TOSHIBA

Q7 Adjustable Speed Drive Installation and Operation Manual

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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 of an HVAC system. Toshiba's technology, quality, and reliability enables the motor to develop high 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 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, and maintenance personnel.

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

Important Notice

The instructions contained in this manual are not intended to cover all details or variations in equipment types, nor may it provide for every possible contingency concerning the installation, operation, or maintenance of this equipment. Should additional information be required contact your Toshiba representative.

The contents of this manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. 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 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 a safety hazard or equipment damage.

Misuse of this equipment could result in injury and equipment damage. In no event will Toshiba Corporation be responsible or liable for direct, indirect, special, or consequential damage or injury that may result from the misuse of this equipment.

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.

At Toshiba we're continuously searching for better ways to meet the constantly changing needs of our customers. Email your comments, questions, or concerns about this publication to **Jay.Williams@TIC.TOSHIBA.COM**.

Manual's Purpose and Scope

This manual provides information on how to safely install, operate, maintain, and dispose of your **Q7Adjustable Speed Drive**. The information provided in this manual is applicable to the **Q7 Adjustable Speed Drive** only.

This operation manual provides information on the various features and functions of this powerful cost-saving device, including

- Installation,
- System operation,
- Configuration and menu options, and
- Mechanical and electrical specifications.

Included is a section on general safety instructions that describe the warning labels and symbols that are used. Read the manual completely before installing, operating, performing maintenance, or disposing of this equipment.

This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English equivalent.

Because of our commitment to continuous improvement, Toshiba International Corporation reserves the right, without prior notice, to update information, make product changes, or to discontinue any product or service identified in this publication.

Toshiba International Corporation (TIC) shall not be liable for direct, indirect, special, or consequential damages resulting from the use of the information contained within this manual.

Printed in the U.S.A.

Contacting Toshiba's Customer Support Center

Toshiba's Customer Support Center can be contacted to obtain help in resolving any **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 **www.tic.toshiba.com**.

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 shipping date.

Complete the following information and retain for your records.

Model Number: _____

Serial Number:_____

Project Number (if applicable):_____

Date of Installation:_____

Inspected By:_____

Name of Application:_____

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General Safety Information

DO NOT attempt to install, operate, maintain or dispose of this equipment until you have read and understood all of the product safety information and directions that are contained in this manual.

Safety Alert Symbol

The **Safety Alert Symbol** indicates that a potential personal injury hazard exists. The symbol is comprised of an equilateral triangle enclosing an exclamation mark.

Signal Words

Listed below are the signal words that are used throughout this manual followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING** and **CAUTION** are used in this manual they will be followed by important safety information that must be carefully adhered to.

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided, will result in death or serious injury to personnel.

DANGER

The word **WARNING** preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided, could result in death or serious injury to personnel.

WARNING

The word **CAUTION** preceded by the safety alert symbol indicates that a potentially hazardous situation exists which, if not avoided, may result in minor or moderate injury.

CAUTION

The word **CAUTION** without the safety alert symbol indicates a potentially hazardous situation exists which, if not avoided, may result in equipment and property damage.

CAUTION

Special Symbols

To identify special hazards, other symbols may appear in conjunction with the **DANGER**, **WARNING** and **CAUTION** signal words. These symbols indicate areas that require special and/or strict adherence to the procedures to prevent serious injury to personnel or death.

Electrical Hazard Symbol

A symbol which indicates a hazard of injury from electrical shock or burn. It is comprised of an equilateral triangle enclosing a lightning bolt.

Explosion Hazard Symbol

A symbol which indicates a hazard of injury from exploding parts. It is comprised of an equilateral triangle enclosing an explosion image.

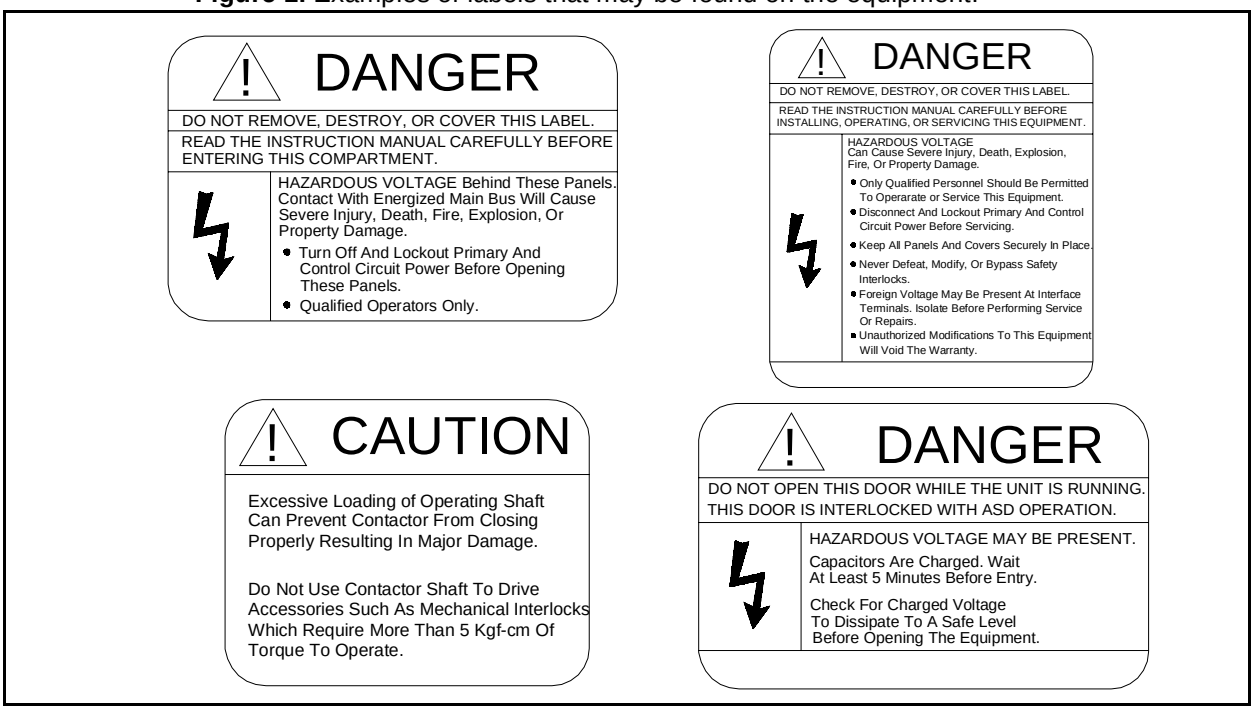
Equipment Warning Labels

DO NOT attempt to install, operate, perform maintenance, or dispose of this equipment until you have read and understood all of the product labels and user directions that are contained in this manual.

Shown below are examples of safety labels that may be found attached to the equipment. **DO NOT** remove or cover any of the labels. If the labels are damaged or if additional labels are required, contact your Toshiba sales representative for additional labels.

Labels attached to the equipment are there to provide useful information or to indicate an imminently hazardous situation that may result in serious injury, severe property and equipment damage, or death if the instructions are not followed.

Figure 1. Examples of labels that may be found on the equipment.



Qualified Personnel

Installation, operation, and maintenance shall be performed by **Qualified Personnel Only**. A **Qualified Person** is one that has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

Qualified Personnel shall:

- Have carefully read the entire operation manual.
- Be familiar with the construction and function of the ASD, the equipment being driven, and the hazards involved.
- Able to recognize and properly address hazards associated with the application of motor-driven equipment.
- Be trained and authorized to safely energize, de-energize, ground, lockout/tagout circuits and equipment, and clear faults in accordance with established safety practices.
- Be trained in the proper care and use of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- Be trained in rendering first aid.

For further information on workplace safety visit www.osha.gov.

Equipment Inspection

- Upon receipt of the equipment inspect the packaging and equipment for shipping damage.
- Carefully unpack the equipment and check for parts that may have been damaged during shipping, missing parts, or concealed damage. If any discrepancies are discovered, it should be noted with the carrier prior to accepting the shipment, if possible. File a claim with the carrier if necessary and immediately notify your Toshiba sales representative.
- **DO NOT** install or energize equipment that has been damaged. Damaged equipment may fail during operation resulting in equipment damage or personal injury.
- Check to see that the rated capacity and the model number specified on the nameplate conform to the order specifications.
- Modification of this equipment is dangerous and must not be performed except by factory trained representatives. When modifications are required contact your Toshiba sales representative.
- Inspections may be required before and after moving installed equipment.
- Keep the equipment in an upright position.
- Contact your Toshiba sales representative to report discrepancies or for assistance if required.

Handling and Storage

- Use proper lifting techniques when moving the ASD; including properly sizing up the load, getting assistance, and using a forklift if required.
- Store in a well-ventilated covered location and preferably in the original carton if the equipment will not be used upon receipt.
- Store in a cool, clean, and dry location. Avoid storage locations with extreme temperatures, rapid temperature changes, high humidity, moisture, dust, corrosive gases, or metal particles.

- The storage temperature range of the **Q7 ASD** is 14° to 104° F (-10 to 40° C).
- Do not store the unit in places that are exposed to outside weather conditions (i.e., wind, rain, snow, etc.).
- Store in an upright position.

Disposal

Never dispose of electrical components via incineration. Contact your state environmental agency for details on disposal of electrical components and packaging in your area.

Installation Precautions

Location and Ambient Requirements

- The Toshiba ASD is intended for permanent installations only.
- Installation should conform to the **2005 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.
- Select a mounting location that is easily accessible, has adequate personnel working space, and adequate illumination for adjustment, inspection, and maintenance of the equipment (refer to 2005 NEC Article 110-13).
- A noncombustible insulating floor or mat should be provided in the area immediately surrounding the electrical system.
- **Do Not** mount the ASD in a location that would produce catastrophic results if it were to fall from its mounting location (equipment damage or injury).
- **Do Not** mount the ASD in a location that would allow it to be exposed to flammable chemicals or gasses, water, solvents, or other fluids.
- Avoid installation in areas where vibration, heat, humidity, dust, fibers, metal particles, explosive/ corrosive mists or gases, or sources of electrical noise are present.
- The installation location shall not be exposed to direct sunlight.
- Allow proper clearance spaces for installation. Do not obstruct the ventilation openings. Refer to the section titled Installation and Connections on pg. 14 for further information on ventilation requirements.
- The ambient operating temperature range of the **Q7 ASD** is 14° to 104° F (-10 to 40° C).
- See the section titled Installation and Connections on pg. 14 for additional information on installing the drive.

Mounting Requirements

- Only **Qualified Personnel** should install this equipment.
- Install the unit in a secure and upright position in a well-ventilated area.
- A noncombustible insulating floor or mat should be provided in the area immediately surrounding the electrical system at the place where maintenance operations are to be performed.
- As a minimum, the installation of the equipment should conform to the NEC Article 110 Requirements For Electrical Installations, OSHA, as well as any other applicable national, regional, or industry codes and standards.
- Installation practices should conform to the latest revision of NFPA 70E Electrical Safety Requirements for Employee Workplaces.
- It is the responsibility of the person installing the ASD or the electrical maintenance personnel to ensure that the unit is installed into an enclosure that will protect personnel against electric shock.

Conductor Requirements and Grounding

⚠ WARNING

- Use separate metal conduits for routing the input power, output power, and control circuits and each shall have its own ground cable.
- A separate ground cable should be run inside the conduit with the input power, output power, and and control circuits.
- **DO NOT** connect control terminal strip return marked **CC** to earth ground.
- Always ground the unit to prevent electrical shock and to help reduce electrical noise.
- 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 **2005 NEC** and any applicable local codes.

The Metal Of Conduit Is Not An Acceptable Ground.

Power Connections

⚠ DANGER

Contact With Energized Wiring Will Cause Severe Injury Or Death.

- Turn off, lockout, and tagout all power sources before proceeding to connect the power wiring to the equipment.
- After ensuring that all power sources are turned off and isolated in accordance with established lockout/tagout procedures, connect three-phase power source wiring of the correct voltage to the correct input terminals and connect the output terminals to a motor of the correct voltage and type for the application (refer to NEC Article 300 – Wiring Methods and Article 310 – Conductors For General Wiring). Size the branch circuit conductors in accordance with NEC Table 310.16.
- Adhere to the recommended conductor sizes listed in the section titled Cable/Terminal Specifications on pg. 159. If multiple conductors 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) (refer to NEC Article 300.20 and Article 310.4). National and local electrical codes should be referenced if

three or more power conductors are run in the same conduit (refer to 2005 NEC Article 310 adjustment factors).

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

- Ensure that the 3-phase input power is **Not** connected to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- Do not install the ASD if it is damaged or if it is missing any component(s).
- **Do Not** connect resistors across terminals PA – PC or PO – PC. This may cause a fire.
- Ensure the correct phase sequence and the desired direction of motor rotation in the **Bypass** mode (if applicable).
- Turn the power on only after attaching and/or securing the front cover.

Protection

- Ensure that primary protection exists for the input wiring to the equipment. This protection must be able to interrupt the available fault current from the power line. The equipment may or may not be equipped with an input disconnect (option).
- All cable entry openings must be sealed to reduce the risk of entry by vermin and to allow for maximum cooling efficiency.
- Follow all warnings and precautions and do not exceed equipment ratings.
- If using multiple motors provide separate overload protection for each motor and use V/f control.
- External dynamic braking resistors must be thermally protected.
- 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. For further information on braking systems, see DC Injection Braking Current on pg. 57 and Dynamic Braking Enable on pg. 60.

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

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

System Integration Precautions

The following precautions are provided as general guidelines for the setup of the ASD within the system.

- The Toshiba ASD is a general-purpose product. It is a system component only and the system design should take this into consideration. Please contact your Toshiba sales representative for application-specific information or for training support.
- The Toshiba ASD is part of a larger system and the safe operation of the ASD will depend on observing certain precautions and performing proper system integration.
- A detailed system analysis and job safety analysis should be performed by the systems designer and/or systems integrator before the installation of the ASD component. Contact your Toshiba sales representative for options availability and for application-specific system integration information if required.

Personnel Protection

- Installation, operation, and maintenance shall be performed by **Qualified Personnel <u>Only</u>**.
- A thorough understanding of the ASD will be required before the installation, operation, or maintenance of the ASD.

⚠ WARNING ⚠

- Rotating machinery and live conductors can be hazardous and shall not come into contact with humans. Personnel should be protected from all rotating machinery and electrical hazards at all times.
- Insulators, machine guards, and electrical safeguards may fail or be defeated by the purposeful or inadvertent actions of workers. Insulators, machine guards, and electrical safeguards are to be inspected (and tested where possible) at installation and periodically after installation for potential hazardous conditions.
- Do not allow personnel near rotating machinery. Warning signs to this effect shall be posted at or near the machinery.
- Do not allow personnel near electrical conductors. Human contact with electrical conductors can be fatal. Warning signs to this effect shall be posted at or near the hazard.
- Personal protection equipment shall be provided and used to protect employees from any hazards inherent to system operation.
- Follow all warnings and precautions and do not exceed equipment ratings.

System Setup Requirements

- When using the ASD as an integral part of a larger system, it is the responsibility of the ASD installer or maintenance personnel to ensure that there is a fail-safe in place, i.e., an arrangement designed to switch the system to a safe condition if there is a fault or failure.
- System safety features should be employed and designed into the integrated system in a manner such that system operation, even in the event of system failure, will not cause harm or result in personnel injury or system damage (i.e., E-Off, Auto-Restart settings, System Interlocks, etc.).
- The programming setup and system configuration of the ASD may allow it to start the motor unexpectedly. A familiarity with the Auto-restart settings is a requirement to use this product.
- Improperly designed or improperly installed system interlocks may render the motor unable to start or stop on command.
- The failure of external or ancillary components may cause intermittent system operation, i.e., the system may start the motor without warning.
- There may be thermal or physical properties, or ancillary devices integrated into the overall system that may allow for the ASD to start the motor without warning. Signs at the equipment installation must be posted to this effect.
- If a secondary magnetic contactor (MC) is used between the ASD and the load, it should be interlocked to halt the ASD before the secondary contact opens. If the output contactor is used for bypass operation, it must be interlocked such that commercial power is never applied to the ASD output terminals (U, V, W).
- Power factor improvement capacitors or surge absorbers must not be installed on the output of the ASD.

- Use of the built-in system protective features is highly recommended (i.e., E-Off, Overload Protection, etc.).
- The operating controls and system status indicators should be clearly readable and positioned where the operator can see them without obstruction.
- Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.
- Follow all warnings and precautions and do not exceed equipment ratings.

Operational and Maintenance Precautions

⚠ WARNING ⚠

- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before inspecting or servicing the drive, or opening the door of the enclosure.
- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before proceeding to disconnect or connect the power wiring to the equipment.
- The capacitors of the ASD maintain a residual charge for a period of time after turning the ASD off. The required time for each ASD typeform is indicated with a cabinet label and a **Charge LED**. Wait for at least the minimum time indicated on the enclosure-mounted label and ensure that the **Charge LED** has gone out before opening the door of the ASD once the ASD power has been turned off.
- Turn the power on only after attaching (or closing) the front cover and **Do Not** remove the front cover of the ASD when the power is on.
- **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.
- If the ASD should emit smoke or an unusual odor or sound, turn the power off immediately.
- The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming in contact with 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.
- 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.
- **Retry** or **Reset** settings may allow the motor to start unexpectedly. Warnings to this effect should be clearly posted near the ASD and motor.
- In the event of a power failure, the motor may restart after power is restored.
- Follow all warnings and precautions and do not exceed equipment ratings.

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.

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	

CE Compliance Requirements

In addition to the local and regional safety requirements, this section describes additional criteria that must be met to qualify for **European Conformity** (CE) certification. All relevant apparatus placed on the European market is required to comply to the European Community directive on electromagnetic compatibility (EMC). The following instructions provide a means of compliance for the **Q7 ASD**. A Technical Construction File (TFC) indicates the rationale used to declare compliance and is on file at Toshiba International Corporation, Houston, Texas U.S.A.

EMC Installation Guidelines

All systems placed on the European market are required to comply with the European Community directive regarding electromagnet compatibility (EMC). Toshiba ensures that all systems deployed in the European market have been screened and are in 100% compliance with the following standards:

- Radiated Interference: EN 55011 Group 1 Class A
- Mains Interference: EN 55011 Group 1 Class A
- Radiated Susceptibility: IEC 801-3 1984
- Conducted RFI Susceptibility: prEN55101-4 (prIEC801-6) Doc 90/30270
- Electrostatic Discharge: IEC801-2 1991
- Electrical Fast Transient: IEC 801-4 1988
- Surge: IEC1000-4-5 1995 2 KV line-to-line, 4 KV line-to-earth
- Voltage Interruption: IEC 1000-4-11

General EMC Guidelines for Consideration

- Input filters of the appropriate rating shall be used.
- Proper grounding is a requirement.
- Grounds shall be kept to the minimum length to accomplish the connection.
- Grounds shall have low RF impedance.
- A central ground shall employed in a complex system.
- Paint or corrosion can hamper good grounding; remove as required.
- Keep control and power cabling separated. Minimize exposed (unscreened) cable.
- Use 360° shielded connections where possible.

CE Compliant Installation Guidelines

ASDs should be installed in accordance with the following guidelines.

1. **Filtering** — An input filter shall be used with the ASD. A Schaffner FN258 series input filter of the appropriate rating shall be used and mounted next to the ASD.
2. **Mechanical** — The ASD and the associated equipment shall be mounted on a flat metallic backplane. A minimum space of 5 cm (2 inches) shall exist between the ASD and the filter to allow for ventilation. The filter output cable is to be connected from the bottom of the filter to the ASD power input and is to be the minimum length required for a connection. See Table 1 on page 11 for filter selection assistance.

   Units received as an Open Chassis shall not be placed into operation until being placed into an approved enclosure that will protect personnel against electrical shock.

Opening and closing of enclosures or barriers should be possible only with the use of a key or a tool.

3. **Cabling** — The power, filter, and motor cables shall be of the appropriate current rating. The cables shall be connected in accordance with the guidelines of the manufacturer and the applicable local and national agencies. A 4-core screened cable (such as RS 379-384) is to be used for the power and earth connections to minimize RF emissions. Control cabling must be screened using P/N RS 367-347 or a similar component.

4. **Grounding** — The mains (input) ground shall be connected at the ground terminal provided on the filter. The filter and motor shall be grounded at the ground terminals provided in the ASD.

5. **Screening** — The mains (input) screen is to be connected to the metallic back-plane at the filter; remove any finish coating as required. The screen over the filter output cables, the motor cable screen, and the control wire screens must be connected to the ASD case using glands or conduit connectors. The motor cable screen shall be connected to the motor case. When using a braking resistor, the cabling between the resistor and ASD shall also be screened. This screen shall connect to both the ASD enclosure and the resistor enclosure.

See the Q7 Filter Selection below for the recommended input filters for a given typeform.

Table 1.

Q7 Filter Selection Table

230V	Filter Number	460V	Filter Number	600V	Filter Number
VT130Q7U**2010B**	FN258-7	VT130Q7U**4015B**	FN258-7	VT130Q7U**6015B**	FN258-7
VT130Q7U**2015B**	FN258-7	VT130Q7U**4025B**	FN258-7	VT130Q7U**6025B**	FN258-7
VT130Q7U**2025B**	FN258-16	VT130Q7U**4035B**	FN258-7	VT130Q7U**6035B**	FN258-7
VT130Q7U**2035B**	FN258-16	VT130Q7U**4055B**	FN258-16	VT130Q7U**6055B**	FN258-16
VT130Q7U**2055B**	FN258-30	VT130Q7U**4080B**	FN258-16	VT130Q7U**6080B**	FN258-16
VT130Q7U**2080B**	FN258-30	VT130Q7U**4110B**	FN258-30	VT130Q7U**6110B**	FN258-16
VT130Q7U**2110B**	FN258-42	VT130Q7U**4160B**	FN258-30	VT130Q7U**6160B**	FN258-30
VT130Q7U**2160B**	FN258-75	VT130Q7U**4220B**	FN258-42	VT130Q7U**6220B**	FN258-42
VT130Q7U**2220B**	FN258-100	VT130Q7U**4270B**	FN258-55	VT130Q7U**6270B**	FN258-42
VT130Q7U**2270B**	FN258-100	VT130Q7U**4330B**	FN258-55	VT130Q7U**6330B**	FN258-55
VT130Q7U**2330B**	FN258-130	VT130Q7U**4400B**	FN258-75	VT130Q7U**6400B**	FN258-55
VT130Q7U**2400B**	FN258-180	VT130Q7U**4500B**	FN258-100	VT130Q7U**6500B**	FN258-75
VT130Q7U**2500B**	FS5236-180	VT130Q7U**4600B**	FN258-100	VT130Q7U**6600B**	FN258-100
VT130Q7U**2600B**	FS5236-300	VT130Q7U**4750B**	FS5236-130	VT130Q7U**6750B**	FN258-100
VT130Q7U**2750B**	FS5236-300	VT130Q7U**410KB**	FS5236-180	VT130Q7U**610KB**	FN258-130
VT130Q7U**210KB**	FS5236-500	VT130Q7U**412KB**	FS5236-300	VT130Q7U**612KB**	FS5236-180
VT130Q7U**212KB**	FS5236-500	VT130Q7U**415KB**	FS5236-300	VT130Q7U**615KB**	FS5236-180
VT130Q7U**215KB**	FS5236-500	VT130Q7U**420KB**	FS5236-300	VT130Q7U**620KB**	FS5236-300
		VT130Q7U**425KB**	FS5236-500	VT130Q7U**625KB**	FS5236-500
		VT130Q7U**430KB**	FS5236-500	VT130Q7U**630KB**	FS5236-500
		VT130Q7U**435KB**	FS5236-500	VT130Q7U**635KB**	FS5236-500
		VT130Q7U**440KB**	FS5236-500		

Motor Characteristics

Listed below are some variable speed AC motor control concepts with which the user of the **Q7 Adjustable Speed Drive** should become familiar.

Pulse Width Modulation Operation

The **Q7 ASD** uses a sinusoidal **Pulse Width Modulation** (PWM) control system. The output current waveform generated by the ASD approaches that of a perfect sine wave; however, the output waveform is slightly distorted. For this reason, the motor may produce more heat, noise, and vibration when operated by an ASD, rather than directly from commercial power.

Overload Protection Adjustment

The **Q7 ASD** software monitors the output current of the system and determines when an overload condition occurs. The overload current level is a percentage of the rating of the motor. This function protects the motor from overload.

The default setting for the overload detection circuit is set to the maximum rated current of the ASD at the factory. This setting will have to be adjusted to match the rating of the motor with which the ASD is to be used. To change the overload reference level, see (Electronic) Thermal Protection #1 on pg. 62.

Power Factor Correction

DO NOT connect a power factor correction capacitor or surge absorber to the output of the ASD.

If the ASD is used with a motor that is equipped with a capacitor for power factor correction, remove the capacitor from the motor.

Connecting either of these devices to the output of the ASD may cause the ASD to malfunction and trip, or the output device may cause an over-current condition resulting in damage to the device or the ASD.

Light Load Conditions

When a motor is operated under a continuous light load (i.e., at a load of less than 50% of its rated capacity) or it drives a load which produces a very small amount of inertia, it may become unstable and produce abnormal vibration or trips because of an over-current condition. In such a case, the carrier frequency may be lowered to compensate for this undesirable condition (see Program ⇒ Special Control Parameters ⇒ **PWM Carrier Frequency**).

Note: *For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the **Constant Torque** or **Variable Torque** modes.*

Load-produced Negative Torque

When the ASD is used with a load that produces negative torque (an overhauling load), the over-voltage or over-current protective functions of the ASD may cause nuisance tripping.

To minimize the undesirable effects of negative torque the dynamic braking system may be used. The dynamic braking system converts the regenerated energy into heat that is dissipated using a braking

resistor. The braking resistor must be suitably matched to the load. Dynamic braking is also effective in reducing the DC bus voltage during a momentary over-voltage condition.

⚠ CAUTION

If under extreme conditions the dynamic braking system or a component of this system were to fail, the dynamic braking resistor may experience an extended over-current condition. The DBR circuit was designed to dissipate excessive amounts of heat and if the extended over-current condition were allowed to exceed the circuit parameters, this condition could result in a fire hazard.

To combat this condition, the 3-phase input may be connected using contactors that are configured to open in the event of an extended DBR over-current condition or an internal circuit failure. Using a thermal sensor and/or overload protection as the 3-phase input contactor drive signal, the contactors will open and remove the 3-phase input power in the event of an extended DBR over-current or system over-voltage condition.

Motor Braking

The motor may continue to rotate and coast to a stop after being shut off due to the inertia of the load. If an immediate stop is required, a braking system should be used. The two most common types of motor braking systems used with the **Q7 ASD** are **DC Injection Braking** and **Dynamic Braking**.

For further information on braking systems, see **DC Injection Braking Current on pg. 57** and **Dynamic Braking Enable on pg. 60**.

ASD Characteristics

Over-current Protection

Each **Q7 ASD** model was designed for a specified operating power range. The ASD will incur a trip if the design specifications are exceeded.

However, the ASD may be operated at 100% of the specified output-current range continuously or at 110% for a limited time as indicated in the section titled Current/Voltage Specifications on pg. 162. Also, the Overcurrent Stall Level setting may be adjusted to help with nuisance over-current trips.

When using the ASD for an application that controls a motor which is rated significantly less than the maximum current rating of the ASD, the over-current limit (Thermal Overload Protection) setting will have to be changed to match the application. For further information on this parameter, see (Electronic) Thermal Protection #1 on pg. 62.

ASD Capacity

The **Q7 ASD** must not be used with a motor that has a significantly larger capacity, even if the motor is operated under a small load. An ASD being used in this way will be susceptible to a high-output peak current which may result in nuisance tripping.

Do not apply a level of input voltage to an ASD that is beyond that which the ASD is rated. The input voltage may be stepped down if required with the use of a step-down transformer or some other type of voltage-reduction system.

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. 19).

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 18 on pg. 26).

As a minimum, the installation of the ASD shall conform to **Article 110** of the **2005 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.

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**).

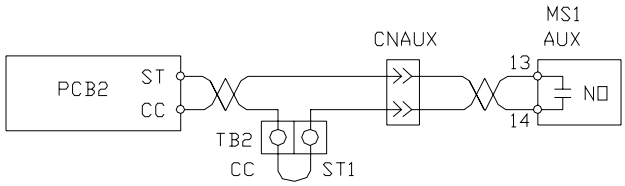
If a secondary magnetic contactor (MC) is used between the output of the ASD and the motor, it should be interlocked such that the **ST – CC** connection is disconnected before the output contactor is opened.

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. 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 40 HP and above systems, on the 460 volt ASD this feature is available on the 75 HP and above systems, and on the 600 volt ASD it is available on the 60 HP and above systems.

Figure 2. Alternative ST activation using the MS1 AUX circuit configuration.



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

Do not use an ASD with a motor that has a power rating that is higher 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.

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

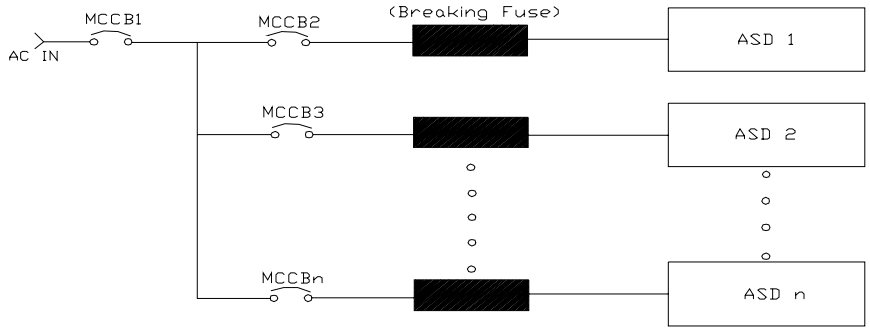
Disconnect the ASD from the motor before megging or applying a bypass voltage to the motor.

Interface problems may occur when an ASD is used in conjunction with some types of process controllers. Signal isolation may be required to prevent controller and/or ASD malfunction (contact your Toshiba sales representative or the process controller manufacturer for additional information about 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 ASD**s are equipped with internal DC bus fuses. However, not all **Q7 ASD**s 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 3, 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 (repeat for successive ASDs).

Figure 3. Circuit breaker configuration.



Mounting the ASD

CAUTION

Install the unit securely in a well ventilated area that is out of direct sunlight using the mounting holes on the rear of the ASD.

The ambient temperature rating for the **Q7 ASD** 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. If installing the ASD in a cabinet, ensure that there is adequate ventilation.

Do Not operate the ASD with the enclosure door open or removed.

When installing multiple 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. 152 for additional information on mounting space requirements).

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

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. 4 and the section titled Lead Length Specifications on pg. 18 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 **2005 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 power, output power, 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 ASD. The ASD may be operated from a single-phase supply. When operating using a single-phase supply, use the **L1** and **L3** terminals.

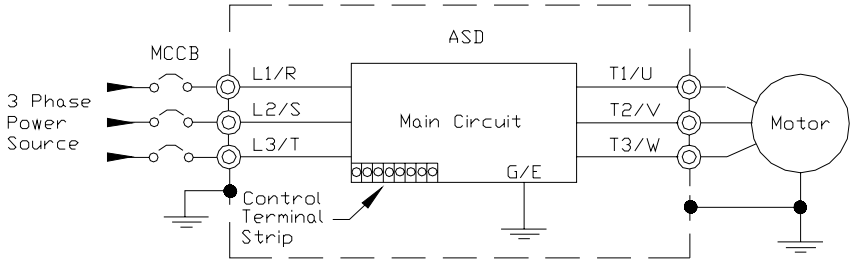
T1/U, **T2/V**, and **T3/W** are the output terminals of the ASD that connect to the motor.

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 18 on pg. 26).

Connect the input and output power lines of the ASD as shown in Figure 4.

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.*

Figure 4. 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 specifications listed in the section titled Cable/Terminal Specifications on pg. 159.

Install a molded case circuit breaker (MCCB) or fuse between the 3-phase power source and the ASD in accordance with the fault current setting of the ASD and **2005 NEC Article 430**.

CAUTION

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

On some Q7 devices 12-Pulse operation is available. A phase-shifting transformer must be supplied by the user when configured for 12-pulse operation.

External fuses may required on the ASDs that are configured for 12-pulse operation.

Use either the Ferraz Shawmut Semiconductor fuse (P/N A70QS200) and fuse block P234C, or the Toshiba ASD-FUSEKIT-12P. The Toshiba kit includes the required fuses and the mounting hardware for the fuses.

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 2 may require filters to be added to the output of the ASD. Table 2 lists the suggested maximum lead lengths for the listed motor voltages.

Table 2. Suggested maximum lead lengths.

Model	PWM Carrier Frequency	NEMA MG-1-1998 Section IV Part 31 Compliant Motors[2]
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

Note: *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.

For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the ***Constant Torque*** *or* ***Variable Torque*** *modes.*

Startup and Test

Perform the following checks before turning on the unit:

- **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 specified tolerance.
- There are no shorts and all grounds are secured.

I/O and Control

The **Q7 ASD** can be controlled by several input types and combinations thereof, as well as operate within a wide range of output frequency and voltage levels. This section describes the ASD control methods and supported I/O functions.

The **Control Terminal Strip** PCB (P/N 48570) supports discrete and analog I/O functions.

The **Control Terminal Strip** is shown in Figure 6 on pg. 22. Table 3 and lists the names, the default settings, and the descriptions of the input and output terminals.

Figure 18 on pg. 26 shows the basic connection diagram for the Q7 system.

Table 3. Control Terminal Strip default assignment terminal names and functions.

Terminal Name	Input/Output	Terminal Function (default setting if programmable)	Circuit Config.
ST	Discrete Input	**Standby** (jumper to **CC** to operate the unit) — Multifunctional programmable discrete input (see Installation Notes on pg. 14 for further information on this terminal).	Figure 8 on pg. 25.
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.	
S2	Discrete Input	**Preset Speed 2** — Multifunctional programmable discrete input.	
S3	Discrete Input	**Damper Fdbk** — Multifunctional programmable discrete input (connect to **CC** to operate the unit).	
S4	Discrete Input	**Emergency Off** — Multifunctional programmable discrete input.	
RR	Analog Input	**RR** — Multifunction programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output). **Reference CC**.	Figure 9 on pg. 25.
RX	Analog Input	**RX** — Multifunctional programmable analog input (-10 to +10 VDC input — -80 to +80 Hz output). **Reference CC**.	Figure 10 on pg. 25.
II	Analog Input	**II** — Multifunctional programmable analog input (4 [0] to 20 mADC input — 0 to 80 Hz output) (see Figure 6 on pg. 22 for the location of the **II** terminal). **Reference CC**.	Figure 11 on pg. 25.
VI	Analog Input	**VI** — Multifunctional programmable analog input (0 to 10 VDC input — 0 to 80 Hz output). **Reference CC**.	
P24	DC Output	24 VDC @ 50 mA output.	Figure 12 on pg. 25.
PP	DC Output	**PP** — 10.0 VDC voltage source for the external potentiometer.	Figure 13 on pg. 25.
OUT1	Discrete Output	**Damper Command** — **Damper Command** — Multifunctional programmable output that is used to open/close the 120 VAC damper motor power circuit when the motor is ASD-driven.	Figure 14 on pg. 25.
OUT2	Discrete Output	**Reach Frequency** — Multifunctional programmable discrete output.	
FP	Output	**Frequency Pulse** — an output pulse train that has a frequency which is based on the output frequency of the ASD.	Figure 15 on pg. 25.
AM	Output	Produces an output current that is proportional to the magnitude of the function assigned to this terminal (see Table 6 on page 48).	Figure 16 on pg. 25
FM	Output		
FLC	Output	Fault relay (common).	Figure 17 on pg. 25.
FLB	Output	Fault relay (N.C.).	
FLA	Output	Fault relay (N.O.).	
CC	—	Control common (**Do Not** connect to **Earth Gnd**).	
Discrete Input Terminals ⇒ **On** = connected to **CC**. **Analog Input** terminals reference **CC**.			

I/O Terminal Descriptions

Note: *The programmable terminal assignments may be accessed and changed from their default settings as mapped on pg. 36.*

ST — The default setting for this terminal is **ST**. The function of this input as **ST** is a **Standby** mode controller (system is in **Standby** when on). As the default setting, this terminal must be connected to **CC** for normal operation. If not connected to **CC**, **Off** is displayed on the LCD screen. This input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

RES — The default setting for this terminal is **Reset**. A momentary connection to **CC** resets the ASD and any fault indications from the display. **Reset** is effective when faulted only.

F — The default setting for this terminal is **Forward Run**. **Forward Run** runs the motor in the **Forward** direction when it is on. This input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

R — The default setting for this terminal is **Reverse Run**. **Reverse Run** runs the motor in the **Reverse** direction when it is on. This input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

S1 — The default setting for this terminal is **Fire Speed**. The function of this input as **Fire Speed** is to run the motor at the **Preset Speed #1** setting when it is on (see Preset Speed #1 on pg. 90). This terminal may be activated by a fire alarm signal or fire sensing device. This discrete input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

S2 — The default setting for this terminal is **S2**. The function of this input as **S2** is to run the motor at **Preset Speed #2** (see Preset Speed #2 on pg. 90) when it is on. This input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

S3 — The default setting for this terminal is **Damper Feedback**. The function of this input as **Damper Feedback** is to provide an indication that the damper is open. Connecting **Damper Feedback** to **CC** is required for normal system operation. This discrete input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

S4 — The default setting for this terminal is **Emergency Off** (normally closed). The function of this input as **Emergency Off** is to remove power from the output of the ASD and may apply a supplemental braking system using the method selected at the **Emg Off Mode** selection parameter. This input terminal may be programmed to any 1 of the 68 functions that are listed in Table 7 on page 130.

RR — The default function assigned to this terminal is to carry out the **Frequency Mode #1** setting. The **RR** terminal accepts a 0 – 10 VDC input signal and controls the function assigned to this terminal. This input terminal may be programmed to control the speed or torque of the motor. It may also be used to regulate (limit) the speed or torque of the motor. The gain and bias of this terminal may be adjusted for application-specific suitability.

RX — The **RX** terminal accepts a ±10 VDC input signal and controls the function assigned to this terminal. This input terminal may be programmed to control the speed, torque, or direction of the motor. It may also be used to regulate (limit) the speed or torque of the motor. The gain and bias of this terminal may be adjusted for application-specific suitability.

II — The function of the **II** input is to receive a 4 – 20 mA input signal that controls a 0 – 80 Hz output. This input terminal may be programmed to control the speed or torque of the motor and may not be used when using the **VI** input. Also, the gain and bias of this terminal may be adjusted.

VI — The function of the **VI** input terminal is to receive a 0 – 10 VDC input signal that controls a 0 – 80 Hz output. This input terminal may be programmed to control the speed or torque of the motor and may not be used when using the **II** input. Also, the gain and bias of this terminal may be adjusted.

P24 — +24 VDC @ 50 mA power supply for customer use.

PP — The function of output **PP** is to provide a 10 VDC output that may be divided using a potentiometer. The tapped voltage is applied to the **RR** input to provide manual control of the **RR** programmed function.

OUT1 — The default setting for this output terminal is **Damper Command**. This terminal may be used to switch the externally-supplied On/Off power to the damper motor. The **OUT1** contacts may be programmed to provide an indication that 1 of 60 possible events has taken place. This function may be used to signal external equipment or to activate the brake. The **OUT1** contact is rated at 2A/250 VAC.

OUT2 — The default setting for this output terminal is **ACC/DEC Complete**. This output terminal may be programmed to provide an indication that 1 of 60 possible events has taken place. This function may be used to signal external equipment or to activate the brake. The **OUT2** contact is rated at 2A/250 VAC.

FP — The default function of this output terminal is to output a series of pulses at a rate that is a function of the output frequency of the ASD. As the output frequency of the ASD goes up so does the **FP** output pulse rate. This terminal may be programmed to provide output pulses at a rate that is a function of the output frequency or the magnitude of any 1 of the 31 the functions listed in Table 6 on page 48.

AM — This output terminal produces an output current that is proportional to the output frequency of the ASD or of the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 6 on page 48.

FM — This output terminal produces an output current that is proportional to the output frequency of the ASD or of the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 6 on page 48.

FLC — **FLC** is the middle leg of a single-pole double-throw (relay) switch. This **FLC** contact of the relay is switched between **FLB** and **FLA**. This contact may be programmed to switch between **FLB** and **FLA** as a function of any 1 of the 60 conditions listed in Table 8 on page 133.

FLB — One of two contacts that, under user-defined conditions, connect to **FLC** (see Figure 5).

FLA — One of two contacts that, under user-defined conditions, connect to **FLC** (see Figure 5).

Note: *The **FLA** and **FLC** contacts are rated at 2A/250 VAC. The **FLB** contact is rated at 1A/250 VAC.*

CC — Control common (**Do Not** connect to **Earth Gnd**).

Figure 5. FLA, FLB, and FLC switching contacts shown in the de-energized state.

Note: *The relay is shown in the **Faulted** or de-energized condition. During normal system operation the relay connection is **FLC**-to-**FLA**.*

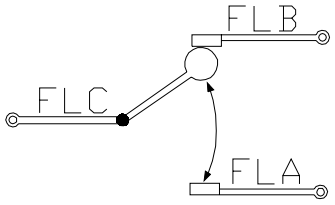
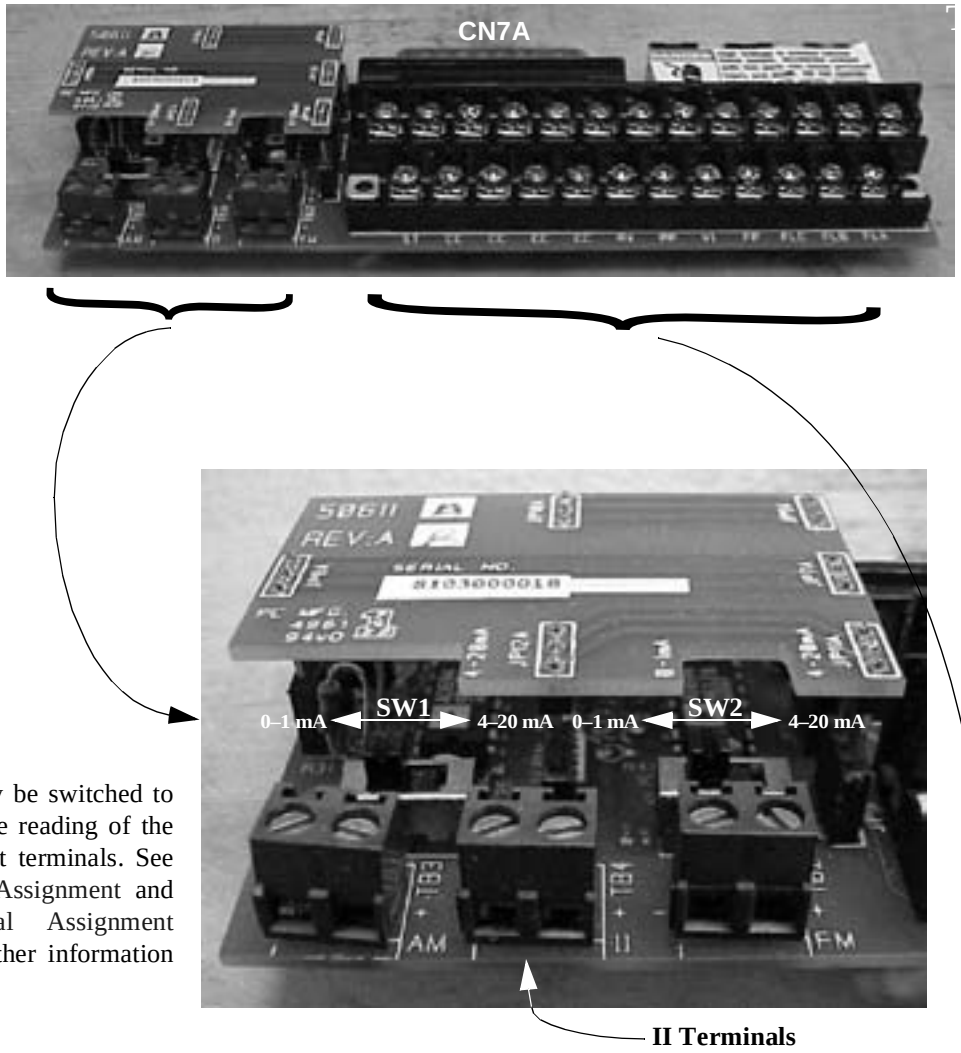


Figure 6. Control Terminal Strip PCB.



SW1 and **SW2** may be switched to change the full-scale reading of the **AM** and **FM** output terminals. See the AM Terminal Assignment and the FM Terminal Assignment descriptions for further information on **SW1** and **SW2**.

Shown below are the TB1 input and output terminals of the **Control Terminal Strip** PCB. For further information on these terminals see pg. 19.

Q7 ASD Control

The Control PCB (P/N 56000) serves as the primary control source for the Q7 ASD and receives input from the Control Terminal Strip PCB, an Option Card, RS232/485 Communications, or the Q7 ASD Keypad.

The Control PCB has been enhanced to support two new functions: Multiple Protocol Communications and the ability to communicate in either half- or full-duplex modes.

Using the optional multiple-protocol communications interface: the ASD-NANOCOM, the Control PCB may be configured for the type of communications protocol being received and respond appropriately to the sending device. The ASD-NANOCOM connects to the J4 and J5 connectors (see Figure 7). A jumper PCB (P/N 55365) is required at the J4 connector if not using the ASD-NANOCOM.

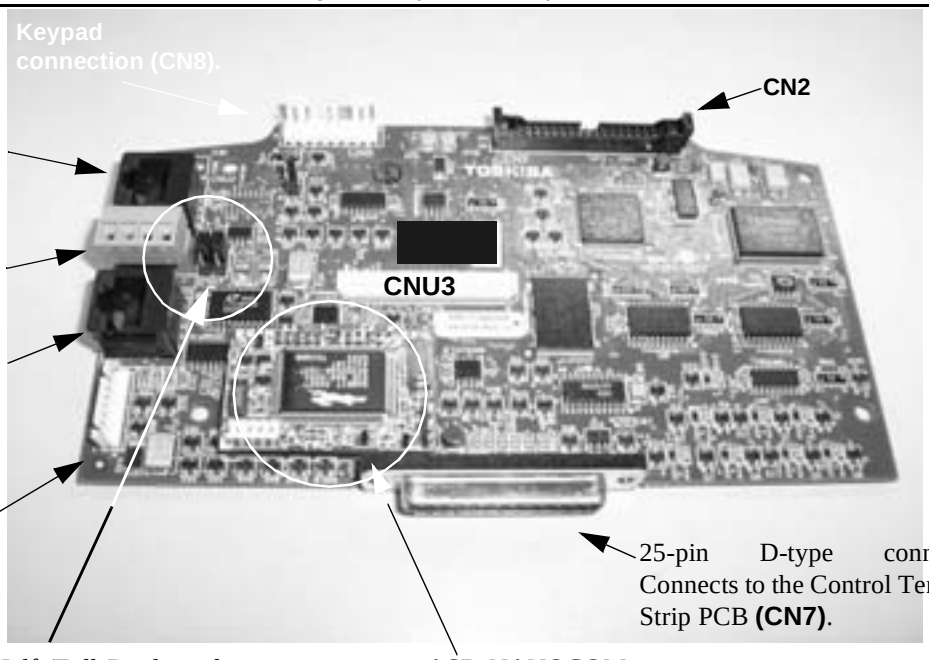
The ASD-NANOCOM must be setup to support the desired communications protocol via Program ⇒ **Comm Settings**. Consult the ASD-NANOCOM User's Manual (P/N 10572-1.000-000) for a complete listing of the setup requirements.

Half or Full duplex communications is available when using RS232/485 communications. The jumpers at the JP1 and the JP2 connectors may be moved from one position to the other to facilitate either half- or full-duplex operation. If no jumpers are used the system will operate in the full duplex mode.

For more information on the Q7 ASD communication requirements, please visit WWW.TIC.TOSHIBA.COM to acquire a copy of the 7-Series Communications User Manual and WWW.ICCDESIGNS.COM to acquire a copy of the ASD-NANOCOM User Manual.

Contact your Toshiba representative if more information is required on the ASD-NANOCOM.

Figure 7. Control Board of the **Q7 ASD** (P/N 56000).



CNU1 and CNU2 Pinout

CNU1 and CNU2 pinout (RJ-45 connectors).

Pin #	CNU1 Pinout (Controller PCB)	TTL/RS232/RS485 Interface	Pin #	CNU2 Pinout (Controller PCB)	TTL/RS232/RS485 Interface
1	P24	P24	1	P24	P24
2	Gnd	Gnd	2	Gnd	Gnd
3	Tx (-)	RXA	3	Rx	Tx
4	Rx (+)	TXA	4	Gnd	Gnd
5	Rx (-)	TXB	5	Tx	Rx
6	Tx (+)	RXB	6	Gnd	Gnd
7	$\overline{\text{RS232}}$/485	CNU3 Pin-7	7	Open	Open
8	Gnd	Gnd	8	Gnd	Gnd

CNU3 Pinout

CNU3 is used for RS232/485 serial communications.

Pin Number	CNU3 Pinout (Controller PCB)
1	RS232/485 Signal +
2	RS232/485 Signal -
3	RS232/485 Signal Gnd
4	Shield

CN7 Pinout

CN7 connects to **CN7A** of the Control Terminal Strip PCBA.

Table 4. CN7 pinout assignments. Programmable terminals are listed as their default settings.

Pin Number	Function	Pin Number	Function
1	PP	14	II
2	FL	15	S1
3	VI	16	R
4	RR	17	S3
5	FM	18	S2
6	RX	19	N15
7	FP	20	S4
8	AM	21	P15
9	*OUT1	22	P24
10	*OUT2	23	CC
11	ST	24	CC
12	RES	25	CC
13	F	—	—
Note: ** Open collector outputs.*			

I/O Circuit Configurations

Figure 8. Discrete Input.

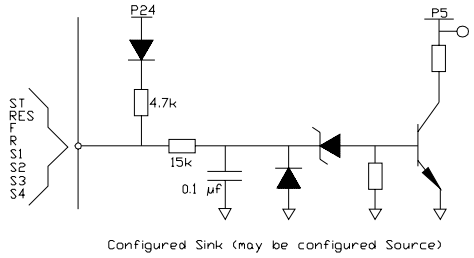


Figure 9. RR Input.

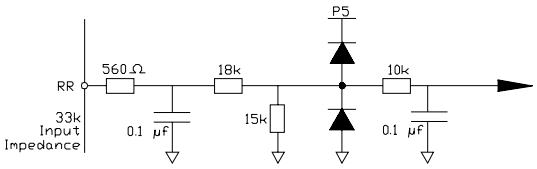


Figure 10. RX Input.

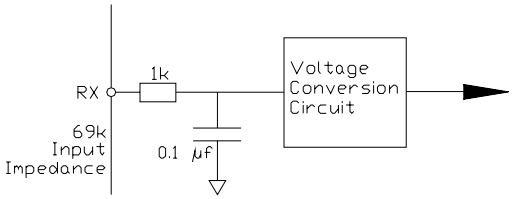


Figure 11. VI/II Input.

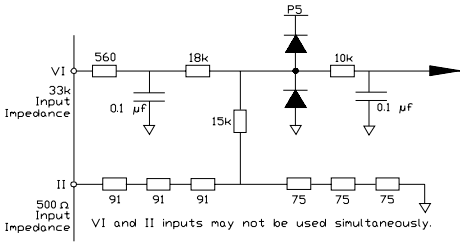


Figure 12. P24 Output.

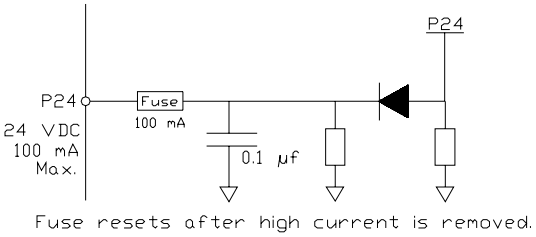


Figure 13. PP Output.

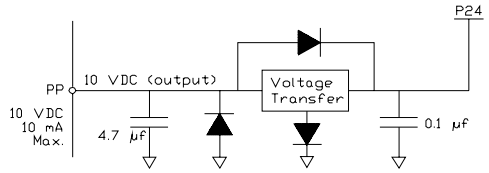


Figure 14. OUT1/OUT2 Output.

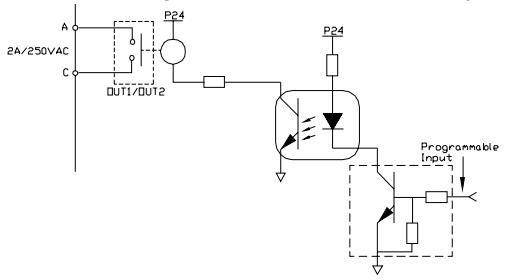


Figure 15. FP Output.

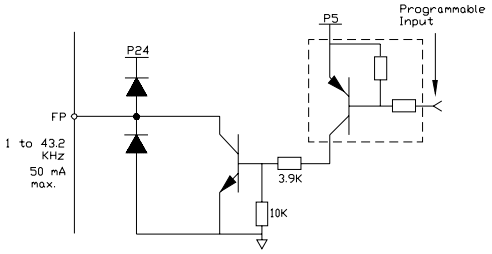


Figure 16. AM/FM Output.

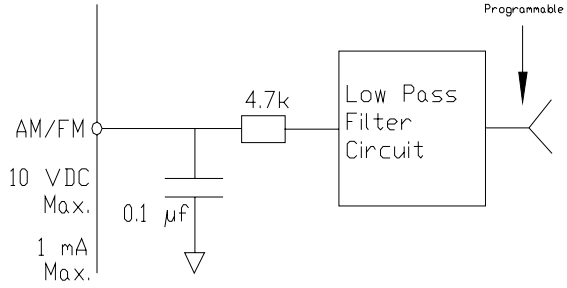
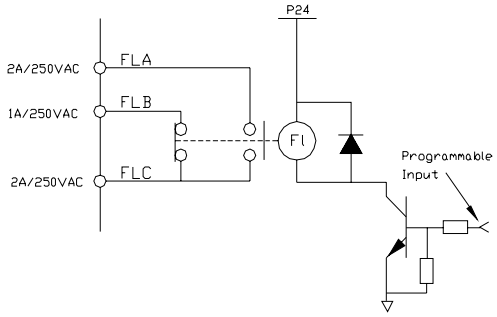


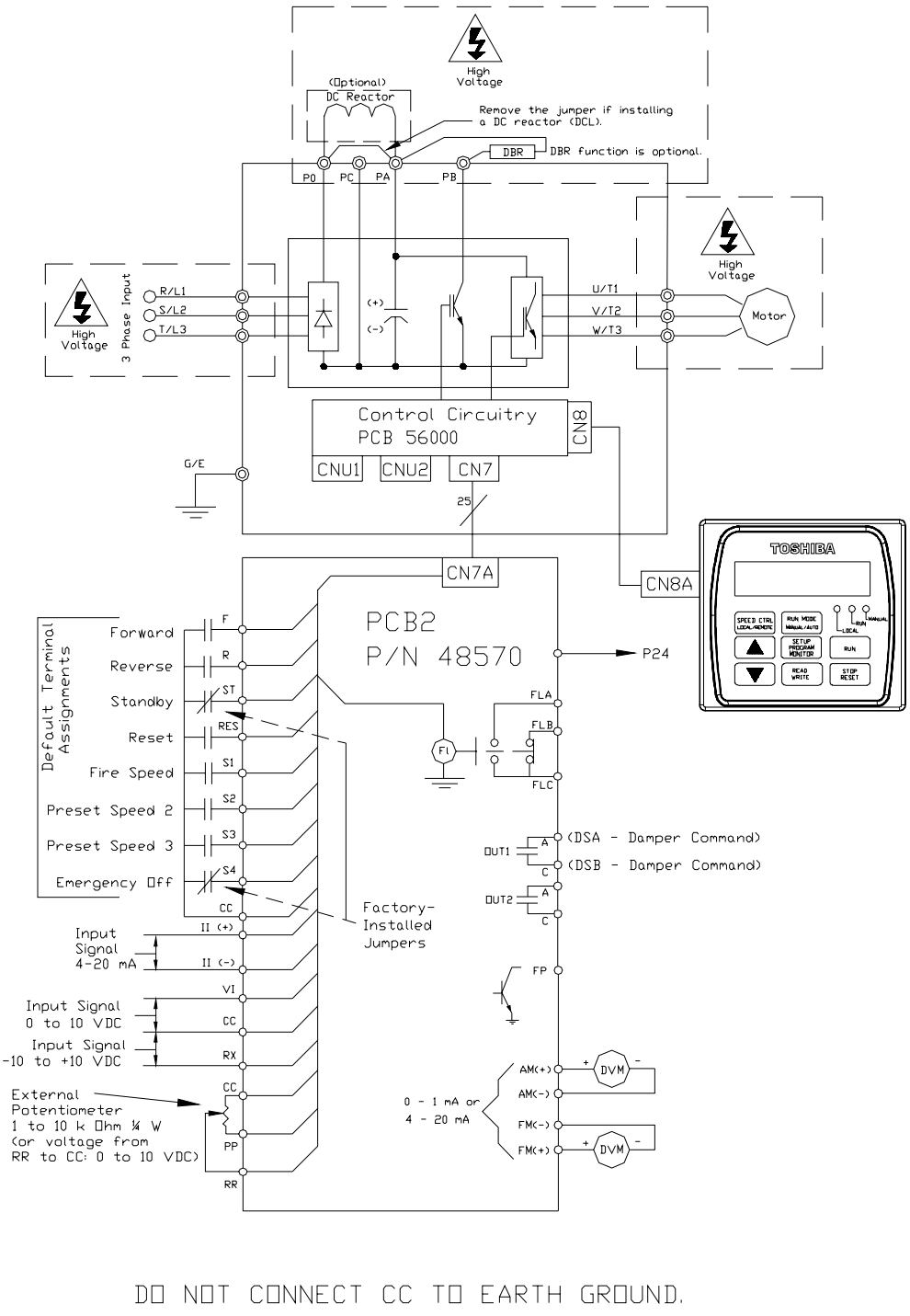
Figure 17. Fault Relay (active fault).



Typical Connection Diagram

Figure 18. Q7 ASD typical 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.*



DO NOT CONNECT CC TO EARTH GROUND.

Q7 ASD Keypad

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 19 on pg. 28.

The keypad may be mounted remotely. See pg. 29 for information on remote mounting.

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:

- Pulse Input,
- Motorized Pot,
- Communication Card,
- RS232/485,
- Common TTL,
- Binary/BCD,
- 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.

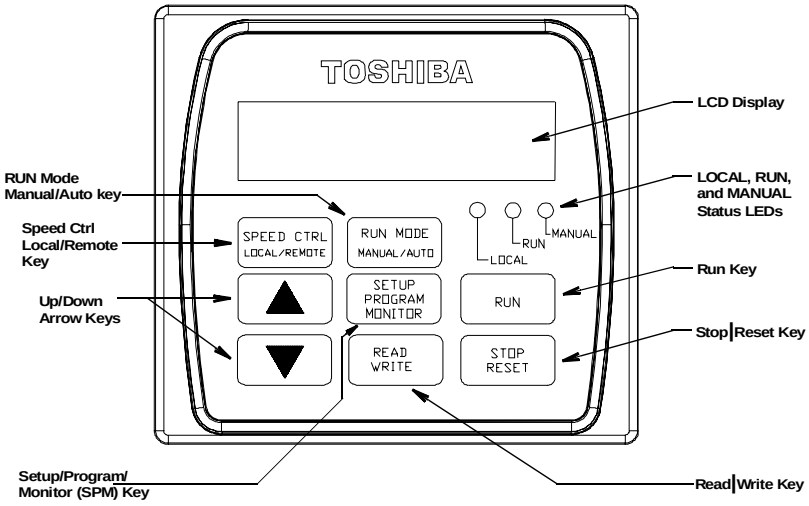
Stop|Reset Key — Issues the **Off** command (decelerates to **Stop** at the programmed rate) if pressed once while in the **Manual** mode, or initiates an **Emergency Off** (terminates the ASD output and applies the brake if so configured) if pressed twice quickly from the **Manual** or **Auto** mode.

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 24 on pg. 34).

Figure 19. The Q7 Keypad.



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.*

Keypad Remote Mounting

The **Q7 ASD** may be controlled from a remotely-mounted keypad. For safety and application-specific reasons, some ASD installations will warrant that the operator not be in the vicinity during operation or that the keypad not be attached to the ASD housing. The keypad may be mounted either with or without the optional **Remote Mounting Kit** (P/N ASD-MTG-KIT). The ease of installation is enhanced by the **Remote Mounting Kit** which allows for easier cable routing and keypad placement.

Remote mounting will also allow for multiple keypad mountings at one location if controlling and monitoring several ASDs from a central location is required.

The keypad can operate up to 9 feet away from the ASD. A keypad extender cable is required for remote mounting. The keypad extender cable is available in a 9-ft. length and may be ordered through your sales representative.

The optional dust cover (P/N ASD-BPC) may be used to cover the front panel opening of the ASD housing after removing the keypad.

Remote Keypad Required Hardware

Keypad Mounting Hardware

- 6-32 x 5/16” Pan Head Screw — P/N 50595 (4 ea.)
- #6 Split-Lock Washer — P/N 01884 (4 ea.)
- #6 Flat Washer — P/N 01885 (4 ea.)

Bezel Plate Mounting Hardware

- Bezel Plate — P/N 52291
- 10-32 Hex Nut — P/N 01922 (4 ea.)
- #10 Split-Lock Washer — P/N 01923 (4 ea.)
- #10 Flat Washer — P/N 01924 (4 ea.)
- Dust Cover — P/N ASD-BPC (Optional)

Extender Cable

- ASD-CAB9F-Q7: Cable, 9 ft.

Keypad Installation Precautions

Install the unit securely in a well ventilated area that is out of direct sunlight using the four mounting holes of the keypad. The ambient temperature rating for the keypad is 14 to 104° F (-10 to 40° C).

- 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 keypad where it may be exposed to flammable chemicals or gases, water, solvents, or other fluids.
- Turn the power on only after securing the front cover to the ASD.

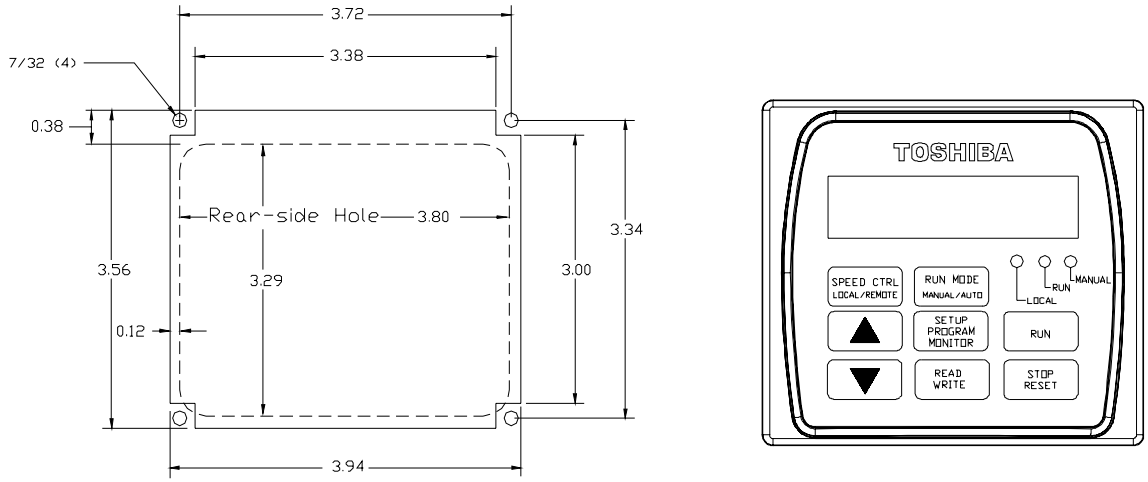
Keypad Remote Mounting w/o the ASD-MTG-KIT

Note: *See Figure 20 for the dimensions and the item locations referenced in steps 1 through 5.*

1. At the keypad mounting location, identify and mark the location of the 3.80” by 3.29” hole and the 7/32” screw holes.
2. Cut the 3.80” by 3.29” rectangular hole.
3. Drill the four 7/32” screw holes.
4. Attach and secure the keypad to the front side of the mounting location using the four 6-32 x 5/16” pan head screws, the #6 split lock washers, and the #6 flat washers.
5. Connect the extension cable.

Keypad Dimensions (mounting)

Figure 20. Keypad Mounting Dimensions.



Keypad Remote Mounting using the ASD-MTG-KIT

Note: *See Figures 21 and 22 for the dimensions and the item locations referenced in steps 1 through 6.*

1. At the keypad mounting location, identify and mark the locations of the 5.00” by 4.60” hole and the four 11/32” screw holes.
2. Cut the 5.00” by 4.60” rectangular hole.
3. Drill the four 11/32” holes.
4. Attach and secure the Bezel plate to the front side of the mounting location using the four 10-32 hex nuts, #10 split lock washers, and the #10 flat washers.
5. Attach and secure the keypad to the front side of the Bezel plate using the four 6-32 x 5/16” pan head screws, #6 split lock washers, and the #6 flat washers.
6. Connect the extension cable.

Keypad ASD-MTG-KIT Dimensions (mounting)

Figure 21. Keypad Bezel Plate Mounting Dimensions.

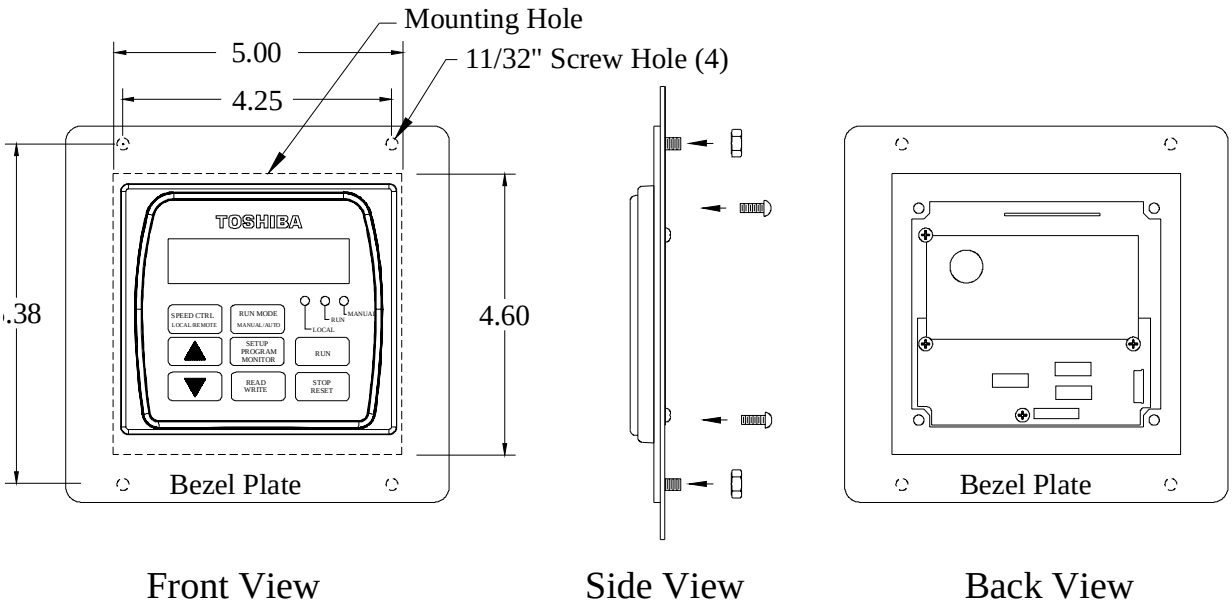


Figure 22. Screw Length Precaution.

CAUTION: Failure to use the correct hardware may result in damage to the outer surface of the keypad panel and/or improper seating of the panel to the bezel plate. Use caution when mounting the keypad assembly to ensure that the internal thread clearance is maintained.

System Operation

Operation (Local)

Read and understand all safety warnings before operating this equipment!

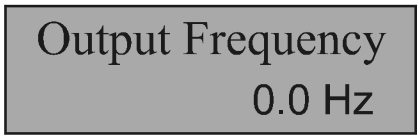
To run the motor perform the following steps:

1. Press the **SPM** key until the **Output Frequency** screen is displayed (see Figure 23).
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. Ensure that there are no personnel around or near the motor or the motor-driven equipment.
6. 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).*

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

Figure 23. Frequency Command screen.



Default Setting Changes

To change a parameter setting from the keypad, 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**/**Down** arrow key until the desired parameter group is displayed. Press the **R**/**W** key to access the sub-menu listing. Press the **Up**/**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**/**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 24 on pg. 34.

For a complete listing of the **Program** menu and **Setup** menu items, see the section titled Menu Navigation on pg. 36. The menu items are 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 factory 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 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.).*

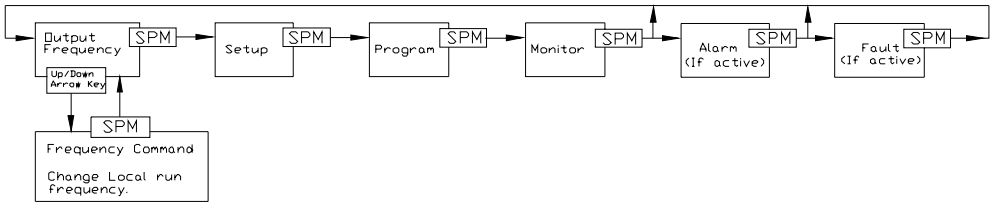
Pressing the **SPM** key when done searching or when halted at a changed parameter returns the system to the primary menu loop.

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 24).

Figure 24. 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 desired **Frequency Command** value and then press the **Run** key. The motor will run at the **Frequency Command** speed and, by using the **Up/Down** arrow keys, may be changed while running.

Setup Screen

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

- Accel Time #1 (pg. 44),
- Switch-on-the-Fly (pg. 121),
- V/f Pattern (pg. 126),
- Type Reset (pg. 124),
- VI/II Speed Frequency #2 (pg. 126),
- VI/II Speed Reference #2 (pg. 127),
- VI/II Speed Frequency #1 (pg. 126),
- VI/II Speed Reference #1 (pg. 127),
- Lower Limit Frequency (pg. 72),
- Upper Limit Frequency (pg. 125), and
- Decel Time #1 (pg. 58).

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 provides easy-access to the most common setup parameters. See the section titled Menu Navigation on pg. 36 for a complete listing of the Q7 parameters and menu 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 the full range of the VI/II value.

Note: *The VI/II input represents two analog inputs (and terminals). The **VI** input terminal is used for a 0 – 10 VDC analog signal and the **II** input terminal is used for current loop applications, such as with a 4-20 mA signal. Either may be used as a frequency or torque command source; however, the two cannot function simultaneously. Throughout this manual they will be listed as **VI/II**.*

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 Voltage and Current on pg. 125).
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 Voltage and Current on pg. 125).
DC Voltage — Shows the instantaneous DC bus voltage as a percentage of the rating of the ASD or as a voltage (see Units for Voltage and Current on pg. 125).
Output Current — Shows the instantaneous output current as a percentage of the rating of the ASD or as a current (see Units for Voltage and Current on pg. 125).
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
Output Frequency Display	Displays output frequency. Press **Up/Down Arrow** key to change setting.	
Setup Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.		Accel Time #1
		Decel Time #1
		Upper Limit Frequency
		Lower Limit Frequency
		VI/II Speed Reference #1
		VI/II Speed Frequency #1
		VI/II Speed Reference #2
		VI/II Speed Frequency #2
		Type Reset
		V/f Pattern
		Switch-on-the-Fly
		(Electronic) Thermal Protection #1
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Search** Press **R/W** key to search. Press **Up Arrow** key to go to next. Press **SPM** key to return to **Primary Menu**.	Changed from Default Parameters
	Fundamental #1 Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Maximum Output Frequency
		Base Frequency 1
		Voltage Compensation for Dead Time
		Maximum Voltage #1
		Disable Forward Run/ Disable Reverse Run
		Upper Limit Frequency
		Lower Limit Frequency
		V/f Pattern
		Torque Boost #1
		Accel Time #1
		Decel Time #1
		Accel/Decel #1 Pattern
		S-Pattern Lower Limit Adjustment
		S-Pattern Upper Limit Adjustment

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Fundamental #2** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Base Frequency 2
		Maximum Voltage #2
		Torque Boost #2
		(Electronic) Thermal Protection #2
		Accel #2 Time
		Decel Time #2
		Accel/Decel #2 Pattern
		Accel/Decel #1 Switching Frequency
	Panel Control (access method same as Fundamental #2)	Panel Direction
		Panel Stop Pattern
		Panel V/f Group
		Panel Acc/Dec Select
		Panel Reset Select
		Panel PID Control
		Ramped PWM
	Input Terminals Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	F Terminal
		R Terminal
		ST Terminal
		RES Terminal
		S1 Terminal
		S2 Terminal
		S3 Terminal
		S4 Terminal
		S5 Terminal
		S6 Terminal
		S7 Terminal
		S8 Terminal
		S9 Terminal
		S10 Terminal

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Input Terminals**	S11 Terminal
		S12 Terminal
		ON Terminal
		ST Selection
		Direction Priority
		Input Priority
	Output Terminals Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	OUT1 Terminal
		OUT2 Terminal
		FL Terminal
		OUT4 Terminal
		OUT5 Terminal
		OUT6 Terminal
		OUT7 Terminal
		Low Signal Frequency
		Reach Frequency
		Reach Detection
		FP Terminal Setting
		FP Terminal Adjustment
	Terminal Delays Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	F Terminal Delay
		R Terminal Delay
		ST Terminal Delay
		RES Terminal Delay
		S1–S4 Terminal Delay
		S5–S12 Terminal Delay
		OUT1 On Delay
		OUT1 Off Delay
		OUT2 On Delay
		OUT2 Off Delay
		FL On Delay
		FL Off Delay
		OUT4 On Delay

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Terminal Delays**	OUT4 Off Delay
		OUT5 On Delay
		OUT5 Off Delay
		OUT6 On Delay
		OUT6 Off Delay
		OUT7 On Delay
		OUT7 Off Delay
	Special Controls Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Startup Frequency
		End Frequency
		Run Frequency
		Run Frequency Hysteresis
		Jump Frequency 1
		Jump 1 Bandwidth
		Jump Frequency 2
		Jump 2 Bandwidth
		Jump Frequency 3
		Jump 3 Bandwidth
		PWM Carrier Frequency
		LCD Contrast
		Switch-on-the-Fly
		4–20 mA Loss Selection
		Ramped PWM
		4–20 mA Speed Reference
		Power Switching
		Power Switching Frequency
		ASD Switching Wait Time
		Commercial Power Wait Time
		Commercial Power Switching Freq. Hold Time

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Preset Speeds** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Preset Speed #1
		Preset Speed #2
		Preset Speed #3
		Preset Speed #4
		Preset Speed #5
		Preset Speed #6
		Preset Speed #7
		Preset Speed #8
		Preset Speed #9
		Preset Speed #10
		Preset Speed #11
		Preset Speed #12
		Preset Speed #13
		Preset Speed #14
		Preset Speed #15
		Preset Speed Mode Control
		PS Speed Mode 1
		PS Speed Mode 2
		PS Speed Mode 3
		PS Speed Mode 4
		PS Speed Mode 5
		PS Speed Mode 6
		PS Speed Mode 7
		PS Speed Mode 8
		PS Speed Mode 9
		PS Speed Mode 10
		PS Speed Mode 11
		PS Speed Mode 12
		PS Speed Mode 13
		PS Speed Mode 14
		PS Speed Mode 15

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Protection** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/ Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Dynamic Braking
		DBR Resistance
		DBR Capacity
		Overcurrent Stall Level
		Overvoltage Stall Level (fast)
		Overvoltage Stall Level (2)
		Overvoltage Stall Level (1)
		Stall Period
		Regen Stall
		DC Injection Braking Start Frequency
		DC Injection Braking Current
		DC Injection Braking Time
		DC Injection on at Direction Change
		Shaft Stationary Control
		Emergency Off Mode
		Emergency Off Time
		Number of Retries
		Speed Search
		Scan Rate
		Lock-on Rate
		Search Method
		Search Inertia
		Ridethrough Mode
		Ridethrough Time
		Undervoltage Stall Level
		Undervoltage Trip
		Undervoltage Time
		Overload Reduction Frequency
		Motor 150% Run Time
		Soft Stall (Select)
		Trip Save
		Cooling Fan Control
		Run Time Alarm Setting
		Output Phase Loss Detection
		Low Current Trip

Q7 ASD Menu Items					
Primary Menu	**Menu Item**	**Sub-menu Items**	**Primary Menu**	**Menu Item**	**Sub-menu Items**
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Protection** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Low Current Setting	**Program** Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Comm. Settings** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	ASD Number
		Low Current Time			TTL Baud Rate
		Abnormal Speed Time			RS485 Baud Rate
		Overspeed Frequency			Parity
		Speed Drop Frequency			RS485 Comm Time-Out Time
		Short Circuit Test			RS485 Comm Time-Out Action
		Short Circuit Time			TTL Response Time
		Overtorque Trip			RS485 Wire Count
		Overtorque Level Positive			RS485 Response Time
		Overtorque Level Negative			TTL Master Output
		Overtorque Detection Time			RS485 Master Output
		Brake Fault Time			Communications Reference Select
		Release After Run Timer			Communications Reference #1
		Inrush Current Time			Communications Speed #1
		MS Relay (status ANDED) with ST			Communications Reference #2
					Communications Speed #2
		Adding Input Selection			Receive Address
		Multiplying Input Selection			Transmit Address
		Earth Fault Alarm Level			Speed Reference Station
		Earth Fault Alarm Delay			Speed Reference Address
		Earth Fault Trip Level			Torque Reference Station
		Earth Fault Trip Delay			Torque Reference Address
		LED Option Override Multiplication Gain			Fault Detect Station
	Feedback Settings (access method same as Protection)	Input Feedback Select			Station Mode
		Proportional (P) Gain			S20 Reset
		Integral (I) Gain			S20 Error Mode
		Differential (D) Gain			Error Detect Time
		Delay Filter			#1 Scan Receive
		Upper Deviation Limit			#2 Scan Receive
		Lower Deviation Limit			#3 Scan Receive
		4–20 mA Loss Selection			#4 Scan Receive
		4–20 mA Speed Reference			#5 Scan Receive
		PG Number of Pulses			#6 Scan Receive
		PG Input Phases			#1 Scan Transmit
		PG Detect Selection			#2 Scan Transmit

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Comm. Settings** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	#3 Scan Transmit
		#4 Scan Transmit
		#5 Scan Transmit
		#6 Scan Transmit
		Communications Data Type
		Ext Comm Cfg #1
		Ext Comm Cfg #2
		Ext Comm Cfg #3
		Ext Comm Cfg #4
		Ext Comm Cfg #5
		Ext Comm Cfg #6
		Ext Comm Cfg #7
		Ext Comm Cfg #8
	AM/FM (Same as Comm. Settings)	FM Terminal Assignment
		FM Terminal Adjustment
		AM Terminal Assignment
		AM Terminal Adjustment
	Utility Group Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Type Reset
		Command Mode
		Frequency Mode
		PWM Carrier Frequency
		Panel Lockout
		CPU Version
		CPU Revision
		Main EEPROM Version
		ASD Typeform
		Frequency Multiplier
		Frequency Display Resolution
		Accel/Decel Display Resolution
		Units for Voltage and Current
		User Unit #1

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Utility Group**	User Unit #2
		User Unit #3
		User Unit #4
		User Unit #5
	Motor Settings Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Base Frequency 1
		Maximum Voltage #1
		Torque Boost #1
		(Electronic) Thermal Protection #1
		Base Frequency 2
		Maximum Voltage #2
		Torque Boost #2
		(Electronic) Thermal Protection #2
		Base Frequency 3
		Maximum Voltage #3
		Torque Boost #3
		(Electronic) Thermal Protection #3
		Base Frequency 4
		Maximum Voltage #4
		Torque Boost #4
		(Electronic) Thermal Protection #4
		Autotune Control
		Motor Slip Gain
		Motor Constant 1
		Motor Constant 2
		Motor Constant 3
		Motor Constant 4
		Motor Constant 5
		Motor Poles
		Motor Capacity
		Motor Type
		Autotune Enable

Q7 ASD Menu Items

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Frequency Settings** Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Reference Priority Selection
		Frequency Mode (#2)
		Mode 1/2 Switching Frequency
		VI/II Speed Reference #1
		VI/II Speed Frequency #1
		VI/II Speed Reference #2
		VI/II Speed Frequency #2
		RR Speed Reference #1
		RR Speed Frequency #1
		RR Speed Reference #2
		RR Speed Frequency #2
		RR Torque Reference #1
		RR Torque Reference #2
		RX Speed Reference #1
		RX Speed Frequency #1
		RX Speed Reference #2
		RX Speed Frequency #2
		RX Torque Reference #1
		RX Torque Reference #2
		RX2 Speed Reference #1
		RX2 Speed Frequency #1
		RX2 Speed Reference #2
		RX2 Speed Frequency #2
		RX2 Torque Reference #1
		RX2 Torque Reference #2
		BIN Speed Reference #1
		BIN Speed Frequency #1
		BIN Speed Reference #2
		BIN Speed Frequency #2
		BIN Torque Reference #1
		BIN Torque Reference #2

Primary Menu	Menu Item	Sub-menu Items
Program Press **Up Arrow** key to scroll menu items. Press **R/W** key to access menu items and the **Up/Down Arrow** keys to change value. Press **SPM** key to return to Primary Menu.	**Frequency Settings**	PG Speed Reference #1
		PG Speed Frequency #1
		PG Speed Reference #2
		PG Speed Frequency #2
		Jog Run Frequency
		Jog Stop Control
	PID Setup Press **R/W** key to access displayed menu item or press **Up Arrow** key to view subsequent menu items. Press the **Up/Down Arrow** key to change accessed menu item. Press **SPM** key to exit.	Input Feedback Select
		Delay Filter
		Proportional (P) Gain
		Integral (I) Gain
		Upper Deviation Limit
		Lower Deviation Limit
		Differential (D) Gain
		Upper Limit Frequency
		Lower Limit Frequency
		Accel Time #1
		Decel Time #1
		LOD Input Selection
		LOD Start Level
		LOD Delay Time
		LOD Boost Level
		LOD Boost Time
		LOD Feedback Level
		LOD Restart Delay Time
		4–20 mA Loss Selection
		4–20 mA Speed Reference
		Frequency Command Panel
		PID Feedback

Table 5. Monitor Screen

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

Q7 Parameter Descriptions

This section lists the parameters of the Q7 ASD alphabetically. The listing includes the access path and a description of each parameter.

Note: *Setup procedures included within this section may require a **Reset** before performing the procedure. Application-specific settings may then be performed. The pre-Reset conditions may be saved (see Type Reset).*

4–20 mA Loss Selection

Program ⇒ Feedback Setting ⇒ **4–20 mA Loss Sel**

Provides an alternative reference in the event of the loss of the 4–20 mA input signal.

Settings:

Setting
Max Speed
Min Speed
Hold Last
0 Hz
RS232/485 Control
Common Serial Control
Panel Control
Fault
Disable

Parameter Type — **Selection List**

Factory Default — **Disable**

Changeable During Run — **No**

4–20 mA Speed Reference

Program ⇒ Feedback Setting ⇒ **4–20 mA Speed Ref**

This setting provides a value to be used in the event that **Setting** is chosen for the **4–20 mA Loss** selection.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 80.0

Units — Hz

Abnormal Speed Time

Program ⇒ Protection ⇒ **Abnrml Spd Time**

This parameter sets the time that an overspeed condition must exist to cause a trip.

Parameter Type — **Numerical**

Factory Default — **10.0**

Changeable During Run — **No**

Minimum — 0.01

Maximum — 100.00

Units — Seconds

Accel Time #1

Program ⇒ Fundamental #1 ⇒ **Accel Time #1**

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000

Units — Seconds

This parameter specifies the programmed time in seconds for the output of the ASD to go from 0.0 Hz to the **Maximum Frequency** for the **#1 Acceleration** profile. The accel/decel pattern may be set using **Accel/Decel #1 Pattern**. The minimum and maximum accel/decel time may be set using **S-Pattern Lower Limit Adjustment** and the **S-Pattern Upper Limit Adjustment**.

Note: *An acceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads.*

***Stall** settings may lengthen the acceleration time.*

Acceleration

The acceleration rate of a motor is determined by several factors: applied power, applied load, and the physical properties of the motor (winding parameters, motor size, etc.). The ASD will control the first of these factors: input power. The settings of the ASD control the frequency and amplitude of the applied voltage to the motor.

Under most operating conditions, as the output frequency of the ASD goes up so does the output voltage (linear acceleration). The ASD has the ability to modify the relationship between frequency and voltage automatically to produce smoother operation or increased (starting) torque.

Accel #2 Time

Program ⇒ Fundamental #2 ⇒ **Accel #2 Time**

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000

Units — Seconds

This parameter specifies the programmed time in seconds for the output of the ASD to go from 0.0 Hz to the **Maximum Frequency** for the **#2 Acceleration** profile. The accel/decel pattern may be set using **Accel/Decel #2 Pattern**. The minimum and maximum accel/decel time may be set using **S-Pattern Lower Limit Adjustment** and the **S-Pattern Upper Limit Adjustment**.

This setting is also used to determine the acceleration rate of the **Motorized Pot** function.

Note: *An acceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads.*
***Stall** settings may lengthen the acceleration time.*

Accel/Decel #1 Pattern

Program ⇒ Fundamental #1 ⇒ **Acc/Dec #1 Pat**

Parameter Type — **Selection List**

Factory Default — **Linear**

Changeable During Run — **No**

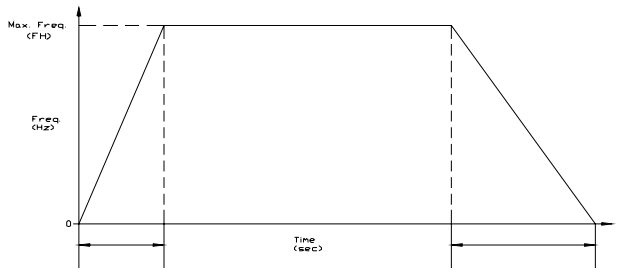
This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the **#1 Accel/Decel** parameter.

Settings:

Linear
S-Pattern 1
S-Pattern 2

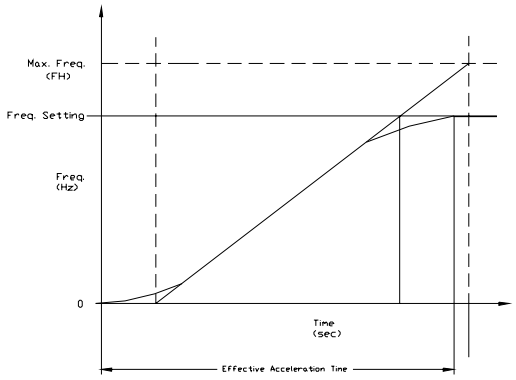
The figures below provide a profile of the available accel/decel patterns.

Linear acceleration and deceleration is the default pattern and is used on most applications.



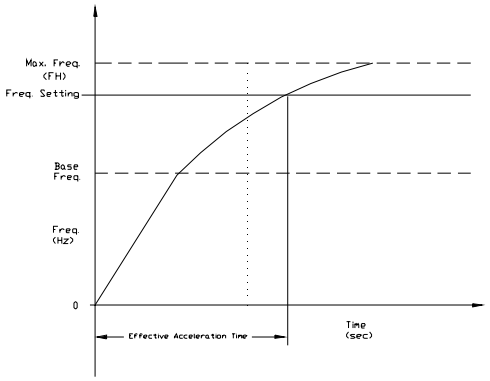
Linear Acceleration/Deceleration

S-pattern 1 is used for applications that require quick acceleration and deceleration. This setting is also popular for applications that require shock absorption at the start of acceleration or deceleration.



S-Pattern Acceleration/Deceleration 1

S-pattern 2 acceleration and deceleration decreases the rate of change above the base frequency.



S-Pattern Acceleration/Deceleration 2

Accel/Decel #1 Switching Frequency

Program ⇒ Fundamental #2 ⇒ **Acc/Dec #1 Pat**

This parameter sets the frequency at which the acceleration/deceleration control is switched from the **Acc/Dec #1** profile to the **Acc/Dec #2** profile during a multiple-profile configuration.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 80.0

Units — Hz

Accel/Decel #2 Pattern

Program ⇒ Fundamental #2 ⇒ **Acc/Dec #2 Pat**

This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the **#2 Accel/Decel** parameter.

See Accel/Decel #1 Pattern for more information on this parameter.

Settings:

S-Pattern 2
S-Pattern 1
Linear

Parameter Type — **Numerical**

Factory Default — **Linear**

Changeable During Run — **No**

Accel/Decel Display Resolution

Program ⇒ Utility Group ⇒ **Acc/Dec Res**

This parameter sets the number of decimal places to be displayed for **Accel/Decel** functions.

Parameter Type — **Numerical**

Factory Default — **0.1**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 1

Adding Input Selection

Program ⇒ Protection ⇒ **Adding Input Sel**

This parameter **Enables/Disables** the feature that allows for the external adjustment of the **Output Frequency**.

Selecting either of the input methods listed enables this feature. The selected input is used as a modifier of the programmed **Output Frequency**.

Settings:

Pulse Input
Motorized Pot
Communication Card
RS232/485
Common Serial (TTL)
Binary/BCD Input
LED Keypad (option)
RX2 (option)
RX
RR
VI/II
Disabled

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

AM Terminal Adjustment

Program ⇒ AM/FM ⇒ **AM Adjustment**

Parameter Type — **Numerical**

Factory Default — **512**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

This function is used to calibrate the **AM** analog output terminal.

To calibrate the **AM** analog output, connect a meter (current or voltage) as described at the **AM Terminal Assignment** parameter. With the ASD 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

Program ⇒ AM/FM ⇒ **AM Assignment**

Parameter Type — **Selection List**

Factory Default — **Output Current**

Changeable During Run — **Yes**

This setting determines the output function of the **AM** analog output terminal. This output terminal produces an output current that is proportional to the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 6 on page 48.

Note: *To read **voltage** at this terminal a 100 – 500Ω resistor is required and must be connected from AM (+) to AM (-). The voltage is read across the 100 – 500Ω resistor.*

Current may be read by connecting an ammeter from AM (+) to AM (-).

The **AM** analog output has a maximum resolution of 1/1024. The **AM Terminal Adjustment** parameter must be used to calibrate the output signal for a proper response. **SW-1** may be switched to allow for the full-range output to be either 0 – 1 mA or 4 – 20 mA when providing an output current, or either 0 – 1 or 1 – 7.5 volts when providing an output voltage at this terminal.

The magnitude of the AM/FM output signal at full-scale is selection-specific and may be adjusted to fit application-specific requirements (see the **AM Terminal Adjustment** and the **FM Terminal Adjustment** parameters).

Table 6 shows the default full-scale output setting of the AM/FM terminal for each selection. The column on the right side of Table 6 shows the actual AM/FM output for a keypad display of 100% (default setting).

Table 6. Output terminal selections for the AM, FM, FP, and Analog 1&2 terminals.

Function	AM/FM Output Value at 100% Displayed Output at the Keypad
Output Frequency	Maximum Frequency
Frequency Reference	
Output Current	150%
DC Bus Voltage	
Output Voltage	
Post-compensation Frequency	Maximum Frequency
Speed Feedback (realtime)	
Speed Feedback (1 sec filter)	
Torque	150%
Torque Command	
Internal Torque Base	
Torque Current	
Excitation Current	
PID Feedback Value	Maximum Frequency
Motor Overload Ratio	Motor Overload Trip Point Setting
ASD Overload Ratio	ASD Overload Trip Point Setting
DBR Overload Ratio	DBR Overload Trip Point Setting
DBR Load Ratio	Maximum DBR Duty Cycle
Input Power	1.73 * input voltage * ASD rated current
Output Power	
Peak Output Current	150%
Peak DC Bus Voltage	
PG Counter	32767 Encoder Pulses
Position Pulse	
RR Input	100%
VI/II Input	
RX Input	
RX2 Input	
FM Output (used for factory testing only)	
AM Output (used for factory testing only)	
Meter Adjust Value	
Analog Output	
Load Torque	150%

ASD Number

Program ⇒ Comm Settings ⇒ **ASD Number**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

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.

The communications network includes other ASDs and Host/Control computers that monitor the status of the ASD(s), transfers commands, and loads or modifies the parameter settings of the ASD.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Note: *Valid address numbers for this parameter are 1–247. The default setting is 0. The default setting must be changed to a valid setting to use this parameter. Otherwise an* ***Invalid Address*** *error is returned.*

ASD Switching Wait Time

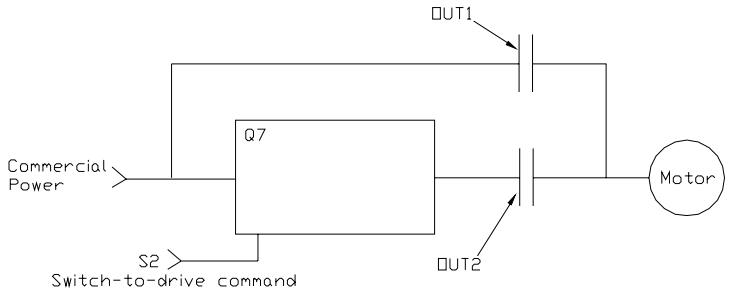
Program ⇒ Utility Group ⇒ **ASD Typeform**

Parameter Type — **Read-Only**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

This parameter determines the amount of time that the drive will wait before outputting a signal to the motor once the switch-to-drive-output criteria has been met.



ASD Typeform

Program ⇒ Utility Group ⇒ **ASD Typeform**

Parameter Type — **Read-Only**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

This parameter is read-only and displays the current typeform configuration of the ASD.

Autotune Control

Program ⇒ Motor Settings ⇒ **Autotune Control**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

When enabled via the **Autotune Enable** parameter, this parameter sets the **Autotune** command status.

Settings:

(Autotune) Disabled
Reset (Motor) Defaults
Enable (Autotune) on Run Command

Autotune Enable

Program ⇒ Motor Settings ⇒ **Autotune Enable**

This parameter **Enables/Disables** the **Autotune** function.

Parameter Type — **Selection List**

Factory Default — **Enabled**

Changeable During Run — **No**

Base Frequency 1

Program ⇒ Motor Settings ⇒ **Base Frequency #1**

The **Base Frequency** setting determines the frequency at which the output voltage of the ASD reaches its maximum setting. The maximum voltage setting cannot be more that the input voltage (see the **Maximum Voltage #1** parameter). There are four **Base Frequency** profile settings: #1 – #4.

Note: *For proper motor operation, the **Base Frequency** is normally set for the name-plated frequency of the motor.*

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 25.0

Maximum — 299.0

Units — Hz

Base Frequency 2

Program ⇒ Motor Settings ⇒ **Base Frequency 2**

The **Motor #2 Base Frequency** setting determines the frequency at which the output voltage of the ASD reaches its maximum setting. The maximum voltage setting cannot be more that the input voltage (see the **Maximum Voltage #2** parameter). There are four **Base Frequency** profile settings: #1 – #4.

This parameter is used only when the parameters for motor set **#2** are configured and selected. Motor set **#2** may be activated via a properly configured discrete input terminal.

For proper motor operation, the **Base Frequency** should be set for the name-plated frequency of the motor.

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 25.0

Maximum — 299.0

Units — Hz

Base Frequency 3

Program ⇒ Motor Settings ⇒ **Base Frequency 3**

The **Motor #3 Base Frequency** setting determines the frequency at which the output voltage of the ASD reaches its maximum setting. The maximum voltage setting cannot be more that the input voltage (see the **Maximum Voltage #3** parameter). There are four **Base Frequency** profile settings: #1 – #4.

This parameter is used only when the parameters for motor set **#3** are configured and selected. Motor set **#3** may be activated via a properly configured discrete input terminal.

For proper motor operation, the **Base Frequency** should be set for the name-plated frequency of the motor.

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 25.0

Maximum — 299.0

Units — Hz

Base Frequency 4

Program ⇒ Motor Settings ⇒ **Base Frequency 4**

The **Motor #4 Base Frequency** setting determines the frequency at which the output voltage of the ASD reaches its maximum setting. The maximum voltage setting cannot be more that the input voltage (see the **Maximum Voltage #4** parameter). There are four **Base Frequency** profile settings: #1 – #4.

This parameter is used only when the parameters for motor set **#4** are configured and selected. Motor set **#4** may be activated via a properly configured discrete input terminal.

For proper motor operation, the **Base Frequency** should be set for the name-plated frequency of the motor.

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 25.0

Maximum — 299.0

Units — Hz

BIN Speed Frequency #1

Program ⇒ Freq Settings ⇒ **BIN Speed Ref 1**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Speed Control** mode.

BIN Input Speed/Direction Control Setup

Perform the following setup to allow the system to receive **Speed** control input at the discrete input terminals:

- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Use Binary/BCD Input**.
- Program ⇒ **Input Terminals**; select and set the desired discrete input terminals to **Bin Bit**(s) **0 – 7** or 0 – MSB (see table Table 7 on page 130 for a listing of the available terminal settings). The binary terminal input word will control the direction, speed, and torque of the motor.
- Provide a **Run** command (**F** and/or **R**).

Speed/Direction Control

Perform the following setup to allow the system to perform **Speed** control from the **BIN** input terminals:

- Set BIN Speed Frequency #1,
- Set the binary input value (% of 255_D) (BIN Speed Ref #1) that represents **BIN Speed Frequency #1**,
- Set **BIN Speed Frequency #2**, and
- Set the binary input value (% of 255_D) (BIN Speed Ref #2) that represents the **BIN Speed Frequency #2**.

Note: *255_D is the decimal equivalent of the 8-bit BIN word with all input terminals set to one (255 decimal = 11111111 binary).*

Once set, as the **BIN** input word changes, the directional information and the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets **BIN Speed Frequency #1** and is the frequency that is associated with the setting of **BIN Speed Reference 1**.

Parameter Type — **Numerical**

Factory Default — **0.0**

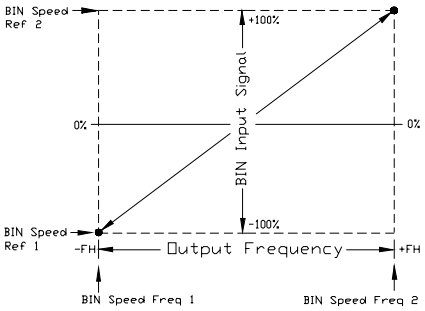
Changeable During Run — **Yes**

Minimum — -80.0

Maximum — 80.0

Units — Hz

Frequency Settings



BIN Speed Frequency #2

Program ⇒ Freq Settings ⇒ **BIN Speed Ref 2**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Speed Control** mode.

See **BIN Speed Frequency #1** for further information on this setting.

This parameter sets **BIN Speed Frequency #2** and is the frequency that is associated with the setting of **BIN Speed Reference 2**.

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — -80.0

Maximum — +80.0

Units — Hz

BIN Speed Reference #1

Program ⇒ Freq Settings ⇒ **BIN Speed Ref 1**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **BIN Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **BIN Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **BIN** input that is associated with **BIN Speed Frequency #1** when operating in the **Speed** control mode or is associated with the **BIN Torque Reference #1** when operating in the **Torque** control mode.

This value is entered as 0 to 100% of the binary input word 11111111 (255_D).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.00

Units — %

BIN Speed Reference #2

Program ⇒ Freq Settings ⇒ **BIN Speed Freq 2**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **BIN Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **BIN Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **BIN** input that is associated with **BIN Speed Frequency #2** when operating in the **Speed** control mode or is associated with the **BIN Torque Reference #2** when operating in the **Torque** control mode.

This value is entered as 0 to 100% of the binary input word 11111111 (255_D).

Parameter Type — **Numerical**

Factory Default — 1**00.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.0

Units — %

BIN Torque Reference #1

Program ⇒ Freq Settings ⇒ **BIN Torque Ref 1**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Torque Control** mode.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

BIN Input Torque Control Setup

Perform the following setup to allow the system to receive **Torque** control input from the discrete input terminals:

- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Use Binary/BCD Input**.
- Program ⇒ **Input Terminals**; select and set the desired discrete input terminals to **Bin Bit**(s) **0 – 7** or 0 – MSB (see Table 7 on page 130 for a listing of the available terminal settings). The binary terminal input word will control the direction, speed, and torque of the motor.
- Provide a **Run** command (**F** or **R**).

Torque Control

When operating in the **Torque Control** mode, scaling of the discrete input terminals is accomplished via the following parameters as described below:

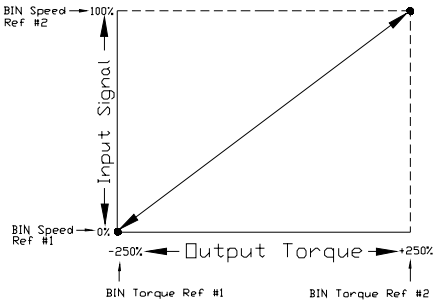
- **BIN Torque Reference 1**,
- the binary input value (% of 255_D) (BIN Speed Ref #1) that represents **BIN Torque Reference 1**,
- **BIN Torque Reference 2**, and
- the binary input value (% of 255_D) (BIN Speed Ref #2) that represents **BIN Torque Reference 2**.

This is accomplished by establishing an associated **V/f** output pattern for a given **BIN** binary input.

This parameter sets **BIN Torque Reference 1** and is the output torque value that is associated with the setting of **BIN Speed Reference 1** when operating in the **Torque** control mode.

This value is entered as -250% to 250% of the output torque range.

Torque Settings



BIN Torque Reference #2

Program ⇒ Freq Settings ⇒ **BIN Torque Ref 2**

This parameter is used to set the direction, gain, and bias of the discrete input terminals when using the discrete input terminals as the control input while operating in the **Torque Control** mode.

Parameter Type — **Numerical**

Factory Default — +**100.0**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This is accomplished by establishing an associated **V/f** output pattern for a given **BIN** binary input.

See **BIN Torque Reference #1** for further information on this setting.

This parameter sets **BIN Torque Reference 2** and is the output torque value that is associated with the setting of **BIN Speed Reference 2** when operating in the **Torque** control mode.

This value is entered as -250% to 250% of the output torque range.

Brake Fault Time

Program ⇒ Protection ⇒ **Brk 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.

This signal may be used to halt a related system or to notify the user.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 10.00

Units — Seconds

Command Mode

Program ⇒ Utility Group ⇒ **Command Mode**

The **Command Mode Selection** establishes the source of the command input for the ASD. **Command** inputs include **Run**, **Stop**, **Forward**, etc.

Settings:

(Use) Control Terminal Strip) Terminal Block
(Use) LED Keypad
(Use) Common Serial (TTL)
(Use) RS232/485
(Use) Communication Card

Parameter Type — **Selection List**

Factory Default — **Terminal Block**

Changeable During Run — **No**

Communications Data Type

Program ⇒ Comm Settings ⇒ **Comm Data Type**

In the event of a communication error during a transmission, the command that was transmitted may be cleared or held.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

0 — Command Request Cleared
1 — Command Request Held

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **No**

Commercial Power Switching Freq. Hold Time

Program ⇒ Special Controls ⇒ **Comm Hold Time**

This parameter determines the amount of time that the connection to commercial power is maintained once the switch-to-drive-output criteria has been met.

Parameter Type — **Selection List**

Factory Default — **2.00**

Changeable During Run — **No**

Minimum — 0.10

Maximum — 10.00

Units — Seconds

Communications Reference #1

Program ⇒ Comm Settings ⇒ **Comm Reference 1**

When enabled via the **Communications Reference Select** parameter, this parameter is used to allow the user to set the gain and bias of the speed control input to the ASD when the speed control signal is received via the source selected at the **Communications Reference Select** parameter.

Gain and Bias Settings

When operating in the **Speed Control** mode and using one of the control sources from the **Communications Reference Select** parameter, the settings that determine the gain and bias properties of the input signal are:

- **Communications Speed #1 (Hz)**,
- the communications input signal value that represents **Communications Speed #1 (Hz)**,
- **Communications Speed #2 (Hz)**, and
- the communications input signal value that represents **Communications Speed #2 (Hz)**.

Once set, as the input signal value changes, the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets the **Communications Reference** input value that represents **Communications Speed #1**. This value is entered as 0 to 100% of the **Communications Reference** input value range.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Parameter Type — **Numerical**

Factory Default — **0.00**

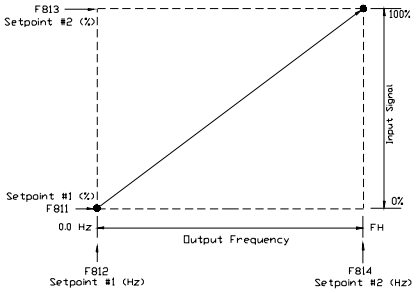
Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.0

Units — %

Frequency Settings



Communications Reference #2

Program ⇒ Comm Settings ⇒ **Comm Reference 2**

This parameter is used to set the gain and bias of the **Communications Reference** speed control input.

See **Communications Reference #1** for further information on this setting.

This parameter sets the **Communications Reference** input value that represents **Communications Speed #2 (Hz)**. This value is entered as 0 to 100% of the **Communications Reference** input value range.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.0

Units — %

Communications Reference Select

Program ⇒ Comm Settings ⇒ **Comm Ref Sel**

This parameter **Enable/Disables** speed control via communications. Selecting a signal source enables this function. Selecting **Disable** disables this function.

Settings:

Communications Card
RS232/485
LCD Keypad
Disabled

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Communications Speed #1

Program ⇒ Comm Settings ⇒ **Comm Speed 1**

This parameter is used to set the gain and bias of the **Communications Reference** speed control input.

See **Communications Reference #1** for further information on this setting.

This parameter sets **Communications Speed #1**.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — **Max. Freq.**

Units — Hz

Communications Speed #2

Program ⇒ Comm Settings ⇒ **Comm Speed 2**

This parameter is used to set the gain and bias of the **Communications Reference** speed control input.

See **Communications Reference #1** for further information on this setting.

This parameter sets the **Communications Speed #2**.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — 0.0

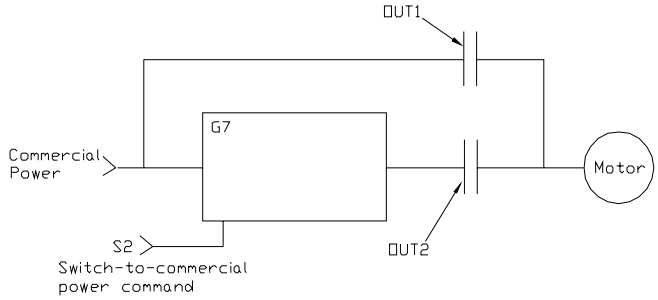
Maximum — **Max. Freq.**

Units — Hz

Commercial Power Wait Time

Program ⇒ Special Controls ⇒ **Comm Wait Time**

This parameter determines the amount of time that the drive will wait before allowing commercial power to be applied to the motor once the switch-to-commercial-power criteria has been met.



Parameter Type — **Selection List**

Factory Default — **0.62**

Changeable During Run — **No**

Minimum — 0.37

Maximum — **10.00**

Units — Seconds

Cooling Fan Control

Program ⇒ Protection ⇒ **Cooling Fan Ctrl**

This parameter sets the cooling fan run-time command.

Settings:

Automatic
Always On

Parameter Type — **Selection List**

Factory Default — **Automatic**

Changeable During Run — **Yes**

CPU Revision

Program ⇒ Utility Group ⇒ **CPU Revision**

This is a read-only parameter that displays the revision level of the CPU.

CPU Version

Program ⇒ Utility Group ⇒ **CPU Version**

This is a read-only parameter that displays the version level of the CPU.

DC Injection Braking Current

Program ⇒ Protection ⇒ **DC Inj Current**

This parameter sets the percentage of the rated current of the ASD that will be used for **DC Injection** braking. A larger load will require a higher setting.

DC Injection Braking

DC Injection Braking is a braking system used with three-phase motors. Unlike conventional brakes, there is no physical contact between the rotating shaft and a stationary brake pad or drum. When braking is required, the ASD outputs a DC current that is applied to the windings of the motor to quickly brake the motor. The braking current stops when the time entered in **DC Injection Braking Time** times out.

The intensity of the DC current used while braking determines how fast the motor will come to a stop and may be set at the **DC Injection Braking Current** parameter. The intensity setting is entered as a percentage of the full load current of the ASD.

Note: ***DC Injection Braking*** *is also used to preheat the motor or to keep the rotor from spinning freely when no rotation is required by providing a pulsating DC current into the motor at the* ***Carrier Frequency****. This feature may be enabled at the* ***Motor Shaft Stationary Control*** *parameter.*

Parameter Type — **Numerical**

Factory Default — **50.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.00

Units — %

DC Injection on at Direction Change

Program ⇒ Protection ⇒ **DC on Dir Change**

This parameter determines if **DC Injection** braking is to be used during a change in the direction of the motor.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

DC Injection Braking Start Frequency

Program ⇒ Protection ⇒ **DC Inj Start**

During deceleration this is the frequency at which **DC Injection** braking will start.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 120.0

Units — Hz

DC Injection Braking Time

Program ⇒ Protection ⇒ **DC Braking**

This parameter is used to set the on-time duration of the **DC Injection** braking.

Parameter Type — **Numerical**

Factory Default — **1.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 10.00

Units — Seconds

Decel Time #1

Program ⇒ Fundamental #1 ⇒ **Decel Time #1**

This parameter specifies the time in seconds for the ASD output to go from the **Maximum Frequency** to 0.0 Hz for the **#1 Deceleration** profile. The accel/decel pattern may be set using **Accel/Decel #1 Pattern**.

Note: *A deceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000

Units — Seconds

Decel Time #2

Program ⇒ Fundamental #2 ⇒ **Decel #2 Time**

This parameter specifies the time in seconds for the ASD output to go from the **Maximum Frequency** to 0.0 Hz for the **#2 Deceleration** profile. The accel/decel pattern may be set using **Accel/Decel #2 Pattern**.

This setting is also used to determine the deceleration rate of the **Motorized Pot** function.

Note: *A deceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000

Units — Seconds

Delay Filter

Program ⇒ Feedback Setting ⇒ **Delay Filter**

This parameter determines the delay in the ASD output response to the motor-control feedback signal.

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Differential (D) Gain

Program ⇒ Feedback Setting ⇒ **Diff Gain**

This parameter determines the degree that the differential function affects the output signal. The larger the value entered here, the more pronounced the **Differential Gain**.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.55

Direction Priority

Program ⇒ Input Terminals ⇒ **Dir Priority**

Parameter Type — **Selection List**

Factory Default — **Reverse**

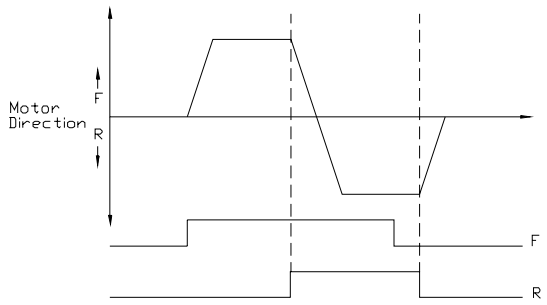
Changeable During Run — **No**

The **Direction Priority** selection determines the operation of the ASD if both the **R** and **F** control terminals are activated simultaneously.

Settings:

Reverse
Suspend

The waveforms below depict the motor response for all combinations of the **F** and **R** terminal settings if the **Reverse** option is chosen.



The **Suspend** setting will decelerate the motor to a stop regardless of the rotation direction when both the **F** and **R** control terminals are activated.

Disable Forward Run/Disable Reverse Run

Program ⇒ Fundamental #1 ⇒ **Disable F/R Run**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

This parameter **Enables/Disables** the **Forward Run** or **Reverse Run** mode.

If either direction is disabled, commands received for the disabled direction will not be recognized.

If **Command Priority** or **Off** is selected, the received direction command will determine the direction of the motor rotation.

Settings:

Off
Disable Reverse
Disable Forward
Command Priority

Dynamic Braking Enable

Program ⇒ Protection ⇒ **Dynamic Braking**

This parameter **Enables/Disables** the **Dynamic Braking** system.

Settings:

Enabled
Disabled

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

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 in an attempt to preclude an overvoltage trip during deceleration. The inertial energy of the load drives the rotor and induces a current into the stator of the motor.

The induced stator current (energy) is dissipated through a resistive load. The resistive load is connected across terminals **PA** and **PB** (non-polarized). Using a low-value, high-wattage resistance as a load for the generated current, the resistive load dissipates the induced energy. The dissipated energy is the energy that would otherwise have caused the rotor to continue to rotate.

Dynamic Braking helps to slow the load quickly; it cannot act as a holding brake.

The **Dynamic Braking** function may be setup and enabled by connecting a braking resistor from terminal **PA** to **PB** of the ASD and providing the proper information at the DBR parameters: **Dynamic Braking Resistor (DBR) Capacity, Dynamic Braking Resistance**, and **DC Injection Braking Current**.

For additional information on selecting the proper resistance value for a given application contact **Toshiba's Marketing Department**.

DBR Resistance

Program ⇒ Protection ⇒ **DBR Resistance**

This parameter is used to input the resistive value of the **Dynamic Braking Resistor**.

Note: *Using a resistor value that is too low may result in system damage.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 1.0

Maximum — 1000.0

Units — Ω

DBR Capacity

Program ⇒ Protection ⇒ **DBR Capacity**

This parameter is used to input the wattage of the **Dynamic Braking Resistor**.

For additional information on selecting the proper resistor wattage value for a given application contact **Toshiba's Marketing Department**.

Note: *Using a resistor with a wattage rating that is too low may result in system damage.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.01

Maximum — 600.0

Units — kW

Earth Fault Alarm Delay

Program ⇒ Protection ⇒ **EF Alarm Delay**

In the event that the **Earth Fault Alarm** activation criteria is met, a timer begins to count down to zero. Upon reaching zero, the **Earth Fault Alarm** is activated.

This parameter sets the start-time of the count-down timer.

Parameter Type — **Numerical**

Factory Default — **1.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.50

Units — Seconds

Earth Fault Alarm Level

Program ⇒ Protection ⇒ **EF Alarm Level**

This parameter sets the threshold level (%) that must be exceeded to meet the **Earth Fault Alarm** activation criteria.

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Earth Fault Trip Delay

Program ⇒ Protection ⇒ **EF Trip Delay**

In the event that the **Earth Fault Trip** activation criteria is met, a timer begins to count down to zero. Upon reaching zero, the **Earth Fault Trip** is activated.

This parameter sets the start-time of the count-down timer.

Parameter Type — **Numerical**

Factory Default — **1.0**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.50

Units — Seconds

Earth Fault Trip Level

Program ⇒ Protection ⇒ **EF Trip Level**

This parameter sets the threshold level (%) that must be exceeded to meet the **Earth Fault Trip** activation criteria.

Parameter Type — **Numerical**

Factory Default — **1.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 1.00

Units — %

(Electronic) Thermal Protection #1

Program ⇒ Motor Settings ⇒ **Therm Prot #1**

This parameter specifies the motor overload current level for motor set #1. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to **Amps** or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when **Amps** is selected as the unit of measurement (see Program ⇒ Utility Group ⇒ **Units for V/I** to change the display unit).

Thermal Protection settings will be displayed in **Amps** if the keypad display units are set to **V/I** rather than **%**.

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 10.0

Maximum — 100.0

Units — %

(Electronic) Thermal Protection #2

Program ⇒ Motor Settings ⇒ **Therm Prot #2**

This parameter specifies the motor overload current level for motor set #2. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to **Amps** or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when **Amps** is selected as the unit of measurement (see Program ⇒ Utility Group ⇒ **Units for V/I** to change the display unit).

Thermal Protection settings will be displayed in **Amps** if the keypad display units are set to **V/I** rather than **%**.

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 10.0

Maximum — 100.0

Units — %

(Electronic) Thermal Protection #3

Program ⇒ Motor Settings ⇒ **Therm Prot #3**

This parameter specifies the motor overload current level for motor set #3. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to **Amps** or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when **Amps** is selected as the unit of measurement (see Program ⇒ Utility Group ⇒ **Units for V/I** to change the display unit).

Thermal Protection settings will be displayed in **Amps** if the keypad display units are set to **V/I** rather than **%**.

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 10.0

Maximum — 100.0

Units — %

(Electronic) Thermal Protection #4

Program ⇒ Motor Settings ⇒ **Therm Prot #4**

This parameter specifies the motor overload current level for motor set #4. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to **Amps** or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when **Amps** is selected as the unit of measurement (see Program ⇒ Utility Group ⇒ **Units for V/I** to change the display unit).

Thermal Protection settings will be displayed in **Amps** if the keypad display units are set to **V/I** rather than **%**.

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 10.0

Maximum — 100.0

Units — %

Emergency Off Mode

Program ⇒ Protection ⇒ **Emg Off Mode Sel**

Parameter Type — **Selection List**

Factory Default — **Coast Stop**

Changeable During Run — **No**

This parameter determines the method used to stop the motor in the event that an **Emergency Off** command is received.

This setting may also be associated with the **FL** terminals to allow the **FL** relay to change states when an **EOFF** condition occurs by setting the **FL** terminal to **Fault FL (all)**.

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

Settings:

Deceleration Stop
DC Injection Braking Stop
Coast Stop

Emergency Off Time

Program ⇒ Protection ⇒ **Emg Off Time**

Parameter Type — **Numerical**

Factory Default — **0.10**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 10.00

Units — Seconds

When **DC Injection** is used as a function of receiving an **Emergency Off** command, this parameter determines the time that the **DC Injection** braking is applied to the motor.

End Frequency

Program ⇒ Special Controls ⇒ **End Frequency**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 80.0

Units — Hz

This parameter sets the lowest frequency that the ASD will recognize during deceleration before the ASD goes to 0.0 Hz.

Error Detect Time

Program ⇒ Comm Settings ⇒ **Error Det Time**

Parameter Type — **Numerical**

Factory Default — **200**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 1000

Units — Seconds

This setting determines the length of time that an ASD is monitored for an error.

Fault Detect Station

Program ⇒ Comm Settings ⇒ **Fault Station**

In a multiple-ASD configuration this setting determines the ASD responsible for fault notification.

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 64

F Terminal

Program ⇒ Input Terminals ⇒ **F Terminal**

This parameter selects the functionality of the **F** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **F** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Forward**

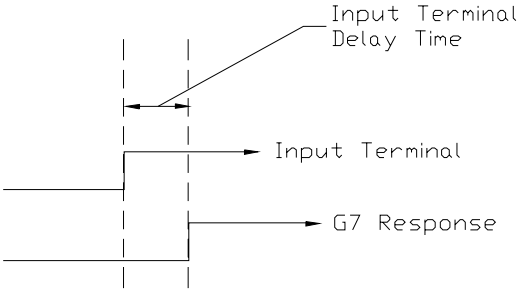
Changeable During Run — **No**

F Terminal Delay

Program ⇒ Terminal Delays ⇒ **F Delay**

This parameter delays the response of the ASD to any change in the **F** terminal input by the programmed value.

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.



Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

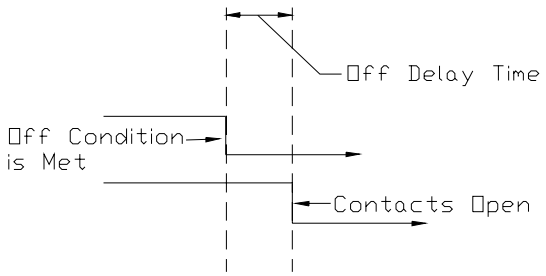
Units — mS

FL Off Delay

Program ⇒ Terminal Delays ⇒ **FL Off Delay**

This parameter delays the response of the **FL** output terminals by the programmed value.

The on and off delay times of the **FL** terminals may be adjusted to provide more response time to the device that is connected to the output terminals.



Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

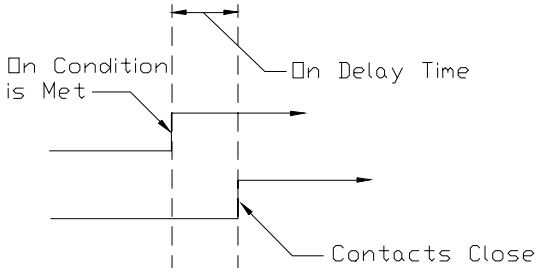
Units — mS

FL On Delay

Program ⇒ Terminal Delays ⇒ **FL On Delay**

This parameter delays the response of the **FL** output terminals by the programmed value.

The delay may be increased to prevent relay chatter.



Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

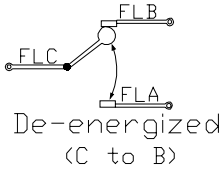
FL Terminal

Program ⇒ Output Terminals ⇒ **FL Terminal**

This parameter sets the functionality of the **FL** output terminals to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **FL** terminals may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output terminals must be specified as **Normally Open** or **Normally Closed**.



Parameter Type — **Selection List**

Factory Default — **Fault (All)**

Changeable During Run — **No**

FM Terminal Adjustment

Program ⇒ AM/FM ⇒ **FM Adjustment**

This function is used to calibrate the **FM** analog output terminal and is required for an accurate reading.

To calibrate the **FM** analog output, connect a meter (current or voltage) as described below. With the ASD running at a known frequency, adjust this parameter until the running frequency produces the desired DC level output at the **FM** terminal.

Note: *To read **voltage** at this terminal a 100 – 500Ω resistor is required and it must be connected from FM (+) to FM (-). The voltage is read across the 100 – 500Ω resistor.*

Current may be read by connecting an ammeter from FM (+) to FM (-).

Parameter Type — **Numerical**

Factory Default — **512**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

FM Terminal Assignment

Program ⇒ Meter Terminal Adjustment Parameters ⇒ **FM**

This setting determines the output function of the **FM** analog output terminal. The **FM** output terminal produces an output current that is proportional to the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 6 on page 48.

The **FM** analog output has a maximum resolution of 1/1024. **SW-2** may be switched to allow for the full-range output to be either 0 – 1 mA or 4 – 20 mA when providing an output current, or either 0 – 1 or 1 – 7.5 volts when providing an output voltage at this terminal.

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

FP Terminal Adjustment

Program ⇒ Output Terminals ⇒ **FP Terminal Adj**

This parameter sets the full-scale reading of the **FP** terminal. The full-scale reading of the monitored variable selected in **FP Terminal Setting** may be set here.

Parameter Type — **Numerical**

Factory Default — **3.840**

Changeable During Run — **Yes**

Minimum — 1.000

Maximum — 43.200

Units — kHz

FP Terminal Setting

Program ⇒ Output Terminals ⇒ **FP Terminal Set**

This parameter 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. As the monitored value goes up so does the pulse count of the **FP** output.

Note: *The duty cycle of the output pulse train remains at 65 ±5.0 µS.*

Possible assignments for this output terminal are listed in Table 6 on page 48.

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

Frequency Command Panel

Program ⇒ PID Setup ⇒ **Freq Cmd Pnl**

While operating using PID control, this parameter sets the reference frequency.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

Frequency Display Resolution

Program ⇒ Utility Parameters ⇒ **Frequency Display Res**

The parameter sets the number of decimal places to be displayed during non-**Accel/Decel** functions.

Parameter Type — **Numerical**

Factory Default — **0.1**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 0.01

Frequency Mode

Program ⇒ Utility Group ⇒ **Frequency Mode**

The **Frequency Mode (#1)** setting establishes the source of the frequency-control input for the ASD.

Parameter Type — **Selection List**

Factory Default — **Use RR**

Changeable During Run — **No**

Settings:

Use VI/II
Use RR
Use RX
Use Option Card RX2
Use LED Keypad Option
Use Binary/BCD Input
Use Common Serial (TTL)
Use RS232/485
Use Communication Card
Use Motorized Pot. Simulation
Use Pulse Input Option

Frequency Mode (#2)

Program ⇒ Utility Group ⇒ **Frequency Mode**

This parameter selects the source of the frequency command signal to be used as **Frequency Mode #2** in the event that **Frequency Mode #1** is disabled or if **Frequency Mode #2** is set up as the primary control parameter.

See the **Reference Priority Selection** parameter for additional information on this setting.

The **Frequency Mode** setting establishes the source of the frequency-control input for the ASD.

Parameter Type — **Selection List**

Factory Default — **Use RR**

Changeable During Run — **No**

Settings:

Use VI/II
Use RR
Use RX
Use Option Card RX2
Use LED Keypad Option
Use Binary/BCD Input
Use Common Serial (TTL)
Use RS232/485
Use Communication Card
Use Motorized Pot. Simulation
Use Pulse Input Option

Frequency Multiplier

Program ⇒ Utility Group ⇒ **Freq Multiplier**

This parameter setting is used as a multiplier of the programmed **Output Frequency**.

Parameter Type — **Selection List**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 200.00

Input Feedback Select

Program ⇒ Feedback Setting ⇒ **Input Fdbk Sel**

This parameter **Enables/Disables PID** feedback control. Selecting a feedback source enables this feature. Selecting **PID Control Disabled** disables this feature.

Settings:

PID (Control) Disabled
VI/II
RR
RX
RX2 (option)

Proportional-Integral-Derivative (PID) — A closed-loop control technique that seeks error minimization by reacting to three values: One that is proportional to the error, one that is representative of the error, and one that is representative of the rate of change of the error.

Parameter Type — **Selection List**

Factory Default — **PID Disabled**

Changeable During Run — **Yes**

Input Priority

Program ⇒ Input Terminals ⇒ **Input Priority**

This parameter is used to allow the **Jog** or the **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.

See **Jog Run Frequency** for further information on using the **Jog** function.

See **DC Injection Braking Current** for further information on this parameter.

Settings:

Enabled
Disabled

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Inrush Current Time

Program ⇒ Protection ⇒ **Inrush Time**

The startup inrush current may be suppressed for up to 2.5 seconds. This parameter determines the length of the inrush current suppression.

Parameter Type — **Numerical**

Factory Default — **0.30**

Changeable During Run — **No**

Minimum — 0.30

Maximum — 2.50

Units — Seconds

Integral (I) Gain

Program ⇒ Feedback Settings ⇒ **Integral Gain**

This parameter determines the degree that the **Integral** function affects the output signal when using PID feedback to control the ASD output. The smaller the value here, the more pronounced the effect of the integral function on the output signal.

Parameter Type — **Numerical**

Factory Default — **0.10**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 100.0

Jog Run Frequency

Program ⇒ Freq Settings ⇒ **Jog Run Freq**

This parameter sets the output frequency of the ASD during a **Jog**. **Jogging** is the term used to describe turning the motor on for small increments of time and is used when precise positioning of motor-driven equipment is required.

The **Jog** function is initiated via the **Control Terminal Strip** or using **Communications** (for further information on using **Communications** for **Jogging** see the **Communications** manual).

To perform a **Jog**, first set this parameter to the desired **Jog** frequency.

Jog Using the Control Terminal Strip

To initiate a **Jog** from the **Control Terminal Strip** perform the following:

1. Assign a discrete input terminal to the **Jog** function (see Table 7 on page 130).
2. Assign a discrete input terminal to the **F** (**Forward**) function (and **Reverse** if required) (see Table 7 on page 130).
3. Provide a **Forward** and/or **Reverse** command from the **Control Terminal Strip**.
4. Place the system in the **Remote** mode (**Local/Remote** LED is off).
5. Connect the assigned **Jog** terminal (from step 1) to **CC** for the desired **Jog** duration.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 20.00

Units — Hz

Jog Stop Control

Program ⇒ Freq Setting ⇒ **Jog Settings**

This parameter sets the stopping method used while operating in the **Jog** mode.

Settings:

Deceleration Stop
Coast Stop
DC Injection Braking Stop

Parameter Type — **Selection List**

Factory Default — **Coast Stop**

Changeable During Run — **Yes**

Jump 1 Bandwidth

Program ⇒ Special Controls ⇒ **Jump 1 Bandwidth**

In conjunction with the **Jump Frequency #1** setting, this parameter establishes a user-defined plus-or-minus frequency range for the **Jump Frequency 1** setting.

During acceleration, the output frequency of the ASD will hold at the frequency of the lower level of the **Jump Frequency** (1, 2, or 3) range until the programmed acceleration ramp reaches the upper level of the **Jump Frequency** range. Then, the output frequency of the ASD will accelerate to the upper level of the **Jump Frequency** range and continue upward as programmed.

During deceleration, the output frequency of the ASD will hold at the frequency of the upper level of the **Jump Frequency** range until the programmed deceleration ramp reaches the lower level of the **Jump Frequency** range. Then, the output frequency of the ASD will decelerate to the lower level of the **Jump Frequency** range and continue downward as programmed.

If overlapping **Jump Frequency** bandwidths are set up, the system will respond with one bandwidth setting that includes the total range.

Once set up and enabled, it is on in all control modes.

User-selected frequencies may be jumped to avoid the negative effects of mechanical resonance.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.00

Units — Hz

Jump 2 Bandwidth

Program ⇒ Special Controls ⇒ **Jump 2 Bandwidth**

This parameter establishes a plus-or-minus value for **Jump Frequency 2**.

See the **Jump 1 Bandwidth** parameter for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — Hz

Jump 3 Bandwidth

Program ⇒ Special Controls ⇒ **Jump 3 Bandwidth**

This parameter establishes a plus-or-minus value for **Jump Frequency 3**.

See the **Jump 1 Bandwidth** parameter for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — Hz

Jump Frequency 1

Program ⇒ Special Controls ⇒ **Jump Frequency 1**

This parameter establishes the **Jump Frequency 1** setting.

Once set up and enabled, it is on in all control modes.

See the **Jump 1 Bandwidth** parameter for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Max. Freq.

Units — Hz

Jump Frequency 2

Program ⇒ Special Controls ⇒ **Jump Frequency 2**

This parameter establishes the **Jump Frequency 2** setting.

Once set up and enabled, it is on in all control modes.

See the **Jump 1 Bandwidth** parameter for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Max. Freq.

Units — Hz

Jump Frequency 3

Program ⇒ Special Controls ⇒ **Jump Frequency 3**

This parameter establishes the **Jump Frequency 3** setting.

Once set up and enabled, it is on in all control modes.

See the **Jump 1 Bandwidth** parameter for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Max. Freq.

Units — Hz

LCD Contrast

Program ⇒ Special Controls ⇒ **LCD Contrast**

Press the **Up/Down Arrow** keys to increase or decrease the contrast of the LCD screen.

Parameter Type — **Numerical**

Factory Default — **4**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 7

LED Option Override Multiplication Gain

Program ⇒ Protection ⇒ **LED Opt Override**

This feature adjusts the gain of the external adjustment of the output frequency (using RR, RX, etc.) while using the LED keypad.

Note: *The LED Keypad is under development and is unavailable at the time of the release of this manual.*

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -100.00

Maximum — 100.00

Lock-on Rate

Program ⇒ Protection ⇒ **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.

The **Speed Search** parameter must be enabled to use this feature.

Parameter Type — **Numerical**

Factory Default — **1.00**

Changeable During Run — **No**

Minimum — 0.50

Maximum — 2.50

Units — Seconds

Low Current Setting

Program ⇒ Protection ⇒ **Low Current Set**

The **Low-current Trip** parameter enables this function. The **Low Current Setting** establishes the low-current trip threshold. The threshold value is entered as a percentage of the maximum rating of the ASD.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.00

Units — A

Low Current Time

Program ⇒ Protection ⇒ **Low Current Time**

When the low-current monitor is enabled, this function sets the time that the low-current condition must exist to cause a trip.

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Units — Seconds

Low Current Trip

Program ⇒ Protection ⇒ **Low Current Trip**

This parameter **Enables/Disables** the low-current trip feature.

When enabled, the ASD will trip on a low-current fault if the output current of the ASD falls below the level defined at the **Low Current Setting** parameter for a duration that exceeds the **Low Current Time** parameter setting.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Lower Deviation Limit

Program ⇒ Feedback Settings ⇒ **Lower Dev Limit**

This parameter determines the maximum amount that the feedback may decrease the output signal.

Parameter Type — **Numerical**

Factory Default — **50.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 50.00

Units — %

Lower Limit Frequency

Program ⇒ Fundamental #1 ⇒ **Lower Limit Freq**

This parameter sets the lowest frequency that the ASD will accept as a frequency command or frequency setpoint. The ASD will output frequencies lower than the **Lower Limit Frequency** when accelerating to the lower limit or decelerating to a stop. Frequencies below the **Lower Limit** may also be output when operating in the **PID Control** mode, **Torque Control** mode, or the **Vector Control** modes (sensorless or feedback).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Upper Limit**

Units — Hz

LOD Boost Level

Program ⇒ PID Setup ⇒ **LOD Boost Level**

The **Low Output Disable** feature adds the user-input frequency value to the commanded frequency (Hz).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

LOD Boost Time

Program ⇒ PID Setup ⇒ **LOD Boost Time**

The **Low Output Disable Boost Time** sets the on-time timer for the **LOD Boost** function.

Once expired, the **LOD Boost** function ceases.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 3600.0

Units — Seconds

LOD Delay Time

Program ⇒ PID Setup ⇒ **LOD Delay Time**

The **Low Output Disable Delay Time** sets the amount of time that the **LOD Start Level** criteria must be met and maintained for the **LOD** function to be initiated.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 3600.0

Units — Seconds

LOD Feedback Level

Program ⇒ PID Setup ⇒ **LOD Feedback Lvl**

The **Low Output Disable Feedback Level** sets a frequency level that, until the output of the ASD drops below this setting, the **Restart Delay Timer** does not start.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

LOD Input Selection

Program ⇒ PID Setup ⇒ **LOD Input Sel**

Enables/Disables the **LOD** function and, if enabled, selects a stopping method.

Settings:

Disabled
Enabled — Decel Stop
Enabled — Coast Stop

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

LOD Restart Delay Time

Program ⇒ PID Setup ⇒ **LOD Restrt Delay**

The **Low Output Disable Restart Delay Time** sets the time that, once expired and all standard ASD requirements are met, normal ASD operation resumes.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 3600.0

Units — Seconds

LOD Start Level

Program ⇒ PID Setup ⇒ **LOD Start Level**

The **Low Output Disable Start Level** sets the output frequency threshold that, if exceeded, will initiate the **LOD** function if properly configured.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

Low Signal Frequency

Program ⇒ Output Terminals ⇒ **Low Signal Freq**

This parameter sets the low-speed trip threshold.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Upper Limit**

Units — Hz

Main EEPROM Version

Program ⇒ Utility Group ⇒ **Main EEPROM VER**

This is a read-only parameter that displays the Main EEPROM version.

Maximum Output Frequency

Program ⇒ Fundamental #1 ⇒ **Max Output Freq**

This setting determines the absolute maximum frequency that the ASD can output. This setting is also referred to as **FH**.

Accel/decel times are calculated based on the **Maximum Frequency** setting.

Note: *This setting may not be lower than the **Upper Limit** setting.*

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **No**

Minimum — 30.0

Maximum — 299.0

Units — Hz

Maximum Voltage #1

Program ⇒ Fundamental #1 ⇒ **Max Voltage #1**

This parameter sets the applied output voltage at the **Base Frequency** and is the maximum value of the output voltage of the ASD for the **#1 Motor Set**.

Regardless of the programmed value, the output voltage cannot be higher than the input voltage.

The actual output voltage will be influenced by the input voltage of the ASD and the **Supply Voltage Compensation** parameter setting.

Parameter Type — **Numerical**

Factory Default — (ASD dependent)

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — (ASD dependent)

Units — Volts

Maximum Voltage #2

Program ⇒ Fundamental #2 ⇒ **Max Voltage #2**

This parameter sets the applied output voltage at the **Base Frequency** and is the maximum value of the output voltage of the ASD for the **#2 Motor Set**.

Regardless of the programmed value, the output voltage cannot be higher than the input voltage.

The actual output voltage will be influenced by the input voltage of the ASD and the **Supply Voltage Compensation** parameter setting.

Parameter Type — **Numerical**

Factory Default — (ASD dependent)

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — (ASD dependent)

Units — Volts

Maximum Voltage #3

Program ⇒ Motor Settings ⇒ **Max Voltage #3**

This parameter sets the applied output voltage at the **Base Frequency** and is the maximum value of the output voltage of the ASD for the **#3 Motor Set**.

Regardless of the programmed value, the output voltage cannot be higher than the input voltage.

The actual output voltage will be influenced by the input voltage of the ASD and the **Supply Voltage Compensation** parameter setting.

Parameter Type — **Numerical**

Factory Default — (ASD dependent)

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — (ASD dependent)

Units — Volts

Maximum Voltage #4

Program ⇒ Motor Settings ⇒ **Max Voltage #4**

This parameter sets the applied output voltage at the **Base Frequency** and is the maximum value of the output voltage of the ASD for the **#4 Motor Set**.

Regardless of the programmed value, the output voltage cannot be higher than the input voltage.

The actual output voltage will be influenced by the input voltage of the ASD and the **Supply Voltage Compensation** parameter setting.

Parameter Type — **Numerical**

Factory Default — (ASD dependent)

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — (ASD dependent)

Units — Volts

Mode 1/2 Switching Frequency

Program ⇒ Freq Settings ⇒ **Mode 1/2 SW Freq**

This parameter sets the threshold frequency that will be used in the **Reference Priority Selection** parameter to determine if **Frequency Mode #1** or **#2** will control the output of the ASD.

Parameter Type — **Numerical**

Factory Default — **1.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — **Max. Freq.**

Units — Hz

Motor 150% Run Time

Program ⇒ Protection ⇒ **Motor 150% Time**

This parameter establishes a time that the motor may operate at 150% of its rated current before tripping. This setting applies the time/150% reference to the individual settings of each motor (e.g., this setting references 150% of the **Thermal Protection** setting for the #1 motor).

The unit will trip sooner than the time entered here if the overload is greater than 150%.

Parameter Type — **Numerical**

Factory Default — **600**

Changeable During Run — **Yes**

Minimum — 10

Maximum — 2400

Units — Seconds

Motor Capacity

Program ⇒ Motor Settings ⇒ **Motor Capacity**

This user-input parameter identifies the wattage rating of the motor.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.10

Maximum — (ASD-dependent)

Units — kW

Motor Constant 1

Program ⇒ Motor Settings ⇒ **Motor Constant 1**

This parameter 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.

To use **Vector Control**, **Automatic Torque Boost**, or **Automatic Energy-saving**, the **Motor Constant** setting (motor tuning) is required.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100,000 MΩ

Units — Ω

Motor Constant 2

Program ⇒ Motor Settings ⇒ **Motor Constant 2**

This parameter 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.

This setting (motor tuning) is required to use the **Vector Control**, **Automatic Torque Boost**, or **Automatic Energy-saving** functions.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Open

Units — Ω

Motor Constant 3

Program ⇒ Motor Settings ⇒ **Motor Constant 3**

This parameter is used to input the excitation inductance for the motor. This value is used in conjunction with other constants to tune the motor.

This setting (motor tuning) is required to use the **Vector Control**, **Automatic Torque Boost**, or **Automatic Energy-saving** functions.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 6500.0

Units — µH

Motor Constant 4

Program ⇒ Motor Settings ⇒ **Motor Constant 4**

This parameter is used to compensate for the affects of load inertia during speed changes.

Acceleration and deceleration overshoot may be reduced by increasing this value.

This setting (motor tuning) is required to use the **Vector Control**, **Automatic Torque Boost**, or **Automatic Energy-saving** functions.

Parameter Type — **Numerical**

Factory Default — **1.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Motor Constant 5

Program ⇒ Motor Settings ⇒ **Motor Constant 5**

This parameter is used to compensate for the affects of leakage inductance.

Increases in this setting results in slight increases in the output voltage of the ASD at the high speed range.

This (motor tuning) setting is required to use the **Vector Control**, **Automatic Torque Boost**, or **Automatic Energy-saving** functions.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 650.0

Units — µH

Motor Poles

Program ⇒ Motor Settings ⇒ **Motor Poles**

This parameter identifies the number of motor poles.

Parameter Type — **Numerical**

Factory Default — **4**

Changeable During Run — **No**

Minimum — 2

Maximum — 16

Motor Slip Gain

Program ⇒ Motor Settings ⇒ **Motor Slip Gain**

This parameter provides a degree of slip compensation for a given load. A higher setting here decreases the slip allowed for a given load/ASD output ratio.

Parameter Type — **Numerical**

Factory Default — **0.60**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.55

Motor Type

Program ⇒ Motor Settings ⇒ **Motor Type**

This parameter identifies the type of motor being used.

Settings:

Toshiba EQP III TEFC
Toshiba EQP III ODP
Toshiba EPACT TEFC
Toshiba EPACT ODP
Other Motor

Parameter Type — **Selection List**

Factory Default — **Toshiba EQP III TEFC**

Changeable During Run — **No**

MS Relay (status ANDED) with ST

Program ⇒ Protection ⇒ **MS Relay with ST**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

The **MS1 AUX** relay circuit is normally open and is in series with the **ST**-to-**CC** connection.

After normal system power is available the **MS1 AUX** relay circuit closes and completes the **ST**-to-**CC** connection.

Settings:

Disabled
Enabled

Multiplying Input Selection

Program ⇒ Protection ⇒ **Mult Input Sel**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

This parameter **Enables/Disables** the feature that allows for the external adjustment of the **Output Frequency**.

Selecting either of the input methods listed enables this feature. The selected input is used as a multiplier of the programmed **Output Frequency**.

If operating using the **LED Keypad Option** and **Setting** is selected, the value entered at **LED Option Override Multiplication Gain** is used as the multiplier.

Settings:

Disabled
VI/II
RR
RX
RX2 (option)
Setting (LED Keypad Option Only)

Number of Retries

Program ⇒ Protection ⇒ **Number Retries**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 10

After a trip has occurred, this parameter sets the number of times that an automatic system restart is attempted for a qualified trip.

The trip conditions listed below will not initiate the **Retry** function:

- OCA1, 2, or 3 (Arm Short Ckt),
- EPH1 (Input Phase Failure),
- EPH0 (Output Phase Failure),
- OCL (Startup Overcurrent),
- EF1 or 2 (Ground Fault),
- EMG (Emergency Off),
- EEP1 (EEPROM Fault),
- Err2 through Err9 (Main RAM/ROM Fault),
- E-10 (Sink/Source Error),
- 13 (Speed Error), or
- 17 (Key Error).

See the section titled General Safety Information on pg. 1 for further information on this setting.

ON Terminal

Program ⇒ Input Terminals ⇒ **On Terminal**

This parameter selects the functionality of the **ON** discrete input virtual terminal.

As a virtual terminal, the **ON** control terminal exists only in memory and is considered to always be in its **True** (or connected to **CC**) state.

It is often practical to assign this terminal to a function that the user desires to be maintained regardless of external conditions or operations.

This parameter sets the programmable **ON** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

OUT1 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT1 Off Delay**

Once the condition is met to change the state of the **OUT1** (**A** & **C**) output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT1** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT1 On Delay

Program ⇒ Terminal Delays ⇒ **OUT1 On Delay**

Once the condition is met to change the state of the **OUT1** (**A** & **C**) output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT1 Terminal

Program ⇒ Output Terminals ⇒ **OUT1 Terminal**

This parameter sets the functionality of the **OUT1** (**A** & **C**) output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT1** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Damper Cmd**

Changeable During Run — **No**

OUT2 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT2 Off Delay**

Once the condition is met to change the state of the **OUT2** (**A** & **C**) output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT2** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT2 On Delay

Program ⇒ Terminal Delays ⇒ **OUT2 On Delay**

This parameter delays the response of the **OUT2** (**A** & **C**) output contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT2 Terminal

Program ⇒ Output Terminals ⇒ **OUT2 Terminal**

This parameter sets the functionality of the **OUT2** (**A** & **C**) output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT2** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Acc/Dec Completion**

Changeable During Run — **No**

OUT4 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT4 Off Delay**

Once the condition is met to change the state of the **OUT4** output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT4** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT4 On Delay

Program ⇒ Terminal Delays ⇒ **OUT4 On Delay**

This parameter delays the response of the **OUT4** output contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT4 Terminal

Program ⇒ Output Terminals ⇒ **OUT4 Terminal**

This parameter sets the functionality of the **OUT4** output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT4** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Lower Limit**

Changeable During Run — **No**

OUT5 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT5 Off Delay**

Once the condition is met to change the state of the **OUT5** output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT5** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT5 On Delay

Program ⇒ Terminal Delays ⇒ **OUT5 On Delay**

This parameter delays the response of the **OUT5** output contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT5 Terminal

Program ⇒ Output Terminals ⇒ **OUT5 Terminal**

This parameter sets the functionality of the **OUT5** output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT5** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Upper Limit**

Changeable During Run — **No**

OUT6 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT6 Off Delay**

Once the condition is met to change the state of the **OUT6** output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT6** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT6 On Delay

Program ⇒ Terminal Delays ⇒ **OUT6 On Delay**

This parameter delays the response of the **OUT6** output contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT6 Terminal

Program ⇒ Output Terminals ⇒ **OUT6 Terminal**

This parameter sets the functionality of the **OUT6** output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT6** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **Reach Speed**

Changeable During Run — **No**

OUT7 Off Delay

Program ⇒ Terminal Delays ⇒ **OUT7 Off Delay**

Once the condition is met to change the state of the **OUT7** output contacts, this parameter delays the response of the contacts by the programmed value (see waveforms at **FL Off Delay**).

The on and off delay times of the **OUT7** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT7 On Delay

Program ⇒ Terminal Delays ⇒ **OUT7 On Delay**

This parameter delays the response of the **OUT7** output contacts by the programmed value (see waveforms at **FL On Delay**).

The delay may be increased to prevent relay chatter.

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

OUT7 Terminal

Program ⇒ Output Terminals ⇒ **OUT7 Terminal**

This parameter sets the functionality of the **OUT7** output contacts to 1 of the 58 possible functions that are listed in Table 8 on page 133.

The on and off delay times of the **OUT7** contacts may be adjusted to provide more response time to the device that is connected to the output terminals.

In addition, the output contacts must be specified as **Normally Open** or **Normally Closed**.

Parameter Type — **Selection List**

Factory Default — **OC Alarm**

Changeable During Run — **No**

Output Phase Loss Detection

Program ⇒ Protection ⇒ **Output Phase Los**

This parameter **Enables/Disables** the monitoring of each phase of the 3-phase output signal (U, V, or W) of the ASD. If either line is missing, inactive, or not of the specified level, the ASD incurs a trip.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Overcurrent Stall Level

Program ⇒ Protection ⇒ **OC Stall Level**

This parameter specifies the output current level at which the output frequency is reduced in an attempt to prevent a trip. The overcurrent level is entered as a percentage of the maximum rating of the ASD.

Note: *Soft Stall must be enabled to use this feature.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.0

Units — %

Overload Reduction Frequency

Program ⇒ Protection ⇒ **OL Reduct Freq**

This parameter 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.

Parameter Type — **Numerical**

Factory Default — **6.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 30.00

Units — Hz

Overspeed Frequency

Program ⇒ Protection ⇒ **Overspeed Freq**

This parameter sets the upper level of the **Base Frequency** range that, once exceeded, will cause an **Overspeed Detected** alert.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — Hz

Overtorque Detection Time

Program ⇒ Protection ⇒ **OT Detec Time**

This parameter sets the amount of time that the overtorque condition may exceed the tripping threshold level set at **Overtorque Trip/Alarm Level (Positive Torque)** and **Overtorque Trip/Alarm Level (Negative Torque)** before a trip occurs.

Parameter Type — **Numerical**

Factory Default — **0.50**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 100.0

Units — Seconds

Overtorque Trip

Program ⇒ Protection ⇒ **Overtorque Trip**

This parameter **Enables/Disables** the **Over Torque Tripping** function.

When enabled, the ASD trips if an output torque larger than the setting of parameters **Overtorque Trip/Alarm Level (Positive Torque)** or **Overtorque Trip/Alarm Level (Positive Torque)** is detected for a time longer than the setting of the **Overtorque Detection Time** parameter.

When disabled, the ASD does not trip due to overtorque conditions.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Overtorque Level Negative

Program ⇒ Protection ⇒ **OT Level Neg**

This parameter sets the torque threshold level that is used as a setpoint for overtorque tripping during regeneration. This setting is a percentage of the maximum rated torque of the ASD.

Parameter Type — **Numerical**

Factory Default — **150.0**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 250.0

Units — %

Overtorque Level Positive

Program ⇒ Protection ⇒ **OT Level Pos**

This parameter sets the torque threshold level that is used as a setpoint for overtorque tripping. This setting is a percentage of the maximum rated torque of the ASD.

Parameter Type — **Numerical**

Factory Default — **150.0**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 250.0

Units — %

Overvoltage Stall Level (1)

Program ⇒ Protection ⇒ **Overvolt Stall**

This parameter **Enables/Disables** the **Overvoltage Stall** function.

When enabled, this function causes the ASD to extend the decel time when the DC bus voltage increases due to transient voltage spikes, regeneration, supply voltage out of specification, etc. in an attempt to reduce the bus voltage.

Settings:

Enabled
Disabled
Enabled (Forced Shorted Deceleration)

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Overvoltage Stall Level (2)

Program ⇒ Protection ⇒ **OvrVolt Level 2**

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 ASD during deceleration for a specified time in an attempt to prevent an **Overvoltage Trip**.

If the overvoltage condition persists for over 4 mS, an **Overvoltage Trip** will be incurred.

Note: *This feature may increase deceleration times.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 50.0

Maximum — 250.0

Units — %

Overvoltage Stall Level (fast)

Program ⇒ Protection ⇒ **OvrVolt Level 1**

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 ASD during deceleration for a specified time in an attempt to prevent an **Overvoltage Trip**.

If the overvoltage condition persists for over 250 µS, an **Overvoltage Trip** will be incurred.

Note: *This feature may increase deceleration times.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 50.00

Maximum — 250.0

Units — %

Panel Acc/Dec Select

Program ⇒ Panel Control ⇒ **Pnl Acc/Dec Sel**

This parameter is used to select 1 of 4 accel/decel profiles that may be configured and run. Each accel/decel profile is comprised of 3 user settings: **Acceleration**, **Deceleration**, and **Pattern**.

Parameter Type — **Selection List**

Factory Default — **Accel/Decel #1**

Changeable During Run — **Yes**

Panel Direction

Program ⇒ Panel Control ⇒ **Panel Direction**

This parameter sets the motor direction while operating from the keypad.

Parameter Type — **Selection List**

Factory Default — **Forward**

Changeable During Run — **Yes**

Panel Lockout

Program ⇒ Utility Group ⇒ **Panel Lockout**

This parameter disables the selected keypad function.

Settings:

Allow All Keys
Allow Emergency Off Only

Parameter Type — **Selection List**

Factory Default — **Allow All Keys**

Changeable During Run — **Yes**

Panel PID Control

Program ⇒ Panel Control ⇒ **Panel PID Ctrl**

Enables/Disables PID control while operating from the keypad.

Parameter Type — **Selection List**

Factory Default — **Enabled**

Changeable During Run — **Yes**

Panel Reset Select

Program ⇒ Panel Control ⇒ **Panel Reset Sel**

Enables/Disables the ability to reset the system from the keypad.

Parameter Type — **Selection List**

Factory Default — **Enabled**

Changeable During Run — **Yes**

Panel Stop Pattern

Program ⇒ Panel Control ⇒ **Panel Stop Pat**

The **Decel Stop** or **Coast Stop** settings determine 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.

Parameter Type — **Selection List**

Factory Default — **Decel Stop**

Changeable During Run — **Yes**

Panel V/f Group

Program ⇒ Panel Control ⇒ **Panel V/f Group**

This parameter is used to select 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 **Thermal Protection**.

Parameter Type — **Selection List**

Factory Default — **1**

Changeable During Run — **Yes**

Parity

Program ⇒ Comm Settings ⇒ **Parity**

This parameter plays a role in the setup of the communications network by establishing the **Parity** setting of the communications link.

The communications network includes other ASDs and Host/Control computers that monitor the status of the ASD(s), transfers commands, and loads or modifies the parameter settings of the ASD.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

No Parity
Even Parity
Odd Parity

Parameter Type — **Selection List**

Factory Default — **Even Parity**

Changeable During Run — **Yes**

PG Detect Selection

Program ⇒ Feedback Settings ⇒ **PG Detect Sel**

This parameter **Enables/Disables** the system's monitoring of the PG connection status when using encoders with line driver outputs.

Note: *The ASD-Multicom-J option board is required to use this feature.*

Settings:

Disabled
Enabled

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

PG Number of Pulses

Program ⇒ Feedback Settings ⇒ **PG Num of Pulses**

This parameter is used to set the end-of-travel range when using an encoder on a motor-driven positioning system (e.g., hoist/crane, etc.).

Parameter Type — **Numerical**

Factory Default — **500**

Changeable During Run — **No**

Minimum — 1

Maximum — 9999

Units — Pulse Count

PG Input Phases

Program ⇒ Feedback Settings ⇒ **PG Input Phases**

This setting determines if motor speed and direction will be conveyed by the encoder.

Settings:

Single-Phase
Two-Phase

Parameter Type — **Selection List**

Factory Default — **Two-Phase**

Changeable During Run — **No**

PG Speed Frequency #1

Program ⇒ Freq Settings ⇒ **PG Speed Freq #1**

This parameter is used to set the direction, gain, and bias of the **PG** input when the **PG** input is used as the **Speed/Direction** control input.

The **PG** input signal is a pulse train originating from a shaft-mounted **Encoder**.

Note:*The **PG** input terminal is available with the **ASD-Multicom** option board only.*

PG Input Speed/Direction Control Setup

Perform the following setup to allow the system to receive **Speed/Direction** control input at the **PG** input:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Use Pulse Input**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ (any setting).
- Provide a **Run** command (**F** and/or **R**).

Speed/Direction Control

Perform the following setup to allow the system to perform **PG Speed/ Direction** control:

- Set **PG Speed Frequency #1**,
- Set the **PG** input pulse count that represents **PG Speed Frequency #1**,
- Set **PG Speed Frequency #2**, and
- Set the **PG** input pulse count that represents **PG Speed Frequency #2**.

Once set, as the **PG** input pulse count changes, the directional information or the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets the **PG** input pulse count that represents **PG Speed Frequency #1** (direction/speed). The range of values for this parameter is -100 to +100% of the **PG** input pulse count range.

Note: *Further application-specific **PG** settings may be performed from the following path: Program ⇒ **Feedback Settings**.*

Parameter Type — **Numerical**

Factory Default — **0.0**

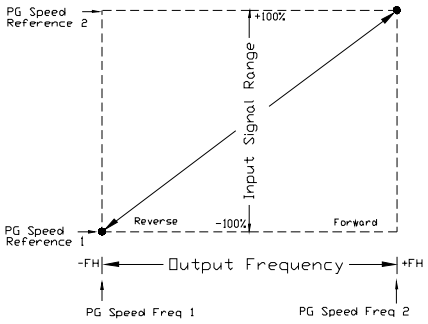
Changeable During Run — **Yes**

Minimum — -80.0

Maximum — +80.0

Units — Hz

Frequency Settings



PG Speed Frequency #2

Program ⇒ Freq Settings ⇒ **PG Speed Freq #2**

This parameter is used to set the direction, gain, and bias of the **PG** input terminal when it is used as the **Speed/Direction-Control** input.

This parameter sets **PG Speed Frequency #2** and is the frequency that is associated with the **PG Speed Reference #2** setting.

See **PG Speed Frequency #1** for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — -80.0

Maximum — +80.0

Units — Hz

PG Speed Reference #1

Program ⇒ Freq Settings ⇒ **PG Speed Ref #1**

This parameter is used to set the direction, gain, and bias of the **PG** input terminal when it is used as the **Speed/Direction-Control** input.

This parameter sets the **PG** input pulse count that represents **PG Speed Frequency #1** (direction/speed) and is entered as a percentage of the full ± range.

The range of values for this parameter is -100 to +100% of the **PG** input pulse count range.

See **PG Speed Frequency #1** for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — +100.0

Units — %

PG Speed Reference #2

Program ⇒ Freq Settings ⇒ **PG Speed Freq #2**

This parameter is used to set the direction, gain, and bias of the **PG** input terminal when it is used as the **Speed/Direction-Control** input.

This parameter sets the **PG** input pulse count that represents **PG Speed Frequency #2** (direction/speed) and is entered as a percentage of the full ± range.

See **PG Speed Frequency #1** for further information on this setting.

Parameter Type — **Numerical**

Factory Default — **+100.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — +100.0

Units — %

Power Switching

Program ⇒ Special Controls ⇒ **Power Switching**

This parameter **Enables/Disables** the **Powerline Switching** feature. When enabled, the system is instructed to discontinue using the output of the drive and to switch to the commercial power in the event of a trip or when reaching a user-set frequency.

This feature may also be activated via a discrete input terminal (see Table 7 on page 130 for further information on this feature).

Settings:

Disabled
On Trip
At Frequency
Trip or At Frequency

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

PID Feedback

Program ⇒ PID Setup ⇒ **PID Feedback**

This parameter is read-only and is provided as a quick reference for the user during **PID** setup.

Power Switching Frequency

Program ⇒ Special Controls ⇒ **Power Sw Freq**

With the **Power Switching** parameter enabled, this parameter sets the frequency at which the **At Frequency** selection of the **Power Switching** parameter is activated.

If the **Power Switching** function is activated via a discrete input terminal, this setting sets the frequency at which discrete input terminal is enabled for activation.

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — **Max. Freq.**

Units — Hz

Preset Speed #1

Program ⇒ Preset Speeds ⇒ **Preset Speed #1**

Up to 15 output frequency values that fall within the **Lower Limit** and the **Upper Limit** range may be programmed into the ASD and output as a **Preset Speed**. This parameter assigns an output frequency to binary number 0001 and is identified as **Preset Speed #1**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed**.

Perform the following setup to allow the system to receive **Preset Speed** control input at the **S1 – S4** terminals:

1. Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Use Binary/BCD**.
2. Program ⇒ Input Terminals ⇒ **S1 Terminal** (set to **Set Speed 1**; LSB of 4-bit count). Repeat for **S2** – **S4 Terminals** (MSB of 4-bit count) as **Set Speed 2** – **4**, respectively (all **Normally Open**).

   Note: *The default setting of **S4** is **EOff**, but this terminal may be re-assigned as the MSB.*

3. Program ⇒ Preset Speeds ⇒ **Preset Speed #1** (press the **Read|Write** key to set an output frequency for **Preset Speed #1**; repeat for **Preset Speed 2** – **15** as required).
4. Program ⇒ Preset Speeds ⇒ PS Spd Mode Ctrl ⇒ **Enable/Disable.**

When **Enabled**, the **Torque**, **Speed**, **Accel/Decel**, and **Direction** settings for the configured **Preset Speed** being run are used (select preset speed configuration at Program ⇒ Preset Speeds ⇒ **PS Speed Mode 1**, **2**, etc.).

When **Disabled**, only the speed setting of the **Preset Speed** being run is used.

5. Place the system in the **Remote** mode (**Local|Remote** LED Off).
6. Provide a **Run** command (connect **F** and/or **R** to **CC**).

Connect **S1** to **CC** to run **Preset Speed #1** (**S1** to **CC** = 0001 binary).

With **S1** – **S4** configured to output **Preset Speeds**, 0001_B – 1111_B may be applied to **S1 – S4** of the **Control Terminal Strip** to run the associated **Preset Speed**. If bidirectional operation is required, **F** and **R** must be connected to **CC**, and **PS Spd Mode Ctrl** must be **Enabled** for a given **Preset Speed** being run.

With **S1** being the least significant bit of a binary count, the **S1 – S4** settings will produce the programmed speed settings as indicated in the table to the right.

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed Truth Table.

Speed #	S 4	S 3	S 2	S 1	O/P
1	0	0	0	**1**	**PS# 1**
2	0	0	**1**	0	**PS# 2**
3	0	0	**1**	**1**	**PS# 3**
4	0	**1**	0	0	**PS# 4**
5	0	**1**	0	**1**	**PS# 5**
6	0	**1**	**1**	0	**PS# 6**
7	0	**1**	**1**	**1**	**PS# 7**
8	**1**	0	0	0	**PS# 8**
9	**1**	0	0	**1**	**PS# 9**
10	**1**	0	**1**	0	**PS# 10**
11	**1**	0	**1**	**1**	**PS# 11**
12	**1**	**1**	0	0	**PS# 12**
13	**1**	**1**	0	**1**	**PS# 13**
14	**1**	**1**	**1**	0	**PS# 14**
15	**1**	**1**	**1**	**1**	**PS# 15**

Note: *1=connected to **CC**.*

Preset Speed #2

Program ⇒ Preset Speeds ⇒ **Preset Speed #2**

This parameter assigns an output frequency to binary number 0010 and is identified as **Preset Speed #2**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #3

Program ⇒ Preset Speeds ⇒ **Preset Speed #3**

This parameter assigns an output frequency to binary number 0011 and is identified as **Preset Speed #3**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #4

Program ⇒ Preset Speeds ⇒ **Preset Speed #4**

This parameter assigns an output frequency to binary number 0100 and is identified as **Preset Speed #4**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #5

Program ⇒ Preset Speeds ⇒ **Preset Speed #5**

This parameter assigns an output frequency to binary number 0101 and is identified as **Preset Speed #5**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #6

Program ⇒ Preset Speeds ⇒ **Preset Speed #6**

This parameter assigns an output frequency to binary number 0110 and is identified as **Preset Speed #6**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #7

Program ⇒ Preset Speeds ⇒ **Preset Speed #7**

This parameter assigns an output frequency to binary number 0111 and is identified as **Preset Speed #7**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #8

Program ⇒ Preset Speeds ⇒ **Preset Speed #8**

This parameter assigns an output frequency to binary number 1000 and is identified as **Preset Speed #8**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #9

Program ⇒ Preset Speeds ⇒ **Preset Speed #9**

This parameter assigns an output frequency to binary number 1001 and is identified as **Preset Speed #9**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #10

Program ⇒ Preset Speeds ⇒ **Preset Speed #10**

This parameter assigns an output frequency to binary number 1010 and is identified as **Preset Speed #10**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #11

Program ⇒ Preset Speeds ⇒ **Preset Speed #11**

This parameter assigns an output frequency to binary number 1011 and is identified as **Preset Speed #11**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #12

Program ⇒ Preset Speeds ⇒ **Preset Speed #12**

This parameter assigns an output frequency to binary number 1100 and is identified as **Preset Speed #12**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #13

Program ⇒ Preset Speeds ⇒ **Preset Speed #13**

This parameter assigns an output frequency to binary number 1101 and is identified as **Preset Speed #13**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #14

Program ⇒ Preset Speeds ⇒ **Preset Speed #14**

This parameter assigns an output frequency to binary number 1110 and is identified as **Preset Speed #14**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed #15

Program ⇒ Preset Speeds ⇒ **Preset Speed #15**

This parameter assigns an output frequency to binary number 1111 and is identified as **Preset Speed #15**. The binary number is applied to **S1** – **S4** of the **Control Terminal Strip** to output the **Preset Speed** (see **Preset Speed #1** for further information on this parameter).

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — **Lower Limit**

Maximum — **Upper Limit**

Units — Hz

Preset Speed Mode Control

Program ⇒ Preset Speeds ⇒ **PS Spd Mode Ctrl**

Enables/Disables the use of the **Preset Speed Mode** control for **Preset Speeds 1** – **15**.

The **Preset Speed Mode** control setting determines if the speed setting only is used (disabled) or if (enabled) stored combinations of the **Torque**, **Speed**, **Accel/Decel**, and **Direction** settings will be used while running a given **Preset Speed**.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Proportional (P) Gain

Program ⇒ Feedback Settings ⇒ **Prop Gain**

This parameter determines the degree that the **Proportional** function affects the output signal when using PID feedback to control the ASD output. The larger the value entered here, the quicker the ASD responds to changes in feedback.

Parameter Type — **Numerical**

Factory Default — **0.10**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 100.0

PS Speed Mode 1

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 1**

This parameter is enabled by selecting **Enable** at the **Preset Speed Mode Control** parameter.

Once enabled, a user-selected combination of **Torque Limit**, **V/f**, **Accel/Decel**, and **Direction** settings are used when **Preset Speed #1** is run.

If disabled, only the Speed setting is used for **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 2

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 2**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #2**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 3

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 3**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #3**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 4

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 4**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #4**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 5

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 5**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #5**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 6

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 6**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #6**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 7

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 7**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #7**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 8

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 8**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #8**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 9

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 9**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #9**

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 10

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 10**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #10**

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 11

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 11**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #11**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 12

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 12**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #12**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 13

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 13**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #13**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 14

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 14**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #14**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PS Speed Mode 15

Program ⇒ Preset Speeds ⇒ **PS Speed Mode 15**

Selecting **Enable** at the **Preset Speed Mode Control** parameter enables this parameter. If disabled, only the Speed setting is used for **Preset Speed #15**.

Same as **Preset Speed #1**.

Parameter Type — **Selection List**

Factory Default — **T1, V1, AD1, Fwd**

Changeable During Run — **Yes**

PWM Carrier Frequency

Program ⇒ Special Controls ⇒ **PWM Carrier Freq**

This parameter sets the frequency of the pulse width modulation signal applied to the motor.

Note: *The carrier frequency must be 2.2 kHz or above except when operating in the **Constant Torque** or the **Variable Torque** modes.*

Note: *The maximum **Carrier Frequency** setting allowed is 5.0 kHz for the following ASDs:*
230-volt, 75 HP – 150 HP.
460-volt, 150 HP – 350 HP.
600-volt, 150 HP – 350 HP.

*The maximum **Carrier Frequency** setting allowed for all other ASDs is 15 kHz.*

Setting the Carrier Frequency above the Derate Threshold frequency (as listed below) for a given ASD will reduce the capability of the ASD.

Carrier-Frequency Derate Threshold Frequency

Derate Threshold Frequency				
2.2 kHz	**4.0 kHz**	**5.0 kHz**	**6.0 kHz**	**8.0 kHz**
VT130Q7U				
2600B – 215KB	4600B	2400B – 2500B	6160B	2010B – 2330B
420KB – 440KB		4500B		4015B – 4400B
615KB – 635KB		412KB – 415KB		4750B – 410KB
		6500B		6015B – 6120B
		612KB		6220B – 6400B
				6600B – 610KB

Parameter Type — **Numerical**

Factory Default — **2.200**

Changeable During Run — **No**

Minimum — 0.500

Maximum — (ASD-dependent)

Units — kHz

Ramped PWM

Program ⇒ Special Controls ⇒ **Ramped PWM**

Enables/Disables the variable PWM frequency.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Reach Detection

Program ⇒ Output Terminals ⇒ **Reach Detection**

This parameter sets the bandwidth of the **Speed Reach Frequency** setting.

Parameter Type — **Numerical**

Factory Default — **2.5**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

Reach Frequency

Program ⇒ Output Terminals ⇒ **Reach Frequency**

This setting establishes a frequency threshold that, when reached or is within the **Reach Detection** bandwidth, will provide a signal at an output terminal that can close an appropriately configured output contact.

Parameter Type — **Numerical**

Factory Default — **2.5**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

Receive Address

Program ⇒ Comm Settings ⇒ **S20 Settings**

This setting defines a memory location to be used for received data via a Multicom option board.

Parameter Type — **Selection List**

Factory Default — **0**

Reference Priority Selection

Program ⇒ Freq Settings ⇒ **Ref Priority Sel**

Parameter Type — **Selection List**

Factory Default — **Freq #1 Priority**

Changeable During Run — **Yes**

Either the **Frequency Mode (#1)** or the **Frequency Mode #2** setting 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.

Settings:

Freq Source #1
Freq Source #2
Freq #1 Priority
Freq #2 Priority
Freq Prty Switch

The **Freq Mode #1** or **Freq Mode #2** setting specifies the source of the input frequency-command signal.

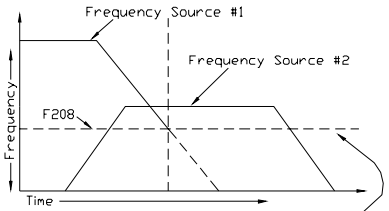
If **Freq Source #1** is selected here, the ASD will follow the speed command of the **Freq Mode #1** selection. If **Freq Source #2** is selected here, the ASD will follow the speed command of the **Freq Mode #2** selection.

The **Freq #1 Priority** and **Freq #2 Priority** selections are used in conjunction with the **Mode #1/#2 SW (Switching) Freq** parameter setting. The **Mode #1/#2 SW (Switching) Freq** parameter establishes a threshold frequency that will be used as a reference when determining when to toggle the output control between the **Frequency Mode (#1)** selection and the **Frequency Mode #2** selection.

If **Freq #1 Priority** is selected here and the commanded frequency exceeds the **Mode #1/#2 SW (Switching) Freq** setting, then the **Freq Mode #1** selection has priority over the **Freq Mode #2** selection.

If **Freq #2 Priority** is selected here and the commanded frequency exceeds the **Mode #1/#2 SW (Switching) Freq** setting, then the **Freq Mode #2** selection has priority over the **Freq Mode #1** selection.

Frequency Prty (Priority) Switch allows for the activation of a preconfigured discrete input terminal to toggle the frequency control between the selections of **Freq Mode #1** and **Freq Mode #2**. Any unused programmable discrete input terminal may be programmed as the **Frequency Prty (Priority) Switch** terminal.



Once the commanded frequency exceeds the F208 value, the setting of parameter F200 determines if the #1 or the #2 frequency command source controls the ASD output.

Regen Stall

Program ⇒ Protection ⇒ **Regen Stall**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Enables/Disables the **Overvoltage Stall** and the **Overcurrent Stall** function during regeneration only.

Release After Run Timer

Program ⇒ Protection ⇒ **Rel After Run**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 10.0

Units — Seconds

This parameter sets the time that the brake will hold after the **Run** command criteria has been met.

RES Terminal

Program ⇒ Input Terminals ⇒ **RES Terminal**

This parameter selects the functionality of the **RES** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **RES** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Reset**

Changeable During Run — **No**

RES Terminal Delay

Program ⇒ Terminal Delays ⇒ **RES Delay**

This parameter delays the response of the ASD to any change in the **RES** terminal input by the programmed value (see waveforms at **F Terminal Delay**).

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

Ridethrough Mode

Program ⇒ Protection ⇒ **Ridethrough Mode**

Enables/Disables the **Ridethrough** function.

In the event of a momentary power outage, when enabled, the **Ridethrough** function uses regenerative energy to maintain the control circuitry settings.

Regenerated energy is not used to drive the motor.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Ridethrough Time

Program ⇒ Protection ⇒ **Ridethrough**

This parameter determines the length of the **Ridethrough** time. The **Ridethrough** will be maintained for the number of seconds set using this parameter.

Note: *The actual **Ridethrough Time** is load-dependent.*

Parameter Type — **Numerical**

Factory Default — **2.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 320.0

Units — Seconds

R Terminal

Program ⇒ Input Terminals ⇒ **R Terminal**

This parameter selects the functionality of the **R** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **R** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Reverse**

Changeable During Run — **No**

R Terminal Delay

Program ⇒ Terminal Delays ⇒ **R Delay**

This parameter delays the response of the ASD to any change in the **R** terminal input by the programmed value.

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

RR Speed Frequency #1

Program ⇒ Freq Settings ⇒ **RR Speed Freq #1**

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Speed Control** mode.

RR Input Speed Control Setup

Perform the following setup to allow the system to receive **Speed** control input at the **RR** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **RR**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Speed Control

Perform the following setup to allow the system to perform **Speed** control from the **RR** input terminal:

- Set **RR Speed Frequency #1**,
- Set the **RR** input signal level (RR Speed Ref #1) that represents **RR Speed Frequency #1**,
- Set **RR Speed Frequency #2**, and
- Set the **RR** input signal level (RR Speed Ref #2) that represents **RR Speed Frequency #2**.

Once set, as the **RR** input voltage changes the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets **RR Speed Frequency #1** and is the frequency that is associated with the setting of **RR Speed Reference #1** when operating in the **Speed Control** mode.

Parameter Type — **Numerical**

Factory Default — **0.0**

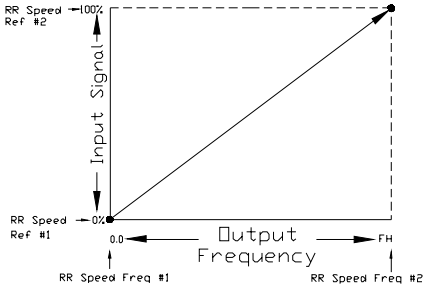
Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 80.0

Units — Hz

Frequency Settings



RR Speed Frequency #2

Program ⇒ Freq Settings ⇒ **RR Speed Freq #2**

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Speed Control** mode.

See **RR Speed Frequency #1** for further information on this setting.

This parameter sets **RR Speed Frequency #2** and is the frequency that is associated with the setting of **RR Speed Reference #2** when operating in the **Speed Control** mode.

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 80.0

Units — Hz

RR Speed Reference #1

Program ⇒ Freq Settings ⇒ **RR Speed Ref #1**

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RR Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RR Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RR** input level that is associated with **RR Speed Frequency #1** when operating in the **Speed** control mode or is associated with the **RR Torque Reference #1** when operating in the **Torque** control mode.

This value is entered as 0.0 to +100% of the 0 – 10 VDC **RR** input signal range.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

RR Speed Reference #2

Program ⇒ Freq Settings ⇒ **RR Speed Ref #2**

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RR Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RR Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RR** input level that is associated with **RR Speed Frequency #2** when operating in the **Speed** control mode or is associated with the **RR Torque Reference #2** when operating in the **Torque** control mode.

This value is entered as 0.0 to +100% of the 0 – 10 VDC **RR** input signal range.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

RR Torque Reference #1

Program ⇒ Freq Settings ⇒ **RR Torque Ref #1**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Torque Control** mode.

RR Input Torque Control Setup

Perform the following setup to allow the system to receive **Torque** control input at the **RR** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **RR**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Torque Control

Perform the following setup to allow the system to perform **Torque** control from the **RR** input terminal:

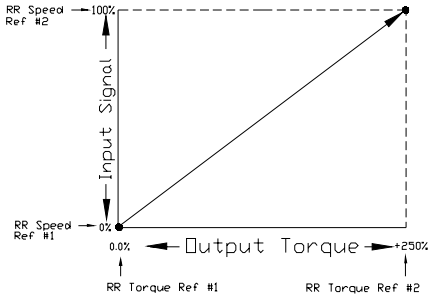
- Set **RR Torque Reference #1**,
- Set the **RR** input signal level (RR Speed Ref #1) that represents the **RR Torque Reference #1**,
- Set **RR Torque Reference #2**, and
- Set the **RR** input signal level (RR Speed Ref #2) that represents the **RR Torque Reference #2**.

This is accomplished by establishing an associated **V/f** output pattern for a given **RR** input level.

This parameter sets **RR Torque Reference #1** and is the output torque value that is associated with the setting of **RR Speed Reference #1** when operating in the **Torque** control mode.

This value is entered as 0.0 to 250% of the output torque range.

Torque Settings



RR Torque Reference #2

Program ⇒ Freq Settings ⇒ **RR Torque Ref #2**

Parameter Type — **Numerical**

Factory Default — **100.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

This parameter is used to set the gain and bias of the **RR** input terminal when the **RR** terminal is used as the control input while operating in the **Torque Control** mode.

This is accomplished by establishing an associated **V/f** output pattern for a given **RR** input level.

See **RR Torque Reference #1** for further information on this setting.

This parameter sets **RR Torque Reference #2** and is the output torque value that is associated with setting of **RR Speed Reference #2** when operating in the **Torque** control mode.

This value is entered as 0.0 to 250% of the output torque range.

RS485 Baud Rate

Program ⇒ Comm Settings ⇒ **RS485 Baud Rate**

Parameter Type — **Selection List**

Factory Default — **9600**

Changeable During Run — **Yes**

This parameter sets the RS485 baud rate.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

1200
2400
4800
9600
19200
38400

RS485 Comm Time-Out Action

Program ⇒ Comm Settings ⇒ **485 Timeout Act**

Parameter Type — **Selection List**

Factory Default — **485-Alarm – TTL-None**

Changeable During Run — **Yes**

This parameter plays a role in the setup of the communications network by determining the action to be taken in the event of a time-out (**Time-Out Action**).

The communications network includes other ASDs and Host/Control computers that monitor the status of the ASD(s), transfers commands, and loads or modifies the parameter settings of the ASD.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

None
485-Alarm – TTL-None
485-Trip – TTL-None
485-None – TTL-Alarm
485-Alarm – TTL-Alarm
485-Trip – TTL-Alarm
485-None – TTL-Trip
485-Alarm – TTL-Trip
485-Trip – TTL-Trip

RS485 Comm Time-Out Time

Program ⇒ Comm Settings ⇒ **485 Timeout Time**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — Seconds

This parameter plays a role in the setup of the communications network by setting the time that no activity may exist over the communications link before the link is severed (**Time Out**).

The communications network includes other ASDs and Host/Control computers that monitor the status of the ASD(s), transfers commands, and loads or modifies the parameter settings of the ASD.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

RS485 Master Output

Program ⇒ Comm Settings ⇒ **RS485 Master Out**

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.

Note: *Select **Normal** if **TTL Master Out** is configured as a **Master Output** controller. Otherwise, a keypad failure will result.*

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

Normal (No Slave)
Frequency Reference
Output Command Frequency
Torque Command
Output Torque

Parameter Type — **Selection List**

Factory Default — **Normal (No Slave)**

Changeable During Run — **Yes**

RS485 Response Time

Program ⇒ Comm Settings ⇒ **RS485 Res Time**

This parameter sets the **RS232/485** response delay time.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Parameter Type — **Numerical**

Factory Default — 0.00

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.00

Units — Seconds

RS485 Wire Count

Program ⇒ Comm Settings ⇒ **RS485 Wire Count**

This parameter sets the communications protocol to the 2 or 4 wire method.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

2 wire
4 wire

Parameter Type — **Selection List**

Factory Default — 4-Wire

Changeable During Run — **Yes**

Run Frequency

Program ⇒ Special Controls ⇒ **Run Frequency**

This parameter establishes a center frequency (**Run Frequency**) of a frequency band.

The **Run Frequency Hysteresis** parameter provides a plus-or-minus value for the **Run Frequency;** thus, establishing a frequency band.

During acceleration, the ASD will not output a signal to the motor until the lower level of the band is reached.

During deceleration, the ASD will continue to output the programmed deceleration output signal to the motor until the lower level of the band is reached; at which time the output will go to 0.0 Hz.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

Run Frequency Hysteresis

Program ⇒ Special Controls ⇒ **Run Freq Hyst**

This parameter provides a plus-or-minus value for the **Run Frequency** setting.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — Hz

Run Time Alarm Setting

Program ⇒ Protection ⇒ **Run Time Alm Set**

This parameter sets a run-time value that, once exceeded, provides an output signal. The output signal may be used to control external equipment or used to engage a brake.

Note: *The time displayed is 1/10th of the actual time (0.1 hr. = 1.0 hr.).*

Parameter Type — **Numerical**

Factory Default — **175.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 999.9

Units — Hours (X 100)

RX Speed Frequency #1

Program ⇒ Freq Settings ⇒ **RX Speed Freq #1**

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Speed Control** mode.

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -Max. Freq.

Maximum — +Max. Freq.

Units — Hz

RX Input Speed/Direction Control Setup

Perform the following setup to allow the system to receive **Speed** control input at the **RX** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Rx**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Speed/Direction Control

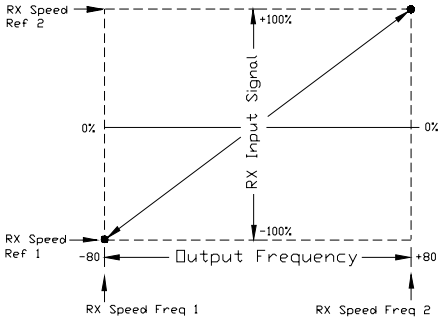
Perform the following setup to allow the system to perform **Speed** control from the **RX** input terminal:

- Set **RX Speed Frequency #1**,
- Set the **RX** input signal level (RX Speed Ref #1) that represents **RX Speed Frequency #1**,
- Set **RX Speed Frequency #2**, and
- Set the **RX** input signal level (RX Speed Ref #2) that represents **RX Speed Frequency #2**.

Once set, as the **RX** input voltage changes, the directional information, and the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets **RX Speed Frequency #1** and is the frequency that is associated with the setting of **RX Speed Reference #1** when operating in the **Speed Control** mode.

Frequency Settings



RX Speed Frequency #2

Program ⇒ Freq Settings ⇒ **RX Speed Freq #2**

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Speed Control** mode.

See **RX Speed Frequency #1** for further information on this setting.

This parameter sets **RX Speed Frequency #2** and is the frequency that is associated with the setting of **RX Speed Reference #2** when operating in the **Speed Control** mode.

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — -Max. Freq.

Maximum — +Max. Freq.

Units — Hz

RX Speed Reference #1

Program ⇒ Freq Settings ⇒ **RX Speed Ref #1**

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RX Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RX Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RX** input level that is associated with **RX Speed Frequency #1** when operating in the **Speed** control mode or is associated with the **RX Torque Reference #1** when operating in the **Torque** control mode.

This value is entered as -100 to +100% of the -10 to +10 VDC **RX** input signal range.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

RX Speed Reference #2

Program ⇒ Freq Settings ⇒ **RX Speed Ref #2**

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RX Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RX Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RX** input level that is associated with **RX Speed Frequency #2** when operating in the **Speed** control mode or is associated with the **RX Torque Reference #2** when operating in the **Torque** control mode.

This value is entered as -100 to +100% of the -10 to +10 VDC **RX** input signal range.

Parameter Type — **Numerical**

Factory Default — **100.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

RX Torque Reference #1

Program ⇒ Freq Settings ⇒ **RX Torque Ref #1**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Torque Control** mode.

RX Input Torque Control Setup

Perform the following setup to allow the system to receive **Torque** control input at the **RX** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Rx**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Torque Control

Perform the following setup to allow the system to perform **Torque** control from the **RX** input terminal:

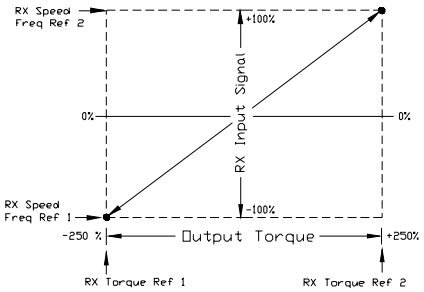
- Set **RX Torque Reference #1**,
- Set the **RX** input signal level (RX Speed Ref #1) that represents the **RX Torque Reference #1**,
- Set **RX Torque Reference #2**, and
- Set the **RX** input signal level (RX Speed Ref #2) that represents the **RX Torque Reference #2**.

This is accomplished by establishing an associated **V/f** output pattern for a given **RX** input level.

This parameter sets **RX Torque Reference #1** and is the output torque value that is associated with the setting of **RX Speed Reference #1** when operating in the **Torque** control mode.

This value is entered as -250 to +250% of the rated torque.

Torque Settings



RX Torque Reference #2

Program ⇒ Freq Settings ⇒ **RX Torque Ref #2**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX** input terminal when the **RX** terminal is used as the control input while operating in the **Torque Control** mode.

This is accomplished by establishing an associated **V/f** output pattern for a given **RX** input level.

See **RX Torque Reference #1** for further information on this setting.

This parameter sets **RX Torque Reference #2** and is the output torque value that is associated with setting of **RX Speed Reference #2** when operating in the **Torque** control mode.

This value is entered as -250 to +250% of the rated torque.

RX2 Speed Frequency #1

Program ⇒ Freq Settings ⇒ **RX2 Speed Freq #1**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -Max. Freq.

Maximum — +Max. Freq.

Units — Hz

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Speed Control** mode.

Note: *The **RX2** input terminal is available with the **ASD-Multicom** option board only.*

RX2 Input Speed/Direction Control Setup

Perform the following setup to allow the system to receive **Speed** control input at the **RX2** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Rx**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Speed/Direction Control

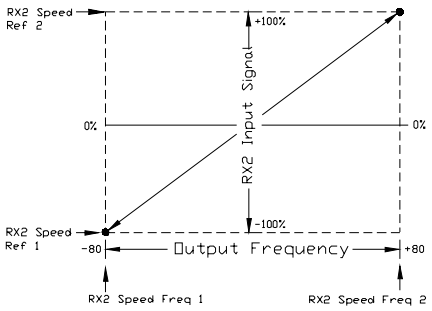
Perform the following setup to allow the system to perform **Speed** control from the **RX2** input terminal:

- Set **RX2 Speed Frequency #1**,
- Set the **RX2** input signal level (RX2 Speed Ref #1) that represents **RX2 Speed Frequency #1**,
- Set **RX2 Speed Frequency #2**, and
- Set the **RX2** input signal level (RX2 Speed Ref #2) that represents **RX2 Speed Frequency #2**.

Once set, as the **RX2** input voltage changes, the directional information, and the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets **RX2 Speed Frequency #1** and is the frequency that is associated with the setting of **RX2 Speed Reference #1** when operating in the **Speed Control** mode.

Frequency Settings



RX2 Speed Frequency #2

Program ⇒ Freq Settings ⇒ **RX2 Speed Freq #2**

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — -Max. Freq.

Maximum — +Max. Freq.

Units — Hz

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Speed Control** mode.

See **RX2 Speed Frequency #1** for further information on this setting.

This parameter sets **RX2 Speed Frequency #2** and is the frequency that is associated with the setting of **RX2 Speed Reference #2** when operating in the **Speed Control** mode.

RX2 Speed Reference #1

Program ⇒ Freq Settings ⇒ **RX2 Speed Ref #1**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RX2 Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RX2 Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RX2** input level that is associated with **RX2 Speed Frequency #1** when operating in the **Speed** control mode and is associated with the **RX2 Torque Reference #1** when operating in the **Torque** control mode.

This value is entered as -100 to +100% of the -10 to +10 VDC **RX2** input signal range.

RX2 Speed Reference #2

Program ⇒ Freq Settings ⇒ **RX2 Speed Ref #2**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **RX2 Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **RX2 Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **RX2** input level that is associated with **RX2 Speed Frequency #2** when operating in the **Speed** control mode and is associated with the **RX2 Torque Reference #2** when operating in the **Torque** control mode.

This value is entered as -100 to +100% of the -10 to +10 VDC **RX2** input signal range.

RX2 Torque Reference #1

Program ⇒ Freq Settings ⇒ **RX2 Torque Ref #1**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Torque Control** mode.

RX2 Input Torque Control Setup

Perform the following setup to allow the system to receive **Torque** control input at the **RX2** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **Rx**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Torque Control

Perform the following setup to allow the system to perform **Torque** control from the **RX2** input terminal:

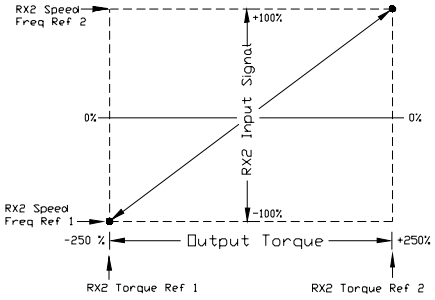
- Set **RX2 Torque Reference #1**,
- Set the **RX2** input signal level (RX2 Speed Ref #1) that represents the **RX2 Torque Reference #1**,
- Set **RX2 Torque Reference #2**, and
- Set the **RX2** input signal level (RX2 Speed Ref #2) that represents the **RX2 Torque Reference #2**.

This is accomplished by establishing an associated **V/f** output pattern for a given **RX2** input level.

This parameter sets **RX2 Torque Reference #1** and is the output torque value that is associated with the setting of **RX2 Speed Reference #1** when operating in the **Torque** control mode.

This value is entered as -250 to +250% of the rated torque.

Torque Settings



RX2 Torque Reference #2

Program ⇒ Freq Settings ⇒ **RX2 Torque Ref #2**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **RX2** input terminal when the **RX2** terminal is used as the control input while operating in the **Torque Control** mode.

This is accomplished by establishing an associated **V/f** output pattern for a given **RX2** input level.

See **RX2 Torque Reference #1** for further information on this setting.

This parameter sets **RX2 Torque Reference #2** and is the output torque value that is associated with setting of **RX2 Speed Reference #2** when operating in the **Torque** control mode.

This value is entered as -250 to +250% of the rated torque.

S1 Terminal

Program ⇒ Input Terminals ⇒ **S1 Terminal**

Parameter Type — **Selection List**

Factory Default — **Fire Speed**

Changeable During Run — **No**

This parameter selects the functionality of the **S1** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S1** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S10 Terminal

Program ⇒ Input Terminals ⇒ **S10 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S10** discrete input terminal.

Note: *The **S10** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S10** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S10** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S11 Terminal

Program ⇒ Input Terminals ⇒ **S11 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S11** discrete input terminal.

Note: *The **S11** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S11** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S11** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S12 Terminal

Program ⇒ Input Terminals ⇒ **S12 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S12** discrete input terminal.

Note: *The **S12** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S12** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S12** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S1–S4 Terminal Delay

Program ⇒ Terminal Delays ⇒ **S1–S4 Delay**

Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

This parameter delays the response of the ASD to any change in the **S1–S4** terminal input by the programmed value (see waveforms at **FL Off Delay**).

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

S2 Terminal

Program ⇒ Input Terminals ⇒ **S2 Terminal**

Parameter Type — **Selection List**

Factory Default — **Preset Speed Cmd #2**

Changeable During Run — **No**

This parameter selects the functionality of the **S2** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S2** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S3 Terminal

Program ⇒ Input Terminals ⇒ **S3 Terminal**

Parameter Type — **Selection List**

Factory Default — **Damper Fdbk**

Changeable During Run — **No**

This parameter selects the functionality of the **S3** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S3** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S4 Terminal

Program ⇒ Input Terminals ⇒ **S4 Terminal**

This parameter selects the functionality of the **S4** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S4** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Emergency Off**

Changeable During Run — **No**

S5 Terminal

Program ⇒ Input Terminals ⇒ **S5 Terminal**

This parameter selects the functionality of the **S5** discrete input terminal.

Note: *The **S5** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S5** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S5** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

S5–S12 Terminal Delay

Program ⇒ Terminal Delays ⇒ **S5–S12 Delay**

This parameter delays the response of the ASD to any change in the **S5–S12** terminal input by the programmed value (see waveforms at **FL Off Delay**).

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

S6 Terminal

Program ⇒ Input Terminals ⇒ **S6 Terminal**

This parameter selects the functionality of the **S6** discrete input terminal.

Note: *The **S6** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S6** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S6** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

S7 Terminal

Program ⇒ Input Terminals ⇒ **S7 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S7** discrete input terminal.

Note: *The **S7** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S7** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S7** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S8 Terminal

Program ⇒ Input Terminals ⇒ **S8 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S8** discrete input terminal.

Note: *The **S8** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S8** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S8** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

S9 Terminal

Program ⇒ Input Terminals ⇒ **S9 Terminal**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter selects the functionality of the **S9** discrete input terminal.

Note: *The **S9** input terminal may be used without the **ASD-Multicom** option board.*

*Without the **ASD-Multicom** option board the **S9** terminal assignment information will be stored in volatile memory. The terminal assignment information will be lost if the system is powered down or reset.*

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **S9** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Scan Rate

Program ⇒ Protection ⇒ **Scan Rate**

In the event of a momentary power outage, the output signal of the ASD will cease. Upon restoration of power, the ASD will output a low-level signal that will be used to determine the rotation speed of the rotor.

The low-level signal will start scanning the motor at **FH** and decrease until it reaches 0.0 Hz or it matches the signal produced by the turning rotor. Once the rate of rotation is determined, the ASD will provide the normal output to engage the motor from its present speed.

This parameter determines the rate at which the scanning signal goes from **FH** to 0.0 Hz.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 0.50

Maximum — 2.50

Units — Seconds

Search (Changed From Default Parameters)

Program ⇒ **Search**

This function reads all of the parameters and halts at the parameters that have been changed from the factory default setting.

Search Inertia

Program ⇒ Protection ⇒ **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.

The **Speed Search** parameter must be enabled to use this feature.

Settings:

0.5 Sec.(fast)
1.0 Sec. (standard)
1.5 Sec.
2.0 Sec.
2.5 Sec.
3.0 Sec.
3.5 Sec.
4.0 Sec.
4.5 Sec.
5.0 Sec. (slow)

Parameter Type — **Selection List**

Factory Default — **1.0**

Changeable During Run — **No**

Units — Seconds

Search Method

Program ⇒ Protection ⇒ **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, depending on the selection, this parameter may be used to select the method used to search for the speed of the rotor.

See **Scan Rate** for additional information on this parameter.

Settings:

Normal
Start from 0.0 Hz
Start from Running Frequency
Option Board (ASD-SS)
PG

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **No**

Shaft Stationary Control

Program ⇒ Protection ⇒ **Shaft Stationary**

This parameter **Enables/Disables** a continuous DC injection at half of the amperage setting of the **DC Injection Braking Current** parameter into a stopped motor. This feature is useful in preheating the motor or to keep a stopped motor from spinning freely.

Motor Shaft Stationary Control starts after the DC injection brake stops the motor and continues until **ST**-to-**CC** is opened, power is turned off, receiving an **Emergency Off** command, or this parameter is changed.

To use this feature, a non-zero entry at the **DC Injection Braking Start Frequency** parameter is required.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Short Circuit Test

Program ⇒ Protection ⇒ **Short CKT Test**

This parameter determines when the system will perform an **Output Short Circuit** test.

Settings:

First Time (each startup from off or reset)
Standard (each startup)

Parameter Type — **Selection List**

Factory Default — **Standard**

Changeable During Run — **No**

Short Circuit Time

Program ⇒ Protection ⇒ **Short CKT Time**

This parameter sets the pulse width of the ASD output pulse that is applied to the motor during an **Output Short Circuit** test.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **No**

Minimum — 1

Maximum — 100

Units — µS

Soft Stall (Select)

Program ⇒ Protection ⇒ **Soft Stall Sel**

Parameter Type — **Selection List**

Factory Default — **Trip Only**

Changeable During Run — **No**

This parameter **Enables/Disables** the **Soft Stall** and **Overload Trip** functions. The **Soft Stall** function reduces the output frequency of the ASD when the current requirements of the motor exceed the **Thermal Protection #1** setting; thus, reducing the output current.

If the current drops below the **Thermal Protection #1** level setting within a specified time, the output of the ASD will accelerate to the programmed frequency setpoint.

If the current does not drop below the **Thermal Protection #1** level setting within the specified time, a trip will be incurred if the **Trip** function is enabled at this parameter.

Soft Stall is highly effective in preventing motor overload trips when used on fans, blowers, pumps, and other centrifugal loads which require less torque at lower frequencies.

This parameter may be configured for a V/f motor or a standard motor.

Note: *The **Soft Stall** setting may affect acceleration times and patterns.*

Settings:

V/f Motor — (Soft) Stall Only
V/f Motor — Disable Trip/Disable Stall
V/f Motor — Enable Trip/Enable Stall
V/f Motor — Trip Only
Standard Motor — (Soft) Stall Only
Standard Motor — Disable Trip/Disable Stall
Standard Motor — Enable Trip/Enable Stall
Standard Motor — Trip Only

S-Pattern Lower Limit Adjustment

Program ⇒ Fundamental #1 ⇒ **S-Pat LL Adj**

Parameter Type — **Numerical**

Factory Default — **25.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 50.00

Units — %

Sets the time added to the lower portion of **S-pattern 1** and **S-pattern 2** (decreases the accel rate at the ramp start).

S-Pattern Upper Limit Adjustment

Program ⇒ Fundamental #1 ⇒ **S-Pat UL Adj**

Parameter Type — **Numerical**

Factory Default — **25.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 50.00

Units — %

Sets the time added to the upper portion of **S-pattern 1** and **S-pattern 2** (decreases the decel rate at the ramp end).

Speed Drop Frequency

Program ⇒ Protection ⇒ **Speed Drop Freq**

This parameter sets the lower level of the deviation limit that, once exceeded, will cause a **Speed Drop Detected** alert while operating using **PG** feedback.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 30.00

Units — Hz

Speed Reference Address

Program ⇒ Comm Settings ⇒ **S20 Settings**

The **S20** system is Toshiba's high-speed fiber optic communication system. This function is unavailable at the time of this release.

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **No**

Speed Reference Station

Program ⇒ Comm Settings ⇒ **S20 Settings**

The **S20** system is Toshiba's high-speed fiber optic communication system. This function is unavailable at the time of this release.

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **No**

Speed Search

Program ⇒ Protection ⇒ **Speed Search Sel**

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).

Settings:

Off
Power Failure
Make/Break ST
Both

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

Stall Period

Program ⇒ Protection ⇒ **Stall Period**

This setting allows the user to extend the **Overvoltage Stall** and the **Overcurrent Stall** time settings.

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 1.00

Units — Seconds

Startup Frequency

Program ⇒ Special Controls ⇒ **Startup Freq**

The output of the ASD will remain at 0.0 Hz until the programmed speed value exceeds this setting during startup. Once exceeded during startup, the output frequency of the ASD will accelerate to the programmed setting.

Output frequencies below the **Startup Frequency** will not be output from the ASD during startup. However, once reaching the **Startup Frequency**, speed values below the **Startup Frequency** may be output from the ASD.

Parameter Type — **Numerical**

Factory Default — **0.10**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 10.0

Units — Hz

ST Terminal Delay

Program ⇒ Terminal Delays ⇒ **ST Delay**

This parameter delays the response of the ASD to any change in the **ST** terminal input by the programmed value (see waveforms at **FL Off Delay**).

The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

Parameter Type — **Numerical**

Factory Default — **8.0**

Changeable During Run — **No**

Minimum — 2.0

Maximum — 200.0

Units — mS

ST Terminal

Program ⇒ Input Terminals ⇒ **ST**

This parameter selects the functionality of the **ST** discrete input terminal.

In addition, the input terminal must be specified as **Normally Open** or **Normally Closed**.

This parameter sets the programmable **ST** terminal to 1 of the 69 possible functions that are listed in Table 7 on page 130.

Parameter Type — **Selection List**

Factory Default — **Standby**

Changeable During Run — **No**

ST Selection

Program ⇒ Input Terminals ⇒ **ST Selection**

Parameter Type — **Selection List**

Factory Default — **ST – CC Required**

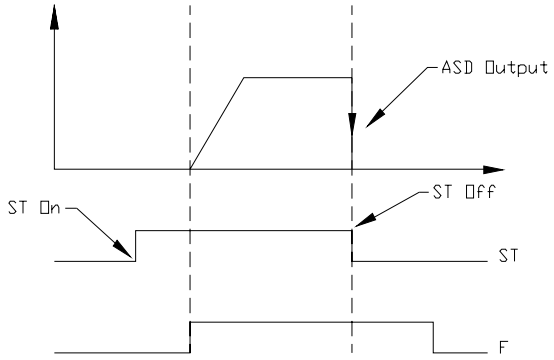
Changeable During Run — **No**

This parameter is used to set the operation of the **Standby** (**ST**) control terminal or any terminal configured as the **ST** terminal.

Settings:

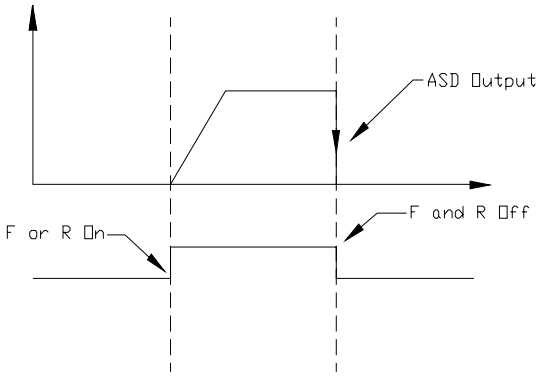
ST-to-CC Required
ST-to-CC Not Required
Interlock with F/R Terminal

The setting **ST-to-CC Required** enables the ASD for operation so long as the control terminal **ST** is connected to **CC** via a jumper, contact, or other means.



The **ST-to-CC Not Required** setting allows the ASD to operate without the **ST**-to-**CC** connection. The control terminal **ST** may be configured for other functions.

The **Interlock with F/R Terminal** setting configures the **F** (**Forward**) and **R** (**Reverse**) control terminals for the secondary function of **Standby**. Closing a set of contacts to either **F** or **R** will cause the ASD to accelerate the motor to the programmed setpoint of **F** or **R**. Opening the **F** and **R** contact will disable the ASD and the motor will coast to a stop. The control terminal **ST** may be configured for other functions.



Switch-on-the-Fly

Program ⇒ Special Controls ⇒ **Switch-on-the-Fly**

The ability to switch between the **Manual** and **Auto** modes while running.

Settings:

Disabled
Enabled
Maintain Motion
Seamless

Parameter Type — **Selection List**

Factory Default — **Disabled**

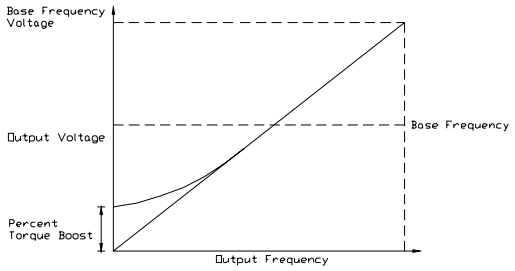
Changeable During Run — **No**

Torque Boost #1

Program ⇒ Motor Settings ⇒ **Torque Boost #1**

The **Motor #1 Torque Boost** 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** setting.

The value programmed as a boost percentage establishes an output voltage vs. output frequency relationship to be used to start the motor or to provide smoother operation.



Note: *Setting an excessive **Torque Boost** level may cause nuisance tripping and mechanical stress to loads.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 30.0

Units — %

Torque Boost #2

Program ⇒ Motor Settings ⇒ **Torque Boost #2**

The **Motor #2 Torque Boost** 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** setting).

This parameter is used only when the parameters for motor set **#2** are configured and selected. Motor set **#2** may be selected by a properly configured input terminal.

See parameter **Motor #1 Torque Boost** for more information on this setting.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Torque Boost #3

Program ⇒ Motor Settings ⇒ **Torque Boost #3**

The **Motor #3 Torque Boost** 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** setting.

This parameter is used only when the parameters for motor set **#3** are configured and selected. Motor set #3 may be selected by a properly configured input terminal.

See parameter **Motor #1 Torque Boost** for more information on this setting.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Torque Boost #4

Program ⇒ Motor Settings ⇒ **Torque Boost #4**

The **Motor #4 Torque Boost** 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** setting.

This parameter is used only when the parameters for motor set **#4** are configured and selected. Motor set #4 may be selected by a properly configured input terminal.

See parameter **Motor #1 Torque Boost** for more information on this setting.

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Torque Reference Address

Program ⇒ Comm Settings ⇒ **Trq Ref Address**

The **S20** system is Toshiba's high-speed fiber optic communication system. This function is unavailable at the time of this release.

Parameter Type — **Selection List**

Factory Default — **0**

Torque Reference Station

Program ⇒ Comm Settings ⇒ **Trq Ref Station**

The **S20** system is Toshiba's high-speed fiber optic communication system. This function is unavailable at the time of this release.

Parameter Type — **Selection List**

Factory Default — **0**

Transmit Address

Program ⇒ Comm Settings ⇒ **Transmit Address**

The **S20** system is Toshiba's high-speed fiber optic communication system. This function is unavailable at the time of this release.

Parameter Type — **Selection List**

Factory Default — **0**

Trip Save

Program ⇒ Protection ⇒ **Trip Save**

This parameter **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. The trip information may be viewed from the **Monitor** screen.

When disabled, the trip information will be cleared when the system powers down.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

TTL Baud Rate

Program ⇒ Comm Settings ⇒ **TTL Baud Rate**

Parameter Type — **Selection List**

Factory Default — **9600**

Changeable During Run — **Yes**

This parameter plays a role in the setup of the communications network by establishing the **Baud Rate** of the communications link.

The communications network includes other ASDs and Host/Control computers that monitor the status of the ASD(s), transfers commands, and loads or modifies the parameter settings of the ASD.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

1200
2400
4800
9600
19200
38400

TTL Master Output

Program ⇒ Comm Settings ⇒ **TTL Master Out**

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **Yes**

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.

Note: *Select **Normal** if **RS485 Master Output** is configured as a **Master Output** controller. Otherwise, a keypad failure will result.*

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Settings:

Normal
Frequency Reference
Output (Commanded) Frequency
Torque Command
Output Torque (Command)

TTL Response Time

Program ⇒ Comm Settings ⇒ **TTL Res Time**

Parameter Type — **Numerical**

Factory Default — 0.00

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.00

Units — Seconds

This parameter sets the **TTL** response delay time.

Changes made to this parameter require that the power be cycled (Off then On) for the changes to take effect.

Type Reset

Program ⇒ Utility Group ⇒ **Type Reset**

This feature assists the user when performing fault analysis or by allowing a quick system setup change when required. Performing a **Type Reset** results in one of the following user-selected post-reset configurations.

Settings:

Auto Setup for 50 Hz
Auto Setup for 60 Hz
Restore Factory Defaults
Clear Past Trips
Clear Run Timer
Typeform (New Base Drive Board)
Save User Parameters
Restore User Parameters

Parameter Type — **Selection List**

Factory Default — **No Reset**

Changeable During Run — **No**

Undervoltage Stall Level

Program ⇒ Protection ⇒ **UV Stall Level**

This parameter sets the low end of the DC bus voltage threshold that, once it drops below this setting, will activate the **Ridethrough** feature, if enabled.

Activation may be the result of a momentary power loss or an excessive load on the bus voltage. Once activated, the system will attempt to maintain the bus voltage level set here until the motor stops.

Note: *This feature may decrease deceleration times.*

Parameter Type — **Numerical**

Factory Default — **(ASD-dependent)**

Changeable During Run — **Yes**

Minimum — 50.00

Maximum — 100.0

Units — %

Undervoltage Time

Program ⇒ Protection ⇒ **Undervoltage/Ridethrough**

This parameter sets the time that the undervoltage condition must exist to cause an **Undervoltage Trip** when this function is enabled at the **Undervoltage Trip** parameter.

Parameter Type — **Numerical**

Factory Default — **0.03**

Changeable During Run — **No**

Minimum — 0.00

Maximum — 10.00

Units — Seconds

Undervoltage Trip

Program ⇒ Protection ⇒ **Undervolt Trip**

This parameter **Enables/Disables** the **Undervoltage Trip** function.

With this parameter **Enabled**, the ASD will trip if the undervoltage condition persists for a time greater than the **Undervoltage Time** setting.

A user-selected contact may be actuated if so configured.

If **Disabled** the ASD will stop and not trip; the **FL** contact is not active.

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Units for Voltage and Current

Program ⇒ Utility Group ⇒ **Units for V/I**

This parameter sets the unit of measurement for current and voltage values displayed on the keypad.

Settings:

%
V/A

Parameter Type — **Selection List**

Factory Default — **%**

Changeable During Run — **Yes**

Upper Deviation Limit

Program ⇒ Feedback Settings ⇒ **Upper Dev Limits**

This parameter determines the maximum amount that the feedback may increase the output signal.

Parameter Type — **Numerical**

Factory Default — **50.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 50.00

Units — %

Upper Limit Frequency

Program ⇒ Fundamental #1 ⇒ **Upper Limit Freq**

This parameter sets the highest frequency that the ASD will accept as a frequency command or frequency setpoint. The ASD may output frequencies higher than the **Upper Limit Frequency** (but, lower than the **Maximum Frequency**) when operating in the **PID Control** mode, **Torque Control** mode, or the **Vector Control** modes (sensorless or feedback).

Note: *This setting may not be higher than the **Maximum Frequency** setting.*

Parameter Type — **Numerical**

Factory Default — **60.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — **Max. Freq.**

Units — Hz

User Unit #1

Program ⇒ Utility Group ⇒ **User Unit #1**

The displayed unit of measurement may be changed from the **Hz** default setting to any of the available characters for the frequency-display screen.

User Unit #2 – 5 may be used to complete the unit of measurement display.

Note: *Program ⇒ Utility Group ⇒ **Frequency Multiplier** must be a non-zero value to use this feature.*

Parameter Type — **Alpha-Numeric**

Factory Default — **None**

Changeable During Run — **Yes**

User Unit #2 – 5

Program ⇒ Utility Group ⇒ **User Unit #2 – 5**

See **User Unit #1** for information on this parameter.

V/f Pattern

Program ⇒ Fundamental #1 ⇒ **V/f Pattern**

Parameter Type — **Selection List**

Factory Default — **Variable Torque**

Changeable During Run — **No**

This function establishes the relationship between the output frequency and the output voltage.

Settings:

Constant Torque
Variable Torque

VI/II Speed Frequency #1

Program ⇒ Freq Settings ⇒ **VI/II Freq #1**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Max. Freq.

Units — Hz

This parameter is used to set the gain and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Speed Control** mode.

Note: *See note on pg. 35 for further information on the **VI/II** terminal.*

VI/II Input Speed Control Setup

Perform the following setup to allow the system to receive **Speed** control input at the **VI/II** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **VI/II**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Speed Control

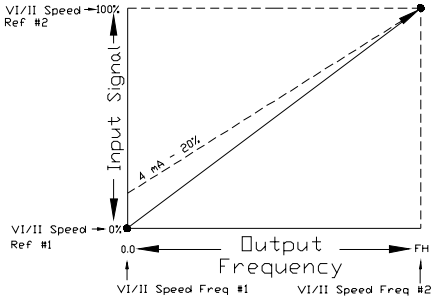
Perform the following setup to allow the system to perform **Speed** control from the **VI/II** input terminal:

- Set **VI/II Speed Frequency #1**,
- Set the **VI/II** input signal level (VI/II Speed Ref #1) that represents **VI/II Speed Frequency #1**,
- Set **VI/II Speed Frequency #2**, and
- Set the **VI/II** input signal level (VI/II Speed Ref #2) that represents **VI/II Speed Frequency #2**.

Once set, as the **VI** input voltage or the **II** current changes, the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets **VI/II Speed Frequency #1** and is the frequency that is associated with the setting of **VI/II Speed Reference #1** when operating in the **Speed Control** mode.

Frequency Settings



VI/II Speed Frequency #2

Program ⇒ Freq Settings ⇒ **VI/II Freq #2**

Parameter Type — **Numerical**

Factory Default — **80.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Max. Freq.

Units — Hz

This parameter is used to set the gain and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Speed Control** mode.

See **VI/II Speed Frequency #1** for further information on this setting.

This parameter sets **VI/II Speed Frequency #2** and is the frequency that is associated with the setting of **VI/II Speed Reference #2** when operating in the **Speed Control** mode.

VI/II Speed Reference #1

Program ⇒ Freq Settings ⇒ **VI/II Spd Ref #1**

Parameter Type — **Numerical**

Factory Default — **20.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

This parameter is used to set the gain and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **VI/II Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **VI/II Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **VI/II** input level that is associated with **VI/II Speed Frequency #1** when operating in the **Speed** control mode or is associated with the **VI/II Torque Reference #1** when operating in the **Torque** control mode.

This value is entered as 0.0% to 100% of the 0.0 to +10 VDC **VI/II** input signal range.

The default value for this parameter is 20%. The **II** input is commonly used for the 4 – 20 mA current loop signal where 4 mA equals 20% of a 20 mA signal. If the **VI** input is used (0 – 10 VDC input), this parameter may be changed to 0.0% (of the input signal).

VI/II Speed Reference #2

Program ⇒ Freq Settings ⇒ **VI/II Spd Ref #2**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

This parameter is used to set the gain and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Speed Control** or the **Torque Control** mode.

See **VI/II Speed Frequency #1** for further information on this setting when used for **Speed** control.

See **VI/II Torque Reference #1** for further information on this setting when used for **Torque** control.

This parameter sets the **VI/II** input level that is associated with **VI/II Speed Frequency #2** when operating in the **Speed** control mode or is associated with the **VI/II Torque Reference #2** when operating in the **Torque** control mode.

This value is entered as 0.0% to 100% of the 0.0 to +10 VDC **VI/II** input signal range.

VI/II Torque Reference #1

Program ⇒ Freq Settings ⇒ **VI/II Torque Ref #1**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Torque Control** mode.

VI/II Input Torque Control Setup

Perform the following setup to allow the system to receive **Torque** control input at the **VI/II** input terminal:

- Program ⇒ Utility Group ⇒ Frequency Mode ⇒ **VI/II**.
- Program ⇒ Utility Group ⇒ Command Mode ⇒ **Terminal Block**.
- Provide a **Run** command (**F** and/or **R**).

Torque Control

Perform the following setup to allow the system to perform **Torque** control from the **VI/II** input terminal:

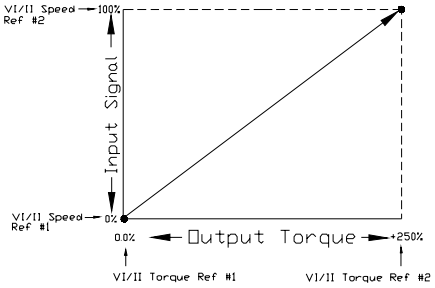
- Set **VI/II Torque Reference #1**,
- Set the **VI/II** input signal level (VI/II Speed Ref #1) that represents the **VI/II Torque Reference #1**,
- Set **VI/II Torque Reference #2**, and
- Set the **VI/II** input signal level (VI/II Speed Ref #2) that represents the **VI/II Torque Reference #2**.

This is accomplished by establishing an associated **V/f** output pattern for a given **VI/II** input level.

This parameter sets **VI/II Torque Reference #1** and is the output torque value that is associated with the setting of **VI/II Speed Reference #1** when operating in the **Torque** control mode.

This value is entered as 0% to 250% of the rated torque.

Torque Settings



VI/II Torque Reference #2

Program ⇒ Freq Settings ⇒ **VI/II Torque Ref #2**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

This parameter is used to set the direction, gain, and bias of the **VI/II** input terminal when the **VI/II** terminal is used as the control input while operating in the **Torque Control** mode.

This is accomplished by establishing an associated **V/f** output pattern for a given **VI/II** input level.

See **VI/II Torque Reference #1** for further information on this setting.

This parameter sets **VI/II Torque Reference #2** and is the output torque value that is associated with setting of **VI/II Speed Reference #2** when operating in the **Torque** control mode.

This value is entered as 0% to 250% of the rated torque.

Voltage Compensation for Dead Time

Program ⇒ Freq Settings ⇒ **Voltage Comp**

Parameter Type — **Selection List**

Factory Default — **On**

Changeable During Run — **Yes**

This parameter adjusts the degree of voltage compensation during dead time by increasing or decreasing the on-time of the programmed PWM just prior to the start of the dead time.

Settings:

Disabled
On
Off, Vout Limit
On, Vout Limit

Table 7. Discrete Input Terminal Assignment Selections and Descriptions.

Unassigned — No operation.
Forward — Enables **Forward** operation commands.
Reverse — Enables **Reverse** operation commands.
Standby — Enables the **Forward** and **Reverse** operation commands (maybe disabled at **ST Selection**).
Reset — Resets the device and any incurred faults.
Set Speed 1 — Is the **LSB** of the 4-bit nibble that is used to select a **Preset Speed**.
Set Speed 2 — Is the second bit of the 4-bit nibble that is used to select a **Preset Speed**.
Set Speed 3 — Is the third bit of the 4-bit nibble that is used to select a **Preset Speed**.
Set Speed 4 — Is the **MSB** of the 4-bit nibble that is used to select a **Preset Speed**.
Jog — **Jog** is the term used to describe turning on the motor for small increments of time and is used when precise positioning of motor-driven equipment is required. This terminal activates a **Jog** for the duration of activation. The **Jog Run Frequency** and **Stop Control** may be set from the (Program ⇒) **Freq Settings** menu.
Emergency Off — Terminates the output signal from the ASD and may apply a brake if so configured. The braking method may be selected at the (Program ⇒ Protection ⇒) **Emg Off Mode Sel** parameter.
DC Braking — The ASD outputs a DC current that is applied to the stator windings of the motor to quickly brake the motor.
A/D 1/2 (**Accel/Decel 1**-to-**2 Switching**) — **Acceleration** and **Deceleration** control may be switched between the **#1** profile and the **#2** profile if using a multiple-accel/decel profile configuration.
A/D 3/4 (**Accel/Decel 3**-to-**4 Switching**) — **Acceleration** and **Deceleration** control may be switched between the **#3** profile and the **#4** profile if using a multiple-accel/decel profile configuration.
Motor 1/2 (**Motor 1**-to-**2 Switching**) — Motor control may be switched between the **Motor #1** profile and the **Motor #2** profile if using a multiple-motor profile configuration.
Motor 3/4 (**Motor 3**-to-**4 Switching**) — Motor control may be switched between the **Motor #3** profile and the **Motor #4** profile if using a multiple-motor profile configuration.
Torque Lim 1/2 (**Torque Limit 1**-to-**2 Switching**) — Torque control may be switched between the **Torque Limit #1** profile and the **Torque Limit #2** profile if using a multiple-profile configuration.
Torque Lim 3/4 (Torque Limit 3-to-**4 Switching**) — Torque control may be switched between the **Torque Limit #3** profile and the **Torque Limit #4** profile if using a multiple-profile configuration.
PID (Control) Off — Activating this terminal turns off **PID** control. Terminal activation overrides the settings of the **Input Feedback Select** parameter and the **Panel PID Control** parameter.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Jog Forward (Forced) — This setting initiates a **Forced Forward Jog** when activated. The **Forced Forward Jog** command provides a forward-run signal for the duration of the activation (the status of the **F** or **R** terminals is ignored). The **Jog Run Frequency** and **Stop Control** may be set from the (Program ⇒) **Freq Settings** menu.
Jog Reverse (Forced) — This setting initiates a **Forced Reverse Jog** when activated. The **Forced Reverse Jog** command provides a reverse-run signal for the duration of the activation (the status of the **F** or **R** terminals is ignored). The **Jog Run Frequency** and **Stop Control** may be set from the (Program ⇒) **Freq Settings** menu.
Binary Bit 0 — Bit 0 – 7 may be set up as a speed/torque control register. Speed/torque settings may be applied to this group of terminals in binary form. The required number of input terminals should be set to the respective binary bit settings (0 – MSB). The **Frequency Mode** setting must be set to **Use Binary/BCD input**. The gain and bias of the binary input may be set from the following path: Program ⇒ **Freq Settings** (see **BIN Speed Frequency #1** for further information on this setting.

Table 7. (Cont.) Discrete Input Terminal Assignment Selections and Descriptions.

Binary Bit 1 — See selection **Binary Bit 0** above.
Binary Bit 2 — See selection **Binary Bit 0** above.
Binary Bit 3 — See selection **Binary Bit 0** above.
Binary Bit 4 — See selection **Binary Bit 0** above.
Binary Bit 5 — See selection **Binary Bit 0** above.
Binary Bit 6 — See selection **Binary Bit 0** above.
Binary Bit 7 — See selection **Binary Bit 0** above.
Forced Stop — Activating this terminal terminates the **Run** command regardless of the **Command Mode** setting and initiates the programmed stopping method.
Reserved — No operation.
Damper Feedback — Activation of this terminal indicates an open damper and enables the system for normal operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Reserved — No operation.
Binary Data Write — This terminal serves two functions: 1) While operating in the **Use Binary/BCD input** mode, each momentary activation of this terminal transfers the speed/ torque **Binary Bit** (0 – MSB) settings to the motor. 2) When operating with the **Frequency Mode** set to **Motorized Pot**, the status of the **Motorized Pot** frequency setting may be **Stored** or **Erased** after a power down or a system reset. Select **Stored** or **Erased** at the **Motorized Pot Frequency at Power Down** parameter. The **Binary Data Write** terminal must be activated before the initiation of the power down or reset.
Motorized Pot Up (MOP) — Activating this terminal causes an increase in motor speed for the duration of the activation until the **Upper Limit** is reached. The **Frequency Mode** setting must be set to **Motorized Pot. Simulation**. The MOP acceleration rate is determined by the **Accel #2 Time** setting.
Motorized Pot Down (MOP) — Activating this terminal causes a decrease in motor speed for the duration of the connection until the **Lower Limit** is reached. The **Frequency Mode** setting must be set to **Motorized Pot. Simulation**. The MOP deceleration rate is determined by the **Decel #2 Time** setting.
Motorized Pot Clear — Activating this terminal will establish a frequency setpoint of 0.0 Hz after a power down or a system reset regardless of the **Motorized Pot Frequency at Power Down** setting. The **Motorized Pot Clear** terminal must be activated before the initiation of the power down or reset.
Momentary (Push) Run — When activated this terminal starts the motor.
Momentary (Push) Stop — When activated this terminal stops the motor.
Forward/Reverse — This setting operates in conjunction with another discrete terminal being set to the **Run/Stop** function. When configured to **Run** (**Run/Stop** activated), the activation/deactivation of this terminal toggles the direction of the motor.
Run/Stop — This terminal enables the motor to run when connected to **CC** and disables the motor when the connection is broken.
Line (Power) Bypass — Terminal activation of the **Line (Power) Bypass** function requires an enable at the **Power Switching** parameter and a user-supplied switching frequency at the **Power Switching Frequency** parameter. During acceleration, once the **Power Switching Frequency** setting is reached, activating this terminal switches off the ASD output and routes commercial power to the motor. If **At Frequency** is selected at the **Power Switching** parameter, **Line (Power) Bypass** will be carried out once reaching the user-supplied switching frequency and activating this terminal will serve no function.
Frequency Priority — Activating this terminal toggles the frequency control between the **Frequency Mode (#1)** setting and the setting of **Frequency Mode #2**. This function is enabled by setting the **Ref Priority Sel** to **Freq Prty Switch** and is located at Program ⇒ Freq Settings ⇒ **Ref Priority Sel**.
VI/II Prty (VI/II Terminal Priority) — Activating this terminal assigns command control to the **VI/II Terminal** and overrides all other **Control Terminal Strip** input so long as the **Command Mode** is set to **Use Control Terminal Strip**.

Table 7. (Cont.) Discrete Input Terminal Assignment Selections and Descriptions.

Term Prty (Terminal Strip Priority) — Activating this terminal overrides the **Frequency Mode** setting and assigns speed control to the **Control Terminal Strip**.
Editing Enabled (LED) — The **LED Keypad** system is unavailable at the time of this release.
Torque/Position (Control Switch) — This function allows for a system change from speed-control to torque- or position-control as a function of the V/f setting when activated.
Deviation Counter Clear — Activating this terminal clears the **Deviation Counter** when operating in the **Position Control** mode.
Forward Limit (Position Control) — Activating this terminal will immediately stop the ASD and hold its position. If the connection remains for an extended period the ASD will time out and trip. This function is normally used for over-travel conditions.
Reverse Limit (Position Control) — Activating this terminal will immediately stop the ASD and hold its position. If the connection remains for an extended period the ASD will time out and trip. This function is normally used for over-travel conditions.
Light-Load High-Speed Enable — Activating this terminal sets the lower limit of an output frequency range in which the **Light-load/High-speed** function may be used.
Snap Stop Control Enable — TBD.
Pre-excite (Motor) — Activating this terminal applies an excitation current to the motor (holds shaft stationary) for the duration of the activation.
Brake Command — TBD.
Brake Release — Activating this terminal initiates the brake release command. This setting requires that another discrete input terminal be set to **System Consistent Sequence** (BA: braking answer) to complete the brake release command and to convey the status of the braking system to the user or to a dependent subsystem. Once the braking release function is initiated, the **Brake Fault Time** begins to count down. Should the count-down timer expire before the brake releases or before the **Braking Answer** is returned, fault **E-11**will occur. Otherwise, the brake releases the motor and normal motor operations resume. The **Braking Release** function is primarily used at startup; but, may be used when the brake is applied while the motor is running.
Brake Answer — This setting is required when the **Braking Release** function is used. The function of this input terminal is to receive the returned the status of the braking system. The returned status is either **Released** or **Not Released**. If **Released** is returned within the time setting of the **Brake Fault Time** parameter, normal system function resumes. If **Not Released** is returned or if the **Brake Fault Time** parameter setting times out before either signal is returned, then fault **E-11** occurs. The returned signal may also be used to notify the user or to control a dependent subsystem.
Brake Test — TBD.
Fire Speed — When activated **Preset Speed #1** is output from the ASD.
MUV Disable — When activated the **Main Undervoltage Detect** function is disabled.

Table 8. Discrete Output Terminal Assignment Selections.

Function	Function
Lower Limit (LL)	POFF Alarm (power supply out of specification)
Upper Limit (UL)	Brake Release
Low	(In) Alarm Status
Acc/Dec Completion	Forward Speed Limit (torque control)
RCH Speed	Reverse Speed Limit (torque control)
Fault (All)	INV (ASD) Healthy (Output)
Fault 2 (except EF or OCL)	Abnormal Communication Alarm 2 (internal cause)
OC (Over-current) Alarm	Error Code Output 1 (6-bit error output)
ASD OL (Overload) Alarm	Error Code Output 2 (6-bit error output)
Motor OL (Overload) Alarm	Error Code Output 3 (6-bit error output)
OH (Overheat) Alarm	Error Code Output 4 (6-bit error output)
OV (Overvoltage) Alarm	Error Code Output 5 (6-bit error output)
DCV (DC Voltage) Low Alarm	Error Code Output 6 (6-bit error output)
Low-current Alarm	Designated Data Output 1 (7-bit transmission output)
OT (Overtorque) Alarm	Designated Data Output 2 (7-bit transmission output)
DBR OL (Dynamic Braking Resistor Overload) Alarm	Designated Data Output 3 (7-bit transmission output)
In E-Off (Emergency Off)	Designated Data Output 4 (7-bit transmission output)
Retrying	Designated Data Output 5 (7-bit transmission output)
Damper Cmd	Designated Data Output 6 (7-bit transmission output)
PID Deviate (Deviation Limit)	Designated Data Output 7 (7-bit transmission output)
Start/Stop	Light Load Detection Signal
Hard Fault (OCA, OCL, EF, Lost Phase, Short Circuit, or Abnormal Output)	Heavy Load Detection Signal
Soft Fault (OL, OC1, 2, 3, OP)	Positive Torque Limit
Bypass (Output) #1	Negative Torque Limit
Bypass (Output) #2	Rush Suppression Relay Output
Fan On/Off	Position Overtravel
Jogging	Position Reached
Terminal Mode (Control Terminal Strip Operation Command Mode)	EF Alarm
Run-time Alarm (Total-operation-hours Alarm)	LOD Alarm
Communication Alarm (external cause)	Fire Alarm
Forward/Reverse Operation	Damper Alarm
Ready (for operation) (including **ST** and **RUN**)	4–20 mA Loss
Ready (for operation)	Auto-bypass

Q7 Communications Numbers

This section lists the Communication Numbers for the parameters of the Q7 ASD. The access path and a description of each parameter may be found in the section titled Q7 Parameter Descriptions on pg. 43.

Table 9. Communication Numbers for the listed parameters.

Comm. Number	Parameter Name
F003	Command Mode
F004	Frequency Mode
F005	FM Terminal Assignment
F006	FP Terminal Adjustment
F007	Type Reset
F008	Panel Direction
F009	Accel Time #1
F010	Decel Time #1
F011	Maximum Output Frequency
F012	Upper Limit Frequency
F013	Lower Limit Frequency
F014	Base Frequency 1
F015	V/f Pattern
F016	Torque Boost #1
F017	Soft Stall (Select)
F018	Preset Speed #1
F019	Preset Speed #2
F020	Preset Speed #3
F021	Preset Speed #4
F022	Preset Speed #5
F023	Preset Speed #6
F024	Preset Speed #7
F100	Low Signal Frequency
F101	Reach Frequency
F102	Reach Detection
F103	ST Selection
F105	Direction Priority
F106	Input Priority

Comm. Number	Parameter Name
F110	ON Terminal
F111	F Terminal
F112	R Terminal
F113	ST Terminal
F114	RES Terminal
F115	S1 Terminal
F116	S2 Terminal
F117	S3 Terminal
F118	S4 Terminal
F119	S5 Terminal
F120	S6 Terminal
F121	S7 Terminal
F122	S8 Terminal
F123	S9 Terminal
F124	S10 Terminal
F125	S11 Terminal
F126	S12 Terminal
F130	OUT1 Terminal
F131	OUT2 Terminal
F132	FL Terminal
F133	OUT4 Terminal
F134	OUT5 Terminal
F135	OUT6 Terminal
F136	OUT7 Terminal
F140	F Terminal Delay
F141	R Terminal Delay
F142	ST Terminal Delay
F143	RES Terminal Delay
F144	S1–S4 Terminal Delay
F145	S5–S12 Terminal Delay
F150	OUT1 On Delay
F151	OUT2 On Delay

Comm. Number	Parameter Name
F152	FL On Delay
F153	OUT4 On Delay
F154	OUT5 On Delay
F155	OUT6 On Delay
F156	OUT7 On Delay
F160	OUT1 Off Delay
F161	OUT2 Off Delay
F162	FL Off Delay
F163	OUT4 Off Delay
F164	OUT5 Off Delay
F165	OUT6 Off Delay
F166	OUT7 Off Delay
F170	Base Frequency 2
F171	Maximum Voltage #2
F172	Torque Boost #2
F173	(Electronic) Thermal Protection #2
F174	Base Frequency 3
F175	Maximum Voltage #3
F176	Torque Boost #3
F177	(Electronic) Thermal Protection #3
F178	Base Frequency 4
F179	Maximum Voltage #4
F180	Torque Boost #4
F181	(Electronic) Thermal Protection #4
F200	Reference Priority Selection
F201	VI/II Speed Reference #1
F202	VI/II Speed Frequency #1
F203	VI/II Speed Reference #2
F204	VI/II Speed Frequency #2
F205	VI/II Torque Reference #1
F206	VI/II Torque Reference #2
F207	Frequency Mode (#2)

Comm. Number	Parameter Name
F208	Mode 1/2 Switching Frequency
F210	RR Speed Reference #1
F211	RR Speed Frequency #1
F212	RR Speed Reference #2
F213	RR Speed Frequency #2
F214	RR Torque Reference #1
F215	RR Torque Reference #2
F216	RX Speed Reference #1
F217	RX Speed Frequency #1
F218	RX Speed Reference #2
F219	RX Speed Frequency #2
F220	RX Torque Reference #1
F221	RX Torque Reference #2
F222	RX2 Speed Reference #1
F223	RX2 Speed Frequency #1
F224	RX2 Speed Reference #2
F225	RX2 Speed Frequency #2
F226	RX2 Torque Reference #1
F227	RX2 Torque Reference #2
F228	BIN Speed Reference #1
F229	BIN Speed Frequency #1
F230	BIN Speed Reference #2
F231	BIN Speed Frequency #2
F232	BIN Torque Reference #1
F233	BIN Torque Reference #2
F234	PG Speed Reference #1
F235	PG Speed Frequency #1
F236	PG Speed Reference #2
F237	PG Speed Frequency #2
F240	Startup Frequency
F241	Run Frequency
F242	Run Frequency Hysteresis

Comm. Number	Parameter Name
F243	End Frequency
F250	DC Injection Braking Start Frequency
F251	DC Injection Braking Current
F252	DC Injection Braking Time
F253	DC Injection on at Direction Change
F254	Shaft Stationary Control
F260	Jog Run Frequency
F261	Jog Stop Control
F270	Jump Frequency 1
F271	Jump 1 Bandwidth
F272	Jump Frequency 2
F273	Jump 2 Bandwidth
F274	Jump Frequency 3
F275	Jump 3 Bandwidth
F287	Preset Speed #8
F288	Preset Speed #9
F289	Preset Speed #10
F290	Preset Speed #11
F291	Preset Speed #12
F292	Preset Speed #13
F293	Preset Speed #14
F294	Preset Speed #15
F300	PWM Carrier Frequency
F301	Speed Search
F302	Ridethrough Mode
F303	Number of Retries
F304	Dynamic Braking
F305	Overvoltage Stall Level (1)
F306	Maximum Voltage #1
F307	Voltage Compensation for Dead Time
F308	DBR Resistance
F309	DBR Capacity

Comm. Number	Parameter Name
F310	Ridethrough Time
F311	Disable Forward Run/Disable Reverse Run
F312	Scan Rate
F313	Lock-on Rate
F314	Search Method
F315	Search Inertia
F354	Power Switching
F355	Power Switching Frequency
F357	Commercial Power Wait Time
F358	Commercial Power Switching Freq. Hold Time
F360	Input Feedback Select
F361	Delay Filter
F362	Proportional (P) Gain
F363	Integral (I) Gain
F364	Upper Deviation Limit
F365	Lower Deviation Limit
F366	Differential (D) Gain
F367	PG Number of Pulses
F368	PG Input Phases
F369	PG Detect Selection
F380	Preset Speed Mode Control
F381	Preset Speed #1
F382	Preset Speed #2
F383	Preset Speed #3
F384	Preset Speed #4
F385	Preset Speed #5
F386	Preset Speed #6
F387	Preset Speed #7
F388	Preset Speed #8
F389	Preset Speed #9
F390	Preset Speed #10
F391	Preset Speed #11

Comm. Number	Parameter Name
F392	Preset Speed #12
F393	Preset Speed #13
F394	Preset Speed #14
F395	Preset Speed #15
F400	Autotune Control
F401	Motor Slip Gain
F402	Motor Constant 1
F403	Motor Constant 2
F404	Motor Constant 3
F405	Motor Constant 4
F410	Motor Constant 5
F411	Motor Poles
F412	Motor Capacity
F413	Motor Type
F414	Autotune Enable
F500	Accel #2 Time
F501	Decel Time #2
F502	Accel/Decel #1 Pattern
F503	Accel/Decel #2 Pattern
F504	Panel Acc/Dec Select
F505	Accel/Decel #1 Switching Frequency
F506	S-Pattern Lower Limit Adjustment
F507	S-Pattern Upper Limit Adjustment
F600	(Electronic) Thermal Protection #1
F601	Overcurrent Stall Level
F602	Trip Save
F603	Emergency Off Mode
F604	Emergency Off Time
F605	Output Phase Loss Detection
F606	Overload Reduction Frequency
F607	Motor 150% Run Time
F608	Inrush Current Time

Comm. Number	Parameter Name
F609	MS Relay (status ANDED) with ST
F610	Low Current Trip
F611	Low Current Setting
F612	Low Current Time
F613	Short Circuit Test
F614	Short Circuit Time
F615	Overtorque Trip
F616	Overtorque Level Positive
F617	Overtorque Level Negative
F618	Overtorque Detection Time
F620	Cooling Fan Control
F621	Run Time Alarm Setting
F622	Abnormal Speed Time
F623	Overspeed Frequency
F624	Speed Drop Frequency
F627	Undervoltage Trip
F628	Undervoltage Time
F629	Undervoltage Stall Level
F630	Brake Fault Time
F640	Earth Fault Alarm Level
F641	Earth Fault Alarm Delay
F642	Earth Fault Trip Level
F643	Earth Fault Trip Delay
F660	Adding Input Selection
F661	Multiplying Input Selection
F670	AM Terminal Assignment
F671	AM Terminal Adjustment
F676	FP Terminal Setting
F677	FP Terminal Adjustment
F701	Units for Voltage and Current
F702	Frequency Multiplier
F703	Frequency Display Resolution

Comm. Number	Parameter Name
F704	Accel/Decel Display Resolution
F720	Panel V/f Group
F721	Panel Stop Pattern
F722	Panel Reset Select
F724	Panel PID Control
F729	LED Option Override Multiplication Gain
F730	Panel Lockout
F731	LOD Input Selection
F732	LOD Start Level
F733	LOD Delay Time
F734	LOD Boost Level
F735	LOD Boost Time
F736	LOD Feedback Level
F737	LOD Restart Delay Time
F800	TTL Baud Rate
F801	Parity
F802	ASD Number
F803	RS485 Comm Time-Out Time
F804	RS485 Comm Time-Out Action
F805	TTL Response Time
F806	TTL Master Output
F810	Communications Reference Select
F811	Communications Reference #1
F812	Communications Speed #1
F813	Communications Reference #2
F814	Communications Speed #2
F820	RS485 Baud Rate
F821	RS485 Wire Count
F825	RS485 Response Time
F826	RS485 Master Output
F830	Communications Data Type
F851	Error Detect Time

Comm. Number	Parameter Name
F860	Receive Address
F861	Transmit Address
F862	Speed Reference Station
F863	Speed Reference Address
F865	Torque Reference Station
F866	Torque Reference Address
F868	Fault Detect Station
F961	Switch-on-the-Fly
F962	4–20 mA Loss Selection
F963	Ramped PWM
F964	4–20 mA Speed Reference
F965	User Unit #1
F966–F969	User Unit #2 – 5

Alarms, Trips, and Troubleshooting

Alarms and Trips

This section lists the available user-notification codes of the keypad display and provides information that assists the user in the event that a **Fault** is incurred. The **User Notification** codes are displayed as an indication that a system function or system condition is active (i.e., atn, db, and dbOn). The code is displayed on the keypad for the duration of the activation.

If a user setting or an ASD parameter has been exceeded, or if a data transfer function produces an unexpected result, a condition that is referred to as a **Fault** is incurred.

An **Alarm** is an indication that a **Fault** is imminent if existing operating conditions continue unchanged. An **Alarm** may be associated with an output terminal to notify the operator of the condition remotely, close a contact, or engage a brake. At the least, an **Alarm** will cause an alarm code to appear on the keypad display. Table 10 on pg. 145 lists the 15 possible **Alarm** codes that may be displayed during operation of the **Q7 ASD**.

In the event that the condition that caused the **Alarm** does not return to its normal operating level within a specified time, the ASD **Faults** and a **Trip** is incurred (**Fault** and **Trip** are sometimes used interchangeably). A **Trip** is a safety feature, and is the result of a **Fault**, that disables the ASD system in the event that a subsystem of the ASD is malfunctioning, or one or more of the variables listed below exceeds its normal range (time and/or magnitude).

- Current,
- Voltage,
- Speed,
- Temperature,
- Torque, or
- Load.

See Table 12 on pg. 147 for a listing of the potential **Trips** and the associated probable causes.

The operating conditions at the time of the trip may be used to help determine the cause of the trip. Listed below are operating conditions that may be used to assist the operator in correcting the problem or that the ASD operator should be prepared to discuss when contacting Toshiba’s Customer Support for assistance.

- What trip information is displayed?
- Is this a new installation?
- Has the system ever worked properly and what are the recent modifications (if any)?
- What is the ASD/Motor size?
- What is the CPU version and revision level?
- Does the ASD trip when accelerating, running, decelerating, or when not running?
- Does the ASD reach the commanded frequency?
- Does the ASD trip without the motor attached?
- Does ASD trip with an unloaded motor?

Alarms

Table 10 lists the alarm codes that may be displayed during operation of the **Q7 ASD**. Each alarm code listed is accompanied by a description and a possible cause. In the event that the source of the malfunction cannot be determined, contact your Toshiba Sales Representative for further information on the condition and for an appropriate course of action.

The active **Alarm** is displayed on the **Frequency Command** screen. Multiple active alarms are displayed one at a time and are scrolled at one-second intervals.

Table 10. Q7 ASD Alarms.

Keypad Display	Function	Description	Possible Causes
CM1	Comm1 Error	Internal communications error.	• Improperly programmed ASD. • Improper communications settings. • Improperly connected cables.
CM2	Comm2 Error	External communications error.	
EMG	Emergency Off	Output signal from the ASD is terminated and a brake may be applied if so configured.	• Stop|Reset pressed twice at the keypad. • EOFF command received remotely. • ASD reset required.
MOFF	Main Undervoltage	Undervoltage condition at the 3-phase AC input to the ASD.	• Low 3-phase utility voltage.
OC	Over Current	ASD output current greater than the parameter **F601** setting.	• Defective IGBT (**U**, **V**, or **W**). • ASD output to the motor is connected incorrectly. Disconnect the motor and retry. • ASD output phase-to-phase short. • The ASD is starting into a spinning motor. • Motor/machine jammed. • Mechanical brake engaged while the ASD is starting or while running. • Accel/Decel time is too short. • Voltage Boost setting is too high. • Load fluctuations. • ASD operating at an elevated temperature.
***OH**	Overheat	ASD ambient temperature excessive.	• ASD is operating at an elevated temperature. • ASD is too close to heat-generating equipment. • Cooling fan vent is obstructed (see Mounting the ASD on pg. 16). • Cooling fan is inoperative. • Internal thermistor is disconnected.
OJ	Timer	Run-time counter exceeded.	• **Type Reset** required; select **Clear run timer**.
***** Reset ignored if active.			

Keypad Display	Function	Description	Possible Causes
***OLI**	ASD Overload	Load requirement in excess of the capability of the ASD.	• The carrier frequency is too high. • An excessive load. • Acceleration time is too short. • DC damping rate is set too high. • The motor is starting into a spinning load after a momentary power failure. • The ASD is improperly matched to the application.
OLM	Motor Overload	Load requirement in excess of the capability of the motor.	• V/f parameter improperly set. • Motor is locked. • Continuous operation at low speed. • The load is in excess of what the motor can deliver.
***OLR**	Resistor Overload	Excessive current at the **Dynamic Braking Resistor**.	• Deceleration time is too short. • DBR configuration improperly set.
***OP**	Overvoltage	DC bus voltage exceeds specifications.	• ASD attempting to start into a spinning motor after a momentary power loss. • Incoming utility power is above the specified range. • Decel time is too short. • Voltage spikes at the 3-phase input; install inductive filter. • DBR required. • DBR resistance value is too high. • DBR function is turned off. • Overvoltage Stall feature is turned off. • System is regenerating. • Load instability. • Disable the Ridethrough function (**F302**).
OT	Overtorque	Torque requirement in excess of the setting of parameter **F616** or **F617** for a time longer than the setting of parameter **F618**.	• ASD is not correctly matched to the application. • Parameter **F616** or **F617** setting is too low. • Obstructed load.
***POFF**	Control Undervoltage	Undervoltage condition at the 5, 15, or the 24 VDC supply.	• Defective Control board. • Excessive load on power supply. • Low input voltage.
PtSt	Reference Point	Two speed-reference frequency setpoint values are too close to each other.	• Two speed reference frequency setpoints are too close to each other (increase the difference).
UC	Undercurrent	Output current of the ASD is below the level defined at parameter **F611** and remains there for the time set at parameter **F612**.	
***** Reset ignored if active.			

User Notification Codes

The **User Notification** codes appear on the **Frequency Command** screen while the associated function is active.

User Notification codes notify the user of active functions that are usually only momentary under normal conditions and are active for the duration of activation only. User notification events are not error conditions and only convey active system functions to the user.

Table 11

Keypad	Function	Description
Atn	Autotune Active	**Atn** indicates that the **Autotune** function is active. If the initial **Autotune** fails for any reason, an automatic retry is initiated if **Other Motor** is selected at parameter **F413**.
db or dbOn	DC Braking Active	This code conveys that the **DC Injection** function being carried out. The display shows **db** when braking and **dbOn** when the **Shaft Stationary** function is active.

Trips/Faults

A **Trip** is an ASD response to a **Fault** (though, **Fault** and **Trip** are sometimes used interchangeably). A **Trip** is a safety feature that disables the ASD system in the event that a subsystem of the ASD is malfunctioning.

Listed in Table 12 are the possible **Faults** that may cause a **Trip** and the possible causes. When a **Trip** is incurred the system displays the **Fault** screen. The **Fault** screen identifies the active **Fault**.

Table 12

Fault Screen Display	Possible Causes
Inverter (ASD) OL	• Acceleration time is too short. • DC Injection current is too high. • V/f setting needs to be adjusted. • Motor running during restart. • ASD or the motor is improperly matched to the application.
Autotuning Err	• **Autotune** readings that are significantly inconsistent with the configuration information. • A non-3-phase motor is being used. • Incorrect settings at parameter **F400**, **F413**, or **F414**. • Using a motor that has a significantly smaller rating than the ASD. • ASD output cabling is too small, too long, or is being housed in a cable tray with other cables that are producing an interfering EMF. • Motor is running during the **Autotune** function.
Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*	

Fault Screen Display	Possible Causes
Comm Error	• Communication malfunction. • Improper or loose connection. • Improper system settings.
Ctrl Undervolts	• This fault is caused by an undervoltage condition at the 5, 15, or the 24 VDC supply. • 3-phase input voltage low.
CPU Error	• CPU malfunction.
Main Undervolts	• 3-phase input voltage low. • Defective control board. • Excessive load on the power supply. • Undervoltage/Ridethrough settings require adjustment.
Fuse	• Internal DC bus fuse is open.
DBR Overcurrent	• ASD inability to discharge the bus voltage during regeneration. • No dynamic braking resistor (DBR) installed. • Deceleration time is too short. • Improper DBR setup information. • Defective IGBT7 (or IGBT7 ckt.). • 3-phase input voltage is above specification.
DBR Overload	• Deceleration time is too short. • DBR setting adjustment required. • Overvoltage Stall setting adjustment required.
GND Fault	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to **Earth Ground**.
Ctrl EEPROM Err	• Internal EEPROM malfunction.
EEPROM Write Err	• EEPROM write malfunction.
E-Off	• Emergency Off command received via keypad or remotely.
Encoder Loss	• Encoder signal missing while running during closed-loop operation.
Flash Error	• Flash memory malfunction.
Gate Array Error	• Defective Gate Array or Gate Array malfunction.
In(put) Phase Loss	• 3-phase input to the ASD is low or missing.
Load Drooping	• Load requirement is in excess of the capabilities of the motor.
Load End OC	• Improper wiring at the ASD output to the motor.
Under Curr(ent) Trip	• Improper Low Current detection level setting.
Main EEPROM Err	• Internal EEPROM malfunction.
Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*	

Fault Screen Display	Possible Causes
Motor Overload	• V/f setting needs to be adjusted. • Motor is locked. • Continuous operation at low speed. • Load requirement exceeds ability of the motor. • Startup frequency setting adjustment required.
Option PCB Error	• Optional device malfunction. • Improper system settings (at ASD or optional device). • Loose or improper connection.
Out(put) Phase Loss	• 3-phase output from the ASD is low or missing.
Overcurrent Acc	• V/f setting needs to be adjusted. • Restart from a momentary power outage. • The ASD is starting into a rotating motor. • ASD/Motor not properly matched. • Phase-to-phase short (**U**, **V**, or **W**). • **Accel** time too short. • **Voltage Boost** setting is too high. • Motor/machine jammed. • Mechanical brake engaged while the ASD is running. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during acceleration. On ASDs that are greater than 100 HP, this fault occurs when the ASD current exceeds 320% of the rated FLA during acceleration.
Overcurrent Dec	• Phase-to-phase short (**U**, **V**, or **W**). • Deceleration time is too short. • Motor/machine jammed. • Mechanical brake engaged while the ASD is running. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during deceleration. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA during deceleration.
Overcurrent Run	• Load fluctuations. • ASD is operating at an elevated temperature. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during a fixed-speed run or if during a fixed-speed run the ASD overheats. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA on a fixed-speed run.
Overheat	• Cooling fan inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected.
Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*	

Fault Screen Display	Possible Causes
Speed Error	• Result of a motor speed that is greater than the commanded speed when using an encoder for speed control. • Improper encoder connection or setup information. • Defective encoder.
Overtorque	• A torque requirement by the load in excess of the setting of parameter **F616** or **F617** for a time longer than the setting of parameter **F618**. • The ASD is improperly matched to the application. • The load is obstructed.
Overvolt Accel	• Motor running during restart.
Overvolt Decel	• Deceleration time is too short. • DBR value is too high. • DBR required (DBR setup required). • Stall protection is disabled. • 3-phase input voltage is out of specification. • Input reactance required.
Overvolt Run	• Load fluctuations. • 3-Phase input voltage out of specification.
Positional Err	• Operating in the **Position Control** mode and the resulting position exceeds the limits of the **Position Control** setting.
RAM Err	• Internal RAM malfunction.
ROM Err	• Internal ROM malfunction.
Sink/Source Error	• Improperly positioned **Sink/Source** jumper on the control board or on an option device. • **Sink/Source** configuration of an option device is incorrect.
Type(form) Error	• Firmware information (typeform) loaded into the **Gate Driver** board is inconsistent with the device in which the firmware is being used. • The **Gate Driver** board has been replaced. • The **Gate Driver** board is defective.
U Phase OC	• Low impedance at the U lead of the ASD output.
V Phase OC	• Low impedance at the V lead of the ASD output.
W Phase OC	• Low impedance at the W lead of the ASD output.
Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*	

Viewing Trip Information

In the event that the condition causing an **Alarm** does not return to the normal operating level within a specified time a **Trip** is incurred.

When a trip occurs, the resultant error information may be viewed either from the **Trip History** screen (Program ⇒ System Information and Setup ⇒ **Trip History**) or from the **Monitor** screen.

Trip History

The **Trip History** screen records the system parameters for up to 24 trips (RTC option required). The recorded trips are numbered from zero to 23. Once the **Trip History** record reaches trip number 23, the oldest recorded trip will be deleted with each new record stored (first-in first-out). The **Trip #** field may be selected and scrolled through to view the recorded trip information for a given trip number. The monitored parameters are listed in Table 13 as **At-trip Recorded Parameters** (parameter readings at the time that the trip occurred).

Table 13. **Trip History Record Parameters** (RTC option required).

At-trip Recorded Parameters			
1) Trip Number	9) Bus Voltage	17) Torque Reference	25) ASD Load
2) Trip Type	10) Discrete Input Status	18) Torque Current	26) DBR Load
3) Time and Date	11) OUT1/OUT2/FL Status	19) Excitation Current	27) Input Power
4) Frequency at Trip	12) Timer	20) PID Value	28) Output Power
5) Output Current	13) Post Compensation Frequency	21) Motor Overload	29) Peak Current
6) Output Voltage	14) Feedback (inst.)	22) ASD Overload	30) Peak Voltage
7) Direction	15) Feedback (1 sec.)	23) DBR Overload	31) PG Speed
8) Frequency Reference	16) Torque	24) Motor Load	32) PG Position

Trip Record at Monitor Screen

The **Monitor** screen records and displays the trip name of up to four trips and catalogs each trip as **Past Trip #1**, **Past Trip #2**, **Past Trip #3**, and **Past Trip #4**. Once reset (**Clear Trip**), the trip records are erased. If no trips have occurred since the last reset, **No Error** is displayed for each trip record.

Note: *An improper ASD setup may cause some trips — reset the ASD to the factory default settings before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Resets ⇒* ***Restore Factory Defaults****).*

The at-trip frequency of the last incurred trip may be viewed at the **Monitor** screen (see pg. 45). The **Monitor** screen at-trip record is erased when the ASD is reset and may be viewed without the use of the RTC option. The current output frequency is displayed here when no trip is active.

Clearing a Trip

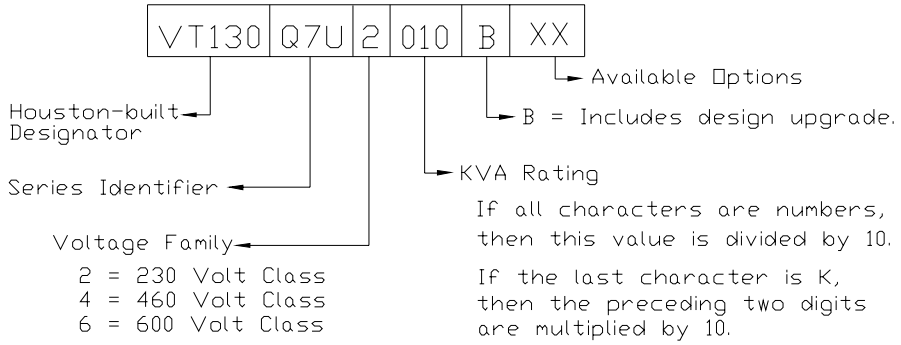
Once the cause of the trip has been corrected, performing a **Reset** re-enables the ASD for normal operation (clears the fault screen).

The fault screen may also be cleared using either of the following methods:

- Cycling power (trip info may be saved via parameter **F602** if desired),
- Pressing the **Stop**|**Reset** key twice,
- Remotely via the communications channel,
- Momentarily connecting terminal **RES** to **CC** of the **Control Terminal Strip**, or
- Via Program ⇒ Utilities ⇒ Type Resets ⇒ **Clear Past Trips**.

Enclosure Dimensions and Conduit Plate Information

Q7 ASD 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.*

Enclosure Dimensions/Weight

Table 14. VT130-Series Enclosure Size 1.

Model Number VT130Q7U	Shipping Weight (lbs. max.)	Conduit Plate Number Bottom
2010B	20	55295
2015B		
2025B		
2035B		
2055B		
2080B		
4015B		
4025B		
4035B		
4055B		
4080B		
4110B		
4160B		
6015B		
6025B		
6035B		
6060B		
6080B		
6120B		
6160B		

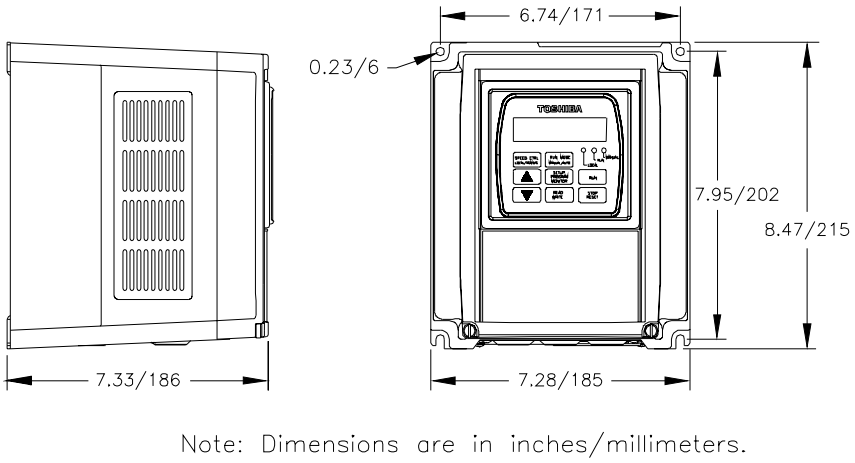


Figure 25. Conduit Plate 55295. Also see the optional Conduit Box on pg. 158.

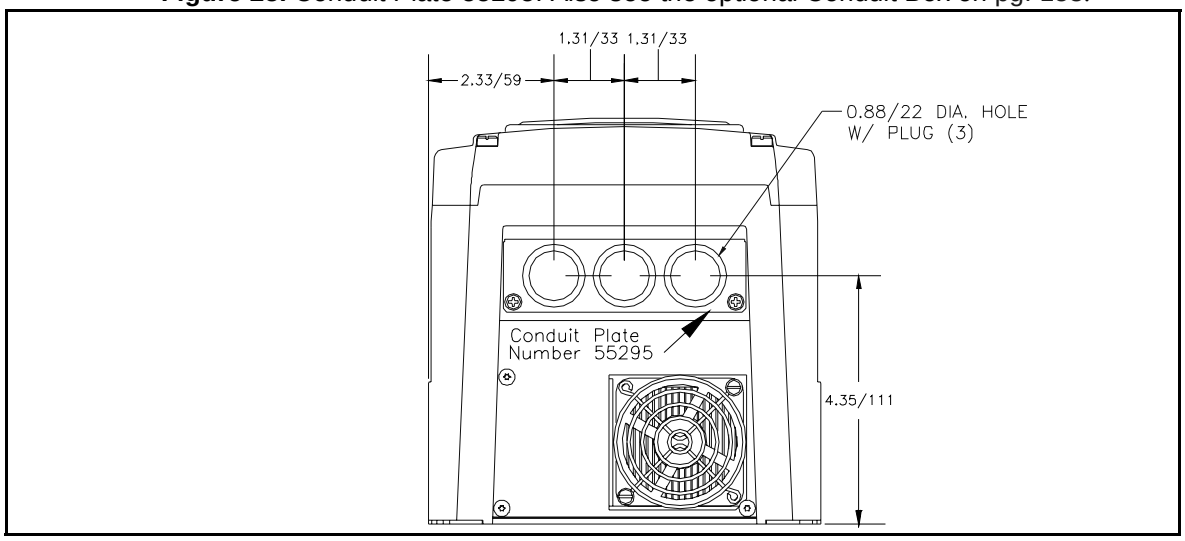
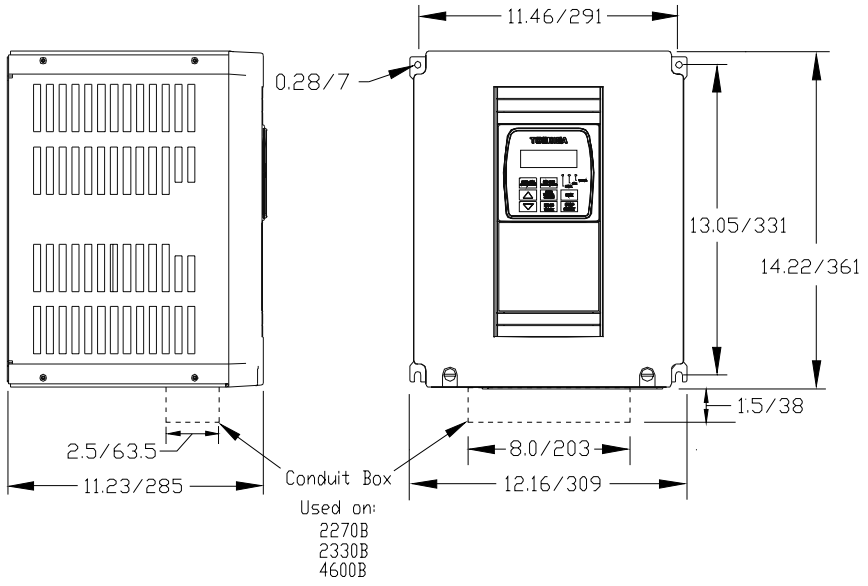


Table 15. VT130-Series Enclosure Size 2.

Model Number VT130Q7U	Shipping Weight (lbs. max.)	Conduit Plate Number Bottom
2110B	60	55361
2160B		
2220B		
***2270B**		
***2330B**		
4220B		
4270B		
4330B		
4400B		
4500B		
***4600B**		
6220B		
6270B		
6330B		
6400B		
6500B		



Note: ** Enclosure has conduit extender box.*

Figure 26. Conduit Plate 55361.

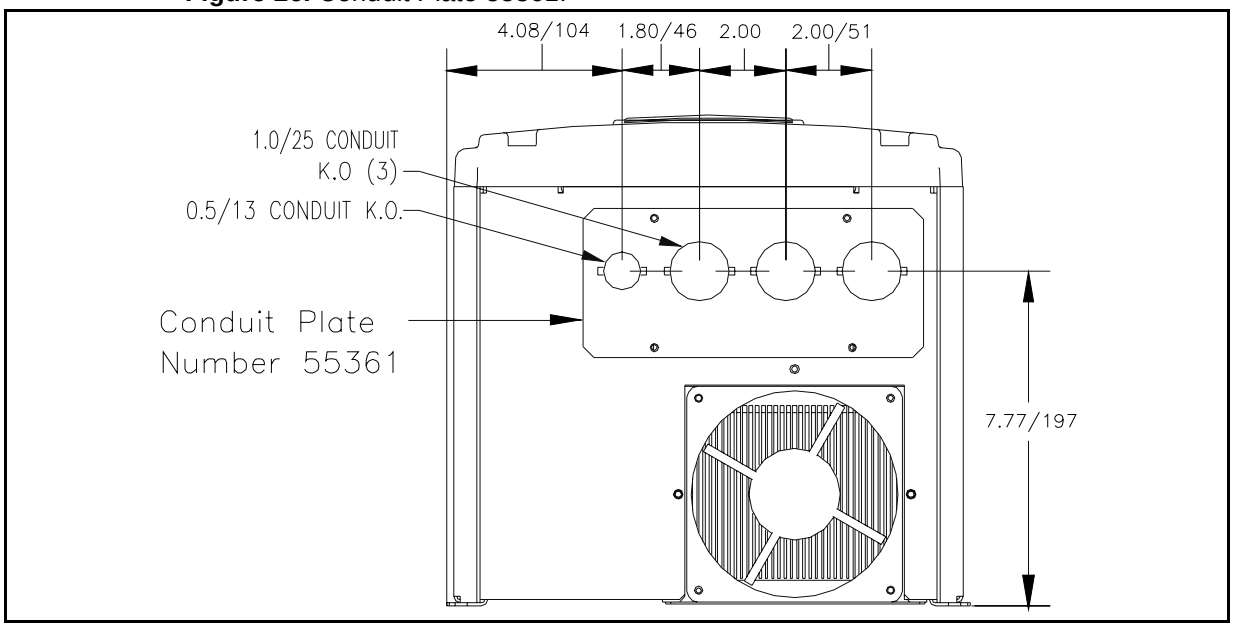
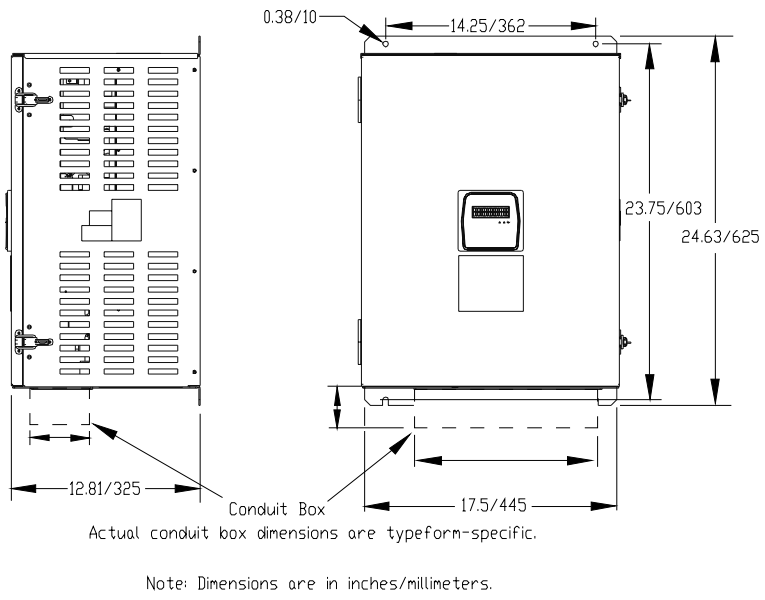


Table 16. VT130-Series Enclosure Size 3.

Model Number VT130Q7U	Shipping Weight (lbs. max.)	Conduit Plate Number (bottom)
*2400B	175	55547
4750B		
*410KB		
*412KB		
6600B		
6750B		
610KB		



Note: ** Enclosure has conduit extender box.*

Figure 27. Conduit Plate 55547.

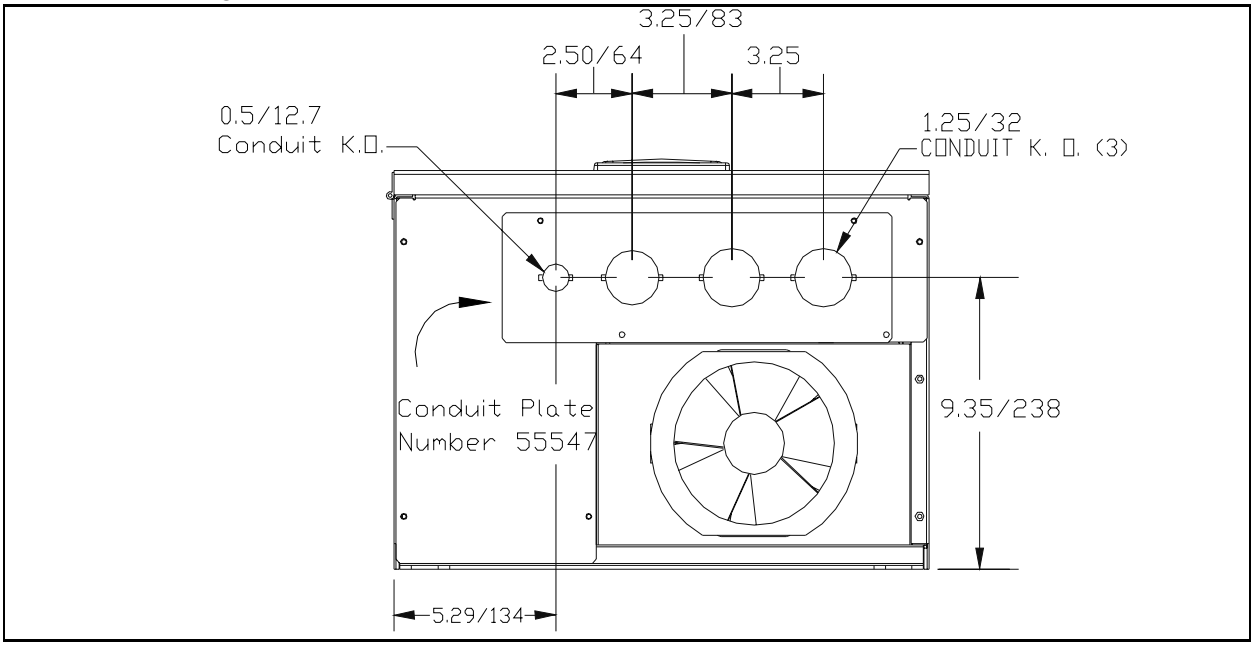


Table 17. VT130-Series Enclosure Size 4.

Model Number VT130Q7U	Shipping Weight (lbs. max.)	Conduit Plate Number	
		Bottom	Top
415KB	250	49900	49468
420KB			
612KB			
615KB			

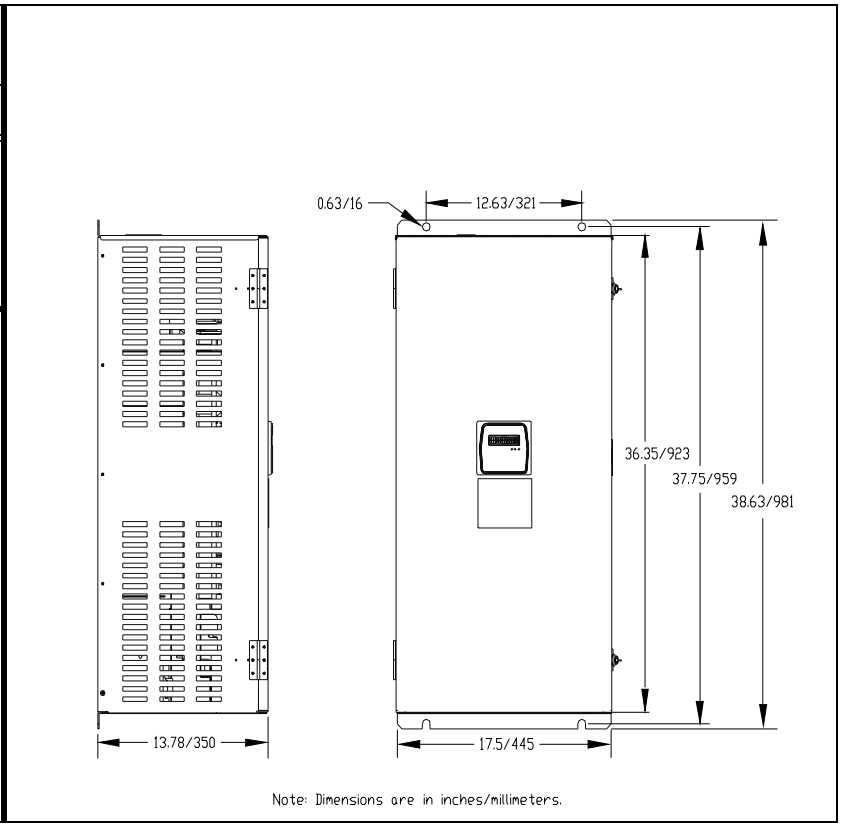


Figure 28. Conduit Plates 49900 and 49648.

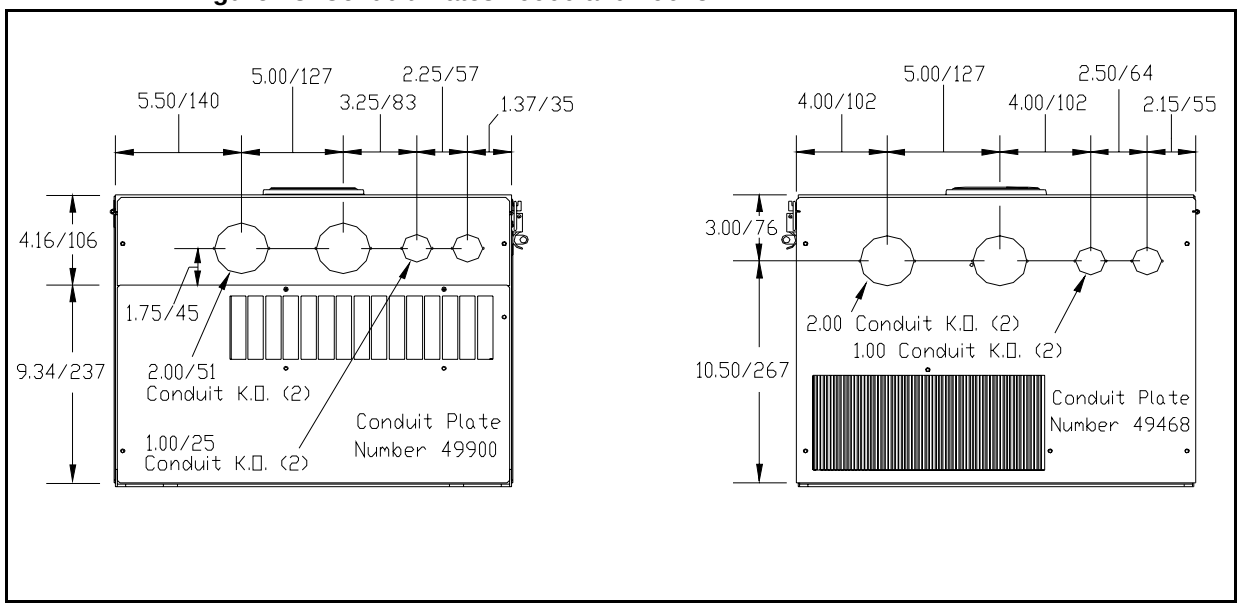


Table 18. VT130-Series Enclosure Size 5.

Model Number VT130Q7U	Shipping Weight (lbs. max.)	Conduit Plate Number	
		Bottom	Top
425KB	550	54086	
430KB			
435KB			
620KB			
625KB			
630KB			
635KB			

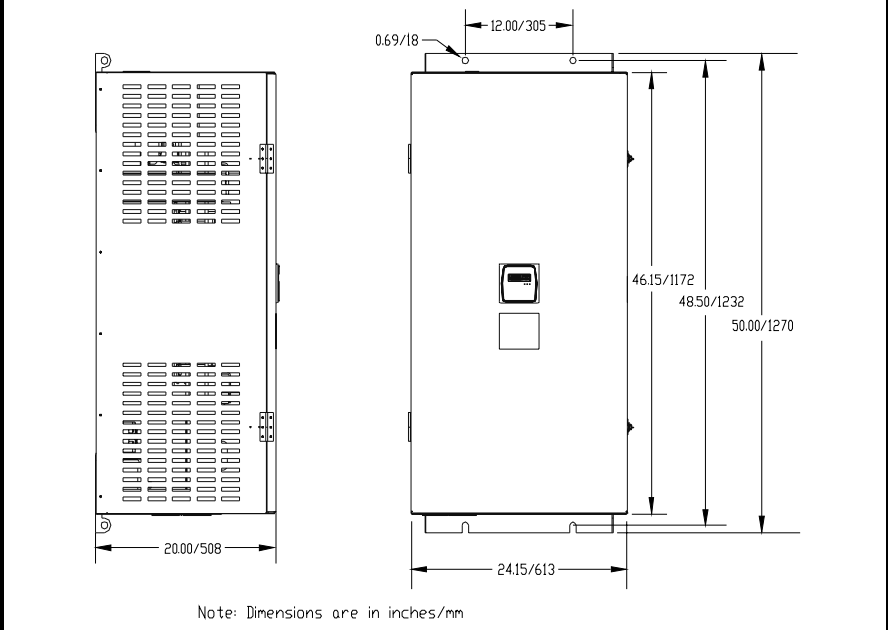
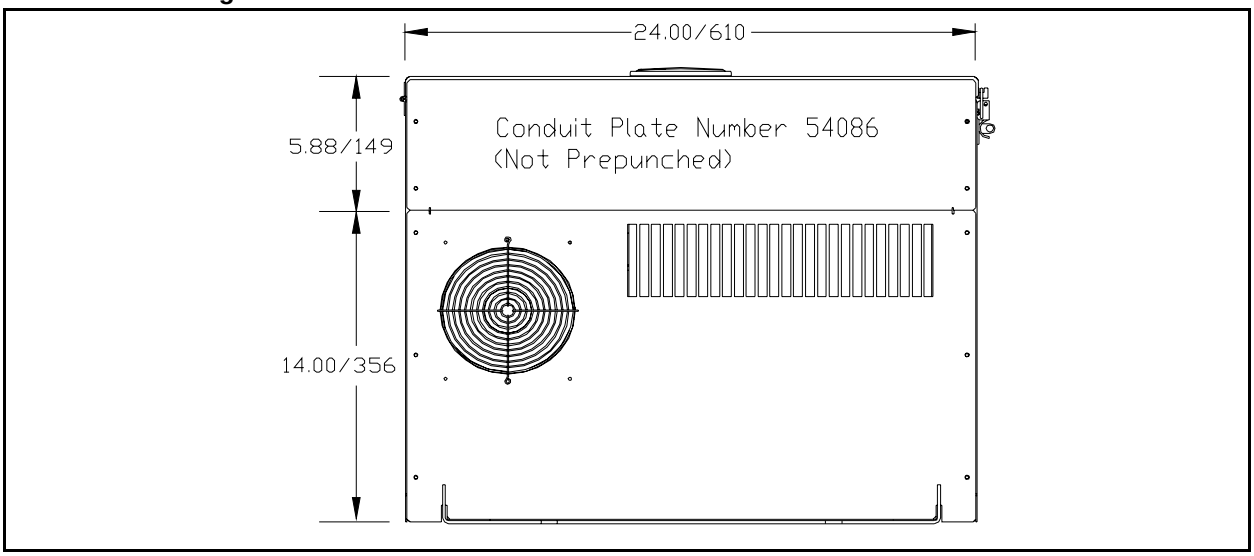


Figure 29. Conduit Plate 54086.



Conduit Box Information

The conduit plate information provided below is for the **VT130 Series Size 1** ASDs listed in Table 14 on page 153.

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 (P/N 55295 of Figure 30.).
2. Install the Conduit Box (P/N 53354 of Figure 31.), using the 2 screws from the conduit plate.
3. Complete the conduit and wiring connections.
4. Install the Conduit Box cover (P/N 53355 of Figure 31.).

Figure 30. Remove Conduit Plate.

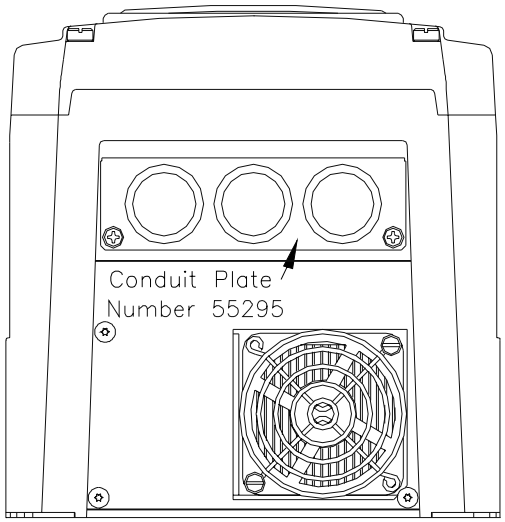
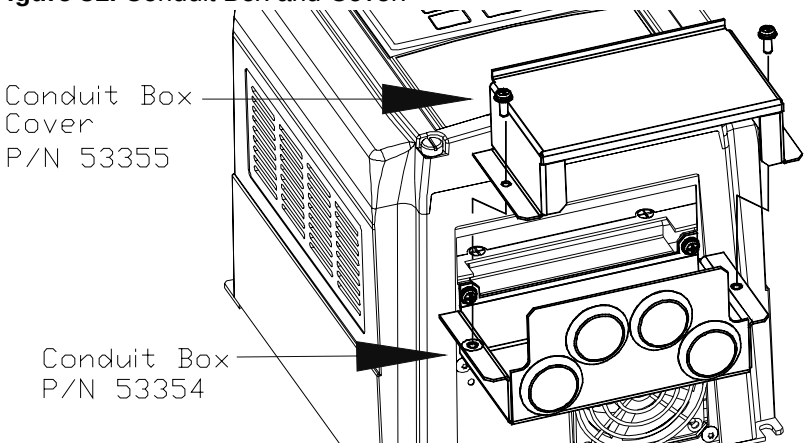


Figure 31. Conduit Box and Cover.



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 **Q7 ASD**.*

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

Table 19. **Q7 ASD** 230 Volt Drive Cable/Terminal Specifications.

Model No. VT130Q7U	Circuit Breaker Rating (Amps)	Typical Wire/Cable Size (AWG or kcmil)			Lug Size
		Input/Output Power	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity (AWG or kcmil)
2010B	15	14	20 (3-core shield)	18 (2-core shield)	24 – 8
2015B	15	14			
2025B	15	14			
2035B	20	14			
2055B	30	10			
2080B	50	8			
2110B	75	8			18 – 4
2160B	75	6			
2220B	100	4			
2270B	125	3			16 – 3
2330B	150	2			10 – 1/0
2400B	200	2/0			12 – 4/0
2500B	250	3/0			
2600B	300	250 – *1/0			*6 – 250
2750B	400	*3/0			
210KB	500	*250			*1/0 – 500
212KB	600	*350			
215KB	700	*400			
Note: *(*) Indicates that the item is one of a set of two parallel cables.*					

Table 20. **Q7 ASD** 460 Volt Drive Cable/Terminal Specifications.

Model No. VT130Q7U	Circuit Breaker Rating (Amps)	Typical Wire/Cable Size (AWG or kcmil)			Lug Size
		Input/Output Power Wire Size	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity (AWG or kcmil)
4015B	15	14	20 (3-core shield)	18 (2-core shield)	24 – 8
4025B	15	14			
4035B	15	14			
4055B	15	14			
4080B	30	14			
4110B	30	12			
4160B	30	10			18 – 4
4220B	50	8			
4270B	75	8			
4330B	75	6			
4400B	100	6			
4500B	100	4			
4600B	125	3			16 – 3
4750B	150	1			10 – 1/0
410KB	200	2/0			12 – 4/0
412KB	250	3/0			
415KB	300	250 – *1/0			*6 – 250
420KB	400	*3/0			
425KB	500	*250			*1/0 – 500
430KB	600	*350			
435KB	700	*500			
440KB	700	*500			

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

Table 21. **Q7 ASD** 600 Volt Drive Cable/Terminal Specifications.

Model No. VT130Q7U	Circuit Breaker Rating (Amps)	Typical Wire/Cable Size (AWG or kcmil)			Lug Size
		Input/Output Power Wire Size	AM, FM, and II Terminals	Control Terminal Strip	ASD Input/Output Power Lug Wire Capacity (AWG or kcmil)
6015B	15	14	20 (3-core shield)	18 (2-core shield)	24 – 8
6025B	15	14			
6035B	15	14			
6060B	15	14			
6080B	15	14			
6120B	30	14			
6160B	30	10			
6220B	50	10			18 – 4
6270B	50	8			
6330B	50	8			
6400B	75	6			
6500B	100	6			
6600B	100	4			16 – 3
6750B	125	3			
610KB	150	1			10 – 1/0
612KB	200	2/0			6 – 250
615KB	250	3/0			
620KB	300	250 – *2/0			*6 – 250
625KB	400	*3/0			
630KB	500	*250			
635KB	500	*300			*1/0 – 500
Note: *(*) Indicates that the item is one of a set of two parallel cables.*					

Current/Voltage Specifications

Table 22. 230 Volt NEMA Type-1 Chassis standard ratings table.

Model No. 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 A	143.0 A
2500	50.0	50.0/37.3			156.0 A	171.6 A
2600	60.0	60.0/44.7			192.0 A	211.0 A
2750	75.0	75.0/56.0			248.0 A	272.8 A
210K	100	100.0/74.6			312.0 A	343.2 A
212K	125	125.0/93.2			370.0 A	407.0 A
215K	150	150.0/112.0			415.0 A	456.5 A

Table 23. 460 Volt NEMA Type-1 Chassis standard ratings table.

Model No. 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 24. 600 Volt NEMA Type-1 Chassis standard ratings table.

Model No. 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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