

19DV Centrifugal Water-Cooled Liquid Chiller



Installation, Operation and Maintenance Instructions

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Installation, Operation and Maintenance Instructions

SAFETY CONSIDERATIONS

Centrifugal liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel. Be sure you understand and follow the procedures and safety precautions contained in the machine instructions, as well as those listed in this guide.

! DANGER

Failure to follow these procedures will result in severe personal injury or death.

DO NOT VENT refrigerant relief devices within a building. Outlet from safety valve must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE 15 (American National Standards Institute/ American Society of Heating, Refrigerating and Air-Conditioning Engineers) (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

PROVIDE adequate ventilation in accordance with ANSI /ASHRAE 15, especially for enclosed and low overhead spaces. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with grease, and other common substances.

DO NOT USE air to leak test. Use only refrigerant or dry nitrogen.

NEVER EXCEED specified test pressures. VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.

DO NOT VALVE OFF any safety device.

BE SURE that all pressure relief devices are properly installed and functioning before operating any machine.

RISK OF INJURY OR DEATH by electrocution. High voltage is present on motor leads even though the motor is not running when a solid state or inside-delta mechanical starter is used. Open the power supply disconnect before touching motor leads or terminals.

! WARNING

Failure to follow these procedures may result in personal injury or death.

DO NOT USE TORCH to remove any component. System contains refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

1. Shut off with LOTO the electrical power to unit.
2. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
3. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
4. Cut component connection tubing with tubing cutter and remove component from unit.
5. Carefully remove remaining tubing stubs if necessary. Inhibitor can ignite when exposed to torch flame.

DO NOT USE eye bolts or eye bolt holes to rig machine sections or the entire assembly.

DO NOT work on high-voltage equipment unless you are a qualified electrician.

DO NOT WORK ON electrical components, including control panels, switches, or VFD until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, confirm that all circuits are de-energized before resuming work.

AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. This can result in high and dangerous pressure. When it is necessary to heat refrigerant, use only warm water not over 100°C.

DO NOT REUSE disposable (nonreturnable) cylinders or attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, evacuate remaining gas pressure, loosen the collar, and unscrew and discard the valve stem. DO NOT INCINERATE.

CHECK THE REFRIGERANT TYPE before adding refrigerant to the machine. Charging of wrong refrigerant can cause machine damage or malfunction.

INTRODUCTION

Prior to initial start-up of the 19DV unit, those involved in the start-up, operation, and maintenance should be thoroughly familiar with these instructions and other necessary job data. This book is outlined to familiarize those involved in the start-up, operation, and maintenance of the unit with the control system before performing start-up procedures. Procedures in this manual are arranged in the sequence required for proper chiller start-up and operation.

! CAUTION

This unit uses a dual microprocessor control system. Do not short or jump between terminals on circuit boards or modules; it may result in control or board failure.

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

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. The PIC 5+ control boards have been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN 61000-3-2 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.

ABBREVIATIONS AND EXPLANATIONS

Frequently used abbreviations in this manual include:

CCN	— Carrier Comfort Network®
CCW	— Counter Clock Wise
CW	— Clock Wise
ECDW	— Entering Condenser Water
ECW	— Entering Chilled Water
EMS	— Energy Management System
SI	— International System of Units
IOB	— Input/Output Board
HMI	— Human Machine Interface
I/O	— Input/Output
ISM	— Integrated Starter Module
LCD	— Liquid Crystal Display
LCDW	— Leaving Condenser Water
LCW	— Leaving Chilled Water
LED	— Light-Emitting Diode
OLTA	— Overload Trip Amps
PIC 5+	— Product Integrated Controls 5 plus
RLA	— Rated Load Amps
SCR	— Silicon Controlled Rectifier

SI	— International System of Units
VFD	— Variable Frequency Drive
IOB	— Input/Output Board
CHWR	— Chilled Water Return
CHWS	— Chilled Water Supply

Chiller Familiarization

Chiller Information Nameplate — The information nameplate is located on the left side of the chiller control panel. (Refer Fig. 1 for model number identification)

System Components — The main components include the cooler and condenser heat exchangers in separate vessels, compressor, refrigerant lubrication system, control panel, economizer, VFD and purge system. All connections from pressure vessels have external threads or flanges to enable each component to be pressure tested with a threaded pipe cap or flange cover during factory assembly. (Refer Fig. 2.)

Cooler — This heat exchanger (also known as the cooler) is located underneath the compressor. The cooler is maintained at lower refrigerant temperature /pressure so evaporating refrigerant can remove heat from water flowing through its internal tubes.

Condenser — This heat exchanger operates at a higher refrigerant temperature/pressure than the cooler and has water flowing through its internal tubes in order to remove heat from the refrigerant.

Compressor — This component maintains system temperature and pressure differences and moves the heat carrying refrigerant from the cooler to the condenser. The 19DV has a back to back two-stage, direct driven, and economized compressor.

Economizer — This chamber reduces the refrigerant temperature to an intermediate level between the cooler and condenser vessels. In the economizer, vapor is separated from the liquid, the separated vapor flows to the second stage of the compressor, and the liquid flows into the cooler. The energy removed from the vaporized refrigerant in the economizer allows the liquid refrigerant in the cooler to absorb more heat when it evaporates and benefits the overall cooling efficiency cycle.

VFD — The VFD provides variable frequency to the compressor motor. It is controlled and monitored from the PIC 5+ control system.

Purge System — The purge is an independent assembly located under condenser. Because chiller system components operate in a vacuum, if air leaks into the chiller, this assembly will automatically remove the air to maintain the chiller performance. It is controlled through the PIC 5+ control system.

PIC5+ Touch Screen Panel — This panel is the user interface for controlling the chiller and has the following functions:

1. Chiller operation
2. Chiller diagnostic
3. Chiller status display
4. Chiller parameter configuration
5. Provide open protocol interface to outside BMS system

Control Panel — This control panel includes the input and output boards (IOB), control transformer, relays, contactors, and circuit breakers. It provides the power distribution and protection to the electrical components which installed on chiller and has the following functions:

1. Communication with PIC5+ touch screen,
2. Communication with purge panel
3. Communication with VFD
4. Sensor input and outputs
5. Actuators control
6. Refrigerant Pump Control

1. Communication with PIC5+ touch screen
2. Sensor input and outputs
3. Solenoid valve control
4. Purge compressor, vacuum pump, heater, fan control

Purge Control Panel — The purge panel includes the Starfire2 input and output boards (SIOB), control transformer, relays, and fuse. It provides the power distribution and protection to the electrical components which installed in the purge system and has the following functions:

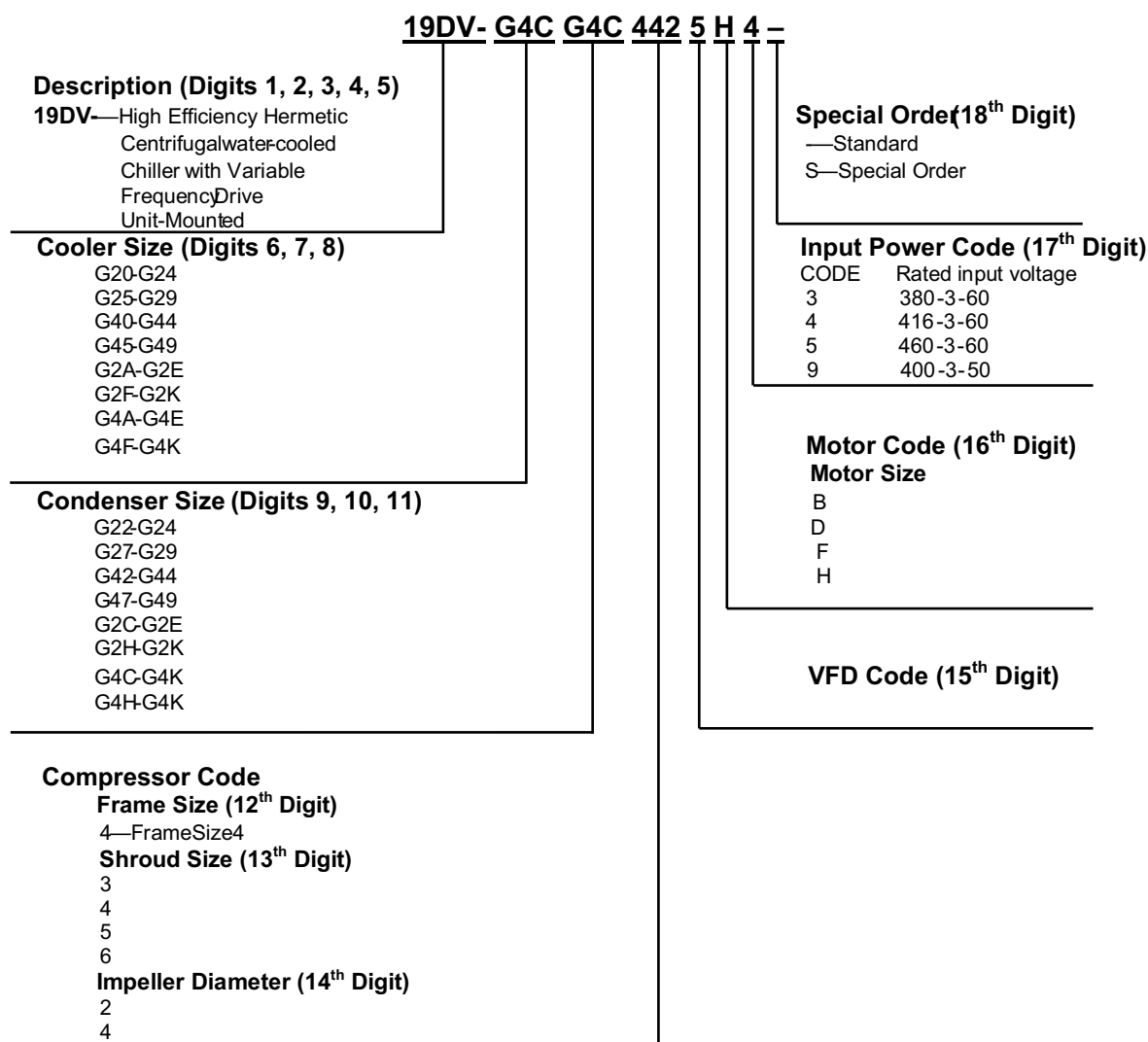
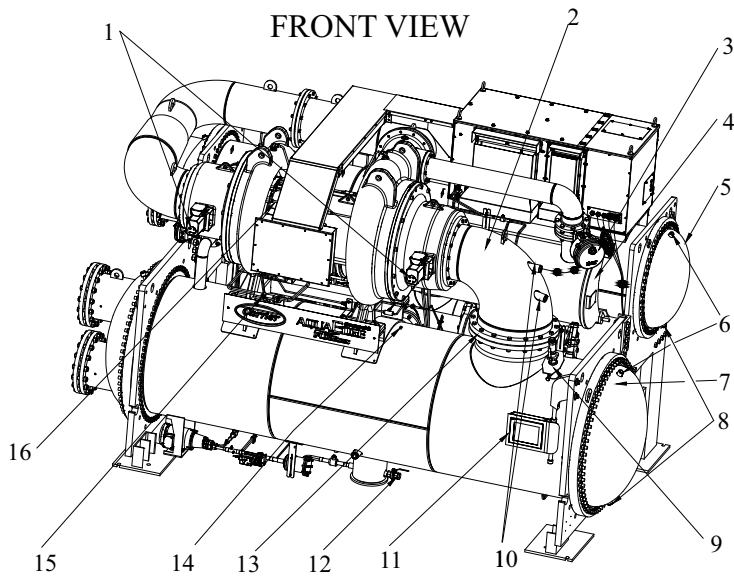
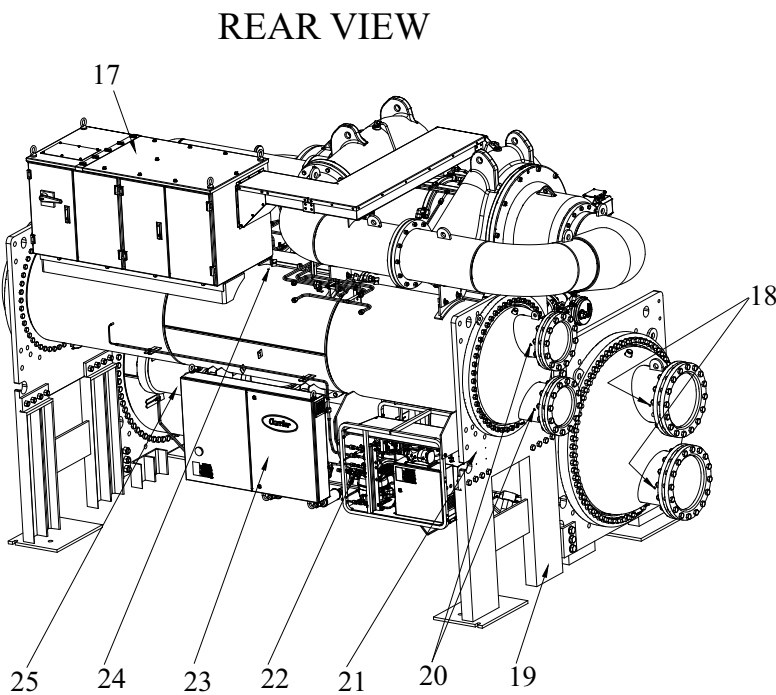


Fig. 1 —19DV Model Number Identification



LEGEND

- 1. Guide Vane Actuator
- 2. 1st Stage Suction Elbow
- 3. Economizer Isolation Valve (Option)
- 4. Economizer
- 5. Condenser Return End Waterbox Cover
- 6. Waterbox Gas Drain Port
- 7. Cooler Return End Waterbox Cover
- 8. Waterbox Water Drain Port
- 9. Cooler Auto. Reset Safety Valves
- 10. Sight Glasses
- 11. PIC 5+ Touch Screen
- 12. Refrigerant Charging Valve
- 13. Typical Flange Connection
- 14. Cooler Pressure Transducer
- 15. Refrigerant Moisture/ Flow Indicator
- 16. Motor



LEGEND

- 17. VFD
- 18. Cooler In/Out Temperature Thermistor
- 19. Vessel Take-Apart Connector
- 20. Condenser In/Out Temperature Thermistor
- 21. ASME Nameplate
- 22. Purge System
- 23. Control Panel
- 24. Condenser Pressure Transducer
- 25. Chiller Name plate

Fig. 2 — Typical 19DV Components

INSTALLATION

Step 1—Receive the Machine — Inspect shipment

! CAUTION

Do not open any valves or loosen any connections. The 19DV machine is shipped with 103.4kPa positive nitrogen pressure.

1. Inspect for shipping damage while machine is still on shipping conveyance. If machine appears to be damaged or has been torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim directly to transportation company. Manufacturer is not responsible for any damage incurred in transit.
2. Check all items against shipping list. Immediately notify the local Carrier representative if any item is missing.
3. To prevent loss or damage, leave all parts in original packages until installation begins. All openings are protected with covers or plugs to prevent dirt and debris from entering machine components during shipping.

Identify Machine — The machine model number, serial number, and heat exchanger sizes are stamped on the chiller name plate located on the left side of the control panel (**Fig. 1-2**). Check this **Installation Requirements** — Certain requirements such as Input power wire sizes, branch circuit protection, and control wiring should be checked before continuing with the chiller's electrical installation.

Determining Wire Size Requirements — Wire size should be determined based on the chiller selection data, and applicable local, national, and international codes. General recommendations are included in the Carrier field wiring drawings.

Conduit Entry Size — It is important to determine the size of the conduit openings in the enclosure power entry plate so that the wire planned for a specific entry point will fit through the opening. DO NOT punch holes or drill into the top surface of the VFD (variable frequency drive) enclosure for field wiring. Knockouts are provided on the side of the VFD enclosure for field control wiring connections.

Recommended Control and Signal Wire

Sizes — The recommended minimum size wire to connect I/O signals to the control terminal blocks is 18AWG (American Wire Gauge).

Recommended VFD Airflow Clearances

Be sure there is adequate clearance for air circulation around the enclosure. A 152.4 mm minimum clearance is required wherever vents are located in the VFD enclosure.

Service Clearances — Verify that there are adequate service clearances as identified in **Fig. 4**.

Verify Adequate Power Supply — It is important to verify that building power will meet the input power requirements of the Machine Electrical Data nameplate input power rating. Be sure the input power to the chiller corresponds to the chiller's nameplate voltage, current, and frequency. The machine electrical data nameplate is located on the **Provide Machine Protection** — Store machine and VFD indoors, protected from construction dirt and moisture. Inspect under shipping tarps, bags, or crates to be sure that water has not collected during transit. Keep protective shipping covers in place until machine is ready for installation.

! CAUTION

Freezing water can damage equipment. If machine can be or possibly has been exposed to freezing temperatures after water circuits have been installed, open waterbox drain and remove all water from cooler and condenser. Leave drains open until system is filled.

It is important to properly plan before installing a 19DV unit to ensure that the environmental and operating conditions are satisfactory and the machine is protected. The installation must comply with all requirements in the certified prints.

Operating Environment — Chiller should be installed in an indoor environment where the ambient temperature is between -25°C and 60°C with a relative humidity between 10% and 95% (Non condensing). To ensure that electrical components operate properly, do not locate the chiller in an area exposed to dust, dirt, corrosive fumes, or excessive

NOTE: NEMA Type 1 electrical enclosures are constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt. This type of enclosure does not protect against water, dust, moisture or airborne contaminants.

Step 2—Rigging the Machine — The 19DV machine shall be rigged as an entire assembly. It also has flanged connections that allow the compressor, cooler, condenser, VFD, and major accessory be separated for plant introduction under the supervision of Carrier. Contact local Carrier office for details if separation is required.

Rig Machine Assembly — See rigging instructions label attached to machine. Refer to rigging guide (**Fig.3**), dimensions in **Fig. 4**, and physical data in Tables 1-14. Lift machine only from the points indicated in rigging guide. Each lifting cable or chain must be capable of supporting the entire weight of the machine. Contractors are not authorized to disassemble any part of the chiller without Carrier's supervision. Any request otherwise must be approved in writing by Carrier.

NOTE: Carrier suggests that a structural engineer be consulted if transmission of vibrations from mechanical equipment is of concern.

! WARNING

Lifting chiller or components from points other than those specified may result in serious damage to the machine or personal injury. Rigging equipment and procedures must be adequate for maximum chiller weight. **See Fig. 3** for maximum chiller and component weights.

19DV VFD MOUNTED MACHINE

COMP. FRAME	COOLER CODE	MAXIMUM WEIGHT (kg)	VESSEL LENGTH (ft.)	DIM "A" (mm)	DIM "B" (mm)	DIM "C" (mm)	CHAIN LENGTH (mm)		
							'D''	'E''	'F''
4	G2A~G2K, G20~G29	16821	12	1812	1134	1486	2498	2215	2668
	G4A~G4K, G40~G49	17800	14	2022	1139	1470	2498	2213	2669

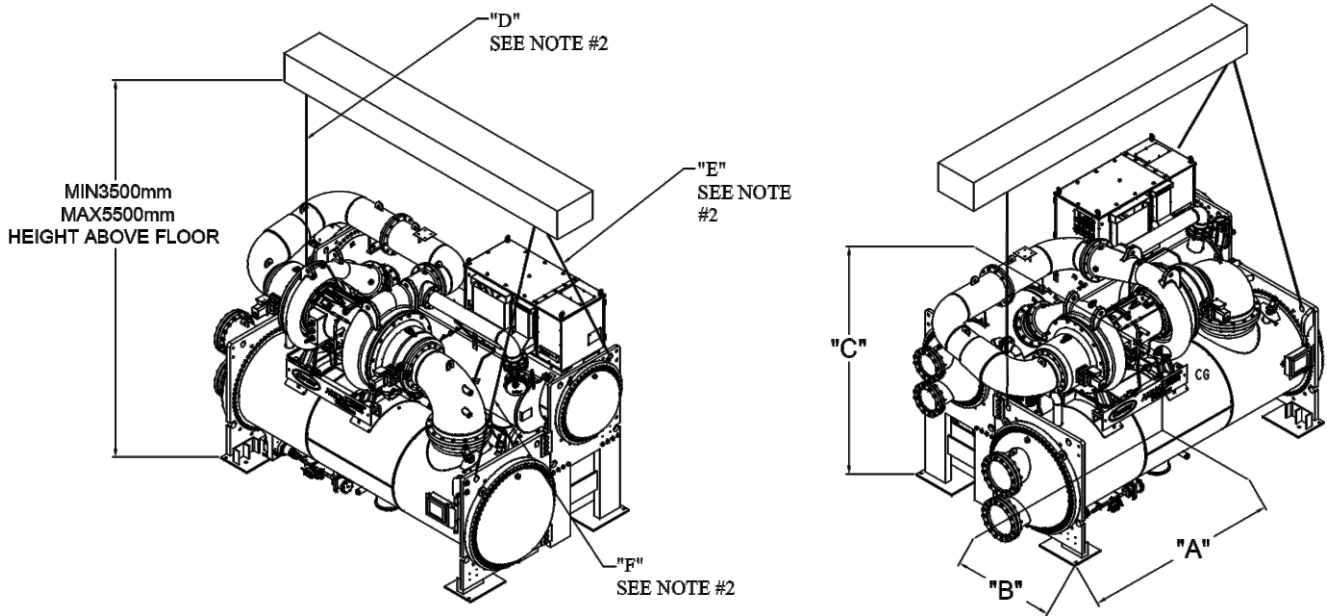


Fig. 3—Machine Rigging Guide

NOTES:

1. Each chain must be capable of supporting the entire weight of the machine. See chart for maximum weight.
2. Chain lengths shown are typical for 4053mm lifting height. Some minor adjustments may be required.
3. Dimensions "A" and "B" define distance from machine center of gravity to tube sheet outermost surfaces. Dimension "C" defines distance from machine center of gravity to floor.

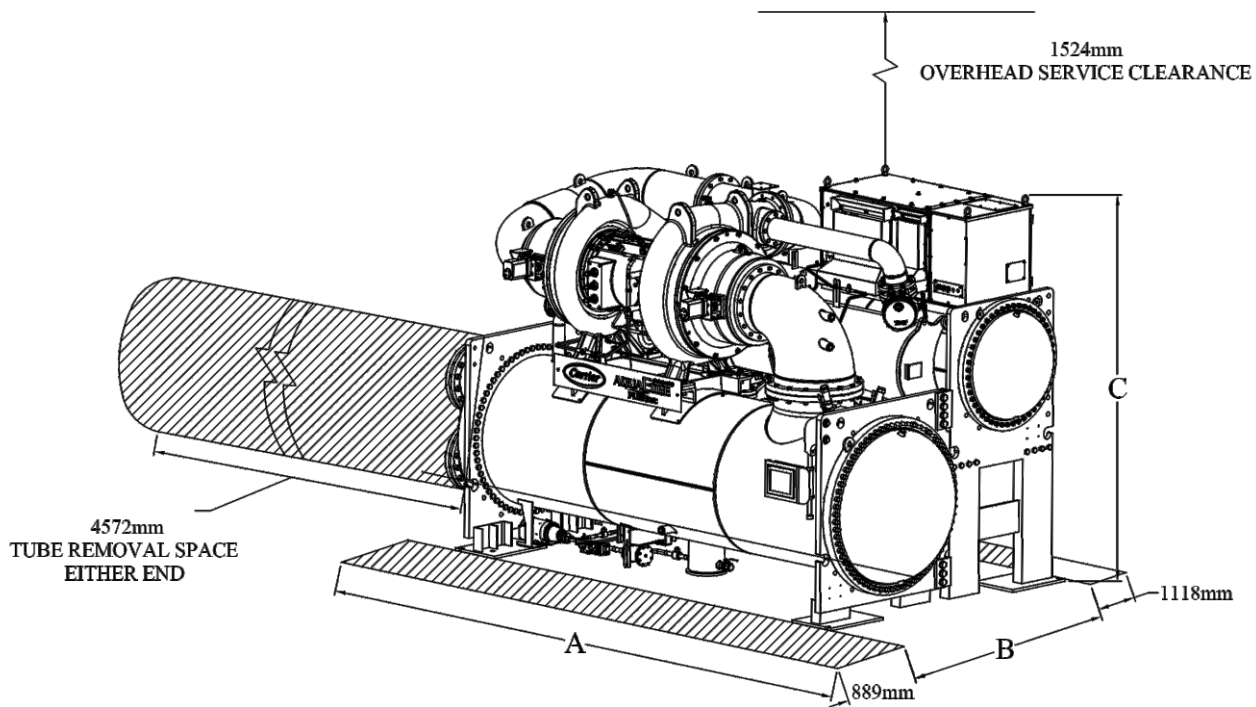


Fig. 4— 19DV Chiller Dimensions and Clearance

NOTES:

1. Dished head waterbox shown.
2. Service area shown is minimum space required. For Major compressor service, it is desirable to have 2.4m wide service area on the cooler or condenser side to allow the compressor to be positioned on the floor next to the chiller, unless arrangement to allow for rigging the compressor elsewhere.

RIG MACHINE COMPONENTS

Refer to instructions below, Fig. 5-7, and Carrier Certified Prints for machine component disassembly for rigging the compressor elsewhere.

! IMPORTANT

Only a qualified service technician should perform this operation.

! WARNING

Do not attempt to disconnect flanges while the machine is under pressure. Failure to relieve pressure can result in personal injury or damage to the unit.

! CAUTION

Before rigging the compressor, disconnect all wires connected to the control panel to avoid damage to electrical components.

NOTES:

Wiring must also be disconnected. Label each wire

before removal (see Carrier Certified Prints). In order to disconnect the starter from the machine, remove wiring for the refrigerant pump, control wiring at the power panel, and the main motor leads at the starter lugs. Remove all transducer and sensor wires at the sensor. Clip all wire ties necessary to pull heat ex-changers apart.

NOTES:

if the cooler, economizer, and condenser vessels are to be separated, the heat exchangers should be kept level by placing a support plate under the tube sheets. The support plate will also help to keep the vessels level and aligned when the vessels are bolted back together.

To Separate Cooler and Condenser:

1. Place a support plate under each tube sheet leg to keep each vessel level (Item 3, Fig. 5).
2. Disconnect refrigerant motor cooling line at the location shown (Item 5, Fig. 5).
3. Disconnect the compressor discharge pipe at the compressor (Item 9, Fig. 5).
4. Disconnect the coupling of the isolation valve near the damper valve as shown (Item 7, Fig. 5).

5. Unbolt the cooler liquid feed line at the location indicated for liquid line isolation valve. **(Item 12, Fig. 5).**
6. Cover all openings.
7. Unbolt the cooler liquid feed line at the location indicated for liquid line isolation valve. **(Item 12, Fig. 5).**
 - a. Disconnect temperature sensor cable at the water box **(Fig.7).**
 - b. Disconnect compressor power wire at VFD **(Item 1, Fig. 5).**
 - c. Wires and cable housings at the control panel that cross from the control panel to the cooler vessel. **(Fig. 6).**
8. Disconnect the take-apart connectors on the tube sheets **(Fig.7).**
9. Rig the vessels apart.

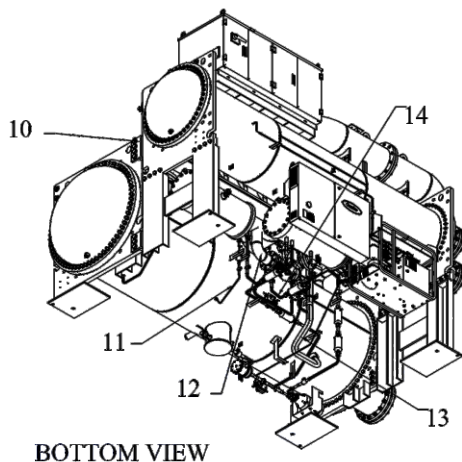
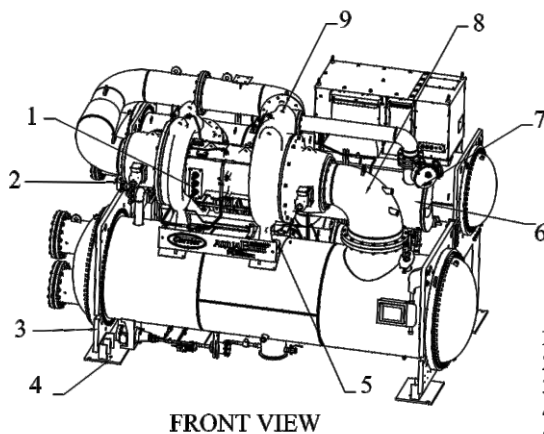
To Separate the Compressor from the Cooler:

1. Unbolt the compressor suction elbow at the cooler flange **(Item 8, Fig. 5).**
2. Disconnect refrigerant motor cooling line at the location shown **(Item 5, Fig. 5).**
3. Disconnect the motor refrigerant return line **(Item 13, Fig. 5).**
4. Disconnect the Purge connection line

5. Disconnect the bearing refrigerant supplier line
6. Disconnect the bearing refrigerant return line
7. Disconnect all wires going to the control panel
8. Disconnect the following:
 - a. bearing temperature sensor cables **(Fig. 7)**
 - b. motor temperature sensor cable **(Fig. 7)**
9. wires and cable housings that cross from the power panel to the starter and control panel
- c. compressor discharge temperature sensor cable **(Fig. 7)**
- d. Pressure switch cable **(Fig. 7)**
- e. Bearing refrigerant supplier pressure cable **(Fig. 7)**
- f. guide vane actuator cable **(Fig. 7)**
10. Disconnect the flared fitting for the liquid reclaimline **(Item 11, Fig. 5).**
11. Unbolt the compressor discharge coupling **(Item 9, Fig. 5).**
12. Cover all openings.
13. Disconnect compressor power cables at the VFD lugs **(Item 1, Fig. 5).**
14. Unbolt the compressor mounting from the cooler.

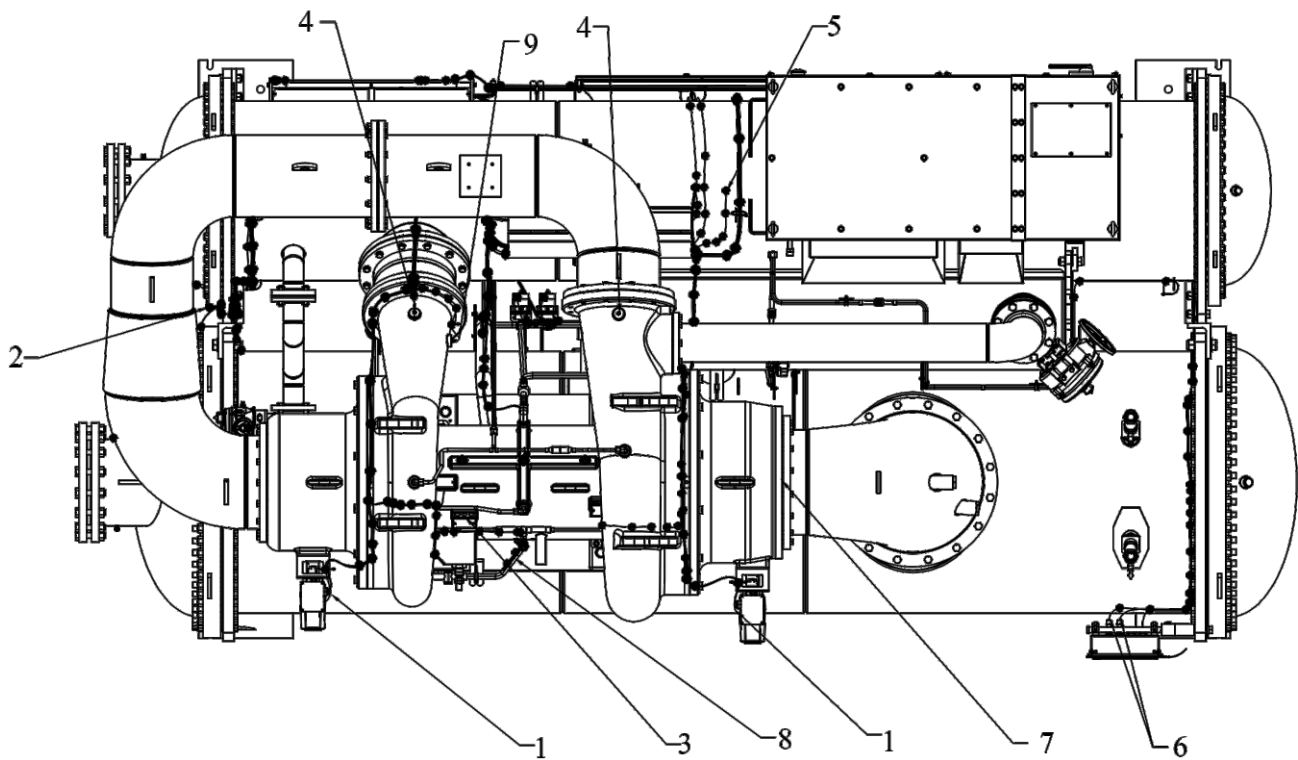
Additional Notes

1. Use silicone grease on new O-rings when refitting.
2. Use gasket sealant on new gaskets when refitting.
3. Cooler and condenser vessels may be rigged vertically.
4. Rigging should be fixed to all 4 corners of the tube sheet.



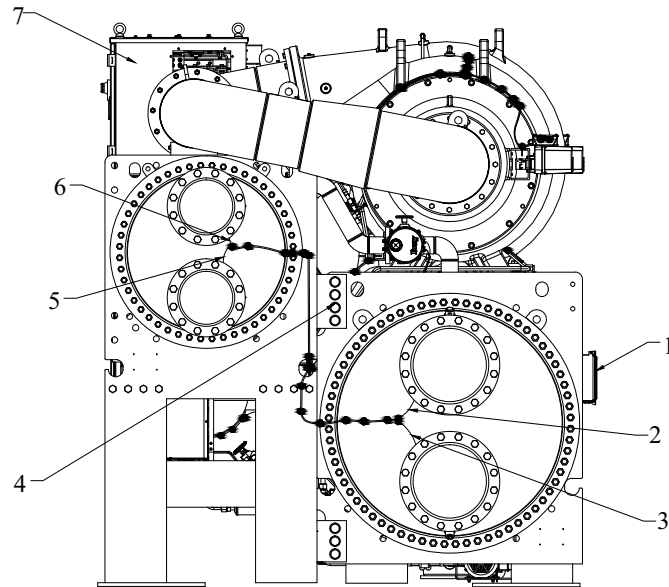
- 1--VFD CONNECTOR (UNBOLT)
- 2--OPTIONAL ENVELOPE CONTROL (CUT)
- 3--TUBE SHEET
- 4--TUBE SHEET LEG OPTION (UNBOLT)
- 5--REFRIGERANT MOTOR COOLING LINE (CUT)
- 6--ECONOMIZER
- 7--REFRIGERANT ISOLATION VALVE
- 8--COMPRESSOR SUCTION ELBOW (Unbolt)
- 9--COMPRESSOR DISCHARGE PIPE
- 10--VESSEL CONNECTOR (UNBOLT)
- 11--LIQUID RECLAIM LINE (UNBOLT)
- 12--COOLER LIQUID FEED LINE (UNBOLT)
- 13--MOTOR DRAIN (UNBOLT)
- 14--REFRIGERANT MOTOR COOLING LINE (CUT)

Fig. 5—19DV Front View and Bottom View



- 1--GUIDE VANE ACTUATOR CABLE
- 2--WATER TEMPERATURE SENSOR CABLE
- 3--MOTOR WINDING TEMPERATURE CABLE
- 4--COMPRESSOR DISCHARGE TEMPERATURE SENSOR CABLE
- 5--CONDENSER PRESSURE CABLE
- 6--PIC 5+ TOUCH SCREEN COMMUNICATION AND POWER SUPPLY CABLE
- 7--COOLER PRESSURE CABLE (HIDE)
- 8--BEARING TEMPERATURE SENSOR CABLE
- 9--PRESSURE SWITCH LOCATION

Fig. 6—19DV Chiller Top View



- 1--PIC 5+ TOUCH SCREEN
- 2--COOLER LEAVING WATER TEMPERATURE CABLE
- 3--COOLER ENTERING WATER TEMPERATURE CABLE
- 4--VESSEL TAKE-APART CONNECTORS
- 5--CONDENSER ENTERING WATER TEMPERATURE CABLE
- 6--CONDENSER LEAVING WATER TEMPERATURE CABLE
- 7--VFD

Fig. 4—19DV Chiller Side View

Table 1 19DVChiller Dimensions (Nozzle-In-Head Waterbox)

19DV Dimensions (Nozzle-In-Head Waterbox)				
COOLER HEAT EXCHANGER SIZER	CONDENSER HAET EXCHANGER SIZE	A(LENGTH, DISHED HEAD WATERBOX)	19DV B (WIDTH)	19DV C (HEIGHT)
		2-PASS		
		mm	mm	mm
G2*	G2*	4778.5	2595.8	2928.1
G4*	G4*	5299.2	2595.8	2928.1

*Assumes both cooler and condenser nozzle on same end of chiller.

NOTES:

1. Service access should be provided per American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 15, latest edition, National Fire Protection Association (NFPA) 70, and local safety code.
2. Overhead clearance for service rigging 19DV compressor should be at least 1524 mm.
3. Dimensions are approximate. Certified drawings available upon request.
4. Marine waterboxes typically add to the width of the machine. See certified drawings for details.
5. 'A' length dimensions shown are for standard 2065 kPa design and flanges connections. The 300 psig design and flanges will add length. See certified drawings.
7. Table contains heat exchanger dimensions. For arrangements where the compressor motor housing extends past the waterbox, consult the 19DV certified drawings.
8. Consult factory for configurations not listed in the above table.

Table 2—19DV Nozzle Size

HEAT EXCHANGER FRAME SIZE	NOZZLE SIZE (mm) (NOMINAL SIZE)					
	COOLER			CONDENSER		
	1-PASS	2-PASS	3-PA	1-PASS	2-PASS	3-PASS
F	457	356	254	356	254	203
G	457	356	254	356	254	203
H	457	356	254	356	254	203

Table 3 19DV Compressor Weights

COMPONENTS	WEIGHT (kg)
Power Train Assembly(Include Motor Stator, Rotor Assembly and 2nd Stage Lube Support)	1000
2ndStage lube support	75
Rotor Assembly (Include Motor Rotor, 1st Stage Lube Support)	310
1st Stage Lube Support	70
1st Stage Suction Assembly(Include 1stStage Blade Ring, 1st Stage Suction Housing)	379
1st Stage Blade Ring Assembly	79
1stStage Suction Housing	281
2ndStage Suction Assembly(Include 2nd Stage Blade Ring, 2nd Stage Suction Housing)	351
2ndStage Blade Ring Assembly	60
2nd Stage Suction Housing	274
1st Stage Volute	613
2nd Stage Volute	478
1st Stage Shroud	225
2st Stage Shroud	200
1st Stage IG V Shroud	54
2st Stage IG V Shroud	44
1stStage Impeller	29
2stStage Impeller	27
Miscellaneous	172
Total Weight (Excludes Motor Stator and Motor Rotor)	2810

Table 4 19DV Motor Weights

COMPRESSOR FRAME	MOTOR CODE	STATOR & HOUSING WEIGHT (kg)	ROTOR & SHAFT WEIGHT (kg)
DV4	B	494	150
	D	522	154
	F	558	159
	H	597	165

VFD CODE	FRAME	WEIGHT (kg)
5	32VSS0850	770

Table 5 19DV VFD Weights

Notes: * Reference until product data is determined

Table 6–19DV Cooler Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: B5 LP 19.05mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G20	4845	318	886
G21	4921	318	921
G22	4997	318	956
G23	5072	318	990
G24	5174	318	1036
G25	4845	318	886
G26	4901	318	912
G27	4977	318	947
G28	5059	318	984
G29	5148	318	1025
G40	5159	381	924
G41	5247	381	936
G42	5335	381	1003
G43	5423	381	1042
G44	5540	381	1095
G45	5159	381	924
G46	5225	381	954
G47	5313	381	993
G48	5407	381	1036
G49	5510	381	1082

Table 7– 19DV Cooler Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: B5 LP 25.4mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G2A	4662	318	897
G2B	4707	318	927
G2C	4757	318	960
G2D	4805	318	992
G2E	4877	318	1041
G2F	4637	318	880
G2G	4680	318	909
G2H	4734	318	945
G2J	4793	318	984

G2K	4851	318	1024
G4A	4949	381	936
G4B	5002	381	970
G4C	5060	381	1008
G4D	5115	381	1045
G4E	5200	381	1100
G4F	4921	381	917
G4G	4971	381	950
G4H	5034	381	991
G4J	5102	381	1036
G4K	5170	381	1080

Table 8 – 19DV Condenser Weights(1STSTAGE END AND 2NDSTAGE END)(TUBE TYPE: C5 LP 19.05mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G22	3050	125	617
G23	3156	121	662
G24	3275	120	712
G27	3050	125	617
G28	3156	121	662
G29	3275	120	712
G42	3271	150	673
G43	3394	145	724
G44	3531	144	781
G47	3271	150	673
G48	3394	145	724
G49	3531	144	781

Table 9 – 19DV Condenser Weights (1ST STAGE END AND 2NDSTAGE END)(TUBE TYPE: C5 LP 25.4mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G2C	2814	125	654
G2D	2903	121	709
G2E	2983	117	758
G2H	2814	125	654
G2J	2903	121	709
G2K	2983	117	758
G4C	3001	150	715
G4D	3104	145	777
G4E	3197	141	833
G4H	3001	150	715
G4J	3104	145	777
G4K	3197	141	833

Table 10– 19DV Economizer Weights

FRAME SIZE	STEEL WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	OPERATION WEIGHT (kg)
DV4	1015	263	1278

Table 11– 19DV Standard Type Dish Head Water Box Weights

WATER DESIGN PRESSURE (Kpa)	FRAME SIZE	PASSES	COOLER		CONDENSER	
			STEEL WEIGHT (kg)	WATER WEIGHT (kg)	STEEL WEIGHT (kg)	WATER WEIGHT (kg)
1034	G	2	845	614	407	215

Table 12– 19DV NIH Water Box Adders Weights

WATER DESIGN PRESSURE (Kpa)	FRAME SIZE	PASSES	COOLER			CONDENSER		
			STEEL WEIGHT (kg)		WATER WEIGHT (kg)	STEEL WEIGHT (kg)		WATER WEIGHT (kg)
			FLANGED	VICTAULIC		FLANGED	VICTAULIC	
1034	G	1	212	-26	19	134	-10	15
		2	147	0	0	86	0	0
		3	126	41	-15	80	23	-6
2068		1	532	196	66	319	105	35
		2	445	227	49	227	111	22
		3	368	253	35	222	134	16

Table 13– 19DV Piping and Others Weights

NAME	WEIGHT (kg)
SUCTION PIPING	222
INTERSTAGE PIPING	454
DISCHARGE PIPING	68
PURGE	60
COPPER PIPING	245
CONTROL PANEL	86
PIC 5+ + TOUCH SCREEN	11
CABLE AND CABLE TRAY	191
INSULATION (COOLING UNIT)	25

Table 14– 19DV ACCESSORIES Weights

CONDENSER FRAME	ENVELOPE CONTROL & PIPING (kg)	LIQUID BYPASS & ISOLATION VALVE (kg)
G	180	227

Step 3—Install Machine Supports

Install Standard Isolation

Fig. 8 and 9 show the position of support plates and shear flex pads, which together form the standard machine support system.

! IMPORTANT

Chiller housekeeping pad, anchor bolts, and attachment points that are designed by others must be in accordance with all applicable national and local codes.

Install Accessory Isolation

Uneven floors or other considerations may make it necessary to use accessory soleplates (supplied by Carrier for field installation) and leveling pads. Refer to Fig. 10 and 11.

Level machine by using jack screw in isolation soleplates. Use a level at least 600 mm long.

For adequate and long lasting machine support, proper grout selection and placement is essential. Carrier recommends that only pre-mixed, epoxy type, non-shrinking grout be used for machine installation.

Follow manufacturer's instructions in applying grout.

1. Check machine location prints for required grout thickness.
2. Carefully wax jack screw for easy removal from grout.

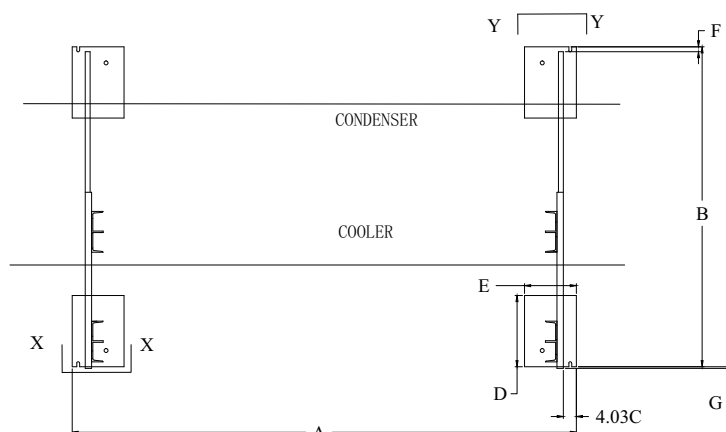
3. Grout must extend above the base of the sole plate and there must be no voids in grout beneath the plates.
4. Allow grout to set and harden, per manufacturer's instructions, before starting machine.
5. Remove jack screw from leveling pads after grout has hardened.

Install Spring Isolation

Spring isolation may be purchased as an accessory from Carrier for field installation. It may also be field supplied and installed. Spring isolators may be placed directly under machine support plates or located under machine sole plates. See Fig. 11. Consult job data for specific arrangement. Low profile spring isolation assemblies can be field supplied to keep the machine at a convenient working height.

Obtain specific details on spring mounting and machine weight distribution from job data. Also, check job data for methods to support and isolate pipes that are attached to spring isolated machines.

NOTE: It is recommended that any installation other than floor on the ground should consider having spring isolation for the chiller and piping.

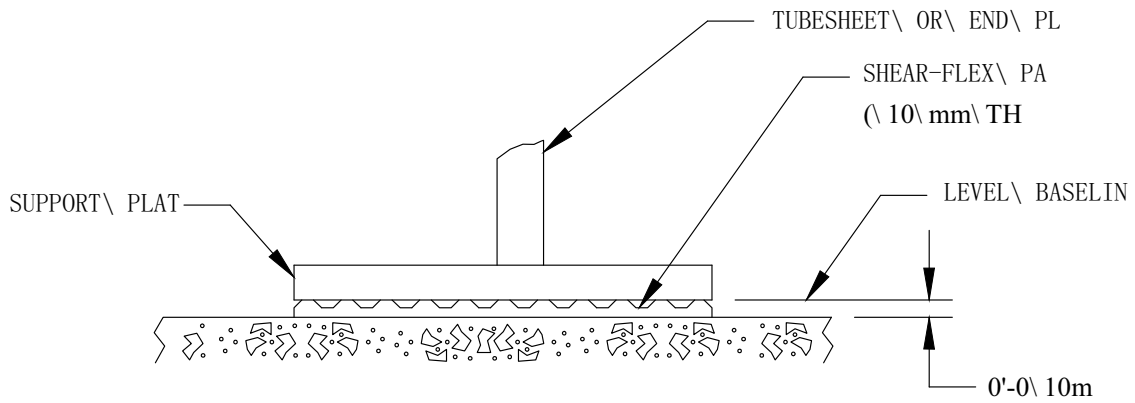


19DV HEAT EXCHANGER SIZE		DIMENSIONS (mm)						
		A	B	C	D	E	F	G
COOLERE	CONDENSER							
G2	G2	3951	2508	102	559	406	38	13
G4	G4	4472	2508	102	559	406	38	13

NOTE:

1. X-X dimension refers to accessory sole plate. See fig.10
2. Y-Y dimension refers to standard sole plate. See fig.9
3. For G2/G2 and G4/G4 cooler/condenser combinations, the tube sheet overhangs the foot plate

Fig. 8 19DV Machine Footprint

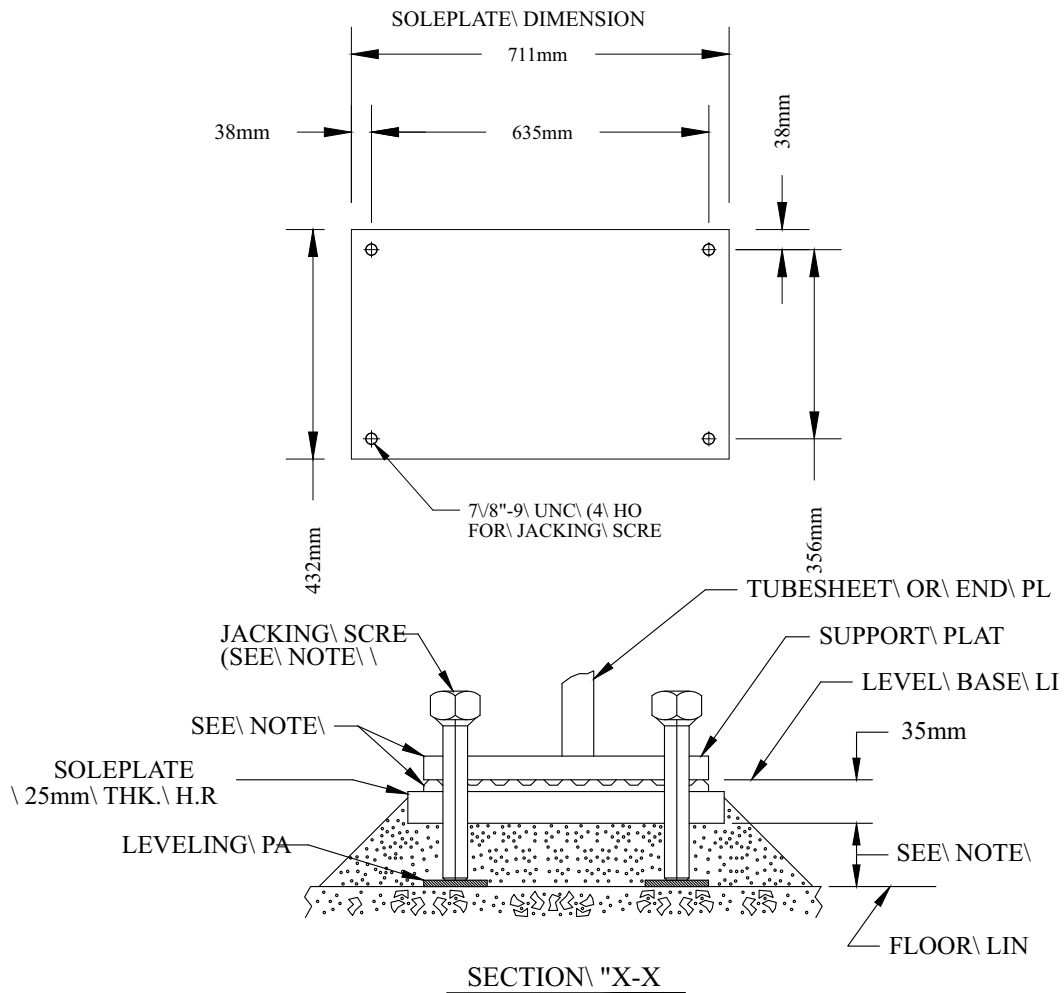


VIEW "Y-Y"

NOTE:

1. Dimensions are in millimeters.
2. Isolation package includes 4 elastomeric pads.

Fig. 9 Standard Isolation

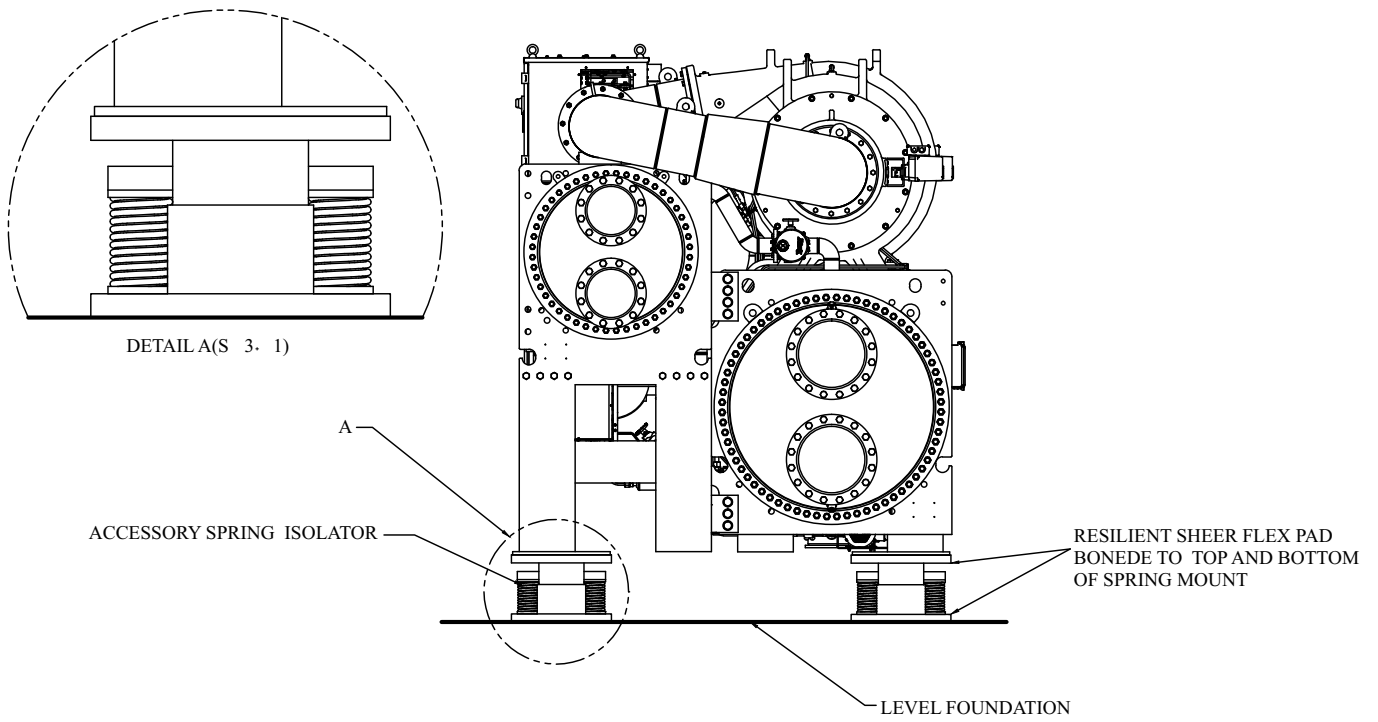


SECTION "X-X"

NOTE:

Fig.10 Accessory Isolation

1. Dimensions are in millimeters.
2. Accessory (Carrier supplied, field, field installed) soleplate package include 4 soleplates, 16 jacking screws and leveling pads. Isolation package is also required.
3. Jacking screws to be removed after grout has set.
4. Thickness of grout will vary, depending on the amount necessary to level chiller. Use only pre-mixed non-shrinking grout, Ceilcote 748 or Embecco 636 Plus Grout, 38.1mm to 57.2 mm thick.



NOTE:

The accessory spring isolators are supplied by Carrier for installation in the field if the accessory is purchased.

Fig. 11 19DV Accessory Spring Isolation (Shown with Accessory Soleplates)

Leveling the Unit

The chiller must be set level within 3 mm.

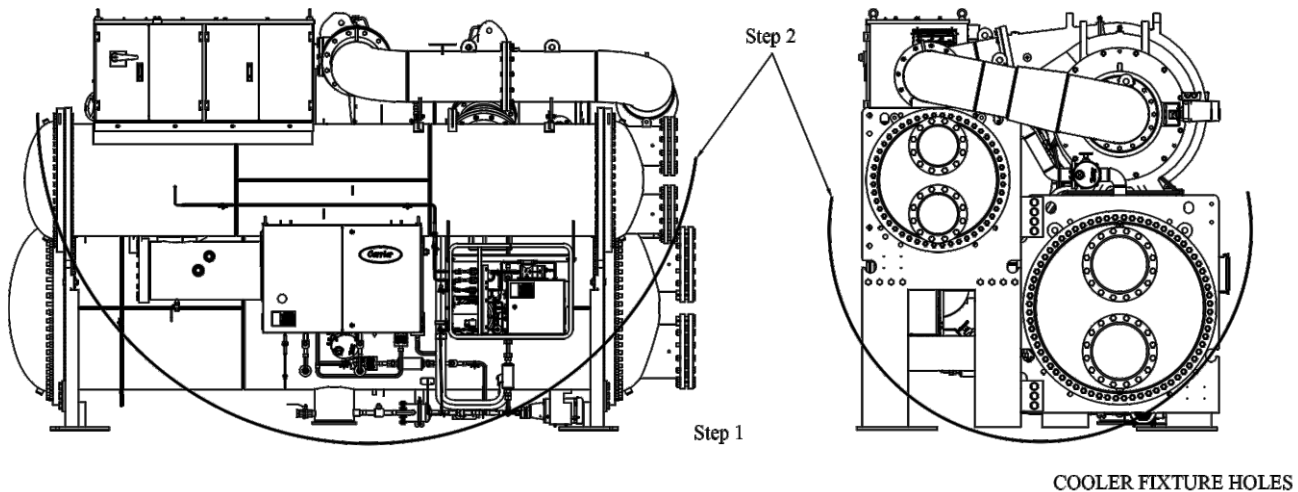
There is a punch mark on each corner on evaporator tube sheets. The chiller need be set to level refer to these four marks.

Suspend a clear plastic tube along the length of the chiller as shown in the following figure.

Fill the tube with water until the level aligns with the punch mark on the evaporator tube sheet at one end of the chiller.

Check the water level at the opposite mark. If the water level does not align with the punch mark, use full length shims to raise one end of the chiller until the water level at each end of the tube aligns with the punch marks at both ends of the chiller.

Once the unit is level across its length, repeat Step 1 through Step 3 to level the unit across its width. Use of a laser level is an acceptable alternative method to level the unit. The cooler fixture holes (see Fig.12) can be used as reference points to level off.



IMPORTANT: Immediately report any unit damage incurred during handling or installation at the job site to the Carrier sales office.

Fig. 12 Leveling the Unit

Step 4—Connect Piping

Install Water Piping to Heat Exchanger

Refer to Table 2 for nozzle sizes. Install piping using job data, piping drawings, and procedures outlined below. A typical piping installation is shown in Fig. 13.

! CAUTION

Factory-supplied insulation is not flammable but can be damaged by welding sparks and open flame. Protect insulation with a wet canvas cover.

! CAUTION

To prevent damage to sensors, remove cooler and condenser water temperature sensors before welding connecting piping to water nozzles. Refer to Fig. 13. Replace sensors after welding is complete.

! CAUTION

When flushing the water systems, isolate the chiller from the water circuits to prevent damage to the heat exchanger tubes.

1. Offset pipe flanges to permit removal of waterbox cover for maintenance and to provide clearance for pipe cleaning. No flanges are necessary with marine waterbox option; however, water piping should not cross in front of the waterbox or compressor because service access will be blocked.
2. Provide openings in water piping for required pressure gages and thermometers. For thorough mixing and temperature stabilization, wells in the leaving water pipe should extend inside pipe at least 50 mm.
3. Install air vents at all high points in piping to remove air and prevent water hammer.

4. Field-installed piping must be arranged and supported to avoid stress on the equipment and transmission of vibration from the equipment. Piping must be installed to prevent interference with routine access for the reading, adjusting, and servicing of the equipment. Provisions should be made for adjusting the piping in each plane for periodic and major servicing of the equipment.
5. Water flow direction must be as specified in **Fig. 14**.
6. Install waterbox vent and drain piping in accordance with individual job data. Consult certified drawings for connection size.
7. Install waterbox drain plugs in the unused waterbox drains and vent openings.
8. Isolation valves are recommended on the cooler and condenser piping to each chiller for service. The isolation valves should allow for piping between the valves and chiller to be removed without draining the system fluid

NOTE:

Entering water is always the lower of the 2 nozzles. Leaving water is always the upper nozzle for cooler or condenser.

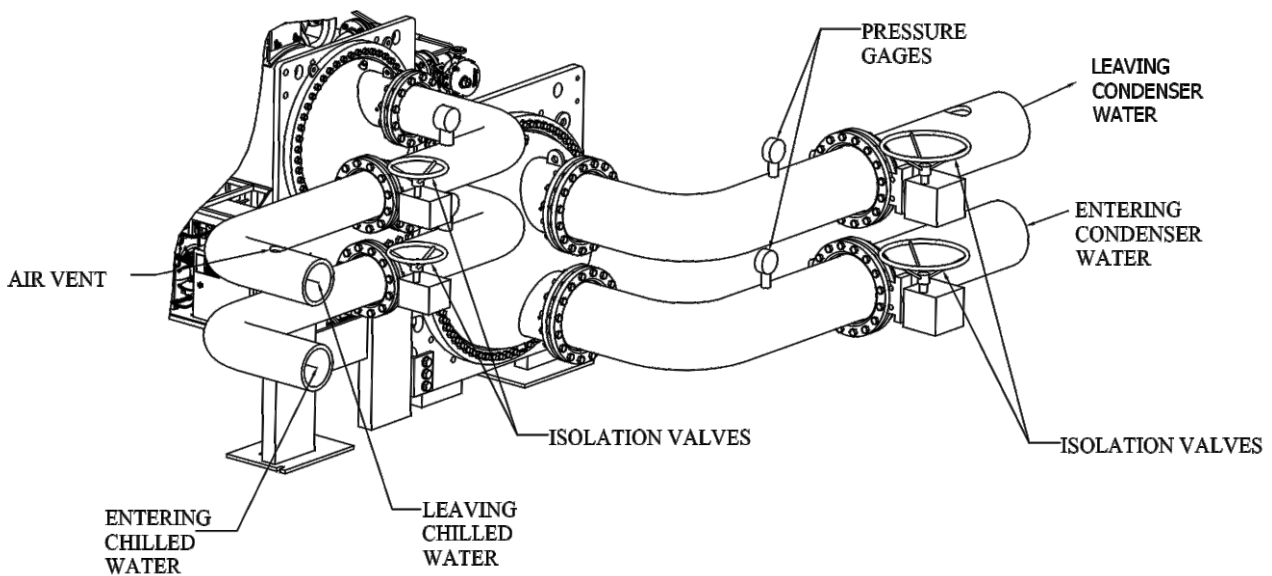
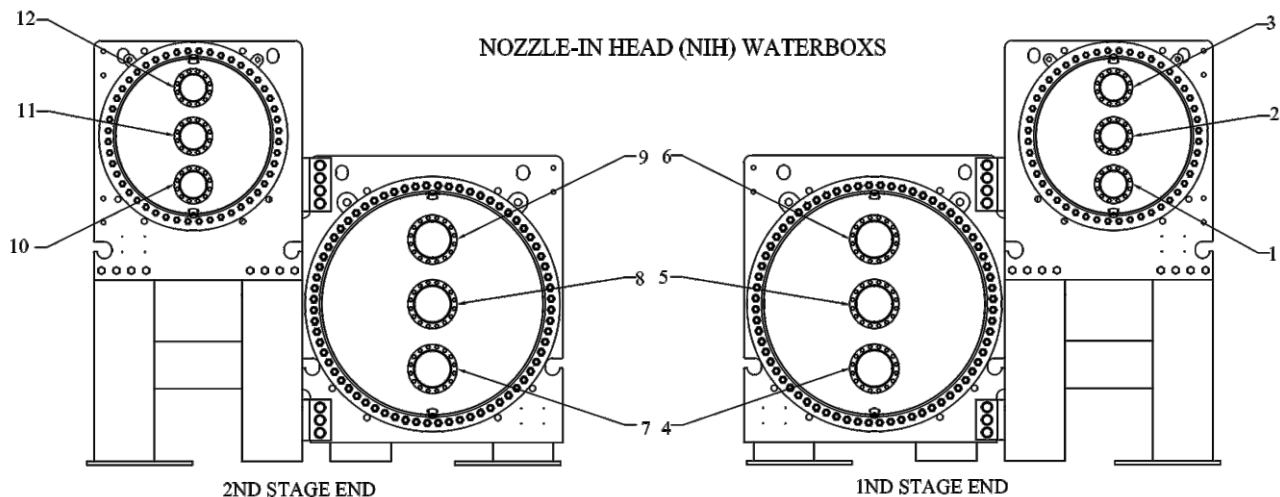


Fig. 13 Typical Nozzle Piping



NOZZLE ARRANGEMENT CODE

COOLER WATERBOXS				CONDENSER WATERBOXS			
PASS	IN	OUT	ARRANGEMENT CODE *	PASS	IN	OUT	ARRANGEMENT CODE*
1	8	5	A	1	11	2	P
	5	8	B		2	11	Q
2	7	9	C	2	10	12	R
	4	6	D		1	3	S
3	7	6	E	3	10	3	T
	4	9	F		1	12	U

* Refer to certified drawings.

1 and 3 passes arrangement are available via special order only.

Fig. 14 Piping Flow Data(NIH)

Install Vent Piping

Install Vent Piping to Safety Valves

The 19DV chiller is factory equipped with safety valves on the cooler shells. Vent relief devices to the outdoors in accordance with ANSI/ASHRAE 15 (latest edition) Safety Code for Mechanical Refrigeration and all other applicable codes.

1. If relief device outlet piping is manifolded, the cross-sectional area of the outlet relief pipe must at least equal the sum of the areas required for individual relief pipes.
2. Provide a pipe plug near outlet side of each relief device for leak testing. Provide pipe fittings that allow vent piping to be disconnected periodically for inspection of valve mechanism.
3. Piping to relief devices must not apply stress to the device. Adequately support piping. A length of flexible tubing or piping near the device is essential on spring isolated machines.
4. The outdoor vent should be weatherproof and a condensation drain should be installed at the low point in the vent piping to prevent water build-up on the atmospheric side of the relief device.

! DANGER

Refrigerant discharged into confined spaces can displace oxygen and cause asphyxiation. 3 for maximum chiller and component weights.

Purge Discharge

Purge discharge shall be connected to the safety valve vent line assembly with 9.6mm flare connection to the discharge line from purge unit.

VFD Drain

Connect a hose pipe to the drain port (9.6mm) of VFD, and the condensed water is drained from the VFD to the water channel under the chiller or floor drain by the hose pipe.

Vent Line Materials

Vent line piping should use carbon steel (20#).

Vent Line Sizing

Follow the ANSI/ASHRAE 15 (latest edition) to size the vent pipe but the inner diameter should be equal or larger than the safety valve outlet inner diameter.

Step 5—Electrical Connections

Field wiring must be installed in accordance with job wiring diagrams and all applicable electrical codes.

! CAUTION

Do not run 50 volt or higher wiring into the PIC5+ Touch Screen Panel and control panel. The panel should only be used for low voltage wiring (50-v maximum).

Wiring diagrams in this publication (**Fig. 15-19**) are for reference only and are not intended for use during actual installation; follow job specific wiring diagrams.

Standard Field Control Option Connection

Carrier provides a terminal strips in the control panel for standard field control option connection.

Connect Control Inputs

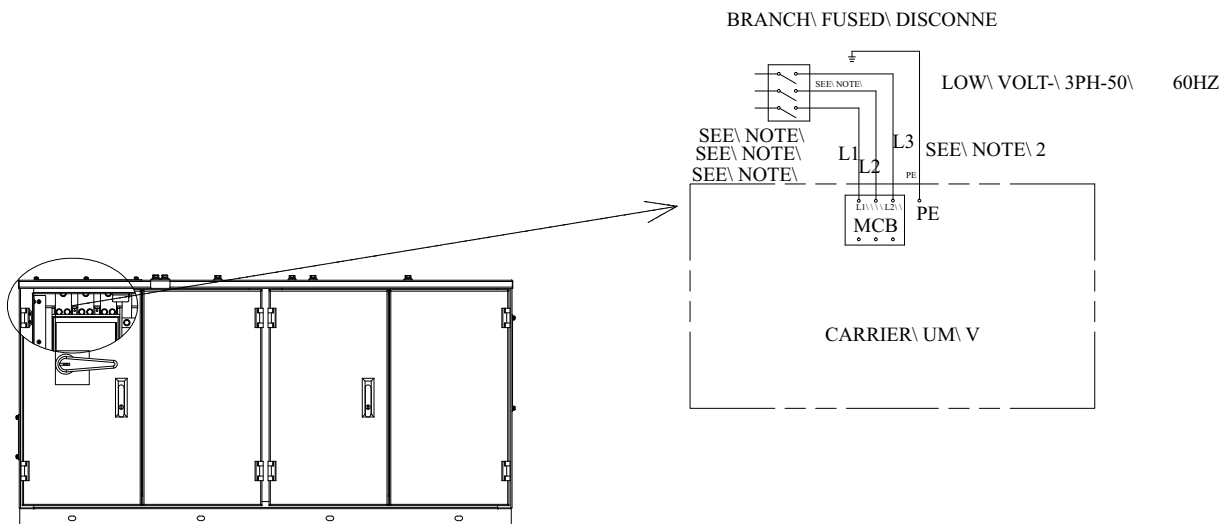
Wiring may be specified for a remote start/stop contact, a remote emergency stop contact, an ice build contact, a spare safety switch, a power request feedback switch, a cooler water flow switch and a condenser water flow switch can be wired to the control panel field terminal strip. Additional spare sensors may be specified for auto demand limit input, refrigerant leak sensor, common CHWS temperature sensor, auto water temp reset and common CHWR temp sensor can be wired to the control panel field terminal strips as well. These are wired to the machine control panel as indicated in **Fig. 16**.

Connect Control Outputs

Wiring maybe specified for a chiller alarm relay, a free cooling mode relay and a power request relay can be wired to the control panel field terminal strip. Additional analog output signals may be specified for chiller running status (on/off/ready) and head pressure output can be wired to the control panel field terminal strips as well. These are wired to the machine control panel as indicated in **Fig.16**.

Enhanced Field Control Option Connection

If 4th IOB is configured, the hydraulic control function will be available. And with this function, water pump control and tower fan can be controlled through Carrier controller. It also can support three types water flow measurement, water flow switch, water flow meter, and water pressure drop sensor, see **(Fig. 17.)** for wiring connection.



NOTE:

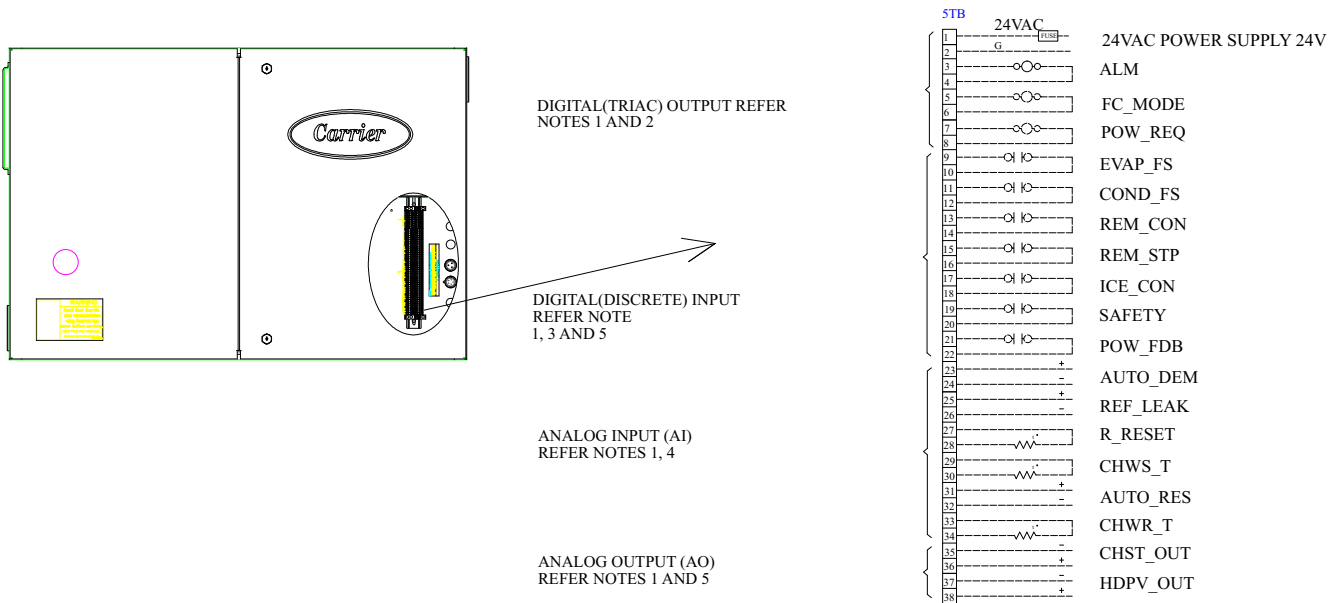
- 1 Provide a means of disconnecting power to VFD. Either circuit breaker or fused disconnect is required on VFD.
- 2 Line side power conductor rating must meet VFD nameplate voltage and chiller full load amps (minimum circuit ampacity).
- 3 Circuit breaker lugs will accommodate the quantity(#) and size cables (per phase) as follows. Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required.

VFD MAX AMPS	LUG CAPACITY (PER PHASE)		LUG CAPACITY (GROUND)	
	Max. NO. of Conductors	Max. Conductor Size	Max. NO. of Conductors	Max. Conductor Size
850A	2	253mm ²	2	253mm ²

- 4 Power conductors to starter must enter through top of enclosure
- 5 Compressor motor and controls must be grounded by using equipment grounding lugs provided inside unit
- 6 *If a different number of conductors are used for the installation than is shown below, the installing contractor

Fig.15 19DV Field Wiring (1)

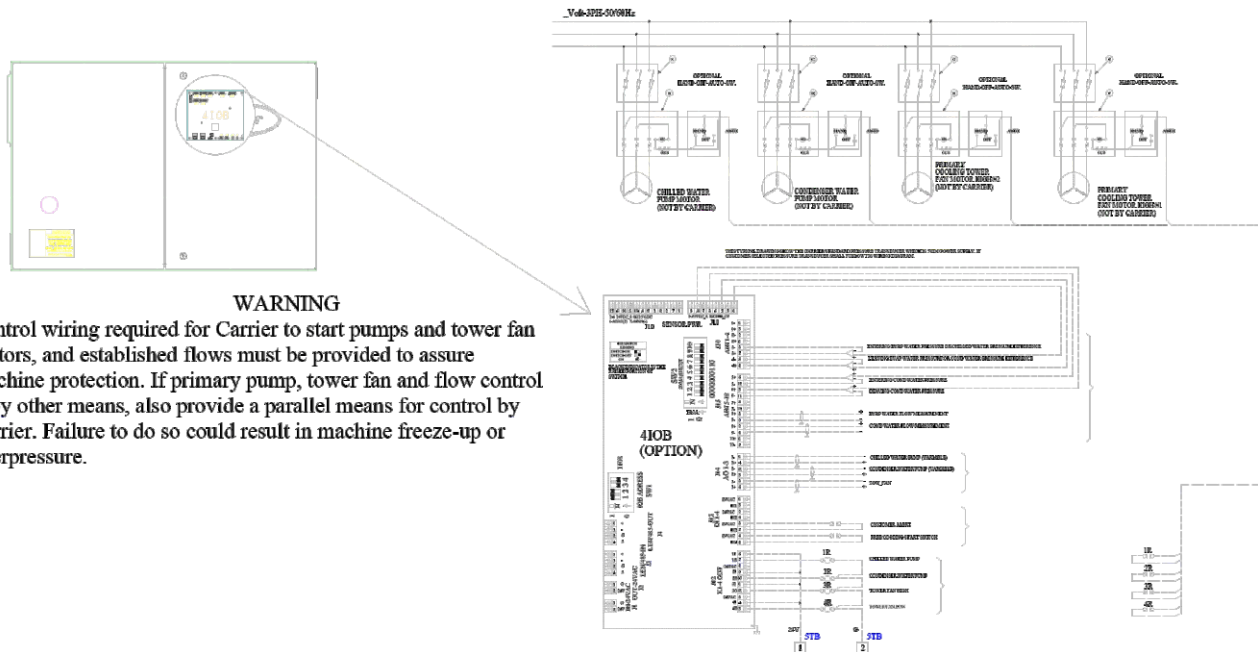
STANDARD FIELD OPTION WIRING INSTRUCTION OF CONTROL PANEL



NOTE:

1. Cross area of field –supplied conductors should be at least 0.8mm² or larger.
2. Each digital output loop shall be limited to a maximum of 1AAC RMS steady-start @ 24 VAC. Light load relay is recommended and the coil voltage of relay is 24 VAC. Connect 5 TB-1 to 3TB-1 and 5TB-2 to 3TB-2 for 24 VAC power supply if total power load less than 40 VA@24VAC. Others, power supply shall be provided by customer fused transformer.
3. The discrete input loop is powered by internal 24 VAC power supply. Each discrete input shall detect whether an external switch or contactor is open or closed.
4. The analog input support 5K/10K NTC thermistor, 0/4-20mA sensor and 5VDV sensor.
5. Each analog output loop support 0/4-20mA or 0/2-10 VDC voltage output. The analog output loop is powered by board. Do not supply external power.
6. For standard discrete input(ON 1/2/3 IOB), only when the contact or switch is closed, an alarm will be generated.
7. Sw2 configured by field, if 4-20 mA signal sensor, shall turn the switch to “ON” position.
8. For 4th IOB discrete input, only when the contact or switch is opened, an alarm will be generated.

Fig.16 19DV Field Wiring (2)



WARNING

Control wiring required for Carrier to start pumps and tower fan motors, and established flows must be provided to assure machine protection. If primary pump, tower fan and flow control is by other means, also provide a parallel means for control by Carrier. Failure to do so could result in machine freeze-up or overpressure.

NOTE: REFER APPENDIX D FOR DETAILS WIRING DIAGRAM

Fig.17 19DV Field Wiring (3)

PIC 5+ TOUCH SCREEN FIELD WIRING INSTRUCTION

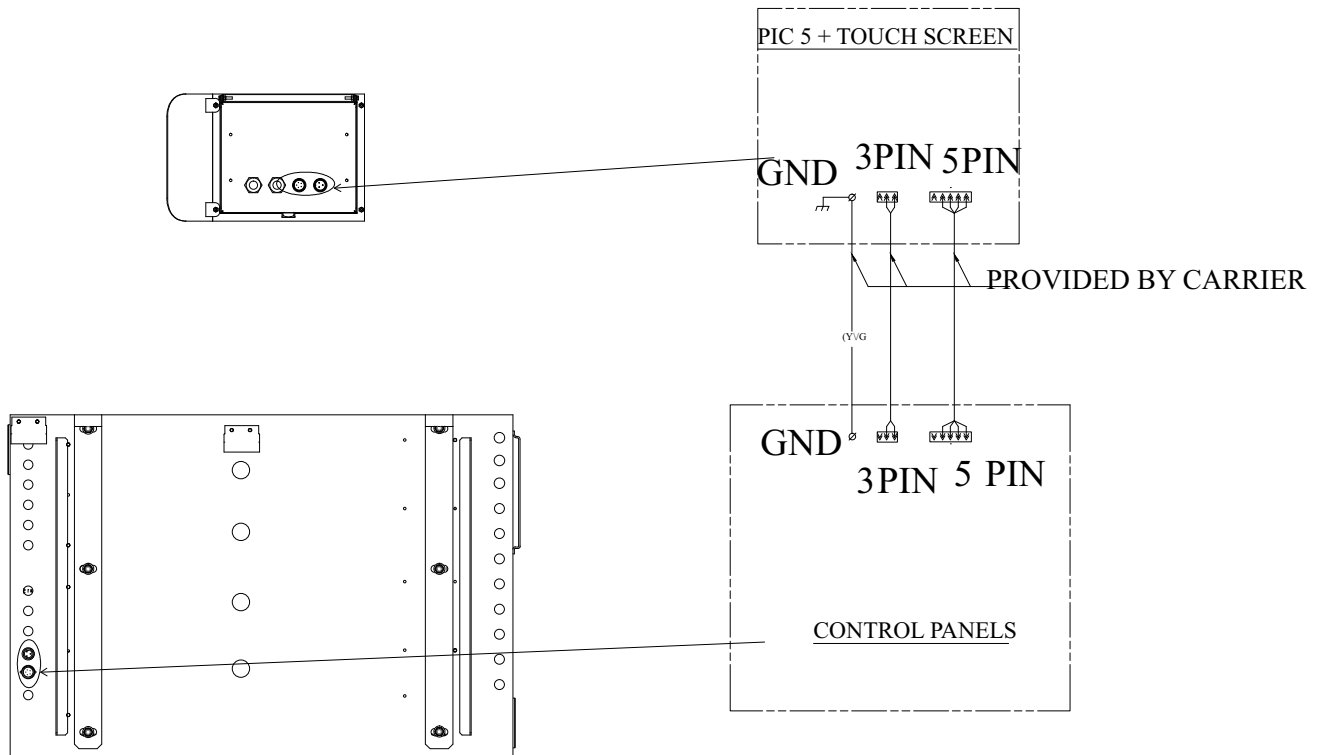


Fig.18 19DV Field Wiring (4)

ETHERNET SWITCH AND BASE CELLULAR GATEWAY FIELD INSTALLATION GUIDE

ETHERNET SWITCH

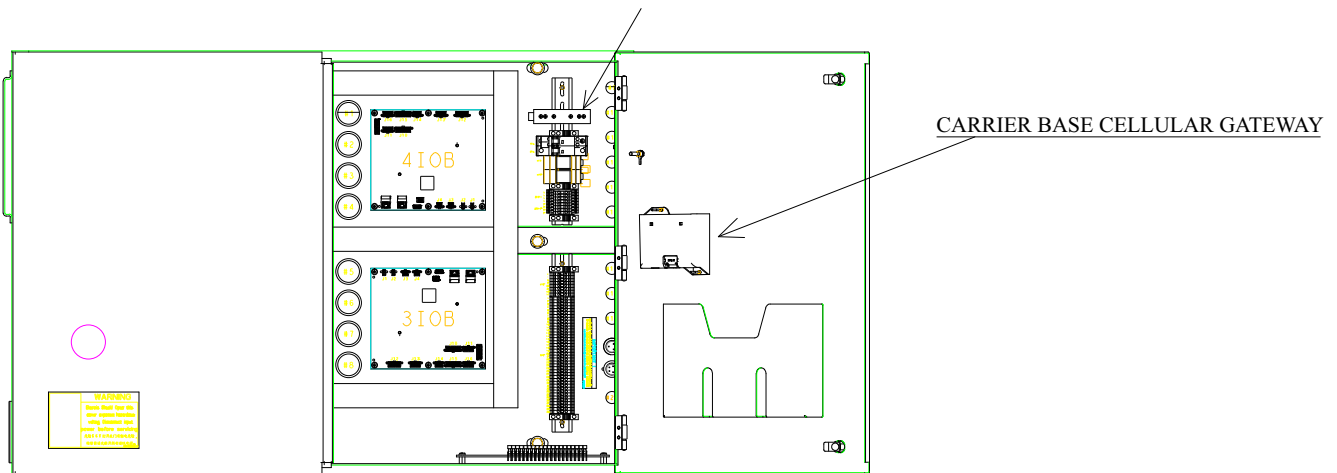


Fig.19 19DV Field Wiring (5)

Electrical Connection to VFD

The 19DV has a unit-mounted, factory installed VFD. Incoming power is connected to the line side of the circuit breaker inside the VFD. See **Fig. 15 and 20**.

! IMPORTANT

Be sure to ground the power circuit in accordance with the National Electrical Code (NEC), applicable local codes, and job wiring diagrams. Also make sure that wiring is as per correct phasing.

! CAUTION

Do not punch holes or drill into the top surface of the power panel. Knockouts are provided in the bottom of the power panel for wiring connections.

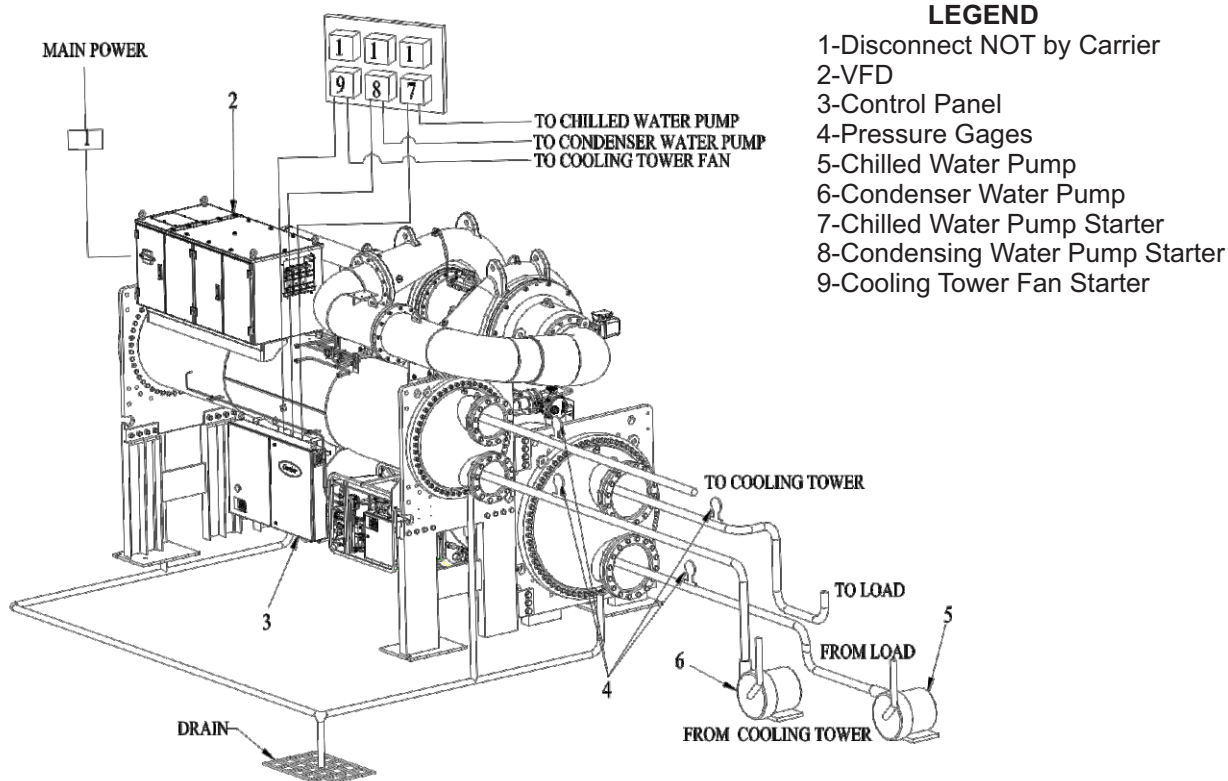
! WARNING

Voltage to terminals LL1 and LL2 comes from a control transformer in a VFD built to Carrier specifications. Do not connect an outside source of control power to the VFD (terminals LL1 and LL2). An outside power source will produce dangerous voltage at the line side of the VFD, because supplying voltage at the transformer secondary terminals produces abnormal input level voltage at the transformer primary terminals.

Connect Wiring to VFD

Connect control wiring to the VFD. All control wiring must use shielded cable. Also, connect the communications cable. Refer to the job wiring diagrams for cable type and cable number. Make sure the control circuit is grounded in accordance with applicable electrical codes and instructions on machine control wiring label.

If need the UPS for the control panel, see **Fig. 15**, remove the cables on iL1/oL1, iL2/oL2, iL3/oL3, then connect the UPS power supply to oL1, oL2, oL3.



NOTES:

1. All wiring must comply with applicable codes.
2. Refer to Carrier System Design Manual for details regarding piping techniques.

Fig.20 19DV with Unit-Mounted VFD

Carrier Comfort Network Interface

The Carrier Comfort Network (CCN) communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it. The negative pins must be wired to the negative pins. The signal ground pins must be wired to the signal ground pins. **See Fig. 21** for location of the CCN network connections on the terminal strip labelled CCN.

NOTES:

Conductors and drain wire must be 0.5189 mm² minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon*, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon,

chrome vinyl, or Teflon with a minimum operating temperature range of -20 C to 60 C is required. See table below for cables that meet the requirements.

MANUFACTURER	CABLE NO.
ALPHA	24 13 or 5463
AMERICAN	A22503
BELDEN	8772
COLUMBIA	2525

When connecting the CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN NETWORK INTERFACE (PIC 5+ Touch Screen Panel)
+	Red	+
GROUND	White	G
-	Black	-

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network. at each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. See **Fig. 21**. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightning suppressor in each building where the cable enters or exits the building (one point only).

To connect the 19DV chiller to the network, proceed as follows (see **Fig. 21**):

1. Route wire through knockout in back of control panel.
2. Strip back leads.
3. Crimp one no. 8 size spring spade terminal on each conductor.
4. Attach red to “+” terminal and white to “G” terminal and black to “-” terminal of CCN Network interface located in the PIC5+ touch screen panel.

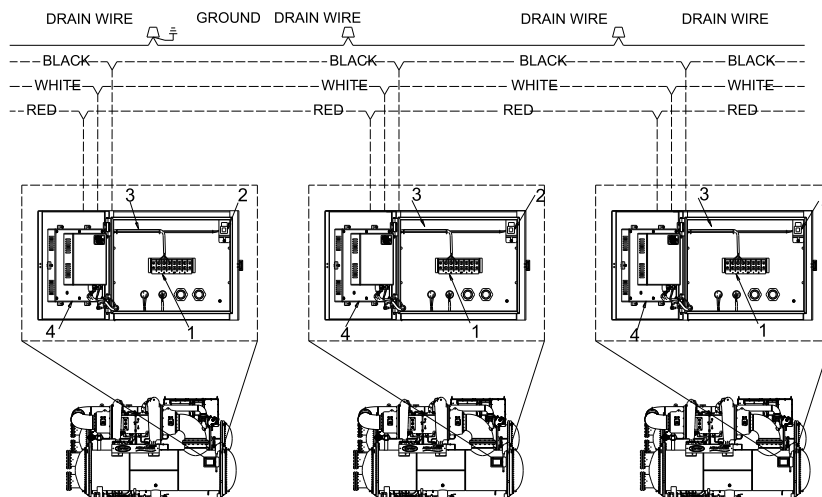


FIG. 21 CCN Communication Wiring For Multiple Chillers (Typical)

Step 6—Install Field Insulation

Unit Insulation Area

! CAUTION

Protect insulation from weld heat damage and weld splatter. Cover with wet canvas cover during water piping installation.

When installing insulation at the jobsite, insulate following components:

1. Cooler shell
2. Cooler tube sheets
3. Suction piping
4. Economizer
5. Water box
6. Interstage communication piping
7. High side float chamber
8. Compressor
9. Copper lines

NOTE:

When insulating the covers, make sure there is access for removal of waterbox covers for servicing. If the insulation is applied on-site, please consult the local Carrier office for detail.

Unit Insulation Thickness

The standard insulation layer is 25.4mm thick.



INSTALLATION START-UP REQUEST CHECKLIST

(This checklist should be filled by qualified Carrier service technician.)

Machine Model Number: _____ 19DV Serial Number _____

To: _____ Date _____

Attn: _____

Project Number _____

Carrier Job Number _____

YES/NO DATE TO BE
(N/A) COMPLETED

The following information provides the status of the chiller installation.

- | | | |
|--|-------|-------|
| 1. The machine is level. | _____ | _____ |
| 2. The machine components are installed and connected in accordance with the installation instructions. | _____ | _____ |
| 3. The isolation package and grouting (if necessary) are installed. | _____ | _____ |
| 4. The Safety valves are piped to the atmosphere. | _____ | _____ |
| 5. The purge outlet is piped to atmosphere. | _____ | _____ |
| 6. All piping is installed and supported. Direction of flow is indicated in accordance with the installation instructions and job prints. | | |
| a. Chilled water piping. | _____ | _____ |
| b. Condenser water piping | _____ | _____ |
| c. Waterbox drain piping | _____ | _____ |
| d. Pumpout unit condenser piping (if installed) | _____ | _____ |
| e. Other _____ | | |
| f. VFD drain hose | _____ | _____ |
| 7. Gages are installed as called for on the job prints required to establish design flow for the cooler and condenser. | | |
| a. Water pressure gages IN and OUT | _____ | _____ |
| b. Water temperature gages IN and OUT | _____ | _____ |
| 8. The machine's VFD wiring is complete. The wiring is installed per installation instructions and certified prints. | | |
| a. Power wiring to VFD circuit breaker (If chiller was disassembled during Installation, motor leads must not be taped until the Carrier technician megger tests the motor.) | _____ | _____ |
| b. Line side voltage is within ±10% of chiller nameplate voltage. | _____ | _____ |
| c. Other _____ | _____ | _____ |

COMMENTS:

TESTING

YES/NO

DATE TO BE
COMPLETED

- | | | |
|--|---|--|
| <ol style="list-style-type: none"> 1. The cooling tower fan has been checked for blade pitch and proper operation. 2. The chilled water and condenser water lines have been: <ol style="list-style-type: none"> a. Vented b. Strainers Cleaned c. Flushed d. Filled e. Tested 3. The chilled water and condenser water pumps have been checked for proper rotation and flow. 4. The following cooling load will be available for start-up: <ol style="list-style-type: none"> a. 25% b. 50% c. 75% d. 100% 5. The refrigerant is charged into the chiller. 6. Services such as electrical power and control air will be available at start-up. 7. The electrical and mechanical representatives will be available to assist in commissioning the machine. 8. The customer's operators will be available to receive instructions for proper operation of the chiller after start-up. | <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> | <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> |
|--|---|--|

Concerns about the installation/request for additional assistance:

I am aware that the start-up time for Carrier chiller can take between 3 and 8 days depending on the model of the machine and the options and accessories used with it.

Jobsite contact details:

Phone number _____

Pager/cell number _____

Fax number _____

In accordance with contract, we hereby request technician to render start-up services per contract terms for this job on _____(Date). I understand that the technician's time will be charged as extra service, if there are any incomplete items in the checklist. Signature of Purchaser _____

Signature of Jobsite Supervisor _____

19 DV Chiller Operating Principles Refrigerant Cycle

The compressor continuously draws refrigerant vapor from the cooler at a rate set by the degree of the first stage guide vane opening (both first stage and second stage have guide vane) and compressor speed. As the compressor suction reduces the pressure in the cooler, the remaining refrigerant boils at a fairly low temperature (typically 3 to 6 °C). The energy required for boiling (Latent heat of vaporization) is obtained from the water flowing through the cooler tubes. With heat energy removed, the water becomes cold enough to be used in an air conditioning circuit or for process liquid cooling. located on the right side of the VFD enclosure.

After taking heat from the water, the refrigerant vapor is compressed by the first stage. The compressed vapor is discharged through the inter-stage connection pipe to the second stage guide vane and goes to the second stage impeller. The vapor is again compressed in the second stage.

After second stage compression the temperature of refrigerant is typically 37 to 40 °C. This superheated vapor moves to condenser, where relatively cool (typically 18 to 32 °C) water flowing in condenser tubes removes heat from the refrigerant and the

vapor condenses to liquid. This liquid refrigerant drains into a high side float chamber between the condenser and economizer. The refrigerant is metered into the economizer by the high side float valve in the float chamber.

In economizer, due to lower pressure, as liquid enters the high side float ball valve; some liquid will flash into a vapor and cool the remaining liquid. The separated vapor flows to the second stage of the compressor for greater cycle efficiency. The second stage guide vane on the compressor also acts as a pressure regulating device to stabilize low load, low condensing pressure operating conditions. The second stage guide vane will back up gas flow and thereby raises the economizer pressure to permit proper refrigerant flow through the economizer to the compressor second stage during those conditions.

The cooled liquid left in the economizer flows through a low side float valve in low side float chamber and then into the cooler. The low side float valve forms a liquid seal to keep vapor away from entering the cooler. Liquid refrigerant passes through the low side float valve into the cooler. The refrigerant is now at a temperature and pressure at which the cycle began. **Fig. 22** summarizes the refrigeration cycle.

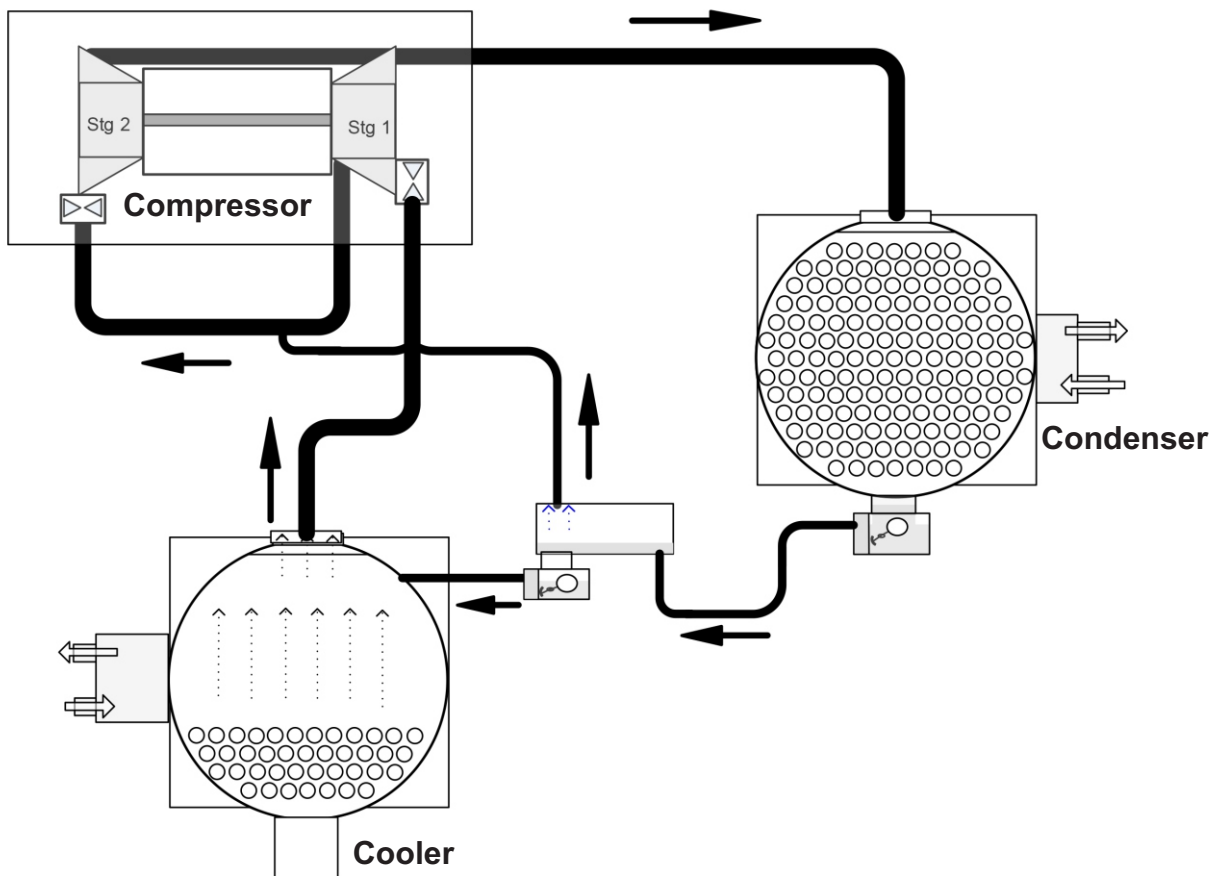


Fig.22 Refrigeration Cycle — 19DV Two-Stage Compressor

Refrigerant Lubrication System

Summary — 19DV series chiller uses refrigerant to lubricate the bearings. The whole lubrication system has four actuator valves and a refrigerant pump. Refrigerant is pulled out from cooler or condenser, pumped through a moisture filter and a bearing filter. Then pure liquid refrigerant enters bearing. Refrigerant is drain to cooler or condenser float chamber depends on chiller running status. (Fig. 23)

Details — Refrigerant lubrication has three stages: pre-lube, running and post-lube. And there are four actuator valves:

- Valve1. Cooler valve
- Valve2. Condenser valve
- Valve3. Cooler drain valve
- Valve4. Condenser drain valve

Valve 1 and 4 operate simultaneously, while valve 2 and 3 operate simultaneously. Refrigerant pump has two inlets (from cooler and from condenser), which are controlled by valve 1 and 2 and outlet of refrigerant pump is connected to bearing. The refrigerant flows from pump outlet through two filters (moisture removal filter and bearing filter) into the bearings, lubricating and cooling the bearings. After this the refrigerant drains to cooler or condenser controlled by valve 3 and 4.

Before starting chiller, control system will monitor liquid level in condenser float chamber. There's a liquid level sensor located on side of the chamber. If liquid level has not reached liquid level sensor.

control will open valve 1 and 4, and pump liquid from cooler to condenser float chamber until the liquid level sensor is satisfied. Once chiller start button is pushed, valve 1 and 4 is open. Refrigerant pump will pump liquid from cooler to bearings and drain to condenser float chamber for 20seconds, this stage is called pre-lube. After that, compressor starts to run. Meanwhile, valve 1 and 4 close and valve 2 and 3 open. Refrigerant is pumped out from condenser and drain to cooler. If chiller is shutdown, valve 2 and 3 close and valve 1 and 4 open. Refrigerant is pumped out from cooler and drain to condenser float chamber. This is post-lube, which lasts 120 seconds.

Bearings— The 19DV compressor assemblies include two sets of Pure Refrigerant Lubricated bearings. The motor shaft is supported by two sets of journal Pure Refrigerant Lubricated bearings located on each end.

Liquid Reclaim System—The liquid reclaim system returns inhibitor in heat exchanger back to bearing house for better lubrication. The inhibitor tends to concentrate at the top level of the refrigerant in the cooler pool boiling part. Using discharge gas to power eductors, this inhibitor and refrigerant mixture is skimmed from the side of the cooler and is then drawn up to the 1st stage guide vane housing. There is a filter in this line the refrigerant vaporizes, leaving the inhibitor behind to be collected and driven into condenser.

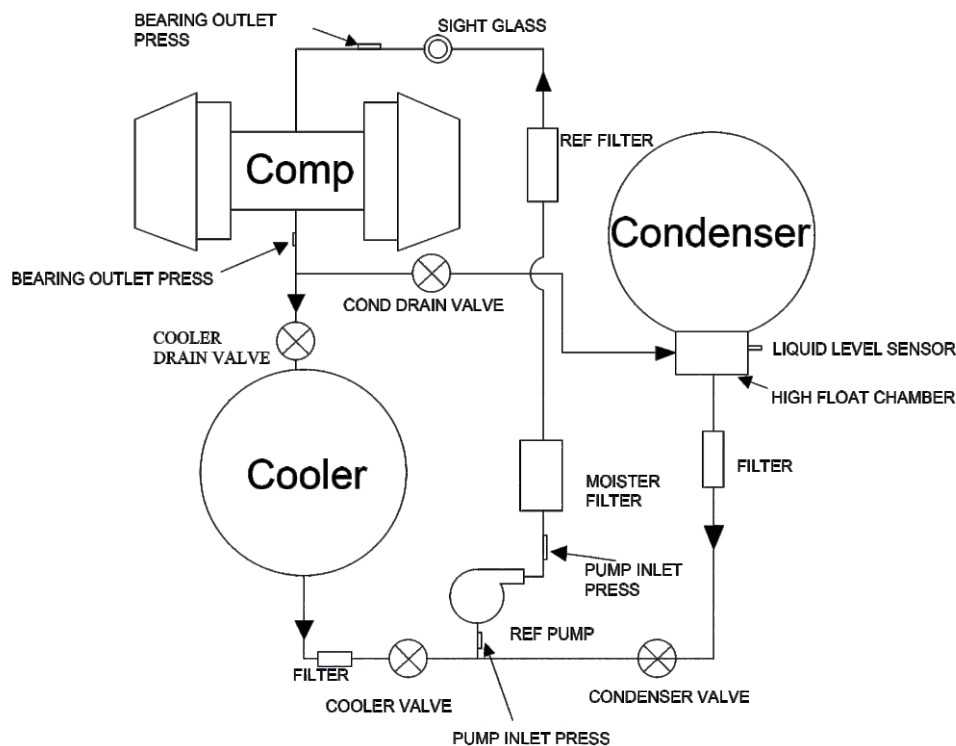


Fig.23 19DV Lubrication System

Motor Cooling System

The motor is cooled by liquid refrigerant taken from the bottom of the condenser flow chamber **Fig. 22 and 23**. Refrigerant flow is maintained by the pressure differential that exists due to compressor operation. After the refrigerant flows past an isolation valve, an in-line filter, and a sight glass/moisture indicator, it is directed over the motor by spray nozzles. The refrigerant collects in the bottom of the motor casing and is then drained back into the cooler through the motor refrigerant drain line. The motor is protected by temperature sensors embedded in the stator windings. An increase in motor winding temperature past the motor override set point overrides the temperature capacity control to hold, and if the motor temperature raises 5.5°C above this set point, the controls close the inlet guide vanes. If the temperature rises above 122.2°C, the compressor shuts down.

VFD Cooling System

VFD is cooled by liquid refrigerant taken from the bottom of the condenser flow chamber. Refrigerant flow is maintained by the pressure differential that exists due to compressor operation. After the refrigerant flows past an isolation valve and an in-line filter, it is directed driven into VFD. The refrigerant is then drained back into the cooler through the refrigerant drain line. The VFD is protected by temperature sensors embedded in the inverter.

An increase in inverter temperature past the override set point overrides the temperature capacity control to hold, and if the temperature raises 5.5°C above this set point, the controls close the inlet guide vanes. If the temperature rises above 80°C, the compressor shuts down.

VFD

All 19DV units are equipped with a VFD to operate the centrifugal hermetic compressor motor. The VFD and control panel are the main field wiring interfaces for the installing contractor. The VFD and control panel are mounted on the chiller.

There are three separate circuit breakers inside the VFD:

1. **Main Circuit breaker (MCB) is the VFD circuit breaker. The ON/OFF switch on the VFD front cover is connected to this breaker.**
2. Circuit breaker CB1 supplies 380/400V power to the refrigerant pump.
3. Circuit breaker CB2 supplies 230V power to the control panel, and portions of the VFD controls.

Purge System

The purge system is located under the condenser. It has two gas inlets coming from condenser and compressor. When chiller is running, the condenser line opens and non-condensable gas will be pulled out from condenser. When chiller is idle, compressor line opens and condenser line closes. Non-condensable gas is pulled out from compressor volute. Because non-condensable gas density is less than refrigerant, so it will float to top of chiller

when idle. There is a purge drain line. The condensed refrigerant liquid is drained to the inlet of refrigerant pump, where it is close to cooler bottom. Another line connects to motor cooling drain line which is a regeneration line. The vapor regenerated from carbon filter of purge will go back to cooler.

The purge system uses R134a as internal refrigerant. It has a compressor, an air cooled condenser coil, an expansion valve, a purge pot, a carbon filter, a vacuum pump and a control box. There's a coil inside purge pot, the low temperature R134a flows through this coil. The purge compressor, condenser coil, expansion valve and coil inside purge pot work as a refrigeration system. It can generate -15.5°C temperature in the purge pot. So when vapor R1233zd (E) contacts the coil, it condenses to liquid. And the area around the coil becomes vacuum. So more refrigerant is pushed by pressure differential of the purge pot and chiller's condenser/volute. This is called thermosyphon. If non-condensable gas comes into purge pot with refrigerant, it can't be condensed and will accumulate on top. When there's enough non-condensable gas inside purge pot, control will start to pump out the non-condensable gas. The remaining vapor refrigerant is absorbed by carbon filter and pure non-condensable gas is vented to atmosphere. If carbon filter is saturated, system will start to regenerate this carbon filter. A heater inside can heat carbon filter to about 100°C. Meanwhile, vacuum pump is evacuating the carbon filter. So after this process, carbon filter is fully regenerated and absorbed refrigerant is recovered to cooler. Refer to **Fig. 43** for purge system and operation sequence.

Controls

Definitions

Analog Signal — An analog signal varies in proportion to the monitored source. It quantifies values between operating limits. (Example: A temperature sensor is an analog device because its resistance changes in proportion to the temperature, generating many values.)

Discrete Signal — A discrete signal is a 2-position representation of the value of a monitored source. (Example: A switch produces a discrete signal indicating whether a value is above or below a set point or boundary by generating an on/off, high/low, or open/closed signal.)

General

The 19DV hermetic centrifugal liquid chiller contains a microprocessor-based control panel that monitors and controls all operations of the chiller. **See Fig. 24 and 25** for control and sensor location. The microprocessor control system matches the cooling capacity of the chiller to the cooling load while providing state-of-the-art chiller protection. The system controls the cooling load within the set point plus/minus the dead band by sensing the leaving chilled water or brine temperature and regulating the inlet guide vane via a mechanically linked actuator motor and VFD speed.

The guide vane is a variable flow pre-whirl assembly that regulates the amount of refrigerant vapor flow into the compressor. An increase in guide vane opening increases capacity. A decrease in guide vane opening decreases capacity. The microprocessor-based controls protect the chiller by monitoring the digital and analog inputs and executing capacity overrides or safety shutdowns, if required. The variable frequency drives (VFD) allows compressor start-up and capacity control by modulating the motor frequency based on the operation condition.

PIC 5+ System Components

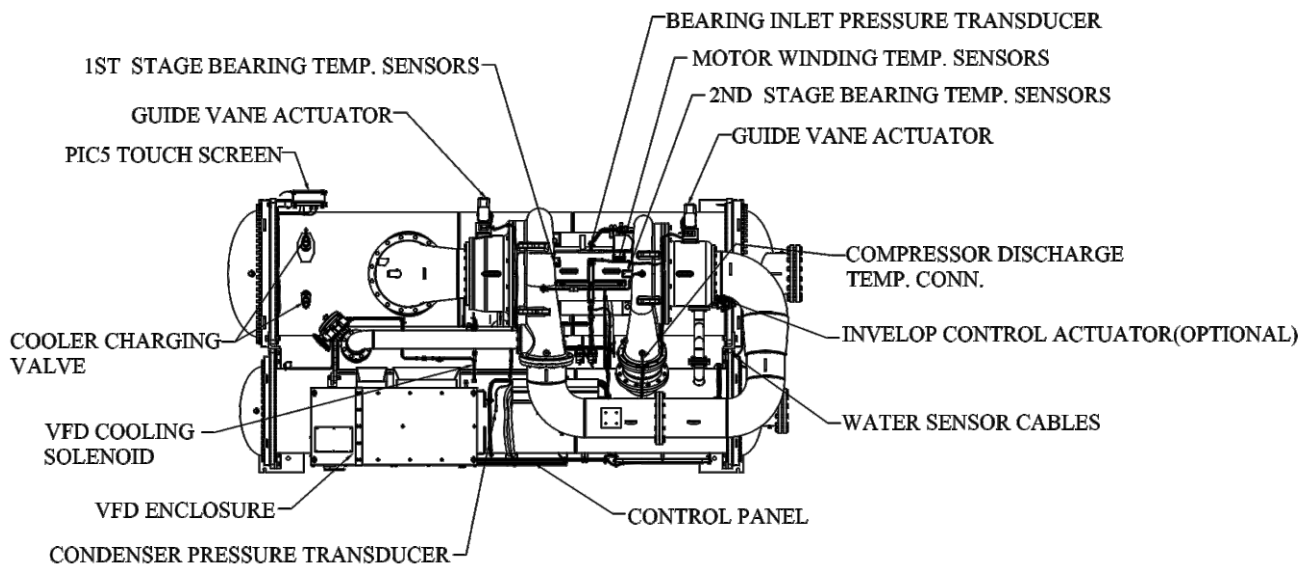
The chiller control system is called the PIC(Product Integrated Control) 5+, See Table 15 for Components and Panel Location. Same as previous PIC versions, the PIC 5+ controls the operation of the chiller by monitoring all operating conditions. It promptly modulates the guide vanes and adjusts VFD speed to maintain leaving or entering chilled water temperature based on the configurations. It continually checks all safeties to prevent any abnormal operating conditions.

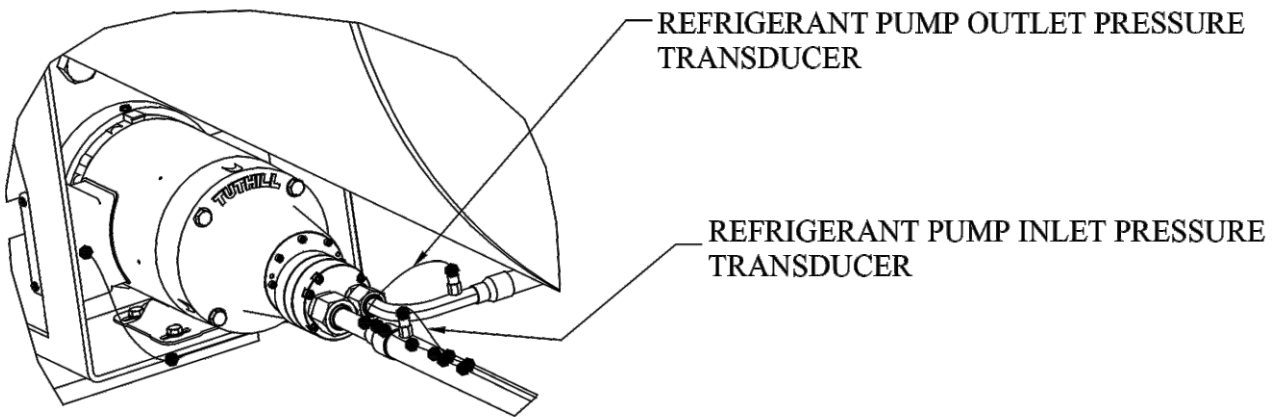
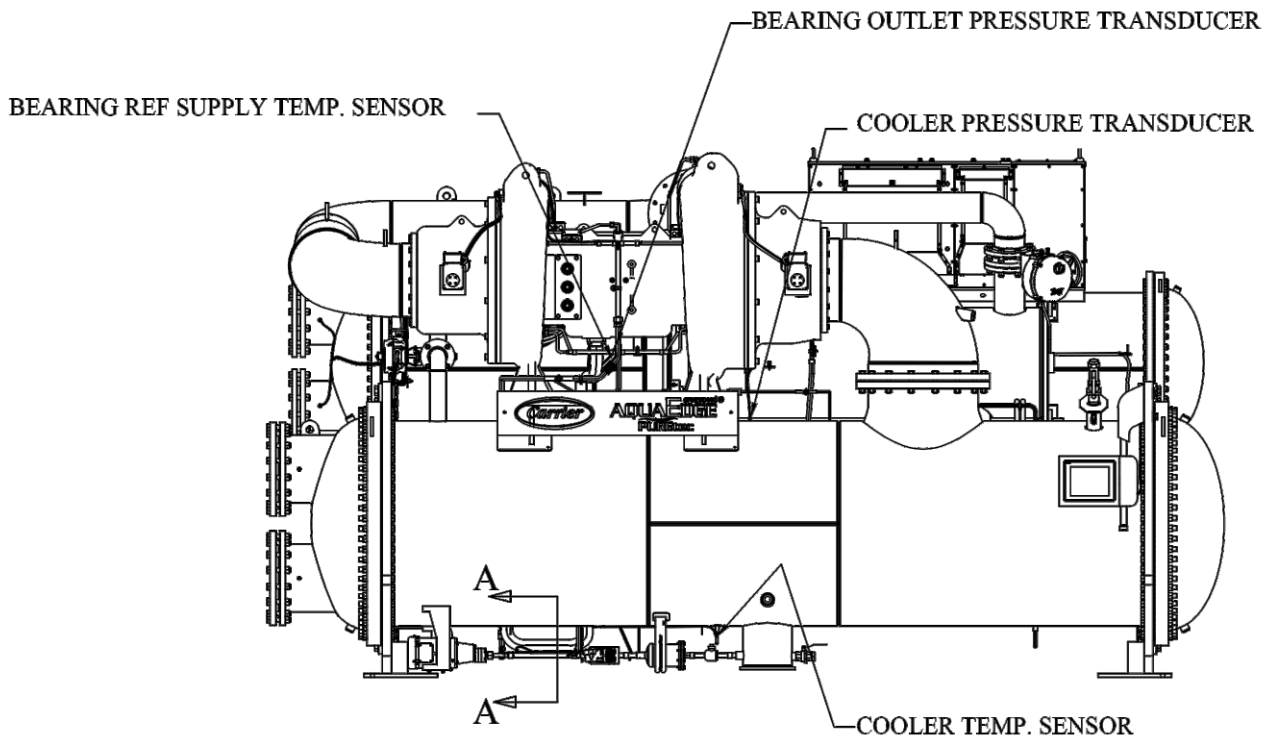
Refrigerant pump is modulated to control the refrigerant pressure difference. Envelope control valve is an option to stabilize the chiller operation if installed. PIC5 + system provide operator trending function to help operator monitor the chiller status more easily. The PIC5 + system provide open protocols to support the competitive BMS system and can be integrated into Carrier's Lifecycle System Management for remote monitoring and data management. Hydraulic system (water pump, tower fan and water flow meter, etc.) control is an option if dedicated IOB-4 is installed.

Table 15 — Major PIC 5+ Components and Panel Locations

PIC 5+ COMPONENT	PANEL LOCATION
PIC 5+ Touch Screen	PIC 5+ TOUCH SCREEN Control Panel
Variable Frequency Drive	See Fig. 22
Chiller Input /Output Boards	Control Panel
Envelope Control Valves (Optional)	Control Panel
Control Transformers (T1, T2, T3)	Control Panel
Temperature Sensors	See Fig. 22 and Fig. 23
Pressure Transducers	See Fig. 22 and Fig. 23

NOTE: For detailed information about the PIC 5+ Touch Screen, please refer to separate PIC5+ Control User Manual.





SECTION A-A
 SCALE 1:4

Fig.24 Chiller Controls and Sensor Location

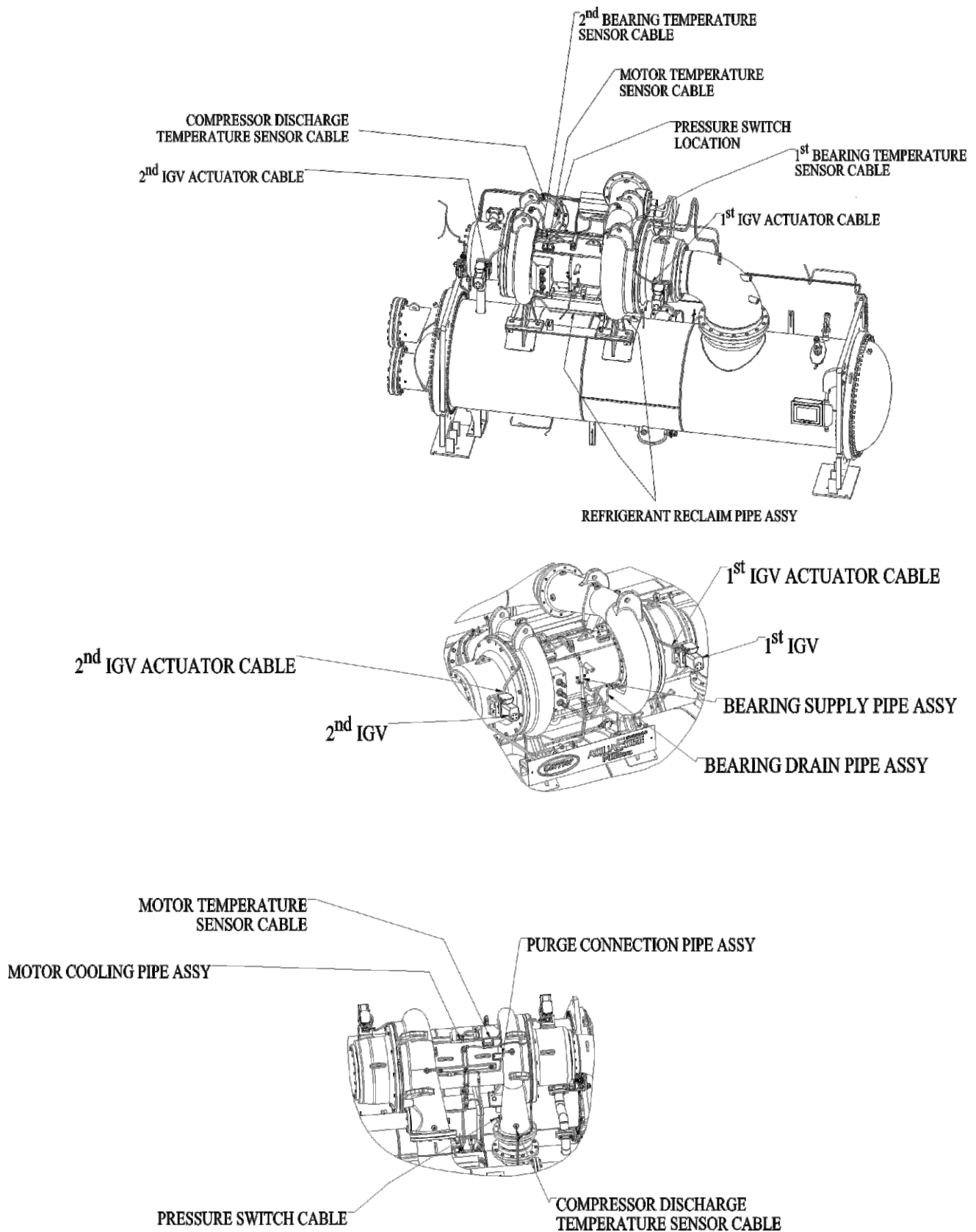


Fig.25 19DV Compressor Controls and Sensor Location

Temperature sensors:

The system uses temperature sensors to measure and control the temperatures in the unit.

There are three types of temperature sensors, 5K thermistor (standard), 10K thermistor and RTD (three wires) based on the IOB channel configurations.

Sensor	Detailed Description
Entering chilled water temperature sensor	Measures the temperature of entering cooler water.
Leaving chilled water temperature sensor	Measures the temperature of leaving cooler water.
Entering condenser water temperature sensor	Measures the temperature of entering condenser water.
Leaving condenser water temperature sensor	Measures the temperature of leaving condenser water.
Cooler refrigerant liquid temperature sensor	Measures the Compressor discharge temperature.
1st Stage Bearing Temp	Measure the 1st stage bearing temperature
2nd Stage Bearing Temp	Measures the temperature of entering cooler water.
Bearing Ref Supply Temp	Measures the temperature of entering cooler water.
Motor winding temperature sensors	The sensors measure the temperature of compressor motor windings

The temperature sensor range is -40 ~ +118°C.

Pressure transducers

Pressure transducers are used to measure and control the pressures in the unit. These electronic sensors deliver 0 to 5 VDC. The transducers can be calibrated through the controller. The pressure transducers are connected to the IOBs.

Sensor	Detailed Description
Cooler pressure transducer	Measures the temperature of entering cooler water.
Condenser pressure transducer	Measures the temperature of leaving cooler water.
Pump Outlet Pressure	Measures the temperature of entering condenser water.
Bearing Outlet Pressure	Measures the temperature of leaving condenser water.
Bearing Inlet Pressure	Measures the Compressor discharge temperature.
Pump Inlet Pressure	Measure the 1st stage bearing temperature

Start-Up/Shut Down/Recycle Sequence

Local Start/Stop Control — Local start-up (or manual start-up) is initiated by pressing the gray Start/Stop icon on the PIC 5+ touch screen. See Fig. 26.

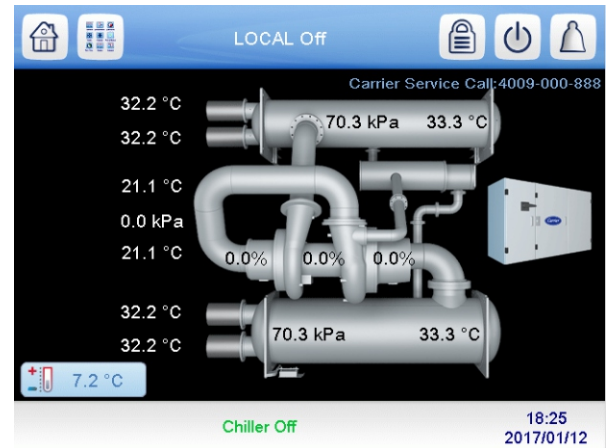


Fig. 26 Chiller Start/Stop Icon

This initiates the PIC 5+ starting sequence by displaying the list of operating modes. Press Local On to initiate start-up. See Fig. 27.

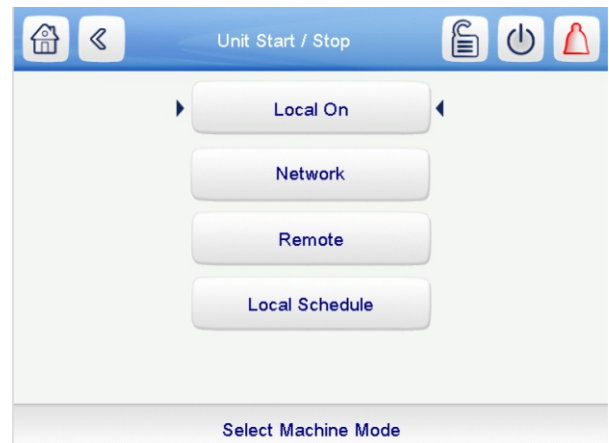


Fig.27 Operating Mode

NOTE: — Prior to start-up, the start-to-start timer and the stop-to-start timer must have elapsed and all alarms must be cleared. When start-up is initiated, the status screen displays the startup progress and the Start/Stop icon blinks green.

Once local start-up begins, the PIC 5+ control system performs a series of pre-start tests to verify that all pre-start alerts and safeties are within acceptable limits. Table 16 shows appropriate Prestart Alerts/Alarms conditions. If a test is not successful, the start-up is delayed or aborted. If the tests are successful, the startup will be in progress and the COMPRESSOR RUN STATUS shall be "Startup." If IOB-4 is installed, the control shall then energize the chilled water/brine pump relay.

Five seconds later, the condenser pump relay energizes.

Thirty seconds later the PIC 5+ control system monitors the chilled water and condenser water flow devices and waits until the WATER FLOW VERIFY TIME (operator-configured, default 5 minutes) expires to confirm flow. After flow is verified, the chilled water temperature is compared to CONTROLPOINT plus 1/2 CHILLED WATER DEADBAND.

If the temperature is less than or equal to this value, the PIC 5+ control system turns off the condenser pump relay and goes into a Recycle mode.

If the water temperature is high enough, the start-up sequence continues and checks the guide vane position. If the guide vanes are more than 4% open, the start-up waits until the PIC 5+ control system closes the vanes. If the vanes are closed and the refrigerant pump pressure is less than 34.5 kPa, the refrigerant pump relay energizes. The PIC 5+ control system then waits until the refrigerant pressure (REF PRESS VERIFY TIME, operator-configured, default of 40 seconds) reaches a maximum of 82.7 kPa. After refrigerant pressure is verified, if high side float chamber with liquid level, refrigerant pump will be kept ON for 20 seconds; if not, refrigerant pump will be kept ON until there is liquid level, and then kept on 10 seconds after that, the compressor start relay energizes to start the compressor.

Compressor on-time and service on-time timers start, and the compressor STARTS IN 12 HOURS counter and the number of starts over a 12-hour period counter advance by one.

Failure to verify any of the requirements up to this point will result in the PIC 5+ control system aborting the start and displaying the applicable pre-start alert alarm state number near the bottom of the home screen on the PIC 5+ Touch Screen. A pre-start failure does not advance the STARTS IN 12 HOURS counter. Any failure after the 1CR relay has energized results in a safety shutdown, advances the starts in 12 hours counter by one, and displays the applicable shutdown status on the display.

The minimum time to complete the entire pre-start sequence is approximately 185 seconds. **See Fig. 28** for normal start-up timing sequence. See Table 16 for a list of pre-start checks.

- B. Condenser water pump started (5 seconds after A).
 - C. Water flows verified (30 seconds to 5 minutes maximum after B). Chilled water temperatures checked against control point. Guide vanes checked for closure. Refrigerant pump started;
 - D. Ref pressure verified (15 seconds minimum, 300 seconds maximum after C).
 - E. Compressor motor starts; compressor ontime and service ontime start, 15-minute inhibit timer starts (10 seconds after D), total compressor starts advances by one, and the number of starts over a 12-hour period advances by one.
 - F. SHUTDOWN INITIATED — Compressor motor stops; compressor ontime and service ontime stop, and 2-minute inhibit timer starts.
 - G. Ref pump and cooler pumps de-energized (120 seconds after F). Condenser pump and tower fan control may continue to operate if condenser pressure is high. Cooler pump may continue if in RECYCLE mode.
- O/A — Restart permitted (both inhibit timers expired: minimum of 15 minutes after E; minimum of 2 minute after F).

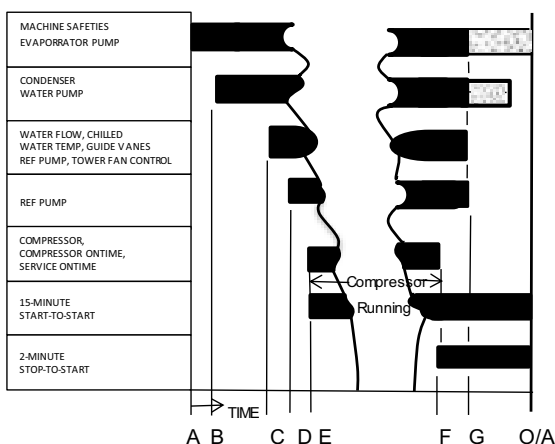


Fig. 28— Control Timing Sequence for Normal Start-Up

- A. START INITIATED: Pre-start checks are made; cooler pump started.*

Table 16 — Prestart Checks

PRESTART ALERTCONDITION	State Number	Alarm or Alert
STARTS IN 12 HOURS >= 8	100	Alert
CONDENSER PRESSURE >= COND PRESS OVERRIDE - 20 PSI	102	Alert
Number of recycle restart in the last 4 hours is greater than 5	103	Alert
COMP BEARING TEMP >= COMP BEARING ALERT- 10F	230	Alarm
COMP MOTOR WINDING TEMP >= MOTOR TEMP OVERRIDE - 10F	231	Alarm
COMP DISCHARGE TEMP >= COMP DISCHARGE ALERT- 10F	232	Alarm
EVAP_SAT <Evap trip point + EVAP OVERRIDE DELTA T OR EVAP REFRIG LIQUID TEMP <Evap trip point + EVAP OVERRIDE DELTA T NOTE: Evap trip point = 33F(water) or EVAP REFRIG TRIPPOINT (brine)	233	Alarm
ACTUAL LINE VOLTAGE <= UNDERVOLTAGE THRESHOLD (N/A for Eaton/Rockwell UM VFDs)	234	Alarm
ACTUAL LINE VOLTAGE >= OVERVOLTAGE THRESHOLD (N/A for Eaton or Rockwell VFDs)	235	Alarm
Guide vane 1 has not been calibrated successfully	236	Alarm
Guide vane 2 has not been calibrated successfully	238	Alarm

The compressor RUN STATUS parameter on the default screen line now reads PRESTART. If one test is not successful, the start-up is delayed or aborted. If all the tests are successful, the chilled water pump relay energizes(if IOB-4 installed), and the main screen line now reads STARTUP.

Lubrication Control

For the 19DV system, refrigerant is used to lubricate and cool the compressor bearings. The refrigerant lubrication system mainly includes refrigerant pump pressure transducers, condenser control valve, cooler control valve, cooler drain valve, condenser drain valve, cooler and condenser filter, moisture removal desiccant, bearing filter, liquid level switch and additive reclaim system. When the chiller is powered on, the controller will maintain liquid level in condenser float chamber. If liquid level is low, refrigerant will be pumped from cooler to condenser float chamber until the liquid level switch is on ON and last 1 minute after that.

Once operator push the start button, the system will go into pre-start check process.

When Refrigerant Pump request is on for pre-lube and the bearing pressure difference is ok for start, if cooler temperature plus leaving condenser water temperature is less than -12.2°C, pump refrigerant from Cooler to Condenser for a certain time until compressor is ON. Else, if cooler temperature plus leaving condenser water is equal or larger than -12.2°C, pump refrigerant from condenser to bearing and drain to condenser for a certain time until compressor is ON.

During pre-lubrication, if the bearing pressure difference is less than 55.2kPa for continuously 8 seconds, the chiller will shutdown. The compressor will run after the pre-lubrication process. Refrigerant will be pumped to bearing and drain to cooler from condenser float chamber. When chiller shutdown, the condenser control valve will be closed and the refrigerant will be pumped from cooler to bearing and drain to condenser.

When the chiller is OFF , always open cooler control valve.

During running, if compressor is ON and the bearing pressure difference is less than 68.9kPa for continuously 10 seconds, the chiller will also shut down.

Shutdown

Chiller shutdown begins if any of the following occurs:

1. Local OFF button is pressed
2. A recycle condition is present (see Recycle Mode section)
3. The time schedule has gone into unoccupied mode when in Network or Local Schedule control mode.

3. The chiller protective limit has been reached and chiller is in alarm
4. The start/stop status (CHIL_S_S) is overridden to stop from the network when in Network mode

If the chiller is normally shutdown from running, soft stop shutdown will be performed. The soft stop feature closes the guide vanes of the compressor automatically if a non-alarm stop signal occurs before the compressor motor is de-energized.

Any time the compressor is directed to STOP (except in the cases of a fault shutdown), the guide vanes are directed to close and VFD is directed to minimum speed for variable speed compressor, and the compressor shuts off when any of the following is true:

1. PERCENT LOAD CURRENT (%) drops below the SOFT STOP AMPS THRESHOLD
2. ACTUAL GUIDE VANE OPENING drops below 4%
3. 4 minutes have elapsed after initializing stop.

BEFORE INITIAL START-UP

Job Data Required

1. List of applicable design temperatures and pressures (Product data submittal)
2. Chiller certified prints
3. VFD details and wiring diagrams
4. Diagrams and instructions for special controls or options
5. 19DV Installation Instruction

Equipment Required

1. Mechanic's tools (refrigeration)
2. Digital volt-ohmmeter (DVM)
3. Clamp-on ammeter
4. Electronic leak detector
5. Absolute pressure manometer or wet bulb vacuum indicator
6. 500V insulation tester
7. 1.5 to 3 m of copper or plastic hose to fit 31.75mmSAE connection
8. Refrigerant drum charging valve
9. Refrigerant charge machine

Remove Shipping Packaging

Remove the packaging material from the control panels, guide vane actuators, motor cooling and liquid reclaim line components.

Tighten All Gasket Joints

Joints with gasket normally loosen by the time the chiller arrives at the job site. Tighten all gasketed joints to ensure a leak-tight chiller. Such gasketed joints (excluding O-rings) shall include:

1. Waterbox covers
2. Compressor first suction elbow flanges (at compressor and at the cooler)
3. Compressor secondary suction flanges (at compressor and low side float chamber)
4. Compressor first and secondary discharge flange
5. Compressor discharge line spacer (both sides)
6. Cooler inlet line spacer (both sides)
7. Envelope control flange (both sides of valve)
8. ICP piping flange
9. High side float chamber cover and low side float chamber cover

See Tables 17 for bolt torque requirements.

Check Chiller Tightness

Fig.29 outlines the proper sequence and procedures for leak testing.

19DV chillers are shipped without refrigerant. Units are shipped with 103 kPa nitrogen-holding charge and refrigerant is to be field supplied.

To check leaks in chiller, in addition to the nitrogen gas, the chiller should be charged with helium tracer gas. Use an electronic leak detector to check all flanges and solder joints after the chiller is pressurized. If any leak is detected, follow the leak test procedure.

If the chiller is spring isolated, keep all springs blocked in both directions to prevent possible pipe stress and damage during the transfer of refrigerant from vessel to vessel during the leak test process, or any other time refrigerant is transferred. Before initial start, ensure that springs are adjusted, chiller is charged with refrigerant, and water circuits are full with water.

Table 17—Bolt Torque Requirements, N-m(gasket or o-ring joint)

mm	CLASS 8.8, SAE 5, SA499 (N·m)			CLASS 10.9, SAE 8, SA354 GR BD (N·m)		
	SOCKET HEAD OR HEX WITH 3 RADIAL LINES MEDIUM CARBON STEEL			HEX HEAD WITH 6 RADIAL LINES MEDIUM CARBON STEEL		
	Minimum	Maximum	Set	Minimum	Maximum	Set
6	8.1	12.2	10±1	12.2	17.6	14±1
8	17.6	24.4	20±1	27.1	38.0	20±1
10	29.8	42.0	34±1	43.4	62.3	34±1
	47.4	67.8	61±7	71.8	101.6	81±7
12	71.8	101.6	81±7	108.4	155.8	122±7
14	101.6	149.1	122±14	155.8	223.6	176±14
16	142.3	203.3	163±14	216.8	304.9	244±14
18,20	237.1	388.8	285±34	352.3	501.4	393±34
22	359.1	514.9	407±34	562.3	799.5	610±34
24	555.6	785.9	597±34	846.9	1210.0	894±34
27	738.5	1056.9	786±34	1334.7	1910.6	1382±34
30	1043.4	1490.5	1084±34	1870.0	2655.8	1911±34
33,36	1382.1	1978.3	1423±34	2493.2	3563.7	2534±34
39	1653.1	2371.3	1721±68	2981.0	4268.3	3049±68
42	2262.1	3238.5	2331±68	4092.1	5840.1	4160±68
45	2953.9	4214.1	3022±68	5325.2	7601.6	5393±68
48	3970.2	5677.5	4038±68	7154.4	10230.3	7222±68
52	4268.3	6165.3	4336±68	7682.9	10975.5	7751±68
56, 60	6165.3	8807.5	6233±68	11111.0	15867.1	11179±68
64	6775.0	96747	6843±68	15379.3	21964.6	15447±68
68	11463.3	16382.0	122±14	221287.1	30406.2	21355±68
72, 76	14959.2	21368.4	11531±68	26964.5	38536.2	27032±68

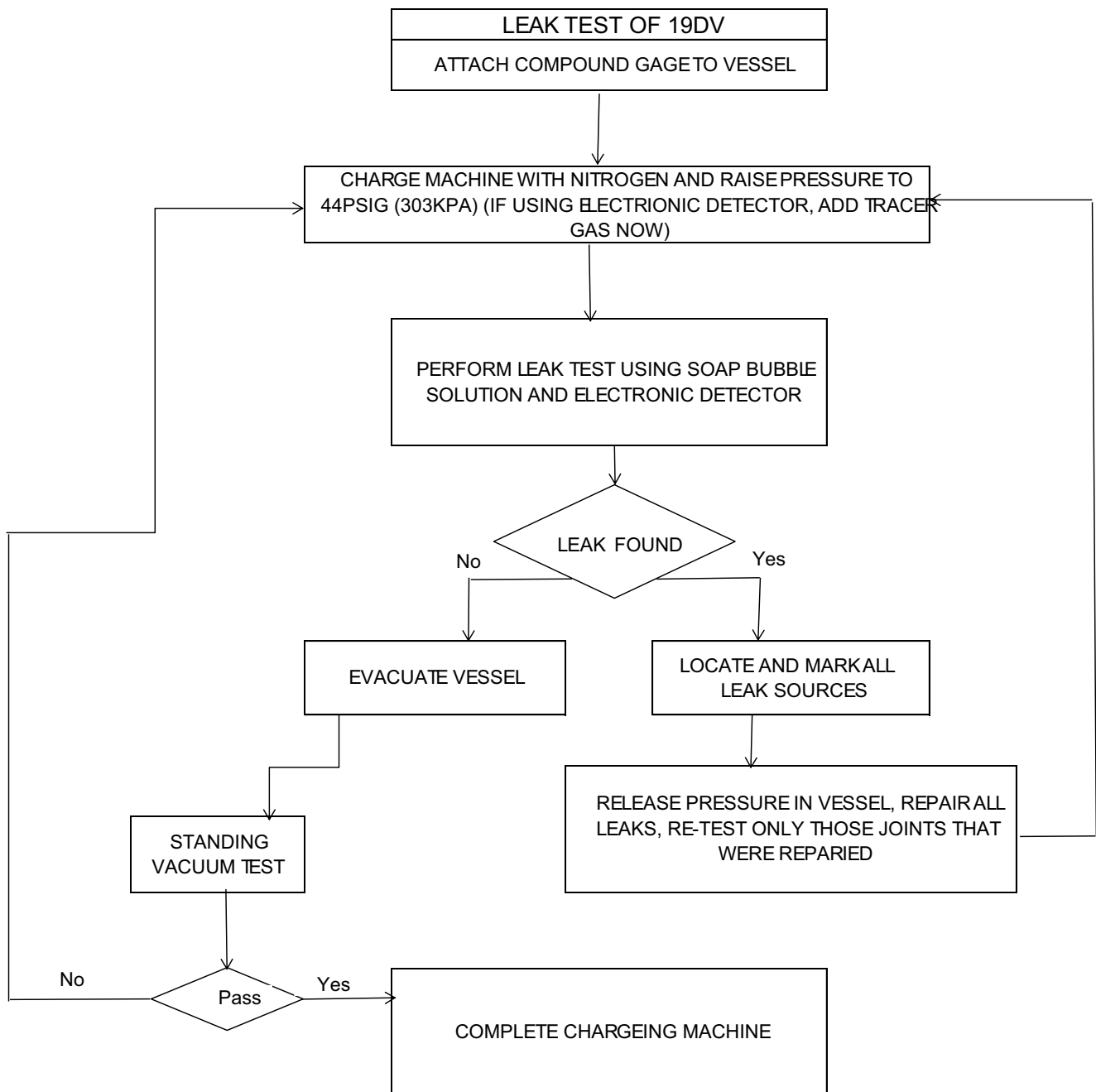


Fig. 29 19 DV Leak Test Procedure

Refrigerant Tracer

Carrier recommends the use of an environmentally acceptable refrigerant tracer for leak testing with an electronic detector. Ultrasonic leak detectors can also be used if the circuit is under pressure.

!WARNING

HFO-R1233zd(E) should not be mixed with air or oxygen and pressurized for leak testing.

Chiller Leak Test

Due to refrigerant emission regulations and the difficulties associated with separating contaminants from the refrigerant, Carrier recommends the following leak test procedure.

Refer to **Tables 18** for R1233zd(E) refrigerant pressure/temperature properties.

1. . If the pressure readings are normal for the chiller condition:
 - a. Evacuate the holding charge from the vessels, if present.
 - b. Raise the chiller pressure, if necessary, by adding refrigerant until pressure is at the equivalent saturated pressure for the surrounding temperature. (Same as above flow chart).

!WARNING

Never charge liquid refrigerant into the chiller if the pressure in the chiller is less than R1233zd(E) saturation pressure corresponding to local temperature. Charge refrigerant in gas phase only, with the cooler and condenser water pumps running, until this pressure is reached, using PUMPDOWN/LOCKOUT (located in the Maintenance menu) and TERMINATE LOCKOUT mode on the PIC 5+. Flashing of liquid refrigerant at low pressures can cause tube freeze-up and considerable damage.

- c. Leak test chiller as outlined in Steps 3 to 9.
2. If the pressure readings are abnormal for the chiller condition (refer to refrigerant property table): Prepare to leak test chillers
 - a. Pressurizing chiller to 303 KPa using nitrogen.
 - b. Check the chiller carefully with an electronic leak detector and soap bubble solution.
 - c. Mark any leaks that are found.
 - d. Release the pressure in the system.
 - e. Repair all leaks.
 - f. Retest the joints that were repaired.
3. **Leak Determination** — Total all leak rates for the entire chiller. Leakage at rates greater than 0.1% of the total charge per year must be repaired. Note the total chiller leak rate on the start-up report.

4. If no leak is found during the initial start-up procedures, complete the transfer of refrigerant gas from the storage tank to the chiller.
5. If no leak is found after a retest, next step is Standing Vacuum Test section.
 - a. If the chiller fails the standing vacuum test, check for leaks (Step 2).
 - b. If the chiller passes the standing vacuum test (Follow the procedure in the Chiller Dehydration section.) Charge the chiller with refrigerant.
6. If a leak is found after a retest, pump the refrigerant back into the storage tank.
7. Transfer the refrigerant until the chiller pressure is at 0.06kPa [abs].
8. Repair the leak and repeat the procedure, beginning from Step 2, to ensure a leak-tight repair. (If the chiller is opened to the atmosphere for an extended period, evacuate it before repeating the leak test.)

Table 18—R1233zd(E) Pressure- Temperature (°C)

Temperature / °C	Pressure / kPa
-12.2	-74.1
-9.4	-70.1
-6.7	-65.8
-3.9	-60.9
-1.1	-55.5
1.7	-49.6
4.4	-43.0
7.2	-35.8
10.0	-28.0
12.8	-19.3
15.6	-10.0
18.3	0.3
21.1	11.4
23.9	23.4
26.7	36.4
29.4	50.5
32.2	65.6
35.0	81.9
37.8	99.3
40.6	118.1
43.3	138.1
46.1	159.6
48.9	182.4
51.7	206.8
54.4	232.7
57.2	260.3
60.0	289.6

Standing Vacuum Test

When performing the standing vacuum test or chiller dehydration, use a manometer or a wet bulb indicator. Dial gages cannot indicate the small amount of acceptable leakage during a short period of time.

1. Attach an absolute pressure manometer or wet bulb indicator to the chiller.
2. Evacuate the vessel to at least 0.06 kPa [abs], using a vacuum pump.
3. Shut off pump valve to hold the vacuum and record the manometer or wet bulb indicator reading.
4.
 - a. If the pressure rise is less than **56 Pa within 8 hours**, the chiller is sufficiently tight.
 - b. If the pressure rise exceeds above criteria, re-pressurize the vessel and conduct leak test and repair the leak point.

Chiller Dehydration

Dehydration is recommended if the chiller has been open for a considerable period of time, if the chiller is known to contain moisture, or if there has been a complete loss of chiller holding charge or refrigerant pressure.

! CAUTION

Do not start or quick-test the compressor motor or refrigerant pump, even for a rotation check, if the chiller is under dehydration vacuum. It may result in insulation breakdown and severe damages.

Dehydration can be done at room temperatures. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required to boil off any moisture. If ambient temperature is low, contact local Carrier Service for the required dehydration techniques.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (0.002 m³/s or larger is recommended) to the refrigerant charging valve (**Fig. 2**). Tubing from the pump to the chiller should be as short in length and as large in diameter as possible to provide least resistance to gas flow.
2. Use an absolute pressure manometer or a wet bulb vacuum indicator to measure the vacuum. Open the shutoff valve to the vacuum indicator only when taking a reading. Leave the valve open for 3 minutes to allow the indicator vacuum to equalize with the chiller vacuum.
3. If the entire chiller is to be dehydrated, open all isolation valves (if present).
4. With the chiller ambient temperature at 15.6 °C or higher, operate the vacuum pump until the manometer reads 757.4 mm Hg vacuum, or a vacuum indicator reads 1.7 °C. Operate the pump an additional 2 hours. Do not apply a greater vacuum than 757.4 mm Hg vacuum or go below 0.56 °C on the wet bulb vacuum indicator. At this temperature and pressure, isolated pockets of moisture can turn into ice. The slow rate of evaporation of ice at these low temperatures and pressures greatly increases dehydration time.
5. Shut off vacuum pump valve, stop the pump, and record the instrument reading.
6. After a 2-hour wait, take another instrument reading. If the reading has not changed, dehydration is complete. If the reading indicates vacuum loss, repeat Steps 4 and 5.
7. If the reading continues to change after several attempts, perform a leak test up to the maximum 303 kPa pressure. Locate and repair the leak, and repeat dehydration.
8. Once dehydration is complete, the evacuation process can continue. The final vacuum prior to charging the unit with refrigerant should in all cases be 0.3 kPa [abs] or less.

Inspect Water Piping

Inspect the piping connected to the cooler and condenser. Be sure that the flow directions are correct and that all piping specifications have been met.

Piping systems must be properly vented with no stress on waterbox nozzles and covers. Water flows through the cooler and condenser must meet job requirements. Measure the pressure drop across the

! CAUTION

Water must be within design limits, clean, and treated to ensure proper chiller performance and to reduce the potential of tube damage due to corrosion, scaling, or erosion. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Check Safety Valve

Be sure the safety valves have been piped to the outdoors in compliance with the latest edition of ANSI/ASHRAE Standard 15 and applicable local safety codes. Piping connections must allow for access to the valve mechanism for periodic inspection and leak testing.

The standard 19DV safety valves are set to relieve at 293.02 kPa chiller design pressure.

Inspect Wiring

! WARNING

Do not check the voltage supply without proper equipment and precautions. It may result in serious injuries. Follow power company recommendations.

! CAUTION

Do not apply any kind of test voltage, even for a rotation check, if the chiller is under dehydration vacuum. It may result in insulation breakdown and serious damages.

1. Examine the wiring according to the job wiring diagrams and all applicable electrical codes.
2. Connect a voltmeter across the power wires to the VFD and measure the phase to phase and phase to ground voltage. Compare the reading to the voltage rating on the compressor and VFD nameplates before applying power to the starter.
3. Compare the ampere rating on the VFD enclosure nameplate to the rating on the compressor nameplate.
4. **Option:** The control panel must be wired to components and terminals required for PIC 5+ hydraulic control. Check line side power and control components shown on the certified prints.
5. Check the phase to phase and phase to ground line voltage to the VFD, control panel, and purge control panel, and compare voltages against nameplate values.
6. Ensure that fuse disconnects or circuit breakers are used in feeder panel.
7. Ensure all electrical equipment and controls are properly grounded in accordance with the job drawings, and all applicable electrical codes.
8. Ensure the customer's contractor has verified proper operation of the pumps, cooling tower fans, and associated auxiliary equipment. This includes ensuring motors are properly lubricated and have proper electrical supply and proper rotation.
9. Tighten all wiring connections on the high and low voltage terminal blocks in the VFD enclosure **confirming no external power supplies are connected to a control input.**
10. Inspect the control panel and VFD enclosure to ensure that the contractor has used the gland to feed the wires into the back of the enclosures. Wiring into the top of the enclosures can allow debris to fall into the enclosures. Clean and inspect the interior of the control panel and VFD.

! WARNING

Do not apply power unless a qualified Carrier technician is present. It may result in serious personal injuries.

Check Purge Operation

Enter Quick Test menu, run purge compressor. Connect a pressure gauge to purge compressor inlet schrader valve. The reading should be about **62.1±6.9 kPa**. If not, please adjust the purge expansion valve until the reading is correct.

Check VFD

! WARNING

Disconnect power supply ahead of the VFD in addition to shutting off the chiller or pump. Failure to follow this procedure may result in personal injury by electric shock.

! WARNING

Risk of electrical shock. Disconnect input power before equipment servicing. Wait 20 minutes then check that the DC-bus capacitors are discharged.

VFD CHECKING PROCEDURE:

1. Check the components arrangement, make sure no failure during the transportation;
2. Check the cable connection, make sure no cables were pulled out;
3. Close the CB1, CB2, CB3, CB4, and set SW to position 2 (**Fig.30**)
4. Check the VFD cooling connection.
5. Connect power cable to mains circuit breaker;
6. Close all the doors;
7. Try to power on the VFD.

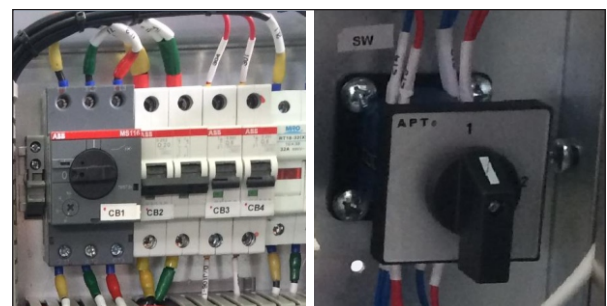


Fig.30 Circuit breaker (CB1 to CB4 and Switch)

Charging Refrigerant

! CAUTION

The transfer, addition, or removal of refrigerant in spring isolated chillers may place severe stress on external piping if springs have not been blocked in both up and down directions.

! CAUTION

Always operate the condenser and chilled water pumps during charging operations to prevent freeze-ups.

The standard 19DV chiller is shipped without refrigerant but with a nitrogen holding charge of 103 kPa. Evacuate the nitrogen from the entire chiller before charging the chiller with refrigerant.

! WARNING

Never charge liquid refrigerant into the chiller if the pressure in the chiller is less than R1233zd(E) saturation pressure corresponding to local temperature. Charge refrigerant in gas phase only, with the cooler and condenser water pumps running, until this pressure is reached, using PUMPDOWN/LOCKOUT (located in the Maintenance menu) and TERMINATE LOCKOUT mode on the PIC 5+. Flashing of liquid refrigerant at low pressures can cause tube freeze-up and considerable damage.

if refrigerant is supplied with the machine, it should be more than that required for initial charging. Charge only the amount shown on machine information plate. Machine vacuum will draw refrigerant from drum.

After machine has been started, adjust charge as required for optimum machine performance. Refer to Trim Refrigerant Charge, **page 7**.

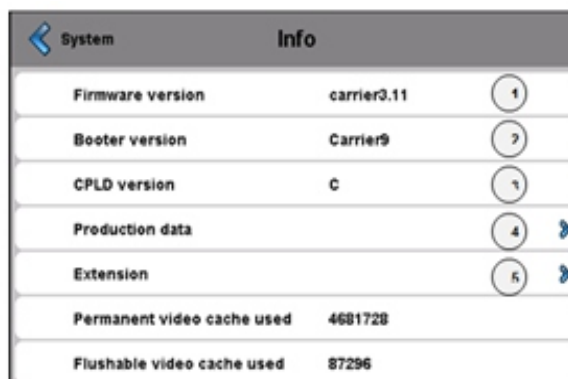
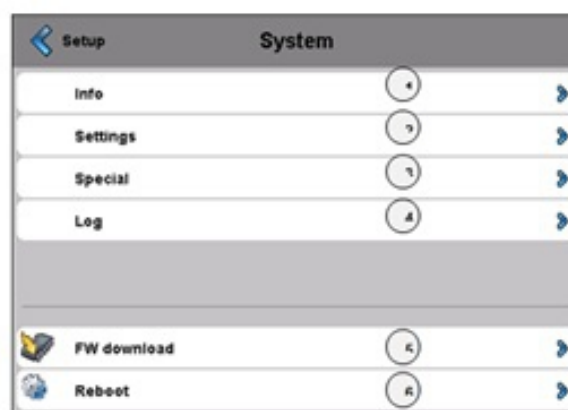
1. Ensure standing vacuum test done and the circuit water circulated before charging process.
2. Connect short piece of plastic hose or copper tubing from refrigerant drum valve to cooler charging valve (**item 13, Fig.2**).
3. Charge refrigerant from refrigerant drum.

Check Lubrication Circuit system

Please check condenser float chamber liquid level. If lubrication system works properly, the liquid level sensor should indicate ON. Before chiller starts, the cooler valve is ON. The other three actuator valves are OFF and the refrigerant pump is idle.

Welcome Screen

The welcome screen is the first screen shown after switching the unit on or after the re-animation of the screen. It displays the application name as well as current software version number.



Change the Set Points

To access the set point screen, press the lock icon on the Main Menu, entering password correctly, then press the Main Menu icon on the home screen. See Fig. 31.

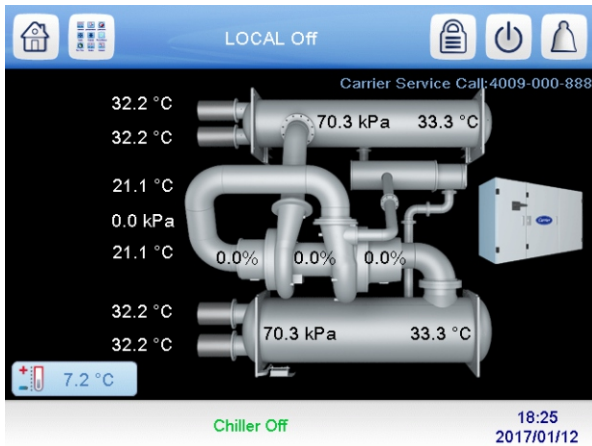


Fig.31 Main Menu Icon

The Main Menu screen is displayed. Press the Setpoint Table icon (Fig. 32).



Fig.32 Main Menu— Setpoint Table Icon

The Setpoint screen is displayed (see Fig. 33). Set the base demand limit set point, and either the LCW set point or the ECW set point. To set a value, press the appropriate set point, enter the value, and press OK. For more information, see the separate PIC5+ Control User Manual.

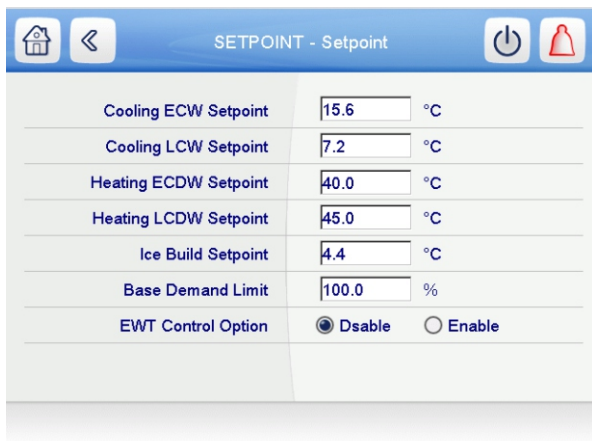


Fig.33 Setpoint Table Screen

Input the Local Occupied Schedule

Access the schedule screen and set up the occupied time schedule according to the customer's requirements. If no schedule is available, the default is factory set for 24 hours occupied, 7 days per week including holidays. The Schedule Menu as well as the Holiday Menu can be reached through the Configuration Menu (see Appendix A on page 74.75) for an overview of the available menus).

When the control mode is LOCAL SCHEDULE, the chiller will be automatically started if the configured local schedule is occupied and be shut down by the unoccupied schedule.

The Network Schedule should be configured if a CCN system is being installed. When control mode is NETWORK, the chiller can be started and stopped by the CHIL_S_S software point as written by other equipment through the network command and network schedule.

For more information about setting time schedules, please refer to separate PIC5+ Control User Manual.

Input Service Configurations

For specific values for the following configurations, refer to the chiller performance data or job-specific data sheet:

1. Password
2. Log in/log out
3. Input time and date
4. Service parameters
5. Equipment configuration
6. Automated control test

Password — PIC 5+ provides smart password for better security and the password changes periodically. With smart password, only authorized people can login controller and do chiller service. Only Carrier authorized technicians can access key product configuration and maintenance data. When accessing the Set Point or other common user tables, a password must be entered. The password can be changed from the general Configuration Menu. USER CONFIGURATION allows change of the User access password.

! IMPORTANT

Be sure to remember the password. Retain a copy for future reference. Without the password, access to the SERVICE menu will not be possible unless accessed by a Carrier representative.

Login/Logout — Press the lock icon on the home screen to enter the password. See **Fig. 34**.

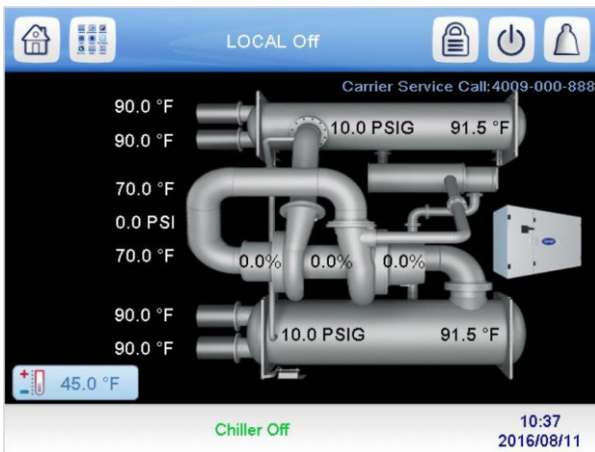


Fig.34 Lock Icon

The User Login Screen is displayed. Enter the password on this screen. See **Fig 35**. The language and system of measurement can also be changed on this screen. For details, please refer to separate PIC5+ Control User Manual.



Fig.35 User Login Screen

Input Time and Date — Set day and time and if applicable Holidays through MAIN MENU CONFIGURATION MENU and then select appropriate icon. See the Controls Operation and Troubleshooting guide for details. Because a schedule is integral to the chiller control sequence, the chiller will not start until the time and date have been set.

NOTE: The date format is YY/MM/DD for English units and for SI units.

Modify Controller Identification if Necessary — The CCN address can be changed from the Configuration Menu. Change this address under CONTROL IDENTIFICATION for each chiller if there is more than one chiller at the jobsite. Write the new address on the PIC 5+ Touch Screen module for future reference.

Configure Tables — Access the related tables through MAIN MENU CONFIGURATION MENU to modify or view job site parameters shown in Table 19. For details, please refer to separate PIC5+ Control User Manual.

Table19—Job Site Parameters

PARAMETER	TABLE
Motor Pole Pair	CFG_19DV ---Select 1 for single pole, 2 for double pole.
IGV2 Travel Limit	CFG_19DV ---19DV IGV2 Travel Limit Percent, min value is 30%, max value is 100%.
IGV2 minimum Degree	CFG_19DV ---19DV IGV2 minimum degree. Default value is 2 degree.
IGV2 Fully Load Open Degree	CFG_19DV ---19DV IGV2 fully load open degree. Default value is 90 degree.
IGV2 Actuator Max Deg	CFG_19DV ---19DV IGV2 actuator max degree. Default value is 94 degree.
VFD Rate Speed Hz	CFG_19DV ---Default value is 80.5Hz.
Purge Regen Lasting Time	CFG_19DV ---19DV purge system regeneration lasting time. Default value is 120 min.
Daily PG Pumpout Limit	CFG_19DV ---19DV purge system daily pump out time limit. Default value is 30 min.
Atmospheric Pressure	SERVICE --- Atmospheric Pressure. Default value is 100 kPa.
Gv1 Travel Limit	SERVICE --- 19DV IGV1 travel limit percent. Default value is 80.7 percent.
Soft Stop Amps Threshold	SERVICE --- 19DV software stop amps threshold percent. Default value is 70 percent.
Water Flow Verify Time	SERVICE --- 19DV water flow verify time. Default value is 5 min.
Purge Active Temp SP	SERVICE --- 19DV purge active temp setpoint. Default value is 18.3 C.
VFD Max Speed Per	CFGGEVFD --- 19DV max VFD speed percent. Default value is 100%
VFD Min Speed Per	CFGGEVFD --- 19DV min VFD speed percent. Default value is 45%
VFD Min Speed Per	CFGGEVFD --- 19DV VFD start speed percent. Default value is 65%
VFD Min Speed Per	CFGGEVFD --- 19DV VFD current limit. Default value is 250 amps.
Auto Restart Option	CONF_OPT --- Select 0 for disable auto restart option, 1 for enable it.
EC Valve Option	CONF_OPT --- There are 3 types of EC valve. Select 0 for no EC valve, 1 for continuous valve, 2 for ON/OFF valve, 3 for mA valve.
EC Selection	CONF_OPT --- Select 0 for disable EC control, 1 for surge, 2 for low load, 3 for combination.
Water Flow Determination	CONF_OPT --- Select 0 for Saturated temp determination, 1 for flow switch determination.
Liquid Bypass Selection	CONF_OPT --- Select 0 to disable liquid bypass, 1 to enable liquid bypass.
Purge On Idle Option	CONF_OPT --- Select 0 to disable purge when chiller is idle, 1 to enable purge no matter what status chiller is.
Compressor Speed 100%	CFGUMVFD --- 19DV motor full load speed. For 19DV, default value is 50 Hz, which can be changed according to different lectotype
Rated Line Voltage	CFGUMVFD --- 19DV Rated Line Voltage. For 19DV, default value is 460V, which can be changed according to different lectotype.
Motor Nameplate Current	CFGUMVFD --- Motor Nameplate Current. For 19DV, default value is 900A, which can be changed according to different lectotype
Motor Rated Load Current	CFGUMVFD --- Motor Rated Load Current. For 19DV, default value is 900A, which can be changed according to different lectotype.
Motor Nameplate Voltage	CFGUMVFD --- Motor Nameplate Voltage. . For 19DV, default value is 460V, which can be changed according to different lectotype.
Motor Nameplate RPM	CFGUMVFD --- Motor Nameplate RPM. For 19DV, default value is 3000, which can be changed according to different lectotype.
Motor Nameplate KW	CFGUMVFD --- Motor Nameplate KW. For 19DV, default value is 550KW, which can be changed according to different lectotype.

Field Set Up and Verification

! IMPORTANT

Some parameters are specific to the chiller configuration and will need to be verified prior to operation. All command functions must be initiated from the PIC 5+ Touch Screen.

Use the PIC 5+ Touch Screen to confirm that the VFD values match the chiller parameter labels and Chiller Builder design data sheet. The VFD values can be located from MAIN MENU→MAINTENANCE MENU→SURGE CORRECTION.

Label Locations — Verify the following labels have been installed properly and match the chiller requisition:

- Surge Parameters** — Located inside the chiller control panel.
- Chiller identification nameplate** — Located on the left side of the control panel. (See Fig. 36.)

Carrier Corporation(USA)	
Name	
Model Number	
Serial Number	
Ex-factory Date	
Max.Cooling/Heating Capacity	
Rated Power Input	
Chilled Water Entering Temp	
Chilled Water Leaving Temp	
Heated Water Leaving Temp	
Cooling Water Entering Temp	
Flow of Chilled/Heated Water	
Flow of Chilled/Cooling Water	
Voltage/Phase/Frequency	
Flows of Fans	
Cooling/Heating Rated Current	
Refrigerant	
Refrigerant W.T.	
RPM	
Length X Width X Height	
W.T.	
COP	
Manufactured under license from Carrier Corporation by Yileng Carrier	

Fig.36 Chiller Nameplate

VFD and other Incoming Wiring

- Verify that the branch disconnects or other local disconnects are open and properly tagged out.
- Verify that the branch circuit protection and AC input wiring to the VFD are in accordance with NEC/CEC (National Electrical Code/California Energy Commission) and all other local codes.

- Verify that the fuses are per the field wiring diagram.
- Verify that the incoming source does not exceed the SCCR (short circuit current rating) of the equipment marking.
- Verify the power lugs in the VFD and branch protection are properly secured. Inspect the ground cable and ensure it is properly connected at the branch and to the ground lug in
- Verify the conduit for the power wiring is securely connected to the VFD flanged cover and runs continuously to the branch protection.
- Ensure the control and signal wires connected to the chiller controller or the VFD are in separate conduit.

Surge prevention trouble shooting guide:

- If chiller surges very frequently, the surge prevention line should be decreased
 - If chiller surges only at full load region, Delta T_{max} should be decreased by **0.28°C** for each step until there is no abnormal surge occurs. **See Fig.38** for the effect of delta T_{max} on surge prevention line.
 - If chiller surges only at low load region, Delta T_{min} should be decreased by **0.28°C** for each step until there is no abnormal surge occurs. **See Fig.37** for the effect of delta T_{min} on surge prevention line.
 - If chiller surges only at medium load region, surge line shape factor should be increased by 0.01 for each step until there is no abnormal surge occurs. **See Fig.39** for the effect of surge line shape factor on surge prevention line.
 - If chiller surges at all the regions, delta T_{max}, delta T_{min} and surge line shape factor can be adjusted at the same time.
- If chiller no surge but efficiency cannot meet the target, the surge prevention line should be increased
 - If the problem only occurs at full load region, Delta T_{max} should be increased by **0.28°C** for each step until chiller enters real surge. **See Fig.38** for the effect of delta T_{max} on surge prevention line.
 - If the problem only occurs at low load region, Delta T_{min} should be increased by **0.28°C** for each step until chiller enters real surge. **See Fig.37** for the effect of delta T_{min} on surge prevention line.
 - If the problem only occurs at medium load region, surge line shape factor should be decreased by 0.01 for each step until chiller enters real surge. **See Fig.39** for the effect of surge line shape factor on surge prevention line.
 - If the problem occur at all the regions, delta T_{max}, delta T_{min} and surge line shape factor can be adjusted at the same time.
- The effect of surge line speed factor on surge prevention line is shown in **Fig.40**.

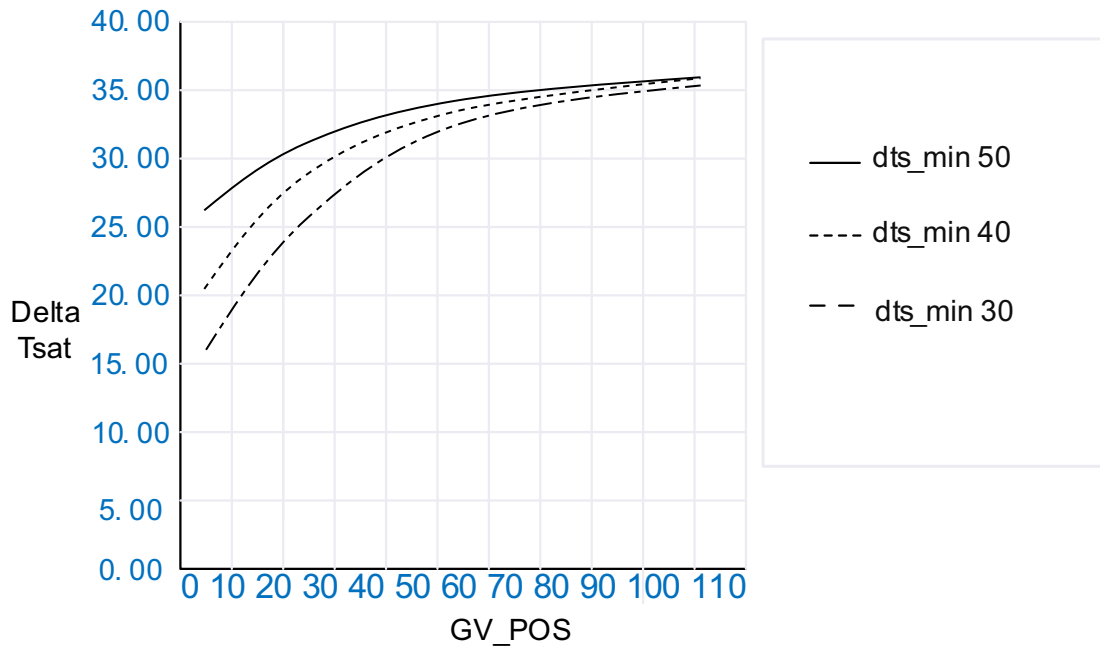


Fig.37 Effect of SURGE DELTA TSMAX on Surge Prevention

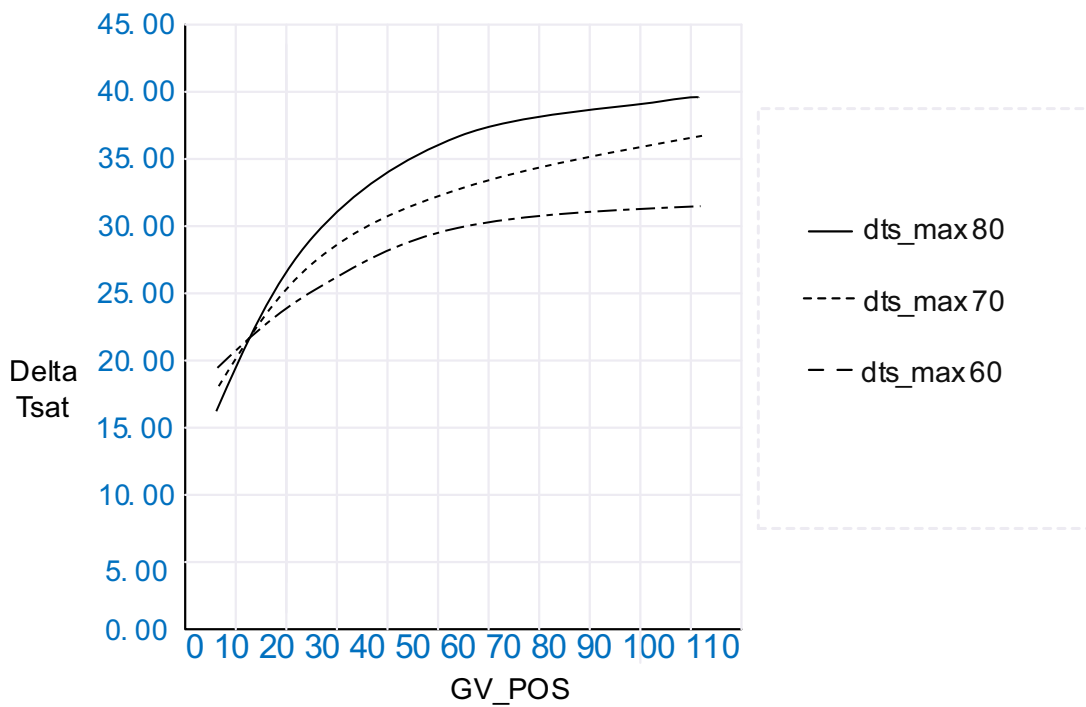


Fig.38 Effect of SURGE DELTA TSMAX on Surge Prevention

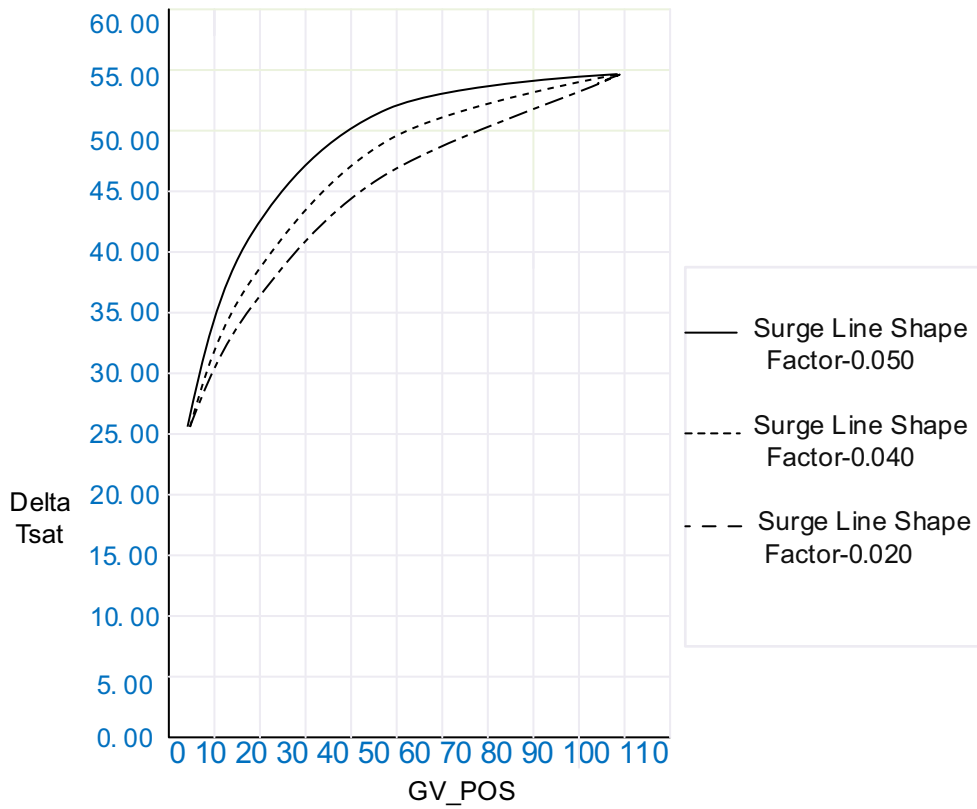


Fig.39 Effect of SURGE LINE SHAPE FACTOR on Surge Prevention

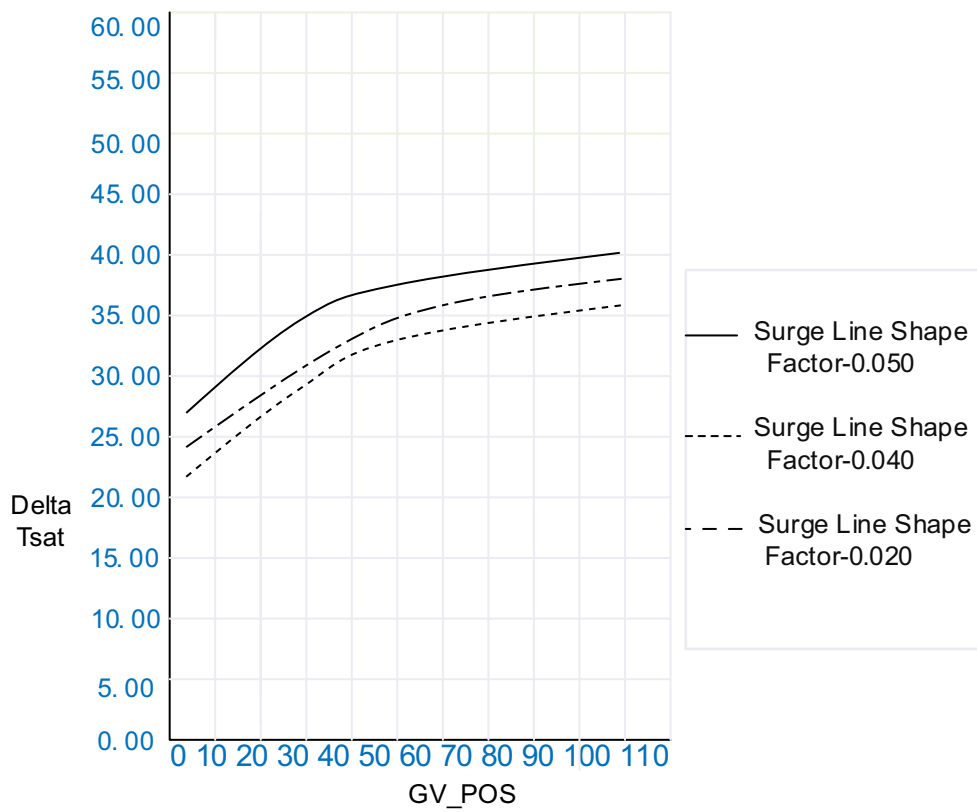


Fig.40 Effect of SURGE LINE SPEED FACTOR on Surge Prevention

Perform a Control Test (Quick Test)

Check the safety controls status by performing an automated controls test. The path to the QUICK TEST is MAIN MENU QUICK TEST TABLE. (The QUICK TEST screen can only be accessed when the chiller is in STOP mode.) On the QUICK TEST table screen, select a test to be performed (**See Table 20**).

The Quick Test checks all outputs and inputs for function.

In order to successfully proceed with the control test, the compressor should be off, no alarm showing and voltage should be within $\pm 10\%$ of rating plate value. If an error occurs, the operator can note the problem.

NOTE: If during the control test the guide vanes do not open, check the low pressure alarm, which shall

not be active. (An active low pressure alarm causes the guide vanes close.)

d, access the particular control test to test the function when ready. Disable the Quick Test Option when completed

NOTE: The refrigerant pump test will not energize the refrigerant pump if cooler pressure is below -89.63kPa .

When the controls test is finished the test stops and the QUICK TEST menu displays. If a specific automated test procedure is not completed, access the particular control test to test the function when ready. Disable the Quick Test Option when completed.

Table 20—Quick Test Table

	POINT	STATUS	DEFAULT	UNITS	NOTE	DESCRIPTION	LOW LIMIT	HIGH LIMIT	CCN FORCE	LEN FORCE
1	QCK_TEST	0~1	0			Quick Test Enable	0	1		X
2	Q_OILP	0~1	0			Quick Test Oil/Ref Pump	0	1		X
3	OIL_PDQ	-6.7~420.0		kPa		Ref Pump Delta Press	-6.7	420.0		
4	OP_PASS	NO/YES	0			Ref Press Test Passed	0	1		
5	Q_GV1OP	0~1	0			Quick Test GV1 Open	0	1		X
6	Q_GV1CL	0~1	0			Quick Test GV1 Close	0	1		X
7	Q_HGBPOP	0~1	0			Quick Test ECV Open	0	1		X
8	Q_HGBPCL	0~1	0			Quick Test ECV Close	0	1		X
9	Q_DMPOP	0~1	0			Quick Test Damper Open	0	1		X
10	Q_DMPCL	0~1	0			Quick Test Damper Close	0	1		X
11	Q_HDP	0.0~100.0	0	%		Quick Test Head Val Pos	0.0	100		X
12	Q_GVSRD	DISABLE/ENABLE	0			GV1/SRD Joint Test	0	1		X
13	Q_SRD	0.0~100.0	0	%		Quick Test Diffuser Pos	0.0	100		X
14	Q_ALM	0~1	0			Quick Test Alarm Output	0	1		X
15	Q_ALE	0~1	0			Quick Test Chiller Stat	4.0	20.0		X
16	Q_CHST	4.0~20.0	0	mA		Quick Test Cond Pump	0	1		X
17	Q_CDWP	0~1	0			Condenser Water Flow	0	1		
18	CDW_FLOW	NO/YES	0			Quick Test Chilled Pump	0	1		X
19	Q_CHWP	0~1	0			Chilled Water Flow	0	1		
20	CHW_FLOW	NO/YES	0			Condenser Water Delta T	-40.0	245.0		
21	CDW_DT	-40.0~245.0	0	° C		Chilled Water Delta T	-40.0	245.0		
22	CHW_DT	-40.0~245.0	0	° C		Guide Vane 1 Tested Pos	0	1		X
23	Q_GV1POS	0.0~100.0	0	%		Guide Vane 2 Tested Pos	0	1		X
24	Q_GV2POS	0.0~100.0	0	%		Quick Test Eco Bypass	0	1		X
25	Q_EBPV	0~1	0			Quick Test VFD Cooling	0	1		X
26	Q_VFDCOL	0~1	0			QCK TST Cond Filling VLV	0	1		X
27	Q_CONDCV	0~1	0			Quick Test Vapor SV	0	1		X
28	Q_VSSV	0~1	0			Quick Test EC Valve Pos	0.0	100.0		X
29	Q_HGBP_T	0.0~100.0	0	%		Quick Test Condenser CV	0	1		X
30	Q_CONDSV	0~1	0			Quick Test Cooler CV	0	1		X
31	Q_EVAPSV	0~1	0			Quick Test Purge Cond SV	0	1		X
32	Q_CDPSV	0~1	0			Quick Test Purge Comp SV	0	1		X
33	Q_CMPSV	0~1	0			Quick Test Pumpout SV	0	1		X
34	Q_POPSV	0~1	0			Quick Test Drainage SV	0	1		X
35	Q_DRPSV	0~1	0			Quick Test Rege SV	0	1		X
36	Q_RGPSV	0~1	0			Quick Test Discharge SV	0	1		X
37	Q_DCPSV	0~1	0			Quick Test Vacuum Pump	0	1		X
38	Q_PVPSV	0~1	0			Quick Test Purge Comp	0	1		X
39	Q_PCPSV	0~1	0			Quick Test Purge Heater	0	1		X
40	Q_PHPSV	0~1	0			Quick Test Lo Tower Fan	0	1		X
41	Q_LOWFAN	0~1	0			Quick Test Hi Tower Fan	0	1		X
42	Q_HIFAN	0~1	0			QCK TST Evap Drain CV	0	1		X
43	Q_OPRLUB	0~1	0			QCK TST Cond Drain CV	0	1		X

Cooler and Condenser Pressure Transducer and Waterside Flow Device Calibration.

Waterside Device Optional with IOB Inputs Available) Calibration can be checked by comparing the pressure readings from the transducer to an accurate refrigeration gage reading. The transducer can be checked and calibrated at 2 pressure points. These calibration points are 0 kPa and between 68.9 and 206.8 kPa. To calibrate these transducers:

1. Shut down the compressor and the cooler and condenser pumps.

NOTE: There should be no flow through the heat exchangers.

2. Disconnect the transducer in question from its Schrader fitting for cooler or condenser transducer calibration. For pump pressure or bearing pressure or flow device calibration keep transducer in place.

NOTE: If the cooler or condenser vessels are at 0 kPa or are open to atmospheric pressure, the Transducers can be calibrated for zero without removing the transducer from the vessel.

3. Access the PRESSURE screen from the Main Menu and view the particular transducer reading (the cooler pressure, condenser pressure, economizer pressure, pump inlet pressure, pump outlet pressure, bearing inlet pressure, bearing outlet pressure).To calibrate a device, view the particular reading on the screen. It should read 0 kPa. If the reading is not 0 kPa, but within 35 kPa, the value may be set to zero while the appropriate transducer parameter is highlighted. The value will now go to zero. No high end calibration is necessary for REF PUMP DELTA P or flow devices. If the transducer value is not within the calibration range, the transducer will return to the original reading. If the pressure is within the allowed range (noted above), check the voltage ratio of the transducer. To obtain the voltage ratio, divide the voltage (dc) input from the transducer by the supply voltage signal (TRANSDUCER VOLTAGE REF displayed in QUICK TEST menu) or measure across the positive (+ red) and negative (- black) leads of the transducer. The voltage ratio must be between 0.80 and 0.11 for the software to allow calibration. Rotate the waterside flow pressure device from the inlet nozzle to the outlet nozzle and repeat this step. If rotating the waterside flow device does not allow calibration then pressurize the transducer until the ratio is within range. Then attempt calibration again.

4. A high pressure point can also be calibrated between 68.9 and 206.8 kPa by attaching a regulated 206.8 kPa maximum pressure (usually from a nitrogen cylinder). The high pressure point can be calibrated by accessing the appropriate transducer parameter on the PRESSURES screen, highlighting the parameter, then increasing or decreasing the value to the exact pressure on the refrigerant gage. Pressures at high altitude locations must

be compensated for, so the chiller temperature/pressure relationship is correct.

The PIC 5+ does not allow calibration if the transducer is too far out of calibration. In this case, a new transducer must be installed and re-calibrated.

Optional Thermal Dispersion Flow Switch Calibration

Set the flow through the water circuit to the minimum safe flow that will be encountered.

Reduce the sensitivity of the switch by turning the adjustment counter-clockwise until the yellow LED turns off. This indicates that the switch is now open.

Increase the sensitivity of the flow switch by turning the adjustment potentiometer clockwise until the yellow LED is lit.

In case of nuisance trips at low flow increase the sensitivity of the switch by turning the potentiometer clockwise.

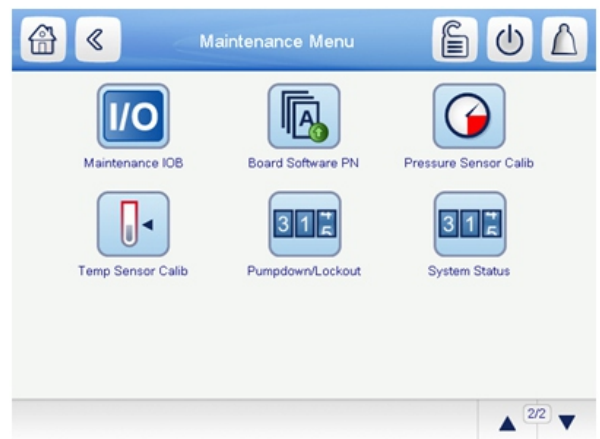
Hydraulic Status

The HYDRAULIC STATUS screen (access from the Main Menu) provides a convenient way to detect if any of the cooler/condenser pressure switches (if installed) are in need of calibration. With no flow the water delta should read 0 kPa. If it does not, the value may be set to zero using PRESSURE SENSOR CALIB located in the Maintenance Menu. High end calibration is not necessary.

HYDRAULIC STATUS screen:



PRESSURE SENSOR CALIB screen:



INITIAL START-UP

Preparation — Before starting the chiller, verify:

1. Power is on to chiller control panel, cooling tower fan, water pumps, and other auxiliary equipments.
2. Cooling tower water is at proper level and at-or-below design entering temperature.
3. Chiller is charged with refrigerant and all valves in refrigerant pipes are in proper operating positions.
4. Valves in the cooler and condenser water circuits are open.

NOTE: If the pumps are not automatic, ensure water is circulating properly.

! WARNING

Do not permit water or brine that is warmer than 50°C to flow through the cooler or condenser. Refrigerant over pressure may discharge through the safety valves and result in the loss of refrigerant charge.

Check Motor Rotation

1. Disengage the VFD disconnect and engage the Aux Panel power circuit breaker.

NOTE:

The circuit breaker may be located in the VFD if the disconnect and step down transformer option was ordered with the VFD. If located in the VFD, close the door securely after this step.

2. Close the VFD enclosure door.
3. The VFD checks for proper phase rotation as soon as power is applied to the VFD and the PIC 5+ controls power up.
4. An alarm message will appear on the PIC 5+ Touch Screen if the phase rotation is incorrect. If this occurs reverse any 2 of the 3 incoming power leads to the VFD and reapply power. The motor is now ready for a rotation check.
5. In Quick Test table, enable quick test, then enable Motor Rotation Check. The controller will initiate the check process.
6. When the VFD is energized and the motor begins to turn, check for clockwise motor rotation as viewed through sight glasses (**Item 10, fig. 2**) for 1st stage of the compressor (**Fig. 41**).

CORRECT MOTOR ROTATION IS CLOCKWISE WHEN VIEWED THROUGH SIGHT GLASSES

TO CHECK ROTATION, ENERGIZE COMPRESSOR MOTOR. MOMENT DO NOT LET MACHINE DEVELOP CONDENSER PRESSURE. CHECK ROTATION IMMEDIATELY.

ALLOW CONDENSER PRESSURE TO BUILD OR CHARGE ROTATION WHILE MACHINE COASTS DOWN. MAY GIVE INDICATION DUE TO GAS PRESSURE EQUALIZING THROUGH COM

Fig.41 Correct Motor Rotation

Check Bearing Pressure — In Quick Test menu, operator can test bearing pressure. First open cooler valve and condenser drain valve, then run the refrigerant pump. Usually the pressure drop across bearing is above **55 kPa**. If the bearing pressure drop is negative, please check pump rotation. If bearing pressure drop is below **55 kPa**, please check if the moisture filter and bearing filter is clogged.

To Prevent Accidental Start-Up — A chiller STOP override setting may be entered to prevent accidental start-up during service or whenever necessary. From the Main Menu, access the General Parameters Menu and use the down arrow to reach Stop Override on the GENUINIT table. Change Stop Override to “Yes”; then execute the command by touching the lightning button. The message “ALM-276 Protective Limit - Stop Override” will appear in the Home Screen message area. To restart the chiller, access the same screen change the Stop Override option to “No”.

Check Chiller Operating Condition — Check to be sure that circuit temperatures, pressures, water flows, and refrigerant levels in the system indicate proper functioning of each circuit.

Instruct the Customer Operator — Ensure the operator(s) understand all operating and maintenance procedures. Point out the various chiller parts and explain their function as part of the complete system.

Cooler-Condenser — High side float chamber, safety valves, refrigerant charging valve, temperature sensor locations, pressure transducer locations, Schrader fittings, water-boxes and tubes, and vents and drains.

Compressor Assembly — Guide vane actuator, transmission, motor cooling system, temperature and pressure sensors, and motor temperature sensors, and compressor serviceability.

Compressor Lubrication System — cooler and condenser filter, moisture removal desiccant, bearing filter, liquid level switch and liquid reclaim system.

Economizer — Float valve, drain valve, Schrader fitting, economizer isolation valve.

Control System — CCN and local start, reset menu, soft key functions, PIC 5+ Touch Screen operation, occupancy schedule, set point, safety controls, and auxiliary and optional controls.

Auxiliary Equipment — Starters and disconnects, separate electrical source, pumps, and cooling tower.

Describe Chiller Cycles — Refrigerant, motor cooling, lubrication, and liquid reclaim.

Review Maintenance — Scheduled, routine, and extended, shutdowns, importance of a log sheet, importance of water treatment and tube cleaning, and importance of maintaining a leak-free chiller.

Safety Devices and Procedures — Electrical disconnects, relief device inspection, and handling refrigerant.

Check Operator Knowledge — Start, stop, and shutdown procedures, safety and operating controls, refrigerant charging, and job safety.

Review the Start-Up Operation, and Maintenance manual.

OPERATING INSTRUCTIONS

Operator Duties

1. Power is on to chiller control panel, cooling tower fan, water pumps, and other auxiliary equipment.
2. Prepare the system for start-up, start and stop the chiller, and place the system in a shutdown condition.
3. Maintain a log of operating conditions and document any abnormal readings.
4. Inspect the equipment, make routine adjustments, and perform a Control Test. Maintain the proper refrigerant level.
5. Protect the system from damage during shutdown periods.
6. Maintain the set point, time schedules, and other PIC5+ Functions.

Prepare the Chiller for Start-Up

Follow the steps described in the Initial Start-Up section.

To Start the Chiller

1. Start the water pumps, if they are not automatic.
2. Press the Start/Stop icon on the PIC 5+ Touch Screen home screen to start the system. If the chiller is in the OCCUPIED mode and the start timers have expired, the start sequence will start. Follow the procedure described in the Start-Up/Shutdown/ Recycle Sequence section.

Check the Running System

After the compressor starts, the operator should monitor the display and observe the parameters for normal operating conditions:

1. The bearing temperature accessed from the Temperatures menu should be 49 to 74 °C for compressors with roller bearings. If the bearing temperature reads more than 83 °C with the refrigerant pump running, stop the chiller and determine the cause of the high temperature. Do not restart the chiller until corrected.
2. The liquid level sensor on condenser float chamber should indicate ON in the INPUT menu.
3. The bearing pressure drop should be between 55 kPa, as seen on the PIC 5+ Touch Screen Transmission Status screen.
4. The moisture indicator sight glass on the refrigerant motor cooling line should indicate refrigerant flow and a dry condition.
5. The condenser pressure and temperature varies with the chiller design conditions. Typically the pressure will range between -9.6 kPa and 118kPa with a corresponding temperature range of 15 to 41 °C The condenser entering water temperature should be controlled below the specified design entering water temperature to save on compressor kilowatt requirements.

6. Cooler pressure and temperature also will vary with the design conditions. Typical pressure range will be between -50 and -35 kPa, with temperature ranging between 1.1 and 7.2 °C.
7. The compressor may operate at full capacity for a short time after the pulldown ramping has ended, even though the building load is small. The active electrical demand setting can be overridden to limit the compressor kW, or the pull down rate can be decreased to avoid a high demand charge for the short period of high demand operation. Pull down rate can be based on load rate or temperature rate and is accessed on the MAINTENANCE MENU → CAPACITY CONTROLS → RAMP_DEM (Ramping Demand Limit Value).
8. Both the high and low float chamber have two sight glasses that look into the float chamber to confirm the floats are not stuck open or closed. When the chiller is operating, the top sight glass is empty and the bottom sight glass is full.

To Stop the Chiller

1. The occupancy schedule starts and stops the chiller automatically once the CCN and time schedule is configured.
2. The unit can be stopped manually by pressing the green Start/Stop icon on the PIC 5+ TOUCH SCREEN. The compressor will then follow the normal shutdown sequence as described in the Start Up/Shutdown/Recycle Sequence section on **page 38-40**. The chiller is now in the OFF control mode.

! Important

Do not attempt to stop the chiller by opening an isolating switch. High intensity arcing may occur.

If the chiller is stopped by an alarm condition, do not restart the chiller until the problem is diagnosed and corrected.

After Limited Shutdown — No special preparations should be necessary. Follow the regular preliminary checks and starting procedures

Preparation for Extended Shutdown — The refrigerant should be transferred into a separate storage tank to reduce chiller pressure and the possibility of leaks. Maintain a holding charge of refrigerant or nitrogen keeping a positive pressure of 103kPa to prevent air from leaking into the chiller. If freezing temperatures are likely to occur in the chiller area, drain the chilled water, condenser water, and the pump out condenser water circuits to avoid freeze-up. Keep the waterbox drains open. It is recommended not to store the refrigerant in the unit if below freezing temperatures are anticipated. A nitrogen holding charge is recommended in this case.

After Extended Shutdown — Ensure the water system drains are closed. It may be advisable to flush the water circuits to remove any soft rust which may have formed. This is a good time to brush the tubes and inspect the Schrader fittings on the waterside flow devices for fouling, if necessary.

Check the cooler pressure on the PIC 5+ TOUCH SCREEN and compare it to the original holding charge that was left in the chiller. If (after adjusting for ambient temperature changes) any loss in pressure is indicated, check for refrigerant leaks. **See Check Chiller Tightness section, page 41.**

Recharge the chiller by transferring refrigerant from the separate storage tank. Observe freeze-up precautions. See charging refrigerant section, **page 47**

Carefully make all regular preliminary and running system checks.

Cold Weather Operation — When the entering condenser water temperature drops below 12.8°C, the operator should automatically cycle the cooling tower fans off to keep the temperature up. Piping may also be arranged to bypass the cooling tower used to maintain a minimum refrigerant pressure differential during an inverted start condition. The PIC5+ controls have a low limit tower fan output that can be used to assist in this control with IOB 4 (optional) installed.

Manual Guide Vane Operation — It is possible to manually operate the guide vanes in order to check control operation or to control the guide vanes in an emergency. Manual operation is possible by overriding the target guide vane position.

NOTE: Manual control overrides the configured pulldown rate during start-up and permits the guide vanes to open at a faster rate. Motor current above the electrical demand setting, capacity overrides, and chilled water temperature below the control point override the manual target and close the guide vanes. For descriptions of capacity overrides and set points, please refer to separate PIC5+ Control User Manual.

Refrigeration Log — A refrigeration log (as shown in **Fig. 42**), is a convenient checklist for routine inspection and maintenance and provides a continuous record of chiller performance. It is also an aid when scheduling routine maintenance and diagnosing chiller problems.

Keep a record of the chiller pressures, temperatures, and liquid levels on a sheet similar to the one in **Fig. 41**. Automatic recording of data is possible by using CCN devices such as the Data Collection module and a Building Supervisor. Contact a Carrier representative for more information.

DATE	TIME														
COOLER	REFRIGERANT	PRESSURE													
		TEMPERATURE													
	FLOW	WATER FLOW VALUE													
		TEMPERATURE	IN												
OUT															
CONDENSER	REFRIGERANT	PRESSURE													
		TEMPERATURE													
	FLOW	WATER FLOW VALUE													
		TEMP.	IN												
OUT															
COMPRESSOR	BEARING TEMPERATURES	1st STAGE													
		2nd STAGE													
	REF LUBE	REF PUMP DELTA P													
		CONDENSER CHAMBER LEVEL													
	MOTOR	FLA	AMPERAGE (or VANE POSITION)												
			TEMPERATURE												
FREQUENCY															
VFD	IGBT TEMPERATURE														
OPERATION INITIALS															
REMARKS															

Fig.-42Refrigeration Log

Chiller Idle Requirement

Be idle for a short time:

There is no special requirement, follow the conventional procedure to check and start-up.

Be idle for a long time:

1. Chiller leak prevention
2. If chiller is idle for one month, suggest running purge every week.
3. If chiller is idle for more than one month, suggest charging nitrogen into chiller until chiller pressure is 103 kPa higher than atmosphere. Before chiller start again, carry out the dehydration process to re-charge refrigerant.
4. Need to run the refrigerant pump to avoid potential corrosion.
5. Chemically treated Water circulation through the condenser and cooler at least once per week for 1-5 minutes (if they are not drained).
6. The purge operation and refrigerant pump operation should be controlled by the PIC 5+ controller to automatically address these items. The water pumps would need to be manually operated by the customer.

Purge Operation Sequence

Refer to Fig. 43. For the Purge Operation Diagram.

Purge Operating Modes

Purge system has two operation modes: Auto and Manual. You can choose it in Configuration Menu->Lab Test Forced->Purge Forced. Select "0" means Auto mode. Select "1" or "2" means Manual mode, where 1 means purge will be active regardless the purge active condition, "2" means you can control purge related valves manually.

Non-condensable Gas Pump Out

When purge tank is full of noncondensable gas, the purge compressor inlet temperature drops to -15 °C, so the discharge valve and pump out valve open, vacuum pump starts to pump out the non-condensable gas inside purge tank.

Carbon Tank and Regeneration Subsystem

If the carbon filter is saturated with refrigerant, the heater can heat carbon filter to about 127 °C. The condenser valve and cooler valve is closed during this time. Only the pump out valve and regeneration valve is open. Meanwhile, the vacuum pump will operate at intervals. Regenerated refrigerant is pumped to cooler. After about 120 minutes, the regeneration process stops. However, purge system will wait for another 4 hours to let carbon filter to cool down before it can operate normally.

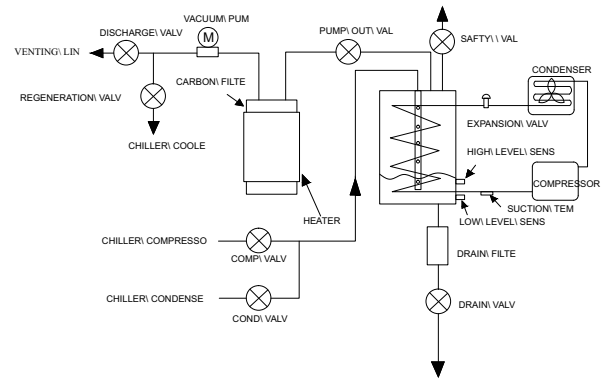


Fig.43 Purge Operation Sequence Diagram

General Maintenance

Refrigerant Properties:

The standard refrigerant for the 19DV chiller is HFO R1233zd (E). At normal atmospheric pressure, R1233zd(E) will boil at 18°C at 1atm and must, therefore, be kept in pressurized containers or storage tanks. The refrigerant is practically odorless when mixed with air and is noncombustible at atmospheric pressure. Read the Material Safety Data Sheet and the latest ASHRAE Safety Guide for Mechanical Refrigeration to learn more about safe handling of this refrigerant.

! DANGER

In heavy concentrations, R1233zd (E) may display enough oxygen to cause asphyxiation. When handling this refrigerant, protect the hands and eyes and avoid breathing fumes.

Adding Refrigerant

Follow the procedures described in Charging Refrigerant section.

Adjusting the Refrigerant Charge

If the addition or removal of refrigerant is required to improve chiller performance, follow the procedures given under the Charging Refrigerant section, page 47

Leak Checking Based on Purge Pump-Out Time

There will be an alert on PIC 5+ TOUCH SCREEN which indicates excessive purges. Leaks, which cause frequent purge cycles, should be repaired without delay. Non-condensable gas in the machine causes higher than normal condenser pressure, compressor surge at start-up and frequent purge cycles, so locate and repair any leaks as soon as possible.

Leak Rate

It is recommended by ASHRAE that chillers be taken off line immediately and repaired if the refrigerant leak rate for the entire chiller is more than 10% of the operating refrigerant charge per year. In addition, Carrier recommends that when leaking is lesser than the above rate but more than a rate of 0.1% of the total charge per year, chiller should be repaired during annual maintenance or whenever the refrigerant is transferred for other service work.

Test After Service, Repair, or Major Leak

If all the refrigerant has been lost or if the chiller has been opened for service, the chiller or the affected vessels must be pressure tested and leak tested. Refer to the Leak Test Chiller section on **page 44**.

! WARNING

HFO-R1233zd(E) shall not be mixed with air or oxygen and pressurized for leak testing.

Testing without Refrigerant Tracer

A method of leak testing is to pressurize with nitrogen only and to use a soap bubble solution or an ultrasonic leak detector to determine if leaks are present.

To Pressurize with Dry Nitrogen

NOTE: Pressurizing with dry nitrogen for leak testing should not be done if the full refrigerant charge is in the vessel.

1. Connect a copper tube from the pressure regulator on the cylinder to the refrigerant charging valve. Never apply full cylinder pressure to the pressurizing line. Follow the listed sequence.
2. Open the charging valve fully.
3. Slowly open the cylinder regulating valve.
4. Observe the pressure gage on the chiller and close the regulating valve when the pressure reaches test level. Do not exceed **303 kPa**.
5. Close the charging valve on the chiller upon the test pressure reached. Remove the copper tube if it is no longer required.

Repair the Leak, Retest, and Apply Standing Vacuum Test

After pressurizing the chiller, test for leaks with an electronic halide leak detector (Need to add in tracer gas), soap bubble solution, or an ultrasonic leak detector. Bring the chiller back to atmospheric pressure, repair any leaks found, and retest. A continuous dry nitrogen purge should be maintained during any leak repairs or when the unit is open to the atmosphere to reduce the potential for corrosion.

After retesting and finding no leaks, apply a standing vacuum test. Then dehydrate the chiller. Refer to the Standing Vacuum Test and Chiller Dehydration sections (**pages 45**) in the Before Initial Start-Up section.

Checking Guide Vanes

During normal shutdown, when the chiller is off, the guide vanes are closed. Check that the coupling is tight on the shaft and make sure that the guide vane shaft is closed. Complete the following steps to adjust position (**see Fig. 44 and 45**):

1. Remove the set screw in the guide vane coupling.
2. Loosen the hold down bolts on the guide vane actuator.
3. Pull the guide vane actuator away from the suction housing.
4. If required, rotate the guide vane sprocket fully clockwise (For 1st stage) or counter-clockwise (For 2nd stage) and spot-drill the guide vane actuator shaft. Spot-drilling is necessary when the guide vane actuator sprocket set screws on the guide vane actuator shaft need to be re-seated.

(Remember: Spot-drill and tighten the first set screw before spot-drilling for the second set screw.)

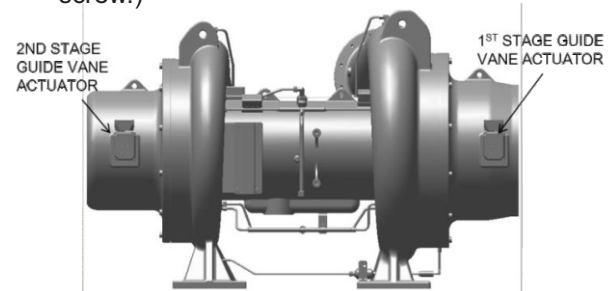


Fig.44 Guide Vane Actuator

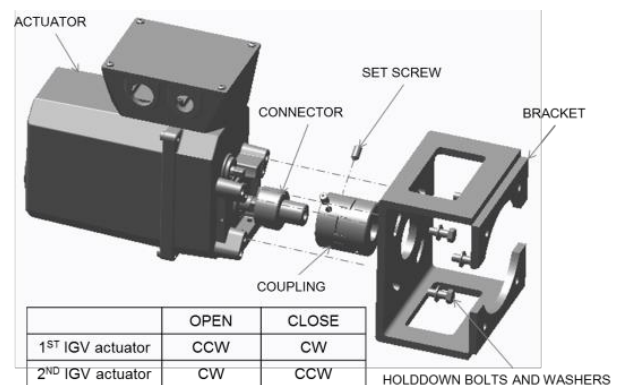


Fig.45 Guide Vane Actuator Detail

Trim Refrigerant Charge

If to obtain optimal chiller performance it becomes necessary to adjust the refrigerant charge, operate the chiller at design load and then add or remove refrigerant slowly until the difference between the leaving chilled water temperature and the cooler refrigerant temperature reaches design conditions or becomes a minimum. Do not overcharge. In job site, use the cooler sight glass to determine the correct refrigerant at all times. During steady state operation at 80-100% of capacity, the boiling pool tubes should be covered with liquid refrigerant at all times. There is no benefit to have a refrigerant level higher than the tubes and capacity will be lost if the tubes are not covered with liquid. Refrigerant may be added either through the storage tank or directly into the chiller as described in the **Charging Refrigerant section page 47**

Pressurizing the Machine

Whenever the machine vacuum must be broken for service work or for extended shutdown, all of the refrigerant should be transferred to a separate storage tank. Dry nitrogen gas is preferred for raising machine pressure because it does not introduce moisture into the machine. Never use oxygen for pressurizing.

1. Connect high-pressure hose or tubing from pressure cylinder to cooler charging valve. Never apply full cylinder pressure to the pressurizing line. Follow the steps below in proper sequence.
2. Open cooler charging valve fully.
3. Open cylinder regulating valve slowly.
4. Observe cooler pressure gage and close cylinder regulating valve when test pressure of 35-55kPa is reached. Do not exceed 69 kPa!
5. Close cooler charging valve upon the test pressure reached. Remove high-pressure hose or tubing if no longer required.

Weekly Maintenance

Check the Lubrication System

1. First enter the Input menu, check if liquid level sensor on condenser chamber is ON.
2. Then enter Quick Test menu, check if cooler valve, condenser valve, cooler drain valve and condenser drain valve can rotate smoothly. Open cooler valve and condenser drain valve, then run refrigerant pump, make sure the bearing pressure differential is above 50 kPa.
3. Check the sight glass on bearing inlet line. If it shows wet, please replace the moisture filter **Item 15. Fig. 2** on refrigerant lubrication line.

Check Purge Operation

If there's an alert on PIC 5+ TOUCH SCREEN which indicates frequent pump out, locate and repair any leak immediately

Scheduled Maintenance

Establish a regular maintenance schedule based on your actual chiller requirements such as chiller load, run hours, and water quality. The time intervals listed in this section are offered as guides to service only.

Service Ontime

The PIC 5+ TOUCH SCREEN will display a SERVICE ON TIME value on the MAIN MENU → RUN TIMES screen. This value should be reset to zero by the service person or the operator each time major service work is completed so that the time between service can be viewed and tracked.

Inspect the Control Panel

Maintenance consists of general cleaning and tightening of connections. Vacuum clean the cabinet to eliminate dust build-up. If the chiller control malfunctions, refer to the Troubleshooting Guide section on **page 65-73** for control checks and adjustments.

Inspect Purge

A purge protects the machine against non-condensable gases. Make sure below procedures are done when chiller is OFF.

1. First drain the liquid in purge tank using refrigerant pump. In Quick Test menu, open purge drain valve, purge condenser valve, cooler valve and condenser drain valve. Then run refrigerant pump to drain the refrigerant liquid. It'll take about 15mins.
2. Close all the isolation valves connect purge and chiller. Enter Quick Test menu, check if all the solenoid valves can work and if vacuum pump can run.
3. Replace the drain filter by disconnecting the O-ring connection on two ends of filter, Always use new O-ring while replacing drain filter.

Changing filter

Refrigerant Lubrication Filter

Replace the filter once a year or when abnormal pressure drop is observed (PIC 5+ TOUCH SCREEN will show alert).

Motor Cooling Filter

Replace the filter once a year.

Bearing filter

Replace the filter once a year or when abnormal pressure drop is observed (PIC 5+ TOUCH SCREEN will show alert).

Moisture Removal Filter

The filter located on the refrigerant lubrication line to bearing and motor cooling should be replaced once a year or more often if filter condition indicates a need for more frequent replacement. A moisture indicator sight glass is located downstream of this filter to indicate the moisture level in refrigerant. If the moisture indicator turns yellow, locate the water source immediately by performing a thorough leak check and replace the filter.

Liquid reclaim filter

Replace the filter once a year or more often if filter condition indicates a need for more frequent replacement.

Purge Drain Filter

Replace the filter once a year.

Purge Carbon Filter

Replace only when the filter is damaged or broken.

Inspect Refrigerant Float System

For 19DV unit, the condenser has a high side ball type float system, and the economizer has a low side ball type float system. The float refrigerant level can be observed through the sight glasses located on the float chamber. **See fig. 46** for float ball valve detail. Perform the inspection every five years. Please follow the procedure as below:

1. Transfer the refrigerant into a separate storage tank
2. Remove the float access cover.
3. Clean the chamber and valve assembly thoroughly. Be sure the valve moves smoothly and the ball bearings that the float moves on are clean.

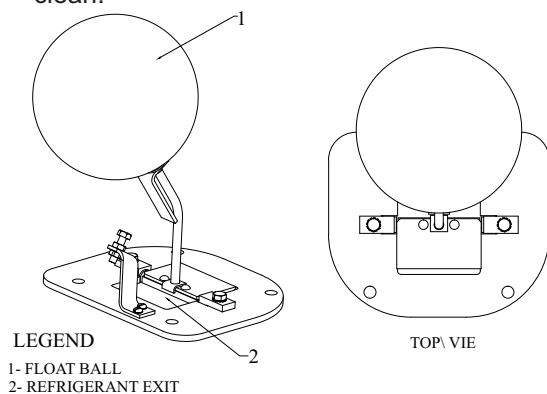


Fig. 46 Condenser/Economizer Float Ball Valve

Inspect Safety Valve and Piping

The safety valves on this chiller protect the system against the potentially dangerous effects of over pressure. To ensure against damage to the equipment and possible injury to personnel, these devices must be kept in perfect operating condition.

As a minimum, the following maintenance is required.

1. At least once a year, disconnect the vent piping at the valve outlet and carefully inspect the valve body and mechanism for any evidence of internal corrosion or rust, dirt, scale, leakage, etc.
2. If corrosion or foreign material is found, do not attempt to repair or recondition. Replace the valve.
3. If the chiller is installed in a corrosive atmosphere or the safety valves are vented into a corrosive atmosphere, inspect the safety valves at more frequent intervals.

Compressor Bearing Maintenance

The key to good bearing maintenance is to maintain a proper lubrication. Inspect the lubrication system regularly and thoroughly annually. Vibration analysis should be used to measure changes in the vibration level of the compressor identifying bearing wear. Excessive bearing wear can sometimes be detected through increased vibration or increased bearing temperature. To inspect the bearings, a complete compressor tear down is required. The frequency of examination is determined by the hours of chiller operation, load conditions during operation, and the condition of the lubrication system. If either symptom appears, contact Carrier service organization for assistance.

Note: The bearing cannot be field disassembly-inspected.

Inspect the Heat Exchanger Tubes and Flow Devices

Cooler and Optional Flow Devices

Inspect and clean the cooler tubes at the end of the first operating season. Because these tubes have internal ridges, a rotary type tube cleaning system is needed to fully clean the tubes. Inspect the tubes' condition to determine the scheduled frequency for future cleaning and to determine whether water treatment in the chilled water/brine circuit is adequate. Inspect the entering and leaving chilled water temperature sensors and flow devices for signs of corrosion or fouling. Replace the sensor if corroded or remove any fouling if found. Confirm there is no foreign material lodged in the tubes that could result in the failure of the tube.

Condenser and Optional Flow Devices

Since this water circuit is usually an open -type system, the tubes may be subject to contamination and fouling. Clean the condenser tubes with a rotary tube cleaning system at least once per year or more often if the water is contaminated. Inspect the entering and leaving condenser water sensors and flow devices for signs of corrosion or fouling. Replace the sensor if corroded or remove any fouling if found. Confirm there is no foreign material lodged in the tubes that could result in the failure of the tube.

Higher than normal condenser pressure, together with the inability to reach full refrigeration load, usually indicate dirty tubes or air in the chiller. When the refrigeration log indicates a rise above normal condenser pressures, check the pressure against actual refrigerant condensing temperature as follows:

When the refrigeration log indicates a rise above normal condenser pressures, check the purge pump out as follows:

1. Check purge pump out frequency on PIC 5+ Touch Screen purge menu. If average pump out time per day is above 15min. Please check the leak and repair it. Using purge to pump out remaining non-condensable inside chiller.
2. If, however, purge pump out time per day is below 15 min, the high condenser pressure is caused by dirty tubes or by abnormal conditions
5. Check operation of condensing water circuit. If water conditions (flow and temperature) appear normal, the tubes should be cleaned.

During the tube cleaning process, use brushes specially designed to avoid scraping and scratching the tube wall. Contact local Carrier representative to obtain these brushes. *Do not use wire brushes.*

! CAUTION

Hard scale may require chemical treatment for its prevention or removal. Consult a water treatment specialist for proper treatment.

Water Leak

The refrigerant moisture indicator on the refrigerant motor cooling line and bearing inlet line (**see Fig. 2**) indicate whether there is water leakage during chiller operation. Water leaks should be repaired immediately.

! CAUTION

The chiller must be dehydrated after repair of water leaks, Not doing so may result in damage. See Chiller Dehydration section.

Water Treatment

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

! CAUTION

Water must be within design flow limits and it should be cleaned and treated to ensure proper chiller performance and to reduce the potential of tube damage due to corrosion, scaling, erosion, and algae formation. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Carrier's recommendations on fluid in heat exchangers:

The inlet water must be appropriately filtered and its quality must be analyzed. Water treatment and control equipment must be suitable for the water system to prevent pump pollution, scale and cross contamination. User can consult water treatment experts or relevant literature data.

1. Limit the concentration of NH_4^+ in the water. It is very harmful to copper and is one of the most important factors influencing the life time of the copper pipe. It may result in serious corrosion even if the concentration of NH_4^+ is less than 1 mg/L. If it is necessary use anode method to remove NH_4^+ and the concentration of NH_3 should be lower than 2 mg/L.
2. Cl^- and Cl_2 can result in the risk of perforation of copper tube. The concentration of Cl^- must be less than 300 mg/L and the concentration of Cl_2 must be lower than 1 mg/L.
3. The concentration of H_2S should be lower than 0.05mg/L.
4. SO_4^{2-} concentration higher than 70mg/L can result in risk of perforation.
5. No fluoride ions (concentration < 0.170 mg/L) .
6. The concentration of carbon dioxide should be lower than 570mg/L.
7. The concentration of dissolved oxygen in the water must be lower than 5mg/L and the concentration of iron ion ($\text{Fe}^{2+}/\text{Fe}^{3+}$) must be lower than 0.2mg/L.
8. Silicon is a kind of acid water element and it can lead to the risk of corrosion. The concentration of silicon must be below 0.1 mg/ml.
9. The concentration of Al must be lower than 0.2 mg/L and the concentration of Mn must be lower than 0.1 mg/L.
10. The water hardness (TH at temperature above 2.8°C) is recommended between 10 and 25, it can affect the hardness of scale deposits and
11. The concentration of NO_3^- must be less than 100mg/L.
12. The relative resistance. The higher the relative resistance is, the less possibility of corrosion.
13. PH: PH between 7.5 and 9 is suitable when the temperature is between 20°C and 25°C . If water pipes will be empty for more than a month, it must be full of nitrogen, in order to prevent the corrosion of pipeline.

Inspect the VFD

Before working on VFD shut off the chiller, open and tag all disconnects supplying power to the VFD.

! CAUTION

The motor leads must be disconnected from the VFD before an insulation test is performed. The voltage generated from the tester can damage the VFD components.

! WARNING

Risk of electrical shock. Disconnect input power before equipment servicing. Wait 20 minutes then check that the DC-bus capacitors are discharged.

Periodically vacuum or blow off accumulated debris on the internal parts with a high-velocity, low-pressure blower. Power connections on installed VFD may relax and loosen after a month of operation. Turn power off and re tighten. Recheck annually thereafter.

! CAUTION

Loose power connections can cause voltage spikes, overheating, malfunctioning, or failures.

! WARNING

Never engage/disengage circuit breaker while equipment is operating. Electrical arcing can cause serious injury.

Recalibrate Pressure Transducers

The pressure transducers should be checked against a pressure gage reading (Re-calibrated) once every year. All ten transducers to be checked : the refrigerant pump inlet pressure transducer , the refrigerant pump outlet pressure transducer , the bearing inlet pressure transducer , the bearing outlet pressure transducer , the condenser pressure transducer, the cooler pressure transducer, and the optional waterside pressure transducer pairs (consisting of 4 flow devices: 2 for cooler, 2 for condenser).

Ordering Replacement Chiller Parts

When ordering Carrier specified parts, the following information must accompany an order:

1. Chiller model number and serial number
2. Name, quantity, and part number of the part required
3. Delivery address and method of shipment.

Trouble Shooting Guide

Overview

The PIC 5+ control system has many features to help the operator and technician troubleshoot a 19DV chiller.

- The PIC 5+ TOUCH SCREEN shows the chiller's actual operating conditions and can be viewed while the unit is running.

- The PIC 5+ TOUCH SCREEN default screen indicates when an alarm occurs. Once all alarms have been cleared (by correcting the problems), the PIC 5+ TOUCH SCREEN default screen indicates normal operation. For information about displaying and resetting alarms and a list of alert codes, please refer to separated PIC5+ Control User Manual.
- The Configuration menu screens display information that helps to diagnose problems with chilled water temperature control, chilled water temperature control overrides, envelope control valve control, surge algorithm status, and time schedule operation.
- The quick test feature facilitates the proper operation and test of temperature sensors, pressure transducers, the guide vane actuator, refrigerant pump, water pumps, tower control, and other on/off outputs while the compressor is stopped. It also has the ability to lock off the compressor and turn on water pumps for pumpout operation. The PIC 5+ TOUCH SCREEN shows the temperatures and pressures required during these operations.
- If an operating fault is detected, an alarm indicator is displayed on the PIC 5+ TOUCH SCREEN default screen. A more detailed message — along with a diagnostic message — is also stored in the Current Alarms table.
- Review the Alarms History table to view other less critical events which may have occurred. Compare timing of relevant events and alarms.

For detailed information about alarms, please refer to separated PIC5+ Control User Manual. Press the bell icon in the top right corner of the home screen to access current alarms and alarm history, and to reset alarms.

Checking Display Messages

The first area to check when troubleshooting the 19DV is the PIC 5+ TOUCH SCREEN display. Status messages are displayed at the bottom of the screen, and the alarm icon indicates a fault. For a complete list of alarms, please refer to separated PIC5+ Control User Manual.

Checking Temperature Sensors

All temperature sensors are NTC thermistor type sensors. This means that the resistance of the sensor varies with temperature. All sensors have the same resistance characteristics. If the controls are on, determine sensor temperature by measuring voltage drop; if the controls are powered off, determine sensor temperature by measuring resistance. Compare the readings to the values listed in **Table 21**.

Resistance Check

Turn off the control power from the module, disconnect the terminal plug of the sensor in question. With a digital ohmmeter, measure sensor resistance between receptacles as designated by the wiring diagram. The resistance and corresponding temperature are listed in Table 21. Check the resistance of both wires to ground. This resistance should be infinite.

Voltage Drop Check

The voltage drop across any energized sensor can be measured with a digital voltmeter while the control is energized. Table 21 lists the relationship between temperature and sensor voltage drop (dv volts measured across the energized sensor). Exercise care when measuring voltage to prevent damage to the sensor leads, connector plugs, and modules. Sensors should also be checked at the sensor plugs.

! CAUTION

Relieve all refrigerant pressure or drain the water before removing any thermowell threaded into the refrigerant pressure boundary. Failure to do so could result in personal injury and equipment damage.

Check Sensor Accuracy

Place the sensor in a medium of known temperature and compare that temperature to the measured reading. The thermometer used to determine the temperature of the medium should be of laboratory quality with 0.25°C graduations. The sensor in question should be accurate to within 1.2°C.

See Fig. 22 for sensor locations. The sensors are immersed directly in the refrigerant or water circuits. When installing a new sensor, apply a pipe sealant or thread sealant to the sensor threads.

An additional thermistor, factory installed in the bottom of the cooler barrel, is displayed as Evap. Refrigerant Liquid Temperature on the TEMPERATURES display screen. This thermistor provides additional protection against a loss of water flow. DUAL TEMPERATURE SENSORS

For servicing convenience, there are 2 redundant temperatures sensors each on the bearing and motor. If one of the sensors is damaged, the other can be used by simply moving a wire. The number 2 terminal in the sensor terminal box is the common line. To use the second sensor, move the wire from the number 1 position to the number 3 position. See Fig. 47 or Fig. 48.

Table 21—Thermistor Temperature (°C) vs. Resistance/Voltage Drop

TEMPERATURE °C	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)	TEMPERATURE °C	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)
-33	4.722	105 616	44	1.338	2 272
-32	4.706	99 640	45	1.300	2 184
-31	4.688	93 928	46	1.263	2 101
-30	4.670	88 480	47	1.227	2 021
-29	4.650	83 297	48	1.192	1 944
-28	4.630	78 377	49	1.158	1 871
-27	4.608	73 722	50	1.124	1 801
-26	4.586	69 332	51	1.091	1 734
-25	4.562	65 205	52	1.060	1 670
-24	4.538	61 343	53	1.029	1 609
-23	4.512	57 745	54	0.999	1 550
-22	4.486	54 411	55	0.969	1 493
-21	4.458	51 341	56	0.941	1 439
-20	4.429	48 536	57	0.913	1 387
-19	4.399	45 819	58	0.887	1 337
-18	4.368	43 263	59	0.861	1 290
-17	4.336	40 858	60	0.835	1 244
-16	4.303	38 598	61	0.811	1 200
-15	4.269	36 476	62	0.787	1 158
-14	4.233	34 484	63	0.764	1 117
-13	4.196	32 613	64	0.741	1 079
-12	4.158	30 858	65	0.719	1 041
-11	4.119	29 211	66	0.698	1 006
-10	4.079	27 663	67	0.677	971
-9	4.037	26 208	68	0.657	938
-8	3.994	24 838	69	0.638	906
-7	3.951	23 545	70	0.619	876
-6	3.906	22 323	71	0.601	846
-5	3.861	21 163	72	0.583	818
-4	3.814	20 083	73	0.566	791
-3	3.765	19 062	74	0.549	765
-2	3.716	18 097	75	0.533	740
-1	3.667	17 185	76	0.518	715
0	3.617	16 325	77	0.503	692
1	3.565	15 513	78	0.488	670
2	3.512	14 747	79	0.474	648
3	3.459	14 023	80	0.460	628
4	3.406	13 341	81	0.447	608
5	3.353	12 696	82	0.434	588
6	3.298	12 087	83	0.422	570
7	3.242	11 510	84	0.410	552
8	3.185	10 963	85	0.398	535
9	3.129	10 444	86	0.387	518
10	3.074	9 949	87	0.376	502
11	3.016	9 486	88	0.365	487
12	2.959	9 046	89	0.355	472
13	2.901	8 628	90	0.344	458
14	2.844	8 232	91	0.335	444
15	2.788	7 855	92	0.325	431
16	2.730	7 499	93	0.316	418
17	2.672	7 160	94	0.308	405
18	2.615	6 839	95	0.299	393
19	2.559	6 535	96	0.291	382
20	2.503	6 246	97	0.283	371
21	2.447	5 972	98	0.275	360
22	2.391	5 711	99	0.267	349
23	2.335	5 463	100	0.260	339
24	2.280	5 226	101	0.253	330
25	2.227	5 000	102	0.246	320
26	2.173	4 787	103	0.239	311
27	2.120	4 583	104	0.233	302
28	2.067	4 389	105	0.227	294
29	2.015	4 204	106	0.221	286
30	1.965	4 028	107	0.215	278
31	1.914	3 861	108	0.210	270
32	1.865	3 701	109	0.205	262
33	1.816	3 549	110	0.198	255
34	1.768	3 404	111	0.193	248
35	1.721	3 266	112	0.188	242
36	1.675	3 134	113	0.183	235
37	1.629	3 008	114	0.178	229
38	1.585	2 888	115	0.174	223
39	1.542	2 773	116	0.170	217
40	1.499	2 663	117	0.165	211
41	1.457	2 559	118	0.161	205
42	1.417	2 459	119	0.157	200
43	1.377	2 363	120	0.153	195

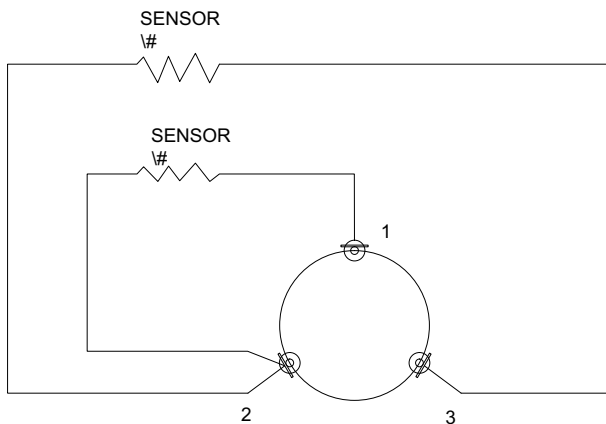


Fig. 47 MOTOR TEMPERATURE SENSOR WIRING DIAGRAM

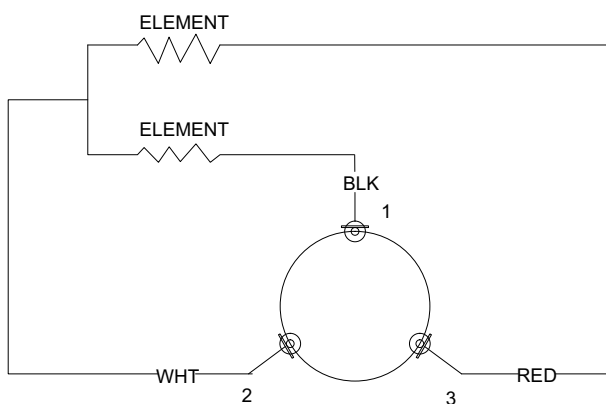


Fig. 48 1st / 2nd STAGE BEARING TEMPERATURE SENSOR WIRING DIAGRAM

Checking Pressure Transducers

There are 6 factory-installed pressure transducers. These transducers can be calibrated if necessary. It is necessary to calibrate at initial start-up, particularly at high altitude locations, to ensure the proper refrigerant temperature/pressure relationship. Each transducer is supplied with 5 vdc power. If the power supply fails, a transducer voltage reference alarm occurs. If the transducer reading is suspected of being faulty, check the **TRANSDUCER**

VOLTAGE REF supply voltage. It should be 5 vdc \pm 0.5v as displayed in **MAINTENANCE MENU** → **MAINTENANCE OTHERS**, where all the transducer voltages are shown. If the **TRANSDUCER VOLTAGE REF** supply voltage is correct, the transducer should be re-calibrated or replaced.

Also check that inputs have not been grounded and are not receiving anything other than a 4 to 20 mA signal. **TRANSDUCER REPLACEMENT** — Since the transducers are mounted on Schrader-type fittings, there is no need to remove refrigerant from the vessel when replacing the transducers. Disconnect the zing.

When installing a new transducer, do not use pipe sealer (which can plug the sensor). Put the plug connector back on the sensor and snap into place. Check for refrigerant leaks.

! WARNING

Be sure to use a back-up wrench on the Schrader fitting whenever removing a transducer, since the Schrader fitting may back out with the transducer, causing a large leak and possible injury to personnel.

COOLER AND CONDENSER PRESSURE TRANSDUCER AND OPTIONAL WATERSIDE FLOW DEVICE CALIBRATION

Calibration can be checked by comparing the pressure readings from the transducer to an accurate refrigerating age reading. These readings can be viewed or calibrated from the PIC 5+ TOUCH SCREEN. The transducer can be checked and calibrated at 2 pressure points. These calibration points are 0 kPa and between 68.9 and 206.8 kPa. To calibrate these transducers:

1. Shut down the compressor, cooler, and condenser pumps.

NOTE: There should be no flow through the heat exchangers.

2. Disconnect the transducer in question from its Schrader fitting for cooler or condenser transducer calibration. For flow device calibration, leave the transducer in place.

NOTE: If the cooler or condenser vessels are at 0 kPa or are open to atmospheric pressure, the transducers can be calibrated for zero without removing the transducer from the vessel.

3. Access the **PRESSURE** or **HYDRAULIC STATUS** screen and view the particular transducer reading. To calibrate or waterside flow device, view the particular reading. It should read 0 kPa. If the reading is not 0 kPa, but within \pm 3.5 kPa, the value may be set to zero from the **Maintenance Menu** while the appropriate transducer parameter is highlighted. The value will now go to zero. No high end calibration is necessary for flow devices. If the transducer value is not within the calibration range, the transducer returns to the original reading. If the pressure is within the allowed range (noted above), check the voltage ratio of the transducer. To obtain the voltage ratio, divide the voltage (dc) input from the transducer by the **TRANSDUCER VOLTAGE REF** supply voltage signal (displayed in **CONTROL TEST** menu in the **PRESSURE TRANSDUCERS** screen) or measure across the positive (+ red) and negative (– black) leads of the transducer. For example, the condenser transducer voltage reference is measured at IOB terminals 1J11-1 and 1J5-10, the condenser transducer voltage input. The input to reference voltage ratio must be between 0.80 and 0.11 for the software to allow calibration. Pressurize the transducer until the ratio is within range. Then attempt calibration again.

A high pressure point can also be calibrated between 68.9 and 206.8 kPa by attaching a regulated 206.8 kPa pressure (usually from a nitrogen cylinder). The high pressure point can be calibrated by accessing the appropriate transducer parameter, highlighting the parameter, and then adjusting the value to the exact pressure on the refrigerant gage. Pressures at high altitude locations must be compensated for, so the chiller temperature/pressure relationship is correct.

The PIC 5+ control system does not allow calibration if the transducer is too far out of calibration. In this case, a new transducer must be installed and re-calibrated.

Quick Test

The Quick Test feature is located in the Main Menu. Through this feature one can perform guide vane calibration, test chiller status, and test the status of various actuators, view water temperature deltas, test ref pump, as well as control inlet guide vane, envelope control, alarms, condenser and chilled water pumps. The tests can help to determine whether a switch is defective or a pump relay is not operating, as well as other useful troubleshooting issues. During pumpdown operations, the pumps are energized to prevent freeze-up and the vessel pressures and temperatures are displayed.

Pumpdown/Lockout

The Pump down/Lockout feature prevents compressor start-up when there is no refrigerant in the chiller. This function is password-protected, user can access to this function via maintenance menu. When using Pump down/Lockout function, will observe freeze up precautions while using external pump out to remove refrigerant from chiller:

1. Start water pumps and confirm flows
2. Monitor Cooler pressure, Condenser pressure, Cooler refrigerant temperature during pumpout procedures
3. Turn pumps off after pumpdown
4. Proceed to lock out compressor

The Terminate Lockout feature ends the Pump down /Lockout:

1. Starts pumps and confirm flows
2. Monitor Cooler pressure, Condenser pressure, Cooler temperature during charging process
3. Terminates compressor lockout

Physical data

Refer to **table 1-table 14** for the physical data of the chiller.

Table 1 19DVChiller Dimensions (Nozzle-In-Head Waterbox)

19DV Dimensions (Nozzle-In-Head Waterbox)				
COOLER HEAT EXCHANGER SIZER	CONDENSER HEAT EXCHANGER SIZE	A(LENGTH, DISHED HEAD WATERBOX)	19DV B (WIDTH)	19DV C (HEIGHT)
		2-PASS		
		mm	mm	mm
G2*	G2*	4778.5	2595.8	2928.1
G4*	G4*	5299.2	2595.8	2928.1

*Assumes both cooler and condenser nozzle on same end of chiller.

NOTES:

1. Service access should be provided per American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 15, latest edition, National Fire Protection Association (NFPA) 70, and local safety code.
2. Overhead clearance for service rigging 19DV compressor should be at least 1524 mm.
3. Dimensions are approximate. Certified drawings available upon request.
4. Marine waterboxes typically add to the width of the machine. See certified drawings for details.
5. 'A' length dimensions shown are for standard 2065 kPa design and flanges connections. The 300 psig design and flanges will add length. See certified drawings.
7. Table contains heat exchanger dimensions. For arrangements where the compressor motor housing extends past the waterbox, consult the 19DV certified drawings.
8. Consult factory for configurations not listed in the above table.

Table 2—19DV Nozzle Size

HEAT EXCHANGER FRAME SIZE	NOZZLE SIZE (mm) (NOMINAL SIZE)					
	COOLER			CONDENSER		
	1-PASS	2-PASS	3-PA	1-PASS	2-PASS	3-PASS
F	457	356	254	356	254	203
G	457	356	254	356	254	203
H	457	356	254	356	254	203

Table 3 19DV Compressor Weights

COMPONENTS	WEIGHT (kg)
Power Train Assembly(Include Motor Stator, Rotor Assembly and 2nd Stage Lube Support)	1000
2ndStage lube support	75
Rotor Assembly (Include Motor Rotor, 1st Stage Lube Support)	310
1st Stage Lube Support	70
1st Stage Suction Assembly(Include 1stStage Blade Ring, 1st Stage Suction Housing)	379
1st Stage Blade Ring Assembly	79
1stStage Suction Housing	281
2ndStage Suction Assembly(Include 2nd Stage Blade Ring, 2nd Stage Suction Housing)	351
2ndStage Blade Ring Assembly	60
2nd Stage Suction Housing	274
1st Stage Volute	613
2nd Stage Volute	478
1st Stage Shroud	225
2st Stage Shroud	200
1st Stage IGV Shroud	54
2st Stage IGV Shroud	44
1stStage Impeller	29
2stStage Impeller	27
Miscellaneous	172
Total Weight (Excludes Motor Stator and Motor Rotor)	2810

Table 4 19DV Motor Weights

COMPRESSOR FRAME	MOTOR CODE	STATOR & HOUSING WEIGHT (kg)	ROTOR & SHAFT WEIGHT (kg)
DV4	B	494	150
	D	522	154
	F	558	159
	H	597	165

Table 5 19DV VFD Weights

VFD CODE	FRAME	WEIGHT (kg)
5	32VSS0850	770

Notes: * Reference until product data is determined

Table 6–19DV Cooler Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: B5 LP 19.05mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G20	4845	318	886
G21	4921	318	921
G22	4997	318	956
G23	5072	318	990
G24	5174	318	1036
G25	4845	318	886
G26	4901	318	912
G27	4977	318	947
G28	5059	318	984
G29	5148	318	1025
G40	5159	381	924
G41	5247	381	936
G42	5335	381	1003
G43	5423	381	1042
G44	5540	381	1095
G45	5159	381	924
G46	5225	381	954
G47	5313	381	993
G48	5407	381	1036
G49	5510	381	1082

Table 7– 19DV Cooler Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: B5 LP 25.4mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G2A	4662	318	897
G2B	4707	318	927
G2C	4757	318	960
G2D	4805	318	992
G2E	4877	318	1041
G2F	4637	318	880
G2G	4680	318	909
G2H	4734	318	945
G2J	4793	318	984

G2K	4851	318	1024
G4A	4949	381	936
G4B	5002	381	970
G4C	5060	381	1008
G4D	5115	381	1045
G4E	5200	381	1100
G4F	4921	381	917
G4G	4971	381	950
G4H	5034	381	991
G4J	5102	381	1036
G4K	5170	381	1080

Table 8 – 19DV Condenser Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: C5 LP 19.05mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G22	3050	125	617
G23	3156	121	662
G24	3275	120	712
G27	3050	125	617
G28	3156	121	662
G29	3275	120	712
G42	3271	150	673
G43	3394	145	724
G44	3531	144	781
G47	3271	150	673
G48	3394	145	724
G49	3531	144	781

Table 9 – 19DV Condenser Weights (1ST STAGE END AND 2ND STAGE END) (TUBE TYPE: C5 LP 25.4mm)

FRAME SIZE	DRY WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	WATER WEIGHT (kg)
G2C	2814	125	654
G2D	2903	121	709
G2E	2983	117	758
G2H	2814	125	654
G2J	2903	121	709
G2K	2983	117	758
G4C	3001	150	715
G4D	3104	145	777
G4E	3197	141	833
G4H	3001	150	715
G4J	3104	145	777
G4K	3197	141	833

Table 10– 19DV Economizer Weights

FRAME SIZE	STEEL WEIGHT (kg)	REFRIGERANT WEIGHT (kg)	OPERATION WEIGHT (kg)
DV4	1015	263	1278

Table 11– 19DV Standard Type Dish Head Water Box Weights

WATER DESIGN PRESSURE (Psi)	FRAME SIZE	PASSES	COOLER		CONDENSER	
			STEEL WEIGHT (kg)	WATER WEIGHT (kg)	STEEL WEIGHT (kg)	WATER WEIGHT (kg)
1034	G	2	845	614	407	215

Table 12– 19DV NIH Water Box Adders Weights

WATER DESIGN PRESSURE (kPa)	FRAME SIZE	PASSES	COOLER			CONDENSER		
			STEEL WEIGHT (kg)		WATER WEIGHT (kg)	STEEL WEIGHT (kg)		WATER WEIGHT (kg)
			FLANGED	VICTAULIC		FLANGED	VICTAULIC	
1034	G	1	212	-26	19	134	-10	15
		2	147	0	0	86	0	0
		3	126	41	-15	80	23	-6
2068		1	532	196	66	319	105	35
		2	445	227	49	227	111	22
		3	368	253	35	222	134	16

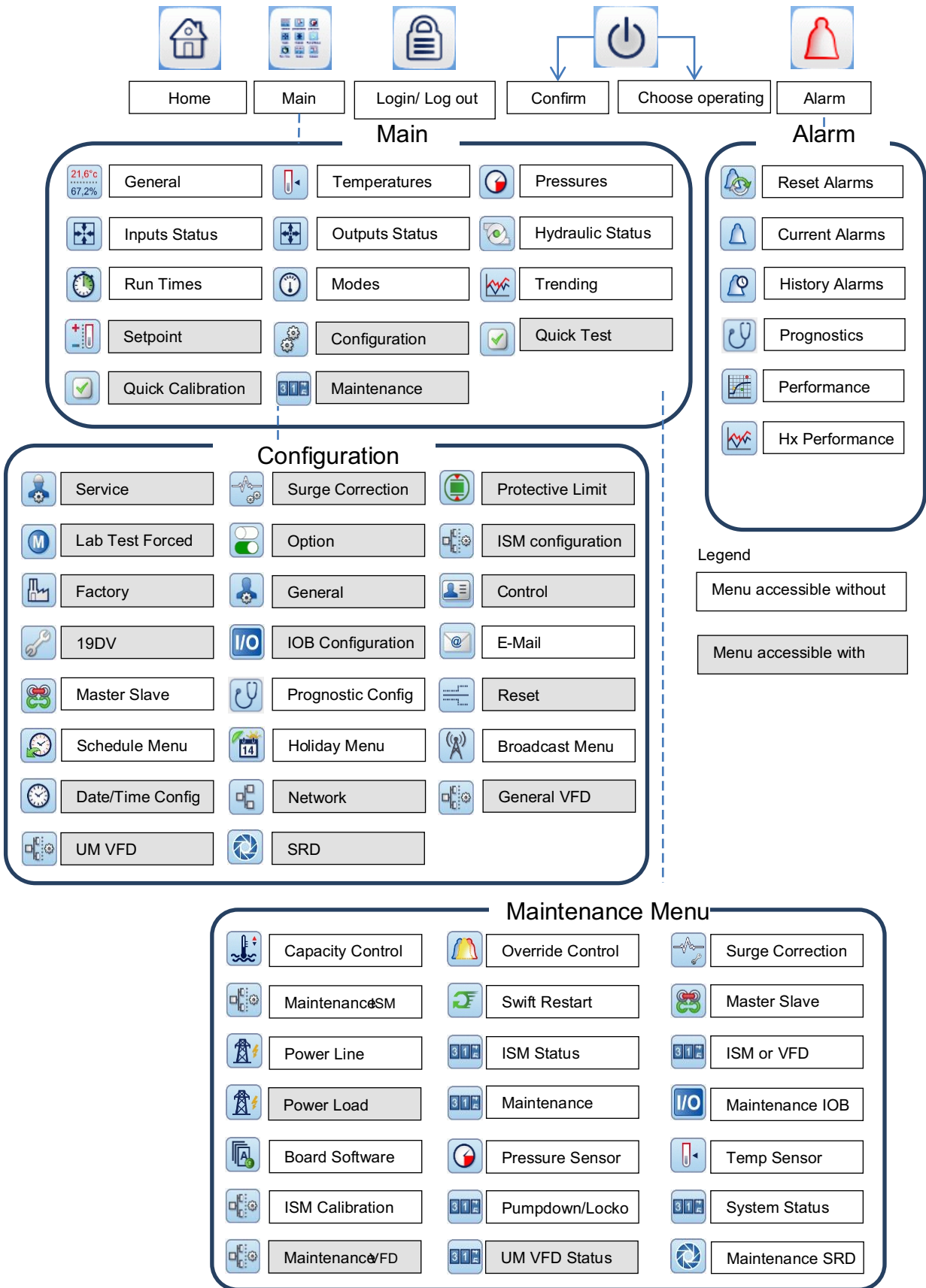
Table 13– 19DV Piping and Others Weights

NAME	WEIGHT (kg)
SUCTION PIPING	222
INTERSTAGE PIPING	454
DISCHARGE PIPING	68
PURGE	60
COPPER PIPING	245
CONTROL PANEL	86
PIC 5+ + TOUCH SCREEN	11
CABLE AND CABLE TRAY	191
INSULATION (COOLING UNIT)	25

Table 14– 19DV ACCESSORIES Weights



CONDENSER FRAME	ENVELOPE CONTROL & PIPING (kg)	LIQUID BYPASS & ISOLATION VALVE (kg)
G	180	227

APPENDIX A – PIC 5+ SCREEN AND MENU STRUCTURE

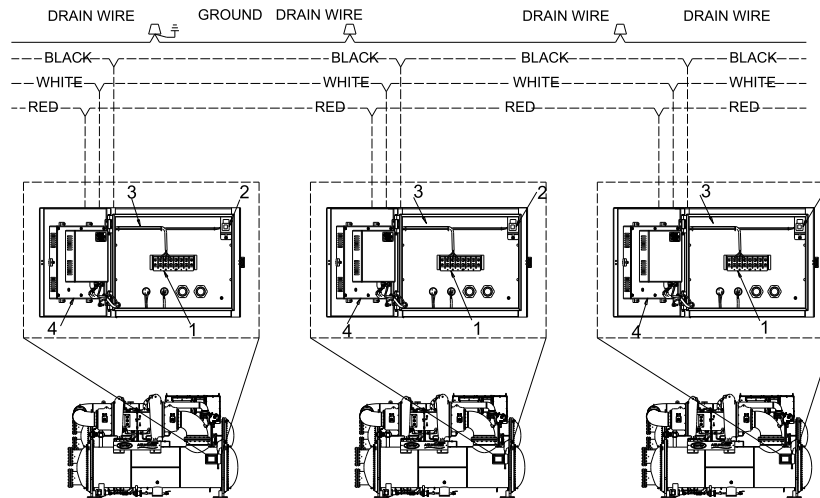


APPENDIX A – PIC 5+ SCREEN AND MENU STRUCTURE (cont)

Detailed menu description

ICON	DISPLAYED TEXT*	Description	ASSOCIATED TABLE
	General Parameters	General Parameters	GENUINT
	Temperatures	Temperatures	TEMP
	Pressures	Pressures	PRESSURE
	Inputs Status	Inputs Status	INPUTS
	Outputs Status	Outputs Status	OUTPUTS
	Hydraulic Status	Hydraulic Status	HYDRLIC
	Run Times	Run Times	RUNTIME
	Modes	Modes	MODES
	Setpoint	Setpoint	SETPOINT
	Configuration Menu	Configuration Menu	CONFIG
	Quick Test	Quick Test	QCK_TEST
	Maintenance Menu	Maintenance Menu	MAINTAIN
	Trendings	Trendings	TRENDING

APPENDIX B —CCN COMMUNICATION WIRING FOR MULTIPLE CHILLER



NOTE: Field supplied terminal trip must be located in PIC 5+ touch screen.

1. Carrier Comfort Network (CCN)
2. Circuit Breakers
3. PIC 5+ Touch Screen Internal View
4. Touch Screen Module

_____ Factory Wiring

- - - - - Field Wiring

APPENDIX C – MAINTENANCE SUMMARY AND LOG SHEETS
19DV Maintenance Interval Requirements

WEEKLY

COMPRESSOR	None.	CONTROLS	Review PIC 5+ Alarm/Alert History.
COOLER	None.	VFD	None.
CONDENSER	None.	LIQUID RECLAIM	None.

MONTHLY

COMPRESSOR	None.	CONTROLS	Perform an Automated Controls test.
COOLER	None.	STARTER	None.
CONDENSER	None.	LIQUID RECLAIM	None.

FIRST YEAR

COMPRESSOR	Change bearing filter.	CONTROLS	Perform general cleaning. Tighten connections. Check pressure transducer. Confirm accuracy of thermistor.
COOLER	Inspect and clean cooler tubes. Inspect safety valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	VFD	Perform general cleaning. Tighten connections. Change VFD refrigerant strainer.
CONDENSER	Replace refrigerant filter/drier. Inspect safety valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	INHIBITOR RECLAIM	Change two liquid reclaim filters.

ANNUALLY

COMPRESSOR	Change bearing filter.	CONTROLS	Perform general cleaning. Tighten connections. Check pressure transducer. Confirm accuracy of thermistor.
COOLER	Inspect and clean cooler tubes. Inspect safety valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	VFD	Perform general cleaning. Tighten connections.
CONDENSER	Replace refrigerant filter/drier. Inspect safety valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	INHIBITOR RECLAIM	Change two liquid reclaim filters.

EVERY 3-5 YEARS

COMPRESSOR	None.	CONTROLS	None.
COOLER	Perform eddy current test.	VFD	None.
CONDENSER	Inspect float valve and strainer. Perform eddy current test.	INHIBITOR RECLAIM	None.

EVERY 5 YEARS

COMPRESSOR	None.	CONTROLS	None.
COOLER	None.	STARTER	None.
CONDENSER	None.	LIQUID RECLAIM	Inspect two liquid reclaim filters. Replace the two liquid reclaim filters.

SEASONAL SHUTDOWN

COMPRESSOR	None.	CONTROLS	Do not disconnect control power.
COOLER	Isolate and drain waterbox. Remove water box cover from one end. Use compressed air to clear tubes.	STARTER	None.
CONDENSER	Isolate and drain waterbox. Remove water box cover from one end. Use compressed air to clear tubes.	LIQUID RECLAIM	None.

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

APPENDIX C— MAINTENANCE SUMMARY AND LOGSHEETS (cont.)

19DV monthly Maintenance Log

MONTH	DATE	1	2	3	4	5	6	7	8	9	10	11	12
OPERATOR		/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
UNIT SECTION	ACTION	ENTRY											
COMPRESSOR	Leak Test												
	Inspect Compressor Rotors	yes/no											
	Bearing Inspection	yes/no											
COOLER	Inspect and Clean Cooler Tubes	yes/no											
	Inspect safety Valves	yes/no											
	Leak Test	PPM											
	Record Water Pressure Differential (PSI)	PSI											
CONDENSER	Inspect Water Pumps	yes/no											
	Eddy Current Test	yes/no											
	Leak Test	PPM											
	Inspect and Clean Condenser Tubes	yes/no											
CONTROLS	Record Water Pressure Differential (PSI)	PSI											
	Inspect Water Pumps and Cooling Tower	yes/no											
	Inspect safety Valves	yes/no											
	Replace Refrigerant Filter Drier	yes/no											
	Inspect Float Valve and Strainer	yes/no											
	Eddy Current Test	yes/no											
STARTER	General Cleaning and Tightening Connections	yes/no											
	Check Pressure Transducers	yes/no											
	Confirm Accuracy of Thermistors	yes/no											
	Perform Automated Controls Test	yes/no											
LIQUID RECLAIM	General Tightening and Cleaning Connections	yes/no											
	Inspect liquid reclaim filter	yes/no											

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

APPENDIX C -- MAINTENANCE SUMMARY AND LOG SHEETS (cont)

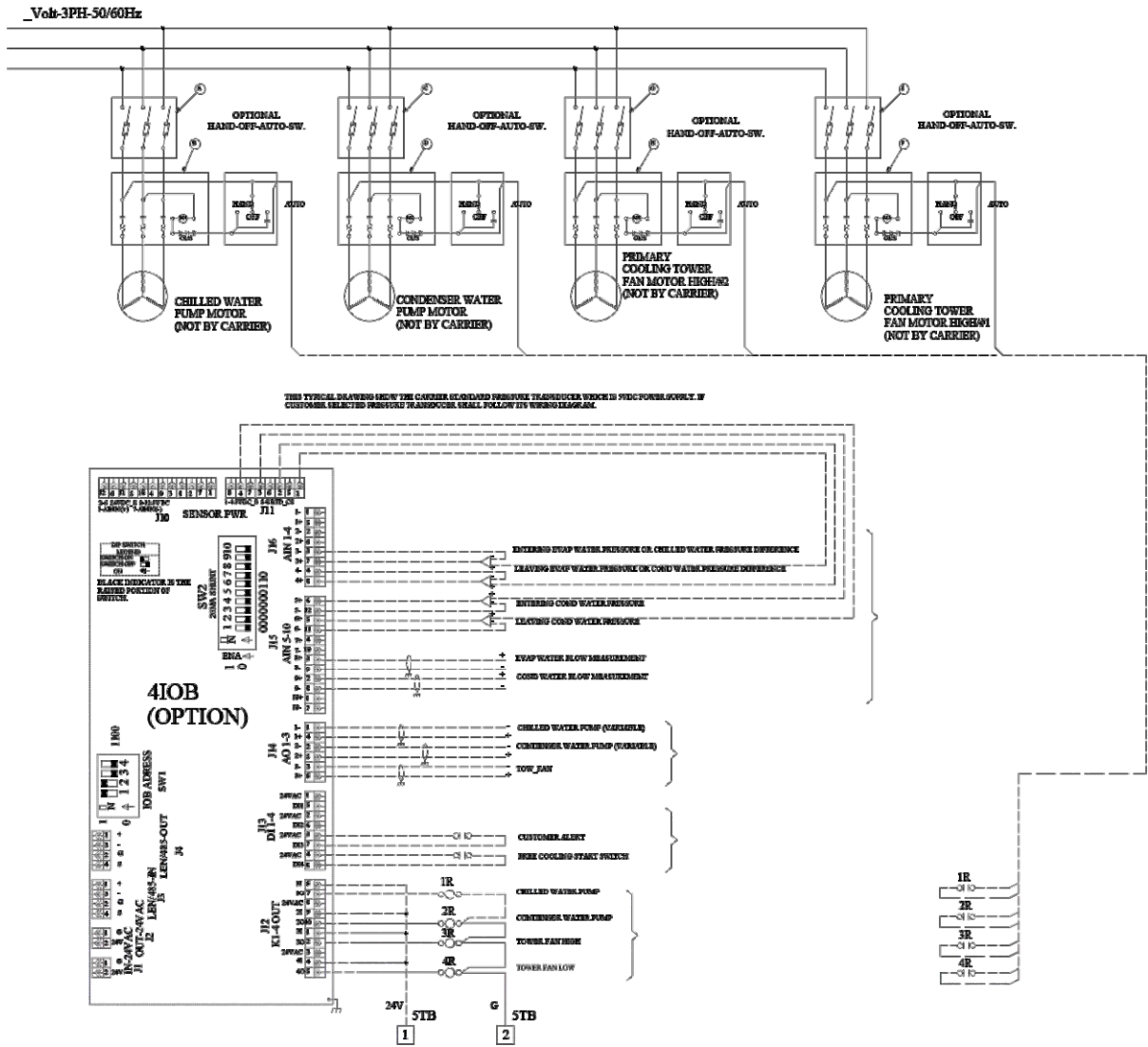
19XR Seasonal Shutdown Log

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
DATE	//	//	//	//	//	//	//	//	//	//	//	//
OPERATOR												

UNIT SECTION	ENTRY												
COOLER	Isolate and Drain Waterbox												
	Remove Waterbox Cover from One End												
	Use Compressed Air to Clean Tubes												
CONDENSER	Isolate and Drain Waterbox												
	Remove Waterbox Cover from One End												
CONTROLS	Use Compressed Air to Clean Tubes												
	Do Not Disconnect Control Power												

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

APPENDIX D — 19DV FIELD WIRING (3) DETAILS



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**INITIAL START-UP CHECKLIST
FOR 19DV HERMETIC TWO-STAGE CENTRIFUGAL WATER COOLED CHILLER
(Remove and use for job file.)**

MACHINE INFORMATION:

NAME _____ JOB NO. _____
 ADDRESS _____ MODEL _____
 CITY _____ STATE _____ ZIP _____ S/N _____

DESIGN CONDITIONS:

	TONS	BRINE	FLOW RATE	TEMPERATURE IN	TEMPERATURE OUT	PRESSURE DROP	PASS	SUCTION TEMPERATURE	CONDENSER TEMPERATURE
COOLER									
CONDENSER									

COMPRESSOR: Volts _____ RLA _____ OLTA _____
 STARTER: Mfg _____ Type _____ S/N _____
 REF PUMP: Volts _____ RLA _____ OLTA _____

AUX CONTROL PANEL SUPPLY: Voltage _____ Hertz _____
 REFRIGERANT: Type: _____ Charge _____

CARRIER OBLIGATIONS: Assemble..... Yes " No "
 Leak Test Yes " No "
 Dehydrate Yes " No "
 Charging Yes " No "
 Operating Instructions _____ Hrs.

START-UP TO BE PERFORMED IN ACCORDANCE WITH APPROPRIATE MACHINE START-UP INSTRUCTIONS

JOB DATA REQUIRED:

- 1. Machine Installation Instructions Yes " No "
- 2. Machine Assembly, Wiring and Piping Diagrams Yes " No "
- 3. Starting Equipment Details and Wiring Diagrams..... Yes " No "
- 4. Applicable Design Data (see above)..... Yes " No "
- 5. Diagrams and Instructions for Special Controls Yes " No "

INITIAL MACHINE PRESSURE: _____

	YES	NO
Was Machine Tight?		
If Not, Were Leaks Corrected?		
Was Machine Dehydrated After Repairs?		

RECORD PRESSURE DROPS: Cooler _____ Condenser _____

CHARGE REFRIGERANT: Initial Charge _____ Final Charge After Trim _____

INSPECT WIRING AND RECORD ELECTRICAL DATA:

RATINGS:

Motor Voltage _____ Motor(s) RLA _____ Chiller LRA Rating _____
 Actual Line Voltage: VFD _____ Ref. Pump _____ Controls _____

Verify 6-in. clearance surrounding all VFD enclosure louvers: Yes* No*
 Visually inspect down through top of power module for debris: Yes* No*

Condenser Water Flow
 Chilled Water Flow
 Pump Interlocks

VFD Manufacture _____ VFD Nameplate I.D. Number _____
 VFD Serial Number _____ VFD Nameplate Input Rating _____
 Mfd in _____ On _____

Does the electrical power supply have a ground wire and is it connected to the VFD: Yes* No*

FIELD-INSTALLED VFDs ONLY:

Check motor winding continuity T1 to T2, etc. Do not megger VFD;
 Disconnect leads to motor and megger the leads.

MEGGER MOTOR "PHASE TO GROUND"

T1 (or T2, or T3)-G

1-Second Readings:

60-Second Readings:

Polarization Ratio:

CONTROLS: SAFETY, OPERATING, ETC.

Perform Controls Test (Yes/No)

! CAUTION

COMPRESSOR AND CONTROL PANEL MUST BE PROPERLY AND INDIVIDUALLY CONNECTED BACK TO THE EARTH GROUND IN VFD (IN ACCORDANCE WITH CERTIFIED DRAWINGS).

WATER/BRINE PUMP CONTROL: Can the Carrier controls independently start the pumps?

Condenser Water Pump Yes* No*
 Chilled Water Pump Yes* No*

RUN MACHINE: Do these safeties shut down machine? Yes* No*
 Condenser Water Flow Yes* No*
 Chilled Water Flow Yes* No*
 Pump Interlocks Yes* No*

INITIAL START:

Line Up All Valves in Accordance With Instruction Manual: _____

Start Water Pumps and Establish Water Flow _____

High Float Chamber Liquid Level OK _____ Check Ref Pump Rotation and Pressure _____

Check Compressor Motor Rotation and Record: Clockwise _____

Restart Compressor, Bring Up To Speed. Shut Down. Any Abnormal Coast down Noise? Yes* No*

*If yes, determine cause.



START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

- A: Trim charge and record under Charge Refrigerant section.
- B: Complete any remaining control calibration and record under Controls section.
- C: Take at least 8 hours of operational log readings and record.
- D: After machine has been successfully run and set up, shut down and mark shutdown refrigerant level.
- E: Give operating instructions to owner's operating personnel Hours Given: _____ Hours
- F: Return a copy of this checklist to the local Carrier Service office.

SIGNATURES:

CARRIER
TECHNICIAN _____ DATE _____

CUSTOMER
REPRESENTATIVE _____ DATE _____

19DV PIC 5+ SETPOINT TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Cooling ECW Setpoint	-9.4 to 48.9	°C	15.6	
EWT Control Option	DSABLE/ENABLE	—	DSABLE	
Ice Build Setpoint	-9.4 to 15.6	°C	4.4	
Cooling LCW Setpoint	-12.2 to 48.0	°C	7.2	
Base Demand Limit	10.0 to 100.0	%	100.0	

PIC 5+ Touch Screen Software Version Number: _____

PIC 5+ Touch Screen Controller Identification: BUS: _____ ADDRESS: _____

119DV PIC 5+ TIME SCHEDULE CONFIGURATION SHEET PERIOD 1

	DAY FLAG							OCCUPIED TIME				UNOCCUPIED TIME				
	M	T	W	T	F	S	S	H								
Period 1:																
Period 2:																
Period 3:																
Period 4:																
Period 5:																
Period 6:																
Period 7:																
Period 8:																

19DV PIC 5+ TIME SCHEDULE CONFIGURATION SHEET PERIOD 2

	DAY FLAG							OCCUPIED TIME				UNOCCUPIED TIME				
	M	T	W	T	F	S	S	H								
Period 1:																
Period 2:																
Period 3:																
Period 4:																
Period 5:																
Period 6:																
Period 7:																
Period 8:																

19DV PIC 5+ TIME SCHEDULE CONFIGURATION SHEET PERIOD 3

	DAY FLAG							OCCUPIED TIME				UNOCCUPIED TIME				
	M	T	W	T	F	S	S	H								
Period 1:																
Period 2:																
Period 3:																
Period 4:																
Period 5:																
Period 6:																
Period 7:																
Period 8:																

19DV PIC 5+ FACTORY TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Chiller Type 19XR6/7=0,19XR2-E/D/V=1, 19DV=2	0 to 2		0	
Unit Type Cool Only=0,Heat Mach=1	0 to 1		0	
Comp(Single=0,Dual=1)	0 to 1		0	
Chilled Medium Type Water =0, Brine =1	0 to 1		0	
19DV Comp Design Press 52PSI=0 72PSI=1	0 to 1		0	
Free Cooling Option	0 to 1		0	
VFD Option No=0,FS VFD=1,Carrier=2 Rockwell LF2=3, Eaton=4 Rockwell STD=5	0 to 5		0	
IOB4 Option	0 to 1		0	
Guide Vane1 Type Digital=0 Analog=1	0 to 1		1	
Marine Option	0 to 1		0	
Power Request Option	0 to 1		0	
Cont. Power Request	0 to 1		0	
Purge System Option	0 to 1		0	
Liquid Bypass Option	0 to 1		0	
Heat Reclaim Option No=0, Full=1, Part=2	0 to 2		0	

119DV PIC 5+ CFG_19DV TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Motor Pole Pair Single=1 Double=2	0 to 1		0	
IGV2 Travel Limit	30 to 100	%	60	
IGV2 Minimum Degree	0 to 20	Deg.	2.0	
IGV2 Fully Open Degree	10 to 100	Deg	90.0	
IGV2 Actuator Max	90 to 100	Deg	94.0	
IGV2 Position @IGV1 20°	10 to 30	Deg	28.1	
IGV2 Position @IGV1 30°	10 to 50	Deg	37.2	
IGV2 Position @IGV1 50°	10 to 80	Deg	71.6	
VFD Rate Speed Hz	10 to 200	Hz	80.0	
Purge Regen Lasting Time		Min	120	

19DV PIC 5+ CFGSURGE TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Surge Line Configuration PR = 0, Delta T = 1	0 to 1		0	
IGV1 POS Configuration Degree =0, Percentage =1	0 to 1		0	
Surge Delta Tmax	0 to 83.3	°C	38.9	
Surge Delta Tmin	0 to 83.3	°C	25	
IGV1 Full Load Open Deg.	80.0 to 120	Deg	88.0	
IGV1 Minimum Open Deg.	0.0 to 10.0	Deg	2.0	
IGV1 Actuator Max Deg.	90.0 to 120	Deg	109.0	
IGV1 Minimum Position	0.0 to 100.0	%	5.0	
IGV1 Full Load Position	0.0 to 100.0	%	100.0	
Envelope Line Offset	0.6 to 1.7	°C	1.1	
Envelope Speed Factor	0.00 to 3.00		2.0	
Surge Line Shape Factor	-1.000 to 0.000		-0.01	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

19DV PIC 5+ CFGGEVFD TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
VFD Max Speed Per	90 to 100	%	100	
VFD Min Speed Per	65 to 89	%	70	
VFD Start Speed Per	65 to 100	%	100	
VFD Current Limit	0~99999	AMPS	250	

19DV PIC 5+ CFGGEVFD TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Compressor Speed 100%	47 to 200	Hz	50	
Motor Rated Line Voltage	200 to 13800	Volts	460	
Motor Nameplate Current	10 to 2000	AMPS	200	
Motor Rated Load Current	10 to 2000	AMPS	200	
Motor Nameplate Voltage	200 to 13800	Volts	460	
Motor Nameplate RPM	1500 to 5000	rpm	3000	
Motor Nameplate KW	0 to 5000	kw	1500	

19DV PIC 5+ SERVICE TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Atmospheric Pressure	55.2 to 103.4	kPa	100	
Soft Stop Amps Threshold	40 to 100	%	70	
Water Flow Verify Time	0.5 to 5.0	Min	5.0	
Gv1 Travel Limit	30 to 100	%	80.7	
Purge Active Temp SP	-1.1 to 32.2	° C	18.3	

19DV PIC 5+ OPTION CONDIGURATION TABLE (CONF_OPT) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Auto Restart Option	0 to 1		0	
Common Sensor Option	0 to 1		0	
EC Valve Option No=0, Cont.=1 ON/OFF=2, mA=3	0 to 3		0	
EC Selection Disable=0, Surge=1 Low Load=2, Comb=3	0 to 3		0	
Ice Build Option	0 to 1		0	
Water Flow Determination	0 to 1		0	
Liquid Bypass Selection	0 to 1		0	
Purge On Idle Option	0 to 1		0	

19DV PIC 5+ GENERAL PARAMETERS TABLE (GENUNIT) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Cooling/Heating Select	0 to 1			

19DV PIC 5+ SETPOINT TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Cooling ECW Setpoint	-9.4 to 48.9	° C	15.6	
Cooling LCW Setpoint	-12.2 to 48.9	° C	7.2	
ICE Build Setpoint	-9.4 to 15.6	° C	4.4	
Heating ECDW Setpoint	17.2 to 65.6	° C	40.0	
Heating LCDW Setpoint	20 to 65.6	° C	45.0	
Base Demand Limit	10.0 to 100.0	%	100.0	

ALARM SHUTDOWN STATE RECORD SHEET

PRIMARY MESSAGE	DATE	TIME	CHW IN	CHW OUT	EVAP REF	CDW IN	CDW OUT	COND REF	AMPS%
—	—	—	—	—	—	—	—	—	—