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 Toshiba.

Manual’s Purpose and Scope

This manual provides information on how to safely install, operate, maintain, and dispose of your Q7 Adjustable 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.

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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.

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:_______________________________________________________
# Table of Contents

**General Safety Information** ........................................................................................................... 1  
  Safety Alert Symbol .......................................................................................................................... 1  
  Signal Words ...................................................................................................................................... 1  
  Special Symbols .................................................................................................................................. 2  
  Electrical Hazard Symbol ............................................................................................................... 2  
  Explosion Hazard Symbol ............................................................................................................... 2  
  Equipment Warning Labels ............................................................................................................ 2  
  Qualified Personnel .......................................................................................................................... 3  
  Equipment Inspection ...................................................................................................................... 3  
  Handling and Storage ..................................................................................................................... 3  
  Disposal ........................................................................................................................................... 4  
  Installation Precautions ................................................................................................................... 4  
    Location and Ambient Requirements .......................................................................................... 4  
    Mounting Requirements ............................................................................................................ 5  
    Conductor Requirements and Grounding .................................................................................. 5  
    Power Connections .................................................................................................................... 5  
    Protection ..................................................................................................................................... 6  
  System Integration Precautions ...................................................................................................... 6  
  Personnel Protection ...................................................................................................................... 7  
  System Setup Requirements ......................................................................................................... 7  
  Operational and Maintenance Precautions ................................................................................... 8  
  Service Life Information ................................................................................................................ 9  

**CE Compliance Requirements** ..................................................................................................... 10  
  EMC Installation Guidelines .......................................................................................................... 10  
  General EMC Guidelines for Consideration ............................................................................... 10  
  CE Compliant Installation Guidelines .......................................................................................... 10  

**Motor Characteristics** .................................................................................................................. 12  
  Pulse Width Modulation Operation .............................................................................................. 12  
  Overload Protection Adjustment .................................................................................................. 12  
  Power Factor Correction ............................................................................................................... 12  
  Light Load Conditions .................................................................................................................. 12  
  Load-produced Negative Torque .................................................................................................. 12  
  Motor Braking .................................................................................................................................. 13  

**ASD Characteristics** ..................................................................................................................... 13  
  Over-current Protection .................................................................................................................. 13  
  ASD Capacity ................................................................................................................................... 13  

**Installation and Connections** ....................................................................................................... 14  
  Installation Notes ............................................................................................................................ 14  
  Mounting the ASD ........................................................................................................................... 16  
  Connecting the ASD ....................................................................................................................... 16  
  System Grounding .......................................................................................................................... 16  
  Power Connections ......................................................................................................................... 17  
  Lead Length Specifications ............................................................................................................ 18
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 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 Only.
- 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

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Service Life</th>
<th>Remarks</th>
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<tr>
<td>Large Capacity Electrolytic Capacitor</td>
<td>5 Years</td>
<td>When not used for long periods, charge semi-annually.</td>
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<tr>
<td>Cooling Fan</td>
<td>26,000 Hours</td>
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</tr>
<tr>
<td>CN Connectors</td>
<td>100 Connects/Disconnects</td>
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</tr>
<tr>
<td>On-board Relays</td>
<td>500,000 Actuations</td>
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</table>
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 electromagnetic 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 Intermittence: 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>
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<th>230V Filter Number</th>
<th>460V Filter Number</th>
<th>600V Filter Number</th>
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<td>VT130Q7U2600B</td>
<td>FS5236-300</td>
<td>VT130Q7U4750B</td>
</tr>
<tr>
<td>VT130Q7U2750B</td>
<td>FS5236-300</td>
<td>VT130Q7U410KB</td>
</tr>
<tr>
<td>VT130Q7U210KB</td>
<td>FS5236-500</td>
<td>VT130Q7U412KB</td>
</tr>
<tr>
<td>VT130Q7U212KB</td>
<td>FS5236-500</td>
<td>VT130Q7U415KB</td>
</tr>
<tr>
<td>VT130Q7U215KB</td>
<td>FS5236-500</td>
<td>VT130Q7U420KB</td>
</tr>
<tr>
<td>VT130Q7U220KB</td>
<td>FS5236-500</td>
<td>VT130Q7U425KB</td>
</tr>
<tr>
<td>VT130Q7U230KB</td>
<td>FS5236-500</td>
<td>VT130Q7U430KB</td>
</tr>
<tr>
<td>VT130Q7U240KB</td>
<td>FS5236-500</td>
<td>VT130Q7U435KB</td>
</tr>
<tr>
<td>VT130Q7U245KB</td>
<td>FS5236-500</td>
<td>VT130Q7U440KB</td>
</tr>
</tbody>
</table>

Q7 ASD Installation and Operation Manual
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.

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 ASDs are equipped with internal DC bus fuses. However, not all Q7 ASDs are equipped with internal primary power input fuses (HP dependent). When connecting two or more drives that have no internal fuse to the same power line as shown in Figure 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.

![Figure 3. Circuit breaker configuration.](image-url)
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.

<table>
<thead>
<tr>
<th>Model</th>
<th>PWM Carrier Frequency</th>
<th>NEMA MG-1-1998 Section IV Part 31 Compliant Motors(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 Volt</td>
<td>All</td>
<td>1000 feet</td>
</tr>
<tr>
<td>460 Volt</td>
<td>&lt; 5 kHz</td>
<td>600 feet</td>
</tr>
<tr>
<td></td>
<td>≥ 5 kHz</td>
<td>300 feet</td>
</tr>
<tr>
<td>600 Volt</td>
<td>&lt; 5 kHz</td>
<td>200 feet</td>
</tr>
<tr>
<td></td>
<td>≥ 5 kHz</td>
<td>100 feet</td>
</tr>
</tbody>
</table>

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 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>
<thead>
<tr>
<th>Terminal Name</th>
<th>Input/Output</th>
<th>Terminal Function (default setting if programmable)</th>
<th>Circuit Config.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>Discrete Input</td>
<td>Standby (jumper to CC to operate the unit) — Multifunctional programmable discrete input</td>
<td>Figure 8 on pg. 25.</td>
</tr>
<tr>
<td>RES</td>
<td>Discrete Input</td>
<td>Reset — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Discrete Input</td>
<td>Forward — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Discrete Input</td>
<td>Reverse — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Discrete Input</td>
<td>Fire Speed — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Discrete Input</td>
<td>Preset Speed 2 — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Discrete Input</td>
<td>Damper Fdbk — Multifunctional programmable discrete input (connect to CC to operate the unit).</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>Discrete Input</td>
<td>Emergency Off — Multifunctional programmable discrete input</td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>Analog Input</td>
<td>RR — Multifunction programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output). Reference CC.</td>
<td></td>
</tr>
<tr>
<td>RX</td>
<td>Analog Input</td>
<td>RX — Multifunctional programmable analog input (-10 to +10 VDC input — -80 to +80 Hz output). Reference CC.</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Analog Input</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Analog Input</td>
<td>VI — Multifunctional programmable analog input (0 to 10 VDC input — 0 to 80 Hz output). Reference CC.</td>
<td></td>
</tr>
<tr>
<td>P24</td>
<td>DC Output</td>
<td>24 VDC @ 50 mA output.</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>DC Output</td>
<td>PP — 10.0 VDC voltage source for the external potentiometer.</td>
<td></td>
</tr>
<tr>
<td>OUT1</td>
<td>Discrete Output</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>OUT2</td>
<td>Discrete Output</td>
<td>Reach Frequency — Multifunctional programmable discrete output</td>
<td></td>
</tr>
<tr>
<td>FP</td>
<td>Output</td>
<td>Frequency Pulse — an output pulse train that has a frequency which is based on the output frequency of the ASD.</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>Output</td>
<td>Produces an output current that is proportional to the magnitude of the function assigned to this terminal (see Table 6 on page 48).</td>
<td></td>
</tr>
<tr>
<td>FM</td>
<td>Output</td>
<td>Fault relay (common).</td>
<td></td>
</tr>
<tr>
<td>FLC</td>
<td>Output</td>
<td>Fault relay (N.C.).</td>
<td></td>
</tr>
<tr>
<td>FLB</td>
<td>Output</td>
<td>Fault relay (N.O.).</td>
<td></td>
</tr>
<tr>
<td>FLA</td>
<td>Output</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td>—</td>
<td>Control common (Do Not connect to Earth Gnd).</td>
<td></td>
</tr>
</tbody>
</table>

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 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.
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 Toshiba website to acquire a copy of the 7-Series Communications User Manual and ICC DESIGNS website 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).

<table>
<thead>
<tr>
<th>Pin #</th>
<th>CNU1 Pinout (Controller PCB)</th>
<th>TTL/RS232/RS485 Interface</th>
<th>Pin #</th>
<th>CNU2 Pinout (Controller PCB)</th>
<th>TTL/RS232/RS485 Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P24</td>
<td>P24</td>
<td>1</td>
<td>P24</td>
<td>P24</td>
</tr>
<tr>
<td>2</td>
<td>Gnd</td>
<td>Gnd</td>
<td>2</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>3</td>
<td>Tx (-)</td>
<td>RXA</td>
<td>3</td>
<td>Rx</td>
<td>Tx</td>
</tr>
<tr>
<td>4</td>
<td>Rx (+)</td>
<td>TXA</td>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>Rx (-)</td>
<td>TXB</td>
<td>5</td>
<td>Tx</td>
<td>Rx</td>
</tr>
<tr>
<td>6</td>
<td>Tx (+)</td>
<td>RXB</td>
<td>6</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>7</td>
<td>RS232/485</td>
<td>CNU3 Pin-7</td>
<td>7</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

CNU3 Pinout

CNU3 is used for RS232/485 serial communications.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>CNU3 Pinout (Controller PCB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RS232/485 Signal +</td>
</tr>
<tr>
<td>2</td>
<td>RS232/485 Signal -</td>
</tr>
<tr>
<td>3</td>
<td>RS232/485 Signal Gnd</td>
</tr>
<tr>
<td>4</td>
<td>Shield</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Function</th>
<th>Pin Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PP</td>
<td>14</td>
<td>II</td>
</tr>
<tr>
<td>2</td>
<td>FL</td>
<td>15</td>
<td>S1</td>
</tr>
<tr>
<td>3</td>
<td>VI</td>
<td>16</td>
<td>R</td>
</tr>
<tr>
<td>4</td>
<td>RR</td>
<td>17</td>
<td>S3</td>
</tr>
<tr>
<td>5</td>
<td>FM</td>
<td>18</td>
<td>S2</td>
</tr>
<tr>
<td>6</td>
<td>RX</td>
<td>19</td>
<td>N15</td>
</tr>
<tr>
<td>7</td>
<td>FP</td>
<td>20</td>
<td>S4</td>
</tr>
<tr>
<td>8</td>
<td>AM</td>
<td>21</td>
<td>P15</td>
</tr>
<tr>
<td>9</td>
<td>*OUT1</td>
<td>22</td>
<td>P24</td>
</tr>
<tr>
<td>10</td>
<td>*OUT2</td>
<td>23</td>
<td>CC</td>
</tr>
<tr>
<td>11</td>
<td>ST</td>
<td>24</td>
<td>CC</td>
</tr>
<tr>
<td>12</td>
<td>RES</td>
<td>25</td>
<td>CC</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**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.
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
• V1/I.

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).
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.

- Mounting Hole: 5.00
- 11/32” Screw Hole (4): 4.25

Front View

Side View

Back View

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.

Correct

Incorrect
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).
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.

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Menu Item</th>
<th>Sub-menu Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output Frequency Display</strong></td>
<td>Displays output frequency.</td>
<td>Press Up/Down Arrow key to change setting.</td>
</tr>
<tr>
<td><strong>Setup</strong></td>
<td>Press Up Arrow key to scroll menu items.</td>
<td>Press R/W key to access menu items and the Up/Down Arrow keys to change value.</td>
</tr>
<tr>
<td></td>
<td>Press R/W key to access menu items and the Up/Down Arrow keys to change value.</td>
<td>Press SPM key to return to Primary Menu.</td>
</tr>
<tr>
<td><strong>Program</strong></td>
<td>Press Up Arrow key to scroll menu items.</td>
<td>Press Up Arrow key to go to next.</td>
</tr>
<tr>
<td></td>
<td>Press R/W key to access displayed menu item or press Up Arrow key to view subsequent menu items.</td>
<td>Press Up/Down Arrow keys to view subsequent menu items.</td>
</tr>
<tr>
<td></td>
<td>Press the Up/Down Arrow key to change accessed menu item.</td>
<td>Press the Up/Down Arrow key to change accessed menu item.</td>
</tr>
<tr>
<td></td>
<td>Press SPM key to exit.</td>
<td>Press SPM key to exit.</td>
</tr>
<tr>
<td><strong>Search</strong></td>
<td>Press Up Arrow key to search.</td>
<td>Changed from Default Parameters</td>
</tr>
<tr>
<td></td>
<td>Press Up Arrow key to go to next.</td>
<td>Press Up Arrow key to view subsequent menu items.</td>
</tr>
<tr>
<td></td>
<td>Press SPM key to return to Primary Menu.</td>
<td>Press SPM key to return to Primary Menu.</td>
</tr>
<tr>
<td><strong>Fundamental #1</strong></td>
<td>Press R/W key to access displayed menu item or press Up Arrow key to view subsequent menu items.</td>
<td>Maximum Output Frequency</td>
</tr>
<tr>
<td></td>
<td>Press the Up/Down Arrow key to change accessed menu item.</td>
<td>Base Frequency 1</td>
</tr>
<tr>
<td></td>
<td>Press SPM key to exit.</td>
<td>Voltage Compensation for Dead Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum Voltage #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disable Forward Run/Disable Reverse Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper Limit Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower Limit Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V/f Pattern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Boost #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accel Time #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decel Time #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accel/Decel #1 Pattern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S-Pattern Lower Limit Adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S-Pattern Upper Limit Adjustment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Menu Item</th>
<th>Sub-menu Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program</strong></td>
<td>Press R/W key to access displayed menu item or press Up Arrow key to view subsequent menu items.</td>
<td>Press the Up/Down Arrow key to change accessed menu item.</td>
</tr>
<tr>
<td></td>
<td>Press SPM key to exit.</td>
<td>Press SPM key to exit.</td>
</tr>
<tr>
<td><strong>Search</strong></td>
<td>Press Up Arrow key to search.</td>
<td>Changed from Default Parameters</td>
</tr>
<tr>
<td></td>
<td>Press Up Arrow key to go to next.</td>
<td>Press Up Arrow key to view subsequent menu items.</td>
</tr>
<tr>
<td></td>
<td>Press SPM key to return to Primary Menu.</td>
<td>Press SPM key to return to Primary Menu.</td>
</tr>
</tbody>
</table>

| **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 SP M key to change accessed menu item. | Press SPM key to exit. |

| **Panel Control** | (access method same as Fundamental #2) | Ramped PWM |
| | | Panel Direction |
| | | Panel Stop Pattern |
| | | Panel V/f Group |
| | | Panel Acc/DecSelect |
| | | Panel Reset Select |
| | | Panel PID Control |

| **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. | Press SPM key to exit. |

| **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 change accessed menu item. | Press SPM key to exit. |
## Q7 ASD Menu Items

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Menu Item</th>
<th>Sub-menu Items</th>
<th>Primary Menu</th>
<th>Menu Item</th>
<th>Sub-menu Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Terminal Delays</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Input Terminals</strong></td>
<td>S11 Terminal</td>
<td></td>
<td><strong>Output Terminals</strong></td>
<td>OUT4 Off Delay</td>
</tr>
<tr>
<td></td>
<td>Press Up Arrow key to scroll menu items.</td>
<td>S12 Terminal</td>
<td></td>
<td>OUT5 On Delay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press R/W key to access menu items and the Up/Down Arrow keys to change value.</td>
<td>ON Terminal</td>
<td></td>
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<td>Commercial Power Switching Freq. Hold Time</td>
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<td>Primary Menu</td>
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<td><strong>Program</strong></td>
<td>Press <strong>Up Arrow</strong> key to scroll menu items.</td>
<td>Press R/W key to access menu items and the <strong>Up/Down Arrow</strong> keys to change value.</td>
<td>Press <strong>Up Arrow</strong> key to scroll menu items.</td>
<td>Press R/W key to access menu items and the <strong>Up/Down Arrow</strong> keys to change value.</td>
<td>Press SPM key to return to Primary Menu.</td>
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<td>Press <strong>R/W</strong> key to access menu items and the <strong>Up/Down Arrow</strong> keys to change value.</td>
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<td><strong>Preset Speeds</strong></td>
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<td>Press the <strong>Up/Down Arrow</strong> key to change accessed menu item.</td>
<td>Press the <strong>Up/Down Arrow</strong> key to change accessed menu item.</td>
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<td>Press the <strong>Up/Down Arrow</strong> key to change accessed menu item.</td>
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**Preset Speeds**

- 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

**Protection**

- 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

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

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<thead>
<tr>
<th>Primary Menu</th>
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<th>Sub-menu Items</th>
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<thead>
<tr>
<th>Primary Menu</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX Speed Frequency #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX Speed Reference #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Speed Reference #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Speed Frequency #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Speed Reference #2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>RX2 Speed Frequency #2</td>
<td></td>
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<td></td>
<td></td>
<td>RX2 Speed Reference #2</td>
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<td></td>
<td></td>
<td>RX2 Speed Frequency #2</td>
<td></td>
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<td></td>
<td>RX2 Speed Reference #2</td>
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<tr>
<td></td>
<td></td>
<td>RX2 Speed Frequency #2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>RX2 Speed Reference #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Speed Frequency #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Speed Reference #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Speed Frequency #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Speed Reference #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Speed Frequency #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Torque Reference #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Torque Reference #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIN Torque Reference #2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Frequency Settings**

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.

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.

**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.
<table>
<thead>
<tr>
<th>Monitor</th>
<th>Trip Hold Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency Command</td>
</tr>
<tr>
<td></td>
<td>Output Current</td>
</tr>
<tr>
<td></td>
<td>DC Voltage</td>
</tr>
<tr>
<td></td>
<td>Output Voltage</td>
</tr>
<tr>
<td></td>
<td>Input Terminals</td>
</tr>
<tr>
<td></td>
<td>Output Terminals</td>
</tr>
<tr>
<td></td>
<td>Run Time</td>
</tr>
<tr>
<td></td>
<td>Post Compensation Frequency</td>
</tr>
<tr>
<td></td>
<td>PID Feedback</td>
</tr>
<tr>
<td></td>
<td>Motor Overload Ratio</td>
</tr>
<tr>
<td></td>
<td>ASD Overload Ratio</td>
</tr>
<tr>
<td></td>
<td>Motor Load</td>
</tr>
<tr>
<td></td>
<td>ASD Load</td>
</tr>
<tr>
<td></td>
<td>Input Power</td>
</tr>
<tr>
<td></td>
<td>Output Power</td>
</tr>
<tr>
<td></td>
<td>Kilowatt Hours</td>
</tr>
<tr>
<td></td>
<td>Peak Current</td>
</tr>
<tr>
<td></td>
<td>Direction</td>
</tr>
<tr>
<td></td>
<td>RR Input</td>
</tr>
<tr>
<td></td>
<td>VI/II Input</td>
</tr>
<tr>
<td></td>
<td>RX Input</td>
</tr>
<tr>
<td></td>
<td>RX2 Input</td>
</tr>
<tr>
<td></td>
<td>FM Output</td>
</tr>
<tr>
<td></td>
<td>AM Output</td>
</tr>
<tr>
<td></td>
<td>Trip Code</td>
</tr>
<tr>
<td></td>
<td>Past Trip #1</td>
</tr>
<tr>
<td></td>
<td>Past Trip #2</td>
</tr>
<tr>
<td></td>
<td>Past Trip #3</td>
</tr>
<tr>
<td></td>
<td>Past trip #4</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Disable</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>80.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Abnormal Speed Time

**Program ⇒ Protection ⇒ Abnrml Spd Time**

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>10.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.00</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>
Accel Time #1

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

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**

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.

**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 2** acceleration and deceleration decreases the rate of change above the base frequency.
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

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
**AM Terminal Adjustment**

Program ⇒ AM/FM ⇒ AM Adjustment

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.

**Parameter Type** — Numerical  
**Factory Default** — 512  
**Changeable During Run** — Yes  
**Minimum** — 1  
**Maximum** — 1280

**AM Terminal Assignment**

Program ⇒ AM/FM ⇒ AM Assignment

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.

**Parameter Type** — Selection List  
**Factory Default** — Output Current  
**Changeable During Run** — Yes
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.

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

Program ⇒ Comm Settings ⇒ **ASD Number**

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**

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**

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

**Autotune Control**

Program ⇒ Motor Settings ⇒ **Autotune Control**

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

Parameter Type — **Numerical**

Factory Default — 0

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Parameter Type — **Read-Only**

Factory Default — (ASD-dependent)

Changeable During Run — **No**

Parameter Type — **Read-Only**

Factory Default — (ASD-dependent)

Changeable During Run — **No**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**
### Autotune Enable

Program ⇒ Motor Settings ⇒ Autotune Enable

This parameter Enables/Disables the Autotune function.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection List</td>
<td>Enabled</td>
<td>No</td>
</tr>
</tbody>
</table>

### 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 than 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>60.0</td>
<td>Yes</td>
<td>25.0</td>
<td>299.0</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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 than 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>60.0</td>
<td>Yes</td>
<td>25.0</td>
<td>299.0</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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 than 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>60.0</td>
<td>Yes</td>
<td>25.0</td>
<td>299.0</td>
<td>Hz</td>
</tr>
</tbody>
</table>
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 than 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 255D) (BIN Speed Ref #1) that represents BIN Speed Frequency #1.
- Set BIN Speed Frequency #2, and
- Set the binary input value (% of 255D) (BIN Speed Ref #2) that represents the BIN Speed Frequency #2.

Note: 255D 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.
### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>80.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-80.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>+80.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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 (255D).

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.00</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### 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 (255D).
**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.

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

**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.

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 — %

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>0.00</td>
<td>Yes</td>
<td>0.00</td>
<td>Max. Freq.</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>80.0</td>
<td>Yes</td>
<td>0.0</td>
<td>Max. Freq.</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection List</td>
<td>0.62</td>
<td>No</td>
<td>0.37</td>
<td>10.00</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

### Cooling Fan Control

**Program** ⇒ **Protection** ⇒ **Cooling Fan Ctrl**

This parameter sets the cooling fan run-time command.

**Settings:**
- Automatic
- Always On

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection List</td>
<td>Automatic</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 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 Injection 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 Injection 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 Time #2**

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

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

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

Parameter Type — **Selection List**

Factory Default — Reverse

Changeable During Run — No
**Dynamic Braking Enable**

Program ⇒ Protection ⇒ **Dynamic Braking**

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

**Settings:**
- Enabled
- Disabled

**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
- **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
- **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
- **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
- **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**

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Emg Off Mode Sel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Coast Stop</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

Emergency Off Time

Program ⇒ Protection ⇒ **Emg Off Time**

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Emg Off Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.00</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

End Frequency

Program ⇒ Special Controls ⇒ **End Frequency**

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>End Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>80.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

Error Detect Time

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

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Error Det Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>200</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>1000</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>
**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 (-).
**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.

**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 — Selection List
Factory Default — Output Frequency
Changeable During Run — Yes

**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.

**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.

Settings:
Use VI/I
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

Parameter Type — Selection List
Factory Default — Use RR
Changeable During Run — No

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.

Settings:
Use VI/I
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

Parameter Type — Selection List
Factory Default — Use RR
Changeable During Run — No
## 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.

## 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

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>20.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Coast Stop</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq.</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>
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**.

- **Parameter Type** — **Numerical**
- **Factory Default** — 80.0
- **Changeable During Run** — No
- **Minimum** — 30.0
- **Maximum** — 299.0
- **Units** — Hz

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>600</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>10</td>
</tr>
<tr>
<td>Maximum</td>
<td>2400</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

## Motor Capacity

**Program ⇒ Motor Settings ⇒ Motor Capacity**

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.10</td>
</tr>
<tr>
<td>Maximum</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Units</td>
<td>kW</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>100,000 MΩ</td>
</tr>
<tr>
<td>Units</td>
<td>Ω</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Open</td>
</tr>
<tr>
<td>Units</td>
<td>Ω</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>6500.0</td>
</tr>
<tr>
<td>Units</td>
<td>μH</td>
</tr>
</tbody>
</table>
### Motor Constant 4

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Constant 4</td>
<td>Numerical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>Yes</td>
<td>0.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

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.

### Motor Constant 5

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Constant 5</td>
<td>Numerical</td>
<td>(ASD-dependent)</td>
<td>0.00</td>
<td>650.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

### Motor Poles

**Program** ⇒ **Motor Settings** ⇒ **Motor Poles**

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Poles</td>
<td>Numerical</td>
<td>No</td>
<td>2</td>
<td>16</td>
</tr>
</tbody>
</table>

This parameter identifies the number of motor poles.

### Motor Slip Gain

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Slip Gain</td>
<td>Numerical</td>
<td>0.60</td>
<td>0.00</td>
<td>2.55</td>
</tr>
</tbody>
</table>

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.

### Motor Type

**Program** ⇒ **Motor Settings** ⇒ **Motor Type**

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Type</td>
<td>Selection List</td>
<td>Toshiba EQP III TEFC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other Motor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
**MS Relay (status ANDED) with ST**

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

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**

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
- V1/I1
- RR
- RX
- RX2 (option)
  - Setting (LED Keypad Option Only)

**Number of Retries**

Program ⇒ Protection ⇒ **Number Retries**

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),
- 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>2.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>200.0</td>
</tr>
<tr>
<td>Units</td>
<td>mS</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>2.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>200.0</td>
</tr>
<tr>
<td>Units</td>
<td>mS</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Acc/Dec Completion</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>2.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>200.0</td>
</tr>
<tr>
<td>Units</td>
<td>mS</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>2.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>200.0</td>
</tr>
<tr>
<td>Units</td>
<td>mS</td>
</tr>
</tbody>
</table>
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 Loss

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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>150.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>250.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>150.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>250.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

**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)

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### 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.*

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>50.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>250.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### 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.*

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>50.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>250.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Accel/Decel #1</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Panel Direction

**Program ⇒ Panel Control ⇒ Panel Direction**

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

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Forward</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Panel Lockout

**Program ⇒ Utility Group ⇒ Panel Lockout**

This parameter disables the selected keypad function.

**Settings:**
- Allow All Keys
- Allow Emergency Off Only

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Allow All Keys</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Panel PID Control

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

Enables/Disables PID control while operating from the keypad.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Enabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**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.

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.
**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).

**Parameter Type — Selection List**

Factory Default — Disabled
Changeable During Run — No

Settings:
- Disabled
- On Trip
- At Frequency
- Trip or At Frequency
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 – 15 as required.
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).

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**, 0001B – 1111B 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.

<table>
<thead>
<tr>
<th>Speed #</th>
<th>S4</th>
<th>S3</th>
<th>S2</th>
<th>S1</th>
<th>O/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>PS# 1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PS# 2</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>PS# 3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>PS# 4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>PS# 5</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>PS# 6</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PS# 7</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>PS# 8</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>PS# 9</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PS# 10</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>PS# 11</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>PS# 12</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>PS# 13</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PS# 14</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PS# 15</td>
</tr>
</tbody>
</table>

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

**Parameter**

- **Type:** Numerical
- **Factory Default:** 60.0
- **Changeable During Run:** Yes
- **Minimum:** **Lower Limit**
- **Maximum:** **Upper Limit**
- **Units:** Hz

---

**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).

<table>
<thead>
<tr>
<th>Speed #</th>
<th>S4</th>
<th>S3</th>
<th>S2</th>
<th>S1</th>
<th>O/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>PS# 0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>PS# 1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PS# 2</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>PS# 3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>PS# 4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PS# 5</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>PS# 6</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>PS# 7</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>PS# 8</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PS# 9</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>PS# 10</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>PS# 11</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>PS# 12</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PS# 13</td>
</tr>
</tbody>
</table>

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

**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).

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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).

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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).

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.0</td>
</tr>
<tr>
<td>PS Speed Mode</td>
<td>Program ➔ Preset Speeds ➔ PS Speed Mode</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>PS Speed Mode 1</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 2</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 3</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 4</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 5</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 6</td>
<td>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.</td>
</tr>
<tr>
<td>PS Speed Mode 7</td>
<td>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.</td>
</tr>
</tbody>
</table>
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**.

### 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**

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

### 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

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.

Regen Stall

Program ⇒ Protection ⇒ Regen Stall

Enables/Disables the Overvoltage Stall and the Overcurrent Stall function during regeneration only.

Release After Run Timer

Program ⇒ Protection ⇒ Rel After Run

This parameter sets the time that the brake will hold after the Run command criteria has been met.
### RES Terminal

Program \(\Rightarrow\) Input Terminals \(\Rightarrow\) **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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection List</strong></td>
<td><strong>Reset</strong></td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

### RES Terminal Delay

Program \(\Rightarrow\) Terminal Delays \(\Rightarrow\) **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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerical</strong></td>
<td><strong>8.0</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>Minimum</td>
<td><strong>2.0</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td><strong>200.0</strong></td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td><strong>mS</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Ridethrough Mode

Program \(\Rightarrow\) Protection \(\Rightarrow\) **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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection List</strong></td>
<td><strong>Disabled</strong></td>
<td><strong>Yes</strong></td>
</tr>
</tbody>
</table>

### Ridethrough Time

Program \(\Rightarrow\) Protection \(\Rightarrow\) **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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerical</strong></td>
<td><strong>2.00</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>Minimum</td>
<td><strong>0.00</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td><strong>320.0</strong></td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td><strong>Seconds</strong></td>
<td></td>
</tr>
</tbody>
</table>

### R Terminal

Program \(\Rightarrow\) Input Terminals \(\Rightarrow\) **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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection List</strong></td>
<td><strong>Reverse</strong></td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>
**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.

**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

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.

---

**RR Torque Reference #2**

Program ➔ Freq Settings ➔ RR Torque 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 **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

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

Parameter Type — Selection List
Factory Default — 9600
Changeable During Run — Yes

RS485 Comm Time-Out Action

Program ⇒ Comm Settings ⇒ 485 Timeout Act

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

Parameter Type — Selection List
Factory Default — 485-Alarm – TTL-None
Changeable During Run — Yes

RS485 Comm Time-Out Time

Program ⇒ Comm Settings ⇒ 485 Timeout Time

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.

Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — 0
Maximum — 100
Units — Seconds
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

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

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.

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.
## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>80.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-Max. Freq.</td>
</tr>
<tr>
<td>Maximum</td>
<td>+Max. Freq.</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-100.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>100.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-100.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>
RX Torque Reference #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 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:

1. Program ⇒ Utility Group ⇒ Command Mode ⇒ Terminal Block.

2. Provide a Run command (F and/or R) to start the system.

Torque Control

Perform the following setup to allow the system to perform torque control from the RX input terminal:

1. Set RX Torque Reference #1.
2. Set the RX input signal level (RX Speed Ref #1) that represents the RX Torque Reference #1.
3. Set RX Torque Reference #2.
4. 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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %

RX Torque Reference #2

Program ⇒ Freq Settings ⇒ RX Torque 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 Torque Control mode.

This is accomplished by establishing an associated V/f output pattern for a given RX input level.

This parameter sets RX Torque Reference #2 and is the output torque value that is associated with the 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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %

RX Torque Reference #1

Program ⇒ Freq Settings ⇒ RX Torque 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 Torque Control mode.

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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %

RX Torque Reference #2

Program ⇒ Freq Settings ⇒ RX Torque 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 Torque Control mode.

This is accomplished by establishing an associated V/f output pattern for a given RX input level.

This parameter sets RX Torque Reference #2 and is the output torque value that is associated with the 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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %
RX2 Speed Frequency #1

Program ⇒ Freq Settings ⇒ RX2 Speed Freq #1

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.

RX2 Speed Frequency #2

Program ⇒ Freq Settings ⇒ RX2 Speed Freq #2

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

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.

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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -100.0
Maximum — 100.0
Units — %

RX2 Speed Reference #2

Program ⇒ Freq Settings ⇒ RX2 Speed Ref #2

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.

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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -100.0
Maximum — 100.0
Units — %
RX2 Torque Reference #1

Program ⇒ Freq Settings ⇒ RX2 Torque Ref #1

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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %

RX2 Torque Reference #2

Program ⇒ Freq Settings ⇒ RX2 Torque Ref #2

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.

Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — -250.0
Maximum — +250.0
Units — %
S1 Terminal

Program ⇒ Input Terminals ⇒ S1 Terminal

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.

Parameter Type — Selection List
Factory Default — Fire Speed
Changeable During Run — No

S10 Terminal

Program ⇒ Input Terminals ⇒ S10 Terminal

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.

Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

S11 Terminal

Program ⇒ Input Terminals ⇒ S11 Terminal

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.

Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No
**S12 Terminal**

Program ⇒ Input Terminals ⇒ **S12 Terminal**

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**

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.

**Parameter Type — Selection List**

**Factory Default — Unassigned**

**Changeable During Run — No**

**Parameter Type — Numerical**

**Factory Default — 8.0**

**Changeable During Run — No**

**Minimum — 2.0**

**Maximum — 200.0**

**Units — mS**

**S2 Terminal**

Program ⇒ Input Terminals ⇒ **S2 Terminal**

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**

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.
S7 Terminal

Program ⇒ Input Terminals ⇒ S7 Terminal

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.

Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

S8 Terminal

Program ⇒ Input Terminals ⇒ S8 Terminal

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.

Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

S9 Terminal

Program ⇒ Input Terminals ⇒ S9 Terminal

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.

Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No
### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical</td>
<td>(ASD-dependent)</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>2.50</td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
<td></td>
</tr>
</tbody>
</table>

### 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)

### 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
**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)

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

Sets the time added to the lower portion of S-pattern 1 and S-pattern 2 (decreases the accel rate at the ramp start).

Parameter Type — Numerical
Factory Default — 25.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 50.00
Units — %

S-Pattern Upper Limit Adjustment

Sets the time added to the upper portion of S-pattern 1 and S-pattern 2 (decreases the decel rate at the ramp end).

Parameter Type — Numerical
Factory Default — 25.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 50.00
Units — %
### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0.10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>8.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>200.0</td>
</tr>
<tr>
<td>Units</td>
<td>mS</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Standby</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
**ST Selection**

Program ⇒ Input Terminals ⇒ **ST Selection**

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

### 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.

![Graph demonstrating torque boost relationship](image)

**Note:** Setting an excessive Torque Boost level may cause nuisance tripping and mechanical stress to loads.

### 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.

### 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.
**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>(ASD-dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Parameter Type</th>
<th>Selection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
**TTL Baud Rate**

**Program ⇒ Comm Settings ⇒ TTL Baud Rate**

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**

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**

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

**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.

**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.

**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.
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

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

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.

**VI/II Speed Frequency #2**

Program ⇒ Freq Settings ⇒ VI/II Freq #2

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

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).

**Parameter Type — Numerical**

Factory Default — 20.00

Changeable During Run — Yes

Minimum — 0.0

Maximum — 100.0

Units — %

---

**VI/II Speed Reference #2**

Program ⇒ Freq Settings ⇒ VI/II Spd Ref #2

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.

**Parameter Type — Numerical**

Factory Default — 0.00

Changeable During Run — Yes

Minimum — 0.0

Maximum — 100.0

Units — %
**VI/II Torque Reference #1**

Program ⇒ Freq Settings ⇒ VI/II Torque Ref #1

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.

---

**VI/II Torque Reference #2**

Program ⇒ Freq Settings ⇒ VI/II Torque Ref #2

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

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

Parameter Type — Selection List
Factory Default — On
Changeable During Run — Yes
Table 7. Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Terminal Assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unassigned</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Forward</strong></td>
<td>— Enables <strong>Forward</strong> operation commands.</td>
</tr>
<tr>
<td><strong>Reverse</strong></td>
<td>— Enables <strong>Reverse</strong> operation commands.</td>
</tr>
<tr>
<td><strong>Standby</strong></td>
<td>— Enables the <strong>Forward</strong> and <strong>Reverse</strong> operation commands (maybe disabled at ST Selection).</td>
</tr>
<tr>
<td><strong>Reset</strong></td>
<td>— Resets the device and any incurred faults.</td>
</tr>
<tr>
<td><strong>Set Speed 1</strong></td>
<td>— Is the LSB of the 4-bit nibble that is used to select a <strong>Preset Speed</strong>.</td>
</tr>
<tr>
<td><strong>Set Speed 2</strong></td>
<td>— Is the second bit of the 4-bit nibble that is used to select a <strong>Preset Speed</strong>.</td>
</tr>
<tr>
<td><strong>Set Speed 3</strong></td>
<td>— Is the third bit of the 4-bit nibble that is used to select a <strong>Preset Speed</strong>.</td>
</tr>
<tr>
<td><strong>Set Speed 4</strong></td>
<td>— Is the MSB of the 4-bit nibble that is used to select a <strong>Preset Speed</strong>.</td>
</tr>
<tr>
<td><strong>Jog</strong></td>
<td>— 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 <strong>Jog Run Frequent</strong> and <strong>Stop Control</strong> may be set from the (Program ⇒) <strong>Freq Settings</strong> menu.</td>
</tr>
<tr>
<td><strong>Emergency Off</strong></td>
<td>— 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 ⇒) <strong>Emg Off Mode Sel</strong> parameter.</td>
</tr>
<tr>
<td><strong>DC Braking</strong></td>
<td>— The ASD outputs a DC current that is applied to the stator windings of the motor to quickly brake the motor.</td>
</tr>
<tr>
<td><strong>A/D 1/2 (Accel/Decel 1-to-2 Switching)</strong></td>
<td>— Acceleration and Deceleration control may be switched between the #1 profile and the #2 profile if using a multiple-accel/decel profile configuration.</td>
</tr>
<tr>
<td><strong>A/D 3/4 (Accel/Decel 3-to-4 Switching)</strong></td>
<td>— Acceleration and Deceleration control may be switched between the #3 profile and the #4 profile if using a multiple-accel/decel profile configuration.</td>
</tr>
<tr>
<td><strong>Motor 1/2 (Motor 1-to-2 Switching)</strong></td>
<td>— Motor control may be switched between the <strong>Motor #1</strong> profile and the <strong>Motor #2</strong> profile if using a multiple-motor profile configuration.</td>
</tr>
<tr>
<td><strong>Motor 3/4 (Motor 3-to-4 Switching)</strong></td>
<td>— Motor control may be switched between the <strong>Motor #3</strong> profile and the <strong>Motor #4</strong> profile if using a multiple-motor profile configuration.</td>
</tr>
<tr>
<td><strong>Torque Lim 1/2 (Torque Limit 1-to-2 Switching)</strong></td>
<td>— Torque control may be switched between the <strong>Torque Limit #1</strong> profile and the <strong>Torque Limit #2</strong> profile if using a multiple-profile configuration.</td>
</tr>
<tr>
<td><strong>Torque Lim 3/4 (Torque Limit 3-to-4 Switching)</strong></td>
<td>— Torque control may be switched between the <strong>Torque Limit #3</strong> profile and the <strong>Torque Limit #4</strong> profile if using a multiple-profile configuration.</td>
</tr>
<tr>
<td><strong>PID (Control) Off</strong></td>
<td>— Activating this terminal turns off PID control. Terminal activation overrides the settings of the <strong>Input Feedback Select</strong> parameter and the <strong>Panel PID Control</strong> parameter.</td>
</tr>
<tr>
<td><strong>Reserved</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Reserved</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Reserved</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Reserved</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Reserved</strong></td>
<td>— No operation.</td>
</tr>
<tr>
<td><strong>Jog Forward (Forced)</strong></td>
<td>— 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 <strong>Jog Run Frequent</strong> and <strong>Stop Control</strong> may be set from the (Program ⇒) <strong>Freq Settings</strong> menu.</td>
</tr>
<tr>
<td><strong>Jog Reverse (Forced)</strong></td>
<td>— 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 <strong>Jog Run Frequent</strong> and <strong>Stop Control</strong> may be set from the (Program ⇒) <strong>Freq Settings</strong> menu.</td>
</tr>
<tr>
<td><strong>Binary Bit 0</strong></td>
<td>— 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 <strong>Frequency Mode</strong> 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 ⇒ <strong>Freq Settings</strong> (see <strong>BIN Speed Frequency #1</strong> for further information on this setting).</td>
</tr>
</tbody>
</table>
**Table 7. (Cont.)** Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary Bit 1</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 2</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 3</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 4</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 5</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 6</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Binary Bit 7</td>
<td>See selection Binary Bit 0 above.</td>
</tr>
<tr>
<td>Forced Stop</td>
<td>Activating this terminal terminates the Run command regardless of the Command Mode setting and initiates the programmed stopping method.</td>
</tr>
<tr>
<td>Reserved</td>
<td>No operation.</td>
</tr>
<tr>
<td>Damper Feedback</td>
<td>Activation of this terminal indicates an open damper and enables the system for normal operation.</td>
</tr>
<tr>
<td>Reserved</td>
<td>No operation.</td>
</tr>
<tr>
<td>Reserved</td>
<td>No operation.</td>
</tr>
<tr>
<td>Reserved</td>
<td>No operation.</td>
</tr>
<tr>
<td>Reserved</td>
<td>No operation.</td>
</tr>
</tbody>
</table>
| 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 Pty 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.

<table>
<thead>
<tr>
<th>Terminal Assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term Prty (Terminal Strip Priority)</td>
<td>Activating this terminal overrides the Frequency Mode setting and assigns speed control to the Control Terminal Strip.</td>
</tr>
<tr>
<td>Editing Enabled (LED)</td>
<td>The LED Keypad system is unavailable at the time of this release.</td>
</tr>
<tr>
<td>Torque/Position (Control Switch)</td>
<td>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.</td>
</tr>
<tr>
<td>Deviation Counter Clear</td>
<td>Activating this terminal clears the Deviation Counter when operating in the Position Control mode.</td>
</tr>
<tr>
<td>Forward Limit (Position Control)</td>
<td>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.</td>
</tr>
<tr>
<td>Reverse Limit (Position Control)</td>
<td>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.</td>
</tr>
<tr>
<td>Light-Load High-Speed Enable</td>
<td>Activating this terminal sets the lower limit of an output frequency range in which the Light-load/High-speed function may be used.</td>
</tr>
<tr>
<td>Snap Stop Control Enable</td>
<td>TBD.</td>
</tr>
<tr>
<td>Pre-excite (Motor)</td>
<td>Activating this terminal applies an excitation current to the motor (holds shaft stationary) for the duration of the activation.</td>
</tr>
<tr>
<td>Brake Command</td>
<td>TBD.</td>
</tr>
<tr>
<td>Brake Release</td>
<td>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.</td>
</tr>
<tr>
<td>Brake Answer</td>
<td>This setting is required when the Brake Release function is used. The function of this input terminal is to receive the returned 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.</td>
</tr>
<tr>
<td>Brake Test</td>
<td>TBD.</td>
</tr>
<tr>
<td>Fire Speed</td>
<td>When activated Preset Speed #1 is output from the ASD.</td>
</tr>
<tr>
<td>MUV Disable</td>
<td>When activated the Main Undervoltage Detect function is disabled.</td>
</tr>
<tr>
<td>Function</td>
<td>Function</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Lower Limit (LL)</td>
<td>POFF Alarm (power supply out of specification)</td>
</tr>
<tr>
<td>Upper Limit (UL)</td>
<td>Brake Release</td>
</tr>
<tr>
<td>Low</td>
<td>(In) Alarm Status</td>
</tr>
<tr>
<td>Acc/Dec Completion</td>
<td>Forward Speed Limit (torque control)</td>
</tr>
<tr>
<td>RCH Speed</td>
<td>Reverse Speed Limit (torque control)</td>
</tr>
<tr>
<td>Fault (All)</td>
<td>INV (ASD) Healthy (Output)</td>
</tr>
<tr>
<td>Fault 2 (except EF or OCL)</td>
<td>Abnormal Communication Alarm 2 (internal cause)</td>
</tr>
<tr>
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<td>OH (Overheat) Alarm</td>
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<td>DBR OL (Dynamic Braking Resistor Overload) Alarm</td>
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<td>In E-Off (Emergency Off)</td>
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<td>Retrying</td>
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<td>Damper Cmd</td>
<td>Designated Data Output 6 (7-bit transmission output)</td>
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<td>PID Deviate (Deviation Limit)</td>
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<td>Start/Stop</td>
<td>Light Load Detection Signal</td>
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<td>Heavy Load Detection Signal</td>
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<td>Soft Fault (OL, OC1, 2, 3, OP)</td>
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<td>Bypass (Output) #1</td>
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<td>Bypass (Output) #2</td>
<td>Rush Suppression Relay Output</td>
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<tr>
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<td>Jogging</td>
<td>Position Reached</td>
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<tr>
<td>Terminal Mode (Control Terminal Strip Operation Command Mode)</td>
<td>EF Alarm</td>
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<td>Run-time Alarm (Total-operation-hours Alarm)</td>
<td>LOD Alarm</td>
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<td>Communication Alarm (external cause)</td>
<td>Fire Alarm</td>
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<td>Forward/Reverse Operation</td>
<td>Damper Alarm</td>
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# 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.

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<tr>
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<th>Parameter Name</th>
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<td>F003</td>
<td>Command Mode</td>
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<td>Frequency Mode</td>
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<td>Reach Detection</td>
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<td>Run Frequency Hysteresis</td>
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<td>DC Injection Braking Current</td>
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<td>DC Injection Braking Time</td>
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<td>DC Injection on at Direction Change</td>
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<td>Shaft Stationary Control</td>
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<td>Jog Stop Control</td>
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<td>Jump Frequency 1</td>
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<td>Jump 1 Bandwidth</td>
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<td>Jump 2 Bandwidth</td>
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<td>Jump Frequency 3</td>
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<td>Jump 3 Bandwidth</td>
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<td>PWM Carrier Frequency</td>
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<td>F300</td>
<td>Speed Search</td>
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<td>F301</td>
<td>Ridethrough Mode</td>
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<tr>
<td>F302</td>
<td>Number of Retries</td>
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<td>F303</td>
<td>Dynamic Braking</td>
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<td>Overvoltage Stall Level (1)</td>
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<td>F305</td>
<td>Maximum Voltage #1</td>
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<td>Voltage Compensation for Dead Time</td>
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<td>DBR Resistance</td>
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<td>DBR Capacity</td>
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<td>Disable Forward Run/Disable Reverse Run</td>
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<td>Commercial Power Switching Freq. Hold Time</td>
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<td>Integral (I) Gain</td>
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<td>F400</td>
<td>Autotune Control</td>
</tr>
<tr>
<td>F401</td>
<td>Motor Slip Gain</td>
</tr>
<tr>
<td>F402</td>
<td>Motor Constant 1</td>
</tr>
<tr>
<td>F403</td>
<td>Motor Constant 2</td>
</tr>
<tr>
<td>F404</td>
<td>Motor Constant 3</td>
</tr>
<tr>
<td>F405</td>
<td>Motor Constant 4</td>
</tr>
<tr>
<td>F410</td>
<td>Motor Constant 5</td>
</tr>
<tr>
<td>F411</td>
<td>Motor Poles</td>
</tr>
<tr>
<td>F412</td>
<td>Motor Capacity</td>
</tr>
<tr>
<td>F413</td>
<td>Motor Type</td>
</tr>
<tr>
<td>F414</td>
<td>Autotune Enable</td>
</tr>
<tr>
<td>F500</td>
<td>Accel #2 Time</td>
</tr>
<tr>
<td>F501</td>
<td>Decel Time #2</td>
</tr>
<tr>
<td>F502</td>
<td>Accel/Decel #1 Pattern</td>
</tr>
<tr>
<td>F503</td>
<td>Accel/Decel #2 Pattern</td>
</tr>
<tr>
<td>F504</td>
<td>Panel Acc/Dec Select</td>
</tr>
<tr>
<td>F505</td>
<td>Accel/Decel #1 Switching Frequency</td>
</tr>
<tr>
<td>F506</td>
<td>S-Pattern Lower Limit Adjustment</td>
</tr>
<tr>
<td>F507</td>
<td>S-Pattern Upper Limit Adjustment</td>
</tr>
<tr>
<td>F600</td>
<td>(Electronic) Thermal Protection #1</td>
</tr>
<tr>
<td>F601</td>
<td>Overcurrent Stall Level</td>
</tr>
<tr>
<td>F602</td>
<td>Trip Save</td>
</tr>
<tr>
<td>F603</td>
<td>Emergency Off Mode</td>
</tr>
<tr>
<td>F604</td>
<td>Emergency Off Time</td>
</tr>
<tr>
<td>F605</td>
<td>Output Phase Loss Detection</td>
</tr>
<tr>
<td>F606</td>
<td>Overload Reduction Frequency</td>
</tr>
<tr>
<td>F607</td>
<td>Motor 150% Run Time</td>
</tr>
<tr>
<td>F608</td>
<td>Inrush Current Time</td>
</tr>
<tr>
<td>Comm. Number</td>
<td>Parameter Name</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>F609</td>
<td>MS Relay (status ANDED) with ST</td>
</tr>
<tr>
<td>F610</td>
<td>Low Current Trip</td>
</tr>
<tr>
<td>F611</td>
<td>Low Current Setting</td>
</tr>
<tr>
<td>F612</td>
<td>Low Current Time</td>
</tr>
<tr>
<td>F613</td>
<td>Short Circuit Test</td>
</tr>
<tr>
<td>F614</td>
<td>Short Circuit Time</td>
</tr>
<tr>
<td>F615</td>
<td>Overtorque Trip</td>
</tr>
<tr>
<td>F616</td>
<td>Overtorque Level Positive</td>
</tr>
<tr>
<td>F617</td>
<td>Overtorque Level Negative</td>
</tr>
<tr>
<td>F618</td>
<td>Overtorque Detection Time</td>
</tr>
<tr>
<td>F620</td>
<td>Cooling Fan Control</td>
</tr>
<tr>
<td>F621</td>
<td>Run Time Alarm Setting</td>
</tr>
<tr>
<td>F622</td>
<td>Abnormal Speed Time</td>
</tr>
<tr>
<td>F623</td>
<td>Overspeed Frequency</td>
</tr>
<tr>
<td>F624</td>
<td>Speed Drop Frequency</td>
</tr>
<tr>
<td>F627</td>
<td>Undervoltage Trip</td>
</tr>
<tr>
<td>F628</td>
<td>Undervoltage Time</td>
</tr>
<tr>
<td>F629</td>
<td>Undervoltage Stall Level</td>
</tr>
<tr>
<td>F630</td>
<td>Brake Fault Time</td>
</tr>
<tr>
<td>F640</td>
<td>Earth Fault Alarm Level</td>
</tr>
<tr>
<td>F641</td>
<td>Earth Fault Alarm Delay</td>
</tr>
<tr>
<td>F642</td>
<td>Earth Fault Trip Level</td>
</tr>
<tr>
<td>F643</td>
<td>Earth Fault Trip Delay</td>
</tr>
<tr>
<td>F660</td>
<td>Adding Input Selection</td>
</tr>
<tr>
<td>F661</td>
<td>Multiplying Input Selection</td>
</tr>
<tr>
<td>F670</td>
<td>AM Terminal Assignment</td>
</tr>
<tr>
<td>F671</td>
<td>AM Terminal Adjustment</td>
</tr>
<tr>
<td>F676</td>
<td>FP Terminal Setting</td>
</tr>
<tr>
<td>F677</td>
<td>FP Terminal Adjustment</td>
</tr>
<tr>
<td>F701</td>
<td>Units for Voltage and Current</td>
</tr>
<tr>
<td>F702</td>
<td>Frequency Multiplier</td>
</tr>
<tr>
<td>F703</td>
<td>Frequency Display Resolution</td>
</tr>
<tr>
<td>Comm. Number</td>
<td>Parameter Name</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>F704</td>
<td>Accel/Decel Display Resolution</td>
</tr>
<tr>
<td>F720</td>
<td>Panel V/f Group</td>
</tr>
<tr>
<td>F721</td>
<td>Panel Stop Pattern</td>
</tr>
<tr>
<td>F722</td>
<td>Panel Reset Select</td>
</tr>
<tr>
<td>F724</td>
<td>Panel PID Control</td>
</tr>
<tr>
<td>F729</td>
<td>LED Option Override Multiplication Gain</td>
</tr>
<tr>
<td>F730</td>
<td>Panel Lockout</td>
</tr>
<tr>
<td>F731</td>
<td>LOD Input Selection</td>
</tr>
<tr>
<td>F732</td>
<td>LOD Start Level</td>
</tr>
<tr>
<td>F733</td>
<td>LOD Delay Time</td>
</tr>
<tr>
<td>F734</td>
<td>LOD Boost Level</td>
</tr>
<tr>
<td>F735</td>
<td>LOD Boost Time</td>
</tr>
<tr>
<td>F736</td>
<td>LOD Feedback Level</td>
</tr>
<tr>
<td>F737</td>
<td>LOD Restart Delay Time</td>
</tr>
<tr>
<td>F800</td>
<td>TTL Baud Rate</td>
</tr>
<tr>
<td>F801</td>
<td>Parity</td>
</tr>
<tr>
<td>F802</td>
<td>ASD Number</td>
</tr>
<tr>
<td>F803</td>
<td>RS485 Comm Time-Out Time</td>
</tr>
<tr>
<td>F804</td>
<td>RS485 Comm Time-Out Action</td>
</tr>
<tr>
<td>F805</td>
<td>TTL Response Time</td>
</tr>
<tr>
<td>F806</td>
<td>TTL Master Output</td>
</tr>
<tr>
<td>F810</td>
<td>Communications Reference Select</td>
</tr>
<tr>
<td>F811</td>
<td>Communications Reference #1</td>
</tr>
<tr>
<td>F812</td>
<td>Communications Speed #1</td>
</tr>
<tr>
<td>F813</td>
<td>Communications Reference #2</td>
</tr>
<tr>
<td>F814</td>
<td>Communications Speed #2</td>
</tr>
<tr>
<td>F820</td>
<td>RS485 Baud Rate</td>
</tr>
<tr>
<td>F821</td>
<td>RS485 Wire Count</td>
</tr>
<tr>
<td>F825</td>
<td>RS485 Response Time</td>
</tr>
<tr>
<td>F826</td>
<td>RS485 Master Output</td>
</tr>
<tr>
<td>F830</td>
<td>Communications Data Type</td>
</tr>
<tr>
<td>F851</td>
<td>Error Detect Time</td>
</tr>
<tr>
<td>Comm. Number</td>
<td>Parameter Name</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>F860</td>
<td>Receive Address</td>
</tr>
<tr>
<td>F861</td>
<td>Transmit Address</td>
</tr>
<tr>
<td>F862</td>
<td>Speed Reference Station</td>
</tr>
<tr>
<td>F863</td>
<td>Speed Reference Address</td>
</tr>
<tr>
<td>F865</td>
<td>Torque Reference Station</td>
</tr>
<tr>
<td>F866</td>
<td>Torque Reference Address</td>
</tr>
<tr>
<td>F868</td>
<td>Fault Detect Station</td>
</tr>
<tr>
<td>F961</td>
<td>Switch-on-the-Fly</td>
</tr>
<tr>
<td>F962</td>
<td>4–20 mA Loss Selection</td>
</tr>
<tr>
<td>F963</td>
<td>Ramped PWM</td>
</tr>
<tr>
<td>F964</td>
<td>4–20 mA Speed Reference</td>
</tr>
<tr>
<td>F965</td>
<td>User Unit #1</td>
</tr>
<tr>
<td>F966–F969</td>
<td>User Unit #2 – 5</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>Keypad Display</th>
<th>Function</th>
<th>Description</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM1</td>
<td>Comm1 Error</td>
<td>Internal communications error.</td>
<td>• Improperly programmed ASD.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Improper communications settings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Improperly connected cables.</td>
</tr>
<tr>
<td>CM2</td>
<td>Comm2 Error</td>
<td>External communications error.</td>
<td></td>
</tr>
<tr>
<td>EMG</td>
<td>Emergency Off</td>
<td>Output signal from the ASD is terminated and a brake may be applied if so configured.</td>
<td>• Stop</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EOFF command received remotely.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ASD reset required.</td>
</tr>
<tr>
<td>MOFF</td>
<td>Main Undervoltage</td>
<td>Undervoltage condition at the 3-phase AC input to the ASD.</td>
<td>• Low 3-phase utility voltage.</td>
</tr>
<tr>
<td>OC</td>
<td>Over Current</td>
<td>ASD output current greater than the parameter F601 setting.</td>
<td>• Defective IGBT (U, V, or W).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ASD output to the motor is connected incorrectly. Connect the motor and retry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ASD output phase-to-phase short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The ASD is starting into a spinning motor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Motor/machine jammed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mechanical brake engaged while the ASD is starting or while running.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Accel/Decel time is too short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Voltage Boost setting is too high.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Load fluctuations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ASD operating at an elevated temperature.</td>
</tr>
<tr>
<td>*OH</td>
<td>Overheat</td>
<td>ASD ambient temperature excessive.</td>
<td>• ASD is operating at an elevated temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ASD is too close to heat-generating equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cooling fan vent is obstructed (see Mounting the ASD on pg. 16).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cooling fan is inoperative.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Internal thermistor is disconnected.</td>
</tr>
<tr>
<td>OJ</td>
<td>Timer</td>
<td>Run-time counter exceeded.</td>
<td>• <strong>Type Reset</strong> required; select <strong>Clear run timer</strong>.</td>
</tr>
</tbody>
</table>

* Reset ignored if active.
<table>
<thead>
<tr>
<th>Keypad Display</th>
<th>Function</th>
<th>Description</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>*OLI</td>
<td>ASD Overload</td>
<td>Load requirement in excess of the capability of the ASD.</td>
<td>• The carrier frequency is too high.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• An excessive load.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Acceleration time is too short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DC damping rate is set too high.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The motor is starting into a spinning load after a momentary power failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The ASD is improperly matched to the application.</td>
</tr>
<tr>
<td>OLM</td>
<td>Motor Overload</td>
<td>Load requirement in excess of the capability of the motor.</td>
<td>• V/f parameter improperly set.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Motor is locked.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Continuous operation at low speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The load is in excess of what the motor can deliver.</td>
</tr>
<tr>
<td>*OLR</td>
<td>Resistor Overload</td>
<td>Excessive current at the <a href="#">Dynamic Braking Resistor</a>.</td>
<td>• Deceleration time is too short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DBR configuration improperly set.</td>
</tr>
<tr>
<td>*OP</td>
<td>Overvoltage</td>
<td>DC bus voltage exceeds specifications.</td>
<td>• ASD attempting to start into a spinning motor after a momentary power loss.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Incoming utility power is above the specified range.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Decel time is too short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Voltage spikes at the 3-phase input; install inductive filter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DBR required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DBR resistance value is too high.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DBR function is turned off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Overvoltage Stall feature is turned off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• System is regenerating.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Load instability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Disable the Ridethrough function (<a href="#">F302</a>).</td>
</tr>
<tr>
<td>OT</td>
<td>Overtorque</td>
<td>Torque requirement in excess of the setting of parameter <a href="#">F616 or F617</a> for a time longer than the setting of parameter <a href="#">F618</a>.</td>
<td>• ASD is not correctly matched to the application.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Parameter <a href="#">F616</a> or <a href="#">F617</a> setting is too low.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Obstructed load.</td>
</tr>
<tr>
<td>*POFF</td>
<td>Control Undervoltage</td>
<td>Undervoltage condition at the 5, 15, or the 24 VDC supply.</td>
<td>• Defective Control board.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Excessive load on power supply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Low input voltage.</td>
</tr>
<tr>
<td>PtSt</td>
<td>Reference Point</td>
<td>Two speed-reference frequency setpoint values are too close to each other.</td>
<td>• Two speed reference frequency setpoints are too close to each other (increase the difference).</td>
</tr>
<tr>
<td>UC</td>
<td>Undercurrent</td>
<td>Output current of the ASD is below the level defined at parameter <a href="#">F611</a> and remains there for the time set at parameter <a href="#">F612</a>.</td>
<td></td>
</tr>
</tbody>
</table>

* 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>
<thead>
<tr>
<th>Keypad</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atn</td>
<td>Autotune Active</td>
<td>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.</td>
</tr>
<tr>
<td>db or dbOn</td>
<td>DC Braking Active</td>
<td>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.</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Fault Screen Display</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter (ASD) OL</td>
<td>• Acceleration time is too short.</td>
</tr>
<tr>
<td></td>
<td>• DC Injection current is too high.</td>
</tr>
<tr>
<td></td>
<td>• V/f setting needs to be adjusted.</td>
</tr>
<tr>
<td></td>
<td>• Motor running during restart.</td>
</tr>
<tr>
<td></td>
<td>• ASD or the motor is improperly matched to the application.</td>
</tr>
<tr>
<td>Autotuning Err</td>
<td>• Autotune readings that are significantly inconsistent with the configuration information.</td>
</tr>
<tr>
<td></td>
<td>• A non-3-phase motor is being used.</td>
</tr>
<tr>
<td></td>
<td>• Incorrect settings at parameter F400, F413, or F414.</td>
</tr>
<tr>
<td></td>
<td>• Using a motor that has a significantly smaller rating than the ASD.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• Motor is running during the Autotune function.</td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Fault Screen Display</th>
<th>Possible Causes</th>
</tr>
</thead>
</table>
| 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.
<table>
<thead>
<tr>
<th>Fault Screen Display</th>
<th>Possible Causes</th>
</tr>
</thead>
</table>
| 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.
<table>
<thead>
<tr>
<th>Fault Screen Display</th>
<th>Possible Causes</th>
</tr>
</thead>
</table>
| 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 |   |   |   |   |   |   |   |   |   |   |
| 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.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Shipping Weight (lbs. max.)</th>
<th>Conduit Plate Number Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010B</td>
<td>20</td>
<td>55295</td>
</tr>
<tr>
<td>2015B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2035B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2055B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2080B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4015B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4025B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4035B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4055B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4080B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4110B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4160B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6015B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6025B</td>
<td></td>
<td></td>
</tr>
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<tr>
<td>6080B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6120B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6160B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Dimensions are in inches/millimeters.

Figure 25. Conduit Plate 55295. Also see the optional Conduit Box on pg. 158.
Table 15. VT130-Series Enclosure Size 2.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Shipping Weight (lbs. max.)</th>
<th>Conduit Plate Number Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130Q7U</td>
<td></td>
<td>55361</td>
</tr>
<tr>
<td>2110B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2160B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2220B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2270B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2330B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4220B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4270B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4330B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4400B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4500B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4600B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6220B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6270B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6330B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6400B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6500B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * Enclosure has conduit extender box.

Figure 26. Conduit Plate 55361.
Table 16. VT130-Series Enclosure Size 3.

<table>
<thead>
<tr>
<th>Model Number VT130Q7U</th>
<th>Shipping Weight (lbs. max.)</th>
<th>Conduit Plate Number (bottom)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*2400B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4750B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*410KB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*412KB</td>
<td>175</td>
<td>55547</td>
</tr>
<tr>
<td>6600B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6750B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>610KB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * Enclosure has conduit extender box.

Figure 27. Conduit Plate 55547.
Table 17. VT130-Series Enclosure Size 4.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Shipping Weight (lbs. max.)</th>
<th>Conduit Plate Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130Q7U</td>
<td>250</td>
<td>Conduit Plate Bottom</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conduit Plate Top</td>
</tr>
</tbody>
</table>

415KB

420KB

612KB

615KB

Figure 28. Conduit Plates 49900 and 49648.
Table 18. VT130-Series Enclosure Size 5.

<table>
<thead>
<tr>
<th>Model Number VT130Q7U</th>
<th>Shipping Weight (lbs. max.)</th>
<th>Conduit Plate Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>425KB</td>
<td>550</td>
<td>54086</td>
</tr>
<tr>
<td>430KB</td>
<td></td>
<td></td>
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<td>435KB</td>
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<tr>
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<td></td>
<td></td>
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<tr>
<td>625KB</td>
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<tr>
<td>630KB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>635KB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.).
### 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.

<table>
<thead>
<tr>
<th>Model No. VT130Q7U</th>
<th>Circuit Breaker Rating (Amps)</th>
<th>Typical Wire/Cable Size (AWG or kcmil)</th>
<th>Lug Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input/Output Power</td>
<td>AM, FM, and II Terminals</td>
<td>Control Terminal Strip</td>
</tr>
<tr>
<td>2010B</td>
<td>15</td>
<td>14</td>
<td>20 (3-core shield)</td>
</tr>
<tr>
<td>2015B</td>
<td>15</td>
<td>14</td>
<td>18 (2-core shield)</td>
</tr>
<tr>
<td>2025B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>2035B</td>
<td>20</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>2055B</td>
<td>30</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2080B</td>
<td>50</td>
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<td></td>
</tr>
<tr>
<td>2110B</td>
<td>75</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>2160B</td>
<td>75</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2220B</td>
<td>100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2270B</td>
<td>125</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2330B</td>
<td>150</td>
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<td></td>
</tr>
<tr>
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<td>2/0</td>
<td></td>
</tr>
<tr>
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<td>250</td>
<td>3/0</td>
<td></td>
</tr>
<tr>
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<td>250 – *1/0</td>
<td></td>
</tr>
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<td>*3/0</td>
<td></td>
</tr>
<tr>
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<td>500</td>
<td>*250</td>
<td></td>
</tr>
<tr>
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<td>*350</td>
<td></td>
</tr>
<tr>
<td>215KB</td>
<td>700</td>
<td>*400</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** (*) Indicates that the item is one of a set of two parallel cables.
Table 20. **Q7 ASD 460 Volt Drive Cable/Terminal Specifications.**

<table>
<thead>
<tr>
<th>Model No. VT130Q7U</th>
<th>Circuit Breaker Rating (Amps)</th>
<th>Typical Wire/Cable Size (AWG or kcmil)</th>
<th>Lug Size</th>
<th>ASD Input/Output Power Lug Wire Capacity (AWG or kcmil)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input/Output Power Wire Size</td>
<td>AM, FM, and II Terminals</td>
<td>Control Terminal Strip</td>
<td></td>
</tr>
<tr>
<td>4015B</td>
<td>15</td>
<td>14</td>
<td>20</td>
<td>24 – 8</td>
</tr>
<tr>
<td>4025B</td>
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<td>18</td>
<td>18 – 4</td>
</tr>
<tr>
<td>4035B</td>
<td>15</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4055B</td>
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<td></td>
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<tr>
<td>4080B</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4160B</td>
<td>30</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4220B</td>
<td>50</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4270B</td>
<td>75</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4330B</td>
<td>75</td>
<td>6</td>
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<tr>
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<td>16 – 3</td>
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<td>12 – 4/0</td>
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<td>3/0</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>420KB</td>
<td>400</td>
<td>*3/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425KB</td>
<td>500</td>
<td>*250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>430KB</td>
<td>600</td>
<td>*350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>435KB</td>
<td>700</td>
<td>*500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>440KB</td>
<td>700</td>
<td>*500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* (*) Indicates that the item is one of a set of two parallel cables.
Table 21. **Q7 ASD** 600 Volt Drive Cable/Terminal Specifications.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Circuit Breaker Rating (Amps)</th>
<th>Typical Wire/Cable Size (AWG or kcmil)</th>
<th>Lug Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130Q7U</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6015B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6025B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6035B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6060B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6080B</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6120B</td>
<td>30</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>6160B</td>
<td>30</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6220B</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6270B</td>
<td>50</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6330B</td>
<td>50</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6400B</td>
<td>75</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6500B</td>
<td>100</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6600B</td>
<td>100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6750B</td>
<td>125</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>610KB</td>
<td>150</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>612KB</td>
<td>200</td>
<td>2/0</td>
<td></td>
</tr>
<tr>
<td>615KB</td>
<td>250</td>
<td>3/0</td>
<td></td>
</tr>
<tr>
<td>620KB</td>
<td>300</td>
<td>250 – *2/0</td>
<td></td>
</tr>
<tr>
<td>625KB</td>
<td>400</td>
<td>*3/0</td>
<td></td>
</tr>
<tr>
<td>630KB</td>
<td>500</td>
<td>*250</td>
<td></td>
</tr>
<tr>
<td>635KB</td>
<td>500</td>
<td>*300</td>
<td></td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Rated KVA</th>
<th>Motor HP/Kw</th>
<th>Input Voltage 3-Ph 50/60 ± 2 Hz</th>
<th>Output Voltage 3-Ph Variable Frequency</th>
<th>Output Current 100% Continuous</th>
<th>Overload Current 110% for 60 Secs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130Q7U</td>
<td>1.0</td>
<td>0.75/0.56</td>
<td></td>
<td></td>
<td>3.7 A</td>
<td>4.1 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>1.5</td>
<td>1.0/0.75</td>
<td></td>
<td></td>
<td>4.8 A</td>
<td>5.3 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>2.5</td>
<td>2.0/1.5</td>
<td></td>
<td></td>
<td>7.8 A</td>
<td>8.6 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>3.5</td>
<td>3.0/2.2</td>
<td></td>
<td></td>
<td>11.0 A</td>
<td>12.1 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>5.5</td>
<td>5.0/3.7</td>
<td></td>
<td></td>
<td>17.5 A</td>
<td>19.3 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>8.0</td>
<td>7.5/5.6</td>
<td></td>
<td></td>
<td>25.3 A</td>
<td>27.8 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>11.0</td>
<td>10.0/7.5</td>
<td></td>
<td></td>
<td>32.2 A</td>
<td>35.4 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>16.0</td>
<td>15.0/11.2</td>
<td></td>
<td></td>
<td>48.3 A</td>
<td>53.1 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>20.0</td>
<td>20.0/14.9</td>
<td>200 – 240 VAC (±10%)</td>
<td></td>
<td>62.1 A</td>
<td>68.3 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>25.0</td>
<td>25.0/18.5</td>
<td></td>
<td></td>
<td>78.2 A</td>
<td>86.0 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>30.0</td>
<td>30.0/22.0</td>
<td></td>
<td></td>
<td>92.0 A</td>
<td>101.2 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>40.0</td>
<td>40.0/30.0</td>
<td></td>
<td></td>
<td>130.0 A</td>
<td>143.0 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>50.0</td>
<td>50.0/37.3</td>
<td></td>
<td></td>
<td>156.0 A</td>
<td>171.6 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>60.0</td>
<td>60.0/44.7</td>
<td></td>
<td></td>
<td>192.0 A</td>
<td>211.0 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>75.0</td>
<td>75.0/56.0</td>
<td></td>
<td></td>
<td>248.0 A</td>
<td>272.8 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>100</td>
<td>100.0/74.6</td>
<td></td>
<td></td>
<td>312.0 A</td>
<td>343.2 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>125</td>
<td>125.0/93.2</td>
<td></td>
<td></td>
<td>370.0 A</td>
<td>407.0 A</td>
</tr>
<tr>
<td>VT130Q7U</td>
<td>150</td>
<td>150.0/112.0</td>
<td></td>
<td></td>
<td>415.0 A</td>
<td>456.5 A</td>
</tr>
</tbody>
</table>
Table 23. 460 Volt NEMA Type-1 Chassis standard ratings table.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Rated KVA</th>
<th>Motor HP/Kw</th>
<th>Input Voltage 3-Ph 50/60 ± 2 Hz</th>
<th>Output Voltage 3-Ph Variable Frequency</th>
<th>Output Current 100% Continuous</th>
<th>Overload Current 110% for 60 Secs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130Q7U</td>
<td>1.5</td>
<td>1.0/0.75</td>
<td></td>
<td></td>
<td>2.6 A</td>
<td>2.9 A</td>
</tr>
<tr>
<td>VT162Q7U</td>
<td>2.5</td>
<td>2.0/1.5</td>
<td></td>
<td></td>
<td>3.4 A</td>
<td>4.3 A</td>
</tr>
<tr>
<td>VT163Q7U</td>
<td>3.5</td>
<td>3.0/2.2</td>
<td></td>
<td></td>
<td>4.8 A</td>
<td>5.3 A</td>
</tr>
<tr>
<td>VT165Q7U</td>
<td>5.5</td>
<td>5.0/3.7</td>
<td></td>
<td></td>
<td>7.6 A</td>
<td>8.4 A</td>
</tr>
<tr>
<td>VT180Q7U</td>
<td>8.0</td>
<td>7.5/5.6</td>
<td></td>
<td></td>
<td>11.0 A</td>
<td>12.1 A</td>
</tr>
<tr>
<td>VT110Q7U</td>
<td>11.0</td>
<td>10.0/7.5</td>
<td></td>
<td></td>
<td>14.0 A</td>
<td>15.4 A</td>
</tr>
<tr>
<td>VT160Q7U</td>
<td>16.0</td>
<td>15.0/11.2</td>
<td></td>
<td></td>
<td>21.0 A</td>
<td>23.1 A</td>
</tr>
<tr>
<td>VT220Q7U</td>
<td>22.0</td>
<td>20.0/14.9</td>
<td></td>
<td></td>
<td>27.0 A</td>
<td>29.7 A</td>
</tr>
<tr>
<td>VT330Q7U</td>
<td>33.0</td>
<td>30.0/22.0</td>
<td></td>
<td></td>
<td>34.0 A</td>
<td>37.4 A</td>
</tr>
<tr>
<td>VT400Q7U</td>
<td>40.0</td>
<td>40.0/30.0</td>
<td></td>
<td></td>
<td>42.0 A</td>
<td>46.2 A</td>
</tr>
<tr>
<td>VT450Q7U</td>
<td>50.0</td>
<td>50.0/37.0</td>
<td></td>
<td></td>
<td>52.0 A</td>
<td>57.2 A</td>
</tr>
<tr>
<td>VT600Q7U</td>
<td>60.0</td>
<td>60.0/45.0</td>
<td></td>
<td></td>
<td>65.0 A</td>
<td>71.5 A</td>
</tr>
<tr>
<td>VT750Q7U</td>
<td>75.0</td>
<td>75.0/55.0</td>
<td></td>
<td></td>
<td>77.0 A</td>
<td>84.7 A</td>
</tr>
<tr>
<td>VT100K</td>
<td>100</td>
<td>100/75.0</td>
<td></td>
<td></td>
<td>96.0 A</td>
<td>105.6 A</td>
</tr>
<tr>
<td>VT12K</td>
<td>125</td>
<td>125/90.0</td>
<td></td>
<td></td>
<td>124.0 A</td>
<td>136.4 A</td>
</tr>
<tr>
<td>VT15K</td>
<td>150</td>
<td>150/110</td>
<td></td>
<td></td>
<td>156.0 A</td>
<td>171.6 A</td>
</tr>
<tr>
<td>VT20K</td>
<td>200</td>
<td>200/150</td>
<td></td>
<td></td>
<td>190.0 A</td>
<td>209.0 A</td>
</tr>
<tr>
<td>VT25K</td>
<td>250</td>
<td>250/185</td>
<td></td>
<td></td>
<td>240.0 A</td>
<td>264.0 A</td>
</tr>
<tr>
<td>VT30K</td>
<td>300</td>
<td>300/220</td>
<td></td>
<td></td>
<td>302.0 A</td>
<td>332.2 A</td>
</tr>
<tr>
<td>VT35K</td>
<td>350</td>
<td>350/280</td>
<td></td>
<td></td>
<td>370.0 A</td>
<td>407.0 A</td>
</tr>
<tr>
<td>VT40K</td>
<td>400</td>
<td>400/298</td>
<td></td>
<td></td>
<td>450.0 A</td>
<td>495.0 A</td>
</tr>
</tbody>
</table>

Note: Input Voltage Level (Max.) is 380 – 480 VAC (±10%).
Table 24. 600 Volt NEMA Type-1 Chassis standard ratings table.

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

## Numerics

12-pulse operation, 17

## A

- About This Manual, 1
- Accel/Decel Display Resolution, 46
- Accel/Decel Selection, 28
- Alarms, 145
- AM, 19, 21
- AM Output, 35
- AM Terminal Assignment, 47
- AM, FM, FP, and Analog 1&2 settings, 48
- AM/FM, 40
- ASD Capacity, 13
- ASD Control, 23
- ASD Load, 35
- ASD Overload Ratio, 35
- ASD-FUSEKIT-12P, 17
- ASD-NANOCOM, 23
- At-trip Recorded Parameters, 151
- Autotuning Err, 147

## B

- Bezel Mounting Dimensions, 31
- Bezel Mounting Hardware, 29

## C

- Cable/Terminal Specifications, 159
- CC, 19, 21
- CE Compliance Requirements, 10
- change direction, 32
- Circuit breaker configuration, 15
- Circuit Breaker Rating, 159
- Clearing a Trip, 151
- CM1, 145
- CM2, 145
- CN7 Pinout, 24
- CNU1 and CNU2 Pinout, 24
- CNU2 Pinout, 24
- CNU3 Pinout, 24
- Comm Error, 148
- Comm. Settings, 39
- Commercial Power Wait Time, 56
- Common Serial (TTL), 23
- Communications Numbers, 134

## D

- Damper Command, 21
- DBR Overcurrent, 148
- DBR Overload, 148
- DC Voltage, 35
- Default Setting Changes, 32
- default setting changes, 33
- Default Term. Setting, 19
- Direction, 35
- Discrete Input, 19
- Discrete Output, 19
- Disposal, 4
- Drive Characteristics, 13

## E

- EEPROM Write Err, 148
- EMG, 145
- Enclosure Dimensions, 152
- Enclosure Dimensions/Weight, 153
- Enclosure Size 1, 153
- Enclosure Size 2, 154
- Enclosure Size 3, 155
- Enclosure Size 4, 156
- Enclosure Size 5, 157

Concerns about this publication, 1
Conductor Requirements, 5
Conduit Box (option), 158
Conduit Box and Cover, 158
Conduit Box Information, 158
Conduit Plate, 158
Conduit Plate 54086, 157
Conduit Plate 55295, 153
Conduit Plate 55361, 154
Conduit Plate 55547, 155
Conduit Plate Information, 152
Conduit Plates 49900 and 49648, 156
Connecting the ASD, 16
Connection Diagram, 26
contact Toshiba, 2
Control Board, 23
Control Terminal Strip, 19, 22
CPU Error, 148
Ctrl EEPROM Err, 148
Ctrl Undervolts, 148
Current/Voltage Specifications, 162
Customer Support Center, 2

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Encoder Loss, 148
E-Off, 148
Equipment Inspection, 3
Explosion Hazard Symbol, 2
Extender Cables, 29

F
F, 19, 20
Fault, 144
Faults, 144
Feedback Settings, 39
Ferraz Shawmut Semiconductor fuse, 17
Filter Selection Table, 11
Fire Speed, 20, 111
FLA, 19, 21
FLA, B, and C switching relationship, 21
Flash Error, 148
FLB, 19, 21
FLC, 19, 21
FM, 19, 21
FM Output, 35
FM Terminal Assignment, 66
FP, 19, 21
Frequency Command, 35
Frequency Command screen, 32
Frequency Setting, 34
Frequency Settings, 41
Fundamental #1, 36
Fundamental #2, 36
Fuse, 148

G
Gate Array Error, 148
General Safety Information, 1
GND Fault, 148

H
Handling and Storage, 3

I
I/O and Control, 19
I/O Circuit Configurations, 25
ICCDESIGNS, 23
II, 19, 20
Important Notice, 2
In(put) Phase Loss, 148
Input Power, 35
Input Terminals, 35, 36, 37
Inrush Current Time, 68
Installation and Connections, 14
Installation Notes, 14
Installation Precautions, 4
Introduction, 2
Inverter (ASD) OL, 147

K
Keypad, 27
Keypad ASD-MTG-KIT Dimensions (mounting), 31
Keypad Features, 27
Keypad Installation Precautions, 29
Keypad Operation, 28
Keypad Remote Mounting, 29
Keypad Remote Mounting using the ASD-MTG-KIT, 30
Kilowatt Hours, 35

L
L1/R, 17
L2/S, 17
L3/T, 17
LCD Display, 27
Lead Length Specifications, 18
Light Load Conditions, 12
Linear, 45
Load Drooping, 148
Load End OC, 148
Load-produced Negative Torque, 12
Local mode, 27
Local/Remote Key, 27
Local/Run/Manual System Status LEDs, 27
Lug Size, 159

M
Main EEPROM Err, 148
Main Undervolts, 148
Maintenance Precautions, 8
Manual’s Purpose and Scope, 1
Menu Items, 36
menu mapping, 34
Menu Options, 34
Mode 1/2 Switching Frequency, 75
MOFF, 145
Monitor, 42
Monitor Mode, 35
Monitor Screen, 42
Monitored Parameters, 42
Motor Braking, 13
Motor Characteristics, 12
Motor connection diagram, 17
Motor Load, 35
Motor Overload, 149
Motor Overload Ratio, 35
Motor Settings, 40
Mounting Requirements, 5
Mounting the ASD, 16
MS1 AUX, 14

O
OC, 145
OH, 145
OI, 145
OLI, 146
OLM, 146
OLR, 146
OP, 146
Operation (Local), 32
Operational and Maintenance Precautions, 8
Option PCB Error, 149
OT, 146
Out(put) Phase Loss, 149
OUT1, 19, 21
OUT2, 19, 21
Output Current, 35
Output Frequency Screen, 34
Output Power, 35
Output Terminal Assignments, 133
Output terminal selections, 48
Output Terminals, 35, 37
Output Voltage, 35
Overcurrent Acc, 149
Overcurrent Dec, 149
Over-current Protection, 13
Overcurrent Run, 149
Overcurrent Stall, 83
Overheat, 149
Overload Protection, 12
Overtorque, 150
Overvolt Accel, 150
Overvolt Decel, 150
Overvolt Run, 150
Overvoltage Stall Level, 84

Q
Qualified Personnel, 3

R
R, 19, 20
RAM Err, 150
Ramped PWM, 28
Read/Write Key, 27
Remote Keypad Required Hardware, 29
Remote mode, 27
RES, 19, 20
Reset Selection, 28
ROM Err, 150
Root Menus, 34
RR, 19, 20
RR Input, 35
RS232, 23
RS485, 23
Run Key, 27
Run Mode|Manual/Auto Key, 27
Run Time, 35
RX, 19, 20
RX Input, 35
RX2 Input, 35
S
S1, 19, 20
S2, 19, 20
S3, 19, 20
S4, 19, 20
Search, 36
Search (Changed From Default Parameters), 115
Search (for default settings changes), 33
Service Life Information, 9
Setup, 36
Setup Requirements, 7
Setup Screen, 34
Setup/Program/Monitor Key (SPM), 27
Shipping Weight, 153
Shipping Weight (lbs.), 153
Sink/Source Error, 150
S-pattern 1, 45
S-pattern 2, 45
Special Controls, 37
Special Symbols, 2
Speed Ctrl|Local/Remote Key, 27
Speed Error, 150
ST, 19, 20
ST Signal Selection, 120, 130
ST1, 14
Startup and Test, 18
Stop Pattern, 28
Stop|Reset Key, 27
SW1, 22
SW2, 22
System Configuration, 34
System Grounding, 16
System Integration Precautions, 6
System Operation, 32

T
T1/U, 17
T2/V, 17
T3/W, 17
Terminal Delays, 37
Terminal Descriptions, 20
Toshiba’s products and services, 2
Trip Code, 35
Trip History, 151
Trip Hold Frequency, 35
Trip Record at Monitor Screen, 151
Trips, 144
Trouble Shooting, 144
Type(form) Error, 150
Typical Wire/Cable Size, 159, 160, 161

U
U Phase OC, 150
UC, 146
Under Current Trip, 148
Up/Down Arrow Key, 27
User Notification codes, 144
Utility Group, 40

V
V Phase OC, 150
V/f Group, 28
VI, 19, 21
VI/II Input, 35
Viewing Trip Information, 151

W
W Phase OC, 150
Warning Labels, 2
Warranty Card, 2