TOSHIBA

W7 Adjustable Speed Drive
Quick Start Guide

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Introduction

Congratulations on the purchase of the new **W7 Adjustable Speed Drive** (ASD). The **W7 ASD** is an 18-pulse PWM drive designed for use with 3-phase AC induction motors. This 18 pulse design includes an 18 pulse input diode bridge rectifier combined with and an integral phase shifting transformer.

U.S. Patent 6396723.

Japan Patent pending 2000-179543.

The drive has been designed with an 18-pulse front end to assist in the compliance of the harmonic distortion limits of standard IEEE 519 1992 at the point of common coupling.

The **W7 ASD** is ideally suited to drive variable torque loads. Toshiba's technology, quality, and reliability enables the motor to develop high torque and provide compensation for motor slip, which results in smooth, quick starts and highly efficient operation. The **W7 ASD** uses digitally-controlled pulse width modulation. The programmable functions may be accessed via the easy-to-use menu. These features, combined with Toshiba's high-performance software, delivers unparalleled motor control and reliability.

The **W7 ASD** is a very powerful tool, yet surprisingly simple to operate. The **W7 ASD** has an easy-to-read LCD screen that provides easy access to the many monitoring and programming features of the **W7 ASD**. The motor control software is menu-driven, which allows for easy access to the motor control parameters and quick changes when required.

To maximize the abilities of your new **W7 ASD**, a working familiarity with this guide will be required. This guide has been prepared for the **W7 ASD** installer, operator, and maintenance personnel.

The **W7 ASD** is truly **Reliability** *in motion.*

Important Notice

The instructions contained in this guide are not intended to cover all details or variations in equipment types, nor may it provide for every possible contingency concerning the installation, operation, or maintenance of this equipment. Should additional information be required contact your Toshiba representative.

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

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

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

About This Guide

This guide was written by the Toshiba Technical Publications Group. This group is tasked with providing technical documentation for the **W7 Adjustable Speed Drive**. Every effort has been made to provide accurate and concise information to you, our customer.

At Toshiba we're continuously searching for better ways to meet the constantly changing needs of our customers. E-mail your comments, questions, or concerns about this publication to the **Technical-Publications-Dept@TIC.TOSHIBA.COM**.

Guide's Purpose and Scope

This guide provides information on how to safely install, operate, maintain, and dispose of your **W7 Adjustable Speed Drive**. The information provided in this guide is applicable to the **W7 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. 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 metric and/or the English equivalent.

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

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Contacting Toshiba's Customer Support Center

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

The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is US (800) 231-1412/Fax (713) 466-8773 — Canada (800) 527-1204.

After-hours support is available by calling the number listed above and following the instructions for after-hours support.

You may also contact Toshiba by writing to:

Toshiba International Corporation

13131 West Little York Road

Houston, Texas 77041-9990

Attn: ASD Product Manager.

For further information on Toshiba's products and services, please visit our website at **WWW.TIC.TOSHIBA.COM**.

TOSHIBA INTERNATIONAL CORPORATION

W7 Adjustable Speed Drive

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

Complete the following information and retain for your records.

Model Number: _____

Serial Number:_____

Project Number (if applicable):_____

Date of Installation:_____

Inspected By:_____

Name of Application:_____

Table of Contents

General Safety Information

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

Signal Words

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

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided, will result in death or serious injury to personnel.

The word **WARNING** preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided, could result in death or serious injury to personnel.

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

The word **CAUTION** without the safety alert symbol indicates a potentially hazardous situation exists which, if not avoided, may result in equipment and property damage.

Special Symbols

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

Electrical Hazard Symbol

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

Explosion Hazard Symbol

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

Equipment Warning Labels

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

DO NOT remove or cover any of the labels. If the labels are damaged or if additional labels are required, contact your Toshiba sales representative for additional labels.

Labels attached to the equipment are there to provide useful information or to indicate an imminently hazardous situation that may result in serious injury, severe property and equipment damage, or death if the instructions are not followed.

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 Quick Start 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, lockout/tagout circuits and equipment, and clear faults in accordance with established safety practices.
- Be trained in the proper care and use of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- Be trained in rendering first aid.

For further information on workplace safety visit www.osha.gov.

Equipment Inspection

- Upon receipt of the equipment inspect the packaging and equipment for shipping damage.
- Carefully unpack the equipment and check for parts that may have been damaged during shipping, missing parts, or concealed damage. If any discrepancies are discovered, it should be noted with the carrier prior to accepting the shipment, if possible. File a claim with the carrier if necessary and immediately notify your Toshiba sales representative.
- **DO NOT** install or energize equipment that has been damaged. Damaged equipment may fail during operation resulting in equipment damage or personal injury.
- Check to see that the rated capacity and the model number specified on the nameplate conform to the order specifications.
- Modification of this equipment is dangerous and must be performed by factory-trained representatives **ONLY**. When modifications are required contact your Toshiba sales representative.
- Inspections may be required before and after moving installed equipment.
- Keep the equipment in an upright position.
- Contact your Toshiba sales representative to report discrepancies or for assistance if required.

Handling and Storage

- Use proper lifting techniques when moving the ASD; including properly sizing up the load, getting assistance, and using a forklift if required.
- Store in a well-ventilated covered location and preferably in the original carton if the equipment will not be used upon receipt.

- Store in a cool, clean, and dry location. Avoid storage locations with extreme temperatures, rapid temperature changes, high humidity, moisture, dust, corrosive gases, or metal particles.
- The storage temperature range of the **W7 ASD** is 14 to 104° F (-10 to 40° C).
- Do not store the unit in places that are exposed to outside weather conditions (i.e., wind, rain, snow, etc.).
- Store in an upright position.

Disposal

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

Installation Precautions

Location and Ambient Requirements

- The Toshiba ASD is intended for permanent installations only.
- Installation should conform to the **2005 National Electrical Code — Article 110** (*Requirements For Electrical Installations*), all regulations of the **Occupational Safety and Health Administration**, and any other applicable national, regional, or industry codes and standards.
- Select a mounting location that is easily accessible, has adequate personnel working space, and adequate illumination for adjustment, inspection, and maintenance of the equipment (refer to 2005 NEC Article 110-13).
- A noncombustible insulating floor or mat should be provided in the area immediately surrounding the electrical system.
- **Do Not** mount the ASD in a location that would produce catastrophic results if it were to fall from its mounting location (equipment damage or injury).
- **Do Not** mount the ASD in a location that would allow it to be exposed to flammable chemicals or gasses, water, solvents, or other fluids.
- Avoid installation in areas where vibration, heat, humidity, dust, fibers, metal particles, explosive/corrosive mists or gases, or sources of electrical noise are present.
- The installation location shall not be exposed to direct sunlight.
- Allow proper clearance spaces for installation. Do not obstruct the ventilation openings. Refer to the section titled Installation and Connections on pg. 12 for further information on ventilation requirements.
- The ambient operating temperature range of the **W7 ASD** is 14 to 104° F (-10 to 40° C).
- See the section titled Installation and Connections on pg. 12 for additional information on installing the drive.

Mounting Requirements

- Only **Qualified Personnel** should install this equipment.
- Install the unit in a secure and upright position in a well-ventilated area.
- A noncombustible insulating floor or mat should be provided in the area immediately surrounding the electrical system at the place where maintenance operations are to be performed.
- As a minimum, the installation of the equipment should conform to the 2005 NEC Article 110 Requirements For Electrical Installations, OSHA, as well as any other applicable national, regional, or industry codes and standards.
- Installation practices should conform to the latest revision of NFPA 70E Electrical Safety Requirements for Employee Workplaces.
- It is the responsibility of the person installing the ASD or the electrical maintenance personnel to ensure that the unit is installed into an enclosure that will protect personnel against electric shock.

Conductor Requirements and Grounding

- Use separate metal conduits for routing the input power, output power, and control circuits. Each conduit shall have its own ground cable.
- A separate ground cable should be run inside the conduit with the input power, output power, and control circuits.
- **DO NOT** connect the control terminal strip return marked **CC** to earth ground.
- Always ground the unit to prevent electrical shock and to help reduce electrical noise.
- It is the responsibility of the person installing the ASD or the electrical maintenance personnel to provide proper grounding and branch circuit protection in accordance with the **2005 NEC** and any applicable local codes.

The Metal Of Conduit Is Not An Acceptable Ground.

Power Connections

Contact With Energized Wiring Will Cause Severe Injury Or Death.

- Turn off, lockout, and tagout all power sources before proceeding to connect the power wiring to the equipment.
- After ensuring that all power sources are turned off and isolated in accordance with established lockout/tagout procedures, connect three-phase power source wiring of the correct voltage to the correct input terminals and connect the output terminals to a motor of the correct voltage and type for the application (refer to 2005 NEC Article 300 – Wiring Methods and Article 310 – Conductors For General Wiring). Size the branch circuit conductors in accordance with 2005 NEC Table 310.16.
- Adhere to the recommended conductor sizes listed in the section titled Cable/Terminal Specifications on pg. 57. If multiple conductors are used in parallel for the input or output power, each branch of the parallel set shall have its own conduit and not share its conduit with other

parallel sets (i.e., place U1, V1, and W1 in one conduit and U2, V2, and W2 in another) (refer to 2005 NEC Article 300.20 and Article 310.4).

Note: *National and local codes should be referenced when running more than three conductors in the same conduit (refer to 2005 NEC Article 310 adjustment factors).*

- Ensure that the 3-phase input power is **Not** connected to the output of the ASD. This will damage the ASD and may cause injury to personnel.
- **Do Not** install the ASD if it is damaged or if it is missing any component(s).
- **Do Not** connect resistors across terminals PA – PC or PO – PC. This may cause a fire.
- Ensure the correct phase sequence and the desired direction of motor rotation in the **Bypass** mode (if applicable).
- Turn the power on only after attaching and/or closing the front cover.

Protection

- Ensure that primary protection exists for the input wiring to the equipment. This protection must be able to interrupt the available fault current from the power line. The equipment may or may not be equipped with an input disconnect (option).
- All cable entry openings must be sealed to reduce the risk of entry by vermin and to allow for maximum cooling efficiency.
- Follow all warnings and precautions and do not exceed equipment ratings.
- If using multiple motors provide separate overload protection for each motor and use V/f control.
- External dynamic braking resistors must be thermally protected.
- It is the responsibility of the person installing the ASD or the electrical maintenance personnel to setup the **Emergency Off** braking system of the ASD. The function of the **Emergency Off** braking function is to remove output power from the drive in the event of an emergency. A supplemental braking system may also be engaged in the event of an emergency. For further information on braking systems, see DC Injection Braking and Dynamic Braking Enable in the *W7 ASD Operation Manual*.

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

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

System Integration Precautions

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

- The Toshiba ASD is a general-purpose product. It is a system component only and the system design should take this into consideration. Please contact your Toshiba sales representative for application-specific information or for training support.
- The Toshiba ASD is part of a larger system and the safe operation of the ASD will depend on observing certain precautions and performing proper system integration.
- A detailed system analysis and job safety analysis should be performed by the systems designer and/or systems integrator before the installation of the ASD component. Contact your Toshiba sales representative for options availability and for application-specific system integration information if required.

Personnel Protection

- Installation, operation, and maintenance shall be performed by **Qualified Personnel <u>Only</u>**.
- 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 humans. Personnel should be protected from all rotating machinery and electrical hazards at all times.
- Insulators, machine guards, and electrical safeguards may fail or be defeated by the purposeful or inadvertent actions of workers. Insulators, machine guards, and electrical safeguards are to be inspected (and tested where possible) at installation and periodically after installation for potential hazardous conditions.
- Do not allow personnel near rotating machinery. Warning signs to this effect shall be posted at or near the machinery.
- Do not allow personnel near exposed electrical conductors. Human contact with electrical conductors can be fatal. Warning signs to this effect shall be posted at or near the hazard.
- Personal protection equipment shall be provided and used to protect employees from any hazards inherent to system operation.
- Follow all warnings and precautions and do not exceed equipment ratings.

System Setup Requirements

- When using the ASD as an integral part of a larger system, it is the responsibility of the ASD installer or maintenance personnel to ensure that there is a fail-safe in place, i.e., an arrangement designed to switch the system to a safe condition if there is a fault or failure.
- System safety features should be employed and designed into the integrated system in a manner such that system operation, even in the event of system failure, will not cause harm or result in personnel injury or system damage (i.e., E-Off, Auto-Restart settings, System Interlocks, etc.).
- The programming setup and system configuration of the ASD may allow it to start the motor unexpectedly. A familiarity with the Auto-restart and the Remote/Local settings and function is a requirement to use this product.
- Improperly designed or improperly installed system interlocks may render the motor unable to start or stop on command.
- The failure of external or ancillary components may cause intermittent system operation (i.e., the system may start the motor without warning).
- There may be thermal or physical properties, or ancillary devices integrated into the overall system that may allow for the ASD to start the motor without warning. Signs to this effect must be posted at the equipment installation site and near the driven equipment.
- If a secondary magnetic contactor (MC) is used between the ASD output 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 utility power is never applied to the ASD output terminals (U, V, W).

- Power factor improvement capacitors or surge absorbers must not be installed on the output of the ASD.
- Use of the built-in system protective features is highly recommended (i.e., E-Off, Overload Protection, etc.).
- The operating controls and system status indicators should be clearly readable and positioned where the operator can see them without obstruction.
- Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.
- Follow all warnings and precautions and do not exceed equipment ratings.

Operational and Maintenance Precautions

- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before inspecting or servicing the drive, or opening the door of the enclosure.
- Turn off, lockout, and tagout the main power, the control power, and instrumentation connections before proceeding to disconnect or connect the power wiring to the equipment.
- The capacitors of the ASD maintain a residual charge for a period of time after turning the ASD off. The required time for each ASD typeform is indicated with a cabinet label and a **Charge LED**. Wait for at least the minimum time indicated on the enclosure-mounted label and ensure that the **Charge LED** has gone out before opening the door of the ASD once the ASD power has been turned off.
- Turn the power on only after attaching (or closing) the front cover and **Do Not** remove the front cover of the ASD when the power is on.
- **Do Not** attempt to disassemble, modify, or repair the ASD. Call your Toshiba sales representative for repair information.
- Do not place any objects inside of the ASD.
- If the ASD should emit smoke or an unusual odor or sound, turn the power off immediately.
- The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming in contact with these items.
- Remove power from the ASD during extended periods of non-use.
- The system should be inspected periodically for damaged or improperly functioning parts, cleanliness, and to ensure that the connectors are tightened securely.
- Ensure that the **Run** functions (**F**, **R**, **Preset Speed**, etc.) of the ASD are off before performing a **Reset**. The post-reset settings may allow the ASD to start unexpectedly.
- **Retry** or **Reset** settings may allow the motor to start unexpectedly. Warnings to this effect should be clearly posted near the ASD and the motor.
- In the event of a power failure, the motor may restart after power is restored.
- Follow all warnings and precautions and do not exceed equipment ratings.

DO NOT install, operate, perform maintenance, or dispose of this equipment until you have read and understood all of the product warnings and user directions. Failure to do so may result in equipment damage, operator injury, or loss of life.

Service Life Information

Part Name	Service Life	Remarks
Large Capacity Electrolytic Capacitor	5 Years	When not used for long periods, charge semi-annually.
Cooling Fan	26,000 Hours	
CN Connectors	100 Connects/Disconnects	
On-board Relays	500,000 Actuations	

Motor Characteristics

Listed below are some variable speed AC motor control concepts with which the user of the **W7 Adjustable Speed Drive** should become familiar.

Pulse Width Modulation Operation

The **W7 ASD** uses a sinusoidal **Pulse Width Modulation** (PWM) control system. The output current waveform generated by the ASD approaches that of a perfect sine wave; however, the output waveform is slightly distorted. For this reason, the motor may produce more heat, noise, and vibration when operated by an ASD, rather than directly from utility power.

Overload Protection Adjustment

The **W7 ASD** software monitors the output current of the system and determines when an overload condition occurs. The overload current level is a percentage of the rating of the motor. This function protects the motor from overload.

The default setting for the overload detection circuit is set to the maximum rated current of the ASD at the factory. This setting will have to be adjusted to match the rating of the motor with which the ASD is to be used. To change the overload reference level, see **Electronic Thermal Protection** in the *W7 ASD Operation Manual*.

Power Factor Correction

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

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

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

Light Load Conditions

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

Note: *For proper operation, the carrier frequency must be 2.2 kHz or above except when operating in the **Constant Torque** or **Variable Torque** modes.*

Load-produced Negative Torque

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

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

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

To combat this condition, the 3-phase input may be connected using contactors that are configured to open in the event of an extended DBR over-current condition or an internal circuit failure. Using a thermal sensor and/or overload protection as the 3-phase input contactor drive signal, the contactors will open and remove the 3-phase input power in the event of an extended DBR over-current or system over-voltage condition.

Motor Braking

The motor may continue to rotate and coast to a stop after being shut off due to the inertia of the load. If an immediate stop is required, a braking system should be used. The two most common types of motor braking systems used with the **W7 ASD** are **DC Injection Braking** and **Dynamic Braking**.

For further information on braking systems, see **DC Injection Braking Current** and **Dynamic Braking Enable** in the in the *W7 ASD Operation Manual*.

ASD Characteristics

Over-current Protection

Each **W7 ASD** model was designed for a specified operating power range. The ASD will incur a trip if the design specifications are exceeded.

However, the ASD may be operated at 100% of the specified output-current range continuously or at 110% for a limited time as indicated in the section titled Current/Voltage Specifications on pg. 58. Also, the **Overcurrent Stall Level** setting may be adjusted to help with nuisance over-current trips.

When using the ASD for an application that controls a motor which is rated significantly less than the maximum current rating of the ASD, the over-current limit (Thermal Overload Protection) setting will have to be changed to match the application. For further information on this parameter, see the **Electronic Thermal Protection** setting in the *W7 ASD Operation Manual*.

ASD Capacity

The **W7 ASD** must not be used with a motor that has a significantly larger capacity, even if the motor is operated under a small load. An ASD being used in this way will be susceptible to a high-output peak current which may result in nuisance tripping.

Do not apply a level of input voltage to an ASD that is beyond that which the ASD is rated. The input voltage may be stepped down if required with the use of a step-down transformer or some other type of voltage-reduction system.

Installation and Connections

The **W7 Adjustable Speed Drive** may be set up initially by performing a few simple configuration settings. To operate properly, the ASD must be securely mounted and connected to a power source (3-phase AC input at the **L1/R**, **L2/S**, and **L3/T** terminals). The control terminals of the ASD may be used by connecting the terminals of the **Control Terminal Strip** to the proper sensors or signal input sources (see the section titled I/O and Control on pg. 16).

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 16 on pg. 23).

As a minimum, the installation of the ASD shall conform to **Article 110** of the **2005 NEC**, the **Occupational Safety and Health Administration** requirements, and to any other local and regional industry codes and standards.

Installation Notes

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

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

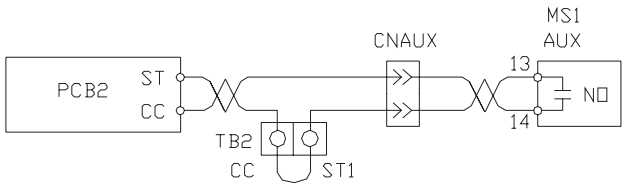
If a secondary magnetic contactor (MC) is used between the output of the ASD and the motor, it should be interlocked such that the **ST – CC** connection is disconnected before the output contactor is opened.

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

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

On some devices the **ST**-to-**CC** connection is further enhanced by the operation of the **MS1 AUX** relay circuit. The **MS1 AUX** relay circuit is normally open and closes the **ST**-to-**CC** connection (via **ST1**) only after normal system power is available. The **MS1 AUX** relay circuit prohibits the **ST**-to-**CC** connection in the event that the **MS1** contactor fails to close during start up or if **MS1** opens while the ASD is running. For the 460 volt ASD this feature is available on the 75 HP and above systems.

Figure 1. Alternative 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 overvoltage and undervoltage stall protection level parameters be adjusted. Voltages outside of the permissible tolerance should be avoided.

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

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

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

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

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

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

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

All **W7 ASD**s are equipped with internal DC bus fuses. However, not all **W7 ASD**s are equipped with internal primary power input fuses (HP-dependent).

Mounting the ASD

Install the unit securely in a well ventilated area that is out of direct sunlight using the mounting holes on the rear of the ASD.

The ambient temperature rating for the **W7 ASD** is from 14 to 104° F (-10 to 40° C). The process of converting AC to DC, and then back to AC produces heat. During normal ASD operation, up to 5% of the input energy to the ASD may be dissipated as heat. If installing the ASD in a cabinet, ensure that there is adequate ventilation.

Do Not operate the ASD with the enclosure door open or removed and ensure that the ventilation openings are not obstructed.

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

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

Connecting the ASD

DANGER

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

System Grounding

Proper grounding helps to prevent electrical shock and to reduce electrical noise. The ASD is designed to be grounded in accordance with **Article 250** of the **2005 NEC** or **Section 10/Part One** of the **Canadian Electrical Code** (CEC).

The grounding conductor shall be sized in accordance with **Article 250-122** of the **2005 NEC** or **Part One-Table 6** of the **CEC**.

Note: *The metal of conduit is not an acceptable ground.*

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

Power Connections

DANGER

Connect the 3-phase input power to the input terminals of the **W7 ASD** at **L1/R**, **L2/S**, and **L3/T**. Connect the output terminals **T1/U**, **T2/V**, and **T3/W** of the **W7 ASD** to the motor.

The input and output conductors and terminal lugs used shall be in accordance with the specifications listed in the section titled Cable/Terminal Specifications on pg. 57.

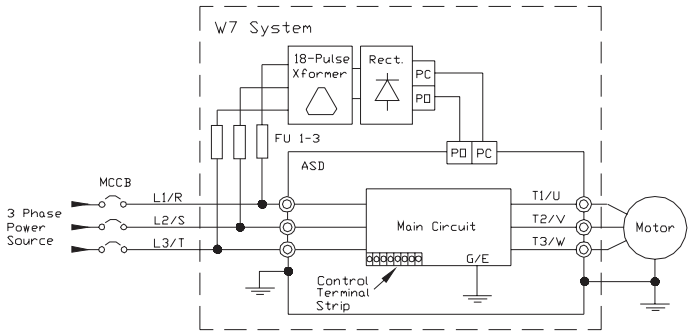
An inductor may be connected across terminals **PA** and **PO** to provide additional filtering. When not used, a jumper must be connected across these terminals (see Figure 16 on pg. 23).

Connect the input and output power lines of the **W7 ASD** as shown in Figure 2.

Install a molded case circuit breaker (MCCB) or fuse between the 3-phase power source and the **W7 ASD** in accordance with the fault current setting of the ASD and **2005 NEC Article 430**.

Note: *In the event that the motor rotates in the wrong direction when powered up, reverse any two of the three leads connected to the motor.*

Figure 2. ASD/Motor connection diagram.



Lead Length Specifications

Adhere to the 2005 NEC and any local codes during the installation of ASD/Motor systems. Excessive lead lengths may adversely effect the performance of the motor. Special cables are not required. Lead lengths from the ASD to the motor in excess of those listed in Table 1 may require filters to be added to the output of the ASD. Table 1 lists the suggested maximum lead lengths for the listed motor voltages.

Table 1. Suggested maximum lead lengths.

Model	PWM Carrier Frequency	NEMA MG-1-1998 Section IV Part 31 Compliant Motors[2]
230 Volt	All	1000 feet
460 Volt	< 5 kHz	600 feet
	≥ 5 kHz	300 feet
600 Volt	< 5 kHz	200 feet
	≥ 5 kHz	100 feet

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

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

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

Startup and Test

Perform the following checks before turning on the unit:

- **L1/R**, **L2/S**, and **L3/T** are connected to the 3-phase input power.
- **T1/U**, **T2/V**, and **T3/W** are connected to the motor.
- The 3-phase input voltage is within the specified tolerance.
- There are no shorts and all grounds are secured.

I/O and Control

The **W7 ASD** can be controlled by several input types and combinations thereof, as well as operate within a wide range of output frequency and voltage levels. This section describes the ASD control methods and supported I/O functions. Expanded descriptions of the I/O terminals may be found on pg. 17.

The **Control Terminal Strip** PCBA (P/N 48570) supports discrete and analog I/O functions.

The **Control Terminal Strip** is shown in Figure 4 on pg. 19. Table 2 and lists the names, the default settings (where applicable), and the descriptions of the input and output terminals.

Figure 16 on pg. 23 shows the typical connection diagram for the **W7 ASD** system.

Table 2. Control Terminal Strip default assignment terminal names and functions.

Terminal Name	Input/Output	Terminal Function (default setting if programmable)	Circuit Config.
ST	Discrete Input	**Standby** (jumper to **CC** to operate the unit) — Multifunctional programmable discrete input (see Installation Notes on pg. 12 for further information on this terminal).	Figure 6 on pg. 22.
RES	Discrete Input	**Reset** — Multifunctional programmable discrete input.	
F	Discrete Input	**Forward** — Multifunctional programmable discrete input.	
R	Discrete Input	**Reverse** — Multifunctional programmable discrete input.	
S1	Discrete Input	**Preset Speed 1** — Multifunctional programmable discrete input.	
S2	Discrete Input	**Preset Speed 2** — Multifunctional programmable discrete input.	
S3	Discrete Input	**Preset Speed 3** — Multifunctional programmable discrete input.	
S4	Discrete Input	**Emergency Off** — Multifunctional programmable discrete input.	
RR	Analog Input	**Frequency Mode 1** — Multifunction programmable analog input (0.0 to 10 volt input — 0 to 80 Hz output). **Reference CC**.	Figure 7 on pg. 22.
RX	Analog Input	**Unassigned** — Multifunctional programmable analog input (-10 to +10 VDC input). **Reference CC**.	Figure 8 on pg. 22.
II	Analog Input	**Unassigned** — Multifunctional programmable analog input (4 [0] to 20 mADC input) (see Figure 4 on pg. 19 for the location of the **II** terminal). **Reference CC**.	Figure 9 on pg. 22.
VI	Analog Input	**Unassigned** — Multifunctional programmable analog input (0 to 10 VDC input). **Reference CC**.	
P24	DC Output	24 VDC @ 50 mA output.	Figure 10 on pg. 22.
PP	DC Output	**PP** — 10.0 VDC voltage source for the external potentiometer.	Figure 11 on pg. 22.
OUT1	Discrete Output	**Low Speed** — Multifunctional programmable discrete output.	Figure 12 on pg. 22.
OUT2	Discrete Output	**Acc/Dec Complete** — Multifunctional programmable discrete output.	
FP	Output	**Output Frequency** — an output pulse train that has a frequency which is based on the output frequency of the ASD.	Figure 13 on pg. 22.
AM	Output	**Output Current** — Produces an output current that is proportional to the magnitude of the function assigned to this terminal.	Figure 14 on pg. 22
FM	Output	**Output Frequency** — Same as AM terminal.	
FLC	Output	Fault relay (common).	Figure 15 on pg. 22.
FLB	Output	Fault relay (N.C.).	
FLA	Output	Fault relay (N.O.).	
CC	—	Control common (**Do Not** connect to **Earth Gnd**).	
Discrete Input Terminals ⇒ **On** = connected to **CC**. **Analog Input** terminals reference **CC**.			

I/O Terminal Descriptions

Note: *The programmable terminal assignments of the discrete input terminals may be accessed and changed from their default settings as mapped on pg. 40 (see Input Terminals).*

ST — The default setting for this terminal is **ST**. The function of this input as **ST** is a **Standby** mode controller (system is in **Standby** when on). As the default setting, this terminal must be connected to **CC** for normal operation. If not connected to **CC**, **Off** is displayed on the LCD screen. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

RES — The default setting for this terminal is **RES**. The function of this input as **RES** is a system **Reset**. A momentary connection to **CC** resets the ASD and any fault indications from the display. This input terminal may be programmed to any 1 of the 69 possible functions that are listed in the *W7 ASD Operation Manual*. **Reset** is effective when faulted only.

F — The default setting for this terminal is **Forward Run**. **Forward Run** runs the motor in the **Forward** direction when it is on. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

R — The default setting for this terminal is **Reverse Run**. **Reverse Run** runs the motor in the **Reverse** direction when it is on. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

S1 — The default setting for this terminal is **S1**. The function of this input as **S1** is to run the motor at **Preset Speed #1** when it is on. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

S2 — The default setting for this terminal is **S2**. The function of this input as **S2** is to run the motor at **Preset Speed #2** when it is on. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

S3 — The default setting for this terminal is **S3**. The function of this input as **S3** is to run the motor at **Preset Speed #3** when it is on. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

S4 — The default setting for this terminal is **Emergency Off** (normally closed). The function of this input as **Emergency Off** is to remove power from the output of the ASD and may apply a supplemental braking system using the method selected at the **Emg Off Mode** selection parameter. This input terminal may be programmed to any 1 of the 69 functions that are listed in the *W7 ASD Operation Manual*.

RR — The default function assigned to this terminal is to carry out the **Frequency Mode #1** speed control. The **RR** terminal accepts a 0 – 10 VDC input signal and controls the function assigned to this terminal. This input terminal may be programmed to control the speed or torque of the motor. It may also be used to regulate (limit) the speed or torque of the motor. The gain and bias of this terminal may be adjusted for application-specific suitability.

RX — This terminal has no default assignment. The **RX** terminal accepts a ±10 VDC input signal and controls the function assigned to this terminal. This input terminal may be programmed to control the speed, torque, or direction of the motor. It may also be used to regulate (limit) the speed or torque of the motor. The gain and bias of this terminal may be adjusted for application-specific suitability.

II — This terminal has no default assignment. The function of the **II** input is to receive a 4 – 20 mA input signal. This input terminal may be programmed to control the speed or torque of the motor and may not be used when using the **VI** input. The gain and bias of this terminal may be adjusted for application-specific suitability.

VI — This terminal has no default assignment. The function of the **VI** input terminal is to receive a 0 – 10 VDC input signal. This input terminal may be programmed to control the speed or torque of the motor and may not be used when using the **II** input. The gain and bias of this terminal may be adjusted for application-specific suitability.

P24 — +24 VDC @ 50 mA power supply for customer use.

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

OUT1 — The default setting for this output terminal is **Low Speed** (activates upon the output speed falling below the setting of parameter **F100**). This output terminal may be programmed to provide an indication that 1 of the 77 possible events listed in the *W7 ASD Operation Manual* has taken place. This function may be used to signal external equipment or to activate the brake. The **OUT1** contact is rated at 2A/250 VAC.

OUT2 — The default setting for this output terminal is **ACC/DEC Complete**. This output terminal may be programmed to provide an indication that 1 of the 77 possible events listed in the *W7 ASD Operation Manual* has taken place. This function may be used to signal external equipment or to activate the brake. The **OUT2** contact is rated at 2A/250 VAC.

FP — The function of this terminal is to output a series of pulses at a rate that is a function of the magnitude of the assigned parameter. The default assignment of this terminal is **Output Frequency**. As the output frequency of the ASD goes up so does the **FP** output pulse rate. This terminal may be programmed to provide output pulses at a rate that is a function of the output frequency or the magnitude of any 1 of the 33 the functions listed in the *W7 ASD Operation Manual*.

AM — The default assignment of this terminal is **Output Current**. This output terminal produces an output current that is proportional to the magnitude of the function assigned to this terminal. This terminal may be programmed to provide a DC output of an amplitude that is a function of the output current or the magnitude of any 1 of the 33 the functions listed in the *W7 ASD Operation Manual*.

FM — The default assignment of this terminal is **Output Frequency**. This output terminal produces an output current that is proportional to the magnitude of the function assigned to this terminal. This terminal may be programmed to provide a DC output of an amplitude that is a function of the output frequency or the magnitude of any 1 of the 33 the functions listed in the *W7 ASD Operation Manual*.

FLC — **FLC** is the middle leg of a single-pole double-throw (relay) switch. The **FLC** contact of the relay is switched between **FLB** and **FLA**. This contact may be programmed to provide an indication that 1 of the 77 possible events listed in the *W7 ASD Operation Manual* has taken place by switching the **FLC** contact to **FLB** or **FLA**.

FLB — One of two contacts that, under user-defined conditions, connect to **FLC** (see Figure 3).

FLA — One of two contacts that, under user-defined conditions, connect to **FLC** (see Figure 3).

Note: *The **FLA** and **FLC** contacts are rated at 2A/250 VAC. The **FLB** contact is rated at 1A/250 VAC.*

CC — Control common (**Do Not** connect to **Earth Gnd**).

Figure 3. FLA, FLB, and FLC switching contacts shown in the de-energized state.

Note: *The relay is shown in the **Faulted** or de-energized condition. During normal system operation the relay connection is **FLC**-to-**FLA**.*

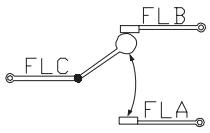
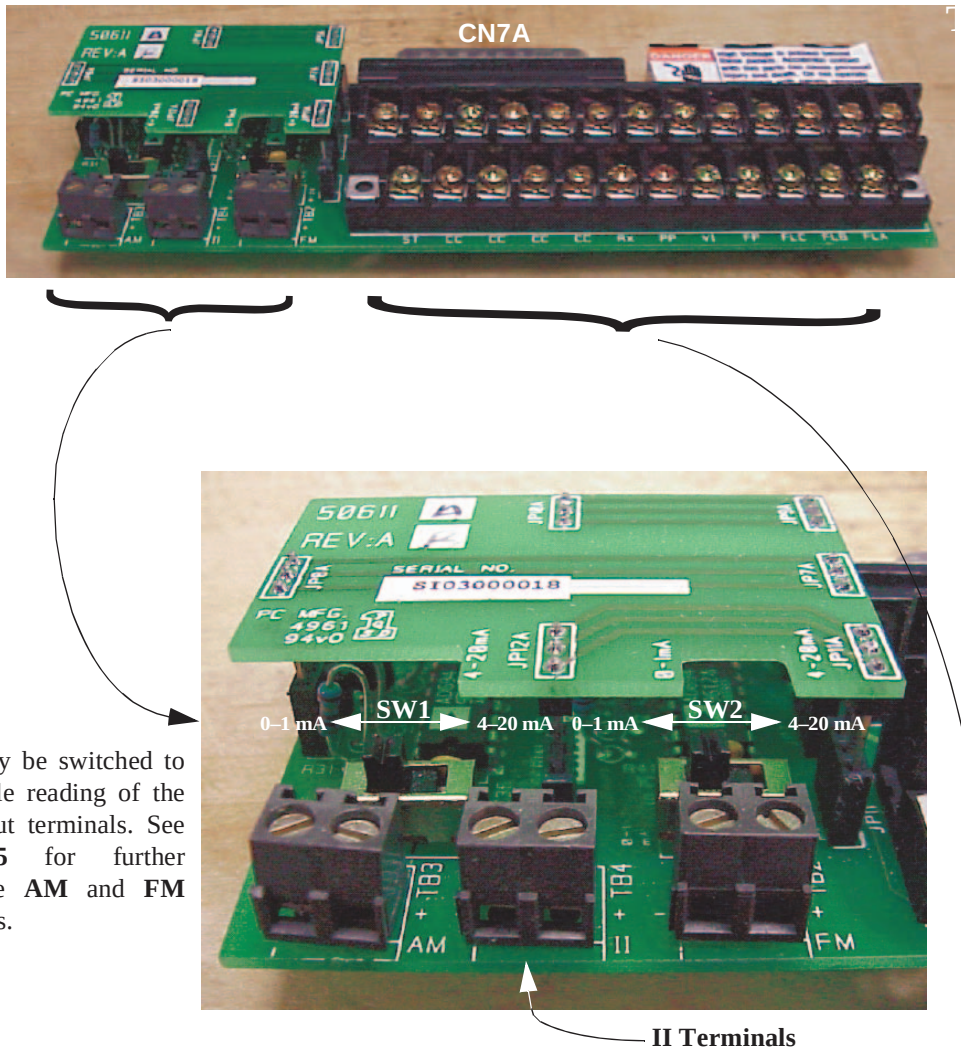
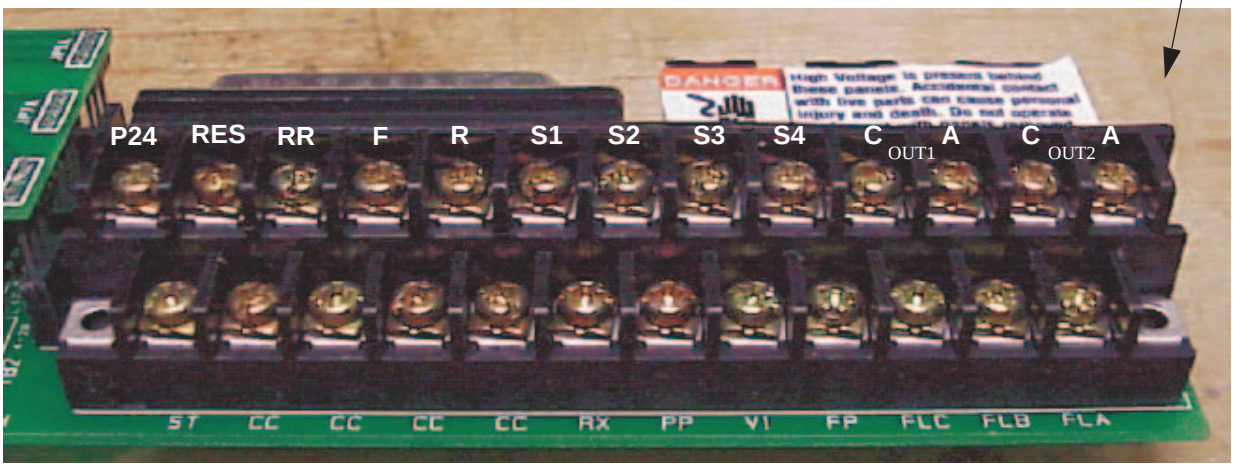


Figure 4. Control Terminal Strip PCBA.



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

Shown below are the TB1 input and output terminals of the **Control Terminal Strip** PCBA. For further information on these terminals see pg. 16.



W7 ASD Control

The Control PCBA (P/N 56000) serves as the primary control source for the W7 ASD and receives input from the Control Terminal Strip, an Option Board, RS232/RS485 Communications, or the EOI.

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

Using the optional multiple-protocol communications interface: the ASD-NANOCOM, the Control 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 5). A jumper board (P/N 55365) is required at the J4 connector if not using the ASD-NANOCOM.

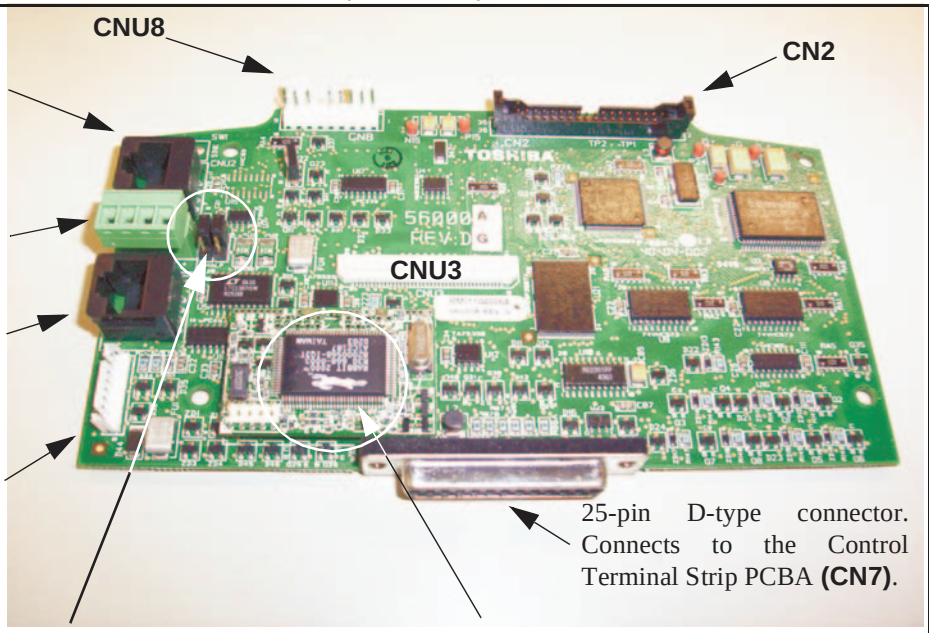
The **ASD-NANOCOM** must be setup to support the desired communications protocol via Program ⇒ **Comm Settings**. Consult the **ASD-NANOCOM** User's Manual (P/N 10572-1.000-000) for a complete listing of the setup requirements.

Half or Full duplex communications is available when using RS232/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.

For more information on the W7 ASD communication requirements, please visit WWW.TIC.TOSHIBA.COM to acquire a copy of the **7-Series Serial Communications** User Manual (P/N 53840) (see Drives ⇒ G7 Severe Duty Industrial ⇒ **Manuals**) and WWW.ICCDESIGNS.COM to acquire a copy of the **ASD-NANOCOM** User Manual.

Contact your Toshiba representative if more information is required on the ASD-NANOCOM.

Figure 5. Control Board of the **W7 ASD** (P/N 56000).



Common Serial (TTL) I/O (**CNU2**).

RS232/RS485 signal I/O (**CN3)**.

RS232/RS485 signal I/O (**CNU1**).

25-pin D-type connector. Connects to the Control Terminal Strip PCBA **(CN7)**.

JP1 Jumpers — Half-/Full-Duplex selection.

ASD-NANOCOM.

CNU1/1A and CNU2/2A Pinout

Control Board CNU1/1A and CNU2/2A pinout (RJ-45 connectors).

Pin #	CNU1 Pinout (Control Board)	CNU1A Pinout (EOI)	Pin #	CNU2 Pinout (Control Board)	CNU2A Pinout (EOI)
1	P24	P24	1	P24	P24
2	Gnd	Gnd	2	Gnd	Gnd
3	Tx (-)	RXA	3	Rx	Tx
4	Rx (+)	TXA	4	Gnd	Gnd
5	Rx (-)	TXB	5	Tx	Rx
6	Tx (+)	RXB	6	Gnd	Gnd
7	RS232/RS485	CNU3 Pin-7	7	Open	Open
8	Gnd	Gnd	8	Gnd	Gnd

CN3 Pinout

CN3 of the Control Board is used for 2-wire RS485 serial communications.

Pin Number	CN3 Pinout (Controller PCBA)
1	RS485 Signal +
2	RS485 Signal -
3	RS485 Signal Gnd.
4	Shield

Note: *CNU2 or CNU3 may be used for RS485 communication — Cannot use both.*

CN7 Pinout

CN7 of the Control Board connects to **CN7A** of the Control Terminal Strip PCBA.

Table 3. CN7 pinout assignments. Programmable terminals are listed as their default settings.

Pin Number	Function	Pin Number	Function
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 outputs.*			

I/O Circuit Configurations

Figure 6. Discrete Input.

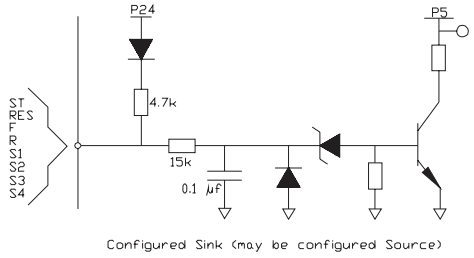


Figure 7. RR Input.

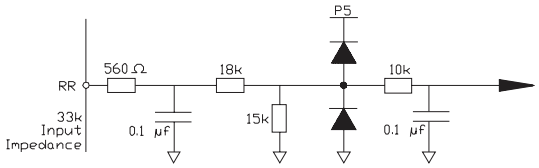


Figure 8. RX Input.

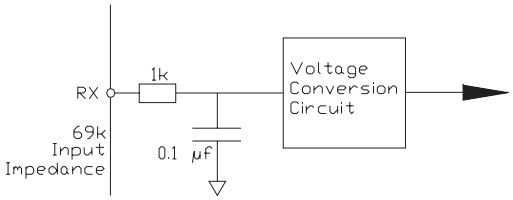


Figure 9. VI/II Input.

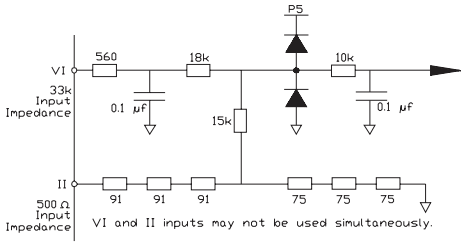


Figure 10. P24 Output.

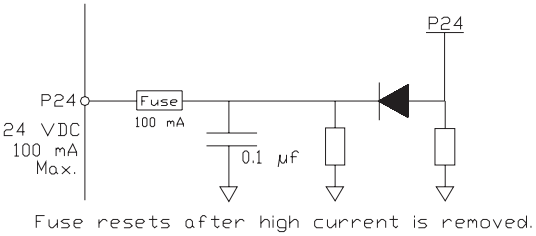


Figure 11. PP Output.

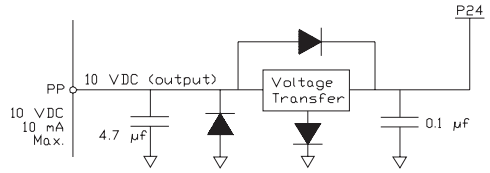


Figure 12. OUT1/OUT2 Output.

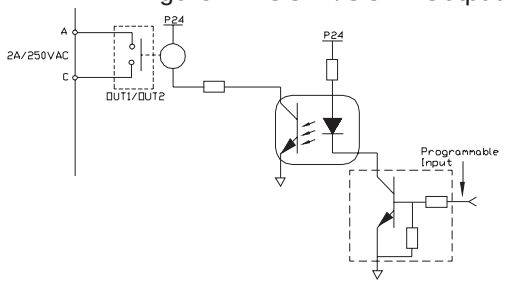


Figure 13. FP Output.

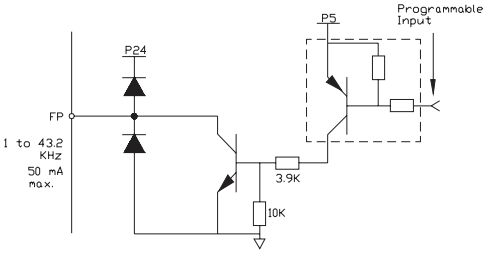


Figure 14. AM/FM Output.

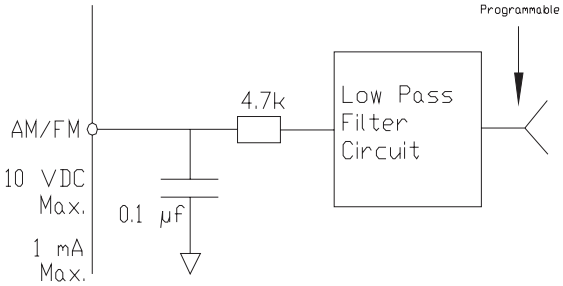
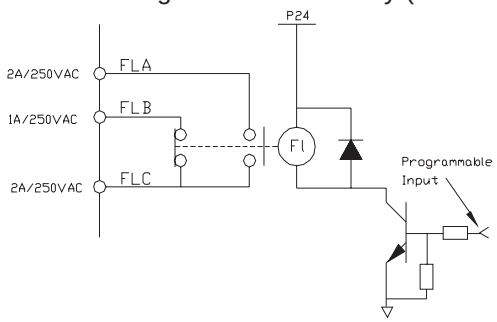


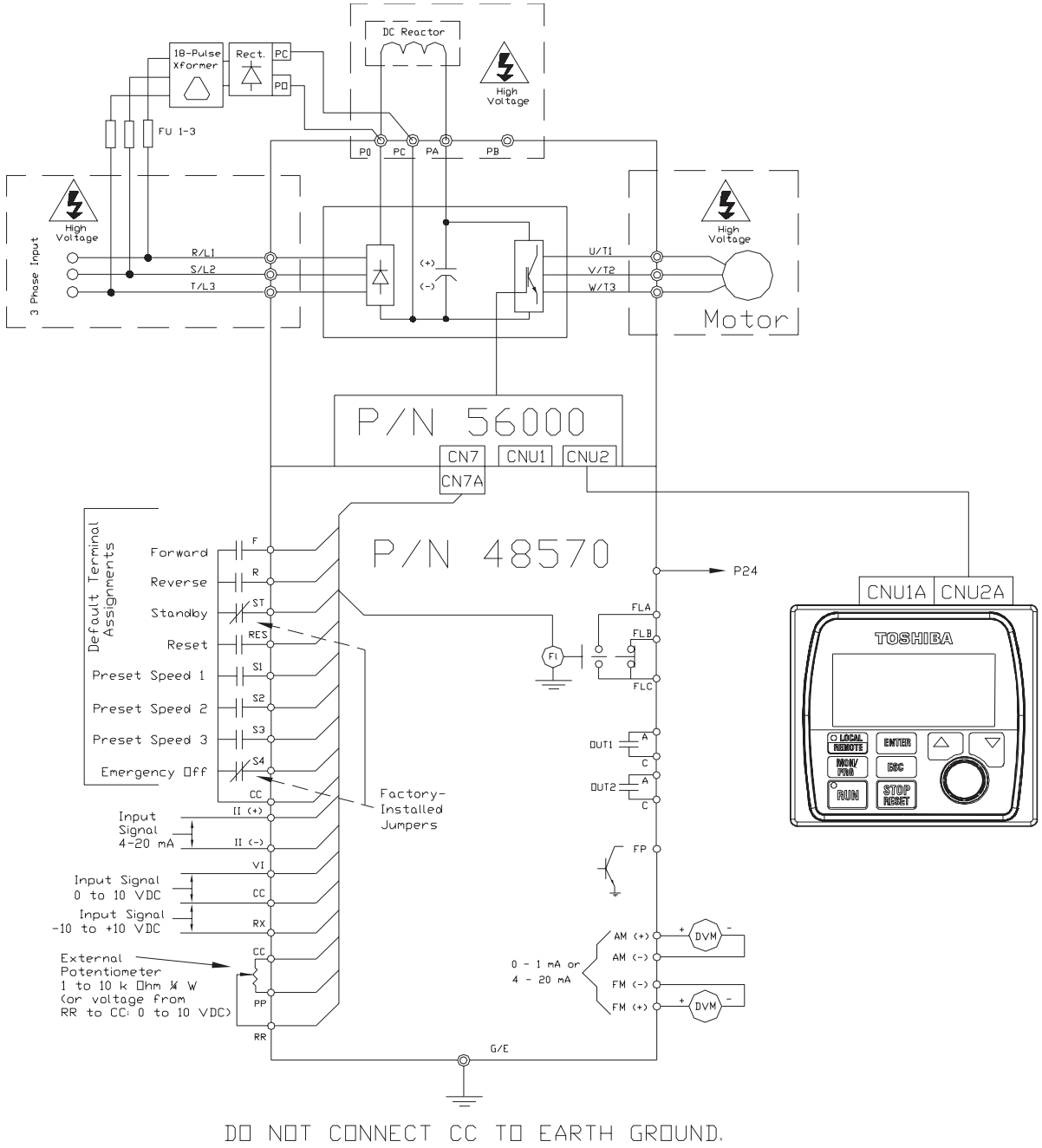
Figure 15. Fault Relay (active fault).



Typical Connection Diagram

Figure 16. W7 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.*



Electronic Operator Interface

The **W7 ASD Electronic Operator Interface** (EOI) is comprised of an LCD display, two LEDs, a rotary encoder, and eight keys. These items are described below and their locations are provided in Figure 17 on pg. 25.

The **EOI** can be mounted remotely from the ASD as described in the *W7 ASD Operation Manual.* The dimensional requirements for remote mounting may also be found there.

The interface can operate up to distances of 15 feet from the ASD via the Common Serial (TTL) Port. For distances beyond 15 feet, the RS232/RS485 port is recommended.

EOI Features

LCD Display — Displays configuration information, performance data (e.g., motor frequency, bus voltage, output power, etc.), and diagnostic information.

Local|Remote Key — Toggles the system to and from the **Local** and **Remote** modes. The LED is on when the system is in the **Local Command** mode.

The **Local Command** mode enables 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 any one of the following methods:

- Pulse Input,
- Motorized Pot,
- Communication Card,
- RS232/RS485,
- Common TTL,
- Binary/BCD,
- LED Keypad,
- Option Card RX2,
- RX,
- RR, or
- VI/II.

The input channel selection may be made via Program ⇒ Utilities ⇒ **CMD, FRQ, & Carrier**.

Enter Key — Selects a menu item to be changed or accepts and records the changed data of the selected field (same as pressing the **Rotary Encoder**).

ESC Key — Returns to the previous level of the menu tree, toggles between the **Panel** screen and the **Frequency Command** screens, or cancels changes made to a field if pressed while still in the reverse video mode (dark background/light text). The 3 functions are menu-specific.

Run Key — Issues the **Run** command while in the **Local** mode.

Run Key Status LED — Illuminates green while stopped or red while running.

Stop Key — If pressed once while in the **Local** mode issues the **Off** command and decelerates the motor at the programmed rate until it stops. If pressed twice in rapid succession initiates an **Emergency Off** (terminates the ASD output and applies the brake if so configured) from the **Local** or **Remote** modes.

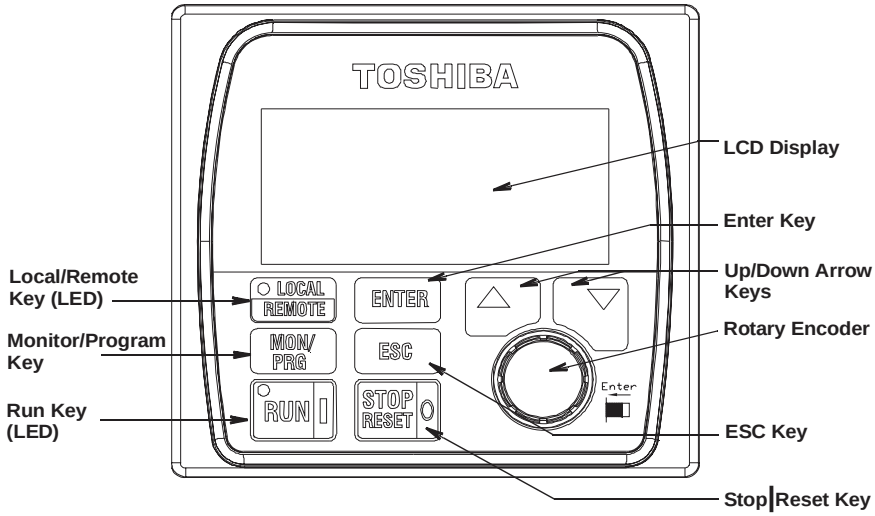
Up Key — Increases the value of the selected parameter or scrolls up the menu listing (continues during press-and-hold).

Down Key — Decreases the value of the selected parameter or scrolls down the menu listing (continues during press-and-hold).

Rotary Encoder — Functions as the **Up** key, the **Down** key, and the **Enter** key. Turn the **Rotary Encoder** either clockwise or counterclockwise to perform the **Up** or **Down** key functions. Press the **Rotary Encoder** to perform the **Enter** function. Press the **Rotary Encoder** while turning to increase the effectiveness of the **Rotary Encoder**. The Up/Down-Clockwise/Counter Clockwise **Rotary Encoder** relationship to menu changes may be changed via Program ⇒ EOI Options ⇒ Encoder Action ⇒ **Encoder Direction (UP)** (Up may be set to clockwise or counter clockwise).

MON/PRG Key (Monitor/Program) — Provides a means to access the three root menus. Pressing the **MON/PRG** key repeatedly loops the system through the three root menus (see Figure 19 on pg. 28). While looping through the root menus, the **Program** menu will display the last menu screen or sub-menu item being accessed at the time that the **MON/PRG** key was pressed.

Figure 17. The W7 ASD Electronic Operator Interface.



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, or perform diagnostics.

Note: *The **Up/Down** arrow keys and the **Enter** key may be used to perform the functions of the **Rotary Encoder**. The **Rotary Encoder** will be used in this explanation and throughout this guide for the **Up**, **Down**, and **Enter** key functions.*

The software used with the **W7 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**.

To change a parameter setting, go to the **Program** mode by pressing the **MON/PRG** key until the **Program** menu is displayed. Turn the **Rotary Encoder** until the desired parameter group is within the cursor block. Press the **Rotary Encoder** (repeat if there is a submenu).

The selection will take on the reverse video format (dark background/light text). Turn the **Rotary Encoder** to change the value of the parameter. Press the **ESC** key while the display is in the reverse video mode to exit the menu without saving the change or press the **Rotary Encoder** to accept the new setting.

Repeated **ESC** key entries takes the menu back one level each time the **ESC** key is pressed until the root level is reached. After reaching the root level, continued **ESC** entries will toggle the system to and from the **Frequency Command** screen and the **Panel** screen.

Note: ***Panel** menu changes entered here will affect EOI-controlled ASD operation only.*

System Operation

Operation (Local)

Read and understand all safety warnings before operating this equipment!

To run the motor perform the following steps:

1. Press the **MON/PROG** key until the **Frequency Command** screen is displayed (see Figure 20 on pg. 28).
2. Place the system in the **Local** mode (green **Local** LED illuminated) by pressing the **Local|Remote** key.
3. Ensure that there are no personnel around or near the motor or the motor-driven equipment.
4. Using the **Rotary Encoder** dial in a speed setting at the **Set** field and press the **Rotary Encoder**.
5. Press the **Run** key (illuminated green **RUN** LED turns red) and the motor accelerates to the set speed at the (default) programmed rate. The speed may be changed while running.
6. Press the **Stop|Reset** key to stop the motor.

Default Setting Changes

To change a parameter setting using the EOI, press the **MON/PRG** key until the **Program** menu is displayed.

From the **Program** menu scroll to the desired parameter group and press the **Rotary Encoder** — Repeat for sub-menu items. Once reaching the lowest level of a parameter group, scroll to the parameter to be changed and press the **Rotary Encoder**.

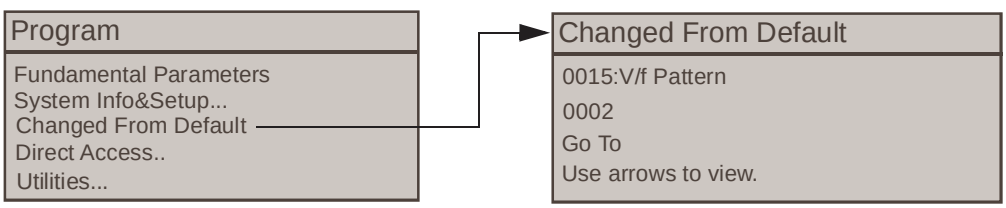
The parameter takes on the reverse video format (dark background/light text). Use the **Rotary Encoder** to scroll to the new value or setting. Press the **ESC** key to exit without saving the parameter change while still in the reverse video mode or press the **Rotary Encoder** to accept and save the change.

For a complete listing of the **Program** menu items, see the section titled Program Menu Navigation on pg. 32. The menu items are mapped for convenience. The **Direct Access Numbers** are listed where applicable. The Direct Access numbers are also listed chronologically in the *W7 ASD Operation Manual*.

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

Note: *Parameter **0015** was changed to create the example shown in Figure 18.*

Figure 18. Changed From Default screen.



The **Changed From Default** feature allows the user to view (or change) the parameters that are different from the factory default settings. Once the **Changed From Default** screen is displayed, the system 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.

Parameter settings may also be changed via **Communications**. See the ***7-Series Serial Communications Manual*** (P/N 53840) for further information on using communications to change parameter settings. *The* ***7-Series Serial Communications Manual*** may be acquired from the TIC.TOSHIBA.COM website at Drives ⇒ G7 Severe Duty Industrial ⇒ **Manuals** or from your Toshiba Sales Representative.

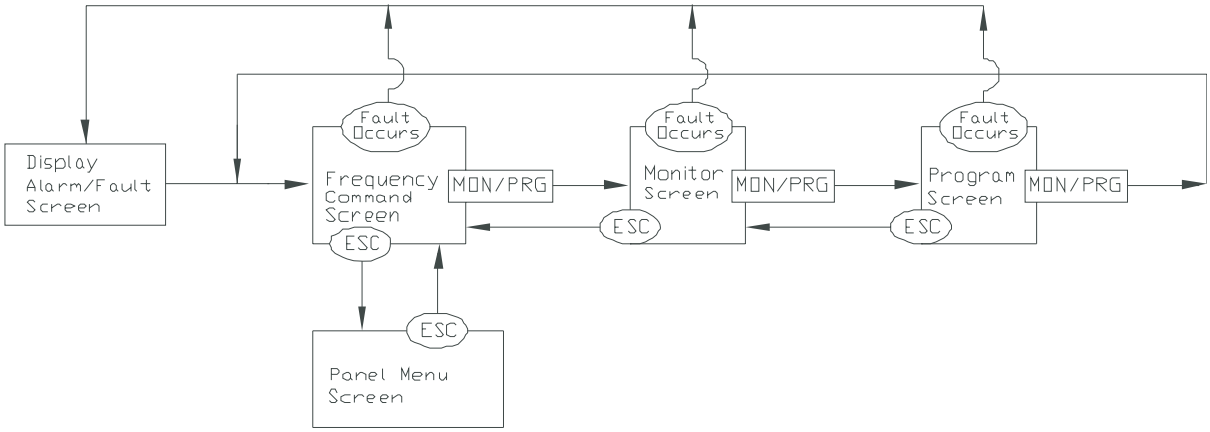
System Configuration and Menu Options

Root Menus

The **MON/PRG** key is used to access the three root menus of the **W7 ASD**: the **Frequency Command** screen, the **Monitor** screen, and the **Program** screen. From either mode, press the **MON/PRG** key to loop through to the other modes (see Figure 19).

In the event of a fault, the **W7 ASD** displays the fault screen and provides an on-screen indication of the fault type. The **Fault** screen remains in the **MON/PRG** screen rotation until the source of the fault is removed and the ASD is reset.

Figure 19. Root Menu Mapping.

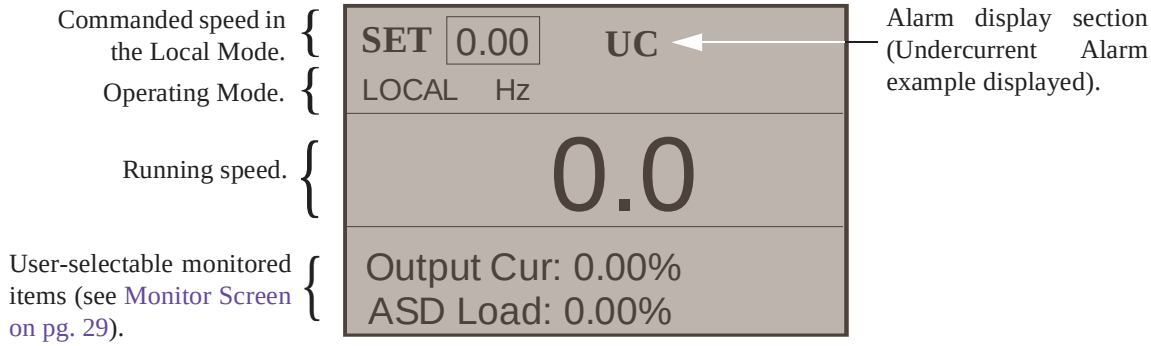


Frequency Command Screen

Frequency Setting

While operating in the **Local** mode (**Local** LED is illuminated on the EOI), the running frequency of the motor may be set from the **Frequency Command** screen. Using the **Rotary Encoder**, enter the desired **Frequency Command** value, press the **Enter** key and then press the **Run** key. The motor will run at the **Frequency Command** speed and may be changed while running. The **Frequency Command** screen is not displayed during an active trip.

Figure 20. Frequency Command Screen.



The **Panel Menu** screen provides easy-access to the most common setup parameters. **Panel Menu** changes will affect EOI-controlled ASD operation only and is accessed by pressing the ESC key from the **Frequency Command** screen.

Monitor Screen

The **Monitor** screen reports the status of motor performance variables, control settings, and configuration data during motor operation. There are 37 monitored items that may be viewed from this screen. The items are listed and described below.

The monitored items listed may be selected and displayed at the **Frequency Command** screen while the ASD is running. See Program ⇒ System Information and Setup ⇒ **Scrolling Monitor** to select the monitored items to be displayed.

Note: *The **Monitor** screen lists the read-only running status and the at-trip status of the listed parameters.*

Run Frequency — If tripped, this field records the at-trip frequency. Otherwise, the current output frequency is displayed.

Frequency Reference — Displays the current frequency command.

Output Current — Shows the instantaneous output current as a percentage of the rating of the ASD or as a current.

Bus Voltage — Shows the instantaneous DC bus voltage as a percentage of the rating of the ASD or as a voltage.

Output Voltage — Shows the instantaneous output voltage as a percentage of the rating of the ASD or as a voltage.

Input Terminals — Shows the status of the discrete input terminals.

Output Terminals — Shows the status of the discrete output terminals.

Timer — Displays the accumulated run-time since the last reset or power up of the ASD.

Post Compensation Frequency — Displays the output frequency of the ASD after the application of the waveform adjustment compensation for changes in the input voltage.

Feedback Instantaneous — Displays the instantaneous PID feedback value.

Feedback 1-Second — Displays the filtered PID feedback value.

Torque — Displays the torque output.

Torque Reference — Displays the commanded torque.

Torque Current — Displays the torque current.

Excitation Current — Displays the excitation current.

PID Value — Displays the instantaneous PID feedback value.

Motor Overload — Displays the relationship of time to the magnitude of the motor overload as a ratio. A higher overload means a shorter run-time in this condition.

ASD Overload — Displays the relationship of time to the magnitude of the ASD overload as a ratio. A higher overload means a shorter run-time in this condition.

DBR Overload — Displays the relationship of time to the magnitude of the DBR overload as a ratio. A higher overload means a shorter run-time in this condition.

Motor Load — Shows the instantaneous motor load requirements.

ASD Load — Shows the instantaneous load placed on the ASD.

DBR Load — Shows the instantaneous load placed on the DBR.

Input Power — Shows the instantaneous input power level to the ASD.

Output Power — Shows the instantaneous output power level of the ASD.

Peak Current — Shows the highest current level achieved since the last startup or reset. This value is displayed as a percentage of the full rating of the ASD or as an amperage.

Peak Voltage — Shows the highest voltage level achieved since the last startup or reset. This value is displayed as a percentage of the full rating of the ASD or as an amperage.

PG Speed — Shows the instantaneous speed as detected by the shaft-mounted encoder.

Direction — Shows the direction of the motor rotation.

PG Position — Shows the instantaneous PG position as detected by the shaft-mounted encoder.

RR — Displays the RR input as a percentage of its full range.

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

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

RX — Displays the RX input as a percentage of its full range.

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

FM — Displays the FM output as a percentage of its full range.

AM — Displays the AM output as a percentage of its full range.

Option Type — TBD.

Option Terminal A — TBD.

Option Terminal B — TBD.

Option Terminal O — TBD.

Option Terminal P — TBD.

Maximum Output — TBD.

Direction — Displays the ASD Forward/Reverse status (not available at the Scrolling Monitor).

Program Screen

The **Program Menu** allows the user access to parameters that setup the input and output specifications of the **W7 ASD**. Many of these settings are application-specific and may require user input.

See the section titled Program Menu Navigation on pg. 32 for a complete listing of the W7 ASD parameters and for menu navigation assistance.

Program Menu Navigation

Table 4 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***.

See the ***W7 Operation Manual*** for more in-depth information on the menu items listed.

Table 4. Program mode mapping**.**

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FUNDAMENTALS	**Fundamentals #1**	Maximum Output Frequency	0011
		#1 Base Frequency	0014
		Supply Voltage Compensation	0307
		Maximum Output Voltage #1	0306
		Disable Forward Run	0311
		Disable Reverse Run	
		Upper Limit Frequency	0012
		Lower Limit Frequency	0013
		V/f Pattern	0015
		Torque Boost #1	0016
		Acceleration Time #1	0009
		Deceleration Time #1	0010
		Acceleration/Deceleration Pattern #1	0502
		S-Pattern Lower Limit Adjustment	0506
		S-Pattern Upper Limit Adjustment	0507
	Fundamentals #2	Base Frequency #2	0170
		Maximum Output Voltage #2	0171
		Torque Boost #2	0172
		Electronic Thermal Protection #2	0173
		Acceleration Time #2	0500
		Deceleration Time #2	0501
		Acceleration/Deceleration Pattern #2	0503
		Acceleration/Deceleration #1/#2 Switching Frequency	0505
SYSTEM INFO & SETUP	**Setup**	Acceleration Time #1	0009
		Deceleration Time #1	0010
		Upper Limit Frequency	0012
		Lower Limit Frequency	0013
		VI/II Speed Reference Setpoint #1	0201
		VI/II Speed Frequency Setpoint #1	0202
		VI/II Speed Reference Setpoint #2	0203
		VI/II Speed Frequency Setpoint #2	0204
		Type Reset	0007

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SYSTEM INFO & SETUP	**Setup**	V/f Pattern	0015
		Switch-on-the-Fly	0961
		Electronic Thermal Protection #1	0600
	PID Setup	Feedback Input	0360
		Delay Filter	0361
		Proportional (P) Gain	0362
		Integral (I) Gain	0363
		Deviation Upper Limit	0364
		Deviation Lower Limit	0365
		Differential (D) Gain	0366
		Upper Limit Frequency	0012
		Lower Limit Frequency	0013
		Acceleration Time #1	0009
		Deceleration Time #1	0010
		Low-output Disable	0731
		Low-output Disable Start Level	0732
		Low-output Disable Delay Time	0733
		Low-output Disable Boost Level	0734
		Low-output Disable Boost Time	0735
		Low-output Disable Feedback Level	0736
		Low-output Disable Restart Delay	0737
		4–20 mA Loss	0962
		4–20 mA Speed Reference	0964
		PID Feedback Value	N/A
	Trip History	Trip Number	N/A
		Trip Type	
		Trip Time and Date	
		Frequency	
		Output Current	
		Output Voltage	
		Direction	
		Frequency Reference	
		DC Bus Voltage	
		Discrete Input Terminals	
		Discrete Output Terminals	
		Run Timer	
		Post-compensation Frequency	
		Speed Feedback (realtime)	
		Speed feedback (filtered)	

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SYSTEM INFO & SETUP	**Trip History**	Torque Feedback	N/A
		Torque Reference	
		Torque Current	
		Excitation Current	
		PID Feedback Value	
		Motor Overload Ratio	
		ASD Overload Ratio	
		DBR Overload Ratio	
		Motor Load	
		ASD Load	
		DBR Load	
		Input Power	
		Output Power	
		Peak Output Current	
		Peak DC Voltage	
		PG Speed	
		PG Position	
	Scrolling Monitor	Display Seconds	N/A
		Parameter Display Selections	
	Password Control	Enter Password	
		Password Enable	
	Local/Remote Key	Command	
		Frequency	
	Contrast	Lighter	
		Darker	
	Realtime Clock Setup	Set Realtime Clock Time and Date	
CHANGED FROM DEFAULT		(See the section titled Default Setting Changes on pg. 26.)	N/A
DIRECT ACCESS		Parameter Number Input	N/A
		Enable Unknown Numbers	
UTILITIES	**Version**	ASD Type	N/A
		CPU Version	
		CPU Revision	
		Control Board EEPROM Version	
		EOI Version	
	Display Attributes	Hz per User-defined Unit	0702
		Frequency Display Resolution	0703
		Acc/Dec Special Display Resolution	0704
		Units for Voltage and Current	0701

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
UTILITIES	**Display Attributes**	User -defined Units	N/A
	Type Reset	Auto Setup for 50 Hz Operation	0007
		Auto Setup for 60 Hz Operation	
		Restore Factory Defaults	
		Clear Past Trips	
		Clear Run Timer	
		New Base Drive Board	
		Save User Settings	
		Restore User Settings	
		Upgrade EOI Firmware	
		Set EOI Memory to Default	
	Command, Frequency, and Carrier Frequency	Command Mode	0003
		Frequency Mode #1	0004
		PWM Carrier Frequency	0300
		Ramped PWM	0963
FREQUENCY SETTINGS	**Speed Reference Setpoints**	VI/II Speed Reference Setpoint #1	0201
		VI/II Speed Frequency Setpoint #1	0202
		VI/II Speed Reference Setpoint #2	0203
		VI/II Speed Frequency Setpoint #2	0204
		VI/II Bias	N/A
		VI/II Gain	
		RR Speed Reference Setpoint #1	0210
		RR Speed Frequency Setpoint #1	0211
		RR Speed Reference Setpoint #2	0212
		RR Speed Frequency Setpoint #2	0213
		RR Bias	N/A
		RR Gain	
		RX Speed Reference Setpoint #1	0216
		RX Speed Frequency Setpoint #1	0217
		RX Speed Reference Setpoint #2	0218
		RX Speed Frequency Setpoint #2	0219
		RX Bias	N/A
		RX Gain	
		RX2 Speed Reference Setpoint #1	0222
		RX2 Speed Frequency Setpoint #1	0223
		RX2 Speed Reference Setpoint #2	0224
		RX2 Speed Frequency Setpoint #2	0225
		RX2 Bias	N/A
		RX2 Gain	

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FREQUENCY SETTINGS	**Speed Reference Setpoints**	BIN Speed Reference Setpoint #1	0228
		BIN Speed Frequency Setpoint #1	0229
		BIN Speed Reference Setpoint #2	0230
		BIN Speed Frequency Setpoint #2	0231
		PG Speed Reference Setpoint #1	0234
		PG Speed Frequency Setpoint #1	0235
		PG Speed Reference Setpoint #2	0236
		PG Speed Frequency Setpoint #2	0237
	Reference Priority	Reference Priority	0200
		Frequency Mode #2	0207
		Mode #1/#2 Switching Frequency	0208
	Jog Settings	Jog Run Frequency	0260
		Jog Stop Control	0261
		Enable Jog Window	N/A
TORQUE SETTINGS	**Torque Reference Setpoints**	VI/II Output-Torque Reference Setpoint #1	0205
		VI/II-Input Torque Setpoint #1	0201
		VI/II Output-Torque Reference Setpoint #2	0206
		VI/II-Input Torque Setpoint #2	0203
		RR Output-Torque Reference Setpoint #1	0214
		RR-Input Torque Setpoint #1	0210
		RR Output-Torque Reference Setpoint #2	0215
		RR-Input Torque Setpoint #2	0212
		RX Output-Torque Reference Setpoint #1	0220
		RX-Input Torque Setpoint #1	0216
		RX Output-Torque Reference Setpoint #2	0221
		RX-Input Torque Setpoint #2	0218
		RX2 Output-Torque Reference Setpoint #1	0226
		RX2-Input Torque Setpoint #1	0222
		RX2 Output-Torque Reference Setpoint #2	0227
		RX2-Input Torque Setpoint #2	0224
		BIN Output-Torque Reference Setpoint #1	0232
		BIN-Input Torque Setpoint #1	0228
		BIN Output-Torque Reference Setpoint #2	0233
		BIN-Input Torque Setpoint #2	0230
	Torque Control	Torque Command	0420
		Torque Command Filter	0421
		Synchronized Torque Bias Input	0422
		Tension Torque Bias Input	0423
		Load Sharing Gain Input	0424

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TORQUE SETTINGS	**Torque Limit**	Power Running Torque Limit #1	0440
		Regenerative Torque Limit #1	0442
		Torque Limit Mode	0450
		Torque Limit Mode (speed-dependent)	0451
	Manual Torque Limit	Manual Torque Limit #1	0441
		Manual Torque Limit #2	0444
		Manual Torque Limit #3	0446
		Manual Torque Limit #4	0448
	Torque Speed Limit	Torque Command Mode	0429
		Forward Speed Limit Input	0425
		Forward Speed Limit Level	0426
		Reverse Speed Limit Input	0427
		Reverse Speed Limit Level	0428
		Speed Limit Reference	0430
		Speed Limit Level	0431
		Speed Limit Band	0432
		Speed Limit Recovery Time	0433
MOTOR SETTINGS	**Motor Set #1**	Base Frequency #1	0014
		Maximum Output Voltage #1	0306
		Torque Boost #1	0016
		Electronic Thermal Protection #1	0600
	Motor Set #2	Base Frequency #2	0170
		Maximum Output Voltage #2	0171
		Torque Boost #2	0172
		Electronic Thermal Protection #2	0173
	Motor Set #3	Base Frequency #3	0174
		Maximum Output Voltage #3	0175
		Torque Boost #3	0176
		Electronic Thermal Protection #3	0177
	Motor Set #4	Base Frequency #4	0178
		Maximum Output Voltage #4	0179
		Torque Boost #4	0180
		Electronic Thermal Protection #4	0181
	Vector Motor Model	Autotune Control	0400
		Slip Frequency Gain	0401
		Motor Constant #1 (primary resistance)	0402
		Motor Constant #2 (secondary resistance)	0403
		Motor Constant #3 (exciting inductance)	0404
		Motor Constant #4 (load inertia moment)	0405
		Motor Constant #5 (leak inductance)	0410

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
MOTOR SETTINGS	**Motor Settings**	Number of Motor Poles	0411
		Rated Capacity of Motor	0412
		Motor Type	0413
	Autotune Enable	Autotune Enable	0414
COMMUNICATION	**Communication Settings**	ASD Number	0802
		Communication Baud Rate (TTL)	0800
		Communication Baud Rate (RS232/RS485)	0820
		Parity	0801
		Communication Time-Out	0803
		Communication Time-Out Action (TTL)	0804
		Communication Time-Out Action (RS232/ RS485)	
		Communication Interval (TTL)	0805
		RS232/RS485 Wire Count	0821
		RS232/RS485 Delay Time	0825
		TTL Master Output for Follower	0806
		RS232/RS485 Master Output for Follower	0826
	Communication Reference Adjust	Frequency Reference Point	0810
		Communication Reference Setpoint #1	0811
		Communication Frequency Reference Setpoint #1	0812
		Communication Reference Setpoint #2	0813
		Communication Frequency Reference Setpoint #2	0814
	S20 Settings	S20 feature is unavailable at the time of this release	N/A
	Scan Settings	Scan feature is unavailable at the time of this release	N/A
	External Settings (used with optional Nanocomm – see ASD Nanocomm Manual)	External Communication Configuration #1	N/A
		External Communication Configuration #2	
		External Communication Configuration #3	
		External Communication Configuration #4	
		External Communication Configuration #5	
		External Communication Configuration #6	
		External Communication Configuration #7	
		External Communication Configuration #8	N/A
FEEDBACK SETTINGS		Feedback Input (PID Enable)	0360
		Proportional (P) Gain	0362
		Integral (I) Gain	0363
		Differential (D) Gain	0366

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
FEEDBACK SETTINGS		Delay Filter	0361
		Upper Deviation Limit	0364
		Lower Deviation Limit	0365
		4–20 mA Loss	0962
		4–20 mA Speed Reference	0964
		Number of PG Input Pulses	0367
		PG Input Phases	0368
		PG Disconnect Detection	0369
PROTECTION SETTINGS	**Dynamic Braking**	Dynamic Braking Enable	0304
		Dynamic Braking Resistance	0308
		Dynamic Braking Resistance Capacity	0309
	Stall	Overcurrent Stall Level	0601
		Overvoltage Stall	0305
		Overvoltage Stall Level	0626
		Overvoltage Stall Level (fast)	0625
		Continuing Stall Period	0452
		Stall Prevention During Regeneration	0453
	DC Injection Braking	Start Frequency	0250
		Start Current Level	0251
		DC Injection Braking Time	0252
		DC Injection Braking During Direction Change	0253
		Motor Shaft Stationary Control	0254
	Retry/Ridethrough	Emergency Off (EOFF) Mode	0603
		DC Injection EOFF Mode Time	0604
		Number of Retries	0303
		Restart Conditions	0301
		Scan Rate	0312
		Lock On Rate	0313
		Search Method	0314
		Search Inertia	0315
		Ridethrough Mode	0302
		Ridethrough Time	0310
	Undervoltage	Undervoltage Stall Level	0629
		Undervoltage Trip	0627
		Undervoltage Detection Time	0628
	Overload	Overload Reduction Starting frequency	0606
		Motor 150% Overload Time Limit	0607
		Soft Stall Selection	0017
	Trip/Fan/Timer	Trip Settings	0602

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
PROTECTION SETTINGS	**Trip/Fan/Timer**	Fan Control Mode	0620
		Cumulative Run Timer Alarm	0621
	Phase Loss	Output Phase Loss Detection	0605
	Low Current	Low Current Trip	0610
		Low Current Trip Threshold Level	0611
		Low Current Trip Threshold Time	0612
	Abnormal Speed	Abnormal Speed Detection Filter	0622
		Overspeed Detection Frequency Range	0623
		Speed Drop Detection Frequency Range	0624
	Short Circuit Test	Output Short Circuit Test	0613
		Output Short Circuit Test Duration	0614
	Overtorque	Overtorque Trip	0615
		Overtorque Trip/Alarm Level (Positive Torque)	0616
		Overtorque Trip/Alarm Level (Negative Torque)	0617
		Overtorque Detection Time	0618
		Braking Fault Internal Timer	0630
		Brake Release After Run Timer	0632
		Inrush Current Suppression Time (relay delay)	0608
		Interlock Inrush Relay With ST Terminal	0609
		Adding Input Selection	0660
		Multiplying Input Selection	0661
	Earth Fault	Earth Fault Alarm Level	0640
		Earth Fault Alarm Time	0641
		Earth Fault Trip Level	0642
		Earth Fault Trip Time	0643
TERMINAL SETTINGS	**Input Terminals**	F	0111
		R	0112
		ST	0113
		RES	0114
		S1	0115
		S2	0116
		S3	0117
		S4	0118
		S5	0119
		S6	0120
		S7	0121
		S8	0122
		S9	0123
		S10	0124

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL SETTINGS	**Input Terminals**	S11	0125
		S12	0126
		ON	0110
	Input Other	ST Signal Selection	0103
		F/F Priority Selection	0105
		Input Terminal Priority	0106
		Extended Terminal Function	0107
	Output Terminals	OUT1	0130
		OUT2	0131
		FL	0132
		OUT4	0133
		OUT5	0134
		OUT6	0135
		OUT7	0136
	Speed Reach	Low Speed Signal Output Frequency	0100
		Speed Reach Frequency	0101
		Speed Reach Band Width	0102
	FP Terminal	FP Terminal Assignment	0676
		FP Terminal Adjustment	0677
	Input Terminal Delay	F	0140
		R	0141
		ST	0142
		RES	0143
		S1–S4	0144
		S5–S16	0145
	Output Terminal Delay	OUT1 On Delay	0150
		OUT1 Off Delay	0160
		OUT2 On Delay	0151
		OUT2 Off Delay	0161
		FL On Delay	0152
		FL Off Delay	0162
		OUT4 On Delay	0153
		OUT4 Off Delay	0163
		OUT5 On Delay	0154
		OUT5 Off Delay	0164
		OUT6 On Delay	0155
		OUT6 Off Delay	0165
		OUT7 On Delay	0156
		OUT7 Off Delay	0166

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
TERMINAL SETTINGS	**FM/AM**	FM Terminal Assignment	0005
		FM Terminal Adjustment	0006
		AM Terminal Assignment	0670
		AM Terminal Adjustment	0671
		Analog 1 Terminal Assignment	0672
		Analog 1 Terminal Adjustment	0673
		Analog 2 Terminal Assignment	0674
		Analog 2 Terminal Adjustment	0675
PRESET SPEEDS	**Preset Speed Mode**	Preset Speed Mode Enable	0380
	Preset Speeds	Preset Speed 1 Settings	0018
		Preset Speed 2 Settings	0019
		Preset Speed 3 Settings	0020
		Preset Speed 4 Settings	0021
		Preset Speed 5 Settings	0022
		Preset Speed 6 Settings	0023
		Preset Speed 7 Settings	0024
		Preset Speed 8 Settings	0287
		Preset Speed 9 Settings	0288
		Preset Speed 10 Settings	0289
		Preset Speed 11 Settings	0290
		Preset Speed 12 Settings	0291
		Preset Speed 13Settings	0292
		Preset Speed 14 Settings	0293
		Preset Speed 15 Settings	0294
SPECIAL CONTROL	**Frequency Control**	Startup Frequency	0240
		End Frequency	0243
		Run Frequency	0241
		Run Frequency Hysteresis	0242
	Jump Frequencies	Jump Frequency #1	0270
		Jump Frequency #1 Band Width	0271
		Jump Frequency #2	0272
		Jump Frequency #2 Band Width	0273
		Jump Frequency #3	0274
		Jump Frequency #3 Band Width	0275
		Jump Frequency Processing Selection	0276
	Carrier Frequency	Carrier Frequency	0300
	Miscellany	Switch-on-the-fly	0961
		4–20 mA Loss Selection	0962
		4–20 mA Speed Reference	0964

Program Menu Navigation			
Primary Menu	**Sub Menu**	**Parameter Name**	**Parameter Number**
SPECIAL CONTROL	**Miscellany**	At-Trip Line Power Switching	0354
		At-Frequency Line Power Switching	0355
		ASD Switching Wait Time	0356
		Utility-Power Switching Wait-Time	0357
		Utility-Power Switching Hold-Time	0358
	Low Output Disable	Low Output Disable On/Off	0731
		Low Output Disable Start Level	0732
		Low Output Disable Start Time	0733
		Low Output Disable Setpoint Boost	0734
		Low Output Disable Boost Time	0735
		Low Output Disable Feedback Level	0736
		Low Output Disable Restart Delay Time	0737
	Earth Fault	Earth Fault Alarm Level	0640
		Earth Fault Alarm Time	0641
		Earth Fault Trip Level	0642
		Earth Fault Trip Time	0643
EOI OPTIONS	**Contrast**	Lighter	N/A
		Darker	
	Local/Remote Key	Command	
		Frequency	
	Realtime Clock Setup	Time and Date Setting	
	Encoder Action	Rotary Encoder Up/Down Response	
	Alarm Popups	Parameter Selection for Alarm Popup	
	Lockout	Parameter Selection for Lockout	
	Review Splash Screen	Displays the Splash Screen	

Alarms, Trips, and Troubleshooting

Alarms and Trips

This section lists the available user-notification codes of the EOI display and provides information that assists the user in the event that a **Fault** is incurred. The **User Notification** codes are displayed as an indication that a system function or system condition is active (i.e., ATN, DB, and DBON). The code is displayed on the EOI for the duration of the activation.

If a user threshold setting or an ASD typeform limitation 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 5 on pg. 45 lists the 15 possible **Alarm** codes that may be displayed during operation of the **W7 ASD**.

In the event that the condition that caused the **Alarm** does not return to its normal operating level within a specified time, the ASD **Faults** and a **Trip** is incurred (**Fault** and **Trip** are sometimes used interchangeably). A **Trip** is a safety feature, and is the result of a **Fault**, that disables the ASD system in the event that a subsystem of the ASD is malfunctioning, or if one or more of the variables listed below exceeds its normal operating range (time and/or magnitude).

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

See Table 7 on pg. 47 for a listing of the potential **Trips** and the associated probable causes.

The operating conditions at the time of the trip may be used to help determine the cause of the trip. Listed below are operating conditions that may be used to assist the operator in correcting the problem or that the ASD operator should be prepared to discuss when contacting Toshiba’s Customer Support for assistance.

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

Alarms

Table 5 lists the alarm codes that may be displayed during operation of the **W7 ASD**. Each alarm code listed is accompanied by a description and a possible cause. In the event that the source of the malfunction cannot be determined, contact your Toshiba Sales Representative for further information on the condition and for an appropriate course of action.

The active **Alarm** is displayed on the **Frequency Command** screen. Multiple active alarms are displayed one at a time and are scrolled at one-second intervals.

Table 5. W7 ASD Alarms.

EOI Display	Function	Description	Possible Causes
CM1	Comm1 Error	Internal communications error.	• Improperly programmed ASD. • Improper communications settings. • Improperly connected cables.
CM2	Comm2 Error	External communications error.	
EMG	Emergency Off	Output signal from the ASD is terminated and a brake may be applied if so configured.	• Stop|Reset pressed twice at the EOI. • EOFF command received. • ASD reset required.
MOFF	Main Undervoltage	Undervoltage condition at the 3-phase AC input to the ASD.	• Low c utility voltage.
OC	Over Current	ASD output current greater than the parameter **F601** setting.	• Defective IGBT (**U**, **V**, or **W**). • ASD output to the motor is connected incorrectly. Disconnect the motor and retry. • ASD output phase-to-phase short. • The ASD is starting into a spinning motor. • Motor/machine 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.
***OH**	Overheat	ASD ambient temperature excessive.	• ASD is operating at an elevated temperature. • ASD is too close to heat-generating equipment. • Cooling fan vent is obstructed (see Mounting the ASD on pg. 18). • Cooling fan is inoperative. • Internal thermistor is disconnected.
OJ	Timer	Run-time counter exceeded.	• **Type Reset** required; select **Clear run timer**.
***** Reset ignored if active.			

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

User Notification Codes

The **User Notification** codes appear on the **Frequency Command** screen while the associated function is active.

User Notification codes notify the user of active functions that are usually only momentary under normal conditions and are active for the duration of activation only. User notification events are not error conditions and only convey active system functions to the user.

Table 6

EOI	Function	Description
Atn	Autotune Active	**Atn** indicates that the **Autotune** function is active. If the initial **Autotune** fails for any reason, an automatic retry is initiated if **Other Motor** is selected at parameter **F413**.
db or dbOn	DC Braking Active	This code conveys that the **DC Injection** function being carried out. The display shows **db** when braking and **dbOn** when the **Shaft Stationary** function is active.

Trips/Faults

A **Trip** is an ASD response to a **Fault** (though, **Fault** and **Trip** are sometimes used interchangeably). A **Trip** is a safety feature that disables the ASD system in the event that a subsystem of the ASD is malfunctioning.

Listed in Table 7 are the **Faults** that may cause a **Trip** and the possible causes. When a **Trip** is incurred the system displays the **Fault** screen. The **Fault** screen identifies the active **Fault**.

Table 7

Fault Screen Display	Fault Name	Possible Causes
E	**Emergency Off**	• Emergency Off command received.
E-10	**Sink/Source Error**	• Improperly positioned **Sink/Source** jumper on the control board. • **Sink/Source** configuration of an option device is incorrect.
E-11	**Brake Error**	• Incorrect braking system setup. • Failed braking system.
E-12	**Encoder Loss**	• Encoder signal missing while running during closed-loop operation.
E-13	**Speed Error**	• Resulting motor speed is greater than the commanded speed when using an encoder for speed control. • Improper encoder connection or PG setup information. • Defective encoder.
Note:	*The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*	

Fault Screen Display	Fault Name	Possible Causes
E-14	**Position Deviation Error**	• Operating in the **Position Control** mode and the resulting position exceeds the limits of the **Position Control** setting.
E-18	**Damper Closed Fault**	• Discrete input terminal setup for **Damper Control** (#37) and requires activation as a permissive for normal ASD operation.
E-19	**4-20 mA Signal Loss**	• Broken wire or miswire at the 4–20 mA signal. • 4 – 20 mA operation is setup and is not used.
E-21	**Xformer/Rectifier Fault**	• Transformer/Rectifier malfunction.
E-22	**Motor Overheat Fault**	• Motor too small for application. • Increased ventilation required at the motor.
EEP1	**EEPROM Write Error**	• EEPROM write malfunction (service call required).
EEP2	**Control EEPROM Data Error**	• Internal EEPROM malfunction (service call required).
EEP3	**Main Board EEPROM Fault**	• Internal EEPROM malfunction (service call required).
EF1 (soft) **EF2** (hard)	**Earth Fault**	• Ground fault at the motor. • Ground fault at the output of the ASD. • Current leakage to **Earth Ground**.
EFU	**DC Fuse Open**	• Internal DC bus fuse is open.
EPHI	**Input Phase Loss**	• 3-phase input to the ASD is low or missing.
EPHO	**Output Phase Loss**	• 3-phase output from the ASD is low or missing.
ERR2	**Control EEPROM Data Error**	• Internal RAM malfunction (service call required).
ERR3	**ROM Fault**	• Internal ROM malfunction (service call required).
ERR4	**CPU Fault**	• CPU malfunction (service call required).
ERR5	**Communication Error**	• Communication malfunction. • Improper or loose connection. • Improper system settings.
ERR6	**Gate Array Fault**	• Defective Gate Array or Gate Array malfunction (service call required).
ERR7	**Output Current Detect**	• Main output current detector is producing an abnormal reading (service call required).
ERR8	**Option Fault**	• Optional device malfunction. • Improper system settings at ASD or optional device. • Loose or improper connection.

Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*

Fault Screen Display	Fault Name	Possible Causes
ERR9	**Flash Memory Fault**	• Flash memory malfunction (service call required).
ETN	**Autotune Error**	• **Autotune** readings that are significantly inconsistent with the configuration information. • A non-3-phase motor is being used. • Incorrect settings at parameter **F400**, **F413**, or **F414**. • 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.
ETYP	**Typeform Error**	• Firmware information (typeform) loaded into the **Gate Driver** board is inconsistent with the device in which the firmware is being used. • The **Gate Driver** board has been replaced. • The **Gate Driver** board is defective.
OC1	**Overcurrent During ACC**	• V/f setting needs to be adjusted. • Restart from a momentary power outage. • The ASD is starting into a rotating motor. • ASD/Motor not properly matched. • Phase-to-phase short (**U**, **V**, or **W**). • **Accel** time too short. • **Voltage Boost** setting is too high. • Motor/driven equipment is jammed (increased load). • 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.
OC1P	**Overcurrent During ACC**	• Hardware problem causing a short circuit at the ASD.
OC2	**Overcurrent During DEC**	• Phase-to-phase short (**U**, **V**, or **W**). • Deceleration time is too short. • Motor/driven equipment is jammed (increased load). • 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		• Hardware problem causing a short circuit at the ASD.

Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*

Fault Screen Display	Fault Name	Possible Causes
OC3	**Overcurrent During Run**	• Load fluctuations. • ASD is operating at an elevated temperature. • ASD current exceeds 340% of the rated FLA on ASDs that are 100 HP or less during a fixed-speed run or if during a fixed-speed run the ASD overheats. On ASDs that are greater than 100 HP, it occurs when the ASD current exceeds 320% of the rated FLA on a fixed-speed run.
OC3P		• Hardware problem causing a short circuit at the ASD.
OCA1	**U-Phase Overcurrent**	• Low impedance at the **U** lead of the ASD output.
OCA2	**V-Phase Overcurrent**	• Low impedance at the **V** lead of the ASD output.
OCA3	**W-Phase Overcurrent**	• Low impedance at the **W** lead of the ASD output.
OCL	**Load End Overcurrent**	• Improper wiring at the ASD output to the motor.
OCR	**Dynamic Braking Resistor Overcurrent**	• ASD inability to discharge the bus voltage during regeneration. • No dynamic braking resistor installed. • Deceleration time is too short. • Improper dynamic braking resistor setup information. • Defective IGBT7 (or IGBT7 ckt.). • 3-phase input voltage is above specification.
OH	**Overheat**	• Cooling fan inoperative. • Ventilation openings are obstructed. • Internal thermistor is disconnected.
OL1	**ASD Overload**	• Acceleration time is too short. • DC Injection current is too high. • V/f setting needs to be adjusted. • Motor running during restart. • ASD or the motor is improperly matched to the application.
OL2	**Motor Overload**	• V/f setting needs to be adjusted. • Motor is locked. • Continuous operation at low speed. • Load requirement exceeds ability of the motor. • Startup frequency setting adjustment required.

Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*

Fault Screen Display	Fault Name	Possible Causes
OLR	**Dynamic Braking Resistor Overload**	• Deceleration time is too short. • Dynamic braking resistor setting adjustment required. • Overvoltage Stall setting adjustment required.
OP1	**Overvoltage During ACC**	• Motor running during restart.
OP2	**Overvoltage During DEC**	• Deceleration time is too short. • Dynamic braking resistor value is too high. • Dynamic braking resistor required. • Stall protection is disabled. • 3-phase input voltage is out of specification. • Input reactance required.
OP3	**Overvoltage During run**	• Load fluctuations. • 3-Phase input voltage out of specification.
OT	**Overtorque**	• The torque requirement of the load is in excess of the setting of parameter **F616** or **F617** for a time longer than the setting of parameter **F618**. • The ASD is improperly matched to the application. • The load is obstructed.
UC	**Under Current Fault**	• Improper Low Current detection level setting.
UP1	**DC Bus Undervoltage**	• Low voltage at the DC Bus.
UP2	**Control Power Undervoltage**	• This fault is caused by an undervoltage condition at the 5, 15, or the 24 VDC power supply. • 3-phase input voltage low.

Note: *The event that caused the Trip(s) must be corrected or must decrease to less than the threshold value required to cause the trip to allow for a Reset to be recognized. In the event of multiple active trips, the trip displayed will remain until all faults are corrected and all trips are cleared.*

Viewing Trip Information

In the event that the condition causing an **Alarm** does not return to the normal operating level within a specified time a **Trip** is incurred.

When a trip occurs, the trip name and the at-trip status of key parameters, including the time and date, may be viewed from the **Trip History** screen (Program ⇒ System Info & Setup ⇒ **Trip History**) or the name of the last trip incurred may be viewed from the **Monitor** screen.

Trip History

The **Trip History** screen records the system parameters for up to 100 trips. The recorded trips are identified as Trip Number zero – Trip Number 99. Once the **Trip History** number reaches trip number 99, 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 at-trip parameters are listed in Table 8 as **At-trip Recorded Parameters** (parameter readings at the time that the trip occurred).

Table 8. **Trip History Record Parameters**.

At-trip Recorded Parameters			
1) Trip Number	9) Bus Voltage	17) Torque Reference	25) ASD Load
2) Trip Type	10) Discrete Input Terminal Status	18) Torque Current	26) DBR Load
3) Time and Date	11) Discrete Output Terminal Status	19) Excitation Current	27) Input Power
4) Frequency at Trip	12) Timer	20) PID Value	28) Output Power
5) Output Current	13) Post Compensation Frequency	21) Motor Overload	29) Peak Current
6) Output Voltage	14) Feedback (inst.)	22) ASD Overload	30) Peak Voltage
7) Direction	15) Feedback (1 sec.)	23) DBR Overload	31) PG Speed
8) Frequency Reference	16) Torque	24) Motor Load	32) PG Position

Note: *Trip Numbers **zero and one** are comprised of At-trip parameters 1 – 32.*
*Trip Numbers **2 through 18** are comprised of At-trip parameters 1 – 18.*
*Trip Numbers **19 through 100** are comprised of At-trip parameters 1 – 8.*

Trip Record at Monitor Screen

The **Monitor** screen records and displays the trip name and the at-trip status of 41 parameters for the most-recent trip. Once a new trip occurs the **Monitor** screen is updated with the new at-trip records. A **Reset** or a **Clear Trip** command clears the trip record.

If no trips have occurred since the ASD was powered up or since the last reset, **No Fault** is displayed at the **Monitor** screen.

The Monitor screen displays the status of the listed parameters when no trip is active.

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

Clearing a Trip

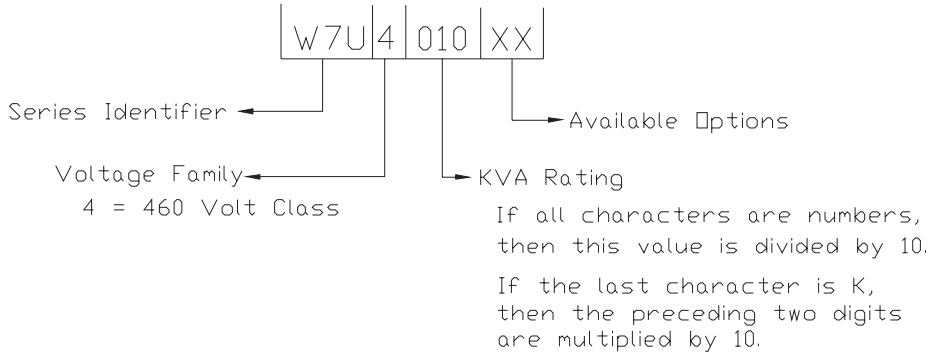
Once the cause of the trip has been corrected, performing a **Reset** re-enables the ASD for normal operation (clears the fault screen).

The fault screen may also be cleared using either of the following methods:

- Cycling power (trip info may be saved via parameter **F602** if desired),
- Pressing the **Stop**|**Reset** key twice,
- Remotely via the communications channel,
- Momentarily connecting terminal **RES** to **CC** of the **Control Terminal Strip**, or
- Via Program ⇒ Utilities ⇒ Type Reset ⇒ **Clear Past Trips**.

Enclosure Dimensions and Conduit Plate Information

W7 ASD Part Numbering Convention.



Note: *The Type 1 enclosed versions of the W7 ASD meet or exceed the specification* ***UL 1995****, the* ***Standard for Heating and Cooling Equipment****, and complies with the applicable requirements for installation in a compartment handling conditioned air.*

Enclosure Dimensions/Weight

Table 9. W7 ASD 60 HP – 200 HP Enclosure Dimensions (in/cm).

Model	Shipping Weight (lbs. max.)
W74600	1100
W74750	1200
W7410K	1300
W7412K	1400
W7415K	1500
W7420K	1600

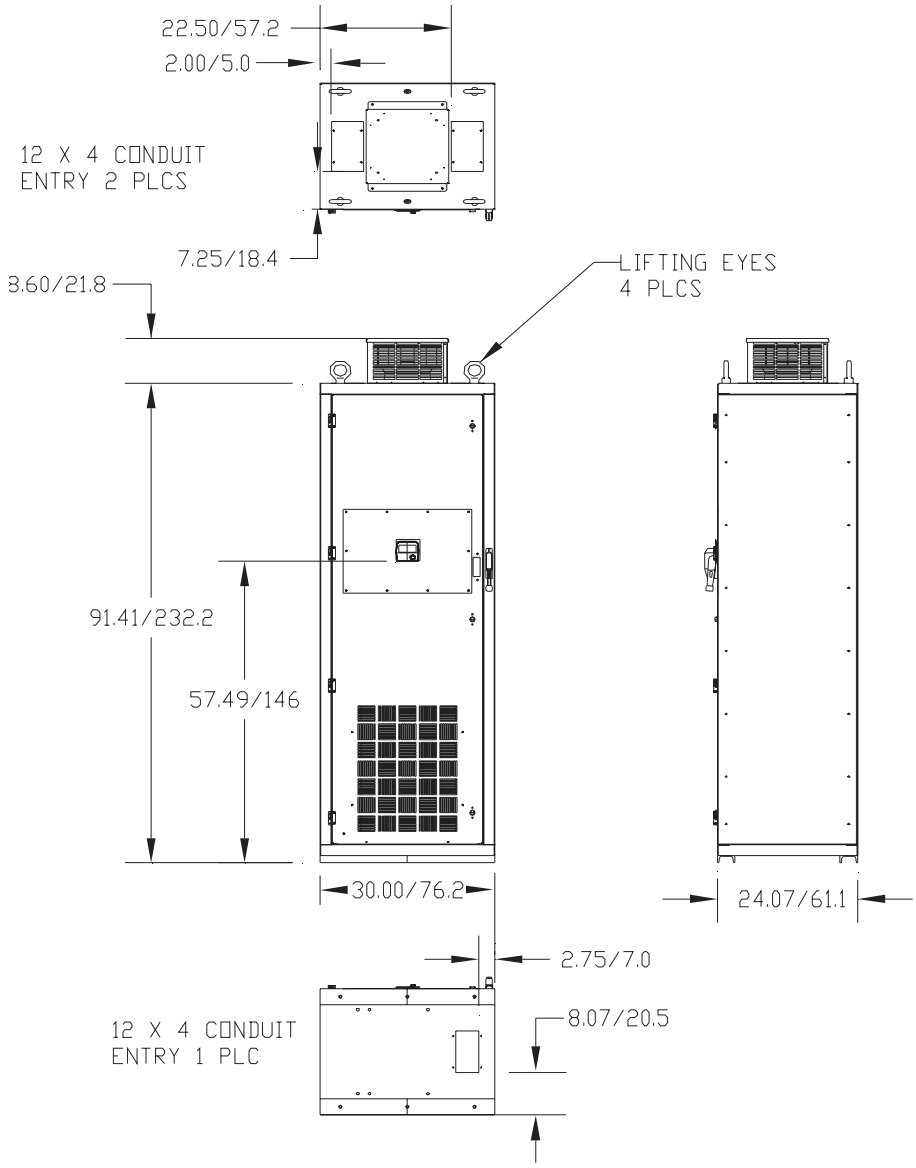
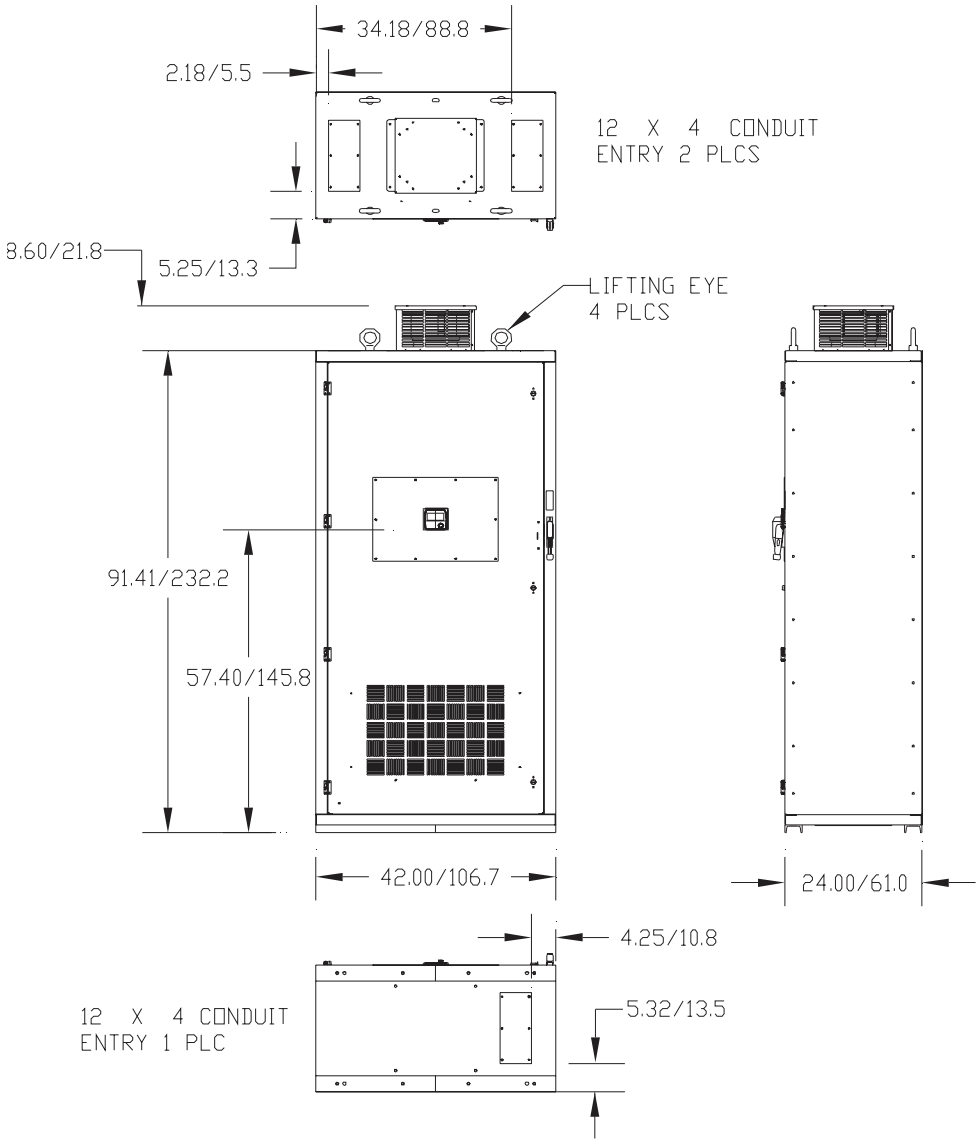


Table 10. W7 ASD 250 HP – 400 HP Enclosure Dimensions (in/cm).

Model	Shipping Weight (lbs. max.)
W7425K	2100
W7430K	
W7440K	



Cable/Terminal Specifications

Installation should conform to the 2005 National Electrical Code Article 110 (NEC) (Requirements for Electrical Installations), all regulations of the Occupational Safety and Health Administration, and any other applicable national, regional, or industry codes and standards.

Note: *The following ratings are guidelines and shall not be the sole determining factor of the lug or wire size used with the W7 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 W7 ASD.*

Note: *Cable/Terminal specifications are based on the rated current of the ASD.*

Note: *Use only 75° C copper wire/cable for motor and power connections.*

Model	MCCB Rating (Amps)	Typical Wire/Cable Size (AWG or kcmil)			Lug Size Range	
		AM, FM, and II Terminals	Control Terminals	Input/Output Power Recommended	Wire-Size/ Lug-Capacity for **Input** Power	Wire-Size/ Lug-Capacity for **Output** Power
W74600	100	20 (3-core shield)	18 (2-core shield)	3	8 to 3/0	16 to 1
W74750	225			1	3/0 to 350	10 to 1/0
W7410K	225			2/0		12 to 4/0
W7412K	225			3/0		
W7415K	400			*1/0	2 to 500	*(6 to 250)
W7420K	400			*3/0		
W7425K	600			*250	**(3/0 to 500)	*(1/0 to 500)
W7430K	600			*350		
W7440K	800			*500		

Note: *Input and Output power wires require shielding for CE compliance.*

Note: *(*) Indicates that the item is one of a set of two parallel cables.*

Note: *(**) Indicates that the item is one of a set of three parallel cables.*

Current/Voltage Specifications

Table 11. W7 ASD 60 – 400 HP 460 Volt NEMA Type-1 Chassis standard ratings table.

Model	Rated KVA	Motor HP/Kw	Input Voltage 3-Ph 50/60 ± 2 Hz	Output Voltage 3-Ph Variable Frequency	Output Current 100% Continuous	Overload Current 120% for 60 Secs.
W74600	60.0	60.0/45.0	380 – 480 VAC (±10%)	Input Voltage Level (Max.)	77.0 A	92.4 A
W74750	75.0	75.0/55.0			96.0 A	115.2 A
W7410K	100	100/75.0			124.0 A	148.8 A
W7412K	125	125/90.0			156.0 A	187.2 A
W7415K	150	150/110			190.0 A	228.0 A
W7420K	200	200/150			240.0 A	288.0 A
W7425K	250	250/185			302.0 A	362.4 A
W7430K	300	300/220			370.0 A	444.0 A
W7440K	400	400/298			480.0 A	576.0 A

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