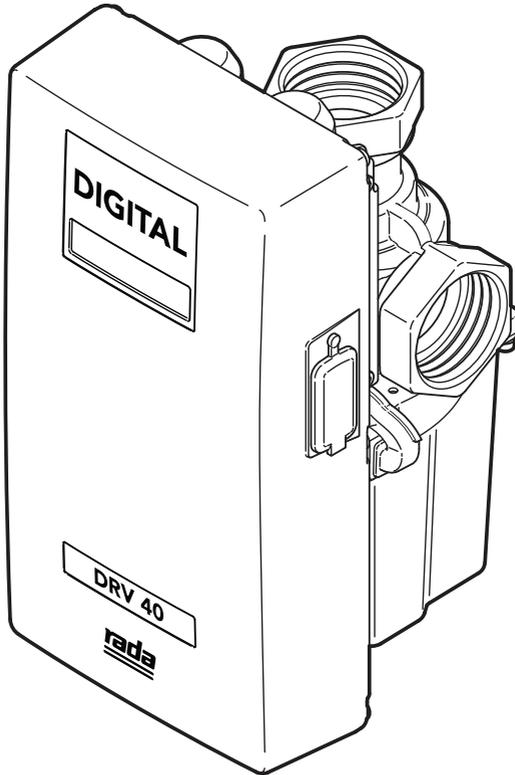


DRV40 Digital Recirculation Valve



Important! This Manual is the property of the customer and must be retained with the product for maintenance and operational purposes.

Product Manual

rada
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If you experience any difficulty with the installation of your new mixing valve, then please refer to the **Fault Diagnosis** section, before contacting Kohler Mira Limited. Our telephone and fax numbers can be found on the back cover of this guide.

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Patent
UK - 2 421 297 2 437 891
USA - 7669776 8043556
PCT - PCT/GB2006/000159
European - 06702758.1
India - 1231/MUMNP/2007
Australia 2006 207 367
Canada 2 595064
China ZL 2006 8000 5853.8
Japan 4933451

SAFETY: WARNINGS

The function of this DRV (Digital Recirculation Valve) is to deliver water consistently at a safe temperature. This requires that:

1. It is installed, commissioned, operated and maintained in accordance with the recommendations given in this Manual.
2. Periodic attention is given, as necessary, to maintain the product in good functional order. Recommended guidelines are given in the '**Maintenance and Spare Parts**' section.
3. If this equipment is used in a manner not specified by Kohler Mira Ltd, the protection provided by the equipment may become impaired.
4. The electrical installation **must** comply with BS 7671 (commonly referred to as the IEE Wiring Regulations) and all relevant building regulations, or any particular regulation or practice specified by the local electricity supply company. **This appliance is to be permanently connected to the fixed electrical wiring and must be earthed.**

ADVICE

The use of the word 'failsafe' to describe the function of any hot and cold water mixing valve is both incorrect and misleading. This DRV (*Digital Recirculation Valve*) incorporates additional shut-off devices to improve the level of safety however, in keeping with every other mechanism it cannot be considered as being functionally infallible.

Provided that the valve is installed, commissioned, operated within the specification limits and maintained according to this Manual, the risk of malfunction, if not limited, is considerably reduced.

Malfunction of valves is almost always progressive in nature and will be detected by the use of proper temperature checking and maintenance routines. Certain types of system can result in excessive 'dead-legs' of pipework. Others allow an auxiliary cold water supply to be added to the mixed water from the mixing valve. Such systems can disguise the onset of thermostatic mixing valve malfunction.

Ultimately, the user or attendant **must** exercise due diligence to ensure that the delivery of warm water is at a stable, safe temperature. This is particularly important in such healthcare procedures as supervised bathing of patients unable to respond immediately to unsafe temperatures.

Where chloramine/chlorine disinfection is practiced, **DO NOT** exceed a chlorine

concentration of **50** mg/l (ppm) in water, per one hour dwell time. Such procedures **must** be conducted strictly in accordance with the information supplied with the disinfectant and with all relevant Guidelines/Approved Codes of Practice.

INTRODUCTION

The Rada DRV40 Digital Recirculation Valve is specified to meet the highest standards of safety, comfort and economy as demanded by todays users. The Rada DRV40 is designed, manufactured and supported in accordance with accredited BS EN ISO 9001:1994 Quality Systems.

Data Storage

Kohler Mira Limited shall not accept liability in contract, tort (including negligence or otherwise) for any loss of profits, business or anticipated savings, or loss or corruption of data, or any indirect or consequential loss arising out of the customer's use of DRV40. The customer shall be solely responsible for the independent backup of all data/information stored on DRV40. Notwithstanding the foregoing, none of the exclusions and limitations stated above are intended to limit any rights the customer may have under local law or other statutory rights which may not be excluded.

Guarantee

We guarantee this product against any defect in materials or workmanship for a period of one year from the date of purchase. For terms and conditions refer to the back cover.

DESCRIPTION

Product Range

A 1 1/2 BSP inlet / outlet thermostatic mixing valve employing digital temperature sensors to provide water at safe, accurate temperature for ablutionary or process requirements. Includes an Electronics Module with LCD display and an interface connection for PC/Laptop device. The '**DRV Programming Software**' is available to monitor and alter the valve's operation (Microsoft Windows based).

Rada DRV40

Pipe mounted Digital Recirculation Valve requiring a permanent electrical power connection.

PACK CONTENTS

Tick the appropriate boxes to familiarize yourself with the part names and to confirm that the parts are included.

Rada DRV40

1 x Electronics Module*

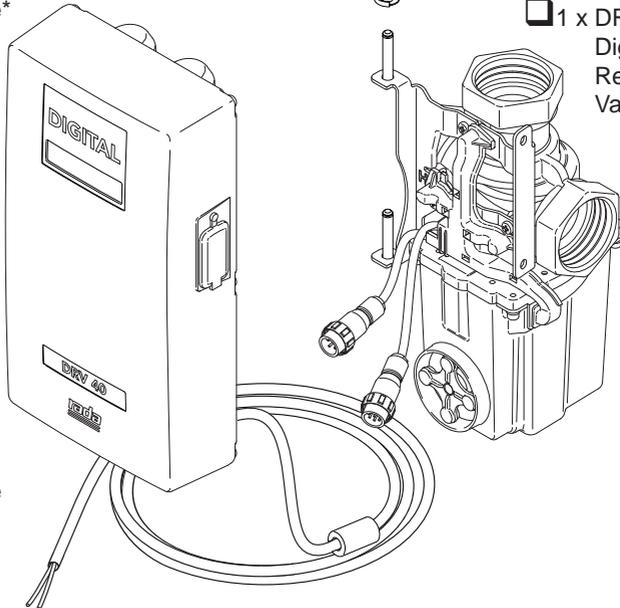
1 x Circlip

1 x DRV
Digital
Recirculation
Valve

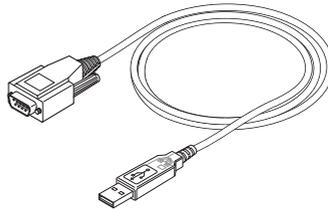
3 x Hexagonal Keys
(1 x 2.5mm)
(1 x 3mm)
(1 x 4mm)



2 x Electronics Module
Screws



1 x PC USB Cable (for connecting
Laptop/PC to Electronics Module)



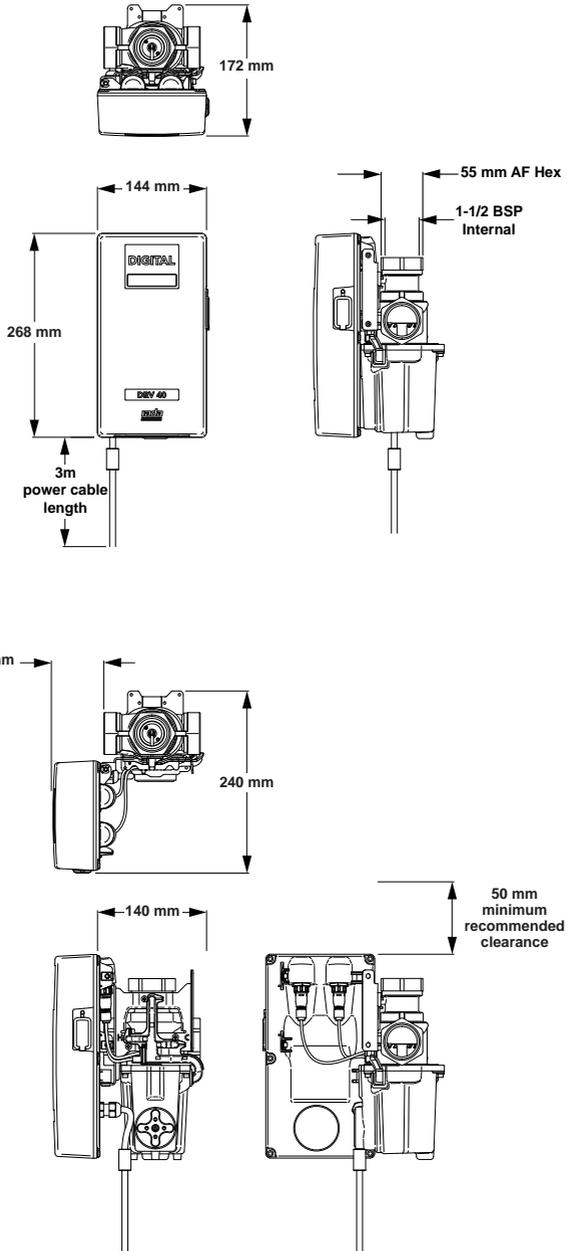
1 x USB stick (contains USB cable driver
software, DRV Programming Software
and DRV40 product guides)



*2 x CR - P2 6V Batteries **not** supplied.

DIMENSIONS

All dimensions are nominal.



SPECIFICATION

General	
Protection	IP20
Connections	1 1/2 BSP Internal (female)
Installation Environment	Suitable for indoor use only
Pressures	
Maximum Static Pressure	1000 kPa (10 bar)
Maximum Operating Pressure Drop across DRV	140 kPa (1.4 bar)
Supply Pressure Differential	Equal pressure recommended - Inlet pressures must be stable for optimum performance.
Temperatures	
Cold Water Range	2 - 25°C
Hot Water Range	2°C above setpoint - 80°C
Optimum Setpoint Range	27 - 70°C
Ambient Temperature	Greater than 2°C, max. 50°C
Maximum Relative Humidity	95% non-condensing
Recirculation Circuit	
Minimum distance to First Outlet	7.6 m
Flow Rates	
Minimum Flow Rate Per Outlet	6 l/min (<500kPa maintained pressure) 8 l/min (>500kPa maintained pressure)
Maximum recommended Flow Rate	155 l/min at 2.3 m/s
Minimum recirculation Flow Rate	19 l/min
Minimum system Draw-off	0 l/min during recirculation 2 l/min from 1 outlet
Electrical	
Power Supply	230V ~ 50Hz 15W
Supply Fuse	Switched type 3 Amp
Internal Fuse (Electronics Module)	T2AH 250V
Battery	2 x CR - P2 6V
Duty cycle	Continuously rated
Auxiliary Relay (see Alerts - Activate Relay on Alert)	
Relay Type	Single pole changeover relay contacts
Power Supply	230V AC / 24V DC
Supply Fuse	2 Amp

The Rada DRV40 conforms to the CE marking requirements.



DEFAULT SETTINGS

The following table shows the factory default settings of the Rada DRV40. These values can be altered using the '**DRV Programming Software**' available to install from the USB stick supplied.

Temperatures	
Adjusted Setpoint	49 °C
Setpoints	
Max	68 °C
Default	49 °C
Min	38 °C
Alerts & Valve Units	
Valve Units	°C
Above Setpoint	2 °C
Below Setpoint	2 °C
Error Temp	60 °C
Activate Relay on Alert	On
Disinfection	
Enable Disinfection	Off
Disinfection Timeout	1 minute
Options	
Valve Address	null
Network	Modbus Inactive
Modbus Address (when ' Active ')	3

INSTALLATION

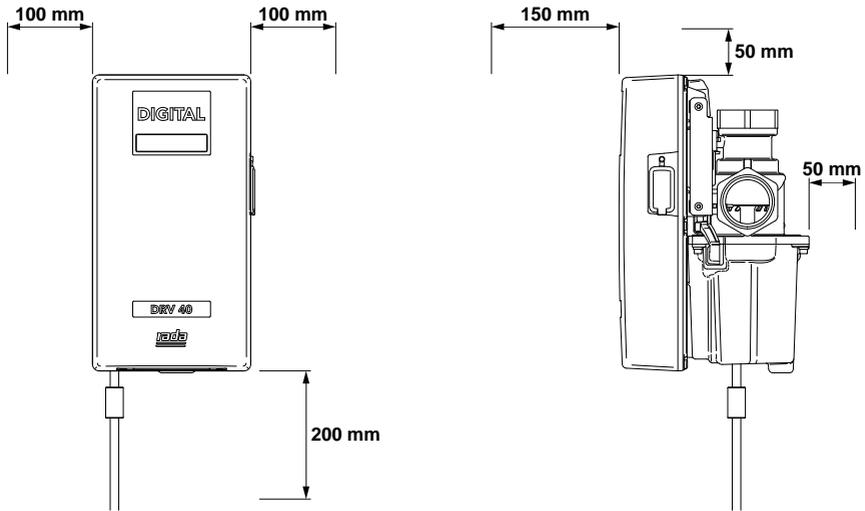
General

Installation **must** be carried out in accordance with these instructions, and **must** be conducted by designated, qualified and competent personnel.

The installation **must** comply with any particular regulations and practices, specified by the local water supply regulations.

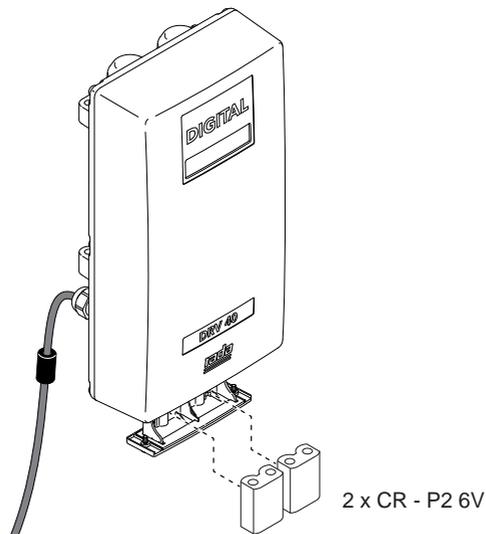
The installation **must** follow the '**Recirculation Circuit - Plumbing Schematic**' in this manual. All plumbing components are to be supplied by the installer. Failure to include these components will compromise the DRV40 and system performance.

1. Before commencing, ensure that the installation conditions comply with the information shown in '**Specification**'.
2. Care **must** be taken during installation to prevent any risk of injury or damage.
3. The DRV40 **must** be installed in a dry area where it will not be able to freeze (minimum ambient temperature of 2°C
4. Inlet isolating valves (full flow type) **must** be installed close to the DRV40 for ease of maintenance. It is recommended that outlet isolating valves (full flow type) are also installed.
5. The DRV40 **must** be positioned for easy access during use and maintenance (this includes connecting to a PC/Laptop). All routine maintenance procedures can be conducted with the valve body in place.
6. The use of supply-line or zone strainers will reduce the need to remove debris at each mixing valve point. The recommended maximum mesh aperture dimension for such strainers is 0.5mm.
7. Inlet pressure tapings which allow measurement of the inlet pressures to the DRV40 under operating conditions are particularly recommended for in-service testing.
8. Pipework **must** be rigidly supported.
9. Supply pipework layout should be arranged to minimise the effect of other outlet usage upon the dynamic pressures at the DRV40 inlets.
10. Inlet and outlet threaded joint connections should be made with PTFE tape or liquid sealant. Do not use oil-based, non-setting jointing compounds.
11. **To eliminate pipe debris it is essential that supply pipes are thoroughly flushed through before connection to the DRV40.**



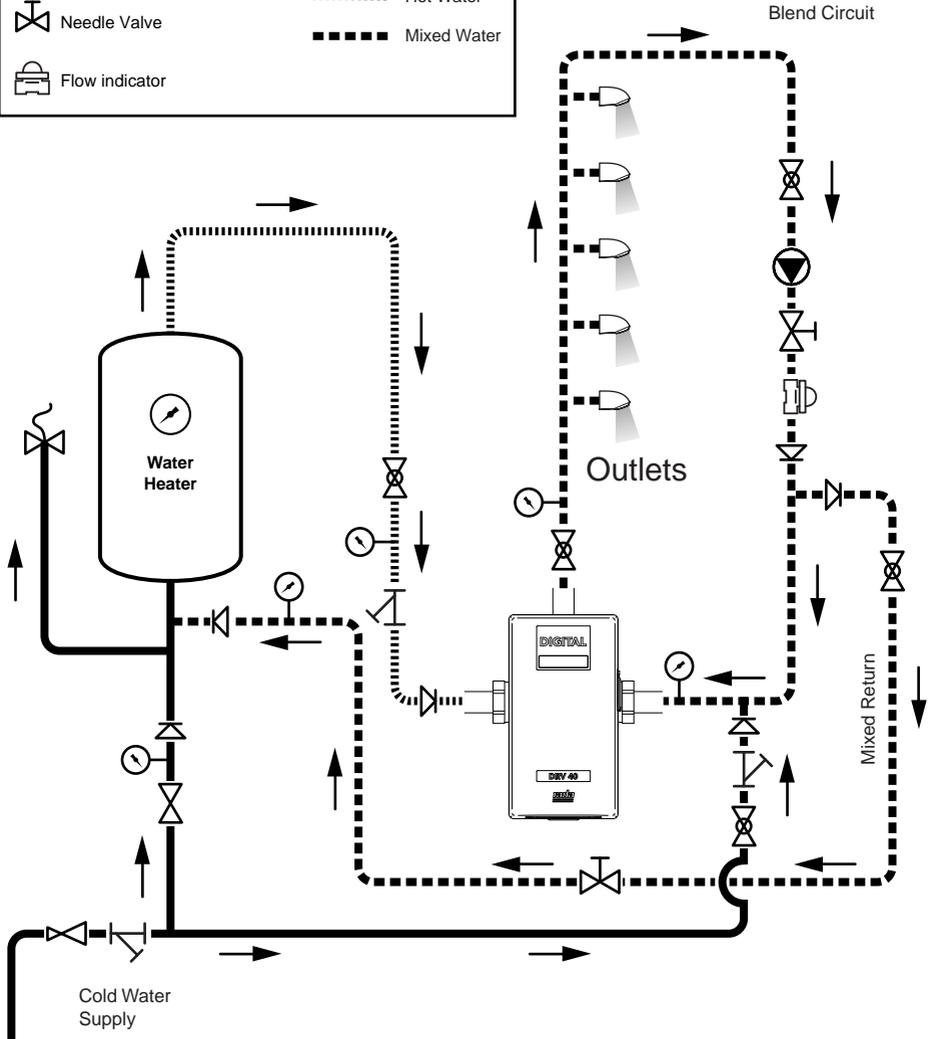
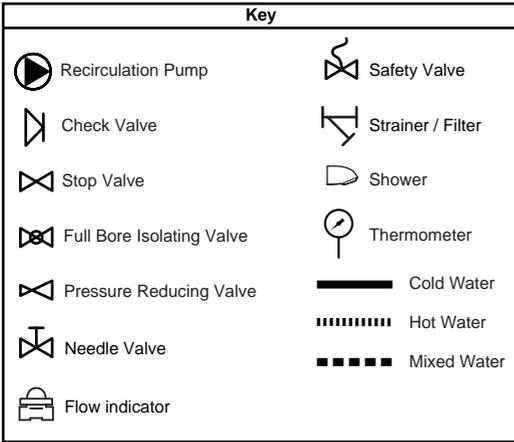
The DRV40 **must** be installed in this orientation only.

These clearance dimensions are recommended for maintenance purposes.



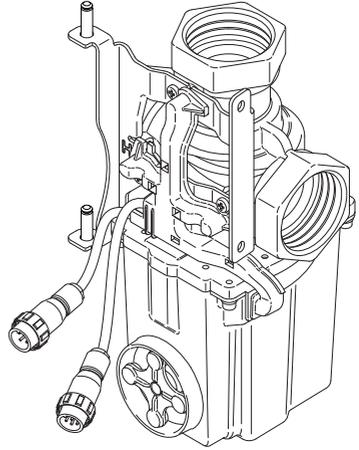
Batteries are **not** supplied with the DRV40, but **must** be fitted prior to installation.
Do not fit rechargeable batteries. (Also see '**Maintenance and Spare Parts**'.)

CAUTION! RISK OF FIRE OR PRODUCT DAMAGE IF INCORRECT TYPE OF BATTERY IS FITTED.
 DISPOSE OF USED BATTERIES ACCORDING TO THE BATTERY MANUFACTURER'S INSTRUCTIONS.



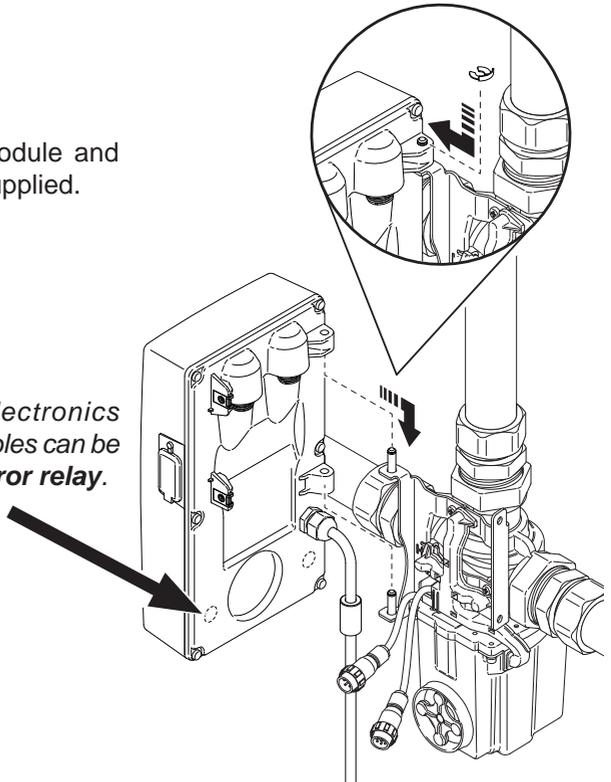
Recirculation Circuit - Plumbing Schematic

1. Before fitting to the pipework, it is recommended that suitable unions are fitted to the inlets and outlet. This will enable the DRV to be easily removed, if required.
2. Flush pipework thoroughly (minimum of 5 minutes).
3. Fit the DRV to the pipework.

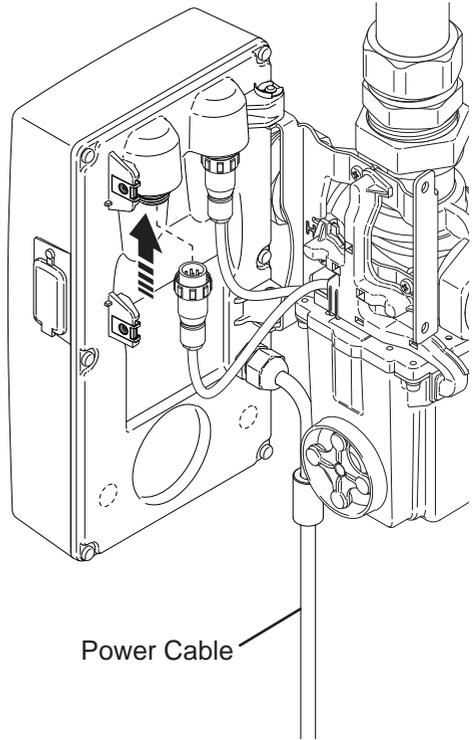


4. Attach the Electronics Module and secure using the circlip supplied.

*Hole markers inside the Electronics Module case indicate where cables can be fitted for options such as an **error relay**.*



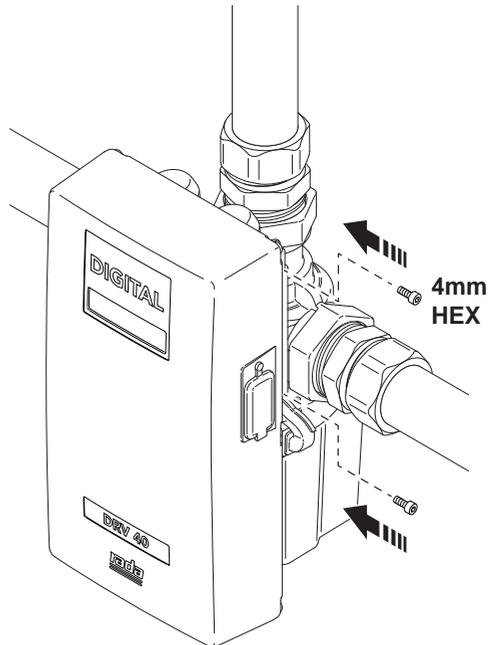
5. Connect and secure the 4 and 8 pin plugs to the back of the Electronics Module.
6. Connect the Power Cable to the mains electricity.
A separate, permanently connected supply **must** be taken from the ring main to the appliance through a 3 Amp double pole switched fuse spur providing a minimum 3mm contact separation gap in each pole. The fuse spur must be suitably located, easily reached and identified as to its purpose.



7. Close and secure the Electronics Module with the 2 x 4mm hexagon socket screws provided.

Note! The Electronics Module must be closed for the DRV40 to function.

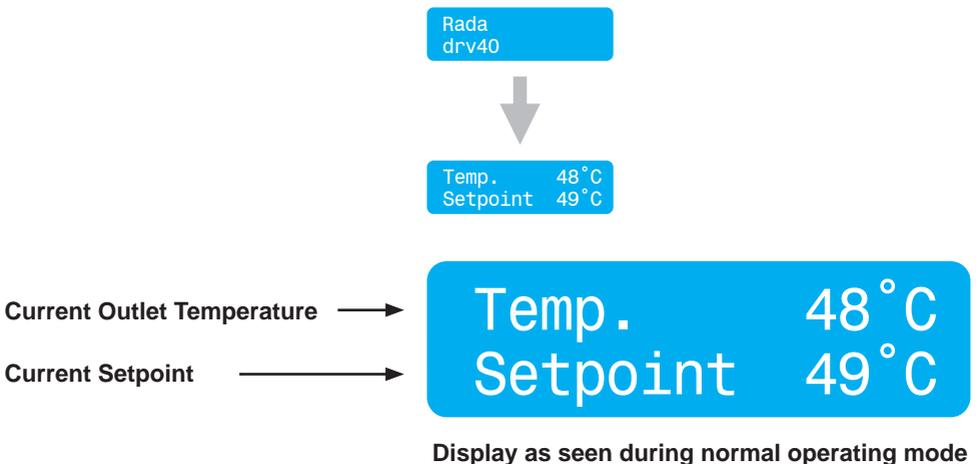
8. Commission the DRV40 and recirculation system using the '**Commissioning**' instructions contained in this manual.



COMMISSIONING

Commissioning **must** be carried out in accordance with these instructions, and **must** be conducted by designated, qualified and competent personnel.

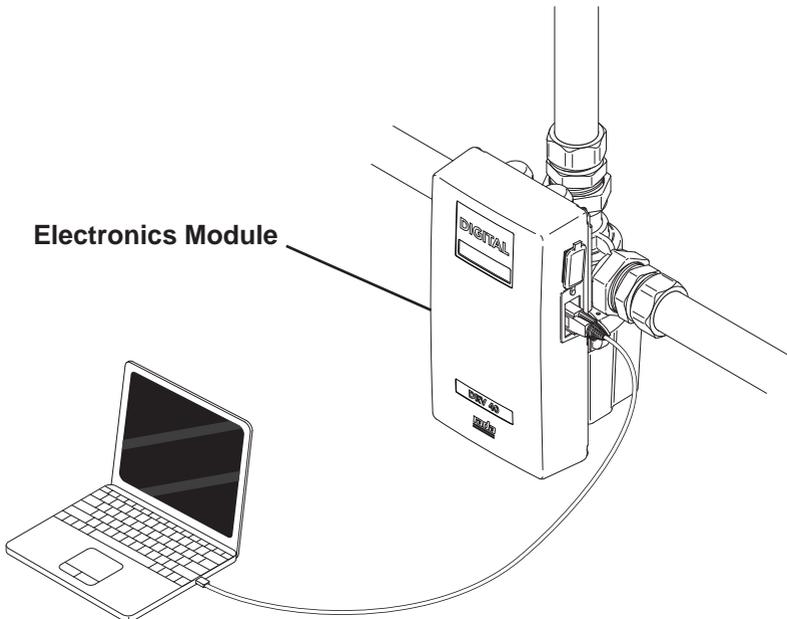
1. Make sure that the system is powered and the display on the Electronics Module is illuminated.
2. Flood the system in the following sequence:
 - Open the cold water supply isolation valve(s).
 - Open the outlet flow isolation valve(s).
 - Open the hot water supply isolation valve(s).
3. Make sure the hot and cold inlet supplies are at their designated pressures and temperatures.
4. Close all the mixed water outlets and turn on the circulating pump.
5. The LCD display will indicate the outlet water temperature and the outlet water temperature setpoint. The setpoint is preprogrammed to 49°C. This can be altered using the '**DRV Programming Software**' on the USB stick supplied.



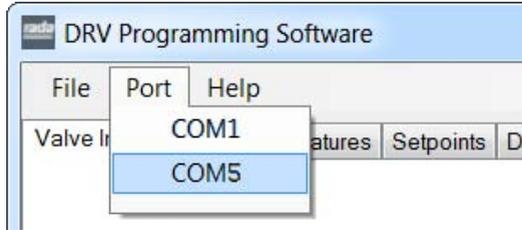
OPERATION

Temperature Adjust Using Laptop or PC

1. Operating System: Microsoft Windows XP, Vista or Windows 7.
Minimum Screen Resolution: 1024 x 768 (Recommended 1280 x 1024 or higher.)
2. Install the **USB Driver** and '**DRV Programming Software**' from USB stick supplied.
3. Connect the Laptop/PC to the Electronics Module with the PC USB Cable supplied. Connect the cable to any USB port on the laptop/PC and the serial port on the Electronics Module of the DRV40.
4.  Run the '**DRV Programming Software**' by double clicking the icon on the desktop or search for and run the file '**Titan Terminal CSharp.exe**'.

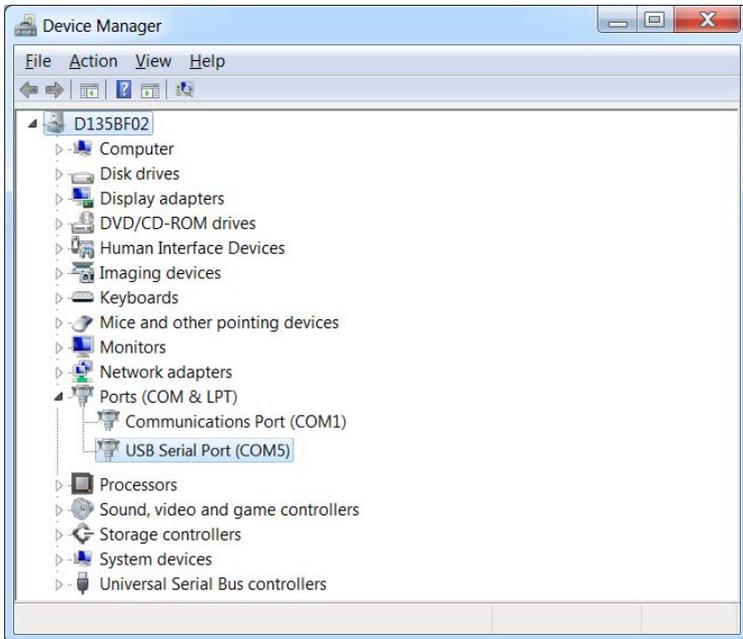


COM Port

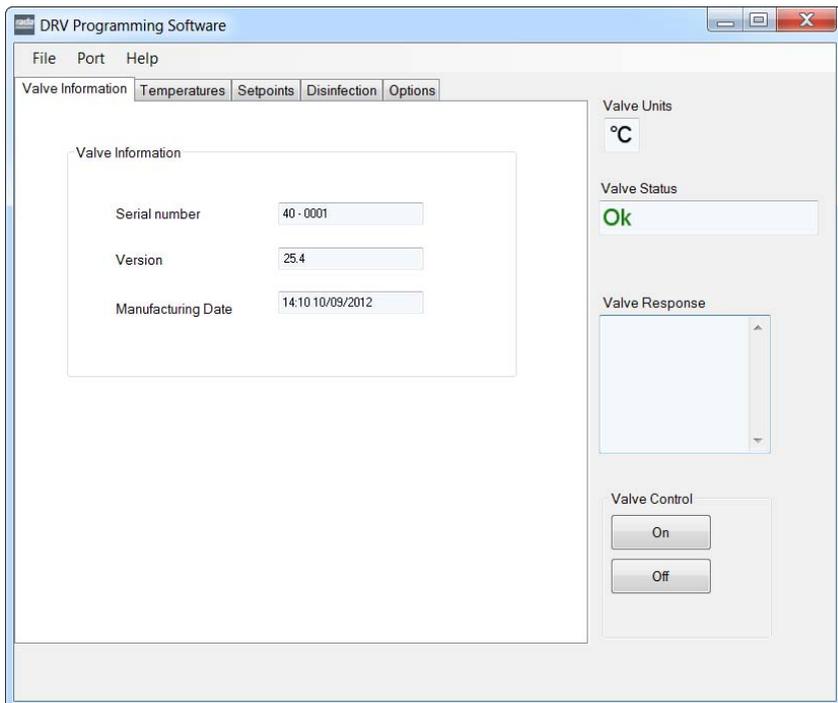


Locate the DRV40 by selecting the correct **COM Port**. The COM Port can be confirmed using the **Device Manager** utility within the Windows OS.

Note! Make sure the USB Driver has been installed.



Example of Windows XP Device Manager



The DRV40 is now connected to the PC/Laptop device and will receive data automatically.

The control screens can be selected individually by clicking on each of the tabs.

The general status of the DRV40 is displayed on the right of the screen.

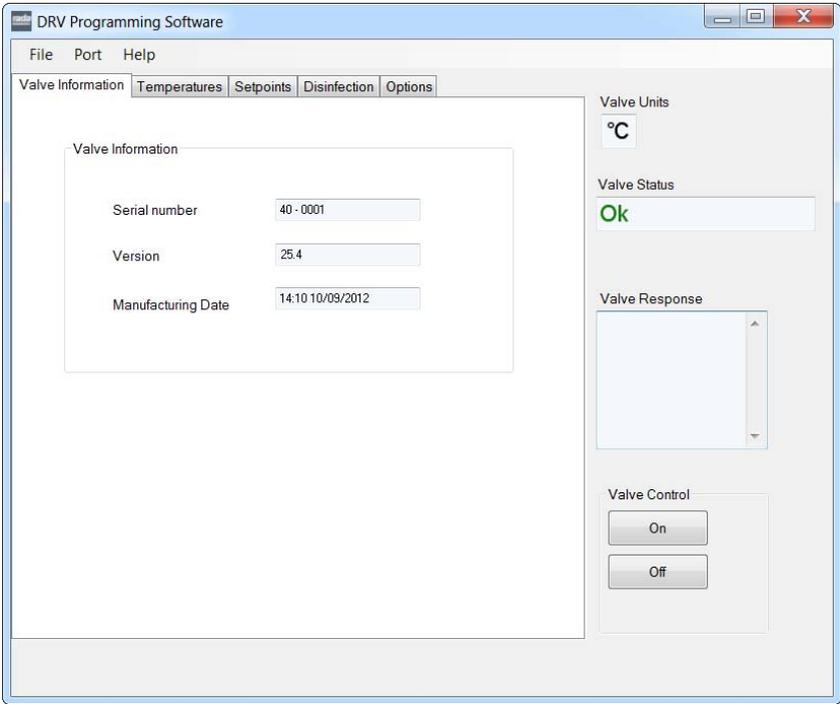
Valve Units - displays the temperature units.

Valve Status - displays the DRV40's current operating status.

Valve Response - displays any confirmation of commands received or any error messages.

Valve Control - Alters the DRV40' state **ON/OFF**. This is required when making specific adjustments to the DRV40's settings (*detailed further in these instructions*).

DRV Information



Once the DRV40 is connected, the DRV information screen is updated.

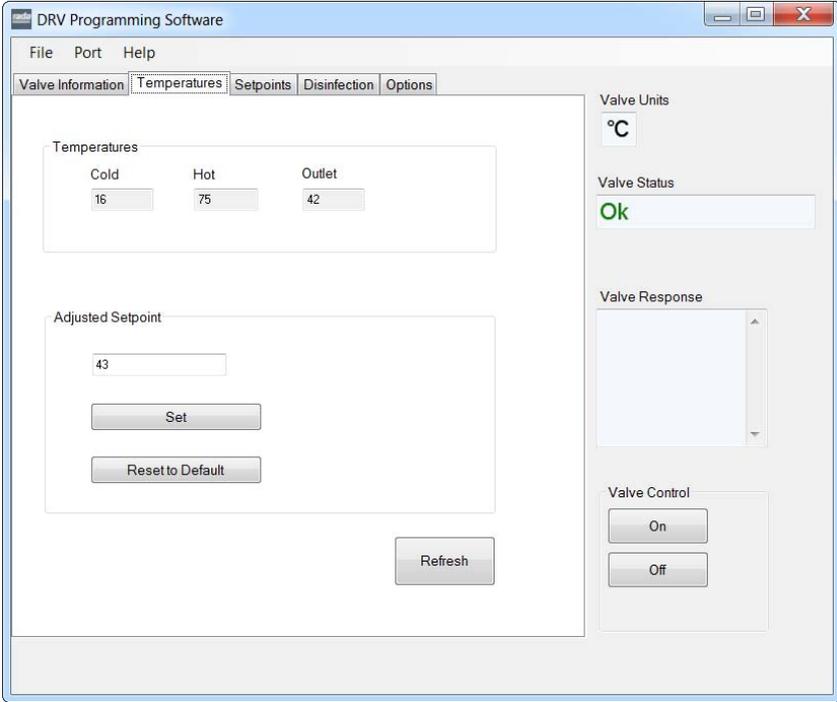
Serial Number - The serial number of the DRV40 assigned at manufacture.

Version - The version of Rada DRV40 control software.

Manufacturing Date - The date the DRV40 was built.

These data fields are read only and can only be changed by updating the DRV40 internal software (*only to be performed by a qualified service engineer*).

Temperatures



Temperatures

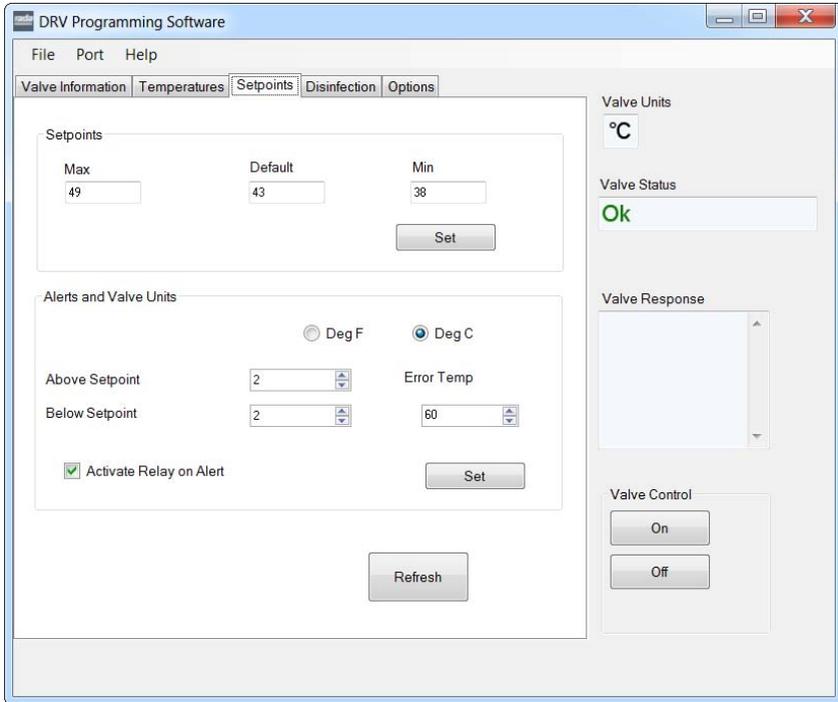
The '**Cold**', '**Hot**' and '**Outlet**' are read only values and can be used to monitor the current settings. They are continuously updated every **2 seconds**.

Adjusted Setpoint

1. Input '**Adjusted Setpoint**' value
2. Click '**Set**' to transfer the value to the DRV40
3. The '**Adjusted Setpoint**' value is displayed on the DRV40 as '**Setpoint**'.
4. To change the '**Adjusted Setpoint**' back to the default value, click '**Reset to Default**'.

Temp 42°C
Setpoint 43°C

Setpoints (Also see 'Setpoints - Explained')



Setpoints

(Also see 'Setpoints - Explained')

Alter the '**Max**', '**Min**' and '**Default**' values as required for the application.

1. Switch '**Valve Control**' to '**OFF**'.
2. Click '**Set**' to transfer the values to the DRV40.
3. Switch '**Valve Control**' back '**ON**'.
4. The '**Setpoint Default**' value is displayed on the DRV40.

Units

1. Click the preferred '**Valve Units**' (°F or °C).

2. Switch the **'Valve Control'** to **'OFF'**.
3. Click **'Set'** to transfer the value to the DRV40.
4. Switch **'Valve Control'** back **'ON'**.

Alerts - optional

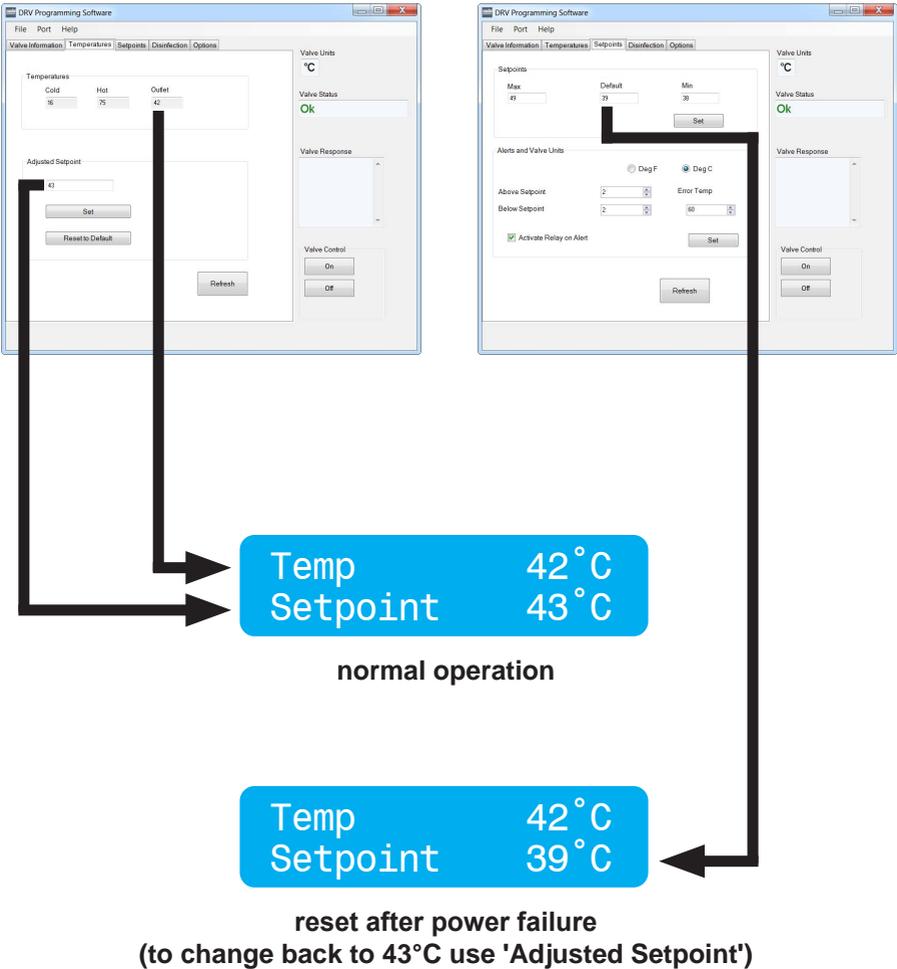
(Also see **'Alerts - Explained'** and **'Preset Display Alerts'**)

1. Input the **'Above Setpoint'** and **'Below Setpoint'** values.
2. Input the **'Error Temp'** value.
3. Click **'Activate Relay on Alerts'** if required.
4. Switch **'Valve Control'** to **'OFF'**.
5. Click **'Set'** to transfer the values to the DRV40.
6. Click **'Refresh'** and confirm the updated values.
7. Switch **'Valve Control'** back **'ON'**.

Setpoints - Explained

The setpoint is the required outlet water temperature. The values in the **'Setpoints'** tab control the range in which the setpoint can be adjusted to, but not the setpoint itself. The **'Default'** value is the temperature the DRV will return to should the power be lost and the DRV40 is reset. The **'Default'** is adjustable, but cannot be more than the **'Max.'** (maximum) value or less than the **'Min.'** (minimum) value.

Example 1



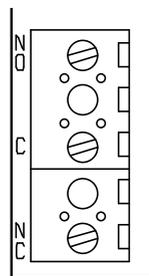
Alerts - Explained

DRV40 will issue an alert which is activated upon a breach of pre-established '**Above Setpoint**' and '**Below Setpoint**' values (factory default +5 °C, -5 °C) located under the '**Setpoints**' tab. Upon activation, the display on the DRV40 will read '**Temp High**' or '**Temp Low**'.

Important! This advisory feature cannot be disabled.

If the '**Activate Relay on Alert**' box is checked, this will enable a feature which can be used to activate an auxiliary alarm or solenoid valve. A connection is made to a set of single pole changeover relay contacts fused at 2 Amps (see '**Specification**'). When the DRV40 is operating normally, '**C**' terminal and '**NO**' terminal of the relay have continuity. Under the following circumstances, the '**C**' terminal and '**NC**' terminal have continuity:

1. Power failure.
2. Start up sequence.
3. Outlet temperature causing an alert signal
(can be disabled via the '**Setpoints**' tab of the '**DRV Programming Software**')
4. Outlet temperature causing an error signal.
5. Internal fault on PCB.
6. Battery failure.
7. Thermistor failure.



Relay

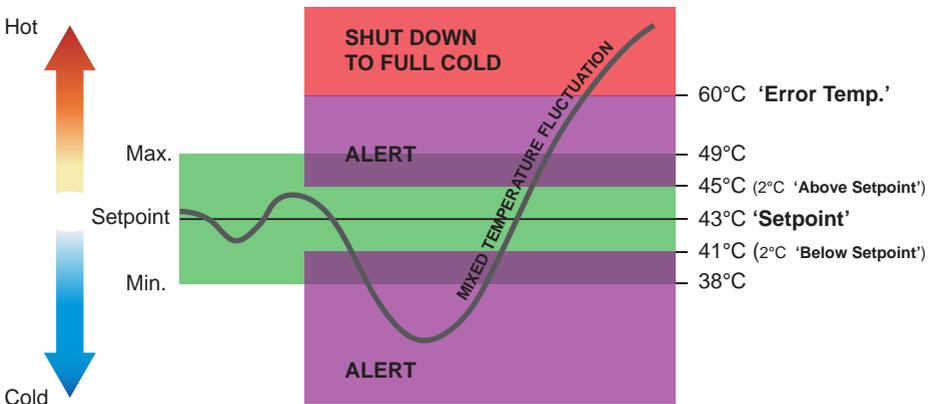
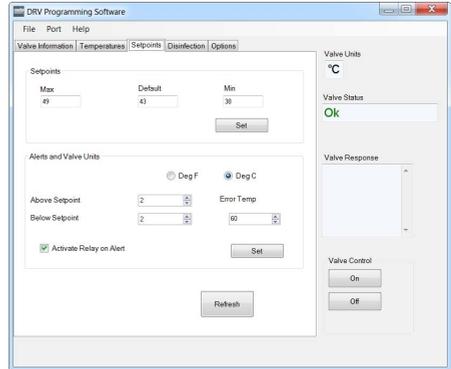
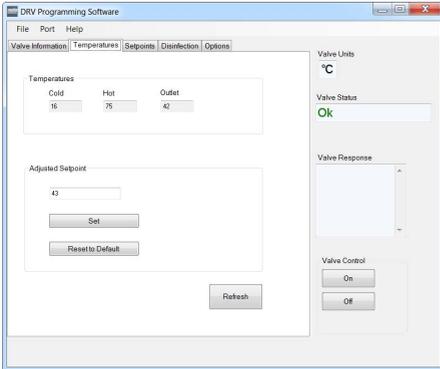
(also see '**PCB Connections**')

DRV40 will also issue an alert if the preset '**Error Temp**' value located under the '**Setpoints**' tab is exceeded (the default is 65 °C). If the '**Error Temp**' is reached, the display on the DRV40 will read '**Error Temp**', the aforementioned relay will be activated and the DRV40 will assume a position where no hot water can enter the blend circuit.

Important! This safety feature cannot be disabled.

The '**Alert**' and the '**Error Temp**' activation can be relayed to a Building Management System (BMS), a Local Area Network (LAN) or can be accessed online via the integrated **Modbus** connection port if connected and programmed accordingly.

Example 2



Important! The 'Error Temp' value cannot be set lower than the sum of the 'Max.' + 'Above Setpoint' values.

Note! The 'Adjusted Setpoint' value does not need to be the same as the 'Default' value. Both 'Adjusted Setpoint' and 'Default' can be set within the 'Max.' and 'Min.' range only.

Preset Display Alerts

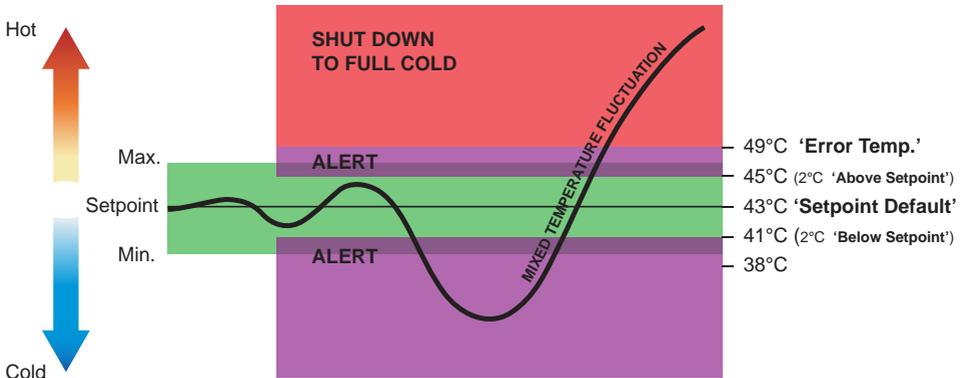
The DRV40 is supplied with two **Preset Display Alert** levels:

Level 1 - Alert preset: 2°C '**Above Setpoint**' DRV40 will display '**Temp High**'
 preset: 2°C '**Below Setpoint**' DRV40 will display '**Temp Low**'

Level 2 - Error preset: 6°C above default setpoint DRV40 will display '**Error Temp**' and switch to full cold

Example 3

If the '**Adjusted Setpoint**' is set to 43°C, the alerts would operate in the following way...



Temp High 49°C
Error Temp

Temp High 45°C
Setpoint 49°C

Temp Low 41°C
Setpoint 49°C

Important!

'Error Temp' can also indicate the need for maintenance.
(See 'DRV40 Display Errors' for further details.)

Thermal Disinfection

IMPORTANT! PLEASE READ CAREFULLY

The thermal disinfection mode of the DRV40 is **not** an automated process. It is manually activated by the supervisor to increase the temperature of the blend circuit to equal the temperature of the hot supply. The circuit pipework and outlets can be thermally disinfected regularly as part of good bacterial infection control.

**DO NOT USE THE THERMAL DISINFECTION FEATURE
IF THE HOT WATER SUPPLY CAN EXCEED 80°C!**

Warning! Thermal disinfection is a potentially hazardous process to raise the water temperature to a level that will scald or even kill. It is therefore the responsibility of the person supervising the process to make sure it is carried out correctly and safely.

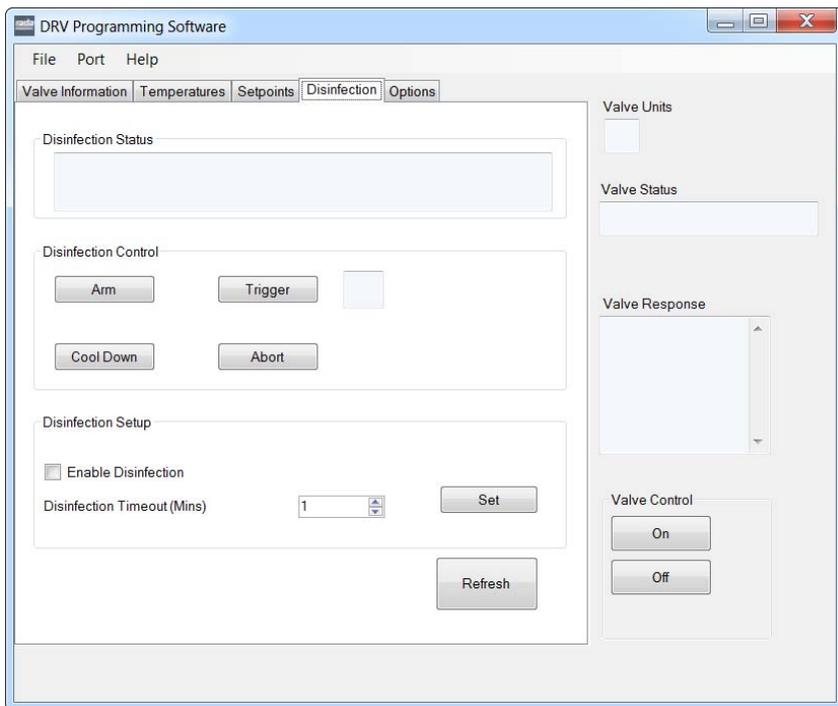
**ALL DRV40 DISPLAY ALERTS AND ERRORS
ARE DISABLED DURING THE PROCESS!**

It is the responsibility of the supervisor to make sure that:

1. An appropriate Risk Assessment is carried out in accordance with the local or national regulations.
2. The water temperature is raised to and held at the required level at all parts of the circuit for the required duration as stated in the Risk Assessment.
3. All outlets are flushed for the correct amount of time if required by the Risk Assessment.
4. Appropriate measures are taken to make sure that none of the outlets are used while the water is at an unsafe temperature.
5. Once thermal disinfection is complete, the supervisor should return the DRV40 to its normal operating mode using the '**Cool Down**' button within the '**Disinfection**' screen. This will switch the DRV40 to its full cold position and allow the blend circuit to be reduced gradually to a safe temperature level*. Make sure the blend circuit temperature returns to normal operation within the '**Disinfection Timeout**' period (see '**Disinfection Cycle**').
6. The Disinfection cycle is monitored constantly and the supervisor is able to stop the cycle using the '**Abort**' button in the '**Disinfection**' screen.

Without a draw off, the water in the blend circuit will remain hot for a long time. In order to speed up the temperature reduction, a draw-off **must be made during '**Cool Down**' using the last outlet of the blend circuit, or a dump valve fitted near to the end of the blend circuit. Check with local water authorities with regard to water temperature limitations to drain.*

*Failure to complete a sufficient cool down of the blend circuit may result in a '**Temp High**' alert or an '**Error Temp**' shut down to full cold (see '**Alert Messages**' and '**Fault Diagnosis - DRV40 Display Errors**').*



'Disinfection Status'

This shows the status of the disinfection cycle.

'Disinfection Control'

The controls for the '**Disinfection Cycle**'.

'Disinfection Setup'

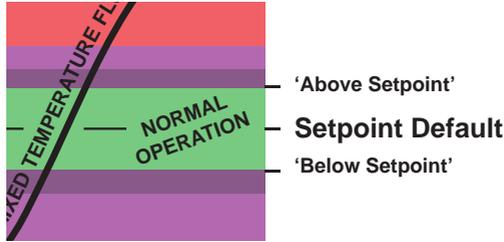
The controls that enable a '**Disinfection Cycle**' to be run and sets the '**Disinfection Timeout**' feature.

1. Click '**Enable Disinfection**' checkbox and set the '**Disinfection Timeout**' value
'Disinfection Timeout' is the number of minutes the temperature alert and error displays are disabled to allow for disinfection and cool down of the blend circuit before switching back on automatically, i.e. if '**Disinfection Timeout**' is set to 30 minutes then the DRV40 has that amount of time to complete the disinfection and cool down before entering an error condition and switching to full cold.

Please note the following:

- '**Disinfection Timeout**' starts when Trigger is pressed.
- During the '**Disinfection Timeout**' the disinfection and cool down **must** be completed manually and the DRV40 returned to '**Setpoint**' (normal operation within the setpoint limits).

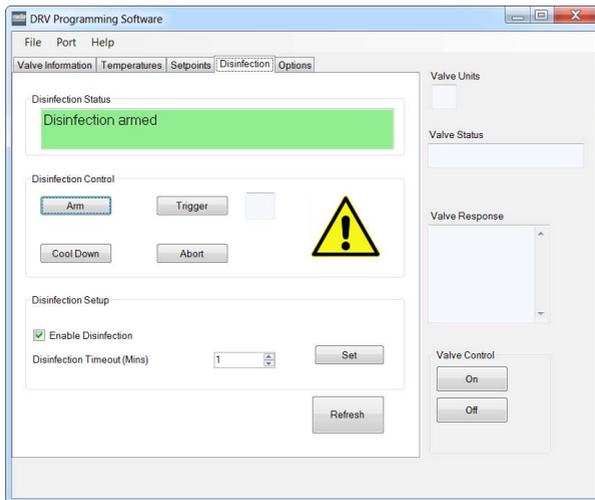
- The '**Disinfection Timeout**' can be set up to a maximum of 1800 minutes (30 hours).



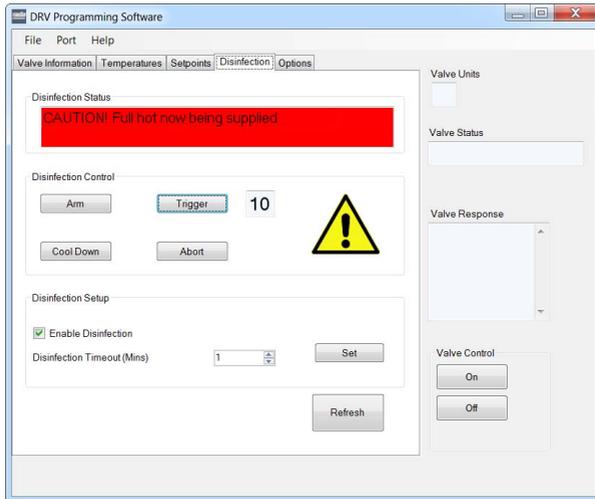
2. Switch '**Valve Control**' to '**OFF**'.
3. Click '**Set**' to transfer the values to the DRV40.
4. Click '**Refresh**' and confirm the updated values.

Disinfection Cycle

Warning! Due to the scalding temperature, the disinfection process **must** be supervised. The DRV40 should be monitored whilst in disinfection mode and no one should be allowed to approach within 3 metres of any affected outlets.



1. Click '**Arm**' when prepared for disinfection cycle, the '**Disinfection Status**' will confirm.



Full Hot 75°C
Disinfection

2. Within 20 seconds, click '**Trigger**' to activate the disinfection, the '**Disinfection Status**' will confirm.
(There is a 10 second countdown before full hot is supplied to the blend circuit. The display on the DRV40 changes to confirm the disinfection cycle is active.)

EMERGENCY STOP! - Click '**Abort**' at any time to stop the cycle.

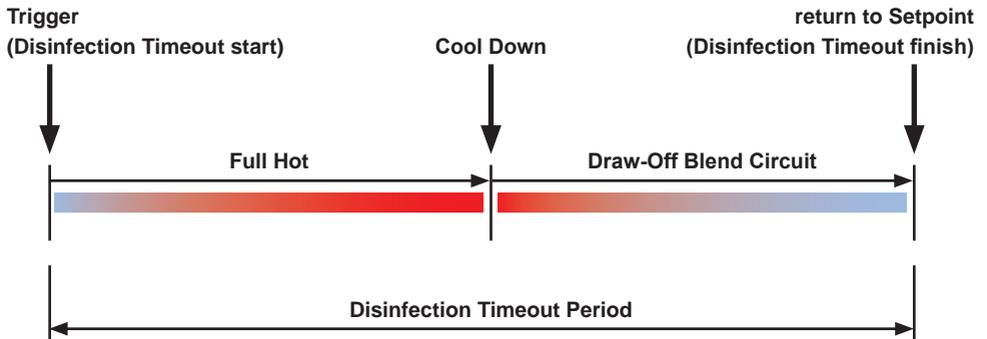
Temp 48°C
Cooling Down

3. Click '**Cool Down**'. The display on the DRV40 changes to confirm the cool down mode. After cool down has been initiated, the blend circuit takes time to return to normal temperature. Drain the hot water using the last outlet of the blend circuit, or use a dump valve fitted near to the end of the blend circuit. Check with local water authorities with regard to water temperature limitations to drain. The time required to cool the blend circuit must be considered when setting the '**Disinfection Timeout**' period.
4. At the end of the '**Disinfection Timeout**' period, the DRV40 will return to normal operating mode and the alerts and errors will be re-enabled.

IMPORTANT! The DRV40 is locked in disinfection mode until one of the following actions has been performed:

- a. The 'Disinfection Timeout' period has expired (automatic).
- b. The 'Abort'* button is pressed (manual).

Disinfection Timeline



*Abort

If Abort is used when the cycle is at full hot, the DRV40 switches to full cold and displays "**Error Temp**". Cycle the power off/on to reset the DRV40, make sure the blend circuit is at a safe temperature before allowing any outlets to be used.

Disinfection Step by Step - 1 (setting parameters for cycle)

Follow these steps to determine the total disinfection cycle time and store that value in the 'Disinfection Timeout' parameter of the 'DRV Programming Software'. At the end, the parameters will be set to run all future disinfection cycles reliably.

You are about to run a test cycle to determine, in total, how long it takes to disinfect the blend circuit. Before you begin, make sure there is an adequate supply of hot water for this test. You will also require a reliable clock or stopwatch to monitor the duration of the test. Make sure all warnings, cautions and responsibilities on page 28 are observed during the test.

1. Click '**Enable Disinfection**' check box.
2. Set '**Disinfection Timeout**' to '**1800 minutes**' (maximum).
3. Click '**Off**' under '**Valve Control**'.
4. Click '**Set**'.
5. Click '**Refresh**' to confirm the settings.

MAKE SURE ALL OUTLETS ON BLEND CIRCUIT ARE NOT IN USE UNTIL TEST IS COMPLETE!

No one should be allowed to approach within 3 metres of any affected outlets.

6. Click '**Arm**'.
7. Click '**Trigger**' and start stopwatch or note the time of day.
8. Monitor the temperature and time until a satisfactory disinfection of the blend circuit has been achieved.
9. Click '**Cool Down**'.
10. Draw-off hot water from the blend circuit. Use either the last outlet on the circuit or a dump valve fitted near to the end of the circuit.
11. When DRV40 temperature is within normal operation, stop the draw-off.
12. Click '**Abort**'.
13. Stop stopwatch or note the time of day. The time difference is the future '**Disinfection Timeout**' period.
14. Click '**Off**' under '**Valve Control**'.
15. Change '**Disinfection Timeout**' to new value.
16. Click '**Set**'.
17. Click '**Refresh**' to confirm.
18. Click '**On**' under '**Valve Control**'.

For all further disinfection cycles, use Step by Step - 2

Disinfection Step by Step - 2 (running a routine cycle)

You are about to run a disinfection cycle of the blend circuit. Before you begin, make sure there is an adequate supply of hot water for the cycle. You will also require a reliable clock or stopwatch to monitor the duration of part of the cycle. Make sure all warnings, cautions and responsibilities on page 28 are observed during the cycle.

1. Click **'Off'** under **'Valve Control'**.
2. Click **'Arm'**.
3. Click **'Trigger'**.

MAKE SURE ALL OUTLETS ON BLEND CIRCUIT ARE NOT IN USE UNTIL CYCLE IS COMPLETE!

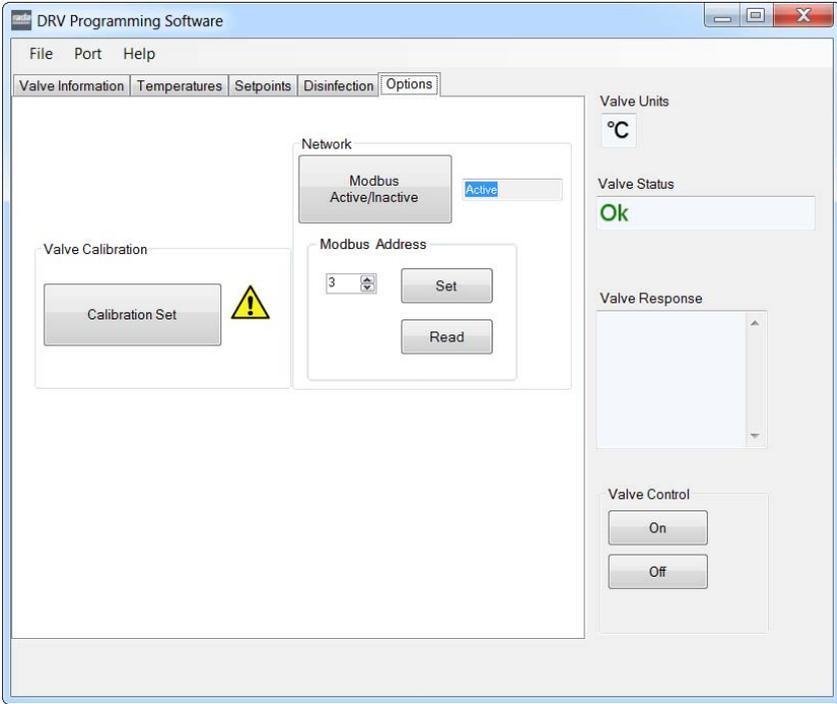
No one should be allowed to approach within 3 metres of any affected outlets.

4. Start the stopwatch or note the time of day. Monitor the temperature and time until a satisfactory disinfection of the blend circuit has been achieved.
5. Click **'Cool Down'**.
6. Draw-off hot water from the blend circuit. Use either the last outlet on the circuit or a dump valve fitted near to the end of the circuit.
7. When DRV40 temperature is within normal operation, stop the draw-off.
8. Allow the DRV40 to return to normal operation automatically.

IMPORTANT! - CHANGES TO THE PLUMBING SYSTEM.

Any alteration to the plumbing system that may affect the blend circuit may, as a consequence, also affect the Disinfection Timeout period. Repeat all steps in 'Step by Step -1' to maintain a reliable disinfection cycle for the system.

Options



Network

Click '**Modbus Active / Inactive**' to enable the DRV40 to be controlled as a Modbus RTU (also see '**Connectivity**').

Valve Calibration

Must be used when replacing the following parts:

- **Proportioning Assembly**
- **PCB**
- **Drive Housing**
- **Gear Drive Assembly**

(see '**Maintenance and Spare Parts**' for further details)

Do not use 'Calibration Set' for any other reason.

ALERT MESSAGES

Temp High 53 °C
Setpoint 49 °C

Outlet temperature exceeds the '**Above Setpoint**' value. This condition causes a relay to be activated.

Temp Low 38 °C
Setpoint 49 °C

Outlet temperature is less than the '**Below Setpoint**' value. This condition causes a relay to be activated.

ERROR MESSAGES

See '**Troubleshooting**'...

CONNECTIVITY

The integral RS485 Serial Port (CN2 on the DRV40 PCB) can be used to connect directly to **Building Management Systems (BMS)** which operates on a **Modbus RTU** protocol.

See '**Options**' screen for details on how to enable DRV40 for **Modbus**.

Modbus

When configured for Modbus the DRV40 becomes a **Remote Terminal Unit (RTU)**. When connected directly to a BMS using Modbus RTU, the DRV40 will be assigned a unique network address which is programmed via the integral DB9 external port.

A separate '**Guide to Rada DRV Modbus Networking**' is available from our website www.radacontrols.com/DRV40

SYSTEM PERFORMANCE

For effective DRV40 performance, the DRV must be able to experience a minimum flow and a minimum temperature differential between its inlet and outlet supplies when the system is in **zero demand**.

Zero demand is defined as periods when there is no mixed water outlet usage on the system.

Pre-installation calculations should have already determined the system heat loss characteristics. For optimum performance the DRV40 requires a minimum of 1°C differential between the digital display on the unit (the outlet temperature) and the thermometer which is installed on the system return line.

When there is no system draw-off, the DRV40 reverts to a zero demand. The recirculation temperature is continuously monitored and adjusted appropriately by the DRV40. The circulating pump must operate continuously, the DRV40 requires a minimum flow of 19 l/m.

Pump Capacity

The circulating pump is only required to keep water gently moving around the system. The pump should be sized and selected to overcome the system resistance (feet of head) at the minimum specified flow rate of 19 l/m while also accounting for system heat loss.

System Safety Measures

System safety measures such as the installation of an aquastat linked to the circulating pump which shuts the pump off if the system exceeds a given temperature setpoint is not required. DRV40 can be programmed to issue suitable alerts and/or system hot water shutoffs (DRV40) and shutdowns (Independent Solenoid Valve).

MAINTENANCE AND SPARE PARTS

Warning! Isolate power to the DRV40. Make sure that the circulating pump is not operating.

DRV40 components should be inspected annually, or more frequently where acknowledged site conditions such as high mineral content water dictate.

Each DRV40 has a serial number displayed on the rating label that is maintained on file with the technical department at Kohler Mira Ltd.

For any installation, operation, maintenance or technical support details not covered in this guide, please call our Technical Department quoting the model and/or serial number.

Batteries (also see 'Installation')

Batteries **must** be fitted to the Electronics Module to make sure the DRV switches to **Full Cold** in the event of a primary power supply failure, they should **not** be considered to be a backup power supply.

Battery life is variable depending upon usage. A battery error message appears on the DRV display when they require replacing.

Where primary power supply failure occurs regularly or the DRV is installed within a supply system where safety is critical, the batteries **must** be changed at least every 12 months as part of an annual maintenance routine.

In noncritical systems or where battery usage is low, longer replacement cycles may be considered up to a maximum of 5 years. Inspection of critical components and/or assemblies.

CAUTION!

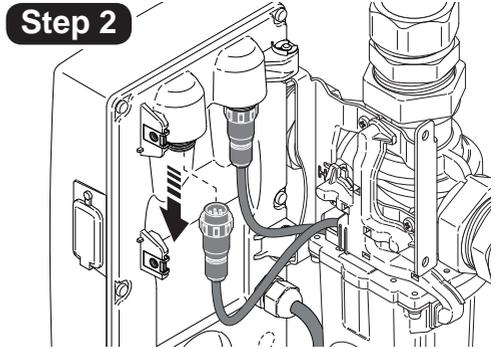
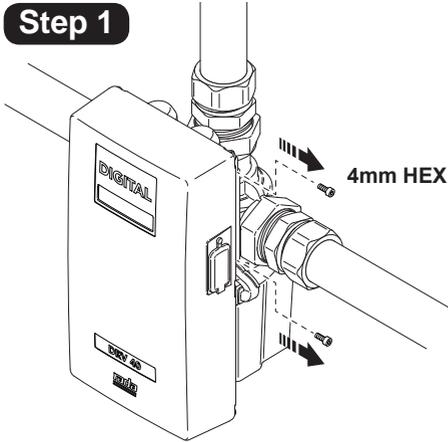
RISK OF FIRE OR PRODUCT DAMAGE IF INCORRECT TYPE OF BATTERY IS FITTED.
DISPOSE OF USED BATTERIES ACCORDING TO THE BATTERY MANUFACTURER'S INSTRUCTIONS.

Disassembly

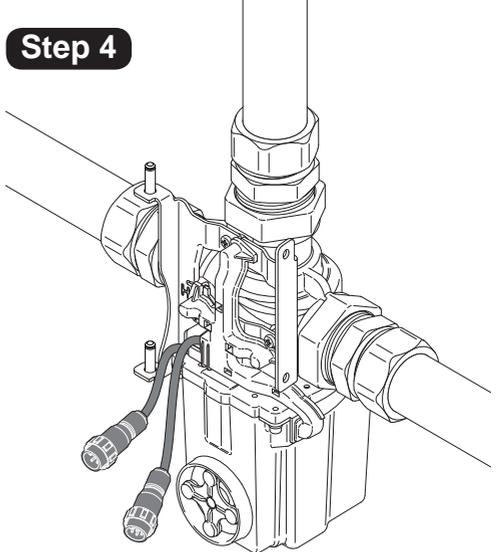
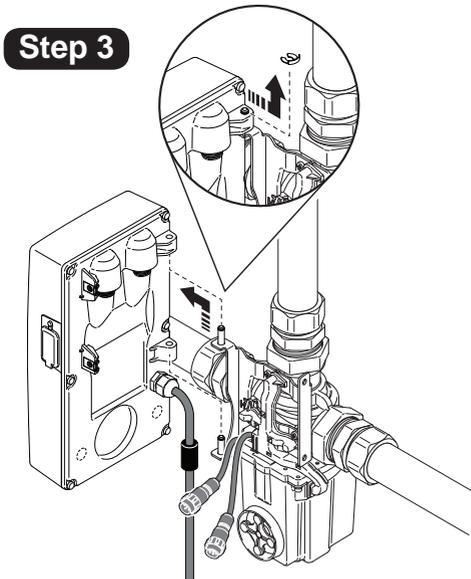
Warning!

Before disassembly observe the following:

- Isolate the electrical supply to the DRV40.
- Isolate the water supplies to the DRV40.
- Allow the hot water inlet to cool sufficiently to reduce the risk of injury through contact with the hot pipe or DRV.



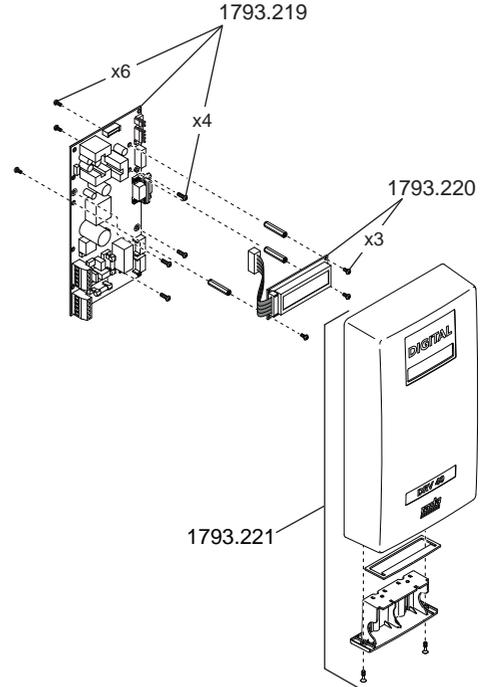
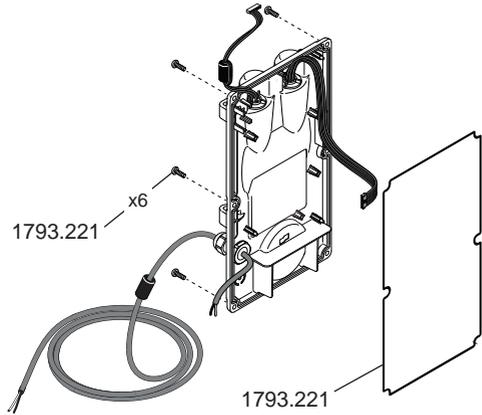
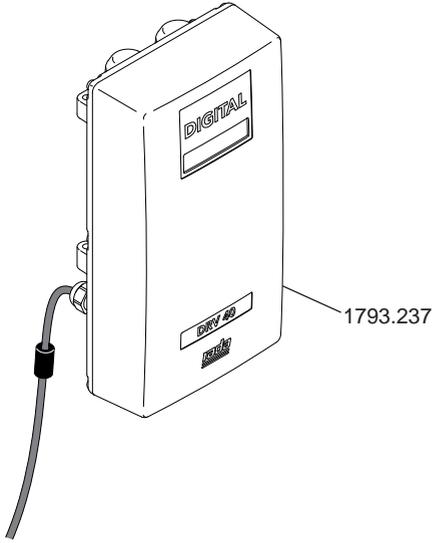
Failure to disconnect the incoming power supply before removing the plugs may result in product damage! Any damage caused in this way is not covered by the warranty. (See back page for full details.)



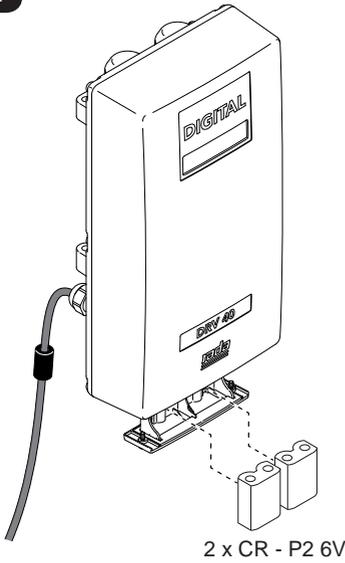
Electronics Module

DRV40 Electronics Module Spare Parts

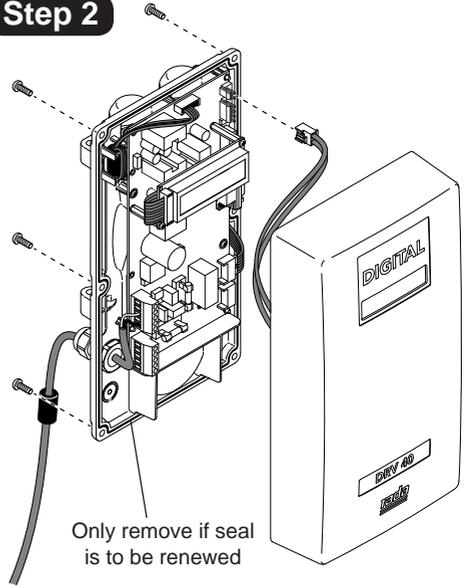
- 1793.237 Electronics Module
- 1793.219 PCB
- 1793.220 LCD
- 1793.221 Front Cover



Step 1



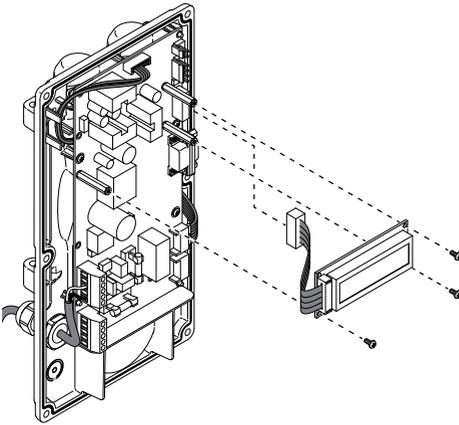
Step 2



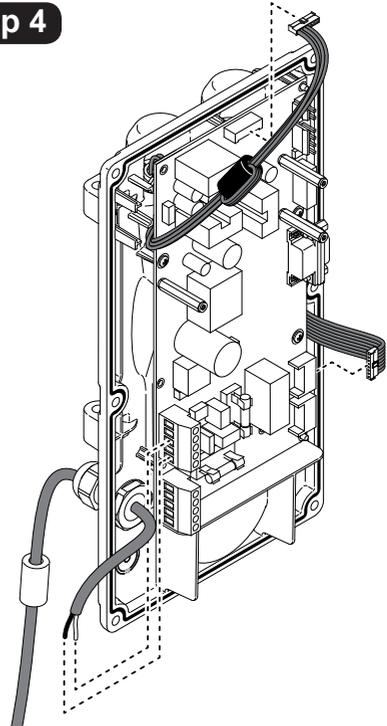
CAUTION!

RISK OF FIRE OR PRODUCT DAMAGE IF INCORRECT TYPE OF BATTERY IS FITTED.
DISPOSE OF USED BATTERIES ACCORDING TO THE BATTERY MANUFACTURER'S INSTRUCTIONS.

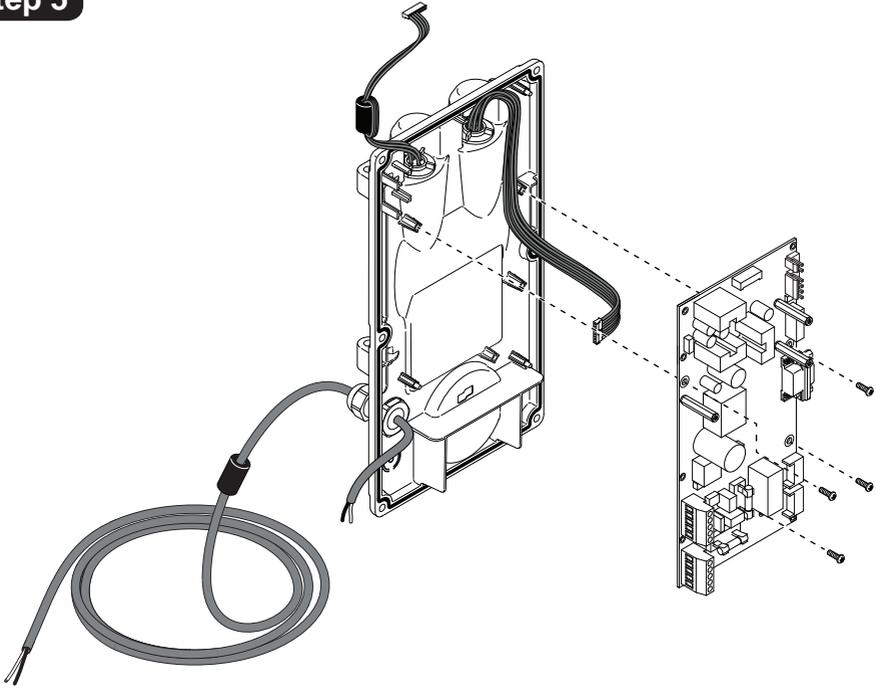
Step 3



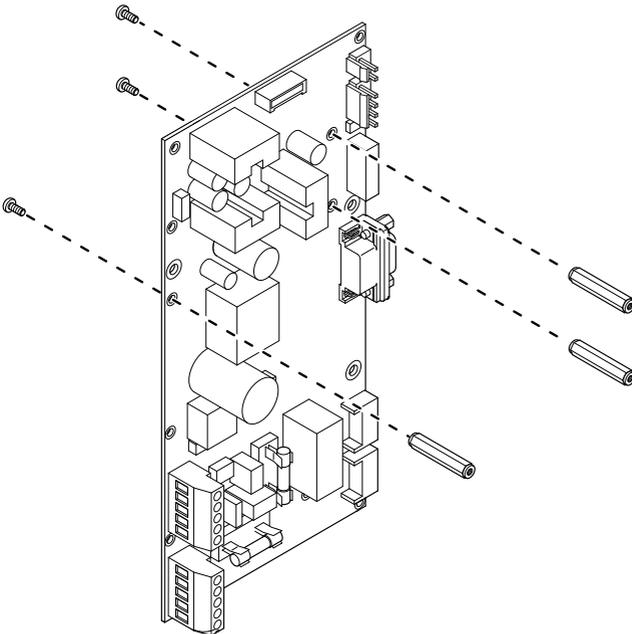
Step 4



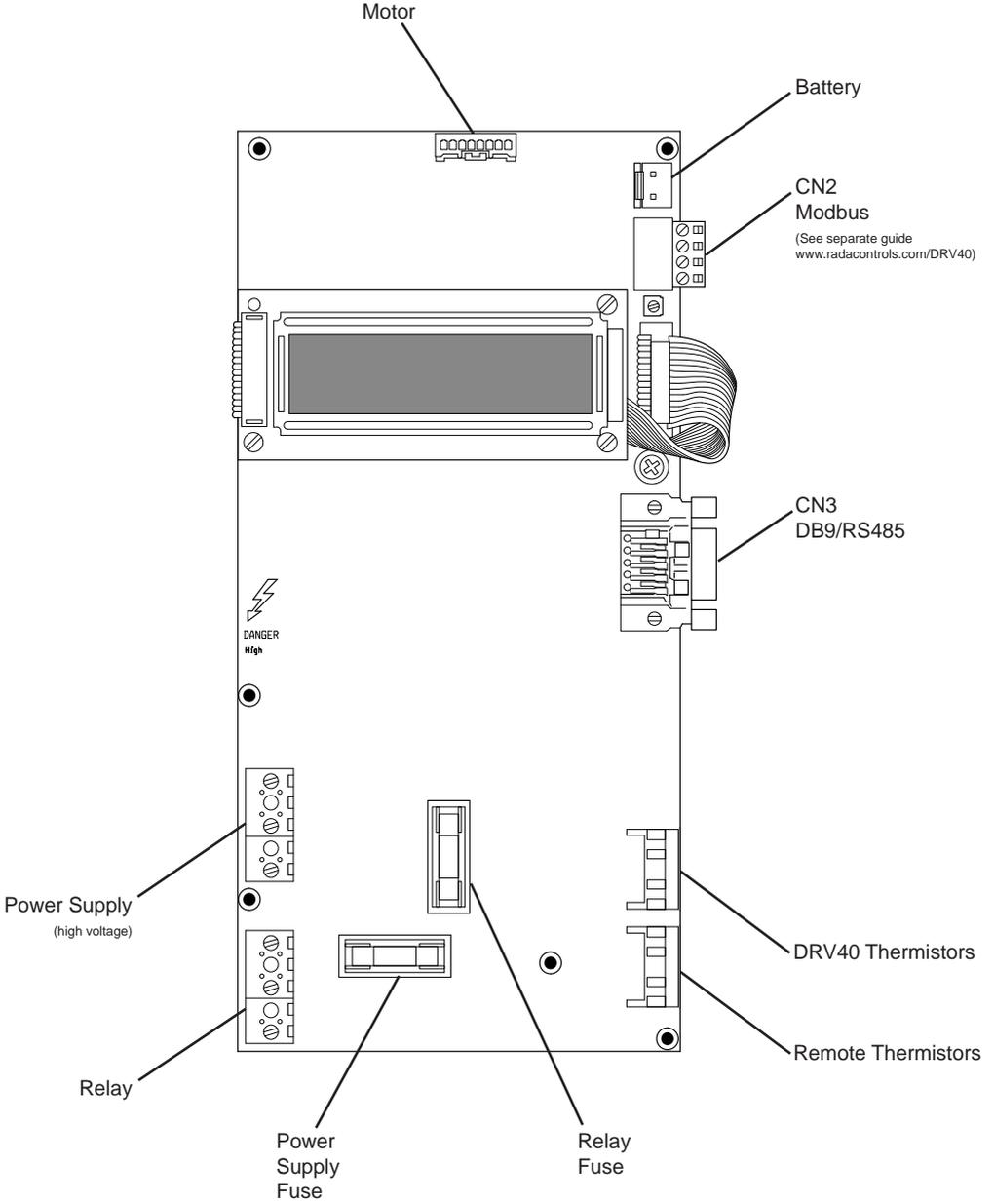
Step 5



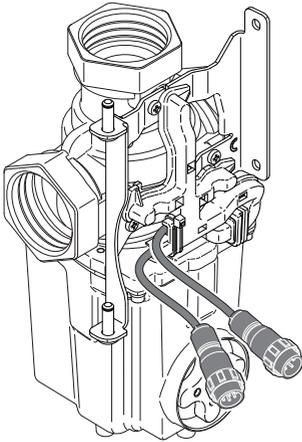
Step 6



PCB Connections

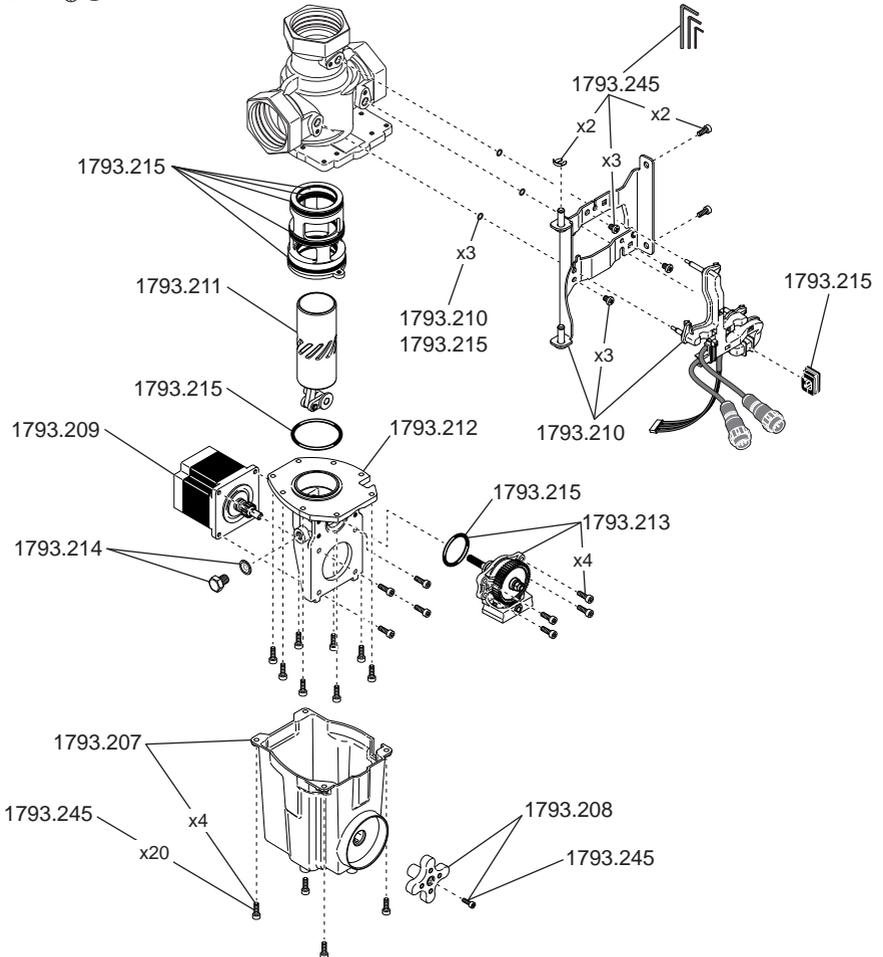


DRV

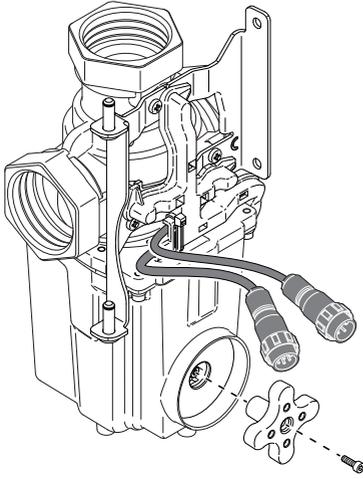


DRV40 DRV Spare Parts

- 1793.207 Motor Cover
- 1793.208 Magnetic Rotor
- 1793.209 Stepper Motor
- 1793.210 Cable Loom Assembly
- 1793.211 Proportioning Assembly
- 1793.212 Drive Housing
- 1793.213 Gear Drive Assembly
- 1793.214 Drain Plug
- 1793.215 Seal Pack
- 1793.245 Screw Pack

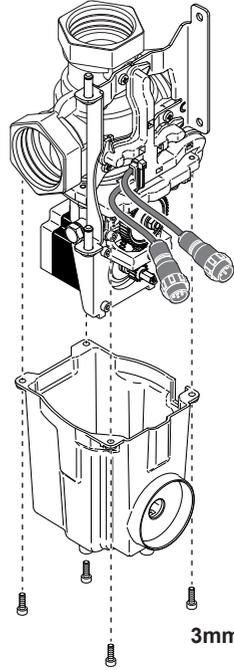


Step 1



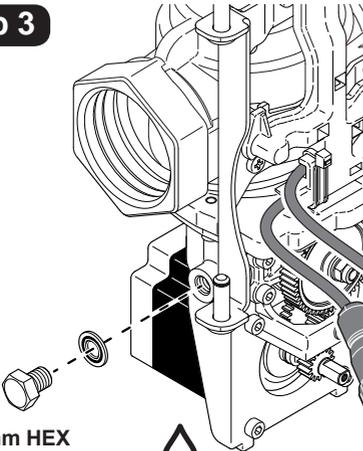
2.5mm HEX

Step 2



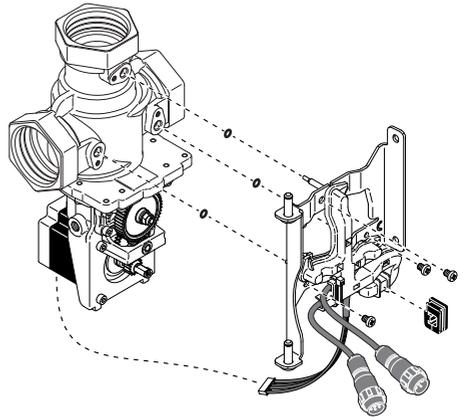
3mm HEX

Step 3



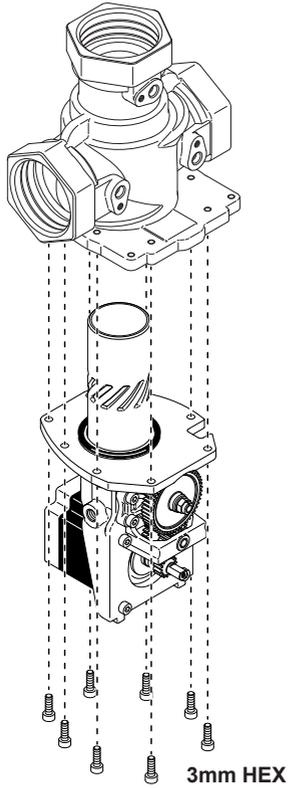
13mm HEX

Step 4

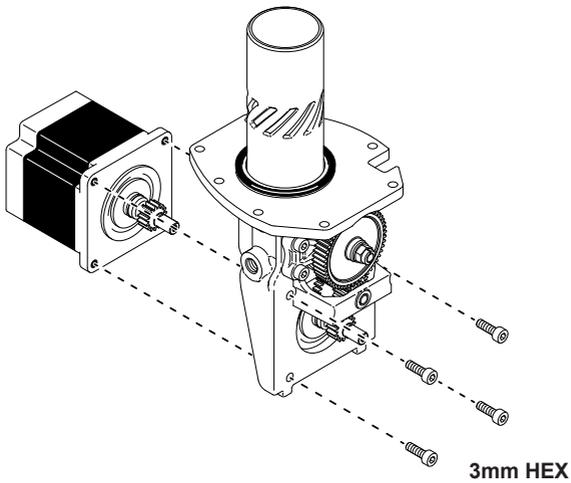


Seals shown 1:1
when
printed at Full Scale

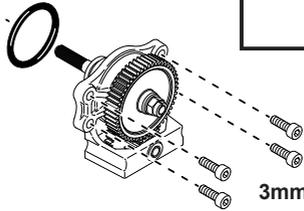
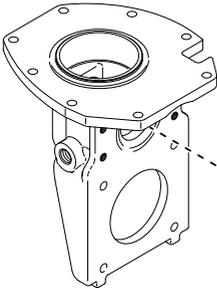
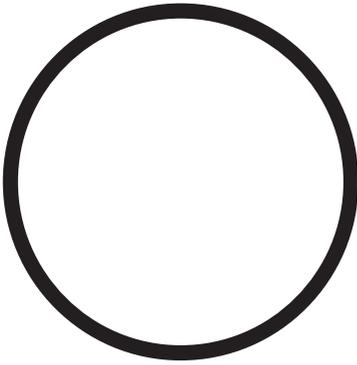
Step 5



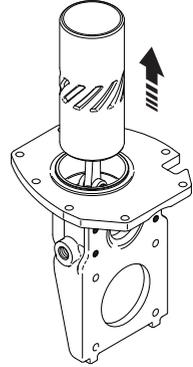
Step 6



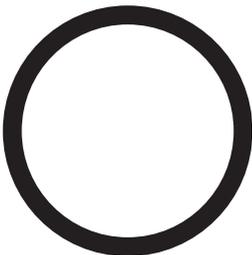
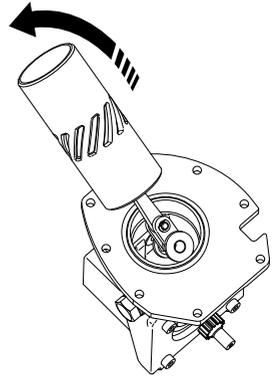
Step 7



Step 7a

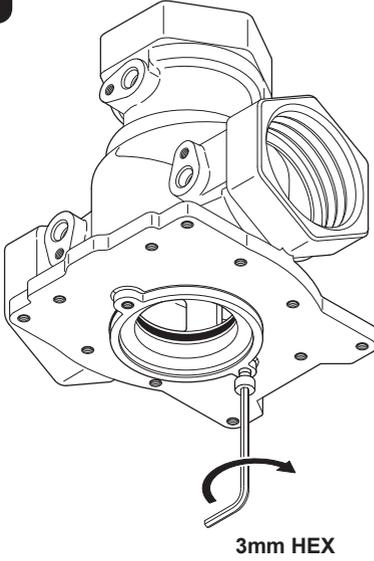


Step 7b



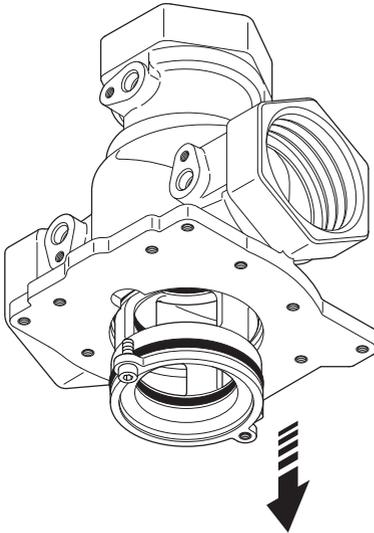
**Seals shown 1:1 when
printed at Full Scale**

Step 8



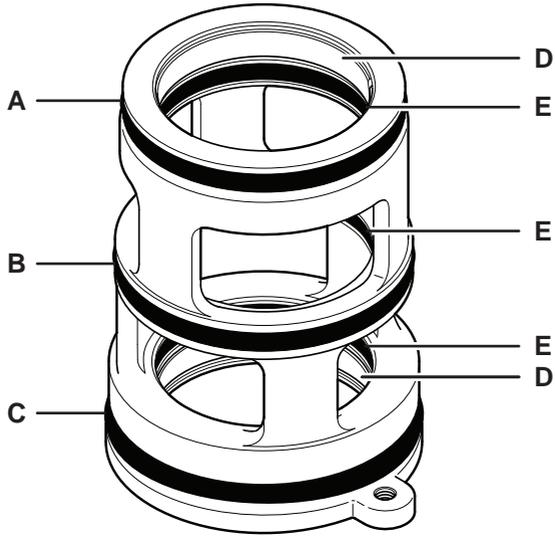
Use one of the 3mm Hex screws to assist in removing the cartridge.

Step 9



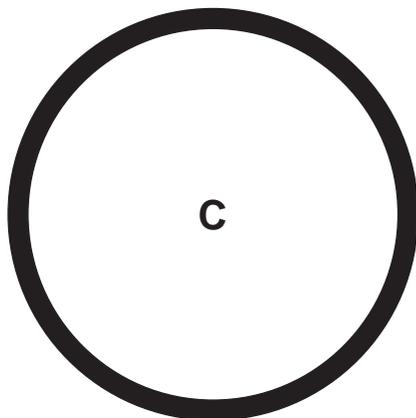
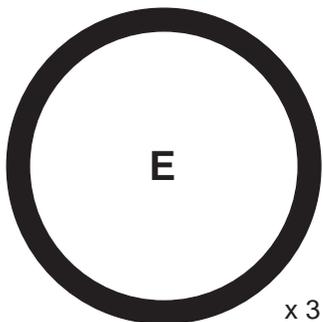
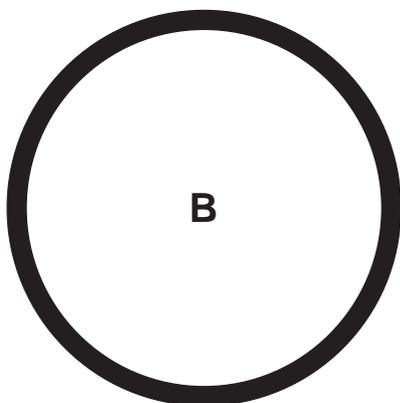
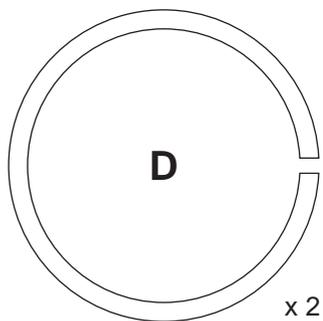
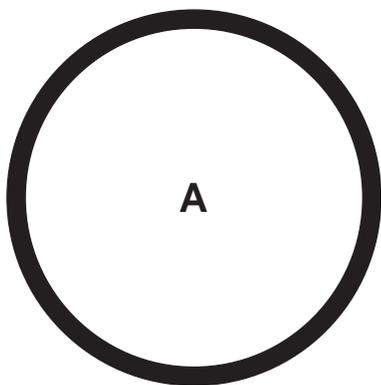
CAUTION!
Cartridge will fall when loose.

Step 10



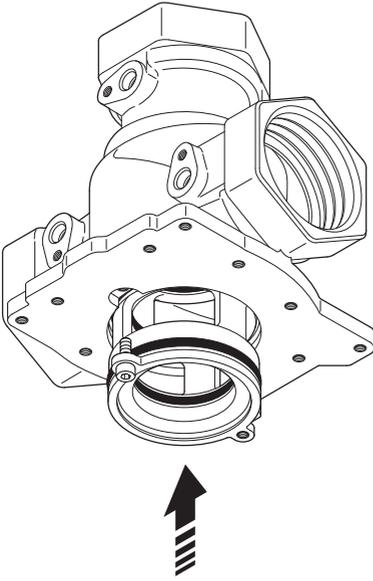
1793.215 Seal Pack

Only use silicone based lubricants on rubber seals.

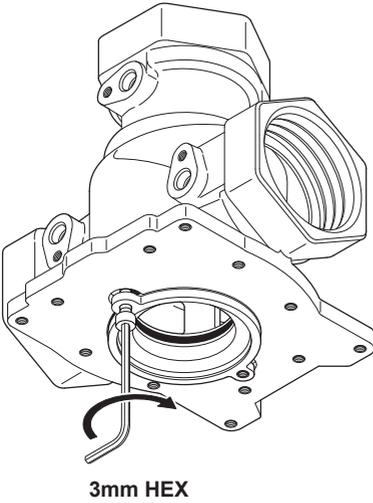


Seals shown 1:1 when
printed at Full Scale

Step 11

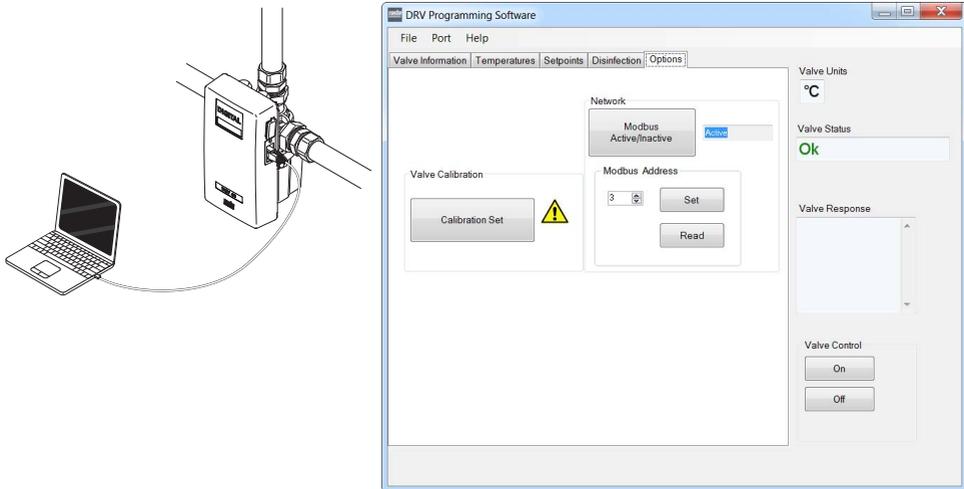


Step 12



Use one of the 3mm Hex screws to assist in refitting the cartridge.
Remove the screw when the cartridge is inserted fully.

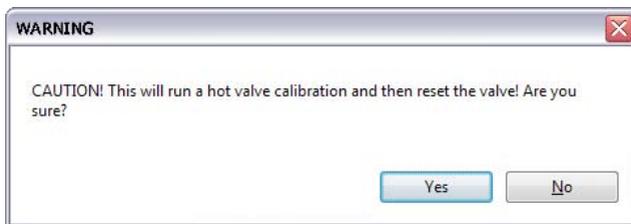
Step 13



Valve Calibration

Must be used after replacing the following parts:

- **Proportioning Assembly**
 - **PCB**
 - **Drive Housing**
 - **Gear Drive Assembly**
1. Turn power on to the reassembled DRV40 and connect to a Laptop/PC device.
 2. Run the '**DRV Programming Software**' and go to the '**Options**' screen.
 3. Click '**Off**' under '**Valve Control**'.
 4. Click '**Calibration Set**'.



5. Click '**Yes**' to proceed with the calibration and monitor the DRV40 display.

Calibrate HotEnd
Valve Reset...

Rada
drv40

Temp.	48 °C
Setpoint	49 °C

6. Wait for the DRV40 to reset.

FAULT DIAGNOSIS

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<i>“Constant difference between blend circuit temperature reading and DRV40 temperature display...”</i>	63
<i>“Unable to adjust outlet temperature...”</i>	64
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DRV40 Display Errors

Emergency Mode
Setpoint 49 °C

Maintenance to the DRV40 internal mechanism is required. DRV40 continues to operate safely, but with reduced performance. Check for the following:

- Motor damage or signs of wear.
- Proportioning Assembly damage or signs or wear.
- Debris in the Drive Housing.
- Anything that could impair the movement of the Proportioning Assembly.

If this mode is not addressed then it is likely the DRV40 will stop working and display any of the following errors.

Temp Error PCB 49 °C

Indicates the PCB has failed. Turn power off for 10 seconds and restart. If the error persists, replace the PCB.

Temp Error Motor 49 °C

Indicates motor / cable loom failure or a malfunction of the positioning sensor. Reset the DRV40. If the error persists, check for the following:

- Electronics module is assembled to the DRV correctly.
- Dirt or debris in gear mechanism.
- Dirt or debris around motor.
- Motor is disconnected.
- Magnetic rotor is not coupled to motor.
- Proportioning assembly is sticking or has seized.
- Motor is loose.
- Gear drive assembly is loose.

If the error persists, replace the motor / cable loom.

If the error still persists, then the positioning sensor on the PCB has failed. Replace the PCB.

Temp Error Thermistor 49 °C

Indicates thermistor / cable loom failure. Turn power off for 10 seconds and restart. If the error persists, check for the following:

- Connectors from DRV to electronics module are disconnected or wet.
- Thermistors are loose

If the error persists, replace the cable loom.

Temp High 49 °C
Error Temp

Outlet temperature exceeds the 'Error Temp' value. This condition causes the DRV40 to switch to full cold. Check for the following:

- Internal seal damage.
- Debris in the internal mechanism.
- Internal mechanism damaged / disconnected.

Temp 49 °C
Error Battery

Indicates the batteries are flat or disconnected. Check for the following:

- Battery is connected to PCB
- Battery connections, signs of wear or debris / corrosion.
- Batteries are at minimal power or flat.

Replace batteries (see '**Maintenance and Spare Parts**'). Do not use rechargeable batteries).

Tem□ %\$ °C
Set□oi&t 43 °C

Rogue characters appear on display. Reset DRV40, if the error persists, replace LCD.

Temp 48 °C
Setpoint 49 °C

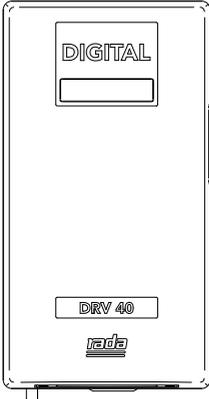
Brightness of LCD. Adjust setting on PCB. (See '**Common Faults - Cannot read the LCD display**'.)

No power to DRV40. Check circuit breaker and electrical supply. If problem persists, replace PCB and / or LCD.

Common Faults

Problem: **“Blend temperature rises when system is in zero demand...”**

DRV40 display errors



Temp 49 °C
Error PCB

Temp 49 °C
Error Motor

Temp 49 °C
Error Thermistor

Temp High 49 °C
Error Temp

These are the most likely error messages to be displayed during this problem. For the most probable causes and solutions see '**DRV40 Display Errors**'.

If any other error message is displayed see '**DRV40 Display Errors**'.

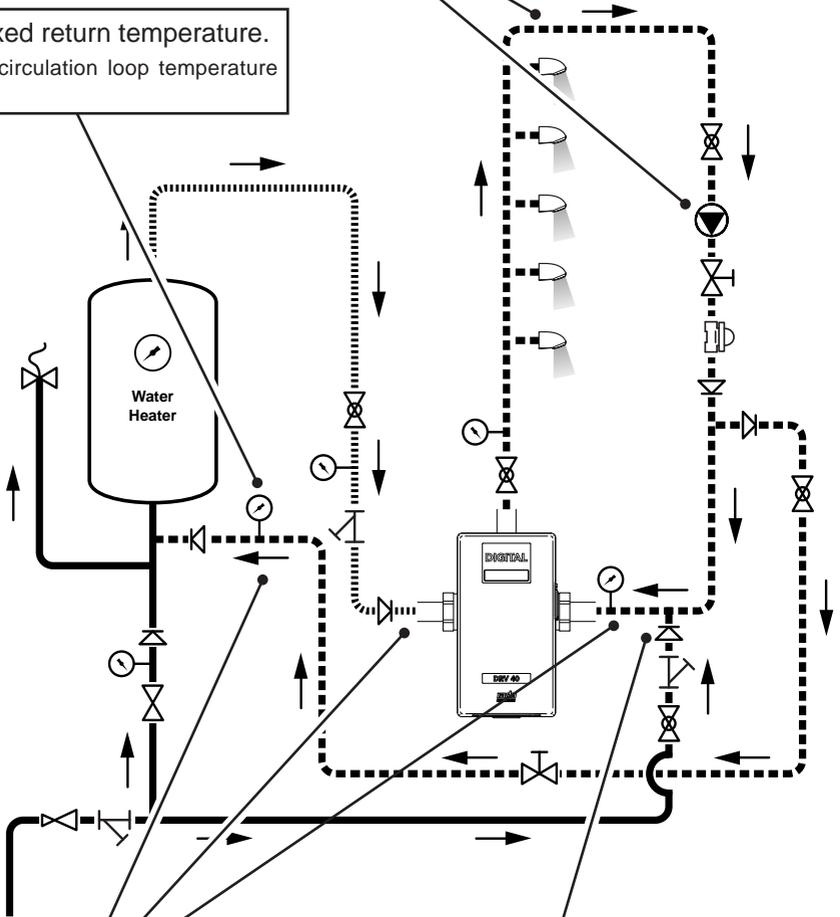
Check blend circuit flow rate.

Flow rate is less than 19 l/m. Reset circuit flow rate and check for the following:

- Air locks
- Blocked strainers
- Closed valves
- Pump failure

Check mixed return temperature.

Minimum recirculation loop temperature loss = 1°C



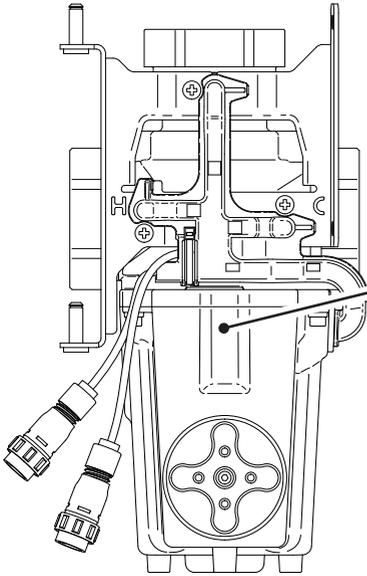
Water pressure

Make sure supply pressures are balanced. Make sure mixed return is flowing correctly to hot water supply inlet.

Checkvalves

Check circuit to make sure checkvalves are correct positioned and operating normally. (See **Recirculation Circuit - Plumbing Schematic**)

Problem: **“Outlet temperature fluctuates more than $\pm 2^{\circ}\text{C}...$ ”**



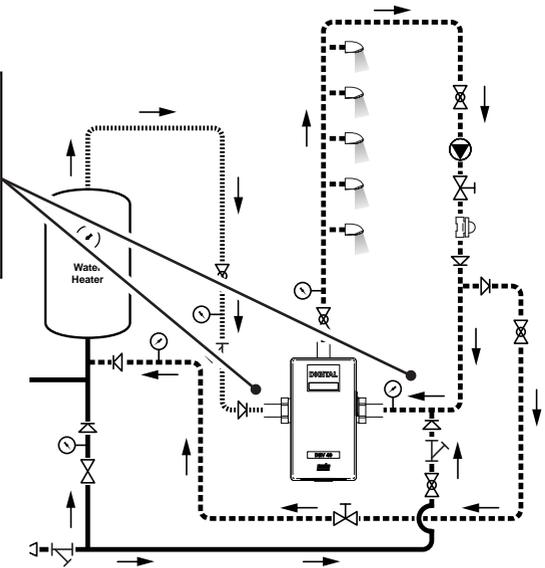
Check internal mechanism
Mechanism is jamming or slow to control.
Clean and descale the following parts:

- Proportioning Assembly
- Gear Drive Assembly
- Magnetic Rotor

Renew separator seal and lubricate internal mechanism.

Water pressure
Make sure supply pressures are balanced.
Check for the following:

- Air locks
- Blocked strainers
- Closed valves



Problem: **“LCD Display shows any of the following...”**

Temp High 53 °C
Setpoint 49 °C

Outlet temperature exceeds the **'Above Setpoint'** value. This condition causes an alert signal to be activated.

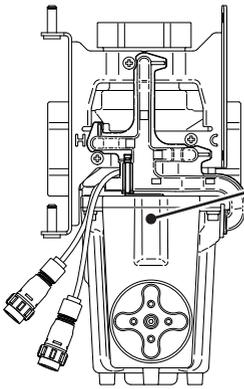
Temp Low 38 °C
Setpoint 49 °C

Outlet temperature is below the **'Below Setpoint'** value. This condition causes an alert signal to be activated.

Temp High 49 °C
Error Temp

See **'DRV40 Display Errors'**.

If any other error message is displayed see **'DRV40 Display Errors'**.



Check internal mechanism

Mechanism is jamming or slow to control.
Clean and descale the following parts:

- Proportioning Assembly
- Gear Drive Assembly
- Magnetic Rotor

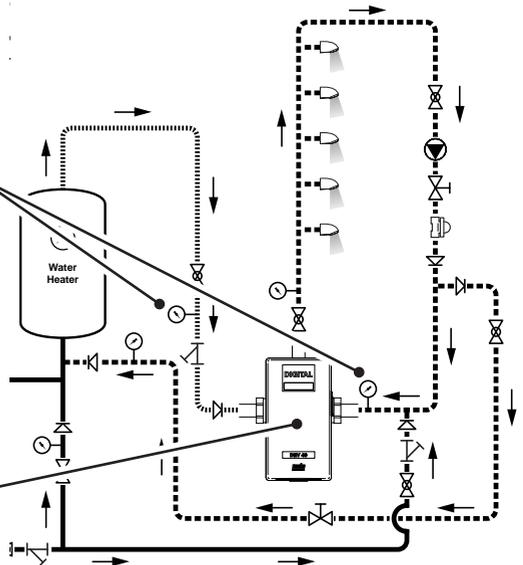
Renew separator seal and lubricate internal mechanism using silicone based grease suitable for plumbing applications.

Inlet water temperatures

Check water supplies are connected to the correct inlet ports.
Check inlet supply temperature.

Reset DRV40

Turn power off for 10 seconds and restart.

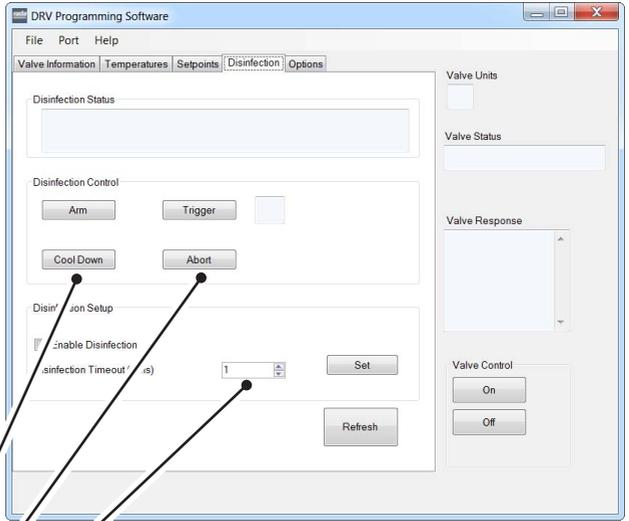


Problem: "LCD Display shows any of the following..."

Temp High 53 °C
Setpoint 49 °C

Temp Low 38 °C
Setpoint 49 °C

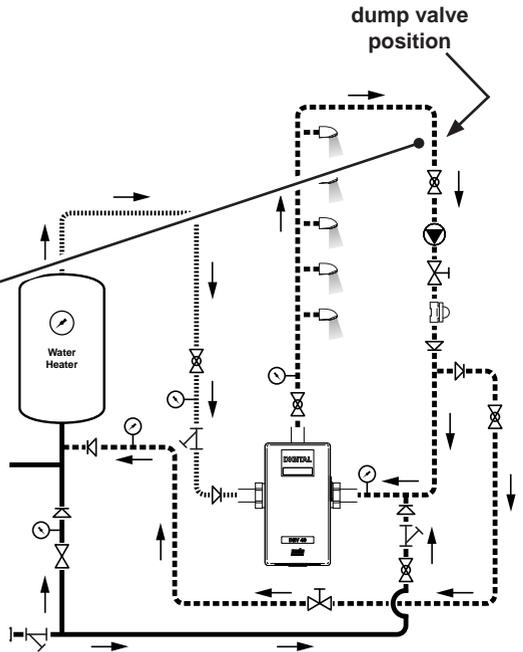
Temp High 49 °C
Error Temp



Blend circuit / 'DRV Programming Software'

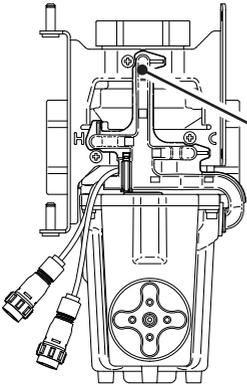
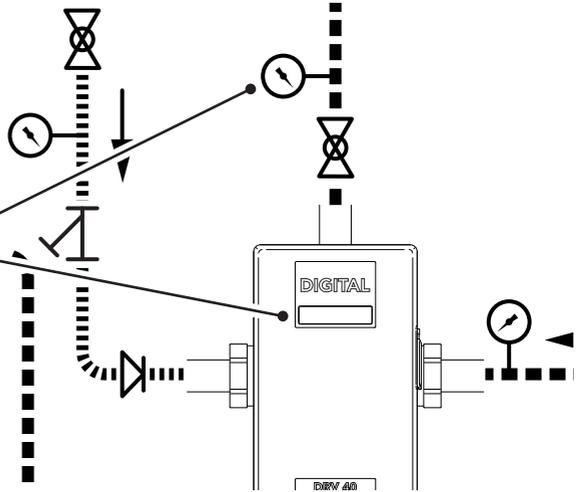
Blend circuit does not fully return to normal temperature within the 'Disinfection Timeout' period. Check the following:

- Disinfection Timeout value.
- Cool Down start and finish times.
- Early abort of disinfection cycle.
- Use of a dump valve to speed up cool down time.



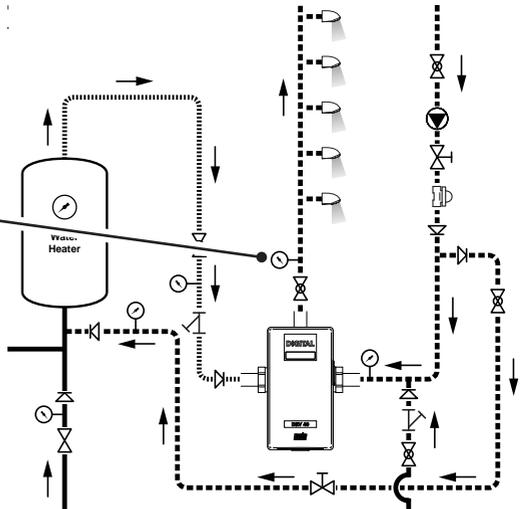
Problem: **“Constant difference between blend circuit temperature reading and DRV40 temperature display...”**

Readings are not equal after outlet temperature has stabilized



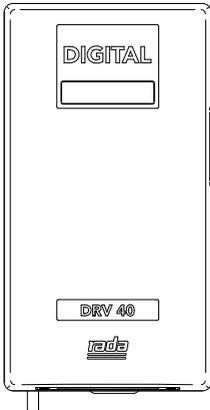
Check outlet thermistor
Turn power off for 10 seconds and restart. If the error persists, check the thermistor connections or replace the thermistors.

Blend circuit thermometer
Check or replace.



Problem: **“Unable to adjust outlet temperature...”**

DRV40 display errors



Temp 49 °C
Error PCB

Temp 49 °C
Error Motor

Temp 49 °C
Error Thermistor

Temp High 49 °C
Error Temp

These are the most likely error messages to be displayed during this problem. For the most probable causes and solutions see '**DRV40 Display Errors**'.

If any other error message is displayed see '**DRV40 Display Errors**'.

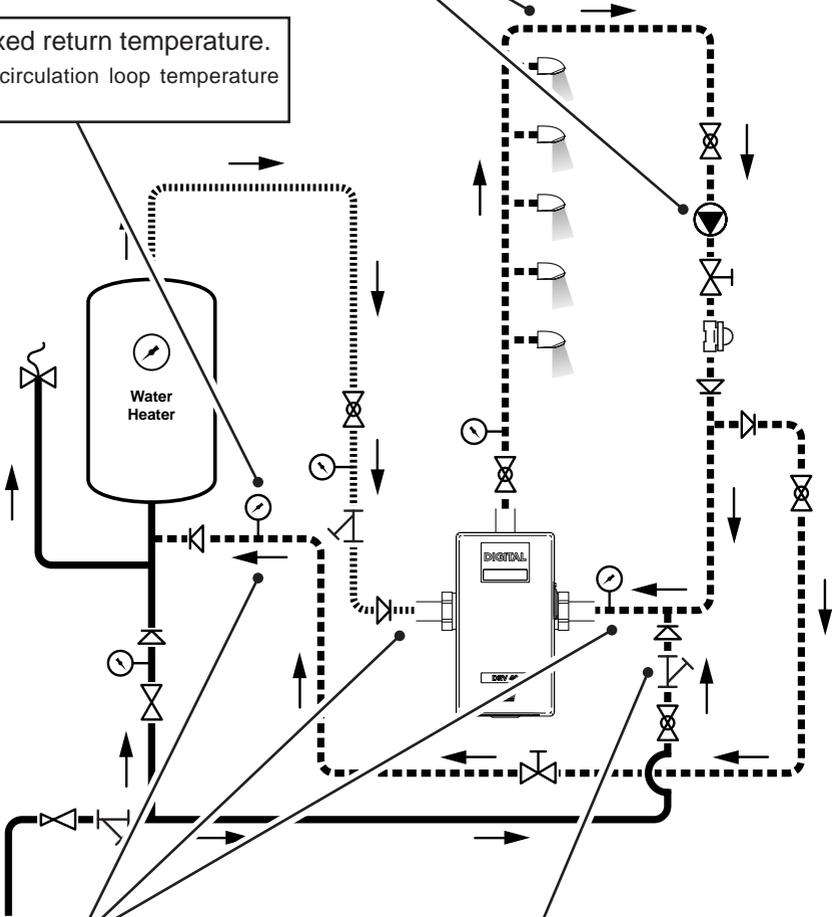
Check blend circuit flow rate.

Flow rate is less than 19 l/m. Reset circuit flow rate and check for the following:

- Air locks
- Blocked strainers
- Closed valves
- Pump failure

Check mixed return temperature.

Minimum recirculation loop temperature loss = 1°C



Water pressure

Make sure supply pressures are balanced. Make sure mixed return is flowing correctly to hot water supply inlet. Check for the following:

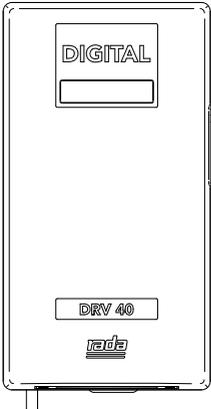
- Air locks
- Blocked strainers
- Closed valves

Checkvalves

Check circuit to make sure checkvalves are correct positioned and operating normally. (See **Recirculation Circuit - Plumbing Schematic**)

Problem: **“No display...”**

DRV40 display errors

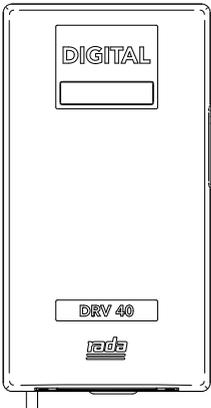


Blank display.
For the most probable causes and solutions see '**DRV40 Display Errors**'.

If any other error message is displayed see '**DRV40 Display Errors**'.

Problem: **“No display or no control...”**

DRV40 display errors



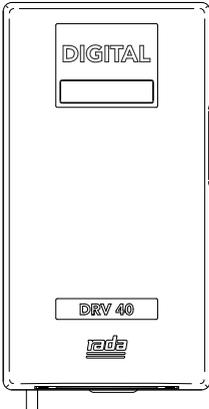
Temp High 49 °C
Error Temp

These are the most likely error messages to be displayed during this problem. For the most probable causes and solutions see '**DRV40 Display Errors**'.

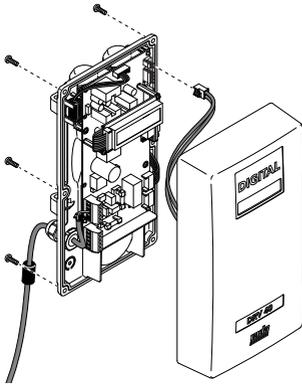
If any other error message is displayed see '**DRV40 Display Errors**'.

Problem: **“Cannot read the LCD display...”**

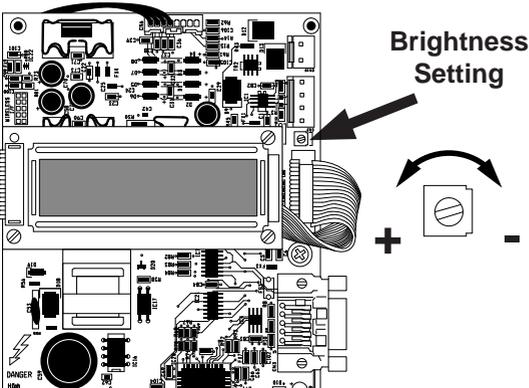
DRV40 display errors



Temp 48 °C
Setpoint 49 °C



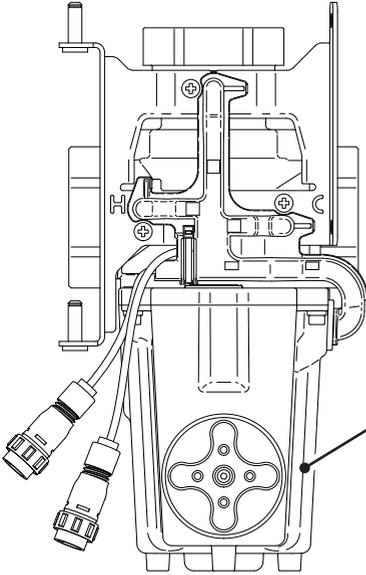
Isolate power to the DRV40 before disconnecting and removing the Electronics Module. Warning! Mains Electrical connections are exposed when the cover is removed.



Adjust the brightness setting on the PCB and reconnect the Electronics Module.

If any other error message is displayed see 'DRV40 Display Errors'.

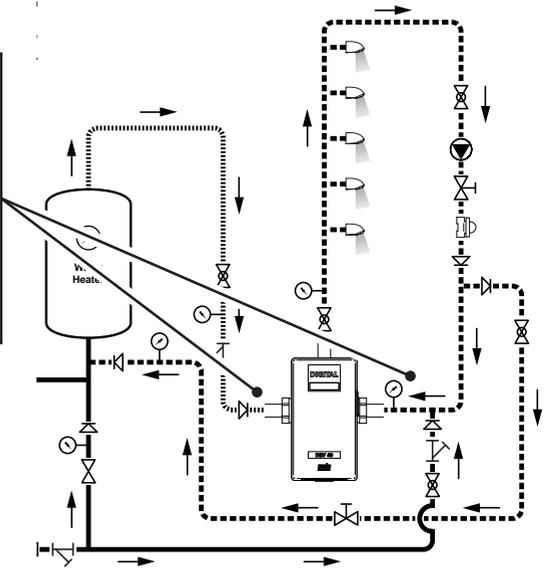
Problem: **“High pitched noise from DRV40...”**



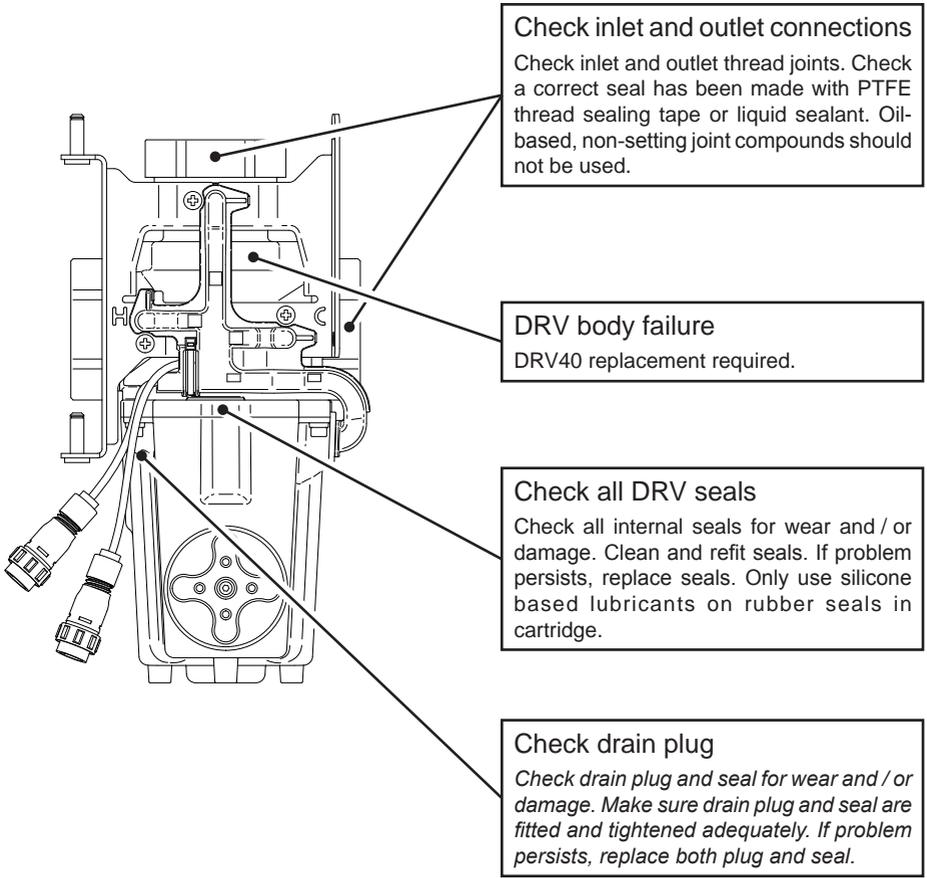
Check motor
Motor may be worn, replace.

Water pressure
Make sure supply pressures are balanced.
Check for the following:

- Air locks
- Blocked strainers
- Closed isolator valves
- Check inlet flow rates are within specified parameters. (See 'Specifications'.)



Problem: **“Water leaking from DRV40...”**



NOTES

NOTES

CUSTOMER SERVICE

Guarantee

Your product has the benefit of our manufacturer's guarantee which starts from date of purchase.

Within the guarantee period we will resolve defects in materials or workmanship, free of charge, by repairing or replacing parts or product as we may choose.

This guarantee is in addition to your statutory rights and is subject to the following conditions:

- The product must be installed and maintained in accordance with the instructions given in this user guide.
- Servicing must only be undertaken by us or our appointed representative. **Note!** if a service visit is required the product must be fully installed and connected to services.
- Repair under this guarantee does not extend the original expiry date. The guarantee on any replacement parts or product ends at the original expiry date.
- For shower fittings or consumable items we reserve the right to supply replacement parts only.

This guarantee does not cover:

- Call out charges for non product faults (such as damage or performance issues arising from incorrect installation, improper use, inappropriate cleaning, lack of maintenance, build up of limescale, frost damage, chemical attack, corrosion, system debris or blocked filters) or where no fault has been found with the product.
- Water or electrical supply, waste and isolation issues.
- Compensation for loss of use of the product or consequential or indirect loss of any kind.
- Damage or defects caused if the product is repaired or modified by persons not authorised by us or our appointed representative.
- Routine maintenance or replacement parts to comply with the requirements of the TMV2 or TMV3 healthcare schemes.
- Accidental or wilful damage.
- Products purchased ex-showroom display.

What to do if something goes wrong

If your product does not work correctly, refer to this manual for fault diagnosis and check that it is installed and commissioned in accordance with our instructions.

If this does not resolve the issue, contact us for help and advice.

Technical Helpdesk Service

Contact our Customer Services Team for product advice, to purchase spare parts or accessories, or to set up a service visit.

You can contact us via phone or e-mail - contact details below.

Please provide your model name, power rating (if applicable) and date of purchase.

Rada Website (www.radacontrols.com)

From our website you can view our full product catalogue or download a brochure.

Spares and Accessories

We hold the largest stocks of genuine Rada spares and accessories.

Service / Repairs

No one knows our products better than our nationwide team of Service Technicians. We can carry out service or repair work to your product both during and after the guarantee period.

You have the assurance of a fully trained Technician, genuine Rada spare parts and a 12 month guarantee on any chargeable work done.

Service Contracts

Regular servicing ensures your product continues to operate at the peak of performance. We offer annual or bi-annual servicing carried out by our fully trained technicians subject to a site survey.

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E-mail: rada_technical@mirashowers.com

By Post: Rada Controls, Cromwell Road, Cheltenham, Gloucestershire, GL52 5EP

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