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TOSHIBA INTERNATIONAL CORPORATION

April, 2020

ADJUSTABLE SPEED DRIVES

WX9 DN-68940-003

INSTALLATION & OPERATION MANUAL

WX9 ASD

Installation & Operation Manual

DN: 68940-003

April, 2020

Introduction

Congratulations on the purchase of the new WX9 Adjustable Speed Drive!

The WX9 Adjustable Speed Drive (ASD) is an 18-pulse PWM drive designed for use with three-phase AC induction motors. The drive has been designed with an 18-pulse front end to assist in compliance with the harmonic distortion limits of standard IEEE 519 1992 at the point of common coupling.

The WX9 ASD is equipped with Vector Control to provide 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 starts and highly efficient operation.

The WX9 ASD is also equipped with Virtual Linear Pump Technology. The Virtual Linear Pump Technology algorithm was designed to remove the guess work that is normally associated with the setup of pumping systems. It allows for direct, linear, and precise pump curve responses at any flow or pressure setting. This is accomplished without the normal concerns of the adverse effects of conventional pumping system control response curves.

Using Virtual Linear Pump Technology, the system seamlessly and easily adapts 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!

The WX9 ASD is a very powerful tool yet surprisingly simple to operate. The user-friendly Electronic Operator Interface (EOI) 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 WX9 ASD.

The WX9 ASD uses digitally-controlled pulse width modulation. The programmable functions may be accessed via the Program Menu, via Direct Access Numbers, or by using communications via a host PC. These features, combined with Toshiba's high-performance software, deliver unparalleled motor control and reliability.

This manual has been prepared for the WX9 ASD installer, user, and maintenance personnel. This manual may also be used as a reference guide or for training. To maximize the abilities of your new WX9 ASD, use this manual to develop a system familiarity before attempting to install, operate, or perform maintenance on the device.

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 WX9 Adjustable Speed Drive. Every effort has been made to provide accurate and concise information to you, our customer.

At Toshiba International Corporation, we are continuously striving 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 WX9 Adjustable Speed Drive. The information provided in this manual is applicable to the WX9 Adjustable Speed Drive only.

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

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

Included is a section on general safety instructions that describe the warning labels and symbols that are used on the device and 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 imperial units 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.

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Contacting the TIC 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 of 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 website at www.toshiba.com/tic/.

TOSHIBA INTERNATIONAL CORPORATION

WX9 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

Safety Information and Precautions

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 word **DANGER**, **WARNING**, or **CAUTION** is used in this manual, it will be followed by important safety information that must be carefully followed.

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.

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 and 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 product labels and user directions that are contained in this manual.

Warning labels that are attached to the equipment will include the exclamation mark within a triangle. **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 exist 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 who has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and who has received safety training on the hazards involved (refer to the latest edition of the NFPA 70E for additional safety requirements).

Qualified Personnel shall:

- Have carefully read the entire 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 additional 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 missing parts, parts that may have been damaged during shipping, and any concealed damage. If any discrepancies are discovered, it should be noted with the carrier prior to accepting the shipment, if possible. File a claim with the carrier if necessary and immediately notify the TIC Customer Support Center.
- **DO NOT** install the ASD if it is damaged or 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 **ONLY**. 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 receive 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 packaging 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 WX9 ASD is 32° to 104° F (0° to 40° C). Thermal specifications are model-specific.
- **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 should conform to the 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.

- 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 the NEC Article 110.13).
- **DO NOT** mount the ASD in a location that would produce catastrophic results if it were to become dislodged from its mounting location (equipment damage or injury).
- **DO NOT** mount the ASD in a location that would allow it to be exposed to flammable chemicals or 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. 10 for additional information on ventilation requirements.
- The ambient operating temperature range of the WX9 ASD is 32° to 104° F (0° 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 (“Requirements for Electrical Installations”), all regulations of the Occupational Safety and Health Administration, and any other applicable national, regional, or industry codes and standards.
- Installation practices should conform to the latest revision of the 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 in a manner that will protect personnel against electric shock.

Conductor Routing and Grounding Precautions

⚠ 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 the CC terminal as the return for analog input terminals VI, RX, and RR.
- Use the CC terminal as the return for output terminals FP, PP, and P24.
- Use the negative terminal of the AM, FM, and II terminals as the return for these analog inputs.
- Always ground the unit to prevent electrical shock and to help reduce electrical noise.
- If the ASD is being used in an ungrounded system (floating system) or in an unsymmetrically grounded system, the EMI filter must be disconnected or removed. The ASD may be damaged if the EMI filter is used under either of these conditions.
- 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 CONDUIT IS NOT AN ACCEPTABLE GROUND—

Power Connections Precautions

⚠ DANGER ⚠

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

- Turn off and lock-out/tag-out all power sources before proceeding to connect the power wiring to the equipment.
- Ensure that all power sources are turned off and isolated in accordance with established lock-out/tag-out procedures before connecting the three-phase power source wiring to the ASD input terminals and connect the ASD output terminals to a motor of the correct voltage and type for the application (refer to the NEC Article 300, “Wiring Methods,” and Article 310, “Conductors For General Wiring”). Size the branch circuit conductors in accordance with the NEC Table 310.16.
- Ensure that the three-phase input power is **NOT** connected to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- 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, W1, and a ground wire in one conduit and U2, V2, W2, and a ground wire in another; refer to the 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 the NEC Article 310 for adjustment factors).

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

- 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 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.
- If the ASD is supplied with a motor as a package, it then becomes a machine and has to meet the Essential Health and Safety Requirements of the EU Machinery Directive, 2006/42/EC. It is also a requirement that the system have an Emergency Off function that meets the requirements of EN ISO 13850:2008 and that any local or regional requirements must be met.
- It is the responsibility of the ASD installer/maintenance personnel to set up the Emergency Off braking system of the ASD. The function of the Emergency Off braking function is to remove output power from the ASD in the event of an emergency. A supplemental braking system may also be engaged in the event of an emergency. For additional information on braking systems, see parameters F250 - F253.

  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.

Residual Voltage Warning

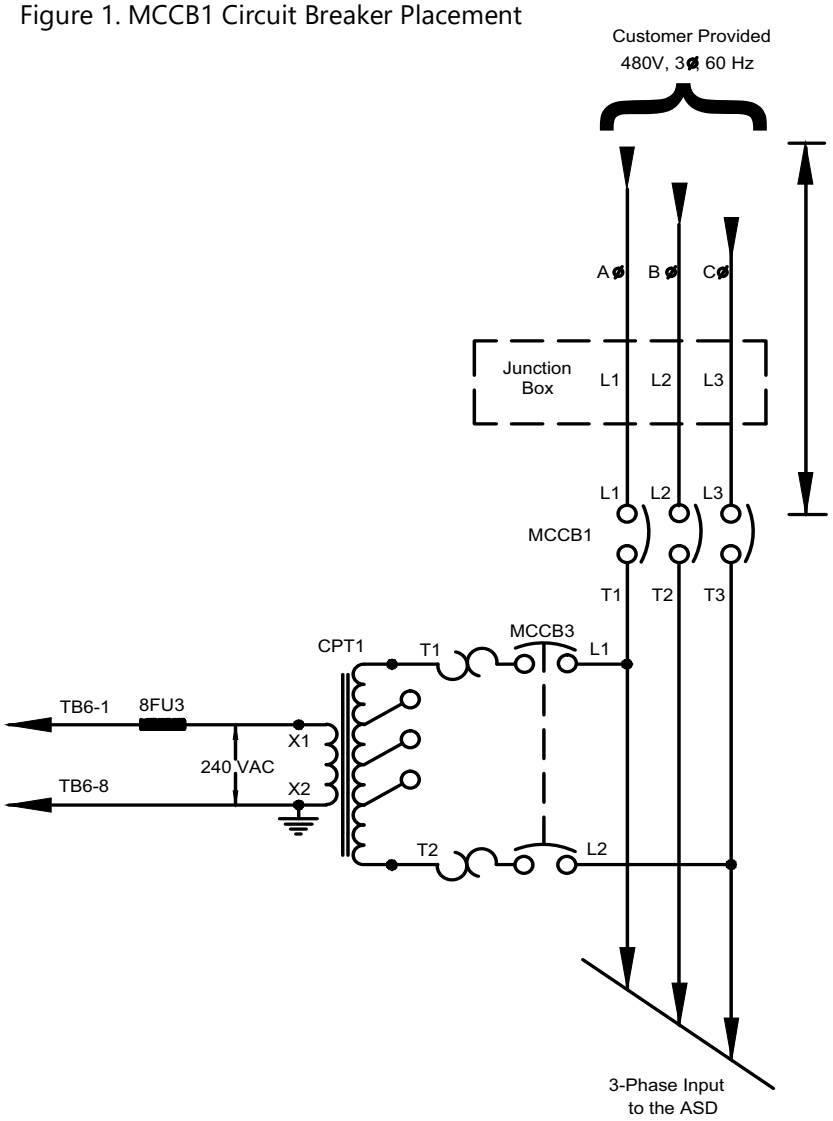
⚠ DANGER

—THREE-PHASE INPUT POWER IS APPLIED AT ALL TIMES—

Ensure that the three-phase power to the system is off and that the system is locked-out and tagged-out before performing maintenance or repair on the WX9 ASD system.

The relationship of MCCB1 to the total circuit is shown in Figure 1.

Figure 1. MCCB1 Circuit Breaker Placement



⚠ DANGER

Always energized.

Not affected by MCCB1 switch position.

MCCB1 effective at remainder of system.

Ensure that the system is locked-out and tagged-out before attempting to service the ASD system.

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 must be clearly posted at or near the machinery/ hazard.
- **DO NOT** allow personnel near electrical conductors. Contact with electrical conductors can be fatal. Warning signs to this effect must be clearly posted at or near the machinery/ hazard.
- Personal Protection Equipment (PPE) shall be provided and used to protect the installer, user, maintenance personnel, and all 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).
- Power factor improvement capacitors or surge absorbers **MUST NOT** be installed on the three-phase output of the ASD.
- Use of the built-in system protective features is highly recommended (i.e., Emergency Off, Overload Protection, etc.).
- The operating controls and system status indicators should be clearly readable and positioned where the operator can see them without obstruction.
- Additional warnings and notifications shall be posted at the equipment installation location as deemed required by Qualified Personnel.
- 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., Emergency 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 and Retry settings is a requirement to use this product.
- The setup procedures included within this manual may require a Reset before performing the procedure. Application-specific settings may then be performed. The pre-Reset conditions may be saved (see F007).
- There may be thermal or physical properties, or ancillary devices integrated into the overall system, that may allow for the ASD to start the motor without warning. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- 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 three-phase output of the ASD is active may result in equipment damage or injury to personnel.

Dynamic Braking Precaution

⚠ CAUTION

- The Dynamic Braking function is **NOT** used with the WX9 ASD.
- **DO NOT** attempt to configure or connect the DBR function to the WX9 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 performing any of the following:

  - inspecting or servicing the ASD,

  - removing any enclosure panels, or

  - connecting/disconnecting the power wiring to the equipment.

- During normal operation, turn the power on only after attaching (or closing) the front cover. **DO NOT** open or remove the front cover or any of the enclosure panels of the ASD when the power is on.
- 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 (equipment is powered) is required, it shall be performed by Qualified Personnel **ONLY**. Proper and approved personal protection equipment is to be used by the 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. Ensure that the ASD power has been turned off and wait at least the minimum time indicated on the enclosure-mounted label before coming into contact with any circuits. Qualified Personnel shall verify that the system capacitors have completely discharged.
- **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 — this includes food or liquids.
- 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 WX9 Adjustable Speed Drive should become familiar.

Motor Autotuning

Motor production methods may cause minor differences in the motor operation. The negative effects of these differences may be minimized by using the Autotune feature of the WX9 ASD. Autotuning is a function of the WX9 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 WX9 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.

The WX9 ASD is also equipped with a factory-loaded table of motor parameters that fit several different types of motors. To use this function, disable Autotune and select a motor type at F413.

Pulse Width Modulation Operation

The WX9 ASD uses a sinusoidal Pulse Width Modulation (PWM) control system. The output current waveform generated by the WX9 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 a WX9 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.

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 TIC VF motor (designed for use in conjunction with an ASD) is recommended.

Overload Protection Adjustment

The WX9 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 rated system current. This function protects the motor from overload.

The default setting for the overload detection circuit is set at the factory to the maximum rated current of the WX9 ASD. This setting will have to be adjusted to match the rating of the motor that is to be used with the WX9 ASD. To change the overload reference level, see Motor Overload Protection Level 1 on pg. 144.

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 three-phase output of the WX9 ASD.

If the WX9 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 WX9 ASD may cause the WX9 ASD to malfunction and trip, or the output device may cause an over-current condition resulting in damage to the device or the WX9 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 that 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: For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the Constant Torque, Variable Torque, or the 5-Point Setting modes. See F300 for more information on setting the carrier frequency for normal operation and for setting the carrier frequency above the derate threshold.

Motor/Load Combinations

When the WX9 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 WX9 ASD.
- An explosion-proof motor.

When using the WX9 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: For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the Constant Torque, Variable Torque, or the 5-Point Setting modes.

- If the motor is coupled to a load that has a large backlash or a reciprocating load, use one of the following procedures to stabilize its operation.
- Adjust the S-pattern Acceleration/Deceleration setting,
- If in the Vector control mode, adjust the response time, or
- Switch to the Constant Torque control mode.

WX9 ASD Characteristics

Over-Current Protection

Each WX9 ASD model was designed for a specified operating power range. The WX9 ASD will incur a trip if the design specifications are exceeded.

However, the WX9 ASD may be operated at 120% of the specified output-current range for a limited amount of time as indicated in the section titled Voltage/Current Specifications on pg. 199. Also, the Stall Prevention Level (F601) may be adjusted to help with nuisance over-current trips.

When using the WX9 ASD for an application that controls a motor which is rated significantly less than the maximum current rating of the WX9 ASD, the over-current limit setting will have to be changed to match the application. See Motor Overload Protection Level 1 (F601) for additional information on this ASD/motor configuration.

WX9 ASD Capacity

The WX9 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 WX9 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 WX9 ASD that is beyond that which the WX9 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 WX9 ASD while maintaining its robust performance.

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

See F402 on pg. 126 for additional information on using Vector Control.

Hand/Auto Operation

⚠ CAUTION

While running in the Hand mode at a non-zero speed, if the RJ45 connector is removed from the EOI, the WX9 ASD remains in the Hand mode running at the last commanded speed even though the Hand/Auto LED is off. The WX9 ASD output remains at the frequency of the Frequency Command field at the time of the disconnect for the duration of the disconnect.

Once reinserted, the reference frequency goes to 0 Hz.

To prevent this condition, before disconnecting the RJ45 connector, ensure that the WX9 ASD is off.

Installation and Connections

The WX9 Adjustable Speed Drive may be set up initially by performing a few simple configuration settings. To operate properly, the ASD must be securely mounted and connected to a power source (three-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 48570) to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 14 and Figure 6 on pg. 16).

Note: The optional ASD-Multicom boards may be used to expand the I/O functionality of the ASD. See the section titled WX9 ASD Optional Devices on pg. 201 for more information on the available options.

The output terminals of the ASD (U/T1, V/T2, and W/T3) must be connected to the motor that is to be controlled (see Figure 20 on pg. 23).

As a minimum, the installation of the ASD shall conform to the 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 Startup Wizard assists with the initial configuration of the WX9 ASD. The Startup Wizard may be launched from the Program Menu or configured to start automatically upon subsequent start ups. See the section titled Startup Wizard Requirements on pg. 50 for additional information.

Installation Notes

⚠ CAUTION

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

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, or 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.

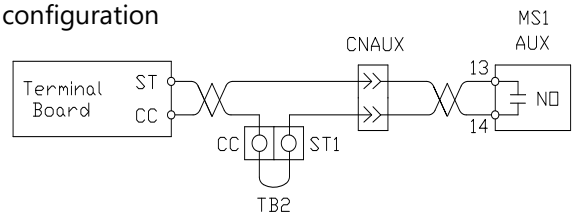
Note: Re-application of power via a secondary contact while the ASD is on or while the motor is still turning may cause ASD damage.

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

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

On some devices, the ST-to-CC connection is further enhanced by the operation of the MS1 AUX relay circuit. The MS1 AUX relay circuit is normally open and closes the ST-to-CC connection (via ST1) only after normal system power is available. The MS1 AUX relay circuit prohibits the ST-to-CC connection in the event that the MS1 contactor fails to close during start up or if MS1 opens while the ASD is running. This feature is available on the 75 HP and above systems.

Figure 2. ST activation using the MS1 AUX circuit configuration



The ASD input voltage should remain within 10% of the specified input voltage range. Input voltages approaching the upper or lower limit settings may require that the over-voltage and under-voltage stall protection level parameters, F626 and F629, be adjusted. Voltages outside of the permissible tolerance should be avoided.

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

DO NOT use an ASD with a motor that has a power rating that is greater than the rated output of the ASD.

The 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.

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 its ability to deliver torque and may result in damage to the motor and/or the driven equipment.

All WX9 ASDs are equipped with internal DC bus fuses. However, not all WX9 ASDs are equipped with internal primary power input fuses (HP dependent). When connecting two or more drives that have no internal fuse to the same power line as shown in Figure 3, it will be necessary to select a circuit-breaking configuration that will ensure that if a short circuit occurs in ASD 1, only MCCB2 trips—not MCCB1. If it is not feasible to use this configuration, insert a fuse between MCCB2 and ASD 1.

Mounting the ASD

CAUTION

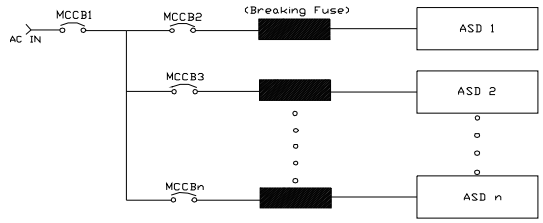
Install the unit securely to the floor in a well-ventilated area that is out of direct sunlight.

The ambient temperature rating for the WX9 ASD is from 32° to 104° F (0° to 40° C).

The process of converting AC to DC and then back to AC produces heat. During normal ASD operation, up to 5% of the input energy to the ASD may be dissipated as heat. If installing the ASD in a cabinet, ensure that there is adequate ventilation.

Note: Ensure that the ventilation openings are not obstructed.

Figure 3. Circuit breaker configuration.



DO NOT operate the ASD with the enclosure door open or with any enclosure panels removed.

When performing maintenance, **DO NOT** insert fingers into the holes of the enclosure.

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

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

Connecting the ASD

⚠ DANGER ⚠

CONTACT WITH THREE-PHASE INPUT/OUTPUT TERMINALS MAY CAUSE AN ELECTRICAL SHOCK RESULTING IN INJURY OR LOSS OF LIFE.

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

Power Connections

See Figure 20 on pg. 23 for a system I/O connectivity schematic.

R/L1, S/L2, and T/L3 are the three-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.

Connect the input and output power lines of the ASD as shown on pg. 12.

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.

PA/+ and PB are used for the DBR connection if using a braking resistor (not used with the WX9 ASD).

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

Ensure that the ASD power has been turned off and wait at least the minimum time indicated on the enclosure-mounted label before coming into contact with any circuits.

Power Connection Requirements

Connect the three-phase input power of the correct voltage to the input terminals of the ASD at R/L1, S/L2, and T/L3 (see Figure 4 for the typical electrical connection scheme and Figure 5 on pg. 13 for the terminal locations).

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. 199.

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

The ASD is designed and tested to comply with UL Standard 508C. Modifications to the ASD system may disqualify the UL rating.

As a minimum, the installation of the ASD shall conform to the 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.

CAUTION

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 (U, V, or W) connected to the motor.

Figure 4. WX9 ASD/Motor Typical Connection Diagram.

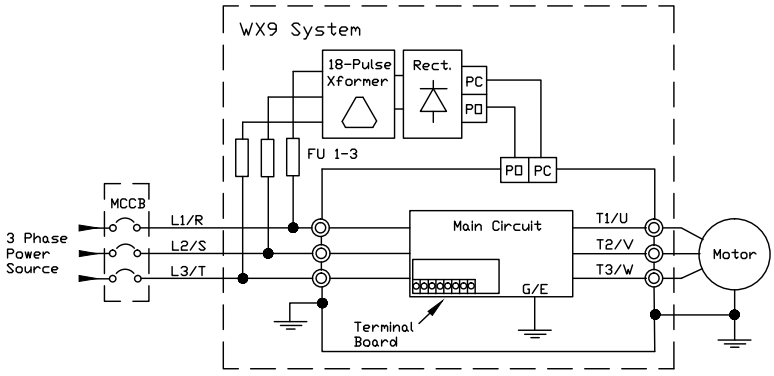
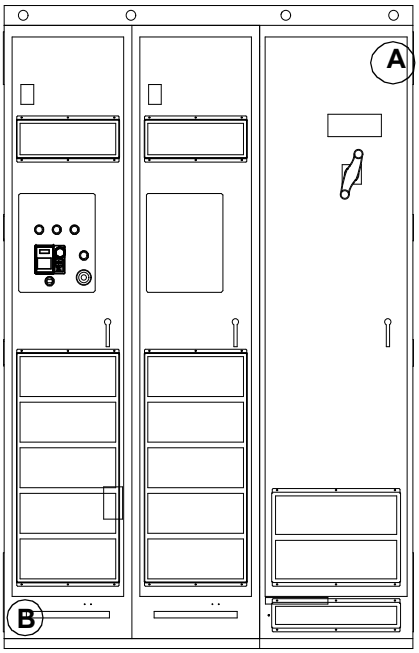
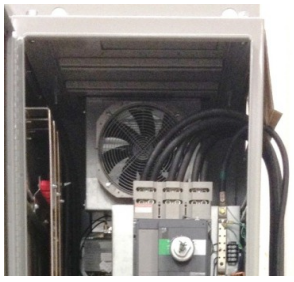


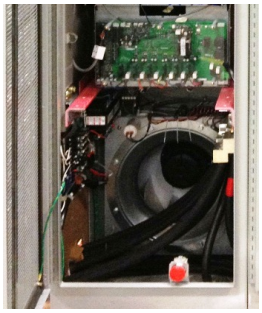
Figure 5. WX9 ASD Three-Phase Input/Output Terminals



A. 3-Phase Input (R,S, T)



B. 3-Phase Output (U,V, W)



Note: Connection shown is the typical three-phase input connection to the WX9 ASD. See the drawings supplied with the received ASD for specifics on the connectivity of the device being connected.

System Grounding

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

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

— METAL 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 — take steps to avoid the negative effects of noise. Listed below are some examples of measures that will help 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.
- Install noise filters as required.

Lead Length Specifications

Adhere to the NEC and any local codes during the installation of ASD/motor systems. Excessive lead lengths may adversely effect the performance of the motor. Special cables are not required. Lead lengths from the ASD to the motor in excess of those listed in Table 1 may require filters to be added to the output of the ASD. Table 1 lists the

suggested maximum lead lengths for the listed motor voltages.

Table 1. Lead Length Specifications.

Model	PWM Carrier Frequency	NEMA MG1 Part 31 Compliant Motors	NEMA MG1 Part 30 Compliant Motors
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.

For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the Constant Torque, Variable Torque, or the 5-Point Setting modes.

I/O and Control

The WX9 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 6 on pg. 16. Table 2 lists the names and the default settings of the input and output terminals of the Terminal Board. See the section titled Terminal Descriptions on pg. 16 for an expanded description of each terminal.

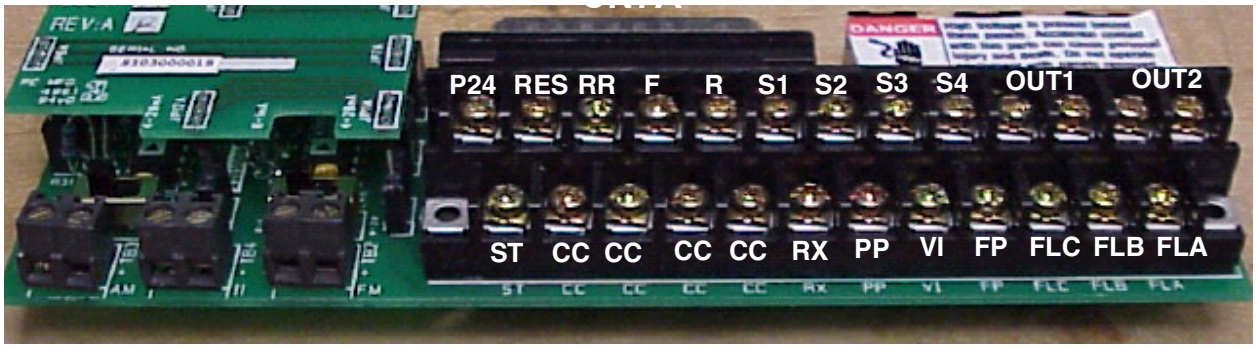
Note: Set the Command Mode to Terminal Board to use the input control lines of the Terminal Board for command input (Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board). Output lines of the Terminal Board need not be selected to enable the output. However, output lines may be set to a user-selected function.

Figure 20 on pg. 23 shows the typical connection diagram for the WX9 ASD system.

Table 2. Terminal Board Terminal Names and Functions.

Default Term. Setting	Input/ Output	Default Function (also see . WX9 ASD Terminal Board. on pg. 16)	Circuit Config.
ST	Discrete Input Connect to CC to activate (Sink mode). *Sink/Source* Switching applies to discrete input terminals only.	Standby — Multifunctional programmable discrete input. Activation required for normal ASD operation.	Figure 10 on pg. 21.
RES		Reset — Multifunctional programmable discrete input. Resets a faulted ASD.	
F		Forward — Multifunctional programmable discrete input.	
R		Reverse — Multifunctional programmable discrete input.	
S1		Preset Speed 1 — Multifunctional programmable discrete input.	
S2		Preset Speed 2 — Multifunctional programmable discrete input.	
S3		Preset Speed 3 — Multifunctional programmable discrete input.	
S4		Emergency Off — Multifunctional programmable discrete input.	
RR	Analog Input	RR — Multifunctional programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output).	Figure 11 on pg. 21.
RX		RX — Multifunctional programmable analog input (-10 to +10 VDC input — -80 to +80 Hz output).	Figure 12 on pg. 21.
II		II — Multifunctional programmable analog input (4 [0] to 20 mADC input — 0 to 80 Hz output).	Figure 13 on pg. 21.
VI		VI — Multifunctional programmable analog input (0 to 10 VDC input — 0 to 80 Hz output).	
AM	Analog Output	Produces an output voltage that is proportional to the magnitude of the function assigned to this terminal.	Figure 18 on pg. 21
FM			
OUT1(C-A)	Switched Output	Low Frequency — Programmable contact (N.O.).	Figure 16 on pg. 21.
OUT2(C-A)		Reach Frequency — Programmable contact (N.O.).	
FLA		Fault relay (N.O.).	Figure 19 on pg. 21.
FLB		Fault relay (N.C.).	
FLC		Fault relay (Common).	
FP	Pulsed Output	Frequency Pulse — an output pulse train that has a frequency based on the output frequency of the ASD.	Figure 17 on pg. 21.
P24	DC Output	24 VDC @ 50 mA output.	Figure 14 on pg. 21.
PP		PP — 10.0 VDC voltage source for the external potentiometer.	Figure 15 on pg. 21.
CC	—	Return for analog and discrete input terminals.	**DO NOT** connect to Earth Gnd.

Figure 6. WX9 ASD Terminal Board.



SW1 and SW2 may be switched to change the full-scale range of the FM and AM output terminals. See F670 and F005 for more information on the FM and AM terminal adjustments.

The remaining input and output terminals of the Terminal Board are shown.

Terminal Descriptions

Note: The programmable terminal assignments may be accessed and changed from the default settings as mapped on pg. 40 or via the Direct Access method: Program ⇒ Direct Access ⇒ applicable parameter number. See the section titled Program Menu Navigation on pg. 40 for the applicable Direct Access parameter numbers. For additional information on terminal assignments and default setting changes, see the section titled Default Setting Changes on pg. 31, Table 9 on pg. 178, and Table 10 on pg. 182.

Note: See the section titled Cable/Terminal Specifications on pg. 200 for the ASD conductor and terminal electrical specifications.

ST — The default terminal assignment is Standby mode controller. As the default setting, this terminal must be activated for normal system operation (system is in Standby when activated). The ST terminal is activated by connecting CC to this terminal (Sink mode). If not connected to CC, Off is displayed on the LCD screen. This input terminal may be programmed to any of the functions that are listed in Table 9 on pg. 178 (see F113).

RES — The default terminal assignment is Reset. As the default setting, this terminal resets any active alarms or faults. 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 pg. 178 (see F114). See the section titled Alarms, Trips, and Troubleshooting on pg. 183 for a listing of the faults that do not respond to a reset.

F — The default terminal assignment is Forward run. As the default setting, this terminal provides a forward run command. The F terminal is activated by connecting CC to this terminal (Sink mode). A connection to CC provides a forward run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F111).

R — The default terminal assignment is Reverse run. As the default setting, this terminal provides a reverse run command. The R terminal is activated by connecting CC to this terminal (Sink mode). A connection to CC provides a forward run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F112).

S1 — The default terminal assignment is Preset Speed 1. As the default setting, this terminal provides a Preset Speed 1 run command. The S1 terminal is activated by connecting CC to this terminal (Sink mode). A connection to CC provides a forward run command for the duration of the activation. The Preset Speed 1 function is configured at F018. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F018).

S2 — The default terminal assignment is Preset Speed 2. As the default setting, this terminal provides a Preset Speed 2 run command. The S2 terminal is activated by connecting CC to this

terminal (Sink mode). A connection to CC provides a forward run command for the duration of the activation. The Preset Speed 2 function is configured at F019. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F019).

S3 — The default terminal assignment is Preset Speed 3. As the default setting, this terminal provides a Preset Speed 3 run command. The S3 terminal is activated by connecting CC to this terminal (Sink mode). A connection to CC provides a forward run command for the duration of the activation. The Preset Speed 3 function is configured at F020. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F020).

S4 — The default terminal assignment is Emergency Off. As the default setting, this terminal provides an off command and may apply a brake if so configured (see F603). The S4 terminal is activated by connecting CC to this terminal (Sink mode). A connection to CC provides an Emergency Off command that terminates the ASD output. A Reset or restart is required to resume normal ASD operation. This input terminal may be programmed to any of the functions listed in Table 9 on pg. 178 (see F118).

RR — The default function assigned to this terminal is Frequency Mode 1. 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, torque, or Acc/Dec of the motor via an amplitude setting or regulate the ASD output by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F210 – F215).

RX — The default function assigned to this terminal is Torque Command. The RX terminal accepts a ±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 the ASD output by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F216 – F221).

Note: The VI terminal or the II terminal may be used to control the speed or torque of the motor, but both cannot be used simultaneously. In cases where either terminal may be used for a function, they will be listed in the manual and on EOI selections as VI/II.

VI — The VI terminal is an isolated voltage input that may be used to control the output speed or output torque of the ASD. Select VI/II at F004 for speed control or select VI/II at F420 for torque control. The VI terminal receives a 0 – 10 VDC input signal that controls the output 0.0 – Maximum Frequency speed output or the -250% – 250% torque output. 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). See the above note for additional information about the VI and II terminals.

II — The II terminal is an isolated current input that may be used to control the output speed or output torque of the ASD. Select VI/II at F004 for speed control or select VI/II at F420 for torque control. The II terminal receives a 0 – 20 mA input signal that controls the output 0.0 – Maximum Frequency speed output or the -250% – 250% torque output. 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). See the above note for additional information about the VI and II terminals.

P24 — +24 VDC at 200 mA power supply for customer use.

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.

OUT1 — The default setting for this output terminal is Low Speed Signal. This output terminal may be programmed to provide an indication that any of the events listed in Table 10 on pg. 182 have occurred or are active. This function may be used to signal the operator or to activate external equipment or a brake (see F130). The OUT1 contact is rated at 2 A/ 120 VAC and 2 A/30 VDC.

OUT2 — The default setting for this output terminal is Speed Reach (acceleration/deceleration complete). This output terminal may be programmed to provide an indication that any of the events listed in Table 10 on pg. 182 have occurred or are active. This function may be used to signal the operator or to activate external equipment or a brake (see F131). The OUT2 contact is rated at 2 A/ 120 VAC and 2 A/30 VDC.

FP — The default function of this output terminal is to output a series of pulses at a rate that is a function of the ASD output frequency (50 mA max. at 1.0 kHz to 43.2 kHz). As the output frequency of the ASD changes, so does the FP output pulse rate. 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 pg. 182. For additional information on this terminal, see parameter F676.

AM — This output terminal produces an output 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 pg. 182. For additional 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 pg. 182. For additional information on this terminal, see F005.

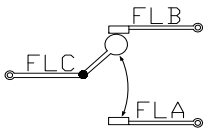
FLA — One of two normally open contacts that, under user-defined conditions, connects to FLC. The FL relay is the Fault Relay by default but may be programmed to any of the items listed in Table 10 on pg. 182. For additional information on this terminal, see F132 and Figure 7.

FLB — One of two normally closed contacts that, under user-defined conditions, connects to FLC.

FLC — FLC is the common leg of a single-pole double-throw form C relay.

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

Figure 7. FLA, FLB, and FLC switching contacts.



Note: The relay is shown in the normal operating condition. During a faulted condition, the relay connection is FLC-to-FLA.

WX9 ASD Control

The Control Board (P/N 56000) serves as the primary control source for the WX9 ASD and receives input from the Terminal Board (see Figure 6 on pg. 16), an Option Card, RS232/RS485 Communications, or the EOI.

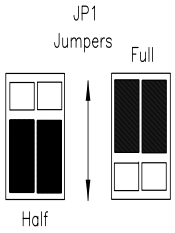
The Control Board has been enhanced to support two additional functions: Multiple Protocol Communications and the ability to communicate in either half- or full-duplex modes.

Using the optional multiple-protocol communications interface (the ASD-NANOCOM), the Control Board may be configured for the type of communications protocol being received and respond appropriately to the sending device. The ASD-NANOCOM connects to the J4 and J5 connectors (see Figure 6). Jumper Board (P/N 55365) is required at the J4 connector if not using the ASD-NANOCOM.

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

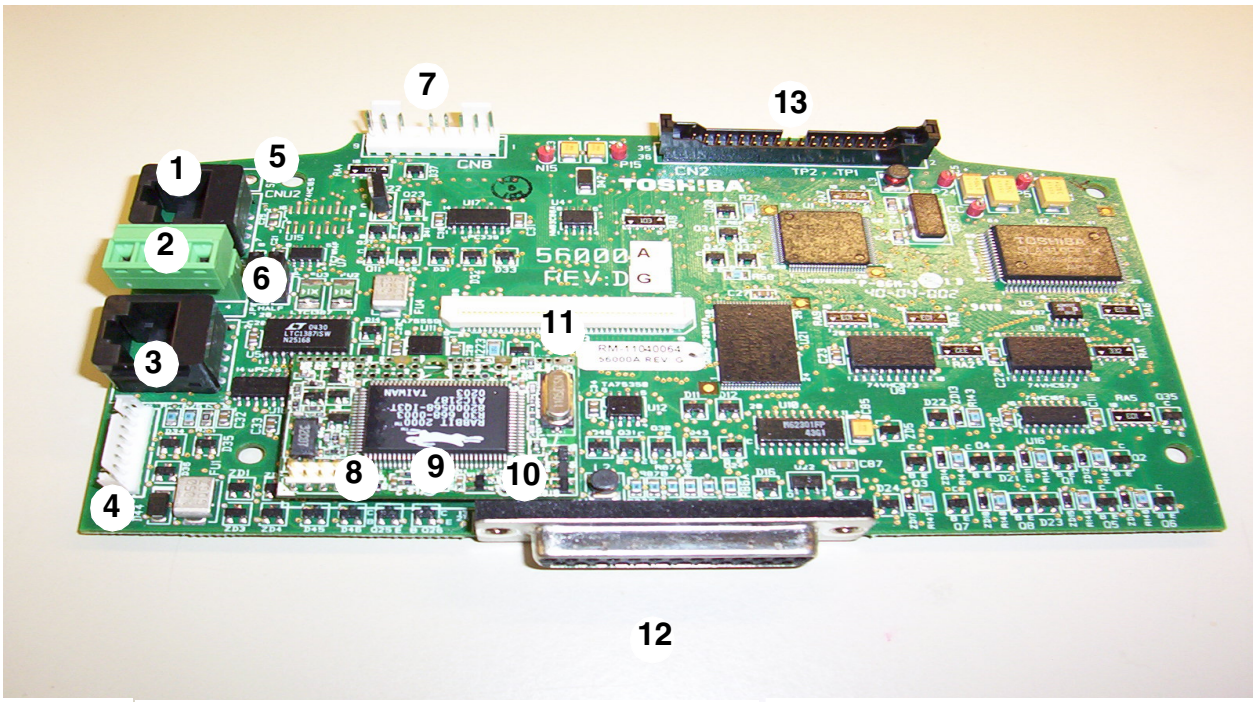
Half- or full-duplex communications is available when using RS232/RS485 communications. The jumpers at the JP1 and the JP2 connectors may be moved from one position to the other to facilitate either half- or full-duplex operation. If no jumpers are used, the system will operate in the full-duplex mode.

Figure 8. JP1 and JP2 Half/Full-Duplex Jumper Settings.



For more information on the WX9 ASD communication requirements, please visit www.tic.toshiba.com/ind/ to acquire a copy of the *7-Series Communications User Manual* and visit www.iccdesigns.com to acquire a copy of the ASD-NANOCOM User Manual. Contact the TIC Customer Support Center if more information is required on the ASD-NANOCOM.

Figure 9. Control Board of the WX9 ASD.



1 — CNU2 (TTL I/O)
2 — CN3 (RS232/RS485 signal I/O)
3 — CNU1 (EOI Connect - RS232/RS485 signal I/O)
4 — CNU4
5 — Sink/Source Switching
6 — JP1 Jumpers (Half-/Full-Duplex selection)
7 — CN8
8 — J4
9 — ASD-NANOCOM
10— J5
11 — CNU3
12 — CN7
13 — CN2

CNU1/1A and CNU2/2A Pinout

Table 3. CNU1/1A and CNU2/2A assignments.

Pin #	CNU1 Pinout (Control Board)	CNU1A Pinout (EOI)
1	P24	P24
2	Gnd	Gnd
3	Tx (-)	RXA
4	Rx (+)	TXA
5	Rx (-)	TXB
6	Tx (+)	RXB
7	$\overline{\text{RS232}}$/RS485	CNU3
8	Gnd	Gnd

Pin #	CNU2 Pinout (Control Board)	CNU2A Pinout (EOI)
1	P24	P24
2	Gnd	Gnd
3	Rx	Tx
4	Gnd	Gnd
5	Tx	Rx
6	Gnd	Gnd
7	Open	Open
8	Gnd	Gnd

⚠ WARNING

Note: For normal operation, connect CNU1 to CNU1A. Connecting CNU1 to CNU2A will result in a failed communications condition indicated by a continuous splash screen display. Connect CNU1 to CNU1A and continue normally.

See the 7-Series Communications Manual (P/N 53840) for more information on the WX9 ASD communications protocol and system configuration requirements.

CN3 Pinout

CN3 is used for RS232/RS485 serial communications.

Table 4. CN3 assignments.

Pin #	CNU3 Pinout (Control Board)
1	RS232/RS485 Signal +
2	RS232/RS485 Signal -
3	RS232/RS485 Signal Gnd
4	Shield

CN7 Pinout

Listed below are the pinouts of the CN7 connector. The CN7 connector is the 25-pin D-type connector of the Control Board (see Figure 9 on pg. 19).

Table 5. CN7 assignments. Default settings listed for the programmable terminals.

Pin #	CN7 Pinout	Pin #	CN7 Pinout
1	PP	14	II
2	FL	15	S1
3	VI	16	R
4	RR	17	S3
5	FM	18	S2
6	RX	19	N15
7	*FP	20	S4
8	AM	21	P15
9	OUT1	22	P24
10	OUT2	23	CC
11	ST	24	CC
12	RES	25	CC
13	F	—	—
*Note: * Open collector output.*			

I/O Circuit Configurations

Figure 10. Discrete Input.

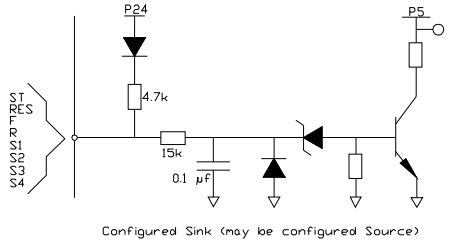


Figure 11. RR Input.

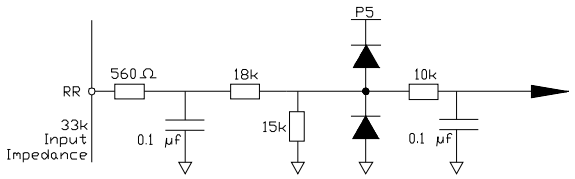


Figure 12. RX Input.

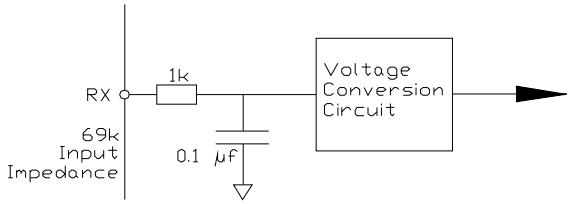


Figure 13. VI/II Input.

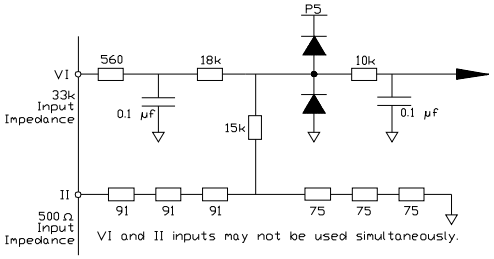


Figure 14. P24 Output.

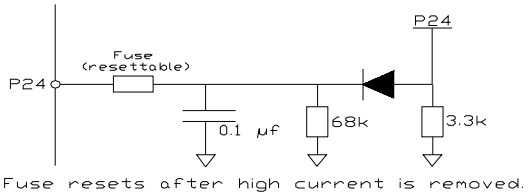


Figure 15. PP Output.

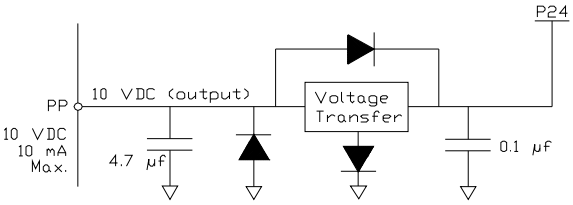


Figure 16. OUT1/OUT2 Output.

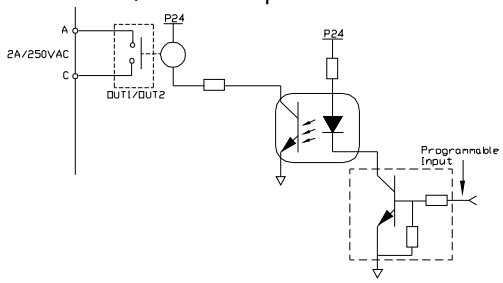


Figure 17. FP Output.

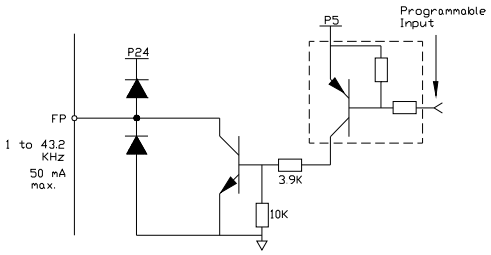


Figure 18. AM/FM Output.

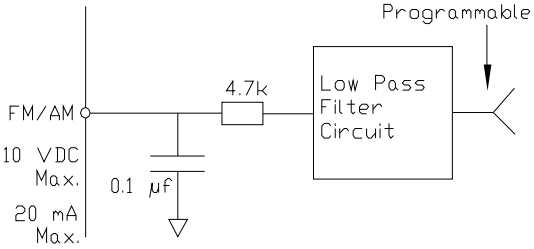
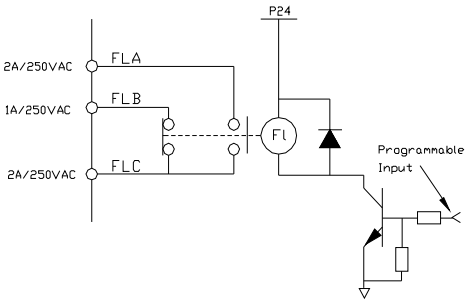


Figure 19. Fault Relay (during fault).



Startup and Test

Perform the following checks before turning on the unit:

- R/L1, S/L2, and T/L3 are connected to the three-phase input power.
- U/T1, V/T2, and W/T3 are connected to the motor.
- The three-phase input voltage is within the specified tolerance.
- There are no shorts and all grounds are secured.
- Front door is closed and all enclosure panels are securely fastened.
- All personnel are clear of the area of the installation and the driven equipment.

Save User Settings

Use the following table to record any changed parameters for future reference.

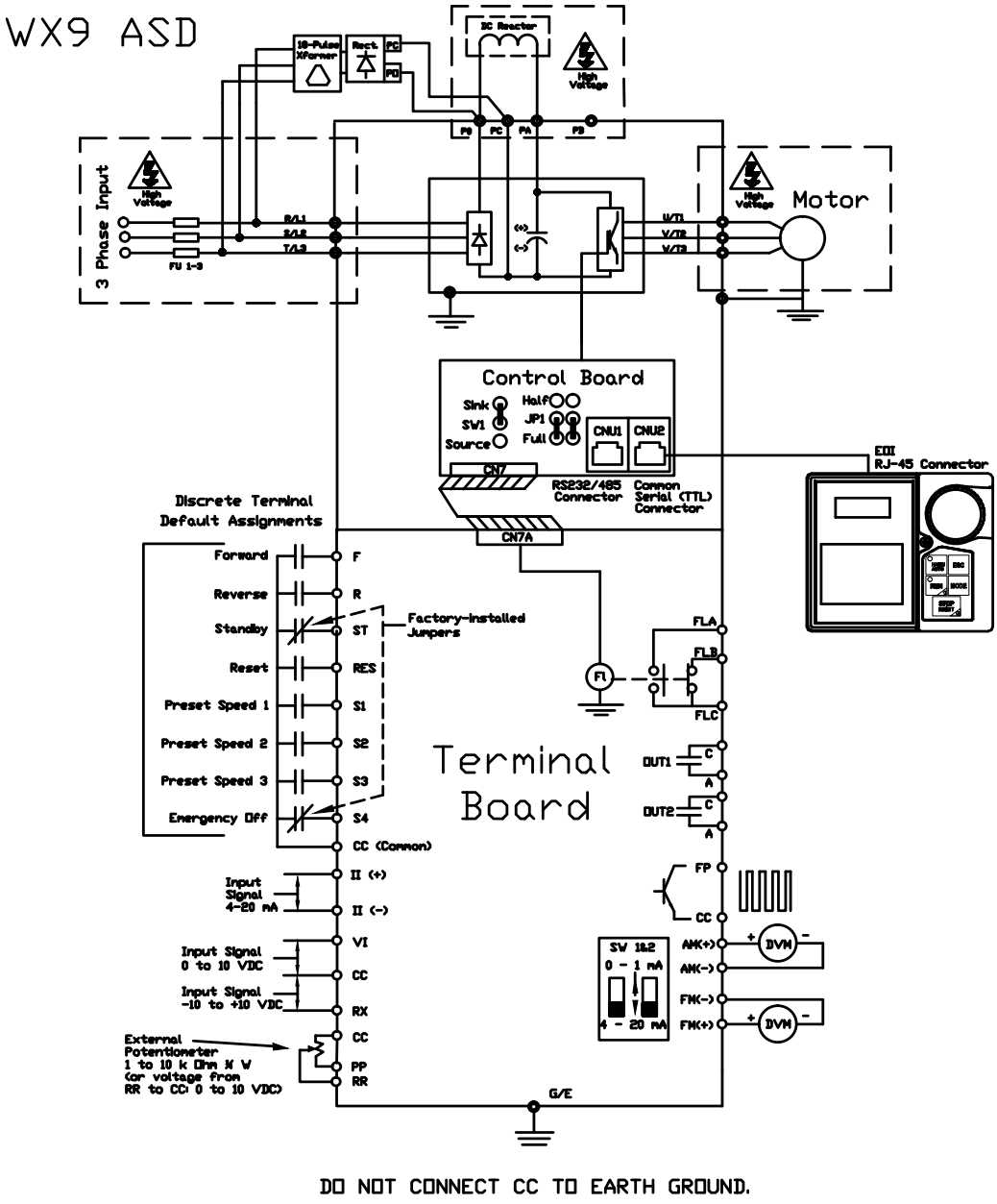
Table 6. ASD Parameter Changes by Installer/Maintenance Personnel.

ASD ID_____Name:_____Date:_____					Notes
Param Number	**Parameter Name**	**Default or Previous Setting**	**New Setting**	**Unit of Measure**	
Note: Settings may also be recorded via Program ⇒ Utilities ⇒ Type Reset ⇒ Save User Settings.					

Typical Connection Diagram

Figure 20. WX9 ASD Typical Connection Diagram.

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



Note: The VI, RX, and RR analog input terminals are referenced to CC.
The AM, FM, and II analog input terminals are referenced to the respective negative terminals.
The FP, PP, and P24 output terminals are referenced to CC.

Electronic Operator Interface

The WX9 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. 24.

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 WX9 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. 28 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,
- Password and Lockout Information,
- Alarm Information,
- Main Monitor Items,
- Prohibited Items, and
- Save User Settings Information (parameter settings may be saved by the user).

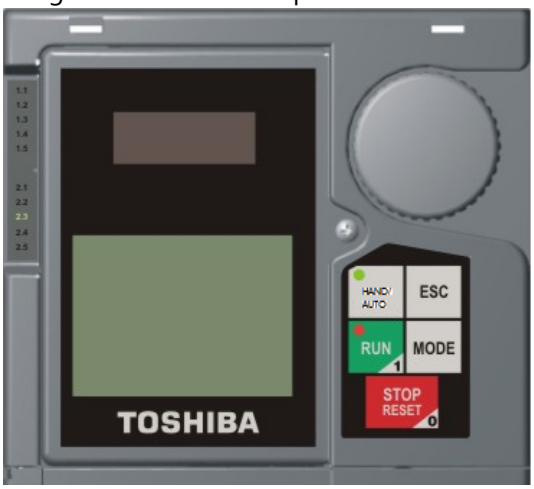
The battery backup system must be activated by the installer or maintenance personnel to use the backup function.

To activate the battery backup system, remove the Phillips screw from the front of the LED/LCD display unit (see Figure 21 on pg. 24). 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.

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.

Figure 21. Electronic Operator Interface.



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 WX9 ASD menu selections, change the value of a displayed parameter, and perform the Enter (select) function. Turn the Rotary Encoder either clockwise or counterclockwise to perform the Up or Down functions of the displayed menu selection. Press the Rotary Encoder to perform the Enter (select) function.

HAND/AUTO Key — Toggles the system to and from the Hand and Auto modes. The LED is on when the system is in the Hand mode. The Hand mode allows the Command and Frequency control functions to be carried out via the EOI.

The Auto 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 Selection and Frequency Mode 1, respectively.

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 Hand 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 30 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.
2. Initiates an Emergency Off command if pressed twice quickly. The Emergency Off function terminates the WX9 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 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.

LED/LCD Screens

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		
-	-		

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 to the right 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.

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. 31 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. When selected, the setting takes on the reverse video format (dark background/light text). Turn the Rotary Encoder to change the parameter setting. To accept the change, press the Rotary Encoder. To exit the selection without saving the change, press the ESC key.

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. Once the Frequency Command screen is reached, additional 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 (RS232/RS485) Menu on pg. 36 *for additional 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.

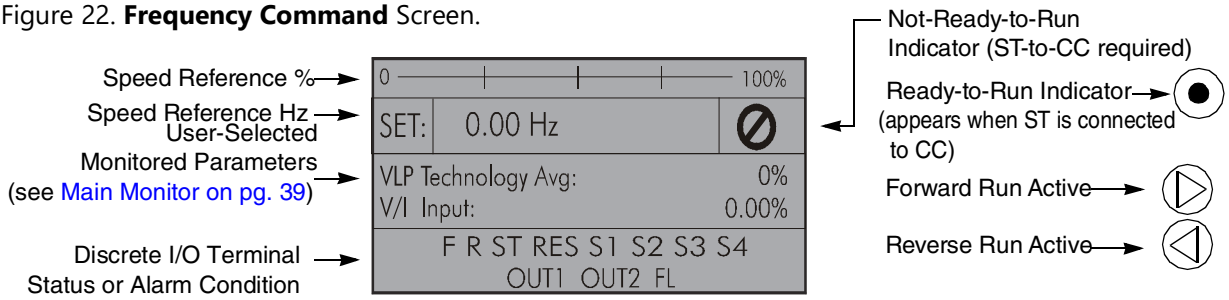


Figure 23. **Monitor** Screen (see pg. 38 for more on the Monitor screen items)

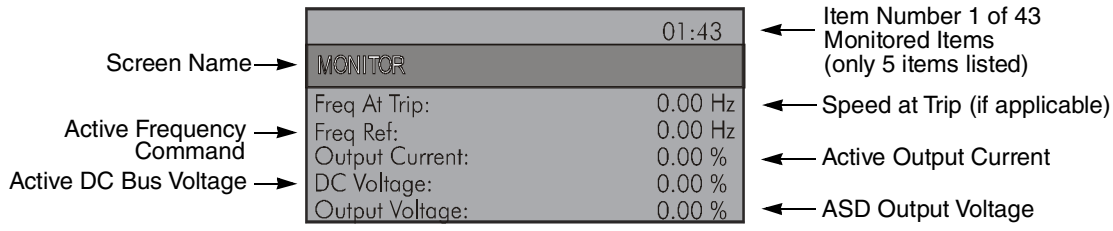
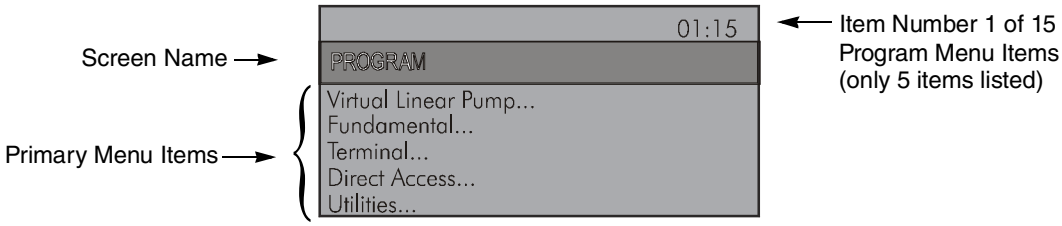


Figure 24. **Program Menu** Screen (see pg. 40 for more on the Program Menu Screen)



EOI Remote Mounting

The WX9 ASD may be controlled from a remotely mounted EOI. 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 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 TIC 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. 29 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. 29).
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. 29).
9. Connect the Extender Cable from the EOI to the Front Panel Assembly.

Figure 25. Remote Mounting Dimensions (inches/millimeters).

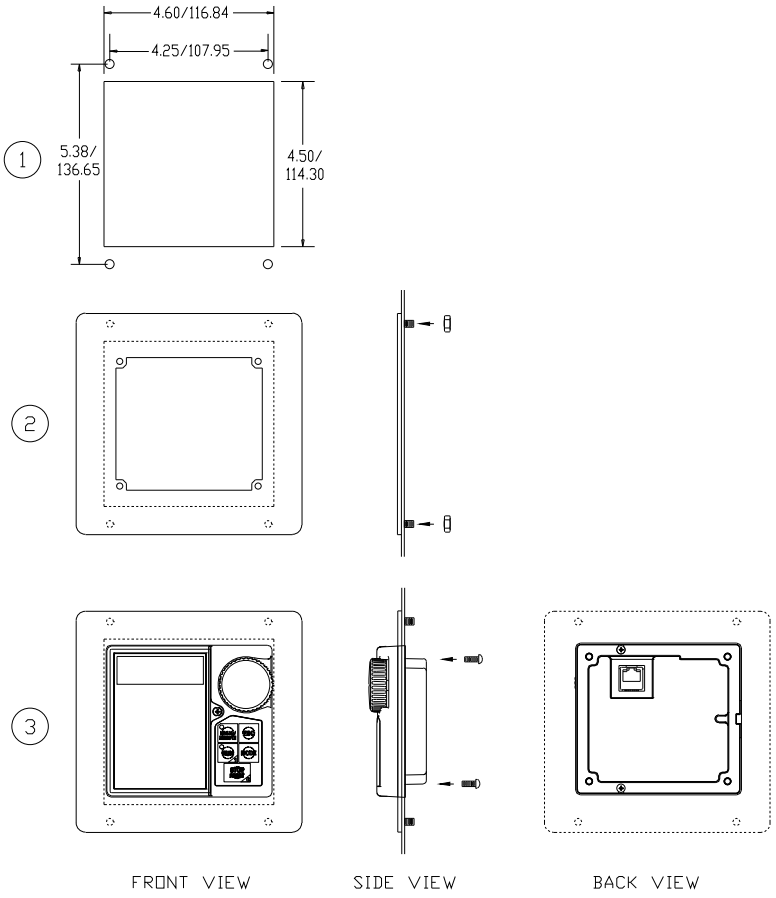
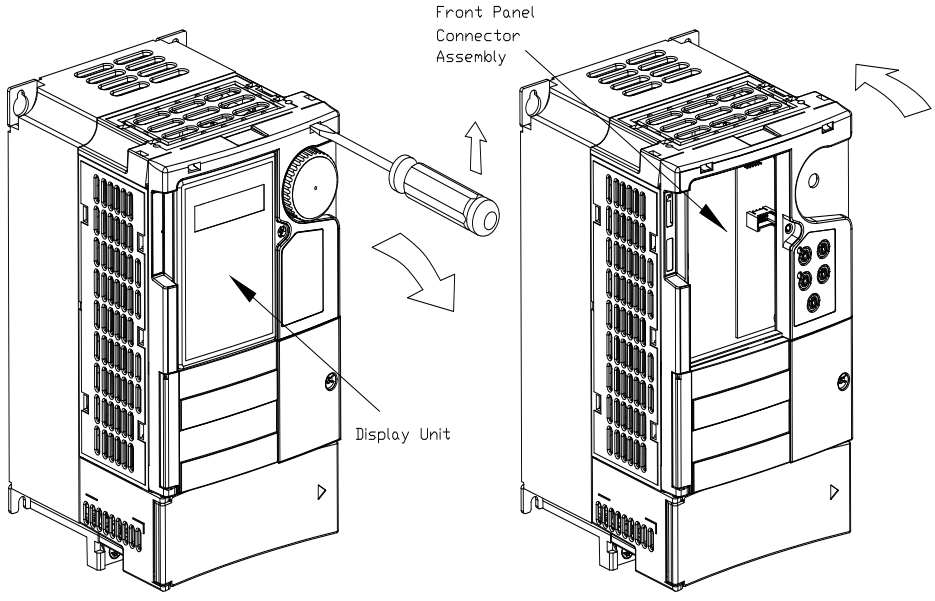


Figure 26. Front Panel Removal/Front Panel Connector Assembly.

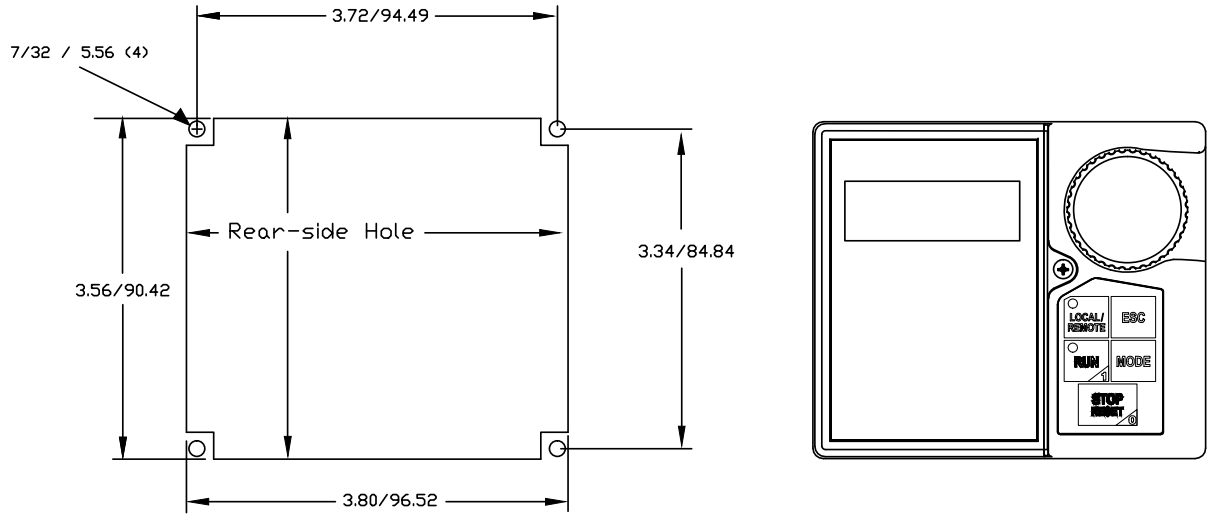


Remote Mounting without the Mounting Kit

Note: See Figure 27 for the dimensions and the item locations referenced in steps 1 – 7.

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 26).
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 26).
8. Connect the Extender Cable from the EOI to the Front Panel Assembly.

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



System Operation

Startup Wizard

Upon initial system power-up, the Startup Wizard may be run to assist the user with the initial configuration of the input power settings and the output parameters of the WX9 ASD. The WX9 ASD may also be set up by directly accessing each of the individual parameters (see the section titled Direct Access Parameter Information on pg. 54). See the section titled Default Setting Changes on pg. 31 for more information on changing the parameter settings.

The Startup Wizard is run from the menu path Program ⇒ Startup Wizard.

The Startup Wizard querys the user for the following information:

Note: Finish may be clicked after any entry to load the Startup Wizard settings and exit.

1. Run now? (if selected, continue on to step #2); Run next time at power up? (if selected, go to Program screen); Manually configure? (if selected, click Finish ⇒ Frequency Command screen)
2. The Voltage and Frequency Rating of the Motor
3. The Upper-Limit Frequency
4. The Lower-Limit Frequency
5. Adjust Accel/Decel Automatically? (if Yes, continue from step 8)
6. The Acceleration Time
7. The Deceleration Time
8. The Volts Per Hertz Setting
9. The Motor Current Rating
10. The Command Source
11. The Frequency Command Source

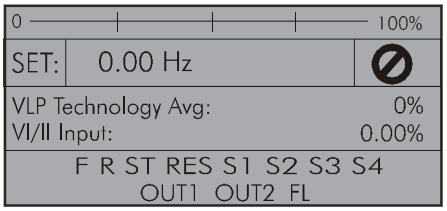
Click Finish to load the settings of the Startup Wizard into the ASD. Application-specific programming may then be required. See the section titled Startup Wizard Requirements on pg. 50 for additional information on the Startup Wizard.

Operation (HAND)

Note: See F003 for information on Auto operation.

To turn the motor on, perform the following:

Frequency Command Screen.



1. Press the MODE key until the Frequency Command screen is displayed.
2. Press the HAND/AUTO key to enter the Hand mode (green HAND/AUTO LED illuminates).
3. Turn the Rotary Encoder clockwise until the Frequency Command value is at the desired setting.
4. Press the RUN key and the motor runs at the Frequency Command value.

   Note: The speed of the motor may be changed while the motor is running by using the Rotary Encoder to change the Frequency Command value.
5. Press the STOP/RESET key to stop the motor.

Default Setting Changes

Changing Default Settings

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) when selected. Turn the Rotary Encoder to change the value of the parameter. To accept the new setting, press the Rotary Encoder. To exit the menu without saving the change, press the ESC key.

For a complete listing of the Program mode menu options, see the section titled Program Menu Navigation on pg. 40. Menu items are listed and mapped for convenience. The Direct Access Numbers are listed where applicable.

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. 54.

Viewing Changed Parameters

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

Note: Parameter F201 was changed to create the example shown below in Figure 28.

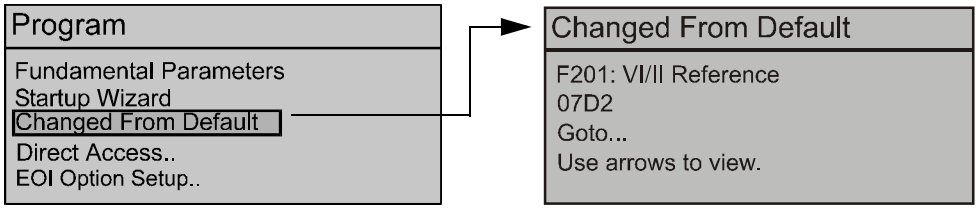
The Changed From Default feature allows the user to view (or change) the parameters that are different from the default or the post-reset settings. Once the Changed From Default screen is displayed, the system automatically scrolls through all of the system parameters and halts once reaching a changed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

Figure 28. Changed From Default screen.



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 ASD. The source of the frequency control signal must be established for normal operation.

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

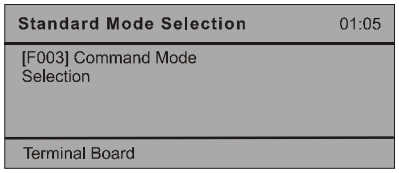
Command Control (F003)

The Command Mode selection of F003 establishes the primary source of the command input for the ASD. The signal source selected here is used for Command control unless the Override Operation feature is enabled.

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

- The F003 setting,
- Placing a signal source in the Override Mode via communications, or
- Placing the EOI in the Hand mode (places only the RS232/RS485 or the TTL in the Override Mode).

Command Control Selections



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

Settings:

0 — Terminal Board (default setting)

Allows for Command control input via the Terminal Board input terminals.

1 — CN8 Option

Allows for Command control input via the CN8 connector of the Control Board.

2 — Common Serial (TTL)

Set the EOI Port Address to TTL to use this feature.

3 — RS232/RS485

Set the EOI Port Address to RS232/RS485 to use this feature.

4 — Communication Option Board

Routes the control and monitoring I/O to CNU3 of the Control Board of the WX9 ASD (Communication Card connector).

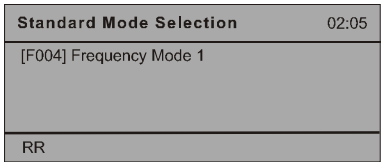
Frequency Control (F004)

The Frequency Mode 1 (or the Frequency Mode 2) setting establishes the user-selected source of the control input for the ASD frequency. The signal source selected here is used for speed control unless the Reference Priority Selection parameter is configured to automatically switch this setting (see F200) or if the Override feature is enabled (via communications or via the Hand mode operation).

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

- The F004 setting,
- Placing a signal source in the Override Mode via communications, or
- Placing the EOI in the Hand mode (places only the RS232/RS485 or TTL in the Override Mode).

Frequency Control Selections



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

Settings:

1 — VI/II

0 to 10-volt DC analog input connected to VI or a 4 – 20 mA (or 0 to 1 mA) DC current connected to II (cannot use both simultaneously).

2 — RR (default setting)

0 to 10-volt DC analog input connected to RR.

3 — RX

-10 to +10-volt DC analog input connected to RX.

4 — RX2

-10 to +10-volt DC analog input connected to RX2.

5 — CN8

Allows for Frequency control input via the CN8 connector of the Control Board.

6 — Binary/BCD Option

Allows for discrete input terminal input to control the ASD output.

7 — Common Serial (TTL)

To use the EOI for control requires that the LCD Port Connection be set to TTL to use this feature.

8 — RS232/RS485

To use the EOI for control requires that the LCD Port Connection be set to RS232/RS485.

9 — Communication Option Board

Routes the control and monitoring I/O to CNU3 of the Control Board of the WX9 ASD (Option Card connector).

10 — UP/DOWN Frequency

Discrete input terminals may be configured to increase or decrease the speed of the motor by momentarily connecting the assigned discrete input terminal to CC. See UP/DOWN Frequency Function on pg. 66 for additional information on this feature.

11 — Pulse Input (option)

Configures the system to receive pulse input. See PG Speed Reference Setpoint on pg. 100 for additional information on this feature.

Control Method Priority

Command and Frequency control may be carried out using any one of several control methods (signal sources) or combinations thereof. In the event that multiple control commands are received simultaneously, the signal sources are assigned priority levels. Typically, the control method for Command and Frequency control uses the settings of F003 and F004, respectively.

Figure 29. Default Control Method Priority Levels.

	Highest Priority → Lowest Priority				
	Priority 1	**Priority 2**	**Priority 3**	**Priority 4**	**Priority 5**
COMMAND/ FREQUENCY MODE	Communication Card	RS232/RS485	TTL	Terminal Board (Binary/BCD Input)	F003/F004 Setting

Override Operation

Any or all of the Command and Frequency control sources may be placed in the Override Mode to alter the default priority assignments. Table 7 lists the input conditions and the resulting output control source selections for Command and Frequency control Override operation. The first item to be read that has the Override feature turned on will be used for Command or Frequency control.

Once placed in the Override Mode, the setting is valid until it is canceled, the power supply is turned off, or the ASD is reset.

Table 7. Command and Frequency Control Hierarchy.

Command/Frequency Mode	Communication Card	RS232/ RS485	TTL	Terminal Board (Binary/BCD Input)	F003/F004 Setting
Communication Card	**1**	X	X	X	X
RS232/RS485	0	**1**	X	X	X
TTL	0	0	**1**	X	X
Terminal Board	0	0	0	**1**	X
F003/F004 Setting	0	0	0	0	F003/F004 Setting
0 = Override inactive 1 = Override active X = Don't care					

The Override control setting supersedes the setting of the Command mode setting (F003) and the Frequency mode setting (F004). However, the F003 and F004 settings will be used in the event that the scan returns the condition that none of the listed items have the Override feature enabled.

Note: The Terminal Board is placed in the Override mode for Command functions by assigning a discrete terminal to Terminal Command Priority and connecting the terminal to CC. Upon activation (Run command required), the Terminal Board settings will be used for Override Command control (F, R, Preset Speeds, etc.).

Note: The Terminal Board is placed in the Override mode for Speed control functions by assigning a discrete input terminal to VI/II Terminal Frequency Priority and connecting the terminal to CC. Upon activation, VI/II is used as the Terminal Board Override control item.

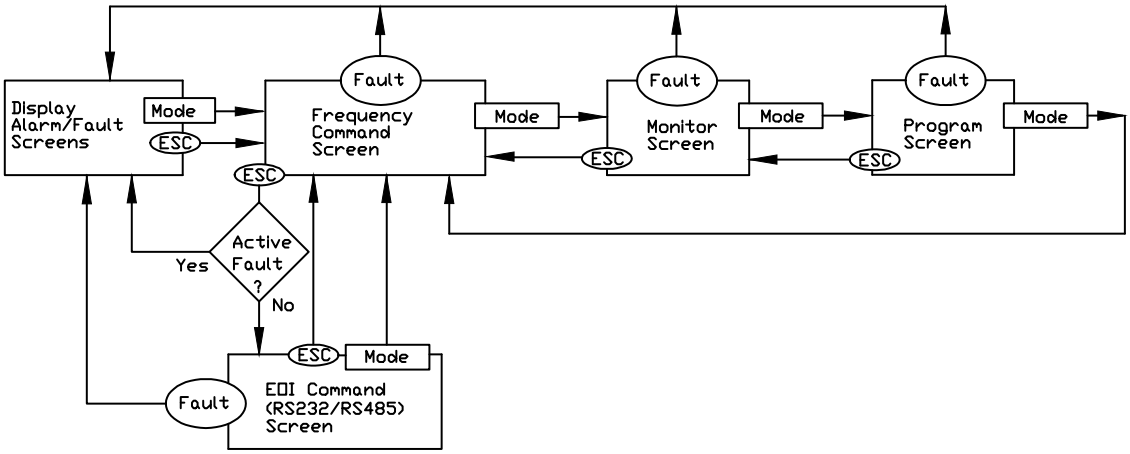
System Configuration and Menu Options

Root Menus

The MODE key accesses the three primary screens of the WX9 ASD — the Frequency Command screen, Monitor screen, and Program Menu screen. From either screen, press the MODE key to loop through to the other two screens (see Figure 30). While on the Frequency Command screen, pressing the ESC key toggles the menu to and from the EOI Command menu and the Frequency Command screen.

Note: Parameter changes made from the EOI Command menu are effective for Hand EOI control Only.

Figure 30. WX9 ASD Root Menu Mapping.



Frequency Command Screen

Frequency Setting

While operating in the Hand mode (Hand/Auto 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 and then press the RUN key. The motor will run at the Frequency Command speed, which may be changed while running.

Alarm/Fault Screen

Alarms and Faults are displayed as they are incurred. 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. Once the cause of the trip has been corrected, performing a Reset clears the Fault screen. Once cleared, NERR is displayed to indicate that there are no errors.

A listing of codes along with their associated causes and remedies is provided in the section titled Alarms, Trips, and Troubleshooting on pg. 183.

EOI Command (RS232/RS485) Menu

The Command (RS232/RS485) menu is accessed by pressing ESC from the Frequency Command screen. The control settings of the Command (RS232/RS485) menu are effective for EOI control only.

The Command (RS232/RS485) menu provides quick access to the following menu parameters:

Direction — Forward or Reverse.

Stop Pattern — The Decel Stop or Coast Stop selection 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.

Note: 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 Motor Overload Protection. Expanded descriptions of these parameters may be found in the section

titled Direct Access Parameter Information on pg. 54 (see V/f Switching Profile).

Acc/Dec Group — One of four Acc/Dec profiles may be selected and run. Each of the Acc/Dec 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. 54 (see F504).

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

Torque Limit Group — This parameter is used to select one of four preset positive torque limits to apply to the active motor (of a multiple motor configuration). The settings of profiles 1 – 4 may be setup at F441, F444, F446, and F448, respectively.

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

Monitor Mode

The Monitor mode allows the user to monitor WX9 ASD/motor performance variables, ASD control settings, and configuration data during motor operation. The monitored parameters are listed and described below.

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. 31.

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) and V (Voltage), or if the value is shown as a % (percentage) of the ASD rating.

Freq at Trip — Displays the at-trip frequency.

Freq Ref — Displays the Frequency Setpoint.

Output Current — Displays the Output Current of the ASD as a percentage of the rated capacity of the WX9 ASD.

DC Voltage — Displays the DC Bus Voltage as a percentage of the rated capacity of the WX9 ASD.

Output Voltage — Displays the Output Voltage as a percentage of the rated capacity of the WX9 ASD.

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.

OUT1 OUT2 FL — Displays the status of the discrete output terminals of the Control Terminal Strip.

Run Time — Displays the Cumulative Run Time in hours.

Comp Freq — Displays the Output Frequency after the application of the slip compensation (Post Compensation) correction value.

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 WX9 ASD.

Torque Ref — Displays the Torque Reference as a percentage.

Torque Current — Displays the current being used to produce torque.

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

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

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

ASD OL (Overload) Trip — Displays the ASD Overload as a percentage of the rated capacity of the WX9 ASD.

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

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

ASD Load — Displays the ASD Load as a percentage of the rated capacity of the WX9 ASD.

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

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

Output Power — Displays the Output Power in Kilowatts (Kw).

Peak Current — Displays the Peak Current since the last start was initiated. The current is displayed as a percentage of the rated capacity of the WX9 ASD.

Peak Voltage — Displays the Peak Voltage since the last start was initiated. The voltage is displayed as a percentage of the rated capacity of the WX9 ASD.

PG Speed — Displays the PG Speed.

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

PG Position — Displays the Pulse Generator Position.

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

***VI/II** — Displays the VI/II signal level as a percentage of the full range of the VI/II value.

*Note: * The VI/II input represents two analog inputs (and terminals). The VI input terminal is used for a 0 – 10 VDC analog signal and the II input terminal is used for current loop applications, such as with a 4-20 mA signal. Either may be used as a frequency or torque command source; however, the two cannot function simultaneously. Throughout this manual, they will be listed as VI/II. See F201 for more information on the setup of this terminal.*

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

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

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

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

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

Max. Output — Not Used.

Pattern Select — Displays the selected pattern when using the Pattern Run function.

Repeats Left — Displays the number of remaining patterns when using the Pattern Run function.

Pattern — Displays the active Pattern Run ID number when using the Pattern Run function.

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

Trip Code — Displays NERR if there are no errors, or displays the active fault. See Table 13 on page 189 for a listing of the possible fault codes.

Main Monitor Selections

Two (2) qualifying Monitor Mode items may be selected from the Main Monitor Selections screen to be displayed on the Frequency Command screen.

The selected items, along with their real-time values, are displayed on the Frequency Command screen while the WX9 ASD is running. Not all Monitor Mode items are available for display on the Frequency Command screen. The available items are underlined on pg. 38.

Any two of the underlined items may be selected from the listing at Program ⇒ Utilities ⇒ Main Monitor Selections. Select an item from the Monitor 1 listing and another item from the Monitor 2 listing to be displayed as shown in Figure 28 on pg. 32 (VLP Technology Average and VI Input shown).

Program Menu Navigation

Table 8 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]

PRIMARY MENU: VIRTUAL LINEAR PUMP			
Setup Wizard	Settings	Start and Stop Points	Sleep Timer
(N/A) MOTOR FULL LOAD AMPS (F912) APPLICATION TYPE (F920) COMMAND SOURCE (F919) LOW FREQUENCY LIMIT (N/A) TRANSDUCER UNITS (F914) TRANSDUCER TYPE (F916) MAX SCALE (F915) MIN SCALE (F918) MAXIMUM (N/A) TRANSDUCER VALUE (F917) MINIMUM (N/A) TRANSDUCER VALUE	(F911) VIRTUAL LINEAR PUMP MODE SWITCH (F912) APPLICATION TYPE (F913) APPLICATION TYPE MODE (N/A) TRANSDUCER UNITS (F914) TRANSDUCER OUTPUT RANGE (F916) TRANSDUCER MAXIMUM READING (F915) TRANSDUCER MINIMUM READING (F917) VIRTUAL LINEAR PUMP MINIMUM (F918) VIRTUAL LINEAR PUMP MAXIMUM (F920) VIRTUAL LINEAR PUMP COMMAND SOURCE (F921) VIRTUAL LINEAR PUMP COMMAND VALUE (F919) VIRTUAL LINEAR PUMP LOW FREQUENCY LIMIT	(F927) VIRTUAL LINEAR PUMP START/STOP MODE (F928) VIRTUAL LINEAR PUMP START/STOP DELAY TIMER (F929) VIRTUAL LINEAR PUMP LOW START/STOP POINT (F930) VIRTUAL LINEAR PUMP HIGH START/STOP POINT (F115) INPUT TERMINAL 5 (S1) FUNCTION	(F925) VIRTUAL LINEAR PUMP SLEEP TIMER (F926) VIRTUAL LINEAR PUMP SLEEP DELAY TIMER
External Devices	Low Suction/No Flow Cut Off	Sealing Water	
(F931) VIRTUAL LINEAR PUMP EXTERNAL DEVICE DELAY TIMER (F932) VIRTUAL LINEAR PUMP EXTERNAL DEVICE LOW BAND (F933) VIRTUAL LINEAR PUMP EXTERNAL DEVICE HIGH BAND (F130) OUTPUT TERMINAL 1 (OUT1) FUNCTION (F131) OUTPUT TERMINAL 2 (OUT2) FUNCTION	(F934) VIRTUAL LINEAR PUMP LOW SUCTION/NO FLOW CUT OFF MODE (F936) VIRTUAL LINEAR PUMP LOW SUCTION/NO FLOW CUT OFF DELAY TIMER (F115) INPUT TERMINAL 5 (S1) FUNCTION (F935) VIRTUAL LINEAR PUMP LOW SUCTION/NO FLOW CUT OFF FAULT ACTION	(F937) VIRTUAL LINEAR PUMP SEALING WATER MODE (F115) INPUT TERMINAL 5 (S1) FUNCTION (F130) OUTPUT TERMINAL 1 (OUT1) FUNCTION	

PRIMARY MENU: FUNDAMENTAL			
Frequency Setting	Standard Mode Selection	Acc/Dec 1 Settings	Motor Set 1
(F011) MAXIMUM FREQUENCY (F012) UPPER-LIMIT FREQUENCY (F013) LOWER-LIMIT FREQUENCY (F015) V/F PATTERN	(F003) COMMAND MODE (F004) FREQUENCY MODE 1 (F207) FREQUENCY MODE 2 (F200) FREQUENCY PRIORITY SELECTION (F208) FREQUENCY MODE PRIORITY SWITCHING FREQUENCY	(F009) ACCELERATION TIME 1 (F010) DECELERATION TIME 1 (F502) S-CURVE ACCELERATION/DECELERATION PATTERN 1 (F000) AUTOMATIC ACCELERATION/DECELERATION SELECTION	(F014) BASE FREQUENCY 1 (F306) BASE FREQUENCY VOLTAGE 1 (F016) MANUAL TORQUE BOOST 1 (F600) MOTOR OVERLOAD PROTECTION LEVEL 1

PRIMARY MENU: DIRECT ACCESS
(See the section titled Direct Access Parameter Information on pg. 54.)

PRIMARY MENU: UTILITIES			
Versions (read only)	Trip History	Type Reset	Display Parameters
(N/A) EOI VERSION (N/A) ASD TYPE (N/A) ASD CPU VERSION (N/A) ASD EEP1 VERSION (N/A) ASD EEP2 VERSION	(READ-ONLY)	(F007) TYPE RESET	(F701) CURRENT/VOLTAGE UNITS SETUP (F702) FREE UNIT MULTIPLICATION FACTOR (0= OFF) (F703) FREE UNIT SELECTION (F704) ACCELERATION/DECELERATION UNIT TIME SETUP (N/A) SELECT LANGUAGE (N/A) DISPLAY THE STARTUP WIZARD AT NEXT POWER UP?
Main Monitor Selections	Real-Time Clock	Changed from Default	Save/Restore Wizard
(N/A) 4-DIGIT LED DISPLAY ITEM (N/A) 4-DIGIT LED DISPLAY ITEM WHILE IN VIRTUAL LINEAR PUMP MODE (N/A) MONITOR 1 (N/A) MONITOR 2	(N/A) TIME AND DATE SETTING	(N/A)	SAVE OR RESTORE EOI USER SETTINGS
Prohibition	Alarm Prohibition		Contrast
(N/A) HAND/AUTO KEY COMMAND OVERRIDE (N/A) HAND/AUTO KEY FREQUENCY OVERRIDE (N/A) SKIP UNINITIALIZED PARAMETERS IN THE CHANGED FROM DEFAULT WINDOW (F709) PROHIBIT INITIALIZING USER PARAMETERS DURING TYPEFORM INITIALIZATION	(N/A) OVER-CURRENT ALARM (N/A) ASD OVERLOAD ALARM (N/A) MOTOR OVERLOAD ALARM (N/A) OVER-HEAT ALARM (N/A) OVER-VOLTAGE ALARM (N/A) MAIN CIRCUIT INSUFFICIENT VOLTAGE ALARM (MOFF) (N/A) CONTROL CIRCUIT INSUFFICIENT VOLTAGE ALARM (POFF) (N/A) UNDER-CURRENT ALARM (N/A) EXCESS TORQUE ALARM (N/A) DBR OVERLOAD ALARM (N/A) CUMULATIVE RUN TIMER ALARM	(N/A) COMMUNICATION ALARM 1 (SCAN TRANSMISSION) (N/A) COMMUNICATION ALARM 2 (RS232/RS485 AND TTL TRANSMISSION) (N/A) RETRY ALARM (N/A) FAULT ALARM (N/A) POINT SETTING ERROR ALARM (N/A) EARTH FAULT ALARM (N/A) PID LOW OUTPUT DISABLE ALARM (N/A) FIRE SPEED ALARM (N/A) DAMPER CLOSED ALARM (N/A) 4-20mA SIGNAL LOSS ALARM (N/A) VIRTUAL LINEAR PUMP ON (N/A) VIRTUAL LINEAR PUMP LOW FREQUENCY (N/A) VIRTUAL LINEAR PUMP NO FLOW	Use the rotary encoder to adjust contrast.

PRIMARY MENU: TERMINAL		
Input Terminals	Output Terminals	Analog Input Functions
(F110) ALWAYS ON TERMINAL FUNCTION (F111) INPUT TERMINAL 1 (F) FUNCTION (F112) INPUT TERMINAL 2 (R) FUNCTION (F113) INPUT TERMINAL 3 (ST) FUNCTION (F114) INPUT TERMINAL 4 (RES) FUNCTION (F115) INPUT TERMINAL 5 (S1) FUNCTION (F116) INPUT TERMINAL 6 (S2) FUNCTION (F117) INPUT TERMINAL 7 (S3) FUNCTION (F118) INPUT TERMINAL 8 (S4) FUNCTION (F119) INPUT TERMINAL 9 (LI1) FUNCTION (F120) INPUT TERMINAL 10 (LI2) FUNCTION (F121) INPUT TERMINAL 11 (LI3) FUNCTION (F122) INPUT TERMINAL 12 (LI4) FUNCTION (F123) INPUT TERMINAL 13 (LI5) FUNCTION (F124) INPUT TERMINAL 14 (LI6) FUNCTION (F125) INPUT TERMINAL 15 (LI7) FUNCTION (F126) INPUT TERMINAL 16 (LI8) FUNCTION	(F130) OUTPUT TERMINAL 1 (OUT1) FUNCTION (F131) OUTPUT TERMINAL 2 (OUT2) FUNCTION (F132) OUTPUT TERMINAL 3 (FL) FUNCTION (F133) OUTPUT TERMINAL 4 (OUT3) FUNCTION (F134) OUTPUT TERMINAL 5 (OUT4) FUNCTION (F135) OUTPUT TERMINAL 6 (R1) FUNCTION (F136) OUTPUT TERMINAL 7 (OUT5) FUNCTION	(F650) ACCELERATION/DECELERATION FREQ ADJUSTMENT (F651) UPPER-LIMIT FREQ ADJUSTMENT (F652) ACCELERATION TIME ADJUSTMENT (F653) DECELERATION TIME ADJUSTMENT (F654) TORQUE BOOST ADJUSTMENT
Analog Output Terminals	Reach Settings	FP (Terminal Settings)
(F005) FM OUTPUT TERMINAL FUNCTION (F006) FM OUTPUT TERMINAL ADJUSTMENT (F670) AM OUTPUT TERMINAL FUNCTION (F671) AM OUTPUT TERMINAL ADJUSTMENT (F672) MON 1 TERMINAL METER SELECTION (F673) MON 1 TERMINAL METER ADJUSTMENT (F674) MON 2 TERMINAL METER SELECTION (F675) MON 2 TERMINAL METER ADJUSTMENT	(F100) LOW SPEED SIGNAL OUTPUT FREQUENCY (F101) SPEED REACH SETTING FREQUENCY (F102) SPEED REACH DETECTION BAND	(F676) PULSE OUTPUT FUNCTION (F677) PULSE OUTPUT FREQUENCY
Input Special Functions	Line Power Switching	Input Terminal Delays
(F103) ST SIGNAL (F105) F/R PRIORITY (W/ BOTH ON) (F106) INPUT TERMINAL PRIORITY SELECTION (F107) 16-BIT BINARY/BCD INPUT SELECTION	(F354) (COMMERCIAL POWER SWITCHING) OUTPUT SELECTION (F355) SWITCHING-FREQUENCY (F356) ASD SIDE SWITCHING WAIT-TIME (F357) COMMERCIAL INPUT-POWER WAIT-TIME (F358) COMMERCIAL-POWER SWITCHING-FREQUENCY HOLD-TIME	(F140) F RESPONSE TIME (F141) R RESPONSE TIME (F142) ST RESPONSE TIME (F143) RES RESPONSE TIME (F144) S1-S4 RESPONSE TIME (F145) S5-S16 RESPONSE TIME
Output Terminal Delays		
(F150) OUT1 ON DELAY (F160) OUT1 OFF DELAY (F151) OUT2 ON DELAY (F161) OUT2 OFF DELAY (F152) FL ON DELAY (F162) FL OFF DELAY (F153) OUT4 ON DELAY (F163) OUT4 OFF DELAY (F154) OUT5 ON DELAY (F164) OUT5 OFF DELAY (F155) OUT6 ON DELAY (F165) OUT6 OFF DELAY (F156) OUT7 ON DELAY (F166) OUT7 OFF DELAY		

PRIMARY MENU: FREQUENCY			
Analog Filter	Speed Ref. Setpoint		Jog Settings
(F209) ANALOG INPUT FILTER	(F202) VI/II POINT 1 FREQUENCY (F201) VI/II REFERENCE POINT 1 (F204) VI/II POINT 2 FREQUENCY (F203) VI/II REFERENCE POINT 2 (F470) VI/II BIAS (F471) VI/II GAIN (F211) RR POINT 1 FREQUENCY (F210) RR REFERENCE POINT 1 (F213) RR POINT 2 FREQUENCY (F212) RR REFERENCE POINT 2 (F472) RR BIAS (F473) RR GAIN (F217) RX POINT 1 FREQUENCY (F216) RX REFERENCE POINT 1 (F219) RX POINT 2 FREQUENCY (F218) RX REFERENCE POINT 2 (F474) RX BIAS (F475) RX GAIN	(F223) RX2 POINT 1 FREQUENCY (F222) RX2 REFERENCE POINT 1 (F225) RX2 POINT 2 FREQUENCY (F224) RX2 REFERENCE POINT 2 (F476) RX2 BIAS (F477) RX2 GAIN (F229) BIN POINT 1 FREQUENCY (F228) BIN REFERENCE POINT 1 (F231) BIN POINT 2 FREQUENCY (F230) BIN REFERENCE POINT 2 (F235) PG POINT 1 FREQUENCY (F234) PG REFERENCE POINT 1 (F237) PG POINT 2 FREQUENCY (F236) PG REFERENCE POINT 2	(F260) JOG FREQUENCY (F261) JOG STOP PATTERN
Fwd/Rev Disable	Preset Speeds		
(F311) DISABLE FORWARD RUN/DISABLE REVERSE RUN	(F018) PRESET SPEED 1 (F019) PRESET SPEED 2 (F020) PRESET SPEED 3 (F021) PRESET SPEED 4 (F022) PRESET SPEED 5 (F023) PRESET SPEED 6	(F024) PRESET SPEED 7 (F287) PRESET SPEED 8 (F288) PRESEST SPEED 9 (F289) PRESET SPEED 10 (F290) PRESET SPEED 11	(F291) PRESET SPEED 12 (F292) PRESET SPEED 13 (F293) PRESET SPEED 14 (F294) PRESET SPEED 15
Preset Speed Modes		UP/DOWN Frequency Settings	
(F380) PRESET SPEED OPERATION MODE (F381) PRESET SPEED 1 (F382) PRESET SPEED 2 (F383) PRESET SPEED 3 (F384) PRESET SPEED 4 (F385) PRESET SPEED 5 (F386) PRESET SPEED 6 (F387) PRESET SPEED 7 (F388) PRESET SPEED 8	(F389) PRESET SPEED 9 (F390) PRESET SPEED 10 (F391) PRESET SPEED 11 (F392) PRESET SPEED 12 (F393) PRESET SPEED 13 (F394) PRESET SPEED 14 (F395) PRESET SPEED 15	(F108) UP/DOWN FREQUENCY DISPOSITION AT POWER DOWN; MINIMUM: MAXIMUM	

PRIMARY MENU: PROTECTION			
Dynamic Braking (not used)	Stall	DC Braking	Emergency Off Settings
(F304) DYNAMIC BRAKING SELECTION (F308) DYNAMIC BRAKING RESISTANCE (F309) CONTINUOUS DYNAMIC BRAKING CAPACITY	(F305) OVER-VOLTAGE LIMIT OPERATION (F452) POWER RUNNING STALL CONTINUOUS TRIP DETECTION TIME (F453) REGENERATIVE BRAKING STALL PREVENTION MODE SELECTION (F601) STALL PREVENTION LEVEL (F626) OVER-VOLTAGE LIMIT OPERATION LEVEL (F625) OVER-VOLTAGE LIMIT OPERATION LEVEL (FAST)	(F250) DC INJECTION BRAKING START FREQUENCY (F251) DC INJECTION BRAKING CURRENT (F252) DC INJECTION BRAKING TIME (F253) FORWARD/REVERSE DC INJECTION BRAKING PRIORITY (F254) MOTOR SHAFT FIXING CONTROL	(F603) EMERGENCY OFF (F604) EMERGENCY DC BRAKING CONTROL TIME
Retry/Restart	Undervoltage/Ridethrough	Overload	Trip Settings
(F301) AUTO RESTART SELECTION (F303) RETRY SELECTION (F312) SCAN RATE (F313) LOCK-ON RATE (F314) SEARCH METHOD (F315) SEARCH INERTIA	(F302) RIDETHROUGH POWER RIDETHROUGH SELECTION (F627) UNDERVOLTAGE TRIP SELECTION (F628) UNDERVOLTAGE (TRIP ALARM) DETECTION TIME (F629) REGENERATIVE POWER RIDETHROUGH CONTROL LEVEL (F310) RIDETHROUGH TIME	(F017) MOTOR OVERLOAD PROTECTION CONFIGURATION (F606) OVERLOAD REDUCTION START FREQUENCY (F607) MOTOR 150% OVERLOAD TIME LIMIT	(F602) ASD TRIP RECORD RETENTION SELECTION
Phase Loss	Low Current Settings	Abnormal Speed Settings	Over Torque Parameters
(F605) OUTPUT PHASE FAILURE DETECTION	(F610) LOW CURRENT TRIP SELECTION (F611) LOW-CURRENT DETECTION CURRENT (F612) LOW-CURRENT DETECTION TIME	(F622) ABNORMAL SPEED DETECTION TIME (F623) OVER-SPEED DETECTION FREQUENCY UPPER BAND (F624) SPEED DROP DETECTION FREQUENCY LOWER BAND	(F615) OVER-TORQUE TRIP SELECTION (F616) OVER-TORQUE TRIP/ ALARM LEVEL DURING POWER RUNNING (F617) OVER-TORQUE TRIP/ ALARM LEVEL DURING REGENERATIVE BRAKING (F618) OVER-TORQUE DETECTION TIME
Base Frequency Voltage	Special Protection Parameters		
(F307) SUPPLY VOLTAGE CORRECTION	(F613) SHORT-CIRCUIT DETECTION AT START (F614) SHORT-CIRCUIT-PULSE RUN DURATION (F620) COOLING FAN CONTROL MODE (F621) CUMULATIVE RUN TIMER ALARM SETTING	(F630) BRAKING ANSWER WAITING TIME (F632) RELEASE AFTER RUN TIMER (F609) SUPPRESSION OF INRUSH CURRENT TIMING	

PRIMARY MENU: TORQUE			
Setpoints	Torque Control	Torque Limit Settings	Manual Torque Limit Settings
(F205) VI/II POINT 1 TORQUE (F201) VI/II REFERENCE POINT 1 (F206) VI/II POINT 2 TORQUE (F203) VI/II REFERENCE POINT 2 (F214) RR INPUT POINT 1 TORQUE (F210) RR REFERENCE POINT 1 (F215) RR INPUT POINT 2 TORQUE (F212) RR REFERENCE POINT 2 (F220) RX INPUT POINT 1 TORQUE (F216) RX REFERENCE POINT 1 (F221) RX INPUT POINT 2 TORQUE (F218) RX REFERENCE POINT 2 (F226) RX2 INPUT POINT 1 TORQUE (F222) RX2 REFERENCE POINT 1 (F227) RX2 INPUT POIONT 2 TORQUE (F224) RX2 REFERENCE POINT 2 (F232) BIN INPUT POINT 1 TORQUE (F228) BIN REFERENCE POINT 1 (F233) BIN INPUT POINT 2 TORQUE (F230) BIN REFERENCE POINT 2	(F420) TORQUE COMMAND SELECTION (F423) TENSION TORQUE BIAS INPUT SELECTION (F421) TORQUE COMMAND FILTER (F422) SYNCHRONIZED TORQUE BIAS INPUT SELECTION (F424) LOAD SHARING GAIN INPUT SELECTION (F425) FORWARD SPEED LIMIT INPUT SELECTION (F426) FORWARD SPEED LIMIT INPUT LEVEL (F427) REVERSE SPEED LIMIT INPUT SELECTION (F428) REVERSE SPEED LIMIT INPUT LEVEL	(F440) POWER RUNNING TORQUE LIMIT 1 (F442) REGENERATIVE BRAKING TORQUE LIMIT 1 (F450) TORQUE LIMIT MODE (F451) TORQUE LIMIT MODE (SPEED DEPENDENT)	(F441) POWER RUNNING TORQUE LIMIT 1 LEVEL (F443) REGENERATIVE BRAKING TORQUE LIMIT 1 LEVEL (F444) POWER RUNNING TORQUE LIMIT 2 LEVEL (F445) REGENERATIVE BRAKING TORQUE LIMIT 2 LEVEL (F446) POWER RUNNING TORQUE LIMIT 3 LEVEL (F447) REGENERATIVE BRAKING TORQUE LIMIT 3 LEVEL (F448) POWER RUNNING TORQUE LIMIT 4 LEVEL (F449) REGENERATIVE BRAKING TORQUE LIMIT 4 LEVEL
Torque Speed Limiting			
(F429) TORQUE COMMAND MODE SELECTION (F430) SPEED LIMIT (TORQUE=0) CENTER VALUE REFERENCE SELECTION	(F431) SPEED LIMIT (TORQUE=0) CENTER VALUE (F432) SPEED LIMIT (TORQUE=0) BAND	(F433) SPEED LIMIT (TORQUE=0) RECOVERY TIME	

PRIMARY MENU: FEEDBACK			
Feedback Settings	PG Settings		Drooping Control
(F360) PID FEEDBACK SIGNAL SELECTION (F361) PID FEEDBACK DELAY FILTER (F362) PID FEEDBACK PROPORTIONAL (P) GAIN (F363) PID FEEDBACK INTEGRAL (I) GAIN (F364) PID DEVIATION UPPER LIMIT (F365) PID DEVIATION LOWER LIMIT (F366) PID FEEDBACK DIFFERENTIAL GAIN	(F367) NUMBER OF PG INPUT PULSES (F368) SELECTION OF NUMBER OF PG INPUT PHASES (F369) PG DISCONNECTION DETECTION (F370) ELECTRONIC GEAR SETTING (F371) POSITION LOOP GAIN (F372) POSITIONING COMPLETION RANGE	(F373) FREQUENCY LIMIT AT POSITION (F374) CURRENT CONTROL PROPORTIONAL GAIN (F375) CURRENT CONTROL INTEGRAL GAIN (F376) SPEED LOOP PROPORTIONAL GAIN (F377) SPEED LOOP INTEGRAL GAIN (F378) MOTOR COUNTER DATA SELECTION	(F379) SPEED LOOP PARAMETER RATIO (F320) DROOPING GAIN (F321) SPEED AT 0% DROOPING GAIN (F322) SPEED AT F320 DROOPING GAIN (F323) DROOPING INSENSITIVE TORQUE BAND (F324) DROOPING OUTPUT FILTER (F327) DROOPING REFERENCE (F325) LOAD INERTIA (ACC/DEC TORQUE) (F326) LOAD TORQUE FILTER
Override Control			
(F660) ADDING INPUT SELECTION (F661) MULTIPLYING INPUT SELECTION	(F729) CN8 OPTION OVERRIDE MULTIPLICATION GAIN		

PRIMARY MENU: COMMUNICATIONS			
Communication Settings			Communications Adjustments
(F802) ASD NUMBER (F800) BAUD RATE (TTL) (F820) BAUD RATE(RS232/RS485) (F801) PARITY (F803) COMMUNICATION TIME OUT TIME (RS232/RS485)	(F804) COMMUNICATION TIME OUT ACTION (RS232/RS485 AND TTL) (F805) SEND WAITING TIME (TTL) (F821) RS485 WIRE COUNT (F825) SEND WAITING TIME (RS232/RS485)	(F806) ASD TO ASD COMMUNICATION (TTL) (F826) ASD TO ASD COMMUNICATION (RS232/RS485) (N/A) SELECTION EOI PORT ADDRESS (EOI MUST BE RESET TO ACTIVATE PORT SWITCH)	(F810) FREQUENCY POINT SELECTION (F811) POINT 1 SETTING (F812) POINT 1 FREQUENCY (F813) POINT 2 SETTING (F814) POINT 2 FREQUENCY
S20 Settings		Scan Settings	
(F860) RECEIVE ADDRESS (F861) TRANSMIT ADDRESS (F862) SPEED REFERENCE STATION (F863) SPEED REFERENCE ADDRESS (F865) TORQUE REFERENCE STATION (F866) TORQUE REFERENCE ADDRESS	(F868) FAULT DETECT STATION NUMBER (F869) STATION MODE (F899) S20 RESET (F850) COMMUNICATION ERROR MODE (F851) COMMUNICATION ERROR DETECT TIME	(F830) COMMAND REQUEST DISPOSITION ON ERROR (F831) INPUT REFERENCE 1 (F832) INPUT REFERENCE 2 (F833) INPUT REFERENCE 3 (F834) INPUT REFERENCE 4 (F835) INPUT REFERENCE 5 (F836) INPUT REFERENCE 6	(F841) OUTPUT MONITOR 1 (F842) OUTPUT MONITOR 2 (F843) OUTPUT MONITOR 3 (F844) OUTPUT MONITOR 4 (F845) OUTPUT MONITOR 5 (F846) OUTPUT MONITOR 6
Optional Parameters			
(F890) OPTIONAL PARAMETERS 1 (F891) OPTIONAL PARAMETERS 2 (F892) OPTIONAL PARAMETERS 3 (F893) OPTIONAL PARAMETERS 4 (F894) OPTIONAL PARAMETERS 5			

PRIMARY MENU: MOTOR			
Vector Motor Model			
(F400) AUTOTUNE AND RESET CONFIG. (F414) AUTOTUNE OF MOTOR CONSTANT 3 (F401) SLIP FREQUENCY GAIN	(F412) MOTOR CAPACITY (kW) (F402) MOTOR CONSTANT 1 (PRIMARY RESISTANCE) (F403) MOTOR CONSTANT 2 (SECONDARY RESISTANCE)	(F404) MOTOR CONSTANT 3 (EXCITING INDUCTANCE) (F405) MOTOR CONSTANT 4 (LOAD INERTIA) (F410) MOTOR CONSTANT 5 (LEAKAGE INDUCTANCE)	(F413) MOTOR TYPE (F411) NUMBER OF MOTOR POLES
Motor Set 1	Motor Set 2	Motor Set 3	Motor Set 4
(F014) BASE FREQUENCY 1 (F306) BASE FREQUENCY VOLTAGE 1 (F016) MANUAL TORQUE BOOST 1 (F600) MOTOR OVERLOAD PROTECTION LEVEL 1	(F170) BASE FREQUENCY 2 (F171) BASE FREQUENCY VOLTAGE 2 (F172) MANUAL TORQUE BOOST 2 (F173) MOTOR OVERLOAD PROTECTION LEVEL 2	(F174) BASE FREQUENCY 3 (F175) BASE FREQUENCY VOLTAGE 3 (F176) MANUAL TORQUE BOOST 3 (F177) MOTOR OVERLOAD PROTECTION LEVEL 3	(F178) BASE FREQUENCY 4 (F179) BASE FREQUENCY VOLTAGE 4 (F180) MANUAL TORQUE BOOST 4 (F181) MOTOR OVERLOAD PROTECTION LEVEL 4

PRIMARY MENU: SPECIAL			
Frequency Control	Jump Frequencies	Carrier Frequency	Acc/Dec (1-4) Settings
(F240) START FREQUENCY (F241) RUN FREQUENCY (F242) RUN FREQUENCY HYSTERESIS (F243) END FREQUENCY	(F270) JUMP FREQUENCY 1 (F271) JUMP FREQUENCY 1 BANDWIDTH (F272) JUMP FREQUENCY 2 (F273) JUMP FREQUENCY 2 BANDWIDTH (F274) JUMP FREQUENCY 3 (F275) JUMP FREQUENCY 3 BANDWIDTH (F276) JUMP FREQUENCY PROCESSING SELECTION	(F300) PWM CARRIER FREQUENCY	(F009) ACCELERATION TIME 1 (F010) DECELERATION TIME 1 (F502) S-CURVE ACCELERATION/DECELERATION PATTERN 1 (F500) ACCELERATION TIME 2 (F501) DECELERATION TIME 2 (F503) S-CURVE ACCELERATION/DECELERATION PATTERN 2 (F510) ACCELERATION TIME 3 (F511) DECELERATION TIME 3 (F512) ACCELERATION/DECELERATION PATTERN 3 (F514) ACCELERATION TIME 4 (F515) DECELERATION TIME 4 (F516) ACCELERATION/DECELERATION PATTERN 4 (F504) ACCELERATION/DECELERATION PATTERN 1-4 SELECTION
Accel/Decel Special	Crane/Hoist Load		V/f Five Point Setting
(F506) S-PATTERN LOWER LIMIT ADJUSTMENT (F507) S-PATTERN UPPER LIMIT ADJUSTMENT (F508) ACCEL/DECEL TIME LOWER LIMIT (F505) ACCELERATION/DECELERATION SWITCHING FREQUENCY 1 (F513) ACCELERATION/DECELERATION SWITCHING FREQUENCY 2 (F517) ACCELERATION/DECELERATION SWITCHING FREQUENCY 3	(F330) LIGHT-LOAD HIGH-SPEED OPERATION (F331) LIGHT-LOAD HIGH-SPEED OPERATION SWITCHING LOWER LIMIT FREQUENCY (F332) LIGHT-LOAD HIGH-SPEED OPERATION LOAD WAITING TIME (F333) LIGHT-LOAD HIGH-SPEED OPERATION LOAD DETECTION TIME (F334) LIGHT-LOAD HIGH-SPEED OPERATION HEAVY LOAD DETECTION TIME (F335) SWITCHING LOAD TORQUE DURING FORWARD RUN	(F336) HEAVY LOAD TORQUE DURING FORWARD ACCELERATION (F337) HEAVY LOAD TORQUE DURING FIXED SPEED FORWARD RUN (F338) SWITCHING LOAD TORQUE DURING REVERSE RUN (F339) HEAVY LOAD TORQUE DURING REVERSE ACCELERATION (F340) HEAVY LOAD TORQUE DURING FIXED SPEED REVERSE RUN (F341) FREQUENCY FOR AUTOMATIC HIGH-SPEED OPERATION AT LIGHT LOAD	(F190) V/F FIVE-POINT 1 FREQUENCY (F191) V/F FIVE-POINT 1 VOLTAGE (F192) V/F FIVE-POINT 2 FREQUENCY (F193) V/F FIVE-POINT 2 VOLTAGE (F194) V/F FIVE-POINT 3 FREQUENCY (F195) V/F FIVE-POINT 3 VOLTAGE (F196) V/F FIVE-POINT 4 FREQUENCY (F197) V/F FIVE-POINT 4 VOLTAGE (F198) V/F FIVE-POINT 5 FREQUENCY (F199) V/F FIVE-POINT 5 VOLTAGE
Low Output Disable Function			
(F731) LOW OUTPUT DISABLE CONTROL AND STOPPING METHOD (F732) LOW OUTPUT DISABLE START LEVEL (F733) LOW OUTPUT DISABLE START TIME (F734) LOW OUTPUT DISABLE SETPOINT BOOST	(F735) LOW OUTPUT DISABLE BOOST TIME (F736) LOW OUTPUT DISABLE FEEDBACK LEVEL (F737) LOW OUTPUT DISABLE RESTART DELAY TIME		

PRIMARY MENU: SPECIAL			
Earth Fault	Special Parameters		Optional Analog Terminal Mark
(F640) EARTH FAULT ALARM LEVEL (F641) EARTH FAULT ALARM TIME (F642) EARTH FAULT TRIP LEVEL (F643) EARTH FAULT TRIP TIME	(F183) V/F ADJUSTMENT COEFFICIENT (F244) DEAD BAND OF 0 HZ FREQUENCY SETTING SIGNAL (F255) SELECT FUNCTION FOR 0 HZ COMMAND STOP FUNCTION (F481) SELECTION FOR OVER EXCITING COOPERATION (F485) STALL COOPERATION GAIN AT FIELD WEAKENING ZONE (F486) EXCITING STARTING RATE	(F487) COMPENSATION COEFFICIENT FOR IRON LOSS (F488) VOLTAGE COMPENSATION COEFFICIENT FOR DEAD TIME (F489) DEAD TIME COMPENSATION (F490) DEAD TIME COMPENSATION BIAS (F491) SWITCHING FREQUENCY BETWEEN CURRENT AND VOLTAGE CONTROL (F680) OPTIONAL ANALOG TERMINAL MARK (F454) CURRENT DIFFERENTIAL GAIN (F480) EXCITING STRENGTHENING COEFFICIENT (F482) CONTROL MARGIN MODULATION FOR CURRENT VECTOR CONTROL (F483) CONTROL MARGIN MODULATION FOR VOLTAGE VECTOR CONTROL (F484) CONTROL MARGIN MODULATION FOR CONSTANT VECTOR CONTROL	(F454) CURRENT DIFFERENTIAL GAIN (F480) EXCITING STRENGTHENING COEFFICIENT (F482) CONTROL MARGIN MODULATION FOR CURRENT VECTOR CONTROL (F483) CONTROL MARGIN MODULATION FOR VOLTAGE VECTOR CONTROL (F484) CONTROL MARGIN MODULATION FOR CONSTANT VECTOR CONTROL

PRIMARY MENU: PASSWORD & LOCKOUTS		
Enter Password	Change Password	Lockouts

Startup Wizard Requirements

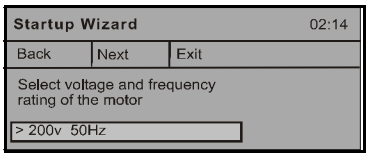
The Startup Wizard assists the user with the initial configuration of the WX9 ASD by querying the user for information on the frequently used ASD control settings and system operational specifications. The WX9 ASD may also be setup by directly accessing each of the settings via the Program menu or the Direct Access Number for each item (see the section titled Direct Access Parameter Information in the *WX9 ASD Installation & Operation Manual* for specifics on each parameter). Application-specific settings may still be required upon completion.

The Startup Wizard is launched from the Program menu.

Select the input power specifications or click Manually Configure-Finish to exit.

Input the required information into the following screens to complete the Startup Wizard. Click Next or Finish after each window. Next opens the next Startup Wizard window. Finish returns the system to the Frequency Command Screen.

1. Voltage and Frequency Rating of the Motor



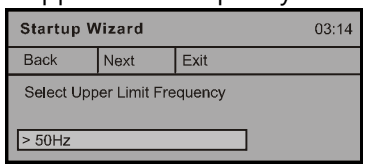
Motors are designed and manufactured for operation within a specific voltage and frequency range. The voltage and frequency specifications for a given motor may be found on the nameplate of the motor.

Settings:

2 — 380v, 50Hz

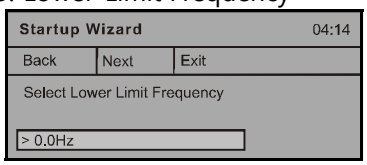
3 — 460v, 60Hz

2. Upper-Limit Frequency



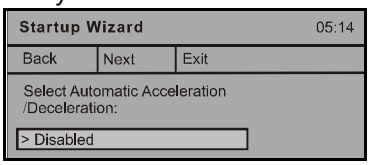
This parameter sets the highest frequency that the WX9 ASD will accept as a frequency command or frequency setpoint. The WX9 ASD may output frequencies greater than the Upper-Limit Frequency (but less than the Maximum Frequency) when operating in the PID Control mode, Torque Control mode, or the Vector Control modes (sensorless or feedback).

3. Lower-Limit Frequency



This parameter sets the lowest frequency that the WX9 ASD will accept as a frequency command or frequency setpoint. The WX9 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. Adjust Accel/Decel Automatically?



When enabled, the WX9 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 actual Accel/Decel times used].

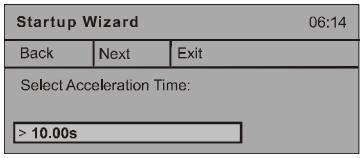
Note: The motor and the load must be connected prior to selecting Automatic Acc/Dec. If Automatic Acc/Dec is not enabled, the Acceleration screen will appear followed by the Deceleration screen as shown below.

Settings:

0 — Disabled

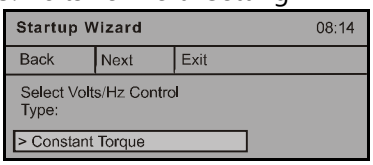
1 — Enabled

Acceleration Time



Deceleration Time

5. Volts Per Hertz Setting



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

Settings:

0 — Constant Torque

1 — Variable Torque

2 — Automatic Torque Boost

3 — Sensorless Vector Control (speed)

4 — Automatic Torque Boost with Automatic Energy Saving

5 — Sensorless Vector Control (speed) with Automatic Energy Saving

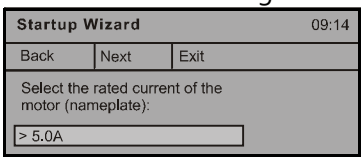
6 — V/f 5-Point Setting (opens 5-point setting screen)

7 — Sensorless Vector Control (speed/torque switching)

8 — PG Feedback Vector Control (speed/torque switching)

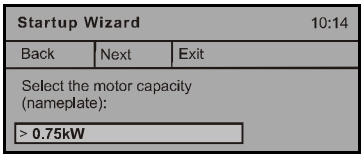
9 — PG Feedback Vector Control (speed/position switching)

6. Motor Current Rating



This parameter allows the user to input the full-load amperage (FLA) of the motor. This value is used by the WX9 ASD to determine the motor overload protection setting for the motor. The value is found on the nameplate of the motor.

7. Command Source



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

Settings:

0 — Terminal Board

1 — CN8 Option

2 — TTL

3 — RS232/RS485

4 — Communication Card

8. Frequency Command Source

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

Settings:

1 — VI/II

2 — RR

3 — RX

4 — RX2 (option)

5 — CN8 Option

6 — Binary/BCD Input

7 — TTL

8 — RS232/RS485

9 — Communication Card

10 — UP/DOWN Frequency

11 — Pulse Input (option)

9. Wizard Finished!

This screen is the final screen of the Startup Wizard. The basic parameters of the WX9 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.

Virtual Linear Pump Setup

Toshiba International Corporation's Virtual Linear Pump algorithm allows for direct and precise control of pressure, flow rate, or level. This is achieved without the concerns, instabilities, or complexities that are traditionally associated with pumping system control. This section provides useful setup and operational information for the Virtual Linear Pump system.

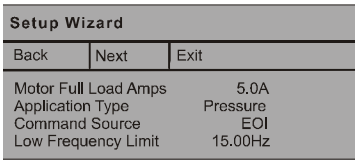
The system is initially configured using the (Program ⇒ Virtual Linear Pump ⇒) Virtual Linear Pump Setup Wizard. Once the Wizard is started, it must be completed for normal Virtual Linear Pump operations to function.

However, the parameters addressed while using the Wizard or the Virtual Linear Pump Settings menu selection are also accessible via their 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 F911 must first be set to 255: Virtual Linear Pump to accept the new or changed Virtual Linear Pump parameter settings. Upon completion of the parameter changes, set parameter F911 to 1 or 2 to use the changed (new) settings for normal Virtual Linear Pump operations (Zero may be selected at F911 to save the changes to be used later).

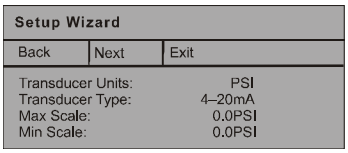
The setup procedure and the Wizard setup screens are shown below.

Input the Electrical Specifications of the Motor



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

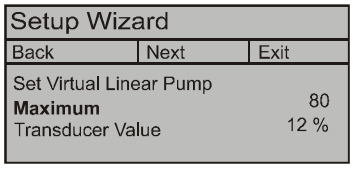
Input the Specifications of the Transducer



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

DANGER **WARNING! — THE FOLLOWING STEP WILL START THE MOTOR!**

Set the Maximum Threshold Value

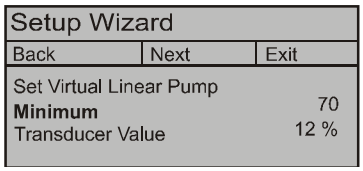


11. Set the system for normal flow and ensure that all system valves are set for normal operation.
12. Place the system in the Local mode and press the Run key.
13. Click Next to continue.

    The Motor/Pump combination capacity is automatically calculated 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 F918. The Maximum threshold setting (F918) minus the F933 setting comprises the range of the Maximum threshold zone.
14. Click Next to continue.

Set the Minimum Threshold Value



15. The Minimum threshold value 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.

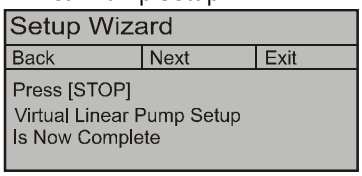
    Click in the Minimum threshold field and, using the Rotary Encoder, slowly decrease the Minimum threshold value while observing the LED display.

    If either of the conditions listed below should occur while decreasing the Minimum threshold value, 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.

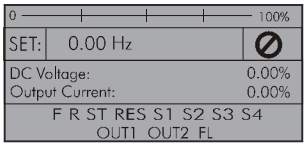
    The Minimum threshold setting (F917) plus the F919 setting comprises the range of the Minimum threshold setting.

Complete the Virtual Linear Pump Setup

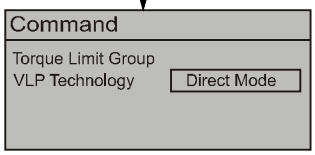


16. Press the Stop key to complete the setup.
17. Click Exit to save settings (Exit becomes available at zero Hz).

Run the Motor/Pump in the Direct Mode



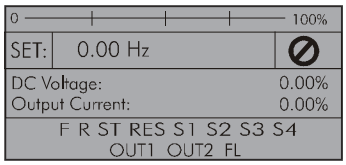
Press **ESC**



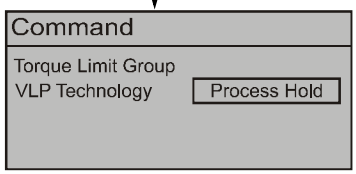
18. Press the ESC key until reaching the Frequency Command screen.
19. From the Frequency Command screen press ESC, scroll to the Control field, and select Direct Mode if using no feedback (if using feedback go to Step 21. on pg. 53).
20. While in the Local mode, press Run.

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

Run the Motor/Pump in Process Hold Mode



Press **ESC**



21. From the Frequency Command screen press ESC, scroll to the Control field, and select Process Hold if using feedback (if not using feedback go to Step 19. on pg. 53).
22. While in the Local mode, press Run.

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

Direct Access Parameter Information

The ASD has the ability to allow the user direct access to the motor control functions. The functions listed below have an associated Parameter Number which accesses its setting. There are two ways in which the motor-control parameters may be accessed for modification: Program ⇒ Applicable Menu Path or Program ⇒ Direct Access ⇒ Applicable Parameter Number. Both methods access the parameter via the Program mode. Once accessed, the parameter setting 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: The setup procedures included within this section may require a Reset before performing the procedure. Application-specific settings may then be performed. The pre-Reset conditions may be saved (see Type Reset (F007)).

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=Disabled; 1= Enabled).

Direct Access Parameters/Numbers

Automatic Acceleration/Deceleration Selection

Program ⇒ Fundamental ⇒ Acc/Dec 1 Settings

Direct Access Number — **F000**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **No**

This parameter Enables/Disables the ability of the ASD to adjust the 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 (Acc) Time 1 (F009) and Deceleration (Dec) Time 1 (F010).

Settings:

0 — Disabled
1 — Enabled

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

Command Mode Selection

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 Override Operation on pg. 34).

Settings:

0 — Terminal Board
1 — CN8 Option
2 — Common Serial (TTL)
3 — RS232/RS485
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 (F207) setting or the Override feature (pg. 34) may supersede the Frequency Mode 1 setting.

Settings:

1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD (Option)
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Option Board
10 — UP/DOWN Frequency
11 — Pulse Input (Option)

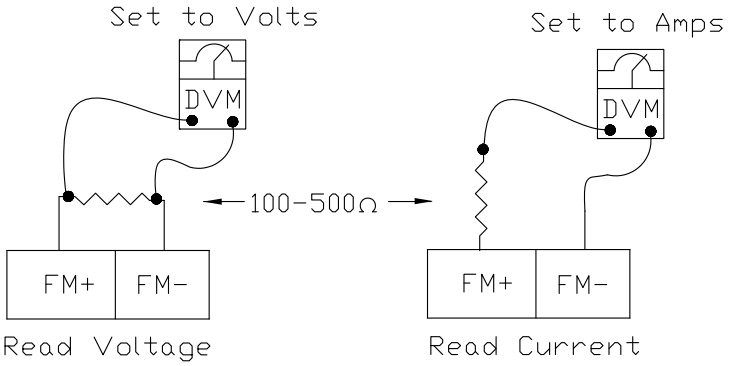
FM Output Terminal Function

Program ⇒ Terminal ⇒ Analog Output Terminals

This setting determines the output function of the FM analog output terminal. The FM output terminal produces an output current that is proportional to the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 10 on pg. 182.

To read Voltage at this terminal, connect a 100 – 500 W resistor from FM (+) to FM (-). The voltage is read across the 100 – 500 W resistor.

To read Current at this terminal, connect an ammeter from FM (+) to FM (-).



The FM Output Terminal Adjustment (F006) is used to calibrate the output signal for a proper response. SW-2 at the Terminal Board may be switched to allow for the full-range output to be either 0 – 1 mA or 4 – 20 mA when providing an output current, or either 0 – 1 or 1 – 7.5 volts when providing an output voltage at this terminal.

Direct Access Number — **F005**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

FM Output Terminal Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This function is used to calibrate the FM terminal analog output.

To calibrate the FM analog output, connect a meter (current or voltage) as described under FM Output Terminal Function (F005).

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

See AM Output Terminal Function (F670) for additional information on this setting.

Direct Access Number — **F006**

Parameter Type — **Numerical**

Factory Default — **512**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

Type Reset

Direct Access Number — **F007**
Parameter Type — **Selection List**
Factory Default — **None**
Changeable During Run — **No**

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 — Reset EOI to Factory Settings

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

Acceleration Time 1

Direct Access Number — **F009**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — F508
Maximum — 6000
Units — Seconds

Program ⇒ Fundamental ⇒ Acc/Dec 1 Settings
Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time in seconds for the drive to go from 0.0 Hz to the Maximum Frequency (F011) for the Acceleration 1 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502. The minimum Acc/Dec time may be set using F508.

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

Acceleration

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

Under most operating conditions, as the output frequency of the drive 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.

Deceleration Time 1

Direct Access Number — **F010**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — F508
Maximum — 6000
Units — Seconds

Program ⇒ Fundamental ⇒ Acc/Dec 1 Settings
Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time in seconds for the drive to go from the Maximum Frequency (F011) to 0.0 Hz for the Deceleration (Dec) 1 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502.

When operating with the Automatic Acceleration/Deceleration Selection (F000) enabled, the minimum Acc/Dec time may be set using F508.

Note: A deceleration time shorter than the load will allow may cause nuisance tripping and mechanical stress to loads.
Automatic Acceleration/Deceleration and Stall settings may lengthen the acceleration time.

Maximum Frequency

Direct Access Number — **F011**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **No**
Minimum — 30.0
Maximum — 299.0
Units — Hz

Program ⇒ Fundamental ⇒ Frequency Settings

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

Acceleration/Deceleration (Acc/Dec) times are calculated based on the Maximum Frequency (F011) setting.

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

Note: The maximum output frequency of the drive cannot be greater than 10.5 times the base frequency, regardless of the Maximum Frequency setting.

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

Upper-Limit Frequency

Direct Access Number — **F012**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Maximum Freq. (F011)
Units — Hz

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 mode (sensorless or feedback).

Note: This setting may not be higher than the Maximum Frequency (F011) setting.

Lower-Limit Frequency

Direct Access Number — **F013**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Upper-Limit Freq. (F012)
Units — Hz

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).

Base Frequency 1

Program ⇒ Fundamental ⇒ Motor Set 1
Program ⇒ Motor ⇒ Motor Set 1

The Base Frequency 1 setting determines the frequency at which the output voltage of the ASD reaches its maximum setting. The maximum voltage setting cannot be more than the input voltage (see Maximum Output Voltage at F306).

There are four Base Frequency Profile settings: 1 – 4.

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

Direct Access Number — **F014**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 25.0
Maximum — 299.0
Units — Hz

V/f Pattern

Program ⇒ Fundamental ⇒ Frequency Settings

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

Settings:

0 — Constant Torque
1 — Variable Torque
2 — Automatic Torque Boost
3 — Sensorless Vector Control (Speed)
4 — Automatic Torque Boost + Automatic Energy Saving
5 — Sensorless Vector Control (Speed) + Automatic Energy Saving
6 — V/f Five-Point Setting (Open Five-Point Setting Window)
7 — Sensorless Vector Control (Speed/Torque Switching)
8 — PG Feedback Vector Control (Speed/Torque Switching)
9 — PG Feedback Vector Control (Speed/Position Switching)

Note: For proper operation, the Carrier Frequency must be 2.2 kHz or above except when operating in the Constant Torque, Variable Torque, or the Five-Point Setting modes.

The Automatic Torque Boost and the Sensorless Vector Control selections use the motor tuning parameters of the drive 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.

Direct Access Number — **F015**
Parameter Type — **Selection List**
Factory Default — **Variable Torque**
Changeable During Run — **No**

Manual Torque Boost 1

Direct Access Number — **F016**

Parameter Type — **Numerical**

Factory Default — **(ASD-Dependent)**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 30.0

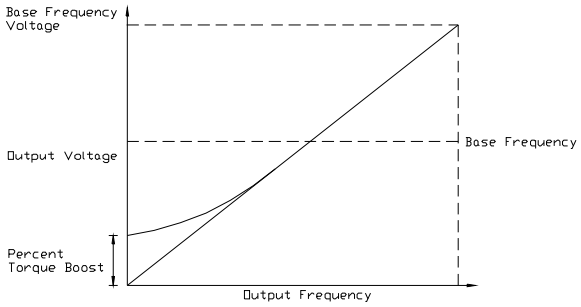
Units — %

Program ⇒ Fundamental ⇒ Motor Set 1

Program ⇒ Motor ⇒ 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.

Motor Overload Protection Configuration

Direct Access Number — **F017**

Parameter Type — **Selection List**

Factory Default — **Motor OL Trip without Soft Stall**

Changeable During Run — **No**

Program ⇒ Protection ⇒ Overload

This parameter is used to protect the motor from an over-current condition.

This parameter setting may extend the Over-Voltage Limit Operation (F305) time settings.

This parameter may be affected by the setting of the Power Running Stall Continuous Trip Detection Time (F452).

Settings:

Setting	Type of Motor Trip	Soft Stall Setting
0	Motor OL Trip	Without Soft Stall
1	Motor OL Trip	With Soft Stall
2	Without Motor OL Trip	Without Soft Stall
3	Soft Stall Only	
4	V/f Motor OL Trip	No Soft Stall
5	V/f Motor OL Trip	With Soft Stall
6	V/f Motor Without OL Trip	Without Soft Stall
7	V/f Motor Without OL Trip	With Soft Stall Only

Preset Speed 1

Program ⇒ Frequency ⇒ Preset Speeds

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

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

1. Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board
2. Program ⇒ Terminal ⇒ Input Terminals ⇒ S1 (set to Preset Speed 1; LSB of 4-bit count). Repeat for S2 – S4 (MSB of 4-bit count) as Preset Speed 2 – 4, respectively (all Normally Open).

   Note: The default setting of S4 is EOff, but this terminal may be re-assigned as the MSB.
3. Program ⇒ Frequency ⇒ Preset Speeds ⇒ Preset Speed 1 (press Enter twice and set an output frequency as Preset Speed 1; repeat for Preset Speeds 2 – 15 as required).
4. Program ⇒ Preset Speed Modes ⇒ Preset Speed Operation Mode ⇒ Enabled/Disabled

   Select Enabled to use the direction, acceleration/deceleration, and torque settings of the Preset Speed being run. The torque settings used will be as defined in F170 - F181 and as selected via the associated discrete input terminals V/f Switching 1 and 2 in Table 9 on pg. 178.
5. Place the system in the Auto mode (Hand/Auto 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, and Preset Speed Operation Mode must be set to Enabled at F380.

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 Speeds are also used in the Pattern Run mode.

Direct Access Number — **F018**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — Upper-Limit Freq. (F012)

Units — Hz

Preset Speed Truth Table

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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F019**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0

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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F020**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F021**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F022**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F023**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F024**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — Upper-Limit Freq. (F012)
Units — Hz

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 — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
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 the Speed Reach Detection Band (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 — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
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 — **2.5**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Upper-Limit Freq. (F012)
Units — Hz

ST Signal Selection

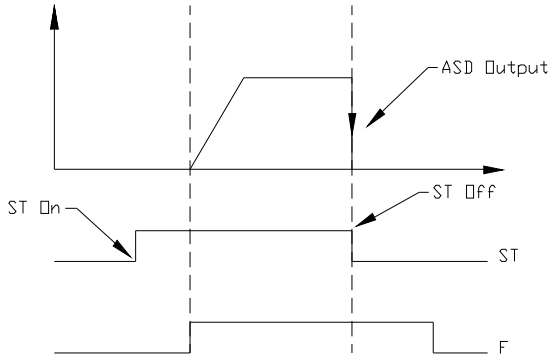
Program ⇒ Terminal ⇒ Input Special Functions

This parameter is used to set the operation of the Standby (ST) control terminal or any terminal configured as the ST terminal.

Settings:

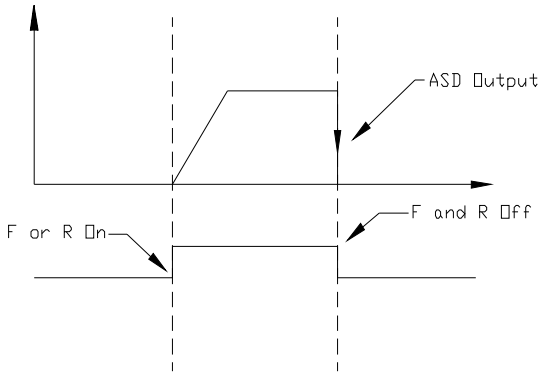
0 — Standard
1 — Always On
2 — Interlock with F/R Terminal

The Standard setting enables the ASD for operation so long as the control terminal ST is connected to CC via a jumper, contact, or other means.



The Always On setting allows the ASD to operate without the ST-to-CC connection. The control terminal ST may be configured for another function or unused.

The Interlock with F/R Terminal setting configures the F (Forward) and R (Reverse) control terminals for the secondary function of Standby. Closing a set of contacts to either F or R will cause the ASD to accelerate the motor to the programmed setpoint of F or R. Opening the F and R contact will disable the ASD and the motor will coast to a stop. The control terminal ST may be configured for another function or unused.



Direct Access Number — **F103**
Parameter Type — **Selection List**
Factory Default — **Standard**
Changeable During Run — **No**

Forward/Reverse Run Priority When Both Are Closed

Direct Access Number — **F105**

Parameter Type — **Selection List**

Factory Default — **Reverse**

Changeable During Run — **No**

Program ⇒ Terminal ⇒ Input Special Functions

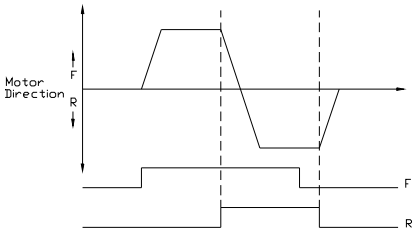
The Forward/Reverse Priority Selection determines the operation of the ASD if both the F and R control terminals are activated.

Settings:

0 — Reverse
1 — Suspend

The waveforms 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.



Input Terminal Priority Selection

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 Hand 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 Jog Frequency (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 Selection

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 optional ASD-Multicom card only. This parameter defines the format of the binary or BCD data when using the option card.

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) must be set to Binary/ BCD (option).

For proper scaling of the binary or BCD input, parameters F228 – F231 must be configured [BIN Reference Point 1, BIN Point 1 Frequency, BIN Reference Point 2, and BIN Point 2 Frequency].

UP/DOWN Frequency Disposition at Power Down

Program ⇒ Frequency ⇒ UP/DOWN Frequency Settings

Direct Access Number — **F108**

Parameter Type — **Selection List**

Factory Default — **Erase**

Changeable During Run — **No**

When the Frequency Mode 1 (F004) setting is set to UP/DOWN Frequency, this parameter determines the outcome of the Frequency Mode 1 setting when the ASD is powered down, stopped, or tripped.

Settings:

0 — Erase
1 — Store

Note: If Store is selected, an input terminal must be set to 43: Binary Data Write in order to save the UP/DOWN Frequency Command.

If Erase is selected, then a set of 0.0 Hz is established when restarted and the ASD will NOT store the frequency setpoint.

If Store is selected, the ASD will retain the current frequency setpoint in memory while stopped, during fault conditions, or when power is removed. This setpoint will be used as the initial frequency setpoint when the ASD is restarted.

An activated discrete input terminal configured as UP/DOWN Frequency (clear) will establish a frequency setpoint of 0.0 Hz regardless of the UP/DOWN Frequency Disposition at Power Down setting upon restart.

If running with an activated UP/DOWN Frequency (up or down) terminal, activation of the UP/DOWN Frequency (clear) terminal forces the ASD output to the Lower-Limit Frequency (F013) setting.

UP/DOWN Frequency Function

The UP/DOWN Frequency function allows for an externally-supplied discrete input signal to increase or decrease the output frequency of the ASD.

This method uses the discrete input terminal settings UP/DOWN Frequency (up), UP/DOWN Frequency (down), and UP/DOWN Frequency (clear). Activation of the Up or Down terminals increases or decreases the output frequency for the duration of the activation at the Acceleration 1 or Deceleration 1 rates, respectively.

To activate-and-hold either terminal 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. The UP/DOWN Frequency (clear) function will clear the stored frequency value if stopped or command the ASD to output the Lower-Limit Frequency if activated while running.

Setup Requirements

F003 — Set the Command control source to Terminal Board.

F004 — Set the Frequency Mode 1 control source to UP/DOWN Frequency.

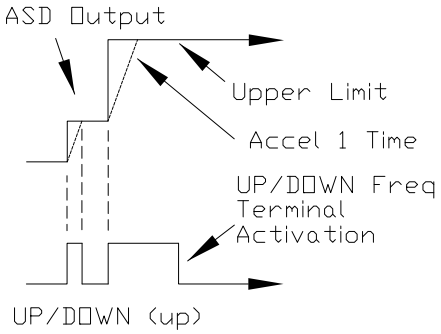
Set an unused discrete input terminal to UP/DOWN Frequency (up).

Set an unused discrete input terminal to UP/DOWN Frequency (down).

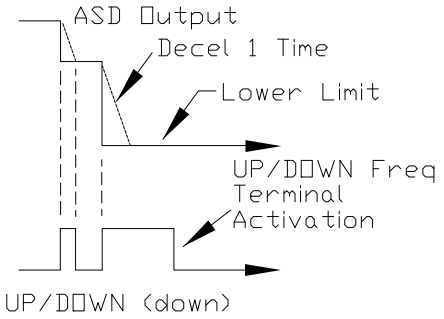
Set an unused discrete input terminal to UP/DOWN Frequency (clear).

F108 — Select the outcome (Erase or Store) of the Frequency Mode 1 setting when the ASD is powered down, stopped, or tripped.

UP/DOWN Frequency (up) Mode



UP/DOWN Frequency (down) Mode



Always ON Terminal Function

Direct Access Number — **F110**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

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

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

This parameter sets the programmable ON terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 1 (F) Function

Direct Access Number — **F111**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **F: Forward Run Command**

Changeable During Run — **No**

This parameter selects the functionality of the F input terminal.

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

This parameter sets the programmable F terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 2 (R) Function

Direct Access Number — **F112**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **R: Reverse Run Command**

Changeable During Run — **No**

This parameter selects the functionality of the R input terminal.

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

This parameter sets the programmable R terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 3 (ST) Function

Direct Access Number — **F113**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **ST: Standby**

Changeable During Run — **No**

This parameter selects the functionality of the ST input terminal.

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

This parameter sets the programmable ST terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 4 (RES) Function

Direct Access Number — **F114**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **RES: Reset**

Changeable During Run — **No**

This parameter selects the functionality of the RES input terminal.

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

This parameter sets the programmable RES terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 5 (S1) Function

Direct Access Number — **F115**

Program ⇒ Terminal ⇒ Input Terminals

Parameter Type — **Selection List**

Factory Default — **S1: Preset Speed 1**

Changeable During Run — **No**

This parameter selects the functionality of the S1 input terminal.

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

This parameter sets the programmable S1 terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Input Terminal 6 (S2) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects the functionality of the S2 input terminal.

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

This parameter sets the programmable S2 terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Direct Access Number — **F116**

Parameter Type — **Selection List**

Factory Default — **S2: Preset Speed 2**

Changeable During Run — **No**

Input Terminal 7 (S3) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects the functionality of the S3 input terminal.

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

This parameter sets the programmable S3 terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Direct Access Number — **F117**

Parameter Type — **Selection List**

Factory Default — **S3: Preset Speed 3**

Changeable During Run — **No**

Input Terminal 8 (S4) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects the functionality of the S4 input terminal.

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

This parameter sets the programmable S4 terminal to one of the possible functions that are listed in Table 9 on pg. 178.

Direct Access Number — **F118**

Parameter Type — **Selection List**

Factory Default — **Emergency Off**

Changeable During Run — **No**

Input Terminal 9 (LI1) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F119**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 10 (LI2) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F120**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 11 (LI3) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F121**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 12 (LI4) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F122**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 13 (LI5) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F123**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 14 (LI6) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F124**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 15 (LI7) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F125**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Input Terminal 16 (LI8) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter selects 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 pg. 178.

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.

Direct Access Number — **F126**

Parameter Type — **Selection List**

Factory Default — **No Function is Assigned**

Changeable During Run — **No**

Output Terminal 1 (OUT1) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the OUT1 (A & C) output terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

Direct Access Number — **F130**

Parameter Type — **Selection List**

Factory Default — **LOW: Low Speed Signal**

Changeable During Run — **No**

Output Terminal 2 (OUT2) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the OUT2 (A & C) output terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

Direct Access Number — **F131**

Parameter Type — **Selection List**

Factory Default — **RCH: ACC/DEC Completion**

Changeable During Run — **No**

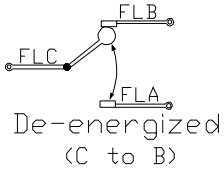
Output Terminal 3 (FL) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the FL output terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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



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

This parameter sets the functionality of the OUT4 terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

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.

Direct Access Number — **F133**

Parameter Type — **Selection List**

Factory Default — **LL: Lower-Limit Frequency**

Changeable During Run — **No**

Output Terminal 5 (OUT4) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the OUT5 terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

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.

Direct Access Number — **F134**

Parameter Type — **Selection List**

Factory Default — **UL: Upper-Limit Frequency**

Changeable During Run — **No**

Output Terminal 6 (R1) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the OUT6 terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

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.

Direct Access Number — **F135**

Parameter Type — **Selection List**

Factory Default — **RCH: Speed Reach Signal**

Changeable During Run — **No**

Output Terminal 7 (OUT5) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the OUT7 terminals to any of the possible functions that are listed in Table 10 on pg. 182.

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

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

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.

Direct Access Number — **F136**

Parameter Type — **Selection List**

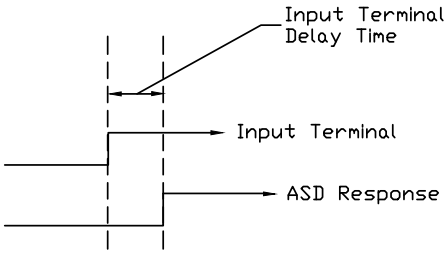
Factory Default — **OC: Over-Current Pre-alarm**

Changeable During Run — **No**

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 — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

Input Terminal 2 (R) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the drive 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 — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

Input Terminal 3 (ST) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the drive to any change in the ST 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 — **F142**
Parameter Type — **Numerical**
Factory Default — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

Input Terminal 4 (RES) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the drive 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 — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

Input Terminal 5-8 (S1-S4) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the drive to any change in the S1 – S4 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 — **F144**
Parameter Type — **Numerical**
Factory Default — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

Input Terminal 9-16 (S5-S12) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the drive to any change in the S5 – S16 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 — **F145**
Parameter Type — **Numerical**
Factory Default — **8.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

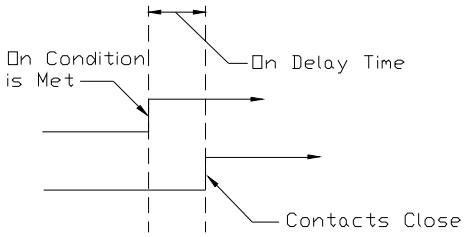
OUT1 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

Once the condition is met to close the OUT1 (A & C) output terminals, this parameter delays the closing of the terminals by the programmed value.

For example, if the OUT1 function is programmed as Over-Torque Alarm, OUT1 will close 2.0 mS (the default value for OUT1 On Delay) after the over-torque condition occurs.

The delay may be increased to prevent relay chatter.



Direct Access Number — **F150**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT2 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the OUT2 (A & C) output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F151**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

FL On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the FL output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F152**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT4 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the OUT4 output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F153**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT5 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the OUT5 output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F154**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT6 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the OUT6 output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F155**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT7 On Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the closing of the OUT7 output terminals by the programmed value (see waveforms at F150).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F156**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

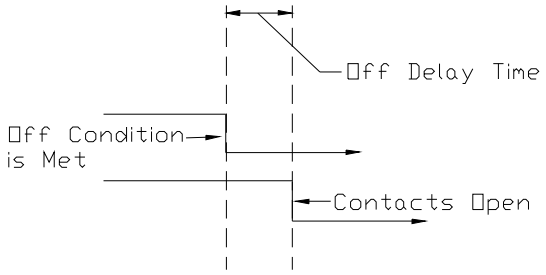
OUT1 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT1 (A & C) output terminals by the programmed value.

The delay may be increased to prevent relay chatter.

Direct Access Number — **F160**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS



OUT2 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT2 (A & C) output terminals by the programmed value (see waveforms at F160).

The delay may be increased to allow the devices that are connected to OUT2 to respond.

Direct Access Number — **F161**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

FL Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the FL output terminals by the programmed value (see waveforms at F160).

The delay may be increased to allow the devices that are connected to FL to respond.

Direct Access Number — **F162**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT4 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT4 output terminals by the programmed value (see waveforms at F160).

The delay may be increased to allow the devices that are connected to OUT4 to respond.

Direct Access Number — **F163**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT5 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT5 output terminals by the programmed value (see waveforms at F160).

The delay may be increased to allow the devices that are connected to OUT5 to respond.

Direct Access Number — **F164**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT6 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT6 output terminals by the programmed value (see waveforms at F160).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F165**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

OUT7 Off Delay

Program ⇒ Terminal ⇒ Output Terminal Delays

This parameter delays the opening of the OUT7 output terminals by the programmed value (see waveforms at F160).

The delay may be increased to prevent relay chatter.

Direct Access Number — **F166**
Parameter Type — **Numerical**
Factory Default — **2.0**
Changeable During Run — **No**
Minimum — 2.0
Maximum — 200.0
Units — mS

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 pg. 178).

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

Direct Access Number — **F170**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 25.0
Maximum — 299.0
Units — Hz

Base Frequency Voltage 2

Program ⇒ Motor ⇒ Motor Set 2

The Base Frequency Voltage 2 is the Motor 2 output voltage at the Base Frequency 2 (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 pg. 178).

Direct Access Number — **F171**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 600.0
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 pg. 178).

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

Motor Overload Protection Level settings (1 – 4) will be displayed in Amps if the EOI display units are set to V/A rather than %.

Direct Access Number — **F173**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 10.0
Maximum — 100.0
Units — %

Base Frequency 3

Program ⇒ Motor ⇒ Motor Set 3

The Base Frequency 3 setting is the frequency at which the output voltage of the ASD reaches its maximum setting. The Maximum Output Voltage is set at F175.

This parameter is used only when the parameters for Motor Set 3 are configured and selected. Motor Set 3 may be selected by a properly configured input terminal.

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

Direct Access Number — **F174**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 25.0
Maximum — 299.0
Units — Hz

Base Frequency Voltage 3

Program ⇒ Motor ⇒ Motor Set 3

The Base Frequency Voltage 3 is the Motor 3 output voltage at the Base Frequency (F174). 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 3 are configured and selected. Motor Set 3 may be selected by a properly configured input terminal.

Direct Access Number — **F175**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 600.0
Units — Volts

Manual Torque Boost 3

Program ⇒ Motor ⇒ Motor Set 3

The Manual Torque Boost 3 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 3 setting (F174).

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

This parameter is used only when the parameters for Motor Set 3 are configured and selected. Motor Set 3 may be selected by a properly configured input terminal.

Direct Access Number — **F176**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 30.0
Units — %

Motor Overload Protection Level 3

Program ⇒ Motor ⇒ Motor Set 3

The Motor Overload Protection Level 3 parameter specifies the motor overload current level for Motor Set 3. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to Amps (V/A) or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (see Current/Voltage Units Setup (F701) to change the display unit).

Motor Overload Protection Level settings (1 – 4) will be displayed in Amps if the EOI display units are set to V/A rather than %.

Direct Access Number — **F177**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 10.0
Maximum — 100.0
Units — %

Base Frequency 4

Program ⇒ Motor ⇒ Motor Set 4

The Base Frequency 4 setting is the frequency at which the output voltage of the ASD reaches its maximum setting. The Maximum Output Voltage for Base Frequency 4 is set at F179.

This parameter is used only when the parameters for Motor Set 4 are configured and selected. Motor Set 4 may be selected by a properly configured input terminal.

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

Direct Access Number — **F178**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 25.0
Maximum — 299.0
Units — Hz

Base Frequency Voltage 4

Program ⇒ Motor ⇒ Motor Set 4

The Base Frequency Voltage 4 is the Motor 4 output voltage at the Base Frequency (F178). 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 4 are configured and selected. Motor Set 4 may be selected by a properly configured input terminal.

Direct Access Number — **F179**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 600.0
Units — Volts

Manual Torque Boost 4

Program ⇒ Motor ⇒ Motor Set 4

The Manual Torque Boost 4 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 4 setting (F178).

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

This parameter is used only when the parameters for Motor Set 4 are configured and selected. Motor Set 4 may be selected by a properly configured input terminal.

Direct Access Number — **F180**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 30.0
Units — %

Motor Overload Protection Level 4

Program ⇒ Motor ⇒ Motor Set 4

The Motor Overload Protection Level 4 parameter specifies the motor overload current level for Motor Set 4. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to Amps (V/A) or it may be set as a percentage of the ASD rating. The name-plated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (see Current/Voltage Units Setup (F701) to change the display unit).

Motor Overload Protection Level settings (1 – 4) will be displayed in Amps if the EOI display units are set to V/A rather than %.

Direct Access Number — **F181**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 10.0
Maximum — 100.0
Units — %

V/f Adjustment Coefficient

Program ⇒ Special ⇒ Special Parameters

This parameter may be used in the Constant Torque or the Variable Torque modes only and should be adjusted gradually to improve the application-specific torque requirements. The Manual Torque Boost 1 setting (F016) may be adjusted to improve the low-frequency torque performance.

Note: The Torque Boost setting should be adjusted gradually before attempting performance corrections using this parameter.

Direct Access Number — **F183**
Parameter Type — **Numerical**
Factory Default — **32**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 255

V/f Five-Point 1 Frequency

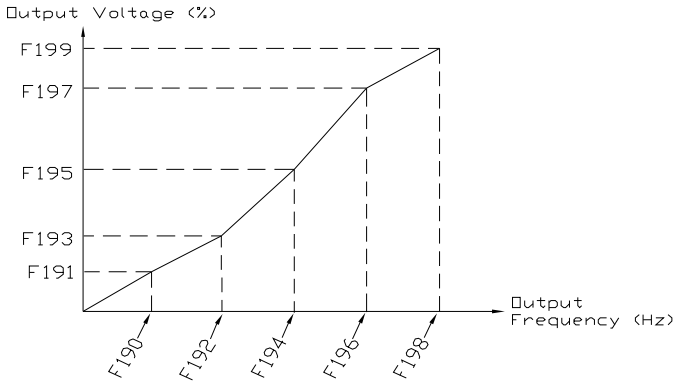
Program ⇒ Special ⇒ V/f Five-Point Setting

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

The V/f Five-Point settings define a custom volts per hertz relationship for the startup output of the ASD.

To enable this function, set the V/f Pattern (F015) selection to V/f Five-Point 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 — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 299
Units — Hz

V/f Five-Point 1 Voltage

Program ⇒ Special ⇒ V/f Five-Point Setting

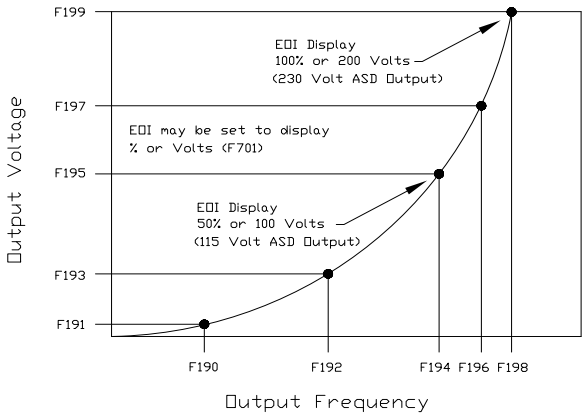
The V/f Five-Point 1 Voltage establishes the percentage of the output voltage that is to be associated with the frequency setting of F190 (V/f Five-Point 1 Frequency).

The Current/Voltage Units Setup (F701) 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 (Supply Voltage Correction (F307) Disabled), the limit of the on-screen display value for this parameter is 575.00 Volts.

If using % as a unit of measure and with no voltage correction (Supply Voltage Correction (F307) Disabled), the ASD output voltage will be the percentage setting multiplied by the ASD-rated voltage.

See V/f Five-Point 1 Frequency (F190) for additional information on this setting.



Direct Access Number — **F191**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 100.0
Units — %

V/f Five-Point 2 Frequency

Program ⇒ Special ⇒ V/f Five-Point Setting

The V/f Five-Point 2 Frequency sets the frequency to be associated with the V/f Five-Point 2 Voltage (F193).

See V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F192**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 299
Units — Hz

V/f Five-Point 2 Voltage

Program ⇒ Special ⇒ V/f Five-Point Setting

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

The Current/Voltage Units Setup (F701) 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 V/f Five-Point 1 Frequency (F190) for additional information on this setting.

Direct Access Number — **F193**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 100.0
Units — %

V/f Five-Point 3 Frequency

Program ⇒ Special ⇒ V/f Five-Point Setting

The V/f Five-Point 3 Frequency sets the frequency to be associated with the V/f Five-Point 3 Voltage (F195).

See V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F194**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 299
Units — Hz

V/f Five-Point 3 Voltage

Program ⇒ Special ⇒ V/f Five-Point Setting

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

The Current/Voltage Units Setup (F701) 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 V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F195**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 100.0
Units — %

V/f Five-Point 4 Frequency

Program ⇒ Special ⇒ V/f Five-Point Setting

The V/f Five-Point 4 Frequency sets the frequency to be associated with the V/f Five-Point 4 Voltage (F197).

See V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F196**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 299
Units — Hz

V/f Five-Point 4 Voltage

Program ⇒ Special ⇒ V/f Five-Point Setting

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

The Current/Voltage Units Setup (F701) 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 V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F197**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 100.0
Units — %

V/f Five-Point 5 Frequency

Program ⇒ Special ⇒ V/f Five-Point Setting

The V/f Five-Point 5 Frequency sets the frequency to be associated with the V/f Five-Point 5 Voltage (F199).

See V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Direct Access Number — **F198**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 299
Units — Hz

V/f Five-Point 5 Voltage

Program ⇒ Special ⇒ V/f Five-Point Setting

Direct Access Number — **F199**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **No**

Minimum — 0.0

Maximum — 100.0

Units — %

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

The Current/Voltage Units Setup (F701) 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 V/f Five-Point 1 Frequency (F190) for additional information on custom V/f curves.

Frequency Priority Selection

Program ⇒ Fundamental ⇒ Standard Mode Selection

Direct Access Number — **F200**

Parameter Type — **Selection List**

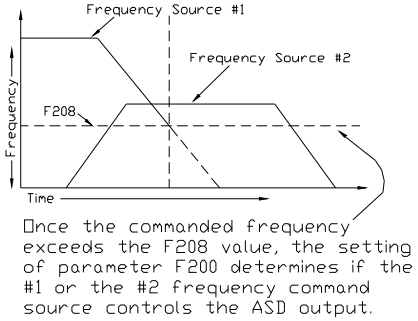
Factory Default — **Frequency Source 1**

Changeable During Run — **Yes**

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.

Settings:

0 — Frequency Source 1
1 — Frequency Source 2
2 — Frequency Source 1 Priority
3 — Frequency Source 2 Priority
4 — Frequency Source Priority Switching



The Frequency Source 1 or Frequency Source 2 setting specifies the source of the input frequency command signal. These settings are performed at Frequency Mode 1 (F004) and Frequency Mode 2 (F207), respectively.

If Frequency Source 1 is selected here, the ASD will follow the settings of Frequency Mode 1 (F004). If Frequency Source 2 is selected here, the ASD will follow the settings of Frequency Mode 2 (F207).

If Frequency Source 1 Priority is selected here, the ASD will follow the control of the Frequency Mode 1 setting for the duration that the commanded frequency of Frequency Mode 1 exceeds the F208 setting. If the commanded frequency of Frequency Mode 1 is less than or equal to the setting of F208, the ASD will follow the setting of Frequency Mode 2.

If Frequency Source 2 Priority is selected here, the ASD will follow the control of the Frequency Mode 2 setting for the duration that the commanded frequency of Frequency Mode 2 exceeds the Frequency Mode Priority Switching Frequency (F208) setting. If the commanded frequency of Frequency Mode 2 is less than or equal to the setting of F208, the ASD will follow the setting of Frequency Mode 1.

If Frequency Source Priority Switching is selected here, the ASD will follow the control of the discrete input terminal assigned the function of Terminal Frequency Priority. The discrete terminal Terminal Frequency Priority will toggle control to and from the Frequency Mode 1 and Frequency Mode 2 selections for the duration of each activation/ deactivation.

VI/II Reference Point 1

Direct Access Number — **F201**

Parameter Type — **Numerical**

Factory Default — **20.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0%

Units — %

Program ⇒ Torque ⇒ Setpoints

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the VI/II level that is associated with the VI/II Point 1 Frequency setting when operating in the Speed control mode or is associated with the VI/II Point 1 Torque setting when operating in the Torque Control mode.

The bias and gain of the VI/II terminal may be trimmed at F470 and F471, respectively.

VI/II Speed Control Setup

Perform the following setup to allow the system to receive control input at the VI/II terminals:

- Connect the input control current or voltage to the II input or the VI input, respectively.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ VI/II
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board
- Set VI/II Point 1 Frequency (F202).
- Set VI/II Reference Point 1 (F201) — the input analog signal level that corresponds to the frequency setting at VI/II Point 1 Frequency.
- Set VI/II Point 2 Frequency (F204).
- Set VI/II Reference Point 2 (F203) — the input analog signal level that corresponds to the frequency setting at VI/II Point 2 Frequency.
- Provide a Run command (F and/or R).

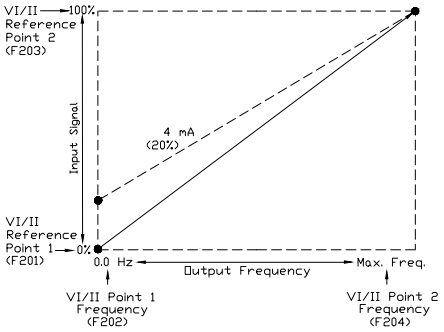
Once set, as the VI/II input changes, the output frequency of the drive will vary in accordance with the above settings.

This parameter value is entered as 0 – 100% of the VI/II input signal range.

The II input is commonly used for the 4 – 20 mA current loop signal where 4 mA equals 20% of a 20 mA signal. If the VI input is used (0 – 10 VDC input), F201 may be changed to 0.0% (of the input signal).

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

Frequency Settings



VI/II Point 1 Frequency

Direct Access Number — **F202**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Maximum Freq. (F011)

Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

See VI/II Reference Point 1 (F201) for additional information on this setting.

This parameter sets VI/II Point 1 Frequency and is the frequency that is associated with the setting of VI/II Reference Point 1 (F201).

VI/II Reference Point 2

Direct Access Number — **F203**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 100.0
Units — %

Program ⇒ Torque ⇒ Setpoints
Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the VI/II level that is associated with VI/II Point 2 Frequency when operating in the Speed control mode or is associated with the VI/II Point 1 Torque when operating in the Torque Control mode.

This value is entered as 0% to 100% of the VI/II signal range.

See VI/II Reference Point 1 (F201) for additional information on this setting when used for Speed control.

See VI/II Point 1 Torque (F205) for additional information on this setting when used for Torque Control.

VI/II Point 2 Frequency

Direct Access Number — **F204**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Maximum Freq. (F011)
Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter is the frequency that is associated with the setting of VI/II Reference Point 2 (F203) when operating in the Speed Control mode.

See VI/II Reference Point 1 (F201) for additional information on this setting.

VI/II Point 1 Torque

Program ⇒ Torque ⇒ Setpoints

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

The bias and gain of the VI/II terminal may be trimmed at F470 and F471, respectively.

VI/II Torque Control Setup

Perform the following setup to allow the system to receive Torque Control input at the VI/II terminal:

- Connect the input control current or voltage to the II input or the VI input, respectively.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ VI/II.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board
- Set VI/II Point 1 Torque (F205).
- Set VI/II Reference Point 1 (F201) — the input analog signal level that corresponds to the torque setting at VI/II Point 1 Torque.
- Set VI/II Point 2 Torque (F206).
- Set VI/II Reference Point 2 (F203) — the input analog signal level that corresponds to the torque setting at VI/II Point 2 Torque.
- Provide a Run command (F and/or R).

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

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

This parameter sets Torque Reference Setpoint 1 (%) and is the output torque value that is associated with the setting of VI/II Reference Point 1 (F201) when operating in the Torque Control mode.

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

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

Direct Access Number — **F205**

Parameter Type — **Numerical**

Factory Default — **0.0**

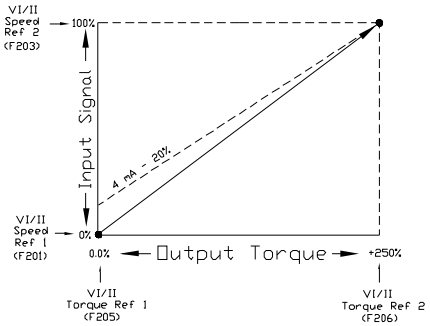
Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

Torque Settings



VI/II Point 2 Torque

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the VI/II input terminals when either 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 VI/II level.

This parameter sets VI/II Point 2 Torque (%) and is the output torque value that is associated with the setting of F203.

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

See F201 for additional information on this setting.

Direct Access Number — **F206**

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

Frequency Mode 2

Program ⇒ Fundamental ⇒ Standard Mode Selection

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

See Frequency Mode 1 (F004) and Frequency Priority Selection (F200) for additional information on this setting.

Settings:

1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD (Option)
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Option Board
10 — UP/DOWN Frequency
11 — Pulse Input (Option)

Direct Access Number — **F207**
Parameter Type — **Selection List**
Factory Default — **VI/II**
Changeable During Run — **Yes**

Frequency Mode Priority Switching Frequency

Program ⇒ Fundamental ⇒ Standard Mode Selection

This parameter sets the threshold frequency that will be used to determine if Frequency Source 1 or 2 will control the output of the ASD when Frequency Source 1 Priority or Frequency Source 2 Priority is selected at F200.

See F200 for additional information on this setting.

Direct Access Number — **F208**
Parameter Type — **Numerical**
Factory Default — **1.0**
Changeable During Run — **Yes**
Minimum — 0.1
Maximum — Maximum Freq. (F011)
Units — Hz

Analog Input Filter

Program ⇒ Frequency ⇒ Analog Filter

Direct Access Number — **F209**

Parameter Type — **Selection List**

Factory Default — **None**

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 — None
1 — Small
2 — Medium
3 — Large

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

If the filtering selection is Small, the ASD averages the last 5 sampled (digital) values. The rolling average is updated (every 4 µS) and scaled for use by the microprocessor.

If the filtering selection is Medium, the ASD averages the last 20 sampled (digital) values. The rolling average is updated (every 4 µS) and scaled for use by the microprocessor.

If the filtering selection is Large, the ASD averages the last 50 sampled (digital) values. The rolling average is updated (every 4 µS) and scaled for use by the microprocessor.

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

RR Reference Point 1

Direct Access Number — **F210**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 100.0

Units — %

Program ⇒ Torque ⇒ Setpoints

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

The bias and gain of the RR terminal may be trimmed at F472 and F473, respectively.

RR Speed Control Setup

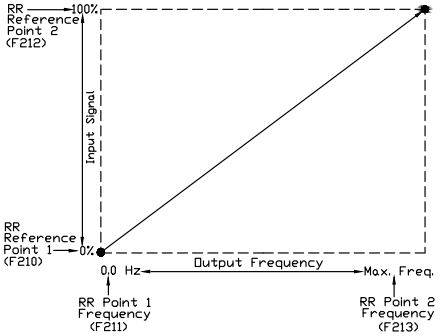
Perform the following setup to allow the system to perform Speed control from the RR terminal:

- Set RR Point 1 Frequency (F211).
- Set RR Reference Point 1 (F210) — the input analog signal level that corresponds to the frequency setting at RR Point 1 Frequency.
- Set RR Point 2 Frequency (F213).
- Set RR Reference Point 2 (F212) — the input analog signal level that corresponds to the frequency setting at RR Point 2 Frequency.
- 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 voltage changes, the output frequency of the drive will vary in accordance with the above settings.

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

Frequency Settings



RR Point 1 Frequency

Direct Access Number — **F211**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — Maximum Freq. (F011)

Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the RR Point 1 Frequency and is the frequency that is associated with the setting of RR Reference Point 1 (F210) when operating in the Speed Control mode.

See RR Reference Point 1 (F210) for additional information on this setting.

RR Reference Point 2

Program ⇒ Torque ⇒ Setpoints
Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the RR input level that represents RR Reference Point 2 (frequency) (torque or frequency).

This value is entered as 0 – 100% of the 0 – 10 VDC RR input signal range.

See RR Reference Point 1 (F210) for additional information on this setting.

Direct Access Number — **F212**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 100.0
Units — %

RR Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets RR Point 2 Frequency and is the frequency that is associated with the setting of RR Reference Point 2 (F212).

See RR Reference Point 1 (F210) for additional information on this setting.

Direct Access Number — **F213**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Maximum Freq. (F011)
Units — Hz

RR Input Point 1 Torque

Program ⇒ Torque ⇒ Setpoints

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

The bias and gain of the RR terminal may be trimmed at F472 and F473, respectively.

RR Torque Control Setup

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

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode ⇒ RR
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board
- Set RR Input Point 1 Torque (F214).
- Set RR Reference Point 1 (F210) — the input analog signal level that corresponds to the torque setting at RR Input Point 1 Torque.
- Set RR Input Point 2 Torque (F215).
- Set RR Reference Point 2 (F212) — the input analog signal level that corresponds to the frequency setting at RR Input Point 2 Torque.
- Provide a Run command (F and/or R).

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

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

This parameter sets RR Input Point 1 Torque and is the output torque value that is associated with the setting of RR Reference Point 1 (F210) when operating in the Torque Control mode.

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

Direct Access Number — **F214**

Parameter Type — **Numerical**

Factory Default — **0.0**

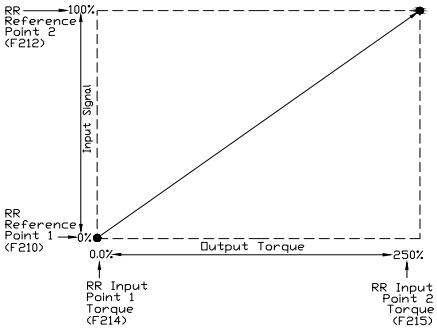
Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

Torque Settings



RR Input Point 2 Torque

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the RR input terminal when this 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 level.

This parameter sets RR Input Point 2 Torque and is the output torque value that is associated with setting of RR Reference Point 2 (F212) when operating in the Torque Control mode.

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

See RR Reference Point 1 (F210) for additional information on this setting.

Direct Access Number — **F215**

Parameter Type — **Numerical**

Factory Default — **100.0**

Changeable During Run — **Yes**

Minimum — 0.0

Maximum — 250.0

Units — %

RX Reference Point 1

Direct Access Number — **F216**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

Program ⇒ Torque ⇒ Setpoints

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the RX input level that represents RX Reference Setpoint 1 (direction/torque/frequency).

The input signal may be trimmed using F474 (bias) and F475 (gain).

RX Speed Control Setup

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

- Program ⇒ Fundamental Parameters ⇒ Standard Mode Selection ⇒ Frequency Mode 1⇒ RX.
- Program ⇒ Fundamental Parameters ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.
- Set RX Point 1 Frequency (F217).
- Set RX Reference Point 1 (F216) — the input analog signal level that corresponds to the speed setting at RX Point 1 Frequency.
- Set RX Point 2 Frequency (F219).
- Set RX Reference Point 2 (F218) — the input analog signal level that corresponds to the speed setting at RX Point 2 Frequency.
- Provide a Run command (F or R).

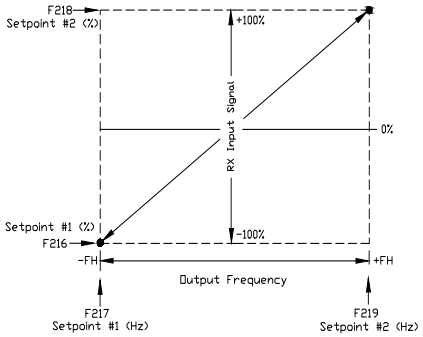
When operating in the Torque Control mode, the settings that determine the direction, gain, and bias of the RX terminal are:

- RX Input Point 1 Torque (F220),
- the RX input signal level that represents the RX Reference Point 1 (F216),
- RX Input Point 2 Torque (F221), and
- the RX input signal level that represents the RX Reference Point 2 (F218).

Once set, as the RX input voltage changes, the directional information, the output frequency, or the output torque of the drive will vary in accordance with the above settings.

This parameter value is entered as -100 to +100% of the -10 to +10 VDC RX input signal range.

Frequency Settings



RX Point 1 Frequency

Direct Access Number — **F217**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — - (Maximum Freq. (F011))

Maximum — + (Maximum Freq. (F011))

Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

See RX Reference Point 1 (F216) for additional information on this setting.

This parameter sets RX Point 1 Frequency and is the frequency that is associated with the setting of RX Reference Point 1 (F216).

RX Reference Point 2

Program ⇒ Torque ⇒ Setpoints
Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the RX input level that represents RX Reference Point 2 (frequency) (direction/torque/frequency). The range of values for this parameter is -100 to +100% of the -10 to +10 VDC RX input signal range.

See RX Reference Point 1 (F216) for additional information on this setting.

Direct Access Number — **F218**
Parameter Type — **Numerical**
Factory Default — +**100.0**
Changeable During Run — **Yes**
Minimum — -100.0
Maximum — +100.0
Units — %

RX Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets RX Point 2 Frequency and is the frequency that is associated with the setting of RX Reference Point 2 (F218).

See RX Reference Point 1 (F216) for additional information on this setting.

Direct Access Number — **F219**
Parameter Type — **Numerical**
Factory Default — +**60.0**
Changeable During Run — **Yes**
Minimum — - (Maximum Freq. (F011))
Maximum — + (Maximum Freq. (F011))
Units — Hz

RX Input Point 1 Torque

Program ⇒ Torque ⇒ Setpoints

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

The bias and gain of the RX terminal may be trimmed at F474 and F475, respectively.

RX 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
- Set RX Input Point 1 Torque (F220).
- Set RX Reference Point 1 (F216) — the input analog signal level that corresponds to the torque setting at RX Input Point 1 Torque.
- Set RX Input Point 2 Torque (F221).
- Set RX Reference Point 2 (F218) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Torque.
- 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 Torque and is the output torque value that is associated with the setting of RX Reference Point 1 (F216).

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

Direct Access Number — **F220**

Parameter Type — **Numerical**

Factory Default — **0.0**

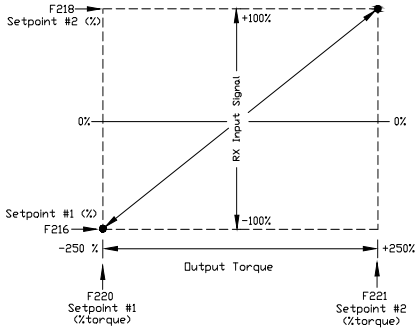
Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

Torque Settings



RX Input Point 2 Torque

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the direction, gain, and bias of the RX input terminal when this 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 Torque and is the output torque value that is associated with the setting of RX Reference Point 2 (F218). This value is entered as -250 to +250% of the rated torque.

See RX Input Point 1 Torque (F220) for additional information on this setting.

Direct Access Number — **F221**

Parameter Type — **Numerical**

Factory Default — +**100.0**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

RX2 Reference Point 1

Direct Access Number — **F222**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -100.0

Maximum — 100.0

Units — %

Program ⇒ Torque ⇒ Setpoints

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control 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 represents RX2 Reference Setpoint 1 (frequency) (direction/torque/frequency).

The input signal may be trimmed using F476 (bias) and F477 (gain).

RX2 Speed Control Setup

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

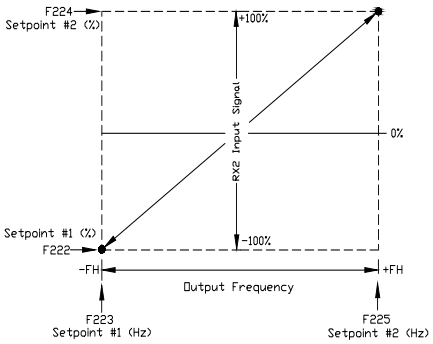
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ RX2.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board.
- Set RX2 Point 1 Frequency (F223).
- Set RX2 Reference Point 1 (F222) — the input analog signal level that corresponds to the speed setting at RX2 Point 1 Frequency.
- Set RX2 Point 2 Frequency (F225).
- Set RX2 Reference Point 2 (F224) — the input analog signal level that corresponds to the speed setting at RX Point 2 Frequency.
- Provide a Run command (F or R).

Once set, as the RX2 voltage changes, the directional information, the output frequency, or the output torque of the drive will vary in accordance with the above settings.

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

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

Frequency Settings



RX2 Point 1 Frequency

Direct Access Number — **F223**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — - (Maximum Freq. (F011))

Maximum — + (Maximum Freq. (F011))

Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control mode.

This parameter sets RX2 Point 1 Frequency and is the frequency that is associated with the setting of RX2 Reference Point 1 (F222).

See RX2 Reference Point 1 (F222) for additional information on this setting.

RX2 Reference Point 2

Program ⇒ Torque ⇒ Setpoints
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control or the Torque Control mode.

This parameter sets the RX2 input level that represents RX2 Reference Point 2 (frequency) (direction/torque/frequency). This value is entered as -100 to +100% of the -10 to +10 VDC RX2 input signal range.

See RX2 Reference Point 1 (F222) for additional information on this setting.

Direct Access Number — **F224**
Parameter Type — **Numerical**
Factory Default — +**100.0**
Changeable During Run — **Yes**
Minimum — -100.0
Maximum — +100.0
Units — %

RX2 Point 2 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control mode.

This parameter sets RX2 Point 2 Frequency and is the frequency that is associated with the setting of RX2 Reference Point 2 (F224).

See RX2 Reference Point 1 (F222) for additional information on this setting.

Direct Access Number — **F225**
Parameter Type — **Numerical**
Factory Default — +**60.0**
Changeable During Run — **Yes**
Minimum — - (Maximum Freq. (F011))
Maximum — + (Maximum Freq. (F011))
Units — Hz

RX2 Input Point 1 Torque

Program ⇒ Torque ⇒ Setpoints

Direct Access Number — **F226**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this terminal is used as the control input while operating in the Torque Control mode.

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

The bias and gain of the RX terminal may be trimmed at F476 and F477, respectively.

RX2 Torque Control Setup

Perform the following setup to allow the system to receive Torque Control input at the RX2 terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode ⇒ RX2
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Board
- Provide a Run command (F and/or R).
- Set RX2 Input Point 1 Torque (F226).
- Set RX2 Reference Point 1 (F222) — the input analog signal level that corresponds to the speed setting at RX2 Input Point 1 Torque.
- Set RX2 Input Point 2 Torque (F227).
- Set RX2 Reference Point 2 (F224) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Torque.
- Provide a Run command (F and/or R).

Torque Control is accomplished by establishing an associated V/f output pattern for a given RX2 level.

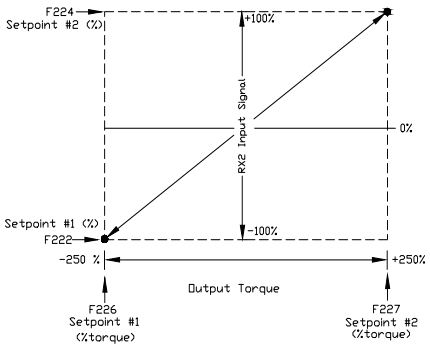
Once set, as the RX2 voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter sets RX2 Input Point 1 Torque and is the output torque value that is associated with the setting of F222.

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

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

Torque Settings



RX2 Input Point 2 Torque

Program ⇒ Torque ⇒ Setpoints

Direct Access Number — **F227**

Parameter Type — **Numerical**

Factory Default — +**100.0**

Changeable During Run — **Yes**

Minimum — -250.0

Maximum — +250.0

Units — %

This parameter is used to set the direction, gain, and bias of the RX2 input terminal when this 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 RX2 input level and motor load.

This parameter sets RX2 Input Point 2 Torque and is the output torque value that is associated with the setting of RX2 Reference Point 2 (F224).

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

BIN Reference Point 1

Direct Access Number — **F228**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — 0.00

Maximum — 100.00

Units — %

Program ⇒ Torque ⇒ Setpoints

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Speed Control or the Torque Control mode.

The discrete input terminals of the Terminal Board are used as the BIN terminals.

BIN Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the BIN 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 terminal 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.
- Set BIN Point 1 Frequency (F229).
- Set the BIN value (% of 255D) (F228) that represents BIN Reference Point 1.

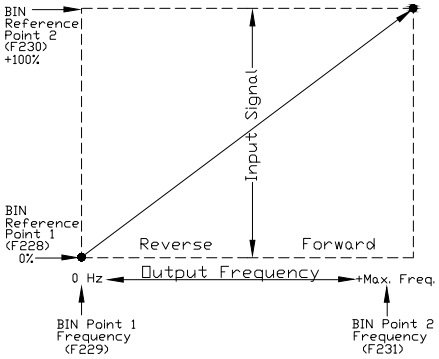
Note: 255D is the decimal equivalent of the 8-bit BIN word with all input terminals set to one (255 decimal = 11111111 binary).

- Set BIN Point 2 Frequency (F231)
- Set the BIN value (% of 255D) (F230) that represents BIN Reference Point 2.
- Provide a Run command (F and/or R).

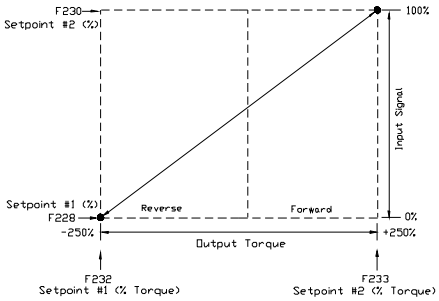
Once set, as the BIN signal changes are transferred to the control board, the directional information, the output frequency, or the output torque of the drive will vary in accordance with the above settings.

This parameter sets BIN Reference Point 1 (direction/torque/frequency) and is entered as 0 to 100% of the BIN binary input byte 11111111 (255D) or the binary bit(s) 0 - MSB.

Frequency Settings



Torque Settings



BIN Point 1 Frequency

Direct Access Number — **F229**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — - (Maximum Freq. (F011))

Maximum — + (Maximum Freq. (F011))

Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Speed Control mode.

This parameter sets BIN Point 1 Frequency and is the frequency that is associated with the setting of F228.

See BIN Reference Point 1 (F228) for additional information on this setting.

BIN Reference Point 2

Direct Access Number — **F230**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 100.0
Units — %

Program ⇒ Torque ⇒ Setpoints
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Speed Control or the Torque Control mode.

This parameter sets BIN Reference Point 2 (direction/torque/frequency) and is entered as 0 to 100% of the BIN binary input word 11111111 (255D).

See BIN Reference Point 1 (F228) for additional information on this setting.

BIN Point 2 Frequency

Direct Access Number — **F231**
Parameter Type — **Numerical**
Factory Default — +**60.0**
Changeable During Run — **Yes**
Minimum — - (Maximum Freq. (F011))
Maximum — + (Maximum Freq. (F011))
Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Speed Control mode.

This parameter sets BIN Point 2 Frequency and is the frequency that is associated with the setting of BIN Reference Point 2 (F230).

See BIN Reference Point 1 (F228) for additional information on this setting.

BIN Input Point 1 Torque

Direct Access Number — **F232**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — -250.00
Maximum — +250.00
Units — %

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Torque Control mode.

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

This parameter sets BIN Input Point 1 Torque and is entered as -250 to +250% of the rated torque.

See BIN Reference Point 1 (F228) for additional information on this setting.

BIN Input Point 2 Torque

Direct Access Number — **F233**
Parameter Type — **Numerical**
Factory Default — +**100.00**
Changeable During Run — **Yes**
Minimum — -250.00
Maximum — +250.00
Units — %

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the direction, gain, and bias of the BIN binary input terminals when these terminals are used as the control input while operating in the Torque Control mode.

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

This parameter sets BIN Input Point 2 Torque and is entered as -250 to +250% of the rated torque.

See BIN Input Point 1 Torque (F232) for additional information on this setting.

PG Reference Point 1

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction, gain, and bias of the PG input terminal when it is used as the Speed/Direction control input. The PG input signal is a pulse count originating from a shaft-mounted Encoder.

Note: See Instruction Manual P/N 58687 for additional information on the PG Option Board.

PG Speed Control Setup

Perform the following setup to allow the system to receive a binary control input:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ (any setting).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ Pulse Input Option.
- Set PG Point 1 Frequency (F235).
- Set the PG input value (F234) that represents PG Reference Point 1.
- Set PG Point 2 Frequency (F237).
- Set the PG input value (F236) that represents PG Reference Point 2
- Provide a Run command (F or R).

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

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

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

Direct Access Number — **F234**

Parameter Type — **Numerical**

Factory Default — **0.00**

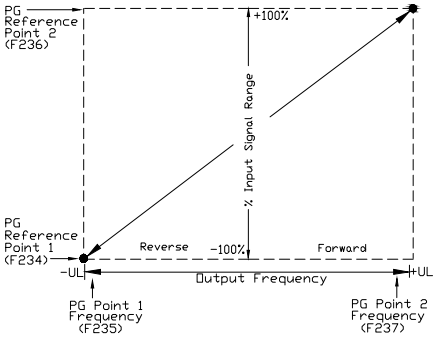
Changeable During Run — **Yes**

Minimum — -100.00

Maximum — +100.00

Units — %

Frequency Settings



PG Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets PG Point 1 Frequency and is the frequency that is associated with the setting of PG Reference Point 1 (F234).

See PG Reference Point 1 (F234) for additional information on this setting.

Direct Access Number — **F235**

Parameter Type — **Numerical**

Factory Default — **0.0**

Changeable During Run — **Yes**

Minimum — - (Maximum Freq. (F011))

Maximum — + (Maximum Freq. (F011))

Units — Hz

PG Reference Point 2

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets the PG input pulse count that represents PG Reference Point 2 (direction/speed). The range of values for this parameter is -100 to +100% of the PG input pulse count range.

See PG Reference Point 1 (F234) for additional information on this setting.

Direct Access Number — **F236**

Parameter Type — **Numerical**

Factory Default — **+100.00**

Changeable During Run — **Yes**

Minimum — -100.00

Maximum — +100.00

Units — %

PG Point 2 Frequency

Direct Access Number — **F237**
Parameter Type — **Numerical**
Factory Default — **+60.0**
Changeable During Run — **Yes**
Minimum — - (Maximum Freq. (F011))
Maximum — + (Maximum Freq. (F011))
Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This parameter sets PG Point 2 Frequency and is the frequency that is associated with the setting of PG Reference Point 2 (F236).

See PG Reference Point 1 (F234) for additional information on this setting.

Start Frequency

Direct Access Number — **F240**
Parameter Type — **Numerical**
Factory Default — **0.10**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 10.0
Units — Hz

Program ⇒ Special ⇒ Frequency Control

The output of the drive will remain at 0.0 Hz until the programmed speed value exceeds this setting during startup. Once exceeded during startup, the output frequency of the drive will accelerate to the programmed setting.

Output frequencies below the Start Frequency will not be output from the drive during startup. However, once reaching the Start Frequency, speed values below the Start Frequency may be output from the drive.

If the setting of this parameter results in an over-current condition at startup, 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 the End Frequency (F243) to 0.0 Hz.

This setting will override the Dead Band of 0 Hz Frequency Setting Signal (F244) if this setting has a higher value.

This parameter setting is used during a Jog as the Lower-Limit Frequency (see F260).

Run Frequency

Direct Access Number — **F241**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Maximum Freq. (F011)
Units — Hz

Program ⇒ Special ⇒ Frequency Control

This parameter establishes a center frequency (Run Frequency) of a frequency band.

The Run Frequency Hysteresis (F242) setting provides a plus-or-minus value for the Run Frequency, thus establishing a frequency band.

During acceleration, the drive will not output a signal to the motor until the lower level of the band is reached.

During deceleration, the drive will continue to output the programmed deceleration output signal to the motor until the lower level of the band is reached. When the lower level of the band is reached, the output will go to 0.0 Hz.

Run Frequency Hysteresis

Direct Access Number — **F242**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 30.0
Units — Hz

Program ⇒ Special ⇒ Frequency Control

This parameter provides a plus-or-minus value for the Run Frequency (F241) setting.

End Frequency

Program ⇒ Special ⇒ Frequency Control

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

Direct Access Number — **F243**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Upper-Limit Freq. (F012)
Units — Hz

Dead Band of 0Hz Frequency Setting 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.

Note: 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 — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 5.0
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 three-phase motors. Unlike conventional brakes, there is no physical contact between the rotating shaft and a stationary brake pad or drum. When braking is required, the drive 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 at DC Injection Braking Time (F252) times out.

The intensity of the DC current used while braking determines how fast the motor will come to a stop and may be set at DC Injection Braking Current (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 Motor Shaft Fixing Control (F254).

Direct Access Number — **F250**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 120.0
Units — Hz

DC Injection Braking Current

Program ⇒ Protection ⇒ DC Braking

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

Direct Access Number — **F251**
Parameter Type — **Numerical**
Factory Default — **50.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.0
Units — %

DC Injection Braking Time

Program ⇒ Protection ⇒ DC Braking

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

Direct Access Number — **F252**
Parameter Type — **Numerical**
Factory Default — **1.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 10.00
Units — Seconds

Forward/Reverse DC Injection Braking Priority

Program ⇒ Protection ⇒ DC Braking

This parameter 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 Fixing Control

Program ⇒ Protection ⇒ DC Braking

This parameter Enables/Disables a continuous DC injection at half of the amperage setting of DC Injection Braking Current (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. It 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 DC Injection Braking Start Frequency (F250).

Settings:

0 — Disabled
1 — Enabled

Direct Access Number — **F254**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Select Function for 0Hz Command Stop

Program ⇒ Special ⇒ Special Parameters

This parameter selects the go-to-zero method to be used by the ASD when the ASD is commanded to go to 0.0 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**

Jog Frequency

Direct Access Number — **F260**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 20.00
Units — Hz

Program ⇒ Frequency ⇒ Jog Settings

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

The Jog function may be initiated from the EOI, remotely via the Terminal Board, or using Communications (for additional information on using Communications for Jogging, see the Communications manual).

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

Select a Jog Stop method (F261).

Jog Using the Terminal Board

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

1. Assign a discrete input terminal to the Jog function (see Table 9 on pg. 178).
2. Assign a discrete input terminal to the F (Forward) function (and Reverse if required) (see Table 9 on pg. 178).
3. Provide a Forward and/or Reverse command from the Terminal Board.
4. Place the system in the Auto mode (Hand/Auto LED is off).
5. Connect the assigned Jog terminal (from step 1) to CC for the desired Jog duration.

The system will run at the F260 speed for the duration of the terminal activation and will stop using the Jog Stop Pattern (F261) method upon terminal deactivation.

Jog Stop Pattern

Direct Access Number — **F261**
Parameter Type — **Selection List**
Factory Default — **Deceleration**
Changeable During Run — **Yes**

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 F603 has priority over this setting and changes made here do not affect the function or setting of F603.

Settings:

0 — Deceleration
1 — Coast
2 — DC Injection

Jump Frequency 1

Program ⇒ Special ⇒ Jump Frequencies

In conjunction with 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 drive will hold at the frequency of the lower level of the Jump Frequency range until the programmed acceleration ramp reaches the upper level of the Jump Frequency range. Then, the output frequency of the drive will accelerate to the upper level of the Jump Frequency range and continue upward as programmed.

During deceleration, the output frequency of the drive will hold at the frequency of the upper level of the Jump Frequency range until the programmed deceleration ramp reaches the lower level of the Jump Frequency range. Then, the output frequency of the drive 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 — 30.00
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 Jump Frequency 2 Bandwidth (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 — 30.0
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 Jump Frequency 3 Bandwidth (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 — 30.0
Units — Hz

Jump Frequency Processing Selection

Program ⇒ Special ⇒ Jump Frequencies

This parameter determines if the output frequency of the ASD or the PID feedback signal will be used as a reference for determining the Jump Frequency range.

See Jump Frequency 1 (F270) for additional information on the Jump Frequency settings.

Settings:
0 — Process Amount
1 — Output Frequency

Direct Access Number — **F276**
Parameter Type — **Selection List**
Factory Default — **Process Amount**
Changeable During Run — **Yes**

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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F288**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.00
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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip 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 — 0.00
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 Control Terminal Strip to output the Preset Speed (see F018 for additional information on this parameter).

Direct Access Number — **F294**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Upper-Limit Freq. (F012)
Units — Hz

PWM Carrier Frequency

Direct Access Number — **F300**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.500
Maximum — (ASD-Dependent)
Units — kHz

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.

Auto Restart Selection

Direct Access Number — **F301**
Parameter Type — **Selection List**
Factory Default — **Off**
Changeable During Run — **Yes**

Program ⇒ Protection ⇒ Retry/Restart

This parameter Enables/Disables the ability of the drive 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).

See Scan Rate (F312) for additional information on this setting.

Settings:

0 — Off
1 — Power Failure
2 — Make/Break ST
3 — Make/Break ST or Power Failure

Regenerative Power Ridethrough Selection

Direct Access Number — **F302**
Parameter Type — **Selection List**
Factory Default — **Off**
Changeable During Run — **Yes**

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter determines the motor-control response of the drive in the event of a momentary power outage, under-voltage condition, or an Auto Restart Selection (F301) selection (1-3) event.

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 motor, the Retry setup of Auto Restart Selection (F301) is required.

Settings:

0 — Off
1 — Ridethrough
2 — Deceleration Stop

Retry Selection

Direct Access Number — **F303**

Parameter Type — **Numerical**

Factory Default — **0**

Changeable During Run — **Yes**

Minimum — 0

Maximum — 10

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 (EMG)
- 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. 6 for additional information on this setting.

Dynamic Braking Selection (not used)

Direct Access Number — **F304**

Parameter Type — **Selection List**

Factory Default — **Off**

Changeable During Run — **Yes**

Program ⇒ Protection ⇒ Dynamic Braking

This parameter is model-specific and has no function on the WX9 ASD.

Settings:

0 — Off
1 — On with Overload

Dynamic Braking uses the inertial energy of the load to produce a braking force. The inertial energy of the load drives the rotor and induces a current into the stator of the motor that may be used to reduce the bus voltage in an attempt to preclude an over-voltage trip during deceleration.

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

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

The Dynamic Braking function may be setup and enabled by connecting a braking resistor from terminal PA and PB of the drive and providing the proper information at F304, F308, and F309.

Over-Voltage Limit Operation

Program ⇒ Protection ⇒ Stall

This parameter Enables/Disables the Over-Voltage Stall function. When enabled, this function causes the drive to extend the deceleration time when the DC bus voltage increases due to transient voltage spikes, regeneration, supply voltage out of specification, etc., in an attempt to reduce the bus voltage.

An Over-Voltage Stall increases the output frequency of the ASD during deceleration for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage threshold level setting of F626 is exceeded for over 4 mS, an Over-Voltage Trip will be incurred.

Parameter F452 (Power Running Stall Continuous Trip Detection Time) setting may affect the performance of this setting.

Note: This setting may increase deceleration times.

Settings:

0 — Enabled
1 — Disabled
2 — Enabled (Forced Shorted Deceleration)

Direct Access Number — **F305**
Parameter Type — **Selection List**
Factory Default — **Enabled**
Changeable During Run — **Yes**

Base Frequency Voltage 1

Program ⇒ Fundamental ⇒ Motor Set 1
Program ⇒ Motor ⇒ Motor Set 1

This parameter sets the maximum value of the output voltage of the drive. The Motor 1 Maximum Output Voltage 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 Compensation setting (F307).

This parameter is used only when the parameters for Motor Set 1 are configured and selected. Motor Set 1 may be selected by a properly configured input terminal (see Table 9 on pg. 178).

Direct Access Number — **F306**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 600.0
Units — Volts

Supply Voltage Correction

Program ⇒ Protection ⇒ Base Frequency Voltage

This parameter Enables/Disables the Voltage Compensation function.

When Enabled, this function provides an output waveform adjustment that compensates for changes in the input voltage.

Settings:

0 — Disabled
1 — Supply Voltage Compensation
2 — Output Voltage Limitation
3 — Supply Voltage Compensation with Output Voltage Limitation

Direct Access Number — **F307**
Parameter Type — **Selection List**
Factory Default — **Supply Voltage Compensation**
Changeable During Run — **No**

Dynamic Braking Resistance (not used)

Program ⇒ Protection ⇒ Dynamic Braking

This parameter is model-specific and has no function on the WX9 ASD.

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

For additional information on selecting the proper resistance value for a given application, contact the TIC Customer Support Center.

For additional information on Dynamic Braking, see F304.

Note: The Dynamic Braking function is NOT used with the WX9 ASD.

Direct Access Number — **F308**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 1.0
Maximum — 1000.0
Units — Ω

Continuous Dynamic Braking Capacity (not used)

Program ⇒ Protection ⇒ Dynamic Braking

This parameter is model-specific and has no function on the WX9 ASD.

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

For additional information on selecting the proper resistor wattage value for a given application, contact the TIC Customer Support Center.

For additional information on Dynamic Braking, see F304.

Note: The Dynamic Braking function is NOT used with the WX9 ASD.

Direct Access Number — **F309**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.01
Maximum — 600.0
Units — kW

Ridethrough Time

Program ⇒ Protection ⇒ Undervoltage/Ridethrough

In the event of a momentary power outage, this parameter determines the length of the Ridethrough time. During a Ridethrough, regenerative energy is used to maintain the control circuitry settings; it is not used to drive the motor.

The Ridethrough will be maintained for the number of seconds set using this parameter.

Note: The actual Ridethrough Time is load-dependent.

Direct Access Number — **F310**
Parameter Type — **Numerical**
Factory Default — **2.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 320.0
Units — Seconds

Forward/Reverse Disable

Program ⇒ Frequency ⇒ Forward/Reverse Disable

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

If either direction is disabled (box checked), commands received for the disabled direction will not be recognized.

If both directions are disabled (both boxes checked), the received direction command will determine the direction of the motor rotation.

Settings:

0 — Permit All
1 — Disable Reverse Run
2 — Disable Forward Run
3 — Direction by Command Permitted

Direct Access Number — **F311**
Parameter Type — **Selection List**
Factory Default — **Permit All**
Changeable During Run — **No**

Scan Rate

Program ⇒ Protection ⇒ Retry/Restart

In the event of a momentary power outage, the output signal of the drive will cease. Upon restoration of power, the drive will output a low-level signal that will be used to determine the rotation speed of the rotor.

The low-level signal will start scanning the motor and decrease until it reaches 0.0 Hz or it matches the signal produced by the turning rotor. Once the rate of rotation is determined, the drive will provide the normal output to engage the motor from its present speed.

This parameter determines the rate at which the scanning signal goes to 0.0 Hz.

See Auto Restart Selection (F301) for additional information on this parameter.

Direct Access Number — **F312**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.50
Maximum — 2.50

Lock-On Rate

Program ⇒ Protection ⇒ Retry/Restart

After a momentary power outage, the ASD may have to startup into a spinning motor. The Lock-On Rate is the difference between the time that the RPM of the motor is determined by the ASD and the time that the ASD outputs a drive signal to the motor.

See Auto Restart Selection (F301) for additional information on this parameter.

Direct Access Number — **F313**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.50
Maximum — 2.50

Search Method

Program ⇒ Protection ⇒ Retry/Restart

In the event of a momentary power outage, this parameter may be used to set the starting point (frequency) of the scanning signal that is used to determine the rotor speed or this parameter may be used to select the method used to search for the speed of the rotor.

See Auto Restart Selection (F301) and Scan Rate (F312) for additional information on this parameter.

Settings:

0 — Normal
1 — Start from 0 Hz
2 — Start from Running Frequency
3 — Option Board
4 — PG

Direct Access Number — **F314**
Parameter Type — **Selection List**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**

Search Inertia

Program ⇒ Protection ⇒ Retry/Restart

After a momentary power loss or the momentary loss of the ST-to-CC connection, this parameter sets the time for the commanded torque to reach its programmed setting during the automatic restart. This function is in effect so long as the Retry/Restart feature is enabled at Auto Restart Selection (F301).

Settings:

0 — 0.5 Second (fast)
1 — 1.0 Second (standard)
2 — 1.5 Seconds
3 — 2.0 Seconds
4 — 2.5 Seconds
5 — 3.0 Seconds
6 — 3.5 Seconds
7 — 4.0 Seconds
8 — 4.5 Seconds
9 — 5.0 Seconds (slow)

Direct Access Number — **F315**
Parameter Type — **Selection List**
Factory Default — **1.0**
Changeable During Run — **No**
Units — Seconds

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.

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 increase or decrease 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 because 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 — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
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 — **60.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 299.0
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 — **60.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 299.0
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 — **10.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.0
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 decreased 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

Load Inertia (Acceleration/Deceleration Torque)

Program ⇒ Feedback ⇒ Drooping Control

This parameter is used for calculating Acceleration/Deceleration torque when compensating for load inertia while operating in the Drooping Control mode.

Direct Access Number — **F325**
Parameter Type — **Numerical**
Factory Default — **1.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 1000.0

Load Torque Filter

Program ⇒ Feedback ⇒ Drooping Control

This parameter is used to set the response sensitivity when calculating the Acceleration/Deceleration torque. This setting applies to load inertia compensation while operating in the Drooping Control mode.

This parameter should be gradually adjusted to provide smoother Drooping Control operation while operating with heavy loads.

Direct Access Number — **F326**
Parameter Type — **Numerical**
Factory Default — **200.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 200.0

Drooping Reference

Program ⇒ Feedback ⇒ Drooping Control

This parameter sets the method to be used in determining the output torque while operating in the Drooping Control mode.

Settings:

0 — Total Torque Calculated by the Detection Current
1 — Torque without Acc/Dec Torque Calculated by Detection Current
2 — Total Torque Calculated by the Command Current
3 — Torque without Acc/Dec Torque Calculated by the Command Current

Direct Access Number — **F327**
Parameter Type — **Selection List**
Factory Default — **Total torque calculated by the detection current**
Changeable During Run — **Yes**

Light-Load High-Speed Operation

Program ⇒ Motor ⇒ Crane/Hoist Load

This parameter enables the Light-Load High-Speed function by selecting an operating mode. The Light-Load High-Speed function accelerates the output frequency of the ASD from the programmed speed to the setting established at Frequency for Automatic High-Speed Operation at Light-Load (F341).

This parameter may be disabled.

If either of the other selections are made and configured, and after the criteria of F331 – F333 are met, the Light-Load High-Speed function is enabled and this parameter determines the operating mode of the Light-Load High-Speed function.

Settings:

0 — Disabled
1 — Reserved
2 — Automatic Enable - Automatic Speed (F341)
3 — Automatic Enable - Preset Speed (Preset ID_{Bin} is OR'ed w/ 1000_{Bin})
4 — Discrete Enable - Automatic Speed (F341) (see item 60 of Table 9 on pg. 178)
5 — Discrete Enable - Preset Speed (Preset ID_{Bin} is OR'ed w/1000_{Bin}) (see item 60 of Table 9 on pg. 178)

Direct Access Number — **F330**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Light-Load High-Speed Operation Switching Lower-Limit Frequency

Program ⇒ Motor ⇒ Crane/Hoist Load

This parameter sets an output frequency threshold that, once surpassed, allows the Light-Load High-Speed function to be used.

The Light-Load High-Speed function may be used if the frequency threshold (F331) and the following conditions are met:

1) Light-Load High-Speed Operation Enable is configured at F330.

2) The output torque is less than the setting established at F335 when reaching the frequency setting here.

Direct Access Number — **F331**
Parameter Type — **Numerical**
Factory Default — **40.00**
Changeable During Run — **Yes**
Minimum — 30.0
Maximum — Upper-Limit Freq. (F012)
Units — Hz

Light-Load High-Speed Operation Load Waiting Time

Program ⇒ Motor ⇒ Crane/Hoist Load

After the time setting of F333 times out, this parameter determines the length of time that the Light-Load High-Speed criteria must be met until the Light-Load High-Speed function engages.

Direct Access Number — **F332**
Parameter Type — **Numerical**
Factory Default — **1.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 10.0
Units — Seconds

Light-Load High-Speed Operation Load Detection Time

Program ⇒ Motor ⇒ Crane/Hoist Load

This parameter determines the length of time that the load requirement must meet the Light-Load High-Speed criteria before the Light-Load High-Speed Enable (F330) is recognized.

Once recognized, the timer setting of F332 must expire to engage the Light-Load High-Speed function.

Direct Access Number — **F333**
Parameter Type — **Numerical**
Factory Default — **1.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 10.0
Units — Seconds

Light-Load High-Speed Operation Heavy-Load Detection Time

Program ⇒ Motor ⇒ Crane/Hoist Load

While operating in the Light-Load High-Speed mode, this parameter determines the length of time that a load exceeding the Light-Load High-Speed operation criteria may exist before the Light-Load High-Speed mode is terminated and normal operation resumes.

Direct Access Number — **F334**
Parameter Type — **Numerical**
Factory Default — **5.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 10.0
Units — Seconds

Switching Load Torque During Forward Run

Program ⇒ Motor ⇒ Crane/Hoist Load

While running forward, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F335**
Parameter Type — **Numerical**
Factory Default — **50**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Heavy-Load Torque During Acceleration in the Forward Direction

Program ⇒ Motor ⇒ Crane/Hoist Load

During forward acceleration, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F336**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Heavy-Load Torque During Deceleration in the Forward Direction

Program ⇒ Motor ⇒ Crane/Hoist Load

During forward deceleration, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F337**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Switching Load Torque During Reverse Run

Program ⇒ Motor ⇒ Crane/Hoist Load

While running in reverse, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F338**
Parameter Type — **Numerical**
Factory Default — **50**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Heavy-Load Torque During Acceleration in the Reverse Direction

Program ⇒ Motor ⇒ Crane/Hoist Load

During reverse acceleration, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F339**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Heavy-Load Torque During Deceleration in the Reverse Direction

Program ⇒ Motor ⇒ Crane/Hoist Load

During reverse deceleration, this parameter establishes the threshold torque level that is used to determine if the Light-Load High-Speed (F331) operation may engage or remain engaged if active.

If the Light-Load High-Speed operation is terminated, normal operation resumes.

Direct Access Number — **F340**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 250
Units — %

Frequency for Automatic High-Speed Operation at Light-Load

Program ⇒ Motor ⇒ Crane/Hoist Load

This parameter establishes the speed that the ASD will ramp to when operating in the Light-Load High-Speed mode.

Direct Access Number — **F341**
Parameter Type — **Numerical**
Factory Default — **60**
Changeable During Run — **Yes**
Minimum — 30.00
Maximum — Upper-Limit Freq. (F012)
Units — %

Commercial Power/ASD Switching Output Selection

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 On Trip Powerline Switching feature.

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) it is 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 Commercial Power/ASD Switching Frequency (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 Commercial Power/ ASD Switching Frequency (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 Trip
2 — Switch at Switching Frequency
3 — Switch at Trip and at 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.

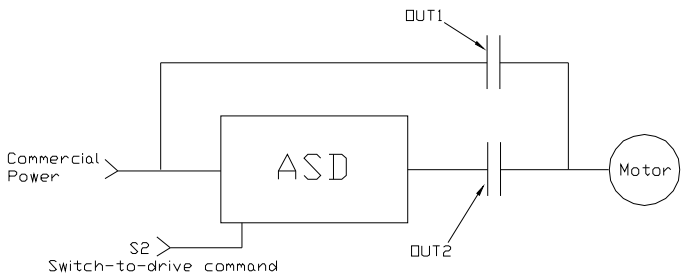
F358 — (Speed) Hold: time of applying commercial power after the switching criteria has been met.

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, 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 drive and to switch to commercial power once reaching the frequency set here.

See Commercial Power/ASD Switching Output Selection (F354) for additional information on this setting.

Direct Access Number — **F355**
Parameter Type — **Numerical**
Factory Default — **60.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

ASD-Side Switching Waiting Time

Program ⇒ Terminal ⇒ Line Power Switching

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

See Commercial Power/ASD Switching Output Selection (F354) for additional information on this setting.

Direct Access Number — **F356**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — (ASD-Dependent)
Maximum — 10.00
Units — Seconds

Commercial Power Side Switching Waiting Time

Program ⇒ Terminal ⇒ Line Power Switching

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

See Commercial Power/ASD Switching Output Selection (F354) for additional information on this setting.

Direct Access Number — **F357**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — (ASD-Dependent)
Maximum — 10.00
Units — Seconds

Commercial Power Switching Frequency Holding 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-drive-output criteria has been met.

See Commercial Power/ASD Switching Output Selection (F354) for additional information on this setting.

Direct Access Number — **F358**
Parameter Type — **Numerical**
Factory Default — **2.00**
Changeable During Run — **Yes**
Minimum — 0.10
Maximum — 10.00
Units — Seconds

PID Feedback Signal Selection

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 — PID Control Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2

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 — **PID Control Disabled**
Changeable During Run — **Yes**

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 PID Feedback Signal Selection (F360).

Direct Access Number — **F361**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 255

PID Feedback Proportional 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 drive responds to changes in feedback.

Direct Access Number — **F362**
Parameter Type — **Numerical**
Factory Default — **0.10**
Changeable During Run — **Yes**
Minimum — 0.01
Maximum — 100.0

PID Feedback Integral 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 — **0.10**
Changeable During Run — **Yes**
Minimum — 0.01
Maximum — 100.0

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 — **50.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 50.00
Units — %

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 — **50.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 50.00
Units — %

PID Feedback Differential 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 — 0.0
Maximum — 2.55

Number of PG Input Pulses

Program ⇒ Feedback ⇒ PG Settings

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

Note: The PG Vector Feedback Board option is required to use this feature.

Direct Access Number — **F367**
Parameter Type — **Numerical**
Factory Default — **500**
Changeable During Run — **No**
Minimum — 1
Maximum — 9999
Units — Pulse Count

Selection of Number of PG Input Phases

Program ⇒ Feedback ⇒ PG Settings

This parameter determines the type of information that is supplied by the phase encoder.

Note: The PG Vector Feedback Board option is required to use this feature.

Settings:

1 — Single Phase
2 — Two Phase

Direct Access Number — **F368**
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

Direct Access Number — **F369**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Electronic Gear Setting (pulses/rotations)

Program ⇒ Feedback ⇒ PG Settings

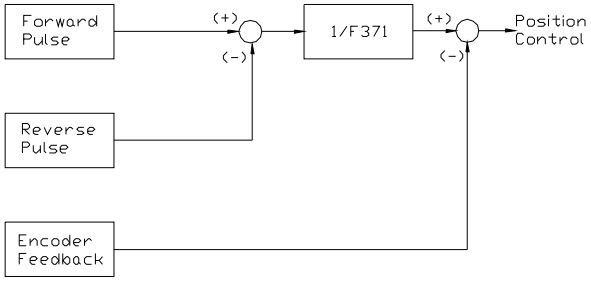
This parameter sets the number of pulses per revolution when using a shaft-mounted encoder and the PG Option Board for closed loop speed control.

Direct Access Number — **F370**
Parameter Type — **Numerical**
Factory Default — **1000**
Changeable During Run — **Yes**
Minimum — 100
Maximum — 4000

Position Loop Gain

Program ⇒ Feedback ⇒ PG Settings

This parameter provides a divisor for the pulse input when operating in the Pulse Control mode.



Direct Access Number — **F371**
Parameter Type — **Numerical**
Factory Default — **4.00**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 100.0

Positioning Completion Range

Program ⇒ Feedback ⇒ PG Settings

During a deceleration ramp, this parameter sets a speed range that must be attained before the Stop command may be executed.

Direct Access Number — **F372**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **Yes**
Minimum — 1
Maximum — 4000

Frequency Limit at Position

Program ⇒ Feedback ⇒ PG Settings

While operating in the Position-Control mode and using PG feedback, this setting determines the maximum acceleration rate in Hz/second.

Direct Access Number — **F373**
Parameter Type — **Numerical**
Factory Default — **800**
Changeable During Run — **No**
Minimum — 1
Maximum — 8001
Units — Hz/Second

Current Control Proportional Gain

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the sensitivity of the drive when monitoring the output current to control speed. The larger the value entered here, the more sensitive the drive is to changes in the received feedback.

Direct Access Number — **F374**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 100.0
Maximum — 1000

Current Control Integral Gain

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the degree and rate at which the output frequency will be allowed to change when prompted by changes in the output current.

The larger the value entered here, the quicker/more the drive responds to changes in feedback.

Direct Access Number — **F375**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 100.0
Maximum — 1250

Speed Loop Proportional Gain

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the Proportional Gain (sensitivity) of the drive when monitoring the PG signal to control speed. The larger the value entered here, the more sensitive the drive is to changes in the received feedback and the quicker it responds.

Direct Access Number — **F376**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 3.2
Maximum — (ASD-Dependent)

Speed Loop Integral Gain (rad/second)

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the response time of the Speed Loop Integral Gain. The smaller the value here, the more pronounced (quicker) the effect of the integral function.

Direct Access Number — **F377**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.1
Maximum — (ASD-Dependent)
Units — Rad/Second

Motor Counter Data Selection

Program ⇒ Feedback ⇒ PG Settings

This parameter sets the pulses-per-revolution displayed on the Monitor screen when using a shaft-mounted encoder for speed control. This setting is used for display purposes only and does not affect the speed control of the system.

If zero is selected here, then the setting at F370 (Electronic Gear Setting) determines the pulses-per-revolution to be displayed on the Monitor screen.

Settings:

0 — **F370** setting
1 — 256 pulses/revolution
2 — 512 pulses/revolution
3 — 1024 pulses/revolution
4 — 2048 pulses/revolution
5 — 4096 pulses/revolution

Direct Access Number — **F378**
Parameter Type — **Selection List**
Factory Default — **F370 Setting**
Changeable During Run — **No**

Speed Loop Parameter Ratio

Program ⇒ Feedback ⇒ PG Settings

Contact the TIC Customer Support Center for information on this parameter.

Direct Access Number — **F379**
Parameter Type — **Numerical**
Factory Default — **1.00**
Changeable During Run — **No**
Minimum — 0.01
Maximum — 10.00
Units — Seconds

Preset Speed Operation Mode

Program ⇒ Frequency ⇒ Preset Speed Modes

This parameter Enables/Disables the Use Speed mode. When enabled, the system uses all of the parameter settings of the Preset Speed being run. Otherwise, only the frequency setting is used.

Settings:

0 — Disabled (Use Frequency Command Only)
1 — Enabled (Use Direction, Acc/Dec, V/f, and Torque)

Direct Access Number — **F380**
Parameter Type — **Selection List**
Factory Default — **Disabled (Use Frequency Command Only)**
Changeable During Run — **No**

Preset Speed 1 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 1 (F018).

Settings:

Forward
Reverse

Direct Access Number — **F381**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 2 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 2 (F019).

Settings:

Forward
Reverse

Direct Access Number — **F382**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 3 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 3 (F020).

Settings:

Forward
Reverse

Direct Access Number — **F383**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 4 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 4 (F021).

Settings:

Forward
Reverse

Direct Access Number — **F384**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 5 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 5 (F022).

Settings:

Forward
Reverse

Direct Access Number — **F385**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 6 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 6 (F023).

Settings:

Forward
Reverse

Direct Access Number — **F386**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 7 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 7 (F024).

Settings:

Forward
Reverse

Direct Access Number — **F387**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 8 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 8 (F287).

Settings:

Forward
Reverse

Direct Access Number — **F388**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 9 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 9 (F288).

Settings:

Forward
Reverse

Direct Access Number — **F389**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 10 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 10 (F289).

Settings:

Forward
Reverse

Direct Access Number — **F390**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 11 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 11 (F290).

Settings:

Forward
Reverse

Direct Access Number — **F391**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 12 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 12 (F291).

Settings:

Forward
Reverse

Direct Access Number — **F392**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 13 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 13 (F292).

Settings:

Forward
Reverse

Direct Access Number — **F393**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 14 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 14 (F293).

Settings:

Forward
Reverse

Direct Access Number — **F394**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Preset Speed 15 (Direction)

Program ⇒ Frequency ⇒ Preset Speed Modes

Determines the forward/reverse setting for the Preset Speed 15 (F294).

Settings:

Forward
Reverse

Direct Access Number — **F395**
Parameter Type — **Selection List**
Factory Default — **Forward**
Changeable During Run — **No**

Autotune and Reset Configuration

Program ⇒ Motor ⇒ Vector Motor Model

This parameter sets the Autotune command status.

Settings:

0 — Autotune Disabled
1 — Reset Motor Defaults
2 — Perform Autotune on Run Command

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 — **0.60**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 2.55

Motor Constant 1 (primary resistance)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is the measurement of the stator resistance and is considered a Motor Constant (unchanging). This value is used in conjunction with other constants to tune the motor.

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

Direct Access Number — **F402**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.0
Maximum — 100,000 MΩ
Units — MΩ

Motor Constant 2 (secondary resistance)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is the measurement of the rotor resistance and is considered a Motor Constant (unchanging). This value is used in conjunction with other constants to tune the motor.

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

Direct Access Number — **F403**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 100,000 MΩ
Units — MΩ

Motor Constant 3 (exciting inductance)

Program ⇒ Motor ⇒ Vector Motor Model

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

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

Direct Access Number — **F404**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 6500.0
Units — µH

Motor Constant 4 (load inertia)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to control the load inertia during speed changes. Acceleration and deceleration overshoot may be reduced by increasing this value.

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

Direct Access Number — **F405**
Parameter Type — **Numerical**
Factory Default — **1.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 100.0

Motor Constant 5 (leakage inductance)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter provides slight increases in the output voltage of the drive at the high speed range.

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

Direct Access Number — **F410**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 650.0

Number of Motor Poles

Program ⇒ Motor ⇒ Vector Motor Model

This parameter identifies the number of motor poles.

Direct Access Number — **F411**
Parameter Type — **Selection List**
Factory Default — **4 pole motor**
Changeable During Run — **No**

Settings:

2 — 2 pole motor
4 — 4 pole motor
6 — 6 pole motor
8 — 8 pole motor
10 — 10 pole motor
12 — 12 pole motor
14 — 14 pole motor
16 — 16 pole motor

Motor Rated Capacity (nameplate)

Program ⇒ Motor ⇒ Vector Motor Model

This parameter identifies the wattage rating of the motor.

Direct Access Number — **F412**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **No**
Minimum — 0.10
Maximum — (ASD-Dependent)
Units — kW

Motor Type

Program ⇒ Motor ⇒ Vector Motor Model

This parameter identifies the type of motor being used.

Settings:

0 — Toshiba EQP III TEFC
1 — Toshiba EQP III ODP
2 — Toshiba EPACT TEFC
3 — Toshiba EPACT ODP
4 — Other Motor

Direct Access Number — **F413**
Parameter Type — **Selection List**
Factory Default — **Toshiba EQP III TEFC**
Changeable During Run — **No**

Autotune of Motor Constant 3

Program ⇒ Motor ⇒ Vector Motor Model

This parameter Enables/Disables tuning of Motor Constant 3 during an Autotune.

Settings:

0 — Prohibited
1 — Valid for Sensorless Vector
2 — Valid for Vector with PG

Direct Access Number — **F414**
Parameter Type — **Selection List**
Factory Default — **Valid for Sensorless Vector**
Changeable During Run — **No**

Torque Command Selection

Program ⇒ Torque ⇒ Torque Control

When operating in the Torque Control mode, this parameter allows the user to select the source of the torque command signal.

Settings:

1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD Input
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Card

Direct Access Number — **F420**
Parameter Type — **Selection List**
Factory Default — **RX**
Changeable During Run — **Yes**

Torque Command Filter

Program ⇒ Torque ⇒ Torque Control

This parameter reduces the motor vibration caused by large-inertia loads. A small value will have a great effect while an increased value will have a lesser effect.

Direct Access Number — **F421**
Parameter Type — **Numerical**
Factory Default — **200.0**
Changeable During Run — **Yes**
Minimum — 10.0
Maximum — 200.0

Synchronized Torque Bias Input Selection

Direct Access Number — **F422**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Synchronized Torque Bias input function. When enabled, this parameter identifies the source of the Synchronized Torque Bias input signal.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD Input
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Card

Tension Torque Bias Input Selection (Torque Control)

Direct Access Number — **F423**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Tension Torque Bias input function. When enabled, this parameter identifies the source of the Tension Torque Bias input signal.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD Input
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Card

Load Sharing Gain Input Selection

Direct Access Number — **F424**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Load Sharing Gain input function and is enabled by selecting a Load Sharing Gain input signal source.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD Input
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Card

Forward Speed Limit Input Selection

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Forward Speed Limit Input control function. When enabled and operating in the Torque Control mode, the forward speed limit is controlled by the terminal selected here. If Setting is selected, the value set at F426 is used as the Forward Speed Limit input.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F426)

Direct Access Number — **F425**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Forward Speed Limit Input Level

Program ⇒ Torque ⇒ Torque Control

This parameter provides a value to be used as the Forward Speed Limit setting if Setting is selected at F425.

Direct Access Number — **F426**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Upper-Limit Freq. (F012)
Units — Hz

Reverse Speed Limit Input Selection

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Reverse Speed Limit Input control function. When enabled and operating in the Torque Control mode, the reverse speed limit is controlled by the terminal selected here. If Setting is selected, the value set at F428 is used as the Reverse Speed Limit input.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F428)

Direct Access Number — **F427**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Reverse Speed Limit Input Level

Program ⇒ Torque ⇒ Torque Control

This parameter provides a value to be used as the Reverse Speed Limit setting if Setting is selected at F427.

Direct Access Number — **F428**
Parameter Type — **Numerical**
Factory Default — **60.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Upper-Limit Freq. (F012)
Units — Hz

Torque Command Mode Selection

Program ⇒ Torque ⇒ Torque Speed Limiting

This parameter specifies whether the torque command function is to be used in one direction or both (F/R).

Settings:

0 — Fixed Direction
1 — F/R Permitted

Direct Access Number — **F429**
Parameter Type — **Selection List**
Factory Default — **Fixed Direction**
Changeable During Run — **No**

Speed Limit (torque = 0) Center Value Reference Selection

Program ⇒ Torque ⇒ Torque Speed Limiting

The system has the ability to limit the amount that the speed may vary as a function of a changing load while operating in the Torque Control mode. This parameter sets the input terminal that will be used to control the allowable speed variance.

If Setting (F431) is selected, the value setting at F431 is used.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F431)

Direct Access Number — **F430**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Speed Limit (torque = 0) Center Value

Program ⇒ Torque ⇒ Torque Speed Limiting

The system has the ability to limit the amount that the speed may vary as a function of a changing load while operating in the Torque Control mode. This parameter sets the targeted speed.

The plus-or-minus value for this setting may be set at F432.

Direct Access Number — **F431**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Speed Limit (torque = 0) Band

Program ⇒ Torque ⇒ Torque Speed Limiting

The system has the ability to limit the amount that the speed may vary as a function of a changing load while operating in the Torque Control mode.

This parameter sets a plus-or-minus value for the Speed Limit Torque Level (F431).

Direct Access Number — **F432**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Speed Limit (torque = 0) Recovery Time

Program ⇒ Torque ⇒ Torque Speed Limiting

The system has the ability to limit the amount that the speed may vary as a function of a changing load while operating in the Torque Control mode. This parameter sets the response time of the system to torque change requirements.

Direct Access Number — **F433**
Parameter Type — **Numerical**
Factory Default — **0.20**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 2.50
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 Setting is selected, the value set at F441 is used as the Power Running Torque Limit 1 input.

Settings:

1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F441)

Direct Access Number — **F440**
Parameter Type — **Selection List**
Factory Default — **Setting (F441)**
Changeable During Run — **Yes**

Power Running Torque Limit 1 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter provides a value for the Power Running Torque Limit 1 setting if Setting is selected at F440. This value provides the positive torque upper-limit for the 1 motor.

Direct Access Number — **F441**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Regenerative Braking Torque Limit 1

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter determines the source of the Regenerative Torque Limit control signal. If Setting is selected, the value set at F443 is used for this parameter.

Settings:

1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F443)

Direct Access Number — **F442**
Parameter Type — **Selection List**
Factory Default — **Setting (F443)**
Changeable During Run — **Yes**

Regenerative Braking Torque Limit 1 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter provides a value to be used as the Regeneration Torque Limit 1 if Setting (F443) is selected at F442.

Direct Access Number — **F443**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Power Running Torque Limit 2 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the positive torque upper-limit for the 2 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F444**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Regenerative Braking Torque Limit 2 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the negative torque upper-limit for the 2 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F445**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Power Running Torque Limit 3 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the positive torque upper-limit for the 3 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F446**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Regenerative Braking Torque Limit 3 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the negative torque upper-limit for the 3 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F447**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Power Running Torque Limit 4 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the positive torque upper-limit for the 4 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F448**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Regenerative Braking Torque Limit 4 Level (250% = disabled)

Program ⇒ Torque ⇒ Manual Torque Limit Settings

This parameter is used to set the negative torque upper-limit for the 4 Motor Profile when multiple motors are controlled by a single drive or when a single motor is controlled by multiple profiles.

Direct Access Number — **F449**
Parameter Type — **Numerical**
Factory Default — **250.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
Units — %

Torque Limit Mode

Program ⇒ Torque ⇒ Torque Limit Settings

Contact the TIC Customer Support Center for information on this parameter.

Settings:

0 — Power Running/Regenerative Torque Limit
1 — Positive/Negative Torque Limits

Direct Access Number — **F450**
Parameter Type — **Selection List**
Factory Default — **Power Running / Regenerative Torque Limit**
Changeable During Run — **No**

Torque Limit Mode (Speed Dependent)

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter allows for either wide or very limited speed fluctuations while operating in the Torque Control mode.

The ASD output follows the commanded speed when No Speed Cooperation is selected and has a very limited speed fluctuation range when Standard is selected.

Settings:

0 — Standard
1 — No Speed Cooperation

Direct Access Number — **F451**
Parameter Type — **Selection List**
Factory Default — **Standard**
Changeable During Run — **Yes**

Power Running Stall Continuous Trip Detection Time

Program ⇒ Protection ⇒ Stall

This parameter allows the user to extend the Over-Voltage Limit Operation (F305) and the Motor Overload Protection Configuration (F017) time settings.

Direct Access Number — **F452**
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — 0.0
Maximum — 1.00
Units — Seconds

Regenerative Braking Stall Prevention Mode Selection

Program ⇒ Protection ⇒ Stall

This parameter Enables/Disables the Over-Voltage Limit Operation (F305) and the Over-Current Stall (F017) function during regeneration only.

Application-specific conditions that warrant disabling the Stall function during regeneration may occur.

Settings:

0 — Enabled
1 — Disabled

Direct Access Number — **F453**
Parameter Type — **Selection List**
Factory Default — **Enabled**
Changeable During Run — **Yes**

Current Differential Gain

Program ⇒ Special ⇒ Special Parameters

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

Direct Access Number — **F454**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 327.6

VI/II Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the VI/II input terminals.

Note: See note on pg. 16 for additional information on the VI/II 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 either increasing or decreasing this setting to provide an output of zero from the ASD.

Direct Access Number — **F470**
Parameter Type — **Numerical**
Factory Default — **99**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

VI/II Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the VI/II input terminals.

Note: See note on pg. 16 for additional information on the VI/II 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 either increasing or decreasing this setting to provide an output of 100% from the ASD.

Direct Access Number — **F471**
Parameter Type — **Numerical**
Factory Default — **156**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RR 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 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 either increasing or decreasing this setting to provide an output of zero from the ASD.

Direct Access Number — **F472**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RR 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 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 either increasing or decreasing this setting to provide an output of 100% from the ASD.

Direct Access Number — **F473**
Parameter Type — **Numerical**
Factory Default — **184**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RX 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 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 either increasing or decreasing this setting to provide an output of zero from the ASD.

Direct Access Number — **F474**
Parameter Type — **Numerical**
Factory Default — **99**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RX 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 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 either increasing or decreasing this setting to provide an output of 100% from the ASD.

Direct Access Number — **F475**
Parameter Type — **Numerical**
Factory Default — **141**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RX2 Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control 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 either increasing or decreasing this setting to provide a zero output from the ASD.

Direct Access Number — **F476**
Parameter Type — **Numerical**
Factory Default — **99**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

RX2 Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the gain of the RX2 input terminal when this terminal is used as the control input while operating in the Speed Control 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 either increasing or decreasing this setting to provide an output of 100% from the ASD.

Direct Access Number — **F477**
Parameter Type — **Numerical**
Factory Default — **141**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 255

Exciting Strengthening Coefficient

Program ⇒ Special ⇒ Special Parameters

This parameter determines the rate at which the excitation current is allowed to go from zero to saturation and is enabled at F481.

Direct Access Number — **F480**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 255

Selection for Over Exciting Cooperation

Program ⇒ Special ⇒ Special Parameters

This parameter determines the method used to control the rate that the excitation current is allowed to reach saturation. If Effective is selected, the preset Torque Control or Speed Control settings will determine the rate that the motor reaches excitation saturation.

Settings:

0 — Effective
1 — Applied by F480

Direct Access Number — **F481**
Parameter Type — **Selection List**
Factory Default — **Effective**
Changeable During Run — **Yes**

Control Margin Modulation for Current Vector Control

Program ⇒ Special ⇒ Special Parameters

This parameter establishes the control margin of modulation when operating in the Current Vector Control mode.

Direct Access Number — **F482**
Parameter Type — **Numerical**
Factory Default — **90.0**
Changeable During Run — **Yes**
Minimum — 80.0
Maximum — 300.0
Units — %

Control Margin Modulation for Voltage Vector Control

Program ⇒ Special ⇒ Special Parameters

This parameter establishes the control margin of modulation when operating in the Voltage Vector Control mode.

Direct Access Number — **F483**
Parameter Type — **Numerical**
Factory Default — **105.0**
Changeable During Run — **Yes**
Minimum — 80.0
Maximum — 300.0
Units — %

Control Margin Modulation for Constant Vector Control

Program ⇒ Special ⇒ Special Parameters

This parameter establishes the control margin of modulation when operating in the Constant Vector Control mode.

Direct Access Number — **F484**
Parameter Type — **Numerical**
Factory Default — **105.0**
Changeable During Run — **Yes**
Minimum — 80.0
Maximum — 300.0
Units — %

Stall Cooperation Gain at Field Weakening Zone

Program ⇒ Special ⇒ Special Parameters

This parameter determines the degree that the Stall function is effective while operating the motor in the field weakening zone.

Direct Access Number — **F485**
Parameter Type — **Numerical**
Factory Default — **128**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 255

Exciting Starting Rate

Program ⇒ Special ⇒ Special Parameters

This parameter establishes the rate of increase in the excitation current from a zero output of the ASD.

Direct Access Number — **F486**
Parameter Type — **Numerical**
Factory Default — **163.84**
Changeable During Run — **Yes**
Minimum — 1.64
Maximum — 327.6

Compensation Coefficient for Iron Loss

Program ⇒ Special ⇒ Special Parameters

This parameter compensates for losses in the rotor-to-stator coupling of the excitation and torque current energy.

Direct Access Number — **F487**
Parameter Type — **Numerical**
Factory Default — **10**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 255

Voltage Compensation Coefficient for Dead Time

Program ⇒ Special ⇒ Special Parameters

This parameter adjusts the degree of voltage compensation during Dead Time by increasing or decreasing the on-time of the programmed PWM just prior to the start of the Dead Time.

Direct Access Number — **F488**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 327.6

Dead Time Compensation

Program ⇒ Special ⇒ Special Parameters

This parameter Enables/Disables the Dead Time Compensation function. The Dead Time Compensation feature provides a smoothing of the on-off IGBT signal that feeds the Gate Driver board during the off portion of the on-off cycle.

Settings:

0 — Enabled
1 — Disabled

Direct Access Number — **F489**
Parameter Type — **Selection List**
Factory Default — **Enabled**
Changeable During Run — **Yes**

Dead Time Compensation Bias

Program ⇒ Special ⇒ Special Parameters

This parameter sets a bias for the Dead Time Compensation function. The Dead Time Compensation feature provides a smoothing of the on-off IGBT signal that feeds the Gate Driver board.

Direct Access Number — **F490**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — -32.768
Maximum — 32.767

Switching Frequency Between Current and Voltage Control

Program ⇒ Special ⇒ Special Parameters

This parameter sets the threshold frequency at which ASD control is switched between current control and voltage control.

Direct Access Number — **F491**
Parameter Type — **Numerical**
Factory Default — **40.00**
Changeable During Run — **Yes**
Minimum — 10.00
Maximum — 60.00
Units — Hz

Acceleration Time 2

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time in seconds for the drive to go from 0.0 Hz to the Maximum Frequency for the Acceleration (Acc) 2 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using S-Curve Acc/Dec Pattern 1 (F502). The minimum Acc/Dec time may be set using Acc/Dec Time Lower Limit (F508).

This setting is also used to determine the acceleration rate of the UP/DOWN Frequency function.

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

Direct Access Number — **F500**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — F508
Maximum — 6000.00
Units — Seconds

Deceleration Time 2

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time in seconds for the drive to go from the Maximum Frequency to 0.0 Hz for the Deceleration (Dec) 2 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using S-Curve Acc/Dec Pattern 1 (F502). The minimum Acc/Dec time may be set using Acc/Dec Time Lower Limit (F508).

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 Acceleration/Deceleration, Stall, and Ridethrough settings may lengthen the deceleration time.

Direct Access Number — **F501**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — F508
Maximum — 6000
Units — Seconds

S-Curve Acceleration/Deceleration Pattern 1

Direct Access Number — **F502**

Parameter Type — **Selection List**

Factory Default — **Linear**

Changeable During Run — **Yes**

Program ⇒ Fundamental ⇒ Acc/Dec 1 Settings

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

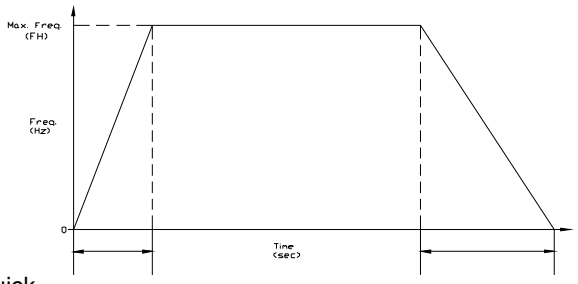
This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the Acceleration/Deceleration (Acc/Dec) 1 parameter.

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

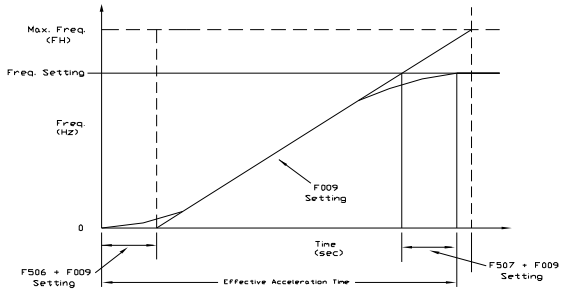
The figures below provide a profile of the available Acc/Dec patterns.

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



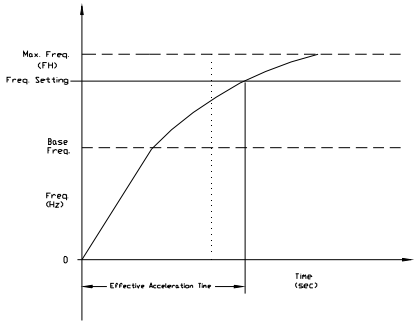
Linear Acceleration/Deceleration

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



S-Pattern Acceleration/Deceleration 1

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



S-Pattern Acceleration/Deceleration 2

S-Curve Acceleration/Deceleration Pattern 2

Direct Access Number — **F503**

Parameter Type — **Selection List**

Factory Default — **Linear**

Changeable During Run — **Yes**

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 Acceleration/Deceleration (Acc/Dec) 2 parameter.

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

Acceleration/Deceleration Pattern 1 - 4 Selection

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter selects the Acceleration/Deceleration (Acc/Dec) Profile to be used during a multiple-profile configuration.

Four Acceleration times and four Deceleration times may be set up and run individually. Acc/Dec Time 1 - 4 may be selected using this parameter setting, switched via threshold frequencies, or by discrete input terminal.

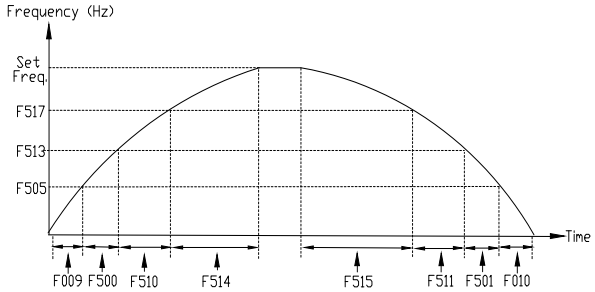
Settings:

1 — Acc/Dec 1
2 — Acc/Dec 2
3 — Acc/Dec 3
4 — Acc/Dec 4

Each Acc/Dec selection is comprised of an Acceleration (Acc) Time, Deceleration (Dec) Time, and a Pattern selection. Selections 1, 2, and 3 have a Switching Frequency setting. The Switching Frequency is used as a threshold frequency that, once reached, triggers the ASD to switch to the next higher Acc/Dec selection (i.e., 1 to 2, 2 to 3, or 3 to 4). Switching Frequency settings are also used during deceleration. A switching frequency setting is not required for Acc/Dec 4.

The figure below 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

Using Acc/Dec Switching



While operating using S-Pattern 1, the system performance may be further enhanced by the adjustment of parameters F506 - F508. These settings provide for upper and lower Acc/Dec limit adjustments. These settings are used to extend or shorten the upper or lower Acc/Dec curve.

Note: If operating from the Hand mode, press ESC from the Frequency Command screen to access this parameter.

To switch using the Terminal Board, assign the functions Acc/Dec Switching 1 and Acc/Dec Switching 2 to two discrete input terminals. Activation combinations of the two terminals result in the Acc/Dec 1 - 4 selections as shown below.

Acc/Dec Switching via Terminal Board Truth Table		
Acc/Dec Switching 1	Acc/Dec Switching 2	Acc/Dec # Out
0	0	1
0	1	2
1	0	3
1	1	4
1 = Discrete terminal activation.		

Direct Access Number — **F504**

Parameter Type — **Selection List**

Factory Default — **Acc/Dec 1**

Changeable During Run — **Yes**

	Acc/Dec 1 Profile	Acc/Dec 2 Profile
Acc Time	F009	F500
Dec Time	F010	F501
Pattern	F502	F503
Switching Frequency	F505	F513
	Acc/Dec 3 Profile	**Acc/Dec 4 Profile**
Acc Time	F510	F514
Dec Time	F511	F515
Pattern	F512	F516
Switching Frequency	F517	(Not Required)

Acceleration/Deceleration Switching Frequency 1

Program ⇒ Special ⇒ Acc/Dec Special

This parameter sets the frequency at which the acceleration control is switched from the Acceleration (Acc) 1 Profile to the Acceleration (Acc) 2 Profile during a multiple-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

S-Pattern Acceleration Lower-Limit Adjustment

Program ⇒ Special ⇒ Acc/Dec Special

During an S-Pattern 1 or 2 sequence, this parameter settings modifies the acceleration rate for the lower part of the acceleration curve by the percentage set here.

This function is commonly used with transportation and lifting applications.

See S-Curve Acc/Dec Pattern 1 (F502) and Acc/Dec Pattern 1-4 Selection (F504) for additional information on this setting.

Direct Access Number — **F506**
Parameter Type — **Numerical**
Factory Default — **25.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 50.00
Units — %

S-Pattern Acceleration Upper-Limit Adjustment

Program ⇒ Special ⇒ Acc/Dec Special

During an S-Pattern 1 or 2 sequence, this parameter setting modifies the acceleration rate for the upper part of the acceleration curve by the percentage set here.

This function is commonly used with transportation and lifting applications.

See S-Curve Acc/Dec Pattern 1 (F502) and Acc/Dec Pattern 1-4 Selection (F504) for additional information on this setting.

Direct Access Number — **F507**
Parameter Type — **Numerical**
Factory Default — **25.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 50.00
Units — %

Acceleration/Deceleration Time Lower Limit

Program ⇒ Special ⇒ Acc/Dec Special

This parameter sets the lower-limit of the Acceleration/Deceleration (Acc/Dec) time.

See Acc/Dec Pattern 1-4 Selection (F504) for additional information on this setting.

Direct Access Number — **F508**
Parameter Type — **Numerical**
Factory Default — **0.10**
Changeable During Run — **Yes**
Minimum — 0.01
Maximum — 10.00
Units — Seconds

Acceleration Time 3

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time for the drive to go from 0.0 Hz to the Maximum Frequency for the Acceleration (Acc) 3 Profile.

The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502.

The minimum Acceleration/Deceleration (Acc/Dec) time may be set using F508.

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

Direct Access Number — **F510**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — F508
Maximum — 6000
Units — Seconds

Deceleration Time 3

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time for the drive to go from the Maximum Frequency to 0.0 Hz for the Deceleration (Dec) 3 Profile.

The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502.

The minimum Acceleration/Deceleration (Acc/Dec) time may be set using F508.

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

Direct Access Number — **F511**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 6000.00
Units — Seconds

Acceleration/Deceleration Pattern 3

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 Acceleration/Deceleration (Acc/Dec) 3 parameter.

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

Direct Access Number — **F512**
Parameter Type — **Selection List**
Factory Default — **Linear**
Changeable During Run — **Yes**

Acceleration/Deceleration Switching Frequency 2

Program ⇒ Special ⇒ Acc/Dec Special

This parameter sets the frequency at which the acceleration control is switched from the Acceleration (Acc) 2 Profile to the Acceleration (Acc) 3 Profile during a multiple-profile configuration.

Direct Access Number — **F513**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Acceleration Time 4

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time for the drive to go from 0.0 Hz to the Maximum Frequency for the Acceleration (Acc) 4 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502. The minimum Acc/Dec time may be set using F508.

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

Direct Access Number — **F514**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 6000.00
Units — Seconds

Deceleration Time 4

Program ⇒ Special ⇒ Acc/Dec (1 - 4) Settings

This parameter specifies the time for the drive to go from the Maximum Frequency to 0.0 Hz for the Deceleration (Dec) 4 Profile. The Acceleration/Deceleration (Acc/Dec) pattern may be set using F502. The minimum Acc/Dec time may be set using F508.

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

Direct Access Number — **F515**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 6000.00
Units — Seconds

Acceleration/Deceleration Pattern 4

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 Acceleration/Deceleration (Acc/Dec) 4 parameter.

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

Direct Access Number — **F516**
Parameter Type — **Selection List**
Factory Default — **Linear**
Changeable During Run — **Yes**

Acceleration/Deceleration Switching Frequency 3

Program ⇒ Special ⇒ Acc/Dec Special

This parameter sets the frequency at which the acceleration control is switched from the Acceleration (Acc) 3 Profile to the Acceleration (Acc) 4 Profile during a multiple-profile configuration.

Direct Access Number — **F517**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Motor Overload Protection Level 1

Program ⇒ Fundamental ⇒ Motor Set 1
Program ⇒ Motor ⇒ Motor Set 1

The Motor Overload Protection Level 1 parameter specifies the motor overload current level for Motor Set 1. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to Amps or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (see Current/Voltage Units Setup (F701) to change the display unit).

Motor Overload Protection Level settings (1 – 4) will be displayed in Amps if the EOI display units are set to V/A rather than **%**.

Direct Access Number — **F600**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 10.0
Maximum — 100.0
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 over-current level is entered as a percentage of the maximum rating of the drive.

Note: Parameter F017 (Motor Overload Protection Configuration) must be enabled to use this feature.

Direct Access Number — **F601**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 200.0
Units — %

ASD Trip Record Retention Selection

Program ⇒ Protection ⇒ Trip Settings

This parameter Enables/Disables the Trip Save at Power Down setting. When enabled, this feature logs the trip event and retains the trip information when the system powers down. The trip information may be viewed from the Monitor screen.

When disabled, the trip information will be cleared when the system powers down.

Settings:

0 — Cleared After Power Off (Disable)
1 — Hold After Power Off (Enable)

Direct Access Number — **F602**
Parameter Type — **Selection List**
Factory Default — **Cleared After Power Off**
Changeable During Run — **No**

Emergency Off

Program ⇒ Protection ⇒ Emergency Off Settings

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) (see 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 Brake
3 — Coast Stop without Tripping
4 — Deceleration without Tripping
5 — DC Injection Braking without Tripping

Direct Access Number — **F603**
Parameter Type — **Selection List**
Factory Default — **Coast Stop**
Changeable During Run — **No**

Emergency DC Braking Control Time

Program ⇒ Protection ⇒ Emergency Off Settings

When DC Injection is used as a function of receiving an Emergency Off command (F603), this parameter determines the time that the DC Injection braking is applied to the motor during an emergency off event.

Direct Access Number — **F604**
Parameter Type — **Numerical**
Factory Default — **0.10**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 10.00
Units — Seconds

Output Phase Failure Detection

Direct Access Number — **F605**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Program ⇒ Protection ⇒ Phase Loss

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

Note: Autotune checks for phase failures regardless of this setting.

Settings:

0 — Disabled
1 — Enabled

Overload Reduction Start Frequency

Direct Access Number — **F606**
Parameter Type — **Numerical**
Factory Default — **6.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 30.00
Units — Hz

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 operations.

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.

Set F607 to the desired Overload Time Limit.

Motor 150% Overload Time Limit

Direct Access Number — **F607**
Parameter Type — **Numerical**
Factory Default — **600**
Changeable During Run — **Yes**
Minimum — 10
Maximum — 2400
Units — Seconds

Program ⇒ Protection ⇒ Overload

This parameter establishes a time that the motor may operate at 150% of its rated current before tripping. This setting applies the time/150% reference to the individual settings of each motor (e.g., this setting references 150% of the F600 setting for the 1 motor).

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

Suppression of Inrush Current Timing

Direct Access Number — **F609**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Program ⇒ Protection ⇒ Special Protection Parameters

The startup inrush current may be suppressed. This parameter Enables/Disables the inrush current suppression function.

Settings:

0 — Disabled
1 — Enabled

Low-Current Trip Selection

Program ⇒ Protection ⇒ Low-Current Settings

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

When enabled, the drive will trip on a low-current fault if the output current of the drive 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 — **No**

Low-Current Detection Current

Program ⇒ Protection ⇒ Low-Current Settings

When the Low-Current Trip Selection (F610) is enabled, this function sets the low-current trip threshold.

The threshold value is entered as a percentage of the maximum rating of the drive.

Direct Access Number — **F611**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.0
Units — %

Low-Current Detection Time

Program ⇒ Protection ⇒ Low-Current Settings

When the Low-Current Trip Selection (F610) is 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 — Check at Every Run
1 — Check at Only Power On or Reset

Direct Access Number — **F613**
Parameter Type — **Selection List**
Factory Default — **Check at Every Run**
Changeable During Run — **No**

Short Circuit Pulse Run Duration

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter sets the pulse width of the ASD output pulse that is applied to the motor during an Output Short Circuit test.

Direct Access Number — **F614**
Parameter Type — **Numerical**
Factory Default — **50**
Changeable During Run — **No**
Minimum — 1
Maximum — 100
Units — µS

Over-Torque Trip Selection

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. This setting is a percentage of the maximum rated torque of the drive.

This function is enabled at Over-Torque Trip Selection (F615).

Direct Access Number — **F616**
Parameter Type — **Numerical**
Factory Default — **150.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
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 regeneration. This setting is a percentage of the maximum rated torque of the drive.

This function is enabled at Over-Torque Trip Selection (F615).

Direct Access Number — **F617**
Parameter Type — **Numerical**
Factory Default — **150.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 250.0
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 — 100.0
Units — Seconds

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 contact. The output signal may be used to control external equipment or used to engage a brake.

Note: The time displayed is 1/10th of the actual time (0.1 hr. = 1.0 hr.).

Direct Access Number — **F621**
Parameter Type — **Numerical**
Factory Default — **175.0**
Changeable During Run — **Yes**
Minimum — 0.1
Maximum — 999.9
Units — Hours (X 100)

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 — **10.0**
Changeable During Run — **Yes**
Minimum — 0.01
Maximum — 100.0
Units — Seconds

Over-Speed Detection Frequency Upper Band (0 = disabled)

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 — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 30.0
Units — Hz

Over-Speed Detection Frequency Lower Band (0 = disabled)

Program ⇒ Protection ⇒ Abnormal Speed Settings

This parameter sets the lower level of the Base Frequency range that, once exceeded, 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**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 30.00
Units — Hz

Over-Voltage Limit Operation Level (fast)

Program ⇒ Protection ⇒ Stall

This parameter sets the upper DC bus voltage threshold that, once exceeded, will cause an Over-Voltage Stall. An Over-Voltage Stall increases the output frequency of the drive during deceleration for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage condition persists for more than 250 µS, an Over-Voltage Trip will be incurred.

Note: This feature may increase deceleration times.

Direct Access Number — **F625**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 50.00
Maximum — 250.0
Units — %

Over-Voltage Limit Operation Level

Program ⇒ Protection ⇒ Stall

This parameter sets the upper DC bus voltage threshold that, once exceeded, will cause an Over-Voltage Stall. An Over-Voltage Stall increases the output frequency of the drive during deceleration for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage condition persists for more than 4 mS, an Over-Voltage Trip will be incurred.

This parameter is enabled at Over-Voltage Limit Operation (F305).

Note: This feature may increase deceleration times.

Direct Access Number — **F626**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 50.0
Maximum — 250.0
Units — %

Under-Voltage Trip Selection

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 Under-Voltage (Trip Alarm) Detection Time (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 active.

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 when this function is enabled at F627.

Direct Access Number — **F628**
Parameter Type — **Numerical**
Factory Default — **0.03**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 10.00
Units — Seconds

Regenerative Power Ridethrough Control Level

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter sets the low end of the DC bus voltage threshold. Once the DC bus voltage drops below this setting, the setting of F302 (Ridethrough Mode) will be activated. Activation may be the result of a momentary power loss or an excessive load on the bus voltage. Once activated, the system will attempt to maintain the bus voltage level set here until the motor stops.

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 Regenerative Power Ridethrough Selection (F302) for additional information on this parameter.

Note: This feature may decrease deceleration times.

Direct Access Number — **F629**
Parameter Type — **Numerical**
Factory Default — **(ASD-Dependent)**
Changeable During Run — **Yes**
Minimum — 50.00
Maximum — 100.0
Units — %

Brake Answer Waiting Time

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter is used in conjunction with the discrete input terminal setting 64 [System Consistent Sequence (BA: braking answer)] (see item 64 of Table 9 on pg. 178 for additional information on this feature).

After activating the discrete input terminal System Consistent Sequence (B: braking release), the setting of this parameter defines a window of time in which 1) a Braking Answer response must be received, or 2) the brake must release.

Should this timer setting expire before the Braking Answer is returned or the brake releases, a Brake Fault (E-11) is incurred. Otherwise, the brake releases and normal motor operations resume.

Direct Access Number — **F630**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 10.00
Units — Seconds

Brake Release After Run Timer

Program ⇒ Protection ⇒ Special Protection Parameters

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

Direct Access Number — **F632**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 2.50
Units — Seconds

Earth Fault Alarm Level

Program ⇒ Special ⇒ Earth Fault

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

Direct Access Number — **F640**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **No**
Minimum — 0
Maximum — 100
Units — %

Earth Fault Alarm Time

Program ⇒ Special ⇒ Earth Fault

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

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

Direct Access Number — **F641**
Parameter Type — **Numerical**
Factory Default — **1.00**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 2.50
Units — Seconds

Earth Fault Trip Level

Program ⇒ Special ⇒ Earth Fault

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

Direct Access Number — **F642**
Parameter Type — **Numerical**
Factory Default — **100**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 100
Units — %

Earth Fault Trip Time

Direct Access Number — **F643**
Parameter Type — **Numerical**
Factory Default — **1.00**
Changeable During Run — **No**
Minimum — 0.00
Maximum — 2.50
Units — Seconds

Program ⇒ Special ⇒ Earth Fault

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

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

Acceleration/Deceleration Frequency Adjustment

Direct Access Number — **F650**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Input Functions

This parameter Enables/Disables the feature that allows for the external adjustment of the Base Frequency. When enabled, either VI/II or RR may be used as an input source for the modification of the Base Frequency setting.

Settings:

0 — Disabled
1 — VI/II
2 — RR

Upper-Limit Frequency Adjustment

Direct Access Number — **F651**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Input Functions

This parameter Enables/Disables the feature that allows for the external adjustment of the Upper-Limit. When enabled, either VI/II or RR may be used as an input source for the modification of the Upper-Limit setting.

Settings:

0 — Disabled
1 — VI/II
2 — RR

Acceleration Time Adjustment

Direct Access Number — **F652**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Input Functions

This parameter Enables/Disables the feature that allows for the external adjustment of the Acceleration Time. Selecting either VI/II or RR enables this feature. The selected input is used as a multiplier of the programmed Acceleration Time setting. The multiplication factor may be from 1 to 10.

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

Settings:

0 — Disabled
1 — VI/II
2 — RR

Deceleration Time Adjustment

Direct Access Number — **F653**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Input Functions

This parameter Enables/Disables the feature that allows for the external adjustment of the Deceleration Time. Selecting either VI/II or RR enables this feature. The selected input is used as a modifier of the programmed Deceleration Time setting.

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

Settings:

0 — Disabled
1 — VI/II
2 — RR

Torque Boost Adjustment

Direct Access Number — **F654**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Input Functions

This parameter Enables/Disables the feature that allows for the external adjustment of the Torque Boost setting. Selecting either VI/II or RR enables this feature. The selected input is used as a modifier of the programmed Torque Boost setting.

Settings:

0 — Disabled
1 — VI/II
2 — RR

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 — VI/II
2 — RR
3 — RX
4 — RX2
5 — CN8 Option
6 — Binary/BCD (Option)
7 — Common Serial (TTL)
8 — RS232/RS485
9 — Communication Option Board
10 — UP/DOWN Frequency
11 — Pulse Input (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 Output Frequency.

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

If operating using the CN8 Option and Setting (F729) is selected, the value entered at CN8 Option Override Multiplication Gain (F729) is used as the multiplier of the commanded frequency.

Settings:

0 — Disabled
1 — VI/II
2 — RR
3 — RX
4 — RX2
5 — Setting (F729)

AM Output Terminal Function

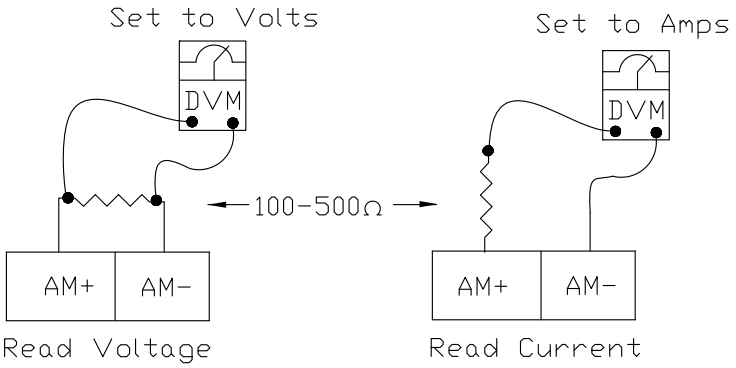
Direct Access Number — **F670**
Parameter Type — **Selection List**
Factory Default — **Output Current**
Changeable During Run — **Yes**

Program ⇒ Terminal ⇒ Analog Output Terminals

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. The available assignments for this output terminal are listed in Table 8 on pg. 177.

To read Voltage at this terminal, connect a 100 – 500W resistor from AM (+) to AM (-). The voltage is read across the 100 – 500W resistor.

To read Current at this terminal, connect a 100 – 500W resistor in series from AM (+), through the current meter, to AM (-).



The AM Terminal Adjustment (F671) is used to calibrate the output signal for a proper response. SW-2 at the Terminal Board may be switched to allow for the full-range output to be either 0 – 1 mA or 4 – 20 mA when providing an output current, or either 0 – 1 or 1 to 7.5 volts when providing an output voltage at this terminal.

AM Output Terminal Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

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

To calibrate the AM analog output, connect a meter (current or voltage) as described at F670.

With the drive running at a known frequency, adjust this parameter until the running frequency produces the desired DC level output at the FM terminal.

Direct Access Number — **F671**
Parameter Type — **Numerical**
Factory Default — **512**
Changeable During Run — **Yes**
Minimum — 1
Maximum — 1280

MON 1 Terminal Meter Selection

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the MON1 analog output terminal. Possible assignments for this output terminal are listed in Table 10 on pg. 182.

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 Meter Setup Parameters

F672 — MON1 Terminal Meter Selection

F673 — MON1 Terminal Meter Adjustment

Direct Access Number — **F672**
Parameter Type — **Selection List**
Factory Default — **Output Voltage**
Changeable During Run — **Yes**

MON 1 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 MON1 Terminal Meter Selection (F672).

See MON1 Terminal Meter Selection (F672) for additional information on this setting.

Direct Access Number — **F673**
Parameter Type — **Numerical**
Factory Default — **512**
Changeable During Run — **Yes**
Minimum — 1
Maximum — 1280

MON 2 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 8 on pg. 177.

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 Meter Setup Parameters

F674 — MON2 Terminal Meter Selection

F675 — MON2 Terminal Meter Adjustment

Direct Access Number — **F674**

Parameter Type — **Selection List**

Factory Default — **Compensated Frequency**

Changeable During Run — **Yes**

MON 2 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 MON2 Terminal Meter Selection (F674).

See MON2 Terminal Meter Selection (F674) for additional information on this setting.

Direct Access Number — **F675**

Parameter Type — **Numerical**

Factory Default — **512**

Changeable During Run — **Yes**

Minimum — 1

Maximum — 1280

Pulse Output Function

Program ⇒ Terminal ⇒ FP Terminal Settings

This parameter commands the multifunction programmable FP terminal to monitor the value of 1 of 31 possible system functions.

As the assigned function changes in magnitude or frequency, the pulse count of the FP output 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.

Possible assignments for this output terminal are listed in Table 10 on pg. 182.

Direct Access Number — **F676**

Parameter Type — **Selection List**

Factory Default — **Output Frequency**

Changeable During Run — **Yes**

Pulse Output Frequency

Program ⇒ Terminal ⇒ FP Terminal Settings

This parameter sets the full-scale reading of the FP Terminal. The full-scale reading of the monitored variable selected at Pulse Output Function (F676) may be set here.

Direct Access Number — **F677**

Parameter Type — **Numerical**

Factory Default — **3840**

Changeable During Run — **Yes**

Minimum — 1000

Maximum — 43200

Units — kHz

Optional Analog Terminal Mark

Direct Access Number — **F680**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 3

Program ⇒ Special ⇒ Special Parameters

This parameter sets the full-scale reading of the FP Terminal. The full-scale reading of the monitored variable selected at Pulse Output Function (F676) may be set here.

Current/Voltage Units Setup

Direct Access Number — **F701**
Parameter Type — **Selection List**
Factory Default — **%**
Changeable During Run — **Yes**

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

Free Unit Multiplication Factor (0 = off)

Direct Access Number — **F702**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 200.0
Units — Hz/UDU

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).

Example: 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 (i.e., F364, F365, F367, and F368) are not affected by this setting.

Free Unit Selection

Direct Access Number — **F703**
Parameter Type — **Selection List**
Factory Default — **0.1**
Changeable During Run — **Yes**

Program ⇒ Utilities ⇒ Display Parameters

The parameter sets the number of decimal places to be displayed during non-Acceleration/Deceleration (Acc/Dec) functions.

Settings:

0 — 1
1 — 0.1
2 — 0.01

Acceleration/Deceleration Unit Time Setup

Direct Access Number — **F704**
Parameter Type — **Selection List**
Factory Default — **0.1**
Changeable During Run — **Yes**

Program ⇒ Utilities ⇒ Display Parameters

This parameter sets the number of decimal places to be displayed for Acceleration/Deceleration (Acc/Dec) functions.

Settings:

0 — 1
1 — 0.1
2 — 0.01

Prohibit Initializing User Parameters During Typeform Initialization

Program ⇒ Utilities ⇒ Prohibition

This parameter Enables/Disables the ability to initialize user parameters during a Type Form initialization.

Settings:

0 — Enabled
1 — Disabled

Direct Access Number — **F709**
Parameter Type — **Selection List**
Factory Default — **Enabled**
Changeable During Run — **Yes**

CN8 Option Override Multiplication Gain

Program ⇒ Feedback ⇒ Override Control

If operating using the CN8 Option, this parameter provides a value to be used in the event that Setting is selected for the Multiplying Input Selection (F661).

Direct Access Number — **F729**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — -100.00
Maximum — 100.00
Units — %

Low Output Disable Control and Stopping Method

Program ⇒ Motor ⇒ Low Output Disable Function

The Low Output Disable Control and Stopping Method Enables/Disables the Low Output Disable function and, if enabled, selects a stopping method.

Settings:

0 — Disabled
1 — Enabled (Deceleration Stop)
2 — Enabled (Coast Stop)

Direct Access Number — **F731**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Low Output Disable Start Level

Program ⇒ Motor ⇒ Low Output Disable Function

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

Direct Access Number — **F732**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Low Output Disable Start Time

Program ⇒ Motor ⇒ Low Output Disable Function

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

Direct Access Number — **F733**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 3600.0
Units — Seconds

Low Output Disable Setpoint Boost

Program ⇒ Motor ⇒ Low Output Disable Function

The Low Output Disable feature adds the user-input frequency value to the commanded frequency.

Direct Access Number — **F734**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Low Output Disable Boost Time

Program ⇒ Motor ⇒ Low Output Disable Function

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

Once expired, the LOD Boost function ceases.

Direct Access Number — **F735**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 3600.0
Units — Seconds

Low Output Disable Feedback Level

Program ⇒ Motor ⇒ Low Output Disable Function

The Low Output Disable Feedback Level sets a frequency level that the ASD output must drop below in order for the Restart Delay Timer to start.

Direct Access Number — **F736**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Low Output Disable Restart Delay Time

Program ⇒ Motor ⇒ Low Output Disable Function

The Low Output Disable Restart Delay Time sets the time that must pass before normal ASD operation resumes (all standard ASD requirements must be met).

Direct Access Number — **F737**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — 3600.0
Units — Seconds

Baud Rate (TTL)

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 settings of the ASD.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — 1200
1 — 2400
2 — 4800
3 — 9600

Direct Access Number — **F800**
Parameter Type — **Selection List**
Factory Default — **9600**
Changeable During Run — **Yes**
Minimum — 1200
Maximum — 9600
Units — BPS

Parity

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 settings of the ASD.

Note: 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.

Note: 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 — 255

Communications Time-Out RS232/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 settings of the ASD.

Note: 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**
Changeable During Run — **Yes**
Minimum — 0
Maximum — 100
Units — Seconds

Communications Time-Out Action (RS232/RS485 and TTL)

Direct Access Number — **F804**
Parameter Type — **Selection List**
Factory Default — **Trip**
Changeable During Run — **Yes**

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 settings of the drive.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

Setting	RS232/RS485	TTL
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

Send Waiting Time (TTL)

Direct Access Number — **F805**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 2.00
Units — Seconds

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the TTL response delay time.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

ASD to ASD Communication (TTL)

Direct Access Number — **F806**

Parameter Type — **Selection List**

Factory Default — **Normal (No Follower)**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Settings

In a master/follower configuration, this setting determines the output parameter of the master ASD that will be used to control the applicable follower ASDs.

Note: Select No Follower if ASD to ASD Communication (RS232/RS485) F826 is configured as a Master Output controller. Otherwise, an EOI failure will result.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — Normal (No Follower)
1 — Frequency Command
2 — Output Command Frequency
3 — Torque Command
4 — Output Torque Command

Frequency Point Selection

Direct Access Number — **F810**

Parameter Type — **Selection List**

Factory Default — **Disabled**

Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Adjustments

This parameter selects the communications reference for scaling.

See F811 — F814 for additional information on this setting.

Note: Scaling the communications signal is not required for all applications.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — Disabled
1 — Common Serial (TTL)
2 — RS232/RS485
3 — Communication Option

Point 1 Setting

Direct Access Number — **F811**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.0
Units — %

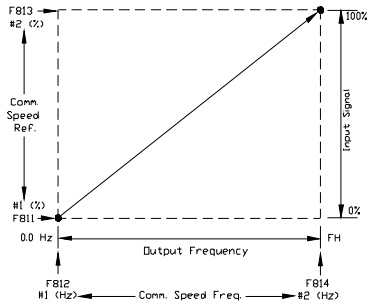
Program ⇒ Communications ⇒ Communication Adjustments

When enabled at Frequency Point Selection (F810), this parameter is used to allow the user to set the gain and bias of the speed control input to the drive when the speed control signal is received via the source selected at Frequency Point Selection (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 Point 1 Frequency (F812),
- the communications input signal value that represents Communications Point 1 Setting (F811),
- Communications Point 2 Frequency (F814), and
- the communications input signal value that represents Communications Point 2 Setting (F813).



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

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

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Point 1 Frequency

Direct Access Number — **F812**
Parameter Type — **Numerical**
Factory Default — **0.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — Maximum Freq. (F011)
Units — Hz

Program ⇒ Communications ⇒ Communication Adjustments

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

See Point 1 Setting (F811) for additional information on this setting.

This parameter sets Point 1 Frequency.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Point 2 Setting

Direct Access Number — **F813**
Parameter Type — **Numerical**
Factory Default — **100.0**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 100.0
Units — %

Program ⇒ Communications ⇒ Communication Adjustments

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

See Point 1 Setting (F811) for additional information on this setting.

This parameter sets the Communications Reference input value that represents Point 2 Setting. This value is entered as 0 to 100% of the Communications Reference input value range.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

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 Point 1 Setting (F811) for additional information on this setting.

This parameter sets the Communications Point 2 Frequency.

Note: 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 — **60.0**
Changeable During Run — **Yes**
Minimum — 0.0
Maximum — Maximum Freq. (F011)
Units — Hz

Baud Rate (RS232/RS485)

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS232/RS485 baud rate.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

1 — 1200
2 — 2400
3 — 4800
4 — 9600
5 — 19200
6 — 38400

Direct Access Number — **F820**
Parameter Type — **Selection List**
Factory Default — **9600**
Changeable During Run — **Yes**

RS485 Wire Count

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the communications protocol to the 2- or 4-wire method.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — 2 wire
1 — 4 wire

Direct Access Number — **F821**
Parameter Type — **Selection List**
Factory Default — **2 wire**
Changeable During Run — **Yes**

Send Waiting Time (RS232/RS485)

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS232/RS485 response delay time.

Note: 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 Communication (RS232/RS485)

Direct Access Number — **F826**
Parameter Type — **Selection List**
Factory Default — **Normal (no follower)**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Communication Settings

In a master/follower configuration, this setting determines the output parameter of the master ASD that will be used to control the applicable follower ASDs.

Note: Select No Follower if F806 is configured as a Master Output controller. Otherwise, an EOI failure will result.

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — Normal (no follower)
1 — Frequency Command
2 — Output Command Frequency
3 — Torque Command
4 — Output Torque Command

Command Request Disposition on Error

Direct Access Number — **F830**
Parameter Type — **Selection List**
Factory Default — **Command Request Cleared**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Scan Settings

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

Note: Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.

Settings:

0 — Command Request Cleared
1 — Command Request Held

Input Reference 1

Direct Access Number — **F831**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Scan Settings

Not used.

Input Reference 2

Direct Access Number — **F832**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Scan Settings

Not used.

Input Reference 3

Direct Access Number — **F833**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Scan Settings

Not used.

Input Reference 4

Direct Access Number — **F834**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Program ⇒ Communications ⇒ Scan Settings

Not used.

Input Reference 5

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F835**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Input Reference 6

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F836**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 1

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F841**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 2

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F842**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 3

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F843**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 4

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F844**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 5

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F845**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Output Monitor 6

Program ⇒ Communications ⇒ Scan Settings

Not used.

Direct Access Number — **F846**
Parameter Type — **Selection List**
Factory Default — **0**
Changeable During Run — **Yes**

Communication Error Mode

Program ⇒ Communications ⇒ S20 Settings

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 — **Selection List**
Factory Default — **Mode 0**
Changeable During Run — **Yes**

Settings:

0 — Mode 0
1 — Mode 1
2 — Mode 2
3 — Mode 3
4 — Mode 4

Communication Error Detect Time Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F851** Parameter Type — **Numerical** Factory Default — **200** Changeable During Run — **Yes** Minimum — 0 Maximum — 1000 Units — Seconds
Receive Address Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F860** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 1023
Transmit Address Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F861** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 1023
Speed Reference Station (0 = disabled) Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F862** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Minimum — 64
Speed Reference Address Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F863** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 1023
Torque Reference Station (0 = disabled) Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F865** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 64
Torque Reference Address Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F866** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 1023

Fault Detect Station Number (0 = disabled) Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F868** Parameter Type — **Numerical** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 64
Station Mode Program ⇒ Communications ⇒ S20 Settings Not used.	Direct Access Number — **F869** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **Yes** Minimum — 0 Maximum — 4
Optional Parameters 1 Program ⇒ Communications ⇒ Optional Parameters Not used.	Direct Access Number — **F890** Parameter Type — **Numerical** Factory Default — **0** Changeable During Run — **No** Minimum — 0 Maximum — 65535
Optional Parameters 2 Program ⇒ Communications ⇒ Optional Parameters Not used.	Direct Access Number — **F891** Parameter Type — **Numerical** Factory Default — **0** Changeable During Run — **No** Minimum — 0 Maximum — 65535
Optional Parameters 3 Program ⇒ Communications ⇒ Optional Parameters Not used.	Direct Access Number — **F892** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **No** Minimum — 0 Maximum — 65535
Optional Parameters 4 Program ⇒ Communications ⇒ Optional Parameters Not used.	Direct Access Number — **F893** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **No** Minimum — 0 Maximum — 65535
Optional Parameters 5 Program ⇒ Communications ⇒ Optional Parameters Not used.	Direct Access Number — **F894** Parameter Type — **Selection List** Factory Default — **0** Changeable During Run — **No** Minimum — 0 Maximum — 65535

S20 Reset

Direct Access Number — **F899**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

Program ⇒ Communications ⇒ S20 Settings

Not used.

Settings:

0 — Disabled
1 — Reset

(Virtual Linear Pump) Mode Switch

Direct Access Number — **F911**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **No**

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 F920. The default selection for each may be used.

Note: If F920 is set to use VI as the command source DO NOT set this parameter to Process Hold. Doing so will result in an error message (VI 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 (VI Feedback Used)
255 — Setup

(Virtual Linear Pump) Application Type

Direct Access Number — **F912**
Parameter Type — **Selection List**
Factory Default — **Pressure**
Changeable During Run — **No**

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

(Virtual Linear Pump) Type Mode

Direct Access Number — **F913**
Parameter Type — **Selection List**
Factory Default — **Direct Acting**
Changeable During Run — **No**

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 VI 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)

(Virtual Linear Pump) Transducer Output Range

Direct Access Number — **F914**
Parameter Type — **Selection List**
Factory Default — **4 – 20 mA**
Changeable During Run — **No**

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the transducer output signal type and range for 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

(Virtual Linear Pump) Transducer Minimum Reading

Direct Access Number — **F915**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — -3276.7
Maximum — 3276.7

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the minimum level of the transducer range for operation.

Note: The unit of measure for this parameter is selected at the Virtual Linear Pump Setup. The default setting is PSI.

(Virtual Linear Pump) Transducer Maximum Reading

Direct Access Number — **F916**
Parameter Type — **Numerical**
Factory Default — **0**
Changeable During Run — **Yes**
Minimum — -3276.7
Maximum — 3276.7

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the maximum level of the transducer range for operation.

Note: The unit of measure for this parameter is selected at the Virtual Linear Pump Setup. The default setting is PSI.

(Virtual Linear Pump) Minimum

Direct Access Number — **F917**
Parameter Type — **Numerical**
Factory Default — **10.00**
Changeable During Run — **Yes**
Minimum — 10.00
Maximum — 165.00

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the minimum setpoint within the operating domain.

(Virtual Linear Pump) Maximum

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the maximum setpoint within the operating domain.

Direct Access Number — **F918**
Parameter Type — **Numerical**
Factory Default — **10.00**
Changeable During Run — **Yes**
Minimum — 10.00
Maximum — 165.00

(Virtual Linear Pump) Low Frequency Limit

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation, this parameter establishes the Low Frequency Limit.

Direct Access Number — **F919**
Parameter Type — **Numerical**
Factory Default — **15.00**
Changeable During Run — **Yes**
Minimum — 10.00
Maximum — 60.00
Units — Hz

(Virtual Linear Pump) Command Source

Program ⇒ Virtual Linear Pump ⇒ Settings

During Direct mode or the Process Hold mode operation, this parameter sets the command source.

Settings:

0 — EOI
1 — *VI
2 — RR
3 — Communication Board

Note: If Process Hold is selected at F911, selecting VI here will result in an error message.

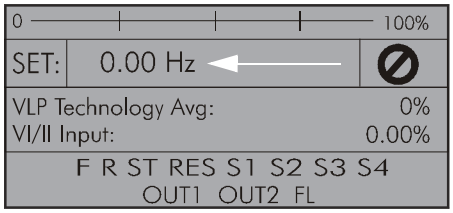
Direct Access Number — **F920**
Parameter Type — **Selection List**
Factory Default — **EOI**
Changeable During Run — **No**

(Virtual Linear Pump) Command Value

Program ⇒ Virtual Linear Pump ⇒ Settings

During a properly configured Virtual Linear Pump operation while operating in the Direct mode and using the EOI for system control, this parameter establishes the operating level.

This parameter setting is effective ONLY while operating in the Direct mode and while receiving a command from the EOI. The end value of this parameter setting appears in the Frequency Command screen in the Set field.



Note: The unit of measure for this parameter is selected at the Virtual Linear Pump Setup. The default setting is PSI.

Direct Access Number — **F921**
Parameter Type — **Numerical**
Factory Default — **0.0**
Changeable During Run — **Yes**
Minimum — 10
Maximum — 165

(Virtual Linear Pump) Sleep Timer

Direct Access Number — **F925**
Parameter Type — **Selection List**
Factory Default — **Disabled**
Changeable During Run — **Yes**

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 Minimum Threshold.

See F926 and F931 for more 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 — Off
1 — On

(Virtual Linear Pump) Sleep Delay Timer

Direct Access Number — **F926**
Parameter Type — **Numerical**
Factory Default — **300**
Changeable During Run — **Yes**
Minimum — 1
Maximum — 63335
Units — Seconds

Virtual Linear Pump ⇒ Sleep Timer

During a properly configured Virtual Linear Pump operation, and once enabled at F925, this parameter establishes the time that system operation will be allowed to operate within the Minimum Threshold before the ASD output to the motor is terminated.

See F925 for more information on this parameter.

(Virtual Linear Pump) Start/Stop Mode

Direct Access Number — **F927**
Parameter Type — **Selection List**
Factory Default — **Off**
Changeable During Run — **Yes**

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 F929 and F930 settings.

On Forward = Run ASD while measured signal is F929 setting and stop ASD upon reaching F930 setting.

On Reverse = Run ASD while measured signal is F930 setting and stop ASD upon reaching F929 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.

(Virtual Linear Pump) Auto Start/Stop Delay Timer

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 F929 and F930 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 F927 for more information on this parameter.

Direct Access Number — **F928**

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

Virtual Linear Pump ⇒ Start and Stop Points

During a properly configured Virtual Linear Pump operation while in the On Forward or On Reverse modes (F927), this parameter establishes the lower level of the Auto Start-Stop threshold.

See F927 for further 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 VLP 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 list of 26 alphabet and 13 special characters.

Direct Access Number — **F929**

Parameter Type — **Numerical**

Factory Default — **Application-Specific**

Changeable During Run — **Yes**

Minimum — F915 Setting

Maximum — F916 Setting

Units — Selectable at Virtual Linear Pump Setup 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 (F927), this parameter establishes the upper level of the Auto Start-Stop threshold.

See F927 for further 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 VLP 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 list of 26 alphabet and 13 special characters.

Direct Access Number — **F930**

Parameter Type — **Numerical**

Factory Default — **300.0**

Changeable During Run — **Yes**

Minimum — F915 Setting

Maximum — F916 Setting

Units — Selectable at Virtual Linear Pump Setup Wizard

(Virtual Linear Pump) External Device Delay Timer

Virtual Linear Pump ⇒ Run External Devices

During a properly configured Virtual Linear Pump operation, this parameter establishes the time that the operating level must remain within the Maximum Threshold or the Minimum Threshold to activate/ deactivate the Sleep Timer (F925) or an auxiliary pump.

See Figures and for more information on the Maximum Threshold and the Minimum Threshold.

Increasing Load

If the operating level of the Lead Pump is within the Maximum Threshold, and the External Device Delay Timer times out, OUT1 will change states and activate an auxiliary pump (Lag1).

Should the operating level return to the Maximum 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 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 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 (F926) to two (2) times the 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.

Note: 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

Direct Access Number — **F931**

Parameter Type — **Numerical**

Factory Default — **5**

Changeable During Run — **Yes**

Minimum — 0.1

Maximum — 6553.5

Units — Seconds

Note: The number of pumps used may be increased by using the optional expansion board (Primary pump plus auxiliary pumps).

(Virtual Linear Pump) External Device Low Band

Direct Access Number — **F932**
Parameter Type — **Numerical**
Factory Default — **10.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 30.00

Virtual Linear Pump ⇒ Run External Devices

During a properly configured Virtual Linear Pump operation, this parameter establishes the upper limit of the Minimum Threshold.

See F931 for more information on this parameter.

(Virtual Linear Pump) External Device High Band

Direct Access Number — **F933**
Parameter Type — **Numerical**
Factory Default — **10.00**
Changeable During Run — **Yes**
Minimum — 0.00
Maximum — 30.00

Virtual Linear Pump ⇒ Run External Devices

This parameter sets the lower limit of the Maximum Threshold.

See F931 for more information on this parameter.

(Virtual Linear Pump) Low Suction/No Flow Cut Off Mode

Direct Access Number — **F934**
Parameter Type — **Selection List**
Factory Default — **Off**
Changeable During Run — **Yes**

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 F936 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 F936.

Note: The On (Electronic Switch) setting allows for the availability of the Trip (0) and Alarm (1) selections at F935 ONLY.

Settings:

0 — Off
1 — On (Physical Switch)
2 — On (Electronic Switch; F936 Setting)

(Virtual Linear Pump) Low Suction/No-Flow Cut Off Fault Action

Program ⇒ Virtual Linear Pump ⇒ Low Suction/No-Flow Cut Off

This parameter is used in conjunction with the setting of parameter F936.

If On (Physical Switch) or On (Electronic Switch) is selected at parameter F936, 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 F936 setting.

If Off is selected at parameter F936, then this parameter selection is ignored.

Settings:

0 — Trip
1 — Alarm

Direct Access Number — **F935**
Parameter Type — **Selection List**
Factory Default — **Trip**
Changeable During Run — **Yes**

(Virtual Linear Pump) Low Suction/No-Flow Cut Off Delay Timer

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.
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 F935 for more information on this function.

Direct Access Number — **F936**
Parameter Type — **Numerical**
Factory Default — **10**
Changeable During Run — **Yes**
Minimum — 1
Maximum — 255
Units — Seconds

(Virtual Linear Pump) Sealing Water Mode

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. Until adequately supplied with sealing water the ASD will not start.

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 — Off
1 — On

Direct Access Number — **F937**
Parameter Type — **Selection List**
Factory Default — **Off**
Changeable During Run — **Yes**

Table 8. Output Terminal Assignments for the AM, FM, FP, MON1, and MON2 Output Terminals.

Selection/ Comm Number	Terminal Assignment Name	Selection/ Comm Number	Terminal Assignment Name
0	Output Frequency	17	DBR Load Ratio (not used)
1	Frequency Command	18	Input Power
2	Output Current	19	Output Power
3	DC Voltage	20	Peak Output Current
4	Output Voltage	21	Peak DC Voltage
5	Compensated Frequency	22	PG Counter
6	Speed Feedback (Real-Time)	23	Location Pulse
7	Speed Feedback (1 Sec Filter)	24	RR Input
8	Torque	25	VI/II Input
9	Torque Reference	26	RX Input
10	Internal Torque Reference	27	RX2 Input
11	Torque Current	28	FM Output
12	Excitation Current	29	AM Output
13	PID Feedback Value	30	Meter Adjust Value
14	Motor Overload Ratio	31	Analog Output
15	ASD Overload Ratio	32	Load Torque
16	DBR Overload Ratio (not used)		

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 Open/Normally Closed. Selection numbers are used when configuring the discrete input terminals via communications. They differentiate the Normally Open and Normally Closed contact settings.</td></tr>
<tr><td>0</td><td>1</td><td>No Function is Assigned — No operation.</td></tr>
<tr><td>2</td><td>3</td><td>F: Forward Run Command — Provides a Forward run command.</td></tr>
<tr><td>4</td><td>5</td><td>R: Reverse Run Command — Provides a Reverse run command.</td></tr>
<tr><td>6</td><td>7</td><td>ST: Standby — Enables the Forward and Reverse operation commands.</td></tr>
<tr><td>8</td><td>9</td><td>RES: Reset — Resets the device and any active faults.</td></tr>
<tr><td>10</td><td>11</td><td>S1: Preset Speed 1 — 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>S2: Preset Speed 2 — 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>S3: Preset Speed 3 — 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>S4: Preset Speed 4 — 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 Setup Terminal — Activates a Jog for the duration of activation. The Jog settings may be configured at F260 and F261.
Jog is the term used to describe turning on the motor for small increments of time and is used when precise positioning of motor-driven equipment is required.</td></tr>
<tr><td>20</td><td>21</td><td>Emergency Off — Terminates the output signal from the drive and may apply a brake. The braking method may be selected at F603.</td></tr>
<tr><td>22</td><td>23</td><td>Forced DC Braking — 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>Acceleration/Deceleration Switching — Activating combinations of discrete input terminals Acceleration/Deceleration (Acc/Dec) Switching 1 and 2 allow for the selection of Acceleration/Deceleration (Acc/Dec) Profiles 1 – 4 as shown below.
See F504 for additional information on this terminal setting.
<table>
<tr><th colspan="2">A/D SW Terminal</th><th rowspan="2">A/D Profile Selection</th></tr>
<tr><th>#1</th><th>#2</th></tr>
<tr><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>2</td></tr>
<tr><td>1</td><td>0</td><td>3</td></tr>
<tr><td>1</td><td>1</td><td>4</td></tr>
<tr><td colspan="3">1 = Terminal Activated</td></tr>
</table>
The settings of the A/D selections 1 – 4 are performed at F009/F010, F500/F501, F510/F511, and F514/F515, respectively.
Acc/Dec Profiles are comprised of the Acc/Dec settings, Pattern, and Switching Frequency.</td></tr>
<tr><td>26</td><td>27</td><td></td></tr>
<tr><td>28</td><td>29</td><td>Motor Switching — Activating combinations of discrete input terminals Motor Switching 1 and 2 allow for the selection of a V/f Switching Profile as listed below.
<table>
<tr><th colspan="2">V/f Switching Terminal</th><th rowspan="2">V/f Selection</th></tr>
<tr><th>#1</th><th>#2</th></tr>
<tr><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>2</td></tr>
<tr><td>1</td><td>0</td><td>3</td></tr>
<tr><td>1</td><td>1</td><td>4</td></tr>
<tr><td colspan="3">1 = Terminal Activated</td></tr>
</table>
The 1 – 4 settings of the V/f Switching selections are performed at F170 – F181.</td></tr>
<tr><td>30</td><td>31</td><td></td></tr>
</table>

Table 9. Discrete Input Terminal Assignment Selections and Descriptions. (Continued)

<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 Open/Normally Closed. Selection numbers are used when configuring the discrete input terminals via communications. They differentiate the Normally Open and Normally Closed contact settings.</td></tr>
<tr><td>32

34</td><td>33

35</td><td>Torque Limit Switching — Activating combinations of discrete input terminals Torque Limit Switching 1 and 2 allow for the selection of a torque limit switching profile as listed below.
<table>
<tr><th colspan="2">Torque Limit Switching Terminal</th><th rowspan="2">Torque Limit Selection</th></tr>
<tr><th>#1</th><th>#2</th></tr>
<tr><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>2</td></tr>
<tr><td>1</td><td>0</td><td>3</td></tr>
<tr><td>1</td><td>1</td><td>4</td></tr>
<tr><td colspan="3">1 = Terminal Activated</td></tr>
</table>
The 1 – 4 settings of the Torque Limit Switching selections are performed at F440 – F449.</td></tr>
<tr><td>36</td><td>37</td><td>PID Control Off — Turns off PID control.</td></tr>
<tr><td>38</td><td>39</td><td>Pattern Run Selection 1 — Selects the configured Pattern 1 Pattern Run for operation. Deactivate to remove the configured Pattern 1 Pattern Run.</td></tr>
<tr><td>40</td><td>41</td><td>Pattern Run Selection 2 — Selects the configured Pattern 2 Pattern Run for operation. Deactivate to remove the configured Pattern 2 Pattern Run.</td></tr>
<tr><td>42</td><td>43</td><td>Pattern Run Selection 3 — Selects the configured Pattern 3 Pattern Run for operation. Deactivate to remove the configured Pattern 3 Pattern Run.</td></tr>
<tr><td>44</td><td>45</td><td>Pattern Run Selection 4 — Selects the configured Pattern 4 Pattern Run for operation. Deactivate to remove the configured Pattern 4 Pattern Run.</td></tr>
<tr><td>46</td><td>47</td><td>Pattern Run Continue Signal — Continues with the last Pattern Run from its stopping point when connected to CC.</td></tr>
<tr><td>48</td><td>49</td><td>Pattern Run Trigger Signal — Used to sequentially initiate each Preset Speed of a Pattern Run with each connection to CC.</td></tr>
<tr><td>50</td><td>51</td><td>Forced Jog Forward — Initiates a Forced Forward Jog when connected to CC. The Forced Forward Jog command provides a forward-run signal so long as this terminal is connected to CC (the status of the F and R terminals is ignored). Use F260 to set the Jog Frequency, and use F261 to select the Jog Stop Pattern.</td></tr>
<tr><td>52</td><td>53</td><td>Forced Jog Reverse — Initiates a Forced Reverse Jog when connected to CC. The Forced Reverse Jog command provides a reverse-run signal so long as this terminal is connected to CC (the status of the F and R terminals is ignored). Use F260 to set the Jog Frequency, and use F261 to select the Jog Stop Pattern.</td></tr>
<tr><td>54</td><td>55</td><td>Binary Bit 0 — Bit 0 – 7 may be set up as a speed/torque control register. Speed/torque settings may be applied to this group of terminals in binary form. The required number of input terminals should be set to the respective binary bit settings
(0 – MSB). The Frequency Mode setting must be set to Use Binary/BCD input.
The gain and bias of the binary input may be set from the following path: Program ⇒ Frequency ⇒ Speed Reference Setpoints ⇒ BIN (see BIN Reference Point 1 (F228)).</td></tr>
<tr><td>56</td><td>57</td><td>Binary Bit 1 — Used in conjunction with terminal setting 54/55 above.</td></tr>
<tr><td>58</td><td>59</td><td>Binary Bit 2 — Used in conjunction with terminal setting 54/55 above.</td></tr>
<tr><td>60</td><td>61</td><td>Binary Bit 3 — Used in conjunction with terminal setting 54/55 above.</td></tr>
<tr><td>62</td><td>63</td><td>Binary Bit 4 — Used in conjunction with terminal setting 54/55 above.</td></tr>
<tr><td>64</td><td>65</td><td>Binary Bit 5 — Used in conjunction with terminal setting 54/55 above.</td></tr>
</table>

Table 9. Discrete Input Terminal Assignment Selections and Descriptions. (Continued)

Sel. No.		Terminal Selection Descriptions
NO	NC	
Note: NO/NC = Normally Open/Normally Closed. Selection numbers are used when configuring the discrete input terminals via communications. They differentiate the Normally Open and Normally Closed contact settings.		
66	67	**Binary Bit 6** — Used in conjunction with terminal setting 54/55 above.
68	69	**Binary Bit 7** — Used in conjunction with terminal setting 54/55 above.
70	71	**Forced Stop**
74	75	**Damper Feedback**
76	77	**User Fault 1** — No operation.
78	79	**User Fault 2** — No operation.
80	81	**User Fault 3** — No operation.
82	83	**User Fault 4** — No operation.
86	87	**Binary Data Write** — This terminal serves two functions: 1) While operating in the Use Binary/BCD input mode, each momentary connection of this terminal to CC transfers the speed/torque Binary Bit (0 – MSB) settings to the motor. 2) The UP/DOWN frequency command will be saved during power down or reset by setting F108 to Store and setting an input terminal to 43:Binary Data Write. If the drive is running and the Binary Data Write terminal is active when an event occurs (Fault, Power Off), the UP/DOWN frequency command will be restored upon power-up or reset.
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 F108 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 F108 for additional information on this feature).
92	93	**UP/DOWN Frequency (clear)** — Initiates a 0 Hz output command while operating in the UP/DOWN Frequency speed control mode. If operating with an activated UP/DOWN Frequency (up or down) terminal, the output goes to the Lower-Limit (F013) setting.
94	95	**Push Run** — Runs the motor for the duration of the activation at the configured speed and direction.
96	97	**Push Stop** — Stops the motor for the duration of the activation. Motor resumes normal operation upon deactivation.
98	99	**Forward/Reverse Selection** — Operates in conjunction with another terminal being set to the Run/Stop (50) function. When configured to Run (Run/Stop to CC), the make-or-break of this connection to CC changes the direction of the motor.
100	101	**Run/Stop Command** — Enables the motor to run when activated and disables the motor when deactivated.
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** — Connecting this terminal to CC allows for the frequency control to be switched from the frequency command source selected as Frequency Mode 1 to Frequency Mode 2. This function is enabled by setting the Frequency Priority Selection to Frequency Source Priority Switching and is located at Program ⇒ Fundamental Parameters ⇒ Standard Mode Selection.
106	107	**Terminal Frequency Priority** — Overrides the F004 setting and assigns speed control to the Terminal Board.
108	109	**Terminal Command Priority** — Overrides the F003 setting and assigns command control to the Terminal Board.
110	111	**Parameter Edit Enable** — Allows for the override of the lock out parameter setting allowing for parameter editing.
112	113	**Control Switching (speed/torque)** — Toggles the system to and from the speed control and torque control modes.

Table 9. Discrete Input Terminal Assignment Selections and Descriptions. (Continued)

Sel. No.		Terminal Selection Descriptions
NO	NC	
Note:		*NO/NC = Normally Open/Normally Closed. Selection numbers are used when configuring the discrete input terminals via communications. They differentiate the Normally Open and Normally Closed contact settings.*
114	115	**Deviation Counter Clear** — Clears the Deviation Counter when operating in the Position Control mode.
116	117	**Position Control Forward Limit LS** — Connecting this terminal to CC will immediately stop the drive and hold its position. If the connection remains, the drive will time-out and trip. This function is normally used for over-travel conditions.
118	119	**Position Control Reverse Limit LS** — Connecting this terminal to CC will immediately stop the drive and hold its position. If the connection remains, the drive will time-out and trip. This function is normally used for over-travel conditions.
120	121	**Light-Load High-Speed Operation Enable** — Sets the lower limit of an output frequency range in which the Light-Load High-Speed function may be used (see F330). The Light-Load High-Speed function accelerates the output frequency of the ASD to the speed setting established in F341 for the duration of the activation.
122	123	**Lag Down Control Valid** — Not used.
124	125	**Spare Excitation** — Not used.
126	127	**System Consistent Sequence (BC: Brake Command)** — Not used.
128	129	**System Consistent Sequence (B: Brake Release)** — Connecting this input terminal to CC initiates the brake release command. This setting requires that another discrete input terminal be set to 65 [System Consistent Sequence (BA: braking answer)] to complete the brake release command and to convey the status of the braking system to the user or to a dependent subsystem. Once the braking release function is initiated, the Trouble Internal Timer begins to count down (Trouble Internal Timer value is set at F630). Should the count-down timer expire before the brake releases or before the Braking Answer is returned, a Brake Fault (E-11) will occur. Otherwise, the brake releases the motor and normal motor operations resume. The Braking Release function is primarily used at startup but may be used when the brake is applied while the motor is running.
130	131	**System Consistent Sequence (BA: Brake Answer)** — Required when the Braking Release (64) function is used. The function of this input terminal is to receive the returned status of the braking system. The returned status is either Released or Not Released. If Released is returned within the time setting of F630, normal system function resumes. If Not Released is returned or if the F630 time setting times out before either signal is returned, then a Brake Fault (E-11) occurs. The returned signal may also be used to notify the user or control a dependent subsystem.
132	133	**System Consistent Sequence (BT: Brake Test)** — Factory use.
134	135	**Fire Speed**
136	137	**Test** — For factory use.
138	139	**No MOFF —** Activation turns off the Main Circuit Under-Voltage (MOFF) monitoring, alarm, and trips.
140	141	**Start/Stop HOA —** Activates the Auto Start-Stop operating mode in accordance with the settings of F385.
142	143	**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.
144	145	**Sealing Water —** Once an adequate water supply is detected at the pump seal via a reed switch, activation enables the ASD for normal operations.
146	147	**Virtual Linear Pump Enable/Disable Switch —** Activation enables the VLP function for normal VLP operation. The VLP function is disabled when the terminal is not active.

Table 10. Output Terminal Assignments 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	LL: Lower-Limit Frequency	1066	66	Under-Voltage of Control Power Alarm
1002	2	UL: Upper-Limit Frequency	1068	68	Brake Release (BR)
1004	4	LOW: Low-Speed Signal	1070	70	In Alarm Status (Alarm Status Active)
1006	6	RCH: Acc/Dec Completion	1072	72	Forward Speed Limit (Torque Control)
1008	8	RCH: Speed Reach Signal	1074	74	Reverse Speed Limit (Torque Control)
1010	10	Failure FL (All Trips)	1076	76	ASD Healthy Output
1012	12	Failure FL (Except EF or OCL)	1078	78	Abnormal Communication (Internal) Alarm
1014	14	OC: Over-Current Pre-Alarm	1106	106	Light Load Detection
1016	16	OL1: ASD Overload Pre-Alarm	1108	108	Heavy Load Detection
1018	18	OL2: Motor Overload Pre-Alarm	1110	110	Torque Limit (Forward)
1020	20	OH: Over-Heat Pre-Alarm	1112	112	Torque Limit (Reverse)
1022	22	OP: Over-Voltage Pre-Alarm	1114	114	Output for External Rush Suppression Relay
1024	24	MOFF: Main Circuit Under-Voltage Alarm	1118	118	Completion of Stop Positioning
1026	26	Low-Current Alarm	1120	120	Alarm Code 16
1028	28	Over-Torque Alarm	1122	122	Alarm Code 17
1030	30	DBR Overload Pre-Alarm (not used)	1124	124	Alarm Code 18
1032	32	In Emergency Off (Emergency Off Active)	1126	126	Alarm Code 19
1034	34	In Retry (Retry Active)	1128	128	Alarm Code 20
1036	36	Pattern Operation Switching Output	1130	130	Virtual Linear Pump On
1038	38	PID Deviation Limit	1132	132	Virtual Linear Pump Low Frequency
1040	40	Run/Stop	1134	134	Virtual Linear Pump No Flow Type
1042	42	Serious Fault (OCA, OCL, EF, Phase Failure, etc.)	1136	136	Alarm Code 24
1044	44	Light Fault (OL, OC1, 2, 3, OP)	1138	138	Alarm Code 25
1046	46	Commercial Power/ASD Switching Output 1	1140	140	Alarm Code 26
1048	48	Commercial Power/ASD Switching Output 2	1142	142	Alarm Code 27
1050	50	Cooling Fan On/Off	1144	144	Alarm Code 28
1052	52	In Jogging Operation (Jogging Operation Active)	1146	146	Alarm Code 29
1054	54	Panel/Terminal Operation Switching	1148	148	Alarm Code 30
1056	56	Cumulative Run Time Alarm	1150	150	Alarm Code 31
1058	58	Abnormal Communication External Alarm (Cause)	1152	152	Virtual Linear Pump External Device 1
1060	60	Forward/Reverse Switching	1154	154	Virtual Linear Pump External Device 2
1062	62	Ready for Operation (Including ST and RUN)	1156	156	Virtual Linear Pump Sealing Water
1064	64	Ready for Operation	1158	158	FL3 (non EOFF trip) status

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 Fault is incurred.

The User Notification codes are displayed as an indication that a system function or system condition is active (i.e., ATN and DBON); they are not error conditions. The code is displayed on the EOI for the duration of the activation.

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 12 on pg. 185 lists the Alarm codes that may be displayed during operation of the WX9 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 the result of a Fault and serves as a safety feature that disables the ASD system and removes the three-phase power from the motor in the event that a subsystem of the ASD is malfunctioning or one or more of the variables listed below exceeds its normal range (time and/or magnitude):

- Current,
- Voltage,
- Speed,
- Temperature,
- Torque, or
- Load.

See Table 13 on pg. 189 for a listing of potential Trips and their 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 is the ASD/Motor size?
- What is the CPU version and revision level?
- What is the EOI version?
- Is this a new installation?
- What trip information is displayed?
- Has the system ever worked properly and what are the recent modifications (if any)?
- Does the ASD trip when accelerating, running, decelerating, or when not running?
- Does the ASD reach the commanded frequency?
- Does the ASD trip with an unloaded motor?
- Does the ASD trip without the motor attached?

User Notification Codes

The User Notification codes appear on the LED screen while the associated function is active. User Notification codes notify the user of active functions that are usually only momentary under normal conditions and are active for the duration of activation only. User notification events are not error conditions. They only convey active system functions to the user and may be associated with an output contact for annunciation or subsystem activation.

Table 11. WX9 ASD User Notification Codes.

LED Screen	Function	Description
Note: Some User Notification conditions and Alarms may be annunciated via a discrete output terminal setting. See Table 10 on pg. 182 for a listing of the possible system conditions that may be associated with an output terminal.		
AtN	Autotune Active	Autotune function is active. If the initial Autotune fails for any reason, an automatic retry is initiated if Other Motor is selected at F413.
db	DC Braking	Motor Shaft Stationary function is active.
dbOn	DC Braking	DC Injection function is active.
nErr	No Error	No active faults.
PuMP	Virtual Linear Pump On	Virtual Linear Pump function is enabled and active.
LoFr	Virtual Linear Pump Low Frequency	Virtual Linear Pump function is operating at the Low-Frequency Limit setting (F919).

Alarms

An Alarm is an indication that a Fault is imminent if existing operating conditions continue unchanged. Table 13 lists the alarm codes that may be displayed during operation of the WX9 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 more information on the condition and an appropriate course of action.

During an active Alarm, the display toggles to and from the running frequency and the active Alarm. In the case of multiple Alarms, only the first to be detected will be displayed on the Frequency Command screen.

Note: Some User Notification conditions and Alarms may be annunciated via a discrete output terminal setting. See Table 11 on pg. 184 for a listing of the possible system conditions that may be associated with an output terminal.

Table 12. WX9 ASD Alarms.

LED Display LCD Display	Description	Possible Causes/Troubleshooting
CM1 Comm1 Error	Internal communications error.	• Improperly programmed ASD. • Improper communications settings. • Improperly connected cables.
CM2 Comm2 Error	External communications error.	
EF Earth Fault	Active ground fault.	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to Earth Ground.
EFU DC Fuse Open	Incorrect current reading at DC fuse circuit.	• Open circuit at DC bus circuit.
Err1 Point Setting Error	Incorrect setup at an analog input (e.g., VI/II, RR, etc.).	• Gain and bias settings for an analog input are either the same or too close to each other (e.g., F201 and F203 are equal).
LOd PID Low Output Disable	LOD function enabled and the output frequency is less than the F732 setting.	• Disable the LOD function at F731 or increase the Low Output Disable Start Level at F732.
nOFF Main Under-Voltage	Under-voltage condition at the three-phase AC input to the ASD.	• Low commercial input voltage.

Table 12. WX9 ASD Alarms. (Continued)

LED Display LCD Display	Description	Possible Causes/Troubleshooting
* Reset ignored if active.		
OC Over-Current	ASD output current greater than the F601 setting.	• Defective IGBT (U, V, or W). • ASD output to the motor is connected incorrectly. Disconnect the motor and retry. • ASD output phase-to-phase short. • The ASD is starting into a spinning motor. • Motor/machine is jammed. • Mechanical brake is engaged while the ASD is starting or while running. • Acc/Dec time is too short. • Voltage Boost setting is too high. • Load fluctuations. • ASD is operating at an elevated temperature.
*OH *Over-Heat	ASD ambient temperature excessive.	• ASD is operating at an elevated temperature. • ASD is too close to heat-generating equipment. • Cooling fan vent is obstructed (see Mounting the ASD on pg. 11). • Cooling fan is inoperative. • Internal thermistor is disconnected.
OJ Timer	Run-time counter exceeded.	• Type Reset is required; select Clear run timer.
*OL 1 *ASD Overload	Load requirement in excess of the capability of the ASD.	• Carrier frequency is too high. • An excessive load. • Acceleration time is too short. • DC damping rate is set too high. • Motor is starting into a spinning load after a momentary power failure. • ASD is improperly matched to the application.
OL2 Motor Overload	Load requirement in excess of the capability of the motor.	• Improper V/f setting. • Motor is locked. • Continuous operation at low speed. • Startup frequency setting adjustment is required.

Table 12. WX9 ASD Alarms. (Continued)

LED Display LCD Display	Description	Possible Causes/Troubleshooting
* Reset ignored if active.		
*OP *Over-Voltage	DC bus voltage exceeds specifications.	• ASD attempting to start into a spinning motor after a momentary power loss. • Incoming commercial power is above the specified range. • Decel time is too short. • Voltage spikes at the three-phase input; install inductive filter. • Over-Voltage Stall feature is turned off. • System is regenerating. • Load instability. • Disable the Ridethrough function (F302).
OL Over-Torque	Torque requirement in excess of the setting of F616 or F617 for a time longer than the setting of F618.	• ASD is not correctly matched to the application. • F616 or F617 setting is too low. • Obstructed load.
*POFF *Control Power Under-Voltage	Under-voltage condition at the 5, 15, or the 24 VDC supply.	• Defective control board. • Excessive load on power supply. • Low input voltage.
rtry Retry	After a trip has occurred, for a number of user-set times, an automatic system restart is attempted for a qualified trip.	• The Retry function is active.
PtSt Reference Point	Two speed-reference frequency setpoint values are too close to each other.	• Two speed reference frequency setpoints are too close to each other (increase the difference).
UC Under-Current	With the Low-Current Trip (F610) parameter enabled, the output current of the ASD is below the level defined at F611 and remains there for a time longer than the setting of F612.	• Output current too low.

Table 12. WX9 ASD Alarms. (Continued)

LED Display LCD Display	Description	Possible Causes/Troubleshooting
noFL Virtual Linear Pump No Flow	A Low suction/No-flow cut off condition has been active for a duration longer than the setting of F936.	• Pump prime required. • Feed water loss. • Output valve is closed. • System may be set to Trip or Alarm for this condition at F935.

Trips/Faults

If a user setting or a WX9 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. A Trip is a WX9 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 14 are the Faults that may result in a Trip and the possible causes. When a Trip is incurred, the system displays the Fault screen. The Fault screen identifies the active Fault.

Note: An improper WX9 ASD setup may cause some trips — reset the ASD to the factory default settings before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Reset ⇒ Reset to Factory Settings).

Table 13. WX9 ASD Trips and Faults.

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
AbFL Virtual Linear Pump Abnormal Flow	• Loss of suction pressure or closed pump output valve. • Activated discrete input terminal set to Low Suction/No Flow Protection. • ASD Upper-Limit Frequency run-time is equal to F936 time setting.
E Emergency Off	• Output signal from the ASD is terminated and a brake may be applied if so configured. • Emergency Off command was received via EOI or remotely.
E-10 Sink/Source Setting Error	• Improperly positioned Sink/Source jumper on the control board or on an option device. • Sink/Source configuration is incorrect.
E-11 Brake Sequence Response Error	• F630 is set to a non-zero value. • Braking sequence discrete input and output terminals are not set up properly.
E-12 Encoder Signal-Loss Error	• Encoder signal missing while running during closed-loop operation. • Disconnection at the Encoder circuit. • Motor is stopped and is generating torque via torque limit control. • ASD is not configured properly.
E-13 Speed Error	• Result of a motor speed that is greater than the commanded speed when using an encoder for speed control. • Improper encoder connection or setup information. • Defective encoder.
E-17 Key Failure	• Same key input for 20 seconds or more.

Table 13. WX9 ASD Trips and Faults. (Continued)

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
E-18 Analog (Terminal) Input Loss	• VI/II signal loss. • Terminal Board failure. • P24 over-current condition.
E-19 CPU Comm. Error	• CPU data Transmit/Receive error.
E-20 V/f Control Error	• Torque processing error. • Make service call.
E-21 CPU Processing Error	• Software processed incorrectly. • Make service call.
E-22 Logic Input Voltage Error	• Incorrect voltage applied to the discrete input terminals.
E-23 Optional Expansion Input Terminal Board 1 Error	• Optional Expansion Input Terminal Board 1 is defective.
E-24 Optional Expansion Input Terminal Board 2 Error	• Optional Expansion Input Terminal Board 2 is defective.
E-25 Positional Err	• Operating in the Position Control mode and the resulting position exceeds the limits of the Position Control setting.
EEP1 EEPROM Fault	• Internal EEPROM write malfunction. • Make a service call.
EEP2 EEPROM Read Error	• Internal EEPROM read malfunction. • Make a service call.
EEP3 EEPROM Read Error	• Main circuit EEPROM read malfunction. • Make a service call.
EF1/EF2 Ground Fault	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to Earth Ground. • Ground fault detected by the software.

Table 13. WX9 ASD Trips and Faults. (Continued)

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
EPH1 In(put) Phase Loss	• Three-phase input to the ASD is low or missing at the R, S, or T input terminals.
EPHO Out(put) Phase Loss	• Three-phase output from the ASD is low or missing at the U, V, or W output terminals or at the input to the motor.
Err2 RAM Err	• Internal RAM malfunction. • Make a service call.
Err3 ROM Err	• Internal ROM malfunction. • Make a service call.
Err4 CPU Fault	• CPU malfunction. • Control Board malfunction. • Make a service call.
Err5 Comm Error	• Communication malfunction. • Improper or loose connection. • Improper system settings. • Communication time out error.
Err6 Gate Array Error	• Defective Gate Array or Gate Array malfunction.
Err7 Low-Current Detector Error	• Improper Low-Current detection level settings at F609 - F612.
Err8 Option (Device) Fault	• Check installation, connections, and option device manual.
Err9 Flash Memory Error	• Flash memory malfunction. • Make a service call.
Etn Autotuning Err	• Autotune readings that are significantly inconsistent with the configuration information. • A non-three-phase motor is being used. • Incorrect settings at F400 or 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.

Table 13. WX9 ASD Trips and Faults. (Continued)

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
EtN1 Autotuning Err	• F402 adjustment is required (Motor temperature is too high). • F410 adjustment is required (Motor Constant 1 improperly set).
EtN2 Autotuning Err	• F412 adjustment is required (Motor Constant 3 is improperly set).
EtN3 Autotuning Err	• Autotune setting F400 is set to Auto Calculation and there is a problem with the Motor Constant readings.
EtYPE ASD Type(form) Error	• Firmware information (typeform) loaded into the Gate Driver board is inconsistent with the device in which the firmware is being used. • The Gate Driver board has been replaced. • The Gate Driver board is defective.
OC 1 Over-Current During Acc	• Improper V/f setting. • Restart from a momentary power outage. • The ASD is starting into a rotating motor. • ASD/Motor is not properly matched. • Phase-to-phase short (U, V, or W). • Accel 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 340% of the rated FLA on ASDs that are 100 HP or less during acceleration. On ASDs that are greater than 100 HP, this fault occurs when the ASD current exceeds 320% of the rated FLA during acceleration.
OC 1P Over-Heat During Acc	• Cooling fan is inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected. • Acceleration time is too short. • Improper V/f setting. • ASD or the motor is improperly matched to the application.

Table 13. WX9 ASD Trips and Faults. (Continued)

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
OC2 Over-Current During Dec	• Phase-to-phase short (U, V, or W). • Deceleration time is too short. • Motor/machine is jammed. • Mechanical brake is engaged while the ASD is running. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during deceleration. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA during deceleration.
OC2P Over-Heat During Dec	• Cooling fan is inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected. • Deceleration time is too short. • DC Injection current is too high. • ASD or the motor is improperly matched to the application.
OC3 Over-Current During Run	• Load fluctuations. • ASD is operating at an elevated temperature. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during a fixed-speed run or if during a fixed-speed run the ASD over-heats. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA on a fixed-speed run.
OC3P Over-Heat During Run	• Cooling fan is inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected. • Improper V/f setting. • ASD or the motor is improperly matched to the application.
OCL or OCA1 U Phase OC	• Low impedance at the U lead of the ASD output.
OCL or OCA2 V Phase OC	• Low impedance at the V lead of the ASD output.
OCL or OCA3 W Phase OC	• Low impedance at the W lead of the ASD output.
OH Over-Heat	• Cooling fan is inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected.

Table 13. WX9 ASD Trips and Faults. (Continued)

LED Display LCD Display	Possible Causes/Troubleshooting
Note: The event that caused the Trip(s) must be corrected or the monitored value must decrease to less than the threshold value required to cause the Trip to allow for a Reset to be recognized. In the event of multiple active Trips, the Trip displayed will remain until all Faults are corrected and all Trips are cleared.	
OL 1 ASD Overload	• Acceleration time is too short. • DC Injection current is too high. • Improper V/f setting. • Motor is running during restart. • ASD or the motor is improperly matched to the application.
OL2 Motor Overload	• Improper V/f setting. • Motor is locked. • Continuous operation at low speed. • Load requirement exceeds ability of the motor. • Startup frequency setting adjustment is required.
OP 1 Over-Volt Accel	• Motor is running during restart.
OP2 Over-Volt Decel	• Deceleration time is too short. • Stall protection is disabled. • Three-phase input voltage is out of specification. • Input reactance is required.
OP3 Over-Volt Run	• Load fluctuations. • Three-phase input voltage is out of specification.
Ot Over-Torque	• A torque requirement by the load in excess of the setting of F616 or F617 for a time longer than the setting of F618. • The ASD is improperly matched to the application. • The load is obstructed.
UC Under-Curr(ent) Trip	• Improper Low-Current detection level setting.
SEAL Virtual Linear Pump Sealing Water Error	• Inadequate pump seal water. • Loss of pump seal water.
UP 1 Main Power Under-Voltage	• Three-phase input voltage is low. • Momentary power failure longer than the time setting of F628.
UP2 Control Power Under-Voltage	• This fault is caused by an under-voltage condition at the 5, 15, or the 24 VDC supply. • Three-phase input voltage is low.

Viewing Trip Information

When a trip occurs, the resultant error information may be viewed either from the LED screen, LCD Fault screen (Table 13 on pg. 189), 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.

Trip History

The Trip History screen records the system parameters for up to 20 trips. The recorded trip events are numbered from 0 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 15 as At-trip Recorded Parameters (parameter readings at the time that the trip occurred).

In the event of a power loss or if the EOI has been removed from the ASD, the trip records and the real-time clock information are retained (if not deleted) within the EOI for up to 4.5 years via Battery Backup.

Table 14. Trip History Record Parameters.

At-Trip Recorded Parameters			
1) Trip Number	9) Bus Voltage	17) Torque Reference	25) ASD Load
2) Trip Type	10) Discrete Input Status	18) Torque Current	26) DBR Load
3) Time and Date	11) OUT1/OUT2/FL Status	19) Excitation Current	27) Input Power
4) Frequency at Trip	12) Timer	20) PID Value	28) Output Power
5) Output Current	13) Post Compensation Frequency	21) Motor Overload	29) Peak Current
6) Output Voltage	14) Feedback (inst.)	22) ASD Overload	30) Peak Voltage
7) Direction	15) Feedback (1 sec.)	23) DBR Overload	31) PG Speed
8) Frequency Reference	16) Torque	24) Motor Load	32) PG Position
Note: Trip records are comprised of the full list of monitored parameters (32).			

Clearing a Trip

Once the cause of the trip has been corrected, performing a Reset re-enables the ASD for normal operation (clears the fault screen).

The fault screen may also be cleared using one of the following methods:

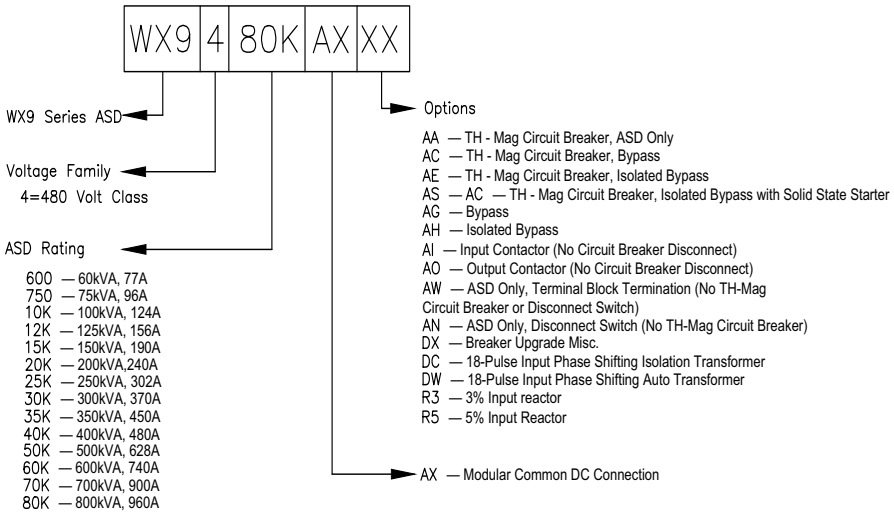
- Cycling power (trip info may be saved via parameter F602 if desired),
- Pressing the STOP/RESET key twice,
- Remotely via the communications channel,
- Momentarily connecting terminal RES to CC of the Control Terminal Strip, or
- Via Type Reset (F007 or Program ⇒ Utilities ⇒ Type Reset ⇒ Clear Past Trips) to clear Monitor screen records only.

Enclosure Dimensions and Ordering Information

The enclosure dimensions for the available models (typeforms) are listed in Table 16.

The WX9 ASD part numbering convention is shown below, and the codes used to represent voltage rating, ASD rating, and options are listed in Table 16.

Figure 31. WX9 Part Numbering Convention.



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.*

Table 15. WX9 ASD Part Numbering Codes.

Voltage Rating Code	ASD Rating Code	Configuration Option Codes	
4: 460-Volt Class	50K: 500kVA, 628A	AA: TH-Mag Circuit Breaker, ASD Only	DC: 18-Pulse Input Phase Shifting Isolation Transformer
	60K: 600kVA, 740A	AC: TH-Mag Circuit Breaker, Bypass	
	70K: 700kVA, 900A	AE: TH-Mag Circuit Breaker, Isolated Bypass	DW: 18-Pulse Input Phase Shifting Auto Transformer
	80K: 800kVA, 960A	AS: TH-Mag Circuit Breaker, Isolated Bypass with Solid State Starter	
		AG: Bypass	
		AH: Isolated Bypass	
		AI: Input Contactor (No Circuit Breaker Disconnect)	
		AN: ASD Only, Disconnect Switch (No TH-Mag Circuit Breaker)	
		AO: Output Contactor (No Circuit Breaker Disconnect)	
		AW: ASD Only, Terminal Block Termination (No TH-Mag Circuit Breaker or Disconnect Switch)	
		BS: Solid State Starter Bypass	

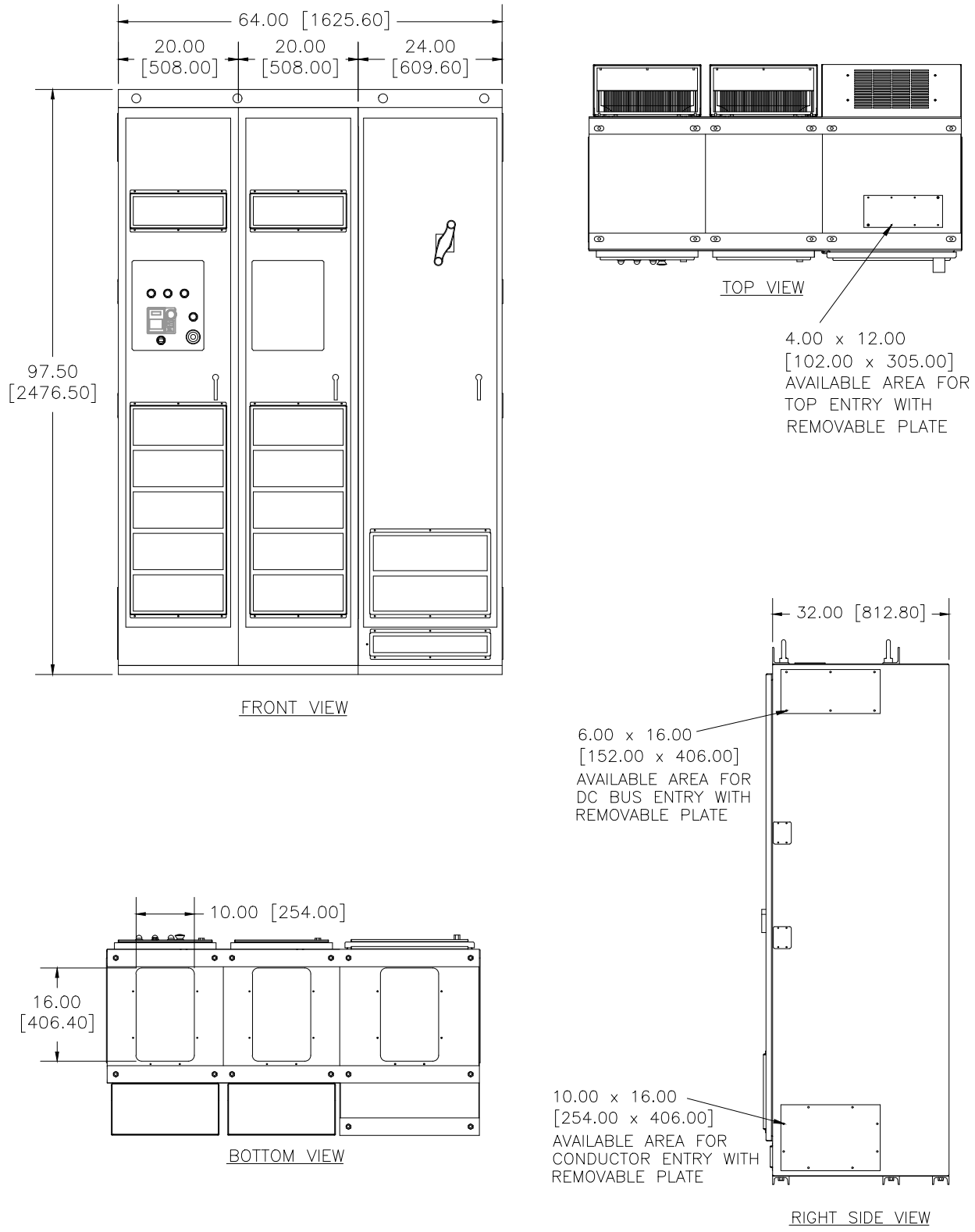
Configuration Option Codes
DX: Breaker Upgrade Misc.
FM: Installed Output Long Lead Filter by TIC
FO: Installed Output Long Lead Filter by Toshiba
HS: Space Heater
LX: Overload Misc.
N3: NEMA 3 (UL Type 3)
N4: NEMA 4 (UL Type 4)
NC: NEMA 12 (UL Type 12)
NX: Enclosure-Misc. Extension Cabinet
R3: 3% Input Reactor
R5: 5% Input Reactor
RE: Installed RF/EMI Filter
-1: Misc.

Enclosure Dimensions

Table 16. 460-Volt WX9 ASD Systems.

Model Number WX94	HP	Figure Number	Width (in/mm)	Height (in/mm)	Depth (in/mm)	Approx. Shipping Weight (lbs/kg)
50K	500	Figure 32	64.00/ 1625.60	97.50/ 2476.50	32.00/ 812.80	4476/ 2031
60K	600					
70K	700					
80K	800					

Figure 32. WX9 ASD Enclosure Dimensions. Dimensions are in inches [mm].



Voltage/Current Specifications

Note: The Short Circuit Current Rating for all items is 85.0 kA if no circuit breaker is used.

Table 17. Voltage/Current Specifications for the WX9 ASD.

Model Number **WX94**	HP	Rated kVA	3-P Input 50/60 Hz ±2%	3-P Output Variable Frequency	Output Current Amps 100% Continuous	Output Current Amps 120% 60 Secs.
50K	500	500	460 VAC	460 VAC	628 A	754 A
60K	600	600			740 A	888 A
70K	700	700			900 A	1080 A
80K	800	800			960 A	1152 A

Cable/Terminal Specifications

Installation should conform to the 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.

Cable sizes for each typeform are listed in the standard drawings that accompany the received system.

Note: The following ratings are guidelines and shall not be the sole determining factor of the lug or wire size used with the WX9 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 WX9 ASD.

Note: Cable/Terminal specifications are based on the rated current of the WX9 ASD and do not include the 10% Service Factor.

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

For more installation information, see the section titled Installation and Connections on pg. 10 and the accompanying drawings for specifics on the actual system being connected.

Table 18. 460-Volt WX9 ASD Cable/Terminal Specifications.

Model Number WX94	Cable Size		Lug Size Range	
	AWG		AWG or MCM/kcmil	
	AM, FM, II Terminals	TB1 Terminal Strip	Input/Output Power	
			3Ø-Input	3Ø-Output
50K	#20 (3-Core Shield)	#18 (2-Core Shield)	4 (3/0 - 500MCM)	4 (1/0 - 750MCM)
60K				
70K				
80K				

Note: For Lug Size values, the non-parenthesized number indicates the quantity of cables to be used for the parenthesized recommended size range [i.e., 4 (1/0 - 750) = Four cables of sizes 1/0 to 750 MCM].

WX9 ASD Optional Devices

The WX9 ASD may be equipped with several options which are used to expand the functionality of the ASD. Table 19 lists the available options and their functions.

Table 19. WX9 ASD Optional Devices and Functions.

Item	Device Function
ASD-CAB-USB	RJ-45-to-USB (ASD to PC cable).
ASD-ISO-1	Provides isolation of the Control Board output circuit from the AM/FM output and from the II input.
ASD-MTG-KIT9	EOI Remote Mounting Kit. See the section titled EOI Remote Mounting on pg. 28 for additional information on this option.
ASD-EOI-N4-G9	EOI Remote Mounting Kit for NEMA 4 applications. See the section titled EOI Remote Mounting on pg. 28 for additional information on mounting the EOI remotely.
ASD-TB1-AC1	Provides 120 VAC discrete input terminal activation and additional I/O terminals.
HS35 Encoder	Provides rotational speed and/or directional information. The Encoder is mounted on the motor shaft or the shaft-driven equipment.
ASD – Multicom Option Board	
Note: Multicom boards are identified as ASD-Multicom-A, -B, -F, etc.	
-A	Incorporates the Modbus, Profibus, or Device Net communications protocol for system control and is able to receive and process Vector Control feedback.
-B	Provides a line driver and open collector interface for system control.
-F	The Tosline-F10 interface provides high-speed communication to Toshiba control equipment via twisted pair wiring.
-J	Able to receive and process vector control feedback via line driver or open collector interface.
-S	The Tosline-S20 interface provides high-speed communication to Toshiba control equipment via fiber optics.
-X	Provides extended terminal I/O functions for monitoring, feedback, and control.
Note: See the user manual of the applicable option for additional information on each item.	

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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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