
Properties: 60
Flow Step:      0.715 l/s/p         Duration 12:27
Comment:test comment


Fri Apr 11 10:45:05 1997
Logger Location: HELLO THERE
Logger ID: ZZ9999
Properties: 1
Flow Step:      25.1 l/s            Duration 00:51
Comment:example step test 2
```

(these values have been simulated, so do not necessarily reflect those you may get in a real system)

CHAPTER 7

Reading data from a Logger

Information on reading information that the logger has stored and saving it on the hard disk.

Before attempting to read the information from a logger, you should check the following :-

1. The software is configured correctly.
2. The communication system has been correctly selected and is ready for use.
3. The logger has been set up correctly and calibrated.
4. The logging start has been set correctly.
5. The logger contains some valid readings.

You are now ready to read the logged information into the computer for permanent storage on disk.

To transfer the readings stored within the logger, click on the *F2 - Read Logger* button from the main menu (or press *F2*). The program then communicates with the logger and requests the logged information.

The data held within the logger is transferred with the following exceptions :-

- Data from inputs currently switched off is not read.
- Data logged before the *logger start* will not be read.
- Unless the days to read value is set to *all* (a) then this limits the number of days worth of data read (i.e. if this is set to 2 then only the data stored in the last two days will be read).

Whilst reading the information the program shows a count of the total number of records to read and a horizontal bar showing the progress of the reading. As the data is read the bar fills from white to grey until it is fully grey, at which point all of the information has been read.

If communication is lost whilst data is being transferred (the infra-red probe is removed or the telemetry looses the connection) then the data transfer is aborted and the information transferred so far during that connection is lost (but is still contained in the logger).

As the information is read by the computer it is stored in the *DATA* directory, within a subdirectory named the same as the logger ID (i.e. if data is read from the logger AA4321 for the first time then a directory will be created within the data directory called AA4321 and the information will be written to a file within this directory) .

If other records from the same logger (and channel pair) exist then the result of the read will depend on the setting of the *days to read* setting within the configuration options (see the section on *Initial Software Setup* for more information). If the *days to read* option is set to *all* then the program adds any data from the logger that was logged after the date and time of the last record previously stored in the file (subject to the previous restrictions).

For example, imagine that the logger data file already contain information logged between 11/10/96 and 11/11/96. If the logger contains information logged between 5/11/96 and 13/11/96 and the *days to read* option is set to all, then reading the data will add the logger data from 11/11/96 to 13/11/96 (i.e. all data after that already stored) to the end of the existing file.

If the *days to read* option is set to a specific number of days, then a new data file will always be created and the set number of days worth of logged data will be read into this new file (this can joined to an existing file using the *Combine* function of the data viewer at a later date).

CHAPTER 8

Reading information using a ReaderMate (RM201) or Psion (RM401)

The ReaderMate 301 software allows logged data temporally stored in a RM201 unit or RM401 unit to be transferred to the main data drive. The RM401 unit is a Psion Organiser II running the Palmer Environmental RM401 software, whilst the RM201 is a custom built data transfer unit, built by Palmer Environmental, that has the advantage of being ruggedised for field use. To transfer information from either of these units, click on the *F7 - Read RM201/RM401* button on the main menu (or press the *F7* key).

Reading Data Stored In A RM201

To read information from the ReaderMate 201 unit it must be fitted with the charging/download lead. One end of the lead connects to the circular connector on the bottom side of the RM201. The other end connects to the port on the PC normally used for telemetry connections (this is the serial port selected using the *F7 - Modem Port* option of the software configuration, see *Chapter 4 - Initial Software Setup* for more information on setting up the modem port). Since the download lead ends in a 9 pin serial port connector, you may require a 25 way to 9 way converter if your computer has 25 pin serial ports.

Once the lead has been connected to the PC, click on the *F7 - Read RM201/RM401* button on the main menu of the ReaderMate 301 software (or press the *F7* key). The window will then present you with two options :-

F1 - ReaderMate RM201
F2 - PSION RM401

Click on the *F1* button (or press the *F1* key) to choose the ReaderMate 201.

A window will then pop up displaying the message *Initialising Communication* and the computer is now waiting for data from the ReaderMate. To send the stored data from the ReaderMate :-

1) If the display on the RM201 is blank, then the unit is currently switched off. Press ENTER on the built in keypad on the RM201 to switch it on and to display the menu.

2) Select option *5) PC Communication* from the main menu on the RM201 by pressing the *5* key on the keypad.

The ReaderMate 201 will then start to send any data files stored in it's memory to the PC. The *ReaderMate 201 Reader* window on the PC will display a count of the data files that it is transferring. Each data file sent to the PC will create a new file on the hard disk that will appear in the *Data Viewer* window, when reading data files from the ReaderMate the information will NOT be added to existing data files already stored in the data directory. Data files for the same logger may, however, be *combined* after transfer (see *Chapter 10 - Manipulating Data Files* for more information).

After all of the files stored on the ReaderMate 201 have been transferred to the PC, the data files on the ReaderMate 201 are deleted from it's memory.

If communication is interrupted during transfer of the data files from the RM201 to the PC (by a cable becoming disconnected, etc.), then the PC will report a communications failure. Press ESC to clear the message. Any complete files that had been received by the PC will appear in the Data Viewer and none of the files on the RM201 will have been deleted.

Reading Data Stored In A RM401

To read information from the ReaderMate 401 unit it must be fitted with the Psion Comms Link lead. One end of the lead connects to the expansion connector on the top of the Psion Organiser (this connector is behind a sliding cover). The other end connects to the port on the PC normally used for telemetry connections (this is the serial port selected using the *F7 - Modem Port* option of the software

configuration, see *Chapter 4 - Initial Software Setup* for more information on setting up the modem port). Since the comms link lead ends in a 25 pin serial port connector, you may require a 25 way to 9 way converter if your computer has 9 pin serial ports.

Once the lead has been connected to the PC, click on the *F7 - Read RM201/RM401* button on the main menu of the ReaderMate 301 software (or press the *F7* key). The window will then present you with two options :-

F1 - ReaderMate RM201
F2 - PSION RM401

Click on the *F2* button (or press the *F2* key) to choose the RM401.

A window will then pop up displaying the message *Initialising Communication* and the computer is now waiting for data from the RM401. To send the stored data from the RM401 :-

1) Switch on the Psion Organiser. The main menu will now be displayed. Check that two options are present among those on the main menu - *RM401* and *Comms* (there are more options available than will all fit on the screen at once, so use the up or down arrow keys to move through the list. As the cursor reaches the last option on the screen, another press on the arrow keys will cause the next set of options to be displayed).

Rm401 - The option is used to start the ReaderMate 401 software. The program is automatically read from the ReaderMate data pack that is installed in the back of the Psion so if this option does not appear then the ReaderMate 401 data pack is either not installed in the Psion, or the pack itself is damaged.

Comms - The option indicates that the standard Psion communications program has been loaded from the comms link lead (the software is held on a chip within the case of the comms link lead itself). The comms lead should be plugged into the Psion before the Psion is switched on for the Psion to load the program automatically.

If one or both of the options does not appear, press the *ON* button again to try and load them. If both options do not appear at some point on the main menu this time then there is a problem with the unit and you will not be able to send any logger data to the PC.

2) Select the Rm401 option on the main menu of the Psion by using the cursor keys and then press the *EXE* button.

3) The Psion screen will now display the main menu of the ReaderMate 401 software. Use the cursor keys to select the *Link* option and then press the *EXE* button.

The RM401 will then start to send any data files stored in it's memory to the PC. The *ReaderMate 401 [PSION] Reader* window on the PC will display a count of the data files that it is transferring. Each data file sent to the PC will create a new file on the hard disk that will appear in the *Data Viewer* window, when reading data files from the RM401 the information will NOT be added to existing data files already stored in the data directory. Data files for the same logger may, however, be *combined* after transfer (see *Chapter 10 - Manipulating Data Files* for more information).

After all of the files stored on the RM401 have been transferred to the PC, the data files on the RM401 are deleted from it's memory.

If communication is interrupted during transfer of the data files from the RM401 to the PC (by a cable becoming disconnected, etc.), then the PC will report a communications failure. Press *ESC* to clear the message. Any complete files that had been received by the PC will appear in the Data Viewer and none of the files on the RM401 will have been deleted.

CHAPTER 9

Viewing Stored Data

This chapter describes the options available for viewing data stored on the hard disk as a table of information or as a graph.

Options for viewing and manipulation of stored data are accessed by selecting the option *F4 - View Logger Data* from the main menu. Selecting this option opens a window with the title *Data Viewer*. Next to this title the program displays the current disk drive that the data is stored on (normally C:).

Within this window is a table showing a summary of the data stored on the current data drive. For each set of data the table displays the ID of the logger that the information was read from, the location information that was stored in the logger at the time, the type of information (pressure, flow, etc.) and the dates of the first and last record in the list (e.g. recorded data from 03/06/96 to 12/08/96). Each row of the table represents one set of data and each set of data is stored as a file on the data disk.

The current data set is highlighted with a black bar, and all operations are carried out on this data set. Another set of data may be selected by clicking on the desired row of the table using the mouse, which moves the black highlighter bar to the new row of the table, or by moving the black bar to the correct row using the up or down arrow keys. The scroll bar on the right hand edge of the window can be used to move the highlighter bar up or down, and if there are more sets of data than will fit in the window at once, then the *Page Up* and *Page Down* keys can be used to move up or down the list, one screenfull at a time. Some of the options can be performed on more than one set of data at once, to do this multiple sets of data can be selected.

To add a set of data to the multiple selection, select the data set then press the space bar (or use the mouse to double click on the data set). An asterix will appear to the left of the location, showing that the file is part of a multiple selection. Any commands that support multiple selection (showing a graph, copying data files, etc.) will now operate on all of the files marked with an asterix. More information on copying files to other drives and combining data files together is given in the section *Manipulating data files (Combining/Copying/Deleting)*.

Sorting the data sets in the Data Viewer Window

There are a number of ways available to sort the data sets in the view window. To select a new method of sorting click on the *Sort* option on the Data Viewer pull down menu, and then click on one of the four methods of sorting.

The four methods are :-

ID

With this option the data sets are sorted by the ID of the logger that the data was read from. This option is useful for grouping together sets of readings from the same loggers.

Location

With this option the data sets are sorted the Location information read from the logger. With good choices for the Location, this could enable the data sets to be grouped together by the sites that the loggers are used on.

Type

The data sets are sorted by the type of data that is stored in the set. This option is good for comparing sets of the same type of data, e.g. flow information.

End Date

This option allows the data sets to be sorted by the last date of the last reading in the set. This is useful as it allows the more recent readings to be easily identified.

Changing the stored setup for a data file

Each data set stored in the data directory is saved with information about the setup of the logger used to take the readings. It is possible to change the non-essential information by selecting the setup option from the data viewer.

To change the logger settings for a data file, highlight the data file by clicking on it (or moving the highlighter bar to the correct data file using the up/down cursor keys) and then click on the option *Display* from the Data Viewer window, then select *Setup* (or simply highlight the data file then press the *F3* key). A new window will then pop up, similar to the normal setup window, but the *F1* and *F10* options are different (selecting setup for a ControlMate setup file presents a different set of options which are not described in this manual). When changing the settings for a stored data file, rather then changing the settings for the logger itself, the title in the window reads *Logger Setup Record* (rather than *Logger Setup [online]*).

The options are as follows :-

F1 - Read By

This line displays the connection method used to read the data (e.g. Infra Red). However it also offers further options by clicking on the *F1* button (or pressing the *F1* key).

If this option is chosen then the window changes to show the logger ID and Location, the connection method used to read the data and a choice of three options, *F1 - Setup*, *F2 - Read*, and *F3 - Now*.

The *F1 - Setup* button is used to run the setup program, the equivalent of selecting the *F1 - Setup Logger* option from the main menu. The advantage of using this option, rather than going to the main menu, is that the program uses the connection method used to read the data set, including the telephone number used if a telemetry connection was used. The enables the user to easily switch between setting up several types of logger without manually changing the communications system (useful if the loggers are all telemetry based using different phone numbers). For more information on using the setup window see the section on *Setting up a Logger*.

The *F2 - Read* button is the equivalent of selecting the *F2 - Read Logger* option from the main menu. The advantage of reading the information from this part of the program, rather than going back to the main menu, is that the communications setting are remembered from the last time the logger was read, and the data is always read with the *days to read* option set to *all*. Thus this represents a quick method of updating a set of data with the latest readings from the logger, making it ideal for day to day use. For more information on reading a logger, see the section *Reading Data from a Logger*.

The *F3 - Now* button is the equivalent of selecting the *F3 - Spot Values* option from the main menu, but using the communications method stored in the data file. For more information see the section *Checking the readings currently on the logger inputs*.

F2 - Logger ID

This option displays the ID of the logger that the data was read from. It can be changed by clicking on the *F2* button (or pressing the *F2* key) and then entering a new logger ID in the same way as using the normal online setup program.

Whilst it is not recommended to change the existing ID of a logger data file there are situations where this may be useful. An example is if a logger is used to take readings which are appended to a single data file. If another logger is substituted with a different ID then the readings from the new logger cannot be automatically added to the existing data file, as the IDs of the data file and the logger that is being read do not match. If the ID of the data file is changed to match the ID of the new logger then the information from the new logger may be automatically added to the end of the data file as before (the location of the data file must also match the logger location).

F3 - Logger (GMT)

This option displays the date and time, in GMT format, that the last reading was made from the logger. The value cannot be changed.

F4 - Sampling Rate

This option displays the sampling rate that was used to read the current data log. The value cannot be changed.

F5 - Pulse Input

This option displays the pulse/flow conversion factor of the pulse input on the channel pair for the data file, if any. Even though the data set may not be for flow data, the setup information for both channels in the channel pair is stored with the data file. If no pulse input was present on the channel pair then this option displays *Pulse Input = None*.

Clicking on the *F5* button (or pressing the *F5* key) displays the window normally used for defining the inputs to the channel pair, and for turning inputs on and off (more information on setting up inputs to the logger may be found in the section *Changing the settings for a logger*). The only value that may be change on the input setup for a data record is the *litres/pulse* value for a pulse input, as the data record stores the pulses themselves, allowing flow to be recalculated if this value were initially entered incorrectly. Changing this value for a data file containing ADC or 4-20mA readings will have no effect.

F6 - ADC Input

or F6 - 4.00-20mA

This option displays the input type and input range of either an ADC input or 4-20mA input used on the channel pair for the data file (if either were used). As mentioned for the previous option, the setup information contained in a data file contains the setup data for both channels of the channel pair, even though the data file only contains data from one of the channels.

The type of input or data range of ADC data sets or 4-20mA data sets cannot be changed within the logger setup record window.

F7 - Register

This contains the value of the internal logger register when the last readings were taken. This value may be changed by clicking on the *F7* button (or pressing the *F7* key) and entering a new value.

F8 - Location

This value contains the location message of the logger at the time the data was read. It can be changed by clicking on the *F8* button (or pressing the *F8* key) and then typing in a new location description.

Please note - this information is important as it is checked when using the *Combine* option in the data viewer to join data logs together. Logs containing different locations cannot be merged in this way.

F9 - Alarms

This option show what, if any, alarms were armed when the data log was read. Clicking the *F9* button (or pressing the *F9* key) shows a window containing more information about the alarms for the channel pair read, though the information cannot be changed.

F10 - Ground Level

This option is provided to allow a setting for ground level to be entered for pressure data (if the data does not contain pressure readings then this option reads *F10 -* and does nothing).

Ground level is used when calculating figures for *Total Head*, pressure measurements relative to sea level, and is required because the pressure transducers used in LoggerMates and ControlMates measure pressure relative to ambient air pressure (an advantage as it means that they do not require recalibration if they are moved to a location at a different altitude). Ground level is the height, in metres, of the location of the logger (when the readings were taken) above sea level.

The value of ground level can be entered by clicking on the *F10* button (or pressing the *F10* key) and then typing a new value into the box and clicking on the *OK* button. This value is individual to the data set and is saved to the data file when the Logger Setup Record window is closed by pressing the *ESC* key.

Viewing stored data as a table

The information contained within a data log file may be displayed as a table of information by highlighting the log file (by clicking on the file in the Data Viewer window or by moving the highlighter bar over the data file using the Up/Down cursor keys) and then clicking on the *Display* option of the Data Viewer pull down menus, and then clicking on the option *Table* (or highlight the file in the data viewer and press the *F1* key).

The program ignores any files which are multiply selected (marked with a *) or selected for arithmetic combination (marked with a + or -), displaying the file currently highlighted with the black bar as a table of data in a new window.

ControlMate setup files cannot be shown as a table as they contain no data relevant to this option. Selecting a ControlMate setup file and selecting *Table* has no effect.

When the table window opens, the exact table layout depends on the type of data being viewed (pressure, flow etc.).

In the window title bar, the letter in the brackets represents the type of data being viewed. The full list of data types is as follows :-

P = Pressure
F = Flow
C = Current
T = Temperature
D = Depth

The title bar also contains the logger ID that the data was read from.

Within the window itself the top line of information lists the logger ID and location information, e.g. *ID - AA1234 Location - Test Location*. The second row of information is only used if pressure information is being shown. If pressure information is shown in the table then this row gives the DG2 Level in red and the OP2 Level in blue, e.g. *DG2 Level = 12.0 OP2 Level = 17.0*. If the table is of any other type of data then the second row of information is blank.

The table of data is given below this row. On the left hand side of the table are headings for date and time (the date is only given for the first row of data that occurs on that date, but the date for the row currently at the top of the screen is always displayed). The rest of the table is headed using the sample rate used and the type of data being displayed (with units), e.g. *15 minute samples - Pressure m*.

The actual data itself is organised in a number of columns, to maximise the use of the window area. For example 15 minute samples are organised into four columns of data, with time for each row incremented by one hour (4 samples * 15 minutes per sample = 1 hours worth of data). The exact number of rows used for the table depends on the sample rate (they are arranged to give convenient times for the rows, so 1 minute samples are arranged into columns of five, to increment the rows of time by five minutes). Strange start times are accommodated by leaving some of the table locations blank, so if a logger is set to record information at 1 minute intervals and is started at three minutes past the hour, then the first three items in the first row would be blank. End times are dealt with in a similar way.

The table data is normally written in black, with the exception of some pressure readings. If a particular pressure reading falls below the OP2 level but remains above the DG2 level then it is written in blue. If the reading falls below the DG2 level then it is written in red. Looking at the table of data it is then immediately obvious if any of the readings fall below one of these two levels.

Pressing the *Tab* key whilst in the table window switches to the graph window for the current data (this window is opened if it is currently closed) and vice versa, so the tab key represents an easy way to switch between viewing the table and graph for a set of data.

At the top of the screen are two pull down menus, *Data* and *Print*.

Clicking on the *Data* menu gives four options :-

Average

In this mode the items of data are averaged over a longer period of time, for instance data sampled at a rate of one sample every fifteen minutes, then the data may be averaged over a period of one hour, i.e. for every hour of information, the average of the four samples is calculated.

The first time the *Average* option is selected, the lowest average suitable for the current sampling rate is selected (e.g. if the sample rate was one sample every 1 minute then the first time *Average* is selected, then it will average the data over five minute periods. If, however, the sample rate was one sample every 15 minutes, then the first average would be over one hour periods). If the *Average* option is selected again, without selecting another option in between, then the next highest averaging period in the list is used. This may be repeated until the highest averaging period of 6 hours is used (since four readings are shown per row, each row represents one days worth of information), when selecting *Average* again goes back to displaying the logged data (see the Logged option below). The current averaging period is given at the top of the table, e.g. *1 Minute Av*erages.

The available averaging periods are :-

30 seconds, 1 minute, 5 minutes, 15 minutes,
1 hour, 2 hours, 3 hours and 6 hours.

Not all loggers will be able to select a sample rate quick enough to use all of these averaging periods.

If pressure information is being viewed, then any averages that are below OP2 or DG2 will be displayed in blue or red respectively.

If the *Total Head* option is selected (only available for pressure data - for more information see below) then the information is shown in terms of total head rather than local pressure readings. If total head is used then the this is indicated at the top of the table, e.g. *1 Hour Averages - Total Head m*.

Logged

This option is used to turn off the averaging mode (see above) and redisplay all of the logged data at the sample rate it was read at.

This is the data sets are displayed in when a table of the information is first selected.

If the *Total Head* option has been selected (only applicable to pressure readings - see below) then any pressure readings are displayed in terms of total head rather than local pressure (and the phrase *Total Head* replaces the word *Pressure* at the top of the table).

Summary

This option is used to display the minimum and maximum readings on a day by day basis. Each row of the summary table represents one days worth of information and on each row is the time that the lowest reading of the day was taken, and the value of this minimum, followed by the time the highest reading of the day was taken, and the value of this maximum.

Pressure information may be displayed in terms of total head rather than local pressure if the *Total Head* option has been selected (see below).

To turn off the summary mode it must be selected again, selecting *Average* or *Logged* data mode will NOT turn off summary mode (a tick appears next to the option *Summary* if summary mode is currently selected).

If a summary is selected for flow information, then two extra columns are used in the table - *Daily Total Litres* and *Window Total Litres*. *Daily Total Litres* is fairly self-explanatory. It is the total number of litres of fluid that have been measured during the 24 hours of the current day. *Window Total Litres* is a measurement of the total number of litres that were measured by the logger during the time period specified by the *F1 - Time Window* option of the system configuration. By specifying a start and end time using this option then the total quantity of water used during this period of time may be calculated (often used for minimum night flow periods). It is possible to select a period of time that crosses midnight.

More information on setting the times for calculating *Window Total Litres* may be found in the section *F1 - Time Window*.

Total Head

This option is only valid if the current data set is pressure information, otherwise this option is *ghosted* (i.e. it appears in a light grey and cannot be selected). Selecting this option results in all table pressure information being converted to total head readings, i.e. the pressures are now displayed in relation to sea level rather than local pressures. To convert readings to total head readings, a value for *Ground Level* must be entered (for more information see the section *F10 - Ground Level*).

The menu option acts as a toggle, that is selecting *Total Head* turns total head readings on if they are off and vice versa. If total head readings are turned on then a tick appears next to the option in the pull down menu.

The final option available from the pull down menus is to *Print* the current table to the printer.

Printing table information

Printing table information is performed by selecting the *Print* option on the pull down menu. The current line of the table (the top line) of the table that was displayed when the *Print* option was selected will be the first data that is printed, and lines of the table before this will not be sent to the printer (this facility may be used to start the print from a particular date in the table). When this option is selected a window pops up requesting the *Print Range*. This enables selection of the dates to be printed, starting with the current date that the table was showing and ending with any date up till the last date in the table. The end date in selected by the scroll bar in the *Print Range* window (and defaults to printing only one days worth of data)

Select the end date by clicking on the arrows on either side of the scroll bar, or by moving the mouse pointer over the button on the scroll bar, and holding down the left mouse button. Moving the mouse left and right will move the button, changing the end date. Release the mouse button when the end date is correct.

When the correct range of dates to be printed has been selected, click on the *OK* button (or *Cancel* if the print option had been selected by mistake). The standard Windows *Print Setup* window will then appear. This may be used to select the size of paper to be used, the actual printer used (if more than one is available) and a number of other options that may affect the resulting printout. As the options on this window may change depending of the particular setup of your computer system, a full description of the use of this window is beyond the scope of this manual. However further information on the use of this window may be found in the Windows manuals that came with your computer. After choosing the desired options in the *Print Setup* window, click on the *OK* button.

The computer will then calculate the number of physical pages that the selected data will require. If the total is more that 10 pages then the computer will warn you of the number of pages that will be printed. This warning appears as a window with the message *Print **n** pages?* (where ***n*** is the number of pages required). Click on the *Yes* button to continue the print or *No* to cancel the print.

If less than 10 pages are to be printed, then the program will print the data without asking if you are sure.

Factors that affect the number of physical pages printed

For a particular table of data there are a number of factors that will affect the number of physical pages that will be printed :-

1) The current position of the table.

The top line currently displayed of the table in the window represents the first line to be sent to the printer, any table data before this is ignored.

2) The current data mode.

At the top of the table window are a number of lines describing the type of data, information about the logger used and other information such as the table headings. When printing, this information is printed at the top of each page, along with another couple of lines used to print the title *Logger Data* and a count of the current page and total number of pages (e.g. *Page 2/5* would be used to indicate that the current page of information represents the second page out of a total of five that were printed).

Since the number of information lines at the top of the table window changes depending on the data mode (logger, average, etc.) then this will affect the total number of lines available to be used for the table data itself and thus may affect the number of pages required to print the data.

As a rough guide, the title lines on the printed page generally use the first 5/6 lines of each page.

3) The printer font.

Also called a *typeface*, the currently selected internal printer font will be used for all printing. The font is the style of writing that the printer will use, such as a curly handwriting style of writing or a straight newspaper style. Each available font has a name, normally derived from the traditional names for the style on printing presses, such as *courier* or *times*. Only *Internal* printer fonts may be used for printing the information, these are the styles of writing stored within the printer currently being used. For more information on the internal fonts built into your printer, and selecting a particular font, consult the manual that came with the printer.

4) The font size.

Most types of font are available in a number of sizes, normally measured by the height of the font in *Points* (*Points* is an archaic measuring system traditionally used on printing presses - equivalent to 1/60th of an inch. So a twelve point font, 12pt, is approximately 1/5th of an inch high). As the size of the font is increased, less lines of information will fit on a page, and thus more pages will be required to print a set of data.

5) The paper size.

Most paper used within printers is of the A4 size. However some printers may be used with smaller paper sizes, such as A5, or larger page sizes, such as A3, and this will have a direct relation to the number of rows of the table that will fit on a single piece of paper.

6) Portrait/Landscape selection.

On the *Printer Setup* window, the paper may be selected to be used in *Portrait* or *Landscape* mode. Portrait is commonly used for this type of report (the paper is used such that vertical is the longest side of the paper and horizontal is the shortest side, with the each row printed horizontally across the paper), but landscape (horizontal is the longer side of the paper, whilst vertical is the shorter) may be used if each row does not fit on the paper (probably due to the font size being too large). Portrait gives more rows of the table per page.

Viewing stored data as a graph

The information contained within a data log file may be displayed as a graph by highlighting the log file (by clicking on the file in the Data Viewer window or by moving the highlighter bar over the data file using the Up/Down cursor keys) and then clicking on the *Display* option of the Data Viewer pull down menus, and then clicking on the option *Graph* (or highlight the file in the data viewer and then press the *F2* key).

The program ignores any files selected for arithmetic combination (marked with a + or -), displaying the file currently highlighted with the black bar as a table of data in a new window. Unlike table mode, multiselect (marked with a *) may be used to choose more than one file and they will all

be plotted on the same graph (each set of data will be plotted in a different colour). Selecting data sets that do not overlap in time is possible, though the resulting graph may have a large gap between plots if the time between the sets of data is considerable.

If multiple data sets are selected when *Graph* is chosen, then a window will pop up, requesting a *Start Date*. This will be the first date shown on the graph, and dates from the earliest date of any of the data set to the latest date from any of the data set may be chosen. To select a start date either use the mouse to click on the left or right arrows in the window (to move the selection bar) or hold down the mouse button when it is over the selection button, drag the button left or right until the desired date is shown, then release the button. The default value presented is the earliest date available from the data sets. After selecting the start date and clicking the *OK* button, another window will appear, this time requesting an *End Date*. This is set in the same way as the start date, and represents the last date that will appear on the graph. This value defaults to the latest date of any of the data sets selected. Clicking *OK* will then display the graph.

ControlMate setup files cannot be shown as a graph as they contain no data relevant to this option. Selecting a ControlMate setup file and selecting *Graph* has no effect.

In the window title bar, the letter in the brackets represents the type of data being viewed. The full list of data types currently used is as follows :-

P = Pressure
F = Flow
C = Current
T = Temperature
D = Depth

The title bar also contains the logger ID that the data was read from.

When a graph is first displayed then the x axis will automatically by scaled so all of the data samples in the data set will be displayed on the graph, and the y axis will be scaled between 0 and the largest measurement in the data set (or from the lowest to the largest measurement if any measurement is less than zero), so all of the data will fit in the y axis. Suitable scales are drawn on the x axis and y axis and a suitable label for the units and scaling of the y axis is drawn (e.g. *Pressure in m*).

A title block is also drawn above the graph, giving information on the type of data, some logger information and the sample rate or average period.

e.g.

PRESSURE DATA FOR LOGGER -AA1234
LOCATION - TEST LOCATION 1
15 Minute Samples

When the graph is first shown then the summary data block option will be turned on and a block of values will appear in the top left hand corner of the graph window. The values displayed are dependent on the type of data that the graph represents. If it is a flow graph, then values for maximum and minimum flow as well as total volume are calculated for all of the data displayed on the graph. For any other type of data, the maximum, minimum and average values are calculated and displayed.

As the mouse cursor is passed over the graph then another block of data will appear in the top right hand corner of the window. This block contains information about the value of the data at the point of the graph where the mouse pointer is currently located. As the mouse cursor is placed at a point on the graph then the time, date and day of the week for that point of the graph is displayed in the top right hand corner of the window. If the point of the graph represents a single reading from the logger, then the value of the reading with appropriate units will also be displayed.

An explanation of why each point on the graph may not necessarily represent a single reading from the logger is given in the next paragraph.

Effects of screen resolution/window size on graphs

Two factors will affect the number of data points that can be accurately drawn on a graph without drawing an average of the stored values - the resolution of the current screen and the size of the graph window compared to the total size of the screen.

Screen resolution is determined by the currently selected screen mode, each mode being defined in terms of the number of pixels (points that can be drawn on the screen) that can be displayed in the horizontal and vertical directions. A common screen size is 800 by 600, that is the computer can draw 800 dots in the horizontal direction and 600 in the vertical. More than 800 points of data (less as the program has to draw a border around the graph, as well as draw the scales and labels, etc.) cannot be accurately drawn on an 800 by 600 screen size, the computer simply cannot draw that many points on the screen. Instead the graph represents the average of the data, scaled to fit the available size on the screen, so that each dot on the graph could be representing two or more actual values of logger data (NOTE :- all calculations are performed on the data itself, not the on screen values).

Zooming in on the data (zooming is plotting a graph of a restricted number of data values, effectively looking at a smaller area of the data) will reduce the number of values that have to be represented on the screen, until a point is reached where each data value to be plotted is represented by one or more pixels on the screen. At this time the graph is accurately plotting all of the data points.

Larger screen modes will increase the accuracy of the graph on the screen.

Window size also acts as a limiting factor on the number of data values that can be accurately drawn. As mentioned previously in this manual, the size of the graph window can be changed by using the sizing button of the window. As the window is made smaller there are less points available in the window, so the logger data is more likely to be accurately displayed if the graph window is made as large as possible on the screen. It is recommended that the graph window be maximised (the button in the top right of the window border) to make full use of the screen resolution.

When a graph of a data set is being viewed, and the table of the data set is not shown on the screen, then pressing TAB will open the table for the current data set, and the first set of values shown on the table will be the current start of the graph. If the table is already on the screen then pressing TAB will take you to the table, but does not update the current position in the table, to avoid confusion.

Use of the pull down menu options

The effects of choosing the options in the pull down menus will change, depending on whether the graph mode was entered with one or multiple sets of data selected.

Graphs of a single set of data

Plotting a single set of data to the graph draws the data in black with all of the information surrounding it as described above.

Viewing a smaller part of the graph (zooming in)

There are a number of ways restrict the plot to a confined range of the data.

Single Point Zoom

Selecting the *Single Point* option of the *Zoom* pull down menu causes the shape of the mouse cursor to change to a pair of back to back arrows pointing along the horizontal direction. Clicking on a section of the graph will cause the x axis to change scale, with the point clicked on centred in the middle of the screen. Each click of the mouse button causes the scaling of the graph in the x direction to be doubled, except when the point clicked on is near the edge of the graph, when the magnification may be increased to place the point clicked on in the centre of the zoomed-in graph.

During single point zoom mode, the cursor cannot be taken outside the area of the graph, and the program will stay in this mode even if the mouse button is clicked more than once. To return to normal mode, click the right mouse button or press ESC (the cursor will also return to it's arrow shape).

X axis zooming

Selecting the *X Scale* option of the *Zoom* pull down menu also changes the cursor to back to back arrows pointing along the horizontal. However this time the zoom is carried out by selecting a *range* from the graph. Click on an area of the graph but hold down the mouse button. Now move the mouse left and right along the graph (you will not be able to take the mouse cursor outside the area of

the graph). You will now see that a rectangle is formed by the mouse. One side of the rectangle will be fixed at the point where the mouse button was first clicked. The other side of the rectangle can be moved in the x direction by moving the mouse pointer. When the mouse button is released then the area of the rectangle drawn on the screen will be the area of the data shown in the zoomed in graph. The program returns to it's normal mode of operation when the graph has been zoomed. If this option is selected by mistake then simply click the right mouse button or press ESC to return to normal mode.

Y axis zooming

Zooming on the data in the y axis operates very similarly to x axis zooming. Select the *Y Scale* option from the *Zoom* pull down menu, and the cursor changes to some back to back arrows pointing in the vertical direction. Then click and hold down the mouse button, move the cursor until the area you want to zoom in on is within the rectangle and then release the mouse button. Again, clicking the right mouse button or pressing the ESC key will abort the operation before the rectangle is drawn.

Zooming in on a window area

Selecting *Window Zoom* from the *Zoom* pull down menu combines the effects of x and y axis zooming. This time the cursor turns into a pair of diagonal back to back arrows. The mouse is used to draw a rectangle as in x and y axis zooming, but this time the two diagonal points of the rectangle are defined, allowing the zoom in both x and y directions.

Subtracting a Day from the graph

When the graph is displayed, selecting the *Minus 1 Day* option from the *Scale* pull down menu (or pressing the - key) will subtract one day from the x axis scale. The amount of difference this will have visually to the graph will depend on the amount of data currently being displayed. The - key may be held down to remove more than a single day. The program will not allow a day to be subtracted if the X axis is currently showing less than two days worth of information.

Showing more of the graph (Zooming out)

Panning Out

The *Pan Out* option of the *Zoom* pull down menu is used to undo a zoom in. When a zoom in the x direction is performed the previous zoom level is remembered. Selecting *Pan Out* restores the previous level of zoom. It should be noted that only x direction zooms are affected by a pan out, using a window zoom to zoom in on the x and y directions, then selecting pan out, will restore the x scale but the y scale will remain the same.

All Data Zoom

Selecting the *All Data* option of the *Zoom* pull down menu will adjust the x scale so that it fits all of the logged data, as first displayed. This does NOT affect the current scaling in the Y direction.

Adding a Day to the graph

When the graph is displayed, selecting the *Plus 1 Day* option from the *Scale* pull down menu (or pressing the + key) will add one day to the x axis scale. The amount of difference this will have visually to the graph will depend on the amount of data currently being displayed. The + key may be held down to add more than a single day.

Moving Along The Data

Viewing Earlier logged data

It is possible to move back through the set of data one day at a time, whilst maintaining the current scaling, by selecting the *Move Left* option from the *Scale* pull down menu (or by pressing the left arrow key). The existing x values displayed will move right to make way for another day of information from the left. Note that data to the left represents older data, so this option moves backwards in time through the data.

Viewing later logged data

It is possible to move along the set of data one day at a time, whilst maintaining the current scaling, by selecting the *Move Right* option from the *Scale* pull down menu (or pressing the right arrow key). The existing x values displayed will move to the left to make way for another day of information from the right. Note that data to the right represents newer data, so this option moves forward in time through the data.

Autoscale Options

There are two autoscale options, for the x and y directions, but they operate very differently.

Y Autoscale

Selecting the *Auto Scale Y* option from the *Scale* pull down menu examines the values of the logged data between the start of the x axis and the end of the x axis, finds the minimum and maximum values and changes the scaling of the y axis so that all of the data values fit within the y axis.

One further option has an effect on y axis autoscaling - the *zero suppress* option. When this option is turned off (the default) then the y scale is chosen so that it will always contain the zero point. Although this gives a good indication of relative scale of fluctuations compared to the total readings, sometimes this mode of operation is undesirable. By turning on the *zero suppress* option, the y axis scaling will be chosen purely by the minimum and maximum recorded values, normally expanding on a smaller range of y axis values, making changes in the amplitude of the readings more evident.

X Autoscale

The *X Autoscale* option from the *Scale* pull down menu is used to “clean up” the x axis, that is it ensures that the x axis scale will start at midnight and end on midnight, so the scale represents one or more complete days of information.

Visual Changes to the graph

Y axis zero suppression

Selecting the option *Zero Suppress* from the *Scale* pull down menu is used to turn zero suppression on and off. Normally when calculating the y axis automatically, the program will ensure that the zero point is always visible on the scale (i.e. if the minimum value of the data are above zero then the y axis will be expanded to include the zero point). However the y axis can also be calculated purely by the minimum and maximum values of the data by switching zero suppression on. For example, if some pressure data readings ranged from 23 to 39 metres of pressure then normally the automatically calculated y axis would range from 0 to just over 39. With zero suppression on, however, the axis would range from just below 23 to just above 39.

When zero suppression is turned on a small tick mark appears next to the option in the menu.

Adding a grid

If required the x and y axis scaling may be added to the graph as grid lines. This option is turned on or off by selecting the *Grid* option of the *Scale* pull down menu, and the option is ticked when turned on. The grid is drawn in a light grey to avoid confusion with any of the plotted values.

Adding the DG2/OP2 levels to a pressure graph

If a pressure graph is being displayed then it is possible to add a line to mark the DG2 level and a line to mark the OP2 level. This is accomplished by selecting the *DG2 Level* option of the *Scale* pull down menu to turn them on or off. When on a tick appears next to the option in the menu.

When DG2/OP2 levels are marked on the graph, if the y scaling is currently such that they would be off the graph then the y axis is rescaled to fit them on the graph.

Showing/Hiding the summary data block

As described earlier, when selected, the summary data block appears in the top left hand corner of the graph window. Three values are given, changing with different types of graph (flow, pressure etc.). If a graph of flow data is currently being shown, then the summary block gives readings of the maximum value of flow in the range of data currently shown on the graph, the minimum value of flow and the total volume. Any other type of graph has maximum, minimum and average values calculated for the current range.

The summary block option may be switched on or off by choosing the *Summary* option of the *Data* pull down menu. When switched on a tick appears next to the option in the pull down menu.

Showing Pressure Reading in terms of *Total Head*

When displaying a graph of pressure readings, the readings may be converted to total head readings. Before this option is used, a value for *Ground Level* should have been set for the data file (more information on setting a *Ground Level* value may be found in the section *Changing the stored setup for a data file* in this chapter).

Total head readings are turned on or off by choosing the *Total Head* option in the *Data* pull down menu. When switched on, the label for the y scale is changed to indicate that readings are in terms of total head, and a tick appears next to the total head option in the pull down menu.

Changing the Font

It is possible to change the style and size of the writing displayed on the graph by changing the *font*. To change the font for a particular graph, select the *Font* pull down menu. A window will then pop up, displaying the fonts that have been installed onto the computer that is currently being used. Note that these are not the same as the internal printer fonts used for the tables, each printer has it's own list of fonts that can be selected.

There are three aspects to selecting a font :-

The *Font Name* selects the actual font to be used (the other two options are used to modify the selected font). Each font has it's own characteristic style, from curly handwriting type, through heavy gothic scripts, to clean newspaper styles. The best way to examine the different fonts is to click on the name and examine the preview that is displayed at the bottom of the window (this shows how the writing will appear on the graph itself).

The *Font Style* is a modification of the current font. Selecting *Regular* displays the font without modifying the style (this is the "normal" setting). Selecting *Bold* thickens the writing, to make it more obvious (**Like This**). Selecting *Italic* causes the writing to be slanted towards the right (*Like This*) and *Bold Italic* combines the effects of the previous two selections (***Like This***).

Finally the *Font Size* is a direct indication of the size that the font will be shown (and printed). Font size is measured in terms of *Points* (e.g. 9pt), a form of measurement traditionally used for printing presses.

When a new font is selected then the graph will be redrawn, and the writing will appear in the newly selected font. However, if the graph is resized then the font name and style will be used, but the font size will be automatically reselected to be suitable for the size of the graph. Thus to set up the fonts for a graph to be printed, choose a suitable window size to be used and then select the desired font size.

When a graph is first displayed then the *Arial* font in *Bold* will be used. Changes to the font are NOT saved with the data file.

Different modes for displaying the data

A number of different modes of operation are available under the *Data* menu. it can be seen that there are four options that have not yet been described - *Average*, *Filter*, *Logged* and *Max/min* (the other two, *Summary* and *Total Head* are options that were described in the previous section on *Visual Changes to the Graph*.)

Average

This option, used to show the average of the logged data over one of a number of averaging periods, is similar to the average mode when displaying logged data in a table.

When the average option is first selected, the program will look at the data sample rate and then select the next highest averaging rate from the preset list of averages, that will allow every point displayed on the graph to represent an actual value (more on this problem is given in the section *Effects on screen resolution/window size on graphs* earlier in this chapter). For example, if the current

data was sampled at a 15 minute sample rate then selecting *Average* will plot a graph of 30 minute averages (i.e. the average of each pair of stored values, 30 minutes ÷ 15 minutes = 2), unless there are too many points on the currently displayed range of data, in which case the next highest value is tested until a value is found that allows each point on the graph to represent a single calculated average. If, when selecting the *Average* mode, the graph immediately selects an average value much higher than the sample rate (say a 15 minute sample rate goes to 12 hour averages when average mode is first selected), then too much data is being displayed to get a smaller average. To get a smaller average value, try displaying a smaller range of logged data (by zooming in using *X Scale*, *Single Point*, or the - key), if the zoom allows a smaller average to be calculated then this will be selected.

Selecting *Average* a second time would plot the next highest averaging rate in the list and so on until the maximum of 4 week averages is selected, when selecting *Average* again will go back to a lower averaging rate. The minimum averaging period will depend on the sampling rate of the current data set.

When average mode is being used, the current averaging rate is shown in the title block of the graph (e.g. *12 Hour Averages*). In average mode the scale of the graph will not change unless reselected (it should be noted that autoscaling is always based upon the values of the *logged* data, not the averages being displayed), but the computer will use logged data currently off the displayed graph to complete it's average calculations. The computer will not, however, attempt to calculate an average for a block of data if it contains areas with no readings (e.g. if data sampled at a 15 minute sample rate is averaged over 2 hours then the data will be averaged in blocks of 8 samples. If one of these samples does not contain a value, then no average will be calculated for that block of 8 samples.

Filter

When average mode is selected it can be seen that as the selected average is increased then the average data will appear as a series of steps on the graph. For visual presentation purposes it is possible to smooth the values, normally resulting in a "nicer" looking graph. This smoothing is performed by selecting the *Filter* mode. When filter mode is selected it will ask for a *filter* value. This value is used to alter the amount of smoothing that will occur, higher numbers smoothing the graph more. Selecting a filter value of 0 will turn off filter mode.

When filter mode is selected then an average graph will be displayed (and higher averages can be selected by choosing the Average option from the *Data* pull down menu) but the graph will also be smoothed, so filter mode is effectively an enhanced average mode. When in filter mode the title block of the graph shows the filter value used (e.g. *1 Hour Averages (Filter 1)*).

It should be noted that graphs of smoothed data no longer truly represent the values of the logged data and, as such, should only be used for visual presentation purposes.

Logged

This option is provided to return the graph to it's normal mode of operation - displaying a graph of the actual values of logged data stored within the data file. It is used to deselect other modes of operation (such as max/min, average etc.).

Max/Min

Selecting the *Max/Min* option from the *Data* pull down menu causes the graph to plot values for the maximum and minimum recorded values for each day of data. Thus the Max/Min graph consists of two lines, one representing the daily maximum value recorded and the other represents the daily minimum value recorded. Max/Min graphs of pressure can be especially useful when combined with the display of DG2/OP2 levels.

Comparing logged data for different days or weeks

The pull down menu *Compare* is used to show graphs of comparisons between days of the week or between weeks. It has three options - *Days in the week*, *Complete Weeks* and *Week Days*. Note that these options will not be available if the graph was started with more than one data set selected.

Days In The week

When this option is selected then the program will examine the current range of days displayed on the graph. If more than 9 days are shown then only the first nine will be used.

A graph will be drawn of the first day using the current mode selected from the *Data* menu (Average, Filter, Logged or max/min), the scale of the x axis reflecting the 24 hour period. Each day after this that was displayed when the *Days in the week* option was selected are then overlaid onto the graph of the first day, each appearing in a different colour (at the bottom of the screen is an indication of what colour refers to what day).

This form of graph is useful when daily usage is roughly the same for each day of the week, as any variations that occurred on a particular day are immediately obvious.

An item to note about this mode is that each day is taken in 24 hour periods from the start time of the graph displayed before the mode is selected, so if the start time is 9:15am on a Monday then the first day will be taken as 9:15am Monday to 9:14am Tuesday, the second day 9:15am Tuesday to 9:14am Wednesday, etc.

If exact days of the week are required then the *X autoscale* option of the *Scale* menu can be used to clean up the x axis to complete days before the *Days in the Week* option is chosen.

If less than nine days are shown before this option is chosen then only these are used on the new graph, so if a comparison of the week days during a particular week is required, then starting the graph on Monday and showing 5 days on the x axis will produced the required result.

Complete Weeks

This option works in a very similar way to the previous option. This time however, when the *Complete Weeks* option is chosen, the program will count the number of weeks worth of data displayed in the current graph (this value is rounded up, so if 8 days are displayed then the program will take two consecutive weeks of data). Again the graph is drawn in the mode currently selected (average, logged etc.) but this time the graph will be drawn of a complete weeks worth of data. Subsequent weeks that were displayed on the original graph are then overlaid over the graph of the first week in different colours.

Again a weeks worth of data represents seven 24 hour periods, starting from the start of the previous graph, so the x axis on the previous graph should be tidied up to the start of the first day of a week, if this option is to display true weeks.

Week Days

Again, this option works in a similar way to the previous two. This time, however, the program looks at the first day in the graph currently displayed and produces a graph of this day, with overlays of the same day in subsequent weeks. Thus if a graph of three weeks of data is displayed, starting from a Monday morning, then choosing this option would produced a graph of the data stored for the first Monday, then overlay the data for the Monday of the second week and the data for the Monday of the third week.

Storing/recalling a snapshot of a graph

When a suitable graph is being displayed then it is possible to take a “snapshot” of the graph in the current settings. Storing and recalling snapshots is carried out by the options available under the *Multiple* pull down menu (note that the *Master* option in this menu is not available when viewing a single set of data on the graph, as the *Multiple* menu performs a different role for multiple data sets, so it is “greyed out”). Up to eight such snapshots can be permanently stored on disk in one of the eight available “slots”. One or more snapshots can then be recalled at a later date and overlaid on the current graph (snapshots are displayed in a different colour). Note that the snapshot does not alter to fit the settings or mode of the currently displayed graph, it is simply drawn on the graph as it appeared when the snapshot was taken.

A common use of this facility is to overlay a graph of max/min values for a set of data over the graph of the logged data itself.

It should be noted that snapshots are saved as references to the original data used to create them, the data itself is not saved. So if a data file used to create a snapshot is renamed, or deleted then you will no longer be able to view the snapshot. If the contents of the data file is changed, then the appearance of the snapshot will be changed as well.

Storing a snapshot of a graph

To store a snapshot of the graph as it is currently displayed, select the *Save* option of the *Multiple* pull down menu. A window will then appear with the title *Graph Selection*. Within the window are eight individual slots. Each slot may contain one snapshot, and if another snapshot is saved to the same slot then the first snapshot will be lost.

Select a slot using the Up and Down arrow keys (or click on a slot using the mouse) and then click on the *OK* button. Another window will then appear, requesting a *description* of the snapshot. The description is used to identify the snapshot when selecting the correct slot for recall and is also displayed on the graph when the snapshot is shown.

Enter a description of the data being saved (up to 24 letters or numbers in any combination may be used) and then click on the *OK* button. The plot of the current graph has now be permanently stored in the slot, it can only be lost by overwriting it with another snapshot.

Recalling a saved snapshot

Once a snapshot of a graph has been saved, then it may be displayed on the current graph by selecting the *Hide/Show* option of the *Multiple* pull down menu. After selecting this option the *Graph Selection* window, used for saving the snapshot, will reappear. This time, however, it is used to display or hide any of the saved snapshots. When this window appears, all of the snapshots will be turned off (they won't be displayed). Any slot that contains a saved snapshot can be identified as it is labelled by a letter and a dash (the letter describes the type of data so *F* - would be a snapshot of some flow data) followed by the description entered when the snapshot was saved.

To display a snapshot click on it's slot (or use the up/down arrows to select the slot then press space). The snapshot will be highlighted by a bar of a darker colour. Multiple snapshot may be selected in this way, and selecting them a second time will switch them off.

When all of the snapshots to be displayed have been selected in this way, click on the *OK* button to go back to the graph. All selected snapshots will now be displayed on the graph in different colours. If any of the snapshots are of a different type of data than the current data set (e.g. a snapshot of flow data overlaid on a graph of pressure), then the first snapshot reached with a different type is used to create a different y scale on the right hand side of the graph, for the stored snapshot.

Labels on a graph

With the ReaderMate 301 software it is possible to add two types of label to a graph - a text label or a spot label. Labels are saved with the logger data when the graph program is exited, so will be shown the next time the data is viewed.

Labels consist of a box containing a message or data value reading and a vertical line joining the box to the data point that it refers to. The text box of a label will move to the left or right of the line, depending on which edge of the graph it is closest to.

Adding a text Label

A text label appears on a graph as a box containing a line of text (letters and/or numbers) joined to a vertical line pointing to a particular point on the graph. Text labels are used to identify a particular feature of a graph, such as a label "*Maximum usage"* at the peak point of a graph.

To add a text label select the *Text* option on the *Label* pull down menu. A window will then appear, requesting you to enter the required text that will appear in the label. Enter the text and click on the OK button. The cursor will now change to a vertical arrow, and be confined to the area of the graph. Move the cursor to the desired point on the graph where the label should be placed and then click the left mouse button. The text label will then be created on the graph. The line joining the label to the graph will be vertical at the point that the mouse cursor was pointing at and the text box will be at the height of the mouse cursor itself.

Adding a Spot Label

A spot label is a special of text label. A spot label is created at a single data point on the graph, and the label box will then contain the time and value of that reading. Spot labels are generally used to identify the times that a minimum or maximum was reached on the graph, and will contain a reading of the value itself.

To create a spot label, select the *Spot* option from the *Label* pull down menu. If a window pops up with the message *Must Zoom In To Sample Required* then too much data is being shown on the current graph. Each dot on the graph is currently representing more than one logged reading, so the program would not be able to identify a single data value by clicking on the graph. This is important since the spot label is to contain a reading of the value at the point. If the message does appear then use one of the zoom options until each point on the graph only represents a single item of logged data (when this occurs then the data block in the top right hand corner of the graph window will show the value of the current data point as the mouse cursor is moved over the graph), and then select the *Spot* option again.

The mouse cursor will then change to a vertical arrow in the same way as adding a text label. Click directly below (or above) the desired point and the spot label will be created in the same way as a text label. This time, however, the text of the label will contain the time that the selected reading was taken and the value of the reading itself.

Deleting Labels

Labels can be deleted by choosing the *Delete* option from the *Data* pull down menu. After selecting this option the cursor will once again change to the vertical arrow. Click the mouse button on the label that you wish to delete. The program will then identify the nearest label and pop up a window asking if you wish to delete the label (the label's name appears in the window). If the *Yes* button is selected then the label will be deleted, or if the *No* button is selected then the operation will be cancelled.

Moving Labels

Labels can be moved by choosing the *Move* option of the *Data* pull down menu. To move a label, select this option then click on the label that you wish to move. The program will then identify the nearest label and a window will pop up asking if you wish to move the label (the label's name appears in the window). Selecting *Yes* will allow you to move the mouse pointer to the new position and selecting *No* will cancel the operation.

Do not use the *Move* option to move spot labels, as the readings in the label will NOT be updated to the readings of the new location. To move a spot label, delete the existing label then create a new spot label at the desired location.

Showing/Hiding Labels

It is possible to hide all of the labels present on a graph by selecting the *Hide* option from the *Label* pull down menu. Selecting this once will hide the labels from the graph (and the option will be ticked on the menu). Selecting it a second time will show the labels again (and remove the tick).

Printing a Graph

The contents of a graph, including the title blocks, axis information, labels and any displayed snapshots can be printed on a printer by selecting the *Print* option from the pull down menu.

Once this option is selected, the standard Windows *print setup* window will appear, to allow you to select your printer and other printing options. This may be used to select the size of paper to be used, the actual printer used (if more than one is available) and a number of other options that may affect the resulting printout of the graph. As the options on this window may change depending of the particular setup of your computer system, a full description of the use of this window is beyond the scope of this manual. However further information on the use of this window may be found in the Windows manuals that came with your computer.

One point that should be noted is the choice of *Portrait* or *Landscape* orientation for the paper. When printing the graph then the program will attempt to scale the graph to the paper so it is as big as possible, whilst maintaining it's aspect ratio (the ratio between the height of the graph and it's width, effectively the program keeps the graph the same shape). When the graph is printed in *Landscape* mode, then the top of the graph will run along the longest side of the piece of paper, normally producing the best fit of the graph onto the paper, when the standard graph shape (short and wide) is

being printed. If, however, the graph is stretched so that it is tall and thin, then selecting *portrait* mode (where the top of the graph runs along the shortest side of the paper) may produce a better fit.

Advanced Options for a graph

There are a number of options available under the *Advanced* pull down menu. These options should only be used by experienced users of this software, as most of them make permanent changes to the logged data itself.

The options are :-

PRV Calibrator

This option can be used to automatically create PRV control tables for the ControlMate range of PRV controllers. More information on the use of this option can be found in the ControlMate manual.

Mark 1 and Mark 2

The options for changing logged data that are available via the *Edit* menu only perform their respective function on a *range* of data. The *Edit* option itself is “greyed out” (cannot be selected) until a range of data has been marked using the *Mark 1* and *Mark 2* options. To select a range of data to be edited, select the *Mark 1* option and move the line over the start of the data that you wish to edit. Clicking the mouse button will create a label named *1*. The end of the range of data should then be selected by choosing the *Mark 2* option. Move the line to the end of the data that you wish to edit and click the mouse button. A label will be created named *2*.

You will now find that the edit option is available, and the options available from the menu will operate only on the ranged data.

Edit

This option is not available until a range of data has been marked out using the *Mark 1* and *Mark 2* options (see above).

When the mouse cursor is brought over the edit option, another submenu of options will be displayed for editing the range of data that has been marked. These options are :-

Pseudo

This option is used to create “false” data, and is normally used to fill in gaps in logger readings. Use of this option requires that a certain amount of data has already been logged and that weekly fluctuations are fairly constant, as it fills the ranged area with a copy from the same time range in the previous week. If the ranged area is small and data for the previous week is not available, then this option fills the ranged area with data from the same time range in the previous day.

Erase

This option will permanently remove the readings within the ranged area from the data file. These readings are not set to zero, they are actually deleted from the file. USE WITH CARE!

Multiply

This option will ask for a multiplying factor and then multiply all readings within the range by the factor. Factors of less than one are acceptable, so 0.5 could be used to half the value of all readings in the range. The option can be used to correct for reading that have been taken with the wrong scaling factor entered in the logger setup.

Offset

This option asks for a value for the offset and then adds the entered value to all of the readings in the marked range.

Set Value

This option will ask for a value to be entered and will then set all of the data in the range to the entered value.

Rate Change

This option will be used to correct for areas of the data file that have accidentally been taken at a different sampling rate from the rest of the file. However, this command is still in development so it's method of use may be subject to change.

Graphs of Multiple Sets of Data

When the graph program is entered with multiple sets of data selected, then most of the functions work identically to using the graph with a single data set.

One idea that may need addition explanation is the concept of having a *Master* set of data. When multiple sets of data are sent to the graph program, the first data set selected is chosen as the master. All of the additional information that is provided on the graph, such as the title block and the summary information, is determined and related only to the master set of data. The master data set is always plotted in black (and is drawn on top of all other plots), whilst the other sets are drawn in other colours. Automatic calculation of the y axis is determined by taking into account the minimum and maximum values from all of the data files.

The pull down menus *Font*, *Zoom*, *Scale*, *Data*, *Label*, *Print* and *Advanced* are all used in the same way as for a single set of data (some functions will only act on the master data set, such as label). The *Compare* menu is "greyed out" (i.e. cannot be selected) as it cannot be used in multiple data mode. The pull down menu *Multiple* now operates in a different way, as it performs a different function with multiple data sets.

Use of the *Multiple* menu with more than one data set

When multiple data sets are being viewed, then the *Save* option cannot be selected, as this menu is no longer used for taking "snapshots". Snapshots cannot be saved, shown or used when viewing multiple data sets.

The *Hide/show* option from the *Multiple* menu is now used to turn the additional data sets on or off (show them on the graph or prevent them being drawn). The master data set cannot be switched off (but another data set could be made the master - see below). When selecting this option, the *Graph Selection* window appears, as with the single data mode. Instead of holding names of snapshots, however, this window contains the name of the additional data sets (up to 8). Clicking on a name with the mouse (or using the up/down cursor keys to move over the correct data set then pressing the space bar) will turn the data set on or off, depending on the previous set. Any set of data highlighted with a darker bar will be shown on the graph.

The *Master* option of the *Multiple* can be used to exchange the current master data set with one of the other data sets. Click on the required data set (or highlight it using the up/down cursor keys and the space bar as before), then click on the *OK* button. The selected data set will now be used as the master and the previous master will be drawn in the colour that the selected data set was using.

CHAPTER 10

Manipulating data files

How to join data files together, delete them and copy them to another disk.

Data file manipulation is performed by selecting the required files on the Data Viewer window and choosing the desired option using the pull-down menu.

Combining Data Files

Using the *combine* option, data files can be combined in one of two ways :-

Joining data files

Joining is used when readings have been made from the same logger at different times, and the results stored in different files, and it is wished to combine these data files into a single file containing all of the information. Files can only be joined in this way if their ID and Location match exactly (comparisons are case sensitive - i.e. lower case letters e.g. a, and upper case letters, e.g. A, are not the same), and they represent the same type of data.

To join data files in this way, the files to be joined should be multiple selected, that is each data file should be selected and the space bar pressed (or the data file double clicked), to place an asterix (*) next to it's *Location* column. After selecting all of the required files in this way then they can be joined by choosing the *Combine* option from the pull down menu. The files will then be added together in turn to produce a single file, before being removed from the system. The program will pop up a window with the error *This option requires at least two files* if you try and combine a single file, click on the *OK* button to go back to the Data Viewer.

Please note that multiple selecting any files in this way will clear the markings for files to be mathematically combined (and vice versa. i.e. marking with * clears + and -).

Mathematical combinations of data files

As well as joining data from the same logger, data files can also be mathematically combined. This involves finding areas of overlap in the data (i.e. elements that have the same time and data within two sets of data) and then adding them or subtracting one from the other, depending on the operation selected.

A common use for this facility is to determine water consumption in an area. Loggers are placed on all in flows and out flows for the area, measuring flow rate, and readings taken over the desired time period. After reading the logged information into separate data files, a new file of consumption for the area can be created by marking all of the input files to be added to the total leakage file and all output files to be subtracted from the total leakage file. A new file is then created which holds the difference between total input flow and total output flow, the loss of flow due to leakage at the junction.

When mathematically combining data files, a new total file is created with it's own ID and location description (this could be used to describe what the file represents - for example "Area Consumption") and the files operated on are not deleted.

To combine files in this way, each file to be combined must be marked as either to be added or subtracted from the total. To mark a file to be added to the total, select the file on the *Data Viewer* window by clicking on it or by moving the highlighting bar over the file using the up/down cursor keys and then press *A* (for *add*). A plus sign (+) should have appeared between the ID and Location for the file. A file is marked to be subtracted from the total by highlighting it in the same way but then pressing *S* (for *subtract*). This should cause a minus sign (-) to appear between the ID and Location for the file.

Once all the files have been selected for either addition or subtraction, choose the option *Combine* from the pull down menu. A window will pop up asking for a *Result Logger ID*. This is the ID that the result file will be given when it is created. Enter a suitable ID and click on the *OK* button. A new window will then appear requesting a *Result Location*. This is the location that the result file will be given, and should be used to describe the meaning of the result file (e.g. Total Leakage). Enter a suitable description and select the *OK* button.

The program then makes final confirmation that you have selected the operation correctly by popping up a window asking *You have selected* n *Files. Add Files* where n is the number of files that you selected. Select the *Yes* button to create the result file or *No* to cancel the operation. After performing the operation the result file will show up in the Data Viewer window and the data can be viewed just like any other logged data.

Mathematically combining files in this way has been provided to combine flow data readings, and should not be performed on pressure data files, as the results are likely to be unpredictable. The program will not allow data files of different types of readings to be combined mathematically.

Please note that selecting any files for mathematical combination in this way will clear the markings from multiple selected files (and vice versa. i.e. marking with + and/or - clears all *).

Using mathematical combination to create a duplicate of a data file

It is possible to use mathematical combination to create another copy of a data file on the same data drive, but with a different logger ID and/or Location. Simply mark just one file with a + (by clicking on the file and pressing *A*) and then selecting *combine*. Enter the desired ID and Location information as in normal mathematical combination and the copy of the selected data file will be created with the new ID and Description.

Copying data files to another disk

Using the *Copy* option from the pull down menu on the Data Viewer it is possible to copy data files from the normal data drive to the floppy data drive (or vice versa if *Copy* is selected on the floppy data drive window).

Both the normal data drive and floppy data drive are set in the *Configuration* menu (for more information see the section on *Initial Software Setup*).

The advantage of using the copy option in this program, rather than using file manager or another method of copying files, is that with the 301 software keeps a record of it's data files in a separate file, so if data files are copied into the data directory without updating this file then they will not appear within the Data Viewer window. Using this copy option automatically updates this file, so data removed or added to the data drive is recognised and the Data Viewer list is updated.

To copy a single data file from one drive to the other, ensure that no other files are multiple selected or marked for mathematical combination (i.e. no files are marked with *, + or -, pressing the - key will clear all of the marks from all files in the window), then place the highlighter bar over the correct data item in the Data Viewer (click on the data set or use the up/down cursor keys) then select the *Copy* option from the pull down menu on the Data Viewer window. The program then makes sure you want to copy the file by popping up a window with the words *Copy File* in it. Click on *Yes* to copy the file to the other drive or *No* to return to the data viewer window without copying the file.

To copy several files at once to the other data drive, multiple select all of the files to be copied (mark them with a * by clicking on them and pressing the space key or double clicking on them), then select the *Copy* option. The program will again confirm that you want to copy the files but this time it also displays the number of files that you have selected, e.g. *You have selected 4 files, Copy files*. Again click on the *Yes* button to copy the files or *No* to go back to the Data Viewer without copying the files.

If any files are marked for mathematical combination (marked with a + or -) then the program will not allow any files to be copied. Instead the message *Files are marked for addition* will appear in a window and the copy will not take place.

If the drive that is being copied to becomes full during the copy then a window will appear informing you of the problem, e.g. *Insufficient Space On Drive A:*. After clicking on the *OK* button

another window will appear, telling you how many of the selected files were copied to the other drive before it was full, e.g. *1 Out Of 3 Files Successfully Copied*. Clicking on the *OK* button will take you back to the Data Viewer. Any files from a multiple selection that weren't copied will still be marked with a *.

Deleting files from the data drive

The pull down menu option *Remove* is used to delete a data file (or files) for the data drive. Caution should be exercised when using this option as the files are permanently deleted from the disk, and can not be undeleted at a later time.

(It may be possible to recover an accidentally deleted data file, though this needs to be attempted as soon as possible after the file is deleted and requires the use of powerful file recovery programs and, as such, is a matter beyond the scope of this manual)

To delete a single file, highlight it by clicking on it in the Data Viewer window or use the up/down cursor keys and then select the *Remove* option from the Data Viewer pull down menu. A window will then pop up with the message *Delete File*. Click on the *Yes* button to delete the file or the *No* button to keep the file

It is also possible to delete more than one file at once. Multiple select all of the files to be deleted (mark them with a * by clicking on them and pressing the space key or double clicking on them), then select the *Remove* option from the Data Viewer pull down menu. A window then pops up telling you how many files you have selected and asking if you want to delete them, e.g. *You have selected 3 files. Delete files*. Click the *Yes* button to delete all the selected files or the *No* button to keep the files.

CHAPTER 11

Using logged data in other programs (exporting)

It is possible to save the information from one or more sets of data to disk in a form that can be read by **Lotus 123** or **Wesnet SLI** software.

The **Lotus 123** format is not only suitable for the Lotus 123 program, but is recognised by most spreadsheets in common use (such as Microsoft Excel), often by selecting an option to *Import* the file. For more information consult the manual that came with the spreadsheet.

To save the data Lotus 123 format select a data file (or several files using multiselect), click on the *Export* option on the data viewer pull down menus and then click on the *Lotus 123* option (or press the CTRL and O keys at the same time).

The program will then ask for a directory to place the file(s) in. The names of the files created are automatically chosen by the program, based in part on the logger ID and end in the letters .WK1. The directory should consist of the directory letter and full subdirectory path that the files should be placed in. When multifile selection is used, one file is created in the directory for each file selected in the data viewer.

After choosing a directory to place the files in, the program asks for the start date, the date of the first data to be included in the exported file. The date given as the default is the date of the earliest record in the data set, press return to accept this date or type in another date (separated by slashes, e.g. 29/12/96). The program then asks for an end date, the date of the last data to be included in the exported file. The default this time is the date of the last record in the data set. Again press return to accept this value or type in a new date.

The conversion program now uses the provided information to create the data files in your chosen directory. If a file of the same name already exists (probably due to the data from the same logger being previously exported) then the data exporter program will say (for example):-

```
        WESSEX - > LOTUS
C:\CDM0094.WK1 Already Exists
        Overwrite (Y/N)
```

Press the Y key to remove the old file and write the new one, or N to cancel the save.

Saving the data in Wesnet SLI format is very similar to exporting the data as a Lotus 123 file. Select a data file (or several files using multiselect), click on the *Export* option on the data viewer pull down menus and then click on the *Wesnet SLI* option (or press the CTRL and W keys at the same time). Again the program asks for the directory where the file(s) should be stored (Wesnet SLI files end in the letters .PRN), and a start date. With Wesnet SLI exporting, however, you can also enter a start time as well. Then the program asks for an end date then end time.

Once again, if the file about to be written already exists, then the program will ask if you want to overwrite the file.

CHAPTER 12

Reference Guide

This chapter serves as a reference to each of the options available from each menu.

Menu Options (From the main menu)

F1 - Setup Logger

Used to view and change the internal settings of a logger. All of the options from this menu are described in detail in **Chapter 5 - Setting Up a Logger**.

Submenu options -

F1 - Read Logger Setup

Re-read the settings stored in the current logger.

F2 - Logger ID

Allows a new ID to be entered for the logger

F3 - Logger (GMT)

Sets the logger internal clock to the current time and date of the PC. Leads to a further submenu :-

F1 - BST

The PC clock is currently in BST.

F2 - GMT

The PC clock is currently in GMT

F4 - Sampling Rate

Allows the current sample rate for the selected channel pair to be altered. The rate is choosen from a set list.

F5 - Pulse Input

Change the transducer type and some of the parameters for the pulse input on the current channel pair.

F6 - ADC input (or F6 - 4-20mA)

Change the transducer type and some of the parameters for the ADC or 4-20mA input on the current channel pair.

F7 - Register

Edit the current setting of the internal register for the current channel pair.

F8 - Location

Edit the current location description stored in the logger.

F9 - Alarms

Allows alarms to be set and switched on/off for the current channel pair. The alarm values can only be changed if using telemetry communications.

F10 - Setup Logger

Write the changed settings into the internal memory of the logger.

F2 - Read Logger

Used to read the logged information from any input channels that are switched on. The number of *days to read* will affect the amount of data read, as will the logger start date. Use of this option is described in detail in **Chapter 7 - Reading a Logger**.

F3 - Spot Values

This option is used to view real-time data on the selected channel pair. If this option is used to view channel number 4 of a ControlMate then a number of readings and values will be displayed, to allow the control parameters to be monitored and the operating mode to be altered. This option is described in detail in **Chapter 6 - Checking Logger Inputs**.

F4 - View Logger Data

This option allows readings from loggers that have been stored on disk to be viewed as tables of information or in graphical form. For each data file the settings used by the logger to create the data can be viewed and some of the parameters may be altered. The *setup* option from this display allows additional readings to be made and the real time values to be viewed by connecting to the same logger used to make a data file. This option is described in **Chapter 9 - Viewing Stored Data**.

F5 - Calibrate Logger

This option is used calibrate a pressure logger connected to the selected input pair, using ambient pressure and a known reference pressure. More information on calibrating a pressure logger may be found in **Chapter 5 - Setting up a logger**.

F6 - Step Tester

The step tester is used to measure the difference to flow rate that shutting a particular valve makes. The value of difference may be given in terms of average flow rate per property (often l/h/p) connected via the valve. Use of the step tester is described in **Chapter 6 - Checking Logger Inputs**.

F7 - Read RM201/RM401

This option is used to transfer logged data held in the internal memory of a ReaderMate 201 (a custom built data retrieval unit) or ReaderMate 401 (a Psion organiser running the correct software) to data file(s) on disk. The data files are not selectively retrieved, all data files held in the memory of the RM201/RM401 are transferred to the PC data drive and then removed from the memory of the RM201/RM401. This option is described in **Chapter 8 - Reading Information Using a ReaderMate (RM201) or Psion (RM401)**.

F8 - Set Communications

This option allows the communications method for contacting loggers to be changed. Infra-red or telemetry communications systems may be selected and the telephone number used for telemetry communications may be changed. This option is described in **Chapter 5 - Setting up a logger**.

F9 - Configure System

This option is used during initial configuration of the software, and when one of the data drives or communications ports needs to be changed. All options on this menu are described in detail in **Chapter 4 - Inital Software Setup**.

Submenu options :-

F1 - Time Window

This option is used to select the time range used to calculate the values for *Window Total Litres*, displayed when viewing flow data as a table. Thus the total volume measured during the time window is displayed for each day of data.

F2 - Days to Read

This is used to affect the amount of data read from a logger. The value can be “all”, to read all available data, or a specific number of days. This option is also used to define if the logger clock is set from the PC clock during a download or the two times are checked for a difference.

F3 - Data Drive

This option is used to select the main data drive to be used to stored logged data.

F4 - Floppy Drive

This option is used to select the secondary data drive, normally a floppy disk drive.

F5 - Printer

This option has no effect on the Windows version of the RM301 software.

F6 - Infra-red Port

This option is used to select the serial port that the infra-red probe is to be connected to.

F7 - RS232 Port

This option is used to select the port that a modem will be connect to, for telemetry communications, or a RM201/RM401 will be connected to.

F8 - Calibrate (mBar)

This option is used to select the default calibration pressure used in the calibration menu.

F9 - DG2/OP2 Pres (m)

This option is used to select new values for DG2 and/or OP2 level.

F10 - l/s * 1

This option is used to enter a conversion factor from litres per second to another suitable flow rate (e.g. l/h).

Map of Menu -> Submenu Options

Main Menu	**Submenu 1**	**Submenu 2**	**Submenu 3**
F1 - Setup Logger ->	F1 - Read Logger Setup		
	F2 - Logger ID		
	F3 - Logger (GMT) ->	F1 - BST F2 - GMT	
	F4 -Sampling Rate		
	F5 - Pulse Input		
	F6 - ADC Input		
	F7 - Register		
	F8 - Location		
	F9 - Alarms		
	F10 - Setup Logger		
F2 - Read Logger			
F3 - Spot Values			
F4 - View Logger Data ->	F1 - Table		
	F2 - Graph		
	F3 - Setup ->	F1 - Read By ->	F1 - Setup **(1)** F2 - Read **(2)** F3 - Now **(3)**
		F2 - Logger ID F3 - Logger (GMT) F4 - Sampling Rate F5 - Pulse Input F6 - ADC Input F7 - Register F8 - Location F9 - Alarms F10 - Ground Level	
F5 - Calibrate Logger ->	F1 - Zero		
	F2 - Hi Pt		
	F3 - Mid Pt		
	F4 - Value		
F6 - Step Tester			
F7 - Read RM201/RM401			
F8 - Set Communications			
F9 - Configure System ->	F1 - Time Window		
	F2 - Days To Read		
	F3 - Data Drive		
	F4 - Floppy Disk		
	F5 - Printer		
	F6 - Infra-Red Port		
	F7 - RS232 Port		
	F8 - Calibrate (mBar)		
	F9 - DG2/OP2 Pres (m)		
	F10 - l/s * 1		

(1) = Go to options called from *F1 - Setup Logger* from the main menu.

(2) = Same as selecting *F2 - Read Logger* from the main menu.

(3) = Same as selecting *F3 - Spot Values* from the main menu.

CHAPTER 13

Backing up the data files

How to make a copy of some or all of the data files stored in the data directory.

Backing up the data files involves making a copy of one or more of the data files stored in the data directory onto another disk, preferably a disk that can be removed and stored at another location for safety, such as a floppy disk.

Although data files may be lost by accidental deletion, other possible reasons for loss of data could be theft of the computer or loss of the computer in a fire and this is the reason for keeping a backup in another building, to reduce the chance of the backups being lost in the same way as the originals.

It is recommended that all data files are backed up at least once a month.

Copying the data files using the data viewer

This is the recommended method of making of copy of any data files. Although it is possible to copy the data files to another disk by hand, the advantage of this method is that the program is responsible for copying the files and will automatically update the record of files on the system. It allows the data files to be selectively copied to another drive, so the data files may be copied to a number of floppy disks if they will not all fit on one, and unwanted files can be excluded from the backup.

Backing up all data files to floppy disk

This is the most common way of performing a backup. Before starting the backup, ensure you have a number of blank formatted floppy disks available (information on formatting disks can be found in the manuals that came with your computer).

First go to the software configuration screen (click on the *F9 - Configure System* button from the main menu). Ensure that option *F4 - Floppy Disk* is set to the drive letter of your floppy disk drive (normally A:, if wrong consult *Chapter 4 - Initial Software Setup* for more information on configuring the drives correctly). Now go back to the main menu and select option *F4 - View Logger Data*.

On the data viewer window press the + key to select all of the data files (all files should have a * to the left of the location name). Now insert a blank floppy disk into the floppy disk drive and select the *Copy* option from the pull down menu. A window will pop up telling you how many files you have selected and asking if you wish to continue the copy (e.g. *You Have Selected 162 Files. Copy Files*). Click on the *Yes* button.

The program will then proceed to start to copy the data files to the floppy disk (the computer will create a directory called *LOGRMATE* on the floppy disk, then a subdirectory called *DATA* within the LOGRMATE directory. All data files will be copied into the *DATA* directory).

The program will not erase any files already present on the disk, but any existing files will reduce the space left for new data files.

If a system holds a large number of data files then they may not all fit on a single floppy disk. If the disk does become full then a window will appear with the message *Insufficient Space On Drive A:*. Click on the *OK* button and then the computer will inform you how many files it has copied to the last floppy disk, e.g. *111 Out Of 162 Files Successfully Copied*. After clicking the *OK* button you will notice that only the files that could not be copied are still selected (with the *), so to copy the rest of the files remove the full floppy disk and insert a new blank disk into the drive, then simply select the *Copy* option again.

If a write-protected disk is used by mistake (the write-protect tab on the floppy disk itself has been set to the wrong position) then the computer will present the message *System Error. Write protected disk in drive A:*. If the disk has been write protected by mistake then remove the floppy disk, write-enable it, then reinsert it in the drive and click on the *Retry* button. If the disk has been used by mistake then click on the *Cancel* button. The computer will then act as if the disk was full (see above). Insert another disk and select *Copy* again.

Following the instructions above you should have one or more floppy disks containing all of the data stored on the data drive. These should be kept safe, should they be required.

CHAPTER 14

Keyboard Shortcuts

This chapter lists the keys that may be used to control the program.

The following lists are the keyboard shortcuts that are available in each part of the program. Apart from the main menu shortcuts, each area includes the keys that must be pressed to access that window from the main menu, e.g. the title for entering a logger ID shows (F1,F2), thus to change the logger ID, press the F1 key and then the F2 key from the main menu.

Main Menu

F1 = Change the logger setup
F2 = Read logged data from the logger
F3 = Show the current values on the logger inputs (updating)
F4 = Show and manipulate logger data stored on disk
F5 = Change ADC pressure transducer calibration
F6 = Enter the step tester
F7 = Read data from a ReaderMate (RM201) or Psion (RM401)
F8 = Select and configure the type of communications to be used
F9 = Change the program configuration
ESC = Quit the program

Setup Logger (F1)

F1 = Re-read the setup information stored in the logger
F2 = Change the Logger ID
F3 = Update the internal clock of the logger
F4 = Change the logger sampling rate
F5 = Change the settings of the pulse input of the current channel pair
F6 = Change the settings of the ADC/0-20mA input of the current channel pair
F7 = Change the current value of the register
F8 = Change the Location description
F9 = Change and arm/disarm the logger telemetry alarms
F10 = Write the settings to the logger memory and change the logger start
Page Up = Select the next channel pair
Page Down = Select the previous channel pair
ESC = Return to the main menu without writing any changed settings to the logger

Entering Logger ID (F1,F2)

Return = Accept Logger ID
ESC = Return to the previous menu without changing logger ID

Changing Logger Time/Date (F1,F3)

F1 = PC time is BST
F2 = PC time is GMT
ESC = Return to the previous menu without changing logger time.

Changing Pulse/ADC/4-20mA Parameters (F1, F5 or F6)

Up Arrow = Select next input on channel pair
Down Arrow = Select next input on channel pair
F1 = Change input type/turn input off
F2 = Change input scaling
F3 = Remember changes
ESC = Return to the previous menu, keeping previous input selections.

Changing the register value (F1,F7)

Return = Accept register value

ESC = Return to the previous menu without changing register value

Changing the location (F1,F8)

Return = Accept location
ESC = Return to the previous menu without changing location

Changing the Alarms (F1,F9)

F1 = Change the alarm parameters
F2 = Turn the alarm on/off
F3 = Change the dial back phone number
F4 = Remember the changes to the alarms
ESC = Return to the previous menu without changing the alarm settings

Read Logger (F2)

ESC = Abort communications (does not work when reading logged data using IR communications. Remove the probe to abort)

Spot Values (F3)

Page Up = Select the next channel pair
Page Down = Select the previous channel pair
Q = Turn the beep On/Off
ESC = Quit the spot reader.

Data Viewer (F4)

Space = Add file to the multiple selection list.
+ = Add all files to multiple selection list.
- = Clear multiple selection list.
A = Select file to be added to other selected files during combine
S = Select file to be subtracted from other files during combine
CTRL + I = Sort data sets by Logger ID
CTRL + L = Sort data sets by Location
CTRL + T = Sort data sets by Type of data (flow, pressure etc.)
CTRL + D = Sort data sets by the date of the last item in the data set
CTRL + O = Export the data set(s) as a Lotus 123 file
CTRL + W = Export the data set(s) as a Wesnet SLI file
F1 = Display the data set as a Table
F2 = Display the data set(s) as a Graph
F3 = Show the Setup information used for the logger when the data was read.
ESC = Quit the data viewing program

Viewing data as a table (F4,F1)

F1 = Select averaged data (or next average if already in average mode)
F2 = Show data as logged
F3 = Toggle summary table on/off
F4 = Toggle Total Head pressures on/off (pressure data only)
F5 = Print table information
TAB = Show the graph of the current table (open it if necessary)
ESC = Close the table window

Viewing data as a graph (F4,F2)

+ = Show 1 extra days worth of information on the graph scale
- = Remove 1 days worth of information from the graph scale
→ = Move graph right by one day
← = Move graph left by one day
TAB = Show the table of the current graph (open if necessary)
ALT + F4 = Close the graph window

Viewing a Logger Setup (F4,F3)

F1 = Select setup or read data from particular logger
F2 = Change logger ID for data set
F5 = Change logged flow scaling for data set
F6 = View ADC/4-20mA input settings for data set
F7 = Change register for data set
F8 = Change Location for data set
F9 = View alarms for data set
F10 = Change ground level (pressure data only)
ESC = Quit back to data viewer

Accessing logger via data set (F4,F3,F1)

F1 = Change setup for listed logger (as F1 from main menu)
F2 = Read logger data (as F2 from main menu)
F3 = View spot values for listed logger (as F3 from main menu)

Calibrate Tester (F5)

F1 = Select the current pressure as the Zero point
F2 = Select the current pressure as equal to the Calibration Pressure
F3 = Select the current pressure as the mid point between the zero point and the calibration pressure
F4 = Select a new Calibration Pressure
+ = Add 1 to the Calibration Pressure
- = Subtract 1 from the Calibration Pressure
Page Up = Select calibration of the next channel pair (only the ADC pressure channels)
Page Down = Select calibration of the previous channel pair (only the ADC pressure channels)
Q = Turn the beep On/Off
ESC = Quit the calibration program (keeps the previous calibration)

Step Tester (F6)

The available keyboard shortcuts varies with the phase of the test.

Entering the number of properties

ESC = Quit the step tester, returning to the main menu

Phase 1 - Measuring Initial Flow

F1 = Restart the current phase
F2 = Start the next phase (only after 2 flow pulses)
ESC = Display exit options -> F1 = EXIT - Quit Step Tester
F2 = Cancel - Resume the test

Phase 2 - Measuring Reduced Flow

F1 = Restart previous phase
F2 = Restart current phase
F3 = Finish test and save results (only after 2 flow pulses)
ESC = Display exit options -> F1 = EXIT - Quit Step Tester
F2 = Cancel - Resume the test

Read RM201/RM401 (F7)

ESC = Cancel Communications

Set Communications (F8)

0 to 9 = The next digit in the phone number
Backspace = Erase the previous digit in the phone number

Return = Confirm the phone number as correct, selecting Telemetry communications and return to the main menu
I = Select Infra-Red communications and return to the main menu
X = Turn Persistent Telemetry On/Off

Configure System (F9)

F1 = Change the Time Window for calculating total water volume
F2 = Change the number of days of data to read from the logger (and the updating of logger time using PC time)
F3 = Choose the main disk drive the data is stored on
F4 = Choose the secondary data drive for storing data
F5 = Choose the Printer port (NOT USED)
F6 = Choose the port for Infra-Red communications
F7 = Choose the port for Telemetry communications
F8 = Enter the default calibration pressure
F9 = Change the DG2/OP2 levels
F10 = Enter a conversion factor from l/s to desired units.
ESC = Accept the changed settings and return to the main menu

CHAPTER 15

Solving Problems

How to solve some problems that may occur.

This chapter lists a number of potential problems that could occur, along with their solution. Do not be concerned by the length of this list - most of these problems are very unlikely to occur, or are advice on using the system better, or represent the user attempting to do something like trying to connect to a telemetry logger but selecting infra-red communications by mistake.

Upon running the program a window appeared with the message *Creating List of Data Files*, which ran through a list of files before the main menu could be used.

The file *LGCOMM.DAT* in the *LOGRMATE* directory had been deleted or could not be found. The program uses this file to keep a record of what data files are available, but if it is missing then the program can automatically rebuild it, though it does take a short while to perform the operation.

Once the file has been recreated. The next time the program is run it will not have to make the file again.

It is also possible that the file could not be found because the drive for the data directory has been incorrectly set in the configuration. For more information on configuring the system, see the section *Initial Software Setup*.

Upon running the program, before the main window appears, a window pops up asking for the directory that the data files are located in.

Either this is the first time the program has been run, or the configuration file *RM301.CFG* has been deleted. The section on *initial software setup* gives more information on configuring the software for use with your system.

The logger's memory fills quickly, overwriting previous values before they can be transferred to a PC

To ensure the maximum use of the memory, remember to switch off unused inputs (see the section on *Setting up a logger*), otherwise readings are taken from unused inputs and stored in memory along with the desired readings.

Another way of increasing the time that a logger may be left unattended without overwriting important values is to decrease the sampling rate (see the section *F4 - Sampling Rate*).

When choosing options F1 or F3 from the main menu, the window pops up then immediately disappears.

You have possibly set the wrong communication system (Infra-Red communications instead of Telemetry or vice versa). The communications system selected appears just above the options on the main menu. For telemetry this reads *Tel:* followed by the phone number of the logger, for the Infra-Red communications system this reads *Infra-Red Probe*. For more information on changing the communications system see the section *F8 - Set Communication*.

If the communications system is correctly set then the port used for the system may be wrong. Choose option F9 - Configure System from the main menu to look at the configuration page and check the port setting for the Infra-Red port (when using the Infra-Red probe) or RS232 port (Telemetry system). More information on configuring the system may be found under the section *F9 - Configure System*.

Another possibility is that telemetry communications has been selected but the MODEM.DAT file has been deleted from the LOGRMATE directory. This file contains essential information about the use of a modem for telemetry communications.

When choosing options F1, F2, F3 or F5 from the main menu, a window pops up giving the error message Port Not Available.

See Previous solution.

When choosing option F5 from the main menu nothing happens.

The communications system is probably set to Telemetry. The software will only allow calibration of the pressure transducers on a logger using the infra-red probe, as Telemetry is designed for remote access to loggers but calibration requires connection/disconnection of a datum pressure source, which can only be done locally.

When choosing option F1 from the main menu, the logger setup window appears with the message Communication Retrying and does not disappear.

The Infra-Red probe cannot establish communication with the logger. The probe itself may be damaged, or incorrectly located over the infra-red communications window of the logger, or the window on the logger or probe may be obscured, or the logger may be damaged in some way.

Press the ESC key to go back to main menu, correct the problem and try again.

When choosing option F2 from the main menu, the logger reader window appears with the message Failure - No Communication.

See previous solution.

When choosing option F3 from the main menu, the real time reader appears but does not contain any information apart from the message *Press ESC To Quit*.

See previous solution.

When choosing option F5 from the main menu, the Logger Calibrator appears with the message *Initialising Infra-Red Channel*, *Please Wait ...* but does not change.

See previous solution.

When using a telemetry connection to a logger the program looses it's connection when going back to the main menu, so the program has to re-dial the logger when moving between the various options on the main menu. This is annoying since I'm currently setting up and testing the logger.

The Persistent Connection option of the telemetry system is turned off. If it is turned on then the program maintains the connection with the logger when going back to the main menu, so the program no longer has to re-dial the logger when going from the Setup page to Spot Values (for example). The logger will automatically disconnect itself if no information is received for a period of one minute.

To turn Persistent connection on or off, choose the Set Communication option from the main menu (Click on the *F8* button or press the *F8* key). The *X* key then allows you to switch Persistent connection on or off. Select the desired value (*Tel:* means it is switched off, *Persistent Tel:* means it is switched on), then hit Return to go back to the main menu.

Note:- The persistent connection option is designed for use while setting up and testing a logger. The use of this option during normal operation is NOT recommended. This option has no effect on Infra-Red connections.

When attempting to set the alarms (*F1 - Setup Logger* from the main menu, followed by *F9 - Alarms*), I can view the alarms but I can't change any of the information

You are probably accessing the logger using the infra-red communications system (or are looking at a setup record from the data viewer, rather than changing an actual logger setup). Alarms can ONLY be changed when using a telemetry connection.

Another item to note is that when accessing the alarm page using an infra-red link, only the first nine numbers in the dial back phone number are shown (followed by ...).

More advice on changing the communications system can be found in the section *F8 - Set Communication* and more information on the alarms page can be found in the section *F9 - Alarms*.

When looking at the alarms page (*F1 - Setup Logger* from the main menu, followed by *F9 - Alarms*), I can only see the first nine numbers of the dial back phone number (followed by ...)

See above solution.

When calibration a logger, the read pressure does not change, despite applying different pressures to the input

A possible solution is that the transducer supplying you with the readings is not the transducer you are applying the input to, i.e. you are looking at the wrong channel pair of a multichannel logger. If the logger ID on the calibration window is followed by a dash and a number (i.e. AB4321 - 2) then the device is multichannel. The number after the dash represents the channel pair currently being calibrated, which can be changed by the *Page Up* and *Page Down* keys on the keyboard.

More information on calibrating multichannel loggers is given in the sections *Logger Calibration (F8 - Calibrate Logger)* and *Calibrating a multichannel logger*.

An alternative is that the pressure sensor is damaged.

Calibration of a pressure sensor seemed to make no difference, but other readings have now altered

It's possible that calibration has been carried out on the wrong pressure sensor of a multichannel logger. If the calibration window (option *F5 - Calibrate Logger* from the main menu) shows a dash followed by a number after the logger ID (e.g. AA1234 - 3. This is logger AA1234 channel pair 3) then the logger is a multichannel device. The channel pair to be calibrated is selected using the *Page Up* and *Page Down* keys on the keyboard.

More information on calibrating multichannel loggers is given in the sections *Logger Calibration (F8 - Calibrate Logger)* and *Calibrating a multichannel logger*.

The readings I get from a logger are wildly wrong.

There are a number of possibilities for incorrect readings, even with fully functional equipment.

For a flow pulse transducer (the input of a channel pair) check that the parameter setting on the logger setup screen has been correctly set up. (see *Chapter 5 - setting up a logger* for more information). Also check that the figures are not being converted into other units (l/s to l/h say) by a conversion factor entered into the software configuration page, and that any conversion factor is correct (*see Chapter 4 - Initial software Setup* for more information on setting up a flow rate conversion factor).

For an analogue pressure transducer (ADC), check that the transducer has been calibrated correctly (Has the transducer been changed without recalibration?).

For a 4-20mA transducer, check that the *parameters* for the transducer have been correctly set in the logger setup page (see *Chapter 5 - setting up a logger* for more information).

Finally, always check the transducer readings using a known calibrated source, do not assume that the input to the transducer is necessarily correct

When looking at the data viewer window, the data files seen are incorrect or no data files are seen (even though some have been created)

First check that you are looking at the correct data drive. The drive letter of the current data drive being viewed in shown in the title of the data viewer window (e.g. *Data Viewer (C:)* means that you are currently looking at the data files on drive C). If this is incorrect then the wrong drive may have been entered in the configuration screen (Option *F3 - Data Drive*, see *Chapter 4 - Initial Setup* for more information), or you may be looking at the alternate data drive (the drive entered under option *F4 - Floppy Disk* on the configuration screen).

If the data drive is correct then have you accidentally deleted data files using the *Remove* option of the data viewer (or deleted files from the data directory on disk)?

If you have copied some data files directly to the data directory without using the *Copy* function of the program then they will NOT appear in the list of the data viewer unless the file *LGCOMM.DAT* in the *LOGERMATE* directory has been updated with the new files.

When reading logger data, the message *Please Check PC & Logger Times* appears in a window (with some other information)

You have selected the option to check the difference between PC and logger times before download (selected from Option *F2 - Days To Read* on the configuration screen, see *Chapter 4 - Initial Software Setup* for more information), and the difference between the two times was found to be more than three minutes.

You must either change the internal logger time or PC's time to correct this difference, or select a different mode, before you can download the information from the logger.

Remember that Loggers always operate in GMT mode, so the software must be informed if the PC is to be set to BST (see *Chapter 4 - Initial Software Setup* for more information).

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Glossary

BST = British Standard Time
DG2 = Director General Report 2
GMT = Greenwich Mean Time
OP2 = User defined pressured limit
PRV = Pressure Reduction Valve
PRVC = Pressure Reduction Valve Controller (ControlMate)
PRVCE = Pressure Reduction Valve Controller - Economy
(Economy ControlMate)

APPENDIX
A

Utilisation of the ControlMate Extra Solenoid Valve

A special version of the ControlMate (models starting with CMV xx) incorporate an extra connector for interfacing to an additional solenoid valve, used for achieving the lowest pressure drop accross the PRV in extra high flow situations. This secondary solenoid is used for venting the top chamber of the PRV allowing :

1) The minimum pressure drop across the PRV. Normally this pressure drop is smaller than that attainable using the ControlMate to control the PRV, so the outlet pressure can more closely match the inlet pressure.

2) Preventing the normal ControlMate control pulses from having any effect on the PRV. This may be useful in certain situations, such as if the Pulse Unit were to fail or freezing of the transducer.

The secondary solenoid is controlled by the value of target pressure currently being used. If a Target pressure of greater than 195 metres requested, then the secondary solenoid will be energised (and thus total venting occurs). If a valid Target pressure less than 195 metres requested, then the secondary solenoid will be de-energised, stopping total venting and re-establishing normal control over outlet pressure.

Since the secondary solenoid is controlled by target pressure, total venting may be used in any of the control modes, though when entering a table for flow control of outlet pressure, the special code (pressure > 195m) for total venting should only be used for the highest flow value.