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SB4000 SERIES MANUAL

INDUSTRIAL SHOCK BLOCK®

CLASS A
REVISION 1-A-031526

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1 INTRODUCTION

1.1 GENERAL

The SB4000 Industrial Shock Block™ is available as a ground-fault circuit interrupter (GFCI) and operates within the time-current curve defined by UL 943 and CSA C22.1 for Class A GFCIs.

The SB4000 is available for voltages from 208 to 240 V and is continuously rated at 26 A. SB4000 models have a polycarbonate enclosure with Type-4X and IP69K ratings.

The following model types are available:

- GFCI Class A with a 6-mA fixed trip level (UL 943 listed).

1.1.1 SB4000 GFCI

GFCI models are permanently-connected GFCIs that meet the requirements of the UL 943 definition for Class A devices, with a fixed 6-mA trip level. It is available for 208 and 240 Vac systems (with or without neutral).

The UL GFCI classes and their intended applications are shown in Fig. 1. See Section 7 Ordering Information for details.

A load-ground-connection monitor feature is not currently available for Class A GFCI models.

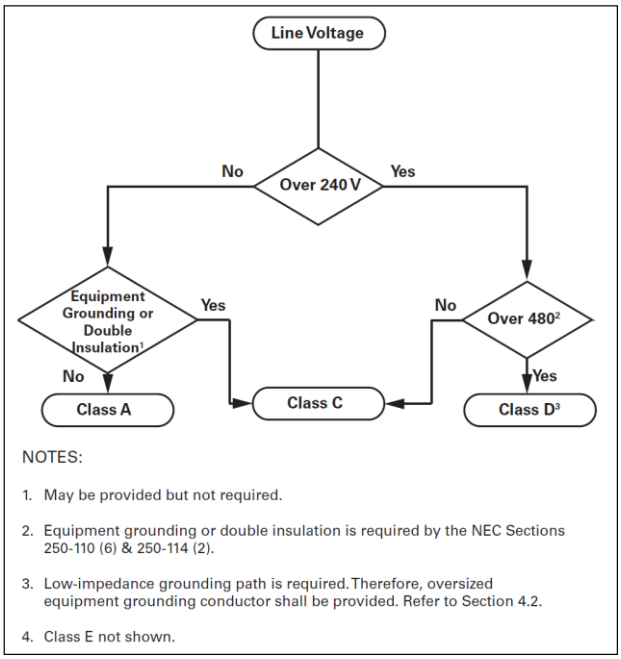


FIGURE 1. UL GFCI Classes.

1.2 FEATURES

- UL 943 inverse time curve reduces the probability of nuisance tripping.
- UL 943 fixed trip level (Class A GFCI models) provides protection meeting NEC 210.8 (B) for commercial kitchens, wet areas, and other applications.
- Undervoltage, brown-out and chatter detection prolong the internal relay life.
- Meets UL 1998 requirements.
- Self-test feature continuously monitors hardware to ensure safe operation.
- Conformally-coated circuit boards.

1.3 OPERATOR INTERFACE

The operator interface includes LED status indication including the following:

- POWER
- ENABLE
- GF TRIP
- GC STATUS
- TEST and RESET buttons

2. INSTALLATION

The SB4000 is considered to be a permanently mounted GFCI and should be attached to a wall or other suitable mounting surface.

The connection diagram for three-phase systems is shown in Fig. 2. Ensure that all conductors have the required voltage and current ratings necessary for the application. SB4000 installation should be performed by a qualified person. For further questions or clarifications, please contact relays@littelfuse.com.

2.1 MOUNTING

Install SB4000 models in any orientation suitable for the application.

All models ship with no cable entry points predrilled. Appropriate holes must be made in the enclosure and fitted with Type-4X-rated (and IP69K-rated when required) fittings for the installation of all conductors. Space is left near the top or bottom of the enclosure to install the wiring. See Figures 7 and 8.

2.2 SUPPLY CONNECTIONS

The supply phases are marked as Inputs L1, L2, L3, and N (Neutral) as shown in Fig. 2.

Strip each phase wire (and neutral wire if applicable) to 18 mm. Use a flat blade screwdriver (3mm width is recommended) to release each spring terminal and insert each wire fully, then remove the flat blade screwdriver. The input terminals will accept 4 to 18 AWG copper wire conductors.

2.3 LOAD PHASE CONNECTIONS

The load phases are marked as Outputs L1, L2, L3, and N (Neutral) as shown in Fig. 2.

Strip each phase wire (and neutral wire if applicable) to 18 mm. Use a flat blade screwdriver (3mm width is recommended) to release each spring terminal and insert each wire fully, then remove the flat blade screwdriver. The output terminals will accept 4 to 18 AWG copper wire conductors.

2.4 GROUND CONNECTIONS

Connect the supply and load ground conductors to the chassis bonding point (⏚) as shown in Fig. 3. Strip the ground wire to 15 mm. Use a flat blade screwdriver (3mm width is recommended) to release each spring terminal and insert each wire fully, then remove the flat blade screwdriver. The ground terminals will accept 8 to 24 AWG copper wire conductors.

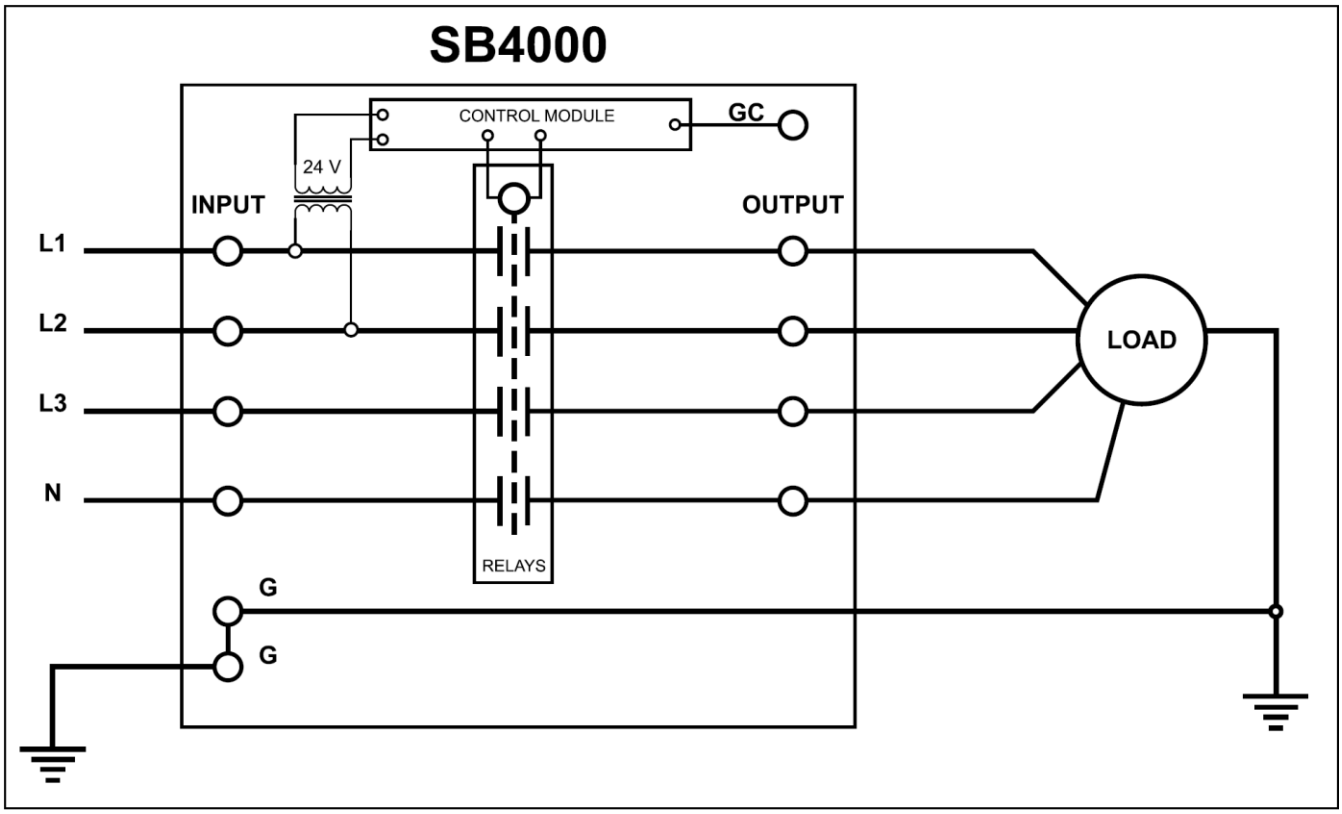


FIGURE 2. Three-Phase Connection Diagram (GFCI Configuration Shown).

FIGURE 3. SB4000 Model (Enclosure not shown).

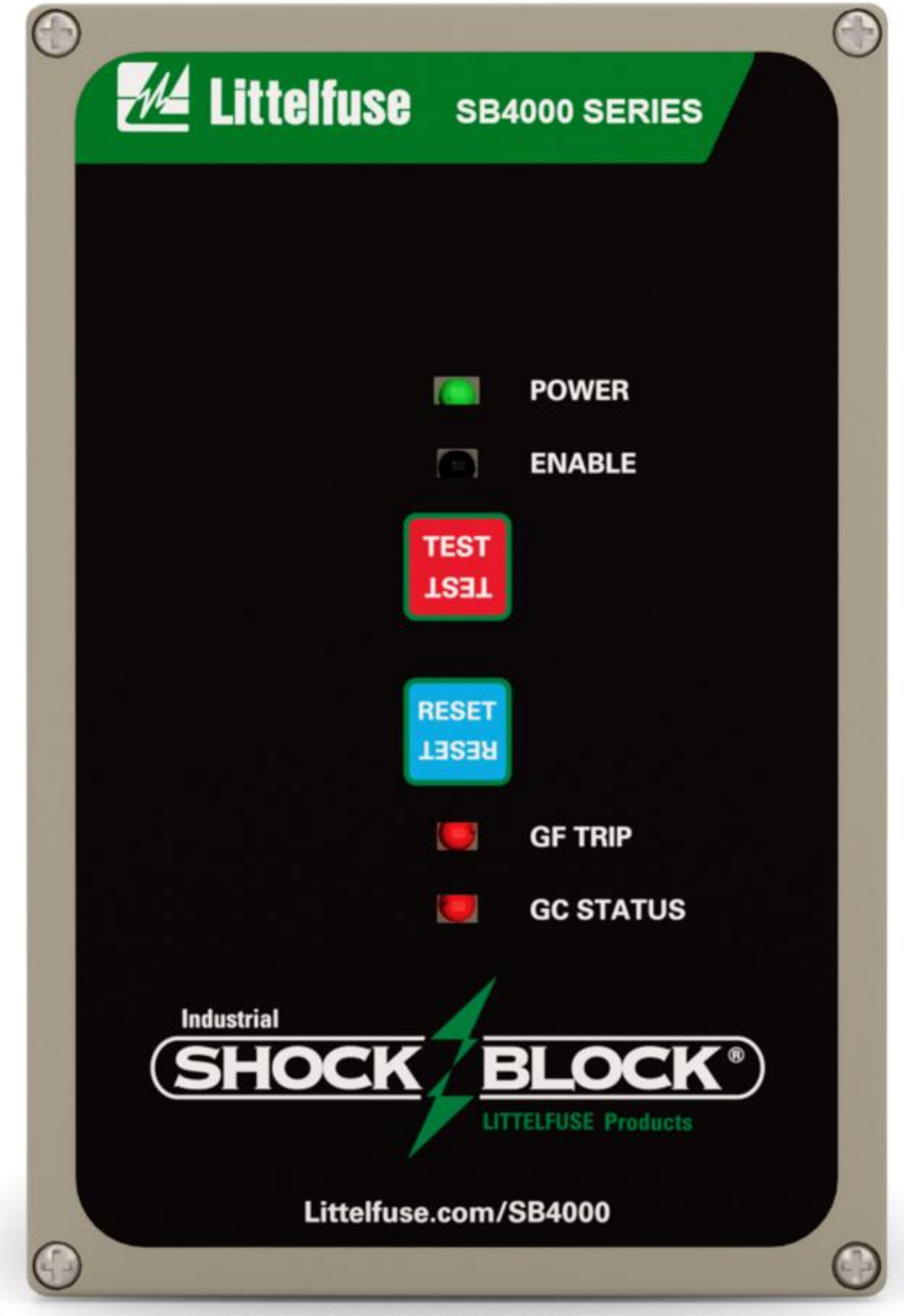


FIGURE 4. SB4000 Front view.

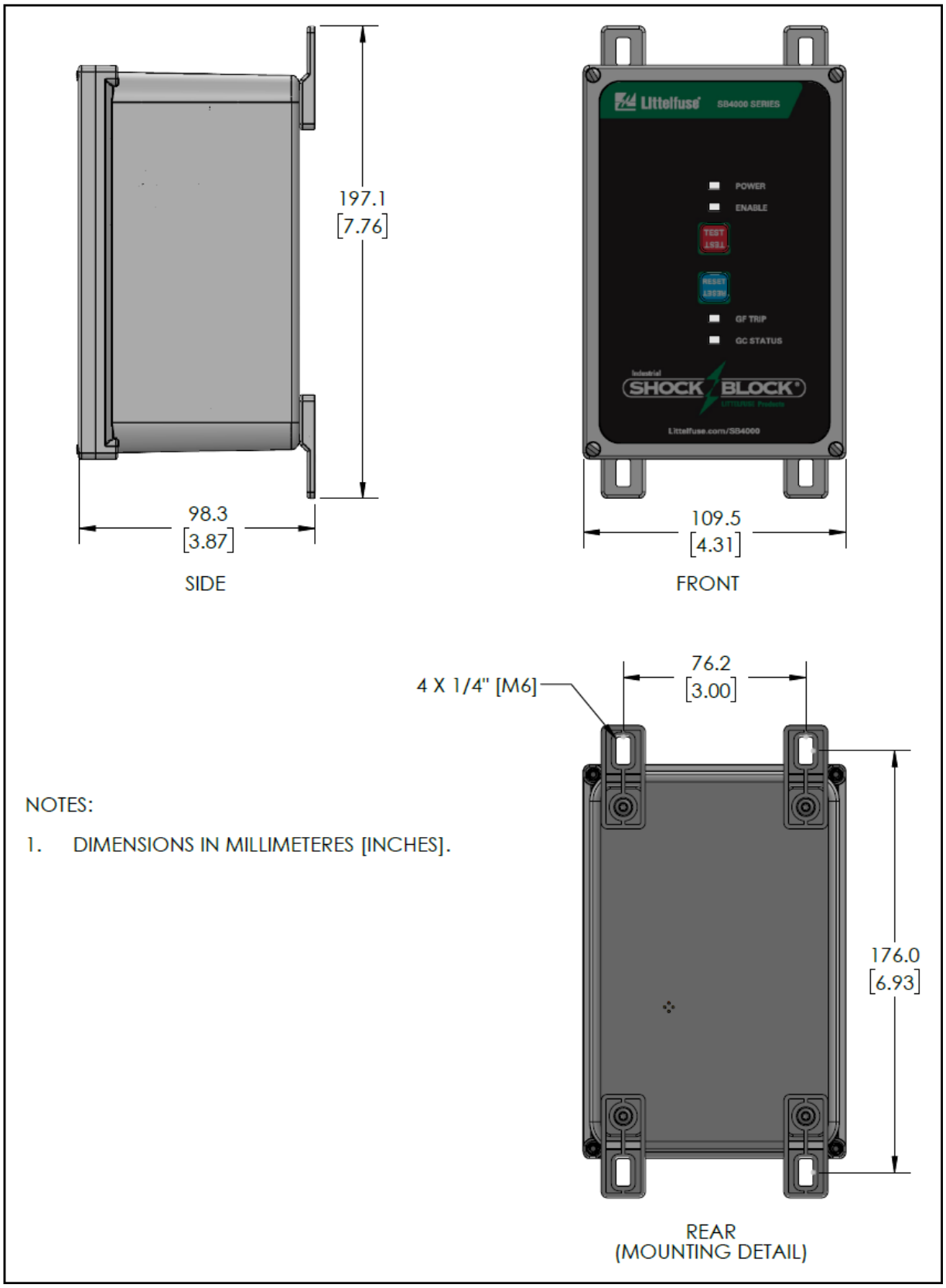


FIGURE 5. SB4000 Outline and Mounting Details.

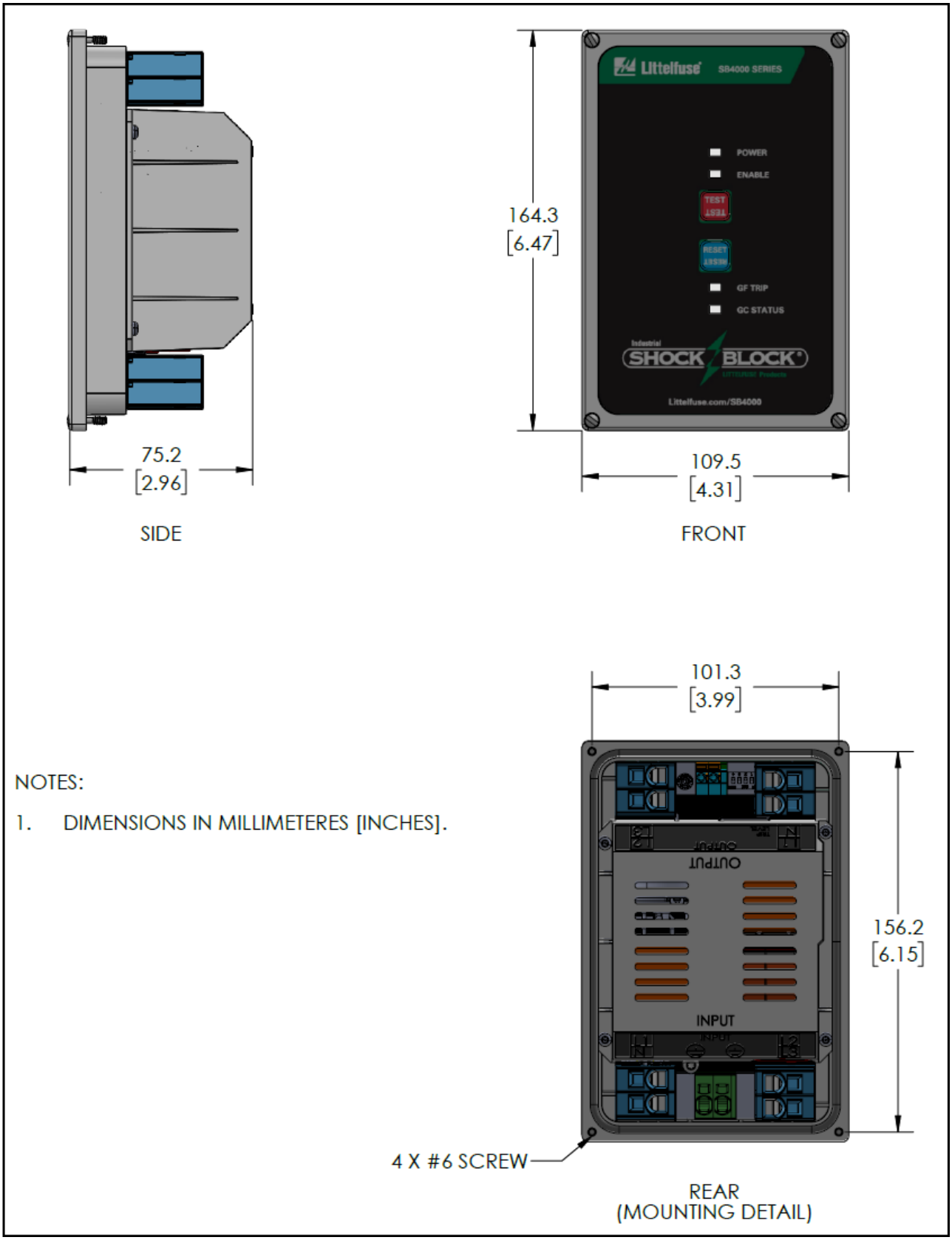
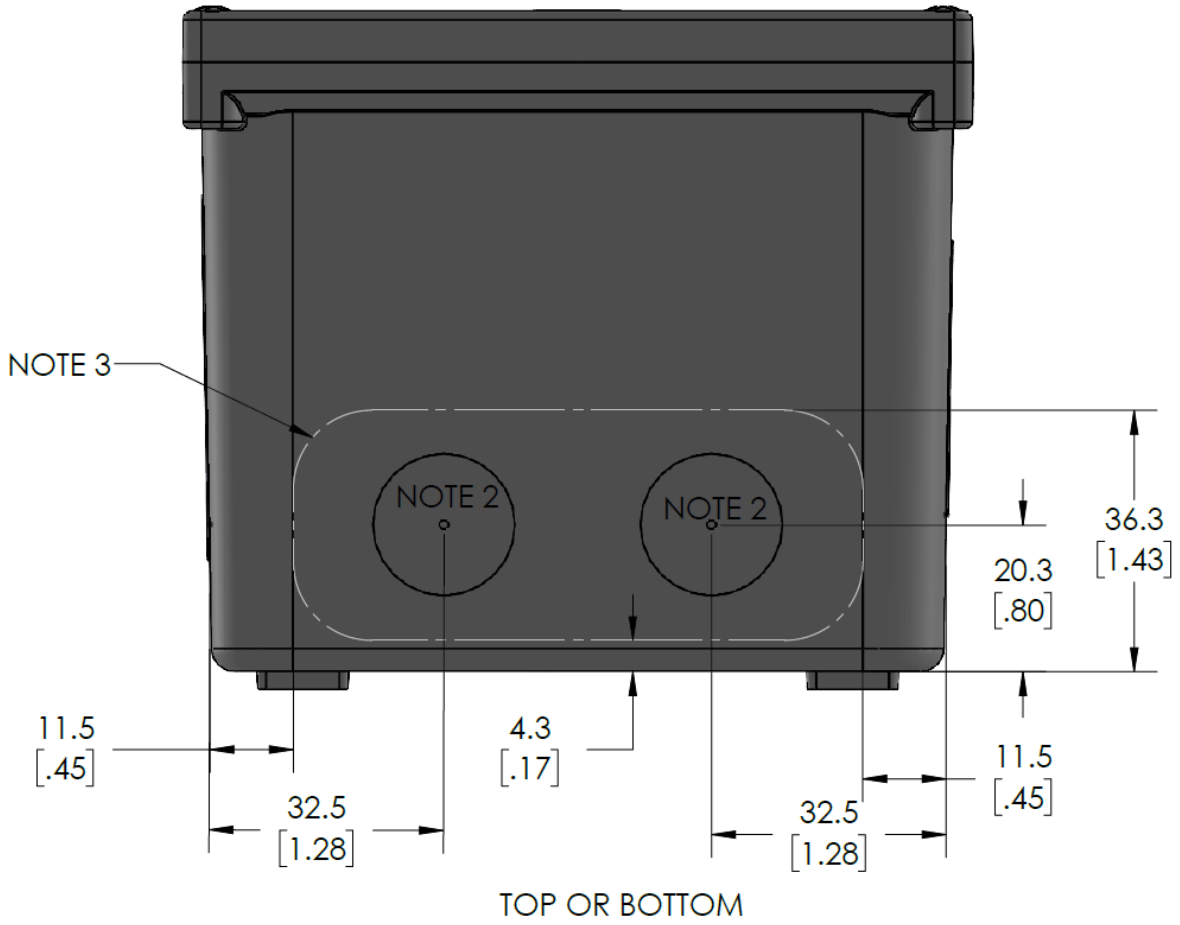


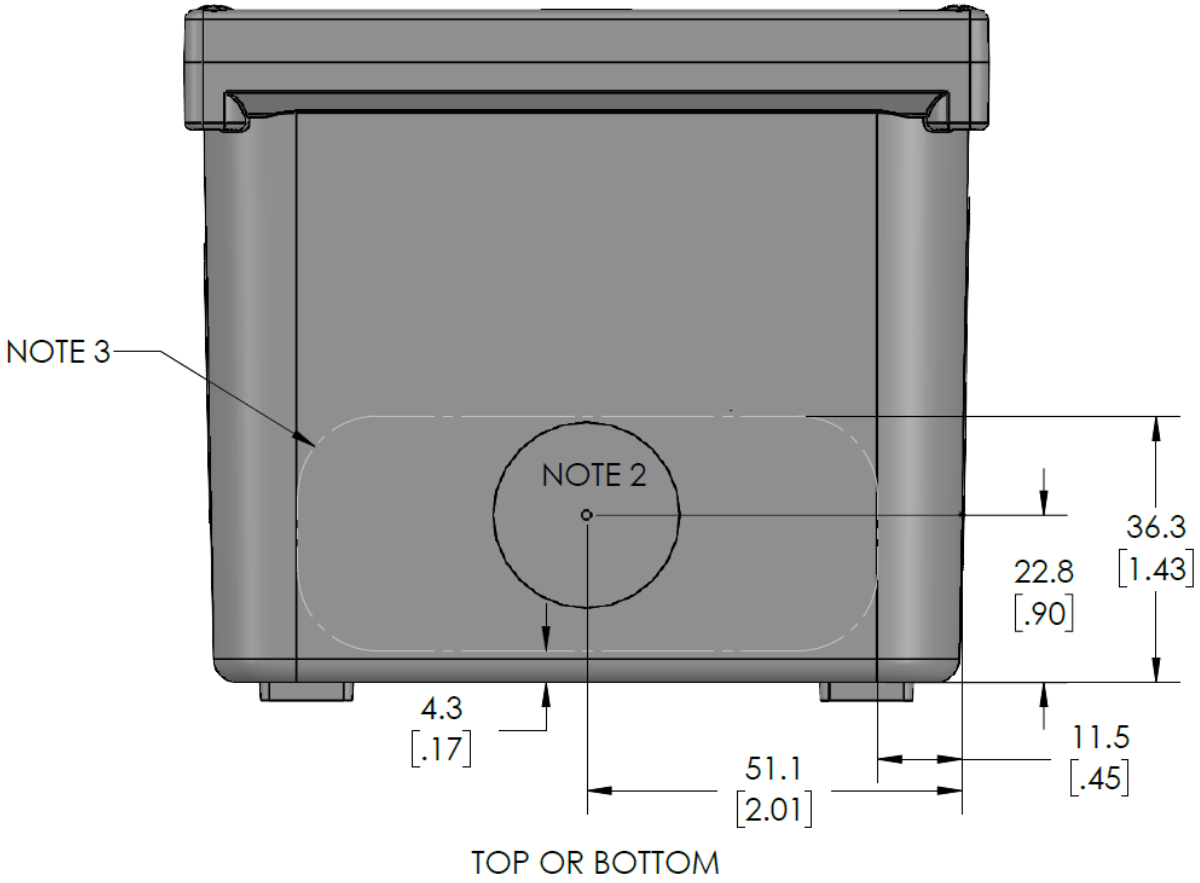
FIGURE 6. SB4000 Interior Outline Details.



NOTES:

1. Dimension in millimeters [inches].
2. Preferred conduit hole locations for top or bottom access. Suggested conduit size 1/2" NPT.
3. Maximum perimeter for conduit locations. Ensure that internal and external conduit hardware stays within this perimeter.

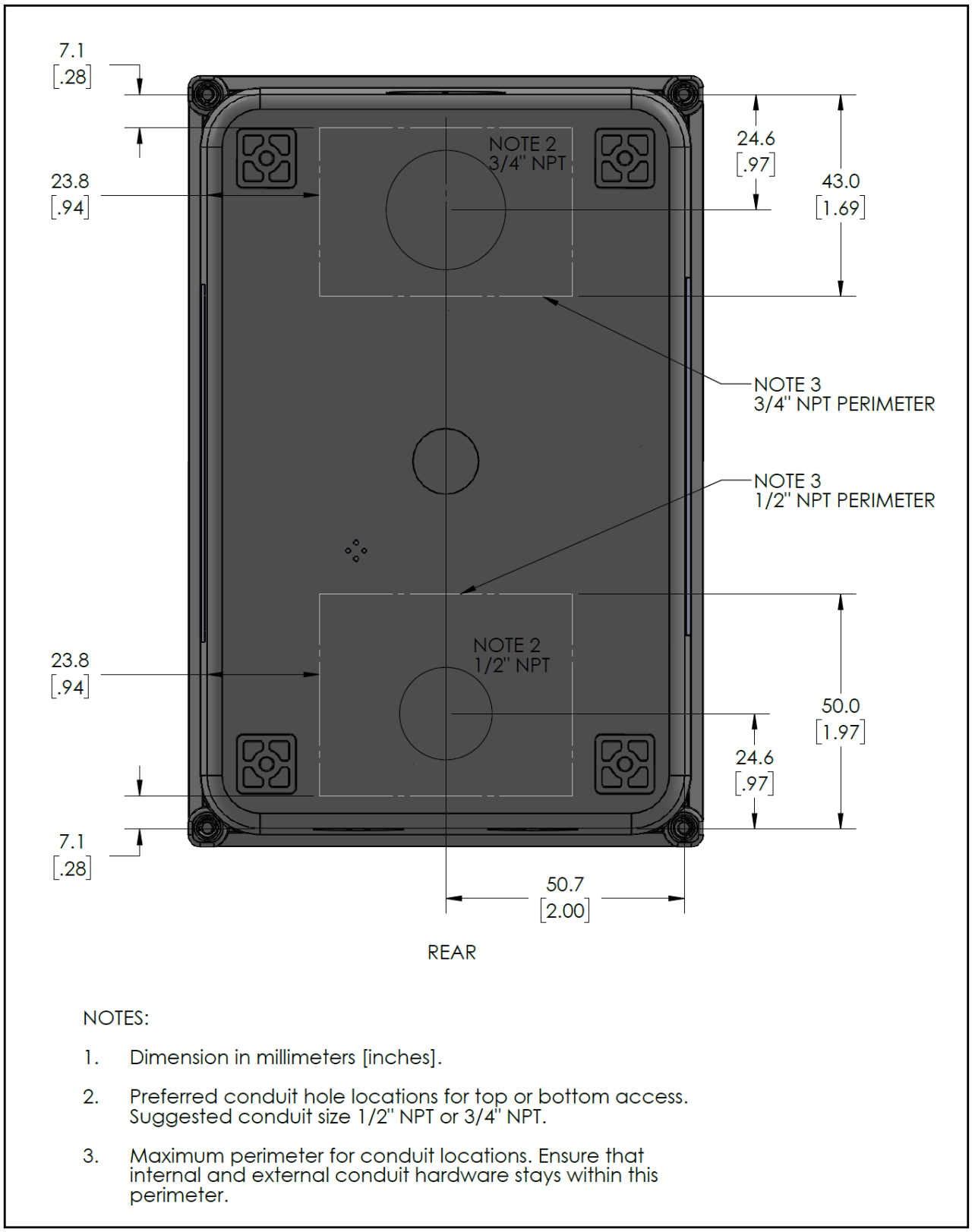
FIGURE 7. SB4000 Conduit Cutout Locations for ½" NPT.



NOTES:

1. Dimension in millimeters [inches].
2. Preferred conduit hole locations for top or bottom access. Suggested conduit size 3/4" NPT.
3. Maximum perimeter for conduit locations. Ensure that internal and external conduit hardware stays within this perimeter.

FIGURE 8. SB4000 Conduit Cutout Locations for ¾” NPT.



NOTES:

1. Dimension in millimeters [inches].
2. Preferred conduit hole locations for top or bottom access. Suggested conduit size 1/2" NPT or 3/4" NPT.
3. Maximum perimeter for conduit locations. Ensure that internal and external conduit hardware stays within this perimeter.

FIGURE 9. SB4000 Conduit Cutout Locations - Rear.

3. OPERATION AND SETUP

NOTE: When its input terminals become energized, the SB4000 powers up in RESET mode (default setting) and the connected circuit will be energized after a brief system test. See Section 3.3. for additional configuration settings.

3.1 OPERATOR INTERFACE BUTTONS

3.1.1 TEST

The TEST button is used to de-energize the load and to test the SB4000 ground-fault detection circuit, indication, and relays.

When the TEST button is pressed for one second, the GF TRIP LED will turn ON, the ENABLE LED will turn OFF, and the SB4000 will trip.

When the TEST button is continuously pressed for at least two seconds after the SB4000 has tripped, the previous fault current range will be displayed. See Section 3.2.5.

3.1.2 RESET

The RESET button is used to reset the SB4000 after a ground fault has occurred and to energize the load.

When the RESET button is momentarily pressed and there are no fault conditions present, the contactor will close and the ENABLE LED will be ON. If the SB4000 trips immediately after a reset, a ground fault is still present.

When the RESET button is continuously pressed for at least two seconds when the SB4000 is energized and is not in a tripped condition, the approximate leakage current will be displayed. See Section 3.2.5.

3.2 LED INDICATION

3.2.1 POWER

The green LED labeled POWER indicates the presence of supply voltage.

3.2.2 ENABLED

The green LED labeled ENABLE indicates that the relays are closed. An audible sound from the internal relays can be heard each time the relays open or close.

When supply voltage is applied to the SB4000, the SB4000 closes the relays after approximately 10 s if there are no fault conditions present.

3.2.3 GF TRIP

The red LED labeled GF TRIP provides ground-fault trip indication.

If the GF TRIP LED is on, the unit has tripped. One or more conditions may have caused a trip. If the GF TRIP LED is flashing, the SB4000 has detected an undervoltage, overvoltage, chatter, or temperature limit condition. See Table 1 and Sections 3.5 and 3.6.

3.2.4 GC STATUS

Class A models currently don't include ground continuity monitoring.

TABLE 1. POWER AND TRIP STATUS LEDS.

LED	STATE	DESCRIPTION
POWER	ON	Unit Powered
	OFF	Unit Not Powered
	Flash	Unit Has Miswire Condition
ENABLE	ON	Load Connected
	OFF	Load Not Connected
GF TRIP	ON	Unit Tripped
	OFF	Unit Not Tripped
	Flash	Relay drop-out due to an undervoltage condition, flash code 1 S – 1 L
	Flash	Relay drop-out due to overvoltage condition, flash code 1 S – 1 L
	Flash	Relay drop-out due to an over-temperature condition, flash code 2 S – 1 L
	Flash	Relay drop-out due to a Grounded-Neutral condition 3 S – 1 L
	Flash	Relay drop-out due to a Power Loss condition, flash code 4 S – 1 L
GC STATUS	ON (Green)	Not used for Class A GFCIs.
	ON (Red)	Not used for Class A GFCIs.
POWER, GF TRIP, GC STATUS	All three LEDs flashing	Internal diagnostic or Self-Test Fail has been detected

3.2.5 Fault Current and Leakage Current Indication

The most recent fault current can be displayed using the TEST button. Refer to Section 3.1.1 and Table 2.

The approximate leakage current can be displayed using the RESET button. Refer to Section 3.1.2 and Table 3.

TABLE 2. Fault Current Status.

LED	< 10 mA	< 25 mA	< 50 mA	< 150 mA	>= 150 mA
POWER	FLASH	ON	ON	ON	FLASH
ENABLE	OFF	FLASH	ON	ON	FLASH
GF TRIP	OFF	OFF	FLASH	ON	FLASH
GC STATUS	OFF	OFF	OFF	FLASH	FLASH

TABLE 3. Leakage Current Status.

LED	< 25% of Trip Setting	< 50% of Trip Setting	< 75% of Trip Setting	>= 75% of Trip Setting
POWER	FLASH	ON	ON	ON
ENABLE	OFF	FLASH	ON	ON
GF TRIP	OFF	OFF	FLASH	ON
GC STATUS	OFF	OFF	OFF	FLASH

3.3 SETTINGS

The GFCI models have a fixed 6 mA (Class A) trip-level value.

All models include four configuration switches that provide additional selections. Default settings are shown in Fig. 10.

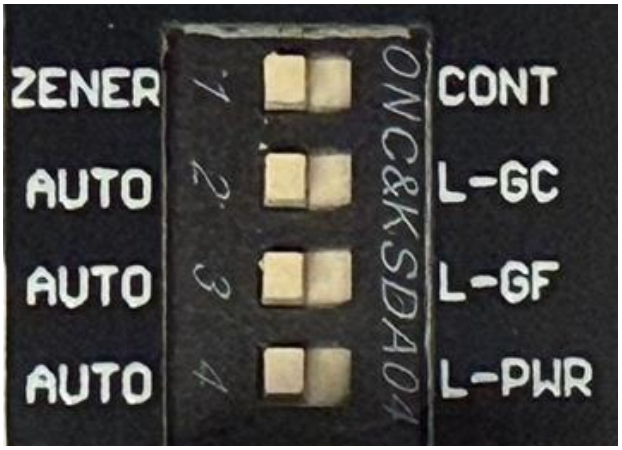


FIGURE 10. Configuration Switches.

3.3.1 Termination Device Type (Switch 1)

This switch is not used for Class A models and should be set to ZENER.

3.3.2 GC Reset Mode (Switch 2)

This switch is not used for Class A models and should be set to AUTO.

3.3.3 GF Reset Mode (Switch 3)

Regardless of the GF Reset Mode, a GF Trip will always remain latched until it is manually reset.

When set to AUTO, a GF Trip will be cleared after cycling power.

When set to LATCHING GF RESET, a GF Trip will not be cleared after cycling power.

3.3.4 PWR Loss Mode (Switch 4)

When set to AUTO, a Temperature Limit trip will automatically reset when the internal temperature sensor returns to a normal temperature range.

When set to AUTO, a Chatter Detection trip, Undervoltage trip, or Overvoltage trip will automatically reset when the supply voltage remains in a normal range for at least 10 s.

When set to LATCHING PWR LOSS, a Temperature Limit trip, Chatter Detection trip, Undervoltage trip, or Overvoltage trip will require a manual reset after returning to a normal state.

3.4 INPUT CONNECTION

The SB4000 electronics are supplied from input phases L1 and L2. If either phase is not connected, the unit will remain off with the relays open.

For applications that do not require L3 or N, the SB4000 will operate normally without these connections.

3.5 UNDERVOLTAGE, OVERVOLTAGE, AND CHATTER DETECTION

The input voltage (phases L1 and L2) is always checked before the relays are closed. If an input undervoltage condition is detected, the relays will remain open and the red GF TRIP LED will flash. The control circuit will continuously check the input voltage and will close the relays when the input voltage is within acceptable limits (if PWR Loss Mode set to AUTO).

Undervoltage detection is provided to prolong the lifetime of the relays by preventing relay chatter. Relay chatter occurs when the voltage applied to the control coil is marginally lower than the minimum pull-in voltage.

3.6 Temperature Limit Trip

The SB4000 includes an internal temperature sensor. A Temperature Limit trip will occur if the temperature is beyond the minimum or maximum temperature limits. The SB4000 can be reset when the temperature returns to a normal temperature range. See Section 6 for details.

3.7 Relay MONITORING

The SB4000 continuously monitors the state of the relays. If an incorrect state is detected, a Diagnostic Trip will occur, the relays will open and will remain open until supply voltage to the unit is cycled. This condition should never be encountered during normal operation.

The SB4000 should be used within the specifications listed in Section 6 to ensure correct operation.

NOTE: At room temperature, the minimum relay pull-in voltage is approximately 80% of the nominal voltage. At higher temperatures, the minimum pull-in voltage is higher than 80% of the nominal voltage.

3.8 GROUND-FAULT DETECTION

The red GF TRIP LED indicates a ground-fault trip. The SB4000 will remain tripped until the RESET button is pressed or supply voltage is cycled (if GF Reset Mode is set to AUTO). See Section 3.1.2.

3.9 UL 943 SELF-TEST AND UL 1998 REQUIREMENTS

The UL 943 standard includes a self-test requirement to verify a GFCIs ability to respond to a ground fault. All SB4000 options include an automatic self-test feature. If a problem is detected, the SB4000 will trip. A Self-Test Failure will be indicated by a unique LED pattern as described in Table 1.

A self-test is initiated a few seconds after power-up, a few seconds after the relays are closed, and during normal operation.

In addition to the automatic self-test, a monthly manual test is also recommended.

Compliance to the UL 1998 Software in Programmable Components standard is also included.

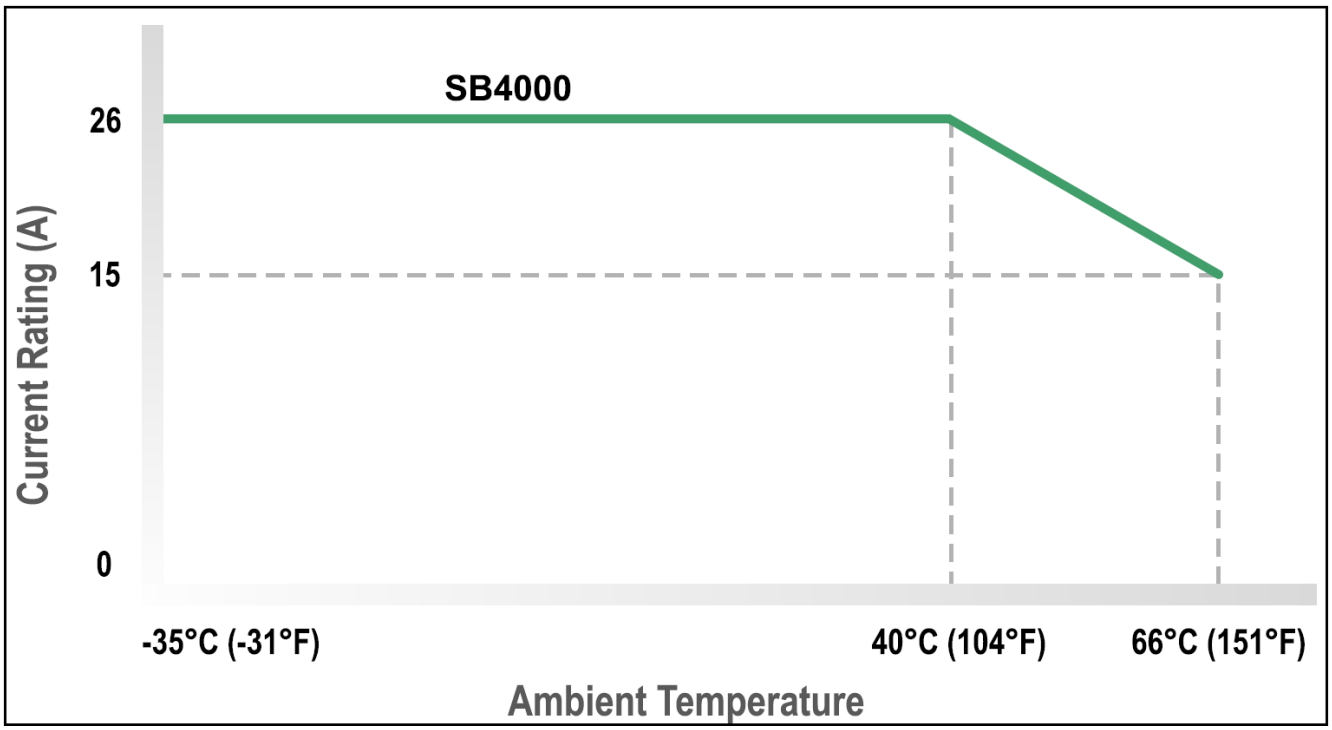


FIGURE 11. SB4000 Series Temperature Derating Curve.

4. UL 943 REQUIREMENTS

4.1 TRIP TIME

Class A GFCIs shall be capable of interrupting the electric circuit to the load when the fault current to ground (*I*) is within the range of a minimum of 6 mA through a maximum of (110% of the rated voltage/500 Ω) *A* within the time interval (*T*) in accordance with the relationship:

$$T = \left(\frac{20}{I}\right)^{1.43}$$

Where:

T is expressed in seconds, and
I is expressed in mA

Fig. 12 shows the Class-A GFCI maximum-trip-time-versus-current curve defined by UL 943 (with the above formula).

NOTES:

(1) Excerpts from UL 943 are the property of Underwriters Laboratories Inc.

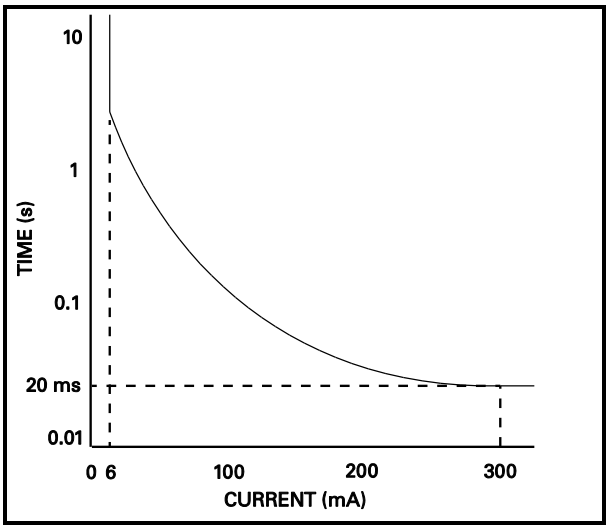


FIGURE 12. Class-A GFCI Curve.

5. TROUBLESHOOTING

TABLE 4. STATUS LED TROUBLESHOOTING.

STATUS LEDS					DESCRIPTION	TROUBLESHOOTING
POWER	ENABLE	GF TRIP	GC STATUS			
ON	ON	OFF	ON (GREEN)		Normal Operation	----------
OFF	OFF	OFF	OFF		No Power to the SB4000	Check supply connection to, and external power fuses of, inputs L1 and L2.
FLASH	OFF	---	---		Miswire Condition	Power off and check supply connections to L1, L2, L3 (if used), N (if used), and ground.
ON	OFF	ON	ON (GREEN)		Ground Fault Occurred	Clear ground fault on the system and press RESET.
ON	OFF	FLASH 1 S – 1 L	ON (GREEN)		Relay Drop-Out Due to an Undervoltage, Overvoltage, or Chattering Condition	Verify the input voltage is within acceptable limits and press RESET.
ON	OFF	FLASH 2 S – 1 L	ON (GREEN)		Relay Drop-Out Due to a Temperature-Limit Exceeded Condition	Allow the temperature to fall back to a normal range.
ON	OFF	FLASH 3 S – 1 L	ON (GREEN)		Temperature limit exceeded Relay Drop-Out Due to a Chattering Condition	Verify the input voltage is within acceptable limits and press RESET.
ON	OFF	OFF	ON (RED)		Not used for Class A models.	GC STATUS (RED) may be indicated momentarily during startup but can be ignored.
FLASH	OFF	FLASH	FLASH RED		Diagnostic error or Self-Test failure	Cycle power. If error repeats, consult factory.

6. TECHNICAL SPECIFICATIONS

6.1 SB4000 Series

Voltage, Current, and Power Ratings[1]:
- 208 to 240 Vac Options:
  - System Configurations ..... 3P+N, 3P, 2P+N, 2P 60 Hz[2], 240Y/138V or 120/240V or 208Y/120V (+10, -15%)
  - Current:
    - AC-1 ..... 26 A
    - AC-3 ..... 26 A
      - Breaking Capacity..... 6 x 30 A
      - Making Capacity..... 6 x 30 A
  - Power (AC-3) ..... 7.5 hp

Wiring Requirements:
- Temperature Rating..... 90°C
- Type..... Copper, Solid or Stranded
- Input and Output Terminals:
  - Conductor Size ..... 18 to 4 AWG (0.75 to 16.0 mm^2)
  - Terminal Type..... Spring-Clamp
  - Strip Length ..... 18 mm
- Ground Terminals:
  - Conductor Size ..... 24 to 8 AWG (2.08 to 53.5 mm^2)
  - Terminal Type..... Spring-Clamp
  - Strip Length ..... 15 mm

Short-Circuit Current Rating ..... 10 kA,
Test Information..... Tested with Littelfuse K5 input fuses installed. K5 fuses have a short-circuit current rating of 50 kA.

Fuse Requirements:
- Input Fuses (not included):
  - Fuse Rating..... 30 A, 600 Vac, Class K5 or RK5
  - Fuse Part Number..... Littelfuse 0NLS030.T or FLSR030.T

Dimensions:
- Outer enclosure (with vertical mounting feet):
  - Height ..... 197.1 mm (7.76 in.)
  - Width ..... 109.5 mm (4.31 in.)
  - Depth ..... 98.3 mm (3.87 in.)

Shipping Weight:
- SB4000 in shipping carton..... 1.5 kg (3.31 lb)

6.2 General Specifications

Trip Level Settings:
- GFCI Class A..... Fixed 6 mA

Trip Time..... Defined by:

$$T = \left(\frac{20}{I}\right)^{1.43}$$

See Section 4.1.

Operating Frequency ..... 60 Hz ± 3 Hz

PWB Conformal Coating ..... MIL-1-46058 qualified
UL QMJU2 recognized

Enclosure Options:
- Polycarbonate
  - Ratings ..... Type 4X, IP69K
  - Cover fasteners and mounting feet Tightening torque..... 10 lbf·in (1.13 N·m)

Environment:
- Temperature:
  - UL Rating..... -35 to 66°C (-31 to 151°F)
  - Maximum Operating Range:
    - SB4000 ..... -35 to 75°C (-31 to 167°F)
  - Maximum Internal Temp Limit: ..... 90°C (194°F)
  - Minimum Internal Temp Limit:
    - SB4000 ..... -40°C (-40°F)
  - Temperature derating ..... See Fig. 11
  - Storage Temperature ..... -55 to 80°C (-67 to 176°F)
- Humidity..... 93% Non-Condensing
- Altitude ..... 2,000 m (6,562 ft) maximum

Certification:
- All Models UL1998
- GFCI models:
  - Class A ..... UL 943 listed

c UL US LISTED Ground-Fault Circuit Interrupter Class A E330856

To: UL 943 Ground-Fault Circuit-Interrupters
UL 1998 Software in Programmable Components
CSA C22.2 No.144.1 Ground-Fault Circuit Interrupters
CSA C22.2 No.144.M91 Ground-Fault Circuit Interrupters

NOTES:

(1) IEC 60947-1 Annex A defines several utilization categories. AC-1 refers to non-inductive or slightly inductive loads. AC-3 refers to squirrel-cage motors.
(2) UL 943 does not apply to 50-Hz installations.

7. Ordering Information

SB4030 - □□□ - 00

Model Type
1 Type 4X, IP69K

Device Type
2 GFCI Class A

Voltage Rating
5 208-240 V (2P, 3P, 2P + N, 3P + N)

APPENDIX A
SB4000 SERIES REVISION HISTORY

MANUAL RELEASE DATE	MANUAL REVISION	PRODUCT REVISION (REVISION NUMBER ON PRODUCT LABEL)	FIRMWARE REVISION
March 15, 2026	1-A-031526	00	1.09

MANUAL REVISION HISTORY

REVISION 1-A-031526

Initial release.

PRODUCT REVISION HISTORY

PRODUCT REVISION 00

Initial release.

FIRMWARE REVISION HISTORY

FIRMWARE REVISION 1.09

Initial release.