Installation, Operation and Maintenance Manual	IOMM 1158-1
	Group: Chiller
	Part Number: 331375501
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	Supercedes: IOMM 1158 March, 2012

Starters for Centrifugal Chillers

Low Voltage: Solid State and Wye-Delta

Medium Voltage: Solid State and Across-the-Line

With MX3 Starter Control

DAIKIN

Table of Contents

CERTIFICATIONS	
UL508C, CAN/CSA-C22.2	EMC Directive (2004/108E/C
EPRI SEMI F47, IEC 61000-4-34.	TUV Rheinland

General

Motor starters can be factory mounted on some size chillers and can be remote mounted on all sizes. Larger size chillers are only available with remote mounted.

These starters are completely automatic and require no operator intervention (other than clearing and resetting faults) to perform their function of providing a controlled connection of the compressor motor to the power supply.

Low and medium voltage starters have similar software characteristics and are discussed together in their operating section. However, some parameters and data are different. Where this occurs, separate tables and figures are provided.

The purpose of this manual is to provide the site operator with sufficient information to understand the operating state of the motor/starter, access motor operating data, and to recognize and deal with faults. Starter setpoints are factory set or set at startup by the Daikin startup technician. Owner/operator adjustment of setpoints is discouraged.

The starters are characterized by their control software, known as "MX3 Control". Certain electrical operating data for these low voltage starters is transmitted to the chiller and can be viewed on the operator touch screen if the "Full Metering Option" has been ordered. See page 40 for details.

Figure 1, Wye-Delta Starter

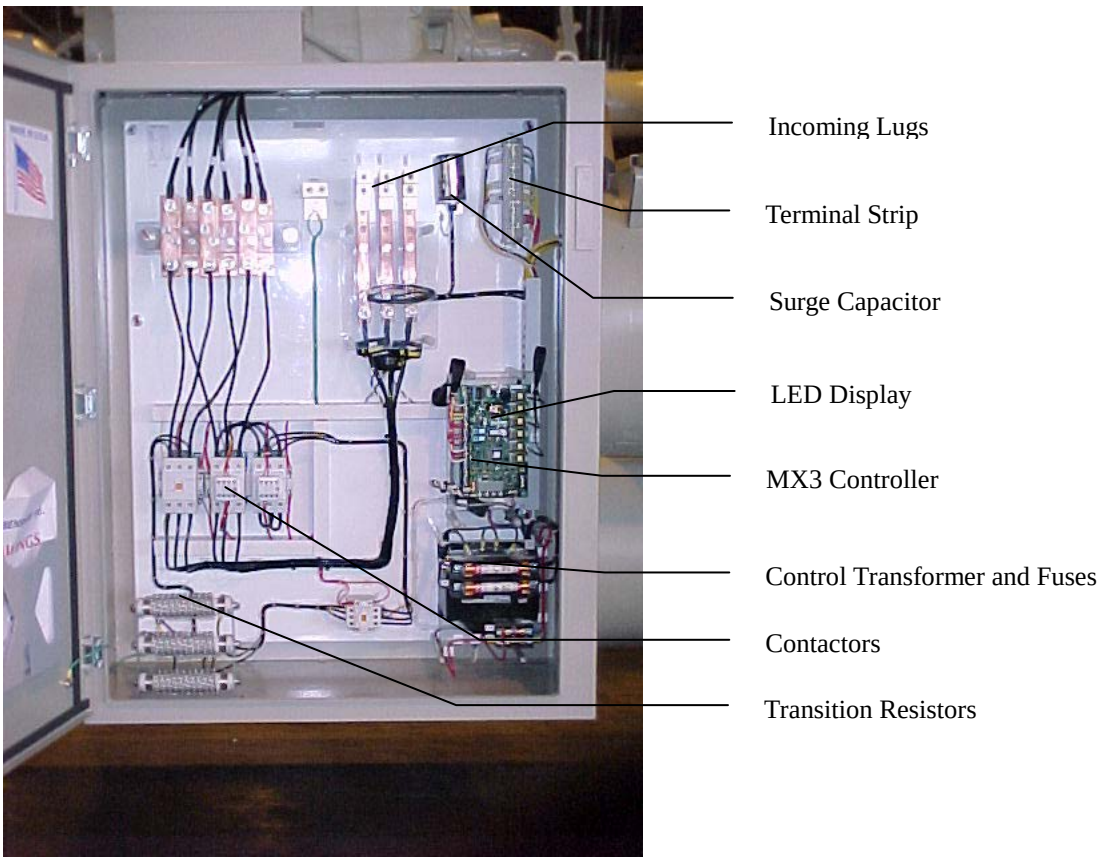
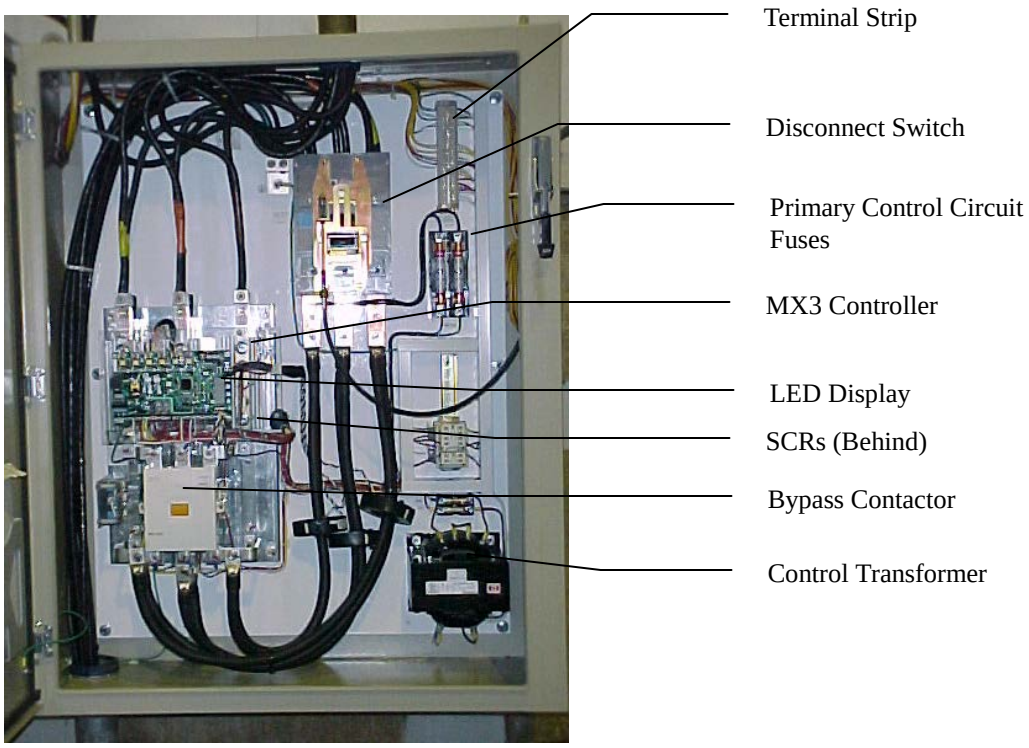


Figure 2, Solid State Starter, Remote Mounted



Variable Frequency Drives

While known and specified for their ability to control compressor motor speed for efficiency enhancement, VFDs also perform starting and motor protection functions. They are only available for 3/60/460-480 service.

VFDs are available only from Daikin and when purchased as part of the original chiller purchase. Installation and operation are covered in Daikin manual IOMM 1159.

Basic Electrical Terms

Bypass contactor: Contactors that bypass auto-transformers, reactors, or SCRs, and allow full power to reach the motor directly.

Closed transition: A reduced voltage starter characteristic when the motor is NOT temporarily disconnected from the line during the transition from starting mode to operating mode. The electrical load is transferred to resistors during the transition phase and the second inrush spike is suppressed

Full load amps (FLA): The maximum amps the motor is designed for.

Inrush current: The amount of current that a specific motor and starter combination will draw during start-up. Normal inrush current will be substantially less than LRA for all starter types, except for across-the-line starters.

Interrupting capacity: The maximum fault current that a circuit breaker or fused disconnect can successfully interrupt. As the rating increases, the construction becomes heavier duty. For disconnect switches with fuses, the rating is based on 0 to 600 volts.

For circuit breakers, the voltage and amperage relationship is considered with interrupting capacity decreasing as voltage increases.

Locked rotor amps (LRA): The amount of current that a specific motor will draw at start-up, when full voltage is applied across the line. The LRA may be 6 to 8 times FLA, or possibly higher in some cases.

Low Voltage: Voltages up to 600 volts

Medium Voltage: Voltages from 1000 volts to 69,000 (1kV to 69kV)

Open transition: A reduced voltage starter characteristic occurring when the motor is temporarily disconnected from power at the time the starter changes from the starting mode to the final running mode. A second smaller inrush spike will occur. Daikin does not recommend use of this type of starter.

Phase amps: The current draw inside the delta connection of a wye-delta motor winding. It is equal to 0.577 x RLA of the motor for a specific load.

Rated load amps (RLA): Actual amperage that the motor draws for a specific application. Centrifugal compressor motors operate at a RLA significantly below their maximum full load amps. RLA is used to determine electrical component sizing such as wire size and disconnect switches.

Starting torque: Minimum torque required to begin the motor's rotation.

Withstand rating: There is a period of time that the short circuit current passes to the shorted circuit before the protection device can open. This time can be as long as 0.020 seconds (one cycle). The withstand rating of a starter is the maximum short circuit current that it can pass safely without emitting sparks or debris.

Model Identification

Full model numbers are as shown below followed by two digits representing the unit's Rated Load Amps (RLA), such as RRSS14

RVSS: low voltage, solid state, free standing

RVST: low voltage, solid state, terminal (unit) mounted

MVSS: medium voltage, solid state, free standing only

D3WD: low voltage, wye-delta, free standing

D3WT: low voltage, wye-delta, terminal (unit) mounted

MVAT: medium voltage, across-the-line, free standing only

MVSS medium voltage solid state, free standing only

Starter Installation

Inspection

Thoroughly inspect the device for possible shipping damage before storing or installing the starter

- Remove the starter from its package and inspect exterior for shipping damage. If damage is apparent, notify the shipping agent and your sales representative.
- Open the enclosure and inspect the starter for any apparent damage or foreign objects. Ensure that all of the mounting hardware and terminal connection hardware is properly seated, securely fastened, and undamaged.
- Ensure all connections and wires are secured.
- Read the technical data label affixed to the starter and ensure that the correct horsepower and input voltage for the application has been purchased.

General Information

Ensure:

- The wiring diagram (supplied separately with the starter) is correct for the required application.
- The starter is the correct current rating and voltage rating for the motor being started.
- All of the installation safety precautions are followed.
- The correct power source is available.
- The starter control method has been selected.
- The connection cables have been obtained (lugs) and associated mounting hardware.
- The necessary installation tools and supplies are procured.
- The installation site meets all environmental specifications for the starter NEMA/CEMA rating.
- The motor being started has been installed and is ready to be started.
- Any power factor correction capacitors (PFCC) are installed on the power source side of the starter and not on the motor side.

  Failure to remove power factor correction or surge capacitors from the load side of the starter will result in serious damage to the starter that will not be covered by the starter warranty. The capacitors must be connected to the line side of the starter. The up-to-speed (UTS) contact can be used to energize the capacitors after the motor has reached full speed.

Safety Information

- Ensure that the installation site meets all of the required environmental conditions
- LOCK OUT ALL SOURCES OF POWER.
- Install circuit disconnecting devices (i.e., circuit breaker, fused disconnect or non-fused disconnect) if they were not previously installed by the factory as part of the package.
- Install short circuit protection (i.e., circuit breaker or fuses) if not previously installed by the factory as part of the package.
- Follow all NEC (National Electrical Code) and/or C.S.A. (Canadian Standards Association) standards or Local Codes as applicable.

- Remove any foreign objects from the interior of the enclosure, especially wire strands that may be left over from installation wiring.
- Ensure that a qualified electrician installs wiring.
- Ensure that the individuals installing the starter are wearing ALL protective eyewear and clothing.
- Ensure the starter is protected from debris, metal shavings and any other foreign objects.

Mounting Arrangements

Low voltage starters can be factory-mounted with power and control wiring factory-installed or they can be free-standing, requiring field mounting remote from the unit and field-wiring of power and control wiring. Because of dimension restrictions for shipping, some "factory-mounted" starters for large chillers are shipped separate from the unit. Mounting supports are on the unit and preassembled cable kits are provided. Mounting and wiring on site are the customer's responsibility and can be subcontracted to Daikin Factory Service if desired.

Medium voltage starters and some size low voltage starters on WSC 100 through 126 are only available for free-standing applications.

Low voltage starters can be supplied in several different mounting arrangements depending on the chiller size and starter type. See Table 1 for available arrangements.

- Factory-Mounted (optional): The starter is mounted on the chiller unit with the back of the starter against the motor terminal box and wired directly to the motor. This arrangement is only available on WSC/WDC 063, 079, or 087 units (cover photograph).
- Free-standing (standard): Floor-mounted, separate from the chiller unit, and field wired to the compressor motor. This is available on all units and is the only starter arrangement available for WDC/WCC 100 and 126 dual compressor units.
- Brackets and cable (optional): Starters for WSC 100 single compressor units may be shipped separately from the chiller unit and furnished with mounting brackets and interconnecting cables for field mounting and connection by others. This option must be clearly specified when chillers are ordered since brackets are welded onto the evaporator during its construction.

Table 1, Starter/VFD Mounting Arrangements

Size	Factory-Mounted	Free-Standing	Brackets & Cables
WSC/WDC 063	X	X	
WSC/WDC 079	X	X	
WSC/WDC 087	X	X	
WSC 100 - 126		X	X (100 only)
WDC 100 - 126		X	
WCC 100 - 126		X	

NOTE: WSC are single compressor chillers, WDC and WCC are dual compressor chillers

Receiving and Setting

Since factory-mounted starters are mounted and wired at the factory, this section will only apply to free-standing units.

All Daikin free-standing centrifugal starters are shipped FOB factory and all claims for handling and shipping damage are the responsibility of the consignee.

Use extreme care when rigging the starter to prevent damage. See the certified dimension drawings included in the job submittal for the center of gravity of the unit. Consult the local Daikin sales office for assistance if the drawings are not available.

Fastening rigging hooks to the four lifting eyes located on the top of the unit.

Location and Mounting

Clearance

The starter must be mounted on a level concrete or steel base and must be located to provide adequate space for servicing. Local codes or the National Electric Code (NEC) can require more clearance in and around electrical components and must be checked.

Mounting

Provide a floor or structural support adequate to support the full weight of the unit.

Standard NEMA 1 and NEMA 12 starters must be installed indoors in an area that is not exposed to direct water spray. Do not install in areas where the ambient temperature falls below 32°F (0°C) or exceeds 104°F (40°C) enclosed, or 122°F (50°C) open unless this was noted at the time of order placement and special precautions were taken to protect against these abnormal temperatures.

Heatsink temperatures can run as high as 158°F (70°C) during normal operation. Do not mount the starter in contact with any material that cannot accept this heat. The starter must be mounted with the heat sink fins oriented vertically in an area that will not experience excessive shock or vibration.

Environmental Requirements

Provisions should be provided in the starter enclosure to ensure that the temperature inside the enclosure never rises above 122°F (50°C) or the starter could be damaged or the life of the starter could be reduced. Storage temperature limits are -4°F to 155°F (-20°C to 70°C).

Safety Precautions

⚠ WARNING

An incoming disconnect must be locked open before wiring or servicing the starter, motor, or other related equipment. Shock hazard exists. Pressing the Stop push-button on the chiller control panel does not remove AC mains potential. The equipment must only be serviced by qualified personnel fully familiar with the equipment.

⚠ WARNING

For safety of maintenance personal as well as others who might be exposed to electrical hazards associated with maintenance activities, the safety related work practices of NFPA 70, Part II, should always be followed when working on electrical equipment.

The opening of the branch circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of electrical shock, current carrying parts and other components of the starter should be inspected and replaced if damaged.

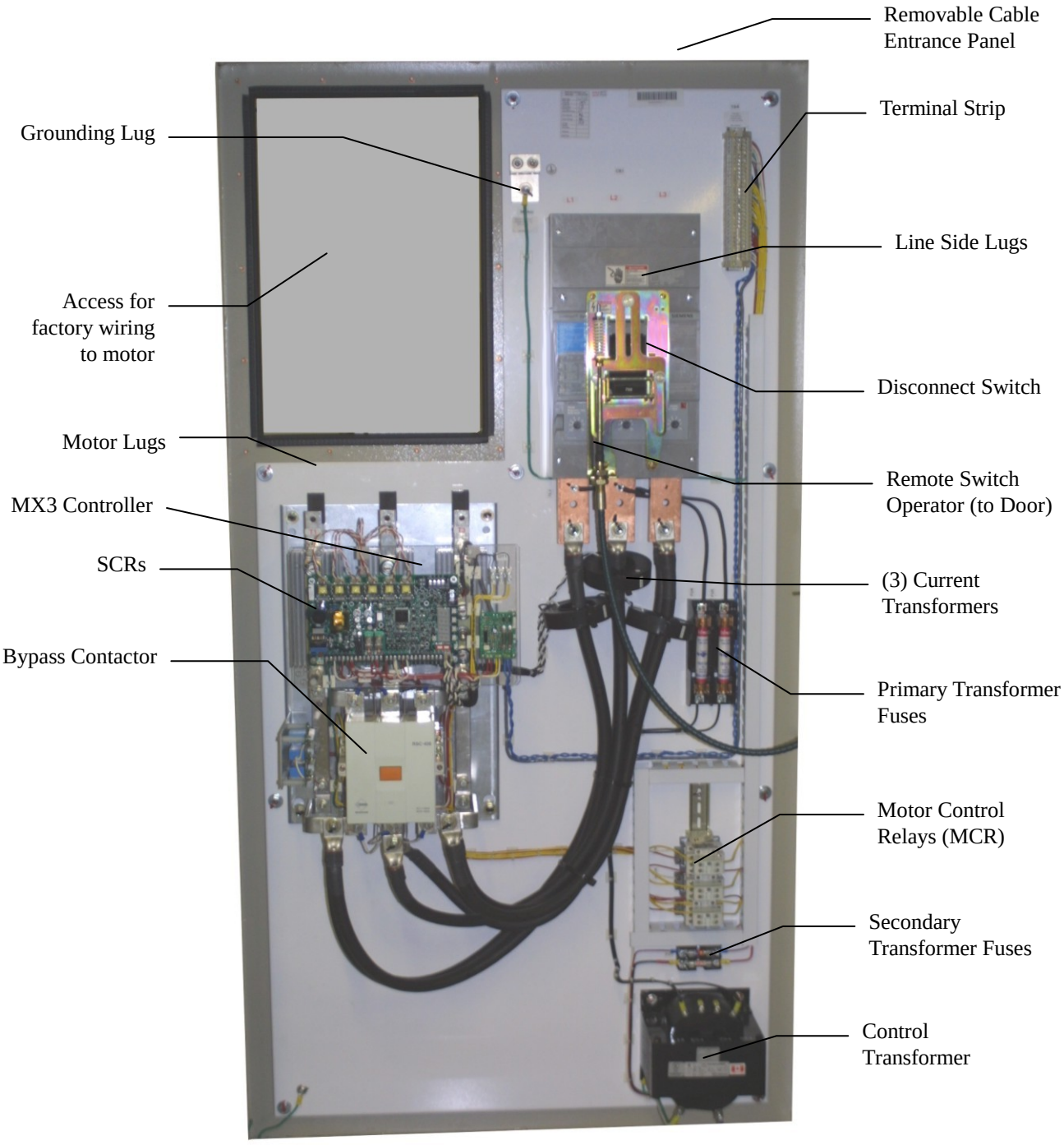
Power Factor Capacitors, Surge Capacitors and Lightning Arrestors

These devices MUST NOT be used with solid state starters. The SCR's in the starter will be damaged by the di/dt levels created.

Dimensions & Terminal Sizes

Low Voltage, Solid State (RVSS and RVST)

Figure 3, Solid-state Starter with Circuit Breaker/ Disconnect
Models RVSS47 – RVSS82, RVST47 – RVST82

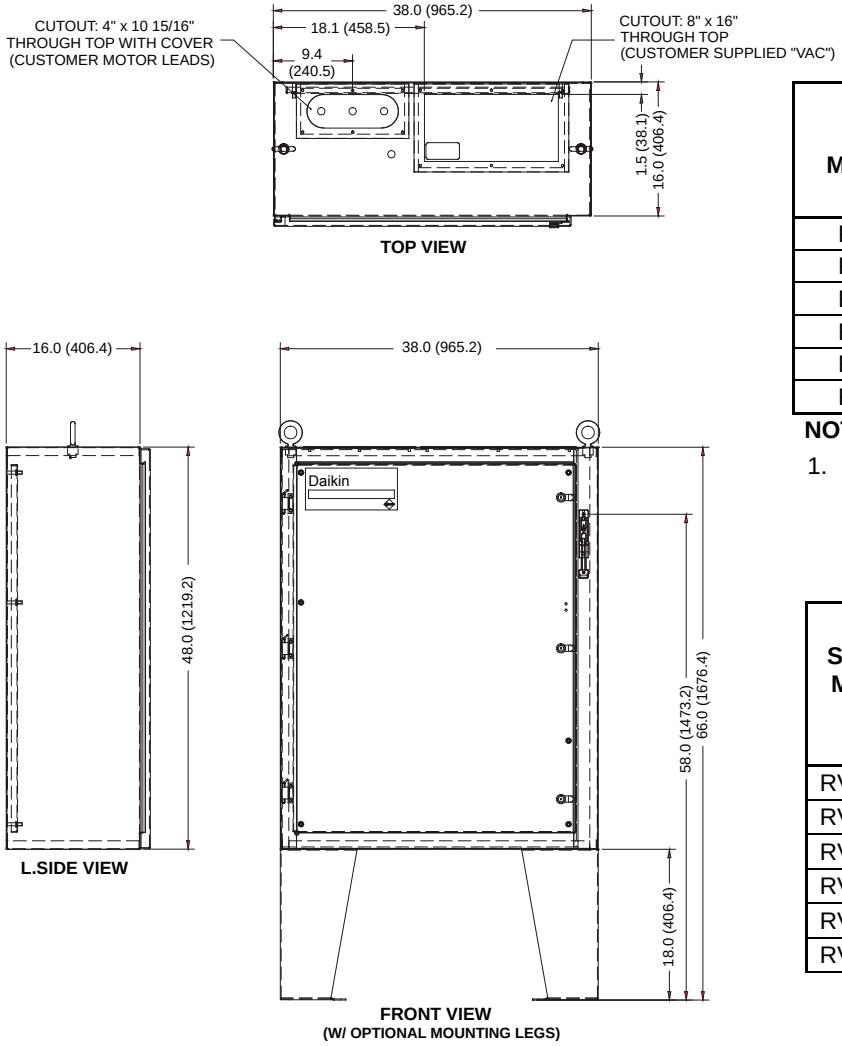


NOTES:

1. Free-standing Models RVST47 to RSVT 82 have 6-inch high feet not shown in photograph.
2. Free-standing Models RVST14 to RSVT 41 are similar in appearance but in a shorter enclosure. They have 18-inch high feet not shown in photograph.

Figure 4, Solid-state, Free-standing Models RVSS14 to RVSS41

NOTE: For starters equipped <u>with</u> optional power factor correction capacitors and/or fused disconnect switches, use Drawing RVSS 14 – 82, which is 78 inches high rather than this 66-inch high unit.



Starter Model No.	Incoming Lug Size to Standard Power Block	Outgoing Connection Size
RVSS14	(2) #6 - 300	0.5
RVSS17	(2) #6 - 300	0.5
RVSS20	(2) #6 - 300	0.5
RVSS27	(2) #6 - 300	0.5
RVSS34	(2) #6 - 300	0.5
RVSS41	(2) #6 - 300	0.5

NOTES:

1. Outgoing lugs are NEMA 2 hole pattern.

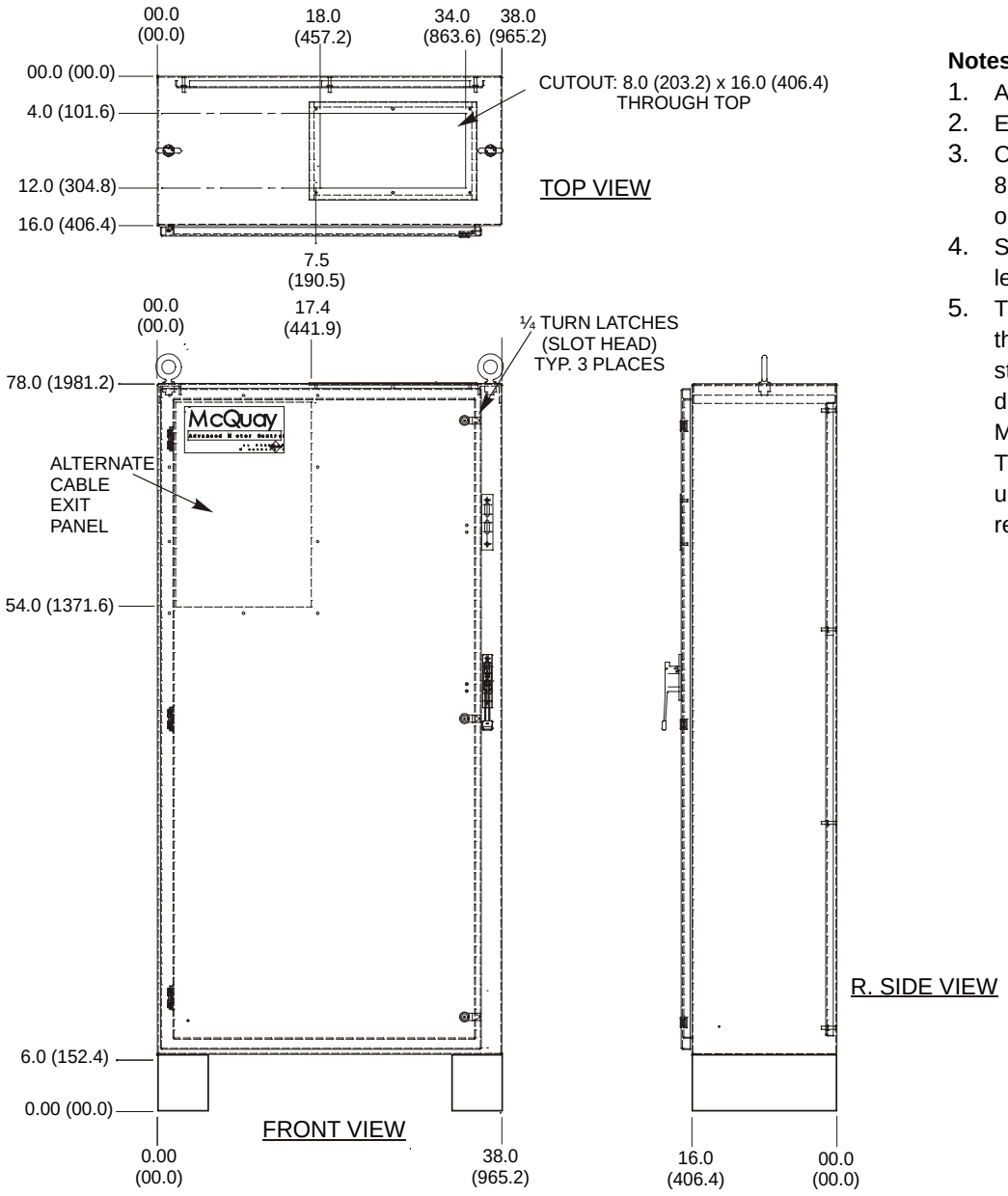
Starter Model Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
RVSS14	250	#6-350	#6-350
RVSS17	250	#6-350	#6-350
RVSS20	300	(2) #3/0-500	(2) #3/0-500
RVSS27	400	(2) #3/0-500	(2) #3/0-500
RVSS34	500	(2) #3/0-500	(2) #3/0-500
RVSS41	600	(2) #3/0-500	(2) #3/0-500

NOTES:

1. All dimensions are in inches (mm).
2. The location of factory-mounted starters is shown on the chiller unit dimension drawing.
3. Free-standing Models RSVT have optional 18-inch legs as shown in front view.
4. Power factor correction capacitors cannot be mounted in this size enclosure.
5. Weight of free-standing model is 450 lbs (204 kg).
6. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
7. For free-standing starters, the outgoing connections can be made through the top of the enclosure or through the upper-left rear area.
8. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.

Figure 5, Free-Standing, Solid-state Starter Models RVSS14 to RVSS82

NOTE: For RVSS 14 – 41 starters without p.f. correction or fused disconnects, use CD RVSS 14 – 41.



Notes:

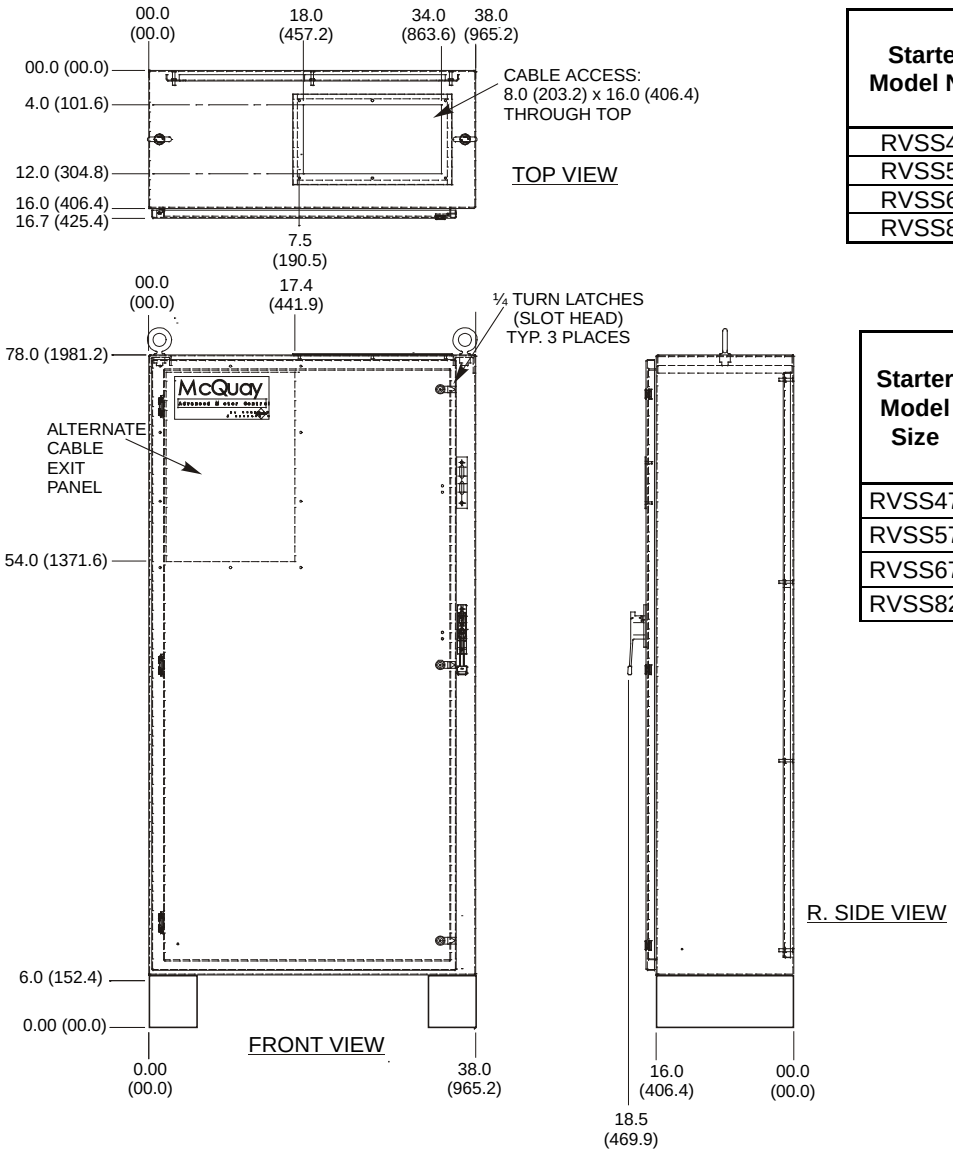
1. All dimensions in inches (mm).
2. Enclosure is NEMA 1.
3. Cable entrance and exit through 8.0 (203.2) x 18.0 (457.2) cutout on top.
4. Shown with optional mounting legs.
5. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.

Starter Model	(All) Outgoing Conn. Size in.	Incoming to Power Block
RVSS14	0.5	(2) #6 - 300
RVSS17	0.5	(2) #6 - 300
RVSS20	0.5	(2) #6 - 300
RVSS27	0.5	(2) #6 - 300
RVSS34	0.5	(2) #6 - 300
RVSS41	0.5	(2) #6 - 300
RVSS47	0.5	(2) #6-350
RVSS57	0.5	(4) 1/0 750
RVSS67	0.5	(4) 1/0-750
RVSS82	0.5	(4) 1/0-750

Starter Model	Incoming to Disconnect Swt.	Incoming to Circuit Breaker
RVSS1	#6-350	#6-350
RVSS1	#6-350	#6-350
RVSS2	(2) #3/0-500	(2) #3/0-500
RVSS2	(2) #3/0-500	(2) #3/0-500
RVSS3	(2) #3/0-500	(2) #3/0-500
RVSS4	(2) #3/0-500	(2) #3/0-500
RVSS4	(3) #1/0-500	(2) #1/0-500
RVSS5	(3) #1/O-500	(2) #1/0-500
RVSS6	(4) #250-500	(4) #250-500
RVSS8	(4) #250-500	(4) #250-500

NOTE: Outgoing connection is NEMA 2-hole pattern

Figure 6, Free-Standing, Solid-state Starter Models RVSS47 to RVSS82



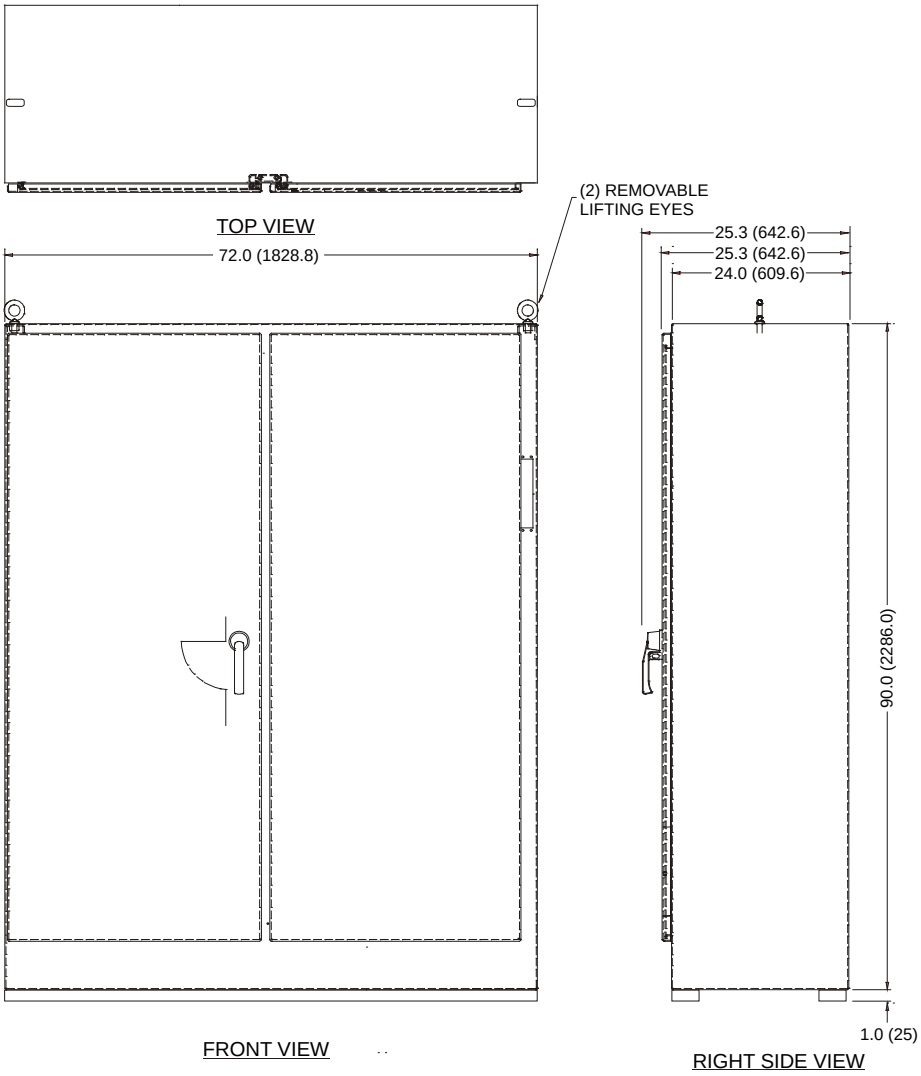
Starter Model No.	Incoming Lug Size, to Standard Power Block	Outgoing Connection Size
RVSS47	(2) #6 - 350	0.66
RVSS57	(4) 1/0-750	0.5
RVSS67	(4) 1/0-750	0.66
RVSS82	(4) 1/0-750	0.66

Starter Model Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
RVSS47	800	(3) #1/0-500	(2) #1/0-500
RVSS57	800	(3) #1/O-500	(2) #1/0-500
RVSS67	1200	(4) #250-500	(4) #250-500
RVSS82	1200	(4) #250-500	(4) #250-500

NOTES:

1. All dimensions are in inches (mm).
2. The location of factory-mounted starters is shown on the chiller unit dimension drawing.
3. The optional 6-inch feet are for free-standing starters only.
4. Weight of free-standing models is 600 lbs (272 kg)
5. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
6. For free-standing starters, the outgoing connections can be made through the top of the enclosure or through the upper-left rear area.
7. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.

Figure 7, Free-Standing, Solid-state Starter Models RVSS96 to RVSS4K

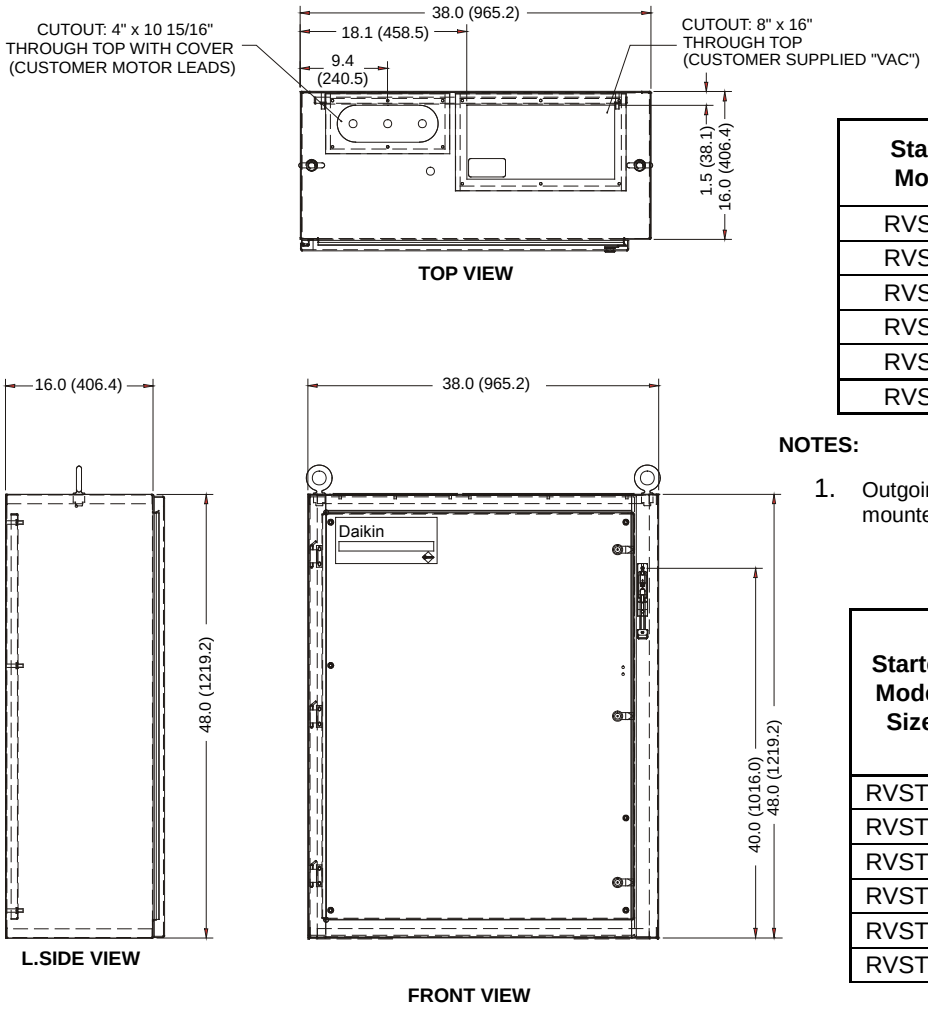


NOTES:

1. All dimensions are in inches (mm).
2. Cable entry and exit through the enclosure top.
3. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.
4. Starter weight is 1200 lbs.

Starter Model No.	Breaker Size (Amps)	Standard	Optional		
		Incoming Lug Size, to Power Block	Incoming Lug Size Disconnect Switch	Incoming Lug Size Circuit Breaker	Outgoing Connection Size
RVSS96	1600	#2 - 600	(5) #300-600	(5) #300-600	0.5
RVSS2K	2000	#2 - 600	(5) #300-600	(5) #300-600	CSO
RVSS4K	2000	#2 - 600	(5) #300-600	(5) #300-600	CSO

Figure 8, Unit-Mounted, Solid-state Starter Models RVST14 to RVST41



Starter Model	Incoming to Standard Power Block
RVST14	(2) #6-300
RVST17	(2) #6-300
RVST20	(2) #6-300
RVST27	(2) #6-300
RVST34	(2) #6-300
RVST41	(2) #6-300

NOTES:

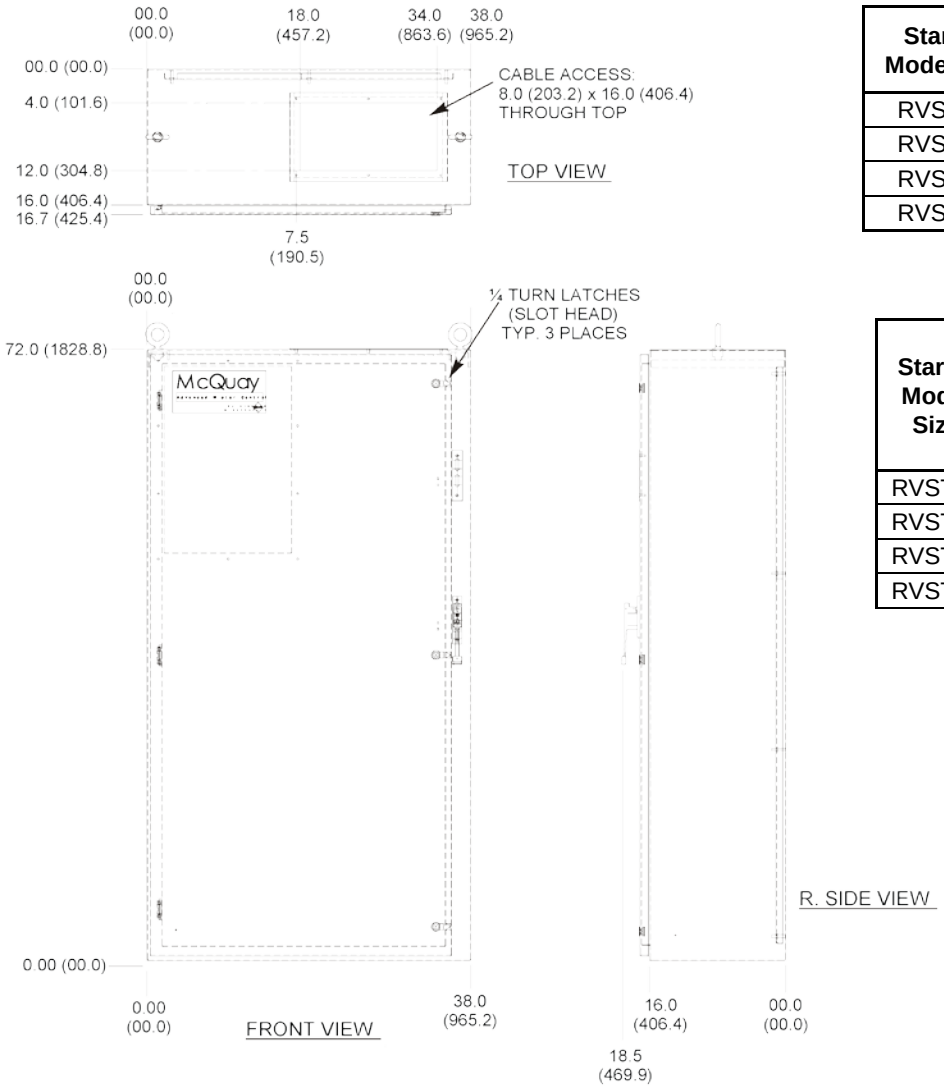
1. Outgoing lugs are factory-connected to the motor on unit-mounted starters.

Starter Model Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
RVST14	250	#6-350	#6-350
RVST17	250	#6-350	#6-350
RVST20	300	(2) #3/0-500	(2) #3/0-500
RVST27	400	(2) #3/0-500	(2) #3/0-500
RVST34	500	(2) #3/0-500	(2) #3/0-500
RVST41	600	(2) #3/0-500	(2) #3/0-500

NOTES:

1. All dimensions are in inches (mm).
2. The location of factory-mounted starters is shown on the chiller unit dimension drawing.
3. Power factor correction capacitors cannot be mounted in this size enclosure.
4. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
5. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.
6. Ship-loose weight: 450 lbs (204 kg)

Figure 9, Unit-Mounted, Solid-state Starter Models RVST47 to RVST82



Starter Model No.	Incoming Lug Size, to Std. Power Block	Outgoing Connection Size
RVST47	(2) #6 - 350	0.66
RVST57	(4) 1/0-750	0.50
RVST67	(4) 1/0-750	0.66
RVST82	(4) 1/0-750	0.66

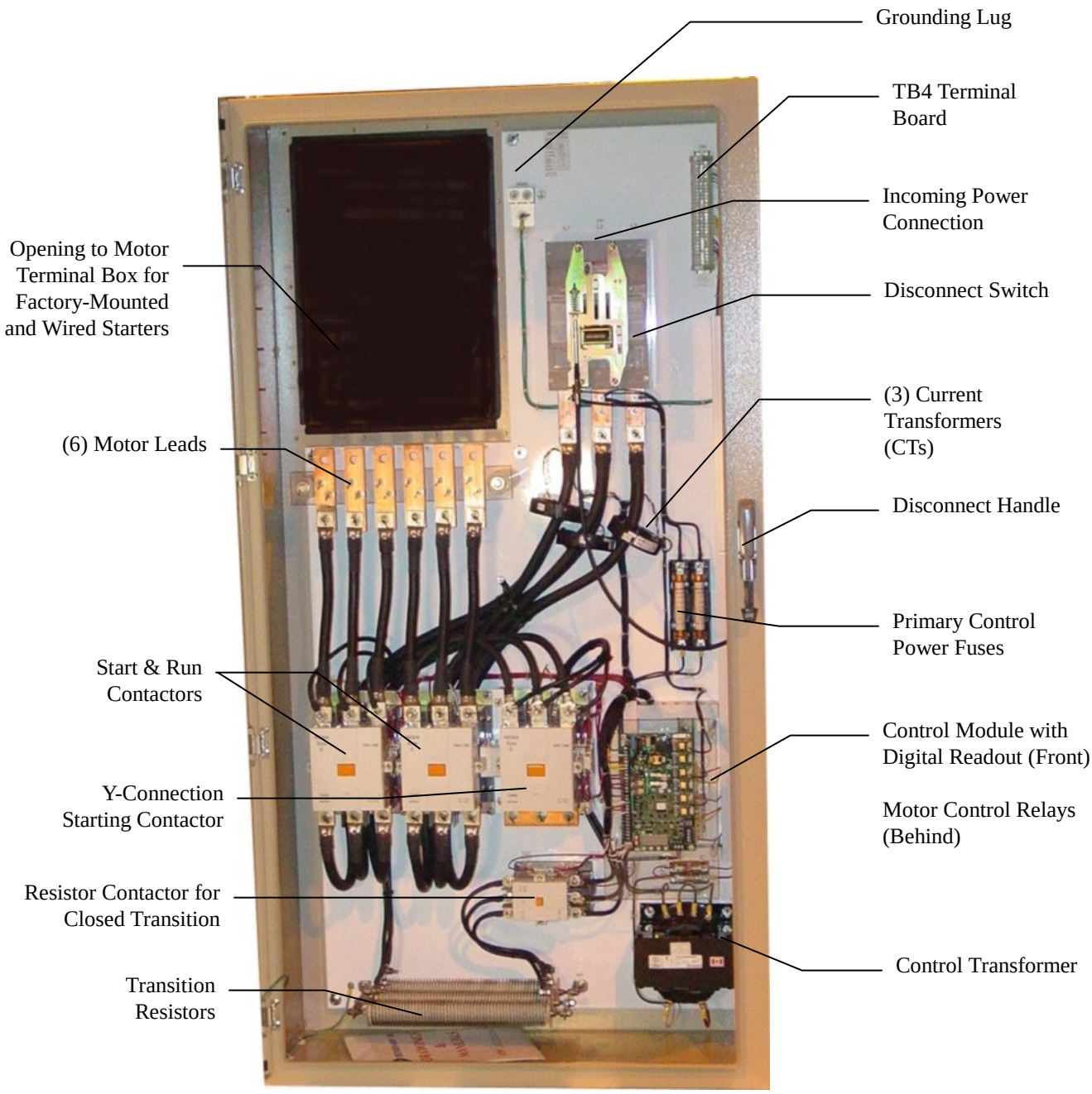
Starter Model Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
RVST47	800	(3) #1-500	(2) #1-500
RVST57	800	(3) #1-500	(2) #1-500
RVST67	1200	(4) #250-500	(4) #250-500
RVST82	1200	(4) #250-500	(4) #250-500

NOTES:

1. All dimensions are in inches (mm).
2. The location of factory-mounted starters is shown on the chiller unit dimension drawing.
3. Ship-loose weight: 600 lbs (272 kg)
4. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
5. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code

Low Voltage, Wye-Delta (D3DW & D3dt)

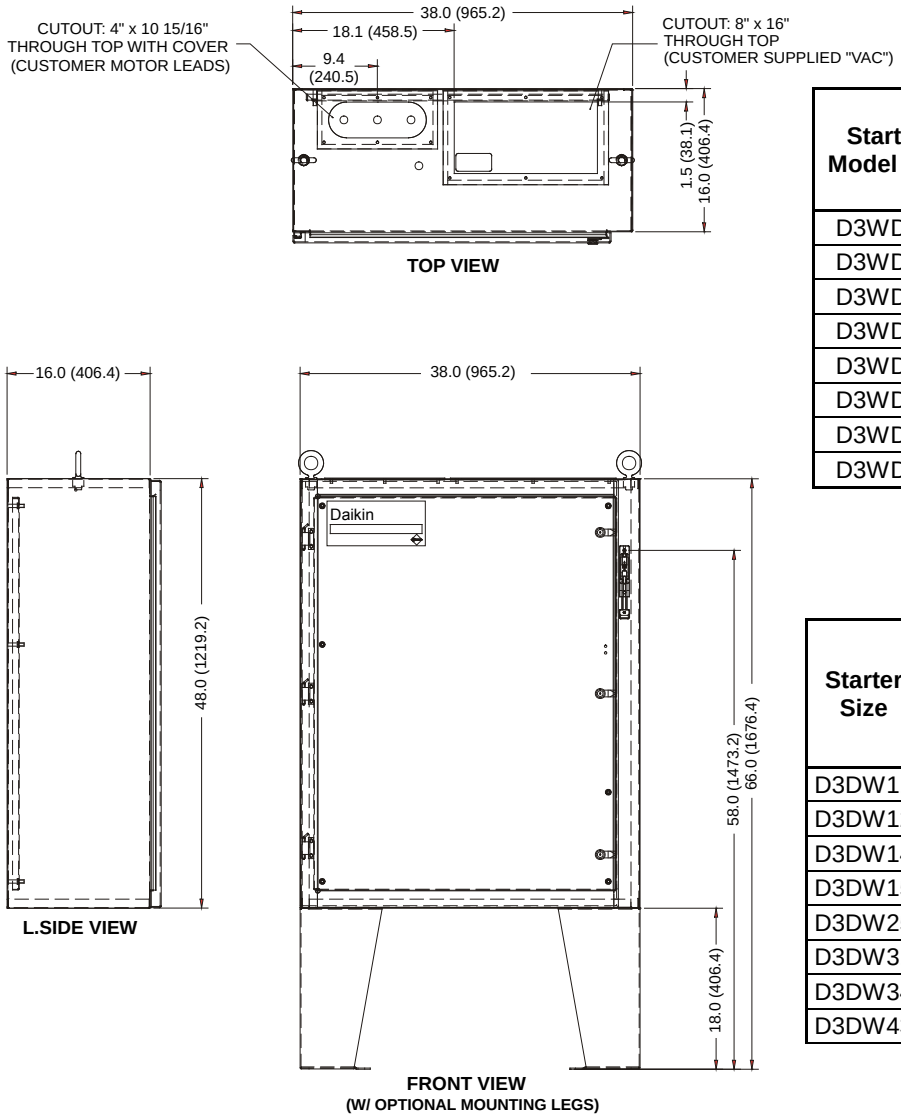
Figure 10, Models D3WD62 – D3WD65, D3WT62 – D3WT65
Wye-Delta, Closed Transition, Low Voltage Starter



NOTE: Models D3WD11 – D3WD43 and D3WT11 – D3WT43 are similar in appearance, but in a shorter cabinet.

Figure 11, Wye-Delta Starter, Free-Standing Models D3WD11 to D3WD43

NOTE: For starters equipped <u>with</u> optional power factor correction capacitors and/or fused disconnect switches, use Drawing D3WD11-65, which is 78 inches high rather than this 66-inch high unit.



Starter Model No.	Incoming Lug Size, Std. Power Block	Outgoing Conn. Hole Size
D3WD11	(2) #6 - 300	0.45”
D3WD12	(2) #6 - 300	0.45”
D3WD14	(2) #6 - 300	0.45”
D3WD15	(2) #6 - 300	0.45”
D3WD25	(2) #6 - 300	0.45”
D3WD31	(2) #6 - 300	0.45”
D3WD34	(2) #6 - 300	0.45”
D3WD43	(2) #6 - 350	0.45”

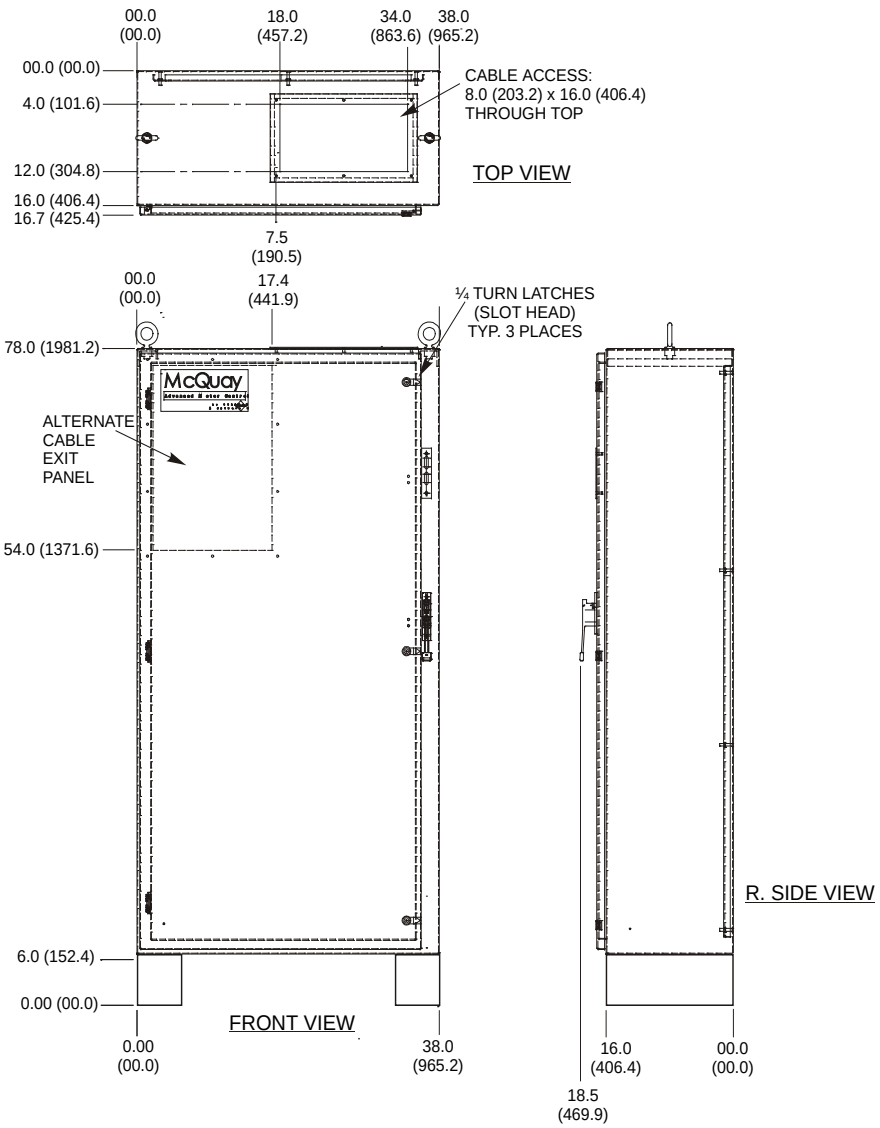
Starter Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DW11	200	#6-350	#6-350
D3DW12	250	#6-350	#6-350
D3DW14	250	#6-350	#6-350
D3DW15	300	(2) #3/0-	#6-350
D3DW25	400	(2) #3/0-	(2) #3/0-
D3DW31	400	(2) #3/0-	(2) #3/0-
D3DW34	500	(2) #3/0-	(2) #3/0-
D3DW43	600	(2) #3/0-	(2) #3/0-

NOTES:

1. All dimensions are in inches (mm).
2. Free-standing Models RSVT have optional 18-inch legs as shown in front view.
3. Power factor correction capacitors cannot be mounted in this size enclosure.
4. Weight of free-standing model is 450 lbs (204 kg).
5. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit’s Technical Data Sheet to size any upstream protection devices required by local code.

Figure 12, Wye-Delta Starter, Free-Standing Models D3WD11 to D3WD65,

NOTE: For D3WD11-43 without p.f. correction or fused disconnects, use drawing D3DW11-43**.**



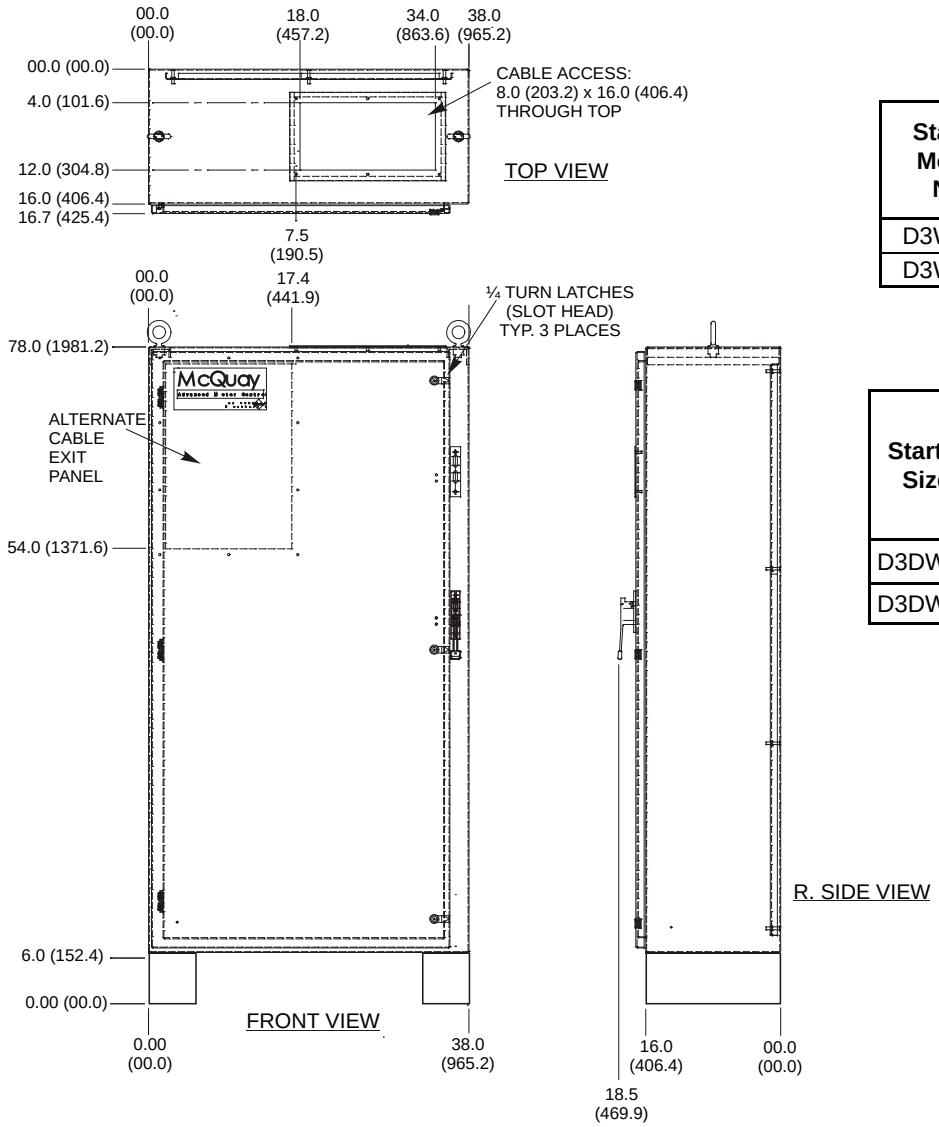
Starter Model No.	Incoming Lug Size, Std. Power Block	Outgoing Connection Hole Size
D3WD11	(2) #6 - 300	0.45
D3WD12	(2) #6 - 300	0.45
D3WD14	(2) #6 - 300	0.45
D3WD15	(2) #6 - 300	0.45
D3WD25	(2) #6 - 350	0.45
D3WD31	(2) #6 - 300	0.45
D3WD34	(2) #6 - 300	0.45
D3WD43	(2) #6 - 350	0.45
D3WT62	(4) #1/0-	0.45
D3WT65	(4) #1/0-	0.45

Starter Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DW11	200	#6-350	#6-350
D3DW12	250	#6-350	#6-350
D3DW14	250	#6-350	#6-350
D3DW15	300	(2) #3/0-	#6-350
D3DW25	400	(2) #3/0-	(2) #3/0-
D3DW31	400	(2) #3/0-	(2) #3/0-
D3DW34	500	(2) #3/0-	(2) #3/0-
D3DW43	600	(2) #3/0-	(2) #3/0-
D3DW62	800	(2) #1-500	(2) #1-500
D3DW65	1000	(2) #1-500	(2) #1-500

NOTES:

1. Optional 6-inch feet can be ordered for free-standing starters.
2. Weight of free-standing unit is 600 lbs (272 kg).
3. Power factor correction capacitors up to 50 KVAR can be mounted internally.
4. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
5. The outgoing connections can be made through the top of the enclosure or the upper-left rear area.
6. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.

Figure 13, Wye-Delta Starter, Free-Standing Models D3WD62 to D3WD65



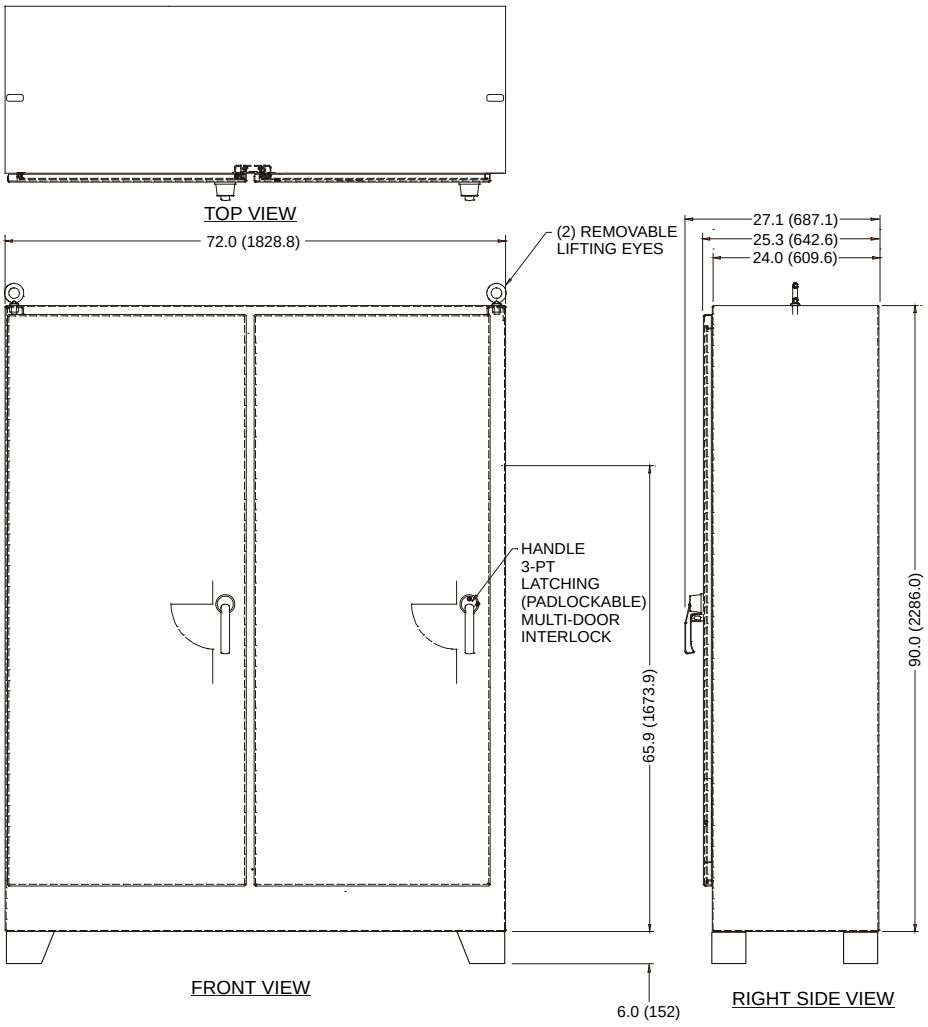
Starter Model No.	Incoming Lug Size, Std. Power Block	Outgoing Conn. Hole Size
D3WD62	(4) #1/0-750	0.45”
D3WD65	(4) #1/0-750	0.45”

Starter Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DW62	800	(2) #1-500	(2) #1-500
D3DW65	1000	(2) #1-500	(2) #1-500

NOTES:

1. Optional 6-inch feet can be ordered for free-standing starters.
2. Weight of free-standing unit is 600 lbs (272 kg).
3. Power factor correction capacitors up to 50 KVAR can be mounted internally.
4. Incoming connections can be made through the removable plate on the top of the enclosure. If drilling is to be performed, the plate should be removed to avoid drill chips entering the enclosure.
5. The outgoing connections can be made through the top of the enclosure or through the upper-left rear area.
6. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit’s Technical Data Sheet to size any upstream protection devices required by local code.

Figure 14, Wye-Delta Starter, Free-Standing, Models D3WD86 to D3WD2K



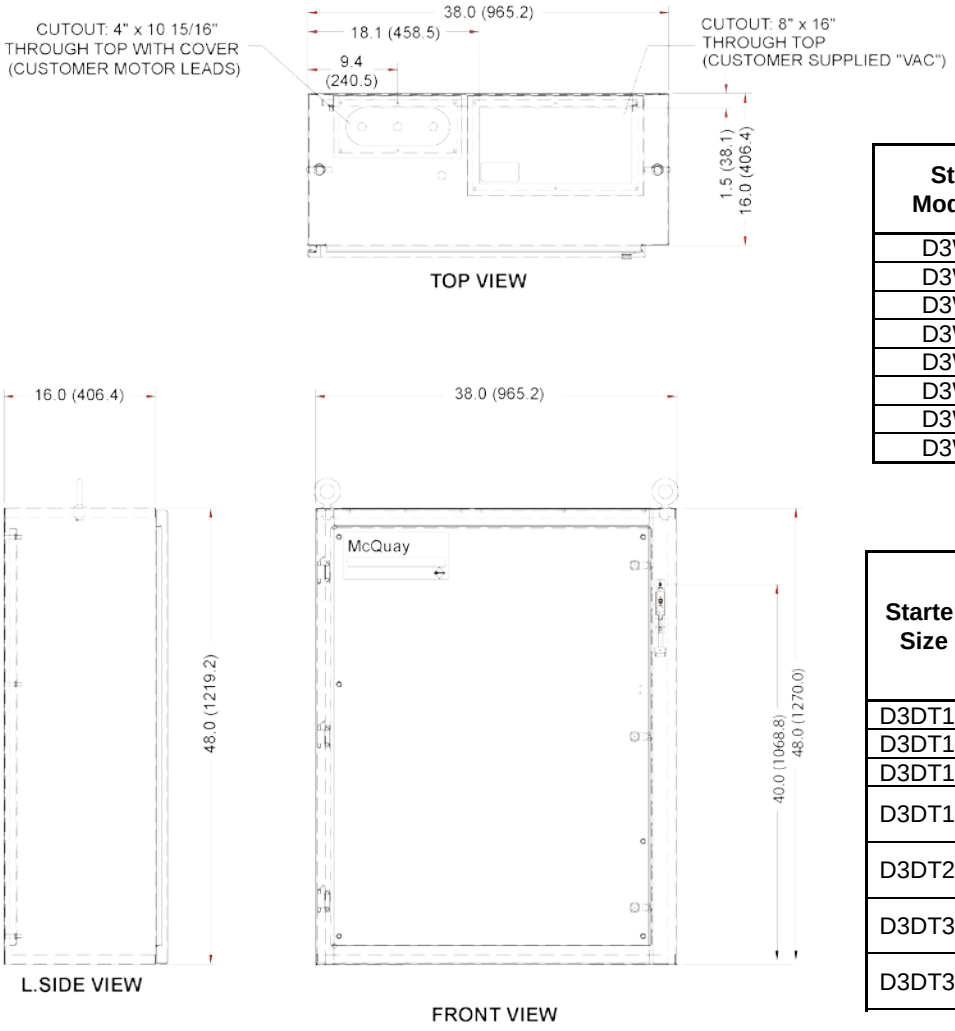
Starter Model No.	Incoming Lug Size, Std. Power Block	Outgoing Conn. Size
D3WD86	#2 - 600	0.66”
D3WD1K	#2 - 600	0.66”
D3WD2K	#2 - 600	0.66”

Starter Size	Breaker Size (Amps)	Standard	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DW86	1200	(4) #250-500	(4) #250-500
D3DW1K	1600	(5) #300-600	(5) #300-600
D3DW2K	2000	(5) #300-600	(5) #300-600

NOTES:

1. All dimensions in inches (mm)
2. Cable entry and exit through the enclosure top.
3. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit’s Technical Data Sheet to size any upstream protection devices required by local code.

Figure 15, Wye-Delta Starter, Unit Mounted, Models D3WT11 to D3WT43



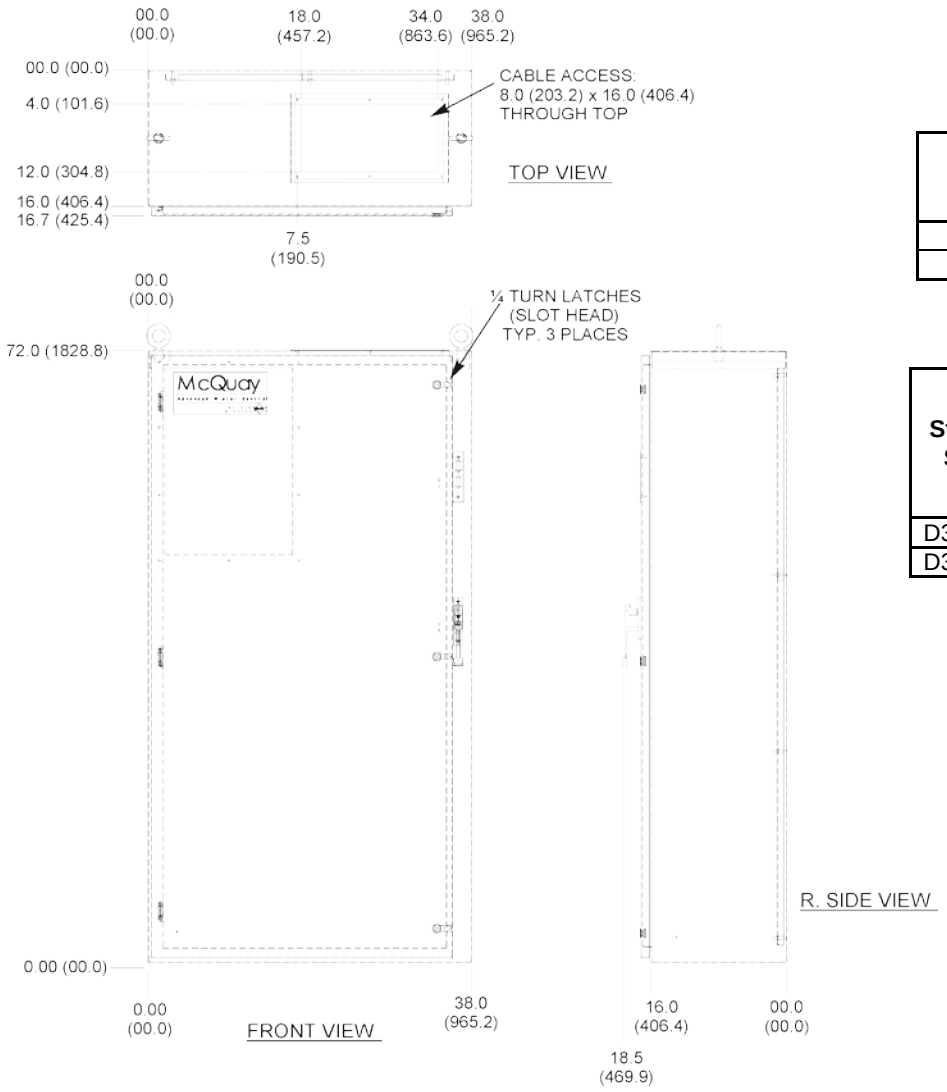
Starter Model No.	Incoming Lug Size,Std. Power Block
D3WT11	(2) #6 - 350
D3WT12	(2) #6 - 350
D3WT14	(2) #6 - 350
D3WT15	(2) #6 - 350
D3WT25	(2) #6 - 350
D3WT31	(2) #6 - 350
D3WT34	(2) #6 - 350
D3WT43	(2) #6 - 350

Starter Size	Breaker Size (Amps)	Standard	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DT11	200	#6-350	#6-350
D3DT12	250	#6-350	#6-350
D3DT14	250	#6-350	#6-350
D3DT15	300	(2) #3/0-500	#6-350
D3DT25	400	(2) #3/0-500	(2) #3/0-500
D3DT31	400	(2) #3/0-500	(2) #3/0-500
D3DT34	500	(2) #3/0-500	(2) #3/0-500

NOTES:

1. All dimensions are in inches (mm).
2. Power factor correction capacitors cannot be mounted in this size enclosure.
3. Incoming power connection is through the 8' x 16" plate at the right rear corner. Remove plate prior to drilling any holes.
4. The starter location is shown on the chiller unit dimension drawing.
5. Outgoing lugs are factory-connected to the motor on unit-mounted starters.
6. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit's Technical Data Sheet to size any upstream protection devices required by local code.

Figure 16, Wye-Delta Starter, Unit Mounted, Models D3WT62 to D3WT65



Starter Model No.	Incoming Lug Size, Standard Power Block
D3WT62	(4) #1/0-750
D3WT65	(4) #1/0-750

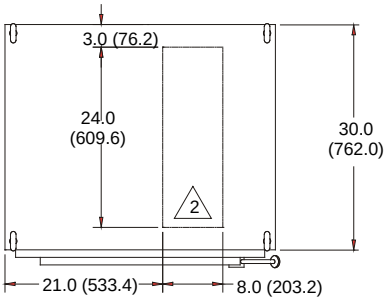
Starter Size	Breaker Size (Amps)	Optional	
		Incoming Lug Size Circuit Breaker	Incoming Lug Size Disconnect Switch
D3DT62	800	(2) #1-500	(2) #1-500
D3DT65	1000	(2) #1-500	(2) #1-500

NOTES:

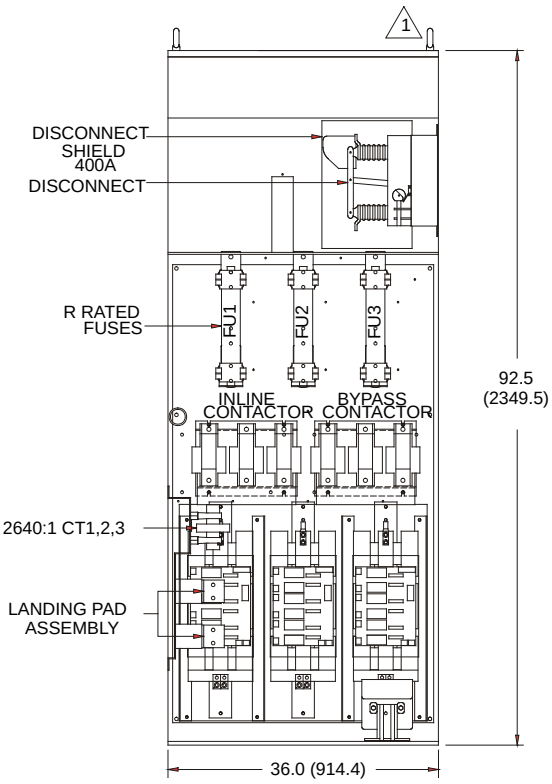
1. All dimensions are in inches (mm).
2. Power factor correction capacitors cannot be mounted in this size enclosure.
3. Incoming power connection is through the 8’ x 16” plate at the right rear corner. Remove plate prior to drilling any holes.
4. The starter location is shown on the chiller unit dimension drawing.
5. Outgoing lugs are factory-connected to the motor on factory-mounted starters.
6. The breaker sizes shown are for the breaker installed in the starter and used as a unit disconnect switch. Use the MOCP shown in the unit’s Technical Data Sheet to size any upstream protection devices required by local code.

Medium Voltage, Solid State (MVSS & HVSS)

Figure 17, Solid-state, Free-Standing Only



VIEW FROM TOP



FRONT INTERIOR VIEW

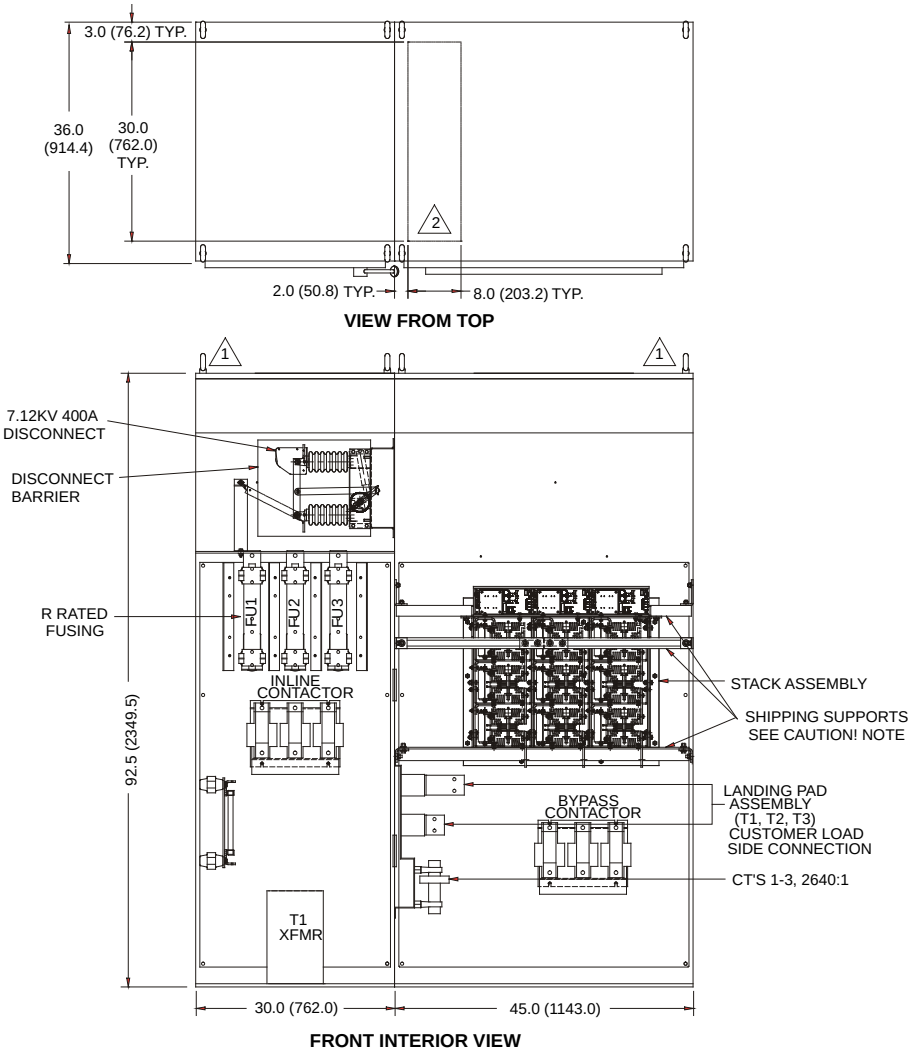
NOTES:

1. REMOVABLE LIFTING EYEBOLTS, PLUG HOLES IF REMOVED.
2. CABLE ENTRY/EXIT AREA. NO CUTOUT SUPPLIED. CUSTOMER TO CUT AS REQUIRED.
3. ENCLOSURE COLOR: ANSI 61 GREY
4. TIGHTEN BOLTS PER CHART BELOW

STEEL BOLT TORQUE IN FOOT-POUNDS				
1/4-20	5/16-18	3/8-16	1/2-13	5/8-11
5	12	20	50	95

5. STARTER WEIGHT: APPOXIMATELY 1800LBS
6. Incoming and outgoing connections are NEMA 2-hole pattern, ½-inch, 1 ¾-inch apart, as defined by NEMA Standard CC!-2 Bus Tabs per phase.
7. Dimensions shown are for standard starters without options that can affect unit dimensions and weight. Consult the local Daikin sales office for information.

Figure 18, Solid-state, Free-Standing Only, Medium Voltage, All Models HVSS 5100V to 7200V



NOTES: 1 REMOVABLE LIFTING EYEBOLTS, PLUG HOLES IF REMOVED.

2 CABLE EXIT AREA. NO CUTOUT SUPPLIED. CUSTOMER TO CUT AS REQUIRED.

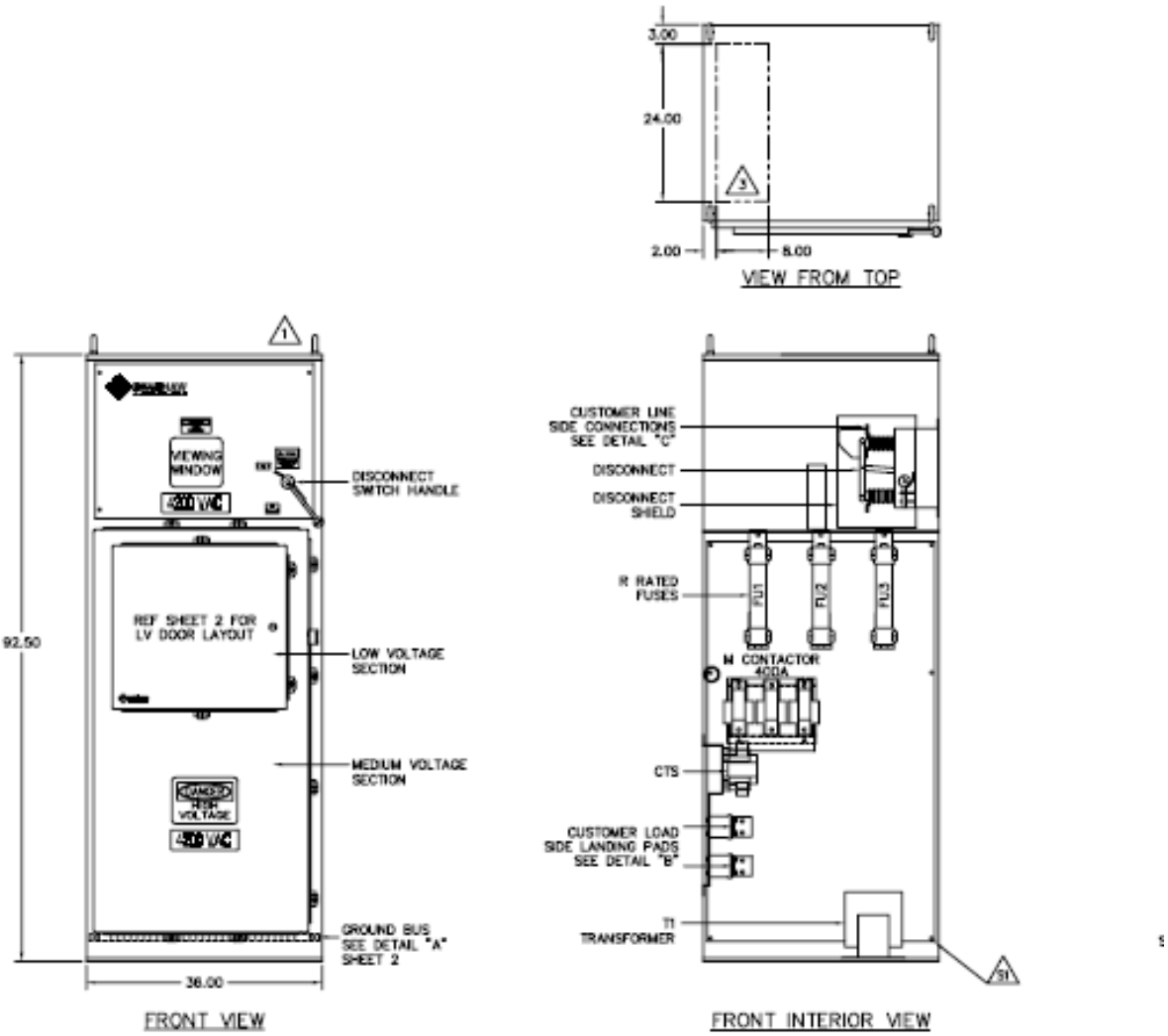
3. ENCLOSURE COLOR: ANSI 61 GREY.
4. TOTAL WEIGHT IS APPROXIMATELY 2400LBS.
5. TYPICAL LAYOUT FOR EACH STARTER.
6. TIGHTEN BOLTS PER CHART AT RIGHT.

STEEL BOLT TORQUE IN FOOT-POUNDS				
1/4-20	5/16-18	3/8-16	1/2-13	5/8-11
5	12	20	50	95

7. Dimensions shown are for standard starters without options that can affect unit dimensions and weight. Consult the local Daikin sales office for information.
8. Incoming and outgoing connections are NEMA 2-hole pattern, ½-inch, 1 ¾-inch apart, as defined by NEMA Standard CC!-2 Bus Tabs per phase.

Medium Voltage, Across-The-Line (MVAT & HVAT)

Figure 19, Across-the-Line, Medium Voltage Free-Standing Only
Models MVAT12-24, MVAT 16-25, MVAT13-26
Model MVAT 36

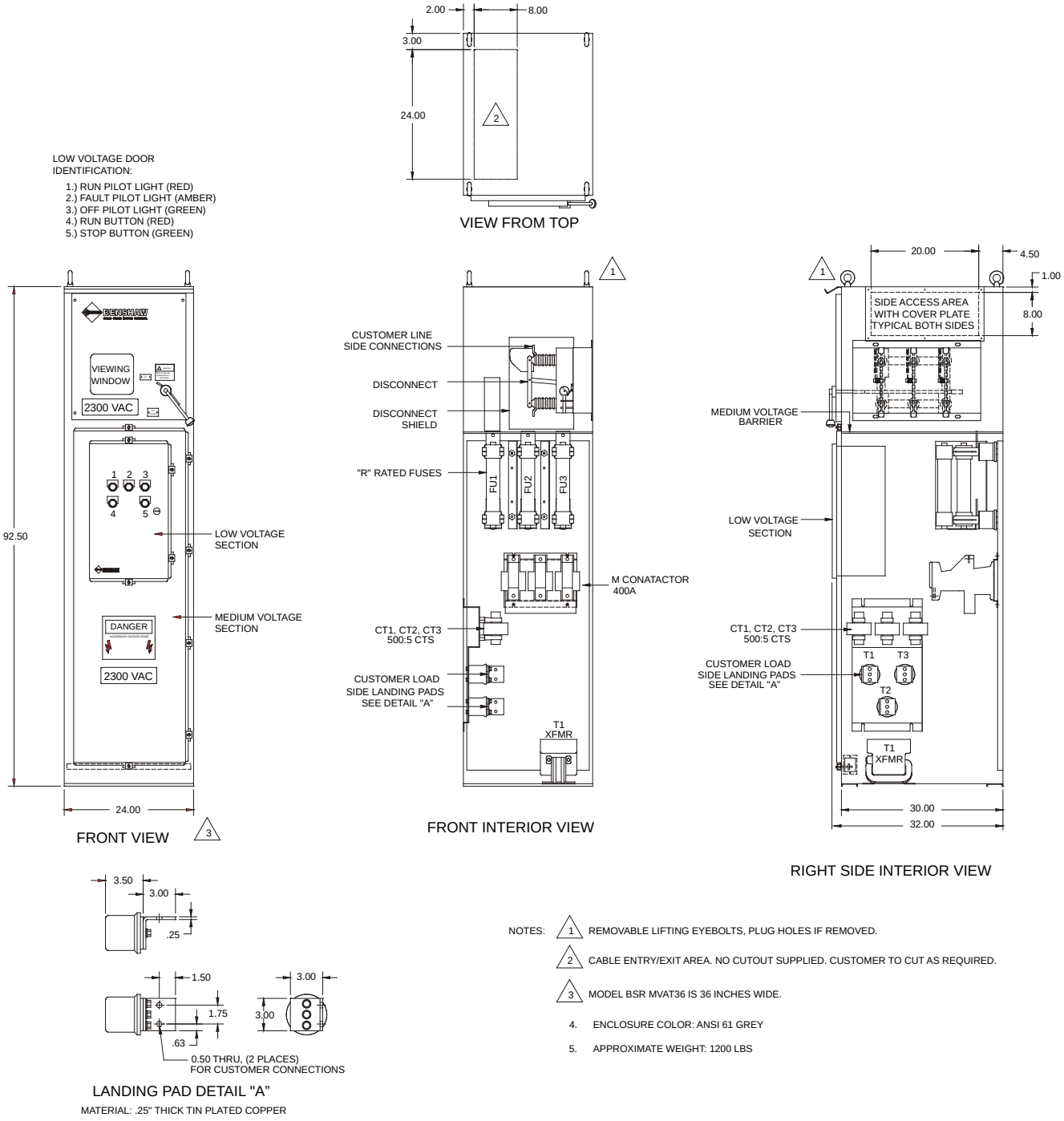


NOTES:

1. Δ1, Removable lifting eyebolts. Plug holes if removed
2. Δ2, Cable entry/exit area.
3. Δ3, Alternate cable entry/exit, cut as required.
4. Color is ANSI 61 grey
5. Approximate weight is 1200 lbs.
6. Incoming and outgoing connections are NEMA 2 ½-inch, 1 ¾-inch apart, as defined by NEMA St Bus Tabs per phase.

Figure 20 Across-the-Line, Medium Voltage, Free-Standing Only ,

Model HVAT27, 5100V to 7200V



Field Power Wiring

Power wiring between the starter and the compressor motor terminals must be field supplied and installed on units with remote-mounted, free-standing starters. See the field wiring diagram on page 32.

Wiring, fuse and wire size must be in accordance with the National Electric Code (NEC). Standard NEMA motor starters require modification to meet Daikin specifications. Refer to Daikin Specification 7359999 Rev 29 which is available on www.DaikinApplied.com .

Starter terminal size range is found on the specific starter dimension drawing beginning on page 9.

⚠ CAUTION

Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard. This is an important restriction that must be followed to avoid equipment damage..

Power wiring to compressors must be in proper phase sequence. Motor rotation is set up for clockwise rotation facing the lead end with phase sequence of 1-2-3. Care must be taken that the proper phase sequence is carried through the starter to compressor. With the phase sequence of 1-2-3 and L1 connected to T1 and T6, L2 connected to T2 and T4, and L3 connected to T3 and T5, rotation is proper. See diagram in terminal box cover.

The Daikin start-up technician will check the phase sequence.

Note: Do not make final connections to motor terminals until wiring has been checked and approved by a Daikin technician.

⚠ CAUTION

Connections to terminals must be made with copper lugs and copper wire to avoid possible equipment damage. Under no circumstances should a compressor be brought up to speed until proper sequence and rotation have been established. Serious damage can result if the compressor starts in the wrong direction. Such damage is not covered by product warranty

General Wiring Practice

Wire groups

Signal wiring refers to wires connected to the control terminals that are below 15V.

- Shielded wire is required to prevent electrical noise interference from causing improper operation or nuisance trips.
- Signal wire should be rated for at least 300V.
- Keep signal wire as far away as possible from control and power wiring.

Control wiring is wiring connected to the control terminal strip that carry 24V to 220V.

- Use only UL or CSA recognized wire.
- Use copper wire rated for 60/75°C.
- Power wiring to the motor must have the maximum possible separation from all other wiring. Do not run control wiring in the same conduit; this separation reduces the possibility of coupling electrical noise between circuits. Minimum spacing between metallic conduits containing different wiring groups should be three inches (76 mm).
- Minimum spacing between different wiring groups should be six inches (152 mm).

- Wire runs outside of an enclosure should be run in metallic conduit or have shielding/armor with equivalent attenuation.
- Wire groups should cross at 90 degrees whenever power and control wiring cross.
- Different wire groups should be run in separate conduits.
- Adhere to local electrical codes.
- The National Electrical Code and Canadian Electrical Code requires that an approved circuit disconnecting device be installed in series with the incoming AC supply in a location readily accessible to personnel installing or servicing this equipment. If a disconnect switch is not supplied with the starter, one must be installed.
- Supply and motor wiring will usually enter and leave the enclosure from the top. Wire connections can be determined to best suit specific installations. Wire runs should be properly braced to handle both starting and fault currents. Size power cable per local electrical codes. Long lengths of cable to the motor of over 150 feet must be de-rated.

BEFORE APPLYING MAIN POWER

The starter has been fully tested before leaving the factory to help a rapid and problem-free start-up. Before applying power to the starter, consult the start-up checklist below.

1. Inspect starter and remove any foreign matter.
2. Inspect the starter for any shipping damage.
3. Ensure that all electrical connections are as per the system schematics supplied with the starter and/or connection diagrams.
4. Ensure that all connections are properly tightened.
5. Test L to T resistance of each phase and ensure that it is greater than 50 kohms. Reverse leads and test again.
6. Check that the gate to cathode resistance of each SCR is between 8 and 50 ohms.
7. Check the resistance of all power and motor leads to ground to ensure that there is no foreign matter present or damage to the insulation which can short one or more of the phases to ground.
8. Apply 120 Vac control voltage to the starter.

Medium Voltage, Solid State, Across-the-Line

Incoming and outgoing connections are NEMA 2-hole pattern, ½-inch, 1 ¾-inch apart, as defined by NEMA Standard CC!-2 Bus Tabs per phase.

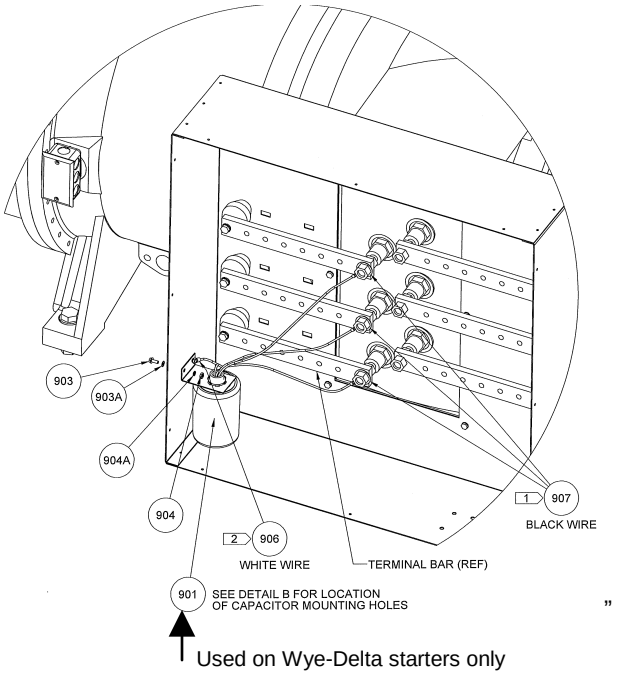
Compressor Motor Connections

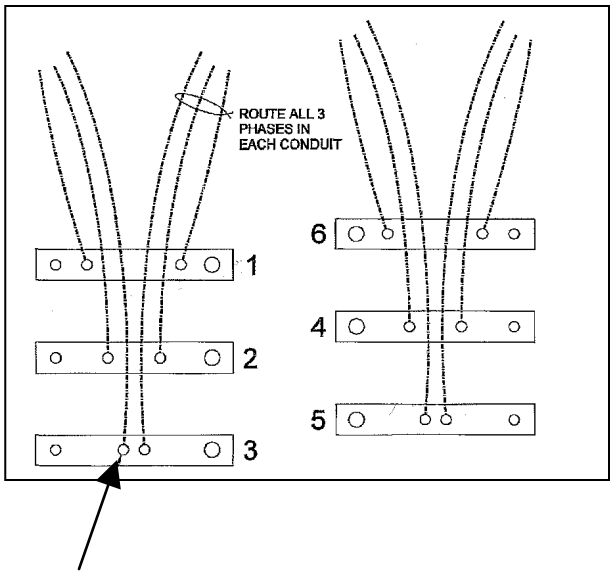
Power wiring connections at the motor are “spark plug” type terminals with threaded copper bar, sized per the following table.

Type/Size	Comp. Size	Terminal Size
Low Voltage to 750 A, to 575V	CE 063-126	0.635-11 UNC-2A, 1.88 in. long
Med. Voltage to 275 A, to 4160 V	CE 063-126	0.375-16 UNC-2A, 0.97 in. long
Hi Voltage to 275 A, to 7200 V	CE 063-126	0.375-16 UNC-2A, 1.00 in. long

NOTE: Connections on applications above 750A will have terminal buss bars with 3/8 in. holes. See details on following page.

Figure 21, Power Wiring over 750 Amps





Use 3/8 dia. Cadmium plated steel bolt, nut and lockwasher. Torque to 20 ft-lbs. Copper wire and lugs must be used.

Field Control Wiring

Control wiring is required between the starter and the unit for three purposes:

1. Transmit start and stop commands from the unit to the starter.
2. Transmit electrical information concerning motor operation from the starter to the unit control system.
3. Supply control power from the starter transformer to the unit control panels.

General Practice

Signal wiring refers to wires connected to the control terminals that are low voltage, below 15V.

- Shielded wire is required to prevent electrical noise interference from causing improper operation or nuisance trips.
- Signal wire should be rated for at least 300V.
- Keep signal wire as far away as possible from control and power wiring.

Control wiring refers to wires connected to the control terminal strip that carry 24V to 220V.

- Use only UL or CSA recognized wire.
- Use copper wire rated for 60/75°C.

Control Power Wiring

Control power wiring for starters covered in this manual is shown on Figure 23 on page 32. Low voltage starters may have additional control wiring as shown on Figure 22 if the optional full metering package is ordered with the unit.

The control circuit on the Daikin centrifugal packaged chiller is designed for 115-volts. Control power can be supplied from three different sources:

- If the unit is supplied with a factory-mounted starter, the control circuit power supply is factory-wired from a transformer located in the starter.
- A free-standing starter furnished by Daikin or by the customer to Daikin specifications, will have a control transformer in it and requires field wiring to terminals in the compressor terminal box.
- Power can be supplied from a separate circuit and fused at 20 amps inductive load. The control circuit disconnect switch must be tagged to prevent current interruption. **Other than for service work, the switch is to remain on at all times in order to keep oil heaters operative and prevent refrigerant from diluting the oil.**

⚠ DANGER

If a separate control power source is used, the following must be done to avoid severe personal injury or death from electrical shock. Place a notice on the unit that multiple power sources are connected to the unit. Place a notice on the main and control power disconnects that another source of power to the unit exists.

Separate Power Source

Chiller control power usually comes from a control transformer located in the starter and factory or field wired to the chiller control panel. In the event a separate transformer supplies control voltage, it must be rated at 3 KVA, with an inrush rating of 12 KVA minimum at 80% power factor and 95% secondary voltage. For control wire sizing, refer to NEC. Articles 215 and 310. In the absence of complete information to permit calculations, the voltage drop should be physically measured.

Table 2, Control Power Line Sizing

Maximum Length, ft (m)	Wire Size (AWG)	Maximum Length, ft (m)	Wire Size (AWG)
0 (0) to 50 (15.2)	12	120 (36.6) to 200 (61.0)	6
50 (15.2) to 75 (22.9)	10	200 (61.0) to 275 (83.8)	4
75 (22.9) to 120 (36.6)	8	275 (83.8) to 350 (106.7)	3

Notes:

1. Maximum length is the distance a conductor will traverse between the control power source and the unit control panel.
2. Panel terminal connectors will accommodate up to number 10 AWG wire. Larger conductors will require an intermediate junction box.

The Unit On/Off switch located in the Unit Control Panel should be turned to the "Off" position any time compressor operation is not desired.

Low Voltage Starters

Control wiring for low voltage starters is per the wiring diagram on page 32. If the optional “Full Metering Display” has been ordered, the following section will apply.

Full Metering Option

Remote mounted wye-delta, solid state, and across-the-line start field wiring to activate the optional ammeter display or ful display option on the chiller's operator interface panel. The wir the MX3 board in the starter to the compressor controller.

Wiring Connection on Starter for Optional Display

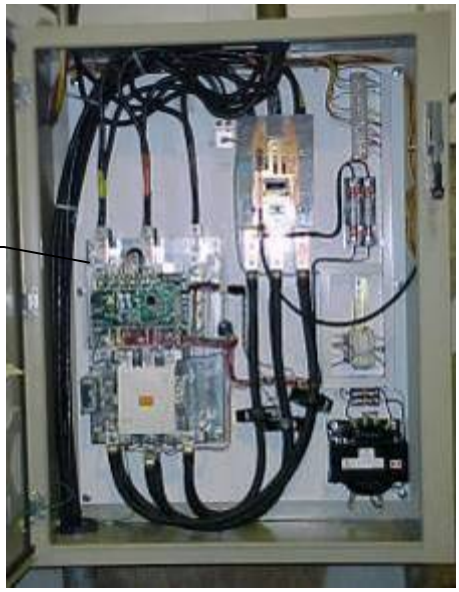
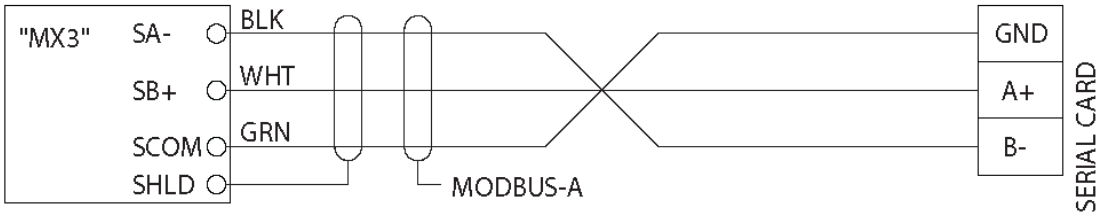


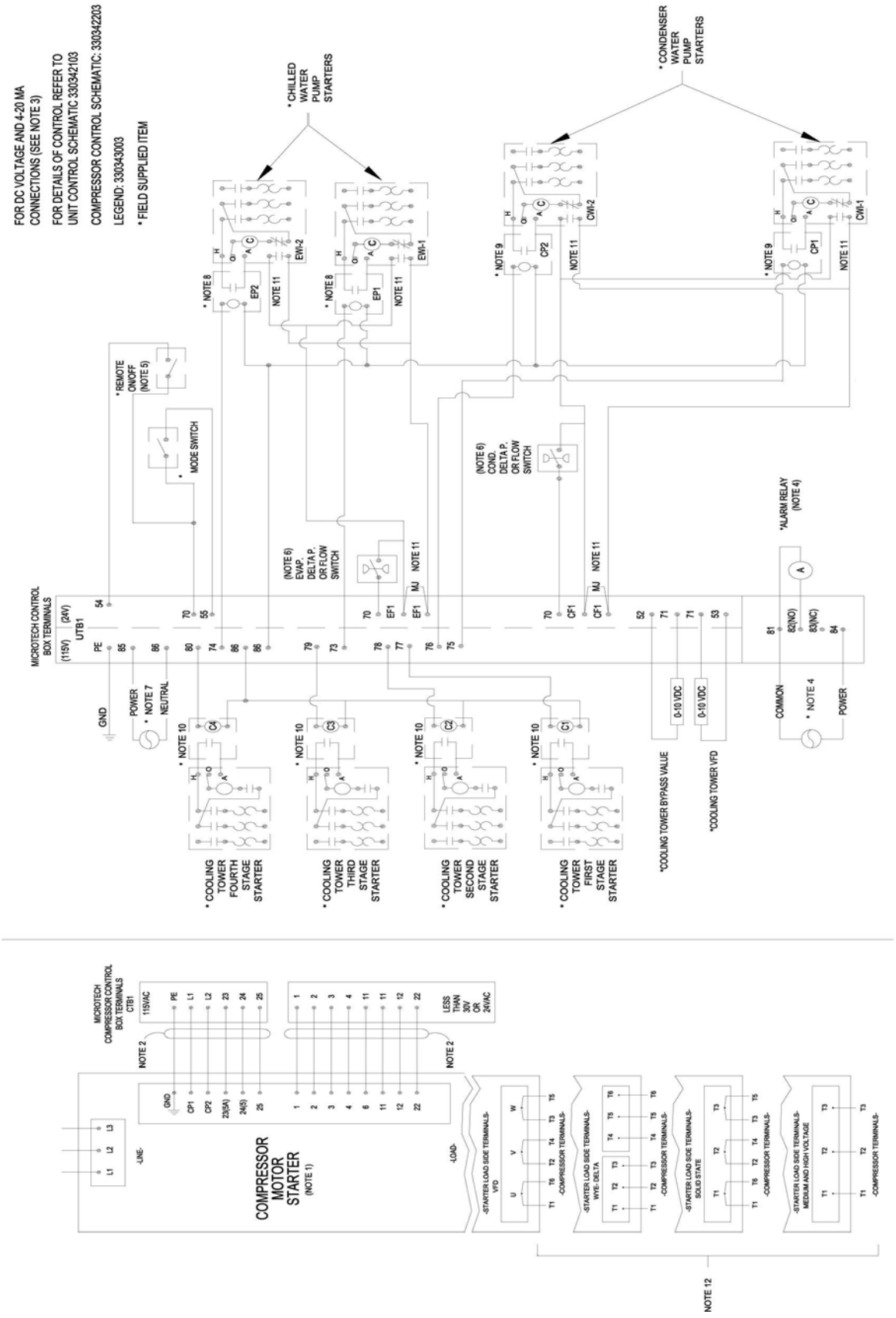
Figure 22, Wiring for Optional Display



NOTES:

- The serial card location is in the lower-center of the compressor controller located in the chiller control panel.
- The "MX3" is located in the starter.
- The connections are (-) to (-), (+) to (+) and SCOM to GND with s shield connection on the starter terminal board.
- Cable is Belden 9841 or equal (120 OHM characteristic impedence)

Figure 23, Control and Power Field Wiring



See notes on the following page.

NOTES for Wiring Diagram

1. Compressor motor starters are either factory mounted and wired, or shipped separate for field mounting and wiring. If provided by others, starters must comply with Daikin specification 359999 Rev29. All line and load side power conductors must be copper.
2. If starters are freestanding, then field wiring between the starter and the control panel is required. Minimum wire size for 115 Vac is 12 GA for a maximum length of 50 feet. If greater than 50 feet, refer to Daikin or recommended wire size minimum. Wire size for 24 Vac is 18 GA. All wiring to be installed as NEC Class 1 wiring system. All 24 Vac wiring must be run in separate conduit from 115 Vac wiring. Main power wiring between starter and motor terminal is factory-installed when units are supplied with unit-mounted starters. Wiring of free-standing starter must be wired in accordance with NEC and connection to compressor motor terminals must be made with copper wire and copper lugs only. Control wiring on free-standing starters is terminated on a terminal strip in the motor terminal box (not the unit control panel). Wiring from the unit control panel to the motor terminal is done in the factory.
3. For optional sensor wiring, see unit control diagram. It is recommended that DC wires be run separately from 115 Vac wiring.
4. Customer furnished 24 or 120 Vac power for alarm relay coil can be connected between UTB1 terminals 84 power and 51 neutral of the control panel. For normally open contacts, wire between 82 & 81. For normally closed contacts, wire between 83 & 81. The alarm is operator programmable. The maximum rating of the alarm relay coil is 25 VA.
5. Remote on/off control of can be accomplished by installing a set of dry contacts between terminals 70 and 54.
6. Evaporator and condenser paddle type flow or water pressure differential switches are required and must be wired as shown. If field supplied pressure differential switches are used then these must be installed across the vessel and not the pump. Factory-mounted thermal dispersion flow sensors are available as an option.
7. Customer supplied 115 Vac, 20 amp power for optional evaporator and condenser water pump control power and tower fans is supplied to unit control terminals (UTBI) 85 power / 86 neutral, PE equipment ground.
8. Optional customer supplied 115 Vac, 25 VA maximum coil rated chilled water pump relay (EP 1 & 2) can be wired as shown. This option will cycle the chilled water pump in response to building load.
9. The condenser water pump must cycle with the unit. A customer supplied 115 Vac 25 VA maximum coil rated condenser water pump relay (CP1 & 2) is to be wired as shown.
10. Optional customer supplied 115 Vac, 25 VA maximum coil rated cooling tower fan relays (CL - C4) can be wired as shown. This option will cycle the cooling tower fans in order to maintain unit head pressure.
11. Auxiliary 24 Vac rated contacts in the chilled and condenser water pump starters must be wired as shown.
12. For VFD, Wye-Delta, and solid state starters connected to six (6) terminal motors. The conductors between the starter and motor carry phase current and selection shall be based on 58 percent of the motor rated load amperes (RLA). Wiring of free-standing starter must be in accordance with the NEC and connection to the compressor motor terminals shall be made with copper wire and copper lugs only. Main power wiring between the starter and motor terminals is factory-installed when chillers are supplied with unit-mounted starters.
13. Optional Open Choices BAS interfaces. The locations and interconnection requirements for the various standard protocols are found in their respective installation manuals, obtainable from the local Daikin sales office and also shipped with each unit:

    Modbus IM 743 LonWorks IM 735 BACnet IM 906
14. The “Full Metering” or “Amps Only Metering” option will require some field wiring when free-standing starters are used. Wiring will depend on chiller and starter type. Consult the local Daikin sales office for information on specific selections.
15. For VFD, Wye-Delta, and solid state starters connected to six (6) terminal motors, the conductors between the starter and motor carry phase current and their ampacity must be based on 58 percent of the motor rated load amperes (RLA) times 1.25. Wiring of free-standing starter must be in accordance with the NEC and connection to the compressor motor terminals shall be made with copper wire and copper lugs only. Main power wiring between the starter and motor terminals is factory-installed when chillers are supplied with unit-mounted starters.

Starter Operation

General

The startup of Daikin centrifugal chillers, including the starters, is performed by Daikin authorized and trained technicians. They review the starter connections, phase sequence, and settings prior to starting the chiller.

Setting a freestanding starter and power and control wiring from it to the chiller is the responsibility of the owner/contractor. See the installation and power and control wiring sections of this manual before commencing installation.

In the rare instances where a starter is being replaced after the chiller has been in service, Daikin service is not automatically involved but can be contracted to supervise the starter installation.

The chiller controller starts and stops the compressor motor as required and is the only way to start it.

Starter Controller (MX3)

The MX3 starter control has a 2x16 character, back-lit LCD display/keypad that is mounted on the starter door, remotely from the MX3 control card inside the starter cabinet.

Figure 24, MX3 Display/Keyboard

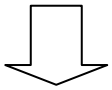
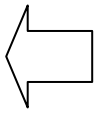
Description of the LEDs on the Keypad

The keypad provides three LED indicators (upper right-hand corner) in addition to the 2x16 character display. The LEDs provide starter status information.

LED	State	Indication
STOP	On	Stopped
	Flashing	Faulted
RUN	On	Running and up to speed
	Flashing	Running and not up to speed (ramping, decelerating
ALARM	Flashing	Alarm condition. If continues, a fault occurs

NOTE: By default, the [STOP] key is always active, regardless of selected control source (Local Source and Remote Source parameters). It may be disabled by using the Keypad Stop Disable (I/O 26) parameter.

Function of Keys

KEY	FUNCTION
start	The control logic is arranged such that only a command from the chiller's MicroTech controller will start the compressor. This start command has no effect on operation..
	Increase the value of a numeric parameter. Select the next value of an enumerated parameter. It scrolls forward through a list of parameters within a group (when the last parameter is displayed, it scrolls to the beginning of the list). When a list of faults is displayed, it moves from one fault to the next. When a list of events is displayed, it moves from one event to the next. When the starter is in the Operate Mode, pressing [UP] allows you to change which group of meter values is monitored.
	Decrease the value of a numeric parameter. Select the previous value of an enumerated parameter. It scrolls backward through a list of parameters within a group (when the first parameter is displayed, it scrolls to the end of the list). When a list of faults is displayed, it moves from one fault to the previous fault. When a list of events is displayed, it moves from one event to the previous event. When the starter is in the Operate Mode, pressing [DOWN] allows you to change which group of meter values is monitored.
	When editing a numeric parameter, the [LEFT] arrow key moves the cursor one digit to the left. If cursor is already at the most significant digit, it returns to the least significant digit on the right. When in Menu mode, the [LEFT] arrow allows groups to be scrolled through in the opposite direction of the [MENU] Key.
enter	Stores the change of a value. When in Fault History, [ENTER] key scrolls through information logged when a fault occurred. When in Event History, [ENTER] key scrolls through information logged when an event occurred. When an alarm condition exists, [ENTER] scrolls through all active alarms.
menu	Repeatedly pressing [MENU] scrolls between the operate screen and the available parameter groups. When viewing a parameter, pressing [MENU] jumps to the top of the menu. The first seven parameters groups are for setpoints and not used by the operator once set at commissioning. The last two are for fault and event review, see page 37.
stop reset	The [STOP/RESET] key halts the operation of the starter (Stop Key). If a fault has occurred, the [STOP/RESET] key is used to clear the fault (Reset Key). The [STOP/RESET] key always halts the operation of the starter if the control source is set to "Keypad". If the Control Source (QST 04/QST 05) is not set to "Keypad", the [STOP/RESET] key may be disabled using the Keypad Stop Disable (I/O 26) parameter.

Alphanumeric Display

The remote LCD keypad and display uses a 32-character alphanumeric LCD display. All starter functions can be accessed by the keypad. The keypad allows easy access to starter programming with parameter descriptions on the LCD display.

Power Up Screen

On power up, the software part numbers are displayed for a few seconds. Pressing any key immediately changes the display to the operate screen.

Operate Screen

The operate screen is the main screen. The operate screen is used to indicate the status of the starter, if it's running, what state it's in, and display the values of Meter 1 and Meter 2, which are selectable.

The Operate Screen is divided into five sections:

- Sections A and B display status information.
- Sections C and D display the meters selected by the Meter 1 and 2 parameters or by scrolling.
- Section S displays the source for the start command.

Figure 25, Operate Screen

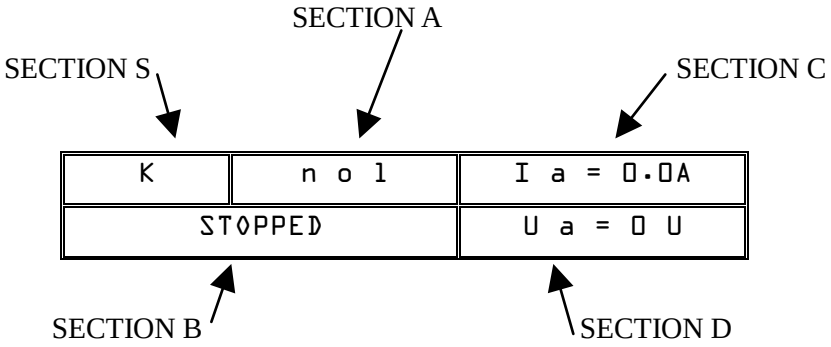


Table 3, Contents, Operate Screen Section A

Display	Description
NoL	L1, L2, L3 not present
Ready	Starter ready to run
Alarm	A fault condition is present. If it continues, a fault occurs
Run	Starter is running

Table 4, Contents, Operate Screen Section B

Display	Description
Stopped	Starter is stopped and no Faults
Fault	Starter tripped on a Fault
Heater	Starter is on and heating motor
Kick	Starter is applying kick current to the motor
Accel	Starter is accelerating the load
Kick 2	Starter is applying kick current to the motor in Ramp 2
Accel 2	Starter is accelerating the load in Ramp 2
Run	Starter is in Run mode and Ramp Time has expired
UTS	Starter is Up To Speed
Control	Phase Control or Current Follower mode
Decel	Starter is decelerating the load
Wye	In Wye-delta control indicates motor is accelerating in Wye mode
Slow Spd Fwd	Preset slow speed forward
Slow Spd Rev	Preset slow speed reverse
Braking	DC Injection Braking.
PORT	Power Outage Ride Through

Table 5, Contents, Operate Screen Section S

Display	Description
K	Keypad Control
T	Terminal Block Wiring Control
S	Serial Communication Connection Control

Meter Pages

Any meter value may be viewed by on the meter pages. There are 19 “Meter Pages” that are easily accessed to view all of the meter information. These meter pages are scrolled through by pressing the [UP] or [DOWN] down arrows from the operate screen.

Current I2= 0.0A I1= 0.0 I3= 0.0A
Voltage V2= 0V V1= 0 V3= 0V
MWatt Hour = 0 kWatt Hour = 0
Watts = 0 VA = 0
Motor PF = 0.00 VARS = 0
TruTorque = 0 Power = 0%
Overload = 0% Curr Imbal =0.0%
RS Gnd Cur = 0% ZS Gnd Cur= 0.0A
LST ST Tim=xx.xs PK ST Cur= xx.xA
Frequency =0.0H Phase = noL

Run Days =xxxx Run Hours = xx:xx
Analog In =0.1% Analog Out =0.0%
Starts =xxxx
Temps Ts= --- To= --- Tb= ---
1= Off 3= Off 2= Off 4= Off
5= Off 7= Off 6= Off 8= Off
9= Off 11= Off 10= Off 12= Off
13= Off 15= Off 14= Off 16= Off
hh:mm:ssA mm/dd/yy

Fault Log Screen

Information regarding each fault is available through the remote MX3 LCD display.

FL# Fault ## NNNNNNNN

- FL#: = Fault Log Number. FL1 is the most recent fault and FL9 is the oldest fault.
- Fault ## = Fault Code
- NNN… = Fault Name, or the condition when the fault occurred.

Press [MENU] until you get to the FL1 parameter.

Pressing the [UP] and [DOWN] keys navigates through older and newer faults in the log.

When you get to your fault on the screen begin pressing the [ENTER] key repeatedly. This will rotate through the steps below to show the conditions the starter was in when the fault occurred.

Enter Step	
1	Fault Description.
2	Status when the fault occurred, Run, Stopped, Accel. etc.
3	The L1 current at the time of the fault.
4	The L2 current at the time of the fault.
5	The L3 current at the time of the fault.
6	L1-2 voltage at the time of the fault.
7	L2-3 voltage at the time of the fault.
8	L3-1 voltage at the time of the fault.
9	kW at the time of the fault.
10	Frequency at the time of the fault.
11	Run time since last run time reset.

Fault Screen

When a Fault occurs, the main screen is replaced with a fault screen. The screen shows the fault number and the name of the fault. The main status screen is not shown until the fault is reset.

The STOP LED flashes when a fault occurs,

```
Fault ##
Fault Name
```

Resetting Faults

When a fault occurs, the fault number will be displayed on the starter control screen. Go to Fault Code Troubleshooting Charts beginning on page 42 to ascertain possible remedies and correct them. To reset from a fault condition, press the [stop/reset] button on the starter controller. Failure of the unit to restart indicates that the fault has not been properly fixed and further intervention is required.

Event Recorder

An event is anything that changes the present state of the starter. Examples of events include a start, a stop, an overload alarm or a fault.

```
E##: Event ###
Event
```

The event recorder stores the last 99 events.

Press [MENU] until you get to the E01 parameter.

Pressing [UP] or [DOWN] will scroll through the last 99 events and displays the event or fault code on top, and the event or fault that changed the starter's state on the bottom.

Pressing [ENTER] gives the starter state condition at the time of event.

Press [ENTER] again to give you the time of the event.

Press [ENTER] again to give you the date that the event occurred.

NOTE: After pressing [ENTER] you can shift through all the different starter states, times and dates by using the [UP] and [DOWN] arrows.

Lockout Screen

When a lockout is present, one of the following screens will be displayed. The main status screen is not shown until the lockout is cleared.

The overload lockout displays the overload content and the time until reset if an overload occurs.

```
Overload   Lockout
96%        xx.xx
```

The stack over temperature lockout will be displayed if a stack over temperature is detected.

```
Stack Overtemp
Lockout
```

The control power lockout will be displayed if the control power is not within specifications.

```
Control Power
Lockout
```

The disconnect open lockout will be displayed if a digital input is programmed to "disconnect" and the input is not on.

```
Disconnect 0pen
Lockout
```

The time between starts lockout displays the time until the next start is allowed when PFN 21 is programmed.

```
Time btw Starts
Lockout XX:XX
```

The backspin timer lockout displays the time until the next restart when PFN 20 is programmed.

```
Backspin Timer
Lockout XX:XX
```

The starts per hour lockout displays the time until the next start is allowed when PFN 22 is programmed.

```
Starts per Hour
Lockout XX:XX
```

The motor PTC lockout is displayed when the motor thermistor is overheated or defective.

```
Motor PTC
Lockout
```

The RTD lockout displays the hottest RTD that tripped the starter.

```
RTD Lockout
RTD##= XXXC
```

The communications loss is displayed when the starter loses communication with the remote RTD modules.

```
RTD Lockout
RTD##commloss
```

The open lockout is displayed when the RTD module senses an open RTD.

```
RTD Lockout
RTD##= 0pen
```

The short lockout is displayed when the RTD module senses a shorted RTD.

```
RTD Lockout
RTD##= Shrt
```

NOTE: XX:XX is the time remaining until the lockout releases.

Alarm Screen

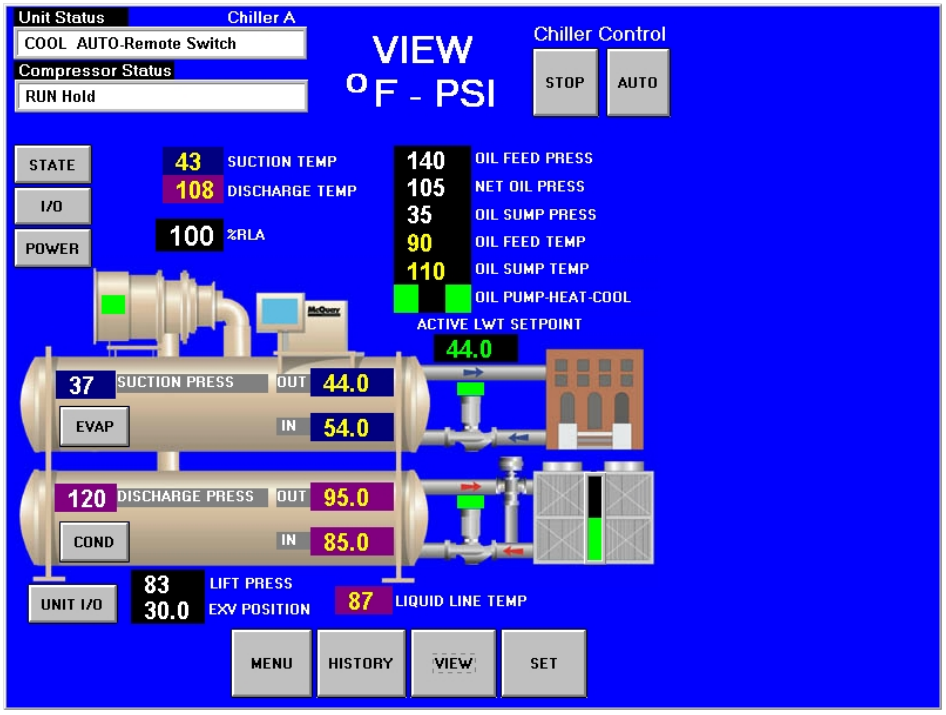
When an alarm is present, the word “Alarm” is displayed on the operate screen. Pressing the [ENTER] key displays more information about the alarm.

```
Alarm ##
Alarm Name
```

Viewing Data

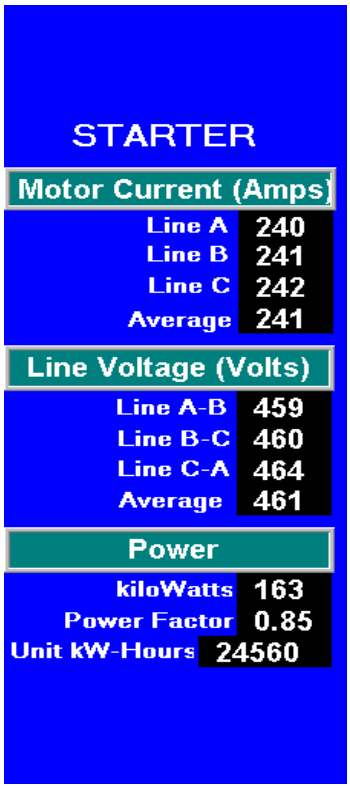
Starter information is available on the starter-mounted LED as explained beginning on page 34. If the optional “Full Meter Display” (available only on low voltage starters) is ordered with the unit, power information will also be available on the chiller’s operator interface touchscreen, as explained below.

Figure 26, Optional Starter View Screen



The standard Home screen is shown above. The ability to view the starter's power characteristics and to set starter setpoints on the operator interface screen is an optional extra available at the time of purchase. If the optional "Full Meter Display" is supplied on the unit, the "POWER" button (or "STARTER" in some software versions) will be visible on the upper left side of the VIEW screen as shown above. Pressing this button will open the screen shown in Figure 27 in the blank area to the right of the screen shown above.

Figure 27, Expanded Starter View Screen



The screen shown to the right will be superimposed on the right side of the VIEW screen shown in Figure 26 when the optional "Full Meter Display" is included with the unit.

If the "Full Meter Display" package is not ordered, only the Percent Unit RLA amps will appear on the Home screen. This Starter/Power screen will remain visible until another display button; such as STATE, I/O, etc, is selected.

The option will also provide a starter setpoint screen in Figure 28. Without this option, the setpoints are m on the starter keypad.

Figure 28, Optional Starter Setpoint Screen

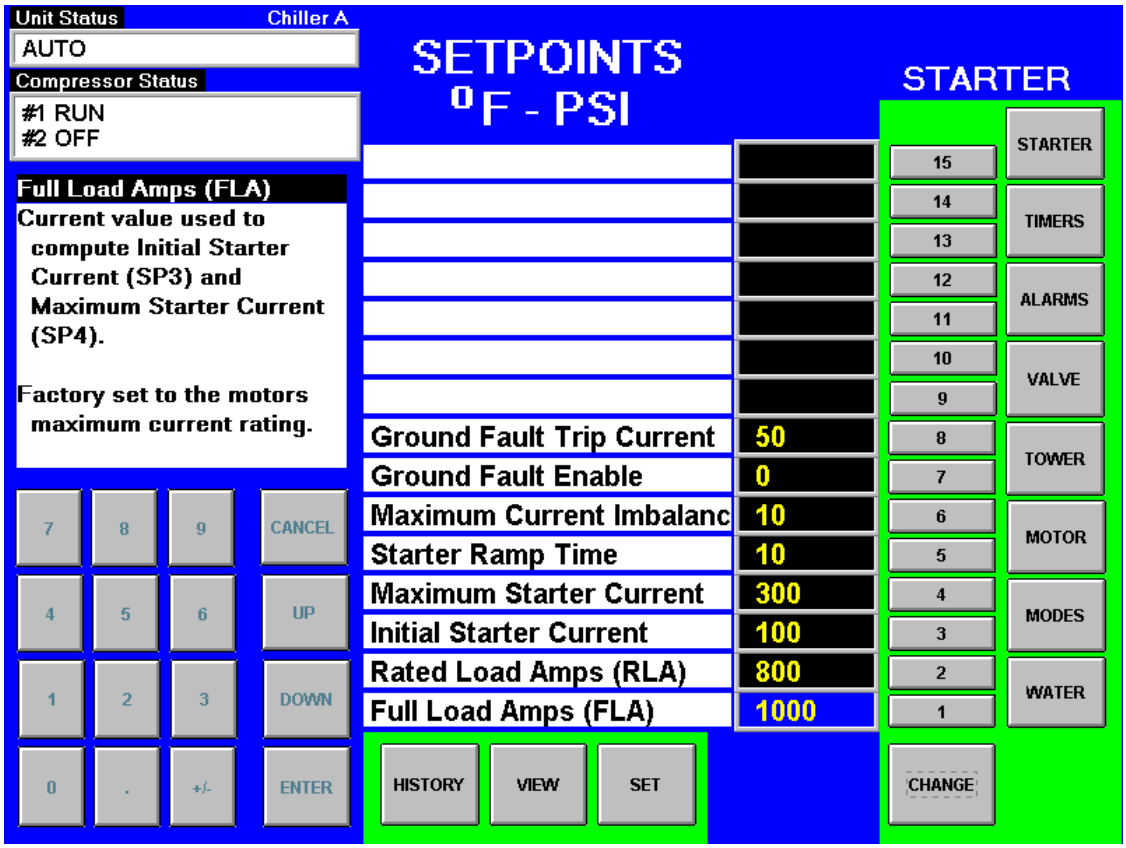


Table 6, Starter Setpoints

Description	No.	Default	Range	Pass-word	Comments
Ground Fault Current Trip	8	1 %	1 to 100% RLA	M	Sets the value for ground current above which the compressor will be shut down
Ground Fault Enable	7	OFF	On or OFF	M	Turns the ground fault option on or off
Maximum Current Unbalance	6	10%	5% to 40%	T	Sets the value for current unbalance above which the compressor will be shut down
Starter Ramp Time	5	15 sec.	0 to 30 seconds	T	Sets the time the starter ramps up the motor current
Maximum Starter Current	4	600%	100% to 800% of FLA (SP1)	T	Sets the maximum current when the compressor starts
Initial Starter Current	3	100%	50% to 400% of FLA (SP1)	T	Sets the initial current when the compressor starts
Rated load Amps	2	1 A	Factory set at design conditions	T	Value that gives the 100% RLA value and used for motor protection
Full Load Amps	1	1 A	Factory set to motor max current rating	T	Value used to compute SP3 and SP4

1. The setpoints shown above are for solid state starters. Other types of starters will have slightly different setpoints. Units without the starter display option have the setpoints set in the starter itself.
2. Do not change these setpoints after factory startup.
3. Do not remove the MX3 control wiring. If accidentally disconnected, contact Daikin service.

Fault Code Troubleshooting Chart

The following is a list of possible fault messages that can be generated by the MX3 starter control.

Code	Description	Detailed Description of Fault / Possible Solutions
F01	UTS Time Limit Expired	Motor did not achieve full speed before the UTS timer (QST 09, P9) expired.
		Check motor for jammed or overloaded condition.
		Verify that the combined kick time (CFN11, P14) and acceleration ramp time (QST 08, P8) is shorter than the UTS timer setting.
		Evaluate acceleration ramp settings. The acceleration ramp settings may be too low to permit the motor to start and achieve full speed. If so, revise acceleration ramp settings to provide more motor torque during starting.
		Evaluate UTS timer setting and, if acceptable, increase UTS timer setting (QST 09, P9).
F02 (F OL)	Motor Thermal Overload Trip	The MX3 motor thermal overload protection has tripped.
		Check motor for mechanical failure, jammed, or overloaded condition.
		Verify the motor thermal overload parameter settings (QST 03, P3 and PFN 12-16, P35-38) and motor service factor setting (QST 02, P2).
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.
		If motor OL trip occurs during starting, review acceleration ramp profile settings.
		Verify that there is not an input line power quality problem or excessive line distortion present.
		Verify that PF caps, if installed, are ahead of CT's.
		Reset overload when content falls below 15%.
F10	Phase Rotation Error, not ABC	Input phase rotation is not ABC and Input Phase Sensitivity parameter (FUN 04, P67) is set to ABC only.
		Verify correct phase rotation of input power. Correct wiring if necessary.
		Verify correct setting of Input Phase Sensitivity parameter (FUN 04, P67).
F11	Phase Rotation Error, not CBA	Input phase rotation is not CBA and Input Phase Sensitivity parameter (FUN 04, P67) is set to CBA only.
		Verify correct phase rotation of input power. Correct wiring if necessary.
		Verify correct setting of Input Phase Sensitivity parameter (FUN 04, P67).
F12	Low Line Frequency	Line frequency below 23 Hz was detected.
		Verify input line frequency.
		If operating on a generator, check generator speed governor for malfunctions.
		Check input supply for open fuses or open connections
		Line power quality problem / excessive line distortion.

Code	Description	Detailed Description of Fault / Possible Solutions
F13	High Line Frequency	Line frequency above 72 Hz was detected.
		Verify input line frequency.
		If operating on a generator, check generator speed governor for malfunctions.
		Line power quality problem / excessive line distortion.
F14	Input power not single phase	Three-phase power has been detected when the starter is expecting single-phase power.
		Verify that input power is single phase.
		Verify that single-phase power is connected to the L1 and L2 inputs. Correct wiring if necessary.
		Verify that the SCR gate wires are properly connected to the MX3 control board.
F15	Input power not three phase	Single-phase power has been detected when the starter is expecting three-phase power.
		Verify that input power is three phase. Correct wiring if necessary.
		Verify that the SCR gate wires are properly connected to the MX3 control board.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.
F21	Low Line L1-L2	Low voltage below the Undervoltage Trip Level parameter setting (PFN 08, P31) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Check input supply for open fuses or open connections.
		On medium voltage systems, verify wiring of the voltage measurement circuit.
F22	Low Line L2-L3	Low voltage below the Undervoltage Trip Level parameter setting (PFN 08, P31) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Check input supply for open fuses or open connections.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.
F23	Low Line L3-L1	Low voltage below the Undervoltage Trip Level parameter setting (PFN 08, P31) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Check input supply for open fuses or open connections.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.

Code	Description	Detailed Description of Fault / Possible Solutions
F24	High Line L1-L2	High voltage above the Over voltage Trip Level parameter setting (PFN 07, P30) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Line power quality problems/ excessive line distortions.
F25	High Line L2-L3	High voltage above the Over voltage Trip Level parameter setting (PFN 07, P30) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Line power quality problems/ excessive line distortions.
F26	High Line L3-L1	High voltage above the Over voltage Trip Level parameter setting (PFN 07, P30) was detected for longer than the Over/Under Voltage Trip delay time (PFN 09, P32).
		Verify that the actual input voltage level is correct.
		Verify that the Rated Voltage parameter (FUN 05, P66) is set correctly.
		Line power quality problems/ excessive line distortions.
F27	Phase Loss	The MX3 control has detected the loss of one or more input or output phases when the starter was running. Can also be caused by line power dropouts.
		Check input supply for open fuses.
		Check power supply wiring for open or intermittent connections.
		Check motor wiring for open or intermittent connections.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.
		Check Gate and Cathode connections to MX3 board
F28	No Line	No input voltage was detected for longer than the Inline Configuration time delay parameter setting (I/O 15, P53) when a start command was given to the starter.
		If an inline contactor is being used, verify that the setting of the Inline Configuration time delay parameter (I/O 15, P53) allows enough time for the inline contactor to completely close before the No Line fault occurs.
		Check input supply for open disconnects, open fuses, open circuit breakers, or disconnected wiring.
		Verify that the SCR gate wires are properly connected to the MX3 control board.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.

Fault Code	Description	Detailed Description of Fault / Possible Solutions
F30	I.O.C. (Instantaneous Overcurrent Current)	During operation, the MX3 controller detected a very high level of current in one or more phases.
		Check motor wiring for short circuits or ground faults.
		Check motor for short circuits or ground faults.
		Check if power factor or surge capacitors are installed on the motor side of the starter.
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.
F31	Overcurrent	Motor current exceeded the Over Current Trip Level setting (PFN 01, P24) for longer than the Over Current Trip Delay Time setting (PFN 02, P25).
		Check motor for a jammed or an overload condition.
F34	Undercurrent	Motor current dropped under the Under Current Trip Level setting (PFN 03, P26) for longer than the Under Current Trip Delay time setting (PFN 04, P27).
		Check system for cause of under current condition.
F37	Current Imbalance	A current imbalance larger than the Current Imbalance Trip Level parameter setting (PFN 05, P28) was present for longer than ten (10) seconds.
		Check motor wiring for cause of imbalance. (Verify dual voltage and 6 lead motors for correct wiring configuration).
		Check for large input voltage imbalances that can result in large current imbalances.
		Check motor for internal problems.
F38	Ground Fault	Ground current above the Ground Fault Trip level setting (PFN 06, P29) has been detected for longer than 3 seconds.
		Check motor wiring for ground faults.
		Check motor for ground faults.
		Megger motor and cabling (disconnect from starter before testing).
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.
		Verify that the CTs are installed with all the White dots towards the input line.
F39	No Current at Run	Motor current went below 10% of FLA while the starter was running.
		Verify Motor Connections.
		Verify the CT wiring to the MX3 control board.
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.

Fault Code	Description	Detailed Description of Fault / Possible Solutions
F39	No Current at Run (Cont'd)	Check if load is still connected to starter
		Check if motor may have been driven by the load (a regeneration condition)
		Check Gate and Cathode connections to MX3 for loose connections.
		Check for inline contactor or disconnect.
F40	Shorted / Open SCR	A shorted or open SCR condition has been detected.
		Verify that all SCR gate leads wires are properly connected at the SCR devices and the MX3 control board.
		Check all SCRs with ohmmeter for shorts.
		Verify that the Input Phase Sensitivity parameter setting (FUN 04, P67) is correct.
		Verify that the Starter Type parameter setting (FUN 07, P64) is correct.
		Verify the motor wiring. (Verify dual voltage motors for correct wiring configuration).
F41	Current at Stop	Motor current was detected while the starter was not running.
		Examine starter for shorted SCRs.
		Examine bypass contactor (if present) to verify that it is open when starter is stopped.
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.
F47	Stack Protection Fault (stack thermal overload)	The MX3 electronic power stack OL protection has detected an overload condition.
		Check motor for jammed or overloaded condition.
		Verify Starter Model Number parameter setting (FUN 13, P70) is correct (if available).
		Verify that the CT ratio (FUN 03, P68) and burden switch settings are correct.
		Motor load exceeds power stack rating. Consult factory
F48	Bypass /2M Contactor Fault	A digital input has been programmed as a Bypass/2M Contactor Feedback input and an incorrect bypass feedback has been detected for longer than the Bypass Confirm time parameter setting (I/O 16, P54).
		Verify that the bypass/2M contactor coil and feedback wiring is correct.
		Verify that the relay output that is connected to the bypass/2M contactor(s) is programmed to the UTS function.
		Verify that the bypass/2M contactor power supply is present.
		Verify that the appropriate Digital Input Configuration parameter has been programmed correctly.
		Verify that the bypass contactor(s) are actually not damaged or faulty.

Continued on next page.

Fault Code	Description	Detailed Description of Fault / Possible Solutions
F50	Control Power Low	Low control power (below 90V) has been detected while running, by the MX3 controller.
		Verify that the control power input level is correct especially during starting when there may be significant line voltage drop.
		Check control power transformer tap setting (if available).
		Check control power transformer fuses (if present).
		Check wiring between control power source and starter.
F51	Current Sensor Offset Error	Indicates that the MX3 control board self-diagnostics have detected a problem with one or more of the current sensor inputs.
		Verify that the motor FLA (QST 01, P1), CT ratio (FUN 03, P68), and burden switch settings are correct.
		Verify that no actual current is flowing through any of the starter's CTs when the starter is not running.
		Consult factory if fault persists.
F52	Burden Switch Error	The burden switch settings were changed when starter was running. Only change burden switches when starter is not running.
F60	External Fault on DI#1 Input	DI#1 has been programmed as a fault type digital input and the input indicates a fault condition is present.
		Verify that the appropriate Digital Input Configuration parameter has been programmed correctly.
		Verify wiring and level of input.
F61	External Fault on DI#2 Input	DI#2 has been programmed as a fault type digital input and input indicates a fault condition is present.
		Verify that the appropriate Digital Input Configuration parameter has been programmed correctly.
		Verify wiring and level of input.
F62	External Fault on DI#3 input	DI#3 input has been programmed as a fault type digital input and input indicates a fault condition is present.
		Verify that the appropriate Digital Input Configuration parameter has been programmed correctly.
		Verify wiring and level of input.

Continued on next page.

Fault Code	Description	Detailed Description of Fault / Possible Solutions
F71	Analog Input Level Fault Trip.	Based on the Analog Input parameter settings, the analog input level has either exceeded or dropped below the Analog Input Trip Level setting (I/O 08, P46) for longer than the Analog Input Trip Delay time (I/O 09, P47).
		Measure value of analog input to verify correct reading.
		Verify settings of all Analog Input parameters (I/O 07-11, P45-49).
		Verify correct positioning of input jumper JP3 (Voltage or Current) on the MX3 control card.
		Verify correct grounding of analog input connection to prevent noise or ground loops from affecting input.
F81	SPI Communication Fault	Indicates that communication has been lost with a remote device such as a remote keypad. (This fault will normally occur if the remote keypad is disconnected while the MX3 control board is powered up. Only connect and disconnect a remote keypad when the control power is off.)
		Verify that the remote keypad cable has not been damaged and that its connectors are firmly seated at both the keypad and the MX3 Control board.
		Verify that the display interface board (when present) is firmly attached to MX3 control card.
		Route keypad cables away from high power and/or high noise areas to reduce possible electrical noise pickup.
F82	Modbus Timeout Fault	Indicates that the starter has lost serial communications. Fault occurs when the starter has not received a valid serial communications within the Communication Timeout parameter (FUN 12, P59) defined time.
		Verify communication parameter settings (FUN 10-12, P59-P61).
		Check wiring between the remote network and the MX3 control card.
		Examine remote system for cause of communication loss.
F94	CPU Error – SW fault	Typically occurs when attempting to run a version of control software that is incompatible with the MX3 control board hardware being used. Verify that the software is a correct version for the MX3 control board being used. Consult factory for more details.
		Fault can also occur if the MX3 control has detected an internal software problem. Consult factory.
F95	CPU Error – Parameter EEPROM Checksum Fault	The non-volatile user parameter values have been found to be corrupted. Typically occurs when the MX3 control is re-flashed with new software.
		Perform a Factory Parameter reset and then properly set all user parameters before resuming normal operation.

Fault Code	Description	Detailed Description of Fault / Possible Solutions
		If fault persists after performing a Factory Parameter reset, consult factory.
F96	CPU Error	The MX3 control has detected an internal CPU problem. Consult factory.
F97	CPU Error – SW Watchdog Fault	The MX3 control has detected an internal software problem. Consult factory.
F98	CPU Error	The MX3 control has detected an internal CPU problem. Consult factory.
F99	CPU Error – Program EPROM Checksum Fault	The non-volatile program memory has been corrupted.
		Consult factory. Control software will need to be reloaded in to the MX3 control card before normal operation can resume.

General Troubleshooting Chart

The following troubleshooting charts can be used to help solve many of the more common problems that may occur.

Motor does not start, no output to motor

Condition	Cause	Solution
Display Blank, CPU Heartbeat LED on MX3 board not blinking.	Control voltage absent.	Check for proper control voltage input. Verify fuses and wiring.
	MX3 control board problem.	Consult factory.
Fault Displayed.	Fault Occurred.	See fault code troubleshooting table for more details.
Start command given but nothing happens.	Start/Stop control input problems.	Verify that the start/stop wiring and start input voltage levels are correct.
	Control Source parameters (P4-5) not set correctly.	Verify that the parameters are set correctly.
NOL or No Line is displayed and a start command is given, it will fault in F28.	No line voltage has been detected by the MX3 when a start command is given.	Check input supply for inline contactor, open disconnects, open fuses, open circuit breakers, or disconnected wiring.
		Verify that the SCR gate wires are properly connected to the D3 control board.
		On medium voltage systems, verify wiring of the voltage feedback measurement circuit.
		See fault code troubleshooting table for more details.

During starting, motor rotates but does not reach full speed

Condition	Cause	Solution
Fault Displayed.	Fault Occurred.	See fault code troubleshooting table for more details.
Display shows Accel or Run.	Maximum Motor Current setting (P7) set too low.	Review acceleration ramp settings.
	Motor loading too high and/or current not dropping below 175% FLA indicating that the motor has not come up to speed.	Reduce load on motor during starting.
	Motor FLA (P1) or CT ratio (P1 & P15) parameter set incorrectly.	Verify that Motor FLA and CT ratio parameters are set correctly.
	Abnormally low line voltage.	Fix cause of low line voltage.
	A mechanical or supplemental brake is still engaged.	Verify that any external brakes are disengaged.
Motor Hums before turning	Initial current to low	Increase initial current
	FLA or CT incorrect	Verify FLA or CT's

Acceleration not operating as desired

Condition	Cause	Solution
Motor accelerates too quickly.	Ramp time (P8) too short.	Increase ramp time.
	Initial current (P6) set too high.	Decrease Initial current.
	Maximum current (P7) set too high.	Decrease Maximum current.
	Kick start current (P13) too high.	Decrease or turn off Kick current.
	Kick start time (P14) too long.	Decrease Kick time.
	Motor RLA (P1) or CT ratio (P15) parameter set incorrectly.	Verify that Motor FLA and CT ratio parameters are set correctly.
	Starter Type parameter (P64) set incorrectly.	Verify that Starter Type parameter is set correctly.
Motor accelerates too slowly	Maximum Motor Current setting (P7) set too low.	Review acceleration ramp settings.
	Motor loading too high.	Reduce load on motor during starting.
	Motor RLA (P1) or CT ratio (P15) parameter set incorrectly.	Verify that Motor FLA and CT ratio parameters are set correctly.
	Abnormally low line voltage.	Fix cause of low line voltage.
	Ramp time to long	Decrease ramp time

Motor stops unexpectedly while running

Condition	Cause	Solution
Fault Displayed.	Fault Occurred.	See fault code troubleshooting table for more details.
Ready Displayed.	Start command lost.	Verify start command input signal is present or serial communications start command is present.
		Check any permissives that may be wired into the run command (Start/Stop)
Display Blank, Heartbeat LED on MX3 board not blinking.	Control voltage absent.	Check for proper control voltage input. Verify wiring and fuses.
	MX3 control board problem.	Consult factory.

Metering incorrect

Condition	Cause	Solution
Power Metering not reading correctly.	CTs installed or wired incorrectly.	Verify correct CT wiring and verify that the CTs are installed with all the White dots towards the input line side.
	CT ratio parameter (FUN 03, P68) set incorrectly.	Verify that the CT ratio parameter is set correctly.
	Burden switches set incorrectly.	Verify that the burden switches are set correctly.
PF Meter not reading correctly.	CTs installed or wired incorrectly.	Verify correct CT wiring and verify that the CTs are installed with all the White dots towards the input line side.
Motor Current or Voltage meters fluctuating with steady load.	Energy Saver active.	Turn off Energy Saver if not desired.
	Loose connections.	Shut off all power and check all connections.
	SCR fault.	Verify that the SCRs gate leads are connected properly and the SCRs are ok.
	Load actually not steady.	Verify that the load is actually steady and that there are not mechanical issues.
	Other equipment on same power feed causing power fluctuations and/or distortion.	Fix cause of power fluctuations and/or distortion.
Voltage Metering not reading correctly.	In medium voltage systems, Rated Voltage parameter (FUN 05, P66) set incorrectly.	Verify that Rated Voltage parameter is set correctly.
Current Metering not reading correctly.	CT ratio parameter (FUN 03, P68) set incorrectly.	Verify that the CT ratio parameter is set correctly.
	Burden switches set incorrectly.	Verify that the burden switches are set correctly.
	CTs installed or wired incorrectly.	Verify correct CT wiring and verify that the CTs are installed with all the White dots towards the input line side.
Ground Fault Current Metering not reading correctly.	CT ratio parameter (FUN 03, P68) set incorrectly.	Verify that the CT ratio parameter is set correctly.
	Burden switches set incorrectly.	Verify that the burden switches are set correctly.
	CTs installed or wired incorrectly.	Verify correct CT wiring and verify that the CTs are installed with all the White dots towards the input line side.

Other Situations

Condition	Cause	Solution
Motor Rotates in Wrong Direction	Phasing incorrect	If input phasing correct, exchange any two output wires.
		If input phasing incorrect, exchange any two input wires.
Erratic Operation	Loose connections	Shut off all power and check all connections.
Motor Overheats	Motor overloaded	Reduce motor load.
	Too many starts per hour	Allow for adequate motor cooling between starts. Set Hot/Cold ratio higher or lengthen cooling time.
	High ambient temperature	Reduce ambient temperature or provide for better cooling. Set OL class lower to compensate for ambient temperature.
	Acceleration time too long	Reduce starting load and/or review acceleration ramp settings.
	Incorrect motor OL settings	Review and correct if necessary motor OL settings.
	Motor cooling obstructed/damaged	Remove cooling air obstructions. Check motor cooling fan.
Starter cooling fans do not operate (When Present)	Fan power supply lost	Verify fan power supply, check fuses.
	Fan wiring problem	Check fan wiring.
	Fan failure	Replace fan
Analog Output not functioning properly	Voltage/Current output jumper (JP1) not set correctly.	Set jumper to give correct output.
	Wiring problem	Verify output wiring.
	Analog Output Function parameter (I/O 12, P50) set incorrectly.	Verify that the Analog Output Function parameter is set correctly.
	Analog Output Offset and/or Span parameters (I/O 13-14, P51-52) set incorrectly.	Verify that the Analog Output Span and Offset parameters are set correctly.
	Load on analog output too high.	Verify that load on analog output meets MX3 control analog output specifications.
	Ground loop or noise problems.	Verify correct grounding of analog output connection to prevent noise or ground loops from affecting output.

Preventive Maintenance

During Commissioning

- Torque all power connections during commissioning, including pre-wired equipment.
- Check all control wiring for loose connections.
- If fans are installed, check for proper operation.

One Month After Commissioning

- Re-torque all power connections, including pre-wired equipment.
- If fans are installed, check for proper operation.

After First Month of Operation

- Re-torque all power connections, including pre-wired equipment annually.
- Clean accumulated dust with clean compressed air.
- Inspect cooling fans, if present, every three months.
- Clean or replace air vent filters every three months.

Daikin Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to Daikin's Standard Terms and Conditions of Sale and Limited Product Warranty. Consult your local Daikin Representative for warranty details. Refer to form 933-430285Y. To find your local representative, go to www.DaikinApplied.com .

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