TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

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ADJUSTABLE SPEED DRIVES

Q9+ DN-68249-003

INSTALLATION & OPERATION MANUAL

Q9 Plus ASD

Installation & Operation Manual

Document Number: 68249-003

April, 2020

Introduction

Congratulations on the purchase of the Q9 Plus Adjustable Speed Drive!

The Q9 Plus Adjustable Speed Drive (ASD) is a solid-state AC drive that features Toshiba International Corporation's (TIC) Virtual Linear Pump Technology, Time-Based Alternation, and Vector Control algorithms. These algorithms provide easy setup, enhanced reliability, and precise control under the most demanding conditions — all while enabling the motors of the system to develop high starting torque and providing compensation for motor slip. The result is smooth, quick starts and highly efficient operation. Additionally, as a BACnet®-compatible device, the Q9 Plus ASD supports interoperable HVAC systems.

Virtual Linear Pump Technology was designed to remove the guesswork that is normally associated with the setup of pumping systems. It allows for pump curve responses that are direct, linear, and precise at any flow or pressure setting. Eliminating the normal concerns of the adverse effects of conventional pumping system control response curves, Virtual Linear Pump Technology allows the system to adapt seamlessly and easily to peak load demands while maintaining the same degree of high performance output and reliability across the entire load range — all without any user intervention!

Time-Based Alternation provides a more evenly-spread machine wear pattern for all motors and pumps of the system by optimizing load sharing such that all pumps are allowed to alternate as the primary pump while the remaining pump(s) operate in an ancillary mode for time intervals that are determined by the user. Time-Based Alternation also offers a significantly decreased level of system down-time during a pump failure by allowing the system to operate, albeit with a diminished capacity.

The Q9 Plus ASD is a very powerful tool, yet surprisingly simple to operate. The user-friendly Electronic Operator Interface (EOI) of the Q9 Plus ASD has an easy-to-read LCD screen and a high-intensity LED display. The EOI provides easy access to the many monitoring and programming features of the Q9 Plus ASD.

The Q9 Plus ASD uses digitally-controlled pulse width modulation. The programmable functions may be accessed via the easy-to-use menu, via the Direct Access Numbers (see pg. 73), or using communications via a host PC. Easy system access to the monitoring and control features combined with Toshiba's high-performance software delivers unparalleled motor control precision and reliability.

This manual has been prepared for the installer, user, and maintenance personnel.

About This Manual

This manual was written by the Toshiba International Corporation Technical Publications Group. This group is tasked with providing technical documentation for the Q9 Plus Adjustable Speed Drive. Every effort has been made to provide accurate and concise information to you, our customer.

At Toshiba International Corporation, we're continuously searching for better ways to meet the constantly changing needs of our customers. E-mail your comments, questions, or concerns about this publication to Technical-Communications-Dept@toshiba.com.

Purpose and Scope of Manual

This manual provides information on how to safely install, operate, maintain, and dispose of your Q9 Plus Adjustable Speed Drive. The information provided in this manual is applicable to the Q9 Plus Adjustable Speed Drive only.

This 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 describes the warning labels and symbols that are used throughout the manual. 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 English and/or the metric equivalent.

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

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

Printed in the U.S.A.

Contacting TIC's Customer Support Center

Toshiba International Corporation'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 Support Center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Center's toll free number is US (800) 231-1412/Fax (713) 937-9349; CAN (800) 872-2192; MEX 01 (800) 527-1204.
For after-hours support follow the directions in the outgoing message when calling.

You may also contact Toshiba International Corporation by writing to:

Toshiba International Corporation

13131 West Little York Road

Houston, Texas 77041-9990

Attn: ASD Product Manager.

For further information on Toshiba International Corporation's products and services, please visit our web site at www.toshiba.com/tic/.

TOSHIBA INTERNATIONAL CORPORATION

Q9 Plus Adjustable Speed Drive

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:______________________________

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, operations, or maintenance of this equipment. Should additional information be required, contact the Toshiba Customer Support Center.

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 the prior written consent of Toshiba International Corporation may void all warranties and may void the UL/CSA 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/or equipment damage. In no event will Toshiba International Corporation be responsible or liable for direct, indirect, special, or consequential damage or injury that may result from the use or misuse of this equipment.

Warranty Information

Toshiba Industrial Corporation (TIC) warrants that the received goods will be free of defects in materials and workmanship.

The complete Toshiba warranty for this equipment is located at the Toshiba.com/tic website.

Activating the TIC Warranty

To activate the TIC warranty for the received equipment go the Toshiba General Warranty & Product Registration site listed below:

https://www.toshiba.com/tic/service-warranty/ general-warranty-product-registration.

Complete all of the required fields of the form and click Submit.

A confirmation of the enacted warranty will be mailed to the registered contact entity.

Table of Contents

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 is comprised of an equilateral triangle enclosing an exclamation mark. This indicates that a potential personal injury hazard exists.

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.

 **DANGER**

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided or if instructions are not followed precisely, will result in serious injury to personnel or loss of life.

 **WARNING**

The word **WARNING** preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided or if instructions are not followed precisely, could result in serious injury to personnel or loss of life.

 **CAUTION**

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

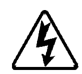
CAUTION

The word **CAUTION** without the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided or if instructions are not followed precisely, may result in equipment or property damage.

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 loss of life.

Electrical Hazard Symbol



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

Explosion Hazard Symbol

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

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 user directions that are contained in this manual.

Warning labels that are attached to the equipment will include an equilateral triangle enclosing an exclamation mark. **DO NOT** remove or cover any of these labels. If the labels are damaged or if additional labels are required, contact the TIC Customer Support Center.

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 loss of life if safe procedures or methods are not followed as outlined in this manual.

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.
- Be 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, lock-out/tag-out 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.

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 damaged parts, missing parts, or concealed damage that may have occurred during shipping. 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 the TIC Customer Support Center.
- **DO NOT** install the ASD if it is damaged or if it is missing any component(s).
- Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.
- Modification of this equipment is dangerous and is to be performed by factory trained personnel. When modifications are required, contact the TIC Customer Support Center.
- Inspections may be required after moving the equipment.
- Contact the TIC Customer Support Center 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 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 Q9 Plus ASD is -13° to 149° F (-25° to 65° 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 TIC ASD is intended for permanent installations only.
- Installation shall conform to the National Electrical Code (NEC) — Article 110 (*Requirements For Electrical Installations*), all regulations of the Occupational Safety and Health Administration, and any other applicable national, regional, or industry codes and standards.

Note: *For ALL references to the National Electrical Code (NEC), see the latest release of the National Electrical Code.*

- 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 NEC Article 110-13).
- **DO NOT** mount the ASD in a location that would produce catastrophic results (equipment damage or injury to personnel) if it were to become dislodged from its mounting location.
- **DO NOT** mount the ASD in a location that would allow it to be exposed to flammable chemicals or gases, 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. 9 for further information on ventilation requirements.
- The ambient operating temperature range of the **Q9 Plus ASD** is 14° to 104° F (-10° to 40° C).

Mounting Requirements

- Only Qualified Personnel should install this equipment.
- Install the unit in a secure and upright position in a well-ventilated area.
- As a minimum, the installation of the equipment should conform to the NEC — Article 110, 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 ASD installer/maintenance personnel to ensure that the unit is installed into an enclosure that will protect personnel against electric shock.

Conductor Routing and Grounding

WARNING

- Use separate metal conduits for routing the input power, output power, and control circuits.
- A separate ground cable should be run inside the conduit with the input power, output power, and control circuits.
- **DO NOT** connect CC to earth ground.
- Use IICC terminal as the return for the V/I input.
- Always ground the unit to prevent electrical shock and to help reduce electrical noise.
- It is the responsibility of the ASD installer/maintenance personnel to provide proper grounding and branch circuit protection in accordance with the NEC and any applicable local codes.

— The Metal Of Conduit Is Not An Acceptable Ground —

Grounding Capacitor Switch

The ASD is equipped with leak reduction capacitors which are used to reduce the EMI leakage via the 3-phase power-input circuit and for compliance with the Electromagnetic Compatibility Directive (EMC).

The effective value of the capacitor may be increased, reduced, or removed entirely via the Selector Switch, Switching Bar, or the Switching Screw — the type used is typeform-specific.

The Grounding Capacitor Switch allows the user to quickly change the value of the leakage-reduction capacitance of the 3-phase input circuit without the use of any tools.

See the section titled Power Connection Requirements on pg. 11 for more on the Grounding Capacitor Switch.

See figures 4, 5, 6, and 7 on pg. 12 for an electrical depiction of the leakage-reduction functionality of the Grounding Capacitor Switch and the methods used to set the capacitance value.

Power Connections

⚠ DANGER ⚠

CONTACT WITH ENERGIZED WIRING WILL CAUSE SEVERE INJURY OR LOSS OF LIFE.

- Turn off, lock-out, and tag-out 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 lock-out/tag-out procedures, connect the 3-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.
- If multiple conductors are used in parallel for the input or output power and it is necessary to use separate conduits, each parallel set shall have its own conduit (i.e., place U1, V1, W1, and a ground wire in one conduit and U2, V2, W2 and a ground wire 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 NEC Article 310 adjustment factors).
- **DO NOT** connect the 3-phase input power to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- **DO NOT** connect resistors across terminals PA – PC or PO – PC. This may result in fire.
- Ensure the correct phase sequence and the desired direction of motor rotation in the Bypass mode (if applicable).

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.
- It is the responsibility of the ASD installer/ 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 parameter F250.

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 TIC ASD is a general-purpose product. It is a system component only and the system design should take this into consideration. Please contact the TIC Customer Support Center for application-specific information or for training support.
- The TIC ASD is part of a larger system and the safe operation of the ASD will depend upon observing certain precautions and performing proper system integration.
- 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).

- 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 the TIC Customer Support Center 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 personnel. 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. 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.

System Setup Requirements

CAUTION

- When using the ASD as an integral part of a larger system, it is the responsibility of the ASD installer/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 system damage or injury to personnel (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 are a requirement to use this product.
- Improperly designed or improperly installed system interlocks may render the motor unable to start or stop on command.
- **DO NOT** install power factor improvement/ correction capacitors or surge absorbers on the output of the ASD.
- Use of the built-in system protective features is highly recommended (i.e., E-Off, Overload Protection, etc.).
- If a secondary magnetic contactor (MC) or an ASD output disconnect 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, or W).
- When using an ASD output disconnect, the ASD and the motor must be stopped before the disconnect is either opened or closed. Closing the output disconnect while the 3-phase output of the ASD is active may result in equipment damage or injury to personnel.
- 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.

Dynamic Braking Precaution

CAUTION

- The Dynamic Braking function is **NOT** used with the Q9 Plus ASD.
- **DO NOT** attempt to configure or connect the DBR function to the Q9 Plus ASD.
- Attempts to configure or adapt the ASD to use the Dynamic Braking function may result in system damage or injury to personnel.

Operational and Maintenance Precautions

DANGER

- Turn off and lock-out/tag-out the main power, the control power, and instrumentation connections before inspecting or servicing the ASD, removing any enclosure panels, or connecting/ disconnecting the power wiring to the equipment.
- Turn the power on only after attaching (or closing) the front cover. **DO NOT** remove or open the front cover or any of the enclosure panels of the ASD during normal ASD operation.
- During system setup, calibration, testing, or troubleshooting it may be required to access live circuits. **DO NOT** leave the system unattended and powered with the door(s) and/or covers removed.
- If/when taking a live reading is required (equipment is powered), it is to be performed by Qualified Personnel **ONLY**. Proper and approved personal protection equipment is to be used by trained personnel for all electrical measurements.
- The capacitors of the ASD maintain a residual charge for a period of time after the ASD is powered off. The required time for each ASD typeform is indicated with a cabinet label and a Charge Indicator LED (shown for smaller ASDs in Figure 2. on pg. 10; LED is located on the front panel of larger ASDs). Wait at least the minimum time indicated on the enclosure-mounted label and ensure that the Charge Indicator LED is off before coming into contact with any circuits or performing any maintenance activity on the ASD.
- **DO NOT** attempt to disassemble, modify, or repair the ASD. Contact the TIC Customer Support Center 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 off the power immediately.
- The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming into contact with these items.
- The Auto-Restart and Retry programmable functions of the ASD may allow for the system to start or stop unexpectedly. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- Remove power from the ASD during extended periods of non-use.
- Inspect the system annually (as a minimum) for damaged or improperly functioning parts, cleanliness, and to ensure that the connectors are tightened securely. Inspect more frequently when operating in a harsh environment or when used on a high-output-demand application.

Motor Characteristics

Listed below are some variable speed AC motor control concepts with which the user of the Q9 Plus Adjustable Speed Drive should become familiar.

Motor Autotuning

Motor production methods may cause minor differences in motor operation. The negative effects of these differences may be minimized by using the Autotune feature of the ASD. Autotuning is a function of the ASD that measures several parameters of the connected motor and places these readings in a stored table. The software uses the information in the table to help optimize the response of the ASD to application-specific load and operational requirements. The Autotuning function may be enabled for automatic tuning, configured manually at F400, or disabled.

The measured parameters include the rotor resistance, the stator resistance, the required excitation inductance, rotational inertia values, and leakage inductance values.

Pulse Width Modulation Operation

The ASD uses sinusoidal Pulse Width Modulation (PWM) control. 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 than when operated directly from commercial power.

Low Speed Operation

Operating a general-purpose motor at lower speeds may cause a decrease in the cooling ability of the motor. Reducing the torque requirement of the motor at lower speeds will decrease the generated heat at lower speeds.

When the motor is to be operated at low speed (less than 50% of full speed) and at the rated torque continuously, a Toshiba VF motor (designed for use in conjunction with an ASD) is recommended.

Overload Protection Adjustment

The 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 Motor Overload Protection Level 1 on pg. 182.

Operation Above 60 Hz

A motor produces more noise and vibration when it is operated at frequencies above 60 Hz. Also, when operating a motor above 60 Hz, the rated limit of the motor or its bearings may be exceeded; this may void the motor warranty.

Contact the motor manufacturer for additional information before operating the motor above 60 Hz.

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 ⇒ Carrier Frequency ⇒ PWM Carrier Frequency).

Note: When operating in the Vector Control mode the carrier frequency should be set to 2.2 kHz or above.

Motor/Load Combinations

When the ASD is used in combination with one of the following motors or loads, it may result in unstable operation.

- A motor with a rated capacity that exceeds the motor capacity recommended for the ASD.
- An explosion-proof motor.

When using the ASD with an explosion-proof motor or other special motor types, lower the carrier frequency to stabilize the operation. **DO NOT** set the carrier frequency below 2.2 kHz if operating the system in the vector control mode.

Note: When operating in the Vector Control mode the carrier frequency should be set to 2.2 kHz or above.

If the motor being used is coupled to a load that has a large backlash or if coupled to a reciprocating load, use one of the following procedures to stabilize motor operation.

- Adjust the S-Pattern acceleration/deceleration setting,
- If operating in the Vector control mode, adjust the response time, or
- Switch to the Constant Torque control mode.

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. For further information on braking systems see DC Injection Braking Current on pg. 124.

Q9 Plus ASD Characteristics

Over-Current Protection

Each Q9 Plus ASD model is designed for a specified operating power range. The Q9 Plus ASD will incur a trip if the design specifications are exceeded.

However, the Q9 Plus ASD may be operated at 110% of the specified output-current range for a limited amount of time as indicated in the section titled Voltage/Current Specifications on pg. 280. Also, the Stall Prevention Level (see F601) may be adjusted to help with nuisance over-current trips.

When using the Q9 Plus ASD for an application that controls a motor which is rated significantly less than the maximum current rating of the Q9 Plus ASD, the over-current limit setting will have to be changed to match the application. See Motor Overload Protection Level 1 for further information on this ASD/motor configuration.

ASD Capacity

The Q9 Plus ASD must not be used with a motor that has a significantly larger capacity, even if the motor is operated under a small load. A Q9 Plus 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 a Q9 Plus ASD that is beyond that which the Q9 Plus ASD is rated. The input voltage may be stepped down when required with the use of a step-down transformer or some other type of voltage reduction system.

Using Vector Control

Using Vector Control enables the system to produce very high torque over the entire operating range even at extremely low speeds. Vector Control may be used with or without feedback. However, using feedback increases the speed accuracy for applications requiring precise speed control. Enabling the Automatic Energy Savings further increases the efficiency of the Q9 Plus ASD while maintaining its robust performance.

Vector Control is not capable of operating multiple motors connected in parallel.

See V/f Pattern on pg. 79 for further information on using Vector Control.

Local/Remote Operation

⚠ **CAUTION**

While running in the Local mode at a non-zero speed, if the RJ45 connector is removed from the EOI, the Q9 Plus ASD remains in the Local mode running at the last commanded speed even though the Local LED is off. The Q9 Plus ASD output remains at the frequency of the Frequency Command field at the time of the disconnect for the duration of the disconnect.

To prevent this condition, before disconnecting the RJ45 connector, ensure that the Q9 Plus ASD is off.

Installation and Connections

The ASD 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 R/L1, S/L2, and T/L3 terminals). The control terminals of the ASD may be used by connecting the terminals of the Terminal Board (P/N 072314P903) to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 14).

System performance may be further enhanced by assigning a function to the output terminals of the Terminal Board and connecting the terminals to the proper indicators or actuators (LEDs, relays, contactors, etc.).

Note: The optional Q9 Plus ASD interface boards may be used to expand the I/O functionality of the ASD.

Installation Notes

⚠ CAUTION

When a brake-equipped motor is connected to the ASD, it is possible that the brake may not release at start up 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 (U/T1, V/T2, and W/T3).

DO NOT apply commercial power to the ASD output terminals U/T1, V/T2, and W/T3.

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 Q9 Plus ASD is on or while the motor is still turning may cause ASD damage.

The Q9 Plus 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 over-voltage and under-voltage 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 higher than the rated output of the ASD.

The Q9 Plus ASD is designed to operate NEMA B motors. Consult with the TIC Customer Support Center before using the ASD for special applications such as with an explosion-proof motor or applications with a piston load.

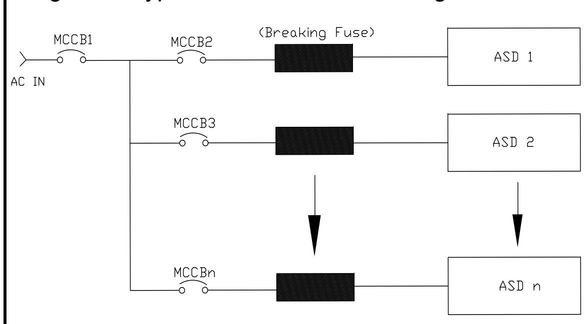
Disconnect the ASD from the motor before megging or applying a bypass voltage to the motor.

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 the TIC Customer Support Center 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 the ability to deliver torque and may result in damage to the motor and/or the driven equipment.

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

Figure 1. Typical Circuit Breaker Configuration.



Mounting the ASD

CAUTION

— The following thermal specifications apply to the 230- and 460-volt ASDs ONLY —

Install the unit securely in a well-ventilated area that is out of direct sunlight.

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.

The ambient operating temperature rating of the Q9 Plus ASD is 14° to 104° F (-10° to 40° C).

When installing multiple ASDs horizontally, Toshiba recommends at least 5 cm of space between adjacent units. However, horizontally mounted ASDs may be installed side-by-side with no space in between the adjacent units if the top cover is removed from each ASD.

For 150 HP ASDs and above, a minimum of 50 cm of space is required above and below adjacent units and any obstruction. This space is the recommended minimum space requirement for the ASD and ensures that adequate ventilation is provided for each unit. More space will provide a better environment for cooling (see the section titled Enclosure Dimensions on pg. 274 for additional information on mounting space requirements).

Note: Ensure that the ventilation openings are not obstructed.

Connecting the ASD

DANGER

Refer to the section titled Installation Precautions on pg. 3 and the section titled Lead Length Specifications on pg. 13 before connecting the ASD and the motor to electrical power.

Power Connections

DANGER

Contact With 3-Phase Input/Output Terminals May Cause Electrical Shock Resulting In Injury Or Loss Of Life.

See Figure 20. on pg. 19 for a system I/O connectivity schematic.

An inductor (DCL) may be connected across the PO and PA/+ terminals to provide additional filtering. When not used, a jumper must be connected across these terminals (see Figure 20. on pg. 19).

PA/+ and PB support the DBR function. The DBR function is **NOT** used on the Q9 Plus ASD.

PC/- is the negative terminal of the DC bus.

R/L1, S/L2, and T/L3 are the 3-phase input supply terminals for the ASD.

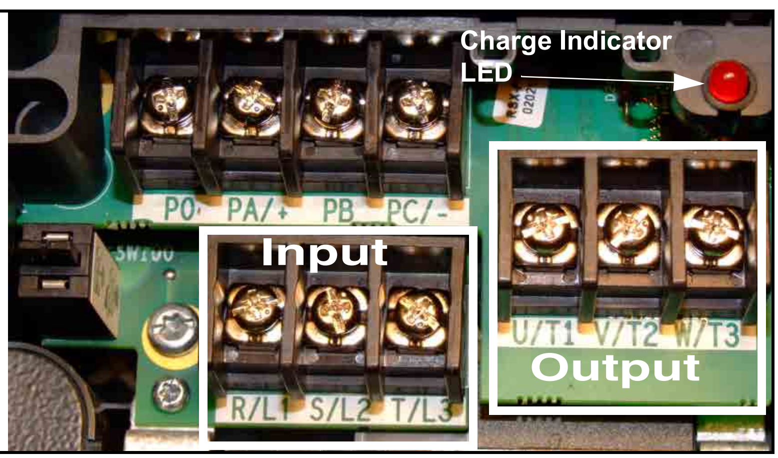
U/T1, V/T2, and W/T3 are the output terminals of the ASD that connect to the motor.

The location of the Charge Indicator LED for the smaller typeform ASD is provided in Figure 2. The Charge Indicator LED is located on the front door of the enclosure of the larger ASDs.

Figure 2. Typical Q9 Plus ASD 3-phase input/output terminals and the Grounding Capacitor Switch.

Grounding Capacitor Switch
Pull for **Small** capacitance/push for **Large** capacitance.

Note: PO-to-PA/+ shorting bar removed to show reference designators.



Power Connection Requirements

Connect the 3-phase input power to the input terminals of the ASD at R/L1, S/L2, and T/L3. Connect the output of the ASD to the motor from the ASD terminals U/T1, V/T2, and W/T3. The input and output conductors and terminal lugs used shall be in accordance with the requirements listed in the section titled Voltage/Current Specifications on pg. 280.

If multiple conductors are used in parallel for the input or output power and it is necessary to use separate conduits, each 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 NEC Article 310 adjustment factors).

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

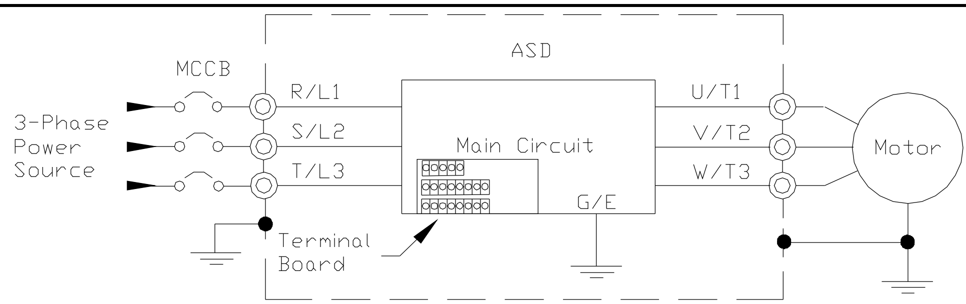
Install a molded case circuit breaker (MCCB) or fuse between the 3-phase power source and the ASD in accordance with the fault current setting of the ASD and NEC Article 430.

The ASD is designed and tested to comply with UL Standard 508C. Modifications to the ASD system or failure to comply with the short circuit protection requirements outlined in this manual may disqualify the UL rating. See Table on page 284 for typeform-specific short circuit protection recommendations.

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

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 3. Q9 Plus ASD/Motor Typical Connection Diagram.



System Grounding

Proper grounding helps to prevent electrical shock and to reduce electrical noise. The Q9 Plus ASD is designed to be grounded in accordance with Article 250 of the 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.

— The Metal Of Conduit Is Not An Acceptable Ground —

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

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.

- **DO NOT** install the input power and output power wires in the same duct or in parallel with each other, and do not bind them together.
- **DO NOT** install the input/output power wires 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.

Grounding Capacitor

The Grounding Capacitor plays a role in minimizing the effects of leakage current through the ASD system and through ground paths to other systems. Leakage current may cause the improper operation of earth-leakage current breakers, leakage-current relays, ground relays, fire alarms, and other sensors — and it may cause superimposed noise on CRT screens.

The Grounding Capacitor Switch allows the user to quickly change the value of the leakage-reduction capacitance of the 3-phase input circuit. See figures 4, 5, 6, and 7 for an electrical depiction of the leakage-reduction functionality and the methods used to change the capacitance value. The method used is typeform-specific.

If using a 460-volt ASD that is in the range of 5.0 HP to 25 HP, and the U/T1, V/T2, and W/T3 connections to the motor are 100 meters or more in length, the ASD Carrier Frequency must be set to 4 kHz or less when activating or deactivating the Grounding Capacitor Switch. ASD overheating may occur if the Carrier Frequency is set above 4 kHz when activating or deactivating the Grounding Capacitor Switch.

See pg. 3 for more information on the Grounding Capacitor Switch and pg. 10 for the location.

Figure 4. The Grounding Capacitor Switch is used on typeforms — 200-volt 0.5 HP to 10 HP and the 25 and 30 HP/460-volt 1.0 HP to 250 HP.

The value may be set to Maximum (default setting) or to Zero by pushing or pulling the switch actuator, respectively.

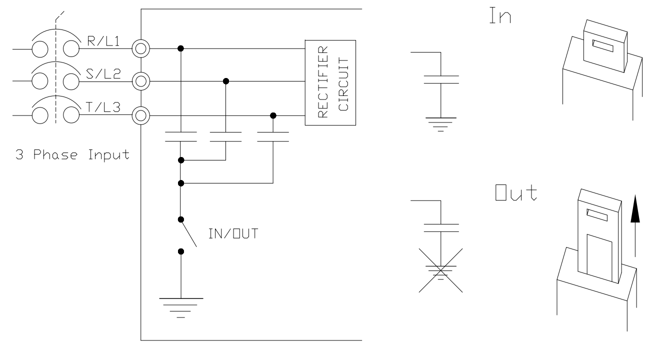


Figure 5. The Grounding Capacitor Switch is used on typeforms — 200-volt 15 HP to 20 HP and the 40 HP to 60 HP/ 460-volt 30 HP to 100 HP.

The value may be set to Large (default setting) or Small by pushing or pulling the switch actuator, respectively.

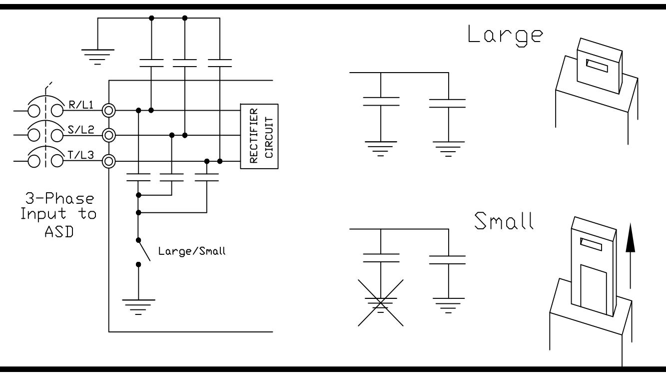


Figure 6. The Grounding Capacitor Bar is used on typeforms — 200-volt 75 HP and the 100 HP/ 460-volt 125 HP and the 150 HP.

The value may be set to Large or Small (default setting) by connecting or disconnecting the switching bar, respectively.

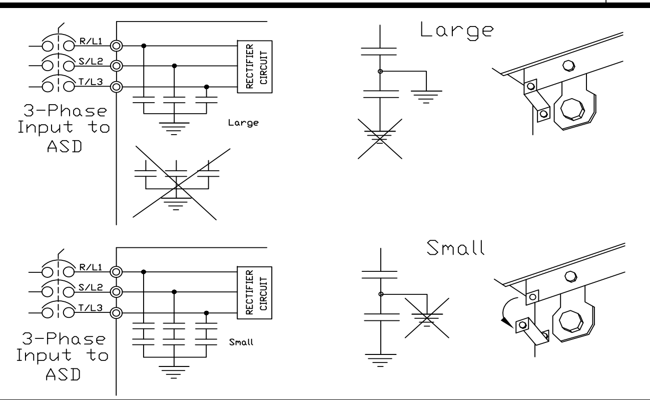
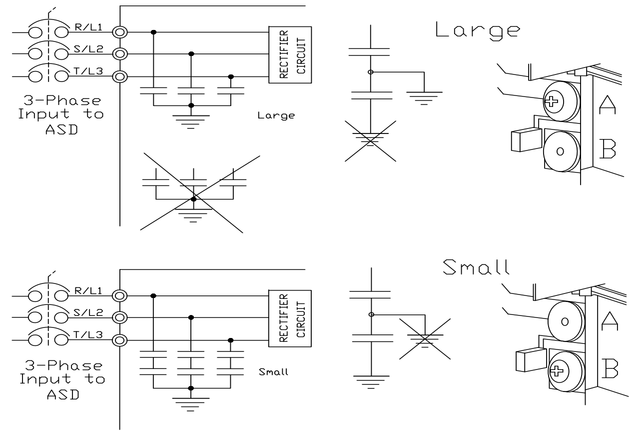


Figure 7. The Grounding Capacitor Screw is used on typeforms — 460-volt 175 HP and above.

The value may be set to Large or Small (default setting) by placing the screw in the A position or by placing the screw in the B position, respectively.



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

Table 1. Lead Length Recommendations.

Model	PWM Carrier Frequency	NEMA MG1 Part 31 Compliant Motors	NEMA MG1 Part 30 Compliant Motors
230-Volt	All	1000 feet	450 feet
460-Volt	< 5 kHz	600 feet	200 feet
	≥ 5 kHz	300 feet	100 feet

Note: Contact the TIC Customer Support Center 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.

When operating in the Vector Control mode the carrier frequency should be set to 2.2 kHz or above.

I/O and Control

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

The Terminal Board supports discrete and analog I/O functions and is shown in Figure 9. on pg. 17. Table 2 lists the names, descriptions, and default settings (of programmable terminals) of the input and output terminals of the Terminal Board.

Note: To use the input lines of the Terminal Board to provide Run commands, the Command Mode setting must be set to Terminal Block.

Figure 20. on pg. 19 shows the typical connection diagram for the Q9 Plus ASD system.

Table 2. Terminal Board Names and Functions.

Terminal Name	Input/Output	Function (Default Setting If Programmable) (see Terminal Descriptions on pg. 15)	Circuit Config.
ST	Discrete Input Connect to CC to activate (Sink mode).	Standby — Multifunctional programmable discrete input. Activation required for normal ASD operation.	Figure 10. on pg. 18.
RES		Reset — Multifunctional programmable discrete input. Activation resets ASD when Faulted — ignored when not Faulted.	
F		Forward — Multifunctional programmable discrete input.	
R		Reverse — Multifunctional programmable discrete input.	
S1		Fire Speed — Multifunctional programmable discrete input.	
S2		Preset Speed Bit 2 — Multifunctional programmable discrete input.	
S3		Damper Feedback — Multifunctional programmable discrete input.	
S4		Emergency Off — Multifunctional programmable discrete input.	
O1A/B (OUT1)	Switched Output Contacts	Damper Command — Multifunctional programmable discrete form A output contacts.	Figure 16. on pg. 18.
O2A/B (OUT2)		Reach Frequency — Multifunctional programmable discrete form A output contacts.	
FLA		Fault relay (N.O.).	Figure 19. on pg. 18.
FLB		Fault relay (N.C.).	
FLC		Fault relay (Common).	
RR	Analog Input	Frequency Mode 1 — Multifunctional programmable analog input. (0.0 to 10 volt input — 0 Hz to Maximum Frequency).	Figure 11. on pg. 18.
RX		Unassigned — Multifunctional programmable analog input (-10 to +10 VDC input).	Figure 12. on pg. 18.
V/I (Select V or I via SW301)		Unassigned — **V** — Multifunctional programmable isolated analog voltage input (0 to 10 VDC input).	Figure 13. on pg. 18.
		Frequency Mode 2 — **I** (Default setting) — Multifunctional programmable isolated analog current input (4 [0] to 20 mADC input — 0 Hz to Maximum Frequency).	
AM	Analog Output	Output Current — Current or Voltage output that is proportional to the output frequency of the ASD or to the magnitude of the function assigned to this terminal (see Table 10 on page 255).	Figure 18. on pg. 18
FM		Output Frequency — Current or Voltage output that is proportional to the output frequency of the ASD or to the magnitude of the function assigned to this terminal (see Table 10 on page 255). Select **Current** or **Voltage** at F681.	

Table 2. Terminal Board Names and Functions. (Continued)

Terminal Name	Input/Output	Function (Default Setting If Programmable) (see Terminal Descriptions on pg. 15)	Circuit Config.
+SU	DC Input	Externally-supplied 24 VDC backup control power (1.1 A max.). An alternative to the EOI Battery Backup.	
P24	DC Output	24 VDC (200 mA max.) output.	Figure 14. on pg. 18.
PP	DC Output	10.0 VDC (10 mA max.) voltage source for the external potentiometer.	Figure 15. on pg. 18.
FP	Pulsed Output	Output Frequency — Multifunctional programmable output pulse train of a frequency based on the output frequency (see Table 10 on page 255).	Figure 17. on pg. 18.
IICC	—	Return for the V/I input terminal.	**DO NOT** connect to **Earth Gnd** or to each other.
CCA	—	Return for the RR, RX, P24, and the PP terminals.	
CC	—	Return for the AM, FM, +SU, and the discrete input terminal.	

Terminal Descriptions

Note: The programmable terminal assignments may be accessed and changed from their default settings as mapped on pg. 40 or via the Direct Access method: Program ⇒ Direct Access ⇒ Applicable Parameter Number. See the section titled Program Mode Menu Navigation on pg. 40 for the applicable Direct Access parameter numbers.

Note: For further information on terminal assignments and default setting changes, see the sections titled Default Setting Changes on pg. 29 and Input Terminals on pg. 44.

Note: See the section titled Cable/Terminal Specifications on pg. 282 for the Q9 Plus ASD conductor and terminal electrical specifications.

Note: Throughout the manual descriptions and examples, the sink mode will be used when referencing discrete terminal functions.

ST — The default setting for this terminal is the Standby mode controller. As the default setting, this terminal must be activated for normal system operation. The ST terminal is activated by connecting CC to this terminal (Sink mode). When deactivated, OFF is displayed on the Frequency Command screen. This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F113).

RES — The default setting for this terminal is Reset. The RES terminal is activated by connecting CC to this terminal (Sink mode). A momentary connection to CC resets the ASD and any fault indications from the display. Reset is effective when faulted only. This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F114).

F — The default setting for this terminal is Forward run command. The F terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in (see F111).

R — The default setting for this terminal is Reverse run command. The R terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F112).

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 15 setting upon activation. Fire Speed activation overrides the Local and Remote commands (see Figure 28. on pg. 34). This terminal may be activated by connecting CC to this terminal (Sink mode) and may be initiated by a fire alarm signal or fire/smoke sensing device. This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F115).

S2 — The default setting for this terminal is Preset Speed Bit 2. The function of this input as Preset Speed Bit 2, in conjunction with S1, S3, and S4, is to run the motor at the Preset Speed selection of the S1 – S4 settings when activated. The terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F116). See F018 for more information on preset speeds.

S3 — The default setting for this terminal is Damper Feedback. The function of this input as Damper Feedback is as a permissive for normal system operation as described in Table 9 on page 252. The S3 terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F117).

S4 — The default setting for this terminal is Emergency Off (Normally Closed). The Emergency Off terminal is activated by opening the connection to CC (Sink mode). 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 Emergency Off Mode selection parameter (see F603). This input terminal may be programmed to any of the functions listed in Table 9 on page 252 (see F118).

RR — The default function assigned to this terminal is the Frequency Mode 1 setting. The RR terminal accepts a 0 – 10 VDC input signal that is used to control the function assigned to this terminal. This input terminal may be programmed to control the speed or torque of the motor via an amplitude setting or regulate by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F210 – F215). See Figure 20. on pg. 19 for an electrical depiction of the RR terminal. This terminal references CCA.

RX — The RX terminal accepts a ±10 VDC analog 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 by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F216 – F221). See Figure 20. on pg. 19 for an electrical depiction of the RX terminal.

V/I — The V/I terminal has the dual function of being able to receive an input voltage or current. The function as a voltage input to receive a 0 – 10 VDC input signal. The function as a current input is to receive a 0 – 20 mA input signal. SW301 must be set to V or I to receive a voltage or current, respectively (see Figure 9. on pg. 17). Using either input type, the function is to control the 0.0 – Maximum Frequency output or the 0.0 to 250% torque output of the ASD. This is an isolated input terminal. This terminal may be programmed to control the speed or torque of the motor and cannot process both simultaneously. Terminal scaling is accomplished via F201 – F206. The gain and bias of this terminal may be adjusted for application-specific suitability (see F470 and F471).

+SU — Control Power Supply Backup input terminal. This terminal accepts the user-supplied 24 VDC backup power to the control circuits (only). Backup power is used in the event of an open MCCB or during a momentary loss of the 3-phase input power. Parameter settings, real-time clock information, and trip history information are retained with the use of the +SU backup power.

The Q9 Plus ASD is also equipped with an EOI-mounted battery for this function. The battery backup has the added feature of allowing for the transfer of the EOI to another ASD while retaining the control programming. See the section titled Battery Backup on pg. 21 for more information on the battery backup features.

P24 — +24 VDC at 200 mA power supply for customer use. This terminal references CCA.

PP — The function of output PP is to provide a 10 VDC (10 mADC max.) 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. This terminal references CCA.

O1A/B (OUT1A/B) — The default function assigned to this terminal is Damper Command. This output may be programmed to provide an indication (open or closed) that any one of the functions listed in Table 12 on page 257 has occurred or is active. This function may be used to signal external equipment (e.g., activate the brake) (see F130). The OUT1 terminal is rated at 2 A/120 VAC and 2 A/30 VDC.

O2A/B (OUT2A/B) — The default function assigned to this terminal is ACC/DEC Complete. This output may be programmed to provide an indication (open or closed) that any one of the functions listed in Table 12 on page 257 has occurred or is active. This function may be used to signal external equipment (e.g., activate the brake) (see F131). The OUT2 terminal is rated at 2A/120 VAC and 2A/30 VDC.

FP — The default function assigned to this open collector output terminal is Output Frequency. This output terminal produces an output pulse train that has a frequency which is proportional to the magnitude of the Output Frequency (or the function assigned to this terminal). This terminal may be programmed to provide an output pulse rate that is proportional to the magnitude of the user-selected item from Table 10 on page 255. For further information on this terminal see F676.

AM — The default function assigned to this output terminal is Output Current. This output terminal produces an output current or voltage that is proportional to the magnitude of the Output Current of the Q9 Plus ASD (or the function assigned to this terminal). The available assignments for this output terminal are listed in Table 10 on page 255. For further information on this terminal see F670.

FM — This output terminal produces an output current or voltage 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 10 on page 255. For further information on this terminal see F005 on pg. 75. The Voltage/Current output selection is performed at F681.

FLA — A normally open contact that, under a user-defined condition, connects to FLC.

FLB — A normally closed contact that, under a user-defined condition, opens the FLB-to-FLC connection.

FLC — FLC is the common leg of a single-pole double-throw form C relay. The FL relay is the Fault Relay by default, but may be programmed to any of the selections of Table 12 on page 257. For further information on this terminal see F132.

Note: The FLA, FLB, and FLC contacts are rated at 2A/120 VAC and 2A/30 VDC.

Figure 8. The relay is shown in the normal operating condition (default setting). During a faulted condition the relay connection is FLC-to-FLA.

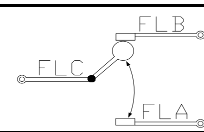
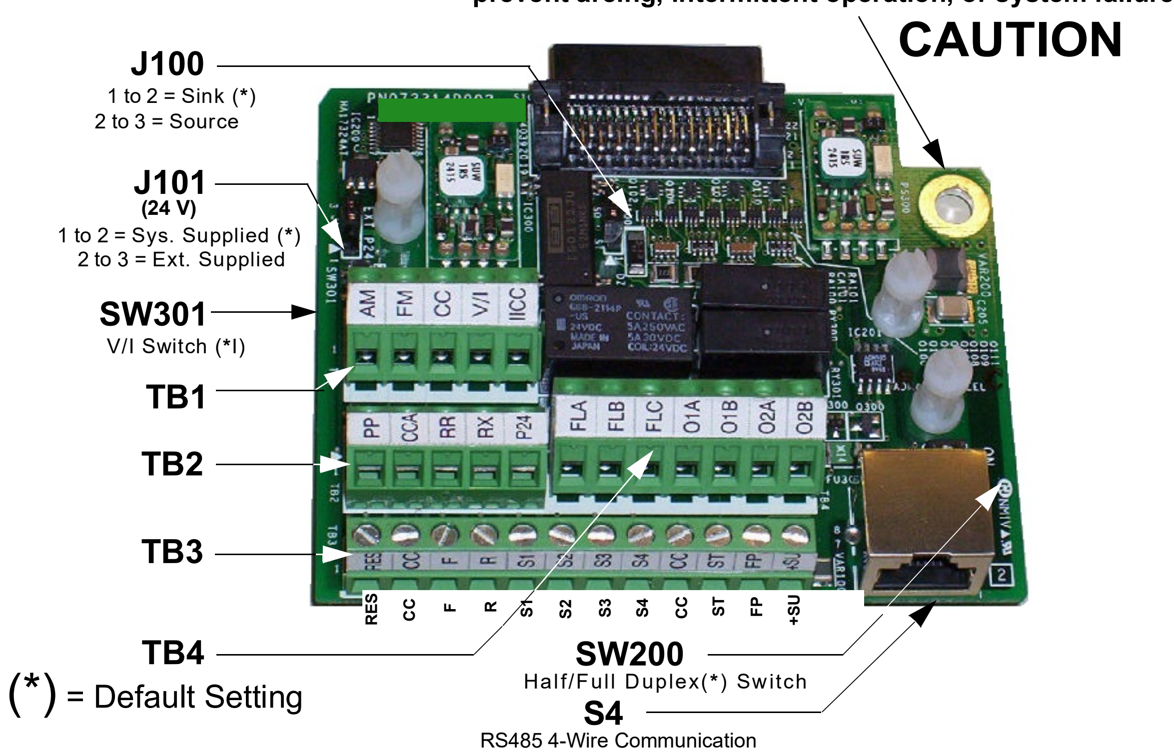


Figure 9. Terminal Board.

Ensure that the ground screw is securely in place to prevent arcing, intermittent operation, or system failure.



See Figure 20. on pg. 19 for more information on the Terminal Board connections.

See the section titled Terminal Descriptions on pg. 15 for terminal descriptions.

See the section titled Cable/Terminal Specifications on pg. 282 for information on the proper cable/terminal sizes and torque specifications when making **Terminal Board** connections.

Terminal Board I/O Configurations

Figure 10. Discrete Input.

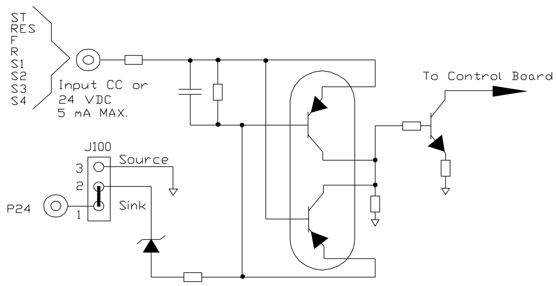


Figure 11. RR Input.

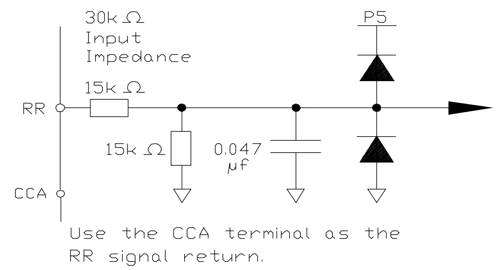


Figure 12. RX Input.

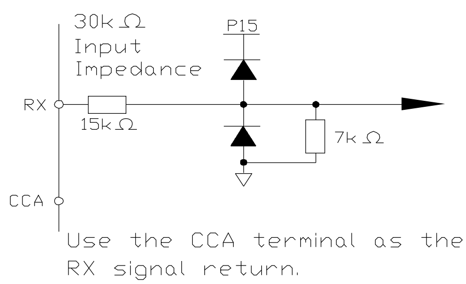


Figure 13. V/I Input.

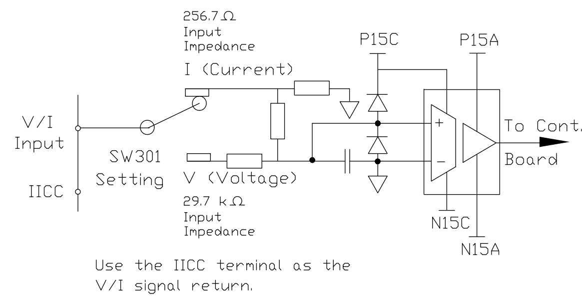


Figure 14. P24 Output.

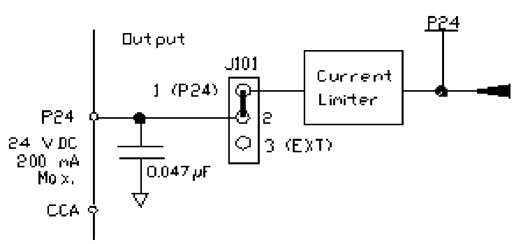


Figure 15. PP Output.

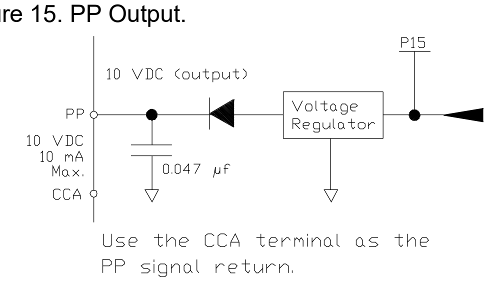


Figure 16. OUT1/OUT2 Output.

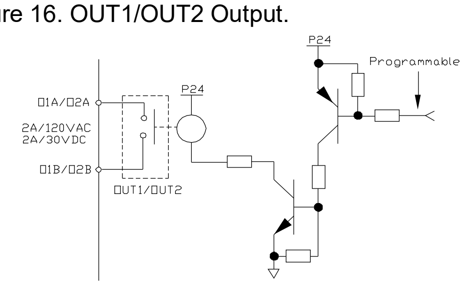


Figure 17. FP Output.

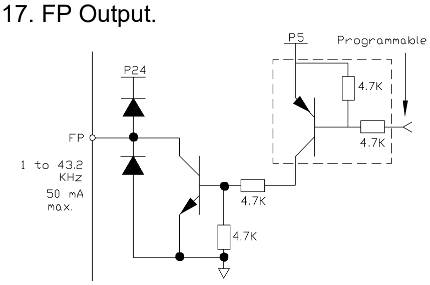


Figure 18. AM/FM Output.

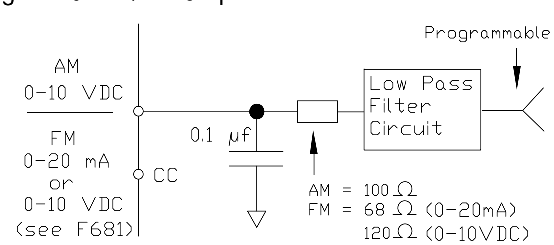
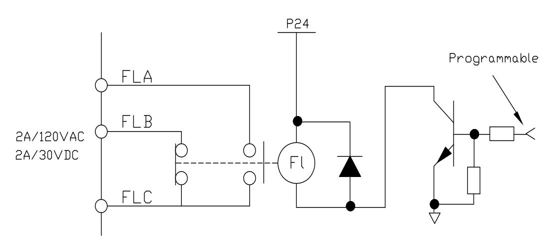
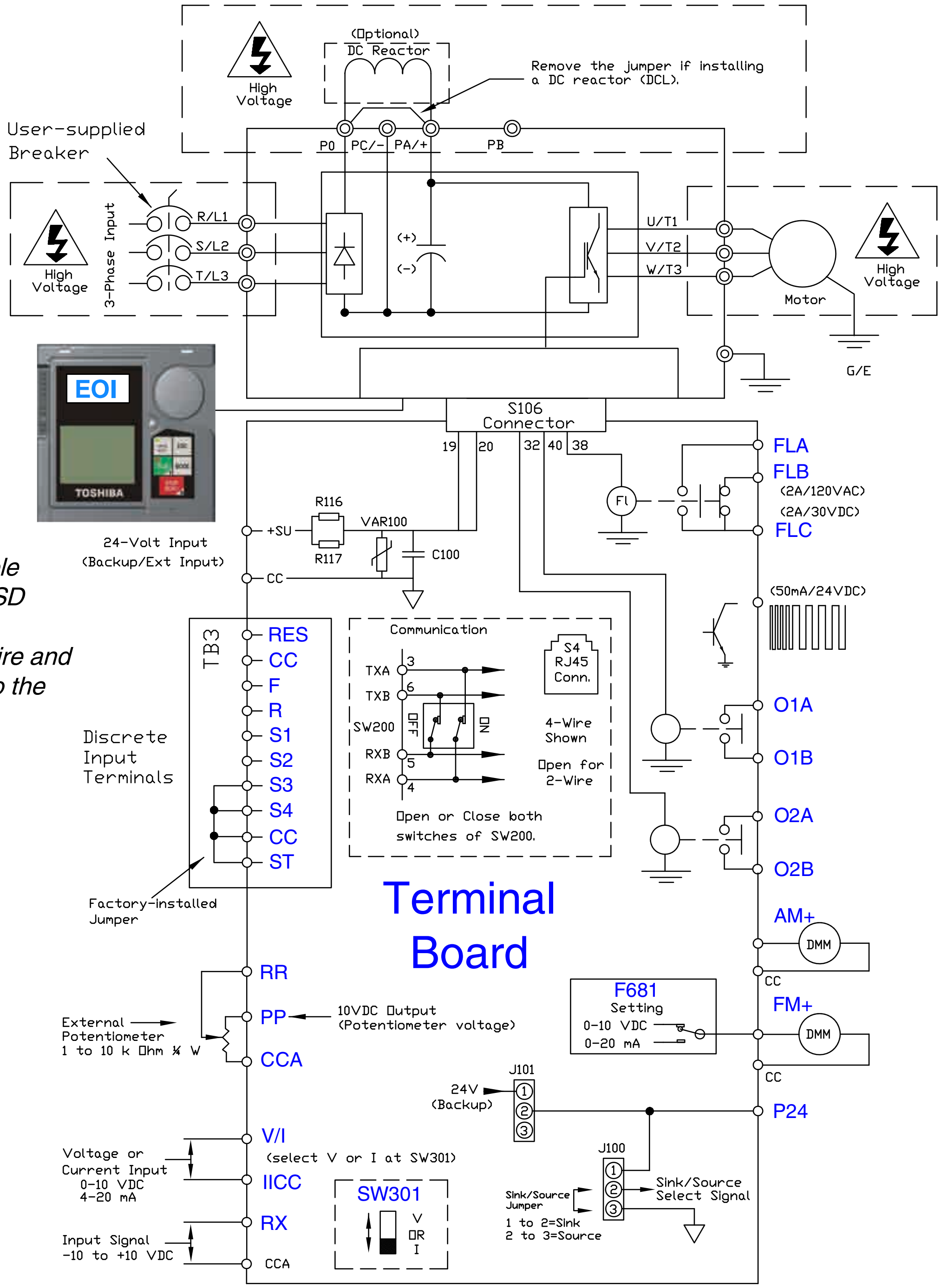


Figure 19. Fault Relay (shown not faulted).



Typical ASD Connection Diagram

Figure 20. The Q9 Plus Typical Connection Diagram.



Note: When connecting multiple wires to any of ASD terminals, do not connect a solid wire and a stranded wire to the same terminal.

Note: *The AM, FM, and the +SU analog terminals are referenced to CC. The RR, RX, P24, and the PP analog terminals are referenced to CCA.*

The isolated V/I analog terminal references IICC.

Start Up and Test

⚠DANGER

Before turning on the ASD ensure that:

- The enclosure door is closed or reattached, and secure.
- R/L1, S/L2, and T/L3 are connected to the 3-phase input power.
- U/T1, V/T2, and W/T3 are connected to the motor.
- The 3-phase input voltage is within the specified tolerance.
- There are no shorts and all grounds are secure.
- All personnel are at a safe distance away from the motor and/or the motor-driven equipment.

Electronic Operator Interface

The Q9 Plus ASD Electronic Operator Interface (EOI) is comprised of an LED screen, an LCD screen, a rotary encoder, and five keys. These items are shown on pg. 22.

EOI Operation

The EOI is the primary input/output device for the user. The EOI may be used to monitor system functions, input data into the system, perform diagnostics, and view performance data (e.g., motor frequency, bus voltage, torque, etc.).

The software used with the Q9 Plus ASD is menu driven; thus, making it a select and click environment. The operating parameters of a motor may be selected and viewed or changed using the EOI (or via communications).

The EOI may be mounted remotely using the optional ASD-MTG-KITQ9. The kit contains all of the hardware required to mount the EOI of the 9-Series ASD remotely. See the section titled EOI Remote Mounting on pg. 25 for more information on this feature.

System operation and EOI operation while using the remotely-mounted EOI are the same as with the ASD-mounted configuration.

Battery Backup

The EOI is equipped with a battery backup system. The function of the backup system is to retain the EOI SRAM programming in the event of a power outage, or if an EOI removal and installation from one system to another is required without the loss of programming.

Listed below are the items retained by the battery backup system:

Trip History,

EOI Contrast,

Real-Time Clock Information,

Monitored Items on pg. 38,

Password and Lockout Information,

Alarm Information,

Main Monitor Items,

Prohibited Items, and

Save User Settings Information (parameter settings may be saved by the user).

The battery backup system must be activated by the installer or maintenance personnel to use the backup function.

To activate the battery backup system, remove the Phillips screw from the front of the LED/LCD display unit (see Figure 21. on pg. 22). Remove the LED/LCD display unit from the ASD. From the circuit side of the display unit, remove the jumper at J1, pins 2 and 3. Place the jumper at J1, pins 1 and 2. The battery backup system is now configured for use.

Note: The Trip History and Real-Time Clock information is cleared when the J1 jumper or the battery is removed.

The expected battery life cycle is four and a half years.

Note: The Battery backup system provides for memory retention only — it does not supply power to the LED/LCD display or any other subsystems.

LED/LCD Screen Installation Note

When installing the LED/LCD display unit of the EOI, ensure that the left side of the display is inserted first with the top and bottom catches (see Phillips screws at underside of display) securely in place. This ensures the proper alignment and electrical connection of the CNX connector of the LED/LCD display unit board. Gently hold the display in place while securing the Phillips mounting screw.

If improperly seated, the periphery of the LED/LCD display unit will not be flush with the EOI surface and the unit will not function properly.

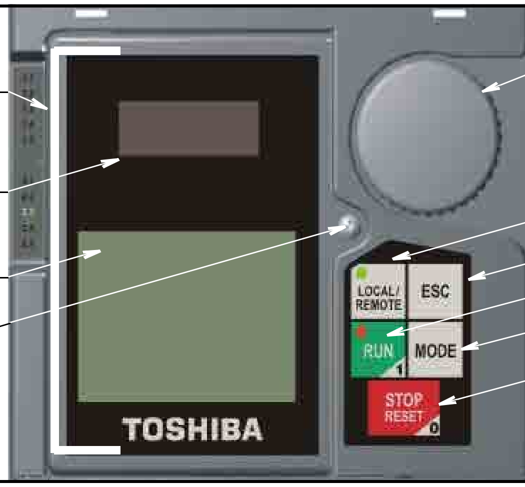
EOI Features

LED Screen — Displays the running frequency, active Fault, or active Alarm information.

LCD Screen — Displays configuration information, performance data (e.g., output frequency, bus voltage, torque, etc.), diagnostic information, and LED screen information in expanded normal text.

Rotary Encoder — Used to access the Q9 Plus ASD menu selections, change the value of a displayed parameter, and performs the Enter key function. Turn the Rotary Encoder either clockwise or counterclockwise to perform the Up or Down

Figure 21. The Q9 Plus ASD Electronic Interface Features.



Remove the Phillips screw first to remove the LED/LCD display unit to activate the Battery Backup system.

functions of the displayed menu selection. Press the Rotary Encoder to perform the Enter (select) function.

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 Command mode. The Local mode allows the Command and Frequency control functions to be carried out via the EOI.

The Remote mode enables the Command and Frequency control functions to be carried out via the Terminal Board, RS485, Communication Card, or Pulse Input. The selection may be made via Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode and Frequency Mode 1, respectively.

Note: See the section titled Command Mode and Frequency Mode Control on pg. 33 for more information on system control.

ESC Key — Returns the system to the previous level of the menu tree, toggles between the EOI Command screen and the Frequency Command screen, or cancels changes made to a field if pressed while still in the reverse video mode (dark background/light text). The three functions are menu-specific.

Run Key — Issues the Run command while in the Local mode. The Run key LED illuminates green while stopped and red while running or exciting the motor.

Mode Key — Provides a means to access the root menus. Pressing the Mode Key repeatedly loops the system through the root menus (see Figure 29. on pg. 36). While looping through the root menus, the Program menu will display the default Program root menu screen item or the Program sub-menu item being accessed prior to pressing the Mode key.

Stop-Reset Key — This key has three functions.

1. Issues the Off command (decelerates to Stop at the programmed rate) if pressed once while in the Local mode.
2. Initiates an Emergency Off command if pressed twice quickly from the Local or Remote modes. The Emergency Off function terminates the Q9 Plus ASD output and will apply the stopping method selected at F603.
3. Resets active Faults and/or active Alarms if pressed twice quickly. The source of the Fault or Alarm must be determined and corrected before normal ASD operation can resume.

LED/LCD Screens

LED Screen Display

The LED screen displays the output frequency, active alarms and/or active faults. If there are no active alarms or faults, the output frequency is displayed.

During an active alarm, the display toggles to and from the running frequency and the active alarm. During an active fault, the fault is displayed.

Loss of the ST-to-CC connection flashes Off.

LED Character/Font Information

Characters displayed on the LED screen will be of the seven-segment format. Not all alpha-numeric characters are used with the LED screen.

Listed are the seven-segment characters used with the LED screen along with the same characters as they are displayed on the LCD screen.

LCD Screen Display

The LCD screen displays the percentage of the Maximum Frequency (if running), running frequency (if running), Ready-to-Run indicator, Main Monitor Selections, and the discrete I/O terminal status.

LCD Character/Font Information

All alpha-numeric characters are available.

LED/LCD Screen Information

LED	LCD	LED	LCD
A	A	1	1
b	b	2	2
C	C	3	3
d	d	4	4
E	E	5	5
F	F	6	6
G	G	7	7
H	H	8	8
I	I	9	9
J	J	0	0
L	L		
M	M		
n	n		
O	O		
P	P		
q	q		
r	r		
S	S		
t	t		
U	U		
v	v		
y	y		
-	-		

Using the LCD Screen

The LCD screen is the primary user input/output information center. Parameter settings may be viewed or changed using the LCD display unit of the EOI. To view or change a parameter setting using the LCD screen, press the Mode key until the Program menu is displayed. Turn the Rotary Encoder until the desired Primary Menu item (see pg. 40) is within the cursor block. Press the Rotary Encoder to select the item from the Primary Menu (repeat for submenu items).

See the section titled Default Setting Changes on pg. 29 for more information on changing parameter settings.

Upon reaching the desired parameter selection, the current setting may be viewed, or selected and changed by pressing the Rotary Encoder and the setting will take on the reverse video format (dark background/light text). Turn the Rotary Encoder to change the parameter setting. Press the ESC key while the new parameter setting is in the reverse video mode to exit the selection without saving the change or press the Rotary Encoder while the parameter setting is in the reverse video mode to accept the change.

Repeated ESC key entries at any time takes the menu back one level each time the ESC key is pressed until the Frequency Command screen is reached. Further ESC entries will toggle the system to and from the Frequency Command screen and the EOI Command menu.

Note: Changes carried out from the EOI Command screen will be effective for EOI-controlled ASD operation only. See the section titled EOI Command Mode on pg. 36 for further information on EOI Command Mode operations.

Primary Menus of the LCD Screen

The three primary screens of the LCD screen are displayed while accessing the associated operating mode: the Frequency Command, Monitor, and the Program Menu screens.

Figure 22. Frequency Command Screen.

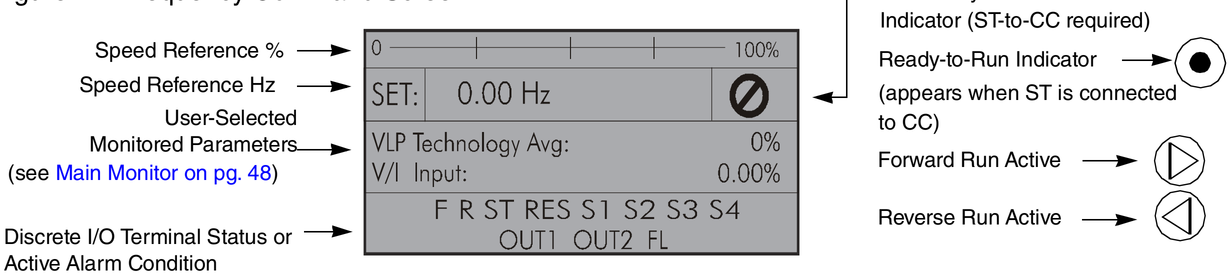


Figure 23. Monitor Screen (see pg. 38 for more on the Monitor Screen).

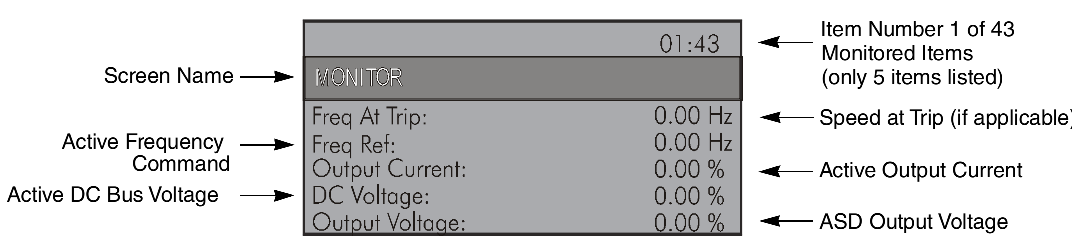
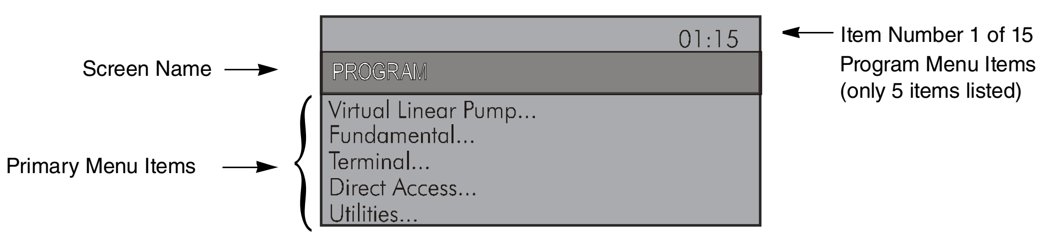


Figure 24. Program Menu Screen (see pg. 40 for more on the Program Menu Screen).



EOI Remote Mounting

For safety and application-specific reasons, some ASD installations will warrant that the operator not be in the vicinity during operation or that the EOI not be attached to the ASD housing. The EOI may be mounted remotely either with or without the optional Remote Mounting Kit (P/N ASD-MTG-KITQ9) which allows for remote EOI placement and easier cable routing.

The EOI can operate up to 9 feet away from the ASD. An EOI extender cable is required for remote mounting and is included with Remote Mounting Kit or can be ordered through the Customer Support Center.

Remote Mounting Hardware

- Remote Mounting Kit (optional) — P/N ASD-MTG-KITQ9
- LCD Cable, 9 ft. — P/N 76268

Remote Mounting Installation Precautions

Install the unit securely in a well-ventilated area that is out of direct sunlight. The ambient temperature rating for the display module 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 or electrical noise (EMI) are present.
- Do not install the unit where it may be exposed to flammable chemicals or gases, water, solvents, or other fluids.
- Turn on the power only after securing the front cover of the ASD.

Remote Mounting Using the Mounting Kit

Note: See Figure 25. on pg. 26 for the dimensions and the item locations referenced in steps 1 – 7.

1. At the EOI mounting location, mark the 4.60” by 4.50” hole and the four 11/32” screw holes.
2. Cut the 4.60” by 4.50” rectangular mounting hole.
3. Drill the four 11/32” screw holes for the Bezel Plate mount.
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. Remove the Front Panel Assembly of the ASD — using a flathead screwdriver, release the upper retaining tabs of the EOI panel then pivot the EOI assembly away from the ASD and lift (see Figure 26. on pg. 26).
6. Remove the Display Module from the Front Panel Assembly of step 5 — discard the assembly.
7. Attach and secure the Display Module to the front side of the Bezel Plate using the four 6-32 x 5/16” pan head screws, and the #6 split lock washers.

When installing the Display Module into the Bezel Plate ensure that the left side of the display is inserted first with the top and bottom catches securely in place (adjacent to the Phillips screws at underside of display). This ensures the proper alignment and electrical connection of the CNX connector of the Display Module PCB. Then gently hold the display in place while securing the Phillips mounting screw.

8. Install the Front Panel Connector Assembly to the ASD (see Figure 26. on pg. 26).
9. Connect the Extender Cable from the EOI to the Front Panel Assembly.

Figure 25. Front Panel Removal/Front Panel Connector Assembly.

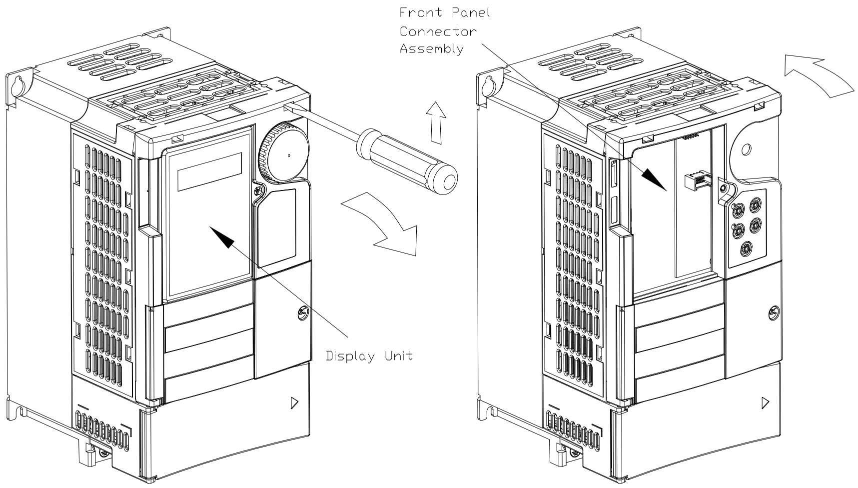
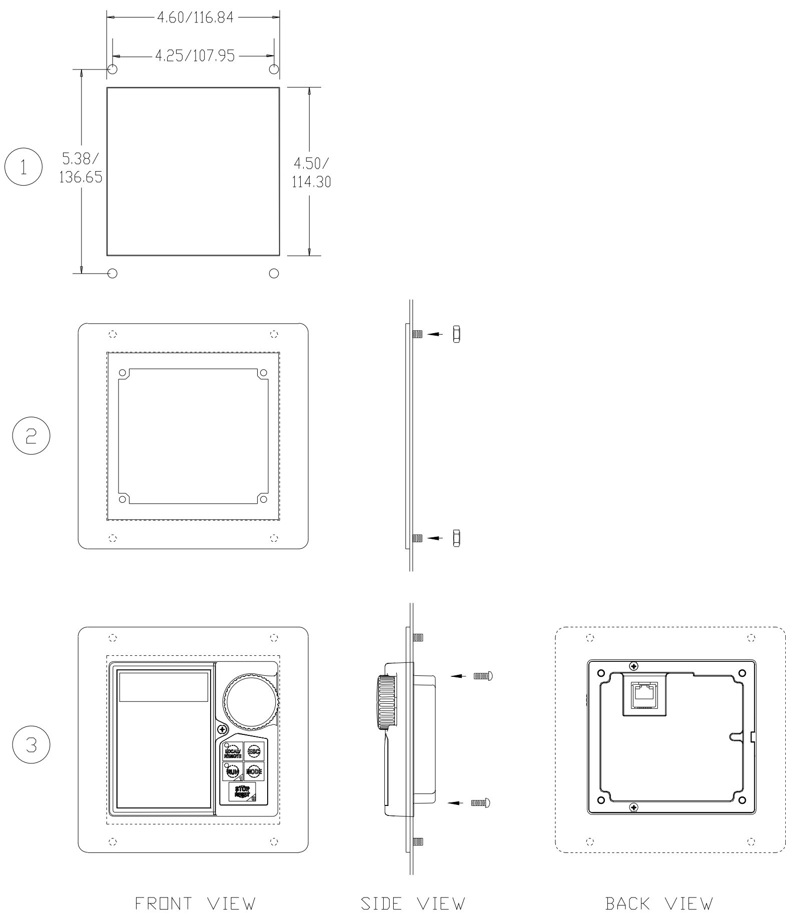


Figure 26. Remote Mounting Dimensions (inches/millimeters).

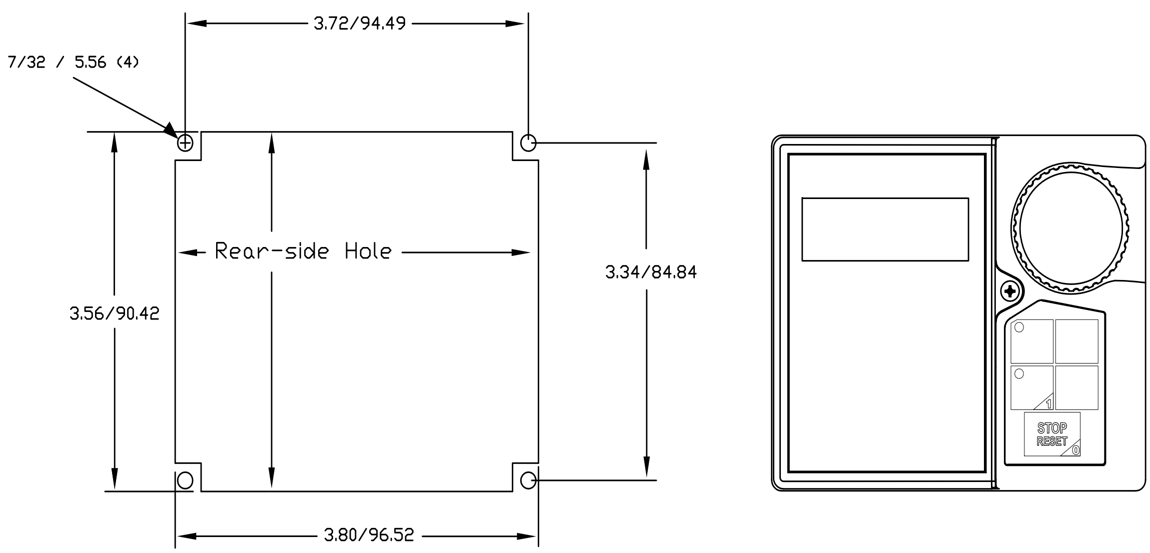


Remote Mounting without the Mounting Kit

Note: See Figure 27. for the dimensions and the item locations referenced in steps 1 – 8.

1. At the EOI mounting location, mark the 3.80” by 3.56” hole and the four 7/32” screw holes.
2. Cut the 3.80” by 3.56” rectangular mounting hole.
3. Drill the four 7/32” screw holes.
4. Remove the Front Panel Assembly of the ASD — using a flathead screwdriver, release the upper retaining tabs of the EOI panel. Then pivot the EOI assembly away from the ASD and lift (see Figure 25.).
5. Remove the EOI from the Front Panel Assembly of step 4 — discard the assembly.
6. Attach and secure the EOI 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.
7. Install the Front Panel Connector Assembly to the ASD (see Figure 25.).
8. Connect the Extender Cable from the EOI to the Front Panel Assembly.

Figure 27. EOI Remote Mounting Dimensions (inches/millimeters).



System Operation

Standard Start Up Wizard

Note: *Do not run the Standard Start Up Wizard and the VLP Wizard. Running both will result in an operational conflict that will require a reset to factory defaults and a restart using only one wizard. Reset to the factory default settings after running either wizard to run the other wizard.*

The Start Up Wizard assists with the initial configuration of the input power settings and the output parameters of the Q9 Plus ASD.

The Start Up Wizard is launched from Program ⇒ Utilities ⇒ Standard Start Up Wizard. See the section titled Standard Startup Wizard Requirements on pg. 30 for more information on launching the wizard.

The Q9 Plus ASD may also be setup via communications, by accessing the individual parameters via the menu hierarchy, or by using the Direct Access Parameters/Numbers.

See the section titled Default Setting Changes on pg. 29 for more information on changing the parameter settings.

After the initial power up, the wizard may be run on the next power up operation by setting the following menu item to Yes — Program ⇒ Utilities ⇒ Display Parameters ⇒ Display the start up wizard next power up?

Upon the next power up, the system will launch the Start Up Wizard. Once completed, the system will set the Display the start up wizard next power-up? setting to No (for the next system power up) and normal start ups will resume.

The Start Up Wizard cannot be used to confirm any parameter settings. Each time that the wizard is launched the default settings appear in all write fields. Any user-written values are recorded and used by the system. Via direct access, the individual wizard parameters may be accessed and viewed to confirm the parameter settings.

The Start Up Wizard querys the user for the following information:

1. The Voltage and Frequency Rating of the Motor (F409/F014).
2. The Upper-Limit Frequency (F012).
3. The Lower-Limit Frequency (F013).
4. Automatic Accel/Decel (F000) (if Enabled, continue from step #7).
5. The Acceleration Time (F009).
6. The Deceleration Time (F010).
7. The Volts Per Hertz Control Type (F015).
8. The Motor Current Rating (F406).
9. The Motor Rated Speed (F407).
10. The Command Source (F003).
11. The Frequency Command Source (F004).
12. The Display Units (F701) for current and voltage.

Click Exit to load the settings of the Start Up Wizard into the ASD.

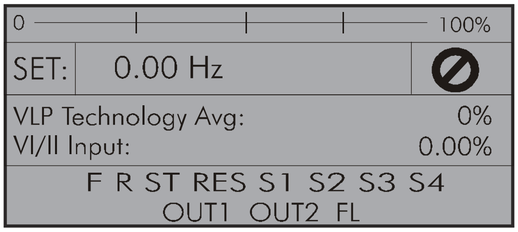
See the section titled Standard Startup Wizard Requirements on pg. 30 for additional information on the Start Up Wizard.

Operation (Local)

To run the motor perform the following steps:

1. Press the Mode key until the Frequency Command screen is displayed.

Frequency Command Screen.



2. Press the Local/Remote key to enter the Local mode (Local LED is illuminated).
3. Turn the Rotary Encoder clockwise until the Frequency Command value is displayed in the **Set** field.

Note: *Ensure that there are no personnel around or near the motor or the motor-driven equipment.*

4. Press the Run key (green Run LED illuminates red) 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 Rotary Encoder to change the Frequency Command value.*

5. Press the Stop-Reset key to stop the motor.

Default Setting Changes

To change a default parameter setting, go to the root of the Program menu and turn the Rotary Encoder until the desired parameter group is within the cursor block. Press the Rotary Encoder (repeat if there is a submenu).

Press the Rotary Encoder to select the default setting to be changed. The selection takes on the reverse video format (dark background, light text). Turn the Rotary Encoder to change the value of the parameter. To exit the menu without saving the change, press the ESC key. To save the new setting, press the Rotary Encoder.

Note: Some parameters (e.g., F800, F801, F805, etc.) require that the ASD be Reset or powered off and then on again in order to enable the new setting.

For a complete listing of the Program menu items, see the section titled Program Mode Menu Navigation on pg. 40. The menu items are mapped for convenience, and Direct Access Numbers are listed where applicable. From any menu, press the Mode key to return to the root menu. Repeated Mode key entries loop the system through the root menus as shown in Figure 29. on pg. 36.

The default settings may also be changed by entering the Parameter Number of the setting to be changed at the Direct Access menu (Program ⇒ Direct Access ⇒ *applicable parameter number*). A listing of the Direct Access/Parameter Numbers and a description of the associated parameter may be found in the section titled Direct Access Parameter Information on pg. 73.

Search For Default Setting Changes

A listing of all parameters that have been changed from the factory default settings may be viewed sequentially by accessing the Changed From Default screen (Program ⇒ Utilities ⇒ Changed From Default).

The Changed From Default feature allows the user to view (and/or change) the parameters that are different from the factory default or post-reset settings. Once the Changed From Default screen is displayed, the system automatically scrolls through all of the system parameters and halts once reaching a changed parameter.

The Rotary Encoder may be clicked once clockwise to continue scrolling forward or clicked once counterclockwise to begin scrolling in reverse. With each click of the Rotary Encoder from a stop, the system scrolls and stops at the next parameter that has been changed.

Pressing the Rotary Encoder while a changed parameter is displayed accesses the settings of the changed parameter for viewing or changing.

Pressing ESC while the system is performing a Changed From Default search terminates the search. Pressing ESC when done searching (or halted at a changed parameter) returns the system to the Program Menu.

Pressing the Mode key when finished searching or when halted at a changed parameter returns the system to the primary menu loop.

Standard Startup Wizard Requirements

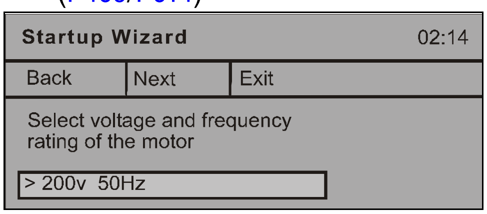
The Startup Wizard assists the user with the initial configuration of the Q9 Plus ASD by querying the user for information on the ASD control settings, motor ratings, and ASD display units. The Q9 Plus ASD may also be setup by directly accessing each of the settings via the Program menu or by using the Direct Access Number of each parameter.

The Startup Wizard is launched from Program ⇒ Utilities ⇒ Standard Startup Wizard. Click Next to continue with the Startup Wizard setup or click Exit to reset the EOI and go to the Frequency Command Screen.

Running the Startup Wizard

Input the required information into the following screens to complete the Startup Wizard.

1. Voltage and Frequency Rating of the Motor (F409/F014)



Motors are designed and manufactured for operation within a specific voltage and frequency range. The voltage and frequency specifications for a given motor may be found on the nameplate of the motor.

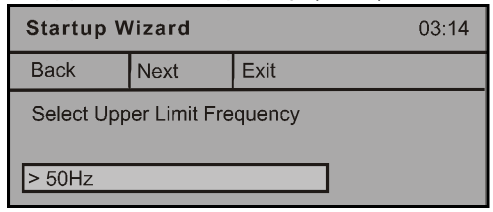
Settings:

0 — 200 v, 50 Hz

1 — 200 v/230 v, 60 Hz

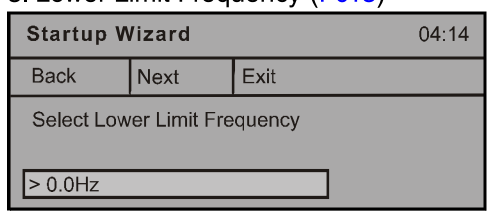
2 — 380v-480v, 50/60 Hz

2. Upper-Limit Frequency (F012)



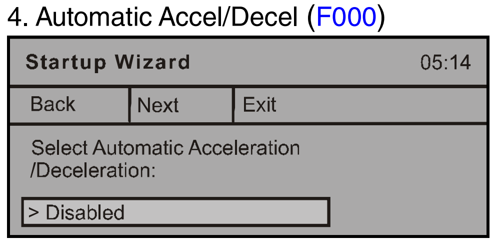
This parameter sets the highest frequency that the Q9 Plus ASD will accept as a frequency command or frequency setpoint. The Q9 Plus ASD may output frequencies greater than the Upper-Limit Frequency (but, less than the Maximum Frequency) when operating in the PID Control mode, Torque Control mode, or the Vector Control modes (sensorless or feedback).

3. Lower-Limit Frequency (F013)



This parameter sets the lowest frequency that the Q9 Plus ASD will accept as a frequency command or frequency setpoint. The Q9 Plus 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).

4. Automatic Accel/Decel (F000)



When enabled, the Q9 Plus ASD adjusts the acceleration and deceleration rates according to the applied load. The acceleration and deceleration times range from 12.5 to 800% of the programmed values [e.g., Acceleration Time 1 (F009) and Deceleration Time 1 (F010) adjusted for the active Accel/Decel times].

Settings:

0 — Manual

1 — Automatic ACC/DEC

2 — Automatic ACC only

The motor and the load must be connected prior to selecting Automatic Accel/Decel.

If Automatic Accel/Decel is not enabled, the Acceleration screen will appear followed by the Deceleration screen as shown below.

Acceleration Time (F009)

Startup Wizard		06:14
Back	Next	Exit

Select Acceleration Time:

> **10.00s**

Deceleration Time (F010)

Startup Wizard		07:14
Back	Next	Exit

Select Deceleration Time:

> **10.00s**

5. Volts Per Hertz Control Type (F015)

Startup Wizard		08:14
Back	Next	Exit

Select Volts/Hz Control Type:

> Constant Torque

This function establishes the relationship between the output voltage and the output frequency of the ASD.

Settings:

0 — Constant Torque

1 — Voltage Decrease Curve

2 — Automatic Torque Boost

3 — Sensorless Vector Control (speed)

5 — V/f 5-Point Setting (open 5-point setting window)

6 — PM Drive

7 — PG Feedback Vector Control (speed)

9 — Energy Saving

10 — Advanced Energy Saving

6. Motor Current Rating (F406)

Startup Wizard		09:14
Back	Next	Exit

Select the rated current of the motor (nameplate):

> 5.0A

This parameter allows the user to input the full-load amperage (FLA) of the motor. This value is used by the Q9 Plus ASD to determine the Motor Overload Protection setting for the motor and may be found on the nameplate of the motor.

7. Motor Rated Speed (F407)

Startup Wizard		10:14
Back	Next	Exit

Set rated speed of the motor (nameplate):

> 1408RPM

This parameter allows the user to input the rated speed of the motor in RPM. This value may be found on the nameplate of the motor.

8. Command Source (F003)

Startup Wizard		11:14
Back	Next	Exit

Select the command source (i.e., Run, Stop, Jog, etc.):

> Terminal Board

This selection establishes the source of the Run commands (e.g., F, R, Stop, etc.).

Settings:

0 — Terminal Board

2 — EOI Keypad

3 — RS485/BACnet

4 — Communication Option Board

9. Frequency Command Source (F004)

Startup Wizard		12:14
Back	Next	Exit

Select the frequency command source:

> RR

This selection establishes the source of the Frequency (speed) command.

Settings:

1 — V/I

2 — RR

3 — RX

5 — EOI Keypad

6 — RS485/BACnet

7 — Communication Option Board

8 — RX2 (AI1 Option)

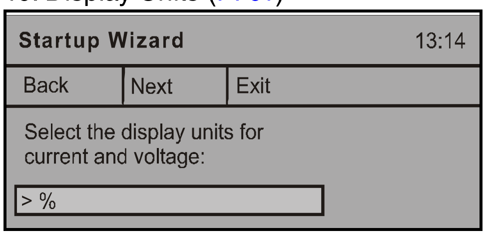
9 — Option V/I (AI2 Option)

10 — UP/DOWN Frequency

11 — Optional RP Pulse Input

12 — Optional High-Speed Pulse Input

10. Display Units (F701)



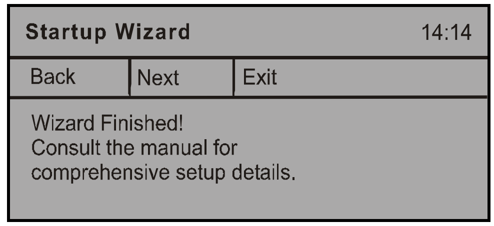
This screen sets the display units for current and voltage.

Settings:

0 — %

1 — A/V (Amp/Volt)

11. Wizard Finished!



This screen is the final screen of the Startup Wizard. The basic parameters of the Q9 Plus ASD have been set. Click Exit to load the Startup Wizard input and to return to the Frequency Command screen. Additional application-specific programming may be required.

Command Mode and Frequency Mode Control

Command control includes instructions such as Stop, Run, Jog, etc. The source of the Command signal must be established for normal operation.

Frequency commands control the output speed of the Q9 Plus ASD. The source of the frequency (speed) control signal must be established for normal operation.

The command and speed reference may come from either internal or external sources. Once the signal source is selected for either function, the system may be configured to use the selected signal all of the time or switch under user-defined conditions.

Command and Frequency control may be carried out using any one of several control methods (signal sources) or combinations. In the event that multiple control commands are received, only the user-configured signal source is recognized. The primary control method for command and frequency control are selected at F003 and F004, respectively. Figure 28. on pg. 34 depicts the command and frequency control sources and the system throughput applicables.

Command Control

The Command Mode selection of F003 establishes the primary command source of the ASD when operating in the Remote mode. While operating in the Local mode the EOI is the command source.

Placing the EOI in the Local mode selects the EOI Keypad as the Command Mode source. Local mode operation may be superseded by other settings.

Example: With the EOI set to Local, an activated discrete input terminal set to Serial/Local Switch places the system in the Remote mode and the settings of F003 and F004 become the source of control.

WARNING

Once the discrete input terminal is no longer activated the system will return to the command of the EOI and run at the commanded EOI value.

The source of the Command control signal may be selected by:

- The F003 setting,
- Via communications, or
- Placing the EOI in the Local mode.

Possible Command signal source selections include the following (F003):

- Terminal Board (default setting),
- EOI Keypad,
- RS485/BACnet, or
- Communication Option Board.

Note: See Table 9 on page 252 for the available discrete input terminal functions that may be used to change the active control source (i.e., Serial/ Local Switch, V/I Terminal Priority, etc.).

Frequency Control

The Frequency Mode 1 (or Frequency Mode 2) setting establishes the primary source of the frequency-control input for the Q9 Plus ASD. Frequency Mode 1 is used for speed control unless the Reference Priority Selection parameter is configured to switch this setting under user-defined conditions (see F200).

Figure 28. on pg. 34 shows the relationship between the frequency-control sources. As indicated in the figure, other items may supersede the selection at F004.

Placing the EOI in the Local mode selects EOI Keypad as the frequency source. Operating in Local mode may be superseded by other settings.

Example: With the EOI as the frequency-control source because the Local/Remote setting is set to Local, activating a discrete input terminal that is set to V/I Terminal Priority enables the V/I terminal as the frequency-control source for the duration of the activation.

The source of the frequency control signal may be selected by:

- The F004 setting,
- Via communications, or
- Placing the EOI in the Local mode.

Possible frequency control source selections include the following (F004):

- V/I,
- RR,
- RX,
- EOI Keypad,
- RS485/BACnet,
- Communication Option Board,
- RX2 Option (Option AI1),
- V/I Option (Option AI2),
- UP/DOWN Frequency,
- RP Pulse Input Option, or
- High-Speed Pulse Input Option.

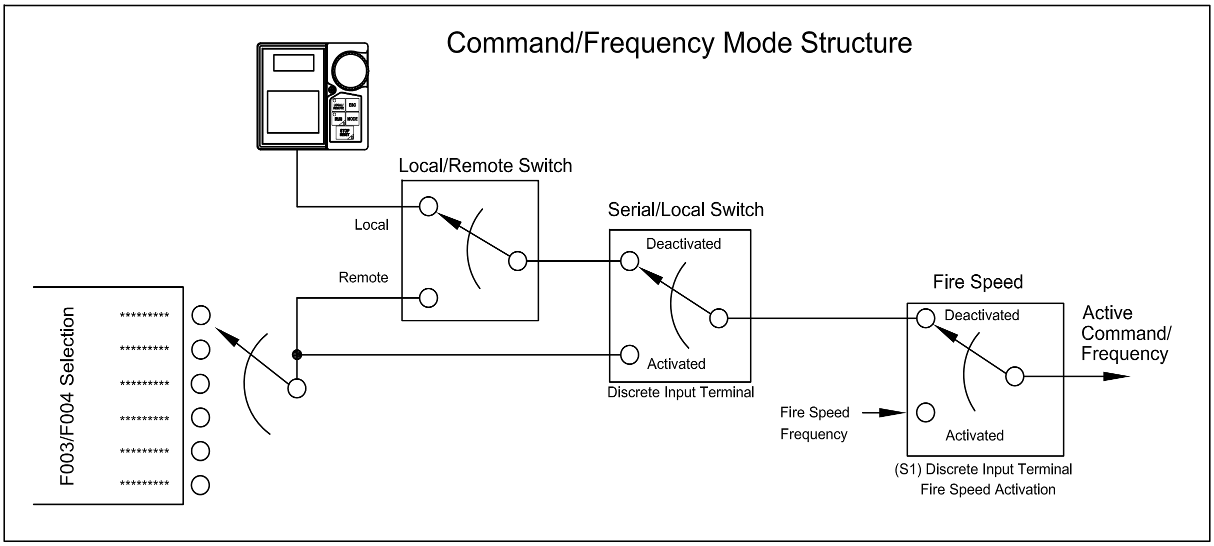
Note: See Table 9 on page 252 for the available discrete input terminal functions that may override the F003 and F004 selections as shown in Figure 28. (i.e., Serial/Local Switch, Fire Speed, etc.).

Command and Frequency Control Selections

Any or all of the command and frequency control sources may be selected and used to control the output speed of the ASD or switched to another source as a function of a user-selected condition.

Placing the Q9 Plus ASD in the Local mode (Local/Remote LED on) selects the EOI Keypad as the control selection for command and frequency input.

Figure 28. Command- and Frequency-Control Source Relationship.



Command Control

The following is a listing with descriptions of the Command Mode (F003) selections (Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode).

Standard Mode Selection	01:05
[F003] Command Mode Selection	
Terminal Board	

Settings:

0 — Terminal Board

Allows for Command control input via the Terminal Board.

2 — EOI Keypad

Allows for EOI command control.

3 — RS485/BACnet

Uses the internal communications command control protocols via the RJ45 connector of the Terminal Board.

4 — Communication Option Board

Use this setting if using any of the optional communication boards for command control.

Frequency Control

The following is a listing with descriptions of the Frequency Mode **1** (F004) selections (Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1).

Standard Mode Selection	02:05
[F004] Frequency Mode 1	
V/I	

Settings:

1 — V/I

Use when a 0 to 10 VDC analog voltage input or a 4 – 20 mA (or 0 to 1 mA) analog DC current input is used as the speed control input. Only one input signal type may be used at a time. Set SW301 to the desired signal type; voltage or current. Scaling for this input is performed at F201.

2 — RR

Use with a 0 to 10 VDC analog input signal. Scaling for this input is performed at F210.

3 — RX

Use with a -10 to +10 VDC analog input signal. Scaling for this input is performed at F216.

5 — EOI Keypad

Use with EOI frequency control.

6 — RS485/BACnet

Uses the internal communications frequency control protocols via the RJ45 connector of the Terminal Board.

7 — Communication Option Board

Use this setting if using any of the optional communication boards for frequency control.

8 — RX2 Option (Option AI1)

Use with a -10 to +10-volt DC analog input signal.

9 — Option V/I (Option AI2)

Allows for the use of the optional voltage/current frequency-control interface.

10 — UP/DOWN Frequency

A discrete input terminal may be configured to increase or decrease the speed of the motor by connecting the assigned terminal to CC momentarily. See F264 for further information on this feature.

11 — Optional RP Pulse Input

Use to allow the system to use a pulsed input for frequency control.

12 — Optional High-Speed Pulse Input

Use to allow the system to use a high-speed pulsed input for frequency control.

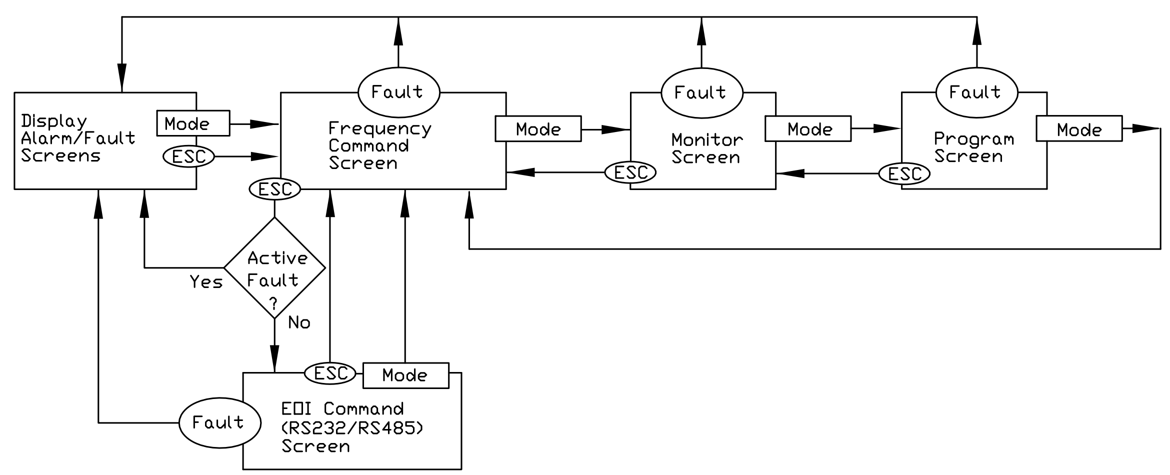
System Configuration and Menu Options

Root Menu Items

The Mode key accesses the three primary modes of the Q9 Plus ASD: the Frequency Command mode, the Monitor mode, and the Program mode. From any mode, press the Mode key to loop through to the other two modes (see Figure 28 below). Press the ESC key from any mode to return to the previous mode until reaching the Frequency Command mode.

The Alarm or Fault information will be displayed in the event of an active Alarm or Fault. Alarm text will be displayed on the Frequency Command screen when active. Fault information will be displayed via a Fault screen. See Alarms, Trips, and Troubleshooting on pg. 263 for more information.

Figure 29. Q9 Plus ASD Root Menu Navigation.



Frequency Command Mode

Frequency Setting

While operating in the Local mode (Local LED is illuminated), the running frequency of the motor may be set from the Frequency Command screen. Using the Rotary Encoder, enter the Frequency Command value, connect ST to CC, provide a Run command (F and/or R), and then press the Run key. The motor will run at the Frequency Command speed and may be changed while running. See Operation (Local) on pg. 28 for more information on the Frequency Command mode.

EOI Command Mode

The EOI Command mode is accessed by pressing the ESC key from the Frequency Command screen.

With the exception of the Virtual Linear Pump Control Enable/Disable, the control settings of the EOI Command menu are effective for EOI control only.

The EOI Command mode provides quick access to the following menu parameters:

Direction — Forward or Reverse.

Stop Pattern — The Decel Stop or Coast Stop setting determines the method used to stop the motor when using the Stop-Reset key of the EOI. The Decel Stop setting enables the DC Injection Braking system setup at F250, F251, and F252. The Coast Stop setting allows the motor to stop at the rate allowed by the inertia of the load.

The Stop Pattern setting has no effect on the Emergency Off settings of F603.

V/f Group — One of four V/f profiles may be selected and run. Each V/f profile is comprised of four user settings: Base Frequency, Base Frequency Voltage, Manual Torque Boost, and Electronic Thermal Protection. Expanded descriptions of these parameters may be found in the section titled Direct Access Parameter Information on pg. 73.

Accel/Decel Group — One of two Accel/Decel profiles may be selected and run. Each of the Accel/Decel profiles is comprised of three user settings: Acceleration, Deceleration, and Pattern. Expanded descriptions of these parameters may be found in the section titled Direct Access Parameter Information on pg. 73 (see F009).

PID Control — This setting enables or disables the PID feedback function.

Torque Limit Group — This group is used to select preset positive torque limits to apply to the active motor (of a multiple motor configuration). The settings may be accessed at F440, F441, F442, and F443, respectively.

VLP Technology Control — This setting enables or disables the Virtual Linear Pump function.

Monitor Mode

The Monitor mode allows the user to monitor motor performance variables, control settings, and configuration data during motor operation. The items are listed and described below.

Press the Rotary Encoder to access the listing of monitored parameters. Turn the Rotary Encoder to access subsequent monitored parameters.

Note: The Monitor mode is a read-only mode. The settings cannot be changed from the Monitor mode. For information on how to change the values, see the section titled *Default Setting Changes on pg. 29*.

Note: Any two of the Underlined monitored items may be selected for display at the Frequency Command screen while running via Program ⇒ Utilities ⇒ Main Monitor Selections.

Note: The F701 setting will determine if the Current and Voltage values displayed appear as A (Amps) or V (Voltage), or if the value is shown as a % (Percentage) of the ASD rating.

Frequency at Trip — Displays the at-trip frequency.

Frequency Reference — Displays the Frequency Setpoint (commanded frequency).

Output Current — Displays the Output Current as a percentage of the rated capacity of the ASD.

DC Voltage — Displays the DC Bus Voltage as a percentage of the rated capacity of the ASD.

Output Voltage — Displays the Output Voltage as a percentage of the rated capacity of the ASD.

AM Output — Displays the magnitude of the function assigned to this terminal relative to the full-scale reading of the AM terminal. This terminal may be configured at F670 for application-specific suitability.

FM Output — Displays the magnitude of the function assigned to this terminal relative to the full-scale reading of the FM terminal. This terminal may be configured at F005 for application-specific suitability.

Motor OL (Overload) Real — Displays the real-time Motor Overload value as a percentage of the rated capacity of the motor.

Motor OL (Overload) Trip — Displays the Motor Overload Trip value as a percentage of the rated capacity of the motor.

Motor Load — Displays the real-time Motor Load as a percentage of the rated capacity of the motor.

ASD OL (Overload) Real — Displays the real-time ASD Overload as a percentage of the rated capacity of the ASD.

ASD OL (Overload) Trip — Displays the ASD Overload Trip value as a percentage of the rated capacity of the ASD.

ASD Load — Displays the ASD Load as a percentage of the rated capacity of the ASD.

Run Time — Displays the Cumulative Run Time in hours. Select Clear Run Timer at F007 to reset this reading.

Compensation Frequency — Displays the Output Frequency after the application of the slip compensation correction value (post compensation frequency).

DBR OL (Overload) Real (not used) — Displays the real-time DBR Overload value as a percentage of the Dynamic Braking Resistor capacity.

DBR OL (Overload) Trip (not used) — Displays the DBR Overload Trip value as a percentage of the Dynamic Braking Resistor capacity.

DBR Load (not used) — Displays the DBR Load as a percentage of the Dynamic Braking Resistor capacity.

Feedback (Inst) — Provides a status of the Real-Time Feedback in Hz.

Feedback (1 Second) — Provides a status of the 1-Second Averaging feedback in Hz.

Torque — Displays the Output Torque as a percentage of the rated capacity of the Q9 Plus ASD.

Torque Reference — Displays the Torque Reference as a percentage of the maximum torque available.

Torque Current — Displays the torque-producing current value.

Exciting Current — Displays the current value required to produce the excitation field.

PID Feedback — Provides a status of the PID Real Time Feedback in Hz.

Input Power — Displays the Input Power in Kilowatts (kW).

Output Power — Displays the Output Power in Kilowatts (kW) and is the default LED displayed item when operating in the Virtual Linear Pump mode.

Pattern Group # — Displays the active Pattern Run Group Number.

Pattern Cycle # — Displays the cycle number of the active Pattern Run Group.

Pattern Preset # — Displays the active Preset Speed of the active Pattern Run Group being run.

Pattern Time — Displays the remaining time for the active Pattern Run Group.

RR Input — Displays the RR input value as a percentage of the full range of the RR value (potentiometer input).

***V/I Input** — Displays the **V/I** input setting as a percentage of the full range of the V/I value.

Note: The isolated V/I input terminal may receive Current or Voltage to control the output speed or the output torque. The input signal type must be selected at SW301 on the Terminal Board.

The V input setting of SW301 is used for the 0 – 10 VDC analog input signal and the I input setting of SW301 is used for the 0 – 20 mA analog input signal. Either may be used as a frequency or torque control source. Throughout this manual, they will be selection-specific and may be listed as V/I.

See parameter F201 for more information on the setup of this input.

RX Input — Displays the RX input setting as a percentage of the full range of the RX value (-10 to +10 VDC Input).

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

Note: The RX2 terminal function is available on the Expansion IO Card Option 1 Option Board (P/N ETB003Z) only.

Trip Code — Displays None if there are no errors, or displays one of the associated Fault Codes listed in Table 18 on page 267 if there is an active Fault (e.g., E = Emergency Off).

Past Trip 1 — This function records and displays the last trip incurred. Subsequent trips will replace Past Trip 1. As trip records are replaced, they are shifted to the next level of the Past Trip locations until being deleted (i.e., Past Trip 1 is moved to Past Trip 2 and then to Past Trip 3 until being shifted out of Past Trip 4). Once shifted out of Past Trip 4, the record is deleted. If no trips have occurred since the last reset, No Error is displayed for each trip record.

Past Trip 2 — Past trip information or None.

Past Trip 3 — Past trip information or None.

Past Trip 4 — Past trip information or None.

Note: An improper Q9 Plus ASD setup may cause some trips — reset the Q9 Plus ASD to the Factory Default settings (Program ⇒ Utilities ⇒ Type Reset ⇒ Reset to Factory Settings) before pursuing a systemic malfunction.

Direction — Displays the Direction command (forward/reverse).

Discrete Input Terminals — Displays the status (activated = reverse video) of the discrete input terminals of the Terminal Board.

Discrete Output Terminals — Displays the status (activated = reverse video) of the discrete output lines of the Terminal Board.

Output Frequency — Displays the running frequency.

Program Mode Menu Navigation

The following table lists the menu items of the Program mode and maps the flow of the menu selections. The Parameter Numbers for the listed functions are provided where applicable.

The functions listed may be viewed, or selected and changed as mapped below or via the Direct Access method: Program ⇒ Direct Access ⇒ *Applicable Parameter Number*.

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
VIRTUAL LINEAR PUMP (see Virtual Linear Pump Setup on pg. 63 for more on this function.)	Setup Wizard	Motor Rated Current (Nameplate)	F406
		Application Type	F391
		Command Source	F396
		Low Frequency Limit	F398
		Transducer Units	N/A
		Transducer Output Range (and Type)	F392
		Transducer Maximum Reading	F393
		Transducer Minimum Reading	F403
		Virtual Linear Pump Maximum (Threshold)	F395
		Set Virtual Linear Pump: Transducer Value	N/A
		Virtual Linear Pump Minimum (Threshold)	F394
		Set Virtual Linear Pump: Transducer Value	N/A
	Settings	Mode Switch	F390
		Application Type	F391
		Application Type (Operating) Mode	F380
		Transducer Units	N/A
		Transducer Output Range	F392
		Transducer Maximum Reading	F393
		Transducer Minimum Reading	F403
		Virtual Linear Pump Minimum (Threshold)	F394
		Virtual Linear Pump Maximum (Threshold)	F395
		Command Source	F396
		Command Value	F397
		Low Frequency Limit	F398
	Start and Stop Points	Start/Stop Mode	F385

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
VIRTUAL LINEAR PUMP	Start and Stop Points	Start/Stop Delay Timer	F387
		Low Start/Stop Point	F388
		High Start/Stop Point	F389
		Input Terminal 5 (S1) Function	F115
	Sleep Timer	Sleep Timer	F382
		Sleep Delay Timer	F383
	Run External Devices	External Device Delay Timer	F480
		External Device Low Band Threshold	F481
		External Device High Band Threshold	F482
		Output Terminal 1 (OUT1) Function	F130
		Output Terminal 2 (OUT2) Function	F131
	Low Suction/No-Flow Cut Off	Low Suction/No-Flow Cut Off Mode	F483
		Low Suction/No-Flow Cut Off Delay Timer	F484
		Input Terminal 5 (S1) Function	F115
		Low Suction/No-Flow Cut Off Fault Disposition	F450
	Sealing Water	Sealing Water Mode	F485
		Input Terminal 5 (S1) Function	F115
		Output Terminal 1 (OUT1) Function	F130
	Time-Based Alternation	Time-Based Alternation	F417
		Time-Based Alternation Period	F418
		Total Number of ASDs on Time-Based Alternation	F437
		Pump Number	F434
		Process Hold Mode Response Time	F438
		Direct Mode Response Time	F439
		Direct Mode Emergency Setpoint	F456
		Input Terminal 5 (S1) Function	F115
		Time-Based Alternation Emergency Timer (Minutes)	F404

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
QUICK START		Type Reset (Reset Selections)	F007
		Command Mode	F003
		Frequency Mode 1	F004
		V/I Input Point 1 Setting	F201
		V/I Input Point 1 Frequency	F202
		V/I Input Point 2 Setting	F203
		V/I Input Point 2 Frequency	F204
		Acceleration Time 1	F009
		Deceleration Time 1	F010
		Lower-Limit Frequency	F013
		V/f Pattern	F015
		Motor Overload Protection	F017
		Current/Voltage Display Units	F701
		Motor Overload Protection Level 1	F600
		Output Terminal 1 (OUT1) Function	F130
		PWM Carrier Frequency	F300
		Auto Restart	F301
		Regenerative Power Ridethrough Mode	F302
		Number of Times to Retry	F303
FUNDAMENTAL	Accel/Decel 1 Settings	Automatic Acceleration/Deceleration	F000
		Acceleration Time 1	F009
		Deceleration Time 1	F010
	Frequency Settings	Maximum Frequency	F011
		Upper-Limit Frequency	F012
		Lower-Limit Frequency	F013
		V/f Pattern	F015
		Time Limit for Lower-Limit Frequency Operation	F256
	Motor Set 1	Automatic Torque Boost	F001

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FUNDAMENTAL	Motor Set 1	Base Frequency 1	F014
		Manual Torque Boost 1	F016
		Motor Overload Protection Level 1	F600
	Standard Mode Selection	Command Mode	F003
		Frequency Mode 1	F004
		Forward/Reverse Run	F008
		Frequency Priority Selection	F200
		Frequency Mode 2	F207
		Frequency Mode Priority Switching Frequency	F208
TERMINAL	Analog Output Terminals	FM Output Terminal Function	F005
		FM Output Terminal Adjustment	F006
		FM Output Gradient Characteristic	F682
		FM Bias Adjustment	F683
		FM Voltage/Current Output Switching	F681
		FM Output Filter	F684
		Constant at the Time of Filtering	F678
		AM Output Terminal Function	F670
		AM Output Terminal Adjustment	F671
		AM Output Gradient Characteristic	F685
		AM Bias Adjustment	F686
		MON1 Terminal Meter Selection	F672
		MON1 Terminal Meter Adjustment	F673
		MON1 Output Gradient Characteristic	F689
		MON1 Bias Adjustment	F690
		MON1 Voltage/Current Output Switching	F688
		MON2 Terminal Meter Selection	F674
		MON2 Terminal Meter Adjustment	F675
		MON2 Output Gradient Characteristic	F692
		MON2 Bias Adjustment	F693

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL	Analog Output Terminals	MON2 Voltage/Current Output Switching	F691
		Logic Output/Pulse Output (OUT1) — Not used with the Q9 Plus ASD.	F669
		Pulse Output Function	F676
		Pulse Output Frequency	F677
	Input Special Functions	Forward/Reverse Run Priority When Both Are Closed (Activated)	F105
		Input Terminal Priority	F106
		16-Bit Binary/BCD Input	F107
		V/I Analog Input Broken Wire Detection Level	F633
		Select Operation when V/I is Disconnected	F644
	Input Terminal Delays	Input Terminal 1 (F) Response Time	F140
		Input Terminal 2 (R) Response Time	F141
		Input Terminal 4 (RES) Response Time	F143
		Input Terminal 5–12 Response Time	F144
		Input Terminal 13–20 Response Time	F145
	Input Terminals	Always ON Terminal Function 1	F110
		Always ON Terminal Function 2	F127
		Always ON Terminal Function 3	F128
		Input Terminal 1 (F) Function	F111
		Input Terminal 2 (R) Function	F112
		Input Terminal 3 (ST) Function	F113
		Input Terminal 4 (RES) Function	F114
		Input Terminal 5 (S1) Function	F115
		Input Terminal 6 (S2) Function	F116
		Input Terminal 7 (S3) Function	F117
		Input Terminal 8 (S4) Function	F118
		Input Terminal 9 (LI1) Function	F119
		Input Terminal 10 (LI2) Function	F120
		Input Terminal 11 (LI3) Function	F121

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL	Input Terminals	Input Terminal 12 (LI4) Function	F122
		Input Terminal 13 (LI5) Function	F123
		Input Terminal 14 (LI6) Function	F124
		Input Terminal 15 (LI7) Function	F125
		Input Terminal 16 (LI8) Function	F126
		Virtual Input Terminal Selection 1	F973
		Virtual Input Terminal Selection 2	F974
		Virtual Input Terminal Selection 3	F975
		Virtual Input Terminal Selection 4	F976
	Line Power Switching	Commercial Power/ASD Switching Output	F354
		Commercial Power/ASD Switching Frequency	F355
		ASD Side Switching Delay Time	F356
		Commercial Power Side Switching Delay Time	F357
		Commercial Power Switching Frequency Hold Time	F358
	Output Terminals	Output Terminal 1 (OUT1) Function	F130
		Output Terminal 2 (OUT2) Function	F131
		Output Terminal 3 (FL) Function	F132
		Output Terminal 4 (OUT3) Function	F133
		Output Terminal 5 (OUT4) Function	F134
		Output Terminal 6 (R1) Function	F135
		Output Terminal 7 (OUT5) Function	F136
		Output Terminal 8 (OUT6) Function	F137
		Output Terminal 9 (R2) Function	F138
		Output Terminal 10 (R3) Function	F168
		Output Terminal 11 (R4) Function	F169
	Reach Settings	Low-Speed Signal Output Frequency	F100
		Speed Reach Frequency	F101
		Speed Reach Detection Band	F102
DIRECT ACCESS		Parameter Number	N/A
		Unknown Numbers	N/A

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
UTILITIES	Version	EOI / ASD Type / CPU Level / EEPROM / MC Level	N/A
	Standard Start Up Wizard	See Standard Startup Wizard Requirements on pg. 30.	N/A
	Prohibition	Local/Remote Key Command Override	N/A
		Local/Remote Key Frequency Override	
		Show Uninitialized Parameters at Changed From Default Screen	
	Alarm Prohibition (prohibits an EOI alarm display ONLY — alarm still activated)	Over-Current Alarm	N/A
		ASD Overload Alarm	
		Motor Overload Alarm	
		Over-Heat Alarm	
		Over-Voltage Alarm	
		Main Power Under-Voltage Alarm	
		Reserved (POFF) Alarm	
		Under-Current Alarm	
		Pre (Approaching) Over-Torque Alarm (Threshold)	
		DBR (Dynamic Braking Resistor) Overload Alarm	
		Cumulative Run Timer Alarm	
		DeviceNet/Profibus/CC-Link Alarm	
		RS485 Communication	
		Main Power Under-Voltage Alarm	
		Stop After Instantaneous Power-Off Alarm	
		Stop After Lower-Limit Continuous Time	
		Light-Load Alarm	
		Heavy-Load Alarm	
		Maintenance Timer Alarm	
		Over-Torque Alarm	
		Soft Stall Alarm	
		Low Suction/No-Flow Cut Off Alarm	
		Time-Based Alternation Alarm Float Active	

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
UTILITIES	Type Reset	Type Reset (Reset Selections)	F007
	Real-Time Clock Setup	Set Real-Time Clock	N/A
		Hours:Minutes:Seconds	
		Month Day Year	
	Trip History (read-only)	Trip Number	N/A
		Trip Type	
		Hours:Minutes:Seconds Month/Day/Year	
		Frequency at Trip	N/A
		Output Current	
		Output Voltage	
		Direction	
		Frequency Reference	
		DC Voltage	
		Discrete Input Terminal Status	
		Discrete Output Terminal Status	
		Run Timer	
		Compensation Frequency	
		Speed Feedback (Inst) (Real-Time)	
		Speed Feedback (1 Second)	
		Torque	
		Torque Reference	
		Torque Current	
		Excitation Current	
		PID Feedback	
		Motor Overload Ratio	
		ASD Overload Ratio	
		DBR (Dynamic Braking Resistor) Overload Ratio	
		Motor Load	
		ASD Load	
		DBR (Dynamic Braking Resistor) Load	

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
UTILITIES	Trip History (read-only)	Input Power	N/A
		Output Power	
	Changed From Default	Display Changed Parameters	N/A
	Display Parameters	Automatic Function Selection	F040
		Current/Voltage Display Units	F701
		Free Unit Multiplication Factor	F702
		Free Unit	F703
		Free Unit Display Gradient Characteristic	F705
		Free Unit Display Bias	F706
		Change Step Selection 1	F707
		Change Step Selection 2	F708
		Integral Output Power Retention	F748
		Integral Output Power Display Unit	F749
		Select Language	N/A
		Display the Start Up Wizard Next Power-Up?	N/A
	Main Monitor Selections	4-digit LED Display Item	N/A
		4-digit LED Display Item while in Virtual Linear Pump Mode	
		Monitor 1	
		Monitor 2	
	Contrast	Contrast Adjustment	N/A
	Trace	Trace Selection	F740
		Trace Cycle	F741
		Trace Data 1	F742
		Trace Data 2	F743
		Trace Data 3	F744
		Trace Data 4	F745
	View Trace Data	Trace Data Display	N/A
	Save/Restore Wizard	Save/Restore System Settings	N/A

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
PROTECTION	Abnormal Speed Settings	Abnormal Speed Detection Time	F622
		Over-Speed Detection Frequency Upper Band	F623
		Over-Speed Detection Frequency Lower Band	F624
	Base Frequency Voltage	Supply Voltage Correction	F307
	DC Braking	DC Injection Braking Start Frequency	F250
		DC Injection Braking Current	F251
		DC Injection Braking Time	F252
		Forward/Reverse DC Braking Priority	F253
		Motor Shaft Stationary Control	F254
	Dynamic Braking (not used)	Dynamic Braking Enable	F304
		Dynamic Braking Resistance	F308
		Continuous Dynamic Braking Capacity	F309
		Braking Resistance Overload Time (10x Rated Torque)	F639
	Emergency Off Settings	Emergency Off	F603
		Emergency DC Braking Control Time	F604
	Low-Current Settings	Low-Current Trip	F610
		Low-Current Detection Current	F611
		Low-Current Detection Time	F612
		Low-Current Detection Current Hysteresis Width	F609
	Overload	Motor Overload Protection Configuration	F017
		Overload Reduction Start Frequency	F606
		ASD Overload	F631
	Over-Torque Parameters	Over-Torque Trip	F615
		Over-Torque Detection Level During Power Running	F616
		Over-Torque Detection Level During Regenerative Braking	F617
		Over-Torque Detection Time	F618
		Over-Torque Detection Hysteresis	F619
	Under-Torque Detection	Under-Torque Detection	F651

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
PROTECTION	Under-Torque Detection	Under-Torque Detection Level During Power Running	F652
		Under-Torque Detection During Regenerative Braking	F653
		Under-Torque Detection Time	F654
		Under-Torque Detection Hysteresis	F655
	Phase Loss	ASD Output Phase Loss Detection	F605
		ASD Input Phase Loss Detection	F608
	Retry/Restart	Auto Restart	F301
		Number of Times to Retry	F303
		Ridethrough Time	F310
		Random Mode	F312
	Stall	Over-Voltage Limit Operation	F305
		Regenerative Over-Excitation Upper Limit	F319
		Stall Prevention Factor 1	F416
		Stall Prevention Level	F601
		Over-Voltage Limit Operation Level	F626
		Over-Voltage Limit Constant	F469
	Trip Settings	Retain Trip Record at Power Down	F602
	Under-Voltage/Ridethrough	Regenerative Power Ridethrough Mode	F302
		Under-Voltage Trip	F627
		Under-Voltage Detection Level	F625
		Under-Voltage (Trip Alarm) Detection Time	F628
		Regenerative Power Ridethrough Control Level	F629
	Special Protection Parameters	Short Circuit Detection at Start	F613
		Cooling Fan Control	F620
		Cumulative Operation Time Alarm Setting	F621
	Fire-Speed Control	Forced Fire-Speed Control	F650
FREQUENCY	Analog Filter	Analog Input Filter	F209
	Forward/Reverse Disable	Forward/Reverse Disable	F311
	Jog Settings	Jog Frequency	F260

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY	Jog Settings	Jog Stop Pattern	F261
		EOI Keypad Operation Jog Mode	F262
	UP/DOWN Frequency Functions	UP/DOWN Up Response Time	F264
		UP/DOWN Up Frequency Step	F265
		UP/DOWN Down Response Time	F266
		UP/DOWN Down Frequency Step	F267
		Initial UP/DOWN Frequency	F268
		Initial UP/DOWN Frequency Rewriting	F269
	V/I Settings	Optional V/I Terminal Voltage/Current Selection	F109
	Preset Speeds	Preset Speed 1	F018
		Preset Speed 2	F019
		Preset Speed 3	F020
		Preset Speed 4	F021
		Preset Speed 5	F022
		Preset Speed 6	F023
		Preset Speed 7	F024
		Preset Speed 8	F287
		Preset Speed 9	F288
		Preset Speed 10	F289
		Preset Speed 11	F290
		Preset Speed 12	F291
		Preset Speed 13	F292
		Preset Speed 14	F293
		Preset Speed 15	F294
	Speed Reference Setpoints	V/I Input Point 1 Setting	F201
		V/I Input Point 1 Frequency	F202
		V/I Input Point 2 Setting	F203
		V/I Input Point 2 Frequency	F204
		RR Input Point 1 Setting	F210

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY	Speed Reference Setpoints	RR Input Point 1 Frequency	F211
		RR Input Point 2 Setting	F212
		RR Input Point 2 Frequency	F213
		RX Input Point 1 Setting	F216
		RX Input Point 1 Frequency	F217
		RX Input Point 2 Setting	F218
		RX Input Point 2 Frequency	F219
		RX2 Input Point 1 Setting	F222
		RX2 Input Point 1 Frequency	F223
		RX2 Input Point 2 Setting	F224
		RX2 Input Point 2 Frequency	F225
		BIN Input Point 1 Setting	F228
		BIN Input Point 1 Frequency	F229
		BIN Input Point 2 Setting	F230
		BIN Input Point 2 Frequency	F231
		PG Input Point 1 Setting	F234
		PG Input Point 1 Frequency	F235
		PG Input Point 2 Setting	F236
		PG Input Point 2 Frequency	F237
		V/I Input Bias	F470
		V/I Input Gain	F471
		RR Input Bias	F472
		RR Input Gain	F473
		RX Input Bias	F474
		RX Input Gain	F475
		RX2 Input Bias	F476
		RX2 Input Gain	F477
		Option V/I Input Bias	F478
		Option V/I Input Gain	F479

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SPECIAL	Acc/Dec 1 – 4 Settings	Acceleration Time 2	F500
		Deceleration Time 2	F501
		Acceleration/Deceleration Pattern 1	F502
		Acceleration/Deceleration Pattern 2	F503
	Acc/Dec Special	Acceleration/Deceleration Pattern 1 – 4	F504
		Acceleration/Deceleration Switching Frequency 1	F505
	Carrier Frequency	PWM Carrier Frequency	F300
		Carrier Frequency Control Mode	F316
	V/f 5-Point Setting	V/f 5-Point Setting Frequency 1	F190
		V/f 5-Point Setting Voltage 1	F191
		V/f 5-Point Setting Frequency 2	F192
		V/f 5-Point Setting Voltage 2	F193
		V/f 5-Point Setting Frequency 3	F194
		V/f 5-Point Setting Voltage 3	F195
		V/f 5-Point Setting Frequency 4	F196
		V/f 5-Point Setting Voltage 4	F197
		V/f 5-Point Setting Frequency 5	F198
		V/f 5-Point Setting Voltage 5	F199
	Frequency Control	Start Frequency	F240
		Run Frequency	F241
		Run Frequency Hysteresis	F242
		End Frequency	F243
	Special Parameters	0 Hz Dead Band Signal	F244
		0 Hz Command Output	F255
		Exciting Strengthening Coefficient	F415
		Annual Average Ambient Temperature	F634
		Rush Current Suppression Relay Activation Time	F635
		PTC 1 Thermal Selection	F637
		PTC 2 Thermal Selection	F638

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SPECIAL	Special Parameters	PTC Thermal Mode	F645
		PTC Detection Resistor Value	F646
		Brake Equipped Motor Restart Condition	F643
	Jump Frequencies	Jump Frequency 1	F270
		Jump Frequency 1 Bandwidth	F271
		Jump Frequency 2	F272
		Jump Frequency 2 Bandwidth	F273
		Jump Frequency 3	F274
		Jump Frequency 3 Bandwidth	F275
MOTOR	Motor Set 2	Base Frequency 2	F170
		Base Frequency Voltage 2	F171
		Manual Torque Boost 2	F172
		Motor Overload Protection Level 2	F173
	PM Motor	PM Motor Constant 1 (D-Axis Inductance)	F498
		PM Motor Constant 2 (Q-Axis Inductance)	F499
		Step-Out Detection-Current Level (For PM Motors)	F640
		Step-Out Detection-Current Time (For PM Motors)	F641
	Vector Motor Model	Autotune 1	F400
		Slip Frequency Gain	F401
		Autotune 2	F402
		Motor Rated Capacity (Nameplate)	F405
		Motor Rated Current (Nameplate)	F406
		Motor Rated RPM (Nameplate)	F407
		Base Frequency Voltage 1	F409
		Motor Constant 1 (Torque Boost)	F410
		Motor Constant 2 (No Load Current)	F411
		Motor Constant 3 (Leak Inductance)	F412
		Motor Constant 4 (Rated Slip)	F413

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TORQUE	Setpoints	V/I Input Point 1 Rate	F205
		V/I Input Point 2 Rate	F206
		RR Input Point 1 Rate	F214
		RR Input Point 2 Rate	F215
		RX Input Point 1 Rate	F220
		RX Input Point 2 Rate	F221
	Torque Limit Settings	Power Running Torque Limit 1	F440
		Power Running Torque Limit 1 Level	F441
		Regenerative Braking Torque Limit 1	F442
		Regenerative Braking Torque Limit 1 Level	F443
		Constant Output Zone Torque Limit	F454
FEEDBACK	Drooping Control	Drooping Gain	F320
		Speed at 0% Drooping Gain	F321
		Speed at F320 Drooping Gain	F322
		Drooping Insensitive Torque	F323
		Drooping Output Filter	F324
	Feedback Settings	PID Control Switching	F359
		PID Feedback Signal	F360
		PID Feedback Delay Filter	F361
		PID Feedback Proportional Gain	F362
		PID Feedback Integral Gain	F363
		PID Deviation Upper Limit	F364
		PID Deviation Lower Limit	F365
		PID Feedback Differential Gain	F366
		Process Upper Limit	F367
		Process Lower Limit	F368
		PID Control Delay Time	F369
		PID Output Upper Limit	F370
		PID Output Lower Limit	F371

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FEEDBACK	Feedback Settings	Process Increasing Rate	F372
		Process Decreasing Rate	F373
		Frequency Command Detection Range	F374
	Override Control	Adding Input Selection	F660
		Multiplying Input Selection	F661
	PG Settings	Number of PG Input Pulses	F375
		Number of PG Input Phases	F376
		PG Disconnection Detection	F377
		Current Control Proportional Gain	F458
		Speed Loop Proportional Gain	F460
		Speed Loop Stabilization Coefficient	F461
		Load Moment of Inertia 1	F462
		Motor Oscillation Control	F467
		Stall Prevention Control Switching	F468
		Max Output Voltage Modulation Rate	F495
		Number of RP Terminal Input Pulses	F378
		PID Output Dead Band	F379
MY FUNCTION	My Function Selection	My Function Operating Mode	F977
	My Function Unit 1	Input Function Target 1	F900
		Input Function Command 1	F901
		Input Function Target 2	F902
		Input Function Command 2	F903
		Input Function Target 3	F904
		Output Function Assigned	F905
	My Function Unit 2	Input Function Target 1	F906
		Input Function Command 1	F907
		Input Function Target 2	F908
		Input Function Command 2	F909
		Input Function Target 3	F910

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
MY FUNCTION	My Function Unit 2	Output Function Assigned	F911
	My Function Unit 3	Input Function Target 1	F912
		Input Function Command 1	F913
		Input Function Target 2	F914
		Input Function Command 2	F915
		Input Function Target 3	F916
		Output Function Assigned	F917
	My Function Unit 4	Input Function Target 1	F935
		Input Function Command 1	F936
		Input Function Target 2	F937
		Input Function Command 2	F938
		Input Function Target 3	F939
		Output Function Assigned	F940
	My Function Unit 5	Input Function Target 1	F941
		Input Function Command 1	F942
		Input Function Target 2	F943
		Input Function Command 2	F944
		Input Function Target 3	F945
		Output Function Assigned	F946
	My Function Unit 6	Input Function Target 1	F947
		Input Function Command 1	F948
		Input Function Target 2	F949
		Input Function Command 2	F950
		Input Function Target 3	F951
		Output Function Assigned	F952
	My Function Unit 7	Input Function Target 1	F953
		Input Function Command 1	F954
		Input Function Target 2	F955
		Input Function Command 2	F956

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
MY FUNCTION	My Function Unit 7	Input Function Target 3	F957
		Output Function Assigned	F958
	My Function Data	My Function Percent Data 1	F918
		My Function Percent Data 2	F919
		My Function Percent Data 3	F920
		My Function Percent Data 4	F921
		My Function Percent Data 5	F922
		My Function Frequency Data 1	F923
		My Function Frequency Data 2	F924
		My Function Frequency Data 3	F925
		My Function Frequency Data 4	F926
		My Function Frequency Data 5	F927
		My Function Time Data 1	F928
		My Function Time Data 2	F929
		My Function Time Data 3	F930
		My Function Time Data 4	F931
		My Function Time Data 5	F932
		My Function Count Data 1	F933
		My Function Count Data 2	F934
	My Function Analog	Analog Input Function Target 11	F959
		Analog Function Assigned Object 11	F961
		Analog Input Function Target 21	F962
		Analog Function Assigned Object 21	F964
	My Function Monitor	Monitor Output Function 11 (2000 – 3099 = FD00 – FE99)	F965
		Monitor Output Function Command 11	F966
		Monitor Output Function 21 (2000 – 3099 = FD00 – FE99)	F967
		Monitor Output Function Command 21	F968

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
MY FUNCTION	My Function Monitor	Monitor Output Function 31 (2000 – 3099 = FD00 – FE99)	F969
		Monitor Output Function Command 31	F970
		Monitor Output Function 41 (2000 – 3099 = FD00 – FE99)	F971
		Monitor Output Function Command 41	F972
COMMUNICATIONS	Communication Settings	Baud Rate (2-Wire RS485)	F800
		Parity (2-Wire RS485)	F801
		ASD Number	F802
		Communications Time-Out (2-Wire and 4-Wire RS485)	F803
		Communication Time-Out Action (2-Wire and 4-Wire RS485)	F804
		Send Delay Time (2-Wire RS485)	F805
		ASD-to-ASD Communication (2-Wire RS485)	F806
		Communication Protocol (2-wire RS485)	F807
		Communication 1 Time-Out Condition	F808
		Baud Rate (4-wire RS485)	F820
		Parity (4-wire RS485)	F827
		Send Delay Time (4-wire RS485)	F825
		ASD-to-ASD Communication (4-wire RS485)	F826
		Communication Protocol (4-wire RS485)	F829
		Free Notes	F880
		Network Option Reset Setting	F899
	Communication Adjustments	Frequency Point Selection	F810
		Point 1 Setting	F811
		Point 1 Frequency	F812
		Point 2 Setting	F813
		Point 2 Frequency	F814
		Communication Protocol (4-Wire RS485)	F829

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
COMMUNICATIONS	BACnet Settings	Communication Protocol (4-Wire RS485)	F829
		Baud Rate (4-Wire RS485)	F820
		ASD Number	F802
		Communication Option Setting 4	F833
		Communication Option Setting 5	F834
		Communication Option Setting 6	F835
		Communication Option Setting 7	F836
		Network Option Reset	F899
	Ethernet Settings	IP Address Setting Method	F576
		IP Card Data 1	F577
		IP Card Data 2	F578
		IP Card Data 3	F579
		IP Card Data 4	F580
		Subnet Mask Data 1	F581
		Subnet Mask Data 2	F582
		Subnet Mask Data 3	F583
		Subnet Mask Data 4	F584
		IP Gate 1 Data 1	F585
		IP Gate 1 Data 2	F586
		IP Gate 1 Data 3	F587
		IP Gate 1 Data 4	F588
		IP Master Data 1	F589
		IP Master Data 2	F590
		IP Master Data 3	F591
		IP Master Data 4	F592
		I/O Scan Permission	F593
		Communication Time-Out (Modbus)	F594
		MAC Address 1	F784
		MAC Address 2	F785
		MAC Address 3	F786

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
COMMUNICATIONS	Ethernet Settings	MAC Address 4	F787
		MAC Address 5	F788
		MAC Address 6	F789
		Device Name Data 1	F792
		Device Name Data 2	F793
		Device Name Data 3	F794
		Device Name Data 4	F795
		Device Name Data 5	F796
		Device Name Data 6	F797
		Device Name Data 7	F798
		Device Name Data 8	F799
		Baud Rate (Ethernet)	F821
		Baud Rate Monitor Right Port (Ethernet)	F822
		Baud Rate Monitor Left Port (Ethernet)	F823
	Modbus Settings	Address Monitor (Modbus+)	F815
		Command Selection (Modbus+)	F816
		Number of Command (Modbus+)	F817
		Number of Monitors (Modbus+)	F818
		Command Station (Modbus+)	F819
	Communication Options	Communication Option Setting 1	F830
		Communication Option Setting 2	F831
		Communication Option Setting 3	F832
		Communication Option Setting 4	F833
		Communication Option Setting 5	F834
		Communication Option Setting 6	F835
		Communication Option Setting 7	F836
		Communication Option Setting 8	F837
		Communication Option Setting 9	F838
		Communication Option Setting 10	F841

Program Mode Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
COMMUNICATIONS	Communication Options	Communication Option Setting 11	F842
		Communication Option Setting 12	F843
		Communication Option Setting 13	F844
		Communication Option Setting 14	F845
		Communication Option Setting 15	F846
		Communication Option Setting 16	F847
		Communication Option Setting 17	F848
		Communication 2 Time-Out Condition	F849
		Disconnection Detection Extended Time	F850
		ASD Operation at Disconnection	F851
		Preset Speed Operation	F852
		Communication Option Station Address Monitor	F853
		Communication Option Speed Switch Monitor DeviceNet/CC-Link	F854
PASSWORD AND LOCK OUTS		Enter Password	N/A
		Change Password	N/A
		Lock Outs	N/A

Virtual Linear Pump Setup

Toshiba's Virtual Linear Pump algorithm allows for direct and precise control of pressure, flow rate, or level. This section provides useful setup and operational information for the Virtual Linear Pump system.

The system is initially configured using the (Program ⇒ Virtual Linear Pump ⇒) Setup Wizard. Once the Wizard is started, it must be completed for normal Virtual Linear Pump operations to function.

Note: *Do not run the VLP Wizard and the Standard Start Up Wizard. Running both will result in an operational conflict that will require a reset to factory defaults and a restart using only one wizard. Reset to the factory default settings after running either wizard to run the other wizard.*

The parameters addressed while using the Virtual Linear Pump ⇒ Setup Wizard or the Virtual Linear Pump ⇒ Settings menu selections are also accessible via the applicable associated direct access numbers for specific adjustments when required.

If not using the Wizard to configure the settings of the Virtual Linear Pump algorithm, parameter F390 must first be set to 255: Setup to accept changes to the Virtual Linear Pump parameter settings. Upon completion of the parameter changes, set parameter F390 to 1: Direct Mode or 2: Process Hold to use the new settings for normal Virtual Linear Pump operations (Zero may be selected at F390 to save the changes to be used later).

The setup procedure and the VLP Setup Wizard setup screens are shown below.

Figure 30. Input the electrical specifications to the motor.

1. Enter the FLA from the nameplate of the motor.
2. Select Pressure, Flow, or Level.
3. Select the command source; EOI, V/I, RR, Com. Opt.
4. Set the Low Frequency Limit. 15 Hz fits most applications.
5. Click Next to continue.

Setup Wizard

Back	Next	Save/Exit

Motor Full Load Amps	5.0A
Application Type	Pressure
Command Source	EOI
Low Frequency Limit	15.00Hz

Figure 31. Input the specifications to the transducer.

1. Select the unit of measure for the transducer; pressure, flow rate, or level (i.e., PSI, GPM, Inches of Water Column, or Cubic Feet per Minute, °C, °F, or Custom).
2. Select the transducer output range and signal type; current or voltage.
3. Select the maximum reading of the transducer.
4. Select the minimum reading of the transducer.
5. Click Next to continue.

Setup Wizard

Back	Next	Save/Exit

Transducer Units:	PSI
Transducer Type:	4–20mA
Max Scale:	0.0PSI
Min Scale:	0.0PSI

⚠ DANGER

—THE FOLLOWING STEP WILL START THE MOTOR!—

Figure 32. Local mode verification.

1. Set the system for normal flow and ensure that all system valves are set for normal operation.
2. Place the system in the Local mode.
3. Press the Run key.
4. Click Next to continue.

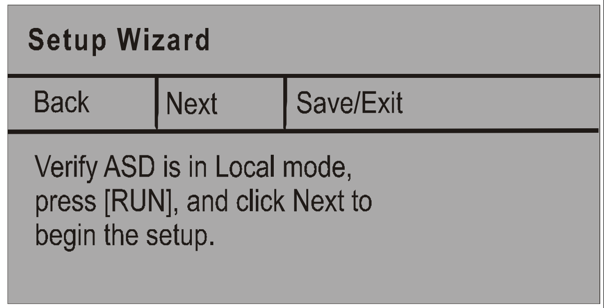


Figure 33. Set the maximum threshold value.

The Motor/Pump combination capacity is calculated automatically and displayed as the Maximum threshold. Normally, no further adjustment is required for the Maximum threshold setting.

The Maximum threshold value may be adjusted, if required, at F395. The Maximum threshold setting (F395) minus the F482 setting comprises the range of the Maximum threshold zone.

Click Next to continue.

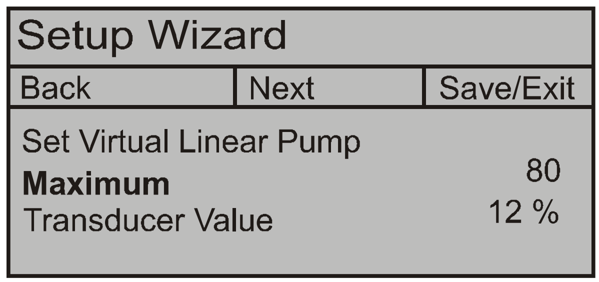
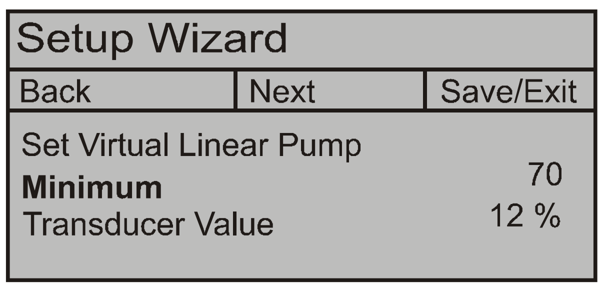


Figure 34. Set the minimum threshold value.

1. The Minimum threshold setting is typically above the electrical stall of the motor, above the minimum system pressure, above the manual change plateau, and well below the typical operating point of the system.

Click the Minimum threshold field and, using the Rotary Encoder, slowly decrease the Minimum threshold value while observing the LED display.



If either of the conditions listed below should occur while decreasing the Minimum threshold value, stop decreasing and increase the Minimum threshold number until the condition is no longer true to set the Minimum threshold:

- The motor stalls,
- The output frequency is greater than the setting of F505, or
- The output frequency no longer changes with continued Virtual Linear Pump number changes.

The Minimum threshold setting (F394) plus the F398 setting comprises the range of the Minimum threshold setting.

2. Click Next to continue

Figure 35. Complete the virtual linear pump setup.

1. Press the Stop key.
2. The motor decelerates to a stop at the programmed rate.
3. Click Next to continue (available once reaching zero Hz).

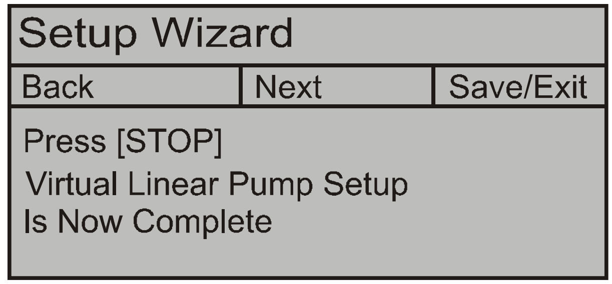
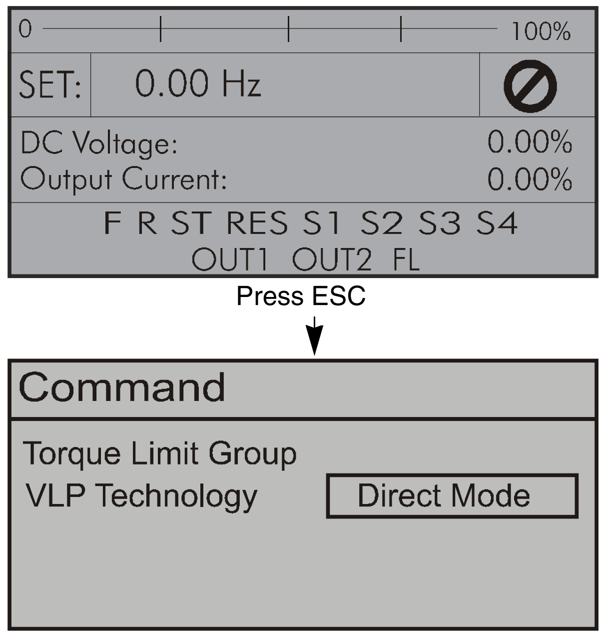


Figure 36. Select an Operating Mode.

1. Select the Virtual Linear Pump operating mode.
2. Select Direct Mode if using no feedback or select Process Hold if using feedback.
3. Click Save/Exit.
4. While in the Local mode, press Run.

While running, adjust parameters F500 and F501 to stabilize operation if unstable.



BACnet® Setup

The Q9 Plus ASD is a BACnet®-compatible device. The BACnet® communications protocol is used to support interoperable HVAC systems. This section provides useful setup and operational information for using the BACnet® protocol with the Q9 Plus ASD to monitor and control HVAC systems.

Perform the following parameter changes to allow the Q9 Plus ASD to communicate with the BACnet® network:

1. Set parameter F802 to select a unique number (Station ID) within the network for the ASD being configured.
2. Set parameter F827 to 0: No Parity.
3. Set parameter F829 to 2: BACnet.
4. Set parameter F899 to Reset Option Board and ASD.

The Q9 Plus ASD is now configured to communicate with the BACnet® network.

S4 Pinout

The S4 RJ-45 connector is located on the Terminal Board and is used for serial communications connectivity.

In order to use the S4 connector for serial communications, both SW200 switches (1 and 2) of the Terminal Board must be ON (2-wire configuration).

Shown below is the S4 connector pin out.

Table 3. S4 Pinout.

Pin Number	S4 (RJ-45) Pinout
1	Do not connect
2	GND
3	Do not connect
4	Signal RS485-A
5	Signal RS485-B
6	Do not connect
7	Do not connect
8	GND

BACnet® I/O, and Values

Table 4. BACnet® Binary Inputs.

Digital Input Terminal	Binary Input Object ID	Object Name	Description	Status	Access
F	Binary Input #6 (BI6)	F Status	Monitors the status of the F input terminal (Forward Run Command)	On/Off	R
R	Binary Input #7 (BI7)	R Status	Monitors the status of the R input terminal (Reverse Run Command)	On/Off	R
ST	Binary Input #8 (BI8)	ST Status	Monitors the status of the ST input terminal (Standby Command)	On/Off	R
RES	Binary Input #9 (BI9)	RES Status	Monitors the status of the RES input terminal (Fault Reset Command)	On/Off	R
S1	Binary Input #10 (BI10)	S1 Status	Monitors the status of the S1 input terminal (Fire-speed Command)	On/Off	R
S2	Binary Input #11 (BI11)	S2 Status	Monitors the status of the S2 input terminal (Preset Speed Bit 2)	On/Off	R
S3	Binary Input #12 (BI12)	S3 Status	Monitors the status of the S3 input terminal (Damper Closed Feedback)	On/Off	R
S4	Binary Input #13 (BI13)	S4 Status	Monitors the status of the S4 input terminal (Emergency Off (NC))	On/Off	R
LI5*	Binary Input #14 (BI14)	LI5 Status	Monitors the status of the LI5 input terminal	On/Off	R
LI6*	Binary Input #15 (BI15)	LI6 Status	Monitors the status of the LI6 input terminal	On/Off	R
LI7*	Binary Input #16 (BI16)	LI7 Status	Monitors the status of the LI7 input terminal	On/Off	R

* The ETB004Z expansion I/O card is required to use this input.

R = Read-only

Table 4. BACnet® Binary Inputs. (Cont)

Digital Input Terminal	Binary Input Object ID	Object Name	Description	Status	Access
LI8*	Binary Input #17 (BI17)	LI8 Status	Monitors the status of the LI8 input terminal	On/Off	R
FLA/FLC (FL)	Binary Input #0 (BI0)	FL Status	Monitors the status of the FL output relay (Any Fault (NC))	On/Off	R
DSA/DSB (OUT 1)	Binary Input #1 (BI1)	OUT 1 Status	Monitors the status of the OUT 1 output relay (Open Damper Command)	On/Off	R
OUT 2	Binary Input #2 (BI2)	OUT 2 Status	Monitors the status of the OUT 2 output relay (Acc or Dec Complete)	On/Off	R
R2*	Binary Input #3 (BI3)	R2 Status	Monitors the status of the R2 output relay	On/Off	R
OUT 5*	Binary Input #4 (BI4)	OUT 5 Status	Monitors the status of the OUT 5 open collector output	On/Off	R
OUT 6*	Binary Input #5 (BI5)	OUT 6 Status	Monitors the status of the OUT 6 open collector output	On/Off	R

* The ETB004Z expansion I/O card is required to use this input.

R = Read-only

Table 5. BACnet® Binary Values.

Binary Value Object ID	Object Name	Description	Status	Access
Binary Value #0 (BV0)	Run/Stop Status	Indicates the running status of the drive	Runs/ Ready	R
Binary Value #1 (BV1)	Fwd/Rev Status	Indicates the rotation direction of the drive	Rev/Fwd	R
Binary Value #2 (BV2)	Fault Status	Indicates the fault status of the drive	Faulted/ None	R
Binary Value #4 (BV4)	Local/Remote Status	Indicates if the drive is being locally controlled	Local/ Remote	R
Binary Value #6 (BV6)	Maint Req	Indicates if the cumulative run timer has expired	Yes/No	R

Table 5. BACnet® Binary Values.(Cont)

Binary Value Object ID	Object Name	Description	Status	Access
Binary Value #7 (BV7)	Drive Ready	Indicates if the drive is ready to run (ST and Run Command)	Ready/ Not Ready	R
Binary Value #8 (BV8)	At Set-Point	Indicates if the drive has reached its target speed	Reached/ No	R
Binary Value #10 (BV10)	Run/Stop Cmd	Commands the drive to start	Start/Stop	C
Binary Value #11 (BV11)	Fwd/Rev Cmd	Commands the rotation direction of the drive	Rev/Fwd	C
Binary Value #14 (BV14)	Fault Reset	Commands the drive to reset a fault	Reset/No	C
Binary Value #18 (BV18)	Preset Spd 1	Commands the Preset Speed 1 operation	SP1/None	C
Binary Value #19 (BV19)	Preset Spd 2	Commands the Preset Speed 2 operation	SP2/None	C
Binary Value #20 (BV20)	Preset Spd 3	Commands the Preset Speed 3 operation	SP3/None	C
Binary Value #21 (BV21)	Freq Ovrd	Overrides the Frequency Mode 1 (F004) selection	Enabled/ Off	C
Binary Value #22 (BV22)	Cmd Ovrd	Overrides the Command Mode (F003) selection	Enabled/ Off	C
R = Read-only; C = Commandable				

Table 6. BACnet® Analog Inputs.

Analog Input Terminal	Analog Input Object ID	Object Name	Description	Value	Access
RR	Analog Input #0 (AI0)	RR Level	Input level of the RR analog input	Percent (%) of full scale	R
V/I	Analog Input #1 (AI1)	V/I Level	Input level of the V/I analog input	Percent (%) of full scale	R
RX	Analog Input #2 (AI2)	RX Level	Input level of the RX analog input	Percent (%) of full scale	R
AI1*	Analog Input #3 (AI3)	AI1 Level	Input level of the AI1 analog input	Percent (%) of full scale	R
AI2*	Analog Input #4 (AI4)	AI2 Level	Input level of the AI2 analog input	Percent (%) of full scale	R
* The ETB004Z expansion I/O card is required to use this input. R = Read-only					

Table 7. BACnet® Analog Outputs

Analog Output Terminal	Analog Output Object ID	Object Name	Description	Value	Access
FM	Analog Output #0 (AO0)	FM Command	Controls the FM analog output terminal (F005 = Data From Comm)	Percent (%) of full scale	W
AM	Analog Output #1 (AO1)	AM Command	Controls the AM analog output terminal (F670 = Data From Comm)	Percent (%) of full scale	W
MON1*	Analog Output #2 (AO2)	MON1 Command	Controls the MON1 analog output terminal (F672 = Data From Comm)	Percent (%) of full scale	W
MON2*	Analog Output #3 (AO3)	MON2 Command	Controls the MON2 analog output terminal (F674 = Data From Comm)	Percent (%) of full scale	W

* The ETB004Z expansion I/O card is required to use this input.

W = Writable

Table 8. BACnet® Analog Values.

Analog Value Object ID	Object Name	Description	Value	Access
Analog Value #0 (AV0)	Output Speed	Output speed (output frequency / base frequency x motor nameplate rpm, ie. 30 / 60 x 1770 = 885)	RPM	R
Analog Value #1 (AV1)	Output Freq	Frequency output	Hz	R
Analog Value #2 (AV2)	DC Bus Volt	DC bus voltage	V	R
Analog Value #3 (AV3)	Output Volt	Voltage output to the motor	V	R
Analog Value #4 (AV4)	Output Current	Current generated by the motor	A	R
Analog Value #5 (AV5)	Output Torque	Torque generated by the motor	%	R
Analog Value #6 (AV6)	Input Power	Power consumed by the drive	kW	R
Analog Value #7 (AV7)	Output Power	Power consumed by the motor	kW	R
Analog Value #8 (AV8)	Total Input Power	Total cumulative power consumed by the drive	kWh	R
Analog Value #9 (AV9)	Total Output Power	Total cumulative power consumed by the motor	kWh	R
Analog Value #10 (AV10)	PID Fbck	PID feedback value	Hz	R
Analog Value #11 (AV11)	Run Time	Total time of operation	Hours	R

Table 8. BACnet® Analog Values.(Cont)

Analog Value Object ID	Object Name	Description	Value	Access
Analog Value #12 (AV12)	VLP Technology Average	Average operating Virtual Linear Pump number	-	R
Analog Value #13 (AV13)	VLP Technology Feedback	Virtual Linear Pump process feedback	-	R
Analog Value #14 (AV14)	VLP Technology Direct Ref	Virtual Linear Pump direct mode command reference	-	C
Analog Value #15 (AV15)	VLP Technology Process Hold Ref	Virtual Linear Pump process hold mode command reference	-	C
Analog Value #16 (AV16)	Freq Ref	Frequency reference	Hz	C
Analog Value #18* (AV18)	Last Flt	Current fault code	-	R
Analog Value #19* (AV19)	Prev Flt 1	Most recent fault code	-	R
Analog Value #20* (AV20)	Prev Flt 2	Second most recent fault code	-	R
Analog Value #23 (AV23)	Accel Time 1	Changes Acceleration Time 1 (F009)	Sec	W
Analog Value #24 (AV24)	Decel Time 1	Changes Deceleration Time 1 (F010)	Sec	W

* Refer to the *BACnet® Option Unit Function Manual* for the list of fault codes.

R = Read-only; C = Commandable; W = Writable

Direct Access Parameter Information

The Q9 Plus ASD has the ability to allow the user direct access to the motor control functions. There are two ways in which the motor control parameters may be accessed for modification from the EOI: Program ⇒ *Applicable Menu Path* or Program ⇒ Direct Access ⇒ *Applicable Parameter Number*. Both methods access the parameter via the Program mode. Parameters may also be accessed via communications. Once accessed, the parameter may be viewed or changed.

The Program mode allows the user to develop an application-specific motor control profile. Motor control functions may be set to accommodate specific power and timing requirements for a given application. The configurable parameters of the Program mode that have user-accessible Parameter Numbers are listed and described below.

Note: Parameter Settings are preceded by the number used to select an item if using communications to write to a parameter location in memory (i.e., F000 ⇒ 0-Manual, 1- Automatic ACC/DEC, 2-- Automatic ACC Only, etc.).

Note: Communications setting changes will require that the ASD input power be removed and then re-applied for the changes to take affect.

Direct Access Parameters/Numbers

Automatic Acceleration/Deceleration

Direct Access Number — **F000**

Parameter Type — **Selection List**

Factory Default — **Manual**

Changeable During Run — **No**

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

This parameter is used to enable acceleration and deceleration rates in accordance with the applied load automatically.

The adjusted acceleration and deceleration times range from 12.5% to 800% of the programmed values for Acceleration Time 1 (F009) and Deceleration Time 1 (F010).

Settings:

0 — Manual
1 — Automatic ACC/DEC
2 — Automatic ACC Only

Note: The motor and the load must be connected prior to selecting Automatic Acceleration/Deceleration.

Automatic Torque Boost

Direct Access Number — **F001**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Program ⇒ Fundamental ⇒ Motor Set 1

This parameter allows the ASD to adjust the output torque in accordance with the applied load automatically. When enabled, Autotuning is performed (the motor should be connected before performing an Autotune).

Note: If selecting 1 or 2, the motor must be connected or the Autotune results will not be valid.

Settings:

0 — Disabled
1 — Automatic Torque Boost + Autotuning
2 — Sensorless Vector Control (Speed) + Autotuning

Command Mode

Direct Access Number — **F003**

Parameter Type — **Selection List**

Factory Default — **Terminal Board**

Changeable During Run — **No**

Program ⇒ Fundamental ⇒ Standard Mode Selection

The Command Mode Selection establishes the source of the command input for the ASD. Command inputs include Run, Stop, Forward, etc. The Override feature may supersede the Command Mode Selection setting (see Command Mode and Frequency Mode Control on pg. 33).

Settings:

0 — Terminal Board
2 — EOI Keypad
3 — RS485/BACnet
4 — Communication Option Board

Frequency Mode 1

Direct Access Number — **F004**

Parameter Type — **Selection List**

Factory Default — **RR**

Changeable During Run — **No**

Program ⇒ Fundamental ⇒ Standard Mode Selection

The Frequency Mode 1 setting establishes the source of the frequency-control input for the ASD. The Frequency Mode 2 setting or the Override feature may supersede the Frequency Mode 1 setting.

Note: Only Bolded items from the Settings list below may be placed in the Override Mode. See the section titled Command Mode and Frequency Mode Control on pg. 33 for additional information on the Override feature.

Settings:

1 — **V/I**
2 — RR
3 — RX
5 — EOI Keypad
6 — **RS485/BACnet**
7 — Communication Option Board
8 — RX2 (AI1 Option)
9 — **Option V/I (AI2 Option)**
10 — UP/DOWN Frequency
11 — Optional RP Pulse Input
12 — Optional High-Speed Pulse Input

FM Output Terminal Function

Direct Access Number — **F005**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Output Terminals

This setting determines the output function of the FM analog output terminal. The FM output terminal produces an output voltage or current that is proportional to the magnitude of the function assigned to this terminal. Select the terminal output signal type at F681 (i.e., current or voltage).

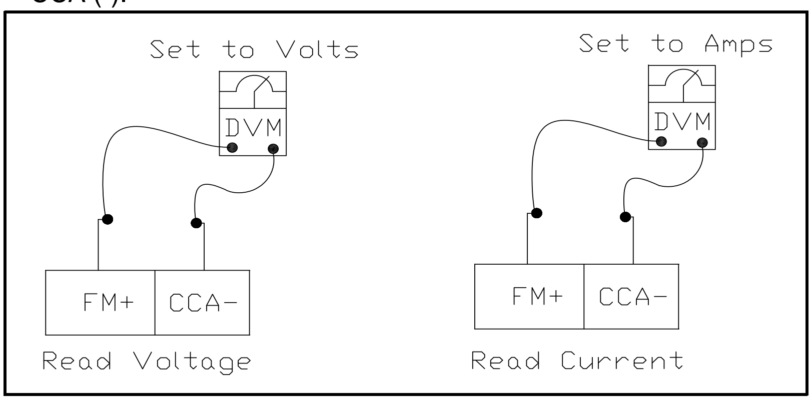
The available assignments for this output terminal are listed in Table 10 on page 255.

Note: If the monitored item has a positive and a negative component, use the Expansion I/O Card 2 (P/N ETB004Z). See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the functions of the option card.

See F678 and F684 for additional information on this parameter.

To read Voltage at this terminal, configure the meter to read DC voltage, and connect the leads of the meter to FM (+) and CCA (-).

To read Current at this terminal, configure the meter to read DC current, and connect the leads of the meter to FM (+) and CCA (-).



FM Terminal Setup Parameters

F005 — Set FM Function

F006 — Calibrate FM Terminal

F681 — Voltage/Current Output Switching Selection

F682 — Output Response Polarity Selection

F683 — Set Zero Level

FM Output Terminal Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to calibrate the FM analog output.

To calibrate the FM analog output, connect a meter (current or voltage) as described at F005.

With the ASD running at a known value (e.g., output frequency), adjust this parameter until the assigned function produces the desired DC level output at the FM output terminal.

See F005 for additional information on this parameter.

Direct Access Number — **F006**

Parameter Type — **Numerical**

Factory Default — **236**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

Type Reset

Program ⇒ Utilities ⇒ 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:

0 — None
1 — 50 Hz Setting
2 — 60 Hz Setting
3 — Reset to Factory Settings
4 — Clear Past Trips
5 — Clear Run Timer
6 — Initialize Typeform
7 — *Save User Settings
8 — Restore User Settings
9 — Clear Cumulative Fan Timer
10 — ACC/DEC Unit 0.01s (FA09=0)
11 — ACC/DEC Unit 0.1s (FA09=1)
12 — Set EOI Memory to Default

Note: Selection 12 clears the following user settings: Contrast, Main Monitor Items, Prohibited Items, and Save User Settings Information.

Note: Selection 12 does not clear Password and Lockout Information.

Note: User settings that are stored in the memory of the EOI are not saved via the Save User Settings selection. The unsaved functions include the EOI Option Setups, (Utilities ⇒) Display Parameters, and (Monitor Setup ⇒) Scrolling Monitor Select.

Direct Access Number — **F007**

Parameter Type — **Selection List**

Factory Default — **None**

Changeable During Run — **No**

Forward/Reverse Run

Direct Access Number — **F008**

Parameter Type — **Selection List**

Factory Default — **Forward**

Changeable During Run — **Yes**

Program ⇒ Fundamental ⇒ Standard Mode Selection

While operating in the **Local** mode, this parameter sets the direction of motor rotation.

From the Frequency Command screen, press the ESC key. At the subsequent EOI Command screen, select the Direction field and change the setting. Press the Rotary Encoder and the new setting will be in effect.

This setting will not override parameter F311 (Forward/Reverse Disable).

If either direction is disabled via parameter F311, the disabled direction will not be recognized if commanded by the keypad. If both directions are disabled via parameter F311, the direction command from the keypad will determine the direction of the motor rotation.

Settings:

0 — Forward
1 — Reverse
2 — Forward (Switchable F/R by Keypad)
3 — Reverse (Switchable F/R by Keypad)

Acceleration Time 1

Direct Access Number — **F009**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000.0

Units — Seconds

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

This parameter specifies the time in seconds for the output of the ASD to go from 0.0 Hz to the Maximum Frequency for the Acceleration 1 profile. The Accel/Decel pattern may be set using F502.

Note: An acceleration time shorter than that which the load will allow may cause nuisance tripping and mechanical stress to loads. Automatic Accel/Decel, Stall, and Ridethrough settings may lengthen the acceleration times.

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 will 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 (see F502).

Deceleration Time 1

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

This parameter specifies the time in seconds for the output of the ASD to go from the Maximum Frequency to 0.0 Hz for the Deceleration 1 profile. The Accel/Decel Pattern may be set using F502.

Note: A deceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads. Automatic Accel/Decel, Stall, and Ridethrough settings may lengthen the deceleration times.

Direct Access Number — **F010**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000.0

Units — Seconds

Maximum Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

This setting determines the absolute maximum frequency that the ASD can output.

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

The Maximum Frequency is not limited by this setting while operating in the Drooping Control mode (see F320).

Note: This setting may not be lower than the Upper-Limit Frequency (F012) setting.

Direct Access Number — **F011**

Parameter Type — **Numerical**

Factory Default — **80.00**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — Hz

Upper-Limit Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

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 (F011) setting or lower than the Lower Limit setting (F013).

Direct Access Number — **F012**

Parameter Type — **Numerical**

Factory Default — **66.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Lower-Limit Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

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).

Note: This setting may not be higher than the Upper Limit Frequency (F012) setting.

Direct Access Number — **F013**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Base Frequency 1

Direct Access Number — **F014**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — Hz

Program ⇒ Fundamental ⇒ Motor Set 1

The Base Frequency 1 setting is the frequency at which the output voltage of the ASD reaches its maximum setting. The Base Frequency Voltage 1 parameter is set at F409.

For proper motor operation, the Base Frequency should be set for the nameplated frequency of the motor.

V/f Pattern

Direct Access Number — **F015**

Parameter Type — **Selection List**

Factory Default — **Automatic Torque Boost**

Changeable During Run — **No**

Program ⇒ Fundamental ⇒ Frequency Settings

This function establishes the relationship between the output frequency and the output voltage.

The Automatic Torque Boost and the Sensorless Vector Control selections use the motor tuning parameters of the ASD to properly configure the ASD for the motor being used. If Load Reactors or Long Lead Filters are used, or if the capacity of the ASD is greater than the motor, manual tuning of the motor parameters may be required for optimum performance.

Settings:

0 — Constant Torque
1 — Variable Torque
2 — Automatic Torque Boost
3 — Sensorless Vector Control (Speed)
5 — V/f 5-point Curve (Go to F190 to configure the V/f 5-Point Settings)
6 — PM Drive (Permanent Magnet)
7 — PG Feedback Vector Control (Speed)
9 — Energy Savings
10 — Advanced Energy Savings

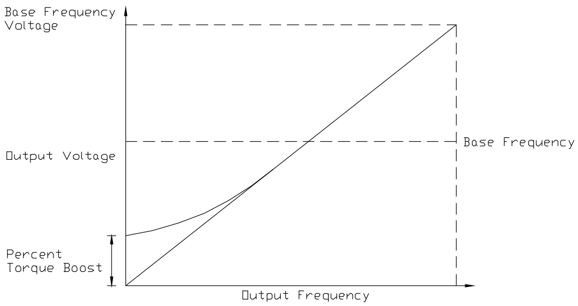
Note: When operating in the Vector Control mode, the carrier frequency should be set to 2.2 kHz or above.

Manual Torque Boost 1

Program ⇒ Fundamental ⇒ Motor Set 1

The Manual Torque Boost 1 function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the Base Frequency 1 (F014) setting.

The value programmed as a boost percentage establishes an output voltage vs. output frequency relationship to be used to start the motor or to provide smoother operation.



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

Direct Access Number — **F016**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Motor Overload Protection Configuration

Program ⇒ Protection ⇒ Overload

This parameter is used to enable the Soft Stall feature which protects the motor from an over-current condition by reducing the output frequency during a temporary increased current requirement from the load.

A V/f motor may be specified here along with the Overload Stall to better match the ASD to the application.

This parameter setting may extend the Over-Voltage Stall time settings.

Settings:

0 — Motor Overload Trip without Soft Stall
1 — Motor Overload Trip with Soft Stall
2 — Without Motor Overload Trip or Soft Stall
3 — Soft Stall Only
4 — V/f Motor Overload Trip without Soft Stall
5 — V/f Motor Overload Trip with Soft Stall
6 — V/f Motor without Overload Trip or Soft Stall
7 — V/f Motor Soft Stall Only

Direct Access Number — **F017**

Parameter Type — **Selection List**

Factory Default — **Motor Overload Trip with Soft Stall**

Changeable During Run — **Yes**

Preset Speed 1

Program ⇒ Frequency ⇒ Preset Speeds

Direct Access Number — **F018**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Up to fifteen (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. A properly configured preset speed is assigned a frequency that will be output from the ASD by selecting the preset speed (1 – 15) using a binary selection process.

The preset speed to be run is selected by applying a binary value (0001 – 1111) at the S1 – S4 discrete input terminals.

This parameter assigns an output frequency to binary number 0001 (Preset Speed 1). The binary selection number 0001 is applied to S1 – S4 of the Terminal Board to output Preset Speed 1.

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

1. Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.
2. Program ⇒ Terminal ⇒ Input Terminals ⇒ S1 (set to Preset Speed (Bit) 1; LSB of 4-bit count).

Note: Though the ASD display shows the selections as Preset Speed 1, 2, 3, and 4; the selections are preset speed binary bits 1, 2, 3, and 4 (i.e., binary nibble 1111).

3. Repeat for S2 – S4 (MSB of 4-bit count) as Preset Speed Bit 2 – 4, respectively (all Normally Open).
4. Program ⇒ Frequency ⇒ Preset Speeds ⇒ Preset Speed 1 (set an output frequency as Preset Speed 1; repeat for Preset Speeds 2 – 15 as required).
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 (F115 – F118), 0001 – 1111 may be applied to S1 – S4 of the Terminal Board to run the associated Preset Speed.

If bidirectional operation is required, F and R must be connected to CC.

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 Preset Speed Truth Table to the right.

Preset Speed Truth Table

	Bit 4	Bit 3	Bit 2	Bit 1	
Preset	S4 MSB	S3	S2	S1 LSB	Output
1	0	0	0	1	F018
2	0	0	1	0	F019
3	0	0	1	1	F020
4	0	1	0	0	F021
5	0	1	0	1	F022
6	0	1	1	0	F023
7	0	1	1	1	F024
8	1	0	0	0	F287
9	1	0	0	1	F288
10	1	0	1	0	F289
11	1	0	1	1	F290
12	1	1	0	0	F291
13	1	1	0	1	F292
14	1	1	1	0	F293
15	1	1	1	1	F294

Note: 1 = Terminal connected to CC.

Preset Speed 2

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F019**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 3

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F020**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 4

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F021**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 5

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F022**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 6

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F023**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 7

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F024**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Automatic Function Selection

Direct Access Number — **F040**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Program ⇒ Utilities ⇒ Display Parameters

This parameter setting is used to configure multiple parameters with the setting of only one parameter. From the selection below, multiple parameters may be set as indicated in the table.

Once set, the selected configuration is placed in effect and remains in effect until this parameter is changed or the individual settings are changed.

Set this parameter to Disable to set these parameters individually.

Note: After performing the desired selection, the EOI display returns to Disabled though the selected function has been carried out (i.e., without this, if selection 1 is performed, F004 and F207 would hold the RR terminal setting regardless of attempts to change the settings individually).

Settings:

0 — Disabled
1 — RR
2 — V/I
3 — Select RR or V/I by TB (Terminal Board)
4 — Keypad Frequency and Command from TB
5 — Keypad Frequency and Command
6 — Coast Stop

<table>
<tr><td></td><td></td><td colspan="6">User Selections</td><td></td></tr>
<tr><td></td><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Related Params</td><td>Default Settings</td><td>Dis-abled</td><td>RR</td><td>V/I</td><td>RR or V/I via TB</td><td>Keypad/ Freq. CMD/TB</td><td>Keypad Freq/CMD</td><td>Coast Stop</td></tr>
<tr><td>Com Mode F003</td><td>Terminal Board</td><td colspan="4">N/C</td><td>Terminal Board</td><td>Keypad</td><td></td></tr>
<tr><td>Freq Mode 1 F004</td><td>RR</td><td>N/C</td><td>RR</td><td>N/C</td><td>RR</td><td colspan="2">Keypad</td><td>N/C</td></tr>
<tr><td>S3 Terminal F117</td><td>Preset Speed 3</td><td colspan="3">N/C</td><td>Freq. Ref. Priority</td><td colspan="2">N/C</td><td>ST</td></tr>
<tr><td>Freq Priority F200</td><td>Terminal Board</td><td>N/C</td><td colspan="5">Terminal Board</td><td>N/C</td></tr>
<tr><td>V/I Setup F201</td><td>0.0%</td><td colspan="2">N/C</td><td colspan="2">20.0%</td><td colspan="2">N/C</td><td>N/C</td></tr>
<tr><td>Freq Mode 2 F207</td><td>V/I</td><td>N/C</td><td>RR</td><td colspan="2">V/I</td><td colspan="2">Keypad</td><td>N/C</td></tr>
<tr><td>Always On F110</td><td>Not Assigned</td><td colspan="6">N/C</td><td>0</td></tr>
<tr><td colspan="8">N/C = No Change — the setting remains as it was before setting parameter F040.</td><td></td></tr>
</table>

Low-Speed Signal Output Frequency

Program ⇒ Terminal ⇒ Reach Settings

The Low-Speed Signal Output Frequency parameter sets an ASD output frequency threshold that activates the assigned discrete output terminal for the duration that the ASD output speed is equal to or less than this setting.

Direct Access Number — **F100**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Speed Reach Frequency

Program ⇒ Terminal ⇒ Reach Settings

The Speed Reach Frequency sets a frequency threshold that, when reached or is within the bandwidth specified by parameter F102, activates the assigned discrete output terminal for the duration that the ASD output is within the F102 bandwidth.

Direct Access Number — **F101**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Speed Reach Detection Band

Program ⇒ Terminal ⇒ Reach Settings

This parameter sets the bandwidth of the Speed Reach Frequency (F101) setting.

Direct Access Number — **F102**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Forward/Reverse Run Priority When Both Are Closed

Program ⇒ Terminal ⇒ Input Special Functions

The Forward/Reverse Priority Selection determines the operation of the ASD if the F and R control terminals are activated simultaneously.

Settings:

0 — Reverse
1 — Suspend

The waveforms shown 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.

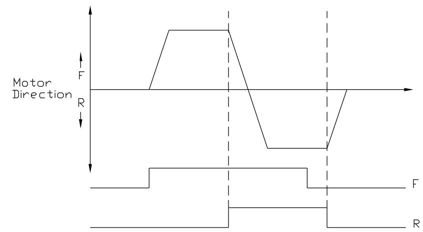
Direct Access Number — **F105**

Parameter Type — **Selection List**

Factory Default — **Suspend**

Changeable During Run — **No**

Simultaneous F and R activation.



Input Terminal Priority

Direct Access Number — **F106**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Special Functions

This parameter is used to allow the Jog and DC Injection Braking input signals to control the ASD when received via the Terminal Board 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 Terminal Board will receive priority over commands from the EOI.

See F260 for additional information on using the Jog function.

See F250 – F252 for additional information on DC Injection Braking.

Settings:

0 — Disabled
1 — Enabled

16-Bit Binary/BCD Input

Direct Access Number — **F107**

Parameter Type — **Selection List**

Factory Default — **None**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Special Functions

The extended terminal function is used with the Expansion IO Card Option (P/N ETB004Z).

This parameter defines the format of the binary or BCD data when using the option card.

Note: The Expansion IO Card Option 2 option board is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Settings:

0 — None
1 — 12-Bit Binary
2 — 16-Bit Binary
3 — 3-Digit BCD
4 — 4-Digit BCD
5 — Inverted 12-Bit Binary
6 — Inverted 16-Bit Binary
7 — Inverted 3-Digit BCD
8 — Inverted 4-Digit BCD

Selections using 16-bit binary or 4-digit BCD will require the configuration of terminals S1-S4 on the Terminal Board as binary bits 0 – 3 (F115 – F118). The Frequency Mode 1 (F004) parameter must be set to Binary/BCD.

For proper scaling of the binary or BCD input, parameters F228 – F231 must be configured.

Optional V/I Terminal Voltage/Current Selection

Program ⇒ Frequency ⇒ V/I Settings

This parameter is used to set the AI2 input terminal to receive either current or voltage as a control signal.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Settings:

0 — Voltage Input
1 — Current Input

Direct Access Number — **F109**

Parameter Type — **Selection List**

Factory Default — **Voltage Input**

Changeable During Run — **No**

Always ON Terminal Function 1

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the virtual discrete input terminal ON. As a virtual terminal, the ON control terminal exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable ON terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F110**

Parameter Type — **Selection List**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Input Terminal 1 (F) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the F discrete input terminal.

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

This parameter sets the programmable **F** terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F111**

Parameter Type — **Selection List**

Factory Default—**Forward**

Changeable During Run — **No**

Input Terminal 2 (R) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the R discrete input terminal.

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

This parameter sets the programmable R terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F112**

Parameter Type — **Selection List**

Factory Default — **Reverse**

Changeable During Run — **No**

Input Terminal 3 (ST) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the ST (Standby) discrete input terminal.

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

This parameter sets the programmable ST terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F113**

Parameter Type — **Selection List**

Factory Default — **Standby**

Changeable During Run — **No**

Input Terminal 4 (RES) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the RES discrete input terminal.

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

This parameter sets the programmable RES terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F114**

Parameter Type — **Selection List**

Factory Default — **Reset**

Changeable During Run — **No**

Input Terminal 5 (S1) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S1 discrete input terminal.

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

This parameter sets the programmable S1 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F115**

Parameter Type — **Selection List**

Factory Default — **Fire Speed**

Changeable During Run — **No**

Input Terminal 6 (S2) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S2 discrete input terminal.

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

This parameter sets the programmable S2 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Direct Access Number — **F116**

Parameter Type — **Selection List**

Factory Default — **Preset Speed 2**

Changeable During Run — **No**

Input Terminal 7 (S3) Function

Direct Access Number — **F117**

Parameter Type — **Selection List**

Factory Default — **Damper Feed-back**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S3 discrete input terminal.

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

This parameter sets the programmable S3 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Input Terminal 8 (S4) Function

Direct Access Number — **F118**

Parameter Type — **Selection List**

Factory Default — **Emergency Off**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S4 discrete input terminal.

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

This parameter sets the programmable S4 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Input Terminal 9 (LI1) Function

Direct Access Number — **F119**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI1 discrete input terminal.

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

This setting assigns the function of the programmable LI1 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Input Terminal 10 (LI2) Function

Direct Access Number — **F120**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI2 discrete input terminal.

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

This setting assigns the function of the programmable LI2 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Input Terminal 11 (LI3) Function

Direct Access Number — **F121**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI3 discrete input terminal.

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

This setting assigns the function of the programmable LI3 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Input Terminal 12 (LI4) Function

Direct Access Number — **F122**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI4 discrete input terminal.

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

This setting assigns the function of the programmable LI4 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Input Terminal 13 (LI5) Function

Direct Access Number — **F123**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI5 discrete input terminal.

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

This setting assigns the function of the programmable LI5 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Input Terminal 14 (LI6) Function

Direct Access Number — **F124**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI6 discrete input terminal.

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

This setting assigns the function of the programmable LI6 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Input Terminal 15 (LI7) Function

Direct Access Number — **F125**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI7 discrete input terminal.

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

This setting assigns the function of the programmable LI7 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Input Terminal 16 (LI8) Function

Program ⇒ Terminal ⇒ Input Terminals

Direct Access Number — **F126**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

This parameter is used to set the functionality of the LI8 discrete input terminal.

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

This setting assigns the function of the programmable LI8 terminal to one of the user-selectable functions listed in Table 9 on page 252.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Always ON Terminal Function 2

Program ⇒ Terminal ⇒ Input Terminals

Direct Access Number — **F127**

Parameter Type — **Selection List**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

This parameter is used to set the functionality of the virtual discrete input terminal Always ON Terminal Function 2. As a virtual terminal, this control terminal exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable ON terminal to one of the user-selectable functions listed in Table 9 on page 252.

Always ON Terminal Function 3

Program ⇒ Terminal ⇒ Input Terminals

Direct Access Number — **F128**

Parameter Type — **Selection List**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

This parameter is used to set the functionality of the virtual discrete input terminal Always ON Terminal Function 3. As a virtual terminal, this control terminal exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable ON terminal to one of the user-selectable functions listed in Table 9 on page 252.

Output Terminal 1 (OUT1) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the OUT1 discrete output terminals O1A and O1B.

The O1A and O1B (OUT1) output terminals change states (open or close) as a function of a user-selected event. See Table 12 on page 257 for a listing of the possible assignments for the OUT1 terminals.

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

Direct Access Number — **F130**

Parameter Type — **Selection List**

Factory Default — **Damper Command**

Changeable During Run — **No**

Output Terminal 2 (OUT2) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the OUT2 discrete output terminals O2A and O2B.

The O2A and O2B (OUT2) output terminals change states (open or close) as a function of a user-selected event. See Table 12 on page 257 for a listing of the possible assignments for the OUT2 terminals.

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

Direct Access Number — **F131**

Parameter Type — **Selection List**

Factory Default — **Acceleration/ Deceleration Completion**

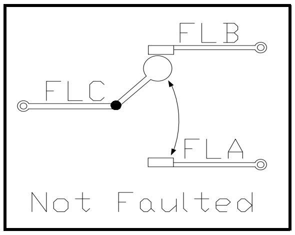
Changeable During Run — **No**

Output Terminal 3 (FL) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the FL output terminals to one of the user-selectable functions listed in Table 12 on page 257.

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



Direct Access Number — **F132**

Parameter Type — **Selection List**

Factory Default — Failure FL (All Trips)

Changeable During Run — **No**

Output Terminal 4 (OUT3) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F133**

Parameter Type — **Selection List**

Factory Default — **Always OFF**

Changeable During Run — **No**

This parameter is used to set the functionality of the OUT3 discrete output terminal.

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

This setting assigns the function of the programmable OUT3 terminal to one of the user-selectable functions listed in Table 12 on page 257.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Output Terminal 5 (OUT4) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F134**

Parameter Type — **Selection List**

Factory Default — **Always OFF**

Changeable During Run — **No**

This parameter is used to set the functionality of the OUT4 discrete output terminal.

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

This setting assigns the function of the programmable OUT4 terminal to one of the user-selectable functions listed in Table 12 on page 257.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Output Terminal 6 (R1) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F135**

Parameter Type — **Selection List**

Factory Default — **Always OFF**

Changeable During Run — **No**

This parameter is used to set the functionality of the R1 discrete output terminal.

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

This setting assigns the function of the programmable R1 terminal to one of the user-selectable functions listed in Table 12 on page 257.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for additional information on the function of this terminal.

Output Terminal 7 (OUT5) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F136**

Parameter Type — **Selection List**

Factory Default — **Always Off**

Changeable During Run — **No**

This parameter is used to set the functionality of the OUT5 discrete output terminal.

In addition, this output terminal must be specified as Normally Open or Normally Closed.

This setting assigns the function of the programmable OUT5 terminal to one of the user-selectable functions listed in Table 12 on page 257.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Output Terminal 8 (OUT6) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F137**

Parameter Type — **Selection List**

Factory Default — **Always Off**

Changeable During Run — **No**

This parameter is used to set the functionality of the OUT6 discrete output terminal.

In addition, this output terminal must be specified as Normally Open or Normally Closed.

This setting assigns the function of the programmable OUT6 terminal to one of the user-selectable functions listed in Table 12 on page 257.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Output Terminal 9 (R2) Function

Program ⇒ Terminal ⇒ Output Terminals

Direct Access Number — **F138**

Parameter Type — **Selection List**

Factory Default — **Always Off**

Changeable During Run — **No**

This parameter is used to set the functionality of the R2 discrete output terminal.

In addition, this output terminal must be specified as Normally Open or Normally Closed.

This setting assigns the function of the programmable R2 terminal to one of the user-selectable functions listed in Table 12 on page 257.

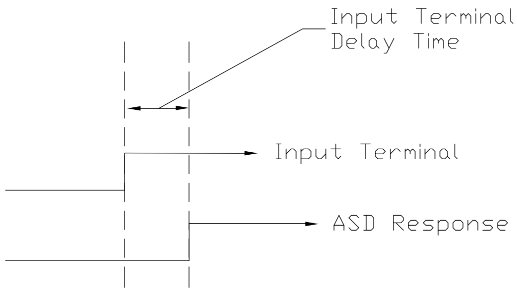
Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Input Terminal 1 (F) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

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.

Direct Access Number — **F140**

Parameter Type — **Numerical**

Factory Default — **8**

Changeable During Run — **No**

Minimum — 2

Maximum — 200

Units — mS

Input Terminal 2 (R) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the R terminal input by the programmed value (see waveforms at F140).

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

Direct Access Number — **F141**

Parameter Type — **Numerical**

Factory Default — **8**

Changeable During Run — **No**

Minimum — 2

Maximum — 200

Units — mS

Input Terminal 4 (RES) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the RES terminal input by the programmed value (see waveforms at F140).

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

Direct Access Number — **F143**

Parameter Type — **Numerical**

Factory Default — **8**

Changeable During Run — **No**

Minimum — 2

Maximum — 200

Units — mS

Input Terminal 5 – 12 Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the 5 – 12 terminal inputs by the programmed value (see waveforms at F140).

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

Direct Access Number — **F144**

Parameter Type — **Numerical**

Factory Default — **8**

Changeable During Run — **No**

Minimum — 2

Maximum — 200

Units — mS

Input Terminal 13 – 20 Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the 13 – 20 terminal inputs by the programmed value (see waveforms at F140).

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

Direct Access Number — **F145**

Parameter Type — **Numerical**

Factory Default — **8**

Changeable During Run — **No**

Minimum — 5

Maximum — 200

Units — mS

Output Terminal 10 (R3) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the R3 output terminal to any one of the user-selectable functions listed in Table 12 on page 257.

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

See the instruction manual for the 16-Bit BIN/BCD option for additional information on the function of this terminal.

Direct Access Number — **F168**

Parameter Type — **Selection List**

Factory Default — **Always OFF**

Changeable During Run — **No**

Output Terminal 11 (R4) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the R4 output terminal to any one of the user-selectable functions listed in Table 12 on page 257.

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

See the instruction manual for the 16-Bit BIN/BCD option for additional information on the function of this terminal.

Direct Access Number — **F169**

Parameter Type — **Selection List**

Factory Default — **Always OFF**

Changeable During Run — **No**

Base Frequency 2

Program ⇒ Motor ⇒ Motor Set 2

The Base Frequency 2 setting is the frequency at which the output voltage of the ASD reaches its maximum setting. The Base Frequency Voltage 2 parameter is set at F171.

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 Table 9 on page 252).

For proper motor operation, the Base Frequency should be set for the nameplated frequency of the motor.

Direct Access Number — **F170**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — Hz

Base Frequency Voltage 2

Program ⇒ Motor ⇒ Motor Set 2

The Base Frequency Voltage 2 setting is the Motor 2 output voltage at the Base Frequency (F170). 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 setting (F307).

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 Table 9 on page 252).

Direct Access Number — **F171**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 50.0

Maximum — (ASD-Dependent)

Units — Volts

Manual Torque Boost 2

Program ⇒ Motor ⇒ Motor Set 2

The Manual Torque Boost 2 function is used to increase the low frequency torque for high inertia loads by increasing the output voltage at frequencies below ½ of the Base Frequency 2 setting (F170).

See F016 (Manual Torque Boost 1) for an explanation of torque boost.

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 Table 9 on page 252).

Direct Access Number — **F172**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Motor Overload Protection Level 2

Program ⇒ Motor ⇒ Motor Set 2

The Motor 2 Overload Protection Level 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 (A/V) or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (see F701 to change the display unit).

The Motor 2 Overload Protection Level setting will be displayed in Amps if the EOI display units are set to A/V rather than **%**.

Direct Access Number — **F173**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 10

Maximum — 100

Units — %

V/f 5-Point Setting Frequency 1

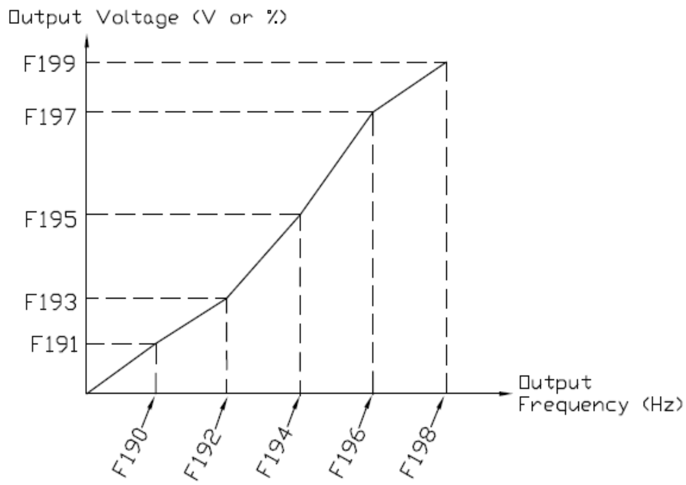
Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Frequency 1 setting establishes the frequency that is to be associated with the voltage setting of F191 (V/f 5-Point Setting Voltage 1).

The V/f 5-Point settings define a volts-per-hertz relationship for the start up output of the ASD.

To enable this function, set the V/f Pattern (F015) selection to the V/f 5-Point Curve setting.

V/f Curves may be useful in starting high inertia loads such as rotary drum vacuum filters.



Direct Access Number — **F190**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/f 5-Point Setting Voltage 1

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Voltage 1 setting establishes the output voltage level that is to be associated with the frequency setting of F190 (V/f 5-Point Setting Frequency 1).

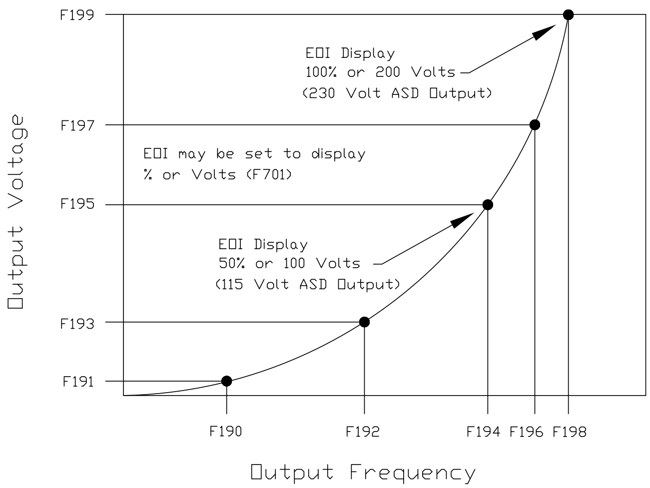
The F701 parameter setting will determine if the on-screen selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.

If using Voltage as a unit of measure and with no voltage correction (F307 Disabled), the limit of the on-screen display value for this parameter is 200 volts for the 230-volt ASD and 400 volts for the 460-volt ASD.

The actual output voltage is scaled to the maximum EOI display values (e.g., a 100-volt EOI display corresponds to a 115-volt actual output for the 230-volt ASD — ½ of the full display range).

If using **%** as a unit of measure and with no voltage correction (F307 Disabled), the ASD output voltage will be the percentage setting times 230 for the 230-volt unit (or % times 460 volts for the 460-volt unit).

See F190 for additional information on this parameter.



Direct Access Number — **F191**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — V or % (F701)

V/f 5-Point Setting Frequency 2

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Frequency 2 sets the frequency to be associated with the voltage setting of parameter F193 (V/f 5-Point Setting Voltage 2).

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F192**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/f 5-Point Setting Voltage 2

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Voltage 2 establishes the output voltage level that is to be associated with the frequency setting of F192 (V/f 5-Point Setting Frequency 2).

The F701 parameter setting will determine if the selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.

The default setting is **%**.

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F193**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — V or % (F701)

V/f 5-Point Setting Frequency 3

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Frequency 3 sets the frequency to be associated with the voltage setting of parameter F195 (V/f 5-Point Setting Voltage 3).

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F194**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/f 5-Point Setting Voltage 3

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Voltage 3 establishes the output voltage level that is to be associated with the frequency setting of F194 (V/f 5-Point Setting Frequency 3).

The F701 parameter setting will determine if the selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.

The default setting is %.

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F195**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — V or % (F701)

V/f 5-Point Setting Frequency 4

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Frequency 4 sets the frequency to be associated with the voltage setting of parameter F197 (V/f 5-Point Setting Voltage 4).

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F196**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/f 5-Point Setting Voltage 4

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Voltage 4 establishes the output voltage level that is to be associated with the frequency setting of F196 (V/f 5-Point Setting Frequency 4).

The F701 parameter setting will determine if the selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.

The default setting is **%**.

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F197**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — %

V/f 5-Point Setting Frequency 5

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Frequency 5 sets the frequency to be associated with the voltage setting of parameter F199 (V/f 5-Point Setting Voltage 5).

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F198**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **No**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/f 5-Point Setting Voltage 5

Program ⇒ Special ⇒ V/f 5-Point Setting

The V/f 5-Point Setting Voltage 5 establishes the output voltage level that is to be associated with the frequency setting of F198 (V/f 5-Point Setting Frequency 5).

The F701 parameter setting will determine if the selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.

The default setting is **%**.

See F190 and F191 for additional information on this parameter.

Direct Access Number — **F199**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — %

Frequency Priority Selection

Program ⇒ Fundamental ⇒ Standard Mode Selection

Either Frequency Mode 1 or Frequency Mode 2 may control the output frequency of the ASD. This parameter determines which of the two will control the output frequency and the conditions in which control will be switched from one to the other.

Note: Frequency Mode is abbreviated as FMOD.

The Frequency Mode 1 or Frequency Mode 2 selection specifies the source of the input frequency command signal. These selections are performed at F004 and F207, respectively.

If FMOD changed by Terminal Board is selected here, the ASD will follow the control of the discrete input terminal assigned the function of Frequency Priority. The discrete terminal Frequency Priority will toggle control to and from Frequency Mode 1 and Frequency Mode 2 with each activation/deactivation.

If FMOD (F208) is selected here, the ASD will follow the control of the Frequency Mode 1 setting for the duration that the commanded frequency of the Frequency Mode 1 setting is greater than the setting of F208.

If the commanded frequency of the Frequency Mode 1 setting is less than or equal to the setting of F208, the ASD will follow the setting of Frequency Mode 2.

Settings:

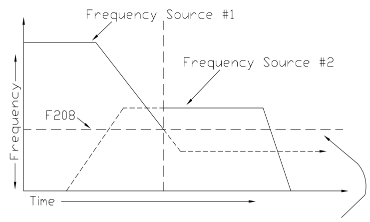
0 — FMOD changed by Terminal Board (Frequency Mode)
1 — FMOD (F208) (Frequency Mode)

Direct Access Number — **F200**

Parameter Type — **Selection List**

Factory Default — **FMOD (changed by TB)**

Changeable During Run — **Yes**



If the frequency command of Frequency Mode 1 is greater than the F208 setting, Frequency Mode 1 has priority over Frequency Mode 2.
If the frequency command of Frequency Mode 1 is equal to or less than the F208 setting, Frequency Mode 2 has priority.

V/I Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

Direct Access Number — **F201**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

This parameter is used to set the gain and bias of the isolated V/I input terminal when the V/I terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This parameter sets the V/I input level that is associated with the V/I Input Point 1 Frequency setting when operating in the Speed control mode or is associated with the V/I Input Point 1 Rate setting when operating in the Torque Control mode.

V/I Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the V/I input terminal:

- Set SW301 of the Terminal Board to Voltage or Current (see Figure 9. on pg. 17).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ V/I.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Speed Control

Perform the following setup to allow the system to perform Speed control from the V/I input terminal:

- Set V/I Input Point 1 Frequency (F202).
- Set V/I Input Point 1 Setting (F201) — the input analog signal level that corresponds to the frequency setting at V/I Input Point 1 Frequency.
- Set V/I Input Point 2 Frequency (F204).
- Set V/I Input Point 2 Setting (F203) — the input analog signal level that corresponds to the frequency setting at V/I Input Point 2 Frequency.
- Provide a Run command (F and/or R).

Once set, as the V/I input voltage or current changes, the output frequency of the ASD will vary in accordance with the above settings.

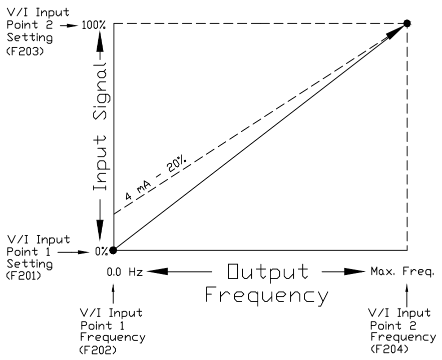
This parameter value is entered as 0% to 100% of the V/I input signal range.

The V/I input is commonly used for a 4 – 20 mA current loop signal where
4 mA equals 20% of a 20 mA signal. Set this parameter to 20% for 4 – 20 mA current loop signal applications.

Note: When using the isolated V/I input terminal, the IICC terminal must be used as the return (negative) connection.

Note: If using P24 to power a transducer that is to be used to supply the V/I input signal, it may be necessary to connect IICC to CCA.

Frequency Settings



V/I Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the V/I input terminal when the V/I terminal is used as the control input while operating in the Speed Control mode.

This parameter sets V/I Input Point 1 Frequency and is the frequency that is associated with the setting of V/I Input Point 1 Setting when operating in the Speed Control mode.

See V/I Input Point 1 Setting (F201) for additional information on this parameter.

Direct Access Number — **F202**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/I Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the V/I input terminal when the V/I terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This parameter sets the V/I input level that is associated with V/I Input Point 2 Frequency when operating in the Speed control mode or is associated with the V/I Input Point 1 Rate when operating in the Torque Control mode.

This value is entered as 0% to 100% of the V/I input signal range.

See V/I Input Point 1 Setting (F201) for additional information on this parameter when used for Speed control.

See V/I Input Point 1 Rate (F203) for additional information on this parameter when used for Torque Control.

Direct Access Number — **F203**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

V/I Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the V/I input terminal when the V/I terminal is used as the control input while operating in the Speed Control mode.

This parameter sets V/I Input Point 2 Frequency and is the frequency that is associated with the setting of V/I Input Point 2 Setting when operating in the Speed Control mode.

See V/I Input Point 1 Setting (F201) for additional information on this parameter.

Direct Access Number — **F204**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

V/I Input Point 1 Rate

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the isolated V/I input terminal when the V/I terminal is used as the control input while operating in the Torque Control mode.

V/I Input Torque Control Setup

Perform the following setup to allow the system to receive Torque Control input at the V/I input terminal:

- Set SW301 of the Terminal Board to Voltage or Current (see Figure 9. on pg. 17).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ V/I.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Torque Control

Perform the following setup to allow the system to perform Torque Control from the V/I input terminal:

- Set V/I Input Point 1 Rate (F205).
- Set V/I Input Point 1 Setting (F201) — the input analog signal level that corresponds to the torque setting at V/I Input Point 1 Rate.
- Set V/I Input Point 2 Rate (F206).
- Set V/I Input Point 2 Setting (F203) — the input analog signal level that corresponds to the torque setting at V/I Input Point 2 Rate.
- Provide a Run command (F and/or R).

Torque Control is accomplished by establishing an associated V/f output pattern for a given V/I input level.

Once set, as the V/I input voltage changes or the V/I current changes, the output torque of the ASD will vary in accordance with the above settings.

This parameter sets V/I Input Point 1 Rate and is the output torque value that is associated with the setting of V/I Input Point 1 Setting when operating in the Torque Control mode.

This value is entered as 0% to 250% of the rated torque.

Note: When using the isolated V/I input terminal, the IICC terminal must be used as the return (negative) connection.

Direct Access Number — **F205**

Parameter Type — **Numerical**

Factory Default — **0.00**

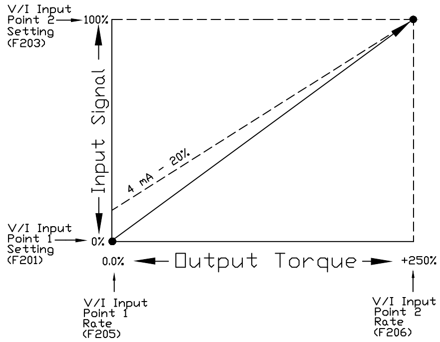
Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Torque Settings



V/I Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the V/I input terminal when the V/I terminal is used as the control input while operating in the Torque Control mode.

Torque Control is accomplished by establishing an associated V/f output pattern for a given V/I input level.

This parameter sets V/I Input Point 2 Rate and is the output torque value that is associated with the setting of V/I Input Point 2 Setting when operating in the Torque Control mode.

This value is entered as 0% to 250% of the rated torque.

See V/I Input Point 1 Rate (F205) for additional information on this parameter.

Direct Access Number — **F206**

Parameter Type — **Numerical**

Factory Default — **100.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Frequency Mode 2

Program ⇒ Fundamental ⇒ Standard Mode Selection

This parameter is used to set 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 F004 and F200 for additional information on this parameter.

Settings:

1 — V/I
2 — RR
3 — RX
5 — EOI Keypad
6 — RS485/BACnet
7 — Communication Option Board
8 — RX2 (AI1 Option)
9 — Option V/I (AI2 Option)
10 — UP/DOWN Frequency
11 — Optional RP Pulse Input
12 — Optional High-Speed Pulse Input

Direct Access Number — **F207**

Parameter Type — **Selection List**

Factory Default — **V/I**

Changeable During Run — **No**

Frequency Mode Priority Switching Frequency

Program ⇒ Fundamental ⇒ Standard Mode Selection

This parameter establishes a threshold frequency that will be used as a reference when determining when to switch the output frequency control source from the Frequency Mode 1 setting to the Frequency Mode 2 setting.

See F200 for additional information on this parameter.

Direct Access Number — **F208**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — (ASD-Dependent)

Maximum — Maximum Freq. (F011)

Units — Hz

Analog Input Filter

Program ⇒ Frequency ⇒ Analog Filter

Direct Access Number — **F209**

Parameter Type — **Selection List**

Factory Default — **No Filter**

Changeable During Run — **Yes**

Analog filtering is applied after the analog reference signal is converted to a digital signal. The type of filtering used is Rolling Average over time.

Settings:

0 — No Filter
1 — Filter (10 mS)
2 — Filter (15 mS)
3 — Filter (30 mS)
4 — Filter (60 mS)

The analog input signal is sampled and converted to a digital signal. With no filtering applied, the resulting digital value is scaled for use by the microprocessor of the ASD.

If the filtering selection 10 mS is selected, the ASD averages the last 10 mS of sampled signal and converted (digital) values. The rolling average is updated (every 4 µS) and scaled for use by the microprocessor.

This holds true for the 15, 30, and 60 mS selections providing a larger sample to produce the average for use by the microprocessor.

False responses to electrical noise are eliminated with no loss in bandwidth because the value used by the ASD is the average value of several samples.

RR Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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 or the Torque Control mode.

This parameter sets the RR input level that is associated with the RR Input Point 1 Frequency setting when operating in the Speed control mode or is associated with the RR Input Point 1 Rate setting when operating in the Torque Control mode.

Speed Control

Perform the following setup to allow the system to perform Speed control from the RR input terminal:

- Set RR Input Point 1 Frequency (F211).
- Set RR Input Point 1 Setting (F210) — the input analog signal level that corresponds to the frequency setting at RR Input Point 1 Frequency.
- Set RR Input Point 2 Frequency (F213).
- Set RR Input Point 2 Setting (F212) — the input analog signal level that corresponds to the frequency setting at RR Input Point 2 Frequency.

RR Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the RR input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ RR.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.
- Provide a Run command (F and/or R).

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

This parameter value is entered as 0% to 100% of the RR input signal range.

Direct Access Number — **F210**

Parameter Type — **Numerical**

Factory Default — **0**

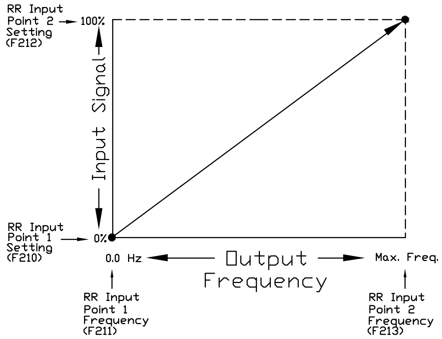
Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Frequency Settings



RR Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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.

This parameter sets RR Input Point 1 Frequency and is the frequency that is associated with the setting of RR Input Point 1 Setting when operating in the Speed Control mode.

See RR Input Point 1 Setting (F210) for additional information on this parameter.

Direct Access Number — **F211**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

RR Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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 or the Torque Control mode.

This parameter sets the RR input level that is associated with RR Input Point 2 Frequency when operating in the Speed control mode or is associated with the RR Input Point 1 Rate when operating in the Torque Control mode.

This value is entered as 0% to 100% of the RR input signal range.

See RR Input Point 1 Setting (F210) for additional information on this parameter when used for Speed control.

See RR Input Point 1 Rate (F214) for additional information on this parameter when used for Torque Control.

Direct Access Number — **F212**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

RR Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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.

This parameter sets RR Input Point 2 Frequency and is the frequency that is associated with the setting of RR Input Point 2 Setting when operating in the Speed Control mode.

See RR Input Point 1 Setting (F210) for additional information on this parameter.

Direct Access Number — **F213**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

RR Input Point 1 Rate

Program ⇒ Torque ⇒ Setpoints

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 ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode ⇒ RR.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Torque Control

Perform the following setup to allow the system to perform Torque Control from the RR input terminal:

- Set RR Input Point 1 Rate (F214).
- Set RR Input Point 1 Setting (F210) — the input analog signal level that corresponds to the torque setting at RR Input Point 1 Rate.
- Set RR Input Point 2 Rate (F215).
- Set RR Input Point 2 Setting (F212) — the input analog signal level that corresponds to the frequency setting at RR Input Point 2 Rate.
- Provide a Run command (F and/or R).

Torque Control is accomplished by establishing an associated V/f output pattern for a given RR input level.

Once set, as the RR input voltage changes, the output torque of the ASD will vary in accordance with the above settings.

This parameter sets RR Input Point 1 Rate and is the output torque value that is associated with the setting of RR Input Point 1 Setting when operating in the Torque Control mode.

This value is entered as 0% to 250% of the rated torque.

Direct Access Number — **F214**

Parameter Type — **Numerical**

Factory Default — **0.00**

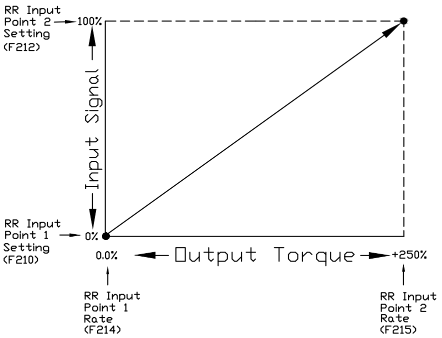
Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Torque Settings



RR Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

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.

Torque Control is accomplished by establishing an associated V/f output pattern for a given RR input level.

This parameter sets RR Input Point 2 Rate and is the output torque value that is associated with the setting of RR Input Point 2 Setting when operating in the Torque Control mode.

This value is entered as 0% to 250% of the rated torque.

See RR Input Point 1 Rate (F214) for additional information on this parameter.

Direct Access Number — **F215**

Parameter Type — **Numerical**

Factory Default — **100.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

RX Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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 or the Torque Control mode.

This parameter sets the RX input level that is associated with RX Input Point 1 Frequency when operating in the Speed Control mode or is associated with the RX Input Point 1 Rate when operating in the Torque Control mode.

RX Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the RX input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ RX.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Speed Control

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

- Set RX Input Point 1 Frequency (F217).
- Set RX Input Point 1 Setting (F216) — the input analog signal level that corresponds to the speed setting at RX Input Point 1 Frequency.
- Set RX Input Point 2 Frequency (F219).
- Set RX Input Point 2 Setting (F218) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Frequency.
- Provide a Run command (F and/or R).

Once set, as the RX input voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter value is entered as -100% to +100% of the RX input signal range.

See F474 and F475 for information on fine-tuning this terminal response.

Direct Access Number — **F216**

Parameter Type — **Numerical**

Factory Default — **0**

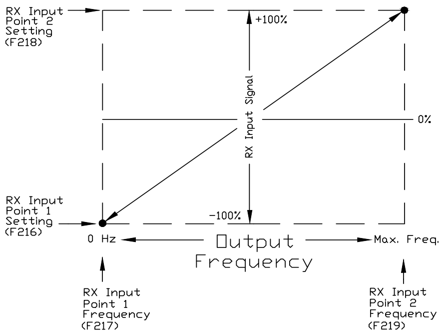
Changeable During Run — **Yes**

Minimum — -100

Maximum — +100

Units — %

Frequency Settings



RX Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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.

This parameter sets RX Input Point 1 Frequency and is the frequency that is associated with the setting of RX Input Point 1 Setting when operating in the Speed Control mode.

See RX Input Point 1 Setting (F216) for additional information on this parameter.

Direct Access Number — **F217**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

RX Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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 or the Torque Control mode.

This parameter sets the RX input level that is associated with RX Input Point 2 Frequency when operating in the Speed control mode or is associated with the RX Input Point 2 Rate when operating in the Torque Control mode.

This value is entered as -100% to +100% of the RX input signal range.

See RX Input Point 1 Setting (F216) for additional information on this parameter when used for Speed control.

See RX Input Point 1 Rate (F220) for additional information on this parameter when used for Torque Control.

Direct Access Number — **F218**

Parameter Type — **Numerical**

Factory Default — **+100**

Changeable During Run — **Yes**

Minimum — -100

Maximum — +100

Units — %

RX Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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.

This parameter sets RX Input Point 2 Frequency and is the frequency that is associated with the setting of RX Input Point 2 Setting when operating in the Speed Control mode.

See RX Input Point 1 Setting (F216) for additional information on this parameter.

Direct Access Number — **F219**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

RX Input Point 1 Rate

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the RX input terminal when the RX terminal is used as the control input while operating in the Torque Control mode.

RX Input Torque Control Setup

Perform the following setup to allow the system to receive Torque Control input at the RX input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode ⇒ RX.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Torque Control

Perform the following setup to allow the system to perform Torque Control from the RX input terminal:

- Set RX Input Point 1 Rate (F220).
- Set RX Input Point 1 Setting (F216) — the input analog signal level that corresponds to the torque setting at RX Input Point 1 Rate.
- Set RX Input Point 2 Rate (F221).
- Set RX Input Point 2 Setting (F218) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Rate.
- Provide a Run command (F and/or R).

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

Once set, as the RX input voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter sets RX Input Point 1 Rate and is the output torque value that is associated with the setting of RX Input Point 1 Setting when operating in the Torque Control mode.

This value is entered as -250% to +250% of the rated torque.

Direct Access Number — **F220**

Parameter Type — **Numerical**

Factory Default — **0.00**

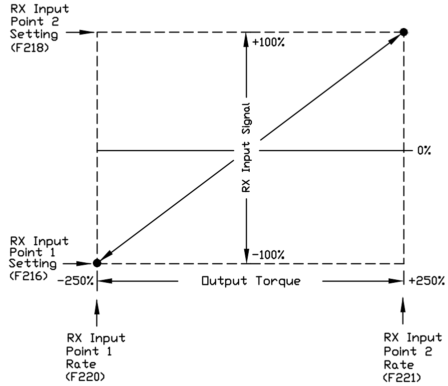
Changeable During Run — **Yes**

Minimum — -250.00

Maximum — +250.00

Units — %

Torque Settings



RX Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the 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.

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

This parameter sets RX Input Point 2 Rate and is the output torque value that is associated with the setting of RX Input Point 2 Setting when operating in the Torque Control mode.

This value is entered as -250% to +250% of the rated torque.

See RX Input Point 1 Rate (F220) for additional information on this parameter.

Direct Access Number — **F221**

Parameter Type — **Numerical**

Factory Default — **100.00**

Changeable During Run — **Yes**

Minimum — -250.00

Maximum — +250.00

Units — %

RX2 Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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 or the Torque Control mode.

Note: The Expansion IO Card Option 1 option board (P/N ETB003Z) is required to use this terminal.

This parameter sets the RX2 input level that is associated with RX2 Input Point 1 Frequency when operating in the Speed Control mode or is associated with the RX2 Input Point 1 Rate when operating in the Torque Control mode.

RX2 Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the RX2 input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ RX2.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.

Speed Control

Perform the following setup to allow the system to perform Speed control from the RX2 input terminal:

- Set RX2 Input Point 1 Frequency (F223).
- Set RX2 Input Point 1 Setting (F222) — the input analog signal level that corresponds to the speed setting at RX2 Input Point 1 Frequency.
- Set RX2 Input Point 2 Frequency (F225).
- Set RX2 Input Point 2 Setting (F224) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Frequency.
- Provide a Run command (F and/or R).

Once set, as the RX2 input voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter value is entered as -100% to +100% of the RX2 input signal range.

See the Expansion IO Card Option **1** instruction manual (P/N 58685) for additional information on the function of this terminal. See F476 and F477 for information on fine-tuning this terminal response.

Direct Access Number — **F222**

Parameter Type — **Numerical**

Factory Default — **0**

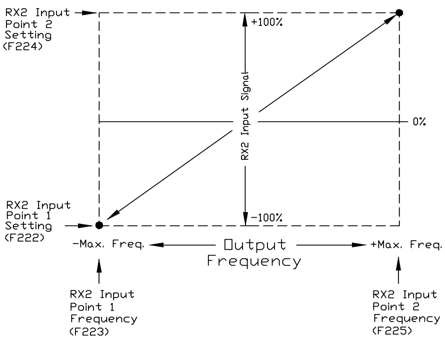
Changeable During Run — **Yes**

Minimum — -100

Maximum — +100

Units — %

Frequency Settings



RX2 Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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.

This parameter sets RX2 Input Point 1 Frequency and is the frequency that is associated with the setting of RX2 Input Point 1 Setting when operating in the Speed Control mode.

See RX2 Input Point 1 Setting (F222) for additional information on this parameter.

Direct Access Number — **F223**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

RX2 Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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 or the Torque Control mode.

This parameter sets the RX2 input level that is associated with RX2 Input Point 2 Frequency when operating in the Speed control mode or is associated with the RX2 Input Point 2 Rate when operating in the Torque Control mode.

This value is entered as -100% to +100% of the RX2 input signal range.

See RX2 Input Point 1 Setting (F222) for additional information on this parameter when used for Speed control.

Direct Access Number — **F224**

Parameter Type — **Numerical**

Factory Default — **+100**

Changeable During Run — **Yes**

Minimum — -100

Maximum — +100

Units — %

RX2 Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the 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.

This parameter sets RX2 Input Point 2 Frequency and is the frequency that is associated with the setting of RX2 Input Point 2 Setting when operating in the Speed Control mode.

See RX2 Input Point 1 Setting (F222) for additional information on this parameter.

Direct Access Number — **F225**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

BIN Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the BIN input terminals when the BIN terminals are used as the control input while operating in the Speed Control mode.

The discrete input terminals of the Terminal Board are used as the BIN terminals.

BIN Input Speed Control Setup

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

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ Binary/BCD.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.
- Program ⇒ Terminal ⇒ Input Terminals; select and set the desired discrete input terminals to Binary Bit(s) 0 – 7 (or 0 – MSB). The binary input byte will control the speed of the motor.
- Program ⇒ Terminal ⇒ Input Terminals; select and set a discrete input terminal to Binary Data Write. Activation of the Binary Data Write terminal will transfer the status of the Binary Bit(s) 0 – 7 (or 0 – MSB) to the control board for speed control.

Speed Control

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

- Set BIN Input Point 1 Frequency (F229).
- Set the BIN input value (% of 255_D) (F228) that represents BIN Input Point 1 Frequency.
- Set BIN Input Point 2 Frequency (F231).
- Set the BIN input value (% of 255_D) (F230) that represents BIN Input Point 2 Frequency.
- Provide a Run command (F and/or R).

Note: 255_D is the decimal equivalent of the 8-bit BIN byte with all input terminals set to 1 (255 decimal = 11111111 binary).

Once set, as the BIN input signal changes are transferred to the control board, the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets BIN Input Point 1 Setting and is entered as 0% to 100% of the range represented by the BIN binary input byte 11111111 (255_D) or the binary bit(s) 0 – MSB.

Direct Access Number — **F228**

Parameter Type — **Numerical**

Factory Default — **0**

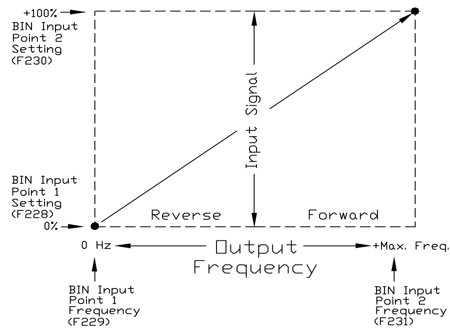
Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Frequency Settings



BIN Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input.

This parameter sets BIN Input Point 1 Frequency and is the frequency that is associated with the setting of BIN Input Point 1 Setting.

See BIN Input Point 1 Setting (F228) for additional information on this parameter.

Direct Access Number — **F229**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

BIN Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input.

This parameter sets the BIN input signal that is associated with BIN Input Point 2 Frequency.

This value is entered as 0% to +100% of the BIN input signal range.

See BIN Input Point 1 Setting (F228) for additional information on this parameter.

Direct Access Number — **F230**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

BIN Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input.

This parameter sets BIN Input Point 2 Frequency and is the frequency that is associated with the setting of BIN Input Point 2 Setting.

See BIN Input Point 1 Setting (F228) for additional information on this parameter.

Direct Access Number — **F231**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Maximum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

PG Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the PG input terminal of the option board when a shaft-mounted encoder is used as the control input while operating in the Speed Control mode.

Note: See Instruction Manual P/N 58687 for additional information on the PG Option Board.

PG Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the PG input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ Pulse Input (option).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ (any setting).
- Provide a Run command (F and/or R).

Speed Control

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

- Set PG Point 1 Frequency (F235).
- Set the PG input value (F234) that represents PG Point 1 Frequency.
- Set PG Point 2 Frequency (F237).
- Set the PG input value (F236) that represents PG Point 2 Frequency.

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

This parameter sets the PG input pulse count that represents Reference Setpoint 1 (frequency). The range of values for this parameter is 0% to 100% of the PG input pulse count range.

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

Direct Access Number — **F234**

Parameter Type — **Numerical**

Factory Default — **0**

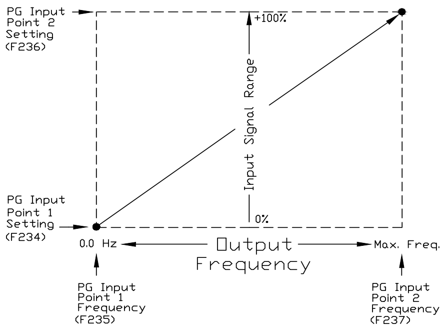
Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Frequency Settings



PG Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the PG input terminals when the PG terminal is used as the control input.

This parameter sets PG Point 1 Frequency and is the frequency that is associated with the setting of PG Point 1 Setting.

See PG Point 1 Setting (F234) for additional information on this parameter.

Direct Access Number — **F235**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

PG Input Point 2 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction and speed of the PG input terminals when the PG terminals are used as the control input.

This parameter sets the PG input signal that is associated with PG Point 2 Frequency.

This value is entered as 0% to 100% of the PG input signal range.

See PG Point 1 Setting (F234) for additional information on this parameter.

Direct Access Number — **F236**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

PG Input Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction and speed of the PG input terminals when the PG terminals are used as the control input.

This parameter sets PG Point 2 Frequency and is the frequency that is associated with the setting of PG Point 2 Setting.

See PG Point 1 Setting (F234) for additional information on this parameter.

Direct Access Number — **F237**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Start Frequency

Program ⇒ Special ⇒ Frequency Control

The output of the ASD will remain at 0.0 Hz until the programmed speed value exceeds this setting during start up. Once exceeded during start up, the output frequency of the ASD will accelerate to the programmed setting.

Output frequencies below the Start Frequency will not be output from the ASD during start up. However, once reaching the Start Frequency, speed values below the Start Frequency may be output from the ASD.

If the setting of this parameter results in an over-current condition at start up, reduce the setting of this parameter to a value less than the rated slippage of the motor.

If zero-speed torque is required, set this parameter and F243 to 0.0 Hz.

This setting will override the setting of F244 if this setting has a higher value.

This parameter setting is used during a Jog as the Lower-Limit Frequency (see F260).

Direct Access Number — **F240**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Run Frequency

Program ⇒ Special ⇒ Frequency Control

This parameter establishes a center frequency (Run Frequency) of a frequency band.

Parameter F242 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 signal to the motor until the lower level of the band is reached; at which time the output will go to 0.0 Hz.

Direct Access Number — **F241**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Run Frequency Hysteresis

Program ⇒ Special ⇒ Frequency Control

This parameter provides a plus-or-minus value for the Run Frequency setting (F241).

Direct Access Number — **F242**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

End Frequency

Program ⇒ Special ⇒ Frequency Control

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

Direct Access Number — **F243**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — (ASD-Dependent)
Units — Hz

0 Hz Dead Band Signal

Program ⇒ Special ⇒ Special Parameters

This parameter sets an output frequency threshold that, until the commanded frequency surpasses this setting, the ASD will output 0.0 Hz to the motor.

This setting will override the Start Frequency setting (F240) if this setting has a higher value.

Direct Access Number — **F244**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — (ASD-Dependent)
Units — Hz

DC Injection Braking Start Frequency

Program ⇒ Protection ⇒ DC Braking

During deceleration, this is the frequency at which DC Injection Braking will start.

DC Injection Braking

DC Injection Braking is a braking system used with 3-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 F252

The intensity of the DC current used while braking determines how fast the motor will come to a stop and may be set at F251. The intensity setting is entered as a percentage of the full load current of the ASD.

DC Injection Braking is also used to preheat the motor or to keep the rotor from spinning freely when the motor is off by providing a pulsating DC current into the motor at the Carrier Frequency. This feature may be enabled at F254.

Direct Access Number — **F250**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — (ASD-Dependent)
Units — Hz

DC Injection Braking Current

Program ⇒ Protection ⇒ DC Braking

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.

Direct Access Number — **F251**
Parameter Type — **Numerical**
Factory Default — **50**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 100
Units — %

DC Injection Braking Time

Program ⇒ Protection ⇒ DC Braking

This parameter setting is used to set the on-time duration of the DC Injection Braking.

Direct Access Number — **F252**

Parameter Type — **Numerical**

Factory Default — **1.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 20.0

Units — Seconds

Forward/Reverse DC Braking Priority

Program ⇒ Protection ⇒ DC Braking

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

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F253**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Motor Shaft Stationary Control

Program ⇒ Protection ⇒ DC Braking

This parameter Enables/Disables a continuous DC injection at half of the amperage setting of F251 into a stopped motor. This feature is useful in preheating the motor or to keep the rotor from spinning freely.

Motor Shaft Stationary Control starts after the DC injection brake stops the motor and continues until ST – CC is opened, power is turned off, an Emergency Off command is received, or this parameter is changed.

Enabling this feature will also require a non-zero entry at F250.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F254**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

0 Hz Command Output

Program ⇒ Special ⇒ Special Parameters

This parameter is used to set the go-to-zero method to be used by the ASD in the event that the ASD is commanded to go to zero Hz.

Settings:
0 — Standard (DC Injection Braking)
1 — 0 Hz Command

Direct Access Number — **F255**

Parameter Type — **Selection List**

Factory Default — **Standard (DC Injection Braking)**

Changeable During Run — **No**

Time Limit For Lower-Limit Frequency Operation

Program ⇒ Fundamental ⇒ Frequency Settings

This parameter sets the time that the ASD is allowed to operate below the Lower-Limit setting before an alarm and subsequent fault is incurred.

Direct Access Number — **F256**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 600.0

Units — Seconds

Jog Frequency

Program ⇒ Frequency ⇒ Jog Settings

This parameter sets the output frequency of the ASD during a Jog. Jogging 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.

The Jog function is initiated via the Terminal Board or using Communications (see the Communications manual-P/N 53840 for additional information on using Communications for Jogging).

The Jog function can be activated from zero Hz or from any frequency below the Jog Run Frequency setting (Jog can only increase the speed). A Jog command will not be recognized when the running frequency is above the Jog Run Frequency setting. The Jog command has priority over other Run commands and is not limited by the Upper-Limit setting of parameter F012.

Jog commands received for the opposite direction of the commanded frequency will follow the programmed stopping method of F261 until reaching zero Hz and will then ramp to the programmed Jog Frequency and direction.

Jog Setup and Execution

To initiate a Jog Run from the EOI perform the following:

7. Set the Command Mode Selection (F003) to EOI Keypad. This setting places the ASD in the Remote mode.
8. Set the Frequency Mode Selection (F004) to EOI Keypad.
9. Enable the Jog function (F262).
10. Set the Input Terminal Priority (F106) function to Enable to receive Jog commands.
11. Assign the Jog Run setting to any unused discrete input terminal (Select from Table 9 on page 252).
12. Set the Jog Frequency at F260.
13. Set up a Jog Stop Pattern at F261.
14. Press the Run key and the ASD will output the commanded frequency (as programmed; not the Jog frequency).
15. Activate the Jog Run terminal (from step 11). The ASD will output the Jog frequency setting of F260 (from step 12) for the duration of the activation.
16. Stop the Jog by either providing a Stop command or terminating the Jog Run terminal activation. Providing a Stop command will terminate the commanded frequency and the Jog function. Terminating the Jog Run terminal activation will terminate the Jog function only and will resume the commanded frequency of step 14.

Direct Access Number — **F260**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — Start Frequency (F240)

Maximum — (ASD-Dependent)

Units — Hz

Jog Stop Pattern

Direct Access Number — **F261**

Parameter Type — **Selection List**

Factory Default — **Deceleration**

Changeable During Run — **No**

Program ⇒ Frequency ⇒ Jog Settings

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

Note: This parameter setting is used for the Jog operation only. The Emergency Off stopping method setting of parameter F603 has priority over this setting and changes made here do not affect the function or setting of parameter F603.

Settings:
- 0 — Deceleration
- 1 — Coast
- 2 — DC Injection

EOI Keypad Operation Jog Mode

Direct Access Number — **F262**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Program ⇒ Frequency ⇒ Jog Settings

This parameter enables the Jog command to be received from the EOI. When disabled, the Jog command received from the EOI is ignored.

Jog commands may also be received from the Terminal Board. Priority as to which is allowed to override the other is selected at F106.

The priority selection at F106 enables the selected source for Jog control and disables the other. The F106 setting overrides the F262 parameter setting.

Settings:
- 0 — Disabled
- 1 — Enabled

UP/DOWN Frequency (up) Response Time

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

This parameter functions in conjunction with the parameter settings of F265, F266, F267, F268, and F269. The purpose of these settings is to set up the ASD to allow an externally-supplied discrete input signal to control the output frequency of the ASD.

This method uses the discrete input terminal settings UP/DOWN Frequency (up) and UP/DOWN Frequency (down) to change the ASD speed. Activation of either terminal increases or decreases the output frequency at the Accel 1 or Decel 1 rates, respectively.

Depending on the Delay setting, the UP/DOWN Frequency (up/down) terminal may perform 1) the increase/decrease function for the duration of activation or 2) the UP/DOWN Frequency (up/down) terminal may act as a momentary contact that loads a new commanded frequency upon activation.

In either case, to activate-and-hold will continue the up or down function until reaching the Upper-Limit Frequency or the Lower-Limit Frequency, respectively, at which point further activation will be ignored.

See Figure 37 on pg. 131 for additional information on the UP/DOWN Frequency function.

Setup Requirements

F003 — Selects the Command control source; set to Terminal Board.

F004 — Selects the Frequency Control Mode 1 control source; set to UP/DOWN Frequency.

F207 — Selects the Frequency Control Mode 2 control source; set to UP/DOWN Frequency if used.

Set one unused discrete input terminal to UP/DOWN Frequency (up) and one unused discrete input terminal to UP/DOWN Frequency (down).

F264 — Sets the system-response delay to the initial activation of the discrete input terminal UP/DOWN Frequency (up). Also sets the response delay of subsequent terminal activations of the UP/DOWN Frequency (up) terminal during an activate-and-hold.

F265 — Sets the frequency increase amount for each activation of the UP/DOWN Frequency (up) terminal activation. The rate of the frequency increase is set at Acceleration Time 1 (F009).

F266 — Sets the system-response delay to the initial activation of the discrete input terminal UP/DOWN Frequency (down). Also sets the activation delay of subsequent terminal activations of the UP/DOWN Frequency (down) terminal during an activate-and-hold.

F267 — Sets the frequency decrease amount for each activation of the UP/DOWN Frequency (down) terminal activation. The rate of the frequency decrease is set at Deceleration Time 1 (F010).

F268 — At power up or after a reset, this parameter setting is used to provide a starting frequency for the UP/DOWN Frequency function.

F269 — At power down while running, and when enabled, this parameter writes the running frequency into the F268 location and, upon a system restart, uses this setting as the start up frequency.

Provide a Run command (F or R). The motor will run at the F268 setting.

Direct Access Number — **F264**

Parameter Type — **Numerical**

Factory Default — **0.1**

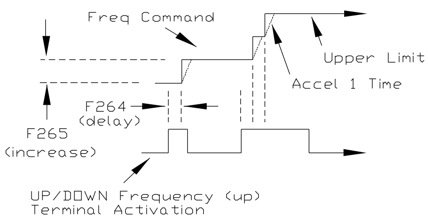
Changeable During Run — **Yes**

Minimum — 0.0

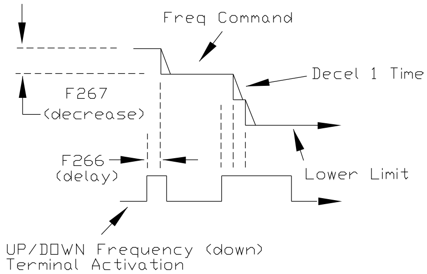
Maximum — 10.0

Units — Seconds

Up/Down Frequency (up) Mode



Up/Down Frequency (down) Mode



UP/DOWN Frequency (up) Frequency Step

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

This parameter sets the frequency increase amount for each activation of the UP/DOWN Frequency (up) terminal activation. The rate of the frequency increase is set at Acceleration Time 1 (F009).

See F264 for additional information on this parameter.

Direct Access Number — **F265**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

UP/DOWN Frequency (down) Response Time

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

This parameter sets the system-response delay to the initial activation of the discrete input terminal UP/DOWN Frequency (down). Also sets the activation delay of subsequent terminal activations of the UP/DOWN Frequency (down) terminal during an activate-and-hold.

See F264 for additional information on this parameter.

Direct Access Number — **F266**

Parameter Type — **Numerical**

Factory Default — **0.1**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 10.0

Units — Seconds

UP/DOWN Frequency (down) Frequency Step

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

This parameter sets the frequency decrease amount for each activation of the UP/DOWN Frequency (down) terminal activation. The rate of the frequency decrease is set at Deceleration Time 1 (F010).

See F264 for additional information on this parameter.

Direct Access Number — **F267**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Initial UP/DOWN Frequency

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

At power up or after a reset, this parameter setting is used to provide a starting frequency for the UP/DOWN Frequency function.

See F269 for additional information on this parameter.

Direct Access Number — **F268**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Initial UP/DOWN Frequency Rewriting

Direct Access Number — **F269**

Parameter Type — **Selection List**

Factory Default — **Enabled**

Changeable During Run — **Yes**

Program ⇒ Frequency ⇒ UP/DOWN Frequency Functions

At power down, and when enabled, this parameter writes the running frequency into the F268 location and, upon a system restart, uses this setting as the start up frequency.

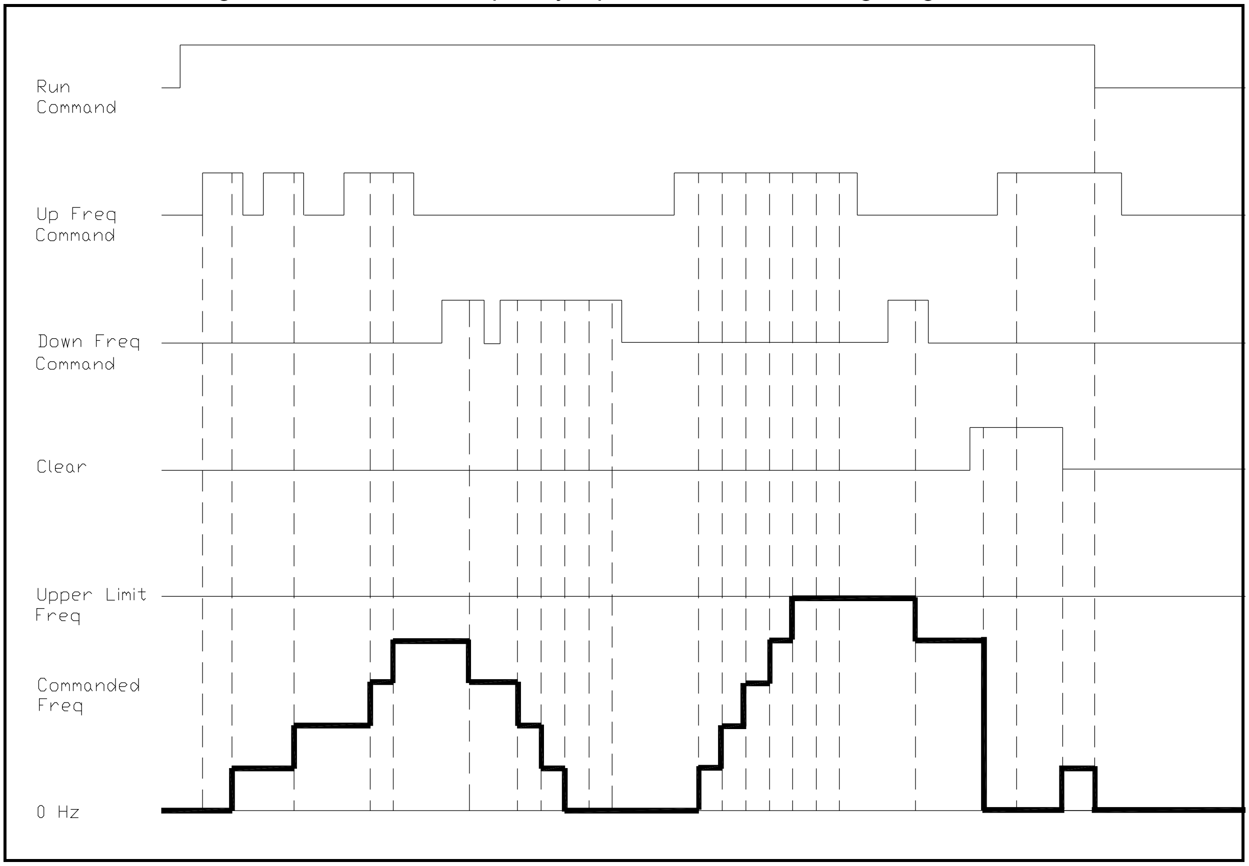
Disable this parameter and set parameter F268 to the desired start up frequency if the same starting frequency is required at each start up.

Note: This parameter setting may be different at each start up when enabled.

Settings:

0 — Disabled
1 — Enabled

Figure 37. UP/Down Frequency Operation Control Timing Diagram.



Jump Frequency 1

Program ⇒ Special ⇒ Jump Frequencies

In conjunction with parameter F271, this parameter establishes a user-defined frequency range: the Jump Frequency and a plus-or-minus value.

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

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.

Direct Access Number — **F270**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Jump Frequency 1 Bandwidth

Program ⇒ Special ⇒ Jump Frequencies

This parameter establishes a plus-or-minus value for Jump Frequency 1 (F270).

Direct Access Number — **F271**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Jump Frequency 2

Program ⇒ Special ⇒ Jump Frequencies

This parameter is the same as Jump Frequency 1 (F270) and is used when multiple frequencies are to be jumped (see the plus-or-minus value setting at F273). When multiple jump frequencies overlap, the system will recognize the lowest and the highest frequencies as one jump range.

Direct Access Number — **F272**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Jump Frequency 2 Bandwidth

Program ⇒ Special ⇒ Jump Frequencies

This parameter establishes a plus-or-minus value for Jump Frequency 2 (F272).

Direct Access Number — **F273**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Jump Frequency 3

Program ⇒ Special ⇒ Jump Frequencies

This parameter is the same as Jump Frequency 1 (F270) and is used when multiple frequencies are to be jumped (see the plus-or-minus value setting at F275).

When multiple jump frequencies overlap, the system will recognize the lowest and the highest frequencies as one jump range.

Direct Access Number — **F274**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Jump Frequency 3 Bandwidth

Program ⇒ Special ⇒ Jump Frequencies

This parameter establishes a plus-or-minus value for Jump Frequency 3 (F274).

Direct Access Number — **F275**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Preset Speed 8

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F287**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 9

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F288**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 10

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F289**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 11

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F290**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 12

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F291**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 13

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F292**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 14

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

Direct Access Number — **F293**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed 15

Program ⇒ Frequency ⇒ Preset Speeds

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 Terminal Board to output the Preset Speed.

See F018 for additional information on this parameter.

This parameter is also used as the Fire Speed running frequency.

Direct Access Number — **F294**

Parameter Type — **Numerical**

Factory Default — **60.00**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

PWM Carrier Frequency

Program ⇒ Special ⇒ Carrier Frequency

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

Note: When operating in the Vector Control mode, the carrier frequency should be set to 2.2 kHz or above.

Note: If the PWM carrier frequency is set at 2.0 kHz or above, it cannot be decreased below 2.0 kHz while running. If the PWM carrier frequency is set at 1.9 kHz or below, it cannot be increased above 2.0 kHz while running. Either change requires that the ASD be stopped and restarted for the changes to take effect.

Direct Access Number — **F300**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — kHz

Auto Restart Selection

Program ⇒ Protection ⇒ Retry/Restart

This parameter Enables/Disables the ability of the ASD to start into a spinning motor when the ST – CC connection opens momentarily and is then closed (Break/Make ST) or after a power interruption (momentary power failure).

Settings:

0 — Off
1 — (Enabled at) Power Failure
2 — (Enabled at) Make-Break ST-CC
3 — (Enabled at) Make-Break ST-CC or Power Failure
4 — All Starts (Enabled at Run)

Direct Access Number — **F301**

Parameter Type — **Selection List**

Factory Default — **All Starts**

Changeable During Run — **No**

Regenerative Power Ridethrough Mode

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

Direct Access Number — **F302**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

This parameter determines the motor control response of the ASD in the event of a momentary power outage or under-voltage condition.

During a Ridethrough, regenerative energy is used to maintain the control circuitry settings for the duration of the Ridethrough; it is not used to drive the motor. The motor(s) of the system are stopped and then restarted automatically if so configured.

Note: If used to restart the motors, the Retry setup of F301 is required.

Settings:

0 — Off
1 — Ridethrough
2 — Deceleration Stop

Ridethrough Setup Requirements

1. Select the Ridethrough Mode at F302.
2. Select the Ridethrough Time at F310.

Number of Times to Retry

Program ⇒ Protection ⇒ Retry/Restart

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 automatic Retry/Restart function:

- Input Phase Loss (Input Phase Failure)
- Output Phase Loss (Output Phase Failure)
- Output Current Protection Fault
- Output Current Detector Error
- Load Side Over-Current at Start
- Earth Fault (Ground Fault)
- Over-Current During Acceleration
- Arm Over-Current at Start-Up
- DBR Resistor Over-Current
- Low-Current
- Voltage Drop In Main Circuit
- EEPROM Data Fault (EEPROM Fault)
- Flash Memory/Gate Array/RAM-ROM Fault
- CPU Fault
- Emergency Off
- Communication Error
- Option Fault
- Sink/Source Setting Error
- Over-Speed Error
- Over-Torque
- Key Error
- External Thermal Error
- Externally-Controlled Interrupt

See the section titled System Setup Requirements on pg. 5 for additional information on this setting.

Direct Access Number — **F303**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 10

Dynamic Braking Enable (not used)

Program ⇒ Protection ⇒ Dynamic Braking

This parameter Enables/Disables the Dynamic Braking system.

Settings:

0 — Off
1 — On with Trip, ST-Off and Overload Detection
2 — On with Trip and ST-Off
3 — On with Trip and Overload Detection
4 — On with Trip
5 — On with ST-Off and Overload Detection
6 — On with ST-Off
7 — On with Overload Detection
8 — On

Direct Access Number — **F304**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

Dynamic Braking

Dynamic Braking is used to prevent over-voltage faults during rapid deceleration or constant speed run on cyclic overhauling applications.

Dynamic Braking dissipates regenerated energy in the form of heat. When using a DBR, use thermal protection.

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.

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

The Dynamic Braking function may be set up and enabled by connecting a braking resistor from terminal PA to PB of the ASD and providing the proper information at F304, F308, and F309.

Over-Voltage Limit Operation (Stall)

Direct Access Number — **F305**

Parameter Type — **Selection List**

Factory Default — **ON (Quick Deceleration)**

Changeable During Run — **No**

Program ⇒ Protection ⇒ Stall

This parameter enables the Over-Voltage Limit function. This feature, in conjunction with the setting of F626, is used to set the upper DC bus voltage threshold that, once exceeded, will cause an Over-Voltage Stall.

While running or during deceleration, the Over-Voltage Stall function increases the output frequency of the ASD for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage threshold level setting of parameter F626 is exceeded for over 4 mS, an Over-Voltage Trip will be incurred.

The effects of this parameter may be further enhanced by the setting of F468.

Note: This parameter setting may increase deceleration times.

Note: Over-voltage alarms will display OP to convey Over Potential.

Settings:

0 — On (OP Stall)
1 — Off
2 — On (Quick Deceleration)
3 — On (Dynamic Quick Deceleration — NOT USED)

Supply Voltage Correction

Direct Access Number — **F307**

Parameter Type — **Selection List**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Program ⇒ Protection ⇒ Base Frequency Voltage

This parameter Enables/Disables the Voltage Compensation function.

When Enabled, this function provides a constant V/f ratio during periods of input voltage fluctuations.

Settings:

0 — Disabled (Output Voltage Unlimited)
1 — Enabled (Supply Voltage Compensation)
2 — Disabled (Output Voltage Limited)
3 — Enabled (Supply Voltage Compensation w/Output Voltage Limited)

Dynamic Braking Resistance (not used)

Direct Access Number — **F308**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 0.5

Maximum — 1000.0

Units — Ω

Program ⇒ Protection ⇒ Dynamic Braking

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

Light-duty and heavy-duty resistors vary from a few ohms to several hundred ohms. The appropriate resistance size will be typeform- and application-specific.

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

Continuous Dynamic Braking Capacity (not used)

Program ⇒ Protection ⇒ Dynamic Braking

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

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

Direct Access Number — **F309**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 0.01

Maximum — 600.00

Units — kW

Ridethrough Time

Program ⇒ Protection ⇒ Retry/Restart

In the event of a momentary power outage, this parameter determines the length of the Ridethrough time.

The Ridethrough will be maintained for the number of seconds set using this parameter.

See F302 for additional information on the Ridethrough function.

Note: The actual Ridethrough Time is load-dependent.

Direct Access Number — **F310**

Parameter Type — **Numerical**

Factory Default — **2.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 320.0

Units — Seconds

Forward Run/Reverse Run Disable

Program ⇒ Frequency ⇒ Forward/Reverse Disable

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 both directions are disabled, the received direction command will determine the direction of the motor rotation.

Settings:

0 — Permit All
1 — Disable Reverse Run
2 — Disable Forward Run

Direct Access Number — **F311**

Parameter Type — **Selection List**

Factory Default — **Permit All**

Changeable During Run — **No**

Random Mode

Program ⇒ Protection ⇒ Retry/Restart

This parameter adjusts the carrier frequency randomly. This feature is effective in minimizing the negative effects of mechanical resonance.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F312**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Carrier Frequency Control Mode

Direct Access Number — **F316**

Parameter Type — **Selection List**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Program ⇒ Special ⇒ Carrier Frequency

This parameter provides for the automatic decrease of the carrier frequency.

Select 1 to decrease the Carrier Frequency setting as a function of an increased current requirement.

Selection 2 or 3 may also include an output voltage drop as a function of an increased current requirement. The Carrier Frequency should be set below 4 kHz.

Settings:

0 — No Decrease and No Limit
1 — Valid Decrease and No Limit
2 — No Decrease and Limit Small Pulse
3 — Valid Decrease and Limit Small Pulse
4 — Dancer Control
5 — Option V/I (AI2 Option)

Regenerative Over-Excitation Upper Limit

Direct Access Number — **F319**

Parameter Type — **Numerical**

Factory Default — **140**

Changeable During Run — **No**

Minimum — 100

Maximum — 160

Units — %

Program ⇒ Protection ⇒ Stall

This parameter is enabled by setting F305 to 2 or 3 and establishes the maximum threshold energy level that may be fed back from the motor during regeneration. If this setting is exceeded, an Over-Voltage Trip will be incurred.

Note: This parameter setting may increase deceleration times.

Drooping Gain

Program ⇒ Feedback ⇒ Drooping Control

This parameter sets the effective 100% output torque level while operating in the Drooping Control mode. This value is the upper torque limit of the motor being driven by a given ASD while operating in the Drooping Control mode.

Note: The maximum frequency output is not limited by the setting of F011 while operating in the Drooping Control mode.

Drooping

Drooping Control, also called Load Share, is used to share the load among two or more mechanically coupled motors. Unlike Stall, which reduces the output frequency in order to limit the load once the load reaches a preset level, Drooping can decrease or increase the V/f setting of a motor to maintain a balance between the output torque levels of mechanically coupled motors.

Because of variances in gearboxes, sheaves, belts, motors, and since the speed of the motor is constrained by the mechanical system, one motor may experience more load than its counterpart and may become overloaded. Drooping Control allows the overloaded motor to slow down, thus shedding load and encouraging a lightly-loaded motor to pick up the slack. The goal of Drooping Control is to have the same torque ratios for mechanically coupled motors.

Direct Access Number — **F320**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

Speed at 0% Drooping Gain

Program ⇒ Feedback ⇒ Drooping Control

This parameter sets the motor speed when at the 0% output torque gain while operating in the Drooping Control mode. This function determines the lowest speed that Drooping will be in effect for motors that share the same load.

Direct Access Number — **F321**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Speed at F320 Drooping Gain

Program ⇒ Feedback ⇒ Drooping Control

This parameter sets the motor speed when at the 100% output torque gain while operating in the Drooping Control mode. This function determines the speed of the individual motors at the 100% Drooping Gain setting for motors that share the same load.

Direct Access Number — **F322**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Drooping Insensitive Torque

Program ⇒ Feedback ⇒ Drooping Control

This parameter defines a torque range in which the Drooping Control settings will be ignored and the programmed torque settings will be followed.

Direct Access Number — **F323**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Drooping Output Filter

Program ⇒ Feedback ⇒ Drooping Control

This parameter is used to set the rate of output change allowed when operating in the Drooping Control mode.

Jerky operation may be reduced by increasing this setting.

Direct Access Number — **F324**

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 200.0

Units — RAD

Commercial Power/ASD Switching Output

Program ⇒ Terminal ⇒ Line Power Switching

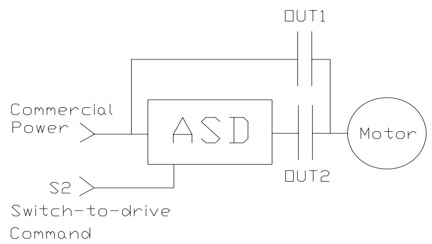
Direct Access Number — **F354**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

This parameter Enables/Disables the Commercial Power/ASD Output Switching function.



When enabled, the system may be set up to discontinue using the output of the ASD and to switch to the commercial power if 1) a trip is incurred, 2) a user-set ASD frequency is reached, or 3) if initiated by a discrete input terminal.

Once set up with the proper switching frequency and hold times, the system will switch to commercial power upon reaching the F355 frequency criterion.

Switching may also be accomplished manually by activating the discrete input terminal Commercial Power ASD Switching. Terminal activation forces the ASD output speed to accelerate to the F355 switching frequency, resulting in the ASD-to-commercial power switching.

Deactivation of the discrete input terminal starts the hold-time counter setting (F356) for ASD-to-commercial power switching. Once timed out, the motor resumes normal commercial power operation.

Settings:

0 — Off

1 — Switch at Signal Input and Trip

2 — Switch at Signal Input with Switching Frequency

3 — Switch at Signal Input and Trip with Switching Frequency

Switching Setup Requirements

F354 — Enable the switching function.

F355 — Set the switching frequency.

F356 — (Speed) Hold -time before applying ASD output after the switching criteria has been met.

F357 — (Speed) Hold -time before applying commercial power after the switching criteria has been met.

F358 — (Speed) Hold -time of applying commercial power after the switching criteria has been met.

Set a discrete input terminal to Commercial Power ASD Switching.

Set OUT1 and OUT2 to Commercial Power/ASD Switching 1 and 2, respectively.

Note: Ensure that the switching directions are the same and that F311 is set to Permit All.

Note: The OUT1 and OUT2 outputs assigned to Commercial Power/ASD Switching Output are used to actuate the re-routing contactors.

Commercial Power/ASD Switching Frequency

Program ⇒ Terminal ⇒ Line Power Switching

When enabled at F354 and with a properly configured discrete output terminal, this parameter sets the frequency at which the At Frequency Powerline Switching function engages.

The At Frequency Powerline Switching function commands the system to discontinue using the output of the ASD and to switch to commercial power once reaching the frequency set here.

See F354 for additional information on this parameter.

Direct Access Number — **F355**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Upper-Limit Freq. (F012)

Units — Hz

ASD Side-Switching Delay Time

Program ⇒ Terminal ⇒ Line Power Switching

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

See F354 for additional information on this parameter.

Direct Access Number — **F356**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.10

Maximum — 10.00

Units — Seconds

Commercial Power Side Switching Delay Time

Program ⇒ Terminal ⇒ Line Power Switching

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

See F354 for additional information on this parameter.

Direct Access Number — **F357**

Parameter Type — **Numerical**

Factory Default — **0.62**

Changeable During Run — **Yes**

Minimum — 0.40

Maximum — 10.00

Units — Seconds

Commercial Power Switching Freq. Hold Time

Program ⇒ Terminal ⇒ Line Power Switching

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

See F354 for additional information on this parameter.

Direct Access Number — **F358**

Parameter Type — **Numerical**

Factory Default — **2.00**

Changeable During Run — **Yes**

Minimum — 0.10

Maximum — 10.00

Units — Seconds

PID Control Switching

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to set the PID control mode.

Selecting Process PID uses the upper and lower-limit settings of parameters F367 and F368.

Selecting Speed PID uses the upper and lower-limit settings of parameters F370 and F371.

Settings:

0 — PID Off
1 — Process PID
2 — Speed PID
4 — Dancer Control

Direct Access Number — **F359**

Parameter Type — **Selection List**

Factory Default — **PID Off**

Changeable During Run — **No**

PID Feedback Signal

Program ⇒ Feedback ⇒ Feedback Settings

This parameter Enables/Disables PID feedback control. When enabled, this parameter determines the source of the motor control feedback.

Settings:

0 — Feedback Value = 0
1 — V/I
2 — RR
3 — RX
4 — RX2 (AI1 Option)
5 — Option V/I (AI2 Option)
6 — PG Feedback 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.

Direct Access Number — **F360**

Parameter Type — **Selection List**

Factory Default — **V/I**

Changeable During Run — **No**

PID Feedback Delay Filter

Program ⇒ Feedback ⇒ Feedback Settings

This parameter determines the delay in the ASD output response to the motor control feedback signal (signal source is selected at F360).

Direct Access Number — **F361**

Parameter Type — **Numerical**

Factory Default — **0.1**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 25.0

PID Feedback Proportional (P) Gain

Program ⇒ Feedback ⇒ Feedback Settings

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

Direct Access Number — **F362**

Parameter Type — **Numerical**

Factory Default — **50.00**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 100.00

PID Feedback Integral (I) Gain

Program ⇒ Feedback ⇒ Feedback Settings

This parameter determines the degree that the Integral function affects the output signal. The smaller the value here, the more pronounced the effect of the integral function on the output signal.

Direct Access Number — **F363**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 100.00

PID Deviation Upper Limit

Program ⇒ Feedback ⇒ Feedback Settings

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

Direct Access Number — **F364**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

PID Deviation Lower Limit

Program ⇒ Feedback ⇒ Feedback Settings

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

Direct Access Number — **F365**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

PID Feedback Differential (D) Gain

Program ⇒ Feedback ⇒ Feedback Settings

This parameter determines the degree that the Differential function affects the output signal. The larger the value entered here, the more pronounced the affect of the differential function for a given feedback signal level.

Direct Access Number — **F366**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.55

Process Upper Limit

Program ⇒ Feedback ⇒ Feedback Settings

Selecting Process PID at parameter F359 allows for this parameter setting to function as the Upper Limit while operating in the PID Control mode.

Direct Access Number — **F367**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Process Lower Limit

Program ⇒ Feedback ⇒ Feedback Settings

Selecting Process PID at parameter F359 allows for this parameter setting to function as the Lower Limit while operating in the PID Control mode.

Direct Access Number — **F368**

Parameter Type — **Numerical**

Factory Default — **Lower-Limit Freq.** (F013)

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

PID Control Delay Time

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to delay the start of PID control at start up. During the wait time set here, the ASD will follow the frequency control input of the process value and the feedback input will be ignored. When this setting times out, the PID setup assumes control.

Direct Access Number — **F369**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 2400

Units — Seconds

PID Output Upper Limit

Program ⇒ Feedback ⇒ Feedback Settings

Selecting Speed PID at parameter F359 allows for this parameter setting to function as the Upper Limit while operating in the PID Control mode.

Direct Access Number — **F370**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

PID Output Lower Limit

Program ⇒ Feedback ⇒ Feedback Settings

Selecting Speed PID at parameter F359 allows for this parameter setting to function as the Lower Limit while operating in the PID Control mode.

Direct Access Number — **F371**

Parameter Type — **Numerical**

Factory Default — **Lower-Limit Freq.** (F013)

Changeable During Run — **Yes**

Minimum — Lower-Limit Freq. (F013)

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Process Increasing Rate

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to limit the rate that the output of the ASD may increase for a given difference in the speed reference and the PID feedback value.

Direct Access Number — **F372**

Parameter Type — **Numerical**

Factory Default — **10.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 600.0

Units — Seconds

Process Decreasing Rate

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to limit the rate that the output of the ASD may decrease for a given difference in the speed reference and the PID feedback value.

Direct Access Number — **F373**

Parameter Type — **Numerical**

Factory Default — **10.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 600.0

Units — Seconds

Frequency Command Detection Range

Program ⇒ Feedback ⇒ Feedback Settings

While operating in the PID mode, this parameter reads the feedback frequency. Once the feedback frequency is within the setting of this parameter (F374) relative to the commanded frequency, a properly configured output terminal is activated.

Available output terminal settings for this parameter include: FC = RR, FC = RX, and FC = VI (see Table 12 on page 257), where FC is the frequency command and RR, RX, and VI are the input terminals of the received feedback.

Direct Access Number — **F374**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Number of PG Input Pulses

Program ⇒ Feedback ⇒ PG Settings

This parameter is used to set the number of pulses output from a shaft-mounted encoder that is used to indicate one revolution of rotation (360°) of the motor or of the motor-driven equipment.

Direct Access Number — **F375**

Parameter Type — **Numerical**

Factory Default — **500**

Changeable During Run — **No**

Minimum — 1

Maximum — 9999

Number of PG Input Phases

Program ⇒ Feedback ⇒ PG Settings

This parameter determines the type of information that is supplied by the phase encoder.

Settings:

1 — Single Phase
2 — Two Phase
3 — Two Phase (Polarity Inversion)

Direct Access Number — **F376**

Parameter Type — **Selection List**

Factory Default — **Two Phase**

Changeable During Run — **No**

PG Disconnection Detection

Program ⇒ Feedback ⇒ PG Settings

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

Note: The PG Vector Feedback Board option is required to use this feature.

Settings:

0 — Disabled
1 — Enabled (with Filter)
3 — Enabled (Detect momentary power fail)

Direct Access Number — **F377**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Number of RP Terminal Input Pulses

Program ⇒ Feedback ⇒ PG Settings

In conjunction with parameter settings F234–F237, this parameter is used to scale the input pulse train speed-control signal when using the optional Expansion IO Card Option 2.

When using the optional terminal board, the frequency command can be input via the pulse train input (RP). The input pulse frequency is calculated to the percent base data which is then converted to the frequency based on settings F234–F237.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

Direct Access Number — **F378**

Parameter Type — **Numerical**

Factory Default — **500**

Changeable During Run — **No**

Minimum — 12

Maximum — 9999

Units — PLS

PID Output Dead Band

Program ⇒ Feedback ⇒ PG Settings

While operating in the PID mode, this parameter establishes an ASD output threshold that must be exceeded in order to activate the configured PID control.

Direct Access Number — **F379**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Virtual Linear Pump Application Operating Mode

Program ⇒ Virtual Linear Pump ⇒ Settings

While operating in the Virtual Linear Pump mode, this parameter sets the system response to the received feedback from the V/I terminal.

Select Direct Acting to produce an increase in the ASD output with a decrease in the feedback signal.

Select Reverse Acting to produce a decrease in the ASD output with an decrease in the feedback signal.

Settings:

0 — Direct Acting (Positive Gradient)
1 — Reverse Acting (Negative Gradient)

Direct Access Number — **F380**

Parameter Type — **Selection List**

Factory Default — **Direct Acting**

Changeable During Run — **No**

Virtual Linear Pump Sleep Timer

Program ⇒ Virtual Linear Pump ⇒ Sleep Timer

During a properly configured Virtual Linear Pump operation, this parameter Enables/Disables the ability of the ASD to terminate the output signal to the motor upon operating for a user-set amount of time within the Virtual Linear Pump Minimum (Threshold) threshold.

See F383 and F480 for additional information on this parameter.

⚠ WARNING

The Sleep Timer function may result in the unexpected Start or Stop of the motor. Signs to this effect are to be posted at the location of the motor/pump.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F382**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Virtual Linear Pump Sleep Delay Timer

Program ⇒ Virtual Linear Pump ⇒ Sleep Timer

During a properly configured Virtual Linear Pump operation, and once enabled at F382, this parameter establishes the time that system operation will be allowed to operate within the Virtual Linear Pump Minimum (Threshold) threshold before the ASD output to the motor is terminated.

See F382 for additional information on this parameter.

Direct Access Number — **F383**

Parameter Type — **Numerical**

Factory Default — **300**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 65535

Units — Seconds

Virtual Linear Pump Start/Stop Mode

Program ⇒ Virtual Linear Pump ⇒ Start and Stop Points

During a properly configured Virtual Linear Pump operation, this parameter Enables/Disables the ability of the system to receive transducer input to manage system starts and stops as it pertains to the process variable.

This parameter is also used to select the ASD response (Stop or Start) upon meeting the criteria of F388 and F389 settings.

On Forward = Run ASD while measured signal is ≤ F388 setting and stop ASD upon reaching F389 setting.

On Reverse = Run ASD while measured signal is ≥ F389 setting and stop ASD upon reaching F388 setting.

Settings:

0 — Off
1 — On (Forward Acting)
2 — On (Reverse Acting)

WARNING

The Auto Start-Stop operating mode may result in the unexpected Start or Stop of the motor. Signs to this effect are to be posted at the location of the motor/pump.

Direct Access Number — **F385**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **Yes**

Virtual Linear Pump Start-Stop Delay Timer

Program ⇒ Virtual Linear Pump ⇒ Start and Stop Points

During a properly configured Virtual Linear Pump operation, this parameter establishes the time that the Start-Stop criteria of F388 and F389 must be maintained to activate the Auto Start-Stop function.

This feature is used to minimize system responses to rapid fluctuations in the feedback signal.

See F385 for additional information on this parameter.

Direct Access Number — **F387**

Parameter Type — **Numerical**

Factory Default — **5.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6553.5

Units — Seconds

Virtual Linear Pump Low Start/Stop Point

Program ⇒ Virtual Linear Pump ⇒ Start and Stop Points

During a properly configured Virtual Linear Pump operation while in the On Forward or On Reverse modes (F385), this parameter establishes the lower level of the Auto Start-Stop threshold.

See F385 for additional information on this parameter.

The unit of measure for this parameter may be one of the following types — the type is selected while running the Virtual Linear Pump Setup Wizard.

- PSI
- GPM
- Inches of Water Column
- Feet of Water Column
- CFM
- °C
- °F
- Custom

(Custom selection allows for three character spaces to be populated from the 26 alphabet and 13 special characters)

Direct Access Number — **F388**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — F403 Setting

Maximum — F393 Setting

Units — Selectable at Wizard

Virtual Linear Pump High Start/Stop Point

Virtual Linear Pump ⇒ Start and Stop Points

During a properly configured Virtual Linear Pump operation while in the On Forward or On Reverse modes (F385), this parameter establishes the upper level of the Auto Start-Stop threshold.

See F385 for additional information on this parameter.

The unit of measure for this parameter may be one of the following types — the type is selected while running the Virtual Linear Pump Setup Wizard.

- PSI
- GPM
- Inches of Water Column
- Feet of Water Column
- CFM
- °C
- °F
- *Custom

*Note: *Custom selection allows for three character spaces to be populated from the 26 alphabet and 13 special characters.*

Direct Access Number — **F389**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — F403 Setting

Maximum — F393 Setting

Units — Selectable at Wizard

Virtual Linear Pump Mode Switch

Program ⇒ Virtual Linear Pump ⇒ Settings

This parameter is enabled for use by completing the Virtual Linear Pump Setup Wizard.

During a properly configured Virtual Linear Pump operation, this parameter establishes if feedback is used or not.

Select the command source or the feedback source for operating in the Direct or Process modes, respectively, at F396. The default selection for each may be used.

Note: If F396 is set to use V/I as the command source, DO NOT set this parameter to Process Hold. Doing so will result in an error message (V/I cannot be used for both functions).

Note: The selected setting for this parameter will be retained when the Virtual Linear Pump function is turned on or off using a discrete input terminal set to Virtual Linear Pump Enable/Disable.

Settings:

0 — Disabled
1 — Direct Mode (No Feedback Used)
2 — Process Hold (V/I Feedback Used)
255 — Setup

Direct Access Number — **F390**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

(Virtual Linear Pump) Application Type

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the process variable measurement type.

Settings:

0 — Pressure
1 — Flow
2 — Level

Direct Access Number — **F391**

Parameter Type — **Selection List**

Factory Default — **Pressure**

Changeable During Run — **No**

(Virtual Linear Pump) Transducer Output Range

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the transducer output signal type and range for Virtual Linear Pump operation.

Note: This parameter is scaled at F201 – F204 for either selection and requires no user intervention.

Settings:

0 — 0 – 20 mA
1 — 4 – 20 mA
2 — 0 – 10 V
3 — 0 – 5 V

Direct Access Number — **F392**

Parameter Type — **Selection List**

Factory Default — **0 – 20 mA**

Changeable During Run — **No**

(Virtual Linear Pump) Transducer Maximum Reading

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the maximum level of the transducer range for Virtual Linear Pump operation.

Direct Access Number — **F393**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -3276.7

Maximum — 3276.7

Virtual Linear Pump Minimum (Threshold)

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the minimum setpoint within the Virtual Linear Pump operating domain.

Direct Access Number — **F394**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 10

Maximum — Virtual Linear Pump Maximum Setting (F395)

Virtual Linear Pump Maximum (Threshold)

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the maximum setpoint within the Virtual Linear Pump operating domain.

Direct Access Number — **F395**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — Virtual Linear Pump Minimum Setting (F394)

Maximum — 165

Virtual Linear Pump Command Source

Program ⇒ Virtual Linear Pump ⇒ Settings

During Direct mode or the Process Hold mode operation, this parameter sets the Virtual Linear Pump command source.

Settings:

0 — EOI
1 — *V/I
2 — RR
3 — Communication Board

*Note: *If Process Hold is selected at F390, selecting V/I here will result in an error message.*

Direct Access Number — **F396**

Parameter Type — **Selection List**

Factory Default — **EOI**

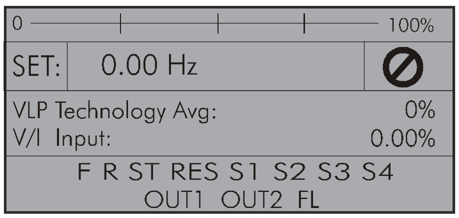
Changeable During Run — **No**

Virtual Linear Pump Command Value

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation while operating in the Process Hold mode and using the EOI for system control, this parameter establishes the Virtual Linear Pump level.

This parameter setting is effective *ONLY* while operating in the Process Hold mode and while receiving a command via the EOI. The end value of this parameter setting appears in the Frequency Command screen as shown below.



Direct Access Number — **F397**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — F403 Setting

Maximum — F393 Setting

Virtual Linear Pump Low Frequency Limit

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the Virtual Linear Pump Low Frequency Limit.

Direct Access Number — **F398**

Parameter Type — **Numerical**

Factory Default — **15.00**

Changeable During Run — **Yes**

Minimum — 1.00

Maximum — 60.00

Units — Hz

Autotune 1

Program ⇒ Motor ⇒ Vector Motor Model

This parameter sets the Autotune command status.

Selecting Reset Motor Defaults for this parameter sets parameters F410, F411, F412, and F413 to the factory default settings.

If selecting Autotune on Run Command, Autotune Initiated by Input Terminal, or Autotune of Detail Parameters for this parameter set the Base Frequency, Base Frequency Voltage, and the Motor Rated Revolutions to the nameplated values of the motor to achieve the best possible Autotune precision.

Settings:

0 — Autotune Disabled
1 — Reset Motor Defaults
2 — Enable Autotune on Run Command
3 — Autotuning by Input Terminal Signal (see Table 9 on page 252)
4 — Motor Constant Auto Calculation

Direct Access Number — **F400**

Parameter Type — **Selection List**

Factory Default — **Autotune Disabled**

Changeable During Run — **No**

Slip Frequency Gain

Program ⇒ Motor ⇒ Vector Motor Model

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.

Direct Access Number — **F401**

Parameter Type — **Numerical**

Factory Default — **70**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 150

Units — %

Autotune 2

Program ⇒ Motor ⇒ Vector Motor Model

This parameter introduces a thermal element into the autotuning equation and is used to automatically adjust the Autotune parameter values as a function of increases in the temperature of the motor.

Settings:

0 — Off
1 — Self-Cooled Motor Tuning
2 — Forced Air Cooled Motor Tuning

Direct Access Number — **F402**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **No**

(Virtual Linear Pump) Transducer Minimum Reading

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the minimum level of the transducer range for Virtual Linear Pump operation.

Direct Access Number — **F403**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -3276.7

Maximum — 3276.7

Time-Based Alternation Emergency Timer

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, in the event that the Lead ASD trips or loses the transducer input signal, this parameter sets a counter time that will count down to zero.

Upon reaching zero, two actions will occur:

1) The Lag 1 ASD will accelerate to the setting of F395 at the Accel Time 1 rate — F009.

If the Lag1 ASD is tripped, another timer count begins and upon reaching zero, the next available ASD will accelerate to the setting of F395.

2) The system will check the load requirement of the Lag1 ASD (or the next available ASD).

If the Lag 1 ASD load is zero, the ASD will stop.

If a non-zero load is detected, the Lag1 ASD will continue to run in accordance with the user-set Virtual Linear Pump settings.

Time-Based Alternation

Time-Based Alternation (TBA) is used to provide a more evenly distributed run-time of the system pumps of a multi-pump system. This is accomplished by varying which system pump plays the Lead role.

Permanently assigning one pump as the Lead pump invariably results in the Lead pump being over worked and requiring more maintenance. The TBA algorithm allows the user to set the time that each pump within the system is to be assigned the Lead pump function and which are assigned the function of being the Lag pump(s).

Upon completion of the user-set time, the system changes the Lead pump assignment to the next pump number (F434).

The Virtual Linear Pump feature allows the Lag pumps to assist the Lead pump when required as the load exceeds the ability of the lead pump.

Direct Access Number — **F404**

Parameter Type — **Numerical**

Factory Default — **60**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 65535

Units — Minutes

Motor Rated Capacity (Nameplate)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the (nameplated) rated capacity of the motor being used.

Direct Access Number — **F405**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — kW

Motor Rated Current (Nameplate)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the (nameplated) current rating of the motor being used.

Direct Access Number — **F406**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 0.1

Maximum — 2000.0

Units — Amps

Motor Rated RPM (Nameplate)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to input the (nameplated) rated speed of the motor.

Direct Access Number — **F407**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 100

Maximum — 60000

Units — RPM

Base Frequency Voltage 1

Program ⇒ Vector ⇒ Vector Motor Model

The Motor 1 Base Frequency Voltage 1 is the Motor 1 output voltage at the Base Frequency (F014). 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 Correction setting (F307).

Direct Access Number — **F409**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 50.0

Maximum — (ASD-Dependent)

Units — Volts

Motor Constant 1 (Torque Boost)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter sets the primary resistance of the motor. Increasing this value can prevent a drop in the torque of the motor at low speeds. Increasing this value excessively can result in nuisance overload tripping.

Direct Access Number — **F410**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

Units — %

Motor Constant 2 (No-Load Current)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the current level required to excite the motor. Specifying a value that is too high for this parameter may result in hunting (erratic motor operation).

Direct Access Number — **F411**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 10

Maximum — 90

Units — %

Motor Constant 3 (Leak Inductance)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the leakage inductance of the motor.

A larger setting here results in higher output torque at high speeds.

Direct Access Number — **F412**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 0

Maximum — 250

Units — %

Motor Constant 4 (Rated Slip)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the secondary resistance of the motor.

An increase in this parameter setting results in an increase of compensation for motor slip.

Direct Access Number — **F413**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 0.10

Minimum — 25.00

Units — %

Exciting Strengthening Coefficient

Program ⇒ Special ⇒ Special Parameters

This parameter is used to increase the magnetic flux of the motor at low-speed. This feature is useful when increased torque at low speeds is required.

Direct Access Number — **F415**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **No**

Minimum — 100

Maximum — 130

Units — %

Stall Prevention Factor 1

Program ⇒ Protection ⇒ Stall

This parameter is to be adjusted in the event that the motor stalls when operated above the base frequency.

If a momentary heavy load occurs the motor may stall before the load current reaches the stall prevention level setting of F601.

A drop in the supply voltage may cause fluctuations of the load current or may cause motor vibration. A gradual adjustment of this parameter may alleviate this condition.

Start with a setting of 85 at these parameters and gradually adjust them from there one at a time until the desired results are produced.

Adjustments to this parameter may increase the load current of the motor and subsequently warrant an adjustment at the Motor Overload Protection Level setting.

Direct Access Number — **F416**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **No**

Minimum — 10

Maximum — 250

Time-Based Alternation

Direct Access Number — **F417**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **Yes**

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

This parameter is enabled for use by completing the Virtual Linear Pump Setup Wizard.

Time-Based Alternation operation is enabled by setting this parameter (F417) to an operating mode and assigning a discrete input terminal to the TBA HOA Switch function and activating the terminal.

During Time-Based Alternation operation, and while running in the Virtual Linear Pump mode, this parameter Enables/Disables the ability of the system to receive transducer input to manage system starts and stops as it pertains to the process variable.

This parameter is also used to select the Lead ASD response (Stop or Start) upon meeting the criteria of F388 and F389 settings.

Forward Auto = Run the ASD while the measured signal is ≤ F388 setting, and stop the ASD upon reaching the F389 setting.

Reverse Auto = Run the ASD while the measured signal is ≥ F389 setting, and stop the ASD upon reaching the F388 setting.

Settings:

0 — Off
1 — Forward Auto
2 — Reverse Auto

⚠ WARNING

The Time-Based Alternation operating mode may result in the unexpected Start or Stop of the motor. Signs to this effect are to be posted at the location of the motor/pump.

Time-Based Alternation Period

Direct Access Number — **F418**

Parameter Type — **Numerical**

Factory Default — **1 Minute**

Changeable During Run — **No**

Minimum — 1 Minute

Maximum — 41 Days 15 Hours

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, this parameter sets the time that the Lead ASD and Lag ASD assignments are valid until changed as a function of the Time-Based Alternation settings.

(Time-Based Alternation) Pump Number

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, this parameter is used to assign an identifying number to an ASD/pump combination.

The identifying number is used to assign the virtual priority Lead and Lag assignments.

The maximum number is limited to the user-assigned number at parameter F437.

Note: This parameter is not associated with nor affected by the setting of F802.

Direct Access Number — **F434**

Parameter Type — **Selection List**

Factory Default — **1**

Changeable During Run — **No**

Minimum — 1

Maximum — F437 Setting

Total Drives On Time-Based Alternation

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

This parameter lists the number of ASDs registered within the system.

This parameter setting is used as the Maximum setting for parameter F434.

Direct Access Number — **F437**

Parameter Type — **Numerical**

Factory Default — **2**

Changeable During Run — **Yes**

Minimum — 2

Maximum — 32

(Time-Based Alternation) Process Hold Mode Response Time

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, while running in the Process Hold mode, this parameter sets the time that the system may operate within the maximum or minimum Virtual Linear Pump zones before turning the ASD on or off, respectively.

Direct Access Number — **F438**

Parameter Type — **Numerical**

Factory Default — **7.5**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — 6553.5

Units — Seconds

(Time-Based Alternation) Direct Mode Response Time

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, while running in the Direct mode, this parameter sets the time that the system may operate within the maximum or minimum Virtual Linear Pump zones before turning the ASD on or off, respectively.

Direct Access Number — **F439**

Parameter Type — **Numerical**

Factory Default — **1000**

Changeable During Run — **No**

Minimum — 0

Maximum — 65535

Units — Seconds

Power Running Torque Limit 1

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter determines the source of the control signal for the positive torque limit setting.

If F441 is selected, the value set at F441 is used as the Power Running Torque Limit 1 input.

Settings:

1 — V/I
2 — RR
3 — RX
4 — F441 (Setting)

Direct Access Number — **F440**

Parameter Type — **Selection List**

Factory Default —F441 (Setting)

Changeable During Run — **Yes**

Power Running Torque Limit 1 Level

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter provides a value for the Power Running Torque Limit 1 setting if F441 is selected at parameter F440.

This value provides the positive torque upper limit for the 1 motor.

Direct Access Number — **F441**

Parameter Type — **Numerical**

Factory Default — **250.00 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00 (Disabled)

Units — %

Regenerative Braking Torque Limit 1

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter determines the source of the Regenerative Torque Limit control signal.

If F443 is selected, the value set at F443 is used as the Regenerative Torque Limit setting.

Settings:

1 — V/I
2 — RR
3 — RX
4 — F443 (Setting)

Direct Access Number — **F442**

Parameter Type — **Selection List**

Factory Default — F443 **Setting**

Changeable During Run — **Yes**

Regenerative Braking Torque Limit 1 Level

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter provides a value to be used as the Regeneration Torque Limit 1 if F443 is selected at parameter F442.

Set this parameter to 250% to disable this function.

Direct Access Number — **F443**

Parameter Type — **Numerical**

Factory Default — **250.0 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

Virtual Linear Pump Low Suction/No-Flow Cut Off Fault Disposition

Program ⇒ Virtual Linear Pump ⇒ Low Suction/No-Flow Cut Off

This parameter is used in conjunction with the setting of parameter F483.

If On (Physical Switch) or On (Electronic Switch) is selected at parameter F483, then this parameter selection sets the disposition of the system in the event of a Low Suction/No-Flow Cut Off condition that exists for the duration of the parameter F484 setting.

If Off is selected at parameter F483, then this parameter selection is ignored.

Settings:
0 — Trip
1 — Alarm
2 — Alarm (auto-restart)

Direct Access Number — **F450**

Parameter Type — **Selection List**

Factory Default — **Trip**

Changeable During Run — **Yes**

Constant Output Zone Torque Limit

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter is used to select if either Constant Torque is applied to the load as selected (selection 1) or if the ASD is allowed to use an over-voltage condition to support a torque requirement at the load that exceeds that of the Constant Torque operation setting during an active over-speed (selection 0).

Settings:
0 — Constant Output Limit
1 — Constant Torque Limit

Direct Access Number — **F454**

Parameter Type — **Selection List**

Factory Default — **Constant Output Limit**

Changeable During Run — **No**

(Time-Based Alternation) Direct Mode Emergency Setpoint

Program ⇒ Virtual Linear Pump ⇒ Time-Based Alternation

During Time-Based Alternation operation, this parameter sets the Virtual Linear Pump setpoint while running in the Direct mode.

Direct Access Number — **F456**

Parameter Type — **Numerical**

Factory Default — F394 **Setting**

Changeable During Run — **Yes**

Minimum — F394 Setting

Maximum — F395 Setting

Units — %

Current Control Proportional Gain

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the sensitivity of the ASD when monitoring the output current to control speed.

The larger the value entered here, the more sensitive the ASD is to changes in the received feedback.

Direct Access Number — **F458**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **No**

Minimum — 0

Maximum — 1000

Speed Loop Proportional Gain

Program ⇒ Feedback ⇒ PG Settings

During closed-loop operation, this parameter sets the response sensitivity of the ASD when monitoring the output speed for control.

The larger the value entered here, the larger the change in the output speed for a given received feedback signal.

Direct Access Number — **F460**

Parameter Type — **Numerical**

Factory Default — **12**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 9999

Speed Loop Stabilization Coefficient

Program ⇒ Feedback ⇒ PG Settings

During closed-loop operation, this parameter sets the response sensitivity of the ASD when monitoring the output speed for control.

The larger the value entered here, the quicker the response to changes in the received feedback.

Direct Access Number — **F461**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 9999

Load Moment of Inertia 1

Program ⇒ Feedback ⇒ PG Settings

This parameter is used for calculating accel/decel torque when compensating for load inertia while operating in the Drooping Control mode.

Direct Access Number — **F462**

Parameter Type — **Numerical**

Factory Default — **35**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Motor Oscillation Control

Program ⇒ Feedback ⇒ PG Settings

While operating in the Torque Control Mode, this parameter setting is used to reduce unstable operation at light loads.

If unstable at light loads, set to 1. Increase to 2 or 3 if more stability is required.

Settings:
- 0 — Disabled
- 1 — Enabled (Low Gain)
- 2 — Enabled (Middle Gain)
- 3 — Enabled (High Gain)

Direct Access Number — **F467**

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **No**

Stall Prevention Control Switching

Direct Access Number — **F468**

Parameter Type — **Selection List**

Factory Default — **Stall Prevention Control 1**

Changeable During Run — **No**

Program ⇒ Feedback ⇒ PG Settings

While running or during deceleration, the Over-Voltage Stall function may be controlled by either of two profile settings as selected at this parameter.

The first profile (Stall Prevention Control 1) increases the output frequency at a maximum of 5 Hz intervals (quick response) in response to the over-voltage condition.

The second profile (Stall Prevention Control 2) increases the output frequency at an interval of 0.5 Hz maximum in response to the over-voltage condition.

Settings:
- 0 — Stall Prevention Control 1
- 1 — Stall Prevention Control 2

Over-Voltage Limit (Time) Constant

Direct Access Number — **F469**

Parameter Type — Numerical

Factory Default — 0

Changeable During Run — No

Minimum — 0

Maximum — 1000

Program ⇒ Protection ⇒ Stall

This parameter is used in conjunction with parameters F305 (Over-Voltage Limit Operation) and F626 (Over-Voltage Limit Operation Level) to set a running window of time. The window of time is used to create an average value to be used in calculating the DC bus voltage upper threshold value that, once exceeded, will cause an Over-Voltage Stall.

While running or during deceleration, the Over-Voltage Stall function increases the output frequency of the ASD for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage threshold level setting of parameter F626 is exceeded for over 4 mS, an Over-Voltage Trip will be incurred.

Select zero (0) for automatic value selection for this parameter.

Note: This parameter setting may increase deceleration times.

Note: Over-voltage alarms will display OP to convey Over-Potential.

V/I Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the **V/I** input terminals.

Note: See note on *pg. 39* *for additional information on the V/I terminal.*

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.

Direct Access Number — **F470**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

V/I Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the **V/I** input terminals.

Note: See note on *pg. 39* *for additional information on the V/I terminal.*

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F471**

Parameter Type — **Numerical**

Factory Default — **124**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RR Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the RR input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.

Direct Access Number — **F472**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RR Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the RR input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F473**

Parameter Type — **Numerical**

Factory Default — **154**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RX Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the RX input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.

Direct Access Number — **F474**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RX Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the RX input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F475**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RX2 Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the RX2 (AI1 Option) input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide a zero output from the ASD.

Direct Access Number — **F476**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

RX2 Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the RX2 (AI1 Option) input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F477**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Option V/I Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the Optional AI2 input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F478**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Option V/I Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the Optional AI2 input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — **F479**

Parameter Type — **Numerical**

Factory Default — **128**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Virtual Linear Pump External Device Delay Timer

Program ⇒ Virtual Linear Pump ⇒ Run External Devices

Direct Access Number — **F480**

Parameter Type — **Numerical**

Factory Default — **5.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6553.5

Units — Seconds

During a properly configured Virtual Linear Pump operation, this parameter establishes the time that the Virtual Linear Pump operating level must remain within the Virtual Linear Pump Maximum (Threshold) or the Virtual Linear Pump Minimum (Threshold) to activate/deactivate the Sleep Timer (F382) or an auxiliary pump.

See Figures 31 and 33 for additional information on the Virtual Linear Pump Maximum (Threshold) and the Virtual Linear Pump Minimum (Threshold).

Note: The number of pumps used may be increased by using the optional expansion board (Primary pump plus auxiliary pumps).

Increasing Load

If the Virtual Linear Pump operating level of the Lead Pump is within the Virtual Linear Pump Maximum (Threshold), and the External Device Delay Timer times out, OUT1 will change states and activate an auxiliary pump (Lag1).

Should the Virtual Linear Pump operating level return to the Virtual Linear Pump Maximum (Threshold) threshold for a duration in excess of the External Device Delay Timer, OUT2 will change states and activate the second auxiliary pump (Lag2).

Decreasing Load

If operating in the Virtual Linear Pump Minimum (Threshold), and the External Device Delay Timer times out while OUT2 is activated, OUT2 will change states and deactivate the second auxiliary pump (Lag2).

Should the system return to the Virtual Linear Pump Minimum (Threshold) for a duration in excess of the External Device Delay Timer, OUT1 will change states and deactivate the auxiliary pump (Lag1).

Note: Set the Sleep Timer Delay (F383) to two (2) times the Virtual Linear Pump External Device Delay Timer (if using the Sleep Timer function) as not to place the primary ASD in the sleep mode with Lag1 and/or Lag2 running.

Set OUT1 and OUT2 to External Device 1 and 2, respectively, as required.

Auxiliary Pump Activation Sequence				
PUMP ID	**IF @**	**AND**	**THEN**	**OR**
Lead Pump	Max Zone	Counter Time = 0	Activate OUT1	
Lag1 Pump	Max Zone	Counter Time = 0	Activate OUT2	
Lag2 Pump	Max Zone	Counter Time = 0	Run Continuous	
Lag2 Pump	Min Zone	Counter Time = 0	Deactivate OUT2	
Lag1 Pump	Min Zone	Counter Time = 0	Deactivate OUT1	
Lead Pump	Min Zone	Counter Time = 0	—	Sleep if enabled

Virtual Linear Pump External Device Low Band Threshold

Program ⇒ Virtual Linear Pump ⇒ Run External Devices

During a properly configured Virtual Linear Pump operation, this parameter establishes the upper limit of the Virtual Linear Pump Minimum (Threshold) threshold.

See F480 for additional information on this parameter.

Direct Access Number — **F481**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 30

Virtual Linear Pump External Device High Band Threshold

Program ⇒ Virtual Linear Pump ⇒ Run External Devices

This parameter sets the lower limit of the Virtual Linear Pump Maximum (Threshold) threshold.

See F480 for additional information on this parameter.

Direct Access Number — **F482**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 30

Virtual Linear Pump Low Suction/No-Flow Cut Off Mode

Program ⇒ Virtual Linear Pump ⇒ Low Suction/No Flow Cut Off

This parameter is used to halt the ASD in the event of the loss of feed water to the pump or if there is a closed output valve at the pump output.

A low-pressure suction switch may be used to detect the loss of feed water by opening or closing a circuit in the event of feed water loss. The switch state change would result in the activation of a discrete input terminal (set to Low Suction/No Flow Protection) resulting in an AbFL trip.

Either a closed output valve or a suction pressure loss will result in the ASD running at the Upper-Limit Frequency indefinitely.

To monitor the Upper-Limit Frequency run time for either condition, set F484 for the time that the ASD may output the Upper-Limit Frequency continuously before the system initiates an AbFL trip.

Set this parameter to On (Physical Switch) if using a discrete input terminal for detection.

Set this parameter to On (Electronic Switch) if using the Upper Limit run-time for detection — set the run-time limit at F484.

Note: The On (Electronic Switch) setting allows for the availability of the Trip (0) and Alarm (1) selections at F450 ONLY.

Settings:

0 — Off
1 — On (Physical Switch)
2 — On (Electronic Switch)

Direct Access Number — **F483**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **Yes**

Virtual Linear Pump Low Suction/No Flow Cut Off Delay Timer

Program ⇒ Virtual Linear Pump ⇒ Low Suction/No Flow Cut Off

This parameter has three functions.

1. It is used to set the time that the ASD will be allowed to run at the Upper-Limit Frequency continuously before the system is turned off.

This condition is used as an indication of loss of feed water or a closed output valve. See F483 for additional information on this function.

2. It is used to set the time that a Low Suction/No Flow condition is allowed to continue before a shut down.
3. It is used to set the time that must lapse before a system restart is attempted after a system shut down due to a Low Suction/No Flow condition. See F450 for additional information on this function.

Direct Access Number — **F484**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 255

Units — Seconds

Virtual Linear Pump Sealing Water Mode

Program ⇒ Virtual Linear Pump ⇒ Sealing Water

This parameter Enables/Disables seal water detection.

On larger or older pumps, external sealing water is required at start up. The ASD will not start until adequately supplied with sealing water.

An external sealing water pump is required to supply sealing water and is enabled via an ASD output contactor set to Sealing Water.

Normal ASD operations are allowed once an adequate water supply is detected at the seal, as detected by a pump-mounted reed switch that is connected to a discrete input terminal of the ASD.

Set the discrete input terminal to Sealing Water.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F485**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Max Output Voltage Modulation Rate

Direct Access Number — **F495**

Parameter Type — Selection List

Factory Default — Standard

Changeable During Run — No

Program ⇒ Feedback ⇒ PG Settings

This parameter is used to adjust the duty cycle of the PWM that is being applied to the motor. Changes to this parameter are effective in reducing the output current during an undervoltage condition (which may result in an increased output current).

Settings:

0 — Standard
1 — 100%
2 — 102.50%
3 — 105%

Permanent Magnet (PM) Motor Constant 1

Direct Access Number — **F498**

Parameter Type — **Numerical**

Factory Default — **10.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — %

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for information on this parameter.

Permanent Magnet (PM) Motor Constant 2

Direct Access Number — **F499**

Parameter Type — **Numerical**

Factory Default — **10.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — %

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for more information on this parameter.

Acceleration Time 2

Direct Access Number — **F500**

Parameter Type — **Numerical**

Factory Default — **5.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000.0

Units — Seconds

Program ⇒ Special ⇒ ACC/DEC 1 – 4 Settings

This parameter specifies the 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 F502.

This setting may be adjusted to stabilize unstable Virtual Linear Pump operation.

This setting is also used to determine the acceleration rate of the UP/DOWN Frequency Functions.

Note: An acceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads. Automatic Accel/Decel, Stall, and Ridethrough settings may lengthen the acceleration times.

Deceleration Time 2

Program ⇒ Fundamental ⇒ ACC/DEC 1 – 4 Settings

This parameter specifies the time in seconds for the output of the ASD to go from the Maximum Frequency to 0.0 Hz for the 2 Deceleration profile. The Accel/Decel pattern may be set using F502.

This setting may be adjusted to stabilize unstable Virtual Linear Pump operation.

This setting is also used to determine the deceleration rate of the UP/DOWN Frequency Functions.

Note: A deceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads. Automatic Accel/Decel, Stall, and Ridethrough settings may lengthen the deceleration times.

Direct Access Number — **F501**

Parameter Type — **Numerical**

Factory Default — **5.0**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6000.0

Units — Seconds

Acceleration/Deceleration Pattern 1

Program ⇒ Special ⇒ ACC/DEC 1 – 4 Settings

Direct Access Number — **F502**

Parameter Type — **Selection List**

Factory Default — **Linear**

Changeable During Run — **Yes**

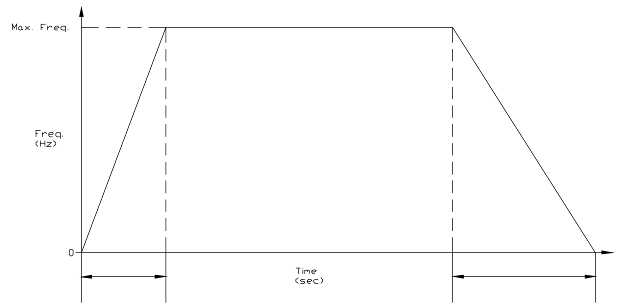
This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the 1 Accel/Decel parameters (see F009 and F010).

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

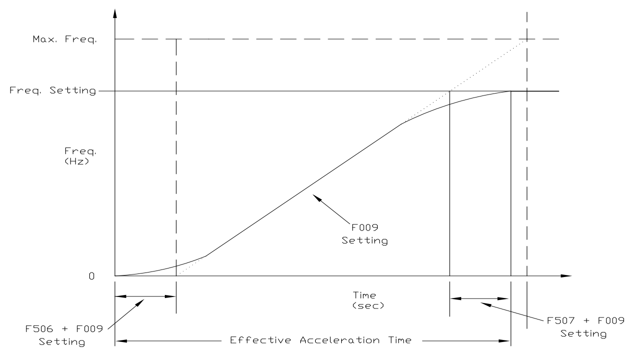
The figures below provide a profile of the available accel/decel patterns.

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



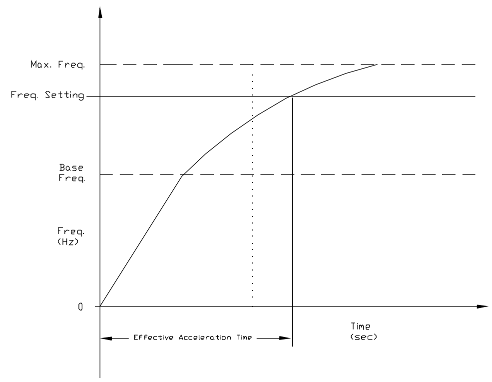
Linear Acceleration/Deceleration

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



S-Pattern Acceleration/Deceleration 1

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



S-Pattern Acceleration/Deceleration 2

Acceleration/Deceleration Pattern 2

Program ⇒ Special ⇒ ACC/DEC 1 – 4 Settings

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

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

Direct Access Number — **F503**

Parameter Type — **Selection List**

Factory Default — **Linear**

Changeable During Run — **Yes**

Acceleration/Deceleration Pattern 1 – 4

Program ⇒ Special ⇒ ACC/DEC Special

Two Accel/Decel profiles may be set up and run individually.

Accel/Decel Time 1 or 2 may be selected using this parameter setting. The system may also be configured to switch between the number 1 and the number 2 profiles under user-set conditions.

Switching may be accomplished manually via a properly configured discrete input terminal or automatically via a threshold frequency setting.

This parameter is used to manually select one of the configured accel/decel profiles to be used.

Settings:

1 — Acc/Dec 1
2 — Acc/Dec 2

Each Accel/Decel selection is comprised of an Acceleration Time, Deceleration Time, and a Pattern selection.

Accel/Decel 1 includes a Switching Frequency setting (F505). The Switching Frequency is used as a threshold frequency that, once reached, signals the ASD to switch to the other profile.

Acc/Dec 1 is set up using parameters F009 (Acc Time), F010 (Dec Time), F502 (Pattern), and F505 (Switching Frequency).

Acc/Dec 2 is set up using parameters F500 (Acc Time), F501 (Dec Time), and F503 (Pattern).

To switch using a discrete input terminal, assign the function A/D 1/2 to an unused discrete input terminal. Activating or deactivating the A/D 1/2 terminal toggles to and from the Accel/Decel profiles 1 and 2 and will override the setting of this parameter.

Figure 38 shows the setup requirements and the resulting output frequency response when using Switching Frequency settings to control the Acc/Dec response of the ASD output.

Note: If operating from the Local mode, press ESC from the Frequency Command screen to access this parameter.

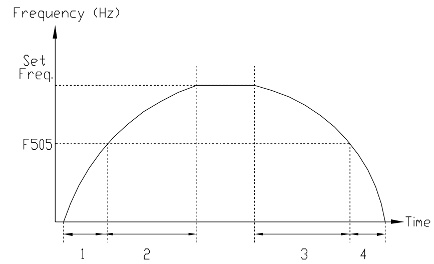
Direct Access Number — **F504**

Parameter Type — **Selection List**

Factory Default — **ACC/DEC 1**

Changeable During Run — **Yes**

Figure 38. Using Acc/Dec Switching.



1 — Accel time 1 (F009 setting)
2 — Accel time 2 (F500 setting)
3 — Decel time 2 (F501 setting)
4 — Decel time 1 (F010 setting)

F505 — Frequency threshold setting at which the 1-to-2 and the 3-to-4 switch during the accel/decel profile.

Acceleration/Deceleration Switching Frequency 1

Program ⇒ Special ⇒ ACC/DEC Special

This parameter sets the frequency at which the acceleration control is switched from the Accel 1 profile to the Accel 2 profile during a multiple-acceleration profile configuration.

Direct Access Number — **F505**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

IP Address Setting Method

Program ⇒ Communications ⇒ Ethernet Settings

This parameter is used to select the method used to set the IP address for a network device (ASD).

Selecting Manual at this parameter will require that parameters F577 – F580 and parameters F582 – F584 be used to manually create the IP address and Subnet Mask Data, respectively, for the device.

Selecting BOOTP or DHCP results in the IP address being supplied by the server. See F577 for additional information on setting the IP address.

Settings:

0 — Manual
1 — BOOTP
2 — DHCP

Direct Access Number — **F576**

Parameter Type — **Selection List**

Factory Default — **Manual**

Changeable During Run — **Yes**

IP Card Data 1

Program ⇒ Communications ⇒ Ethernet Settings

Selecting Manual at parameter F576 enables parameters F577 – F580 to be used to create an IP address for the connected device.

This parameter is used to configure the IP Data Card 1 section of the IP address of the device.

IP Card Data 1	IP Card Data 2	IP Card Data 3	IP Card Data 4

Direct Access Number — **F577**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

IP Card Data 2

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F577.

This parameter is used to configure the IP Data Card 2 section of the IP address of the device.

See F577 for additional information on this parameter.

Direct Access Number — **F578**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

IP Card Data 3

Direct Access Number — **F579**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F577.

This parameter is used to configure the IP Data Card 3 section of the IP address of the device.

See F577 for additional information on this parameter.

IP Card Data 4

Direct Access Number — **F580**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F577.

This parameter is used to configure the IP Data Card 4 section of the IP address of the device.

See F577 for additional information on this parameter.

Subnet Mask Data 1

Direct Access Number — **F581**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter is used to configure the Subnet Mask Data 1 section of the subnet mask for the device.

Selecting Manual at parameter F576 will require that parameters F577 – F580 and parameters F582 – F584 be used to manually create the IP address and Subnet Mask Data, respectively, for the device.

Subnet Mask Data 1	Subnet Mask Data 2	Subnet Mask Data 3	Subnet Mask Data 4

Subnet Mask Data 2

Direct Access Number — **F582**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F581.

This parameter is used to configure the Subnet Data Mask 2 section of the subnet mask for the device.

See F581 for additional information on this parameter.

Subnet Mask Data 3

Direct Access Number — **F583**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F581.

This parameter is used to configure the Subnet Data Mask 3 section of the subnet mask for the device.

See F581 for additional information on this parameter.

Subnet Mask Data 4

Direct Access Number — **F584**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F581.

This parameter is used to configure the Subnet Data Mask 4 section of the subnet mask for the device.

See F581 for additional information on this parameter.

IP Gate 1 Data 1

Direct Access Number — **F585**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

If using the option board IPE001Z, this parameter is used in conjunction with parameters F586 – F588 to configure a network gateway address.

IP Gate 1 Data 1	IP Gate 1 Data 2	IP Gate 1 Data 3	IP Gate 1 Data 4

See the IPE001Z Instruction Manual (P/N E6581580) for additional information on this parameter.

IP Gate 1 Data 2

Direct Access Number — **F586**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

See F585 for information on this parameter.

IP Gate 1 Data 3

Direct Access Number — **F587**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

See F585 for information on this parameter.

IP Gate 1 Data 4

Direct Access Number — **F588**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

Program ⇒ Communications ⇒ Ethernet Settings

See F585 for information on this parameter.

IP Master Data 1

Program ⇒ Communications ⇒ Ethernet Settings

If using the option board IPE001Z, this parameter is used in conjunction with parameters F589 – F592 to configure the network.

Parameters F589 – F592 identify locations that may be used by the Master ASD in managing transfers to and from the Slave ASD in a Master-Slave ASD network relationship.

IP Master Data 1	IP Master Data 2	IP Master Data 3	IP Master Data 4

Direct Access Number — **F589**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

IP Master Data 2

Program ⇒ Communications ⇒ Ethernet Settings

See F589 for information on this parameter.

Direct Access Number — **F590**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

IP Master Data 3

Program ⇒ Communications ⇒ Ethernet Settings

See F589 for information on this parameter.

Direct Access Number — **F591**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

IP Master Data 4

Program ⇒ Communications ⇒ Ethernet Settings

See F589 for information on this parameter.

Direct Access Number — **F592**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

I/O Scan Permission

Program ⇒ Communications ⇒ Ethernet Settings

This parameter Enables/Disables the ability of the system to read the terminal settings of the Terminal Board (i.e., F, R, OUT1, FP, etc.).

Settings:

0 — Prohibit
1 — Permit

Direct Access Number — **F593**

Parameter Type — **Selection List**

Factory Default — **Prohibit**

Changeable During Run — **Yes**

Communication Time-Out (Modbus)

Program ⇒ Communications ⇒ Ethernet Settings

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.

Direct Access Number — **F594**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 60.0

Motor Overload Protection Level 1

Program ⇒ Fundamental ⇒ Motor Set 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 a percentage of the FLA of the motor.

The unit of measurement for this parameter may be set to A/V (Amps) or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (use F701 to change the display unit).

Motor Overload Protection Level 1 settings will be displayed in Amps if the EOI display units are set to A/V rather than %.

Direct Access Number — **F600**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 10

Maximum — 100

Units — %

Stall Prevention Level

Program ⇒ Protection ⇒ Stall

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: The Motor Overload Protection parameter must be enabled at F017 *to use this feature.*

Direct Access Number — **F601**

Parameter Type — **Numerical**

Factory Default — **150**

Changeable During Run — **Yes**

Minimum — 10

Maximum — 165

Units — %

Retain Trip Record at Power Down

Program ⇒ Protection ⇒ Trip Settings

Direct Access Number — **F602**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

This parameter Enables/Disables the Trip Record Retention 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 (Program ⇒ Utilities ⇒) Trip History screen or the Monitor screen.

When disabled, the trip information will be cleared when the system powers down.

Settings:

0 — Disabled
1 — Enabled

Emergency Off Mode

Program ⇒ Protection ⇒ Emergency Off Settings

Direct Access Number — **F603**

Parameter Type — **Selection List**

Factory Default — **Coast Stop**

Changeable During Run — **No**

This parameter determines the method used to stop the motor in the event that an Emergency Off command is received and the system is configured to use this feature.

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) at F132.

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

Settings:

0 — Coast Stop
1 — Deceleration Stop
2 — DC Injection Braking Stop

Emergency DC Braking Control Time

Program ⇒ Protection ⇒ Emergency Off Settings

Direct Access Number — **F604**

Parameter Type — **Numerical**

Factory Default — **1.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 20.0

Units — Seconds

When DC Injection is selected at F603 this parameter determines the time that the DC Injection Braking is applied to the motor.

Output Phase Loss Detection

Program ⇒ Protection ⇒ 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 for one second or more, the ASD incurs a trip.

Note: Autotune checks for phase failures regardless of this setting.

Settings:

0 — (Disabled) No Detection
1 — (Enabled) First Running Only at Start Up After Power On and Retry
2 — (Enabled) Running Only at Start Up and Retry
3 — (Enabled) During Run
4 — (Enabled) At Starting and During Run
5 — (Enabled) Auto-Restart When Cut on Drive Output

Direct Access Number — **F605**

Parameter Type — **Selection List**

Factory Default — **No Detection**

Changeable During Run — **No**

Overload Reduction Starting Frequency

Program ⇒ Protection ⇒ Overload

This parameter is primarily used with V/f motors. It is used to reduce the starting frequency at which the Overload Reduction function begins and is useful during extremely low-speed motor operation.

During very low-speed operation the cooling efficiency of the motor decreases. Lowering the start frequency of the Overload Reduction function aides in minimizing the generated heat and precluding an Overload trip.

This function is useful in loads such as fans, pumps, and blowers that have the square reduction torque characteristic.

The default overload time is 300 seconds at 150% ASD output; this time may vary as a function of the magnitude of the overload.

Direct Access Number — **F606**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — (ASD-Dependent)

Units — Hz

Input Phase Loss Detection

Program ⇒ Protection ⇒ Phase Loss

This parameter enables the 3-phase input power phase loss detection feature. A loss of either input phase (R, S, or T) results in a trip.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F608**

Parameter Type — **Selection List**

Factory Default — **Enabled**

Changeable During Run — **No**

Low-Current Detection Current Hysteresis Width

Program ⇒ Protection ⇒ Low-Current Settings

During a momentary low-current condition, this parameter provides a current threshold level to which the low-current condition must return within the time setting of F612 or a Low-Current Trip will be incurred.

Direct Access Number — **F609**

Parameter Type — **Numerical**

Factory Default — **10**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 20

Units — %

Low-Current Trip

Program ⇒ Protection ⇒ Low-Current Settings

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 F611 and remains there for the time set at F612.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F610**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Low-Current Detection Current

Program ⇒ Protection ⇒ Low-Current Settings

With the Low-Current Trip (F610) parameter enabled, this function sets the low-current trip threshold.

The threshold value is entered as a percentage of the maximum rating of the ASD.

Direct Access Number — **F611**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Low-Current Detection Time

Program ⇒ Protection ⇒ Low-Current Settings

With the Low-Current Trip (F610) parameter enabled, this function sets the time that the low-current condition must exist to cause a trip.

Direct Access Number — **F612**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Units — Seconds

Short Circuit Detection At Start

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter determines when the system will perform an Output Short Circuit test.

Note: Selection 3 is recommended for high-speed motor applications. Because of the low impedance of high-speed motors the standard-pulse setting may result in a motor malfunction.

Settings:

0 — Every Start (Standard Pulse)
1 — Power On or Reset (Standard Pulse)
2 — Every Start (Short Pulse)
3 — Power On or Reset (Short Pulse)
4 — Every Start (Extremely Short Pulse)
5 — Power On or Reset (Extremely Short Pulse)

Direct Access Number — **F613**

Parameter Type — **Selection List**

Factory Default — **Every Start** (Standard Pulse)

Changeable During Run — **No**

Over-Torque Trip

Program ⇒ Protection ⇒ Over-Torque Parameters

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

When enabled, the ASD trips if an output torque value greater than the setting of F616 or F617 exists for a time longer than the setting of F618.

When disabled, the ASD does not trip due to over-torque conditions.

Note: A discrete output terminal may be activated when an over-torque alarm occurs if so configured (see F130).

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F615**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Over-Torque Detection Level During Power Running

Program ⇒ Protection ⇒ Over-Torque Parameters

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

This function is enabled at F615.

Direct Access Number — **F616**

Parameter Type — **Numerical**

Factory Default — **150.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Over-Torque Detection Level During Regenerative Braking

Program ⇒ Protection ⇒ Over-Torque Parameters

This parameter sets the torque threshold level that is used as a setpoint for over-torque tripping during negative torque (regen). This setting is a percentage of the maximum rated torque of the ASD.

This function is enabled at F615.

Direct Access Number — **F617**
Parameter Type — **Numerical**
Factory Default — **250.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.00
Units — %

Over-Torque Detection Time

Program ⇒ Protection ⇒ Over-Torque Parameters

This parameter sets the amount of time that the over-torque condition may exceed the tripping threshold level set at F616 and F617 before a trip occurs.

This function is enabled at F615.

Direct Access Number — **F618**
Parameter Type — **Numerical**
Factory Default — **0.50**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 10.00
Units — Seconds

Over-Torque Detection Hysteresis

Program ⇒ Protection ⇒ Over-Torque Parameters

During a momentary over-torque condition, this parameter provides a torque threshold level to which the over-torque condition must return within the time setting of F618 or an Over-Torque Trip will be incurred.

Direct Access Number — **F619**
Parameter Type — **Numerical**
Factory Default — **10.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.00
Units — %

Cooling Fan Control

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter sets the cooling fan run-time command.

Settings:

0 — Automatic
1 — Always On

Direct Access Number — **F620**
Parameter Type — **Selection List**
Factory Default — **Automatic**
Changeable During Run — **Yes**

Cumulative Operation Time Alarm Setting

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter sets a run-time value that, once exceeded, closes a discrete output contact. The output signal may be used to control external equipment or used to engage a brake.

Associate the Total-Operation-Hours Alarm setting of Table 12 on page 257 to a discrete output contactor.

Note: The time displayed is 1/10th of the actual time (0.1 hr. = 1.0 hr.).

Direct Access Number — **F621**
Parameter Type — **Numerical**
Factory Default — **610.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 999.9
Units — Hours (X 10)

Abnormal Speed Detection Time

Program ⇒ Protection ⇒ Abnormal Speed Settings

This parameter sets the time that an over-speed condition must exist to cause a trip.

This parameter functions in conjunction with the settings of F623 and F624.

Direct Access Number — **F622**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 100.00

Units — Seconds

Over-Speed Detection Frequency Upper Band

Program ⇒ Protection ⇒ Abnormal Speed Settings

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

This parameter functions in conjunction with the settings of F622 and F624.

Direct Access Number — **F623**

Parameter Type — **Numerical**

Factory Default — **0.00 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0.00 (Disabled)

Maximum — (ASD-Dependent)

Units — Hz

Over-Speed Detection Frequency Lower Band

Program ⇒ Protection ⇒ Abnormal Speed Settings

This parameter sets the lower level of the Base Frequency range that, once the output speed falls below this setting, will cause a Speed Drop Detected alert.

This parameter functions in conjunction with the settings of F622 and F623.

Direct Access Number — **F624**

Parameter Type — **Numerical**

Factory Default — **0.00 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0.00 (Disabled)

Maximum — (ASD-Dependent)

Units — Hz

Under-Voltage Detection Level

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter sets the voltage threshold level that is used as a setpoint for under-voltage tripping.
This function is enabled at F627.

Direct Access Number — **F625**

Parameter Type — Numerical

Factory Default — 60

Changeable During Run — No

Minimum — (ASD-Dependent)

Maximum — (ASD-Dependent)

Units — %

Over-Voltage Limit Operation Level

Program ⇒ Protection ⇒ Stall

This parameter sets the upper limit of the DC bus voltage threshold that, once exceeded, will cause an Over-Voltage Stall.

While running or during deceleration, the Over-Voltage Stall function increases the output frequency of the ASD for a specified time in an attempt to prevent an Over-Voltage Trip.

If the Over-Voltage Stall persists for over 4 mS, an Over-Voltage Trip will be incurred.

This parameter is enabled at F305.

Note: This parameter setting may increase deceleration times.

Direct Access Number — **F626**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — 100

Maximum — 150

Units — %

Under-Voltage Trip

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter Enables/Disables the Under-Voltage Trip function.

With this parameter Enabled, the ASD will trip if the under-voltage condition persists for a time greater than the F628 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 activated.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F627**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Under-Voltage (Trip Alarm) Detection Time

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter sets the time that the under-voltage condition must exist to cause an Under-Voltage Trip.

This parameter is enabled at F627.

Direct Access Number — **F628**

Parameter Type — **Numerical**

Factory Default — **0.03**

Changeable During Run — **No**

Minimum — 0.01

Maximum — 10.00

Units — Seconds

Regenerative Power Ridethrough Control Level

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter is activated during regeneration. It is used to set the low end of the DC bus voltage threshold that, once the bus voltage drops below this setting, activates the setting of F302 (Ridethrough Mode).

Activation may be the result of a momentary power loss or an excessive load on the bus voltage.

During a Ridethrough, regenerative energy is used to maintain the control circuitry settings for the duration of the Ridethrough; it is not used to drive the motor.

The motor(s) of the system are stopped and then restarted automatically or may continue seamlessly if so configured.

See F302 for additional information on this parameter.

Note: This parameter setting may increase deceleration times.

Direct Access Number — **F629**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **No**

Minimum — (ASD-Dependent)

Maximum — 100

Units — %

ASD Overload

Program ⇒ Protection ⇒ Overload

This parameter is used to protect the ASD from an over-current condition. The standard overload rating of the Q9 Plus ASD is 120% operation for 60 seconds.

This setting allows for the overload protection to be switched from the standard overload detection means (Thermal Detection and Overload) to thermal detection only.

Settings:

0 — Temperature (Thermal Detection) + Overload
1 — Temperature (Thermal Detection) Only

The Thermal Detection Only selection is used when multiple devices are installed horizontally as described on pg. 10.

Direct Access Number — **F631**

Parameter Type — **Selection List**

Factory Default — **Thermal Detection + Overload**

Changeable During Run — **No**

V/I Analog Input Broken Wire Detection Level

Program ⇒ Terminal ⇒ Input Special Functions

This parameter is enabled by providing a non-zero value here. This function monitors the V/I input signal and if the V/I input signal falls below the level specified here and remains there for a period in excess of 0.3 seconds a trip will be incurred (E-18).

This value is entered as 0% to 100% of the **V/I** input signal range.

Direct Access Number — **F633**

Parameter Type — **Numerical**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Annual Average Ambient Temperature

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F634**

Parameter Type — **Selection List**

Factory Default — **Under 30°**

Changeable During Run — **Yes**

This parameter is used in conjunction with a discrete output terminal setting to notify the operator of the remaining useful life of critical components of the ASD system.

With a discrete output terminal set to Part Replacement Alarm (see Table 12 on page 257) and the calculation derived from the parameter setting, maintenance scheduling may be enhanced.

Settings:

1 — Under 10° C (50° F)
2 — Under 20° C (68° F)
3 — Under 30° C (86° F)
4 — Under 40° C (104° F)
5 — Under 50° C (122° F)
6 — Under 60° C (140° F)

Rush Current Suppression Relay Activation Time

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F635**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 2.5

Units — Seconds

At system start up, this parameter sets a time-delay for the start of the Rush Relay activation in an attempt to allow the DC bus voltage to reach the normal operating level before outputting a signal to the motor.

PTC 1 Thermal Selection

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F637**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

This parameter Enables/Disables the optional external thermal detection circuit of the Expansion IO Card Option 1. A thermistor is connected from TH1+ to TH1- of TB3 on the Expansion IO Card Option 1.

Should the thermistor resistance reading fall below 50W because of an over-temperature condition or exceed 3000W because of an open circuit, an External Thermal Fault (OH2) will be incurred.

Note: While this parameter is Enabled, the system cannot be restarted until the thermistor value recovers to the level of 1.8 kΩ from an over-temperature condition. An Auto-Restart will not be initiated subsequent to an External Thermal Trip (OH2); a manual restart will be required.

Settings:

0 — Disabled
1 — Detect Disconnect

PTC 2 Thermal Selection

Program ⇒ Special ⇒ Special Parameters

This parameter Enables/Disables the optional external thermal detection circuit of the Expansion IO Card Option 2. A thermistor is connected from TH1+ to TH1- of TB4 on the Expansion IO Card Option 2.

Should the thermistor resistance reading fall below 50W because of an over-temperature condition or exceed 3000W because of an open circuit, an External Thermal Fault (OH2) will be incurred.

Note: While this parameter is Enabled, the system cannot be restarted until the thermistor value recovers to the level of 1.8 kΩ from an over-temperature condition. An Auto-Restart will not be initiated subsequent to an External Thermal Trip (OH2). A manual restart will be required in the event of an OH2 trip.

Settings:

0 — Disabled
1 — Detect Disconnect

Direct Access Number — **F638**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

Braking Resistance Overload Time (not used)

Program ⇒ Protection ⇒ Dynamic Braking

This parameter sets the time that the braking resistor is allowed to sustain an overload condition before a trip is incurred.

This feature is useful for applications that have a fluctuating load or for loads that require a long deceleration time.

Direct Access Number — **F639**

Parameter Type — **Numerical**

Factory Default — **5.0**

Changeable During Run — **No**

Minimum — 0.1

Maximum — 600.0

Units — Seconds

Step-Out Detection Current Level (for PM motors)

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for information on this parameter.

Direct Access Number — **F640**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **No**

Minimum — 10

Maximum — 150

Units — %

Step-Out Detection Current Time (for PM motors)

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for information on this parameter.

Direct Access Number — **F641**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 25.0

Units — Seconds

Brake Equipped Motor Restart Condition

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F643**

Parameter Type — **Selection List**

Factory Default — **No Wait Time for Frequencies Less Than 10 Hz**

Changeable During Run — **No**

This parameter is used with synchronous motor applications only and is not used with the Q9 Plus ASD.

Settings:

0 — No Wait Time for Frequencies Less Than 10 Hz
1 — No Wait Time for Frequencies Less Than 20 Hz

Select Operation When V/I is Disconnected

Program ⇒ Terminal ⇒ Input Special Functions

Direct Access Number — **F644**

Parameter Type — **Selection List**

Factory Default — **Trip**

Changeable During Run — **No**

This parameter is used to select a system disposition in the event of the loss of the V/I input signal.

The system will either trip, run the speed set at Preset Speed 14, or run at the F454 setting in the Direct mode.

Note: Preset Speed 14 *must be configured to use the preset speed selection.*

Settings:

0 — Trip
1 — Preset Speed 14
2 — Direct Mode Setpoint

PTC Thermal Mode

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F645**

Parameter Type — **Selection List**

Factory Default — **Disable**

Changeable During Run — **No**

This parameter sets the ASD disposition in the event that the PTC resistance exceeds the setting of parameter F646.

The RR input terminal becomes the PTC Thermal Input terminal when Alarm or Trip is selected at this parameter.

This parameter setting overrides the Frequency Mode 1 and Frequency Mode 2 settings.

Settings:

0 — Disable
1 — Enable (trip mode)
2 — Enable (alarm mode)

PTC Detection Resister Value

Program ⇒ Special ⇒ Special Parameters

Direct Access Number — **F646**

Parameter Type — **Numerical**

Factory Default — **3000**

Changeable During Run — **Yes**

Minimum — 100

Maximum — 9999

Units — Ω

This parameter provides a user-set resistance threshold for the thermal sensor that, once exceeded, will activate the selection of F645.

Forced Fire-Speed Control

Direct Access Number — **F650**

Parameter Type — Selection List

Factory Default — Enabled

Changeable During Run — Yes

Program ⇒ Protection ⇒ Fire-Speed Control

This parameter is used to enable the Forced Fire Speed function. The Forced Fire Speed function runs Preset Speed 15 in the event of an emergency. Preset Speed 15 must be configured to use the Forced Fire Speed function.

Settings:

0 — Disabled
1 — Enabled

Under-Torque Detection

Direct Access Number — **F651**

Parameter Type — **Selection List**

Factory Default — **Alarm Mode**

Changeable During Run — **Yes**

Program ⇒ Protection ⇒ Under-Torque Detection

This parameter sets the ASD operating mode and disposition in the event that an Under-Torque condition were to occur.

For an Under-Torque event to occur, the minimum criteria of parameters F652 – F655 must be met:

Settings:

0 — Alarm Mode
1 — Trip Mode

Under-Torque Detection Level During Power Running

Program ⇒ Protection ⇒ Under-Torque Detection

While the motor is being driven by the ASD, this setting is used to set a low-torque threshold minimum level that must exist for the duration of the parameter F654 time setting to activate the Under-Torque disposition of the parameter F651 setting.

Direct Access Number — **F652**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Under-Torque Detection Level During Regenerative Braking

Program ⇒ Protection ⇒ Under-Torque Detection

During regeneration, this setting is used to set a low-torque threshold minimum level that must exist for the duration of the parameter F654 time setting to activate the Under-Torque disposition of the parameter F651 setting.

Direct Access Number — **F653**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 250.00

Units — %

Under-Torque Detection Time

Program ⇒ Protection ⇒ Under-Torque Detection

This parameter sets the time that the low-torque condition must exist to activate the Under-Torque disposition of the parameter F651 setting.

Direct Access Number — **F654**

Parameter Type — Numerical

Factory Default — 0.50

Changeable During Run — Yes

Minimum — 0.00

Maximum — 10.00

Units — Seconds

Under-Torque Detection Hysteresis

Program ⇒ Protection ⇒ Under-Torque Detection

With Alarm selected at parameter F651, this parameter setting is used to set the hysteresis threshold of the low-torque condition for which the system must return to deactivate the Under-Torque Alarm setting of parameter F651 and to return to normal system operation.

If Trip is selected at parameter F651, the same threshold applicables are in effect with the addition that operator intervention will be required to return the system to the normal operating condition. Remove the source of the trip condition and/or perform a system reset.

Direct Access Number — **F655**

Parameter Type — Numerical

Factory Default — 10.00

Changeable During Run — Yes

Minimum — 0.00

Maximum — 100.00

Units — %

Adding Input Selection

Direct Access Number — **F660**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Program ⇒ Feedback ⇒ Override Control

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:

0 — Disabled
1 — V/I
2 — RR
3 — RX
5 — EOI Keypad
6 — RS485/BACnet
7 — Communication Option Board
8 — RX2 (AI1 Option)
9 — Option V/I (AI2 Option)
10 — UP/DOWN Frequency
11 — Optional RP Pulse Input
12 — Optional High-Speed Pulse Input
13 — Binary/BCD (Option)

Multiplying Input Selection

Direct Access Number — **F661**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Program ⇒ Feedback ⇒ Override Control

This parameter Enables/Disables the feature that allows for the external adjustment of the commanded frequency.

Selecting either of the input methods listed enables this feature. The selected input is used as a multiplier of the commanded frequency.

If Setting (A729) is selected, the % value entered at parameter A729 is used as the multiplier of the commanded frequency.

Note: Contact the TIC Customer Support Center for more information on using the A729 selection.

Settings:

0 — Disabled
1 — V/I
2 — RR
3 — RX
4 — Setting (A729)
5 — RX2 (AI1 Option) Option

Logic Output/Pulse Output (OUT1)

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to select the output of the OUT1 terminals.

Note: This parameter is not used with the Q9 Plus ASD.

Settings:

0 — Logic Output
1 — Pulse Train Output

Direct Access Number — **F669**

Parameter Type — Selection List

Factory Default — **Logic Output**

Changeable During Run — No

AM Output Terminal Function

Program ⇒ Terminal ⇒ Analog Output Terminals

Direct Access Number — **F670**

Parameter Type — **Selection List**

Factory Default — **Output Current**

Changeable During Run — **Yes**

This setting determines the output function of the AM analog output terminal. The AM output terminal produces an output voltage or current that is proportional to the magnitude of the function assigned to this terminal. Configure the DVM, as shown below, in accordance with the output signal type of interest (i.e., current or voltage).

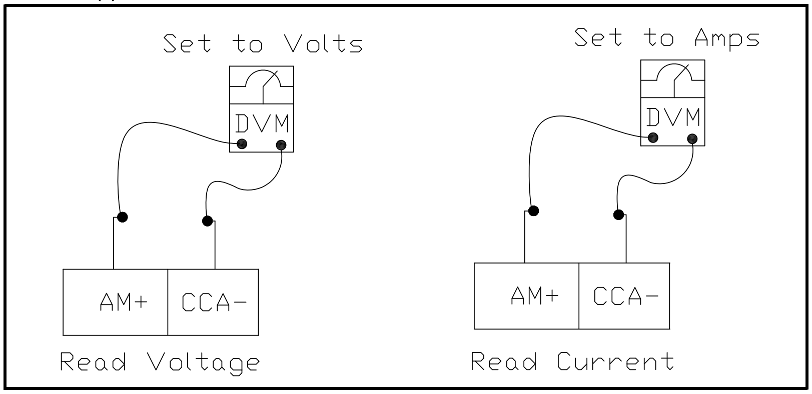
The available assignments for this output terminal are listed in Table 10 on page 255.

Note: If the monitored item has a positive and a negative component, use the Expansion I/O Card 2 (P/N ETB004Z). See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the functions of the option card.

See F678 for additional information on this parameter.

To read Voltage at this terminal, configure the meter to read DC voltage, and connect the leads of the meter to AM (+) and CCA (-).

To read Current at this terminal, configure the meter to read DC current, and connect the leads of the meter to AM (+) and CCA (-).



AM Terminal Setup Parameters

F670 — Set AM Function

F671 — Calibrate AM Terminal

F685 — Output Response Polarity Selection

F686 — Set Zero Level

AM Output Terminal Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to calibrate the AM analog output.

To calibrate the AM analog output, connect an ammeter as described at parameter F670.

While the ASD is running at a known value (e.g., output frequency), adjust this parameter until the associated function of parameter F670 produces the desired DC level output at the AM output terminal.

See F670 for additional information on this parameter.

Direct Access Number — **F671**

Parameter Type — **Numerical**

Factory Default — **154**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

MON1 Terminal Meter Selection

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output function of the MON1 analog output terminal. The available assignments for this output terminal are listed in Table 10 on page 255.

The MON1 analog output terminal produces an output voltage or current that is proportional to the magnitude of the function assigned to this terminal.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

MON1 Terminal Setup Parameters

F672 — MON1 Output Function

F673 — MON1 Terminal Meter Adjustment

F688 — MON1 Voltage/Current Output Switching

F689 — MON1 Output Gradient Characteristic

F690 — MON1 Bias Adjustment Set Zero Level

Direct Access Number — **F672**

Parameter Type — **Selection List**

Factory Default — **Output Voltage**

Changeable During Run — **Yes**

MON1 Terminal Meter Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the gain of the MON1 output terminal and is used in conjunction with the settings of parameter F672.

See F672 for additional information on this parameter.

Direct Access Number — **F673**

Parameter Type — **Numerical**

Factory Default — **682**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

MON2 Terminal Meter Selection

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output function of the MON2 analog output terminal. The available assignments for this output terminal are listed in Table 10 on page 255.

The MON2 analog output terminal produces an output voltage or current that is proportional to the magnitude of the function assigned to this terminal.

Note: The Expansion IO Card Option 2 option board (P/N ETB004Z) is required to use this terminal.

See the Expansion IO Card Option 2 instruction manual (P/N 58686) for additional information on the function of this terminal.

MON2 Terminal Setup Parameters

F674 — MON2 Output Function

F675 — MON2 Terminal Meter Adjustment

F691 — MON2 Voltage/Current Output Switching

F692 — MON2 Output Gradient Characteristic

F693 — MON2 Bias Adjustment Set Zero Level

Direct Access Number — **F674**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

MON2 Terminal Meter Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the gain of the **MON2** output terminal and is used in conjunction with the settings of parameter F674.

See F674 for additional information on this parameter.

Direct Access Number — **F675**

Parameter Type — **Numerical**

Factory Default — **682**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

Pulse Output Function

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the functionality of the FP output terminal to any one of the user-selectable functions listed in Table 10 on page 255.

As the assigned function changes in magnitude or frequency, the pulse count of the FP output terminal pulse train changes in direct proportion to changes in the assigned function.

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

This parameter is used in conjunction with F677.

Direct Access Number — **F676**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

Pulse Output Frequency

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter scales the FP output terminal by setting the pulses-per-second output signal of the FP terminal.

This parameter is used in conjunction with F676.

Direct Access Number — **F677**

Parameter Type — **Numerical**

Factory Default — **3.84**

Changeable During Run — **Yes**

Minimum — 1.00

Maximum — 43.20

Units — Pulses/Second

Constant at the Time of Filtering

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to select the degree of filtering to be applied to the AM, FM, and FP output terminals.

The output reading provided by the monitored terminal is filtered via a rolling average. The sample time of the average is selected at this parameter.

A longer average time results in a more stable output signal.

Direct Access Number — **F678**

Parameter Type — Numerical

Factory Default — 64

Changeable During Run — Yes

Minimum — 4

Maximum — 100

Units — mS

FM Voltage/Current Output Switching

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to select the type of output signal provided at the FM terminal (i.e., voltage or current).

The output voltage and current range is 0 – 10 VDC and 0 – 20 mA, respectively.

See F005 for additional information on this parameter.

Settings:

0 — 0 – 10 V
1 — 0 – 20 mA

Direct Access Number — **F681**

Parameter Type — **Selection List**

Factory Default — **0–10V**

Changeable During Run — **No**

FM Output Gradient Characteristic

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the output response polarity of the FM output terminal. The FM output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F005 for additional information on this parameter.

Settings:

0 — Minus (Negative Gradient)
1 — Plus (Positive Gradient)

Direct Access Number — **F682**

Parameter Type — **Selection List**

Factory Default — **Plus**

Changeable During Run — **Yes**

FM Bias Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the FM terminal.

Set the function of F005 to zero and then set this parameter to zero for proper operation.

See F005 for additional information on this parameter.

Direct Access Number — **F683**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -10.0

Maximum — +100.0

Units — %

FM Output Filter

Program ⇒ Terminal ⇒ Analog Output Terminals

Direct Access Number — **F684**

Parameter Type — **Selection List**

Factory Default — **No Filter**

Changeable During Run — Yes

This parameter is used to select the degree of filtering to be applied to the FM output terminal.

The output reading provided by the FM terminal is filtered via a rolling average. The sample time of the average is selected at this parameter.

A longer average time results in a more stable output signal.

This parameter setting further filters the F678 setting for the FM terminal.

See F005 for additional information on this parameter.

Note: Selecting No Filter has no effect on the setting of F678.

Settings:

0 — No Filter
1 — Filter (10 mS)
2 — Filter (15 mS)
3 — Filter (30 mS)
4 — Filter (60 mS)
5 — Filter (120 mS)
6 — Filter (250 mS)
7 — Filter (500 mS)
8 — Filter (1 S)

AM Output Gradient Characteristic

Program ⇒ Terminal ⇒ Analog Output Terminals

Direct Access Number — **F685**

Parameter Type — **Selection List**

Factory Default — **Plus**

Changeable During Run — **Yes**

This parameter sets the output response polarity of the AM output terminal.

The AM output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F670 for additional information on this parameter.

Settings:

0 — Minus (Negative Gradient)
1 — Plus (Positive Gradient)

AM Bias Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

Direct Access Number — **F686**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -10.0

Maximum — +100.0

Units — %

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the AM terminal.

Set the function selected at F670 to zero and then set this parameter to zero for proper operation.

See F670 for additional information on this parameter.

MON1 Voltage/Current Output Switching

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output signal type of the MON1 output terminal.

Settings

0 — -10 V – +10 V
1 — 0 – 10 V
2 — 0 – 20 mA

Direct Access Number — **F688**

Parameter Type — **Selection List**

Factory Default — **0 – 10 V**

Changeable During Run — **No**

MON1 Output Gradient Characteristic

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the output response polarity of the MON1 output terminal. The MON1 output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F672 for additional information on this parameter.

Settings:

0 — Minus (Negative Gradient)
1 — Plus (Positive Gradient)

Direct Access Number — **F689**

Parameter Type — **Selection List**

Factory Default — **Plus**

Changeable During Run — **Yes**

MON1 Bias Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the MON1 terminal.

Set the assigned function of parameter F672 to zero and then set this parameter to a zero output.

See F672 for additional information on this parameter.

Direct Access Number — **F690**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -10.0

Maximum — 100.0

Units — %

MON2 Voltage/Current Output Switching

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output signal type of the MON2 output terminal.

See F674 for additional information on this parameter.

Settings:

0 — -10 V – +10 V
1 — 0 – 10 V
2 — 0 – 20 mA

Direct Access Number — **F691**

Parameter Type — **Selection List**

Factory Default — **0 – 10V**

Changeable During Run — **No**

MON2 Output Gradient Characteristic

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the output response polarity of the MON2 output terminal. The MON2 output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F672 for additional information on this parameter.

Settings:

0 — Minus (Negative Gradient)
1 — Plus (Positive Gradient)

Direct Access Number — **F692**

Parameter Type — **Selection List**

Factory Default — **Plus**

Changeable During Run — **Yes**

MON2 Bias Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the MON2 terminal.

Set the assigned function of F674 to zero and then set this parameter to a zero output.

See F674 for additional information on this parameter.

Direct Access Number — **F693**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -10.0

Maximum — 100.0

Units — %

Current/Voltage Display Units

Program ⇒ Utilities ⇒ Display Parameters

This parameter sets the unit of measurement for current and voltage values displayed on the EOI.

Settings:

0 — %
1 — A/V

Direct Access Number — **F701**

Parameter Type — **Selection List**

Factory Default — **%**

Changeable During Run — **Yes**

Free Unit Multiplication Factor

Program ⇒ Utilities ⇒ Display Parameters

This parameter provides a multiplier for the displayed speed value shown on the EOI of the ASD.

This parameter may be used to display the rate that a commodity is being processed by the driven load in process units (i.e., units/time).

Note: An output frequency of 100 Hz would be displayed as 50 Hz if using a multiplier of 0.5 for this parameter.

Note: PID frequency-limiting parameters are not affected by this setting (i.e., F364, F365, F367, and F368).

Direct Access Number — **F702**

Parameter Type — **Numerical**

Factory Default — **0.00 (OFF)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Free Unit

Direct Access Number — **F703**

Parameter Type — **Selection List**

Factory Default — **All Frequencies**

Changeable During Run — **Yes**

Program ⇒ Utilities ⇒ Display Parameters

This parameter is used in conjunction with F702 to set the method in which the frequency is displayed on the EOI.

The multiplier setting of F702 will be applied to the display of all frequencies if all frequencies are selected at this parameter.

The multiplier setting of F702 will be applied to parameters F364, F365, F367, and F368 ONLY if PID Process Data is selected at this parameter.

Settings:

0 — All Frequencies
1 — PID Process Data

Free Unit Display Gradient Characteristic

Direct Access Number — **F705**

Parameter Type — **Selection List**

Factory Default — **Plus**

Changeable During Run — **Yes**

Program ⇒ Utilities ⇒ Display Parameters

The ASD-displayed response to output speed changes will be displayed as directly proportional or inversely proportional as a function of this parameter setting.

Selecting Negative Gradient displays an increased output speed as going more negative.

Selecting Positive Gradient displays an increased output speed as going more positive.

Settings:

0 — Minus (Negative Gradient)
1 — Plus (Positive Gradient)

Free Unit Display Bias

Direct Access Number — **F706**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Program ⇒ Utilities ⇒ Display Parameters

In conjunction with the setting of F702, this parameter sets the bias of the EOI speed display.

The frequency entered here will be multiplied by the setting of F702 and then displayed as the zero value on the EOI display.

Change Step Selection 1

Direct Access Number — **F707**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Program ⇒ Utilities ⇒ Display Parameters

In conjunction with the parameter setting of F708, this parameter sets the amount that the output speed will increase or decrease for each speed command change entered from the EOI using the Rotary Encoder.

Change Step Selection 2

Program ⇒ Utilities ⇒ Display Parameters

The parameter is used to modify the degree that the setting of F707 affects the output speed changes that are input from the EOI using the Rotary Encoder.

Selecting a zero value here disables this parameter and the resulting non-zero value of parameter setting F707 is output from the ASD.

Selecting a non-zero value here provides a dividend that will be used in the following equation resulting in the actual output frequency applied to the motor.

$$OutputFrequencyDisplayed = InternallyCommandedFrequency \times \frac{F708}{F707}$$

Direct Access Number — **F708**

Parameter Type — **Numerical**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Trace Selection

Program ⇒ Utilities ⇒ Trace

In conjunction with parameter F741 – F745, this parameter is used to monitor and store 4 ASD output waveform data points. The data may be read and stored as a function of a trip (At Trip) or it may be initiated by the activation of a discrete terminal activation (At Trigger).

Set a discrete input terminal to Trace Back Trigger Signal and activate the terminal to initiate the At Trigger read/store function.

Table 13 on page 259 lists the items that may be selected for the data read/store function along with the associated communication number for each selection.

The duration of the read/store cycle for the selected items is set at parameter F741.

To acquire and store the data, a communications device and a PC are required. The Q9 Plus ASD supports the following communications protocols: RS485 (MODBUS-RTU) Toshiba Protocol, USB Toshiba Protocol, CC-Link, ProfiBus, and DeviceNet (refer to the manual of each protocol type for more information).

Trace data may be viewed graphically via Program ⇒ Utilities ⇒ View Trace Data.

Settings:

0 — None (Disabled)
1 — At Trip
2 — At Trigger

Direct Access Number — **F740**

Parameter Type — **Selection List**

Factory Default — **At Trip**

Changeable During Run — **Yes**

Trace Cycle

Program ⇒ Utilities ⇒ Trace

Direct Access Number — **F741**

Parameter Type — **Selection List**

Factory Default — **100 mS**

Changeable During Run — **Yes**

This parameter sets the record time for the Trace Data events selected at F742 – F745.

See F740 for additional information on this parameter.

Settings:

0 — 4 mS
1 — 20 mS
2 — 100 mS
3 — 1 Second
4 — 10 Seconds

Trace Data 1

Program ⇒ Utilities ⇒ Trace

Direct Access Number — **F742**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

This parameter is used to select the Trace Data 1 item from Table 13 on page 259 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for additional information on this parameter.

Trace Data 2

Program ⇒ Utilities ⇒ Trace

Direct Access Number — **F743**

Parameter Type — **Selection List**

Factory Default — **Freq. Reference**

Changeable During Run — **Yes**

This parameter is used to select the Trace Data 2 item from Table 13 on page 259 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for additional information on this parameter.

Trace Data 3

Program ⇒ Utilities ⇒ Trace

Direct Access Number — **F744**

Parameter Type — **Selection List**

Factory Default — **Output Current**

Changeable During Run — **Yes**

This parameter is used to select the Trace Data 3 item from Table 13 on page 259 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for additional information on this parameter.

Trace Data 4

Program ⇒ Utilities ⇒ Trace

Direct Access Number — **F745**

Parameter Type — Selection List

Factory Default — DC Voltage

Changeable During Run — Yes

This parameter is used to select the Trace Data 4 item from Table 13 on page 259 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for additional information on this parameter.

Integral Output Power Retention

Program ⇒ Utilities ⇒ Display Parameters

This parameter is used to set the disposition of the kWh meter reading at power off.

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F748**
Parameter Type — **Selection List**
Factory Default — **Enabled**
Changeable During Run — **Yes**

Integral Output Power Display Unit

Program ⇒ Utilities ⇒ Display Parameters

This parameter sets the unit of measure for the power/time display.

Settings:

0 — 1=1 kWh
1 — 1=10 kWh
2 — 1=100 kWh
3 — 1=1000 kWh
4 — 1=10000 kWh

Direct Access Number — **F749**
Parameter Type — Selection List
Factory Default — (ASD-Dependent)
Changeable During Run — Yes

MAC Address 1

Program ⇒ Communications ⇒ Ethernet Settings

This parameter is used to configure the MAC Address 1 section of the MAC address of the device.

MAC Address 1	MAC Address 2	MAC Address 3	MAC Address 4	MAC Address 5	MAC Address 6

Direct Access Number — **F784**
Parameter Type — **Numerical**
Factory Default — **00**
Changeable During Run — **Yes**
Minimum — 00
Maximum — 255

MAC Address 2

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F784.

This parameter is used to configure the MAC Address 2 section of the MAC address of the device.

See F784 for additional information on this parameter.

Direct Access Number — **F785**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

MAC Address 3

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F784.

This parameter is used to configure the MAC Address 3 section of the MAC address of the device.

See F784 for additional information on this parameter.

Direct Access Number — **F786**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

MAC Address 4

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F784.

This parameter is used to configure the MAC Address 4 section of the MAC address of the device.

See F784 for additional information on this parameter.

Direct Access Number — **F787**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

MAC Address 5

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F784.

This parameter is used to configure the MAC Address 5 section of the MAC address of the device.

See F784 for additional information on this parameter.

Direct Access Number — **F788**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

MAC Address 6

Program ⇒ Communications ⇒ Ethernet Settings

This parameter operates in conjunction with parameter F784.

This parameter is used to configure the MAC Address 6 section of the MAC address of the device.

See F784 for additional information on this parameter.

Direct Access Number — **F789**

Parameter Type — **Numerical**

Factory Default — **00**

Changeable During Run — **Yes**

Minimum — 00

Maximum — 255

Device Name Data 1

Program ⇒ Communications ⇒ Ethernet Settings

This parameter is used to configure a unique identifier for the drive.

Direct Access Number — **F792**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 2

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F793**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 3

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F794**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 4

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F795**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 5

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F796**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 6

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F797**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 7

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F798**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Device Name Data 8

Program ⇒ Communications ⇒ Ethernet Settings

See F792 for information on this parameter.

Direct Access Number — **F799**

Parameter Type — **Numerical**

Factory Default — **0000**

Changeable During Run — **Yes**

Minimum — 0000

Maximum — FFFF

Baud Rate (2-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

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:

0 — 9600
1 — 19200
2 — 38400

Direct Access Number — **F800**

Parameter Type — **Selection List**

Factory Default — **19200**

Changeable During Run — **Yes**

Units — bps

Parity (2-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

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:

0 — No Parity
1 — Even Parity
2 — Odd Parity

Direct Access Number — **F801**

Parameter Type — **Selection List**

Factory Default — **Even Parity**

Changeable During Run — **Yes**

ASD Number

Program ⇒ Communications ⇒ Communication Settings

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.

Direct Access Number — **F802**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 247

Communications Time-Out (2- and 4-wire RS485)

Program ⇒ Communications ⇒ Communication Settings

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.

Direct Access Number — **F803**

Parameter Type — **Numerical**

Factory Default — **0 (Off)**

Changeable During Run — **Yes**

Minimum — 0 (Off)

Maximum — 100

Units — Seconds

Communications Time-Out Action (2- and 4-wire RS485)

Program ⇒ Communications ⇒ Communication Settings

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:

0 — No Action/No Action
1 — Alarm/No Action
2 — Trip/No Action
3 — No Action/Alarm
4 — Alarm/Alarm
5 — Trip/Alarm
6 — No Action/Trip
7 — Alarm/Trip
8 — Trip/Trip

Direct Access Number — **F804**

Parameter Type — **Selection List**

Factory Default — **Trip/Trip**

Changeable During Run — **Yes**

Send Delay Time (2-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS485 (2-wire) response delay time.

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

Direct Access Number — **F805**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.00

Units — Seconds

ASD-to-ASD Communication (2-wire RS485)

Direct Access Number — **F806**

Parameter Type — **Selection List**

Factory Default — **Follower (Decel Stop)**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Settings

The function of this parameter is two-fold:

1) In a Master/Follower configuration and while communicating via RS485 2-wire, this parameter sets the ASD as the Master or the Follower.

2) This parameter determines the function of the ASD while operating as the Master or the Follower. If operating as the Master ASD, an output parameter of the Master ASD is used to control the Follower ASDs and is set here.

If operating as a Follower ASD, the ASD response if an error is incurred is set here.

Note: Select a Follower function here if F826 is configured as a Master Output controller for any other ASD in the system. Otherwise, an EOI failure will result.

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

Settings:

0 — Follower (Decel Stop If Error Detected)
1 — Follower (Continues Operation If Error Detected)
2 — Follower (Emergency Off If Error Detected)
3 — Master (Frequency Command)
4 — Master (Output Frequency)
5 — Master (Torque Reference)
6 — Master (Output Torque)

Communication Protocol (2-Wire RS485)

Direct Access Number — **F807**

Parameter Type — **Selection List**

Factory Default — **Toshiba**

Changeable During Run — No

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the 2-Wire RS485 communications protocol.

Settings:

0 — Toshiba
1 — Modbus

Communication 1 Time-Out Condition

Direct Access Number — **F808**

Parameter Type — **Selection List**

Factory Default — **Always Detect**

Changeable During Run — Yes

Program ⇒ Communications ⇒ Communication Settings

This parameter determines the condition under which the drive will detect time-out errors.

Settings:

0 — Always Detect
1 — Detect Time-Out Error During Communications
2 — Detect Time-Out Error During Communications and Running

Frequency Point Selection

Direct Access Number — **F810**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Adjustments

This parameter is used to set the communications reference for scaling.

See F811 — F814 for additional information on this parameter.

Note: Scaling the communications signal is not required for all applications.

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

Settings:

0 — Disabled
1 — 2-Wire RS485 (EOI)
2 — 4-Wire RS485 (Terminal Board)
3 — Communication Option Board

Point 1 Setting

Program ⇒ Communications ⇒ Communication Adjustments

When enabled at F810, 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 F810.

Gain and Bias Settings

When operating in the Speed Control mode and using one of the control sources from Settings above, the settings that determine the gain and bias properties of the input signal are:

- Communications Reference Speed Setpoint 1 (frequency) (F812),
- the communications input signal value that represents Communications Reference Speed Setpoint 1 (frequency): F811,
- Communications Reference Speed Setpoint 2 (frequency) (F814), and
- the communications input signal value that represents Communications Reference Speed Setpoint 2 (frequency): F813.

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 Reference Speed Setpoint 1 (frequency). 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.

Direct Access Number — **F811**

Parameter Type — **Numerical**

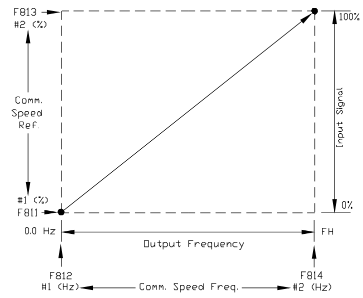
Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %



Point 1 Frequency

Program ⇒ Communications ⇒ Communication Adjustments

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

See F811 for additional information on this parameter.

This parameter sets Communications Reference Speed Setpoint 1.

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

Direct Access Number — **F812**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Point 2 Setting

Program ⇒ Communications ⇒ Communication Adjustments

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

See F811 for additional information on this parameter.

This parameter sets the Communications Reference input value that represents Communications Reference Speed Setpoint 2 (frequency). 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.

Direct Access Number — **F813**

Parameter Type — **Numerical**

Factory Default — **100**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 100

Units — %

Point 2 Frequency

Program ⇒ Communications ⇒ Communication Adjustments

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

See F811 for additional information on this parameter.

This parameter sets the Communications Reference Speed Setpoint 2.

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

Direct Access Number — **F814**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — Hz

Address Monitor (Modbus+)

Program ⇒ Communications ⇒ Modbus Settings

This parameter is used to select a node/station to monitor.

Direct Access Number — **F815**

Parameter Type — **Numerical**

Factory Default — **1**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 64

Command Selection (Modbus+)

Program ⇒ Communications ⇒ Modbus Settings

This parameter sets the command function to Prohibit or Permit.

Settings:

0 — Prohibit
1 — Permit

Direct Access Number — **F816**
Parameter Type — **Selection List**
Factory Default — **Prohibit**
Changeable During Run — **Yes**

Number of Command (Modbus+)

Program ⇒ Communications ⇒ Modbus Settings

This parameter is used to assign commands.

Settings:

0 — Prohibit
1 — Permit

Direct Access Number — **F817**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 8

Number of Monitors (Modbus+)

Program ⇒ Communications ⇒ Modbus Settings

This parameter is used to assign monitors.

Direct Access Number — **F818**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 8

Command Station (Modbus+)

Program ⇒ Communications ⇒ Modbus Settings

This parameter is used to assign the command station.

Direct Access Number — **F819**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 64

Baud Rate (4-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

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:

0 — 9600 bps
1 — 19200 bps
2 — 38400 bps

Direct Access Number — **F820**
Parameter Type — **Selection List**
Factory Default — **19200**
Changeable During Run — **Yes**

Baud Rate (Ethernet)

Program ⇒ Communications ⇒ Ethernet Settings

This parameter sets the Ethernet baud rate.

Settings:

0 — Automatic Detection
1 — 10 Mbps Full
2 — 10 Mbps Half
3 — 100 Mbps Full
4 — 100 Mbps Half

Direct Access Number — **F821**

Parameter Type — **Selection List**

Factory Default —**Automatic Detection**

Changeable During Run — **Yes**

Baud Rate Monitor Right Port (Ethernet)

Program ⇒ Communications ⇒ Ethernet Settings

This parameter establishes the baud rate detection setting of the right port.

Settings:

0 — Automatic Detection
1 — 10 Mbps Full
2 — 10 Mbps Half
3 — 100 Mbps Full
4 — 100 Mbps Half

Direct Access Number — **F822**

Parameter Type — Selection List

Factory Default —Automatic Detection

Changeable During Run — **Yes**

Baud Rate Monitor Left Port (Ethernet)

Program ⇒ Communications ⇒ Ethernet Settings

This parameter establishes the baud rate detection setting of the left port.

Settings:

0 — Automatic Detection
1 — 10 Mbps Full
2 — 10 Mbps Half
3 — 100 Mbps Full
4 — 100 Mbps Half

Direct Access Number — **F823**

Parameter Type — Selection List

Factory Default —Automatic Detection

Changeable During Run — **Yes**

RS485 Send Delay Time (4-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS485 response delay time.

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

Direct Access Number — **F825**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 2.00

Units — Seconds

ASD-to-ASD Communications (4-Wire RS485)

Program ⇒ Communications ⇒ Communication Settings

Direct Access Number — **F826**

Parameter Type — **Selection List**

Factory Default — **Follower (Decel Stop)**

Changeable During Run — **Yes**

The function of this parameter is two-fold:

1) In a Master/Follower configuration and while communicating via RS485 4-wire, this parameter sets the ASD as the Master or the Follower.

2) This parameter determines the function of the ASD while operating as the Master or the Follower. If operating as the Master ASD, an output parameter of the Master ASD is used to control the Follower ASDs and is set here. If operating as a Follower ASD, the ASD response if an error is incurred is set here.

Note: Select a Follower function here if F806 *is configured as a Master Output controller for any other ASD in the system. Otherwise, an EOI failure will result.*

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

Settings:

0 — Follower (Decel Stop if Error Detected)
1 — Follower (Continues Operation if Error Detected)
2 — Follower (Emergency Off if Error Detected)
3 — Master (Frequency Command)
4 — Master (Output Frequency)
5 — Master (Torque Reference)
6 — Master (Output Torque)

Parity (4-Wire RS485)

Direct Access Number — **F827**

Parameter Type — Selection List

Factory Default — Even Parity

Changeable During Run — Yes

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the Parity setting of the RS485 4-Wire 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:

0 — No Parity
1 — Even Parity
2 — Odd Parity

Communications Protocol (4-Wire RS485)

Direct Access Number — **F829**

Parameter Type — **Selection List**

Factory Default — **Toshiba**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the communications protocol for ASD-to-ASD communications.

Settings:

0 — Toshiba
1 — Modbus
2 — BACnet

Communication Option (DeviceNet/Profibus) Setting 1

Direct Access Number — **F830**

Parameter Type — **Selection List**

Factory Default — **0**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

While using the DeviceNet/Profibus communications protocol, this parameter allows the user to select the read and write information communicated between the ASD and the Host.

Read information may include the ASD fault status, ASD speed, ASD MAC ID, etc. Write information may include Enable/Disable DeviceNet commands, Forward run, ACC/DEC command, etc.

See the DeviceNet Option Instruction Manual (P/N 58683) for additional information on this parameter.

Settings:

0 – 7

Communication Option (DeviceNet/Profibus) Setting 2

Program ⇒ Communications ⇒ Communication Options

While using the DeviceNet/Profibus communications protocol, parameters F831 – F838 allow the user to select the ASD memory location that holds the Command/Frequency/Monitoring instructions to be applied to the ASD for Communications Option Settings 2 – 9, respectively.

See the DeviceNet Option Instruction Manual (P/N 58683) for additional information on this parameter.

Direct Access Number — **F831**

Parameter Type — **Numerical**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 3

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F832**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 4

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F833**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 5

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F834**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 6

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F835**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 7

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F836**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 8

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F837**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting 9

Program ⇒ Communications ⇒ Communication Options

See F831 for information on this parameter.

Direct Access Number — **F838**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Communication Option (DeviceNet/Profibus) Setting10

Direct Access Number — **F841**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

While using the DeviceNet/Profibus communications protocol, parameters F841 – F848 allow the user to select the ASD memory location that holds the Command/Frequency/Monitoring instructions to be applied to the ASD for Communications Option Settings 10 – 17, respectively.

See the DeviceNet Option Instruction Manual (P/N 58683) for additional information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 11

Direct Access Number — **F842**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 12

Direct Access Number — **F843**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 13

Direct Access Number — **F844**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 14

Direct Access Number — **F845**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 15

Direct Access Number — **F846**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 16

Direct Access Number — **F847**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication Option (DeviceNet/Profibus) Setting 17

Direct Access Number — **F848**

Parameter Type — **Selection List**

Factory Default — **0000h**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Options

See F841 for information on this parameter.

Communication 2 Time-Out Condition

Program ⇒ Communications ⇒ Communication Options

This parameter determines the condition under which the drive will detect time-out errors.

Settings:

0 — Always Detect
1 — Detect Time-Out Error During Communications
2 — Detect Time-Out Error During Communications and Running

Direct Access Number — **F849**

Parameter Type — **Selection List**

Factory Default — **Always Detect**

Changeable During Run — **Yes**

Disconnection Detection Extended Time

Program ⇒ Communications ⇒ Communication Options

This parameter is used to set the length of time that no communications activity may exist before the communications link is disconnected.

Direct Access Number — **F850**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — Seconds

ASD Operation at Disconnect

Program ⇒ Communications ⇒ Communication Options

This parameter is used to set the Q9 Plus ASD action to be carried out in the event of the loss of communications.

Settings:

0 — Stop and Terminate Communication
1 — Do Nothing (Continue Programmed Operation)
2 — Deceleration Stop
3 — Coast Stop
4 — Emergency Off
5 — Preset Speed (Setting of F852)

Direct Access Number — **F851**

Parameter Type — **Selection List**

Factory Default — **Stop and Terminate Communication**

Changeable During Run — **Yes**

Preset Speed Operation

Program ⇒ Communications ⇒ Communication Options

This parameter setting is used to set the Preset Speed selection to be used if Preset Speed is selected at parameter F851.

Settings:

0 — Disabled
1–15 — Preset Speed Number

Direct Access Number — **F852**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Communications Option Station Address Monitor

Program ⇒ Communications ⇒ Communication Options

This parameter is used in the setup of the communications network by reading the Media Access Code (MAC) address of the ASD that is connected to a node of the communications system.

The MAC Address is set via DIP switches of the optional device.

See the DeviceNet Option Instruction Manual (P/N 58683) for additional information on this parameter.

Direct Access Number — **F853**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 127

Communications Option Speed Switch Monitor DeviceNet/ CC-Link

Program ⇒ Communications ⇒ Communication Options

This parameter is used in the setup of the communications network by reading the hardware-specific settings of the option card being used with the ASD.

If using the DEV002Z Devicenet card, this parameter reads the hardware switch SW300 setting of the Devicenet card. SW300 sets the baud rate and the MAC address of the option card that is connected to a node of the communications system.

See the DeviceNet Option Instruction Manual (P/N 58683) for additional information on this parameter or see the instruction manual for the option being used with the Q9 Plus ASD.

Direct Access Number — **F854**

Parameter Type — **Hardware Selectable**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 255

Free Notes

Program ⇒ Communications ⇒ Communication Settings

This is an unused parameter that has allocated memory space.

The space may be used at the discretion of the user. This space may be used to store information or a note to be transferred using communications.

Direct Access Number — **F880**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 65535

Network Option Reset Setting

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the targets of a Reset command received via the communications link.

Settings:

0 — ---
1 — Reset Option Board and ASD

Direct Access Number — **F899**

Parameter Type — **Selection List**

Factory Default — **- - -**

Changeable During Run — **No**

Input Function Target 1

Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Direct Access Number — **F900**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Input Function Command 1

Program ⇒ My Function ⇒ My Function Unit 1

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Direct Access Number — **F901**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Input Function Target 2

Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Direct Access Number — **F902**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Input Function Command 2

Program ⇒ My Function ⇒ My Function Unit 1

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Direct Access Number — **F903**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **No**

Input Function Target 3

Direct Access Number — **F904**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Direct Access Number — **F905**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 11 on pg. 256.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Input Function Target 1

Direct Access Number — **F906**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 1

Direct Access Number — **F907**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Program ⇒ My Function ⇒ My Function Unit 2

Direct Access Number — **F908**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **No**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Program ⇒ My Function ⇒ My Function Unit 2

Direct Access Number — **F909**
Parameter Type — **Selection List**
Factory Default — **0 (NOP)**
Changeable During Run — **No**

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Program ⇒ My Function ⇒ My Function Unit 2

Direct Access Number — **F910**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **No**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Program ⇒ My Function ⇒ My Function Unit 2

Direct Access Number — **F911**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **No**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Input Function Target 1

Direct Access Number — **F912**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 1

Direct Access Number — **F913**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Direct Access Number — **F914**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Direct Access Number — **F915**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Direct Access Number — **F916**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Direct Access Number — **F917**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the **My Function Instruction Manual** (P/N E6581335) and F977 for additional information on this parameter.

My Function Percent Data 1

Direct Access Number — **F918**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Units — %

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 1.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Once the assigned output value reaches the threshold setting of this parameter the output value is transferred to My Function Out 1.

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

My Function Percent Data 2

Direct Access Number — **F919**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Units — %

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 2.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

My Function Percent Data 3

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 3.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F920**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Units — %

My Function Percent Data 4

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 4.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F921**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Units — %

My Function Percent Data 5

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 5.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F922**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 200.00

Units — %

My Function Frequency Data 1

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 1.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F923**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — %

My Function Frequency Data 2

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 2.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F924**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — %

My Function Frequency Data 3

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 1.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F925**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — %

My Function Frequency Data 4

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 4.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F926**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — %

My Function Frequency Data 5

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 5.

The analog signal is selected using the Input Setting number from Table 12 on page 257.

Direct Access Number — **F927**

Parameter Type — **Numerical**

Factory Default — **0.00**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — Maximum Freq. (F011)

Units — %

My Function Time Data 1

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 1 terminal.

The applied discrete input signal must be present at the input terminal of the Q9 Plus ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — **F928**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 600.00

Units — Seconds

My Function Time Data 2

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 2 terminal.

The applied discrete input signal must be present at the input terminal of the Q9 Plus ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — **F929**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 600.00

Units — Seconds

My Function Time Data 3

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 3 terminal.

The applied discrete input signal must be present at the input terminal of the Q9 Plus ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — **F930**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 600.00

Units — Seconds

My Function Time Data 4

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 4 terminal.

The applied discrete input signal must be present at the input terminal of the Q9 Plus ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — **F931**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 600.00

Units — Seconds

My Function Time Data 5

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 5 terminal.

The applied discrete input signal must be present at the input terminal of the Q9 Plus ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — **F932**

Parameter Type — **Numerical**

Factory Default — **0.01**

Changeable During Run — **Yes**

Minimum — 0.01

Maximum — 600.00

Units — Seconds

My Function Count Data 1

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the pulse-count threshold value used to trigger the discrete output COUNT1 (ON Timer).

COUNT1 (ON Timer) outputs a 1 upon reaching the threshold setting of this parameter.

Direct Access Number — **F933**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 9999

Units — Pulses

My Function Count Data 2

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the pulse-count threshold value used to trigger the discrete output COUNT2 (ON Timer).

COUNT2 (ON Timer) outputs a 1 upon reaching the threshold setting at this parameter.

Direct Access Number — **F934**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 9999

Units — Pulses

Input Function Target 1

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Direct Access Number — **F935**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Input Function Command 1

Program ⇒ My Function ⇒ My Function Unit 4

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Direct Access Number — **F936**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Input Function Target 2

Direct Access Number — **F937**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Direct Access Number — **F938**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 4

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Direct Access Number — **F939**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Direct Access Number — **F940**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Input Function Target 1

Direct Access Number — **F941**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 1

Direct Access Number — **F942**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Direct Access Number — **F943**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Direct Access Number — **F944**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Direct Access Number — **F945**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Direct Access Number — **F946**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Input Function Target 1

Direct Access Number — **F947**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 1

Direct Access Number — **F948**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Program ⇒ My Function ⇒ My Function Unit 6

Direct Access Number — **F949**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **Yes**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Program ⇒ My Function ⇒ My Function Unit 6

Direct Access Number — **F950**
Parameter Type — **Selection List**
Factory Default — **0 (NOP)**
Changeable During Run — **Yes**

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Program ⇒ My Function ⇒ My Function Unit 6

Direct Access Number — **F951**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **Yes**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Program ⇒ My Function ⇒ My Function Unit 6

Direct Access Number — **F952**
Parameter Type — **Selection List**
Factory Default — **0 (Disabled)**
Changeable During Run — **Yes**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Input Function Target 1

Direct Access Number — **F953**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 1

Direct Access Number — **F954**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Direct Access Number — **F955**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Input Function Command 2

Direct Access Number — **F956**

Parameter Type — **Selection List**

Factory Default — **0 (NOP)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 15 on pg. 262 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Direct Access Number — **F957**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 11 on pg. 256, Table 12 on pg. 257, or Table 14 on pg. 260.

See F977 for additional information on this parameter.

Output Function Assigned

Direct Access Number — **F958**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 12 on pg. 257.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for additional information on this parameter.

Analog Input Function Target 11

Direct Access Number — **F959**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Analog Input Function Target 11 terminal.

The function selected at F961 may be adjusted using the input analog control signal selected here.

Settings:

0 — Disabled (None)
1 — V/I
2 — RR
3 — RX
4 — RX2+, RX2-
5 — Optional V/I
6 — Internal Memory

Analog Function Assigned Object 11

Program ⇒ My Function ⇒ My Function Analog

Direct Access Number — **F961**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

This parameter plays a role in the setup of the My Function feature by selecting the functionality to which the adjustment of F959 is applied.

Settings:

0 — Disabled (None)
1 — Acceleration Rate
2 — Upper-Limit Frequency
3 — Acceleration Multiplication Factor
4 — Deceleration Multiplication Factor
5 — Manual Torque Boost
6 — Over-Current Stall (F601)
7 — Thermal Protection
8 — Speed Loop Proportional Gain (F460)
9 — Drooping Gain (F320)
10 — PID Proportional Gain (F362)

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Analog Function Assigned Object parameter.

Analog Input Function Target 21

Program ⇒ My Function ⇒ My Function Analog

Direct Access Number — **F962**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **Yes**

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Analog Input Function Target 21 terminal.

The function selected at F964 may be adjusted using the input analog control signal selected here.

Settings:

0 — None (Disabled)
1 — V/I
2 — RR
3 — RX
4 — Optional RX2+, RX2-
5 — Optional V/I
6 — Internal Memory

Analog Function Assigned Object 21

Direct Access Number — **F964**

Parameter Type — **Selection List**

Factory Default — **0 (Disabled)**

Changeable During Run — **No**

Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality to which the adjustment of F962 is applied.

Settings:

0 — Disabled (None)
1 — Acceleration Rate
2 — Upper-Limit Frequency
3 — Acceleration Multiplication Factor
4 — Deceleration Multiplication Factor
5 — Manual Torque Boost
6 — Over-Current Stall (F601)
7 — Thermal Protection
8 — Speed Loop Proportional Gain (F460)
9 — Drooping Gain (F320)
10 — PID Proportional Gain (F362)

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Analog Function Assigned Object parameter.

Monitor Output Function 11

Direct Access Number — **F965**

Parameter Type — **Selection List**

Factory Default — **2000**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F966.

Select the Monitor Display Input Setting number from Table 14 on page 260 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function Command 11

Direct Access Number — **F966**

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Maximum, Minimum, or Normal (Avg.) value of the parameter F965 selection to be recorded and output as a monitored function.

Settings:

0 — Normal
1 — Maximum
2 — Minimum

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function 21

Direct Access Number — **F967**

Parameter Type — **Selection List**

Factory Default — **2000**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F968.

Select the Monitor Display Input Setting number from Table 14 on page 260 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function Command 21

Direct Access Number — **F968**

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Maximum, Minimum, or Normal (Avg.) value of the parameter F967 selection to be recorded and output as a monitored function.

Settings:

0 — Normal
1 — Maximum
2 — Minimum

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function 31

Direct Access Number — **F969**

Parameter Type — **Selection List**

Factory Default — **2000**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F970.

Select the Monitor Display Input Setting number from Table 14 on page 260 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function Command 31

Direct Access Number — **F970**

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Peak, Minimum, or Normal (Avg.) value of the parameter F969 selection to be recorded and output as a monitored function.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Settings:

0 — Normal
1 — Maximum
2 — Minimum

Monitor Output Function 41

Direct Access Number — **F971**

Parameter Type — **Selection List**

Factory Default — **2000**

Changeable During Run — **Yes**

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Normal (Avg.) value as selected at parameter F972.

Select the Monitor Display Input Setting number from Table 14 on page 260 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function Command 41

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Maximum, Minimum, or Normal (Avg.) value of the parameter F971 selection to be recorded and output as a monitored function.

Settings:

0 — Normal
1 — Maximum
2 — Minimum

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Direct Access Number — **F972**

Parameter Type — **Selection List**

Factory Default — **Normal**

Changeable During Run — **Yes**

Virtual Input Terminal Selection 1

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 1. As a virtual terminal, it exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 1 terminal to one of the functions that are listed in Table 9 on page 252.

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

Direct Access Number — **F973**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Virtual Input Terminal Selection 2

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 2. As a virtual terminal, it exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 2 terminal to one of the functions that are listed in Table 9 on page 252.

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

Direct Access Number — **F974**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Virtual Input Terminal Selection 3

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 3. As a virtual terminal, it exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 3 terminal to one of the functions that are listed in Table 9 on page 252.

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

Direct Access Number — **F975**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

Virtual Input Terminal Selection 4

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 4. As a virtual terminal, it exists only in memory and is considered always to be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 4 terminal to one of the functions that are listed in Table 9 on page 252.

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

Direct Access Number — **F976**

Parameter Type — **Selection List**

Factory Default — **Unassigned**

Changeable During Run — **No**

My Function Operating Mode

Program ⇒ My Function ⇒ My Function Selection

This parameter Enables/Disables the configured My Function feature of the Q9 Plus ASD.

Settings:

0 — None (Disabled)

1 — My Function with Terminal Board Signal (discrete terminal)

2 — My Function Always On

My Function

The My Function feature is configured using the settings of F900 to F977 and is used to enhance the programmability of the Q9 Plus ASD by performing two programmable functions: 1) the Combined Terminal Function, and 2) Logic Operations.

Combined Terminal Function

Assigning more than one function to a discrete output terminal provides two advantages: it effectively expands the number of input terminals, and it reduces the number of cables required to support the input/output functions (e.g., assigning ST and F to one terminal). Using Virtual Terminals 1 – 4 (F973 – F976) is required to use this function.

In the example below, the ST terminal assignment and the F terminal assignment will be combined as one terminal to illustrate this feature. However, any two of the discrete output terminal assignments listed in Table 12 on pg. 257 may be combined in this manner.

Setup (Example)

1. Disable the My Function parameter at F977 to prevent the system from starting upon completion of the setup.
2. Assign the ST function to the S1 terminal (F115).
3. Assign the F function to Virtual Input Terminal 1 (F973).
4. Set Input Function Target 1 to 5 (F900). This setting assigns S1 as the control input terminal.
5. Set Output Function Assigned to 21 (F905). This setting is a command that writes the F115 selection (S1) to Virtual Input Terminal 1, activating both.
6. Enable the My Function parameter at F977 by selecting My Function Always On or selecting My Function With TB Signal.

If set to My Function Always On, the combination of ST and F are always On (both are connected to CC only during the S1 activation).

— Continued on next page —

Direct Access Number — **F977**

Parameter Type — **Selection List**

Factory Default — **None** (Disabled)

Changeable During Run — **No**

⚠ DANGER

This parameter must always be set to **None** at the start of the **My Function** setup and remain set to **None** until all of the **My Function** parameter settings have been confirmed as being correct.

If enabled for normal operation using settings **1** or **2**, the motor may start and engage the driven equipment unexpectedly upon receiving a **Run** signal during the **My Function** setup.

Combined Terminal Function (cont.)

If set to My Function With TB Signal, set a discrete input terminal to My Function Run Signal and connect it to CC to enable My Function. Connect S1 to CC to activate the ST+F function. A disconnection at either terminal will terminate the My Function programming (discrete input terminal My Function Run Signal is Anded with discrete input terminal S1).
Connect S1 to CC and the F-to-CC + the ST-to-CC functions will be carried out using only S1.
With the aforementioned setup completed, provide a Frequency Command (F004) and the motor will run at the commanded frequency.

Output terminals may also be combined to produce one output response to multiple conditions using the computational operators of Table 15 on pg. 262.

Assigning more than one function to a discrete output terminal provides two advantages: it effectively expands the number of input terminals, and it reduces the number of cables required to support the input/output functions (e.g., assigning Low-Speed Detection and Low Current Detection to one output terminal). Using Virtual Terminals 1 – 4 (F973 – F976) is required to use this function.

In the example below, the Low-Speed Signal (detection) terminal assignment and the Low Current Detection terminal assignment will be combined as one terminal output to illustrate this feature. However, any two of the discrete output terminal assignments listed in Table 12 on pg. 257 may be combined in this manner.

Setup (example)

1. Disable the My Function parameter at F977 to prevent the system from starting upon completion of the setup.
2. From Program ⇒ Direct Access ⇒ Unknown Numbers, select Enabled.
3. Set the OUT1 terminal (F130) to My Function Output 1 (222).
4. Set Input Function Target 1 (F900) to 1004 (Low-Speed Signal detection). See Table 12 on pg. 257 for a complete listing of available settings.
5. Set Input Function Target 2 (F902) to 1026 (Low Current Alarm). See Table 12 on pg. 257 for a complete listing of available settings.
6. Set Input Function Command 1 (F901) to AND (3). This setting assigns an operator to the Input Function Target 1 and the Input Function Target 2 settings.
7. Set Output Function Assigned (F905) to 1222. This setting will transfer the results of the logical AND to My Function Output 1 (OUT1).

— Continued on next page —

Direct Access Number — **F977**

Parameter Type — **Selection List**

Factory Default — **None** (Disabled)

Changeable During Run — **No**

DANGER

This parameter must always be set to **None** at the start of the **My Function** setup and remain set to **None** until all of the **My Function** parameter settings have been confirmed as being correct.

If enabled for normal operation using settings **1** or **2**, the motor may start and engage the driven equipment unexpectedly upon receiving a **Run** signal during the **My Function** setup.

Combined Terminal Function (cont.)

8. Enable the My Function parameter at F977 by selecting My Function Always On.

With the aforementioned setup completed in the example, once the Low-Speed Signal AND the Low Current Alarm are active, the OUT1 terminal is activated for the duration of the Low-Speed/Low Current condition.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the My Function parameter.

Direct Access Number — **F977**

Parameter Type — **Selection List**

Factory Default — **None** (Disabled)

Changeable During Run — **No**

⚠ DANGER

This parameter must always be set to **None** at the start of the **My Function** setup and remain set to **None** until all of the **My Function** parameter settings have been confirmed as being correct.

If enabled for normal operation using settings **1** or **2**, the motor may start and engage the driven equipment unexpectedly upon receiving a **Run** signal during the **My Function** setup.

Table 9. Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<tr><th colspan="2">Sel. No.</th><th rowspan="2">Terminal Selection Descriptions</th></tr>
<tr><th>NO</th><th>NC</th></tr>
<tr><td colspan="3">Note: NO/NC = Normally Opened/Normally Closed contact. NO/NC selection numbers are used when making system changes via communications.</td></tr>
<tr><td>0</td><td>1</td><td>Unassigned — No operation.</td></tr>
<tr><td>2</td><td>3</td><td>Forward — Provides a Forward run command.</td></tr>
<tr><td>4</td><td>5</td><td>Reverse — Provides a Reverse run command.</td></tr>
<tr><td>6</td><td>7</td><td>Standby — Enables the Forward and Reverse operation commands.</td></tr>
<tr><td>8</td><td>9</td><td>Reset — Resets the device and any active faults.</td></tr>
<tr><td>10</td><td>11</td><td>Preset Speed Bit 1 — Preset Speed Bit 1 is used as the LSB of the 4-bit nibble that is used to select a Preset Speed.</td></tr>
<tr><td>12</td><td>13</td><td>Preset Speed Bit 2 — Preset Speed Bit 2 is used as the second bit of the 4-bit nibble that is used to select a Preset Speed.</td></tr>
<tr><td>14</td><td>15</td><td>Preset Speed Bit 3 — Preset Speed Bit 3 is used as the third bit of the 4-bit nibble that is used to select a Preset Speed.</td></tr>
<tr><td>16</td><td>17</td><td>Preset Speed Bit 4 — Preset Speed Bit 4 is used as the MSB of the 4-bit nibble that is used to select a Preset Speed.</td></tr>
<tr><td>18</td><td>19</td><td>Jog Run — This terminal activates a Jog for the duration of the activation. The Jog settings may be configured at F260 – F262.</td></tr>
<tr><td>20</td><td>21</td><td>Emergency Off — Terminates the output signal from the ASD and may apply a brake if so configured. The braking method may be selected at F603.</td></tr>
<tr><td>22</td><td>23</td><td>DC Braking — The ASD outputs a DC current that is injected into the windings of the motor to quickly brake the motor.</td></tr>
<tr><td>24</td><td>25</td><td>ACC/DEC Switching — Activating the Accel/Decel Switching discrete input terminal allows for the selection of Accel/Decel profile 1 or 2.

See F504 for additional information on this terminal setting.

<table>
<tr><th>A/D SW Terminal</th><th>A/D Profile Selection</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td colspan="2">1 = Terminal Activated</td></tr>
</table>

The settings of the A/D selections 1 – 2 are performed at F009/F010 and F500/F501, respectively.

Accel/Decel profiles are comprised of the Accel/Decel settings, Pattern, and Switching Frequency.</td></tr>
<tr><td>28</td><td>29</td><td>V/f Switching Signal — Activating V/f Switching discrete input terminal allows for the selection of V/f switching profile 1 or 2.

<table>
<tr><th>V/f Switching Terminal</th><th>V/f Selection</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td colspan="2">1 = Terminal Activated</td></tr>
</table>

The settings of the V/f selections 1 – 2 are performed at parameters F014, F409, F016, and F600 (for selection 1) and F170-F173 (for selection 2).

V/f profiles are comprised of Base Frequency, Base Frequency Voltage, Manual Torque Boost, and Motor Overload Protection.</td></tr>
</table>

Table 9. Discrete Input Terminal Assignment Selections and Descriptions. (Cont)

Sel. No. NO	Sel. No. NC	Terminal Selection Descriptions
Note: NO/NC = Normally Opened/Normally Closed contact. NO/NC selection numbers are used when making system changes via communications.		
36	37	**PID Off** — Turns off **PID** control.
46	47	**External Thermal Error** — Causes an Over-Heat Trip (OH).
48	49	**Serial/Local Switch** (cancels serial priority) — Overrides any serial control and returns the Command and Frequency control to the settings of F003 and F004.
50	51	**Hold Direction** (3-Wire Stop) — Decelerates the motor to a stop.
52	53	**PID Differentiation/Integration Clear** — Clears the PID value.
54	55	**PID Forward/Reverse Switching** — Toggles the gradient characteristic of the feedback response of the **V/I** terminal during PID-controlled operation.
56	57	**Forced Continuous Operation** — Ignore PID control settings for the duration of activation.
58	59	**Fire Speed** — Runs Preset Speed 15 for the duration of the activation.
64	65	**My Function Run Signal** — Activates the configured My Function feature. See F977 for additional information on this parameter.
66	67	**Autotuning Signal** — Initiates the Autotune function. Set F400 to Autotuning by Input Terminal Signal.
70	71	**Servo Lock** — Holds the motor at 0 Hz until a **Run** command is received.
74	75	**kWH Meter Display Clear** — Clears the kWH meter display.
76	77	**Trace Back Trigger Signal** — Initiates the data Read/Store function of the Trace Selection parameter. See F740 for additional information on this feature.
80	81	**Damper Feedback** — Activation of this terminal indicates an open damper and enables the system for normal operation. This terminal connects to a damper-mounted Damper Open/ Damper Closed switch.
86	87	**Binary Data Write** — Writes the status of the discrete input terminals to the control board during binary input speed control.
88	89	**UP/DOWN Frequency** (up) — Increases the speed of the motor for the duration of activation until reaching the Upper-Limit setting or increases the speed of the motor in steps. See F264 for additional information on this feature.
90	91	**UP/DOWN Frequency** (down) — Decreases the speed of the motor for the duration of activation until reaching the Lower-Limit setting or decreases the speed of the motor in steps. See F264 for additional information on this feature.
92	93	**UP/DOWN Frequency** (clear) — While operating in the Up/Down Frequency speed control mode this terminal initiates a 0 Hz output command. If operating with an activated UP/DOWN Frequency (up or down) terminal, the output goes to the Lower-Limit (F013) setting.
94	95	**Dancer Correction Off** — Disables dancer correction.
98	99	**Forward/Reverse** — Operates in conjunction with another terminal being set to the Run/Stop (100/101) function. When configured to Run (Run/Stop to CC), the activation/deactivation of this terminal changes the direction of the motor.
100	101	**Run/Stop Command** — This terminal enables the motor to run when activated and disables the motor when deactivated.

Table 9. Discrete Input Terminal Assignment Selections and Descriptions. (Cont)

Sel. No. NO	Sel. No. NC	Terminal Selection Descriptions
Note: NO/NC = Normally Opened/Normally Closed contact. NO/NC selection numbers are used when making system changes via communications.		
102	103	**Commercial Power/ASD Switching** — Initiates the ASD-to-Commercial Power switching function. See F354 for additional information on this feature.
104	105	**Frequency Command Priority Switching** — Toggles frequency control to and from the settings of F004 and F207.
106	107	**V/I Terminal Priority** — Assigns Speed control to the V/I Terminal and overrides the F004 setting.
108	109	**Command Terminal Board Priority** — Assigns **Command** control to the Terminal Board and overrides the F003 setting.
110	111	**Parameter Edit Enable** — Allows for the override of the lock out parameter setting (F700) allowing for parameter editing (SELECTION NOT USED WITH THE Q9 Plus ASD).
122	123	**Fastest Deceleration Command** — Using dynamic braking (if enabled and supported), stops the motor at the fastest rate allowed by the load.
124	125	**Preliminary Excitation** — Applies an excitation current to the motor (holds shaft stationary) for the duration of the activation.
136	137	**Start-Stop HOA** — Activates the Auto Start-Stop operating mode in accordance with the settings of F385.
138	139	**Low Suction/No Flow Protection** — Will not allow the ASD to start if activated, or terminates the ASD output upon activation (if running) in the event of the loss of feed water or a closed output valve at the pump output.
140	141	**Sealing Water** — Once an adequate water supply is detected at the pump seal via a reed switch, activation enables the ASD for normal operations.
142	143	**Virtual Linear Pump Enable/Disable Switch** — Activation enables the Virtual Linear Pump function for normal operation. The Virtual Linear Pump function is disabled when the terminal is not active.
144	145	**TBA ON Float** — Activation runs the ASD at the setting of F390.
146	147	**TBA OFF Float** — Activation has a dual function: 1) Changes the operating mode from Process Hold to Direct. 2) Turns off the ASD.
148	149	**TBA Trigger Float** — Activation changes the operating mode from Process Hold to Direct.
150	151	**TBA Warning Float** — This input is typically connected to a float switch that, when activated, annunciates that the fluid level is now critical. The discrete output terminals OUT1 and/or OUT2 may be associated with the activation (set OUT1/OUT2 to TBA Alarm Float to activate an auxiliary system — i.e., aux pump, relief valve, audible/visual alarm, etc.).
152	153	**TBA Local-Off-Auto** — Activation enables Time-Based Alternation operation. Operates in conjunction with the setting of F417.
154	155	**V/Hz Rate Switching** — This function is not used with the Q9 Plus ASD.
156	157	**Manual Boost Switching** — Activation applies the torque boost setting of F016 and F172 to motor profiles 1 and 2, respectively, for the duration of the activation.

Table 10. Output Terminal Assignments for the **FP**, **AM**, **FM**, **MON1**, and **MON2** Output Terminals.

Output Meter Terminal Assignments and Display Item Selections			
Selection/Comm Number	**Terminal Assignment Name**	**Selection/Comm Number**	**Terminal Assignment Name**
0	Output Frequency	31	Data from Communications
1	Frequency Command	32	185% Meter Adjust Value
2	Output Current	33	250% Meter Adjust Value
3	DC Bus Voltage	34	Input Watt Hour
4	Output Voltage	35	Output Watt Hour
5	Compensated Frequency	45	Gain Display
6	Speed Feedback (Real-Time)	46	My Function Monitor 1 Without Sign
7	Speed Feedback (1 Sec Filter)	47	My Function Monitor 2 Without Sign
8	Torque	48	My Function Monitor 3 With Sign
9	Torque Command	49	My Function Monitor 4 With Sign
11	Torque Current	50	Signed Output Frequency
12	Excitation Current	51	Signed Frequency Command (pre-PI)
13	PID Feedback Value	52	Signed Compensated Frequency
14	Motor Overload Ratio	53	Signed Speed Feedback (Real-Time)
15	ASD Overload Ratio	54	Signed Speed Feedback (1 Sec Filter)
16	DBR Overload Ratio (not used)	55	Signed Torque
17	DBR Load Ratio (not used)	56	Signed Torque Command
18	Input Power	58	Signed Torque Current
19	Output Power	59	Signed PID Feedback Value
23	Option V/I (AI2 Option) Input	60	Signed RX Input
24	RR Input	61	Signed RX2 (AI1 Option) Input
25	V/I Input	62	Signed 100% Meter Adjust Value
26	RX Input	63	Signed 185% Meter Adjust Value
27	RX2 (AI1 Option) Input	64	Signed 250% Meter Adjust Value
28	FM Output	74	Analog Output MON1 (Extended I/O)
29	AM Output	75	Analog Output MON2 (Extended I/O)
30	100% Meter Adjust Value	76	Pulse Input RP (Extended I/O)

Table 11. My Function Input Function Target Selections.

Selection/ Communications Number	Terminal Assignment	Selection/Communications Number	Terminal Assignment
0	Unassigned	17	B12
1	Forward	18	B13
2	Reverse	19	B14
3	Standby	20	B15
4	Reset	21	Virtual Input Terminal 1
5	S1	22	Virtual Input Terminal 2
6	S2	23	Virtual Input Terminal 3
7	S3	24	Virtual Input Terminal 4
8	S4	25	Internal Terminal 1
9	LI1	26	Internal Terminal 2
10	LI2	27	Internal Terminal 3
11	LI3	28	Internal Terminal 4
12	LI4	29	Internal Terminal 5
13	LI5	30	Internal Terminal 6
14	LI6	31	Internal Terminal 7
15	LI7	32	Internal Terminal 8
16	LI8		

Table 12. Output Terminal Assignments, **My Function Input Setting** Assignments, and Parameter/Input Setting Numbers for the **FLA**/**B**/**C**, **O1A**/**O1B** (OUT1), **O2A**/**O2B** (OUT2), **OUT3** – **OUT6**, and **R1** – **R4**.

Discrete Output Terminal Assignment Selections					
Input Setting	Param. Setting	Function	Input Setting	Param. Setting	Function
1000	0	Lower-Limit Frequency	1096	96	Specified Data Output 3
1002	2	Upper-Limit Frequency	1098	98	Specified Data Output 4
1004	4	Low-Speed Signal	1100	100	Specified Data Output 5
1006	6	Acceleration/Deceleration Completion	1102	102	Specified Data Output 6
1008	8	Speed Reach Signal	1104	104	Specified Data Output 7
1010	10	Failure FL (All Trips)	1106	106	Light Load Detected
1012	12	Failure FL (Except EF, OCL, EPHO, and OL2)	1108	108	Heavy Load Detected
1014	14	Over-Current (OC) Alarm	1110	110	Positive Torque Limit
1016	16	ASD Overload (OL1) Alarm	1112	112	Negative Torque Limit
1018	18	Motor Overload (OL2) Alarm	1114	114	External Rush Suppression Relay Activated
1020	20	Over-Heat Alarm	1118	118	Completion of Stop Positioning
1022	22	Over-Voltage Alarm	1120	120	L-STOP
1024	24	Main Circuit (MOFF) Under-Voltage Alarm	1122	122	Power Failure Synchronized Operation
1026	26	Low-Current Alarm	1124	124	Traverse in Progress
1028	28	Over-Torque Alarm	1126	126	Traverse Deceleration Active
1030	30	DBR Overload Alarm (not used)	1128	128	Part Replacement Alarm
1032	32	Emergency Off Active	1130	130	Over-Torque Alarm
1034	34	Retry Active	1132	132	Frequency Command ½ Selection
1038	38	PID Deviation Limit	1134	134	Failure FL (Except Emergency Off)
1040	40	Run/Stop	1136	136	External Device 1
1042	42	Serious Failure (OCA, OCL, EF, Phase Failure)	1138	138	External Device 2
1044	44	Light Failure (OL, OC1, 2, 3, or OP)	1140	140	External Device 3
1046	46	Commercial Power/ASD Switching Output 1	1142	142	External Device 4
1048	48	Commercial Power/ASD Switching Output 2	1144	144	External Device 5
1050	50	Cooling Fan On/Off	1146	146	External Device 6
1052	52	Jogging Operation Active (Jog Run Active)	1148	148	Sealing Water
1054	54	EOI Keypad/Terminal Board Operation Switching	1150	150	NPSH/No Flow Alarm
1056	56	Cumulative Run-Time Alarm	1154	154	TBA Active
1058	58	ProfiBus/DeviceNet/CC-Link Communication Error	1156	156	TBA Alarm Float
1060	60	Forward/Reverse Switching	1158	158	Local/Remote Switching
1062	62	Ready for Operation 1	1160	160	Forced Operation (RUN)
1064	64	Ready for Operation 2	1162	162	Forced Operation (Fire Speed)
1066	66	POFF Alarm	1164	164	Under-Torque Detection
1070	70	Alarm Status Active	1166	166	Frequency Command From (RR/S4)

Table 12. Output Terminal Assignments, **My Function Input Setting** Assignments, and Parameter/Input Setting Numbers for the **FLA**/**B**/**C**, **O1A**/**O1B** (OUT1), **O2A**/**O2B** (OUT2), **OUT3** – **OUT6**, and **R1** – **R4**. (Cont)

Discrete Output Terminal Assignment Selections					
1072	72	Forward Speed Limit	1168	168	Frequency Command From (V/I)
1074	74	Reverse Speed Limit	1170	170	Frequency Command From (RX)
1076	76	ASD Healthy Output	1172	172	PTC Alarm Detection
1078	78	RS485 Communication Error	1174	174	Power Removal Signal
1080	80	Error Code Output 1	1176	176	V/I Input Wire Breakage
1082	82	Error Code Output 2	1178	178	Damper Command
1084	84	Error Code Output 3	1222	222	My Function Output 1
1086	86	Error Code Output 4	1224	224	My Function Output 2
1088	88	Error Code Output 5	1226	226	My Function Output 3
1090	90	Error Code Output 6	1228	228	My Function Output 4
1092	92	Specified Data Output 1	1230	230	My Function Output 5
1094	94	Specified Data Output 2	1232	232	My Function Output 6
1234	234	My Function Output 7	1246	246	My Function Output 13
1236	236	My Function Output 8	1248	248	My Function Output 14
1238	238	My Function Output 9	1250	250	My Function Output 15
1240	240	My Function Output 10	1252	252	My Function Output 16
1242	242	My Function Output 11	1254	254	Always Off
1244	244	My Function Output 12			

Table 13. Trace Back Data Selections.

Selection Number	Comm. Number	Trace (Monitor) Function	Resolution/Unit
0	FD00	Output Frequency	0.01 Hz
1	FD02	Frequency Command	0.01 Hz
2	FD03	Output Current	0.01%
3	FD04	DC Bus Voltage	0.01%
4	FD05	Output Voltage	0.01%
5	FD15	Compensated Frequency	0.01 Hz
6	FD16	Speed Feedback (Real-Time)	0.01 Hz
7	FD17	Speed Feedback (1 Sec Filter)	0.01 Hz
8	FD18	Torque	0.01%
9	FD19	Torque Command	0.01%
11	FD20	Torque Current	0.01%
12	FD21	Excitation Current	0.01%
13	FD22	PID Feedback Value	0.01 Hz
14	FD23	Motor Overload Ratio	0.01%
15	FD24	ASD Overload Ratio	0.01%
16	FD25	DBR Overload Ratio (not used)	1%
17	FD28	DBR Load Ratio (not used)	1%
18	FD29	Input Power	0.01 kW
19	FD30	Output Power	0.01 kW
23	FE39	V/I Option (AI2)	1%
24	FE35	RR Input	0.01%
25	FE36	V/I Input	0.01%
26	FE37	RX Input	0.01%
27	FE38	RX2 (AI1 Option) Input	1%
28	FE40	FM Output	0.01%
29	FE41	AM Output	0.01%
30	FE51	Signed 100% Meter Adjust Value	1%
31	FA51	Communication Data	N/A
32	FE50	Signed 185% Meter Adjust Value	1%
33	FE67	Signed 250% Meter Adjust Value	1%
34	FE76	Input Watt-Hour	0.01 kWhr
35	FE77	Output Watt-Hour	0.01 kWhr
45	0006/0671	FM/AM Gain Display	1
46	FE60	My Function Monitor 1 (Unsigned Value)	1
47	FE61	My Function Monitor 2 (Unsigned Value)	1
48	FE62	My Function Monitor 3 (Signed Value)	1
49	FE63	My Function Monitor 4 (Signed Value)	1

Table 14. **Input Function Target** Selections and the Associated Communications Number.

Input Setting/Communication Number				Function	Resolution/Unit
FM/AM/FP Input Setting	Comm. Number	Monitor Display Input Setting	Comm. Number		
2000	FD00	3000	FE00	Output Frequency	0.01 Hz
2002	FD02	3002	FE02	Frequency Reference	0.01 Hz
2003	FD03	3003	FE03	Output Current	0.01%
2004	FD04	3004	FE04	DC Bus Voltage	0.01%
2005	FD05	3005	FE05	Output Voltage	0.01%
2015	FD15	3015	FE15	Compensated Frequency	0.01 Hz
2016	FD16	3016	FE16	Speed Feedback (Real-Time) *(see Note 1)*	0.01 Hz
2017	FD17	3017	FE17	Speed Feedback (1 Sec Filter) *(see Note 1)*	0.01 Hz
2018	FD18	3018	FE18	Torque *(see Note 2)*	0.01%
2019	FD19	3019	FE19	Torque Command *(see Note 2)*	0.01%
2020	FD20	3020	FE20	Torque Current *(see Note 2)*	0.01%
2021	FD21	3021	FE21	Excitation Current	0.01%
2022	FD22	3022	FE22	PID Feedback Value	0.01 Hz
2023	FD23	3023	FE23	Motor Overload Ratio	0.01%
2024	FD24	3024	FE24	ASD Overload Ratio	0.01%
2025	FD25	3025	FE25	DBR Overload Ratio (not used)	1%
2028	FD28	3028	FE28	DBR Load Ratio (not used)	1%
2029	FD29	3029	FE29	Input Power	0.01 kW
2030	FD30	3030	FE30	Output Power	0.01 kW
		3031	FE31	Pattern Operation Group Number	0.1
		3032	FE32	Pattern Operation Cycles Remaining	1
		3033	FE33	Pattern Operation Preset Speed Number	1
		3034	FE34	Pattern Operation Preset Speed Time Remaining	0.1
2050	FD50			Light-Load High-Speed Load Torque Monitor 1	0.01%
2051	FD51			Light-Load High-Speed Load Torque Monitor 2	0.01%
		3035	FE35	RR Input	1%
		3036	FE36	V/I Input	1%
		3037	FE37	RX Input *(see Note 2)*	1%
		3038	FE38	RX2 (AI1 Option) Option Input *(see Note 2)*	1%

Note 1: If no PG feedback is used, an estimated speed value is displayed.

Note 2: My Function cannot process negative values. A negative value is processed by My Function as an absolute value.

Table 14. **Input Function Target** Selections and the Associated Communications Number. (Cont)

Input Setting/Communication Number				Function	Resolution/Unit
FM/AM/FP Input Setting	Comm. Number	Monitor Display Input Setting	Comm. Number		
		3039	FE39	RX2 (AI1 Option) Option Input	1%
		3040	FE40	FM Output	1
		3041	FE41	AM Output	1
3050	FE50			Communication Data Output 2	
3051	FE51			Communication Data Output 1	
3052	FE52			Communication Data Output 3	
3060	FE60			My Function Monitor 1 (Output of Unsigned Value)	
3061	FE61			My Function Monitor 2 (Output of Unsigned Value)	
3062	FE62			My Function Monitor 3 (Output of Signed Value)	
3063	FE63			My Function Monitor 4 (Output of Signed Value)	
		3066	FE66	Expansion I/O Card 1 CPU Version	
		3067	FE67	Expansion I/O Card 2 CPU Version	
		3076	FE76	Integral Input Power	0.01 kW
		3077	FE77	Integral Output Power	0.01 kW
		3084	FE84	16-Bit BIN/BCD Input Value	1

Note 1: If no PG feedback is used, an estimated speed value is displayed.

Note 2: My Function cannot process negative values. A negative value is processed by My Function as an absolute value.

Table 15. My Function Operator Selections.

My Function Computational Selections		
Input Function Command	Function Name	Function Description
0	NOP (No Operation)	Disables the My Function feature.
1	ST	Execute data read/transfer.
2	STN	Execute inverted data read/transfer.
3	AND	Logical product of A AND B.
4	ANDN	Logical product of A AND $\overline{B}$.
5	OR	Logical sum of A OR B.
6	ORN	Logical sum of A OR $\overline{B}$.
7	EQ	Compares data — Outputs 1 if Equal; 0 if not Equal.
8	NE	Compares data — Outputs 0 if Equal; 1 if not Equal.
9	GT	Compares data — Outputs 1 if A>B; 0 if A≤B.
10	GE	Compares data — Outputs 1 if A≥B; 0 if A<B.
11	LT	Compares data — Outputs 1 if A<B; 0 if A≥B.
12	LE	Compares data — Outputs 1 if A≤B; 0 if A>B.
13	ASUB	Outputs absolute difference between A and B — |A–B|
14	FB_ON_DELAY (Timer)	Enables the On response time delay settings of My Function Time Data 1 – 5 (F928 – F932) for My Function Data.
15	FB_OFF_DELAY (Timer)	Enables the Off response time delay settings of My Function Time Data 1 – 5 (F928 – F932) for My Function Data.
16	FB_COUNTER1 (Timer)	Outputs a 1 upon reaching the pulse count setting of F933.
17	FB_COUNTER2 (Timer)	Outputs a 1 upon reaching the pulse count setting of F934.
18	FB_PEEK_HOLD	Outputs the peak output value since powering up or since the last reset.
19	SET	Sets data.
20	RESET	Resets data.
21	CLR	Clears data.
22	CLRN	Retains data.

Alarms, Trips, and Troubleshooting

This section lists the available User Notification codes of the EOI display and provides information that assists the user in the event that an Alarm or 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). The code is displayed on the EOI for the duration of the activation.

If a user setting or a Q9 Plus 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 EOI display. Table 17 on pg. 264 lists the Alarm codes that may be displayed during operation of the Q9 Plus 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 (the result of a Fault) that disables the Q9 Plus ASD system and removes the 3-phase power from the motor in the event that a subsystem of the ASD is malfunctioning, or if one or more of the variables listed below exceeds its normal range in time and/or magnitude:

- Current,
- Voltage,
- Speed,
- Temperature,
- Torque, or
- Load.

See Table 18 on pg. 267 for a listing of the potential Faults/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 the TIC Customer Support Center 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?
- What is the EOI version?
- 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?

User Notification Codes

The User Notification codes are displayed as an indication that a system function or system condition is active. The code is displayed on the EOI for the duration of the activation.

Table 16. User Notification Codes.

LED Screen	LCD Screen	Description
Atn	Autotune Active	Autotune function is active.
LOFr	Virtual Linear Pump Low Frequency	Virtual Linear Pump function is operating at the Low-Frequency Limit setting.
nErr	No Error	No active errors.
PuMP	Virtual Linear Pump On	Virtual Linear Pump function is enabled and active.

Alarms

An Alarm is an indication that there is a system operating limit that is being exceeded and that a Fault may be imminent (not all ongoing alarms result in a fault) or to provide an indication that an operator error has occurred. An Alarm may be associated with an output terminal to notify the operator of the condition remotely, close a contact, or to engage a brake. At the least, an Alarm will cause an alarm code to appear on the EOI display

The active alarm may be displayed on the Alarm screen — some alarms are displayed on the Frequency Command screen. Press the Mode key if the alarm is displayed on the Frequency Command screen to scroll to the Alarm screen.

Table 17 lists the Alarm codes that may be displayed during operation of the Q9 Plus 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 the TIC Customer Support Center for further information on the condition and for an appropriate course of action.

In the event that multiple alarms are activated, only the first to be detected will be displayed.

Table 17. Alarms.

LED Screen	LCD Screen	Alarm Description	Possible Cause
* Reset ignored if active.			
4-20 mA	4-20 mA	4-20 Signal Loss.	• Misconnection, poor connection, or broken wire. • Improper programming at F201 and associated parameters.
AbFL	Low Suction/No Flow Cut Off	Running ASD producing no flow.	• **Low Suction/No-Flow Alarm** enabled at F450. • Loss of suction pressure or closed pump output valve. • Activated discrete input terminal set to Low Suction/No Flow Protection. • Pump cavitation. • ASD Upper-Limit Frequency run-time is equal to F484 time setting.
CM1	Comm Error	Communication Error Interruption.	• Improperly programmed ASD. • Improper communications settings. • Improperly connected cables.
CM2	Comm Error 2	Communication Error.	
dAMP	Damp	Damper Closed.	• Improper configuration/programming for Damper Control at discrete input terminals. • Damper motor failure. • Damper position switch failure.
E	Emergency Off	Emergency Off.	• Stop-Reset was pressed twice at the EOI. • E-OFF command was received remotely.
HLd	Heavy Load	Motor/ASD Over Loaded.	• Acceleration time is too short. • ASD is improperly matched to the application. • Excessive load.
LLd	Light Load	Light Load.	• ASD is improperly matched to the application.
* Reset ignored if active.			

Table 17. Alarms. (Continued)

LED Screen	LCD Screen	Alarm Description	Possible Cause
LLt	Lower Limit	Lower-Limit Time.	• Parameter F256 adjustment is required.
LtA	Part Replace	Part replacement alarm.	• Part Replacement Alarm at F634 timed out.
MOFF	Main Under-Volts	Under-Voltage (Main Circuit Power Supply).	• 3-phase input voltage low. • Defective control board. • Excessive load on power supply. • Under-Voltage/Ridethrough settings require adjustment. • Failed rectifier module. • PO–PA jumper missing or loose.
OC	Over-Current	ASD Output Current greater than F601 setting.	• Phase-to-phase short (U/T1, V/T2, or W/T3). • Defective IGBT (U/T1, V/T2, or W/T3). • ASD output to the motor is connected incorrectly. • ASD is attempting to start into a spinning motor after a momentary power loss. • Motor/machine is jammed. • Mechanical brake engaged while the ASD is starting or while running. • Acceleration/deceleration time is too short. • Voltage Boost setting is too high. • V/f setting adjustment is required. • Load fluctuations. • ASD is operating at an elevated temperature. • ASD/Motor is improperly matched. • ASD current exceeds 320% or 340% of the rated FLA on ASDs that are greater than 100 HP or that are 100 HP or less, respectively, during acceleration. • Normal when Automatic Accel/Decel active.
*OH	*Over-Heat	Over-Heating.	• ASD is operating at an elevated temperature. • ASD is too close to heat-generating equipment. • Cooling fan vent is obstructed. • Cooling fan is inoperative. • Internal thermistor is disconnected.
OJ	Run-Time Counter	User-set run-time counter exceeded.	• Type Reset is required; select Clear run timer.

* Reset ignored if active.

Table 17. Alarms. (Continued)

LED Screen	LCD Screen	Alarm Description	Possible Cause
*OL1	*ASD Overload	Load Requirement in Excess of the Capability of the ASD.	• Carrier frequency is too high. • Excessive load. • Acceleration time is too short. • DC damping rate is too high. • Motor is starting into a spinning load after a momentary power failure. • ASD is improperly matched to the application.
OLM	Motor Overload	Motor Overload.	• V/f setting requires adjustment. • Motor is locked. • Continuous operation at low speed. • Motor is improperly matched to the load.
OLSt	Soft Stall	Overload soft stall active.	• Soft Stall selection adjustment is required (F017).
*OP	*DC Over-Volts	DC Bus Voltage Exceeds Specifications.	• ASD is attempting to start into a spinning motor after a momentary power loss. • Incoming commercial power voltage level is above the specified range. • Deceleration time is too short. • Voltage spikes at the 3-phase input; install inductive filter. • Over-Voltage Stall feature is turned off. • System is regenerating. • Load fluctuations. • Normal when Automatic Accel/Decel active.
Ot	Over-Torque	Torque requirement in excess of the setting of F616 or F617 for a time longer than the setting of F618.	• ASD is improperly matched to the application. • Parameter F616 or F617 setting is too low. • Obstructed load.
*POFF	*DC Under-Volts	Under-Voltage Condition at the 5, 15, or the 24 VDC supply.	• Defective control board. • Excessive load on power supply. • Low input voltage.
PtC	Thermal Err	Option thermal sensor threshold exceeded.	• User-set thermal threshold setting of F646 is exceeded.
UC	Under-Current	Output current of the ASD is below the level defined at F611.	• Disable detection at F610. • Parameter F611 adjustment is required. • Motor not connected.

Trips

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 or a parameter setting has been exceeded.

Listed in Table 18 are Faults that may be displayed at the EOI and the possible causes. When a Trip is incurred, the system displays the Fault screen. The Fault screen displays the active Fault.

Note: *See FC90 of the Q9 Plus ASD for the communications error code number of the active fault.*

Table 18. Fault Codes

LED Screen	LCD Screen	Fault Description	Possible Cause
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 cleared.*			
AbFL	Low Suction/No Flow Cut Off	Running ASD producing no flow.	• Low Suction/No-Flow Trip enabled at F450. • Loss of suction pressure or closed pump output valve. • Activated discrete input terminal set to Low Suction/No Flow Protection. • Pump cavitation. • ASD Upper-Limit Frequency run-time is equal to F484 time setting.
E	Emergency Off	Emergency Off command received via keypad or remotely. Output signal from the ASD is terminated.	• Stop-Reset was pressed twice at the EOI. • E-Off command was received remotely. • Select stopped method at F603.
E- 10	Analog In OV	Analog input terminal over-voltage.	• Mis-wire at the ASD input terminals.
E- 12	Encoder Loss	Encoder loss.	• Encoder signal is not received.
E- 13	Over-Speed	Speed error (over-speed).	• 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.
E- 18	Analog In Loss	Analog input loss.	• V/I input terminal configured for operation but the voltage/current input is either missing or low. • Over-current at P24.
E- 19	Abnormal CPU2	Abnormal CPU2 communication.	• Contact TIC Customer Support Center.
E-21	Stack Err	Stack overflow error.	• Contact TIC Customer Support Center.
E-22	Discrete In Volts	Improper input voltage level at discrete input terminal.	• Discrete input terminal configured for operation and the input activation voltage level is out of specification.

Table 18. Fault Codes (Continued)

LED Screen	LCD Screen	Fault Description	Possible Cause
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 cleared.			
E-26	CPU Fault	CPU fault.	• Contact TIC Customer Support Center.
EEP1	EEPROM Write Err	EEPROM fault (writing error).	• Contact TIC Customer Support Center.
EEP2, EEP3	Ctrl Read Err	Initial read error (parameter initialization).	• Contact TIC Customer Support Center.
EF1, EF2	Ground Fault	Ground fault.	• Mis-wired ground. • Loose ground connection.
EPH0	Output Phase	Output phase failure.	• Mis-wired output phase. • Loose or missing output phase connection.
EPH1	Input Phase	Input phase failure.	• Mis-wired input phase. • Loose input phase connection.
Err2	ASD RAM Fault	ASD RAM fault.	• Contact TIC Customer Support Center.
Err3	ASD ROM Fault	ASD ROM fault.	• Contact TIC Customer Support Center.
Err4	ASD CPU Fault	CPU fault.	• CPU malfunction. • Control board malfunction. • Contact TIC Customer Support Center.
Err6	Gate Array Fault	Gate array fault.	• Defective gate array or gate array malfunction. • Contact TIC Customer Support Center.
Err7	Current Err	Current detection hardware error.	• Improper low-current detection level setting. • Motor (phase) is disconnected.
Err8	Net Card Err	Network option card error.	• Optional device malfunction. • Improper system settings (at ASD or optional device). • Loose or improper connection.
Etn	Autotuning Err	Autotuning error except Etn1, Etn2, or Etn3.	• Autotune readings are inconsistent with the configuration information. • Non-3-phase motor is being used. • Improper settings at F400 or F410 – F413. • Using a motor that has a significantly smaller rating than the ASD. • ASD output cabling is too small, too long, or is being housed in a cable tray with other cables that are producing an interfering EMF. • Motor is running during the Autotune function. • Motor not connected.

Table 18. Fault Codes (Continued)

LED Screen	LCD Screen	Fault Description	Possible Cause
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 cleared.			
Etn1	Torque Boost Err	Autotuning Error — Torque boost error.	• Improper setting at F410.
Etn2	Leak Inductance Err	Autotuning Error — Leak inductance error.	• Improper setting at F412.
Etn3	Motor Rating Err	Autotuning Error — Motor rating error.	• Improper setting at F405, F406, or F407.
EtYP	ASD Type Error	ASD type error.	• Firmware information (typeform) loaded into the Application Board is inconsistent with the typeform information loaded into the Motor Control Board. • Application Board or Motor Control Board is defective.
OC1, OC1P	Over-Current Acc	Over-current during acceleration.	• V/f setting needs to be adjusted. • Restart from a momentary power outage. • The ASD is starting into a rotating motor. • ASD/Motor is improperly matched to the application. • Phase-to-phase short (U/T1, V/T2, or W/T3). • Acceleration time is too short. • Voltage Boost setting is too high. • Motor/machine is jammed. • Mechanical brake is engaged while the ASD is running. • ASD current exceeds 320% or 340% of the rated FLA on ASDs that are greater than 100 HP or that are 100 HP or less, respectively, during acceleration.
OC2, OC2P	Over-Current Dec	Over-current during deceleration.	• Phase-to phase short (U/T1, V/T2, or W/T3). • Deceleration time is too short. • Motor/machine is jammed. • Mechanical brake is engaged while the ASD is running. • ASD current exceeds 320% or 340% of the rated FLA on ASDs that are greater than 100 HP or that are 100 HP or less, respectively, during acceleration.

Table 18. Fault Codes (Continued)

LED Screen	LCD Screen	Fault Description	Possible Cause
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 cleared.			
OC3, OC3P	Over-Current Run	Over-current during fixed speed operation.	• ASD/Motor is improperly matched to the application. • Load fluctuations. • ASD is operating at an elevated temperature. • ASD current exceeds 320% or 340% of the rated FLA on ASDs that are greater than 100 HP or that are 100 HP or less, respectively, during acceleration.
OCA1	U-Phase OC	U-phase over-current.	• Low impedance at the U/T1 phase. • IGBT failure.
OCA2	V-Phase OC	V-phase over-current.	• Low impedance at the V/T2 phase. • IGBT failure.
OCA3	W-Phase OC	W-phase over-current.	• Low impedance at the W/T3 phase. • IGBT failure.
OCL	Output Short	Output short circuit at U-V-W phases.	• ASD is starting into a rotating motor. • ASD/Motor is improperly matched to the application. • Phase-to-phase short (U/T1, V/T2, or W/T3). • Acceleration time is too short. • Voltage Boost setting is too high. • Motor/machine is jammed. • Mechanical brake is engaged while the ASD is running. • Short Circuit Detection adjustment is required (F613). • ASD current exceeds 320% or 340% of the rated FLA on ASDs that are greater than 100 HP or that are 100 HP or less, respectively, during acceleration. • Motor winding short. • Phase-to-phase short or phase-to-ground short external to the ASD.

Table 18. Fault Codes (Continued)

LED Screen	LCD Screen	Fault Description	Possible Cause
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 cleared.			
OH2	Option Over-Heat	Over temperature error at PTC1 or PTC2 (see F637 and F638).	• Over temperature condition detected by option board.
OL1	ASD Overload	ASD overload.	• Acceleration time is too short. • DC Injection current is too high. • V/f setting needs to be adjusted. • Motor is running during restart. • ASD/motor is improperly matched to the application.
OP1	Over-Voltage Acc	Over-voltage during acceleration.	• Motor is running during restart.
OP2	Over-Voltage Dec	Over-voltage during deceleration.	• Deceleration time is too short. • Stall prevention is disabled. • 3-phase input voltage is out of specification. • Input reactance is required.
OP3	Over-Voltage Run	Over-voltage during fixed speed operation.	• Load fluctuations. • 3-phase input voltage out of specification.
Ot	Over-Torque	Over-torque.	• Output torque requirement in excess of the F616 or F617 settings for a time longer than the F618 setting.
SOUt	Step-Out (PM)	Step-out (for PM motors only).	• Contact TIC Customer Support Center.
UC	Low-Current	Low-current operation.	• Improper low-current detection level setting.

Viewing Trip Information

When a trip occurs, the resultant error information may be viewed either from the LED screen, LCD Fault screen, Monitor screen, or the Trip History screen (Program ⇒ Utilities ⇒ Trip History).

Trip Record at Monitor Screen

An active trip is displayed at the Monitor screen. Once cleared, NERR is displayed to indicate that there are No Errors.

Note: An improper Q9 Plus ASD setup may cause some trips — reset the ASD to the Factory Default settings from the following location before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Reset ⇒ Reset to Factory Settings).

Trip History

The Trip History screen records the system parameters for up to 20 trips. The recorded trips are numbered from zero to 19. Once the Trip History record reaches trip number 19, 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 as At-trip Recorded Parameters (parameter readings at the time that the trip occurred).

Table 19. Trip History Record Parameters.

At-trip Recorded Parameters			
1) Trip Number	8) Frequency Reference	15) Feedback (1 sec.)	22) ASD Overload
2) Trip Type	9) Bus Voltage	16) Torque	23) DBR Overload
3) Time and Date	10) Discrete Input Status	17) Torque Reference	24) Motor Load
4) Frequency at Trip	11) OUT1/OUT2/FL Status	18) Torque Current	25) ASD Load
5) Output Current	12) Timer	19) Excitation Current	26) DBR Load
6) Output Voltage	13) Post Compensation Frequency	20) PID Value	27) Input Power
7) Direction	14) Feedback (inst.)	21) Motor Overload	28) Output Power
Note: Trip records are comprised of the full list of monitored parameters (28).			

Clearing a Trip

Once the cause of the trip has been corrected, performing a Reset re-enables the Q9 Plus ASD for normal operation.

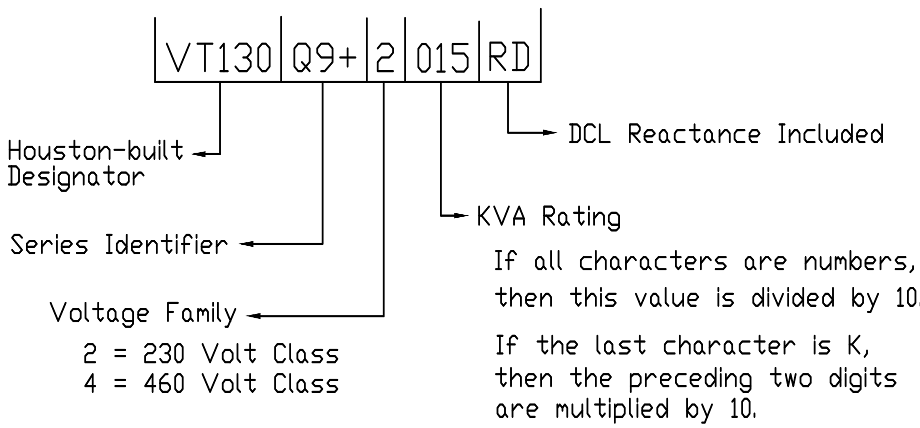
The record of a trip may also be cleared using one of the following methods:

- Cycling power (trip info may be saved via F602 if desired),
- Pressing the Stop-Reset key twice,
- Remotely via the communications channel,
- Momentarily connecting terminal RES to CC of the Terminal Board, or
- Via Program ⇒ Utilities ⇒ Type Reset: Clear Past Trip (clears Monitor screen records only).

Part Numbering Convention

The part numbering convention and the enclosure dimensions for the available models (typeforms) are listed below.

Use the part numbering convention to identify the ASD typeform and for placing orders.



Note: The Type 1 enclosed versions of these drives meet or exceed the specification UL 50- 1995, the Standard for Heating and Cooling Equipment, and complies with the applicable requirements for installation in a compartment handling conditioned air.

Note: All Toshiba ASD enclosures carry an IP20 rating.

Enclosure Dimensions

Table 20. 230-Volt Q9 Plus ASD Systems.

<table>
<tr><th rowspan="2">Frame</th><th rowspan="2">ASD HP Rating</th><th rowspan="2">Model No. VT130Q9+</th><th rowspan="2">Enclosure Figure Number</th><th rowspan="2">A Width (in/mm)</th><th rowspan="2">B Height (in/mm)</th><th rowspan="2">C Depth (in/mm)</th><th colspan="7">Mounting Hole Dimensions (in/mm)</th></tr>
<tr><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th><th>R1</th><th>R2</th></tr>
<tr><td rowspan="2">2</td><td>1</td><td>2015</td><td rowspan="8">Figure 39.</td><td rowspan="2">5.1/130</td><td rowspan="2">10.0/254</td><td rowspan="2">6.0/152</td><td rowspan="2">8.7/220</td><td rowspan="2">4.5/114</td><td colspan="3" rowspan="16">N/A</td><td rowspan="5">0.098/ 2.5</td><td rowspan="4">0.217/5.5</td></tr>
<tr><td>2</td><td>2025</td></tr>
<tr><td rowspan="2">3</td><td>3</td><td>2035</td><td rowspan="2">6.1/155</td><td rowspan="2">11.1/281</td><td rowspan="3">6.5/164</td><td rowspan="2">9.8/249</td><td rowspan="2">5.4/138</td></tr>
<tr><td>5</td><td>2055</td></tr>
<tr><td>4</td><td>7.5</td><td>2080</td><td>6.9/175</td><td rowspan="2">12.6/320</td><td rowspan="2">11.1/283</td><td>6.2/158</td><td>0.236/6.0</td></tr>
<tr><td>5A</td><td>10</td><td>2110</td><td>8.3/210</td><td>7.6/194</td><td>7.5/190</td><td rowspan="5">0.118/3.0</td><td rowspan="3">0.276/7.0</td></tr>
<tr><td rowspan="2">5B</td><td>15</td><td>2160</td><td rowspan="2">9.1/230</td><td rowspan="2">16.7/425</td><td rowspan="2">7.5/191</td><td rowspan="2">15.2/386</td><td rowspan="2">8.3/210</td></tr>
<tr><td>20</td><td>2220</td></tr>
<tr><td rowspan="2">6</td><td>25</td><td>2270</td><td rowspan="5">Figure 40.</td><td rowspan="2">9.4/240</td><td rowspan="2">16.5/420</td><td rowspan="2">8.3/212</td><td rowspan="2">15.9/403</td><td rowspan="2">8.1/206</td><td rowspan="2">0.295/7.5</td></tr>
<tr><td>30</td><td>2330</td></tr>
<tr><td rowspan="3">7B</td><td>40</td><td>2400</td><td rowspan="3">12.6/320</td><td rowspan="3">21.7/550</td><td rowspan="3">9.5/242</td><td rowspan="3">20.7/525</td><td rowspan="3">11.0/280</td><td rowspan="3">0.177/ 4.5</td><td rowspan="3">0.394/10</td></tr>
<tr><td>50</td><td>2500</td></tr>
<tr><td>60</td><td>2600</td></tr>
<tr><td rowspan="2">9</td><td>75</td><td>2750</td><td rowspan="7">Figure 42.</td><td rowspan="2">12.2/310</td><td rowspan="2">26.7/680</td><td rowspan="7">14.6/370</td><td rowspan="2">25.6/650</td><td rowspan="2">9.8/250</td><td rowspan="7">0.224/ 5.7</td><td rowspan="7">0.472/12</td></tr>
<tr><td>100</td><td>210K</td></tr>
<tr><td>10</td><td>125</td><td>212K</td><td>13.8/350</td><td>30.8/782</td><td>29.8/758</td><td>11.7/298</td></tr>
<tr><td rowspan="2">9</td><td>75</td><td>2750RD</td><td rowspan="2">12.2/310</td><td rowspan="2">36.2/920</td><td rowspan="2">25.6/650</td><td rowspan="2">9.8/250</td><td rowspan="3">5.9/ 150</td><td rowspan="2">3.0/ 75</td><td rowspan="3">9.5/ 240</td></tr>
<tr><td>100</td><td>210KRD</td></tr>
<tr><td>10</td><td>125</td><td>212KRD</td><td>13.8/350</td><td>40.2/1022</td><td>29.8/758</td><td>11.7/298</td><td>2.8/ 72</td></tr>
<tr><td colspan="14">RD Suffix = DCL Included.</td></tr>
</table>

Table 21. 460-Volt Q9 Plus ASD Systems.

<table>
<tr><th rowspan="2">Frame</th><th rowspan="2">ASD HP Rating</th><th rowspan="2">Model Number VT130Q9+</th><th rowspan="2">Enclosure Figure Number</th><th rowspan="2">A Width (in/mm)</th><th rowspan="2">B Height (in/mm)</th><th rowspan="2">C Depth (in/mm)</th><th colspan="7">Mounting Hole Dimensions (in/mm)</th></tr>
<tr><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th><th>R1</th><th>R2</th></tr>
<tr><td rowspan="3">2</td><td>1</td><td>4015</td><td rowspan="8">Figure 39.</td><td rowspan="3">5.1/130</td><td rowspan="3">10.0/254</td><td rowspan="3">6.0/152</td><td rowspan="3">8.7/220</td><td rowspan="3">4.5/114</td><td rowspan="22" colspan="3">N/A</td><td rowspan="6">0.098/2.5</td><td rowspan="5">0.217/5.5</td></tr>
<tr><td>2</td><td>4025</td></tr>
<tr><td>3</td><td>4035</td></tr>
<tr><td rowspan="2">3</td><td>5</td><td>4055</td><td rowspan="2">6.1/155</td><td rowspan="2">11.1/281</td><td rowspan="3">6.5/164</td><td rowspan="2">9.8/249</td><td rowspan="2">5.4/138</td></tr>
<tr><td>7.5</td><td>4080</td></tr>
<tr><td>4</td><td>10</td><td>4110</td><td>6.9/175</td><td rowspan="3">12.6/320</td><td rowspan="3">11.1/283</td><td>6.2/158</td><td>0.236/6.0</td></tr>
<tr><td rowspan="2">5A</td><td>15</td><td>4160</td><td rowspan="2">8.3/210</td><td rowspan="2">7.6/194</td><td rowspan="2">7.5/190</td><td rowspan="7">0.118/3.0</td><td rowspan="4">0.276/7.0</td></tr>
<tr><td>20</td><td>4220</td></tr>
<tr><td rowspan="2">5B</td><td>25</td><td>4270</td><td rowspan="3">Figure 40.</td><td rowspan="2">9.1/230</td><td rowspan="2">16.7/425</td><td rowspan="2">7.5/191</td><td rowspan="2">15.2/386</td><td rowspan="2">8.3/210</td></tr>
<tr><td>30</td><td>4330</td></tr>
<tr><td>6</td><td>40</td><td>4400</td><td rowspan="3">9.4/240</td><td>16.5/420</td><td>8.3/212</td><td>15.9/403</td><td rowspan="3">8.1/206</td><td rowspan="3">0.295/7.5</td></tr>
<tr><td rowspan="2">7A</td><td>50</td><td>4500</td><td rowspan="5">Figure 41.</td><td rowspan="2">21.7/550</td><td rowspan="2">9.5/242</td><td rowspan="2">20.8/529</td></tr>
<tr><td>60</td><td>4600</td></tr>
<tr><td rowspan="3">8</td><td>75</td><td>4750</td><td rowspan="3">12.6/320</td><td rowspan="3">24.8/630</td><td rowspan="3">11.4/290</td><td rowspan="3">23.8/605</td><td rowspan="3">11.0/280</td><td rowspan="3">0.177/4.5</td><td rowspan="3">0.394/10</td></tr>
<tr><td>100</td><td>410K</td></tr>
<tr><td>125</td><td>412K</td></tr>
<tr><td>9</td><td>150</td><td>*415K</td><td rowspan="12">Figure 42.</td><td>12.2/310</td><td>26.8/680</td><td rowspan="12">14.6/370</td><td>25.6/650</td><td>9.8/250</td><td rowspan="12">0.224/5.7</td><td rowspan="12">0.472/12</td></tr>
<tr><td>10</td><td>200</td><td>*420K</td><td>13.0/350</td><td>30.8/782</td><td>29.8/758</td><td>11.7/298</td></tr>
<tr><td>11</td><td>250</td><td>*425K</td><td>13.8/334</td><td rowspan="4">37.4/950</td><td rowspan="4">36.2/920</td><td>11.2/285</td></tr>
<tr><td rowspan="2">12</td><td>300</td><td>*430K</td><td rowspan="2">16.9/430</td><td rowspan="2">13.8/350</td></tr>
<tr><td>350</td><td>*435K</td></tr>
<tr><td>13</td><td>400</td><td>*440K</td><td>23.0/585</td><td>21.3/540</td></tr>
<tr><td>9</td><td>150</td><td>415KRD</td><td>12.2/310</td><td>26.8/680</td><td>25.6/650</td><td>9.8/250</td><td rowspan="6">5.9/150</td><td>3.0/75</td><td rowspan="6">9.5/240</td></tr>
<tr><td>10</td><td>200</td><td>420KRD</td><td>13.0/350</td><td>30.8/782</td><td>29.8/758</td><td>11.7/298</td><td>2.8/72</td></tr>
<tr><td>11</td><td>250</td><td>425KRD</td><td>13.8/334</td><td rowspan="4">37.4/950</td><td rowspan="4">36.2/920</td><td>11.2/285</td><td rowspan="4">3.0/75</td></tr>
<tr><td rowspan="2">12</td><td>300</td><td>430KRD</td><td rowspan="2">16.9/430</td><td rowspan="2">13.8/350</td></tr>
<tr><td>350</td><td>435KRD</td></tr>
<tr><td>13</td><td>400</td><td>440KRD</td><td>23.0/585</td><td>21.3/540</td></tr>
<tr><td colspan="14">* = Reactance NOT included; but, required (ACL or DCL).
RD suffix = DCL included.</td></tr>
</table>

Figure 39. See Table 20 and 21 for Actual Dimensions.

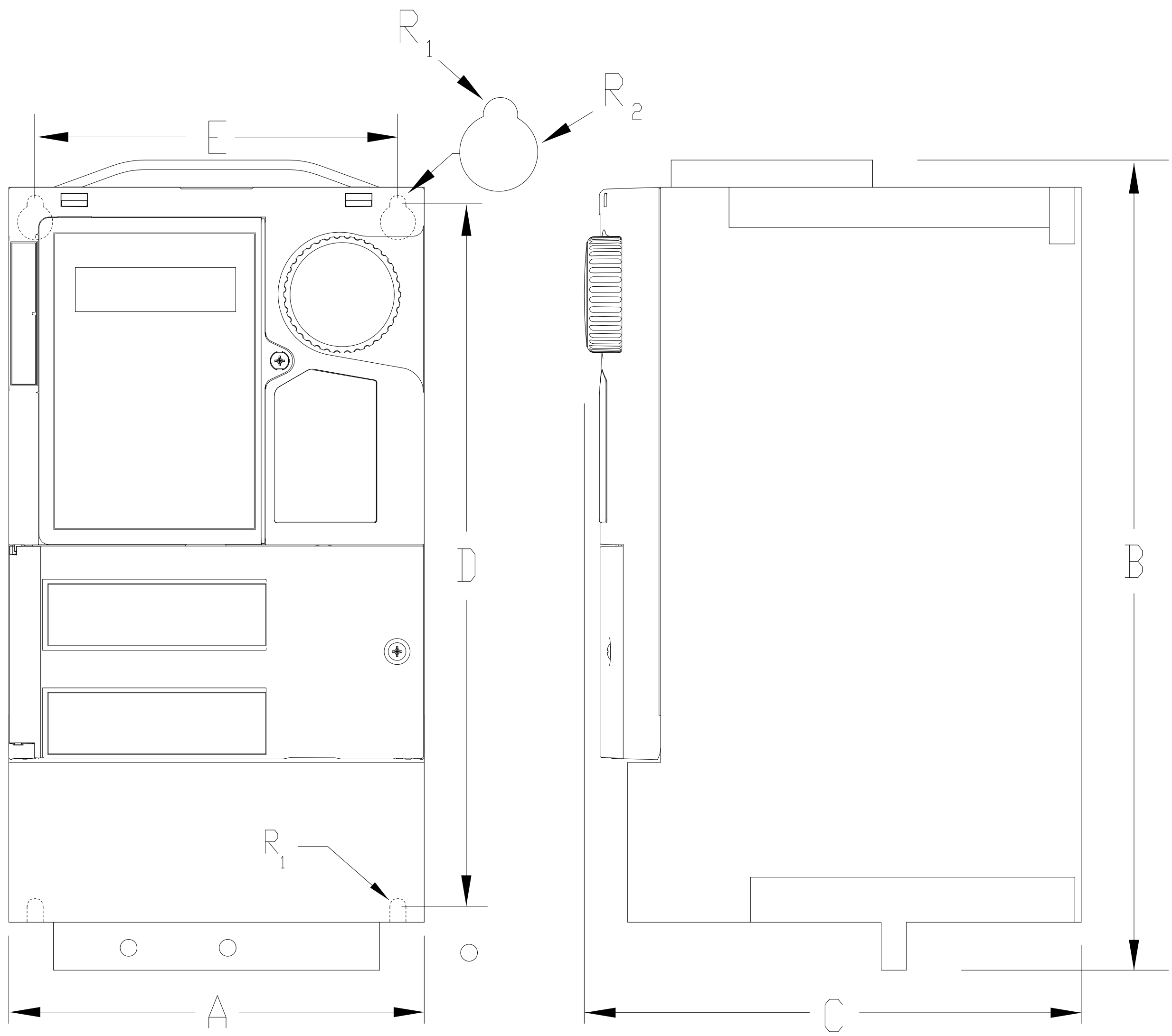


Figure 40. See Table 20 and 21 for Actual Dimensions.

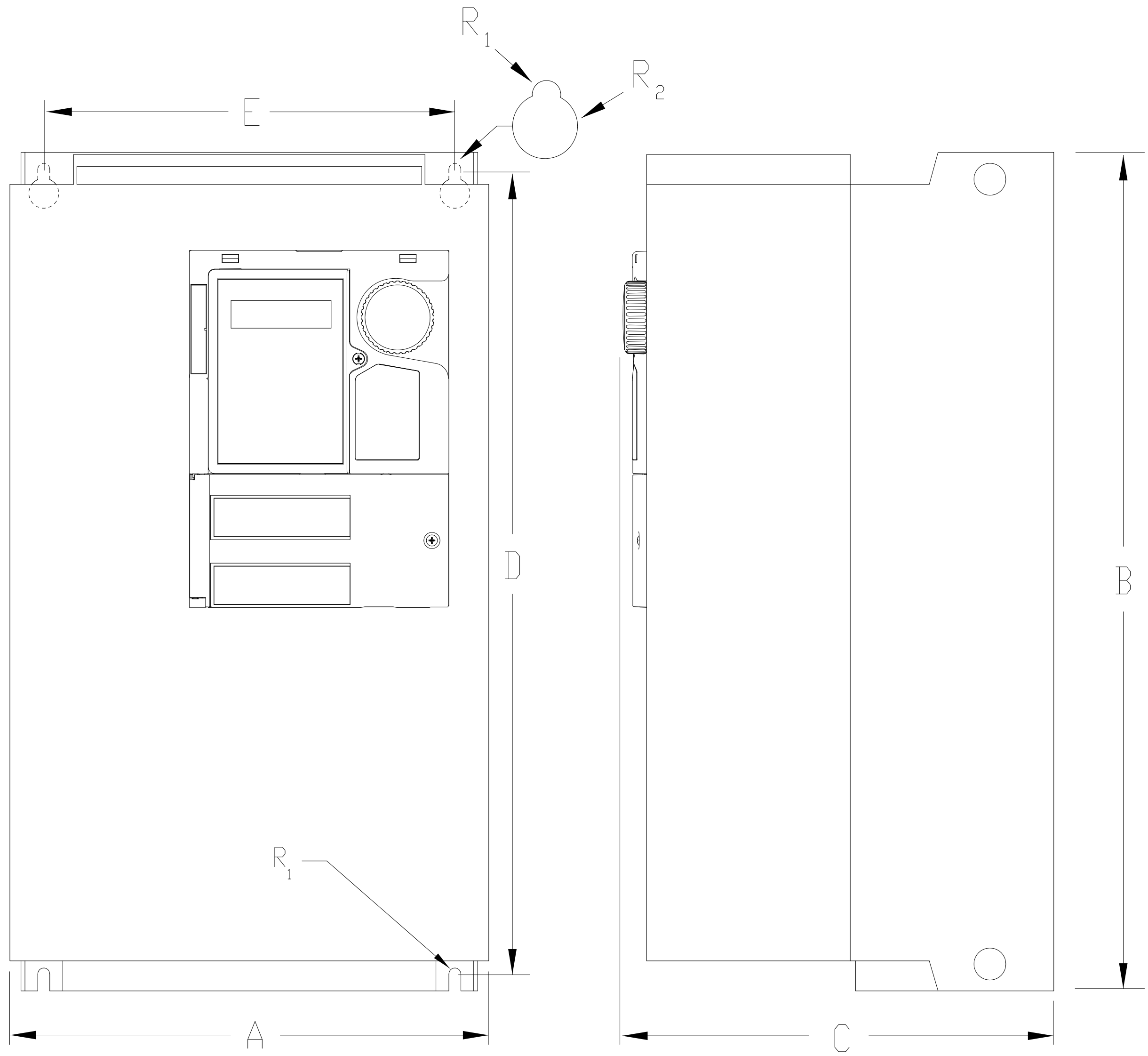


Figure 41. See Table 20 and 21 for Actual Dimensions.

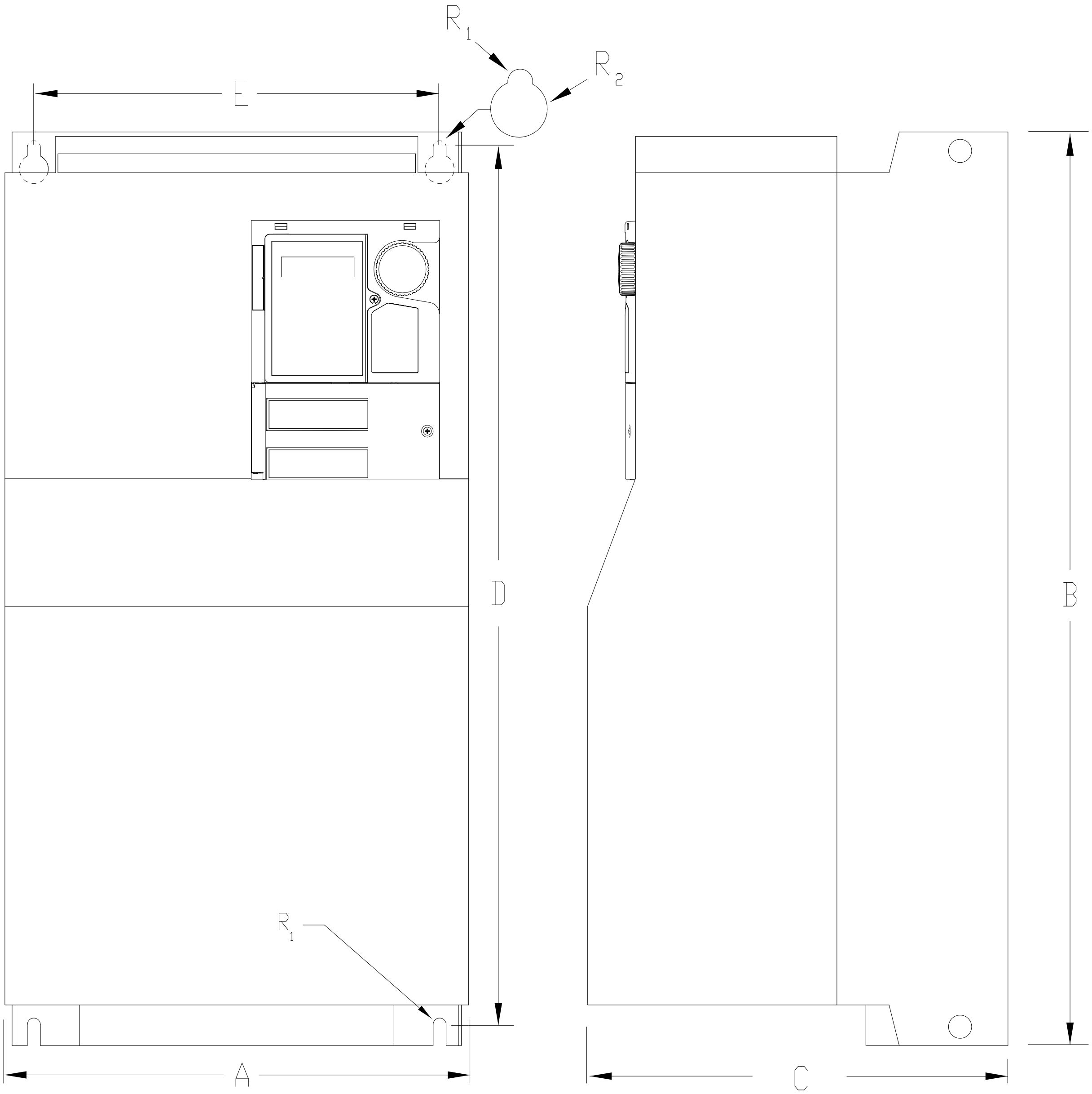
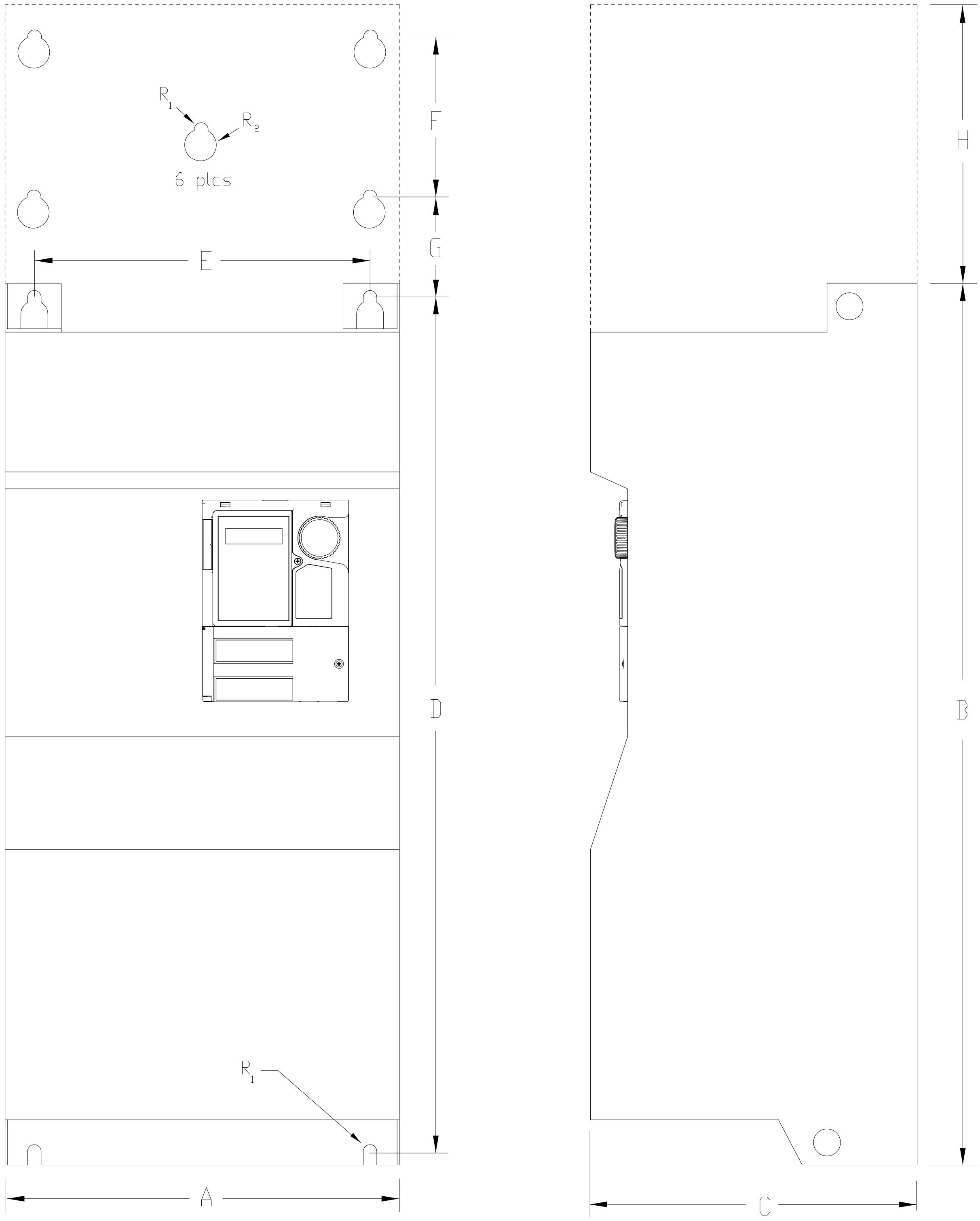


Figure 42. See Table 20 and 21 for Actual Dimensions.



Voltage/Current Specifications

Table 22. 230-Volt UL Type-1/IP-20 Chassis Standard Ratings Table.

Model Number VT130Q9+	100% Output Current Continuous	Overload Current 110% for 60 Seconds	Input Voltage 3-Ph 50/60 ± 2 Hz	Output Voltage 3-Ph Variable Frequency	Typical Motor HP
2015	4.8 A	5.3 A	200–240 VAC (±10%)	Input Voltage Level (Max.)	1.0
2025	7.8 A	8.6 A			2.0
2035	11.0 A	12.1 A			3.0
2055	17.5A	19.3 A			5.0
2080	25.3 A	27.8 A			7.5
2110	32.2 A	35.4 A			10
2160	48.3 A	53.1 A			15
2220	62.1 A	68.3 A			20
2270	78.2 A	86.0 A			25
2330	92.0 A	101 A			30
2400	120 A	132 A			40
2500	150 A	165 A			
2600	177 A	194.7 A			
2750	221 A	243.1 A			
210K	285 A	313.5 A			
212K	359 A	394.9 A			
2750RD	221 A	243.1 A			
210KRD	285 A	313.5 A			
212KRD	359 A	394.9 A			
Rd Suffix = DCL Included.					

Table 23. 460-Volt UL Type-1/IP-20 Chassis Standard Ratings Table.

Model Number VT130Q9+	100% Output Current Continuous	Overload Current 110% for 60 Seconds	Input Voltage 3-Ph 50/60 ± 2 Hz	Output Voltage 3-Ph Variable Frequency	Typical Motor HP
4015	2.1 A	2.3 A	380 – 480 VAC (±10%)	Input Voltage Level (Max.)	1.0
4025	3.4 A	3.7 A			2.0
4035	4.8 A	5.3 A			3.0
4055	7.6 A	8.4 A			5.0
4080	11.0 A	12.1 A			7.5
4110	14.0 A	15.4 A			10
4160	21.0 A	23.1 A			15
4220	27.0 A	29.7 A			20
4270	34.0 A	37.4 A			25
4330	40.0 A	44.0 A			30
4400	52.0 A	57.2 A			40
4500	65.0 A	71.5 A			50
4600	77.0 A	84.7 A			60
4750	96.0 A	106 A			75
410K	124 A	136 A			100
412K	156 A	172 A			125
415K	180 A	198 A			150
420K	240 A	264 A			200
425K	302 A	332 A			250
430K	361 A	397 A			300
435K	414 A	455 A			350
440K	477 A	525 A			400

Cable/Terminal Specifications

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

The following ratings are guidelines and shall not be the sole determining factor of the lug or wire size used with the Q9 Plus 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 Q9 Plus ASD.

Note: Cable/Terminal specifications are based on the rated current of the Q9 Plus ASD and Do Not include the 10% Service Factor.

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

Table 24. 230-Volt Q9 Plus ASD Cable/Terminal/Torque Specifications.

<table>
<tr><th rowspan="4">Model Number VT130Q9+</th><th colspan="2">Wire/Cable Size</th><th colspan="2">Lug Size Range</th><th>Terminal Board Wire Size</th><th colspan="2" rowspan="2">Torque</th></tr>
<tr><th colspan="5">AWG or kcmil</th></tr>
<tr><th colspan="2">Input/Output Power</th><th colspan="2">Wire-Size/Lug-Capacity for Input/Output Power</th><th colspan="3">In-Lbs./N·m</th></tr>
<tr><th>Recommended</th><th>Maximum</th><th>3Ø-Input</th><th>3Ø-Output</th><th>TB1 – 4 Terminals</th><th>3Ø-Input</th><th>3Ø-Output</th></tr>
<tr><td>2015</td><td>14</td><td>10</td><td colspan="2" rowspan="4">14 to 10</td><td rowspan="19">20
(3-core shield)

Torque to 5.3/
0.6</td><td colspan="2" rowspan="4">12.4/1.4</td></tr>
<tr><td>2025</td><td>14</td><td>10</td></tr>
<tr><td>2035</td><td>14</td><td>10</td></tr>
<tr><td>2055</td><td>10</td><td>10</td></tr>
<tr><td>2080</td><td>8</td><td>8</td><td colspan="2">12 to 8</td><td colspan="2" rowspan="2">26.6/3</td></tr>
<tr><td>2110</td><td>8</td><td>8</td><td colspan="2">10 to 4</td></tr>
<tr><td>2160</td><td>6</td><td>3</td><td colspan="2" rowspan="2">8 to 2</td><td colspan="2" rowspan="2">47.8/5.4</td></tr>
<tr><td>2220</td><td>4</td><td>3</td></tr>
<tr><td>2270</td><td>3</td><td>3</td><td colspan="2" rowspan="2">4 to 1/0</td><td colspan="2" rowspan="2">212/24</td></tr>
<tr><td>2330</td><td>2</td><td>2</td></tr>
<tr><td>2400</td><td>1/0</td><td>4/0</td><td colspan="2">2 to 300</td><td colspan="2">360/41</td></tr>
<tr><td>2500</td><td>1/0</td><td>4/0</td><td rowspan="2">6 to 250</td><td rowspan="2">2 to 300</td><td rowspan="2">275/31</td><td rowspan="2">168/19</td></tr>
<tr><td>2600</td><td>3/0</td><td>4/0</td></tr>
<tr><td>2750</td><td>*3/0</td><td>*4/0</td><td colspan="2" rowspan="6">6 to 250</td><td colspan="2" rowspan="6">275/31</td></tr>
<tr><td>210K</td><td>*3/0</td><td>*4/0</td></tr>
<tr><td>212K</td><td>*3/0</td><td>*4/0</td></tr>
<tr><td>2750RD</td><td>*3/0</td><td>*4/0</td></tr>
<tr><td>210KRD</td><td>*3/0</td><td>*4/0</td></tr>
<tr><td>212KRD</td><td>*3/0</td><td>*4/0</td></tr>
<tr><td colspan="8">Note: (*) Indicates that the item is one of a set of two (listed type) parallel cables.
RD Suffix = DCL Included.</td></tr>
</table>

Table 25. 460-Volt Q9 Plus ASD Cable/Terminal/Torque Specifications.

<table>
<tr><th rowspan="4">Model Number VT130Q9+</th><th colspan="2">Wire/Cable Size</th><th colspan="2">Lug Size Range</th><th>Terminal Board Wire Size</th><th colspan="2" rowspan="2">Torque</th></tr>
<tr><th colspan="5">AWG or kcmil</th></tr>
<tr><td colspan="2">Input/Output Power</td><td colspan="2">Wire-Size/Lug-Capacity for Input/Output Power</td><th colspan="3">In-Lbs./N·m</th></tr>
<tr><td>Recommended</td><td>Maximum</td><td>3Ø-Input</td><td>3Ø-Output</td><td>TB1 – 4 Terminals</td><td>3Ø-Input</td><td>3Ø-Output</td></tr>
<tr><td>4015</td><td>14</td><td>10</td><td colspan="2" rowspan="5">14 to 10</td><td rowspan="22">20
(3-core shield)

Torque to 5.3/0.6</td><td colspan="2" rowspan="5">12.4/1.4</td></tr>
<tr><td>4025</td><td>14</td><td>10</td></tr>
<tr><td>4035</td><td>14</td><td>10</td></tr>
<tr><td>4055</td><td>14</td><td>10</td></tr>
<tr><td>4080</td><td>14</td><td>10</td></tr>
<tr><td>4110</td><td>12</td><td>8</td><td colspan="2">12 to 8</td><td colspan="2" rowspan="3">26.6/3</td></tr>
<tr><td>4160</td><td>8</td><td>4</td><td colspan="2" rowspan="2">10 to 4</td></tr>
<tr><td>4220</td><td>8</td><td>4</td></tr>
<tr><td>4270</td><td>6</td><td>3</td><td colspan="2" rowspan="2">8 to 2</td><td colspan="2" rowspan="2">47.8/5.4</td></tr>
<tr><td>4330</td><td>6</td><td>3</td></tr>
<tr><td>4400</td><td>6</td><td>2</td><td colspan="2" rowspan="3">4 to 1/0</td><td colspan="2" rowspan="3">212/24</td></tr>
<tr><td>4500</td><td>4</td><td>2</td></tr>
<tr><td>4600</td><td>3</td><td>2</td></tr>
<tr><td>4750</td><td>1</td><td>4/0</td><td colspan="2" rowspan="3">2 to 300</td><td colspan="2" rowspan="3">360/41</td></tr>
<tr><td>410K</td><td>1/0</td><td>4/0</td></tr>
<tr><td>412K</td><td>3/0</td><td>4/0</td></tr>
<tr><td>415K</td><td>*1</td><td>*4/0</td><td colspan="2" rowspan="3">6 to 250</td><td colspan="2" rowspan="3">212/24</td></tr>
<tr><td>420K</td><td>*2/0</td><td>*250</td></tr>
<tr><td>425K</td><td>*4/0</td><td>*250</td></tr>
<tr><td>430K</td><td>*300</td><td>*350</td><td colspan="2" rowspan="3">4 to 350</td><td colspan="2" rowspan="3">360/41</td></tr>
<tr><td>435K</td><td>*350</td><td>*350</td></tr>
<tr><td>440K</td><td>**250</td><td>**350</td></tr>
</table>

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

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

Short Circuit Protection Recommendations.

230/240 and 400/480-Volt ASD Recommended Circuit Breaker Selection.

Model Number VT130Q9+	HP	Continuous Output Current (Amps)	Circuit Breaker Part Number
2015	1.0	4.8	Contact TIC Customer Support Center.
2025	2.0	7.8	
2035	3.0	11.0	HLL36025
2055	5.0	17.5	HLL36025
2080	7.5	25.3	HLL36040
2110	10	32.2	HLL36050
2160	15	48.3	HLL36070
2220	20	62.1	HLL36090
2270	25	78.2	HLL36100
2330	30	92.0	HLL36100
2400	40	120	HLL36125
2500	50	150	Contact TIC Customer Support Center.
2600	60	177	
2750	75	221	
210K	100	285	
212K	125	359	
2750RD	75	221	
210KRD	100	285	
212KRD	125	359	
4015	1.0	2.1	Contact TIC Customer Support Center.
4025	2.0	3.4	
4035	3.0	4.8	
4055	5.0	7.6	HLL36025
4080	7.5	11	HLL36040
4110	10	14	HLL36050
4160	15	21	HLL36070
4220	20	27	HLL36090
4270	25	34	HLL36100
4330	30	40	HLL36100
4400	40	52	HLL36125
4500	50	65	HLL36150
4600	60	77	JLL36200
4750	75	96	JLL36225
410K	100	124	JLL36250
412K	125	156	LIL36300
415K	150	180	LIL36300
420K	200	240	LIL36400
425K	250	302	LIL36400
430K	300	361	Contact TIC Customer Support Center.
435K	350	414	
440K	400	477	

Index

Numerics

A

B

C

D

E

F

L

M

N

O

P

Q

R

S

W

Toshiba International Corporation
Motors & Drives
13131 West Little York Road
Houston, Texas 77041 USA
Tel +713-466-0277
US 1-800-231-1412

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