Model CSV240B WSE
Vertical R-410A
Water Side Economizer

Supersedes 145.15-IOM4 (910)

Form 145.15-IOM4 (412)

MODEL CSV240B WATER SIDE ECONOMIZER

FOR CSV240B VERTICAL R-410A WATER COOLED AIR CONDITIONING UNITS

INSTALLATION INSTRUCTIONS

B Style

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDLINES

This equipment is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, 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 responsibilty of 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 sever personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses 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 this document and any referenced materials. This individual shall also be familiar with and comply with all applicable 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 areas of potential hazard.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually and instruction will be given, together with a brief explanation.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTE is used to highlight additional information which may be helpful to you.

All wiring must be in accordance with published specifications and must be performed ONLY by qualified service personnel. Johnson Controls will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. *Failure to follow this will void the manufacturers' warranty and cause serious damage to property or injury to persons.*

TABLE OF CONTENTS

4 **…… Economizer Coil Installation**

6 …… Economizer Piping & Valve Installation

12 ……. Temperature Control Panel Installation

14….. Unit Schematic Diagram

14 ……. WSE Harness Connections

14….. Sequence of Operation

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.

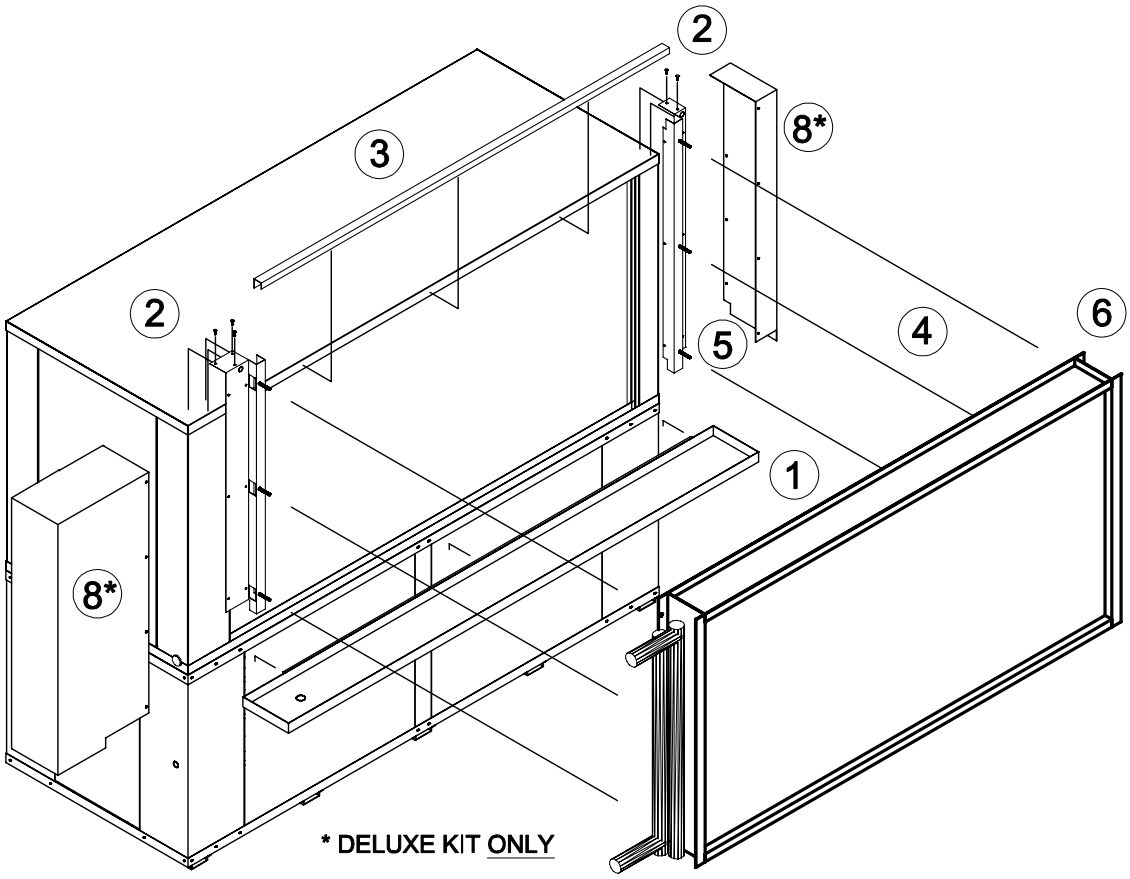
ECONOMIZER COIL INSTALLATION

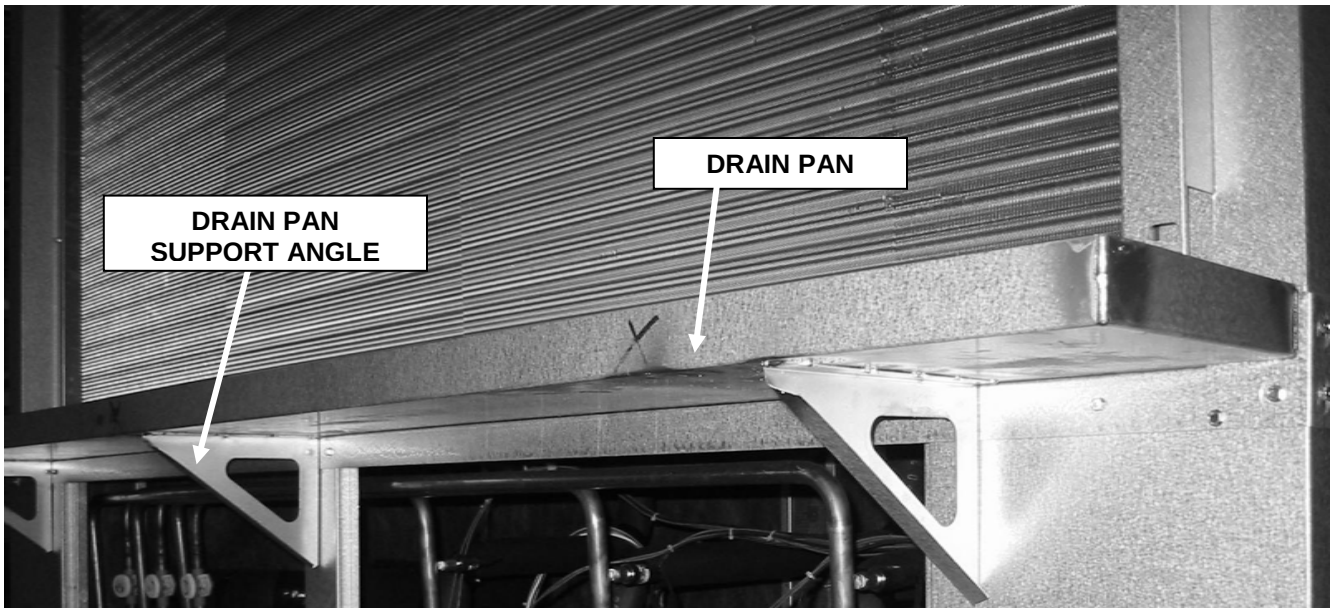
1) Position the drain pan using bent down lip of the drain pan according to illustration. Make sure the drain pan is level, do not force it. Push the drain pan against the unit; the pan assembly is designed to rest on the heads of the corner post screws. Using self-drilling screws, attach drain pan support angles to corner posts.
2) 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.
3) 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). Push the WSE Coil against the Brackets; align holes on the WSE Coil flange with mating holes on the Brackets.
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.

Applies ONLY to DELUXE WSE KIT

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

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




DRAIN PAN
DRAIN PAN
SUPPORT ANGLE

LEFT HAND COIL
BRACKET

RIGHT HAND COIL
BRACKET

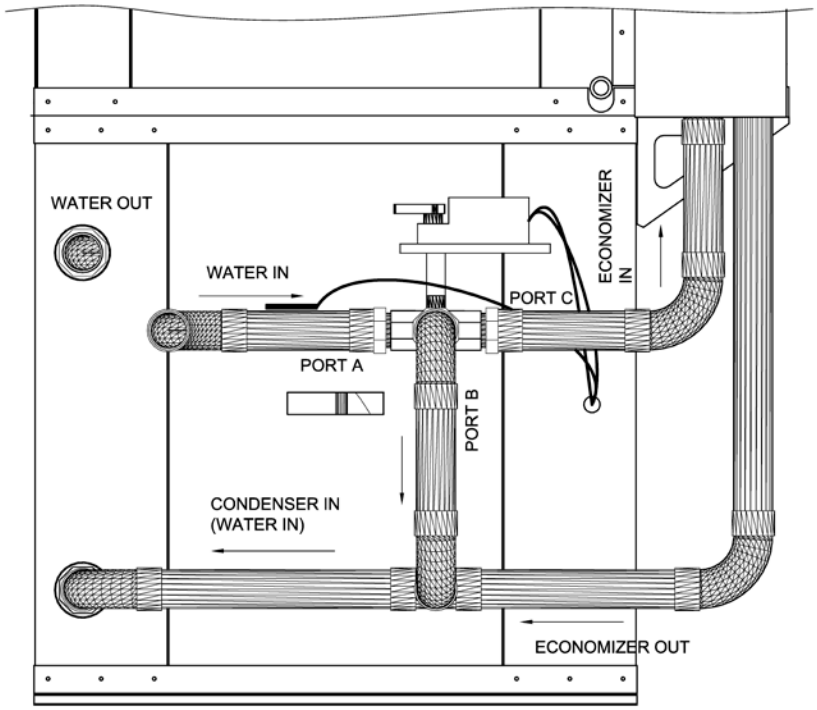
BASIC KIT INSTRUCTIONS

WATERSIDE ECONOMIZER PIPING AND VALVE INSTALLATION:

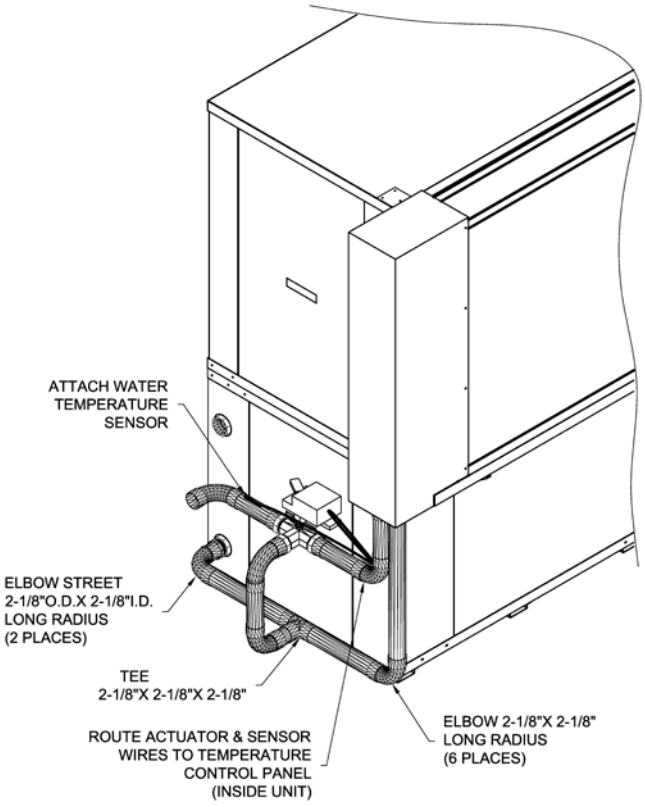
1) Refer to the accompanying illustrations for recommended piping and valve mounting layout. The piping layout may be varied from that illustrated, to suit on-site conditions or requirements, provided that the correct water flow arrangement is maintained. The 3-way diverting valve ports are marked 'A', 'B', and 'C'. The common port need to be changed from port C to port A (See supplementary instruction sheet #WSEK-INS-02, packed with the diverting valve). Proper orientation of the valve ports is critical for correct operation of the economizer cycle.
2) Wrought copper adapters are provided with the kit to adapt the 3 X 2"NPT valve connections, and the CVWC Unit's 2" NPT water inlet connection, to 2-1/8 OD copper tube fittings. The balance of required fittings, and the straight tube lengths, must be field provided (see piping layout illustrations).
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 accompanying photo)
4) The copper adapters for the 3-way valve should be first soldered to the short lengths of tubing connecting them to the adjacent fittings, before being threaded into the valve body.

<u>DO NOT</u> 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. Tack all tubes in place before soldering to ensure proper fit-up.
6) Pressure test the completed piping assembly with nitrogen. Test pressure should at least equal the working water supply pressure to the unit. Maximum pressure rating for the 3-way diverting valve is 580 psig.
7) Locate the remote electronic temperature sensor (it will be attached to the Temperature Control Panel assembly). The sensor must be securely attached to the surface of the incoming water supply line, upstream of the 3-way valve (use wire ties, tape, or gear clamps). The sensor leads will need to be extended; the two sensor leads must be connected to the terminal strip on the Temperature Control Panel. A wire routing hole is provided in the condenser corner post of the unit (early model units require field punching – use a wire protection bushing).
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. Before tightening the self-centering shaft adapter, manually rotate the diverting valve stem to the fully counter-clockwise position. The actuator motor position should be in the fully counter-clockwise position; if not, depress the black 'de-clutch' button and rotate the shaft adapter assembly to the fully CCW position stop. Slide the anti-rotation bracket forward to engage the clip on the connection end of the actuator motor. Do not seat the anti-rotation bracket at the end of the slot; allow sufficient end-play for the motor to 'float' on the valve platform
10) Remove the cover from the actuator, and connect three wire leads to the terminal strip. Lead length must be sufficient to reach the terminal strip of the 'Temperature Control Panel', which will be installed immediately inside the left hand end panel of the condenser section (behind the water bypass piping / valve assembly). See Panel wiring diagram for proper terminal connections.


WATER OUT
WATER IN
PORT C
ECONOMIZER IN
PORT A
PORT B
CONDENSER IN
(WATER IN)
ECONOMIZER OUT

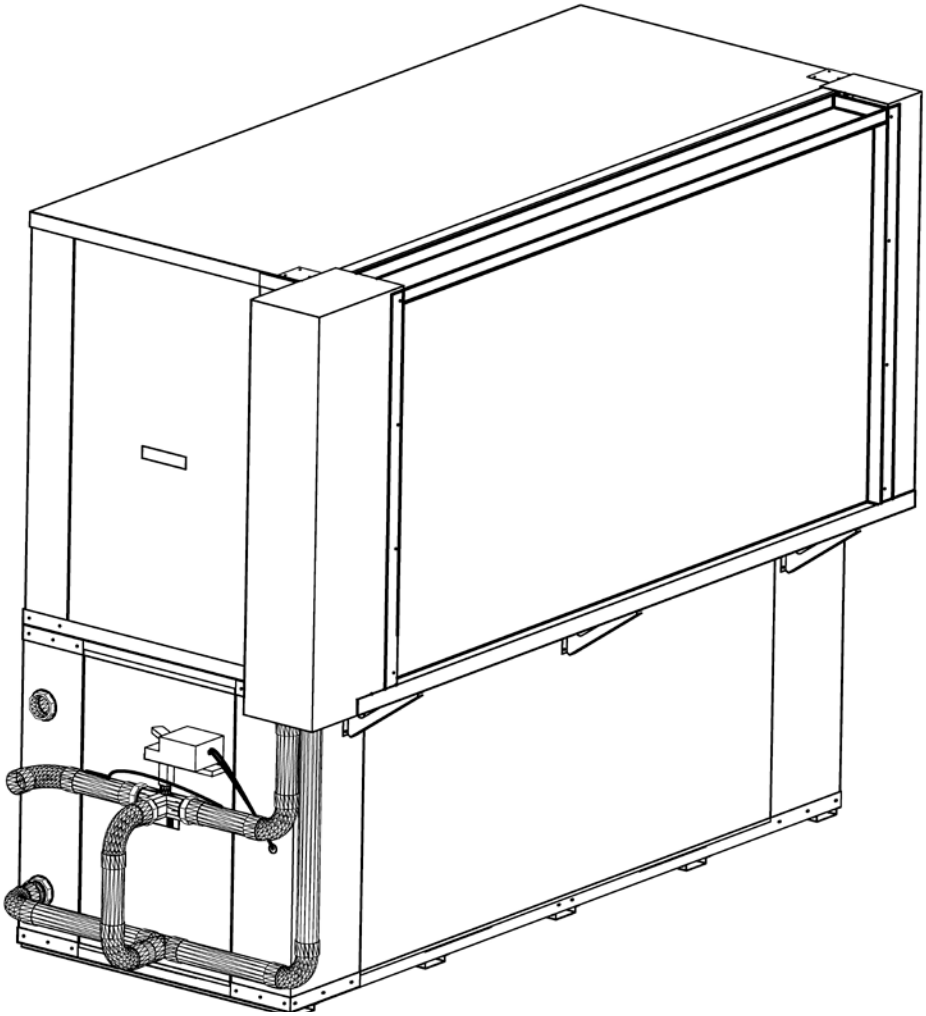
CONDENSER
WATER INLET

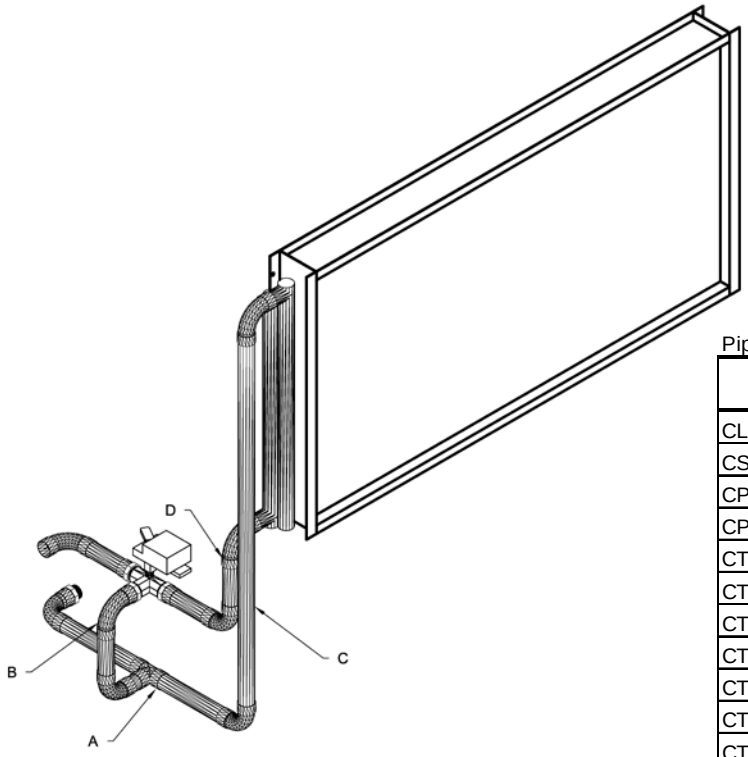

ATTACH WATER
TEMPERATURE
SENSOR
ELBOW STREET
2-1/8"O.D.X 2-1/8"I.D.
LONG RADIUS
(2 PLACES)
TEE
2-1/8"X 2-1/8"X 2-1/8"
ROUTE ACTUATOR & SENSOR
WIRES TO TEMPERATURE
CONTROL PANEL
(INSIDE UNIT)
ELBOW 2-1/8"X 2-1/8"
LONG RADIUS
(6 PLACES)

DELUXE KIT INSTRUCTIONS

WATERSIDE ECONOMIZER PIPING AND VALVE INSTALLATION:

1) Refer to the accompanying illustrations 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'. The common port need to be changed from port C to port A (See supplementary instruction sheet #WSEK-INS-02, packed with the diverting valve). Proper orientation of the valve ports is critical for correct operation of the economizer cycle.
2) All required fittings, and the straight tube lengths, are provided with the kit (see piping assembly A-D illustrations for full instructions). Wrought copper adapters are provided with the kit to adapt the 3 X 2"NPT valve connections, and the CVWC Unit's 2" NPT water inlet connection, to 2-1/8 OD copper tube fittings.
3) It is recommended that the connection of the economizer-bypass pipe branch, to the CVWC 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 accompanying photo on page 5)
4) The copper adapters for the 3-way valve should be first soldered to the short lengths of tubing (see piping assembly "B") connecting them to the adjacent fittings, before being threaded into the valve body (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. Tack all tubes in place before soldering to ensure proper fit-up.
6) Pressure test the completed piping assembly with nitrogen. Test pressure should at least equal the working water supply pressure to the unit (**NOTE:** Maximum pressure rating for the 3-way diverting valve is 580 psig).
7) Locate the remote electronic temperature sensor (it will be attached to the Temperature Control Panel assembly). The sensor must be securely attached to the surface of the incoming water supply line, upstream of the 3-way valve (use wire ties, tape, or gear clamps). The two sensor leads must be connected to the terminal strip on the Temperature Control Panel. A wire routing hole is provided in the condenser corner post of the unit (early model units require field punching – use a wire protection bushing).
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. Before tightening the self-centering shaft adapter, manually rotate the diverting valve stem to the fully counter-clockwise position. The actuator motor position should be in the fully counter-clockwise position; if not, depress the black 'de-clutch' button and rotate the shaft adapter assembly to the fully CCW position stop. Slide the anti-rotation bracket forward to engage the clip on the connection end of the actuator motor.
10) Remove the cover from the actuator, and connect three wire leads to the terminal strip. Lead length must be sufficient to reach the terminal strip of the 'Temperature Control Panel', which will be installed immediately inside the left hand end panel of the condenser section (behind the water bypass piping / valve assembly). See Panel wiring diagram for proper terminal connections.

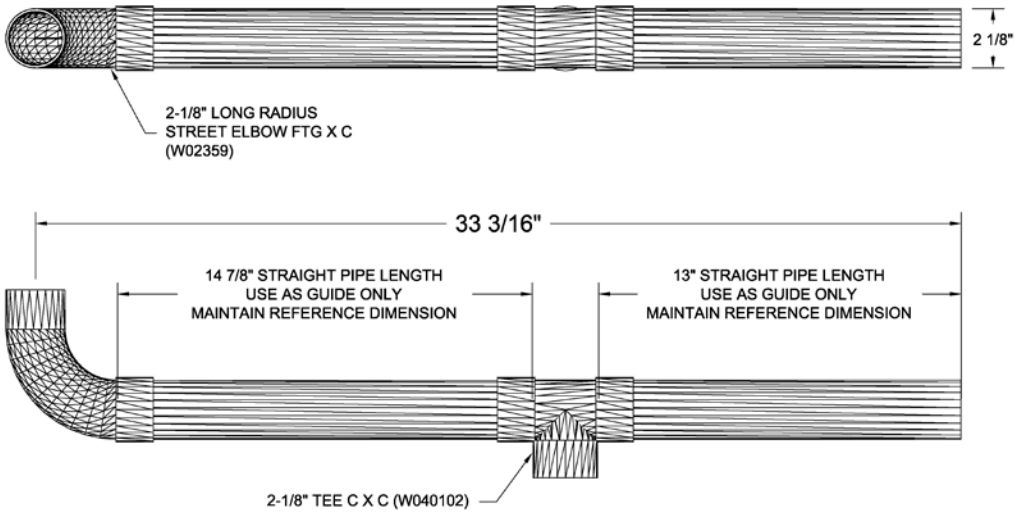




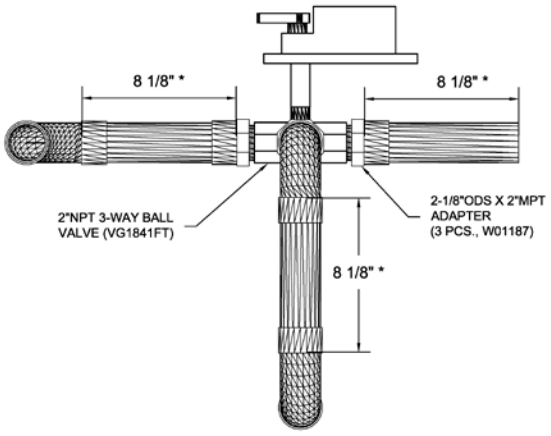
Piping Parts Supplied in DELUXE KIT

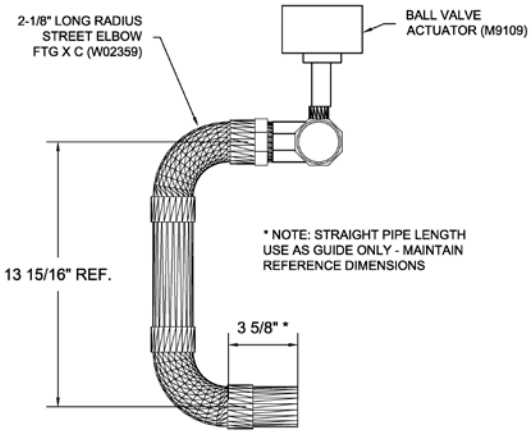
Part #	Qty	Description
CLR-218	6	ELBOW - 2-1/8" LG RADIUS 90DEG CxC
CST-218	2	ELBOW -STREET 2-1/8" 90DEG CxF
CPA-21820M	4	2-1/8 ODS X 2" MPT ADAPTER
CPT-218	1	COPPER TEE - 2-1/8" CxCxC
CTH-218	3-5/8"	COPPER TUBING - 2-1/8" HARD
CTH-218	8-1/8"	COPPER TUBING - 2-1/8" HARD
CTH-218	8-1/8"	COPPER TUBING - 2-1/8" HARD
CTH-218	8-1/8"	COPPER TUBING - 2-1/8" HARD
CTH-218	8-7/16"	COPPER TUBING - 2-1/8" HARD
CTH-218	13"	COPPER TUBING - 2-1/8" HARD
CTH-218	14-7/8"	COPPER TUBING - 2-1/8" HARD
CTH-218	57-13/16"	COPPER TUBING - 2-1/8" HARD

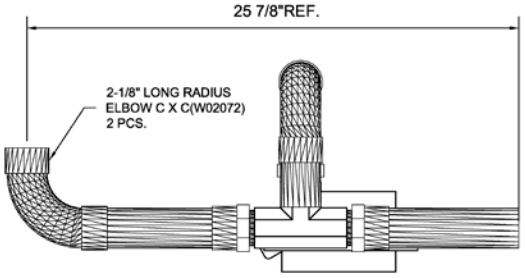
ASSEMBLY A



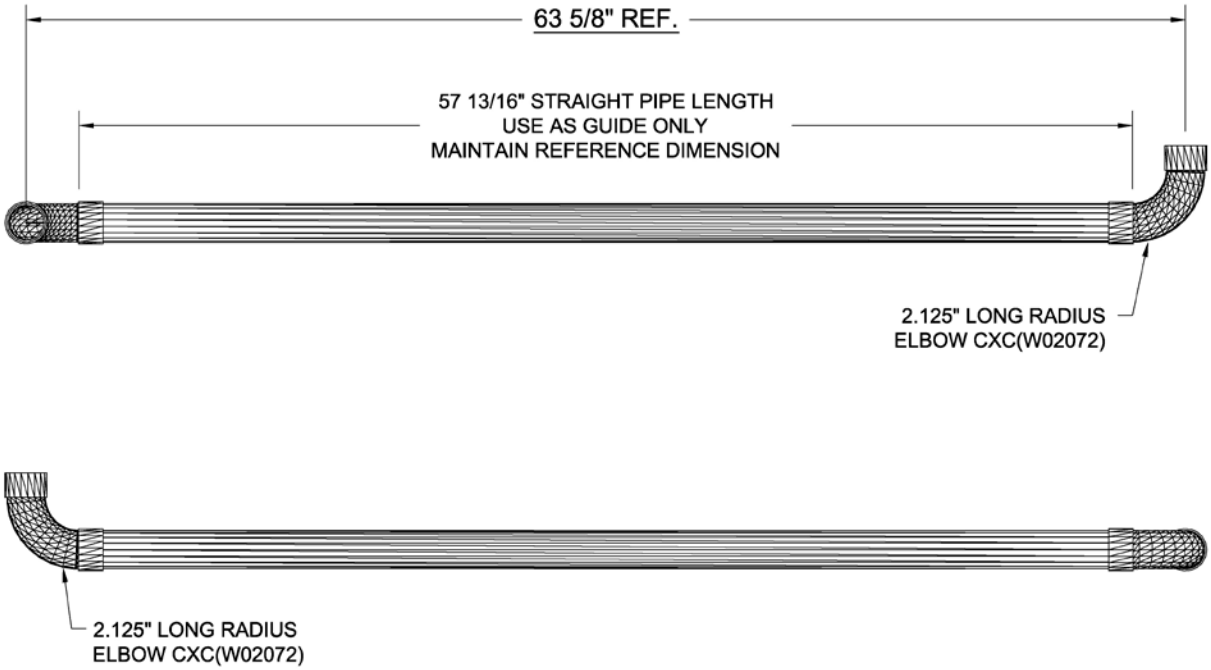
ASSEMBLY B



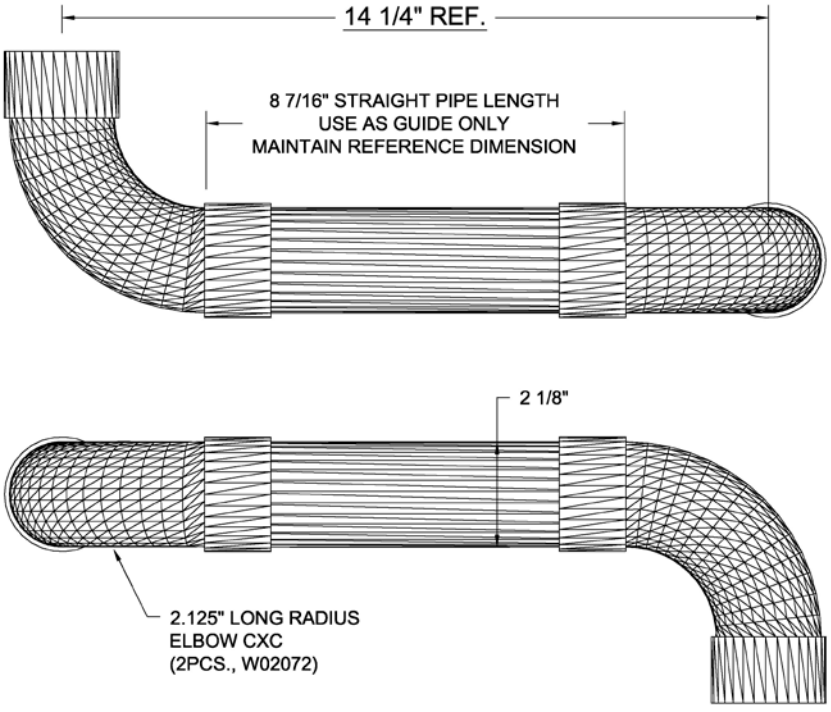




ASSEMBLY C



ASSEMBLY D



CONTROL PANEL INSTALLATION - WATERSIDE ECONOMIZER

Each Waterside Economizer is shipped with a pre-wired Water Temperature Control / Compressor Staging Panel. The panel is complete with a pre-terminated wiring harness, for connection to the economizer plug on the microprocessor control board of the water-cooled unit.

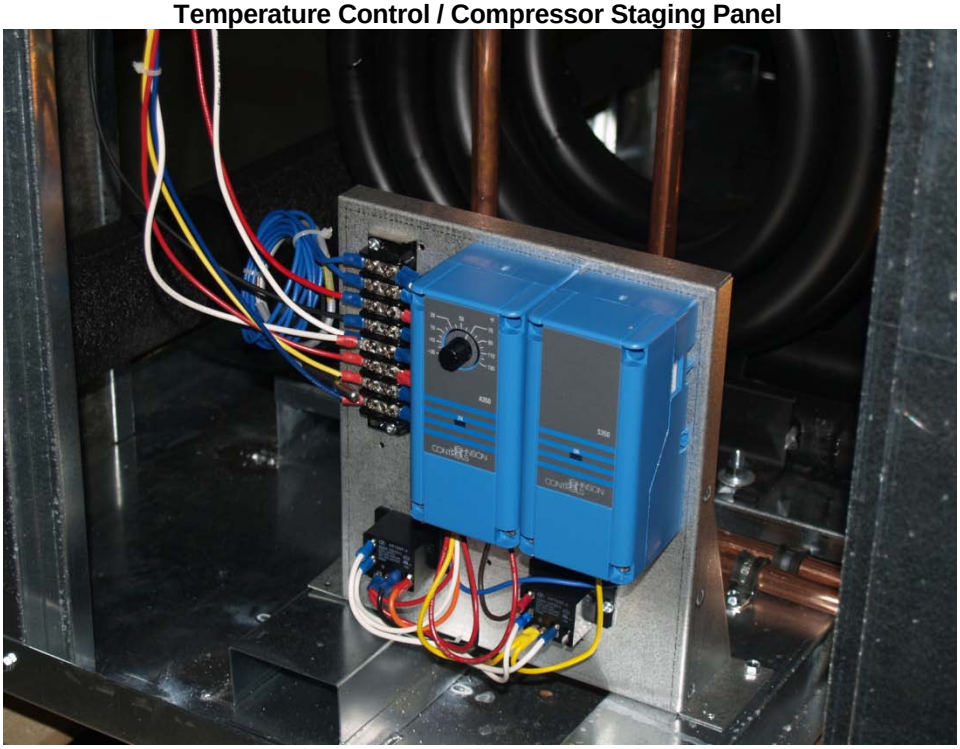
Installing Temperature Control Panel

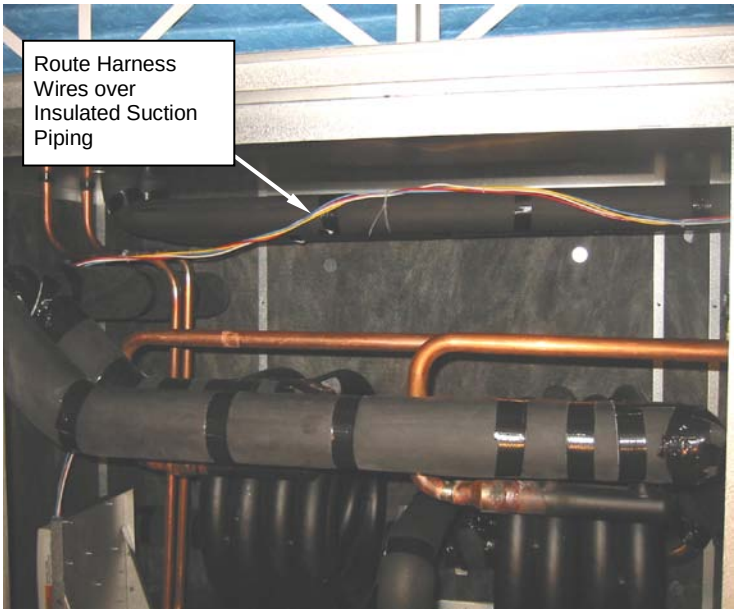
1) The Temperature Control Panel fixture is intended for mounting on the wide condenser clamp rail, supplied with the economizer kit (see photo below). Fasten the panel feet to the rail, using the provided self-drilling screws.
2) Route the pre-terminated 4-wire harness toward*s* the back of the main electrical panel. The harness wiring should be kept away from hot gas piping, and the top of the compressor shell. Pass the wiring into the low voltage section of the main electrical panel, through the thermostat wire entrance hole (see photo below).
3) On the microprocessor, locate the Economizer pin P5 and unplug the two Yellow/Red jumper wires Y1-OUT and ECON and connect these leads to the corresponding colored Yellow/Red harness wires (see table below). On pin P5, connect the G-OUT wire lead to corresponding colored harness wire Gray/Red. Using the provided ¼" tab adapter, create a dual connection on the C-Common tab on the microprocessor board and connect the White harness wire to this dual connection at C. See table below for connecting the harness wires to the corresponding economizer plug connection leads and Common tab on the Microprocessor Board. See wiring schematic for information on pin P5 and C (Common locations).

Single and Dual Compressor Units WSE Control Harness			
Wire #	Color	Connection ID	
		WSE Temp/Staging Panel	Microprocessor Board
1	Yellow/Red	TB3-A1	Y1-OUT (P5)
2	Yellow/Red	TB3-A2	ECON (P5)
3	Gray/Red	TB3-A3	G-OUT (P5)
4	White	TB3-A5	C

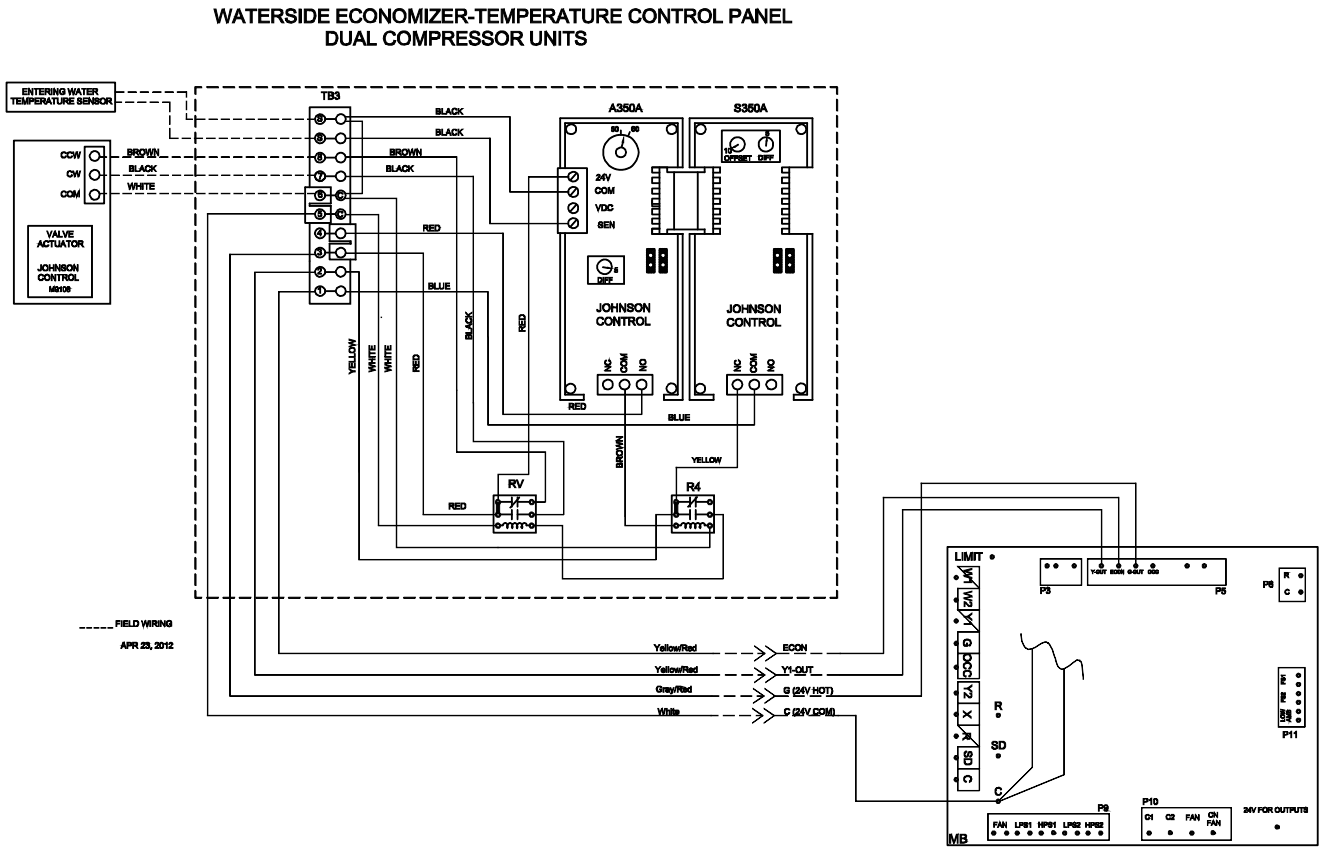
4) Connect the spade terminals of the other end of the WSE harness to the correspond terminals on TB3 as indicated in the above table. See wiring schematic for more information.
5) Secure the harness to the insulated condenser water piping, or compressor suction piping, in the condensing section of the unit, using wire ties. Ensure that the harness is routed clear of hot surfaces, sharp edges, or screw points.
6) Apply power to the unit, and observe for proper operation of the temperature control, and correct valve actuator rotation (valve position is fully CCW for full mechanical cooling operation, fully CW for economizer mode).

Temperature Control / Compressor Staging Panel





WATERSIDE ECONOMIZER HARNESS – DUAL COMPRESSOR WIRING SCHEMATIC



SEQUENCE OF OPERATION - Single Compressor Models

The economizer/unit control package is designed for use with a conventional 24-Volt cooling thermostat. A JOHNSON CONTROL A350A Electronic Temperature Control and a S350A Temperature Stage Module – with remote sensor – are used to measure the temperature of the cooling water supplied to the unit. The A350A will energize/de-energize its relay output stages as dictated by the deviation of the measured water supply temperature to the control set point. The LED in A350A and S350A indicate their relay status. When water temperatures are suitable for economizing, the control circuit will engage a JOHNSON CONTROL M9106 actuator motor; driving a 3-way diverting valve. The actuator motor power supply is 24vac, connected to the motor for 2-postion control logic.

The control set point for the economizing cycle is user-adjustable. The recommended operating set point is 55^{o}F. Entering Water Temperatures higher than this value (i.e. 60^{o}F) will provide only marginal cooling benefit from the economizing coil – near continuous operation of the compressor circuits may be required to maintain desired space temperature.

Economizer Operation Scenarios

Scenario A

Entering water temperature is above 55^{o}F and not adequate for economizer cooling.

Scenario B

At the factory economizer activation set point of 55^{o}F or less, the economizer coil will be activated, and compressor operation will be maintained. Total unit capacity is significantly increased, thereby reducing compressor operating time. Water valve will be activated to allow water flow through coil and condensers.

Scenario C

At an entering water temperature of 55°F or less, and with first and second stage cooling being called by the thermostat (Y1 and Y2), economizer and mechanical cooling will both be active.

Scenario D

At an entering water temperature of 45°F or less, and with a call for first stage cooling present from the thermostat (Y1), economizer will be activated and both compressors will be locked-out. Water temperature is deemed to be sufficient to provide sufficient cooling capacity without the need for mechanical cooling.

Scenario E

At an entering water temperature of 45°F or less, with unit running in economizer mode and a call for second stage cooling from the thermostat being detected, the unit will turn on compressor 1, until there is no longer a call for second stage cooling. Economizer will run in tandem with compressor 1 in this scenario.

Scenario F

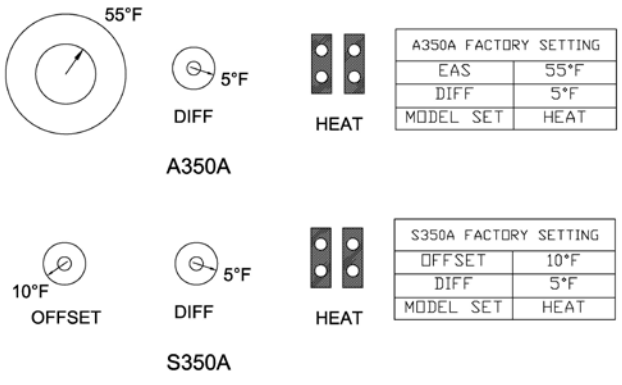
At an entering water temperature of 45°F or less, with unit running in economizer mode and a call for second stage cooling from the thermostat being detected, the unit will turn on compressor 1. If there is a continuous call for second stage cooling for more than 20 minutes, compressor 2 will also be activated. Economizer will operate in tandem with compressors 1 and 2 as long a call for second stage cooling is active from the thermostat (Y2).

Dual Compressor Unit Sequence of Operation							
Scenario	**Y1**	**Y2**	**Entering Water Temp**	**COMP 1**	**COMP 2**	**Water Flow**	**Economizer**
A	ON	OFF	Greater Than 55°F	ON	OFF	Condenser Only	OFF
B	ON	OFF	55°F Or Less	ON	OFF	Cond and Econo Coil	ON
C	ON	ON	55°F Or Less	ON	ON	Cond and Econo Coil	ON
D	ON	OFF	45°F Or Less	OFF	OFF	Cond and Econo Coil	ON
E	ON	ON	45°F Or Less	ON	OFF	Cond and Econo Coil	ON
F	ON	ON*	45°F Or Less	ON	ON	Cond and Econo Coil	ON

* call for Y2 for 20 minutes or more.

Note: If the Economizer Activation Set-point is desired to be higher than 55°F, the "Offset" Potentiometer of the S350A should be adjusted. If the "Offset" Potentiometer is not increased, lock-out of the compressor will occur at an EWT higher than that which will allow the economizer coil alone to handle the space cooling load (factory setting: EAS set point minus 10°F). To adjust "Offset" Potentiometer, remove the cover from the S350A, and locate the "Offset" Potentiometer for setting the stage differentials. Turn the "Offset" Potentiometer clockwise to increase the differential. The desired switching set-point for the second relay stage is 45°F. Adjustment of the individual stage differentials is not recommended (excessive valve / compressor cycling may result).

S350A & A350A FACTORY SETTING



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