TOSHIBA

Reliability *in motion*

Q7 Adjustable Speed Drive Installation and Operation Manual

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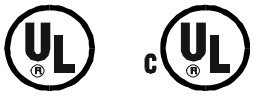

About This Manual

This manual was written by the Toshiba Technical Publications Group. This group is tasked with providing technical documentation for the **Q7 Adjustable Speed Drive**. Every effort has been made to provide accurate and concise information to you, our customer.

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Contacting Toshiba's Customer Support Center

Toshiba's helpful Customer Support Center has been rated among the best in the industry and can be contacted to obtain assistance in resolving any **Q7 Adjustable Speed Drive** system problem that you may experience or to provide application information.

The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is US (800) 231-1412/Fax (713) 466-8773 — Canada (800) 527-1204.

You may also contact Toshiba by writing to:

Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041-9990
Attn: ASD Product Manager.

For further information on Toshiba's products and services, please visit our website at **TIC.TOSHIBA.COM**.

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Introduction

Congratulations on the purchase of the new **Q7 Adjustable Speed Drive** (ASD). The **Q7 ASD** is a solid-state AC drive. The **Q7 ASD** is ideally suited to drive the variable torque load in your HVAC system. Toshiba's technology, quality, and reliability enables the motor to develop good torque and provide compensation for motor slip, which results in smooth, quick starts and highly efficient operation. The **Q7 ASD** uses digitally-controlled pulse width modulation. The programmable functions may be accessed via the easy-to-use menu. These features, combined with Toshiba's high-performance software, delivers unparalleled motor control and reliability. The **Q7 ASD** is also compatible with Windows CE® and PALM®.

The **Q7 ASD** is a very powerful tool, yet surprisingly simple to operate. The **Q7 ASD** has an easy-to-read LCD screen that provides easy access to the many monitoring and programming features of the **Q7 ASD**.

The motor control software is menu-driven, which allows for easy access to the motor control parameters and quick changes when required.

To maximize the abilities of your new **Q7 ASD**, a working familiarity with this manual will be required. This manual has been prepared for the **Q7 ASD** installer/operator.

Whether you are using the **Q7 ASD Power Unit** or the **Integrated Enclosure,** both are truly **Reliability** *in motion.*

This Manual's Purpose and Scope

This manual provides information that will assist the qualified installer/operator in the safe installation and operation of the **Q7 ASD**.

This manual provides information on the various features that pertain to the installation and operation of this powerful cost-saving device and is applicable to the **Q7 ASD** only.

Important Notice

This manual may not cover all of the variations of ASD applications, nor may it provide information on every possible contingency concerning installation.

The contents of this manual shall not become a part of or modify any prior agreement, commitment, or relationship between the customer and Toshiba International Corporation. The sales contract contains the entire obligation of Toshiba International Corporation. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation's ASD Division and any statements contained herein do not create new warranties or modify the existing warranty.

Any electrical or mechanical modifications to this equipment without prior written consent of Toshiba International Corporation will void all warranties and may void the UL/CUL listing or other safety certifications. Unauthorized modifications may also result in equipment damage or personal injury.

TOSHIBA INTERNATIONAL CORPORATION

Q7 Adjustable Speed Drive

Please complete the Warranty Card supplied with the ASD and return it to Toshiba by prepaid mail. This will activate the 12 month warranty from the date of installation; but, shall not exceed 18 months from the date of purchase.

Complete the following information about the drive and retain it for your records.

Q7 Model Number: _____

Q7 Serial Number: _____

Project Number (if applicable): _____

Date of Installation: _____

Inspected By: _____

Name of Application: _____

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Safety Precautions

DANGER!

Rotating shafts and electrical equipment can be hazardous. Installation, operation, and maintenance shall be performed by **Qualified Personnel** only.

Qualified Personnel shall be:

- Familiar with the construction and function of the ASD, the equipment being driven, and the hazards involved.
- Trained and authorized to safely clear faults, ground and tag circuits, energize and de-energize circuits in accordance with established safety practices.
- Trained in the proper care and use of protective equipment in accordance with established safety practices.
- Able to recognize and properly address hazards associated with the application of motor-driven equipment.

Installation of ASD systems should conform to the **2002 National Electrical Code Article 110** (NEC) (*Requirements For Electrical Installations*), all regulations of the **Occupational Safety and Health Administration**, and any other applicable national, regional, or industry codes and standards.

- Ensure that the **Run** functions (**F**, **R**, **Preset Speed**, etc.) of the ASD are off before performing a **Reset**. The post-reset settings may allow the ASD to start unexpectedly.
- In the event of a power failure, the motor may restart after power is restored.
- **Retry** or **Reset** settings may allow the motor to start unexpectedly. Warnings to this effect should be clearly posted near the ASD and motor.

DO NOT install, operate, perform maintenance, or dispose of this equipment until you have read and understood all of the product warnings and user directions. Failure to do so may result in equipment damage, operator injury, or loss of life.

Lock out and tag out all power feeding the enclosure before opening the door of the enclosure.

Installation Precautions

DANGER!

- Use lockout/tagout procedures on the branch circuit disconnect feeding the enclosure before installing or servicing the ASD.
- **Do Not** mount the device in a location that would produce catastrophic results if it were to fall from its mounting location (equipment damage or injury).
- Select a mounting location that is easily accessible by the user.
- Avoid installation in areas where vibration, heat, humidity, dust, metal particles, or high levels of electrical noise (EMI) are present.
- Do not install the ASD where it may be exposed to flammable chemicals or gasses, water, solvents, or other fluids.
- Always ground the unit to prevent electrical shock to personnel and to help reduce electrical noise. The input, output, and control power cables are to be run separately and each shall have its own ground cable.

Note: *Conduit is not an acceptable ground.*

- Ensure that the 3 phase input power is **Not** connected to the output of the ASD. This may destroy the ASD and may cause injury to personnel.
- **Do Not** connect resistors across terminals PA – PC or PO – PC. This may cause a fire.
- Do not install the ASD if it is damaged or if it is missing any component(s).
- Turn the power on only after attaching the front cover.

It is the responsibility of the person installing the ASD or the electrical maintenance personnel to setup the **Emergency Off** braking system of the ASD. The function of the **Emergency Off** braking function is to remove output power from the drive in the event of an emergency. A supplemental braking system may also be engaged in the event of an emergency.

Note: *A supplemental emergency stopping system should be used with the ASD. Emergency stopping should not be a task of the ASD alone.*

It is the responsibility of the person installing the ASD or the electrical maintenance personnel to provide proper grounding and branch circuit protection in accordance with the **2002 NEC** and applicable local codes.

Adequate working space and illumination must be provided for adjustment, inspection, and maintenance of the ASD (see **2002 NEC Article 110-16**).

A noncombustible insulating floor or mat should be provided in the area immediately surrounding the electrical system.

Follow all warnings and precautions and do not exceed equipment ratings.

Ensure the correct phase sequence and the desired direction of motor rotation in the **Bypass** mode.

If using multiple motors provide separate overload protection for each motor and use V/f control.

See the section titled Installation and Connections on pg. 5 for additional information on installing the drive.

External dynamic braking resistors must be thermally protected.

Maintenance Precautions

DANGER!

- Use lockout/tagout procedures on the upstream branch circuit disconnect before servicing the ASD or connected load. Turning off the enclosure breaker is not sufficient to protect service personnel.
- The ASD maintains a residual charge for a while after the circuit breaker (MCP) is switched off. Wait at least five minutes before servicing the ASD after removing power from the ASD. Ensure that the **Charge LED** is off.
- Ensure that the **Charge Indicator** and the MCP are off before performing an inspection or maintenance.
- **Do Not** attempt to disassemble, modify, or repair the ASD. Call your Toshiba sales representative for repair information.
- Do not place any objects inside of the ASD.
- Turn the power on only after attaching the front cover and **Do Not** remove the front cover of the ASD when the power is on.
- If the ASD should emit smoke or an unusual odor or sound, turn the power off immediately.
- The heat sink and the discharge resistors may become extremely hot to the touch. Allow the unit to cool before coming in contact or performing service on these items.
- Remove power from the ASD during extended periods of non-use.
- The system should be inspected periodically for damaged or improperly functioning parts, cleanliness, and to ensure that the connectors are tightened securely.
- Replace damaged components and ensure proper system grounding before blown fuse replacement.

Service Life Information

Part Name	Service Life	Remarks
Large Capacity Electrolytic Capacitor	5 Years	When not used for long periods, charge semi-annually.
Cooling Fan	26,000 Hours	
CN Connectors	100 Connects/Disconnects	
On-board Relays	500,000 Actuations	

Adjustable Speed Drive Inspection

Upon receipt, perform the following checks:

- Inspect the unit for shipping damage.
- Check for loose, broken, or damaged parts.
- Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.

Report any discrepancies to your Toshiba sales representative.

Storage

Store the device in a well ventilated location (in its shipping carton is recommended).

Avoid storage locations of extreme temperatures, high humidity, dust, or metal particles.

Disposal

Do not dispose of the unit via incineration.

Contact the local or state environmental agency in your area for details on the proper disposal of electrical components and packaging.

Device Types and Installation

The **Q7 Adjustable Speed Drive** is available in two system configurations: the stand-alone ASD unit housed within a plastic enclosure and the stand-alone unit enclosed within the **Integrated Enclosure**. The available Q7 ASD typeforms and HP ranges for the 230, 460, and the 600 volt units are listed in the section titled Current/Voltage Specifications on pg. 60.

The **Integrated Enclosure** configuration includes an increased-sized enclosure, bypass circuitry, and system protection hardware as standard features. Both systems perform all of the ASD functions that Toshiba has become known for including the ability to run at 110 % for up to 60 seconds. The Q7 ASD has the added advantage of being offered at a significantly reduced cost when compared to comparably sized ASD units.

Installation and Connections

The **Q7 Adjustable Speed Drive** may be set up initially by performing a few simple configuration settings. To operate properly, the ASD must be securely mounted and connected to a power source (3-phase AC input at the **L1/R**, **L2/S**, and **L3/T** terminals). The control terminals of the ASD may be used by connecting the terminals of the **Control Terminal Strip** to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 14 for an expanded description of the system control options).

The output terminals of the ASD (**T1/U**, **T2/V**, and **T3/W**) must be connected to the motor that is to be controlled.

See Figure 6 on pg. 15 for the connection diagram of the stand-alone Q7 ASD and Figure 8 on pg. 18 for the connection diagram of the **Q7 Integrated Enclosure** configuration.

As a minimum, the installation of the ASD shall conform to **Article 110** of the **2002 NEC**, the **Occupational Safety and Health Administration** requirements, and to any other local and regional industry codes and standards.

Installation Notes

When a brake-equipped motor is connected to the ASD, it is possible that the brake may not release at startup because of insufficient voltage. To avoid this, **Do Not** connect the brake or the brake contactor to the output of the ASD.

Do Not apply commercial power to the output terminals **T1/U**, **T2/V**, or **T3/W**.

If an output contactor is used for bypass operation, it must be interlocked such that commercial power is never applied to the output terminals of the ASD (**T1/U**, **T2/V**, or **T3/W**).

If a secondary magnetic contactor (MC) is used between the output of the ASD and the motor, it should be interlocked such that the **ST – CC** terminals are disconnected before the output contactor is opened.

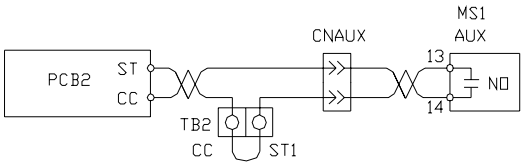
Do Not open and then close a secondary magnetic contactor between the ASD and the motor unless the ASD is off and the motor is not rotating.

Note: *Re-application of power via a secondary contact while the ASD is on or while the motor is still turning may cause ASD damage.*

On some devices the **ST**-to-**CC** connection is further enhanced by the operation of the **MS1 AUX** relay circuit (see Figure 1 on pg. 6). The **MS1 AUX** relay circuit is normally open and closes the **ST**-to-**CC** connection (via **ST1**) only after normal system power is available. The **MS1 AUX** relay circuit prohibits the **ST**-to-**CC** connection in the event that the **MS1** contactor fails to close during start up or if

MS1 opens while the ASD is running. For the 230 volt ASD this feature is available on the 30 HP system, on the 460 and 600-volt ASD's this feature is available on the 75 HP and above systems.

Figure 1. MS1 AUX Circuit Configuration.



The motor circuit protector (MCP) that is used on the **L1**, **L2**, and **L3** input power lines has a **Shunt Trip** feature (optional) which may be used to further enhance the system protection function of the Q7 ASD. The **Shunt Trip** feature may be connected such that the **L1**, **L2**, and **L3** MCP may be opened by a state change of another circuit. If another circuit is experiencing a problem which warrants a system shutdown, the **L1**, **L2**, and **L3** MCP will be opened by opening the **Shunt Trip** circuit. During normal operation the **Shunt Trip** circuit is closed.

The Q7 ASD is shipped with jumpers connected to the following terminals:

ST to CC (coasts to stop if removed),

S4 to CC (Emergency Off trip if removed),

CIA to CIB (Test mode operation only), and

DRA to DRB (Disables the ASD mode and Bypass mode if open).

All four jumper connections are required for normal operation of the Q7 ASD while in the default settings configuration (see the section titled Default Setting Changes on pg. 32 for information on changing the default settings and section Q7 Integrated Enclosure Theory of Operation on pg. 16 for jumper requirement information).

The ASD input voltage should remain within 10% of the specified input voltage range. Input voltages approaching the upper or lower limit settings may require that the overvoltage and undervoltage stall protection level parameters be adjusted. Voltages outside of the permissible tolerance should be avoided.

The input power frequency should be ±2 Hz of the specified input frequency.

Do not use an ASD with a motor that has a higher power rating than the rated output of the ASD.

The ASD is designed to operate NEMA B motors. Consult with your sales representative before using the ASD for special applications such as with an explosion-proof motor or applications with a piston load.

Disconnect the ASD (or isolate via contactors) from the motor before megging or applying a bypass voltage to the motor.

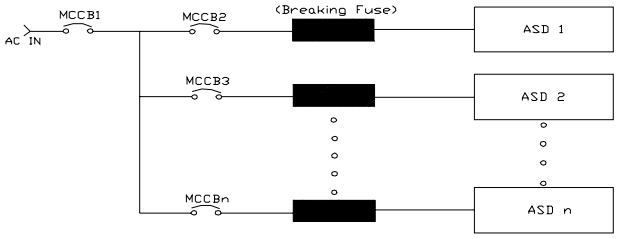
Interface problems may occur when the Q7 ASD is used in conjunction with some types of process controllers. Signal isolation may be required to prevent controller and/or ASD malfunction. The Q7 ASD option, ASD-ISO-1, provides isolation of the **Control Board** output circuit from the **AM/FM** output and from the **II** input (for further information on the ASD-ISO-1 option contact your Toshiba sales representative or contact the manufacturer of the process controller for additional information on controller compatibility and signal isolation).

Use caution when setting the output frequency. Over speeding a motor decreases its ability to deliver torque and may result in damage to the motor and/or the driven equipment.

All Q7 ASDs are equipped with internal DC bus fuses. However, not all Q7 ASDs are equipped with internal primary power input fuses (HP dependent). When connecting two or more drives that have no internal fuse to the same power line as shown in Figure 2 on pg. 7, it will be necessary to select a circuit-

breaking configuration that will ensure that if a short circuit occurs in ASD 1, only MCCB2 trips, not MCCB1. If it is not feasible to use this configuration, insert a fuse between MCCB2 and ASD 1.

Figure 2. Circuit breaker configuration.



Mounting the ASD

Caution!

The ambient operating temperature rating for the Q7 is from 14 to 104° F (-10 to 40° C). The process of converting AC to DC, and then back to AC produces heat. During normal ASD operation, up to 5% of the input energy to the ASD may be dissipated as heat.

The stand-alone ASDs that are housed in the plastic enclosure should be installed securely using the four mounting holes on the rear of the ASD in a well ventilated area that is out of direct sunlight.

When installing multiple stand-alone ASDs, ensure that there is a clearance space of at least 8 inches (20 cm) from the top and the bottom of adjacent units. There should be at least 2 inches (5 cm) on either side of adjacent units. For the models below 50 HP the top and bottom clearance specifications may be reduced to 4 inches (10 cm). This space ensures that adequate ventilation is provided (see the section titled Enclosure Dimensions and Conduit Plate Information on pg. 48 for additional information on mounting space requirements).

Note: *Ensure that the ventilation openings are not obstructed.*

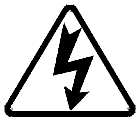
Do Not operate the ASD with the enclosure door open.

ASDs produce high-frequency noise — steps must be taken during installation to avoid the negative effects of noise. Listed below are some examples of measures that will help to combat noise problems.

- Separate the input and output power conductors of the main circuit. Do not install the input and output wires in the same duct or in parallel with each other, and do not bind them together.
- Do not install the input or output power conductors of the main circuit and the wires of the control circuit in the same duct or in parallel with each other, and do not bind them together.
- Use shielded wires or twisted wires for the control circuits.
- Ensure that the grounding terminals (G/E) of the ASD are securely connected to ground.
- Connect a surge suppressor to every electromagnetic contactor and every relay installed near the ASD.
- Install noise filters as required.

Connecting the ASD

DANGER!



Refer to the section titled Installation Precautions on pg. 2 and the section titled Lead Length Specifications on pg. 13 before attempting to connect the ASD and the motor to electrical power.

System Grounding

Proper grounding helps to prevent electrical shock and to reduce electrical noise. The ASD is designed to be grounded in accordance with **Article 250** of the **2002 NEC** or **Section 10/Part One** of the **Canadian Electrical Code** (CEC).

The grounding conductor shall be sized in accordance with **Article 250-122** of the **NEC** or **Part One-Table 6** of the **CEC**.

Note: *The metal of conduit is not an acceptable ground.*

The input, output, and control lines of the system shall be run in separate metal conduits and each shall have its own ground conductor.

Power Connections

DANGER!

L1/R, **L2/S**, and **L3/T** are the 3-phase input supply terminals for the Q7 ASD and are located on the top of the breaker for the **Integrated Enclosure** ASD.

T1/U, **T2/V**, and **T3/W** are the output terminals of the ASD that connect to the motor.

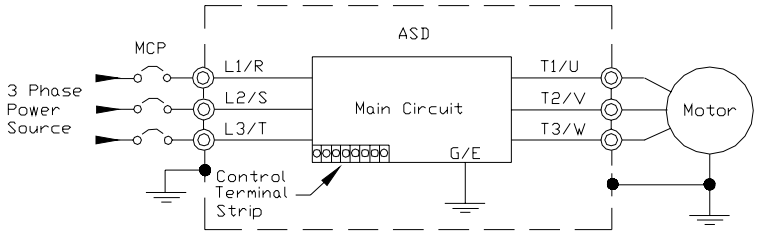
An inductor may be connected across terminals **PA** and **PO** to provide additional filtering. When not used, a jumper is connected across these terminals (see Figure 6 on pg. 15).

Connect the input and output power lines of the stand-alone ASD as shown in Figure 3. See Figure 8 on pg. 18 for information on the connection of the ASD when using the **Integrated Enclosure** configuration.

Note: *In the event that the motor rotates in the wrong direction when powered up, reverse any two of the three ASD output power leads connected to the motor.*

Note: *The connection diagram of Figure 3 is not appropriate for the Q7 Integrated Enclosure system. See the section titled Q7 Integrated Enclosure Theory of Operation on pg. 16 for Q7 ASD Bypass system operation information.*

Figure 3. Simplified stand-alone ASD/Motor connection diagram.



Connect the 3-phase input power to the input terminals of the ASD at **L1/R**, **L2/S**, and **L3/T**. Connect the output of the ASD to the motor from terminals **T1/U**, **T2/V**, and **T3/W**. The input and output conductors and terminal lugs used shall be in accordance with the requirements listed in Cable/Terminal Specifications on pg. 57.

If conductors smaller than the recommended sizes are used in parallel for the input or output power, each branch of the parallel set shall have its own conduit and not share its conduit with other parallel sets (i.e., place **U1**, **V1**, and **W1** in one conduit and **U2**, **V2**, and **W2** in another conduit).

Note: *National and local codes should be referenced when running more than three conductors in the same conduit.*

Install a molded case circuit breaker (MCCB) or fuse between the 3-phase power source and the ASD in accordance with the **2002 NEC Article 430-102** through **430-111** and the **Fault Current** setting of the ASD (see Electronic Thermal Protection 1 on pg. 36).

For 600 volt ASDs, the 15 HP or less drives (P/N VT130Q7U6015 – 6160) require a class-J fuse rated at 600 Volts/30 A.

Startup and Test

Before turning on the unit, the following checks are to be performed by **Qualified Personnel**:

- **L1/R**, **L2/S**, and **L3/T** are connected to the 3-phase input power.
- **T1/U**, **T2/V**, and **T3/W** are connected to the motor.
- The 3-phase input voltage is within the ASD setup tolerances.
- There are no shorts and all grounds are secured.
- Check the motor rotation direction in the **Bypass** mode and the ASD-driven mode.

System Protection Features and Setup

The Q7 ASD uses protection features that are designed to protect the ASD and to protect the motor from overload/overcurrent damage. Because of the different types of abnormal conditions that may occur (e.g., inrush current, short circuit current, extended overloads, etc.), instantaneous and overcurrent protective devices have ben provided. Both protection mechanisms require an application-specific adjustment for performance optimization and the minimization of nuisance tripping.

ASD Protection

The Q7 ASD is designed and manufactured to accommodate a wide range of voltage and current requirements; from the 0.75 HP to the 350 HP ASD (Typeform). Each ASD is equipped to operate at 100% output continuously and can operate at 110% for 60 seconds. A trip will be incurred if the design specifications are exceeded for a given ASD.

ASD overload protection is accomplished via the ASD software which can be configured to disable the system in the event of an overload. Using the **Electronic Thermal Protection** setting, the ASD may be properly matched to the motor being driven and the application.

The short circuit protection, which is provided by hardware and software, disables the system in the event of a fault.

Motor Protection

Motor circuit protection is accomplished using circuit breakers that have adjustable trip thresholds to properly match the motor being driven and the application. The circuit breakers are set to the minimum current value of the circuit breaker at the factory and must be set for the motor being used and to properly match the requirements of the application.

The motor protection hardware is comprised of a **Motor Circuit Protector** (**MCP**) (see Figure 4 on pg. 11) at the 3-phase system input and an **Overload Circuit Protector** (**OCP**) connected to the motor (see Figure 5 on pg. 12). See Figure 8 on pg. 18 for the schematic representation and electrical location of the **MCP** and the **OCP** circuit breakers.

Motor Protection

Read and understand all safety warnings before operating this equipment!

MCP Adjustment Setting

The trip threshold of the **MCP** is set to the lowest setting when the product ships from the factory. Refer to NEC Table 430-152 for recommendations on establishing the proper **MCP** setting for a given application.

When using a **Design E** motor, the setting for the instantaneous trip circuit breaker shall not be more than 1100% of the full-load input current. The maximum setting for a motor, other than **Design E**, shall be 800% of the input current. This is done to ensure that the protection does not activate while starting the motor, but is able to provide adequate protection for a fault condition.

Figure 4. MCP Adjustment.

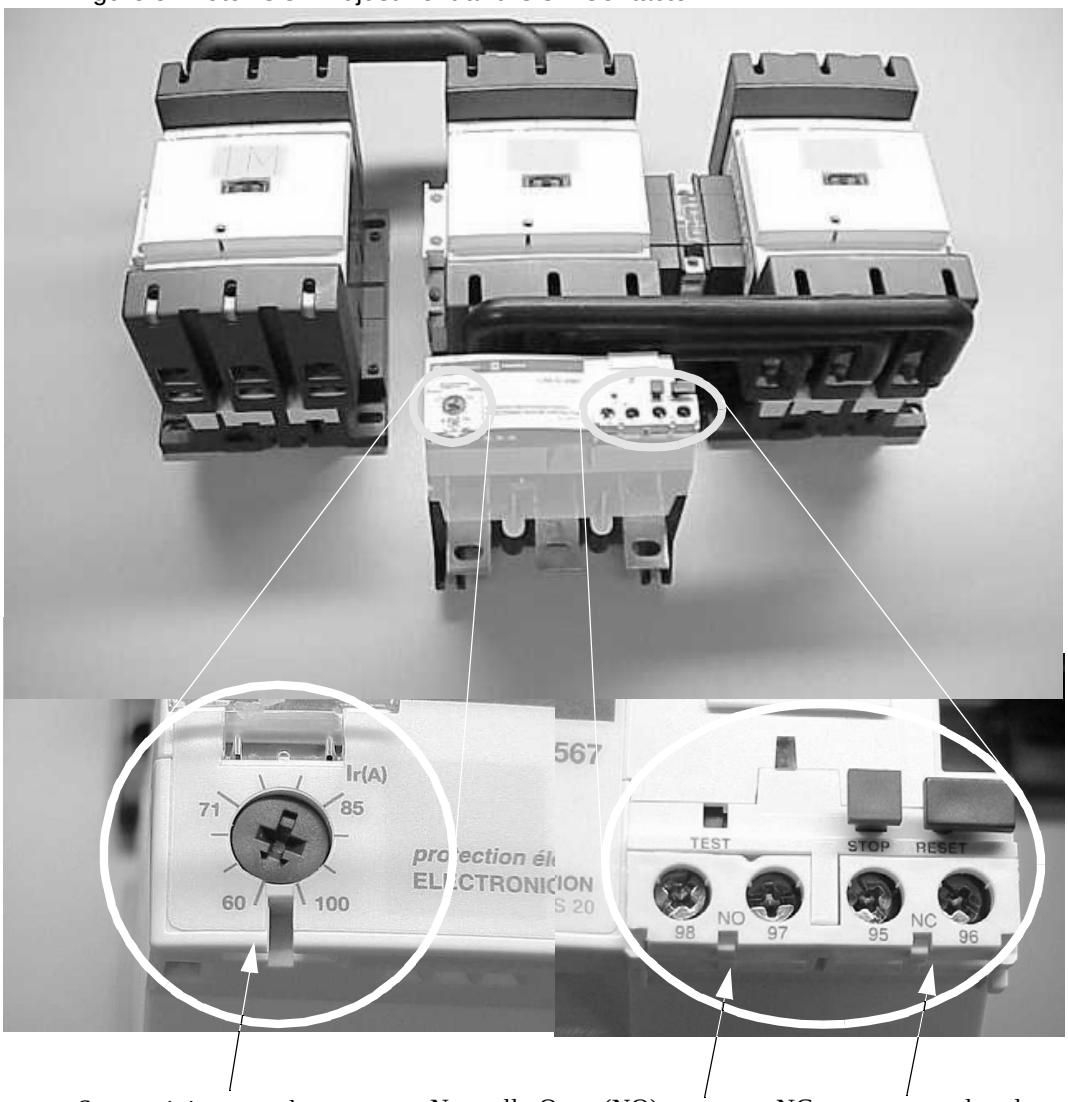
OCP Setting

There are two operating modes for the motor: ASD-driven and **Bypass**. When the motor is being driven by the ASD, overcurrent protection and extended overload protection is accomplished via the **Electronic Thermal Protection** setting of the ASD. Set this parameter as a ratio of the FLA of the ASD to the FLA of the motor.

When operating in the **Bypass** mode, the **OCP** setting should allow for the high inrush current of startup and the short-time overload current of high-inertia loads and not be set so high as to provide inadequate overcurrent protection. The **OCP** should be set to a level that is just above the maximum level of the application's requirements.

For large motor applications, a motor starter is recommended.

Figure 5. Motor OCP Adjustment and OCP Contactor.



Set to minimum at the factory. Application-specific adjustment is required.

Normally Open (NO) contacts are unused. NO contacts may be used with ancillary circuit to annunciate an overload trip.

NC contacts are closed during normal operation. The NC contacts open during an overload trip.

Lead Length Specifications

Adhere to the NEC and any local codes during the installation of ASD/Motor systems. Excessive lead lengths may adversely effect the performance of the motor. Special cables are not required.

Lead lengths from the ASD to the motor in excess of those listed in Table 1 may require filters to be added to the output of the ASD. Table 1 lists the suggested maximum lead lengths for the listed motor types.

Table 1.

Model	PWM Carrier Frequency	Suggested Maximum Lead Distance
230 Volt	All	1000 feet
460 Volt	< 5 kHz	600 feet
	≥ 5 kHz	300 feet
600 Volt	< 5 kHz	200 feet
	≥ 5 kHz	100 feet

Contact Toshiba for application assistance when using lead lengths in excess of those listed.

Exceeding the peak voltage rating or the allowable thermal rise time of the motor insulation will reduce the life expectancy of the motor.

I/O and Control

The ASD can be controlled by several input types and combinations thereof, as well as operate within a wide range of voltage levels. This section discusses the ASD control methods and supported I/O functions.

The **Control Terminal Strip** PCB (P/N 48570) of the stand-alone unit and the **Control Terminal Strip** PCB (P/N 53750) for the **Integrated Enclosure** configuration support discrete and analog I/O functions. Table 2 lists the names, the default settings (where applicable), and the descriptions of the input and output terminals of the **Control Terminal Strip** PCB for both systems.

Figure 6 on pg. 15 and Figure 8 on pg. 18 show the basic connection diagrams for the Q7 systems.

Table 2. Input terminal names and functions.

Terminal Name	Input/Output	Default Function (for programmable terminals)
ST	Discrete Input	**Standby** — Multifunctional programmable discrete input (jumper to **CC** to operate the unit).
RES	Discrete Input	**Reset** — Multifunctional programmable discrete input.
F	Discrete Input	**Forward** — Multifunctional programmable discrete input.
R	Discrete Input	**Reverse** — Multifunctional programmable discrete input.
S1	Discrete Input	**Fire Speed** — Multifunctional programmable discrete input (**Preset Speed 1** = Fire Speed).
S2	Discrete Input	**Preset Speed 2** — Multifunctional programmable discrete input.
S3	Discrete Input	**Preset Speed 3** — Multifunctional programmable discrete input.
S4	Discrete Input	**Emergency Off** — Multifunctional programmable discrete input (jumper to **CC** to operate the unit).
***CIA/CIB**	Discrete Input	**Customer Interlock** — Discrete input (C1A to C1B required to operate the unit).
***DRA/DRB**	Discrete Input	**Damper Response** — 120 VAC switching circuit that provides the damper open/close status to the ASD (DRA to DRB connection required to operate the ASD).
RR	Analog Input	**RR** — Multifunction programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output).
RX	Analog Input	**RX** — Multifunctional programmable analog input (-10 to +10 VDC input — -80 to +80 Hz output).
II	Analog Input	**II** — Multifunctional programmable analog input (4 to 20 mADC input — 0 to 80 Hz output).
VI	Analog Input	**VI** — Multifunctional programmable analog input (0 to 10 VDC input — 0 to 80 Hz output).
P24	DC Output	24 VDC @ 50 mA output.
PP	DC Output	**PP** — 10.0 VDC voltage source for the external potentiometer.
OUT1-A	Discrete Output	**Low** — Output is below the programmed frequency. Changes state when the output is no longer below the programmed frequency.
OUT1-C	Discrete Output	
OUT2-A	Discrete Output	**Acc/Dec Complete** — Changes state when the programmed acceleration or deceleration ramp has completed.
OUT2-C	Discrete Output	
FLA	Discrete Output	**Fault Relay** - rated at 2A/250 VAC (N.O.). Energized at power up (closed during normal operation).
FLB	Discrete Output	**Fault Relay** - rated at 1A/250 VAC (N.C.).
FLC	Discrete Output	**Fault Relay** - rated at 2A/250 VAC (common).
FP	Output	**Frequency Pulse** — an output pulse train that has a frequency which is based on the output frequency of the ASD.
AM	Output	Produces an output current that is proportional to the magnitude of the function assigned to either of these terminals.
FM	Output	
CC	—	Control common (**Do Not** connect to **Earth Gnd**).

Discrete Input Terminals ⇒ **On** = connected to **CC**.

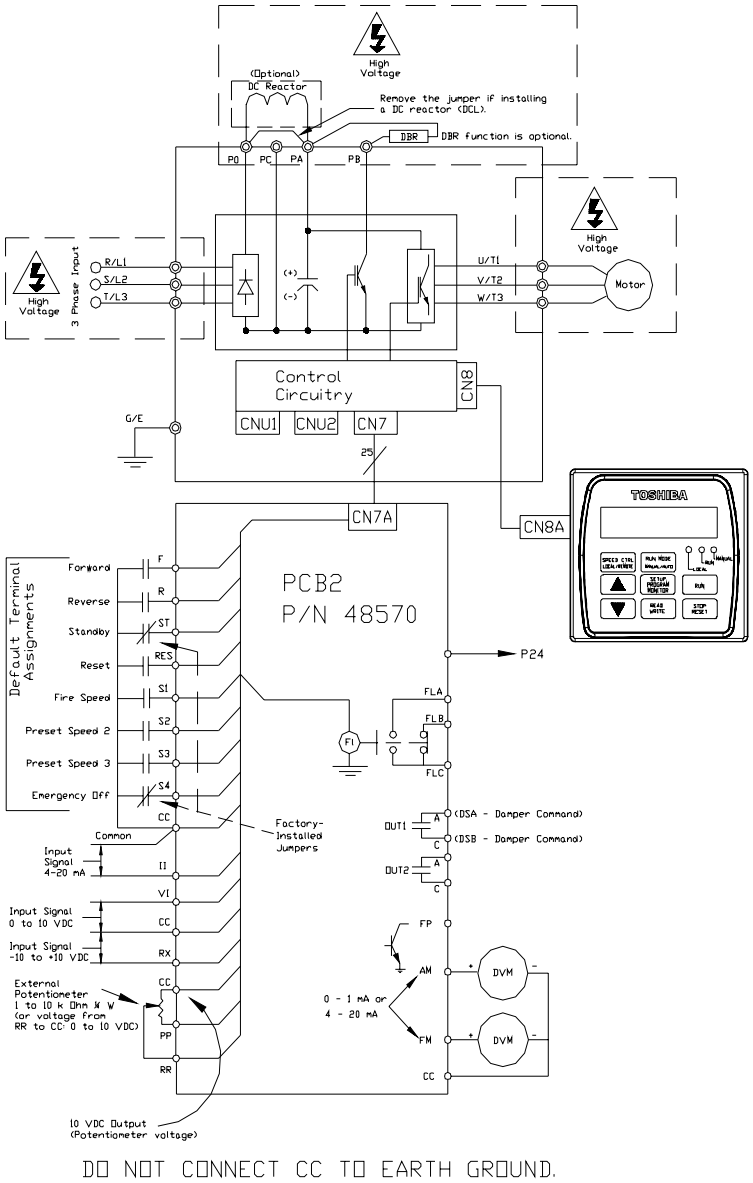
Note: *Multifunctional discrete terminals are shown in the default setting condition.*

*Available on the 53750 PCB of the **Integrated Enclosure** only.

Typical Q7 ASD Connection Diagram

Figure 6. Q7 stand-alone unit connection diagram.

Note: *When connecting multiple wires to the PA, PB, PC, or PO terminals, do not connect a solid wire and a stranded wire to the same terminal.*



Q7 Integrated Enclosure Theory of Operation

Note: *Reference figures* 7 *and* 8 *for the following explanation.*

Initially all switches are open and the normal states of all relays are as indicated in Figure 7 on pg. 17.

Stage 1 Function

Power is applied to stage one via the **Control Power Transformer** (CPT). The 120 VAC signal is applied to LED 5 (Control Power) only and LED 5 illuminates.

Stage 2 Function

Closing the door switch (LS) applies 120 VAC to stage two.
Stage two has two operating modes: **Test** operation and **Normal** operation (**K2** energized). If the **Test** switch (SW1) is closed or if **K2** is energized via **SW2** (SW2 to INV, OL closed [open = overload], and CIA-to-B closure required), the **K1** relay is energized and the states of the **K1** contacts change. The **1M** contactor energizes which closes the **1M** contacts (see Figure 8 on pg. 18; 3-phase input is applied to the ASD).
Opening the **LS** (door open) switch terminates all stage 2 activity.

Stage 3 Function

The closures of the **OL** contacts and the **CIA/B** contacts are required to provide 120 VAC to stage 3.

The three positions of **SW2**; **Off**, **INV**, and **BYP**, are described below.

Off — **K2** and **K3** remain in the normal state.

INV — Energizes **K2** which turns off **LED 1** (Test; if on), illuminates **LED 2** (INV Mode), opens **K2** at stage 3, closes **K2** at stage 4, and completes the **ST** terminal path via PCB 11. The resulting closure of **K2** at stage 4 energizes the **2M** contactor (jumper or open-damper signal at DRA/B required) which allows the ASD output to be applied to the motor (see 2M at Figure 8 on pg. 18).

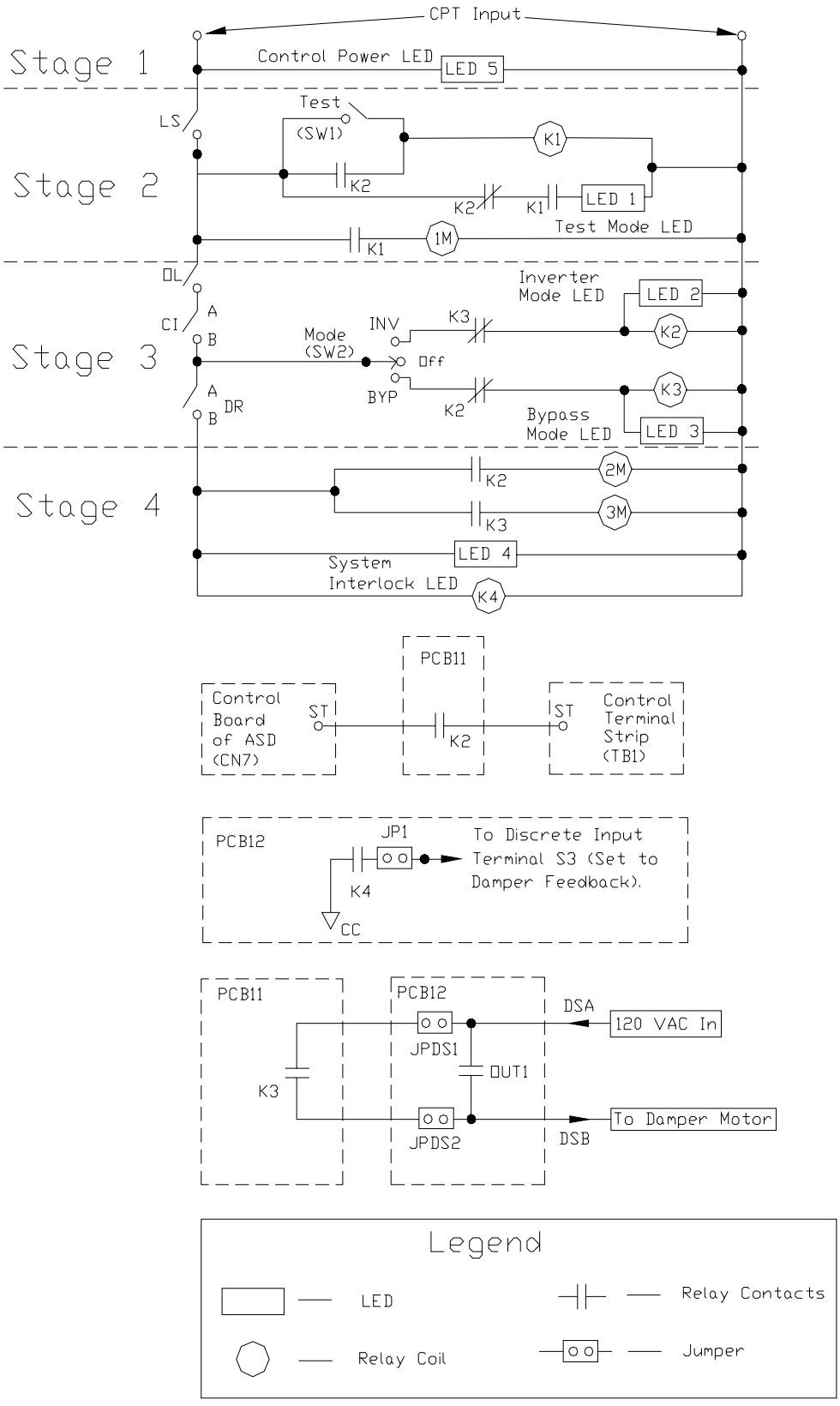
BYP — Energizes **K3** which turns off **LED 2** (INV Mode) (if on), illuminates **LED 3** (Bypass Mode), opens **K2** at stage 4 (which opens 2M if closed), and closes **K3** at stage 4. The resulting closure of **K3** at stage 4 energizes the **3M** contactor (jumper or open-damper signal at DRA/B required) which allows the utility power to be applied directly to the motor bypassing the ASD (see 3M at Figure 8 on pg. 18).

Note: *Ensure that the phase relationship of the **L1**, **L2**, and **L3** connections to the motor for the **Bypass** mode of operation and for the ASD-driven operation are consistent. The **Reverse** and **Forward** functions will be reversed if not properly connected (see diagram in Figure 8 on pg. 18). Changing the utility power input at the ASD will not affect ASD drive direction.*

Damper Response Feedback (DRA/B circuit) may be required to prevent a motor from attempting to force air flow through a duct that has a closed damper. A discrete terminal may be programmed to disable the system if the damper is not fully open. The damper status is conveyed to the ASD via limit switches on the damper that close the **DRA/B** circuit. When the damper is fully open the limit switch closes and provides 120 VAC to the coil of **K4**. The **K4** closure connects the programmed discrete terminal (**S3** assigned to **Damper Feedback**) to **CC** enabling normal system operation (**JP1** jumper at PCB12 required for this function).

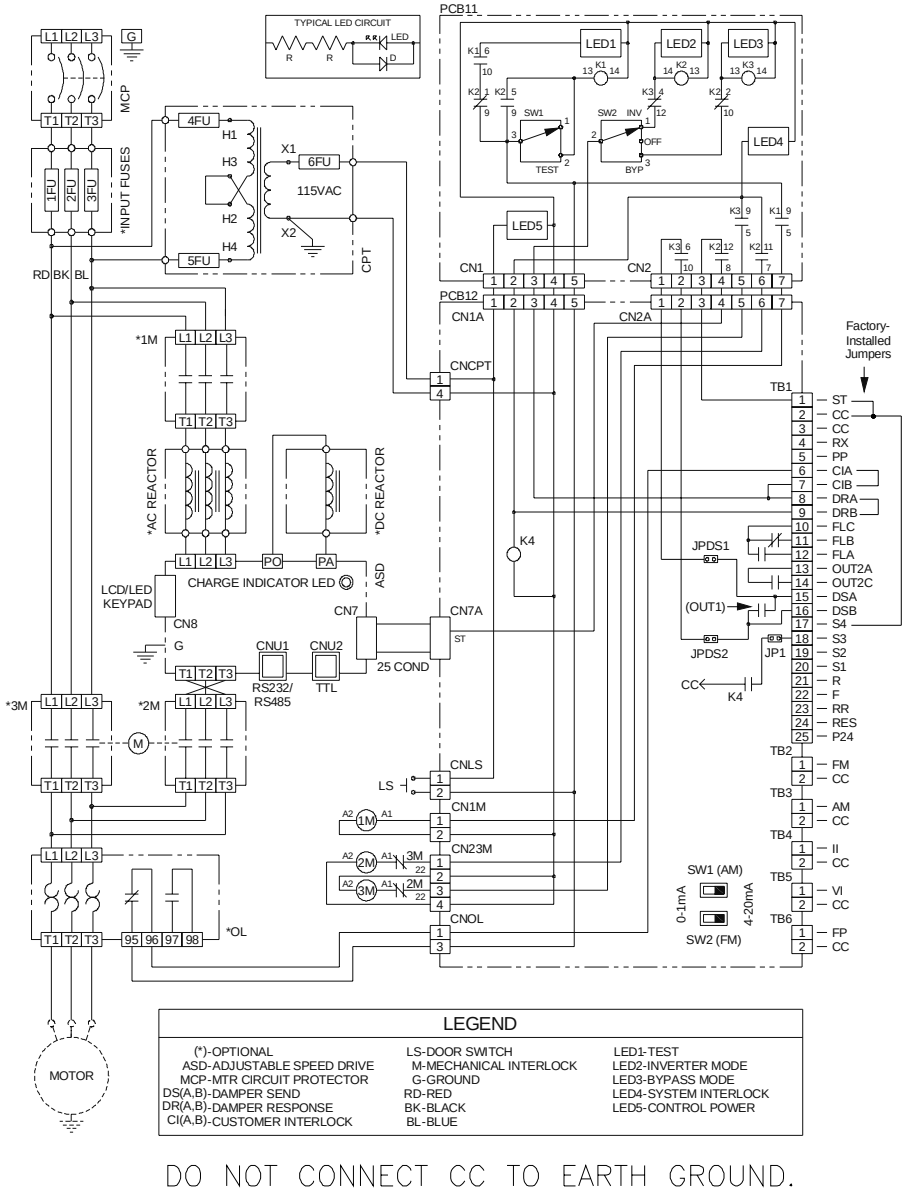
Damper motor power may be provided via the **DSA/B** circuit. 120 VAC is provided externally and is switched via the **K3** contacts if operating in the **Bypass** mode or the **OUT1** (DSA/B) contacts if the motor is ASD-driven. Reversible limit switches at the damper location terminates power once the damper is fully open or fully closed (reversible means that only the opposite function is available once reaching the fully open or fully closed position). Only a fully opened damper provides a connection to **CC** of the **Damper Feedback** terminal.

Figure 7. Simplified depiction of the Q7 ASD Bypass operation.



Q7 Integrated Enclosure/ASD Connection Diagram

Figure 8



Note: *The 1M, 2M, and 3M contacts should be checked after an overcurrent event to ensure that the contacts have not been welded together.*

Note: *Ensure that the phase relationship of the **L1**, **L2**, and **L3** connections to the motor for the **Bypass** mode of operation and for the ASD-driven operation are consistent. The **Reverse** and **Forward** functions will be reversed if not properly connected (see above diagram).*

Q7 Keypad and Integrated Enclosure Control Panel Information

Q7 Keypad Features

The **Q7 Keypad** is comprised of an LCD display, three system status LEDs, and eight keys. These items are described below and their locations are provided in Figure 9 on pg. 20.

Speed Ctrl|Local/Remote Key — Toggles the system to and from the **Local** and **Remote** modes. The LED is on when the system is in the **Local** mode. The **Local** mode allows the **Frequency** control functions to be carried out via the **Q7 Keypad**.

The **Remote** mode enables the **Frequency** control functions to be carried out via any one of the following methods:

- Control Terminal Strip,
- Pulse Input,
- Motorized Pot,
- Communication Card,
- RS232/485,
- Common TTL,
- Binary/BCD,
- LCD/LED Keypad,
- Option Card RX2,
- RX,
- RR, or
- VI/II.

The **Remote Frequency** control mode selection may be made via Program ⇒ Utility Group ⇒ **Frequency Mode**.

Up/Down Arrow Key — Increases/decreases the value of the selected parameter or scrolls up/down the menu listing (continues during press and hold).

Run Mode|Manual/Auto Key — Allows the Q7 ASD to receive **Run** commands (i.e., **Stop**, **Run**, **Forward**, etc.) from either the Q7 keypad (**Manual**) or remotely (**Auto**) (e.g., RS232/485, Option Card RX2, etc.).

Read/Write Key (R/W) — Selects a menu item to be changed or accepts and records the changed data of the selected field.

LCD Display — Displays configuration information, performance data (e.g., motor frequency, bus voltage, torque, etc.), and diagnostic information.

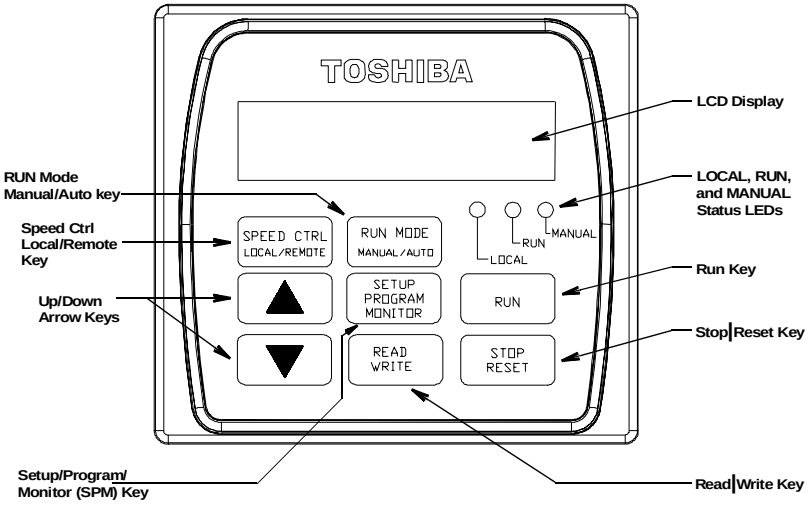
Stop|Reset Key — Issues the **Off** command (decelerates to **Stop** at the programmed rate) if pressed once while in the **Manual** mode, or initiates an **Emergency Off** (terminates the ASD output and applies the brake if so configured) if pressed twice quickly from the **Manual** or **Auto** mode.

Run Key — Issues the **Run** command while in the **Manual** mode.

Local/Run/Manual System Status LEDs — On while active.

Setup/Program/Monitor Key (SPM) — Provides a means to access the root menus. Pressing the **SPM** key repeatedly loops the system through the active root menus (see Figure 11 on pg. 23).

Figure 9. The Q7 Keypad.



Q7 Keypad Operation

The **Q7 Keypad** is the primary input/output device for the user. The **Q7 Keypad** may be used to monitor system functions, input data into the system, or perform diagnostics.

Press the **SPM** key to loop through the root menu selections. Use the **R/W** key and the **Up** and **Down** arrow keys to access and change the system parameters as described in the section titled Default Setting Changes on pg. 32.

From any menu, press the **SPM** key to return to the root menu.

Panel Control Menu

The (Program ⇒) **Panel Control** menu allows for quick access the ASD parameters listed below. Changes to the listed parameters are effective for commands received via the **Q7 Keypad** only.

Direction — Forward or **Reverse**.

Ramped PWM — The PWM frequency ramps from 9.99 kHz to 5 kHz as the ASD output frequency increases.

PID Control — This feature enables/disables the **PID** feedback function.

Reset Selection — Enables/Disables the ability to reset the system from the panel.

Accel/Decel Selection — 1 of 4 **Accel/Decel** profiles may be selected and run.

V/f Group — 1 of 4 **V/f** profiles may be selected and run.

Stop Pattern — The **Decel Stop** or **Coast Stop** settings determines the method used to stop the motor when using the **Stop|Reset** key of the keypad.

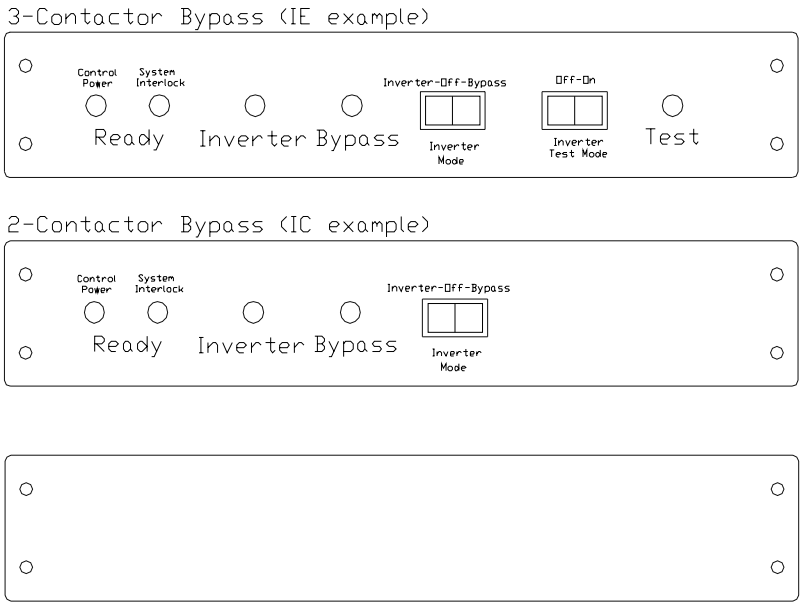
Note: *The **Stop Pattern** setting has no effect on the **Emergency Off** settings.*

Q7 Integrated Enclosure Control Panel Features

There are three types of **Q7 Integrated Enclosure** control panels available. The panel used will be a function of the system features available for a given system. Two of the panels provide the user with control and monitoring features and one is used as a cover for an unused panel mounting hole and has no active features.

Figure 10 shows the three **Q7 Integrated Enclosure** panel types followed by a description of the applicable features of each.

Figure 10. Available Q7 Panels.



Control Power LED (LED 5) — On when the control circuit power is available. This is not an indication that power is off.

System Interlock LED (LED 4) — On when the following conditions are met:

- **Control Power** is applied,
- Door switch (LS) is closed,
- **Protective Overload** contactor (OL) is closed,
- **Customer Interface** contact (CI) is closed, and
- The damper is fully open (**DRA** connected to **DRB**).

Inverter LED (LED 2) — On when the following conditions are met:

- **Control Power** is applied,
- Door switch (LS) is closed,
- **Protective Overload** contactor (OL) is closed,
- **Customer Interface** contact (CI) is closed, and
- The **Inverter Mode** switch is switched to **INV**.

This closes the **1M** and **2M** contactors allowing for normal ASD operation.

Bypass LED (LED 3) — On when the following conditions are met:

- **Control Power** is applied,
- Door switch (LS) is closed,
- **Protective Overload** contactor (OL) is closed,
- **Customer Interface** contact (CI) is closed,
- The damper is fully open (**DRA** connected to **DRB**), and
- The **Inverter Mode** switch is switched to **BYP**.

This opens the **2M** contactor and closes the **3M** contactor.

Inverter Mode Switch — With the **System Interlock LED** criteria being met, the **Inverter Mode** switch allows the user to switch the system to the **Inverter Mode**, the **Bypass Mode**, or **Off**.

Inverter Test Mode Switch — With the **CPT** input power applied and the door closed, the **Inverter Test Mode** switch closes the **1M** contactor (via **K1**) to test the ASD section of the system without providing an output to the connected motor.

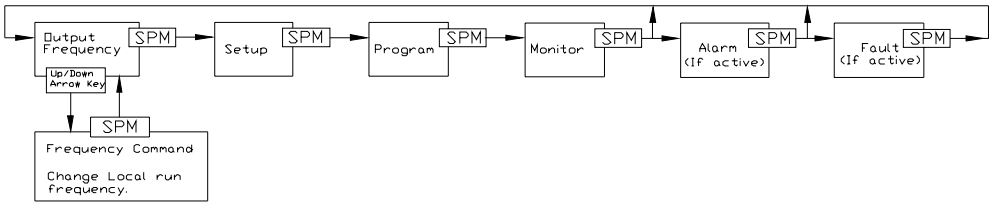
Test LED (LED 1) — On during **Test Mode** operation.

System Configuration and Menu Options

Root Menus

The **SPM** key accesses the (active) root menus of the **Q7**: the **Output Frequency**, **Setup**, **Program**, **Monitor**, and the **Alarm** and **Fault** screens (if active). From either mode, press the **SPM** key to loop through to the other modes (see Figure 11).

Figure 11. Q7 Root menu mapping.



Output Frequency Screen

Frequency Setting

While operating in the **Local** mode (**Local** LED is illuminated on the LCD keypad), the running frequency of the motor may be set from the **Output Frequency** screen. Using the **Up/Down** arrow keys, enter the **Frequency Command** value and then press the **Run** key. The motor will run at the **Frequency Command** speed and may be changed while running.

Setup Screen

The **Setup** screen allows quick-access to the following commonly used parameters:

- Acceleration Time #1 (pg. 34),
- Switch-on-the-fly (pg. 46),
- V/f Pattern (pg. 47),
- Type Reset (pg. 46),
- VI/II Freq #2 (pg. 47),
- VI/II Speed Ref #2 (pg. 47),
- VI/II Freq #1 (pg. 47),
- VI/II Speed Ref #1 (pg. 47),
- Lower Limit Frequency (pg. 38),
- Upper Limit Frequency (pg. 47), and
- Deceleration Time #1 (pg. 36).

Program Menu

The **Program Menu** allows the user access to parameters that setup the input and output specifications of the Q7 ASD. These settings are usually application-specific and will require setup. The **Setup** screen (above) provides easy-access to the most common setup parameters. See the section titled Menu Navigation on pg. 25 for a complete listing of Q7 parameters and menu for navigation assistance.

Monitor Mode

The **Monitor** mode allows for the monitoring of motor performance variables, control settings, and configuration data during motor operation. There are 30 items that may be monitored from this mode. The items are listed and described below.

Note: *The **Monitor** parameters are read-only.*

Trip Hold Frequency — If tripped, this field records the at-trip frequency. Otherwise, the current output frequency is displayed.

Past Trip #4 — This feature reads and stores trip records and is the first of four recorded trips.

Past Trip #3 — This feature reads and stores trip records.

Past Trip #2 — This feature reads and stores trip records.

Past Trip #1 — This feature reads and stores trip records and is the last of four recorded trips.

Trip Code— If tripped, this field displays the trip code (e.g., E-Stop). If not tripped **No Error** is displayed.

AM Output— Displays the AM output as a percentage of its full range.

FM Output — Displays the FM output as a percentage of its full range.

RX2 Input — Displays the RX2 input as a percentage of its full range.

RX Input — Displays the RX input as a percentage of its full range.

VI/II Input — Displays the VI/II input as a percentage of its full range.

RR Input — Displays the RR input as a percentage of its full range.

Direction — Displays the Forward/Reverse status.

Peak Current — Shows the highest current level achieved since the last startup or reset. This value is displayed as a percentage of the full rating of the ASD or as an amperage (see Units for V/I on pg. 47).

Kilowatt Hours — Displays accumulated Kilowatt hours. Saved at 2-hour intervals.

Output Power — Shows the instantaneous output power level of the ASD.

Input Power — Shows the instantaneous input power level to the ASD.

ASD Load — Shows the instantaneous load placed on the ASD.

Motor Load — Shows the instantaneous motor load requirements.

ASD Overload Ratio — Displays the relationship of time to the magnitude of the ASD overload as a ratio. A higher overload means a shorter run-time in this condition.

Motor Overload Ratio — Displays the relationship of time to the magnitude of the motor overload as a ratio. A higher overload means a shorter run-time in this condition.

PID Feedback — Displays the instantaneous PID feedback value.

Post Compensation Frequency — Displays the output frequency of the ASD after the application of the waveform adjustment compensation for changes in the input voltage.

Run Time — Displays the accumulated run-time since the last reset or power up of the ASD.

Output Terminals — Shows the active discrete output terminals.

Input Terminals — Shows the active discrete input terminals.

Output Voltage — Shows the instantaneous output voltage as a percentage of the rating of the ASD or as a voltage (see Units for V/I on pg. 47).

DC Voltage — Shows the instantaneous DC bus voltage as a percentage of the rating of the ASD or as a voltage (see Units for V/I on pg. 47).

Output Current — Shows the instantaneous output current as a percentage of the rating of the ASD or as a current (see Units for V/I on pg. 47).

Frequency Command — Displays the current frequency command.

Menu Navigation

Listed below are the mapped menu items of the **Q7 ASD**.

Q7 ASD Menu Items					
Primary Menu	**Menu Item**	**Sub-menu Items**	**Primary Menu**	**Menu Item**	**Sub-menu Items**
Output Frequency Display	Displays the output frequency.		**Program**	**Frequency Settings**	RX Speed Ref #2
	Press Up/Down Arrow Key	**Frequency Command**			RX Speed Freq #1
Setup (Press **R/W** key to access menu items) (Press **Up**/**Down Arrow** key to access subsequent menu items) (Press **SPM** key to go to **Program** menu)	Acceleration Time #1				RX Speed Ref #1
	Switch-on-the-fly				RR Torque Ref #2
	V/f Pattern				RR Torque Ref #1
	Type Reset				RR Speed Freq #2
	VI/II Freq #2				RR Speed Ref #2
	VI/II Speed Ref #2				RR Speed Freq #1
	VI/II Freq #1				RR Speed Ref #1
	VI/II Speed Ref #1				VI/II Freq #2
	Lower Limit Frequency				VI/II Speed Ref #2
	Upper Limit Frequency				VI/II Freq #1
	Deceleration Time #1				VI/II Speed Ref #1
Program (Press **Up/Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Search**	Changed From Default Parameters		**Motor Settings** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Base Frequency 1
	Frequency Settings (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Reference Priority Selection			Autotune Enable
		Jog Stop Control			Motor Type
		Jog Run Frequency			Motor Capacity
		PG Speed Freq #2			Motor Poles
		PG Speed Ref #2			Motor Constant 5
		PG Speed Freq #1			Motor Constant 4
		PG Speed Ref #1			Motor Constant 3
		BIN Torque Ref #2			Motor Constant 2
		BIN Torque Ref #1			Motor Constant 1
		BIN Speed Freq #2			Motor Slip Gain
		BIN Speed Ref #2			Autotune Control
		BIN Speed Freq #1			Electronic Thermal Protection #4
		BIN Speed Ref #1			Torque Boost #4
		RX2 Torque Ref #2			Maximum Voltage #4
		RX2 Torque Ref #1			Base Frequency 4
		RX2 Speed Freq #2			Electronic Thermal Protection #3
		RX2 Speed Ref #2			Torque Boost #3
		RX2 Speed Freq #1			Maximum Voltage #3
		RX2 Speed Ref #1			Base Frequency 3
		RX Torque Ref #2			Electronic Thermal Protection #2
		RX Torque Ref #1			Torque Boost #2
		RX Speed Freq #2			Maximum Voltage #2

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program (Press **Up/ Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Motor Settings** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Maximum Voltage #2
		Base Frequency 2
		Electronic Thermal Protection 1
		Torque Boost #1
		Maximum Voltage #1
	Utility Group (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Type Reset
		User Unit #5
		User Unit #4
		User Unit #3
		User Unit #2
		User Unit #1
		Units for V/I
		Acc/Dec Resolution
		Frequency Display Resolution
		Frequency Multiplier
		ASD Typeform
		Main EEPROM Version
		CPU Revision
		CPU Version
		Panel Lockout
		PWM Carrier Frequency
		Frequency Mode
		Command Mode
	AM/FM (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	FM Terminal Assignment
		AM Terminal Adjustment
		AM Terminal Assignment
		FM Terminal Adjustment
	Comm. Settings	ASD Number
		Ext Comm Cfg #8
		Ext Comm Cfg #7
		Ext Comm Cfg #6

Primary Menu	Menu Item	Sub-menu Items
Program	**Comm. Settings** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Ext Comm Cfg #5
		Ext Comm Cfg #4
		Ext Comm Cfg #3
		Ext Comm Cfg #2
		Ext Comm Cfg #1
		Communication Data Type
		#6 Scan Transmit
		#5 Scan Transmit
		#4 Scan Transmit
		#3 Scan Transmit
		#2 Scan Transmit
		#1 Scan Transmit
		#6 Scan Receive
		#5 Scan Receive
		#4 Scan Receive
		#3 Scan Receive
		#2 Scan Receive
		#1 Scan Receive
		Error Detect Time
		S20 Error Mode
		S20 Reset
		Station Mode
		Fault Detect Station
		Torque Reference Address
		Torque Reference Station
		Speed Reference Address
		Speed Reference Station
		Transmit Address
		Receive Address
		Communications Speed 2
		Communications Reference 2

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program (Press **Up/Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Comm. Settings** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Communications Speed 1
		Communications Reference 1
		Communications Reference Select
		RS485 Master Output
		TTL Master Output
		RS485 Response Time
		RS485 Wire Count
		TTL Response Time
		RS485 Time-out Action
		RS485 Time-out Time
		Parity
		RS485 Baud Rate
		TTL Baud Rate
	Feedback Settings (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Input Feedback Select
		PG Detect Selection
		PG Input Phases
		PG Number of Pulses
		4–20 mA Speed Reference
		4–20 mA Loss Selection
		Lower Deviation Limit
		Upper Deviation Limit
		Delay Filter
		Differential Gain
		Integral Gain
		Proportional Gain

Primary Menu	Menu Item	Sub-menu Items
Program	**Protection** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Dynamic Braking
		LED Option Override
		Multiplying Input Select
		Adding Input Select
		MS Relay (status Anded) with ST
		Inrush Time
		Release After Run
		Brake Fault Time
		Overtorque Detect Time
		Overtorque Level Negative
		Overtorque Level Positive
		Overtorque Trip
		Short Circuit Time
		Short Circuit Test
		Speed Drop Frequency
		Overspeed Frequency
		Abnormal Speed Time
		Low Current Time
		Low Current Setting
		Low Current Trip
		Output Phase Loss
		Run Time Alarm Setting
		Cooling Fan Control
		Trip Save
		Soft Stall Selection
		Motor 150% Run Time Setting
		Overload Reduction Frequency
		Undervoltage Time
		Undervoltage Trip

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program (Press **Up/Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Protection** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Undervoltage Stall Level
		Ridethrough Time
		Ridethrough Mode
		Search Inertia
		Search Method
		Lock-on Rate
		Scan Rate
		Speed Search Selection
		Number of Retries
		Emergency Off Time
		Emergency Off Mode
		Shaft Stationary
		DC Injection on at Direction Change
		DC Injection Time
		DC Injection Current
		DC Injection Start
		Regen Stall
		Stall Period
		Overvoltage Level 1
		Overvoltage Level 2
		Overvoltage Stall
		Overcurrent Stall Level
		DBR Capacity
		DBR Resistance
	Preset Speeds (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Preset Speed #1
		PS Speed Mode 15
		PS Speed Mode 14
		PS Speed Mode 13
		PS Speed Mode 12
		PS Speed Mode 11
		PS Speed Mode 10
		PS Speed Mode 9
		PS Speed Mode 8
		PS Speed Mode 7
		PS Speed Mode 6
		PS Speed Mode 5
		PS Speed Mode 4
		PS Speed Mode 3

Primary Menu	Menu Item	Sub-menu Items
Program	**Preset Speeds**	PS Speed Mode 2
		PS Speed Mode 1
		Preset Speed Mode Control
		Preset Speed #15
		Preset Speed #14
		Preset Speed #13
		Preset Speed #12
		Preset Speed #11
		Preset Speed #10
		Preset Speed #9
		Preset Speed #8
		Preset Speed #7
		Preset Speed #6
		Preset Speed #5
		Preset Speed #4
		Preset Speed #3
		Preset Speed #2
	Special Controls (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Startup Frequency
		4–20 mA Speed Reference
		Ramped PWM
		4–20 mA Loss Selection
		Switch-on-the-fly
		LCD Contrast
		PWM Carrier Frequency
		Jump 3 Bandwidth
		Jump Frequency 3
		Jump 2 Bandwidth
		Jump Frequency 2
		Jump 1 Bandwidth
		Jump Frequency 1
		Run Frequency Hysteresis
		Run Frequency
		End Frequency

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program (Press **Up/Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Terminal Delays** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	F Delay
		OUT7 Off Delay
		OUT7 On Delay
		OUT6 Off Delay
		OUT6 On Delay
		OUT5 Off Delay
		OUT5 On Delay
		OUT4 Off Delay
		OUT4 On Delay
		FL Off Delay
		FL On Delay
		OUT2 Off Delay
		OUT2 On Delay
		OUT1 Off Delay
		OUT1 On Delay
		S5–S16 Delay
		S1–S4 Delay
		RES Delay
		ST Delay
		R Delay
	Output Terminals (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	OUT1 Terminal
		FP Terminal Adjust
		FP Terminal Setting
		Reach Detection
		Reach Frequency
		Low Signal Frequency
		OUT7 Terminal
		OUT6 Terminal
		OUT5 Terminal
		OUT4 Terminal
		FL Terminal
		OUT2 Terminal

Primary Menu	Menu Item	Sub-menu Items
Program	**Input Terminals** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	F Terminal
		Input Priority
		Direction Priority
		ST Terminal
		ON Terminal
		S12 Terminal
		S11 Terminal
		S10 Terminal
		S9 Terminal
		S8 Terminal
		S7 Terminal
		S6 Terminal
		S5 Terminal
		S4 Terminal
		S3 Terminal
		S2 Terminal
		S1 Terminal
		RES Terminal
		ST Terminal
		R Terminal
	Panel Control (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Panel Direction
		Ramped PWM
		Panel PID Control
		Panel Reset Select
		Panel Acc/Dec Select
		Panel V/f Group
		Panel Stop Pattern
	Fundamental #2 (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Base Frequency 2
		Mode 1/2 Switching Frequency
		Acc/Dec #2 Pattern
		Deceleration #2 Time
		Acceleration #2 Time
		Electronic Thermal Protection #2
		Torque Boost #2
		Maximum Voltage #2

Q7 ASD Menu Items					
Primary Menu	**Menu Item**	**Sub-menu Items**	**Primary Menu**	**Menu Item**	**Sub-menu Items**
Program (Press **Up/Down Arrow** key to access menu items) (Press **R/W** key to select sub-menu items) (Press **SPM** key to go to **Monitor** screen)	**Fundamental #1** (Press **R/W** key to select sub-menu items) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit menu items)	Maximum Output Frequency S-Pattern Upper Limit Adjustment (%) S-Pattern Lower Limit Adjustment (%) Acc/Dec #1 Pattern Deceleration Time #1 Acceleration Time #1 Torque Boost #1 V/f Pattern Lower Limit Frequency Upper Limit Frequency Disable F/R Run Maximum Voltage #1 Voltage Compensation Base Frequency 1			

Table 3. Monitor Screen

Monitored Parameters (Read Only)	
Monitor (Press **R/W** key to access **Monitor** menu) (Press **Up/Down Arrow** key to access subsequent menu items) (Press **SPM** key to exit **Monitor** menu)	Trip Hold Frequency
	Past Trip #4
	Past Trip #3
	Past Trip #2
	Past Trip #1
	Trip Code
	AM Output
	FM Output
	RX2 Input
	RX Input
	VI/II Input
	RR Input
	Direction
	Peak Current
	Kilowatt Hours
	Output Power
	Input Power
	ASD Load
	Motor Load
	ASD Overload Ratio
	Motor Overload Ratio
	PID Feedback
	Post Compensation Frequency
	Run Time
	Output Terminals
	Input Terminals
	Output Voltage
	DC Voltage
	Output Current
	Frequency Command

System Operation

Operation (Local)

Read and understand all safety warnings before operating this equipment!

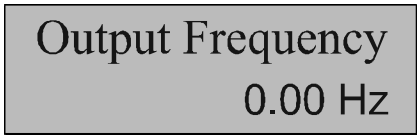
To turn the motor on perform the following steps:

1. Press the **SPM** key until the **Output Frequency** screen is displayed (see Figure 12.).
2. Press the **Speed Ctrl|Local/Remote** key to enter the **Local** mode (green **Local** LED illuminates).
3. Press the **Run Mode|Manual/Auto key** (green **Manual** LED illuminates).
4. Press (and hold) the **Up/Down** arrow key until the displayed **Frequency Command** value is at the desired setting.
5. Press the **SPM** key to view the running frequency.
6. Ensure that there are no personnel around or near the motor or the motor-driven equipment.
7. Press the **Run** key and the motor runs at the **Frequency Command** value.

Note: *The speed of the motor may be changed while the motor is running by using the **Up/Down** arrow keys to change the **Frequency Command** value. To change the direction press and hold the **R/W** key and momentarily press the **Up** or **Down** arrow key (Up=Forward/Down=Reverse).*

8. Press the **Stop|Reset** key to stop the motor.

Figure 12. Frequency Command screen.



Default Setting Changes

To change a parameter setting, go to the **Program** menu or the **Setup** menu by pressing the **SPM** key until the desired menu is displayed. From the **Program** menu press the **Up** or **Down** arrow key until the desired parameter group is displayed. Press the **R/W** key to access the sub-menu listing. Press the **Up** or **Down** arrow keys to access the parameter to be changed.

From the **Setup** menu press the **R/W** key to access the sub-menu items and then use the **Up** or **Down** arrow key to access the parameter to be changed.

Once a parameter setting has been accessed, press the **R/W** key to enter the **Edit** mode (screen title flashes). Use the **Up** or **Down** arrow keys to change the parameter setting.

Press the **R/W** key when done to accept and save the changed setting and remain in the active menu, or press the **SPM** key to retain the changed setting in volatile memory (lost when powered down or reset) and return to the root menu.

Note: *Some parameters use the unsaved changed value until the ASD is Reset or powered off (e.g., Frequency Command, Accel/Decel, etc.).*

Repeated **R/W** key entries loop the menu through its full list of items of the active sub-menu. From any menu, press the **SPM** key to return to the root menu. Repeated **SPM** entries loop the system through the root menus as shown in Figure 11 on pg. 23.

For a complete listing of the **Program** menu and **Setup** menu items, see the section titled Menu Navigation on pg. 25. The menu items are listed and mapped for convenience.

Search (for default setting changes)

A listing of all parameters that have been changed from the default settings may be viewed sequentially by accessing the **Search** screen (Program ⇒ **Search**).

The **Search** feature allows the user to view (or change) the parameters that are different from the default settings. From the **Search** screen, press the **R/W** key to start the **Search** function. Once started, the system automatically scrolls through all of the system parameters and halts once reaching a changed parameter.

After stopping at a changed parameter, the **Up** or **Down** arrow keys may be pressed once to continue scrolling forward. With each **Up** or **Down** arrow key pressed from a stop, the system scrolls and stops at the next parameter that has been changed.

Press the **R/W** key while a changed parameter is displayed to access the settings of the changed parameter. Use the **Up** or **Down** arrow keys to change the setting. Press the **R/W** key once to save the change.

Press the **R/W** key when done to accept and save the changed setting and remain in the active menu, or press the **SPM** key to retain the changed setting in volatile memory (lost when powered down or reset) and return to the root menu.

Note: *Some parameters use the unsaved changed value until the ASD is Reset or powered off (e.g., Frequency Command, Accel/Decel, etc.).*

Pressing the **SPM** key when done searching or when halted at a changed parameter returns the system to the primary menu loop.

Parameter Descriptions

#1 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#1 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
#2 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#2 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
#3 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#3 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
#4 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#4 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
#5 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#5 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
#6 Scan Receive	This setting defines one of six memory locations to be used for received data via a Multicom option board.
#6 Scan Transmit	This setting defines one of six memory locations to be used for transmitted data via a Multicom option board.
4–20 mA Loss Selection	Provides an alternative reference in the event of the loss of the 4–20 mA input signal.
4–20 mA Speed Reference	This setting provides a value to be used in the event that **Setting** is chosen for the **4–20 mA Loss** selection.
Abnormal Speed Time	This setting determines the time that an overspeed condition must exist to cause a trip.
Acc/Dec #1 Pattern	This setting enables a user-selected preprogrammed output profile that controls the #1 acceleration and deceleration pattern for a multiple-profile configuration.
Acc/Dec #2 Pattern	This setting enables a user-selected preprogrammed output profile that controls the #2 acceleration and deceleration pattern for a multiple-profile configuration.
Acc/Dec Resolution	Sets the number of decimal places to be displayed during Accel/Decel functions.
Acceleration Time #1	Motor acceleration rate; measured in seconds.
Acceleration #2 Time	Motor acceleration rate; measured in seconds. Is used during multiple accel profile configurations.
Adding Input Select	Selecting either of the available input methods enables this feature. The selected input is used as a modifier of the programmed output frequency.
AM Terminal Adjustment	With the drive running at a known frequency, adjust this parameter until the running frequency produces the desired DC level output at the **AM** terminal.

AM Terminal Assignment	The selected function is associated with the output signal of terminal **AM** (i.e., as the associated output variable changes, so does the output level of the **AM** terminal).
AM Output	Displays the status of the **AM** output.
ASD Load	Displays the instantaneous load placed on the ASD.
ASD Number	In a multiple ASD system configuration, this parameter plays a role in the setup of the communications network by assigning an identification (ID) number to each ASD in the communications network.
ASD Overload Ratio	This value displays the relationship of time to the magnitude of the ASD overload as a ratio. A higher overload means a shorter run-time in this condition.
ASD Typeform	Defines the applicable ASD variables (i.e., input voltage, HP, max. current, etc.).
Autotune Enable	**Enables/Disables** the **Autotune** function.
Autotune Control	Allows the user to set **Autotune** parameters or to disable the **Autotune** function.
Base Frequency 1	This setting determines the frequency at which the output voltage of the ASD reaches its maximum setting for the #1 motor.
Base Frequency 2	This setting determines the frequency at which the output voltage of the ASD reaches its maximum setting for the #2 motor.
Base Frequency 3	This setting determines the frequency at which the output voltage of the ASD reaches its maximum setting for the #3 motor.
Base Frequency 4	This setting determines the frequency at which the output voltage of the ASD reaches its maximum setting for the #4 motor.
BIN Speed Freq #1	This parameter sets **BIN Speed Freq #1** (frequency) and is the frequency that is associated with the binary input **BIN Speed Ref #1** (%).
BIN Speed Freq #2	This parameter sets **BIN Speed Freq #2** (frequency) and is the frequency that is associated with the binary input **BIN Speed Ref #2** (%).
BIN Speed Ref #1	This parameter sets **BIN Speed Ref #1** (%) and is the binary input that is associated with the frequency/direction setting **BIN Speed Freq #1** (frequency).
BIN Speed Ref #2	This parameter sets **BIN Speed Ref #2** (%) and is the binary input that is associated with the frequency/direction setting **BIN Speed Freq #2** (frequency).
BIN Torque Ref #1	This parameter sets **BIN Torque Ref #1** (%) and is the binary input that is associated with the torque/direction setting **BIN Speed Freq #1** (frequency).
BIN Torque Ref #2	This parameter sets **BIN Torque Ref #2** (%) and is the binary input that is associated with the torque/direction setting **BIN Speed Freq #2** (frequency).
Brake Fault Time	After a brake failure has occurred, the user-set **Brake Fault Time** clock setting will begin to count down. Once this time has elapsed, a signal will be provided to indicate that the brake has failed.
Changed From Default Parameters	This function reads all of the parameters and stops at those that have been changed from the default setting.
Command Mode	This setting determines the source of the run commands (e.g., stop, forward, reverse, etc.).
Communication Data Type	Defines the protocol for system information that is transferred via the communications channel.
Communications Reference 1	The value that is associated with the frequency setting **Communications Speed 1**.
Communications Reference 2	The value that is associated with the frequency setting **Communications Speed 2**.

Communications Reference Select	This parameter selects the communications reference for scaling.
Communications Speed 1	The frequency that is associated with the value **Communications Reference 1**.
Communications Speed 2	The frequency that is associated with the value **Communications Reference 2**.
Cooling Fan Control	This parameter sets the cooling fan run-time command to **Automatic** or **Always on**.
CPU Revision	Revision of the CPU.
CPU Version	Version of the CPU.
Damper Control	This function is used to prevent normal operation while a damper is closed. See Q7 Integrated Enclosure Theory of Operation on pg. 16 for further information on this function.
DBR Capacity	This screen is used to input the electrical capacity (kW) of the **Dynamic Braking Resistor**. ***Note:*** *If using a DBR, the DBR thermal protection must be connected to the ***CIA/CIB (Customer Interlock)** terminals or the **MCP Shunt Trip** must be used.*
DBR Resistance	This screen is used to input the resistive value of the **Dynamic Braking Resistor**.
DC Injection Current	This setting sets the percentage of the rated current of the drive that will be used for **DC Injection Braking**. A larger load will require a higher setting.
DC Injection on at Direction Change	This setting determines if **DC Injection Braking** is to be used during a change in the direction of the motor.
DC Injection Start	During deceleration this is the frequency at which **DC Injection Braking** will start.
DC Injection Time	This setting is used to set the on-time duration of the **DC Injection Braking**.
DC Voltage	The DC bus voltage displayed as a percentage of the maximum bus voltage of the ASD.
Deceleration Time #1	Motor #1 deceleration rate; measured in seconds.
Deceleration #2 Time	Motor #2 deceleration rate; measured in seconds.
Delay Filter	This setting determines the delay in the ASD output response to the motor-control feedback signal.
Differential Gain	When using PID feedback to control the ASD output, this function is used to control the output by monitoring the rate of change of the error.
Direction	Displays the direction of the motor (forward or reverse).
Direction Priority	This setting determines if **Forward** or **Reverse** has priority in the event that both commands are received simultaneously.
Disable F/R Run	**Enables/Disables** the **Forward Run** or **Reverse Run** modes. If either direction is disabled, commands received for the disabled direction will not be recognized. If both directions are disabled, the received direction command will determine the direction of the motor rotation.
Dynamic Braking	**Dynamic Braking** uses the inertial energy of the load to produce a braking force or it may be used to reduce the bus voltage.
Electronic Thermal Protection 1	The motor overload current level for motor set #1.
Electronic Thermal Protection #2	The motor overload current level for motor set #2.
Electronic Thermal Protection #3	The motor overload current level for motor set #3.

Electronic Thermal Protection #4	The motor overload current level for motor set #4.
Emergency Off Mode	This setting determines the method used to stop the motor in the event that an **Emergency Off** command is received and the system is configured to use this feature.
Emergency Off Time	When **DC Injection Braking** is used as a function of receiving an **Emergency Off** command, this setting determines the time that the **DC Injection Braking** is applied to the motor.
End Frequency	This setting determines the lowest frequency that the drive will recognize during deceleration before the drive goes to 0.0 Hz.
Error Detect Time	This setting determines the length of time that an ASD is monitored for an error.
Fault Detect Station	In a multiple-ASD configuration this setting determines the ASD responsible for fault notification.
F Delay	This setting delays the response of the drive output to any change in the **F** terminal input.
Fire Speed	The **S1** terminal default setting. When activated the ASD outputs the value of **Preset Speed 1**. **Damper Open** signal required for activation.
FL Terminal	Multifunctional programmable discrete output.
FL Off Delay	This setting delays the **Off** response-time of the **FL** terminal to an input change.
FL On Delay	This setting delays the **On** response-time of the **FL** terminal to an input command.
FM Terminal Adjustment	With the drive running at a known frequency, adjust this parameter until the running frequency produces the desired DC level output at the **FM** terminal.
FM Terminal Assignment	The selected function is associated with the output signal of terminal **FM** (i.e., as the associated output variable changes, so does the output level of the **FM** terminal).
FM Output	Displays the status of the **FM** output.
FP Terminal Adjust	This setting determines the full-scale reading of the **FP** terminal.
FP Terminal Setting	This setting commands the multifunction programmable **FP** terminal to monitor the value of 1 of 31 possible system functions. As the monitored function changes in magnitude or frequency, the pulse count of the **FP** output pulse train changes in direct proportion to changes in the monitored function.
Frequency Command	The programmed frequency displayed in Hz.
Frequency Display Resolution	Sets the number of decimal places to be displayed during non-Accel/Decel functions.
Frequency Mode	This setting determines the source of the frequency command (e.g., RR, RX, Communication Card, etc.).
Frequency Multiplier	Sets a multiplication factor to be applied to the programmed frequency as a modifier.
F Terminal	Multifunctional programmable discrete input.
Input Feedback Select	Establishes the source of the feedback for the ASD.
Input Power	Displays the input power in kW.

Input Priority	This parameter is used to allow the **Jog** and **DC Injection Braking** input signals to control the ASD when received via the **Control Terminal Strip** even though the system is in the **Local** mode. With this parameter enabled**,** a **Jog** command or a **DC Injection Braking** command received from the **Control Terminal Strip** will receive priority over commands from the keypad.
Input Terminals	Displays the active discrete input terminals of the ASD.
Inrush Time	This setting determines the length of time of the inrush current suppression.
Integral Gain	When using PID feedback to control the ASD output, this function is used to control the output by providing a value that is representative of the error over time.
Jog Run Frequency	This setting determines the output frequency of the drive during a **Jog**.
Jog Stop Control	This setting determines the stopping method used while operating in the **Jog** mode.
Jump 1 Bandwidth	This setting establishes a ± value to the **Jump Frequency 1** setting.
Jump 2 Bandwidth	This setting establishes a ± value to the **Jump Frequency 2** setting.
Jump 3 Bandwidth	This setting establishes a ± value to the **Jump Frequency 3** setting.
Jump Frequency 1	This setting establishes a frequency setting that may not be output from the ASD.
Jump Frequency 2	This setting establishes a frequency setting that may not be output from the ASD.
Jump Frequency 3	This setting establishes a frequency setting that may not be output from the ASD.
Kilowatt Hours	Accumulated Kilowatt hours. Saved at 2-hour intervals.
LCD Contrast	Adjusts the contrast of the LCD screen.
LED Option Override	This feature allows for the external adjustment of the output frequency (using RR, RX, etc.) while using the LED keypad.
Lock-on Rate	After a momentary power outage, the ASD may have to startup into a spinning motor. The **Lock On Rate** is the difference between the time that the RPM of the motor is determined by the ASD and the time that the ASD outputs a drive signal to the motor.
Low Current Setting	While operating with the **Low Current Trip** setting enabled, this function sets the **Low Current Trip** threshold.
Low Current Time	While operating with the **Low Current Trip** setting enabled, this setting determines the time that the low-current condition must exist to cause a trip.
Low Current Trip	When enabled, the drive will trip on a low-current fault if the output current of the drive falls below the **Low Current Setting**.
Lower Deviation Limit	This parameter determines the maximum amount that the feedback may decrease the output signal.
Lower Limit Frequency	The lowest frequency the will be recognized as a frequency command.
Low Signal Frequency	This setting determines low-speed trip threshold.
Main EEPROM Version	Version of the **Main EEPROM**.
Maximum Output Frequency	This setting determines the maximum frequency that the ASD can output.
Maximum Voltage #1	This setting determines the maximum value of the output voltage of the drive.
Maximum Voltage #2	This setting determines the maximum value of the output voltage of the drive for the #2 motor when using a multiple-profile configuration.

Maximum Voltage #3	This setting determines the maximum value of the output voltage of the drive for the #3 motor when using a multiple-profile configuration.
Maximum Voltage #4	This setting determines the maximum value of the output voltage of the drive for the #4 motor when using a multiple-profile configuration.
Mode 1/2 Switching Frequency	This setting determines if **Frequency Mode #1** or **#2** will control the output frequency and the conditions in which control will be switched from one to the other.
Motor 150% Run Time Setting	This parameter establishes a time that the motor may operate at 150% of its rated current before tripping.
Motor Capacity	This setting identifies the wattage rating of the motor.
Motor Constant 1	This reading is the measurement of the stator resistance and is considered a **Motor Constant** (unchanging). This value is used in conjunction with other constants to tune the motor.
Motor Constant 2	This reading is the measurement of the rotor resistance and is considered a **Motor Constant** (unchanging). This value is used in conjunction with other constants to tune the motor.
Motor Constant 3	This reading is used to input the excitation inductance for the motor. This value is used in conjunction with other constants to tune the motor.
Motor Constant 4	This reading is used to control the load inertia during speed changes. Acceleration and deceleration overshoot may be reduced by increasing this value.
Motor Constant 5	This reading provides slight increases in the output voltage of the drive at the high speed range.
Motor Load	Displays the instantaneous motor load.
Motor Overload Ratio	This value displays the relationship of time to the magnitude of the motor overload as a ratio. A higher overload means a shorter run-time in this condition.
Motor Poles	This setting identifies the number of motor poles.
Motor Slip Gain	This setting determines the output torque response sensitivity for a given load change.
Motor Type	This setting identifies the type of motor being used.
MS Relay (status Anded) with ST	The **MS1 AUX** relay circuit is normally open; after normal system power is available, the **MS1 AUX** relay circuit closes the **ST**-to-**CC** connection.
Multiplying Input Select	Selecting either of the input methods enables this feature. The selected input is used as a multiplying modifier of the programmed output frequency.
Number of Retries	After a trip has occurred, this parameter sets the number of times that an automatic system restart is attempted.
ON Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
OUT1 Terminal	Multifunctional programmable discrete output.
OUT1 Off Delay	This setting delays the **Off** response-time of the **OUT1** terminal to an input change.
OUT1 On Delay	This setting delays the **On** response-time of the **OUT1** terminal to an input command.
OUT2 Terminal	Multifunctional programmable discrete output.
OUT2 Off Delay	This setting delays the **Off** response-time of the **OUT2** terminal to an input change.

OUT2 On Delay	This setting delays the **On** response-time of the **OUT2** terminal to an input command.
OUT4 Terminal	Multifunctional programmable discrete output (Multicom expansion card required).
OUT4 Off Delay	This setting delays the **Off** response-time of the **OUT4** terminal to an input change.
OUT4 On Delay	This setting delays the **On** response-time of the **OUT4** terminal to an input command.
OUT5 Terminal	Multifunctional programmable discrete output (Multicom expansion card required).
OUT5 Off Delay	This setting delays the **Off** response-time of the **OUT5** terminal to an input change.
OUT5 On Delay	This setting delays the **On** response-time of the **OUT5** terminal to an input command.
OUT6 Terminal	Multifunctional programmable discrete output (Multicom expansion card required).
OUT6 Off Delay	This setting delays the **Off** response-time of the **OUT6** terminal to an input change.
OUT6 On Delay	This setting delays the **On** response-time of the **OUT6** terminal to an input command.
OUT7 Terminal	Multifunctional programmable discrete output (Multicom expansion card required).
OUT7 Off Delay	This setting delays the **Off** response-time of the **OUT7** terminal to an input change.
OUT7 On Delay	This setting delays the **On** response-time of the **OUT7** terminal to an input command.
Output Current	The current that is applied to the motor displayed as a percentage of the maximum output of the ASD.
Output Phase Loss	**Enables/Disables** the monitoring of each phase of the 3-phase output signal (U, V, and W) of the ASD. If either line is missing, inactive, or not of the specified level, the ASD incurs a trip.
Output Power	Displays the output power in kW.
Output Terminals	Displays the active output terminals of the ASD.
Output Voltage	The voltage that is applied to the motor displayed as a percentage of the maximum output of the ASD.
Overcurrent Stall Level	This setting specifies the output current level at which the output frequency is reduced in an attempt to prevent a trip.
Overload Reduction Frequency	This setting is used to reduce the start frequency during very low-speed motor operation. During very low-speed operation the cooling efficiency of the motor decreases. Lowering the start frequency aides in minimizing the generated heat.
Overspeed Frequency	A user-set frequency that, once exceeded, will cause an **Overspeed Alert**.
Overtorque Detect Time	This setting determines the amount of time that the overtorque condition may exceed the tripping threshold level before a trip occurs.
Overtorque Level Negative	This setting determines the torque threshold level that is used as a setpoint for overtorque tripping during regeneration.

Overtorque Level Positive	This parameter sets the torque threshold level that is used as a setpoint for overtorque tripping (positive torque).
Overtorque Trip	When enabled, the ASD trips if a torque larger than the user-set level exists for a time longer than the overtorque detect time.
Overvoltage Level 1	An overvoltage condition that exceeds this setting results in a reduced output frequency.
Overvoltage Level 2	An overvoltage condition that exceeds this setting results in a reduced output frequency.
Overvoltage Stall	This parameter sets the upper DC bus voltage threshold that, once exceeded, will cause an **Overvoltage Stall**. An **Overvoltage Stall** increases the output frequency of the drive during deceleration for a specified time in an attempt to prevent an **Overvoltage Trip**.
Panel Acc/Dec Select	1 of 4 accel/decel profiles may be selected and run. Each accel/decel profile is comprised of 3 user settings: **Acceleration**, **Deceleration**, and **Pattern**.
Panel Direction	Sets the motor direction while operating from the keypad.
Panel Lockout	When enabled, keypad input is not available.
Panel PID Control	**Enables/Disables** PID control while running from the keypad.
Panel Reset Select	**Enables/Disables** the ability to reset the system from the keypad.
Panel Stop Pattern	The **Decel Stop** or **Coast Stop** settings determines the method used to stop the motor when using the **Stop|Reset** key of the keypad. The **Decel Stop** setting enables either the **Dynamic Braking** system or the **DC Injection Braking** system. The **Coast Stop** setting allows the motor to stop at the rate allowed by the inertia of the load.
Panel V/f Group	1 of 4 V/f profiles may be selected and run. Each V/f profile is comprised of 4 user settings: **Base Frequency**, **Base Frequency Voltage**, **Manual Torque Boost**, and **Electronic Thermal Protection**.
Parity	Sets the communications parity setting to **Even**, **Odd**, or **None**.
Past Trip #1	The past trip feature reads and stores the last four trip records. **Past Trip #1** occurred last of the recorded trips.
Past Trip #2	The past trip feature reads and stores the last four trips.
Past Trip #3	The Past Trip feature reads and stores the last four trips.
Past Trip #4	The **Past Trip** feature reads and stores the last four trips. **Past Trip #4** occurred first of the four recorded trips and will be erased when the next trip occurs.
Peak Current	Displays the **Peak Current** as a percentage of the maximum ASD rating or as an amperage (see Units for V/I on pg. 47)).
PG Detect Selection	**Enables/Disables** the use of the **PG** feedback function.
PG Number of Pulses	This setting is used to determine the end-of-travel range when using an encoder on a motor-driven positioning system (e.g., hoist/crane, etc.).
PG Input Phases	This setting determines if motor speed and direction will be conveyed by the encoder.
PG Speed Freq #1	This parameter sets **PG Speed Freq #1** (frequency) and is the frequency that is associated with the pulse count setting **PG Speed Ref #1** (%).
PG Speed Ref #1	This parameter sets **PG Speed Ref #1** (%) and is the pulse count that is associated with the frequency/direction setting **PG Speed Freq #1** (frequency).
PG Speed Freq #2	This parameter sets **PG Speed Freq #2** (frequency) and is the frequency that is associated with the pulse count setting **PG Speed Ref #2** (%).

PG Speed Ref #2	This parameter sets **PG Speed Ref #2** (%) and is the pulse count that is associated with the frequency/direction setting **PG Speed Freq #2** (frequency).
PID Feedback	Displays the instantaneous PID feedback value.
Post Compensation Frequency	The output frequency of the ASD after the application of the waveform adjustment compensation due to changes in the input voltage.
Preset Speed #1	Values that fall within the **Lower Limit Frequency** and the **Upper Limit Frequency** range may be programmed into the drive and output as a **Preset Speed**. This parameter assigns an output frequency to the binary number input 0001.
Preset Speed #2	Same as **Preset Speed #1** (binary number = 0010).
Preset Speed #3	Same as **Preset Speed #1** (binary number = 0011).
Preset Speed #4	Same as **Preset Speed #1** (binary number = 0100).
Preset Speed #5	Same as **Preset Speed #1** (binary number = 0101).
Preset Speed #6	Same as **Preset Speed #1** (binary number = 0110).
Preset Speed #7	Same as **Preset Speed #1** (binary number = 0111).
Preset Speed #8	Same as **Preset Speed #1** (binary number = 1000).
Preset Speed #9	Same as **Preset Speed #1** (binary number = 1001).
Preset Speed #10	Same as **Preset Speed #1** (binary number = 1010).
Preset Speed #11	Same as **Preset Speed #1** (binary number = 1011).
Preset Speed #12	Same as **Preset Speed #1** (binary number = 1100).
Preset Speed #13	Same as **Preset Speed #1** (binary number = 1101).
Preset Speed #14	Same as **Preset Speed #1** (binary number = 1110).
Preset Speed #15	Same as **Preset Speed #1** (binary number = 1111).
Preset Speed Mode Control	**Enables/Disables** the use of the **Preset Speed Mode** control. The **Preset Speed Mode** control setting determines if the speed only is used (disabled) or if (enabled) the **Torque**, **Speed**, **Accel/Decel**, and **Direction** settings will be used while running a given preset speed.
Proportional Gain	When using PID feedback to control the ASD output, this function is used to control the output by applying a multiplier to the error.
PS Speed Mode 1	When **Enabled**, the **Preset Speed Mode Control** is in effect for **Preset Speed #1**.
PS Speed Mode 2	Same as **PS Speed Mode 1**.
PS Speed Mode 3	Same as **PS Speed Mode 1**.
PS Speed Mode 4	Same as **PS Speed Mode 1**.
PS Speed Mode 5	Same as **PS Speed Mode 1**.
PS Speed Mode 6	Same as **PS Speed Mode 1**.
PS Speed Mode 7	Same as **PS Speed Mode 1**.
PS Speed Mode 8	Same as **PS Speed Mode 1**.
PS Speed Mode 9	Same as **PS Speed Mode 1**.
PS Speed Mode 10	Same as **PS Speed Mode 1**.
PS Speed Mode 11	Same as **PS Speed Mode 1**.
PS Speed Mode 12	Same as **PS Speed Mode 1**.
PS Speed Mode 13	Same as **PS Speed Mode 1**.

PS Speed Mode 14	Same as **PS Speed Mode 1**.
PS Speed Mode 15	Same as **PS Speed Mode 1**.
PWM Carrier Frequency	The user-set ASD output frequency that is used to apply the pulsating DC voltage to the motor.
Ramped PWM	**Enables/Disables** the variable PWM frequency.
R Delay	This setting delays the response of the drive output to any change in the **R** terminal input.
Reach Detection	Sets the bandwidth of the **Reach** function if enabled.
Reach Frequency	This setting establishes a frequency threshold that, when reached or is within the specified bandwidth, will provide a signal at an output terminal that can close an appropriately configured output contact.
Receive Address	This setting defines a memory location to be used for received data via a **Multicom** option board.
Reference Priority Selection	Either **Frequency Mode #1** or **Frequency Mode #2** may control the output frequency of the ASD. This parameter determines which of the two will control the output frequency and the conditions in which control will be switched from one to the other.
Regen Stall	**Enables/Disables** the **Overvoltage Stall** and the **Overcurrent Stall** function during regeneration only.
Release After Run	This setting sets the time that the brake will hold after the **Run** command criteria has been met.
RES Terminal	Multifunctional programmable discrete input.
RES Delay	This setting delays the response of the drive output to any change in the **RES** terminal input.
Ridethrough Mode	This setting determines the motor-control response of the drive in the event of a momentary power outage. During a **Ridethrough**, regenerative energy is used to maintain the control circuitry settings; it is not used to drive the motor.
Ridethrough Time	In the event of a momentary power outage, this parameter determines the length of the **Ridethrough** time. During a **Ridethrough**, regenerative energy is used to maintain the control circuitry settings; it is not used to drive the motor.
RR Input	Displays the **RR** input level.
RR Speed Freq #1	This parameter sets **RR Speed Freq #1** (frequency) and is the frequency that is associated with the analog input **RR Speed Ref #1** (%).
RR Speed Freq #2	This parameter sets **RR Speed Freq #2** (frequency) and is the frequency that is associated with the binary input **RR Speed Ref #2** (%).
RR Speed Ref #1	This parameter sets **RR Speed Ref #1** (%) and is the analog input that is associated with the frequency/direction setting **RR Speed Freq #1** (frequency).
RR Speed Ref #2	This parameter sets **RR Speed Ref #2** (%) and is the binary input that is associated with the frequency/direction setting **RR Speed Freq #2** (frequency).
RR Torque Ref #1	This parameter sets **RR Torque Ref #1** (%) and is the binary input that is associated with the torque/direction setting **RR Speed Freq #1** (frequency).
RR Torque Ref #2	This parameter sets **RR Torque Ref #2** (%) and is the binary input that is associated with the torque/direction setting **RR Speed Freq #2** (frequency).
RS485 Baud Rate	Sets the information transfer rate for RS485 communications.
RS485 Master Output	In a master/follower configuration, this setting determines the output parameter of the master ASD that will be used to control the applicable follower ASDs.

RS485 Response Time	This setting determines the RS485 response delay time.
RS485 Time-out Action	This setting determines the action to be taken in the event of a communications time-out.
RS485 Time-out Time	This setting determines time that no activity may exist over the communications link before the link is severed.
RS485 Wire Count	This setting establishes the communications protocol as the 2 or 4 wire method.
R Terminal	Multifunctional programmable discrete input.
Run Frequency	This parameter setting plus the **Run Frequency Hysteresis** setting establishes the starting frequency of the ASD.
Run Frequency Hysteresis	This parameter provides start and stop setting for the **Run Frequency**.
Run Time	Displays the accumulated run-time since the last reset or power up of the ASD.
Run Time Alarm Setting	This setting provides a run-time value that, once exceeded, closes a contact. The output signal may be used to notify an operator or control external equipment.
RX2 Input	Displays the **RX2** input level.
RX Input	Displays the **RX** input level.
RX Speed Freq #1	This parameter sets **RX Speed Freq #1** (frequency) and is the frequency that is associated with the analog input **RX Speed Ref #1** (%).
RX Speed Freq #2	This parameter sets **RX Speed Freq #2** (frequency) and is the frequency that is associated with the binary input **RX Speed Ref #2** (%).
RX Speed Ref #1	This parameter sets **RX Speed Ref #1** (%) and is the analog input that is associated with the frequency/direction setting **RX Speed Freq #1** (frequency).
RX Speed Ref #2	This parameter sets **RX Speed Ref #2** (%) and is the binary input that is associated with the frequency/direction setting **RX Speed Freq #2** (frequency).
RX Torque Ref #1	This parameter sets **RX Torque Ref #1** (%) and is the binary input that is associated with the torque/direction setting **RX Speed Freq #1** (frequency).
RX Torque Ref #2	This parameter sets **RX Torque Ref #2** (%) and is the binary input that is associated with the torque/direction setting **RX Speed Freq #2** (frequency).
RX2 Speed Freq #1	This parameter sets **RX2 Speed Freq #1** (frequency) and is the frequency that is associated with the analog input **RX2 Speed Ref #1** (%).
RX2 Speed Freq #2	This parameter sets **RX2 Speed Freq #2** (frequency) and is the frequency that is associated with the binary input **RX2 Speed Ref #2** (%).
RX2 Speed Ref #1	This parameter sets **RX2 Speed Ref #1** (%) and is the analog input that is associated with the frequency/direction setting **RX2 Speed Freq #1** (frequency).
RX2 Speed Ref #2	This parameter sets **RX2 Speed Ref #2** (%) and is the binary input that is associated with the frequency/direction setting **RX2 Speed Freq #2** (frequency).
RX2 Torque Ref #1	This parameter sets **RX2 Torque Ref #1** (%) and is the binary input that is associated with the torque/direction setting **RX2 Speed Freq #1** (frequency).
RX2 Torque Ref #2	This parameter sets **RX2 Torque Ref #2** (%) and is the binary input that is associated with the torque/direction setting **RX2 Speed Freq #2** (frequency).
S1 Terminal	Multifunctional programmable discrete input.
S10 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S11 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).

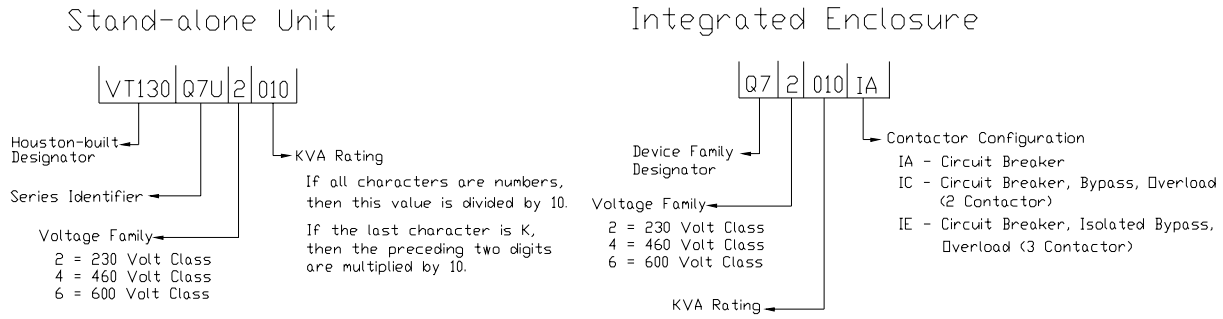
S12 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S1–S4 Delay	This setting delays the response of the drive output to any change in the **S1 – S4** terminal inputs.
S2 Terminal	Multifunctional programmable discrete input.
S20 Reset	**Enables/Disables** the ability to reset the system via S20 communication.
S3 Terminal	Multifunctional programmable discrete input.
S4 Terminal	Multifunctional programmable discrete input.
S5 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S5–S16 Delay	This setting delays the response of the drive output to any change in the **S5 – S16** terminal inputs (Multicom expansion card required).
S6 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S7 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S8 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
S9 Terminal	Multifunctional programmable discrete input (Multicom expansion card required).
Scan Rate	In the event of a momentary power outage, the output signal of the drive will cease. Upon restoration of power, the drive will output a low-level signal that will ramp up in frequency until matching the rotor RPM to determine the rotation speed of the rotor. The **Scan Rate** is the speed of the ramp up.
Search Inertia	After a momentary power loss or the momentary loss of the **ST**-to-**CC** connection, this parameter sets the time for the commanded torque to reach its programmed setting during the automatic restart.
Search Method	In the event of a momentary power outage, this parameter may be used to set the starting point (frequency) of the scanning signal that is used to determine the rotor speed or this parameter may be used to select the method used to search for the speed of the rotor.
Shaft Stationary	**Enables/Disables** a continuous **DC Injection** at half of the **DC Injection** amperage setting into a stopped motor.
Short Circuit Test	Selects the **Short Circuit Test** method.
Short Circuit Time	This setting determines the pulse width of the output pulse that is supplied by the ASD during an output short circuit test.
Soft Stall Selection	Limits the maximum output frequency to 80% of the base frequency once the overload level reaches 75%.
S-Pattern Lower Limit Adjustment (%)	Sets the time added to the lower portion of **S-pattern 1** (decreases the accel rate at the ramp start).
S-Pattern Upper Limit Adjustment (%)	Sets the time added to the upper portion of **S-pattern 1** (decreases the decel rate at the ramp end).
Speed Drop Frequency	Sets the lower deviation limit of the output frequency while operating using **PG** feedback.
Speed Reference Address	In a multiple-ASD configuration, this setting determines the memory location of the speed reference.

Speed Reference Station	In a multiple-ASD configuration, this setting determines the source of the speed reference.
Speed Search Selection	**Enables/Disables** the ability of the drive to start into a spinning motor when the **ST**-to-**CC** connection momentarily opens and is then closed (Break/Make ST) or after a power interruption (momentary power failure).
Stall Period	This setting allows the user to extend the **Overvoltage Stall** and the **Overcurrent Stall** time settings.
Startup Frequency	Sets the initial output frequency when a **Run** command is received.
ST Delay	This setting delays the response of the drive output to any change in the **ST** terminal input.
ST Terminal	Multifunctional programmable discrete input.
Switch-on-the-fly	The ability to switch between the **Manual** and **Auto** modes while running.
Torque Boost #1	This function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the **#1 Base Frequency**.
Torque Boost #2	This function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the **#2 Base Frequency**.
Torque Boost #3	This function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the **#3 Base Frequency**.
Torque Boost #4	This function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the **#4 Base Frequency**.
Torque Reference Address	In a multiple-ASD configuration, this setting determines the memory location of the torque reference.
Torque Reference Station	In a multiple-ASD configuration, this setting determines the source of the torque reference.
Transmit Address	This setting defines a memory location to be used for transmitted data via a **Multicom** option board.
Trip Code	Displays the active trip.
Trip Hold Frequency	Displays the at-trip frequency or current frequency if no trip is active.
Trip Save	**Enables/Disables** the **Trip Save at Power Down** setting. When enabled, this feature logs the trip event and retains the trip information when the system powers down so that the trip is active when the power is restored.
TTL Baud Rate	Sets the information transfer rate for TTL communications.
TTL Master Output	In a master/follower configuration, this setting determines the output parameter of the master ASD that will be used to control the applicable follower ASDs.
TTL Response Time	This setting determines the TTL response delay time.
Type Reset	This feature resets the system, or when performing fault analysis, allows for a quick system setup change. Press **R/W** key (once) after **Reset Type** selection to execute selection (the system may take up to 10 seconds to respond).
Undervoltage Stall Level	This setting establishes the low end of the DC bus voltage threshold that, once exceeded, will cause an **Undervoltage Stall**.
Undervoltage Time	This parameter sets the time that the undervoltage condition must exist to cause an **Undervoltage Trip**.

Undervoltage Trip	**Enables/Disables** the **Undervoltage Trip** function.
Units for V/I	Establishes a unit of measurement for voltage and current. Display may be in volts, current, or a percentage of the ASD rating
Upper Deviation Limit	This parameter determines the maximum amount that the feedback may increase the output signal.
Upper Limit Frequency	The highest frequency the will be recognized by the ASD as a frequency command.
User Unit #1	The displayed unit of measurement may be changed from **Hz** to any of the available characters for frequency-display operations. **User Unit #2 – #5** may be used to complete the display of the unit of measurement. ***Note:*** *Program* ⇒ Utility Group ⇒ **Frequency Multiplier** must be a non-zero value.
User Unit #2	See User Unit #1.
User Unit #3	See User Unit #1.
User Unit #4	See User Unit #1.
User Unit #5	See User Unit #1.
V/f Pattern	Volts per Hertz pattern (ASD output voltage-to-frequency ratio).
VI/II Freq #1	The user-set frequency that is associated with the voltage or current input level of the **VI/II Speed Reference #1** setting.
VI/II Freq #2	The user-set frequency that is associated with the voltage or current input level of the **VI/II Speed Reference #2** setting.
VI/II Input	Displays the **VI/II** input level.
VI/II Speed Ref #1	A voltage or current setting that is to be associated with the frequency setting **VI/II Frequency #1**.
VI/II Speed Ref #2	The user-set frequency that is associated with the voltage or current input level of the **VI/II Speed Reference #2** setting.
Voltage Compensation	This function provides a varying degree of output waveform adjustment that compensates for changes in the input voltage.

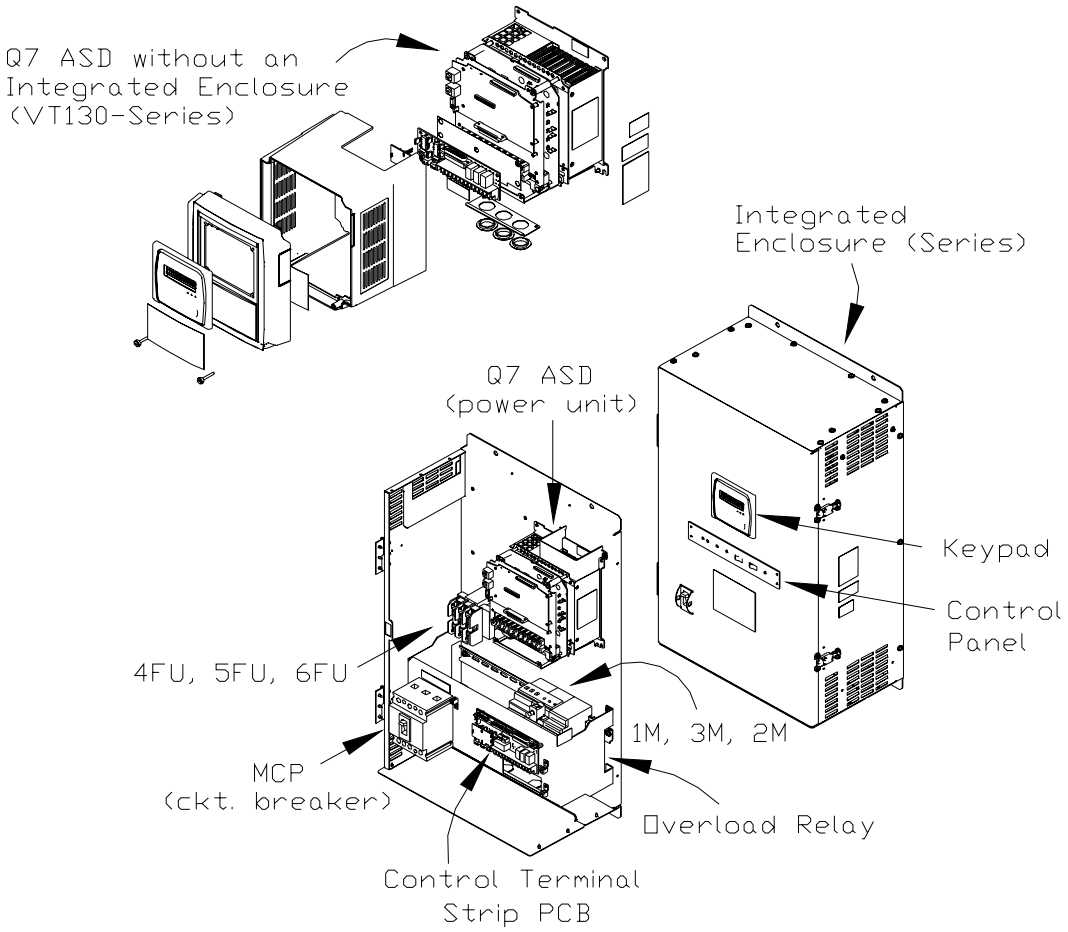
Enclosure Dimensions and Conduit Plate Information

Q7 Part Numbering Convention.



Note: *The Type 1 enclosed versions of the Q7 ASD meet or exceed the specification* ***UL 1995****, the* ***Standard for Heating and Cooling Equipment****, and complies with the applicable requirements for installation in a compartment handling conditioned air.*

Figure 13. Q7 System Configurations.



Enclosure Dimensions/Weights

Table 4. VT130-Series Enclosure Size 1.

Model Number VT130Q7U	Unit Weight (lbs.)	Shipping Weight (lbs.)	Conduit Plate Number Bottom
2010	10	12	55295
2015			
2025			
2035			
2055			
2080			
4015	11	13	
4025			
4035			
4055	11	13	
4080			
4110	13	15	
4160			
6015	11	13	
6025			
6035			
6060			
6080			
6120			
6160			

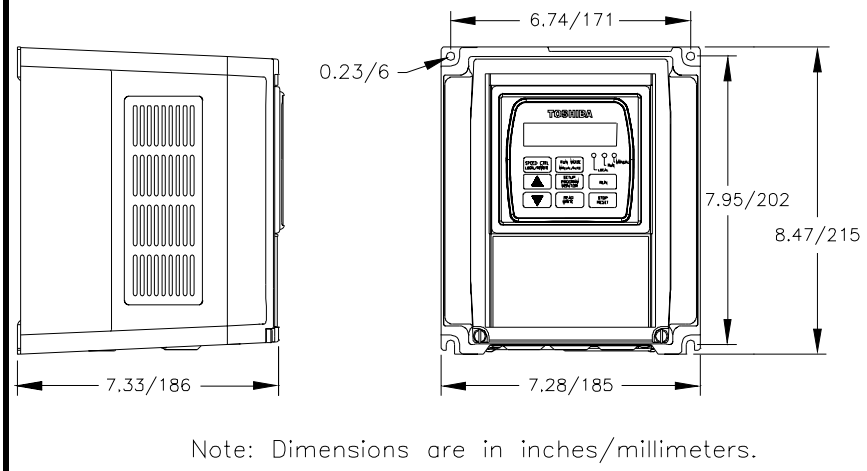


Figure 14. Conduit Plate 55295. Also see Conduit Box 53354 on pg. 56.

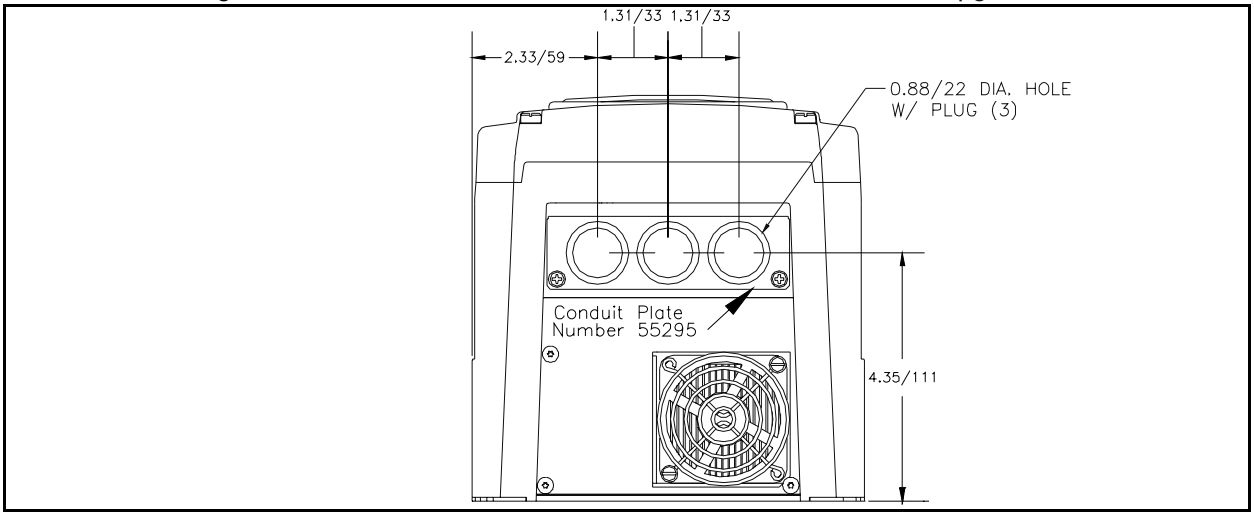


Table 5. VT130-Series Enclosure Size 2.

Model Number VT130Q7U	Conduit Plate Number Bottom
2110	
2160	
2220	
2270	
2330	
2400	
4220	
4270	
4330	
4400	55361
4500	
4600	
6220	
6270	
6330	
6400	
6500	
6600	
6750	

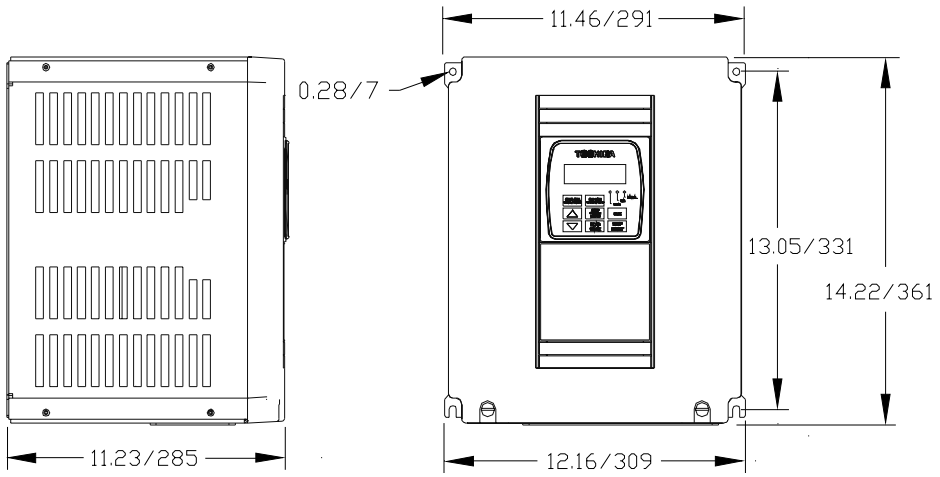


Figure 15. Conduit Plate 55361.

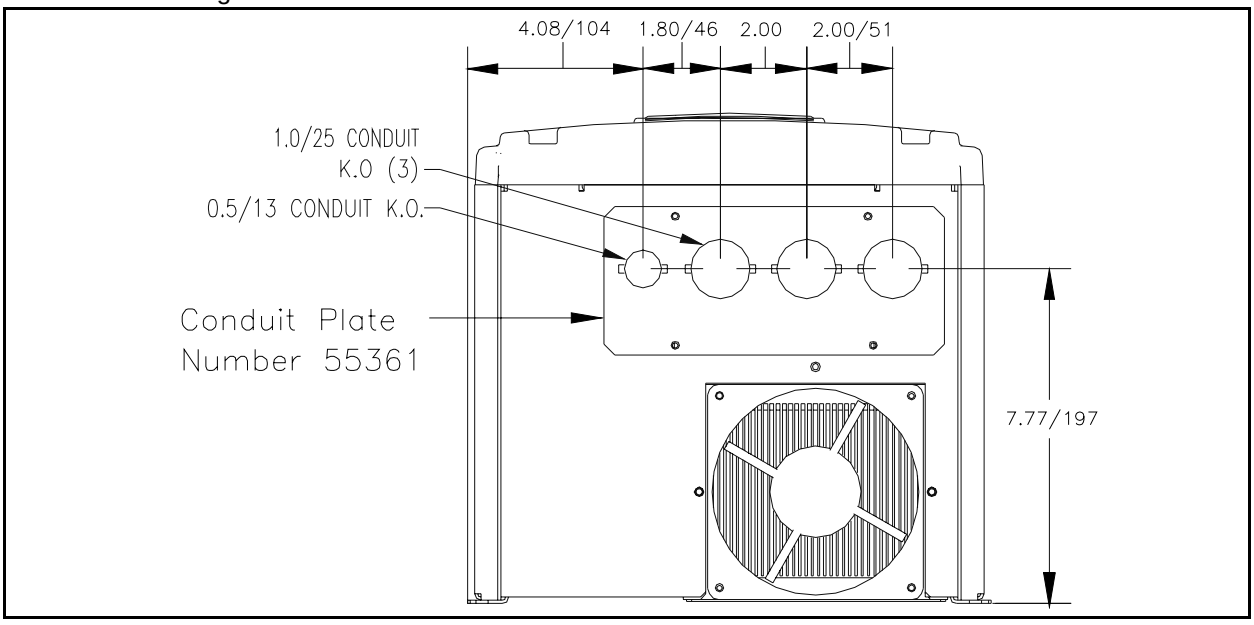


Table 6. VT130-Series Enclosure Size 3.

Model Number VT130Q7U	Conduit Plate Number Bottom
4750	55547
410K	
412K	
610K	

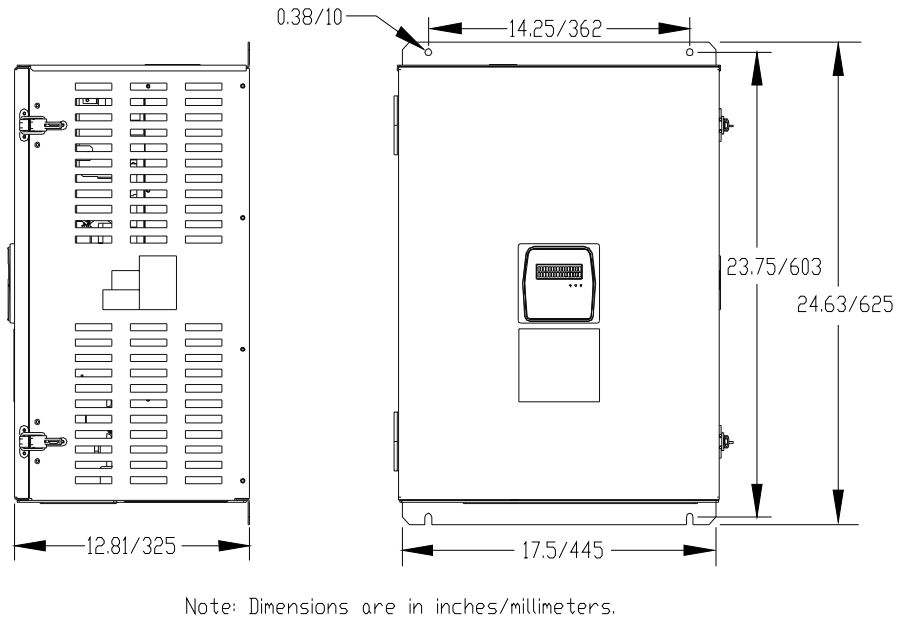


Figure 16. Conduit Plate 55547.

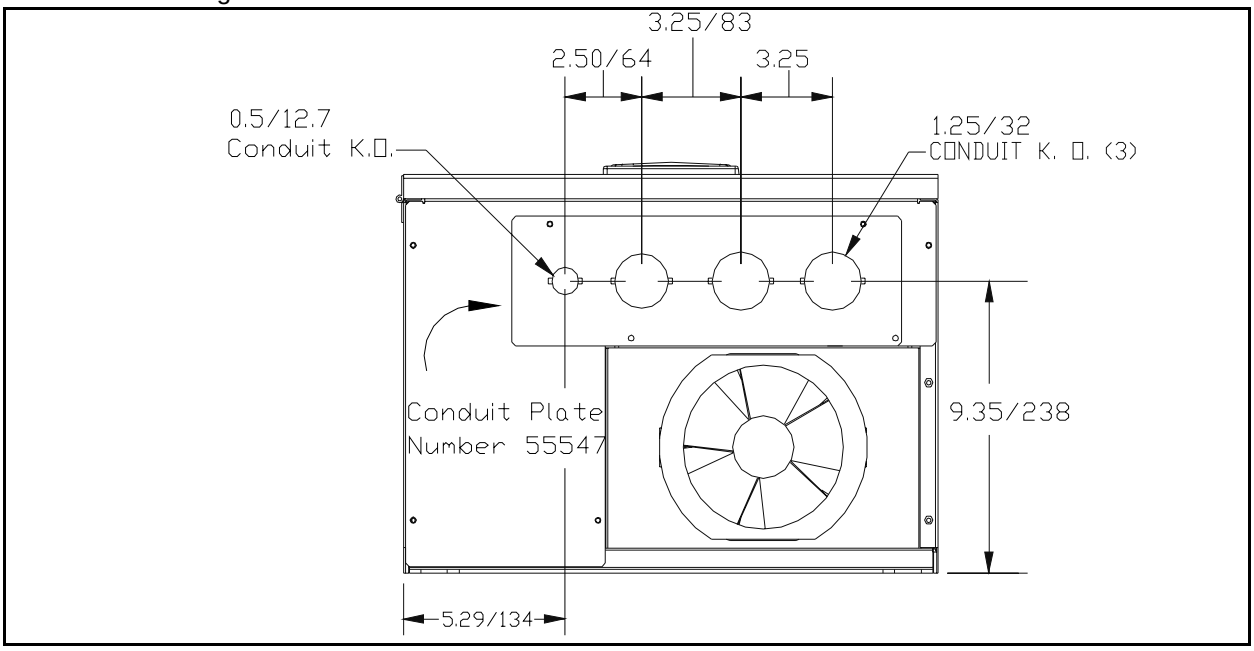


Table 7. VT130-Series Enclosure Size 4.

Model Number VT130Q7U	Conduit Plate Number	
	Bottom	Top
415K	49900	49468
420K		
612K		
615K		
620K		

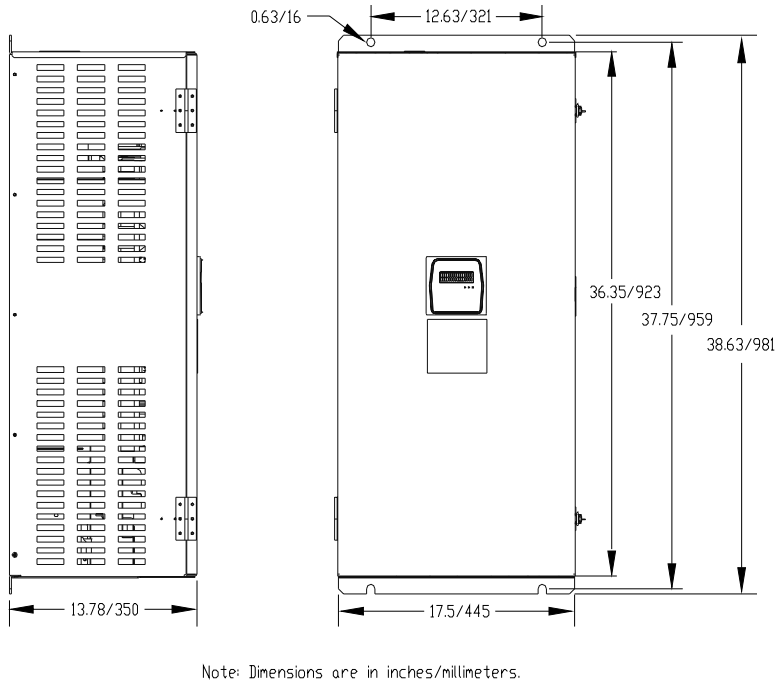


Figure 17. Conduit Plates 49900 and 49648.

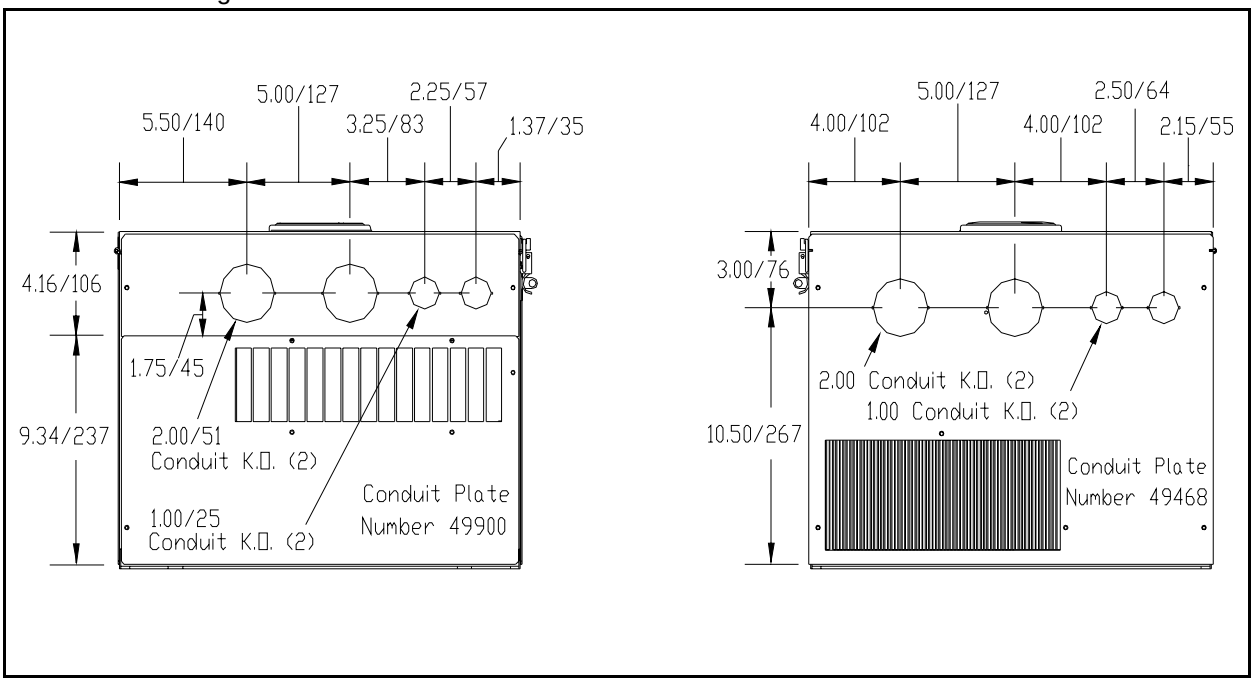


Table 8. VT130-Series Enclosure Size 5.

Model Number VT130Q7U	Conduit Plate Number	
	Bottom	Top
425K	54086	
430K		
435K		
625K		
630K		
635K		

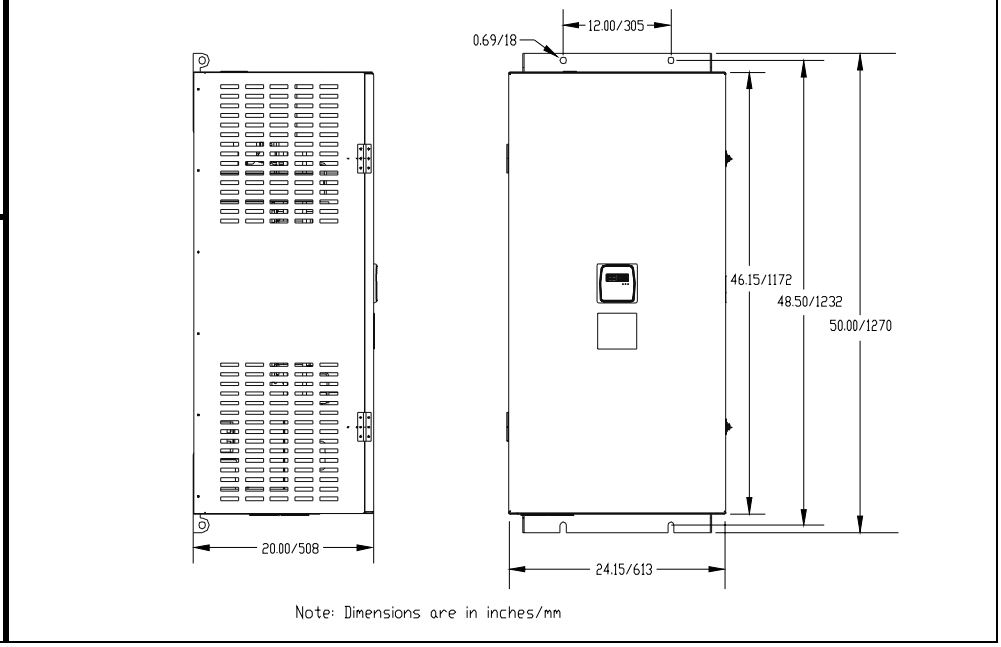


Figure 18. Conduit Plate 54086.

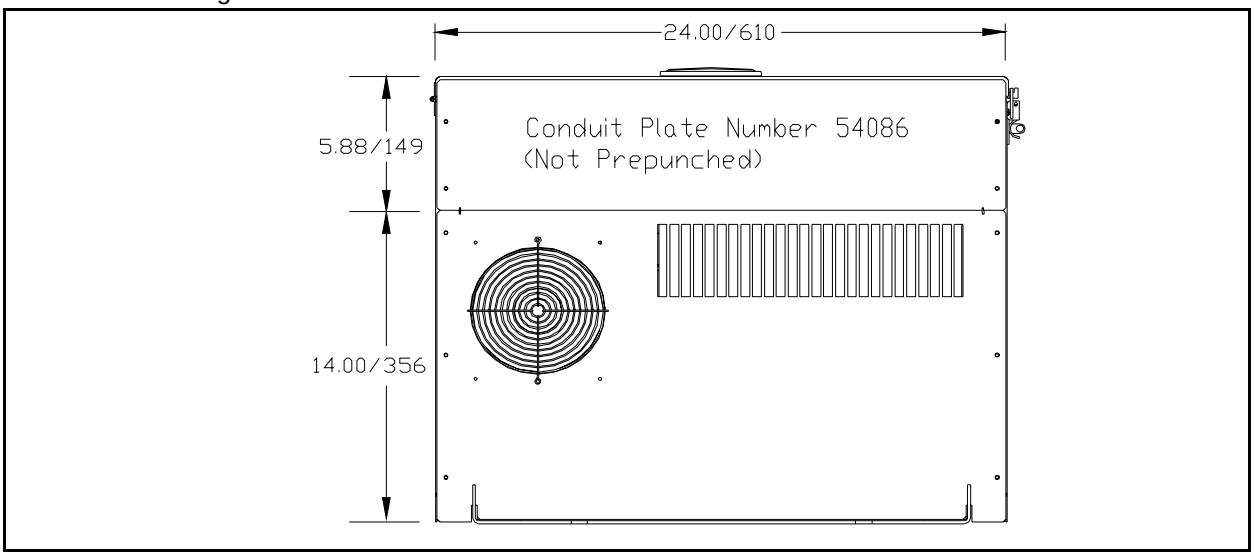
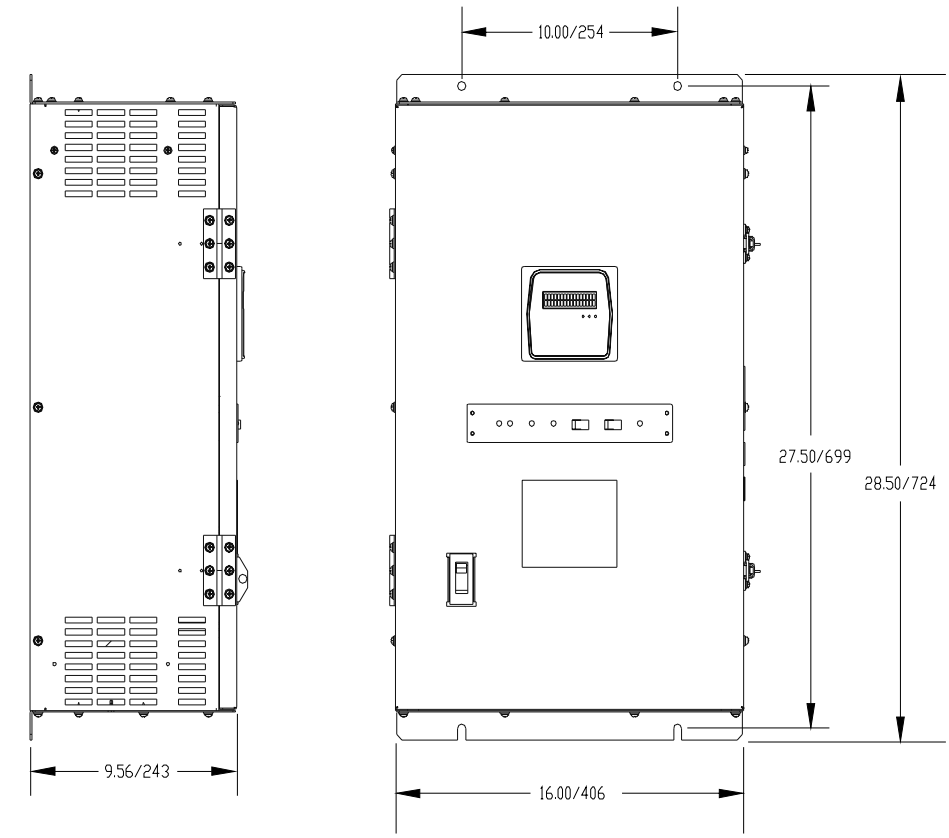


Table 9. Q7 *Flow* Series Integrated Enclosure Size 1.

Model Number Q7
2010
2015
2025
2035
2055
2080
4015
4025
4035
4055
4080
4110
4160
6015
6025
6035
6060
6080
6120
6160



Note: Dimensions are in inches/millimeters.

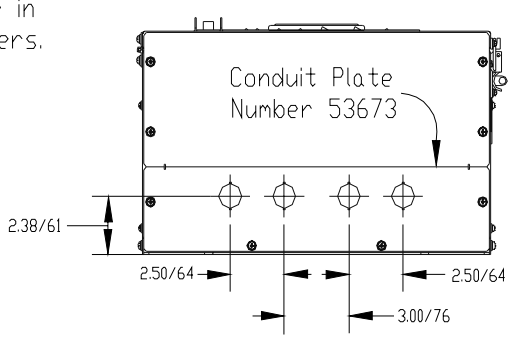
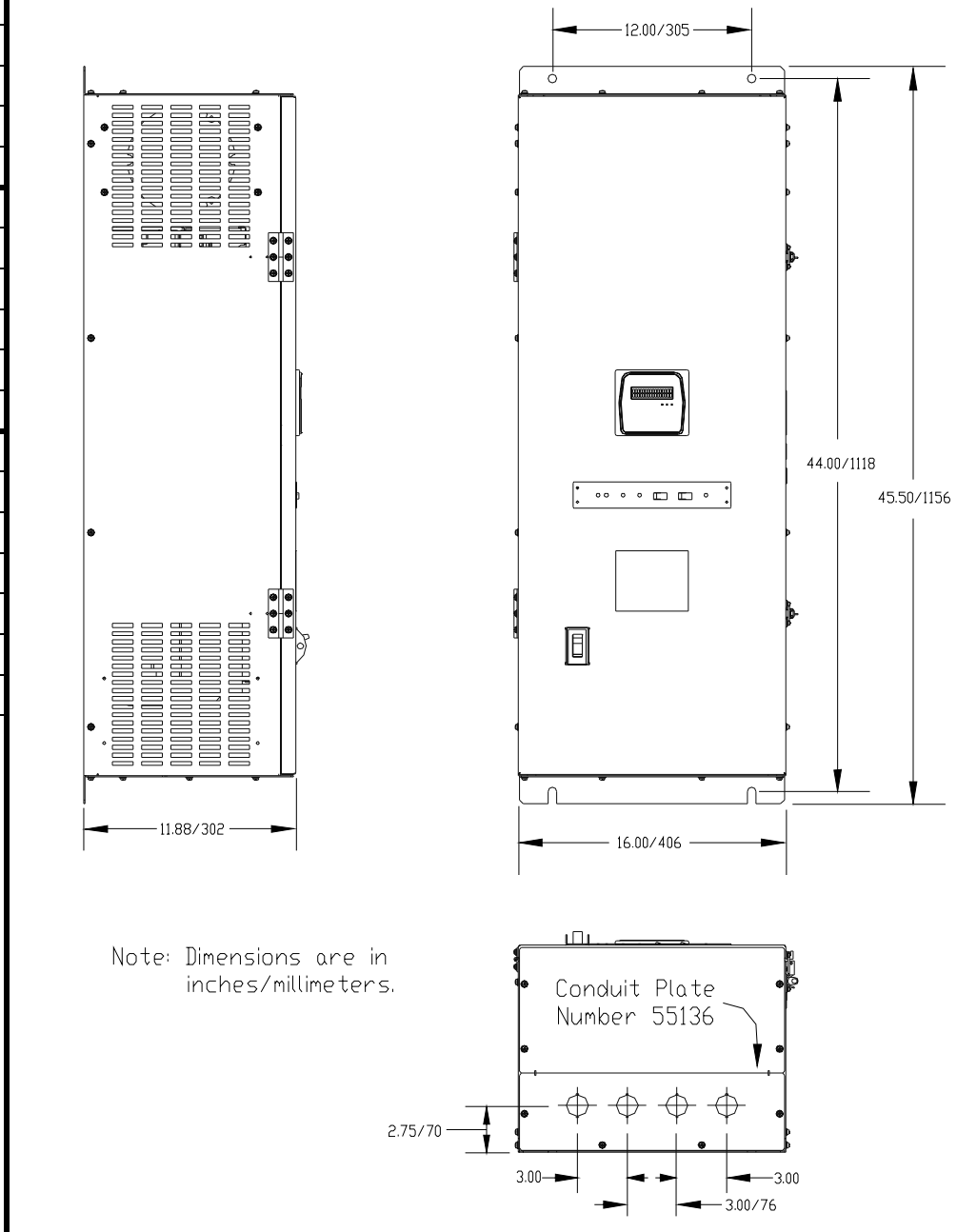


Table 10. Q7 *Flow* Series Integrated Enclosure Size 2.

Model Number Q7
2110
2160
2220
2270
2330
2400
4220
4270
4330
4400
4500
4600
6220
6270
6330
6400
6500
6600
6750



Conduit Box Information

The conduit plate information provided below is for the **VT130 Series Q7 ASDs** listed in Table 4 on page 49.

The Conduit Box (P/N ASD-Conduit-1) may be used when more room is required at the ASD conduit connection point for the stand-alone devices. This option makes adding and removing conduit easier and quicker.

Installation

1. Remove the conduit plate 55295.
2. Install the Conduit Box 53354 (see Figure 20), using the 2 screws from the conduit plate.
3. Make the conduit and wiring connections.
4. Install the Conduit Box cover 53355.

Figure 19. Conduit Box (option).

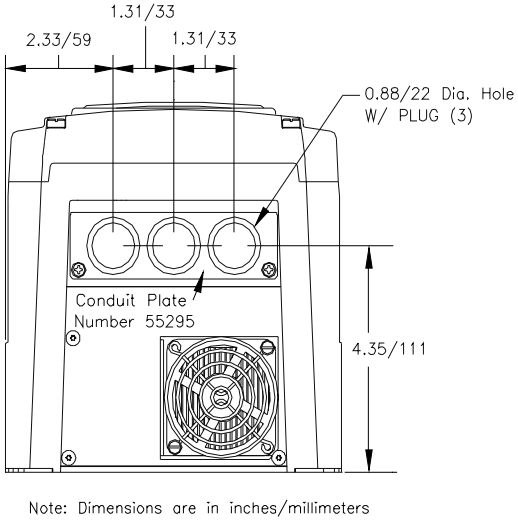
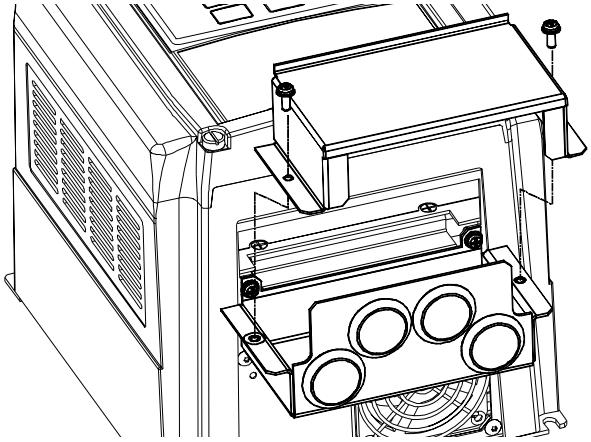


Figure 20. Conduit Box.



Cable/Terminal Specifications

Note: *The following ratings are guidelines and shall not be the sole determining factor of the lug or wire size used with the Q7 ASD. Application-specific applicables, wire insulation type, conductor material, and local and regional regulations are but a few of the considerations when selecting the actual lug and wire type to be used with the ASD.*

Note: *Use only 75° C copper wire/cable for motor and power connections.*

Table 11. Q7 ASD 230 Volt Drive Cable/Terminal Specifications.

Model No. Q7 or VT130Q7U	Circuit Breaker Rating (Amps)	Typical Wire/Cable Size (AWG)			Lug Size
		Input/Output Power	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity
2010	15	#14	#20 (3-core shield)	#18 (2-core shield)	8 to 24 AWG
2015	15	#14			
2025	15	#14			
2035	20	#14			
2055	30	#14			
2080	50	#10			
2110	70	#8			
2160	90	#6			
2220	100	#4			14-1/0 AWG
2270	125	#4			
2330	150	#3			

Table 12. Q7 ASD 460 Volt Drive Cable/Terminal Specifications.

Model No. Q7 or VT130Q7U	Circuit Breaker Rating (Amps)	Typical Cable Size (AWG)			Lug Size
		Input/Output Power Wire Size	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity
4015	15	#14	#20 (3-core shield)	#18 (2-core shield)	8 to 24 AWG
4025	15	#14			
4035	15	#14			
4055	15	#14			
4080	30	#14			
4110	30	#14			
4160	40	#10			4 to 18 AWG
4220	50	#10			
4270	70	#8			
4330	90	#8			
4400	100	#6			
4500	100	#4			
4600	125	#3			14 to 1/0 AWG
4750	175	#2			6 to 250 AWG
410K	200	#1			
412K	225	#2/0			
415K	300	*#4/0			
420K	350	*#2/0			
425K	400	*#4/0			
430K	600	*#300			
435K	700	*#400			

Note: *(*) Indicates that the item is one of a set of two parallel cables.*

Table 13. Q7 ASD 600 Volt Drive Cable/Terminal Specifications.

Model No. Q7 or VT130Q7U	Circuit Breaker Rating (Amps)	Typical Cable Size (AWG)			Lug Size
		Input/Output Power Wire Size	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity
6015	15	#14	#20 (3-core shield)	#18 (2-core shield)	8 to 24 AWG
6025	15	#14			
6035	15	#14			
6060	15	#14			
6080	20	#14			
6120	30	#14			
6160	35	#12			
6220	50	#10			18-2/14-2 AWG
6270	60	#10			
6330	70	#10			
6400	90	#8			
6500	100	#6			
6600	100	#6			
6750	125	#4			6-250 AWG
610K	175	#3			
612K	200	#1			
615K	225	#2/0			
620K	300	#3/0			
625K	400	*#3/0			

Note: *(*) Indicates that the item is one of a set of two parallel cables.*

Current/Voltage Specifications

Table 14. 230 Volt NEMA Type-1 Chassis standard ratings table.

Model No. Q7 or VT130Q7U	Rated KVA	Motor HP/Kw	Input Voltage 3-Ph 50/60 ± 2 Hz	Output Voltage 3-Ph Variable Frequency	Output Current 100% Continuous	Overload Current 110% for 60 Secs.
2010	1.0	0.75/0.56	200 – 240 VAC (±10%)	Input Voltage Level (Max.)	3.7 A	4.1 A
2015	1.5	1.0/0.75			4.8 A	5.3 A
2025	2.5	2.0/1.5			7.8 A	8.6 A
2035	3.5	3.0/2.2			11.0 A	12.1 A
2055	5.5	5.0/3.7			17.5 A	19.3 A
2080	8.0	7.5/5.6			25.3 A	27.8 A
2110	11.0	10.0/7.5			32.2 A	35.4 A
2160	16.0	15.0/11.2			48.3 A	53.1 A
2220	22.0	20.0/14.9			62.1 A	68.3 A
2270	27.0	25.0/18.5			78.2 A	86.0 A
2330	33.0	30.0/22.0			92.0 A	101.2 A
2400	40.0	40.0/30.0			130.0	143.0 A
2500	50.0	50.0/37.3			156.0	171.6 A
2600	60.0	60.0/44.7			192.0	211.0 A
2750	75.0	75.0/56.0			248.0	272.8 A
210K	100	100.0/74.6			312.0	343.2 A
212K	125	125.0/93.2			370.0	407.0 A
215K	150	150.0/112.0			415.0	456.5 A

Table 15. 460 Volt NEMA Type-1 Chassis standard ratings table.

Model No. Q7 or VT130Q7U	Rated KVA	Motor HP/Kw	Input Voltage 3-Ph 50/60 ± 2 Hz	Output Voltage 3-Ph Variable Frequency	Output Current 100% Continuous	Overload Current 110% for 60 Secs.
4015	1.5	1.0/0.75	380 – 480 VAC (±10%)	Input Voltage Level (Max.)	2.6 A	2.9 A
4025	2.5	2.0/1.5			3.4 A	4.3 A
4035	3.5	3.0/2.2			4.8 A	5.3 A
4055	5.5	5.0/3.7			7.6 A	8.4 A
4080	8.0	7.5/5.6			11.0 A	12.1 A
4110	11.0	10.0/7.5			14.0 A	15.4 A
4160	16.0	15.0/11.2			21.0 A	23.1 A
4220	22.0	20.0/14.9			27.0 A	29.7 A
4270	27.0	25.0/18.5			34.0 A	37.4 A
4330	33.0	30.0/22.0			42.0 A	46.2 A
4400	40.0	40.0/30.0			52.0 A	57.2 A
4500	50.0	50.0/37.0			65.0 A	71.5 A
4600	60.0	60.0/45.0			77.0 A	84.7 A
4750	75.0	75.0/55.0			96.0 A	105.6 A
410K	100	100/75.0			124.0 A	136.4 A
412K	125	125/90.0			156.0 A	171.6 A
415K	150	150/110			190.0 A	209.0 A
420K	200	200/150			240.0 A	264.0 A
425K	250	250/185			302.0 A	332.2 A
430K	300	300/220			370.0 A	407.0 A
435K	350	350/280			450.0 A	495.0 A
440K	400	400/298			492.0 A	541.2 A

Table 16. 600 Volt NEMA Type-1 Chassis standard ratings table.

Model No. Q7 or VT130Q7U	Rated KVA	Motor HP/Kw	Input Voltage 3-Ph 50/60 ±2 Hz	Output Voltage 3-Ph Variable Frequency	Output Current 100% Continuous	Overload Current 110% for 60 Secs.
6015	1.5	1.0/0.75	495 – 600 VAC (+5/-10%)	Input Voltage Level (Max.)	2.1 A	2.3 A
6025	2.5	2.0/1.5			3.0 A	3.3 A
6035	3.5	3.0/2.2			4.0 A	5.6 A
6060	6.0	5.0/3.7			6.1 A	6.7 A
6080	8.0	7.5/5.6			9.0 A	9.9 A
6120	12.0	10.0/7.5			12.0 A	13.2 A
6160	16.0	15.0/11.2			17.0 A	18.7 A
6220	22.0	20.0/14.9	495 – 600 VAC (±10%)		22.0 A	24.2 A
6270	27.0	25.0/18.5			27.0 A	29.7 A
6330	33.0	30.0/22.0			32.0 A	35.2 A
6400	40.0	40.0/30.0			41.0 A	45.1 A
6500	50.0	50.0/37.0			52.0 A	57.2 A
6600	60.0	60.0/45.0			62.0 A	68.2 A
6750	75.0	75.0/55.0			77.0 A	84.7 A
610K	100	100/75.0			99.0 A	108.9 A
612K	125	125/90.0			125.0 A	137.5 A
615K	150	150/110			150.0 A	165.0 A
620K	200	200/150			200.0 A	220.0 A
625K	250	250/185			250.0 A	275.0 A
630K	300	300/220			300.0 A	330.0 A
635K	350	350/261			336.0 A	369.6 A

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