

instruction
bulletin

**Sag Fighter™
Power Conditioner**



NOTICE



Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

 DANGER
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DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
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 WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.
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 CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. This document is not intended as an instruction manual for untrained persons. No responsibility is assumed by Square D for any consequences arising out of the use of this manual.

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1. SAFETY PRECAUTIONS

This chapter contains important safety precautions that must be followed before attempting to install, service, or maintain electrical equipment. Carefully read and follow the safety precautions outlined below.



HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Only qualified workers should install this equipment. Such work should be performed only after reading this entire set of instructions.

NEVER work alone.

Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.

Turn off all power supplying this equipment before working on or inside.

All enclosures must be grounded, using the provided grounding lugs and/or studs, and all applicable National Electrical Codes and local codes must be observed.

DO NOT expose the unit to rain or any type of moisture.

DO NOT install unit in any environment where it may be exposed to flammable, combustible, explosive, abrasive or corrosive vapors, fumes, liquids, mists or dust.

Unit should be installed only in an area where it is protected from vibration, heat sources, accidental or intentional damage.

Maintain recommended unit orientation and clearances around the unit to prevent overheating.

Beware of potential hazards, wear personal protective equipment, carefully inspect the work area for tools and objects that may be left inside the equipment.

The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Failure to follow these instructions will result in death or serious injury.

2. INTRODUCTION

General

The Sag Fighter Power Conditioner is an electronic voltage regulator designed to protect sensitive loads from the effects of voltage sags. Today, many industrial loads can be disrupted or damaged by supply voltage reductions lasting only a few electrical cycles. These disruptions commonly occur as a result of transmission and distribution line faults, such as during a storm, or due to animal contact and other accidents.

Features

The Sag Fighter Power Conditioner normally operates in a low loss bypass mode. When a voltage disturbance is detected, the unit responds within 2-3 milliseconds to correct the output voltage to rated or near-rated value for an indefinite time period (although normally sags persist for only a second or less). The Sag Fighter Power Conditioner corrects for voltage reductions down to 35% on one or two phases, and for reductions down to 60% on all three phases. Additionally, waveform distortion and phase shifts which often accompany sags are corrected to provide a sinusoidal, regulated voltage to the load.

Rugged Construction - All magnetic and electronic components are generously sized to handle severe duty. Electronic components and microprocessors are encapsulated to protect against environmental and physical damage.

Self Protection – All units are protected against system transients and overvoltages by an input choke, and a Surge Protection Device (80 kA surge current rating, category C3)

No Harmonic Interactions – The unit is unaffected by harmonic voltages and currents, and produces no distortion during normal operation.

High Overload Capacity - Motor starting and momentary overloads will not trip the unit, and output short circuits will not damage the unit.

Auto Bypass – Failure of any component, including power supply, semiconductors, or microprocessor, results in a seamless transition to bypass with no interruption to the load. The unit will also auto bypass on detection of overcurrent or overtemperature.

Diagnostic Display – Non volatile memory records date, time, and duration of sag events and diagnostic information.

3. INSTALLATION

Immediately upon receipt of the unit, inspect the unit(s) internally and externally for signs of shipping damage and/or mishandling (e.g. broken, loose or bent parts, dents, holes, etc.). If damaged, photograph all damage, file a claim with the carrier, and contact manufacturer for further instructions.

Mounting

The minimum spacing around the enclosure must be as indicated in Figure 1 to ensure adequate ventilation. The unit must be mounted on a concrete floor or other non-flammable and non combustible surface.

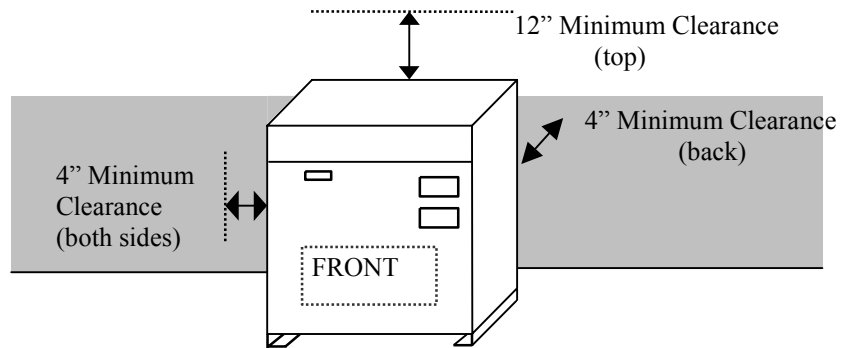


Figure 1. Minimum Spacing Requirements, excluding space required for conduit entry/exit

Environmental

Units are heavy. Take care not to drop or jar unit as damage may result.

When selecting a location for installation of the unit, the following environmental conditions must be met:

- Ambient temperature: 0°C - 40°C (32°F - 104°F)
- Relative Humidity: < 95% non-condensing
- Altitude less than 10,000 feet above mean sea level
- Ambient environment must be free of flammable, combustible, explosive, abrasive or corrosive vapors, fumes, liquids or mists or particulate or dust of any kind
- If unit is to be located in an enclosed space, there must be a sufficient volume or supply of air such that the ambient air temperatures are not exceeded.
- Locate where unit will not be intentionally or accidentally exposed to liquids, mists, sprays or vapors of any type and where it is protected from vibration, heat sources, accidental or intentional damage or tampering from other equipment, machinery or unauthorized personnel.

Conduit Entry / Exit Locations

The conduit entry/exit holes must be punched in the sides or back of the rear portion of the enclosure (the side with the transformers), so that the power conductors run to the circuit breaker and output lugs through the hole(s) provided in the barrier panel.

Electrical Connections

The Sag Fighter Power Conditioner is designed to operate from a voltage source as indicated on the nameplate, and to power loads whose maximum continuous kVA does not exceed that indicated on the nameplate. **Ensure that the source voltage and maximum load KVA conform to the nameplate rating on the front of the unit.**

The Sag Fighter Power Conditioner is a series connected device, and is installed much like a transformer, between the supply lines and the load(s) being protected as shown in Figure 2. Remove the cover and upper portion of the front panel to access the input/output lugs and/or connectors. **USE CAUTION IS THE LOWER PORTION OF THE FRONT PANEL IS REOED SO THAT THE LCD DISPLAY RIBBON CONNECTOR AND BYPASS SWITCH LEADS ARE NOT DAMAGED.** Sufficient slack has been provided in these leads so that the panel can be removed and set aside during installation if necessary.

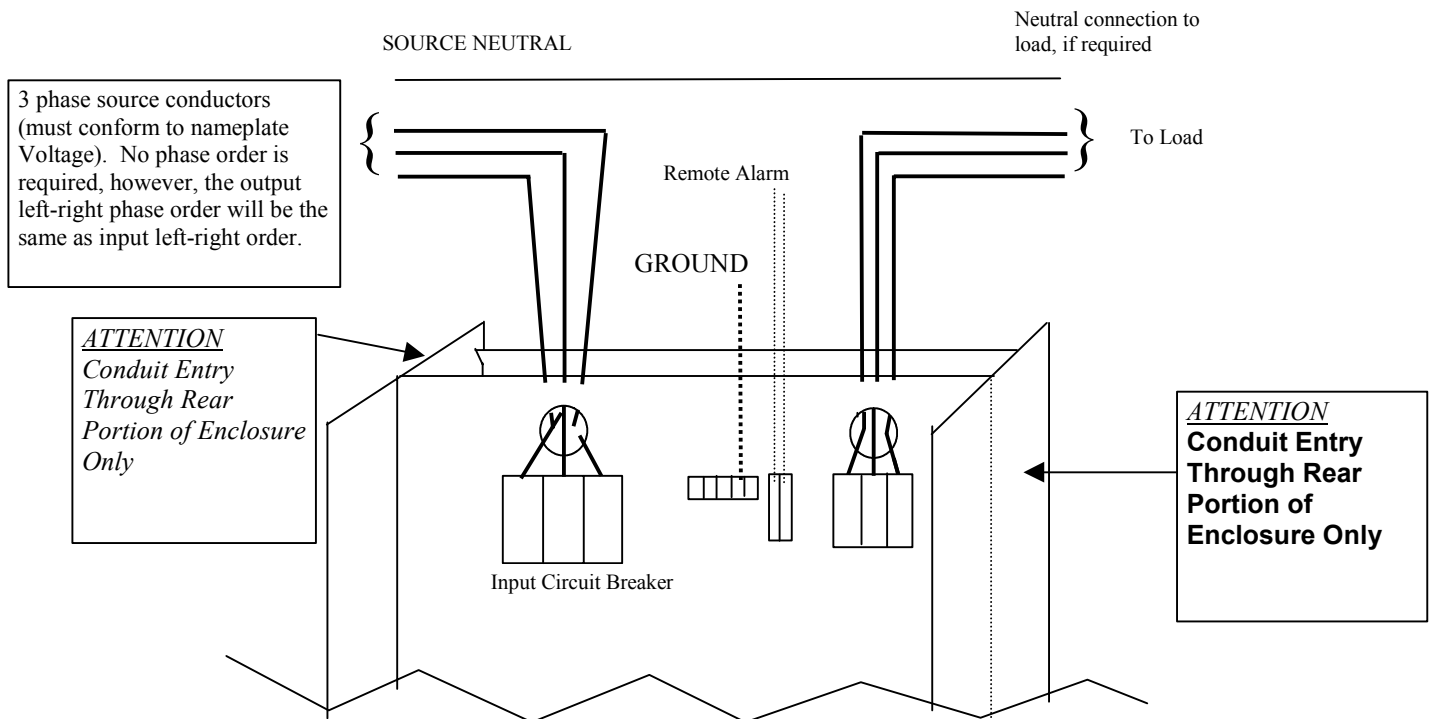


Figure 2. Electrical Connections

4. START-UP

Power may be applied to the unit AFTER the following conditions have been met:

- 1) All power and ground cable connections have been secured.
- 2) The enclosure has been closed.
- 3) The disconnect or circuit breaker operating mechanism, if so equipped, is in the OFF position.
- 4) The Bypass/Auto Switch is in the 'Bypass' position.

Procedure

- A) Turn the circuit breaker to the 'On' position. The unit is now operating in manual bypass mode, during which the LCD display is NOT active. Under this condition, load may be applied to the unit, but there will be no sag correction.
- B) Turn the Auto/Bypass switch to the "auto" position (Normal Operation). The LCD display will now begin a brief self-check, during which a 5 second countdown timer will be displayed. At the end of this initialization countdown, the display will briefly go blank, followed by a display which indicates the number of sags, internal temperature, and other information.

The unit has been fully calibrated at the factory and requires no user adjustment upon startup.

5. OPERATION / DIAGNOSTICS

Features

The Sag Fighter will maintain a log of up to 100 each of sag events, overcurrent events, and overvoltage faults. The record of these events (date, time and sag duration) is permanent until it is cleared by the user. Each event will be recorded with the date and time of the event.

Battery-backed clock

The calendar/clock chip is located to the left of the main microprocessor. It is accurate to +/- 15 seconds each month. The clock will recognize the correct number of days in each month, however, it will need to be re-set at the end of February during leap years.

Battery replacement

The battery should last for more than 3 years. To replace the battery, first de-energize the Sag Fighter or place the Sag Fighter in manual bypass to avoid any accidental contact with the microprocessor which could disrupt the operation of the Sag Fighter.

Display

During normal conditions, the display on the Sag Fighter will indicate the number of recorded sags, the heatsink temperature, the activation setpoint % and whether any faults have been recorded.

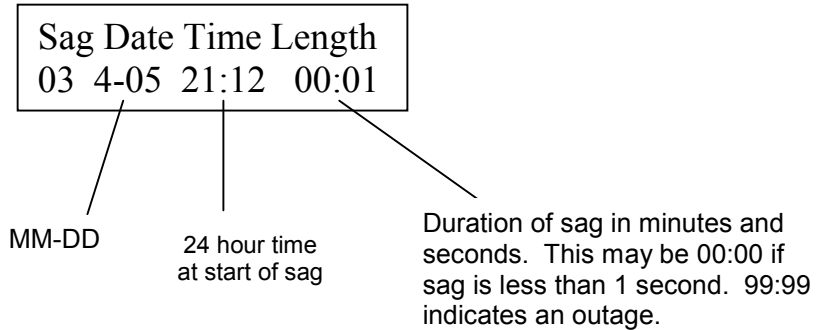
The activation setpoint is adjustable from 70% to 97% using the potentiometer mounted behind the door. Turning the potentiometer clockwise reduces the target setpoint. It is recommended that the setpoint be 95% or less.

The LCD may display 'garbage' when the Sag Fighter is correcting for a sag. This is normal and will be cleared shortly after the sag is corrected.

Sag/Fault Log

To enter the sag and fault log, press and hold the select button until the log appears. To set the time only, press the button when prompted. Otherwise, the sags and fault information will be displayed sequentially. Each sag and fault will be displayed for 5 seconds, or the

button maybe pressed at each entry to advance to the next entry.



Note that the maximum number of sags and faults which can be stored is 100 (of each event). If this number is exceeded, all events greater than #100 will not be recorded. The log should be erased at this point so that recording can continue.

After all of the sags and faults have been displayed (or immediately if the user has selected to set the time only), the current time will be displayed, and the date and time may be set. Follow the menu instructions to set the date and time, pressing the button to advance each date and time setting.

Overcurrent Faults

An overcurrent fault occurs when the inverter current exceeds its maximum current while a sag is being corrected. This is normally the result of inrush current into the series transformer at the beginning of sag correction. The Sag Fighter will normally limit the inrush to below the maximum rating of the inverter, however during very deep 3 phase sags this may occasionally be exceeded. If there is an overcurrent error for each sag event, this normally indicates a failed (shorted) SCR. This can be checked by measuring the voltage across each of the 2 SCR switches when the Sag Fighter is loaded. The AC voltage should be approximately 1.0 to 1.3 Vac. If the voltage is 0.6V or less, the SCR needs to be replaced.

Overvoltage Faults

Because very small deviations in the supply voltage will activate the Sag Fighter, if the setpoint is too high, the Sag Fighter may activate when the input voltage is higher than rated voltage but there is some disturbance in the sinusoidal waveform. Under these conditions, if the load on the Sag Fighter is high enough, the DC bus voltage will rise when the Sag Fighter activates and there will be an overvoltage error. This is normally the only way that an overvoltage fault will occur. If there are many overvoltage errors, the setpoint should be reduced.

Manual (Service) Bypass

Units equipped with a manual bypass can be bypassed without interruption to the load (closed transition), so that the unit can be serviced while off-line.

Bypass Procedure:

- 1) Turn 'Bypass-Auto' switch to 'Bypass'. The LED display should go blank.
- 2) Place the interlocked bypass power switch in the 'Bypass' position (using either manual or pushbutton operator).
- 3) Open the Sag Fighter input circuit breaker.



WARNING

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After placing the unit in manual bypass, wait at least five (5) minutes before accessing internal components so that the DC bus capacitors have time to discharge.

Failure to follow these instructions can result in death, serious injury, or fire.

Remote Alarm

The unit is equipped with a normally closed remote alarm contact rated 1A, 120VAC, accessible at TB1 next to the output connector block. The alarm contact will be CLOSED under the following circumstances:

1. There is no power applied to the unit
2. Power is applied, but the input circuit breaker has tripped, or a control power transformer fuse has blown
3. The power supply has failed
4. The heatsink temperature exceeds 60°C
5. There has been a failure requiring service (this will result in a permanent bypass)

See troubleshooting section for details.

6. MAINTENANCE

The Sag Fighter Power Conditioner requires little maintenance to operate reliably when operating under proper environmental conditions.

Sag Fighter Power Conditioner units rated greater than 50 kVA may contain a temperature activated blower, with filtered air intakes located in the front bottom of the enclosure, and air outlets located at the top front of the enclosure. The clearances indicated in Section 2 must be observed in order to allow proper air flow.

7. TROUBLESHOOTING

Symptom	Correction
No LCD display after power is applied and unit is in 'Auto' mode	<ol style="list-style-type: none"> 1) Check Circuit Breaker and CPT fuses. 2) 2) Check LCD ribbon cable connection
LCD display is locked, and does not display sag counter and heatsink after 5 second self check	<ol style="list-style-type: none"> 1) Check system Voltage and frequency 2) Ensure incoming voltage is not lower than 85% of rated nameplate voltage 3) Contact factory
"High Temperature" is displayed	<ol style="list-style-type: none"> 1) Check /clean air filter, ensure mounting and environmental requirements are met (See Section 3)
LCD displays "Service Required"	<ol style="list-style-type: none"> 1) Turn 'Auto/Bypass' switch to 'Bypass' 2) Contact Factory



WARNING

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All troubleshooting and/or required maintenance is to be performed by qualified personnel only with incoming power disconnected, except as required to measure voltages. Such personnel must be familiar with industrial electrical apparatus and all safety and other precautions required to service such equipment.

Failure to follow these instructions can result in death, serious injury, or fire.

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