TOSHIBA

GX7 Adjustable Speed Drive Addendum

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Purpose and Scope

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

This addendum provides information on how to safely install, operate, and maintain your Toshiba power electronics product and is intended to be used in conjunction with the supplied Operation Manual. Read the Operation Manual received with the ASD and the addendum completely before installing, operating, or performing maintenance on this equipment.

This addendum and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown are in inches.

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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Printed in the U.S.A.

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.

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.toshiba.com/ind**.

Important Notice

The information contained within this addendum is 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. The information within this addendum is to be used in conjunction with the information contained within the operation manual received with the ASD. Should additional information be required contact your Toshiba representative.

The contents of this addendum 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.

TOSHIBA INTERNATIONAL CORPORATION

GX7 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 date of purchase.

Complete the following information about the drive and retain it for your records.

Model Number: _____

Serial Number: _____

Project Number (if applicable): _____

Date of Installation: _____

Inspected By: _____

Name of Application: _____

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General Safety Information

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

Safety Alert Symbol

The **Safety Alert Symbol** 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 manual followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING** and **CAUTION** are used in this manual they will be followed by important safety information that must be carefully adhered to.

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.

 **DANGER**

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.

 **WARNING**

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.

 **CAUTION**

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.

CAUTION

Special Symbols

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

Warning labels that are attached to the equipment will include the exclamation mark within a triangle. **DO NOT** remove or cover any of these labels. If the labels are damaged or if additional labels are required, contact your 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 safe procedures or methods are not followed as outlined in this manual.

Qualified Personnel

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

Qualified Personnel shall:

- Have carefully read the entire operation manual.
- Be familiar with the construction and function of the ASD, the equipment being driven, and the hazards involved.
- Be able to recognize and properly address hazards associated with the application of motor-driven equipment.
- Be trained and authorized to safely energize, de-energize, ground, 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 were 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 not be performed except by factory trained representatives. 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 packaging if the equipment will not be used upon receipt.
- Store in a cool, clean, and dry location. Avoid storage locations with extreme temperatures, rapid temperature changes, high humidity, moisture, dust, corrosive gases, or metal particles.
- The storage temperature range of the ASD is 14° to 122° F (-10 to 50° 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** (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.
- Select a 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** locate the ASD such that it would be exposed to flammable chemicals or gases, water, solvents, or other fluids.
- Avoid installation in areas where vibration, heat, humidity, dust, fibers, steel 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 operation manual of the ASD for further information on ventilation requirements.
- The ambient operating temperature range of the ASD is 14° to 104° F (-10 to 40° C).
- See the operation manual of the ASD for additional information on installing the ASD.
- 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.

Installation Site 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 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.

Conductor Routing and Grounding

⚠ WARNING ⚠

- Use separate metal conduits for routing the input power, output power, and control circuits and each shall have its own ground cable.
- A separate ground cable should be run inside the conduit with the input power, output power, and and control circuits.
- **DO NOT** connect **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

⚠ DANGER ⚠

Contact With Energized Wiring Will Cause Severe Injury Or Death.

- Turn off, lockout, and tag out all power sources before proceeding to connect the power wiring to the equipment.
- After ensuring that all power sources are turned off and isolated in accordance with established lockout/tag out 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 NEC Article 300 – Wiring Methods and Article 310 – Conductors For General Wiring). Size the branch circuit conductors in accordance with NEC Table 310.16.
- If multiple conductors that are smaller than the recommended sizes 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 NEC Article 300.20 and Article 310.4). National and local electrical codes should be referenced if three or more power conductors are run in the same conduit (refer to 2005 NEC Article 310 adjustment factors on page 70-142).
- 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).
- Dynamic Braking Resistors shall be connected across terminals PA and PB (when used). Connecting a Dynamic Braking Resistor elsewhere 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 securing the front door or 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.
- 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 ASD in the event of an emergency. A supplemental braking system may also be engaged in the event of an emergency. For further information on braking systems see operation manual of the ASD.

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.

⚠ WARNING ⚠

- 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 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 settings are a requirement to use this product.

- Improperly designed or improperly installed system interlocks may render the motor unable to start or stop on command.
- 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 at the equipment installation must be posted to this effect.
- 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.

⚠ CAUTION

- If a secondary magnetic contactor (MC) or an ASD output disconnect is used between the ASD and the load, it should be interlocked to halt the ASD before the secondary contactor opens. If the output contactor is used for bypass operation, it must be interlocked such that commercial power is never applied to the ASD output terminals (U, V, W).
- When using an ASD output disconnect the ASD and the motor must be stopped before the disconnect is either opened or closed. Closing the output disconnect while the 3-phase output of the ASD is active may result in equipment damage or injury to personnel.

Operational and Maintenance Precautions

⚠ WARNING ⚠

- Turn off, lockout, and tag out the main power, the control power, and instrumentation connections before inspecting or servicing the ASD, or opening the door of the enclosure.
- Turn off, lockout, and tag out 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 door and **Do Not** open the front door 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.

Standard Specifications

GX7 ASD Standard Specifications		
Control Specification	Control System	Sinusoidal PWM control.
	Output Voltage Regulation	Same as powerline.
	Frequency Setting	0.01 to 80 Hz.
	Frequency Accuracy	Analog Input — ±0.02% of the maximum output frequency. Discrete Input — ±0.01% of the maximum output frequency.
	Voltage/Frequency Characteristics	Constant V/f, Variable Torque, Automatic Torque Boost, True Torque Control, Automatic Energy Saving Control, and Maximum Voltage and Frequency Adjustment, Torque Boost Adjustment (0 to 30%), and Startup Frequency Adjustment (0 to 10 Hz).
	PWM Carrier Frequency	Adjustable from 0.5 kHz to 3 kHz.
	Transistor Type	Insulated Gate Bipolar Transistor (IGBT).
	Output Voltage Regulation	ASD output voltage may be programmed to a fixed Maximum Output Voltage, to float with the input voltage, or the Maximum Voltage may be set to the Input Voltage sensed at the last power down.
	Dynamic Braking	Standard.
Frequency	Input Signal Parameters	1 kΩ to 10 kΩ, 0.0 to 10 VDC (Zin = 33 kΩ), ±10 VDC (Zin = 67 kΩ), ±5 VDC (Zin = 34 kΩ), 4 – 20 mADC (Zin = 500Ω).
	Setpoint Control (PID)	Proportional Gain, Integral Gain, Anti-hunting Gain, Lag Time-constant, and PID Error Limit Adjustment.
Operating Functions	Accel/Decel Time	0.1 to 6000 Seconds, Accel/Decel time 1 and 2 selection, Accel/Decel Pattern selection.
	Forward or Reverse Run	F to CC = Forward Run, R to CC = Reverse Run, F and R to CC = Reverse Run (programmable), ST to CC open = Coast Stop (programmable).
	Jog Run	Jog Run from EOI or from Terminal Block.
	Multispeed Run	Run up to 15 preset frequencies by connecting combinations of CC and S1, S2, S3, and/or S4.
	Retry	ASD can clear fault upon trip automatically; programmable up to 10 retries with a wait time of up to 10 seconds between each attempt.
	Soft Stall	Automatic load reduction during overload (default = Off).
	Automatic Restart	ASD can smoothly catch a coasting motor.
	Pattern Run	Four groups of 8 patterns. Each pattern may be comprised of up to 15 Preset Speeds. Terminal block control and repetitive run possible from 1 to infinity.
	DC Injection Braking	Braking Starting frequency adjustment (0 to 120 Hz), braking current adjustment (0 to 100%), braking time adjustment (0 to 10 seconds), Emergency Off braking function, motor shaft stationary control.

GX7 ASD Standard Specifications		
Operating Functions	Upper/Lower Limit	Limits the recognized commanded frequency to the user-set values from 0 to the Maximum Frequency setting. End-of-range of the Upper/Lower Limit speed when reached can be indicated via output contactor.
	Frequency Jump	Three Jump frequency settings; each with unique band settings. Overlapping bands are treated as one range.
	Edit Function	Easy-access user group containing all changed parameters.
	Blind Function	Select to display parameter groups and parameters.
	User-defined Settings	User-set parameters can be saved into a library. User may then set the ASD to the default factory settings or load the customized user-stored settings.
Display	Operator Interface	240 x 64-pixel graphical LCD screen.
	Fault Display	Overcurrent, overvoltage, heatsink overheat, load-side short circuit, load-side ground fault, ASD overload, load-side overcurrent during startup, EEPROM error, RAM error, ROM error, communication error, **dynamic braking unit overcurrent/overload**, **emergency off**, **undervoltage**, **low current**, **overtorque**, **open output phase**, **motor overload**. **Bolded** items may be selected or deselected for activation.
	Monitor Functions	Terminal input/output status, forward/reverse, frequency setting value, output frequency, output current, output voltage, input power, output power, torque current, cumulative run-time, past faults, excitation current, DBR overload ratio, ASD overload ratio, motor overload ratio, PID feedback value, DC bus voltage.
	Selectable Units Display	Scales the frequency display. Displays current readings as amps or % and voltage readings as V or %.
	DC Bus Charge Indicator	LED (On) indicates that the main circuit capacitors are charged.
	Local/Remote Indicator	Mounted at the Local/Remote key. Indicates Local (On) or Remote control.
	Run/Stop Indicator	Mounted at the Run key. Indicates Run (Red) or Stopped (Green).
ASD/Motor	Protective Functions	Soft stall, current limit, overcurrent, overvoltage, short-circuit at load, load-side ground fault, undervoltage, momentary power failure ride-through, regeneration power ridethrough, electronic thermal overload protection, main circuit overcurrent at start-up, load-side overcurrent during startup, DBR resistor overcurrent/ overload, heatsink over heat, emergency off, open output phase.
	Electronic Thermal Characteristics	The motor overload protection setting at the ASD may be adjusted for the current rating of the motor being used. The motor overload setting has a speed-sensitivity adjustment, soft stall feature, and the 150% run time of the motor is programmable. **This device meets the NEC 2005 specification for Thermal Memory Retention.**
	Reset	Fault reset via EOI, remote contact closure, cycling power to the ASD, or programming ASD Retry (not all faults may be reset via ASD Retry setting).
	Ridethrough Control	The GX7 ASD may be configured to use regenerative energy from the motor to maintain programmable settings during a brownout.
Output Signals	Fault Detection Signals	NC/NO form C contact (250 VDC, 2 A).
	Low Speed/Reach Signals	Dry contacts (250 VDC, 2 A).
	Upper/Lower Limit	Dry contacts (250 VDC, 2 A).

GX7 ASD Standard Specifications		
Output Signals	Programmable Meter Output Signals	Pre-compensation reference frequency, post-compensation output frequency, frequency setting value, output current, DC voltage, output voltage, torque current, excitation current, PID feedback value, motor/ASD/DBR overload ratio, input/output power.
	Pulse Train Frequency	Open collector output (24 VDC, 50 mA max.).
	Communications Functions	RS232-, RS485-, and TTL-equipped as standard. Other industrial communications protocols are available as an option.
Enclosure	Type	Type 1
	Cooling Method	Forced-air cooling. To extend the life of the fan, the fan can be configured to stop when not required without user intervention.
	Color	ANSI gray #61 standard.
	Service Environment	Indoor ratings. Consult factory for use in elevations above 1000 meters (requires derate). For example, at 2000 meters derate the FLA rating of the ASD by 11%. Must not be exposed to direct sunlight. Must not be exposed to corrosive or explosive gases, mists, fibers, or dusts.
	Ambient Temperature	14° to 104° F (-10 to 40° C).
	Relative Humidity	95% maximum (non-condensing).
	Vibration	5.9 m/s^2 (0.6 G) maximum (10 to 57 Hz).

GX7 ASD Part Numbering Convention

The GX7 is a large-horsepower ASD and is used for general indoor applications.

The associated part numbering scheme for a given configuration is defined in the section below.

Ordering Information

Use the following part numbering system when ordering the GX7 ASD.

GX7	4	70K	AA
Series	VoltageRating	ASD Rating	Configuration Options
	4 = 460 VAC 6 = 600 VAC E = 690 VAC	40K = 400 kVA 50K = 500 kVA 60K = 625 kVA 70K = 725 kVA 80K = 800 kVA *90K = 900 kVA *10L = 1000 kVA *11L = 1100 kVA *12L = 1200 kVA	AA — Input Disconnect AW — No Input Disconnect

*Consult factory for availability.

GX7 ASD Typeform/Enclosure Specifications

Figure 1. **460-Volt GX7 ASD**.

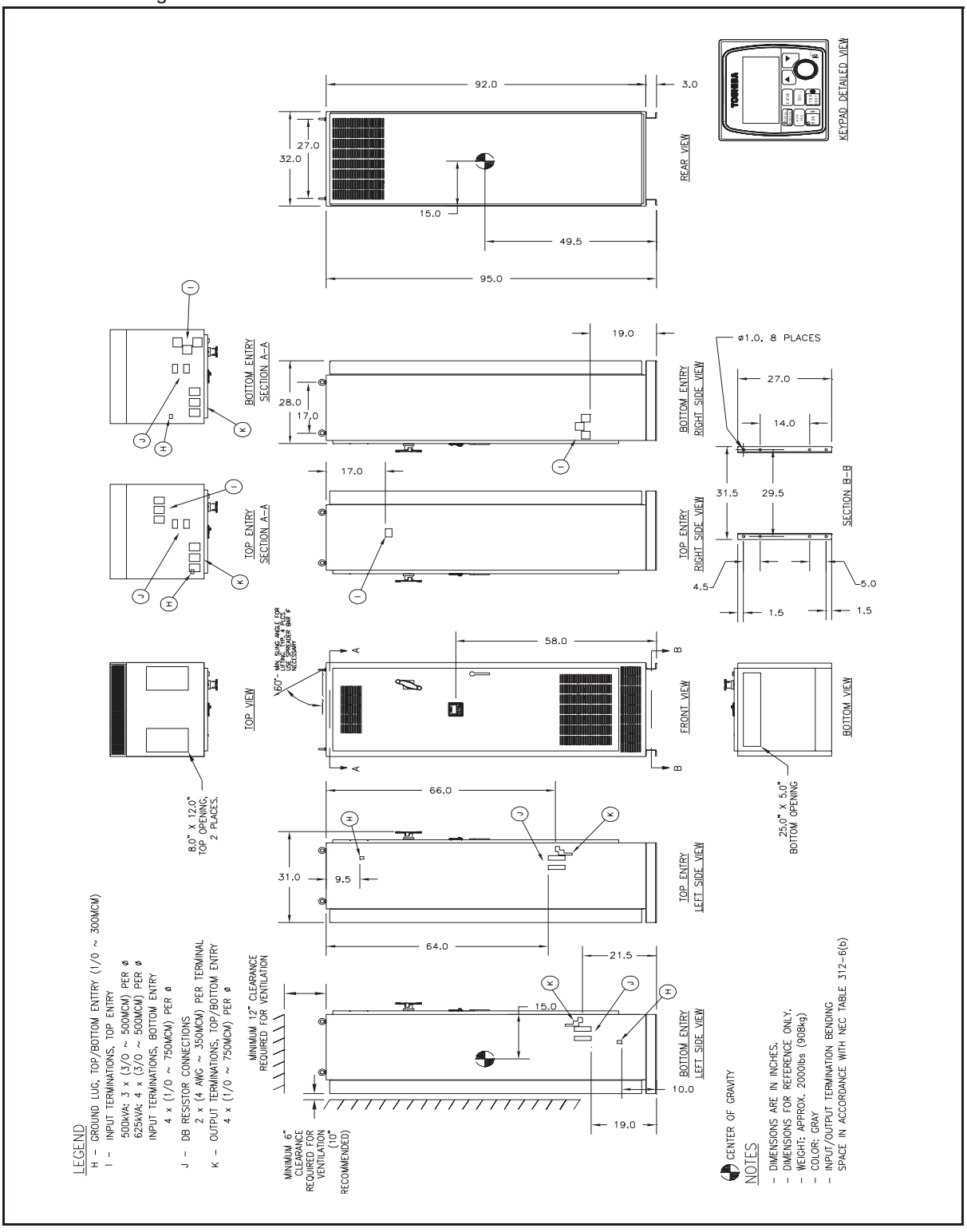
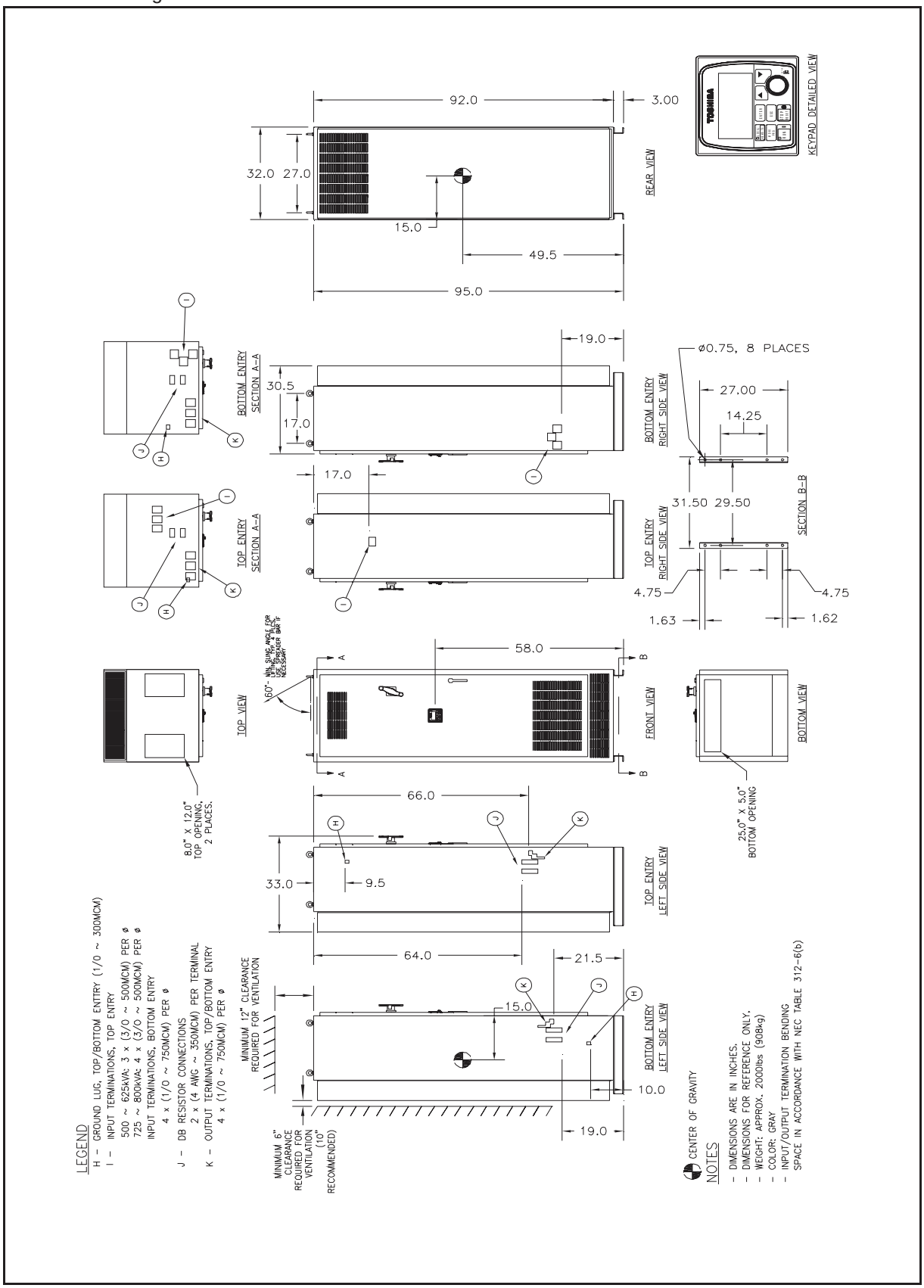


Figure 2. **600-Volt GX7 ASD**.



GX7 ASD Weights

GX7 ASD Model	Lbs.	Kgs.
40K	1800	817
50K	2000	907
60K		
70K		
80K		
90K	2800	1270
10L	3000	1361
11L		
12L		