

**Model CSV
Vertical R-410A
Air Conditioning Units**

Supersedes: 145.15-IOM7 (312)

Form 145.15-IOM7 (412)

**MODEL CSV060B-240B
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 responsibility 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 severe 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.



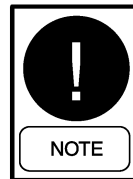
DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



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.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls policy for continuous product improvement, the information contained in this document is subject to change without notice. While Johnson Controls makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest Johnson Controls service office.

It is the responsibility of operating/service personnel as to the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then, prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

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GENERAL INFORMATION

All models are shipped as factory-charged unitized packages. All models are designed for freestanding mounting on the floor, or on a field fabricated structural steel stand. All models are shipped with vertical evaporator fan discharge as standard. The evaporator fan discharge configuration is field convertible on all units.

The 5 ton unit utilizes a single compressor. All 8 ~ 20 ton models are dual compressor units with two independent refrigerant circuits. All units come standard with a microprocessor control board (refer to 'Microprocessor' section).



ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION AND SERVICE OF THIS EQUIPMENT.

PRE-INSTALLATION INSPECTION OF EQUIPMENT

All units are factory tested to ensure safe operation and quality assembly. Units are packaged and sealed on shipping skids and shipped in first class condition. Torn and broken packaging, scratched or dented panels should be reported to carrier immediately. Internal inspection of all units should be performed prior to installation. Remove all access doors and check for visual defects that can occur during transport. Any problems found internally should be reported to carrier and manufacturer immediately. Refrigerant circuit should be checked to ensure no leaks have occurred during shipment. Install gauge set to high and low pressure ports to confirm pressure has been maintained and no leaks have occurred during shipment. Repair any damage prior to installation to ensure safe operation.



Record any unit damage on the Bill of Lading and report to carrier and factory immediately. Shipping and handling damages are not warranty items.

RIGGING



PRIOR TO MOUNTING UNIT, CHECK INDIVIDUAL UNIT WEIGHTS (PAGE 10) AND VERIFY LIFTING CAPACITY OF LIFTING EQUIPMENT EXCEEDS WEIGHT OF UNITS BY SAFE MARGINS. FAILURE TO DO SO MAY RESULT IN UNIT DAMAGE, PERSONAL INJURY OR EVEN DEATH.

To ensure safe installation of the unit when ceiling mount application is specified, estimate the approximate center of gravity of the unit. The configuration of internal components for each unit is different and weight is unevenly distributed.



DETERMINE THE ACTUAL CENTER OF GRAVITY OF THE UNIT BY PERFORMING A TEST LIFT. LIFTING AN UNBALANCED UNIT CAN CAUSE PERSONAL INJURY OR EVEN DEATH.

INSTALLATION SITE



LOCK ALL ELECTRICAL POWER SUPPLY SWITCHES IN THE OFF POSITION BEFORE INSTALLING THE UNIT. FAILURE TO DISCONNECT POWER SUPPLY MAY RESULT IN ELECTRICAL SHOCK OR EVEN DEATH.

Location - To ensure unit operates at maximum efficiencies, choose a dry indoor area where the temperature is controlled between 50°F and 115°F. Consideration of surrounding areas should be taken when choosing a location to install the unit. Common vibration and sound levels associated with commercial equipment may be objectionable to people or equipment.



Failure to allow adequate space between units may result in poor unit performance and possible unit failure.

Install thermostats, air supplies and returns so that each unit will operate only on individual unit control. To assure fast drainage of condensate run-off, unit can be slightly pitched in the same direction as drain pan outlet.

CSV Operating Weight		
Unit	Operating Weight (Lbs)	Shipping Weight (Lbs)
CSV060B	590	635
CSV096B	795	835
CSV120B	955	995
CSV180B	1310	1365
CSV240B	1465	1525

UNIT MOUNTING

The 5 ~ 20 ton models are shipped as a fully assembled integral package. If required units may be field split to allow for passage through doors, elevators, hallways, etc.

Duct flanges for evaporator return are incorporated into the filter rack.

Units should be secured on a solid, level pad or sturdy stand. The use of an isolating rubber sheet is recommended to reduce vibration and noise transmission. Ensure that the entire base is continuously supported - do not support unit at corner points only! Unit may be pitched slightly to ensure efficient drainage of condensate.

EVAPORATOR / CONDENSER SEPARATION - (All models)

- Reclaim the entire refrigerant charge from each compressor circuit.
- Disconnect the evaporator motor high voltage wires. Pull all wiring into the evaporator compartment. Remove bushing/clamp from routing hole for evaporator motor wiring.
- Cut and remove sections of all liquid and suction refrigerant lines. Make two cuts in each line, approximately 6 inches above and below the evaporator floor/condenser roof.



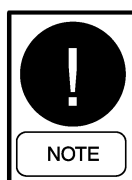
Use a TUBING CUTTER ONLY - do not use a hacksaw to cut refrigerant tubing otherwise serious damage can occur to refrigeration system!

- Remove corner securing brackets from the outside corners of the cabinet, at the joint line between the evaporator and condenser sections.
- Remove the evaporator section.

ASSEMBLY OF SPLIT UNITS - (All models)

- Place the condenser section in the required location.
- Carefully position the evaporator section atop the condensing section. Align all sides, the evaporator motor wire routing hole, and the refrigerant line routing holes.
- Install the securing brackets at all four corners, on the evaporator/condenser separation joint. Note that one bracket, intended for use at the corner with the +drain fitting, has a short "leg".

- Use appropriate tubing couplings and splice previously cut refrigerant lines. Pressure test refrigerant circuits with dry nitrogen (500 psig).
- Evacuate each circuit to at least 350 microns. If gauge pressure rises above 500 microns in one minute, evacuation is incomplete or the system has a leak.
- Charge circuit(s) to the value indicated on the unit nameplate.
- Install bushing/clamp into evaporator wiring routing hole, and pull wires through into electrical control panel. Connect motor leads to load terminals on contactor/overload relay.



Ensure evaporator motor rotation is correct upon unit start-up. Switch any two wires at contactor if blower rotation is not correct.

WATER PIPING

All factory installed water piping terminates inside the unit. Multi-condenser units feature manifolded single water in and out connections.

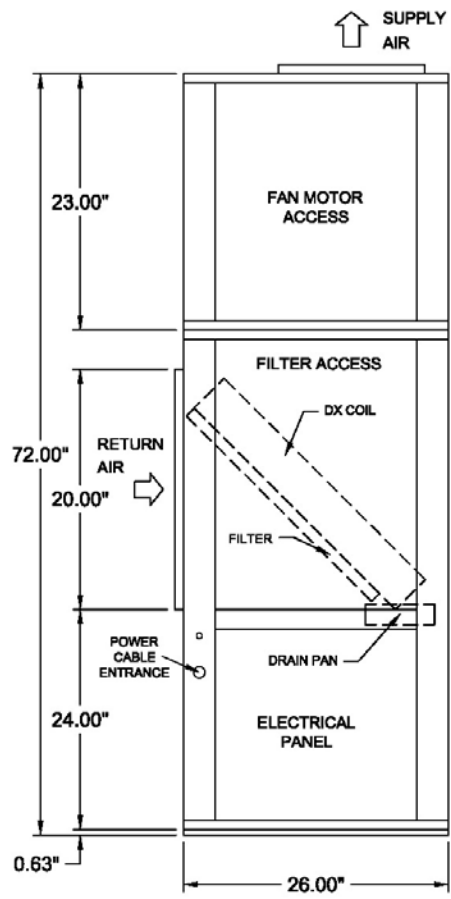
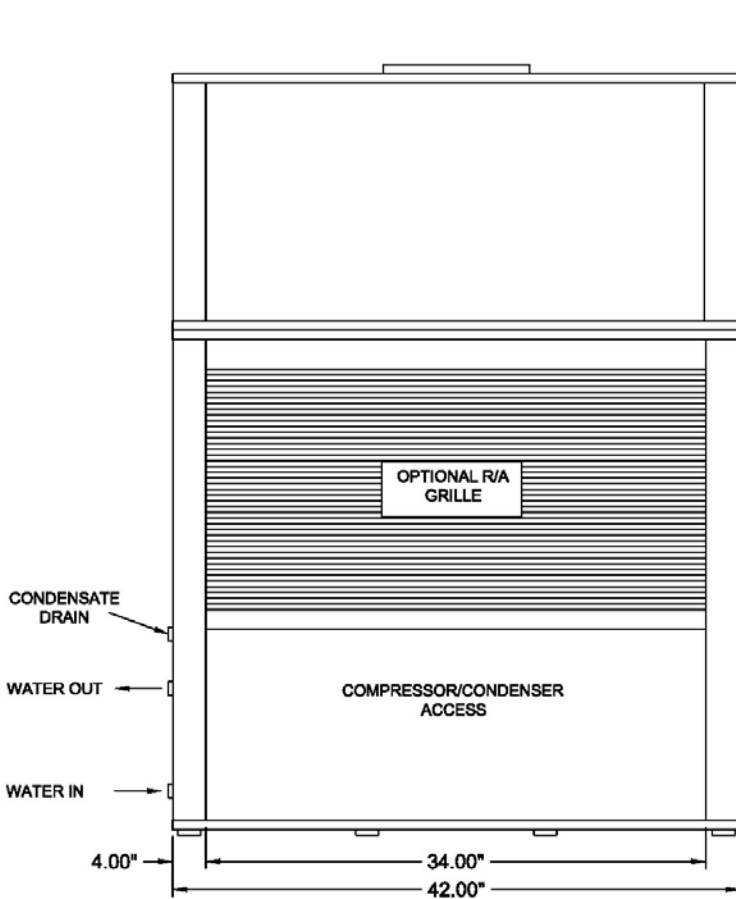
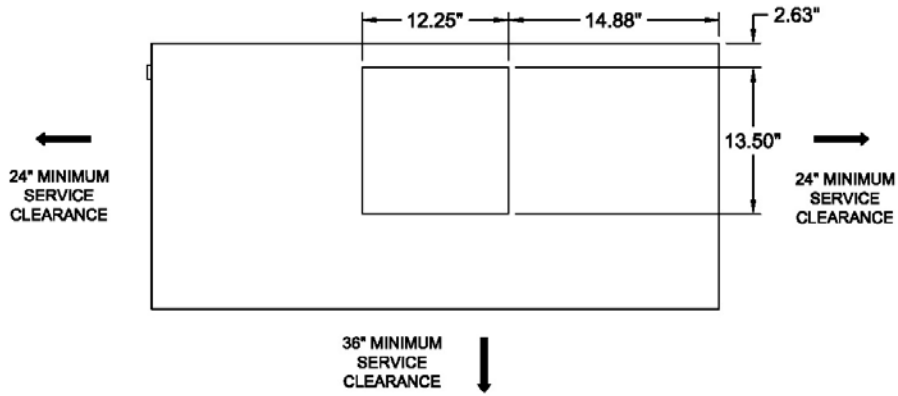


Water connection fittings are threaded copper. Use caution when tightening steel pipe into copper fittings. Always use a backing wrench on the hex fittings inside the unit.

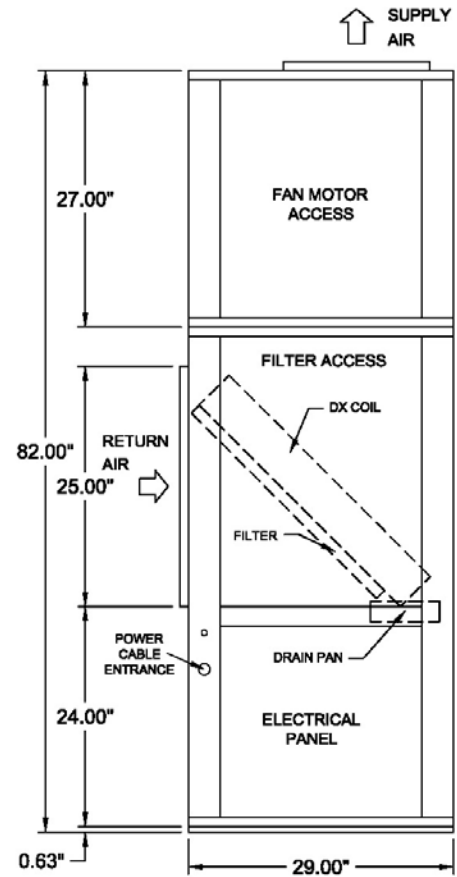
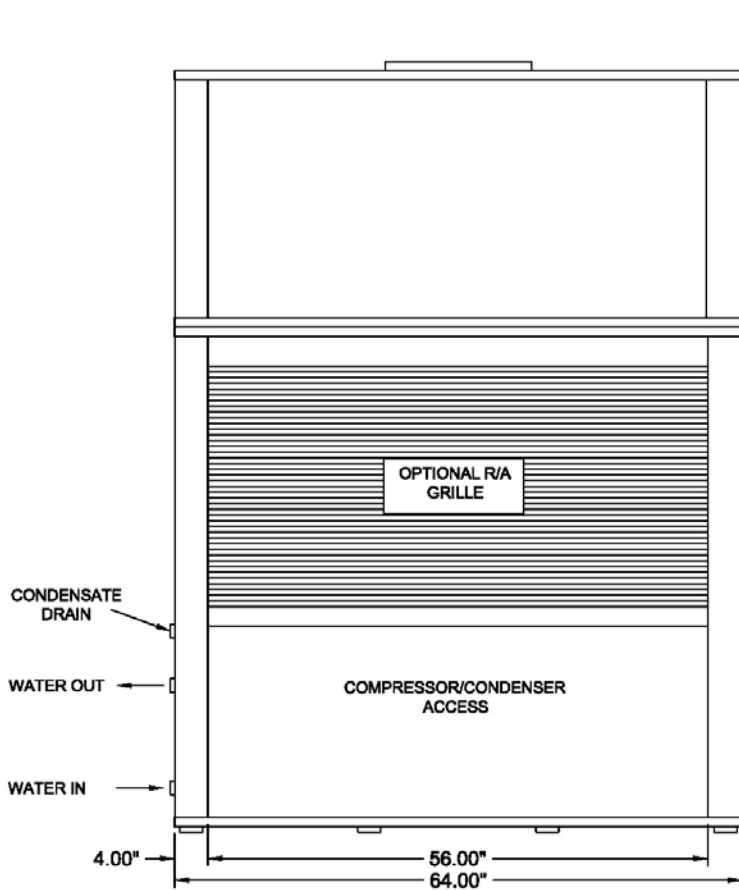
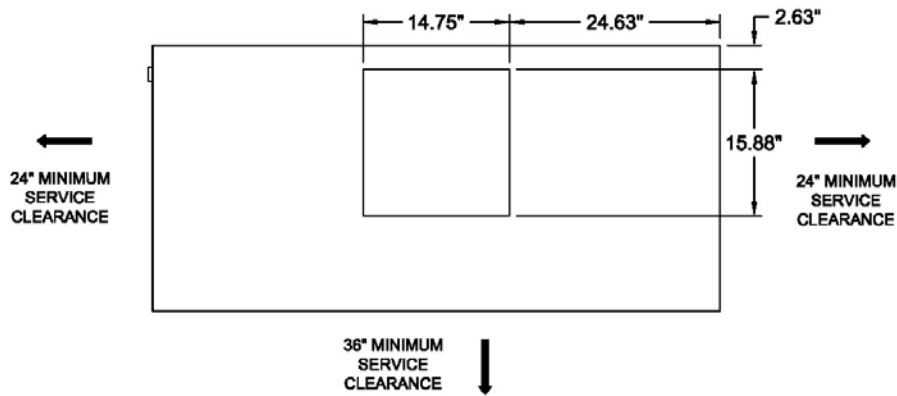
It is recommended that flexible connectors be provided on the water supply and return lines if noise and vibration transmission could be a problem.

Water piping should include shutoff / balancing valves so that the unit can be serviced without shutting down and draining the entire water supply circuit. Since units are piped in parallel piping circuits, the shutoff valves may be used to equalize the pressure drop to each branch for even condenser water distribution. A bibcock or a plugged tee fitting should be installed between the shut-off valves and the unit in both the inlet and outlet pipes. These connections are to provide for acid cleaning of the condenser, if this should become necessary.

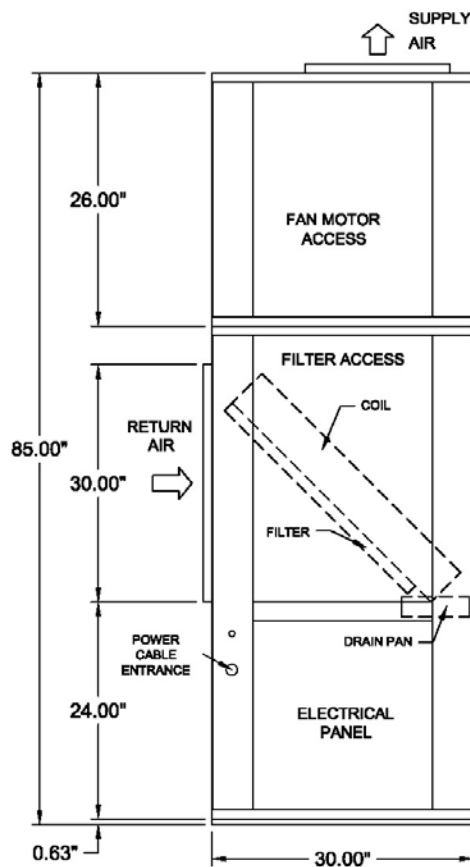
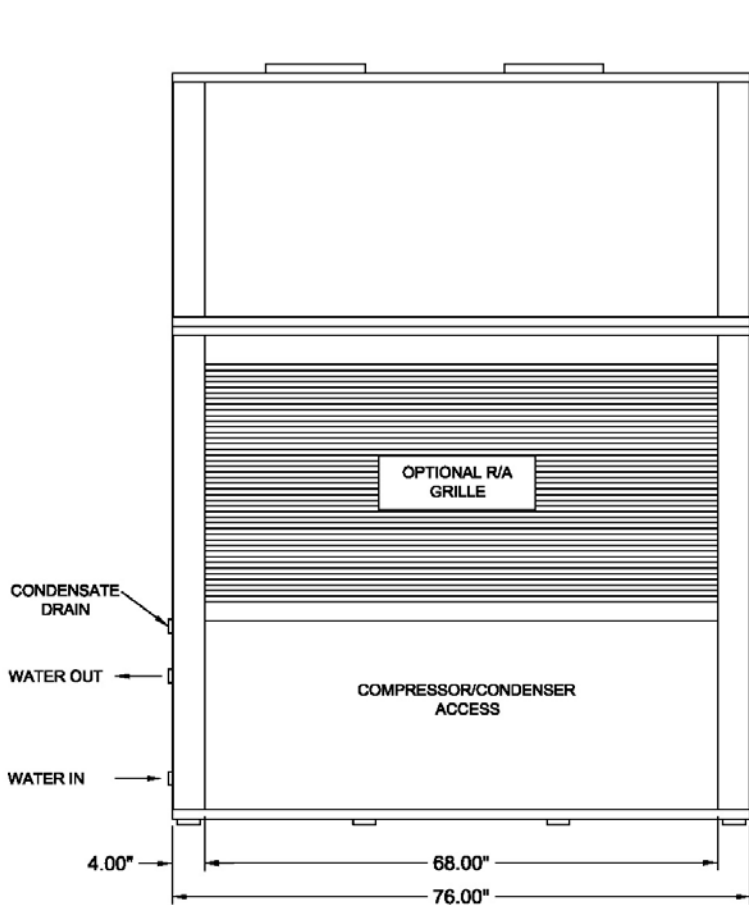
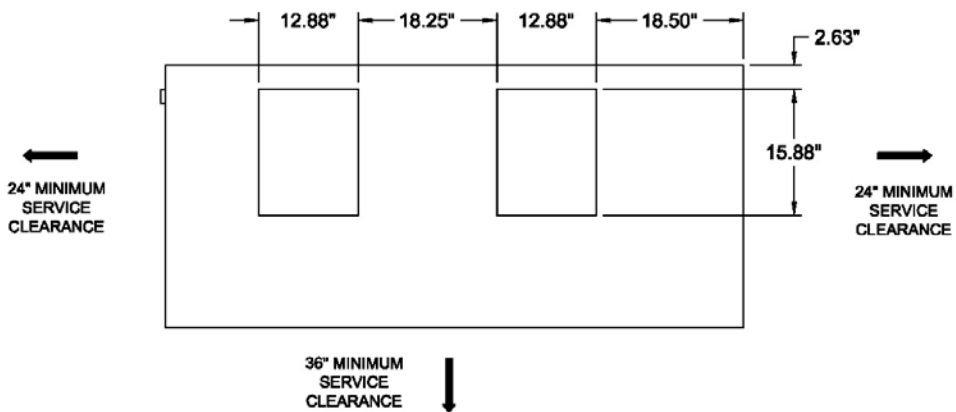
CSV060 DIMENSIONAL DATA



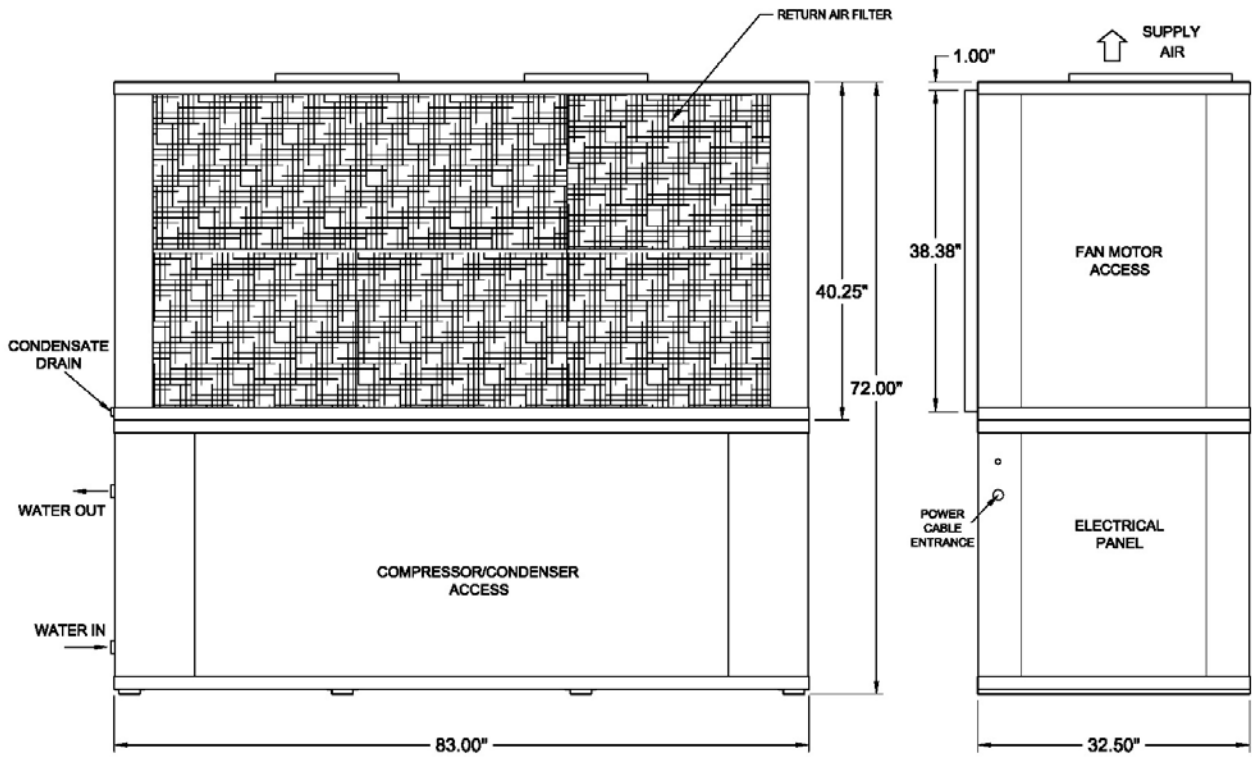
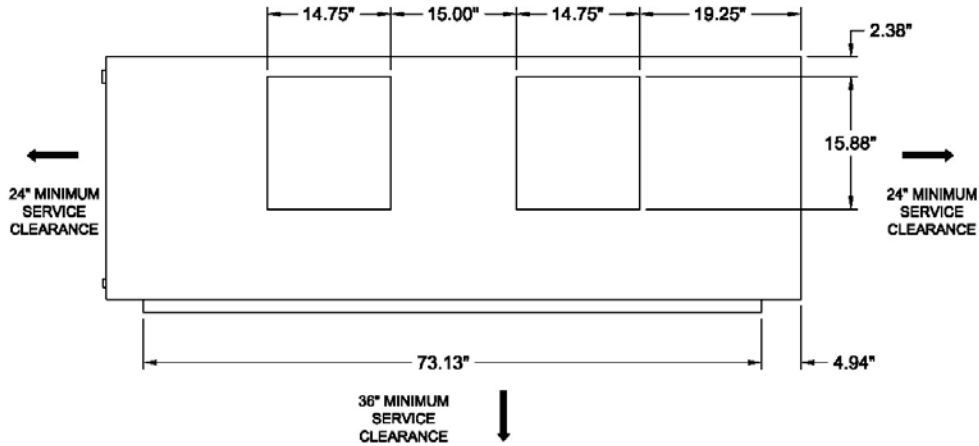
CSV096-120 DIMENSIONAL DATA



CSV180 DIMENSIONAL DATA



CSV240 DIMENSIONAL DATA



DUCTWORK

When installing ductwork, adhere to local Codes and sensible practice. Minimize duct runs and avoid abrupt changes in direction where possible. Allow ample access space for servicing of the coils and changing of filters. Perform regular maintenance on ducts to increase unit life, maintain efficient operation, and reduce accumulation of explosive dust. Refer to blower performance charts, and engineer duct runs and accessory pressure drop so as not to exceed maximum external static values.

Canvas or other types of flexible collars are recommended for connecting the air ducts to the unit. The supply air duct collar can be connected directly to the blower outlet flanges. Return air may be ducted to the unit, or drawn directly from the conditioned space (with optional return air grille). If a ducted return is desired, duct connection flanges may be secured directly to the air intake opening – filters are accessible from the right hand side.



The Manufacturer will not accept any liability resulting from incorrect installation of this equipment. Follow installation instructions carefully.

EVAPORATOR BLOWER DISCHARGE CONVERSION

All models can be field converted to the alternate evaporator discharge orientation, as indicated on the unit dimensional drawings. All models are shipped with vertical fan discharge as standard.

The removable upper fan module that can be rotated 180° for top rear discharge applications (see below). In addition, the blower outlet panel may be interchanged with the front panel of the fan module. Interchanging these two panels allows horizontal fan discharge to either front or rear of the unit.

Procedure for converting the fan discharge from vertical to horizontal is similar on all models, single fan or dual fan.

- Remove blower drive belt on all models with base mounted motors. Remove the complete fan motor and drive on models with blower mounted motor assemblies.
- Remove the panel attachment screws on the alternate location access panel (front blower module panel). The front roof support angle must be removed to allow access to the front panel. Remove the panel and set aside.

- Remove the panel attachments screws on the blower outlet mounting panel. Do not remove fasteners securing blowers to panel! The blowers are to remain attached to the mounting panel at all times.
- Carefully remove the blower panel assembly from the evaporator cabinet. Do not allow blower housings to contact the evaporator coil during the removal. On some models, the housing(s) will have to be "rotated" to exit through the panel opening.
- Interchange the blower panel assembly with the position of the alternate access panel. Exercise care in locating the panel. Do not allow blower housings to contact the evaporator coil. Install the attachment screws and tighten securely.
- Install the blank access panel into the remaining evaporator opening. Fasten securely.
- Relocate the evaporator fan drive motor to the alternate location.
- Install and adjust drive belts to appropriate tension. Test run blower and observe operation for unusual sounds or vibration.

In order to utilize the 'rear vertical' or 'rear horizontal' discharge, the upper fan module must be rotated.

- Disconnect power wiring at motor terminal box.



DISCONNECT AND LOCK OUT POWER WHEN SERVICING UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK.

- Remove corner connecting brackets which secure the blower module to the lower evaporator unit.
- Carefully lift the blower module, and rotate 180°. Reposition the blower module on top of the evaporator/compressor unit. Reinstall the corner connecting brackets.

Connect new power wire leads, from the evaporator motor contactor in the electrical box to the motor terminal box. Ensure wires are routed clear of any moving components. Secure the wiring so that it does not contact the evaporator coil.

ELECTRICAL WIRING

Follow local electrical codes when making electrical connections. Units are completely factory wired for normal supply voltages (ie.208-230, 460, 575V/3Ph/60Hz) Confirm unit specifications by checking unit data plate. All electrical components are accessible through an independent electrical panel located on the right hand end of the evaporator/compressor section. The electrical control boxes are located behind outer access panels. The compressor section electrical cover is provided with wiring diagrams on the inside, which must be opened to be read.



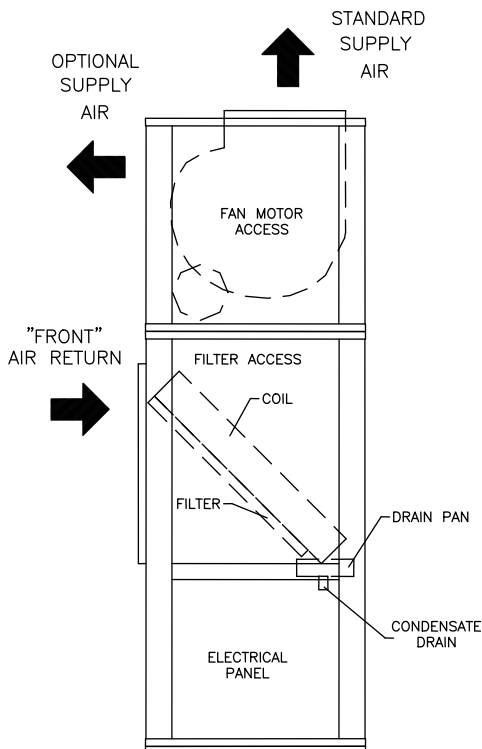
DISCONNECT AND LOCK OUT POWER WHEN SERVICING UNIT. UNIT MAY START AUTOMATICALLY IF POWER IS NOT DISCONNECTED. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK.



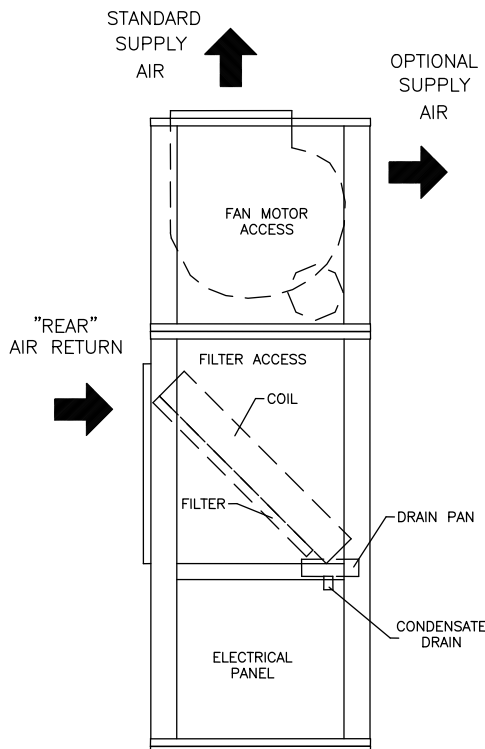
All wiring must comply with applicable local and national codes (NEC). Type and location of disconnect switches must comply with all applicable codes.

Unit requires installer to provide a 24volt thermostat with appropriate heating and cooling stages as needed. For low voltage wiring, 18 gauge wire may be used for up to 50 feet lengths. Low voltage runs up to 125 feet require 16 gauge wire.

All models are designed for single zone cooling applications, utilizing space or return air thermostatic controls. A low voltage terminal block is provided for hook-up of conventional or programmable thermostats.



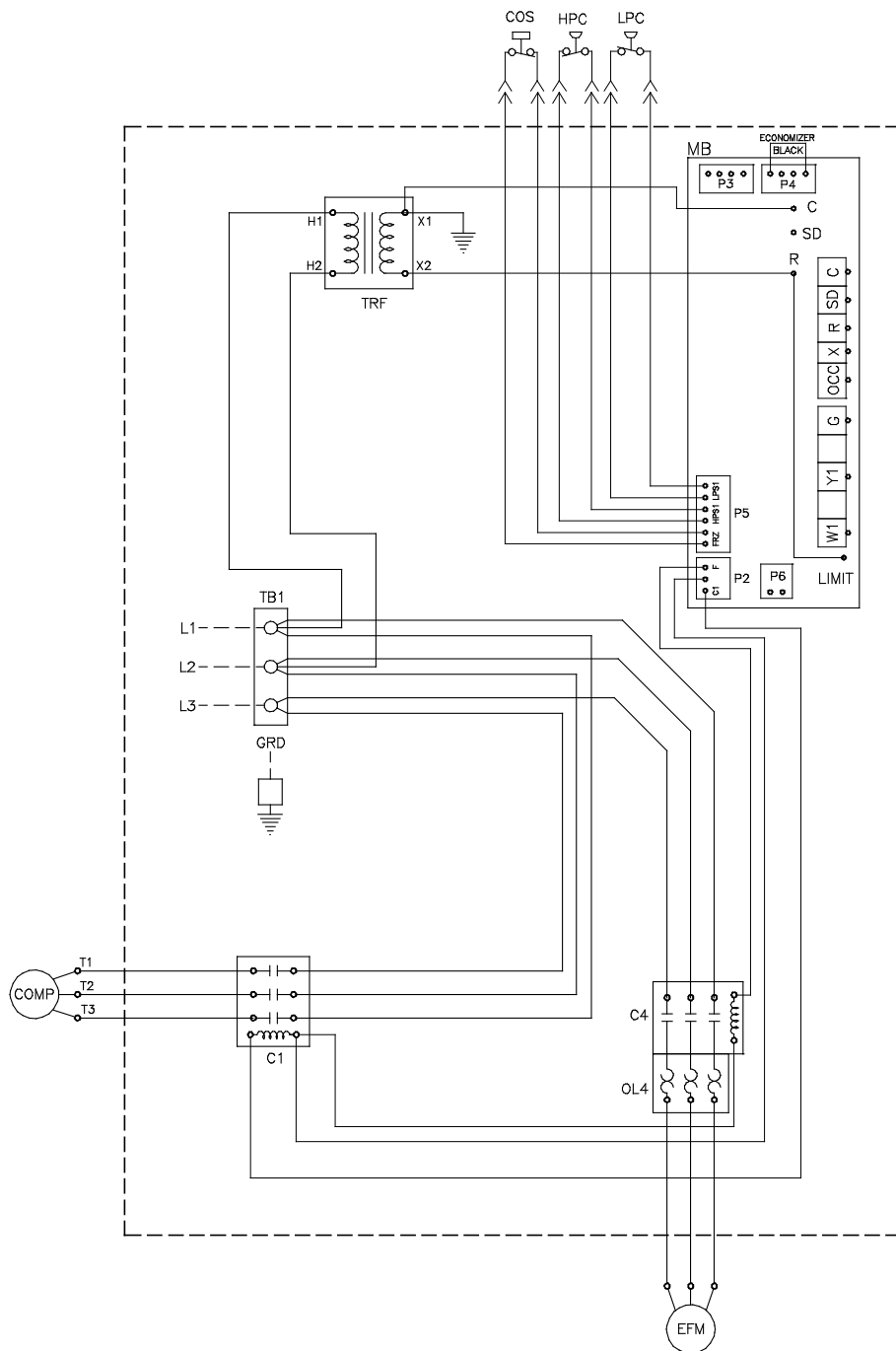
UNIT CONFIGURATION #1
(STANDARD)



UNIT CONFIGURATION #2

TYPICAL WIRING SCHEMATIC

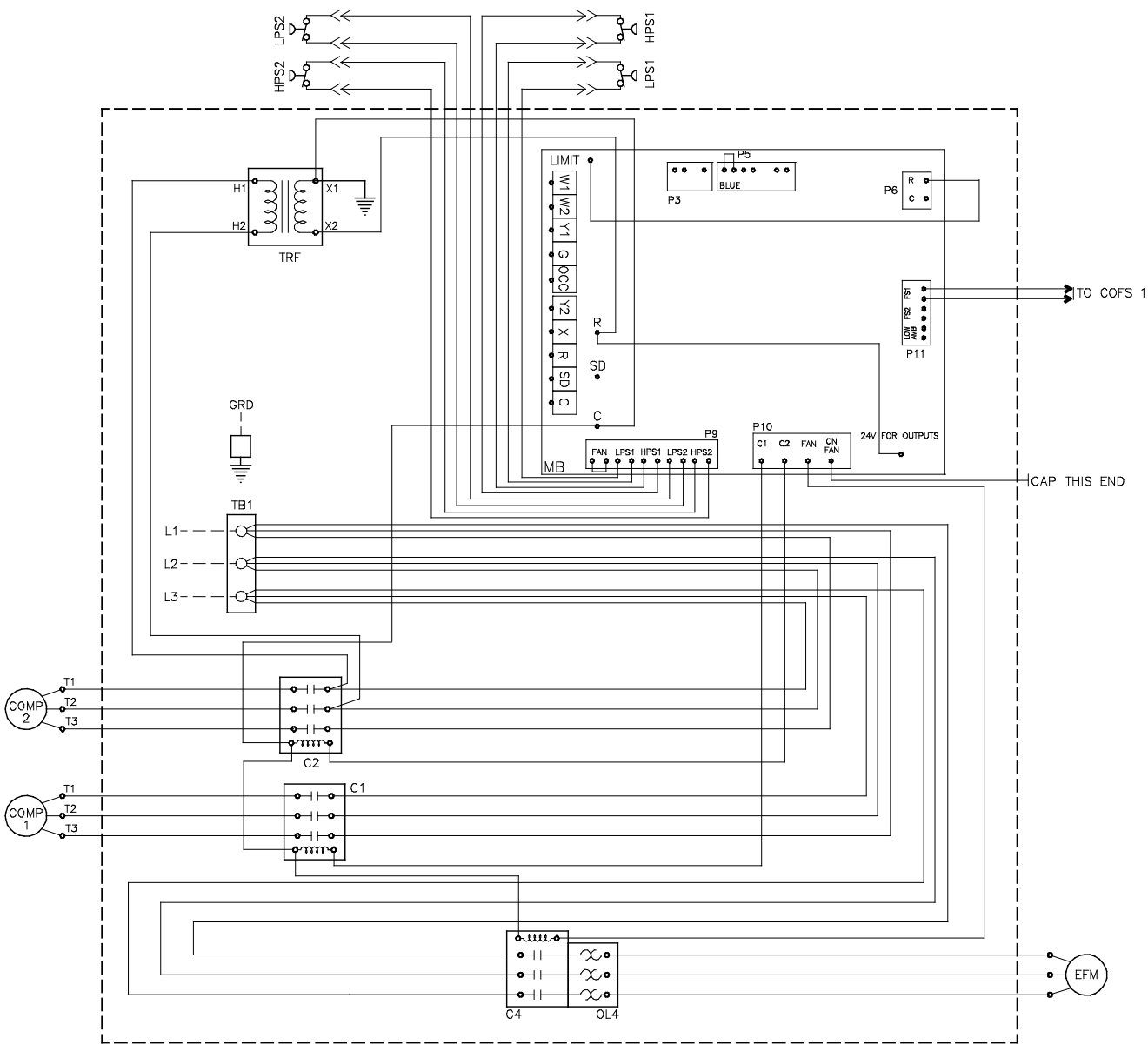
CSV060B VERTICAL W/C UNIT WIRING SCHEMATIC
208-230,460,575V/3PH/60HZ



TB1 - LINE VOLTAGE TERMINAL BLOCK
CFM - CONDENSER FAN MOTOR
EFM - EVAPORATOR FAN MOTOR
COMP 1 - COMPRESSOR ONE
TRF - TRANSFORMER
GRD - GROUND

MB - MICROPROCESSOR BOARD
C1 - COMPRESSOR ONE CONTACTOR
C3 - COND. FAN MOTOR CONTACTOR
C4 - EVAP. FAN MOTOR CONTACTOR
OL3 - COND. FAN MOTOR OVERLOAD
OL4 - EVAP. FAN MOTOR OVERLOAD
HPC1 - HIGH PRESSURE SWITCH (COMP 1)
LPC1 - LOW PRESSURE SWITCH (COMP 1)
COS - CONDENSATE OVERFLOW SWITCH

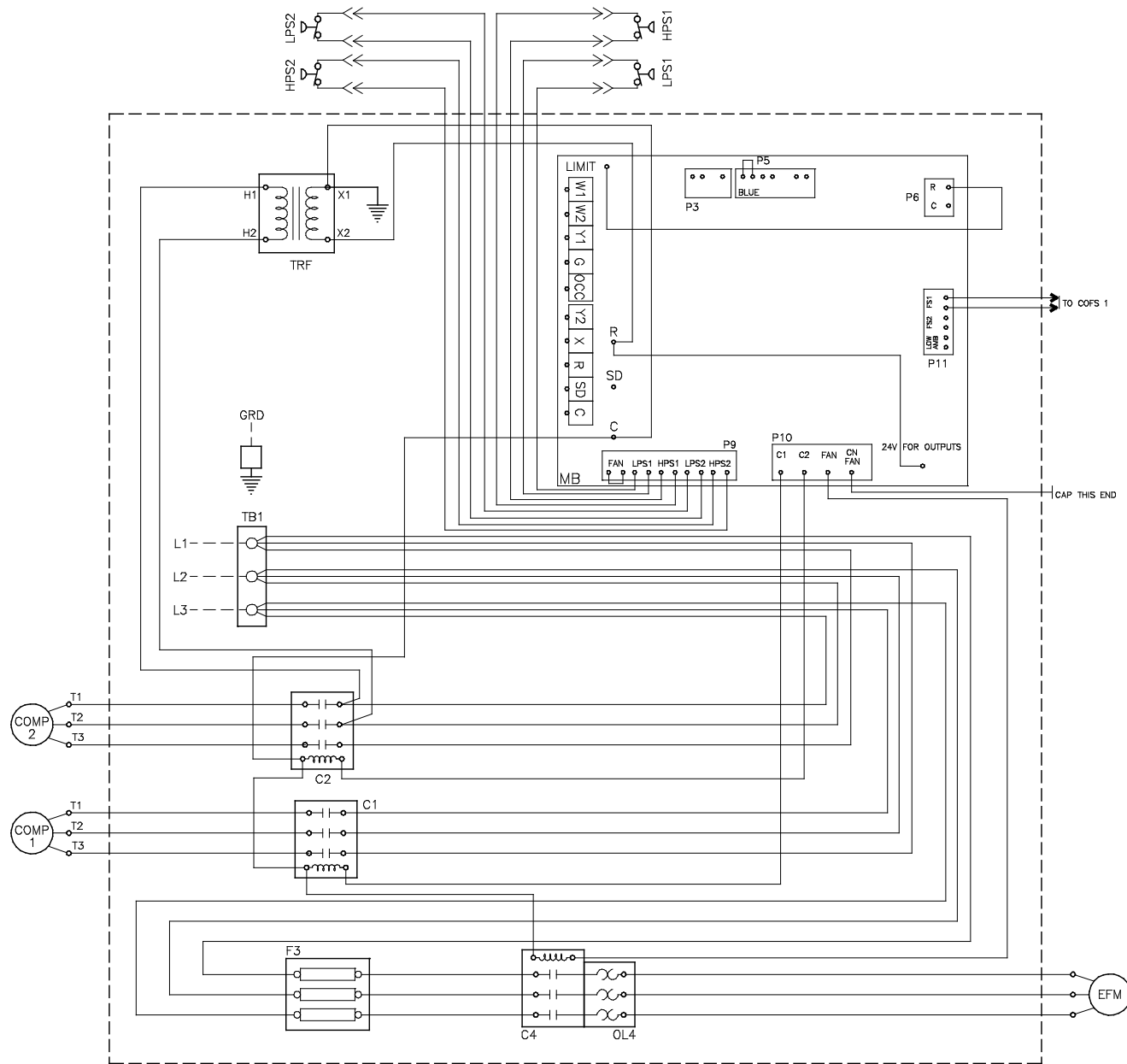
CSV096B-120B VERTICAL W/C UNIT 208-230,460,575V/3PH/60HZ
 CSV180B VERTICAL W/C UNIT 460,575V/3PH/60HZ
 WIRING SCHEMATIC



TB1 - LINE VOLTAGE TERMINAL BLOCK
 EFM - EVAPORATOR FAN MOTOR
 COMP 1 - COMPRESSOR ONE
 COMP 2 - COMPRESSOR TWO
 MB - MICROPROCESSOR BOARD
 COS - CONDENSATE OVERFLOW SWITCH
 TRF - TRANSFORMER
 GRD - GROUND

MB - MICROPROCESSOR BOARD
 C2 - COMPRESSOR TWO CONTACTOR
 C1 - COMPRESSOR ONE CONTACTOR
 C4 - EVAP. FAN MOTOR CONTACTOR
 OL4 - EVAP. FAN MOTOR OVERLOAD
 HPC1 - HIGH PRESSURE SWITCH (COMP 1)
 LPC1 - LOW PRESSURE SWITCH (COMP 1)
 HPC2 - HIGH PRESSURE SWITCH (COMP 2)
 LPC2 - LOW PRESSURE SWITCH (COMP 2)

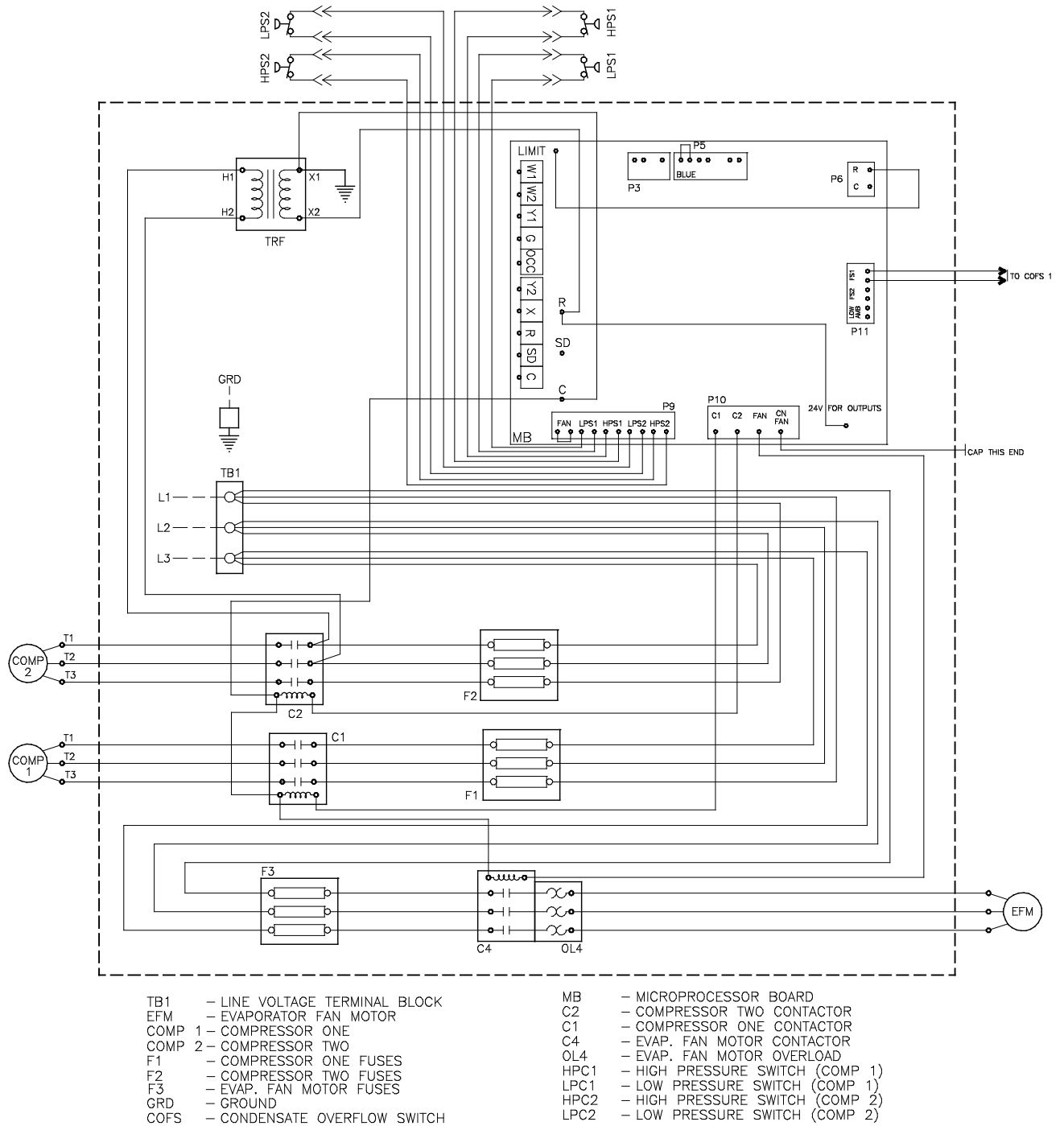
CSV180B VERTICAL W/C UNIT 208-230V/3PH/60HZ
WIRING SCHEMATIC



TB1 - LINE VOLTAGE TERMINAL BLOCK
 EFM - EVAPORATOR FAN MOTOR
 COMP 1 - COMPRESSOR ONE
 COMP 2 - COMPRESSOR TWO
 F3 - EVAP. FAN MOTOR FUSES
 GRD - GROUND
 COS - CONDENSATE OVERFLOW SWITCH
 TRF - TRANSFORMER
 GRD - GROUND

MB - MICROPROCESSOR BOARD
 C2 - COMPRESSOR TWO CONTACTOR
 C1 - COMPRESSOR ONE CONTACTOR
 C4 - EVAP. FAN MOTOR CONTACTOR
 OL4 - EVAP. FAN MOTOR OVERLOAD
 HPC1 - HIGH PRESSURE SWITCH (COMP 1)
 LPC1 - LOW PRESSURE SWITCH (COMP 1)
 HPC2 - HIGH PRESSURE SWITCH (COMP 2)
 LPC2 - LOW PRESSURE SWITCH (COMP 2)

CSV240B VERTICAL W/C UNIT 208-230, 460, 575V/3PH/60HZ
WIRING SCHEMATIC



ELECTRICAL DATA**ELECTRICAL DATA - STANDARD EVAPORATOR MOTOR**

MODEL #	VOLTAGE	COMPRESSOR			EVAPORATOR FAN		MIN. CCT. AMPACITY	MAX FUSE / CCT. BKR. AMP
		QTY	RLA	LRA	HP	FLA		
CSV060B2	208-230/3/60	1	@ 16.0	110.0	1.00	3.1	23.10	35
CSV060B4	460/3/60	1	@ 7.8	52.0	1.00	1.5	11.25	15
CSV060B5	575/3/60	1	@ 5.7	38.9	1.00	1.2	8.33	15
CSV096B2	208-230/3/60	2	@ 13.1	83.1	1.50	4.5	33.98	45
CSV096B4	460/3/60	2	@ 6.1	41.0	1.50	2.2	15.93	20
CSV096B5	575/3/60	2	@ 4.4	33.0	1.50	1.8	11.70	15
CSV120B2	208-230/3/60	2	@ 16.0	110.0	2.00	5.8	41.80	50
CSV120B4	460/3/60	2	@ 7.8	52.0	2.00	2.9	20.45	25
CSV120B5	575/3/60	2	@ 5.7	38.9	2.00	2.3	15.13	20
CSV180B2	208-230/3/60	2	@ 23.2	164.0	3.00	8.5	60.70	80
CSV180B4	460/3/60	2	@ 11.2	75.0	3.00	4.2	29.40	40
CSV180B5	575/3/60	2	@ 7.9	54.0	3.00	3.4	21.18	25
CSV240B2	208-230/3/60	2	@ 30.1	225.0	5.00	14.0	81.73	110
CSV240B4	460/3/60	2	@ 16.7	114.0	5.00	6.6	44.18	60
CSV240B5	575/3/60	2	@ 12.2	80.0	5.00	5.3	32.75	40

ELECTRICAL DATA - OVERSIZED EVAPORATOR MOTOR

MODEL #	VOLTAGE	COMPRESSOR			EVAPORATOR FAN		MIN. CCT. AMPACITY	MAX FUSE / CCT. BKR. AMP
		QTY	RLA	LRA	HP	FLA		
CSV060B2	208-230/3/60	1	@ 16.0	110.0	1.50	4.5	24.50	40
CSV060B4	460/3/60	1	@ 7.8	52.0	1.50	2.2	11.95	15
CSV060B5	575/3/60	1	@ 5.7	38.9	1.50	1.8	8.93	15
CSV096B2	208-230/3/60	2	@ 13.1	83.0	2.00	5.8	35.28	45
CSV096B4	460/3/60	2	@ 6.1	41.0	2.00	2.9	16.63	20
CSV096B5	575/3/60	2	@ 4.4	33.0	2.00	2.3	12.20	15
CSV120B2	208-230/3/60	2	@ 16.0	110.0	3.00	8.5	44.50	60
CSV120B4	460/3/60	2	@ 7.8	52.0	3.00	4.2	21.75	25
CSV120B5	575/3/60	2	@ 5.7	38.9	3.00	3.4	16.23	20
CSV180B2	208-230/3/60	2	@ 23.2	164.0	5.00	14.0	66.20	80
CSV180B4	460/3/60	2	@ 11.2	75.0	5.00	6.6	31.80	40
CSV180B5	575/3/60	2	@ 7.9	54.0	5.00	5.2	22.98	30
CSV240B2	208-230/3/60	2	@ 30.1	225.0	7.50	20.4	88.13	110
CSV240B4	460/3/60	2	@ 16.7	114.0	7.50	9.7	47.28	60
CSV240B5	575/3/60	2	@ 12.2	80.0	7.50	7.8	35.25	45

FAN PERFORMANCE

CSV060B

SUPPLY AIR BLOWER PERFORMANCE

SUPPLY CFM	AVAILABLE EXTERNAL STATIC PRESSURE - Inches W.C. ¹																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Low Static Drive				Standard Drive + 1 HP								Optional Hi-Static Drive + 1.5 HP							
1600	645	0.29	733	0.36	814	0.43	888	0.50	958	0.57	1024	0.64	1087	0.72	1154	0.83	1211	0.91	1245	0.99
1800	708	0.40	788	0.48	863	0.55	933	0.63	999	0.71	1061	0.79	1121	0.87	1178	0.95	1233	1.04	1295	1.17
2000	763	0.52	837	0.61	907	0.69	973	0.77	1035	0.86	1095	0.95	1152	1.04	1207	1.13	1260	1.22	1311	1.31
2200	836	0.69	904	0.78	969	0.87	1030	0.97	1089	1.06	1145	1.15	1199	1.25	1252	1.35	1303	1.45	~	~
2400	898	0.88	961	0.98	1021	1.08	1079	1.18	1135	1.28	1188	1.38	1240	1.48	~	~	~	~	~	~

1. Blower performance includes evaporator coil and 2" filters
2. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

CSV096B

SUPPLY AIR BLOWER PERFORMANCE

SUPPLY CFM	AVAILABLE EXTERNAL STATIC PRESSURE - Inches W.C. ¹																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Low Static Drive				Standard Drive + 1.5 HP								Optional Hi-Static Drive + 2 HP							
2400	510	0.31	600	0.45	672	0.60	741	0.78	810	0.96	878	1.14	936	1.33	982	1.54	1033	1.76	1074	2.00
2800	538	0.44	628	0.57	700	0.71	778	0.89	830	1.10	890	1.29	950	1.50	1010	1.72	1048	1.92	~	~
3200	599	0.62	675	0.79	745	0.98	815	1.18	875	1.38	927	1.58	985	1.78	1037	1.99	~	~	~	~
3600	661	0.86	730	1.03	795	1.23	853	1.43	915	1.64	973	1.85	~	~	~	~	~	~	~	~
4000	712	1.10	773	1.28	830	1.50	888	1.72	946	1.95	~	~	~	~	~	~	~	~	~	~

1. Blower performance includes evaporator coil and 2" filters
2. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

CSV120B

SUPPLY AIR BLOWER PERFORMANCE

SUPPLY CFM	AVAILABLE EXTERNAL STATIC PRESSURE - Inches W.C. ¹																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Low Static Drive				Standard Drive + 2 HP								Optional Hi-Static Drive + 3 HP							
3200	599	0.62	675	0.79	745	0.98	815	1.18	875	1.38	927	1.58	984	1.78	1037	1.99	1082	2.22	1128	2.42
3600	661	0.86	730	1.03	795	1.23	853	1.43	915	1.64	973	1.85	1020	2.10	1070	2.37	1114	2.67	1160	2.89
4000	712	1.10	773	1.28	830	1.50	888	1.72	946	1.95	1004	2.19	1062	2.44	1098	2.70	1146	2.97	~	~
4400	768	1.42	824	1.62	877	1.82	930	2.04	985	2.30	1035	2.60	1085	2.90	~	~	~	~	~	~
4800	822	1.78	875	1.98	925	2.20	975	2.43	1026	2.68	1078	2.96	~	~	~	~	~	~	~	~

1. Blower performance includes evaporator coil and 2" filters
2. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

CSV180B

SUPPLY AIR BLOWER PERFORMANCE

SUPPLY CFM	AVAILABLE EXTERNAL STATIC PRESSURE - Inches W.C. ¹																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Low Static Drive				Standard Factory Drive + 3 HP								Optional Hi-Static Drive + 5 HP							
4800	634	1.20	697	1.42	757	1.62	813	1.84	867	2.06	918	2.30	968	2.52	1015	2.76	1065	3.02	1109	3.32
5400	701	1.66	758	1.90	812	2.14	864	2.38	914	2.62	962	2.88	1009	3.12	1053	3.38	1097	3.66	1139	3.92
6000	765	2.22	817	2.48	867	2.74	916	3.00	962	3.28	1007	3.54	1051	3.82	1093	4.10	1134	4.38	1174	4.68
6600	832	2.90	880	3.20	927	3.48	972	3.76	1015	4.06	1057	4.34	1099	4.64	1139	4.96	~	~	~	~
7200	900	3.72	945	4.02	988	4.34	1030	4.64	1070	4.96	~	~	~	~	~	~	~	~	~	~

1. Blower performance includes evaporator coil and 2" filters

2. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

CSV240B

SUPPLY AIR BLOWER PERFORMANCE

SUPPLY CFM	AVAILABLE EXTERNAL STATIC PRESSURE - Inches W.C. ¹																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Low Static Drive				Standard Factory Drive + 5 HP								Optional Hi-Static Drive + 7.5HP							
6400	705	1.96	760	2.22	812	2.48	862	2.72	910	3.02	956	3.28	1001	3.56	1043	3.84	1085	4.12	1125	4.42
7200	788	2.76	837	3.06	884	3.34	930	3.64	952	3.78	995	4.08	1037	4.38	1078	4.70	1118	5.00	1156	5.32
8000	861	3.70	906	4.02	950	4.34	992	4.66	1033	4.98	1073	5.32	1111	5.66	1149	5.98	1186	6.32	1222	6.68
8800	949	4.94	970	5.12	1010	5.46	1049	5.82	1087	6.18	1125	6.52	1161	6.90	1197	7.26	~	~	~	~
9600	1028	6.34	1066	6.72	1103	7.10	1139	7.48	~	~	~	~	~	~	~	~	~	~	~	~

1. Blower performance includes evaporator coil and 2" filters

2. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

MOTOR AND PULLEY DATA**EVAPORATOR-STANDARD BLOWER MOTOR AND DRIVE DATA**

Model	Drive Range (RPM)	Motor			Adjustable Motor Pulley		Fixed Blower Pulley		Belts
		HP	Frame Size	Eff. (%)	Pitch Dia. (in)	Browning Part No.	Pitch Dia. (in)	Browning Part No.	Rating/Size
CSV060B	745-1117	1	145	88.5	1.9-2.9	1VP34X7/8	4.7	AK49H	A29
CSV096B	614-921	1.5	145	88.5	1.9-2.9	1VP34X7/8	5.7	AK59H	AX35
CSV120B	711-984	2	145	88.5	2.4-3.4	1VP40X7/8	6.4	AK66H	AX37
CSV180B	724-925	3	184	90.2	3.4-4.4	1VP50X1 1/8	8.7	AK89H	AX39
CSV240B	848-1064	5	184	90.2	4.7-5.9	1VP60X1 1/8	9.7	BK100H	BX60

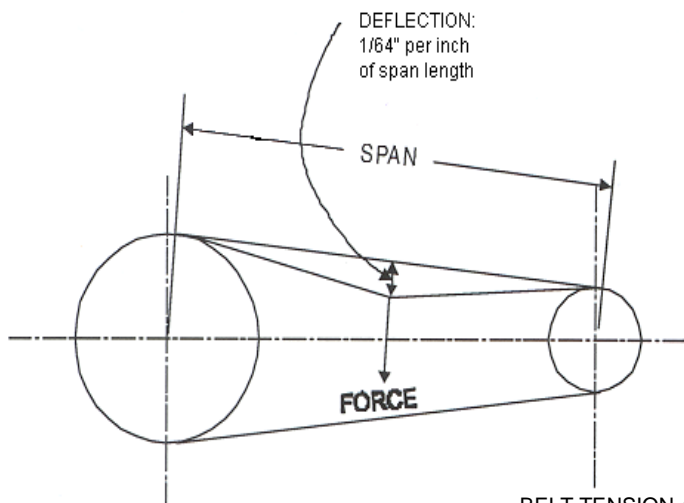
EVAPORATOR-OVERSIZED BLOWER MOTOR AND DRIVE DATA

Model	Drive Range (RPM)	Motor			Adjustable Motor Pulley		Fixed Blower Pulley		Belts
		HP	Frame Size	Eff. (%)	Pitch Dia. (in)	Browning Part No.	Pitch Dia. (in)	Browning Part No.	Rating/Size
CSV060B	897-1346	1.5	145	88.5	1.9-2.9	1VP34X7/8	3.9	AK41H	A28
CSV096B	798-1105	2	145	88.5	2.4-3.4	1VP40X7/8	5.7	AK59H	AX36
CSV120B	875-1118	3	184	90.2	3.4-4.4	1VP50X1 1/8	7.2	AK74H	AX36
CSV180B	894-1122	5	184	90.2	4.7-5.9	1VP60X1 1/8	9.2	BK95H	BX40
CSV240B	1046-1287	7.5	213	90.2	5.2-6.4	1VP65X1 3/8	10.2	BK90H	BX57

BLOWER SPEED ADJUSTMENT

The RPM of the supply air and condenser air blowers will depend on the required CFM, and the static resistances of both the supply/discharge and the return/intake duct systems. With this information, the RPM for the blowers can be determined from the blower performance tables. Adjustment of blower speed is accomplished as follows:

- 1) Loosen belt tension by moving motor towards the blower shaft via the adjustable mounting.
- 2) Loosen the setscrew in the adjustable motor pulley flange. Remove external key on pulleys 4 in. diameter and larger.
- 3) Blower speed will increase when moveable flange is adjusted towards the fixed flange (closed). Blower speed will decrease when the moveable flange is adjusted away from the fixed flange (opened). Pulleys are adjustable only in half-turn increments. Do not open pulley more than five full turns for "4L" and "A" belts, or six full turns for "B" belts.
- 4) Once the pulley has been opened/closed the appropriate number of turns, replace the external key and tighten the adjustment setscrew. Proper torque is 110-130 in.-lbs.
- 5) Install drive belt and adjust motor mount to tension belt.

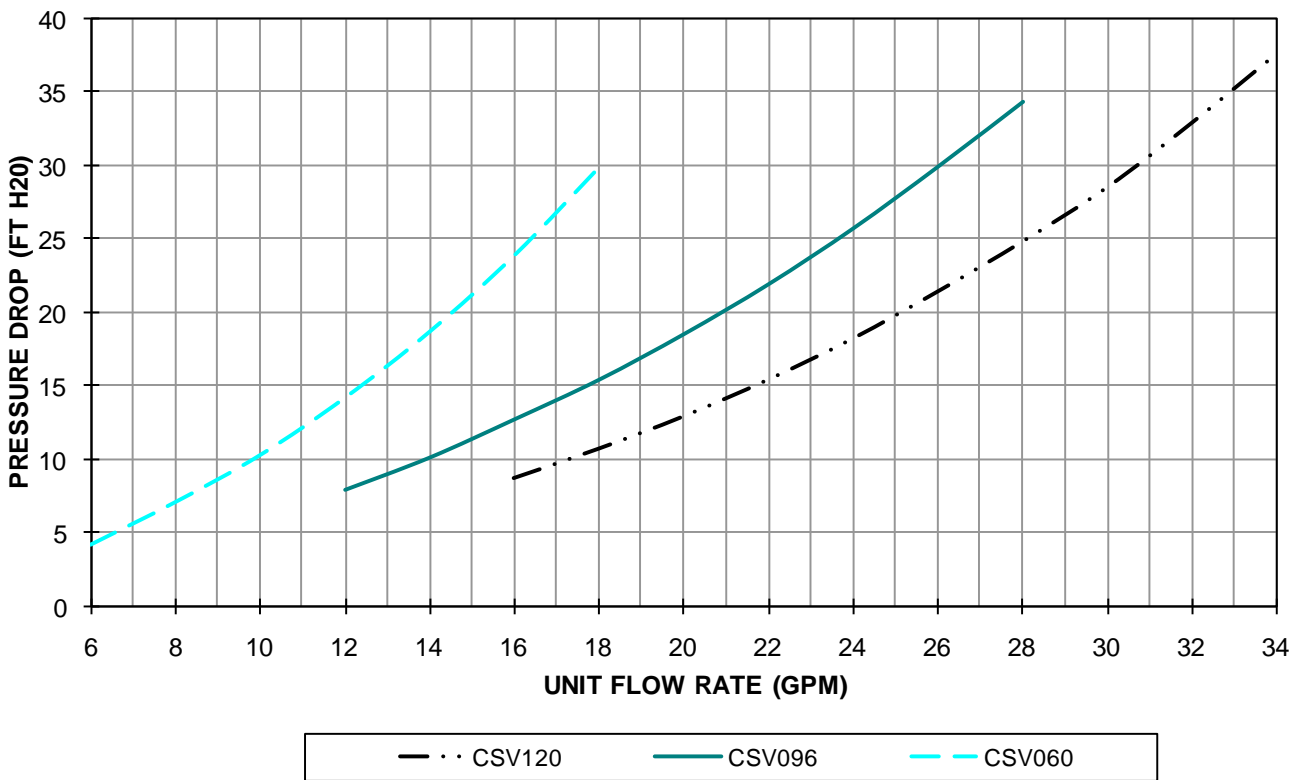
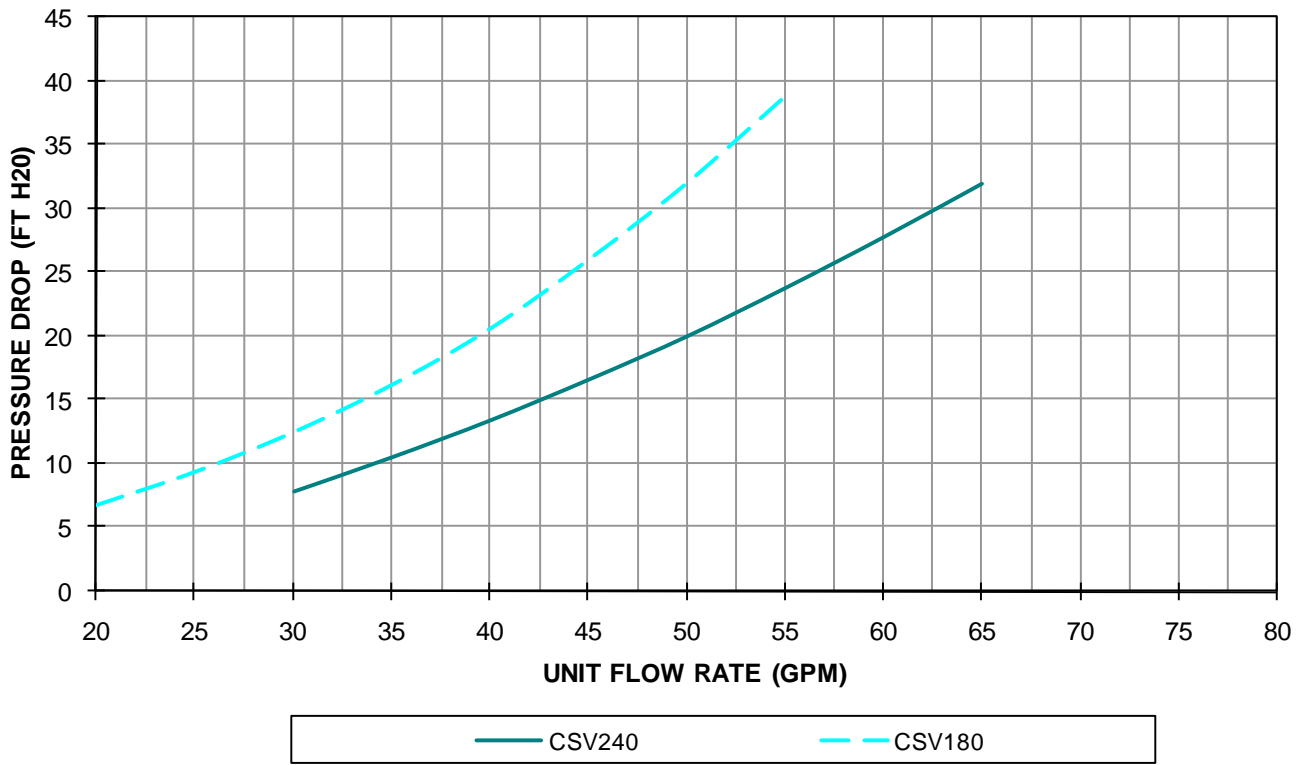


Cross Section	POUNDS FORCE	
	Min.	Max.
4L	1-1/2	2-1/2
A	3-1/2	6-1/2
B	5-1/2	8
BX	8	11

BELT TENSION ADJUSTMENT
DEFLECTION FORCE VERSUS DRIVE BELT CROSS-SECTION

LD13547

WATER PRESSURE DROP DATA



START-UP AND OPERATION

Start unit and check rotation of fans and compressors.

Scroll compressors will only compress in one rotational direction. Three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, **it is important to ensure proper rotation direction is achieved when the system is installed and operated.**

Monitor the microprocessor board for any fault codes. This will ensure proper unit operation. Verification of proper compressor direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse compressor rotation also results in an elevated sound level as well as substantially reduced current draw.



The Air Conditioning section of this equipment is charged with R-410A; a hi-pressure refrigerant. Only qualified technicians, using appropriately pressure-rated test instruments, should perform troubleshooting or service on this equipment.



Observe unit operation and check for unusual noise or vibration.

There is no negative impact on durability caused by operating three phase Scroll compressors in the reversed direction for a short period of time (under one hour). However, after several minutes of operation the compressors internal protector will trip.

If opposite rotation is needed, disconnect and reverse any two leads of the three phase supply. Reconnect power.

Pressure Switch Settings - All Models		
	High	Low
Cut Out (PSIG)	600	50
Cut In (PSIG)	450	75

UNIT	Refrigerant Charge (LBS)	
	Circuit 1	Circuit 2
CSV060B	5.25 (5 lbs 4 oz)	-
CSV096B	5.18 (5 lbs 3 oz)	5.30 (5 lbs 5 oz)
CSV120B	6.12 (6 lbs 2 oz)	6.25 (6 lbs 4 oz)
CSV180B	8.69 (8 lbs 11oz)	9.12 (9 lbs 2 oz)
CSV240B	12.45 (12 lbs 7 oz)	12.45 (12 lbs 7 oz)

MICROPROCESSOR CONTROLLER

The microprocessor control system is specifically designed for single and dual stage systems. The control system interfaces with a conventional type thermostat.

- Unit shall be complete with self-contained low-voltage control circuit
- Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit, should any of the following standard safety devices trip and shut off compressor.
 - Loss-of-charge/Low-pressure switch
 - High-pressure switch
 - Condensate Overflow protection switch
- Unit shall operate with conventional thermostat designs and have a low voltage terminal strip for easy hook-up.
- Unit control board shall have on-board diagnostics and fault code display.
- Standard controls shall include anti-short cycle and low voltage protection
- Control board shall monitor each compressor and refrigerant safety switch independently.
- Control board shall have random start feature
- Control board shall retain last 5 fault codes in non volatile memory which will not be lost in the event of a power loss.

OPERATION

For cooling the room t-stat energizes the low-voltage circuit between "R" & "Y1".

The call is passed to the unit microprocessor control, which then determines whether the requested operation is available and, if so, which components to energize.

CONTINUOUS BLOWER

By setting the room t-stat fan switch set to "ON", the supply air blower will operate continuously. With the room t-stat fan switch set to "AUTO", the blower is energized whenever a cooling operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

When the room t-stat calls for cooling, the low-voltage control circuit from "R" to "Y1" and "G" is completed. The compressor and fan motor are energized. After completing the specified fan on delay for cooling, the microprocessor control will energize the blower motor.

Once the room t-stat has been satisfied, it will de-energize "Y1". If the compressor has satisfied its minimum run time, the compressor and fan de-energize. Otherwise, the unit operates the cooling system until the minimum run time for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan-off delay for cooling.

To be available, a compressor must not be locked-out due to a high-pressure switch; low-pressure switch; condensate overflow switch; and the anti-short cycle delay (ASCD) must have elapsed.

SAFETY SWITCHES

Each refrigerant system is monitored to ensure it does not operate outside of its intended operating parameters. Safety switches are handled as described below. All system errors override minimum run times for compressors.

High-Pressure Limit Switch

If a high-pressure limit switch opens, the microprocessor control de-energizes the compressor, initiates the ASCD, and stops the fan. If a call for cooling or heating is still present at the conclusion of the ASCD, the microprocessor control will re-energize the compressor and unit fan.

Should a high-pressure switch open three times within two hours of operation, the microprocessor control will permanently lock-out the compressor. The system must be manually reset by de-energizing the 24 volt power to unit, or turning the room t-stat to the "OFF" position then back to cooling position. The microprocessor control will flash a fault code indicating a high-pressure lock-out.

Low-Pressure Limit Switch

The low-pressure limit switch is not monitored during the initial 30 seconds of compressor operation. After the initial 30 seconds have passed, the microprocessor control will monitor the low-pressure switch for another 30 seconds. If the low-pressure switch fails to close after the 30 second monitoring phase, the microprocessor control will de-energize the compressor, initiate the ASCD, and stop the fan.

Once the low-pressure switch has been proven (closed during the 30-second monitoring period as

described above), the microprocessor control board will continue to monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the microprocessor control board will de-energize the compressor, initiate the ASCD, and stop the fan.

If the call for cooling is still present at the conclusion of the ASCD, the microprocessor control will re-energize the compressor.

Should a low-pressure switch fault three (3) times within one (1) hour of operation, the microprocessor control board will lock-out the compressor and flash a fault code indicating a low-pressure lock-out.

Condensate Overflow Switch

A Condensate Overflow fault occurs when the Condensate Overflow switch opens for more than two line cycles. The compressor is shutdown regardless of Minimum Run Time, ASCD is initiated, and alarm is tripped. The fan continues operating in its current state. Compressor will re-energize once the Condensate Overflow switch closes, and ASCD has been satisfied and a call for cooling is still present.

The microprocessor control board logs the first incident per compressor request. If the compressor request is removed, the fault occurrence counter is reset to zero. Should the Condensate Overflow switch open three within two hours of run time, the microprocessor control board will lock-out the compressor, turn off the fan and flash a fault code indicating a Condensate Overflow lock-out.

SAFETY CONTROLS

The microprocessor control monitors the following inputs:

1. A High-Pressure Switch on each compressor circuit to protect against excessive discharge pressures.
2. A Low-Pressure Switch on each compressor circuit to protect against loss of refrigerant charge.
3. A Condensate Overflow Switch to protect against condensate overflow.

Compressor Protection

In addition to the external pressure switches, the compressor also has inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the internal protection will immediately shut down the compressor. The microprocessor control incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD)

is utilized to prevent short cycling of the compressor. Additionally, a minimum run time is imposed any time a compressor is energized. The ASCD is initiated on unit start-up and on any compressor reset or lockout.

Microprocessor Control Unit Flash Codes

Various flash codes are utilized by the microprocessor control to aid in troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control boards flash a 1 second on, 1 second off "heart beat" during normal operation. This is to verify that the microprocessor is functioning correctly. Do not confuse this with an error flash code. To avoid confusion the 1-flash, fault code is not used.

Current alarms or active restrictions are flashed on the microprocessor control LED.

1. LAST ERROR – When this button is pressed and released, it flashes the last five (5) flash codes on the board's LED. The most recent alarm is shown first and the oldest alarm is shown last.
2. TEST RESET – When this button is pressed and released, any anti-short cycle delays (ASCD) are bypassed for one cycle. When pressed twice, any active lockouts are reset.
3. COMM SETUP – If the board is to be networked with other units, this button is used to set the network address. Press the button once and it scans the bus, then assigns itself the first available address, (starts at 2). It then flashes that address one time. Pressing the button twice causes the control to flash the address.

FLASH CODES	Description
On Steady	This is Control Failure
2 Flashes	Control waiting ASCD (Anti-Short Cycle Delay) *
3 Flashes	High Pressure Compressor 1 Lockout
4 Flashes	High Pressure Compressor 2 Lockout
5 Flashes	Low Pressure Compressor 1 Lockout
6 Flashes	Low Pressure Compressor 2 Lockout
7 Flashes	Condensate Overflow Switch Lockout
11 Flashes	Compressor(s) locked out due to Economizer running (Free Cooling) *
13 Flashes	Compressor Held Off due to Low Voltage
14 Flashes	EEPROM Storage Failure
OFF	No Power or Control Failure

Note: Flash rates marked with * are NOT alarms.

MAINTENANCE / SERVICE

DISCONNECT AND LOCK OUT POWER WHEN SERVICING UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL IN-JURY OR DEATH DUE TO ELECTRICAL SHOCK.



Exercise care when working around the sharp metal edges of door panels or door frames, etc. These edges can cause injury.

EVAPORATOR COIL

Inspect the evaporator coil at filter change intervals. Dirty or clogged evaporator coils causes low suction pressure and lost capacity. If the coils appear dirty, they should be cleaned using a mild detergent or a commercial coil cleaning agent.

REFRIGERANT CIRCUIT(S)-

The Air Conditioning section of this equipment is charged with R-410A; a high pressure refrigerant. Only qualified technicians, using appropriately pressure rated test instruments, should perform troubleshooting or service on this equipment.

With the unit operating, check and record the compressor discharge and suction pressures. The compressor running current should also be recorded. A maintenance log of these readings can indicate if the unit is operating within its normal limits. Abnormal readings should be investigated, and the Cause corrected.

BLOWER -

Inspect the evaporator blower at each regular service interval. Clean blower wheel as needed. Bearings are permanently sealed ball type, and do not require lubrication. Check bearings for any signs of wear (movement between inner and outer races). Ensure bearing locking collars are secure to the shaft, and that collar locking screw is properly set. Check that the blower wheel is tight on the shaft, and that the hub set screws are properly torqued.

DRIVE BELT -

Examine belt periodically for wear. Glazed areas on the drive surfaces indicate overheating due to belt slippage. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over-tensioning shortens belt and bearing life (see section 'Blower Speed Adjustment').

The tension on the belt should be adjusted for a deflection of 1/64 of an inch per inch of belt span, with the appropriate force applied at the midpoint of the span (see section 'Blower Speed Adjustment'). Tension "New" belts at the maximum value indicated. Used belts should be maintained at the minimum value.

FILTERS -

Inspect filters monthly and replace as necessary. Use UL Class 2 rated filters. Factory supplied filters are medium efficiency, extended surface pleated type. Replacements should be of the same type, to maintain optimum airflow performance. Filter sizes are as follows:

Filters	Qty/Size
CSV060B	2/20x16x2
CSV096B	6/14x20x2
CSV120B	6/14x20x2
CSV180B	2/16x20x2 4/16x25x2
CSV240B	6/20x25x2

R-410A QUICK REFERENCE GUIDE

Refer to Installation Instructions for specific installation requirements.

- R-410A Refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A Refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig. DOT 4BA400 or DOT BW400.
- Recovery equipment must be rated for R-410A.
- Do not use R-410A service equipment on R-22 systems. All hoses, gages, recovery cylinders, charging cylinders and recovery equipment must be dedicated for use on R-410A systems only.
- Manifold sets must be at least 700 psig high side, and 180 psig low side, with 550 psig retard.
- All hoses must have a service pressure rating of 800 psig.
- Leak detectors, must be designed to detect HFC refrigerants.
- Systems must be charged with refrigerant. Use a commercial type metering device in the manifold hose.
- R-410A can only be used with POE type oils.
- POE type oils rapidly absorb moisture from the atmosphere.
- Vacuum pumps will not remove moisture from POE type oils.
- Do not use liquid line driers with a rated working pressure rating less than 600 psig.
- Do not install suction line driers in the liquid line.
- A liquid line drier is required on every unit.
- Do not use an R-22 TXV. If a TXV is to be used, it must be an R-410A TXV.
- Never open system to atmosphere when under vacuum.
- If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace filter driers.

