Introduction

Congratulations on the purchase of the new **P9 Adjustable Speed Drive**!

The **P9 Adjustable Speed Drive** (ASD) is a solid-state AC drive that features Toshiba International Corporation’s (TIC) new **Virtual Linear Pump** function. The **VLP** algorithm was designed to remove the guess work that is associated with the setup of pumping systems. The **VLP** algorithm allows for precise, linear, and consistent pump curve responses at any flow or pressure setting!

The **Virtual Linear Pump** function allows for direct and precise pumping system control. This is accomplished without the normal concerns of the adverse effects of conventional pumping system control response curves.

Toshiba’s **VLP** algorithm is further enhanced by the introduction of the new **Time-Based Alternation** (TBA) function! **Time-Based Alternation** optimizes load sharing and offers a significantly decreased level of system down-time.

**Time-Based Alternation** provides a more evenly-spread machine wear pattern for all motors and pumps of the system. Load sharing is optimized by allowing all pumps to alternate as the primary pump while the remaining pump(s) operate in an ancillary mode for time intervals that are determined by the user.

The decreased system down-time is realized in the event of a failure of one or more pumps, when seamlessly, the system continues to operate, albeit with a diminished capacity.

Using **VLP** and **Time-Based Alternation**, the system seamlessly and easily adapts to peak load demands while maintaining the same degree of high performance and reliability output across the entire load range - without any user intervention!

The **VLP** and **Time-Based Alternation** algorithms coupled with Toshiba International Corporation’s **Vector Control Algorithm** provides setup ease, enhanced reliability, and precise control under the most demanding conditions. All while enabling the motors of the system to develop high starting torque and provide compensation for motor slip, which results in smooth, quick starts, and highly efficient operation.

The programmable functions may be accessed via the easy-to-use menu or via the Direct Access Numbers (see pg. 81). This feature, combined with Toshiba International Corporation’s high-performance software, delivers unparalleled motor control, reliability, and ease of use.

The P9 is a very powerful tool, yet surprisingly simple to operate. The user-friendly **Electronic Operator Interface** (EOI) of the P9 has an easy-to-read LCD screen. There is also a high-visibility LED screen that can be read from a greater distance. The EOI provides easy access to the many monitoring and programming features of the P9.

To maximize the abilities of your new P9, a working familiarity with this manual is required. This manual has been prepared for the ASD installer, user, and maintenance personnel. This manual may also be used as a reference guide or for training. With this in mind, use this manual to develop a familiarity with the P9 before attempting to install, operate, or perform maintenance on the device.
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 your TIC Sales Representative.

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

Any electrical or mechanical modifications to this equipment without prior written consent of Toshiba International Corporation 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 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 misuse of this equipment.
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 P9 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-Publications-Dept.

Manual’s Purpose and Scope

This manual provides information on how to safely install, operate, maintain, and dispose of your P9 Adjustable Speed Drive. The information provided in this manual is applicable to the P9 Adjustable Speed Drive only.

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

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

Included is a section on general safety instructions that 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 English and/or the metric equivalent.

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

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

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Contacting TIC’s Customer Support Center

Toshiba International Corporation’s Customer Support Center can be contacted to obtain help in resolving any Adjustable Speed Drive system problem that you may experience or to provide application information.

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

You may also contact Toshiba International Corporation by writing to:

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

For further information on Toshiba International Corporation’s products and services, please visit our website.

TOSHIBA INTERNATIONAL CORPORATION
P9 Adjustable Speed Drive

Please complete the Warranty Card supplied with the P9 ASD and return it to Toshiba International Corporation by prepaid mail. This will activate the 12-month warranty from the date of installation; but, shall not exceed 18 months from the shipping date.

Complete the following information and retain for your records.

Model Number: ____________________________
Serial Number: ____________________________
Project Number (if applicable): ______________
Date of Installation: _______________________
Inspected By: ______________________________
Name of Application: ________________________
# Table of Contents

**General Safety Information** ................................................................. 1  
  Safety Alert Symbol .............................................................................. 1  
  Signal Words ....................................................................................... 1  
  Special Symbols .................................................................................... 2  
  Equipment Warning Labels ................................................................. 2  
  Qualified Personnel ............................................................................. 2  
  Equipment Inspection ......................................................................... 3  
  Handling and Storage ......................................................................... 3  
  Disposal ............................................................................................... 3  

**Installation Precautions** ................................................................. 4  
  Location and Ambient Requirements ................................................. 4  
  Mounting Requirements ..................................................................... 4  
  Conductor Routing and Grounding Precautions ................................ 5  
  Power Connections Precautions ......................................................... 6  
  Protection ............................................................................................ 6  

**System Integration Precautions** ....................................................... 7  
  Personnel Protection ........................................................................... 7  
  System Setup Requirements .............................................................. 8  

**Operational and Maintenance Precautions** ....................................... 9  

**Motor Characteristics** ................................................................... 10  
  Motor Autotuning ............................................................................... 10  
  Pulse Width Modulation Operation ................................................... 10  
  Low-Speed Operation ........................................................................ 10  
  Overload Protection Adjustment ....................................................... 10  
  Operation Above 60 Hz ...................................................................... 10  
  Power Factor Correction ................................................................... 11  
  Light Load Conditions ........................................................................ 11  
  Motor/Load Combinations ................................................................ 11  
  Load-Produced Negative Torque ......................................................... 12  
  Motor Braking .................................................................................. 12  

**ASD Characteristics** ..................................................................... 13  
  Over-Current Protection .................................................................. 13  
  ASD Capacity ................................................................................... 13  
  Using Vector Control .......................................................................... 13  

**Installation and Connections** .......................................................... 14  
  Installation Notes ............................................................................... 14  
  Mounting the ASD ............................................................................ 15
General Safety Information

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

**Safety Alert Symbol**

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

⚠️

**Signal Words**

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

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.

⚠️ **DANGER**

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.

⚠️ **WARNING**

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 a potentially hazardous situation exists that, if not avoided or if instructions are not followed precisely, may result in equipment and property damage.

⚠️ **CAUTION**
Special Symbols

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

Labels attached to the equipment are there to provide useful information or to indicate an imminently hazardous situation that may result in serious injury, severe property and equipment damage, or loss of life if safe procedures or methods are not followed as outlined in this manual.

Qualified Personnel

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

Qualified Personnel shall:

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

For further information on workplace safety, visit www.osha.gov.
Equipment Inspection

- Upon receipt of the equipment, inspect the packaging and equipment for shipping damage.
- Carefully unpack the equipment and check for parts that may have been damaged during shipping, missing parts, or concealed damage. If any discrepancies are discovered, it should be noted with the carrier prior to accepting the shipment, if possible. File a claim with the carrier if necessary and immediately notify your TIC Sales Representative.
- DO NOT install the ASD if it is damaged or if it is missing any component(s).
- Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.
- Modification of this equipment is dangerous and is to be performed by factory trained personnel. When modifications are required contact your TIC Sales Representative.
- Inspections may be required after moving equipment.
- Contact your TIC Sales Representative to report discrepancies or for assistance if required.

Handling and Storage

- Use proper lifting techniques when moving the ASD; including properly sizing up the load, getting assistance, and using a forklift if required.
- Store in a well-ventilated 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 P9 ASD is -13° to 149° F (-25° to 65° C).
- DO NOT store the unit in places that are exposed to outside weather conditions (i.e., wind, rain, snow, etc.).
- Store in an upright position.

Disposal

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

Location and Ambient Requirements

- The TIC ASD is intended for permanent installations only.
- Installation should conform to the **National Electrical Code — Article 110 (NEC) (Requirements For Electrical Installations)**, all regulations of the **Occupational Safety and Health Administration**, and any other applicable national, regional, or industry codes and standards.

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

- Select a mounting location that is easily accessible, has adequate personnel working space, and adequate illumination for adjustment, inspection, and maintenance of the equipment (refer to 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. 14** for further information on ventilation requirements.
- The ambient operating temperature range of the P9 ASD is 14° to 104° F (-10° to 40° C).

Mounting Requirements

- Only **Qualified Personnel** should install this equipment.
- Install the unit in a secure and upright position in a well-ventilated area.
- As a minimum, the installation of the equipment should conform to the **NEC — Article 110** (NEC), OSHA, as well as any other applicable national, regional, or industry codes and standards.
- Installation practices should conform to the latest revision of NFPA 70E Electrical Safety Requirements for Employee Workplaces.
- It is the responsibility of the ASD installer/maintenance personnel to ensure that the unit is installed into an enclosure that will protect personnel against electric shock.
Conductor Routing and Grounding 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 IICC terminal as the return for the V/I input.
- 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 asymmetrically grounded system, the EMI filter must be disconnected or removed. The ASD may be damaged if the EMI filter is used.
- 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 —

Grounding Capacitor Setting Precaution

⚠️ WARNING ⚠️

If operating using an ungrounded 3-phase power source or within a high-resistance grounding system, the Grounding Capacitance must be set to **Small** or **Out** (typeform-specific) as shown on pg. 19. If set to **High**, a system malfunction, component failure, or fire may result.

Grounding Capacitor Switching

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

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

The **Grounding Capacitor Switch** allows the user to quickly change the value of the capacitance of the 3-phase input circuit without the use of tools. The **Switching Bar** and the **Switching Screw** are easily changed with the use of a wrench or a screw driver, respectively.

See the section titled **System Grounding on pg. 18** for more on the **Grounding Capacitor**.

See figures 4, 5, 6, and 7 on pg. 19 for an electrical depiction of the leakage-reduction functionality of the **Grounding Capacitor** and the methods used to set the capacitance value.
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.
- After ensuring that all power sources are turned off and isolated in accordance with established lock out/tag out procedures, connect the 3-phase power source wiring of the correct voltage to the correct input terminals and connect the output terminals to a motor of the correct voltage and type for the application (refer to 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 3-phase input power is NOT connected to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- **DO NOT** connect resistors across terminals PA – PC or PO – PC. This may cause a fire.
- Ensure the correct phase sequence and the desired direction of motor rotation in the Bypass mode (if applicable).

Protection

- Ensure that primary protection exists for the input wiring to the equipment. This protection must be able to interrupt the available fault current from the power line. The equipment may or may not be equipped with an input disconnect (option).
- All cable entry openings must be sealed to reduce the risk of entry by vermin and to allow for maximum cooling efficiency.
- External dynamic braking resistors must be thermally protected.
- 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 further information on braking systems, see parameters F250 and F304.

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

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

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

- The TIC ASD is a general-purpose product. It is a system component only and the system design should take this into consideration. Please contact your TIC Sales Representative 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 your TIC Sales Representative for options availability and for application-specific system integration information if required.

Personnel Protection

- Installation, operation, and maintenance shall be performed by Qualified Personnel ONLY.

- A thorough understanding of the ASD will be required before the installation, operation, or maintenance of the ASD.

⚠️ WARNING ⚠️

- Rotating machinery and live conductors can be hazardous and shall not come into contact with personnel. Personnel should be protected from all rotating machinery and electrical hazards at all times.

- Insulators, machine guards, and electrical safeguards may fail or be defeated by the purposeful or inadvertent actions of workers. Insulators, machine guards, and electrical safeguards are to be inspected (and tested where possible) at installation and periodically after installation for potential hazardous conditions.

- **DO NOT** allow personnel near rotating machinery. Warning signs to this effect shall be posted at or near the machinery.

- **DO NOT** allow personnel near electrical conductors. Contact with electrical conductors can be fatal. Warning signs to this effect shall be posted at or near the hazard.

- Personal Protection Equipment (PPE) shall be provided and used to protect employees from any hazards inherent to system operation.
**System Setup Requirements**

- With the exception of the **TBA Pump Number (F434)**, ensure that all **Time-Based Alternation** parameter settings and the real-time clock settings for each ASD within the system are the same.

- 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 output of the ASD.

- Use of the built-in system protective features is highly recommended (i.e., E-Off, Overload Protection, etc.).

- The operating controls and system status indicators should be clearly readable and positioned where the operator can see them without obstruction.

- Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.

⚠️ **CAUTION**

- System safety features should be employed and designed into the integrated system in a manner such that system operation, even in the event of system failure, will not cause harm or result in system damage or injury to personnel (i.e., E-Off, Auto-Restart settings, System Interlocks, etc.).

- The programming setup and system configuration of the ASD may allow it to start the motor unexpectedly. A familiarity with the **Time-Based Alternation (F404)**, **VLP Auto Start-Stop (F385)**, **Auto-Restart (F301)**, and the **Sleep Timer (F383)** settings are 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. Signs to this effect must be posted at the equipment installation location.

- If a secondary magnetic contactor (MC) or an ASD output disconnect is used between the ASD and the load, it should be interlocked to halt the ASD before the secondary contact opens. If the output contactor is used for bypass operation, it must be interlocked such that commercial power is never applied to the ASD output terminals (U, V, or W).

- When using an ASD output disconnect, the ASD and the motor must be stopped before the disconnect is either opened or closed. Closing the output disconnect while the 3-phase output of the ASD is active may result in equipment damage or injury to personnel.
Operational and Maintenance Precautions

⚠️ DANGER ⚠️

- Turn off and lock out/tag out the main power, the control power, and instrumentation connections before inspecting or servicing the ASD, opening the door of the enclosure, or connecting/disconnecting the power wiring to the equipment.

- The capacitors of the ASD maintain a residual charge for a period of time after turning the ASD off. The required time for each ASD typeform is indicated with a cabinet label and a Charge Indicator LED (shown for smaller ASDs in Figure 2 on pg. 16). Wait at least the minimum time indicated on the enclosure-mounted label and ensure that the Charge Indicator LED has gone out once the ASD power has been turned off before coming into contact with any circuits or performing any maintenance operations on the P9 ASD.

- Turn the power on only after attaching (or closing) the front cover and DO NOT remove or open the front cover of the ASD when the power is on.

- DO NOT attempt to disassemble, modify, or repair the ASD. Call your TIC Sales Representative for repair information.

- DO NOT place any objects inside of the ASD.

- If the ASD should emit smoke, or an unusual odor or sound, turn off the power immediately.

- The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming in contact with these items.

- The Auto Start-Stop and the Sleep Timer programmable functions of the ASD may allow for the system to start or stop unexpectedly. Signs to this effect are to be clearly posted at the installation location.

- Remove power from the ASD during extended periods of non-use.

- The system should be inspected periodically for damaged or improperly functioning parts, cleanliness, and to ensure that the connectors are tightened securely.
Motor Characteristics

Listed below are some variable speed AC motor control concepts with which the user of the ASD 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 ASD. Autotuning is a function of the ASD that measures several parameters of the connected motor and places these readings in a stored table. The software uses the information in the table to help optimize the response of the ASD to application-specific load and operational requirements. The Autotuning function may be enabled for automatic tuning, configured manually at F400, or disabled.

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

Pulse Width Modulation Operation

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

Low-Speed Operation

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

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

Overload Protection Adjustment

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

The default setting for the overload detection circuit is set to the maximum rated current of the ASD at the factory. This setting will have to be adjusted to match the rating of the motor with which the ASD is to be used. To change the overload reference level, see Motor Overload Protection Level 1 on pg. 198.

Operation Above 60 Hz

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

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

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

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

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

Light Load Conditions

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

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

Motor/Load Combinations

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

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

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

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

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

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

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

To minimize the undesirable effects of negative torque, the dynamic braking system may be used. The dynamic braking system converts the regenerated energy into heat that is dissipated using a braking resistor. The braking resistor must be suitably matched to the load. Dynamic braking is very effective in reducing the DC bus voltage during a momentary over-voltage condition.

⚠️ CAUTION ⚠️

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

To combat this condition, the 3-phase input may be connected using contactors that are configured to open in the event of an extended DBR over-current condition or an internal circuit failure. Using a thermal sensor and/or overload protection as the 3-phase input contactor drive signal, the contactors will open and remove the 3-phase input power in the event of an extended DBR over-current or system over-voltage condition. See Dynamic Braking Protection on pg. 283 for more information on using dynamic braking with the P9 ASD.

Motor Braking

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

For further information on braking systems, see DC Injection Braking on pg. 129 and Dynamic Braking on pg. 141.
ASD Characteristics

Over-Current Protection

Each ASD model is designed for a specified operating power range. The ASD will incur a trip if the design specifications are exceeded. However, the ASD may be operated at 100% of the specified output-current range continuously or at 120% for a limited amount of time as indicated in the section titled Current/Voltage Specifications on pg. 279. Also, the Stall Prevention Level may be adjusted to help with nuisance over-current trips (see F601).

When using the ASD for an application to control a motor that is rated significantly less than the maximum current rating of the ASD, the over-current limit (Thermal Overload Protection) setting will have to be changed to match the FLA of the motor. For further information on this parameter, see Motor Overload Protection Level 1 on pg. 198.

ASD Capacity

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

DO NOT apply a level of input voltage to an ASD that is beyond that which the ASD is rated. The input voltage may be stepped down 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.

See F015 on pg. 86 for further information on using Vector Control.
Installation and Connections

The **P9 True Torque Control** Adjustable Speed Drive may be set up initially by performing a few simple configuration settings. To operate properly, the ASD must be securely mounted and connected to a power source (3-phase AC input at the 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 to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 21 and Figure 9 on pg 24).

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

*Note:* The optional ASD interface boards may be used to expand the I/O functionality of the ASD. See the section titled P9 ASD Optional Devices on pg. 286 for more information on the available options.

Installation Notes

⚠ CAUTION

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

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

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

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

**DO NOT** open and then close a secondary magnetic contactor between the ASD and the motor unless the ASD is off and the motor is not rotating.

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

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 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 current rating that is greater than the rated current of the ASD.

The P9 ASD is designed to operate NEMA B motors. Consult with your TIC Sales Representative before using the ASD for special applications such as with an explosion-proof motor or applications with a piston load.

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

Interface problems may occur when an ASD is used in conjunction with some types of process controllers. Signal isolation may be required to prevent controller and/or ASD malfunction (contact your TIC Sales Representative or the process controller manufacturer for additional information on 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.

Not all P9 ASDs are equipped with internal primary power input fuses (HP dependent). When connecting two or more ASDs that have no internal fuse to the same power line as shown in Figure 1, select a circuit-breaking configuration that will ensure that if a short circuit occurs in ASD 1, only MCCB2 trips, not MCCB1. If it is not feasible to use this configuration, insert a fuse between MCCB2 and ASD 1.

![Figure 1. Typical Circuit Breaker Configuration.](image)

**Mounting the ASD**

---

**CAUTION**

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

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

The ambient operating temperature rating of the P9 ASD is 14° to 104° F (-10° to 40° C).

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

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

When installing adjacent ASDs horizontally, TIC recommends at least 5 cm of space between adjacent units. However, horizontally mounted ASDs may be installed side-by-side with no space in between the adjacent units — side-by-side installations require that the top cover be removed from each ASD.

For 150 HP and above ASDs, a minimum of 50 cm of space is required above and below adjacent units and any obstruction. This space is the recommended minimum space requirement for the ASD and ensures that adequate ventilation is provided for each unit. More space will provide a better environment for cooling (see the section titled Enclosure and Conduit Plate Dimensions on pg. 271 for additional information on mounting space requirements).

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

⚠️ DANGER ⚠️

Refer to the section titled Installation Precautions on pg. 4 and the section titled Lead Length Specifications on pg. 20 before attempting to connect the ASD and/or the motor to electrical power.

Power Connections

⚠️ DANGER ⚠️

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

See the Typical Connection Diagram on pg. 26 for a system I/O connectivity schematic.

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

PA/+ and PB are used for the DBR connection if using a braking resistor.

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

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

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

The location of the Charge Indicator LED for the smaller typeform ASD is provided in Figure 2.

Note: The Charge Indicator LED shown is of the 1 HP P9 ASD. See the accompanying drawings of your received P9 ASD for the actual location of the Charge Indicator LED.

Figure 2. Typical P9 ASD Input/Output Terminals, Charge Indicator LED, and the Grounding Capacitor Switching.
Power Connection Requirements

Connect the 3-phase input power to the input terminals of the ASD at R/L1, S/L2, and T/L3 (see Figure 3 for the typical electrical connection scheme). 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 Current/Voltage Specifications on pg. 279.

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 adjustment factors).

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

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

The ASD is designed and tested to comply with UL Standard 508C. Modifications to the ASD system or failure to comply with the short circuit protection requirements outlined in this manual may disqualify the UL rating. See Table 23 on pg. 285 for typeform-specific short circuit protection recommendations.

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

Note: In the event that the motor rotates in the wrong direction when powered up, reverse any two of the three ASD output power leads (U, V, or W) connected to the motor.

Figure 3. P9 ASD/Motor Typical Connection Diagram.
System Grounding

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

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

— The Metal 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 to combat noise problems.

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

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

• Use shielded wires or twisted wires for the control circuits.

• Ensure that the grounding terminals (G/E) of the ASD are securely connected to ground.

• Connect a surge suppressor to every electromagnetic contactor and every relay installed near the ASD.

• Install noise filters as required.

Grounding Capacitor

⚠️ WARNING ⚠️

If operating using an ungrounded 3-phase power source or within a high-resistance grounding system, the **Grounding Capacitance** must be set to **Small** or **Out** (typeform-specific) as shown on pg. 19. If set to **High** or **In**, a system malfunction, component failure, or fire may result.

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

The **Grounding Capacitor Switching** allows the user to quickly change the value of the leakage-reduction capacitance of the 3-phase input circuit. See figures 4, 5, 6, and 7 on pg. 19 for an electrical depiction of the leakage-reduction functionality and the methods used to change the capacitance value. The method used is typeform-specific.

If using a 460-volt 5 HP ASD or a 460-volt ASD that is in the range of 7.5 HP to 25 HP, and the **U/T1**, **V/T2**, and **W/T3** connections to the motor are 100 meters or more in length, the ASD **Carrier Frequency** must be set to 4 kHz or less when activating or deactivating the **Grounding Capacitor Switching**. ASD overheating may occur if the **Carrier Frequency** is set above 4 kHz when activating or deactivating the **Grounding Capacitor Switching**.

See pg. 5 for more information on the **Grounding Capacitor Switching** and pg. 16 for the switch location.
Figure 4. The **Grounding Capacitor Switch** is used on typeforms **230-volt 0.75 HP to 10 HP and the 25 and 30 HP/460-volt 1.0 HP to 25 HP.**

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

---

Figure 5. The **Grounding Capacitor Switch** is used on typeforms **230-volt 15 HP and 20 HP and the 40 HP to 60 HP/460-volt 30 HP to 100 HP.**

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

---

Figure 6. The **Grounding Capacitor Bar** is used on typeforms **230-volt 75 HP to 125 HP/460-volt 125 HP and the 150 HP.**

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

---

Figure 7. The **Grounding Capacitor Screw** is used on typeforms **460-volt 200 HP and above.**

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

Adhere to the NEC and any local codes during the installation of ASD/motor systems. Excessive lead lengths may adversely affect 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.

All Toshiba CT motors use an insulation system that is NEMA MG1 Part 30 compliant.

All Toshiba XT motors use an insulation system that is NEMA MG1 Part 31 compliant.

Table 1 lists the suggested maximum lead lengths for the listed motor voltages.

Table 1. Lead Length Recommendations.

<table>
<thead>
<tr>
<th>Model</th>
<th>PWM Carrier Frequency</th>
<th>NEMA MG1 Part 30 Compliant Motors</th>
<th>NEMA MG1 Part 31 Compliant Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>230-Volt</td>
<td>All</td>
<td>450 feet</td>
<td>1000 feet</td>
</tr>
<tr>
<td>460-Volt</td>
<td>≤ 5 kHz</td>
<td>200 feet</td>
<td>600 feet</td>
</tr>
<tr>
<td></td>
<td>&gt; 5 kHz</td>
<td>100 feet</td>
<td>300 feet</td>
</tr>
</tbody>
</table>

Note: Contact the TIC Customer Support Center for application assistance when using lead lengths in excess of those listed or for filter selection assistance for a given application.

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

When operating in the Vector Control mode, the carrier frequency should be set to 2.2 kHz or above.
I/O and Control

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

The Terminal Board supports discrete and analog I/O functions and is shown in Figure 9 on pg 24. Table 2 lists the names, functions, and settings (default settings of programmable terminals) of the input and output terminals of the Terminal Board.

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

Typical Connection Diagram on pg. 26 shows the typical connection diagram for the ASD system.

<table>
<thead>
<tr>
<th>Terminal Name</th>
<th>Input/Output</th>
<th>Function (Default Setting If Programmable) (See Terminal Descriptions on pg. 22)</th>
<th>Circuit Config.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>Discrete Input</td>
<td><strong>Standby</strong> — Multifunctional programmable discrete input. Activation required for normal ASD operation.</td>
<td>Figure 10 on pg 25.</td>
</tr>
<tr>
<td>RES</td>
<td></td>
<td><strong>Reset</strong> — Multifunctional programmable discrete input. Resets a faulted ASD.</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td><strong>Forward</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td><strong>Reverse</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td><strong>Preset Speed 1</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td><strong>Preset Speed 2</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td></td>
<td><strong>Preset Speed 3</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td></td>
<td><strong>Preset Speed 4</strong> — Multifunctional programmable discrete input.</td>
<td></td>
</tr>
<tr>
<td>O1A/B (OUT1)</td>
<td>Switched Output</td>
<td><strong>External Device 1</strong> — Programmable contact (N.O.). <strong>External Device 2</strong> — Programmable contact (N.O.).</td>
<td>Figure 16 on pg 25.</td>
</tr>
<tr>
<td>O2A/B (OUT2)</td>
<td></td>
<td><strong>Fault relay (N.O.).</strong></td>
<td></td>
</tr>
<tr>
<td>FLA</td>
<td></td>
<td><strong>Fault relay (N.C.).</strong></td>
<td>Figure 19 on pg 25.</td>
</tr>
<tr>
<td>FLB</td>
<td></td>
<td><strong>Fault relay (common).</strong></td>
<td></td>
</tr>
<tr>
<td>FLC</td>
<td></td>
<td><strong>Frequency Mode 1</strong> — Multifunctional programmable analog input. (0.0 to 10 VDC input — 0 Hz to Maximum Frequency).</td>
<td>Figure 11 on pg 25.</td>
</tr>
<tr>
<td>RR</td>
<td>Analog Input</td>
<td><strong>Frequency Mode 2</strong> (default SW301 setting) — <strong>I</strong> — Multifunctional programmable isolated analog current input (0 to 10 VDC input).</td>
<td>Figure 13 on pg 25.</td>
</tr>
<tr>
<td>RX</td>
<td></td>
<td><strong>Unassigned — V</strong> — Multifunctional programmable isolated analog voltage input (0 to 10 VDC input).</td>
<td></td>
</tr>
<tr>
<td>V/I (Select V or I via SW301)</td>
<td>Analog Input</td>
<td><strong>Frequency Mode 2</strong> (default SW301 setting) — <strong>I</strong> — Multifunctional programmable isolated analog current input (0 to 10 VDC input).</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>Analog Output</td>
<td><strong>Output Current</strong> — Current output that is proportional to the output current of the ASD or to the magnitude of the function assigned to this terminal.</td>
<td>Figure 18 on pg 25.</td>
</tr>
<tr>
<td>FM</td>
<td></td>
<td><strong>Output Frequency</strong> — Current or Voltage output that is proportional to the output frequency of the ASD or to the magnitude of the function assigned to this terminal. Select Current or Voltage at F681.</td>
<td></td>
</tr>
<tr>
<td>SU+</td>
<td>DC Input</td>
<td>Externally-supplied 24 VDC backup control power (1.1 A min.).</td>
<td>Figure 14 on pg 25.</td>
</tr>
<tr>
<td>P24</td>
<td>DC Output</td>
<td>24 VDC output (200 mA max.).</td>
<td>Figure 15 on pg 25.</td>
</tr>
<tr>
<td>PP</td>
<td></td>
<td>10.0 VDC/10 mA voltage source for an external potentiometer.</td>
<td></td>
</tr>
<tr>
<td>FP</td>
<td>Pulsed Output</td>
<td><strong>Frequency Pulse</strong> — Multifunctional programmable output pulse train of a frequency based on the output frequency of the ASD.</td>
<td>Figure 17 on pg 25.</td>
</tr>
<tr>
<td>IICC</td>
<td></td>
<td>— Return for the V/I input terminal (see IICC on pg. 110).</td>
<td>DO NOT connect to Earth Gnd.</td>
</tr>
<tr>
<td>CCA</td>
<td></td>
<td>— Return for the RR, RX, P24, and the PP terminals.</td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td></td>
<td>— Return for the AM, FM, SU+, and the discrete input terminals.</td>
<td></td>
</tr>
</tbody>
</table>
Terminal Descriptions

**Note:** The programmable terminal assignments may be accessed and changed from the default settings as mapped on pg. 52 or via the Direct Access method: Program ⇒ Direct Access ⇒ Applicable Parameter Number. See the section titled Program Mode Menu Navigation on pg. 52 for the applicable Direct Access parameter numbers. For further information on terminal assignments and default setting changes, see the sections titled Terminal on pg. 54 and Default Setting Changes on pg. 40.

**Note:** See the section titled Cable/Terminal/Torque Specifications on pg. 281 for the ASD conductor and terminal electrical specifications.

**ST** — The default setting for this terminal is the Standby mode controller. As the default setting, this terminal must be activated for normal system operation. The ST terminal is activated by connecting CC to this terminal (Sink mode). When deactivated, OFF is flashed on the LED screen and the Not-Ready-to-Run icon is displayed on the LCD screen as shown in Figure 22 on pg 32. This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F113).

**RES** — The default setting for this terminal is Reset. The RES terminal is activated by connecting CC to this terminal (Sink mode). A momentary connection to CC resets the ASD and any fault indications from the display. Reset is effective when faulted only. This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F114).

**F** — The default setting for this terminal is the Forward run command. The F terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F111).

**R** — The default setting for this terminal is the Reverse run command. The R terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F112).

**S1** — The default setting for this terminal is the Preset Speed 1 (see Preset Speed 1 on pg. 88). The S1 terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F115).

**S2** — The default setting for this terminal is the Preset Speed 2 (see Preset Speed 2 on pg. 88). The S2 terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F116).

**S3** — The default setting for this terminal is the Preset Speed 3 (see Preset Speed 3 on pg. 89). The S3 terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (see F117).

**S4** — The default setting for this terminal is the Preset Speed 4 (see Preset Speed 4 on pg. 89). The S4 terminal is activated by connecting CC to this terminal (Sink mode). This input terminal may be programmed to any of the functions listed in Table 6 on pg. 249 (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 or torque of the motor via an amplitude setting or regulate by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F210 – F215).

**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 raise or lower the speed or torque of the motor via an amplitude setting or this terminal may be used to regulate the speed or torque of a motor by setting a limit. The gain and bias of this terminal may be adjusted for application-specific suitability (see F216 – F221).
V/I — The V/I terminal has the dual function of being able to receive an input voltage or current. The function as a voltage input is to receive a 0 – 10 VDC input signal. The function as a current input is to receive a 0 – 20 mA input signal. Using either input type, the function is to control the 0.0 – Maximum Frequency output or the 0.0 to 250% torque output of the ASD. This is an isolated input terminal. This terminal may be programmed to control the speed or torque of the motor and cannot process both input types simultaneously. SW301 must be set to V or I to receive a voltage or current, respectively (see Figure 9 on pg 24). Terminal scaling is accomplished via F201 – F206. The gain and bias of this terminal may be adjusted for application-specific suitability (see F470 and F471).

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

The P9 ASD is also equipped with an EOI-mounted battery for this function. The battery backup has the added feature of allowing for the transfer of the EOI to another ASD while retaining the control programming. See the section titled Battery Backup on pg. 28 for more information on the battery backup features.

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.

O1A/B (OUT1A/B) — The default function assigned to this terminal is External Device 1. The function as External Device 1 is to activate or deactivate an auxiliary motor once the VLP level has remained within the VLP Maximum Zone or the VLP Minimum Zone, respectively, for the time setting of F480. The OUT1 terminal is rated at 2 A/120 VAC and 2 A/30 VDC. This terminal may be set to any of the functions listed in Table 9 on pg. 255 (see F130).

O2A/B (OUT2A/B) — The default function assigned to this terminal is External Device 2. The function as External Device 2, in conjunction with External Device 1, is to activate or deactivate an auxiliary motor once the VLP level has remained within the VLP Maximum Zone or the VLP Minimum Zone, respectively, for the time setting of F480. The OUT2 terminal is rated at 2 A/120 VAC and 2 A/30 VDC. This terminal may be set to any of the functions listed in Table 9 on pg. 255 (see F131).

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 43.3 kHz). As the output frequency of the ASD goes up 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 7 on pg. 253. For further information on this terminal, see parameter F676 on pg. 209.

AM — This output terminal produces an output current that is proportional to the output frequency of the ASD or of the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in Table 7 on pg. 253. For further information on this terminal, see F670 on pg. 208.

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 7 on pg. 253. For further information on this terminal, see F005 on pg. 83. The Voltage/Current output selection is performed at F681.

FLA — One of two normally open contacts that, under user-defined conditions, connect to FLC.

FLB — One of two normally closed contacts that, under user-defined conditions, connect to FLC.
**FLC** — FLC is the common leg of a single-pole double-throw form C relay. The FL relay is the Fault Relay by default, but may be programmed to any of the selections of Table 9 on pg. 255. For further information on this terminal, see F132 and Figure 8 on pg 24.

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

Figure 8. FLA, FLB, and FLC Switching Contacts Shown in the Normal Operating Condition.

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

Figure 9. Terminal Board.

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

See the section titled Terminal Descriptions on pg. 22 for terminal descriptions.

See the section titled Cable/Terminal/Torque Specifications on pg. 281 for information on the proper cable/terminal sizes and torque specifications when making Terminal Board connections.
I/O Circuit Configurations

Figure 10. Discrete Input.

Figure 11. RR Input.

Figure 12. RX Input.

Figure 13. V/I Isolated Input.

Figure 14. P24 Output.

Figure 15. PP Output.

Figure 16. OUT1/OUT2 Output.

Figure 17. FP Output.

Figure 18. AM/FM Output.

Figure 19. Fault Relay (shown not faulted).
Typical Connection Diagram

Figure 20. The P9 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.

The AM, FM, and the +SU analog terminals are referenced to CC.

The RR, RX, P24, and the PP analog terminals are referenced to CCA.

The isolated V/I analog terminal references IICC.
**Startup and Test**

⚠️ **DANGER**

Before turning on the ASD ensure that:

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

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

**Table 3. ASD Parameter Changes by Installer/Maintenance Personnel.**

<table>
<thead>
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**Note:** Settings may also be recorded via Program ⇒ Utilities ⇒ Type Reset ⇒ Save User Settings.
Electronic Operator Interface

The P9 ASD Electronic Operator Interface (EOI) is comprised of an LED screen, an LCD screen, two LEDs, a rotary encoder, and five keys. These items are shown and described on pg. 30.

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 P9 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).

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 (Parameter settings may be saved by the user).

Note: User settings must be stored by the user to result in battery backup support. Otherwise, in the event of a power outage, the user settings will not be retained. Retained settings will be erased and/or overwritten during a Type Reset via selections 3 or 12.

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. 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 (as shown).

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

Note: The Battery backup system does not supply power to the LED/LCD display.

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 PCB. 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.

**Real-Time Clock Setting**

The Real-Time Clock of the P9 ASD provides a time stamp of the trip history, Time-Based Alternation control timing, and other real-time event control functions.

The Real-Time Clock must be set in order to use the real-time monitoring and control functions of the ASD (trip history dates, Time-Based Alternation, etc.).

Set the Real-Time Clock from Program\Utilities\Real-Time Clock Setup. Scroll to select the field to be changed. Press Enter to enter the Edit mode. Turn the rotary encoder to change the value. Once set, press Escape to exit without accepting the change, or press Enter to accept the change.

Continue to subsequent fields of the Real-Time Clock Setup screen and repeat the procedure until done.

**EOI Remote Mounting**

The EOI may be mounted remotely using the optional ASD-MTG-KIT-P9. Or if operating in a NEMA 4 environment, the ASD-EOI-N4-G9 is best suited for this application. Each kit contains all of the hardware required to mount the EOI of the HX7+ ASD remotely.

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

See the section titled EOI Remote Mounting on pg. 33 for more information on mounting the EOI remotely.
**EOI Features**

Figure 21. The P9 ASD Electronic Operator Interface Features.

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

Rotary Encoder — Used to access the P9 ASD menu selections, change the value of a displayed parameter, and performs the Enter key function. Turn the Rotary Encoder either clockwise or counterclockwise to perform the Up or Down functions of the displayed menu selection. Press the Rotary Encoder to perform the Enter (select) function. Press while turning for times-ten increment/decrement.

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.

Hand/Auto Key — Toggles the system to and from the Hand and Auto modes. The Hand/Auto key is disabled while the Fault screen is active. The Hand/Auto key 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 Board, Pulse Input, or the settings of F003/F004. The (F003/F004) selection may be made via Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode and Frequency Mode 1, respectively.

The availability of Hand mode control (Command and Frequency control) may be disabled via Program ⇒ Utilities ⇒ Prohibition ⇒ Hand/Auto Key Command Override and Hand/Auto Key Frequency Override. The availability of the Hand mode of operation may be reinstated by changing this setting or performing a Reset (See F007).

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 or red while running to alert personnel.

Mode Key — Provides a means to access the three root menus. Pressing the Mode key repeatedly loops the system through the three root menus (See Figure 28 on pg. 47). While looping through the root menus, the Program menu will display the root menu screen or the Program sub-menu item being accessed prior to pressing the Mode key.
Stop-Reset Key — This key has three functions.

1. Issues the Off command (decelerates to Stop at the programmed rate) if pressed once while in the Hand mode in accordance with the setting of F721.

2. Initiates an Emergency Off Fault if pressed twice quickly from the Hand or Auto modes. The Emergency Off function terminates the P9 ASD output and stops the motor in accordance with the setting of F603.

3. Resets active Faults and/or active Alarms if pressed twice quickly. The source of the Faults or Alarms must be determined and corrected before normal ASD operation can resume.

LED/LCD Screens

LED Display

The LED screen displays the output frequency, active alarms and/or active faults.

If there are no active alarms or faults, the output frequency is displayed.

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

During an active fault, the fault is displayed.

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

LED Character/Font Information

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

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

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LCD 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. 52) is within the cursor block. Press the **Rotary Encoder** to select the item from the **Primary Menu** (repeat the press-to-select for submenu items).

See the section titled **Default Setting Changes on pg. 40** for more information on changing parameter settings.

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

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

**Note:** Changes carried out from the **EOI Command** screen will be effective for EOI-controlled ASD operation only. See the section titled **EOI Command Mode on pg. 48** for further information on **EOI Command Mode** operations.

Primary Menus of the LCD Screen

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

---

**Figure 22. Frequency Command Screen.**

- **Speed Reference %**
- **Speed Reference Hz**
- **User-Selected Monitored Parameters (See Main Monitor Selections on pg. 51)**
- **Discrete I/O Terminal Status Or Alarm Condition**

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**Figure 23. Monitor Screen (See pg. 49 for more on the Monitor screen items).**

- **Screen Name**
- **Active Frequency Command**
- **Active DC Bus Voltage**

---

**Figure 24. Program Menu Screen (See pg. 52 for more on the Program Menu Screen).**

- **Screen Name**
- **Primary Menu Items**

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EOI Remote Mounting

The P9 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. Remote mounting will also allow for multiple EOI mountings at one location if controlling and monitoring several ASDs from a central location is required.

The door-mounted EOI of the 230-volt 30-HP and above ASDs, and the 460-volt 40 HP and above ASDs, use the remote mounting kit 58333 to allow for the door-mount EOI configuration.

The ease of installation and mounting distance away from the ASD may be increased with the use of the optional remote mounting kit ASD-MTG-KIT-P9.

The ASD-EOI-N4-G9 remote-mount kit is recommended for NEMA 4 applications. Contact your TIC Sales Representative for more information on the NEMA 4 remote mounting kit.

An EOI extender cable is required for remote mounting. The EOI extender cable is available in a 10-ft. length and may be ordered through your TIC Sales Representative. Remote mounting may be extended up to the distance supported by standard RS485 communication — typically 4000 feet (1200 meters) maximum.

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

Remote EOI Hardware

EOI Mounting Hardware

- EOI Remote-Mount Housing — P/N 58333 (included with the 230-volt 30-HP and above; and with the 460-volt 40 HP and above)
- 6-32 x 5/16” Pan Head Screw — P/N 50595 (4 ea.)
- #6 Split-Lock Washer — P/N 01884 (4 ea.)
- #6 Flat Washer — P/N 01885 (4 ea.)

Bezel Plate Mounting Hardware

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

Extender Cable

- ASD-CAB10F: Cable, 10 ft.
EOI Installation Precautions

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

- Select a mounting location that is easily accessible by the user.
- Avoid installation in areas where vibration, heat, humidity, dust, metal particles, or high levels of electrical noise (EMI) are present.
- DO NOT install the EOI 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.

EOI Remote Mounting w/o the ASD-MTG-KIT-P9

Note: See Figure 25 for the dimensions and the item locations referenced in steps 1 through 5.

1. At the EOI mounting location, mark the 4.00” by 3.63” hole and the four 3/16” screw holes.
2. Cut the 4.00” by 3.63” rectangular hole.
3. Drill the four 3/16” screw holes.
4. 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.
5. Connect the extension cable.

EOI Mounting Dimensions

Figure 25. EOI Mounting Dimensions.
EOI Remote Mounting Using the ASD-MTG-KIT-P9

**Note:** See Figure 26 for the dimensions and the item locations referenced in steps 1 through 6.

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 hole.
3. Drill the four 11/32” 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. Attach and secure the EOI to the front side of the Bezel Plate using the four 6-32 x 5/16” pan head screws, #6 split lock washers, and the #6 flat washers.
6. Connect the extension cable.

**EOI ASD-MTG-KIT-P9 Mounting Dimensions**

Figure 26. EOI Bezel Plate Mounting Dimensions.

![Diagram of EOI Bezel Plate Mounting Dimensions](image-url)
System Operation

Initial Setup

The Standard Startup Wizard is run from Program\Utilities\Standard Startup Wizard and is used to assist the user with the initial configuration of the input power settings and the output signal parameters of the ASD. The Standard Startup Wizard is comprised of the more commonly used parameters of the ASD. The parameters of the wizard may also be viewed or changed individually via the associated Direct Access Numbers or the Program Menu hierarchy.

Standard Startup Wizard Parameters

Startup parameter settings may be viewed or changed. Change the parameter setting and click Next. Or click Next without making any changes to go to the next startup parameter.

See the section titled Standard Startup Wizard Parameter Requirements on pg. 37 for further information on the Standard Startup Wizard parameters.

1. The Voltage and Frequency Rating of the Motor (F409/F014) (Must make a selection to continue, or select Exit).
2. The Upper-Limit Frequency (F012).
3. The Lower-Limit Frequency (F013).
4. The Automatic Acceleration/Deceleration (F000) Setting.
5. The Acceleration Time (F009).
6. The Deceleration Time (F010).
7. The Volts per Hertz Setting (F015).
8. The Motor Current Rating (F406).
10. The Command Source (F003).
11. The Frequency Reference Source (F004).
12. The Display Unit (F701).

Click Exit to close the Standard Startup Wizard when done.
Standard Startup Wizard Parameter Requirements

The Standard Startup Wizard queries the user for information on the I/O signal parameters, control, and the EOI display settings of the ASD. The ASD may also be setup by directly accessing each of the startup settings via the Program menu or the associated Direct Access Numbers (See the section titled Direct Access Parameter Information on pg. 81).

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

Motors are designed and manufactured to be operated within a specific voltage and frequency range. The voltage and frequency specifications for a given motor may be found on the name-plate of the motor. Highlight and click the voltage and frequency of the motor being used.

Upper-Limit Frequency (F012)

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

Lower-Limit Frequency (F013)

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 be output when operating in the PID Control mode, Torque Control mode, or the Vector Control modes (sensorless or feedback).

Automatic Acceleration/Deceleration (F000)

When Automatic ACC/DEC is chosen, the ASD adjusts the acceleration and deceleration rates according to the applied load. The minimum accel/decel time may be set using F508. The motor and the load must be connected prior to selecting Automatic Accel/Decel.

Select Manual to allow the settings of F009 and F010 to control the accel/decel, respectively. The acceleration and deceleration times range from 12.5% to 800% of the programmed values for the active acceleration time.

Select Automatic ACC Only to allow for the acceleration rate to be controlled automatically only.

Acceleration Time (F009)

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

Deceleration Time (F010)

This parameter specifies the time in seconds for the output of the ASD to go from the Maximum Frequency to 0.0 Hz for the 1 Deceleration profile. The Accel/Decel Pattern may be set using F502.
**Volts per Hertz Setting (F015)**

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

Settings:
- Constant Torque
- Voltage Decrease Curve
- Automatic Torque Boost
- Sensorless Vector Control (Speed)
- Sensorless Vector Control (Speed/Torque Switching)
- V/f 5-Point Curve (Go to F190 to Configure the V/f 5-Point Settings)
- PM Drive (Permanent Magnet)
- PG Feedback Vector Control (Speed)
- PG Feedback Vector Control (Speed/Torque Switching)

**Motor Current Rating (F406)**

This parameter allows the user to input the full load amperage (FLA) of the motor. This value is found on the name-plate of the motor and is used by the ASD to determine the **Thermal Overload Protection** setting for the motor.

**Motor RPM (F407)**

This parameter is used to input the (name-plated) rated speed of the motor.

**Command Source (F003)**

This selection allows the user to establish the source of the **Run** commands. Run commands are **Run**, **Stop**, **Jog**, etc.

Settings:
- Use Terminal Block
- Use EOI Keypad
- Use RS485
- Use Communication Option Board
Frequency Reference Source (F004)

This selection allows the user to establish the source of the Frequency command.

Settings:
- Use VI/II (V/I)
- Use RR
- Use RX
- EOI Keypad
- RS485
- Communication Option Board
- RX2 Option (A11)
- Option V/I
- UP/DOWN Frequency
- Pulse Input (Option)
- Pulse Input (Motor CPU)
- Binary/BCD Input (Option)

Display Unit (F701)

This parameter sets the unit of measurement for current and voltage values displayed on the EOI.

Exit >>

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

Operation (Hand)

Note: See the section titled EOI Features on pg. 30 for information on Auto operation.

To turn the motor on, perform the following:

1. Connect the CC terminal to the ST terminal.
2. Press the Mode key until the Frequency Command screen is displayed.
3. Press the Hand/Auto key to enter the Hand mode (green Hand LED illuminates).
4. Turn the Rotary Encoder clockwise until the desired Frequency Command value is displayed in the SET field of the LCD screen.
5. 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.

6. Press the Stop-Reset key to stop the motor.
Default Setting Changes

To change a default parameter setting, go to the root level of the Program menu. Turn the Rotary Encoder until the desired parameter group is within the cursor block. Press the Rotary Encoder to select an item or to access a subgroup (repeat if required until reaching the parameter to be changed).

Press the Rotary Encoder to enter the Edit mode and the value/setting takes on the reverse video format (dark background/light text). Turn the Rotary Encoder to change the parameter value/setting.

Press ESC key while the new parameter setting is still in the reverse video mode to exit the menu without saving the change or press the Rotary Encoder while the parameter setting is in the reverse video mode to accept the new setting.

For a complete listing of the Program mode menu selections, see the section titled Program Mode Menu Navigation on pg. 52. Program 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 Numbers and a description of the associated parameter may be found in the section titled Direct Access Parameter Information on pg. 81.

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

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

Once stopped at 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.

Press the Rotary Encoder while stopped at a changed parameter to display the settings of the changed parameter. Press the Rotary Encoder to enter the Edit mode — the parameter value/setting takes on the reverse video format (dark background/light text). Turn the Rotary Encoder to change the parameter setting.

Press the ESC key while the setting is in the reverse video format to exit the Edit mode without saving the change and to resume the Changed From Default search. Or press the Rotary Encoder while the setting is in the reverse video format to save the change. Press ESC to return to the Changed From Default search.

Pressing ESC while the system is performing a Changed From Default search terminates the search. Pressing ESC when finished searching (or halted at a changed parameter) takes the menu back one level.

Note: Communications setting changes will require that the power be removed and then reapplied for the changes to take affect.

Note: Parameter F201 was changed to create the example shown in Figure 27.

Figure 27. Changed From Default Screen.
Saving User Settings

A profile of an existing setup (user-settable parameters) may be saved and re-loaded when required by using the **Save User Settings**/**Restore User Settings** feature or via the **Save/Restore Wizard**.

Both Save functions are accessed via the **Utilities** menu.

**Save/Restore User Settings**

The **Save User Settings** feature is selection seven (7) of the Program\Utilities\Type Reset menu. This function saves the user parameter settings to the EEPROM of the ASD. Because this feature is not available while the ASD is running, the ASD must be stopped to save or restore data using either of these selections.

The **8:Restore User Settings** selection of the Program\Utilities\Type Reset menu restores the saved user parameters for system operation.

**Save/Restore Wizard**

The **Save/Restore Wizard** feature is accessed via Program\Utilities\Save/Restore Wizard. This function saves the user parameter settings to the SRAM of the EOI and is menu-driven. From the **Save/Restore Wizard** dialog box, select either **Save User Settings to EOI** or **Restore User Settings from EOI**. The restore feature is not available or displayed for selection until a profile is saved.

Because the **Save/Restore Wizard** saves to the EOI, the saved data may be loaded into other systems as required by installing the loaded EOI and executing the **Restore User Settings from EOI**.

From the Program\Utilities\Type Reset menu, selections **3:Reset to Factory Settings** and **12:Set EOI Memory to Default** will clear the EOI memory of any user-stored information.

**Note:** See the section titled **Battery Backup on pg. 28** for more information on the EOI storage function.
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 P9 ASD. The source of the frequency control signal must be established for normal operation.

The source of the command control and frequency 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 under user-defined conditions.

**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, the signal sources are assigned priority levels. The primary control method for **Command** and **Frequency** control uses the settings of F003 and F004, respectively.

### Command Control (F003)

The **Command Mode** selection of F003 establishes the primary source of the command input for the ASD. However, the **Override** feature may supersede the F003 setting as indicated in Table 4 on pg. 44.

Table 4 shows the hierarchy of the control sources managed by the **Override** function. The level of the control item of the hierarchy is listed from left to right, most to least, respectively. As indicated in the table, the **Override** setting may supersede the F003 setting.

Placing the EOI in the **Hand** mode selects the **RS485** (2-wire) as the **Command Mode** control source. **Hand** mode operation may be superseded by other **Override** settings.

**Example:** With the EOI set to **Hand, Communication Board** input or **RS485** (4-wire) input will supersede EOI control input.

The remaining control sources may be placed into the **Override Mode** using communications.

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

- The F003 setting,
- Placing an item from the **Command** signal source selections in the **Override Mode** via communications, or
- Placing the EOI in the **Hand** mode (places only the RS485 [2-wire] or the RS485 [4-wire] in the **Override Mode**).

Possible **Command** signal source selections include the following:

- Terminal Block (default),
- EOI Keypad,
- RS485,
- Communication Option Board, or
- F003 setting (is used if no signal sources are in the Override Mode).

**Note:** The **Terminal Board** is placed in the **Override Mode** for **Command** functions by activating a discrete terminal that is assigned to **Command Terminal Board Priority**.
Frequency Control (F004)

The Frequency Mode 1 (or the Frequency Mode 2) setting establishes the user-selected source of the frequency-control input for the P9 ASD. The signal source selected here is used for speed control unless the Reference Priority Selection parameter is configured to switch this setting automatically (See F200) or if the Override feature is enabled.

Table 4 on pg. 44 shows the hierarchy of the control sources managed by the Override function. The level of the control item of the hierarchy is listed from left to right, most to least, respectively. As indicated in the table, the Override setting may supersede the selection at F004.

Placing the EOI in the Hand mode selects the RS485 (2-wire) as the Frequency Mode 1 control source. Hand mode operation may be superseded by other Override settings.

Example: With the EOI set to Hand, the Communication Board input or the RS485 (4-wire) input will supersede EOI control input.

The remaining control sources may be placed into the Override Mode using communications.

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

- The F004 setting,
- Placing an item from the Frequency control source selections in the Override Mode via communications, or
- Placing the EOI in the Hand mode (places only the RS485 [2-wire] in the Override Mode).

Possible Frequency control source selections include the following:

- Communication Board,
- RS485,
- EOI Keypad,
- Terminal Block (the default setting), or
- F004 setting (used if no other items are in the Override mode).

Note: The Terminal Board is placed in the Override Mode for Speed control functions by activating a discrete terminal that is assigned to V/I Terminal Priority. Once the discrete terminal is activated, V/I is used as the Terminal Board Override speed-control input.

Command and Frequency Control Selections

The user may select only one Command source and only one source for Frequency control. The default settings for Command and Frequency control are Terminal Block and RR, respectively.

The P9 ASD has a command register that holds each of the items listed in Table 4 on pg. 44 as a Command or Frequency source. The listed items are continuously scanned to determine if any of the listed items are providing a Command or Frequency command.

The first active item of the Command section and the first active item of the Frequency section (both are read from left to right) detected as having an active signal will be used for Command and Frequency control, respectively. If no items are detected as having an active signal, the settings of F003 and F004 will be used for Command and Frequency control, respectively.
Placing the P9 ASD in the **Hand** mode (Hand/Auto LED on) via the EOI places the **RS485 (2-wire)** control selection in the **Override Mode** for **Command** and **Frequency** input (See the section titled **Override Operation** for the proper setting). The **Hand/Auto** control **Override** feature for **Command** and **Frequency** (or either) may be enabled/disabled at Program ⇒ Utilities ⇒ Prohibition ⇒ **Hand/Auto Key** (Command or Frequency) **Override**.

**Communications** may be used to place the remaining **Command** and eligible **Frequency** control input sources in the **Override Mode**. Once placed in the **Override Mode**, this setting is valid until it is cancelled, the power supply is turned off, or the P9 ASD is reset.

**Override Operation**

The signal sources of **Table 4** are scanned from left to right in the order that they are listed to determine which input sources are in the **Override Mode** (active Command or Frequency command signal present). The first item detected as having the **Override** function turned on is the selection that is used for **Command** or **Frequency** control input.

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 register scan returns the condition that none of the listed items have the **Override** feature turned on or a discrete input terminal is set to **Hand Priority** and is activated.

**Command and Frequency-Control Override Hierarchy**

**Table 4** lists the input conditions and the resulting output control source selections for **Command** and **Frequency** control **Override** operation.

The P9 ASD software reads the listed control sources from the left to the right as listed in **Table 4**.

The first item to be read that has the **Override** feature turned on will be used for **Command** or **Frequency** control.

**Table 4. Command and Frequency Control Hierarchy.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>≤ Priority Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced F003/ F004 by I/P Terminal (Assign to Hand Priority)</td>
<td>Comm. Board</td>
<td>RS485 (4-Wire)</td>
<td>RS485 (2-Wire)</td>
<td>Terminal Board (Binary/BCD Input)</td>
<td>F003/F004</td>
<td>Command/ Frequency Mode</td>
</tr>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>F003/F004 Setting</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Communication Board</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>RS485 (4-Wire)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>RS485 (2-Wire)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>X</td>
<td>Terminal Board</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>F003/F004 Setting</td>
</tr>
</tbody>
</table>

**Note:** 1 = **Override** feature is turned on for that control input source; 0 = **Override** Off; X = Don’t Care.
Command Control Selections

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

Settings:

0 — Terminal Block
   Allows for Command control input via the Terminal Board.

2 — EOI Keypad
   Used for EOI command control.

3 — RS485
   Used to transfer commands to the ASD via 4-wire RS485.

4 — Communication Option Board
   Use this setting if using the optional Communication Board for command control.

Frequency Control Selections

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

Settings:

1 — V/I
   Used when a 0 to 10 VDC analog input or a 0 – 20 mA DC current input is used as the speed control input. Only one input signal type may be used at a time. Set SW301 to the desired input signal type.

2 — RR
   Used for a 0 to 10 VDC analog input signal.

3 — RX
   Used for a -10 to +10 VDC analog input signal.

5 — EOI Keypad
   Used for EOI frequency control.

6 — RS485
   Used to transfer speed commands to the ASD via 4-wire RS485.
7 — **Communication Option Board**
   Use this setting if using the optional Communication Board for frequency control.

8 — **RX2 Option** (AI1)
   Used for a -10 to +10-volt DC analog input signal.

9 — **Option V/I**
   Allows for the use of the optional voltage/current frequency-control interface.

10 — **UP/DOWN Frequency**
   A discrete terminal may be configured to increase or decrease the speed of the motor by momentarily connecting the assigned discrete input terminal to CC. See F264 on pg. 133 for further information on this feature.

11 — **Pulse Input Option**
   Used to allow the system to use a pulsed input for frequency control. See PG Input Point 1 Setting on pg. 127 for further information on this feature.

12 — **Pulse Input** (motor CPU)
   Used to allow the system to use a pulsed input for frequency control. See PG Input Point 1 Setting on pg. 127 for further information on this feature.

13 — **Binary/BCD Input Option**
   Allows for discrete terminal to be used for frequency-control input.
System Configuration and Menu Options

Root Menus

The Mode key accesses the three primary modes of the P9 ASD: the Frequency Command mode, the Monitor mode, and the Program mode. From either mode, press the Mode key to loop through to the other two modes (See Figure 28). While in the Frequency Command mode, pressing the ESC key toggles the menu to and from the EOI Command mode and the Frequency Command mode.

The Alarm or Fault information will be displayed in the event of an active Alarm or Fault. Alarm text will be displayed on the Frequency Command screen and on the LED screen when active. Fault information will be displayed via the Fault screen. See Alarms and Trips on pg. 260 for more information on Alarms and Trips.

Figure 28. P9 ASD Root Menu Navigation.

Frequency Command Mode

Frequency Setting

While operating in the Hand mode (Hand LED is illuminated on the EOI), the running frequency of the motor may be set from the Frequency Command screen. Using the Rotary Encoder, enter the Frequency Command value, connect ST to CC, and provide a Run command (F and/or R) and then press the Run key. The motor will run at the Frequency Command speed and may be changed while running. See Figure 22 on pg. 32 and Operation (Hand) on pg. 39 for more information on the Frequency Command mode.
EOI Command Mode

The **EOI Command** mode is accessed by pressing the **ESC** key from the **Frequency Command** screen. With the exception of the **VLP Control Enable/Disable**, the control settings of the **EOI Command** menu are effective for **EOI** control only.

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

- **Direction** — **Forward** or **Reverse**.
- **Stop Pattern** — The **Decel Stop** or **Coast Stop** setting determines the method used to stop the motor when using the **Stop-Reset** key of the **EOI**. The **Decel Stop** setting enables the **Dynamic Braking** system setup at F304 or 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 4 **V/f** profiles may be selected and run. Each **V/f** profile is comprised of 4 user settings: **Base Frequency**, **Base Frequency Voltage**, **Manual Torque Boost**, and **Electronic Thermal Protection**. Expanded descriptions of these parameters may be found in the section titled **Direct Access Parameter Information on pg. 81**.

- **Accel/Decel Group** — One of 4 **Accel/Decel** profiles may be selected and run. Each of the **Accel/Decel** profiles is comprised of three user settings: **Acceleration**, **Deceleration**, and **Pattern**. Expanded descriptions of these parameters may be found in the section titled **Direct Access Parameter Information on pg. 81** (See F009).

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

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

- **VLP Control** — This setting enables or disables the **VLP** function.
Monitor Mode

The Monitor mode allows the user to monitor motor performance variables, control settings, and configuration data during motor operation. There are 43 items that may be monitored from this mode. The items 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. 40.

**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.

**Frequency at Trip** — Displays the at-trip frequency.

**Frequency Reference** — Displays the Frequency Setpoint.

**Output Current** — Displays the Output Current as a percentage of the rated capacity of the P9 ASD.

**DC Bus Voltage** — Displays the Bus Voltage as a percentage of the rated capacity of the P9 ASD.

**Output Voltage** — Displays the Output Voltage as a percentage of the rated capacity of the P9 ASD.

**AM Output** — Displays the AM output terminal value for the function assigned to the AM terminal.

**FM Output** — Displays the FM output terminal value for the function assigned to the FM terminal.

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

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

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

**ASD OL (Overload) Real** — Displays the real-time ASD Overload as a percentage of the rated capacity of the P9 ASD.

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

**ASD Load** — Displays the ASD Load as a percentage of the rated capacity of the P9 ASD.

**Run Time** — Displays the Cumulative Run Time in hours.

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

**DBR OL (Overload) Real** — Displays the real-time DBR Overload value as a percentage of the Dynamic Braking Resistor capacity.

**DBR OL (Overload) Trip** — Displays the DBR Overload Trip value as a percentage of the Dynamic Braking Resistor capacity.

**DBR Load** — Displays the DBR Load as a percentage of the Dynamic Braking Resistor capacity.
Feedback (Instr) — 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 P9 ASD.

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

Torque Current — Displays the torque-producing current value.

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

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

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

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

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

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

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

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

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

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

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

The V input setting of SW301 is used for the 0 – 10 VDC analog input signal and the I input setting of SW301 is used for the 0 – 20 mA analog input signal. Either may be used as a frequency or torque command source. See parameter 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 Option (AI1) — 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.

Trip Code — Displays None if there are no errors, or displays one of the associated Fault Codes listed in the P9 ASD Installation and Operation Manual if there is an active Fault (e.g., E = Emergency Off).

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

Past Trip 2 — Past trip information or None.
Past Trip 3 — Past trip information or None.

Past Trip 4 — Past trip information or None.

**Note:** An improper P9 ASD setup may cause some trips — reset the P9 ASD to the Factory Default settings before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Reset ⇒ Reset to Factory Settings).

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

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

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

**Output Frequency** — Displays the running frequency.

**Main Monitor Selections**

Two (2) Monitor Mode items may be selected from the Main Monitor Selections screen to be displayed on the Frequency Command screen while the P9 ASD is running.

**Note:** VLP Technology Average and Work Hours may also be selected as Main Monitor items, but are not displayed at the Monitor screen.

The selected items, along with their real-time values, are displayed on the Frequency Command screen while running. Not all Monitor Mode items are available for display on the Frequency Command screen. The available items are underlined on pg. 49 and pg. 50.

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 22 on pg. 32 (DC Voltage and Output Current shown).
Program Mode Menu Navigation

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

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

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIRTUAL LINEAR PUMP</td>
<td>VLP Setup Wizard</td>
<td>VLP Motor/ASD Setup</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VLP Transducer Setup</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VLP Setup</td>
<td></td>
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<td>VLP Settings</td>
<td>VLP Mode Switch</td>
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<td>VLP Application Type</td>
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<td>VLP Application Operating Mode</td>
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<tr>
<td></td>
<td></td>
<td>Transducer Units</td>
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<td>VLP Transducer Output Range</td>
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<td>VLP Transducer Maximum Reading</td>
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<td></td>
<td>VLP Transducer Minimum Reading</td>
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<td>VLP Low Frequency Limit</td>
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<td>VLP Start and Stop Points</td>
<td>VLP Start and Stop Mode</td>
<td>F385</td>
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<td>VLP Start and Stop Delay Timer</td>
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<td>VLP Low Start and Stop Point</td>
<td>F388</td>
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<td>VLP High Start and Stop Point</td>
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<td>Input Terminal 5 (S1) Function</td>
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<td>VLP Sleep Timer</td>
<td>VLP Sleep Timer</td>
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<td>VLP Sleep Timer Delay</td>
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<td>VLP Run External Devices</td>
<td>VLP External Delay Timer</td>
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<td>VLP External Device Low Band</td>
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<td><strong>VIRTUAL LINEAR PUMP</strong></td>
<td>VLP Run External Devices</td>
<td>Output Terminal 1 (OUT1) Function</td>
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<td>Output Terminal 2 (OUT2) Function</td>
<td>F131</td>
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<td>VLP Low Suction/No-Flow Cut Off</td>
<td>VLP Low Suction/No-Flow Cut Off Mode</td>
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<td>VLP Low Suction/No-Flow Cut Off Delay Timer</td>
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<td>Input Terminal 5 (S1) Function</td>
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<td>Low Suction/No-Flow Cut Off Fault Disposition</td>
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<td>Output Terminal 1 (OUT1) Function</td>
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<td>VLP Time-Based Alternation</td>
<td>Time-Based Alternation</td>
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<td>Time-Based Alternation Period</td>
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<td>Total Number of ASDs on TBA</td>
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<td>Time-Based Alternation Pump Number</td>
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<td>Time-Based Alternation Process Hold Mode Response Time</td>
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<td>TBA Direct Mode Emergency Setpoint</td>
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<td>Time-Based Alternation Emergency Timer</td>
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<td>Accel/Decel 1 Settings</td>
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<td>Acceleration/Deceleration Suspended Function</td>
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<td></td>
<td></td>
<td>Deceleration Suspend Frequency</td>
<td>F352</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deceleration Suspend Time</td>
<td>F353</td>
</tr>
<tr>
<td></td>
<td>Frequency Settings</td>
<td>Maximum Frequency</td>
<td>F011</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper-Limit Frequency</td>
<td>F012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower-Limit Frequency</td>
<td>F013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V/f Pattern</td>
<td>F015</td>
</tr>
</tbody>
</table>
## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FUNDAMENTAL</strong></td>
<td>Frequency Settings</td>
<td>Time Limit for Lower-Limit Frequency Operation</td>
<td>F256</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatic Torque Boost</td>
<td>F001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Base Frequency 1</td>
<td>F014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manual Torque Boost 1</td>
<td>F016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Overload Protection Level 1</td>
<td>F600</td>
</tr>
<tr>
<td></td>
<td>Motor Set 1</td>
<td>Command Mode</td>
<td>F003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Mode 1</td>
<td>F004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forward/Reverse Run</td>
<td>F008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Priority</td>
<td>F200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Mode 2</td>
<td>F207</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Mode Priority Switching Frequency</td>
<td>F208</td>
</tr>
<tr>
<td></td>
<td>Standard Mode Selection</td>
<td>Standard Mode Selection</td>
<td></td>
</tr>
<tr>
<td><strong>TERMINAL</strong></td>
<td>FM Output Terminal Function</td>
<td>F005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FM Output Terminal Adjustment</td>
<td>F006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FM Output Gradient Characteristic</td>
<td>F682</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FM Bias Adjustment</td>
<td>F683</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FM Voltage/Current Output Switching</td>
<td>F681</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM Output Terminal Function</td>
<td>F670</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM Output Terminal Adjustment</td>
<td>F671</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM Output Gradient Characteristic</td>
<td>F685</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM Bias Adjustment</td>
<td>F686</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 1 Terminal Meter Selection</td>
<td>F672</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 1 Terminal Meter Adjustment</td>
<td>F673</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 1 Output Gradient Characteristic</td>
<td>F689</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 1 Bias Adjustment</td>
<td>F690</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 1 Voltage/Current Output Switching</td>
<td>F688</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 2 Terminal Meter Selection</td>
<td>F674</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 2 Terminal Meter Adjustment</td>
<td>F675</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 2 Output Gradient Characteristic</td>
<td>F692</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 2 Bias Adjustment</td>
<td>F693</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MON 2 Voltage/Current Output Switching</td>
<td>F691</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog Output Terminals</td>
<td>Analog Output Terminals</td>
<td></td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>TERMINAL</td>
<td>Analog Output</td>
<td>FP Terminal Assignment</td>
<td>F676</td>
</tr>
<tr>
<td></td>
<td>Terminals</td>
<td>FP Terminal Frequency</td>
<td>F677</td>
</tr>
<tr>
<td></td>
<td>Input Special</td>
<td>Forward/Reverse Run Priority When Both Are Activated</td>
<td>F105</td>
</tr>
<tr>
<td></td>
<td>Functions</td>
<td>Input Terminal Priority</td>
<td>F106</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16-Bit Binary/BCD Input</td>
<td>F107</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V/I Analog Input Broken Wire Detection Level</td>
<td>F633</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V/I Analog Input Loss Response</td>
<td>F644</td>
</tr>
<tr>
<td></td>
<td>Input Terminal</td>
<td>Input Terminal 1 (F) Response Time</td>
<td>F140</td>
</tr>
<tr>
<td></td>
<td>Delays</td>
<td>Input Terminal 2 (R) Response Time</td>
<td>F141</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 3 (ST) Response Time</td>
<td>F142</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 4 (RES) Response Time</td>
<td>F143</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 5–12 Response Time</td>
<td>F144</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 13–20 Response Time</td>
<td>F145</td>
</tr>
<tr>
<td></td>
<td>Input Terminal</td>
<td>Always ON Terminal Function</td>
<td>F110</td>
</tr>
<tr>
<td></td>
<td>Terminals</td>
<td>Input Terminal 1 (F) Function</td>
<td>F111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 2 (R) Function</td>
<td>F112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 3 (ST) Function</td>
<td>F113</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 4 (RES) Function</td>
<td>F114</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 5 (S1) Function</td>
<td>F115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 6 (S2) Function</td>
<td>F116</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 7 (S3) Function</td>
<td>F117</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 8 (S4) Function</td>
<td>F118</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 9 (LI1) Function</td>
<td>F119</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 10 (LI2) Function</td>
<td>F120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 11 (LI3) Function</td>
<td>F121</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 12 (LI4) Function</td>
<td>F122</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 13 (LI5) Function</td>
<td>F123</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 14 (LI6) Function</td>
<td>F124</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 15 (LI7) Function</td>
<td>F125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 16 (LI8) Function</td>
<td>F126</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------</td>
<td>----------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>TERMINAL</strong></td>
<td><strong>Input Terminals</strong></td>
<td>Input Terminal 17 (B12) Function</td>
<td>F164</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 18 (B13) Function</td>
<td>F165</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 19 (B14) Function</td>
<td>F166</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Terminal 20 (B15) Function</td>
<td>F167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual Input Terminal Selection 1</td>
<td>F973</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual Input Terminal Selection 2</td>
<td>F974</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual Input Terminal Selection 3</td>
<td>F975</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual Input Terminal Selection 4</td>
<td>F976</td>
</tr>
<tr>
<td></td>
<td><strong>Line Power Switching</strong></td>
<td>Commercial Power/ASD Switching Output</td>
<td>F354</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial Power/ASD Switching Frequency</td>
<td>F355</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Side Switching Delay</td>
<td>F356</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial Power-Side Switching Delay</td>
<td>F357</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial Power Switching Frequency Hold Time</td>
<td>F358</td>
</tr>
<tr>
<td></td>
<td><strong>Output Terminals</strong></td>
<td>Output Terminal 1 (OUT1) Function</td>
<td>F130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 2 (OUT2) Function</td>
<td>F131</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 3 (FL) Function</td>
<td>F132</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 4 (OUT3) Function</td>
<td>F133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 5 (OUT4) Function</td>
<td>F134</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 6 (R1) Function</td>
<td>F135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 7 (OUT5) Function</td>
<td>F136</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 8 (OUT6) Function</td>
<td>F137</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 9 (R2) Function</td>
<td>F138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 10 (R3) Function</td>
<td>F168</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Terminal 11 (R4) Function</td>
<td>F169</td>
</tr>
<tr>
<td></td>
<td><strong>Reach Settings</strong></td>
<td>Low-Speed Signal Output Frequency</td>
<td>F100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Reach Frequency</td>
<td>F101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Reach Detection Band</td>
<td>F102</td>
</tr>
<tr>
<td><strong>DIRECT ACCESS</strong></td>
<td></td>
<td>Parameter Number Input Field</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unknown Numbers Accepted</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>UTILITIES</strong></td>
<td><strong>Version</strong></td>
<td>EOI / ASD Type / CPU Level / EEPROM / MC Level</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTILITIES</td>
<td>Standard Startup Wizard</td>
<td>See the section titled Initial Setup on pg. 36 for Startup Wizard Requirements.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Prohibition</td>
<td>Hand/Auto Key Command Override</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand/Auto Key Frequency Override</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Show Uninitialized Parameters at Changed From Default Screen</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Alarm Prohibition (prohibits an EOI alarm display ONLY — alarm still activates)</td>
<td>Over-Current Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Overload Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Overload Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Heat Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Voltage Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Main Power Under-Voltage Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reserved (POFF) Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Under-Current Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Approaching) Over-Torque Alarm Threshold</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dynamic Braking Resistor (DBR) Overload Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cumulative Run Timer Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DeviceNet/Profibus/CC-Link Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RS485 Communication</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Main Power Under-Voltage Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop After Instantaneous Power-Off Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop After Lower-Limit Continuous Time</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light-Load Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heavy-Load Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintenance Timer Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Torque Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft Stall Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VLP Low Suction/No-Flow Cut Off Alarm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time-Based Alternation Alarm Float Active</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Type Reset</td>
<td>Reset Selections</td>
<td>F007</td>
</tr>
<tr>
<td></td>
<td>Real-Time Clock Setup</td>
<td>Set Real-Time Clock (See page 29 for more info.)</td>
<td>N/A</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>UTILITIES</td>
<td>Trip History (read-only)</td>
<td>Trip Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trip Type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency at Trip</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Current</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Voltage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC Voltage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discrete Input Terminals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discrete Output Terminals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run Timer</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post Compensation Frequency</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Feedback (Real Time)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Feedback (1 Second)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Feedback</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Current</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excitation Current</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PID Feedback</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Overload Ratio</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Overload Ratio</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dynamic Braking Resistor (DBR) Overload Ratio</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Load</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dynamic Braking Resistor (DBR) Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Power</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Changed From Default</td>
<td>Display Changed Parameters</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Display Parameters</td>
<td>Automatic Function Selection</td>
<td>F040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current/Voltage Display Units</td>
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<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
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<td>Display Parameters</td>
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<td>Free Unit</td>
<td>F703</td>
</tr>
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<td>Free Unit Display Gradient Characteristic</td>
<td>F705</td>
</tr>
<tr>
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<td></td>
<td>Free Unit Display Bias</td>
<td>F706</td>
</tr>
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<td></td>
<td></td>
<td>Change Step Selection 1</td>
<td>F707</td>
</tr>
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<td>Change Step Selection 2</td>
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</tr>
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<td>Main Monitor Selections</td>
<td>Monitor 1</td>
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<td>Trace Selection</td>
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<td>Trace Cycle</td>
<td>F741</td>
</tr>
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<td>Trace Data 1</td>
<td>F742</td>
</tr>
<tr>
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<td></td>
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<td>F743</td>
</tr>
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<td></td>
<td>Trace Data 3</td>
<td>F744</td>
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<td>Save/Restore Wizard</td>
<td>Save/Restore ASD Settings (See page 41 for more info.)</td>
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<td><strong>PROTECTION</strong></td>
<td>Abnormal Speed Settings</td>
<td>Abnormal Speed Detection Time</td>
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</tr>
<tr>
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<td>Over-Speed Detection Frequency Upper Band</td>
<td>F623</td>
</tr>
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<td>F624</td>
</tr>
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<td>Base Frequency Voltage</td>
<td>Supply Voltage Correction</td>
<td>F307</td>
</tr>
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<td>DC Injection Braking</td>
<td>DC Injection Braking Start Frequency</td>
<td>F250</td>
</tr>
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<td>DC Injection Braking Current</td>
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</tr>
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<td></td>
<td></td>
<td>DC Injection Braking Time</td>
<td>F252</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forward/Reverse DC Injection Braking Priority</td>
<td>F253</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Shaft Stationary Control</td>
<td>F254</td>
</tr>
<tr>
<td></td>
<td>Dynamic Braking</td>
<td>Dynamic Braking Selection</td>
<td>F304</td>
</tr>
<tr>
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<td></td>
<td>Dynamic Braking Resistance</td>
<td>F308</td>
</tr>
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<td></td>
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<td>Continuous Dynamic Braking Capacity</td>
<td>F309</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Braking Resistance Overload Time (10x Rated Torque)</td>
<td>F639</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
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<td><strong>PROTECTION</strong></td>
<td>Emergency Off Settings</td>
<td>Emergency Off</td>
<td>F603</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency DC Injection Braking Control Time</td>
<td>F604</td>
</tr>
<tr>
<td></td>
<td>Low-Current Settings</td>
<td>Low-Current Trip</td>
<td>F610</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low-Current Detection Current</td>
<td>F611</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low-Current Detection Time</td>
<td>F612</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low-Current Detection Hysteresis Width</td>
<td>F609</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Motor Overload Protection Configuration</td>
<td>F017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overload Reduction Start Frequency</td>
<td>F606</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor 150% Overload Time Limit</td>
<td>F607</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Overload</td>
<td>F631</td>
</tr>
<tr>
<td></td>
<td>Over-Torque Parameters</td>
<td>Over-Torque Trip</td>
<td>F615</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Torque Detection Level During Power Running</td>
<td>F616</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Torque Detection Level During Regenerative Braking</td>
<td>F617</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Torque Detection Time</td>
<td>F618</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Torque Detection Hysteresis</td>
<td>F619</td>
</tr>
<tr>
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<td>Phase Loss</td>
<td>ASD Output Phase Loss Detection</td>
<td>F605</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASD Input Phase Loss Detection</td>
<td>F608</td>
</tr>
<tr>
<td></td>
<td>Retry/Restart</td>
<td>Auto Restart Selection</td>
<td>F301</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of Times to Retry</td>
<td>F303</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ridethrough Time</td>
<td>F310</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random Mode</td>
<td>F312</td>
</tr>
<tr>
<td></td>
<td>Stall</td>
<td>Over-Voltage Limit Operation</td>
<td>F305</td>
</tr>
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<td>Stall Prevention Factor 1</td>
<td>F416</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Running Stall Continuous Trip Detection Time</td>
<td>F452</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stall Prevention During Regeneration</td>
<td>F453</td>
</tr>
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<td></td>
<td></td>
<td>Stall Prevention Level</td>
<td>F601</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over-Voltage Limit Operation Level</td>
<td>F626</td>
</tr>
<tr>
<td></td>
<td>Trip Settings</td>
<td>Retain Trip Record at Power Down</td>
<td>F602</td>
</tr>
<tr>
<td></td>
<td>Under-Voltage/ Ridethrough</td>
<td>Regenerative Power Ridethrough Mode</td>
<td>F302</td>
</tr>
</tbody>
</table>
## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROTECTION</strong></td>
<td>Under-Voltage/Ridethrough</td>
<td>Synchronized Deceleration Time</td>
<td>F317</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Synchronized Acceleration Time</td>
<td>F318</td>
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<tr>
<td></td>
<td></td>
<td>Under-Voltage Trip</td>
<td>F627</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Under-Voltage (Trip Alarm) Detection Time</td>
<td>F628</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regenerative Power Ridethrough Control Level</td>
<td>F629</td>
</tr>
<tr>
<td></td>
<td>Special Protection Parameters</td>
<td>Short Circuit Detection at Start</td>
<td>F613</td>
</tr>
<tr>
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<td></td>
<td>Cooling Fan Control</td>
<td>F620</td>
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<td></td>
<td>Cumulative Operation Time Alarm Setting</td>
<td>F621</td>
</tr>
<tr>
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<td></td>
<td>Brake Answer Delay Time</td>
<td>F630</td>
</tr>
<tr>
<td><strong>FREQUENCY</strong></td>
<td>Analog Filter</td>
<td>Analog Input Filter</td>
<td>F209</td>
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<tr>
<td></td>
<td>Forward/Reverse Disable</td>
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<td>F311</td>
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<td>Jog Settings</td>
<td>Jog Frequency</td>
<td>F260</td>
</tr>
<tr>
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<td></td>
<td>Jog Stop Pattern</td>
<td>F261</td>
</tr>
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<td></td>
<td></td>
<td>EOI Operation Jog Mode</td>
<td>F262</td>
</tr>
<tr>
<td></td>
<td>UP/DOWN Frequency Functions</td>
<td>UP/DOWN Up Response Time</td>
<td>F264</td>
</tr>
<tr>
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<td></td>
<td>UP/DOWN Up Frequency Step</td>
<td>F265</td>
</tr>
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<td></td>
<td>UP/DOWN Down Response Time</td>
<td>F266</td>
</tr>
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<td></td>
<td></td>
<td>UP/DOWN Down Frequency Step</td>
<td>F267</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initial UP/DOWN Frequency</td>
<td>F268</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initial UP/DOWN Frequency Rewriting</td>
<td>F269</td>
</tr>
<tr>
<td></td>
<td>V/I Settings</td>
<td>Option V/I Terminal Voltage/Current Selection (AI2 Option Board Input)</td>
<td>F109</td>
</tr>
<tr>
<td></td>
<td>Preset Speeds</td>
<td>Preset Speed 1</td>
<td>F018</td>
</tr>
<tr>
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<td>Preset Speed 2</td>
<td>F019</td>
</tr>
<tr>
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<td>Preset Speed 3</td>
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<td>Preset Speed 8</td>
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## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
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<td><strong>FREQUENCY</strong></td>
<td>Preset Speeds</td>
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<td>Preset Speed 10</td>
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<td>Preset Speed 13</td>
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<td>Preset Speed 14</td>
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<td>Preset Speed 15</td>
<td>F294</td>
</tr>
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<td>Speed Reference Setpoints</td>
<td>V/I Input Point 1 Setting</td>
<td>F201</td>
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<td>V/I Input Point 1 Frequency</td>
<td>F202</td>
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<td></td>
<td>V/I Input Point 2 Setting</td>
<td>F203</td>
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<td></td>
<td>V/I Input Point 2 Frequency</td>
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<td>RR Input Point 1 Setting</td>
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<td>RR Input Point 1 Frequency</td>
<td>F211</td>
</tr>
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<td>RR Input Point 2 Setting</td>
<td>F212</td>
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<td>F213</td>
</tr>
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<td>F216</td>
</tr>
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<td>RX Input Point 1 Frequency</td>
<td>F217</td>
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<td>RX Input Point 2 Setting</td>
<td>F218</td>
</tr>
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<td>RX Input Point 2 Frequency</td>
<td>F219</td>
</tr>
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<td>RX2 Option (AI1) Input Point 1 Setting</td>
<td>F222</td>
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<td>RX2 Option (AI1) Input Point 1 Frequency</td>
<td>F223</td>
</tr>
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<td>F224</td>
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<td>RX2 Option (AI1) Input Point 2 Frequency</td>
<td>F225</td>
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<td>F229</td>
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<td>F230</td>
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<td>F231</td>
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<td>PG Input Point 1 Setting</td>
<td>F234</td>
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<td>PG Input Point 1 Frequency</td>
<td>F235</td>
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<td>PG Input Point 2 Setting</td>
<td>F236</td>
</tr>
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<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
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<tr>
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<td>Speed Reference Setpoints</td>
<td>PG Input Point 2 Frequency</td>
<td>F237</td>
</tr>
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<td></td>
<td></td>
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<td></td>
<td>RR Input Bias</td>
<td>F472</td>
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<td>RR Input Gain</td>
<td>F473</td>
</tr>
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<td>RX Input Bias</td>
<td>F474</td>
</tr>
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<td></td>
<td>RX Input Gain</td>
<td>F475</td>
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<td>RX2 Option (A11) Input Bias</td>
<td>F476</td>
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<td>RX2 Option (A11) Input Gain</td>
<td>F477</td>
</tr>
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<td>V/I Input Bias (A12 Option Board Input)</td>
<td>F478</td>
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<td>V/I Input Gain (A12 Option Board Input)</td>
<td>F479</td>
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<td><strong>SPECIAL</strong></td>
<td>Acc/Dec 1 – 4 Settings</td>
<td>Acceleration Time 2</td>
<td>F500</td>
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<td>Deceleration Time 2</td>
<td>F501</td>
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<td>Acceleration/Deceleration Pattern 1</td>
<td>F502</td>
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<td>Acceleration/Deceleration Pattern 2</td>
<td>F503</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration Time 3</td>
<td>F510</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deceleration Time 3</td>
<td>F511</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration/Deceleration Pattern 3</td>
<td>F512</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration Time 4</td>
<td>F514</td>
</tr>
<tr>
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<td></td>
<td>Deceleration Time 4</td>
<td>F515</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration/Deceleration Pattern 4</td>
<td>F516</td>
</tr>
<tr>
<td></td>
<td>Acc/Dec Special</td>
<td>Acceleration/Deceleration Pattern 1 – 4</td>
<td>F504</td>
</tr>
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<td></td>
<td>Acceleration/Deceleration Switching Frequency 1</td>
<td>F505</td>
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<tr>
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<td>S-Pattern Acceleration Lower-Limit Adjustment</td>
<td>F506</td>
</tr>
<tr>
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<td>S-Pattern Acceleration Upper-Limit Adjustment</td>
<td>F507</td>
</tr>
<tr>
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<td>S-Pattern Deceleration Lower-Limit Adjustment</td>
<td>F508</td>
</tr>
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<td>F509</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration/Deceleration Switching Frequency 2</td>
<td>F513</td>
</tr>
<tr>
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<td></td>
<td>Acceleration/Deceleration Switching Frequency 3</td>
<td>F517</td>
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<td><strong>Carrier Frequency</strong></td>
<td>PWM Carrier Frequency</td>
<td>F300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carrier Frequency Control Mode</td>
<td>F316</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
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<td>F190</td>
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<td>V/f 5-Point Setting Voltage 1</td>
<td>F191</td>
</tr>
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<td>V/f 5-Point Setting Frequency 2</td>
<td>F192</td>
</tr>
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<td>F196</td>
</tr>
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<td>V/f 5-Point Setting Voltage 4</td>
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</tr>
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<td>V/f 5-Point Setting Frequency 5</td>
<td>F198</td>
</tr>
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<td></td>
<td>V/f 5-Point Setting Voltage 5</td>
<td>F199</td>
</tr>
<tr>
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<td>Frequency Control</td>
<td>Start Frequency</td>
<td>F240</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run Frequency</td>
<td>F241</td>
</tr>
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<td>Run Frequency Hysteresis</td>
<td>F242</td>
</tr>
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<td>End Frequency</td>
<td>F243</td>
</tr>
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<td></td>
<td>Special Parameters</td>
<td>0 Hz Dead Band Signal</td>
<td>F244</td>
</tr>
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<td>0 Hz Command Output</td>
<td>F255</td>
</tr>
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<td>Exciting Strengthening Coefficient</td>
<td>F415</td>
</tr>
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<td>Annual Average Ambient Temperature</td>
<td>F634</td>
</tr>
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<td></td>
<td></td>
<td>Rush Current Suppression Relay Activation Time</td>
<td>F635</td>
</tr>
<tr>
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<td>PTC 1 Thermal Selection</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>PTC 2 Thermal Selection</td>
<td>F638</td>
</tr>
<tr>
<td></td>
<td>Jump Frequencies</td>
<td>Jump Frequency 1</td>
<td>F270</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jump Frequency 1 Bandwidth</td>
<td>F271</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jump Frequency 2</td>
<td>F272</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jump Frequency 2 Bandwidth</td>
<td>F273</td>
</tr>
<tr>
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<td></td>
<td>Jump Frequency 3</td>
<td>F274</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jump Frequency 3 Bandwidth</td>
<td>F275</td>
</tr>
<tr>
<td></td>
<td>Operation Panel</td>
<td>Operation Command Clear Selection When Standby</td>
<td>F719</td>
</tr>
<tr>
<td>Parameters</td>
<td></td>
<td>Terminal is Off</td>
<td></td>
</tr>
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<td></td>
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<td>Panel Stop Pattern</td>
<td>F721</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panel Torque Command</td>
<td>F725</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
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<td>------------------</td>
<td>---------------------------------------</td>
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<td>SPECIAL</td>
<td>Operation Panel Parameters</td>
<td>Panel Tension Torque Bias</td>
<td>F727</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panel Load Sharing Gain</td>
<td>F728</td>
</tr>
<tr>
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<td></td>
<td>Panel Override Multiplication Gain</td>
<td>F729</td>
</tr>
<tr>
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<td></td>
<td>Panel Frequency Lock Out</td>
<td>F730</td>
</tr>
<tr>
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<td></td>
<td>Panel Emergency Off Lock Out</td>
<td>F734</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panel Reset Lock Out</td>
<td>F735</td>
</tr>
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<td>MOTOR</td>
<td>Motor Set 2</td>
<td>Motor Set 2 Base Frequency</td>
<td>F170</td>
</tr>
<tr>
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<td></td>
<td>Motor Set 2 Base Frequency Voltage</td>
<td>F171</td>
</tr>
<tr>
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<td>Motor Set 2 Manual Torque Boost</td>
<td>F172</td>
</tr>
<tr>
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<td>Motor Set 2 Overload Protection Level</td>
<td>F173</td>
</tr>
<tr>
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<td>Motor Set 3</td>
<td>Motor Set 3 Base Frequency</td>
<td>F174</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Set 3 Base Frequency Voltage</td>
<td>F175</td>
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<tr>
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<td>Motor Set 3 Manual Torque Boost</td>
<td>F176</td>
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<td>Motor Set 3 Overload Protection Level</td>
<td>F177</td>
</tr>
<tr>
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<td>Motor Set 4</td>
<td>Motor Set 4 Base Frequency</td>
<td>F178</td>
</tr>
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<td>Motor Set 4 Base Frequency Voltage</td>
<td>F179</td>
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<td>Motor Set 4 Manual Torque Boost</td>
<td>F180</td>
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<td>Motor Set 4 Overload Protection Level</td>
<td>F181</td>
</tr>
<tr>
<td>PM Motor</td>
<td></td>
<td>PM Motor Constant 1 (D-Axis Inductance)</td>
<td>F498</td>
</tr>
<tr>
<td></td>
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<td>PM Motor Constant 2 (Q-Axis Inductance)</td>
<td>F499</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Step-Out Detection-Current Level (For PM Motors)</td>
<td>F640</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Step-Out Detection-Current Time (For PM Motors)</td>
<td>F641</td>
</tr>
<tr>
<td>Vector Motor Model</td>
<td></td>
<td>Autotune 1</td>
<td>F400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slip Frequency Gain</td>
<td>F401</td>
</tr>
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<td></td>
<td></td>
<td>Autotune 2</td>
<td>F402</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Rated Capacity (Nameplate)</td>
<td>F405</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Rated Current (Nameplate)</td>
<td>F406</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Rated RPM (Nameplate)</td>
<td>F407</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Base Frequency Voltage 1</td>
<td>F409</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Constant 1 (Torque Boost)</td>
<td>F410</td>
</tr>
<tr>
<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
<td>--------------------------------------------------------</td>
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<td><strong>MOTOR</strong></td>
<td>Vector Motor Model</td>
<td>Motor Constant 2 (No Load Current)</td>
<td>F411</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Constant 3 (Leak Inductance)</td>
<td>F412</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor Constant 4 (Rated Slip)</td>
<td>F413</td>
</tr>
<tr>
<td><strong>TORQUE</strong></td>
<td>Manual Torque Limit</td>
<td>Power Running Torque Limit 2 Level</td>
<td>F444</td>
</tr>
<tr>
<td></td>
<td>Settings</td>
<td>Regenerative Braking Torque Limit 2 Level</td>
<td>F445</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Running Torque Limit 3 Level</td>
<td>F446</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regenerative Braking Torque Limit 3 Level</td>
<td>F447</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Running Torque Limit 4 Level</td>
<td>F448</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regenerative Braking Torque Limit 4 Level</td>
<td>F449</td>
</tr>
<tr>
<td></td>
<td>Setpoints</td>
<td>V/I Input Point 1 Rate</td>
<td>F205</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V/I Input Point 2 Rate</td>
<td>F206</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RR Input Point 1 Rate</td>
<td>F214</td>
</tr>
<tr>
<td></td>
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<td>RR Input Point 2 Rate</td>
<td>F215</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX Input Point 1 Rate</td>
<td>F220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX Input Point 2 Rate</td>
<td>F221</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Option (AI1) Input Point 1 Rate</td>
<td>F226</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX2 Option (AI1) Input Point 2 Rate</td>
<td>F227</td>
</tr>
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<td>Torque Control</td>
<td>Braking Mode</td>
<td>F341</td>
</tr>
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<td></td>
<td>Torque Bias Input</td>
<td>F342</td>
</tr>
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<td>Panel Torque Bias</td>
<td>F343</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panel Torque Gain</td>
<td>F344</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Release Time</td>
<td>F345</td>
</tr>
<tr>
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<td></td>
<td>Creeping Frequency</td>
<td>F346</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creeping Time</td>
<td>F347</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Braking Time Learning Function</td>
<td>F348</td>
</tr>
<tr>
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<td>Torque Command</td>
<td>F420</td>
</tr>
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<td>Tension Torque Bias Input (Torque Control)</td>
<td>F423</td>
</tr>
<tr>
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<td></td>
<td>Load Sharing Gain Input</td>
<td>F424</td>
</tr>
<tr>
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<td>Forward Speed Limit Input</td>
<td>F425</td>
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<td>Forward Speed Limit Input Level</td>
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</table>
# Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TORQUE</strong></td>
<td>Torque Control</td>
<td>Reverse Speed Limit Input</td>
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<td>Reverse Speed Limit Input Level</td>
<td>F428</td>
</tr>
<tr>
<td></td>
<td>Torque Limit Settings</td>
<td>Power Running Torque Limit 1</td>
<td>F440</td>
</tr>
<tr>
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<td></td>
<td>Power Running Torque Limit 1 Level</td>
<td>F441</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regenerative Braking Torque Limit 1</td>
<td>F442</td>
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<td>Regenerative Braking Torque Limit 1 Level</td>
<td>F443</td>
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<td></td>
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<td>Acceleration/Deceleration Operation After Torque Limit</td>
<td>F451</td>
</tr>
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<td>Torque Speed Limiting</td>
<td>Speed Limit (Torque = 0) Center Value Reference</td>
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<td></td>
<td>Speed Limit (Torque = 0) Center Value</td>
<td>F431</td>
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<td></td>
<td>Speed Limit (Torque = 0) Band</td>
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<tr>
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<td>Allow Rotation in Specified Direction ONLY</td>
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<tr>
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<td>Drooping Control</td>
<td>Drooping Gain</td>
<td>F320</td>
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<td>Speed at 0% Drooping Gain</td>
<td>F321</td>
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<td>Speed at F320 Drooping Gain</td>
<td>F322</td>
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<td>Drooping Insensitive Torque</td>
<td>F323</td>
</tr>
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<td></td>
<td>Drooping Output Filter</td>
<td>F324</td>
</tr>
<tr>
<td></td>
<td>Feedback Settings</td>
<td>PID Control Switching</td>
<td>F359</td>
</tr>
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<td>PID Feedback Signal</td>
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<td>PID Feedback Delay Filter</td>
<td>F361</td>
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<td>PID Feedback Proportional Gain</td>
<td>F362</td>
</tr>
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<td>PID Feedback Integral Gain</td>
<td>F363</td>
</tr>
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<td>PID Deviation Upper-Limit</td>
<td>F364</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PID Deviation Lower-Limit</td>
<td>F365</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PID Feedback Differential Gain</td>
<td>F366</td>
</tr>
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<td>Process Upper-Limit</td>
<td>F367</td>
</tr>
<tr>
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<td>F368</td>
</tr>
<tr>
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<td></td>
<td>PID Control Delay</td>
<td>F369</td>
</tr>
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<td>PID Output Upper-Limit</td>
<td>F370</td>
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<td>PID Output Lower-Limit</td>
<td>F371</td>
</tr>
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<td>Process Increasing Rate</td>
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<td>Primary Menu</td>
<td>Sub Menu</td>
<td>Parameter Name</td>
<td>Parameter Number</td>
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<td>Process Decreasing Rate</td>
<td>F373</td>
</tr>
<tr>
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<td></td>
<td>Speed PI Switching Frequency</td>
<td>F466</td>
</tr>
<tr>
<td></td>
<td><strong>Override Control</strong></td>
<td>Adding Input Selection</td>
<td>F660</td>
</tr>
<tr>
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<td></td>
<td>Multiplying Input Selection</td>
<td>F661</td>
</tr>
<tr>
<td></td>
<td><strong>PG Settings</strong></td>
<td>Number of PG Input Pulses</td>
<td>F375</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of PG Input Phases</td>
<td>F376</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PG Disconnection Detection</td>
<td>F377</td>
</tr>
<tr>
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<td>Simple Positioning Completion Range</td>
<td>F381</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current Control Proportional Gain</td>
<td>F458</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Loop Proportional Gain</td>
<td>F460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed Loop Stabilization Coefficient</td>
<td>F461</td>
</tr>
<tr>
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<td></td>
<td>Load Moment of Inertia 1</td>
<td>F462</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second Speed Loop Proportional Gain</td>
<td>F463</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second Speed Loop Stabilization Coefficient</td>
<td>F464</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Load Moment of Inertia 2</td>
<td>F465</td>
</tr>
<tr>
<td><strong>MY FUNCTION</strong></td>
<td><strong>My Function Selection</strong></td>
<td>My Function Operating Mode</td>
<td>F977</td>
</tr>
<tr>
<td></td>
<td><strong>My Function Unit 1</strong></td>
<td>Input Function Target 1</td>
<td>F900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 1</td>
<td>F901</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 2</td>
<td>F902</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 2</td>
<td>F903</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 3</td>
<td>F904</td>
</tr>
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<td>Output Function Assigned</td>
<td>F905</td>
</tr>
<tr>
<td></td>
<td><strong>My Function Unit 2</strong></td>
<td>Input Function Target 1</td>
<td>F906</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 1</td>
<td>F907</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 2</td>
<td>F908</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 2</td>
<td>F909</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 3</td>
<td>F910</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Function Assigned</td>
<td>F911</td>
</tr>
</tbody>
</table>
## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MY FUNCTION</strong></td>
<td></td>
<td>Input Function Target 1</td>
<td>F912</td>
</tr>
<tr>
<td></td>
<td>My Function Unit 3</td>
<td>Input Function Command 1</td>
<td>F913</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 2</td>
<td>F914</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 2</td>
<td>F915</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 3</td>
<td>F916</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output Function Assigned</td>
<td>F917</td>
</tr>
<tr>
<td></td>
<td>My Function Unit 4</td>
<td>Input Function Target 1</td>
<td>F935</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Command 1</td>
<td>F936</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input Function Target 2</td>
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## Program Mode Menu Navigation

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<td>F814</td>
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<td>Baud Rate (2-Wire RS485)</td>
<td>F800</td>
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<td>Parity (2-Wire and 4-Wire RS485)</td>
<td>F801</td>
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<td>ASD Number</td>
<td>F802</td>
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<td>F803</td>
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<td>F804</td>
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<td>Send Delay (2-Wire RS485)</td>
<td>F805</td>
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<td>F806</td>
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<td>Baud Rate (4-Wire RS485)</td>
<td>F820</td>
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<td>RS485 Send Delay (4-Wire RS485)</td>
<td>F825</td>
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<td>ASD-to-ASD Communication (4-Wire RS485)</td>
<td>F826</td>
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<td>F830</td>
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<td>Disconnection Detection Extended Time</td>
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Program Mode Menu Navigation

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## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
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<td>Communication Settings</td>
<td>ASD Operation at Disconnection</td>
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<tr>
<td></td>
<td></td>
<td>Preset Speed Operation</td>
<td>F852</td>
</tr>
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<td>Communication Option Station Address Monitor</td>
<td>F853</td>
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<td>DeviceNet/CC-Link</td>
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## Program Mode Menu Navigation

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P9 ASD Installation and Operation Manual
## Program Mode Menu Navigation

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<td></td>
<td></td>
<td>Acceleration/Deceleration Group</td>
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<tr>
<td></td>
<td></td>
<td>V/f Group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Limit Group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preset Speed 14</td>
<td>F574</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration/Deceleration Group</td>
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<td>V/f Group</td>
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<tr>
<td></td>
<td></td>
<td>Torque Limit Group</td>
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</tr>
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</table>
## Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PATTERN RUN</strong></td>
<td><strong>Operation Mode</strong></td>
<td>Preset Speed 15</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Direction</td>
<td></td>
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<td></td>
<td></td>
<td>Acceleration/Deceleration Group</td>
<td></td>
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<td></td>
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<td>V/f Group</td>
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<tr>
<td></td>
<td></td>
<td>Torque Limit Group</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Operation Time</strong></td>
<td>Speed 1 Operation Time</td>
<td>F540</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed 2 Operation Time</td>
<td>F541</td>
</tr>
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<td></td>
<td></td>
<td>Speed 3 Operation Time</td>
<td>F542</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed 4 Operation Time</td>
<td>F543</td>
</tr>
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<td></td>
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<td>Speed 5 Operation Time</td>
<td>F544</td>
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<td></td>
<td>Speed 6 Operation Time</td>
<td>F545</td>
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<td></td>
<td></td>
<td>Speed 7 Operation Time</td>
<td>F546</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed 8 Operation Time</td>
<td>F547</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed 9 Operation Time</td>
<td>F548</td>
</tr>
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<td></td>
<td></td>
<td>Speed 10 Operation Time</td>
<td>F549</td>
</tr>
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<td></td>
<td></td>
<td>Speed 11 Operation Time</td>
<td>F550</td>
</tr>
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<td></td>
<td></td>
<td>Speed 12 Operation Time</td>
<td>F551</td>
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<td></td>
<td></td>
<td>Speed 13 Operation Time</td>
<td>F552</td>
</tr>
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<td></td>
<td></td>
<td>Speed 14 Operation Time</td>
<td>F553</td>
</tr>
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<td></td>
<td></td>
<td>Speed 15 Operation Time</td>
<td>F554</td>
</tr>
<tr>
<td></td>
<td><strong>Pattern Run</strong></td>
<td>Pattern Operation</td>
<td>F520</td>
</tr>
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<td></td>
<td></td>
<td>Pattern Operation Mode</td>
<td>F521</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern 1 Repeat</td>
<td>F522</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern 2 Repeat</td>
<td>F531</td>
</tr>
<tr>
<td></td>
<td><strong>Speeds</strong></td>
<td>Pattern Group 1, Selection 1</td>
<td>F523</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern Group 1, Selection 2</td>
<td>F524</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 1, Selection 3</td>
<td>F525</td>
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<td></td>
<td>Pattern Group 1, Selection 4</td>
<td>F526</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern Group 1, Selection 5</td>
<td>F527</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern Group 1, Selection 6</td>
<td>F528</td>
</tr>
</tbody>
</table>
# Program Mode Menu Navigation

<table>
<thead>
<tr>
<th>Primary Menu</th>
<th>Sub Menu</th>
<th>Parameter Name</th>
<th>Parameter Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PATTERN RUN</strong></td>
<td>Speeds</td>
<td>Pattern Group 1, Selection 7</td>
<td>F529</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern Group 1, Selection 8</td>
<td>F530</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 1</td>
<td>F532</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 2</td>
<td>F533</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 3</td>
<td>F534</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 4</td>
<td>F535</td>
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<td></td>
<td></td>
<td>Pattern Group 2, Selection 5</td>
<td>F536</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 6</td>
<td>F537</td>
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<td></td>
<td></td>
<td>Pattern Group 2, Selection 7</td>
<td>F538</td>
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<tr>
<td></td>
<td></td>
<td>Pattern Group 2, Selection 8</td>
<td>F539</td>
</tr>
<tr>
<td><strong>PASSWORD and Lock Outs</strong></td>
<td>Enter Password</td>
<td>Password is 0 (zero) for a new unit</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Change Password</td>
<td>Enter New Password</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lock Outs</td>
<td>Reset From Trip</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand/Auto</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run/Stop from EOI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Change From EOI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor Screen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parameter Access</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parameter Write</td>
<td></td>
</tr>
</tbody>
</table>
Virtual Linear Pump

Toshiba International Corporation’s Virtual Linear Pump (VLP) 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 of the VLP system.

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

However, the VLP parameters addressed while using the wizard or the VLP Settings menu selection are also accessible via their associated direct access numbers for specific adjustments when required.

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

Figure 29. Input the Electrical Specifications of the Motor.

1. From the nameplate of the motor, enter the FLA.
2. Select Pressure or Level.
3. Select the command source; EOI or V/I analog input.
4. Set the Low Frequency Limit. For most applications 15 Hz is ideal.
5. Click Next to continue.

Figure 30. Input the Specifications of the Transducer.

6. Set the unit of measure for the transducer. Selections are PSI, GPM, °WC, °WC, CFM, °C, °F, or Custom. Custom allows for 3 characters to represent the unit of measure.
7. Select the transducer output signal type; Current or Voltage and the range.
8. Set the full-scale reading of the transducer.
9. Click Next to continue.
WARNING! — THE FOLLOWING STEP WILL START THE MOTOR!

Figure 31. The VLP Maximum Value.

10. Set the system for normal flow and ensure that all system valves are set for normal operation.

11. Place the system in the **Hand** mode and press the **Run** key. The system will run at the **Upper Limit** setting (F012).

12. Click **Next** to continue.

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

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

Figure 32. Set the VLP Minimum Value.

14. The **VLP Minimum** 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 **VLP Minimum** field and, using the **Rotary Encoder**, slowly decrease the **VLP Minimum** value while observing the LED display.

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

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

The **VLP Minimum** setting (F394) plus the F481 setting comprises the range of the **VLP Minimum Zone**.

15. Click **Next** to continue.
16. Press the Stop key to complete the VLP setup.

17. Click Exit to save settings (Exit available at zero Hz).

18. From the Frequency Command screen press ESC, scroll to the VLP Control field, and select Direct Mode if using no feedback (if using feedback go to Step 21. on pg. 80).


20. During operation, adjust parameters F500 and F501 to stabilize VLP operation if unstable.
21. From the **Frequency Command** screen press ESC, scroll to the **VLP Control** field, and select **Process Hold** if using feedback (if not using feedback go to Step 18. on pg. 79).

22. From the **Frequency Command** screen press **Run**.

23. During operation, adjust parameters **F500** and **F501** to stabilize **VLP** operation if unstable.
Direct Access Parameter Information

The P9 ASD has the ability to allow the user direct access to the motor control functions. There are two ways in which the motor control parameters may be accessed for modification from the EOI: Program ⇒ Applicable Menu Path or Program ⇒ Direct Access ⇒ Applicable Parameter Number. Both methods access the parameter via the Program mode. Parameters may also be accessed via communications. Once accessed, the parameter may be viewed or changed.

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

Note: Parameter Settings are preceded by the number used to select an item if using communications to write to a parameter location in memory (i.e., F000 ⇒ 0-Manual, 1-No Trip on Acc/Dec, 2-No trip on Acc Only, etc.).

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

Direct Access Parameters/Numbers

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Direct Access Number</th>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Acceleration/Deceleration</td>
<td>F000</td>
<td>Selection List</td>
<td>Manual</td>
<td>No</td>
</tr>
<tr>
<td>Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This parameter is used to enable acceleration and deceleration rates in accordance with the applied load automatically. The adjusted acceleration and deceleration times range from 12.5% to 800% of the programmed values for Acceleration Time 1 (F009) and Deceleration Time 1 (F010). Settings: 0 — Manual 1 — Automatic ACC/DEC 2 — Automatic ACC Only</td>
<td></td>
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<tr>
<td>Note: The motor and the load must be connected prior to selecting Automatic Acceleration/Deceleration.</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>F001</th>
<th>Selection List</th>
<th>Disabled</th>
<th>No</th>
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<tbody>
<tr>
<td>Automatic Torque Boost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program ⇒ Fundamental ⇒ Motor Set 1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>This parameter allows the ASD to adjust the output torque in accordance with the applied load automatically. When enabled Autotuning is performed — the motor should be connected before performing an Autotune. Settings: 0 — Disabled 1 — Automatic Torque Boost + Autotuning 2 — Sensorless Vector Control + Autotuning</td>
<td></td>
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</tr>
</tbody>
</table>
**Command Mode Selection**

Program \(\Rightarrow\) Fundamental \(\Rightarrow\) Standard Mode Selection

The **Command Mode Selection** establishes the source of the command input for the ASD. Command inputs include **Run**, **Stop**, **Forward**, etc. The **Override** feature may supersede the **Command Mode Selection** setting (See **Command Mode and Frequency Mode Control** on pg. 42).

Settings:

- 0 — Terminal Block
- 2 — EOI (Keypad)
- 3 — RS485
- 4 — Communication Option Board

---

**Frequency Mode 1**

Program \(\Rightarrow\) Fundamental \(\Rightarrow\) Standard Mode Selection

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

**Note:** Only **Bolded** items from the **Settings** list below may be placed in the **Override Mode**. See the section titled **Command Mode and Frequency Mode Control** on pg. 42 for more information on the **Override** feature.

Settings:

- 1 — V/I
- 2 — RR
- 3 — RX
- 5 — EOI (Keypad)
- 6 — RS485
- 7 — Communication Option Board
- 8 — RX2 Option (AI1)
- 9 — Option V/I
- 10 — UP/DOWN Frequency
- 11 — Pulse Input (Option)
- 12 — Pulse Input (Motor CPU)
- 13 — Binary/BCD Input (Option)

---

**Direct Access Number** — F003

**Parameter Type** — Selection List

**Factory Default** — Terminal Block

**Changeable During Run** — No

---

**Direct Access Number** — F004

**Parameter Type** — Selection List

**Factory Default** — RR

**Changeable During Run** — No
### FM Output Terminal Function

This parameter is used to set the output function of the FM analog output terminal. The FM output terminal produces an output current or voltage that is proportional to the magnitude of the function assigned to this terminal (select current or voltage at F681). The available assignments for this output terminal are listed in Table 7 on pg. 253.

**Note:** To read voltage at this terminal connect a 100 – 500Ω resistor from the FM (+) terminal to the CC (-) terminal. Using a voltmeter read the voltage across the 100 – 500Ω resistor.

To read current at this terminal connect a 100 – 500Ω resistor from the FM (+) terminal through a series Ammeter to the CC (-) terminal.

The FM analog output has a maximum resolution of 1/1024 and a maximum load rating of 500 ohms.

### FM Terminal Setup Parameters

- **F005** — Set FM Function
- **F006** — Calibrate FM Terminal
- **F681** — Voltage/Current Output Switching Selection
- **F682** — Output Response Polarity Selection
- **F683** — Set Zero Level

### FM Output Terminal Adjustment

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

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

See F005 for more information on this setting.
**Type Reset**

Program ⇒ Utilities

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 — Sets the Maximum and Upper Limit Frequencies to 50 Hz.
2 — 60 Hz Setting — Sets the Maximum and Upper Limit Frequencies to 60 Hz.
3 — Reset to Factory Settings — Restores factory settings.
4 — Clear Past Trips — Clears four most-recent trips from the Monitor screen.
5 — Clear Run Timer — Sets the Run Timer to zero.
6 — Initialize Typeform — Restores factory settings and includes the analog terminals.
7 — *Save User Settings — Stores user settings to the EOI memory.
8 — Restore User Settings — Restores user settings from the EOI memory.
9 — Clear Cumulative Fan Timer — Clears the part-replacement alarm.
10 — Accel/Decel Time Setting 0.01 – 600.00 Seconds — Display resolution.
11 — Accel/Decel Time Setting 0.1 – 6000.0 Seconds — Display resolution.
12 — Set EOI Memory to Default.

**Note:** User settings that are stored in the memory of the EOI are not saved via the **Save User Settings** selection. The unsaved functions include the items listed in the section titled Battery Backup on pg. 28.

**Forward/Reverse Run Selection**

Program ⇒ Fundamental ⇒ Standard Mode Selection

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

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

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

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

**Settings:**

0 — Forward
1 — Reverse
2 — Forward (EOI-Switchable F/R)
3 — Reverse (EOI-Switchable F/R)
Acceleration Time 1

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

This parameter specifies the time in seconds for the output of the ASD to go from 0.0 Hz to the Maximum Frequency for the 1 Acceleration profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel time may be set using F508.

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

Acceleration

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

Under most operating conditions, as the output frequency of the ASD goes up so does the output voltage (linear acceleration). The ASD has the ability to modify the relationship between frequency and voltage automatically to produce smoother operation or increased (starting) torque (See F502).

Deceleration Time 1

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

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

When operating with the **Automatic Accel/Decel** enabled (F000) the minimum accel/decel 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 Accel/Decel, Stall, and Ridethrough** settings may lengthen the deceleration times.

Maximum Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

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

Accel/Decel times are calculated based on the **Maximum Frequency** setting. The **Maximum Frequency** is not limited by this setting while operating in the **Drooping Control** mode (See F320 for more information on this setting).

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

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Direct Access Number</th>
<th>Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceleration Time 1</td>
<td>F009</td>
<td>Numerical</td>
<td>(ASD-Dependent)</td>
<td>Yes</td>
<td>0.1</td>
<td>6000</td>
<td>Seconds</td>
</tr>
<tr>
<td>Deceleration Time 1</td>
<td>F010</td>
<td>Numerical</td>
<td>(ASD-Dependent)</td>
<td>Yes</td>
<td>0.1</td>
<td>6000</td>
<td>Seconds</td>
</tr>
<tr>
<td>Maximum Frequency</td>
<td>F011</td>
<td>Numerical</td>
<td>66.0</td>
<td>No</td>
<td>Upper Limit (F012)</td>
<td>299.0</td>
<td>Hz</td>
</tr>
</tbody>
</table>
Upper-Limit Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

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

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

Lower-Limit Frequency

Program ⇒ Fundamental ⇒ Frequency Settings

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

Base Frequency 1

Program ⇒ Fundamental ⇒ Motor Set 1

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

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

V/f Pattern

Program ⇒ Fundamental ⇒ Frequency Settings

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

**Bolded** selections use the motor tuning parameters of the ASD to properly configure the ASD for the motor being used. If **Load Reactors** or **Long Lead Filters** are used, or if the capacity of the ASD is greater than the motor, manual tuning of the motor parameters may be required for optimum performance.

**Settings:**

0 — Constant Torque  
1 — Voltage Decrease Curve  
2 — **Automatic Torque Boost**  
3 — Sensorless Vector Control (Speed)  
4 — Sensorless Vector Control (Speed/Torque Switching)  
5 — V/f 5-point Curve (Go to **F190** to configure the V/f 5-Point Settings)  
6 — PM Drive (Permanent Magnet)  
7 — PG Feedback Vector Control (Speed)  
8 — PG Feedback Vector Control (Speed/Torque Switching)

**Note:** When operating in the **Vector Control** mode the carrier frequency should be set to 2.2 kHz or above.
Manual Torque Boost 1
Program ⇒ Fundamental ⇒ Motor Set 1

The Manual Torque Boost 1 function is used to increase the low frequency torque for high-inertia loads by increasing the output voltage at frequencies below ½ of the Base Frequency 1 (F014) setting. The value programmed as a boost percentage establishes an output voltage vs. output frequency relationship to be used to start the motor or to provide smoother operation.

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

Motor Overload Protection Configuration
Program ⇒ Protection ⇒ Overload

This parameter is used to protect the motor from an over-current condition. The type of motor being used and the Overload Stall setting is selected here to better match the application. This parameter setting may extend the Over-Voltage Stall time settings. This parameter may be affected by the setting of the Power Running Stall Continuous Trip Detection Time (F452).

Parameter F452 (Power Running Stall Continuous Trip Detection Time) setting may affect the performance of this parameter setting.

Settings:
0 — Overload Trip without Stall
1 — Overload Trip with Stall
2 — No Overload without Stall
3 — Stall Only
4 — V/f Motor-Overload without Stall
5 — V/f Motor-Overload with Stall
6 — V/f Motor-No Overload without Stall
7 — V/f Motor-Stall Only
Preset Speed 1
Program ⇒ Frequency ⇒ Preset Speeds

Up to fifteen (15) output frequency values that fall within the Lower-Limit and the Upper-Limit range may be programmed into the ASD and output as a Preset Speed. 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 Block.
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).
3. Program ⇒ Frequency ⇒ Preset Speeds ⇒ Preset Speed 1 (set an output frequency as Preset Speed 1; repeat for Preset Speeds 2 – 15 as required).
   Select Enabled to use the direction, accel/decel, 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 6 on pg. 249.

Select Disabled to use the speed setting only of the Preset Speed being run.
5. Place the system in the Hand 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 F560.

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.

Preset Speed 2
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0010 and is identified as Preset Speed 2. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed Truth Table

<table>
<thead>
<tr>
<th>Preset</th>
<th>S4</th>
<th>S3</th>
<th>S2</th>
<th>S1</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>F018</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>F019</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>F020</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>F021</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>F022</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>F023</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>F024</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>F287</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>F288</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>F289</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>F290</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>F291</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>F292</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>F293</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>F294</td>
</tr>
</tbody>
</table>

*Note: 1 = Terminal connected to CC.*

Direct Access Number — F018
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — Lower-Limit (F013)
Maximum — Upper-Limit (F012)
Units — Hz

Direct Access Number — F019
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — Lower-Limit (F013)
Maximum — Upper-Limit (F012)
Units — Hz
### Preset Speed 3
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0011 and is identified as **Preset Speed 3**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See **F018** for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Preset Speed 4
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0100 and is identified as **Preset Speed 4**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See **F018** for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Preset Speed 5
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0101 and is identified as **Preset Speed 5**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See **F018** for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Preset Speed 6
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0110 and is identified as **Preset Speed 6**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See **F018** for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Preset Speed 7
Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 0111 and is identified as **Preset Speed 7**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See **F018** for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>
Automatic Function Selection

Program ⇒ Utilities ⇒ Display Parameters

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

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

Set this parameter to Disable to set these parameters individually.

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

Settings:

- 0 — Disabled
- 1 — RR
- 2 — V/I
- 3 — RR or V/I (V/I) Switched via Terminal Board
- 4 — Keypad = Frequency/Terminal Board = Command
- 5 — Keypad = Frequency and Command

<table>
<thead>
<tr>
<th>Related Parameters</th>
<th>Default Settings</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Mode F003</td>
<td>Terminal Board</td>
<td>N/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Mode 1 F004</td>
<td>RR</td>
<td>N/C</td>
<td>RR</td>
<td>N/C</td>
<td>RR</td>
<td>Keypad</td>
<td></td>
</tr>
<tr>
<td>S3 Terminal F117</td>
<td>Preset Speed 3</td>
<td>N/C</td>
<td>Freq. Ref. Priority</td>
<td>N/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Priority F200</td>
<td>Terminal Board</td>
<td>N/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V/I Setup F201</td>
<td>0.0%</td>
<td>N/C</td>
<td>20.0%</td>
<td>N/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Mode 2 F207</td>
<td>V/I</td>
<td>N/C</td>
<td>RR</td>
<td>V/I</td>
<td></td>
<td>Keypad</td>
<td></td>
</tr>
</tbody>
</table>

N/C = No Change — the setting remains as it was before setting parameter F040.
### Low-Speed Signal Output Frequency

Program $\Rightarrow$ Terminal $\Rightarrow$ 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.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Speed Reach Frequency

Program $\Rightarrow$ Terminal $\Rightarrow$ Reach Settings

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Speed Reach Detection Band

Program $\Rightarrow$ Terminal $\Rightarrow$ Reach Settings

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F102</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>2.50</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Forward/Reverse Run Priority Selection

Program $\Rightarrow$ Terminal $\Rightarrow$ Input Special Functions

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

- **Settings:**
  - 0 — Reverse
  - 1 — Suspend

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

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Suspend</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

Simultaneous F and R activation.
**Input Terminal Priority**

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 F260 for more information on using the Jog function.

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

Settings:
- 0 — Disabled
- 1 — Enabled

**16-Bit Binary/BCD Input**

Program ⇒ Terminal ⇒ Input Special Functions

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

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

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

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

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

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

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

---

Direct Access Number — F106
Parameter Type — Selection List
Factory Default — Disabled
Changeable During Run — No

Direct Access Number — F107
Parameter Type — Selection List
Factory Default — None
Changeable During Run — No
Option VI/ Terminal Voltage/Current Selection

Program ⇒ Frequency ⇒ VI/ Settings

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

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

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

Settings:

0 — Voltage Input
1 — Current Input

Always ON Terminal 1

Program ⇒ Terminal ⇒ Input Terminals ⇒ ON

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

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

This parameter sets the programmable ON terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**Input Terminal 1 (F) Function**

Program ⇒ Terminal ⇒ Input Terminals

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

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

This parameter sets the programmable F terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**Input Terminal 2 (R) Function**

Program ⇒ Terminal ⇒ Input Terminals

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

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

This parameter sets the programmable R terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**Input Terminal 3 (ST) Function**

Program ⇒ Terminal ⇒ Input Terminals

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

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

This parameter sets the programmable ST terminal to one of the user-selectable functions listed in Table 6 on pg. 249.
Input Terminal 4 (RES) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the RES discrete input terminal.
In addition, this input terminal must be specified as Normally Open or Normally Closed.
This parameter sets the programmable RES terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

Input Terminal 5 (S1) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S1 discrete input terminal.
In addition, this input terminal must be specified as Normally Open or Normally Closed.
This parameter sets the programmable S1 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

Input Terminal 6 (S2) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S2 discrete input terminal.
In addition, this input terminal must be specified as Normally Open or Normally Closed.
This parameter sets the programmable S2 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

Input Terminal 7 (S3) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S3 discrete input terminal.
In addition, this input terminal must be specified as Normally Open or Normally Closed.
This parameter sets the programmable S3 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

Input Terminal 8 (S4) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the S4 discrete input terminal.
In addition, this input terminal must be specified as Normally Open or Normally Closed.
This parameter sets the programmable S4 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.
### Input Terminal 9 (LI1) Function

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

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

This setting assigns the function of the programmable LI1 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number — F119</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Unassigned</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>

### Input Terminal 10 (LI2) Function

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

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

This setting assigns the function of the programmable LI2 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number — F120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Unassigned</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>

### Input Terminal 11 (LI3) Function

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

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

This setting assigns the function of the programmable LI3 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number — F121</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Unassigned</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>
### Input Terminal 12 (LI4) Function

This parameter is used to set the functionality of the LI4 discrete input terminal. In addition, this input terminal must be specified as **Normally Open** or **Normally Closed**.

This setting assigns the function of the programmable LI4 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F122</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Unassigned</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Input Terminal 13 (LI5) Function

This parameter is used to set the functionality of the LI5 discrete input terminal. In addition, this input terminal must be specified as **Normally Open** or **Normally Closed**.

This setting assigns the function of the programmable LI5 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Unassigned</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Input Terminal 14 (LI6) Function

This parameter is used to set the functionality of the LI6 discrete input terminal. In addition, this input terminal must be specified as **Normally Open** or **Normally Closed**.

This setting assigns the function of the programmable LI6 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

**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 more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F124</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Unassigned</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
Input Terminal 15 (LI7) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI7 discrete input terminal. In addition, this input terminal must be specified as Normally Open or Normally Closed. This setting assigns the function of the programmable LI7 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

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 more information on the function of this terminal.

Input Terminal 16 (LI8) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the LI8 discrete input terminal. In addition, this input terminal must be specified as Normally Open or Normally Closed. This setting assigns the function of the programmable LI8 terminal to one of the user-selectable functions listed in Table 6 on pg. 249.

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 more information on the function of this terminal.

Output Terminal 1 (OUT1) Function
Program ⇒ Terminal ⇒ Output Terminals

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

The O1A and O1B (OUT1) output terminals change states (open or close) as a function of a user-selected event. See Table 9 on pg. 255 for listing the possible assignments for the OUT1 terminals.

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

Output Terminal 2 (OUT2) Function
Program ⇒ Terminal ⇒ Output Terminals

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

The O2A and O2B (OUT2) output terminals change states (open or close) as a function of a user-selected event. See Table 9 on pg. 255 for listing the possible assignments for the OUT2 terminals.

In addition, the output terminals must be specified as Normally Open or Normally Closed.
### Output Terminal 3 (FL) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the FL output terminals to one of the user-selectable functions listed in Table 9 on pg. 255. In addition, the output terminals must be specified as Normally Open or Normally Closed.

![FL Output Terminal Diagram]

**Direct Access Number —** F132  
**Parameter Type —** Selection List  
**Factory Default —** Fault (All)  
**Changeable During Run —** No

### Output Terminal 4 (OUT3) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the OUT3 discrete output terminal. In addition, this input terminal must be specified as Normally Open or Normally Closed. This setting assigns the function of the programmable OUT3 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

*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 more information on the function of this terminal.

**Direct Access Number —** F133  
**Parameter Type —** Selection List  
**Factory Default —** Always OFF  
**Changeable During Run —** No

### Output Terminal 5 (OUT4) Function

Program ⇒ Terminal ⇒ Output Terminals

This parameter is used to set the functionality of the OUT4 discrete output terminal. In addition, this input terminal must be specified as Normally Open or Normally Closed. This setting assigns the function of the programmable OUT4 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

*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 more information on the function of this terminal.

**Direct Access Number —** F134  
**Parameter Type —** Selection List  
**Factory Default —** Always OFF  
**Changeable During Run —** No
**Output Terminal 6 (R1) Function**

Program ⇒ Terminal ⇒ Output Terminals

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

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

This setting assigns the function of the programmable R1 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

*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 more information on the function of this terminal.

---

**Output Terminal 7 (OUT5) Function**

Program ⇒ Terminal ⇒ Output Terminals

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

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

This setting assigns the function of the programmable OUT5 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

*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 more information on the function of this terminal.

---

**Output Terminal 8 (OUT6) Function**

Program ⇒ Terminal ⇒ Output Terminals

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

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

This setting assigns the function of the programmable OUT6 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

*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 more information on the function of this terminal.
Output Terminal 9 (R2) Function

Program ⇒ Terminal ⇒ Output Terminals

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

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

This setting assigns the function of the programmable R2 terminal to one of the user-selectable functions listed in Table 9 on pg. 255.

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 more information on the function of this terminal.

Input Terminal 1 (F) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

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

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

Input Terminal 2 (R) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

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

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

Input Terminal 3 (ST) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD 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.
### Input Terminal 4 (RES) Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the RES terminal input by the programmed value (See waveforms at F140). The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

<table>
<thead>
<tr>
<th>Direct Access Number — F143</th>
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<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 8.0</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 2.0</td>
</tr>
<tr>
<td>Maximum — 200.0</td>
</tr>
<tr>
<td>Units — mS</td>
</tr>
</tbody>
</table>

### Input Terminal 5 – 12 Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the 5 – 12 terminal inputs by the programmed value (See waveforms at F140). The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

<table>
<thead>
<tr>
<th>Direct Access Number — F144</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 8.0</td>
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<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 2.0</td>
</tr>
<tr>
<td>Maximum — 200.0</td>
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<tr>
<td>Units — mS</td>
</tr>
</tbody>
</table>

### Input Terminal 13 – 20 Response Time

Program ⇒ Terminal ⇒ Input Terminal Delays

This parameter delays the response of the ASD to any change in the 13 – 20 terminal inputs by the programmed value (See waveforms at F140). The delay may be increased to provide additional electrical noise immunity or to prevent the ASD from responding to contact bounce or chatter.

<table>
<thead>
<tr>
<th>Direct Access Number — F145</th>
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<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 8.0</td>
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<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 2.0</td>
</tr>
<tr>
<td>Maximum — 200.0</td>
</tr>
<tr>
<td>Units — mS</td>
</tr>
</tbody>
</table>

### Input Terminal 17 (B12) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the B12 discrete input terminal.

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

This setting assigns the functionality of the programmable B12 terminal to any one of the user-selectable functions listed in Table 6 on pg. 249. See the My Function Instruction Manual (P/N E6581335) for more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number — F164</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Unassigned</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>

### Input Terminal 18 (B13) Function

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the B13 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 B13 terminal to any one of the user-selectable functions listed in Table 6 on pg. 249. See the My Function Instruction Manual (P/N E6581335) for more information on the function of this terminal.

<table>
<thead>
<tr>
<th>Direct Access Number — F165</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Unassigned</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>
Input Terminal 19 (B14) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the B14 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 B14 terminal to any one of the user-selectable functions listed in Table 6 on pg. 249.
See the My Function Instruction Manual (P/N E6581335) for more information on the function of this terminal.

Input Terminal 20 (B15) Function
Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the B15 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 B15 terminal to any one of the user-selectable functions listed in Table 6 on pg. 249.
See the My Function Instruction Manual (P/N E6581335) for more information on the function of this terminal.

Output Terminal 10 (R3) Function
Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the R3 output terminal to any one of the user-selectable functions listed in Table 9 on pg. 255.
In addition, the output terminals must be specified as Normally Open or Normally Closed.
See the instruction manual for the 16-Bit BIN/BCD option for more information on the function of this terminal.

Output Terminal 11 (R4) Function
Program ⇒ Terminal ⇒ Output Terminals

This parameter sets the functionality of the R4 output terminal to any one of the user-selectable functions listed in Table 9 on pg. 255.
In addition, the output terminals must be specified as Normally Open or Normally Closed.
See the instruction manual for the 16-Bit BIN/BCD option for more information on the function of this terminal.
### 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 F170.

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 6 on pg. 249).

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

### Base Frequency Voltage 2

**Program** ⇒ **Motor** ⇒ **Motor Set 2**

The **Base Frequency Voltage 2** setting is the **Motor 2** output voltage at the **Base Frequency** (F170). Regardless of the programmed value, the output voltage cannot be higher than the input voltage.

The actual output voltage will be influenced by the input voltage of the ASD and the **Supply Voltage Compensation** setting (F307).

This parameter is used only when the parameters for **Motor Set 2** are configured and selected. **Motor Set 2** may be selected by a properly configured input terminal (See Table 6 on pg. 249).

### 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 parameter 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 6 on pg. 249).

### Motor Overload Protection Level 2

**Program** ⇒ **Motor** ⇒ **Motor Set 2**

The **Motor 2 Overload Protection Level** parameter specifies the motor overload current level for **Motor Set 2**. This value is entered as either a percentage of the full load rating of the ASD or as the FLA of the motor.

The unit of measurement for this parameter may be set to **Amps** (A/V) or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when **Amps** is selected as the unit of measurement (See F701 to change the display unit).

The **Motor 2 Overload Protection Level** setting will be displayed in **Amps** if the **EOI** display units are set to A/V rather than %.
The **Base Frequency 3** setting is the frequency at which the output voltage of the ASD reaches its maximum setting. The **Base Frequency Voltage 3** parameter 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 (See Table 6 on pg. 249).

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

---

The **Base Frequency Voltage 3** setting 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 (See Table 6 on pg. 249).

---

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 $\frac{1}{2}$ of the **Base Frequency 3** setting (F174).

See parameter 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 (See Table 6 on pg. 249).

---

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

The **Motor 3 Overload Protection Level** setting will be displayed in **Amps** if the EOI display units are set to **A/V** rather than %.
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 Base Frequency Voltage 4 parameter 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 (See Table 6 on pg. 249).

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

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 (See Table 6 on pg. 249).

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 4 Base Frequency setting (F178).

See parameter F016 (Manual Torque Boost 1) 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 (See Table 6 on pg. 249).

Motor Overload Protection Level 4

Program ⇒ Motor ⇒ Motor Set 4

The Motor 4 Overload Protection Level 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 (A/V) or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (See F701 to change the display unit).

The Motor 4 Overload Protection Level setting will be displayed in Amps if the EOI display units are set to A/V rather than %.
**V/f 5-Point Setting Frequency 1**

Program ⇒ Special ⇒ V/f 5-Point Setting

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

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

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

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

<table>
<thead>
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<th>Direct Access Number — F190</th>
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<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>

![Graph showing V/f 5-Point Setting](image)
**V/f 5-Point Setting Voltage 1**

Program ⇒ Special ⇒ V/f 5-Point Setting

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

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

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

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

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

See F190 for additional information on this setting.

**V/f 5-Point Setting Frequency 2**

Program ⇒ Special ⇒ V/f 5-Point Setting

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

See F190 and F191 for additional information on this setting.
V/f 5-Point Setting Voltage 2
Program ⇒ Special ⇒ V/f 5-Point Setting

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

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

The default setting is %.

See F190 and F191 for additional information on this setting.

Direct Access Number — F193
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — No
Minimum — 0.0
Maximum — 100.0
Units — V or % (F701)

V/f 5-Point Setting Frequency 3
Program ⇒ Special ⇒ V/f 5-Point Setting

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

See F190 and F191 for additional information on this setting.

Direct Access Number — F194
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — No
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz

V/f 5-Point Setting Voltage 3
Program ⇒ Special ⇒ V/f 5-Point Setting

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

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

The default setting is %.

See F190 and F191 for additional information on this setting.

Direct Access Number — F195
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — No
Minimum — 0.0
Maximum — 100.0
Units — V or % (F701)

V/f 5-Point Setting Frequency 4
Program ⇒ Special ⇒ V/f 5-Point Setting

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

See F190 and F191 for additional information on this setting.

Direct Access Number — F196
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — No
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz

V/f 5-Point Setting Voltage 4
Program ⇒ Special ⇒ V/f 5-Point Setting

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

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

The default setting is %.

See F190 and F191 for additional information on this setting.

Direct Access Number — F197
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — No
Minimum — 0.0
Maximum — 100.0
Units — V or % (F701)
V/f 5-Point Setting Frequency 5
Program ⇒ Special ⇒ V/f 5-Point Setting
The V/f 5-Point Setting Frequency 5 sets the frequency to be associated with the voltage setting of parameter F199 (V/f 5-Point Setting Voltage 5).
See F190 and F191 for additional information on this setting.

V/f 5-Point Setting Voltage 5
Program ⇒ Special ⇒ V/f 5-Point Setting
The V/f 5-Point Setting Voltage 5 establishes the output voltage level that is to be associated with the frequency setting of F198 (V/f 5-Point Setting Frequency 5).
The F701 parameter setting will determine if the selection for this parameter appears in the form of a Voltage (V) or as a Percentage (%) of the ASD rating.
The default setting is %.
See F190 and F191 for additional information on this setting.

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

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

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

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

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

Settings:
0 — FMOD changed by Terminal Board (Frequency Mode)
1 — FMOD (F208) (Frequency Mode)
V/I Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

V/I Input Speed Control Setup

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

- Set SW301 of the Terminal Board to Voltage or Current (See Figure 9 on pg. 24).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ V/I.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Block.

Speed Control

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

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

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

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

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

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

Note: If using P24 to power a transducer that is to be used to supply the V/I input signal, it may be necessary to connect IICC to CCA.
### V/I Input Point 1 Frequency

**Program → Frequency → Speed Reference Setpoints**

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

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

See [V/I Input Point 1 Setting (F201)](#) for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number — F202</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>

### V/I Input Point 2 Setting

**Program → Frequency → Speed Reference Setpoints**

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

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

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

See [V/I Input Point 1 Setting (F201)](#) for more information on this setting when used for **Speed** control.

See [V/I Input Point 1 Rate (F203)](#) for more information on this setting when used for **Torque Control**.

<table>
<thead>
<tr>
<th>Direct Access Number — F203</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 100</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 100</td>
</tr>
<tr>
<td>Units — %</td>
</tr>
</tbody>
</table>

### V/I Input Point 2 Frequency

**Program → Frequency → Speed Reference Setpoints**

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

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

See [V/I Input Point 1 Setting (F201)](#) for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number — F204</th>
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<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 60.00</td>
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<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>
This parameter is used to set the gain and bias of the isolated V/I input terminal when the V/I terminal is used as the control input while operating in the Torque Control mode.

**V/I Input Torque Control Setup**

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

- Set SW301 of the Terminal Board to Voltage or Current (See Figure 9 on pg. 24).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ V/I.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Block.

**Torque Control**

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

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

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

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

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

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

**Note:** When using the isolated V/I input terminal the IICC terminal must be used as the return (negative) connection.
V/I Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

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

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

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

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

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

Frequency Mode 2

Program ⇒ Fundamental ⇒ Standard Mode Selection

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

See F004 and F200 for additional information on this setting.

Settings:

1 — V/I
2 — RR
3 — RX
5 — EOI (Keypad)
6 — RS485
7 — Communication Option Board
8 — RX2 Option (AI1)
9 — Option V/I
10 — UP/DOWN Frequency (Terminal Board)
11 — Pulse Input (Option)
12 — Pulse Input (Motor CPU)
13 — Binary/BCD Input (Option)

Frequency Mode Priority Switching Frequency

Program ⇒ Fundamental ⇒ Standard Mode Selection

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

See F200 for additional information on this setting.
Analog Input Filter

Program ⇒ Frequency ⇒ Analog Filter

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 mS)
- 1 — Small (8 mS)
- 2 — Medium (16 mS)
- 3 — Large (32 mS)
- 4 — Huge (64 mS)

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

If the filtering selection Small is selected, the ASD averages the last 8 mS of sampled signal and converted (digital) values. The rolling average is updated (every 4 µS) and scaled for use by the microprocessor.

This holds true for the Medium, Large, and Huge selections providing a larger sample to produce the average for use by the microprocessor.

False responses to electrical noise are eliminated with no loss in bandwidth because the value used by the ASD is the average value of several samples.
**RR Input Point 1 Setting**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

**Speed Control**

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

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

**RR Input Speed Control Setup**

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

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

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

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

**RR Input Point 1 Frequency**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

See RR Input Point 1 Setting (F210) for more information on this setting.
**RR Input Point 2 Setting**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

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

See **RR Input Point 1 Setting (F210)** for more information on this setting when used for Speed control.

See **RR Input Point 1 Rate (F214)** for more information on this setting when used for Torque Control.

---

**RR Input Point 2 Frequency**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

See **RR Input Point 1 Setting (F210)** for more information on this setting.
RR Input Point 1 Rate

Program ⇒ Torque ⇒ Setpoints

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

RR Input Torque Control Setup

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

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

Torque Control

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

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

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

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

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

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

See RR Input Point 1 Rate (F214) for more information on this setting.

RR Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

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

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

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

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

See RR Input Point 1 Rate (F214) for more information on this setting.
RX Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

RX Input Speed Control Setup

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

• Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ RX.
• Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Block.

Speed Control

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

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

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

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

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

RX Input Point 1 Frequency

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

See RX Input Point 1 Setting (F216) for more information on this setting.
**RX Input Point 2 Setting**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

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

See **RX Input Point 1 Setting (F216)** for more information on this setting when used for **Speed** control.

See **RX Input Point 1 Rate (F220)** for more information on this setting when used for **Torque Control**.

---

**RX Input Point 2 Frequency**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

See **RX Input Point 1 Setting (F216)** for more information on this setting.
**RX Input Point 1 Rate**

**Program ⇒ Torque ⇒ Setpoints**

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

**RX Input Torque Control Setup**

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

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

**Torque Control**

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

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

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

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

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

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

**RX Input Point 1 Rate**

**Program ⇒ Torque ⇒ Setpoints**

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

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

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

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

See RX Input Point 1 Rate (F220) for more information on this setting.

---

Direct Access Number — F220

Parameter Type — Numerical

Factory Default — 0.00

Changeable During Run — Yes

Minimum — -250.00

Maximum — +250.00

Units — %

Direct Access Number — F221

Parameter Type — Numerical

Factory Default — 0.00

Changeable During Run — Yes

Minimum — -250.00

Maximum — +250.00

Units — %
RX2 (AI1) Input Point 1 Setting

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

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

This parameter sets the RX2 (AI1) input level that is associated with RX2 (AI1) Input Point 1 Frequency when operating in the Speed Control mode or is associated with the RX2 (AI1) Input Point 1 Rate when operating in the Torque Control mode.

RX2 (AI1) Input Speed Control Setup

Perform the following setup to allow the system to receive Speed control input at the RX2 (AI1) input terminal:

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

Speed Control

Perform the following setup to allow the system to perform Speed control from the RX2 (AI1) input terminal:

- Set RX2 (AI1) Input Point 1 Frequency (F223).
- Set RX2 (AI1) Input Point 1 Setting (F222) — the input analog signal level that corresponds to the speed setting at RX2 (AI1) Input Point 1 Frequency.
- Set RX2 (AI1) Input Point 2 Frequency (F225).
- Set RX2 (AI1) Input Point 2 Setting (F224) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Frequency.
- Provide a Run command (F and/or R).

Once set, as the RX2 (AI1) input voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter value is entered as -100% to +100% of the RX2 (AI1) input signal range.

See the Expansion IO Card Option 1 instruction manual (P/N 58685) for more information on the function of this terminal. See parameter F476 and F477 for information on fine-tuning this terminal response.
RX2 (AI1) Input Point 1 Frequency

Direct Access Number — F223
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) terminal is used as the control input while operating in the Speed Control mode.

This parameter sets RX2 (AI1) Input Point 1 Frequency and is the frequency that is associated with the setting of RX2 (AI1) Input Point 1 Setting when operating in the Speed Control mode.

See RX2 (AI1) Input Point 1 Setting (F222) for more information on this setting.

RX2 (AI1) Input Point 2 Setting

Direct Access Number — F224
Parameter Type — Numerical
Factory Default — +100
Changeable During Run — Yes
Minimum — -100
Maximum — +100
Units — %

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) terminal is used as the control input while operating in the Speed Control mode.

This parameter sets the RX2 (AI1) input level that is associated with RX2 (AI1) Input Point 2 Frequency when operating in the Speed control mode or is associated with the RX2 (AI1) Input Point 2 Rate when operating in the Torque Control mode.

This value is entered as -100% to +100% of the RX2 (AI1) input signal range.

See RX2 (AI1) Input Point 1 Setting (F222) for more information on this setting when used for Speed control.

See RX2 (AI1) Input Point 1 Rate (F226) for more information on this setting when used for Torque Control.

RX2 (AI1) Input Point 2 Frequency

Direct Access Number — F225
Parameter Type — Numerical
Factory Default — 60.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) terminal is used as the control input while operating in the Speed Control mode.

This parameter sets RX2 (AI1) Input Point 2 Frequency and is the frequency that is associated with the setting of RX2 (AI1) Input Point 2 Setting when operating in the Speed Control mode.

See RX2 (AI1) Input Point 1 Setting (F222) for more information on this setting.
RX2 (AI1) Input Point 1 Rate

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) 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.

RX2 (AI1) Input Torque Control Setup

Perform the following setup to allow the system to receive Torque Control input at the RX2 (AI1) input terminal:

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode ⇒ RX2.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Block.
- Provide a Run command (F and/or R).

Torque Control

Perform the following setup to allow the system to perform Torque Control from the RX2 (AI1) input terminal:

- Set RX2 (AI1) Input Point 1 Rate (F226).
- Set RX2 (AI1) Input Point 1 Setting (F222) — the input analog signal level that corresponds to the speed setting at RX2 (AI1) Input Point 1 Rate.
- Set RX2 (AI1) Input Point 2 Rate (F227).
- Set RX2 (AI1) Input Point 2 Setting (F224) — the input analog signal level that corresponds to the speed setting at RX Input Point 2 Rate.
- Provide a Run command (F and/or R).

Torque Control is accomplished by establishing an associated V/f output pattern for a given RX2 (AI1) input level.

Once set, as the RX2 (AI1) input voltage changes, the ASD output speed and/or torque will vary in accordance with the above settings.

This parameter sets RX2 (AI1) Input Point 1 Rate and is the output torque value that is associated with the setting of RX2 (AI1) Input Point 1 Setting when operating in the Torque Control mode.

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 more information on the function of this terminal.
### RX2 (AI1) Input Point 2 Rate

Program ⇒ Torque ⇒ Setpoints

This parameter is used to set the gain and bias of the RX2 (AI1) input terminal when the RX2 (AI1) 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 (AI1) input level.

This parameter sets RX2 (AI1) **Input Point 2 Rate** and is the output torque value that is associated with the setting of RX2 (AI1) **Input Point 2 Setting** when operating in the Torque Control mode.

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

See RX2 (AI1) **Input Point 1 Rate** (F226) for more information on this setting.

<table>
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<th>Parameter Type</th>
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<tr>
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<tr>
<td>Factory Default</td>
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<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-250.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>+250.00</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>
**BIN Input Point 1 Setting**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

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

**BIN Input Speed Control Setup**

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

- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ Binary/BCD.
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ Terminal Block.
- Program ⇒ Terminal ⇒ Input Terminals; select and set the desired discrete input terminals to Binary Bit(s) 0 – 7 (or 0 – MSB). The binary input byte will control the speed of the motor.
- Program ⇒ Terminal ⇒ Input Terminals; select and set a discrete input terminal to Binary Data Write. Activation of the Binary Data Write terminal will transfer the status of the Binary Bit(s) 0 – 7 (or 0 – MSB) to the control board for speed control.

**Speed Control**

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

- Set BIN Input Point 1 Frequency (F229).
- Set the BIN input value (% of 255D) (F228) that represents BIN Input Point 1 Frequency.
- Set BIN Input Point 2 Frequency (F231).
- Set the BIN input value (% of 255D) (F230) that represents BIN Input Point 2 Frequency.
- Provide a Run command (F and/or R).

*Note: 255D is the decimal equivalent of the 8-bit BIN byte with all input terminals set to 1 (255 decimal = 11111111 binary).*

Once set, as the BIN input signal changes are transferred to the control board, the output frequency of the ASD will vary in accordance with the above settings.

This parameter sets BIN Input Point 1 Setting and is entered as 0% to 100% of the of the range represented by the BIN binary input byte 11111111 (255D) or the binary bit(s) 0 – MSB.
**BIN Input Point 1 Frequency**  
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input. This parameter sets BIN Input Point 1 Frequency and is the frequency that is associated with the setting of BIN Input Point 1 Setting.

See BIN Input Point 1 Setting (F228) for further information on this setting.

| Direct Access Number — F229 | Parameter Type — Numerical | Factory Default — 0.00 | Changeable During Run — Yes | Minimum — 0 | Maximum — Max. Freq. (F011) | Units — Hz |

**BIN Input Point 2 Setting**  
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input. This parameter sets BIN Input Point 2 Frequency and is the frequency that is associated with the setting of BIN Input Point 2 Setting.

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

See BIN Input Point 1 Setting (F228) for further information on this setting.

| Direct Access Number — F230 | Parameter Type — Numerical | Factory Default — 100 | Changeable During Run — Yes | Minimum — 0 | Maximum — 100 | Units — % |

**BIN Input Point 2 Frequency**  
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the BIN input terminals when the BIN terminals are used as the control input. This parameter sets BIN Input Point 2 Frequency and is the frequency that is associated with the setting of BIN Input Point 2 Setting.

See BIN Input Point 1 Setting (F228) for further information on this setting.

| Direct Access Number — F231 | Parameter Type — Numerical | Factory Default — 60.00 | Changeable During Run — Yes | Maximum — 0.00 | Maximum — Max. Freq. (F011) | Units — Hz |
PG Input Point 1 Setting
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the gain and bias of the PG input terminal of the option board when a shaft-mounted encoder is used as the control input while operating in the Speed Control mode.

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

PG Input Speed Control Setup
Perform the following setup to allow the system to receive Speed control input at the PG input terminal:
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Frequency Mode 1 ⇒ Pulse Input (option).
- Program ⇒ Fundamental ⇒ Standard Mode Selection ⇒ Command Mode Selection ⇒ (any setting).
- Provide a Run command (F and/or R).

Speed Control
Perform the following setup to allow the system to perform Speed control from the PG input terminals:
- Set PG Point 1 Frequency (F235).
- Set the PG input value (F234) that represents PG Point 1 Frequency.
- Set PG Point 2 Frequency (F237).
- Set the PG input value (F236) that represents PG Point 2 Frequency.

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

This parameter sets the PG input pulse count that represents Reference Setpoint 1 (frequency). The range of values for this parameter is 0% to 100% of the PG input pulse count range.

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

PG Input Point 1 Frequency
Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the speed of the PG input terminals when the PG terminal is used as the control input.

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

See PG Point 1 Setting (F234) for further information on this setting.
**PG Input Point 2 Setting**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction and speed of the PG input terminals when the PG terminals are used as the control input.

This parameter sets the PG input signal that is associated with **PG Point 2 Frequency**.

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

See **PG Point 1 Setting (F234)** for further information on this setting.

---

**PG Input Point 2 Frequency**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to set the direction and speed of the PG input terminals when the PG terminal are used as the control input.

This parameter sets **PG Point 2 Frequency** and is the frequency that is associated with the setting of **PG Point 2 Setting**.

See **PG Point 1 Setting (F234)** for further information on this setting.

---

**Start Frequency**

Program ⇒ Special ⇒ Frequency Control

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

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

If the setting of this parameter results in an over-current condition at 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 **F243** to 0.0 Hz.

This setting will override the setting of **F244** if this setting has a higher value.

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

---

**Run Frequency**

Program ⇒ Special ⇒ Frequency Control

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

Parameter **F242** provides a plus-or-minus value for the **Run Frequency**; thus, establishing a frequency band.

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

During deceleration, the ASD will continue to output the programmed deceleration signal to the motor until the lower level of the band is reached; at which time the output will go to 0.0 Hz.
Run Frequency Hysteresis

Program ⇒ Special ⇒ Frequency Control

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

**Direct Access Number — F242**
- Parameter Type — Numerical
- Factory Default — 0.00
- Changeable During Run — Yes
- Minimum — 0.00
- Maximum — 30.0
- Units — Hz

End Frequency

Program ⇒ Special ⇒ Frequency Control

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

**Direct Access Number — F243**
- Parameter Type — Numerical
- Factory Default — 0.00
- Changeable During Run — Yes
- Minimum — 0.00
- Maximum — 30.0
- Units — Hz

0 Hz Dead Band Signal

Program ⇒ Special ⇒ Special Parameters

This parameter sets an output frequency threshold that, until the commanded frequency surpasses this setting, the ASD will output 0.0 Hz to the motor.

This setting will override the Start Frequency setting (F240) if this setting has a higher value.

**Direct Access Number — F244**
- Parameter Type — Numerical
- Factory Default — 0.00
- Changeable During Run — Yes
- Minimum — 0.00
- Maximum — 5.00
- Units — Hz

DC Injection Braking Start Frequency

Program ⇒ Protection ⇒ DC Braking

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

**Direct Access Number — F250**
- Parameter Type — Numerical
- Factory Default — 0.00
- Changeable During Run — Yes
- Minimum — 0.00
- Maximum — 120.00
- Units — Hz

DC Injection Braking

DC Injection Braking is a braking system used with 3-phase motors. Unlike conventional brakes, there is no physical contact between the rotating shaft and a stationary brake pad or drum. When braking is required, the ASD outputs a DC current that is applied to the windings of the motor to quickly brake the motor. The braking current stops when the time entered in F252 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 F251. The intensity setting is entered as a percentage of the full load current of the ASD.

DC Injection Braking is also used to preheat the motor or to keep the rotor from spinning freely when the motor is off by providing a pulsating DC current into the motor at the Carrier Frequency. This feature may be enabled at F254.

DC Injection Braking Current

Program ⇒ Protection ⇒ DC Braking

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

**Direct Access Number — F251**
- Parameter Type — Numerical
- Factory Default — 50
- Changeable During Run — Yes
- Minimum — 0
- Maximum — 100
- Units — %
### DC Injection Braking Time

**Program** ⇒ **Protection** ⇒ **DC Braking**

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

<table>
<thead>
<tr>
<th>Direct Access Number — F252</th>
<th>Parameter Type — Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default — 1.0</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.0</td>
<td>Maximum — 20.0</td>
</tr>
<tr>
<td>Units — Seconds</td>
<td></td>
</tr>
</tbody>
</table>

### Forward/Reverse DC Injection Braking Priority

**Program** ⇒ **Protection** ⇒ **DC Braking**

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

**Settings:**
- 0 — Disabled
- 1 — Enabled

<table>
<thead>
<tr>
<th>Direct Access Number — F253</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Disabled</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

### Motor Shaft Fixing Control

**Program** ⇒ **Protection** ⇒ **DC Braking**

This parameter **Enables/Disables** a continuous DC injection at half of the amperage setting of F251 into a stopped motor. This feature is useful in preheating the motor or to keep the rotor from spinning freely.

**Motor Shaft Stationary Control** starts after the DC injection brake stops the motor and continues until **ST – CC** is opened, power is turned off, an **Emergency Off** command is received, or this parameter is changed.

Enabling this feature will also require a non-zero entry at F250.

**Settings:**
- 0 — Disabled
- 1 — Enabled

<table>
<thead>
<tr>
<th>Direct Access Number — F254</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Disabled</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

### 0 Hz Command Output

**Program** ⇒ **Special** ⇒ **Special Parameters**

This parameter is used to set the go-to-zero method to be used by the ASD in the event that the ASD is commanded to go to zero Hz.

**Settings:**
- 0 — Standard (DC Injection Braking)
- 1 — 0 Hz Command

<table>
<thead>
<tr>
<th>Direct Access Number — F255</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Standard (DC Injection Braking)</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>

### Time Limit For Lower-Limit Frequency Operation

**Program** ⇒ **Fundamental** ⇒ **Frequency Settings**

This parameter sets the time that the ASD is allowed to operate below the **Lower-Limit** setting before an alarm and subsequent fault is incurred.

<table>
<thead>
<tr>
<th>Direct Access Number — F256</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.0</td>
</tr>
<tr>
<td>Maximum — 600.0</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>
**Jog Run Frequency**

Program ⇒ Frequency ⇒ Jog Settings

This parameter sets the output frequency of the ASD during a Jog. Jogging is the term used to describe turning on the motor for small increments of time and is used when precise positioning of motor-driven equipment is required. The Jog function is initiated via the Terminal Board or using Communications (See the Communications manual-P/N 53840 for further information on using Communications for Jogging).

To perform a Jog, set this parameter (F260) to the desired Jog frequency. Select a Jog Stop method (F261).

**Jog Run Using the Terminal Board**

To initiate a Jog from the Terminal Board perform the following:

1. Assign an unused discrete input terminal to the Jog setting.
2. Assign a discrete input terminal to the F (Forward) function (and Reverse if required) (See Table 6 on pg. 249).
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. Activate the Jog terminal of Step 1.

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

**Jog Stop Pattern**

Program ⇒ Frequency ⇒ Jog Settings

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

*Note:* This parameter setting is used for the Jog operation only. The Emergency Off stopping method setting of parameter F603 has priority over this setting and changes made here do not affect the function or setting of parameter F603.

Settings:

- 0 — Deceleration Stop
- 1 — Coast Stop
- 2 — DC Injection Braking Stop
EOI (Panel) Operation Jog Mode

Program ⇒ Frequency ⇒ Jog Settings

This parameter enables the Jog command to be received from the EOI. When disabled the Jog command received from the EOI is ignored.

Jog commands may also be received from the Terminal Board. Priority as to which is allowed to override the other is selected at F106.

The priority selection at F106 enables the selected source for Jog control and disables the other. The F106 setting overrides the F262 parameter setting.

Settings:
0 — Disabled
1 — Enabled

Direct Access Number — F262
Parameter Type — Selection List
Factory Default — Disabled
Changeable During Run — Yes
### UP/DOWN Frequency (up) Response Time

No Path — Direct Access Only

This parameter functions in conjunction with the parameter settings of F265, F266, F267, F268, and F269. The purpose of these settings is to set up the ASD to allow an externally-supplied discrete input signal to control the output frequency of the ASD.

This method uses the discrete input terminal settings **UP/DOWN Frequency (up)** and **UP/DOWN Frequency (down)** to change the ASD speed. Activation of either terminal increases or decreases the output frequency at the **Accel 1** or **Decel 1** rates, respectively.

Depending on the **Delay** setting, the **UP/DOWN Frequency (up/down)** terminal may perform 1) the increase/decrease function for the duration of activation or 2) the **UP/DOWN Frequency (up/down)** terminal may act as a momentary contact that loads a new commanded frequency upon activation.

In either case, to activate-and-hold will continue the up or down function until reaching the **Upper-Limit Frequency** or the **Lower-Limit Frequency**, respectively. At which point further activation will be ignored.

See Figure 36 on pg. 135 for more information on the **UP/DOWN Frequency** function.

### Setup Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F003</td>
<td>Selects the Command control source; set to Terminal Block.</td>
</tr>
<tr>
<td>F004</td>
<td>Selects the Frequency Control Mode 1 control source; set to UP/DOWN Frequency.</td>
</tr>
<tr>
<td>F207</td>
<td>Selects the Frequency Control Mode 2 control source; set to UP/DOWN Frequency if used.</td>
</tr>
<tr>
<td>F264</td>
<td>Sets the system-response delay to the initial activation of the discrete input terminal <strong>UP/DOWN Frequency (up)</strong>. Also sets the response delay of subsequent terminal activations of the <strong>UP/DOWN Frequency (up)</strong> terminal during an activate-and-hold.</td>
</tr>
<tr>
<td>F265</td>
<td>Sets the frequency increase amount for each activation of the <strong>UP/DOWN Frequency (up)</strong> terminal activation. The rate of the frequency increase is set at <strong>Acceleration Time 1</strong> (F009).</td>
</tr>
<tr>
<td>F266</td>
<td>Sets the system-response delay to the initial activation of the discrete input terminal <strong>UP/DOWN Frequency (down)</strong>. Also sets the activation delay of subsequent terminal activations of the <strong>UP/DOWN Frequency (down)</strong> terminal during an activate-and-hold.</td>
</tr>
<tr>
<td>F267</td>
<td>Sets the frequency decrease amount for each activation of the <strong>UP/DOWN Frequency (down)</strong> terminal activation. The rate of the frequency decrease is set at <strong>Deceleration Time 1</strong> (F010).</td>
</tr>
<tr>
<td>F268</td>
<td>At power up or after a reset, this parameter setting is used to provide a starting frequency for the <strong>UP/DOWN Frequency</strong> function.</td>
</tr>
<tr>
<td>F269</td>
<td>At power down while running, and when enabled, this parameter writes the running frequency into the F268 location and, upon a system restart, uses this setting as the startup frequency.</td>
</tr>
</tbody>
</table>

Provide a **Run** command (F or R). The motor will run at the F268 setting.
UP/DOWN Frequency (up) Frequency Step
No Path — Direct Access Only

This parameter sets the frequency increase amount for each activation of the UP/DOWN Frequency (up) terminal activation. The rate of the frequency increase is set at Acceleration Time 1 (F009).

See F264 for more information on this parameter.

UP/DOWN Frequency (down) Response Time
No Path — Direct Access Only

This parameter sets the system-response delay to the initial activation of the discrete input terminal UP/DOWN Frequency (down). Also sets the activation delay of subsequent terminal activations of the UP/DOWN Frequency (down) terminal during an activate-and-hold.

See F264 for more information on this parameter.

UP/DOWN Frequency (down) Frequency Step
No Path — Direct Access Only

This parameter sets the frequency decrease amount for each activation of the UP/DOWN Frequency (down) terminal activation. The rate of the frequency decrease is set at Deceleration Time 1 (F010).

See F264 for more information on this parameter.

Initial UP/DOWN Frequency
No Path — Direct Access Only

At power up or after a reset, this parameter setting is used to provide a starting frequency for the UP/DOWN Frequency function.

See F269 for more information on this parameter setting.

Initial UP/DOWN Frequency Rewriting
No Path — Direct Access Only

At power down, and when enabled, this parameter writes the running frequency into the F268 location and, upon a system restart, uses this setting as the startup frequency.

Disable this parameter and set parameter F268 to the desired startup frequency if the same starting frequency is required at each startup.

Note: This parameter setting may be different at each startup when enabled.

Settings:

0 — Disabled
1 — Enabled (overwrite F268 at Power Off or Reset)
In conjunction with parameter F271, this parameter establishes a user-defined frequency range: the Jump Frequency and a plus-or-minus value.

During acceleration, the output frequency of the ASD will hold at the lower level of the Jump Frequency range until the programmed acceleration ramp reaches the upper level of the Jump Frequency range. At which time the output frequency of the ASD will accelerate to the upper level of the Jump Frequency range and continue upward as programmed.

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

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

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

**Jump Frequency 1**

Program ⇒ Special ⇒ Jump Frequencies

During acceleration, the output frequency of the ASD will hold at the lower level of the Jump Frequency range until the programmed acceleration ramp reaches the upper level of the Jump Frequency range. At which time the output frequency of the ASD will accelerate to the upper level of the Jump Frequency range and continue upward as programmed.

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

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

User-selected frequencies may be jumped to avoid the negative effects of mechanical resonance.
### Jump Frequency 1 Bandwidth
- **Program** ⇒ **Special** ⇒ **Jump Frequencies**
- This parameter establishes a plus-or-minus value for **Jump Frequency 1** (See F270).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F271</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Jump Frequency 2
- **Program** ⇒ **Special** ⇒ **Jump Frequencies**
- Same as **Jump Frequency 1** (F270) and is used when multiple frequencies are to be jumped (See the plus-or-minus value setting at F273). When multiple jump frequencies overlap, the system will recognize the lowest and the highest frequencies as one jump range.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F272</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Jump Frequency 2 Bandwidth
- **Program** ⇒ **Special** ⇒ **Jump Frequencies**
- This parameter establishes a plus-or-minus value for **Jump Frequency 2** (F272).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F273</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Jump Frequency 3
- **Program** ⇒ **Special** ⇒ **Jump Frequencies**
- Same as **Jump Frequency 1** (F270) and is used when multiple frequencies are to be jumped (See the plus-or-minus value setting at F275).
- When multiple jump frequencies overlap, the system will recognize the lowest and the highest frequencies as one jump range.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F274</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Jump Frequency 3 Bandwidth
- **Program** ⇒ **Special** ⇒ **Jump Frequencies**
- This parameter establishes a plus-or-minus value for **Jump Frequency 3** (F274).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F275</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Preset Speed 8
- **Program** ⇒ **Frequency** ⇒ **Preset Speeds**
- This parameter assigns an output frequency to binary number 1000 and is identified as **Preset Speed 8**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See F018 for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F287</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>
Preset Speed 9

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1001 and is identified as Preset Speed 9. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed 10

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1010 and is identified as Preset Speed 10. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed 11

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1011 and is identified as Preset Speed 11. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed 12

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1100 and is identified as Preset Speed 12. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed 13

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1101 and is identified as Preset Speed 13. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).

Preset Speed 14

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1110 and is identified as Preset Speed 14. The binary number is applied to S1 – S4 of the Terminal Board to output the Preset Speed (See F018 for more information on this parameter).
### Preset Speed 15

Program ⇒ Frequency ⇒ Preset Speeds

This parameter assigns an output frequency to binary number 1111 and is identified as **Preset Speed 15**. The binary number is applied to S1 – S4 of the **Terminal Board** to output the **Preset Speed** (See F018 for more information on this parameter).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F294</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### PWM Carrier Frequency

Program ⇒ Special ⇒ Carrier Frequency

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

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

**Note:** If the PWM carrier frequency is set at 2.0 kHz or above, it cannot be decreased below 2.0 kHz while running. If the PWM carrier frequency is set at 1.9 kHz or below, it cannot be increased above 2.0 kHz while running. Either change requires that the ASD be stopped and restarted for the changes to take effect.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>2.200</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>(ASD-Dependent)</td>
</tr>
<tr>
<td>Units</td>
<td>kHz</td>
</tr>
</tbody>
</table>

### Auto Restart Selection

Program ⇒ Protection ⇒ Retry/Restart

This parameter **Enables/Disables** the ability of the ASD to start into a spinning motor when the ST – CC connection opens momentarily and is then closed (Break/Make ST) or after a power interruption (momentary power failure).

**Settings:**

- 0 — Off
- 1 — Enabled (at Power Failure)
- 2 — Enabled (at Make-Break ST-CC)
- 3 — Enabled (at Make-Break ST-CC or Power Failure)
- 4 — Enabled (at Run)

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Off</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
Regenerative Power Ridethrough Mode

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

This parameter determines the motor control response of the ASD in the event of a momentary power outage or under-voltage condition.

During a Ridethrough, regenerative energy is used to maintain the control circuitry settings for the duration of the Ridethrough; it is not used to drive the motor. The motor(s) of the system are stopped and then restarted automatically if so configured.

In a multiple-motor application, there will be a requirement to synchronize the stopping and restarting of the motors as not to cause breakage in the product being processed by the motors stopping/starting at different times (e.g., wire spools, bobbin winder for textile machines, etc.). Parameters F317 and F318 must be set up to synchronize motor operation as to avoid breakage in these types of applications.

Note: If used to restart the motors, the Retry setup of F301 is required.

Note: The Jog function will not operate while in the Synchronized Decel/Accel mode.

Settings:

0 — Off
1 — Ridethrough On
2 — Decel Stop
3 — Synchronized ACC/DEC (TB)
4 — Synchronized ACC/DEC (TB + Power Off)

Ridethrough Setup Requirements

1. Select the Ridethrough Mode at F302.
2. Select the Ridethrough Time at F310.
3. Select the Synchronized Stop/Start Times at F317/F318 (if required).

Note: F317 and F318 are not functional while operating in the Torque or Position control modes, or for the Jog Run function (F260).

4. Set a discrete input terminal to Power Failure Synchronized Signal and activate the terminal to enable the Synchronized Accel/Decel function.
5. Select the Ridethrough Control Level at F629.
Retry Selection

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. 8 for more information on this setting.
**Dynamic Braking Selection**

Program ⇒ Protection ⇒ Dynamic Braking

This parameter Enables/Disables the Dynamic Braking system.

Settings:

0 — Off
1 — On with Overload Detection
2 — On without Overload Detection

Dynamic Braking uses the transistor IGBT7 to dissipate the bus voltage when required.

IGBT7 is a standard item on the 25 HP and below P9 ASD 230-volt systems and is standard on the 400 HP and below for the for the 460-volt systems.

IGBT7 is optional for all remaining systems.

**Dynamic Braking**

Dynamic Braking is used to prevent over-voltage faults during rapid deceleration or constant speed run on cyclic overhauling applications.

Dynamic Braking dissipates regenerated energy in the form of heat. When using a DBR use thermal protection.

The resistive load is connected across terminals PA and PB (non-polarized).

Using a low-value, high-wattage resistance as a load for the generated current, the resistive load dissipates the induced energy.

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

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

See the section titled Dynamic Braking Protection on pg. 283 for more information on using the DBR system and for assistance in selecting the appropriate resistor for a given application.

---

**Over-Voltage Limit Operation**

Program ⇒ Protection ⇒ Stall

This parameter enables the Over-Voltage Limit function. This feature is used to set 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 ASD during deceleration for a specified time in an attempt to prevent an Over-Voltage Trip.

If the over-voltage threshold level setting of parameter F626 is exceeded for over 4 mS, an Over-Voltage Trip will be incurred.

Parameter F452 (Power Running Stall Continuous Trip Detection Time) setting may affect the performance of this parameter setting.

**Note:** This parameter setting may increase deceleration times.

Settings:

0 — Enabled (Over-voltage Stall)
1 — Disabled
2 — Enabled (Forced Shorted Deceleration)
3 — Enabled (Forced Dynamic Braking Deceleration)
Supply Voltage Correction
Program ⇒ Protection ⇒ Base Frequency Voltage

This parameter Enables/Disables the Voltage Compensation function. When Enabled, this function provides a constant V/f ratio during periods of input voltage fluctuations.

Settings:
0 — Disabled (Output Voltage Unlimited)
1 — Enabled (Supply Voltage Compensation)
2 — Disabled (Output Voltage Limited)
3 — Enabled (Supply Voltage Compensation w/Output Voltage Limited)

Direct Access Number — F307
Parameter Type — Selection List
Factory Default — Disabled
Changeable During Run — No

Dynamic Braking Resistance
Program ⇒ Protection ⇒ Dynamic Braking

This parameter is used to input the resistive value of the Dynamic Braking Resistor being used. Light-duty and heavy-duty resistors vary from a few ohms to several hundred ohms. The appropriate resistance size will be typeform- and application-specific.

See the section titled Dynamic Braking Protection on pg. 283 for more information on using the DBR system and for assistance in selecting the appropriate resistor for a given application.

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

Continuous Dynamic Braking Capacity
Program ⇒ Protection ⇒ Dynamic Braking

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

See the section titled Dynamic Braking Protection on pg. 283 for more information on using the DBR system.

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

Ridethrough Time
Program ⇒ Protection ⇒ Retry/Restart

In the event of a momentary power outage, this parameter determines the length of the Ridethrough time.

The Ridethrough will be maintained for the number of seconds set using this parameter.

See parameter F302 for more information on the Ridethrough function.

Note: The actual Ridethrough Time is load-dependent.
Forward Run/Reverse Run Disable

Program ⇒ Frequency ⇒ Forward/Reverse Disable

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

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

If both directions are disabled, the received direction command will determine the direction of the motor rotation.

Settings:
0 — Off
1 — Disable Reverse Run
2 — Disable Forward Run

Random Mode

Program ⇒ Protection ⇒ Retry/Restart

This parameter adjusts the carrier frequency randomly. This feature is effective in minimizing the negative effects of mechanical resonance.

Settings:
0 — Disabled
1 — Enabled

Carrier Frequency Control Mode

Program ⇒ Special ⇒ Carrier Frequency

This parameter provides for the automatic decrease of the carrier frequency.

Select 1 to decrease the Carrier Frequency setting as a function of an increased current requirement.

Selection 2 or 3 may also include an output voltage drop as a function of an increased current requirement. The Carrier Frequency should be set below 4 kHz.

Settings:
0 — No Decrease and No Limit
1 — Valid Decrease and No Limit
2 — No Decrease and Limit Small Pulse
4 — Valid Decrease and Limit Small Pulse

Synchronized Deceleration Time

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

In the event that the Ridethrough function activates in a multiple-motor application it will be necessary to manage the motors synchronously as not to damage the product being processed (e.g., wire spools, bobbin winder for textile machines, etc.).

This parameter is used to minimize the product breakage during a momentary power outage. This function stops multiple machines simultaneously or makes them reach their respective command frequencies simultaneously by regulating their deceleration times.

See parameter F302 for more information on this setting.
Synchronized Acceleration Time

Program ⇒ Protection ⇒ Under-Voltage/Ridethrough

In the event that the Ridethrough function activates in a multiple-motor application it will be necessary to manage the accelerating motors synchronously as not to damage the product being processed (e.g., wire spools, bobbin winder for textile machines, etc.).

This parameter is used to minimize the product breakage during a momentary power outage. This function orchestrates the acceleration of multiple machines simultaneously or makes them reach their respective command frequencies simultaneously by regulating their acceleration times.

See parameter F302 for more information on this setting.

Drooping Gain

Program ⇒ Feedback ⇒ Drooping Control

This parameter sets the effective 100% output torque level while operating in the Drooping Control mode. This value is the upper torque limit of the motor being driven by a given ASD while operating in the Drooping Control mode.

Note: The maximum frequency output is not limited by the setting of F011 while operating in the Drooping Control mode.

Drooping

Drooping Control, also called Load Share, is used to share the load among two or more mechanically coupled motors. Unlike Stall, which reduces the output frequency in order to limit the load once the load reaches a preset level, Drooping can decrease or increase the V/f setting of a motor to maintain a balance between the output torque levels of mechanically coupled motors.

Because of variances in gearboxes, sheaves, belts, motors, and since the speed of the motor is constrained by the mechanical system, one motor may experience more load than its counterpart and may become overloaded.

Drooping Control allows the overloaded motor to slow down, thus shedding load and encouraging a lightly-loaded motor to pick up the slack. The goal of Drooping Control is to have the same torque ratios for mechanically coupled motors.

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.

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.
### 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.

<table>
<thead>
<tr>
<th>Direct Access Number —  F323</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 10.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — 100.0</td>
</tr>
<tr>
<td>Units — %</td>
</tr>
</tbody>
</table>

### 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.

Jerk operation may be reduced by increasing this setting.

<table>
<thead>
<tr>
<th>Direct Access Number —  F324</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 100.0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.1</td>
</tr>
<tr>
<td>Maximum — 200.0</td>
</tr>
<tr>
<td>Units — Radians/Second</td>
</tr>
</tbody>
</table>

### Braking Mode Selection
Program ⇒ Torque ⇒ Torque Control

This parameter is primarily used with lifting systems to allow for enough torque to be produced after receiving a Run command before releasing the brake. Without this feature the load would drop for a period once the brake was released.

This parameter enables this function by setting the system operating mode.

Settings:
- 0 — Disabled
- 1 — Forward Direction
- 2 — Reverse Direction
- 3 — Same Direction

<table>
<thead>
<tr>
<th>Direct Access Number —  F341</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Disabled</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

### Torque Bias Input Selection
Program ⇒ Torque ⇒ Torque Control

Once enabled at parameter F341, this parameter sets the source of the input signal that will set the torque level used to provide the Braking Mode Selection function of parameter F341.

Settings:
- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — EOI (Keypad)
- 5 — RS485 2-Wire
- 6 — RS485 4-Wire
- 7 — Communication Option Board
- 8 — RX2 Option (AI1)
### Panel Torque Bias

**Program ⇒ Torque ⇒ Torque Control**

Once enabled at parameter F341, this parameter establishes the torque bias setting to which the setting of F342 will either add to or subtract from to produce the final torque value used to carry out the **Braking Mode Selection** function of parameter F341.

### Panel Torque Gain

**Program ⇒ Torque ⇒ Torque Control**

Once enabled at parameter F341, this parameter sets the sensitivity of the torque control source selected at F342 for the **Braking Mode Selection** function of parameter F341.

### Release Time

**Program ⇒ Torque ⇒ Torque Control**

Once enabled at parameter F341, this parameter sets the time that the brake will hold after the requirements of the **Braking Mode Selection** function of parameter F341 have been met.

### Creeping Frequency

**Program ⇒ Torque ⇒ Torque Control**

Once enabled at parameter F341, and while running, upon receiving a **Stop** command this parameter sets an output frequency to be provided for the duration of the time setting of parameter F347.

### Creeping Time

**Program ⇒ Torque ⇒ Torque Control**

Once the **Creep** function of F346 is activated, this parameter determines the duration of activation of the **Creep** function.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Direct Access Number</th>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>F343</td>
<td>F347</td>
<td>Numerical</td>
<td>100.00</td>
<td>Yes</td>
<td>-250.00</td>
<td>+250.00</td>
<td>%</td>
</tr>
<tr>
<td>F344</td>
<td></td>
<td>Numerical</td>
<td>100.00</td>
<td>Yes</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
</tr>
<tr>
<td>F345</td>
<td>F346</td>
<td>Numerical</td>
<td>0.05</td>
<td>Yes</td>
<td>0.00</td>
<td>2.50</td>
<td>Seconds</td>
</tr>
<tr>
<td>F346</td>
<td></td>
<td>Numerical</td>
<td>3.00</td>
<td>Yes</td>
<td>F240 Setting</td>
<td>20.0</td>
<td>Hz</td>
</tr>
<tr>
<td>F347</td>
<td></td>
<td>Numerical</td>
<td>0.10</td>
<td>Yes</td>
<td>0.0</td>
<td>2.50</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

---

F343 F347

Buy: www.ValinOnline.com | Phone 844-385-3099 | Email: CustomerService@valin.com
Braking Time Learning Function

This parameter is used to establish approximate settings for parameters F343, F345, F346, and F347.

Note: Setting this parameter should be done using a light load only.

Set this parameter to Brake Signal Learning. Provide a Run command. The aforementioned parameters will receive approximate values. Application-specific adjustments may be required when finished.

Settings:
0 — Disabled
1 — Enabled

Accel/Decel Suspend

To maintain a constant speed setting while running, this parameter may be used to suspend speed changes for a user-set length of time.

The Accel/Decel Suspend function is enabled by setting this parameter to either Terminal Board Input or to F350 – F353.

Selecting Terminal Board Input at this parameter requires that a discrete input terminal be set to Dwell Signal (See Table 6 on pg. 249 for a listing of available settings). Upon activation of the Dwell Signal terminal the output frequency remains at the at-activation speed for the duration of the activation. When deactivated the programmed accel or decel ramp resumes.

Selecting F350 – F353 at this parameter requires that the acceleration and/or the deceleration Suspend Frequency and Suspend Time settings be completed at F350, F351, F352, and F353. Upon reaching the frequency setting of F350 (Accel) or F352 (Decel), the Accel/Decel ramp will cease and the output frequency will hold at the threshold frequency setting for the time setting of F351 for acceleration or F353 for deceleration.

Settings:
0 — Off
1 — F350 – F353 Settings
2 — Terminal Board Input

Acceleration Suspend Frequency

When Enabled at F349, this parameter is used to set the frequency at which the Acceleration Suspend function will activate.

During acceleration, this parameter sets the frequency at which acceleration will stop and the motor will run at the setting of this parameter for the time setting of F351.
### Acceleration Suspend Time

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

When Enabled at F349, this parameter is used to set the duration of activation of the Acceleration Suspend function when initiated by reaching the Acceleration Suspend Frequency setting (F350). Once this parameter times out the acceleration rate will resume from the point of suspension.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F351</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.0</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

### Deceleration Suspend Frequency

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

When Enabled at F349, this parameter is used to set the frequency at which the Deceleration Suspend function will activate. During deceleration, this parameter sets the frequency at which deceleration will stop and the motor will run at the setting of this parameter for the time setting of F353.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F352</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Deceleration Suspend Time

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

When Enabled at F349, this parameter is used to set the duration of activation of the Deceleration Suspend function when initiated by reaching the Deceleration Suspend Frequency setting (F352). Once this parameter times out the deceleration rate will resume from the point of suspension.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F353</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.0</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>
Commercial Power/ASD Output Switching

Program ⇒ Terminal ⇒ Line Power Switching

This parameter Enables/Disables the Commercial Power/ASD Output Switching function.

When enabled, the system may be set up to discontinue using the output of the ASD and to switch to the commercial power if 1) a trip is incurred, 2) a user-set ASD frequency is reached, or 3) if initiated by a discrete input terminal.

Once set up with the proper switching frequency and hold times, the system will switch to commercial power upon reaching the F355 frequency criterion.

Switching may also be accomplished manually by activating the discrete input terminal Commercial Power ASD Switching. Terminal activation forces the ASD output speed to accelerate to the F355 switching frequency, resulting in the ASD-to-commercial power switching.

Deactivation of the discrete input terminal starts the hold-time counter setting (F356) for ASD-to-commercial power switching. Once timed out the motor resumes normal commercial power operation.

Settings:
0 — Off
1 — Switch at Trip
2 — Switch at Switching Frequency
3 — Switch at Trip or Switching Frequency

Switching Setup Requirements

F354 — Enable the switching function.
F355 — Set the switching frequency.
F356 — (Speed) Hold-time before applying ASD output after the switching criteria has been met.
F357 — (Speed) Hold-time before applying commercial power after the switching criteria has been met.
F358 — (Speed) Hold-time of applying commercial power after the switching criteria has been met.

Set a discrete input terminal to Commercial Power ASD Switching.
Set OUT1 and OUT2 to Commercial Power/ASD Switching 1 and 2, respectively.

Note: Ensure that the switching directions are the same and that F311 is set to Permit All.

Note: The OUT1 and OUT2 outputs assigned to Commercial Power/ASD Switching Output are used to actuate the re-routing contactors.
**Commercial Power/ASD Switching Frequency**

Program ⇒ Terminal ⇒ Line Power Switching

When enabled at F354 and with a properly configured discrete output terminal, this parameter sets the frequency at which the At Frequency Powerline Switching function engages.

The At Frequency Powerline Switching function commands the system to discontinue using the output of the ASD and to switch to commercial power once reaching the frequency set here.

See parameter F354 for more information on this setting.

**ASD-Side Switching Delay**

Program ⇒ Terminal ⇒ Line Power Switching

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

See parameter F354 for more information on this setting.

**Commercial Power Switching Delay**

Program ⇒ Terminal ⇒ Line Power Switching

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

See parameter F354 for more information on this setting.

**Commercial Power Switching Freq. Hold Time**

Program ⇒ Terminal ⇒ Line Power Switching

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

See parameter F354 for more information on this setting.

**PID Control Switching**

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to set the PID control mode.

Selecting Process PID uses the upper and lower-limit settings of parameters F367 and F368.

Selecting Speed PID uses the upper and lower-limit settings of parameters F370 and F371.

Settings:

0 — PID Off
1 — Process PID
2 — Speed PID
3 — Easy Positioning PID (Not Used with the P9 ASD)
### PID Feedback Signal

**Program ⇒ Feedback ⇒ Feedback Settings**

This parameter **Enables/Disables PID** feedback control. When enabled, this parameter determines the source of the motor control feedback.

**Settings:**
- 0 — PID Control Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — RX2 Option (A11)
- 5 — Option V/I (A12)
- 6 — PG Feedback Option

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F360</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>V/I</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### PID Feedback Delay Filter

**Program ⇒ Feedback ⇒ Feedback Settings**

This parameter determines the delay in the ASD output response to the motor control feedback signal (signal source is selected at F360).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F361</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.1</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>25.0</td>
</tr>
</tbody>
</table>

### PID Feedback Proportional (P) Gain

**Program ⇒ Feedback ⇒ Feedback Settings**

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F362</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### PID Feedback Integral (I) Gain

**Program ⇒ Feedback ⇒ Feedback Settings**

This parameter determines the degree that the **Integral** function affects the output signal. The smaller the value here, the more pronounced the effect of the integral function on the output signal.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F363</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.01</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.00</td>
</tr>
</tbody>
</table>

### PID Deviation Upper-Limit

**Program ⇒ Feedback ⇒ Feedback Settings**

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F364</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>60.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>60.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>
### PID Deviation Lower-Limit

*Program ⇒ Feedback ⇒ Feedback Settings*

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

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F365</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>60.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>60.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### PID Feedback Differential (D) Gain

*Program ⇒ Feedback ⇒ Feedback Settings*

This parameter determines the degree that the Differential function affects the output signal. The larger the value entered here, the more pronounced the affect of the differential function for a given feedback signal level.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F366</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>2.55</td>
</tr>
</tbody>
</table>

### Process Upper-Limit

*Program ⇒ Feedback ⇒ Feedback Settings*

Selecting Process PID at parameter F359 allows for this parameter setting to function as the Upper-Limit while operating in the PID Control mode.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F367</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>60.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Process Lower-Limit

*Program ⇒ Feedback ⇒ Feedback Settings*

Selecting Process PID at parameter F359 allows for this parameter setting to function as the Lower-Limit while operating in the PID Control mode.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F368</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### PID Control Delay

*Program ⇒ Feedback ⇒ Feedback Settings*

This parameter is used to delay the start of PID control at start up. During the wait time set here, the ASD will follow the frequency control input of the process value and the feedback input will be ignored until this setting times out. At which time the PID setup assumes control.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F369</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>2400</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

### PID Output Upper-Limit

*Program ⇒ Feedback ⇒ Feedback Settings*

Selecting Speed PID at parameter F359 allows for this parameter setting to function as the Upper-Limit while operating in the PID Control mode.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F370</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>60.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lower-Limit (F013)</td>
</tr>
<tr>
<td>Maximum</td>
<td>Upper-Limit (F012)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>
### PID Output Lower-Limit

Program ⇒ Feedback ⇒ Feedback Settings

Selecting Speed PID at parameter F359 allows for this parameter setting to function as the **Lower-Limit** while operating in the **PID Control** mode.

<table>
<thead>
<tr>
<th>Direct Access Number — F371</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — <strong>Numerical</strong></td>
</tr>
<tr>
<td>Factory Default — <strong>4.00</strong></td>
</tr>
<tr>
<td>Changeable During Run — <strong>Yes</strong></td>
</tr>
<tr>
<td>Minimum — <strong>Lower-Limit</strong> (F013)</td>
</tr>
<tr>
<td>Maximum — <strong>Upper-Limit</strong> (F012)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>

### Process Increasing Rate

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to limit the rate that the output of the ASD may increase for a given difference in the speed reference and the PID feedback value.

<table>
<thead>
<tr>
<th>Direct Access Number — F372</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — <strong>Numerical</strong></td>
</tr>
<tr>
<td>Factory Default — <strong>10.0</strong></td>
</tr>
<tr>
<td>Changeable During Run — <strong>Yes</strong></td>
</tr>
<tr>
<td>Minimum — <strong>0.1</strong></td>
</tr>
<tr>
<td>Maximum — <strong>600.0</strong></td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

### Process Decreasing Rate

Program ⇒ Feedback ⇒ Feedback Settings

This parameter is used to limit the rate that the output of the ASD may decrease for a given difference in the speed reference and the PID feedback value.

<table>
<thead>
<tr>
<th>Direct Access Number — F373</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — <strong>Numerical</strong></td>
</tr>
<tr>
<td>Factory Default — <strong>10.0</strong></td>
</tr>
<tr>
<td>Changeable During Run — <strong>Yes</strong></td>
</tr>
<tr>
<td>Minimum — <strong>0.1</strong></td>
</tr>
<tr>
<td>Maximum — <strong>600.0</strong></td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

### Number of PG Input Pulses

Program ⇒ Feedback ⇒ PG Settings

This parameter is used to set the number of pulses output from a shaft-mounted encoder that is used to indicate one revolution of rotation (360°) of the motor or of the motor-driven equipment.

<table>
<thead>
<tr>
<th>Direct Access Number — F375</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — <strong>Numerical</strong></td>
</tr>
<tr>
<td>Factory Default — <strong>(ASD-Dependent)</strong></td>
</tr>
<tr>
<td>Changeable During Run — <strong>No</strong></td>
</tr>
<tr>
<td>Minimum — <strong>12</strong></td>
</tr>
<tr>
<td>Maximum — <strong>9999</strong></td>
</tr>
</tbody>
</table>

### Number of PG Input Phases

Program ⇒ Feedback ⇒ PG Settings

This parameter determines the type of information that is supplied by the phase encoder.

**Settings:**
- 1 — Single Phase
- 2 — Two Phase

<table>
<thead>
<tr>
<th>Direct Access Number — F376</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — <strong>Selection List</strong></td>
</tr>
<tr>
<td>Factory Default — <strong>(ASD-Dependent)</strong></td>
</tr>
<tr>
<td>Changeable During Run — <strong>No</strong></td>
</tr>
</tbody>
</table>
PG Disconnection Detection

Program ⇒ Feedback ⇒ PG Settings

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

Note: The PG Vector Feedback Board option is required to use this feature.

Settings:

- 0 — Disabled
- 1 — Enabled with Filter
- 3 — Enabled (Detect momentary power fail)

VLP Application Operating Mode

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

While operating in the VLP mode, this parameter sets the system response to the received feedback from the V/I terminal.

Select Direct Acting to produce an increase in the ASD output with a decrease in the feedback signal.

Select Reverse Acting to produce a decrease in the ASD output with an decrease in the feedback signal.

Settings:

- 0 — Direct Acting (Positive Gradient)
- 1 — Reverse Acting (Negative Gradient)

Simple Positioning Completion Range

Program ⇒ Feedback ⇒ PG Settings

While operating in the Positioning Control mode, this parameter sets the range of accuracy for a Stop command initiated via the terminal board.

If the setting is too low the stop may be too abrupt.

Settings:

- 0 — Direct Acting (Positive Gradient)
- 1 — Reverse Acting (Negative Gradient)

VLP Sleep Timer

Virtual Linear Pump ⇒ Sleep Timer Enable

During a properly configured VLP 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 VLP Minimum Zone.

See F383 and F480 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 — Disabled
- 1 — Enabled
VLP Sleep Timer Delay

Virtual Linear Pump ⇒ Sleep Timer Setting

During a properly configured VLP operation, and once enabled at F382, this parameter establishes the time that system operation will be allowed to operate within the VLP Minimum Zone before the ASD output to the motor is terminated.

See F382 for more information on this parameter.

Direct Operation VLP Command Value

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation while operating in the Direct mode and using the EOI for system control, this parameter establishes the VLP 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 as shown below.

Direct Access Number — F383
Parameter Type — Numerical
Factory Default — 300
Changeable During Run — Yes
Minimum — 1
Maximum — 63335
Units — Seconds

Direct Access Number — F384
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — 10
Maximum — 165

VLP Auto Start-Stop Mode

Virtual Linear Pump ⇒ Auto Start-Stop Mode Enable

During a properly configured VLP operation, this parameter Enables/Disables the ability of the system to receive transducer input to manage system starts and stops as it pertains to the process variable.

This parameter is also used to select the ASD response (Stop or Start) upon meeting the criteria of F388 and F389 settings.

On Forward = Run ASD while measured signal is ≤ F388 setting and stop ASD upon reaching F389 setting.

On Reverse = Run ASD while measured signal is ≥ F389 setting and stop ASD upon reaching F388 setting.

Settings:

0 — Off
1 — On Forward
2 — On Reverse

⚠️ 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.
VLP Auto Start-Stop Delay Timer
Virtual Linear Pump ⇒ Auto Start-Stop Delay Timer

During a properly configured VLP operation, this parameter establishes the time that the Start-Stop criteria of F388 and F389 must be maintained to activate the Auto Start-Stop function. This feature is used to minimize system responses to rapid fluctuations in the feedback signal.

See F385 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F387</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 5.0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.1</td>
</tr>
<tr>
<td>Maximum — 6553.5</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

VLP Auto Start-Stop Lower Threshold
Virtual Linear Pump ⇒ Auto Start-Stop Threshold Setting

During a properly configured VLP operation while in the On Forward or On Reverse modes (F385), this parameter establishes the lower level of the Auto Start-Stop threshold.

See F385 for 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 Wizard.

- PSI
- GPM
- Inches of Water Column
- Feet of Water Column
- CFM
- °C
- °F
- Custom

(Custom selection allows for three character spaces to be populated from the 26 alphabet and 13 special characters)

<table>
<thead>
<tr>
<th>Direct Access Number — F388</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — Application-Specific</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — F403 Setting</td>
</tr>
<tr>
<td>Maximum — F393 Setting</td>
</tr>
<tr>
<td>Units — Selectable at VLP Setup Wizard</td>
</tr>
</tbody>
</table>

VLP Auto Start-Stop Upper Threshold
Virtual Linear Pump ⇒ Auto Start-Stop Threshold Setting

During a properly configured VLP operation while in the On Forward or On Reverse modes (F385), this parameter establishes the upper level of the Auto Start-Stop threshold.

See F385 for 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 Wizard.

- PSI
- GPM
- Inches of Water Column
- Feet of Water Column
- CFM
- °C
- °F
- Custom

(Custom selection allows for three character spaces to be populated from the 26 alphabet and 13 special characters)

<table>
<thead>
<tr>
<th>Direct Access Number — F389</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 300.0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — F403 Setting</td>
</tr>
<tr>
<td>Maximum — F393 Setting</td>
</tr>
<tr>
<td>Units — Selectable at VLP Setup Wizard</td>
</tr>
</tbody>
</table>
**Virtual Linear Pump Mode Switch**

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

This parameter is enabled for use by completing the VLP Setup Wizard. During a properly configured VLP operation, this parameter establishes if feedback is used or not.

Select the command source or the feedback source for operating in the Direct or Process modes, respectively, at F396. The default selection for each may be used.

*Note:* If F396 is set to use V/I as the command source DO NOT set this parameter to Process Hold. Doing so will result in an error message (V/I cannot be used for both functions).

*Note:* The selected setting for this parameter will be retained when the VLP function is turned on or off using a discrete input terminal set to VLP Enable/Disable.

Settings:
- 0 — Disabled
- 1 — Direct Mode (No Feedback Used)
- 2 — Process Hold (V/I Feedback Used)
- 255 — Setup

---

**Virtual Linear Pump Application Type**

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the process variable measurement type.

Settings:
- 0 — Pressure
- 1 — Flow
- 2 — Level

---

**Virtual Linear Pump Transducer Output Type/Range**

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the transducer output signal type and range for VLP operation.

*Note:* This parameter is scaled at F201 – F204 for either selection and requires no user intervention.

Settings:
- 0 — 0 – 20 mA
- 1 — 4 – 20 mA
- 2 — 0 – 10 V
- 3 — 0 – 5 V

---

**Direct Access Number** — F390
**Parameter Type** — Selection List
**Factory Default** — Disabled
**Changeable During Run** — No

---

**Direct Access Number** — F391
**Parameter Type** — Selection List
**Factory Default** — Pressure
**Changeable During Run** — No

---

**Direct Access Number** — F392
**Parameter Type** — Selection List
**Factory Default** — 0 – 20 mA
**Changeable During Run** — No
**Virtual Linear Pump Transducer Maximum Reading**
Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the maximum level of the transducer range for VLP operation.

Direct Access Number — F393
Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — -3276.7
Maximum — 3276.7

**Virtual Linear Pump Transducer Minimum Reading**
Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the minimum level of the transducer range for VLP operation.

Direct Access Number — F403
Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — -3276.7
Maximum — 3276.7

**Virtual Linear Pump Minimum**
Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the minimum setpoint within the VLP operating domain.

Direct Access Number — F394
Parameter Type — Numerical
Factory Default — 10
Changeable During Run — Yes
Minimum — 10
Maximum — 165

**Virtual Linear Pump Maximum**
Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the maximum setpoint within the VLP operating domain.

Direct Access Number — F395
Parameter Type — Numerical
Factory Default — 10
Changeable During Run — Yes
Minimum — 10
Maximum — 165

**Virtual Linear Pump Command Source**
Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During Direct mode or the Process Hold mode operation, this parameter sets the VLP command source.

*Note:* If Process Hold is selected at F390, selecting V/I here will result in an error message.

Settings:

0 — EOI
1 — *V/I
2 — RR
3 — Communication Board
Process Hold Operation VLP Command Value via the EOI

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation while operating in the Process Hold mode and using the EOI for system control, this parameter establishes the VLP level.

This parameter setting is effective ONLY while operating in the Process Hold mode and while receiving a command via the EOI. The end value of this parameter setting appears in the Frequency Command screen as shown below.

Virtual Linear Pump Low Frequency Limit

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the VLP Low Frequency Limit.

Autotuning 1

Program ⇒ Motor ⇒ Vector Motor Model

This parameter sets the Autotune command status.

Selecting Reset Motor Defaults for this parameter sets parameters F410, F411, F412, and F413 to the factory default settings.

If selecting Autotune on Run Command, Autotune Initiated by Input Terminal, or Autotune of Detail Parameters for this parameter set the Base Frequency, Base Frequency Voltage, and the Motor Rated Revolutions to the nameplated values of the motor to achieve the best possible Autotune precision.

Settings:

0 — Autotune Disabled
1 — Reset Motor Defaults
2 — Enable Autotune on Run Command
3 — Autotuning by Input Terminal Signal (See Table 6 on pg. 249)
4 — Motor Constant Auto Calculation
### 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.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F401</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>70</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>150</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Autotuning 2

Program ⇒ Motor ⇒ Vector Motor Model

This parameter introduces a thermal element into the autotuning equation and is used to automatically adjust the Autotune parameter values as a function of increases in the temperature of the motor.

Settings:
- 0 — Off
- 1 — Self-Cooled Motor Tuning
- 2 — Forced Air Cooled Motor Tuning

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F402</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Off</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Virtual Linear Pump Transducer Minimum Reading

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation, this parameter establishes the minimum level of the transducer range for VLP operation.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F403</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-32767</td>
</tr>
<tr>
<td>Maximum</td>
<td>32767</td>
</tr>
</tbody>
</table>
Time-Based Alternation Emergency Timer
Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

During Time-Based Alternation operation, in the event that the Lead ASD trips or loses the transducer input signal, this parameter sets a counter time that, upon such an event, will start a count down to zero.

Upon reaching zero, two actions will occur:
1) The Lag 1 ASD will accelerate to the setting of F395 at the Accel Time 1 rate — F009.
If the Lag1 ASD is tripped, another timer count down begins and upon reaching zero, the next available ASD will accelerate to the setting of F395.
2) The system will check the load requirement of the Lag1 ASD (or the next available ASD).
If the Lag 1 ASD load is zero, the ASD will stop.
If a non-zero load is detected, the Lag1 ASD will continue to run in accordance with the user-set VLP settings.

Time-Based Alternation

Time-Based Alternation (TBA) is used to provide a more evenly distributed run-time of the system pumps of a multi-pump system. This is accomplished by alternating which system pump plays the Lead role.

Permanently assigning one pump as the Lead pump invariably results in the Lead pump being over worked and it will require more maintenance. The TBA algorithm allows the user to set the time that each pump within the system is to be assigned the Lead pump function and which are assigned the function of being the Lag pump(s).

Upon completion of the user-set time, the system changes the Lead pump assignment to the next pump number (F434).

The VLP feature allows the Lag pumps to assist the Lead pump when required as the load exceeds the ability of the lead pump.

Motor Rated Capacity
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the (nameplated) rated capacity of the motor being used.

Motor Rated Current
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the (nameplated) current rating of the motor being used.
**Motor Rated RPM**
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to input the (nameplated) rated speed of the motor.

**Base Frequency Voltage 1**
Program ⇒ Vector ⇒ Vector Motor Model

The Motor 1 Base Frequency Voltage 1 is the Motor 1 output voltage at the Base Frequency (F014). Regardless of the programmed value, the output voltage cannot be higher than the input voltage. The actual output voltage will be influenced by the input voltage of the ASD and the Supply Voltage Correction setting (F307).

**Motor Constant 1 (Torque Boost)**
Program ⇒ Motor ⇒ Vector Motor Model

This parameter sets the primary resistance of the motor. Increasing this value can prevent a drop in the torque of the motor at low speeds. Increasing this value excessively can result in nuisance overload tripping.

**Motor Constant 2 (No-Load Current)**
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the current level required to excite the motor. Specifying a value that is too high for this parameter may result in hunting (erratic motor operation).

**Motor Constant 3 (Leak Inductance)**
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the leakage inductance of the motor. A larger setting here results in higher output torque at high speeds.

**Motor Constant 4 (Rated Slip)**
Program ⇒ Motor ⇒ Vector Motor Model

This parameter is used to set the secondary resistance of the motor. An increase in this parameter setting results in an increase of compensation for motor slip.
### Exciting Strengthening Coefficient

**Program** ⇒ **Special** ⇒ **Special Parameters**

This parameter is used to increase the magnetic flux of the motor at low-speed. This feature is useful when increased torque at low speeds is required.

**Direct Access Number** — **F415**
- **Parameter Type** — Numerical
- **Factory Default** — 100
- **Changeable During Run** — No
- **Minimum** — 100
- **Maximum** — 130
- **Units** — %

### Stall Prevention Factor 1

**Program** ⇒ **Protection** ⇒ **Stall**

This parameter is to be adjusted in the event that the motor stalls when operated above the base frequency.

If a momentary heavy load occurs the motor may stall before the load current reaches the stall prevention level setting of **F601**.

A drop in the supply voltage may cause fluctuations of the load current or may cause motor vibration. A gradual adjustment of this parameter may alleviate this condition.

Start with a setting of 85 at these parameters and gradually adjust them from there one at a time until the desired results are produced.

Adjustments to this parameter may increase the load current of the motor and subsequently warrant an adjustment at the **Motor Overload Protection Level** setting.

**Direct Access Number** — **F416**
- **Parameter Type** — Numerical
- **Factory Default** — 100
- **Changeable During Run** — No
- **Minimum** — 10
- **Maximum** — 250
**Time-Based Alternation**

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

This parameter is enabled for use by completing the VLP Setup Wizard.

**Time-Based Alternation** operation is enable by setting this parameter (F417) to an operating mode and assigning a discrete input terminal to the TBA HOA Switch function and activating the terminal.

During **Time-Based Alternation** operation, and while running in the VLP mode, this parameter Enables/Disables the ability of the system to receive transducer input to manage system starts and stops as it pertains to the process variable.

This parameter is also used to select the Lead ASD response (Stop or Start) upon meeting the criteria of F388 and F389 settings.

**Forward Auto** = Run the ASD while the measured signal is ≤ F388 setting, and stop the ASD upon reaching the F389 setting.

**Reverse Auto** = Run the ASD while the measured signal is ≥ F389 setting, and stop the ASD upon reaching the F388 setting.

Settings:

0 — Off
1 — Forward Auto
2 — Reverse Auto

**WARNING**

The Time-Based Alternation operating mode may result in the unexpected Start or Stop of the motor. Signs to this effect are to be posted at the location of the motor/pump.

---

**Time-Based Alternation Period**

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

During **Time-Based Alternation** operation, this parameter sets the time that the Lead ASD and Lag ASD assignments are valid until changed as a function of the **Time-Based Alternation** settings.

**Torque Command**

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 — V/I
2 — RR
3 — RX
4 — EOI (Keypad) (F725 Setting)
5 — RS485 2-Wire
6 — RS485 4-Wire
7 — Communication Option Board
8 — RX2 Option (AI1)
**Tension Torque Bias Input**

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Tension Torque Bias input function.

This feature is enabled by selecting a Tension Torque Bias input signal source.

Settings:

- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — EOI (Keypad)
- 5 — RS485 2-Wire
- 6 — RS485 4-Wire
- 7 — Communication Option Board
- 8 — RX2 Option (A11)

**Load Sharing Gain Input**

Program ⇒ Torque ⇒ Torque Control

This parameter Enables/Disables the Load Sharing Gain input function.

This feature is enabled by selecting a Load Sharing Gain input signal source.

Settings:

- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — EOI (Keypad)
- 5 — RS485 2-Wire
- 6 — RS485 4-Wire
- 7 — Communication Option Board
- 8 — RX2 Option (A11)

**Forward Speed Limit Input**

Program ⇒ Torque ⇒ Torque Speed Limiting

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 input selected here.

If Setting is selected, the value set at F426 is used as the Forward Speed Limit input.

Settings:

- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — F426 (Setting)
### Forward Speed Limit Level

Program ⇒ Torque ⇒ Torque Control

This parameter provides a value to be used as the **Forward Speed Limit** setting if F426 is selected at F425.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>F426</th>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Access Number</td>
<td></td>
<td>Numerical</td>
<td>80.0</td>
<td>Yes</td>
<td>0.00</td>
<td>Upper-Limit (F012)</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Reverse Speed Limit Input

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 — V/I
- 2 — RR
- 3 — RX
- 4 — F428 (Setting)

### Reverse Speed Limit Input Level

Program ⇒ Torque ⇒ Torque Control

This parameter provides a value to be used as the **Reverse Speed Limit** setting if F428 is selected at F427.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>F428</th>
<th>Parameter Type</th>
<th>Factory Default</th>
<th>Changeable During Run</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Access Number</td>
<td></td>
<td>Numerical</td>
<td>80.0</td>
<td>Yes</td>
<td>0.00</td>
<td>Upper-Limit (F012)</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Speed Limit (torque=0) Center Value Reference

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 signal source or value that will be used to control the allowable speed variance.

Settings:
- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — F431 (Setting)
### Speed Limit (torque=0) Center Value

Program ⇒ Torque ⇒ Torque Speed Limiting

This parameter provides a value to be used as the **Speed Limit (torque=0) Center Value Reference** setting if F431 is selected at F430.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F431</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### 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 (range) for the **Speed Limit Torque Level** (F431).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F432</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Time-Based Alternation Pump Number

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

During **Time-Based Alternation** operation, this parameter is used to assign an identifying number to an ASD/pump combination.

The identifying number is used to assign the virtual priority Lead and Lag assignments.

The maximum number is limited to the user-assigned number at parameter F437.

**Note:** This parameter is not associated with nor affected by the setting of F802.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F434</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>1</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>F437 Setting</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Rotation in Specified Direction ONLY

Program ⇒ Torque ⇒ Torque Speed Limiting

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

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

If both directions are disabled, the received direction command will determine the direction of the motor rotation.

**Settings**

- 0 — Disabled
- 1 — Enabled

### Time-Based Alternation Total Number of ASDs

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

This parameter lists the number of ASDs registered within the system.

This parameter setting is used as the **Maximum** setting for parameter F434.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F437</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>2</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>2</td>
</tr>
<tr>
<td>Maximum</td>
<td>32</td>
</tr>
</tbody>
</table>
**Time-Based Alternation Process Hold Mode Response Time**

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

During *Time-Based Alternation* operation, while running in the *Process Hold* mode, this parameter sets the time that the system may operate within the maximum or minimum VLP zones before turning the ASD on or off, respectively.

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F438</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>7.5</td>
</tr>
<tr>
<td>Changeable During Run —</td>
<td>No</td>
</tr>
<tr>
<td>Minimum —</td>
<td>0.0</td>
</tr>
<tr>
<td>Maximum —</td>
<td>6553.5</td>
</tr>
<tr>
<td>Units —</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

**Time-Based Alternation Direct Mode Response Time**

Program ⇒ Virtual Linear Pump ⇒ VLP Time-Based Alternation

During *Time-Based Alternation* operation, while running in the *Direct* mode, this parameter sets the time that the system may operate within the maximum or minimum VLP zones before turning the ASD on or off, respectively.

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F439</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>1000</td>
</tr>
<tr>
<td>Changeable During Run —</td>
<td>No</td>
</tr>
<tr>
<td>Minimum —</td>
<td>0</td>
</tr>
<tr>
<td>Maximum —</td>
<td>65535</td>
</tr>
<tr>
<td>Units —</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

**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 — V/I
2 — RR
3 — RX
4 — F441 (Setting)

**Power Running Torque Limit 1 Level**

Program ⇒ Torque ⇒ Torque Limit Settings

This parameter provides a value for the *Power Running Torque Limit 1* setting if F441 is selected at parameter F440.

This value provides the positive torque upper-limit for the 1 motor.

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F441</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>250.0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run —</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum —</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum —</td>
<td>250.0 (Disabled)</td>
</tr>
<tr>
<td>Units —</td>
<td>%</td>
</tr>
</tbody>
</table>

**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 — V/I
2 — RR
3 — RX
4 — F443 (Setting)
Regenerative Braking Torque Limit 1 Level
Program ⇒ Torque ⇒ Torque Limit Settings

This parameter provides a value to be used as the Regeneration Torque Limit 1 if F443 is selected at parameter F442.
Set this parameter to 250% to disable this function.

Power Running Torque Limit 2 Level
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 ASD or when a single motor is to be controlled by multiple profiles.
Set this parameter to 250% to disable this function.

Regenerative Braking Torque Limit 2 Level
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 ASD or when a single motor is to be controlled by multiple profiles.
Set this parameter to 250% to disable this function.

Power Running Torque Limit 3 Level
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 ASD or when a single motor is to be controlled by multiple profiles.
Set this parameter to 250% to disable this function.

Regenerative Braking Torque Limit 3 Level
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 ASD or when a single motor is to be controlled by multiple profiles.
Set this parameter to 250% to disable this function.

Power Running Torque Limit 4 Level
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 ASD or when a single motor is to be controlled by multiple profiles.
Set this parameter to 250% to disable this function.
**Regenerative Braking Torque Limit 4 Level**

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 ASD or when a single motor is to be controlled by multiple profiles.

Set this parameter to 250% to disable this function.

**VLP Low Suction/No-Flow Cut Off Fault Disposition**

Program ⇒ Virtual Linear Pump ⇒ Low Suction/No-Flow Cut Off

This parameter is used in conjunction with the setting of parameter F483.

If On (Physical Switch) or On (Electronic Switch) is selected at parameter F483, then this parameter selection sets the disposition of the system in the event of a Low Suction/No-Flow Cut Off condition that exists for the duration of the parameter F484 setting.

If Off is selected at parameter F483, then this parameter selection is ignored.

If Alarm i

Settings:

0 — Trip
1 — Alarm
2 — Alarm and Restart at F484 Interval

**Accel/Decel Operation After Torque Limit**

Program ⇒ Torque ⇒ Torque Limit Settings

In a Crane/Hoist application that is operating using a mechanical brake, this parameter is used to minimize the delay between the brake release and the output torque reaching a level that can sustain the load.

This setting may reference time or the operating speed of the motor.

Settings:

0 — In Sync with Accel/Decel
1 — In Sync with Minimum Time

**Power Running Stall Continuous Trip Detection Time**

Program ⇒ Protection ⇒ Stall

This parameter is used to extend the Over-Voltage Stall (F305) and the Over-Current Stall (F017) time settings.
### Stall Prevention During Regeneration

**Program** ⇒ **Protection** ⇒ **Stall**

This function of this parameter is to disable the **Over-Voltage Stall** (F305) and the **Over-Current Stall** (F017) function during regeneration only. Application-specific conditions may occur that warrant disabling the **Stall** function during regeneration.

**Settings:**
- 0 — Disabled (Stall During Regenerative Braking)
- 1 — Enabled (No Stall During Regenerative Braking)

**Direct Access Number** — F453  
**Parameter Type** — Selection List  
**Factory Default** — Enabled  
**Changeable During Run** — Yes

---

### Time-Based Alternation Direct Mode Emergency Setpoint

**Program** ⇒ **Virtual Linear Pump** ⇒ **VLP Time-Based Alternation**

During **Time-Based Alternation** operation, while running in the **Direct** mode, this parameter sets the **VLP** setpoint.

**Direct Access Number** — F456  
**Parameter Type** — Numerical  
**Factory Default** — 10  
**Changeable During Run** — Yes  
**Minimum** — F394 Setting  
**Maximum** — F395 Setting  
**Units** — %

---

### Current Control Proportional Gain

**Program** ⇒ **Feedback** ⇒ **PG Settings**

This parameter sets the sensitivity of the ASD when monitoring the output current to control speed.

The larger the value entered here, the more sensitive the ASD is to changes in the received feedback.

**Direct Access Number** — F458  
**Parameter Type** — Numerical  
**Factory Default** — (ASD-Dependent)  
**Changeable During Run** — No  
**Minimum** — 0.0  
**Maximum** — 100.0

---

### Speed Loop Proportional Gain

**Program** ⇒ **Feedback** ⇒ **PG Settings**

During closed-loop operation, this parameter sets the response sensitivity of the ASD when monitoring the output speed for control.

The larger the value entered here, the larger the change in the output speed for a given received feedback signal.

**Direct Access Number** — F460  
**Parameter Type** — Numerical  
**Factory Default** — 12  
**Changeable During Run** — No  
**Minimum** — 1  
**Maximum** — 9999

---

### Speed Loop Stabilization Coefficient

**Program** ⇒ **Feedback** ⇒ **PG Settings**

During closed-loop operation, this parameter sets the response sensitivity of the ASD when monitoring the output speed for control.

The larger the value entered here, the quicker the response to changes in the received feedback.

**Direct Access Number** — F461  
**Parameter Type** — Numerical  
**Factory Default** — 100  
**Changeable During Run** — Yes  
**Minimum** — 1  
**Maximum** — 9999

---

### Load Moment of Inertia 1

**Program** ⇒ **Feedback** ⇒ **PG Settings**

This parameter is used for calculating accel/decel torque when compensating for load inertia while operating in the **Drooping Control** mode.

**Direct Access Number** — F462  
**Parameter Type** — Numerical  
**Factory Default** — 35  
**Changeable During Run** — Yes  
**Minimum** — 0  
**Maximum** — 100
**Second Speed Loop Proportional Gain**

Program ⇒ Feedback ⇒ PG Settings

During closed-loop operation, this parameter sets the sensitivity of the ASD when monitoring the output speed for control. The larger the value entered here, the more sensitive the ASD is to changes in the received feedback.

<table>
<thead>
<tr>
<th>Direct Access Number — F463</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 12</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 1</td>
</tr>
<tr>
<td>Maximum — 9999</td>
</tr>
</tbody>
</table>

**Second Speed Loop Stabilization Coefficient**

Program ⇒ Feedback ⇒ PG Settings

During closed-loop operation, this parameter sets the response sensitivity of the ASD when monitoring the output speed for control. The larger the value entered here, the quicker the response to changes in the received feedback.

<table>
<thead>
<tr>
<th>Direct Access Number — F464</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 1</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 1</td>
</tr>
<tr>
<td>Maximum — 9999</td>
</tr>
</tbody>
</table>

**Load Moment of Inertia 2**

Program ⇒ Feedback ⇒ PG Settings

This parameter is used for calculating accel/decel torque when compensating for load inertia while operating in the **Drooping Control** mode.

<table>
<thead>
<tr>
<th>Direct Access Number — F465</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 35</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 100</td>
</tr>
</tbody>
</table>

**Speed PID Switching Frequency**

Program ⇒ Feedback ⇒ Feedback Settings

While running, this parameter establishes the threshold speed setting that is used to determine if PID control may engage or remain engaged if active.

<table>
<thead>
<tr>
<th>Direct Access Number — F466</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>

**V/I Input Bias**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine-tune the bias of the V/I input terminals.

*Note:* See note on pg. 50 for more information on the V/I terminal.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system. This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number — F470</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 141</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 255</td>
</tr>
</tbody>
</table>
**V/I Input Gain**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the gain of the V/I input terminals.

*Note:* See note on pg. 50 for more information on the V/I terminal.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

**RR Input Bias**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.

**RR Input Gain**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

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

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

**RX Input Bias**

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the bias of the RX input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide an output of zero from the ASD.
### RX Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the gain of the RX input terminal when this terminal is used as the control input while operating in the **Speed Control** mode or the **Torque Control** mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F475</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>127</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>255</td>
</tr>
</tbody>
</table>

### RX2 (AI1) Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the bias of the RX2 (AI1) input terminal when this terminal is used as the control input while operating in the **Speed Control** mode or the **Torque Control** mode.

This setting may be used to ensure that the zero level of the input source (pot, pressure transducer, flow meter, etc.) is also the zero level setting of the ASD system.

This is accomplished by setting the input source to zero and adjusting this setting to provide a zero output from the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F476</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>128</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>255</td>
</tr>
</tbody>
</table>

### RX2 (AI1) Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the gain of the RX2 (AI1) input terminal when this terminal is used as the control input while operating in the **Speed Control** mode or the **Torque Control** mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F477</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>128</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>255</td>
</tr>
</tbody>
</table>

### AI2 (Option V/I) Input Bias

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the gain of the Optional AI2 input terminal when this terminal is used as the control input while operating in the **Speed Control** mode or the **Torque Control** mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F478</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>128</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>255</td>
</tr>
</tbody>
</table>
AI2 (Option VII) Input Gain

Program ⇒ Frequency ⇒ Speed Reference Setpoints

This parameter is used to fine tune the gain of the Optional AI2 input terminal when this terminal is used as the control input while operating in the Speed Control mode or the Torque Control mode.

This setting may be used to ensure that the 100% level of the input source (pot, pressure transducer, flow meter, etc.) is also the 100% level setting of the ASD system.

This is accomplished by setting the input source to 100% and adjusting this setting to provide an output of 100% from the ASD.

Direct Access Number — F479
Parameter Type — Numerical
Factory Default — 128
Changeable During Run — Yes
Minimum — 0
Maximum — 255
VLP External Device Delay Timer

Virtual Linear Pump ⇒ External Device Delay Timer

During a properly configured VLP operation, this parameter establishes the time that the VLP operating level must remain within the VLP Maximum Zone or the VLP Minimum Zone to activate/deactivate the Sleep Timer (F382) or an auxiliary pump.

See Figures 31 and 32 for more information on the VLP Maximum Zone and VLP Minimum Zone.

Increasing Load

If the VLP operating level of the Lead Pump is within the VLP Maximum Zone, and the External Device Delay Timer times out, OUT1 will change states and activate an auxiliary pump (Lag1).

Should the VLP operating level return to the VLP Maximum Zone 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 VLP Minimum Zone, 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 VLP Minimum Zone for a duration in excess of the External Device Delay Timer, OUT1 will change states and deactivate the auxiliary pump (Lag1).

Note: Set the Sleep Timer Delay (F383) to two (2) times the VLP 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.

<table>
<thead>
<tr>
<th>PUMP ID</th>
<th>IF @</th>
<th>AND</th>
<th>THEN</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Pump</td>
<td>Max Zone</td>
<td>Counter Time = 0</td>
<td>Activate OUT1</td>
<td></td>
</tr>
<tr>
<td>Lag1 Pump</td>
<td>Max Zone</td>
<td>Counter Time = 0</td>
<td>Activate OUT2</td>
<td></td>
</tr>
<tr>
<td>Lag2 Pump</td>
<td>Max Zone</td>
<td>Counter Time = 0</td>
<td>Run Continuous</td>
<td></td>
</tr>
<tr>
<td>Lag2 Pump</td>
<td>Min Zone</td>
<td>Counter Time = 0</td>
<td>Deactivate OUT2</td>
<td></td>
</tr>
<tr>
<td>Lag1 Pump</td>
<td>Min Zone</td>
<td>Counter Time = 0</td>
<td>Deactivate OUT1</td>
<td></td>
</tr>
<tr>
<td>Lead Pump</td>
<td>Min Zone</td>
<td>Counter Time = 0</td>
<td>—</td>
<td>Sleep if enabled</td>
</tr>
</tbody>
</table>

Note: The number of pumps used may be increased by using the optional expansion board (Primary pump plus auxiliary pumps).
VLP Low Band Threshold
Virtual Linear Pump ⇒ Low Band Threshold

During a properly configured VLP operation, this parameter establishes the upper limit of the VLP Minimum Zone.
See F480 for more information on this parameter.

VLP High Band Threshold
Virtual Linear Pump ⇒ High Band Threshold

This parameter sets the lower limit of the VLP Maximum Zone.
See F480 for more information on this parameter.

VLP Low Suction/No-Flow Cut Off Pressure Mode
Virtual Linear Pump ⇒ Low Suction Pressure Mode

This parameter is used to halt the ASD in the event of the loss of feed water to the pump or if there is a closed output valve at the pump output.

A low-pressure suction switch may be used to detect the loss of feed water by opening or closing a circuit in the event of feed water loss. The switch state change would result in the activation of a discrete input terminal (set to Low Suction/No Flow Protection) resulting in an AbFL trip.

Either a closed output valve or a suction pressure loss will result in the ASD running at the Upper-Limit Frequency indefinitely.

To monitor the Upper-Limit Frequency run time for either condition, set F484 for the time that the ASD may output the Upper-Limit Frequency continuously before the system initiates an AbFL trip.

Set this parameter to On (Physical Switch) if using a discrete input terminal for detection.

Set this parameter to On (Electronic Switch) if using the Upper Limit run-time for detection — set the run-time limit at F484.

Note: The On (Electronic Switch) setting allows for the availability of the Trip (0) and Alarm (1) selections at F450 ONLY.

Settings:
0 — Off
1 — On (Physical Switch)
2 — On (Electronic Switch; F484 Setting)
Low Suction Pressure Delay Timer

Virtual Linear Pump ⇒ Low Suction Pressure Delay Timer

This parameter has three functions.
1. It is used to set the time that the ASD will be allowed to run at the Upper-Limit Frequency continuously before the system is turned off. This condition is used as an indication of loss of feed water or a closed output valve. See F483 for more information on this function.
2. It is used to set the time that a Low Suction/No Flow condition is allowed to continue before a shut down.
3. It is used to set the time that must lapse before a system restart is attempted after a system shut down due to a Low Suction/No Flow condition. See F450 for more information on this function.

Sealing Water/Vacuum Prime Enable

Virtual Linear Pump ⇒ Sealing Water/Vacuum Prime Enable

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 — Disabled
1 — Enabled

Direct Operation VLP Command Value via Communications

Program ⇒ Virtual Linear Pump ⇒ VLP Settings

During a properly configured VLP operation while operating in the Direct mode and using communications for system control, this parameter establishes the VLP level.

This parameter setting is effective ONLY while operating in the Direct mode and while receiving a command via communications. The end value of this parameter setting appears in the Frequency Command screen as shown below.

Direct Access Number — F484
Parameter Type — Numerical
Factory Default — 10
Changeable During Run — Yes
Minimum — 1
Maximum — 255
Units — Seconds

Direct Access Number — F485
Parameter Type — Selection List
Factory Default — Disabled
Changeable During Run — Yes

Direct Access Number — F486
Parameter Type — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — 10
Maximum — 165
## Process Hold Operation VLP Command Value via Communications

Program ➔ Virtual Linear Pump ➔ VLP Settings

During a properly configured VLP operation while operating in the Process Hold mode and using communications for system control, this parameter establishes the VLP level.

This parameter setting is effective ONLY while operating in the Process Hold mode and while receiving a command via communications. The end value of this parameter setting appears in the Frequency Command screen as shown below.

![Diagram showing VLP Technology Avg and V/L Input parameters](image)

### Permanent Magnet (PM) Motor Constant 1

Program ➔ Motor ➔ PM Motor

This parameter is used with synchronous motor applications only. Contact the TIC Customer Support Center for information on this parameter.

### Permanent Magnet (PM) Motor Constant 2

Program ➔ Motor ➔ PM Motor

This parameter is used with synchronous motor applications only. Contact the TIC Customer Support Center for information on this parameter.

### Acceleration Time 2

Program ➔ Special ➔ Acc/Dec 1 – 4 Settings

This parameter specifies the time in seconds for the output of the ASD to go from 0.0 Hz to the Maximum Frequency for the 2 Acceleration profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel time may be set using F508.

This setting may be adjusted to stabilize unstable VLP operation.

This setting is also used to determine the acceleration rate of the UP/DOWN Frequency Functions.

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

### Direct Access Numbers

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Direct Access Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLP Level</td>
<td>F487</td>
</tr>
<tr>
<td>PM Motor Constant 1</td>
<td>F498</td>
</tr>
<tr>
<td>PM Motor Constant 2</td>
<td>F499</td>
</tr>
<tr>
<td>Acceleration Time 2</td>
<td>F500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter Setting</th>
<th>F403 Setting</th>
<th>F393 Setting</th>
</tr>
</thead>
</table>

Note: Values in parentheses are ASD-dependent.
**Deceleration Time 2**

Program ⇒ Fundamental ⇒ Accel/Decel 1 Settings

This parameter specifies the time in seconds for the output of the ASD to go from the **Maximum Frequency** to 0.0 Hz for the **2 Deceleration** profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel time may be set using F508.

This setting may be adjusted to stabilize unstable VLP operation.

This setting is also used to determine the deceleration rate of the **UP/DOWN Frequency Functions**.

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

---

**Direct Access Number — F501**

Parameter Type — Numerical

Factory Default — (ASD-Dependent)

Changeable During Run — Yes

Minimum — 0.1

Maximum — 6000

Units — Seconds
**Acceleration/Deceleration Pattern 1**

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the 1 Accel/Decel parameters (See F009 and F010).

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

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

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

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

- **S-pattern 2** decreases the rate of change above the base frequency for acceleration and deceleration.
Acc/Dec Pattern 2

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

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

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2
Acc/Dec Pattern 1 – 4

Program ⇒ Special ⇒ Acc/Dec Special

Four Acceleration times and four Deceleration times may be set up and run
individually. Accel/Decel Time 1 – 4 may be selected using this parameter
setting or switched via threshold frequencies, or by discrete input terminal.

This parameter is used to select one of the four configured accel/decel profiles
to be used.

Settings:

1 — Acc/Dec 1
2 — Acc/Dec 2
3 — Acc/Dec 3
4 — Acc/Dec 4

Each Accel/Decel selection is comprised of an Acceleration Time,
Deceleration Time, and a Pattern selection. Selection 1, 2, and 3 have a
Switching Frequency setting. The Switching Frequency is used as a threshold
frequency that, once reached, the ASD switches 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.

Acc/Dec 1 is set up using parameters F009 (Acc Time), F010 (Dec Time), F502
(Pattern), and F505 (Switching Frequency).

Acc/Dec 2 is set up using parameters F500 (Acc Time), F501 (Dec Time), F503
(Pattern), and F513 (Switching Frequency).

Acc/Dec 3 is set up using parameters F510 (Acc Time), F511 (Dec Time), F512
(Pattern), and F513 (Switching Frequency).

Acc/Dec 4 is set up using parameters F514 (Acc Time), and F515 (Dec Time),
F516 (Pattern).

This parameter (F504) is used to manually select Acc/Dec 1 – 4.

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 in Table 5.

Figure 37 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.

While operating using S-Pattern 1 the system performance may be further
enhanced by the adjustment of parameters F506 – F509. 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.

Table 5. Using combinations of discrete terminal activations Accel/Decel profiles
1 – 4 may be selected.

<table>
<thead>
<tr>
<th>A/D SW 1</th>
<th>A/D SW 2</th>
<th>Acc/Dec # Out</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

1 = Discrete terminal activation.

Accel/Decel Switching Frequency 1

Program ⇒ Special ⇒ Accel/Decel Special

This parameter sets the frequency at which the acceleration control is switched
from the Accel 1 profile to the Accel 2 profile during a multiple-acceleration
profile configuration.

Direct Access Number — F504
Parameter Type — Selection List
Factory Default — 1
Changeable During Run — Yes

Figure 37. Using Acc/Dec Switching.

Acc/Dec Switching Truth Table

<table>
<thead>
<tr>
<th>Acc/Dec # Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

Direct Access Number — F505
Parameter Type — Numerical
Factory Default — 30.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz
### S-Pattern Acceleration Lower-Limit Adjustment

Program ⇒ Special ⇒ Accel/Decel 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 parameter **F502** on pg. 181 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F506</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>50</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### S-Pattern Acceleration Upper-Limit Adjustment

Program ⇒ Special ⇒ Accel/Decel Special

During an **S-Pattern 1** or **2** sequence, this parameter settings 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 parameter **F502** on pg. 181 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F507</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>50</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### S-Pattern Deceleration Lower-Limit Adjustment

Program ⇒ Special ⇒ Accel/Decel Special

During an **S-Pattern 1** or **2** sequence, this parameter settings modifies the deceleration rate for the lower part of the deceleration curve by the percentage set here.

This function is commonly used with transportation and lifting applications. See parameter **F502** on pg. 181 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F508</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>50</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### S-Pattern Deceleration Upper-Limit Adjustment

Program ⇒ Special ⇒ Accel/Decel Special

During an **S-Pattern 1** or **2** sequence, this parameter settings modifies the deceleration rate for the upper part of the deceleration curve by the percentage set here.

This function is commonly used with transportation and lifting applications. See parameter **F502** on pg. 181 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F509</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>50</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Acceleration Time 3

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

This parameter specifies the time in seconds for the output of the ASD to go from 0.0 Hz to the **Maximum Frequency** for the **3 Acceleration** profile. The Accel/Decel pattern may be set using **F502**. The minimum Accel/Decel 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 Accel/Decel, Stall, and Ridethrough** settings may lengthen the acceleration times.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F510</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>(ASD-Dependent)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum</td>
<td>6000</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>
Deceleration Time 3

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

This parameter specifies the time in seconds for the output of the ASD to go from the Maximum Frequency to 0.0 Hz for the 3 Deceleration profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel 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 Accel/Decel, Stall, and Ridethrough settings may lengthen the deceleration times.

Acceleration/Deceleration Pattern 3

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the 3 Accel/Decel parameter.

Settings:

0 — Linear
1 — S-Pattern 1
2 — S-Pattern 2

Acceleration/Deceleration Switching Frequency 2

Program ⇒ Special ⇒ Accel/Decel Special

This parameter sets the frequency at which the acceleration control is switched from the Accel 2 profile to the Accel 3 profile during a multiple-acceleration profile configuration.

Acceleration Time 4

Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings

This parameter specifies the time in seconds for the output of the ASD to go from 0.0 Hz to the Maximum Frequency for the 4 Acceleration profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel 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 Accel/Decel, Stall, and Ridethrough settings may lengthen the acceleration times.
### Deceleration Time 4

<table>
<thead>
<tr>
<th>Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings</th>
</tr>
</thead>
</table>

This parameter specifies the time in seconds for the output of the ASD to go from the **Maximum Frequency** to 0.0 Hz for the **4 Deceleration** profile. The Accel/Decel pattern may be set using F502. The minimum Accel/Decel 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 Accel/Decel, Stall, and Ridethrough** settings may lengthen the deceleration times.

### Acceleration/Deceleration Pattern 4

<table>
<thead>
<tr>
<th>Program ⇒ Special ⇒ Accel/Decel 1 – 4 Settings</th>
</tr>
</thead>
</table>

This parameter enables a user-selected preprogrammed output profile that controls the acceleration and deceleration pattern for the **4 Accel/Decel** parameter.

**Settings:**
- 0 — Linear
- 1 — S-Pattern 1
- 2 — S-Pattern 2

### Acceleration/Deceleration Switching Frequency 3

<table>
<thead>
<tr>
<th>Program ⇒ Special ⇒ Accel/Decel Special</th>
</tr>
</thead>
</table>

This parameter sets the frequency at which the acceleration control is switched from the **Accel 3** profile to the **Accel 4** profile during a multiple-acceleration profile configuration.

### Pattern Operation Selection

<table>
<thead>
<tr>
<th>Program ⇒ Pattern Run ⇒ Pattern Run</th>
</tr>
</thead>
</table>

**Pattern Run** operation is enabled by selecting **Seconds** or **Minutes** as a unit of measure for the **Operation Time** setting for the selected **Preset Speeds**.

See Parameter F523 for more information on **Selections** and **Group Speeds** setup.

**Settings:**
- 0 — Disabled
- 1 — Enabled (Units in Seconds)
- 2 — Enabled (Units in Minutes)

### Pattern Operation Mode

<table>
<thead>
<tr>
<th>Program ⇒ Pattern Run ⇒ Pattern Run</th>
</tr>
</thead>
</table>

This parameter sets the start condition of subsequent **Pattern Runs** after the initial **Pattern Run** has been terminated or has completed its programming.

**Settings:**
- 0 — Reset After Stop
- 1 — Continue After Stop
**Pattern 1 Repeat**

Program ⇒ Pattern Run ⇒ Pattern Run

This parameter sets the number of times to repeat the Pattern Group 1.

**Settings:**
- 1 = Once Then Stop
- 2 – 254 = Number of Repeats
- 255 = Infinite (Forever)

**Direct Access Number —** F522

**Parameter Type —** Numerical

**Factory Default —** 255 (Infinite)

**Changeable During Run —** No

**Minimum —** 1

**Maximum —** 255 (Infinite)

**Units —** Repetitions
Pattern Group 1 Selection 1

Program ⇒ Pattern Run ⇒ Speeds

Groups of configured Preset Speeds may be selected and run from this screen. The execution of grouped Preset Speeds in this manner is called a Pattern Run.

One to eight user-selected Preset Speeds may be run sequentially for a user-set number of repetitions. The group of user-selected Preset Speeds is called a Pattern Group. The Pattern Run function executes the user-set Pattern Group.

Pattern Group 1 is comprised of up to 8 Selections with each Selection being 1 of 15 possible Preset Speed settings. Skip may be selected to ignore a Selection.

This parameter allows the user to choose one configured Preset Speed that is to be used as Selection 1 (of 8) for Pattern Group 1. See F018 for information on configuring the individual Preset Speeds. Parameters F524 – F530 may be set up for subsequent Selections 2 – 8.

One Preset Speed number (1 – 15) or Skip is selected for Selection 1 (F523). The number of times to repeat Pattern Group 1 is selected at F522. Set this value to 255 to run forever.

Setup Pattern Group 2 at F531 – F539 if more Preset Speed entries are required.

Pattern Run Setup (for Pattern Group 1)

1. From Program ⇒ Pattern Run ⇒ Speeds, select the Preset Speeds that are to be used as the Pattern Group 1 set of Selections. Select a speed from the 1 – 15 configured presets; 1 speed number per Selection. Set any unused Selections to Skip.

2. From Program ⇒ Pattern Run ⇒ Pattern Run ⇒ Pattern Operation Selection, enable the Pattern Run mode of operation by selecting Seconds or Minutes as the unit of measure for the Operation Time setting.

3. From Program ⇒ Pattern Run ⇒ Operation Time, set the run-time for each Preset Speed selected in step 1.

4. Configure two unused discrete input terminals for Pattern Operation Group 1 and Pattern Operation Trigger Signal.

Note: Activation of the Pattern Operation Group 1 discrete input terminal is required to enable Pattern Group 1 for use.

Activation of the Pattern Operation Trigger Signal discrete input terminal starts the Pattern Group 1 pattern run.

5. From Program ⇒ Pattern Run ⇒ Pattern Run ⇒ Pattern 1 Repeat, set to the number of times that Pattern Group 1 is to be run. Set to 255 to run forever.

6. From Program ⇒ Pattern Run ⇒ Pattern Run ⇒ Pattern Operation Mode, set the end-of-pattern command to Reset or Continue.

7. From the Hand mode (Hand/Auto light is off), initiate a Run command (i.e., F and/or R terminal On).

8. Connect the Pattern Operation Group 1 input terminal to CC.

9. Connect the Pattern Operation Trigger Signal input terminal to CC and the Pattern Run will start and continue as programmed.

10. Open the Pattern Operation Trigger Signal connection to CC to stop the Pattern Run before its conclusion if required.
Pattern Group 1 Selection 2

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 2 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip
1 – 15 Preset Speed Number

See F523 for more information on this parameter.

Pattern Group 1 Selection 3

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 3 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip
1 – 15 Preset Speed Number

See F523 for more information on this parameter.

Pattern Group 1 Selection 4

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 4 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip
1 – 15 Preset Speed Number

See F523 for more information on this parameter.

Pattern Group 1 Selection 5

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 5 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip
1 – 15 Preset Speed Number

See F523 for more information on this parameter.
**Pattern Group 1 Selection 6**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 6 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip

1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern Group 1 Selection 7**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 7 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip

1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern Group 1 Selection 8**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 8 Selection to be included in Pattern Group 1.

Skip may be selected to ignore this Selection.

Setting

0 — Skip

1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern 2 Repeat**

Program ⇒ Pattern Run ⇒ Pattern Run

This parameter sets the number of times to repeat the Pattern Group 2.

Direct Access Number — F531

Parameter Type — Numerical

Factory Default — 255 (Infinite)

Minimum — 1

Maximum — 255 (Infinite)

Units — Repetitions

See F523 for more information on this parameter.
**Pattern Group 2 Selection 1**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 1 selection to be included in the Group 2 Selection. Skip may be selected to ignore this Selection.

Setting

- 0 — Skip
- 1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern Group 2 Selection 2**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 2 selection to be included in the Group 2 Selection. Skip may be selected to ignore this Selection.

Setting

- 0 — Skip
- 1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern Group 2 Selection 3**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 3 selection to be included in the Group 2 Selection. Skip may be selected to ignore this Selection.

Setting

- 0 — Skip
- 1 – 15 Preset Speed Number

See F523 for more information on this parameter.

**Pattern Group 2 Selection 4**

Program ⇒ Pattern Run ⇒ Speeds

This parameter allows the user to select 1 of 15 configured Preset Speeds as the number 4 selection to be included in the Group 2 Selection. Skip may be selected to ignore this Selection.

Setting

- 0 — Skip
- 1 – 15 Preset Speed Number

See F523 for more information on this parameter.
### Pattern Group 2 Selection 5

<table>
<thead>
<tr>
<th>Program</th>
<th>Pattern Run</th>
<th>Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This parameter allows the user to select 1 of 15 configured **Preset Speeds** as the number **5** selection to be included in the **Group 2 Selection**.

Skip may be selected to ignore this **Selection**.

**Setting**

- 0 — Skip
- 1 – 15 Preset Speed Number

See [F523](#) for more information on this parameter.

### Pattern Group 2 Selection 6

<table>
<thead>
<tr>
<th>Program</th>
<th>Pattern Run</th>
<th>Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This parameter allows the user to select 1 of 15 configured **Preset Speeds** as the number **6** selection to be included in the **Group 2 Selection**.

Skip may be selected to ignore this **Selection**.

**Setting**

- 0 — Skip
- 1 – 15 Preset Speed Number

See [F523](#) for more information on this parameter.

### Pattern Group 2 Selection 7

<table>
<thead>
<tr>
<th>Program</th>
<th>Pattern Run</th>
<th>Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This parameter allows the user to select 1 of 15 configured **Preset Speeds** as the number **7** selection to be included in the **Group 2 Selection**.

Skip may be selected to ignore this **Selection**.

**Setting**

- 0 — Skip
- 1 – 15 Preset Speed Number

See [F523](#) for more information on this parameter.

### Pattern Group 2 Selection 8

<table>
<thead>
<tr>
<th>Program</th>
<th>Pattern Run</th>
<th>Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This parameter allows the user to select 1 of 15 configured **Preset Speeds** as the number **8** selection to be included in the **Group 2 Selection**.

Skip may be selected to ignore this **Selection**.

**Setting**

- 0 — Skip
- 1 – 15 Preset Speed Number

See [F523](#) for more information on this parameter.
### Speed 1 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 1**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F540
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting

<table>
<thead>
<tr>
<th>F540</th>
<th>F545</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed 1 Operation Time</td>
<td>Speed 2 Operation Time</td>
</tr>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Time</td>
<td>Program ⇒ Pattern Run ⇒ Operation Time</td>
</tr>
<tr>
<td>This parameter sets the run-time for <strong>Preset Speed 1</strong>.</td>
<td>This parameter sets the run-time for <strong>Preset Speed 2</strong>.</td>
</tr>
<tr>
<td>This time is effective when used with <strong>Group Speeds</strong> and non-<strong>Group Speeds</strong>.</td>
<td>This time is effective when used with <strong>Group Speeds</strong> and non-<strong>Group Speeds</strong>.</td>
</tr>
<tr>
<td>If the <strong>Auto-Restart</strong> function is activated, the search time required for the <strong>Auto-Restart</strong> function will be subtracted from the <strong>Operation Time</strong> setting; resulting in a shorter run time.</td>
<td>If the <strong>Auto-Restart</strong> function is activated, the search time required for the <strong>Auto-Restart</strong> function will be subtracted from the <strong>Operation Time</strong> setting; resulting in a shorter run time.</td>
</tr>
</tbody>
</table>

### Speed 2 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 2**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F541
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting

### Speed 3 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 3**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F542
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting

### Speed 4 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 4**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F543
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting

### Speed 5 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 5**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F544
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting

### Speed 6 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for **Preset Speed 6**.

This time is effective when used with **Group Speeds** and non-**Group Speeds**.

If the **Auto-Restart** function is activated, the search time required for the **Auto-Restart** function will be subtracted from the **Operation Time** setting; resulting in a shorter run time.

**Direct Access Number** — F545
**Parameter Type** — Numerical
**Factory Default** — 5.0
**Changeable During Run** — Yes
**Minimum** — 0.1
**Maximum** — 6000.0
**Units** — F520 Setting
Speed 7 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 7.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F546
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 8 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 8.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F547
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 9 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 9.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F548
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 10 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 10.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F549
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 11 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 11.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F550
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 12 Operation Time
Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 12.
This time is effective when used with Group Speeds and non-Group Speeds.
If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F551
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting
Speed 13 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 13. This time is effective when used with Group Speeds and non-Group Speeds. If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F552
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 14 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 14. This time is effective when used with Group Speeds and non-Group Speeds. If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F553
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Speed 15 Operation Time

Program ⇒ Pattern Run ⇒ Operation Time

This parameter sets the run-time for Preset Speed 15. This time is effective when used with Group Speeds and non-Group Speeds. If the Auto-Restart function is activated, the search time required for the Auto-Restart function will be subtracted from the Operation Time setting; resulting in a shorter run time.

Direct Access Number — F554
Parameter Type — Numerical
Factory Default — 5.0
Changeable During Run — Yes
Minimum — 0.1
Maximum — 6000.0
Units — F520 Setting

Preset Speed Operation Mode

Program ⇒ Pattern Run ⇒ Operation Mode

This parameter is used to set the Preset Speed operating mode. Select Disabled at this parameter to use the speed command only for Preset Speed operation. Select Enabled at this parameter to apply the control settings of F561 – F575 to the associated Preset Speed while operating in the Preset Speed mode.

Settings:
0 — Disabled (Preset Speed Only)
1 — Enabled (Full Preset Speed Mode)
**Preset Speed 1 Operation Mode**

Program ⇒ Pattern Run ⇒ Operation Mode

This parameter is enabled at F560 and is used to set the speed, torque, and direction of Preset Speed 1.

This screen is comprised of 4 fields that are labeled as follows: **Direction**, **Acc/Dec Group**, **V/f Group**, and **Torque Limit Group**. Scroll to the field of interest and press the scroll knob (Enter). Using the scroll knob, set the value and press the scroll knob (Enter).

Parameters F562 – F575 are used to set the functions listed here for Preset Speeds 2 – 15.

When using communications write the appropriate byte to location F561 as indicated below.

Settings:
- 0 — Forward Run
- 1 — Reverse Run
- 2 — Accel/Decel Switching 1
- 4 — Accel/Decel Switching 2
- 8 — V/f Switching Signal 1
- 16 — V/f Switching Signal 2
- 32 — Torque Limit Switching Signal 1
- 64 — Torque Limit Switching Signal 2

Writing the following data to location F561 via communications results in:
Forward Run, A/D SW 2, V/f SW 3, Torque Lim SW 4.

<table>
<thead>
<tr>
<th>Torque Limit Switch 2</th>
<th>V/f Switch</th>
<th>A/D Switch</th>
<th>F/R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>64</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Preset Speed 2 Operation Mode**

Program ⇒ Pattern Run ⇒ Operation Mode

Same as Preset Speed 1 Operation Mode (See F561).

**Preset Speed 3 Operation Mode**

Program ⇒ Pattern Run ⇒ Operation Mode

Same as Preset Speed 1 Operation Mode (See F561).
<table>
<thead>
<tr>
<th>Preset Speed 4 Operation Mode</th>
<th>Direct Access Number — F564</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 5 Operation Mode</th>
<th>Direct Access Number — F565</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 6 Operation Mode</th>
<th>Direct Access Number — F566</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 7 Operation Mode</th>
<th>Direct Access Number — F567</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 8 Operation Mode</th>
<th>Direct Access Number — F568</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 9 Operation Mode</th>
<th>Direct Access Number — F569</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 10 Operation Mode</th>
<th>Direct Access Number — F570</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 11 Operation Mode</th>
<th>Direct Access Number — F571</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 12 Operation Mode</th>
<th>Direct Access Number — F572</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preset Speed 13 Operation Mode</th>
<th>Direct Access Number — F573</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ Pattern Run ⇒ Operation Mode</td>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Same as Preset Speed 1 Operation Mode (See F561).</td>
<td>Factory Default — Forward Run</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
<td></td>
</tr>
</tbody>
</table>
### Preset Speed 14 Operation Mode

Program → Pattern Run → Operation Mode

Same as Preset Speed 1 Operation Mode (See F561).

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F574</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>Forward Run</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Preset Speed 15 Operation Mode

Program → Pattern Run → Operation Mode

Same as Preset Speed 1 Operation Mode (See F561).

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F575</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>Forward Run</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Motor Overload Protection Level 1

Program → Fundamental → Motor Set 1

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

The unit of measurement for this parameter may be set to A/V (Amps) or it may be set as a percentage of the ASD rating. The nameplated FLA of the motor may be entered directly when Amps is selected as the unit of measurement (See F701 to change the display unit).

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

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>100</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum —</td>
<td>10</td>
</tr>
<tr>
<td>Maximum —</td>
<td>100.0</td>
</tr>
<tr>
<td>Units —</td>
<td>%</td>
</tr>
</tbody>
</table>

### 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 ASD.

**Note:** The Motor Overload Protection parameter must enabled at F017 to use this feature.

### Retain Trip Record at Power Down

Program → Protection → Trip Settings

This parameter Enables/Disables the Trip Record Retention setting. When enabled, this feature logs the trip event and retains the trip information when the system powers down. The trip information may be viewed from the (Program ⇒ Utilities ⇒) Trip History screen or the Monitor screen.

When disabled, the trip information will be cleared when the system powers down.

Settings:

0 — Disabled

1 — Enabled

<table>
<thead>
<tr>
<th>Direct Access Number —</th>
<th>F602</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type —</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default —</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Emergency Off Mode Settings
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 Braking Stop
- 3 — Deceleration Stop (Decel 4 setting; F515)

Emergency Off DC Injection Application Time
Program ⇒ Protection ⇒ Emergency Off Settings

When DC Injection is selected at F603 this parameter determines the time that the DC Injection Braking is applied to the motor.

<table>
<thead>
<tr>
<th>Direct Access Number — F604</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 1.0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.0</td>
</tr>
<tr>
<td>Maximum — 20.0</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

ASD Output Phase Failure Detection
Program ⇒ Protection ⇒ Phase Loss

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

*Note:* Autotune checks for phase failures regardless of this setting.

Settings:
- 0 — Disabled (No Detection)
- 1 — Enabled (Run at Startup and Retry)
- 2 — Enabled (Every Run Command and Retry)
- 3 — Enabled (During Run)
- 4 — Enabled (At Startup and During Run)
- 5 — Enabled (Detects an ALL-PHASE Failure ONLY - Will Not Trip, Restarts At Reconnect)
### Overload Reduction Starting Frequency

**Program** ⇒ Protection ⇒ Overload

This parameter is primarily used with V/f motors. It is used to reduce the starting frequency at which the Overload Reduction function begins and is useful during extremely low-speed motor operation.

During very low-speed operation the cooling efficiency of the motor decreases. Lowering the start frequency of the Overload Reduction function aides in minimizing the generated heat and precluding an Overload trip.

This function is useful in loads such as fans, pumps, and blowers that have the square reduction torque characteristic.

Set parameter F607 to the desired Overload Time Limit.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F606</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>6.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.00</td>
</tr>
<tr>
<td>Units</td>
<td>Hz</td>
</tr>
</tbody>
</table>

### Motor 150% Overload Time Limit

**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%.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F607</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>300</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>10</td>
</tr>
<tr>
<td>Maximum</td>
<td>2400</td>
</tr>
<tr>
<td>Units</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

### ASD Input Phase Failure Detection

**Program** ⇒ Protection ⇒ Phase Loss

This parameter enables the 3-phase input power phase loss detection feature. A loss of either input phase (R, S, or T) results in a trip.

Settings:
- 0 — Disabled
- 1 — Enabled

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F608</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Enabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>

### Low-Current Detection Current Hysteresis Width

**Program** ⇒ Protection ⇒ Low-Current Settings

During a momentary low-current condition, this parameter provides a current threshold level to which the low-current condition must return within the time setting of F612 or a Low-Current Trip will be incurred.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F609</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>20</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Low-Current Trip

**Program** ⇒ Protection ⇒ Low-Current Settings

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

When enabled, the ASD will trip on a low-current fault if the output current of the ASD falls below the level defined at F611 and remains there for the time set at F612.

Settings:
- 0 — Disabled
- 1 — Enabled

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F610</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Disabled</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
### Low-Current Detection Threshold

With the **Low-Current Trip (F610)** parameter enabled, this function sets the low-current trip threshold. The threshold value is entered as a percentage of the maximum rating of the ASD.

<table>
<thead>
<tr>
<th>Direct Access Number — F611</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 100</td>
</tr>
<tr>
<td>Units — %</td>
</tr>
</tbody>
</table>

### Low-Current Trip Threshold Time

With the **Low-Current Trip (F610)** parameter enabled, this function sets the time that the low-current condition must exist to cause a trip.

<table>
<thead>
<tr>
<th>Direct Access Number — F612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 255</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

### Short Circuit Detection At Start

This parameter determines when the system will perform an **Output Short Circuit** test.

**Note:** Selection 3 is recommended for high-speed motor applications. Because of the low impedance of high-speed motors the standard-pulse setting may result in a motor malfunction.

Settings:

- 0 — Every Start (Standard Pulse)
- 1 — Power On or Reset (Standard Pulse)
- 2 — Every Start (Short Pulse)
- 3 — Power On or Reset (Short Pulse)

### Over-Torque Trip

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
Over-Torque Detection Level (Positive Torque)

Program ⇒ Protection ⇒ Over-Torque Parameters

This parameter sets the torque threshold level that is used as a setpoint for over-torque tripping during positive torque. This setting is a percentage of the maximum rated torque of the ASD.
This function is enabled at F615.

Direct Access Number — F616
Parameter Type — Numerical
Factory Default — 200.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 250.00
Units — %

Over-Torque Detection Level (Negative Torque)

Program ⇒ Protection ⇒ Over-Torque Parameters

This parameter sets the torque threshold level that is used as a setpoint for over-torque tripping during negative torque (regen). This setting is a percentage of the maximum rated torque of the ASD.
This function is enabled at F615.

Direct Access Number — F617
Parameter Type — Numerical
Factory Default — 200.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 250.00
Units — %

Over-Torque Detection Time

Program ⇒ Protection ⇒ Over-Torque Parameters

This parameter sets the amount of time that the over-torque condition may exceed the tripping threshold level set at F616 and F617 before a trip occurs.
This function is enabled at F615.

Direct Access Number — F618
Parameter Type — Numerical
Factory Default — 0.50
Changeable During Run — Yes
Minimum — 0.00
Maximum — 10.0
Units — Seconds

Over-Torque Detection Hysteresis

Program ⇒ Protection ⇒ Over-Torque Parameters

During a momentary over-torque condition, this parameter provides a torque threshold level to which the over-torque condition must return within the time setting of F618 or an Over-Torque Trip will be incurred.

Direct Access Number — F619
Parameter Type — Numerical
Factory Default — 10.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 100.00
Units — %

Cooling Fan Control

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter sets the cooling fan run-time command.

Settings:
0 — Automatic
1 — Always On

Direct Access Number — F620
Parameter Type — Selection List
Factory Default — Automatic
Changeable During Run — Yes

Cumulative Operation Time Alarm

Program ⇒ Protection ⇒ Special Protection Parameters

This parameter sets a run-time value that, once exceeded, closes a discrete output contact. The output signal may be used to control external equipment or used to engage a brake.
Associate the Total-Operation-Hours Alarm setting of Table 9 on pg. 255 to a discrete output contactor.

Note: The time displayed is 1/10th of the actual time (0.1 hr. = 1.0 hr.).

Direct Access Number — F621
Parameter Type — Numerical
Factory Default — 610.0
Changeable During Run — Yes
Minimum — 0.0
Maximum — 999.9
Units — Hours (X 10)
Abnormal Speed Detection Time
Program ⇒ Protection ⇒ Abnormal Speed Settings
This parameter sets the time that an over-speed condition must exist to cause a trip.
This parameter functions in conjunction with the settings of F623 and F624.

Direct Access Number — F622
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 100.00
Units — Seconds

Over-Speed Detection Frequency Upper Band
Program ⇒ Protection ⇒ Abnormal Speed Settings
This parameter sets the upper level of the Base Frequency range that, once exceeded, will cause an Over-Speed Detected alert.
This parameter functions in conjunction with the settings of F622 and F624.

Direct Access Number — F623
Parameter Type — Numerical
Factory Default — 0.00 (Disabled)
Changeable During Run — Yes
Minimum — 0.0 (Disabled)
Maximum — 30.00
Units — Hz

Over-Speed Detection Frequency Lower Band
Program ⇒ Protection ⇒ Abnormal Speed Settings
This parameter sets the lower level of the Base Frequency range that, once the output speed falls below this setting, will cause a Speed Drop Detected alert.
This parameter functions in conjunction with the settings of F622 and F623.

Direct Access Number — F624
Parameter Type — Numerical
Factory Default — 0.00 (Disabled)
Changeable During Run — Yes
Minimum — 0.00 (Disabled)
Maximum — 30.00
Units — Hz

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 ASD during deceleration for a specified time in an attempt to prevent an Over-Voltage Trip.
If the over-voltage condition persists for over 4 mS, an Over-Voltage Trip will be incurred.
This parameter is enabled at F305.

Note: This parameter setting may increase deceleration times.

Under-Voltage Trip
Program ⇒ Protection ⇒ Under-Voltage/Ridethrough
This parameter Enables/Disables the Under-Voltage Trip function.
With this parameter Enabled, the ASD will trip if the under-voltage condition persists for a time greater than the F628 setting.
A user-selected contact may be actuated if so configured.
If Disabled the ASD will stop and not trip; the FL contact is not activated.

Settings:
0 — Disabled
1 — Enabled

Direct Access Number — F626
Parameter Type — Numerical
Factory Default — (ASD-Dependent)
Changeable During Run — Yes
Minimum — 100
Maximum — 150
Units — %

Direct Access Number — F627
Parameter Type — Selection List
Factory Default — Disabled
Changeable During Run — No
### Under-Voltage Trip Detection Time

**Program** ⇒ **Protection** ⇒ **Under-Voltage/Ridethrough**

This parameter sets the time that the under-voltage condition must exist to cause an Under-Voltage Trip.

This parameter is enabled at F627.

<table>
<thead>
<tr>
<th>Direct Access Number — F628</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.03</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
<tr>
<td>Minimum — 0.01</td>
</tr>
<tr>
<td>Maximum — 10.00</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>

### Regenerative Power Ridethrough Control Level

**Program** ⇒ **Protection** ⇒ **Under-Voltage/Ridethrough**

This parameter is activated during regeneration. It is used to set the low end of the DC bus voltage threshold that, once the bus voltage drops below this setting, activates the setting of F302 (Ridethrough Mode).

Activation may be the result of a momentary power loss or an excessive load on the bus voltage.

During a **Ridethrough**, regenerative energy is used to maintain the control circuitry settings for the duration of the **Ridethrough**; it is not used to drive the motor.

The motor(s) of the system are stopped and then restarted automatically or may continue seamlessly if so configured.

See F302 for more information on this parameter.

**Note:** This parameter setting may increase deceleration times.

### Brake Answer Delay Time

**Program** ⇒ **Protection** ⇒ **Special Protection Parameters**

This parameter is used in conjunction with the discrete input terminal setting **Brake Answerback Input** (See Table 6 on pg. 249 for more information on this feature).

After activating the discrete input terminal **Braking Request**, the setting of this parameter starts a count-down timer in which 1) a **Brake Answerback Input** response must be received or 2) the brake must release before the timer expires.

Should this timer setting expire before the **Brake Answerback Input** is returned or the brake releases, a **Brake Fault** (E-11) is incurred. Otherwise, the brake releases and normal motor operations resume.

### ASD Overload

**Program** ⇒ **Protection** ⇒ **Overload**

This parameter is used to protect the ASD from an over-current condition. The standard overload rating of the P9 ASD is 120% operation for 60 seconds.

This setting allows for the overload protection to be switched from the standard overload detection means (Thermal Detection and Overload) to thermal detection only.

**Settings:**

- 0 — Thermal Detection + Overload
- 1 — Thermal Detection Only

The **Thermal Detection Only** selection is used when multiple devices are installed horizontally as described on pg. 15.

<table>
<thead>
<tr>
<th>Direct Access Number — F631</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Thermal Detection + Overload</td>
</tr>
<tr>
<td>Changeable During Run — No</td>
</tr>
</tbody>
</table>

---

**F628**

Direct Access Number — F628

Parameter Type — Numerical

Factory Default — 0.03

Changeable During Run — No

Minimum — 0.01

Maximum — 10.00

Units — Seconds

**F629**

Parameter Type — Numerical

Factory Default — (ASD-Dependent)

Changeable During Run — No

Minimum — 55

Maximum — 100

Units — %

**F630**

Parameter Type — Numerical

Factory Default — 0.0 (Disabled)

Changeable During Run — Yes

Minimum — 0.0 (Disabled)

Maximum — 10.0

Units — Seconds

**F631**

Parameter Type — Selection List

Factory Default — Thermal Detection + Overload

Changeable During Run — No
V/I Analog Input Broken Wire Detection Level

This parameter is enabled by providing a non-zero value here. This function monitors the V/I input signal and if the V/I input signal falls below the level specified here and remains there for a period in excess of 0.3 seconds a trip will be incurred (E-18).

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

Annual Average Ambient Temperature

This parameter is used in conjunction with a discrete output terminal setting to notify the operator of the remaining useful life of critical components of the ASD system.

With a discrete output terminal set to Part Replacement Alarm (See Table 9 on pg. 255) and the calculation derived from the parameter setting, maintenance scheduling may be enhanced.

Settings:

1 — Under 10° C (50° F)
2 — Under 20° C (68° F)
3 — Under 30° C (86° F)
4 — Under 40° C (104° F)
5 — Under 50° C (122° F)
6 — Under 60° C (140° F)

Rush Relay Current Activation Time

At system startup, this parameter sets a time-delay for the start of the Rush Relay activation in an attempt to allow the DC bus voltage to reach the normal operating level before outputting a signal to the motor.

PTC1 Thermal Selection

This parameter Enables/Disables the optional external thermal detection circuit of the Expansion IO Card Option 1. A thermistor is connected from TH1+ to TH1- of TB3 on the Expansion IO Card Option 1.

Should the thermistor resistance reading fall below 50Ω because of an over-temperature condition or exceed 3000Ω because of an open circuit an External Thermal Fault (OH2) will be incurred.

Note: While this parameter is Enabled, the system cannot be restarted until the thermistor value recovers to the level of 1.8 kΩ from an over-temperature condition. An Auto-Restart will not be initiated subsequent to an External Thermal Trip (OH2). A manual restart will be required in the event of an OH2 trip.

Settings:

0 — Disabled
1 — Detect Disconnect
PTC2 Thermal Selection

Program ⇒ Special ⇒ Special Parameters ⇒ PTC2 Thermal Selection

This parameter Enables/Disables the optional external thermal detection circuit of the Expansion IO Card Option 2. A thermistor is connected from TH1+ to TH1- of TB4 on the Expansion IO Card Option 2.

Should the thermistor resistance reading fall below 50Ω because of an over-temperature condition or exceed 3000Ω because of an open circuit an External Thermal Fault (OH2) will be incurred.

Note: While this parameter is Enabled, the system cannot be restarted until the thermistor value recovers to the level of 1.8 kΩ from an over-temperature condition. An Auto-Restart will not be initiated subsequent to an External Thermal Trip (OH2). A manual restart will be required in the event of an OH2 trip.

Settings:
0 — Disabled
1 — Detect Disconnect

Braking Resistance Overload Time (10x rated torque)

Program ⇒ Protection ⇒ Dynamic Braking

This parameter sets the time that the braking resistor is allowed to sustain and overload condition before a trip is incurred.

This feature is useful for applications that have a fluctuating load or for loads that require a long deceleration time.

Step-Out Current Detection Level

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for information on this parameter.

Step-Out Current Detection Time

Program ⇒ Motor ⇒ PM Motor

This parameter is used with synchronous motor applications only.

Contact the TIC Customer Support Center for information on this parameter.
### V/I Analog Input Loss Response

**Program → Terminal → Input Special Functions**

This parameter is used to provide a system disposition in the event of the loss of the V/I input signal. The system will either trip, run the speed set at Preset Speed 14, or run at the F456 setting in the Direct mode.

*Note:* Preset Speed 14 must be configured to use the preset speed selection.

**Settings:**
- 0 — Trip
- 1 — Preset Speed 14
- 2 — Direct Mode Speed Setpoint (Run at F456 setting)

### Adding Input Selection

**Program → Feedback → Override Control**

This parameter Enables/Disables the feature that allows for the external adjustment of the Output Frequency. Selecting either of the input methods listed enables this feature. The selected input is used as a modifier of the programmed Output Frequency.

**Settings:**
- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 5 — EOI (Keypad)
- 6 — RS485 (2-Wire)
- 7 — Communication Option Board
- 8 — RX2 Option (AI1)
- 9 — Option V/I
- 10 — UP/DOWN Frequency (Terminal Board)
- 11 — Pulse Input (Option)
- 12 — Pulse Input (Motor CPU)
- 13 — Binary/BCD Input (Option)

### Multiplying Input Selection

**Program → Feedback → Override Control**

This parameter Enables/Disables the feature that allows for the external adjustment of the commanded frequency. Selecting either of the input methods listed enables this feature. The selected input is used as a multiplier of the commanded frequency.

If Setting (F729) is selected, the % value entered at parameter F729 is used as the multiplier of the commanded frequency.

**Settings:**
- 0 — Disabled
- 1 — V/I
- 2 — RR
- 3 — RX
- 4 — Setting (F729)
- 5 — RX2 Option (AI1)
AM Output Terminal Function

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output function of the AM analog output terminal. The AM analog 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 7 on pg. 253.

**Note:** To read current at this terminal connect a 100 – 500Ω resistor from the AM (+) terminal through the series Ammeter to the CC (-) terminal.

AM Terminal Setup Parameters

F670 — Set AM Function
F671 — Calibrate AM Terminal
F685 — Output Response Polarity Selection
F686 — Set Zero Level

AM Output Terminal Adjustment

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to calibrate the AM analog output. To calibrate the AM analog output, connect an ammeter as described at parameter F670.

With the ASD is running at a known value (e.g., output frequency), adjust this parameter until the associated function of parameter F670 produces the desired DC level output at the AM output terminal.

See F670 for more information on this setting.

MON1 Terminal Meter Selection

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output function of the MON1 analog output terminal. The available assignments for this output terminal are listed in Table 7 on pg. 253.

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 more information on the function of this terminal.

MON1 Terminal Setup Parameters

F672 — MON1 Output Function
F673 — MON1 Terminal Meter Adjustment
F688 — MON1 Voltage/Current Output Switching
F689 — MON1 Output Gradient Characteristic
F690 — MON1 Bias Adjustment Set Zero Level

Direct Access Number — F670
Parameter Type — Selection List
Factory Default — Output Current
Changeable During Run — Yes

Direct Access Number — F671
Parameter Type — Numerical
Factory Default — 512
Changeable During Run — Yes
Minimum — 1
Maximum — 1280

Direct Access Number — F672
Parameter Type — Selection List
Factory Default — Output Voltage
Changeable During Run — Yes
**MON1 Terminal Adjustment**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the gain of the MON1 output terminal and is used in conjunction with the settings of parameter F672.

See parameter F672 for more information on this setting.

**MON2 Terminal Meter Selection**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output function of the MON2 analog output terminal. The available assignments for this output terminal are listed in Table 7 on pg. 253.

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 more information on the function of this terminal.

**MON2 Terminal Setup Parameters**

- **F674** — MON2 Output Function
- **F675** — MON2 Terminal Meter Adjustment
- **F691** — MON2 Voltage/Current Output Switching
- **F692** — MON2 Output Gradient Characteristic
- **F693** — MON2 Bias Adjustment Set Zero Level

**FP Terminal Assignment**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the functionality of the FP output terminal to any one of the user-selectable functions listed in Table 7 on pg. 253.

As the assigned function changes in magnitude or frequency, the pulse count of the FP output terminal pulse train changes in direct proportion to changes in the assigned function.

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

This parameter is used in conjunction with parameter F677.
**FP Terminal Frequency**

**Program** ⇒ **Terminal** ⇒ **Analog Output Terminals**

This parameter scales the FP output terminal by setting the pulses-per-second output signal of the FP terminal.

See F676 for more information on this parameter.

---

**FM Voltage/Current Output Switching**

**Program** ⇒ **Terminal** ⇒ **Analog Output Terminals**

This parameter is used to select the type of output signal provided at the FM terminal (i.e., voltage or current).

The output voltage and current range is 0 – 10 VDC and 0 – 20 mA, respectively.

See F005 for more information on this setting.

Settings:
- 0 — 0 – 10 V
- 1 — 0 – 20 mA

---

**FM Output Gradient Characteristic**

**Program** ⇒ **Terminal** ⇒ **Analog Output Terminals**

This parameter sets the output response polarity of the FM output terminal. The FM output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F005 for more information on this setting.

Settings:
- 0 — Minus (Negative Gradient)
- 1 — Plus (Positive Gradient)

---

**FM Bias Adjustment**

**Program** ⇒ **Terminal** ⇒ **Analog Output Terminals**

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the FM terminal.

Set the function of F005 to zero and then set this parameter to zero for proper operation.

See F005 for more information on this setting.

---

**AM Output Gradient Characteristic**

**Program** ⇒ **Terminal** ⇒ **Analog Output Terminals**

This parameter sets the output response polarity of the AM output terminal.

The AM output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See F670 for more information on this setting.

Settings:
- 0 — Minus (Negative Gradient)
- 1 — Plus (Positive Gradient)
**AM Bias Adjustment**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the AM terminal.

Set the function set at F670 to zero and then set this parameter to zero for proper operation.

See F670 for more information on this setting.

**MON 1 Voltage/Current Output Switching**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output signal type of the MON1 output terminal.

Settings:
- 0 — -10 V – +10 V
- 1 — 0 – 10 V
- 2 — 0 – 20 mA

**MON 1 Output Gradient Characteristic**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the output response polarity of the MON1 output terminal.

The MON1 output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See parameter F672 for more information on this setting.

Settings:
- 0 — Minus (Negative Gradient)
- 1 — Plus (Positive Gradient)

**MON 1 Bias Adjustment**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the MON1 terminal.

Set the assigned function of parameter F672 to zero and then set this parameter to a zero output.

See parameter F672 for more information on this setting.

**MON 2 Voltage/Current Output Switching**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter is used to set the output signal type of the MON2 output terminal.

See parameter F674 for more information on this setting.

Settings:
- 0 — -10 V – +10 V
- 1 — 0 – 10 V
- 2 — 0 – 20 mA
**MON 2 Output Gradient Characteristic**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter sets the output response polarity of the MON2 output terminal. The MON2 output terminal response may be set to respond inversely (-) or directly (+) to the input signal.

See parameter F672 for more information on this setting.

Settings:
- 0 — Minus (Negative Gradient)
- 1 — Plus (Positive Gradient)

**MON 2 Bias Adjustment**

Program ⇒ Terminal ⇒ Analog Output Terminals

This parameter setting is used to ensure that a zero-level input signal produces a zero-level output at the MON2 terminal.

Set the assigned function of parameter F674 to zero and then set this parameter to a zero output.

See parameter F674 for more information on this setting.

**Parameter Write Lock Out**

Program ⇒ Utilities ⇒ Prohibition

This parameter Enables/Disables the Run and Stop keys.

Settings:
- 0 — Enabled
- 1 — Disabled

**Display Units for Current and Voltage**

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

**Display Unit Multiplication Factor**

Program ⇒ Utilities ⇒ Display Parameters

This parameter provides a multiplier for the displayed speed value shown on the EOI of the ASD.

This parameter may be used to display the rate that a commodity is being processed by the driven load in process units (i.e., units/time).

**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 are not affected by this setting (i.e., F364, F365, F367, and F368).
**Display Unit Selection**

Program ⇒ Utilities ⇒ Display Parameters

This parameter is used in conjunction with F702 to set the method in which the frequency is displayed on the EOI.

The multiplier setting of F702 will be applied to the display of all frequencies if all frequencies are selected at this parameter.

The multiplier setting of F702 will be applied to parameters F364, F365, F367, and F368 ONLY if **PID Process Data** is selected at this parameter.

Settings:

0 — All Frequencies  
1 — PID Process Data

**Display Gradient Characteristic**

Program ⇒ Utilities ⇒ Display Parameters

The ASD-displayed response to output speed changes will be displayed as directly proportional or inversely proportional as a function of this parameter setting.

Selecting **Negative Gradient** displays an increased output speed as going more negative.

Selecting **Positive Gradient** displays an increased output speed as going more positive.

Settings:

0 — Minus (Negative Gradient)  
1 — Plus (Positive Gradient)

**Display Bias**

Program ⇒ Utilities ⇒ Display Parameters

In conjunction with the setting of F702, this parameter sets the bias of the EOI speed display.

The frequency entered here will be multiplied by the setting of F702 and then displayed as the zero value on the EOI display.

**Change Step Selection 1**

Program ⇒ Utilities ⇒ Display Parameters

In conjunction with the parameter setting of F708, this parameter sets the amount that the output speed will increase or decrease for each speed command change entered from the EOI using the **Rotary Encoder**.
Change Step Selection 2

Program ⇒ Utilities ⇒ Display Parameters

The parameter is used to modify the degree that the setting of F707 affects the output speed changes that are input from the EOI using the Rotary Encoder. Selecting a zero value here disables this parameter and the resulting non-zero value of parameter setting F707 is output from the ASD.

Selecting a non-zero value here provides a dividend that will be used in the following equation resulting in the actual output frequency applied to the motor.

\[ \text{Output Frequency Displayed} = \text{Internally Commanded Frequency} \times \frac{F708}{F707} \]

Operation Command Clear Selection When ST Off

Program ⇒ Special ⇒ Operation Panel Parameters

Upon deactivation of the ST terminal while operating in the Hand mode, the ASD output to the motor will cease — this parameter setting is used to allow for the reactivation of the motor without user intervention upon the reactivation of the ST terminal.

Upon reactivation of the ST terminal in this condition the ASD will resume the Run condition and the motor will start (1 — Retain Run Command).

This feature may be Disabled and the Run command must be re-initiated by the user for ASD operation (0 — Clear Panel Run Command).

**DANGER**

**WHEN ENABLED THE ASD WILL RESUME THE RUN CONDITION WHEN THE ST TERMINAL IS REACTIVATED.**

Settings:

0 — Clear Panel Run Command
1 — Retain Panel Run Command

Panel Stop Pattern

Program ⇒ Special ⇒ Operation Panel Parameters

While operating in the Hand mode this parameter determines the method used to stop the motor when the stop command is issued via the EOI.

The Deceleration Stop selection enables the Dynamic Braking system that is set up at F304 or the DC Injection Braking system that is set up at F250, F251, and F252.

The Coast Stop setting allows the motor to stop at the rate allowed by the inertia of the load.

Settings:

0 — Deceleration Stop
1 — Coast Stop

Note: The Stop Pattern setting has no effect on the Emergency Off settings of F603. This parameter may also be accessed by pressing the ESC key from the Frequency Command screen.

Direct Access Number — F708
Parameter Type — Numerical
Factory Default — 0 (Disabled)
Changeable During Run — Yes
Minimum — 0
Maximum — 255

Direct Access Number — F719
Parameter Type — Selection List
Factory Default — Retain Panel Run Command
Changeable During Run — Yes

Direct Access Number — F721
Parameter Type — Selection List
Factory Default — Deceleration Stop
Changeable During Run — Yes
### Panel Torque Command
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This function is not used with the P9 ASD.
- The Torque Command selection is performed at F420.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F725</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-250.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>+250.00</td>
</tr>
</tbody>
</table>

### Panel Tension Torque Bias
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This function is not used with the P9 ASD.
- The Tension Torque Bias selection is performed at F423.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F727</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-250.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>+250.00</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Panel Load Sharing Gain
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This function is not used with the P9 ASD.
- The Load Sharing Gain selection is performed at F424.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F728</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>100.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>250.00</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Panel Override Multiplication Gain
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This parameter provides a value to be used in the event that Setting (F729) is selected for the Frequency Override Multiplying Input (F661).

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F729</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Numerical</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0.00</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
<tr>
<td>Minimum</td>
<td>-100.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>100.00</td>
</tr>
<tr>
<td>Units</td>
<td>%</td>
</tr>
</tbody>
</table>

### Panel Frequency Lock Out
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This parameter is model-specific and has no function on the P9 ASD system.
- Settings:
  - 0 — Unlocked
  - 1 — Locked

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F730</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Unlocked</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Panel Emergency Off Lock Out
- **Program** ⇒ **Special** ⇒ **Operation Panel Parameters**
- This parameter is model-specific and has no function on the P9 ASD system.
- Settings:
  - 0 — Unlocked
  - 1 — Locked

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F734</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>Unlocked</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>No</td>
</tr>
</tbody>
</table>
### Panel Reset Lock Out

*Program ⇒ Special ⇒ Operation Panel Parameters*

This parameter is model-specific and has no function on the P9 ASD system.

<table>
<thead>
<tr>
<th>Settings</th>
<th>0 — Unlocked</th>
<th>1 — Locked</th>
</tr>
</thead>
</table>

| Direct Access Number — | F735 |
| Parameter Type — | Selection List |
| Factory Default — | Unlocked |
| Changeable During Run — | Yes |

### Command Mode/Frequency Mode Change Lock Out

*Program ⇒ Utilities ⇒ Prohibition*

This parameter is model-specific and has no function on the P9 ASD system.

<table>
<thead>
<tr>
<th>Settings</th>
<th>0 — Unlocked</th>
<th>1 — Locked</th>
</tr>
</thead>
</table>

| Direct Access Number — | F736 |
| Parameter Type — | Selection List |
| Factory Default — | Locked |
| Changeable During Run — | Yes |

### Lock Out All Keys

*Program ⇒ Utilities ⇒ Prohibition*

This parameter is model-specific and has no function on the P9 ASD system.

<table>
<thead>
<tr>
<th>Settings</th>
<th>0 — Unlocked</th>
<th>1 — Locked</th>
</tr>
</thead>
</table>

| Direct Access Number — | F737 |
| Parameter Type — | Selection List |
| Factory Default — | Unlocked |
| Changeable During Run — | Yes |

### Trace Selection

*Program ⇒ Utilities ⇒ Trace*

In conjunction with parameter F741 – F745, this parameter is used to monitor and store 4 ASD output waveform data points. The data may be read and stored as a function of a trip (At Trip) or it may be initiated by the activation of a discrete terminal activation (At Trigger).

Set a discrete input terminal to **Trace Back Trigger Signal** and activate the terminal to initiate the **At Trigger** read/store function.

**Table 10 on pg. 256** lists the items that may be selected for the data read/store function along with the associated communication number for each selection.

The duration of the read/store cycle for the selected items is set at parameter F741.

To acquire and store the data a communications device and a PC are required. The P9 ASD supports the following communications protocols: RS485 (MODBUS-RTU) Toshiba Protocol, USB Toshiba Protocol, CC-Link, ProfiBus, and DeviceNet (Refer to the manual of each protocol type for more information).

Trace data may be viewed graphically via **Program ⇒ Utilities ⇒ View Trace Data**.

<table>
<thead>
<tr>
<th>Settings</th>
<th>0 — None (Disabled)</th>
<th>1 — At Trip</th>
<th>2 — At Trigger</th>
</tr>
</thead>
</table>
Trace Cycle

Program ⇒ Utilities ⇒ Trace

This parameter sets the record time for the Trace Data events selected at F742 – F745.

See F740 for more information on this parameter setting.

Settings:
0 — 4 mS
1 — 20 mS
2 — 100 mS
3 — 1 Second
4 — 10 Seconds

Trace Data 1

Program ⇒ Utilities ⇒ Trace

This parameter is used to select the Trace Data 1 item from Table 10 on pg. 256 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for more information on this parameter setting.

Direct Access Number — F741
Parameter Type — Selection List
Factory Default — 100 mS
Changeable During Run — Yes

Trace Data 2

Program ⇒ Utilities ⇒ Trace

This parameter is used to select the Trace Data 2 item from Table 10 on pg. 256 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for more information on this parameter setting.

Direct Access Number — F742
Parameter Type — Selection List
Factory Default — Output Frequency
Changeable During Run — Yes

Trace Data 3

Program ⇒ Utilities ⇒ Trace

This parameter is used to select the Trace Data 3 item from Table 10 on pg. 256 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for more information on this parameter setting.

Direct Access Number — F743
Parameter Type — Selection List
Factory Default — Freq. Reference
Changeable During Run — Yes

Trace Data 4

Program ⇒ Utilities ⇒ Trace

This parameter is used to select the Trace Data 4 item from Table 10 on pg. 256 to be read and stored in accordance with the setup of parameters F740 and F741.

See F740 for more information on this parameter setting.

Direct Access Number — F744
Parameter Type — Selection List
Factory Default — Output Current
Changeable During Run — Yes

Direct Access Number — F745
Parameter Type — Selection List
Factory Default — DC Voltage
Changeable During Run — Yes
Baud Rate (RS485 2-Wire)

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the Baud Rate of the communications link.

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

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

Settings:
- 0 — 9600
- 1 — 19200
- 2 — 38400

Parity (RS485 2- and 4-Wire)

Program ⇒ Communications ⇒ Communication Settings

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

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

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

Settings:
- 0 — No Parity
- 1 — Even Parity
- 2 — Odd Parity

ASD Number

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by assigning an identification (ID) number to each ASD in the communications network.

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

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

Communications Time-Out Time (RS485 2- and 4-Wire)

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by setting the time that no activity may exist over the communications link before the link is severed (Time Out).

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

Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.
Communications Time-Out Action (RS485 2- and 4-wire)

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by determining the action to be taken in the event of a time-out (Time-Out Action).

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

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

Settings:

(Settings Are For 2-Wire/4-Wire)

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 Delay (RS485 2-Wire)

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS485 (2-wire) response delay time.

Changes made to this parameter require that the power be cycled (off then on) for the changes to take effect.
ASD-to-ASD Communications (RS485 2-wire)

Program ⇒ Communications ⇒ Communication Settings

The function of this parameter is 2-fold:

1) In a Master/Follower configuration and while communicating via RS485 2-wire, this parameter sets the ASD as the Master or the Follower.

2) This parameter determines the function of the ASD while operating as the Master or the Follower. If operating as the Master ASD, an output parameter of the Master ASD is used to control the Follower ASDs and is set here.

If operating as a Follower ASD, the ASD response if an error is incurred is set here.

*Note:* Select a Follower function here if F826 is configured as a *Master Output* controller for any other ASD in the system. Otherwise, an *EOI* failure will result.

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

Settings:

0 — Follower (Decel Stop If Error Detected)
1 — Follower (Continues Operation If Error Detected)
2 — Follower (Emergency Off If Error Detected)
3 — Master (Frequency Command)
4 — Master (Output Frequency)
5 — Master (Torque Reference)
6 — Master (Output Torque)

Frequency Point Selection

Program ⇒ Communications ⇒ Communication Reference Adjust

This parameter is used to set the communications reference for scaling.

See F811 — F814 for more information on this setting.

*Note:* Scaling the communications signal is not required for all applications.

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

Settings:

0 — Disabled
1 — RS485 (2-Wire — NOT USED)
2 — RS485 (4-Wire)
3 — Communication Option Board
Point 1 Setting
Program ⇒ Communications ⇒ Communication Reference Adjust

When enabled at F810, this parameter is used to allow the user to set the gain and bias of the speed control input to the ASD when the speed control signal is received via the source selected at F810.

Gain and Bias Settings
When operating in the Speed Control mode and using one of the control sources from Settings above, the settings that determine the gain and bias properties of the input signal are:

- Communications Reference Speed Setpoint 1 (frequency) (F812),
- the communications input signal value that represents Communications Reference Speed Setpoint 1 (frequency): F811,
- Communications Reference Speed Setpoint 2 (frequency) (F814), and
- the communications input signal value that represents Communications Reference Speed Setpoint 2 (frequency): F813.

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

This parameter sets the Communications Reference input value that represents Communications Reference Speed Setpoint 1 (frequency). This value is entered as 0 to 100% of the Communications Reference input value range.

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

Direct Access Number — F811
Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — 0
Maximum — 100
Units — %

Point 1 Frequency
Program ⇒ Communications ⇒ Communication Reference Adjust

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

See F811 for more information on this setting.

This parameter sets Communications Reference Speed Setpoint 1.

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

Direct Access Number — F812
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — Max. Freq. (F011)
Units — Hz

Point 2 Setting
Program ⇒ Communications ⇒ Communication Reference Adjust

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

See F811 for more information on this setting.

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

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

Direct Access Number — F813
Parameter Type — Numerical
Factory Default — 100
Changeable During Run — Yes
Minimum — 0
Maximum — 100
Units — %
**Point 2 Frequency**

Program ⇒ Communications ⇒ Communication Reference Adjust

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

See F811 for more information on this setting.

This parameter sets the Communications Reference Speed Setpoint 2.

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

<table>
<thead>
<tr>
<th>Direct Access Number — F814</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 60.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — Max. Freq. (F011)</td>
</tr>
<tr>
<td>Units — Hz</td>
</tr>
</tbody>
</table>

**Baud Rate (RS485)**

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS485 baud rate.

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

Settings:

- 0 — 9600 bps
- 1 — 19200 bps
- 2 — 38400 bps

<table>
<thead>
<tr>
<th>Direct Access Number — F820</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — 19200</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

**RS485 Send Delay (4-Wire RS485)**

Program ⇒ Communications ⇒ Communication Settings

This parameter sets the RS485 response delay time.

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

<table>
<thead>
<tr>
<th>Direct Access Number — F825</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — 2.00</td>
</tr>
<tr>
<td>Units — Seconds</td>
</tr>
</tbody>
</table>
ASD-to-ASD Communications (RS485)

The function of this parameter is 2-fold:

1) In a Master/Follower configuration and while communicating via RS485 4-wire, this parameter sets the ASD as the Master or the Follower.

2) This parameter determines the function of the ASD while operating as the Master or the Follower. If operating as the Master ASD, an output parameter of the Master ASD is used to control the Follower ASDs and is set here. If operating as a Follower ASD, the ASD response if an error is incurred is set here.

Note: Select a Follower function here if F806 is configured as a Master Output controller for any other ASD in the system. Otherwise, an EOI failure will result.

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

Settings:

0 — Follower (Decel Stop if Error Detected)
1 — Follower (Continues Operation if Error Detected)
2 — Follower (Emergency Off if Error Detected)
3 — Master (Frequency Command)
4 — Master (Output Frequency)
5 — Master (Torque Reference)
6 — Master (Output Torque)

RS485 Protocol Selection

This parameter sets the communications protocol for ASD-to-ASD communications.

Settings:

0 — Toshiba
1 — Modbus
2 — BACnet

Communications Option (DeviceNet/Profibus) Setting 1

While using the DeviceNet/Profibus communications protocol, this parameter allows the user to select the read and write information communicated between the ASD and the Host.

Read information may include the ASD fault status, ASD speed, ASD MAC ID, etc. Write information may include Enable/Disable DeviceNet commands, Forward run, ACC/DEC command, etc.

See the DeviceNet Option Instruction Manual (P/N 58683) for more information on this parameter.

Settings:

0 – 7
### Communications Option (DeviceNet/Profibus) Setting 2

**Program** ⇒ **Communications** ⇒ **Communication Settings**

While using the DeviceNet/Profibus communications protocol, parameters F831 – F836 allow the user to select the ASD memory location that holds the Command/Frequency/Monitoring instructions to be applied to the ASD for Communications Option Settings 2 – 7, respectively.

See the [DeviceNet Option Instruction Manual](P/N 58683) for more information on this parameter.

**Settings:**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disabled</td>
</tr>
<tr>
<td>1</td>
<td>FA06 (ALCAN Command 1)</td>
</tr>
<tr>
<td>2</td>
<td>FA23 (ALCAN Command 2)</td>
</tr>
<tr>
<td>3</td>
<td>FA07 (ALCAN Frequency Command, 0.01 Hz)</td>
</tr>
<tr>
<td>4</td>
<td>FA33 (Torque Command, 0.01%)</td>
</tr>
<tr>
<td>5</td>
<td>FA50 (Terminal Output)</td>
</tr>
<tr>
<td>6</td>
<td>FA51 (Analog Output Data from Comm. [FM])</td>
</tr>
<tr>
<td>7</td>
<td>FA52 (Analog Output Data from Comm. [AM])</td>
</tr>
<tr>
<td>8</td>
<td>F601 (Stall Prevention Level, %)</td>
</tr>
<tr>
<td>9</td>
<td>F441 (Power Running Torque Limit 1 Level, 0.01%)</td>
</tr>
<tr>
<td>10</td>
<td>F443 (Regen. Braking Torque Limit 1 Level, 0.01%)</td>
</tr>
<tr>
<td>11</td>
<td>F460 (Speed Loop Proportional Gain)</td>
</tr>
<tr>
<td>12</td>
<td>F461 (Speed Loop Stabilization Coefficient)</td>
</tr>
</tbody>
</table>

**Direct Access Number** — F831  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes

### Communications Option (DeviceNet/Profibus) Setting 3

**Program** ⇒ **Communications** ⇒ **Communication Settings**

Same as F831. See F831 for information on this parameter

**Direct Access Number** — F832  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes

### Communications Option (DeviceNet/Profibus) Setting 4

**Program** ⇒ **Communications** ⇒ **Communication Settings**

Same as F831. See F831 for information on this parameter

**Direct Access Number** — F833  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes

### Communications Option (DeviceNet/Profibus) Setting 5

**Program** ⇒ **Communications** ⇒ **Communication Settings**

Same as F831. See F831 for information on this parameter

**Direct Access Number** — F834  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes

### Communications Option (DeviceNet/Profibus) Setting 6

**Program** ⇒ **Communications** ⇒ **Communication Settings**

Same as F831. See F831 for information on this parameter

**Direct Access Number** — F835  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes

### Communications Option (DeviceNet/Profibus) Setting 7

**Program** ⇒ **Communications** ⇒ **Communication Settings**

Same as F831. See F831 for information on this parameter

**Direct Access Number** — F836  
**Parameter Type** — Selection List  
**Factory Default** — 0000h  
**Changeable During Run** — Yes
Communications Option (DeviceNet/Profibus) Setting 8

Program ⇒ Communications ⇒ Communication Settings

While using the DeviceNet/Profibus communications protocol, parameters F841 – F846 allow the user to select the ASD memory location that holds the Command/Frequency/Monitoring instructions to be applied to the ASD for Communications Option Settings 8 – 13, respectively.

See the DeviceNet Option Instruction Manual (P/N 58683) for more information on this parameter.

Settings:

0 — Disabled
1 — FD01 (ASD Status 1)
2 — FD00 (Output Frequency, 0.01 Hz)
3 — FD03 (Output Current, 0.01%)
4 — FD05 (Output Voltage, 0.01%)
5 — FC91 (ASD Alarm)
6 — FD22 (PID Feedback Value, 0.01 Hz)
7 — FD06 (Input Terminal Status)
8 — FD07 (Output Terminal Status)
9 — FE36 V/I
10 — FE35 (RR Input)
11 — FE37 (RX Input)
12 — FD04 (Input Voltage [DC Detection], 0.01%)
13 — FD16 (Real-Time Speed Feedback)
14 — FD18 (Torque, 0.01%)
15 — FE60 (My Monitor)
16 — FE61 (My Monitor)
17 — FE62 (My Monitor)
18 — FE63 (My Monitor)
19 — F880 (Free Notes)
20 — FD29 (Input Power, 0.01 kW)
21 — FD30 (Output Power, 0.01 kW)
22 — FE14 (Cumulative Operation Time, 0.01=1 Hour)
23 — FE40 (FM Terminal Output Monitor)
24 — FE41 (AM Terminal Output Monitor)

Communications Option (DeviceNet/Profibus) Setting 9

Program ⇒ Communications ⇒ Communication Settings

Same as F841. See F841 for information on this parameter.

Communications Option (DeviceNet/Profibus) Setting 10

Program ⇒ Communications ⇒ Communication Settings

Same as F841. See F841 for information on this parameter.

Communications Option (DeviceNet/Profibus) Setting 11

Program ⇒ Communications ⇒ Communication Settings

Same as F841. See F841 for information on this parameter.
Communications Option (DeviceNet/Profibus) Setting 12
Program ⇒ Communications ⇒ Communication Settings
Same as F841. See F841 for information on this parameter.

Direct Access Number — F845
Parameter Type — Selection List
Factory Default — 0000h
Changeable During Run — Yes

Communications Option (DeviceNet/Profibus) Setting 13
Program ⇒ Communications ⇒ Communication Settings
Same as F841. See F841 for information on this parameter.

Direct Access Number — F846
Parameter Type — Selection List
Factory Default — 0000h
Changeable During Run — Yes

Disconnection Detection Extended Time
Program ⇒ Communications ⇒ Communication 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 — Numerical
Factory Default — 0.0
Changeable During Run — Yes
Minimum — 0.0
Maximum — 100.0
Units — Seconds

ASD Operation at Disconnect
Program ⇒ Communications ⇒ Communication Settings
This parameter is used to set the P9 ASD action to be carried out in the event of the loss of communications.

Direct Access Number — F851
Parameter Type — Selection List
Factory Default — Stop and Terminate Communication
Changeable During Run — Yes

Preset Speed Operation Selection
Program ⇒ Communications ⇒ Communication Settings
This parameter setting is used to set the Preset Speed selection to be used if Preset Speed is selected at parameter F851.

Direct Access Number — F852
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes

Communications Option Station Address Monitor
Program ⇒ Communications ⇒ Communication Settings
This parameter is used in the setup of the communications network by reading the Media Access Code (MAC) address of the ASD that is connected to a node of the communications system.

Direct Access Number — F853
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes
Minimum — 0
Maximum — 255
Communications Option Speed Switch Monitor DeviceNet/CC-Link

Program ⇒ Communications ⇒ Communication Settings

This parameter is used in the setup of the communications network by reading the hardware-specific settings of the option card being used with the ASD.

If using the DEV002Z Devicenet card, this parameter reads the hardware switch SW300 setting of the Devicenet card. SW300 sets the baud rate and the MAC address of the option card that is connected to a node of the communications system.

See the DeviceNet Option Instruction Manual (P/N 58683) for more information on this parameter or see the Instruction manual for the option being used with the P9 ASD.

Block Write Data 1

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be written to the ASD of the communications link.

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

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

Settings:

0 — None
1 — FA00 (Command 1)
2 — FA20 (Command 2)
3 — FA01 (Frequency)
4 — FA50 (TB Output)
5 — FA51 (Analog Output)

Block Write Data 2

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be written to the ASD of the communications link.

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

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

Settings:

0 — None
1 — FA00 (Command 1)
2 — FA20 (Command 2)
3 — FA01 (Frequency)
4 — FA50 (TB Output)
5 — FA51 (Analog Output)
Block Read Data 1

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be read from the ASD using the communications link.

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

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

Settings:
0 — None
1 — Status Information
2 — Output Frequency
3 — Output Current
4 — Output Voltage
5 — Alarm Information
6 — PID Feedback Value
7 — Input Terminal Status
8 — Output Terminal Status
9 — V/I
10 — RR
11 — RX
12 — DC Voltage
13 — PG Feedback
14 — Torque
15 — My Monitor 1
16 — My Monitor 2
17 — My Monitor 3
18 — My Monitor 4
19 — Free Memo

Direct Access Number — F875
Parameter Type — Selection List
Factory Default — 0 (None)
Changeable During Run — Yes

Block Read Data 2

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be read from the ASD of the communications link.

See parameter F875 for more information on this setting.

Direct Access Number — F876
Parameter Type — Selection List
Factory Default — None
Changeable During Run — Yes

Block Read Data 3

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be read from the ASD of the communications link.

See parameter F875 for more information on this setting.

Direct Access Number — F877
Parameter Type — Selection List
Factory Default — None
Changeable During Run — Yes
**Block Read Data 4**

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be read from the ASD of the communications link.

See parameter F875 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number — F878</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — None</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

**Block Read Data 5**

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the type of data to be read from the ASD of the communications link.

See parameter F875 for more information on this setting.

<table>
<thead>
<tr>
<th>Direct Access Number — F879</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — None</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

**Free Notes**

Program ⇒ Communications ⇒ Communication Settings

This is an unused parameter that has allocated memory space.

The space may be used at the discretion of the user. This space may be used to store information or a note to be transferred using communications.

<table>
<thead>
<tr>
<th>Direct Access Number — F880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0</td>
</tr>
<tr>
<td>Maximum — 65534</td>
</tr>
</tbody>
</table>

**Network Option Reset Settings**

Program ⇒ Communications ⇒ Communication Settings

This parameter plays a role in the setup of the communications network by establishing the targets of a Reset command received via the communications link.

Settings:

0 — Reset ASD only
1 — Reset Option Board and ASD

<table>
<thead>
<tr>
<th>Direct Access Number — F899</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — Reset ASD only</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

**Input Function Target 1**

Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — 0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

**Input Function Command 1**

Program ⇒ My Function ⇒ My Function Unit 1

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.
Input Function Target 2
Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes

Input Function Command 2
Program ⇒ My Function ⇒ My Function Unit 1

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

Parameter Type — Selection List
Factory Default — 0 (NOP)

Input Function Target 3
Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes

Output Function Assigned
Program ⇒ My Function ⇒ My Function Unit 1

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 8 on pg. 254.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.
**Input Function Target 1**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Direct Access Number — F906**
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes

**Input Function Command 1**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

**Direct Access Number — F907**
Parameter Type — Selection List
Factory Default — 0 (NOP)

**Input Function Target 2**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Direct Access Number — F908**
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes

**Input Function Command 2**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

**Direct Access Number — F909**
Parameter Type — Selection List
Factory Default — 0 (NOP)

**Input Function Target 3**

Program ⇒ My Function ⇒ My Function Unit 2

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Direct Access Number — F910**
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes
Output Function Assigned

Program ⇒ My Function ⇒ My Function Unit 2

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal. This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 9 on pg. 255.

Settings:
0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.

Input Function Target 1

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal. This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257. See F977 for more information on this parameter.

Input Function Command 1

Program ⇒ My Function ⇒ My Function Unit 3

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function. Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal. This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257. See F977 for more information on this parameter.

Input Function Command 2

Program ⇒ My Function ⇒ My Function Unit 3

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function. Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.
### Input Function Target 3

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the **My Function** feature by selecting the functionality of the programmable **Input Function Target 3** terminal.

This setting assigns the function of the programmable **Input Function Target 3** terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F916</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — 0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

### Output Function Assigned

Program ⇒ My Function ⇒ My Function Unit 3

This parameter plays a role in the setup of the **My Function** feature by selecting the functionality of the **Output Function Assigned** terminal.

This setting assigns the function of the programmable **Output Function Assigned** data location to one of the functions listed in the **Input Setting** field of Table 9 on pg. 255.

Settings:

0 – 3099

See the **My Function Instruction Manual** (P/N E6581335) and F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F917</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Selection List</td>
</tr>
<tr>
<td>Factory Default — 0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
</tbody>
</table>

### My Function Percent Data 1

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the **My Function Percent Data 1**.

The analog signal is selected using the **Input Setting** number from Table 9 on pg. 255.

Once the assigned output value reaches the threshold setting of this parameter the output value is transferred to **My Function Out 1**.

See the **My Function Instruction Manual** (P/N E6581335) and F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F918</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td>Units — %</td>
</tr>
</tbody>
</table>

### My Function Percent Data 2

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the **My Function Percent Data 2**.

The analog signal is selected using the **Input Setting** number from Table 9 on pg. 255.

See the **My Function Instruction Manual** (P/N E6581335) and F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number — F919</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td>Units — %</td>
</tr>
<tr>
<td><strong>My Function Percent Data 3</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 3.</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>My Function Percent Data 4</strong></th>
<th><strong>Direct Access Number</strong> — F921</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 4.</td>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td></td>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td></td>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td></td>
<td>Units — %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>My Function Percent Data 5</strong></th>
<th><strong>Direct Access Number</strong> — F922</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Percent Data 5.</td>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td></td>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td></td>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td></td>
<td>Units — %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>My Function Frequency Data 1</strong></th>
<th><strong>Direct Access Number</strong> — F923</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 1.</td>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td></td>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td></td>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td></td>
<td>Units — %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>My Function Frequency Data 2</strong></th>
<th><strong>Direct Access Number</strong> — F924</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 2.</td>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td></td>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td></td>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td></td>
<td>Units — %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>My Function Frequency Data 3</strong></th>
<th><strong>Direct Access Number</strong> — F925</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program ⇒ My Function ⇒ My Function Data</td>
<td>Parameter Type — Numerical</td>
</tr>
<tr>
<td>This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 1.</td>
<td>Factory Default — 0.00</td>
</tr>
<tr>
<td>The analog signal is selected using the Input Setting number from Table 9 on pg. 255.</td>
<td>Changeable During Run — Yes</td>
</tr>
<tr>
<td></td>
<td>Minimum — 0.00</td>
</tr>
<tr>
<td></td>
<td>Maximum — 200.00</td>
</tr>
<tr>
<td></td>
<td>Units — %</td>
</tr>
</tbody>
</table>
**My Function Frequency Data 4**

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 4.
The analog signal is selected using the Input Setting number from Table 9 on pg. 255.

Direct Access Number — F926
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 200.00
Units — %

**My Function Frequency Data 5**

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the trigger threshold level of the analog signal of the My Function Frequency Data 5.
The analog signal is selected using the Input Setting number from Table 9 on pg. 255.

Direct Access Number — F927
Parameter Type — Numerical
Factory Default — 0.00
Changeable During Run — Yes
Minimum — 0.00
Maximum — 200.00
Units — %

**My Function Time Data 1**

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 1 terminal.
The applied discrete input signal must be present at the input terminal of the P9 ASD for the time setting here for a system response.
Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — F928
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 600.00
Units — Seconds

**My Function Time Data 2**

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 2 terminal.
The applied discrete input signal must be present at the input terminal of the P9 ASD for the time setting here for a system response.
Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — F929
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 600.00
Units — Seconds

**My Function Time Data 3**

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 3 terminal.
The applied discrete input signal must be present at the input terminal of the P9 ASD for the time setting here for a system response.
Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — F930
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 600.00
Units — Seconds
My Function Time Data 4

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 4 terminal.

The applied discrete input signal must be present at the input terminal of the P9 ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — F931
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 600.00
Units — Seconds

My Function Time Data 5

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the response delay of the My Function Time Data 5 terminal.

The applied discrete input signal must be present at the input terminal of the P9 ASD for the time setting here for a system response.

Discrete terminal input activation that does not equal or exceed this setting will be ignored.

Direct Access Number — F932
Parameter Type — Numerical
Factory Default — 0.01
Changeable During Run — Yes
Minimum — 0.01
Maximum — 600.00
Units — Seconds

My Function Count Data 1

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the pulse-count threshold value used to trigger the discrete output COUNT1 (ON Timer).

COUNT1 (ON Timer) outputs a 1 upon reaching the threshold setting of this parameter.

Direct Access Number — F933
Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — 0
Maximum — 9999
Units — Pulses

My Function Count Data 2

Program ⇒ My Function ⇒ My Function Data

This parameter is used to set the pulse-count threshold value used to trigger the discrete output COUNT2 (ON Timer).

COUNT2 (ON Timer) outputs a 1 upon reaching the threshold setting at this parameter.

Direct Access Number — F934
Parameter Type — Numerical
Factory Default — 0
Changeable During Run — Yes
Minimum — 0
Maximum — 9999
Units — Pulses

Input Function Target 1

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

Direct Access Number — F935
Parameter Type — Selection List
Factory Default — 0 (Disabled)
Changeable During Run — Yes
Input Function Command 1

Program ⇒ My Function ⇒ My Function Unit 4

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 2

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

Input Function Command 2

Program ⇒ My Function ⇒ My Function Unit 4

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

Input Function Target 3

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

Output Function Assigned

Program ⇒ My Function ⇒ My Function Unit 4

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 9 on pg. 255.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.
### Input Function Target 1

**Program ⇒ My Function ⇒ My Function Unit 5**

This parameter plays a role in the setup of the **My Function** feature by selecting the functionality of the programmable **Input Function Target 1** terminal.

This setting assigns the function of the programmable **Input Function Target 1** terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F941</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Input Function Command 1

**Program ⇒ My Function ⇒ My Function Unit 5**

This parameter is used to assign a user-selected logical operator to two user-selected **Input Function Target** variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F942</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (NOP)</td>
</tr>
</tbody>
</table>

### Input Function Target 2

**Program ⇒ My Function ⇒ My Function Unit 5**

This parameter plays a role in the setup of the **My Function** feature by selecting the functionality of the programmable **Input Function Target 2** terminal.

This setting assigns the function of the programmable **Input Function Target 2** terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F943</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Input Function Command 2

**Program ⇒ My Function ⇒ My Function Unit 5**

This parameter is used to assign a user-selected logical operator to two user-selected **Input Function Target** variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F944</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (NOP)</td>
</tr>
</tbody>
</table>

### Input Function Target 3

**Program ⇒ My Function ⇒ My Function Unit 5**

This parameter plays a role in the setup of the **My Function** feature by selecting the functionality of the programmable **Input Function Target 3** terminal.

This setting assigns the function of the programmable **Input Function Target 3** terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

<table>
<thead>
<tr>
<th>Direct Access Number</th>
<th>F945</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Selection List</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (Disabled)</td>
</tr>
<tr>
<td>Changeable During Run</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Output Function Assigned**

Program ⇒ My Function ⇒ My Function Unit 5

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal. This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 9 on pg. 255.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.

**Input Function Target 1**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal. This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Input Function Command 1**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function. Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

**Input Function Target 2**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal. This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Input Function Command 2**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function. Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.
**Input Function Target 3**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Output Function Assigned**

Program ⇒ My Function ⇒ My Function Unit 6

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 9 on pg. 255.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.

**Input Function Target 1**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 1 terminal.

This setting assigns the function of the programmable Input Function Target 1 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Input Function Command 1**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.
**Input Function Target 2**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 2 terminal.

This setting assigns the function of the programmable Input Function Target 2 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Input Function Command 2**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter is used to assign a user-selected logical operator to two user-selected Input Function Target variables, enable a counter/timer function, or perform a hold/reset function.

Table 12 on pg. 259 lists the available selections. Their use and selection requirements are described in an example at F977.

**Input Function Target 3**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Input Function Target 3 terminal.

This setting assigns the function of the programmable Input Function Target 3 terminal to any one of the user-selectable functions listed in Table 8 on pg. 254, Table 9 on pg. 255, or Table 11 on pg. 257.

See F977 for more information on this parameter.

**Output Function Assigned**

Program ⇒ My Function ⇒ My Function Unit 7

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the Output Function Assigned terminal.

This setting assigns the function of the programmable Output Function Assigned data location to one of the functions listed in the Input Setting field of Table 9 on pg. 255.

Settings:

0 – 3099

See the My Function Instruction Manual (P/N E6581335) and F977 for more information on this parameter.
Analog Input Function Target 11
Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Analog Input Function Target 11 terminal.

The function selected at F961 may be adjusted using the input analog control signal selected here.

Settings:
0 — Disabled (None)
1 — V/I
2 — RR
3 — RX
4 — Optional RX2+, RX2-
5 — Optional V/I

Analog Function Assigned Object 11
Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality to which the adjustment of F959 is applied.

Settings:
0 — Disabled (None)
1 — Acceleration Rate
2 — Upper-Limit Frequency
3 — Acceleration Multiplication Factor
4 — Deceleration Multiplication Factor
5 — Manual Torque Boost
6 — Over-Current Stall (F601)
7 — Thermal Protection
8 — Speed Loop Proportional Gain (F460)
9 — Drooping Gain (F320)
10 — PID Proportional Gain (F362)

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Analog Function Assigned Object parameter.

Analog Input Function Target 21
Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality of the programmable Analog Input Function Target 21 terminal.

The function selected at F964 may be adjusted using the input analog control signal selected here.

Settings:
0 — Disabled (None)
1 — V/I
2 — RR
3 — RX
4 — Optional RX2+, RX2-
5 — Optional V/I
Analog Function Assigned Object 21

Program ⇒ My Function ⇒ My Function Analog

This parameter plays a role in the setup of the My Function feature by selecting the functionality to which the adjustment of F962 is applied.

Settings:
- 0 — Disabled (None)
- 1 — Acceleration Rate
- 2 — Upper-Limit Frequency
- 3 — Acceleration Multiplication Factor
- 4 — Deceleration Multiplication Factor
- 5 — Manual Torque Boost
- 6 — Over-Current Stall (F601)
- 7 — Thermal Protection
- 8 — Speed Loop Proportional Gain (F460)
- 9 — Drooping Gain (F320)
- 10 — PID Proportional Gain (F362)

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Analog Function Assigned Object parameter.

Monitor Output Function 11

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F966.

Select the Monitor Display Input Setting number from Table 11 on pg. 257 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Monitor Output Function Command 11

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Peak, Minimum, or Normal (Avg.) value of the parameter F965 selection to be recorded and output as a monitored function.

Settings:
- 0 — Normal
- 1 — Peak
- 2 — Minimum

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.
Monitor Output Function 21

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F968.

Select the Monitor Display Input Setting number from Table 11 on pg. 257 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Direct Access Number — F967
Parameter Type — Selection List
Factory Default — 2000
Changeable During Run — Yes

Monitor Output Function Command 21

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by allowing the user to select the Peak, Minimum, or Normal (Avg.) value of the parameter F967 selection to be recorded and output as a monitored function.

Settings:

0 — Normal
1 — Peak
2 — Minimum

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Direct Access Number — F968
Parameter Type — Selection List
Factory Default — Normal
Changeable During Run — Yes

Monitor Output Function 31

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the My Function feature by establishing the function that is to be recorded and output as the Peak, Minimum, or Average value as selected at parameter F970.

Select the Monitor Display Input Setting number from Table 11 on pg. 257 to output the corresponding function.

Use the Communication Number if operating using communications.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the Monitor Output Function parameter.

Direct Access Number — F969
Parameter Type — Selection List
Factory Default — 2000
Changeable During Run — Yes
Monitor Output Function Command 31

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the **My Function** feature by allowing the user to select the **Peak**, **Minimum**, or **Normal** (Avg.) value of the parameter **F969** selection to be recorded and output as a monitored function.

See the **My Function Instruction Manual** (P/N E6581335) for a complete description of the setup requirements and operational information of the **Monitor Output Function** parameter.

Settings:

- 0 — Normal
- 1 — Peak
- 2 — Minimum

Monitor Output Function 41

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the **My Function** feature by establishing the function that is to be recorded and output as the **Peak**, **Minimum**, or **Normal** (Avg.) value as selected at parameter **F972**.

Select the **Monitor Display Input Setting** number from Table 11 on pg. 257 to output the corresponding function.

Use the Communication Number if operating using communications.

See the **My Function Instruction Manual** (P/N E6581335) for a complete description of the setup requirements and operational information of the **Monitor Output Function** parameter.

Monitor Output Function Command 41

Program ⇒ My Function ⇒ My Function Monitor

This parameter plays a role in the setup of the **My Function** feature by allowing the user to select the **Peak**, **Minimum**, or **Normal** (Avg.) value of the parameter **F971** selection to be recorded and output as a monitored function.

Settings:

- 0 — Normal
- 1 — Peak
- 2 — Minimum

See the **My Function Instruction Manual** (P/N E6581335) for a complete description of the setup requirements and operational information of the **Monitor Output Function** parameter.
Virtual Input Terminal 1 Selection

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 1. As a virtual terminal, it exists only in memory and is considered to always be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 1 terminal to one of the functions that are listed in Table 6 on pg. 249.

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

Direct Access Number — F973
Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

Virtual Input Terminal 2 Selection

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 2. As a virtual terminal, it exists only in memory and is considered to always be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 2 terminal to one of the functions that are listed in Table 6 on pg. 249.

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

Direct Access Number — F974
Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

Virtual Input Terminal 3 Selection

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 3. As a virtual terminal, it exists only in memory and is considered to always be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 3 terminal to one of the functions that are listed in Table 6 on pg. 249.

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

Direct Access Number — F975
Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No

Virtual Input Terminal 4 Selection

Program ⇒ Terminal ⇒ Input Terminals

This parameter is used to set the functionality of the Virtual Input Terminal 4. As a virtual terminal, it exists only in memory and is considered to always be in its True (connected to CC) state.

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

This parameter sets the programmable Virtual Input Terminal 4 terminal to one of the functions that are listed in Table 6 on pg. 249.

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

Direct Access Number — F976
Parameter Type — Selection List
Factory Default — Unassigned
Changeable During Run — No
My Function Selection

Program ⇒ My Function

This parameter Enables/Disables the configured My Function feature of the P9 ASD.

Settings:
- 0 — None (Disabled)
- 1 — My Function with Terminal Board Signal (discrete terminal activation)
- 2 — My Function Always On

My Function

The My Function feature is configured using the settings of F900 to F977 and is used to enhance the programmability of the P9 ASD by performing two programmable functions: 1) the Combined Terminal Function, and 2) Logic Operations.

Combined Terminal Function

Assigning more than one function to a discrete output terminal provides two advantages: it effectively expands the number of input terminals, and reduces the number of cables required to support the input/output functions (e.g., assigning ST and F to one terminal). Using Virtual Terminals 1 – 4 (F973 – F976) are required to use this function.

In the example below, the ST terminal assignment and the F terminal assignment will be combined as one terminal to illustrate this feature. However, any two of the discrete output terminal assignments listed in Table 9 on pg. 255 may be combined in this manner.

Setup (Example)

1. Disable the My Function parameter at F977 to prevent the system from starting upon completion of the setup.
2. Assign the ST function to the S1 terminal (F115).
3. Assign the F function to Virtual Input Terminal 1 (F973).
4. Set Input Function Target 1 to 5 (F900). This setting assigns S1 as the control input terminal.
5. Set Output Function Assigned to 21 (F905). This setting is a command that writes the F115 selection (S1) to Virtual Input Terminal 1, activating both.
6. Enable the My Function parameter at F977 by selecting My Function Always On or selecting My Function With TB Signal.
   - If set to My Function Always On, the combination of ST and F are always On (both are connected to CC only during the S1 activation).
   - If set to My Function With TB Signal, set a discrete input terminal to My Function Run Signal and connect it to CC to enable My Function. Connect S1 to CC to activate the ST+F function. A disconnection at either terminal will terminate the My Function programming (discrete input terminal My Function Run Signal is Anded with discrete input terminal S1).

Connect S1 to CC and the F-to-CC + the ST-to-CC functions will be carried out using only S1.

With the aforementioned setup completed, provide a Frequency Command (F004) and the motor will run at the commanded frequency.

Continued on next page.
Combined Terminal Function

Output terminals may also be combined to produce one output response to multiple conditions using the computational operators of Table 12 on pg. 259. Assigning more than one function to a discrete output terminal provides two advantages: it effectively expands the number of input terminals, and reduces the number of cables required to support the input/output functions (e.g., assigning Low-Speed Detection and Low Current Detection to one output terminal). Using Virtual Terminals 1 – 4 (F973 – F976) are required to use this function.

In the example below, the Low-Speed Signal (detection) terminal assignment and the Low Current Detection terminal assignment will be combined as one terminal output to illustrate this feature. However, any two of the discrete output terminal assignments may listed in Table 9 on pg. 255 may be combined in this manner.

Setup (example)

1. Disable the My Function parameter at F977 to prevent the system from starting upon completion of the setup.
2. From Program ⇒ Direct Access ⇒ Unknown Numbers, select Enabled.
3. Set the OUT1 terminal (F130) to My Function Output 1 (222).
4. Set Input Function Target 1 (F900) to 1004 (Low-Speed Signal detection). See Table 9 on pg. 255 for a complete listing of available settings.
5. Set Input Function Target 2 (F902) to 1026 (Low Current Alarm). See Table 9 on pg. 255 for a complete listing of available settings.
6. Set Input Function Command 1 (F901) to AND (3). This setting assigns an operator to the Input Function Target 1 and the Input Function Target 2 settings.
7. Set Output Function Assigned (F905) to 1222. This setting will transfer the results of the logical AND to My Function Output 1 (OUT1).
8. Enable the My Function parameter at F977 by selecting My Function Always On.

With the aforementioned setup completed in the example, once the Low-Speed Signal AND the Low Current Alarm are active, the OUT1 terminal is activated for the duration of the Low-Speed/Low Current condition.

See the My Function Instruction Manual (P/N E6581335) for a complete description of the setup requirements and operational information of the My Function parameter.

Direct Access Number — F977
Parameter Type — Selection List
Factory Default — None (Disabled)
Changeable During Run — No

⚠️ DANGER

This parameter must always be set to None at the start of the My Function setup and remain set to None until all of the My Function parameter settings have been confirmed as being correct.

If enabled for normal operation using settings 1 or 2, the motor may start and engage the driven equipment unexpectedly upon receiving a Run signal during the My Function setup.
Table 6. Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Sel. No.</th>
<th>Terminal Selection Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO/NC</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Unassigned</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
</tr>
<tr>
<td>4</td>
<td>Reverse</td>
</tr>
<tr>
<td>6</td>
<td>Standby</td>
</tr>
<tr>
<td>8</td>
<td>Reset</td>
</tr>
<tr>
<td>10</td>
<td>Preset Speed 1</td>
</tr>
<tr>
<td>12</td>
<td>Preset Speed 2</td>
</tr>
<tr>
<td>14</td>
<td>Preset Speed 3</td>
</tr>
<tr>
<td>16</td>
<td>Preset Speed 4</td>
</tr>
<tr>
<td>18</td>
<td>Jog</td>
</tr>
<tr>
<td>20</td>
<td>Emergency Off</td>
</tr>
<tr>
<td>22</td>
<td>DC Braking</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accel/Decel Switching 1/Accel/Decel Switching 2</th>
<th>Activating combinations of discrete input terminals Accel/Decel Switching 1 and 2 allow for the selection of Accel/Decel profiles 1 – 4 as shown below. See F504 for more information on this terminal setting.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D SW Terminal</td>
<td>A/D Profile Selection</td>
</tr>
<tr>
<td>#1</td>
<td>#2</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1=Terminal Activated</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V/f Switching 1/V/f Switching 2</th>
<th>Activating combinations of discrete input terminals V/f Switching 1 and 2 allow for the selection of a V/f switching profile as listed below.</th>
</tr>
</thead>
<tbody>
<tr>
<td>V/f Switching Terminal</td>
<td>V/f Selection</td>
</tr>
<tr>
<td>#1</td>
<td>#2</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1=Terminal Activated</td>
<td></td>
</tr>
</tbody>
</table>

Note: NO/NC = Normally Open/Normally Closed. NO/NC selection numbers are used when making system changes via communications.
Table 6. (Continued) Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Sel. No.</th>
<th>Terminal Selection Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>NC</td>
</tr>
<tr>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>00</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1=Terminal Activated</td>
<td></td>
</tr>
<tr>
<td>The 1 – 4 settings of the torque limit switching selections are performed at parameters F440 – F449.</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>40</td>
<td>41</td>
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<tr>
<td>42</td>
<td>43</td>
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<tr>
<td>44</td>
<td>45</td>
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<tr>
<td>48</td>
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<td>50</td>
<td>51</td>
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<td>52</td>
<td>53</td>
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<td>54</td>
<td>55</td>
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<td>56</td>
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<td>58</td>
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<td>60</td>
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<td>62</td>
<td>63</td>
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<tr>
<td>64</td>
<td>65</td>
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<td>66</td>
<td>67</td>
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<tr>
<td>68</td>
<td>69</td>
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<tr>
<td>70</td>
<td>71</td>
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<tr>
<td>72</td>
<td>73</td>
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<tr>
<td>74</td>
<td>75</td>
</tr>
<tr>
<td>76</td>
<td>77</td>
</tr>
<tr>
<td>78</td>
<td>79</td>
</tr>
</tbody>
</table>
Table 6. (Continued) Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Sel. No.</th>
<th>Terminal Selection Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO/NC=</td>
<td>Normally Open/Normally Closed. NO/NC selection numbers are used when making system changes via communications</td>
</tr>
<tr>
<td>86 87</td>
<td>Binary Write — Writes the status of the discrete input terminals to the control board during binary input speed control.</td>
</tr>
<tr>
<td>88 89</td>
<td>UP/DOWN Frequency (up) — Increases the speed of the motor for the duration of activation until reaching the Upper-Limit setting or increases the speed of the motor in steps (See F264 for more information on this feature).</td>
</tr>
<tr>
<td>90 91</td>
<td>UP/DOWN Frequency (down) — Decreases the speed of the motor for the duration of activation until reaching the Lower-Limit setting or decreases the speed of the motor in steps (See F264 for more information on this feature).</td>
</tr>
<tr>
<td>92 93</td>
<td>UP/DOWN Frequency (clear) — While operating in the Up/Down Frequency speed control mode this terminal initiates a 0 Hz output command. If operating with an activated UP/DOWN Frequency (up or down) terminal, the output goes to the Lower-Limit (F013) setting.</td>
</tr>
<tr>
<td>98 99</td>
<td>Forward/Reverse — Operates in conjunction with another terminal being set to the Run/Stop (100/101) function. When configured to Run (Run/Stop to CC), the activation/deactivation of this terminal changes the direction of the motor.</td>
</tr>
<tr>
<td>100 101</td>
<td>Run/Stop — This terminal enables the motor to run when activated and disables the motor when deactivated.</td>
</tr>
<tr>
<td>102 103</td>
<td>Commercial Power/ASD Switching — Initiates the ASD-to-Commercial Power switching function. See parameter F354 for more information on this feature.</td>
</tr>
<tr>
<td>104 105</td>
<td>Frequency Reference Priority Switching — Toggles frequency control to and from the settings of F004 and F207.</td>
</tr>
<tr>
<td>106 107</td>
<td>V/I Terminal Priority — Assigns Speed control to the V/I Terminal and overrides the F004 setting.</td>
</tr>
<tr>
<td>108 109</td>
<td>Command Terminal Board Priority — Assigns Command control to the Terminal Board and overrides the F003 setting.</td>
</tr>
<tr>
<td>110 111</td>
<td>Edit Enable — Allows for the override of the lock out parameter setting (F700) allowing for parameter editing.</td>
</tr>
<tr>
<td>112 113</td>
<td>Control Switching — Toggles the system to and from the speed control and the torque control modes.</td>
</tr>
<tr>
<td>122 123</td>
<td>Fast Deceleration — Using dynamic braking (if enabled and supported), stops the motor at the fastest rate allowed by the load.</td>
</tr>
<tr>
<td>124 125</td>
<td>Preliminary Excitation — Applies an excitation current to the motor (holds shaft stationary) for the duration of the activation.</td>
</tr>
<tr>
<td>126 127</td>
<td>Brake Request — Initiates the brake release command. This setting requires that another discrete input terminal be set to Brake Answerback Input to complete the brake release command and to convey the status of the braking system to the user or to a dependent subsystem.</td>
</tr>
<tr>
<td></td>
<td>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 Brake Answerback Input is returned, fault E-11 will occur. Otherwise, the brake releases the motor and normal motor operations resume.</td>
</tr>
<tr>
<td></td>
<td>The Braking Release function is primarily used at startup; but, may be used when the brake is applied while the motor is running.</td>
</tr>
<tr>
<td>130 131</td>
<td>Brake Answerback Input — This setting is required when the Braking Request 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.</td>
</tr>
<tr>
<td></td>
<td>If Released is returned within the time setting of F630, normal system function resumes.</td>
</tr>
<tr>
<td></td>
<td>If Not Released is returned or if the F630 time setting times out before either signal is returned, then fault E-11 occurs.</td>
</tr>
<tr>
<td></td>
<td>The returned signal may also be used to notify the user or control a dependent subsystem.</td>
</tr>
<tr>
<td>134 135</td>
<td>Traverse Permission Signal — Enables/Disables the Traverse function.</td>
</tr>
<tr>
<td>136 137</td>
<td>Start-Stop HOA — Activates the Auto Start-Stop operating mode in accordance with the settings of F385.</td>
</tr>
<tr>
<td>138 139</td>
<td>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.</td>
</tr>
</tbody>
</table>
Table 6. (Continued) Discrete Input Terminal Assignment Selections and Descriptions.

<table>
<thead>
<tr>
<th>Sel. No.</th>
<th>NO</th>
<th>NC</th>
<th>Terminal Selection Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 141</td>
<td></td>
<td></td>
<td><strong>Sealing Water</strong> — Once an adequate water supply is detected at the pump seal via a reed switch, activation enables the ASD for normal operations.</td>
</tr>
<tr>
<td>142 143</td>
<td></td>
<td></td>
<td><strong>VLP Enable/Disable</strong> — Activation enables the VLP function for normal VLP operation. The VLP function is disabled when the terminal is not active.</td>
</tr>
<tr>
<td>144 145</td>
<td></td>
<td></td>
<td><strong>ON Float</strong> — Activation runs the ASD at the setting of F456.</td>
</tr>
<tr>
<td>146 147</td>
<td></td>
<td></td>
<td><strong>OFF Float</strong> — Activation has a dual function: 1) Changes the operating mode from Process Hold to Direct. 2) Turns off the ASD.</td>
</tr>
<tr>
<td>148 149</td>
<td></td>
<td></td>
<td><strong>Trigger Float</strong> — Activation changes the operating mode from Process Hold to Direct.</td>
</tr>
<tr>
<td>150 151</td>
<td></td>
<td></td>
<td><strong>Alarm Float</strong> — This input is typically connected to a float switch that, when activated, annunciates that the fluid level is now critical. The discrete output terminals OUT1 and/or OUT2 may be associated with the activation (set OUT1/OUT2 to TBA Alarm Float to activate an auxiliary system — i.e., aux pump, relief valve, audible/visual alarm, etc.).</td>
</tr>
<tr>
<td>152 153</td>
<td></td>
<td></td>
<td><strong>TBA HOA Switch</strong> — Activation enables Time-Based Alternation operation. Operates in conjunction with the setting of F417.</td>
</tr>
</tbody>
</table>
Table 7. Output Terminal Assignments for the FP, AM, FM, MON1, and MON2 Output Terminals.

<table>
<thead>
<tr>
<th>Selection/Comm Number</th>
<th>Terminal Assignment Name</th>
<th>Selection/Comm Number</th>
<th>Terminal Assignment Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Output Frequency</td>
<td>30</td>
<td>100% Meter Adjust Value</td>
</tr>
<tr>
<td>1</td>
<td>Frequency Reference</td>
<td>31</td>
<td>Data from Communications</td>
</tr>
<tr>
<td>2</td>
<td>Output Current</td>
<td>32</td>
<td>185% Meter Adjust Value</td>
</tr>
<tr>
<td>3</td>
<td>DC Bus Voltage</td>
<td>33</td>
<td>250% Meter Adjust Value</td>
</tr>
<tr>
<td>4</td>
<td>Output Voltage</td>
<td>34</td>
<td>Input Watt Hour</td>
</tr>
<tr>
<td>5</td>
<td>Compensated Frequency</td>
<td>35</td>
<td>Output Watt Hour</td>
</tr>
<tr>
<td>6</td>
<td>Speed Feedback (Real Time)</td>
<td>45</td>
<td>Gain Display</td>
</tr>
<tr>
<td>7</td>
<td>Speed Feedback (1 Sec Filter)</td>
<td>46</td>
<td>My Function Monitor 1 Without Sign</td>
</tr>
<tr>
<td>8</td>
<td>Torque</td>
<td>47</td>
<td>My Function Monitor 2 Without Sign</td>
</tr>
<tr>
<td>9</td>
<td>Torque Command</td>
<td>48</td>
<td>My Function Monitor 3 With Sign</td>
</tr>
<tr>
<td>11</td>
<td>Torque Current</td>
<td>49</td>
<td>My Function Monitor 4 With Sign</td>
</tr>
<tr>
<td>12</td>
<td>Excitation Current</td>
<td>50</td>
<td>Signed Output Frequency</td>
</tr>
<tr>
<td>13</td>
<td>PID Feedback Value</td>
<td>51</td>
<td>Signed Frequency Reference</td>
</tr>
<tr>
<td>14</td>
<td>Motor Overload Ratio</td>
<td>52</td>
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<td>Signed Speed Feedback (1 Sec Filter)</td>
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### Table 10. Trace Back Data Selections.

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### Table 11. Input Function Target Selections and the Associated Communications Number.

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<th>Comm. Number</th>
<th>Function</th>
<th>Resolution/Unit</th>
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</tr>
<tr>
<td>2020 FD20 3020 FE20</td>
<td></td>
<td></td>
<td>Torque Current (See Note 2)</td>
<td></td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>2021 FD21 3021 FE21</td>
<td></td>
<td></td>
<td>Excitation Current</td>
<td></td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>2022 FD22 3022 FE22</td>
<td></td>
<td></td>
<td>PID Feedback Value</td>
<td></td>
<td>0.01 Hz</td>
<td></td>
</tr>
<tr>
<td>2023 FD23 3023 FE23</td>
<td></td>
<td></td>
<td>Motor Overload Ratio</td>
<td></td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>2024 FD24 3024 FE24</td>
<td></td>
<td></td>
<td>ASD Overload Ratio</td>
<td></td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>2025 FD25 3025 FE25</td>
<td></td>
<td></td>
<td>DBR Overload Ratio</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2028 FD28 3028 FE28</td>
<td></td>
<td></td>
<td>DBR Load Ratio</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2029 FD29 3029 FE29</td>
<td></td>
<td></td>
<td>Input Power</td>
<td></td>
<td>0.01 kW</td>
<td></td>
</tr>
<tr>
<td>2030 FD30 3030 FE30</td>
<td></td>
<td></td>
<td>Output Power</td>
<td></td>
<td>0.01 kW</td>
<td></td>
</tr>
<tr>
<td>3031 FE31</td>
<td></td>
<td></td>
<td>Pattern Operation Group Number</td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>3032 FE32</td>
<td></td>
<td></td>
<td>Pattern Operation Cycles Remaining</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3033 FE33</td>
<td></td>
<td></td>
<td>Pattern Operation Preset Speed Number</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3034 FE34</td>
<td></td>
<td></td>
<td>Pattern Operation Preset Speed Time Remaining</td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>2050 FD50</td>
<td>Light-Load High-Speed Load Torque Monitor 1</td>
<td></td>
<td>Light-Load High-Speed Load Torque Monitor 1</td>
<td>0.01%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2051 FD51</td>
<td>Light-Load High-Speed Load Torque Monitor 2</td>
<td></td>
<td>Light-Load High-Speed Load Torque Monitor 2</td>
<td>0.01%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3035 FE35</td>
<td>RR Input</td>
<td></td>
<td>RR Input (See Note 2)</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>3036 FE36</td>
<td>V/I Input</td>
<td></td>
<td>V/I Input</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>3037 FE37</td>
<td>RX Input (See Note 2)</td>
<td></td>
<td>RX Input (See Note 2)</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>3038 FE38</td>
<td>RX2 Option (A11) Input</td>
<td></td>
<td>RX2 Option (A11) Input</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>3039 FE39</td>
<td>RX2 Option (A11) Input</td>
<td></td>
<td>RX2 Option (A11) Input</td>
<td></td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>3040 FE40</td>
<td>FM Output</td>
<td></td>
<td>FM Output</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3041 FE41</td>
<td>AM Output</td>
<td></td>
<td>AM Output</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** If no PG feedback is used an estimated speed value is displayed.

**Note 2:** My Function cannot process negative values — A negative value is processed by My Function as an absolute value.
Table 11. (Continued) **Input Function Target** Selections and the Associated Communications Number.

<table>
<thead>
<tr>
<th>FM/AM/FP Input Setting</th>
<th>Comm. Number</th>
<th>Monitor Display Input Setting</th>
<th>Comm. Number</th>
<th>Function</th>
<th>Resolution/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3050</td>
<td>FE50</td>
<td></td>
<td></td>
<td>Communication Data Output 2</td>
<td></td>
</tr>
<tr>
<td>3051</td>
<td>FE51</td>
<td></td>
<td></td>
<td>Communication Data Output 1</td>
<td></td>
</tr>
<tr>
<td>3052</td>
<td>FE52</td>
<td></td>
<td></td>
<td>Communication Data Output 3</td>
<td></td>
</tr>
<tr>
<td>3060</td>
<td>FE60</td>
<td></td>
<td></td>
<td>My Function Monitor 1 (Output of Unsigned Value)</td>
<td></td>
</tr>
<tr>
<td>3061</td>
<td>FE61</td>
<td></td>
<td></td>
<td>My Function Monitor 2 (Output of Unsigned Value)</td>
<td></td>
</tr>
<tr>
<td>3062</td>
<td>FE62</td>
<td></td>
<td></td>
<td>My Function Monitor 3 (Output of Signed Value)</td>
<td></td>
</tr>
<tr>
<td>3063</td>
<td>FE63</td>
<td></td>
<td></td>
<td>My Function Monitor 4 (Output of Signed Value)</td>
<td></td>
</tr>
<tr>
<td>3066</td>
<td>FE66</td>
<td></td>
<td></td>
<td>Expansion I/O Card 1 CPU Version</td>
<td></td>
</tr>
<tr>
<td>3067</td>
<td>FE67</td>
<td></td>
<td></td>
<td>Expansion I/O Card 2 CPU Version</td>
<td></td>
</tr>
<tr>
<td>3076</td>
<td>FE76</td>
<td></td>
<td></td>
<td>Integral Input Power</td>
<td>0.01 kW</td>
</tr>
<tr>
<td>3077</td>
<td>FE77</td>
<td></td>
<td></td>
<td>Integral Output Power</td>
<td>0.01 kW</td>
</tr>
<tr>
<td>3084</td>
<td>FE84</td>
<td></td>
<td></td>
<td>16-Bit BIN/BCD Input Value</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 12. My Function Operator Selections.

<table>
<thead>
<tr>
<th>Input Function Command</th>
<th>Function Name</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NOP (No Operation)</td>
<td>Disables the My Function feature.</td>
</tr>
<tr>
<td>1</td>
<td>ST</td>
<td>Execute data read/transfer.</td>
</tr>
<tr>
<td>2</td>
<td>STN</td>
<td>Execute inverted data read/transfer.</td>
</tr>
<tr>
<td>3</td>
<td>AND</td>
<td>Logical product of A AND B.</td>
</tr>
<tr>
<td>4</td>
<td>ANDN</td>
<td>Logical product of A AND $\overline{B}$.</td>
</tr>
<tr>
<td>5</td>
<td>OR</td>
<td>Logical sum of A OR B.</td>
</tr>
<tr>
<td>6</td>
<td>ORN</td>
<td>Logical sum of A OR $\overline{B}$.</td>
</tr>
<tr>
<td>7</td>
<td>EQ</td>
<td>Compares data — Outputs 1 if Equal; 0 if not Equal.</td>
</tr>
<tr>
<td>8</td>
<td>NE</td>
<td>Compares data — Outputs 0 if Equal; 1 if not Equal.</td>
</tr>
<tr>
<td>9</td>
<td>GT</td>
<td>Compares data — Outputs 1 if $A&gt;B$; 0 if $A \leq B$.</td>
</tr>
<tr>
<td>10</td>
<td>GE</td>
<td>Compares data — Outputs 1 if $A \geq B$; 0 if $A &lt; B$.</td>
</tr>
<tr>
<td>11</td>
<td>LT</td>
<td>Compares data — Outputs 1 if $A &lt; B$; 0 if $A \geq B$.</td>
</tr>
<tr>
<td>12</td>
<td>LE</td>
<td>Compares data — Outputs 1 if $A \leq B$; 0 if $A &gt; B$.</td>
</tr>
<tr>
<td>13</td>
<td>ASUB</td>
<td>Outputs absolute difference between A and B — $</td>
</tr>
<tr>
<td>14</td>
<td>ON (Timer)</td>
<td>Enables the On response time delay settings of My Function Time Data 1 – 5 ($F928 – F932$) for My Function Data.</td>
</tr>
<tr>
<td>16</td>
<td>COUNT1 (Timer)</td>
<td>Outputs a 1 upon reaching the pulse count setting of $F933$.</td>
</tr>
<tr>
<td>17</td>
<td>COUNT2 (Timer)</td>
<td>Outputs a 1 upon reaching the pulse count setting of $F934$.</td>
</tr>
<tr>
<td>18</td>
<td>HOLD</td>
<td>Outputs the peak output value since powering up or since the last reset.</td>
</tr>
<tr>
<td>19</td>
<td>SET</td>
<td>Sets data.</td>
</tr>
<tr>
<td>20</td>
<td>RESET</td>
<td>Resets data.</td>
</tr>
</tbody>
</table>
Alarms, Trips, and Troubleshooting

Alarms and Trips

This section lists the available user-notification codes of the EOI display and provides information that assists the user in the event that a Fault is incurred. The User Notification codes are displayed as an indication that a system function or system condition is active (i.e., ATN, DB, and DBON). The code is displayed on the EOI for the duration of the activation.

If a user setting or an P9 ASD parameter has been exceeded, or if a data transfer function produces an unexpected result, a condition that is referred to as a Fault is incurred.

An Alarm is an indication that a Fault is imminent if existing operating conditions continue unchanged. An Alarm may be associated with an output terminal to notify the operator of the condition remotely, close a contact, or engage a brake. At the least, an Alarm will cause an alarm code to appear on the EOI display. Table 14 lists the Alarm codes that may be displayed during operation of the P9 ASD.

In the event that the condition that caused the Alarm does not return to its normal operating level within a specified time, the ASD Faults and a Trip is incurred (Fault and Trip are sometimes used interchangeably).

A Trip is a safety feature (the result of a Fault) that disables the P9 ASD system and removes the 3-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 15 on pg. 265 for a listing of the potential Trips and the associated probable causes.

The operating conditions at the time of the trip may be used to help determine the cause of the trip. Listed below are operating conditions that may be used to assist the operator in correcting the problem or that the P9 ASD operator should be prepared to discuss when contacting the TIC Customer Support Center for assistance.

- What trip information is displayed?
- Is this a new installation?
- Has the system ever worked properly and what are the recent modifications (if any)?
- What is the ASD and Motor size?
- What is the CPU version and revision level?
- What is the EOI version?
- Does the ASD trip when accelerating, running, decelerating, or when not running?
- Does the ASD reach the commanded frequency?
- Does the ASD trip without the motor attached?
- Does the ASD trip with an unloaded motor?
User Notification Codes

The User Notification codes appear in the top right corner of the Frequency Command screen while the associated function is active.

User Notification codes notify the user of active functions that are usually only momentary under normal conditions and are active for the duration of activation only. User notification events are not error conditions and only convey active system functions to the user.

Table 13. User Notification Codes.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atn</td>
<td>Autotune active</td>
<td>Atn indicates that the Autotune function is active.</td>
</tr>
<tr>
<td>dbOn</td>
<td>DC Braking</td>
<td>This code conveys the DC Injection function being carried out. The display shows db when braking and shows dbOn when the motor shaft stationary function is being carried out.</td>
</tr>
</tbody>
</table>
Alarms

Table 14 lists the alarm codes that may be displayed during operation of the P9 ASD. Each alarm code listed is accompanied by a description and a possible cause. In the event that the source of the malfunction cannot be determined, contact your TIC Sales Representative for further information on the condition and for an appropriate course of action.

The Alarms are listed in the top-down order that they are checked for activation. Only the first to be detected will be displayed on the Frequency Command screen.

<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Description</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| AbFL       | Low Suction/No Flow Cut Off | Running ASD producing no 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 F484 time setting. |
| CM1        | Comm1 Error | Internal communications error. | • Improperly programmed ASD.  
• Improper communications settings.  
• Improperly connected cables. |
| CM2        | Comm2 Error | External communications error. | • Improperly connected cables. |
| E          | Emergency Off | Output signal from the ASD is terminated and a brake may be applied if so configured. | • Stop|Reset pressed twice at the EOI.  
• EOFF command received remotely.  
• ASD reset required. |
| MOFF       | Main Under-Voltage | Under-voltage condition at the 3-phase AC input to the ASD. | • Low 3-phase commercial voltage.  
• PO-to-PA jumper not secured or missing.  
• Typeform error.  
• Loss of externally-supplied control power. |
| OC         | Over-Current | ASD output current greater than F601 setting. | • Defective IGBT (U, V, or W).  
• ASD output to the motor is connected incorrectly.  
• ASD output phase-to-phase short.  
• The ASD is starting into a spinning motor.  
• Motor/machine jammed.  
• Mechanical brake engaged while the ASD is starting or while running.  
• Accel/Decel time is too short.  
• Voltage Boost setting is too high.  
• Load fluctuations.  
• ASD operating at an elevated temperature.  
• Disconnected/damaged cable while operating in the PG Feedback Vector Control mode. |
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Description</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| *OH        | Overheat   | ASD ambient temperature excessive. | • ASD is operating at an elevated temperature.  
• ASD is too close to heat-generating equipment.  
• Cooling fan vent is obstructed (see Mounting the ASD on pg. 15).  
• Cooling fan is inoperative.  
• Internal thermistor is disconnected. |
| OJ         | Timer      | Run-time counter exceeded. | • Type Reset required; select Clear run timer. |
| *OL1       | ASD Overload | Load requirement in excess of the capability of the ASD. | • The carrier frequency is too high.  
• An excessive load.  
• Acceleration time is too short.  
• DC damping rate is set too high.  
• The motor is starting into a spinning load after a momentary power failure.  
• The ASD is improperly matched to the application. |
| OLM        | Motor Overload | Load requirement in excess of the capability of the motor. | • V/f parameter improperly set.  
• Motor is locked.  
• Continuous operation at low speed.  
• The load is in excess of what the motor can deliver.  
• Disconnected/damaged cable while operating in the PG Feedback Vector Control mode. |
| *OLr       | Resistor Overload | Excessive current at the Dynamic Braking Resistor. | • Deceleration time is too short.  
• DBR configuration improperly set. |
| *OP        | Over-Voltage | DC bus voltage exceeds specifications.  
**Note:** It is normal for the OP alarm to flash during decel when using the **Automatic Acc/Dec** setting at F000. | • 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 3-phase input; install inductive filter.  
• DBR required.  
• DBR resistance value is too high.  
• DBR function is turned off.  
• Over-Voltage Stall feature is turned off.  
• System is regenerating.  
• Load instability.  
• Disable the Ridethrough function (F302). |
| Ot         | Over-Torque | Torque requirement is 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.  
• Disconnected/damaged cable while operating in the PG Feedback Vector Control mode. |
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Description</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| *P0FF      | Control 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. |
| 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. |

* Reset ignored if active.
# Trips/Faults

A **Trip** is an P9 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 15** 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**.

**Table 15.** P9 ASD Fault Listing.

<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| AbFL       | Low Suction/No Flow Cut Off |  • 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 F484 time setting. |
| E          | Emergency Off |  • Emergency Off command received via EOI or remotely. |
| E-10       | Sink/Source Setting Error |  • Improperly positioned **Sink/Source** jumper on the Terminal board or on an option device (see J100 at the Terminal PCB of the ASD).  
  • **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 |  • **ASD** is configured to receive a signal from a shaft-mounted encoder and no signal is being received while running.  
  • 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. |
| E-18       | Analog (Terminal) Input Loss |  • V/I signal loss.  
  • Terminal Board failure.  
  • P24 over-current condition.  
  • **F633** setting is too high. |
| E-19       | CPU Communication 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. |
<p>| E-22       | Logic Input Voltage Error |  • Incorrect voltage applied to the discrete input terminals. |</p>
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-23</td>
<td>Optional Expansion Input Terminal Board 1 Error</td>
<td>• Optional Expansion Input Terminal Board 1 is defective.</td>
</tr>
<tr>
<td>E-24</td>
<td>Optional Expansion Input Terminal Board 2 Error</td>
<td>• Optional Expansion Input Terminal Board 2 is defective.</td>
</tr>
</tbody>
</table>
| E-25       | Stop Positioning Retention Error | • Load movement while stopped.  
• F381 setting is too low.  
• Encoder malfunction.  
• Creep speed is too high. |
| E-26       | CPU2 Fault | • CPU malfunction.  
• Control board malfunction. |
| E-50/E-51 | Sink/Source Setting Error | • Improperly positioned Sink/Source jumper on the Terminal board or on an option device (see J100 at the Terminal PCB of the ASD).  
• Sink/Source configuration is incorrect. |
| EEP1       | EEPROM Fault | • EEPROM write malfunction.  
• Make a service call. |
| EEP2/EEP3  | EEPROM Read Error | • EEPROM read malfunction.  
• Make a service call. |
| EF1/EF2    | (Earth) Ground Fault | • Ground fault at the motor.  
• Ground fault at the output of the ASD.  
• Current leakage to Earth Ground. |
| EPH1       | Input Phase Failure | • 3-phase input to the ASD is low or missing at the R, S, or T input terminals. |
| EPH0       | Output Phase Failure | • 3-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 Fault | • Internal RAM malfunction.  
• Make a service call. |
| Err3       | ROM Fault | • Internal ROM malfunction.  
• Make a service call. |
| Err4       | CPU Fault | • CPU malfunction.  
• Control board malfunction.  
• Make a service call. |
| Err5       | Communication Error | • Communication time out error.  
• Communication malfunction.  
• Improper or loose connection.  
• Improper system settings. |
<p>| Err6       | Gate Array Fault | • Main Gate Array is defective. |
| Err7       | Low -Current | • Improper Low- Current detection level settings at F609 – F612. |
| Err8       | Option Device Fault | • Check installation, connections, and option device manual. |</p>
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| Err9       | Flash Memory Fault | • Flash memory malfunction.  
• Make a service call. |
| Errn        | Autotune Error | • No motor connected or improperly secured connection.  
• **Autotune** readings that are significantly inconsistent with the configuration information.  
• A non-3-phase motor is being used.  
• Incorrect settings at F400, F413, or F416.  
• 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. |
| Errn1       |             | • **F402** adjustment required (Motor temperature is too high).  
• **F410** adjustment required (Motor Constant 1 improperly set). |
| Errn2       |             | • **F402** adjustment required (Motor temperature is too high).  
• **F412** adjustment required (Motor Constant 3 improperly set).  
• Motor shaft is rotating during **Autotune**. |
| Errn3       |             | • Autotune setting **F400** is set to Auto Calculation and there is a problem with the Motor Constant readings. |
| ETYP        | Typeform 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. |
| None        | No Errors   | • No active faults. |
| OC 1        | Over-Current During Acceleration | • Improper V/f setting.  
• Restart from a momentary power outage.  
• The ASD is starting into a rotating motor.  
• ASD/Motor not properly matched.  
• Phase-to-phase short (U, V, or W).  
• **Accel** time too short.  
• **Voltage Boost** setting is too high.  
• Motor/machine jammed.  
• Mechanical brake engaged while the ASD is running.  
• ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during acceleration. On ASDs that are greater than 100 HP, this fault occurs when the ASD current exceeds 320% of the rated FLA during acceleration. |
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| OC1P       | Overheat During Acceleration | • Cooling fan 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. |
| OC2        | Over-Current During Deceleration | • Phase-to-phase short (U, V, or W).  
• Deceleration time is too short.  
• Motor/machine jammed.  
• Mechanical brake engaged while the ASD is running.  
• ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during deceleration. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA during deceleration. |
| OC2P       | Overheat During Deceleration | • Cooling fan 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 overheats. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA on a fixed-speed run. |
| OC3P       | Overheat During Run | • Cooling fan inoperative.  
• Ventilation openings are obstructed.  
• Internal thermistor is disconnected.  
• Improper V/f setting.  
• ASD or the motor is improperly matched to the application. |
| OCR1 or OCR2 or OCR3 | U-Phase Over-Current, V-Phase Over-Current, W-Phase Over-Current | • Low impedance at the U lead of the ASD output.  
• Low impedance at the V lead of the ASD output.  
• Low impedance at the W lead of the ASD output. |
| OCR       | Dynamic Braking Resistor Over-Current | • ASD inability to discharge the bus voltage during regeneration.  
• No dynamic braking resistor (DBR) installed.  
• Deceleration time is too short.  
• Improper DBR setup information.  
• Defective IGBT7 (or IGBT7 ckt.).  
• 3-phase input voltage is above specification. |
<table>
<thead>
<tr>
<th>LED Screen</th>
<th>LCD Screen</th>
<th>Possible Causes/Troubleshooting</th>
</tr>
</thead>
</table>
| OH         | Overheat                 | • Cooling fan inoperative.  
• Ventilation openings are obstructed.  
• Internal thermistor is disconnected.                                                                                                                                                                               |
| OH2        | External Overheat        | • Excessive-heat signature received at the TB3 – TH1(+) and TH1(-) terminals. See F637 for setup information.                                                                                                                                 |
| OL1        | ASD Overload             | • Acceleration time is too short.  
• DC Injection current is too high.  
• Improper V/f setting.  
• Motor 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 required.                                                                                                                                                                     |
| OLr        | Dynamic Braking          | • Deceleration time is too short.  
• DBR setting adjustment required.  
• Over-Voltage Stall setting adjustment required.                                                                                                                                                                      |
| OP1        | Over-Voltage During      | • Motor running during restart.                                                                                                                                                                                                 |
| OP2        | Acceleration             | • Deceleration time is too short.  
• DBR value is too high.  
• DBR required (DBR setup required).  
• Stall protection is disabled.  
• 3-phase input voltage is out of specification.  
• Input reactance required.                                                                                                                                                                                        |
| OP3        | Over-Voltage During      | • Load fluctuations.  
• 3-Phase input voltage out of specification.  
• DBR required (DBR setup required).                                                                                                                                                                                  |
|              | Deceleration             |                                                                                                                                                                                                                               |
| 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.                                                                                                                                                                                             |
| SEAL       | Sealing Water Error      | • Inadequate pump seal water.  
• Loss of pump seal water.                                                                                                                                                                                                 |
| SOUT       | Step-Out (for PM Motor   | • Motor shaft is locked.  
• Output phase is open.  
• Operating a reciprocating load.                                                                                                                                                                                          |
|             | Only)                    |                                                                                                                                                                                                                               |
| UP1        | Main Power Under-Voltage | • Input 3-phase voltage is too 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.  
• 3-phase input voltage low.                                                                                                                                                                                           |
Viewing Trip Information

In the event that the condition causing an Alarm does not return to the normal operating level within a specified time, the P9 ASD Faults and a Trip is incurred.

When a trip occurs, the resultant error information may be viewed either from the LED screen, LCD Fault screen (Table 15 on pg. 265), Monitor screen, or the Trip History screen (Program ⇒ Utilities ⇒ Trip History).

Trip Record at Monitor Screen

The at-trip condition of the last 4 incurred trips may be viewed at the Monitor screen. The Monitor screen displays the records of up to four trips and catalogs each trip as Past Trip 1 through Past Trip 4 (see pg. 50). Once reset (Type Reset), the trip records are erased. If no trips have occurred since being powered up or since the last reset, None is displayed for each trip record.

The Monitor screen at-trip record is erased when the P9 ASD is reset.

Note: An improper P9 ASD setup may cause some trips — Save the existing parameter profile via Program\Utilities\Save/Restore Wizard and then reset the ASD to the Factory Default settings before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Reset ⇒ Reset to Factory Settings).

Trip History

The Trip History screen records the system parameters for up to 20 trips. The recorded trips are numbered from zero to 19. Once the Trip History record reaches trip number 19, the oldest recorded trip will be deleted with each new record stored (first-in first-out). The Trip # field may be selected and scrolled through to view the recorded trip information for a given trip number. The monitored parameters are listed in Table 16 as At-trip Recorded Parameters (parameter readings at the time that the trip occurred).

In the event of a power loss or if the keypad has been removed from the ASD, the trip records and the real-time clock information are retained within the keypad for up to 4.5 years via Battery Backup.

Table 16. Trip History Record Parameters.

<table>
<thead>
<tr>
<th>Trip records are comprised of the full list of monitored parameters (28).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Trip Number</td>
</tr>
<tr>
<td>2) Trip Type</td>
</tr>
<tr>
<td>3) Time and Date</td>
</tr>
<tr>
<td>4) Frequency at Trip</td>
</tr>
<tr>
<td>5) Output Current</td>
</tr>
<tr>
<td>6) Output Voltage</td>
</tr>
</tbody>
</table>

Clearing a Trip

Once the cause of the trip has been corrected, performing a Reset re-enables the P9 ASD for normal operation.

The record of a trip may also be cleared using either of the following methods:

- Cycling power (trip info may be saved via F602 if desired),
- Pressing the Stop-Reset key twice,
- Remotely via the communications channel,
- Momentarily connecting terminal RES to CC of the Terminal Board, or
- Via Program ⇒ Utilities ⇒ Type Reset ⇒ Clear Past Trip (clears Monitor screen records only).
Enclosure and Conduit Plate Dimensions

The P9 ASD part numbering convention is shown below.

The enclosure dimensions for the available models (typeforms) are listed in Tables 17 and 18. The conduit plates referenced are shown in Figures 41, 42, and 43.

P9 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.

Enclosure Dimensions

Table 17. 230-Volt P9 ASD Systems.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Model Number VT130P9U</th>
<th>Enclosure Figure Number</th>
<th>A Width (in/mm)</th>
<th>B Height (in/mm)</th>
<th>C Depth (in/mm)</th>
<th>Mounting Hole Dimensions (in/mm)</th>
<th>Conduit Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2010</td>
<td></td>
<td>5.2/132</td>
<td>11.2/285</td>
<td>6.1/155</td>
<td>8.7/220 4.5/114 0.098/2.5 0.217/5.5</td>
<td>Figure 41-A</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2035</td>
<td>Figure 38</td>
<td>6.1/155</td>
<td>12.4/315</td>
<td>6.6/168</td>
<td>9.8/249 5.4/138</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2055</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2080</td>
<td></td>
<td>6.9/175</td>
<td>15.0/381</td>
<td></td>
<td>11.1/283 6.2/158 0.236/6.0</td>
<td>Figure 41-B</td>
</tr>
<tr>
<td></td>
<td>2110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5B</td>
<td>2160</td>
<td></td>
<td>9.1/231</td>
<td>19.3/490</td>
<td>7.6/193</td>
<td>15.2/386 8.3/210 0.118/3.0 0.276/7.0</td>
<td>Figure 41-D</td>
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<tr>
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</tr>
<tr>
<td>6</td>
<td>2330</td>
<td>Figure 39</td>
<td>11.1/283</td>
<td>25.9/658</td>
<td>13.2/335</td>
<td>25.0/635</td>
<td>Figure 41-E</td>
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<tr>
<td>7B</td>
<td>2500</td>
<td>Figure 39</td>
<td>14.3/363</td>
<td>33.1/841</td>
<td>15.0/381</td>
<td>32.3/820 8.0/203 0.188/4.8 0.375/9.5</td>
<td>Figure 42-G</td>
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<td>210K</td>
<td>Figure 40</td>
<td>14.6/371</td>
<td>51.7/1313</td>
<td></td>
<td>50.2/1275 9.2/234 0.344/8.7 0.670/17</td>
<td>Figure 42-I</td>
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<td>15.7/399</td>
<td>53.1/1349</td>
<td>17.6/447</td>
<td>51.7/1313 9.9/252</td>
<td>Figure 42-J</td>
</tr>
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</table>
Table 18. 460-Volt P9 ASD Systems.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Model Number</th>
<th>Enclosure Figure Number</th>
<th>A Width (in/mm)</th>
<th>B Height (in/mm)</th>
<th>C Depth (in/mm)</th>
<th>Mounting Hole Dimensions (in/mm)</th>
<th>Conduit Plate</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>2</td>
<td>4015</td>
<td>Figure 38</td>
<td>5.2/132</td>
<td>11.2/285</td>
<td>6.1/155</td>
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<td>6.9/175</td>
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<td>7.5/190</td>
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<td>8.3/210</td>
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<td>6</td>
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<td>25.0/635</td>
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<td>14.3/363</td>
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<td>15.3/389</td>
<td>35.3/897</td>
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<td>14.3/363</td>
<td>36.1/917</td>
<td>15.3/389</td>
<td>35.3/897</td>
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<td>36.1/917</td>
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<tr>
<td>9</td>
<td>415K</td>
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<td>9.9/252</td>
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<td>13.8/351</td>
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<td>70.0/1778</td>
<td>17.6/447</td>
<td>68.5/1740</td>
<td>21.3/541</td>
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</tbody>
</table>
Figure 38. See Tables 17 and 18 for Actual Dimensions.
Figure 39. See Tables 17 and 18 for Actual Dimensions.
Figure 40. See Tables 17 and 18 for Actual Dimensions.
Conduit Plate Dimensions

Figure 41. See Tables 17 and 18 for the associated device. Dimensions are in in/cm.

ΔX - Concentric Knockouts for Diameter Sizes 0.5", 0.75", and 1.0" Conduit.
Figure 42. See Tables 17 and 18 for the associated device. Dimensions are in in/cm.

$\otimes X =$ Concentric Knockouts for Diameter Sizes 0.5", 0.75", and 1.0" Conduit.
Figure 43. See Table 18 for the associated device. Dimensions are in in/cm.
## Current/Voltage Specifications

Table 19. 230-Volt Chassis Standard Ratings Table.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Typical Motor HP</th>
<th>100% Output Current Continuous</th>
<th>Overload Current 120% for 60 Seconds</th>
<th>Input Voltage 3-Ph 50/60 ±2 Hz</th>
<th>Output Voltage 3-Ph Variable Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130P9U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>0.75</td>
<td>3.2 A</td>
<td></td>
<td></td>
<td>200 – 240 VAC (±10%)</td>
</tr>
<tr>
<td>2015</td>
<td>1.0</td>
<td>4.2 A</td>
<td></td>
<td></td>
<td>Input Voltage Level (Max.)</td>
</tr>
<tr>
<td>2025</td>
<td>2.0</td>
<td>6.8 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
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<td>15.2 A</td>
<td>18.2 A</td>
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<tr>
<td>2080</td>
<td>7.5</td>
<td>22.0 A</td>
<td>26.0 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2110</td>
<td>10</td>
<td>28.0 A</td>
<td>34.0 A</td>
<td></td>
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<tr>
<td>2160</td>
<td>15</td>
<td>42.0 A</td>
<td>50.0 A</td>
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<td>2600</td>
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<td>154 A</td>
<td>185 A</td>
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<td>230 A</td>
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<td>248 A</td>
<td>298 A</td>
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<tr>
<td>212K</td>
<td>125</td>
<td>312 A</td>
<td>374 A</td>
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</table>
Table 20. 460-Volt Chassis Standard Ratings Table.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Typical Motor HP</th>
<th>100% Output Current Continuous</th>
<th>Overload Current 120% for 60 Seconds</th>
<th>Input Voltage 3-Ph 50/60 ±2 Hz</th>
<th>Output Voltage 3-Ph Variable Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT130P9U</td>
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</table>

Input Voltage Level (Max.)
Cable/Terminal/Torque Specifications

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

**Note:** The following ratings are guidelines and shall not be the sole determining factor of the lug or wire size used with the P9 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 P9 ASD.

**Note:** Cable/Terminal specifications are based on the rated current of the P9 ASD and Do Not include the 10% Service Factor.

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

For further installation information see the section titled Installation and Connections on pg. 14.

<table>
<thead>
<tr>
<th>Model Number VT130P9U</th>
<th>MCP Rating (Amps)</th>
<th>Wire/Cable Size</th>
<th>Lug Size Range</th>
<th>Terminal Board</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AWG or kcmil</td>
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<td></td>
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<td></td>
<td></td>
<td>Input/Output Power</td>
<td>Wire-Size/Lug-Capacity for Input/Output Power</td>
<td>TB1 – 4 Terminals</td>
<td>3Ø-Input</td>
</tr>
<tr>
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<td></td>
<td>Recommended</td>
<td>Maximum</td>
<td>3Ø-Input</td>
<td>3Ø-Output</td>
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<td>15</td>
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<td>2160</td>
<td>75</td>
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<td>8 to 3</td>
</tr>
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</tr>
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<td>2</td>
</tr>
<tr>
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<td></td>
<td>2400</td>
<td>175</td>
<td>1/0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2500</td>
<td>200</td>
<td>2/0</td>
<td>4/0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2600</td>
<td>250</td>
<td>3/0</td>
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</tr>
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<td></td>
<td></td>
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<td>300</td>
<td>4/0</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>210K</td>
<td>400</td>
<td>*3/0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>212K</td>
<td>500</td>
<td>*250</td>
<td>*250</td>
</tr>
</tbody>
</table>

**Note:** (*) Indicates that the item is one of a set of two parallel cables.
Table 22. 460-Volt P9 ASD Cable/Terminal/Torque Specifications.

<table>
<thead>
<tr>
<th>Model Number VT130P9U</th>
<th>MCP Rating (Amps)</th>
<th>Wire/Cable Size</th>
<th>Lug Size Range</th>
<th>Terminal Board</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Input/Output Power</td>
<td>Wire-Size/Lug-Capacity for Input/Output Power</td>
<td>TB1 – 4 Terminals</td>
<td>In-Lbs./Nm</td>
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<tr>
<td></td>
<td></td>
<td>Recommended</td>
<td>Maximum</td>
<td>3Ø-Input</td>
<td>3Ø-Output</td>
</tr>
<tr>
<td>4015</td>
<td>15</td>
<td>14</td>
<td>10</td>
<td>14 to 8</td>
<td>11.5/1.3</td>
</tr>
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<td></td>
<td>15</td>
<td>14</td>
<td>11.5/1.3</td>
<td></td>
</tr>
<tr>
<td>4035</td>
<td>20</td>
<td>12</td>
<td>10</td>
<td>14 to 8</td>
<td>11.5/1.3</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>12</td>
<td>10</td>
<td>14 to 8</td>
<td></td>
</tr>
<tr>
<td>4110</td>
<td>30</td>
<td>10</td>
<td>8</td>
<td>12 to 8</td>
<td>17.7/2.0</td>
</tr>
<tr>
<td>4160</td>
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<td>8</td>
<td>4</td>
<td>10 to 4</td>
<td>21/2.4</td>
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<tr>
<td>4270</td>
<td>75</td>
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<td>3</td>
<td>8 to 3</td>
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</tr>
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<td>4330</td>
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<td>8 to 3</td>
<td></td>
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<td>2</td>
<td>12 to 1/0</td>
<td>Torque to 5.3/0.6</td>
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<td></td>
<td>4 to 1/0</td>
<td>50/5.7</td>
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<td></td>
</tr>
<tr>
<td>4600</td>
<td>175</td>
<td>1/0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>200</td>
<td>2/0</td>
<td>4/0</td>
<td>6 to 250</td>
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<tr>
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<td>*1/0</td>
<td>*4/0</td>
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</tr>
<tr>
<td>415K</td>
<td>400</td>
<td>*3/0</td>
<td>*250</td>
<td>6 to 250</td>
<td>275/31</td>
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<td></td>
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</tr>
</tbody>
</table>

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

Note: (**) Indicates that the item is one of a set of three parallel cables.
Dynamic Braking Protection

Thermal protection for the DBR circuit (see Figure 44. on pg. 284) or an input contactor that will open the 3-phase power input circuit (see Figure 45. on pg. 284) to the P9 ASD in the event that a DBR over-temperature condition occurs is a requirement. Should a DBR failure or a power source over-voltage condition occur, the DBR thermal protection circuitry will prevent hazardous DBR temperatures.

To use the Dynamic Braking function the following requirements must be met:

- Enable the DBR function,
- Select a Resistance Value, and
- Set the Continuous Braking Wattage value at F304, F308, and F309, respectively.

Set the Braking Resistance Overload Time at parameter F639 to establish how long the braking resistor is allowed to sustain the overload condition before a trip is incurred (the factory default setting is 5 seconds).

Light-duty and heavy-duty resistors vary from a few ohms to several hundred ohms. The appropriate resistance size will be typeform- and application-specific. Contact your TIC Sales Representative or the TIC Customer Support Center for more information on your specific DBR requirements.

Heavy-duty DBRs should be wired using the same gauge wire as the motor leads. Light-duty DBRs may use one wire size smaller (AWG or kcmil) than the motor leads.

Because the heat generated by the DBR will affect the cooling capacity of the heat sink, the resistor pack should be mounted above or to the side of the ASD — Never below the ASD. Maintain a minimum of six inches between the resistor pack and the ASD unit.

The total wire length from the ASD to the DBR should not exceed 10 feet.

The wiring from the ASD to the DBR should be twisted approximately two twists per foot throughout the length of the wire.

If EMI/RFI noise is of concern, the DBR wiring should be 3-core screened cable. The screen should connect to the ASD enclosure and the resistor enclosure.

CAUTION

Though the in-line DBR fuse and the thermal relay are designed into the system to prevent a catastrophic DBR over-current condition, they are both intended to be used as backup protection ONLY.

A proper typeform-specific and application-specific system setup that includes using the appropriate Dynamic Braking Resistor and Overload settings will be required.
Figure 44.
Braking Resistor Circuit With a Thermal Fuse.

![Diagram of Braking Resistor Circuit]

Figure 45.
Shown below is the connection diagram using an MCCB with a Trip Coil (TC) in lieu of an input contactor. A control transformer is required for 400-volt models only. The primary MC is opened in the event of a DBR over-current detection. With no power supplied to the ASD the failure will not be displayed on the EOI; see the Trip History for failure information once restarted.

![Diagram of Connection using MCCB with Trip Coil]
# Short Circuit Protection Recommendations

Table 23. 230/240 and 400/480-Volt ASD Recommended Circuit Breaker Selection.

<table>
<thead>
<tr>
<th>Model Number VT130P9U</th>
<th>HP</th>
<th>Continuous Output Current (Amps)</th>
<th>Circuit Breaker Part Number</th>
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<td>0.75</td>
<td>3.2</td>
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<tr>
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<td>477</td>
<td>Consult the NEC</td>
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</table>
The ASD may be equipped with several options which are used to expand the functionality. Table 24 lists the available options and their functions.

Table 24. P9 Optional Devices and Functions.

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<tr>
<th>Part Identifier</th>
<th>Device Name</th>
<th>Device Function</th>
</tr>
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<tbody>
<tr>
<td>ASD-CAB-USB</td>
<td>H9 USB Communication Cable</td>
<td>Used to connect the ASD to a PC via the USB port of the PC.</td>
</tr>
<tr>
<td>ASD-EOI-HH-G9</td>
<td>Display Module Docking Station</td>
<td>Used to flash the 9-series display module.</td>
</tr>
<tr>
<td>ASD-MTG-KIT-P9</td>
<td>P9-ASD EOI Remote Mounting Kit</td>
<td>Hardware used to mount the P9 ASD EOI remotely.</td>
</tr>
<tr>
<td>ASD-EOI-N4</td>
<td>NEMA-4 EOI</td>
<td>A replacement NEMA-4 EOI (without Rotary Encoder)</td>
</tr>
<tr>
<td>ASD-EOI-N4-G9</td>
<td>9-Series EOI NEMA-4 Remote Mounting Kit</td>
<td>EOI Remote Mounting Kit for NEMA 4 applications. See the section titled EOI Remote Mounting on pg. 33 for further information on mounting the EOI remotely.</td>
</tr>
<tr>
<td>ASD-TB1-SIM9</td>
<td>ASD Input/Output Signal Simulator</td>
<td>Used to simulate the ASD I/O monitor and control signals.</td>
</tr>
<tr>
<td>DEV002Z</td>
<td>DeviceNet Module</td>
<td>Allows the ASD to communicate via DeviceNet with other DeviceNet-supported equipment including a host computer.</td>
</tr>
<tr>
<td>ETB003Z</td>
<td>Expansion I/O Board 1</td>
<td>Expands the Input/Output functionality of the ASD.</td>
</tr>
<tr>
<td>ETB004Z</td>
<td>Expansion I/O Board 2</td>
<td>Expands the Input/Output functionality of the ASD.</td>
</tr>
<tr>
<td>PDP002Z</td>
<td>ProfiBus DP Module</td>
<td>Allows the ASD to communicate via ProfiBus with other ProfiBus-supported equipment including a host computer.</td>
</tr>
<tr>
<td>USB001Z</td>
<td>USB-to-Serial Converter</td>
<td>Allows for the USB port of a computer to be used as a communications port for monitoring and controlling the ASD.</td>
</tr>
<tr>
<td>VEC007Z</td>
<td>PG Vector Feedback Board</td>
<td>Allows for the use of Vector Control using a sensor (for use with a 5-volt encoder).</td>
</tr>
<tr>
<td>VEC004Z</td>
<td>PG Vector Feedback Board</td>
<td>Allows for the use of Vector Control using a sensor (for use with a 12-volt encoder).</td>
</tr>
<tr>
<td>VEC005Z</td>
<td>PG Vector Feedback Board</td>
<td>Allows for the use of Vector Control using a sensor (for use with a 15-volt encoder).</td>
</tr>
<tr>
<td>VEC006Z</td>
<td>PG Vector Feedback Board</td>
<td>Allows for the use of Vector Control using a sensor (for use with a 24-volt encoder).</td>
</tr>
</tbody>
</table>

Note: See the user manual of the applicable option for further information on each item.
Index

Numerics

0 Hz Command Output, 130
0 Hz Dead Band Signal, 129
16-Bit Binary/BCD Input, 92

A

AbFL, 262, 265
Abnormal Speed Detection Time, 203
Abnormal Speed Settings, 59
Acc/Dec 1 – 4 Settings, 63
Acc/Dec Pattern 1, 181
Acc/Dec Pattern 1 – 4, 183
Acc/Dec Pattern 2, 182
Acc/Dec Special, 63
Accel/Decel 1 Settings, 53
Accel/Decel Operation After Torque Limit, 170
Accel/Decel Suspend, 147
Accel/Decel Switching Frequency 1, 183
Acceleration, 85
Acceleration Suspend Frequency, 147
Acceleration Suspend Time, 148
Acceleration Time 1, 85
Acceleration Time 2, 229
Acceleration Time 3, 226
Acceleration Time 4, 185
Acceleration/Deceleration Pattern 3, 185
Acceleration/Deceleration Pattern 4, 186
Acceleration/Deceleration Switching Frequency 2, 185
Acceleration/Deceleration Switching Frequency 3, 186
activate the battery backup, 28
Adding Input Selection, 207
AI2, 93
AI2 (Option V/I) Input Bias, 174
AI2 (Option V/I) Input Gain, 175
Alarm Float, 252
Alarms, 260, 262
Always ON 1 Terminal 1, 93
AM, 21, 23
AM Bias Adjustment, 211
AM Output, 49
AM Output Gradient Characteristic, 210
AM Output Terminal Adjustment, 208
AM Output Terminal Function, 208
AM/FM Output, 25
Analog Filter, 61
Analog Function Assigned Object 11, 242
Analog Function Assigned Object 21, 243
Analog Input Filter, 114
Analog Input Function Target 11, 242
Analog Input Function Target 21, 242
Analog Output Terminals, 54
Annual Average Ambient Temperature, 205
ASD Capacity, 13
ASD Input Phase Failure Detection, 200
ASD Load, 49
ASD Number, 218
ASD OL (Overload) Trip, 49
ASD Operation at Disconnect, 226
ASD Output Phase Failure Detection, 199
ASD Overload, 49, 204, 269
ASD Side-Switching Delay, 150
ASD-EOI-N4-G9, 33
ASD-to-ASD Communications (2-Wire), 220
ASD-to-ASD Communications (2-wire), 223
Atn, 261
At-Trip Recorded Parameters, 270
Auto Accel/Decel, 37
Auto Mode, 30
Auto Restart, 138
Automatic Acceleration/Deceleration, 81
Automatic Function Selection, 90
Automatic Torque Boost, 81
Autotune Error, 267
Autotuning, 10
Autotuning 1, 159
Autotuning 2, 160

B

Base Frequency 1, 86
Base Frequency 2, 103
Base Frequency 3, 104
Base Frequency 4, 105
Base Frequency Voltage, 59
Base Frequency Voltage 1, 162
Base Frequency Voltage 2, 103
Base Frequency Voltage 3, 104
Base Frequency Voltage 4, 105
Battery Backup, 28
battery life, 28
Baud Rate (2-Wire RS485), 218
Baud Rate (4-Wire RS485), 222
Bezel Plate Mounting Hardware, 33
BIN Input Point 1 Frequency, 126
BIN Input Point 1 Setting, 125
BIN Input Point 2 Frequency, 126
BIN Input Point 2 Setting, 126
Block Read Data 1, 228
Block Read Data 2, 228
Block Read Data 3, 228
Block Read Data 4, 229
Block Read Data 5, 229
Block Write Data 1, 227
Block Write Data 2, 227
Brake Answer Delay Time, 204
Braking Mode Selection, 145
Braking Resistance Overload Time (10x Rated Torque), 206
Braking Time Learning Function, 147

Cable/Terminal Specifications, 281
Carrier Frequency, 63
Carrier Frequency Control Mode, 143
CC, 21
CCA, 21
Change Step Selection 1, 213
Change Step Selection 2, 214
Changed From Default, 40, 58
Changed From Default Screen, 40
Changes by Installer, 27
Charge Indicator LED, 9, 16
Circuit Breaker Configuration, 15
Clearing a Trip, 270
CM1, 262
CM2, 262
CMOD/FMOD Change Lockout, 216
Command Control Selections, 45
Command Mode, 82
Command Mode and Frequency Mode Control, 42
Command Source, 38
Commercial Power Switching Delay, 150
Commercial Power Switching Freq. Hold Time, 150
Commercial Power/ASD Output Switching, 149
Commercial Power/ASD Switching Frequency, 150
Communication Adjustments, 71
Communication Error, 266
Communication Settings, 71
Communications Option (DeviceNet/Profibus) Setting 1, 223
Communications Option (DeviceNet/Profibus) Setting 2, 224
Communications Option (DeviceNet/Profibus) Setting 8, 225
Communications Option Speed Switch Monitor DeviceNet/CC-Link, 227
Communications Option Station Address Monitor, 226
Communications Setting Changes, 40
Communications Settings, 71
Communications Time Out Time (2- and 4-Wire RS485), 218
Communications Time-Out Action (2- and 4-wire RS485), 219
Compensation Frequency, 49
Conduit Plate Dimensions, 271
Connect IICC to CCA, 110
Connecting the ASD, 16
Connection Diagram, 26
Continuous Dynamic Braking Capacity, 142
Contrast, 59
Control Power Under-Voltage, 269
Cooling Fan Control, 202
CPU Fault, 266
Creeping Frequency, 146
Creeping Time, 146
Cumulative Operation Time Alarm, 202
Current Control Proportional Gain, 171
Current/Voltage, 279
Current/Voltage Specifications, 279
Customer Support, 2

D

dbOn, 261
DBR Load, 49
DBR OL (Overload) Trip, 49
DBR Over-Current, 284
DBR Overload, 49
DC Bus Voltage, 49
DC Injection Braking, 59
DC Injection Braking Current, 129
DC Injection Braking Start Frequency, 129
DC Injection Braking Time, 130
Deceleration Suspend Frequency, 148
Deceleration Suspend Time, 148
Deceleration Time 1, 85
Deceleration Time 2, 180
Deceleration Time 3, 185
Deceleration Time 4, 186
Default Setting Changes, 40
Direct Access, 56
Disconnection Detection Extended Time, 226
Discrete Input, 21, 25
Discrete Input Terminals, 51
Discrete Output, 21
Display Bias, 213
Display Gradient Characteristic, 213
Forward Speed Limit Input, 165
Forward Speed Limit Level, 166
Forward/Reverse DC Injection Braking Priority, 130
Forward/Reverse Disable, 61
Forward/Reverse Run Priority Selection, 91
Forward/Reverse Run Selection, 84
FP, 21, 23
FP Output, 25
FP Terminal Assignment, 209
FP Terminal Frequency, 210
Free Notes, 229
Frequency, 61
Frequency at Trip, 49
Frequency Command Mode, 47
Frequency Command Screen, 32, 39
Frequency Control, 64
Frequency Control Selections, 45
Frequency Mode 1, 82
Frequency Mode 2, 113
Frequency Mode Control, 42
Frequency Mode Priority Switching Frequency, 113
Frequency Point Selection, 220
Frequency Priority Selection, 109
Frequency Reference, 49
Frequency Reference Source, 39
Frequency Setting, 47
Frequency Settings, 53
Fundamental, 53

G
Gate Array Fault, 266
General Safety Information, 1
Ground Fault, 266

H
Hand Mode, 30
Hand/Auto Key, 30
Handling and Storage, 3

I
I/O and Control, 21
I/O Circuit Configurations, 25
IICC, 21, 26, 110, 112
Important Notice, 4
Initial Setup, 36
Initial UP/DOWN Frequency, 134
Initial UP/DOWN Frequency Rewriting, 134
Input Function Command 1, 229, 231, 232, 237, 238, 239, 240
Input Function Command 2, 230, 231, 232, 237, 238, 239, 241
Input Function Target 1, 229, 231, 232, 236, 238, 239, 240
Input Function Target 2, 230, 231, 232, 237, 238, 239, 241
Input Function Target 3, 230, 231, 233, 237, 238, 240, 241
Input Phase Failure, 266
Input Phase Failure Detection, 200
Input Power, 50
Input Special Functions, 55
Input Terminal 1 (F) Function, 93
Input Terminal 1 (F) Response Time, 100
Input Terminal 10 (L12) Function, 95
Input Terminal 11 (L13) Function, 95
Input Terminal 12 (L14) Function, 96
Input Terminal 13 – 20 Response Time, 101
Input Terminal 13 (L15) Function, 96
Input Terminal 14 (L16) Function, 96
Input Terminal 15 (L17) Function, 97
Input Terminal 16 (L18) Function, 97
Input Terminal 17 (B12) Function, 101
Input Terminal 18 (B13) Function, 101
Input Terminal 19 (B14) Function, 102
Input Terminal 2 (R) Function, 93
Input Terminal 2 (R) Response Time, 100
Input Terminal 20 (B15) Function, 102
Input Terminal 3 (ST) Function, 93
Input Terminal 3 (ST) Response Time, 100
Input Terminal 4 (RES) Function, 94
Input Terminal 4 (RES) Response Time, 101
Input Terminal 5 – 12 Response Time, 101
Input Terminal 5 (S1) Function, 94
Input Terminal 6 (S2) Function, 94
Input Terminal 7 (S3) Function, 94
Input Terminal 8 (S4) Function, 94
Input Terminal 9 (L11) Function, 95
Input Terminal Delays, 55
Input Terminal Priority, 92
Installation and Connections, 14
Installation Notes, 14
Installation Precautions, 4
isolated V/I input, 110

J
Jog Run Frequency, 131
Jog Settings, 61
Jog Setup Using the EOI, 131
Jog Stop Pattern, 131
Jump Frequencies, 64
Jump Frequency 1, 135
Jump Frequency 1 Bandwidth, 136
Jump Frequency 2, 136
Jump Frequency 2 Bandwidth, 136
Jump Frequency 3, 136
Jump Frequency 3 Bandwidth, 136

L
LCD Character/Font Information, 31
LCD Screen, 30
LCD Screen Display, 31
Lead Length Specifications, 20
LED Character/Font Information, 31
LED Screen, 30
LED Screen Display, 31
LED/LCD Screen Information, 31
Light Load Conditions, 11
Line Power Switching, 56
Linear Acceleration, 181
Load Moment of Inertia 1, 171
Load Moment of Inertia 2, 172
Load Sharing Gain Input, 165
Load-Produced Negative Torque, 12
Lockout, 76
Lockout All Keys, 216
Low Suction Pressure Delay Timer, 178
Low Suction/No Flow Cut Off, 262, 265
Low Suction/No-Flow Cut Off, 53
Low-Current, 266
Low-Current Detection Current Hysteresis Width, 200
Low-Current Detection Threshold, 201
Low-Current Settings, 60
Low-Current Trip, 200
Low-Current Trip Threshold Time, 201
Lower Limit Frequency, 86
Lower-Limit Frequency, 37
Low-Speed Operation, 10
Low-Speed Signal Output Frequency, 91
Lug Size, 281, 282

M
Main Monitor, 59
Main Monitor Selections, 51
Manual Torque Boost 1, 87
Manual Torque Boost 2, 103
Manual Torque Boost 3, 104
Manual Torque Boost 4, 105
Manual Torque Limit Settings, 66
Maximum Frequency, 85
MCP Rating, 281, 282
Mode Key, 30
My Function Count Data 2, 236
My Function Frequency Data 1, 234
My Function Frequency Data 2, 234
My Function Frequency Data 3, 234
My Function Frequency Data 4, 235
My Function Frequency Data 5, 235
My Function Monitor, 70
My Function Percent Data 1, 233
My Function Percent Data 3, 234
My Function Percent Data 4, 234
My Function Percent Data 5, 234
My Function Selection, 247
My Function Time Data 1, 235
My Function Time Data 2, 235
My Function Time Data 3, 235
My Function Time Data 4, 236
My Function Time Data 5, 236

N
NEMA 4, 33
NERR, 267
Network Option Reset Settings, 229
Number of PG Input Phases, 153
Number of PG Input Pulses, 153

O
O1A/B, 21
O2A/B, 23
OC, 262
OC1, 267
OC1P, 268
OC2, 268
OC2P, 268
OC3, 268
OC3P, 268
OCA1, 268
OCA2, 268
OCA3, 268
OCL, 268
OCR, 268
OFF Float, 252
OH, 263, 269
OH2, 269
OI, 263
OL1, 269
OL2, 269
OL3, 263
OLM, 263
OLR, 263, 269
ON Float, 252
OP, 263
OP1, 269
OP2, 269
OP3, 269
Operation (Hand), 39
Operation Above 60 Hz, 10
Operation Command Clear Selection When ST Off, 214
Operation Mode, 72
Operation Panel Parameters, 64
Operational and Maintenance Precautions, 9
Option V/I Terminal Voltage/Current Selection, 93
Optional Devices, 286
Options, 286
OT, 263, 269
OUT1, 21, 23
Out1 Out2 FL, 51
OUT1/OUT2 Output, 25
OUT2, 23
Output Current, 49
Output Disconnect, 8
Output Phase Failure, 266
Output Phase Failure Detection, 199
Output Power, 50
Output Terminal 1 (OUT1) Function, 97
Output Terminal 10 (R3) Function, 102
Output Terminal 11 (R4) Function, 102
Output Terminal 2 (OUT2) Function, 97
Output Terminal 3 (FL) Function, 98
Output Terminal 4 (OUT3) Function, 98
Output Terminal 5 (OUT4) Function, 98
Output Terminal 6 (R1) Function, 99
Output Terminal 7 (OUT5) Function, 99
Output Terminal 8 (OUT6) Function, 99
Output Terminal 9 (R2) Function, 100
Output Terminals, 56
Output Voltage, 49
Over-Current During Acceleration, 267
Over-Current During Deceleration, 268
Over-Current During Run, 268
Over-Current Protection, 13
Overheat, 269
Overheat During Acceleration, 268
Overheat During Deceleration, 268
Overheat During Run, 268
Overload, 60
Overload Protection, 10
Overload Reduction Starting Frequency, 200
Override Control, 68
Override Hierarchy, 44
Override Mode, 44
Override Operation, 44
Over-Speed, 265
Over-Speed Detection Frequency Lower Band, 203
Over-Speed Detection Frequency Upper Band, 203
Over-Torque, 269
Over-Torque Detection Hysteresis, 202
Over-Torque Detection Level (Negative Torque), 202
Over-Torque Detection Level (Positive Torque), 202
Over-Torque Detection Time, 202
Over-Torque Parameters, 60
Over-Torque Trip, 201
Over-Voltage During Acceleration, 269
Over-Voltage During Deceleration, 269
Over-Voltage Limit Operation, 141
Over-Voltage Limit Operation Level, 203

P

P24, 21, 23
P24 Output, 25
PA/+ , 16
Panel Emergency Off Lockout, 215
Panel Frequency Lockout, 215
Panel Load Sharing Gain, 215
Panel Override Multiplication Gain, 215
Panel Reset Lockout, 216
Panel Stop Pattern, 214
Panel Tension Torque Bias, 215
Panel Torque Bias, 146
Panel Torque Command, 215
Panel Torque Gain, 146
Parameter Changes, 27
Parameter Write Lockout, 212
Parity (2- and 4-Wire RS485), 218
Part Numbering Convention, 271
Password, 76
Past Trip 1, 50
Past Trip 2, 50
Past Trip 3, 51
Past Trip 4, 51
Pattern 1 Repeat, 187
Pattern 2 Repeat, 190
Pattern Group 1 Selection 1, 188
Pattern Group 1 Selection 2, 189
Pattern Group 1 Selection 3, 189
Pattern Group 1 Selection 4, 189
Pattern Group 1 Selection 5, 189
Pattern Group 1 Selection 6, 190
Pattern Group 1 Selection 7, 190
Pattern Group 1 Selection 8, 190
Pattern Group 2 Selection 1, 191
Pattern Group 2 Selection 2, 191
Pattern Group 2 Selection 3, 191
Pattern Group 2 Selection 4, 191
Pattern Group 2 Selection 5, 192
Pattern Group 2 Selection 6, 192
Pattern Group 2 Selection 7, 192
Pattern Group 2 Selection 8, 192
Pattern Group Cycle, 50
Pattern Group Number, 50
Pattern Group Preset, 50
Pattern Operation Mode, 186
Pattern Run, 72
Pattern Time, 50
PC/-, 16
Permanent Magnet (PM) Motor Constant 1, 179
Permanent Magnet (PM) Motor Constant 2, 179
PG Disconnection Detection, 154
PG Input Point 1 Frequency, 127
PG Input Point 1 Setting, 127
PG Input Point 2 Frequency, 128
PG Input Point 2 Setting, 128
PG Settings, 68
PG Type/Connection Error, 265
Phase Loss, 60
PID Control Delay, 152
PID Control Switching, 150
PID Deviation Lower-Limit, 152
PID Deviation Upper-Limit, 151
PID Feedback, 50
PID Feedback Delay Filter, 151
PID Feedback Differential (D) Gain, 152
PID Feedback Integral (I) Gain, 151
PID Feedback Proportional (P) Gain, 151
PID Feedback Signal, 151
PID Output Lower-Limit, 153
PID Output Upper-Limit, 152
PM Motor, 65, 179
PO, 16
POFF, 264
Point 1 Frequency, 221
Point 1 Setting, 221
Point 2 Frequency, 222
Point 2 Setting, 221
Power Connections, 16
Power Factor Correction, 11
Power Running Stall Continuous Trip Detection Time, 170
Power Running Torque Limit 1, 168
Power Running Torque Limit 1 Level, 168
Power Running Torque Limit 2 Level, 169
Power Running Torque Limit 3 Level, 169
Power Running Torque Limit 4 Level, 169
PP, 21, 23
PP Output, 25
Preset Speed 1, 88
Preset Speed 1 Operation Mode, 196
Preset Speed 10, 137
Preset Speed 10 Operation Mode, 197
Preset Speed 11, 137
Preset Speed 12, 137
Preset Speed 13, 137
Preset Speed 14, 137
Preset Speed 15, 138
Preset Speed 2, 88
Preset Speed 3, 89
Preset Speed 4, 89
Preset Speed 5, 89
Preset Speed 6, 89
Preset Speed 7, 89
Preset Speed 8, 136
Preset Speed 9, 137
Preset Speed Operation Mode, 195
Preset Speed Operation Selection, 226
Preset Speeds, 61
Primary Menus, 32
Process Decreasing Rate, 153
Process Increasing Rate, 153
Process Lower-Limit, 152
Process Upper-Limit, 152
Program Menu, 32
Program Mode Menu Navigation, 52
Prohibition, 57
Protection, 59
PTC1 Thermal Selection, 205
PTC2 Thermal Selection, 206
PtSt, 264
Pulse Width Modulation, 10
PWM Carrier Frequency, 138
RAM Fault, 266
Random Mode, 143
Reach Settings, 56
Read Error, 266
real-time clock, 270
Real-Time Clock Setup, 57
reciprocating load, 11
Regenerative Braking Torque Limit 1, 168
Regenerative Braking Torque Limit 1 Level, 169
Regenerative Braking Torque Limit 2 Level, 169
Regenerative Braking Torque Limit 3 Level, 169
Regenerative Braking Torque Limit 4 Level, 170
Regenerative Power Ridethrough Control Level, 204
Regenerative Power Ridethrough Mode, 139
Release Time, 146
Remote EOI Hardware, 33
RES, 21, 22
Reset, 57, 84
Retain Trip Record at Power Down, 198
Retry Selection, 140
Retry/Restart, 60
Reverse Speed Limit Input, 166
Reverse Speed Limit Input Level, 166
Ridethrough Time, 142
ROM Fault, 266
Root Menu Mapping, 47
Root Menus, 47
Rotary Encoder, 30
Rotation in Specified Direction ONLY, 167
RR, 21, 22, 50
RR Input, 25
RR Input Bias, 173
RR Input Gain, 173
RR Input Point 1 Frequency, 115
RR Input Point 1 Rate, 117
RR Input Point 1 Setting, 115
RR Input Point 2 Frequency, 116
RR Input Point 2 Rate, 117
RR Input Point 2 Setting, 116
RS485 4-Wire Protocol Selection (TSB/ModBus), 223
RS485 Send Delay (4-Wire RS485), 222
Run Frequency, 128
Run Frequency Hysteresis, 129
Run Key, 30
Run Time, 49
Rush Relay Current Activation Time, 205
RX, 21, 22, 50
RX Input, 25
RX Input Bias, 173
RX Input Gain, 174
RX Input Point 1 Frequency, 118
RX Input Point 1 Rate, 120
RX Input Point 1 Setting, 118
RX Input Point 2 Frequency, 119
Qualified Personnel, 2

Q
R
R, 21, 22
R/L1, 16
RX Input Point 2 Rate, 120
RX Input Point 2 Setting, 119
RX2, 50
RX2 (AI1) Input Bias, 174
RX2 (AI1) Input Gain, 174
RX2 (AI1) Input Point 1 Frequency, 122
RX2 (AI1) Input Point 1 Rate, 123
RX2 (AI1) Input Point 1 Setting, 121
RX2 (AI1) Input Point 2 Frequency, 122
RX2 (AI1) Input Point 2 Rate, 124
RX2 (AI1) Input Point 2 Setting, 122

S
S/L2, 16
S1, 21, 22
S2, 21, 22
S3, 21, 22
S4, 21, 22
Saving User Settings, 41
SEAL, 269
Sealing Water Error, 269
Sealing Water/Vacuum Prime Enable, 178
Second Speed Loop Proportional Gain, 172
Second Speed Loop Stabilization Coefficient, 172
Send Wait Time (2-wire), 219
Setpoints, 66
Short Circuit Detection At Start, 201
Short Circuit Protection, 285
Simple Positioning Completion Range, 154
Sink, 24
Sink/Source Setting Error, 265, 266
Slip Frequency Gain, 160
Source, 24
SOUT, 269
S-Pattern 1, 181
S-Pattern 2, 181
S-Pattern Acceleration Lower-Limit Adjustment, 184
S-Pattern Acceleration Upper-Limit Adjustment, 184
S-Pattern Deceleration Lower-Limit Adjustment, 184
S-Pattern Deceleration Upper-Limit Adjustment, 184
Special, 63
Special Parameters, 64
Special Protection Parameters, 61
Speed 1 Operation Time, 193
Speed 10 Operation Time, 194
Speed 11 Operation Time, 194
Speed 12 Operation Time, 194
Speed 13 Operation Time, 195
Speed 14 Operation Time, 195
Speed 15 Operation Time, 195
Speed 2 Operation Time, 193
Speed 3 Operation Time, 193
Speed 4 Operation Time, 193
Speed 5 Operation Time, 193
Speed 6 Operation Time, 193
Speed 7 Operation Time, 194
Speed 8 Operation Time, 194
Speed 9 Operation Time, 194
Speed at 0% Drooping Gain, 144
Speed at F320 Drooping Gain, 144
Speed Error, 265
Speed Limit (torque=0) Band, 167
Speed Limit (torque=0) Center Value, 167
Speed Limit (torque=0) Center Value Reference, 166
Speed Loop Proportional Gain, 171
Speed Loop Stabilization Coefficient, 171
Speed PID Switching Frequency, 172
Speed Reach Detection Band, 91
Speed Reach Frequency, 91
Speed Reference Setpoints, 62
ST, 21, 22
Stall, 60
Stall Prevention During Regeneration, 171
Stall Prevention Factor 1, 163
Stall Prevention Level, 198
Standard Mode Selection, 54
Standard Startup Wizard Parameter Requirements, 37
Start Frequency, 128
Startup and Test, 27
Stepout Current Detection Level, 206
Stepout Current Detection Time, 206
Stop-Reset Key, 31
SU+, 21, 23
Supply Voltage Correction, 142
Synchronized Acceleration Time, 144
Synchronized Deceleration Time, 143
System Configuration and Menu Options, 47
System Grounding, 18
System Integration Precautions, 7
System Operation, 36

T
T/L3, 16
TBA HOA Switch, 252
Tension Torque Bias Input, 165
Terminal, 54
Terminal Board, 21, 24
Terminal Descriptions, 22
Time Limit For Lower-Limit Frequency Operation, 130
Time-Based Alternation, 53, 161, 164
Time-Based Alternation Direct Mode Emergency Setpoint, 171
Time-Based Alternation Direct Mode Response Time, 168
Time-Based Alternation Emergency Timer, 161
Time-Based Alternation operation, 164
Time-Based Alternation Period, 164
Time-Based Alternation Process Hold Mode Response
Time, 168
Time-Based Alternation Pump Number, 167
Time-Based Alternation Total Number of ASDs, 167
Torque, 50, 66
Torque Bias Input Selection, 145
Torque Command Selection, 164
Torque Control, 66
Torque Current, 50
Torque Limit Settings, 67
Torque Reference, 50
Torque Speed Limiting, 67
Trace, 59
Trace Cycle, 217
Trace Data 1, 217
Trace Data 2, 217
Trace Data 3, 217
Trace Data 4, 217
Trace Selection, 216
Transducer Setup, 52
Trigger Float, 252
Trip Code, 50
Trip History, 270
Trip History (read-only), 58
trip records are retained, 270
Trip Settings, 60
Trouble Shooting, 260
Type Reset, 57, 84
Typeform Error, 267

U

U/T1, 16
UC, 264
UL 1995, 271
Under-Voltage Trip, 203
Under-Voltage Trip Detection Time, 204
Under-Voltage/Ridethrough, 60
unstable VLP operation, 179, 180
UP/DOWN Frequency (down) Frequency Step, 134
UP/DOWN Frequency (down) Response Time, 134
UP/DOWN Frequency (up) Frequency Step, 134
UP/DOWN Frequency (up) Response Time, 133
UP/DOWN Frequency Functions, 61
Up/Down Frequency Operation, 135
UP1, 269
UP2, 269
U-Phase Over-Current, 268
Upper Limit Frequency, 86
Upper-Limit Frequency, 37

V

V/f 5-Point Setting, 64
V/f 5-Point Setting Frequency 1, 106
V/f 5-Point Setting Frequency 2, 107
V/f 5-Point Setting Frequency 3, 108
V/f 5-Point Setting Frequency 4, 108
V/f 5-Point Setting Frequency 5, 109
V/f 5-Point Setting Voltage 1, 107
V/f 5-Point Setting Voltage 2, 108
V/f 5-Point Setting Voltage 3, 108
V/f 5-Point Setting Voltage 4, 108
V/f 5-Point Setting Voltage 5, 109
V/f Pattern, 86
V/I, 50, 61
V/I Analog Input Broken Wire Detection Level, 205
V/I Input, 25
V/I Input Bias, 172
V/I Input Broken-Wire Detection Level, 207
V/I Input Gain, 173
V/I Input Point 1 Frequency, 111
V/I Input Point 1 Rate, 112
V/I Input Point 1 Setting, 110
V/I Input Point 2 Frequency, 111
V/I Input Point 2 Rate, 113
V/I Input Point 2 Setting, 111
V/I Settings, 61
V/T2, 16
Vector Control, 13
Vector Motor Model, 65
Version, 56
Viewing Trip Information, 270
Virtual Input Terminal 1 Selection, 246
Virtual Input Terminal 2 Selection, 246
Virtual Input Terminal 3 Selection, 246
Virtual Input Terminal 4 Selection, 246
VIRTUAL LINEAR PUMP, 52
Virtual Linear Pump Application Type, 157
Virtual Linear Pump Command Source, 158
Virtual Linear Pump Low Frequency Limit, 159
Virtual Linear Pump Maximum, 158
Virtual Linear Pump Minimum, 158
Virtual Linear Pump Mode Switch, 157
Virtual Linear Pump Transducer Maximum Reading, 158, 160
Virtual Linear Pump Transducer Output Type/Range, 157
VLP Application Operating Mode, 154
VLP Auto Start-Stop Delay Timer, 156
VLP Auto Start-Stop Lower Level Threshold, 156
VLP Auto Start-Stop Mode, 155
VLP Auto Start-Stop Upper Level Threshold, 156
VLP Enable/Disable, 252
VLP External Device Delay Timer, 176
VLP High Band Threshold, 177
VLP Low Band Threshold, 177
VLP Low Suction Pressure Mode, 177
VLP Run External Devices, 52
VLP Sealing Water, 53
VLP Settings, 52
VLP Setup Wizard, 52
VLP Sleep Timer, 52, 154
VLP Sleep Timer Delay, 155
VLP Start and Stop Points, 52
Voltage and Frequency Rating of the Motor, 37
Volts Per Hertz Setting, 38
V-Phase Over-Current, 268

W

W/T3, 16
Warranty Card, 2
W-Phase Over-Current, 268