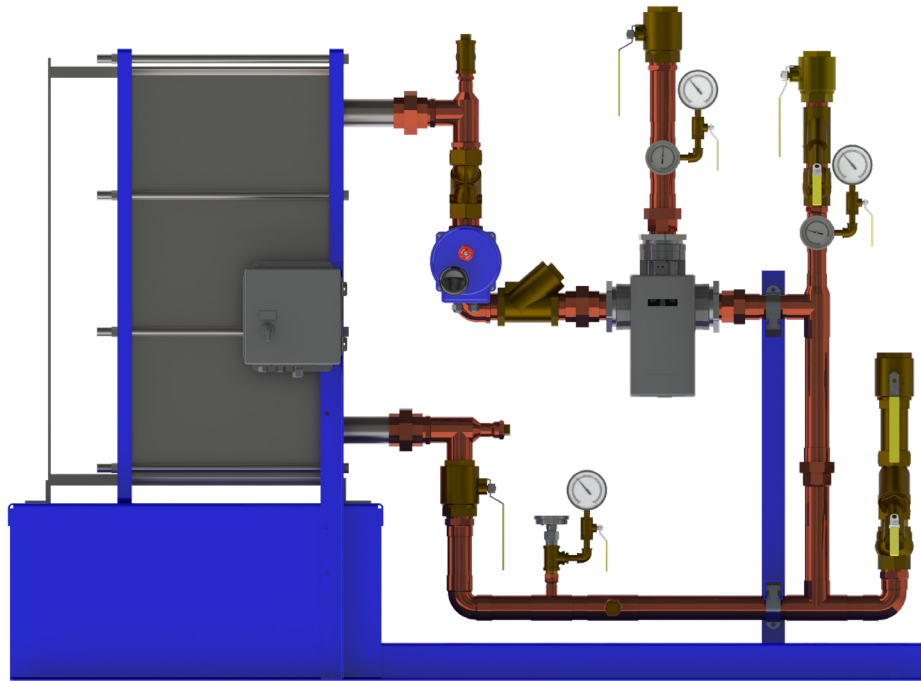


Digital-Flo™ Boiler Water/Water Plate & Frame Heat Exchanger Installation, Operation, and Maintenance Manual



Please read and save
these instructions.

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Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

General Safety Information

Icon Legend

If instructions are not followed:



— injury or death and property damage are **imminent**



— injury or death and property damage are **possible**



— potential property damage, expensive repairs, and/or voiding the warranty may result



Read this manual. It contains important information.



Installation must comply with all applicable federal, state, and local sanitary, construction, plumbing and regulatory codes.

Service must be performed by a qualified person.



Burn hazard

- Components and piping may be hot.
- Skin exposure to 140 °F (60 °C) water for only five seconds may cause a second degree burn.



Improper installation, start-up, operation, maintenance, or service may void the warranty.

General Description

Note: In this manual "DF" stands for "Digital Flo" and is the brand designation. "PHE" stands for "Plate Heat Exchanger" as distinct from a tube and shell type.

The Digital-Flo Boiler Water/Water Plate and Frame Heat Exchanger uses digital technology to monitor water temperature (inlet hot and inlet cold/system return), eliminating the need for the following components:

- Boiler Water Control Valve
- PID Controller
- High Temperature Limit Thermostat
- High Temperature Limit Controller
- Cold Water Injection Valve
- Internal Circulating Pump
- Compressed Air Requirement

The secondary (sometimes called domestic) side of all units is equipped with a safety shut-off valve.

Units are shipped pre-piped and pressure tested.

All Digital-Flo units may be integrated into Building Automation Systems or LANs.

Among the available options:

Boiler water greater than 160 °F units—optimized for 180 °F (82.2 °C) in and 150 °F (65.6 °C) out.

Boiler water less than 160 °F units—optimized for 150 °F (65.6 °C) in and 115 °F (46.1 °C) out.

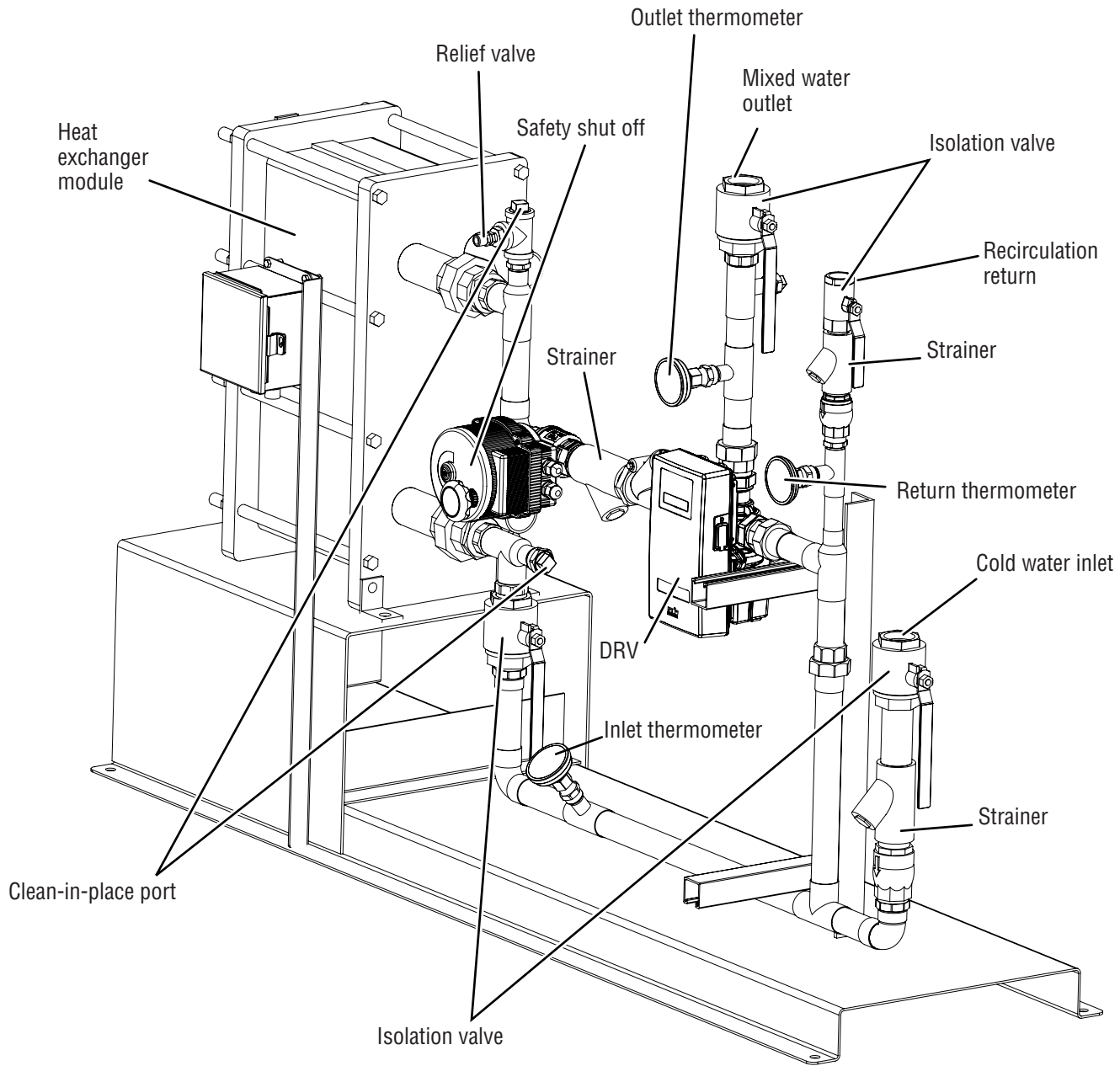
Standard Components:

DRV40, DRV50, or DRV80 digital recirculating valve
Heat exchanger module (ASME stamped)
Thermometers
Check valves
Inlet strainer(s)
Isolation valves
Safety shut-off valves

Note: Because the Digital-Flo is customizable, there may be components that are not addressed in this IOM.

Armstrong reserves the right to make design or specification changes without notification.

Typical Layout



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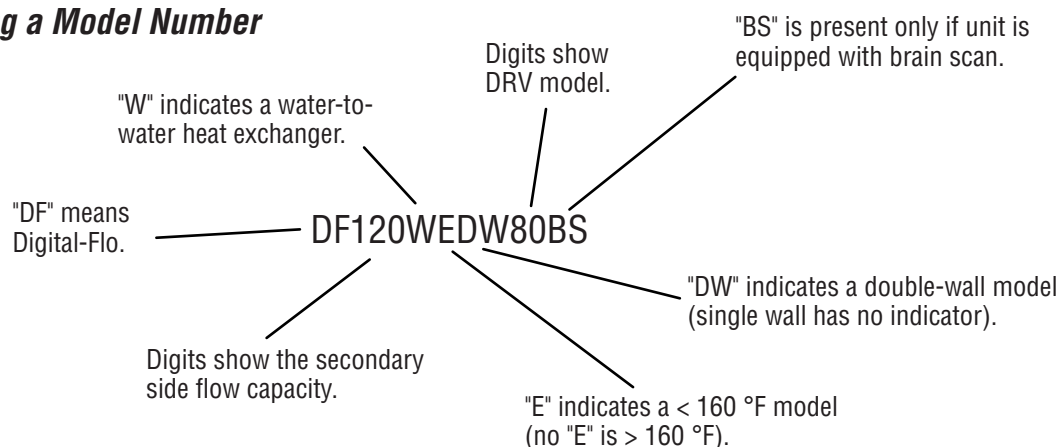
Specifications

Operational Specifications

Parameter	Specification
Primary Side	
Maximum Boiler Water Temperature	250 °F (121 °C)
Maximum Boiler Water Pressure	150 psi (10 bar)
Secondary Side	
Minimum Inlet Supply Water Temperature	34 °F (1 °C)
Digital Recirculating Valve (DRV) Set Point Range	81–158 °F (29–70 °C)
Minimum Recirculation Loop Temperature Loss	2 °F (1 °C)
Minimum Recirculation Pump Flow Rate	5 GPM (DRV40) / 10 GPM (DRV50/DRV80)
Minimum System Draw Off	0 GPM
Minimum Distance to First Outlet	25 ft (7.62 m)
Maximum Water Pressure	150 psi (10 bar)
Maximum Operating Pressure Drop	7 psi (0.5 bar)
Power Supply	120/240 VAC 50–60 Hz 10 A
Supply Fuse/Circuit Breaker	3 A
Protection Rating	IPX4
Signal Cable Fittings	3/8" SOW and cord grips
Battery	2 x CR - P2 6V
Duty Cycle	Continuously Rated

Technical Specifications

Deciphering a Model Number



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Primary Side Data

< 160 °F Models		> 160 °F Models	
Capacity (GPM [LPM] @ 150 to 115 °F [65.6 to 46.1 °C])	Connections*	Capacity (GPM [LPM] @ 180 to 150 °F [82.2 to 65.6 °C])	Connections*
44 (166.6)	2 (51)	51 (193.1)	1 ¼ (32)
101 (382.3)	2 (51)	119 (450.5)	2 (51)
188 (711.7)	2.5 (64) flg (4 [102] flg DW)	221 (836.6)	2 (51)
260 (984.2)	3 (76) flg (4 [102] flg DW)	306 (1158.3)	4 (102) flg
347 (1313.5)	4 (102) flg	407 (1540.7)	4 (102) flg

Secondary Side Data

Capacity	Connections*		
(GPM [LPM] @ 40–140 °F [4.4–60 °C])	In/Out	Recirc	DRV
15 (56.8)	1 (25)	1 (25)	1 ½ (38)
35 (132.5)	1 ½ (38)	1 (25)	1 ½ (38)
65 (246.1)	2 (51)	1 ½ (38)	3 (76)
90 (340.7)	3 (76) flg	2 (51)	3 (76)
120 (454.3)	3 (76) flg	2 (51)	3 (76)

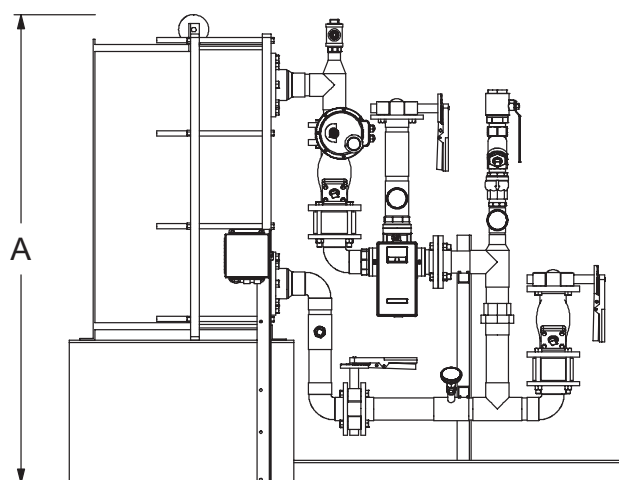
* All connections are shown in inches (mm) and are NPT unless shown as flanged ("flg").

Materials of Construction

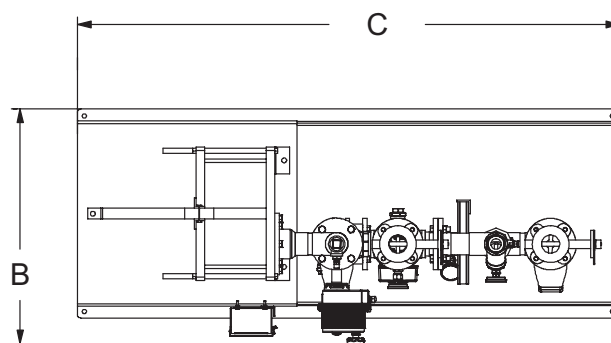
Component	Material
Primary Side	
PHE Plates	316 Stainless Steel
PHE Frame	Carbon Steel Painted Acrylic
Gasket	Nitrile (FDA approved)
Secondary Side	
DRV	316L Stainless Steel
Pipework	Copper Type L
Fittings	Brass/Bronze (Lead Free)

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Dimensions



Side View



Top View

Model	Single Wall Dimensions in. (mm)		
	A	B	C
> 160 °F Models			
DF15W40	40 (1016)	25 (635)	68 (1727)
DF15W40BS		27 (686)	
DF35W40	50 (1270)	25 (635)	76 (1930)
DF35W40BS		27 (686)	
DF65W50	65 (1651)	25 (635)	94 (2388)
DF65W50BS		27 (686)	
DF90W80	67 (1702)	34 (864)	79 (2007)
DF90W80BS		35 (889)	
DF120W80		34 (864)	
DF120W80BS		35 (889)	
< 160 °F Models			
DF15WE40	56 (1422)	25 (635)	68 (1727)
DF15WE40BS		27 (686)	
DF35WE40	62 (1575)	25 (635)	84 (2134)
DF35WE40BS		27 (686)	
DF65WE50	65 (1651)	29 (737)	86 (2184)
DF65WE50BS		31 (787)	
DF90WE80	61 (1549)	34 (864)	79 (2007)
DF90WE80BS		35 (889)	
DF120WE80	62 (1575)	34 (864)	94 (2388)
DF120WE80BS		35 (889)	

Model	Double Wall Dimensions in. (mm)		
	A	B	C
> 160 °F Models			
DF15WDW40	40 (1016)	25 (635)	68 (1727)
DF15WDW40BS		27 (686)	
DF35WDW40	62 (1570)	25 (635)	76 (1930)
DF35WDW40BS		27 (686)	
DF65WDW50	65 (1651)	25 (635)	94 (2388)
DF65WDW50BS		27 (686)	
DF90WDW80	67 (1702)	34 (864)	79 (2007)
DF90WDW80BS		35 (889)	
DF120WDW80	64 (1626)	34 (864)	94 (2388)
DF120WDW80BS		35 (889)	
< 160 °F Models			
DF15WEDW40	56 (1422)	25 (635)	68 (1727)
DF15WEDW40BS		27 (686)	
DF35WEDW40	62 (1575)	25 (635)	84 (2134)
DF35WEDW40BS		27 (686)	
DF65WEDW50	67 (1702)	33 (838)	106 (2692)
DF65WEDW50BS		35 (889)	
DF90WEDW80	64 (1626)	34 (864)	94 (2388)
DF90WEDW80BS		35 (889)	
DF120WEDW80		34 (864)	
DF120WEDW80BS		35 (889)	

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Installation

General Information

Locate adjacent to appropriate electrical service.

Position with adequate space for service and maintenance.

Installation must be performed by designated, qualified, and competent personnel, including a licensed electrician and plumber or pipe fitter.

Follow all applicable codes.

Requires primary and secondary side circulating pumps (not supplied).

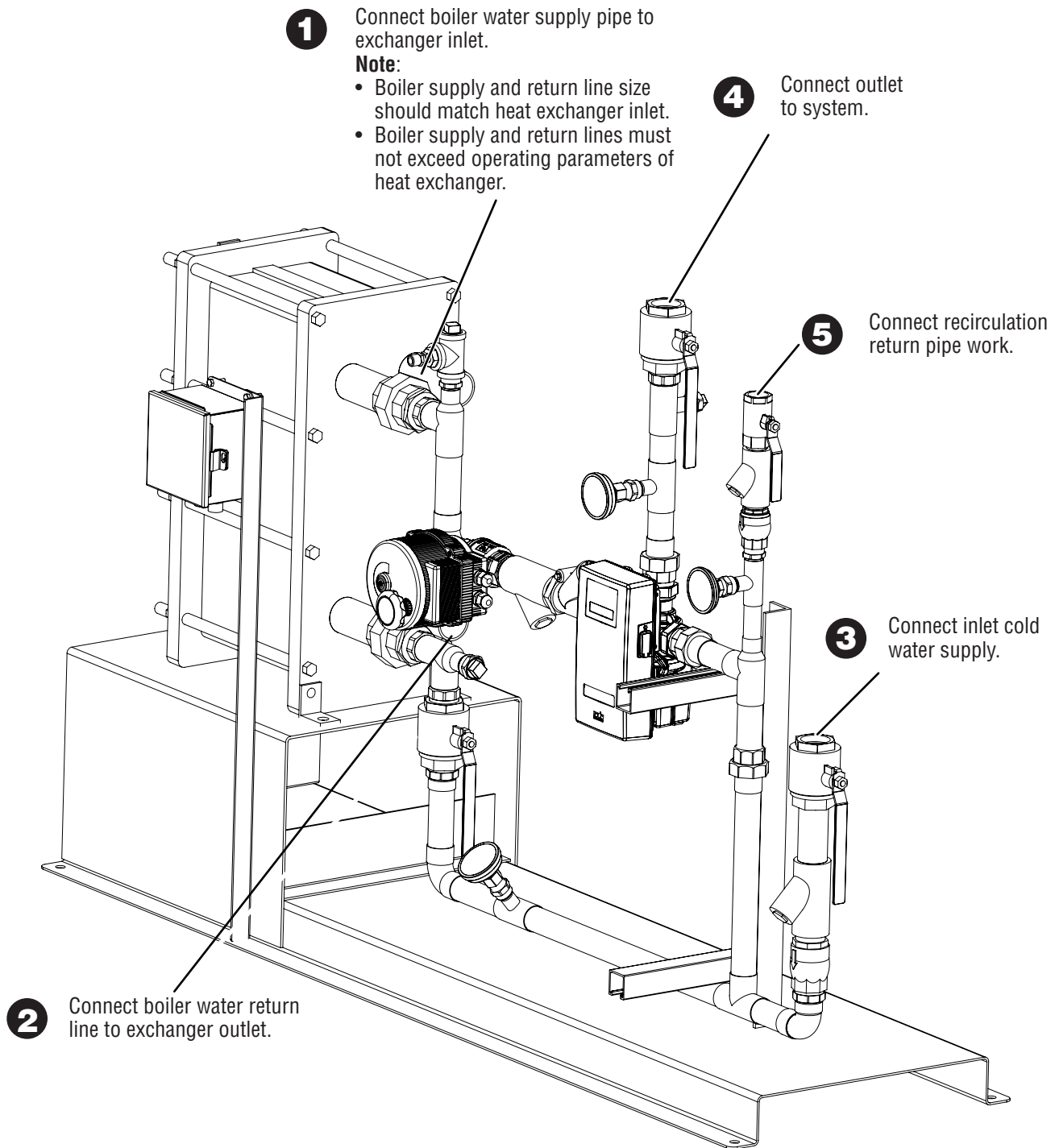


Always wear appropriate safety clothing and equipment.
Isolate all water and condensate lines.
Relieve residual pressure in system or connecting piping.
Allow hot parts to cool before beginning work.

Notes:

- Secondary loop is supplied with enable/disable temperature limit protection.
- A secondary system recirculation pump must be installed and be operational at all times on the inlet to the unit.
- Isolating valves should be fitted to primary side connections (not supplied).

Typical Installation



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Commissioning

1 Confirm all plumbing, piping, and electrical connections.

2 Ensure that boiler water supply valve and all valves on heat exchanger are closed.

3 Open several fixtures in building to vent air from system.

4 Open isolation valves to flood secondary side of system.

5 Start secondary side recirculating pump.

6 Confirm water circulation through heat exchanger.

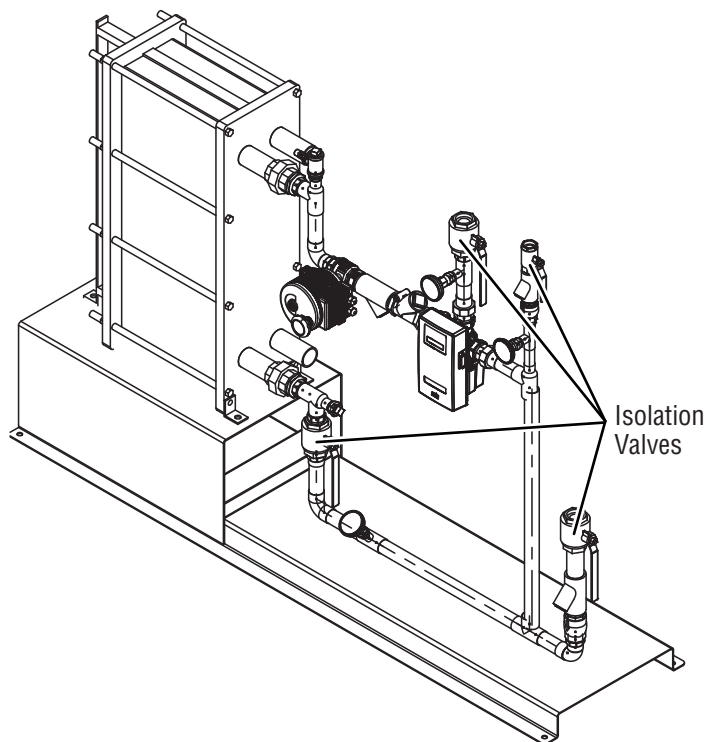
7 Turn on power to DRV.

Note: Water temperature is preset based on information provided to Armstrong. Secondary high side limit default is set 18 °F (10 °C) above setpoint. See DRV IOM for information on changing preset values.

8 Slowly open inlet boiler water supply valve.

9 Confirm display of system setpoint and secondary side delivery temperature on DRV.

Note: Display will show "temp low" during start-up.




Periodic Maintenance



Hot parts when unit is operating.

Prior to performing any invasive procedure, turn off heat exchanger, allow to cool, and relieve pressure.

Note: Maintenance information for the DRV is not shown here. See the separate IOM.

Interval	Task
Six months	Check PHE temperatures and flow rates against standard specifications.
Six months	Check plate pack tightening dimension of PHE and look for signs of leakage.
Six months	Check condition of PHE nozzles and for signs of leakage.
Six months	Wipe PHE frame painted parts. Check for damage. Touch up if required.
Six months	Clean bolts and bars of PHE. Lightly coat threaded parts with molybdenum grease or a corrosion inhibitor.  Do not allow grease or inhibitor to fall onto plate gaskets.
As required	Check and replace PHE gaskets.
Six months	If PHE rollers are fitted to follower frame plate, lubricate bearings with light machine oil.
As required	Descale system (frequency depends on water quality)

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Troubleshooting



Components and water may be hot.

Note: For problems exclusive to the DRV controller, see that IOM.

Problem	Probable Cause	Correction
Secondary side temperature low	Restriction on primary side	Confirm that all isolation valves are fully open.
	Primary side pump not running	Restart or troubleshoot pump (If pump is variable-speed, confirm that speed selection is correct for necessary flow and discharge pressure.)
	Primary side water temperature too low	Confirm that temperature is set to design spec.
	Secondary side check valve failed	Confirm that recirculation line is hot. If not, check for failed check valve (allows cold water to bypass heat exchanger).
Secondary side temperature rises when there is no demand.	Secondary side flow rate < 10 GPM (38 LPM)	1. Confirm that flow rate setting is > 10 GPM (38 LPM). 2. Check system for: <ul style="list-style-type: none"> Air locks Closed valves Pump failure Other similar causes
	Return temperature is within 2 °F (1.1 °C) of set point	Ensure temperature differential in circuit is ≥ 2 °F (1.1 °C).
	Check valve problem	1. Confirm that check valves were installed as designed. 2. Ensure proper function of valves.
	Water pressure problem	1. Ensure that supply pressure differential is ≤ 20 psi (1.4 bar). 2. Confirm that recirc pump is operating.
	Flow restriction	Check for: <ul style="list-style-type: none"> Air locks Closed valves Clogged filters Other restrictions
	DRV fault	See DRV IOM.
Secondary side system temperature fluctuates $> \pm 5$ °F (2.8 °C)	Unequal supply pressures on secondary side	Balance pressures.
	Secondary side flow restriction	Check for: <ul style="list-style-type: none"> Air locks Closed valves Clogged filters Other restrictions
	Excessive supply temperature differential	Confirm that differentials between set point and hot and cold inlet supplies to DRV are ≥ 10 °F (5.6 °C).
	DRV fault	See DRV IOM.
	Primary side inlet temperature fluctuating	1. Confirm that connections are as designed (no cross connections). 2. Confirm that bypass is not open.
	Demand exceeds capacity of unit	Reduce demand.

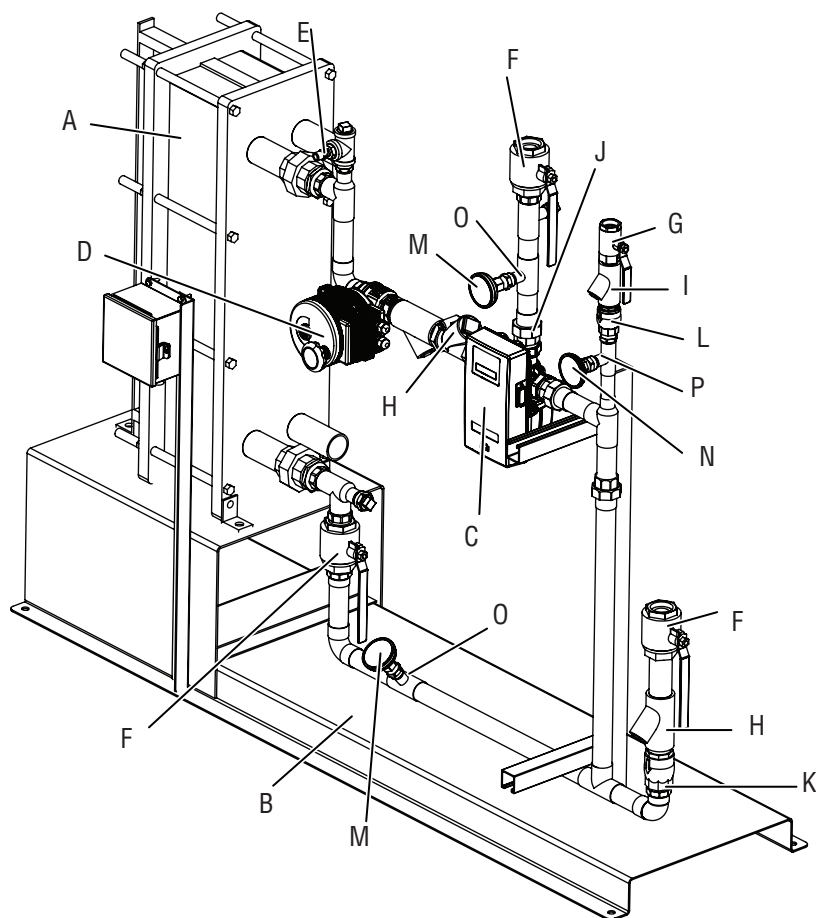
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Problem	Probable Cause	Correction
Secondary side temperature low	Restriction on primary side	Confirm that all isolation valves are fully open.
	Primary side pump not running	Restart or troubleshoot pump (If pump is variable-speed, confirm that speed selection is correct for necessary flow and discharge pressure.)
	Primary side water temperature too low	Confirm that temperature is set to design spec.
	Secondary side check valve failed	Confirm that recirculation line is hot. If not, check for failed check valve (allows cold water to bypass heat exchanger).
Secondary side temperature rises when there is no demand.	Secondary side flow rate < 10 GPM (38 LPM)	1. Confirm that flow rate setting is > 10 GPM (38 LPM). 2. Check system for: <ul style="list-style-type: none"> • Air locks • Closed valves • Pump failure • Other similar causes
	Return temperature is within 2 °F (1.1 °C) of set point	Ensure temperature differential in circuit is ≥ 2 °F (1.1 °C).
	Check valve problem	1. Confirm that check valves were installed as designed. 2. Ensure proper function of valves.
	Water pressure problem	1. Ensure that supply pressure differential is ≤ 20 psi (1.4 bar). 2. Confirm that recirc pump is operating.
	Flow restriction	Check for: <ul style="list-style-type: none"> • Air locks • Closed valves • Clogged filters • Other restrictions
	DRV fault	See DRV IOM.
Secondary side system temperature fluctuates $> \pm 5$ °F (2.8 °C)	Unequal supply pressures on secondary side	Balance pressures.
	Secondary side flow restriction	Check for: <ul style="list-style-type: none"> • Air locks • Closed valves • Clogged filters • Other restrictions
	Excessive supply temperature differential	Confirm that differentials between set point and hot and cold inlet supplies to DRV are ≥ 10 °F (5.6 °C).
	DRV fault	See DRV IOM.
	Primary side inlet temperature fluctuating	1. Confirm that connections are as designed (no cross connections). 2. Confirm that bypass is not open.
	Demand exceeds capacity of unit	Reduce demand.

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Problem	Probable Cause	Correction
Water leaking from plate and frame module	N/A	<ol style="list-style-type: none"> 1. Check plate pack tightening dimension (see heat exchanger module manufacturer's IOM). 2. Note serial number on PHE and call Armstrong.

Parts Lists



Model	PHE (A)	Base (B)
DF15W	D44041	D46281
DF15WE	D44042	D46281
DF15W DW	D44044	D46281
DF15WE DW	D44045	D46281
DF35W	D44047	D46282
DF35WE	D44048	D46283
DF35W DW	D44050	D46282
DF35WE DW	D44051	D46283
DF65W	D44053	D46285
DF65WE	D44054	D46284
DF65W DW	D44056	D46285
DF65WE DW	D44057	D46286

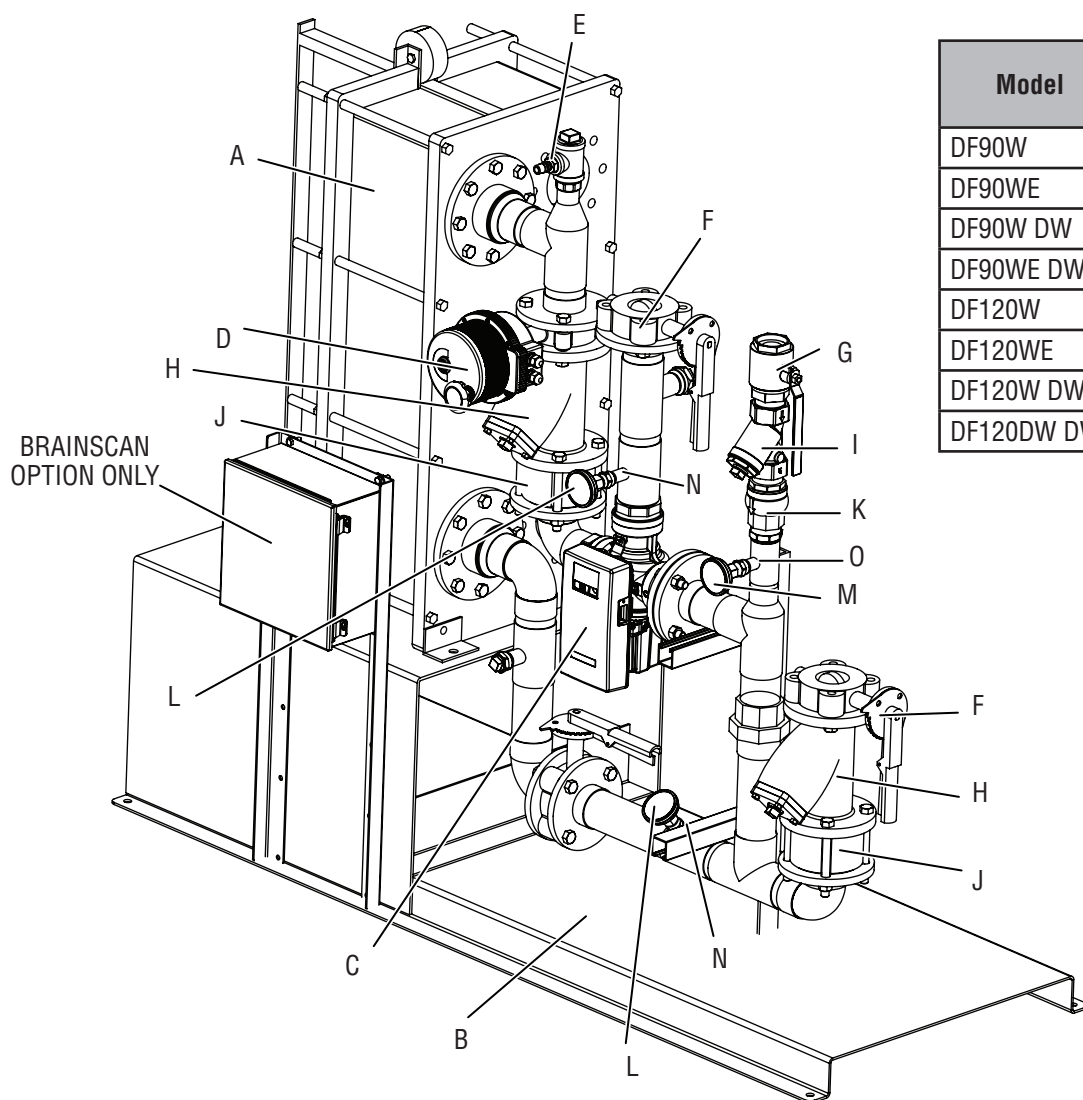
Note: All dimensions shown as in. (mm).

Ref.	Description	DF15 (all)		DF35 (all)		DF65 (all)	
		No.	Size	No.	Size	No.	Size
C	DRV*	D41578	1 ½ (38)	D41578	1 ½ (38)	D40864	2 (51)
D	Safety Shut-Off Valve	D40163	1 (25)	D40164	1 ½ (38)	D40165	2 (51)
E*	Pressure Relief Valve	D32789	¼ (6)	D32789	¼ (6)	D32789	¼ (6)
F	Inlet/Mixed Isolation Valve	D30040	1 (25) (ball)	D30019	1 ½ (38) (ball)	D30037	2 (51) (ball)
G	Return Isolation Valve	D30040	1 (25) (ball)	D30040	1 (25) (ball)	D30019	1 ½ (38) (ball)
H	Inlet/Hot Y-Strainer	D30039	1 (25)	D38922	1 ½ (38)	D30036	2 (51)
I	Return Y-Strainer	D30039	1 (25)	D30039	1 (25)	D38922	1 ½ (38)
J	Mixed Check Valve	D30028	1 (25) (swing)	D39479	1 ½ (38) (swing)	D30024	2 (51) (swing)
K	Inlet Check Valve	D30022	1 (25) (spring)	D38888	1 ½ (38) (spring)	D30026	2 (51) (spring)
L	Return Check Valve	D30022	1 (25) (spring)	D30022	1 (25) (spring)	D38888	1 ½ (38) (spring)
M	Inlet/Mixed Thermometer	D8931	½ (13)	D8969	½ (13)	D8969	½ (13)
N	Return Thermometer	D8931	½ (13)	D8931	½ (13)	D8969	½ (13)
O	Inlet/Mixed Thermowell	D22048	¾ (19)	D40277	¾ (19)	D40277	¾ (19)
P	Return Thermowell	D22048	¾ (19)	D22048	¾ (19)	D40277	¾ (19)

* See DRV IOM for parts

* Outlet for Pressure Relief Valve should be piped to floor/drain to make sure individual does not get sprayed with hot water.
Standard cracking pressure is 165 psi.

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Model	PHE (A)	Base (B)
DF90W	D44059	D46287
DF90WE	D44060	D46287
DF90W DW	D44062	D46287
DF90WE DW	D44063	D46287
DF120W	D44065	D46287
DF120WE	D44066	D46288
DF120W DW	D44068	D46288
DF120DW DW	D44069	D46288

Ref.	Description	DF90 and 120 (all)	
		No.	Size
C	DRV*	D41579	3 (76)
D	Safety Shut-Off Valve	D40168	3 (76) flg
E	Pressure Relief Valve	D32789	1/4 (6)
F	Inlet/Mixed Isolation Valve	D8743	3 (76) flg
G	Return Isolation Valve	D30037	2 (51) (ball)
H	Inlet/Hot Y-Strainer	D39199	3 (76) flg (epoxy)
I	Return Y-Strainer	D30036	2 (51)
J	Inlet/Hot Check Valve	D8745	3 (76) flg (wafer)
K	Return Check Valve	D30026	2 (51) (spring)
L	Inlet/Mixed Thermometer	D8746	1/2 (13)
M	Return Thermometer	D8969	1/2 (13)
N	Inlet/Mixed Thermowell	D36848	3/4 (19)
O	Return Thermowell	D40277	3/4 (19)

*See DRV80 IOM for parts

Note: All dimensions shown as in. (mm).

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LIMITED WARRANTY AND REMEDY

Armstrong Hot Water, 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 defects in material and workmanship for a period of two (2) years from the date of installation, but not longer than 27 months from the date of shipment from the factory [unless a special warranty period applies, as listed below]. 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, EXPRESS 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 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 other 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 applicable 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.

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Notes

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