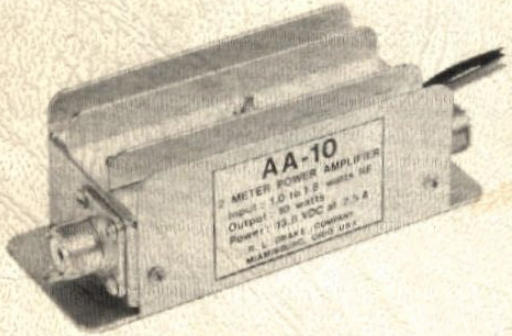
DRAKE

INSTRUCTION MANUAL



MODEL AA-10

POWER AMPLIFIER

R. L. DRAKE COMPANY Miamisburg, Ohio U. S. A.

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STANDARD WARRANTY

R. L. DRAKE COMPANY warrants each new product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective. Should a malfunction be suspected, write in detail to our Service Department for suggestions concerning the operation, repair or return of your unit if it should prove necessary.

This warranty does not extend to any of our products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside our factory, nor in cases where the serial number thereof has been removed, defaced or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized dealer or wholesaler without charge to the owner.

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 sale of our products.

The R. L. DRAKE COMPANY reserves the right to make any improvements to its products which it may deem desirable without obligating itself to install such improvement in its previously manufactured products.

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CHAPTER 1
INTRODUCTION

1-1. DESCRIPTION.

The AA–10 is a single stage, solid state power amplifier for use with the TR–22 2M Transceiver or any other transceiver with 1 to 1.8 Watts output power. The AA–10 provides approximately 10 dB signal increase on transmit with no noticeable loss in the receive path. Solid state Transmit/Receive switching is completely automatic and uses no relay.

1-2. SPECIFICATIONS.

GENERAL

Frequency Coverage:	2 Meter amateur band.
RF Output Power:	10 Watts at 13.8 Volts DC and with rated input power. 15 Watts maximum.
RF Input Power:	1.0 Watts for rated output power. 1.8 Watts maximum.
Receive Path Loss:	Typically ½ dB – unnoticeable.
Dimensions:	5¾" x 2¼" x 2".

CONNECTORS

1 Type SO-239 Antenna Connector
1 Type SO-239 Transceiver Connector

POWER REQUIREMENTS

13.8 Volts at 2.5 Amperes for full output.

SEMICONDUCTOR COMPLEMENT

Type	Function
1 – PT4544	Power Amplifier
6 – 1N 4148	Transmit/Receive Automatic Switching
1 – B5G5	Reverse Polarity Protection

CHAPTER II
INSTALLATION

2-1. UNPACKING.

Carefully remove the unit from the shipping carton, and examine it for evidence of damage. If any damage is discovered, immediately notify the transportation company that delivered the unit. Be sure to keep the shipping carton and packing material, as the transportation company will want to examine them if there is a damage claim. Keep the carton and packing material even if no shipping damage occurs. Having the original carton available makes packing the unit much easier should it ever be necessary to store it or return it to the factory for service.

NOTE

Fill out the enclosed registration card and return it to the factory immediately to insure registration and validation of the warranty.

2-2. LOCATION.

The location of the AA–10 in general is not critical. However, some space for air circulation around the heat sink fins should be provided. In a mobile installation, it is recommended that the AA–10 be installed up front (under the dash, etc.) close to the TR–22 so that there is minimum coax length between the two units. However, the AA–10 may also be very satisfactorily mounted in the trunk. If more than 15 feet of coax is needed, RG8/U coax should be used. RG58/U, in lengths over 15 feet, has high enough line loss that rated output power may not be obtained due to excessive drop in drive power.

NOTE

In all cases nominal 50 to 52 Ohm cable must be used both on the input and output sides of the amplifier. Attempts to use even very short lengths of other impedance coax (such as 75 Ohm RG59, RG11, etc.) in this 50 Ohm system will severely degrade performance.

2-3. CABLING.

The positive power lead (red) should be connected to a source which will not have excessive voltage drop with a 2.5 Ampere maximum load. It is not necessary to place a switch in the lead as the AA–10 draws no current when drive is not applied.

The lug on the end of the negative lead (black) may be secured by a convenient screw in the vehicle or by drilling a hole with a number 36 drill for the sheet metal screw supplied with the AA–10. Be sure to follow the instructions in paragraph 2-2 above regarding input and output coaxial cable connections.

2-4. USE WITH AC POWER SUPPLY.

If the AA–10 is used with an AC supply, it should be well regulated and must be free of transients. The supply must be capable of supplying 13.8 Volts at 2.5 Amperes. The instantaneous peak output voltage from the supply must never exceed 18 Volts or the power transistor may be destroyed due to breakdown.

The Drake model AC–10 regulated supply will provide the necessary power for the AA–10 amplifier and the TR–22 transceiver from a 120 Volt AC source.

CHAPTER III
OPERATION

With DC voltage applied, the AA–10 will transmit when RF is applied from the TR–22. On receive, signals will pass through the AA–10 to the TR–22 receiver without attenuation. The DC supply voltage has no effect on the receiver path of the AA–10. Most two meter mobile installations have low VSWR and therefore it should not be necessary to make any tuning adjustments to the AA–10. Although the power transistor used in the AA–10 has instantaneous VSWR protection, the amplifier should not be used with a VSWR exceeding 2:1.

NOTES

CHAPTER IV
PRINCIPLES OF OPERATION

The AA–10 consists of a single stage power amplifier using a balanced-emitter VHF power transistor with VSWR protection. The amplifier has more than 10 dB gain at 146 MHz with 13.8 Volts supply voltage.

Transmit/Receive switching is accomplished by diodes CR2 through CR7, capacitor C9, and coil L6. On receive, when no RF is applied to the AA–10, C9 and L5 form a series-resonant circuit which provides a low impedance path from the antenna jack to the transceiver jack. Diodes CR2 through CR7 all act as open circuits because no RF is present to forward-bias them.

On transmit, RF from the transceiver causes CR2 and CR3 to conduct thus connecting drive power to the amplifier section. The amplified output causes diodes CR4 and CR5 to conduct, connecting the output to the antenna. RF also forward-biases diodes CR6 and CR7 which then detune the series-resonant circuit consisting of C9 and L6 thus preventing power from the output of the amplifier from reaching the input. L5 and C8 form a low-pass filter section to reduce the harmonic level.

NOTES

CHAPTER V
MAINTENANCE

5-1. SERVICE DATA.

We will check and align your unit at the factory for a nominal fee if it has not been tampered with. Transportation charges are extra. Any necessary repairs will be made on a time and material basis. Please write or call the factory for authorization before returning your unit for alignment or service. Address your request for authorization to:

R. L. Drake Company
540 Richard Street
Miamisburg, Ohio 45342
ATTN: Customer Service Department
Telephone: (Area Code 513) 866-3211
Code-A-Phone Service after
1630 Hours E.S.T.
Telex No. 288-017

5-2. CABINET REMOVAL.

The cover may be removed by removing the screws holding it in place. The amplifier will operate properly without the cover for alignment purposes.

5-3. TROUBLE SHOOTING.

The AA–10 must be connected to a proper supply as described under paragraph 2-4 or to a battery. If the amplifier passes receive signals normally but has no output and draws no current on transmit, check the 3 Ampere fuse mounted between the two terminals on the PC board. If the amplifier has been accidentally connected to the supply in the wrong polarity, this fuse will be blown. Replace the fuse with a 3 Ampere type 3AG3APT fuse if necessary.

Connect the output of the AA–10 to a dummy load and VHF wattmeter. Connect the transceiver jack of the AA–10 to the TR–22 with a short length of 50 Ohm coax. With a supply voltage of 13.8 Volts under load, output power should be at least 10 Watts. If less than ten Watts is obtained, first check the TR–22 to be sure it is operating normally and has at least 1 Watt output. If drive is proper, proceed with the alignment instructions.

If the amplifier cannot be tuned, a defective power transistor may be the problem. Also check the six receive/transmit switching diodes with an ohmmeter to be sure they are not damaged.

5-4. ALIGNMENT.

A. Touch-up alignment only–to match the AA–10 output to a slightly mismatched load (less than 1.5:1 VSWR).

1. Do not touch C4, C5 or C9. These are factory adjusted for 50 Ohm output.
2. Apply drive power and very carefully adjust C6 for an increase in output.

3. With drive applied, adjust C7 slightly for any increase in output (do not turn more than ¼ turn).
4. Repeat Steps 2 and 3 until no further increase is obtained.

B. Complete alignment.

NOTE

Make all adjustments with *INSULATED* alignment tool.

1. Tighten all trimmers down until snug but not overly tight.
2. Connect the transceiver side of the AA–10 to the TR–22 with a short length of 50 Ohm coax. Connect the antenna side of the AA–10 to a 50 Ohm signal generator. Apply enough signal from the generator to read ½ scale on the TR–22 receive meter. Adjust C9 for maximum receive strength. Keep the signal generator level turned down so that a weak signal is always present. With a weak signal, an accurate adjustment can be made.

   After adjustment of C9, do not readjust this trimmer again or transmitter realignment will be necessary. If replacement of the AA–10 by a double female UHF fitting results in no noticeable difference in receive signal, the receive alignment is suitable.
3. Reconnect the AA–10 with a VSWR meter between the TR–22 and the AA–10 and connect a dummy load and VHF wattmeter to the antenna jack of the AA–10.

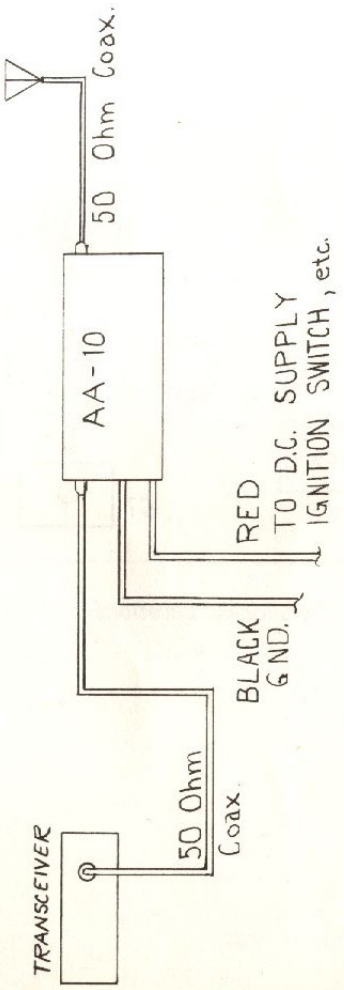
   Apply 13.8 Volts supply voltage. Apply drive from the TR–22. Adjust C5 for minimum VSWR on the meter between the AA–10 and TR–22.
4. Adjust C6 for maximum output from the AA–10.

5. Adjust C7 in small increments for maximum output.
6. Repeat Steps 4 and 5 until no further increase results, then proceed to Step 7.
7. Adjust C4 in small increments for maximum output.
8. Readjust C5 for maximum output.
9. Repeat Steps 7 and 8 until no further increase results.
10. Repeat Steps 4 and 5 until no further increase results.
11. Repeat Steps 7 and 8 until no further increase results.
12. Repeat Steps 10 and 11 until no further increase results.

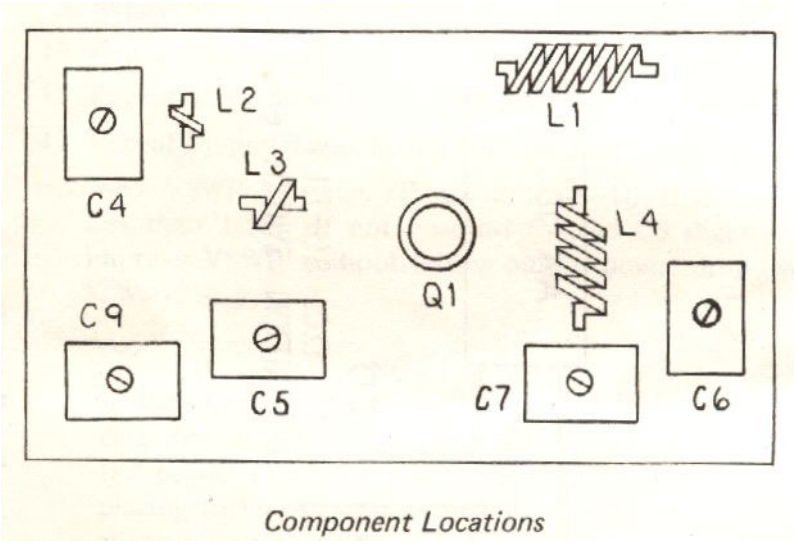
Note VSWR between TR–22 and AA–10. It should be less than 1.5:1. If not, readjust C4 and C5 slightly to improve VSWR without letting output power drop over ½ Watt.

NOTE

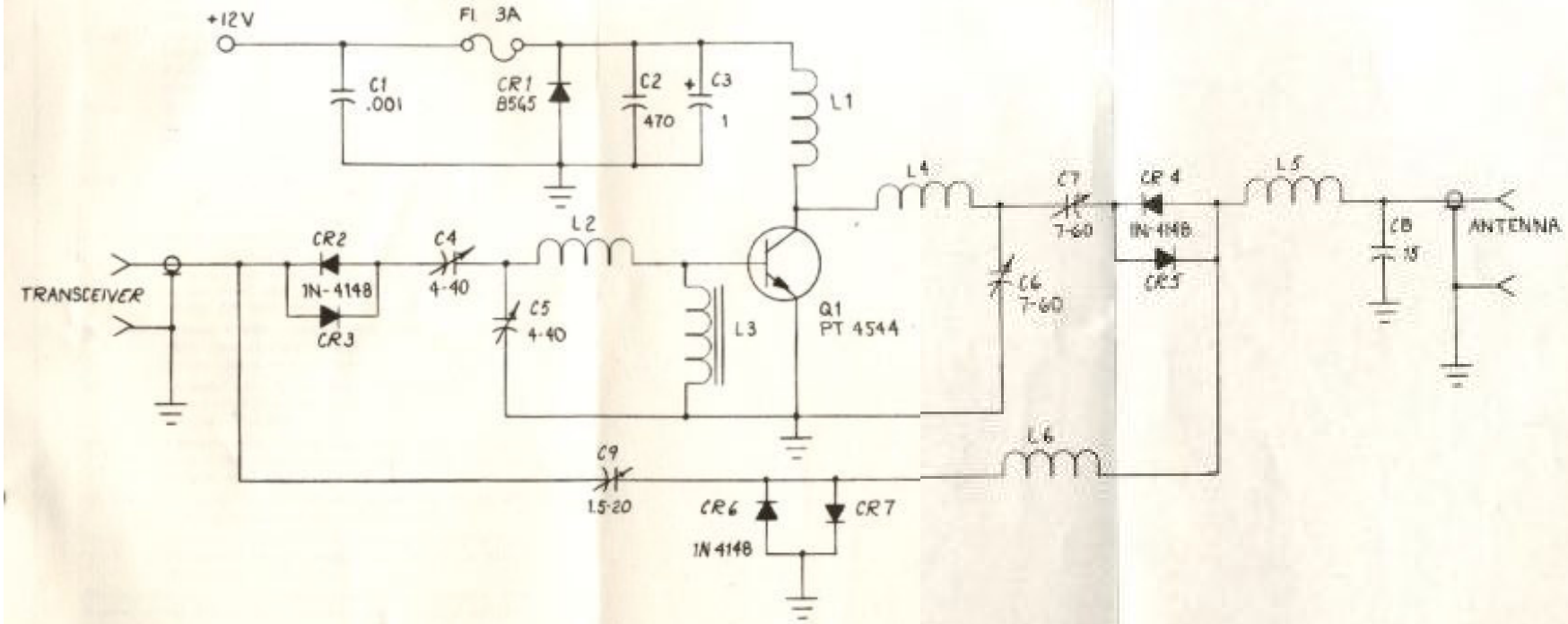
If the printed circuit board must be removed, care should be taken not to place any strain on the power transistor mounting stud. When replacing the board, tighten the nut on the transistor mounting stud to 6 inch-pounds of torque.



Installation Diagram



Component Locations



AA-10 Schematic Diagram