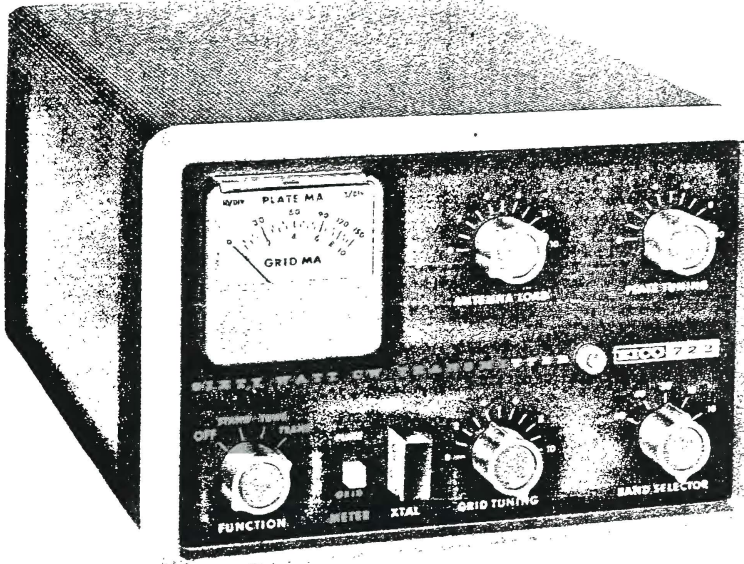


# 60 WATT CW TRANSMITTER



## GENERAL DESCRIPTION

Beautifully packaged, compact CW transmitter ideal for the novice or for the advanced ham requiring a low-power, stand-by rig. 60 watts input to a rugged 6DQ6-B neutralized final on CW; external plate modulation terminals permit use as an AM phone transmitter of up to 50 watts input. 6CL6 oscillator is an electron-coupled Colpitts type noted for low crystal heating and minimized effect of plate loading on frequency. Oscillator keying for break-in operation. Full-wave, choke input, 500V power supply employing high efficiency GZ34 rectifier. Features a one-knob bandswitch covering 80, 40, 20, 15 and 10 meters, and a one-knob power-tune-operate switch. Output pi-network consists of a tapped coil and plate tuning and antenna loading air variables. Another air variable tunes grid tank of final (and plate tank of oscillator). Panel meter can be switched into either grid or plate circuit of final. Rear apron load switch inserts extra capacity for low Z loads on 80 and 40 meters. Modulator/accessory socket for modulator input, antenna relay, VFO power take-off, and emergency input. Effective TVI suppression through filtering and by-passing, copper-plated chassis, and solid die-cast bezel providing tight-fitting joint between panel and cabinet.

## SPECIFICATIONS

Power Input: 60 watts cw; 50 watts AM-phone with external plate modulation.

Output Load Impedance: 50-1000 ohms

Band Coverage: 80, 40, 20, 15, 10 meters

Operation: XTal, external VFO, external plate modulation.

Tubes: 1-6DQ6-B final amplifier; 1-6CL6 oscillator, 1-GZ34 rectifier

Power Requirements: 117 volts, 60 cycles AC, 140 watts

Cabinet Size: (HWD) 6" x 8 1/2" x 11 1/4"

Weight: 15 lbs.

## CIRCUIT DESCRIPTION

**OSCILLATOR:** A high transconductance 6CL6 pentode is employed as an electron-coupled Colpitts crystal oscillator. This circuit is noted for its high harmonic output and low crystal heating. Since the oscillatory part of the circuit is isolated from the load side by the screen grid, frequency shift due to plate loading is minimized.

The plate tank circuit is simultaneously bandswitched with the final amplifier pi-network. It resonates at the output frequency on all bands except ten meters, where it is tuned to 14Mc. 80 meter crystals may be used for 80, 40, and 20 meter operation, while 40 meter crystals may be used on 40, 20, 15 and 10.

**FINAL AMPLIFIER:** A 6DQ6-B high efficiency power pentode is used as a stright-through class C power amplifier on all bands except ten meters, where, in addition to providing power amplification, the 6DQ6-B functions as a frequency doubler.

A variable-tuned, band-switching pi-network tank circuit is used to match the final amplifier to various loads between 50 and 1000 ohms approximately. A variable 900mmf capacitor is connected across the output of the pi-network for controlling the degree of loading of the antenna or other load. Should additional capacitance be required, a .001mf capacitor may be added by means of the slide switch on the rear apron.

**POWER SUPPLY AND CONTROL:** The power supply is a full-wave, choke input type providing 500 volts with a high efficiency GZ-34 indirectly heated rectifier. A swinging choke is used in conjunction with two 40mf electrolytic capacitors connected in series to provide good regulation under CW conditions. The power for the final plate and screen supply is connected to two terminals on an octal plug so that plate modulation can be applied simply by connecting a suitable modulation source to the terminals. A jumper is normally used for CW operation. 6.3volts ac is also at the same socket for any accessory. There is 117 volts provided at the octal socket for the antenna change-over relay which is energized only in the XMIT position of the FUNCTION switch.

The four-position ceramic wafer FUNCTION switch is used to control the ac line input, center tap grounding of high voltage winding of the power supply, and the screen circuit of the 6DQ6-B. In the TUNE position,

the screen of the 6DQ6-B is grounded in order to prevent excessive plate current flow when the grid current is being tuned. A line filter is employed at the input of the transmitter to attenuate any harmonics that are present on the AC leads. There is a two position METER switch that switches the meter to the grid of the final or the plate.

## FUNCTION OF CONTROLS

**FUNCTION Switch:** Four-position switch providing an OFF position and three mode of operation positions.

OFF — Disconnected from ac line.

STANDBY — Filaments energized, B+ supply disabled. ON-OFF pilot lit.

TUNE — Filaments energized and B+ supply enabled and applied generally, but withheld from screen of 6DQ6-B final amplifier which is grounded to limit plate current to a very low level.

TRANSMIT — Filaments energized, B+ supply enabled and applied to all appropriate points including the 6DQ6-B final amplifier screen through its associated dropping resistor. 117 VAC line power applied to external relay terminals via pins 2 & 7 of the MODULATOR/EXT. POWER octal socket on the rear chassis apron.

**METER Switch:** Two-position switch providing two positions of meter insertion.

GRID — Inserted in grid circuit of 6DQ6-B final amplifier.

PLATE — Inserted in cathode circuit of 6DQ6-B final amplifier.

**ANTENNA LOADING Control:** Variable capacitor in the output pi-network that permits matching of the final amplifier to various antenna load impedances between approximately 50 and 1000 ohms. Functions on all bands.

**BAND SELECTOR Switch:** Two-section ceramic wafer switch permitting choice of the desired band of operation from 80 to 10 meter. Selects one of four coils in the oscillator circuit and proper taps and coils in the plate tank circuit of the final amplifier.

**PLATE TUNING Control:** Variable capacitor in the output pi-network that tunes the final amplifier to resonance.



**GRID TUNING Control:** Variable capacitor that tunes the oscillator-multiplier plate tank circuit to resonance at the desired fundamental or harmonic (second or third) frequency.

**XTAL Socket:** Either crystal or external VFO may be plugged into the socket. For external VFO use, note that upper terminal is the ground side.

**MODULATOR/ACCESSORY Socket:** Octal socket on rear chassis apron which may serve a number of purposes.

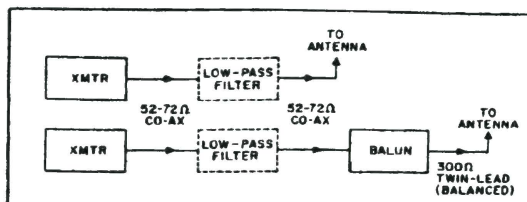
a) modulator input, b) operation of antenna relay, c) power take-off for any VFO not having a power supply, d) emergency power input.

**ANTENNA LOAD Switch:** Slide switch on rear chassis apron provides additional 1000mmf for matching to low impedance antenna loads. Used in conjunction with ANTENNA LOADING control. To add the 1000mmf capacitance, set the ANTENNA LOAD switch to the "down" position.

## OPERATING INSTRUCTION

1. From the ground binding post on the rear chassis apron, connect a heavy copper strap to earth ground. A good earth ground connection can be a cold water pipe or an eight to ten foot metal stake driven into the ground.

2. Connect the antenna feed line co-axial cable to the RF output co-axial receptacle on the rear chassis apron. An Amphenol 83-1SP type or equivalent male connector is required for this connection. If a single wire or twin lead is employed, attach a banana plug to the end of the single wire or one conductor of the twin lead and insert it in the center hole of the receptacle. (The remaining conductor of the twin lead should be connected to the adjacent ground binding post). In areas where interference with TV reception is a difficulty, it is recommended that a low-pass filter and possibly an antenna coupler be inserted between the RF transmitter and the antenna feed line. A short length of co-axial cable should be used to connect the transmitter RF output to the input end of the filter and the antenna feed line co-ax should be connected to the output of the filter. A balanced type of feed line (300 $\Omega$ , 600 $\Omega$ , etc.) requires an antenna coupler or balun matching device for proper connection to the transmitter or low-pass filter. (See Fig. 1.) For satisfactory use of a low-pass filter, a low SWR is necessary.



**FIGURE 1**

3. Set controls as follows: FUNCTION switch to STANDBY, BAND SELECTOR switch to desired band from 80-10 meters, ANTENNA LOADING control to 0, PLATE TUNING control to 5, GRID TUNING to 5, METER switch to GRID. If VFO is used, connect output of VFO to XTAL socket (upper terminal is ground); if crystal operation is desired, insert proper crystal into XTAL socket. The frequency range for each band is given in the following chart:

Band	80 Meter Crystals or VFO (kc)	40 Meter Crystals or VFO (kc)
80	3500 - 4000	—
40	3500 - 3650	7000 - 7300
20	3500 - 3587.5	7000 - 7175
15	—	7000 - 7150
10	—	7000 - 7425

4. Insert the phone plug from the telegraph key into the KEY jack on the rear apron. Set the FUNCTION switch at TUNE. Then close the key terminals and adjust the GND TUNING control for maximum grid current, not to exceed 2ma.

5. Set the METER switch to PLATE and the FUNCTION switch to TRANSMIT. Then close the key terminals and adjust the PLATE TUNING control for a minimum current reading (dip).

**NOTE:** Obtain the dip as quickly as possible as the 6DQ6-B final amplifier will draw very high plate current when the plate tank is off resonance. The high current, if prolonged, will damage the 6DQ6-B tube.

On 80 & 40 meters, it may be required to shunt the RF output terminals with additional capacitance (.001mf) in order to obtain a good dip with low impedance loads. To do this, set the ANTENNA LOAD switch on the rear apron to the "down" position.

6. Turn the ANTENNA LOADING control gradually

until the plate current reaches 120ma. Again adjust the PLATE TUNING control for a minimum current reading (dip). Repeat these two operations until the current reading is 120ma for full power input. These operations can be performed with two hands, one adjusting the PLATE TUNING and the other the ANTENNA LOADING. An increase in the plate current dip indicates antenna loading (power transfer to the load).

7. After the final amplifier is properly loaded, re-set the meter switch to GRID and again adjust the GRID TUNING control for the proper reading. For CW operation, the proper maximum grid current is 1.5ma. For operation with plate modulation, 2ma maximum grid current is necessary.

### ACCESSORY CONNECTIONS

The octal socket on the rear chassis apron is mainly intended to provide 117VAC line power to an antenna change-over relay (pins 2 & 7) applied at the TRANSMIT position of the FUNCTION switch only, and to permit connection of an external modulator (pins 4 & 6) such as the EICO Model 730. It also permits power take-off for accessory equipment as follows: 500 VDC at up to 15ma between pins 3 and 8 (gnd.); 6.3 VAC at up to 600ma between pins 5 and 8 (gnd.). In case of absence or failure of AC power line, emergency power to operate the transmitter may be fed in through this socket as follows: 500 VDC at 150ma between pins 4 and 8 (gnd.) and 6.3 VDC at 3A between pins 5 and 8 (gnd.). In all cases, pins 4 and 6 must be shorted together if a modulator is not connected to these pins, as otherwise the transmitter will not operate. An octal plug must always be inserted in this socket connected appropriately for the desired type of operation. See figures 2 and 3 for details.

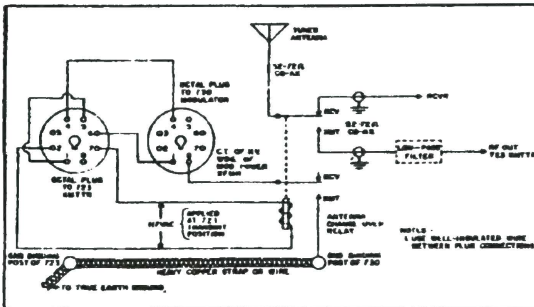


FIGURE 2

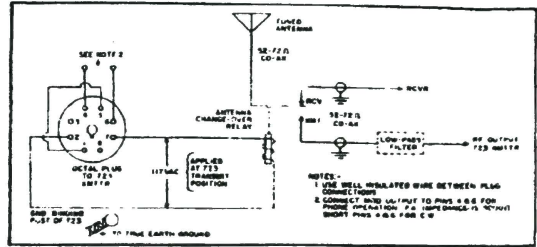


FIGURE 3

### MAINTENANCE

Your transmitter should require little service except normal tube replacement. We recommend no substitutions for the tube types used. To facilitate servicing, remedial and trouble-shooting procedures have been provided in the TROUBLE-SHOOTING CHART that follows. A VOLTAGE CHART and a RESISTANCE CHART have also been provided as aids in locating defective components and to permit a careful, stage-by-stage check of the transmitter.

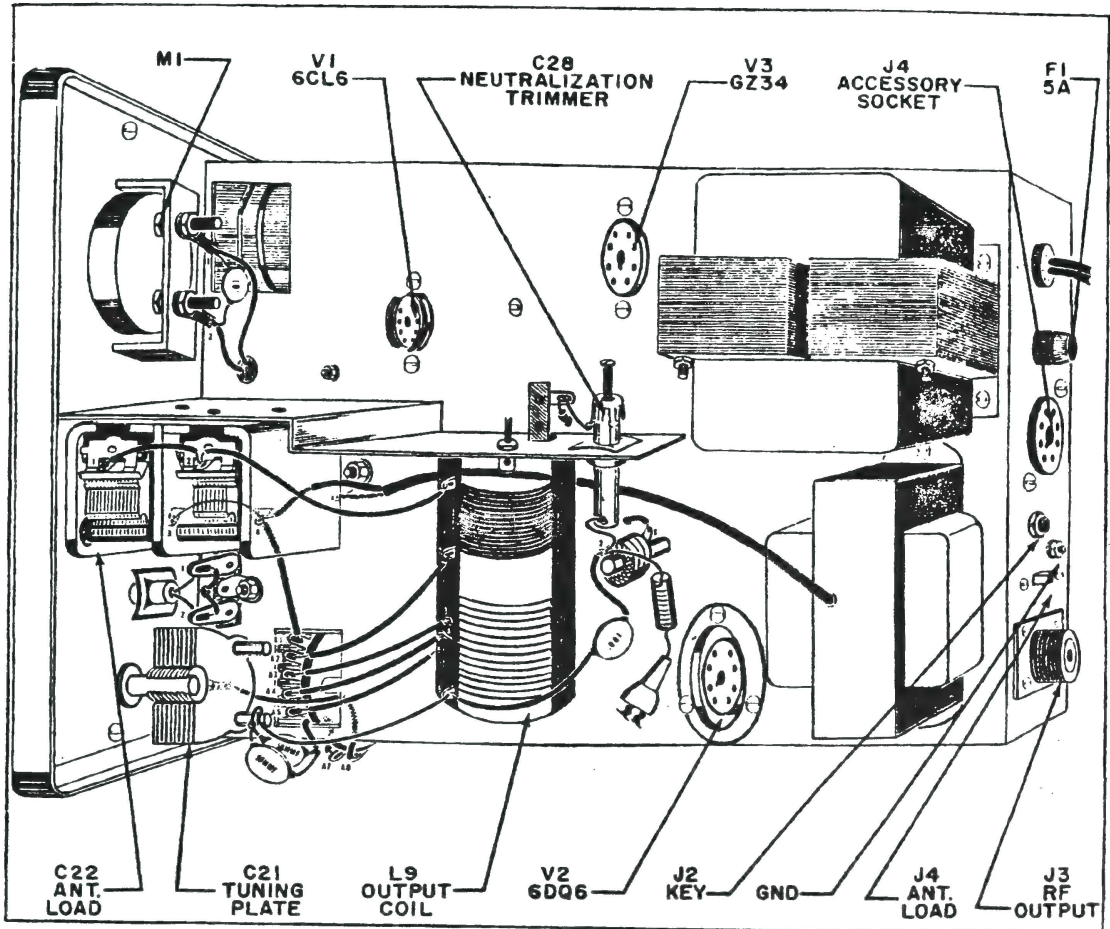
**WARNING:** If the transmitter is operated outside the cabinet at any time, the operator is exposed to lethal high voltage points and locations where severe RF burns can occur through bodily contact. If, for purpose of voltage checks, the transmitter must be operated outside the cabinet, great care must be taken to avoid inadvertent bodily contact to dangerous points and all the general precautions for high voltage work must be observed. In any case, never leave the transmitter in an operative state removed from the cabinet, especially if children have access to it.

### NEUTRALIZATION PROCEDURE

1. Neutralization is performed on 20m. With a crystal plugged into the XTAL socket, the key plugged into the KEY jack and closed, and the antenna disconnected, set the controls as follows: FUNCTION switch to TUNE, BAND SELECTOR to 20, METER switch to GRID.

2. See TOP CHASSIS VIEW (Fig. 4) for location of neutralizing capacitor C28. C21 is the PLATE TUNING control. Adjust C28 so variation of the setting of C21 gives minimum variation of grid current. (Note that even though the screen of V2 is grounded at the TUNE position of the FUNCTION switch, varying the setting of C21 will affect the grid current if neutralizing capacitor C28 is adjusted improperly.)





TOP VIEW FIGURE 4

## SERVICE

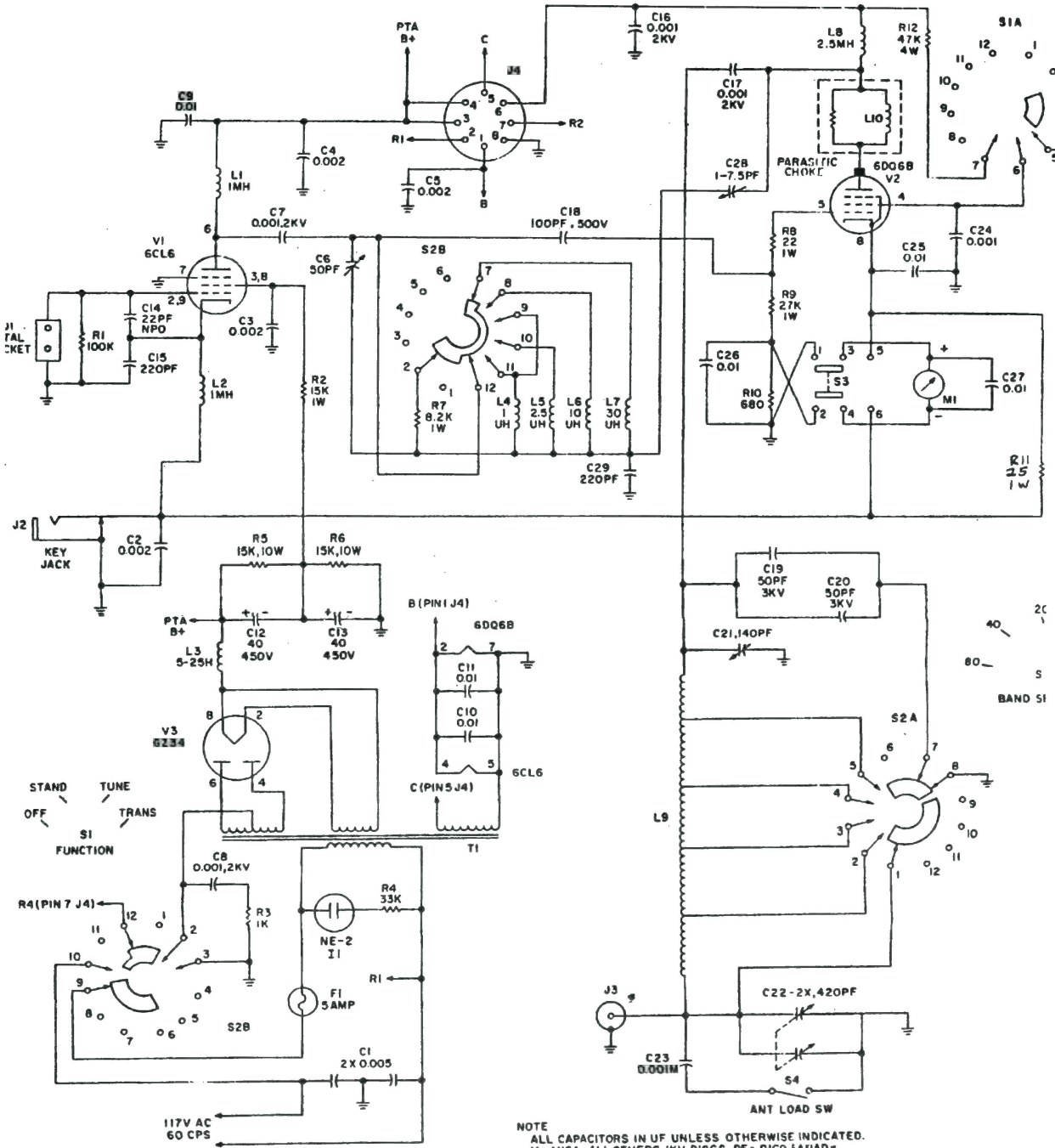
If trouble develops in your instrument which you can not remedy yourself, write to our service department listing all possible indications that might be helpful. If desired, you may return the instrument to our factory where it will be placed in operating condition for \$7.50 plus the cost of parts replaced due to their being damaged in the course of construction. NOTE: Before returning this unit, be sure all parts are securely mounted. Attach a tag to the instrument, giving your home address and the trouble with the unit. Pack very care-

fully in a rugged container, using sufficient packing material (cotton, shredded newspaper, or excelsior), to make the unit completely immovable within the container. The original shipping carton is satisfactory, providing the original inserts are used or sufficient packing material is inserted to keep the instrument immovable. Ship by prepaid Railway Express, if possible, to Electronic Instrument Co., Inc., 33-00 Northern Blvd., Long Island City 1, N.Y. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damages in transit if packing IN HIS OPINION, is insufficient.

TRUBLE-SHOOTING CHART

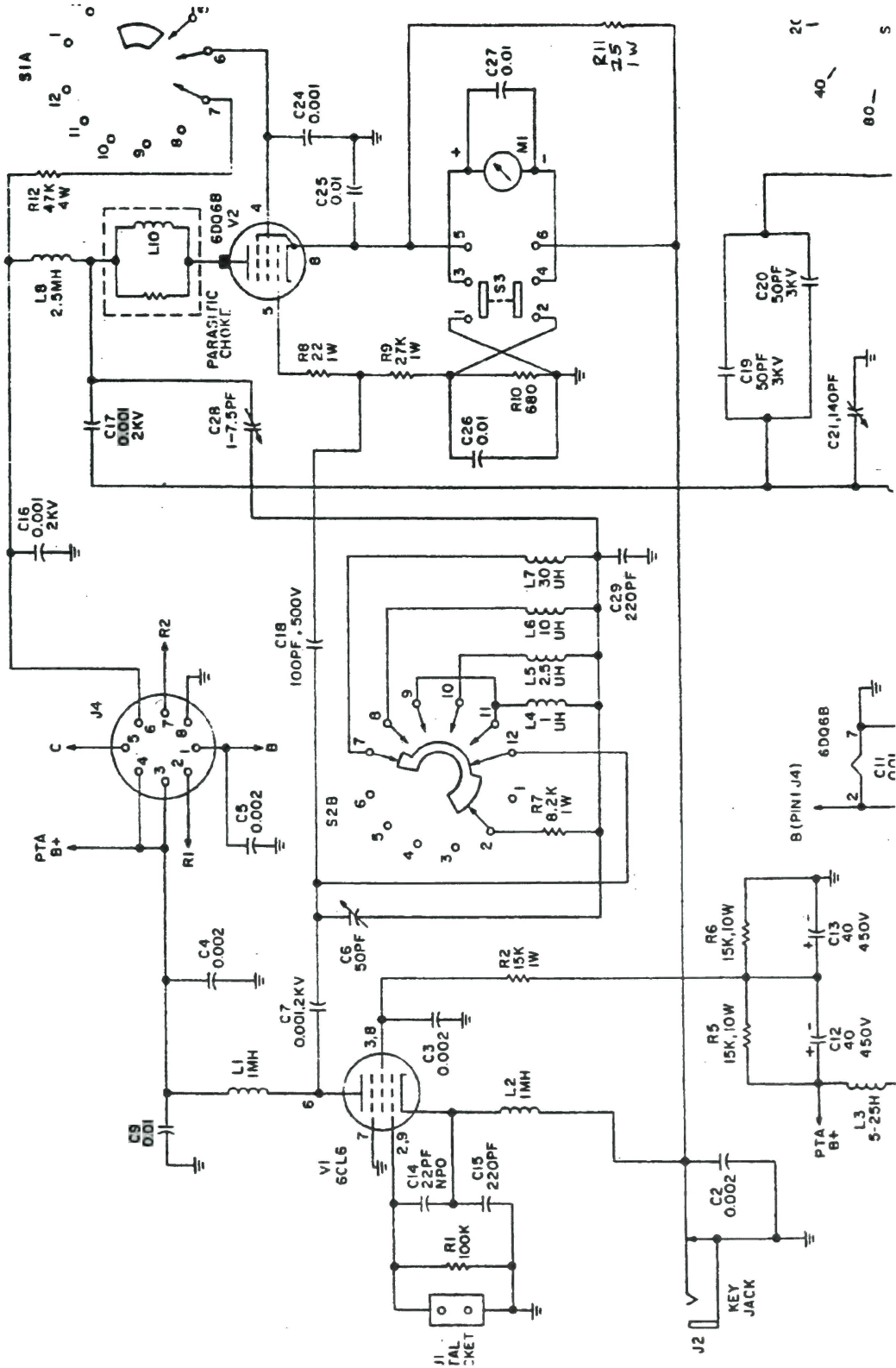
House fuse blows F1 remains o.k.	Short in line cord Shorted C1
Fuse F1 blows	T1 Pri; h.v. sec. or filament shorted Short in FUNCTION switch S1B Short in accessory socket Shorted V3 C28 shorted to ground  C12, C13 excessively leaky or short Shorted C14, C9, C17, C18 L3 shorted to ground
V1, V2 lit; V3 not lit	Open 5 volt winding Wrong filament connections to V3 Defective V3
V3 lit; V1, V2 not lit	Open 6.3V winding Wrong filament connections Open filament lead (s) Jumper missing between pins 1 and 5 on J4
DCV at V3 cathode (pin 8) is incorrect	
(a) No voltage	Defective V3 Open T1 h.v. winding Defective S1B
(b) Low voltage	Leaky or shorted C12, C13 Low line voltage One half of h.v. winding of T1 open
(c) High voltage	High line voltage R5, R6 open
No drive to P.A. grid	Defective V1, V3 Key contacts open Open L1, L2, R2 Defective S2B Meter M1 open Defective Xtal Leaky or shorted C6, C3, C15 Open L4, L5, L6, L7
P.A. not dipping enough (Meter reads off scale)	No grid excitation Improper tuning - add 100mmf with ANTENNA LEAD switch
Antenna will not load properly (Low plate current after attempting to load antenna)	Wrong antenna Open antenna lead Improper neutralization (See MAINTENANCE)
No final plate current with grid current	Jumper wire (4-6) on accessory socket missing or open (When operated as a CW transmitter) Wrong connections to accessory socket Open L8, R11, L10 Defective S1A





NOTE  
 ALL CAPACITORS IN UF UNLESS OTHERWISE INDICATED.  
 M = MICA, ALL OTHERS = MKV DISCS. PF = PICO FARAD =  
 MICRO-MICROFARAD (UUF) UF = MICROFARAD

**SCHEMATIC DIAGRAM**



80-  
40-  
20-  
S





## REPLACEMENT

SYM. #	STOCK #	AM'T.	DESCRIPTION	SYM. #
C1	22528	1	cap., disc, 2 x .005mfd, GMV	T1
C2, 3, 4, 5	22553	4	cap., disc, .002mfd, 1KV, GMV (2K or 2000mmf)	TB1
C6	29017	1	cap., variable, 50mmf	TB2
C7, 8	22557	2	cap., disc, .001mfd, 2KV, $\pm 20\%$ (1K or 1000mmf)	TB3
C9, 10, 11	22554	3	cap., disc, .01mfd, 1KV, GMV (10K or 10,000mmf)	TB4
C12, 13	23021	2	cap., elec., 40mmf, 450V	TB5
C14	22551	1	cap., disc, 22mmf, 1KV, NPO	TB6, 7
C15	22552	1	cap., disc, 220mmf, 1KV, $\pm 10\%$	T88
C16, 17	22557	2	cap., disc, .001mfd, 2KV, $\pm 20\%$ (1K or 1000mmf)	V1
C18	22509	1	cap., disc, 100mmf, 500V, $\pm 10\%$	V2
C19, 20	22558	2	cap., disc, 50mmf, 3KV, $\pm 10\%$	V3
C21	29011	1	cap., variable, 140mmf	XF1
C22	29018	1	cap., variable, 2 x 420mmf	XV1
C23	21000	1	cap., mica, .001mfd, 500V, $\pm 20\%$	XV2
C24	22557	1	cap., disc, .001mfd, 2KV, $\pm 20\%$ (1K or 1000mmf)	XV3
C25, 26, 27	22554	3	cap., disc, .01mfd, 1KV, GMV (10K or 10,000mmf)	
C28	29510	1	cap., trimmer, 1-7.5mmf	
C29	21006	1	cap., mica, 220mmf, 500V, $\pm 5\%$	
F1	91001	1	fuse, 5A	
I1	97715	1	indicator, neon	
J1	97500	1	socket, crystal	
J2	50022	1	jack, closed circuit (key)	
J3	50023	1	jack, UHF	
J4	97041	1	socket, octal	
L1, 2	35034	2	choke, 1mh	
L3	34003	1	choke, swinging, 5-25h	
L4	35058	1	coil, 1uh (coil with radial leads)	
L5	35057	1	coil, 2.5uh, white dot	
L6	35056	1	coil, 10uh, violet dot	
L7	35055	1	coil, 30uh, yellow dot	
L8	35035	1	choke, 2.5mh, ceramic standoff	
L9	35059	1	coil, tapped output	
L10	35037	1	choke, parasitic	
M1	74008	1	meter, 0-5MA	
R1	10410	1	res., 100K $\Omega$ , 1/2W, $\pm 10\%$ (brown, black, yellow, silver)	
R2	10852	1	res., 15K $\Omega$ , 1W, $\pm 10\%$ (brown, green, orange, silver)	
R3	10015	1	res., 1K $\Omega$ , 1/2W, $\pm 20\%$ (brown, black, red)	
R4	10020	1	res., 33K $\Omega$ , 1/2W, $\pm 20\%$ (orange, orange, orange)	
R5, 6	14307	2	res., 15K $\Omega$ , 10W, $\pm 10\%$ (brown, green, orange, silver)	
R7	10953	1	res., 8.2K $\Omega$ , 2W, $\pm 10\%$ (grey, red, red, silver)	
R8	10869	1	res., 22 $\Omega$ , 1W, $\pm 10\%$ (red, red, black, silver)	
R9	10832	1	res., 27K $\Omega$ , 1W, $\pm 10\%$ (red, violet, orange, silver)	
R10	10529	1	res., 680 $\Omega$ , 1/2W, $\pm 5\%$ (blue, grey, brown, gold)	
R11	11751	1	res., 25 $\Omega$ , 1W, $\pm 2\%$	
R12	13601	1	res., 47K, 4W, $\pm 10\%$ (yellow, violet, orange, silver)	
S1	60078	1	switch, rotary, bakelite (FUNCTION)	
S2	60079	1	switch, rotary, ceramic (BAND SEL.)	
S3	62016	1	switch, slide, DPDT (METER)	
S4	62001	1	switch, slide, SPST	



## ENT PARTS LIST

STOCK#	AM'T.	DESCRIPTION	STOCK#	AM'T.	DESCRIPTION
30039	1	transformer, power	57000	1	line cord
54005	1	terminal strip, 2 post right w/gnd.	66093	1	instruction book (wired)
54014	1	terminal strip, 3 post 2 left	66347	1	instruction book (kit)
54007	1	terminal strip, 3 post, 2 right w/gnd.	80076	1	panel
54012	1	terminal strip, 1 post left, upright	81175	1	cable clamp
54002	1	terminal strip, 1 post right w/gnd.	81234	1	chassis
54003	2	terminal strip, 2 post	81235	1	top shield
54015	1	terminal strip, 3 post, 2 left w/gnd.	81237	1	bottom shield
90056	1	tube, 6CL6	81913	1	socket receptacle
90067	1	tube, 6DQ68	82006	1	plastic shaft
90044	1	tube, 5AR4/GZ34	83002	1	shaft coupling
97800	1	fuseholder	85000	1	brass bushing, 3/8"
97027	1	socket, 9 pin min., top mount	86003	1	frame
97053	1	socket, octal, ring mount	88067	1	cabinet
97041	1	socket, octal, saddle mount	89241	1	nomenclature label
40000	25	nut, hex, #6-32	98501	1	plastic grid cap
40001	5	nut, hex, 3/8-32			
40007	6	nut, hex, #4-40			
40008	5	nut, hex, #8-32			
40016	1	nut, hex, 1/2" for fuseholder			
40022	1	nut, hex, #4-40 x 3/16 (for Xtal socket)			
40034	6	nut, Tinnerman, #4			
41003	5	screw, #8-32 x 3/8			
41009	1	screw, #4-40 x 3/4, round head			
41010	4	screw, #6-32 x 1/8			
41035	4	screw, #6 self-tapping			
41059	1	screw, #6-32 x 1 1/8			
41069	2	screw, #6-32 x 1/8 set			
41086	17	screw, #6-32 x 5/16			
41089	10	screw, #6-32 x 3/16, round head			
41090	12	screw, #4-40 x 5/16			
41091	2	screw, #4-40 x 1/4, flat head			
42000	5	washer, lock, 3/8			
42001	5	washer, flat, 3/8			
42002	22	washer, lock, #6			
42007	4	washer, lock, #4			
42008	5	washer, lock, #8			
42011	1	washer, flat, #10			
42029	1	washer, rubber for fuseholder, 1/2"			
42501	1	socket retaining ring			
42511	1	retainer for neon indicator			
43000	4	lug, #6			
43002	4	lug, #10			
43006	2	lug, #4			
44010	1	spacer, 11/16" long			
46000	1	grommet			
46011	4	foot, plastic			
51007	1	octal plug			
53050	5	knob			

**RESISTANCE CHART**

TUBE	1	2	3	4	5	6	7	8	9
GZ34	INF.	28KΩ	INF.	INF.	INF.	INF.	INF.	28KΩ	
6CL6	35	100KΩ	28KΩ	—	—	28KΩ	0	28KΩ	100KΩ
6DQ6B	0	—	680Ω or 320Ω*	0	27KΩ	27KΩ	0	25Ω	
J4- Acc. Socket	—	INF.	28KΩ	28KΩ	0	INF.	INF.	—	

\*Depends on meter switch position.

Transmitter line cord disconnected from AC power line, function switch in off position. Dash (-) indicates very low ohmic readings. INF. means Infinite. ACCESSORY plug removed.

**VOLTAGE CHART**

TUBE	1	2	3	4	5	6	7	8	9
GZ34	500VDC	520VDC	0	600VAC	130VDC	600VAC	0	520VDC	
6CL6	RF	RF	175VDC	0	6.3VAC	RF	0	175VDC	RF
6DQ6B	0	6.3VAC	-1VDC	130VDC**	RF	RF	0-	0	(CAP) RF
J4 - Acc. Socket	6.3VAC	0*	500VDC	500VDC	6.3VAC	500VDC	0*	6.3VAC	

All voltages measured to ground with a 20KΩ/V VOM (not a VTVM). Set to 20 meter operation with a 52Ω dummy load or 75W lamp connected to R.F. output co-axial connector. Plate current set to 120ma and grid current set to 1.5ma. Selectro in transmit. All voltages ±20%. Meter switch in grid position.

\*Depending upon whether the unit is grounded or not. If the unit is grounded to earth ground 117VAC will appear between either pin 2 or 7 and ground. 117VAC will appear between 2 and 7 when in transmit position.

\*\*±30%