

HENRY/TEMPO SOLID STATE VHF AMPLIFIERS

OPERATING AND MAINTENANCE MANUAL

INCLUDING MODELS:

C100C30	100C30
C100C10	100C10
C100C02	100C02

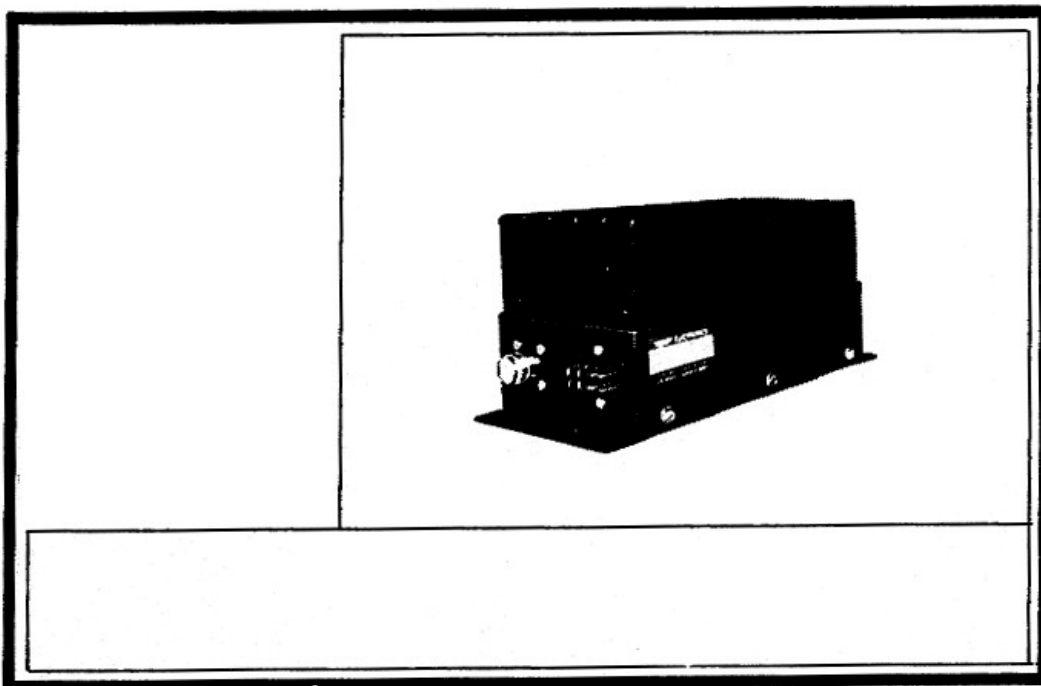
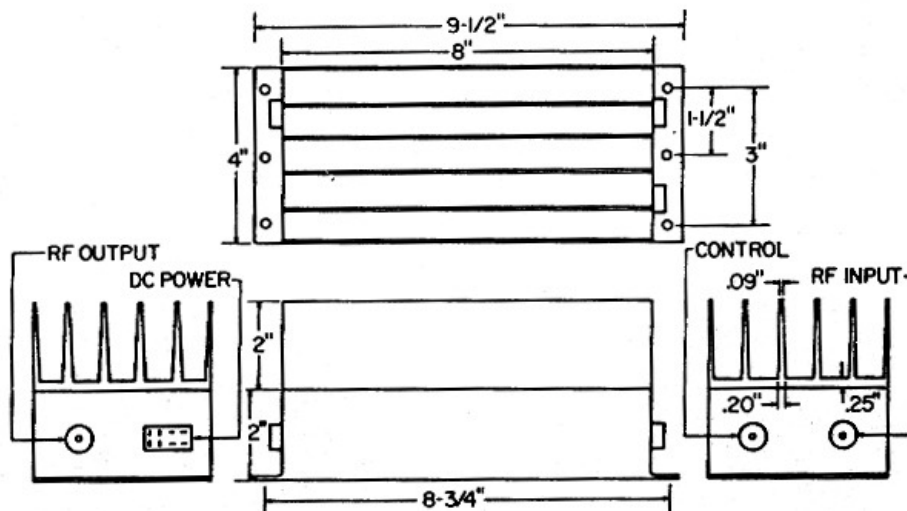


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DIMENSIONAL DRAWING



PLEASE NOTE All rated amplifier outputs are measured under laboratory conditions with a proper drive level. If the amplifiers are operated with improper drive, at a voltage less than 13.8 VDC, with mismatched cables, or with a mismatched antenna the output will be less than maximum!

The standard cables required for a normal installation are provided with the amplifier. Special cables or connectors can be supplied on request. When installing the amplifier, keep in mind that the equipment should be mounted as closely as possible to the 13.8 VDC power source to prevent low output caused by a voltage drop in the DC cable. We recommend installation inside the vehicle for mobile installations. The red (or white) power lead connects to the battery's positive (+) terminal and the black DC lead connects to the battery's negative (-) terminal. Figure 1 is a diagram of the necessary interconnections.

The DC power cables should be connected directly across the battery to prevent damage to the ignition system of the car caused by the high operating current of the amplifier. Screw the amplifier into position at the location desired and plug the DC power cable into the 13.8 VDC connector (8-pin Jones plug) of the amplifier.

Connect the RF OUT coax connector to an appropriate antenna (50 ohms) using coaxial cable. These amplifiers, as with all solid state devices, operate with maximum output when facing a low SWR. The SWR of the antenna should be measured and adjusted for a minimum at the desired operating frequency. Also remember that long coax leads cause significant power losses at VHF frequencies. Connect the supplied drive cable to the exciter and to the RF IN coax connector of the amplifier.

The mobile installation has been completed when all of the described connections have been made.

For base station installations, the amplifier must be connected to a 13.8 VDC source (either a storage battery, or an AC to DC power converter such as the Henry PS-1220) capable of supplying the necessary current - - 16 to 18 amperes.

The amplifiers are designed to key into transmit automatically whenever they are driven with more than about .5 watts. The CONTROL jack, described in Section 6, disables the automatic keying circuit for low power operation.

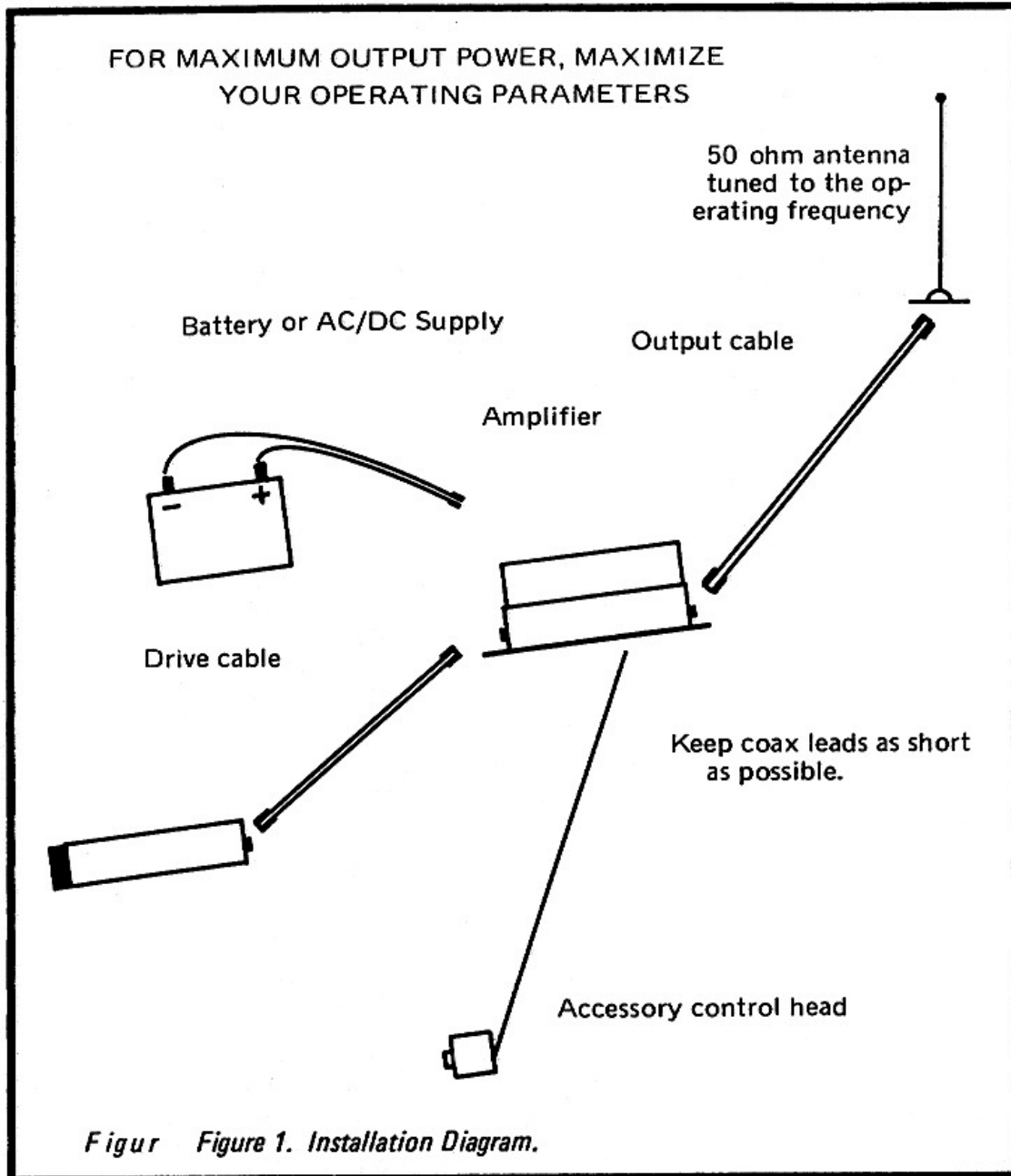
For optimum output, remember that the voltage at the amplifier, the drive power, the length of the coax lead, and proper antenna tuning are all important operating parameters. Complaints of low output can usually be traced to an improper type of installation.

SECTION 3 SPECIFICATIONS

POWER OUTPUT: 100 watts maximum
...C30 Models - 3 to 6 db gain (2-3 times drive)
...C10 Models - 10 db gain (10 times drive)
...C02 Models - 16 to 18 db gain (40-50 times drive)

DRIVE REQUIREMENTS: ...C30 Models - 20 to 50 watts.
...C10 Models - 5 to 20 watts.
...C02 Models - 1 to 5 watts.

FREQUENCY RANGE: 35 to 60 MHz (type accepted).



BANDWIDTH: *Approximately 4 MHz without retuning.*

HARMONIC ATTENUATION: *Better than 70 db below carrier with commercial filtering.*

DUTY CYCLE: *50% standard commercial use.*

POWER REQUIREMENTS: *13.8 VDC nominal.
11.0 to 15.5 VDC possible.
5 ma nominal - standby.
16 amps nominal maximum.*

CONNECTORS: *RF OUT - UHF type.
RF IN - BNC type.*

TYPE OF EMISSION: *AM, SSB, or FM.*

IMPEDANCE: *50 ohms unbalanced nominal.*

MISMATCH PROTECTION: *Balanced emitter transistors will withstand infinite VSWR.*

ANTENNA CHANGEOVER: *Automatic built-in RF sensing.*

CONTROLS: *Remote off.*

DIMENSIONS: *9.5" long x 4.0" high x 4.0" wide.*

SHIPPING WEIGHT: *Approximately 5 pounds.*

MADE IN THE U.S.A.

SECTION 4 CIRCUIT DESCRIPTION

4.1 MODEL C100C02

The circuit diagram of the amplifier is shown in Figure 2. The amplifier consists of three distinct circuits: An RF sensor and relay circuit, a preamplifier stage, and a final power amplifier stage.

In the sensing-relay circuit, RF from the antenna to J3 (RF OUT) goes directly through the relay and J1 (RF IN) into the transceiver during receive. During transmit the RF from the transceiver enters the amplifier through J1 (RF IN) and creates a DC voltage across diode D1. The voltage is amplified by Q1 to trip relay RY1, causing the signal to enter the amplifier sections. Grounding the base circuit of Q1 disables the sensing circuit to turn the amplifier off.

In the preamplifier section (the driver stage) the base of Q4 is matched to 50 ohms by C3, L9, and C15. L9 is a torroidally wound coil on a ferrite core. L11 and C16 decouple the driver stage from the DC power line.

The output from Q4, approximately 10 watts, is matched to and divided between the two final output transistors (Q2 and Q3) by L10 a broad band ferrite matching transformer. C4 matches the impedance between the two stages. Q2 and Q3, operating in a push-pull circuit, deliver the output power to L6 and L7, another broad band ferrite matching transformer and combiner. C14 matches the output impedance to 50 ohms.

L8, C6, and C7 decouple the amplifier stage from the DC power line.

C10 through C13 and L1 through L3 form a low pass filter to suppress the harmonics generated in the amplifier. The coils are selected in final assembly for the lower or upper part of the specified operating frequency range.

D2 is a reverse polarity protection diode. The amplifiers are designed to operate from a negative ground power source. The amplifiers use glass epoxy circuit boards.

4.2 MODEL C100C10

The C100C10 is identical to the C100C02 in all respects except for the deletion of the following parts in the preamplifier section: C15, C16, C17, L9, L10, L11 and Q4.

4.3 MODEL C100C30

The C100C30 is the identical circuit to the C100C10. The only difference is the addition of a 3 to 6 db attenuator pad at the input of the amplifier section to prevent overdrive of the final section. The exact attenuator is selected to meet the customer's specified drive power.

SECTION 5 TESTING AND ALIGNMENT

WARNING: *The transistors in these amplifiers are easily damaged and expensive to replace. An insulated alignment tool is recommended for all servicing. The equipment warranty can not extend to transistors shorted during alignment.*

5.1 MODEL C100C02

See Figures 4 and 5 for the parts locations, alignment connections, and the test equipment. First verify that the RF drive power of the transceiver or exciter is proper for the amplifier being used (nominally 2-3 watts for the C100C02, 8-12 watts for the C100C10, and 20-40 watts for the C100C30).

Remove the bottom plate of the amplifier and turn the unit upside down onto its heat sink and make all the interconnections described in Figure 5.

CAUTION: *The amplifier must be operated into a 50 ohm dummy load capable of accepting 100 watts of power whenever it is transmitting during alignment.*

(Step 1) - We recommend the initial tuning of the amplifier be done at about half power to prevent damage from operation into an untuned filter circuit. Adjust trimmer C3 for minimum reflected power between the transceiver and the amplifier.

(Step 2) - Adjust trimmer C4 for maximum output from the amplifier.

(Step 3) - Adjust trimmer C14 for maximum output from the amplifier.

(Step 4) - The filter should be tuned into a spectrum analyzer for maximum suppression of unwanted harmonics. If a spectrum analyzer is not available, the filter

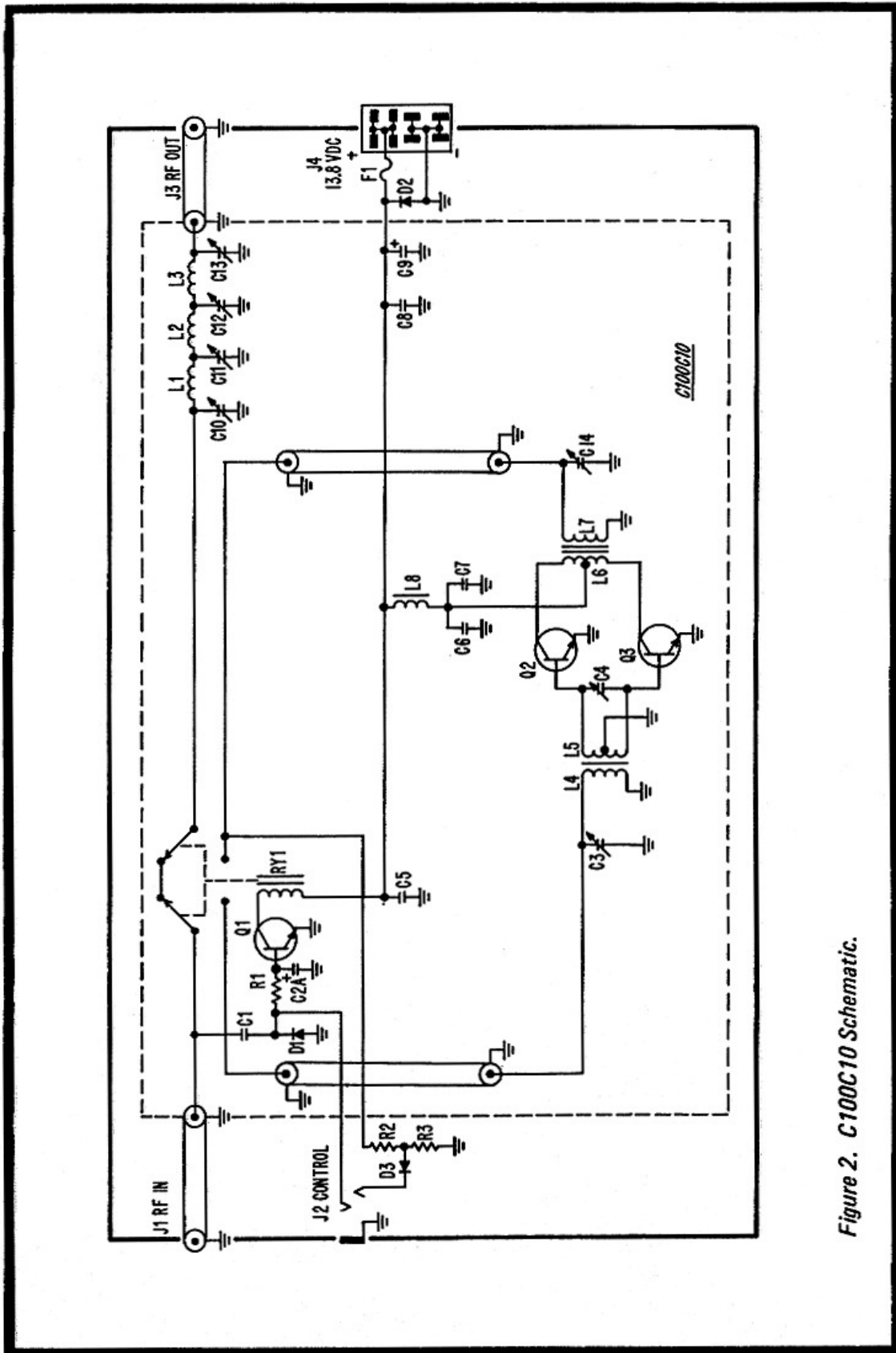


Figure 2. C100C10 Schematic.

should be tuned for maximum output. Tune trimmers C10, C11, C12, and C13 in succession for minimum spurious output or for maximum power output.

5.2 MODEL C100C10

The alignment procedure for this model is identical to steps 2, 3 and 4 as described in Section 5.1. The drive requirement is nominally 8 to 12 watts for the amplifier but it will accept from 5 to 20 watts of drive.

5.3 MODEL C100C30

The alignment procedure for this model is identical to steps 2, 3, and 4 as described in Section 5.1. The drive acceptance is nominally 20 to 50 watts.

SECTION 6 POWER ADJUST

The power input or output of these amplifiers can be adjusted by tuning C4 for the desired power. Transmit into a proper load with a thru-line wattmeter inserted in the output line of the amplifier. Adjust C4 until the amplifier is operating at the maximum level desired.

Input power to the final stage can be calculated by measuring the DC current to the amplifier for the C100C10 and C100C30 and the DC current to the driver stage for the C100C02.

For the C100C10 and C100C30:

Input Power (watts) = 13.8 VDC x (total amplifier current)

For the C100C02:

Input Power (watts) = 13.8 VDC x (total amp. current – driver current)

SECTION 7 CONTROL CONNECTION

The control jack on the amplifier allows remote control on/off switching of the amplifier without switching the high current DC line. As shown in Figure 6, grounding the control line (the sleeve of the connector) disables the amplifier.

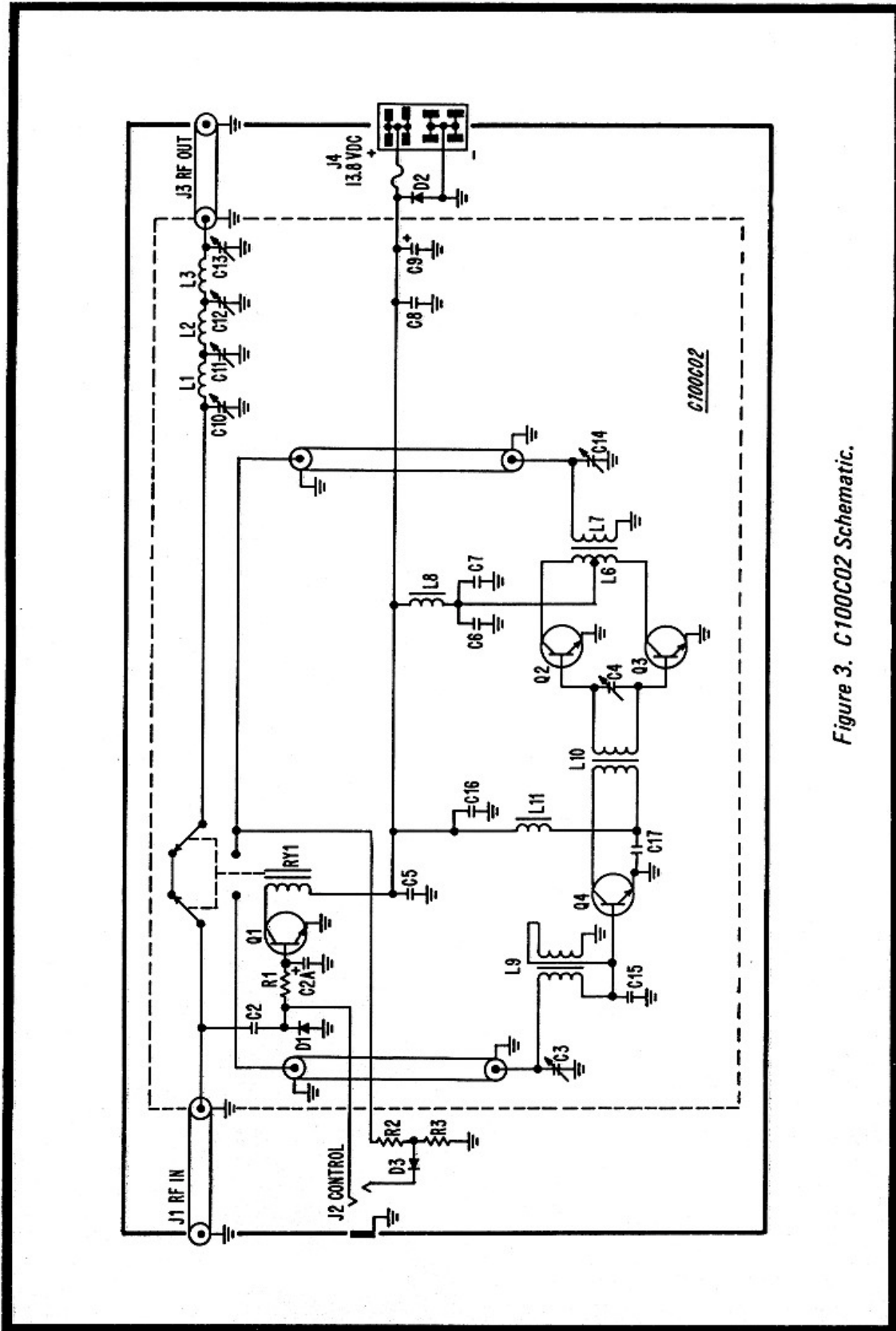


Figure 3. C100C02 Schematic.

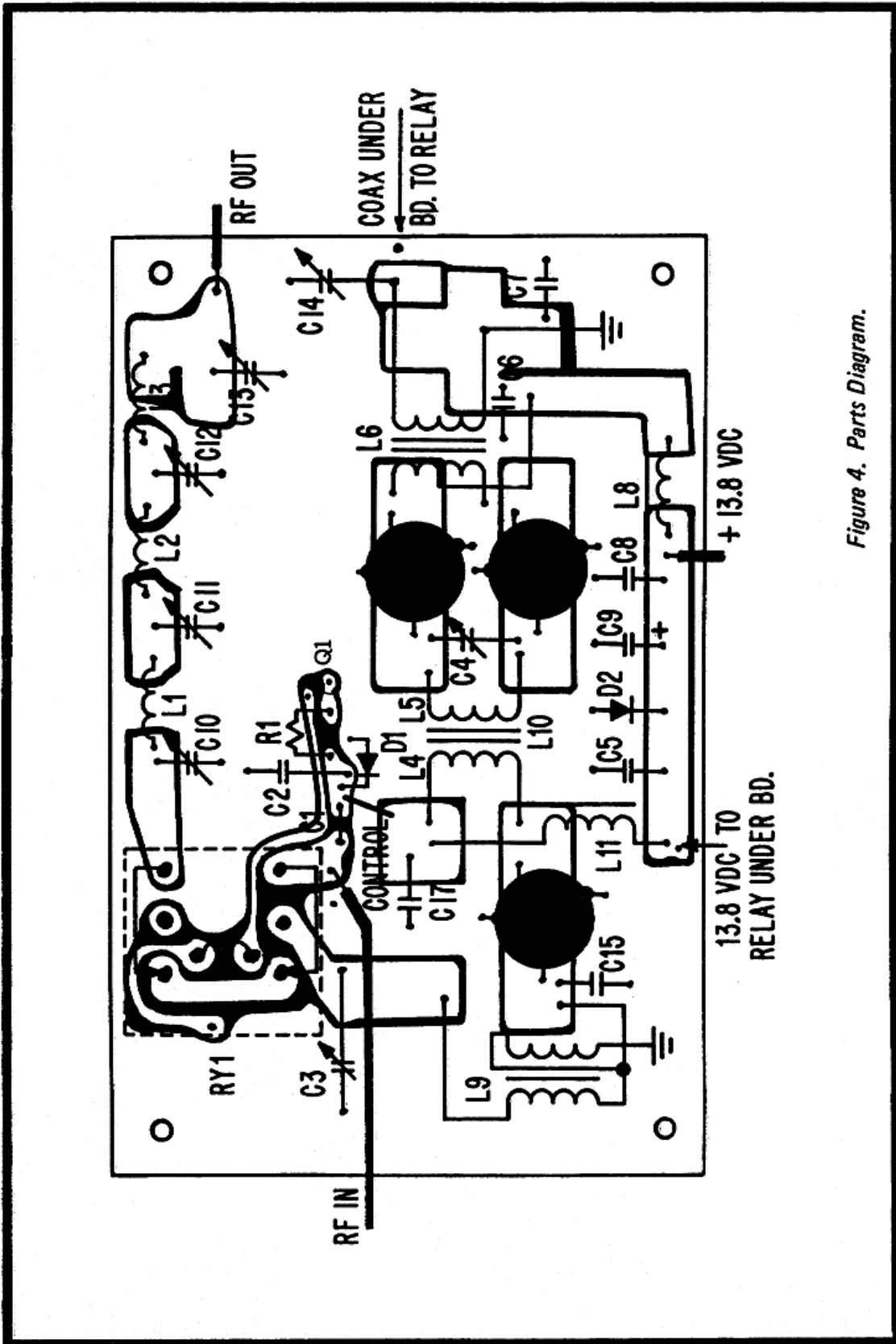
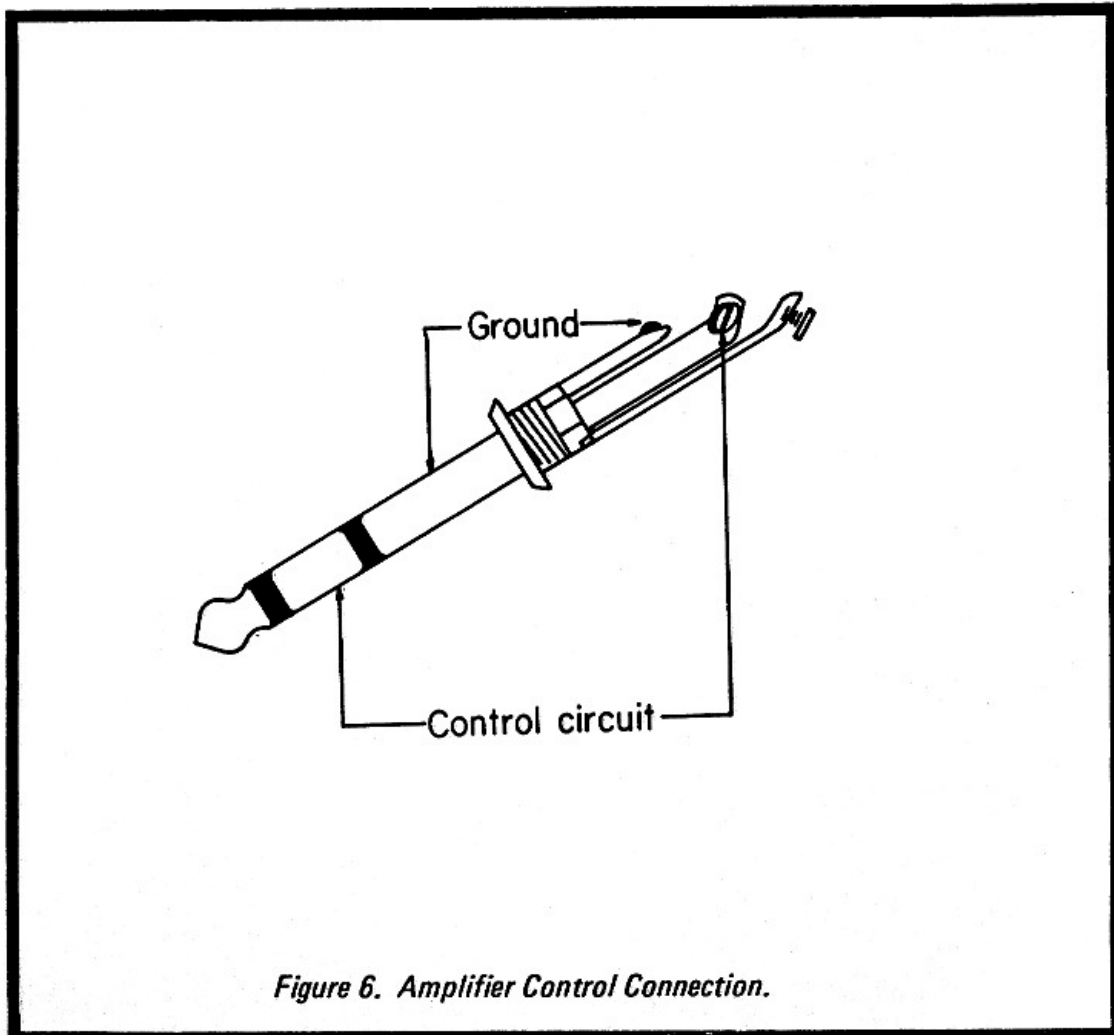
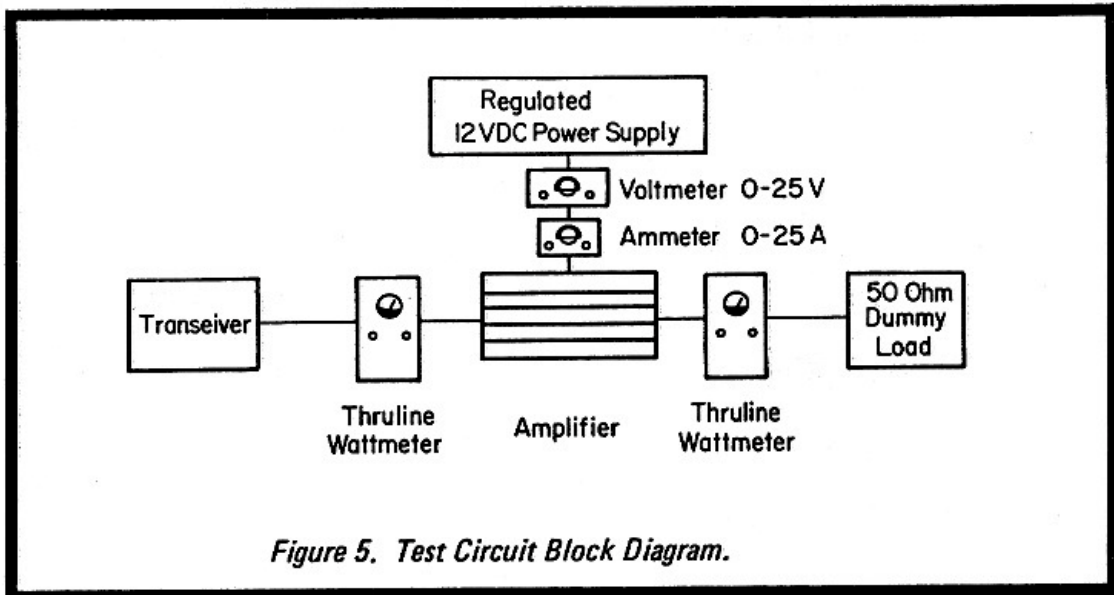


Figure 4. Parts Diagram.



SECTION 8 PARTS LISTS

8.1 C100C02 PARTS LIST

Schematic No.	DESCRIPTION	MANUFACTURER
	Box and Packing Material.	Henry
	CABLE: DC primary cable with S308-CCT	Henry
	CABLE: RF drive cable with type BNC RF connector.	Henry
	CIRCUIT BOARD: Glass epoxy, 100C02 board.	Henry
C1	CAPACITOR: Silver mica, 3 pf, 100 VDC, 5%.	Arco DM05-030J
C2	CAPACITOR: Electrolytic, 25 mf, 50 VDC.	Arco RME-FJ-02
C3	CAPACITOR: Midget ceramic trimmer, 55 - 300 pf, 175 VDC.	Arco 427
C4	CAPACITOR: Ceramic trimmer, 170 - 780 pf, 175 VDC.	Arco 469
C5 through C7	CAPACITOR: Ceramic disc, .01 mf, 150 VDC.	Ctl. DDM-103
C8	CAPACITOR: Ceramic disc, .005 mf, 50 VDC.	Ctl. CK-502
C9	CAPACITOR: Same as C2.	
C10	CAPACITOR: Miniature ceramic trimmer, 15 - 115 pf, 175 VDC.	Arco 406
C11 and C12	CAPACITOR: Midget ceramic trimmer, 24 - 200 pf, 175 VDC.	Arco 425
C13 and C14	CAPACITOR: Miniature ceramic trimmer, 4 - 60 pf, 175 VDC.	Arco 404
C15 through C17	CAPACITOR: Same as C5.	
D1	DIODE: Silicon rectifier, 50 PIV, 1 amp.	1N4148 or equiv.
D2	DIODE: Polarity protection, silicon, 3 amp, 100 PIV.	Mot. HEP-R0091
D3	DIODE: Silicon rectifier, 400 PIV, 1 amp.	1N4004 or equiv.
F1	FUSE: 3 AG, 20 amp, 250 V. FUSEHOLDER: Clip type.	Littelfuse 312 020 Littelfuse 357 001
J1	CONNECTOR: RF INPUT, type BNC coax connector.	Amphenol 031-102
J2	CONNECTOR: CONTROL, 3 conductor phone jack, 1/4".	Switchcraft S-12B
J3	CONNECTOR: RF OUTPUT, type UHF coax connector.	Amphenol 083-14
J4	CONNECTOR: 13.8 VDC, DC primary connector, 8 pin plug.	Cinch S-308 AB

(continued)		
L1 and L2	INDUCTOR: 20 ga., 5/16" ID, 4 turn.	Henry
L3	INDUCTOR: 20 ga., 5/16" ID, 3 turn.	Henry
L4 and L5	INDUCTOR: Interstage, broadband, ferrite matching transformer.	Henry
L6 and L7	INDUCTOR: Interstage, broadband, ferrite matching transformer.	Henry
L8	INDUCTOR: Torroidally wound RF choke.	Henry
L9	INDUCTOR: Torroidally wound matching transformer.	Henry
L10	INDUCTOR: Same as L6 and L7 (used only in 100C10).	Henry
L11	INDUCTOR: Torroidally wound RF choke.	Henry
METAL PIECES:		
	Bottom Plate.	Henry
	Chassis.	Henry
	Heat sink.	Henry
Q1	TRANSISTOR: RF amplifier, type 2N2222A.	2N2222A
Q2 and Q3	TRANSISTOR: RF power amplifier, HF, 60 watts, linear.	CTC A60-12
Q4	TRANSISTOR: RF power amplifier, HF, low gain.	TRW Special Order
R1	RESISTOR: Carbon, 1 K ohm, 1/4 watt, 10%.	Resistor
R2 and R3	RESISTOR: Carbon, 10 K ohm, 1/2 watt, 10%.	Resistor
RY1	RELAY: Antenna changeover, 12 VDC.	Guardian 1365-PC

8.2 C100C10 PARTS LIST

This amplifier is identical to the C100C02 except that the following parts are deleted: C15, C16, C17, L9, L10, and L11, and Q4.

8.3 C100C30 PARTS LIST

This amplifier is identical to the C100C10 except for the addition of a 3 to 6 db attenuator resistor pad at the input to the amplifier section.