Carrier

09FC020-080
Free Cooling Unit
50/60 Hz

Installation, Start-Up and Maintenance Instructions

CONTENTS

SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

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Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

Untrained personnel can perform basic maintenance functions, such as cleaning coils. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment and any other safety precautions that may apply.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling, rigging, and setting bulky equipment.

⚠ DANGER

Separate power sources (main and control power circuits) are used for these units. Be sure both main and control power circuits are disconnected before servicing. Failure to do so could result in personal injury from electric shock.

⚠ WARNING

Open all remote disconnects before servicing this equipment. Failure to do so could result in personal injury from electric shock.

⚠ WARNING

The free cooling module is not to be used by children or persons with reduced physical, sensory, or mental capabilities. Anyone with lack of experience and knowledge shall have supervision or have been given instruction.

⚠ DANGER

Electrical shock can cause personal injury and death. After unit power is disconnected, wait at least 20 minutes for the Variable Frequency Drives (VFD) capacitors to discharge before opening drive.

⚠ CAUTION

This unit uses a microprocessor control system. Do not short or jumper between terminations on circuit boards or modules; control or board failure may result.

Be aware of electrostatic discharge (static electricity) when handling or making contact with circuit boards or module connections. Always touch a chassis (grounded) part to dissipate body electrostatic charge before working inside control center.

Use extreme care when handling tools near boards and when connecting or disconnecting terminal plugs. Circuit boards can easily be damaged. Always hold boards by the edges and avoid touching components and connections.

This equipment uses, and can radiate, radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN 61000-2/3 which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Always store and transport replacement or defective boards in anti-static shipping bag.

INTRODUCTION

This book contains the installation instructions, start-up and service information for free cooling units.

See Table 1 for 09FC physical data information. See Fig. 1 for model number nomenclature. See Tables 2 and 3 and Fig. 2 for corner weight information.

Table 1 — Physical Data

UNIT	09FC*020	09FC*030	09FC*040	09FC*050	09FC*060	09FC*070	09FC*080
Shipping Weight, lbs (kg)	3471 (1574)	4946 (2243)	6482 (2940)	8219 (3728)	9694 (4397)	11209 (5084)	12683 (5753)
Operating Weight, lbs (kg)	4288 (1945)	6162 (2795)	8098 (3673)	10251 (4650)	12126 (5500)	14041 (6369)	15915 (7219)
Net Fluid Volume, gal (l)	98 (371)	146 (552)	194 (734)	234 (888)	281 (1062)	340 (1286)	388 (1468)
Nitrogen Shipping Charge	5 psig						
Fans and Motors	Shrouded Axial Type, Vertical Discharge						
Quantity	4	6	8	10	12	14	16
Maximum Speed, rpm (r/s)	1140 (19)						
Coils							
Type	Round Tube/Plate Fin						
No. of Coils	4	6	8	10	12	14	16
Drain/Vent Size, in.	1/4 SAE male flare						
Piping							
Field Connection Size, in.	6	6	6	6	6	6	6
Field Connection Type	Victaulic-type						
Drain/Vent Size, in.	1/4 NPT						
Max. Temperature, °F (°C)	100 (37.8)						
Max. Pressure, psi (kPa)	300 (2068)						
Chassis Dimensions							
Length, ft-in. (mm)	8’ 4" (2535)	12’ 3" (3729)	16’ 2" (4923)	20’ 1" (6117)	24’ 0" (7311)	27’ 11" (8505)	31’ 10" (9699)
Width, ft-in. (mm)	7’ 4" (2236)						
Height, ft-in. (mm)	8’ 3" (2513)						

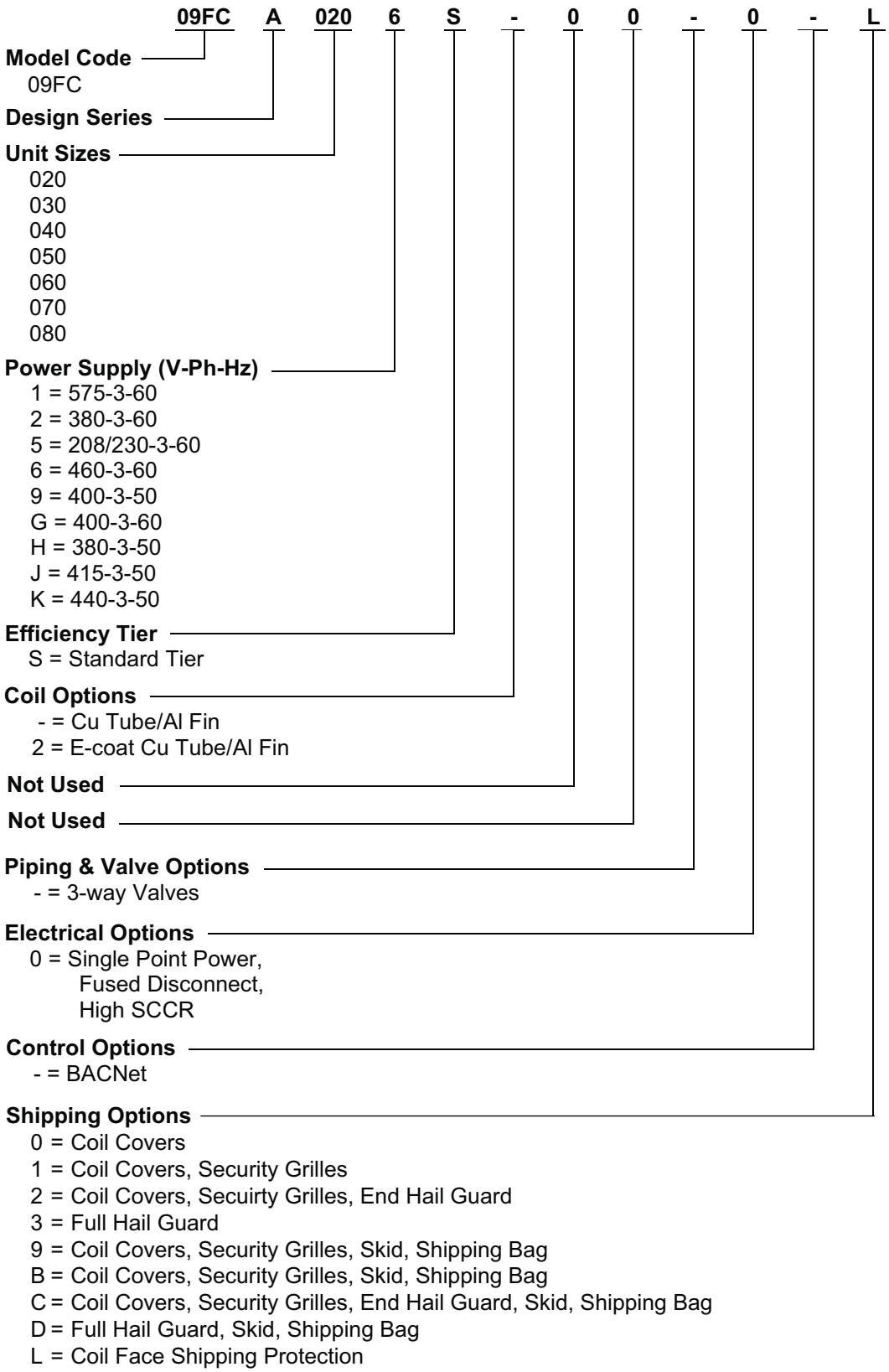


Fig. 1 — Model Number Nomenclature

Table 2 — Unit Operating Corner Weights — lbs

UNIT SIZE	OPERATING WEIGHT AT CORNER WEIGHTS, LBS							
	A	B	C	D	E	F	G	H
020	991	1137	1006	1154	—	—	—	—
030	1410	1663	1417	1672	—	—	—	—
040	955	1105	920	1065	847	862	1162	1182
050	971	1118	965	1111	1340	1429	1605	1711
060	1390	1645	1376	1629	1340	1429	1605	1711
070	1396	1643	1380	1623	912	1084	892	1060
080	941	1088	935	1082	864	1050	891	1084

UNIT SIZE	OPERATING WEIGHT AT CORNER WEIGHTS, LBS							
	I	J	K	L	M	N	O	P
070	902	1087	936	1128	—	—	—	—
080	922	1069	916	1063	884	1069	932	1127

Table 3 — Unit Operating Corner Weights — kg

UNIT SIZE	OPERATING WEIGHT AT CORNER WEIGHTS, LBS							
	A	B	C	D	E	F	G	H
020	450	516	456	523	—	—	—	—
030	639	754	643	758	—	—	—	—
040	433	501	418	483	384	391	527	536
050	440	507	438	504	608	648	728	776
060	630	746	624	739	608	648	728	776
070	633	745	626	736	414	492	405	481
080	427	494	424	491	392	476	404	492

UNIT SIZE	OPERATING WEIGHT AT CORNER WEIGHTS, LBS							
	I	J	K	L	M	N	O	P
070	409	493	424	512	—	—	—	—
080	418	485	416	482	401	485	423	511

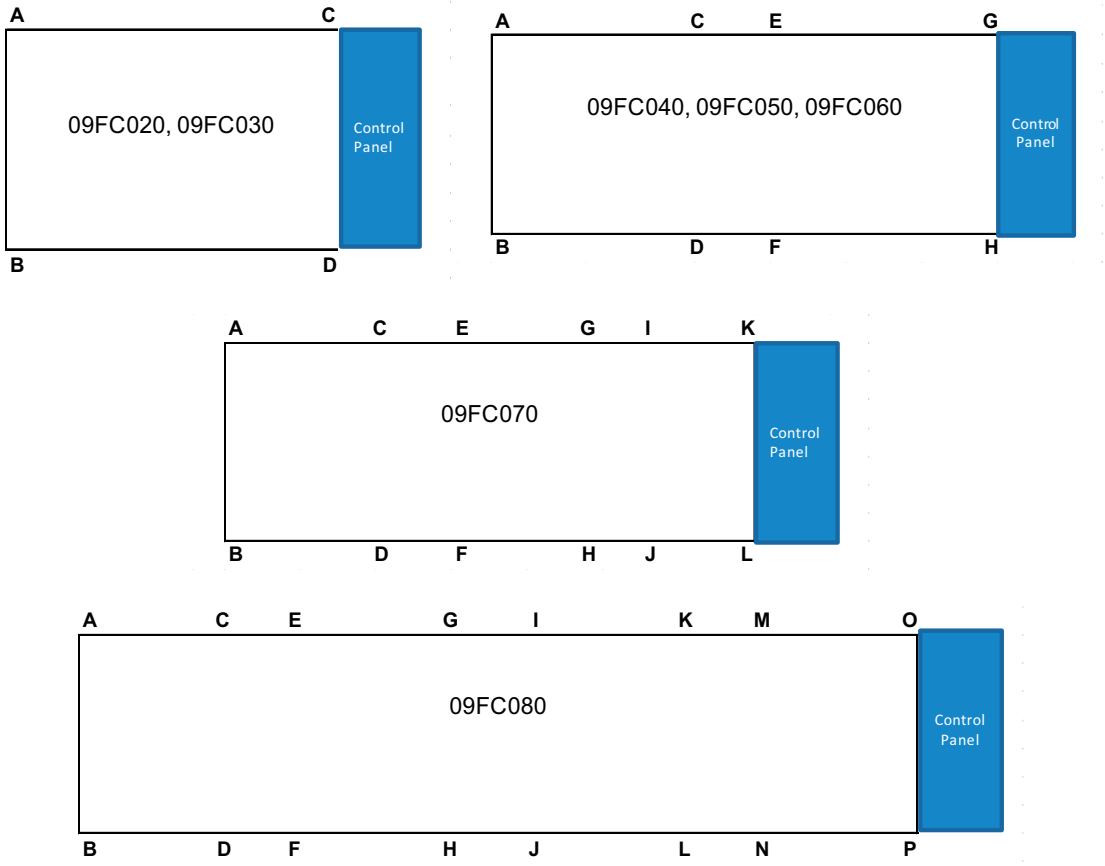


Fig. 2 — Corner Weights

INSTALLATION

Storage

The 09FC free cooling units are designed for outdoor installations. At times, a delay in construction or other factors require that a unit be stored for a period of time prior to installation. The following guidelines should be used for unit storage.

PROVIDE MACHINE PROTECTION

Place and store the unit in an area that will protect it from vandalism, accidental contact with vehicles, falling debris or construction waste. Ideally, do not remove the shipping protection such as the coil protectors. This will provide additional protection for the unit. The unit can be stored outdoors.

INSPECTION DURING STORAGE

To ensure faster installation when the time comes, the following inspection schedule is recommended:

Every 3 Months

The 09FC units are shipped with a nitrogen holding charge in the water loop. Check to be sure that there is positive pressure, at least 5 psig (34 kPa) in the water piping. If a circuit is found to be without pressure, contact a qualified refrigeration mechanic. The system should be pressurized to find the leak. It should be repaired and recharged with nitrogen.

Every 6 Months

Check the unit for damage, both physical and from wildlife. Check the unit for nests from rodents, birds, or insects. Depending on location, these organisms can cause deterioration of components which may result in failure. Consider an exterminator if necessary. If damage is found and it will interfere with the installation, consider repairing the damage before installation. Check the unit control box for signs of moisture. If moisture is found, determine the entry path and seal the leak.

Step 1 — Inspect Shipment

Inspect unit for damage upon arrival. If damage is found, immediately file a claim with the shipping company. Verify proper unit delivery by checking unit nameplate data and the model number nomenclature shown in Fig. 1. See Table 1 for unit physical data.

Step 2 — Rig and Place Unit

All units are designed for overhead rigging, it is *important that this method be used*. Lifting holes are provided in frame base rails. It is recommended shackles are used in the lifting holes (see rigging label on unit and Fig. 4 for rigging weights and center of gravity). All panels must be in place when rigging.

IMPORTANT: To maintain unit stability while lifting, use a minimum of 4 cables, chains or straps of equal length. Attach one end of each cable to shackle attachment point and the other end of each cable to overhead rigging point.

Use spreader bars or frame to keep the cables, chains, and straps clear of the unit sides. Leave standard coil protection packaging in place during rigging to provide coil protection. Remove and discard all coil protection after rigging cables are detached.

⚠CAUTION

All panels must be in place when rigging. Failure to comply could result in equipment damage.

⚠CAUTION

For all unit sizes, do not forklift unit unless unit is attached to a skid designed for forklifting. Failure to follow this caution could result in equipment damage or personal injury.

Standard 09FC unit packaging consists of coil protection only. Skids are not provided unless selected as a shipping option. If overhead rigging is not available at the jobsite, the unit should be placed on a skid or pad before dragging or rolling. Units with export shipping skid option, cannot be moved using rollers unless there is a way to remove them first. When rolling, use a minimum of 3 rollers. When dragging, pull the pad or skid. *Do not apply force to the unit.* When in final position, raise from above to lift unit off the pad or skid.

PLACING UNITS

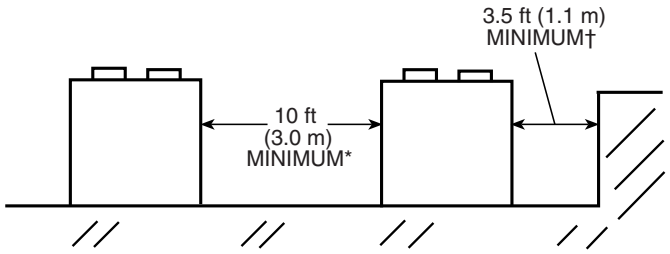
When considering unit location, be sure to consult National Electrical Code (NEC, U.S.A.) and local code requirements. Allow sufficient space for airflow, wiring, piping, and service. The placement area must be level and strong enough to support the operating weight of the unit. (See Tables 2 and 3.)

In areas where snow can be expected, consider the snow depth for the location. The fan variable frequency drive (VFD) is equipped with a cooling fan located on the bottom of the device. The unit should be installed with the inlet of the VFD cooling fan at least 12 in. (304 mm) above the anticipated snow level.

Refer to Fig. 5-11 for airflow clearances. Recommended minimum clearances are 6 ft (1829 mm) for unrestricted airflow and service on sides of unit, 4 ft (1219 mm) on ends, and unrestricted clear air space above the unit. Provide ample space to connect fluid lines to unit.

For multiple units, allow 10 ft (3048 mm) separation between airflow surfaces. See Fig. 3. If walls surround the unit, wall height should not exceed the top of the unit fan discharge. Installation in a pit is not recommended.

The unit may be placed at the end (opposite control box) of a chiller, however assure there is space for piping between water connections. Some chiller water connections are at the end of the chiller and may not be accessible if 09FC is too close to it.



* Minimum for when coils face each other. Less clearance is required in other configurations.
† Clearance of 3.5 ft is required when a coil faces the wall. When there is no coil facing the wall, see the certified drawing for the required service clearance.

Fig. 3 — 09FC Multiple Unit Separation

⚠ CAUTION - NOTICE TO RIGGERS:

ALL PANELS MUST BE IN PLACE WHEN RIGGING. DO NOT FORK THESE UNITS IF NO SKID IS SUPPLIED.

⚠ ATTENTION –AVIS AUX GRÉEURS:

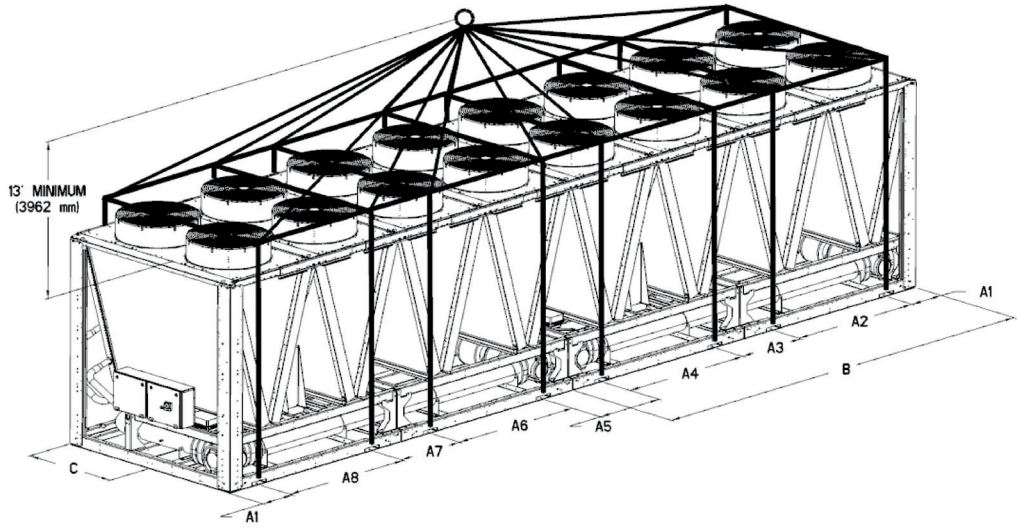
LORS DU LEVAGE, TOUS LES PANNEAUX DOIVENT ÊTRE EN PLACE. NE PAS MANIPULER AVEC CHARIOT ÉLÉVATEUR À FOURCHE S'IL N'Y A PAS DE PALETTE.

NOTE:

1. 1.50 dia (38.1mm) lifting holes provided for field supplied clevis.
2. Rig with a minimum of 25 ft (7620mm) length chain or cables.
3. If central lifting point is used, it must be minimum of 13 ft. (3962mm) above the top of the unit.
4. Spreader bars made from steel or double nailed, and notched 2x6's approximately 8 ft. (2438mm) long, must be placed just above the top of the unit and coils.
5. If overhead rigging is not available, the unit can be moved on roller or dragged. When unit is moved on roller, the unit steel skid, if equipped, must be removed. To lift the unit, use jacks at rigging points. Use a minimum of one roller every 6 ft. (1829mm) to distribute the load. If the unit is to be dragged, lift the unit as described above, and place unit on a pad. Apply moving force to the pad, not the unit. When in its final location, raise the unit and remove the pad.
6. Check the bill of lading to determine shipping weight of the unit.

REMARQUE:

1. Des oeillets de levage de 38,1 mm (1,50 po) de diamètre sont prévus pour les manipulations sur le terrain.
2. Gréer avec une chaîne ou des câbles de longueur minimale de 7 620 mm (25 pi).
3. Si un point de levage central est utilisé, il doit être au moins 3 962 mm (13 pieds) au-dessus du haut de l'unité.
4. Des barres d'écartement en acier ou des 2 par 6 doubles cloués ensemble et entaillés, d'environ 2 438 mm (8 pieds) de longueur doivent être placés juste au-dessus du haut de l'unité et des bobines.
5. Si le soulèvement par le dessus n'est pas possible, l'unité devra être déplacée ou glissée sur des rouleaux et les patins d'acier de l'unité, si présents, devront être retirés. Pour incliner l'unité, utiliser des vérins aux points de levage. Placer un rouleau à au moins tous les 1 829 mm (6 pi) pour répartir la charge. Si l'unité sera glissée, la soulever comme indiqué plus haut et la placer sur une plateforme. Pour déplacer l'unité sur son emplacement final, appliquer la force de déplacement sur la plateforme et non sur l'unité. Soulever l'unité et retirer la plateforme
6. Pour déterminer le poids d'expédition de l'unité, vérifier le connaissement.



Model Number	Max Shipping Wt w/o Packaging		Max Shipping Wt with Packaging		Lifting Holes																Center of Gravity			
	Model number position 11= -,1,2		Model number position 11= -,1,2																		B		C	
	Al/CU**		Al/CU**		A1		A2		A3		A4		A5		A6		A7		A8		AL/CU**			
	lbs	Kgs	lbs	Kgs	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
09FC020	3471	1574	3980	1805	16.1	409	62.0	1575													47.4	1203	41.7	1058
09FC030	4946	2243	5672	2573	16.1	409	109.0	2769													70.7	1795	41.0	1042
09FC040	6482	2940	7425	3368	16.1	409	62.0	1575	32.0	813	62.0	1575									94.2	2393	41.3	1048
09FC050	8219	3728	9553	4333	16.1	409	62.0	1575	32.0	813	109.0	2769									117.3	2978	41.2	1047
09FC060	9694	4397	11251	5103	16.1	409	109.0	2769	32.0	813	109.0	2769									141.2	3587	41.0	1041
09FC070	11209	5084	12977	5886	16.1	409	109.0	2769	32.0	813	62.0	1575	32.0	813	62.0	1575					163.3	4148	41.1	1043
09FC080	12683	5753	14654	6647	16.1	409	62.0	1575	32.0	813	62.0	1575	32.0	813	62.0	1575	32.0	813.0	62.0	1575	187.9	4774	41.0	1041

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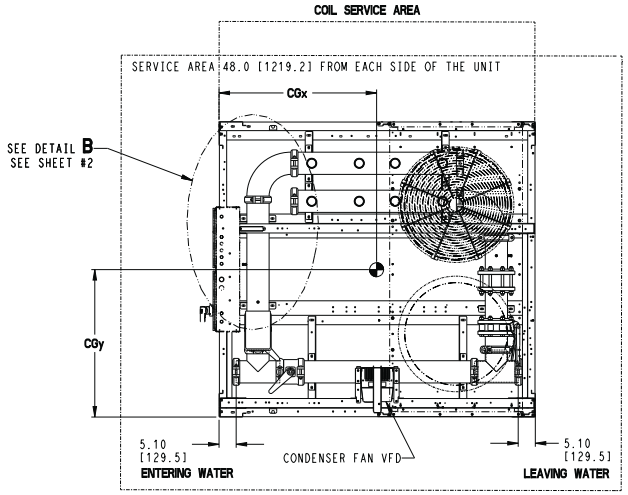
**Condenser coil (Al/CU): Aluminum fins/Copper Tubing

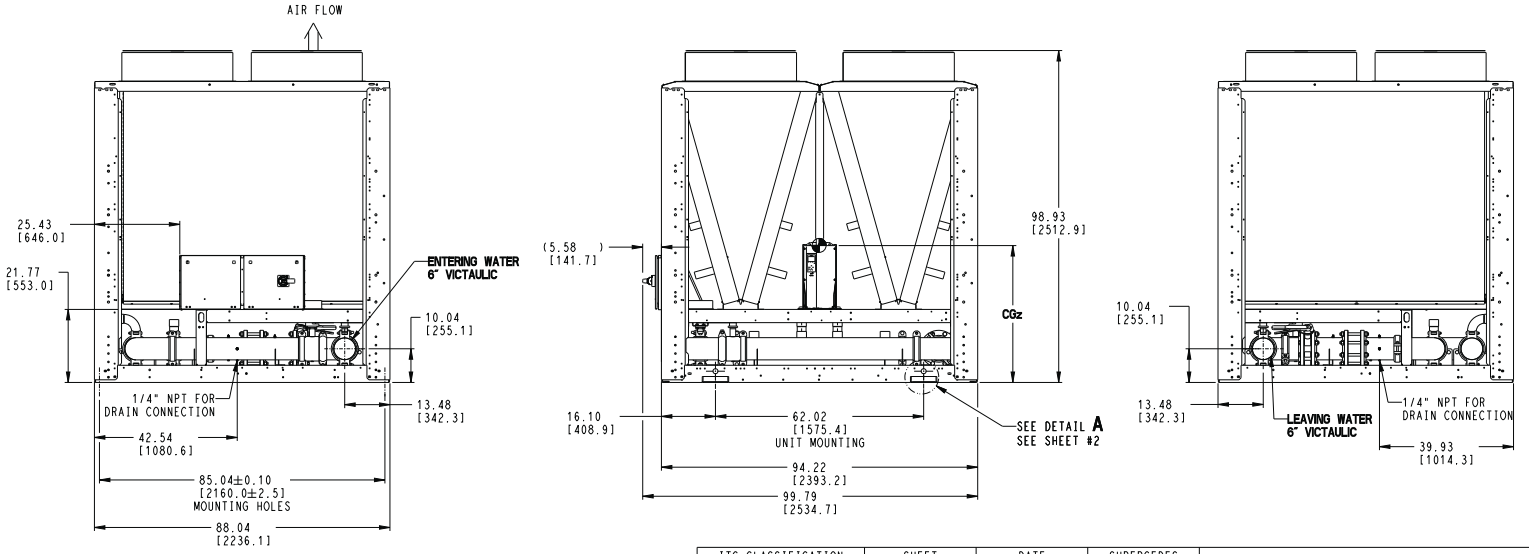
Fig. 4 — Rigging Label

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-020	1203	47.4	1058	41.6	1059	41.7	1945	4288

SYMBOL DENOTES CG





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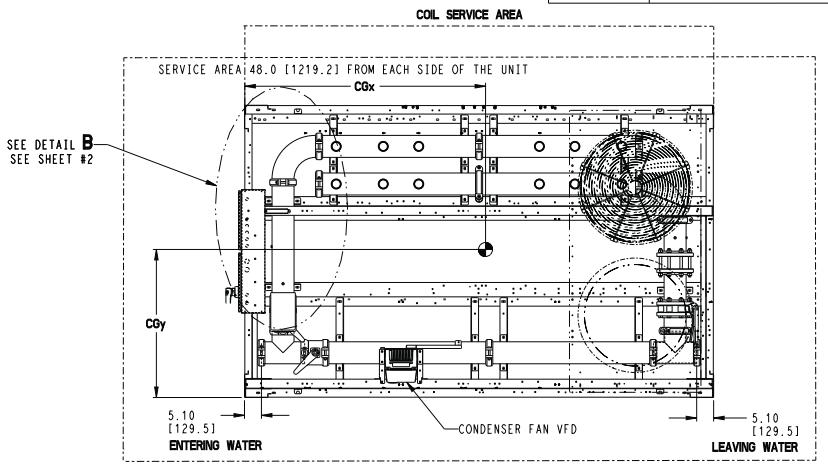
U.S. ECCN:EAR99	1 OF 2	01/06/21	-	09FC-020	09FC60000200	A

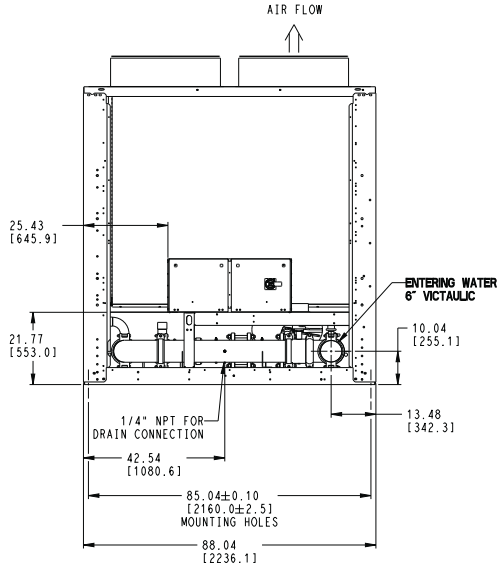
Fig. 5 — 09FC 020 Unit Dimensions

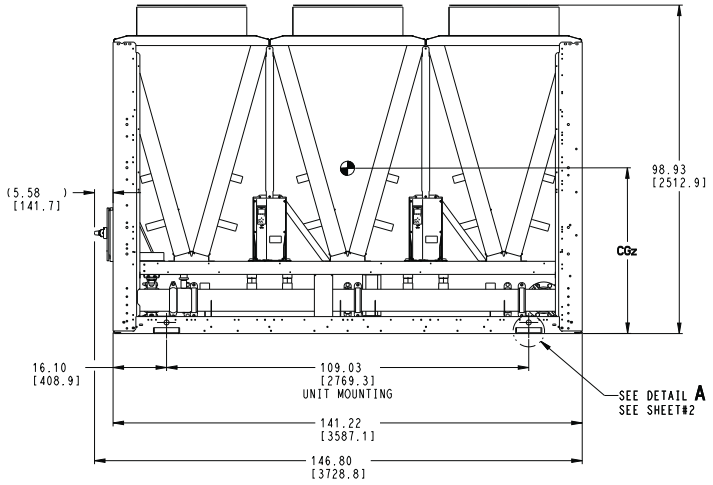
NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

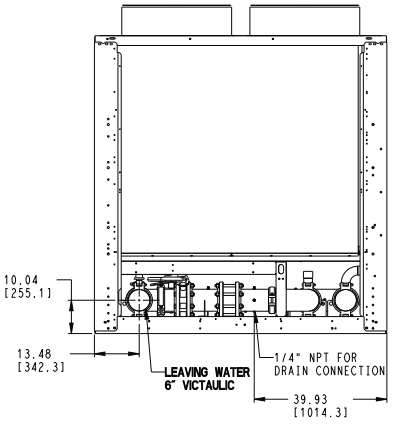
UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-030	1795	70.7	1042	41.0	1074	42.3	2795	6162

SYMBOL DENOTES CG









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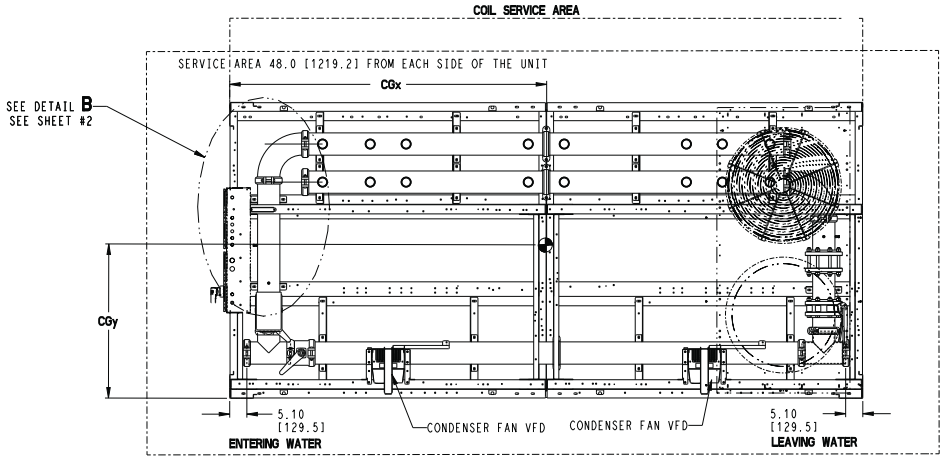
U.S. ECCN:EAR99	1 OF 2	01/06/21	-	09FC-030	09FC60000300	A

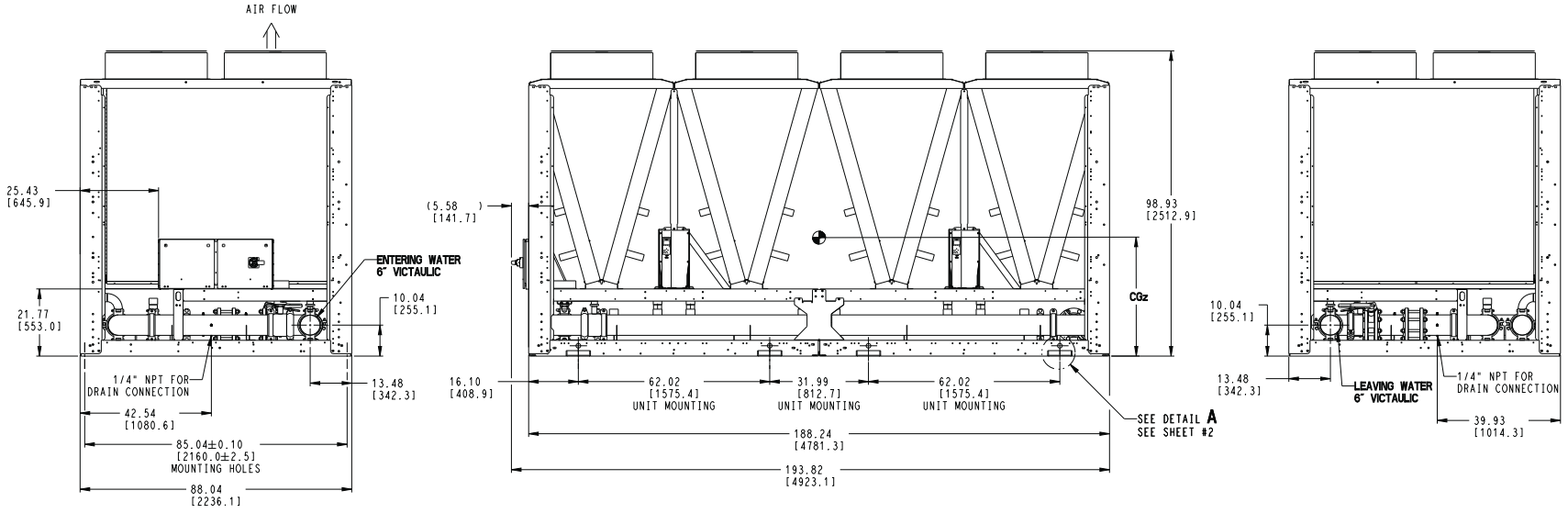
Fig. 6 — 09FC 030 Unit Dimensions

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-040	2393	94.2	1048	41.3	1079	42.4	3673	8098

SYMBOL DENOTES CG





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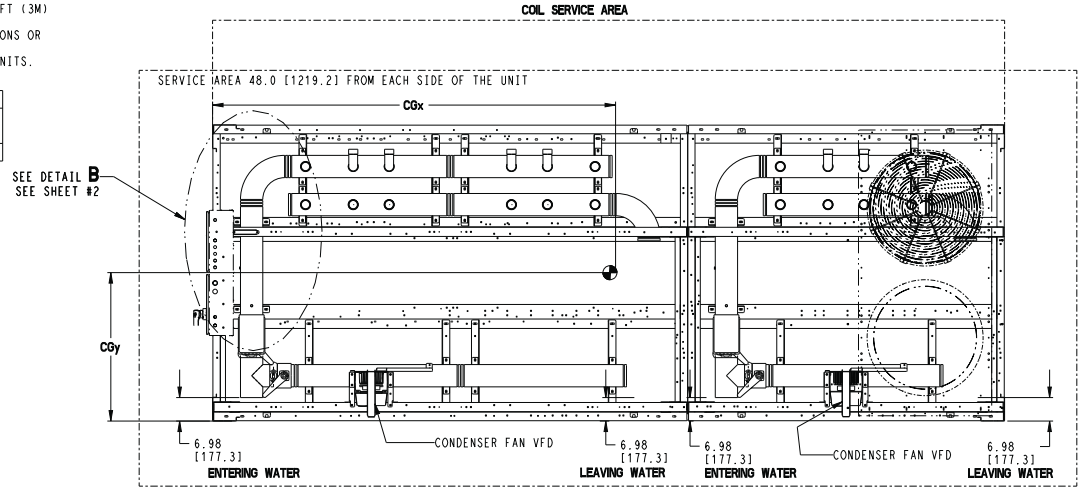
U.S. ECCN:EAR99	1 OF 2	01/06/21	-	09FC-040	09FC60000400	A

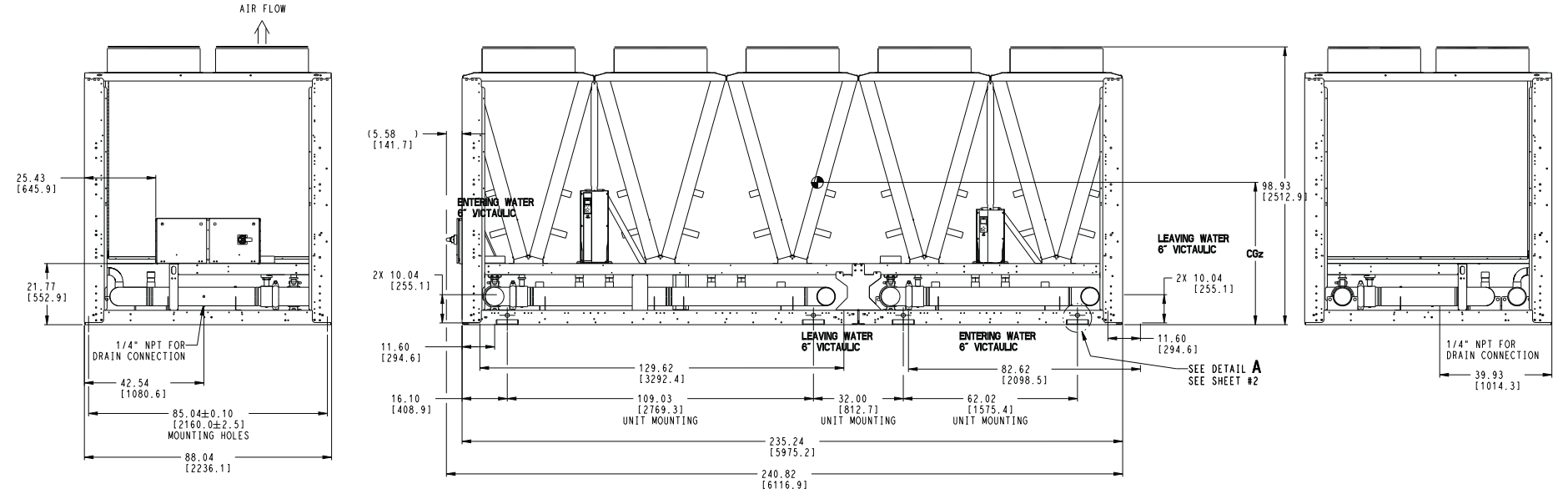
Fig. 7 — 09FC 040 Unit Dimensions

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz			
	MM	INCH	MM	INCH	MM	INCH	KG	LBS
09FC-050	2978	117.3	1047	41.2	1057	41.6	4650	10251

SYMBOL DENOTES CG





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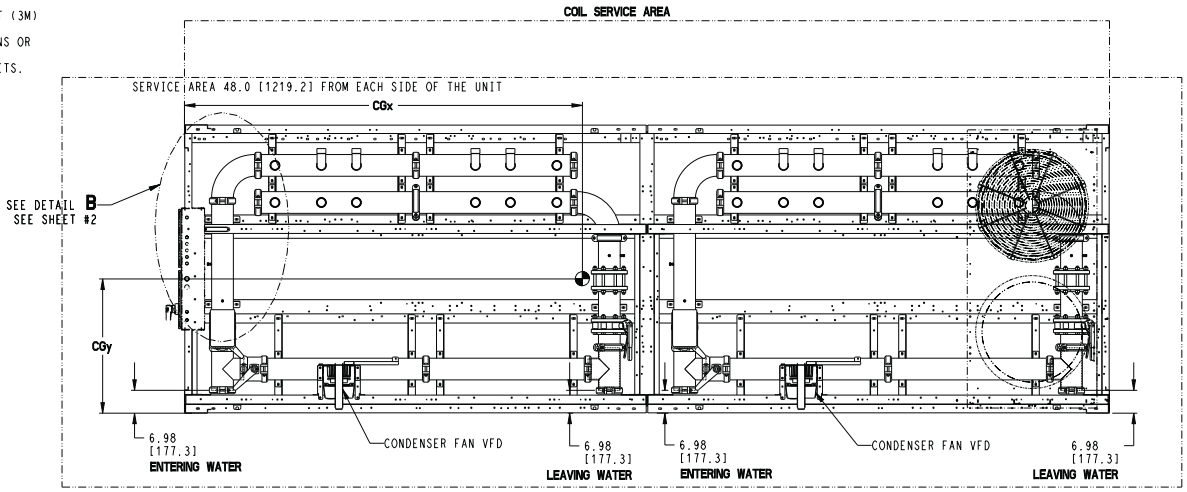
U.S. ECCN:EAR99	1 OF 2	01/07/21	-	09FC-050	09FC60000500	A

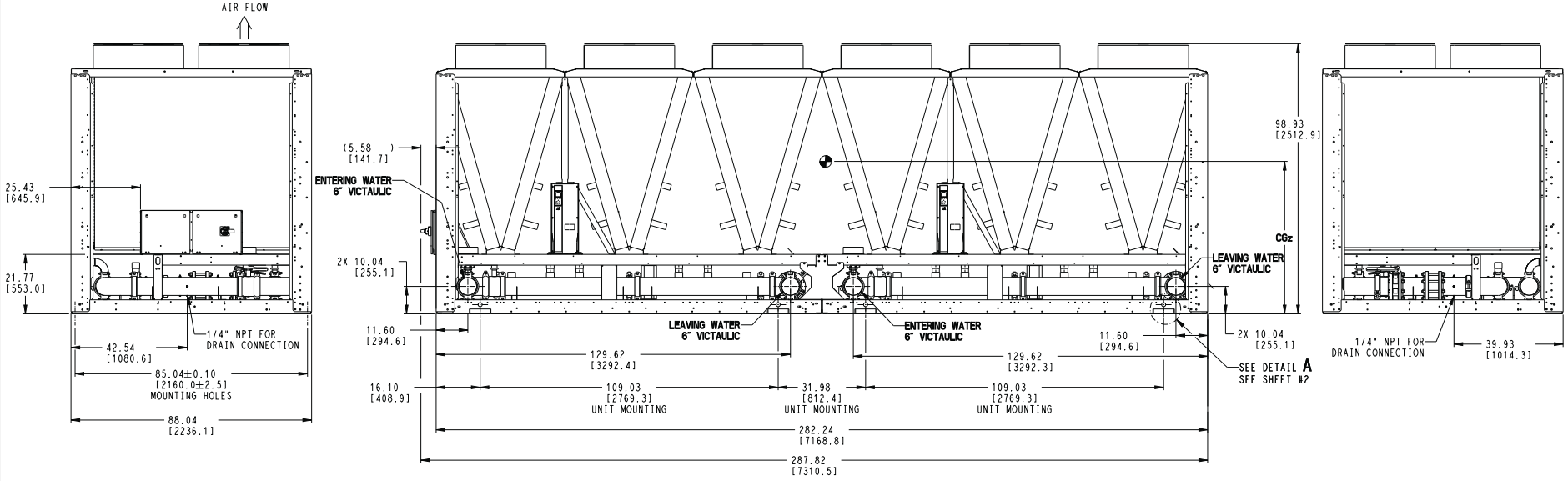
Fig. 8 — 09FC 050 Unit Dimensions

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-060	3587	141.2	1041	41.0	1065	42.0	5500	12126

SYMBOL DENOTES CG





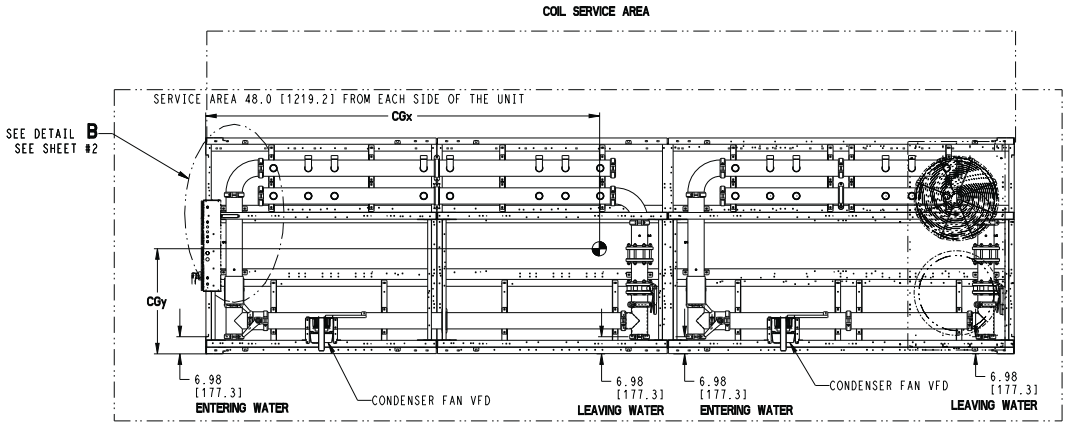
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:EAR99	1 OF 2	01/07/21	-	09FC-060	09FC60000600	A

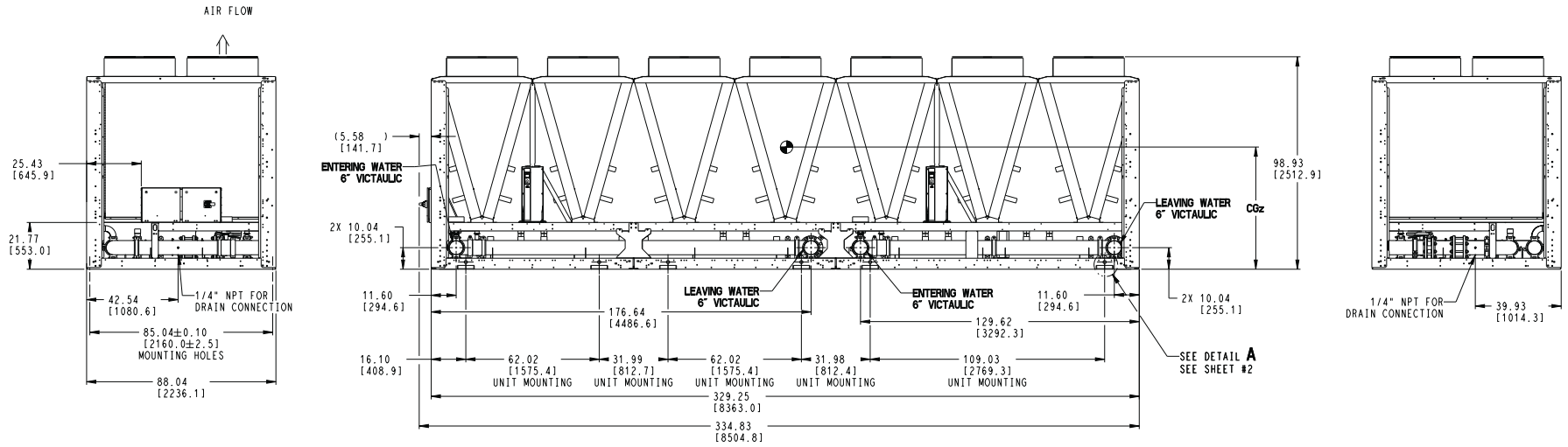
Fig. 9 — 09FC 060 Unit Dimensions

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6' FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-070	4148	163.3	1043	41.1	1070	42.1	6369	14041

SYMBOL DENOTES CG





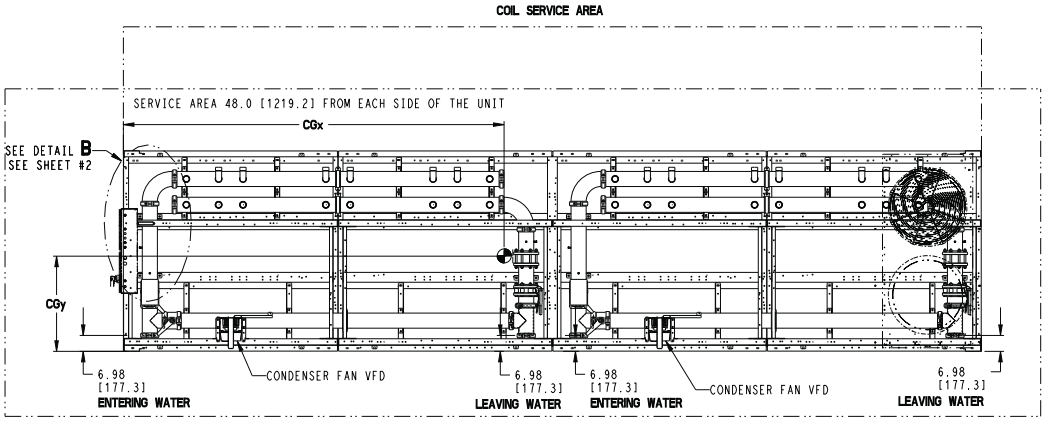
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:EAR99	1 OF 2	01/07/21	-	09FC-070	09FC60000700	A

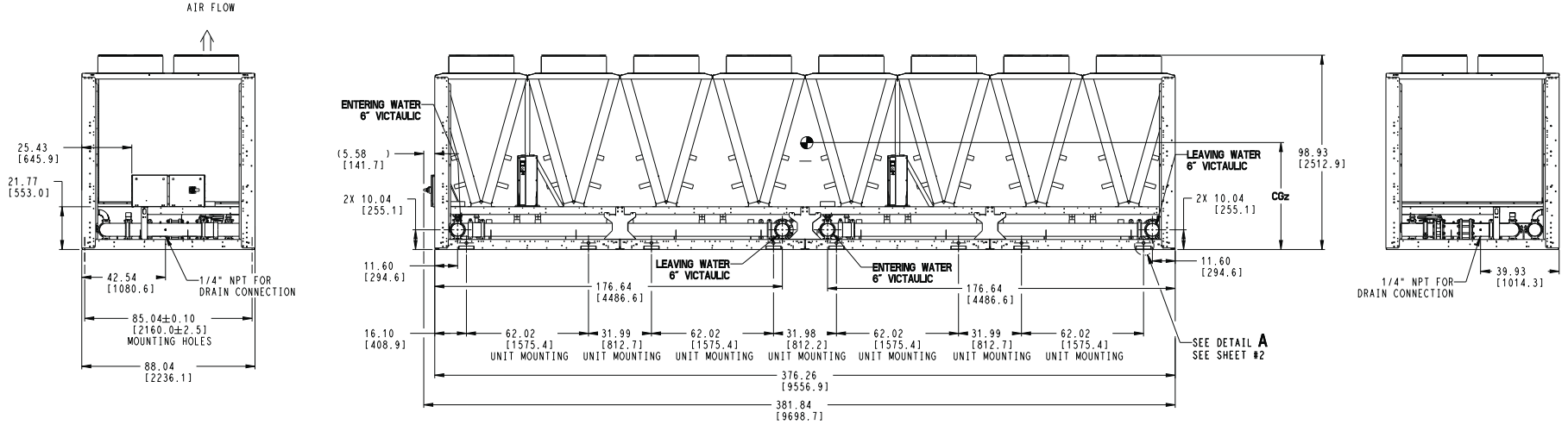
Fig. 10 — 09FC 070 Unit Dimensions

NOTES:
1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP- DO NOT RESTRICT.
   SIDES AND END- 6′ FROM SOLID SURFACE.
   FOR AIRFLOW SIDE- 8′ REQUIRED FOR COIL SERVICE AREA.
   IF MULTIPLE UNITS ARE INSTALLED AT THE SAME SITE, A MINIMUM SEPARATION OF 10FT (3M) BETWEEN THE SIDES OF THE MACHINES IS REQUIRED TO MAINTAIN PROPER AIRFLOW.
2. FACTORY WIRING IS IN ACCORDANCE WITH UL 60335-40 STANDARDS. FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
3. WIRING FOR MAIN FIELD SUPPLY MUST BE RATED 75C MINIMUM. USE COPPER FOR ALL UNITS.
4. DIMENSIONS SHOWN ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MM.

UNIT	CENTER OF GRAVITY						OPERATING WEIGHT	
	CGx		CGy		CGz		KG	LBS
	MM	INCH	MM	INCH	MM	INCH		
09FC-080	4774	187.9	1041	41.0	1074	42.3	7219	15915

SYMBOL DENOTES CG





ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:EAR99	1 OF 2	01/07/21	-	09FC-080	09FC60000800	A

Fig. 11 — 09FC 080 Unit Dimensions

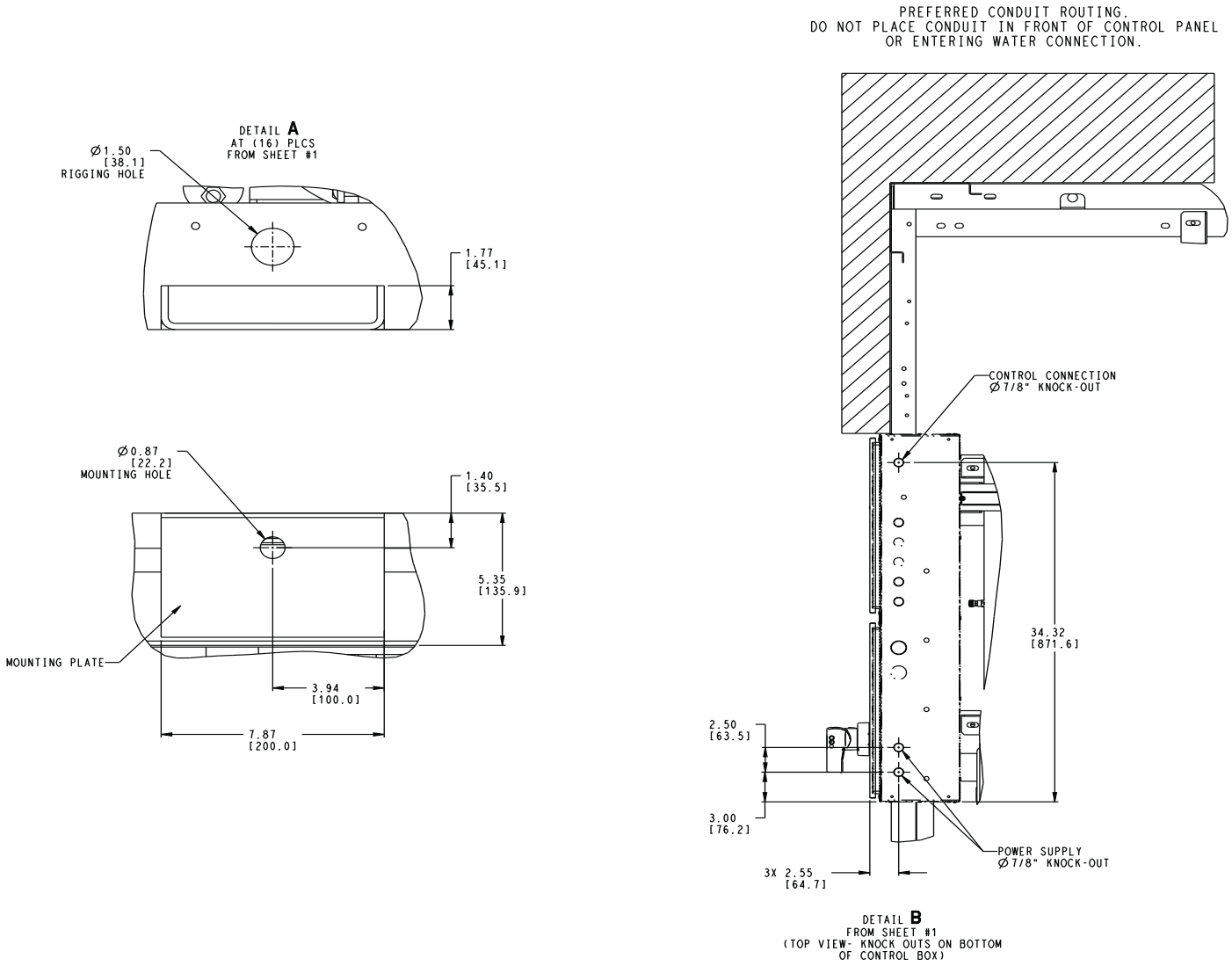


Fig. 11 — 09FC Unit Dimensions

MOUNTING UNITS

When unit is in proper location, use of mounting holes in base rails is recommended for securing unit to supporting structure. Fasteners for mounting unit are field supplied. See Fig. 5-11. Be sure unit is level to within $^1/_8$ in. (3.2 mm) per foot for factory supplied drains to operate properly.

NOTE: For units that are point loaded, such as those using rubber and shear isolators, the base rail must be supported with a 24 x 4 in. (610 x 102 mm) plate at each mounting location, or base rail deflection may result. See Fig. 12-15. Fasten the unit to the plates using the mounting holes.

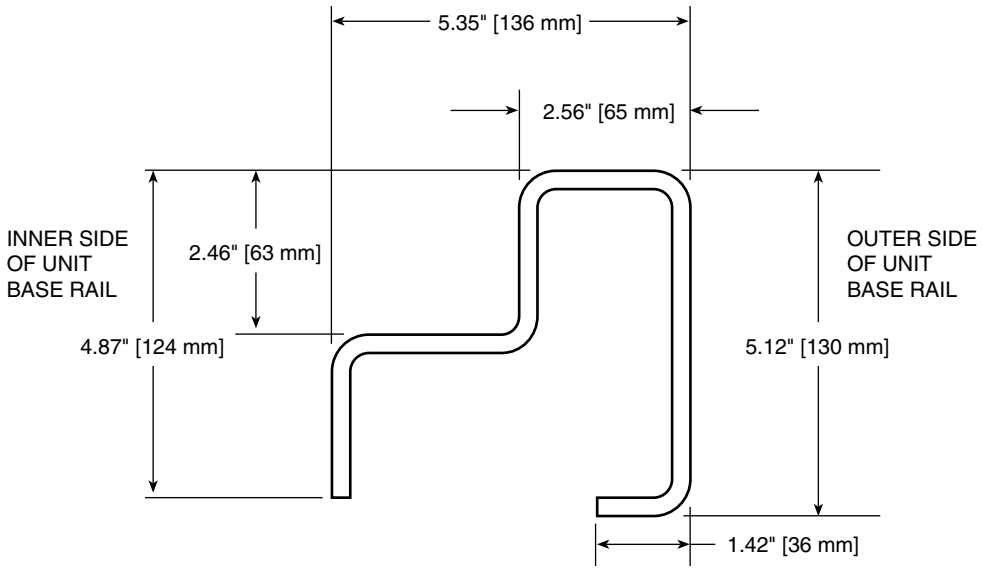
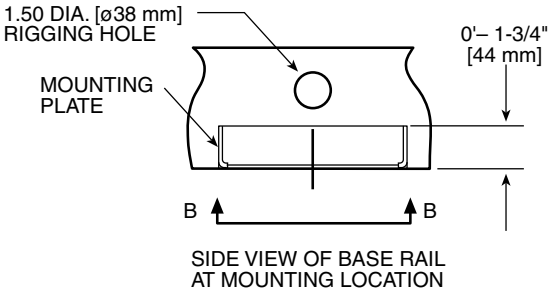


Fig. 12 — 09FC Base Rail Cross Section



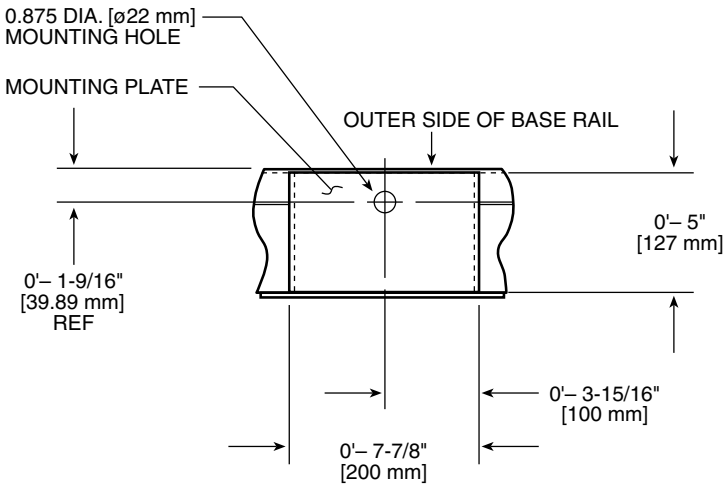


Fig. 13 — 09FC Mounting Plate

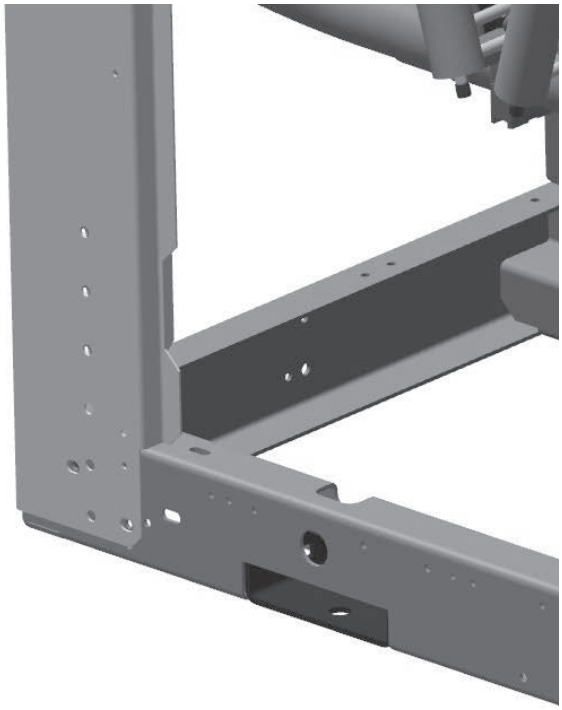


Fig. 14 — Perimeter Support Channel

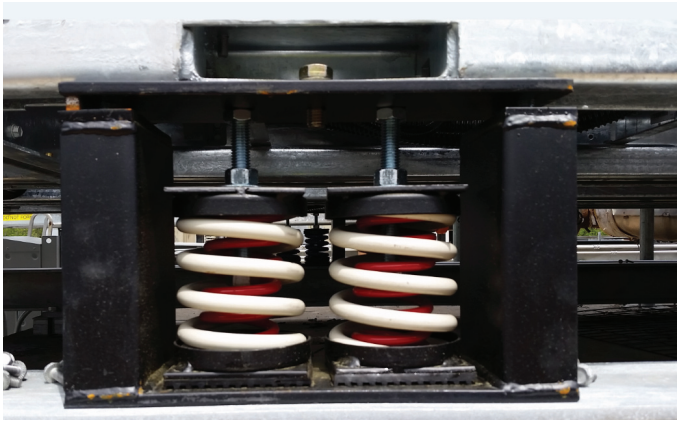


Fig. 15 — Isolator

Step 3 — Connect Chilled Water Loop

Proper system design and installation procedures should be followed closely. The system must be constructed with pressure tight components and thoroughly tested for installation leaks.

Installation of water systems should follow sound engineering practice as well as applicable local and industry standards. Improperly designed or installed systems may cause unsatisfactory operation and/or system failure. Consult a water treatment specialist or appropriate literature for information regarding filtration, water treatment, and control devices. Figure 16 show a typical installation and components.

To facilitate servicing, it is recommended additional field-supplied air vents be installed. Locate air vents at the highest possible point of the chilled water systems. To assist with filling and draining the coils, a vent and drain are located on the top and bottom of each coil header. Connections are 1/4 in. SAE male flare. In addition to field-supplied air vents, facilitate servicing in addition to flow balancing by installing field-supplied shut-off valves, thermometers, clean-out tees, pressure and temperature taps in the inlet and outlet piping. Locate valves in return and supply chilled water as close to the 09FC as possible.

AIR SEPARATION

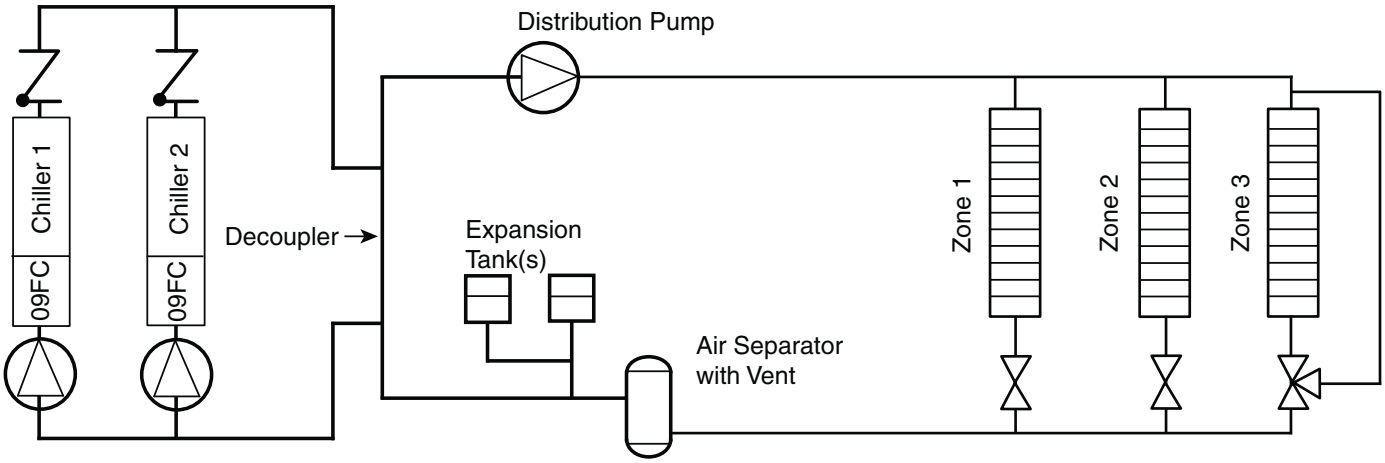
For proper system operation, it is essential that water loops be installed with proper means to manage air in the system. Free air in the system can cause noise, reduce capacity, stop flow, or even cause pump failure due to pump cavitation. For closed systems, equipment should be provided to eliminate all air from the system.

The amount of air that water can hold in solution depends on the pressure and temperature of the water/air mixture. Air is less soluble at higher temperatures and at lower pressures. Therefore, separation can best be done at the point of highest water temperature and lowest pressure. Typically, this point would be on the suction side of the pump as the water is returning from the system or terminals. This is generally the optimal place to install an air separator, if possible.

1. Install automatic air vents at all high points in the system. (If the 09FC unit is located at the high point of the system, a vent can be installed on the supply piping.)
2. Install an air separator in the water loop, at the place where the water is at higher temperatures and lower pressures — usually in the chilled water return piping. On a primary-secondary system, the highest temperature water is normally in the secondary loop, close to the de-coupler. Preference should be given to that point on the system (see Fig. 16). In-line or centrifugal air separators are readily available in the field.

If it is not possible to install air separators at the place of the highest temperature and lowest pressure, preference should be given to the points of highest temperature. It is important that the pipe be sized correctly so that free air can be moved to the point of separation. Generally, a water velocity of at least 2 feet per second (0.6 m per second) will keep free air entrained and prevent it from forming air pockets.

Automatic vents should be installed at all physically elevated points in the system so that air can be eliminated during system operation. Provisions should also be made for manual venting during the water loop fill.



NOTE: Expansion tanks for 30XV/09FC hydronic kits must be installed for chillers piped in parallel in the primary water loop.

Fig. 16 — Typical Air Separator and Expansion Tank Location on Primary-Secondary Systems

FIELD PIPING

When facing the coil header side of the unit, the inlet (return) water connection is on the right. It is required that a field-supplied strainer with a minimum size of 20 mesh and blow-down valve be installed within 10 ft (3.05 m) of the unit connection to prevent debris from damaging coil tubes. The blow-down valve allows removal of particulates caught in the strainer without complete removal of the screen. The outlet (supply) water connection is on the left.

The 09FC has water-side Victaulic-type connections. Provide proper support for the piping. If security grilles have been added, holes must be cut in the grilles for field piping and insulation, if required.

⚠WARNING

Safely relieve the pressure, and check for zero residual pressure before removing the caps.

Victaulic Coupling Installation

1. The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from indentations, projections (including weld seams), and roll marks to ensure a leak-tight seal. All oil, grease, loose paint, and dirt must be removed.
2. Apply a thin coat of Victaulic lubricant or silicone lubricant to the gasket sealing lips and exterior.

⚠CAUTION

Always use a compatible lubricant to prevent the gasket from pinching or tearing during installation. Failure to follow this instruction could result in joint leakage.

3. Position the gasket over the pipe end. Make sure the gasket does not overhang the pipe end.
4. Align and bring the two pipe ends together. Slide the gasket into position and center it between the groove in each pipe end. Make sure no portion of the gasket extends into the groove in either pipe end.
5. Install the housings over the gasket.

   NOTE: Make sure the housings' keys engage the grooves completely on both pipe ends.

⚠CAUTION

Make sure the gasket does not become rolled or pinched while installing the housings. Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.

6. Install the bolts, and thread a nut finger-tight onto each bolt. For couplings supplied with stainless steel hardware, apply an anti-seize compound to the bolt threads. Make sure the oval neck of each bolt seats properly in the bolt hole.
7. Tighten the nuts evenly by alternating sides until metal-to-metal contact occurs at the bolt pads. Make sure the housings' keys engage the grooves completely.

   NOTE: It is important to tighten the nuts evenly to prevent gasket pinching.
8. Visually inspect the bolt pads at each joint to ensure metal-to-metal contact is achieved.

See Fig. 18-22 for a typical piping diagram of a 09FC unit. Drain connections are located at the bottom of the entering and leaving water piping at the end of the unit. See Fig. 5-11 for connection location.

The EWT and LWT thermistors are field-installed. See Fig. 17. The thermistors are supplied with the unit coiled up near the entering and leaving water connections. Thermowells are included with the unit and are placed in the control panel. Thermowells are $^1/_4$ in. NPT to be installed in entering and leaving piping. Allow 4 pipe diameters or straight pipe upstream of thermistor mounting location to achieve mix flow for an accurate temperature measurement. See Fig. 18-21 for suggested locations. On larger units, 09FC050-080, the LWT thermowell must be placed in the common piping if unit is piped in parallel arrangement.

In sound sensitive applications, consider the installation of piping vibration isolators.

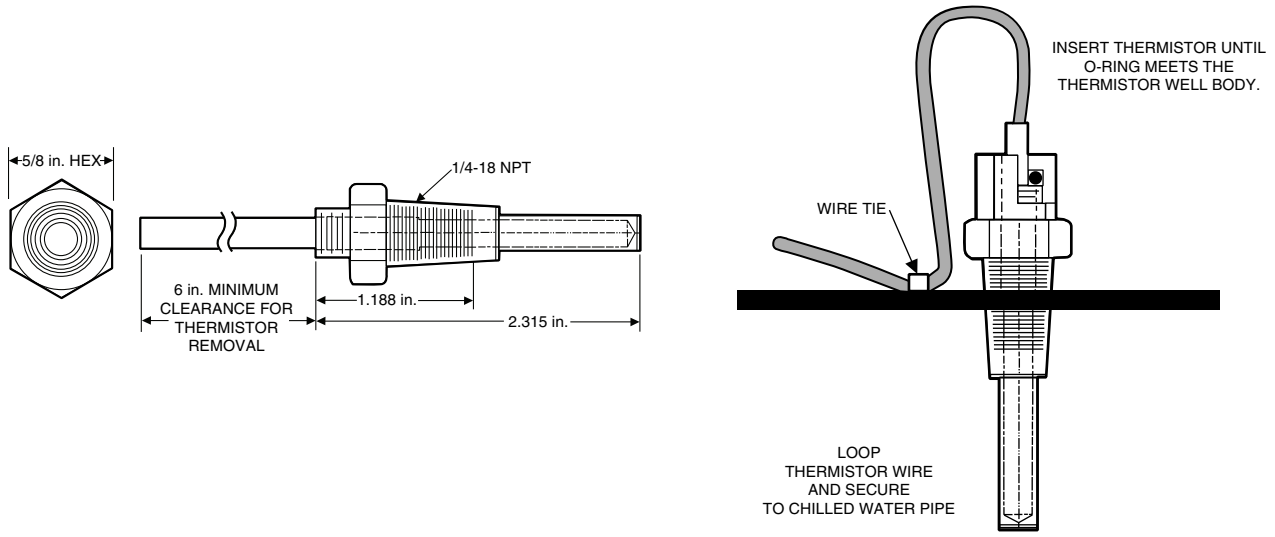


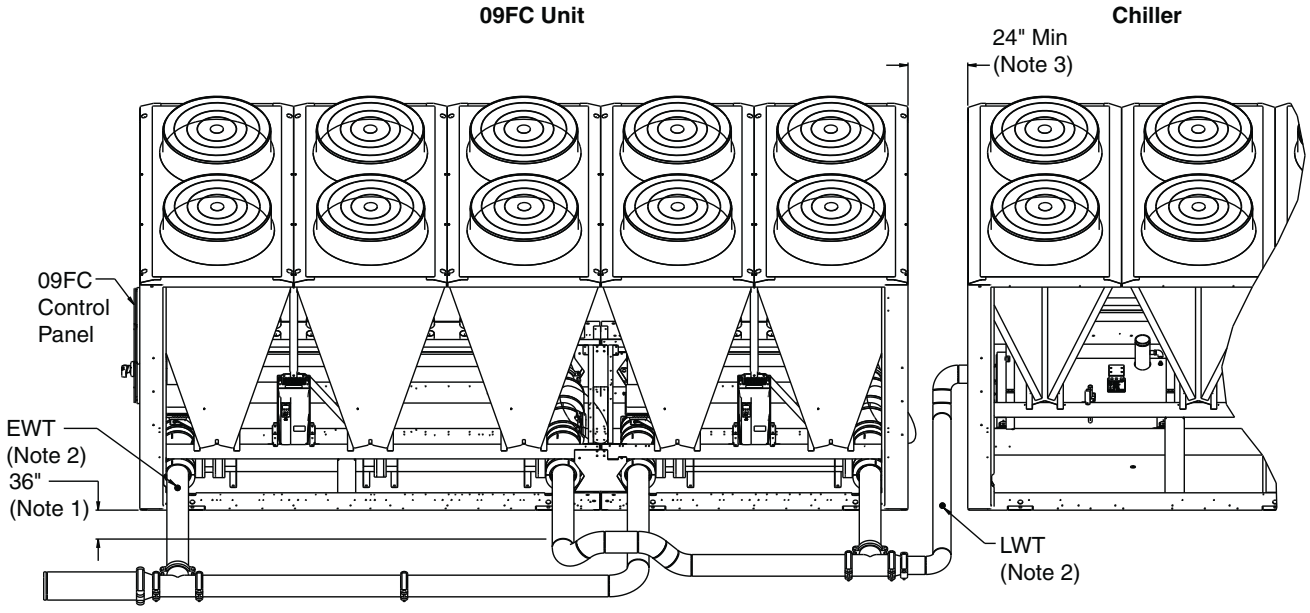
Fig. 17 — Dual Chiller Accessory Kit Leaving Water Thermistor and Well (P/N 00EFN900044000A)

MODULAR UNIT SERIES PIPING (09FC050 - 080)

The modular unit sizes 050 - 080, have two piping systems. From the factory they are separated for parallel piping in the field. For low flow rates, less than 150 gpm per V section, the unit may need to be converted to a series arrangement for improved performance.

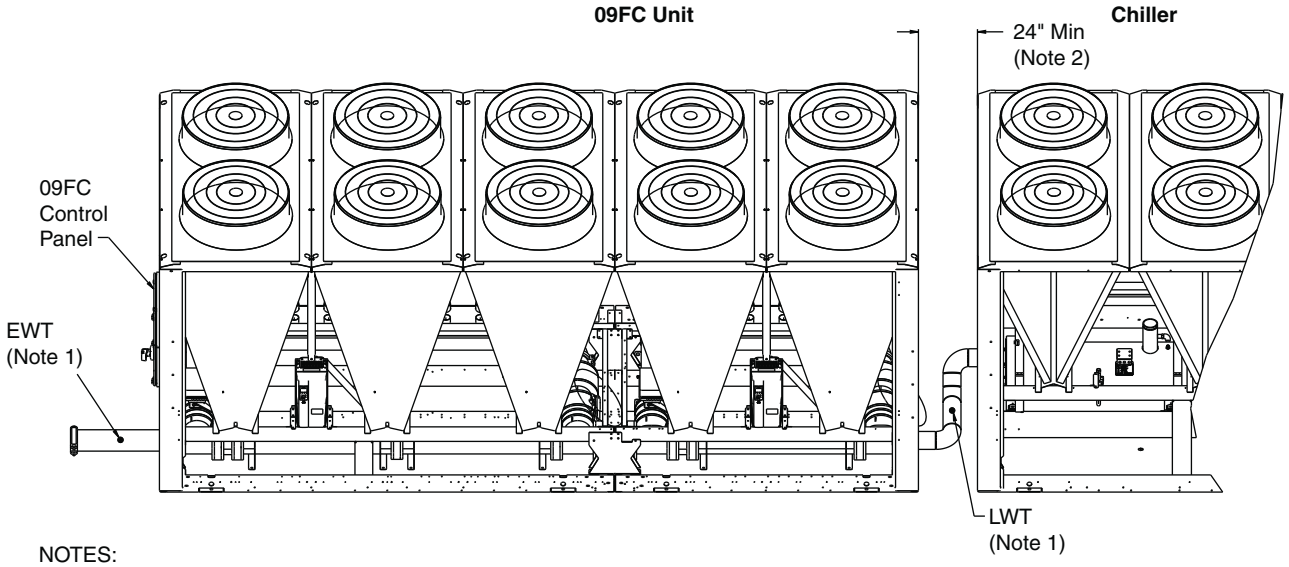
This conversion requires joining the two unit connections in the center of the unit. These are the leaving water connection for the first circuit and the entering water connection of the second circuit.

First step is to remove the insulation from these tees. Rotate the tees at these locations so they point towards each other. Remove the couplings holding the tees. Reorient the tees so they point towards each other, see Fig. 22. Once the tees are reattached add the joining pipe include in the Modular Piping Accessory (Part No. 09FC70000801). Attach with the existing couplings. Add insulation back to the tees and joining pipe section.



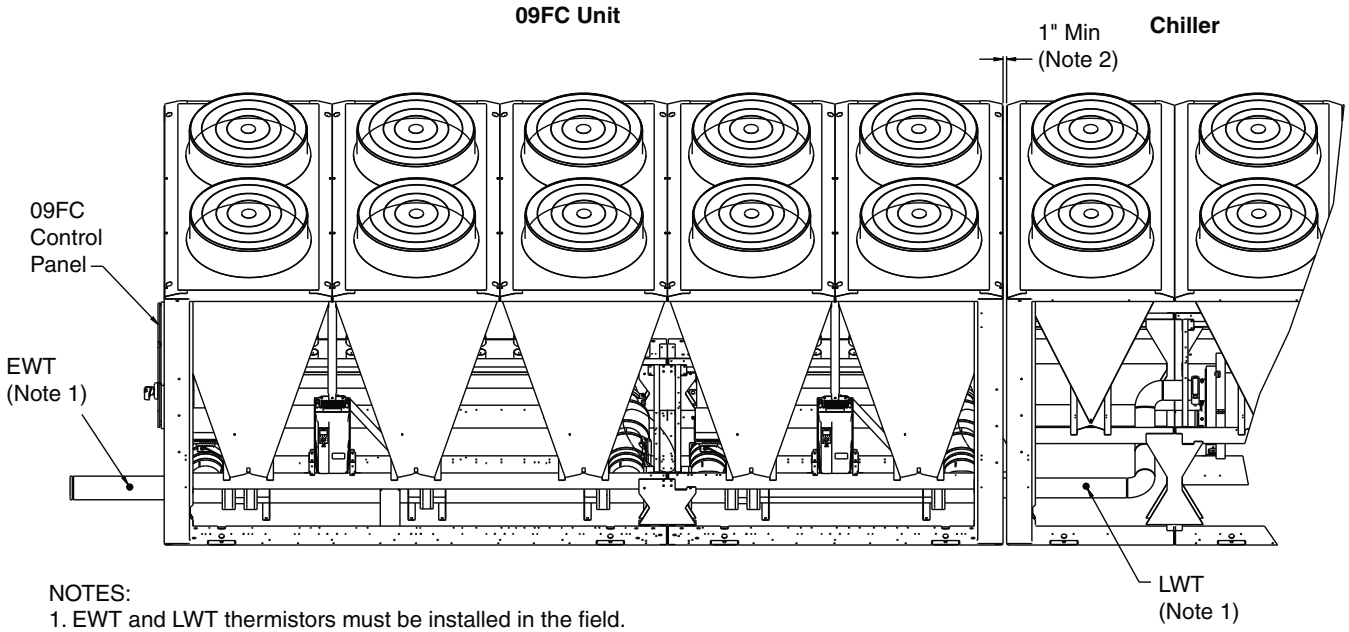
NOTES:
1. Allow 36 in. for fan VFD access. Verify 36 in. meets local codes.
2. EWT and LWT thermistors must be installed in the field.
   Thermistors are supplied inside control panel. Add 1/4 in. NPT hole in pipe for mounting.
   LWT thermistor well must be in mixed flow piping.
3. Minimum access is a recommendation. Local code may require increased spacing.
4. Chiller tube service must be done from control panel end for this arrangement. See chiller certified drawings for details.

Fig. 18 — 09FC 050-080 Parallel Piping
30XV 140, 160, 180, 225 Standard Tier, 140 Mid Tier



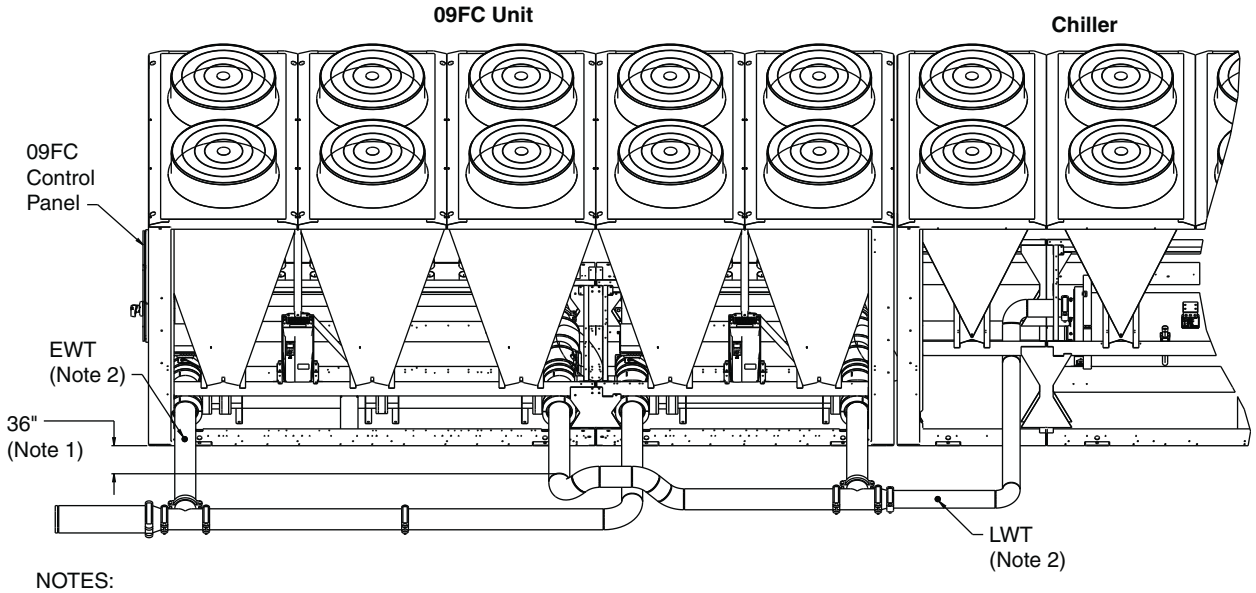
NOTES:
1. EWT and LWT thermistors must be installed in the field.
   Thermistors are supplied inside control panel. Add 1/4 in. NPT hole in pipe for mounting.
   LWT thermistor well must be in mixed flow piping.
2. Minimum access is a recommendation. Local code may require increased spacing.
3. Chiller tube service must be done from control panel end for this arrangement. See chiller certified drawings for details.

Fig. 19 — 09FC 020-040, 050-080 Series Piping
30XV 140, 160, 180, 225 Standard Tier, 140 Mid Tier



NOTES:
1. EWT and LWT thermistors must be installed in the field.
   Thermistors are supplied inside control panel. Add 1/4 in. NPT hole in pipe for mounting.
   LWT thermistor well must be in mixed flow piping.
2. Minimum access is a recommendation. Local code may require increased spacing.
3. Chiller tube service must be done from control panel end for this arrangement. See chiller certified drawings for details.

Fig. 20 — 09FC 050-080 Series Piping
30XV 200, 250-500 Standard Tier
160-500 Mid Tier
140-500 High Tier



NOTES:
1. Allow 36 in. for fan VFD access. Verify 36 in. meets local codes.
2. EWT and LWT thermistors must be installed in the field.
   Thermistors are supplied inside control panel. Add 1/4 in. NPT hole in pipe for mounting.
   LWT thermistor well must be in mixed flow piping.
3. Chiller tube service must be done from control panel end for this arrangement. See chiller certified drawings for details.

Fig. 21 — 09FC 050-080 Parallel Piping
30XV 200, 250-500 Standard Tier
160-500 Mid Tier
140-500 High Tier

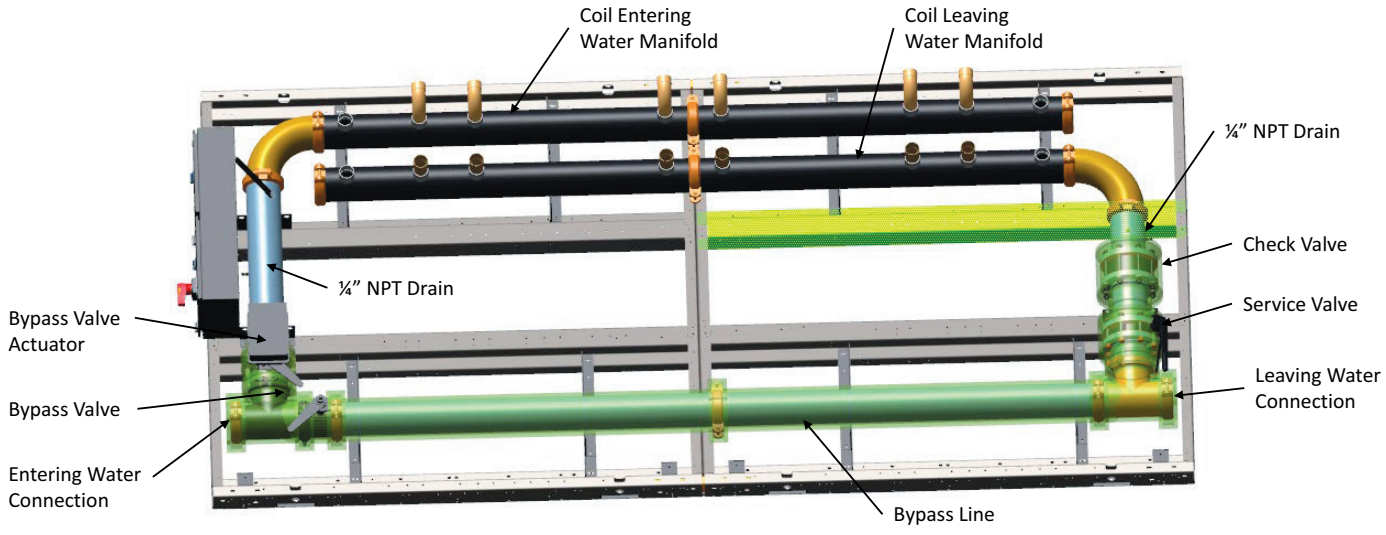


Fig. 22 — Modular Unit Series Piping

Step 4 — Fill the Chilled Water Loop

WATER SYSTEM CLEANING

Proper water system cleaning is of vital importance. Excessive particulates in the water system can cause excessive pump seal wear, reduce or stop flow, and cause damage of other components. Water quality should be maintained per recommendations in the chiller installation manual. This may vary for different types of chillers. Failure to maintain proper water quality may result in heat exchanger failure.

⚠ CAUTION

Failure to properly clean all piping and components of the chilled water system before unit start-up may result in plugging of the heat exchanger, which can lead to poor performance, nuisance alarms and damage from freezing. Freezing damage caused by an improperly cleaned system represents abuse and may impair or otherwise negatively affect the Carrier product warranty.

1. Install a temporary bypass around the unit to avoid circulating dirty water and particulates into coils during the flush. Use a temporary circulating pump during the cleaning process.

Also, be sure that there is capability to fully drain the system after cleaning. (See Fig. 23 and 24.)

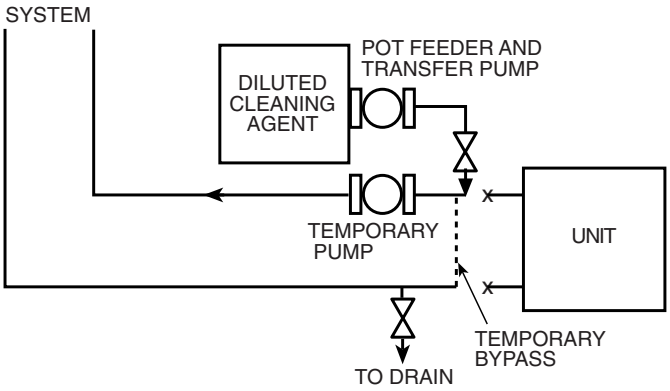


Fig. 23 — Typical Set-up for Cleaning Process

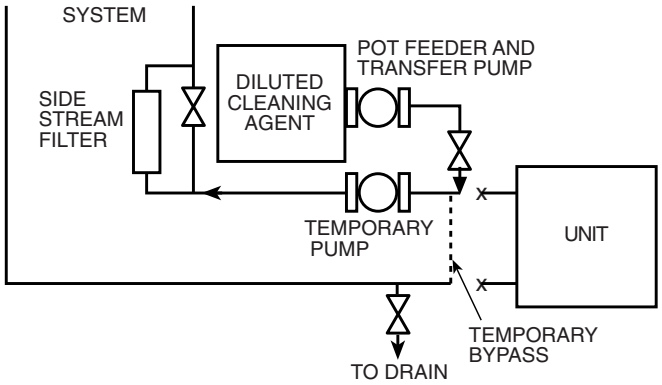


Fig. 24 — Cleaning Process Using Side Stream Filter

2. Be sure to use a cleaning agent that is compatible with all system materials. Be especially careful if the system contains any galvanized or aluminum components. Both detergent-dispersant and alkaline-dispersant cleaning agents are available.
3. It is a good idea to fill the system through a water meter. This provides a reference point for the future for loop volume readings, and it also establishes the correct quantity of cleaner needed in order to get the required concentration.
4. Use a feeder/transfer pump to mix the solution and fill the system. Circulate the cleaning system for the length of time recommended by the cleaning agent manufacturer.
   a. After cleaning, drain the cleaning fluid and flush the system with fresh water.
   b. A slight amount of cleaning residue in the system can help keep the desired, slightly alkaline, water pH of 8 to 9. Avoid a pH greater than 10, since this will adversely affect pump seal components.
   c. A side stream filter is recommended (see Fig. 24) during the cleaning process. Filter side flow rate should be enough to filter the entire water volume every 3 to 4 hours. Change filters as often as necessary during the cleaning process.
   d. Remove temporary bypass when cleaning is complete.

Properly installed and cleaned systems will rarely need the strainer cleaned after the initial fill. This time interval is user-configurable.

WATER TREATMENT

Fill the fluid loop with an inhibited antifreeze solution suitable for the water of the area. The solution concentration must be sufficient to protect the chilled water loop to a freeze protection (first crystals) concentration of at least 15°F (8.3°C) below the lowest design ambient temperature. Consult the local water treatment specialist for characteristics of system water and a recommended inhibitor for the fluid loop.

Untreated or improperly treated fluid may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

FILLING THE SYSTEM

In areas where the piping or unit is exposed to 32°F (0°C) or lower ambient temperatures, freeze-up protection is required using inhibited glycol or other suitable, heat exchanger rated, corrosion-resistant antifreeze solution. Heater tapes cannot be installed on the coils and heater tape on piping will not provide any protection.

IMPORTANT: Adding antifreeze solution is the only certain means of protecting the unit from freeze-up since heaters cannot protect the coils while temperatures are below 32°F (0°C).

NOTE: Do not use automobile antifreeze, or any other fluid that is not approved for heat exchanger duty. Only use appropriately inhibited glycols, concentrated to provide adequate protection for the temperature considered.

If the unit is in operation year-round, add sufficient suitable inhibited antifreeze solution such as propylene or ethylene glycol to chilled water to prevent freezing under low-ambient temperature operating conditions. Consult a local water treatment specialist on characteristics of water and recommended inhibitor.

The initial fill of the fluid system must accomplish three purposes:

- The entire piping system must be filled with water/antifreeze solution.
- The pressure at the top of the system must be high enough to vent air from the system (usually 4 psig [28 kPa] is adequate for most vents).
- The pressure at all points in the system must be high enough to prevent flashing in the piping or cavitation in the pump.

Ensure the following when filling the system:

1. Remove temporary bypass piping and cleaning/flushing equipment.
2. Check to make sure all drain plugs are installed.
3. Vents (if installed) at the top of the coils should be open.
4. Open the blow-down valve to flush the strainer.
5. Check for fluid leaks and repair as necessary.

Normally, a closed system needs to be filled only once. The actual filling process is generally a fairly simple procedure. All air should be purged or vented from the system. Thorough venting at the high points at the top of all coils and circulation at room temperature for several hours is recommended.

NOTE: Local codes concerning backflow devices and other protection of the city water system should be consulted and followed to prevent contamination of the public water supply. This is especially important when antifreeze is used in the system.

SET WATER FLOW RATE

Once the system is cleaned, pressurized, and filled, the flow rate must be set. Set the flow rate per the chiller instructions. The chiller flow is critical for correct performance and reliability. The 09FC is less sensitive to off design flow rates. Flowrate should be set with the 09FC unit in free cooling mode. This mode will have a larger pressure drop than the bypass mode. Setting the flow in this mode assures the chiller will always have the minimum flow required for operation.

See the 09FC pressure drop Fig. 25-27 for reference. The 09FC020, 09FC030, and 09FC040 are shown. Larger units are combinations of these piping systems. Combine pressures for larger systems. Add pressures for series configuration. For parallel configurations, combine the pressure drop for each using the equation Rt=R1*R2/(R1+R2). Rt equals the equivalent pressure drop which R1 and R2 are the individual circuits.

Curves are for 30% Propylene Glycol (PG). Use multipliers for other fluids or brine concentration amounts.

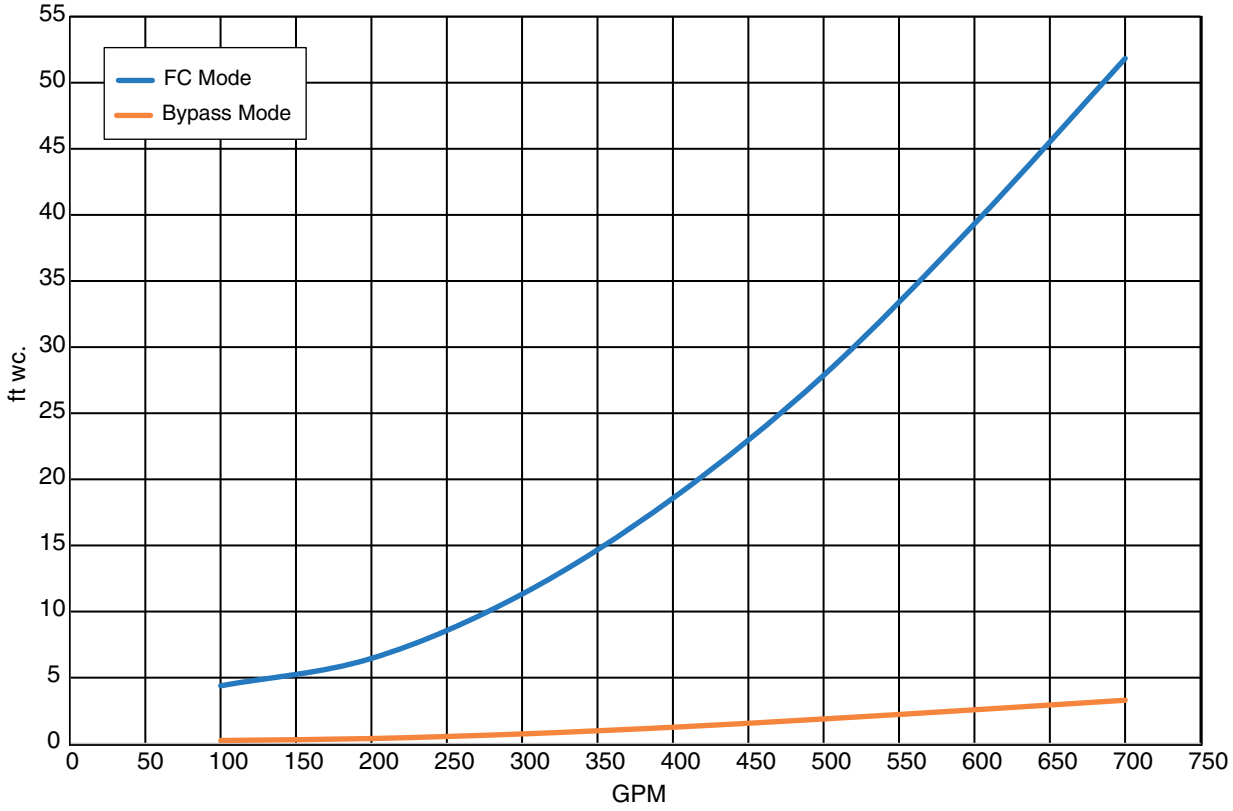


Fig. 25 — 09FC 020 Pressure Curve

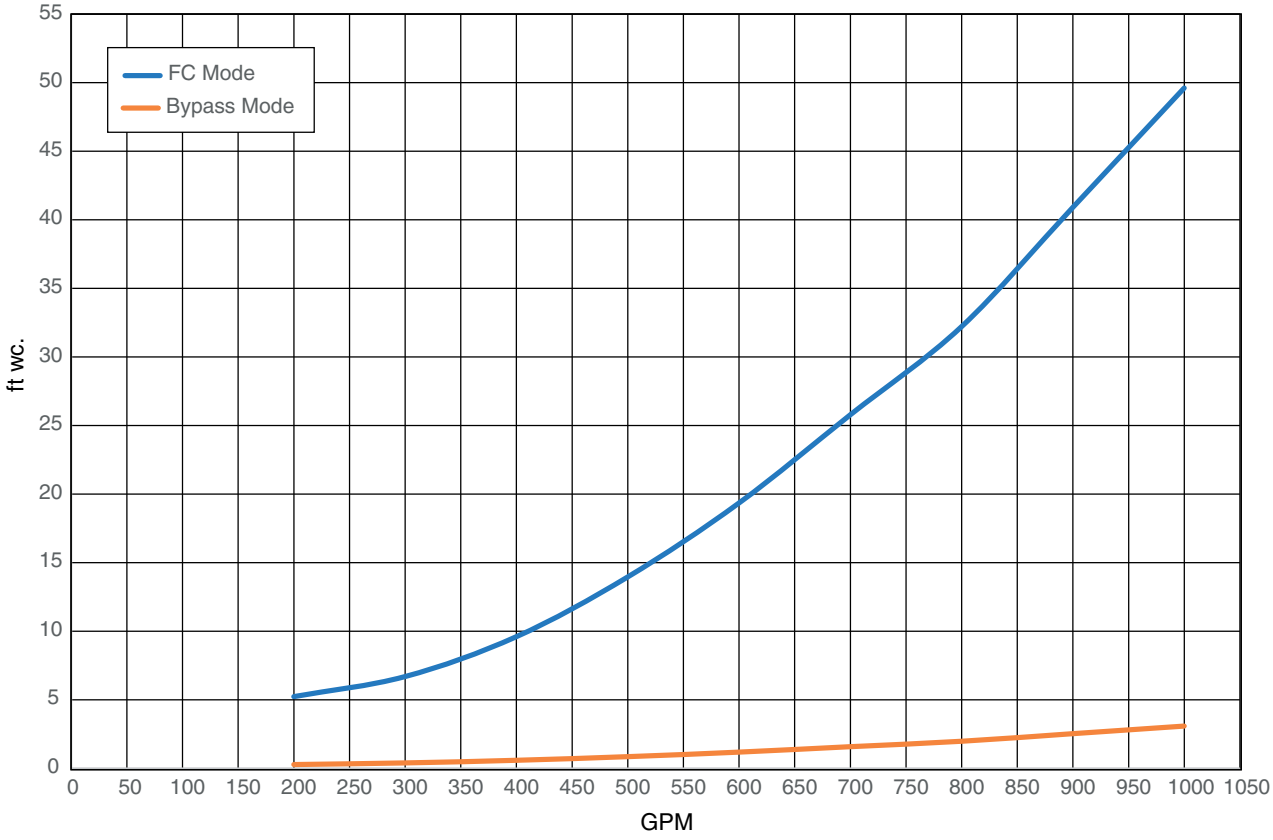


Fig. 26 — 09FC 030 Pressure Curve

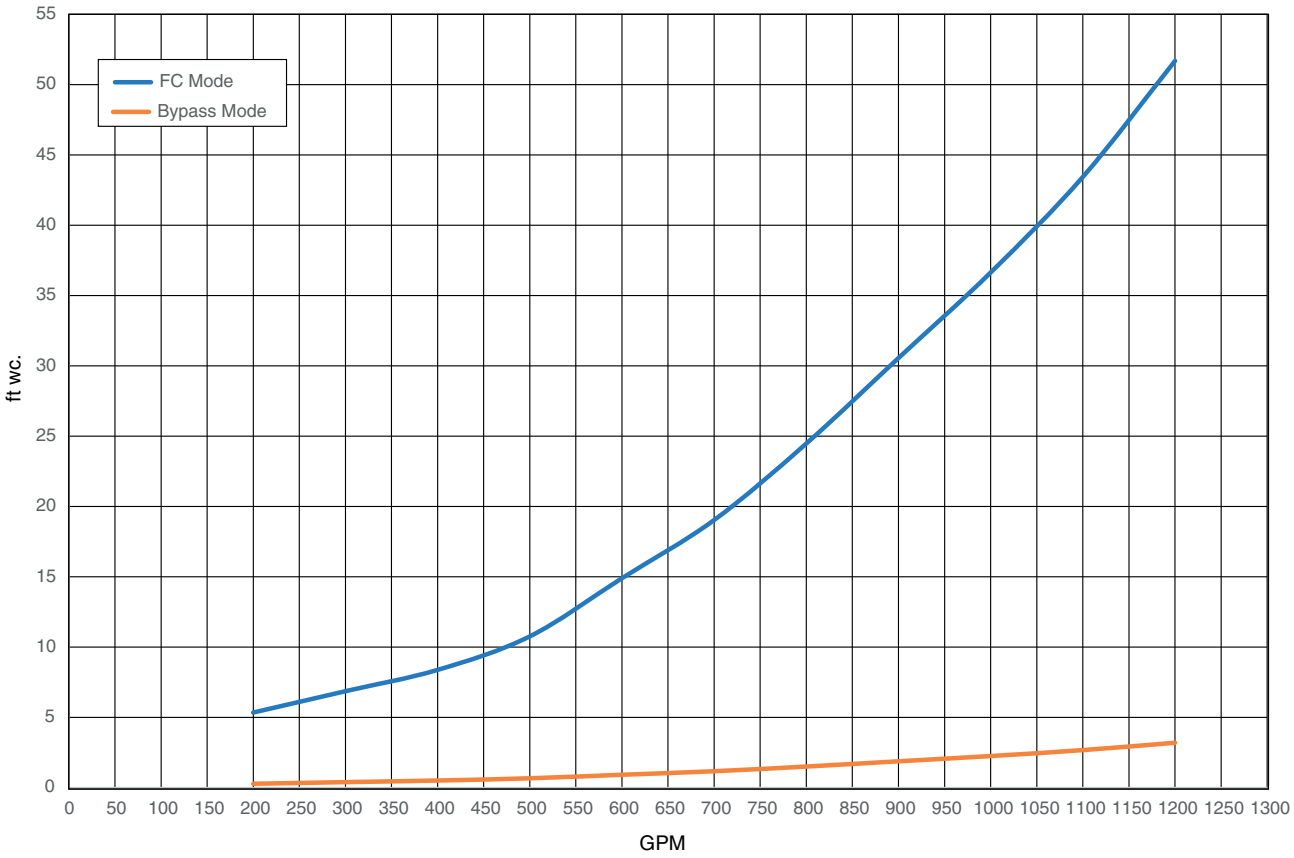


Fig. 27 — 09FC 040 Pressure Curve

Step 5 — Make Electrical Connections

⚠WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

POWER SUPPLY

Electrical characteristics of available power supply must agree with unit nameplate rating. Field wiring size must be within limits shown in Table 4. See Table 5 for unit electrical data. See Fig. 28 and 29 for typical wiring connections.

IMPORTANT: Operating unit on improper supply voltage or with excessive phase imbalance constitutes abuse and may affect Carrier warranty.

Table 4 — Field Wire Sizes

CONNECTION TYPE	UNIT SIZES	VOLTAGE	MCA RANGE	WIRE SIZE RANGE	LUG TORQUE	MAXIMUM NUMBER OF WIRES PER PHASE
FUSED DISCONNECT	020 030 040 050 060	All 380-575V 380-575V 440-575V 575V	Up to 60A	#4 - #18	30 in-lb (3.39 N-m)	1
	030 040 050 060 070 080	200/230V 200/230V 380-415V 380-460V All All	Over 60A	#1 - #8	40 in-lb (4.52 N-m)	1

NOTES:
1. Field wiring for supply conductors must be rated 75°C minimum.
2. Use copper conductors only.

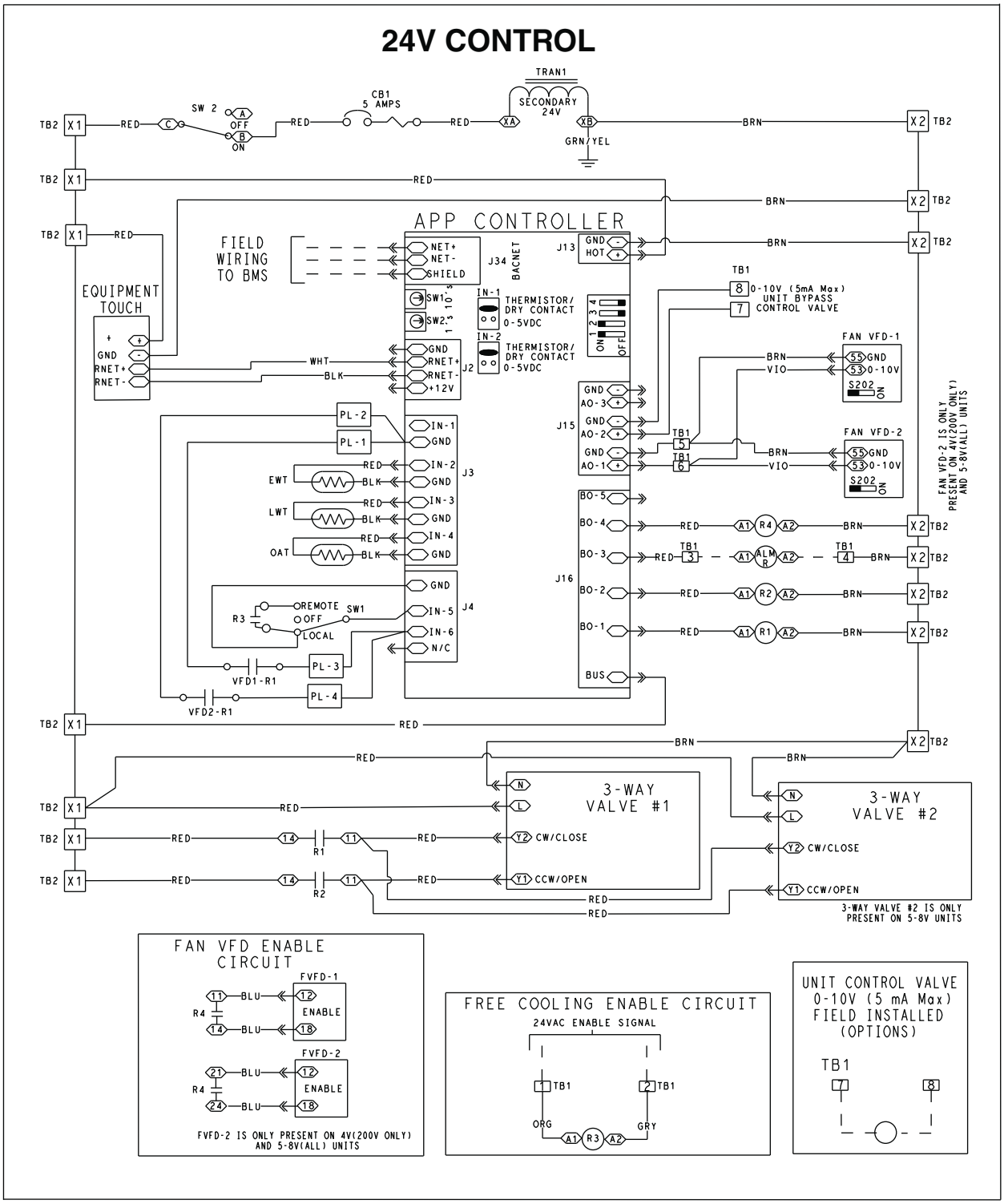
Table 5 — 09FC Electrical Data

UNIT SIZE	POWER SUPPLY				FAN MOTORS		MCA	MOCP	REC FUSE SIZE
	VOLTAGE	HZ	SUPPLY VOLTAGE		QTY	FLA (EACH)			
			MIN	MAX					
020	208/230	60	187	253	4	10.6	45.1	50	50
	380		342	418		5.8	24.7	30	30
	400		360	400		5.5	23.4	25	25
	460		414	506		4.8	20.4	25	25
	575		518	633		3.8	16.2	20	20
	380	50	342	418		5.9	25.1	30	30
	400		360	440		5.6	23.9	25	25
	415		374	456		5.4	23.0	25	25
	440		396	480		5.1	21.7	25	25
030	208/230	60	187	253	6	10.6	66.3	70	70
	380		342	418		5.8	36.3	40	40
	400		360	400		5.5	34.4	35	35
	460		414	506		4.8	30.0	35	35
	575		518	633		3.8	23.8	25	25
	380	50	342	418		5.9	37.0	40	40
	400		360	440		5.6	35.1	40	40
	415		374	456		5.4	33.9	35	35
	440		396	480		5.1	31.9	35	35
040	208/230	60	187	253	8	10.6	87.5	90	90
	380		342	418		5.8	47.9	50	50
	400		360	400		5.5	45.5	50	50
	460		414	506		4.8	39.6	40	40
	575		518	633		3.8	31.4	35	35
	380	50	342	418		5.9	48.8	50	50
	400		360	440		5.6	46.4	50	50
	415		374	456		5.4	44.7	50	50
	440		396	480		5.1	42.2	45	45
050	380	60	342	418	10	5.8	59.5	60	60
	400		360	400		5.5	56.5	60	60
	460		414	506		4.8	49.2	50	50
	575		518	633		3.8	39.0	40	40
	380	50	342	418		5.9	60.6	70	70
	400		360	440		5.6	57.6	60	60
	415		374	456		5.4	55.5	60	60
	440		396	480		5.1	52.4	60	60
060	380	60	342	418	12	5.8	71.1	80	80
	400		360	400		5.5	67.5	70	70
	460		414	506		4.8	58.8	60	60
	575		518	633		3.8	46.6	50	50
	380	50	342	418		5.9	72.5	80	80
	400		360	440		5.6	68.8	70	70
	415		374	456		5.4	66.4	70	70
	440		396	480		5.1	62.6	70	70
070	380	60	342	418	14	5.8	82.7	90	90
	400		360	400		5.5	78.5	80	80
	460		414	506		4.8	68.4	70	70
	575		518	633		3.8	54.2	60	60
	380	50	342	418		5.9	84.3	90	90
	400		360	440		5.6	80.1	90	80
	415		374	456		5.4	77.2	80	80
	440		396	480		5.1	72.8	80	80
080	380	60	342	418	16	5.8	94.3	100	100
	400		360	400		5.5	89.5	90	90
	460		414	506		4.8	78.0	80	80
	575		518	633		3.8	61.8	70	70
	380	50	342	418		5.9	96.1	100	100
	400		360	440		5.6	91.3	100	100
	415		374	456		5.4	88.0	90	90
	440		396	480		5.1	83.0	90	90

LEGEND

FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

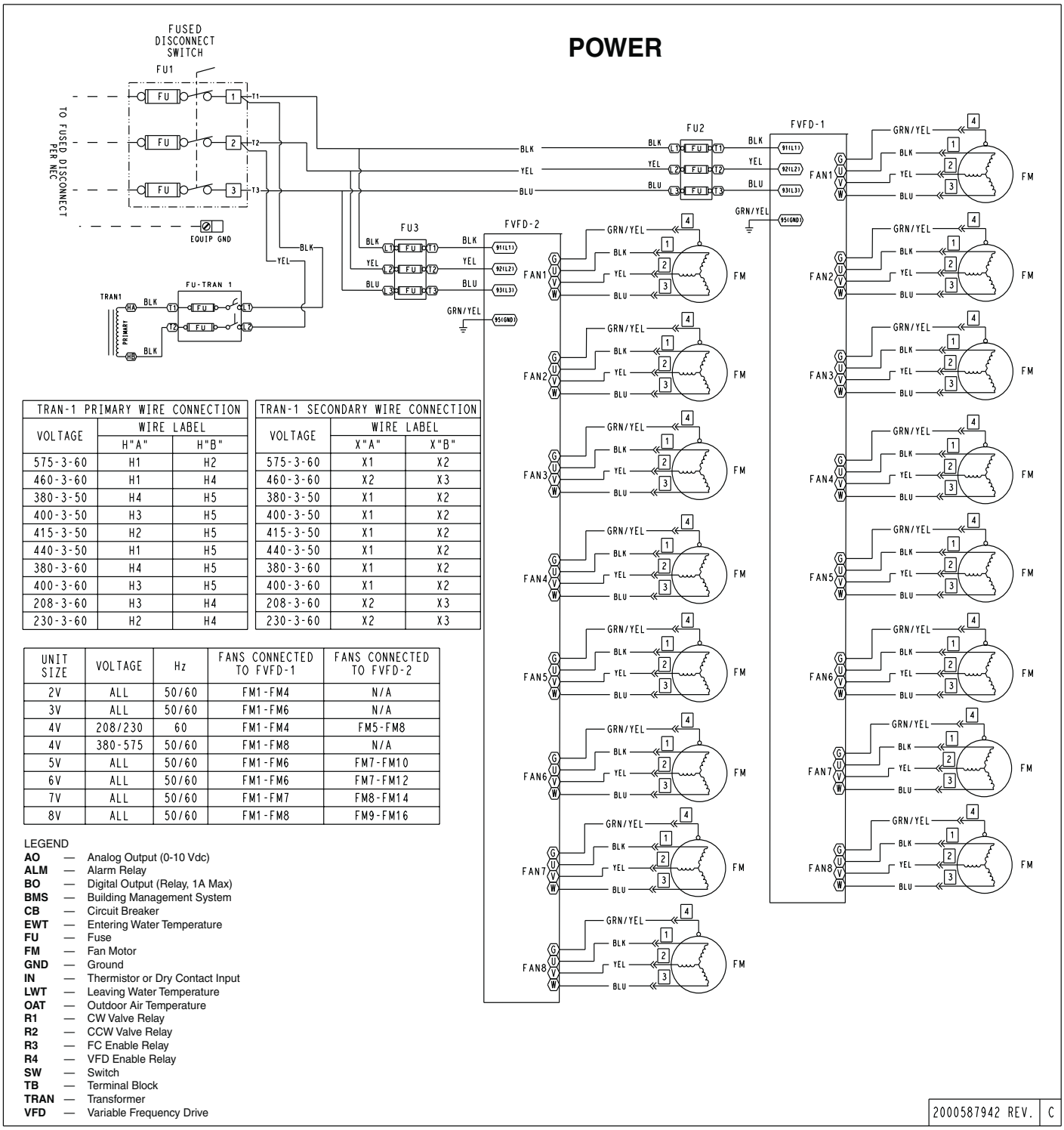
NOTES:
1. Units are suitable for use on electrical systems where voltage supplied to the unit is between the listed minimum and maximum limits.
2. Maximum allowable phase imbalance is 2% for voltage and 10% for current.



LEGEND

AO — Analog Output (0-10 Vdc)
ALM — Alarm Relay
BO — Digital Output (Relay, 1A Max)
BMS — Building Manangement System
CB — Circuit Breaker
EWT — Entering Water Temperature
FU — Fuse
FM — Fan Motor
GND — Ground
IN — Thermistor or Dry Contact Input
LWT — Leaving Water Temperature
OAT — Outdoor Air Temperature
R1 — CW Valve Relay
R2 — CCW Valve Relay
R3 — FC Enable Relay
R4 — VFD Enable Relay
SW — Switch
TB — Terminal Block
TRAN — Transformer
VFD — Variable Frequency Drive

Fig. 28 — Typical Control Field Connections



TRAN-1 PRIMARY WIRE CONNECTION		
VOLTAGE	WIRE LABEL	
	H"A"	H"B"
575-3-60	H1	H2
460-3-60	H1	H4
380-3-50	H4	H5
400-3-50	H3	H5
415-3-50	H2	H5
440-3-50	H1	H5
380-3-60	H4	H5
400-3-60	H3	H5
208-3-60	H3	H4
230-3-60	H2	H4

TRAN-1 SECONDARY WIRE CONNECTION		
VOLTAGE	WIRE LABEL	
	X"A"	X"B"
575-3-60	X1	X2
460-3-60	X2	X3
380-3-50	X1	X2
400-3-50	X1	X2
415-3-50	X1	X2
440-3-50	X1	X2
380-3-60	X1	X2
400-3-60	X1	X2
208-3-60	X2	X3
230-3-60	X2	X3

UNIT SIZE	VOLTAGE	Hz	FANS CONNECTED TO FVFD-1	FANS CONNECTED TO FVFD-2
2V	ALL	50/60	FM1-FM4	N/A
3V	ALL	50/60	FM1-FM6	N/A
4V	208/230	60	FM1-FM4	FM5-FM8
4V	380-575	50/60	FM1-FM8	N/A
5V	ALL	50/60	FM1-FM6	FM7-FM10
6V	ALL	50/60	FM1-FM6	FM7-FM12
7V	ALL	50/60	FM1-FM7	FM8-FM14
8V	ALL	50/60	FM1-FM8	FM9-FM16

LEGEND

AO — Analog Output (0-10 Vdc)
ALM — Alarm Relay
BO — Digital Output (Relay, 1A Max)
BMS — Building Management System
CB — Circuit Breaker
EWT — Entering Water Temperature
FU — Fuse
FM — Fan Motor
GND — Ground
IN — Thermistor or Dry Contact Input
LWT — Leaving Water Temperature
OAT — Outdoor Air Temperature
R1 — CW Valve Relay
R2 — CCW Valve Relay
R3 — FC Enable Relay
R4 — VFD Enable Relay
SW — Switch
TB — Terminal Block
TRAN — Transformer
VFD — Variable Frequency Drive

Fig. 29 — Typical Main Power Connections

POWER WIRING

All power wiring must comply with applicable local and national codes. A fused disconnect is supplied in the control panel with an external handle on all 09FC models.

General Wiring Notes:

1. The control circuit does NOT require a separate power source. Control circuit power is obtained by a step-down transformer from the main three-phase power supply. The LVT (low voltage terminal) strip is provided for field-wired control devices.
2. All field power enters the unit through a hole located in the bottom of the control box shelf. Refer to Fig. 25 for field wiring details. Refer to Fig. 5-11 for exact location of field power entry. Be sure to seal entering power wire conduit per NEC requirements.
3. Maximum field wire sizes allowed by lugs on fused disconnect are listed in Table 4.
4. Terminals for field power supply are suitable for copper conductors. Insulation must be rated 75°C minimum.

Control power is obtained from the main power supply and does NOT require a separate source. A toggle switch, SW1 (marked

ENABLE-OFF on the unit label diagram and by the switch) allows the control circuit to be manually disconnected when necessary.

IMPORTANT: For 208-volt systems, sizes 020-040 only, the primary connection tap for all transformers must be changed. The factory default setting is for 230-volt. Failure to connect to the proper tap may result in unreliable operation.

ENABLE SIGNAL

Remote control of the unit enable function is active when SW2 is in the remote position. The control requires 24 Vac across terminals TB1-1 and TB1-2. This is the "Enable" signal for the controls. Voltage at these terminals will allow the 09FC unit to operate when conditions allow.

If connected with a 30XV chiller, this power can be taken from TB4-1 and TB11-X2. This will "Enable" the 09FC unit whenever the chiller is "Enabled" locally from SW2.

The 09FC may be kept independent from the chiller by placing SW2 in the local position. With the switch in this position, the unit is always enabled.

COMMUNICATION OPTIONS

The 09FC controls can support communication via BACnet ARC156 (156 kbps) or BACnet MS/TP (9600 bps - 76.8 kbps).

Wiring for BACnet communication is at Net +, Net -, and Shield at the top left of the 09FC controller. Disconnect the 09FC controls power by placing SW2 in the OFF position before wiring BACnet cable. While disconnected, check cable for shorts and grounds. Wire the controllers on an MS/TP network segment in a daisy-chain configuration. Install a BT485 on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing. See Fig. 30 and Table 6 and 7.

NOTE: BT485 does not come with controller. It must be purchased separately.

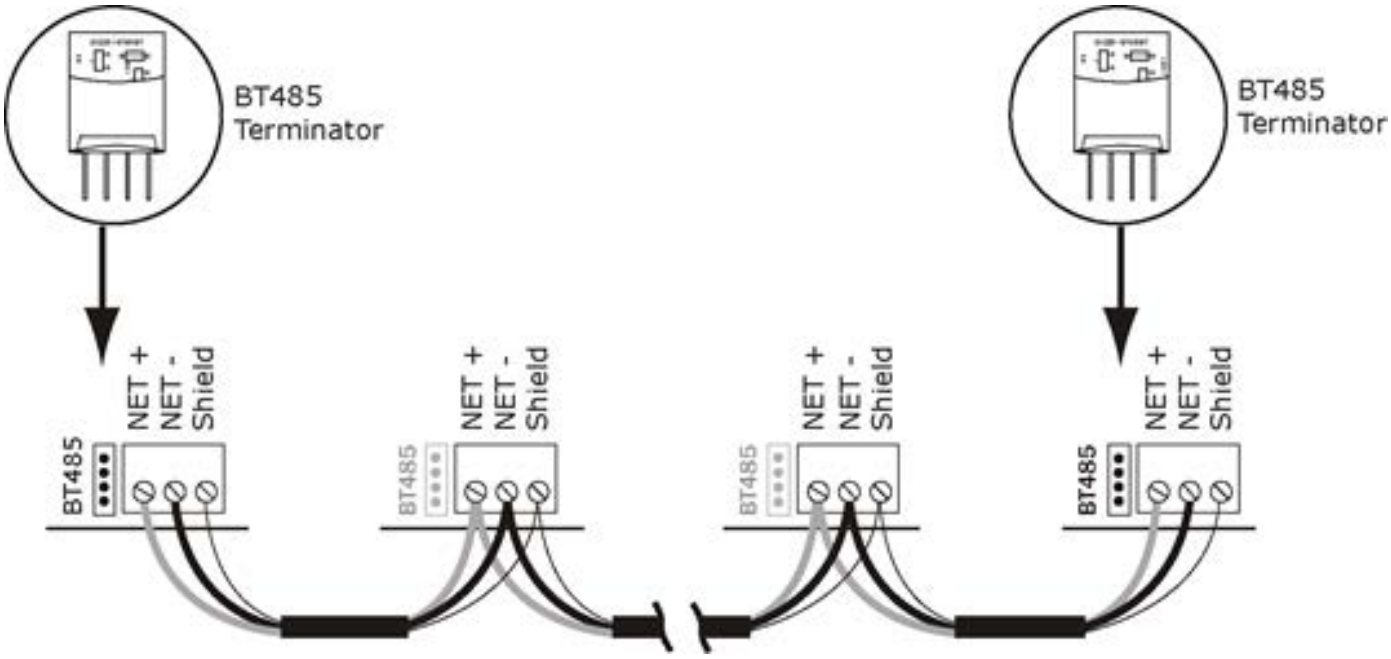


Fig. 30 — Wiring Diagram

Table 6 — Wiring Specifications

CABLE	22 AWG or 24 AWG, low capacitance, twisted stranded, shielded copper wire		
MAXIMUM LENGTH	2000 feet (610 meters)		
Set the communication type and baud rate.			
For...	**Set Communications Selection jumper to...**	**Set DIP switches 1 and 2 to...**	**Set DIP switches 3 and 4 to...**
MS/TP	BACnet MS/TP	The appropriate baud rate. See the MS/TP Baud diagram on the controller.	Off/Off
ARC156	BACnet ARC156	N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.	Off/Off

NOTE: Use the same baud rate for all controllers on the network segment. Wire the controls on a BACnet MS/TP ARC156 network segment in a daisy-chain configuration. If the AppController is at either end of a network segment, connect a BT485 (purchased separately) to the AppController. The communication selection DIP Switches are defined on the AppController (see Fig. 32).

Table 7 — CCN Communication Bus Wiring

MANUFACTURER	PART NUMBER	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhatten	M13402	M64430
Quabik	6130	—

Step 6 — Install Accessories/Optional Equipment

LOW AMBIENT OPERATION

If outdoor ambient operating temperatures below 20°F (–6.67°C) and the wind velocity is anticipated to be greater than 5 mph (8 km/h), wind baffles are required. If required, the wind baffles are field fabricated and installed. Two are required, one for each end. Wind baffle should be constructed with minimum 18-gage galvanized sheet metal or other suitable corrosion-resistant material with cross breaks for strength. See Fig 31. Use field-supplied screws to attach baffle to the corner posts of the machine. Be sure to hem or turn a flange on all edges to eliminate sharp edges.

⚠ WARNING

Disconnect all power to the unit before performing maintenance or service. Electrical shock and personal injury could result.

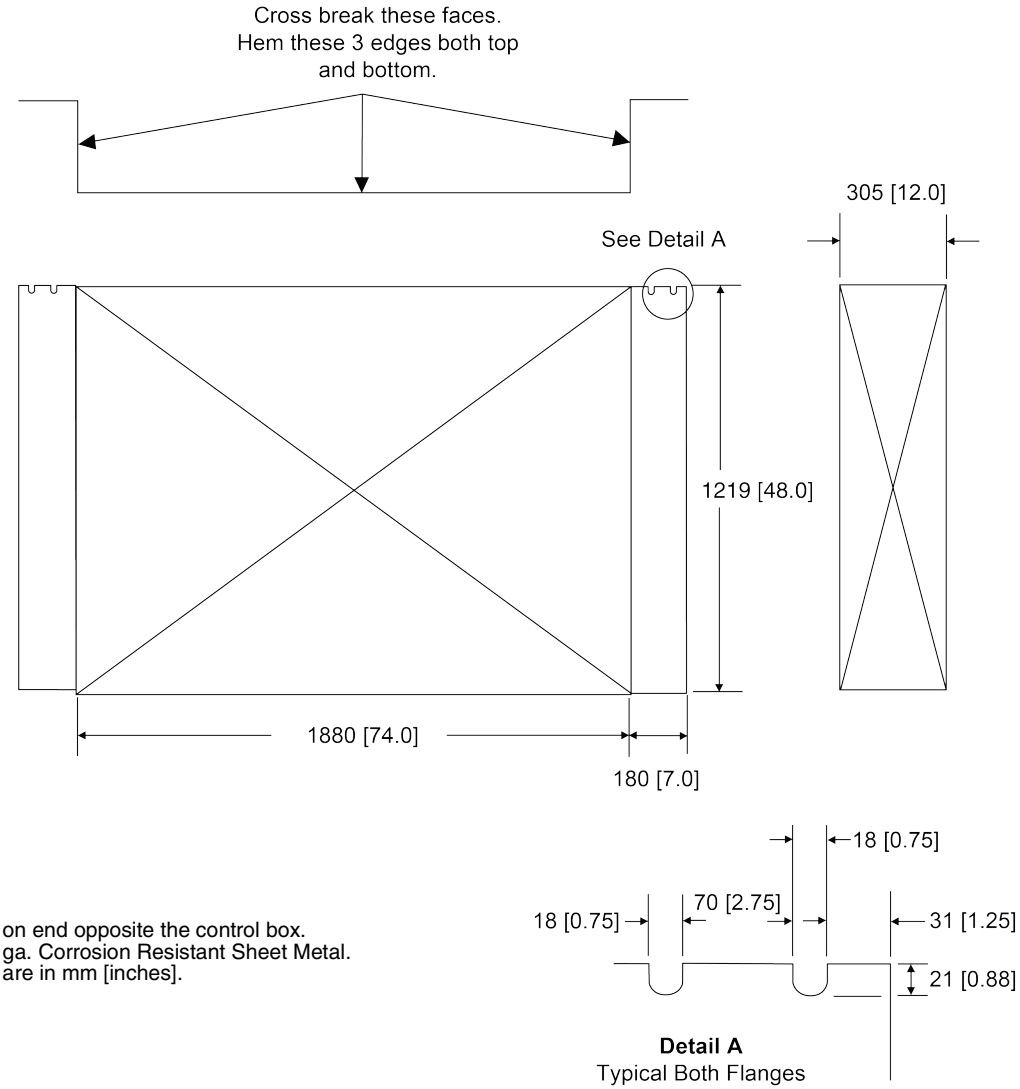
⚠ CAUTION

To avoid damage to the refrigerant coils and electrical components, use extreme care when drilling screw holes and screwing in fasteners.

Mount a baffle on each end of the unit. Use the upper notches to locate the baffle. This reduces the risk of damaging a coil while drilling. Loosen the upper corner post bolts and slide the baffle underneath the flange bolt. Tighten the bolt. Drill holes in the bottom of the flange of the baffle and mount with two screws to secure the bottom to the corner post.

FIELD-INSTALLED ACCESSORY INSTALLATION

For applications requiring special accessories, the following packages are available: hail guard and security grilles. For installation details, refer to separate installation instructions supplied with these accessory packages.



NOTES:
1. Place baffle on end opposite the control box.
2. Material: 18 ga. Corrosion Resistant Sheet Metal.
3. Dimensions are in mm [inches].

Fig. 31 — Field-Fabricated and Field-Installed Wind Baffle

CONTROLS

General

The 09FC utilizes the Carrier AppController electronic control system that controls and monitors all operations of the unit. The control system is composed of several components as listed in following sections. Wiring Diagrams and Component Arrangement Diagrams are shown in Appendix A.

Control Boards

Two control boards are used in this unit, the Carrier AppController and the Equipment Touch™ display.

Carrier AppController

The Carrier AppController is the heart of the control system. It contains the operating software and controls the operation of the machine. The Carrier AppController software continuously evaluates information received from its inputs and controls outputs accordingly. The Carrier AppController receives inputs from the Entering Water, Leaving Water and Outdoor Air temperature Thermsitors as well as a 24Vac signal to enable the unit. Based on the inputs, it controls the 3-Way Bypass Valve, an Alarm relay and controls the VFD Fan Speed with a 0-10 vdc signal.

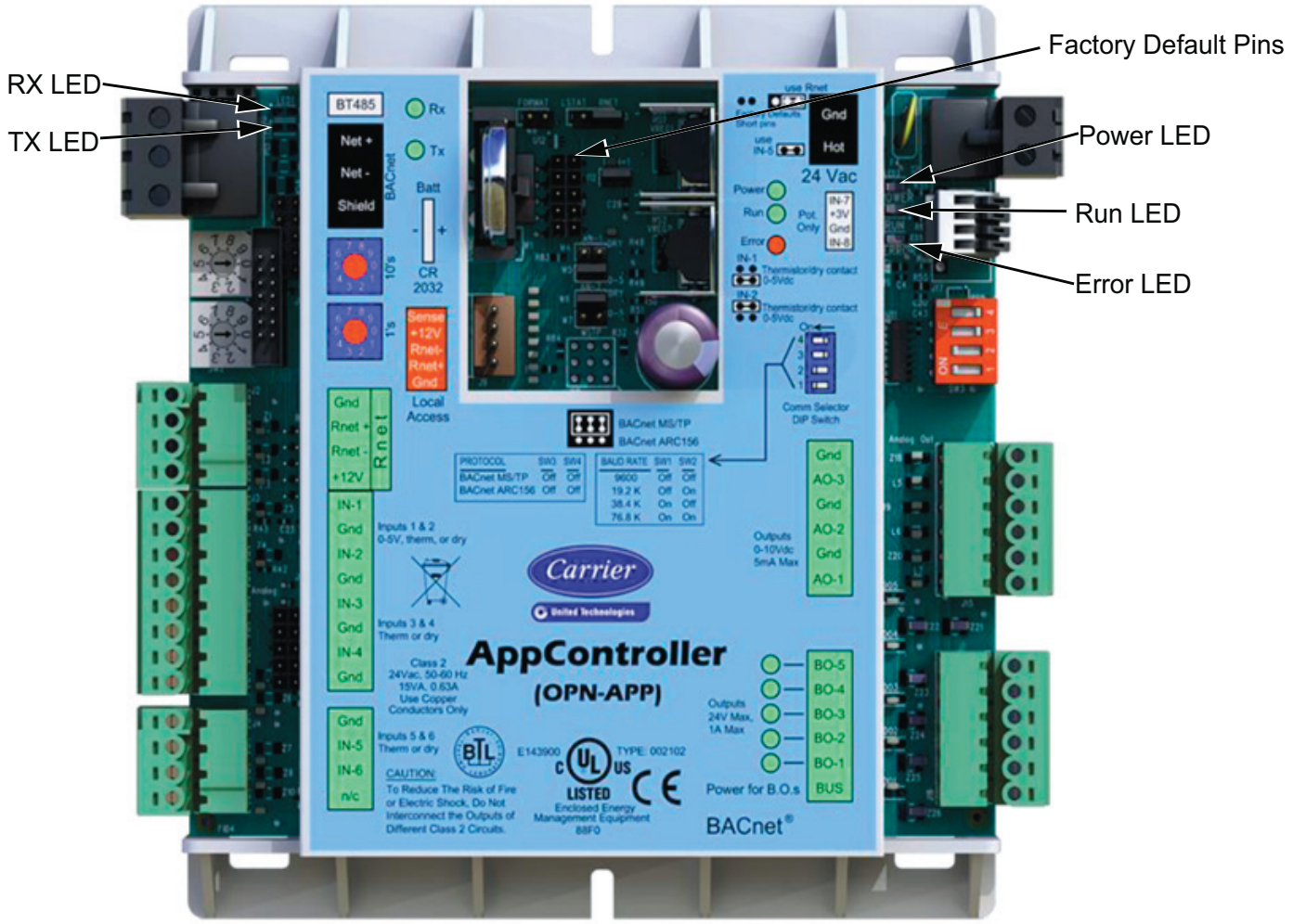


Fig. 32 — Carrier AppController

Required Configurations

Jumper settings for configurations are shown in Fig. 33.

IN-2 should be set to the upper position for thermistor.

IN-5 jumper should be on.

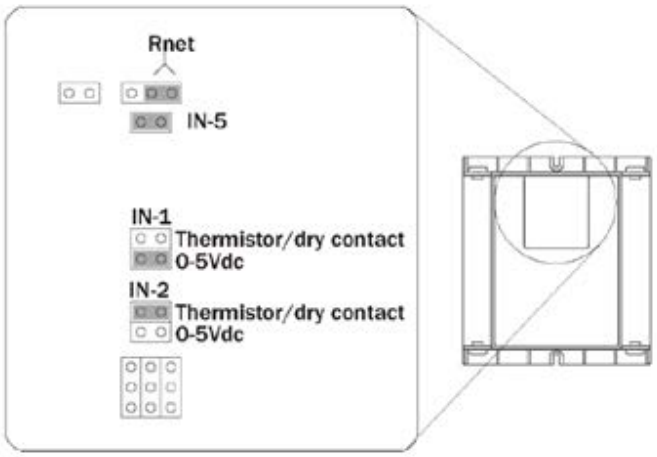


Fig. 33 — Carrier AppController Jumper Settings

Carrier Equipment Touch Display

Equipment touch is the user interface for the Carrier AppController. Screen navigation is shown in Table 8.

Table 8 — App Controller Screen Navigation

SCREEN NAMES	DISPLAY	DETAILS
Standby	 Not an interactive screen. Touch **Home** icon in top lift corner to advance to the **Home** screen.	Screen displays after the **Inactive Timer** expires (default is 5 minutes). Displays: • Leaving water temperature • Outdoor air temperature • Operating Mode • Run Command • Occupancy • Current Time
Password Level: None		
Home	 Click ... on the right to navigate to **Snapshot** screen.	The HOME screen is the main screen. Displays: • Leaving water temperature • Outdoor air temperature • Operating Mode • Run Command • Occupancy
Password Level: None		
Snapshot	 Back to the **Home** screen - click ... on the left. Forward to **Properties Menu** screen - click ... on the right. Displays: • Leaving water temperature • Entering water temperature • Outdoor air temperature • Operating mode • Run command • Control setpoint	Navigates: • Alarm status  See page 35. • Schedules  • Trends  See page 35. Displays: • Alarms, if present 
Password Level: None		

Table 8 — App Controller Screen Navigation (cont)

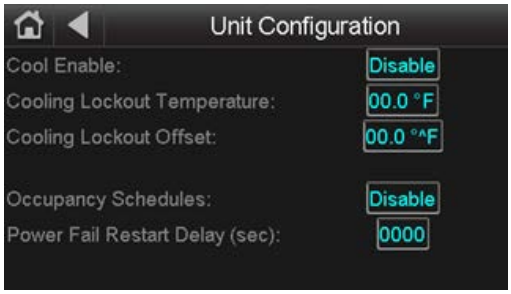
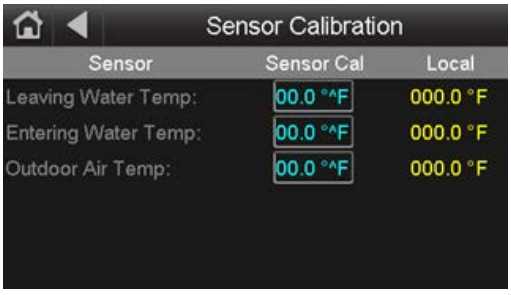
SCREEN NAMES	DISPLAY	DETAILS
Properties Menu		Navigates to **Property** pages Login with one of the following passwords: • User level - type ***user*** • Admin level - type ***admin*** - Unit configuration - Sensor configuration - Setpoints Password Level: None - Alarm configuration - Maintenance - Service test - Touchscreen setup • Factory level - type ***Touch*** - Startup wizard - ET (Equipment Touch) system **NOTE:** Only the buttons that are authorized for a specific password level are visible.
Password Level: None		
Properties/Status		This menu shows the status or value of the listed point.
Password Level: None		
Properties / Unit Configuration		**Cooling Lockout** Default: 50 Range: –20 to 80°F Does not allow free cooling mode if OAT is above this temp. **Cooling Lockout Offset** Default: 3 Range: 1 to 10°F Increases the Lockout setpoint by the value of the setting.
Password Level: Admin		
Properties / Sensor Calibration		Allows calibration of sensor. Default: 0 Range: –10 to 10°F
Password Level: Admin		

Table 8 — App Controller Screen Navigation (cont)

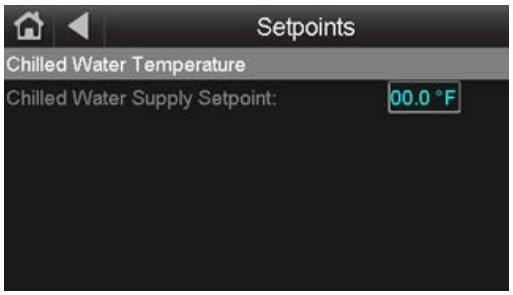
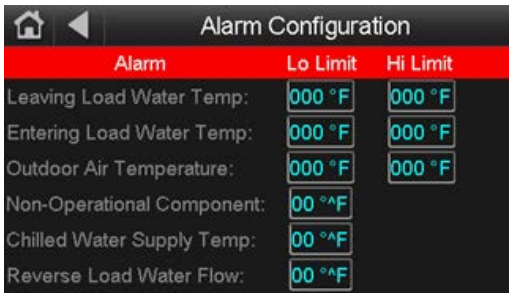
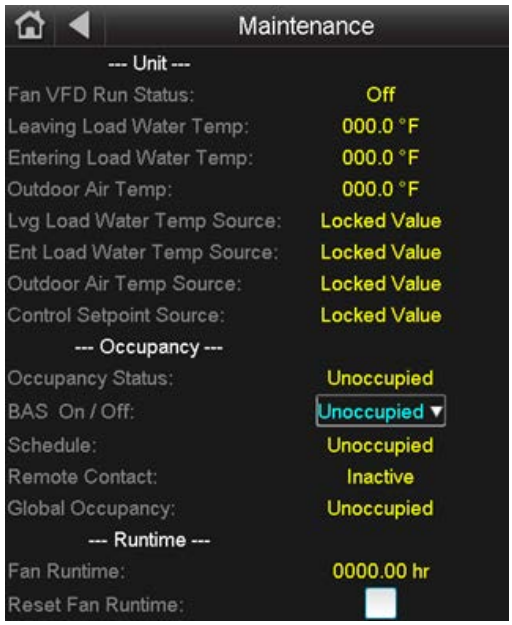
SCREEN NAMES	DISPLAY	DETAILS
Properties / Setpoints		Default: 44°F Range: 15 to 75°F
Password Level: Admin		
Properties / Alarm Configuration		**LWT** lo 42 (Range: –45 to 45°F) hi 125 (Range: –20 to 150°F) **EWT** lo 42 (Range: –45 to 45°F) hi 125 (Range: –20 to 150°F) **OAT** lo –65 (Range: –65 to 40°F) hi 245 (Range: 100 to 245°F) **Non-Operational Comp** This drives the Non-Operational Component alarm. The is the alarm offset value. **CWST** This is a low limit alarm offset. **Reverse Load Water Flow** This alarm detects incorrect flow direction. Default is 2°F.
Password Level: Admin		
Properties / Maintenance		Values show current status of these points.
Password Level: Admin		

Table 8 — App Controller Screen Navigation (cont)

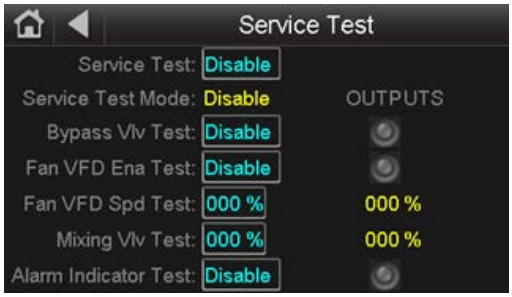
SCREEN NAMES	DISPLAY	DETAILS
Properties / Service Test		This is service test. Defaults are shown.
Password Level: Admin		
Properties / Alarms		See page 47 for details on alarms.
Password Level: None		
Alarms		Views alarms from the controller. To access select the exclamation point in the top left of the screen from the Snapshot screen.
Trends	 NOTE: Example screen shown.	Review trends for points that have trending enabled. Access from the Snapshot screen by selecting the icon in the lower right of the screen. Select Analog for measured values such as temperature or Digital for on/off status.

Table 8 — App Controller Screen Navigation (cont)

SCREEN NAMES	DISPLAY
Properties / Alarms / Alarm Help (11 screens)	

Help: Equipment Alarm

Equipment Alarm

A general alarm that indicates if any Alarm which is specified to initiate an Equipment Alarm is currently in alarm.

This alarm energizes the Alarm Output binary output #3.

Help: Leaving Load Water Temp Alarm

Leaving Load Water Temperature Alarm

Indicates an alarm when the leaving load water temperature is not within the high and low alarm limits.

Help: Leaving Load Water Temp Sensor Alarm

Leaving Load Water Temperature Sensor Alarm

Indicates an alarm when the leaving load water temperature sensor no longer has a valid output value.

This alarm causes the equipment to shutdown.

Help: Entering Load Water Temp Alarm

Entering Load Water Temperature Alarm

Indicates an alarm when the entering load water temperature is not within the high and low alarm limits.

Help: Entering Load Water Temp Sensor Alarm

Entering Load Water Temperature Sensor Alarm

Indicates an alarm when the entering load water temperature sensor no longer has a valid output value.

This alarm causes the equipment to shutdown.

Help: Outdoor Air Temp Alarm

Outdoor Air Temperature Alarm

Indicates an alarm when the outdoor air temperature is not within the high and low alarm limits.

Help: Outdoor Air Temp Sensor Alarm

Outdoor Air Temperature Sensor Alarm

Indicates an alarm when the outdoor air temperature sensor no longer has a valid output value.

This alarm causes the equipment to shutdown.

Help: Fan VFD Failure Alarm

Fan VFD Failure Alarm

Indicates an alarm when the fan vfd running status is not identical to the fan vfd commanded state while the fan vfd is commanded ON.

This alarm causes the equipment to shutdown.

Help: Non-Operational Component Alarm

Non-Operational Component Alarm

Indicates an alarm when there are non-operational components.

This alarm causes the equipment to shutdown.

Help: Low Chilled Water Supply Temp Alarm

Low Chilled Water Supply Temperature Alarm

Indicates an alarm when the chilled water supply temperature is too far below the chilled water setpoint.

This alarm causes the equipment to shutdown when a mixing valve is not configured.

Help: Reverse Load Water Flow Alarm

Reverse Load Water Flow Alarm

Indicates an alarm when there is reverse load water flow or sensor issues.

This alarm causes the equipment to shutdown.

Password Level: None

Table 8 — App Controller Screen Navigation (cont)

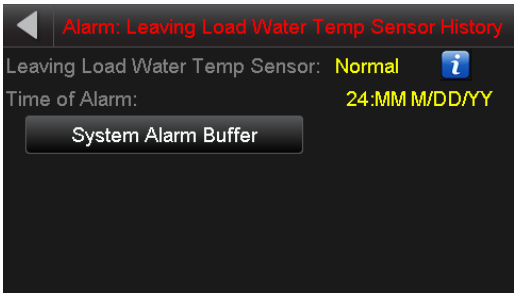
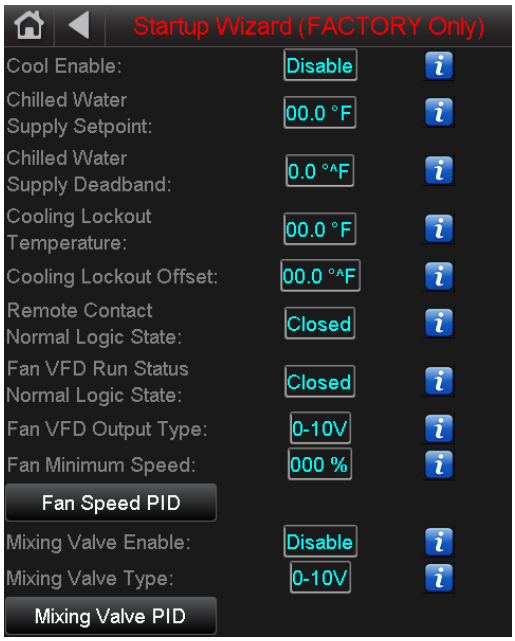
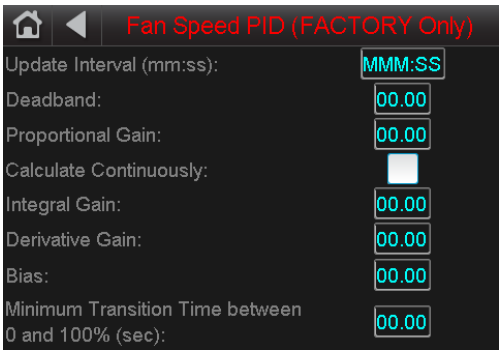
SCREEN NAMES	DISPLAY	DETAILS
Properties / Alarms / Alarm History		
Password Level: None		
Properties / Startup Wizard		
Password Level: Factory		
Properties / Startup Wizard / Fan Speed PID		
Password Level: Factory		

Table 8 — App Controller Screen Navigation (cont)

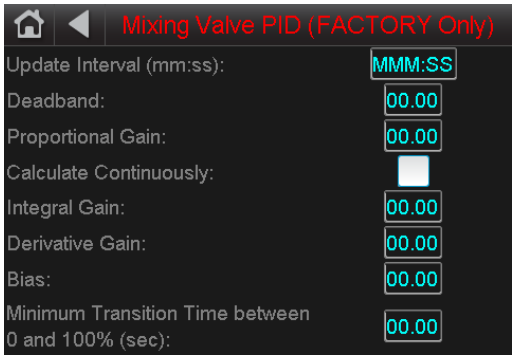
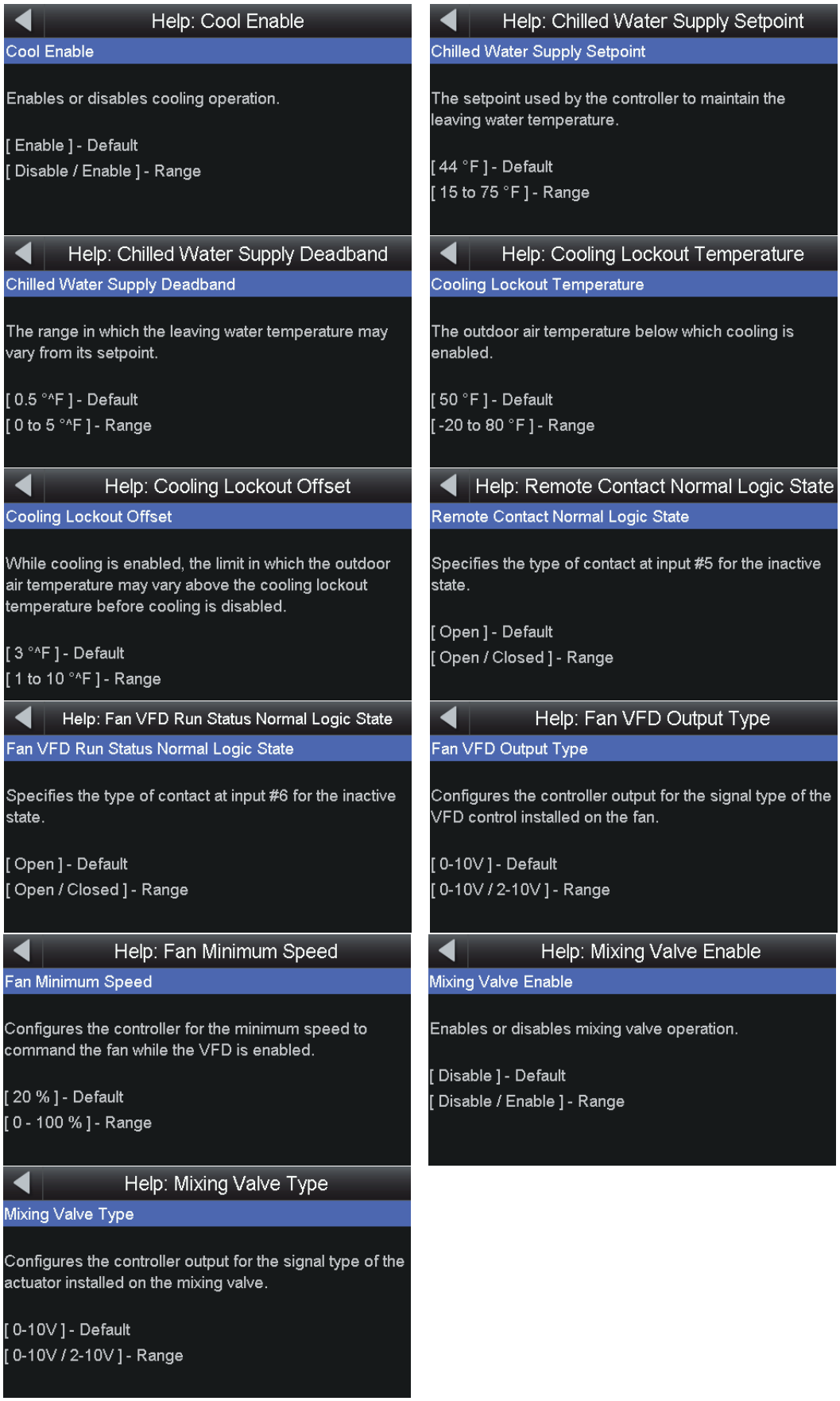
SCREEN NAMES	DISPLAY	DETAILS
Properties / Startup Wizard / Mixing Valve PID		
Password Level: Factory		

Table 8 — App Controller Screen Navigation (cont)

SCREEN NAMES	DISPLAY
Properties / Startup Wizard / Help (11 screens)	

Password Level: Factory

Table 8 — App Controller Screen Navigation (cont)

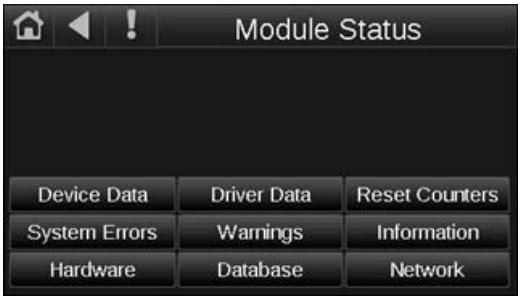
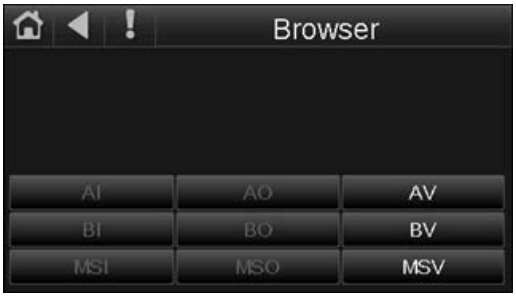
SCREEN NAMES	DISPLAY	DETAILS
Properties / ET System		
Password Level: Factory		
Properties / ET System / Module Status		
Password Level: Factory		
Properties / ET System / Alarms		
Password Level: Factory		
Properties / ET System / Setup		
Password Level: Factory		

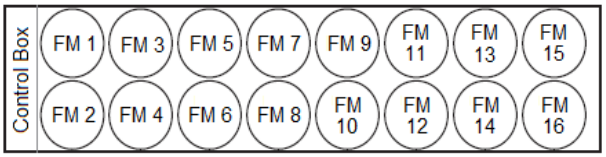
Table 8 — App Controller Screen Navigation (cont)

SCREEN NAMES	DISPLAY	DETAILS
Properties / ET System / Setup / Module Setup		
Password Level: Factory		
Properties / ET System / Setup / Module Setup / Communication		
Password Level: Factory		
Properties / ET System / Browser		
Password Level: Factory		
Properties / Touchscreen Setup		
Password Level: Admin		

Outdoor Fan Control

Outdoor fan layout shown in Table 9:

Table 9 — Fan Motor Controls



09FC	Volt-Hz	Fan Motor															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
020	208/230-60	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	380-50	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	380-60	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	400-50	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	400-60	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	415-50	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	460-60	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
	575-60	VFD 1				—	—	—	—	—	—	—	—	—	—	—	—
030	208/230-60	VFD 1				VFD2		—	—	—	—	—	—	—	—	—	—
	380-50	VFD 1						—	—	—	—	—	—	—	—	—	—
	380-60	VFD 1						—	—	—	—	—	—	—	—	—	—
	400-50	VFD 1						—	—	—	—	—	—	—	—	—	—
	400-60	VFD 1						—	—	—	—	—	—	—	—	—	—
	415-50	VFD 1						—	—	—	—	—	—	—	—	—	—
	460-60	VFD 1						—	—	—	—	—	—	—	—	—	—
	575-60	VFD 1						—	—	—	—	—	—	—	—	—	—
040	208/230-60	VFD 1				VFD 2				—	—	—	—	—	—	—	—
	380-50	VFD 1								—	—	—	—	—	—	—	—
	380-60	VFD 1								—	—	—	—	—	—	—	—
	400-50	VFD 1								—	—	—	—	—	—	—	—
	400-60	VFD 1								—	—	—	—	—	—	—	—
	415-50	VFD 1								—	—	—	—	—	—	—	—
	460-60	VFD 1								—	—	—	—	—	—	—	—
	575-60	VFD 1								—	—	—	—	—	—	—	—
050	380-50	VFD 1						VFD 2				—	—	—	—	—	—
	380-60	VFD 1						VFD 2				—	—	—	—	—	—
	400-50	VFD 1						VFD 2				—	—	—	—	—	—
	400-60	VFD 1						VFD 2				—	—	—	—	—	—
	415-50	VFD 1						VFD 2				—	—	—	—	—	—
	460-60	VFD 1						VFD 2				—	—	—	—	—	—
	575-60	VFD 1						VFD 2				—	—	—	—	—	—
060	380-50	VFD 1						VFD 2						—	—	—	—
	380-60	VFD 1						VFD 2						—	—	—	—
	400-50	VFD 1						VFD 2						—	—	—	—
	400-60	VFD 1						VFD 2						—	—	—	—
	415-50	VFD 1						VFD 2						—	—	—	—
	460-60	VFD 1						VFD 2						—	—	—	—
	575-60	VFD 1						VFD 2						—	—	—	—
070	380-50	VFD 1								VFD 2						—	—
	380-60	VFD 1								VFD 2						—	—
	400-50	VFD 1								VFD 2						—	—
	400-60	VFD 1								VFD 2						—	—
	415-50	VFD 1								VFD 2						—	—
	460-60	VFD 1								VFD 2						—	—
	575-60	VFD 1								VFD 2						—	—
080	380-50	VFD 1									VFD 2						
	380-60	VFD 1									VFD 2						
	400-50	VFD 1									VFD 2						
	400-60	VFD 1									VFD 2						
	415-50	VFD 1									VFD 2						
	460-60	VFD 1									VFD 2						
	575-60	VFD 1									VFD 2						

VFD DISPLAY NAVIGATION

IMPORTANT: The VFDs are configured through the Carrier Controller controls, and parameters should not be changed manually. This section is included for information and troubleshooting purposes only.

NOTE: The following instructions apply to Danfoss VLT VFD. See Table 11 for voltage specific VFD parameters.

The VFD can be operated in 2 ways:

- Graphical Local Control Panel (GLCP)
- RS-485 serial communication for PC connection

Graphical Local Control Panel

The LCD display is divided into 4 functional groups:

1. Graphical display with Status lines
2. Menu keys and indicator lights (LEDs) — selecting mode, changing parameters and switching between display functions
3. Navigation keys and indicator lights (LEDs)
4. Operation keys and indicator lights (LEDs)

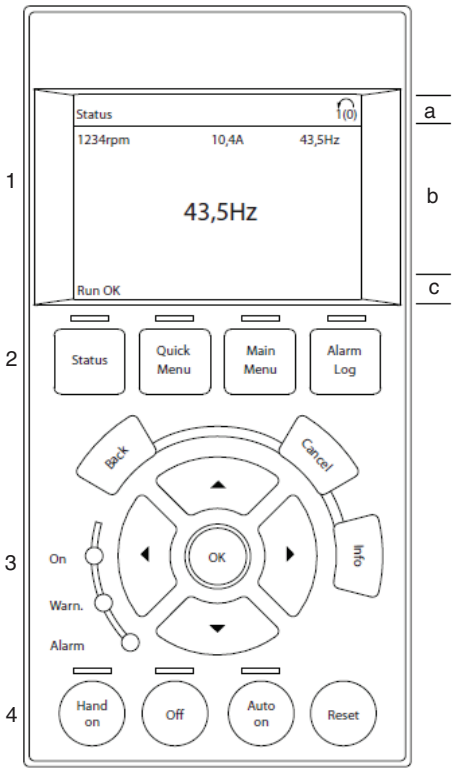
See Fig. 34. The display is backlit with a total of 6 alpha-numeric lines. All data is displayed on the GLCP, which can show up to 5 operating variables while in Status mode.

The display lines (see items a-c in Fig. 34) function as follows:

a. The status line at the top of the display shows VFD status when in [Status] mode or up to 2 variables when not in [Status] mode, or in case of an alarm or warning (alert).
b. The operator data line in the middle section shows up to 5 variables with their related units, regardless of status. In the case of an alarm or warning, the warning is shown instead of the variables.
c. The status line in the bottom section always shows the state of the VFD in Status mode.

The operator can toggle among 3 status read-out screens by touching the Status key. Several values or measurements can be linked to each of the displayed operating variables. The values/measurements to be displayed can be defined via parameter 0-20 Display Line 1.1 Small, 0-21 Display Line 1.2 Small, 0-22 Display Line 1.3 Small, 0-23 Display Line 2 Large and 0-24 Display Line 3 Large. The settings are accessed by selecting ***QUICK MENU → Q3 Function Setups → Q3-1 General Settings → Q3-13 Display Settings***. Each value/measurement readout parameter selected in 0-20 Display Line 1.1 Small to 0-24 Display Line 3 Large has its own scale and number of digits after a possible decimal point. Larger numeric values are displayed with fewer digits after the decimal point. For example, a current readout might be 5.25 A,15.2 A, or 105 A.

Status Display I is standard after start-up or initialization. Touch [INFO] to obtain information about the value/measurement linked to the displayed operating variables 1.1, 1.2, 1.3, 2, and 3). See the operating variables shown in the display in Fig. 35. Variables 1.1, 1.2, and 1.3 are shown in small size. Variables 2 and 3 are shown in medium size.



LEGEND

1 — Graphical display with status lines
2 — Menu keys and indicator lights
3 — Navigation keys and indicator lights
4 — Operation keys and indicator lights
a — Status line
b — Operator data lines
c — Status messages

Fig. 34 — VFD Graphical Local Control Panel

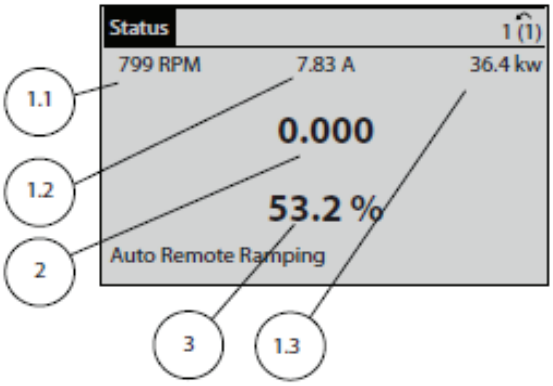


Fig. 35 — Status Display I

Status Display II shows the operating variables 1.1, 1.2, 1.3 and 2. In the example shown in Fig. 36, Speed, Motor Current, Motor Power, and Frequency are selected as variables in the first and second lines. Variables 1.1, 1.2, and 1.3 are shown in small size. Variable 2 is shown in large size.

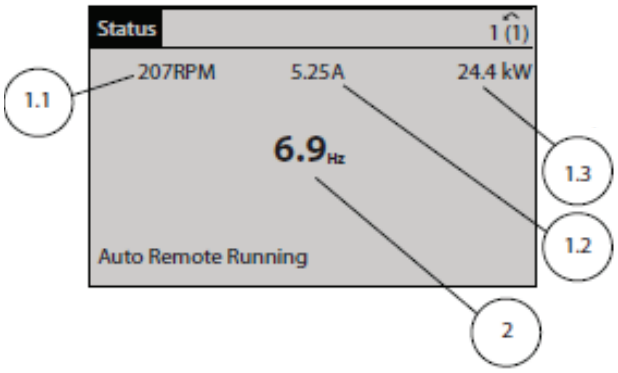


Fig. 36 — Status Display II

Status Display III shows events and actions of the Smart Logic Control. Figure 37 shows an example.

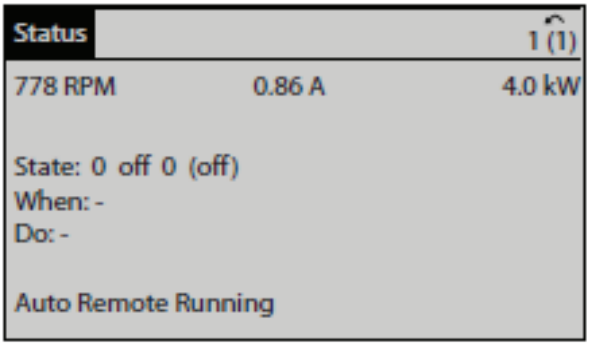


Fig. 37 — Status Display III

The operator can adjust the display brightness by touching Status and ▲ to darken the display or ▼ to lighten it.

Indicator lights (LEDs) indicate whether the unit is on and if there are any warning or alarm conditions:

- Green LED (On): Control section is working. The On LED is activated when the VFD receives power from mains voltage, a DC bus terminal, or an external 24 V supply. At the same time, the back light is on.
- Yellow LED (Warning): Indicates a warning.
- Flashing Red LED (Alarm): Indicates an alarm.

The warning and/or alarm LEDs light up if certain threshold values are exceeded. A status message and alarm text also appear on the control panel. See Fig. 38.

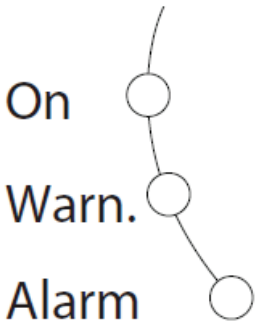


Fig. 38 — Indicator Lights

The menu keys below the display and indicator lights include Status, Quick Menu, Main Menu, and Alarm Log. The Status menu indicates the status of the frequency converter and/or the motor. Three display modes are available (see Fig. 35-37). Use the Status key for selecting mode of display or for changing back to display mode from the Quick Menu Mode, the Main Menu Mode, or the Alarm Log mode. The operator can also use the Status key to toggle between single or double read-out mode.

The Quick Menu key allows quick set-up of the frequency converter. The most common HVAC functions can be programmed here. Menu options include:

- My Personal Menu
- Quick Set-up
- Function Set-up
- Changes Made
- Loggings

The Function Set-up option provides quick and easy access to all parameters required for most HVAC applications. Among other features it also includes parameters for selecting which variables to display on the local control panel, digital preset speeds, scaling of analog references, closed loop single-zone and multi-zone applications, and specific functions related to fans, pumps and compressors.

The Quick Menu parameters can be accessed immediately unless a password has been created via 0-60 Main Menu Password, 0-61 Access to Main Menu without Password, 0-65 Personal Menu Password, or 0-66 Access to Personal Menu without Password. It is possible to switch directly between Quick Menu mode and Main Menu mode.

The Main Menu key is used for programming all parameters. These can be accessed immediately unless a password has been created via 0-60 Main Menu Password, 0-61 Access to Main Menu without Password, 0-65 Personal Menu Password, or 0-66 Access to Personal Menu without Password. For most HVAC applications it is not necessary to access the Main Menu parameters but instead use the Quick Menu. Quick Set-up and Function Set-up provides the simplest and quickest access to the typical required parameters.

It is possible to switch directly between Main Menu mode and Quick Menu mode. The parameter shortcut can be carried out by touching the Main Menu key for 3 seconds. The parameter shortcut allows direct access to any parameter.

Touch Alarm Log to display a list of the 10 latest alarms (numbered A1-A10). To obtain additional details about an alarm, touch the navigation keys to reach the alarm number and touch OK. Information is displayed about the condition of the frequency converter before it enters the alarm mode. The Alarm Log key also provides access to a Maintenance log.

At the middle part of the local control panel, the Back key reverts to the previous step or layer in the navigation structure. The Cancel key cancels the last change or command as long as the display has not changed. The Info Key displays information about a command, parameter, or function in any display window, providing detailed information when needed. The four arrow keys are used among menu options by moving the cursor in the direction indicated. Touch OK to select a parameter marked by the cursor or to enable a parameter change.

Operation keys for local control are found at the bottom of the control panel (see Fig. 34). Hand On enables control of the frequency converter via the local control panel. Hand On also starts the motor, and it is possible to enter the motor speed data by means of the navigation keys. The key can be selected as [1] Enable or [0] Disable via 0-40 Hand On Key on the local control panel.

NOTE: External stop signals activated by means of control signals or a serial bus override a start command via the local control panel.

The Off key stops the connected motor. If no external stop function is selected and Off key is inactive, the motor can only be stopped by disconnecting the mains supply.

Auto On enables the frequency converter to be controlled via the control terminals and/or serial communication. When a start sig-

nal is applied on the control terminals and/or the bus, the frequency converter starts.

NOTE: An active HAND-OFF-AUTO signal via digital inputs has higher priority than the local control keys Hand On –Auto On.

The Reset key resets the frequency converter after an alarm (trip).

See Table 10 for a list of common VFD parameters.

Table 10 — Common VFD Parameters

Voltage												
# of V's			2V	3V	4V	5V		6V		7V		8V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2
# of Connected Fans			4	6	8	6	4	6	6	7	7	8	8
1-03	Torque Characteristic	variable torque	1	1	1	1	1	1	1	1	1	1	1
1-21	Motor Hp	size dependent	10	15	25.0	20.0	15.0	15	15	20	20	20	20
1-22	Motor Volts	motor dependent	REFER TO VOLTAGE SPECIFIC TABLE										
1-23	Motor Frequency	Hz	60	60	60	60	60	60	60	60	60	60	60
1-24	Motor Amperage	size dependent	REFER TO VOLTAGE SPECIFIC TABLE										
1-25	Motor Rpm	size dependent	1130	1130	1130	1130	1130	1130	1130	1130	1130	1130	1130
1-73	Flying Restart	NO	0	0	0	0	0	0	0	0	0	0	0
1-80	Function at Stop	coast	0	0	0	0	0	0	0	0	0	0	0
1-90	Motor Thermal Protection	0	0	0	0	0	0	0	0	0	0	0	0
3-02	Min Reference	Hz	0	0	0	0	0	0	0	0	0	0	0
3-03	Max Reference	Hz	60	60	60	60	60	60	60	60	60	60	60
3-13	Type Reference	remote	1	1	1	1	1	0	0	0	0	0	0
3-15	Src Ref#1	analog input	1	1	1	1	1	1	1	1	1	1	1
3-16	Src Ref#2	no function	0	0	0	0	0	0	0	0	0	0	0
3-41	Ramp Up	s	20	20	20	20	20	20	20	20	20	20	20
3-42	Ramp Down	s	20	20	20	20	20	20	20	20	20	20	20
4-10	Motor Speed Direct	clockwise	0	0	0	0	0	0	0	0	0	0	0
4-12	Motor Speed Low Limit	Hz	5	5	5	5	5	5	5	5	5	5	5
4-14	Motor Speed High Limit	Hz	60	60	60	60	60	60	60	60	60	60	60
4-16	Torque Limit	size dependent	150	150	150	150	150	150	150	150	150	150	150
4-18	Current Limit	size dependent	110	110	110	110	110	110	110	110	110	110	110
4-19	Max Output Frequency	Hz	61	61	61	61	61	61	61	61	61	61	61
5-10	Term#18 Di	Start	8	8	8	8	8	8	8	8	8	8	8
5-12	Di #27	no function	0	0	0	0	0	2	2	2	2	2	2
5-40	Relay 1	running	5	5	5	5	5	5	5	5	5	5	5
6-10	Term#53 Low V	0V	0	0	0	0	0	0	0	0	0	0	0
6-11	Term#53 High V	10V	10	10	10	10	10	10	10	10	10	10	10
8-01	Control Site	digital	0	0	0	0	0	0	0	0	0	0	0
8-02	Control Source	FC port=RS485	1	1	1	1	1	1	1	1	1	1	1
8-03	Time Out Time	s	10	10	10	10	10	10	10	10	10	10	10
8-04	Time Out Function	stop	2	2	2	2	2	2	2	2	2	2	2
14-00	Pattern [Avm]	60AVM	0	0	0	0	0	0	0	0	0	0	0
14-01	Switching Frequency	4kHz	6	6	6	6	6	6	6	6	6	6	6

Table 11 — Voltage Specific VFD Parameters

Voltage			208/230V-60			
# of V's			2V	3V	4V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-2
# of Connected Fans			4	6	4	4
1-22	motor volts	motor dependent	208	208	208	208
1-24	motor amperage	size dependent	44.8	67.2	44.8	44.8

Voltage			380V, 400V-60									
# of V's			2V	3V	4V	5V		6V		7V		8V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2
# of Connected Fans			4	6	8	6	4	6	6	7	7	8	8
1-22	motor volts	motor dependent	380	380	380	380	380	380	380	380	380	380	380
1-24	motor amperage	size dependent	30.4	45.6	60.8	45.6	30.4	45.6	45.6	53.2	53.2	60.8	60.8

Voltage			460V-60									
# of V's			2V	3V	4V	5V		6V		7V		8V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2
# of Connected Fans			4	6	8	6	4	6	6	7	7	8	8
1-22	motor volts	motor dependent	460	460	460	460	460	460	460	460	460	460	460
1-24	motor amperage	size dependent	24.4	36.6	48.8	36.6	24.4	36.6	36.6	42.7	42.7	48.8	48.8

Voltage			575V-60									
# of V's			2V	3V	4V	5V		6V		7V		8V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2
# of Connected Fans			4	6	8	6	4	6	6	7	7	8	8
1-22	motor volts	motor dependent	575	575	575	575	575	575	575	575	575	575	575
1-24	motor amperage	size dependent	20.8	31.2	41.6	31.2	20.8	31.2	31.2	36.4	36.4	41.6	41.6

Voltage			380V, 400V, 415V, 440V-50									
# of V's			2V	3V	4V	5V		6V		7V		8V	
Drive Designation			FVFD-1	FVFD-1	FVFD-1	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2	FVFD-1	FVFD-2
# of Connected Fans			4	6	8	6	4	6	6	7	7	8	8
1-22	motor volts	motor dependent	380	380	380	380	380	380	380	380	380	380	380
1-24	motor amperage	size dependent	31.2	46.8	62.4	46.8	31.2	46.8	46.8	54.6	54.6	62.4	62.4

VFD ALARMS AND ALERTS

Alarms and alerts associated with the VFD function follow a different naming convention than general unit faults. Table 12 lists the VFD alarm and alert naming conventions, while Table 13 lists the Danfoss codes associated with the alarms and alerts. These represent the most common alarms and alerts associated with VFD malfunction. Refer to the appropriate Danfoss documentation for more information on other alarms.

Table 12 — VFD Alarm/Alert Naming Conventions

VFD ALARMS AND ALERTS	ALARM FORMAT*	ALERT FORMAT*
Compressor A	17nnn	35nnn
Compressor B	18nnn	36nnn
Fan A1	20nnn	38nnn
Fan A2	21nnn	39nnn
Fan B1	23nnn	41nnn
Fan B2	24nnn	42nnn

* The Danfoss Alarm/Alert code is represented by nnn. See Table 13.

Table 13 — Alarms List

CODE	WARNING/ ALARM	DESCRIPTION	POSSIBLE CAUSES	DOES MACHINE SHUT DOWN	ACTION TO BE TAKEN	REFERENCE PARAMETER
001	Warning	10 Volts Low	The control card voltage is <10 V from terminal 50. Remove some of the load from terminal 50, as the 10 V supply is overloaded. Maximum 15 mA or minimum 590 Ω. A short circuit in a connected potentiometer or incorrect wiring of the potentiometer can cause this condition.		Remove the wiring from terminal 50. If the warning clears, the problem is with the wiring. If the warning does not clear, replace the control card.	
002	NOTE 1	Live Zero Error	This warning or alarm only appears if programmed in parameter 6-01 Live Zero Timeout Function. The signal on 1 of the analog inputs is less than 50% of the minimum value programmed for that input. Broken wiring or a faulty device sending the signal can cause this condition.		• Check the connections on all the analog mains terminals. - Control card terminals 53 and 54 for signals, terminal 55 common. - MCB 101 terminals 11 and 12 for signals, terminal 10 common. - MCB 109 terminals 1, 3, and 5 for signals, terminals 2, 4, and 6 common. • Check that the frequency converter programming and switch settings match the analog signal type. • Perform an input terminal signal test.	6-01 Live Zero Timeout
003	Warning	No Motor	Motor wiring disconnected. Reference Parameter must be programmed to (2) or (6)		Inspect motor wiring connections at VFD and at motor	1-80 Function at Stop
004	NOTE 1	Mains Phase Loss	A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears for a fault in the input rectifier on the frequency converter. Options are programmed in parameter 14-12 Function at Mains Imbalance.		Check the supply voltage and supply currents to the frequency converter	14-12 Function at Mains Imbalance
005	Warning	DC Link Voltage High	The DC-link voltage (DC) is higher than the high-voltage warning limit. The limit depends on the frequency converter voltage rating. The unit is still active.		Check the supply voltage and supply currents to the frequency converter	
006	Warning	DC Link Voltage Low	The DC-link voltage (DC) is lower than the low-voltage warning limit. The limit depends on the frequency converter voltage rating. The unit is still active.		Check the supply voltage and supply currents to the frequency converter	
007	NOTE 1	DC Overvoltage	If the DC-link voltage exceeds the limit, the frequency converter trips after a time.		• Extend the ramp time. • Change the ramp type.	
008	NOTE 1	DC Undervoltage	If the DC-link voltage drops below the undervoltage limit, the frequency converter checks if a 24 V DC back-up supply is connected. If no 24 V DC back-up supply is connected, the frequency converter trips after a fixed time delay. The time delay varies with unit size.		• Check that the supply voltage matches the frequency converter voltage. • Perform an input voltage test. • Perform a soft charge circuit test.	
009	NOTE 1	Inverter Overloaded	The frequency converter has run with more than 100% overload for too long and is about to cut-out. The counter for electronic thermal inverter protection issues a warning at 98% and trips at 100%, while giving an alarm. The frequency converter cannot be reset until the counter is below 90%.		• Compare the output current shown on the LCP with the frequency converter rated current. • Compare the output current shown on the LCP with the measured motor current. • Display the thermal frequency converter load on the LCP and monitor the value. When running above the frequency converter continuous current rating, the counter increases. When running below the frequency converter continuous current rating, the counter decreases.	
010	NOTE 1	Motor ETR Overtemperature	According to the electronic thermal protection (ETR), the motor is too hot. Select whether the frequency converter issues a warning or an alarm when the counter reaches 100% in parameter 1-90 Motor Thermal Protection. The fault occurs when the motor runs with more than 100% overload for too long.		• Check for motor overheating. • Check if the motor is mechanically overloaded. • Check that the motor current set in 1-24 Motor Current is correct. • Ensure that the motor data in parameters 1–20 to 1–25 are set correctly.	1-90 Motor Thermal Protection (this parameter should be set to [0])
011	NOTE 1	Motor Thermistor Overtemperature	Check whether the thermistor is disconnected. Select whether the frequency converter issues a warning or an alarm in parameter 1-90 Motor Thermal Protection		• Check for motor overheating. • Check if the motor is mechanically overloaded.	1-90 Motor Thermal Protection (this parameter should be set to [0])
012	NOTE 1	Torque Limit	The torque has exceeded the value in parameter 4-16 Torque Limit Motor Mode or the value in parameter 4-17 Torque Limit Generator Mode. Parameter 14-25 Trip Delay at Torque Limit can change this warning from a warning-only condition to a warning followed by an alarm.		• If the motor torque limit is exceeded during ramp-up, extend the ramp-up time. • If the generator torque limit is exceeded during ramp-down, extend the ramp-down time. • If torque limit occurs while running, increase the torque limit. Make sure that the system can operate safely at a higher torque. • Check the application for excessive current draw on the motor	

Table 13 — Alarms List (cont)

CODE	WARNING/ ALARM	DESCRIPTION	POSSIBLE CAUSES	DOES MACHINE SHUT DOWN	ACTION TO BE TAKEN	REFERENCE PARAMETER
013	NOTE 1	Overcurrent	The inverter peak current limit (approximately 200% of the rated current) is exceeded. The warning lasts approximately 1.5 s, then the frequency converter trips and issues an alarm. Shock loading or quick acceleration with high-inertia loads can cause this fault. If the acceleration during rampup is quick, the fault can also appear after kinetic back-up. If extended mechanical brake control is selected, a trip can be reset externally.		• Remove the power and check if the motor shaft can be turned. • Check that the motor size matches the frequency converter. • Check that the motor data is correct in parameters 1–20 to 1–25.	
014	NOTE 1	Ground Fault	There is current from the output phase to ground, either in the cable between the frequency converter and the motor or in the motor itself. This fault is detected during motor operation.		• Remove power to the frequency converter and repair the ground fault. • Check for ground faults in the motor by measuring the resistance to ground of the motor cables and the motor with a megohmmeter.	
015	Alarm	Hardware Mismatch	A fitted option is not operational with the present control board hardware or software		Record the value of the following parameters and contact Danfoss: • 15-40 FC Type • 15-41 Power Section • 15-42 Voltage • 15-43 Software Version • 15-45 Actual Typecode String • 15-49 SW ID Control Card • 15-50 SW ID Power Card • 15-60 Option Mounted • 15-61 Option SW Version (for each option slot)	
016	Alarm	Short Circuit	There is short-circuiting in the motor or motor wiring		• Remove the power to the frequency converter and repair the short circuit	
017	NOTE 1	Control Word Timeout (Serial Communication Failure)	There is no communication to the frequency converter. The warning is only active when 8-04 Control Word Timeout Function is NOT set to [0] Off. If 8-04 Control Word Timeout Function is set to [5] Stop and Trip, a warning appears and the frequency converter ramps down until it stops, and then it displays an alarm		Check the connections on the serial communications cables including the shields and termination resistors.	8-04 Control Timeout Function
023	Warning	Internal Fan Fault	Monitors operation of the internal cooling fan		Check for proper fan operation, cycle power to VFD and confirm that fan operates at startup	
029	NOTE 1	Heat Sink Overtemperature	The maximum temperature of the heat sink has been exceeded. The temperature fault does not reset until the temperature drops below a defined heat sink temperature. The trip and reset points are different based on the frequency converter power size		• Ambient temperature too high. • Motor cables too long. • Incorrect airflow clearance above and below the frequency converter. • Blocked airflow around the frequency converter. • Damaged heat sink fan. • Dirty heat sink.	
030	NOTE 1	Motor Phase U Missing	Motor phase U between the frequency converter and the motor is missing		Remove the power from the frequency converter and check motor phase U	4-58 Missing Motor Phase Function
031	NOTE 1	Motor Phase V Missing	Motor phase V between the frequency converter and the motor is missing		Remove the power from the frequency converter and check motor phase V	4-58 Missing Motor Phase Function
032	NOTE 1	Motor Phase W Missing	Motor phase W between the frequency converter and the motor is missing		Remove the power from the frequency converter and check motor phase W	4-58 Missing Motor Phase Function
034	NOTE 1	Fieldbus Communication Fault	The fieldbus on the communication option card is not working		Check the communication wiring connections, including the shield. Check the termination resistors.	
036	NOTE 1	Mains Failure	This warning/alarm is only active if the supply voltage to the frequency converter is lost and parameter 14-10 Mains Failure is not set to option [0] No Function		Check the fuses to the frequency converter, mains supply to the unit and the phase imbalance (±3%)	
039	Alarm	Heat Sink Sensor	No feedback from the heat sink temperature sensor		The signal from the IGBT thermal sensor is not available on the power card. The problem could be on the power card, on the gatedrive card, or the ribbon cable between the power card and gate drive card	
045	Alarm	Ground Fault	Ground fault detected on motor start		• Remove power to the frequency converter and repair the ground fault. • Check for ground faults in the motor by measuring the resistance to ground of the motor cables and the motor with a megohmmeter.	
046	Alarm	Power Card Supply	The supply on the power card is out of range		Contact Carrier Service	
047	NOTE 1	24V Supply Low	The supply on the power card is out of range		Contact Carrier Service	
049	NOTE 1	Speed Limit	When the speed is outside of the specified range in parameter 4-12 Motor Speed Low Limit [Hz] and parameter 4-14 Motor Speed High Limit [Hz], the frequency converter shows a warning. When the speed is below the specified limit in parameter 1-87 Trip Speed Low [Hz](except when starting or stopping), the frequency converter trips		Contact Carrier Service	1-87 Trip Speed Low [Hz]
059	Warning	Current Limit Exceeded	The current is higher than the value in parameter 4-18 Current Limit.		Ensure that motor data in parameters 1–20 to 1–25 are set correctly. Contact Carrier Service	

Table 13 — Alarms List (cont)

CODE	WARNING/ ALARM	DESCRIPTION	POSSIBLE CAUSES	DOES MACHINE SHUT DOWN	ACTION TO BE TAKEN	REFERENCE PARAMETER
062	Warning	Output Frequency at Maximum Limit	The output frequency has reached the value set in parameter 4-19 Max Output Frequency		The warning clears when the output drops below the maximum limit	
064	Warning	Voltage Limit	Supply Voltage is too low		Check supply voltage to determine if within permissable limits of VFD	
065	Warning/ Alarm	Control Card Over-Temperature	The temperature limit of the control card has been exceeded		• Check that the ambient operating temperature is within the limits. • Check for clogged filters. • Check the fan operation. • Check the control card	
066	Warning	Heat Sink Temperature Low	The frequency converter is too cold to operate. This warning is based on the temperature sensor in the IGBT module		Confirm that the VFD heater is working properly by checking voltage across the heater terminals, 120V should be present at low temperatures which would trigger this warning	
068	Alarm	Safe Stop	Safe Stop input has been activated	Yes	Check Compressor High Pressure Switch	5-19 Terminal 37 Safe Stop
069	Alarm	Power Card Temperature	The temperature sensor on the power card is either too hot or too cold		• Check that the ambient operating temperature is within limits. • Check for clogged filters. • Check fan operation. • Check the power card	
072	Alarm	Emergency Stop	An unexpected combination of failures		Contact Carrier Service	
098	Warning	Clock Fault	Time is not set or the RTC clock has failed		Reset the clock in parameter 0-70 Date and Time. Contact Carrier Service	0-7* Clock Settings
243	Warning/ Alarm	IGBT Fault	IGBT is defective or not functioning properly		Contact Carrier Service	
244	Warning/ Alarm	Heat Sink Temperature	This alarm is generated by the Variable Frequency Drive. The alarm will be generated if the maximum temperature of the heat sink has been exceeded. The temperature fault cannot reset until the temperature drops below a defined heat sink temperature. The trip and reset points are different based on the power size. This alarm is equivalent to A29 - Heat Sink Temp.	The circuit is shut down or not allowed to start.	Automatic, after heat sink temperature falls below a preset point.	
246	Alarm	Power Card Supply				
247	Alarm	Power Card Temperature				

LEGEND

AMA — Automatic Motor Adaptation
IGBT — Insulated Gate Bipolar Transistor
PTC — Positive Temperature Coefficient
VFD — Variable Frequency Drive

NOTE:
1. Warning or Alarm is determined by the setting of the reference Parameter.

Field Configuration

The following configurations must be set in the 09FC controls per the site application for proper operation.

LEAVING WATER SETPOINT

OUTDOOR AIR SETPOINT

The Table 14 below is a reference for the major points in the control. For a detailed list see appendix B.

Table 14 — Field Configuration

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Cool Enable	Enables or disables cooling operation.	D: Enable R: Disable/Enable
Leaving Water Temp Setpoint	The leaving water temperature setpoint maintained by the module.	D: 44°F R: 15 to 75°F
Outdoor Air Temp Setpoint	The outside air temperature below which the module is allowed to operate.	D: 50°F R: –20 to 80°F
OAT Offset Setpoint	The number of degrees that the outdoor air temperature must rise above setpoint to disable the module's operation.	D: 3°F R: 1 to 10°F
Remote Contact Normal Logic State	Specifies the remote contact's normal logic state.	D: Open R: Open/Closed
Fan VFD Run Status Normal Logic State	Specifies the fan's variable frequency drive run status normal logic state.	D: Open R: Open/Closed
Fan VFD Output Type	Defines the type of fan variable frequency drive output control.	D: 0-10V R: 0-10V/2-10V
Fan Initial Start Speed	The speed that the module's fans are briefly run on initial startup.	D: 100% R: 0 to 100%
Fan Minimum Speed	The lowest speed that the module's fan is commanded when the fans' variable frequency drive is enabled.	D: 20% R: 0 to 100%
Fan Speed PID	The BACnet Object calculates the amount of fan speed required to satisfy the **Leaving Water Temp Setpoint** and allows access to the control loops tuning parameters. **NOTE:** The following default values should be charged only by a technician trained in tuning PID loop algorithms. Action direct Update Interval 1:00 mm:ss Proportional 15 Integral 5 Derivative 0 Deadband 0 Bias 0	R: 0 to 100%
Bypass Valve PID	This BACnet Object calculates the amount of bypass required to satisfy the Leaving Water Temp Setpoint when bypass valve modulation is enabled and allows access to the control loop's tuning parameter. **NOTE:** The following default values should be changed only by a technician trained in turning PID Loop algorithms. Action reverse Update Interval 1:00 mm:ss Proportional 10 Integral 2 Derivative 0 Deadband 0 Bias 0	R: 0 to 100%
Lvg Wtr Temp Setpoint OA Reset	Enables OA reset of the leaving water temperature's setpoint.	D: Disable R: Disable/Enable
Maximum LWT Setpoint OA Reset	The highest leaving water temperature setpoint reset allowed by the outdoor air temperature.	D: 10°F R: 0 to 25°F

Communication - BACnet

See Table 15 for a list of BACnet Points.

Addressing the controller may be done with or without power. Each time power is applied the controller reads the address.

Address is set using rotary switches. Set the Tens (10's) switch to the tens digit of the address, and the Ones (1's) switch to the ones digit. See Fig. 39.

Example: If the controllers address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

The factory default setting is 00 and must be changed to successfully install BACnet communication.

See Table 16 for required BACnet configurations.

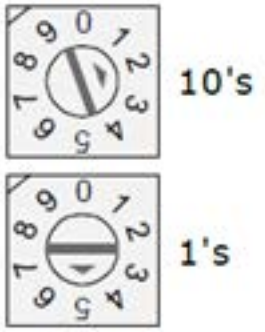


Fig. 39 — Addressing the Controller

Table 15 — BACnet Points

POINT NAME	TYPE	BACNET NAME	OBJECT ID	R/W	RANGE	DEFAULT
Fan VFD Speed Output	BAV	fanspeed	1001	R	0 - 100 %	
Mixing Valve Postion	BAV	mixing_valve_pct	1002	R	0 - 100 %	
Outdoor Air Temperature	BAV	oa_temp	1003	R	°F	
Entering Load Water Temp	BAV	ent_load_wtr_temp	1019	R	°F	
Leaving Load Water Temp	BAV	lvg_load_wtr_temp	1020	R	°F	
System Outdoor Air Temp	BAV	system_oat	1901	R/W		-999
System Entering Load Water Temp	BAV	system_elwt	1910	R/W		-999
System Leaving Load Water Temp	BAV	system_llwt	1912	R/W		-999
System Control Setpoint	BAV	system_ctrl_stpt	1916	R/W		-999
Chilled Water Setpoint	BAV	ctrl_stpt	2024	R	°F	
Chilled Water Supply Temp	BAV	ctrl_temp	2035	R	°F	
Chilled Water Supply Setpoint	BAV	chws_setpoint	3024	R/W	15 - 75 °F	44
Cooling Lockout Offset	BAV	oat_cl_lockout_offset	3027	R/W	1 - 10 °^F	3
Cooling Lockout Temperature	BAV	oat_cl_lockout	9002	R/W	-20 - 80 °F	50
Power Fail Restart Delay	BAV	start_delay	9007	R/W	0 - 600 sec	20
Fan Minimum Speed	BAV	fan_min_speed	9009	R/W	0 - 100 %	20
System OAT Master	BAV	mstr_oa_temp	80001	R	°F	
Cool Enable	BBV	cl_enable	1011	R/W	0=Disable 1=Enable	1
Bypass Valve Position	BBV	vlv_pos	2001	R	0=Close 1=Open	
Fan VFD Enable	BBV	fanenable	2004	R	0=Stop 1=Start	
Occupancy Status	BBV	occ_status	2008	R	0=Unocc 1=Occ	
Operating Mode	BBV	op_mode	2014	R	0=Bypass 1=Free Cool	
Run Command	BBV	run_cmnd	2030	R	0=Stop 1=Start	
Shutdown	BBV	shutdown	9001	R/W	0=Inactive 1=Active	0
BAS On / Off	BMSV	keypad_ovrde	1001	R/W	1=Inactive 2=Occupied 3=Unoccupied	1
Low Chilled Water Supply Temp	BBV	chws_lo_alarm	7021	R	0=Normal 1=Alarm	
Non-Operational Component	BBV	nonop_comp_alarm	7023	R	0=Normal 1=Alarm	
Reverse Load Water Flow	BBV	reverse_flow_alarm	7025	R	0=Normal 1=Alarm	
Outdoor Air Temp Sensor	BBV	oat_fail	7029	R	0=Normal 1=Alarm	
Outdoor Air Temperature	BBV	oat_alarm	7036	R	0=Normal 1=Alarm	
Fan VFD Fail	BBV	fan_vfd_fail	7039	R	0=Normal 1=Alarm	
Entering Load Water Temperature	BBV	elwt_alarm	7040	R	0=Normal 1=Alarm	
Entering Load Water Temp Sensor	BBV	ent_lwt_fail	7041	R	0=Normal 1=Alarm	
Leaving Load Water Temperature	BBV	llwt_alarm	7043	R	0=Normal 1=Alarm	
Leaving Load Water Temp Sensor	BBV	lvg_lwt_fail	7044	R	0=Normal 1=Alarm	
Equipment Alarm	BBV	equip_alarm	7048	R	0=Normal 1=Alarm	

Table 16 — Required Configurations

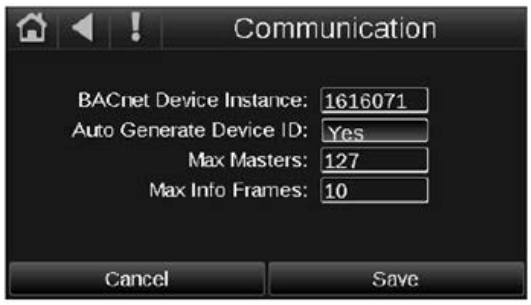
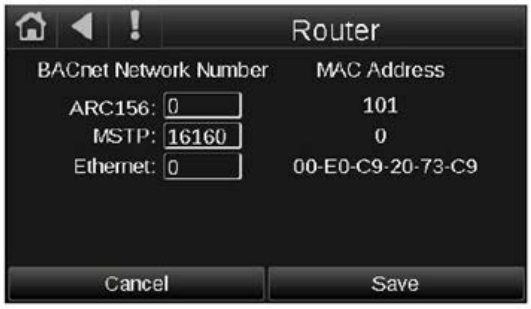
SCREEN NAMES	DISPLAY/DETAILS
Communication	 Lets you edit the information below for the controller. Touch a field to tap in new information. **BACnet Device Instance** number **Auto Generate Device ID** - Enter No or Yes You can edit the following fields that pertain to the controller's MS/TP network: **Max Masters** - Set this to the highest MAC address (up to 127) on the MS/TP network. If you later add a device with a higher address you must change this field to that new address. **Max Info Frames** - Specifies the maximum number of information messages a controller may transmit before it must pass the token to the next controller. **CAUTION:** Increasing this number allows the controller to transmit more messages while it has the token, but it also increases the overall time it takes for the token to pass through the network. • For a router, set this value to a high number such as 200. • In non-router controllers, use the following formula to calculate the value: [2 - (devices * (0.002 + (80/baud))] / [(600/baud) * devices] = Max Info Frames For example, if the network has 15 devices at 19,200 baud, Max Info Frames would be 4. **NOTE:** You may need to increase the result of the formula for controllers that need to communicate many values to other devices.
Router	 Lets you view or edit the router's ARC156 or MS/TP network number. Touch a field to tap in the new number on the keypad. NOTE: BACnet Ethernet network support will be added in the future release.
IP	 Lets you view or edit network addresses and the UDP Port. Touch a field to tap in the new number on the keypad.

Table 16 — Required Configurations (cont)

SCREEN NAMES	DISPLAY/DETAILS
Time Master	 If the Equipment Touch is serving as the front-end for your system, you should designate a controller to be the BACnet Time Master. If a controller will be the BACnet Time Master, this screen lets you configure how it sends time synchronization broadcasts. **Time Sync Mode** - Tap in the number below that represents your selection: • **0 = No Broadcast** - The controller will not act as Time Master. • **1 = Local Broadcast** - If it doesn't already exist, a BACnet address with network number and MAC address length both set to zero is added to the controller's **Time Synchronization Recipients** list found on the driver's **Device** page in the i-Vu® interface. The controller will then send time broadcasts only to controller on its ARCnet or MS/TP network. • **2 = Global Broadcast** - If it doesn't already exist, a global address with network number set to 65535 and MAC address length set to zero is added to the controller's **Time Synchronization Recipients** list found on the driver's **Device** page in the i-Vu interface. The controller will then send time broadcasts to all its connected networks. **Time Sync Interval** - Enter how often local or global time broadcast should be sent (1-9999 minutes). If **Time Sync Interval** is set to zero, no time sync messages are sent. **NOTE:** If the controller looks through its Time Synchronization Recipient List and finds an entry with MAC address length set to zero and network number set to 65535, the controller's BACnet Time Master mode is set for Global Broadcast. If there is no global broadcast entry in the recipient list, the controller then looks for a local broadcast address (MAC address length set to zero and network number set to zero or to the same network number as the module's). If such an entry is found, the BACnet Time Master mode is set for Local Broadcast. Otherwise, the mode defaults to Disable/None.

Operation

SEQUENCE OF OPERATION

When the unit is in an occupied mode, SW1 is in the Local position or in the Remote position with 24 vac applied to the Remote Contact Relay, R3. Once enabled the AppController will determine if the conditions are favorable to use free cooling. If so, the 3-way valve will move from the bypass position to free cooling. This will route water through the coils. At the same time the fan will ramp to full speed. If LWT is above the setpoint, fans will stay at full speed. If not, the fans will reduce speed to control to the LWT setpoint. If the outdoor air temperature continues to drop and the LWT falls below setpoint with the fans at 0 Hz, the 3-way valve will adjust to mix return water and water from the coils to keep LWT from going too low. The opposite sequence will occur as the outdoor air temperature increases.

Any alarms or loss of the enable signal will cause the valve to move to bypass mode and the fans to stop.

LOW AMBIENT START

The water in the unit will move to outdoor air temperature when unit is not running. If unit has not run for 1 hr. and outdoor air temperature is more than 30°F below the LWT setpoint, the valve will open slightly to mix return water with free cooling water for a period of time before going into full free cooling mode. This will prevent low temperature spikes from entering the building.

SNOW CLEARING

At temps below 34°F the fans will go to full speed for 15 seconds each time the unit goes into free cooling mode.

START-UP

Verify the LWT setpoint and OAT setpoint are correct for the application. See Field Configuration section.

Flowrate should be set with the 09FC unit in free cooling mode. This mode will have a larger pressure drop than the bypass mode. Setting the flow in this mode assures the chiller will always have the minimum flow required for operation.

Start the chilled water pump.

Complete the Start-Up Checklist to verify all components are operating properly.

Set SW2 toggle switch to ENABLE. This will power the controls. The switch is behind the left door of the control panel. This side of the panel only contains 24Vac, no line voltage.

Check inputs on the display to verify all temps are reading correctly. Reference the Carrier Equipment Touch section of this manual.

SERVICE

Alarms

NON-OPERATIONAL COMPONENT ALARM

If (***LWT > Cooling Lockout Temp + Cooling Lockout Offset + Non-Operational Component Alarm Offset***) and (Unit is in free cooling mode for 3 minutes), alarm contact will close, valves will drive to bypass position, and fans will stop. This alarm detects equipment failures.

Manual reset.

REVERSE LOAD WATER FLOW ALARM

[If (***LWT → EWT + Reverse Load Water Flow Alarm Temp Diff***) and (bypass valve is open, to free cool)] for 3 minutes. Alarm contact will close, valves will drive to bypass position, and fans will stop. This alarm detects reverse water flow or reversed sensors.

Manual reset.

THERMISTOR ALARM

Thermistor out of range. Detects failed thermistor. Close alarm contact, drive valves to bypass position, and disable fans.

Automatic reset.

FAN VFD FAILURE

This alarm detects a non-functioning VFD.

Manual reset.

Alarm Troubleshooting

LEAVING WATER TEMPERATURE ALARM

Alarm Criteria: Leaving water temperature is below the Low Leaving Water Temp Alarm Limit or above the High Leaving Water Temp Alarm Limit.

Action Taken by Controller: Alarm shown on display and alarm output energized. For high water alarm, the valve will go to bypass mode and the fan VFD will be disabled.

Reset Method: Automatic once temp is back in range.

Possible Causes: Bypass valve not functioning, Fans not functioning, Unit not enabled, Pump not on.

LEAVING WATER SENSOR FAILURE ALARM

Alarm Criteria: Sensor reading at controller is out of range.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once reading is back in range.

Possible Causes: Loose connection at controller, damaged sensor wire, failed thermistor.

ENTERING WATER TEMPERATURE ALARM

Alarm Criteria: Entering water temperature is below the Low Entering Water Temp Alarm Limit or above the High Entering Water Temp Alarm Limit.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once temp is back in range.

Possible Causes: Building return temperature beyond set limit.

ENTERING WATER SENSOR FAILURE ALARM

Alarm Criteria: Sensor reading at controller is out of range.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once reading is back in range.

Possible Causes: Loose connection at controller, damaged sensor wire, failed thermistor.

OUTDOOR AIR TEMPERATURE ALARM

Alarm Criteria: Outdoor air temperature is below the Low Outdoor Air Temp Alarm Limit or above the High Outdoor Air Temp Alarm Limit.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once temp is back in range.

Possible Causes: Air temperature beyond set limits.

OUTDOOR AIR SENSOR FAILURE ALARM

Alarm Criteria: Sensor reading at controller is out of range.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once reading is back in range.

Possible Causes: Loose connection at controller, damaged sensor wire, failed thermistor.

FAN VFD FAILURE

Alarm Criteria: Fan VFD feedback signal not received at the controller.

Action Taken by Controller: Alarm shown on display and alarm output energized.

Reset Method: Automatic once contact closure is made.

Possible Causes: Wiring issue between fan VFD and controller. Alarm at VFD. No power to VFD. VFD in Hand or Off position.

REVERSE LOAD WATER FLOW ALARM

Alarm Criteria: Entering water temperature is less than leaving water temperature.

Action Taken by Controller: Alarm shown on display, alarm output energized, valve will go to bypass mode, and the fan VFD will be disabled.

Reset Method: Automatic once delta T is positive.

Possible Causes: 3-way valve not functioning, EWT and LWT sensors swapped, damaged sensor wire, failed thermistor.

Controller Troubleshooting

The LED's shown in Fig. 32 indicate if the controller is speaking to the device on the network. The LED's should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LEDs become. See Table 17.

Verify the LED patterns by cycling power to the controller and noting the lights and flashes. See Fig. 32.

Table 17 — LED Statuses

LEDS	STATUS
Power	Lights when power is being supplied to the controller. **NOTE:** The AppController is protected by internal solid state Polyswitches on the incoming power and network connections. These Polyswitches are not replaceable, but they will reset themselves if the condition that caused the fault returns to normal.
Rx	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
Tx	Lights when the controller transmits data from the network segment; there is a Rx LED for Ports 1 and 2.
Run	Lights based on controller health. See table below.
Error	Lights based on controller health. See table below.

The **Run** and **Error** LED's indicate controller and network status.

If Run LED shows...	And Error LED shows...	Status is...
1 flash per second	1 flash per second, alternating with the **Run** LED	The controller files are archiving. Archive is complete when **Error** LED stops flashing.
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	Five minutes auto-restart delay after system error
2 flashes per second	3 flashes, then off	The controller has just been formatted
2 flashes per second	4 flashes, then pause	Two or more devices on this network have the same network address
2 flashes per second	1 flash per second	The controller is alone on the network
2 flashes per second	On	Exec halted after frequent system errors, due to: - Controller halted - Program memory corrupted - One of more programs stopped
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout
On	On	Failure. Try the following solutions: - Turn the AppController off, then on - Download memory to the AppController - Replace the AppController

NOTE: If you resolve the issue but the **Error** LED does not turn off, cycle power to the controller.

To Restore Defaults

⚠ CAUTION

This erases all archived information and user-configuration settings. You will have to reconfigure all custom settings. It is recommended to restore the factory defaults only under the guidance of Carrier Control Systems Support.

To erase volatile memory data and restore factory default configuration settings:

1. Turn off the AppController's power switch.
2. Put the **Factory Defaults** jumper on. See Fig. 32 for location of factory default jumper.
3. Turn on the AppController's power switch.
4. Remove the **Factory Defaults** jumper.

TO REPLACE THE CONTROLLER'S BATTERY

To determine when to replace the battery, remove power and measure the voltage. If the voltage is below 2.9 volts, replace the battery.

Use CR2032 battery for replacement.

⚠ CAUTION

Power must be ON to the controller when replacing the battery, or your date, time and trend data will be lost. Software and settings will also be lost. A new clipping file must be loaded. Same is true for loss of power if battery is dead or missing.

1. Remove the battery from the controller, making note of the battery's polarity.
2. Insert the new battery, matching the battery's polarity with the polarity indicated on the controller.

Fluid Piping System

The 09FC internal fluid piping directs the flow in order to provide the required cooling. Several components comprise this piping system. See Fig. 19-21. A by-pass line bypasses the coils. Coil supply and return lines connect the fluid to the coils. A 3-way by-pass valve directs the flow between the by-pass line and the supply line. A check valve included in the return line prohibits reverse flow.

Check Valve

This device is provided in the Return Line. It is a wafer style check valve. There are no user accessible settings.

3-Way Bypass Valve

A modulating valve consisting of an actuator linked to two butterfly valves, one in the bypass line and one to the coil supply line is factory installed. This device controls the supply of fluid to the coils. It is controlled by the controller through relays to open and close the valve.

The linkage between the two valves is critical to the operation of this unit. The linkage must be set as noted in Fig. 40.

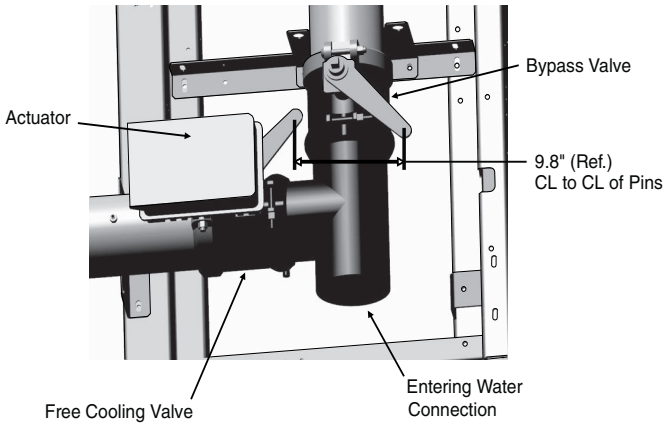


Fig. 40 — 3-Way Valve (Configuration for 09FC020-040, 09FC050-080 Series Piping)

The actuator can be manually operated with a handle inserted into the actuator. See Fig. 41.

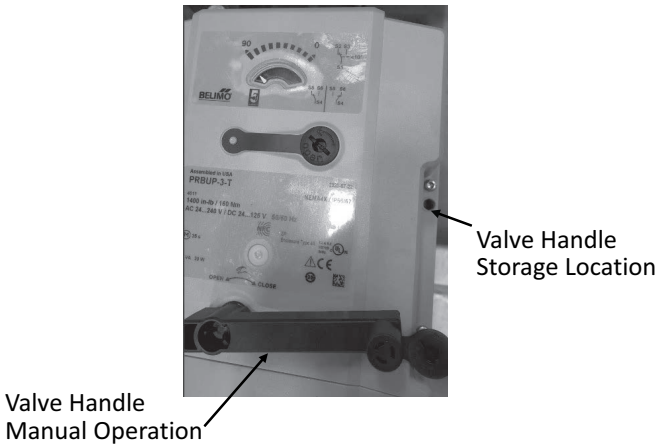


Fig. 41 — Manual Valve Operation

IMPORTANT: If the manual handle is inserted in the actuator, the valve will not respond to open and close commands from the controller.

Valve Linkage Adjustment

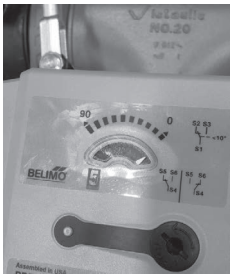
This information will help return the valve linkage to the proper configuration to assure optimum performance of the unit.

Figure 40 identifies the components of the 3 way valve. See Fig. 42 and 43 for bypass and free cooling details. The linkage consist of threaded rod, connectors, and a nut for locking the linkage at the proper length. To set up the linkage:

1. Use the handle supplied on the side of the actuator to rotate the "free cooling valve" to the closed position, full clockwise, 0 degrees on the actuator display. The handle is inserted into the hole in the top of the valve marked "Open/Close". A waterproof cap covers this hole and must be unscrewed and removed first.
2. Move the "bypass valve" to the open position. See the diagram to reference the shaft and shaft arm position. Verify this by looking in the entering water connection if possible.
3. Adjust the linkage to fit the valve arms and connect with the pins.
4. Using the handle, rotate the actuator to the full CCW, 90 degree position.
5. Verify the "bypass valve" is fully closed. If not able to view in the entering water connection, temporarily remove the

linkage to verify the “bypass valve” arm will not move any further in the CW direction.

6. Add cotter pins to the clevis pin and tighten the adjuster nut.
7. Remove handle from actuator and return to storage position. Valve will not operate with handle in place. Make sure to replace the waterproof cap.

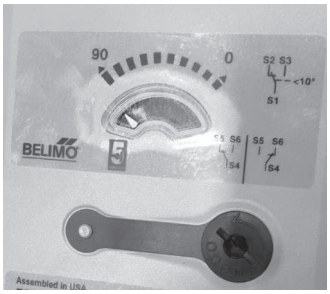


Actuator at “0” Full Clockwise Rotation

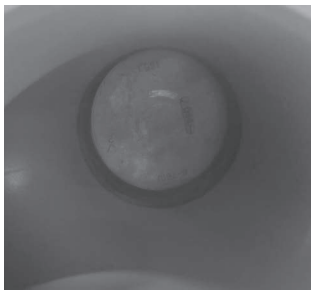
Valve Stem Position – Bypass Valve

Bypass Valve Open (Entering Water Connection)

Fig. 42 — Bypass Mode



Actuator at “90” Full CCW Rotation



Bypass Valve Closed (Entering Water Connection)

Fig. 43 — Free Cooling

Thermistor

Electronic control uses (3) 5 kΩ thermistors to sense temperatures used to control operation of the chiller. Thermistors for Entering Water Temperature (EWT), and Leaving Water Temperature (LWT) and Outdoor Air Temperature (OAT) are identical in their temperature and voltage drop performance.

Resistance at various temperatures are listed in Table 18. For dual chiller operation, a dual chiller sensor is required which is a 5 kΩ thermistor.

External Control Valve

Fan speed is used for leaving water temp control. In extreme conditions, the leaving water setpoint may be met with the fans at 0 Hz. In this condition the leaving water temperature may continue to drop until an alarm is tripped. The unit will return to bypass mode in the alarm condition. Once the water temp increases from the building load, the alarm will reset and the unit will go back into free cooling mode.

If more precise water temp control is desired, an external control valve may be added to bypass the water around the free cooling unit. This can be controlled by the unit controller. The controller will provide a 0 to 10V signal to the valve through terminal TB1-5 and 6.

Replacing Thermistors (EWT, LWT)

Add a small amount of thermal conductive grease to the thermistor well and end of probe. For all probes, tighten the retaining nut 1/4 turn past finger tight. See Fig. 44. Insulate the thermistor with cork tape or other appropriate insulating material.

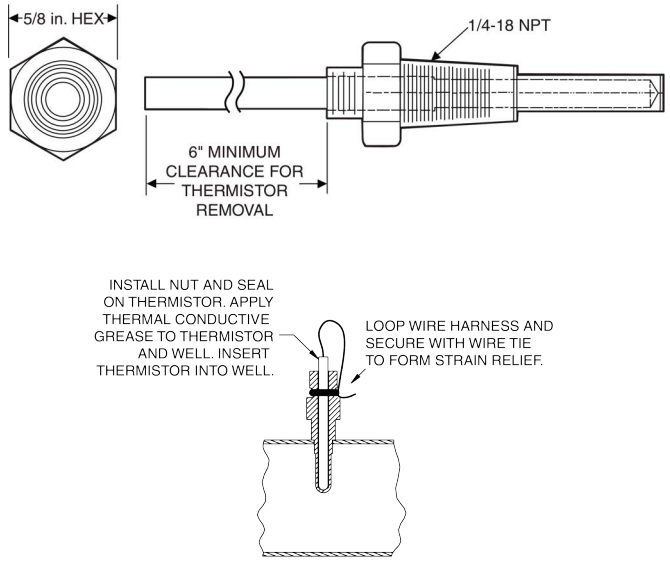


Fig. 44 — Thermistor Well (EWT, LWT) Thermistor Mounting

Replacing Thermistor (OAT)

The OAT thermistor is does not use a thermowell, the OAT should be in a location that is not affected by sunlight, providing an accurate outdoor air temperature. It should hang about 3 in. below the condenser section nearest the control panel.

Thermistor/Temperature Sensor Check

A high quality digital volt-ohmmeter is required to perform this check.

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J3 terminal strip on the controller. See Fig. 45.
2. Using the voltage reading obtained, read the sensor temperature from Table 18. Supply voltage to the thermistor should be 4 vdc ± 0.2 v with the thermistor disconnected from the controller.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5°F (3°C) if care was taken in applying thermocouple and taking readings.

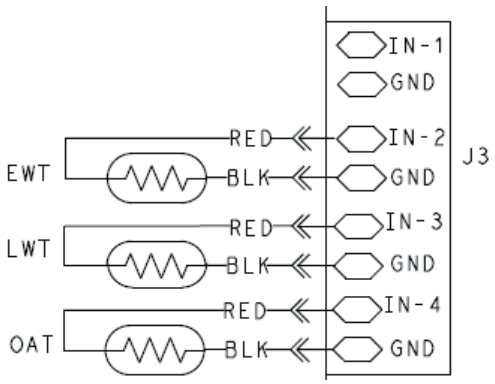


Fig. 45 — Thermistor Connections to Controller, J3

Table 18 — 5K Thermistor Temperature vs. Resistance

°F	°C	RESISTANCE, OHMS
–40	–40	166,781
–38	–39	156,158
–36	–38	146,275
–35	–37	137,078
–33	–36	128,514
–31	–35	120,536
–29	–34	113,101
–27	–33	106,170
–26	–32	99,705
–24	–31	93,672
–22	–30	88,041
–20	–29	82,781
–18	–28	77,868
–17	–27	73,275
–15	–26	68,980
–13	–25	64,963
–11	–24	61,203
–9	–23	57,683
–8	–22	54,387
–6	–21	51,299
–4	–20	48,404
–2	–19	45,689
0	–18	43,143
1	–17	40,754
3	–16	38,511
5	–15	36,404
7	–14	34,426
9	–13	32,566
10	–12	30,818
12	–11	29,173
14	–10	27,626
16	–9	26,171
18	–8	24,800
19	–7	23,509
21	–6	22,292
23	–5	21,146
25	–4	20,065
27	–3	19,045
28	–2	18,084
30	–1	17,177
32	0	16,320
34	1	15,511
36	2	14,746
37	3	14,024
39	4	13,341
41	5	12,695
43	6	12,084
45	7	11,506
46	8	10,959
48	9	10,441
50	10	9,951
52	11	9,486
54	12	9,046
55	13	8,628
57	14	8,232
59	15	7,857
61	16	7,500
63	17	7,152
64	18	6,841
66	19	6,536
68	20	6,247

Table 18 — 5K Thermistor Temperature vs. Resistance (cont)

°F	°C	RESISTANCE, OHMS
70	21	5,972
72	22	5,710
73	23	5,461
75	24	5,225
77	25	5,000
79	26	4,786
81	27	4,582
82	28	4,389
84	29	4,204
86	30	4,028
88	31	3,860
90	32	3,701
91	33	3,549
93	34	3,403
95	35	3,265
97	36	3,133
99	37	3,007
100	38	2,887
102	39	2,772
104	40	2,662
106	41	2,558
108	42	2,458
109	43	2,362
111	44	2,271
113	45	2,183
115	46	2,100
117	47	2,020
118	48	1,943
120	49	1,870
122	50	1,800
124	51	1,733
126	52	1,669
127	53	1,608
129	54	1,549
131	55	1,492
133	56	1,438
135	57	1,386
136	58	1,337
138	59	1,289
140	60	1,243
142	61	1,199
144	62	1,157
145	63	1,117
147	64	1,078
149	65	1,041
151	66	1,005
153	67	971
154	68	938
156	69	906
158	70	876
160	71	846
162	72	818
163	73	791
165	74	765
167	75	740
169	76	716
171	77	692
172	78	670
174	79	649
176	80	628
178	81	608
180	82	589

Table 18 — 5K Thermistor Temperature vs. Resistance (cont)

°F	°C	RESISTANCE, OHMS
181	83	570
183	84	552
185	85	535
187	86	518
189	87	502
190	88	487
192	89	472
194	90	458
196	91	444
198	92	431
199	93	418
201	94	405
203	95	393
205	96	382
207	97	370
208	98	360
210	99	349
212	100	339
214	101	329
216	102	320
217	103	311
219	104	302
221	105	293
223	106	285
225	107	277
226	108	269
228	109	262
230	110	255
232	111	248
234	112	241
235	113	234
237	114	228
239	115	222
241	116	216

Table 18 — 5K Thermistor Temperature vs. Resistance (cont)

°F	°C	RESISTANCE, OHMS
243	117	210
244	118	205
246	119	199
248	120	194
250	121	189
252	122	184
253	123	179
255	124	175
257	125	170
259	126	166
261	127	162
262	128	157
264	129	154
266	130	150
268	131	146
270	132	142
271	133	139
273	134	135
275	135	132
277	136	129
279	137	126
280	138	123
282	139	120
284	140	117
286	141	114
288	142	111
289	143	109
291	144	106
293	145	104
295	146	101
297	147	99
298	148	97
300	149	94
302	150	92

If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J3 terminal, by determining the resistance with unit shut down and thermistor disconnected from J3. Compare the values determined with the value read by the control in the Temperatures mode using the controller display.

Fan Blade and Fan Motor Service

A formed metal mount bolted to the coil caps supports each fan and motor assembly. A shroud and a wire grille provide protection from the rotating fan. See Figure 46. To remove the fan a special puller (RCD part no. 30RB680082) can be used. The fan utilizes a set screw and does not require the use of retaining compound in the keyway. The fan can be removed without the puller, but its use eases disassembly. The exposed end of the fan motor shaft is protected from weather by grease. If fan motor must be removed for service or replacement, re-grease the fan shaft. The fan needs to be positioned fully down against the step on the motor shaft. Apply blue thread locker (Loctite 243) to the threads of both the axial bolt and the set screw. Install the thick washer and M8 axial bolt; do not fully tighten. Install set screw and tighten to 16 ± 2 ft-lbs (21.7 ± 2.7 Nm). Torque the axial bolt to 24 ± 2 ft-lbs (32.5 ± 2.7 Nm). Reinstall shroud and wire grille.

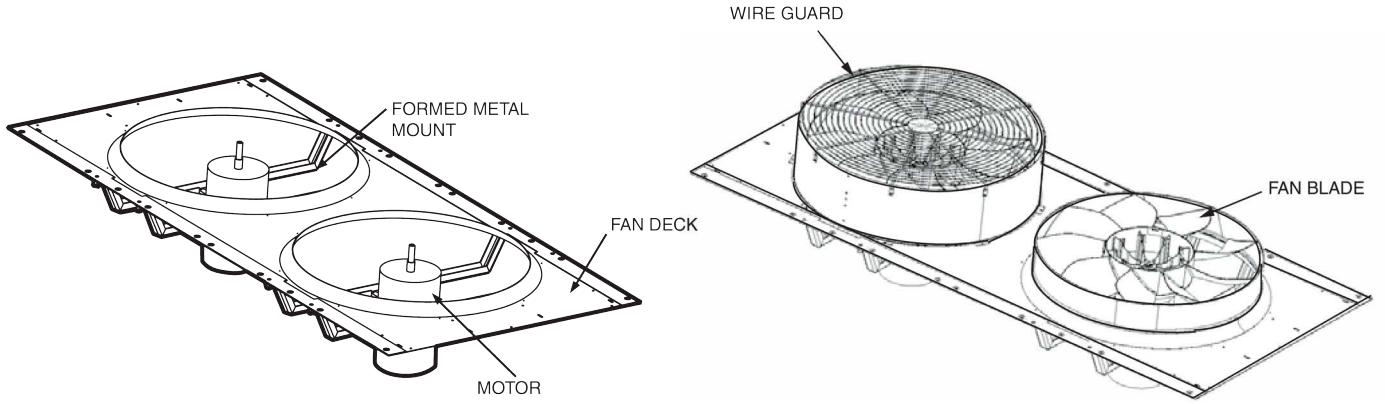


Fig. 46 — Fan Motor and Blade Mounting

Round Tube Plate Fin Condenser Coil Cleaning

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

Remove Surface Loaded Fibers

Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage to the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse

A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning is recommended.

Routine Cleaning of Coil Surfaces

Routine cleaning with Totaline® Indoor and Outdoor Coil Cleaner is essential to extend the life of coils. This cleaner is available from Carrier Replacement Components as part number P902-0301 for a one-gallon container, and part number P902-0305 for a 5-gallon container. It is recommended that all coils, including the standard copper tube aluminum fin or e-coated coils be cleaned with the Indoor and Outdoor Coil Cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline Indoor and Outdoor Coil Cleaner is non-flammable, hypoallergenic, nonbacterial, and a USDA accepted biodegradable agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces, or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

Totaline Indoor/Outdoor Coil Cleaner Instructions

REQUIRED EQUIPMENT

- 2-1/2 gallon garden sprayer
- Water rinse with low velocity spray nozzle

⚠CAUTION

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Totaline Indoor and Outdoor Coil Cleaner as described below.

⚠CAUTION

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

Application Instructions

1. Proper eye protection such as safety glasses is recommended during mixing and application.
2. Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
3. Thoroughly wet finned surfaces with clean water and a low velocity garden hose, being careful not to bend fins.
4. Mix Indoor and Outdoor Coil Cleaner in a 2-1/2 gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100°F (38°C).

   NOTE: Do NOT USE water in excess of 130°F (54.4°C), as the enzymatic activity will be destroyed.
5. Thoroughly apply Totaline Indoor and Outdoor Coil Cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
6. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
7. Ensure cleaner thoroughly penetrates deep into finned areas.
8. Interior and exterior finned areas must be thoroughly cleaned.

9. Finned surfaces should remain wet with cleaning solution for 10 minutes.
10. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.
11. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

Variable Frequency Drives

The 09FC units are equipped with VFDs to control the fan motors. The drives each include an LCD user interface display. This display will show the drive status and details of any alarm. The VFDs are configured at the factory and should not be changed. The settings are listed in Table 12 for reference.

The 09FC units use VFDs that operate by an enable signal and an analog (0-10Vdc) signal to the drive. Refer to schematic for connection details.

MAINTENANCE

Recommended Maintenance Schedule

The following are only recommended guidelines. Jobsite conditions may dictate that maintenance schedule is performed more often than recommended.

Routine:

- Periodic clean water rinse, especially in coastal and industrial applications.
- Check heat exchanger coils for debris, clean as necessary.

Every 3 months:

- Check all joints and valves for leaks, repair as necessary.
- Check chilled water flow switch operation.
- Check all fan motors for proper operation.

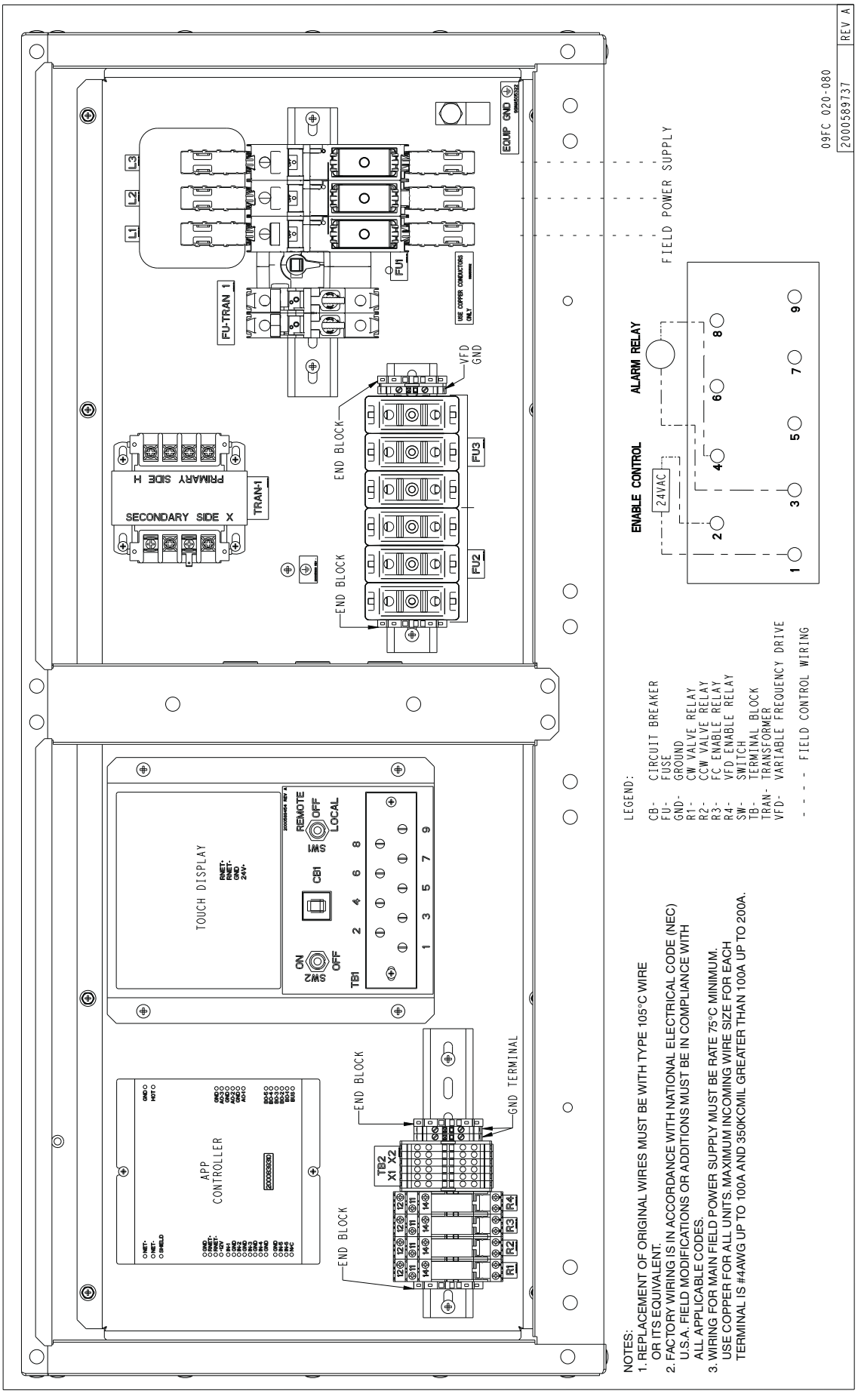
Every 12 months (for all machines):

- Check all electrical connections, tighten as necessary.
- Inspect all contactors and relays, replace as necessary.
- Check accuracy of thermistors, replace if greater than ± 2°F (1.2°C) variance from calibrated thermometer.
- Check to be sure that the proper concentration of antifreeze is present in the chilled water loop, if applicable.
- Verify that the chilled water loop is properly treated.
- Check chilled water strainers, clean as necessary.
- Check condition of condenser fan blades and that they are securely fastened to the motor shaft.
- Perform Service Test? to confirm operation of all components.
- Check for excessive cooler approach (Leaving Chilled Water Temperature - Ambient Temperature) which may indicate fouling. Clean heat exchanger/chilled water loop if necessary.

Coil Maintenance and Cleaning

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. See page 60.

APPENDIX A — CONTROL PANEL COMPONENT LAYOUT



APPENDIX B — 09FC FREE COOLING MODULE CONTROLLER

The following tables describe all of the possible settings for your controller on the i-Vu® or Field Assistant Properties tab.

NOTE: Some of the properties are available only when other settings have been enabled. See Table 8 for the points and properties available on the touchscreen interface.

NOTE: Engineering units shown in this document in the defaults and ranges are strictly for reference. You must enter an integer only.

Status

Navigation: i-Vu® / Field Assistant: Properties → Control Program → Status

Point Name – Description	Default/Range
Run Command – The module's current run command.	R: Stop/Run
Operating Mode – The module's current operating mode.	R: Bypass/Free Cool
Equipment Alarm – Indicates the controller has an active alarm. See **Service Configuration** for causes.	R: Normal/Alarm
Leaving Water Temp Setpoint – Displays the leaving water temperature's effective setpoint used to control the module fans.	R: 15 to 75°F
Outdoor Air Temperature – Displays the outdoor air temperature used for control.	R: -56 to 245°F
Valve Position – Displays the current position of the module's bypass valve. This value is associated with the floating motor output.	R: Close/Open
Bypass Valve Position – Displays the current position of the module's bypass valve. This value is associated with the analog output.	R: 0 to 100%
Fan VFD Enable – Displays the current command of the module fans' variable frequency drive.	R: Stop/Start
Fan VFD Speed – Displays the current speed of the module's fans.	R: 0 to 100%
Shutdown – When **Active**, provides a means to stop the module in an orderly manner. All alarms are reset and current active alarms are displayed.	D: Inactive R: Inactive/Active

Unit Configuration

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Configuration > Unit Configuration

Point Name – Description	Default/Range
Cool Enable – Enables or disables cooling operation.	D: Enable R: Disable/Enable
Lvg Wtr Temp Setpoint OA Reset – Enables OA reset of the leaving water temperature's setpoint.	D: Disable R: Disable/Enable
OAT LWT Setpoint Reset Low Limit – The lowest outdoor air temperature which resets the leaving water temperature.	D: 70°F R: __°F
OAT LWT Setpoint Reset High Limit – The highest outdoor air temperature which resets the leaving water temperature.	D: 90°F R: __°F
Maximum LWT Setpoint OA Reset – The highest leaving water temperature setpoint reset allowed by the outdoor air temperature.	D: 10°F R: 0 to 25°F
Power Fail Restart Delay – The amount of time the controller delays normal operation after the power is restored.	D: 20 seconds R: 0 to 600 seconds
Occupancy Schedules – Enables or disables the occupancy schedule function.	D: Disable R: Disable/Enable
Sensor Calibration	
Leaving Water Temperature – The current leaving water temperature.	R: -56 to 245°F
Leaving Water Temp Sensor Calibration – A calibration offset value that allows for adjusting the local leaving water temperature sensor to match a calibrated standard that is measuring the temperature in the same location.	D: 0°F R: -10 to 10°F
Entering Water Temperature – The current leaving water temperature.	R: -56 to 245°F
Entering Water Temp Sensor Calibration – A calibration offset value that allows for adjusting the local entering water temperature sensor to match a calibrated standard that is measuring the temperature in the same location.	D: 0°F R: -10 to 10°F
Outdoor Air Temperature – The current outdoor air temperature.	R: -56 to 245°F
Outdoor Air Temp Sensor Calibration – A calibration offset value that allows for adjusting the local outdoor air temperature sensor to match a calibrated standard that is measuring the temperature in the same location.	D: 0°F R: -10 to 10°F

Setpoints

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Configuration > Setpoints

Point Name – Description	Default/Range
Leaving Water Temperature	
Leaving Water Temp Setpoint – The leaving water temperature setpoint maintained by the module.	D: 44°F R: 15 to 75°F
Leaving Water Temp Setpoint Offset – An offset value that allows for adjusting the leaving water temperature setpoint received by the **System Control Setpoint** or written by a Third Party.	D: 0°F R: -5 to 5°F
Leaving Water Temp Bypass Setpoint – The number of degrees that the leaving water temperature must drop below setpoint to enable modulation of the module's bypass valve.	D: 2°F R: 0 to 5°F
Outdoor Air Temperature	
Outdoor Air Temp Setpoint – The outdoor air temperature below which the module is allowed to operate.	D: 50°F R: -20 to 80°F
OAT Offset Setpoint – The number of degrees that the outdoor air temperature must rise above setpoint to disable the module's operation.	D: 3°F R: 1 to 10°F
Cooling Demand Limit	
Demand Level 1 Cool Adj – The leaving water temperature setpoint is increased by this number of degrees when receiving a Demand Level 1 signal.	D: 1°F R: 0 to 10°F
Demand Level 2 Cool Adj – The leaving water temperature setpoint is increased by this number of degrees when receiving a Demand Level 2 signal.	D: 2°F R: 0 to 10°F
Demand Level 3 Cool Adj – The leaving water temperature setpoint is increased by this number of degrees when receiving a Demand Level 3 signal.	D: 3°F R: 0 to 10°F

Alarm Configuration

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Configuration > Alarm Configuration

Point Name – Description	Default/Range
Leaving Water Temperature Alarm	
Low Leaving Water Temp Alarm Limit – The **Leaving Water Temp** must drop below this value to generate a **Leaving Water Temperature Alarm**. There is a fixed hysteresis of 2Δ°F for return to normal. **NOTE**: This value should be set to at least 4°F below the configured leaving water temperature setpoint.	D: 42°F R: -45 to 45°F
High Leaving Water Temp Alarm Limit – The **Leaving Water Temp** must rise above this value to generate a **Leaving Water Temperature Alarm**. There is a fixed hysteresis of 2Δ°F for return to normal. **NOTE**: This value should be set to at least 10°F above the configured leaving water temperature setpoint.	D: 125°F R: -20 to 150°F
Entering Water Temperature Alarm	
Low Entering Water Temp Alarm Limit – The **Entering Load Water Temp** must drop below this value to generate an **Entering Water Temperature Alarm**. There is a fixed hysteresis of 2Δ°F for return to normal.	D: 42°F R: -45 to 45°F
High Entering Water Temp Alarm Limit – The **Entering Load Water Temp** must rise above this value to generate an **Entering Water Temperature Alarm**. There is a fixed hysteresis of 2Δ°F for return to normal.	D: 125°F R: 90 to 150°F
Outdoor Air Temperature Alarm	
Low Outdoor Air Temp Alarm Limit – The **Outdoor Air Temperature** must drop below this value to generate an **Outdoor Air Temperature Alarm**. There is a fixed hysteresis of 1Δ°F for return to normal.	D: -65°F R: -65 to 40°F
High Outdoor Air Temp Alarm Limit – The **Outdoor Air Temperature** must rise above this value to generate an **Outdoor Air Temperature Alarm**. There is a fixed hysteresis of 1Δ°F for return to normal.	D: 245°F R: 100 to 245°F

Service Configuration

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Configuration > Service Configuration

Point Name – Description	Default/Range
Remote Contact Normal Logic State – Specifies the remote contact's normal logic state.	D: Open R: Open/Closed
Fan VFD Run Status Normal Logic State – Specifies the fan's variable frequency drive run status normal logic state.	D: Open R: Open/Closed
Fan VFD Output Type – Defines the type of fan variable frequency drive output control.	D: 0-10V R: 0-10V/2-10V
Fan Initial Start Speed – The speed that the module's fans are briefly run on initial startup.	D: 100% R: 0 to 100%
Fan Minimum Speed – The lowest speed that the module's fan is commanded when the fans' variable frequency drive is enabled.	D: 20% R: 0 to 100%
Fan Speed PID – This BACnet Object calculates the amount of fan speed required to satisfy the **Leaving Water Temp Setpoint** and allows access to the control loop's tuning parameters. **NOTE**: The following default values should be changed only by a technician trained in tuning PI Action direct Update Interval 1:00 mm:ss Proportional 10 Integral 5 Derivative 0 Deadband 0 Bias 0	D Loop algorithms. R: 0 to 100%
Bypass Valve Type – Defines the type of bypass valve analog output control.	D: 0-10V R: 0-10V/2-10V
Bypass Valve PID – This BACnet Object calculates the amount of bypass required to satisfy the **Leaving Water Temp Setpoint** when bypass valve modulation is enabled and allows access to the control loop's tuning parameters. NOTE The following default values should be changed only by a technician trained in tuning PI Action reverse Update Interval 1:00 mm:ss Proportional 10 Integral 2 Derivative 0 Deadband 0 Bias 0	D Loop algorithms. R: 0 to 100%
System Cool Demand Level – The system cool demand level being received over the network.	D: 0.00 R: 0 to 3
System Leaving Water Temperature – Allows using another controller's leaving water temperature sensor value (system water temperature), to be read over the network. The remote controller must have a network-accessible leaving water temperature sensor value.	D: -999°F R: -25 to 125°F
System Entering Water Temperature – Allows using another controller's entering water temperature sensor value (system water temperature), to be read over the network. The remote controller must have a network-accessible entering water temperature sensor value.	D: -999°F R: -25 to 125°F
System Outdoor Air Temperature – Allows using another controller's outdoor air temperature value over the network. The remote controller must have a network accessible outdoor air temperature sensor value.	D: -999°F R: -50 to 150°F
System Control Setpoint – Allows using another controller's Control Setpoint value to be read over the network. The remote controller must have a network-accessible point.	D: -999°F R: -20 to 65°F
System Occupancy – Allows reading and using another controller's occupancy status value over the network. The remote controller must have a network-accessible Occupancy Status point.	D: Unoccupied R: Unoccupied/Occupied
Equipment Alarm Lamp Initiators	
Lvg Water Temp Alarm – When set to **Enable**, any Leaving Water Temperature Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Lvg Wtr Sensor Fail Alarm – When set to Enable, any Leaving Water Temperature Sensor Failure Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable
Ent Water Temp Alarm – When set to **Enable**, any Entering Water Temperature Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Ent Wtr Sensor Fail Alarm – When set to **Enable**, any Entering Water Temperature Sensor Failure Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Outdoor Air Temp Alarm – When set to **Enable**, any Outdoor Air Temperature Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Outdoor Air Sensor Fail Alarm – When set to **Enable**, an Outdoor Air Temperature Sensor Failure Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Fan VFD Fail Alarm – When set to **Enable**, a Fan VFD Failure Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Lvg Water Temp Hi Alarm – When set to **Enable**, a High Leaving Water Temperature Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Negative DeltaT Alarm – When set to **Enable**, a Negative Differential Temperature Alarm indicated by the controller also initiates an **Equipment Alarm** and energizes the **Alarm Lamp** binary output.	D: Enable R: Disable/Enable
Service Test	
Service Test – When set to **Enable**, any output can be overridden for up to 5 minutes. The **Service Test** has a 1 hour timeout.	D: Disable R: Disable/Enable

Point Name – Description	Default/Range
Fan VFD Enable Test – When set to **Enable**, **Binary Output #4** is enabled for up to 5 minutes.	D: Disable R: Disable/Enable
Fan VFD Speed % Test – When set to a value greater than 0, **Analog Output #1** is enabled for up to 5 minutes. **Binary Output #4** is also enabled with this test.	D: Disable R: Disable/Enable
Bypass Valve Test – When set to **Enable**, **Binary Output #2** is enabled for up to 5 minutes to open the bypass valve. When set to **Disable**, **Binary Output #1** is enabled to close the bypass valve.	D: Disable R: Disable/Enable
Bypass Valve % Test – When set to a value greater than 0, **Analog Output #2** is enabled for up to 5 minutes.	D: Disable R: Disable/Enable
Alarm Indicator Test – When set to **Enable**, **Binary Output #3** is enabled for up to 5 minutes.	D: Disable R: Disable/Enable

Maintenance

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Maintenance

Point Name — Description	Default/Range
Unit	
Fan VFD Run Status — Indicates that the fans', variable frequency drive is running.	R: Off/On
Ext Demand Limit Status — The external demand limit input status.	R: Off/On
Leaving Water Temp — The current leaving water temperature value.	R: -56 to 245F
Entering Water Temp — The current entering water temperature value.	R: -56 to 245F
Leaving Water Temp Source — The source of the **Leaving Water Temp** value. States: - **N/A** - No sensor value associated with this device - **Local** - A physical sensor is wired and connected to the appropriate input channel of this controller - **Network** - A network sensor value provided to this controller - **Locked Value** - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Locked Value
Entering Water Temp Source — The source of the **Entering Water Temp** value. States: - **N/A** - No sensor value associated with this device - **Local** - A physical sensor is wired and connected to the appropriate input channel of this controller - **Network** - A network sensor value provided to this controller - **Locked Value** - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Locked Value
Outdoor Air Temp Source - The source of the **Outdoor Air Temp** value. States: - **N/A** - No sensor value associated with this device - **Local** - A physical sensor is wired and connected to the appropriate input channel of this controller - **Network** - A network sensor value provided to this controller - **Locked Value** - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Locked Value
Control Setpoint Source — The control setpoint value's source. States: - **Local** - The leaving water temperature setpoint software point - **Network** - A network value provided to this controller	R: Local Network Occupancy
Occupancy Status — The module's occupancy status.	R: Unoccupied/Occupied
BAS On/Off — Determines the occupancy state of the controller and can be set over the network by another device or third party BAS. Options: - **Inactive** — Occupancy is determined by a remote contact - **Occupied** — The controller is always in the occupied mode - **Unoccupied** — The controller is always in the unoccupied mode	D: Inactive R: Inactive Occupied Unoccupied
Schedules — The controller's occupancy status based on the local schedule.	R: Unoccupied/Occupied
Remote Contact — The current status of Input Channel #4.	R: Inactive/Active
Global Occupancy — The System Occupancy network input's current state.	D: Unoccupied R: Unoccupied/Occupied
Reset	
Cooling Supply Setpoint Reset — The leaving water temperature setpoint's current reset method.	R: Inactive OAT Reset Demand Limit
Calculated OA Clg Reset — Based on outdoor air temperature, the amount of cooling reset.	R: __F
Demand Limit	
Ext Demand Limit — The current status of Input Channel #6.	R: Inactive/Active
System Cooling Demand Level — This module's system cool demand level currently in effect.	R: 0 to 3

Alarms

Navigation: i-Vu® / Field Assistant: Properties > Control Program > Alarms

Point Name – Description	Range
Equipment Alarm – Indicates if the unit is in a general equipment alarm.	R: Normal/Alarm
Leaving Water Temperature – Indicates if the leaving water temperature exceeds the high or low alarm limits.	R: Normal/Alarm
Entering Water Temperature – Indicates if the entering water temperature exceeds the high or low alarm limits.	R: Normal/Alarm
Outdoor Air Temperature – Indicates if the outdoor air temperature exceeds the high or low alarm limits.	R: Normal/Alarm
Leaving Water Temp Sensor – Indicates if the leaving water temperature sensor fails.	R: Normal/Alarm
Entering Water Temp Sensor – Indicates if the entering water temperature sensor fails.	R: Normal/Alarm
Outdoor Air Temp Sensor – Indicates if the outdoor air temperature sensor fails.	R: Normal/Alarm
Fan VFD Fail Alarm – Indicates if the fan variable frequency drive is commanded On while its running status is Off.	R: Normal/Alarm
Lvg Water Temp Hi Alarm – Indicates if the leaving water temperature exceeds the outdoor air temperature.	R: Normal/Alarm
Negative DeltaT Alarm – Indicates if the leaving water temperature exceeds the entering water temperature.	R: Normal/Alarm

I/O Points

Navigation: i-Vu® / Field Assistant: Properties > Control Program > I/O Points

⚠ WARNING

Do not change the **Value**, **Offset/Polarity**, **Exp:Num**, **I/O Type**, **Sensor/Actuator Type**, **Min/Max**, or **Resolution** I/O configuration parameter for the points listed below. Changing these parameters could cause improper control and/or equipment damage.

Use extreme caution if locking a point as this may also cause improper control and/or equipment damage.

Point Name – Description	Range
Remote Contact – The remote contact input's current state.	R: Open/Close
OAT Sensor – The value of the controller's outdoor air temperature sensor input, prior to any operator-configured Calibration Offset.	R: -56 to 245°F
Leaving Water Temp – The value of the controller's leaving water temperature sensor input, prior to any operator-configured **Calibration Offset**.	R: -56 to 245°F
Entering Water Temp – The value of the controller's entering water temperature sensor input, prior to any operator-configured **Calibration Offset**.	R: -56 to 245°F
Fan VFD Run Status – The fan VFD status input's current state.	R: Off/On
Ext Demand Limit – The external demand limit input's current state.	R: Off/On
Fan VFD Speed – The assigned output channel's current commanded, configuration dependent, fan VFD speed output.	R: 0 to 100%
Bypass Valve – The assigned output channel's current commanded, configuration dependent, bypass valve analog output.	R: 0 to 100%
Valve Command – The assigned output channel's current commanded, configuration dependent, valve floating motor binary outputs.	R: Close/Open
Alarm Lamp – The assigned output channel's current commanded, configuration dependent, alarm output.	R: Off/On
Fan VFD Enable – The assigned output channel's current commanded, configuration dependent, fan VFD enable output.	R: Off/On

09FC Free Cooling Module Controller Start-Up Wizard

Navigation: Equipment Touch Startup Wizard

Point Name – Description	Default/Range
Cool Enable – Enables or disables cooling operation.	D: Enable R: Disable/Enable
Leaving Water Temp Setpoint – The leaving water temperature setpoint maintained by the module.	D: 44°F R: 15 to 75°F
Outdoor Air Temp Setpoint – The outdoor air temperature below which the module is allowed to operate.	D: 50°F R: -20 to 80°F
OAT Offset Setpoint – The number of degrees that the outdoor air temperature must rise above setpoint to disable the module's operation.	D: 3°F R: 1 to 10°F
Remote Contact Normal Logic State – Specifies the remote contact's normal logic state.	D: Open R: Open/Closed
Fan VFD Run Status Normal Logic State – Specifies the fan's variable frequency drive run status normal logic state.	D: Open R: Open/Closed
Fan VFD Output Type – Defines the type of fan variable frequency drive output control.	D: 0-10V R: 0-10V/2-10V
Fan Initial Start Speed – The speed that the module's fans are briefly run on initial startup.	D: 100% R: 0 to 100%
Fan Minimum Speed – The lowest speed that the module's fan is commanded when the fans' variable frequency drive is enabled.	D: 20% R: 0 to 100%
Fan Speed PID – This BACnet Object calculates the amount of fan speed required to satisfy the **Leaving Water Temp Setpoint** and allows access to the control loop's tuning parameters. **NOTE**: The following default values should be changed only by a technician trained in tuning PID Loop algorithms. Action direct Update Interval 1:00 mm:ss Proportional 10 Integral 5 Derivative 0 Deadband 0 Bias 0	R: 0 to 100%
Bypass Valve Type – Defines the type of bypass valve analog output control.	D: 0-10V R: 0-10V/2-10V
Bypass Valve PID – This BACnet Object calculates the amount of bypass required to satisfy the Leaving Water Temp Setpoint when bypass valve modulation is enabled and allows access to the control loop's tuning parameters. **NOTE**: The following default values should be changed only by a technician trained in tuning PID Loop algorithms. Action reverse Update Interval 1:00 mm:ss Proportional 10 Integral 2 Derivative 0 Deadband 0 Bias 0	R: 0 to 100%
Lvg Wtr Temp Setpoint OA Reset – Enables OA reset of the leaving water temperature's setpoint.	D: Disable R: Disable/Enable
Maximum LWT Setpoint OA Reset – The highest leaving water temperature setpoint reset allowed by the outdoor air temperature.	D: 10°F R: 0 to 25°F

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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START-UP CHECKLIST FOR 09FC WATERSIDE ECONOMIZER

(Remove and use for Job File)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation, Start-Up and Maintenance document.

A. PROJECT INFORMATION

Job name _____

Address _____

City _____State ____Zip_____

Equipment tag/mark for_____

Installing contractor_____

Sales office _____

Start-up performed by_____

Unit

Model _____ Serial_____

B. PRELIMINARY EQUIPMENT CHECK (This section to be completed by installing contractor)

1. Is there any physical damage?	☐ Yes	☐ No
Will this prevent start-up?	☐ Yes	☐ No
Description:		
2. Power supply agrees with the unit nameplate.	☐ Yes	☐ No
3. Correct control voltage _____vac.	☐ Yes	☐ No
4. Electrical power wiring is installed properly.	☐ Yes	☐ No
5. Unit is properly grounded.	☐ Yes	☐ No
6. Electrical circuit protection has been sized and installed properly.	☐ Yes	☐ No
7. All terminals are tight.	☐ Yes	☐ No
8. All plug assemblies are tight.	☐ Yes	☐ No
9. All cables and thermistors have been inspected for cross wires.	☐ Yes	☐ No
10. All thermistors are installed and fully inserted into wells.	☐ Yes	☐ No

Chilled Water System Check

1. All water valves are open.	☐ Yes	☐ No
2. All piping is connected properly.	☐ Yes	☐ No
3. All air has been purged from the system.	☐ Yes	☐ No
4. Units installed in open loop: inlet piping to evaporator includes a 20 mesh strainer within 10 ft of unit.	☐ Yes	☐ No
5. Water loop volume greater than 3 gal/ton (40 L/kW) for air conditioning or 6 gal/ton (80 L/kW) for process cooling and low ambient operation.	☐ Yes	☐ No
6. Proper loop freeze protection provided to ____ °F (°C). Antifreeze type_____ Concentration _____%.	☐ Yes	☐ No

C. UNIT START-UP

1. Voltage at terminal block is within unit nameplate range. ☐ Yes ☐ No

   Check voltage imbalance: A-B_____ A-C_____B-C_____

   Average voltage = _____ (A-B + A-C + B-C)/3
   Maximum deviation from average voltage = _____
   Voltage imbalance = _____% (max. deviation / average voltage) X 100

   Is voltage imbalance less than 2%. ☐ Yes ☐ No

   (DO NOT start unit if voltage imbalance is greater than 2%.
   Contact local utility for assistance.)

2. Verify flow rate (Set unit in free cooling mode prior to setting flow rate.)

   Pressure entering unit _____ psig (kPa)

   Pressure leaving unit _____ psig (kPa)

   Unit pressure drop _____ psig (kPa)

   Psig x 2.31 ft/psi = _____ ft of water

   kPa x 0.334 m/psi = _____ mm of water

   Evaporator flow rate _____ gpm (L/s) (See Evaporator Pressure Drop Curve)

Start and Operate Machine

1. Complete component test utilizing Service Test Mode
2. Operate all fans and verify operation and rotation.
3. Operate 3-way valve.
4. Record condenser fan motor current.
5. Provide operating instructions to owner's personnel.

COMMENTS:

SIGNATURES:

Start-up Technician _____ Date_____

Customer Representative _____ Date_____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE