TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

April, 2020

ADJUSTABLE SPEED DRIVES

GX9 DN-66900-003

QUICK START GUIDE

GX9 ASD
Quick Start Guide

Document Number: 66900-003
April, 2020

Introduction

Congratulations on the purchase of the **GX9 Adjustable Speed Drive**!

The **GX9 Adjustable Speed Drive** (ASD) is a solid-state AC drive that features Toshiba International Corporation's (TIC) **Virtual Linear Pump Technology** (VLP Technology) and **Vector Control** algorithms. The **Virtual Linear Pump Technology** and **Vector Control** algorithms provide easy setup, enhanced reliability, and precise control under the most demanding conditions, all while enabling the motors of the system to develop high starting torque and providing compensation for motor slip. The result is setup ease, smooth starts, and highly efficient operation.

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

The **GX9 ASD** is a very powerful tool, yet surprisingly simple to operate. The user-friendly **Electronic Operator Interface** (EOI) of the GX9 ASD has an easy-to-read LCD screen and a high-intensity LED display. The EOI provides easy access to the many monitoring and programming features of the GX9 ASD.

The **GX9 ASD** uses digitally-controlled pulse width modulation. The programmable functions may be accessed via the easy-to-use menu, via the **Direct Access Numbers**, or using communications via a host PC. The ease of system access to the monitoring and control features combined with Toshiba's high-performance software, delivers unparalleled motor control precision and reliability.

This guide has been prepared to enable installers, users, and maintenance personnel to maximize the abilities of the **GX9 ASD**. With this in mind, use this guide to develop a system familiarity before attempting to install or operate the device. This guide may also be used as a reference guide or for training.

About This Guide

This guide was written by the Toshiba International Corporation Technical Publications Group. This group is tasked with providing technical documentation for the **GX9 Adjustable Speed Drive**. Every effort has been made to provide accurate and concise information to you, our customer.

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

Purpose and Scope of Guide

This guide provides information on how to safely install, operate, maintain, and dispose of your **GX9 Adjustable Speed Drive**. The information provided in this guide is applicable to the **GX9 Adjustable Speed Drive** only.

This guide 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 guide. Read the guide completely before installing, operating, performing maintenance, or disposing of this equipment.

This guide 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 guide 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 guide.**

Printed in the U.S.A.

Contacting TIC's Customer Support Center

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

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

You may also contact Toshiba International Corporation by writing to:

Toshiba International Corporation

13131 West Little York Road

Houston, Texas 77041-9990

Attn: ASD Product Manager.

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

TOSHIBA INTERNATIONAL CORPORATION

GX9 Adjustable Speed Drive

Complete the following information and retain for your records.

Model Number: _____

Serial Number: _____

Project Number (if applicable):_____

Date of Installation: _____

Inspected By: _____

Name of Application: _____

Important Notice

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

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

Any electrical or mechanical modifications to this equipment without the prior written consent of Toshiba International Corporation may void all warranties and may void the UL/CSA listing or other safety certifications. Unauthorized modifications may also result in a safety hazard or equipment damage.

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

Warranty Information

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

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

Activating the TIC Warranty

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

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

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

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

Table of Contents

General Safety Information

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

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 guide followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING**, or **CAUTION** are used in this guide, 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 guide.

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

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

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 guide.
- 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 the Toshiba Customer Support Center.
- **DO NOT** install the ASD if it is damaged or if it is missing any component(s).
- Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.
- Modification of this equipment is dangerous and is to be performed by factory trained personnel **ONLY**. When modifications are required contact the Toshiba Customer Support Center.
- Inspections may be required after moving equipment.
- Contact the Toshiba Customer Support Center to report discrepancies or for assistance if required.

Handling and Storage

- Use proper lifting techniques when moving the ASD; including properly sizing up the load, getting assistance, and using a forklift if required.
- Store in a well-ventilated location and preferably in the original 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 **GX9 ASD** is -13° to 149° F (-25° to 65° C).
- **DO NOT** store the unit in places that are exposed to outside weather conditions (i.e., wind, rain, snow, etc.).
- Store in an upright position.

Disposal

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

Installation Precautions

Location and Ambient Requirements

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

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

- Select a mounting location that is easily accessible, has adequate personnel working space, and adequate illumination for adjustment, inspection, and maintenance of the equipment (refer to 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, explosive/corrosive mists or gases, or other fluids.
- Avoid installation in areas where vibration, heat, humidity, dust, fibers, metal particles, or sources of electrical noise are present.
- For NEMA 1 installations, the system 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. 11 for further information on ventilation requirements.
- The ambient operating temperature range of the **GX9 ASD** is 14° to 104° F (-10° to 40° C).

Mounting Requirements

- Only **Qualified Personnel** shall 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 shall conform to the **NEC — Article 110** (NEC), OSHA, as well as any other applicable national, regional, or industry codes and standards.
- Installation practices shall 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 shall be run inside the conduit with the input power, output power, and control circuits.
- If multiple conductors are used in parallel for the input or output power, 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 shall be referenced if three or more power conductors are run in the same conduit (refer to the NEC Article 310 adjustment factors).
- Under no circumstances in a multiple ASD or multiple motor system configuration shall the input power or output power cables of the system ASDs or motors be routed within a shared conduit. Each ASD and each motor shall have its own conduit for input power and output power cable routing.

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

- **DO NOT** connect **CC** to earth ground.
- Use the **CC** terminal as the return for analog input terminals **VI**, **RX**, and **RR**.
- Use the **CC** terminal as the return for output terminals **FP**, **PP**, and **P24**.
- Use the negative terminal of the **AM**, **FM**, and **II** terminals as the return for these analog inputs.
- Always ground the unit to prevent electrical shock and to help reduce electrical noise.
- It is the responsibility of the ASD installer/maintenance personnel to provide proper grounding and branch circuit protection in accordance with the **NEC** and any applicable local codes.

— The Metal Conduit Is Not An Acceptable Ground —

Power Connections Precautions

⚠ DANGER ⚠

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

- Turn off and lock-out/tag-out all power sources before connecting the power wiring to the equipment.
- Ensure that all power sources are turned off and isolated in accordance with established lock-out/tag-out procedures before connecting the 3-phase power source wiring to the ASD input terminals and connect the ASD output terminals to a motor of the correct voltage and type for the application (refer to the NEC Article 300 – Wiring Methods and Article 310 – Conductors For General Wiring). Size the branch circuit conductors in accordance with the NEC Table 310.16.
- Ensure that the 3-phase input power is **NOT** connected to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- 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.
- If the ASD is supplied with a motor as a package, it then becomes a machine and has to meet the Essential Health and Safety Requirements of the EU Machinery Directive, 2006/42/EC. It is also a requirement that the system have an **Emergency Off** function that meets the requirements of EN ISO 13850:2008, and that any local or regional requirements must be met.
- It is the responsibility of the ASD installer/maintenance personnel to set up the **Emergency Off** braking system of the ASD. The function of the **Emergency Off** braking function is to remove output power from the ASD in the event of an emergency. A supplemental braking system may also be engaged in the event of an emergency. For 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.

Dynamic Braking Resistor Requirements

When using a **Dynamic Braking Resistor** (DBR), use thermal protection and an input contactor that will open the input 3-phase power circuit to the ASD in the event that a DBR over-temperature condition occurs. In the event of a power source over-voltage condition or an ASD failure, the input contactor will prevent hazardous DBR temperatures.

Dynamic Braking Resistors shall be connected across terminals **PA** and **PB ONLY** (when used). Connecting a **Dynamic Braking Resistor** elsewhere may cause a fire.

Heavy duty DBRs shall be wired using the same gauge wire as the motor leads. Light duty DBRs may use one wire size smaller (AWG) than the motor leads.

The total wire length from the ASD to the DBR shall not exceed ten feet.

Because the heat generated by the DBR will affect the cooling capacity of the heat sink, the resistor pack shall 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.

Note: *Dynamic braking is not available on the 100 HP – 400 HP GX9 ASDs.*

If EMI/RFI noise is of concern, the DBR wiring shall be three-core screened cable. The screen shall connect to the ASD enclosure and the resistor enclosure.

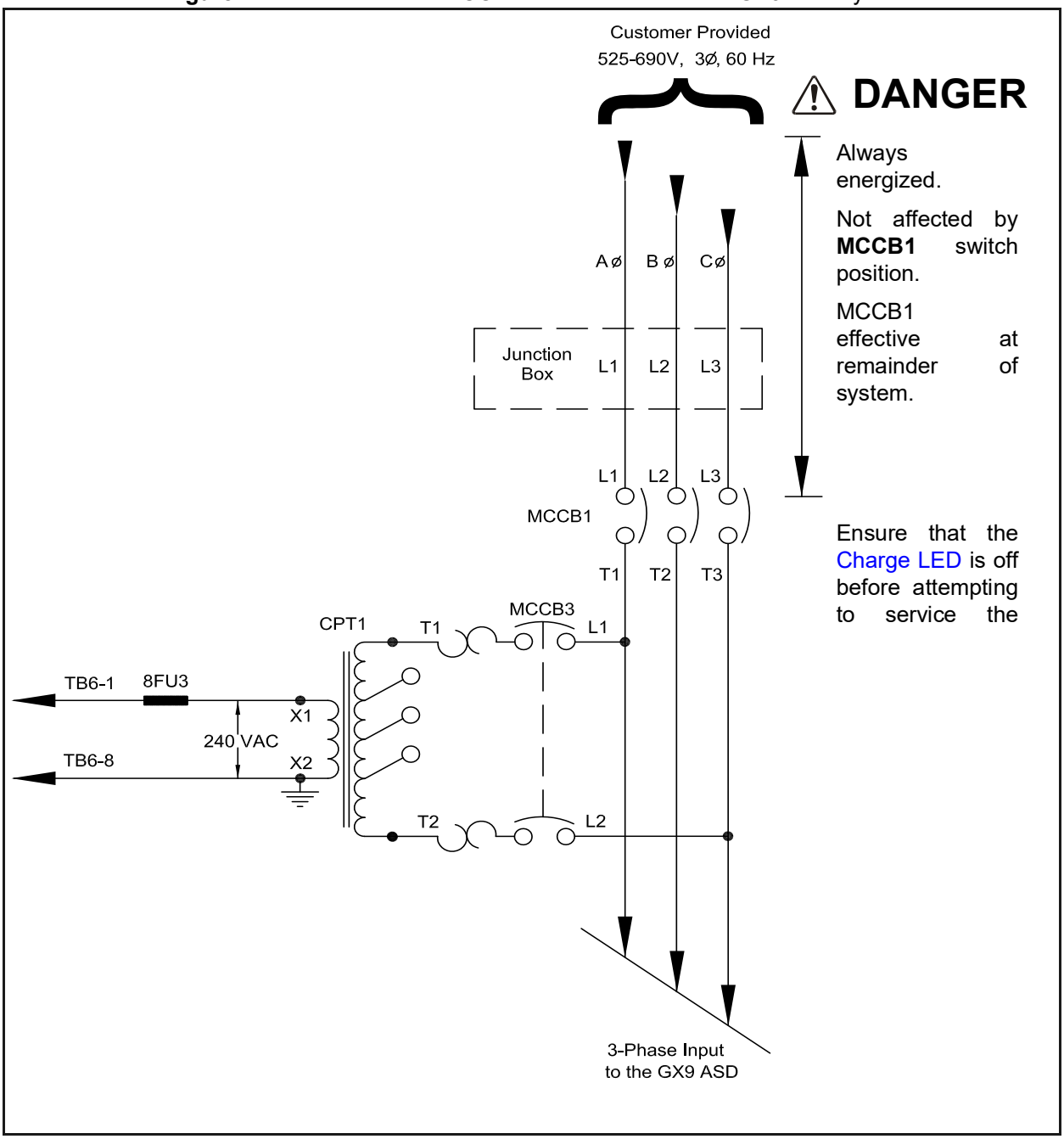
Residual Voltage Warning

Three-phase input power is applied at all times.

Ensure that the 3-phase power to the system is off and that the system is locked out and tagged out before performing maintenance or repair on the **GX9 ASD** system.

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

Figure 1. Placement of the MCCB1 circuit breaker in the GX9 ASD system.



System Integration Precautions

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

- The TIC ASD is a general-purpose product. It is a system component only and the system design should take this into consideration. Please contact the Toshiba Customer Support Center for application-specific information or for training support.
- The TIC ASD is part of a larger system and the safe operation of the ASD will depend upon observing certain precautions and performing proper system integration.
- Improperly designed or improperly installed system interlocks may render the motor unable to start or stop on command.
- The failure of external or ancillary components may cause intermittent system operation (i.e., the system may start the motor without warning).
- A detailed system analysis and job safety analysis shall be performed by the systems designer and/or systems integrator before the installation of the ASD component. Contact the Toshiba Customer Support Center for options availability and for application-specific system integration information if required.

Personnel Protection

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

- Rotating machinery and live conductors can be hazardous and shall not come into contact with personnel. Personnel shall be protected from all rotating machinery and electrical hazards at all times.
- Insulators, machine guards, and electrical safeguards may fail or be defeated by the purposeful or inadvertent actions of workers. Insulators, machine guards, and electrical safeguards are to be inspected (and tested where possible) at installation and periodically after installation for potential hazardous conditions.
- **DO NOT** allow personnel near rotating machinery. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- **DO NOT** allow personnel near electrical conductors. Contact with electrical conductors can be fatal. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- Personal Protection Equipment (PPE) shall be provided and used to protect the installer, user, maintenance personnel, and all employees from any hazards inherent to system operation.

System Setup Requirements

⚠ CAUTION

- When using the ASD as an integral part of a larger system, it is the responsibility of the ASD installer/maintenance personnel to ensure that there is a fail-safe in place (i.e., an arrangement designed to switch the system to a safe condition if there is a fault or failure).
- Power factor improvement capacitors or surge absorbers **MUST NOT** be installed on the three-phase output of the ASD.
- Use of the built-in system protective features is highly recommended (i.e., Emergency Off, Overload Protection, etc.).
- The operating controls and system status indicators shall be clearly readable and positioned where they may be viewed without obstruction.
- Additional warnings and notifications shall be posted at the equipment installation location as deemed required by Qualified Personnel.
- System safety features shall be employed and designed into the integrated system in a manner such that system operation, even in the event of system failure, will not cause harm or result in system damage or injury to personnel (i.e., Emergency Off, Auto-Restart settings, System Interlocks, etc.).
- The programming setup and system configuration of the ASD may allow it to start the motor unexpectedly. A familiarity with the **Auto-Restart** and **Retry** settings is a requirement to use this product.
- The setup procedures included within this guide may require a **Reset** before performing the procedure. Application-specific settings may then be performed. The pre-Reset conditions may be saved (see **F007**).
- There may be thermal or physical properties, or ancillary devices integrated into the overall system that may allow for the ASD to start the motor without warning. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- If a secondary magnetic contactor (MC) or an ASD output disconnect is used between the ASD and the load, it should be interlocked to halt the ASD before the secondary contact opens. If the output contactor is used for bypass operation, it must be interlocked such that commercial power is never applied to the ASD output terminals (U, V, or W).
- When using an ASD output disconnect, the ASD and the motor must be stopped before the disconnect is either opened or closed. Closing the output disconnect while the 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, removing any enclosure panels, or connecting/disconnecting the power wiring to the equipment.
- If/when taking a live reading is required (equipment is powered), it is to be performed by Qualified Personnel **ONLY**. Proper and approved personal protection equipment is to be used by trained personnel for all electrical measurements.
- The capacitors of the ASD maintain a residual charge for a period of time after the ASD is powered off. The required time for each ASD typeform is indicated with a cabinet label and a **Charge Indicator LED** (see Figure 3 on pg. 13). Wait at least the minimum time indicated on the enclosure-mounted label and ensure that the **Charge Indicator LED** has turned off once the ASD power has been turned off before coming into contact with any circuits.
- **DO NOT** attempt to disassemble, modify, or repair the ASD. Contact the Toshiba Customer Support Center for repair information.
- **DO NOT** place any objects inside of the ASD.
- If the ASD should emit smoke, or an unusual odor or sound, turn off the power immediately.
- The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming in contact with these items.
- The **Auto-Restart** and **Retry** programmable functions of the ASD may allow for the system to start or stop unexpectedly. Warning signs to this effect must be clearly posted at or near the machinery/hazard.
- Remove power from the ASD during extended periods of non-use.
- Inspect the system annually (as a minimum) for damaged or improperly functioning parts, cleanliness, and to ensure that the connectors are tightened securely. Inspect more frequently when operating in a harsh environment or when used on a high-output-demand application.

Installation and Connections

The **GX9 ASD** may be set up initially by performing a few simple configuration settings. To operate properly, the ASD must be securely mounted and connected to a power source (3-phase AC input at the **L1/R**, **L2/S**, and **L3/T** terminals). The control terminals of the ASD may be used by connecting the terminals of the **Terminal Board** (P/N 48570) to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 16 and Figure 6 on pg 20).

Note: *The optional **ASD-Multicom** boards may be used to expand the I/O functionality of the ASD. See the section titled **GX9 ASD Optional Devices** in the **GX9 ASD Installation and Operation Manual** for more information on the available options.*

The output terminals of the ASD (T1/U, T2/V, and T3/W) must be connected to the motor that is to be controlled (see Figure 19 on pg 26).

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

The **Startup Wizard** assists with the initial configuration of the commonly used GX9 ASD parameters. See the section titled Startup Wizard on pg. 52 for additional information on the **Startup Wizard**. The **Startup Wizard** is launched by configuring the system to start the wizard automatically upon a system restart.

Installation Notes

⚠ CAUTION

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

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

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

Do Not open and then close a secondary magnetic contactor between the ASD and the motor unless the ASD is off and the motor is not rotating.

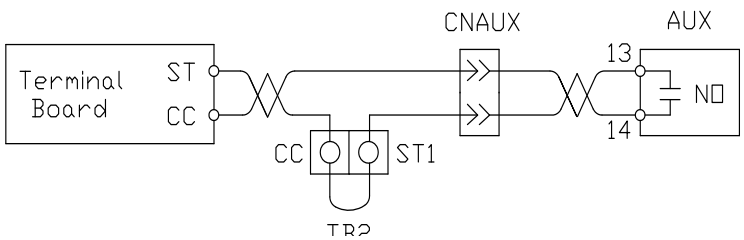
Note: *Re-application of power via a secondary contact while the ASD is on or while the motor is still turning may cause ASD damage.*

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

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

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

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



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

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

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

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

Interface problems may occur when an ASD is used in conjunction with some types of process controllers. Signal isolation may be required to prevent controller and/or ASD malfunction (contact the Toshiba Customer Support Center or the process controller manufacturer for additional information about compatibility and signal isolation).

Use caution when setting the output frequency. Over speeding a motor decreases its ability to deliver torque and may result in damage to the motor and/or the driven equipment.

Mounting the ASD

CAUTION

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

The ambient temperature rating for the **GX9 ASD** is from 14° to 104° F (-10° to 40° C).

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

During system setup, calibration, testing, or troubleshooting it may be required to access live circuits. **DO NOT** leave the system unattended and powered with the door(s) and/or covers removed.

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

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

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

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

Connecting the ASD

⚠ DANGER ⚠

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

Refer to the section titled Installation Precautions on pg. 4 and the section titled Lead Length Specifications on pg. 15 before attempting to connect the ASD and the motor to electrical power.

Power Connections

See Figure 19 on pg 26 for a system I/O connectivity schematic.

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.

Connect the input and output power lines of the ASD as shown in Figure 4 on pg 14.

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.

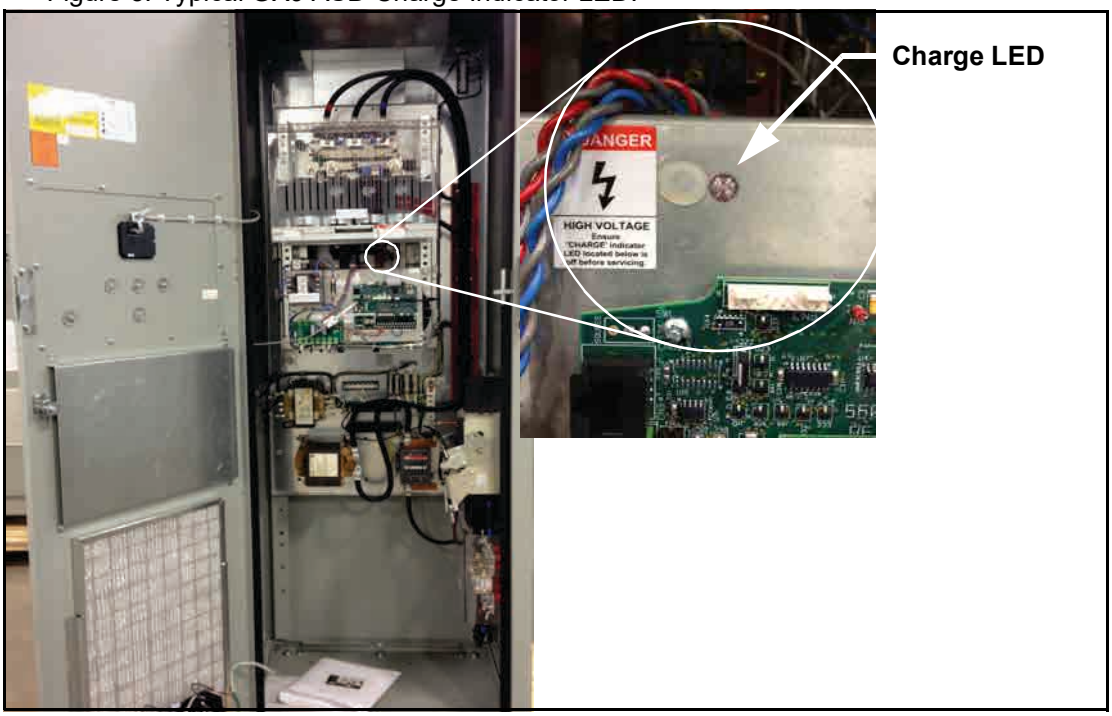
PC/- is the negative terminal of the DC bus.

The **Charge Indicator LED** provides an indication that there is a harmful voltage level present. The location of the **Charge Indicator LED** is shown in Figure 3.

Ensure that the **Charge Indicator LED** is off before coming into contact with any circuits or attempting to perform any maintenance on the ASD.

Note: *The GX9610K is shown in figure 3 below. See the drawings of the system received for the actual location of the Charge LED.*

Figure 3. Typical GX9 ASD Charge Indicator LED.



Power Connection Requirements

Connect the 3-phase input power of the correct voltage to the input terminals of the ASD at **R/L1**, **S/L2**, and **T/L3** (see Figure 4 for the typical electrical connection scheme and on pg 15 for the terminal locations).

Connect the output of the ASD to the motor from the ASD terminals **U/T1**, **V/T2**, and **W/T3**. The input and output conductors and terminal lugs used shall be in accordance with the requirements listed in the section titled Voltage/Current Specifications on pg. 76.

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**.

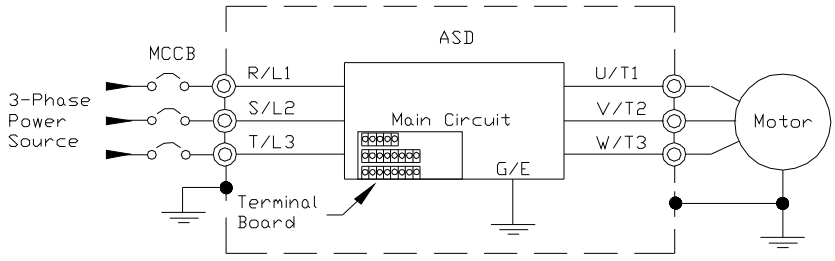
The ASD is designed and tested to comply with UL Standard 508C. Modifications to the ASD system may disqualify the UL rating.

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.

CAUTION

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

Figure 4. The GX9 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.
- Install noise filters as required.

Lead Length Specifications

Adhere to the NEC and any local codes during the installation of ASD/Motor systems. Excessive lead lengths may adversely effect the performance of the motor. Special cables are not required.

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

Table 1. Lead Length Specifications

AC Motor Voltage	PWM Carrier Frequency	NEMA MG1 Part 31 Compliant Motors	NEMA MG1 Part 30 Compliant Motors
600 V	< 5 kHz	600 ft.	200 ft.
	≥ 5 kHz	300 ft.	100 ft.

Note: *Contact Toshiba for application assistance when using lead lengths in excess of those listed.*

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

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

I/O and Control

The **GX9 ASD** can be controlled by several input types and combinations thereof, as well as operate within a wide range of output frequency and voltage levels. This section discusses the ASD control methods and supported I/O functions.

The **Terminal Board** supports discrete and analog I/O functions and is shown in Figure 6 on pg 20. Table 2 lists the names and the default settings of the input and output terminals of the **Terminal Board**. See the section titled Terminal Descriptions on pg. 17 for an expanded description of each terminal.

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

Figure 19 on pg 26 shows the typical connection diagram for the GX9 ASD system.

Table 2. Terminal Board Terminal Names and Functions.

Default Term. Setting	Input/Output	Default Function (also see Terminal Descriptions on pg. 17)	Circuit Config.
ST	Discrete Input Connect to CC to activate (Sink mode) *Sink/Source Switching applies to discrete input terminals only.*	**Standby** — Multifunctional programmable discrete input. Activation required for normal ASD operation.	Figure 9 on pg 24.
RES		**Reset** — Multifunctional programmable discrete input. Resets a faulted ASD.	
F		**Forward** — Multifunctional programmable discrete input.	
R		**Reverse** — Multifunctional programmable discrete input.	
S1		**Preset Speed 1** — Multifunctional programmable discrete input.	
S2		**Preset Speed 2** — Multifunctional programmable discrete input.	
S3		**Preset Speed 3** — Multifunctional programmable discrete input.	
S4		**Emergency Off** — Multifunctional programmable discrete input.	
RR	Analog Input	**RR** — Multifunction programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output).	Figure 10 on pg 24.
RX		**RX** — Multifunctional programmable analog input (-10 to +10 VDC input — -80 to +80 Hz output).	Figure 11 on pg 24.
II		**II** — Multifunctional programmable analog input (4 [0] to 20 mADC input — 0 to 80 Hz output). Return at II(-).	Figure 12 on pg 24
VI		**VI** — Multifunctional programmable analog input (0 to 10 VDC input — 0 to 80 Hz output).	
AM	Analog Output	Produces an output current that is proportional to the magnitude of the function assigned to this terminal.	Figure 17 on pg 24
FM			
OUT1 (C-A)	Switched Output	**Low Frequency** — Programmable contact (N.O.).	Figure 15 on pg 24
OUT2 (C-A)		**Reach Frequency** — Programmable contact (N.O.).	
FLA		Fault relay (N.O.).	Figure 18 on pg 24
FLB		Fault relay (N.C.).	
FLC		Fault relay (Common).	
FP	Pulsed Output	**Frequency Pulse** — an output pulse train that has a frequency which is based on the output frequency of the ASD.	Figure 16 on pg 24
P24	DC Output	24 VDC @ 50 mA output.	Figure 13 on pg 24
PP		**PP** — 10.0 VDC voltage source for the external potentiometer.	Figure 14 on pg 24
CC	—	Return for analog and discrete input terminals.	**DO NOT** connect to Earth Gnd.

Terminal Descriptions

Note: *The programmable terminal assignments may be accessed and changed from the default settings as mapped on pg. 36 or via the **Direct Access** method: Program ⇒ Direct Access ⇒ **applicable parameter number**. See the section titled Program Mode Menu Navigation on pg. 36 for the applicable **Direct Access** parameter numbers. For further information on terminal assignments and default setting changes, see the sections titled Default Setting Changes on pg. 53 and Terminal on pg. 39.*

ST — The default terminal assignment is **Standby** (ST). 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 21 on pg 30. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F113**).

RES — The default terminal assignment is **Reset** (RES). As the default setting, this terminal resets any active alarms or faults. The **RES** terminal is activated by connecting **CC** to this terminal (Sink mode). A momentary connection to **CC** resets the ASD and any fault indications from the display. **Reset** is effective when faulted only. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F114**). The cause of the trip must be corrected for a **Reset** to enable the system for normal ASD operations.

F — The default terminal assignment is **Forward** (F) run. As the default setting, this terminal provides a forward run command. The **F** terminal is activated by connecting **CC** to this terminal (Sink mode). A connection to **CC** provides a forward run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F111**).

R — The default terminal assignment is **Reverse** (R) run. As the default setting, this terminal provides a reverse run command. The **R** terminal is activated by connecting **CC** to this terminal (Sink mode). A connection to **CC** provides a forward run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F112**).

S1 — The default terminal assignment is **Preset Speed 1** (S1). As the default setting, this terminal provides a run command for the **Preset Speed 1** setting (**F018**). The **S1** terminal is activated by connecting **CC** to this terminal (Sink mode). A connection to **CC** provides a **Preset Speed 1** run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F115**).

S2 — The default terminal assignment is **Preset Speed 2** (S2). As the default setting, this terminal provides a run command for the **Preset Speed 2** setting (**F019**). The **S2** terminal is activated by connecting **CC** to this terminal (Sink mode). A connection to **CC** provides a **Preset Speed 2** run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F116**).

S3 — The default terminal assignment is **Preset Speed 3** (S3). As the default setting, this terminal provides a run command for the **Preset Speed 3** setting (**F020**). The **S3** terminal is activated by connecting **CC** to this terminal (Sink mode). A connection to **CC** provides a **Preset Speed 3** run command for the duration of the activation. This input terminal may be programmed to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F117**).

S4 — The default terminal assignment is **Emergency Off** (S4). As the default setting, this terminal provides an **Emergency Off** command upon activation and the system remains in the **Emergency Off** condition until reset. 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 the *GX9 ASD Installation & Operation Manual* (see **F118**).

RR — The default function assigned to this terminal is **Frequency Mode 1**. The **RR** terminal accepts an analog 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 an analog ±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 **F216** – **F221**).

II — The **II** terminal is an isolated current input that is used to control the speed or torque of the motor. Return at **II**(-). Select **VI/II** at **F004** for speed control or select **VI/II** at **F420** for torque control. The **II** terminal receives a 0 – 20 mA input signal that controls the output 0.0 – **Maximum Frequency** output or the -250% – 250% torque output of the ASD. 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**).

VI — The **VI** terminal is an isolated voltage input that is used to control the speed or torque of the motor. Select **VI/II** at **F004** for speed control or select **VI/II** at **F420** for torque control. The **VI** terminal receives a 0 – 10 VDC input signal that controls the output 0.0 – **Maximum Frequency** output or the -250% – 250% torque output of the ASD. 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**).

Note: *The **VI** terminal or the **II** terminal may be used to control the speed or torque of the motor. Selecting VI/II at parameter **F004** enables both terminals for use, but both cannot be used simultaneously. The user connects the proper input (current or voltage) to the appropriate terminal to be used for control.*

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

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

OUT1 — The default function assigned to this terminal is **External Device 1**. The function as **External Device 1** is to activate/deactivate an auxiliary motor once the **Virtual Linear Pump** level has remained above the **Maximum** threshold setting or below the **Minimum** threshold setting for the time setting of **F931**. The **OUT1** terminal is rated at 2 A/120 VAC and 2 A/30 VDC and may be set to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (see **F130**).

OUT2 — The default function assigned to this terminal is **External Device 2**. The function as **External Device 2** is to activate/deactivate an auxiliary motor once the control level of the **Virtual Linear Pump** settings has remained above the **Maximum** threshold or below the **Minimum** threshold settings for the time setting of **F931**. The **OUT2** terminal is rated at 2 A/120 VAC and 2 A/30 VDC and may be set to any of the functions listed in the *GX9 ASD Installation & Operation Manual* (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 listed in the *GX9 ASD Installation & Operation Manual*. For further information on this terminal, see parameter **F676**.

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 the *GX9 ASD Installation & Operation Manual*. For further information on this terminal, see **F670**.

FM — This output terminal produces an output current that is proportional to the output frequency of the ASD or of the magnitude of the function assigned to this terminal. The available assignments for this output terminal are listed in the *GX9 ASD Installation & Operation Manual*. For further information on this terminal, see **F005**.

FLA — One of two normally open contacts that, under user-defined conditions, connect to FLC. The FL relay is the Fault Relay by default, but may be programmed to any of the selections listed in the *GX9 ASD Installation & Operation Manual*. For further information on this terminal, see Figure 5 and **F132**.

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.

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

Figure 5. 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**.*

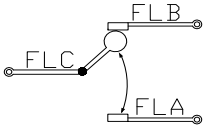
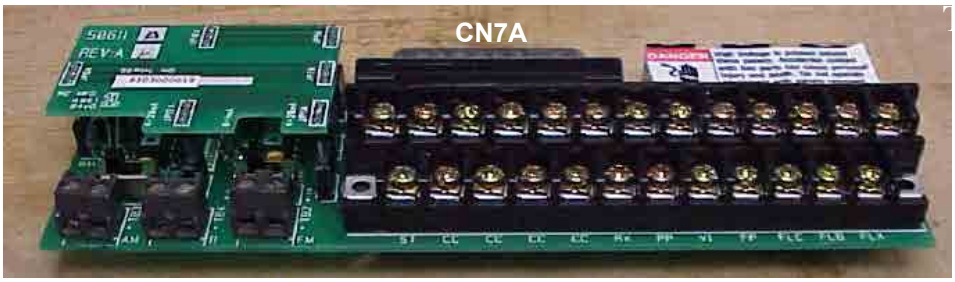
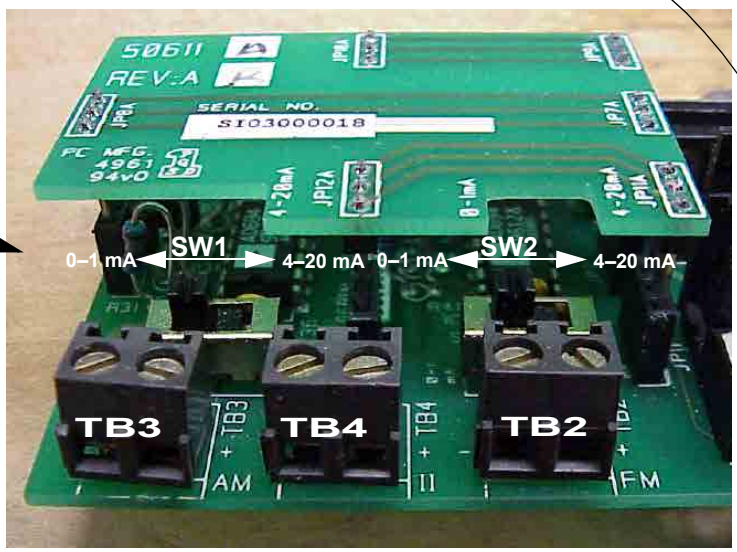


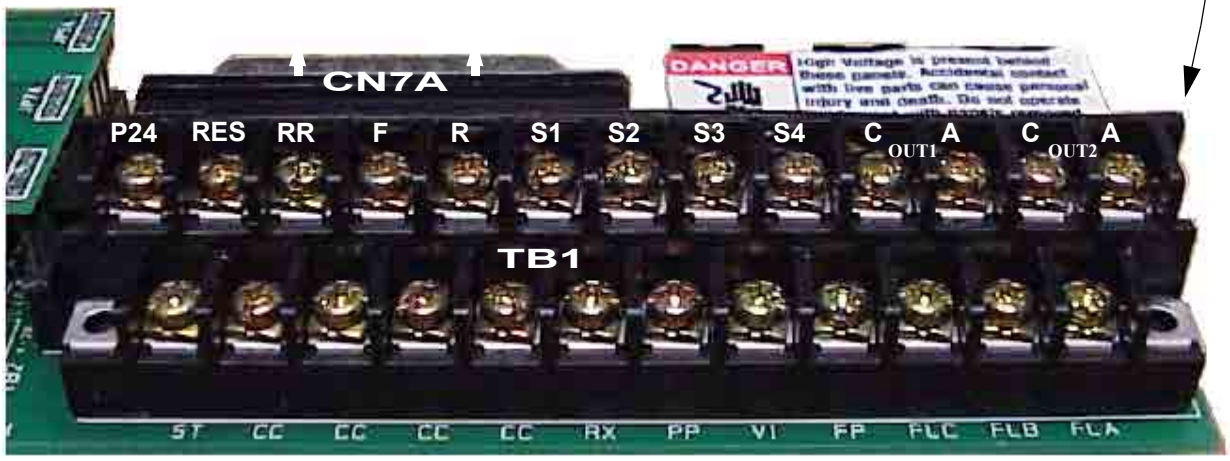
Figure 6. GX9 ASD Terminal Board.





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

The remaining input and output terminals of the **Terminal Board** are shown below. For more information on these terminals see pg. 16.



GX9 ASD Control

The **Control Board** (P/N 56000) serves as the primary control source for the **GX9 ASD** and receives input from the **Terminal Board** (see Figure 6 on pg 20), an Option Card, RS232/RS485 Communications, or the EOI.

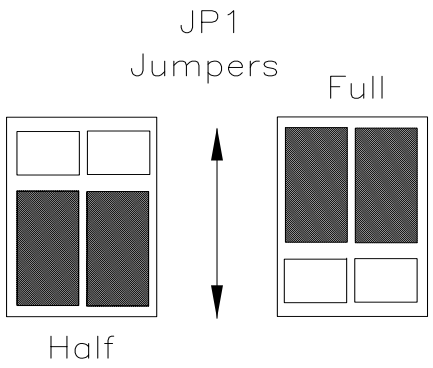
The **Control Board** has been enhanced to support two additional functions: Multiple Protocol Communications and the ability to communicate in either half- or full-duplex modes.

Using the optional multiple-protocol communications interface; the **ASD-NANOCOM**, the **Control Board** may be configured for the type of communications protocol being received and respond appropriately to the sending device. The ASD-NANOCOM connects to the **J4** and **J5** connectors (see Figure 8). Jumper Board (P/N 55365) is required at the **J4** connector if not using the ASD-NANOCOM.

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

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

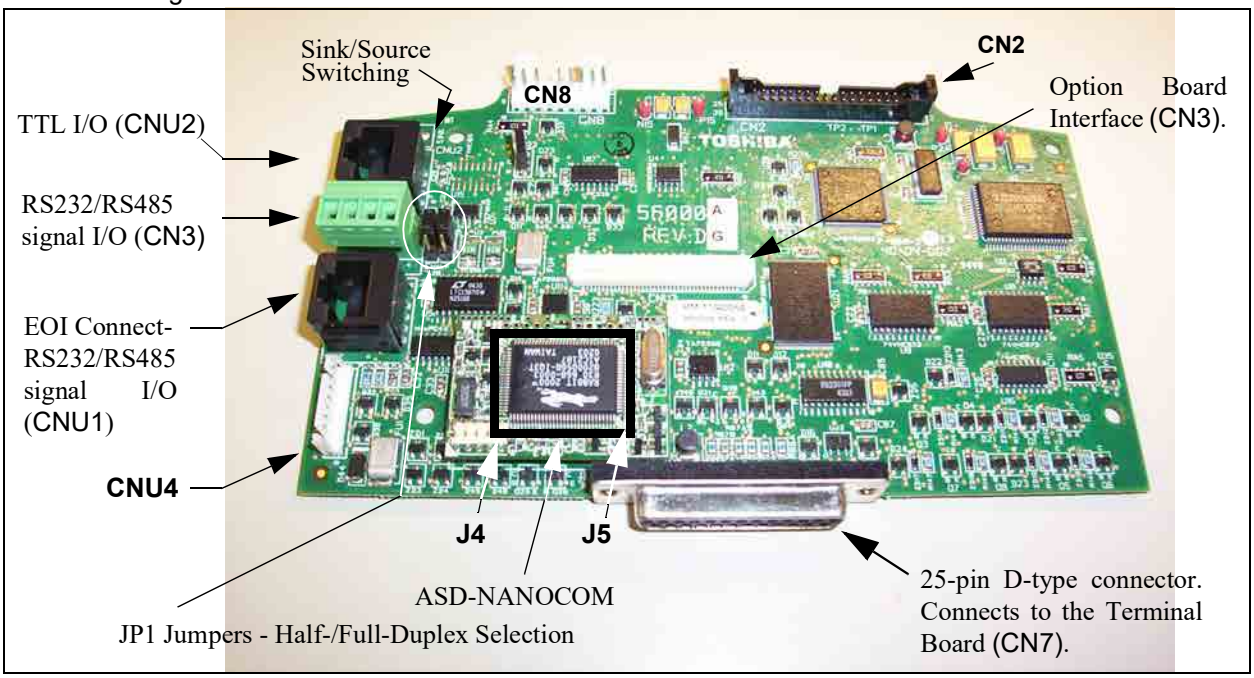
Figure 7. JP1 Half-Full Duplex Jumper Settings.



For more information on the GX9 ASD communication requirements, please visit www.tic.toshiba.com/ind/ to acquire a copy of the 7-Series Communications User Manual and visit www.iccdesigns.com to acquire a copy of the ASD-NANOCOM User Manual.

Contact the Toshiba Customer Support Center if more information is required on the ASD-NANOCOM.

Figure 8. Control Board of the GX9 ASD.



CNU1 and CNU2 Pinout

Pin #	CNU1 Pinout (Control Board)	Pin #	CNU2 Pinout (Control Board)
1	P24	1	P24
2	Gnd	2	Gnd
3	Tx (-)	3	Rx
4	Rx (+)	4	Gnd
5	Rx (-)	5	Tx
6	Tx (+)	6	Gnd
7	$\overline{\text{RS232}}$/RS485	7	Open
8	Gnd	8	Gnd

CN3 Pinout

CN3 is used for RS232/RS485 serial communications.

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

CN7 Pinout

Listed below are the pinouts of the **CN7** connector. The **CN7** connector is the 25-pin D-type connector of the **Control Board** (see Figure 8 on pg 22). **CN7** connects to **CN7A** of the **Terminal Board**.

Table 3. CN7 pinout assignments. Default settings listed for the programmable terminals.

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

I/O Circuit Configurations

Figure 9. Discrete Input.

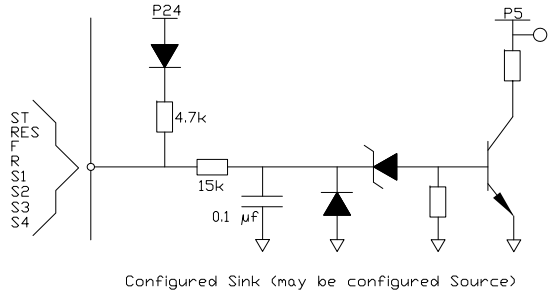


Figure 10. RR Input.

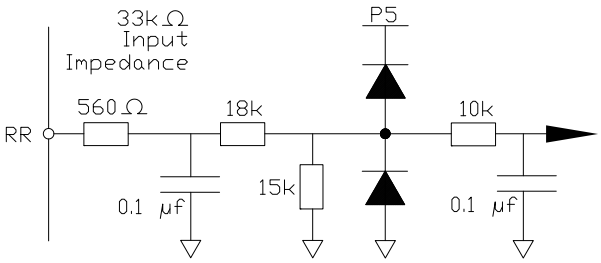


Figure 11. RX Input.

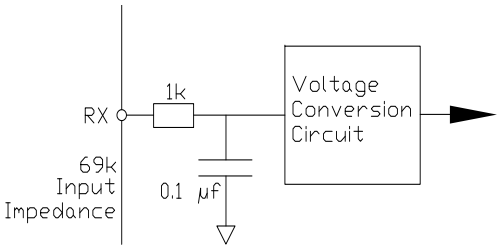


Figure 12. VI/II Input.

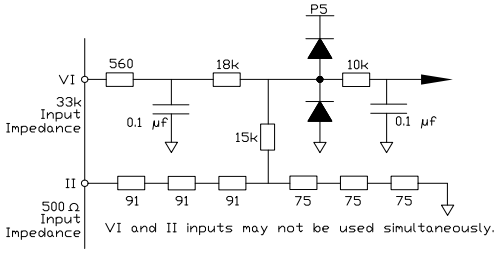


Figure 13. P24 Output.

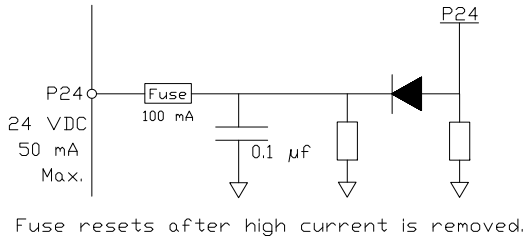


Figure 14. PP Output.

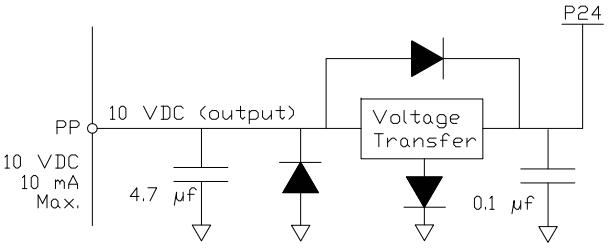


Figure 15. OUT1/OUT2 Output.

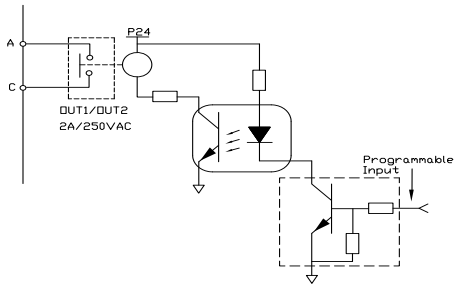


Figure 16. FP Output.

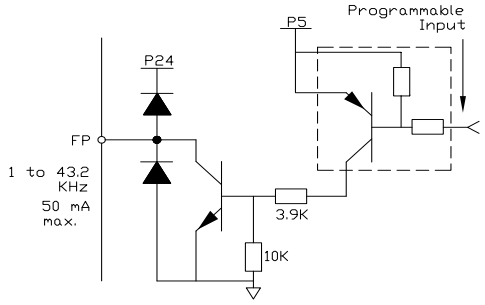


Figure 17. AM/FM Output.

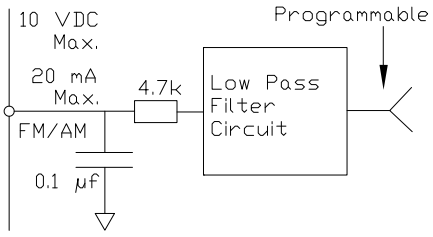
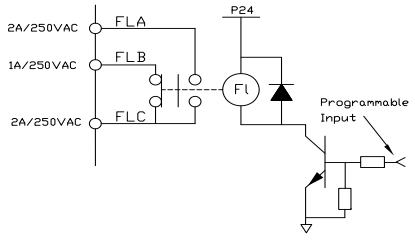


Figure 18. Fault Relay (during fault).



Startup and Test

Perform the following checks before turning on the unit:

- **L1/R**, **L2/S**, and **L3/T** are connected to the 3-phase input power.
- **T1/U**, **T2/V**, and **T3/W** are connected to the motor.
- The 3-phase input voltage is within the specified tolerance.
- There are no shorts and all grounds are secured.
- Front door is closed and all enclosure panels are securely fastened.
- All personnel are clear of the area of the installation and the driven equipment.

Save User Settings

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

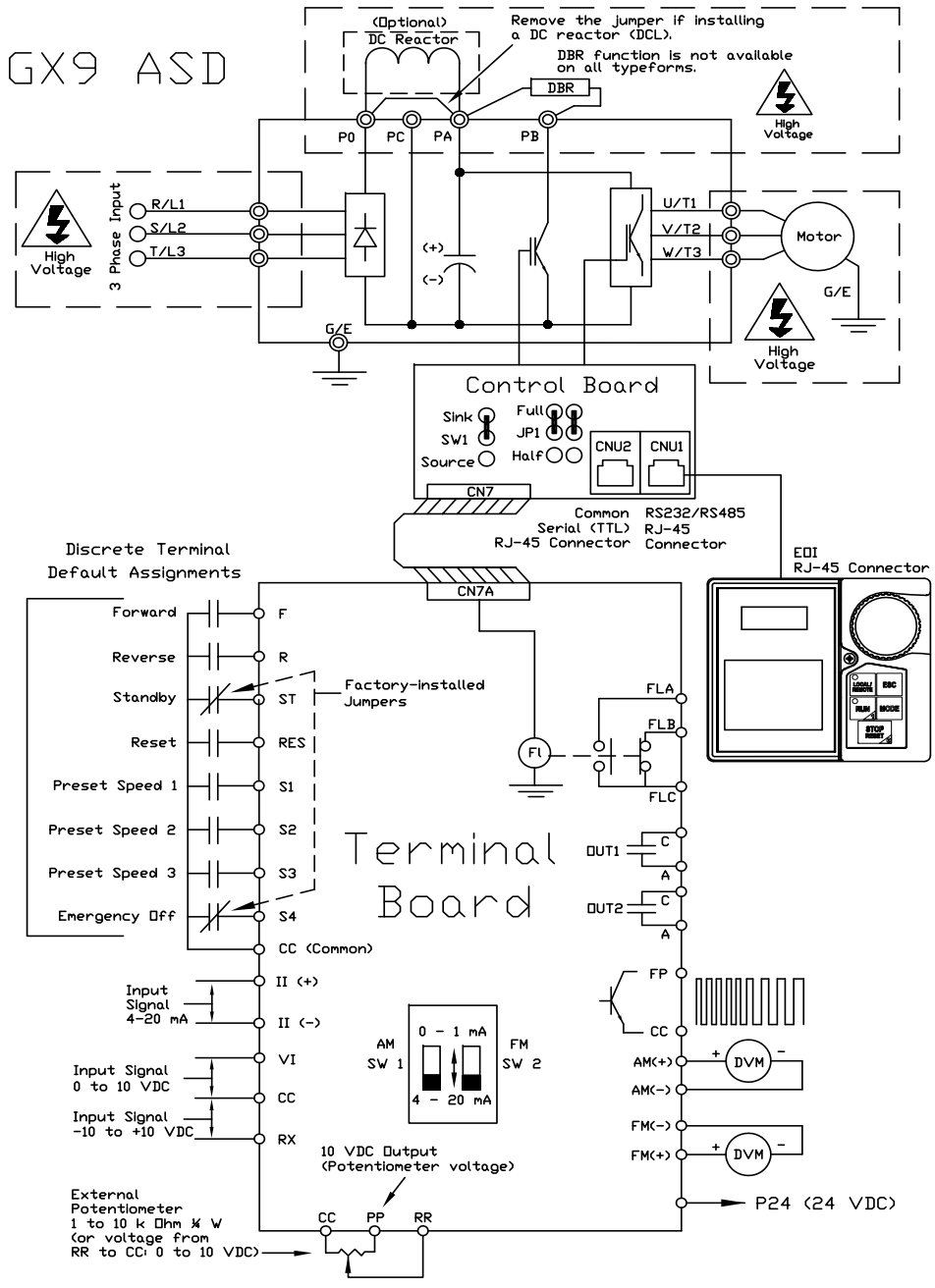
Table 4. ASD Parameter Changes by Installer/Maintenance Personnel.

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

Typical Connection Diagram

Figure 19. GX9 ASD Typical Connection Diagram.

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



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

Note: *See alternative **ST**-to-**CC** activation configuration on pg. 12.*

Electronic Operator Interface

The GX9 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. 28.

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 GX9 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 Lockouts Information,

Alarm Information,

Main Monitor Items,

Prohibited Items, and

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

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

To activate the battery backup system, remove the Phillips screw from the front of the LED/LCD display unit (see Figure 20. on pg. 28). Remove the LED/LCD display unit from the ASD. From the circuit side of the display unit, remove the jumper at **J1**, pins **2** and **3**. Place the jumper at **J1**, pins **1** and **2**. The battery backup system is now configured for use.

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

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

LED/LCD Screen Installation Note

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

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

EOI Remote Mounting

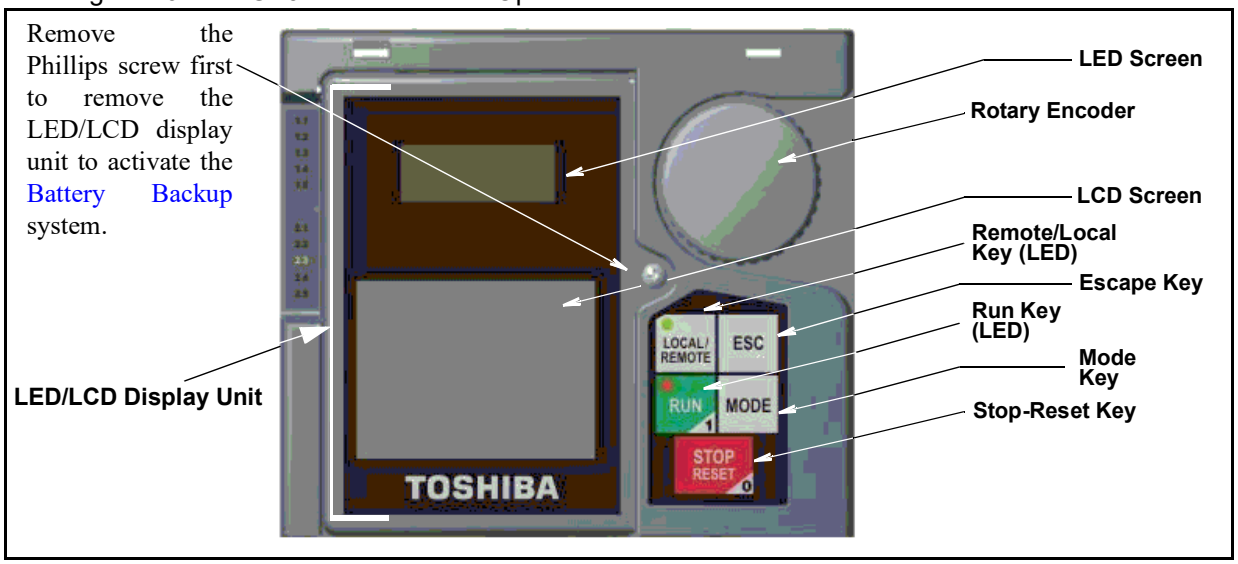
The EOI may be mounted remotely using the optional **ASD-MTG-KIT9**. Or if operating in a **NEMA 4** environment, the **ASD-EOI-N4-G9** is best suited for this application. Each kit contains all of the hardware required to mount the EOI of the GX9 ASD remotely.

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 in the *GX9 ASD Installation & Operation Manual* for more information on mounting the EOI remotely.

EOI Features

Figure 20. The GX9 ASD Electronic Operator Interface Features.



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

Rotary Encoder — Used to access the GX9 ASD menu selections, change the value of a displayed parameter (while in edit mode), and perform 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.

Local|Remote Key — Toggles the system to and from the **Local** and **Remote** modes. The **Local/Remote** key is disabled while the **Fault** screen is active. The **Local/Remote** key LED is on when the system is in the **Local** mode. The **Local** mode allows the **Command** and **Frequency** control functions to be carried out via the **EOI**.

The **Remote** mode enables the **Command** and **Frequency** control functions to be carried out via the **Terminal Board**, **RS485**, **Communication 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 **Local** mode control (**Command** and **Frequency** control) may be disabled via Program ⇒ Utilities ⇒ Prohibition ⇒ Local/Remote Key Command Override and Local/Remote Key Frequency Override. The availability of the **Local** 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 **Local** 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 24 on pg. 31). 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.
2. Initiates an **Emergency Off Fault** if pressed twice quickly. The **Emergency Off** function terminates the GX9 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 Screen Display

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

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

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

During an active fault, the fault is displayed.

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

LED Character/Font Information

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

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

LCD Screen Display

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

LCD Character/Font Information

All alpha-numeric characters are available.

LED/LCD Screen Information

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

Using the LCD Screen

The **LCD** screen is the primary user input/output information center. Parameter settings may be viewed or changed using the LCD display unit of the **EOI**. To view or change a parameter setting using the LCD screen, press the **Mode** key until the **Program** menu is displayed. Turn the **Rotary Encoder** until the desired **Primary Menu** item (see pg. 36) is within the cursor block. Press the **Rotary Encoder** to select the item from the **Primary Menu** (repeat for submenu items).

See the section titled Default Setting Changes on pg. 53 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 (RS232/RS485) Menu on pg. 32 *for further information on EOI Command (RS232/RS485) Menu 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 21. **Frequency Command** Screen.

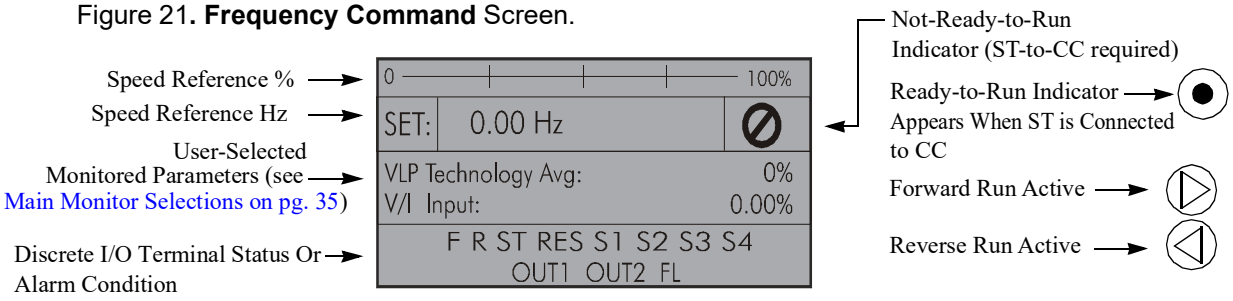


Figure 22. **Monitor** Screen (see pg. 33 for more on the Monitor screen items).

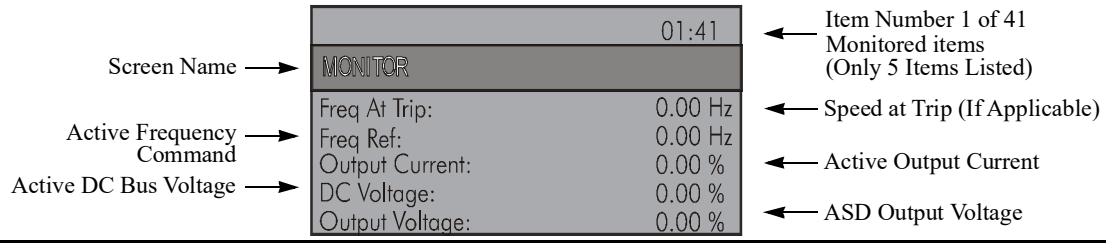
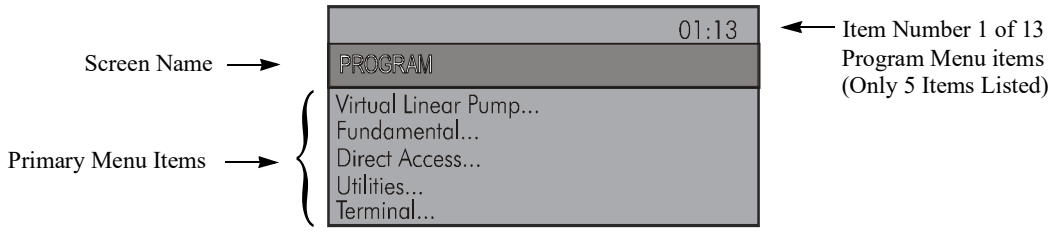


Figure 23. **Program Menu** Screen (see pg. 36 for more on the Program Menu Screen).



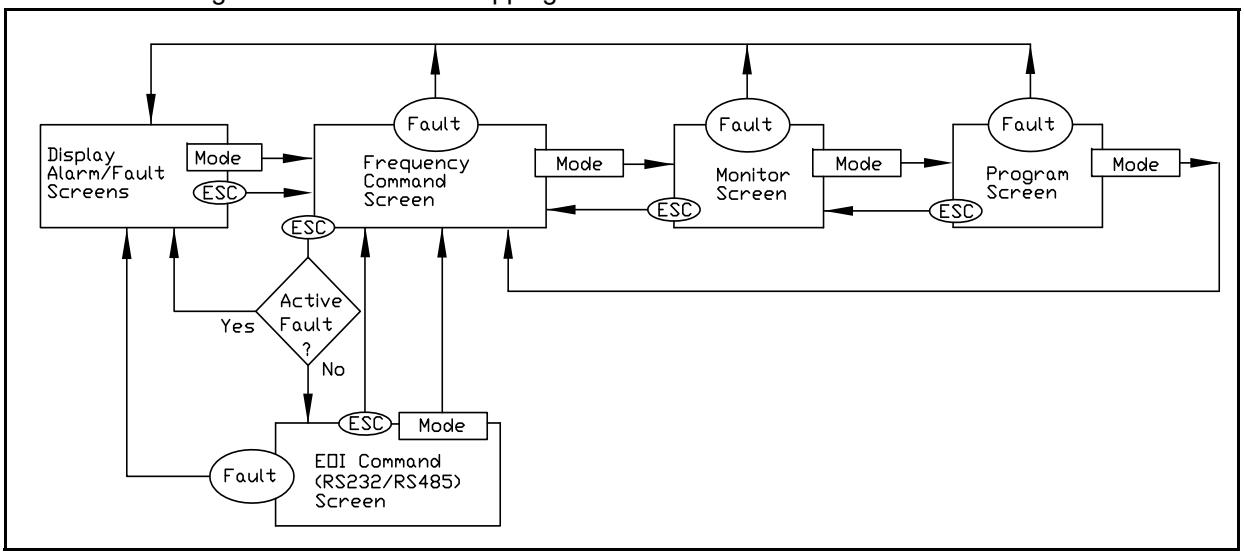
System Configuration and Menu Options

Root Menus

The **Mode** key accesses the three primary modes of the **GX9 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 24). While in the **Frequency Command** mode, pressing the **ESC** key toggles the menu to and from the **Command (RS232/RS485)** menu and the **Frequency Command** mode.

Note: *Parameter changes made from the* ***Command (RS232/RS485)*** *menu are effective for* ***Local*** *LCD* ***EOI*** *control* ***Only****.*

Figure 24. Root menu mapping.



Frequency Command Mode

Frequency Setting

While operating in the **Local** mode (Local LED is illuminated on the front panel), the running frequency of the motor may be set from the **Frequency Command** screen. Using the **Rotary Encoder**, enter the **Frequency Command** value and then press the **Run** key. The motor will run at the **Frequency Command** speed and may be changed while running.

EOI Command (RS232/RS485) Menu

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

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

Direction — **Forward** or **Reverse**.

Stop Pattern — The **Decel Stop** or **Coast Stop** settings 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 — 1 of 4 **V/f** profiles may be selected and run. Each **V/f** profile is comprised of 4 user settings: **Base Frequency**, **Base Frequency Voltage**, **Manual Torque Boost**, and **Motor Overload Protection**. Expanded descriptions of these parameters may be found in the section titled Direct Access Parameter Information in the *GX9 ASD Installation & Operation Manual*.

Accel/Decel Group — 1 of 4 **Accel/Decel** profiles may be selected and run. Each of the **Accel/Decel** profiles is comprised of 3 user settings: **Acceleration**, **Deceleration**, and **Pattern**. Expanded descriptions of these parameters may be found in the section titled Direct Access Parameter Information in the *GX9 ASD Installation & Operation Manual*.

PID Control — This feature 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 setup at **F441**, **F444**, **F446**, and **F448**, respectively.

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

Monitor Mode

The **Monitor** mode allows the user to monitor motor performance variables, control settings, and configuration data during motor operation. 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. 53*.

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 GX9 ASD.

DC Bus Voltage — Displays the **Bus Voltage** as a percentage of the rated capacity of the GX9 ASD.

Output Voltage — Displays the **Output Voltage** as a percentage of the rated capacity of the GX9 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) 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) 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 GX9 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) 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 (Inst) — Provides a status of the **Real-Time Feedback** in Hz.

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

Torque — Displays the **Output Torque** as a percentage of the rated capacity of the GX9 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).

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

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

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

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

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

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

Peak Current — Displays the peak current since the last start was initiated. The current is displayed as a percentage of the rated capacity of the GX9 ASD.

Peak Voltage — Displays the peak voltage since the last start was initiated. The voltage is displayed as a percentage of the rated capacity of the GX9 ASD.

PG Speed — Displays the PG Speed.

PG Position — Displays the Pulse Generator Position.

Max Output — Not used.

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

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

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

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

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**.

Trip Code — Displays **NERR** if there are no errors, or displays the active fault. See Table 8 on page 67 for a listing of the possible fault codes.

Main Monitor Selections

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

The selected items, along with their real-time values, are displayed on the **Frequency Command** screen while the GX9 ASD is running. Not all **Monitor Mode** items are available for display on the **Frequency Command** screen. The available items are underlined on pg. 33 and pg. 34.

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 21 on pg. 30 (VLP Technology Average and VI/II Input shown).

Program Mode Menu Navigation

Table 5 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 accessed (and changed) as mapped below or via the **Direct Access** method: Program ⇒ Direct Access ⇒ ***applicable parameter number***.

Table 5. Program Mode Mapping.

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
VIRTUAL LINEAR PUMP (see Virtual Linear Pump Setup on pg. 58 for more on this function)	**Setup Wizard**	Motor/ASD Setup	N/A
		Transducer Setup	
		Virtual Linear Pump Max/Min Setup	
	Settings	Mode Switch	F911
		Application Type	F912
		Application Operating Mode	F379
		Transducer Units	N/A
		Transducer Output Range	F914
		Transducer Maximum Reading	F916
		Transducer Minimum Reading	F915
		Minimum (Threshold)	F917
		Maximum (Threshold)	F918
		Command Source	F920
		Command Value	F921
		Low Frequency Limit	F919
	Start and Stop Points	Start and Stop Mode	F927
		Start and Stop Delay Timer	F928
		Low Start and Stop Point	F929
		High Start and Stop Point	F930
		Input Terminal 5 (S1) Function	F115
	Sleep Timer	Sleep Timer	F925
		Sleep Timer Delay	F926
	Run External Devices	External Delay Timer	F931
		External Device Low Band	F932
		External Device High Band	F933
		Output Terminal 1 (OUT1) Function	F130
		Output Terminal 2 (OUT2) Function	F131
	Low Suction/No-Flow Cut Off	Low Suction/No-Flow Cut Off Mode	F934
		Low Suction/No-Flow Cut Off Delay Timer	F936
		Input Terminal 5 (S1) Function	F115
		Low Suction/No-Flow Cut Off Disposition	F935

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
VIRTUAL LINEAR PUMP	**Sealing Water**	Sealing Water Mode	F937
		Input Terminal 5 (S1) Function	F115
		Output Terminal 1 (OUT1) Function	F130
FUNDAMENTAL	**Frequency Setting**	Maximum Frequency	F011
		Upper Limit	F012
		Lower Limit	F013
		V/f Pattern	F015
	Standard Mode Selection	Command Mode	F003
		Frequency Mode 1	F004
		Frequency Mode 2	F207
		Frequency Priority	F200
		Frequency Mode Priority Switching Frequency	F208
	Accel/Decel 1 Settings	Acceleration Time 1	F009
		Deceleration Time 1	F010
		S-Curve Accel/Decel Pattern 1	F502
		Automatic Accel/Decel Enable/Disable	F000
	Motor Set 1	Base Frequency 1	F014
		Base Frequency Voltage 1	F306
		Manual Torque Boost 1	F016
		Motor Overload Protection #1	F600
DIRECT ACCESS	See the section titled Direct Access Parameter Information in the *GX9 ASD Installation & Operation Manual*.		
UTILITIES	**Version**	EOI Version	N/A
		ASD Type	N/A
		ASD CPU Version	N/A
		ASD EEP1 Version	N/A
		ASD EEP2 Version	N/A
	Trip History		N/A
	Type Reset	None	F007
		Setup for 50 Hz	
		Setup for 60 Hz	
		Restore Factory Defaults	
		Clear Trips	
		Clear Run Timer	
		Initialize Typeform	
		Save User Settings	
		Restore User Settings	
		Reload EOI to Factory Defaults	
	Display Parameters	Current/Voltage Units Setup	F701

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
UTILITIES	**Display Parameters**	Free Unit Multiplication Factor	F702
		Free Unit Display Resolution	F703
		Acceleration/Deceleration Unit Time Setup	F704
		Language	N/A
		Display the Startup Wizard at Next Power Up	N/A
	Main Monitor Selections	Monitor 1	N/A
		Monitor 2	N/A
	Real-Time Clock Setup	Time/Date Setting	N/A
	Changed From Default	See the section titled Default Setting Changes on pg. 53.	N/A
	Save/Restore Wizard	Save or Restore EOI User Settings	N/A
	Prohibition	Local/Remote Key Command Override	N/A
		Local/Remote Key Frequency Override	N/A
		Skip Uninitialized Parameters in the Changed From Default Window	N/A
		Prohibit Initializing User Parameters During Typeform Initialization	F709
	Alarm Prohibition	Over-Current Alarm	N/A
		ASD Overload Alarm	N/A
		Motor Overload Alarm	N/A
		Over-Heat Alarm	N/A
		Over-Voltage Alarm	N/A
		Main Circuit Low Voltage (MOFF)	N/A
		Control Circuit Low Voltage (POFF)	N/A
		Under-Current Alarm	N/A
		Over-Torque Alarm	N/A
		DBR Overload Alarm	N/A
		Cumulative Run Timer Alarm	N/A
		Communication Alarm 1 (Scan Transmission)	N/A
		Communication Alarm 2 (TTL/RS232/RS485 Transmission)	N/A
		Retry Alarm	N/A
		Fault Alarm	N/A
		Point Setting Error Alarm	N/A
		Earth Fault Alarm	N/A
		PID Low Output Disable Alarm	N/A
		Virtual Linear Pump On	N/A
		Virtual Linear Pump Low Frequency	N/A
		Virtual Linear Pump No Flow	N/A
	Contrast	Use Rotary Encoder to Adjust	N/A

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL	**Input Terminals**	Always On	F110
		Input Terminal 1 (F)	F111
		Input Terminal 2 (R)	F112
		Input Terminal 3 (ST)	F113
		Input Terminal 4 (RES)	F114
		Input Terminal 5 (S1)	F115
		Input Terminal 6 (S2)	F116
		Input Terminal 7 (S3)	F117
		Input Terminal 8 (S4)	F118
		Input Terminal 9 (LI1)	F119
		Input Terminal 10 (LI2)	F120
		Input Terminal 11 (LI3)	F121
		Input Terminal 12 (LI4)	F122
		Input Terminal 13 (LI5)	F123
		Input Terminal 14 (LI6)	F124
		Input Terminal 15 (LI7)	F125
		Input Terminal 16 (LI8)	F126
	Output Terminals	Output Terminal 1 (OUT1)	F130
		Output Terminal 2 (OUT2)	F131
		Output Terminal 3 (FL)	F132
		Output Terminal 4 (OUT3)	F133
		Output Terminal 5 (OUT4)	F134
		Output Terminal 6 (R1)	F135
		Output Terminal 7 (OUT5)	F136
	Analog Input Functions	Acc/Dec Base Frequency Adjustment	F650
		Upper-Limit Frequency Adjustment	F651
		Acceleration Time Adjustment	F652
		Deceleration Time Adjustment	F653
		Torque Boost Adjustment	F654
	Analog Output Terminals	FM Output Terminal Function	F005
		FM Output Terminal Adjustment	F006
		AM Output Terminal Function	F670
		AM Output Terminal Adjustment	F671
		MON 1 Terminal Meter Selection	F672
		MON 1 Terminal Meter Adjustment	F673
		MON 2 Terminal Meter Selection	F674
		MON 2 Terminal Meter Adjustment	F675
	Reach Settings	Low Speed Signal Output Frequency	F100
		Speed Reach Frequency	F101
		Speed Reach Detection Band	F102

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL	**FP Terminal Settings**	(FP Terminal) Pulse Output Function	F676
		(FP Terminal) Pulse Output Frequency	F677
	Input Special Functions	ST Signal	F103
		F/R Run Priority (w/both activated)	F105
		Input Terminal Priority	F106
		16-Bit Binary/BCD Input	F107
	Line Power Switching	Commercial Power/ASD Switching Enable/ Selection	F354
		Commercial Power/ASD Switching Freq.	F355
		(Apply) ASD Output Wait-Time	F356
		(Apply) Commercial Power Wait-Time	F357
		Commercial Power Switching Frequency Hold-Time	F358
	Input Terminal Delays	Input Terminal 1 (F)	F140
		Input Terminal 2 (R)	F141
		Input Terminal 3 (ST)	F142
		Input Terminal 4 (RES)	F143
		Input Terminal 5 – 8 (S1-S4)	F144
		Input Terminal 9 – 16 (S5-S12)	F145
	Output Terminal Delays	Output Terminal 1 (OUT1) On Delay	F150
		Output Terminal 1 (OUT1) Off Delay	F160
		Output Terminal 2 (OUT2) On Delay	F151
		Output Terminal 2 (OUT2) Off Delay	F161
		FL On Delay	F152
		FL Off Delay	F162
		OUT4 On Delay	F153
		OUT4 Off Delay	F163
		OUT5 On Delay	F154
		OUT5 Off Delay	F164
		OUT6 On Delay	F155
		OUT6 Off Delay	F165
		OUT7 On Delay	F156
		OUT7 Off Delay	F166
FREQUENCY	**Analog Filter**	Analog Input Filter	F209
	Speed Reference Setpoints	VI/II Point 1 Frequency	F202
		VI/II Reference Point 1	F201
		VI/II Point 2 Frequency	F204
		VI/II Reference Point 2	F203
		VI/II Bias	F470
		VI/II Gain	F471

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY	**Speed Reference Setpoints**	RR Point 1 Frequency	F211
		RR Reference Point 1	F210
		RR Point 2 Frequency	F213
		RR Reference Point 2	F212
		RR Bias	F472
		RR Gain	F473
		RX Point 1 Frequency	F217
		RX Reference Point 1	F216
		RX Point 2 Frequency	F219
		RX Reference Point 2	F218
		RX Bias	F474
		RX Gain	F475
		RX2 Point 1 Frequency	F223
		RX2 Reference Point 1	F222
		RX2 Point 2 Frequency	F225
		RX2 Reference Point 2	F224
		RX2 Bias	F476
		RX2 Gain	F477
		BIN Point 1 Frequency	F229
		BIN Reference Point 1	F228
		BIN Point 2 Frequency	F231
		BIN Reference Point 2	F230
		PG Point 1 Frequency	F235
		PG Reference Point 1	F234
		PG Point 2 Frequency	F237
		PG Reference Point 2	F236
	Jog Settings	Jog Run Frequency	F260
		Jog Stop Pattern	F261
	Pattern Run	Pattern Run Enable/Disable	F520
		Pattern Run Group 1 Repeat Factor (255 = Continuous)	F530
		Pattern Run Group 1 Selection 1	F531
		Pattern Run Group 1 Selection 2	F532
		Pattern Run Group 1 Selection 3	F533
		Pattern Run Group 1 Selection 4	F534
		Pattern Run Group 1 Selection 5	F535
		Pattern Run Group 1 Selection 6	F536
		Pattern Run Group 1 Selection 7	F537
		Pattern Run Group 1 Selection 8	F538
		Pattern Run Group 2 Repeat Factor (255 = Continuous)	F540

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY	**Pattern Run**	Pattern Run Group 2 Selection 1	F541
		Pattern Run Group 2 Selection 2	F542
		Pattern Run Group 2 Selection 3	F543
		Pattern Run Group 2 Selection 4	F544
		Pattern Run Group 2 Selection 5	F545
		Pattern Run Group 2 Selection 6	F546
		Pattern Run Group 2 Selection 7	F547
		Pattern Run Group 2 Selection 8	F548
		Pattern Run Group 3 Repeat Factor (255 = Continuous)	F550
		Pattern Run Group 3 Selection 1	F551
		Pattern Run Group 3 Selection 2	F552
		Pattern Run Group 3 Selection 3	F553
		Pattern Run Group 3 Selection 4	F554
		Pattern Run Group 3 Selection 5	F555
		Pattern Run Group 3 Selection 6	F556
		Pattern Run Group 3 Selection 7	F557
		Pattern Run Group 3 Selection 8	F558
		Pattern Run Group 4 Repeat Factor (255 = Continuous)	F560
		Pattern Run Group 4 Selection 1	F561
		Pattern Run Group 4 Selection 2	F562
		Pattern Run Group 4 Selection 3	F563
		Pattern Run Group 4 Selection 4	F564
		Pattern Run Group 4 Selection 5	F565
		Pattern Run Group 4 Selection 6	F566
		Pattern Run Group 4 Selection 7	F567
		Pattern Run Group 4 Selection 8	F568
	Fwd/Rev Disable	Disable Forward Run/Disable Reverse Run	F311
	Preset Speeds	Preset Speed 1	F018
		Preset Speed 2	F019
		Preset Speed 3	F020
		Preset Speed 4	F021
		Preset Speed 5	F022
		Preset Speed 6	F023
		Preset Speed 7	F024
		Preset Speed 8	F287
		Preset Speed 9	F288
		Preset Speed 10	F289
		Preset Speed 11	F290

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY	**Preset Speeds**	Preset Speed 12	F291
		Preset Speed 13	F292
		Preset Speed 14	F293
		Preset Speed 15	F294
	Preset Speed Modes	Preset Speed Operation Mode	F380
	Preset Speed Time Settings	Preset Speed Time Settings 1 – 15	N/A
	UP/DOWN Frequency Settings	UP/DOWN Frequency Disposition at Power Down	F108
		UP/DOWN Frequency Minimum	
		UP/DOWN Frequency Maximum	
PROTECTION	**Dynamic Braking**	Dynamic Braking Enable/Disable	F304
		Dynamic Braking Resistance	F308
		Dynamic Braking Capacity	F309
	Stall	Over-Voltage Stall Enable/Disable	F305
		Power Running Stall Continuous Trip Detection Time	F452
		Regenerative Braking Stall Prevention Mode	F453
		Stall Prevention Level	F601
		Over-Voltage Stall Operation Level	F626
		Over-Voltage Stall Operation Level (Fast)	F625
		Over-Heat Stall	F740
	DC (Injection) Braking	DC Injection Start Frequency	F250
		DC Injection Braking Current	F251
		DC Injection Braking Time	F252
		Forward/Reverse DC Braking Priority	F253
		Motor Shaft Fixing Control Enable/Disable	F254
	Emergency Off Settings	Emergency Off Stopping Method	F603
		Emergency Off DC Injection Braking Time	F604
	Retry/Restart	Auto Restart	F301
		Auto Restart Attempts (Retry Select)	F303
		Scan Rate	F312
		Lock-On Rate	F313
		Search Method	F314
		Search Inertia	F315
	Under-Voltage/ Ridethrough	Regenerative Ridethrough	F302
		Under-Voltage Trip Enable/Disable	F627
		Under-Voltage Detection Time	F628
		Regenerative Ridethrough Control Level	F629
		Ridethrough Time	F310

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
PROTECTION	**Overload**	Motor Overload Protection	F017
		OL Reduction Starting Frequency	F606
		Motor 150% OL Time Limit	F607
	Trip Settings	Retain Trip Record at Power Down	F602
	Phase Loss	Output Phase Failure Detection Enable/ Disable	F605
	Low Current Settings	Low Current Trip Enable/Disable	F610
		Low Current Detection Current	F611
		Low Current Detection Time	F612
	Abnormal Speed Settings	Abnormal Speed Detection Time	F622
		Over-Speed Detection Frequency Upper Band	F623
		Over-Speed Detection Frequency Lower Band	F624
	Over-Torque Settings	Over-Torque Trip Enable/Disable	F615
		Over-Torque Detection Level During Power Running	F616
		Over-Torque Detection Level During Regenerative Braking	F617
		Over-Torque Detection Time	F618
	Base Frequency Voltage	Supply Voltage and Output Voltage Compensation/Limiting Enable/Disable	F307
	Special Protection Parameters	Short Circuit Detection at Start	F613
		Short-Circuit-Pulse Run Duration	F614
		Cooling Fan Control	F620
		Cumulative Run-Timer Alarm Setting	F621
		Braking Answer Wait Time	F630
		Brake Release After Run Timer	F632
		Suppression of Inrush-Current Timing	F609
TORQUE	**Set Points**	VI/II Point 1 Torque	F205
		VI/II Reference Point 1	F201
		VI/II Point 2 Torque	F206
		VI/II Reference Point 2	F203
		RR Input Point 1 Torque	F214
		RR Reference Point 1	F210
		RR Input Point 2 Torque	F215
		RR Reference Point 2	F212
		RX Input Point 1 Torque	F220
		RX Reference Point 1	F216
		RX Input Point 2 Torque	F221
		RX Reference Point 2	F218

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TORQUE	**Set Points**	RX2 Input Point 1 Torque	F226
		RX2 Reference Point 1	F222
		RX2 Input Point 2 Torque	F227
		RX2 Reference Point 2	F224
		BIN Point 1 Torque	F232
		BIN Reference Point 1	F228
		BIN Point 2 Torque	F233
		BIN Reference Point 2	F230
	Torque Control	Torque Command	F420
		Tension Torque Bias Input	F423
		Torque Command Filter	F421
		Synchronized Torque Bias Input	F422
		Load Sharing Gain Input	F424
		Forward Speed Limit	F425
		Forward Speed Limit Level	F426
		Reverse Speed Limit	F427
		Reverse Speed Limit Level	F428
	Torque Limit Settings	Power Running Torque Limit 1	F440
		Regenerative Braking Torque Limit 1	F442
		Torque Limit Mode	F450
		Torque Limit Mode (speed dependent)	F451
	Manual Torque Limit Settings	Power Running Torque Limit 1 Level	F441
		Regenerative Braking Torque Limit 1	F443
		Power Running Torque Limit 2 Level	F444
		Regenerative Braking Torque Limit 2	F445
		Power Running Torque Limit 3 Level	F446
		Regenerative Braking Torque Limit 3	F447
		Power Running Torque Limit 4 Level	F448
		Regenerative Braking Torque Limit 4	F449
	Torque Speed Limiting	Torque Command Mode	F429
		Speed Limit Center Value Reference	F430
		Speed Limit Center Value	F431
		Speed Limit Band	F432
		Speed Limit Recovery Time	F433
FEEDBACK	**Feedback Settings**	PID Feedback Input Signal	F360
		PID Feedback Delay Filter	F361
		PID Feedback Proportional (P) Gain	F362
		PID Feedback Integral (I) Gain	F363
		PID Deviation Upper Limit	F364
		PID Deviation Lower Limit	F365

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FEEDBACK	**Feedback Settings**	PID Feedback Differential (D) Gain	F366
	PG Settings	Number of PG Pulses	F367
		PG Phases	F368
		PG Disconnection Detection	F369
		Electronic Gear Setting	F370
		Position Loop Gain	F371
		Positioning Completion Range	F372
		Frequency Limit at Position	F373
		Current Control Proportional Gain	F374
		Current Control Integral Gain	F375
		Speed Loop Proportional Gain	F376
		Speed Loop Integral Gain	F377
		Motor Counter Data	F378
		Speed Loop Parameter Ratio	F379
	Drooping Control	Drooping Gain	F320
		Speed at Drooping Gain 0%	F321
		Speed at **F320** Drooping Gain	F322
		Drooping Insensitive Torque	F323
		Drooping Output Filter	F324
		Drooping Reference	F327
		Load Inertia (Acc/Dec Torque)	F325
		Load Torque Filter	F326
	Override Control	Adding Input	F660
		Multiplying Input	F661
		CN8 Option Override Multiplication Gain	F729
COMMUNICATIONS	**Communication Settings**	ASD Number	F802
		TTL Baud Rate	F800
		RS232/RS485 Baud Rate	F820
		Parity	F801
		RS232/RS485 Communication Time Out Time	F803
		TTL and RS232/RS485 Communication Time Out Action	F804
		TTL Send Wait Time	F805
		RS232/RS485 Wire Count	F821
		RS232/RS485 Send Wait Time	F825
		TTL ASD-to-ASD Communication	F806
		RS232/RS485 ASD-to-ASD Communication	F826
		EOI Port Address (Reset ASD after change)	N/A

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
COMMUNICATIONS	**Communication Adjustments**	Frequency Point	F810
		Point 1 Setting	F811
		Point 1 Frequency	F812
		Point 2 Setting	F813
		Point 2 Frequency	F814
	S20 Settings (not used)	Receive Address	F860
		Transmit Address	F861
		Speed Reference Station	F862
		Speed Reference Address	F863
		Torque Reference Station	F865
		Torque Reference Address	F866
		Fault Detect Station Number	F868
		Station Mode	F869
		S20 Reset	F899
		Communication Error Mode	F850
		Communication Error Detect Time	F851
	Scan Settings (not used)	Command Request Disposition on Error	F830
		Input Reference 1	F831
		Input Reference 2	F832
		Input Reference 3	F833
		Input Reference 4	F834
		Input Reference 5	F835
		Input Reference 6	F836
		Output Monitor 1	F841
		Output Monitor 2	F842
		Output Monitor 3	F843
		Output Monitor 4	F844
		Output Monitor 5	F845
		Output Monitor 6	F846
	Optional Parameters (not used)	Optional Parameters 1	F890
		Optional Parameters 2	F891
		Optional Parameters 3	F892
		Optional Parameters 4	F893
		Optional Parameters 5	F894
MOTOR	**Vector Motor Model**	Autotune Enable/Disable and Reset Config.	F400
		Autotune of Motor Constant 3	F414
		Slip Frequency Gain	F401
		Motor Capacity (kW)	F412
		Motor Constant 1 (primary resistance)	F402

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
MOTOR	**Vector Motor Model**	Motor Constant 2 (secondary resistance)	F403
		Motor Constant 3 (exciting inductance)	F404
		Motor Constant 4 (load inertia)	F405
		Motor Constant 5 (leakage inductance)	F410
		Motor Type	F413
		Number of Motor Poles	F411
	Motor Set 1	Base Frequency 1	F014
		Base Frequency Voltage 1	F306
		Manual Torque Boost 1	F016
		Motor Overload Protection #1	F600
	Motor Set 2	Base Frequency 2	F170
		Base Frequency Voltage 2	F171
		Manual Torque Boost 2	F172
		Motor Overload Protection Level 2	F173
	Motor Set 3	Base Frequency 3	F174
		Base Frequency Voltage 3	F175
		Manual Torque Boost 3	F176
		Motor Overload Protection Level 3	F177
	Motor Set 4	Base Frequency 4	F178
		Base Frequency Voltage 4	F179
		Manual Torque Boost 4	F180
		Motor Overload Protection Level 4	F181
SPECIAL	**Frequency Control**	Start Frequency	F240
		Run Frequency	F241
		Run Frequency Hysteresis	F242
		End Frequency	F243
	Jump Frequencies	Jump Frequency 1	F270
		Jump Frequency 1 Bandwidth	F271
		Jump Frequency 2	F272
		Jump Frequency 2 Bandwidth	F273
		Jump Frequency 3	F274
		Jump Frequency 3 Bandwidth	F275
		Jump Frequency Processing	F276
	Carrier Frequency	PWM Carrier Frequency Setting	F300
		Minimum Carrier Frequency 2.2 kHz	F738
	Accel/Decel 1 – 4 Settings	Acceleration Time 1	F009
		Deceleration Time 1	F010
		S-Curve Acceleration/Deceleration Pattern 1	F502
		Acceleration Time 2	F500

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SPECIAL	**Accel/Decel 1 – 4 Settings**	Deceleration Time 2	F501
		S-Curve Acceleration/Deceleration Pattern 2	F503
		Acceleration Time 3	F510
		Deceleration Time 3	F511
		S-Curve Acceleration/Deceleration Pattern 3	F512
		Acceleration Time 4	F514
		Deceleration Time 4	F515
		S-Curve Acceleration/Deceleration Pattern 4	F516
		Acceleration/Deceleration Pattern 1 – 4	F504
	Accel/Decel Special	S-Pattern Acceleration Lower Limit Adjustment	F506
		S-Pattern Acceleration Upper Limit Adjustment	F507
		Accel/Decel Time Lower Limit	F508
		Accel/Decel Switching Frequency 1	F505
		Accel/Decel Switching Frequency 2	F513
		Accel/Decel Switching Frequency 3	F517
	Crane/Hoist Load	Light-Load High-Speed Operation	F330
		Light-Load High-Speed Operation Switching Lower Limit Frequency	F331
		Light-Load High-Speed Operation Load Waiting Time	F332
		Light-Load High-Speed Operation Load Detection Time	F333
		Light-Load High-Speed Operation Heavy Load Detection Time	F334
		Switching Load Torque During Forward Run	F335
		Heavy Load Torque During Acceleration in the Forward Direction	F336
		Heavy Load Torque During Fixed Speed in the Forward Direction	F337
		Switching Load Torque During Reverse Run	F338
		Heavy Load Torque During Acceleration in the Reverse Direction	F339
		Heavy Load Torque During Deceleration in the Reverse Direction	F340
		Frequency for Automatic High-Speed Operation at Light Load	F341
	V/f Five-Point Setting	V/f Five-Point 1 Frequency	F190
		V/f Five-Point 1 Voltage	F191
		V/f Five-Point 2 Frequency	F192
		V/f Five-Point 2 Voltage	F193

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SPECIAL	**V/f Five-Point Setting**	V/f Five-Point 3 Frequency	F194
		V/f Five-Point 3 Voltage	F195
		V/f Five-Point 4 Frequency	F196
		V/f Five-Point 4 Voltage	F197
		V/f Five-Point 5 Frequency	F198
		V/f Five-Point 5 Voltage	F199
	Low Output Disable Function	LOD Control and Stopping Method	F731
		LOD Start Level	F732
		LOD Start Time	F733
		LOD Setpoint Boost	F734
		LOD Boost Time	F735
		LOD Feedback Level	F736
		LOD Restart Delay Time	F737
	Earth Fault	Earth Fault Alarm Level	F640
		Earth Fault Alarm Time	F641
		Earth Fault Trip Level	F642
		Earth Fault Trip Time	F643
	Special Parameters	V/f Adjustment Coefficient	F183
		0 Hz Dead Band Frequency Setting Signal	F244
		0 Hz Command Stop Method	F255
		Over Exciting Cooperation	F481
		Stall Cooperation Gain at Field Weakening Zone	F485
		Exciting Starting Rate	F486
		Compensation Coefficient for Iron Loss	F487
		Voltage Compensation Coefficient for Dead Time	F488
		Dead Time Compensation Enable/Disable	F489
		Dead Time Compensation Bias	F490
		Switching Frequency Between Current and Voltage Control	F491
		Optional Analog Terminal Mark	F680
		Current Differential Gain	F454
		Exciting Strengthening Coefficient	F480
		Control Margin Modulation for Current Vector Control	F482
		Control Margin Modulation for Voltage Vector Control	F483
		Control Margin Modulation for Constant Vector Control	F484
		Rocking Start	F739

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
Password and Lockouts	**Enter Password**		
	Change Password		
	Lockouts		

System Operation

Startup Wizard

The **Startup Wizard** launches upon the first power up of the system and assists with the initial configuration of the input power settings and the output parameters of the **GX9 ASD**. The GX9 ASD may also be setup via communications, by directly accessing the individual parameters via the menu hierarchy, or using the **Direct Access** parameter numbers.

See the section titled Default Setting Changes on pg. 53 for more information on changing the parameter settings.

After the initial execution of the **Startup Wizard** at the first power up, the wizard may only be run by setting the following menu item to **Yes** — Program ⇒ Utilities ⇒ Display Parameters ⇒ **Display the startup wizard next power-up?**

Upon the next power up, the system will launch to the **Startup Wizard**. Once completed, the system will set the **Display the startup wizard next power-up?** setting to **No** (for the next system power up) and normal startups will resume.

The **Startup Wizard** querys the user for the following information:

1. The Voltage and Frequency Rating of the Motor.
2. The Upper Limit Frequency.
3. The Lower Limit Frequency.
4. Adjust Adjust Accel/Decel Automatically? (if **Enabled**, continue from step #7).
5. The Acceleration Time.
6. The Deceleration Time.
7. The Volts Per Hertz Setting.
8. The Motor Current Rating.
9. The Motor Capacity.
10. The Command Source.
11. The Frequency Command Source.
12. The Display Units for current and voltage.

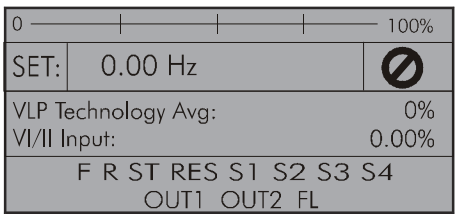
Click **Exit** to load the settings of the **Startup Wizard** into the ASD.

See the section titled Startup Wizard Requirements on pg. 54 for additional information on the **Startup Wizard**.

Operation (Local)

Note: *See Local|Remote Key on pg. 28 for information on **Remote** operation.*

To turn the motor on, perform the following:



1. Press the **Mode** key until the **Frequency Command** screen is displayed.
2. Press the **Local/Remote** key to enter the **Local** mode (green Local LED illuminates).
3. Turn the **Rotary Encoder** clockwise until the **Frequency Command** value is displayed in the **Set** field.
4. Press the **Run** key and the motor runs at the **Frequency Command** value.

Note: *The speed of the motor may be changed while the motor is running by using the **Rotary Encoder** to change the **Frequency Command** value.*

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

Default Setting Changes

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

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

For a complete listing of the **Program** mode menu options, see the section titled Program Mode Menu Navigation on pg. 36. Menu items are listed and mapped for convenience. The **Direct Access Numbers** are listed where applicable.

The default settings may also be changed by entering the **Parameter Number** of the setting to be changed at the **Direct Access** menu (Program ⇒ Direct Access ⇒ *applicable parameter number*). A listing of the **Direct Access/Parameter Numbers** and a description of the associated parameter may be found in the section titled Direct Access Parameter Information in the *GX9 ASD Installation & Operation Manual*.

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).

Note: *Parameter **F201** was changed to create the example shown in Figure 25.*

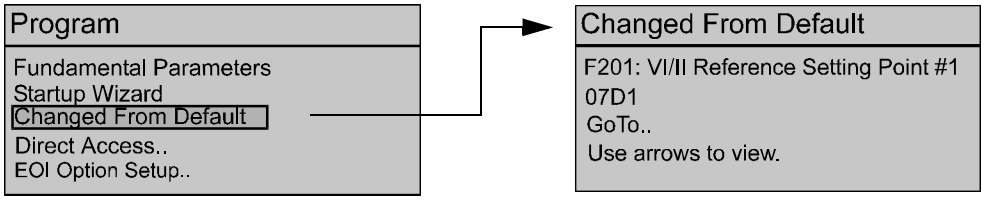
The **Changed From Default** feature allows the user to view (or change) the parameters that are different from the default or the post-reset settings. Once the **Changed From Default** screen is displayed, the system automatically scrolls through all of the system parameters and halts once reaching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

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

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

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

Figure 25. Changed From Default screen.



Startup Wizard Requirements

The **Startup Wizard** assists the user with the initial configuration of the **GX9 ASD** by querying the user for information on the ASD control settings, motor ratings, and ASD display units. The GX9 ASD may also be setup by accessing each of the settings via the **Program** menu or by using the **Direct Access Number** of each parameter (see the ***GX9 ASD Installation and Operation Manual*** for specifics on each parameter).

Upon initial system power up, the **Startup Wizard** starts automatically and the Welcome screen is displayed. Click **Next** to continue with the **Startup Wizard** or click **Exit** to go to the Wizard Finished! screen.

Running the Startup Wizard

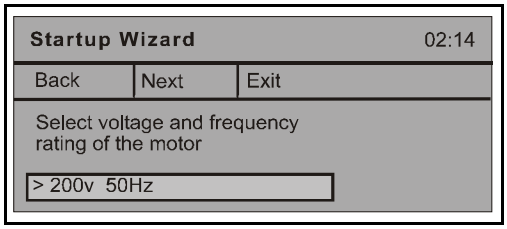
Input the required information into the following screens to complete the **Startup Wizard**.

1. Voltage and Frequency Rating of the Motor

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

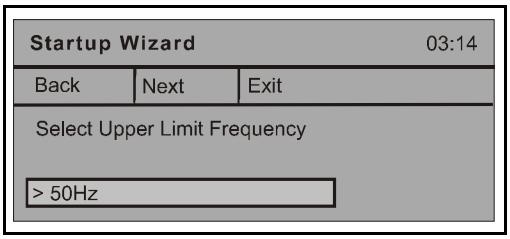
Settings:

4 — 575V 60 Hz



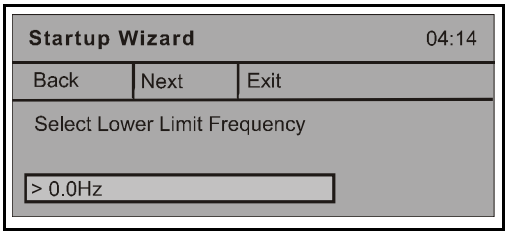
2. Upper Limit Frequency

This parameter sets the highest frequency that the GX9 ASD will accept as a frequency command or frequency setpoint. The GX9 ASD may output frequencies greater than the **Upper Limit Frequency** (but, less than the Maximum Frequency) when operating in the **PID Control** mode, **Torque Control** mode, or the **Vector Control** mode (sensorless or feedback).

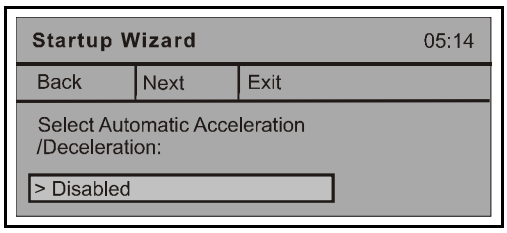


3. Lower Limit Frequency

This parameter sets the lowest frequency that the GX9 ASD will accept as a frequency command or frequency setpoint. The GX9 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** mode (sensorless or feedback).



4. Adjust Accel/Decel Automatically?



When enabled, the GX9 ASD adjusts the acceleration and deceleration rates according to the applied load. The acceleration and deceleration times range from 12.5% to 800% of the programmed values [e.g., Acceleration Time 1 **(**F009) and Deceleration Time 1 **(**F010) adjusted for the active Accel/Decel times].

Settings:

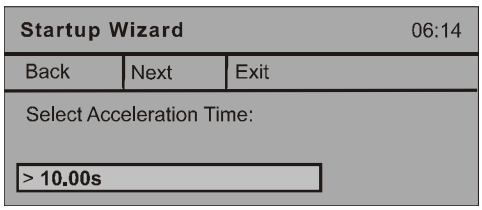
0 — Disabled

1 — Enabled

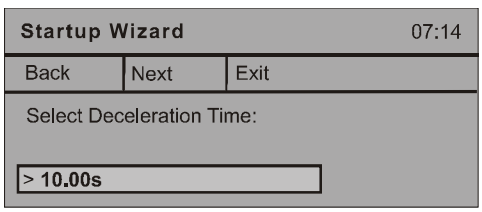
The motor and the load must be connected prior to selecting **Automatic Accel/Decel**.

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

Acceleration Time



Deceleration Time



5. Volts Per Hertz Setting

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

Settings:

0 — Constant Torque

1 — Variable Torque

2 — Automatic Torque Boost

3 — Sensorless Vector Control (Speed)

4 — Automatic Torque Boost with Automatic Energy Saving

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

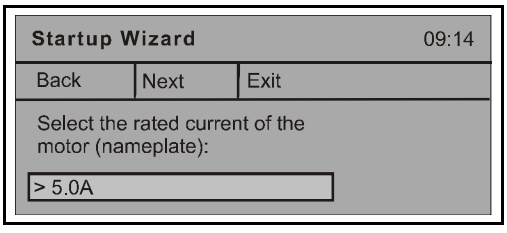
6 — V/f 5-Point Setting (opens 5-Point setting screen)

7 — Sensorless Vector Control (Speed/Torque switching)

8 — PG Feedback Vector Control (Speed/Torque switching)

9 — PG Feedback Vector Control (Speed/Position switching)

6. Motor Current Rating



This parameter allows the user to input the full-load amperage (FLA) of the motor. This value is used by the GX9 ASD to determine the **Motor Overload Protection** setting for the motor and may be found on the nameplate of the motor.

7. Motor Capacity

This parameter allows the user to input the full-load capability of the motor in kilo Watts. This value is used by the GX9 ASD to determine the motor overload protection setting for the motor and may be found on the nameplate of the motor.

8. Command Source

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

Settings:

0 — Terminal Board

1 — CN8 Option

2 — Common Serial (TTL)

3 — RS232/RS485

4 — Communication Card

9. Frequency Command Source

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

Settings:

1 — VI/II

2 — RR

3 — RX

4 — RX2 Option

5 — CN8 Option

6 — Binary/BCD Input

7 — Common Serial (TTL)

8 — RS232/RS485

9 — Communication Card

10 — UP/DOWN Frequency

11 — Pulse Input Option

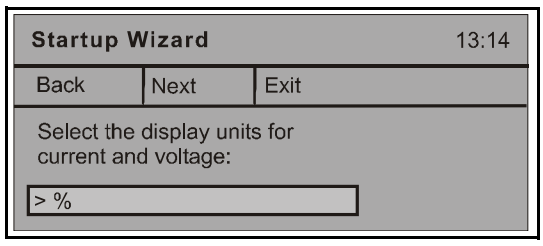
10. Display Units

This screen sets the display units for current and voltage.

Settings:

0 — %

1 — A/V (Amp/Volt)



11. Wizard Finished!

This screen is the final screen of the **Startup Wizard**. The basic parameters of the GX9 ASD have been set. Click **Exit** to load the **Startup Wizard** input and to return to the **Frequency Command** screen. Additional application-specific programming may be required.

Virtual Linear Pump Setup

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

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

However, the parameters addressed while using the Wizard or the **Virtual Linear Pump Settings** menu selection are also accessible via their associated direct access numbers for specific adjustments when required.

If using direct access numbers or the **Virtual Linear Pump Settings** to configure the **Virtual Linear Pump** algorithm, parameter **F911** must first be set to **255:Virtual Linear Pump** to accept the new or changed **Virtual Linear Pump** parameter settings. Upon completion of the parameter changes, set parameter **F911** to **1** or **2** to use the changed (new) settings for normal **Virtual Linear Pump** operations (Zero may be selected at **F911** to save the changes to be used later).

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

Figure 26. Input the Electrical Specifications of the Motor.

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

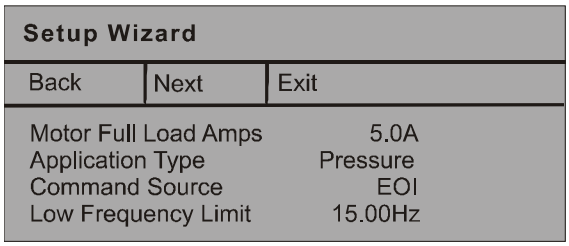
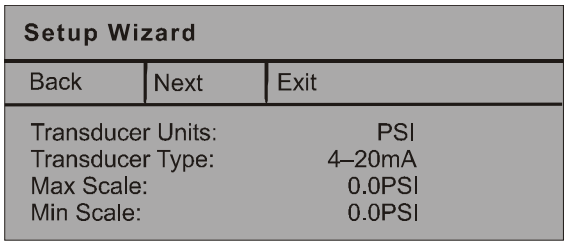


Figure 27. Input the Specifications of the Transducer.

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



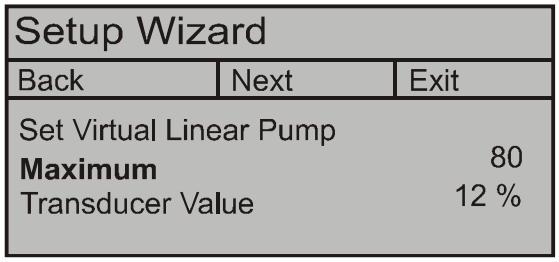
Note: *The **Custom** selection allows for a user-created unit of measure for the process variable as measured by the transducer.*

⚠ DANGER

WARNING! — THE FOLLOWING STEP WILL START THE MOTOR!

Figure 28. Set the Maximum Threshold Value.

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



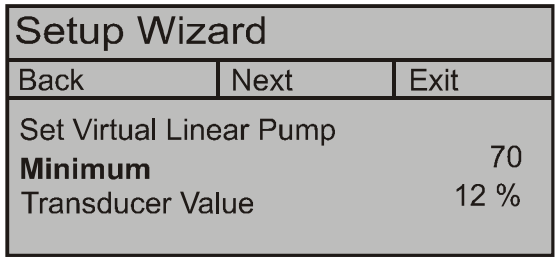
The Motor/Pump combination capacity is automatically calculated and displayed as the **Maximum** threshold. Normally, no further adjustment is required for the **Maximum** threshold setting.

The **Maximum** threshold value may be adjusted, if required, at **F918**. The **Maximum** threshold setting (**F918**) minus the **F933** setting comprises the range of the **Maximum** threshold zone.

14. Click **Next** to continue.

Figure 29. Set the Minimum Threshold Value.

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



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

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

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

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

Figure 30. Complete the Virtual Linear Pump Setup.

16. Press the **Stop** key to complete the setup.

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

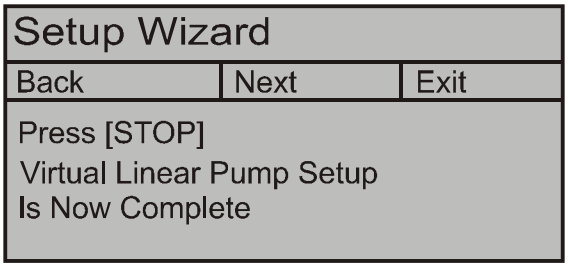


Figure 31. Run the Motor/Pump in the Direct Mode.

18. Press the **ESC** key until reaching the **Frequency Command** screen.

19. From the **Frequency Command** screen press **ESC**, scroll to the **Control** field, and select **Direct Mode** if using no feedback (if using feedback go to Step 22. on pg. 61).

20. While in the **Local** mode, press **Run**.

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

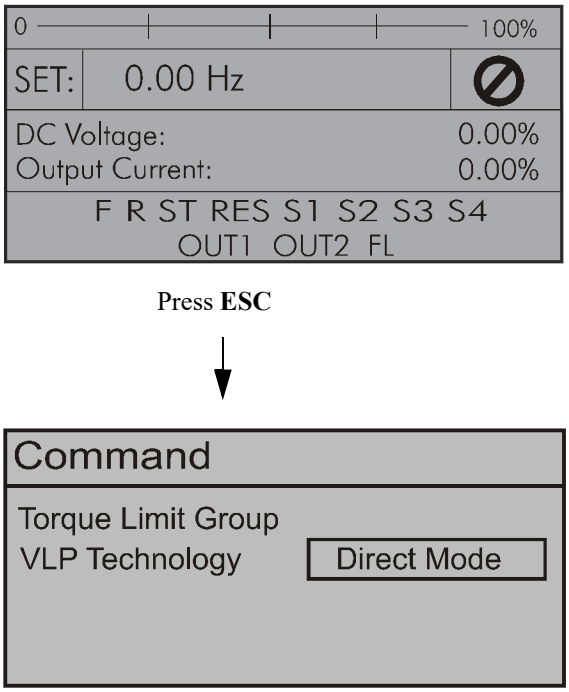
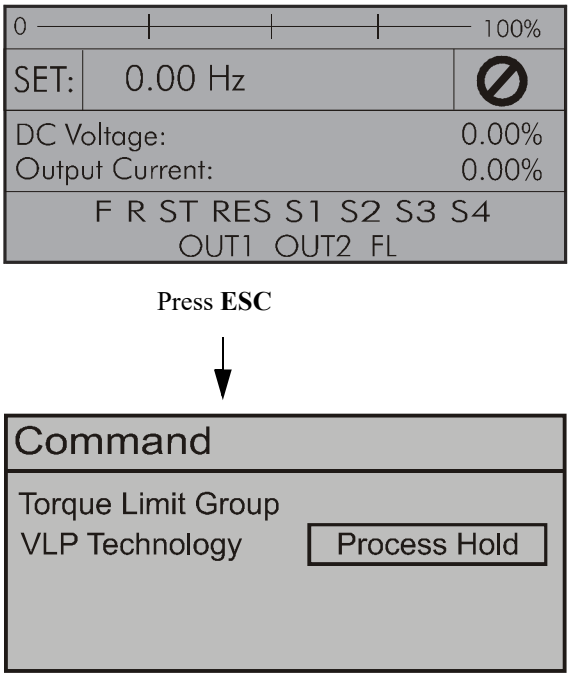


Figure 32. Run the Motor/Pump in Process Hold Mode.

22. From the **Frequency Command** screen press **ESC**, scroll to the **Control** field, and select **Process Hold** if using feedback (if not using feedback go to Step 19. on pg. 60).

23. While in the **Local** mode, press **Run**.

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



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 an **Alarm** or a **Fault** is incurred. The **User Notification** codes are displayed as an indication that a system function or system condition is active (i.e., ATN and DBON). The code is displayed on the EOI for the duration of the activation.

If a user setting or a **GX9 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 7 on pg. 64 lists the **Alarm** codes that may be displayed during operation of the GX9 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 GX9 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 (in time and/or magnitude).

- Current,
- Voltage,
- Speed,
- Temperature,
- Torque, or
- Load.

See Table 8 on pg. 67 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 GX9 ASD operator should be prepared to discuss when contacting the TIC Customer Support Center for assistance.

- What is the ASD and Motor size?
- What is the CPU version and revision level?
- What is the EOI version?
- Is this a new installation?
- What trip information is displayed?
- Has the system ever worked properly and/or what are the recent modifications (if any)?
- Does the ASD trip when accelerating, running, decelerating, or when not running?
- Does the ASD reach the commanded frequency?
- Does the ASD trip with an unloaded motor?
- Does the ASD trip without the motor attached?

User Notification Codes

The **User Notification** codes appear on the LED and LCD screens while the associated function is active.

User Notification codes notify the user of active functions that are usually only momentary under normal operating conditions.

User notification events are not error conditions and only convey active system functions to the user and may be associated with an output contact for annunciation or subsystem activation.

Table 6. User Notification Codes.

LED Screen	LCD Screen	Function	Description
AtN	—	Autotune Active	**Autotune** function is active.
db	—	DC Braking	**Motor Shaft Stationary** function is active.
dbOn	—	DC Braking	**DC Injection** function is active.
PuMP	Virtual Linear Pump On	Virtual Linear Pump On	**Virtual Linear Pump** function is enabled and active.
LOFr	Virtual Linear Pump Low Frequency	Virtual Linear Pump Low Frequency	**Virtual Linear Pump** function is operating at the **Low-Frequency Limit** setting (**F919**).

Note: *Some **User Notification** conditions and **Alarms** may be annunciated via a discrete output terminal setting. See the GX9 ASD Installation & Operation Manual for a listing of the possible system conditions that may be associated with an output terminal.*

Alarms

Table 7 lists the alarm codes that may be displayed during operation of the **GX9 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.

Note: *Some **User Notification** conditions and **Alarms** may be annunciated via a discrete output terminal setting. See the GX9 ASD Installation & Operation Manual for a listing of the possible system conditions that may be associated with an output terminal.*

Table 7. GX9 ASD Alarms.

LED Screen	LCD Screen	Description	Possible Causes/ Troubleshooting
Cn1	Communication Error (scan error)	Internal communications error.	• Improperly programmed ASD. • Improper communications settings. • Improperly connected cables.
Cn2	Communication alarm 2 (RS232/RS485/TTL error)	External communications error.	
EF	Earth Fault	Active ground fault.	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to **Earth Ground**.
EFU	DC Fuse Open	Incorrect current reading at DC fuse circuit.	• Open circuit at DC bus circuit.
Err1	Point Setting Error	Incorrect setup at an analog input (e.g., VI/II, RR, etc.).	• Gain and bias settings for an analog input are either the same or too close to each other (e.g., **F201** and **F203** are equal).
LOd	PID Low Output Disable	LOD function enabled and the output frequency is less than the **F732** setting.	• Disable the **LOD** function at **F731** or increase the **Low Output Disable Start Level** at **F732**.
nOFF	Main Power Under-Voltage	Under-voltage condition at the 3-phase AC input to the ASD.	• Low 3-phase commercial voltage.
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.

LED Screen	LCD Screen	Description	Possible Causes/ Troubleshooting
*OH	*Over-Heat	ASD ambient temperature excessive.	• ASD is operating at an elevated temperature. • ASD is too close to heat-generating equipment. • Cooling fan vent is obstructed (see Mounting the ASD on pg. 12). • Cooling fan is inoperative. • Internal thermistor is disconnected.
OJ	Cumulative Run Timer	Run-time counter exceeded.	• **Type Reset** required; select **Clear run timer**.
OL2	Motor Overload	Load requirement exceeds the ability of the motor.	• Improper V/f setting. • Motor is locked. • Continuous operation at low speed. • Startup frequency setting adjustment required.
*OL 1	*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.
*OLr	*Braking 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.	• 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**).
OE	Excessive 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.
* Reset ignored if active.			

LED Screen	LCD Screen	Description	Possible Causes/ Troubleshooting
*POFF	*Control Power Under-Voltage	Under-voltage condition at the 5, 15, or the 24 VDC supply.	• Defective **Control Board**. • Excessive load on power supply. • Low input voltage.
rtry	Retry	After a trip has occurred, for a number of user-set times an automatic system restart is attempted for a qualified trip.	• The **Retry** function is active.
UC	Low-Current Operation	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.
nOFL	Virtual Linear Pump No Flow	A Low suction/No-flow cut off condition has been active for a duration longer than the setting of **F936**.	• Pump prime required. • Feed water loss. • Output valve is closed. • System may be set to Trip or Alarm for this condition at **F935**.
* Reset ignored if active.			

Trips/Faults

A **Trip** is a **GX9 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 8 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 8. GX9 ASD Fault Listing.

LED Screen	LCD Screen	Possible Causes/Troubleshooting
AbFL	Virtual Linear Pump Abnormal Flow	• Loss of suction pressure or closed pump output valve. • Activated discrete input terminal set to **Low Suction/No Flow Protection**. • ASD Upper-Limit Frequency run-time is equal to **F936** time setting.
E	Emergency Off	• Output signal from the ASD is terminated and a brake may be applied if so configured. • Emergency Off command 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 Board 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	• VI/II signal loss. • Terminal Board failure. • P24 over-current condition.
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.
E-22	Logic Input Voltage Error	• Incorrect voltage applied to the discrete input terminals.

LED Screen	LCD Screen	Possible Causes/Troubleshooting
E-23	Optional Expansion Input Terminal Board 1 Error	• Optional Expansion Input Terminal Board 1 is defective.
E-24	Optional Expansion Input Terminal Board 2 Error	• Optional Expansion Input Terminal Board 2 is defective.
EEP1	EEPROM Fault	• EEPROM write malfunction. • Make a service call.
EEP2	EEPROM Read Error	• Control EEPROM read malfunction. • Make a service call.
EEP3	EEPROM Read Error	• Main Circuit EEPROM read malfunction. • Make a service call.
EF1/EF2	(Earth) Ground Fault - Software or Hardware	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to **Earth Ground**. • Ground fault detected by the software.
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	ASD RAM Fault	• Internal RAM malfunction. • Make a service call.
Err3	ASD ROM Fault	• Internal ROM malfunction. • Make a service call.
Err4	CPU Fault	• CPU malfunction. • **Control Board** malfunction. • Make a service call.
Err5	Communication Error Interruption	• Communication time out error. • Communication malfunction. • Improper or loose connection. • Improper system settings.
Err6	Gate Array Fault	• Main Gate Array is defective.
Err7	Low-Current Detector Error	• Improper Low-Current detection level settings at **F609** – **F612**.
Err8	Option (Device) Fault	• Check installation, connections, and option device manual.
Err9	Flash Memory Error	• Flash memory malfunction. • Make a service call.

LED Screen	LCD Screen	Possible Causes/Troubleshooting
EtN	Autotune Error	• **Autotune** readings that are significantly inconsistent with the configuration information. • A non-3-phase motor is being used. • Incorrect settings at **F400** or **F413**. • Using a motor that has a significantly smaller rating than the ASD. • ASD output cabling is too small, too long, or is being housed in a cable tray with other cables that are producing an interfering EMF. • Motor is running during the **Autotune** function.
EtN1		• **F402** adjustment required (Motor temperature is too high). • **F410** adjustment required (Motor Constant 1 improperly set).
EtN2		• **F412** adjustment required (Motor Constant 3 improperly set).
EtN3		• Autotune setting **F400** is set to Auto Calculation and there is a problem with the Motor Constant readings.
EtYP	ASD 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.
nErr	No Error	• 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.
OC iP	Over-Heat 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.

LED Screen	LCD Screen	Possible Causes/Troubleshooting
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	Over-Heat 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 Fixed Speed	• 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	Over-Heat 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.
OCA1 or OCL	U-Phase Over-Current	• Low impedance at the U lead of the ASD output.
OCA2 or OCL	V-Phase Over-Current	• Low impedance at the V lead of the ASD output.
OCA3 or OCL	W-Phase Over-Current	• 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.
OH	Over-Heat	• Cooling fan inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected.

LED Screen	LCD Screen	Possible Causes/Troubleshooting
OL 1	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 Resistor Overload	• Deceleration time is too short. • DBR setting adjustment required. • Over-Voltage Stall setting adjustment required.
OP 1	Over-Voltage During Acceleration	• Motor running during restart.
OP2	Over-Voltage During Deceleration	• 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 Fixed Speed	• Load fluctuations. • 3-Phase input voltage out of specification. • DBR required (DBR setup required).
OE	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	Virtual Linear Pump Sealing Water Error	• Inadequate pump seal water. • Loss of pump seal water.
UP 1	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 GX9 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 8 on pg. 67), **Monitor** screen, or the Trip History screen (Program ⇒ Utilities ⇒ Trip History).

Trip Record at Monitor Screen

An active trip is displayed at the **Monitor** screen. Once cleared, **NERR** is displayed to indicate that there are No Errors.

Note: *An improper GX9 ASD setup may cause some trips — reset the ASD to the **Factory Default** settings before pursuing a systemic malfunction (Program ⇒ Utilities ⇒ Type Reset ⇒ **Reset to Factory Settings**).*

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 9 as **At-trip Recorded Parameters** (parameter readings at the time that the trip occurred).

In the event of a power loss or if the EOI has been removed from the ASD, the trip records and the real-time clock information are retained within the EOI for up to 4.5 years via Battery Backup.

Table 9. Trip History Record Parameters.

At-trip Recorded Parameters			
1) Trip Number	8) Frequency Reference	15) Feedback (1 sec.)	22) ASD Overload
2) Trip Type	9) Bus Voltage	16) Torque	23) DBR Overload
3) Time and Date	10) Discrete Input Status	17) Torque Reference	24) Motor Load
4) Frequency at Trip	11) OUT1/OUT2/FL Status	18) Torque Current	25) ASD Load
5) Output Current	12) Timer	19) Excitation Current	26) DBR Load
6) Output Voltage	13) Post Compensation Frequency	20) PID Value	27) Input Power
7) Direction	14) Feedback (inst.)	21) Motor Overload	28) Output Power
Trip records are comprised of the full list of monitored parameters (28).			

Clearing a Trip

Once the cause of the trip has been corrected, performing a Reset re-enables the GX9 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 communications,
- Momentarily connecting terminal **RES** to **CC** of the **Terminal Board**, or
- Via Program ⇒ Utilities ⇒ Type Reset ⇒ **Clear Past Trip** (clears Monitor screen records only).

Part Numbering Convention and Ordering Information

The **GX9 ASD** is a special-configuration, large-horsepower ASD and is manufactured in the range from 5.0 HP to 1200 HP typeforms. Not all options are available for all typeforms. Application-specific requirements are to be discussed at the time of order placement.

The GX9 ASD may be ordered configured to the requirements of the application. Listed below are customer selections that, with the exception of the IP56 enclosure, may be defined in the part number of the desired system.

- 6- or 18-Pulse Option.
- NEMA 1 Enclosure.
- IP56 (18-Pulse) Rated ASD (this is an available option — submit request at time of purchase).

The NEMA 3R and IP56 versions are designed for outdoor applications. Outdoor systems are painted white — indoor systems are painted ANSI 61 gray.

The GX9 ASD has a 1.1 service factor and includes input fuses, an input circuit breaker (5 – 75 HP excluded), a locking cabinet, and grounding lugs as standard features.

The associated part numbering scheme for a given configuration is defined below. Use this part numbering convention when ordering the GX9 ASD.

Series	Version	Voltage Rating Code	ASD Rating Code	Configuration	Options

For example, the 600-Volt 900 kVA GX9 ASD with the disconnect and junction box configuration is identified by the following part number.

Series	Version	Voltage Rating Code	ASD Rating Code	Configuration	Options
GX	9	6	90K	AA	JB

The codes used to represent voltage rating, ASD rating, and configuration options are listed in Table 10 on page 74.

Table 10. Part Numbering Codes for the GX9 ASD.

Voltage Rating Code	ASD Rating Code	Configuration Code	Options Code
6 = 525–690 VAC	060 = 5.0 HP 080 = 7.5 HP 110 = 10 HP 160 = 15 HP 220 = 20 HP 270 = 25 HP 330 = 30 HP 400 = 40 HP 500 = 50 HP 600 = 60 HP 750 = 75 HP 10K = 100 HP 12K = 125 HP 15K = 150 HP 17K = 175 HP 20K = 200 HP 25K = 250 HP 30K = 300 HP 40K = 400 HP 50K = 500 HP 60K = 600 HP 70K = 700 HP 80K = 800 HP 90K = 900 HP 10L = 1000 HP 12L = 1200 HP	AA = Circuit Breaker AE = Circuit Breaker, Isolated Bypass AS = Circuit Breaker, Isolated Bypass, Solid State Starter DW = 18-Pulse Transformer ***Note:*** *An IP56 rating is an available option for the 18-pulse system.*	JB = Input/Output Junction Box

Cable/Terminal Specifications

Installation should conform to the **NEC** Article 110 (Requirements for Electrical Installations), all regulations of the Occupational Safety and Health Administration, and any other applicable national, regional, or industry codes and standards.

Cable sizes for each typeform are listed in the standard drawings that accompany the received system.

The ratings supplied are of the cable sizes that will meet with the mechanical requirements of the associated system. These values are guidelines and shall not be the sole determining factor of the lug or wire size used with the GX9 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 GX9 ASD.

Cable/Terminal specifications are based on the rated current of the GX9 ASD and **Do Not** include the 10% Service Factor.

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. 11 and the accompanying drawings for specifics on the actual system being connected.

See the drawings supplied with the GX9 ASD for cable and terminal specifications.

Voltage/Current Specifications

*Note: The **Short Circuit Current Rating** for the all items is 85.0 kA if no circuit breaker is used.*

Table 11. Voltage/Current Specifications for the GX9 ASD.

Model Number GX96	HP	Rated kVA	kW	3-P Input 50/60 Hz ±2%	3-P Output Variable Frequency	Output Current Amps 100% FLA/ 110% Cont.	Output Current Amps 130% 120 Seconds	Output Current Amps 150% 60 Seconds
060	5.0	5.0	6.0	525 - 690 VAC (±10%)	Input VAC Level Max.	6.1/6.7	N/A	9.2
080	7.5	7.5	7.5			9.0/9.9		13.5
110	10	10	10			12/13.2		18.0
160	15	15	15			17/19		25.5
220	20	20	20			22/24		33.0
270	25	25	25			27/30		40.5
330	30	30	30			32/35		48.0
400	40	40	40			41/45		61.5
500	50	50	50			52/57		78.0
600	60	60	60			62/68		93.0
750	75	75	75			77/85		116
10K	100	100	90			96/106		144
12K	125	120	110			118/130		177
15K	150	150	132			144/158	187.2	N/A
17K	175	175	160			168/185	218.4	
20K	200	200	200			196/216	254.8	
25K	250	250	250			247/172	321.1	
30K	300	300	315			304/334	395.2	
40K	400	400	400			384/422	499.2	
50K	500	500	450			481/529	625.3	
60K	600	600	600			601/661	781.3	
70K	700	700	700			698/768	907.4	
80K	800	800	800			770/847	1001	
90K	900	900	900			866/953	1125.8	
10L	1000	1000	1000			962/1058	1250.6	
12L	1200	1200	1200			1155/1271	1501.5	

Enclosure Dimensions/Weight

Refer to the drawings of Figure 33 to Figure 38 for the referenced enclosure figures.

Table 12. 5 – 1200 HP ASD Weights and Enclosure Dimensions.

Model Number GX96	Shipping Weight Lbs/kg		Figure
	Junction Box	No Junction Box	
060	45/21	43/20	Figure 33
080			
110			
160			
220			
270	162/74	160/73	Figure 34
330			
400			
500			
600			
750			
10K	1450/658	1300/590	Figure 35
12K			
15K			
17K			
20K			
25K	2350/1066	2250/1021	Figure 36
30K			
40K	2560/1162	2330/1057	
50K	1700/772	1500/681	Figure 37
60K			
70K			
80K			
90K	3500/1588	3200/1452	Figure 38
10L			
12L			

Figure 33. GX9 ASD 5.0 – 20 HP Enclosure.

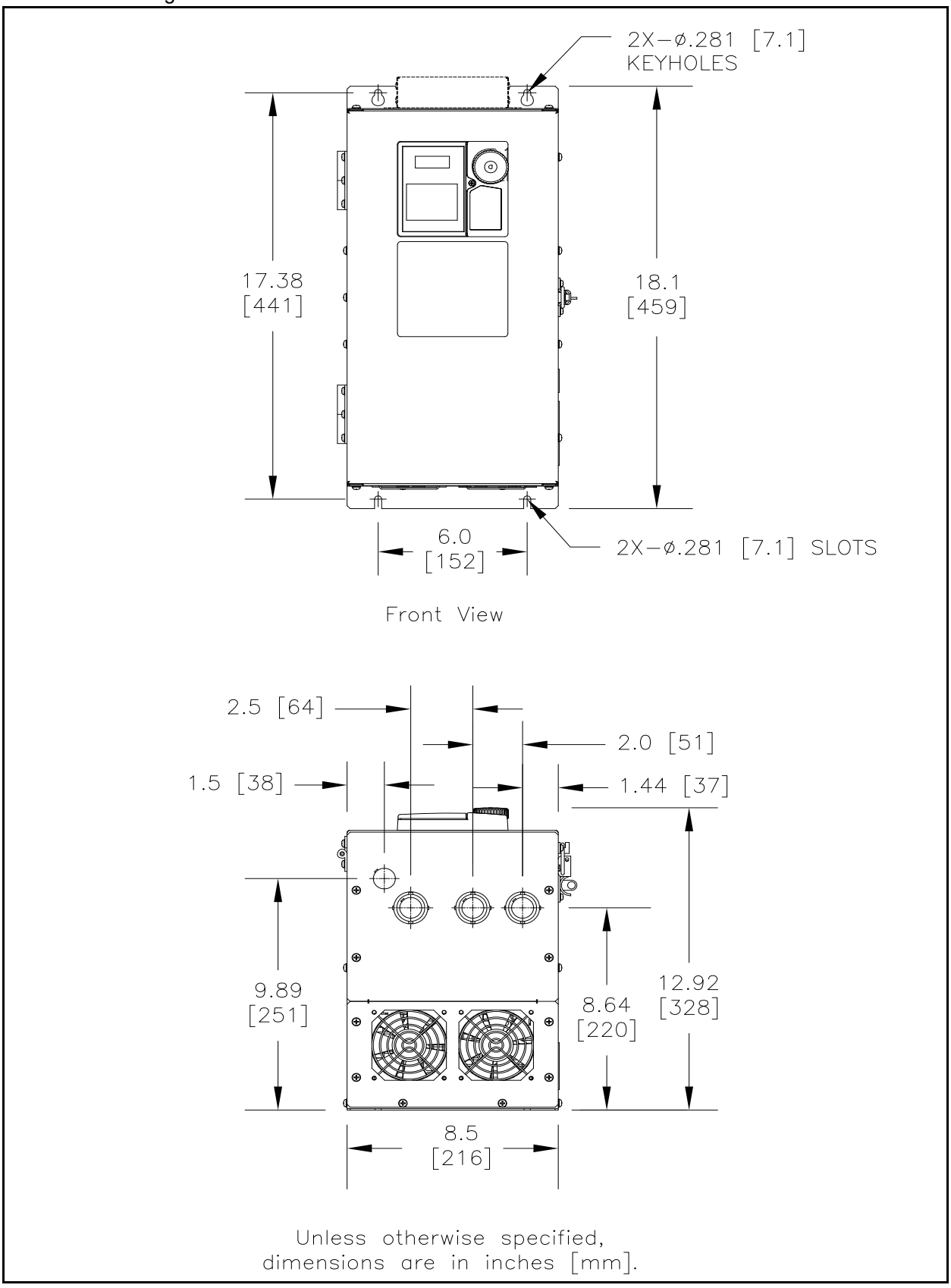
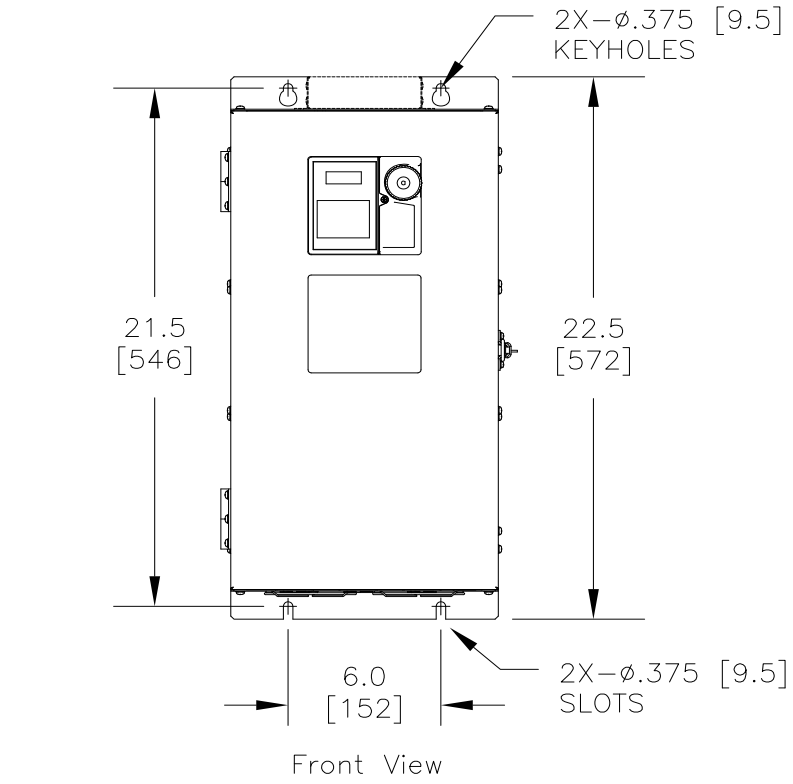
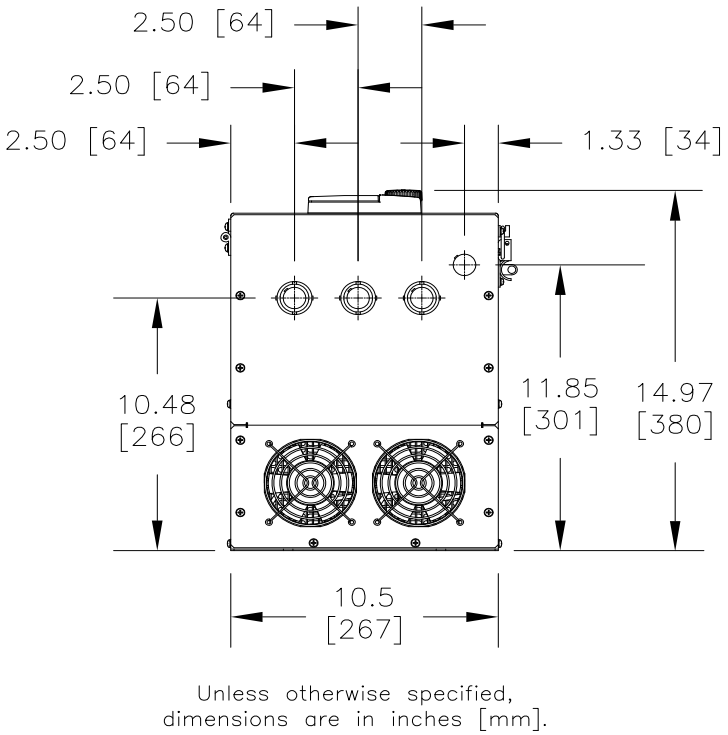


Figure 34. GX9 ASD 25 – 75 HP Enclosure.





Unless otherwise specified,
dimensions are in inches [mm].

Figure 35. GX9 ASD 100 – 200 HP Enclosure.

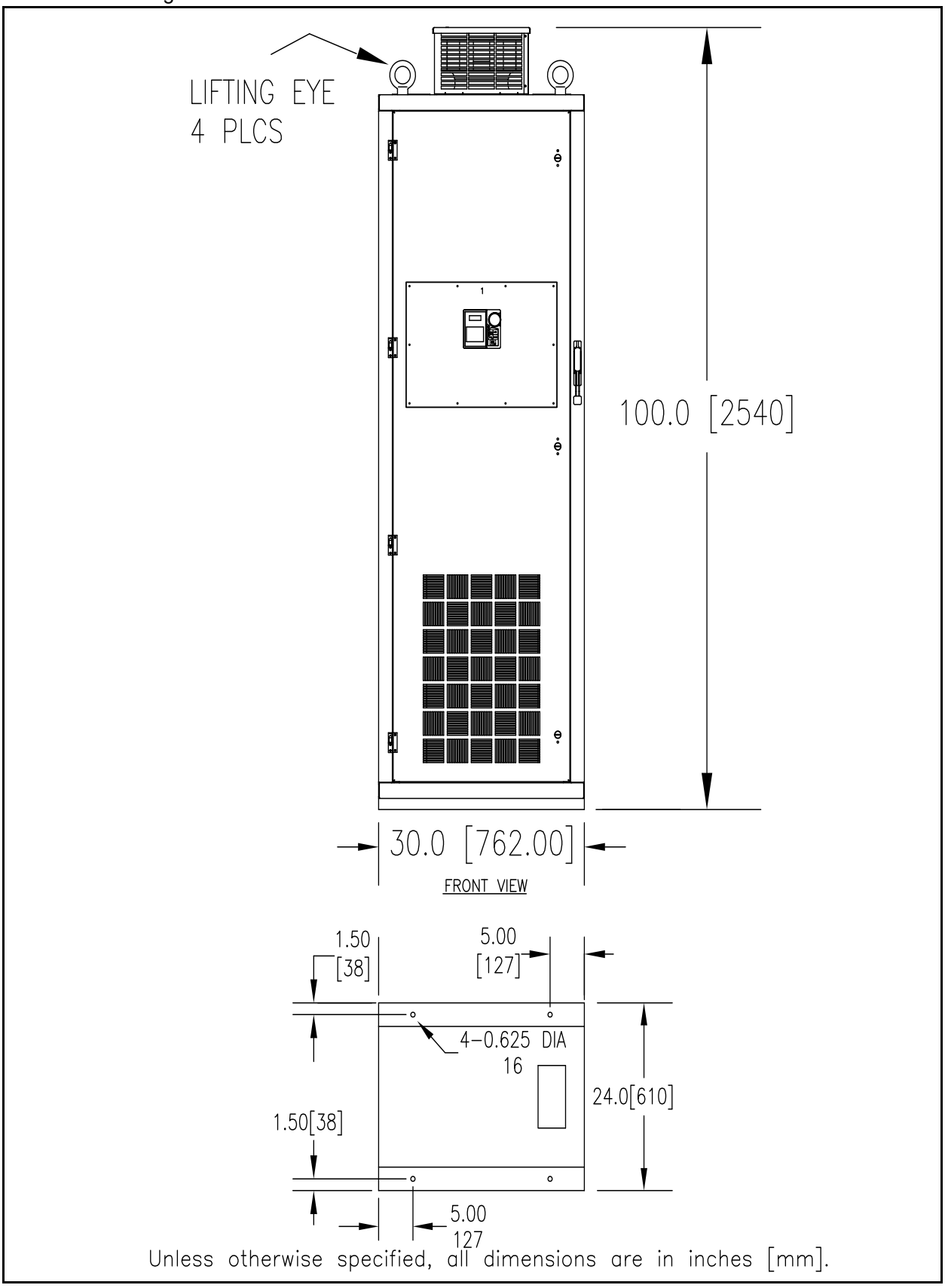


Figure 36. GX9 ASD 250 – 400 HP Enclosure.

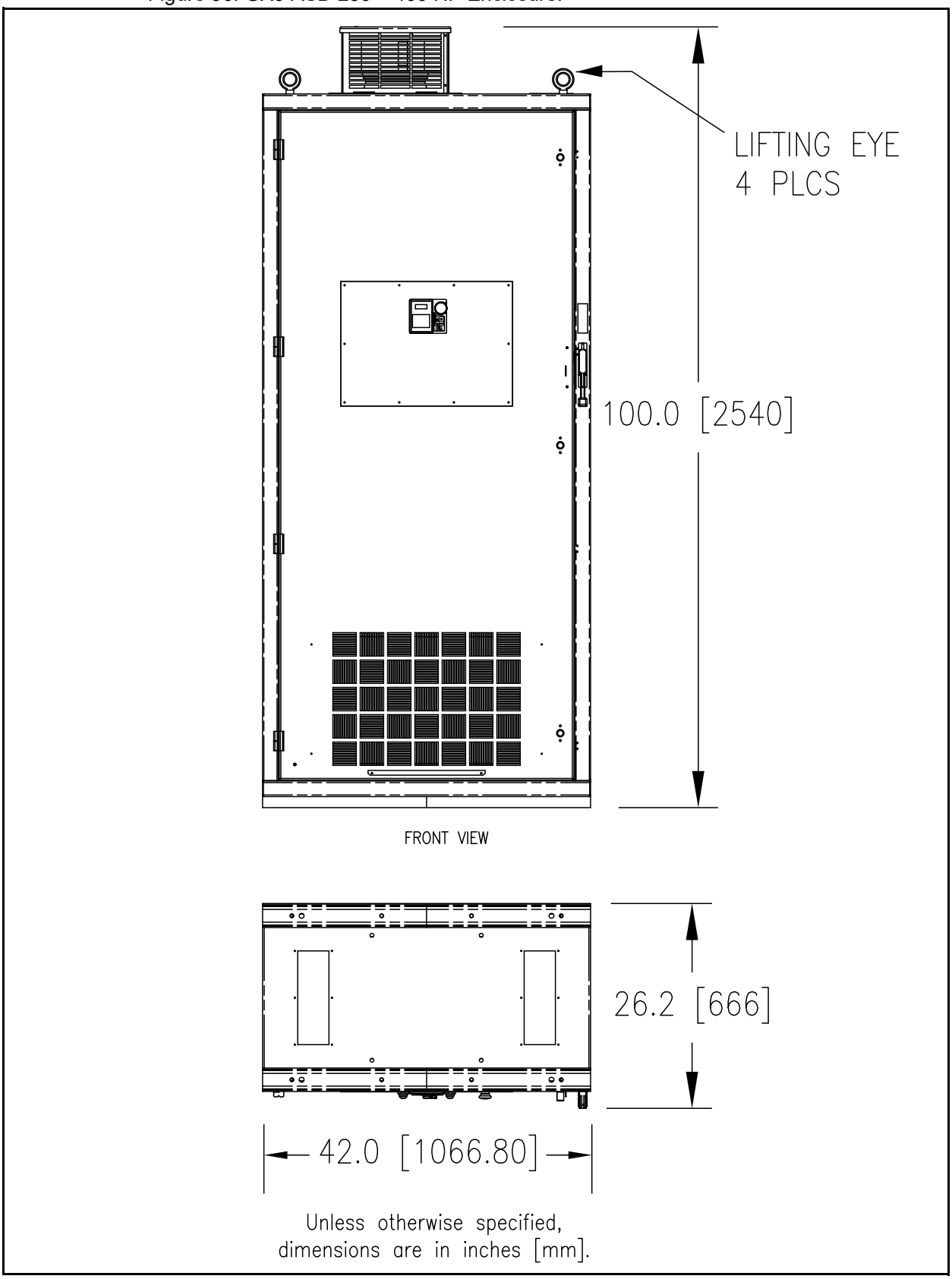


Figure 37. GX9 ASD 500 – 800 HP Enclosure.

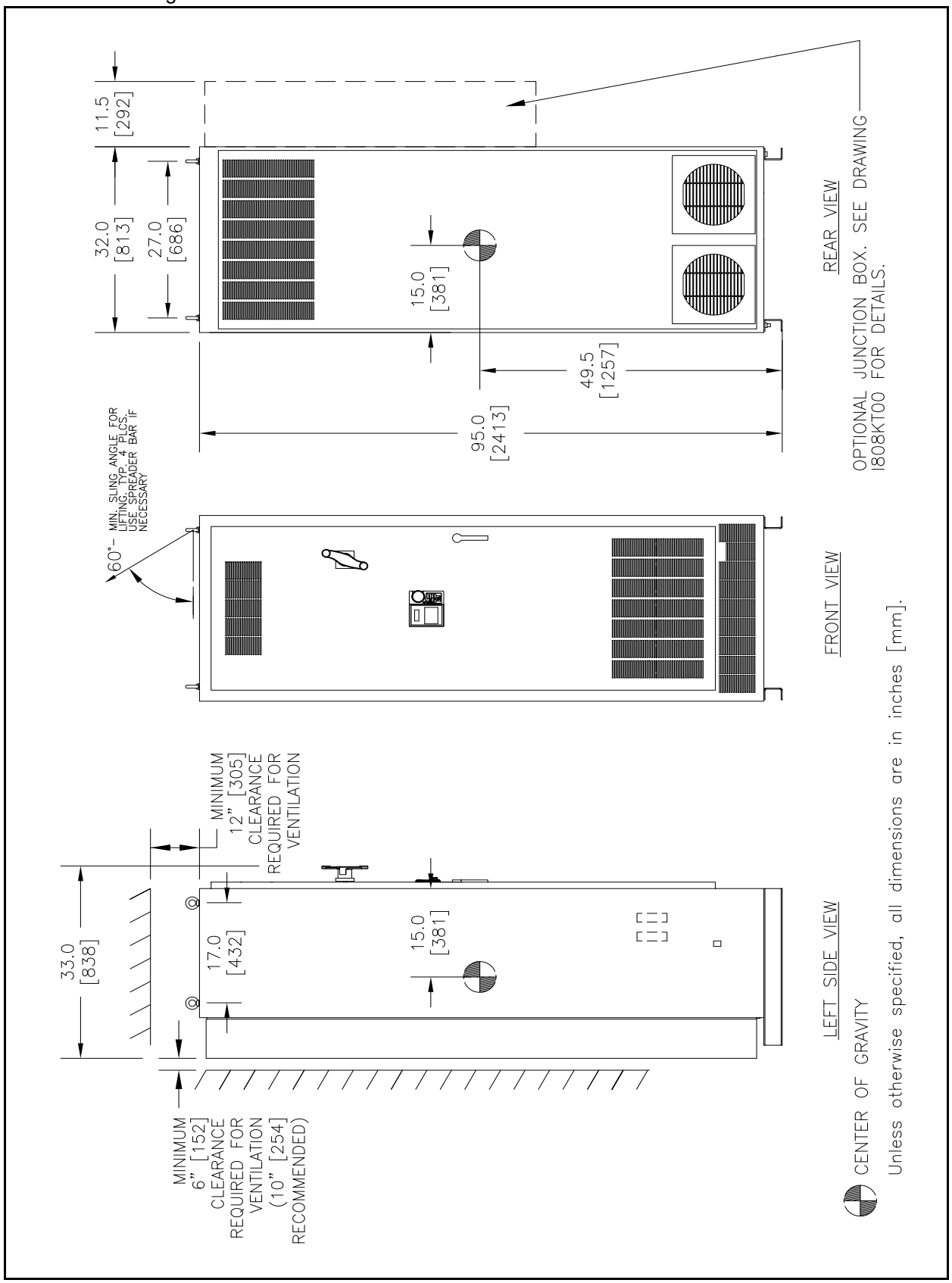
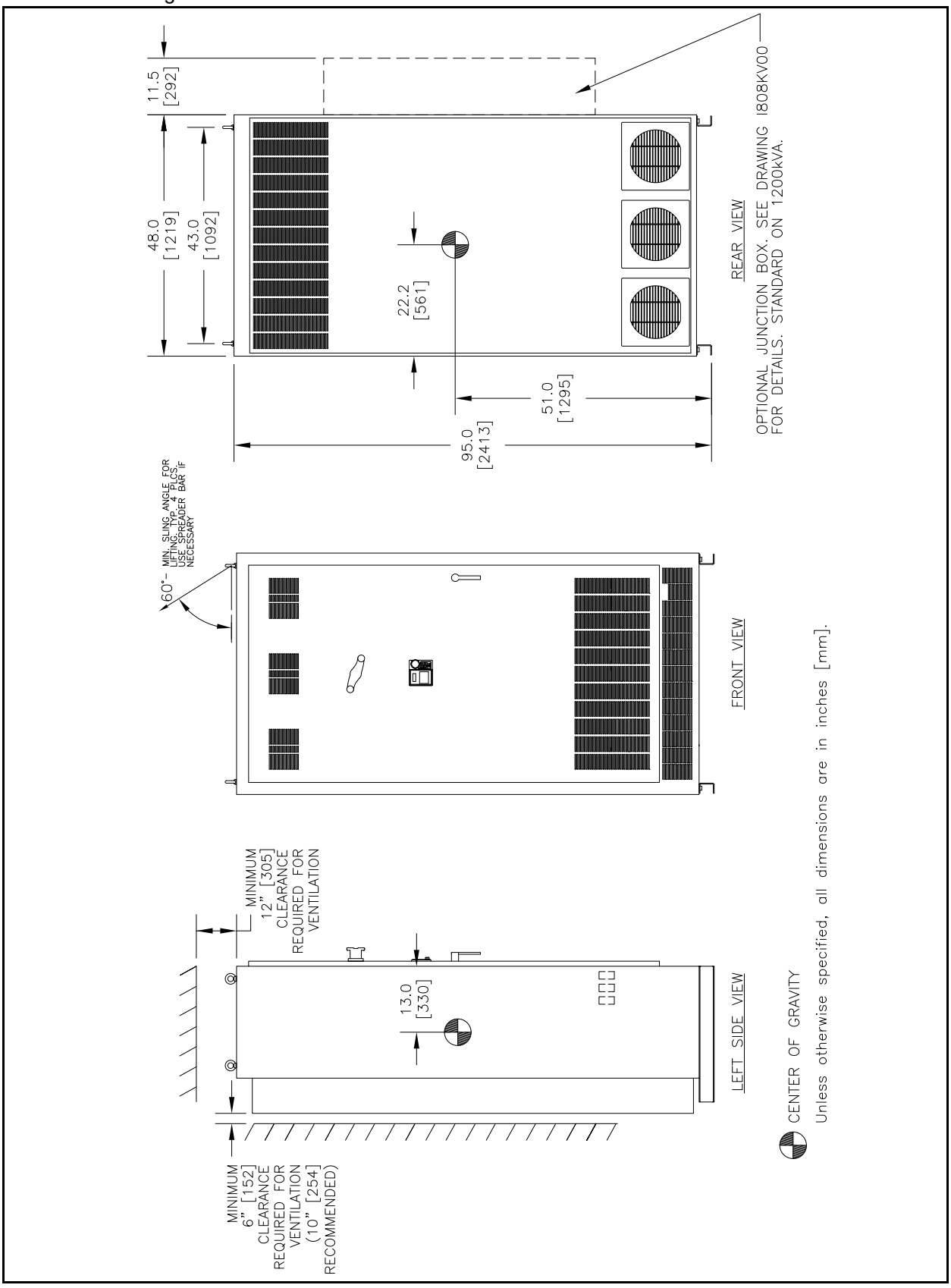


Figure 38. GX9 ASD 900 – 1200 HP Enclosure.



Index

F

G

H

I

J

L

M

N

O

P

Q

R

S

T

U

V

W

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