Chapter 2

Installation and Wiring

In This Chapter...

Ambient Conditions

The AC drive should be kept in the shipping carton before installation. In order to retain the warranty coverage, the AC drive should be stored properly when it is not to be used for an extended period of time. Some storage suggestions are:

- Store in a clean and dry location free from direct sunlight or corrosive fumes.
- Store within an ambient temperature range of -20°C to +60°C.
- Store within a relative humidity range of 0% to 90% and non-condensing environment.
- Store within an air pressure range of 86 kPA to 106 kPA.

Ambient Conditions	
Ambient Temperature	-10°C to 50°C (14°F to 122°F) for models below 7.5 hp (5.5 kW), -10°C to 40°C (14°F to 104°F) for models 7.5 hp (5.5 kW) and higher
Storage Temperature	-20° to 60°C (-4°F to 140°F)
Relative Humidity	0 to 90% (non-condensing)
Atmosphere Pressure	86 kPA to 106 kPA
Vibration	9.8 m/s^2 (1G) less than 10 Hz, 5.9 m/s^2 (0.6G) 10 to 60 Hz
Installation Location	Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust
Enclosure Rating	IP20: Protection against contact by fingers. Protection against medium-size foreign objects

Installation

Improper installation of the AC drive will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location:

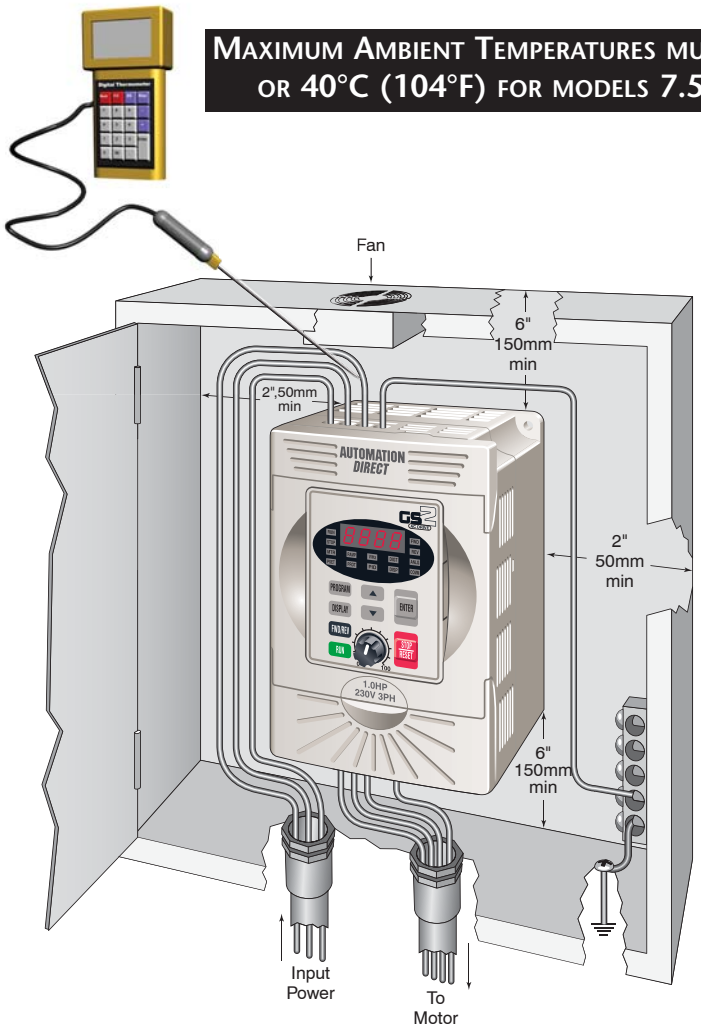
WARNING: Failure to observe these precautions may damage the drive and void the warranty!

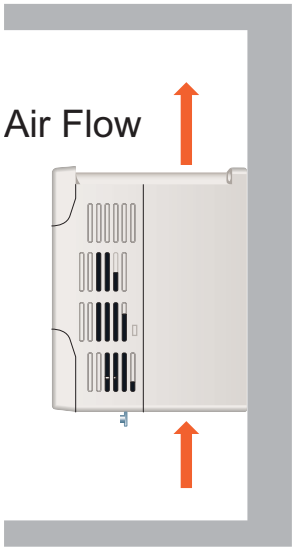
- Do not mount the AC drive near heat-radiating elements or in direct sunlight.
- Do not install the AC drive in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
- Mount the AC drive securely on a flat, rigid, non-flammable surface.
- Mount the AC drive vertically and do not restrict the air flow to the heat sink fins.

WARNING: AC drives generate a large amount of heat which may damage them. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.

Minimum Clearances and Air Flow

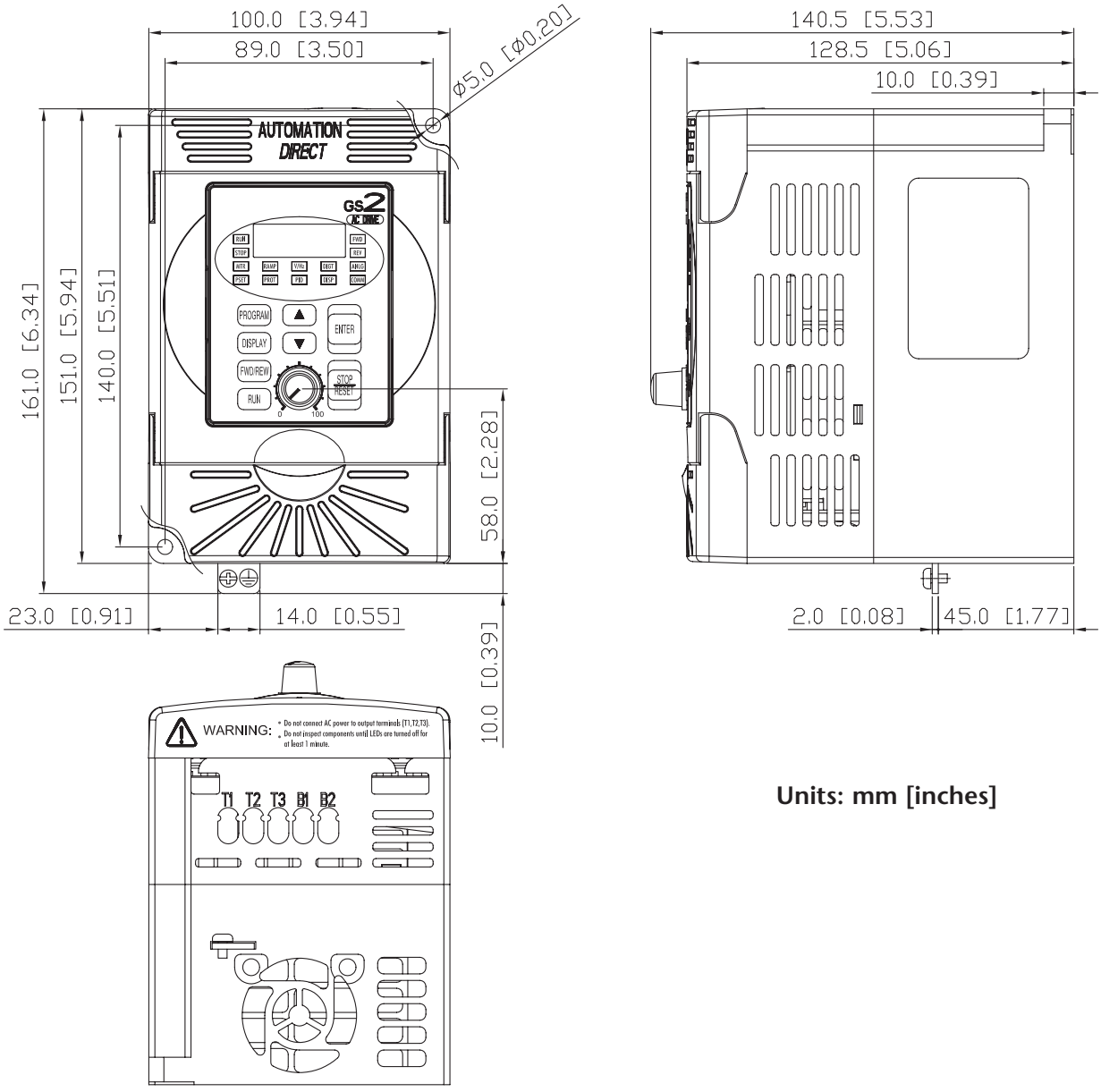
MAXIMUM AMBIENT TEMPERATURES MUST NOT EXCEED 50°C (122°F), OR 40°C (104°F) FOR MODELS 7.5 HP (5.5 KW) AND HIGHER!





Dimensions

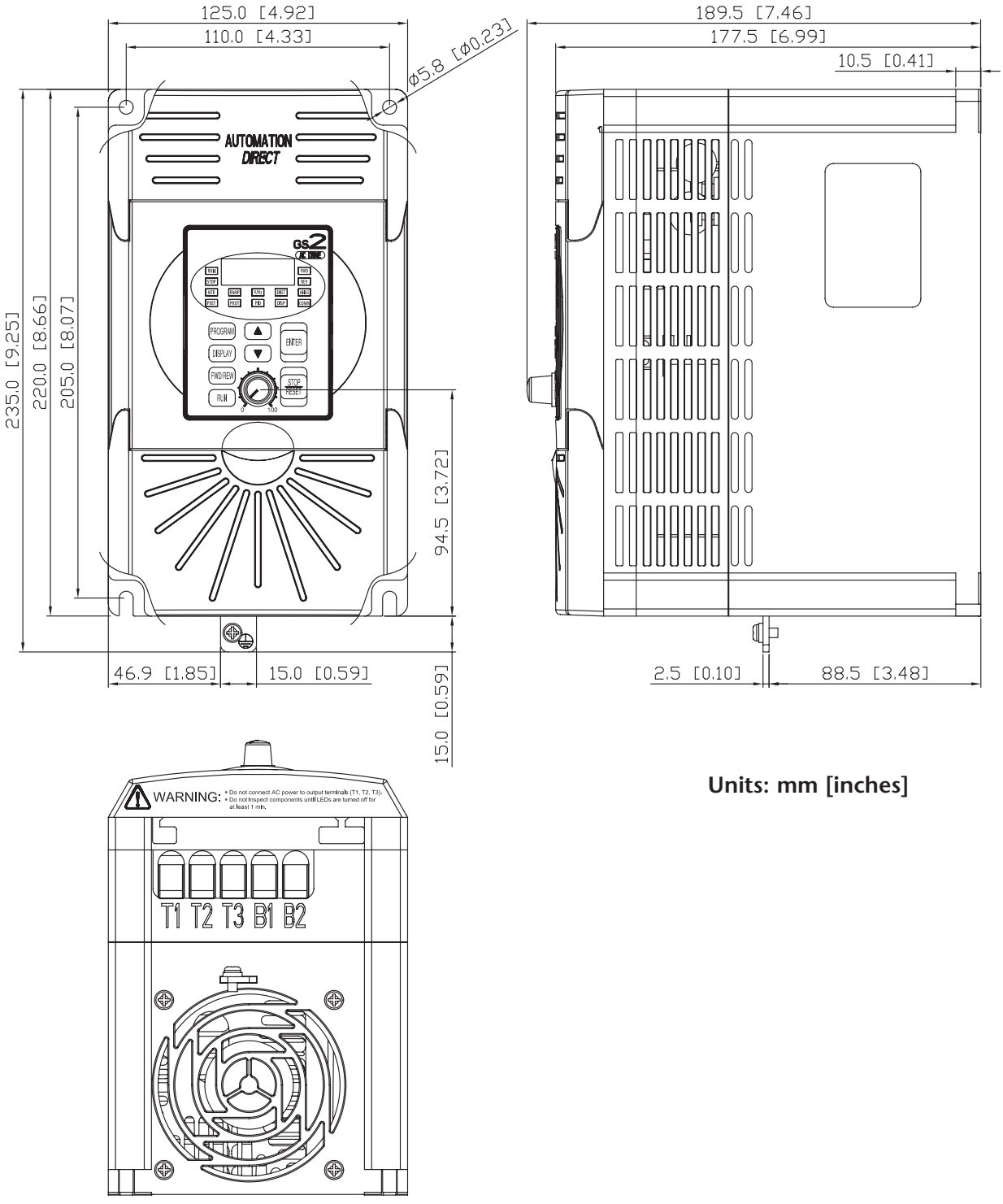
GS2-10P2, GS2-10P5, GS2-11P0,
GS2-20P5, GS2-21P0, GS2-22P0,
GS2-41P0, GS2-42P0, GS2-43P0,
GS2-51P0, GS2-52P0, GS2-53P0



Units: mm [inches]

Dimensions (continued)

GS2-23P0, GS2-25P0, GS2-27P5,
GS2-45P0, GS2-47P5, GS2-4010,
GS2-55P0, GS2-57P5, GS2-5010



Units: mm [inches]

GS2 Circuit Connections

DANGER!

HAZARDOUS VOLTAGE! Before making any connection to the AC drive, disconnect all power to the AC drive, and wait five minutes for DC bus capacitors to discharge.

Warning: Any electrical or mechanical modification to this equipment without prior written consent of AutomationDirect.com, Inc. will void all warranties, may result in a safety hazard, and may void the UL listing.

WARNING: Do not connect the AC input power to the T1, T2, and T3 output terminals. This will damage the AC drive

WARNING: Tighten all screws to the proper torque rating. See "Main Circuit Wiring" later in this chapter.

Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.

1. During installation, follow all local electrical, construction, and safety codes for the country in which the AC drive is to be installed.
2. Make sure the appropriate circuit protective devices (circuit breaker or fuses) are connected between the power supply and AC drive.
3. Make sure that the leads are connected correctly and the AC drive is properly grounded. (Ground resistance should not exceed 0.1Ω.)
4. Use ground leads that comply with AWG/MCM standards and keep them as short as possible.
5. Do not use a power circuit contactor or disconnect switch for run/stop control of the AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.
6. Multiple GS2 units can be installed in one location. All of the units should be grounded directly to a common ground terminal, or connected in parallel, as shown in the figure below. **Make sure there are no ground loops.**

7. When the AC drive output terminals T1, T2, and T3 are connected to the motor terminals T1, T2, and T3, respectively, the motor will rotate counterclockwise (as viewed from the shaft end of the motor) when a forward operation command is received. To reverse the direction of motor rotation, switch the connections of any of the two motor leads.
8. Make sure that the power source is capable of supplying the correct voltage and required current to the AC drive.

9. Do not attach or remove wiring when power is applied to the AC drive.
10. Do not inspect components unless inside "POWER" lamp is turned off.
11. Do not monitor the signals on the circuit board while the AC drive is in operation.
12. For the 115V single-phase rated AC drives, AC power must be connected to input terminals L1 and L2. For the 230V single-phase rated AC drives, AC power can be connected to any two of the three input terminals L1, L2, and L3. **Note: This AC drive is not intended for use with single-phase motors.**
13. Route the power and control wires separately, or at 90 degree angle to each other.
14. If a filter is required for reducing EMI (Electro-Magnetic Interference), install it as close as possible to the AC drive. EMI can also be reduced by lowering the Carrier Frequency.
15. If the AC drive is installed in a place where a load reactor is needed, install the filter close to the T1, T2, and T3 side of AC drive. Do not use a Capacitor, L-C Filter (Inductance-Capacitance), or R-C Filter (Resistance-Capacitance), unless approved by AutomationDirect.
16. When using a GFCI (Ground Fault Circuit Interrupt), select current sensor with sensitivity of 200 mA, and not less than 0.1-second detection to avoid nuisance tripping.

Motor Operation Precautions

1. If the AC drive is used to operate a standard 3-phase induction motor, the energy loss is greater than if using an inverter duty motor.
2. Avoid running a standard induction motor at low speed, which may cause the motor temperature to exceed the motor rating due to limited airflow produced by the motor's fan.
3. When the standard motor operates at low speed, the output load must be decreased.
4. If 100% output torque is desired at low speed, it may be necessary to use a special "inverter-duty" rated motor.

Short Circuit Withstand Current

Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical Amperes. The maximum voltage is 120, 240, 480, and 600V for all 115, 230, 460, and 575V models, respectively. (An optional line reactor can be installed in the incoming power circuit to reduce the available short circuit current.)

Applicable Codes

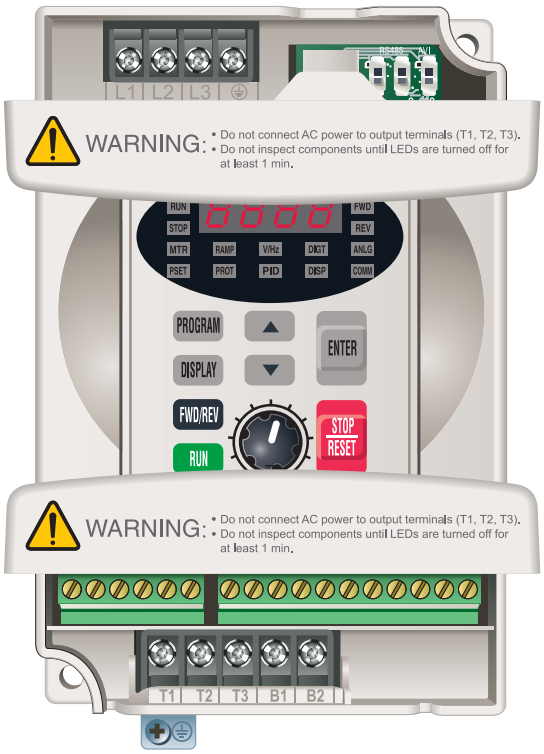
All GS2 Series AC drives are Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL) listed, and therefore comply with the requirements of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Installation intended to meet the UL and cUL requirements must follow the instructions provided in "Wiring Notes" as a minimum standard. Follow all local codes that exceed UL and cUL requirements. Refer to the technical data label affixed to the AC drive and the motor nameplate for electrical data.

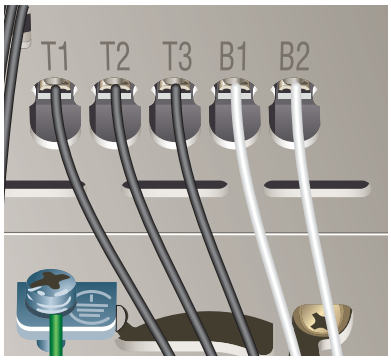
The "Fuses and Fuse Kits" section in APPENDIX A, lists the recommended fuse part number for each GS2 Series part number. These fuses (or equivalent) must be used on all installations where compliance with U.L. standards is required.

Main Circuit Wiring

Main Circuit Terminals	
Terminal	Description
L1, L2, L3	Input Power
T1, T2, T3	AC Drive Output
B1, B2	Dynamic Braking Resistor (optional)
⏚	Ground

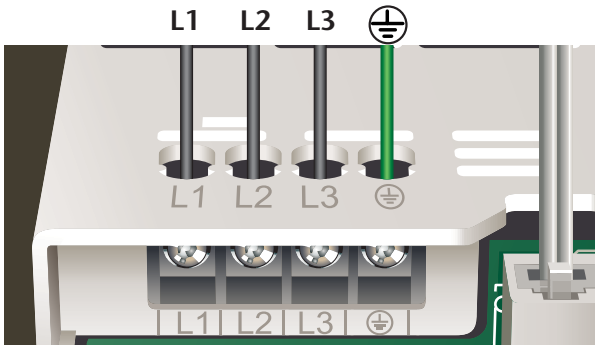


Output Power Connections



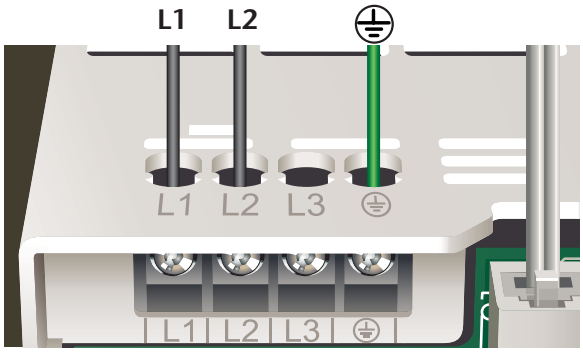
⏚ **T1 T2 T3 B1 B2**

3-phase Input Power Connections



3-phase Input Power	
230V Class	200-240V ± 10%; 50/60 Hz ± 5%
460V Class	380-480V ± 10%; 50/60 Hz ± 5%
575V Class	500-600V -15/+10%; 50/60 Hz ± 5%

1-phase Input Power Connections*



1-phase* Input Power	
115V Class	100-120V ± 10%; 50/60Hz ± 5%
230V Class	200-240V ± 10%; 50/60Hz ± 5%

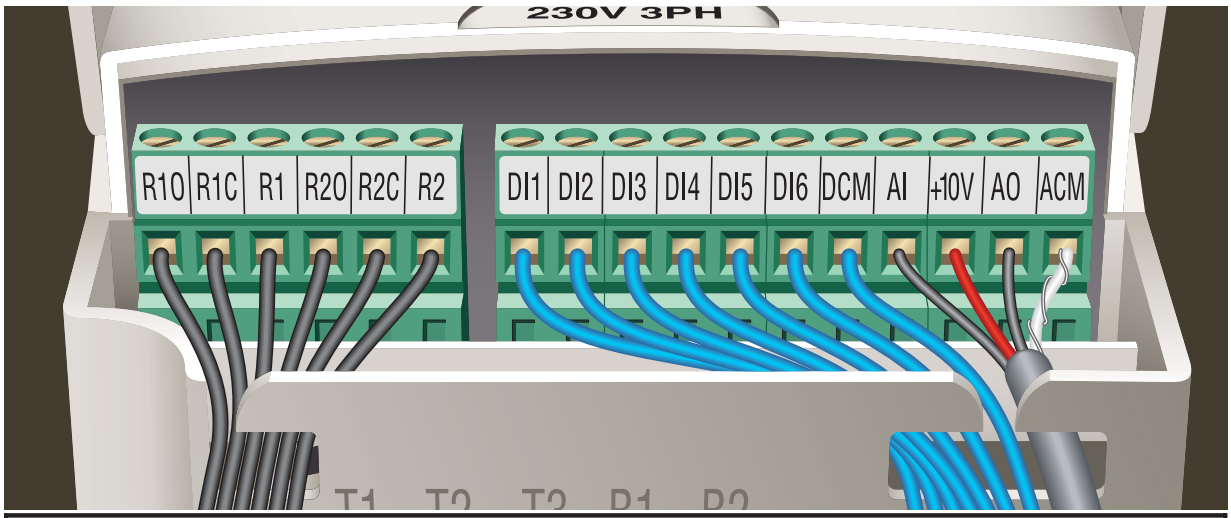
**** Only models GS2-10P2, GS2-10P5, GS2-11P0, GS2-20P5, GS2-21P0, GS2-22P0, and GS2-23P0 are rated for 1-phase input power***

Main Circuit Wiring (continued)

Main Circuit Wiring Specifications			
AC Drive Model	**Current Input/Output (A)**	**Wire Gauge (AWG)**	**Terminal Screw Torque (in·lbf)**
GS2-10P2 (1-phase)	6 / 1.6	12-14	12
GS2-10P5 (1-phase)	9 / 2.5		
GS2-11P0 (1-phase)	16 / 4.2	12	
GS2-20P5 (1-phase)	6.3 / 2.5	12-14	
GS2-20P5 (3-phase)	3.2 / 2.5		
GS2-21P0 (1-phase)	11.5 / 5.0		
GS2-21P0 (3-phase)	6.3 / 5.0		
GS2-22P0 (1-phase)	15.7 / 7.0	12	
GS2-22P0 (3-phase)	9 / 7.0	12-14	
GS2-23P0 (1-phase)	27 / 10	8	13
GS2-23P0 (3-phase)	12.5 / 10	8-12	
GS2-25P0	19.6 / 17	8-10	
GS2-27P5	28 / 25	8	
GS2-41P0	4.2 / 3.0	12-14	12
GS2-42P0	5.7 / 4.0		
GS2-43P0	6.0 / 5.0		
GS2-45P0	8.5 / 8.2	8-14	13
GS2-47P5	14 / 13	8-12	
GS2-4010	23 / 18	8-10	
GS2-51P0	2.4 / 1.7	12-14	12
GS2-52P0	4.2 / 3.0		
GS2-53P0	5.9 / 4.2		
GS2-55P0	7.0 / 6.6	8-14	13
GS2-57P5	10.5 / 9.9		
GS2-5010	12.9 / 12.2	8-12	

NOTE: Use 75°C (or higher) copper wire only.

Control Terminal Wiring



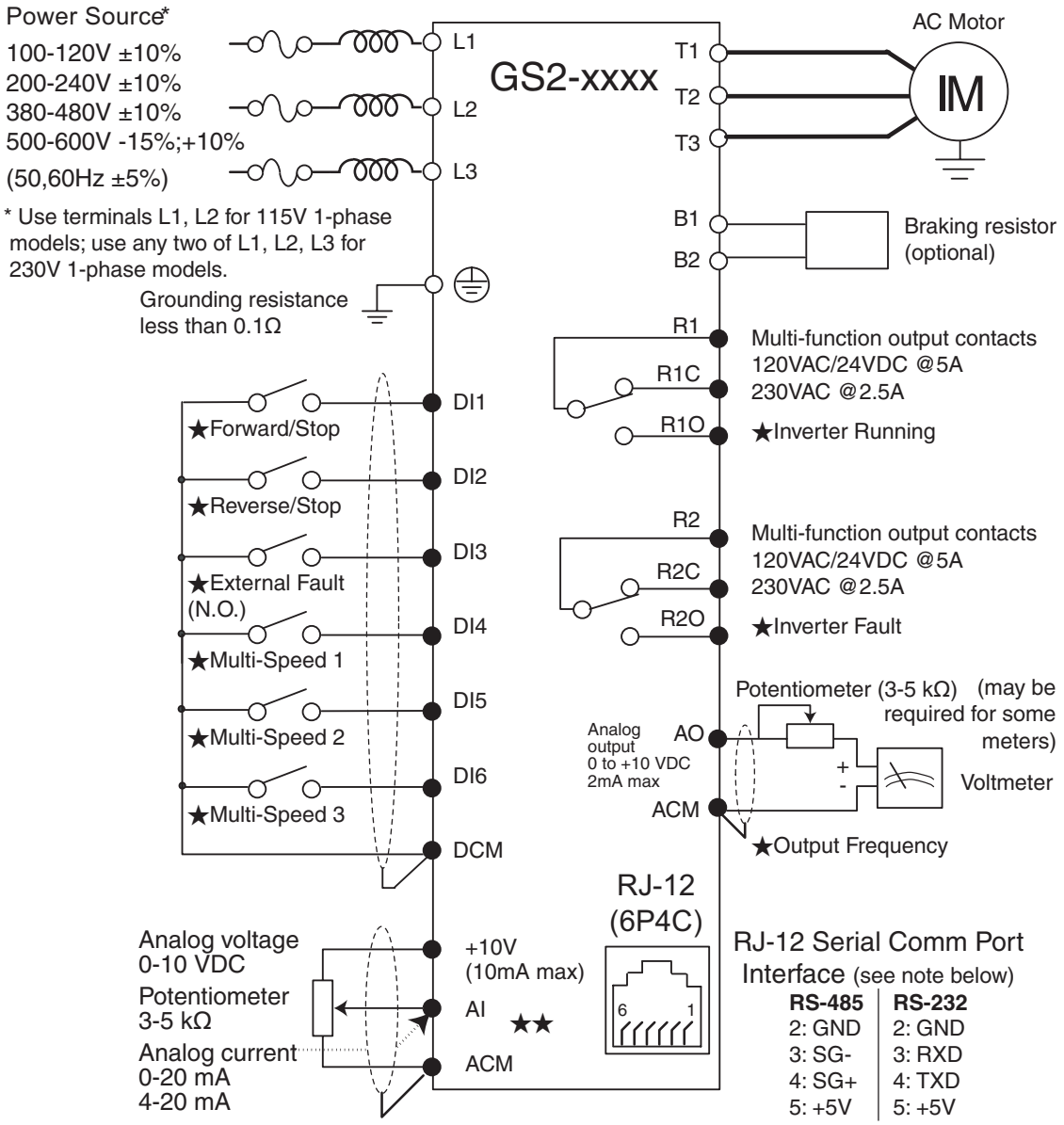
Control Circuit Terminals		
Terminal Symbol	**Description**	**Remarks**
R1O	Relay Output 1 Normally Open	120 VAC / 24 VDC @ 5A 230 VAC @ 2.5A
R1C	Relay Output 1 Normally Closed	
R1	Relay Output 1 Common	
R2O	Relay Output 2 Normally Open	
R2C	Relay Output 2 Normally Closed	
R2	Relay Output 2 Common	
DI1	Digital Input 1	Input Voltage: Internally Supplied *(see WARNING below)* Input Voltage Range: 4-12V Minimum ON Current: 22 mA max Maximum OFF Current: 1.1 mA also see "Basic Wiring Diagram" on next page.
DI2	Digital Input 2	
DI3	Digital Input 3	
DI4	Digital Input 4	
DI5	Digital Input 5	
DI6	Digital Input 6	
DCM	Digital Common	
AI	Analog Input	0 to +10 V Input 0 to 20 mA Input, or 4 to 20 mA Input
+10V	Internal Power Supply	+10 VDC (10 mA maximum load)
AO	Analog Output	0 to +10V Output (2mA maximum load)
ACM	Analog Common	

Warning: Do NOT connect external voltage sources to the Digital Inputs. Permanent damage may result.

Note: Use twisted-shielded, twisted-pair, or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should be connected only at the AC drive. Do not connect shield wire on both ends.

Basic Wiring Diagram

Note: Users must connect wiring according to the circuit diagram shown below.



★Factory default setting

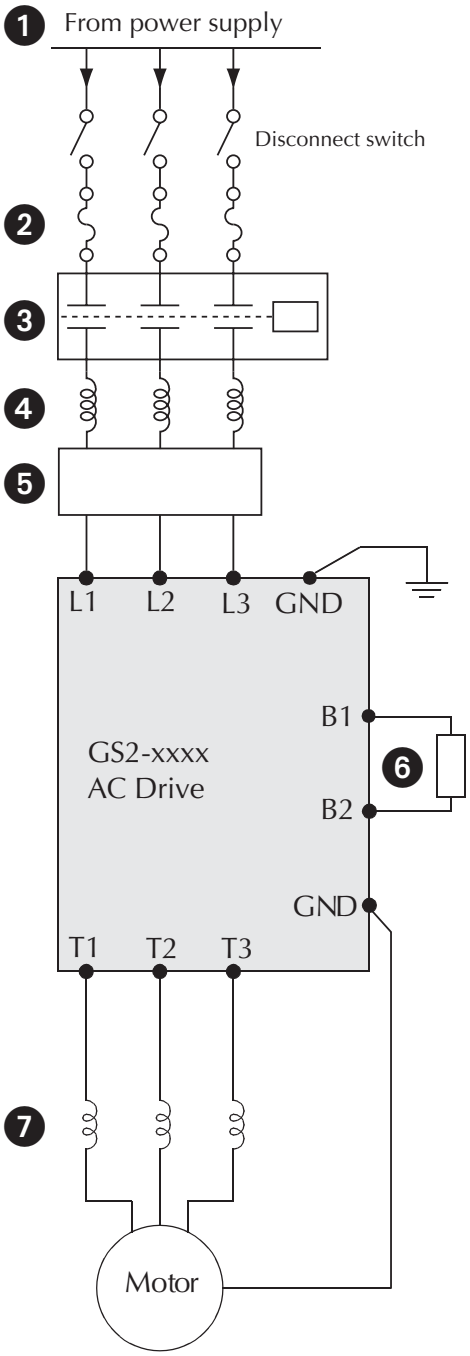
★★Factory default source of frequency command is via the keypad potentiometer

○ Main circuit (power) terminals ● Control circuit terminal ⫩ Shielded leads

WARNING: Do not plug a modem or telephone into the GS2 RJ-12 Serial Comm Port, or permanent damage may result. Terminals 2 and 5 should not be used as a power source for your communication connection.

External Accessories

Refer to Appendix A for information regarding external accessories.



1 Power Supply
Please follow the specific power supply requirements shown in CHAPTER 1

2 Fuses
Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations.

3 Contactor (Optional)
Do not use a contactor or disconnect switch for run/stop control of the AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

4 AC Line Reactor (Optional)
Input line reactors protect the AC drive from transient overvoltage conditions typically caused by utility capacitor switching. Input line reactors also reduce the harmonics associated with AC drives, and are recommended for all installations.

5 EMI filter (Optional)
Input EMI filters reduce electromagnetic interference or noise on the input side of the AC drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

6 Braking Resistors (Optional)
Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% & 20% braking torque without the addition of any external components. The addition of optional braking may be required for applications that require rapid deceleration or high inertia loads.

7 AC Line Reactor (Optional)
Output line (load) reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also allow the motor to run cooler by smoothing the motor current waveform. They are recommended for operating "non-inverter-duty" motors, and for any motors when the length of wiring between the AC drive and motor exceeds 75 feet.

Note: Please refer to Appendix A for specifications on GS2 AC Drive Accessories.