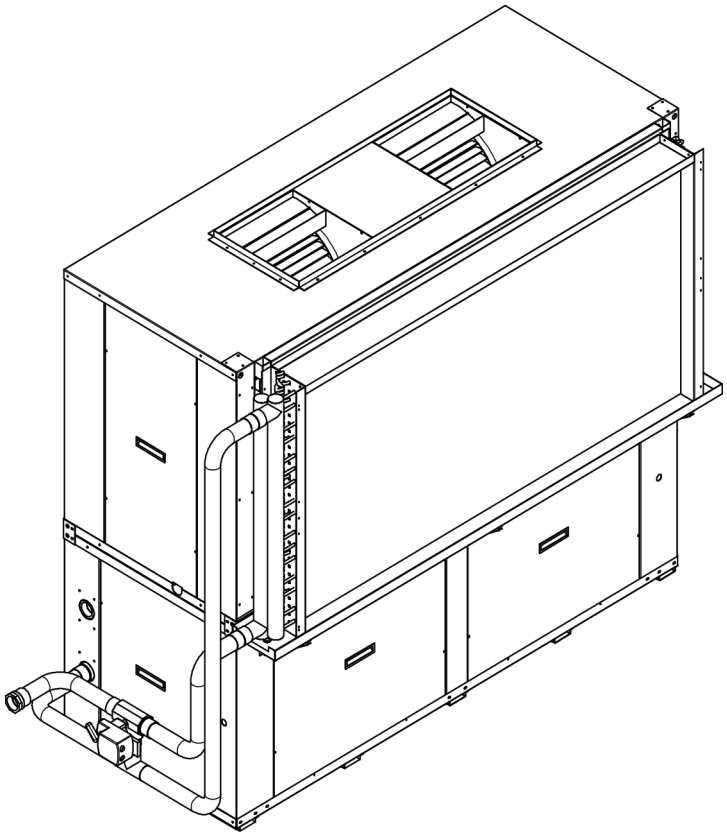
CVWSEK Waterside Economizer for CSV060C-300C Water-Cooled Self-Contained Units, C Generation, R-410A



Installation Manual

www.johnsoncontrols.com

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Form number: 145.15-NO1 (920)

New Release

Contents

Important!

Read before proceeding!

General safety guidelines

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

Safety symbols

The following symbols are used in this document to alert the reader to specific situations:

DANGER

Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

WARNING

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.

CAUTION

Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

Note: Highlights additional information useful to the technician in completing the work being performed properly.

WARNING

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with the manufacturer's published specifications and must be performed only by a qualified electrician. The manufacturer will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

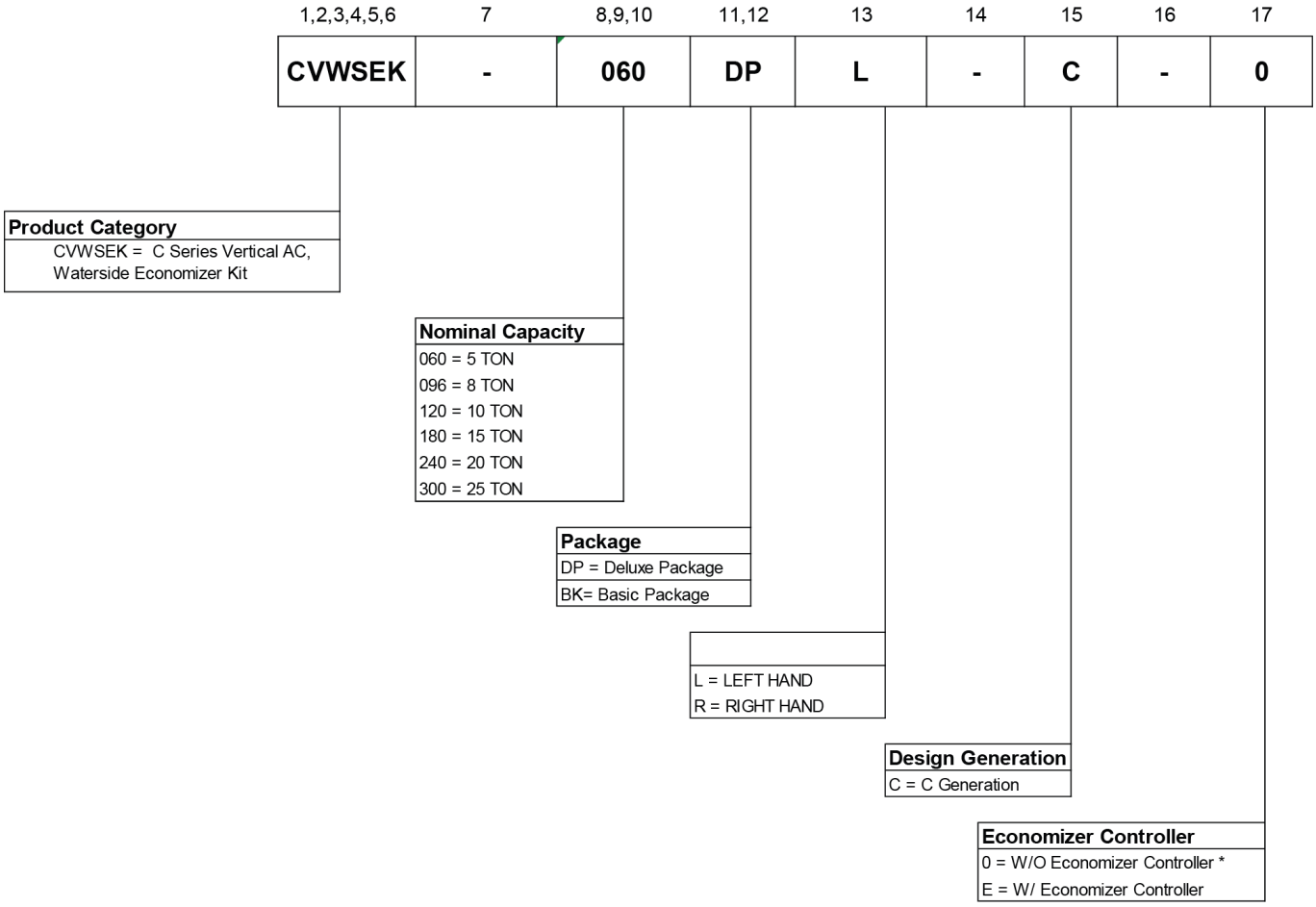
Installation warning

WARNING

Prior to installing or servicing the unit, lock all electrical power supply switches in the OFF postion. Failure to disconnect power supply may result in electrical shock or even death.

Nomenclature

Figure 1: Waterside economizer nomenclature



Note: * Economizer module factory-installed on CSV unit

Waterside economizer option description

The SE-ECO1001-X Economizer Controller is a newly designed Johnson Controls controller that meets the requirements of the Indoor Packaged Water-Cooled Equipment. The new economizer controller replaces the previous third-party economizer controller. The economizer controller communicates via standard Sensor/ Actuator (SA) bus to the main controller of the Indoor Packaged Unit (IPU), the Smart Equipment Unit Control Board (SEC).

The economizer has the ability to report up to five dedicated Fault Detection Diagnostics (FDD) through the local LCD, network sensor, thermostat with the X output for faults, or MAP gateway. In cases of equipment integration into a building management system (BMS), the same faults are communicated via the standard communication protocols.

Table 1: Package comparison

Deluxe package contents	Basic package contents
Economizer controller	Economizer controller
Chilled water coil	Chilled water coil
3-way ball valve and actuator (proportional control)	3-way ball valve and actuator (proportional control)
Coil drain pan assembly	Coil drain pan assembly
Wiring harnesses	Wiring harnesses
Coil mounting brackets (20 ton, 25 ton)	Coil mounting brackets (20 ton, 25 ton)
Coil return bend and header covers	-
Pre-bent piping	-
Pipe fittings	-
Pipe couplings	-
Pipe tee	-
Installation manual	Installation manual

Economizer coil installation (left hand shown, right hand opposite)

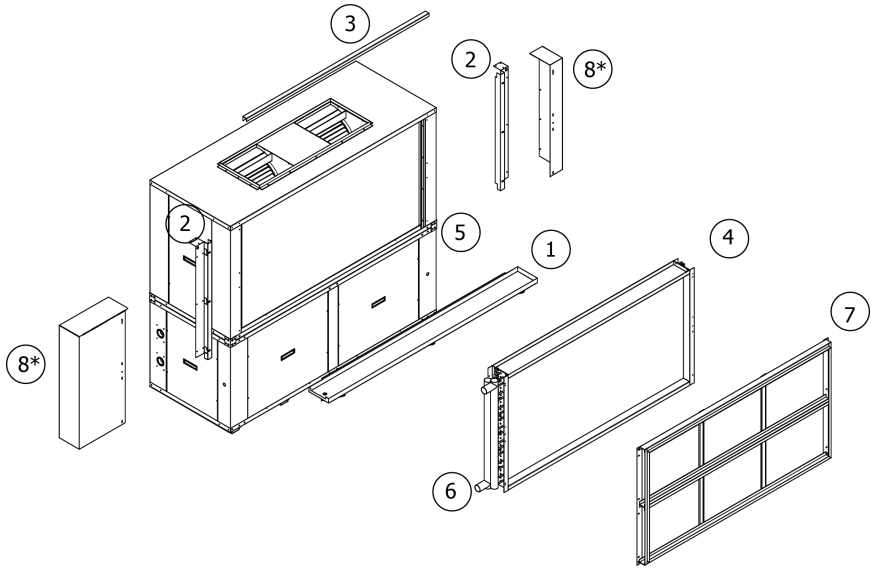
1. Position the drain pan using bent down lip of the drain pan according to illustration. Make sure the drain pan is level, do not force it. Push the drain pan against the unit; the pan assembly is designed to rest on the heads of the corner post screws. Using self-drilling screws, attach drain pan support angles to corner posts. (Figure 3)
2. CSV240C-300C ONLY. Identify the Left-hand and Right-hand WSE Coil Brackets.The Brackets are designed for easy positioning. Press the Left Bracket against the top of the unit then slide it sideways to left until the bracket flange butts against the inside bend of the left unit corner post. The bottom of the Bracket will be inside the drain pan. Repeat the same for the Right Bracket. Attach the Brackets to the corner posts using self-drilling screws in ALL pre-punched clearance holes. Check distance between coil mounting holes centers prior to lifting the coil into the drain pan. (Figure 4, Figure 5)
3. CSV240C-300C ONLY. Center the U-shaped Top Filler between the WSE Coil Brackets, then align Top Filler with Unit Top. The longer flange (one with pre-punched holes) must face Unit Top front flange. Using supplied self-drilling screws, attach Top Filler to Unit Top.
4. Carefully lift the WSE coil and place it inside of the drain pan, coil connections facing left side of the unit (see illustration, right hand opposite of this.) Push the WSE Coil against the Brackets/Posts; align holes on the WSE Coil flange with mating holes on the Brackets/Posts.
5. Slide provided bolts through the mounting holes on the Brackets and the WSE Coil flange (Insert bolts, threaded end first, through “windows” in the Brackets).
6. Tighten the WSE Coil to the unit using provided nuts and lock-washers.
7. Attach unit filter rack to entering air face of waterside economizer coil, using self-drilling screws.
8. Step 8 ONLY for DELUXE WSE KIT

   After the unit piping has been completed, attach Return Bends Cover and Header Cover using provided self-drilling screws.

⚠ CAUTION

Exercise care when working around the sharp metal edges of door panels or flanges. These edges can be sharp and can cause injury.

Figure 2: CSV240C LH shown, other models similar



*DELUXE KIT ONLY

LD30071

Figure 3: Drain pan installation

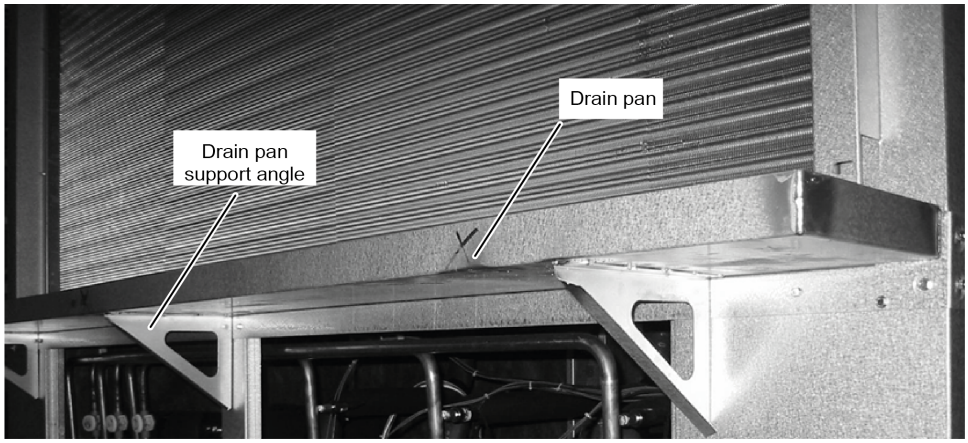


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Figure 4: Left hand coil bracket installation

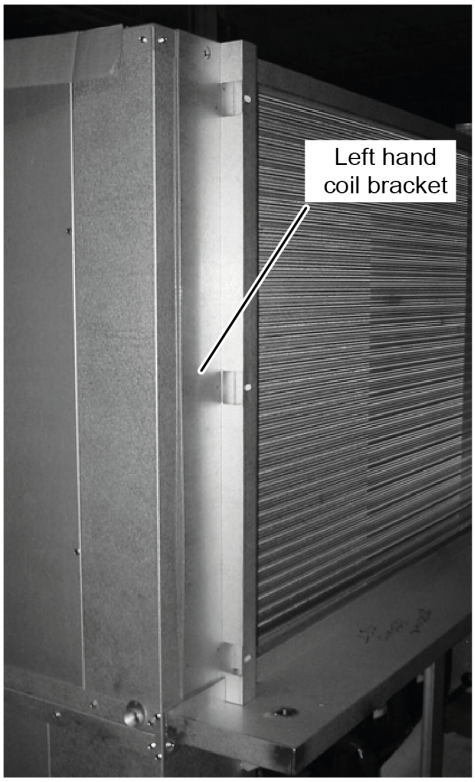

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Figure 5: Right hand coil bracket

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Deluxe and basic package kit instructions

Water side economizer piping and valve installation

1. Refer to the accompanying illustrations in Appendix A - Economizer piping layout (deluxe package shown) for recommended piping and valve mounting layout. The piping layout may be varied from that illustrated, to suit on-site conditions or requirements, provided that the correct water flow arrangement is maintained.

   The 3-way diverting valve ports are marked ‘A’, ‘B’, and ‘C’. For LH units the common port need to be changed to Port A. For RH units the common port needs to be changed to Port C. (See Appendix B - Electrical schematic for 3-way waterside economizer diverting valve adjustment). Proper orientation of the valve ports is critical for correct operation of the economizer cycle.
2. Basic package does not include fittings, elbows, adapters, or the straight tube lengths. These will need to be Field provided. See piping layout drawings for fitting and adapter descriptions. Deluxe package includes all pre-bent pipes, adapters and fittings for installation.
3. It is recommended that the connection of the economizer-bypass pipe branch, to the CSV condenser water inlet, be soldered or brazed in place in after being fully threaded into the unit inlet fitting. This will ensure that this joint remains a permanent leak-free connection. See Figure 7.
4. The copper adapters for the 3-way valve should be first soldered to the tubing connecting them to the adjacent fittings, before being threaded into the valve body.

⚠ CAUTION

DO NOT install the valve actuator until piping assembly is complete. A low-temperature solder alloy should be used to prevent annealing or out of round distortion which can occur with high temperature brazing. Use a good quality pipe sealant on the threaded fittings, and fully tighten the adapters into the brass valve body (Torque should not exceed 75 ft-lb).

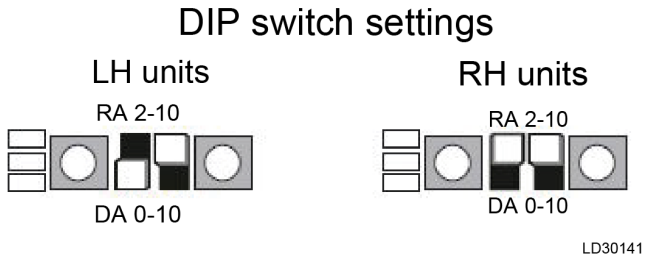
5. Assemble the tubing and fittings into the correct arrangement as shown in Appendix A - Economizer piping layout (deluxe package shown). Tack all tubes in place before soldering to ensure proper fit-up.
6. Pressure test the completed piping assembly with nitrogen. Test pressure should be at least equal to the working water supply pressure to the unit. Maximum pressure rating for the 3-way diverting valve is 580 psig, and 320 psig for the chilled water coil.
7. Relocate the EWT sensor from inside the CSV unit condenser water supply pipe to the surface of the incoming water supply line, upstream of the 3-way valve. A sensor clip is provided for 1.5” and smaller piping. Use wire ties, tape, or gear clamps for 2” piping. The two sensor leads must be connected to the OAT terminals of the SEC controller. Use the EWT sensor wiring extension provided (8 Ton and larger). A wire routing hole is provided in the condenser corner post of the unit. See Figure 9.
8. Insulate all exposed water piping to prevent sweating; ensure that the water temperature sensor location is well insulated. Insulation should cover horizontal stub-outs on economizer coil; insulation of the vertical coil headers is not required.

9. Install actuator motor to the 3-way diverting valve. The ball inside the 3-way valve must be oriented as shown in Appendix C - 3-way valve common port and DIP switches. Water should flow from the common port to the bypass port when WSE is OFF. Water should flow from common port to Economizer-In port when WSE is ON and actuator motor turns 90° CW for LH units, and 90° CCW for RH units. See Figure 9.

   The actuator motor position should be installed in the fully CCW position for LH units, and fully CW for RH units. If not, depress the black 'de-clutch' button and rotate the shaft adapter assembly.

10. For LH units set the actuator dip switches to 2-10 VDC, and DA. For RH units set the actuator dip switches to 2-10 VDC, and RA. (See Appendix C - 3-way valve common port and DIP switches).

Figure 6: DIP switch settings



11. Connect the actuator's 4 wire leads (Figure 8) to the economizer control inside the CSV main electrical box. Use the provided extension harness (15 Ton and larger). See wiring diagram for proper terminal connections.

Figure 7: Condenser water inlet

Figure 8: Actuator wire leads

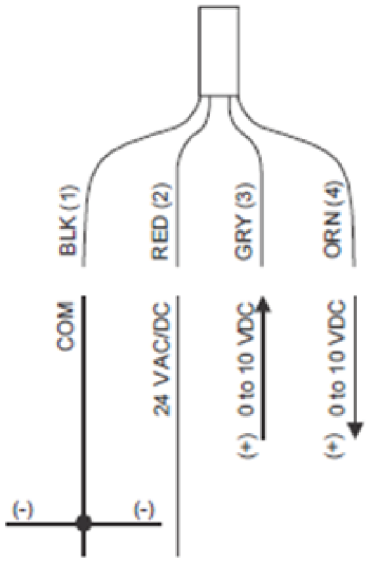


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Figure 9: Actuator/EWT sensor wiring

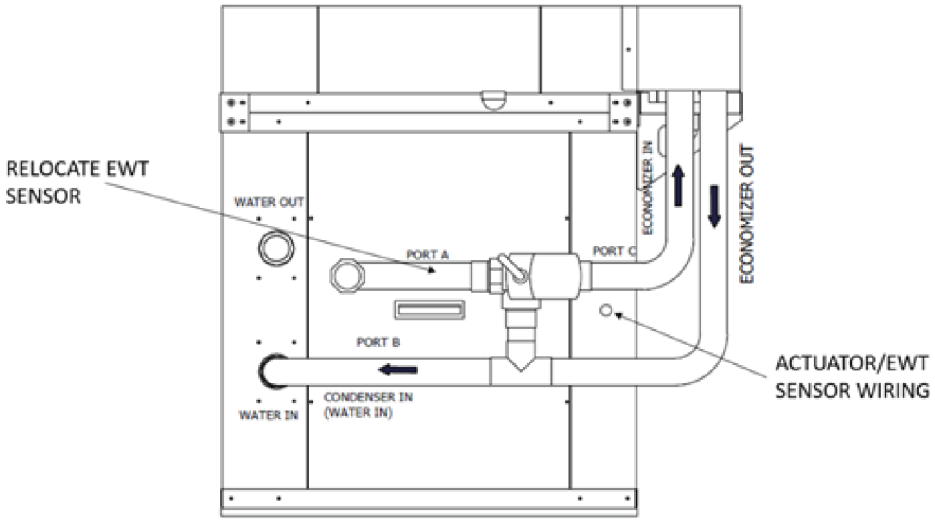

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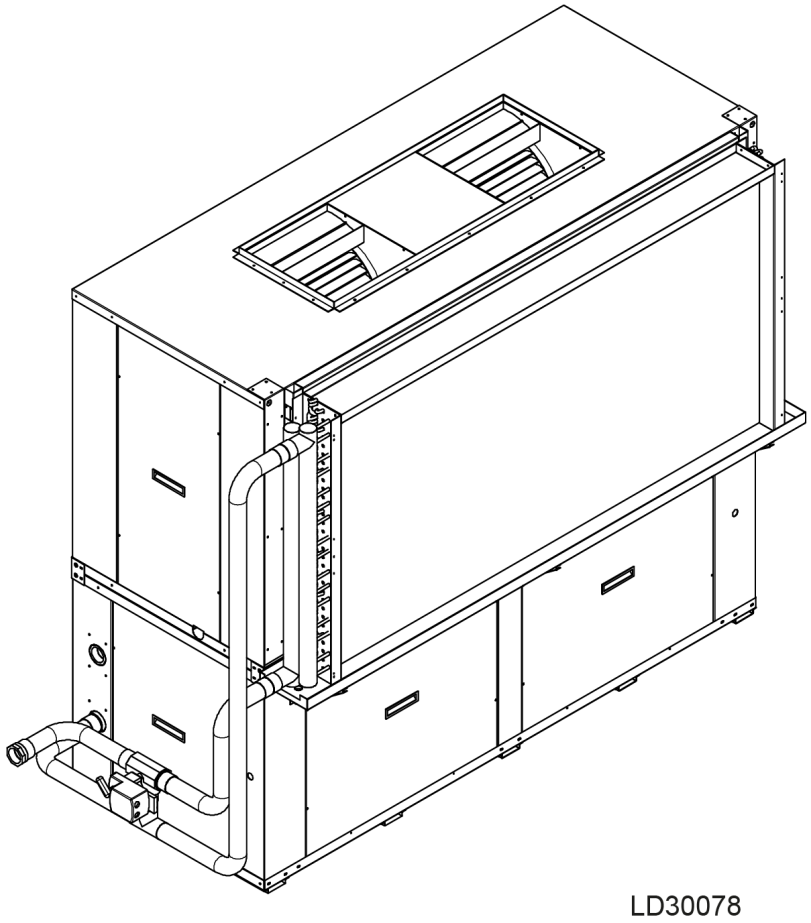
Figure 10: CSV240C left-hand shown (right-hand is opposite)



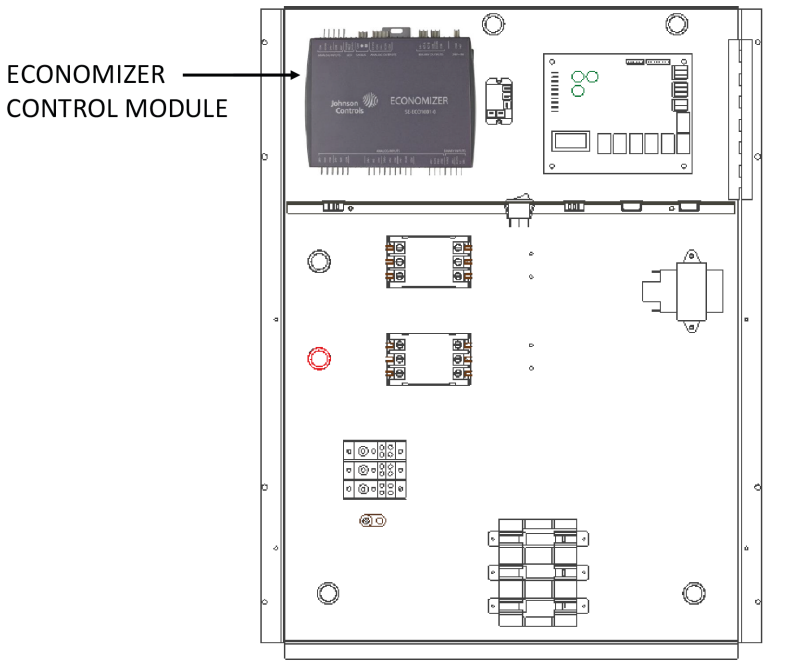
Economizer controls installation

Control module

Deluxe and Basic packages ship with an economizer controller for Field installation. CSV units with optional factory economizer controls package will have this controller already installed and wired.

Mount the economizer controller in the low voltage side of the CSV main electrical box. Use provided self-tapping screws (3) through the controller's retractable mounting tabs (3X) and into the pre-punched holes in the electrical box. Be careful not to overtighten these screws.

Figure 11: Control module



Control wiring

1. Connect the SA BUS from the economizer controller to the SA BUS on the SEC controller (J15).
2. Connect 24VAC (R) from the SEC controller to the 24V analog input on the economizer controller.
3. Once connected, the economizer controller receives power and communication from the SEC controller. No additional programming is required in the field. The controllers automatically discover each other, and enable the economizer application to execute.

   Note: Upon first start-up, if required the SEC controller will push firmware updates to the economizer controller. It important to let the updates finish completely before proceeding. If the update is interrupted the economizer module may lock-up.

4. Installer will still have to set a few configuration parameters using the local UI or the Mobile Access Portal (MAP) Gateway. Specific configuration parameters and options, available through our Smart Equipment Controls system, are to be field selected and configured. It is responsibility of installer to perform field changes to these parameters in order to enable desired and specific Waterside Economizer mode of operation.

Waterside economizer operating parameter and summary

Free cooling changeover

Only one type of available free cooling changeover option is applicable and permitted for use for waterside economizer operation and control: dry bulb changeover.

Dry bulb changeover

The control determines the type of free cooling changeover based on which sensors are present and reliable. Conditions include:

- Return Air Temperature (RAT) and Entering Water Temperature (OAT) = dry bulb changeover
- If either the RAT or Entering Water Temperature (OAT) dry bulb value is unreliable, free cooling is not available

For dry bulb water side economizer operation, the Entering Water Temperature (OAT) is suitable for free cooling if the Entering Water Temperature (OAT) is 1°F below the Economizer OAT Enable Setpoint (55°F) and 1°F below the Return Air Temperature.

Free cooling is no longer available if the Entering Water Temperature (OAT) rises above either the Economizer OAT Enable Setpoint (55°F) or the return air temperature (RAT).

IntelliSpeed™ - free cooling operation

When the control determines that the Entering Water Temperature (OAT) is suitable for economizing, the first stage of cooling is always free cooling. If the parameter “All Compressors Off in Free Cooling” is True (ON) and EWT is suitable for economizing, free cooling will be only cooling option, regardless of the number of compressor cooling stages demanded. Factory default for option “All Compressors Off in Free Cooling” is False (OFF), as that is the desired setting that will increase number of real stages and total cooling capacity of the unit.

Variable air volume (VAV) unit - free cooling operation

The operating VAV SAT setpoint is determined by the reset function, not by the number of compressors operating. With free cooling available and the SAT above the operating VAV SAT setpoint the WSE water valve will start modulating to control the operating (upper or lower) SAT setpoint +/-0.5°F. If the economizer output is at 100% for 5 consecutive minutes and the operating space temperature is 0.6°F or greater than the operating cooling setpoint, the control will start energizing compressors.

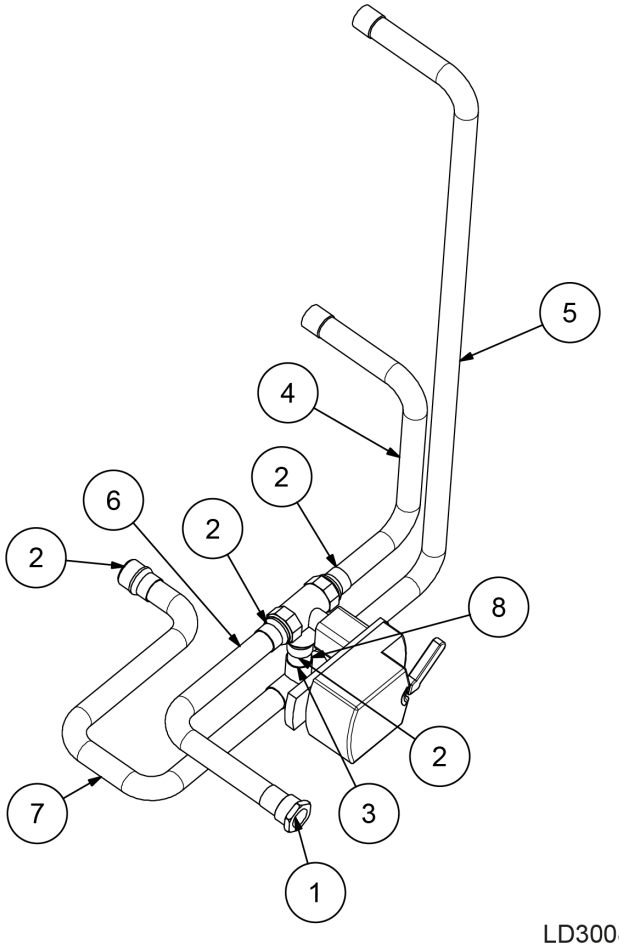
As soon as the staged percent command begins to increase, the economizer remains at 100%. If the SAT drops to less than the operating VAV SAT setpoint +1.8F, the staged percent command holds the current value. If the SAT drops to less than the operating VAV SAT setpoint -1.8°F, the staged percent command begins to decrease. If the staged percent command remains at 0% for 5 consecutive minutes the economizer modulates to control to the Upper SAT setpoint +/-0.5°F.

Table 2: Waterside econonomizer factory default parameters

Economizer SEC parameter	Setting
Econ-En	Yes
Econ-MinPos	0 % ?
EconOAT-SpEn	55°F
FreeClg-Mode	Dry bulb
AllCompOff-Econ	No
FreeClg-Sel	Auto
SATUp-Sp	Field Set for MZVAV
SATLo-Sp	Field Set for MZVAV
EconLoad-En	No
EconFltDetectEn	Disable

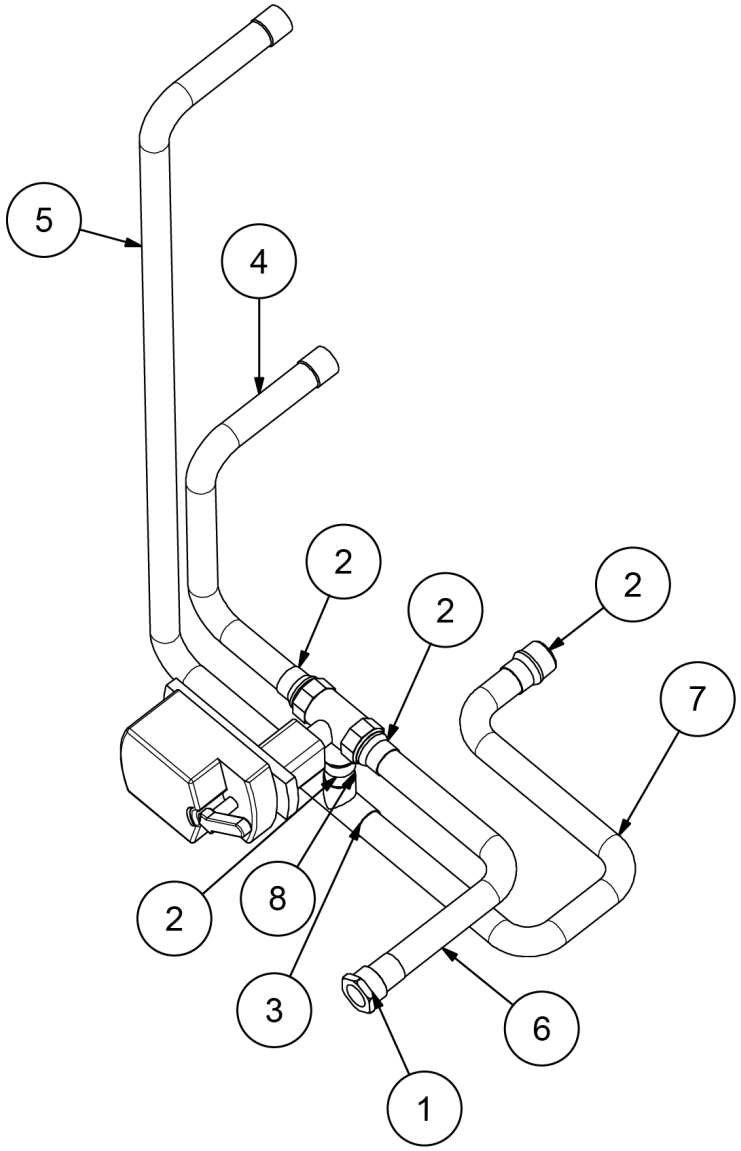
Appendix A - Economizer piping layout (deluxe package shown)

Figure 12: CSV060C left-hand pipe assembly-factory provided



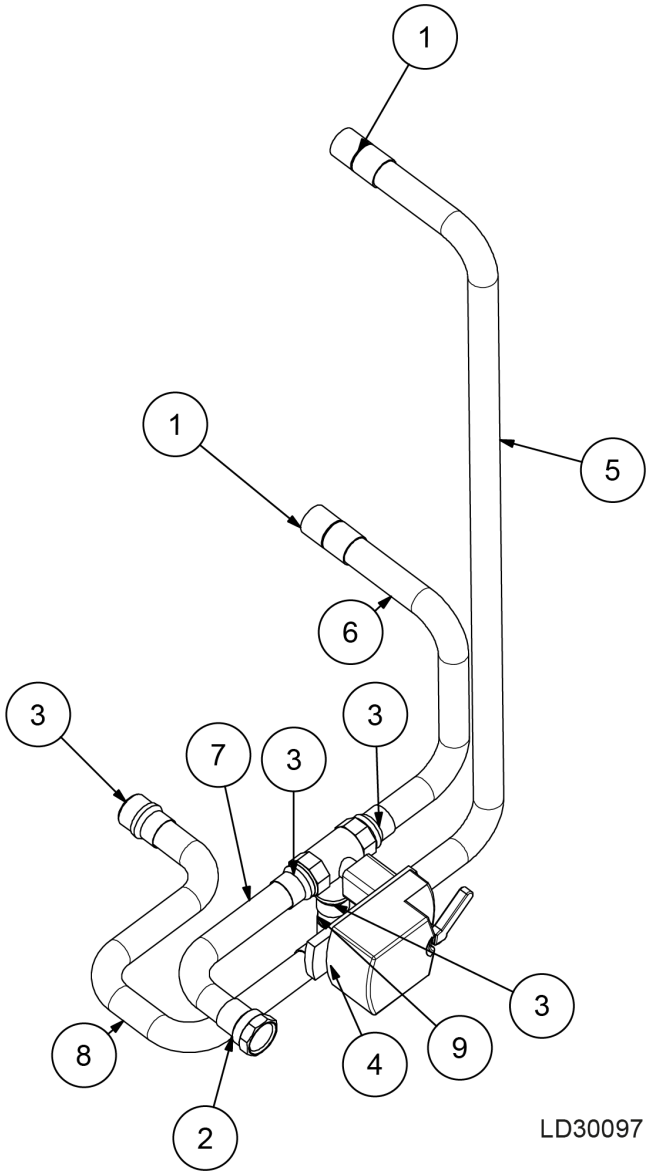
Callout	Part number	Description	Quantity
1	CPA-1181F	1 1/8 in. ODS x 1 in. FPT adapter	1
2	CPA-1181M	1 1/8 in. ODS x 1 in. MPT adapter	4
3	CPT-118	Copper tee 1 1/8 in. CXCXC	1
4	CPT-5068	Water inlet WSE	1
5	CTP-5065	Water outlet WSE	1
6	CTP-5067	Water inlet	1
7	CTP-5066	Water inlet unit	1
8	CTP-5064	Joint tee	1

Figure 13: CSV060C right-hand pipe assembly-factory provided



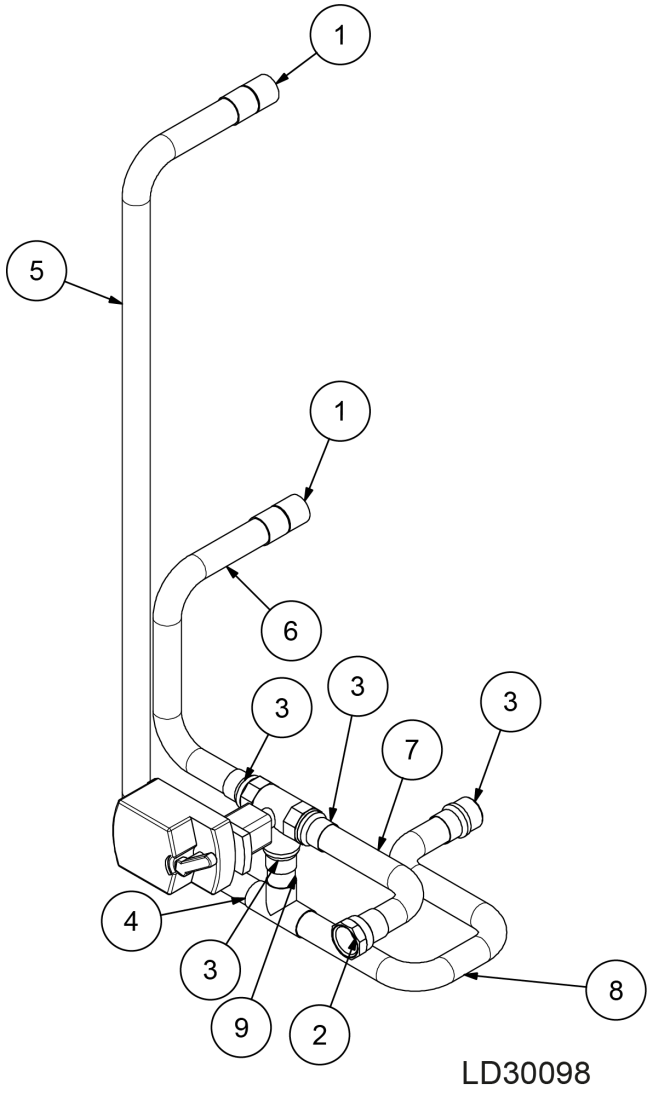
Callout	Part number	Description	Quantity
1	CPA-1181F	1 1/8 in. ODS x 1 in. FPT adapter	1
2	CPA-1181M	1 1/8 in. ODS x 1 in. MPT adapter	4
3	CPT-118	Copper tee 1 1/8 in. CXCXC	1
4	CPT-5068	Water inlet WSE	1
5	CTP-5065	Water outlet WSE	1
6	CTP-5067	Water inlet	1
7	CTP-5066	Water inlet unit	1
8	CTP-5064	Joint tee	1

Figure 14: CSV096C left-hand pipe assembly-factory provided



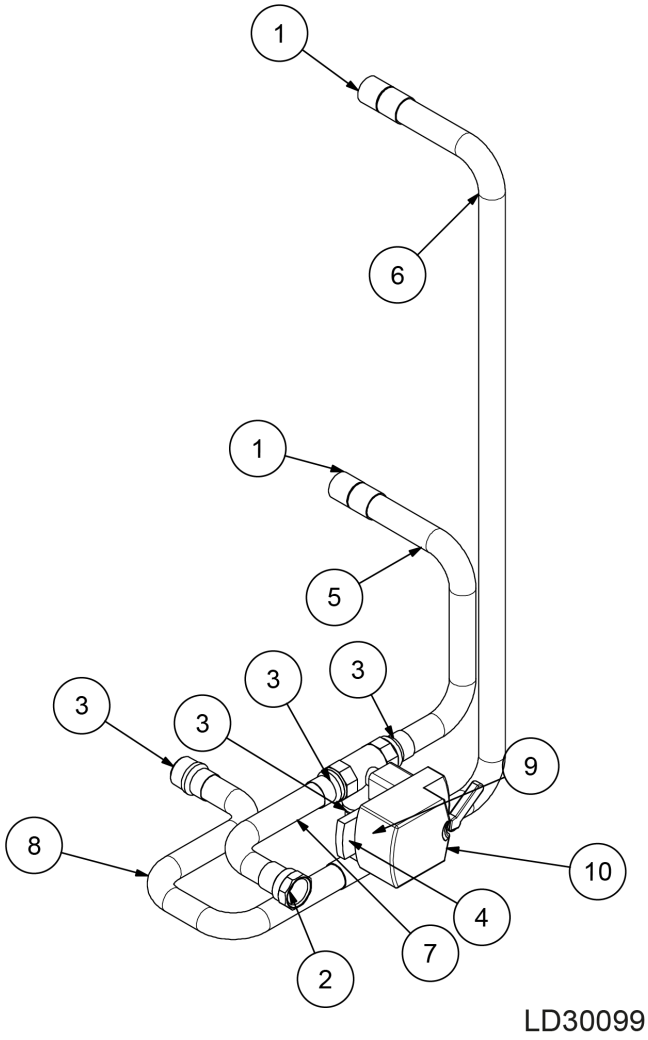
Callout	Part number	Description	Quantity
1	RSC-1375	Joint	2
2	CPA-138114F	1-3/8 in. ODS x 1-1/4 in. FPT adapter	1
3	CPA-138114M	1-3/8 in. ODS x 1-1/4 in. MPT adapter	4
4	CPT-138	Copper tee 1-3/8 in. CXCXC	1
5	CPT-5047	Water inlet WSE	1
6	CTP-5044	Water outlet WSE	1
7	CTP-5046	Water inlet	1
8 (096C)	CTP-5084	Water inlet unit	1
9	CTP-5072	Joint tee	1

Figure 15: CSV096 right-hand pipe assembly-factory provided



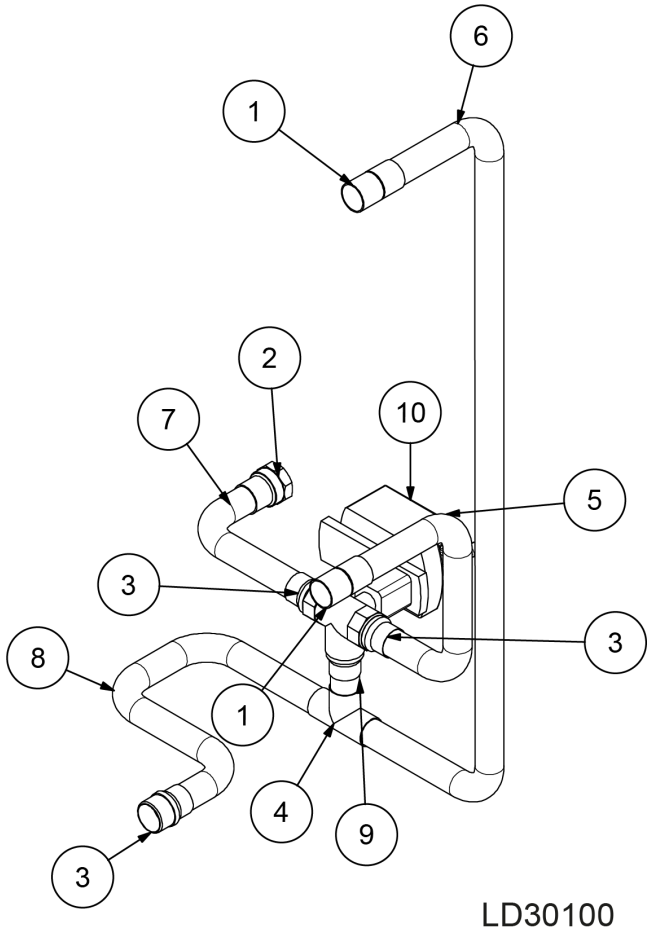
Callout	Part number	Description	Quantity
1	RSC-1375	Joint	2
2	CPA-138114F	1-3/8 in. ODS x 1-1/4 in. FPT adapter	1
3	CPA-138114M	1-3/8 in. ODS x 1-1/4 in. MPT adapter	4
4	CPT-138	Copper tee 1-3/8 in. CXCXC	1
5	CPT-5047	Water inlet WSE	1
6	CTP-5044	Water outlet WSE	1
7	CTP-5046	Water inlet	1
8 (096C)	CTP-5084	Water inlet unit	1
9	CTP-5072	Joint tee	1

Figure 16: CSV120C left-hand pipe assembly-factory provided



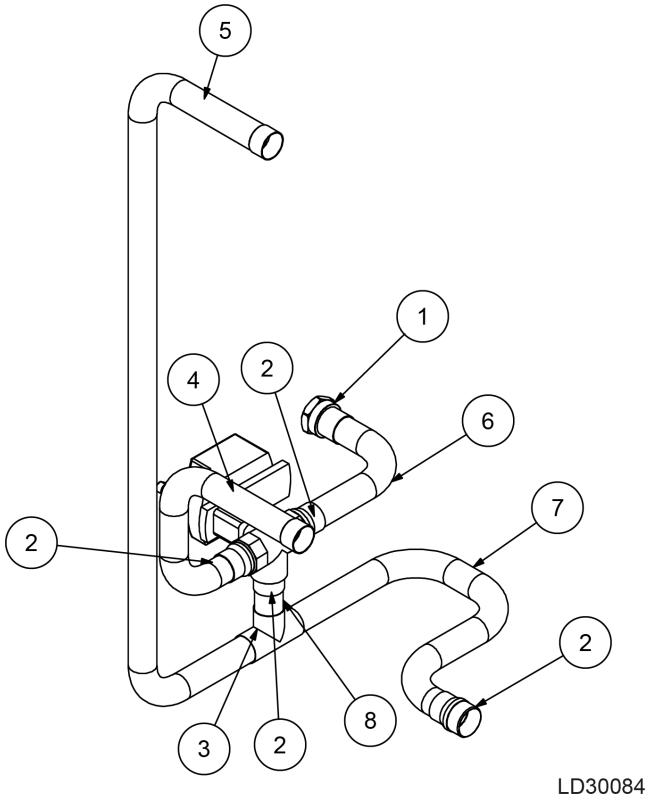
Callout	Part number	Description	Quantity
1	RSC-1375	Joint	2
2	CPA-138114F	1-3/8 in. ODS x 1-1/4 in. FPT adapter	1
3	CPA-138114M	1-3/8 in. ODS x 1-1/4 in. MPT adapter	4
4	CPT-138	Copper tee 1-3/8 in. CXCXC	1
5	CPT-5047	Water inlet WSE	1
6	CTP-5044	Water outlet WSE	1
7	CTP-5046	Water inlet	1
8 (120C)	CTP-5071	Water inlet unit	1
9	CTP-5072	Joint tee	1
10	VLBM-120-ACT	Actuator for 1 1-4 in. 3 way valve	1

Figure 17: CSV120C right-hand pipe assembly-factory provided



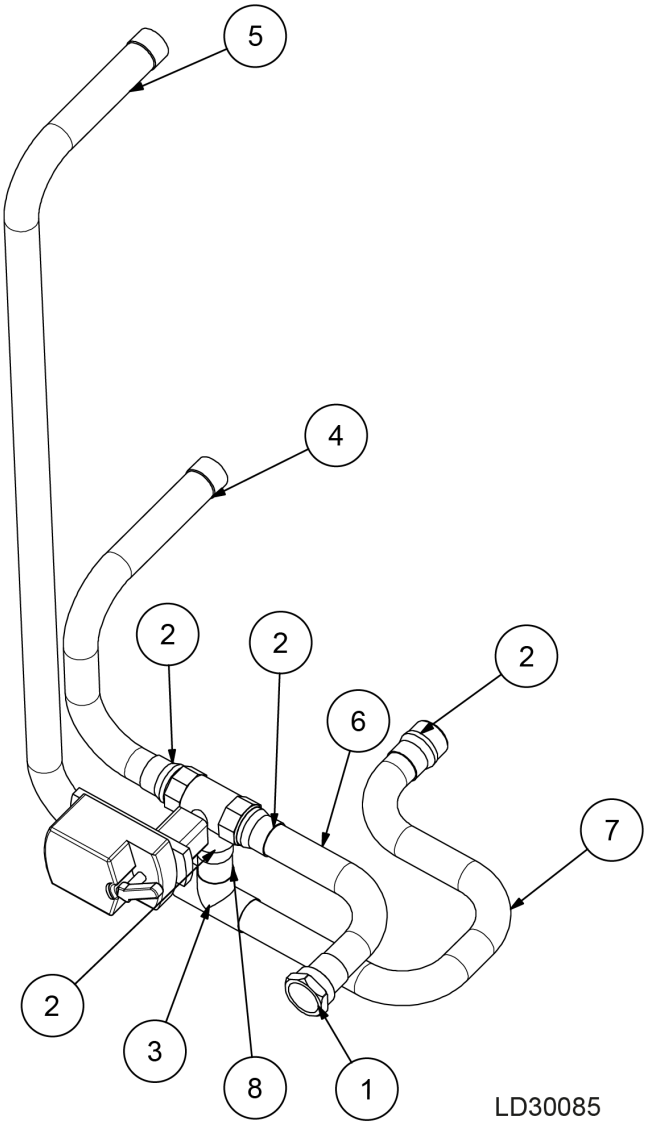
Callout	Part number	Description	Quantity
1	RSC-1375	Joint	2
2	CPA-138114F	1-3/8 in. ODS x 1-1/4 in. FPT adapter	1
3	CPA-138114M	1-3/8 in. ODS x 1-1/4 in. MPT adapter	4
4	CPT-138	Copper tee 1-3/8 in. CXCXC	1
5	CPT-5047	Water inlet WSE	1
6	CTP-5044	Water outlet WSE	1
7	CTP-5046	Water inlet	1
8 (120C)	CTP-5071	Water inlet unit	1
9	CTP-5072	Joint tee	1
10	VLBM-120-ACT	Actuator for 1 1-4 in. 3 way valve	1

Figure 18: CSV180C left-hand pipe assembly-factory provided



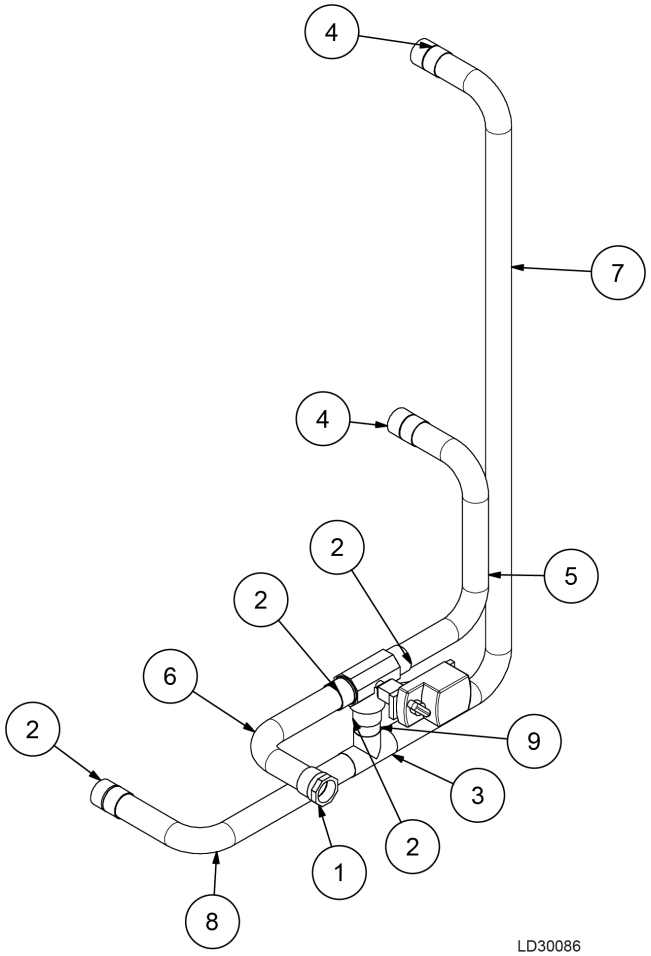
Callout	Part number	Description	Quantity
1	CPA-15815F	1 5/8 in. ODS x 1 in. FPT adapter	1
2	CPA-15815M	1 5/8 in. ODS x 1 in. MPT adapter	4
3	CPT-158	Copper tee 1 5/8 in. CXCXC	1
4	CPT-5059	Water inlet WSE	1
5	CTP-5058	Water outlet WSE	1
6	CTP-5061	Water inlet	1
7	CTP-5060	Water inlet unit	1
8	CTP-5057	Joint tee	1

Figure 19: CSV180C right-hand pipe assembly-factory provided



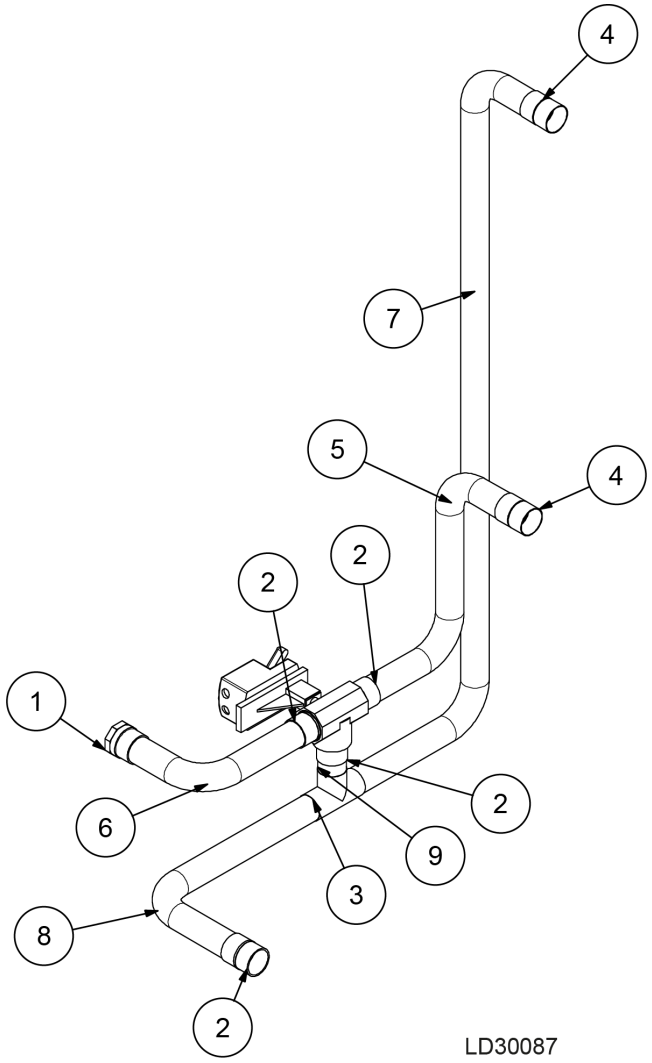
Callout	Part number	Description	Quantity
1	CPA-15815F	1 5/8 in. ODS x 1 in. FPT adapter	1
2	CPA-15815M	1 5/8 in. ODS x 1 in. MPT adapter	4
3	CPT-158	Copper tee 1 5/8 in. CXCXC	1
4	CPT-5059	Water inlet WSE	1
5	CTP-5058	Water outlet WSE	1
6	CTP-5061	Water inlet	1
7	CTP-5060	Water inlet unit	1
8	CTP-5057	Joint tee	1

Figure 20: CSV240C left-hand pipe assembly-factory provided



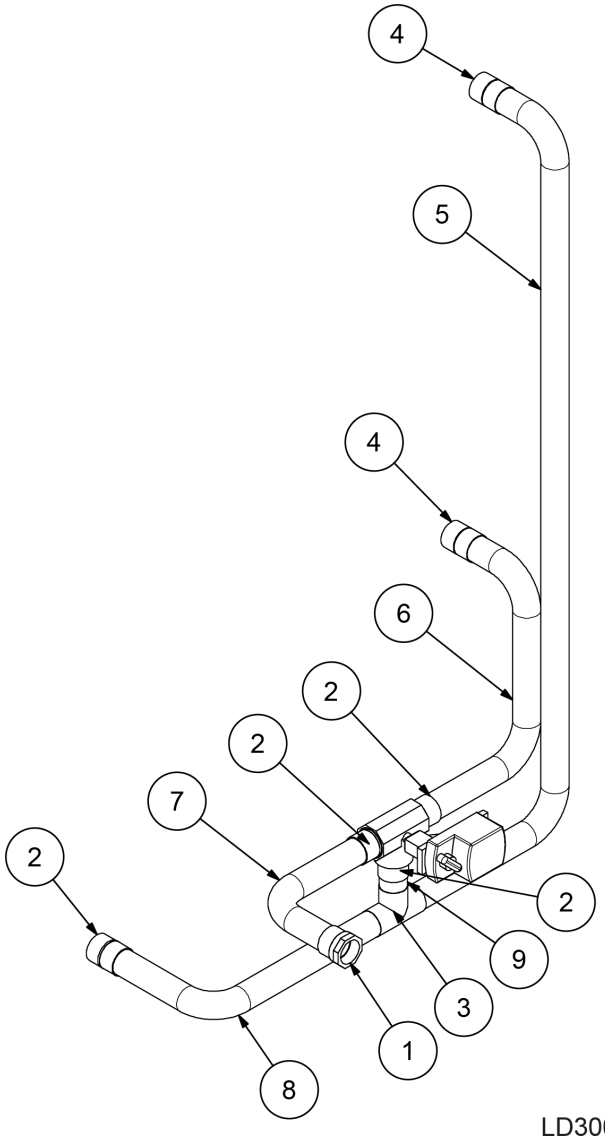
Callout	Part number	Description	Quantity
1	CPA-21802F	2 1/8 in. ODS x 2 in. FPT adapter	1
2	CPA-21802M	2 1/8 in. ODS x 2 in. MPT adapter	4
3	CPT-218	Copper tee 2 1/8 in. CXCXC	1
4	RSC-218	Joint	2
5	CPT-5050	Water inlet WSE	1
6	CTP-5052	Water outlet WSE	1
7	CTP-5049	Water inlet	1
8	CTP-5051	Water inlet unit	1
9	CTP-5048	Joint tee	1

Figure 21: CSV240C right-hand pipe assembly-factory provided



Callout	Part number	Description	Quantity
1	CPA-21802F	2 1/8 in. ODS x 2 in. FPT adapter	1
2	CPA-21802M	2 1/8 in. ODS x 2 in. MPT adapter	4
3	CPT-218	Copper tee 2 1/8 in. CXCXC	1
4	RSC-218	Joint	2
5	CPT-5050	Water inlet WSE	1
6	CTP-5052	Water outlet WSE	1
7	CTP-5049	Water inlet	1
8	CTP-5051	Water inlet unit	1
9	CTP-5048	Joint tee	1

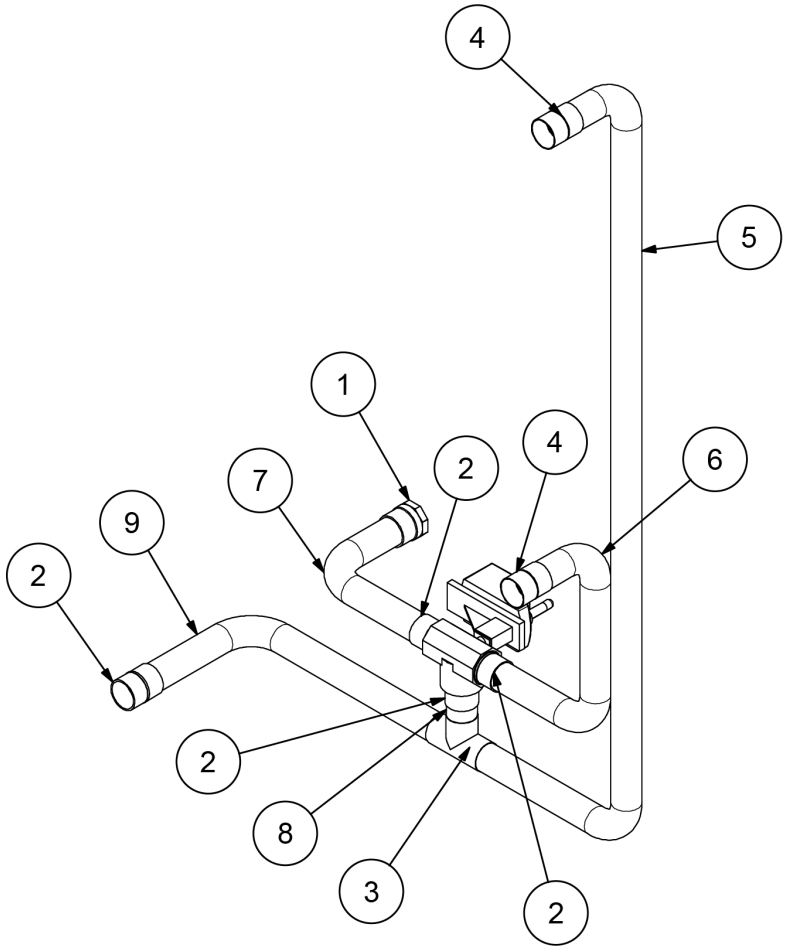
Figure 22: CSV300C left-hand pipe assembly-factory provided



LD30088

Callout	Part number	Description	Quantity
1	CPA-2182F	2 1/8 in. ODS x 2 in. FPT adapter	1
2	CPA-2182M	2 1/8 in. ODS x 2 in. MPT adapter	4
3	CPT-218	Copper tee 2 1/8 in. CXCXC	1
4	RSC-218	Joint	2
5	CPT-5079	Water inlet WSE	1
6	CTP-5078	Water outlet WSE	1
7	CTP-5052	Water inlet	1
8	CTP-5080	Water inlet unit	1
9	CTP-5048	Joint tee	1

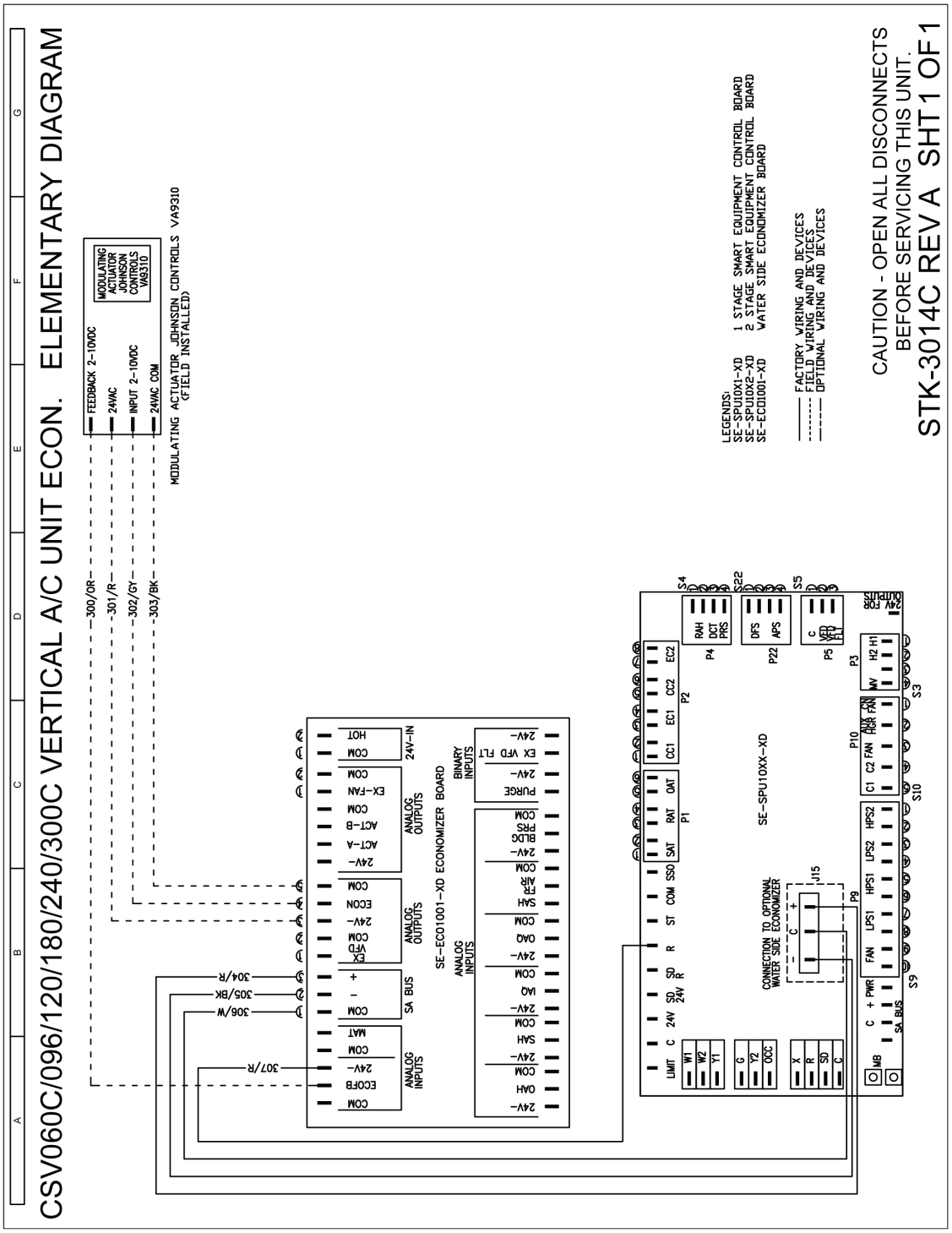
Figure 23: CSV300C right-hand pipe assembly-factory provided



Callout	Part number	Description	Quantity
1	CPA-2182F	2 1/8 in. ODS x 2 in. FPT adapter	1
2	CPA-2182M	2 1/8 in. ODS x 2 in. MPT adapter	4
3	CPT-218	Copper tee 2 1/8 in. CXCXC	1
4	RSC-218	Joint	2
5	CPT-5079	Water inlet WSE	1
6	CTP-5078	Water outlet WSE	1
7	CTP-5052	Water inlet	1
8	CTP-5080	Water inlet unit	1
9	CTP-5048	Joint tee	1

Appendix B - Electrical schematic

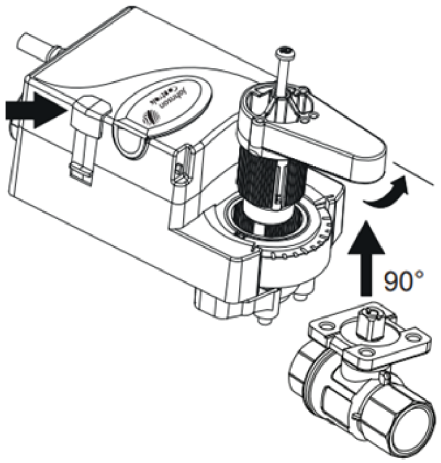
Figure 24: Waterside economizer electrical schematic



Appendix C - 3-way valve common port and DIP switches

I. Changing common ports

1. For LH WSE units, port A is the common port.
2. For RH WSE units, port C is the common port.
3. Remove the actuator from the 3-way valve. Remove the screw from the handle and pull the actuator assembly upward (2-way valve shown for illustrative purposes, 3-way valve is similar).



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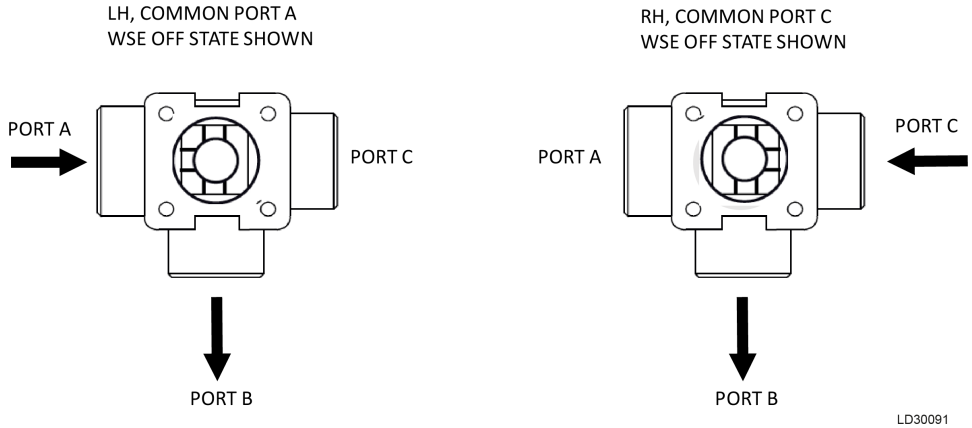
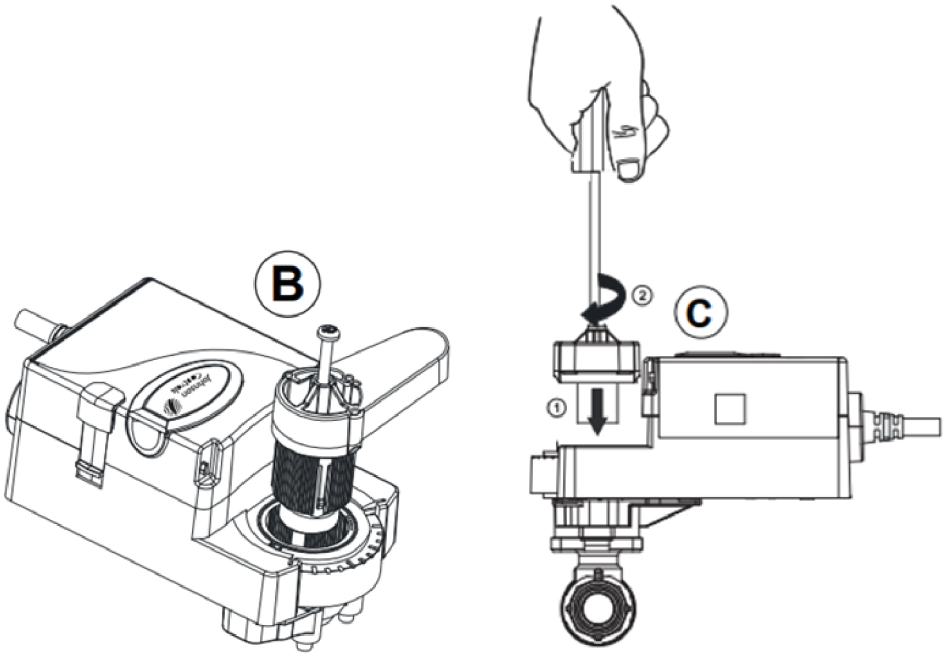
4. Verify the WSE OFF orientation of the valve ball is correct. If required, rotate the valve stem.



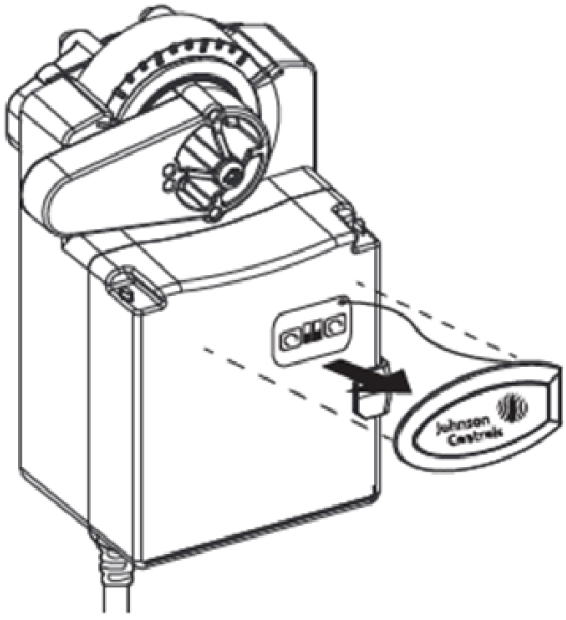
LD30091

5. Re-install the actuator onto the 3-way valve. Align the splines in the handle with those in the motor, and fully seat the actuator onto the valve stem. Tighten the screw on the handle 8-11 in-lbs (2-way valve shown for illustrative purposes, 3-way valve is similar).



LD30092

II. Accessing actuator DIP switches



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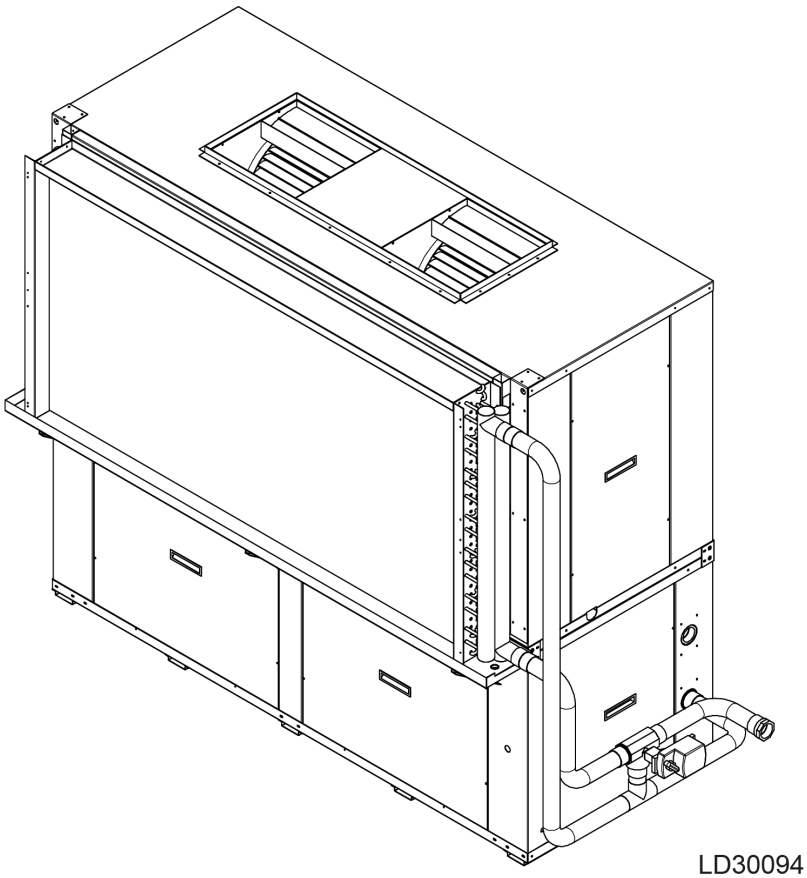
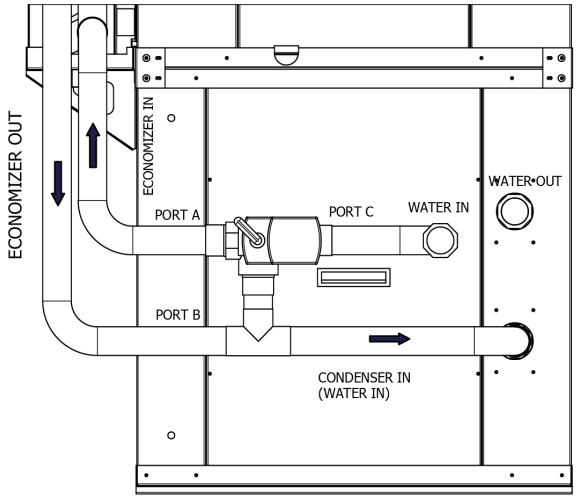
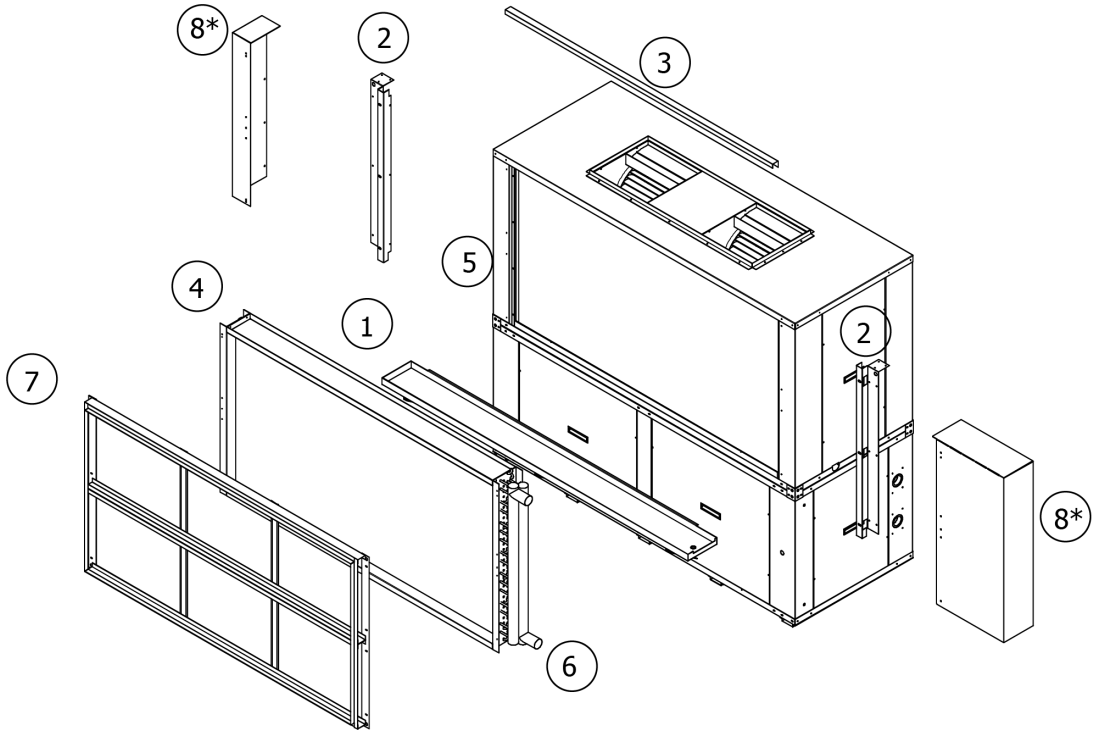
Appendix D (right hand unit shown for reference, CSV240C)



LD30094



LD30095



*DELUXE KIT ONLY

LD30096