

## Power Sequencer

MODELS PS-8, PS-8R, PS-8E and PS-8RE

## Instruction Sheet



### PS-8 Features

- Power-up in three delayed outlet groups
- Power-down reverses sequence
- Triple-mode varistor spike and surge suppression
- RFI filtering with multi-stage pi filter
- Power Status LED's indicate which outlet groups have power
- Mains Wiring indicators monitor wiring integrity, show Normal and five kinds of faults
- Rated 15 amps
- Remote option allows turn-on and turn-off at a distance simply by connecting a momentary or maintained-contact switch (and LED if desired)
- Multiple units may be linked to handle higher currents and/or more than three delay groups
- Three pairs of switched outlets on rear panel
- Three unswitched outlets (one front, two rear)
- Circuit breaker
- Ten foot heavy duty A.C. cord
- Three year limited warranty

### Introduction

Congratulations on your purchase of a Furman **PS-8 Power Sequencer**, a well-designed, reliable, and simple to use product that will help you avoid many headaches involved in installing a rack full of complex equipment.

The PS-8 Power Sequencer is needed whenever various kinds of equipment must be powered up or down in groups, rather than all simultaneously. In audio systems, sequenced powering is often necessary to allow turn-on transients from low level amplifiers and processors to settle down before any power amps are turned on, because simultaneous powering would result in a loud, annoying, and potentially destructive "pop" reaching the speakers. And in any large system whose components present an inductive load to the AC line (including electric motors, power supplies, and power amplifiers of all kinds), sequenced powering can avoid excessive inrush currents that cause circuit breakers to trip even though the steady-state currents are not excessive.

### Power Sequencing Features

Using the PS-8 is a simple and inexpensive way to apply and remove power in a controlled, repeatable, foolproof 3-step sequence. It is ideal when large installations must be switched by inexperienced personnel.

The PS-8 provides three outlet pairs labeled Delay 1, Delay 2, and Delay 3, that receive power approximately 1/2, 5, and 10 seconds, respectively, after the front panel switch is thrown to "ON." When thrown to "OFF," the sequence is reversed, with Delay 3 losing power after approximately 1/2 second, Delay 2 after 5 seconds, and Delay 1 after 10 seconds. See the rear panel illustration on the next page. The turn-on delay intervals are factory preset at these durations, but may be altered by means of an internal trimpot adjustment (see "Adjusting the Delay Intervals" below for details). In addition to the delayed outlets, a single front panel outlet and a rear panel pair are unswitched. Power is available at the unswitched outlets regardless of the position of the front panel (or remote) switch. All rear panel outlets are standard 120V, 15A duplex types. Isolated-ground "Super Spec" outlets are available by special order.

In the event of a power out, of course all equipment plugged into a PS-8 will lose power simultaneously. However, when power is restored, the delayed outlet groups will again turn on in the usual delayed sequence.

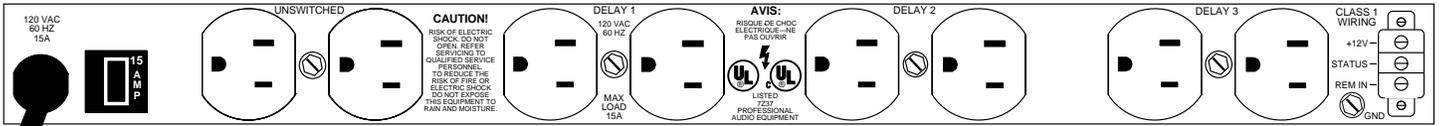
We recommend that power amps receive power last — plug them all into Delay 3 or divide them into two groups and plug one group into Delay 2 and the other into Delay 3. Low level equipment such as mixers and signal processors should use Delay 1.

Equipment incorporating clocks or timers such as VCR's, or equipment that must respond to wireless remote actuation should use the unswitched outlets. We suggest keeping the front panel unswitched outlet free for equipment that is only in use temporarily.

The overall capacity of the PS-8 is 15 amps. This refers to the combined steady-state current drawn by all devices plugged into all of its nine outlets. If this combined current level exceeds 15 amps at any time, the circuit breaker will trip, cutting off power to your rack. If this occurs, you must reduce the load by unplugging one or more units from the PS-8. Then push the white button on

# Rear Panel Outlets

Model PS-8R is shown. Model PS-8 is similar except the barrier terminal strip at right is not present.



<b>ON POWER UP:</b>	This pair of outlets plus the one on the front panel are on regardless of the switch position.	This pair of outlets comes on approx. 1/2 second after the switch is turned on.	This pair of outlets comes on approx. 5 seconds after the switch is turned on.	This pair of outlets comes on approx. 10 seconds after the switch is turned on.
<b>ON POWER DOWN:</b>	Same as above.	This pair of outlets goes off approx. 10 seconds after the switch is turned off.	This pair of outlets goes off approx. 5 seconds after the switch is turned off.	This pair of outlets goes off approx. 1/2 second after the switch is turned off.

Note: "The switch" referred to in this chart is either the front panel switch or, if used, the remote switch connected to the terminal strip of a PS-8R.

the circuit breaker (on the rear panel) down and in to reset it.

Although 15 amps is an absolute limit, the PS-8's power sequencing capability will allow you to come as close as possible to using the full 15 amps, because the risk of tripping the breaker is greatly reduced. This is because the PS-8 handles large but temporary inrush currents in stages, rather than simultaneously, allowing each stage to settle to its steady-state current draw before the next stage is powered.

## Power Conditioning Features

The PS-8 offers all basic power conditioning features besides its sequencing capability. It provides varistor spike and surge protection across all three modes (line to neutral, line to ground, and neutral to ground), responding in nanoseconds to clamp excessive transient voltages to safe levels. There is also a sophisticated multi-stage filter for blocking radio frequency line noise. The filter works to prevent noise from fluorescent lights, certain dimmers, radio transmitters, and similar sources of "electronic pollution" from leaking from the AC line into sensitive audio, video, or computer circuits. Clean, filtered power is provided at all 9 outlets, even the unswitched ones.

Despite its many protective features, you should be aware that the PS-8 does not compensate if the AC line voltage itself is high or low (i.e., it does not compensate for brownout conditions). If you frequently move your rack to different locations, derive power from generators, use long extension cords, travel internationally, or are in an area particularly prone to brownouts, you may benefit from the use of one of Furman's AC Line Voltage Regulators in addition to the PS-8. If you do use a voltage regulator, run the raw power line into the regulator first so that the PS-8 receives a stabilized voltage to distribute.

## Mains Wiring Fault Analyzer

The PS-8 also assists in analyzing any faults that may occur in the AC mains wiring. Two green and one red neon indicators light in a specific pattern for normal wiring and in different patterns for various faults. When the AC wiring is correct, both green indicators will be lit, but not the red indicator. If any other pattern of indicators is lit, a fault is present. The chart next to the indicators identifies its exact nature. Since any wiring fault presents a potentially serious safety hazard, the assistance of a qualified electrician should be obtained in correcting the problem.

## Adjusting the Delay Interval

The delay interval (the time between the turn-on or turn-off of outlets 1 and 2, or 2 and 3 — not 1 and 3) is factory preset at approximately 5 seconds. It is possible to lengthen or shorten the delay interval by making an internal adjustment to the PS-8. However, due to the risk of electric shock, this procedure should only be done by a qualified technician.

Unplug the PS-8 and remove its top cover by unscrewing the four screws that secure it. The delay adjustment is Trimpot VR1, located on the printed circuit board near the front left corner. It is the only trimpot on the board. It is equipped with a thumbwheel for easy adjustment. The range of adjustment of the delay interval is from a minimum of about 1 second to a maximum of about 7 seconds.

## 220/240V Versions (Units with "E" Suffix Only)

Models PS-8E and PS-8RE are intended for use in countries with nominal 220 to 240 volt AC lines. They are identical to the PS-8 and PS-8R except their rear panel outlets are the internationally-accepted IEC-320 connectors. They are rated at 10 amps.

# Remote Switching (Units with “R” Suffix Only\*)

Model PS-8R and PS-8RE differ from the corresponding models without the “R” suffix in the addition of a barrier terminal strip on the rear panel that allows a switch to be connected to turn the unit on and off at a distance, and also in the START ON-OFF SEQUENCE pushbutton on the front panel.

In the most basic configuration, only two Class 1 wires and an SPST switch are needed to initiate an ON or OFF sequence. The switch may be either a momentary or maintained-contact type. If a third wire is used, an LED may also be installed at the remote end to indicate that the power is on.

## Maintained vs. Momentary Contact Switching

*Maintained* switches, such as most toggle switches and push-on/push-off button switches (including the Furman RS-1), stay open until thrown, then stay closed until thrown again. *Momentary* switches, usually pushbutton types like the Furman RS-2, are normally open and stay closed only as long as the button is pressed. An on-off switch of either kind may be used to actuate the PS-8's remote operation.

Maintained switches are generally most convenient when there is only one remote location. When more than one switch location is required, momentary switches allow the sequence to be started from any location.

PS-8R units come factory-set for maintained operation. They may be easily converted to momentary operation by moving a jumper plug on the PS-8R's circuit board. To do this:

1. Disconnect the unit from AC power.
2. Remove the four screws that secure the top cover.
3. In the rear left corner of the circuit board, there is an area labeled “REMOTE CONTROL.” There are two pairs of terminals in this area, one labeled “MAINTAINED” and the other “MOMENTARY.” There is a small black jumper linking the MAINTAINED terminals. Slide it up and off, and replace it securely over the MOMENTARY terminals.
4. Reattach the top cover.

## Maintained Mode

A simple connection of the REM IN terminal to the +12V terminal initiates an OFF sequence. Disconnecting it initiates an ON sequence. If the cable run is long, it is recommended that the REM IN wire be tied to the PS-8R's GND terminal during ON operation rather than leaving it floating. This will require the use of a third conductor and a double-throw switch.

The STATUS terminal is an output that may be used to illuminate an LED at the remote location to indicate that power is available at the PowerPort's outlets. If it is high (+5V), the unit is ON (or at least in the process of sequencing ON); if low, the unit is OFF (or sequencing OFF). Simply connect the indicator LED between STATUS and ground (do not use a series resistor). If the LED does not light when the switch is in the ON position, check the polarity and reverse the LED leads (if it is wrong). If a Furman RS-1 is the controlling switch, contact Furman's Tech Support department for the proper wiring diagrams.

In Maintained Mode, DO NOT USE the “START ON-OFF SEQUENCE” switch on the front panel. If you do, you may activate an unintended partial turn-off sequence.

## Momentary Mode

In Momentary Mode, the PS-8R has “memory” — it only needs a momentary signal from the remote switch to change its state from ON to OFF.

When first plugged in (or after power is lost and reapplied for any reason) the “memory” state is OFF. This means the unit will be OFF even if the front panel on/off rocker switch is on. It will stay off until sequenced on by a momentary connection of the REM IN terminal to +12V. The sequence starts on the rising edge of the signal.

The front panel START ON-OFF SEQUENCE switch is in parallel with, and functionally equivalent to, one or more remote momentary switches connected to the barrier strip in the rear.

The “memory” is independent of the front panel on/off rocker switch. This means that even if the unit is sequenced OFF by the rocker switch on the front panel, when the rocker switch is turned back on the unit will sequence back on — it will not be necessary to push the START ON-OFF SEQUENCE button again. The unit “remembers” its state until the incoming power is lost, which would then default back to OFF.

The front panel rocker is not the primary means of control in momentary mode, and should normally be left ON. It may be a useful secondary means of control in the rare case of having several PS-8R's in parallel, if there is some reason to shut down one unit without affecting the others.

Because it is a maintained-contact switch, the RS-1 is not an appropriate remote switch for the PS-8R when it is in momentary mode. The momentary-contact RS-2 would be the correct choice.

## Multiple Units

You can use more than one PS-8R to handle loads that exceed 15 amps. The power input for each PS-8R should come from a separate 15 amp AC circuit. To control PS-8R's remotely with one or more remote switches, connect the REM IN +12V (and optionally GND) terminals of all units together. Be sure that the mode (momentary or maintained) of all units is set the same. Connect a single maintained switch or one or more momentary switches to the nearest PS-8R, as discussed above. If you are unsure whether your building wiring can accommodate multiple fully-loaded PS-8's or PS-8R's, consult a qualified electrician.

If multiple PS-8R's are controlled by one or more momentary remote switches, they will all change state (from on to off or vice versa) on each rising edge of the voltage on the REM IN terminal. Any remote switch AND any of the grey pushbuttons on any unit's front panel will toggle all the units. The rocker switch on each unit's front panel will turn off any individual unit that is currently on, without affecting the other units.

The STATUS lines work the same in either mode. Each reflects the true state of the outlets of its unit, and is affected by both the “memorized” state and by the front panel rocker switch. A separate LED must be used to indicate the status of each PS-8R.

To take care of the case of having several PS-8R's in parallel that somehow get out of sync such that every time a remote button is pushed, some units turn on and others turn off, there is a special feature of the remote signal line:

Holding the REM line high for at least 4 seconds (whether by an actual remote switch or by any unit's front panel switch) will force all units to the OFF state, which will put them back in sync. This is the only way to re-sync units other than disconnecting AC power to all the units. Remember — operating the front panel rocker switch does NOT affect the stored state of the unit, even though it does temporarily turn the outputs off.

This section covers the case of multiple units in parallel (all sequences initiate simultaneously). See “AC Relay Accessory PS-REL” on the following page for a discussion of wiring multiple units in series.

\*Momentary mode switching is not available in PS-8R's with serial numbers below H12757.

## AC Relay Accessory PS-REL

The AC Relay Accessory (model PS-REL) is a sensor which can close a switch in response to the presence of AC power, while only drawing a minimal amount of that power. It is necessary whenever a PS-8R must be turned on in response to energizing a switched outlet, where that outlet is rated less than 15 amps or is not grounded. This occurs frequently in "home theater" installations when a small ungrounded switched outlet on a preamp or receiver (often activated by a wireless remote device) is to be used to power up a large amount of equipment. The AC Relay Accessory may also be used to allow a PS-8R to be hooked up in series to a PS-8 (or another PS-8R) to double the number of delayed turn-on/turn-off groups, by having the relay sense the presence of power at the DELAY 3 outlet of the PS-8.

The PS-REL is simply a small box containing a relay. A two-prong AC plug on a 6 foot cord activates the relay, and two wires ending in terminals connect to the relay contacts. These two wires should be connected to the +12V and REM IN screw terminals of the PS-8R, with the PS-REL's AC plug in the outlet to be sensed. The PS-8R itself should be plugged into a separate 15 amp electrical circuit. When AC power appears at the sensed outlet, the PS-8R will begin its turn-on sequence and will be able to supply its full rated 15 amps.

## Blinking DELAY 1 Indicator

The DELAY 1 LED on a PS-8R blinks whenever the unit is OFF due to the remote switch. In Maintained Mode, this will only occur when the REM IN terminal is tied to +12V. In Momentary Mode, the LED blinks if the "memorized" state is OFF.

## Related Products

The PS-8R, along with other Furman AC power accessories, can be an integral part of a complete AC power control system. Visit our website or contact us— we'll send you our "AC Power System Application Suggestions" brochure, and Furman's new color catalog.



MiniPort  
Power Relays.  
15A, 20A, 30A



PS-REL AC Relay



RS-1 and RS-2  
Remote System  
Control Panels

## PS-8, PS-8R SPECIFICATIONS

Maximum load:	PS-8: 15 amps (1800 watts at 120 VAC) PS-8E: 10 amps (2300 watts at 230 VAC)
Input Voltage Range:	PS-8: 85 to 135 VAC; PS-8E: 190 to 270 VAC
Mains Wiring Analyzer:	Detects 1 normal mode and 5 fault modes
Delay Interval:	5 seconds (adjustable with internal trimpot)
Remote Switch (PS-8R only):	Momentary or maintained action. Screw terminals, 3 for switch, 1 additional for optional LED (22 ga. wiring minimum).
Spike Protection Modes:	Line to neutral, neutral to ground, line to ground
Spike Clamping Voltage:	PS-8: TVSS rating 400V peak, L-N, N-G, L-G (tested to UL 1449). PS-8E: 500V peak
Response Time:	1 nanosecond
Maximum Surge Current:	6,500 amps (8 x 20 ms pulse)
Maximum Spike Energy:	80 joules per mode, 240 joules total protection ("E" versions 130 joules L-N, 160 joules N-G, L-G, 450 joules total)
Noise Attenuation:	PS-8 and PS-8R: Transverse and common modes: 20 dB at 200 kHz, rising to >40 dB, 1 to 100 MHz
Mechanical:	Dimensions: 1.75" H x 19" W x 8" D. Weight: 6 lbs (2.7 kg). Construction: Steel chassis, zinc chromate plating; .125" brushed and black anodized aluminum front panel; 3 oz. copper double-sided glass epoxy printed circuit board
Power Consumption:	Switch off: 6 watts Switch on: 8.5 watts



Safety Agency Approvals: UL, CUL, CE listed.

The Furman PS-8 is manufactured in the U.S.A.

## Three Year Limited Warranty

The Furman PS-8, PS-8E, PS-8R, and PS-8RE are warranted against failures due to defective parts or faulty workmanship for a period of three years after delivery to the original owner. During this period, Furman will make any necessary repairs without charge for parts or labor. Shipping charges to the factory or repair station must be prepaid by the owner; return shipping charges (via UPS Ground) will be paid by Furman. This warranty applies only to the original owner and is not transferable. Also, it does not apply to repairs done other than by the Furman factory or its Authorized Repair Stations.

This warranty may be cancelled by Furman at its sole discretion if the unit has been subjected to physical abuse or has been modified in any way without written authorization from Furman. Furman's liability under this warranty is limited to repair or replacement of the defective unit.

Furman will not be responsible for incidental or consequential damages resulting from the use or misuse of its products. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

When returning any equipment for repair, please be sure that it is adequately packed and cushioned against damage in shipment, and that it is insured. Warranty claims should be accompanied by a copy of the original purchase invoice showing the purchase date (if a Warranty Registration Card was mailed in at the time of purchase, this is not necessary). Also, please enclose a note giving your name, address, phone number, and a description of the problem.

## Service

Before returning any equipment for repair, please be sure that it is adequately packed and cushioned against damage in shipment, and that it is insured. We suggest that you save the original packaging and use it to ship the product for servicing. Also, please enclose a note giving your name, address, phone number and a description of the problem.

NOTE: All equipment being returned for repair must have a Return Authorization (RA) Number. To get an RA Number, please call the Furman Service Department, (707) 763-1010 ext. 40, between 8 a.m. and 5 p.m., U.S. Pacific Time. Please display your RA Number prominently on the front of all packages.