ControlMate
User's Guide

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INTRODUCTION

What is ControlMate?

ControlMate is an advanced, electronic, Pressure Reduction Valve (PRV) controller, combined with a standard Palmer Environmental' multi-channel data logger. It allows accurate control of the pressure output of a PRV according to a set of user defined rules.

The unit is powered by Lithium Batteries and has an expected life of over five years under normal operating conditions. When used with the telemetry option, it allows a user to setup the PRV, alter the outlet pressure in real-time, and download the logged data, without having to visit the unit in the field.

Methods of Control

ControlMate may be configured to automatically 'modulate' the outlet pressure of the PRV according to either the flow rate of a point near the valve, or the time of day. Entering a few values into a simple table (described later in this chapter) defines the control pattern for the valve.

ControlMate has a manual mode of operation that allows the user to set a single pressure, which the unit will treat as a fixed outlet pressure for the valve.

Data Logging Capabilities

All ControlMate units can (optionally) log data from up to two pressures and three flow channels. The logging function is performed at a user-selected interval (1,5,15,60 ***minutes) and the large capacity cyclic logging memory is capable of storing over*** 60,000 samples.

User Interface

ControlMate is easy to use and set up; the control and logging parameters can be defined in three different ways.

Every ControlMate may be configured 'in the field' by using the unit's Liquid Crystal Display, and the two built in key switches.

All the ControlMate units have an infrared communication facility, which allows rapid setup and data downloading, via an infrared probe connected to a PC. The PC needs to be equipped with ReaderMate 301 software.

Units that are fitted with the telemetry option can be setup and read by a modem communicating over standard PSTN telephone lines. As with the infrared communication, this is done with the ReaderMate 301 software running on a PC.

How It Works

The outlet pressure of the PRV is constantly monitored and compared with the required (or target) pressure If there is a difference of greater than one metre, the ControlMate will attempt to re-adjust the outlet pressure accordingly.

The outlet pressure is adjusted by pulsing miniature solenoid valves contained in the solenoid box. The solenoids allow small amounts of water to be transferred around the system, altering the pressure on the Actuator of the pilot valve and in turn control the pressure of the main PRV.

The user can select during setup whether a ControlMate is going to be operated by flow modulation, or time based control. The user then has to enter a table of values to describe the exact control pattern required.

Flow Modulation

When using the flow modulation method of control, the user enters a sequence of up to ten pairs of numbers. Every pair describing the desired (ideal) outlet pressure for a given flow. (i.e. a point on a flow/pressure profile of the unit).

The Control Mate interpolates data between these points to give a continuous control profile. ControlMate units operating with this method of control have outlet pressures profiles that slightly lag the flow profile.

Example

In the example below the user wishes to setup a flow modulation control pattern such that the outlet pressure reaches a minimum of 20 metres, at times of minimum demand, and is allowed to peak at 60 metres. The following table could be used to define the desired control pattern.

Flow ***(m^3/h)***	**Pressure (m)**
1.0	20.0
10.0	25.0
50.0	45.0
100.0	60.0

The table defines the desired control pattern with four pairs of values. However there are a few points to note about what the outlet pressure will be when the flow is outside of the defined flow range of to 100 m^3/h.

The final pair of values in any table indicates the pressure that will be used for all flows at or above the specified flow value. In the given example, this means that at 1 00.0m^3/h and above, the outlet pressure will always be 60m ± 1 m.

The lowest flow value in the table defines a fail-safe value. Below this flow rate, it is assumed that flow measurement has failed (metre or pulse unit failure). In this situation ControlMate tries to set the outlet pressure to the highest value in the table (in this case 60m)

Time Based Control

In the time-based method of control, the user may enter up to ten different points, which describe the desired outlet pressure for specific times of day. Once a specific target pressure from the table is selected, ControlMate will maintain the outlet at this pressure until it is time for a new target to be set.

British Summer Time Handling

The time-based mode of operation operates on local time. The user is given the option of entering a small table of dates indicating the days when switching to and from British Summer Time occurs.

Given a correct list of dates ControlMate will automatically cater for any changeovers, (always keeping track of local time). This means the control table does not require redefinition when a change between BST and GMT has occurred.

Example

Time	Pressure (m)
00:00	30.0
06:00	35.0
07:00	44.0
12:00	37.0
18:00	39.0
22:00	32.0

The table above specifies a six period time control pattern with pressures ranging between 30, late at night when demand is very low, and 44 metres, during the early morning peak of demand. At any time of day the target pressure will always be the pressure for the last time period reached. (e.g. at 10:00 the target will be 44 metres)

NOTE: The Controller cannot force a PRV to instantly reach a target pressure, a small period of time is required to reach any given target. If it is essential that a target is reached by a certain time of day, then the target should be set for five minutes before the necessary time to allow the outlet pressure to reach the target.

Manual Mode

ControlMate also provides a simple manual mode of operation; in this mode, the user sets a single target pressure for the outlet. This can be done by any of the communication methods mentioned earlier.

Unlike either the flow modulation or time based control methods, where pulses are sent to the solenoid box every 10 seconds, in manual mode the ControlMate sends pulses every second trying to reach the target faster.

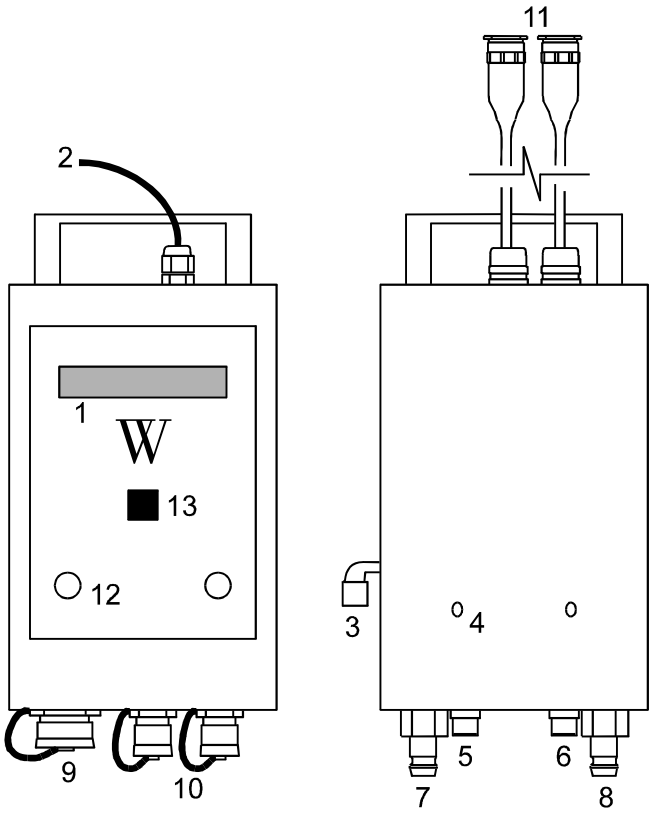
The self-learning nature of the system allows the steps in pressure to be between 0.1 – 0.5 m per adjustment.

>NOTE:

The main use of the manual mode is for commissioning the system, and verifying its operation.

If the adjustment in manual mode is too fast, then pressing and holding SELECT button will delay adjustments as long as SELECT is pressed.

System Components



LCD

Modem Connection

Vent Pipe

Activity LEDs.

In-let Pipe

Control Pipe

In-let Transducer

Out-let Transducer

Pulse Input (Flow Meter)

Connection to Solenoid Box

Connection to Control Unit

Menu Buttons

Infra-Red Probe Window

The Full Modulating ControlMate system consists of two main components (excluding the PRV, pilot valve and the Actuator). The two components are the Control Mate unit itself, and the solenoid box, which is used to alter the pressure of the pilot valve by adjusting it's set point via the Hydraulic Actuator.

ControlMate

The diagram shows in detail the features of the Full Modulating ControlMate unit configured as a flow modulating telemetry unit with 2 pressure and 1 Flow inputs.

The unit is fully sealed to 1P68 standards, the pressure connections are of quick-fit type, and can be to either 10, 16, 20 or 25 bar internal pressure transducers. The Flow and solenoid connectors are Military specification connectors.

The 2x16-character display and fully sealed buttons provide the user with a simple but effective way of configuring the unit in the field.

Solenoid Box

The solenoid box contains the solenoids and pipe work necessary for the system to work. It is connected to the main ControlMate unit by means of two electrical cables with 6 & 7 way military spec connectors. These cables are normally supplied as with 5m length, but may be longer if required.

INSTALLATION & COMMISSIONING

Palmer Environmental Limited strongly recommend that all Controllers must be used with our Hydraulic Actuator (HA) or an equivalent pilot interface device. In the case of the full modulating controllers, using a dual chamber pilot instead of a HA may lead to excessive battery use, and with some PRVs to unstable outlet pressure. Failure of electronics controllers with dual chamber pilots may even result in a complete closing of the main valve and cut-off of the supply to consumers.

Palmer are continuously developing and manufacturing new actuator types on request from customers. If a particular type of pilot is not covered by one of the existing actuators, please contact Palmer for the latest list of available "safe" pilot interface devices.

For information on using the Actuator, refer to the relevant section in this manual.

PALMER RESERVES THE RIGHT NOT TO HONOUR THE WARRANTY ON A FULL MODULATING CONTROLLER IF IT IS INSTALLED USING A DUAL CHAMBER PILOT.

INTRODUCTION

Historically, a basic requirement PRV control installations has been the addition of a “bias” chamber to the pilot of the valve under control. This in the past has not always been a straightforward operation for a number of reasons.

Some PRV manufacturers do not produce a “bias” chamber for their pilots. In these situations a number of our customers have changed the complete pilot on their valve to one from a different manufacturer. While this has lead to many operational systems, it is not ideal due to the extra cost and additional installation time, etc.

In certain circumstances Palmer customers have reported that the addition of a “bias” chamber to their pilot has lead to its instability of operation. This in some cases is due to the friction of the ‘O’ ring and stems in the bias chambers.

Palmer are also aware of “bias” chambers/pilot combinations which, due to the type of ‘O’ ring material in the bias chamber, do not operate well if the bias chamber is dry. Hence, if a controller is not fully commissioned at the same time as the pilot alteration, the valve would not operate well in a fixed outlet mode.

All the “bias” chambers, which Palmer are aware of, when added to a pressure-reducing pilot, operate in a hydraulic “subtraction” mode. The pilot spring sets the maximum out-let pressure, and an increase in the bias chamber pressure leads to a decrease in outlet pressure. In these installation, if care is not taken to limit the maximum pressure which may be applied to the bias chamber, then due to failures such as frozen transducers, leaks, or wrong commands from an operator, the main valve may be completely closed.

In order to improve on some of these potential problems, Palmer have developed a range of Hydraulic Actuators. Palmer Hydraulic Actuators have been in existence since October 1998. They have proved to be very easy to install and use as well as extremely reliable. The following models are available: WHA-3/8WHIT, WHA-M8, WHA-3/8UNF and WHA-5/8UNF.

CONTROLMATE SOFTWARE VERSIONS

The Hydraulic Actuator (HA) can be used as the interface between the pilot and both models of the ControlMate (2-point or Full Controllers) with the following versions of ControlMate software:

Full Controller Versions from V2.19

1st release 16 April 1998

2-Point Controller Versions from V1.13

1st release 15 March 1998

In the above versions of the software, the ControlMate User Interface through the switches and local display allows the installer to define the polarity of pressure pulse applied to the control chamber. On the display this would take the form:

Normal Pulse or Inverted Pulses

or

Actuator Mode or Non-Actuator Mode

appearing on the top line allowing the user to change (toggle) between the option.

It should be noted that apart from interfacing to a pilot, the Actuators may be used for modulation on some of the smaller direct acting pressure reducing valves.

CONTROLMATE USER INTERFACE

ControlMate is designed to offer the user maximum flexibility in setup and control. Two different strategies are available for setting up ControlMate units, firstly the user may use the ReaderMate 301 software, this can be done using either an infra-red probe, or telemetry communication with approved modems.

Secondly the user can use the built in Liquid Crystal Display and key switches, this provides a simple but effective way of setting up controllers in the field.

General Principles

The user interface is designed to be easy to use, It uses a few basic principles to ensure that data entry is as consistent as possible.

The NEXT key is used for progressing through the screens, confirming entries, changing fields, and advancing to the next digit. (i.e. It always advances to the 'next' stage)

The SELECT key is used for changing the current option, editing fields, and increasing the value of the current digit. (i.e. It always 'selects' a new option or value).

If no keys are pressed for a short while the display will turn itself off, this can happen during any screen, if data is being edited at the time the unit turns off, the old value is maintained and the partially edited value is discarded.

Option screens are used throughout, this allows the user to select various options and confirm data entries, in these screens the flashing value will be the option taken when NEXT is pressed.

Real-Time Display

Introduction Screen

Most of the operation of ControlMate (including commissioning) will only require use of the Real-time display. To bring the Real-time display up press the NEXT button. The introduction screen below will be displayed briefly before entering the real time display.

WECL

CONTROLMATE

Real-time Data

The real-time screen displays all the real time values being used by the system, current flow, inlet pressure, outlet pressure, target pressure, and time of day (time based control only).

The flow value is displayed on the top line of the display, in the currently selected units (either m^3/h or l/s).

012.57 LTR/S

65.4 m 32.1m

The top line will alternate between displaying the flow value and displaying the target pressure. The target pressure value is located in the top right corner of the display, preceded by, Auto P: for flow modulation mode, Manual P: for manual modes, and the time of day for the time based modes (shown below)

The bottom line of the display shows the inlet pressure in the left corner and the outlet pressure in the right corner.

10:45:30 42.0 m

65.4 m 41.5 m

Changing the units of flow

To change the flow units press the SELECT key while the flow rate value is being displayed on the screen. ControlMate will toggle the units between m^3/h and l/s updating the flow rate value automatically.

Zeroing the Pressure Values

The pressure values for the inlet and outlet, are based on atmospheric pressure, to set the zero point for both inlet and outlet pressure simultaneously, press and hold the SELECT button then press the NEXT button.

Zero ADC Input?

<Cancel> **<OK>**

ControlMate responds by asking the user to confirm whether the pressure zeroing operation is required. Press the SELECT button to choose whether or not to proceed with the zeroing operation. Press next to proceed.

<CHAN 1> **<CHAN 2>**

<CHAN 3> **<CHAN 4>**

Select the required channel for zeroing then NEXT button to confirm the choice.

Ensure the pressure input is disconnected before zeroing. Zeroing the pressure without disconnecting the pressure hose will result in the unit being unable to control the outlet correctly.

Turning ControlMate Off

To turn the unit off, press the NEXT button, and then select the <OFF> option when prompted. Alternatively the unit will turn itself off after approximately two minutes of inactivity.

Entering Setup Mode

To enter setup mode, press the NEXT button and then select the <SETUP>option when prompted.

Setup Mode

Entering the PIN

A pin number protects the setup mode of operation for ControlMate. The three-digit pin must be correctly entered before any of the setup functions may be used. When supplied, ControlMate should respond to a default pin of '000' for normal operational configuration (User PIN) and ‘100’ for additional installation parameters (Master PIN).

ControlMate will display the following screen when it requires entry of a pin number.

ENTER PIN CODE

PIN = 000

The digit underlined indicates the current digit that is being operated on. Press SELECT to add one to the value of this digit and NEXT to move to the next digit. Once the final digit is entered press NEXT to proceed. If the pin entered is incorrect the user is required to try again.

Summer Time Dates

If the Controller is being used in Time Modulation mode, then the '100' PIN gives access to a table of summer time start/end dates. Up to four pairs of dates may be entered into this table, thus allowing ControlMate to be left in the field for four years without a further visit.

BST ST1 16/03/00

GMT ST1 20/10/00

Zeroing the pressure without disconnecting the pressure hoses first will result in the unit being unable to control the outlet correctly.

When the date screen is displayed, pressing NEXT will proceed to the next pair of dates, pressing SELECT will allow editing of the displayed pair of dates.

If no dates are entered for any of the table entries, then the following screen will appear, again pressing SELECT will allow the date to be edited. Pressing NEXT will bring up the next screen. (Progress through the remaining screens by repeatedly pressing the NEXT key.)

BST ST3 ##/##/##

GMT ST3 ##/##/##

Entering The Time

The first screen displayed after entry of the user pin in the time based mode of control is a display of the current (local) time and date.

Pressing the NEXT key will proceed to the next screen, pressing

Time and Date

08:44 29/03/00

SELECT will allow editing of the time and date.

NOTE: The time must be entered as a GMT time. For example during BST instead of entering the local time of 11:37 the user would enter 10:37.

GMT TIME & DATE

08:44 29/03/00

After entering the time and date, and confirming the entry, ControlMate checks the values entered, and proceeds to the next screen if they are valid.

Battery Usage Indication

The following screen is displayed after correct entry of a PIN number (and time and date). It indicates the current usage of the batteries, shown as an approximated percentage along with a bar graph style display of the estimated remaining life.

BATTERY : 95%

Pressing the NEXT key will advance the display to the next data entry screen.

NOTE: The battery usage values shown are only approximations, since exact battery capacity is impossible to estimate.

Altering the mode of Operation

The mode of operation used by ControlMate is displayed after the battery usage value screen, to skip to the next screen (entry of a target for manual mode, or flow rate entry for other modes) press the NEXT button.

Current Setting:

Manual

To alter the mode of operation press the SELECT button, this changes the mode indicated on the bottom line.

Once the desired mode has been selected, press NEXT. If the mode has been changed, then an option screen is displayed and the user asked to confirm or cancel the change.

NOTE:

Changing between Auto Flow and Auto Time will reset the control pattern to a default state (a table with two values both at 40m outlet).

Entering a Manual Target

If the mode is set to manual, then the user is given the option of changing the manual target pressure. The current target setting is first displayed on the screen, (as below) to continue to the next screen press the NEXT button. To change the target value, press the SELECT key.

Manual Pressure

Setting: 32.0 m

Once SELECT is pressed, the cursor will flash under the first digit of the target value; to alter the value of the digit press SELECT1 to advance to the next digit press NEXT. When the desired value has been entered the user is given the option to confirm or cancel the entry. Any value, in 0.5m increments, between 0.Om and 1 99.5m may be entered.

Canceling the entry will display the old target value again, allowing the user to either enter a new value or skip to the next screen. Confirming the entry will turn the display off, and begin pulsing the solenoids.

Changing Pulse Input Rate

The pulse input rate used for flow modulation is displayed on the screen after the mode has been selected. The pulse rate displayed is that used for logging of flow on channel pair 1, and calculations involved in flow modulation.

Pulse Input 1

10.000 ltr/pls

ControlMate requires that a value between 9999.99 and 0.01 litres per pulse is entered.

If the value displayed is correct pressing the NEXT button will advance to the next screen. Pressing SELECT will allow the value displayed to be changed in the usual way using the NEXT and SELECT keys. Once the value has been entered the user is given a chance to confirm or cancel the changes made.

Confirming the changes will advance to the next screen, whilst canceling the changes will allow re-entry of a pulse rate.

Changing the User or Master PIN

The User and Master PIN numbers that give access to the setup functions are user definable. If the Master PIN is in use you have access to editing both PINs through the following screens.

Master PIN: 100

User PIN: 000

Select PIN

<Master> <User>

To keep the PIN numbers press NEXT. After selecting the PIN for editing the following screen is given.

Pin No. Change?

PIN = 000

Once the SELECT key has been pressed the user is presented with screens which allow entry and confirmation of a new PIN number.

Enter New PIN

PIN = 000

Verify New PIN

PIN = 000

The user should type the desired pin in both screens. Once the pin has been entered correctly at both screens, it will be activated. Make sure you do not forget the PIN number, as it is needed to perform any setup functions on-site.

Control Table Editing

After the basic setup has been dealt with, the user can edit/view the control table or turn the display off.

Continue?

<OFF> **<Values>**

Selecting the off option will turn the display off. Selecting the 'Values' option will enter the table edit mode.

Viewing Values

If the 'Values' option is selected then the user is presented with a screen showing the first pair of points in the table. The screen should look something like the two below (depending on the control method being used).

F(01): 10.0 m^3/h

P(01): 40.0 m

T(01): 02:30

P(01): 25.0 m

Pressing the NEXT key advances to the next pair of values in the table, (the number in brackets indicates the index for the pair of values). Pressing SELECT gives the following options screen.

<Edit> **<Insert>**

<Delete> **<End>**

After changes to the table, it is reorder by the modulating value and the user restarts at the first values in the table.

Editing Values

The edit option gives a screen very similar to that used for viewing data, (except for the addition of leading zeros and a cursor). The user is then expected to enter or change the displayed pair of values.

F(03): 00<u>3</u>4.0 m^3/h

P(03): 023.0 m

T(02): 08:<u>4</u>0

P(02): 42.0 m

When editing values, data is entered in the usual way, with the SELECT key changing the digit, and the NEXT key advancing to the next digit or field. However when entering a time value the hours value changes as if it was a single digit (range 0 to 23), and the minute value does likewise (with range 0 to 55, in 5 minute increments).

Once the desired value has been entered the user is asked to confirm or cancel the change. If confirm is chosen, the new value is validated to ensure it is in ascending order, before it is updated into the modified table.

Inserting Values

The user can insert a new value in the table with this option. A screen is presented allowing the user to edit a new value. The operation is as in the editing screens above.

Deleting Values

If delete is selected then the pair of values displayed previously will be deleted.

Adding a New value

Once all the currently defined values for the table have been viewed, the user is given an option to turn off the display or add a new value. If the Add New Values option is chosen, then a screen for editing a value is brought up (see Inserting Values).

ACTUATOR INSTALLATION

One major advantage of using the Palmer Hydraulic Actuator (HA) is the ability of the installer to mechanically limit both the Minimum and the Maximum setting of the pilot.

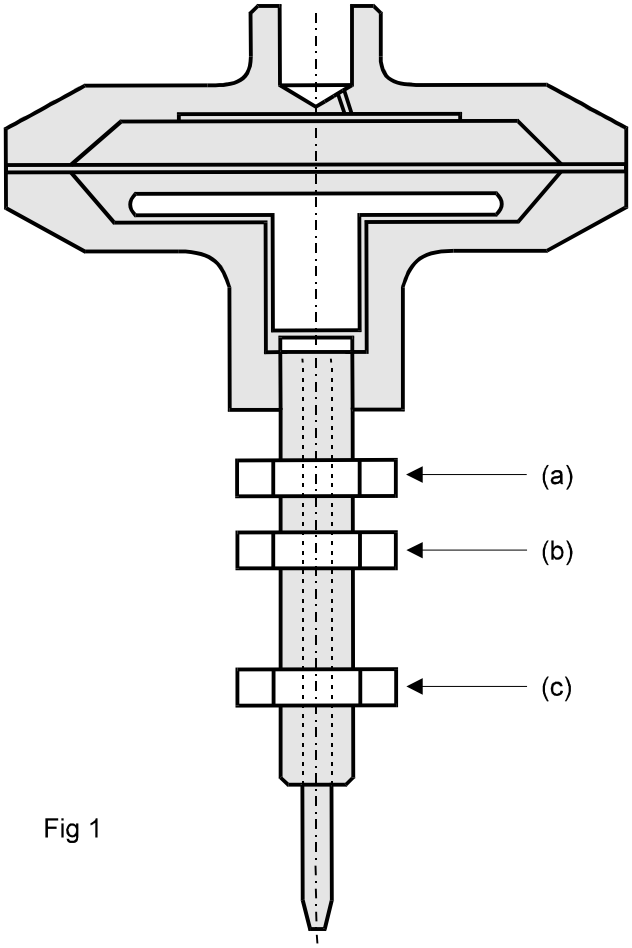


Fig 1

The actuator with model No. WHA-3/8WHIT is only suitable for installation on pilots with a 3/8WHIT screw thread on their adjusting screw. This is one of the more common screw threads amongst the PRV suppliers in the UK. Palmer would consider adapting the hydraulic actuator to other thread types on user requests.

Ensure that the main valve, out-let pressure, etc. are in the required state (i.e. valve's top chamber is locked).

Completely remove the adjusting screw from the pilot (this must be a 3/8WHIT thread).

On the HA (Fig 1), holding the retainer (b) of the main screw, bring both lock nuts (a) and (c) to the centre (as close to (b) as possible).

Holding (b) with a spanner, turn the main actuator body clockwise until tight.

Insert the actuator screw (and its adjusting pin) in place of the pilots adjusting screw, and turn the actuator body clockwise for the adjusting pin to exert pressure on the pilot spring.

Put the valve back into operation, further clock-wise turns of the actuator body would increases the PRV out-let pressure. The maximum required out-let pressure can now be set. Using lock nut (c), the main actuator screw should be locked tight at the maximum required setting.

Note that if its required to reduce the maximum setting (i.e. the main screw of the actuator being turned anti-clock wise), care must be taken not to unscrew the opposite end of the screw out of the actuator body (i.e. use the retainer (b) and an spanner, rather than turning the actuator body anti-clockwise at this stage).

Having locked the main actuator screw for the maximum setting, hold (b) with a spanner to stop the main screw turning and turn the actuator body slowly anti-clockwise. This will reduce the PRV out-let pressure. When the absolute minimum required pressure is reached, then the actuator body should be locked firmly using (a).

ACTUATOR CONNECTIONS

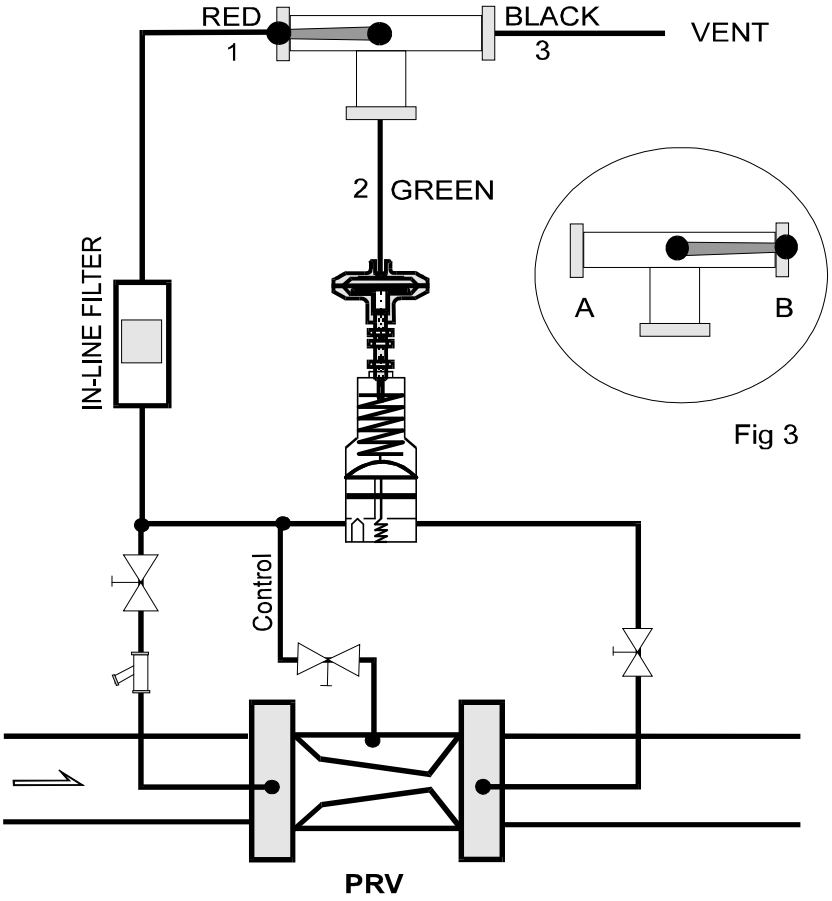


Fig 2

Fig 3

Palmer ship the Hydraulic actuator together with a 3 way ball valve. We recommend that this valve should be included in the installation of the actuator. Immediately following the mechanical installation the ball valve should be used as in Fig. 2. In this arrangement, the two positions of the valve would correspond to fully pressurised or fully vented actuator states. We recommend that the 3-way valve should initially be operated a number of times to exercise the new actuator. The minimum and maximum outlet pressure setting should be monitored. These pressures should be reasonably repeatable (within +/- 2 m). If the pressures need further mechanical adjustment, then the installer should refer to section 3.0.

The installer should be aware that with:

the actuator fully pressurised (3-way valve in position A), the absolute maximum setting can be reduced by loosening the lock nut (c) and turning (b) anti-clockwise (i.e. unscrewing the main screw of the actuator further out of the pilot)

the actuator fully vented (3-way valve in position B in fig 3), the absolute minimum setting can be reduced by loosening lock nut (a), holding (b) and turning the actuator body anti-clockwise (i.e. unscrewing the main actuator screw further out of the actuator body).

Note:

The maximum pressure applied to the actuator and the in-let port of the ControlMate should not be above 10 Bar. If the in-let pressure to the PRV is higher than this, then both the actuator and the ControlMate input port may be operated from the PRV out-let. This 10 Bar limitation does not necessarily apply to the transducer ports of the ControlMate, which depending on user requirements might be 10, 16, 20, 25, ...Bar specification.

Having adjusted and locked the absolute minimum and maximum setting of the out-let pressure. Palmer recommends that the 3-way ball valve should stay in the ControlMate installation as a manual Control Over-ride. When the controller is commissioned, the 3-way valve should be left in its “B” position, however, a user can then over-ride the ControlMate by turning the valve to its “A” position, forcing the out-let to be at its highest setting.

For both the 2-point and full ControlMates, the control port of the controller (green) should be connected to port 3 (black) of the 3-way ball valve. The installer should ensure that through the controller software (display and switches), the “Actuator” pulse option is selected, and with the ball valve in position “B”, the controller can be commissioned.

When using a 2-point ControlMate with the Hydraulic Actuator, for versions prior to 1998 the installer should ensure that the small regulator valve is turned fully clockwise (disabled).

CONTROL RANGE

In the case of the 2-point Controllers, the minimum and maximum set pressure as locked on the actuator/pilot combination correspond to the low and high pressures as controlled by the ControlMate.

In the case of the full controllers, due to the pressure drops across the solenoids, filters, etc. and in order to reduce power consumptions (extend battery life), it should not be expected that the controller fully vents the actuator to reach the lowest possible out-let pressure. In these cases we recommend that the absolute lowest out-let pressure locked on the actuator/pilot combination may be adjusted to around 3 metres below the lowest pressure that the controller is expected to reach during its normal control cycles.

Note:

Any height difference between the In-let port of the actuator and the vent port of the controller may allow a water column to apply a small pressure to the actuator.

IMPORTANT

After the installation of a new pilot, or the addition of a hydraulic actuator to an existing pilot.

1. Ensure there are no leaks on the new installation.

2. Ensure full operation and stability of the PRV, preferably checked over a long period of time, before connecting the control pipe to the hydraulic actuator and attempting control.

CONTROLLER INSTALLATION

General notes

For obtaining information regarding the Data Logging Capabilities, User Interface, various modes of Operation, and General methods of entering data, using the display and two buttons on the 2-point ControlMate etc. the user should refer to the rest of the ‘User Interface” section of this manual.

The 2-point and Full ControlMate are identical in respect of their logging capabilities, and are very similar in many other respects. In these notes, only the aspects of the installation and the configuration that are different to those of the standard ControlMate, are explained.

ALL CONTROLMATES ARE SHIPPED WITH ‘000' AND ‘100’ AS THE PIN REQUIRED FOR ACCESS TO THE SETUP MODE.

Introduction

2-point and Full ControlMates are Pressure Reducing Valve (PRV) Controllers combined with a standard Palmer Environmental’ three channel (2 pressures & 1 flow) data logger. They allow 2 point or full control of the output of a PRV according to the flow or time settings defined by the user.

Methods of Control

ControlMates can be configured to adjust the output of a PRV between various pressures at user defined time intervals or in response to a user defined flow through the PRV.

The adjustment of the pressure at the outlet of the PRV is achieved by either adding to (for higher pressure), or subtracting from (for lower pressures), the volume of water in the Actuator and hence the set point of the pilot.

Pressure Measurement

The two quick fit pressure transducer ports on the ControlMate are used for logging and feedback of the achieved downstream pressure. However, the usual procedure is to connect the inlet and the outlet of the PRV to these ports. During the installation and setup, connect the PRV outlet using a blue pipe and quick fit coupling to the to the channel 1 pressure transducer on the right hand side. This allows displaying of the outlet pressure of the PRV which eliminates the need for pressure gauges, and simplifies the installation procedure significantly. Also connect the PRV inlet using a red pipe and quick fit coupling to the channel 2 pressure transducer on the left hand side.

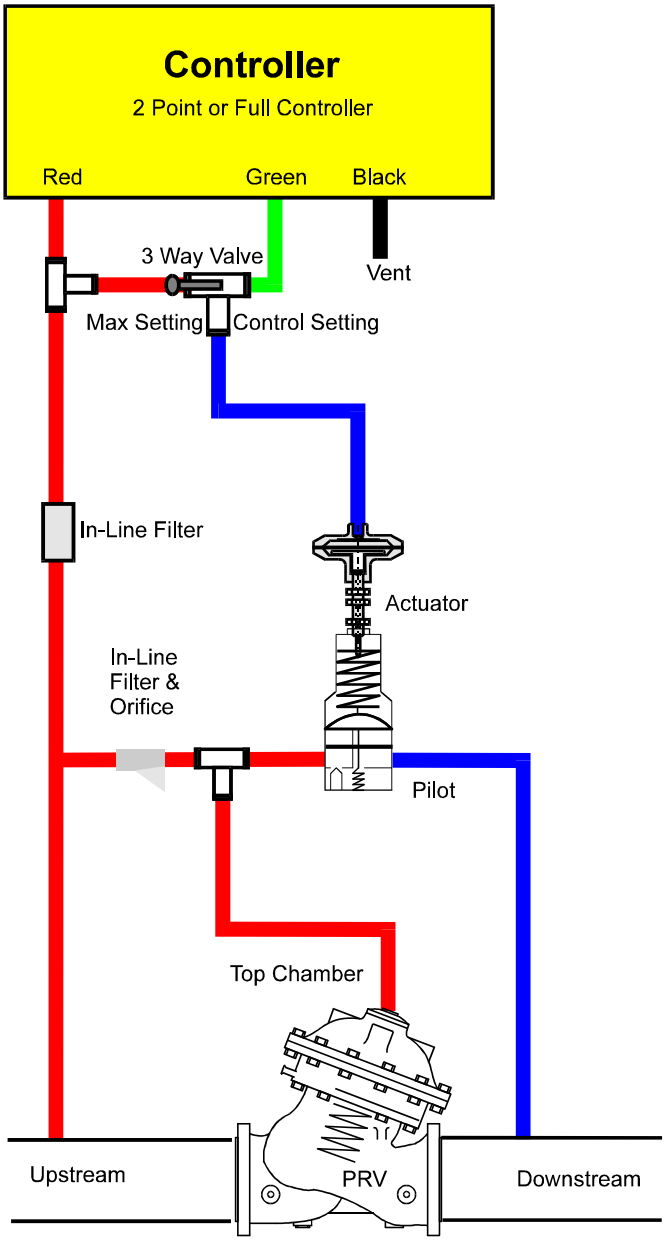
Flow Measurement

The ten way military specification connector at the bottom of the 2-point controller is for it's flow input channel. The flow input to the unit is the same as Palmer Environmental' data loggers (i.e. pulse inputs in the range 0 to 66Hz), and is compatible with suitably wired MeterMate, PU10, PU100, HRP, and other types of volt-free pulse output devices.

The Flow input to the ControlMate MUST be connected if you intend to use the ControlMate in 'Auto Flow' mode (i.e. switching the pressure depending on the flow through the PRV). In this situation follow your supplier's instructions for installing their pulse unit and ensure that the litres per pulse factor of the ControlMate is set correctly for your type of pulse unit.

NOTE: The connector type, or the input frequency may be different to the above standard if you have specified special requirements with your order.

Installation Diagram



Connecting the ControlMate to the PRV.

You should have completed the Actuator Connections described in a previous section.

1. Using a red pipe connect the PRV inlet to the push fit red port situated on the left side of the Controller.

2. Using a green pipe connect the black port of the 3-way valve to the green port of the ControlMate. This port is just to the right of the port above.

3. Connect a length of blue pipe to the black vent port on the right side of the ControlMate. During adjustment of the outlet pressure, a small amount of water may be vented from this port.

Commissioning the 2-point ControlMate

1. Set the ControlMate to 'Manual' mode with a high-pressure target.

Note: The controller does automatically turn itself off after about 40 seconds of operation if none of the switches are pressed. Pressing SELECT toggles the units for flow rate display (litre/seconds or cubic metres/hour), and keeps the ControlMate 'on' for a further 40 seconds. If ControlMate turns the display off when you need the display, press NEXT.

2. Ensure that the PRV is fully operational (i.e. all valves in line with the pilot, and the PRV top cover is in the correct position), and that on the ControlMate display, the expected values for the inlet and particularly the outlet pressures are shown.
Hint: The pressure measurement on the ControlMate is in general much more accurate than measurement with pressure gauges. You may see variations in pressure displayed. With a reasonably well-adjusted PRV, these variations should not be more than +/- 2 metres. While adjusting the pressure, give the PRV reasonable time to react to any adjustment before continuing with the operation.

3. Using the display and switches, change the ControlMate manual target between high and low'setting a number of times, checking the PRV out-let pressure.

Setting Up Table Values

Flow Control

Use the display and switches to change the ControlMate mode of operation to 'Auto Flow'.

Use the 'next' switch to display various settings of the ControlMate.

When the display gives options of '<OFF> <Values>?', select values to display table settings for flow control.

ControlMates allow up to 10 points in their control table. in the case of the 2-point ControlMate in 'Auto Flow' mode, only two of these points (first two) are required. Each row of the table defines a required pressure at the defined flow rate. With 2-point ControlMate the required pressure can only be selected as one of either high or low settings. Therefore, the table is simplified to the following format:

Flow1	Pressure (Hi / Low / Vent)
Flow2	Pressure (Hi / Low / Vent)

Flow1 and Flow2 in the above format are flow rates (in cubic metres/ hour in the range 0 to 9999.9) at which the outlet pressure settings will change to the selected setting. In theory, a simple two-point pressure controller in auto flow mode only requires one flow input to switch from low to high setting and visa versa. In 2-point ControlMate, two table entries are required, the first being used as a safety point against the failure of the flow measuring device (i.e. metre jam or pulse unit failure). If the measured flow drops below the first flow setting, then it is assumed that the flow channel is measuring incorrectly. Therefore, this first flow setting should be well below the minimum expected night flow for the installation. In situations when the minimum flow rate can drop to zero, this flow1 of the table can be set to zero, however, in this case the ControlMate can not distinguish this from failure of the pulse unit.

The following is an example of a valid entry for auto flow mode of operation:

F(01) = 05 m3/h	P(01) = Low
F(02) = 25 m3/h	P(02) = High

The above table would select the low setting of pressure for flow rates between 5 and 25 m3/h, and switch to the high setting for other flow rates.

When a table entry is displayed, the user is allowed to edit, or delete the entry (refer to section 3-7). If an attempt is made to reduce the number of points in the table below 2 (by deleting), the ControlMate refuses the request.

Note: The flow rate in the ControlMate is calculated by accumulating the number of pulses received from the Pulse Unit over a set period of time (referred to as 'Flow Averaging Period', and then calculating the flow rate according to 'Flow Pulse Factor' (litres per pulse). As a default the flow averaging period is set at 15 minutes, this however can be changed by using the display or switches (giving ControlMate Pin no. 100), and or

through infra-red or modem interfaces of the ControlMate. It should be noted that a very low flow averaging period reduces the accuracy of the flow measurement, potentially increases the switching between pressure settings (pressure fluctuations), and increases the battery use in the ControlMate.

Time Based Control

Use the display and switches to select 'Auto Time' mode of operation on the ControlMate.

Use the 'next' switch to display various settings of the ControlMate.

When the display gives options of '<OFF> <Values>?', select values to display the table for time based control.

Up to 10 times can be set to a resolution of 5 minutes, and a required pressure setting (High or Low) chosen for each time.

Note: There must be at least two points defined in the table.

Note: If the mode of the ControlMate is changed from 'Auto Flow' to 'Auto Time', then the entries in the table are automatically changed to valid times. The user should check and ensure that the entries are valid for their requirements.

GMT, British Summer Time Start and End

ControlMate allows pre-programming of start and end of the british summer time when in 'Auto Time' mode. Refer to page 4-3 of the manual.

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 across 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.

Using milliAmp Input with Palmer's PRV Controllers.

Some models of both full modulating and 2-point controllers may have an extra Analogue channel dedicated to measurement of 0-20mA or 4-20mA signals. There are different methods for using this extra input, which is assigned to the analogue input of channel-pair three on the hardware.

1. Using the input for logging purpose only.

The analogue input of channel pair 3 is calibrated for mA measurement. Using the set-up part of ReaderMate 301 (PC software package), the user can select 0-20mA or 4-20mA and may assign the variable type (flow, pressure, temperature, ..etc.) , and the measurement range to this input. The user can also include the channel for logging purposes.

2. Using the input as flow parameter in the PRV control function.

In this mode the mA input of channel pair 3 of the controller can be assigned to represent the flow parameter of a flow modulating PRV control function. This flow measurement is usually assigned to the digital (pulse) input of the channel pair 1 on a PRV controller.

The change of input type for flow measurement of a PRV from the default digital input 1 to the alternative analogue input 3, is considered a significant installation only change which can only be carried out by using the display and switches of the controller itself.

Intentionally, the designers do not allow this switching of the input type to be carried-out through the Infra-red and/or remote telemetry (modem) link of the controller.

Through the switches and display of the controller itself, and even then only after using the higher level 3-digit pin, the installer can select the flow modulating signal to be either through digital or the mA input. If mA is selected, then the installer has options of 0-20mA or 4-20mA and is also asked to assign the flow equivalent to the 20mA input scale.

If the selection of flow input channel of a PRV controller is changed at any time from digital to analogue (mA) or vice versa, the controller automatically switches off data logging on previous flow input, and starts logging on the new selection. In order to log on both digital and analogue inputs, the "off" input should be turned "on" as detailed in section 1 above.