Models PR-300 & PR-300C Compound Regulated Dual Power Supplies

GAP/R MODEL PR-300/C

DESIGN PHILOSOPHY

Model PR-300 is a compound unit made up of two tracking regulated power supplies which provide 300 milliamperes at ±15 vdc with respect to common. It also provides chopper excitation for up to 10 SP656 amplifiers.* Both 115 vac for photochoppers and 6.3 vac for mechanical choppers are provided at an octal socket on the rear of the unit.

The PR-300C is the chassis version of the PR-300. It is intended to be bolted into other equipment, to which it connects with a sixteen-pin Blue Ribbon connector. Both input and output power are handled by this connector. No switches, pilot lights, or fuses are provided in the chassis model, since these are properly a part of the equipment this unit is intended to power. The chassis model is electronically identical with the bench model.

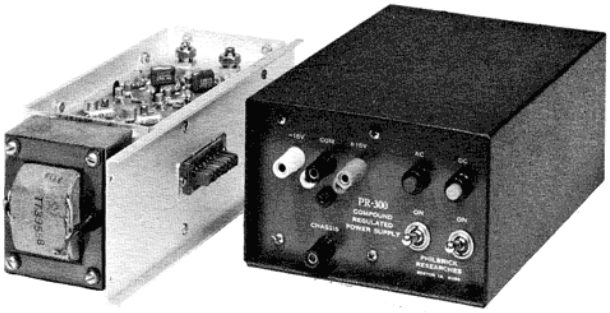


Figure 1. Models PR-300 & PR-300C Power Supplies, General View

GENERAL CHARACTERISTICS

INPUT:
Power: 250 ma. at 115 v ±10%, 50-400 cps.
Connections: (Bench Model)
Via standard 125 vac 7 amp plug and nine-foot power cord. Power cord plugs into rear of unit.
Connections: (Chassis Model)
Via 16 pin Blue Ribbon connector.

OUTPUT:
Through Power: (at line frequency)
6.3 v 1.0 amp
115 v 0.05 amp (transformer secondary isolated from line)
Regulated DC Power:
0-300 ma +15 vdc } preset at factory to within
0-300 ma −15 vdc } ±.01% at 25°C
Connections:
PR-300: Via standard 5-way binding posts. Also regulating tie points are brought out on banana jacks beneath binding posts. 6.3 vac, 115 vac and ±15 vdc brought out on octal socket at rear.
PR-300C:
Via 16 pin male Blue Ribbon connector 26-4100-16P. Mates with 26-4200-16S.

REGULATION:
within 250 microvolts over the following ranges
Line: 115 v ±10%
Load: 0-300 ma dc

NOISE, JITTER, AND RIPPLE:
Less than 250 microvolts p-p

INTERNAL IMPEDANCE:
Less than 1 milliohm dc.
0.5Ω in series with 450 μf beyond 16 kc.

TRANSIENT RESPONSE:
A load disturbance consisting of 50 ma steps superimposed on a 150 ma nominal load.
Peak voltage error: Less than 30 mv
Settling time to within specified dc regulation: Less than 50 μsec.

TEMPERATURE RANGE:
Operating: −25°C to +85°C
Storage: −50°C to +85°C

OUTPUT LIMITED TO 250 MA ABOVE 70 DEGREES WITH 115 VOLT LINE (SEE FIG. 4)

OUTPUT VOLTAGE STABILITY OVER THE TEMPERATURE RANGE:
−25°C to +85°C typically 0.1% (15 mv), maximum 0.2%
Units having improved stability vs. temperature are available from Philbrick at small extra cost.

SHORT CIRCUIT CURRENT:
325 to 550 milliamperes (lower figure at high temperature; higher figure at low temperature).

TRACKING:
The two sides of the supply track within 5 mv over the temperature range.

MECHANICAL SPECIFICATIONS

DIMENSIONS:
See outline and dimension drawing (Figure 5.)

WEIGHT:
Installed: PR-300 — 5.6 lb. / PR-300C — 4.0 lb.
Packed: PR-300 — 7 lb. / PR-300C — 5 lb.

MOUNTING:
Bench Model: for bench-top use
Chassis Model: main chassis mounts with four 6-32 screws (not supplied)

CONSTRUCTION:
Bench Model: Rigid frame aluminum chassis housed in aluminum case having black leatherette finish
Chassis Model: Rigid frame aluminum chassis with aluminum semi-cover
Both Models: A glass epoxy etched circuit board embodies the circuitry for both regulator amplifiers.

A separate glass epoxy board carries the silicon rectifiers and the electrolytic capacitors, which are mounted with nylon straps. The structural integrity and vibration resistance of the unit are assured by thoughtful mechanical design employing packaging techniques typical of the best military practice. The power transistors are mounted and heat sunk to the aluminum chassis at a safe distance from the reference diode and regulator amplifier input transistors.

*When line frequency is in the range 50-90 cps.

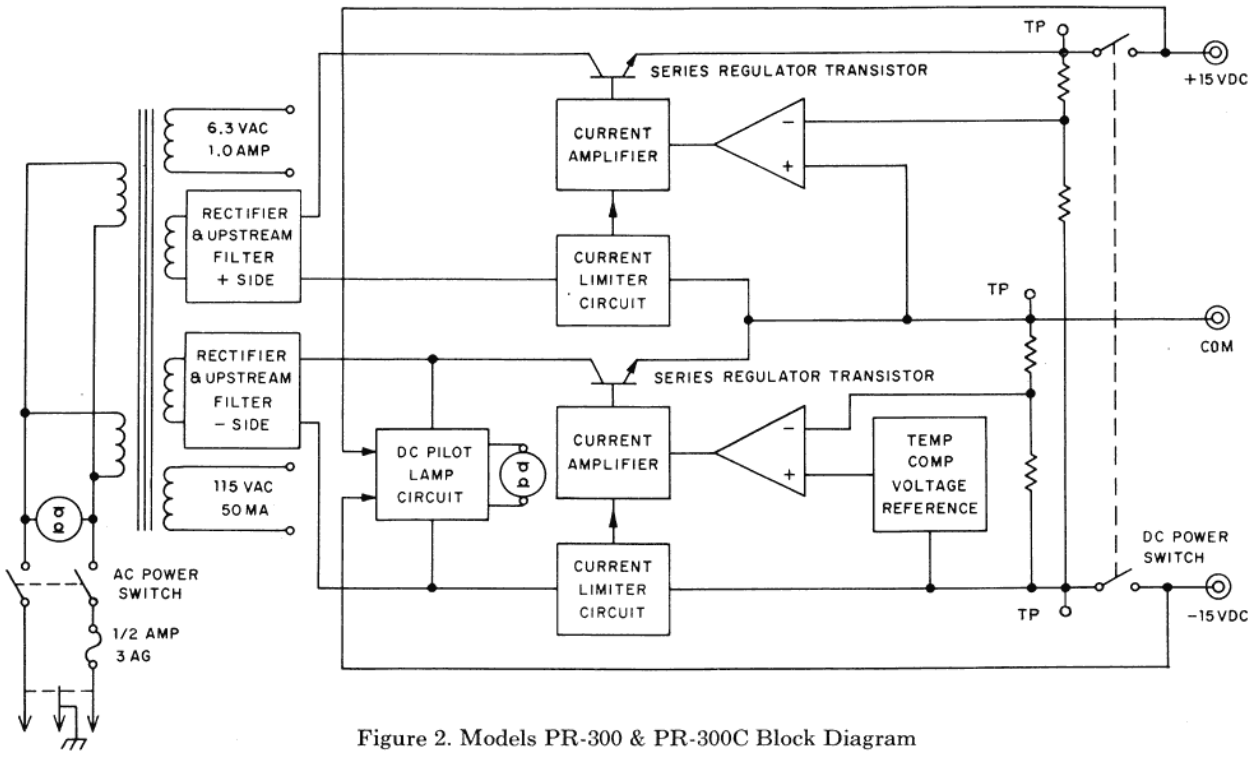


Figure 2. Models PR-300 & PR-300C Block Diagram

The PR-300 uses a classical series regulator scheme. The series regulator or "pass" transistor is controlled by a comparison amplifier which senses the difference between the output voltage and the voltage of a temperature-compensated reference diode. The circuit is arranged so that the negative 15 vdc is regulated by comparison with the reference. The positive supply voltage is set by comparing the algebraic sum of the plus and minus outputs with ground potential and controlling the pass transistor in the positive side in such a way as to hold this algebraic sum at zero. Consequently the positive supply voltage may be said to track the negative supply voltage; that is, the positive voltage is the mirror image of the negative voltage. This mode of operation is usually best for powering d.c. operational amplifier and related equipment. Typically the two halves of the PR-300 track within a few millivolts.

Transistor power supplies differ from vacuum tube supplies in one important respect: In a vacuum tube supply, the output current under short circuit conditions is limited by the cathode emission of the series regulator tube; no such intrinsic limit exists in a transistor. A current limiting circuit is provided in the PR-300 to hold the output short circuit current to safe limits. The user should note that the PR-300 will deliver its rated 300 ma of regulated, ripple-free power. However, the supply is so designed that when this rating is exceeded by more than about 10% the current limiter starts to act, the output voltage drops, and ripple appears. The volt-ampere characteristics of the PR-300 are shown in the accompanying diagram, Figure 3, for room temperature and normal line voltage. Figure 4 shows in detail how the output current capability is reduced at high temperature and low line voltage.

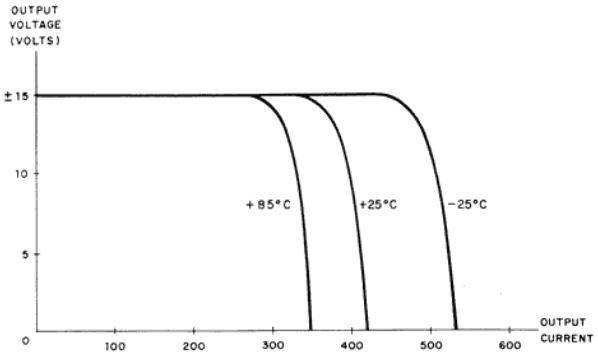


Figure 3. Model PR-300 Current Limiter Characteristics Applies to Either Side of Supply (Typ. 115 vac line voltage)

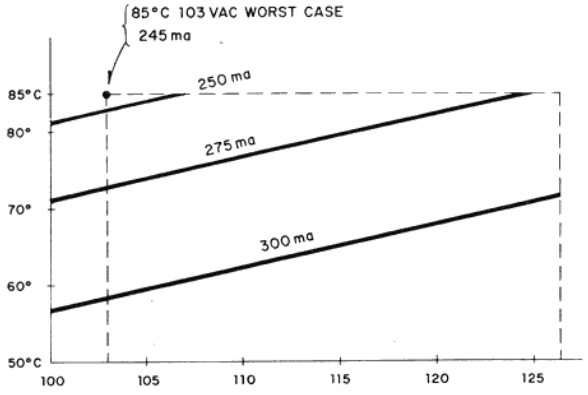


Figure 4. Model PR-300 Output Current Capability as a Function of Temperature and Line Voltage
(Operate to the right and below the given curves)

The reference diode in the PR-300 is such as to provide ±15 vdc, ±15 mv, or 0.1 per cent over the temperature range −25 to +85°C. Under laboratory conditions — that is, within a few degrees of room temperature — the unit maintains a nominal accuracy of 0.01 per cent.

The user should carefully note that the high quality regulation of the PR-300 may not be apparent at the load. The supply itself has an output impedance better than one milliohm. However, one foot of No. 10 AWG copper wire has a resistance of one milliohm; hence, this much lead between the supply and the load will degrade the performance by more than a factor of two. Strictly speaking, the specified regulated voltage is available only at the regulating tie points, or sensing points, which are brought out on jacks below the terminals of the PR-300. It should be noted also that the convenience of the d.c. switch provided has as its price the contact resistance of the switch — typically on the order of ten milliohms. The user who desires to obtain the maximum performance of which the PR-300 is capable should connect his load to the regulating tie point jacks. He must content himself with turning the unit off and on with the ac switch.

MAINTENANCE

The unit should require no field maintenance. As can be seen from the block diagram, the electronic circuits, although simple and straightforward in principle, are rather elaborate in practice and for a number of reasons present problems to the trouble shooter; perhaps the least obvious and surely the most serious such problem is that the regulated output voltage of the supply is also used to power the electronic amplifiers doing the measuring and regulating in the first place. Indeed the convoluted character of the previous sentence is appropriate to suggest the tail-chasing nature of trouble-shooting a closed-loop regulator of this type.

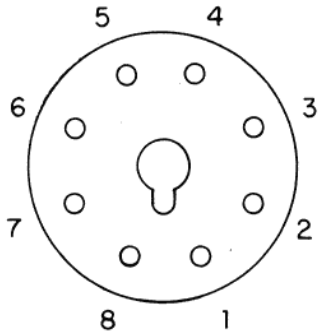
In view of the above, and in view of the high level of accuracy and reliability expected of this equipment, *it is strongly recommended that the unit be returned to the factory on those occasions when the need for maintenance has been established.* To establish such a need, the user should carefully check all associated circuitry; trouble is frequently external to the supply. He should then check pilot lamps, the fuse, and *especially cabling* used with the octal or Blue Ribbon connectors; it cannot be overemphasized how frequently faulty cabling causes malfunctions that seem to implicate the supply itself.

RELIABILITY

The PR-300 regulator amplifiers consist of etched circuits on a glass epoxy board. Emphasis has been placed on mechanical integrity; all large parts are firmly clamped to the glass epoxy mounting boards. The series-regulator or pass transistors are bolted to the aluminum chassis away from the reference diode and sensing amplifiers. A mica washer passes heat to the chassis. Hermetically sealed silicon semiconductors are used throughout.

REAR POWER CONNECTOR, 8 PIN OCTAL
PR-300 POWER SUPPLY

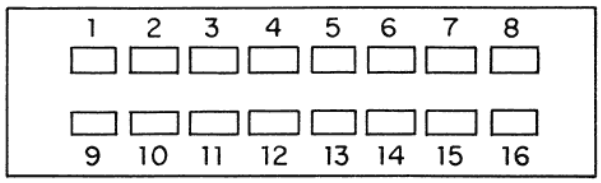
1. } 115 volts RMS AC Output for Photochopper
2. } Drive (5.0 watts)
3. } 6.3 volts RMS AC Output
4. }
5. Chassis Ground
6. −15 volts 300 ma dc
7. Power Common
8. +15 volts 300 ma dc



FROM REAR VIEW OF CHASSIS

BLUE RIBBON CONNECTOR, 16 PIN
PR-300C POWER SUPPLY

1. 115 volts AC Power Line
2. 115 volts AC 0.05 amp Photochopper Drive
3. 6.3 volts AC 1 amp Mechanical Chopper Drive
4. N.C.
5. −15 volts DC
6. Common
7. +15 volts DC
8. Chassis
9. 115 volts AC Power Line
10. 115 volts AC 0.05 amp Photochopper Drive
11. 6.3 volts AC 1 amp Mechanical Chopper Drive
12. N.C.
13. −15 volts DC T.P.
14. Common T.P.
15. +15 volts DC T.P.
16. Chassis Ground



← TRANSFORMER

NOTE: Power common is isolated from chassis ground. For lowest noise, all grounds should be connected together at one point in system applications.

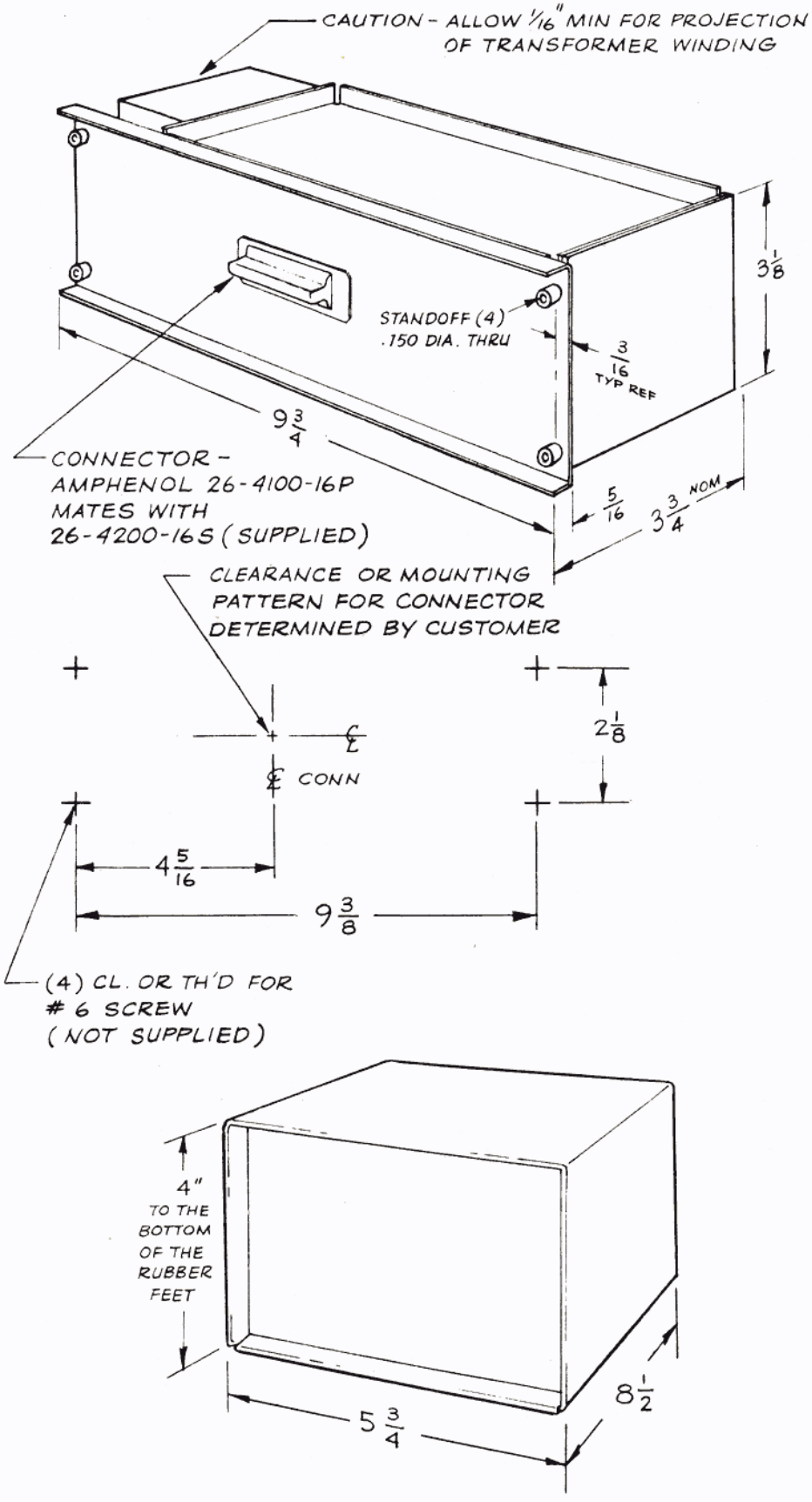


Figure 5. Outline and Mounting Dimensions of Models PR-300 & PR-300C

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