

**Installation, Operation
and Maintenance Manual**

PN 750-0075-005

SurgeBan™

**Transient
Suppression
Systems**



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Installation and Service Assistance:

**Call Joslyn Technical Support at
800-752-8068 or 805-968-3551, ext. 3,
Monday-Friday, 7:00 a.m. to 5 p.m. (PST).**

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Your Installation Guide to the SurgeBan™ Transient Suppression System

Color stripes on front and side indicate module type. For example, 100kA MOV modules have red stripes.



Today’s sophisticated electronic equipment requires reliable, suppression filter systems. By selecting Joslyn® SurgeBan™ devices, you have taken a critical step toward decreasing downtime and ensuring longer product life for your equipment.

The SurgeBan Transient Suppression System connects to your electrical distribution system to protect sensitive electrical and electronic equipment against the harmful effects of lightning strikes, induced transients on AC power lines, internally generated transients and high-frequency noise. SurgeBan fulfills the single-pulse surge current capacity testing recommendations per NEMA LS1-1992, paragraphs 2.2.9 and 3.9.

SurgeBan provides advanced surge protection and filtering technology. Created for optimum reliability and flexibility, SurgeBan offers unrivaled protection and features in a modular, building-block design with a choice of four types of suppression modules: ‘JM’ 50kA Metal Oxide Varistor (MOV); 100kA MOV; ‘JS’ Silicon Avalanche Diode (SAD); and ‘JC’ High-Frequency Filter. This innovative modularity allows simple and quick maintenance procedures should a module need to be replaced. Each suppression and filter module has an at-a-glance, bicolor status light (green = healthy and red = fault) to confirm the individual elements of the suppressor system are functioning properly.

In addition, each module has a keyed mounting as well as color-coded labels to ensure correct module replacement:

STRIPE COLOR	MODULE TYPE
Orange	50 kA MOV
Red	100 kA MOV
Purple	10 kA SAD
Green	Filter

SurgeBan’s unique design provides true, fail-safe protection. An individual thermal cut-off on each MOV and SAD protects against temporary overvoltage, limited short circuit current conditions and ensures clean end-of-life performance. Both 50kA and 100kA MOV modules have 20kA backup MOVs to provide continuous protection.

SurgeBan offers a full range of monitoring options. Choices range from the basic commercial-power and suppressor-status indicator lights, to the full-featured package featuring Form C dry relay contacts, audible alarm with disable switch and surge event counter.

SurgeBan’s robust NEMA 4/4X enclosure allows installation in outdoor and corrosive environments.

Installation Assistance

Monday through Friday, 7:00 a.m. to 5:00 a.m. (PST)
800-752-8068 or 805-968-3551 ext. 3

Ten-Year Limited and Five-Year Extended Warranty

10-Year Limited Warranty: Joslyn SurgeBan products are warranted for a period of 10 years from date of shipment. A Five-Year Extended Warranty is available for a total of 15 years coverage.

Patent Notice

The Joslyn® SurgeBan™ has filed for United States patent protection for the technology incorporated in the SurgeBan product. Should such patents subsequently issue, Current Technology, Inc. will enforce and protect its patent rights as provided by Section 35 USC.

The Importance of Correct Installation

This manual provides installation guidelines for SurgeBan products. Proper product selection and compliance with these guidelines will help your new suppression system provide years of reliable service. If installers are unsure about the facility's electrical configuration or have other installation-related questions, they should consult a master electrician or other qualified electrical professional.

When shortcuts take the place of proper installation procedures, the SurgeBan system may be damaged or may not provide adequate protection. Improper installation may also void the warranty. It is extremely important to follow these installation procedures carefully.

This manual is designed to guide you through the procedure of installing the SurgeBan product and connecting it to your electrical system. If you have any questions about how to install SurgeBan, please call Joslyn Technical Support at 800-752-8068 or 805-968-3551, ext. 3.

WARNING!

Pre-Installation Checklist

WARNING!

WARNING! SurgeBan's warranty is void if the unit is damaged as a result of improper installation or failure to verify the following conditions prior to installation.

WARNING! Discontinue installation if (1) your conditions are inconsistent with the checklist below or (2) your conditions cannot be verified. Call Joslyn Products Technical Support at 800-752-8068 or 805-968-3551, ext. 3 if you have questions.

Before Beginning

Confirm that the voltage(s) and service configuration shown on the SurgeBan product label are consistent with the voltage and service configuration of the facility. A model number is on the label inside the SurgeBan door. Each model number corresponds to the voltage and service configurations printed in the table below:

Example of a suppressor model number: SBM100-120/240-2A6B

Product Label Designation	System Voltage, Service Configuration
SBxxxx-120-1xxx	120VAC, 1-phase, 2-wire + ground
SBxxxx-127-1xxx	127VAC, 1-phase, 2-wire + ground
SBxxxx-120/240-2xxx	120/240VAC, split-phase, 3-wire + ground
SBxxxx-208/120-3xxx	208/120VAC, 3-phase WYE, 4-wire + ground
SBxxxx-220/127-3xxx	20/127VAC, 3-phase WYE, 4-wire + ground
SBxxxx-230-1xxx	230VAC, 1-phase, 2-wire + ground
SBxxxx-240-5xxx	240VAC 3-phase ungrounded DELTA, 3-wire + ground
SBxxxx-240/120-7xxx	240/120VAC, 3-phase high-leg DELTA, 4-wire + ground (B phase must be 208V)
SBxxxx-277-1xxx	277VAC, 1-phase, 2-wire + ground
SBxxxx-400-5xxx	400VAC 3-phase ungrounded DELTA, 3-wire + ground
SBxxxx-400/230-3xxx	400/230VAC, 3-phase WYE, 4-wire + ground
SBxxxx-480-5xxx	480VAC 3-phase ungrounded DELTA, 3-wire + ground
SBxxxx-480/277-3xxx	480/277VAC, 3-phase WYE, 4-wire + ground

WARNING! Check to ensure that a proper Xo bond is installed between the neutral and ground terminals at the transformer upstream from all 3-phase WYE, 3-phase high-leg DELTA or split-phase SurgeBan devices (see NEC article 250).

If the transformer is not accessible, check the main service disconnect/panel for the N-G bond. Lack of a proper bond will damage SurgeBan and void the warranty.

Installation Methods for Common Service Configurations for the Design Engineer and the Installer

Service Configurations

FIG. 1:
Single-Phase, 2-Wire

Confirm that the environmental conditions are consistent with the following ranges:

- **Ambient temperatures:** SurgeBan must be installed in an area with a temperature between -40° and $+160^{\circ}$ F (-40° and 70° C).
- **Humidity:** SurgeBan must be installed in an area with relative humidity between 5 percent and 95 percent non-condensing.
- **Altitude:** SurgeBan must be installed in an altitude below 16,000 feet (5,000 m).

SurgeBan must be connected in parallel with the electrical system. It must be connected to an overcurrent protection device (circuit breaker or fused switch) rated 200A maximum. If the suppressor is connected to a dedicated overcurrent protection device, it needs to be rated at 60A minimum. The advantage of using a dedicated overcurrent protection device for the suppressor (even if the upstream breaker is 200A or less) is that it allows the suppressor to be de-energized during service without disturbing the electrical service to the rest of the facility.

- Do not connect SurgeBan to the line side of the main service breaker or disconnecting means.
- Do not install SurgeBan where the available short-circuit current to the SurgeBan unit is more than 100,000A RMS symmetrical amperes at 480VAC.

Figures 1–8 show the electrical relationship between SurgeBan and these eight basic service configurations: Single-phase, 2-Wire; Split Single-phase, 3-Wire; 3-phase, 4-Wire WYE; 3-phase, 3-Wire (2 sides of WYE); 3-phase, 3-Wire DELTA; 3-phase, 2 Wire (2 sides of DELTA); 3-phase, 3-Wire Corner-grounded DELTA; and 3-phase, 4-Wire High-leg DELTA.

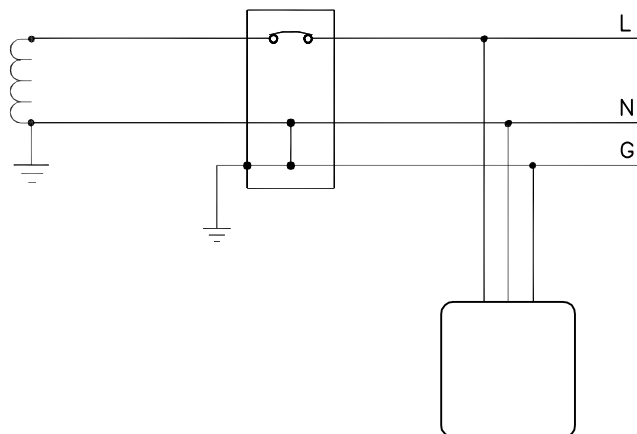


FIG. 2:
Split-Phase, 3-Wire

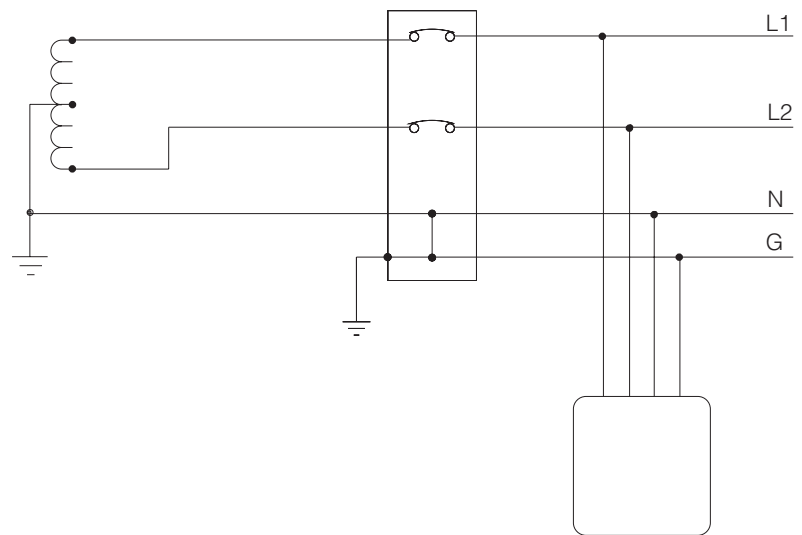
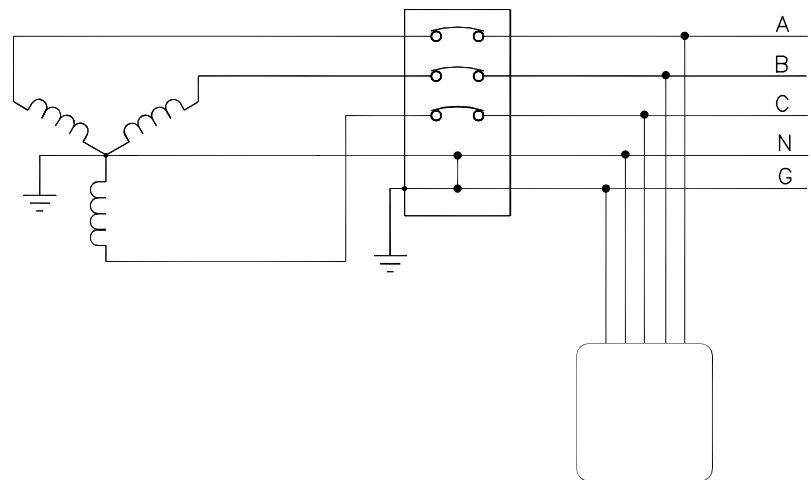
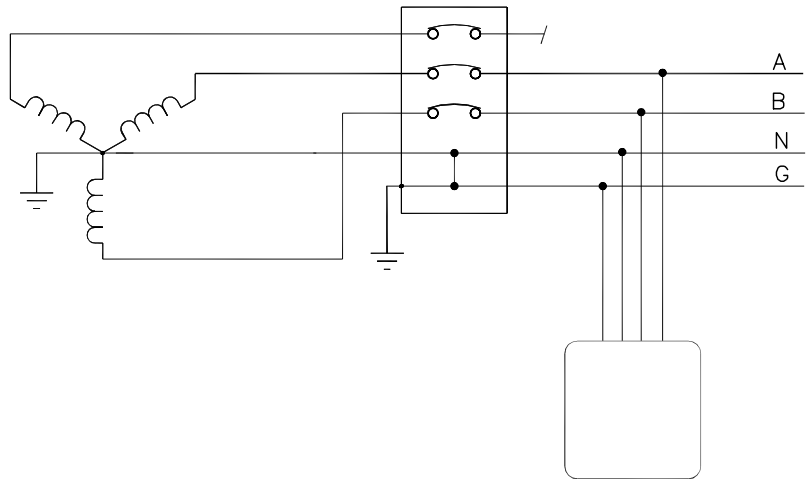


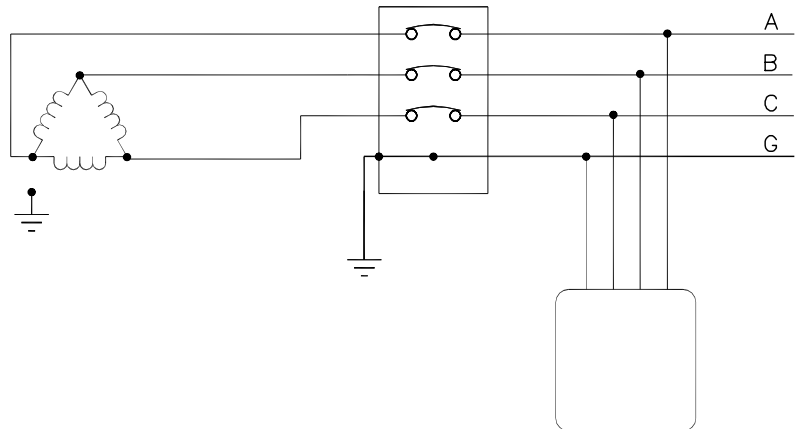
FIG. 3:
3-Phase, 4-Wire WYE



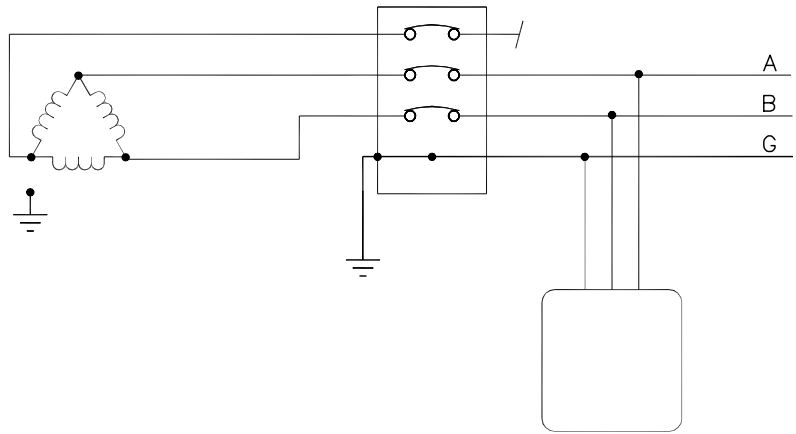
**FIG. 4:
3-Phase, 3-Wire
(2-Sides of WYE)**



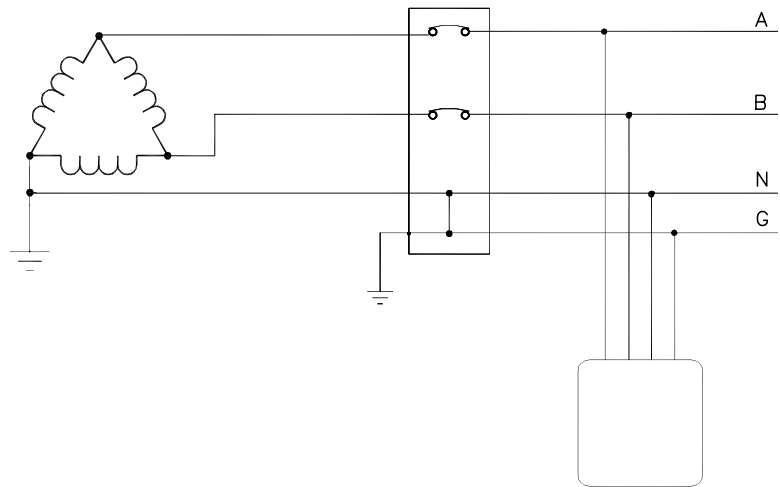
**FIG. 5:
3-Phase, 3-Wire DELTA**



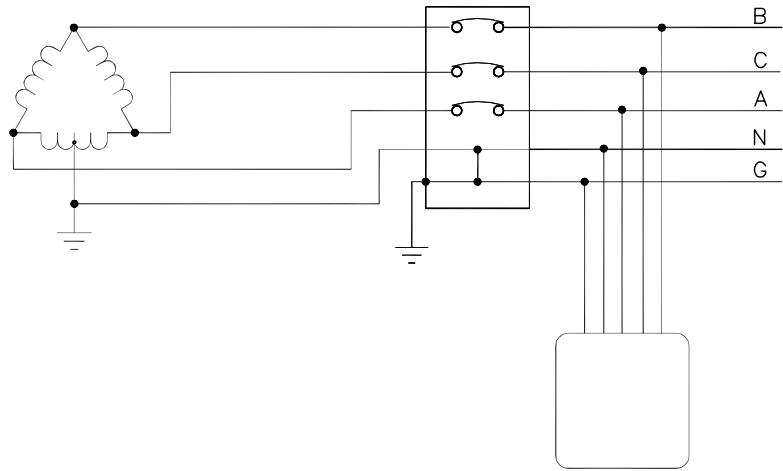
**FIG. 6:
3-Phase, 2-Wire
(2-Sides of DELTA)**



**FIG. 7:
3-Phase, 3-Wire Corner-Grounded
DELTA**



**FIG. 8:
3-Phase, 4-Wire High-Leg DELTA**



Plan Your Installation

Conductor Routing

Conductor Sizing

WARNING! SurgeBan’s performance will be limited severely if the conductors are (a) too long, (b) are of too small a wire gauge, (c) have too many bends or (d) have sharp bends.

Conductor Routing: The factors listed above should be addressed during the design of an installation to reserve a suitable place for SurgeBan next to its point of connection to the electrical system. The selected mounting location should allow for the shortest possible conductor runs and a direct route with a minimum of bends. If bends are required, they should be *sweeping* bends. Do not make sharp 90° bends for appearance purposes because they will severely decrease the effectiveness of SurgeBan.

Conductor Sizing: Joslyn recommends installing SurgeBan by using the following conductor sizes for phase, ground and neutral connections. The conductor length should be as short as possible to ensure the maximum level of protection. Use a larger conductor (#2 AWG maximum) where space and bending radii permit.

Example of a suppressor model number: SBM100-120/240-2A6B

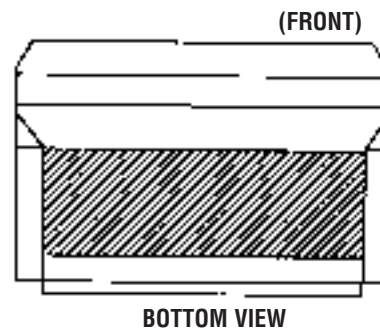
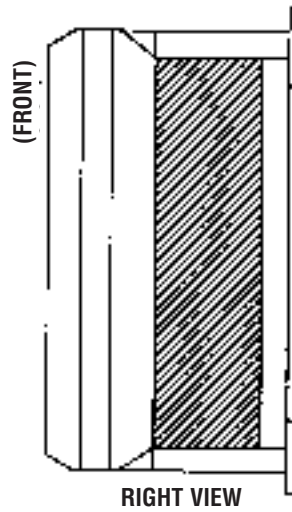
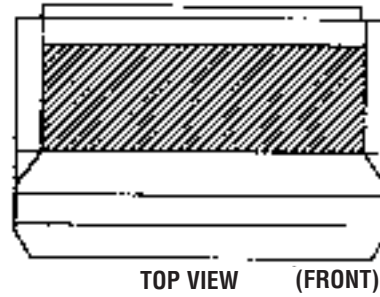
Product Label Designation	Surge Current Capacity	Conductor Size
SBx50-xxx-xxxx	50kA/phase	#8 AWG
SBx100-xxx-xxxx	100kA/phase	#6 AWG
SBx200-xxx-xxxx	200kA/phase	#4 AWG
SBx400-xxx-xxxx	400kA/phase	#2 AWG

Note: To maximize protection, the above conductor sizing recommendations ensure that SurgeBan’s effective clamping voltage at the connection point is kept to a minimum. Increasing the conductor size to compensate for distances more than 10 feet has a negligible effect on minimizing clamping voltage. Additionally, conventional voltage drop calculations appropriate for 60Hz do not apply to transients.

Conduit Openings

If desired, punch holes at this time for the conduit or nipple or wait until SurgeBan is properly mounted.

Punch holes only in the shaded areas as shown in the following illustrations:



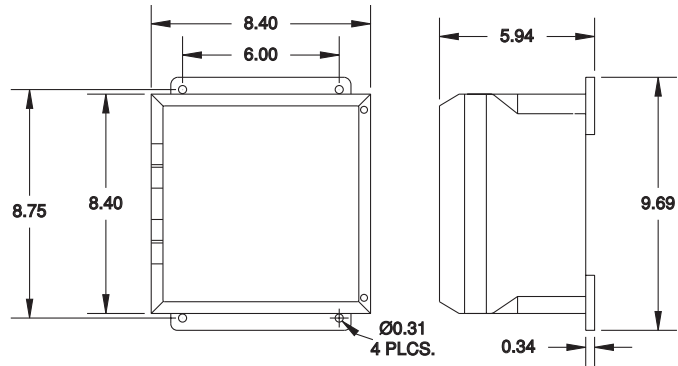
Mounting

Mount SurgeBan using construction methods and hardware appropriate for your site. Install the conduit and pull the conductors as specified above or according to the engineer's design.

Enclosure Dimensions

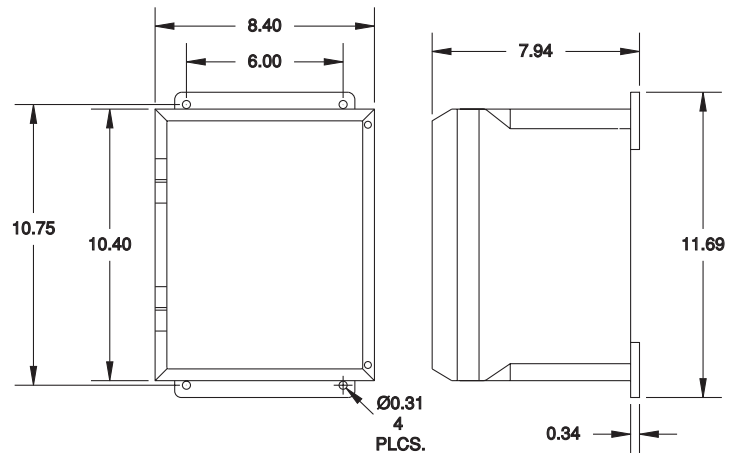
Enclosure Size: A

inches	9.69H	8.40W	5.94D
centimeters	24.61H	21.34W	15.09D



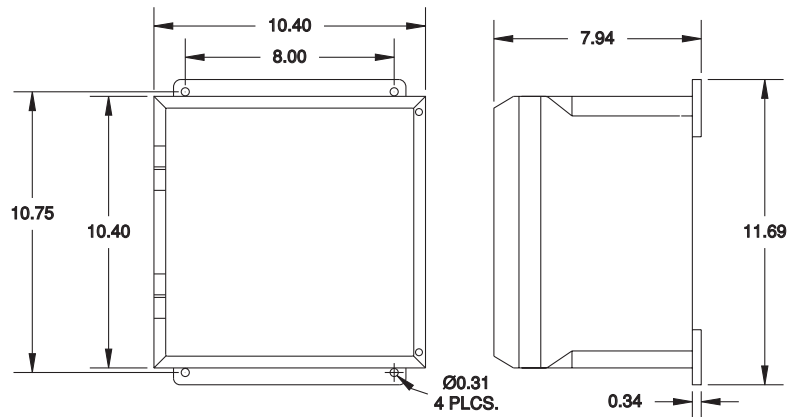
Enclosure Size: B

inches	11.69H	8.40W	7.94D
centimeters	29.69H	21.34W	20.17D



Enclosure Size: C

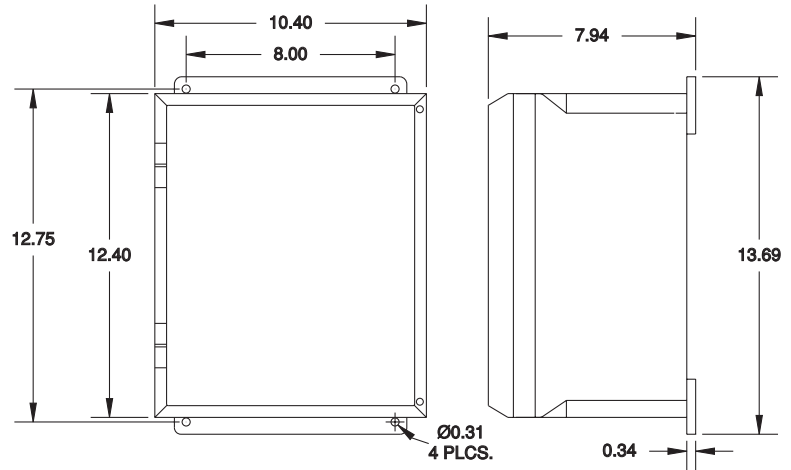
inches	11.69H	10.40W	7.94D
centimeters	29.69H	26.42W	20.17D



Enclosure Dimensions (continued)

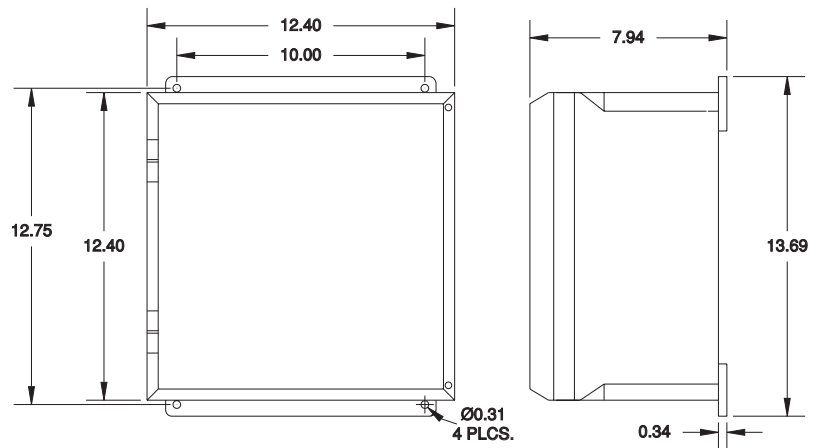
Enclosure Size: D

inches	13.69H	10.40W	7.94D
centimeters	34.77H	26.42W	20.17D



Enclosure Size: E

inches	13.69H	12.40W	7.94D
centimeters	34.77H	31.50W	20.17D



Monitoring Options

There are five monitoring options available for SurgeBan. If you are not sure which monitoring option your SurgeBan is equipped with, please check the label located inside the enclosure door.

MONITORING OPTION	DESCRIPTION
M1	Basic "COMMERCIAL-POWER" AND "MODULE STATUS" indicating lights.
M2	Basic indicating lights with Form C relay contacts for suppressor status
M3	Basic indicating lights with Form C relay contacts for suppressor and Commercial-Power status
M4	M3 plus audible alarm with alarm silence switch
M5	M4 plus surge counter

Electrical Connections

Phase, Neutral* and Ground: Following all applicable National Electrical Code standards as well as state and local codes, connect the phase, neutral* and ground conductors to SurgeBan's lugs. Ensure that the conductor lengths are kept as short and straight as possible. The lugs can be rotated to face in the direction of the cable exit by loosening the nut on the input terminal lugs in the suppressor. Tighten all lugs to 20 in-lb (2.2 Nm). The Phase B (color-coded orange according to NEC) conductor must be connected to the Phase B terminal of the suppressor.

*DELTA-connected SurgeBan does not have a neutral conductor.

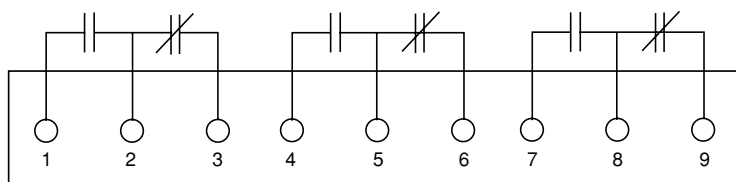
Connecting Form C Dry Contacts

Remote Alarm Relays (M2 Option): SurgeBan units equipped with the optional remote alarm relays have a dual set of Form "C" dry contacts for connection to a user-provided remote alarm and monitoring circuits. The contacts work with the bicolor indicating light (green = healthy and red = fault) labeled "Module Status" on the enclosure door. They will change state when a suppression or filter module has failed. The relay contacts are rated 110V DC/125V AC with maximum switching power of 30W DC/62.5VA AC.

The installer must provide the appropriate raceway and wiring for the monitoring circuit, observing the restrictions and conduit openings illustrated in an earlier section of this manual. The installer must route the monitoring conductors to the terminal blocks on the door-mounted main monitoring board. Route the wires to allow the door to open and close properly. Tighten screws on terminals to 4.5 in-lbs (0.5 Nm). See Fig. 9 for the Form "C" contact configuration. The annotations on the diagram match the markings on the terminal block.

**Fig. 9:
Remote Monitoring
Terminal Block**

(contacts shown during normal conditions with power energized)



FCC TERMINAL BLOCK C

Commercial-Power Relay (M3 Option): This optional Form "C" relay enunciates the status of the site's commercial power. The relay will change to the alarm state when the line voltage drops to 50 percent of nominal for duration of 10 cycles on any phase. See Fig. 9 for the contact configuration. The relay contacts are rated 150V DC/125V AC with maximum switching power of 30W DC/60VA AC.

**Before Applying Power:
Checklist**

Confirm Pre-Installation Checklist: Confirm that the "Pre-Installation Checklist" (refer to page 6 of this manual) was completed correctly before proceeding.

Confirm Line Voltage: Measure the line to neutral and/or line to line voltages of the facility's electrical system and be sure it is within SurgeBan's rated line voltage. Use the following to determine the range of acceptable voltages for each SurgeBan model.

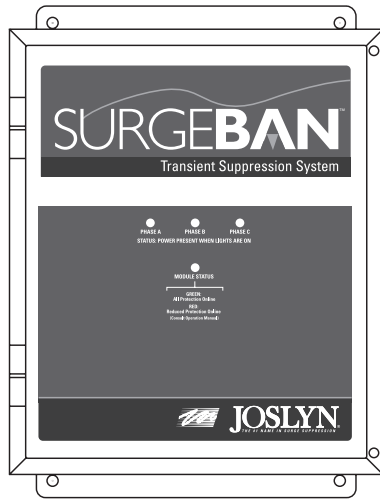
Acceptable Voltage Ranges

Product Label Designation	Line-to-Neutral Voltage Acceptable Range	Line-to-Line Voltage Acceptable Range
SBxxxx-120-1xxx	102-132 VAC	N/A
SBxxxx-127-1xxx	108-140 VAC	N/A
SBxxxx-120/240-2xxx	102-132 VAC	204-264 VAC
SBxxxx-208/120-3xxx	102-132 VAC	177-229 VAC
SBxxxx-220/127-3xxx	108-140 VAC	187-242 VAC
SBxxxx-230-1xxx	196-253 VAC	N/A
SBxxxx-240-5xxx	N/A	204-264 VAC
SBxxxx-240/120-7xxx	102-132 VAC (A and C Phases) 177-229 VAC (B Phase)	204-264 VAC
SBxxxx-277-1xxx	236-305 VAC	N/A
SBxxxx-400-5xxx	N/A	340-440 VAC
SBxxxx-400/230-3xxx	187-264 VAC	340-440 VAC
SBxxxx-480-5xxx	N/A	408-528 VAC
SBxxxx-480/277-3xxx	236-305 VAC	408-528 VAC

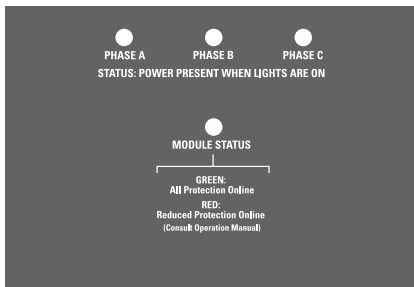
WARNING!

WARNING! Do not apply power if the measured voltage is not within the range specified for the SurgeBan model being installed.

Verify Proper Operation



Standard Door Overlay



M1 Monitoring

Apply power to SurgeBan by closing the circuit breaker or molded-case switch feeding the suppressor.

If you have either M4 (audible alarm) or M5 (surge counter) monitoring options, be sure to re-enable the audible alarm by pressing the "ALARM SILENCE" button. The "ALARM SILENCED" light should not be illuminated and the alarm should not be audible. (See diagrams shown on next page)

Depending on the monitoring option your SurgeBan came with you can verify proper operation of the unit as follows:

All SurgeBan units come with the M1 (standard indicator lights) basic monitoring. The enclosure cover has two rows of indicating lights. The first row shows the status of the commercial-power feeding the suppressor. They are labeled Line 1, Line 2 for the single and split single-phase units and Phase A, Phase B and Phase C for the three-phase units. Amber lights indicate a normal condition for each phase. No lights illuminated indicate the loss of the input power to the suppressor.

The second row of indicating lights is labeled "MODULE STATUS" and shows the status of the suppressor. The green light indicates that all of the suppression and filter modules are functioning properly. If any one of the modules fails, the light changes to red.

If your SurgeBan has the M2 (remote alarm relays) or M3 (commercial power relay) Monitoring Option:

Verify that all M1 indicating lights, "COMMERCIAL-POWER STATUS" and "MODULE STATUS," are illuminated.

The M2 (remote alarm relays) monitoring option provides two sets of Form "C" relay dry contacts for the suppressor status and the M3 (commercial power relays) option provides one set of Form "C" relay dry contacts for the commercial-power status. Figure 9 on page 16 shows the state of these dry contacts in normal energized conditions. When all suppression and filter modules are functional and power is present to all phases, terminals "1 and 2" and "4 and 5" are an open circuit while terminals "2 and 3" and "5 and 6" are a closed circuit. The contacts change state when one or more modules have failed.

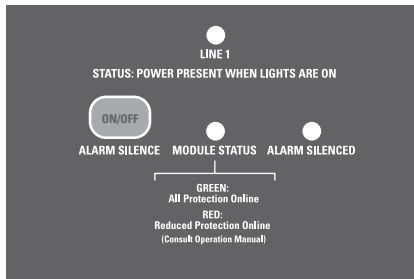
Similarly, when input power is present in all phases, terminals 7 and 8 are an open circuit and terminals 8 and 9 are a closed circuit. The contacts change state when the unit is encountering loss of power to one or more phases.

Test the operation of the Form "C" contacts by de-energizing SurgeBan and checking the state of the contacts with a continuity tester or observing the effect of the contacts on the user-provided remote alarm circuits.

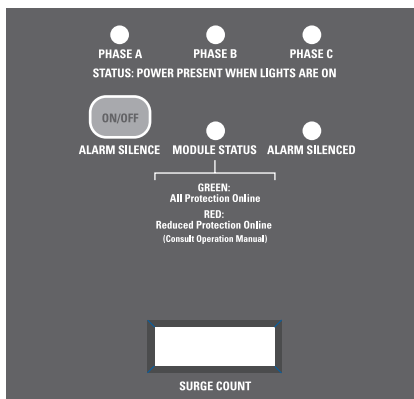
If your SurgeBan has the M4 (audible alarm) Monitoring Option:

Verify that all M1 power status indicating lights, COMMERCIAL-POWER STATUS" and "MODULE STATUS," are illuminated.

The M4 (audible alarm) monitoring option contains an audible alarm that should not operate under normal conditions. The audible alarm can be "muted" by pressing the "ALARM SILENCE" button, which subsequently will illuminate the "ALARM SILENCED" light. Pressing the "ALARM SILENCE" button again will enable the alarm.



M4 Monitoring, Audible Alarm Option



M5 Monitoring, Surge Counter

If your SurgeBan has the M5 (surge counter) Monitoring Option: The M5 (surge counter) monitoring option is equipped with a surge event counter in addition to the L4 monitoring features described above. The number of surges detected by the suppressor is displayed on an eight-digit LCD display on the front of the SurgeBan door. The counter is powered by a 10-year lithium battery, which is built into the display.

Troubleshooting

Your SurgeBan system does not require scheduled maintenance. The unit's heavy-duty construction is designed to provide years of uninterrupted service.

INDICATION	PROCEDURE
One or more commercial-power status indicating lights are off	Verify that the input power feeding SurgeBan is energized using a voltage tester.
The upstream circuit breaker is tripped and cannot be reset	Contact factory for assistance. 800-752-8068 or 805-968-3551, ext. 3.
"MODULE STATUS" indicating light on SurgeBan door is illuminated RED	One or more suppression/filter modules may have failed and need to be replaced. Follow the module replacement procedures below.

Module Replacement Procedure

WARNING!

1. A bicolor (green/red) indicating light is available on the side of each module to help you visually identify the failed module(s). Carefully open the SurgeBan door while the power is still applied to the suppressor and visually identify the module(s) with a side-mounted RED indicating light.

WARNING! HAZARDOUS VOLTAGES ARE PRESENT WITHIN THE SUPPRESSOR ENCLOSURE. USE EXTREME CAUTION WHEN PERFORMING THIS TASK.

2. Remove input power to SurgeBan by disconnecting the upstream overcurrent protection device. **Verify that the circuits are de-energized by using a voltage tester. The indicating lights on the suppressor should not be illuminated at this time.**

Module Replacement Procedure

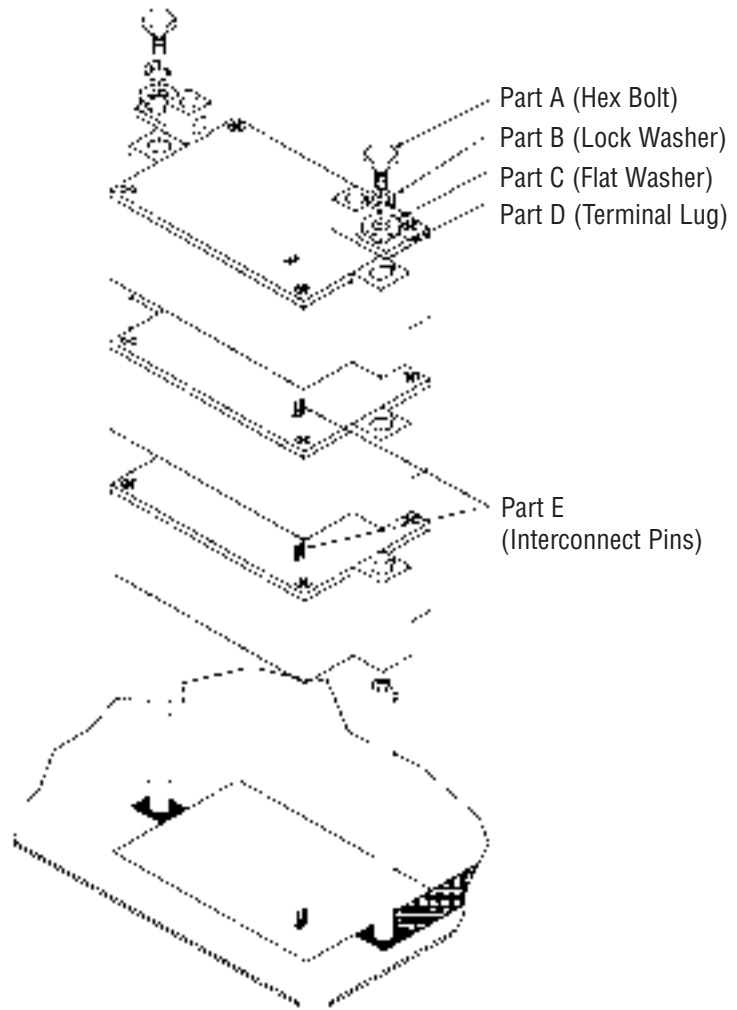


Figure 10:
Module Replacement

3. Using a standard flat-head screwdriver remove the hex bolts (Part A), lock washers (Part B) and flat washers (Part C) on the top module(s). You may need to remove the power terminal lugs (Part D) before removing the bolts holding the modules.
4. Slide the failed module(s) out.

Note: There are small interconnect pins (Part E) between modules. The pins are used to monitor the status of each module. If the pins are not properly re-installed in next step, indicating lights on the side of the modules will not illuminate.

5. Slide the replacement module(s) along with the interconnect pins back in place. Ensure that:
 - the correct type of replacement module(s) is used. The color stripes on front and side labels easily identify the module. For example, all 100kA MOV modules have a red stripe on the top and side of the module.
 - the identification label is facing up.
 - the connection jacks are oriented directly over the interconnect pins below.
 - all the interconnect pins (Part E) are installed.
6. Secure the modules with the hardware that was removed in step 2 (Part A-C) with a screwdriver or a nut driver. Reconnect the power terminal lugs (Part D) if they were removed previously.
7. Tighten the bolts to 20 in-lbs (2.2 Nm).
8. Close enclosure door.
9. Apply power to SurgeBan by closing the upstream overcurrent protection device. The "MODULE STATUS" light on the SurgeBan door should be illuminated GREEN. If the "MODULE STATUS" light is illuminated RED, review repeat steps one through nine.
10. Carefully re-open the door while the power is applied to the suppressor and visually verify that all of the status lights on the side of the modules are illuminated GREEN.

WARNING!

WARNING! USE CAUTION! HAZARDOUS VOLTAGES ARE PRESENT IN THE ENCLOSURE.

Missing status light(s) on the side of module(s) indicates that you are missing interconnect pins (Part E). If so, repeat module replacement steps again.

11. Close and secure the door.

Technical Assistance

Returns and Warranty Procedures

Our staff is ready to support you and answer any questions.

**Monday through Friday, 7:00 a.m. to 5:00 p.m. (PST)
800-752-8068 or 805-968-3551, ext. 3.**

Joslyn SurgeBan products are warranted for a period of 10 years from date of shipment. A five-year warranty extension is available.

In the event that any module or subassembly within the suppressor fails to perform as specified during the warranty period, call our Technical Support at 800-752-8068 or 805-968-3551 to obtain a Return Material Authorization number. We will immediately ship a replacement for the defective parts free of charge (installation labor and site preparations excluded).

Return the defective parts to Joslyn within 30 days of receiving the replacement. Failure to return the defective parts will result in billing for the replacement parts. To help expedite the return procedures, please have the following information at hand when you contact Joslyn:

INFORMATION	EXAMPLE
Model Number	SBM200-120/240-2A6B
Date Code	2100
Date of Purchase	September 2000
Sales Order Number	C019047
Description of Failure	Cannot silence the audible alarm
Desired Action from Joslyn	Repair and return

Warranty Statement

The Company warrants that the purchased item (the "Product") shall meet Joslyn standards and specifications and be free from defects in materials and/or workmanship. Should any failure to conform to this warranty appear within ten (10) years of the date of shipment of the Product, the Company shall either repair or replace the defective Product, or part thereof, upon return to its manufacturing facility. A Return Material Authorization (RMA) number must be obtained from the Company's Customer Service department before returning any Products.

The Company shall have no liability under this warranty for problems or defects directly or indirectly caused by misuse of the Product, alteration of the Product (including removal of any warning labels), accidents, improper installation, application, operation, or improper repair of the Product.

THIS WARRANTY REPRESENTS THE ENTIRE WARRANTY OF THE COMPANY. ALL OTHER WARRANTIES EXPRESS OR IMPLIED, ORAL OR WRITTEN, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

The liability of the Company, at its sole option, under this warranty is expressly limited to the replacement or repair of the defective part thereof. IN NO EVENT SHALL THE COMPANY BE LIABLE OR RESPONSIBLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR CHARACTER, NOR SHALL ITS LIABILITY EVER EXCEED THE PURCHASE PRICE PAID FOR SUCH DEFECTIVE PRODUCT.

Claims under this warranty must be submitted to the Company within thirty (30) days of discovery of any suspected product defect.

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Locations in Goleta, CA and Irving, TX

Tel: 800.752.8058
805.968.3551

Fax: 877-822-8406
805-968-0922
805-968-8491

Learn more about Joslyn surge protectors
at <http://www.joslynsurge.com>