Start-Up and Service Instructions

CONTENTS

SAFETY CONSIDERATIONS

Centrifugal and screw compressor 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 chiller instructions as well as those listed in this guide.

⚠ DANGER

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

ONLY QUALIFIED electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment.

READ AND UNDERSTAND this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

DO NOT install modification kits with power applied to the drive. Disconnect and lock out incoming power before attempting such installation or removal. Failure to observe this precaution could result in severe bodily injury or loss of life.

UNUSED WIRES in conduit must be grounded at both ends to avoid a possible shock hazard caused by induced voltages. Also, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled to eliminate the possible shock hazard from cross-coupled motor leads. Failure to observe these precautions could result in bodily injury.

DO NOT VENT refrigerant relief valves within a building. Outlet from rupture disc, relief valve or any other type of safety relief device 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). 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. 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 chiller for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

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 USE air for leak testing. Use only refrigerant or dry nitrogen.

DO NOT VALVE OFF any safety device.

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

THERE IS A RISK OF INJURY OR DEATH by electrocution. High voltage may be present on the motor leads even though the motor is not running. Open the power supply disconnect before touching motor leads or terminals.

(Dangers continued on next page.)

⚠ DANGER

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

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

DO NOT WORK ON electrical components, including control panels, switches, VFD, or oil heater 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.

⚠ WARNING

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

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

a. Shut off electrical power to unit.

b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.

c. 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.

d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.

e. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

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

⚠ WARNING

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while chiller is under pressure or while chiller is running. Be sure pressure is at 0 psig (0 kPa) before breaking any refrigerant connection.

⚠ CAUTION

USE only repair or replacement parts that meet the code requirements of the original equipment.

PERIODICALLY INSPECT all valves, fittings, and piping for corrosion, rust, leaks, or damage.

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations.

DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed.

⚠ CAUTION

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

TO AVOID an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the power terminal block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all 3 measurements.

THE USER is responsible to conform with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

THIS DRIVE contains ESD (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. Typical ESD protections are ESD mat and grounded wrist strap.

DO NOT alter the setting of any jumper. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

USE OF power correction capacitors on the output of the drive can result in erratic operation of the motor, nuisance tripping, and/or permanent damage to the drive. Remove power correction capacitors before proceeding. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

MOST CODES require that upstream branch circuit protection be provided to protect input power wiring.

DO NOT route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

DISTRIBUTION SYSTEM short circuit capacity shall not exceed the rating of the drive. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

DO NOT STEP on refrigerant lines. Broken lines can whip about and release refrigerant, causing personal injury.

DO NOT climb over a chiller. Use platform, catwalk, or staging. Follow safe practices when using ladders.

USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move inspection covers or other heavy components. Even if components are light, use mechanical equipment when there is a risk of slipping or losing your balance.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE VFD, TOWER FAN, OR PUMPS. Open the disconnect ahead of the VFD, tower fans, or pumps.

INTRODUCTION

The Carrier VFD option Start-Up and Service Manual is intended for trained and qualified service personnel and is to be used during start-up, operation, and maintenance of Danfoss VLT FC102 series drives.

ABBREVIATIONS AND EXPLANATIONS

Frequently used abbreviations in this manual include:

DC	— Direct Current
HMI	— Human Machine Interface
IGBT	— Insulated Gate Bipolar Transistor
I/O	— Inputs/Outputs
IP	— Internet Protocol
LCP	— Local Control Panel
LEN	— Local Equipment Network
MCB	— Main Control Board
MDCIC	— Multi-Drive Control Interface
MOV	— Metal Oxide Varistor
PCB	— Printed Circuit Board
PE	— Protective Earthing Conductor
PIC	— Product Integrated Control
PWM	— Pulse Width Modulation
STO	— Safe Torque Off
VFD	— Variable Frequency Drive

Required Publications

The Carrier VFD option Start-Up and Service Manual must be used with the following manuals:

- Latest version of the Danfoss VLT FC 102 and VLT parallel AC Drives manuals as applicable.
- Latest revision of the Start-Up, Operation, and Maintenance Instructions for the 19XR with PIC 6 Controls.
- Latest revision of the Controls Operation and Troubleshooting manual for 19XR with PIC 6 Controls.

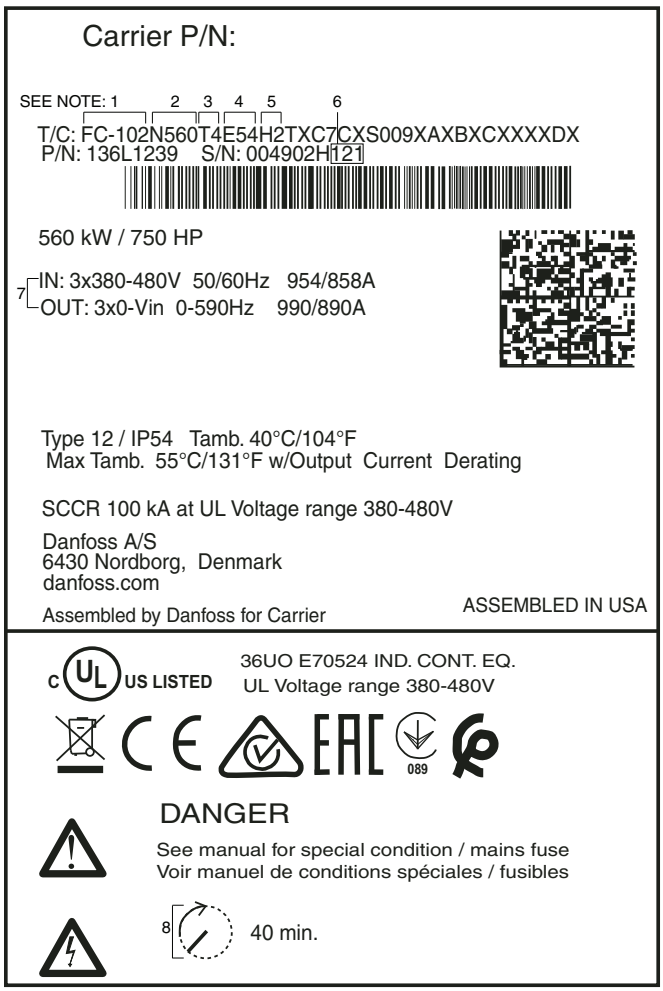
Getting Assistance from Danfoss

For technical support on drives, contact Technical Support experts: 1-888-Danfoss (1-888-326-3677).

Before calling, have the following information available. Type Code and Serial Number can be found on the Danfoss data nameplate. See Fig. 1.

- Image of drive nameplate including:
  Carrier VFD Code (Carrier Part Number)
  Danfoss Part Number / Type Code (T/C)
  Danfoss Serial Number (S/N)
- Images of cable connections, filters, resisters, fuses, chokes, etc.
- Alarms/warnings experienced
- MCT 10 *.ssp file

For detailed repair procedures, refer to Danfoss VLT Drive Service Manual MG94A502.



NOTES:

1. Identifies product group and drive series. This should always start with FC-102.
2. Drive Power Rating (N315, N355, N400, N450, N500, N560, N630, N710, N800, N1M0).
3. Voltage Rating (T4 = 380-480V AC).
4. Enclosure Type: E54: IP54 (NEMA 12).
5. Drive type (H=6-pulse drive with RFI filter, P2=6-pulse parallel drive with RFI filter).
6. S/N contains information related to Build date after the capital letter (wwy, where ww is the week and y is the year; for example, 121 = week 12, 2021.
7. IN = input voltage; OUT = output voltage.
8. Danger Electrical Symbol; 40 min indicates that for this size drive the internal capacitors will have discharged 40 minutes after power has been removed from the drive.

Fig. 1 — Sample Danfoss VFD Nameplate

IDENTIFYING DRIVE COMPONENTS

Chiller control, VFD Power Assembly and VFD schematics are included in Appendix A.

⚠ WARNING

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait the time specified in Table 1 or as specified on the Danfoss VFD nameplate for the DC bus capacitors to discharge. Always check the voltage with a voltmeter rated for the DC bus voltage to ensure the DC bus capacitors are discharged before touching any internal components. For parallel drive modules (N630 and larger) check voltage before and after the individual DC fuses. Failure to observe these precautions could result in severe bodily injury or loss of life.

An isolated multimeter with diode tester is needed to measure DC bus voltage and to make resistance and diode checks.

Table 1 — Discharge Time

VFD FRAME	DANFOSS POWER MODULE SIZE	CAPACITOR DISCHARGE TIME (MIN)
DD588	D	20
DE658-DE990	E	40
DP1120-DP1670	D	20

The Danfoss VFD offering has a passive rectifier section and a six pulse inverter section. For Danfoss VFD frames DD and DE, chiller topology offering consists of a VFD power panel and a separate Danfoss drive mounted on the chiller condenser. The VFD power panel contains the required integration components for the VFD to operate with the chiller system. These components consist of the main circuit breaker, oil pump breaker and terminal block feed to power panel, terminal blocks, control power circuit breaker, control transformers, heater power terminal block feed, and fan relays.

The larger Danfoss DP frame size is used for multiple power modules to be used in parallel. The drive modules and the VFD power panel components are consolidated into a common enclosure.

The Danfoss VFD offering includes optional protective MOVs for VFD electrical surge protection and volt- and ammeter options along with a line reactor offering. The drive is offered with no local control panel (LCP) keypad, and therefore if programming is required, a version of Danfoss' MCT-10 will need to be installed on a laptop. For details of MCT-10, see Danfoss published literature VLT[1] Motion Control Tools MCT 10 Setup Software Operating Instructions. Note that a keypad is required for some service functions such as enabling LEN on a non-Carrier configured Danfoss type code. (LEN is configured default on a Carrier type code.) A keypad is also required if a drive power card is being replaced.

⚠ WARNING

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

Refer to Fig. 2 for lockout/tagout details.

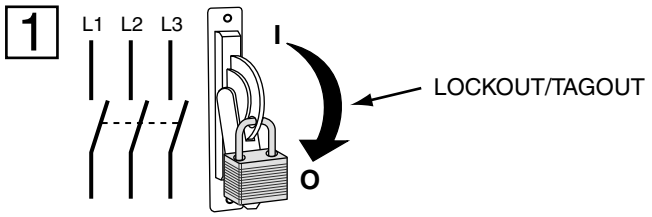


Fig. 2 — Lockout/Tagout

When there is a need to access the VFD enclosure to do any troubleshooting, it is important to identify the type of drive prior to initiating any work.

The Carrier FC-102 Danfoss product offering consists of three main configurations: D size, E size, and D size parallel drive (PD) modules. See details for the D size drive in Fig. 3, for the E size drive in Fig. 4, and for the D size parallel drive modules in Fig. 5. The product range covers a drive range of 315 to 1000 kW. When any work or troubleshooting is required, it is critical to determine the type of drive since their design layouts vary. This can be done by locating the Carrier VFD label located on the outside of the drive or the Danfoss type code on the Danfoss VFD nameplate and matching up the appropriate VFD Power Rating in Table 2 or Table 3.

1. VLT is a registered trademark of Danfoss A/S.

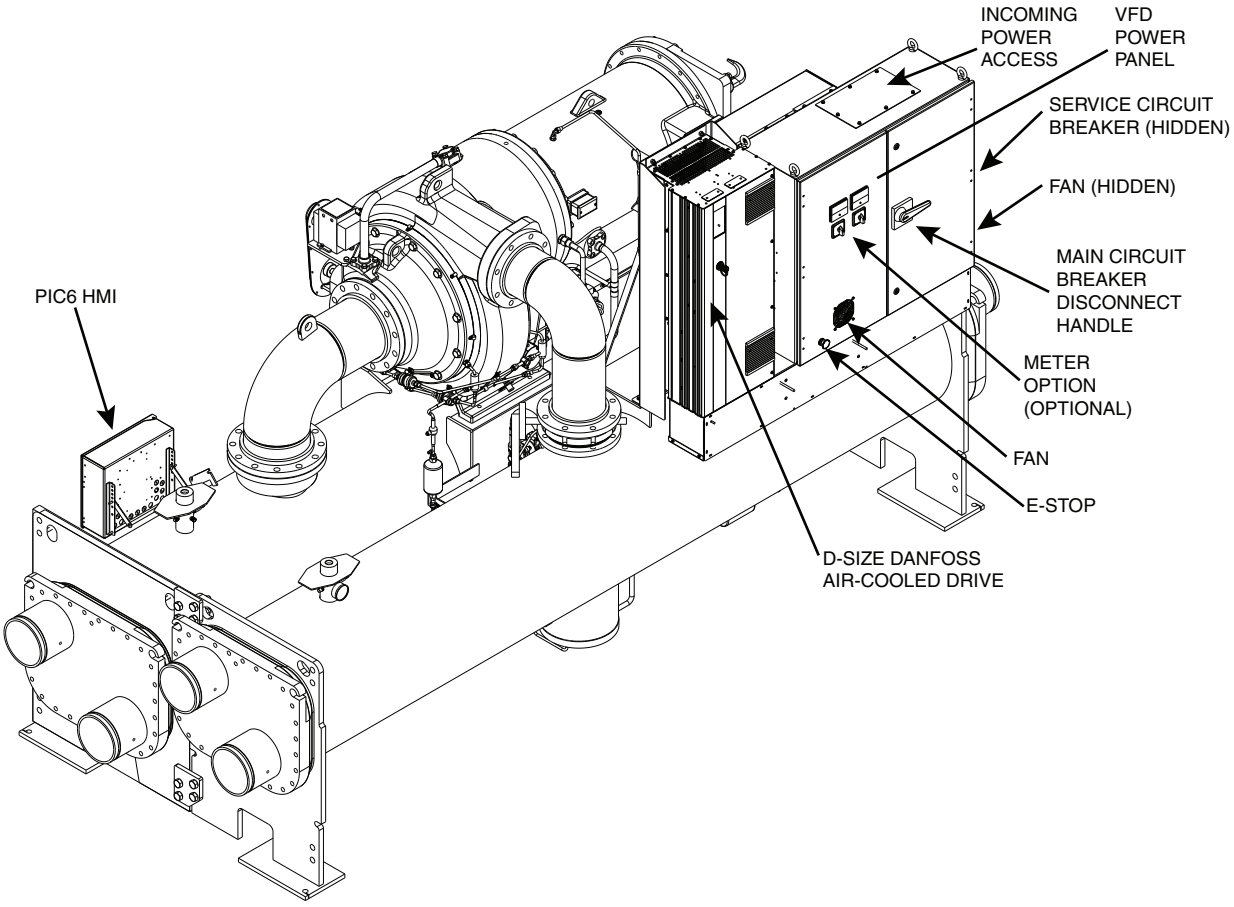


Fig. 3 — D Size Drive

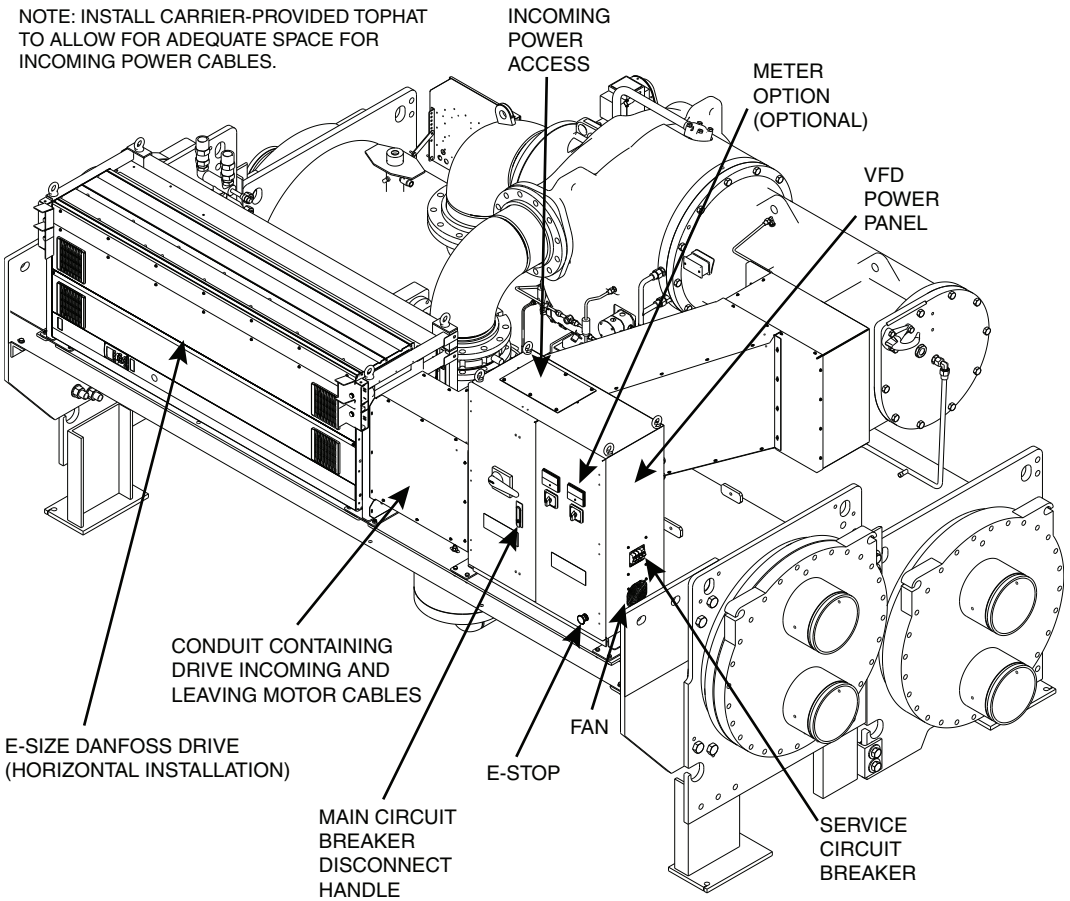


Fig. 4 — E Size Drive

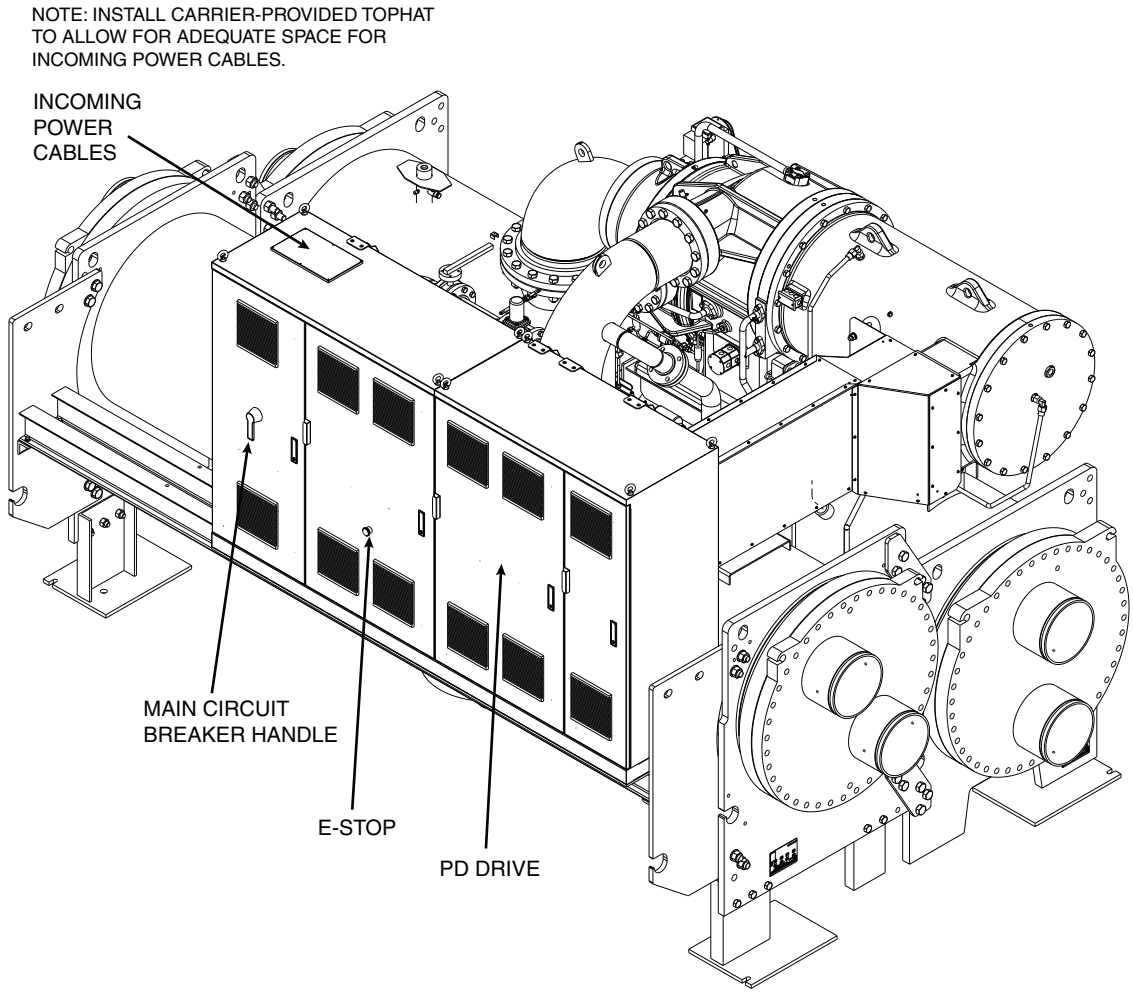


Fig. 5 — Size PD Danfoss Drive (Integrated VFD and VFD Power Panel)

Table 2 — VFD Type by Frame Size, D-E

CARRIER VFD FRAME	DANFOSS			MAX DRIVE ENCLOSURE	DANFOSS DRIVE			VFD POWER PANEL			
	TYPE	ENCLOSURE SIZE	DRIVE	WEIGHT LB (KG)	HEIGHT IN. (MM)	WIDTH IN. (MM)	DEPTH IN. (MM)	WEIGHT LB (KG)	HEIGHT IN. (MM)	WIDTH IN. (MM)	DEPTH IN. (MM)
DD558	D	D2h	N315	275 (125)	43.6 (1107)	12.8 (325)	14.9 (379)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)
DE658	E1	E1h	N355	650 (295)	80.4 (2043)	23.7 (602)	20.2 (513)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)
DE745	E1	E1h	N400	650 (295)	80.4 (2043)	23.7 (602)	20.2 (513)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)
DE800	E1	E1h	N450	650 (295)	80.4 (2043)	23.7 (602)	20.2 (513)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)
DE880	E2	E2h	N500	700 (318)	80.4 (2043)	27.5 (698)	20.2 (513)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)
DE990	E2	E2h	N560	700 (318)	80.4 (2043)	27.5 (698)	20.2 (513)	300 (136)	40.5 (1030)	37.25 (950)	19.0 (480)

Table 3 — VFD Type by Frame Size, PD

CARRIER VFD FRAME	DANFOSS			MAX DRIVE ENCLOSURE	DANFOSS DRIVE			VFD ENCLOSURE			
	TYPE	ENCLOSURE SIZE	DRIVE	WEIGHT LB (KG)	HEIGHT IN. (MM)	WIDTH IN. (MM)	DEPTH IN. (MM)	WEIGHT LB (KG)	HEIGHT IN. (MM)	WIDTH IN. (MM)	DEPTH IN. (MM)
DP1120	D Parallel	Da4	N630	275 (125)	88.7 (2254)	63.3 (1608)	25.0 (636)	3000 (1361)	65 (1652)	110 (2800)	24.6 (625)
DP1260	D Parallel	Da4	N710	275 (125)	88.7 (2254)	63.3 (1608)	25.0 (636)	3000 (1361)	65 (1652)	110 (2800)	24.6 (625)
DP1460	D Parallel	Da4	N800	275 (125)	88.7 (2254)	63.3 (1608)	25.0 (636)	3000 (1361)	65 (1652)	110 (2800)	24.6 (625)
DP1670	D Parallel	Da4	N1M0	275 (125)	88.7 (2254)	63.3 (1608)	25.0 (636)	3000 (1361)	65 (1652)	110 (2800)	24.6 (625)

NOTE: Weight and dimensions for PD (parallel drive) for the Danfoss power module are for the combined VFD enclosure (both VFD and VFD power panel components).

Rigging

D, E SIZES

Drive enclosure and associated components are heavy. To avoid injury be sure to use appropriate equipment with appropriate weight ratings for lifting. Always use dedicated lifting eyes for lifting and never walk under suspended load. Wear PPE such as gloves, safety glasses and safety shoes to prevent injury. Ensure correct length of lifting cables so lifting angle is 65 degrees or larger with horizontal (Fig. 6). Always use lifting eye bolts (Fig. 7) to rig drive if it needs to be removed from the chiller. Note that E series drives are placed on the chiller in horizontal position and will need to be rigged from that orientation using rigging eyes in the four corners.

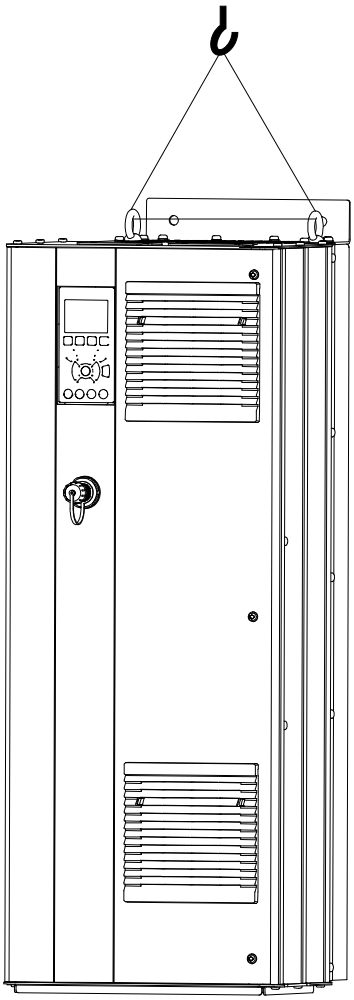


Fig. 6 — Lifting Cables

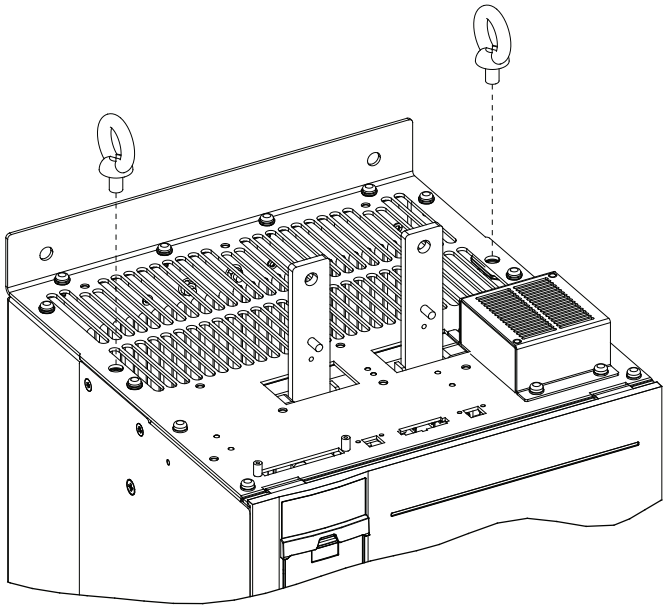


Fig. 7 — Installation of Eye Bolts

PARALLEL DRIVE MODULES

Parallel Drive Modules consist of four smaller D size modules installed in parallel configuration.

Install eye bolts and rig individual modules as a D series drive. Note that some component removal is necessary to gain access to remove an individual drive.

If the entire drive module enclosure is to be rigged, use dedicated rigging lugs. Use the 4 rigging lugs located in each corner of the drive enclosure.

The PD enclosure can be lifted by the 4 outside eyebolts. Lifting angle must never be more than a 45 degree pull (Fig. 8). See Fig. 9 for location of eyebolts.

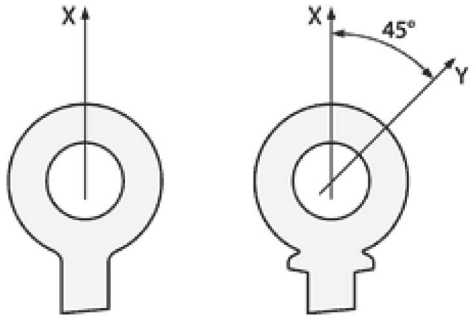


Fig. 8 — Lifting Angle for Eyebolts

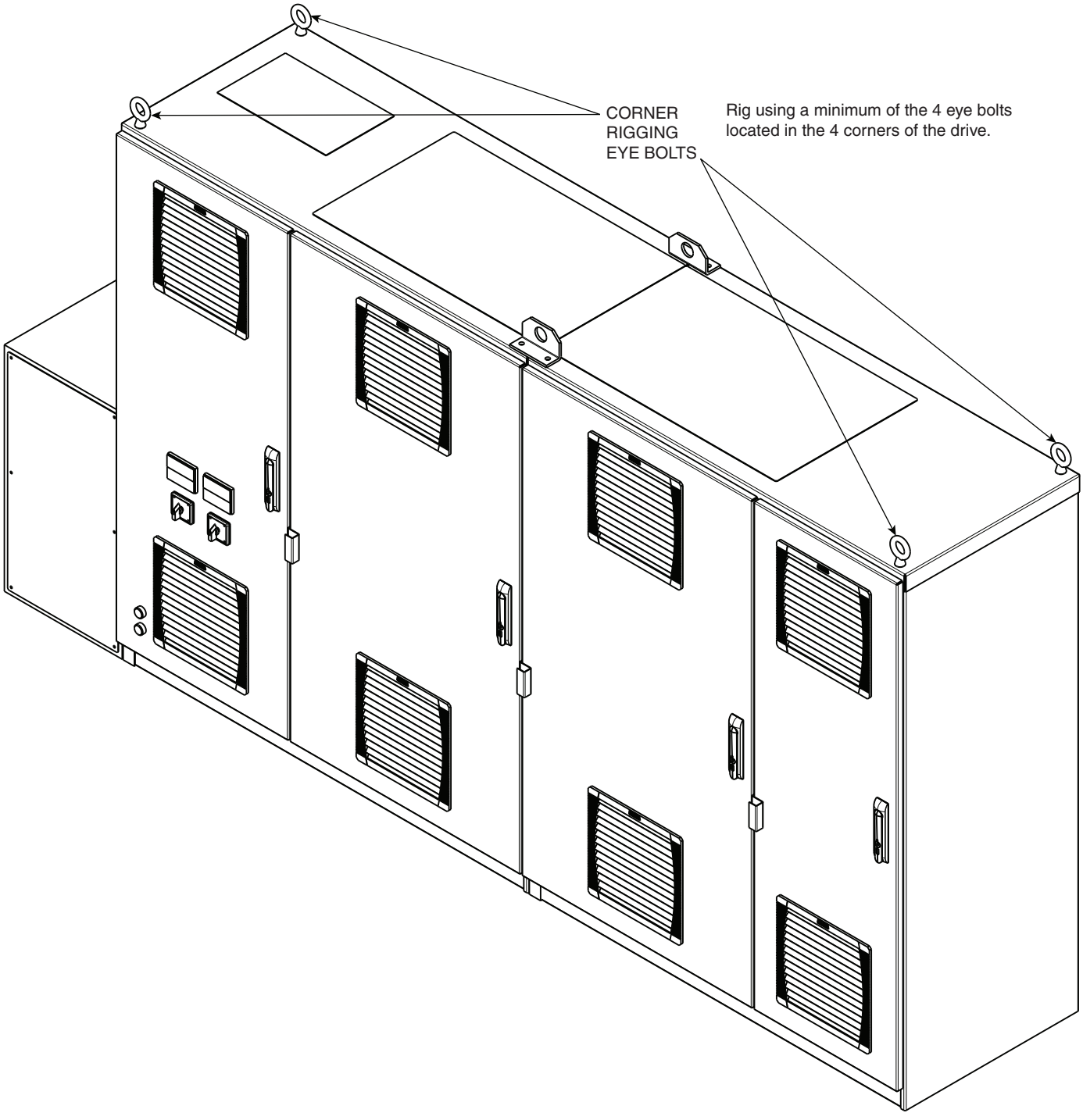


Fig. 9 — Danfoss PD Drive Rigging

Components and Physical Data

19XRV Carrier Danfoss VFD Part Numbers are structured as shown in Fig. 10 and 11.

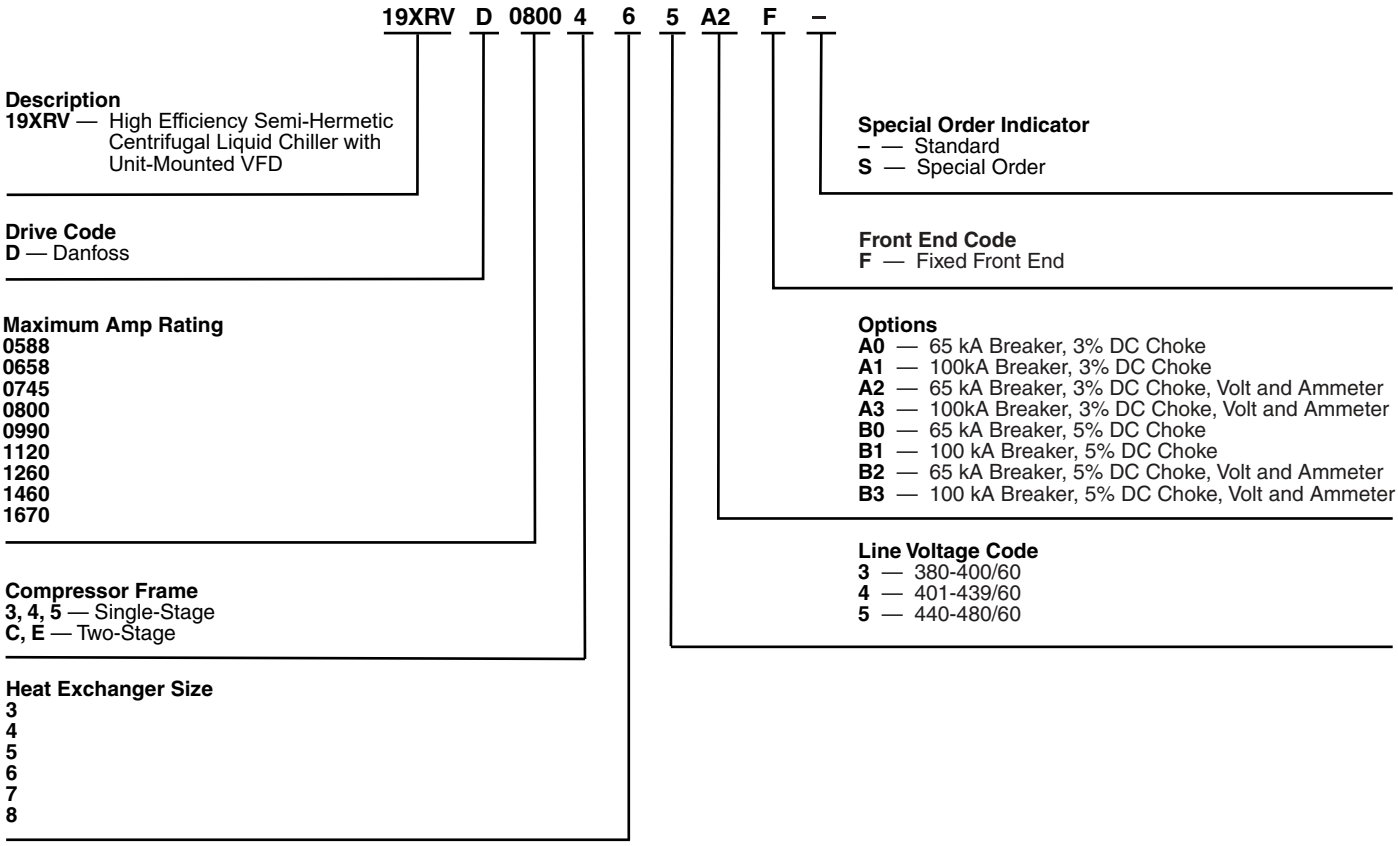


Fig. 10 — Carrier Part Number for 19XRV Danfoss Drive

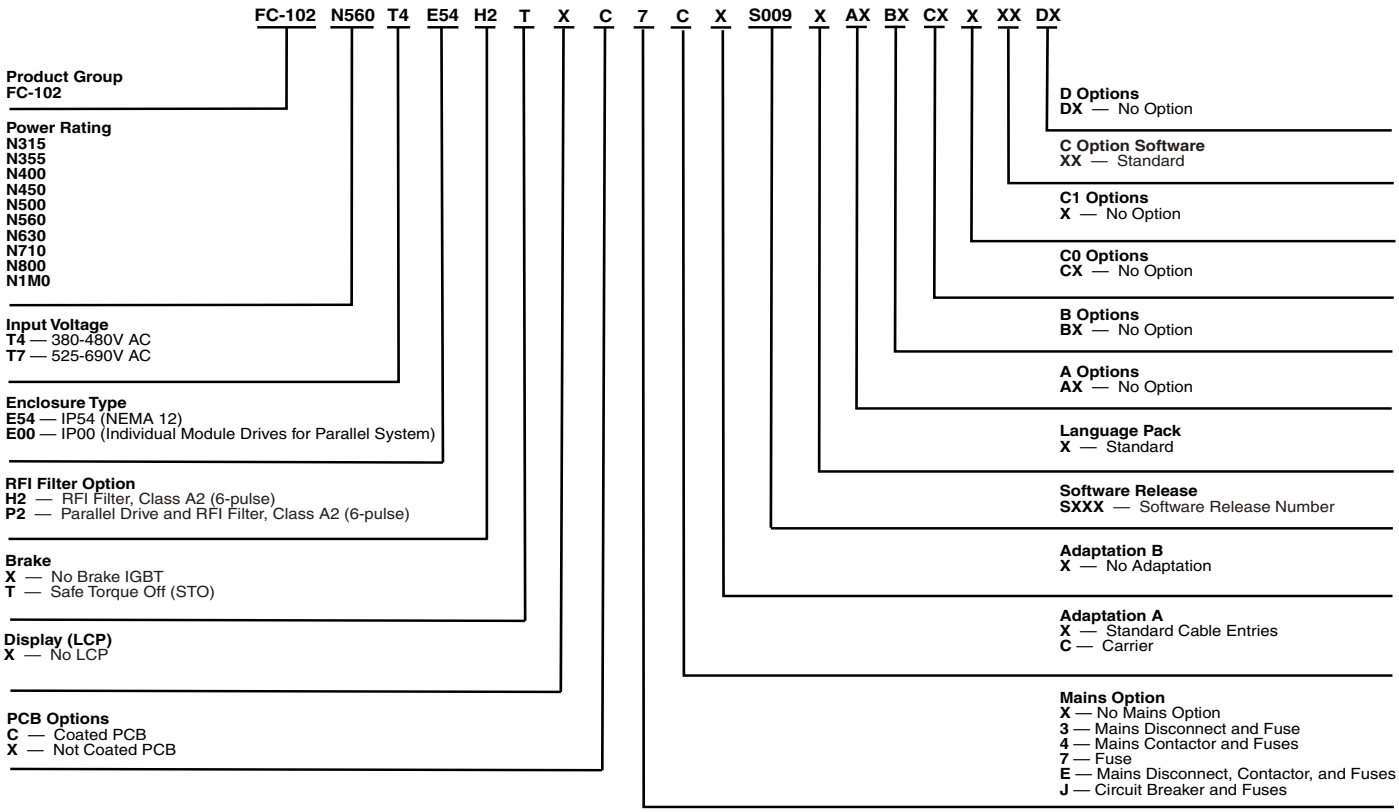


Fig. 11 — Example of Danfoss Type Code (TC) Breakdown

D Size Drive

The D size FC-102 drive and Carrier VFD control panel are positioned side by side off-center on top of the condenser shell. Both the drive and the VFD control are positioned on a common base on the condenser.

The Carrier VFD power panel is where the customer runs unit incoming power; the panel contains all required components to interface with the VFD, control panel, and power panel. See Fig. 12-14.

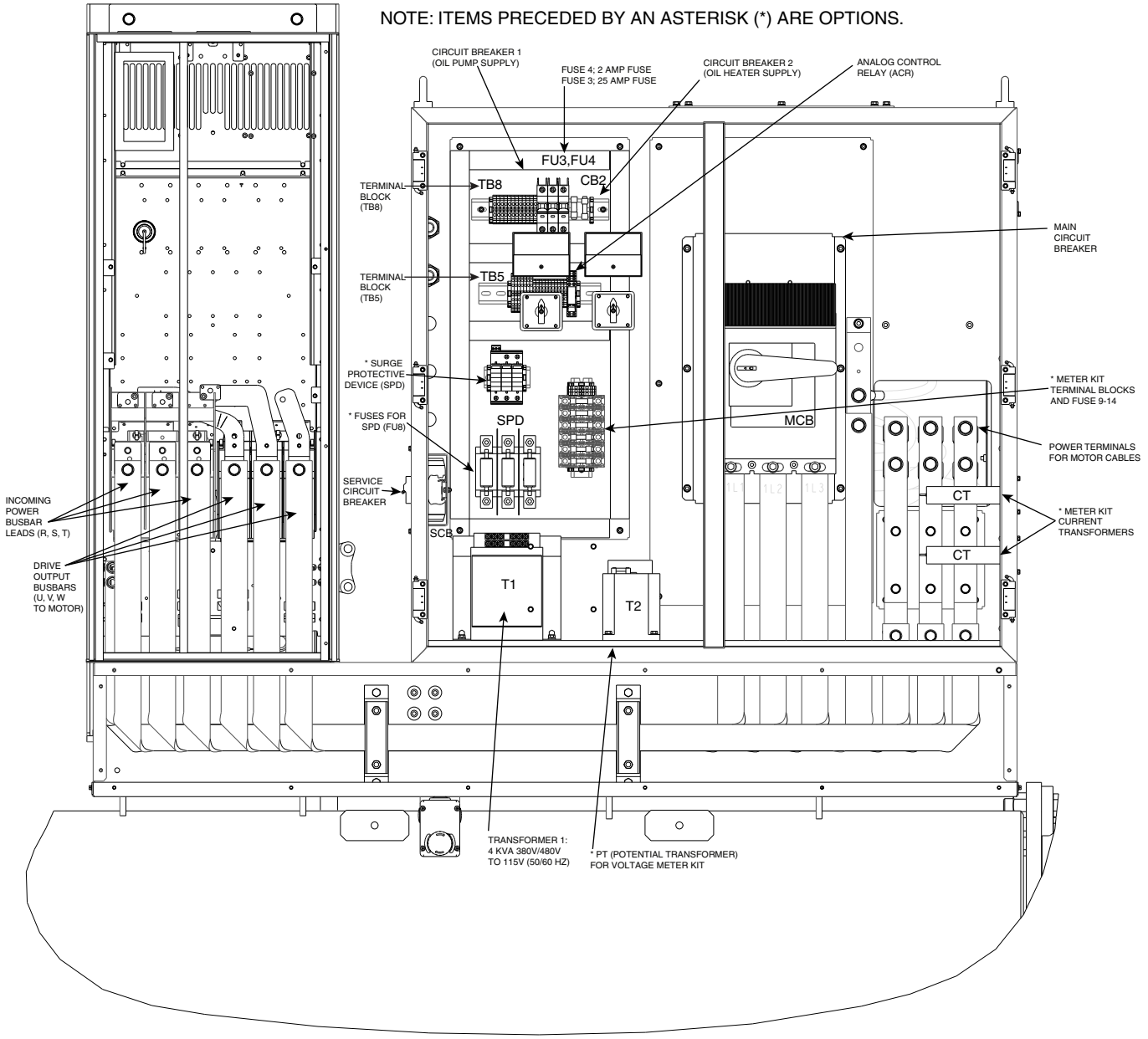


Fig. 12 — D Size FC-102 Drive and Carrier VFD Power Panel

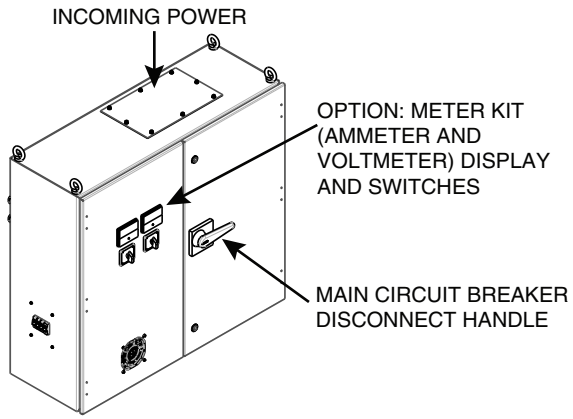
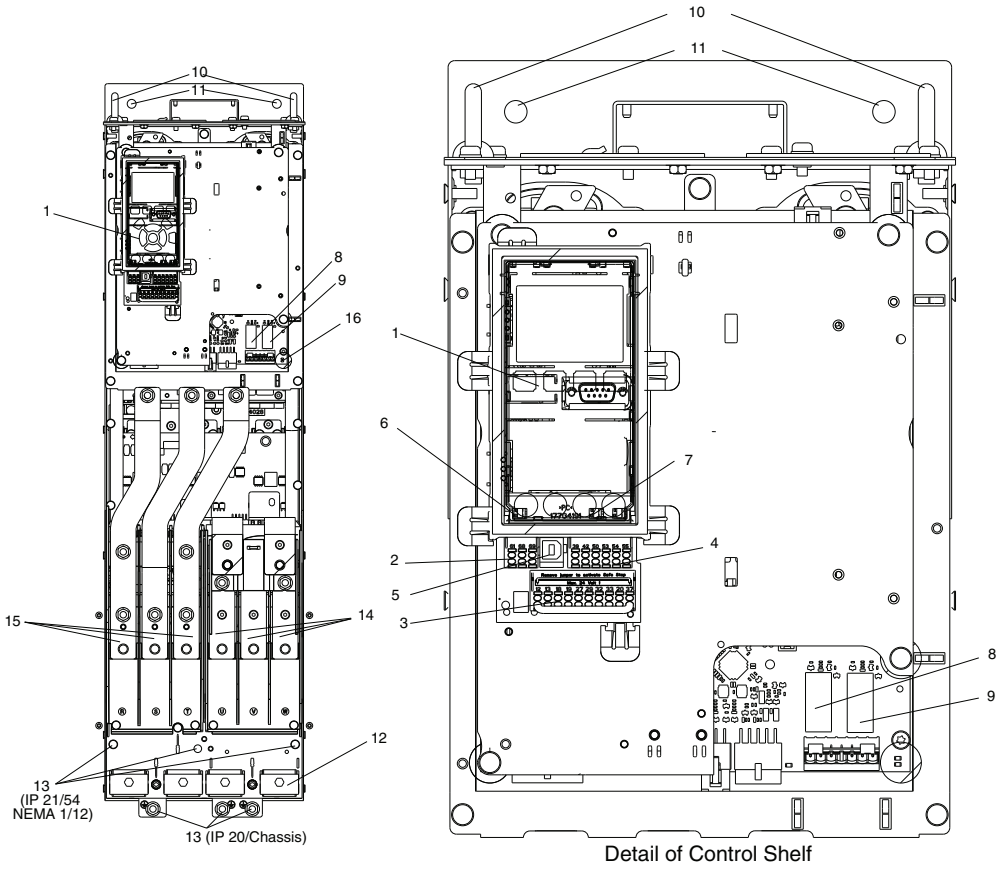


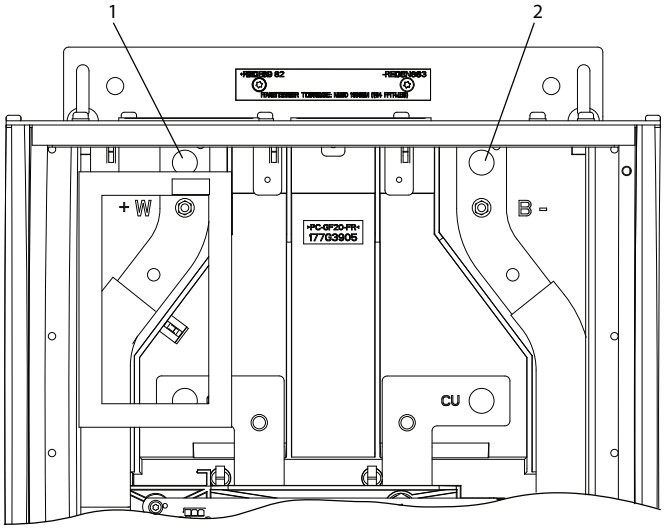
Fig. 13 — Carrier VFD Power Panel for D and E Size Drives (D size panel shown)



1	LCP (Local Control Panel) — not provided
2	RS-485 Serial Bus Connector
3	Digital I/O and 24V Power Supply
4	Analog I/O Connector
5	USB Connector
6	Serial Bus Terminal Switch
7	Analog Switches (A53), (A54)
8	Relay (01, 02, 03)
9	Relay 2 (04, 05, 06)
10	Lifting Ring
11	Mounting Slot
12	Cable Clamp (PE)
13	Ground
14	Motor Output Terminals 96 (U), 97 (V), 98 (W)
15	Line Power Input Terminals 91 (R), 92 (S), 93 (T)
16	TB5 (IP21/54 only) Terminal block for anti-condensation heater.

Fig. 14 — D Size Control Shelf Components

To check DC bus voltage check voltage between terminal 1 and 2 as depicted below. To reach the DC bus location a voltmeter with safety probe tip extenders must be utilized since the DC bus studs are located far back in the drive. See Fig. 15 and static checks later in this manual.



1	DC (+) Bus
2	DC (-) Bus

Fasteners are M5 studs.

Fig. 15 — DC Bus Location in D1h–D8h Drives

E Size Drive

The E size FC102 drives have higher amperage capacity compared to the D size. Like the D size, the E size drive is positioned on the condenser in conjunction with the VFD power panel. The E size drives are mounted in horizontal position. The E size drives are mounted on a VFD bracket arrangement supported and suspended between the condenser tubesheets. See Fig. 16.

For the smaller D size drives, customer incoming power is terminated in the VFD Power Panel; power leads are run from the VFD Power Panel to the VFD and from the VFD to the motor (see Fig. 17). The main power panel is detailed in Fig. 18. For an interior view of the E drive enclosure, see Fig. 19; Fig. 20 details control shelf elements.

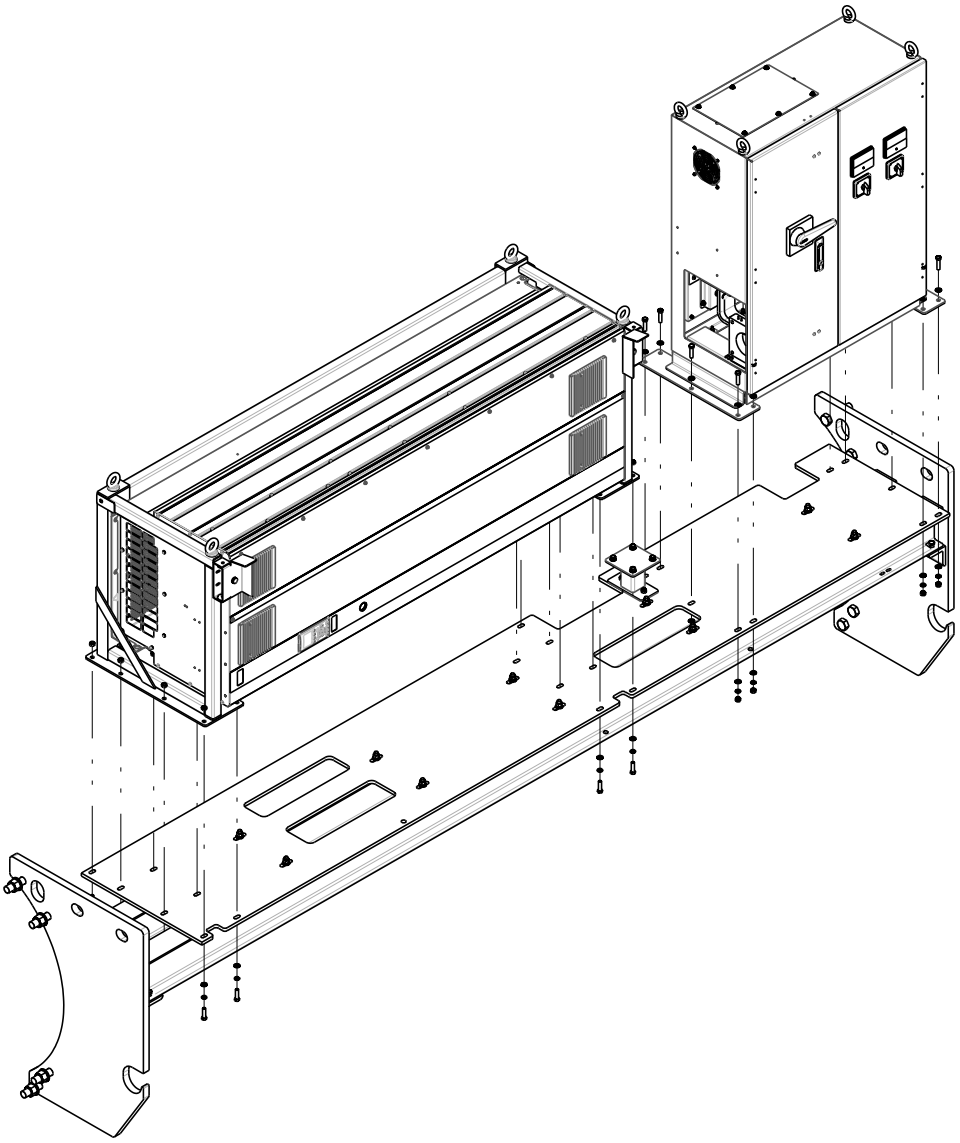


Fig. 16 — VFD Brackets for E Size Drive Support

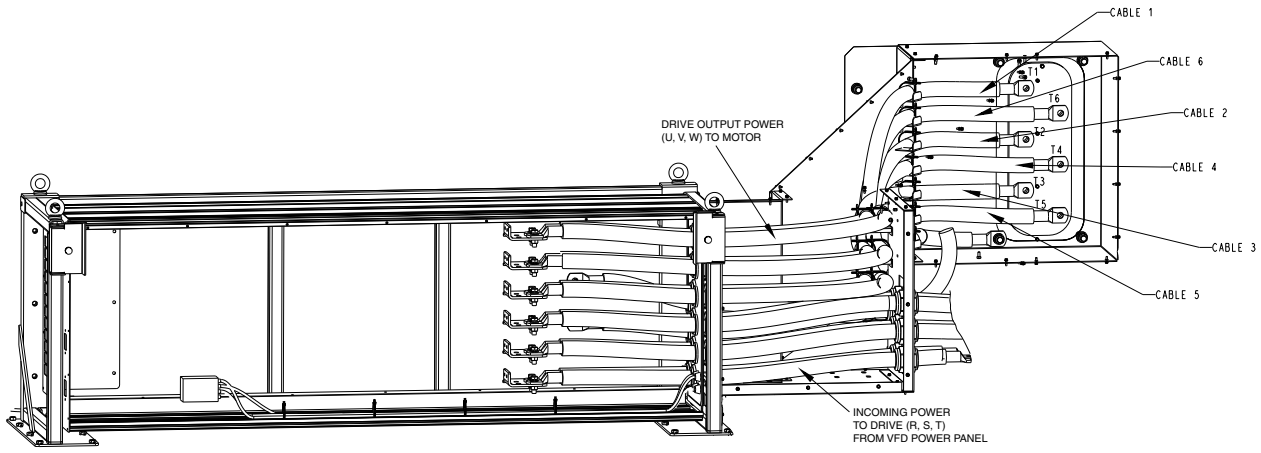


Fig. 17 — Power Cable Routing Schematic, E size

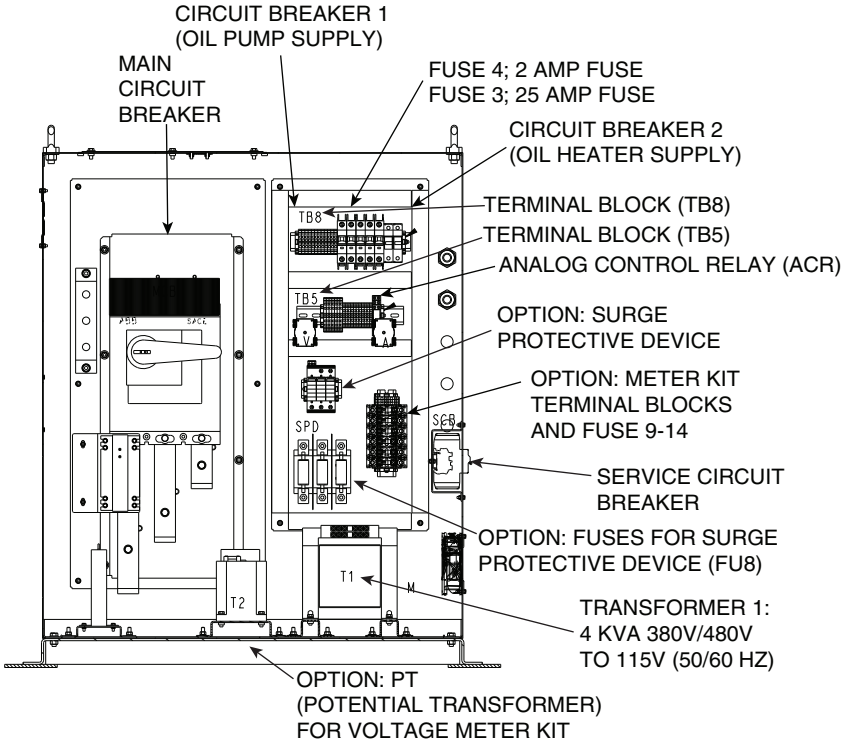
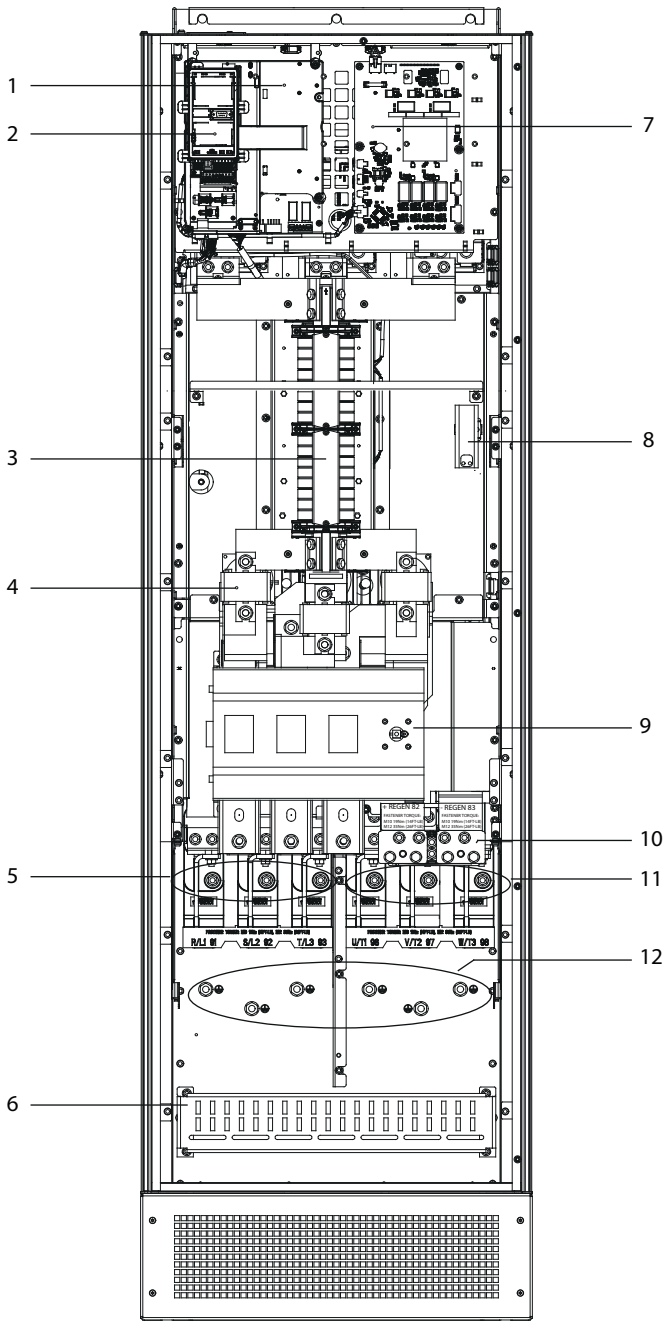
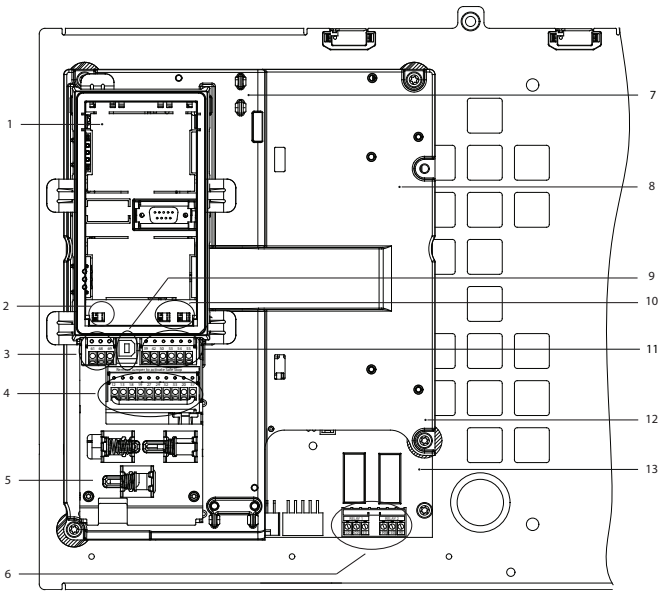


Fig. 18 — Main Power Panel (MPP), E Size



1	Control Shelf
2	Local Control Panel (LCP) cradle
3	RFI Filter (optional)
4	Mains fuses (required for UL compliance, but otherwise optional)
5	Mains Terminal
6	FRI Shield Termination
7	Fan Power Card
8	Space Heater (optional)
9	Mains Disconnect (optional)
10	Brake/Regeneration Terminals (optional)
11	Motor Terminals
12	Ground Terminals

Fig. 19 — Interior View of Enclosures, E Size Drive DE658 through DE990



1	LCP Cradle (LCP not shown or provided)
2	Bus Terminal Switch
3	Serial Communication Terminals
4	Digital Input/Output Terminals
5	Cable/EMC Clamps
6	Relay 1 and Relay 2
7	Control Card (underneath LCP and Control Terminals)
8	Control Shelf
9	USB Port
10	Analog Input Switches A53/A54
11	Analog Input/Output Terminals
12	Brake Resistor Terminals, 104-106 (on power card underneath control shelf)
13	Power Card (underneath the control shelf)

Fig. 20 — Control Shelf Details

For static checks an isolated multimeter with diode tester is needed to measure DC bus voltage and to make diode checks. DC+ and DC– terminals are identified in Fig. 21 for E sized drives.

1	DC (+) Bus
2	DC (-) Bus

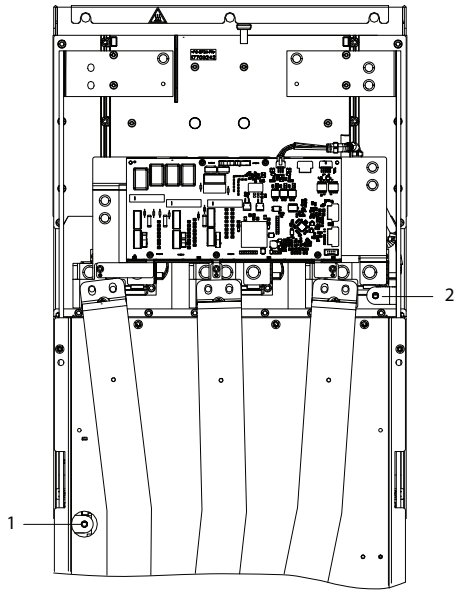
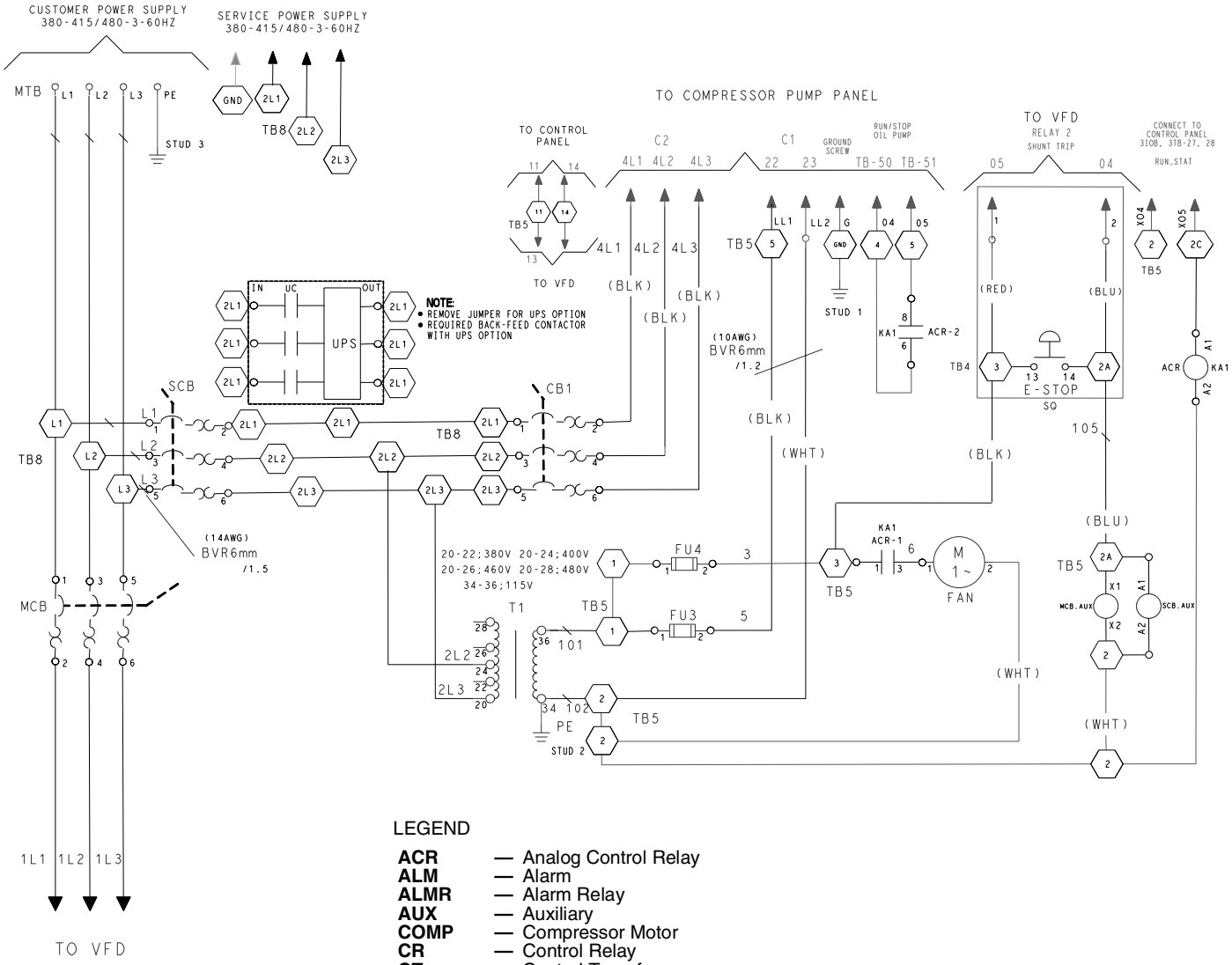


Fig. 21 — DC Bus Location in E1h–E4h Drives, Shown in Upright Position

D and E Size VFD Power Panel Schematics

See Fig. 22 and 23 for detailed drawings.



LEGEND

ACR	—	Analog Control Relay
ALM	—	Alarm
ALMR	—	Alarm Relay
AUX	—	Auxiliary
COMP	—	Compressor Motor
CR	—	Control Relay
CT	—	Control Transformer
DS	—	Door Switch
FL	—	Fluorescent Lamp
FU	—	Fuse
J	—	Jumper
LR	—	Line Reactor
LS	—	Limit Switch
MCB	—	Master Circuit Breaker
MCB, SH	—	Master Circuit Breaker, Shunt Trip
NC	—	Normally Closed
NO	—	Normally Open
SCB	—	Service Circuit Breaker
SCB, SH	—	Service Circuit Breaker, Shunt Trip
SOL	—	Solenoid
SPD	—	Surge Protective Device
ST	—	Shunt Trip
TB	—	Terminal Block
V	—	Voltmeter
VFD	—	Variable Frequency Drive
BLK	—	Color Black
RED	—	Color Red
YEL-GRN	—	Color Yellow-Green

Fig. 22 — Danfoss D and E Size VFD Power Panel Wiring Diagram

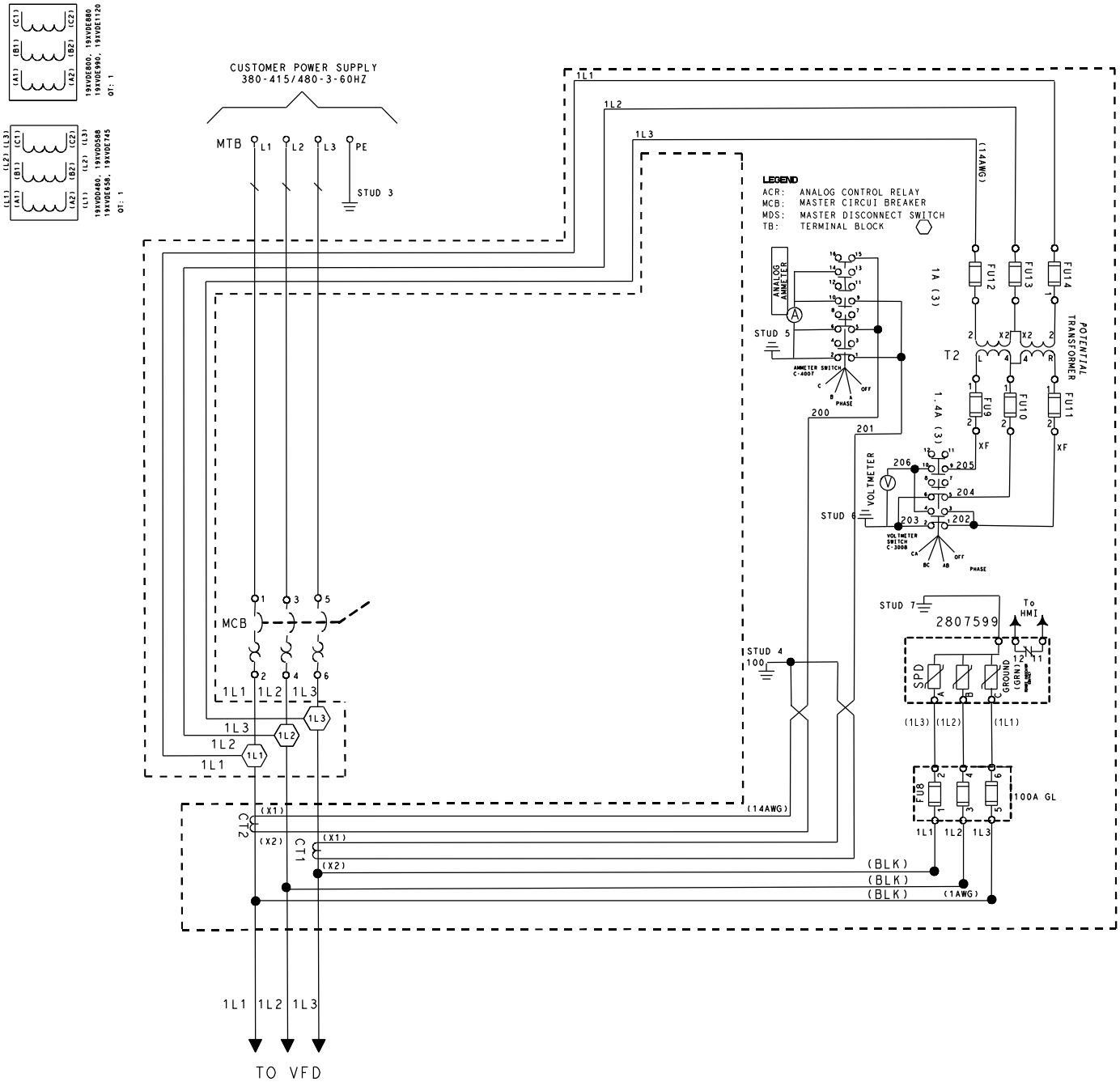


Fig. 23 — Danfoss D and E Size VFD Power Panel Schematic (Ammeter, Voltmeter, and Surge Protective Device Options)

PD Size Drive

PARALLEL DRIVE SYSTEMS - DP1120 - DP1670

Parallel drive (PD) systems consist of four D size FC-102 drives mounted in a common enclosure, creating a larger PD size with greater ampacity than D and E size drives. As per Table 3 the Carrier PD size drives offering yields a range up to 1670 amp.

The PD size drive enclosure includes both the drive components and the VFD Power Panel components which were separated in its own enclosure for the D and E drive size offering. See Fig. 24-26.

NOTE: Enclosure does not represent Carrier application.

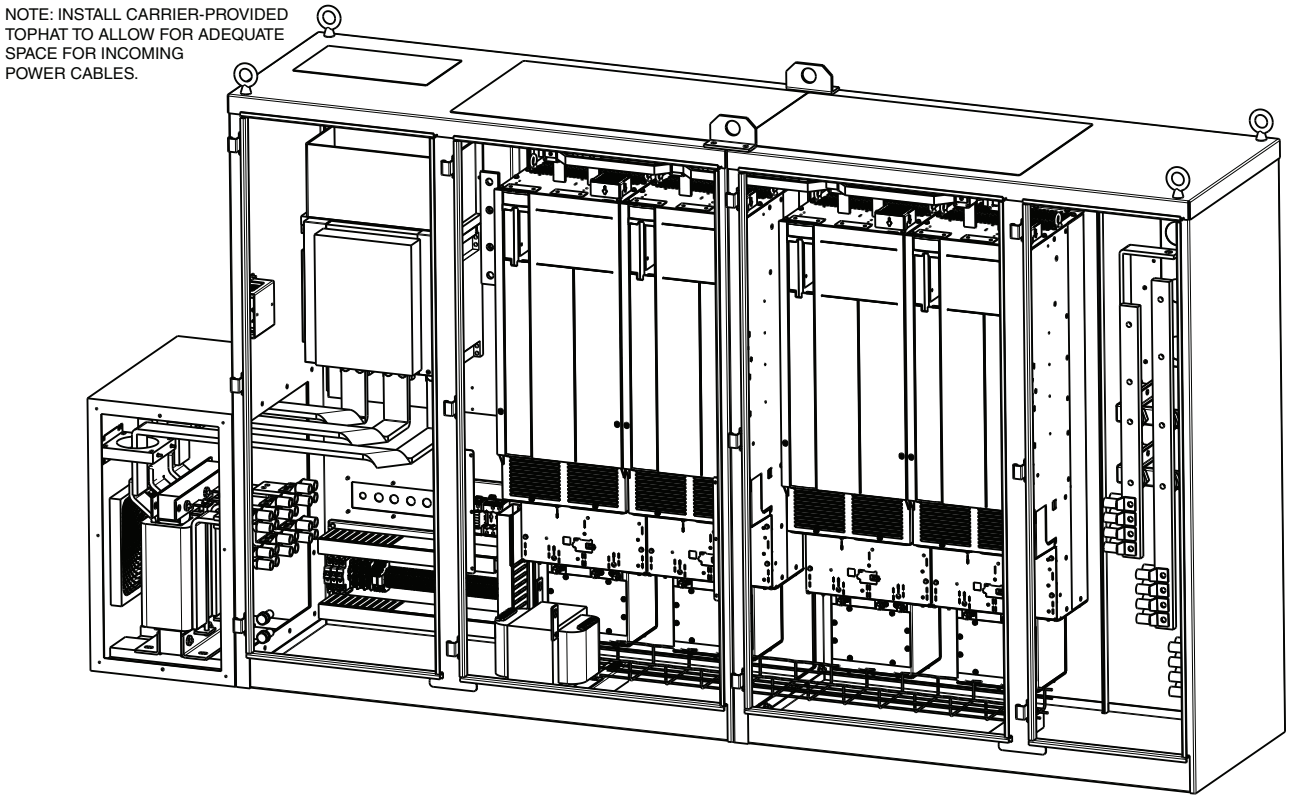


Fig. 24 — Parallel Drive Isometric View

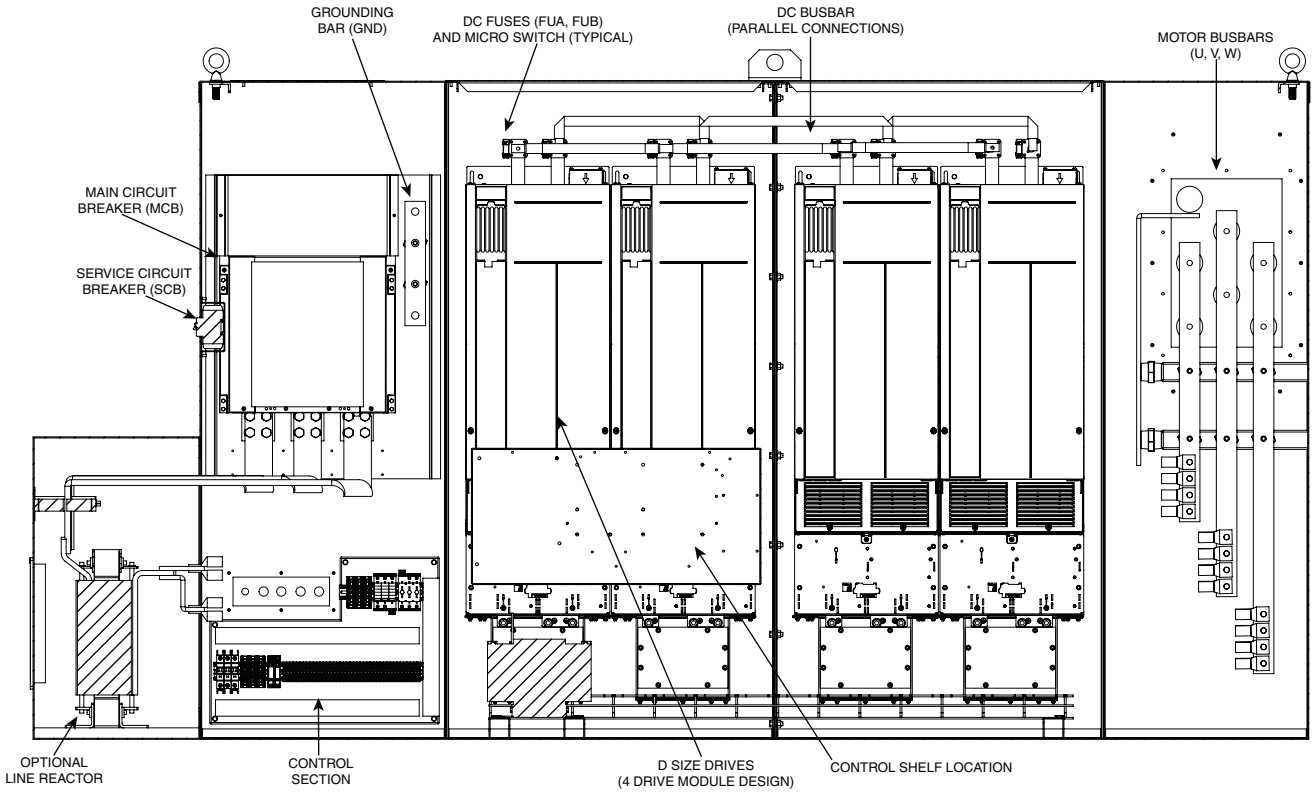


Fig. 25 — Parallel Drive Overall Layout

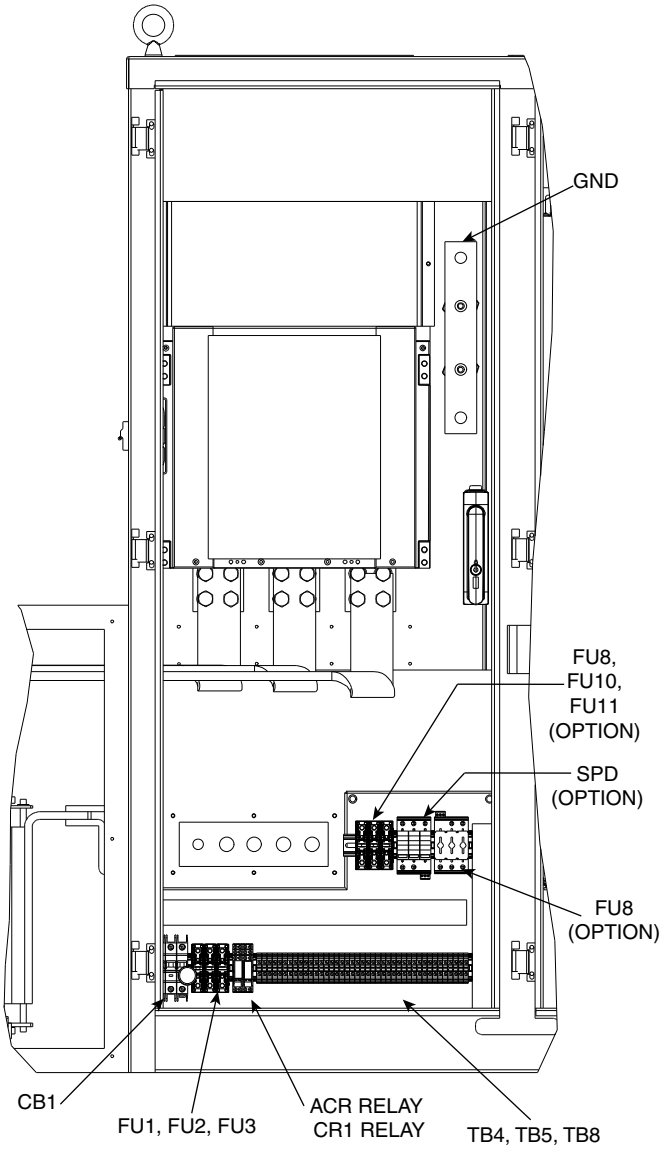
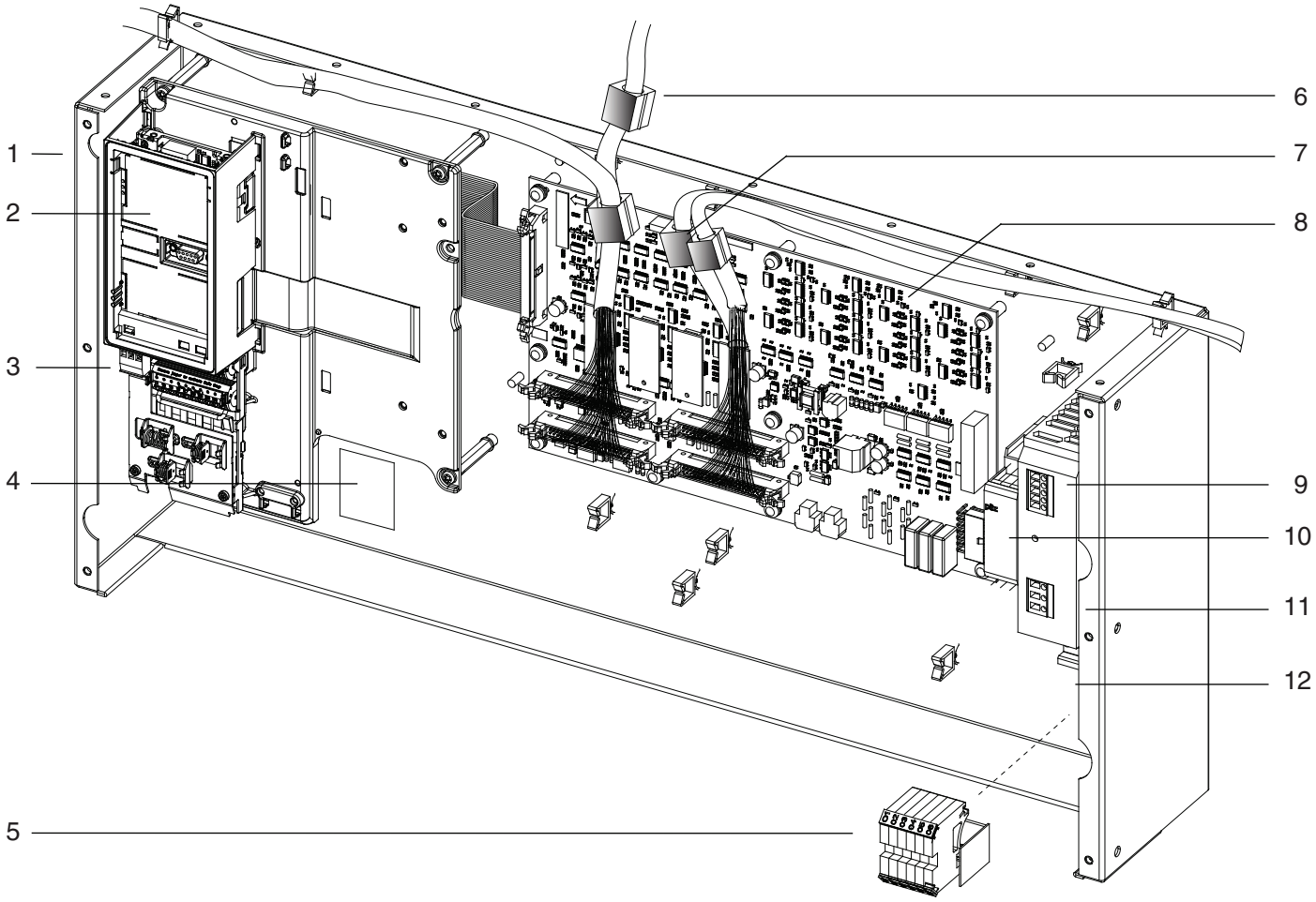


Fig. 26 — Control Section Component Identification

Control Shelf

The control shelf contains the MDCIC (multi-drive control interface card), and control card. The MDCIC is connected to each of the drive modules via a ribbon cable and communicates to the control card. The control card controls the operation of the drive modules. See Fig. 27.

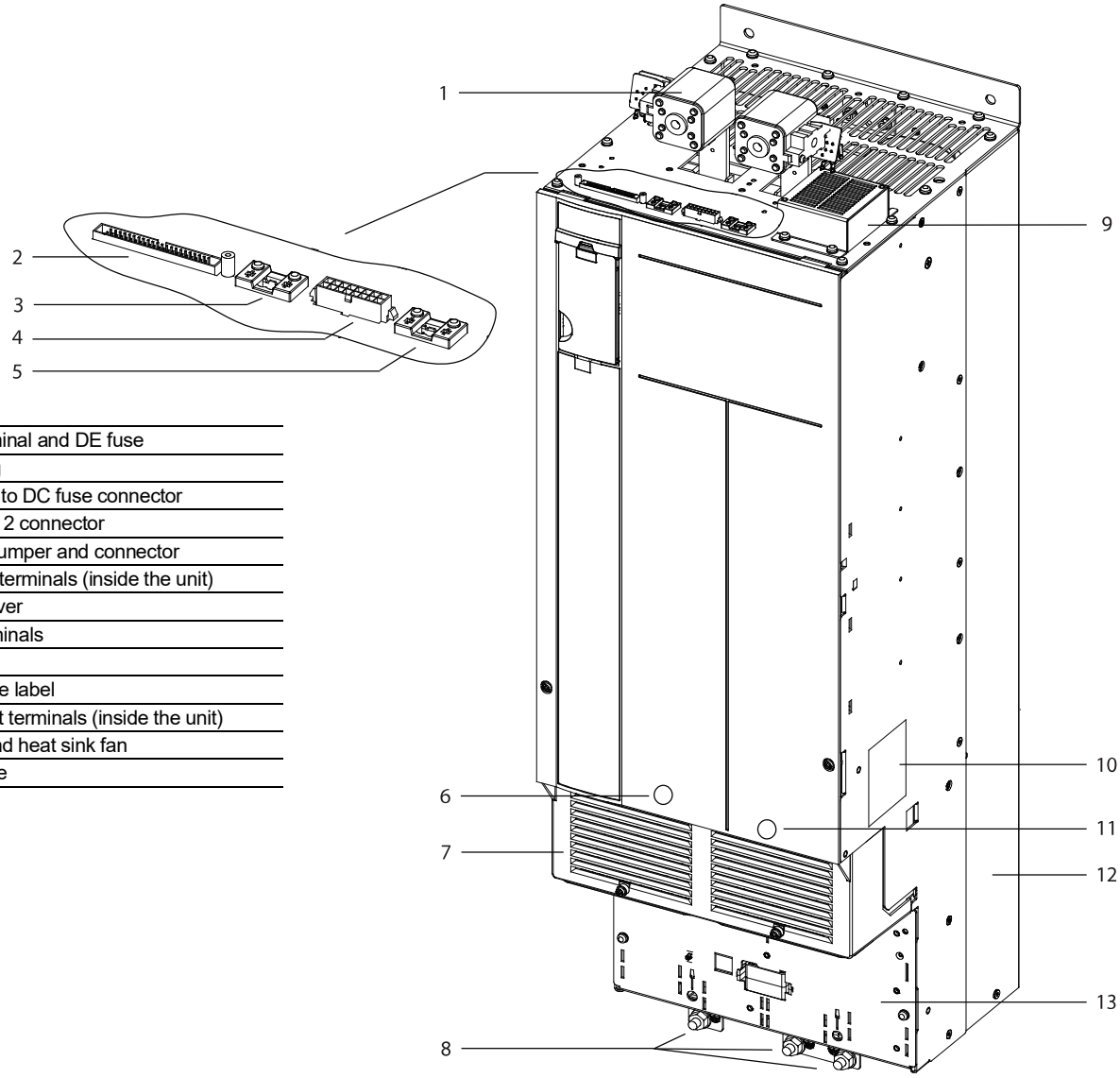


1	Control Shelf	Interfaces with, and controls, the various drive system components. Allows connection of an external control device.
2	LCP Cradle	Cradle where the LCP may optionally be installed, but is not provided by factory.
3	Control Terminal Blocks	Terminal blocks for connecting control wiring.
4	Top Level Drive System Label	Label describing the drive system at the top-level.
5	Relay Terminal Blocks	Terminal blocks for connecting the relay cable from the relay connector on the top plate of drive module 1.
6	Ferrite core	Reduces high frequency electromagnetic noise.
7	44-Pin Ribbon Cable	Connects the individual drive module with MDCIC.
8	MDCIC	Multi-drive control interface card (MDCIC) with cover plate removed.
9	SMPS	Switched mode power supply
10	Pilz relay	Relay
11	DIN rail	Mounting
12	Terminal block	Mounted on DIN rail

Fig. 27 — Control Shelf

PD Module

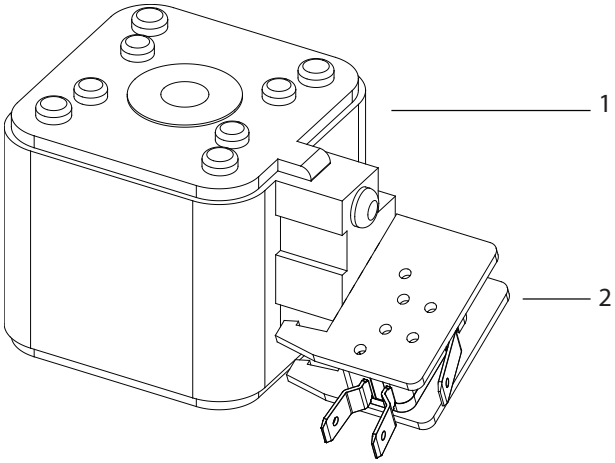
Each drive module has an IP00 protection rating. Four modules are connected in parallel to create a drive system. See Fig. 28-29.



1	DC-link terminal and DE fuse
2	MDCIC plug
3	Microswitch to DC fuse connector
4	Relay 1 and 2 connector
5	Brake fault jumper and connector
6	Mains input terminals (inside the unit)
7	Terminal cover
8	Ground terminals
9	Top fan
10	Drive module label
11	Motor output terminals (inside the unit)
12	Heat sink and heat sink fan
13	Ground plate

Fig. 28 — View of Parallel Drive Module

The parallel drive modules contain 2 DC fuses per drive module.



1	DC Fuse
2	Microswitch Connector

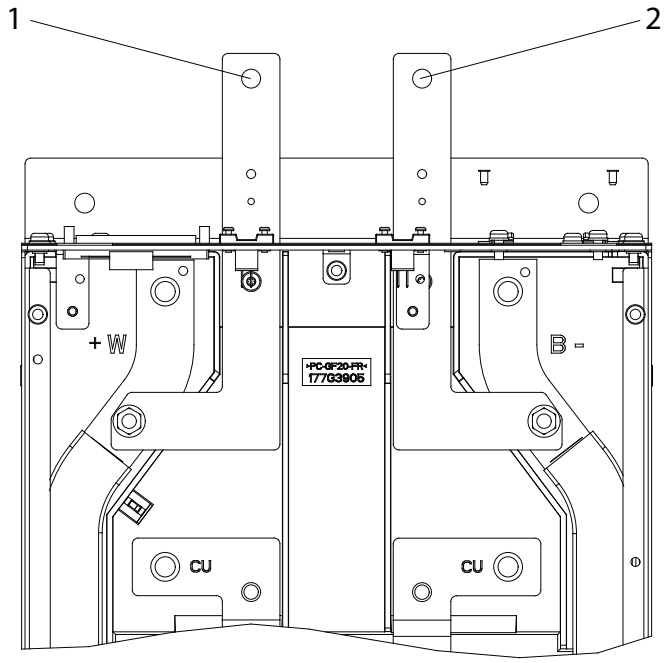
Fig. 29 — DC Fuse and Microswitch Connector

DC Bus

When testing parallel drive systems do the following:

- To access the DC bus voltage, use the REGEN terminals at the top of one of the modules.
- When testing DC bus voltage for the entire system, it is not necessary to remove the interlink connections between the individual drives.
- When testing DC bus voltage for an individual drive, the module must be isolated by removing interlink connections and the control cable connections of the module.

For DC bus location, see Fig. 30. For more details, see the PD VFD module wiring schematic (Fig. 31).



1	DC (+) Bus
2	DC (-) Bus

Fasteners are M5 studs.

Fig. 30 — DC Bus Location in Parallel Drive Systems

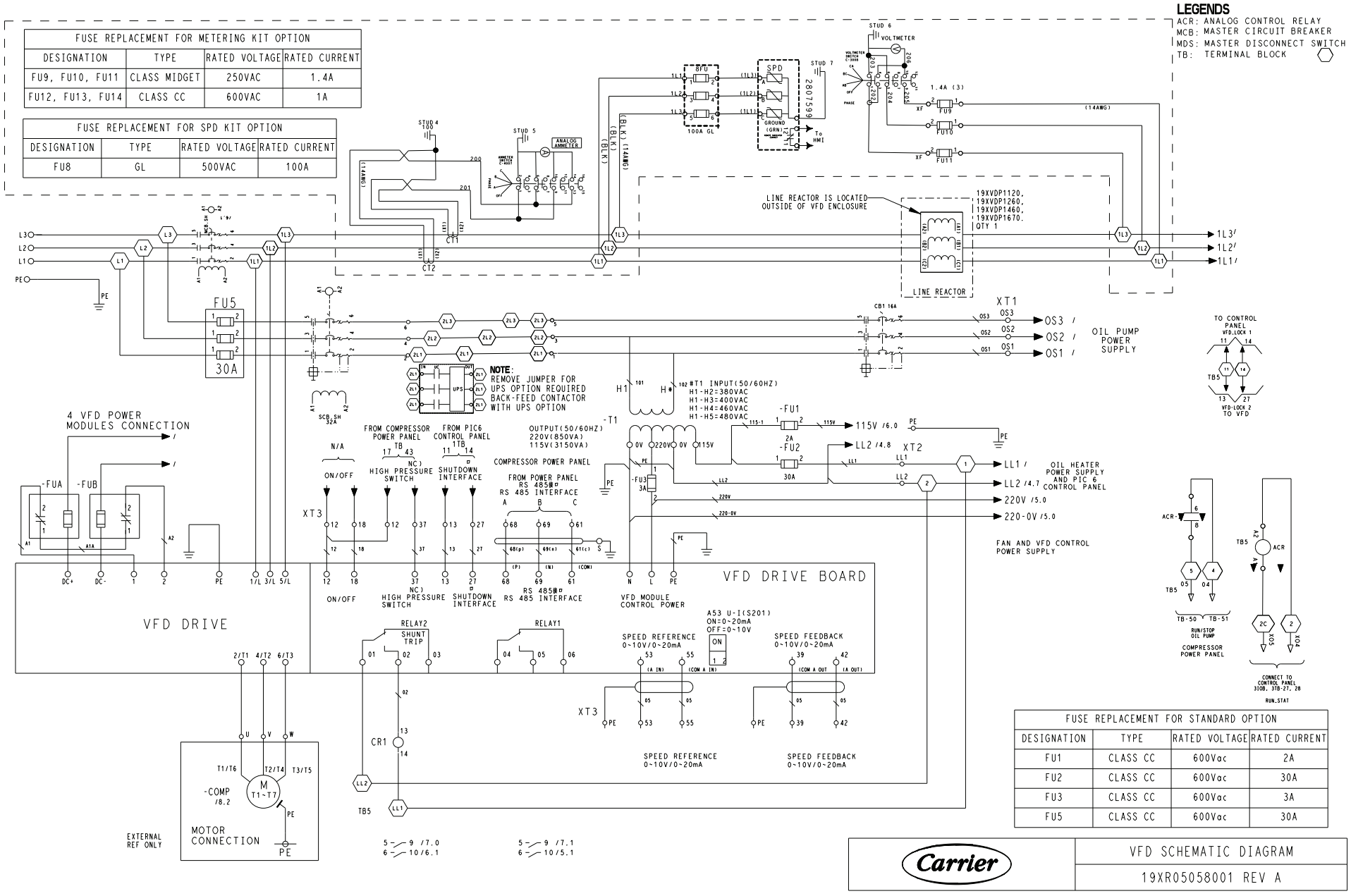


Fig. 31 — Danfoss PD VFD Module Wiring Schematic

START-UP

⚠ DANGER

Internal components and circuit boards of the drive are live when the drive is connected to incoming power. Coming into contact with this voltage is extremely dangerous and will result in severe personal injury or death.

The motor terminals U, V, W and the DC bus (DC+ and DC-) are live when the drive is connected to incoming power, even if the motor is not running.

Do not make any connections when the drive is connected to the incoming power.

After having disconnected the drive, if any service work is to be performed wait for the capacitors to fully discharge. The minimum waiting time is specified on the drive label.

Prior to performing any repair work measure DC bus voltage with a volt meter. For drives in parallel ensure to measure DC bus voltage before and after the individual DC fuses.

Before connecting the drive to the incoming power, make sure that the enclosure is closed.

⚠ WARNING

The control I/O-terminals are isolated from the mains potential. However, the relay outputs and other I/O terminals may have a dangerous control voltage present even when the drive is disconnected from incoming power. Coming into contact with this voltage could result in severe personal injury.

Alternate Wire Lugs

If the incoming power wire size in the VFD power panel does not fit the standard lug, alternate lugs may be available. Please contact the circuit breaker manufacturer for availability. Note that lugs rated for a higher current than the circuit breaker may be used. See Table 4 for wire lug specifications.

Verify Installation

Record the following job information:

1. Job Name
2. Job Number
3. City
4. State
5. Zip Code

Record the following nameplate information, it is suggested to take a picture of the appropriate nameplates for future reference.

1. From the Danfoss nameplate (Fig. 1) located inside the VFD enclosure:
   a. Danfoss Type Code (TC) Number
   b. Danfoss Serial Number
2. From the machine nameplate (Fig. 32) located on the VFD enclosure:
   a. Chiller Serial Number
   b. Chiller Model
   c. Motor rated load amps
   d. Motor nameplate rpm
   e. Motor nameplate kW
   f. Motor nameplate voltage
   g. Voltage

Grounding bar hole size:

DD/DE size 14 mm (0.55 in.)

PD size 18 mm (0.71 in.)

Table 4 — Wire Lugs

VOLTAGE	VFD	MAX RATED OUTPUT AMP	BREAKER AMP SIZE	ABB LUG	LUG CABLE RANGE
380-439V	DD588	570	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE658	638	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE745	722	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE800	776	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE880	853	1000A	1SDA104758R1	(4) 4/0-500 kcmil
	DE990	960	1000A	1SDA104758R1	(4) 4/0-500 kcmil
	DP1120	1086	1600A	K8TM	(4) 1/0-750 kcmil
	DP1260	1222	1600A	K8TM	(4) 1/0-750 kcmil
	DP1460	1416	2000A	K8TM	(4) 1/0-750 kcmil
	DP1670	1619	2000A	K8TM	(4) 1/0-750 kcmil
440-480V	DD588	518	800A	1SDA113095R	(3) 2/0-400 kcmil
	DE658	572	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE745	658	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE800	708	800A	1SDA113095R1	(3) 2/0-400 kcmil
	DE880	757	1000A	1SDA104758R1	(4) 4/0-500 kcmil
	DE990	863	1000A	1SDA104758R1	(4) 4/0-500 kcmil
	DP1120	1019	1600A	K8TM	(4) 1/0-750 kcmil
	DP1260	1125	1600A	K8TM	(4) 1/0-750 kcmil
	DP1460	1339	2000A	K8TM	(4) 1/0-750 kcmil
	DP1670	1484	2000A	K8TM	(4) 1/0-750 kcmil

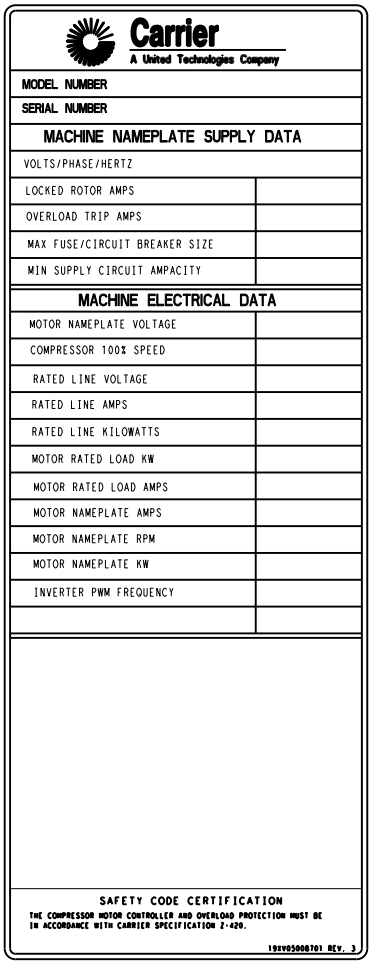


Fig. 32 — Machine Nameplate

Configure the VFD

All configurations required by the VFD are supplied by the HMI through the VFD Gateway. The Danfoss Std Tier VFD can operate with PIC 6 via LEN. Any configuration changes necessary and possible are made on the HMI screens. A complete set of configurations is transmitted to the VFD each time the controls are powered up.

Table 5 shows parameters in the Unit Mounted VFD Configuration menu for PIC6. Parameters in *italics* are to be entered or confirmed at start-up.

Table 5 — VFD Configuration (PIC6/UM VFD Configuration) CFGUMVFD - UM VFD Configuration

PARAMETER	DEFAULT VALUE
COMPRESSOR 100% SPEED	60
*RATED LINE VOLTAGE**	460
MOTOR NAMEPLATE CURRENT	200
MOTOR RATED LOAD CURRENT	200
MOTOR NAMEPLATE VOLTAGE	460
MOTOR NAMEPLATE RPM	3000
MOTOR NAMEPLATE KW	1500
INCREASE RAMP TIME	30
DECREASE RAMP TIME	30

NOTES: Parameters in *italics* are to be entered or confirmed at start-up.

Commissioning the Unit

The commission procedure is as follows:

1. If the chiller has been stored outdoors, allow at least 24 hours room temperature stabilization prior to commissioning. Ensure any condensation that occurs as a result of the ambient temperature is allowed to evaporate.
2. Verify parameters in the VFD_CONF UM VFD Config (CFGUMVFD) screen against chiller nameplate.
3. Install surge suppression devices if required.
4. Review the power wiring and grounding to ensure that it has been properly connected.
5. Visually examine the inside of the drive enclosure to:
   a. Look for signs of corrosion or moisture residue.
   b. Remove any dirt or debris.
   c. Make sure all vents are clear.
6. Apply power to the drive and take thermal measurements of the capacitor bank and power connections. Do this again before start-up.
7. Measure and record the incoming line voltage. Line-to-line voltages should be balanced within 3% as calculated below:

   Measure voltages phase-to-phase and phase-to-ground.

   Vmax = Maximum measured phase-to-phase voltage (A to B, B to C, C to A)

   Vmin = Minimum measured phase-to-phase voltage

   Imbalance Calculation Formula

$$Vavg = \frac{(VAB + VBC + VCA)}{3}$$

$$\text{Imbalance \%} = \frac{(Vmax - Vmin) \times 100}{Vavg}$$

8. Take a final thermal measurement of the capacitor bank and power after finalizing the installation to ensure all connections are good.
9. If a ground fault occurs, then do the following:
   a. Check for a ground in the motor or motor wiring.
   b. Check for damage to wiring insulation and that wiring is dry.
   c. Verify the motor wiring is separated from ground and there is no connection between phases.
   d. Check for failed IGBTs.
10. If an overcurrent fault occurs, then do the following:
    a. Check for excessive load and verify load limit settings on the HMI.
    b. Check motor and wiring insulation.
    c. Check parameter settings in Table 5.

SERVICE

⚠ WARNING

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait the time specified in Table 1 or as specified on the Danfoss VFD nameplate. For the DC bus capacitors to discharge and then check the voltage with a voltmeter rated for the DC bus voltage to ensure the DC bus capacitors are discharged before touching any internal components. For parallel drive modules (N630 and larger) check voltage before and after the individual DC fuses. Failure to observe this precaution could result in severe bodily injury or loss of life.

An isolated multimeter with diode tester will be needed to measure DC bus voltage and to make resistance and SCR/IGBT checks.

Troubleshooting the Drive

An isolated multimeter with diode tester is needed to measure DC bus voltage and to make resistance and diode checks.

The drive can display two (2) kinds of error codes on the PIC6 HMI called Alert and Alarm codes. These codes signal a problem detected during self-tuning or drive operation.

- A warning message on the HMI is an ALERT. The same message when viewed with Danfoss' software MCT-10 is a VFD WARNING.
- A failure resulting in a shutdown is seen as an ALARM on the HMI and the VFD when viewed with Danfoss' software MCT-10.

  CONDITION CODES

  CHILLER ALERT =VFD WARNING

  CHILLER ALARM =VFD ALARM

See Tables 5 and 6.

CHILLER ALERT CODES

An alert condition is indicated by a message on the HMI screen. The drive will continue to operate during the alert condition. Investigate the cause of the alert to ensure it does not lead to a fault condition. The alert code will automatically be cleared from the HMI when the condition causing the alert no longer exists. See the 19XR Controls Operation and Troubleshooting manual for PIC6 controls.

CHILLER ALARM CODES

An alarm condition is also indicated by a message on the HMI screen. If an alarm occurs, the drive coasts to stop. For the drive to restart the underlying condition must be resolved and drive must be Reset. This can typically be done from the PIC6 HMI by resetting the Alarm. In rare instances the reset may need to be done with Danfoss MCT-10 software or a customer-supplied LCP (Local Control Panel). See the 19XRV Controls Operation and Troubleshooting manual for PIC6 controls for chiller Alarm codes.

TEST EQUIPMENT NEEDED TO TROUBLESHOOT

An isolated multimeter adequately rated for DC bus voltage will be needed to measure DC bus voltage and make resistance checks. Note that dedicated troubleshooting test points are not provided.

VISUAL INSPECTION FAULT TROUBLESHOOTING

When troubleshooting a unit which has been in service for an extended period of time do not assume that everything external to the drive is fine. Look for issues such as loose connections, improper programming. It is suggested to look at all the following:

- Cable routing; check for parallel routing of wires.
- Control wiring; check for broken or damaged wires and connections. In parallel drive systems check connections between the control shelf and the modules. Check the voltage source of the signals.
- Cooling; check operation of all cooling fans. Check the enclosure filters. Check for blocked air passages. Check the positive and negative interconnections between modules.
- DC fuse micro-switch; In parallel drive systems, check that the micro-switches have been snapped properly on to the DC fuse fixtures.
- DC fuse mounting; In parallel drive systems, check both ends of DC fuses for loose connections.
- Interior; check that the drive is free of dirt, metal chips, moisture, and corrosion. Check for burnt or damaged power components, or carbon deposits resulting from component failure. Check for cracks in the housings of power semiconductors, or for pieces of broken component housings inside the unit.
- Environmental; The drive can operate within a maximum ambient temperature of 50°C (122°F) and a 24-hour temperature limit of 45°C (113°F). Humidity levels must be less than 95% non-condensing. Check for harmful airborne contaminates such as sulfur-based compounds.
- Grounding; The drive requires a dedicated ground wire from its enclosure to the building ground. Grounding the motor to the drive enclosure is recommended. Check that ground connections are tight and free of oxidation.
- Input power wiring; Check for loose connections, proper fusing, and blown fuses.
- Motor; Check the nameplate ratings of the motor. Ensure that the motor ratings correspond with the drive ratings. Check that the motor parameters (parameter 1-20 Motor Power [kW] to parameter 1-25 Motor Nominal Speed) are set according to the motor ratings. It is sufficient to check these values from the PIC6 configuration menu.
- Output to motor wiring; Check for loose connections. Check for switching components in the output circuit. Check for faulty contacts in the switchgear. In parallel drive systems, check for proper interconnections between the modules. Check cable length and cross-section imbalance between the terminals of the modules. One missing wire can cause an overcurrent trip.
- Programming; Make sure that drive parameter settings are correct according to motor, application, I/O configuration.
- Proper clearance; Drives require adequate top and bottom clearance to ensure proper airflow for cooling. Ensure that no foreign elements are obstructing air flow.
- Vibration; Look for unusual amounts of vibration around the drive.

VERIFY THAT DC BUS CAPACITORS ARE DISCHARGED

The drive’s DC bus capacitors retain hazardous voltages after input power has been disconnected. Perform the following steps before touching any internal components:

1. Turn off and lock out input power. Wait the appropriate time as indicated on drive nameplate.
2. Verify that there is no voltage at the drive’s input power terminals.
3. Measure the DC bus potential with a voltmeter while standing on a non-conductive surface and wearing insulated gloves (1000 v). Measure the DC bus potential. The voltage between DC+ and DC-, and from each DC terminal to the chassis must be zero before proceeding. For parallel drive modules, measure for DC-bus voltage before and after the individual DC fuses.
4. Once the drive has been serviced, reapply input power.

Table 6 — Typical Fault Code Descriptions and Corrective Actions*

DANFOSS ALARM/ WARNING CODE	DANFOSS ALARM	PIC6 ALARM CODE	PIC 6 - DESCRIPTION	PIC6 DISPLAY DANFOSS VFD ALARM IN MAINTENANCE MENU	DESCRIPTION AND POSSIBLE CORRECTIVE ACTION
2	Live zero error	449	VFD Fault	Live Zero Error	This warning or alarm only appears if programmed in parameter 6-01 Live Zero Timeout Function. OFF = not relevant
4	Mains phase loss	449	VFD Fault	Mains Phase Loss	A phase is missing on the supply side, or the mains voltage imbalance is too high. This fault indicates excessive AC ripple on the DC bus. First check the F supply voltage to the drive. The voltage imbalance between all three input phases must be within 3%. If the imbalance is greater than 3% it could be the cause of the alarm. If the voltage imbalance is within limits, use a clamp-on ammeter and measure the current in each of the three input phases, and note which phase is imbalanced. Remove the main power from the input of the VFD. Move motor leads connected to A to B and B to C and C to A (to keep consistent rotation). Power the drive back on and start chiller. If the low phase followed the motor lead, then the problem is likely associated with the input power. If the low phase remained in the same position after the swap the VFD likely has a faulty rectifier section.
7	DC overvoltage	449	VFD Fault	DC Link over Voltage	Drive bus exceeds the limit. Check that supply voltage matches the drive voltage. Check phase to phase input voltage. The fault can be caused by harmonic distortion. Check drive parameter 16-30 DC Link voltage.
8	DC under voltage	449	VFD Fault	DC Link under Voltage	Drive bus is below the undervoltage limit. Check that the supply voltage matches the drive voltage. Check phase to phase input voltage.
9	Inverter overload	449	VFD Fault	Inverter Overload	The drive has run with more than 100% overload for too long and is about to cut out. The counter (Danfoss parameter P16-35) for electronic thermal inverter protection issues a warning at 98% and trips at 100% with an alarm. The drive cannot be reset until the counter is below 90%.
10	Motor overload temperature	449	VFD Fault	Motor ETR overtemp	Motor overload temperature; according to the electronic thermal protection (ETR), the motor is too hot. Status can be monitored in drive parameter P16-18. The fault occurs when the motor runs with more than 100% overload for too long. Check VFD config table values.
11	Motor thermistor overtemp	449	VFD Fault	Motor Therm overtemp	0 = not relevant
12	Torque limit	449	VFD Fault	Torque Limit	The torque has exceeded the value in parameter 4-16 Torque Limit Motor Mode or the value in parameter 4-17 Torque Limit Generator Mode. Verify configured motor data. If limit was exceeded during ramp-up, increase the Increase Ramp Time; if limit was exceeded during VFD ramp down time increase the Decrease Ramp Time. Check the application for excessive motor current draw.
13	Over current	449	VFD Fault	Over Current	The inverter peak current limit (approximately 200% of the rated current) is exceeded. The warning lasts approximately 1.5 s, then the drive trips and issues an alarm. Check motor values in "VFD Parameters" menu in Configuration Menu. Run with motor disconnected and monitor current. If drive faults with no motor connected or if current display is not zero, the likely cause is a bad current sensor. Fault can be triggered by switching to generator power.
14	Earth (ground) fault while running at speed	449	VFD Fault	Earth Fault	There is current from the output phase to ground, either in the cable between the drive and the motor, or in the motor itself. The current transducers detect the ground fault by measuring current going out from the drive and current going into the drive from the motor. Ground fault is issued if the deviation of the two currents is too large. The current going out of the drive must be the same as the current going into the drive. Troubleshoot as follows: Remove AC power from the drive and disconnect the motor. Power the drive back on and reset the fault by pressing the “Reset” key. Run the VFD with no motor to see if the fault appears or if the drive runs without tripping. Observe the motor current in the display. It should be very close to zero with no motor connected. Reconnect the motor and attempt to run the drive again. If the drive trips on an “Alarm 14” with the motor disconnected, then the problem is inside the drive. A bad current sensor is the most likely cause of this type of fault. If drive runs without the motor connected, but current shown in the display is greater than 0.3 amps then it has a faulty current sensor.

Table 6 — Typical Fault Code Descriptions and Corrective Actions* (cont)

DANFOSS ALARM/ WARNING CODE	DANFOSS ALARM	PIC6 ALARM CODE	PIC 6 - DESCRIPTION	PIC6 DISPLAY DANFOSS VFD ALARM IN MAINTENANCE MENU	DESCRIPTION AND POSSIBLE CORRECTIVE ACTION
14 (cont)	Earth (ground) fault while running at speed	449	VFD Fault	Earth Fault	If the drive runs with no motor connected and the current shown in the display is less than 0.3 amps, then the ground fault is likely in the connecting cables or the motor. Check the motor and connected cables with a megohmmeter to find out which has the short. May need to check motor internal lugs with a megohmmeter to find out if short is in the motor terminal. reconnect the motor. In the event that there is current shown in the display with no motor connected, performing a “manual initialization” of the drive might help in zeroing out the current sensors. With power off, press and hold the “Status”, “Main Menu” and “OK” keys on the keypad (not provided). Power the drive back on while holding the keys for 5 seconds. The drive will power up in an alarm 80 “Drive Initialization” if successful. WARNING: A manual initialization will cause the drive to revert back to factory default settings, wiping out all parameter changes, any fault log data, and any personal menu settings that have been made, so ensure the drive parameter file with MCT 10 has been downloaded prior to doing this reset.
16	Short circuit	449	VFD Fault	Short Circuit	There is short-circuiting in the motor or motor wiring. Test with no motor connected as described above. Remove power to the drive and check motor cables and motor for short circuit with a megohmmeter. This alarm will occur after replacing a power card and neglecting to transfer the current scaling card from the old board to the new board.
17	Control word timeout	449	VFD Fault	Control Word Timeout	There has been no communication between the drive and PIC6 for 10 seconds. Check the connections on the serial communications cable.
23	Internal fan fault	449	VFD Fault	Fans Error	The fan warning function is a protective function that checks if the fan is running/mounted. Default setting in 14-53 is [1]=Warning.
25	Brake resistor short circuit	449	VFD Fault	Brake Res Short Cir	Not relevant; Carrier has no brake resistor.
26	Brake resistor power limit	449	VFD Fault	Brake OverLoad	Not relevant; Carrier has no brake resistor.
28	Brake check failed	449	VFD Fault	Brake Check	Not relevant; Carrier has no brake resistor.
29	Heat sink temp	449	VFD Fault	Power Card overtemp	The max temperature of the heat sink has been exceeded. The temperature sensor is mounted inside the IGBT modules. The fault will not reset until the temperature drops below the defined heat sink temperature. Check the following: Ambient temperature (less than 113°F/45°C), possible blocked airflow above and below the drive, damaged heat sink fan, dirty heat sink, fan resistance, soft charge fuses, IGBT terminal. Turn the fan on using parameter 14-52 and verify that it is running. Read heat sink temperature of the drive (parameter 16-34) - does it make sense? The trip point occurs at 95°C.
30	Motor phase U missing	449	VFD Fault	Motor Phase U Missing	Motor phase U between the drive and the motor is missing. Disconnect drive from motor and measure the open circuit output voltage for phase U, V, W. An imbalance indicates that the drive is at fault. If no imbalance then reconnect motor, but rotate order (keep phasing to maintain direction of rotation) so A to B, B to C and C to A. If Alarm 30 persists the drive is at fault. If the Alarm follows the motor lead the motor or the motor cables are causing the fault.
31	Motor phase V missing	449	VFD Fault	Motor Phase V Missing	Motor phase V between the drive and the motor is missing. See Alarm 30.
32	Motor phase W missing	449	VFD Fault	Motor Phase W Missing	Motor phase W between the drive and the motor is missing. See Alarm 30.
33	Inrush fault	449	VFD Fault	Inrush Fault	Excessive power-ups have occurred within a short time period. Allow unit to cool. Check DC bus voltage.
34	Fieldbus communication fault	449	VFD Fault	Field Bus Fault	The fieldbus on the communication option card is not working. Verify that the wiring is correct. In addition, verify parameter 8.01 = [0] Digital and ctrl.word and 8.02 = [1] FC Port.
36	Mains failure	454	VFD Fault - Main Power Failure	Mains failure	Check fuses to drive and supply power to the chiller.
38	Internal fault	449	VFD Fault	Internal Fault	When an internal fault occurs, a code number is shown. This fault occurs when there is a communication error between the control card and the power card. Try the following: Cycle power, check that any options are installed correctly, check for loose or missing wires. It may be necessary to contact Danfoss Technical Support.

Table 6 — Typical Fault Code Descriptions and Corrective Actions* (cont)

DANFOSS ALARM/ WARNING CODE	DANFOSS ALARM	PIC6 ALARM CODE	PIC 6 - DESCRIPTION	PIC6 DISPLAY DANFOSS VFD ALARM IN MAINTENANCE MENU	DESCRIPTION AND POSSIBLE CORRECTIVE ACTION
39	Heat sink sensor	449	VFD Fault	-	No feedback from the heat sink temperature sensor. The power card does not sense the IGBT thermal sensor. Problem could be the power card, the gatedrive card or the ribbon cable connection between the power card and gatedrive card.
40	Warning - overload of digital output terminal 27.	449	VFD Fault		Check the load connection to terminal 27 and remove the short-circuit connection.
45	Earth Fault While Ramping	449	VFD Fault	-	There is current from the output phase to ground, either in the cable between the drive and the motor, or in the motor itself. The current transducers detect the ground fault by measuring current going out from the drive and current going into the drive from the motor. Ground fault is issued if the deviation of the two currents is too large. The current going out of the drive must be the same as the current going into the drive. Troubleshoot as follows: Remove AC power from the drive and disconnect the motor. Power the drive back on and reset the fault by pressing the “Reset” key. Run the VFD with no motor to see if the fault appears or if the drive runs without tripping. Observe the motor current in the display. It should be very close to zero with no motor connected. Reconnect the motor and attempt to run the drive again. If the drive trips on an “Alarm 14” with the motor disconnected, then the problem is inside the drive. A bad current sensor is most likely the cause of this type of fault. If the drive runs without the motor connected, but the current shown in the display is greater than 0.3 amps then it has a faulty current sensor. If the drive runs with no motor connected and the current shown in the display is less than 0.3 amps, then the ground fault is likely in the connecting cables or the motor. Check the motor and connected cables with a megohmmeter to find out which has the short. May need to check motor internal lugs with a megohmmeter to find out if short is in the motor terminal. reconnect the motor. In the event that there is current shown in the display with no motor connected, performing a “manual initialization” of the drive might help in zeroing out the current sensors. With power off, press and hold the “Status”, “Main Menu” and “OK” keys on the keypad (not provided). Power the drive back on while holding the keys for 5 seconds. The drive will power up in an alarm 80 “Drive Initialization” if successful. WARNING: A manual initialization will cause the drive to revert back to factory default settings, wiping out all parameter changes, any fault log data, and any personal menu settings that have been made, so ensure the drive parameter file with MCT 10 has been downloaded prior to doing this reset.
46	Power card supply	449	VFD Fault	-	The supply on the power card is out of range. Check for a defective power card, control card, option card, 24 V DC power supply, defective heat sink fan.
47	24 V supply low	449	VFD Fault	24V Supply Fault	The supply on the power card is out of range. Check for a defective power card.
48	1.8 V supply low	449	VFD Fault	1.8V Supply Fault	The 1.8 V DC supply used on the control card is outside of the allowable limits. The supply is measured on the control card. Check for a defective control card. If an option card is present, check for overvoltage.
57	AMA internal fault	449	VFD Fault	AMA Not OK	Not relevant; Carrier default has AMA =0 [off].
59	Current Limit	449	VFD Fault	-	Current is higher than the value in P4-18 Current Limit. Verify configured motor data.
65	Control card over temperature	449	VFD Fault	Ctrl Card overtemp	The cutout temperature of the control card is 85°C (185°F). Check the following: Ambient temperature, clogged filters, fan operation, control card.
67	Option module configuration has changed	449	VFD Fault	Option Change	One or more options have either been added or removed since the last power-down. Check that the configuration change is intentional and reset the unit.
68	Safe Stop activated	449	VFD Fault	Safe Stop	Safe Torque Off (STO) has been activated. To resume normal operation, apply 24 V DC to terminal 37, then send a reset signal (via bus, digital I/O, or by pressing [Reset]).
69	Power card temperature	449	VFD Fault	-	The power card temperature sensor is either too cold or too hot. Verify ambient operating temperature, check filters, verify fans are operating, check power card.

Table 6 — Typical Fault Code Descriptions and Corrective Actions* (cont)

DANFOSS ALARM/ WARNING CODE	DANFOSS ALARM	PIC6 ALARM CODE	PIC 6 - DESCRIPTION	PIC6 DISPLAY DANFOSS VFD ALARM IN MAINTENANCE MENU	DESCRIPTION AND POSSIBLE CORRECTIVE ACTION
70	Illegal FC configuration	449	VFD Fault	-	Control and power cards are incompatible. Verify type code from unit nameplate and part numbers of cards with supplier of the parts.
71	PTC 1 Safe Stop	449	VFD Fault	PTC1 Safe Stop	Safe Torque Off (STO) has been activated from the VLT PTC Thermistor Card MCB 112 because the motor is too warm. Once the motor cools and the digital input from the MCB 112 is deactivated, normal operation can resume when the MCB 112 applies 24 V DC to terminal 37 again. When the motor is ready for normal operation, a reset signal is sent (via serial communication, digital I/O, or by pressing [Reset] on the LCP). If automatic restart is enabled, the motor can start when the fault is cleared.
72	Dangerous failure	449	VFD Fault	Dangerous Failure	Safe Torque Off (STO) with trip lock. Unexpected signal levels on safe torque off and digital input from the VLT PTC Thermistor Card MCB 112.
79	Illegal power section configuration	449	VFD Fault	-	The power card scaling card is incorrect or is not installed.
80	Drive initialised to default value	449	VFD Fault	Drive Initialized	Parameter settings are initialized to default settings after a manual reset. To clear alarm, reset unit.
94	End of curve	449	VFD Fault	End of Curve	22-50=[0]Off
95	Broken belt	449	VFD Fault	Broken Belt	22-60=[0]Off
99	Locked rotor	449	VFD Fault	-	An overload condition was detected. This can indicate a locked compressor/motor. Further inspection is required.
243	Brake IGBT	449	VFD Fault	Brake IGBT Fault	Not relevant; no brake IGBT.
245	Heat Sink Sensor	449	VFD Fault	-	No feedback from the heat sink sensor. See Alarm 39.
250	New spare part	449	VFD Fault	n/a	Parameter 14-23 type code (T/C) must be set correctly. Will occur when power or switch mode supply has been replaced and the drive type code must be set correctly in EEPROM in accordance with the drive label. At index number 20 in parameter 14-23 enter Save to EEPROM and press the OK key. Alarm will change to Alarm 251. To reset alarm 251 remove power to the unit and reapply power and press the Reset key to clear the alarm. Important: A keypad is required to enter the type code.
251	New type code	449	VFD Fault	Service Trip, Type code	The power card or other components have been replaced and the type code has been changed. Cycle power and reset the drive to remove the warning and to resume normal operation.
N/A	N/A	311	N/A	Loss Communication with Danfoss VFD	LEN Communication error with VFD is lost. Check wiring. Note that for new drive not factory configured for Carrier or after software upgrade LEN must be enabled. Set parameter 14-29 to 00006100. This gives access to hidden parameter 14-23. Change this parameter using a field-provided keypad With keypad: Press OK once. You should now have a cursor on the value [00] just below the parameter number and name. Increase this by pressing the UP key until the value [12] and you see this on the line below: "[nnn] SXXX (std. sw)". Press OK and change to "[nnn] S009 (Special sw)", with the UP and DOWN buttons. Press OK again. You should have the cursor in the same place as on the previous step. Press UP until the value is [20]; press OK; change to [1] Save to EEPROM; press OK. You should now get a trip lock alarm A251 New Type Code. Do a power cycle and reset the alarm. It should be okay now. Check parameter 8-30; change it to [20] LEN if necessary.

NOTE: This is not a complete list of Danfoss FC-102 codes. If a warning/alarm is present which is not included in this table refer to the Danfoss manual.

Checking Power Modules and Motor Input with Input Power Off — Static Test

Use the following procedure to check the drive's power module circuitry with power off:

1. Turn off and lock out input power. Wait appropriate time as per Danfoss VFD nameplate.
2. Verify there is no voltage at the drive's input power terminals.
3. Using a voltmeter, check the DC bus potential as described in the section Verifying That DC Bus Capacitors Are Discharged to ensure the DC bus capacitors are discharged.
4. Disconnect the motor from the drive.
5. Check all AC line and DC bus fuses.
6. Use a multimeter to perform a static check on the input diodes and output IGBTs. See Table 7. For parallel drives this test will have to be done for each individual drive module, so in addition to removing the input and motor busbars for parallel drives the DC link connection will have to be removed for the individual drives.
7. Check motor impedance.
8. Reconnect the motor to the drive.
9. Reapply input power.

⚠WARNING

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait the time specified in Table 1 or as specified on the Danfoss VFD nameplate. For the DC bus capacitors to discharge and then check the voltage with a voltmeter rated for the DC bus voltage to ensure the DC bus capacitors are discharged before touching any internal components. For parallel drive modules (N630 and larger) check voltage before and after the individual DC fuses. Failure to observe this precaution could result in severe bodily injury or loss of life.

An isolated multimeter will be needed to measure DC bus voltage and to make resistance checks.

Table 7 — Diode Checks

METER LEAD		METER READING
(+)	(-)	
R	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
S	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
T	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
U	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
V	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
W	DC+	0.3 to 0.7 v
	DC-	Infinite (OL)
DC+	R	Infinite (OL)
	S	
	T	
	U	
	V	
	W	
DC-	R	0.5 v
	S	
	T	
	U	
	V	
	W	

Digital meters require a special diode check function because the current sourced by the meter during a normal resistance (Ohms) test is too low to accurately test a diode. Make sure the meter is set to the diode test function. Voltage readings may not be exact as shown in above table, but look for consistency during each of the 4 tests. When performing a test that should return infinity (OL) as shown in above table, you should see a value slowly climbing toward infinity. This is a result of the meter charging a capacitor and is normal.

If an incorrect reading is observed associated with U, V, W (outputs) this indicates a failed inverter IGBT module. Replace the shorted IGBT modules. Similarly if an incorrect reading is observed associated with R, S, T (inputs) this indicates a shorted SCR. Replace the shorted SCR module.

Servicing the Drive

⚠WARNING

To guard against possible personal injury and/or equipment damage:

1. Inspect all lifting hardware for proper attachment before lifting drive.
2. Do not allow any part of the drive or lifting mechanism to make contact with electrically charged conductors or components.
3. Do not subject the drive to high rates of acceleration or deceleration while transporting to the mounting location or when lifting.

Do not allow personnel or their limbs directly underneath the drive when it is being lifted and mounted.

⚠WARNING

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait the time specified in Table 1 or as specified on the Danfoss VFD nameplate. For the DC bus capacitors to discharge and then check the voltage with a voltmeter rated for the DC bus voltage to ensure the DC bus capacitors are discharged before touching any internal components. For parallel drive modules (N630 and larger) check voltage before and after the individual DC fuses. Failure to observe this precaution could result in severe bodily injury or loss of life.

An isolated multimeter will be needed to measure DC bus voltage and to make resistance checks.

Refer to Fig. 33 for location of DC bus terminals.

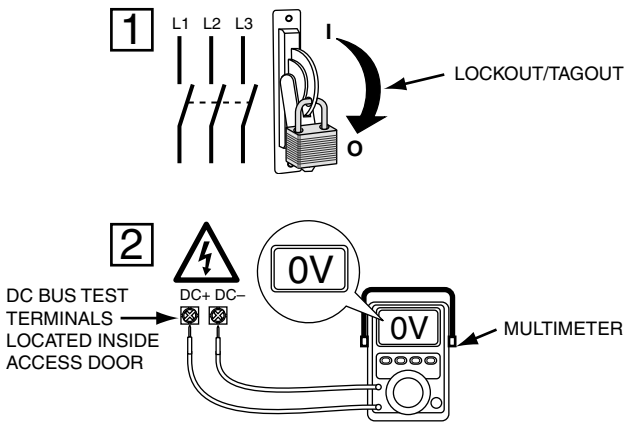
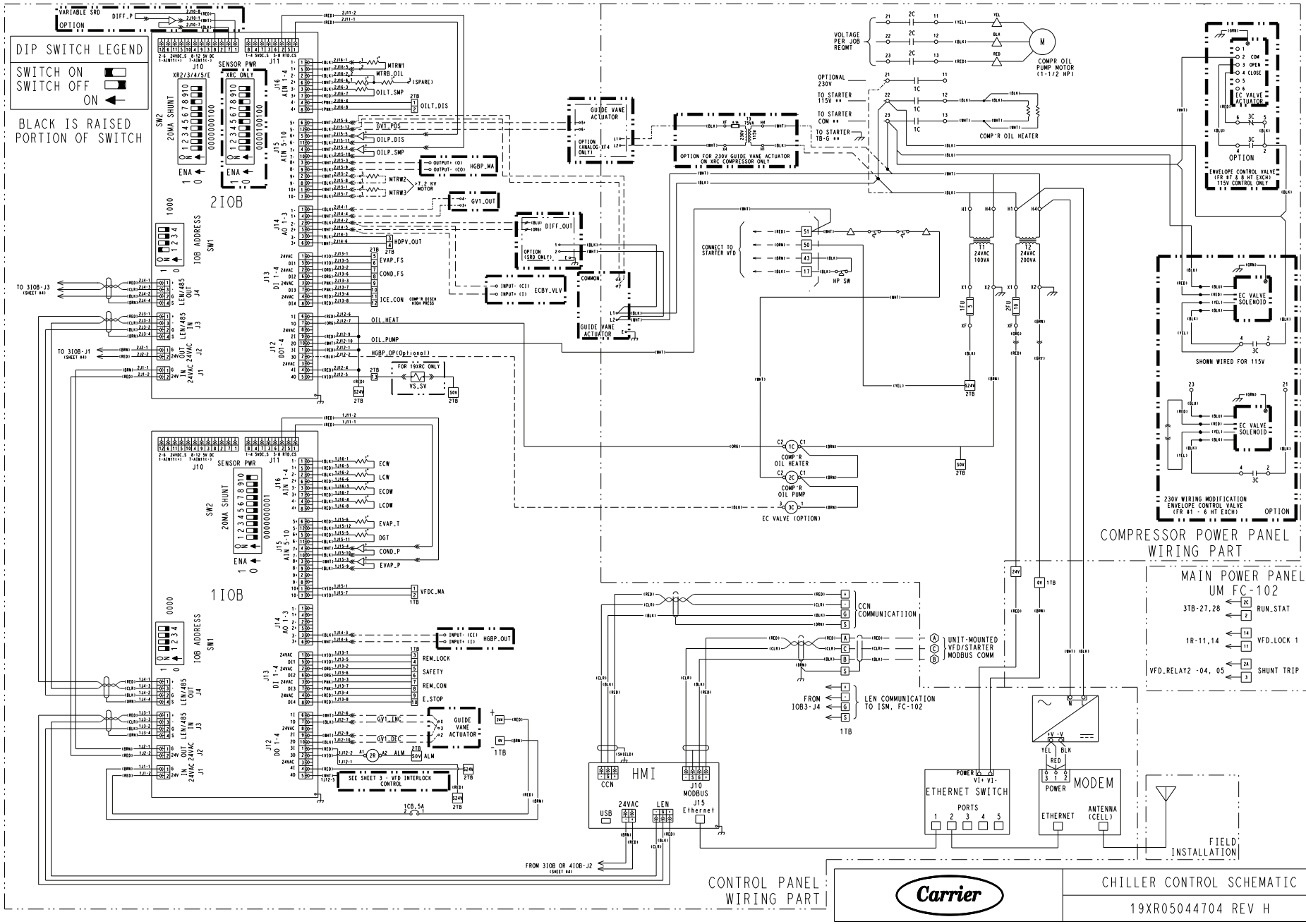


Fig. 33 — Check DC Bus Terminals

For FC-102 service guide lines, refer to Danfoss Manuals; the latest Service Guide for VLT FC Series is MG94A502.

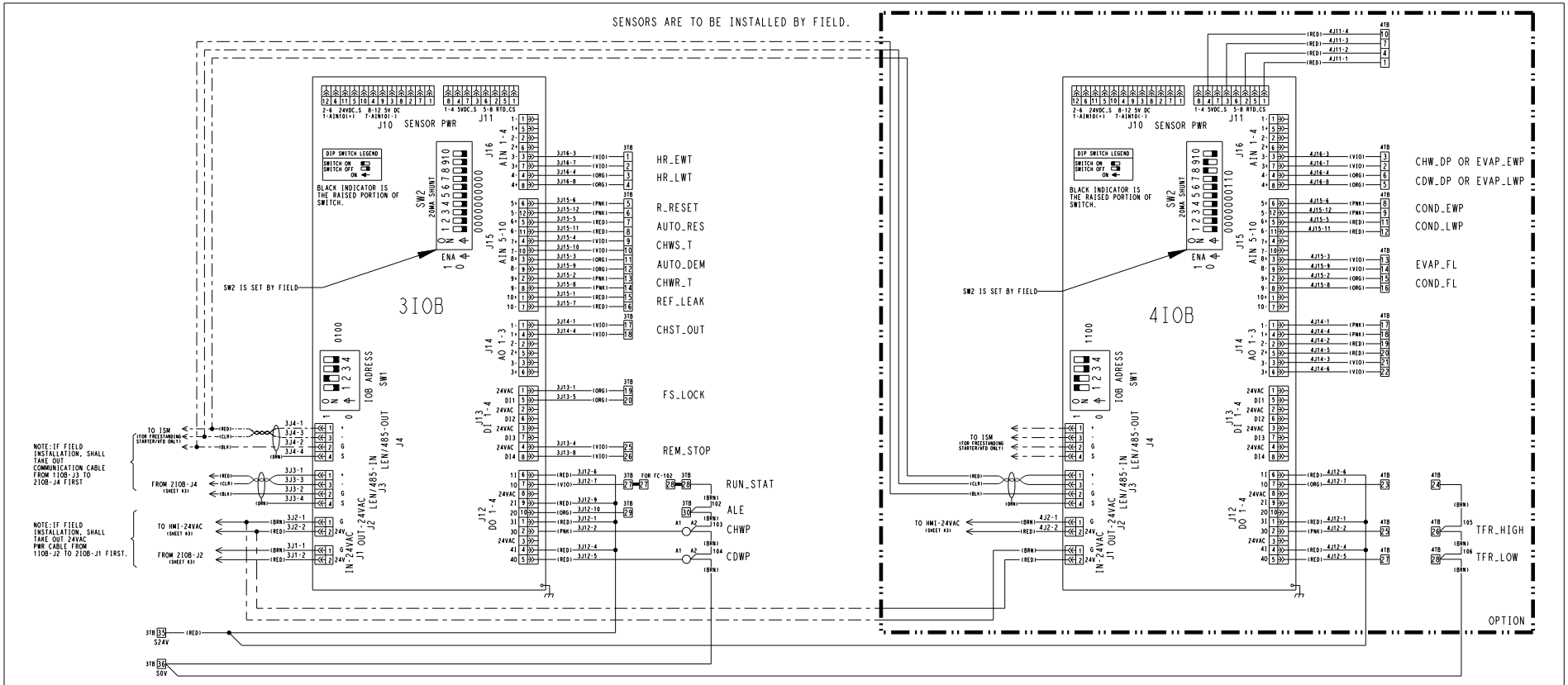
APPENDIX A — WIRING SCHEMATICS

19XRV CHILLER CONTROL SCHEMATIC (PIC 6)



APPENDIX A — WIRING SCHEMATICS (CONT)

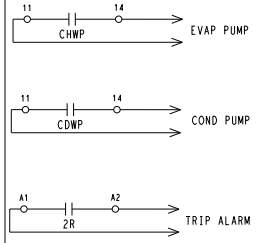
19XRV CHILLER CONTROL SCHEMATIC (PIC 6) (cont)



POWER CONNECTION

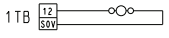
NOTE: TB-1 AND TB-2 ARE FOR EXTERNAL 24VAC POWER SUPPLY CONNECTION. LIMITED TO 100VA@24VAC.

CONTROL RELAY CONTACT

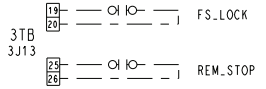


FOR VFD INTERLOCK CONTROL DANFOSS VFD

FOR VFD INTERLOCK CONTROL ROCKWELL VFD

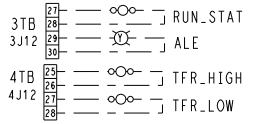


DIGITAL INPUT



NOTE: THE DIGITAL INPUT LOOP IS POWERED BY INTERNAL 24VAC POWER SUPPLY. EACH DISCRETE INPUT SHALL DETECT WHETHER AN EXTERNAL SWITCH OR CONTACTOR IS OPEN OR CLOSED OR OPENED.

DIGITAL OUTPUT

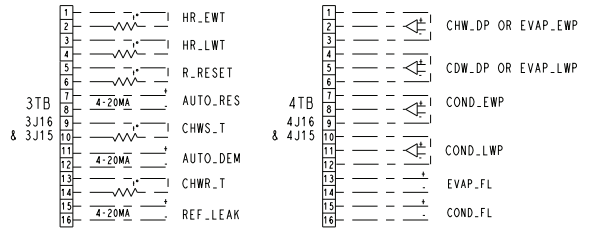


NOTE: EACH DIGITAL OUTPUT LOOP SHALL BE LIMITED TO A MAXIMUM OF 1A AC RMS STEADY-STATE.AND 4A SURGE. LIGHT LOAD RELAY IS RECOMMENDED AND THE COIL VOLTAGE OF RELAY IS 24VAC.

ANALOG OUTPUT

NOTE: EACH ANALOG OUTPUT LOOP SUPPORT 0/4-20MA OR 0/2-10VDC VOLTAGE OUTPUT.THE ANALOG OUTPUT LOOP IS POWERED BY BOARD. DO NOT SUPPLY EXTERNAL POWER.

ANALOG INPUT



NOTE: THE ANALOG INPUTS SUPPORT 5K/10K THERMISTOR, 4-20MA SENSOR AND 5VDC SENSOR.

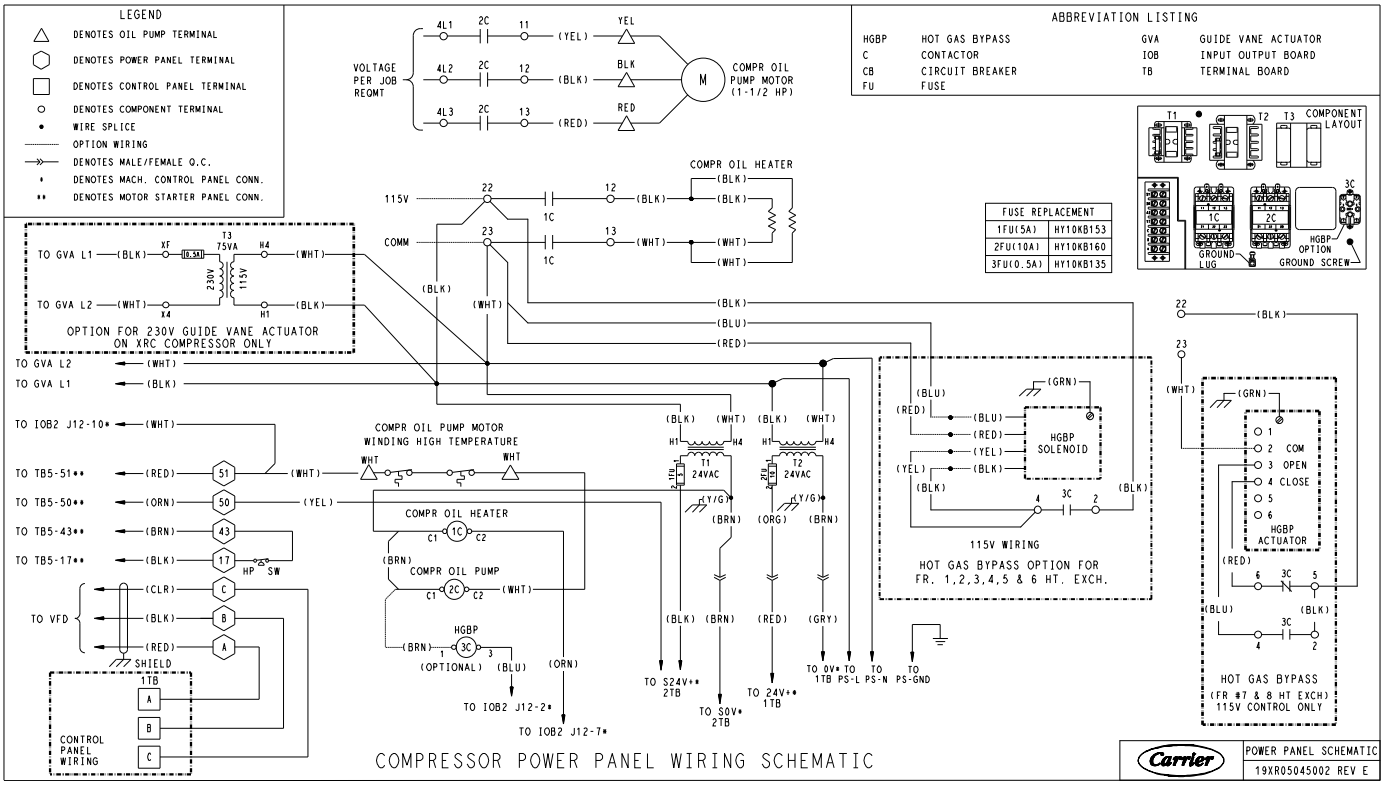
Carrier

CHILLER CONTROL SCHEMATIC

19XR05044703 REV H

APPENDIX A — WIRING SCHEMATICS (CONT)

19XRV COMPRESSOR POWER PANEL SCHEMATIC



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

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