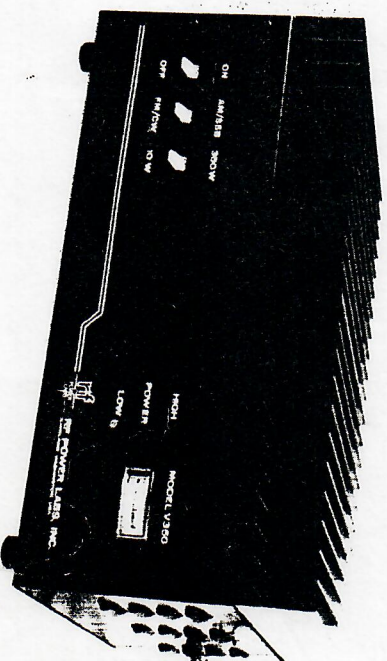


OWNER'S GUIDE



WARRANTY

RF Power Labs, Inc., warrants each new product to be free from defects in material and workmanship under normal use and service for a period of 90 days after delivery to the ultimate user and will replace or repair the product at our option, at no charge should it become defective and which our examination shall disclose to be defective and under warranty.

This warranty shall not apply to any RF Power Labs product which has been subject to misuse, neglect, accident, incorrect wiring not of our own installation, or to use in violation of instructions furnished by us, nor extended to units which have been repaired or altered outside of our factory.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sales of our products.

Sales receipt must accompany product to validate the date of purchase.

RF POWER LABS

RF POWER LAB OF WASHINGTON, INC.
 21820 87th Avenue S.E., #200
 WOODINVILLE, WASHINGTON 98072
 (206) 481-8833

Our New Address

DOUBLE RELAY
 PART # 60-230442
 SPST WITH DDDT Auxiliary
 PRICE \$100.00

ALL MODE 350 WATT VHF AMPLIFIER

MODEL V350

RF POWER LABS, INC.

21820-87th S.E.
 Maltby Industrial Village
 Woodinville, WA 98072

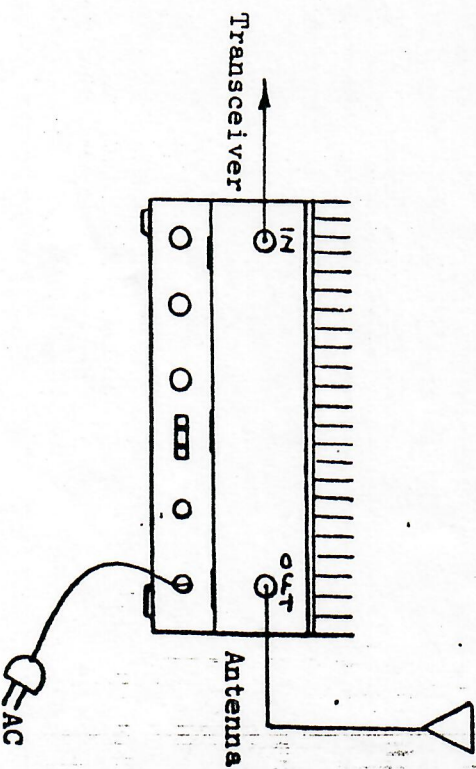
11013-
 Tel: 32-1042

ign 98033

CONGRATULATIONS! You are now the proud owner of one of the most powerful and versatile VHF amplifiers that money can buy. Your amplifier has been designed by professionals who know amplifiers and know what the radio amateur is looking for in conjunction with today's multi-purpose VHF radio equipment.

Your V350 has been designed for pulsed applications. The factory suggests you use the Model F135 (for 115 Volt) or the Model F235 (for 230 Volt) Fan Kit to keep the amplifier heatsink cool for long and trouble free operation. The dual fan kit is prewired and plugs directly into the AC fan socket located in the rear of the V350 amplifier cabinet. The socket is internally wired through a temperature sensor switch. This switch is temperature sensitive and will start the fans turning when the heatsink reaches excessively high temperatures. It will shut itself off automatically after the heatsink has cooled down sufficiently.

The fan kit is only required for continuous CW, AM, RTTY, FSK, ASCII and FM operation if the duty cycle is more than 30%. For SSB operation, the amplifier usually does not run hot enough to cause any concern.



SPECIFICATIONS

| | |
|---------------------|---|
| Frequency Range | : 144-148MHz; No Tuning |
| Final D.C. Input | : 650-750 Watts |
| RF Power Output | : 350-400 Watts Maximum* |
| Drive Power | : 20 Watts Maximum* |
| Circuitry | : Fully Transistorized |
| Modes of Operation | : AM-FM-SSB-CW-RTTY- ASCII-FSK |
| Duty Cycle | : Continuous |
| Gain, Typical: | |
| 8 Watts Input | : 300 Watts Output |
| 12 Watts Input | : 350 Watts Output |
| 15 Watts Input | : 400 Watts Output |
| Primary Wiring | : Built-in AC Power Supply 115/230VAC |
| T/R Switching | : Built-in 1kW Coaxial T/R Relay |
| Spurious | : 60dB down all Harmonics 60dB down all Spurious |
| Power Output Select | : 10 Watts (LOW) or 350 Watts (HIGH) |
| Metering, Lighted | : Front Panel All Mode Set Indicator |
| Cooling | : Convection SSB and CW Model #135 or F235 required for Continuous FM operation |
| Temperature Control | : Built-in Thermos-Switch for Fan Control |

*See power IN/OUT chart for other input levels.

SPECIFICATIONS (Continued)

| | |
|------------------|--|
| Auxiliary Output | : +13 Volt at 3 Amperes on Rear Panel |
| Design Layout | : Hinged Amplifier and Heatsink Top Assembly for easy accessibility and service |
| Weight | : 52 pounds, 24 kilograms |
| Size (W x H x D) | : 17 x 8 x 13 inches, 432 x 203 x 330 millimeters |
| Mounting | : Bench Mounting: Rubber Bumpers Rack Mounting: 19" Adaptor Kit (OPTIONAL) |

UNPACKING the instrument as soon as it arrives at your home is very important. You must report any damage to the freight company at once. If purchased from a dealer, let him know the extent of the damage. Keep the shipping container in case you may have to return the V350 to the factory. The factory will not honor any warranty if the instrument is not shipped in its original shipping container. The V350 is very heavy for its size and a special cushion has been designed for safe transportation over great distances. Make sure all the accessories including the manual were packed with your amplifier. Fill in all of the blank spaces on your warranty card and return it within ten days to the factory. It will assure you full protection as outlined on the back of this manual. Failing to return the warranty card will disqualify you from receiving any factory warranty assistance.

COOLING is probably one of the most under-estimated safeguard precautions of any RF power amplifier. The RF power devices used in today's amplifiers are very rugged and can survive all kinds of abuses. One of the most damaging is "overheating" without any immediate ill effects. The transistor chip will, however, lose its potency after a few years and will gradually show a decrease in gain and power output. Yes, a transistor will age and it will do so much quicker if it is run at constant high temperatures. So, please make sure your amplifier is properly cooled at all times. The small investment for the fan kit is a good long term investment and can save you many dollars in repair costs years from now. Don't worry about control circuitry; it is all built-in. The fan will run and stop running automatically as the heatsink temperature changes. The temperature sensor located inside the amplifier controls the rear panel AC socket marked "External Fan". The temperature range of the switch is about 46 to 50 Celcius.

PROTECTION Normally it is very difficult to destroy the output transistors of the V350 amplifier. However, it is possible! So, please do not do anything that could cost you a lot of grief. The devices are specially designed for this circuit and are capable of VSWR mismatches up to 20:1 and also open and short circuit conditions. There are some conditions that make this rugged transistor not so rugged. Depending on just what the frequency is at the time of the transmission and the load and the length of the cable used and a few other things, you may find that your amplifier is working at reduced power output. It is possible that you have destroyed one or more output transistors. The amplifier is extremely rugged and chances are you will not hurt it if you blow 350 watts into any open circuit or even into a short circuit.

You must, however, be aware of the fact that the devices "are" fallible, so please be careful and make sure you always feed it into a 50 ohm load. OVERDRIVE is one of the most common causes of transistor failure. Injecting too much RF drive into a transistor is the same as feeding a 6 volt lamp with 12 volts. The lamp will no doubt burn out very quickly. So will the transistor. So please make sure the amplifier is driven with the proper level of about 7 to 15 watts. (20 watts maximum.) If you feed 30 watts into the amplifier, you WILL destroy the unit. Use your meter up front; it will tell you when you have reached the correct drive. Any increase from that level will result in excessive heat dissipation and possible distortion.

SSB OPERATION Set the mode switch to the AM/SSB position. This will provide the correct amount of DC bias for linear class "B" operation, providing both good linearity and best efficiency. Maximum PEP output is 400 watts. A slight upswing of the panel meter will indicate the bias circuit is functioning. When talking normally into the microphone, the needle should swing back and forth, from zero to about half-way up. Input power for clean operation should be 8 to 15 watts PEP.

Any attempt to drive the amplifier harder will cause increased distortion or may even cause permanent damage to the amplifier. You will notice that a time delay has been designed into the T/R switch to absorb the relay chatter and keep it operating smoothly. The delay is about 1-2 seconds. It can be altered by changing the value of the capacitor C42 located on the terminal strip next to the input connector. For AM and FM operation, the capacitor could be omitted.

AM OPERATION Set the mode switch to AM/SSB position. The amplifier is now biased for class "B" linear operation. While injecting an unmodulated carrier into the amplifier, listen for the T/R switch to click in. After the relay has engaged, keep your eyes on the panel meter and adjust the carrier until the meter reads in the AM portion of the dial. This corresponds to about 25-30% of the maximum peak output power capability of the amplifier. A fully modulated AM signal reaches about four times as much peak power as the unmodulated carrier. With this in mind and the maximum amplifier output being 400 watts, we must keep the carrier level to about 100 watts as indicated by the meter dial marked "AM". You are now ready to put 400 watts of fully modulated peak AM power on the air with very respectable distortion content. Increasing the drive level to a higher value will result in an increase in distortion.

CW OPERATION Set the mode switch to CW/FM. Adjust your exciter drive level to a meter reading corresponding to the CW/FM mark on the dial. This setting will produce a near maximum power output from the amplifier. The timing capacitor keeps it from following the RF bursts and forces it into a 1-2 second time delay.

FM OPERATION Set the mode switch to the FM/CW position. Adjust the output power of your exciter to CW/FM on the meter dial. You are now putting out near maximum power into your antenna. Do not overdrive the amplifier for the reasons stated earlier in this guide. An overdrive into the red portion of the meter will not harm the amplifier; it should nevertheless be avoided. It will cause a dramatic increase in transistor power dissipation, resulting in an increase of heat. If the T/R switch holds on too long for your FM pleasure, remove the timing capacitor C42.

RTTY, FSK and ASCII OPERATION Adjust your V350 as you would for FM, but keep in mind that the RTTY, FSK and ASCII modes run full power for a long period of time and therefore, you must make sure you have your V350 equipped with either the F135 or F235 Fan Kit for continuous duty.

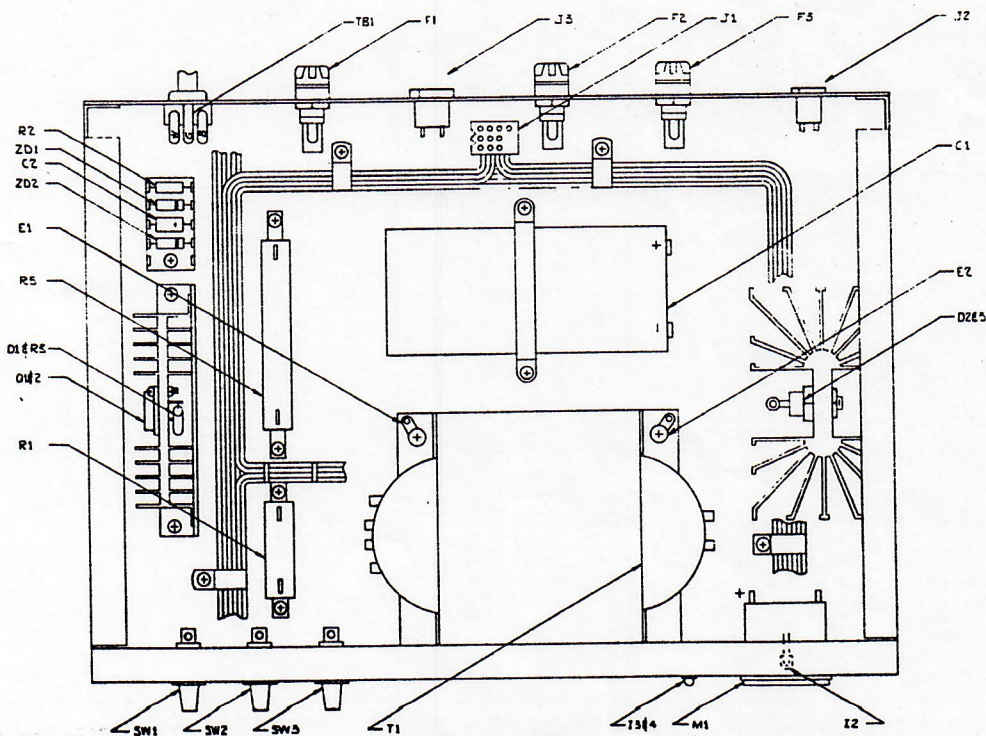
LOW POWER-HIGH POWER SWITCH is used to disengage the T/R relay. If the switch is moved to the 10 watt position, the T/R relay is disconnected and the driver input power to the V350 cannot reach the output transistors. The result, the signal travels through the coaxial relay and right back out through the low-pass filter to the antenna. With the switch in the 350 watt position, the signal activates the relay sensor and pulls in K1. This directs the 10 watts from the driver to the amplifier circuit and boosts it up to 350-400 watts. This feature enables the operator to go from high power to low power with the flick of a switch, without physically having to disconnect anything or without having to shut the linear amplifier off and thus, maybe losing the +13 volts at the accessory socket. The red and green lights will indicate what state the T/R relay is in. Red means the relay is activated, meaning high power; green means the relay is disengaged, meaning low power or receive mode.

+13 VOLT OUTPUT SOCKET A well regulated +13 volt, 3 amperes DC output is available at the rear panel. It can be used to drive accessories such as 10 watt transceivers or preamps, RTTY computer terminal or alike. It is capable of 3 amperes continuous. If higher currents are required, consult the factory. The +13 volt supply is protected by a 3 ampere fast acting fuse. DO NOT replace it with any other type. The DC power supply feeding the amplifier is protected by a 35 ampere fuse. Normal current at maximum power output is 25-28 amperes DC at +28 volts.

Twenty-eight amperes drawn by the V350 amplifier corresponds to a front panel meter reading of FM, set just under the RED warning line. It also corresponds to 350-400 watts of power output under normal operation and assuming, of course, the amplifier is tuned properly. **CAUTION:** DO NOT permit your V350 to operate for long periods of time with the meter indicating into the red area; it will cause a dramatic increase in heat dissipation.

PRIMARY POWER Your V350 has been factory wired for either of the following voltages: 100V; 115V; 127V; 200V or 240 Volts, 50-60Hz. The amplifier may be operating at reduced power output if you operate it from low line voltages. On the other hand, you may run the risk of permanently damaging the transistors if you operate the amplifier off excessively high line voltages. Please check your AC supply voltage to make sure your amplifier is wired correctly, before plugging it in. You may save yourself a big headache. See AC PRIMARY POWER CONNECTION chart for transformer connections. The line cord is fused for your protection. Please do not replace the fuse with a wrong substitute. Fuses blow for a reason and, if your amplifier blows a fuse, investigate the cause before you replace or substitute it. The line cord is also grounded to protect you from injury in case of a voltage breakdown or any other serious defect. DO NOT remove it even if your primary does not have three wires. The green ground wire does not affect the operation of your amplifier in any way, it's only function is safety.

RACK ADAPTOR As an option, a 19-inch (483mm) rack mount adaptor is available for standard rack mounting of the amplifier. The rack mount adaptor is attached to the holes on the sides of the chassis.



| REV | | CHANGE DESCRIPTION | | W | |
|---------|--|--------------------|--|---|--|
| REV 1 | | REV 1 | | W | |
| REV 2 | | REV 2 | | W | |
| REV 3 | | REV 3 | | W | |
| REV 4 | | REV 4 | | W | |
| REV 5 | | REV 5 | | W | |
| REV 6 | | REV 6 | | W | |
| REV 7 | | REV 7 | | W | |
| REV 8 | | REV 8 | | W | |
| REV 9 | | REV 9 | | W | |
| REV 10 | | REV 10 | | W | |
| REV 11 | | REV 11 | | W | |
| REV 12 | | REV 12 | | W | |
| REV 13 | | REV 13 | | W | |
| REV 14 | | REV 14 | | W | |
| REV 15 | | REV 15 | | W | |
| REV 16 | | REV 16 | | W | |
| REV 17 | | REV 17 | | W | |
| REV 18 | | REV 18 | | W | |
| REV 19 | | REV 19 | | W | |
| REV 20 | | REV 20 | | W | |
| REV 21 | | REV 21 | | W | |
| REV 22 | | REV 22 | | W | |
| REV 23 | | REV 23 | | W | |
| REV 24 | | REV 24 | | W | |
| REV 25 | | REV 25 | | W | |
| REV 26 | | REV 26 | | W | |
| REV 27 | | REV 27 | | W | |
| REV 28 | | REV 28 | | W | |
| REV 29 | | REV 29 | | W | |
| REV 30 | | REV 30 | | W | |
| REV 31 | | REV 31 | | W | |
| REV 32 | | REV 32 | | W | |
| REV 33 | | REV 33 | | W | |
| REV 34 | | REV 34 | | W | |
| REV 35 | | REV 35 | | W | |
| REV 36 | | REV 36 | | W | |
| REV 37 | | REV 37 | | W | |
| REV 38 | | REV 38 | | W | |
| REV 39 | | REV 39 | | W | |
| REV 40 | | REV 40 | | W | |
| REV 41 | | REV 41 | | W | |
| REV 42 | | REV 42 | | W | |
| REV 43 | | REV 43 | | W | |
| REV 44 | | REV 44 | | W | |
| REV 45 | | REV 45 | | W | |
| REV 46 | | REV 46 | | W | |
| REV 47 | | REV 47 | | W | |
| REV 48 | | REV 48 | | W | |
| REV 49 | | REV 49 | | W | |
| REV 50 | | REV 50 | | W | |
| REV 51 | | REV 51 | | W | |
| REV 52 | | REV 52 | | W | |
| REV 53 | | REV 53 | | W | |
| REV 54 | | REV 54 | | W | |
| REV 55 | | REV 55 | | W | |
| REV 56 | | REV 56 | | W | |
| REV 57 | | REV 57 | | W | |
| REV 58 | | REV 58 | | W | |
| REV 59 | | REV 59 | | W | |
| REV 60 | | REV 60 | | W | |
| REV 61 | | REV 61 | | W | |
| REV 62 | | REV 62 | | W | |
| REV 63 | | REV 63 | | W | |
| REV 64 | | REV 64 | | W | |
| REV 65 | | REV 65 | | W | |
| REV 66 | | REV 66 | | W | |
| REV 67 | | REV 67 | | W | |
| REV 68 | | REV 68 | | W | |
| REV 69 | | REV 69 | | W | |
| REV 70 | | REV 70 | | W | |
| REV 71 | | REV 71 | | W | |
| REV 72 | | REV 72 | | W | |
| REV 73 | | REV 73 | | W | |
| REV 74 | | REV 74 | | W | |
| REV 75 | | REV 75 | | W | |
| REV 76 | | REV 76 | | W | |
| REV 77 | | REV 77 | | W | |
| REV 78 | | REV 78 | | W | |
| REV 79 | | REV 79 | | W | |
| REV 80 | | REV 80 | | W | |
| REV 81 | | REV 81 | | W | |
| REV 82 | | REV 82 | | W | |
| REV 83 | | REV 83 | | W | |
| REV 84 | | REV 84 | | W | |
| REV 85 | | REV 85 | | W | |
| REV 86 | | REV 86 | | W | |
| REV 87 | | REV 87 | | W | |
| REV 88 | | REV 88 | | W | |
| REV 89 | | REV 89 | | W | |
| REV 90 | | REV 90 | | W | |
| REV 91 | | REV 91 | | W | |
| REV 92 | | REV 92 | | W | |
| REV 93 | | REV 93 | | W | |
| REV 94 | | REV 94 | | W | |
| REV 95 | | REV 95 | | W | |
| REV 96 | | REV 96 | | W | |
| REV 97 | | REV 97 | | W | |
| REV 98 | | REV 98 | | W | |
| REV 99 | | REV 99 | | W | |
| REV 100 | | REV 100 | | W | |

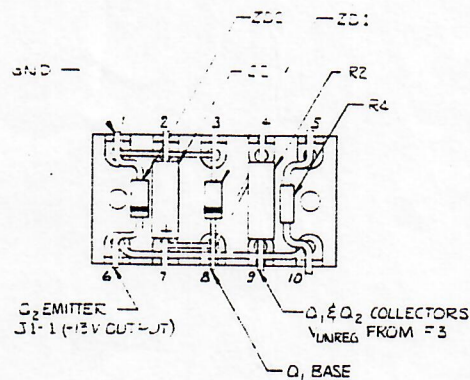


FIG. 2 COMPONENT LAYOUT
RELAY DRIVER

FIG.1 COMPONENT LAYOUT
-13V REGULATOR ASSY.

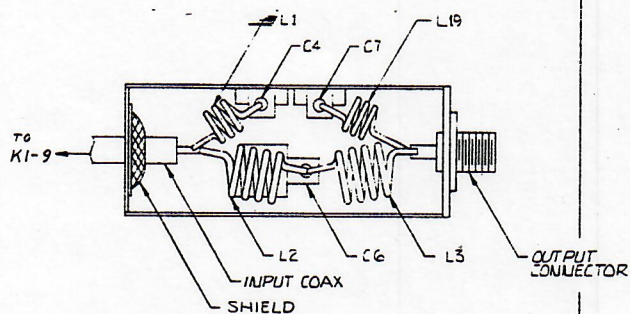
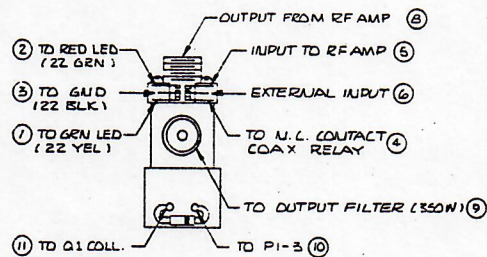

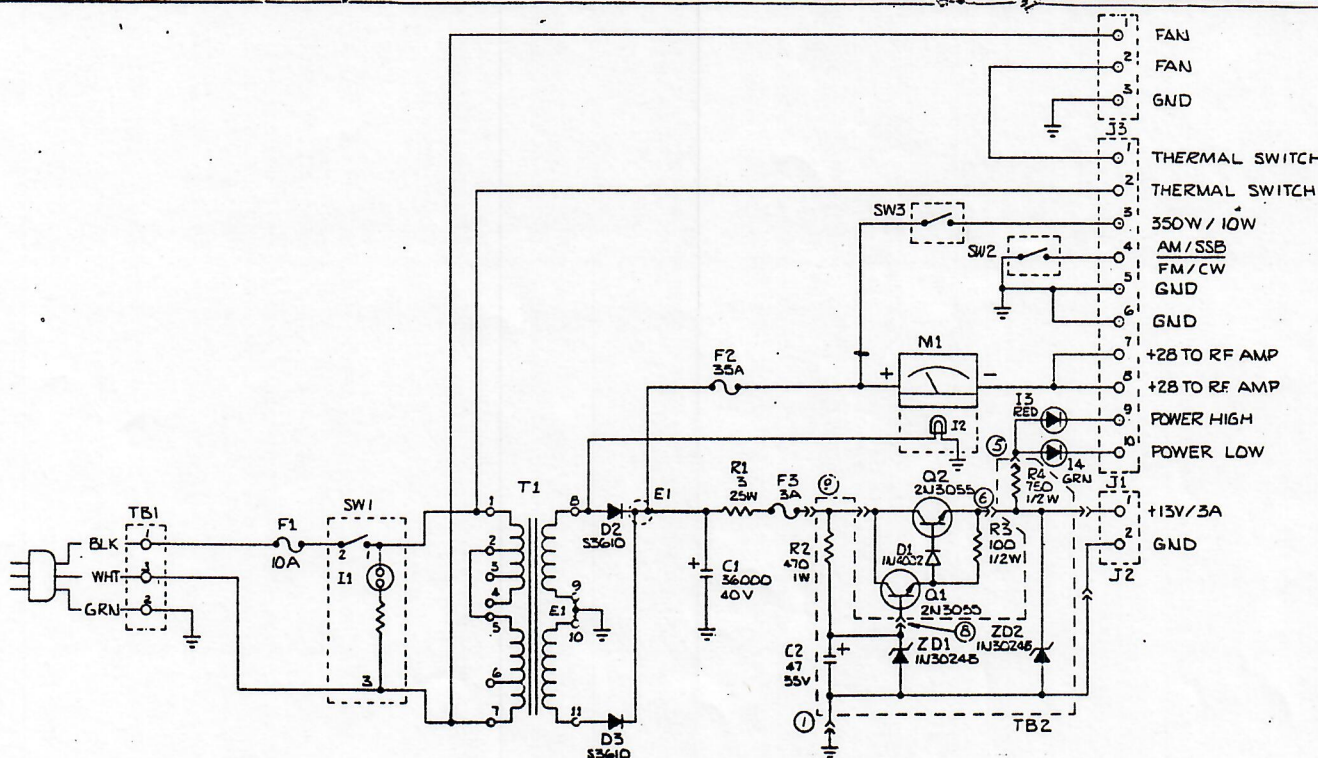


FIG 3 LIFT-UP FILTER ASSY.




RELAY, COAX

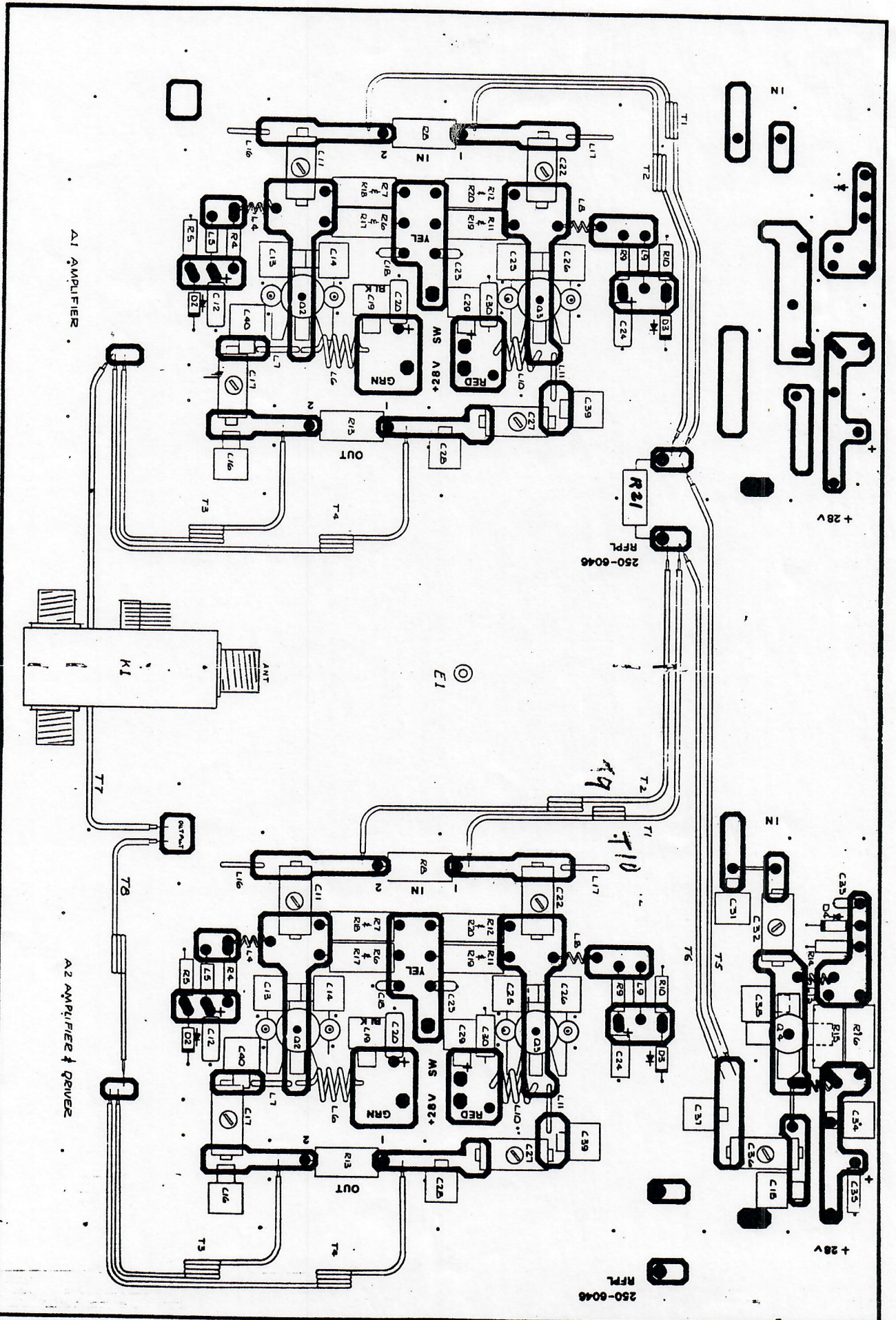
| | | | | | |
|---|--|---------------------|---|-------------|-----|
| REV. | | CHANGE DESCRIPTION | | BY | |
|  | R.F. POWER LABS, INC. 11013 - 11018 PL. N.E. KIRKLAND WA. 98033 | | PARTS LAYOUT V350 SUBASSEMBLES | | |
| UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES | | | | | |
| XXX | N A | DRM. I KEY 10-10-76 | SIZE | DRAWING NO. | REV |
| XXX | | CHK | | | |
| AMG. | | ENG. S. 10-10-76 | C | V350 - A2 | |
| FRAC. | | APPD. | SCALE | 2 / 1 | SMT |



NOTES:

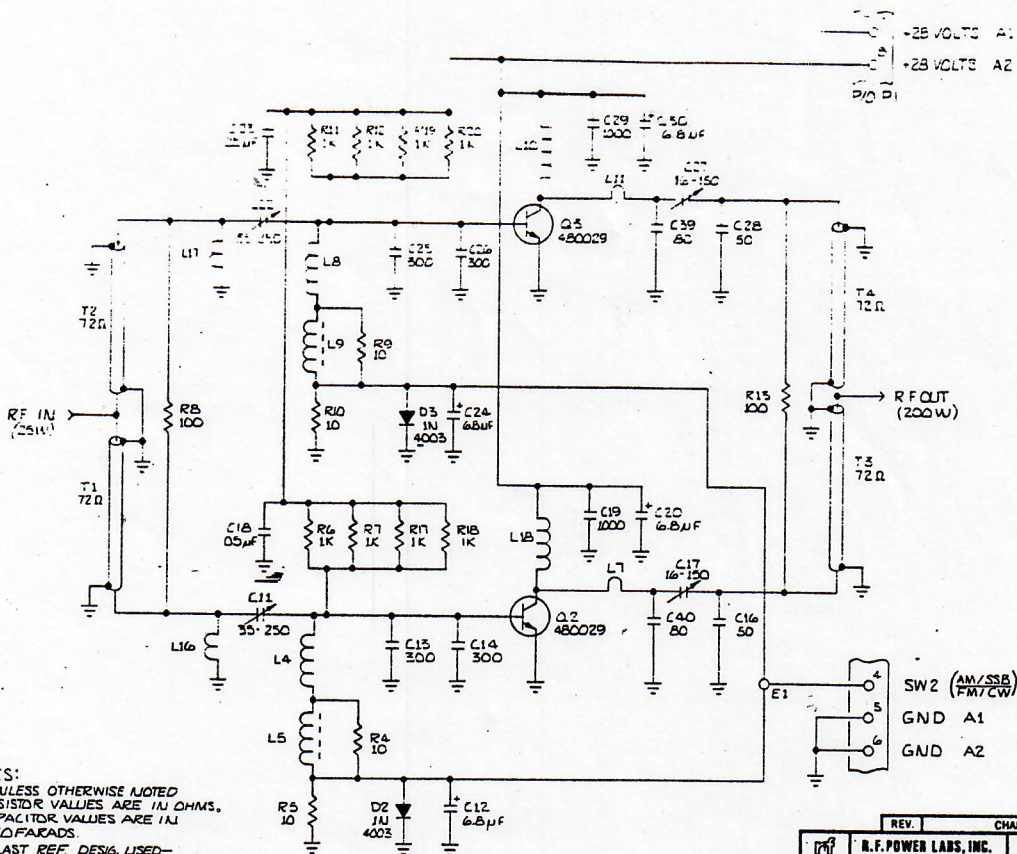
1. UNLESS OTHERWISE NOTED
RESISTOR VALUES IN OHMS
CAPACITOR VALUES IN MICROFARADS.
2. T1 SHOWN WIRED FOR 115V INPUT.
FOR 220V OPERATION - JUNE TO
TERMINAL 127, JUMPER - 456
3. LAST REFERENCE DESIGNATION ASSIGNED:
R5, C2, D3, I4, Q2, ZD2

| | | | | |
|--|--|--------------------|-------------------|------|
| REV. | | CHANGE DESCRIPTION | | BY |
|  | R.F. POWER LABS, INC. | | SCHEMATIC DIAGRAM | |
| | 11012 - 11016 PL. ME. KIRKLAND, WA. 98033 | | V350 POWER SUPPLY | |
| QUANTITY OF PARTS SPECIFIED, DIMENSIONS AND IN CHARGE | | | | |
| JAN 83 | DRN. KEY 40-42 | SIZE | DRAWING NO. | REV. |
| N | CHK. | C | V350-S1 | |



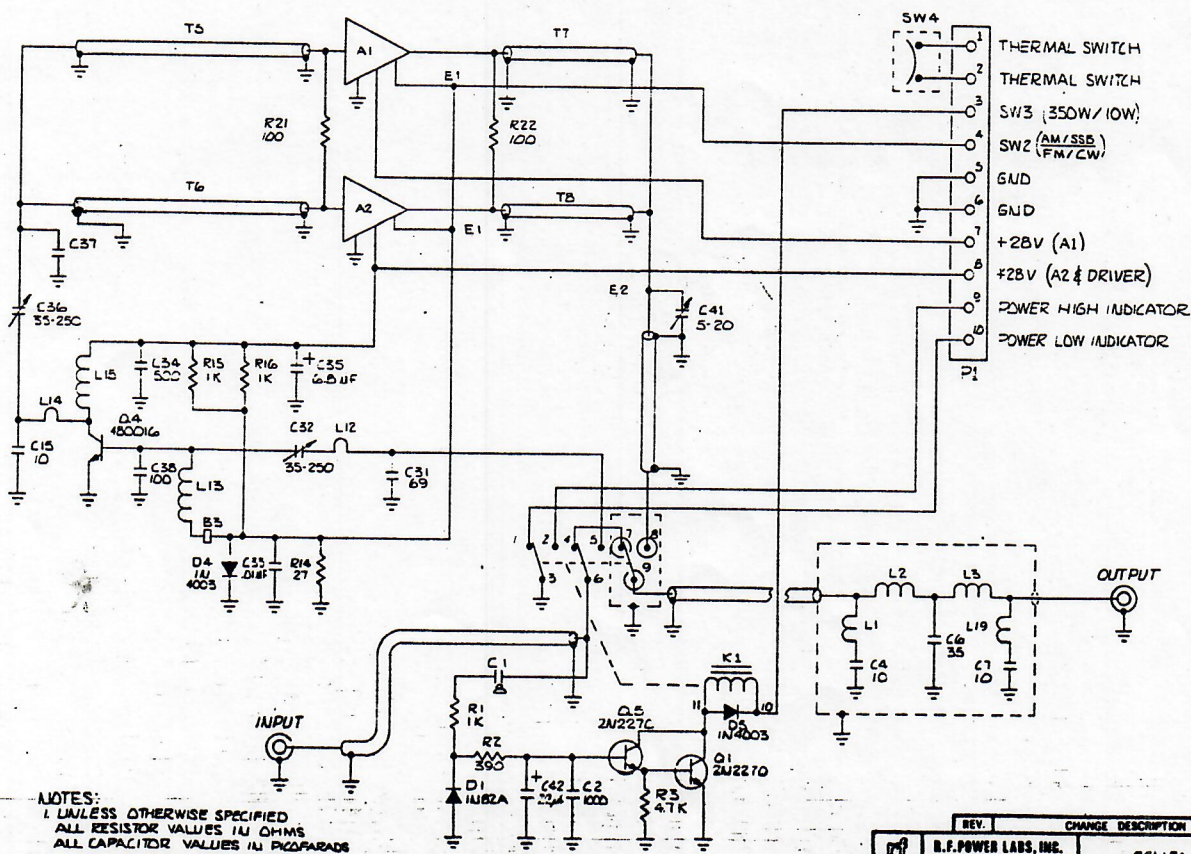
A1 AMPLIFIER

A2 AMPLIFIER & DRIVER



NOTES:
1. UNLESS OTHERWISE NOTED
RESISTOR VALUES ARE IN OHMS.
CAPACITOR VALUES ARE IN
PICO FARADS.
2. LAST REF DESIG. USED—
R20, C40, L18, Q3, D3, T4

| REV. | CHANGE DESCRIPTION | BY |
|---|--|-------------|
| 1 | R.F. POWER LABS, INC. 11013 - 118th PL. N.E. KIRKLAND, WA. 98033 | |
| UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES | | |
| JXX± | DRN. J KEY 10-11-78 | SIZE |
| JXX± | CHK | DRAWING NO. |
| ANG± | ENG. J KEY 10-11-78 | REV. |
| FRAC± | APPVD. | SCALE |
| | | SHT. 1 OF 1 |



NOTES:
1. UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES IN OHMS
ALL CAPACITOR VALUES IN PICO FARADS
2. LAST REF DESIG. - R22, C41, L19, Q5, D5, T8

| REV. | CHANGE DESCRIPTION | BY |
|---|--|-------------|
| 1 | R.F. POWER LABS, INC. 11013 - 118th PL. N.E. KIRKLAND, WA. 98033 | |
| UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES | | |
| JXX± | DRN. J KEY 10-12-78 | SIZE |
| JXX± | CHK | DRAWING NO. |
| ANG± | ENG. J KEY 10-12-78 | REV. |
| | | SCALE |
| | | SHT. 1 OF 1 |

TUNE-UP PROCEDURE: Normally, it should not be necessary to disturb the adjustments of the amplifier. Only after major circuit repair or if a change in frequency operation is desired should the variable elements be readjusted. The factory does not suggest any circuit adjustments be made unless the person performing these adjustments is technically qualified and has the proper equipment available to insure that the equipment performs as specified after adjustments are completed. Improper adjustments of the amplifier components may cause spurious output not meeting FCC specifications.

Before proceeding with the alignment of the tunable elements of the amplifier, it is required that the amplifier subchassis be lifted from the cabinet in order to gain access to the adjustments.

Remove the four 6/32 by 5/8" Phillips pan head screws located directly on top and up front of the heatsink. Also, remove the two screws holding the RF connector panel to the chassis.

NOTE: DO NOT remove the two screws holding the heatsink to the rear connector plate. Tilt the amplifier up making sure the harness and connector do not short out against any chassis parts.

Connect the amplifier and test equipment as shown in Fig. 1 and very carefully proceed as follows:

- 1) Adjust variac to 50% of normal line voltage.
- 2) Push AC power switch to "ON". I1 pilot light will illuminate, so will the meter light. Mode switch should be down to FM/CW. 10W/350W switch to 350W.
- 3) Inject about 3 watts of RF power at the operating frequency into the amplifier and watch the output power meter M2 and the panel meter for an upward indication.
- 4) Slowly tune C17 & C27 on A1 and on A2 for maximum power output as seen on the RF output meter M2.

NOTE: Make sure you hear K1 relay click in. If not, slowly increase the variac or the input drive power until it does.

- 5) Adjust C36, C11, C22 and C41 for maximum output power as can be seen on M2 and M1 respectively. Adjust C32 for minimum input VSWR on M1.
- 6) Slowly go through the entire procedure again, there will be some interaction between adjustments. Do not try to tune the amplifier with one quick adjustment. All adjustments should require the same amount of change for best results.
- 7) Set the variac to full line voltage and repeat the entire procedure several times to insure a balanced adjustment of all stages.
- 8) Set the input drive power to 15 watts. Peak all adjustments for maximum output power and minimum input VSWR. The amplifier should produce a minimum of 350 watts of clean RF power output.
- 9) Check the output signal with a good spectrum analyzer to insure that all spurious emissions are down 60dB minimum from the desired signal. The panel meter should not indicate into the red area of the meter scale. If it does, retune the final output stages by means of C17 and C27, for a dip in the collector current (meter dip). The best setting is clockwise through the power output peak plus 1/8 turn of the capacitor adjustment. Bandwidth is about 5MHz.

CAUTION: Always start with low input levels and low AC line voltages. Gradually increase them as the amplifier is being tuned-up. It may require several complete tune-up procedures to arrive at the correct final setting. Never operate the amplifier with AC line voltages producing more than +33VDC across C1 capacitor under no load conditions.

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