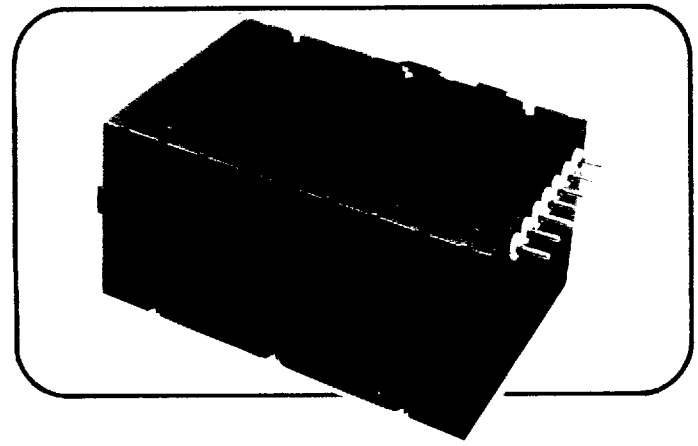
# RS Series DC-DC Switching Regulators 50-75 Watts

## Features:

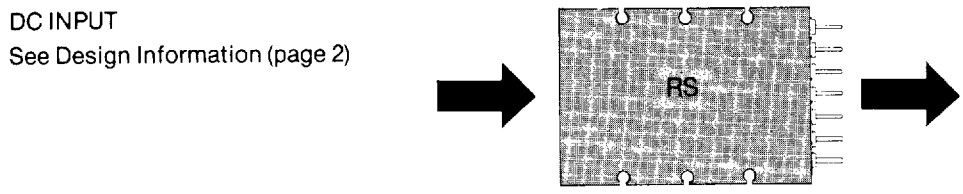
- **6 models available**
- **5V, 12V, or 15V dc output**
- **Complies with positive transient requirements of MIL-STD-704A when used with Powercube® ATDC modules**

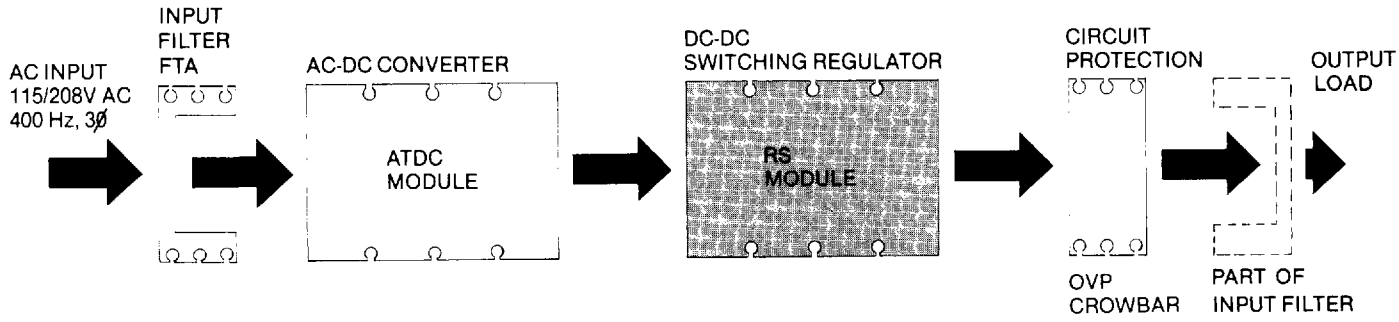


## RS Switching Regulators

The RS Series of DC-DC Switching Regulators manufactured by Powercube are rugged, miniaturized switching regulators which provide high efficiency power conversion at low level output voltages (+5V, +12V or +15V dc). These dependable units operate over a wide range of DC voltage (see Design Information, page 2) and accept input voltages in accordance with MIL-STD-704A when driven from Powercube model ATDC AC-DC Converter. There are six RS modules, two models in each output voltage range. One model in each range is designed to operate individually. The other model in each range, with slightly lower current limiting, can be combined in parallel with another RS module of the same model number. The 2" x 3" x 1.5" modules, fully encapsulated, are designed for heat sink mounting. These efficient switching regulators are ideal for applications where small power system size is desired.

Other standard features in the RS series include over-current protection, overvoltage protection, polarity reversal protection (using shunt diode), remote sensing and programmable operation.



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# RS Series DC-DC Switching Regulators

## DESIGN INFORMATION

| Model Number | Input Voltage Min. (including ripple) (DC) | Input Voltage Max. (including ripple) (DC) | Output Voltage Min. $V_{IN}$Nom No Load (DC) | Output Voltage Max. $V_{IN}$Nom No Load (DC) | Output Current (amperes) Max. | Line and Load Regulation (mV) | Efficiency (full load at 25°C case temp) |
|---|---|---|---|---|---|---|---|
| 5RS70*<br>5RS100 | 18 | 32 | 4.95 | 5.05 | 7<br>10 | 40 | 65% at 24V input |
| 12RS40*<br>12RS50 | 30 | 42 | 11.88 | 12.12 | 4<br>5 | 80 | 70% at 36V input |
| 15RS35*<br>15RS50 | 30 | 42 | 14.85 | 15.15 | 3.5<br>5 | 100 | 75% at 36V input |

*These units are designed for parallel operation.

## RS SERIES SPECIFICATIONS

| | |
|---|---|
| Input Voltage: | +24V dc nominal, for +5V dc outputs<br>+36V dc nominal, for +12V and +15V dc outputs |
| Output Voltage: | +5V, +12V, and +15V dc |
| Output Current: | See Design Information |
| Ripple w/Feedthrough: (10MHz Bandwidth) | +5V Outputs 150mV p-p (max)<br>+12V and +15V outputs: 175mV p-p (max) |
| Operating Temperature: | -55°C to +100°C (case temp) |
| Storage Temperature: | -65°C to +125°C |
| Temperature Coefficient: | .025%/°C max. |
| Frequency: | 16-30 kHz |
| Overcurrent Protection: | See Figure 5 |
| Standby Current: | <100 ma |
| Isolation: PIN to case | 500VDC Min. |
| Weight: | 11.5 oz. (typical) |
| Finish: | Anodize per MIL-A-8625-11, Class 2 |

Figure 1

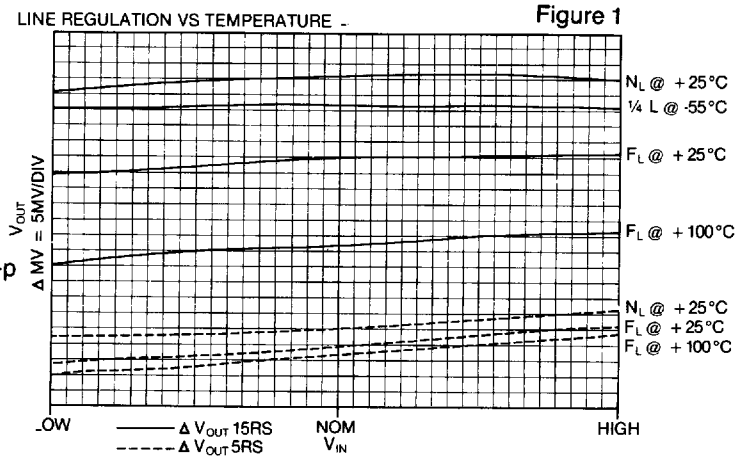
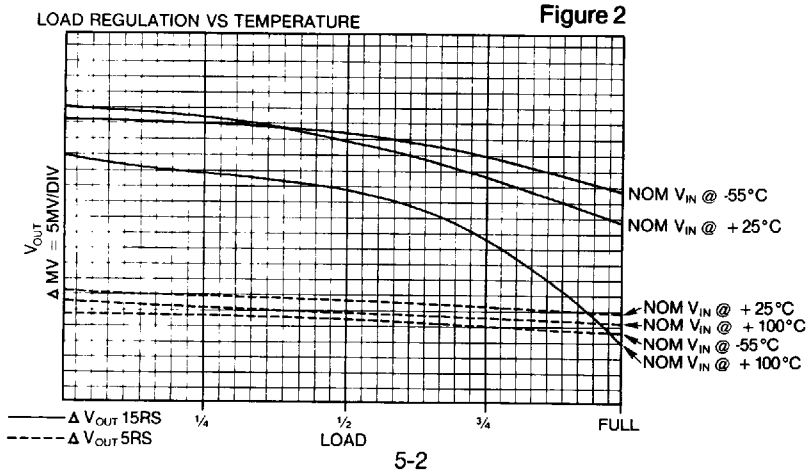



Figure 2



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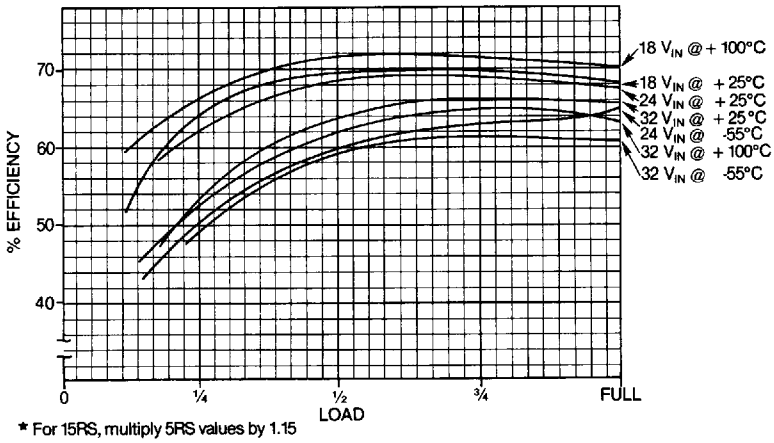
EFFICIENCY VS TEMPERATURE (5RS)*

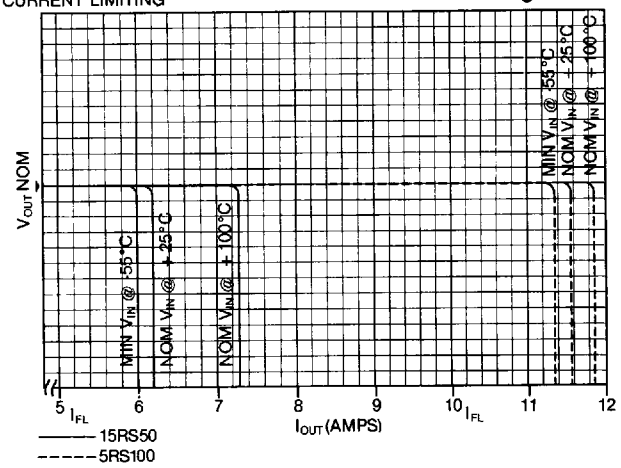
Figure 4




* For 15RS, multiply 5RS values by 1.15

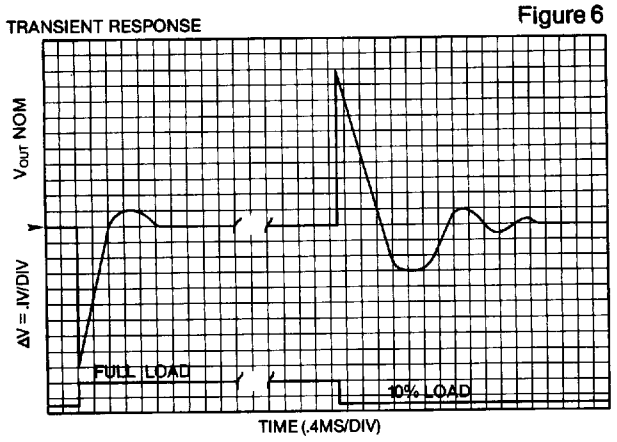
CURRENT LIMITING

Figure 5




TRANSIENT RESPONSE

Figure 6




Note 1: Unless otherwise indicated, performance data is typical for 5RS and 15RS modules.

# APPLICATIONS INFORMATION

To insure optimum performance of the RS modules, the following applications information is offered.

**Filtering**

Feedthrough filters are recommended on inputs and outputs to minimize possible switching noise.

The following table shows typical test data obtained when various input filter modules are used preceding a 5RS100 switching regulator. The data is presented in typical rms input current noise levels with source impedance stabilized at 0.1 ohms.

**Input Current Noise**

| Input Voltage Vdc | No. Filter | Model 18SP50-S1 | Powercube Filters Model 32FB50 |
|---|---|---|---|
| 18 | 560 mA | 110 mA | 14 mA |
| 24 | 420 mA | 57mA | 2 mA |

Allow for approximately a 1.6V drop across the 32FB50 filter to maintain an 18V minimum input to the 5RS100 module. Allow 1.2V drop across the filter module if the input to the module is 24V dc. Note: 32FB50 restricted to use with 5RS only.

**Crowbar Use**

A crowbar module is recommended when both the RS module and the load need to be protected from accidental application of excessive voltage at the output. When the crowbar is exposed to internally or externally applied overvoltages, it actuates and forces the regulator module output towards zero volts. Once the fault is removed, the input voltage to the RS module must be cycled off/on to reset the crowbar module. A single crowbar



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# RS Series DC-DC Switching Regulators

## APPLICATIONS INFORMATION (cont'd)

module can accommodate an RS Switching Regulator or two specially trimmed switching regulator modules operating in parallel. Consult Powercube for proper crowbar modules.

**Remote Sensing**

The sense terminals (D and F) are strapped to their respective output terminals (C and G) upon shipment from the factory. If remote sense is not to be used, these straps must be left in place. To activate the remote sense terminals, remove both straps and wire as per the typical application depicted in Figure 7. A line drop of up to 0.5V dc may be compensated with the remote sense terminal. External Capacitors (0.01 ufd) should be added after the sense straps are removed.

**Fuse or Circuitbreaker Selection**

There are applications where it may be desirable to fuse the input to the RS Switching Regulator or the 3-phase, 400 Hz line (if an ATDC module is used) for added protection in the event the switching regulator fails. In this case, a three pole circuitbreaker or three fuses each with one ampere rating are recommended. A maximum of two Powercube ATDC modules can be protected with one three-pole circuitbreaker. When driving the RS Switching Regulator/crowbar combination from 28V dc, select a circuitbreaker or fuse which has a rating close to maximum short circuit input current. Calculate the input current by the formula:

$$\frac{P_{OUT} \div \text{Efficiency}}{V_{IN}NOM} = \text{Max. Input I}$$

**External Output Voltage Trim**

The schematic diagram for the RS module shows a voltage divider connected between output terminals "C" and "G" with a tap at terminal "E". The external output voltage can be *raised* 10% by placing an external resistor between terminals "D" and "E" or *lowered* 10% by placing an external resistor between terminals "E" and "F". The resistor should be of the RLR05 type (per MIL-R-39C17/5). The minimum permissible value is zero (0) ohms when shunting from terminal "E" to "F" and 2.7 kilohms when shunting from terminal "E" to "D".

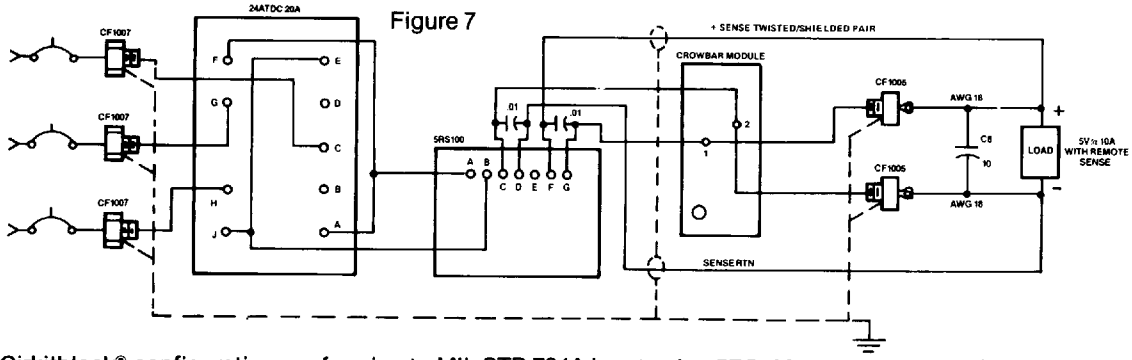
**Parallel Connections of Switching Regulators**

The 5RS70, 12RS40 and 15RS35 are designed with specially adjusted overcurrent protection, thereby allowing parallel connection. In these units, (I knee), is set at approximately 70 percent of I rated, so that when operating two RS modules in parallel, neither module operates in excess of its individual full rated capacity. Under special conditions, more than two RS module of the above listed types can be paralleled. Please consult Powercube for information regarding multiple parallel operation.

3Ø AC INPUT
400 Hz

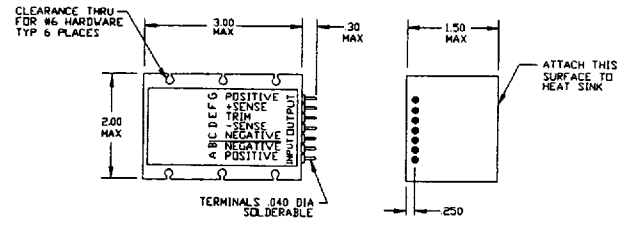
(MIL-STD-704A COMPATIBLE: 180V RMS/.1 SEC ON 115V AC LINE TO NEUTRAL AC INPUT)

Figure 7

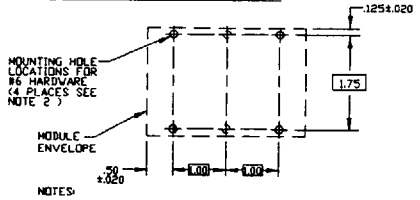



Typical Cirkitblock® configuration conforming to MIL-STD-704A input using 5RS100 with crowbar and remote sense.

RS MODULE
DIMENSIONAL DRAWINGS

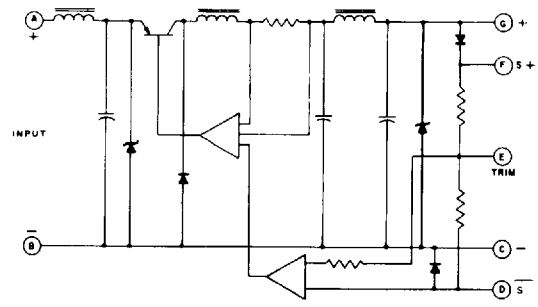



MOUNTING DIMENSIONS




NOTES:
1. ALL DIMENSIONS IN INCHES.
2. A TOTAL OF 4 MOUNTING SCREWS ARE RECOMMENDED. TWO SCREWS SHOULD BE USED ON EACH SIDE OF THE MODULE. POWERCUBE SUGGESTS THAT THE 2 "OUTSIDE" POSITIONS BE USED (SHOWN AS SOLID CIRCLES).

RS MODULE
SCHEMATIC



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