



## The Brain<sup>®</sup>

### Model DRV80 Digital Recirculating Valve

### Installation and Maintenance

---

**Water Temperature Control  
Recirculation Systems - Digital**



This Digital Recirculating Valve or Digital Mixing Center has been supplied for this application based upon information provided to Armstrong at the time the order was placed.

This Digital Recirculating Valve or Digital Mixing Center is configured for use in a central pumped recirculation system and should be installed as per the drawing specific to the Model number within this guide.

For further information, please call our technical department Toll Free at 1-888-468-4673.

**Model No.**    **DRV80** \_\_\_\_\_

**Serial No.** \_\_\_\_\_

**Ship Date:** \_\_\_\_\_



ASSE 1017



B125

# Water Temperature Control - Recirculation Systems

---

## Product Range

### Digital

Water Temperature Control - Digital features Digital Recirculating Valves (DRV) and Digital Mixing Centers (DMC) specifically designed for use in a pumped recirculating hot water system.

### Options

#### The Brain - Digital Recirculating Valve

Model DRV80 - 90 is a Digital Recirculating Valve (DRV). DRV80 - 90 is designed for systems that experience diverse draw-off between 0 - 90 GPM and is provided with 2" NPT connections.

Model DRV80 - 150 is a Digital Recirculating Valve (DRV). DRV80 - 150 is designed for systems that experience diverse draw-off between 0 - 133 GPM and is provided with 3" NPT connections.

#### The Brain - Digital Recirculating Valve with pre-piped recirculation manifold

Model DRV80R - 90 is a Digital Recirculating Valve (DRV) for systems that experience diverse user draw-off between 0 - 90 GPM. Model DRV80R - 90 includes a recirculation system return manifold assembly with 2" (50 mm) threaded connections.

Model DRV80R - 150 is a Digital Recirculating Valve (DRV) for systems that experience diverse user draw-off between 0 - 133 GPM. Model DRV80R - 150 includes a recirculation system return manifold assembly with 3" (80 mm) threaded connections.

#### The Brain - Digital Mixing Centers (DMC)

Model DMC1 - 90 is a pre-piped Digital Mixing Center supplied with all requisite installation components. DMC1 - 90 is designed for systems that experience diverse draw-off between 0 - 90 GPM and is provided with 2" union connections.

Model DMC1 - 150 is a pre-piped Digital Mixing Center supplied with all requisite installation components. DMC1 - 150 is designed for systems that experience diverse draw-off between 0 - 133 GPM and is provided with 3" flanged connections.

Model DMC2 is a pre-piped Digital Mixing Center that includes two DRV80 valves supplied with all requisite installation components. DMC2 is designed for systems that experience diverse draw-off between 0 - 266 GPM and is provided with 4" flanged connections.

Model DMC3 is a pre-piped Digital Mixing Center that includes three DRV80 valves supplied with all requisite installation components. DMC3 is designed for systems that experience diverse draw-off between 0 - 399 GPM and is provided with 5" flanged connections.

### System Connectivity

The Brain - Model DRV80/R and Digital Mixing Centers are provided as standard with an integral two way 4 - 20 mA connection. This connection can be used to display the outlet temperature and to adjust the set point remotely.

The Brain Model DRV80/R and Digital Mixing Centers are provided as standard with an integral relay point to activate /deactivate a solenoid or to enable an audible alarm.

The Brain - Model DRV80/R and Digital Mixing Centers are provided as standard with a BrainScan connection port.

### BrainScan™

BrainScan™ is an optionally selected control module. BrainScan™ connects directly to the DRV80 and enables a direct onward connection to Building Automation Systems which utilize ModBus, Bacnet™ and LonWorks™ protocols\* and contains an Ethernet port for web access.

BrainScan™ can receive and communicate the following inputs from The Brain - Model DRV80:

- Set Point
- Inlet/Outlet Temperature
- Over Temperature Alert

BrainScan™ can receive and communicate the following self-diagnostic error messages from The Brain - DRV80:

- Over Temperature Error
- PCB Error
- Thermistor Error
- Motor Error/Safe Mode
- Battery Error

The DRV80 provides an RS485 serial interface\*\* for connection to BrainScan™.

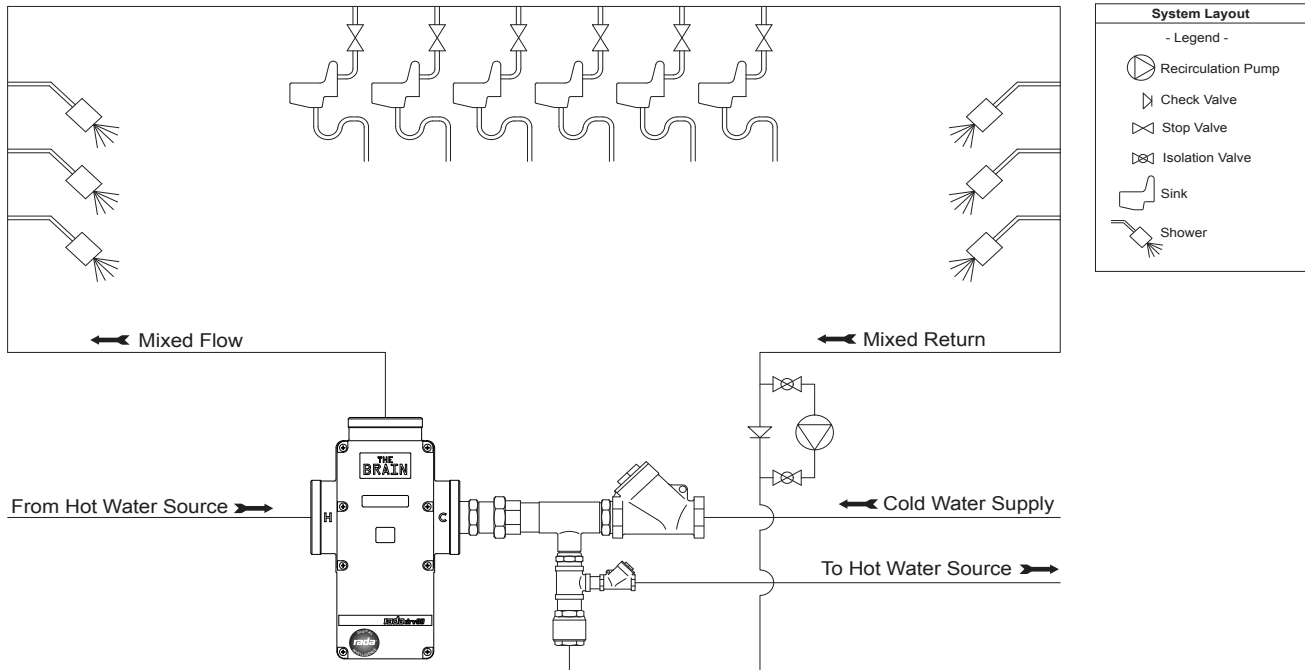
**Note: BrainScan™ is not specifically addressed by this Installation Manual.**

\* Building Automation System "mapping" and related interface procedures required by onsite BAS technical support.

\*\* Serial Line Connection is detailed in a separate Installation, Operation and Maintenance (IOM) Guide for BrainScan™. Available by contacting Armstrong technical support.

Note - Flow rates recorded at 10 psi pressure drop.

## Water Temperature Control - Recirculation Systems



Recirculation Systems - Digital (GPM)

Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126

# Water Temperature Control - Recirculation Systems

## Digital

### The Brain™ DRV80

The DRV80 is a fully digital recirculation valve (DRV) for “point of source” or mechanical room based installation. DRV80 is designed specifically to be the primary water temperature controller in a continuously pumped recirculating hot water system.

### Operational Specifications - DRV80

The enhanced accuracy possible with DRV80 digital technology, combined with its data input/output communication capability equals:

- Accurate control of blended water drawn from the system at a point of use typically within  $\pm 2^{\circ}\text{F}$  at draw off points a minimum of 5m downstream of mixing valve during consistent system demand periods.
- Operational water pressure of 10 - 150 psig.
- Minimum valve inlet to outlet temperature requirement (system recirculation temperature loss) of  $2^{\circ}\text{F}$ .
- Automatic shutoff of hot water flow upon cold water inlet supply failure.
- Automatic shutoff of hot water flow in the event of a power failure.
- Maintain a consistent system “idling” temperature and control temperature creep without the use of a manual throttling device or balancing valve.
- System shall not require a temperature activated pump shutoff device (aquastat).
- Programmable set point range of  $81 - 158^{\circ}\text{F}$  ( $29 - 71^{\circ}\text{C}$ ).
- Ability to thermally disinfect at recommended temperatures.
- Programmable 1st level high/low temperature alarm display.
- Programmable temperature error level for safety shutdown.

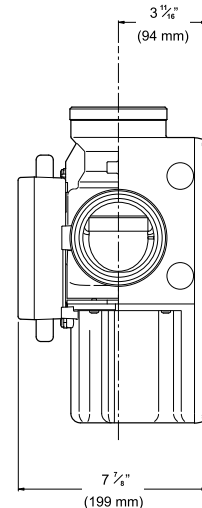
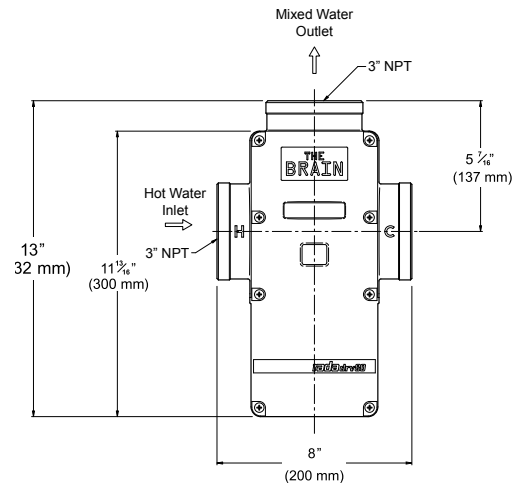
For submittal drawings, refer to:

DRV80 - 90 D6764

DRV80 - 150 D6774

### Technical Specifications

- 100 - 240V Power supply (12V AC output).
- 2 x 12 to 30vdc, 4-20mA current loop interfaces:  
Input: Setpoint Selection  
Output: Measured Blend Temperature
- Relay output: 24V DC/240 V AC SPCO.  
Error Relay: Activated in alarm or error mode.
- Stainless Steel Construction
- 3" NPT Connections DRV80 - 150
- 2" NPT Option DRV80 - 90.
- ASSE 1017 and CSA B125 Certified and CE.
- Ambient operating temperature range  $32 - 122^{\circ}\text{F}$  ( $0 - 50^{\circ}\text{C}$ ).
- Shipping weight = 40 lbs (18 kg)



### Recirculation Systems - Digital (GPM)

Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126

# Water Temperature Control - Recirculation Systems

## Digital

### The Brain™ DRV80R

The DRV80R is a fully digital recirculation valve (DRV) for “point of source” or mechanical room based installation. DRV80 is designed specifically to be the primary water temperature controller in a continuously pumped recirculating hot water system.

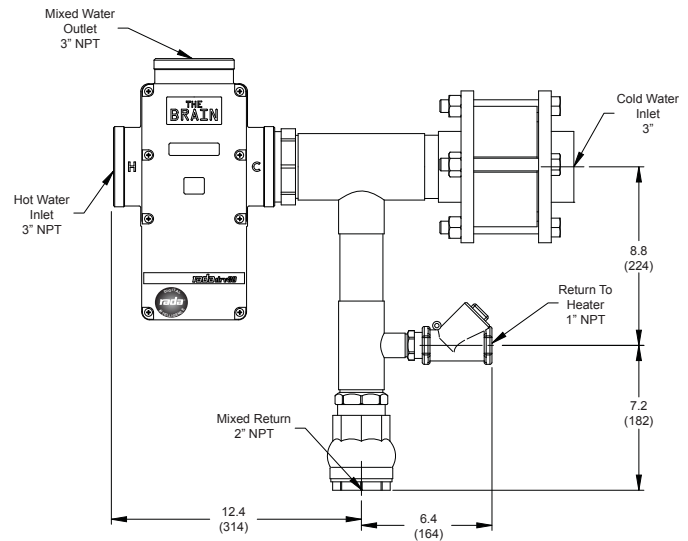
### Operational Specifications

The enhanced accuracy possible with DRV80 digital technology, combined with its data input/output communication capability equals:

- Accurate control of blended water drawn from the system at a point of use typically within  $\pm 2^{\circ}\text{F}$  at draw off points a minimum of 5m downstream of mixing valve during consistent system demand periods.
- Operational water pressure of 10 - 150 psig.
- Minimum valve inlet to outlet temperature requirement (system recirculation temperature loss) of  $2^{\circ}\text{F}$ .
- Automatic shutoff of hot water flow upon cold water inlet supply failure.
- Automatic shutoff of hot water flow in the event of a power failure.
- Maintain a consistent system “idling” temperature and control temperature creep without the use of a manual throttling device or balancing valve.
- System shall not require a temperature activated pump shutoff device (aquastat).
- Programmable set point range of  $81 - 158^{\circ}\text{F}$  ( $29 - 71^{\circ}\text{C}$ ).
- Ability to thermally disinfect at recommended temperatures.
- Programmable 1st level high/low temperature alarm display.
- Programmable temperature error level for safety shutdown.

### Technical Specifications

- 100 - 240V Power supply (12V AC output).
- 2 x 12 to 30vdc, 4-20mA current loop interfaces:  
Input: Setpoint Selection  
Output: Measured Blend Temperature
- Relay output: 24V DC/240 V AC SPCO.  
Error Relay: Activated in alarm or error mode.
- BrainScan Connection Port.
- Stainless Steel Construction (DRV80).
- 3” NPT Connections DRV80R - 150 (shown)
- 2” NPT Option DRV80R - 90.
- ASSE 1017 and CSA B125 Certified and CE.
- Shipping weight = 75 lbs (34 kg)



For submittal drawings, refer to:

DRV80R - 90 D6765

DRV80R - 150 D6775

### Recirculation Systems - Digital (GPM)

Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126

Armstrong has technical support personnel available from 8:00am to 5:00pm EST. Call Toll Free 1-888-468-4673.

# Water Temperature Control - Recirculation Systems

## Digital

### The Brain® Model DMC1

Model DMC1 features a single DRV80 pre-piped and pressure tested complete with isolation valves, strainers, check valves, thermometers and pressure gauges along with an optionally selected system circulating pump (DMC12). The Brain™ Model DRV80 is a fully digital recirculating valve (DRV) for “point of source” or mechanical room based installation. DRV80 is designed specifically to be the primary water temperature controller in a continuously pumped recirculating hot water system.

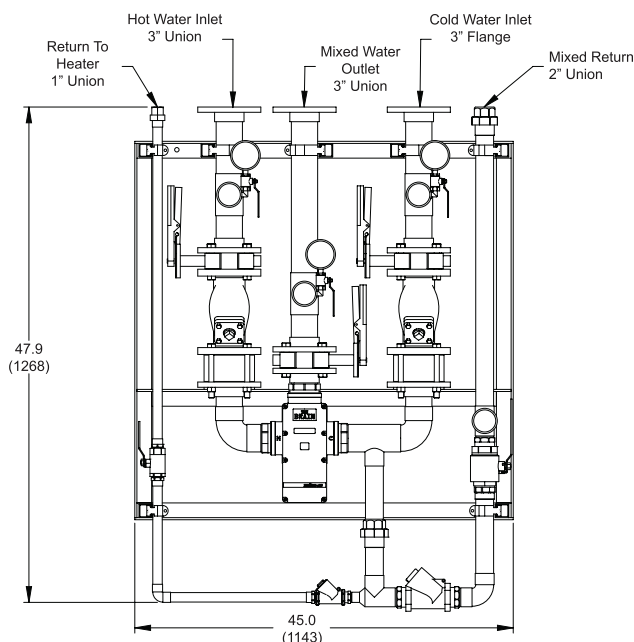
### Operational Specifications

The enhanced accuracy possible with DRV80 digital technology, combined with its data input/output communication capability equals:

- Accurate control of blended water drawn from the system at a point of use typically within  $\pm 2^{\circ}\text{F}$  at draw off points a minimum of 5m downstream of mixing valve during consistent system demand periods.
- Operational water pressure of 10 - 150 psig.
- Minimum valve inlet to outlet temperature requirement (system recirculation temperature loss) of  $2^{\circ}\text{F}$ .
- Automatic shutoff of hot water flow upon cold water inlet supply failure.
- Automatic shutoff of hot water flow in the event of a power failure.
- Maintain a consistent system “idling” temperature and control temperature creep without the use of a manual throttling device or balancing valve.
- System shall not require a temperature activated pump shutoff device (aquastat).
- Programmable set point range of  $81 - 158^{\circ}\text{F}$  ( $29 - 71^{\circ}\text{C}$ ).
- Ability to thermally disinfect at recommended temperatures.
- Programmable 1st level high/low temperature alarm display.
- Programmable temperature error level for safety shutdown.

### Technical Specifications

- 100 - 240V Power supply (12V AC output).
- 2 x 12 to 30vdc, 4-20mA current loop interfaces:  
Input: Setpoint Selection.  
Output: Measured Blend Temperature.
- Relay output: 24V DC/240 V AC SPCO.  
Error Relay: Activated in alarm or error mode.
- BrainScan Connection Port.
- Stainless Steel Construction (DRV80).
- 3" Flanged Connections DMC1 - 150 (shown).
- 2" NPT Option DMC1 - 90.
- ASSE 1017 and CSA B125 Certified and CE.
- Shipping weight = 700 lbs (317.5 kg).



For submittal drawings, refer to:

DMC1 - 90      D6766  
DMC1 - 150    D6776

Recirculation Systems - Digital (GPM)							
Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126

Armstrong has technical support personnel available from 8:00am to 5:00pm EST. Call Toll Free 1-888-468-4673.

# Water Temperature Control - Recirculation Systems

## Digital

### The Brain® Model DMC2

Model DMC2 features two DRV80 pre-piped in parallel and pressure tested complete with isolation valves, strainers, check valves, thermometers and pressure gauges. The Brain™ Model DRV80 is a fully digital recirculating valve (DRV) for “point of source” or mechanical room based installation. DRV80 is designed specifically to be the primary water temperature controller in a continuously pumped recirculating hot water system.

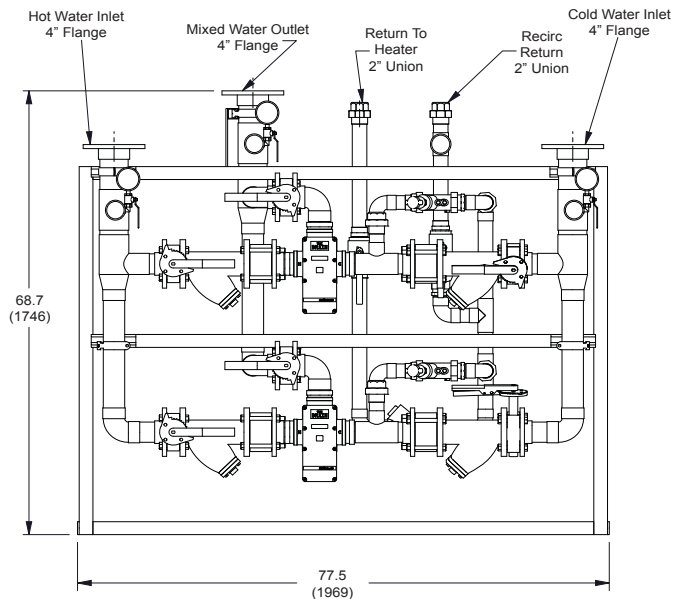
### Operational Specifications

The enhanced accuracy possible with DRV80 digital technology, combined with its data input/output communication capability equals:

- Accurate control of blended water drawn from the system at a point of use typically within  $\pm 2^{\circ}\text{F}$  at draw off points a minimum of 5m downstream of mixing valve during consistent system demand periods.
- Operational water pressure of 10 - 150 psig.
- Minimum valve inlet to outlet temperature requirement (system recirculation temperature loss) of  $2^{\circ}\text{F}$ .
- Automatic shutoff of hot water flow upon cold water inlet supply failure.
- Automatic shutoff of hot water flow in the event of a power failure.
- Maintain a consistent system “idling” temperature and control temperature creep without the use of a manual throttling device or balancing valve.
- System shall not require a temperature activated pump shutoff device (aquastat).
- Programmable set point range of  $81 - 158^{\circ}\text{F}$  ( $29 - 71^{\circ}\text{C}$ ).
- Ability to thermally disinfect at recommended temperatures.
- Programmable 1st level high/low temperature alarm display.
- Programmable temperature error level for safety shutdown.

### Technical Specifications

- 100 - 240V Power supply (12V AC output).
- 2 x 12 to 30vdc, 4-20mA current loop interfaces:  
Input: Setpoint Selection.  
Output: Measured Blend Temperature.
- Relay output: 24V DC/240 V AC SPCO.  
Error Relay: Activated in alarm or error mode.
- Stainless Steel Construction (DRV80).
- 4" Flanged Connections.
- ASSE 1017 and CSA B125 Certified and CE.
- Shipping weight = 1150 lbs (522 kg).



For submittal drawings, refer to D6784

Recirculation Systems - Digital (GPM)							
Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126



# Water Temperature Control - Recirculation Systems

## Digital

### The Brain® Model DMC3

Model DMC3 features three DRV80 pre-piped in parallel and pressure tested complete with isolation valves, strainers, check valves, thermometers and pressure gauges. The Brain™ Model DRV80 is a fully digital recirculating valve (DRV) for “point of source” or mechanical room based installation. DRV80 is designed specifically to be the primary water temperature controller in a continuously pumped recirculating hot water system.

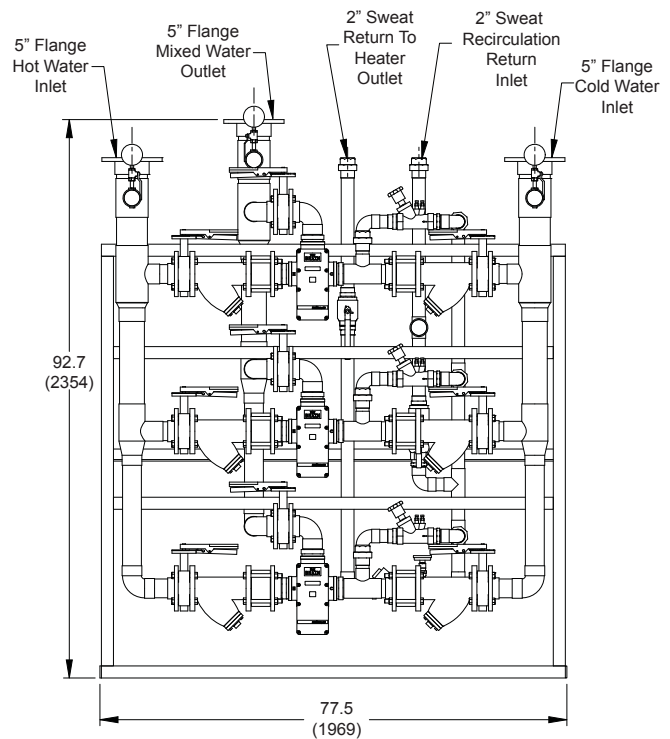
### Operational Specifications

The enhanced accuracy possible with DRV80 digital technology, combined with its data input/output communication capability equals:

- Accurate control of blended water drawn from the system at a point of use typically within  $\pm 2^{\circ}\text{F}$  at draw off points a minimum of 5m downstream of mixing valve during consistent system demand periods.
- Operational water pressure of 10 - 150 psig.
- Minimum valve inlet to outlet temperature requirement (system recirculation temperature loss) of  $2^{\circ}\text{F}$ .
- Automatic shutoff of hot water flow upon cold water inlet supply failure.
- Automatic shutoff of hot water flow in the event of a power failure.
- Maintain a consistent system “idling” temperature and control temperature creep without the use of a manual throttling device or balancing valve.
- System shall not require a temperature activated pump shutoff device (aquastat).
- Programmable set point range of  $81 - 158^{\circ}\text{F}$  ( $29 - 71^{\circ}\text{C}$ ).
- Ability to thermally disinfect at recommended temperatures.
- Programmable 1st level high/low temperature alarm display.
- Programmable temperature error level for safety shutdown.

### Technical Specifications

- 100 - 240V Power supply (12V AC output).
- 2 x 12 to 30vdc, 4-20mA current loop interfaces:  
Input: Setpoint Selection.  
Output: Measured Blend Temperature.
- Relay output: 24V DC/240 V AC SPCO.  
Error Relay: Activated in alarm or error mode.
- Stainless Steel Construction (DRV80).
- 5" Flanged Connections.
- ASSE 1017 and CSA B125 Certified and CE.
- Shipping weight = 1400 lbs (635 kg).



For submittal drawings, refer to D31414

### Recirculation Systems - Digital (GPM)

Model	Pressure Drop (psi)				Minimum System Draw-Off	Maximum Flow at 7.5ft/sec.	C <sub>v</sub>
	5	10	15	20			
DRV80/R	94	133	163	188	0	165	42
DMC1	94	133	163	188	0	165	42
DMC2	188	266	326	376	0	294	84
DMC3	282	399	489	564	0	459	126

Armstrong has technical support personnel available from 8:00am to 5:00pm EST. Call Toll Free 1-888-468-4673.



## Introduction

---

The DRV80 is available in the following configurations:

1. “Out of the Box Solution”, an individual Mixing Unit.
2. “Plug and Play Solution”, an individual Mixing Unit with Armstrong supplied piping manifold.
3. “Packaged Solution”, either a single or multiple DRV80s pre-piped and plumbed in parallel as a full Digital Mixing Center.

**Warning:** DRV80 and DRV80R require additional fittings such as inlet strainers, stop valves and check valves. Consult the piping schematics from page 12 onwards.

DRV80 is a motorized mixing valve with digital water temperature control and a 4 - 20mA two way communication capability. It is designed specifically to control the blended water in a multi-outlet recirculating hot water system.

To reduce complexity within this document, the following functional aspects are detailed specifically for the DRV80 Digital Mixing Valve “Out of the Box” model only:

- Commissioning
- Temperature Adjust
- Programming and Servicing
- Maintenance
- Spare Parts

Each DRV80 has a serial number that is maintained on file with the technical department at Armstrong.

For any installation, operation, maintenance or technical support details not covered in this guide, please call our Technical Department Toll Free at 1-888-468-4673 quoting the DMC or DRV80 model and/or serial number.

## Safety Warnings

The function of a Digital Recirculating Valve is to consistently deliver water at a predesignated temperature. The DRV80 is precision engineered to give continued superior performance provided:

1. It is installed, commissioned, operated and maintained in accordance with the recommendations provided and accepted plumbing practices.

Periodic attention is given, as necessary, to maintain the product, the accessory fittings and the plumbing system in good functional order.

In keeping with every other mechanical product, the DRV80 should not be considered as functionally infallible and as such will never totally replace the vigilance and attention of site staff who are responsible for nursing/ bathing, operation, maintenance, industrial safety and supervisory roles where such devices are in use.

Provided the DRV80 is installed, commissioned, operated and maintained, the risk of product failure and its associated consequences are either eliminated or reduced to a minimum.

## Introduction

DRV80 Operating Specifications - Hydronic	
Maximum Inlet Hot Water Supply Temperature	180°F (82°C)
Minimum Inlet Hot Water Supply Temperature	5°F (2°C) above set point
Maximum Inlet Cold Water Supply Temperature	80°F (27°C)
Minimum Inlet Cold Water Supply Temperature	34°F (1°C)
Optimum Set Point Range	100°F to 158°F (38°C to 70°C)
Minimum Recirculation Loop Temperature Loss	2°F (1°C)
Maximum Suggested Flow Rate	150 gpm (568 lpm) at 9ft per second
Minimum Re-Circulation Flow Rate	10 gpm (38 lpm)
Minimum System Draw-off	0 gpm (0 lpm)
Minimum Distance to First Outlet	49ft (15 m)
Maximum Inlet Supply Pressure	145 psi (10 bar)
Maximum Operating Pressure Drop	100 psi (7 bar)

*Inlet supply pressure must be nominally equal*

*\*DRV80 can accept temporary excursions above 185°F (85°C) and maintain control without sustaining internal damage. (ASSE 1017 certification requires exposure to 200°F (93°C) for a period of 30 minutes). Prolonged operation of the mixing valve at such elevated temperatures is not recommended.*

### DRV80 Operating Specifications - Power

Important Note: DRV80 is supplied with a UL listed “smart” transformer to reduce the incoming 120V or 240V current to 12V. The power supply should be on a GFI protected circuit. Local electrical codes must prevail and all power supply connections should be made by a licensed electrician.

It is recommended that the circulating pump is powered by the same circuit as the DRV80.

DRV80 Operating Specifications - Power	
Power Supply	120/240V AC 50 - 60 Hz
Supply Fuse / Circuit Breaker	3 Amp
Protection Rating	IPX4
Signal Cable Fittings	3/8" Light Tight Conduit Fitting
Battery	2 x CR - P2 6V
Duty Cycle	Continuously rated

DRV80 Operating Specifications - General	
Inlet Connections 0 - 90 GPM Models	2"
Inlet Connections	3"
Weight DRV80	33 lbs (15 kg)
Weight DRV80R	45 lbs (20 kg)
Weight DMC1	Consult Factory
Weight DMC2	Consult Factory

## Installation - DRV80

### DRV80

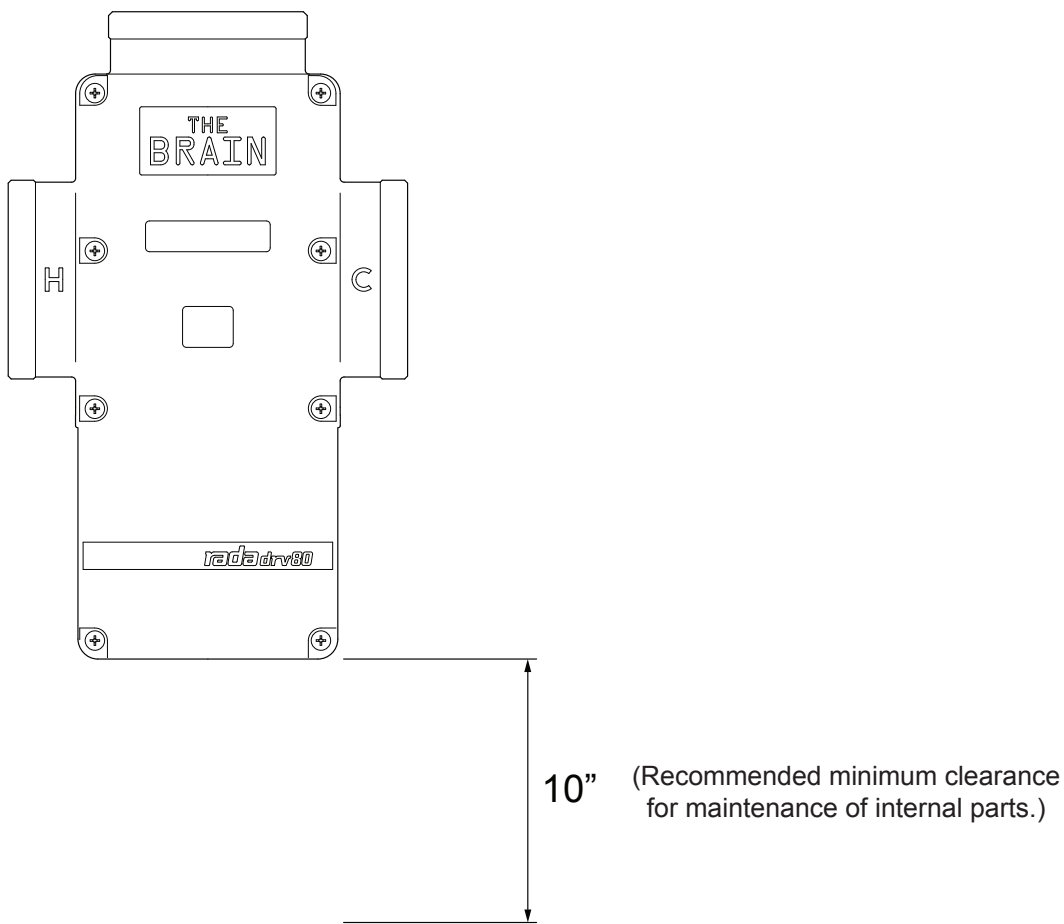
The DRV80 MUST be installed per the piping diagram (figure 12-1 or 13-1). The components circled are supplied by the installer. Failure to include these components will compromise valve and system performance.

#### Notes:

1. DRV80 is supplied fully performance and pressure tested. DRV80 should be secured firmly and safely in place in a location which will afford maintenance access.

**WARNING: Do not install DRV80 flat against the wall. Clearance must be left to access the power supply.**

2. DRV80 is supplied with a UL approved “smart” transformer which terminates in a two prong plug suitable for US electrical systems.
3. DRV80 requires a GFI protected 110V power supply.
4. The hot and cold water inlet supply pressures must be nominally equal.
5. The cold inlet supply feed to the DRV80 must be “tapped” directly from the cold inlet supply to the water heater.
6. Be sure to thoroughly flush the pipe work before fitting the DRV80.



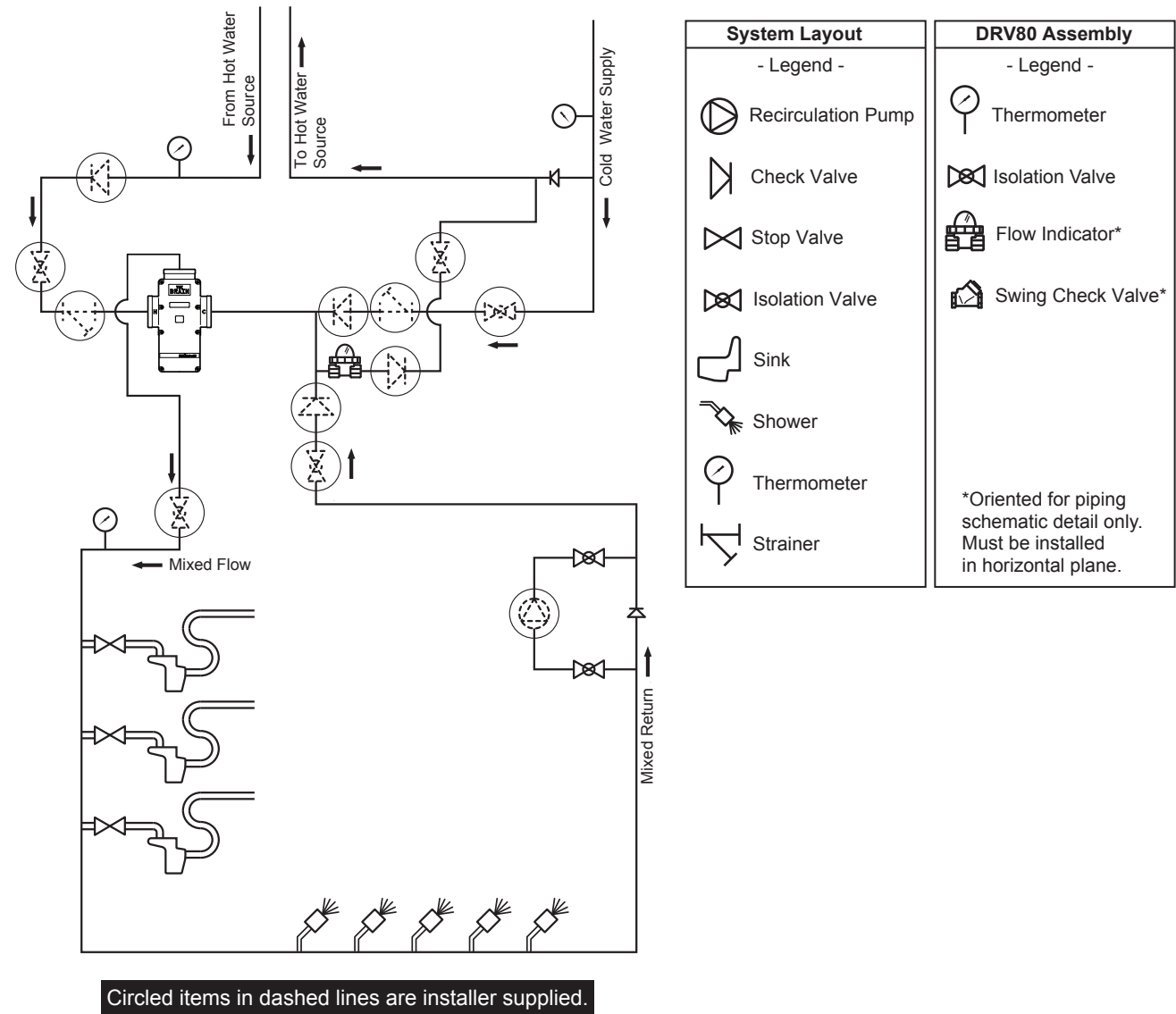
Armstrong has technical support personnel available from 8:00am to 5:00pm EST. Call Toll Free 1-888-468-4673.

# Installation - DRV80

**Figure 12-1. Single Valve Installation**

*Note: For 0-90 GPM Systems the DRV80 inlet connections are 2".*

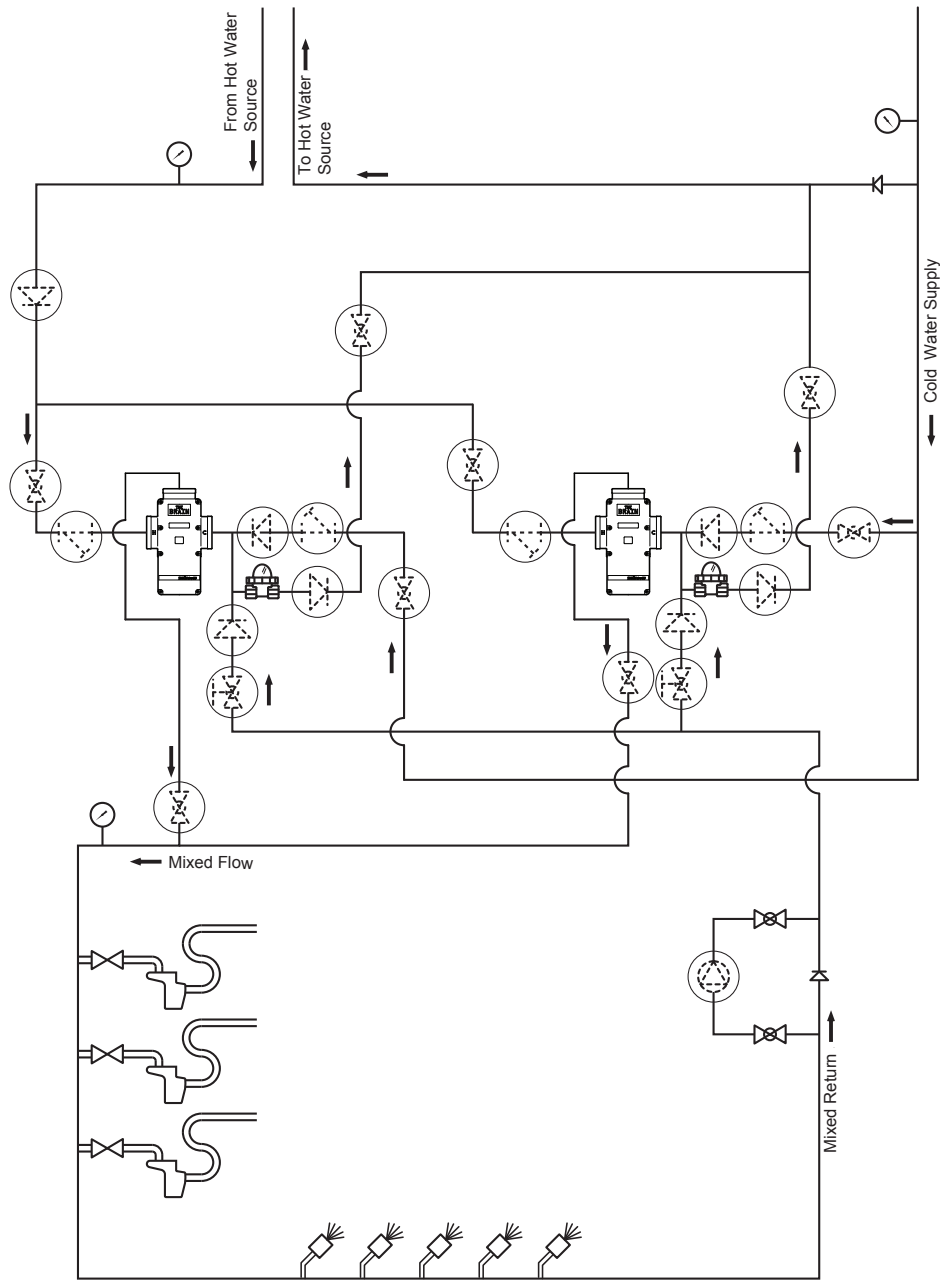
*Note: For 0-150 GPM Systems the DRV80 inlet connections are 3".*
















# Installation - DRV80

**Figure 13-1. Dual Valve 300 GPM Installation**

*Note: DRV80 inlet connections are 3".*



Circled items in dashed lines are installer supplied.

System Layout	
- Legend -	
	Recirculation Pump
	Check Valve
	Stop Valve
	Isolation Valve
	Balancing Valve
	Sink
	Shower
	Thermometer
	Strainer
DRV80 Assembly	
- Legend -	
	Thermometer
	Isolation Valve
	Flow Indicator*
	Swing Check Valve*
*Oriented for piping schematic detail only. Must be installed in horizontal plane.	

## Installation - DRV80R

---

### DRV80R

The DRV80 MUST be installed per the piping diagram (figure 15-1 or 16-2). The components circled are supplied by the installer. Failure to include these components will compromise valve and system performance.

#### Notes:

1. DRV80R is supplied fully performance and pressure tested. DRV80 should be secured firmly and safely in place in a location which will afford maintenance access.

**WARNING: Do not install DRV80 flat against the wall. Clearance must be left to access the power supply.**

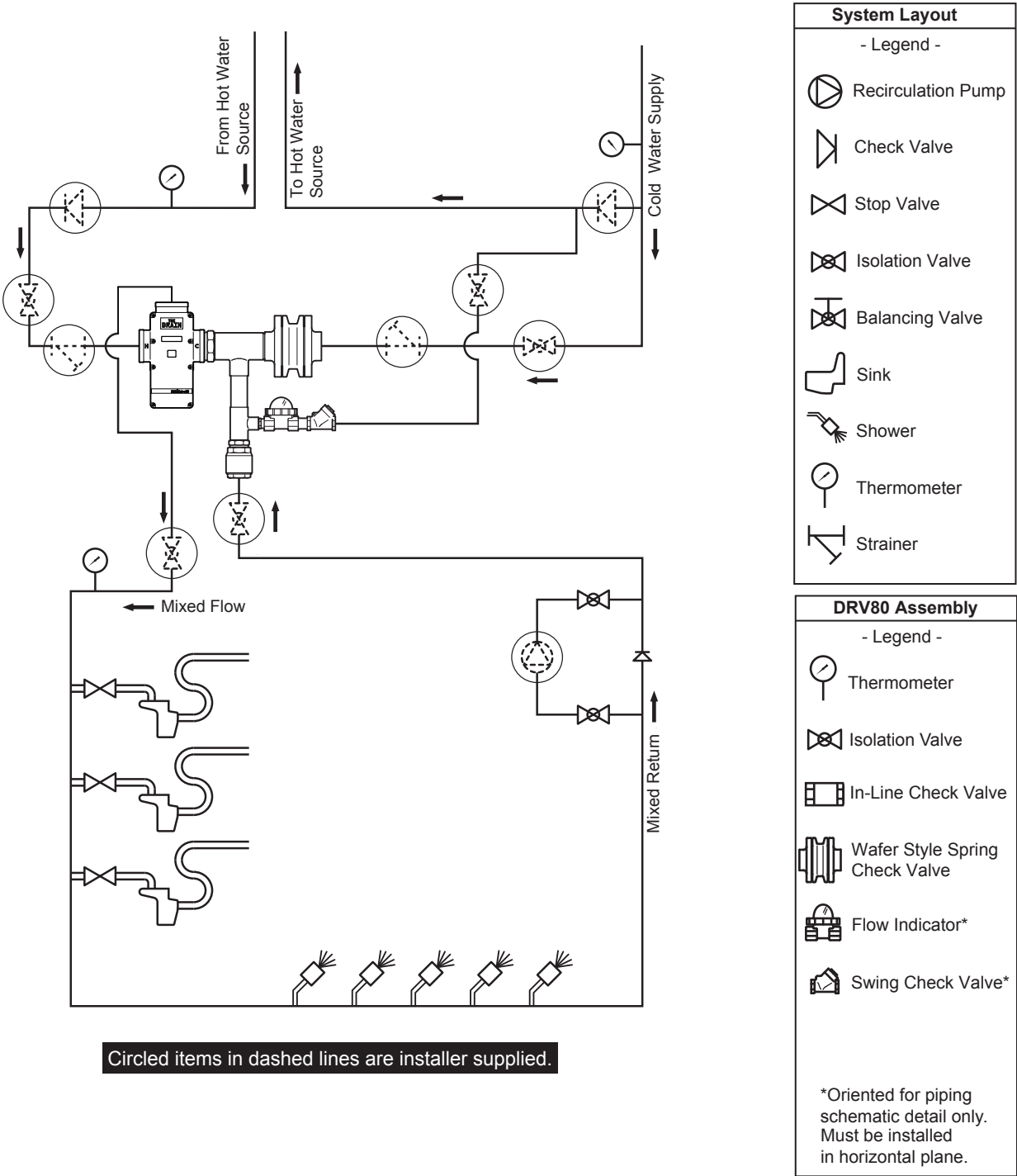
2. DRV80R is supplied with a UL approved “smart” transformer which terminates in a two prong plug suitable for US electrical systems.
3. DRV80R requires a GFI protected 110V power supply.
4. The hot and cold water inlet supply pressures must be nominally equal.
5. The cold inlet supply feed to the DRV80R must be “tapped” directly from the cold inlet supply to the water heater.
6. Be sure to thoroughly flush the pipe work before fitting the DRV80R.

# Installation - DRV80R

**Figure 15-1. Single Valve Installation**

*Note: For 0-90 GPM Systems the DRV80R inlet connections are 2".*

*Note: For 0-150 GPM Systems the DRV80R inlet connections are 3".*

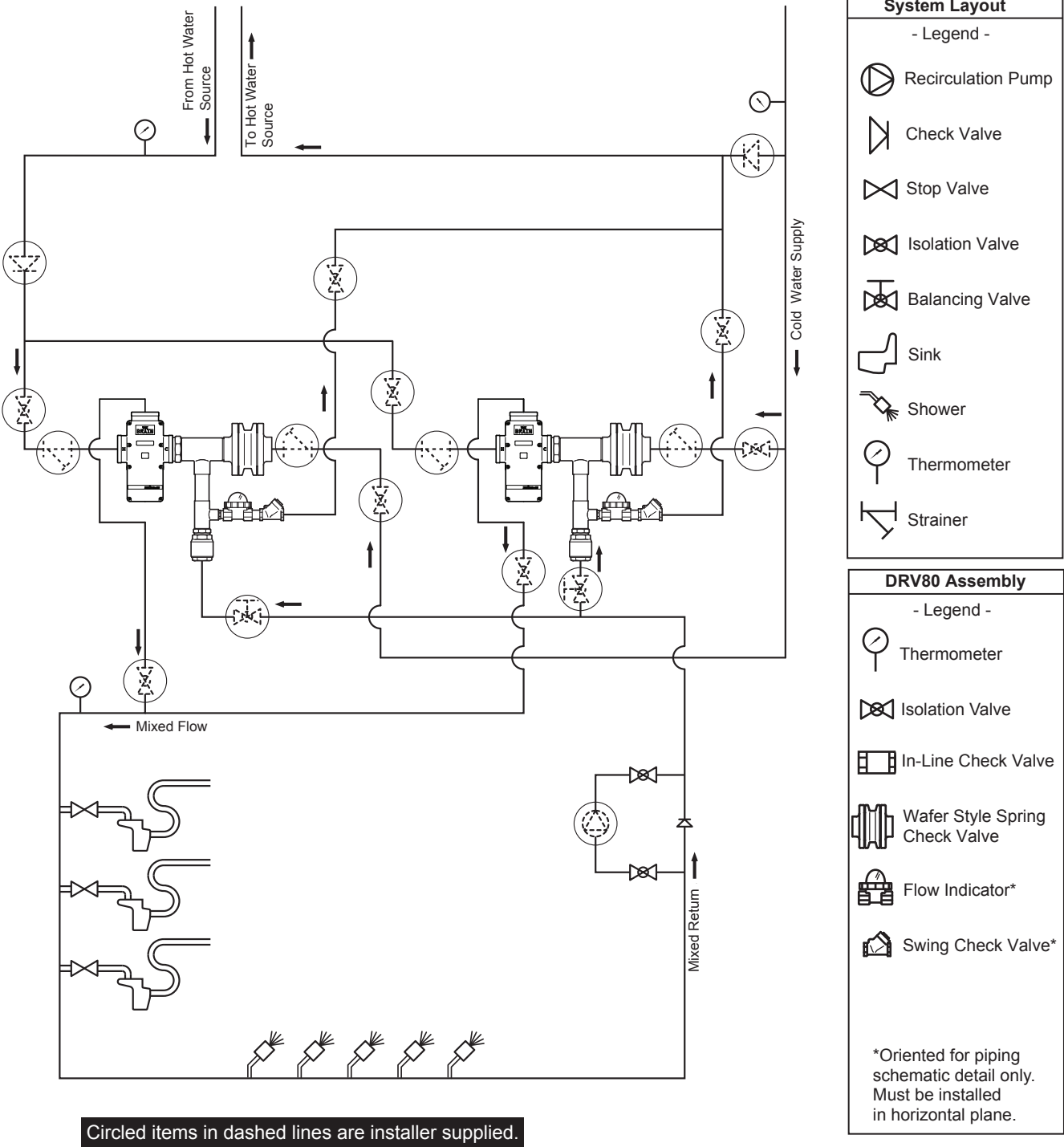




# Installation - DRV80R

**Figure 16-1. Dual Valve 300 GPM Installation**

*Note: DRV80R inlet connections are 3".*



## Installation - DMC1/DMC2

---

### DMC1/DMC2 and Higher Flow Systems

DMC1/DMC2 and higher flow systems feature either a single DRV80 Digital Recirculating Valve or multiple DRV80 Digital Recirculating Valves installed in parallel. Many of the required system components are supplied in a pre-piped assembly and the assembly **MUST** be installed per the piping diagram (figure 18-1). Please note that the circulating pump is optional and may not be included in the assembly provided by Armstrong.

#### Notes:

1. DMCs are supplied fully pressure tested, assembled and mounted to an enameled steel frame. The frame is supplied with mounting holes and should be secured firmly and safely in place in a location which will afford maintenance access.

**WARNING:** Do not install DRV80 flat against the wall. Clearance must be left to access the power supply.

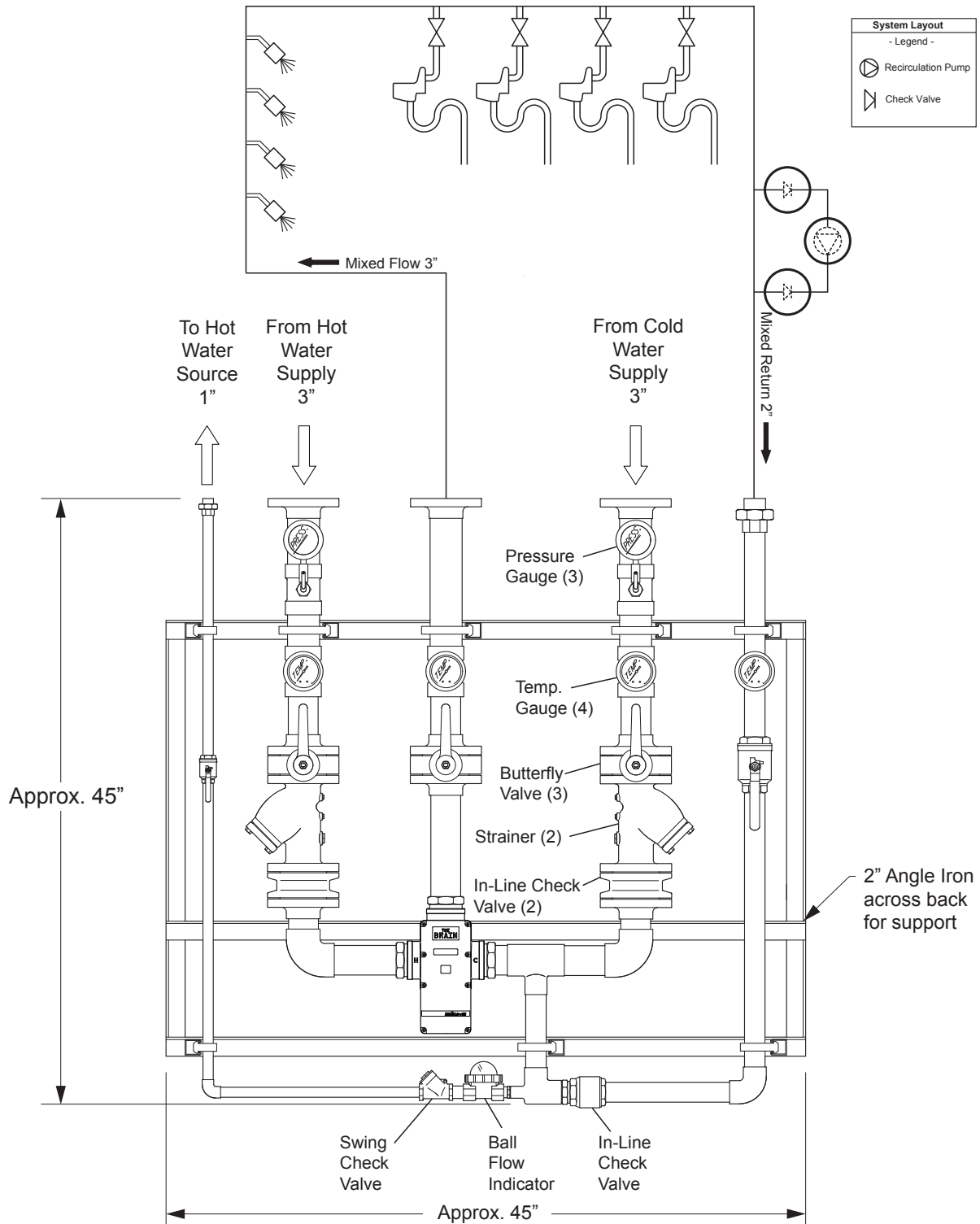
2. DMCs are supplied with a UL approved “smart” transformer which terminates in a two prong plug suitable for US electrical systems.
3. DMCs require a GFI protected 110V power supply.
4. DMCs are supplied with flanged inlet and union, identified from left to right as follows: Return to Hot Water Source, Hot Water Inlet, Mixed Flow to System, Cold Water Inlet and Return from System.
5. The hot and cold water inlet supply pressures must be nominally equal.
6. The cold inlet supply feed to the DMC must be “tapped” directly from the cold inlet supply to the water heater.
7. Be sure to thoroughly flush the pipe work before fitting the DMC.

## Installation - DMC1

### Figure 18-1. Single Valve Installation

Note: For 0-150 GPM Systems the DMC1 inlet connections are 3".

Note: For 0-300 GPM Systems the DMC2 inlet connections are 4".



Circled items in dashed lines are installer supplied.

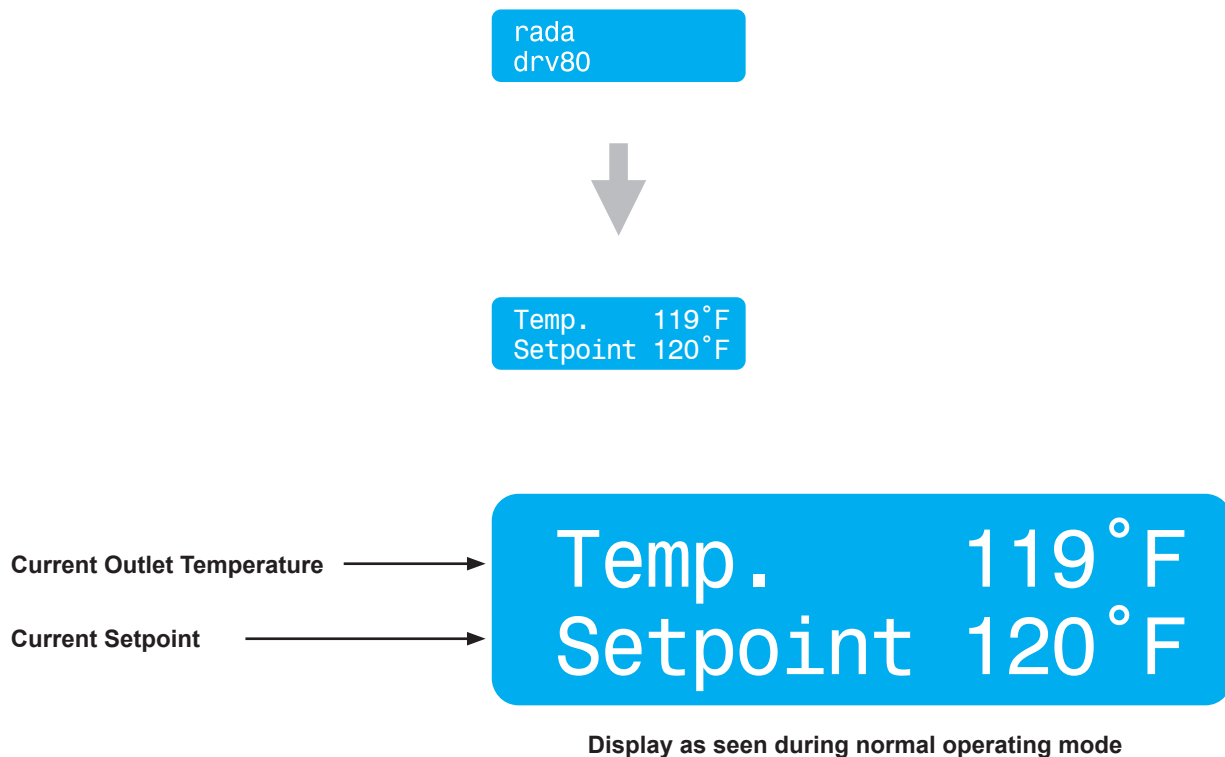
## Commissioning the System

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

### Commissioning:

1. Ensure that the system is powered and the display on the DRV80 is illuminated. Note: At system start-up the display on the DRV80 may read an error message. This will correct itself automatically during commissioning.\*
2. Flood the system by sequentially opening the inlet cold water isolation valve(s), the outlet flow isolation valve(s) and the inlet hot isolation valves(s). Ensure that the hot and cold inlet supplies are at their designated pressures and temperatures.
3. Ensure that all mixed water outlets are closed and turn on the circulating pump.
4. The display on the DRV80 will initially indicate the outlet water temperature and the default outlet water temperature setpoint which was preprogrammed at the factory per installation details which were specified at the time of order.

*\* If an error message appears in the LCD and does not correct itself automatically during commissioning, see "DRV80 Display Errors" on page 33.*



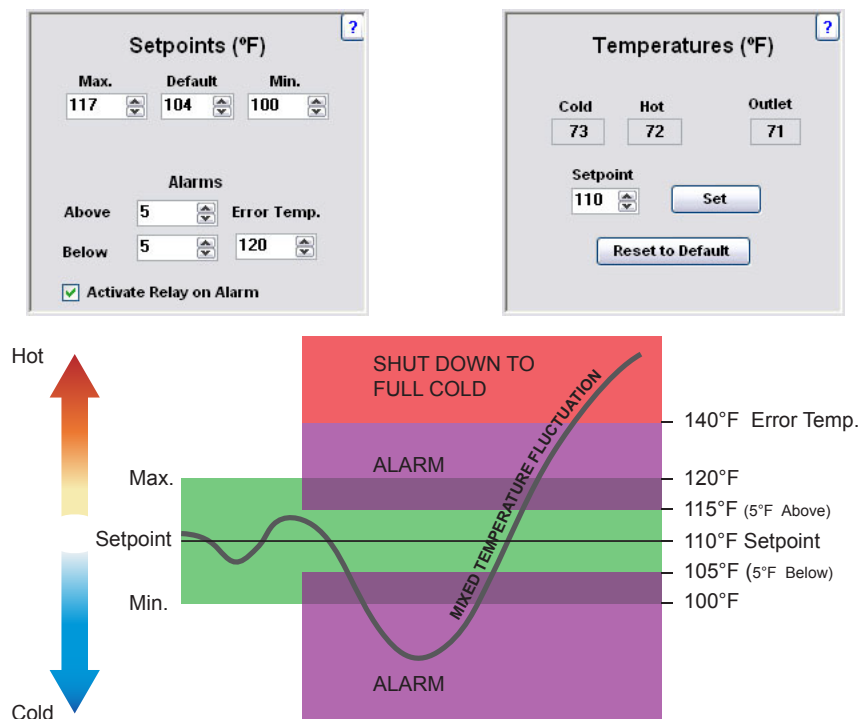
## Adjusting Temperature

**Important!** The DRV80 is supplied to the job site preprogrammed to an outlet temperature setpoint specified to Armstrong at the time the order was placed. In addition, Armstrong has enabled two levels of “out of temperature range” alerts. The alert presets can be adjusted by using the control software.

Out of Temperature Range Alert Level 1 preset:  $\pm 5^{\circ}\text{F}$  from setpoint = DRV80 will display “Temp High” or “Temp Low” only.

Out of Temperature Range Alert Level 2 preset  $+ 10^{\circ}\text{F}$  from setpoint = DRV80 will display “Error Temp” and shut off inlet hot water supply.

The following example shows how the above settings affect the DRV80’s operation:



**Note!** The “**Setpoint**” value does not need to be the same as the “**Default**” value. Both “**Setpoint**” and “**Default**” are adjustable within the “**Max.**” and “**Min.**” range only.

**Important!** The software will not allow an “**Error Temp.**” value to be set lower than the “**Max.**” value plus the “**Above**” value.

### There are three options for on site temperature adjustment:

1. Temperature Adjustment using a Laptop Computer with software and a USB port adapter (supplied with valve).
2. Temperature Adjustment using a Building Automation System (BAS) or local area computer network (LAN) with a direct 4-20 mA connection to the DRV80. This is termed “Remote Setpoint Adjustment”.
3. Temperature Adjustment using a Web Browser via the integral serial port and BrainScan™ supplied by Armstrong.\*

\* This option is detailed in a separate Installation, Operation and Maintenance (IOM) Guide for BrainScan™. Available by contacting Armstrong technical support.

## Temperature Adjust Using Laptop or PC

---

### System Requirements

---

Operating System: Windows XP or Windows Vista.

Minimum Screen Resolution: 1024 x 768 (Recommended 1280 x 1024 or higher.)

### Wireless Connection to DRV80

---

1. Connect the IrDA Wireless Adapter to an available USB port on a laptop or PC.
2. The IrDA Wireless Adapter needs to be within range of the DRV80 and pointing toward the black IrDA sensor on the front, below the LCD Display.
3. When the Adapter is in range, an icon will appear on the Windows Taskbar to confirm.
4. When transferring data to and from the DRV80, the icon changes to confirm function.



### Software Installation

---

1. Insert the CD-ROM. The CD should run automatically. If the CD does not start automatically, then please use the support instructions on the CD wallet.
2. Select the “**Control Software**” button from the menu and follow the on-screen instructions.
3. The “**Rada**” Icon will automatically be placed on the desktop. Double-click the icon to launch the software.
4. If the icon does not appear, locate and double click on the “**Rada**” icon in “**C:\Program Files\Kohler Mira\Rada Digital**”.
5. You are now ready to add new users and set up passwords. Please go to the next section.

The Control Software can be downloaded at <http://armstronginternational.com/resource-library> and search for “**DRV80 Laptop**”.

## DRV80 Control Screen

The screenshot shows the Rada DRV80 Control Screen interface. At the top, there is a menu bar with 'File' and 'Help'. The main title is 'Rada DRV80'. Below the title, there are six main panels, each with a question mark icon in the top right corner:

- Options:** Contains 'Address' (Standard selected, Alternate unselected), 'Offset (°F)' (0), 'Units' (°F selected, °C unselected), 'Setpoint Source' (Internal selected, Ext. 4-20mA unselected), 'Enable Disinfection' (checkbox), and 'Disinfection Timeout (Mins)' (85).
- Disinfection:** Contains 'Arm' and 'Trigger' buttons, 'Last Disinfection' text, 'by' text, and 'Cool Down' and 'Abort' buttons.
- Engineer:** Contains a note 'This data in this Panel must be written for each individual Valve.', 'Calibration No.' (0), 'Calibrate' button, 'Location' text box, 'Commissioned on' text box, 'Commission' button, 'Serviced by' text box, and 'Serviced' button.
- Setpoints (°F):** Contains 'Max.' (158), 'Default' (100), 'Min.' (100), 'Alarms' section with 'Above' (4) and 'Below' (4) values, 'Error Temp.' (173), and 'Activate Relay on Alarm' checkbox.
- Temperatures (°F):** Contains 'Cold' (72), 'Hot' (72), 'Outlet' (32), 'Setpoint' (100), 'Set' button, and 'Reset to Default' button.
- Valve Information:** Contains 'Serial No.' (0), 'Version' (0), and 'Date of manufacture' text box.

At the bottom of the screen, there are 'Read' and 'Write' buttons, and a status indicator 'The Valve is Off line' with a 'Valve On line/ Off line' button.

On launching an initial session, it is good practice to establish the DRV80's current settings before making a change. Point the IrDA Infrared Adapter at the valve until the icon appears on the taskbar to confirm a connection is established (see page 21), then press **"Read"**. The box above the **"Read"** and **"Write"** buttons shows the progress of the transfer. The DRV80's current settings are now displayed.

To transfer data from the screen to the valve, press **"Write"**.

Press **"Online/Offline"** to change the DRV80's control state.

**"Online"** - the DRV80 is controlling the temperature of the blend circuit within the programmed parameters.

**"Offline"** - the valve is switched to full cold flow and all temperature control functions and alarms are suspended.

Switching the DRV80 **"Offline"** makes the blend circuit safe when writing changes to the valve.

The current settings can be saved to a recipe file (\*.rcp) by choosing **"File"**, **"Save"**.



## Options

### Switch “Offline” to make changes to “Options”.

The “**Address**” of the DRV80 as used by the BrainScan™ can be set to “**Standard**” or “**Alternate**”. This allows the use of two DRV80s on one serial line, such as DMC2 or DMC22 recirculation systems.

Set the first DRV80 to “**Standard**” and the second DRV80 to “**Alternate**”. The “**Write**” button must be pressed after this option is changed.

**Important Note:** This function will only work with DRV80 version 9 and onwards. This can be found under “**Valve Information**” on the “**DRV80 Control Screen**”.

The “**Offset**” enables the system to correct for temperature loss and mixing conditions by creating a temperature offset to the valve. The offset temperature is subtracted from the setpoint temperature, this allows the valve to produce water at the correct temperature at the required point in the circuit. The offset is limited to  $\pm 9^{\circ}\text{F}$  ( $\pm 5^{\circ}\text{C}$ ). The “**Write**” button must be pressed after this option is changed.

**Important Note:** This function will only work with DRV80 Version 9 and onwards. This can be found under “**Valve Information**” on the “**DRV80 Control Screen**”.

The temperature conversion units can be changed from  $^{\circ}\text{F}$  to  $^{\circ}\text{C}$ .

If the setpoint is required to be controlled via external software, switch the setpoint source to “**Ext. 4-20mA**”. Refer to section “**DRV80 using Building Automation System (BAS)**” for further details (page 34).

**Note!** After changing the temperature display units or the setpoint source, the valve must be unplugged (powered off/ on electrically) to complete the change. Press “**Read**” to confirm the settings.

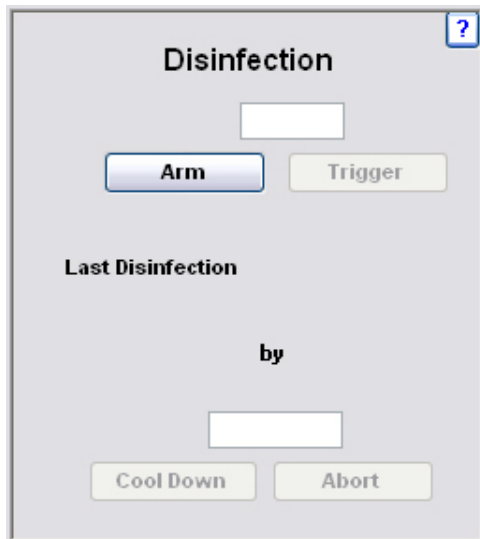
The “**Disinfection Timeout**” is the maximum number of minutes the temperature error messages are disabled to allow for disinfection and cool down before automatically switching back to normal operation. The “**Disinfection Enable**” box must be checked before the disinfection mode can be armed and triggered.

**Caution!** All temperature error messages could remain disabled after disinfection has been completed. During “**Disinfection Timeout**”, the temperature within the blend circuit is not thermostatically controlled until the “**Cool Down**” button is pressed.

The screenshot shows the 'Options' screen of the DRV80 control interface. It features a title bar with the word 'Options' and a question mark icon. Below the title bar, there are several settings: 'Address' with radio buttons for 'Standard' (selected) and 'Alternate'; 'Offset (°F)' with a text box containing '0'; 'Units' with radio buttons for '°F' (selected) and '°C'; 'Setpoint Source' with radio buttons for 'Internal' (selected) and 'Ext. 4-20mA'; a checkbox for 'Enable Disinfection' which is unchecked; and 'Disinfection Timeout (Mins)' with a text box containing '85' and a small up/down arrow icon.

## Disinfection

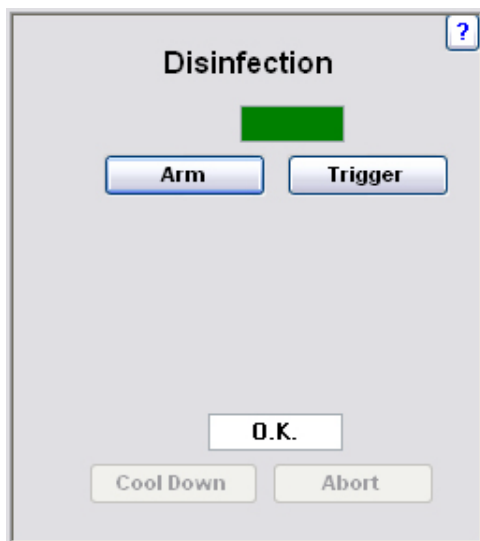
---



The screenshot shows a control panel titled "Disinfection" with a help icon (?) in the top right corner. Below the title is a white rectangular box. Underneath this box are two buttons: "Arm" (highlighted in blue) and "Trigger" (grey). Below these buttons is the text "Last Disinfection" followed by the word "by" and another white rectangular box. At the bottom of the panel are two buttons: "Cool Down" and "Abort".

Switch "Online" to perform "Disinfection Cycle".

The disinfection mode must first be enabled under "**Options**" before it can be armed and triggered. Due to the scalding temperature, the disinfection process must be supervised. The DRV80 should be monitored whilst in disinfection mode and no one should be allowed to approach within 3 metres of any affected outlets.



The screenshot shows the same control panel as before, but with a green rectangular box above the "Arm" and "Trigger" buttons. The "Arm" button is still highlighted in blue. Below the "Arm" and "Trigger" buttons is a white rectangular box containing the text "O.K.". The "Cool Down" and "Abort" buttons remain at the bottom.

Press "**Arm**" to make ready. The green box will confirm the operation.

Press "**Trigger**" while the box is green to start the disinfection cycle. The box will turn from green to red to confirm the operation.

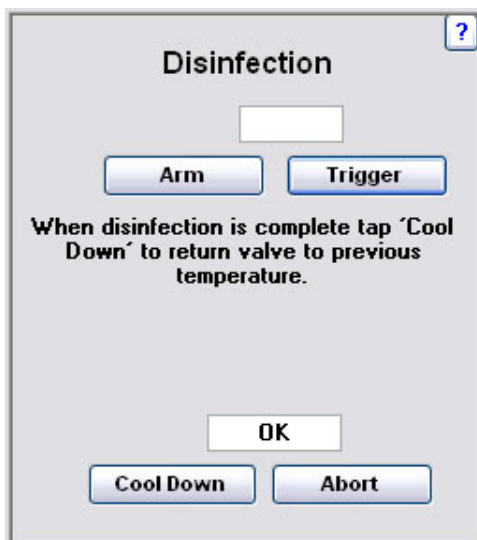
## Disinfection (continued)



Water flow commences when the nine second countdown reaches zero and the display on the DRV80 changes to confirm the disinfection mode. Press **“Abort”** at any time to stop the cycle.

**Note!** Pressing **“Abort”** could cause a temperature error to be displayed.

Full Hot 160°F  
Disinfection



Press **“Cool Down”** as per the on screen instructions. The display on the DRV80 changes to confirm the cool down mode. After the cool down period has been initiated, the blend circuit takes time to return to normal temperature. This must be considered when setting the **“Disinfection Timeout”** value under **“Options”**.

At the end of the **“Disinfection Timeout”** period, the DRV80 will return to it's normal operating mode.

Temp 119°F  
Cooling Down

## Commission, Calibration and Servicing

---

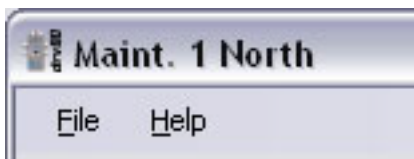


Switch “Online” to make changes to “Engineer”.

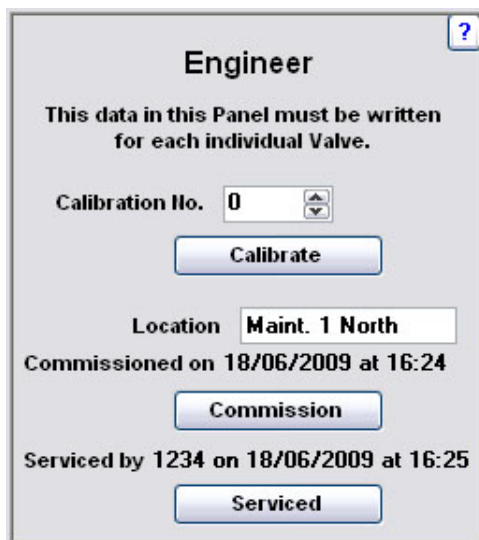
Altering the “**Calibration No.**” will affect the performance of the DRV80. The “**Calibration No.**” must match the value printed on the valve body.

Enter a name for the location of the DRV80 (maximum 16 characters).

Press “**Commission**” and the location will be stored along with the date and time.



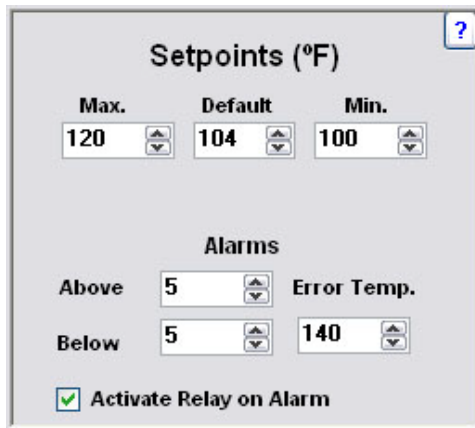
The location will now appear at the top of the window every time the “**Read**” button is pressed..



Press “**Serviced**” to record the time and date from the Laptop or PC.

## Altering Absolute Setpoint Range and Alarms

---

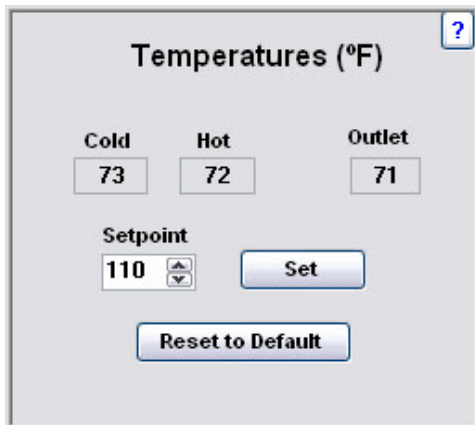


Switch “Offline” to make changes to “Setpoints”.

1. Alter values to their required settings.
2. Turn DRV80 Offline by pressing “**Valve Online/Offline**”.
3. Transfer the settings to DRV80 by pressing “**Write**”.
4. Turn DRV80 back Online by pressing “**Valve Online/Offline**”.
5. Press “**Read**” to confirm the settings have transferred to the DRV80.

## Altering Local Setpoint Value

---



Switch “Online” to make changes to “Temperatures”.

1. Alter the Setpoint to the required value.
2. Transfer the settings to DRV80 by pressing “**Set**”. (Valve does not have to be “**Offline**”.)
3. Alter the Setpoint back to the “**Default**” value by pressing “**Reset to Default**”.
4. The Setpoint value is shown on the DRV80.

## Setpoint - Explained

---

The setpoint is the required outlet water temperature supplied to the blend circuit. This area controls the range in which the setpoint can be adjusted to, but not the current setpoint itself (valve display). The Default value is the setpoint the valve will return to should the power be lost and the DRV80 reset. The “**Default**” is adjustable, but cannot be more than the “**Max.**” (maximum) value or less than the “**Min.**” (minimum) value.

## Alarms - Explained

The DRV80 does not contain an audible alarm, however, the error relay may be used to send an alarm signal from the DRV80 if the blend temperature falls outside either the “**Above**” or “**Below**” tolerance values of the setpoint. If the blend temperature exceeds the “**Error Temp.**” value, the DRV80 activates the error relay and closes down to full cold. For more details on the error relay connection see section “**DRV80 using Building Automation System (BAS)**” in the **Installation and Maintenance Guide**.

### Example 1:

#### Setpoints (°F)

Max.	Default	Min.
120	104	100

#### Alarms

Above	5	Error Temp.
Below	5	140

☒ Activate Relay on Alarm

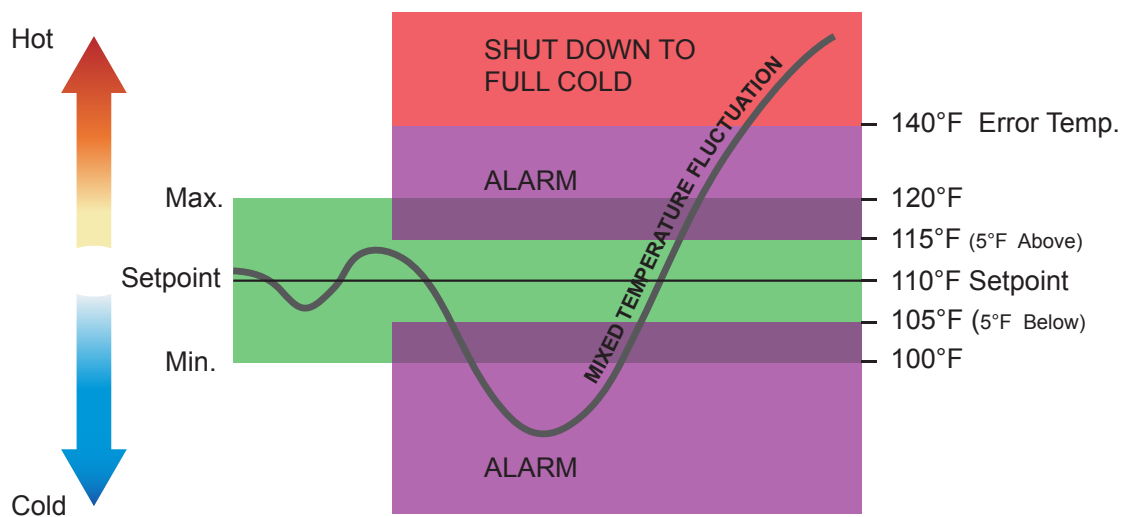
#### Temperatures (°F)

Cold	Hot	Outlet
73	72	71

Setpoint: 110

Set

Reset to Default



**Note!** The “**Setpoint**” value does not need to be the same as the “**Default**” value. Both “**Setpoint**” and “**Default**” are adjustable within the “**Max.**” and “**Min.**” range only.

## Example 2:

### Setpoints (°F)

Max.	Default	Min.
120	104	100

#### Alarms

Above	0	Error Temp.
Below	5	120

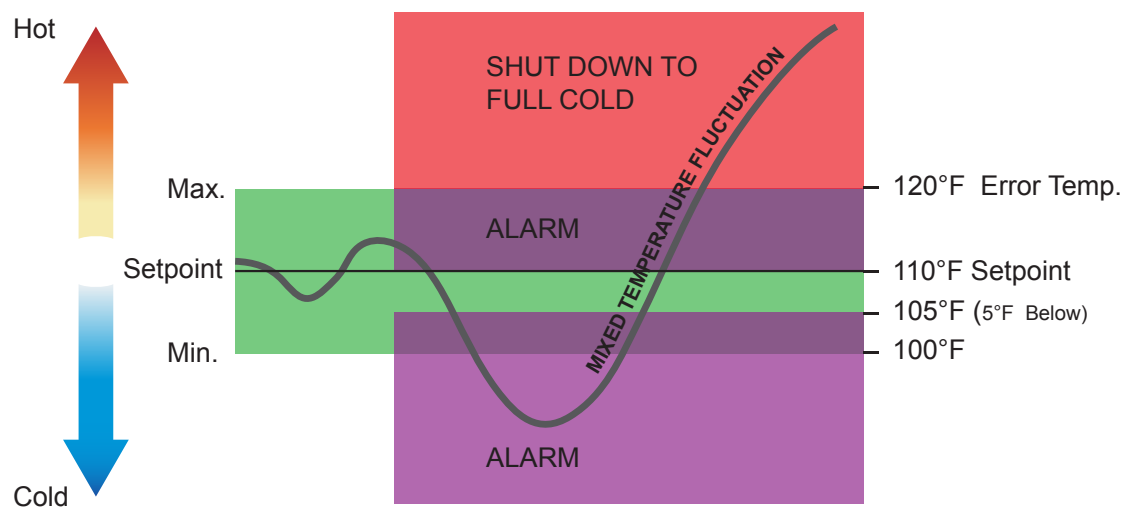
☒ Activate Relay on Alarm

### Temperatures (°F)

Cold	Hot	Outlet
73	72	71

Setpoint: 110 Set

Reset to Default



**Important!** The software will not allow an “Error Temp.” value to be set lower than the “Max.” value plus the “Above” value.



# Temperatures

?

Temperatures (°F)

Cold

73

Hot

72

Outlet

71

Setpoint

110

Set

Reset to Default

The current inlet and outlet temperatures are displayed. The setpoint is the current blend temperature the DRV80 is instructed to control to. Pressing **“Reset to Default”** will alter to match the **“Default”** value in the **“Setpoints”** area. Switch valve to the **“on”** state and press **“Read”** to show the current settings. Press **“Set”** to transfer the setpoint to the valve. The display appears on the DRV80 indicating the normal operating mode.

?

Setpoints (°F)

Max.

120

Default

104

Min.

100

Alarms

Above

5

Error Temp.

Below

5

140

☒ Activate Relay on Alarm

Temp

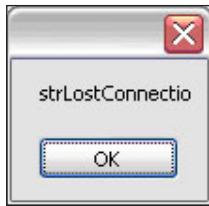
119°F

Setpoint

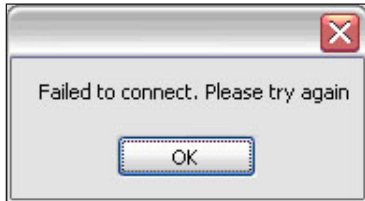
120°F

## Error Messages - PC Display

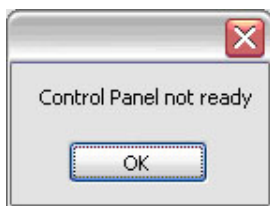
---



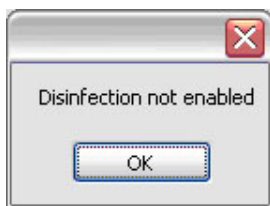
Connection was lost during data transfer. Make sure IrDA adapter remains in range of DRV80 (see IrDA symbols below). If the error persists, make sure the IrDA adapter is in range and cycle the power to DRV80 off/on once to reset.



Connection was not established before data transfer. Make sure IrDA adapter is in range of DRV80 (see IrDA symbols below). If the error persists, make sure the IrDA adapter is in range and cycle the power to DRV80 off/on once to reset.



Connection was not established before data transfer. Make sure IrDA adapter is in range of DRV80 (see IrDA symbols below).



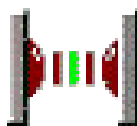
The “**Enable Disinfection**” box has not been checked and transferred to DRV80 prior to initiating a disinfection cycle. Check “**Enable Disinfection**” box and press “**Write**”.

## IrDA Symbols (Windows Taskbar)

---



DRV80 is in range of IrDA adapter. If symbol is not displayed when IrDA is at close range, check USB connection (remove and reconnect IrDA) or cycle power to DRV80 off/on once.



Data is being transferred to/from DRV80. If symbol is not displayed, check IrDA adapter is in range of DRV80.

## DRV80 Display Alerts

---

Temp High 127°F  
Setpoint 120°F

Outlet temperature exceeds the alarm range. This condition causes an alarm signal to be activated.

Temp Low 100°F  
Setpoint 120°F

Outlet temperature is below the alarm range. This condition causes an alarm signal to be activated.

Emergency Mode  
Setpoint 102°F

Maintenance to the DRV80 internal motor is required. DRV80 continues to operate safely, but with reduced performance.

## DRV80 Display Errors

---

Temp 120°F  
Error PCB

Reset the DRV80. If the error persists, replace the PCB.

Temp 120°F  
Error Motor

Reset the DRV80. If the error persists, replace the Motor.

Temp 120°F  
Error Thermistor

Reset the DRV80. If the error persists, check the Thermistor connections or replace the Thermistors.

Temp High 120°F  
Error Temp

Outlet temperature exceeds the “**Error Temp**” value. This condition causes the DRV80 to switch to full cold.

Temp 120°F  
Error Battery

Reset the DRV80. If the error persists, replace the battery (see “**Fitting the Cable Conduit and Changing the Battery**”).

## DRV80 using Building Automation System (BAS)

---

DRV80 contains three integral connection points for component/system integration.

### 1. Building Automation System

The DRV80 can be adjusted remotely when linked via its integral 4-20 mA connection to a Building Automation System (BAS) or Local Area Computer Network (LAN).

Two signal connections can be made via a 3/8" Liquitight connector conduit fitting.

#### The connections are:

**Remote Setpoint Adjustment.** The ability to change the setpoint on the DRV80 via a Building Automation System (BAS) or Local Area Computer Network (LAN). This is an opto-isolated input intended for connection to a 4-20 mA self powered transmitter with a maximum output of 12V. The connection is used to determine the DRV80's setpoint and is scaled at 4-20 mA for 0 - 100°C. The input signal is only active when the DRV80 is configured to "Ext. 4-20 mA". These settings can only be altered when the DRV80 is switched to its "Offline" state.

**Actual Outlet Temperature Reading.** The ability to link the computer signal from the DRV80 outlet temperature thermistor to a Building Automation System (BAS) or Local Area Computer Network (LAN).

This is an opto-isolated signal intended for connection to a 4-20 mA self powered indicator with a maximum output of 12V. The signal sends the DRV80's outlet temperature and is scaled at 4-20 mA for 1 - 100°C.

### 2. Error Relay Connection

The DRV80 can be connected to a downstream audible alarm, a solenoid valve or another ancillary device via a direct connection to its error relay via a liquitight connector conduit fitting.

This provides a connection to a set of single pole changeover relay contacts fused at 2 Amps. When the DRV80 is operating normally, the relay is energized and therefore the contacts are closed. The relay is de-energized and the contacts are open under the following circumstances:

1. Power failure.
2. Start up sequence.
3. Outlet temperature causing an alarm signal.
4. Outlet temperature causing an error signal.
5. Internal fault on PCB.
6. Battery failure.
7. Thermistor failure.

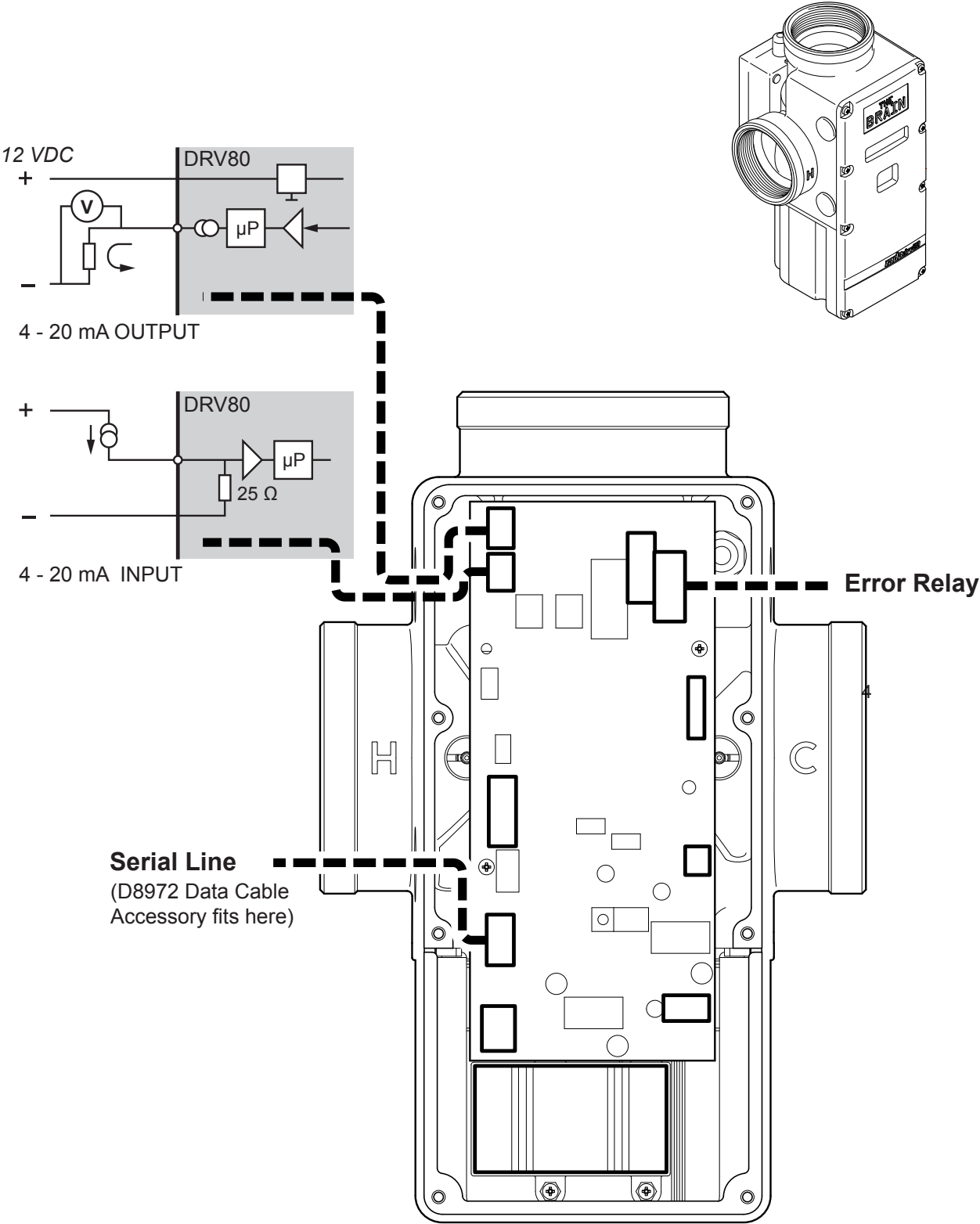
### 3. Serial Line Connection\*

The DRV80 provides an RS485 serial interface for connection to BrainScan™.

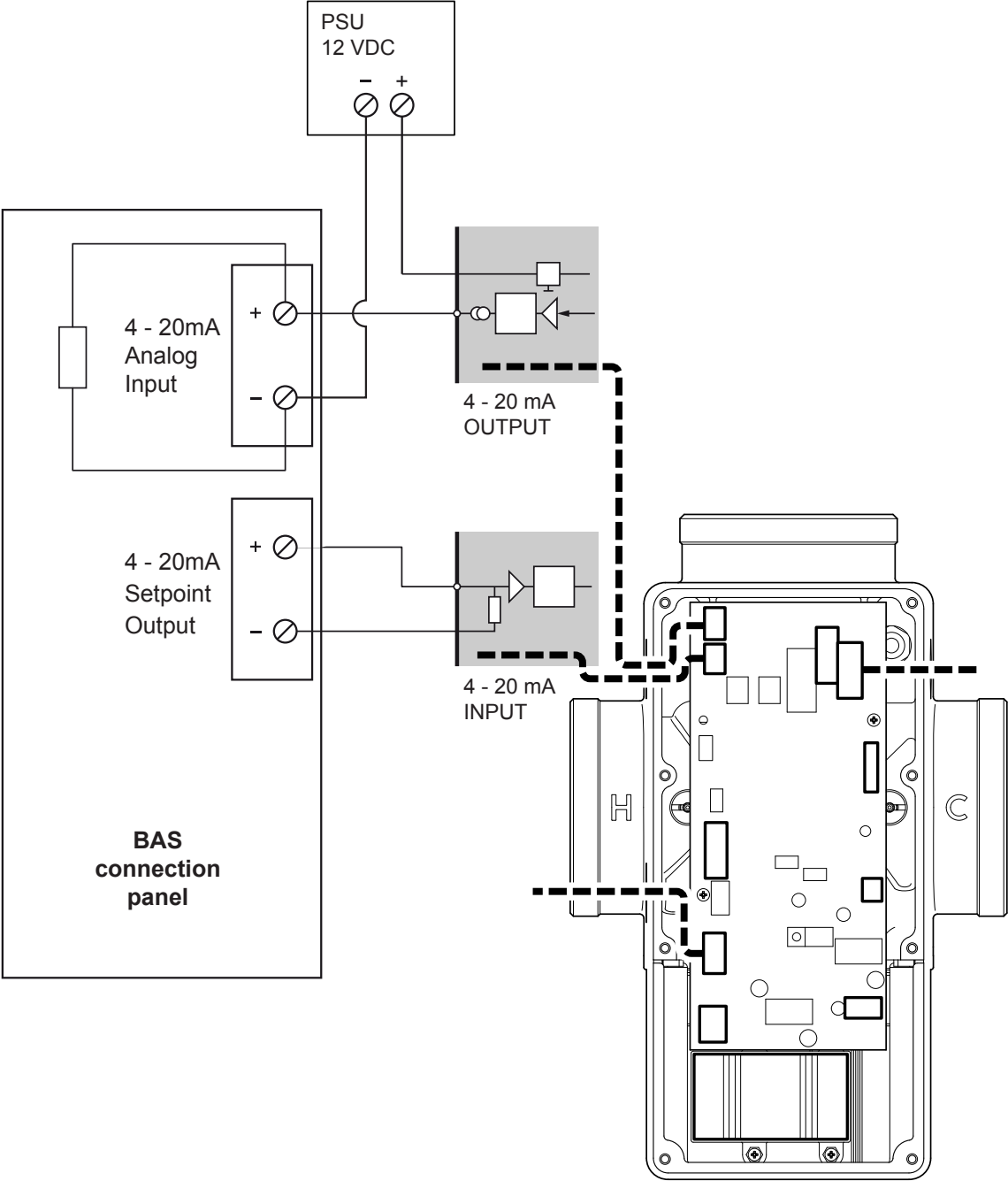
**Note:** BrainScan™ is not specifically addressed by this Installation Manual.

*\* Serial Line Connection is detailed in a separate Installation, Operation and Maintenance (IOM) Guide for BrainScan™. Available by contacting Armstrong technical support.*

**DRV80 using Building Automation System (BAS) (continued)**



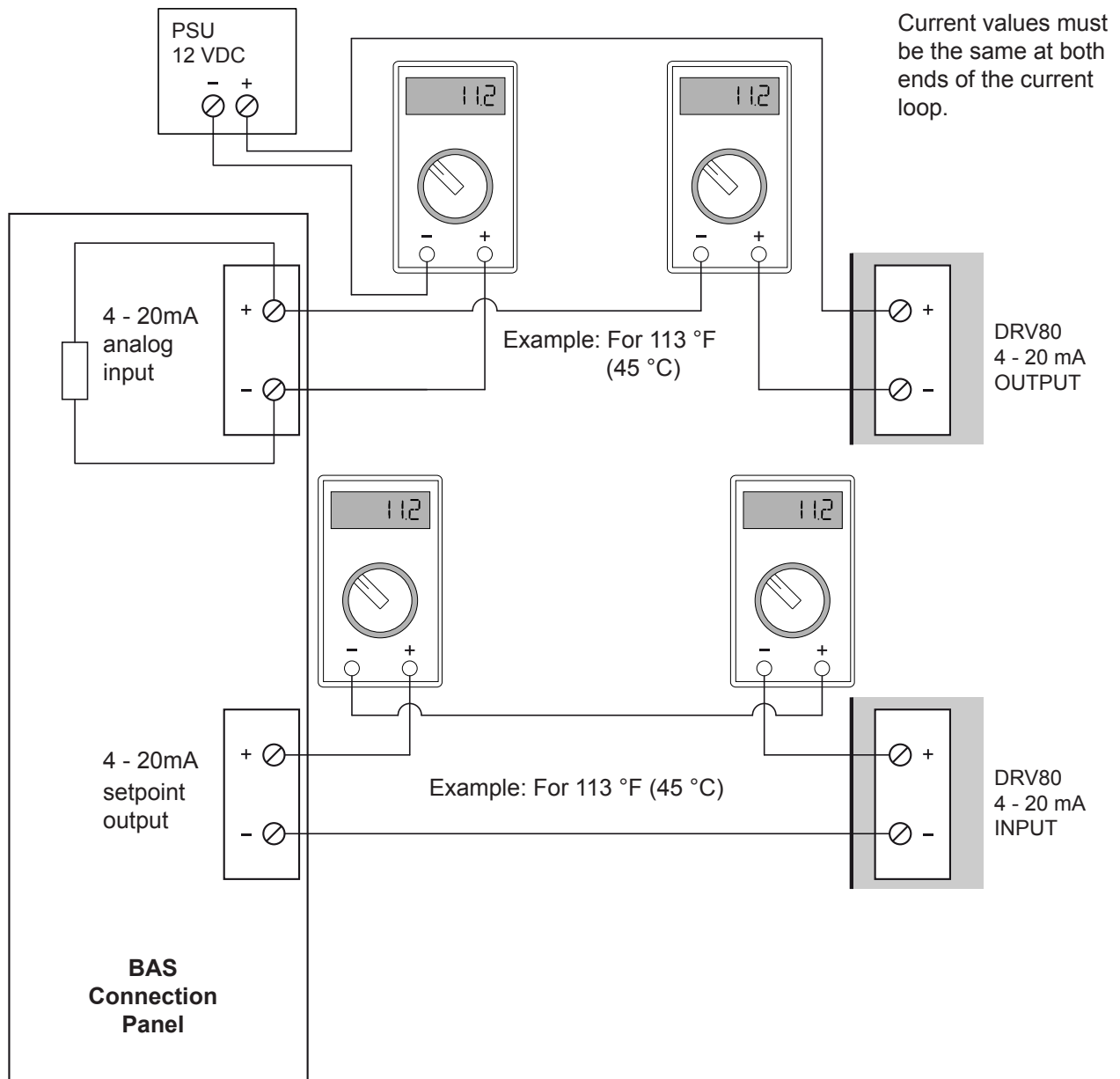
**DRV80 connected to generic BAS**



## Testing DRV80/BAS connections using two multimeters

### Current Loop Check

Set Multimeters to mA dc current range.



### Fault Diagnosis for BAS

Possible causes for BAS indicating an incorrect flow value:

- **BAS analog input terminals resistance is too high causing current to be limited to the analog input giving a lower reading than expected on the BAS display.**
- **BAS signal scaling is incorrect. Consult BAS engineer.**

Use Charts 1.1 and 1.2 to check the temperature output from the DRV80 against the current input from the BAS.

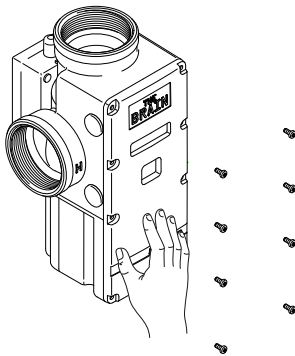
°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA	°C	mA
0	4	10	5.6	20	7.2	30	8.8	40	10.4	50	12	60	13.6	70	15.2	80	16.8	90	18.4				
1	4.16	11	5.76	21	7.36	31	8.96	41	10.56	51	12.16	61	13.76	71	15.36	81	16.96	91	18.56				
2	4.32	12	5.92	22	7.52	32	9.12	42	10.72	52	12.32	62	13.92	72	15.52	82	17.12	92	18.72				
3	4.48	13	6.08	23	7.68	33	9.28	43	10.88	53	12.48	63	14.08	73	15.68	83	17.28	93	18.88				
4	4.64	14	6.24	24	7.84	34	9.44	44	11.04	54	12.64	64	14.24	74	15.84	84	17.44	94	19.04				
5	4.8	15	6.4	25	8	35	9.6	45	11.2	55	12.8	65	14.4	75	16	85	17.6	95	19.2				
6	4.96	16	6.56	26	8.16	36	9.76	46	11.36	56	12.96	66	14.56	76	16.16	86	17.76	96	19.36				
7	5.12	17	6.72	27	8.32	37	9.92	47	11.52	57	13.12	67	14.72	77	16.32	87	17.92	97	19.52				
8	5.28	18	6.88	28	8.48	38	10.08	48	11.68	58	13.28	68	14.88	78	16.48	88	18.08	98	19.68				
9	5.44	19	7.04	29	8.64	39	10.24	49	11.84	59	13.44	69	15.04	79	16.64	89	18.24	99	19.84				
																		100	20				

°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA	°F	mA
32	4	50	5.6	68	7.2	86	8.8	104	10.4	122	12	140	13.6	158	15.2	176	16.8	194	18.4				
33.8	4.16	51.8	5.76	69.8	7.36	87.8	8.96	105.8	10.56	123.8	12.16	141.8	13.76	159.8	15.36	177.8	16.96	195.8	18.56				
35.6	4.32	53.6	5.92	71.6	7.52	89.6	9.12	107.6	10.72	125.6	12.32	143.6	13.92	161.6	15.52	179.6	17.12	197.6	18.72				
37.4	4.48	55.4	6.08	73.4	7.68	91.4	9.28	109.4	10.88	127.4	12.48	145.4	14.08	163.4	15.68	181.4	17.28	199.4	18.88				
39.2	4.64	57.2	6.24	75.2	7.84	93.2	9.44	111.2	11.04	129.2	12.64	147.2	14.24	165.2	15.84	183.2	17.44	201.2	19.04				
41	4.8	59	6.4	77	8	95	9.6	113	11.2	131	12.8	149	14.4	167	16	185	17.6	203	19.2				
42.8	4.96	60.8	6.56	78.8	8.16	96.8	9.76	114.8	11.36	132.8	12.96	150.8	14.56	168.8	16.16	186.8	17.76	204.8	19.36				
44.6	5.12	62.6	6.72	80.6	8.32	98.6	9.92	116.6	11.52	134.6	13.12	152.6	14.72	170.6	16.32	188.6	17.92	206.6	19.52				
46.4	5.28	64.4	6.88	82.4	8.48	100.4	10.08	118.4	11.68	136.4	13.28	154.4	14.88	172.4	16.48	190.4	18.08	208.4	19.68				
48.2	5.44	66.2	7.04	84.2	8.64	102.2	10.24	120.2	11.84	138.2	13.44	156.2	15.04	174.2	16.64	192.2	18.24	210.2	19.84				
																		212	20				



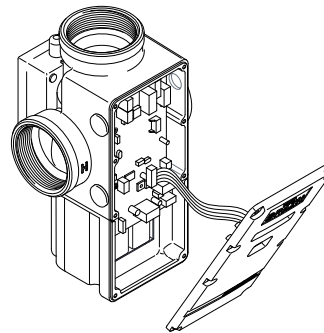
## Fitting the Cable Conduit and Changing the Battery

Battery replacement and conduit connection must be carried out in accordance with these instructions by designated and competent personnel.



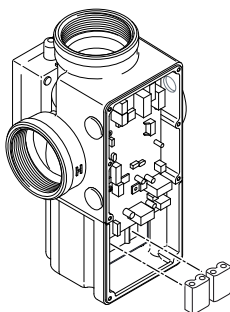
**Figure 22-1.**

Isolate electricity to DRV80. Remove all 8 cover screws, make sure cover is constantly supported.



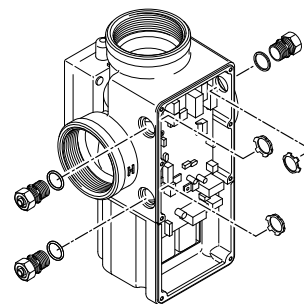
**Figure 22-2.**

**Caution heavy parts.**  
**Carefully** remove cover and disconnect display cable.



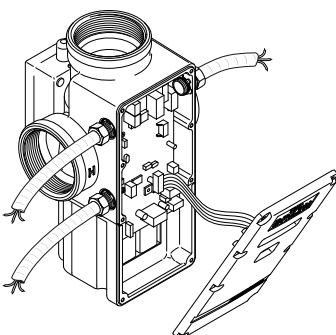
**Figure 22-3.**

If required, pull batteries from housing and replace with new batteries of same type.  
**Do not** mix old and new batteries.  
**Do not** use rechargeable batteries.



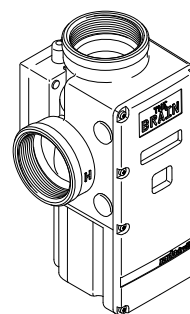
**Figure 22-4.**

Remove blanking plugs as required and connect 3/8" Liquitight conduit fittings (not supplied) as shown using a suitable spanner.



**Figure 22-5.**

Fit 3/8" Liquitight conduit tube (not supplied) and feed the wires through as required. Do not overtighten the conduit fittings.



**Figure 22-6.**

Reconnect display cable and carefully refit cover. Loosely refit screws to locate cover correctly. Tighten all screws to secure cover. Restore electricity to DRV80.

## System Performance

---

For effective DRV80 performance, the mixing valve must be able to experience a minimum flow and a minimum temperature differential between its inlet and outlet supplies when the system is “idling”.

“Idling” periods are defined as periods when there is no mixed water outlet demand on the system.

Pre-installation calculations should have already determined the system heat loss characteristics. For optimum performance the DRV80 requires a minimum of 2°F (1°C) differential between the digital display on the unit (the outlet temperature) and the thermometer which is installed on the system return line.

Additionally, during idling periods, the DRV80 requires a minimum flow of 10gpm (38 lpm). This minimal flow is only required so that the mixing valve can take frequent temperature measurements as the water passes across its inlet and outlet thermistors. Without flow, temperature adjustment is neither possible nor, in effect, required. As such, for optimum system performance, the circulating pump should operate continuously.

In almost all applications, the plumbing system will be able to achieve the aforementioned temperature differential requirements independently.

Seasonally high ambient temperatures around the system and/or high flow circulating pumps may impact this requirement. For solutions, please contact our technical department.

## Pump Capacity

Circulating pumps are only required to keep water gently moving around the system. They should be sized and selected so that the pump can overcome the system resistance (feet of head) at the minimum requirement while also accounting for system heat loss.

Over sized pumps may cause system flow to exceed recommended pipeline velocities (9ft/sec is the Armstrong recommendation) and may impact the 2°F (1°C) temperature differential requirement previously discussed.

## Energy Conservation Codes

Energy conservation codes which require the circulating pump to shut off during idling periods, will counter the digital intelligence integral to the DRV80. The system will cool to below the DRV80 setpoint and the DRV80 will respond with a “Temperature Error”; and, if programmed accordingly, will take corrective action.

## 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. DRV80 can be programmed to issue suitable alerts, alarms or system hot water shutoffs (DRV80) or shutdowns (Independent Solenoid Valve).

## Thermal Disinfection

### IMPORTANT! PLEASE READ CAREFULLY

The disinfection mode of the DRV80 is **not** an automated process. It allows the supervisor to easily raise the temperature of the blend circuit to that of the hot supply to allow the circuit pipework and outlets to be thermally disinfected as part of a bacterial infection control regime.

**Caution! 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.**

## System Performance (continued)

---

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.  
**Note:** *provision must be made to monitor the blend circuit temperature independently when the DRV80 is in disinfection mode.*
3. All outlets are flushed for the correct amount of time if required by the Risk Assessment.  
**Caution!** *The “Disinfection Timeout” feature of the DRV80 is included as a fail-safe should the supervisor fail to restore the DRV80 back to normal operation in a reasonable amount of time. It **must not** be used as the method of controlling the disinfection duration. During this time all alarms and errors are disabled.*
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 valve to its normal operating mode using the “Cool Down” function. This will switch the DRV80 to its full cold position and allow the blend circuit to be reduced to a safe temperature level. Make sure the blend circuit temperature returns to normal operation within the “Disinfection Timeout” period.  
**Warning!** *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, the operating procedure should consider whether the supervisor should switch on the last outlet of the circuit to cause a draw off, or use a dump valve fitted near to the end of the blend circuit.*

## Servicing and Maintenance

---

### Servicing and Maintenance - Digital Mixing Center (DMC)

**Warning:** *Isolate power to the DRV80. Ensure that the circulating pump is not operating.*

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

To reduce complexity within this document, the following functional aspects are detailed specifically for the DRV80 Digital Mixing Valve “Out of the Box” model only:

- Primary Servicing
- Maintenance
- Spare Parts

Each DMC has a serial number that is maintained on file with the technical department at Armstrong.

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

### Servicing and Maintenance - DRV80

The DRV80 should be inspected annually, or more frequently where acknowledged site conditions such as high mineral content water dictate.

## Servicing and Maintenance (continued)

---

### Servicing and Maintenance - DRV80

#### Batteries

Batteries are supplied to ensure the valve 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 valve display when they require changing.

Where primary power supply failure occurs regularly or the valve 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.

## Servicing and Maintenance (continued)

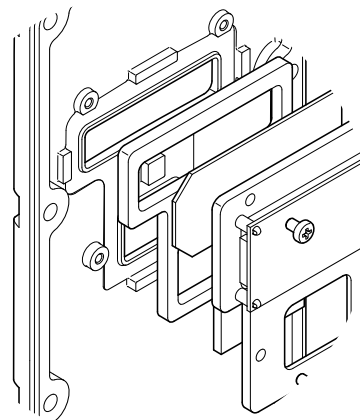


**WARNING** - ISOLATE POWER AND WATER SUPPLIES BEFORE REMOVING COVER!

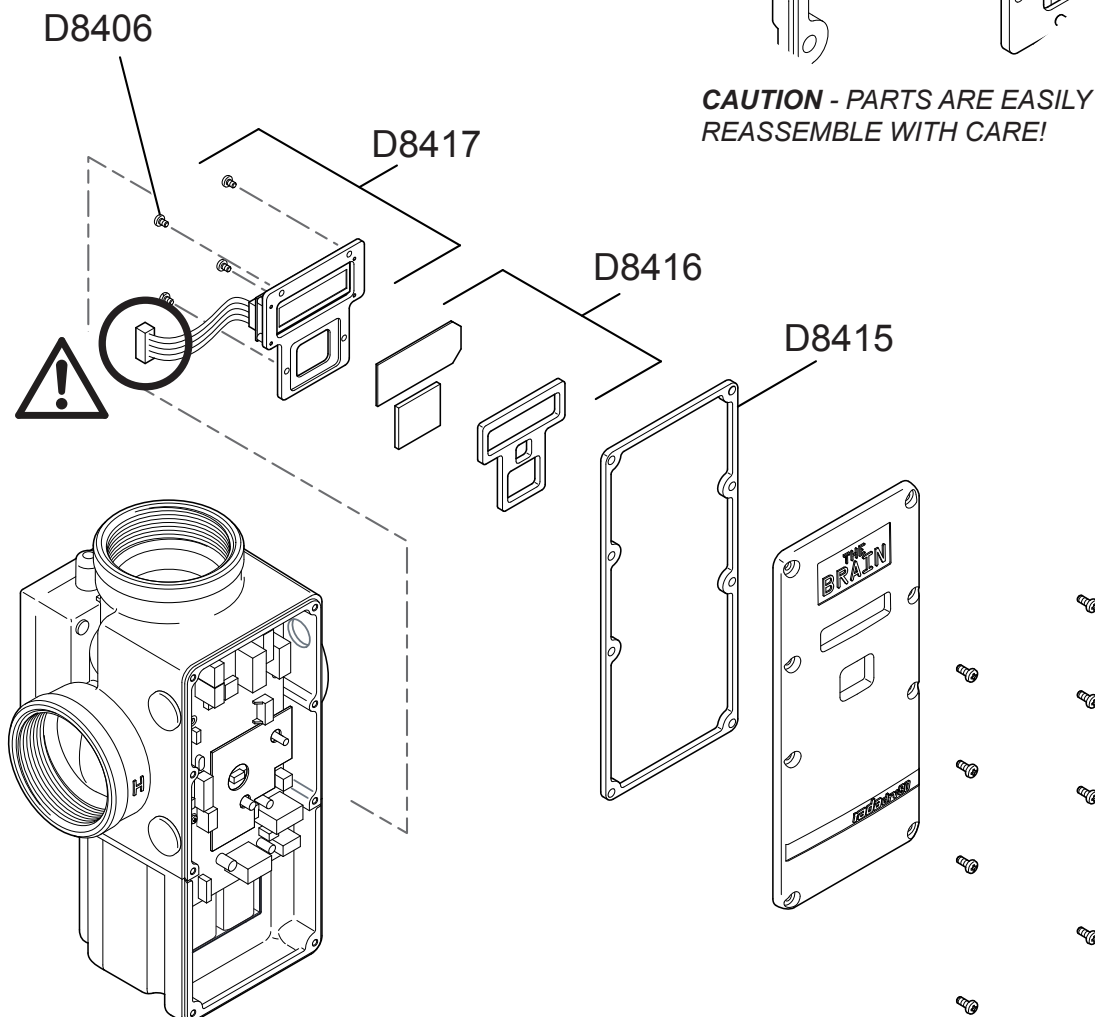


**CAUTION** - HEAVY EQUIPMENT! DISASSEMBLE WITH CARE. A MINIMUM OF 2 PEOPLE REQUIRED TO SAFELY REMOVE APPLIANCE FROM PIPEWORK.

- DO NOT DAMAGE ELECTRONIC CONNECTIONS WHEN REMOVING COVER.
- DO NOT TRAP ANY WIRES WHEN REFITTING COVER.



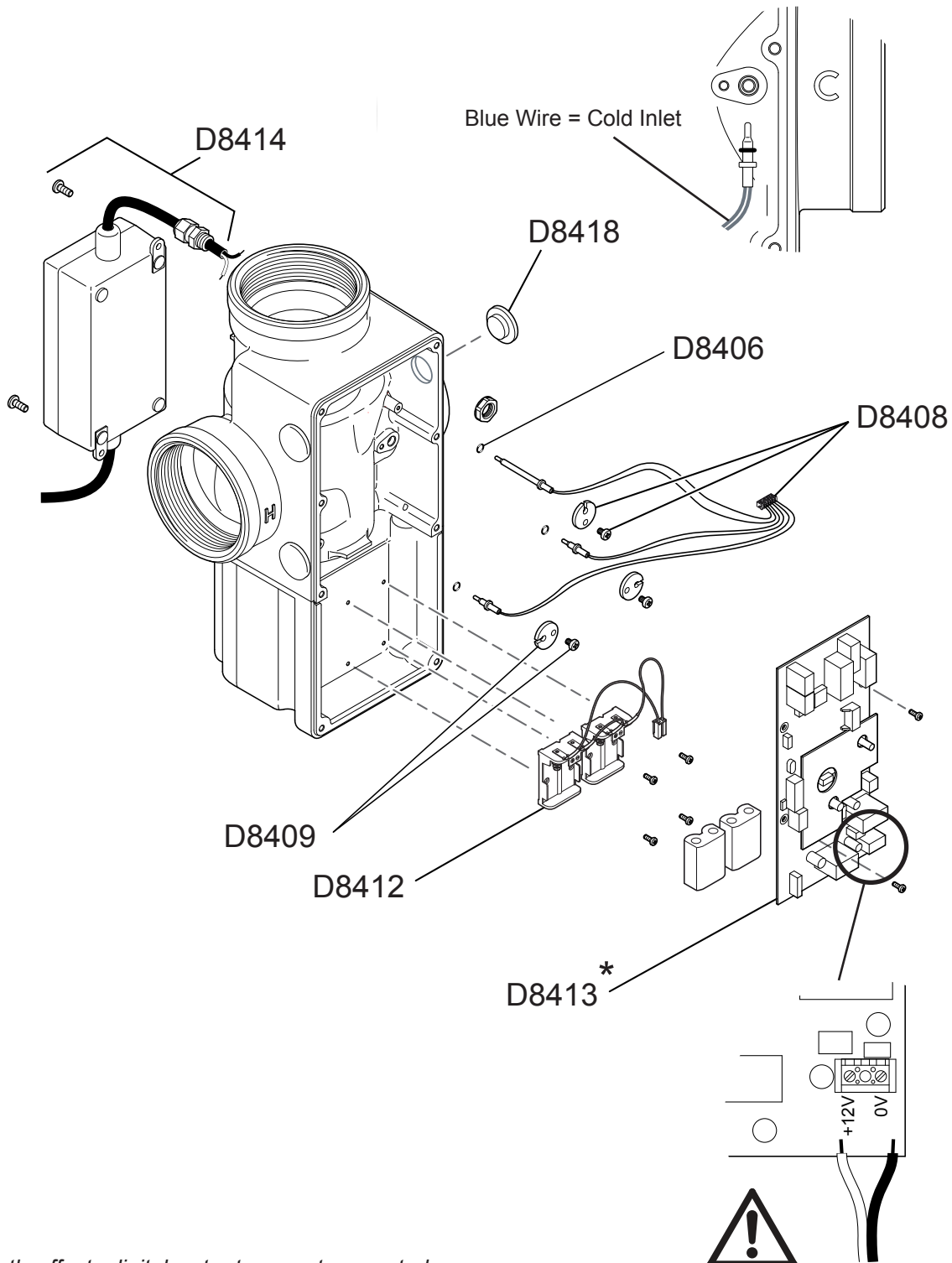
**CAUTION** - PARTS ARE EASILY DAMAGED! REASSEMBLE WITH CARE!



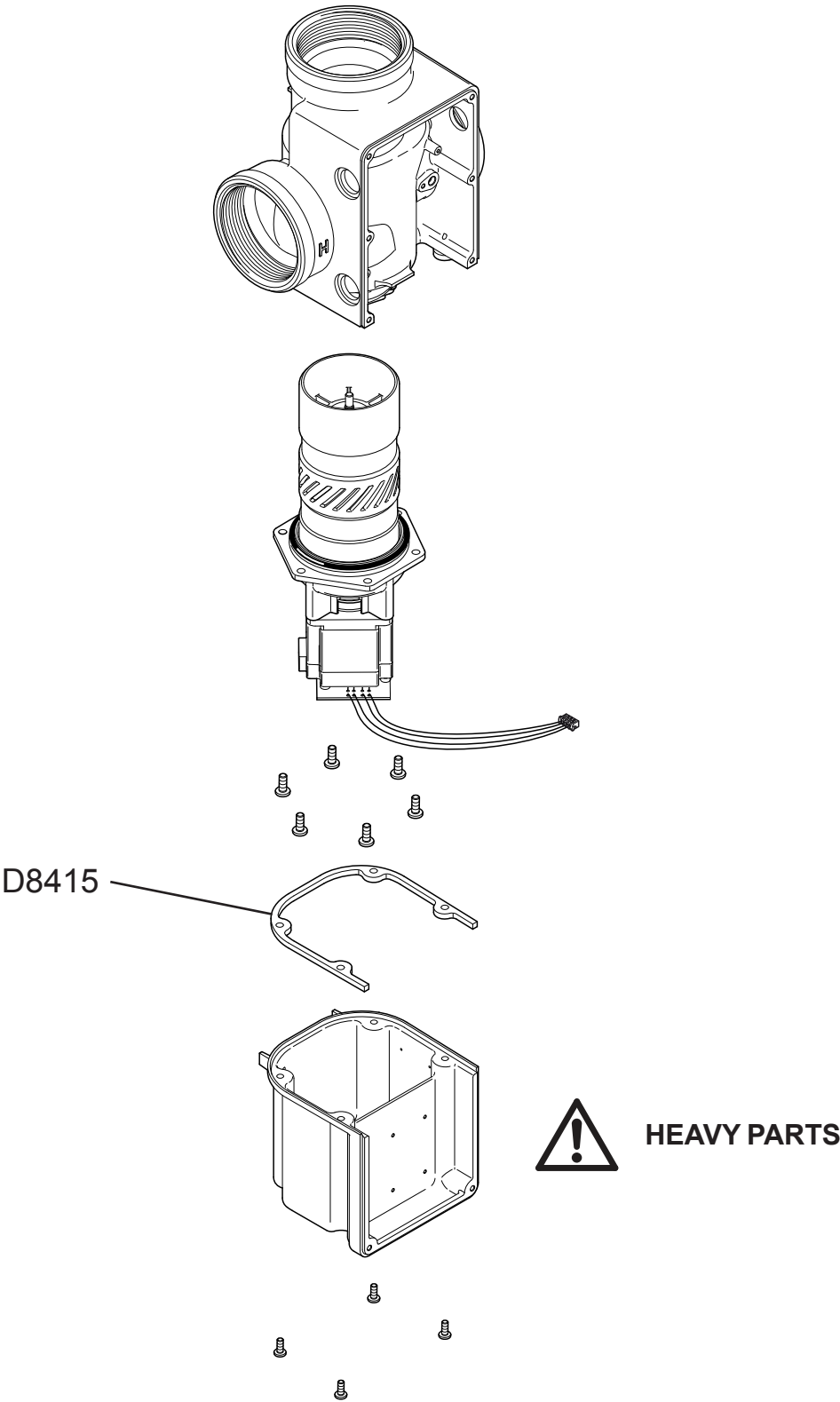
Armstrong has technical support personnel available from 8:00am to 5:00pm EST. Call Toll Free 1-888-468-4673.

## Servicing and Maintenance (continued)

- ONLY USE 2 X CR - P2 6V BATTERIES (NOT INCLUDED IN SPARE PARTS).
- DISCONNECT ALL WIRES BEFORE REMOVING PBC
- USE GREASE PROVIDED ON REPLACEMENT SEALS.
- CHECK PCB FOR SIGNS OF RUST. SEE SECTION "FAULT DIAGNOSIS - PROBLEM 9"



\* Directly affects digital water temperature control.  
Contact Armstrong for technical advice prior to fitting.

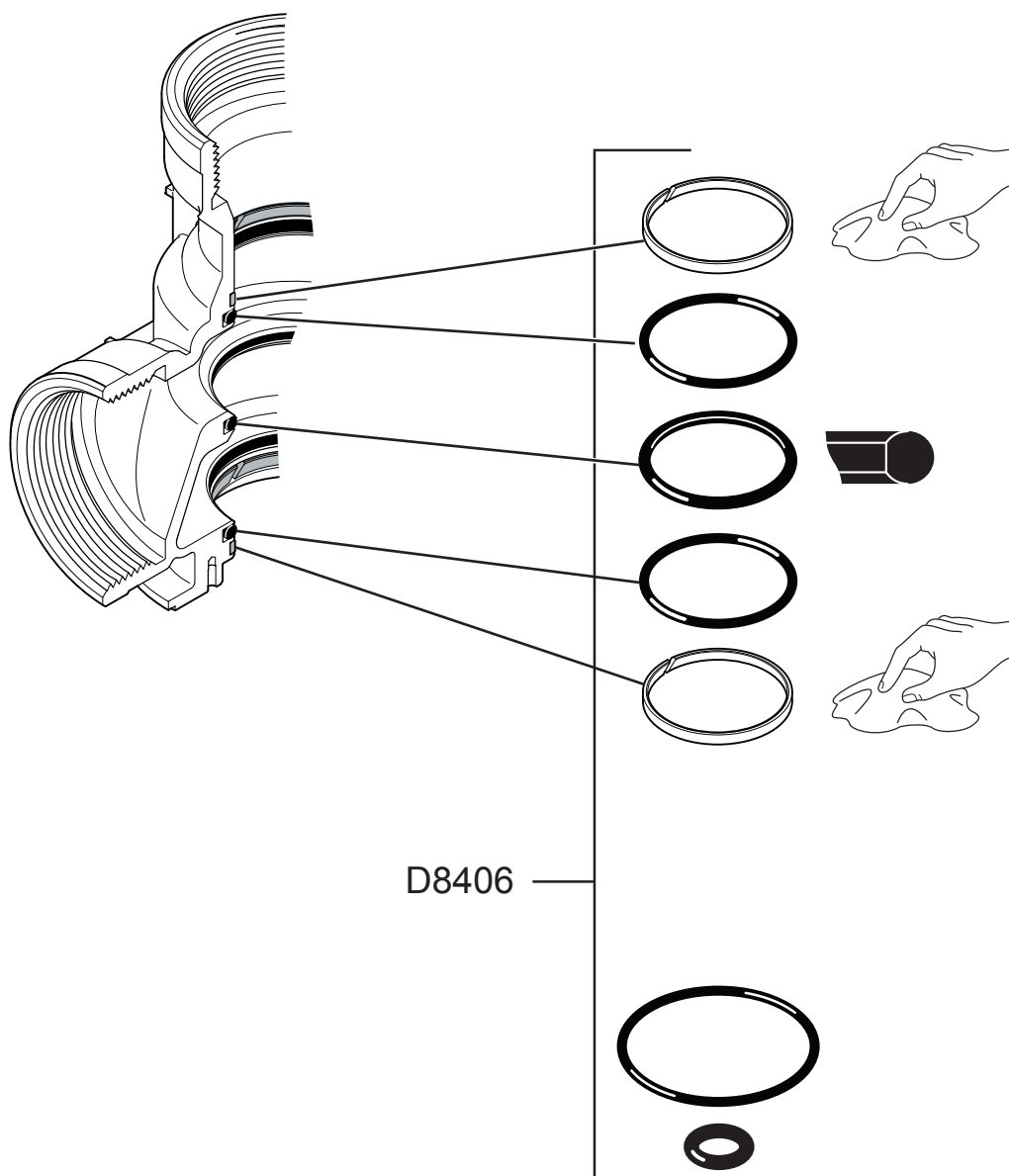


## Servicing and Maintenance (continued)

---



- REMOVE SEALS USING NONMETALLIC TOOLS TO PREVENT SEAL GROOVE DAMAGE.
- CLEAN ALL GROOVES BEFORE REASSEMBLY.
- USE GREASE PROVIDED WHEN REASSEMBLING SEALS.

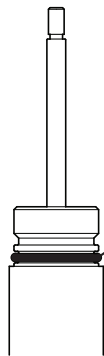
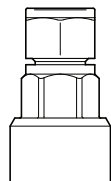




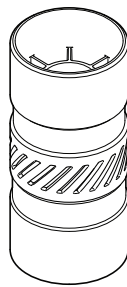
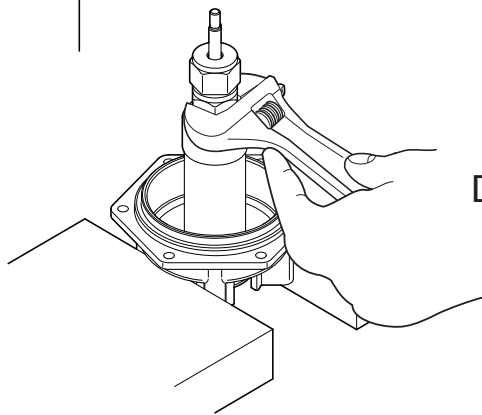
**Servicing and Maintenance (continued)**



• DO NOT DAMAGE MOTOR PCB.



REPLACE  
SEAL ONLY IF  
NECESSARY.



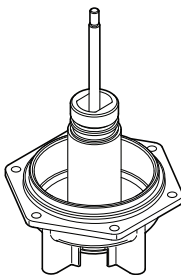
D8405 \*



D8407

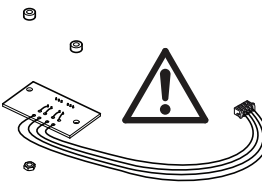
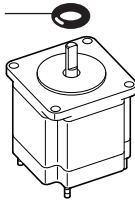


D8406



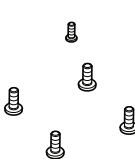
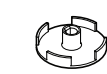
D8404 \*

D8406



D8410

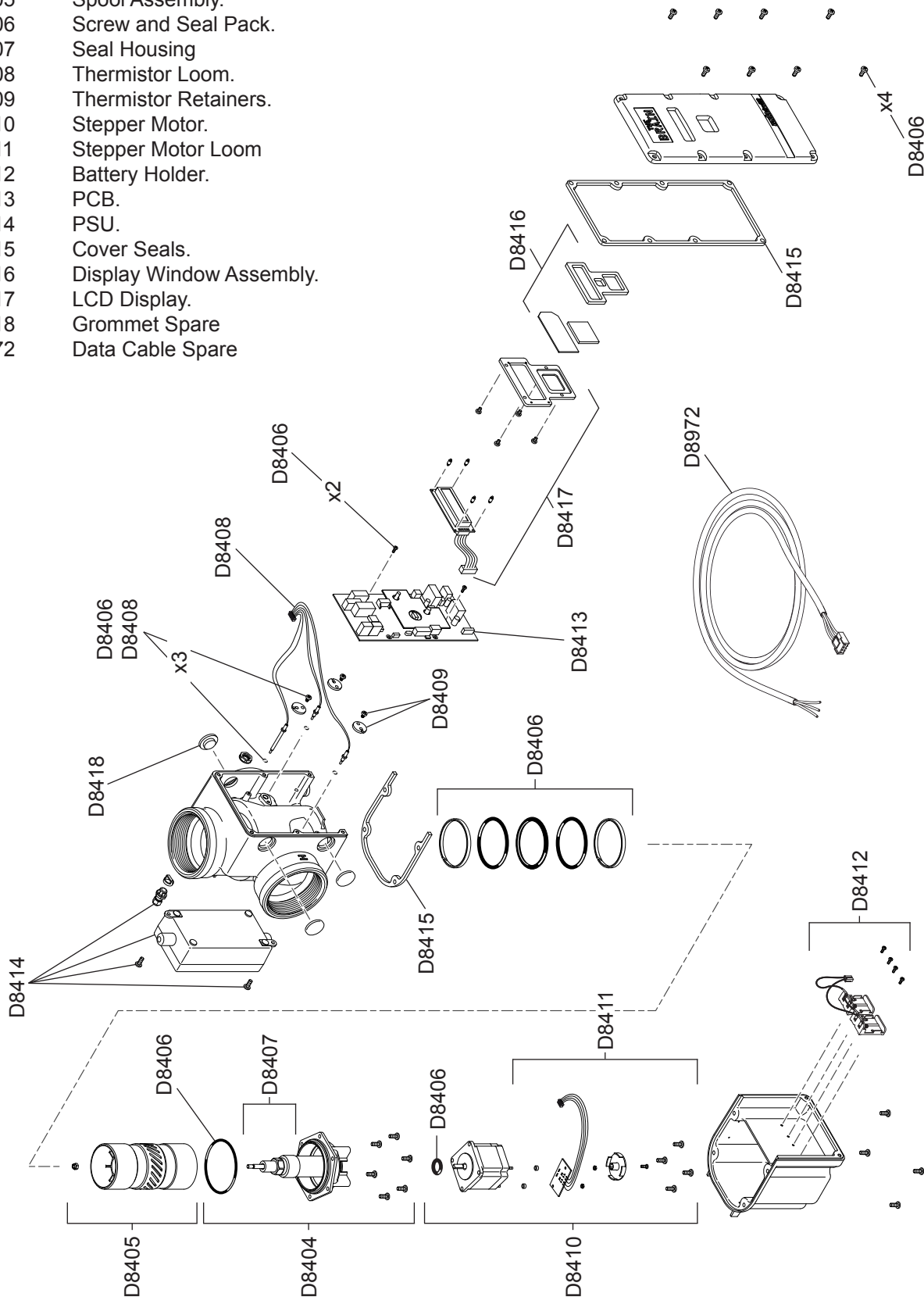
D8411



\* Directly affects digital water temperature control.  
Contact Armstrong for technical advice prior to fitting.

## Spare Parts

D8404	Drive Mechanism.
D8405	Spool Assembly.
D8406	Screw and Seal Pack.
D8407	Seal Housing
D8408	Thermistor Loom.
D8409	Thermistor Retainers.
D8410	Stepper Motor.
D8411	Stepper Motor Loom
D8412	Battery Holder.
D8413	PCB.
D8414	PSU.
D8415	Cover Seals.
D8416	Display Window Assembly.
D8417	LCD Display.
D8418	Grommet Spare
D8972	Data Cable Spare



## Fault Diagnosis

Problem	Cause	Solution
1. Blend temperature rises when idling.	1. Blend circuit fault.	a. Flow rate is less than 10 gpm (38 l/min). Reset circuit flow rate. Check for air locks, blocked filters, closed valves, pump failure etc. b. Circuit return temperature less than 2°F below blend setpoint. Make sure minimum temperature drop around circuit of 2°F.
	2. System fault.	a. Checkvalve problem. Make sure placement of check valves is correct. Refer to installation schematics from page 12 onwards. Make sure check valves are operating correctly. b. Water pressure. Make sure maintained supply pressures are balanced. Make sure mixed return from circuit to water heater is allowing flow. c. Flow problem. Check for air locks, blocked filters, closed valves etc.
	3. DRV80 fault.	a. Refer to DRV80 display error messages.
2. Blend temperature fluctuates more than $\pm 5^\circ\text{F}$ .	1. System fault.	a. Maintained supply pressures are unequal. Make sure pressures are balanced. Check for blocked filters, closed valves, air locks etc. b. Supply temperatures. Check for reasonable temperature differential between set mixed and hot or cold supply.
	2. DRV80 fault.	a. Spool sticking. Clean and descale Spool. Renew separator seal and lubricate assembly. b. Refer to DRV80 display error messages. c. Poor calibration. Refer to "Valve Calibration" screen.
3. Display shows any of the following:  <div>Temp High 127°F Setpoint 120°F</div> <div>Temp Low 100°F Setpoint 120°F</div> <div>Temp High 130°F Error Temp</div>	1. System fault.	a. Inlets are reversed. b. Water supply problem. Check supply temperatures as close to the DRV80 as possible. c. Turn power off for 10 seconds and restart.
	2. DRV80 fault.	a. Spool sticking. Clean and descale Spool. Renew separator seal and lubricate assembly. b. Refer to DRV80 display error messages.
	3. Process Error	a. Blend circuit does not fully return to normal temperature within the "Disinfection Timeout" period. Check the following: <ul style="list-style-type: none"> <li>Disinfection Timeout value. ("Valve Setup" screen.)</li> <li>Cool Down start and finish times.</li> <li>Use of Dump Valve to speed up Cool Down time.</li> </ul> b. Early abort of disinfection process.
4. Constant difference between blend circuit temperature reading and DRV80 temperature display.	1. System fault.	a. Outlet thermometer inaccurate. Renew.
	2. DRV80 fault.	a. Thermistor problem. Refer to thermistor error message.

## Fault Diagnosis (continued)

Problem	Cause	Solution
5. Unable to adjust circuit temperature.	1. Recirculation circuit fault.	<ul style="list-style-type: none"> <li>a. Pump flow rate too low. Reset circuit flow rate. Check for air locks, blocked filters, closed valves, pump failure etc.</li> <li>b. Circuit return temperature less than 2°F below mixed setpoint. Make sure minimum temperature drop around circuit of 2°F.</li> </ul>
	2. System fault.	<ul style="list-style-type: none"> <li>a. Problem with check valve. Make sure placement of check valves is correct. Refer to installation schematics from page 12 onwards. Make sure check valves are operating correctly.</li> <li>b. Water pressure. Make sure maintained supply pressures are balanced. Make sure mixed return from circuit to water heater is allowing flow.</li> <li>c. Flow problem. Check for air locks, blocked filters, closed valves etc.</li> <li>d. Maintained supply pressures are unequal. Make sure pressures are balanced. Check for blocked filters, closed valves, air locks etc.</li> <li>e. Supply temperatures. Check for reasonable temperature differential between set mixed and hot or cold supply.</li> </ul>
	3. DRV80 fault.	<ul style="list-style-type: none"> <li>a. Refer to DRV80 display error messages.</li> </ul>
6. No display and/or no control.	1. System fault.	<ul style="list-style-type: none"> <li>a. No power to DRV80. Check electrical supply.</li> </ul>
	2. DRV80 fault.	<ul style="list-style-type: none"> <li>a. Internal power connection or display connection is loose or not made. Check and reconnect.</li> <li>b. DRV80 power transformer failed. Replace.</li> <li>c. Internal fuse failure. Replace fuse and investigate cause.</li> <li>d. PCB failure. Replace.</li> </ul>
7. High pitched noise from DRV80.	1. System fault.	<ul style="list-style-type: none"> <li>a. Maintained supply pressures are unequal. Make sure pressures are balanced. Check for blocked filters, closed valves, air locks etc.</li> <li>b. Supply temperatures. Check for reasonable temperature differential between set mixed and hot or cold supply.</li> </ul>
	2. DRV80 fault.	<ul style="list-style-type: none"> <li>a. Motor is worn. Replace.</li> <li>b. Refer to DRV80 display error messages.</li> </ul>
8. Water leaking from DRV80.	1. DRV80 fault.	<ul style="list-style-type: none"> <li>a. Check all seals for wear and/or damage. Clean, lubricate and replace or renew.</li> <li>b. Main body failure. DRV80 replacement required.</li> </ul>
9. Water/moisture visible in cover.	1. DRV80 fault.	<ul style="list-style-type: none"> <li>a. Water left in DRV80 during previous maintenance. Interior of cover must be kept dry, as moisture will condense and cause corrosion of PCB.</li> <li>b. Check thermistor seals for wear and/or damage. Clean, lubricate and replace or renew.</li> </ul>

## Notes

---



## Limited Warranty and Remedy

---

**Armstrong Hot Water Group, Inc.** ("Armstrong") warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended, that such products shall be free from defect in material and workmanship for a period of five (5) years from the date of shipment from the factory. This warranty does not extend to any product that has been subject to misuse, neglect, or alteration after shipment from the Armstrong factory. Except as may be expressly provided in a written agreement between Armstrong and the user, which is signed by both parties, Armstrong **DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.** The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to defects or any other condition or use of the products supplied by Armstrong, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Armstrong's repair or replacement of the part or product, excluding any labor or any cost to remove or install said part or product, or, at Armstrong's option, to repayment of the purchase price. As a condition of enforcing any rights or remedies relating to Armstrong products, notice of any warranty or other claim relating to the products must be given in writing to Armstrong: (i) within 30 days of last day of the appliance warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. **IN NO EVENT SHALL ARMSTRONG BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS.** The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Armstrong.