- HIGH-POWER: 150 WATTS INPUT ON 80 THROUGH 10; 100 WATTS ON 6 METERS
- BUILT-IN, HIGHLY STABLE VFO OR CRYSTAL OPERATION
- ADJUSTABLE PI OUTPUT NETWORK MATCHES A WIDE RANGE OF ANTENNAS
- AM PHONE AND CW OPERATION
- ALL STAGES KEYED — NO SHOCK VOLTAGE ON CONTACTS
- BANDSWITCH COVERAGE OF 80 THROUGH 6 METERS
- FULL METER SWITCHING

knight-kit

T-150

TRANSMITTER

The T-150 is a compact, high-power AM-CW transmitter that's sure to rate a place in your Ham setup. Providing bandswitching coverage of the 80 through 6 meter bands, the T-150 operates at a power input of 150 watts. Built-in AM modulation is provided by a combination of screen modulation and controlled carrier. Thus, at low cost, practically the equivalent talk-power of plate modulation is obtained.

Designed to provide a minimum of TVI, all leads going in-and-out of the case are bypassed for RF. There is more than ample gain in the audio circuit to operate from any high-impedance, dynamic or crystal microphone. Keying is clean and chirpless with no hazardous voltages at the key contacts.

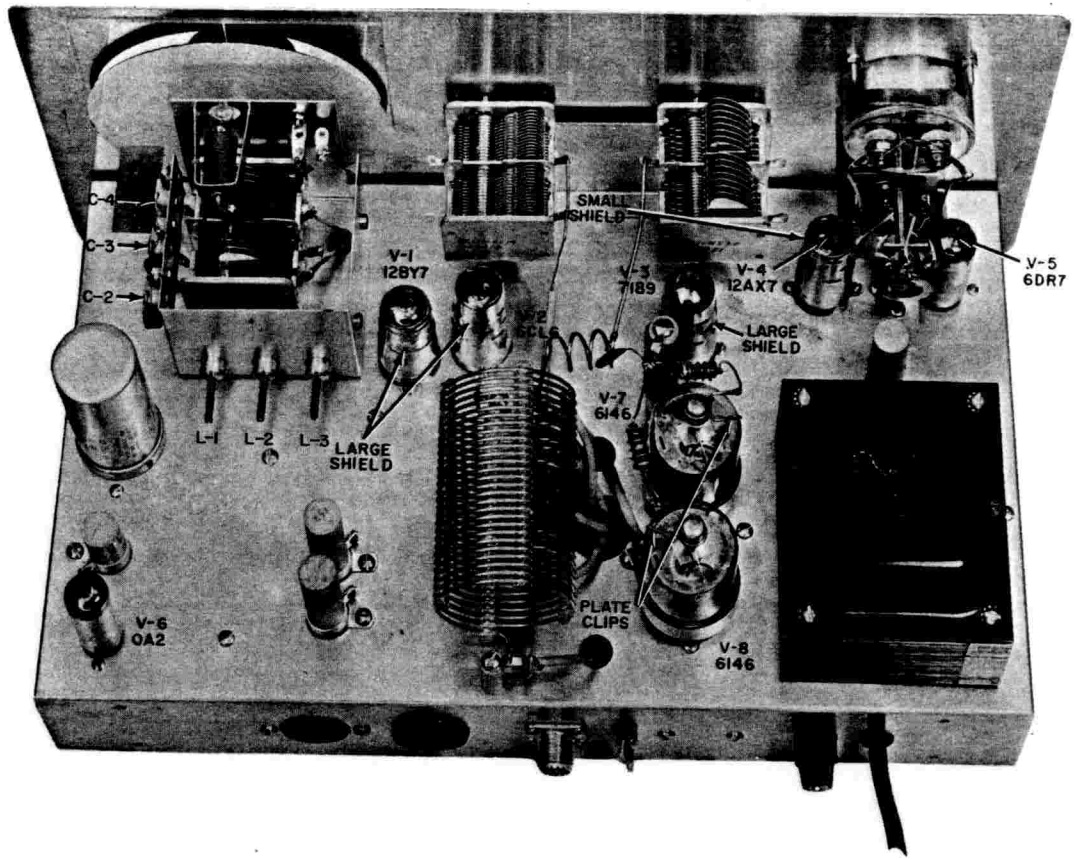


FIGURE 31. TUBE LOCATION

☐ Place a small knob over the shaft of the BAND switch with the marked portion in the 80 position. Fasten the knob to the shaft.

☐ Place a small knob over the shaft of the XTAL-VFO switch with the marked portion in the XTAL position. Fasten the knob to the shaft.

☐ Place a medium knob over the shaft of the FUNCTION switch with the marked portion in the OFF position. Fasten the knob to the shaft.

☐ Place a medium knob over the shafts of the FINAL TUNE and LOAD controls with the marked portions in the zero positions. Fasten each knob to the shaft.

☐ Place the large knob over the shaft of the VFO TUNING control. Fasten the knob to the shaft.

SEE FIGURE 31.

☐ Insert the tubes into the sockets as shown.

☐ Place the three large shields over the tubes shown.

☐ Place the small shield over the tube shown.

☐ Place the two plate clips on the plate caps of V-7 and V-8.

☐ Four rubber feet. Mount to the bottom of the cabinet with four self-tapping screws.

☐ Remove the two support brackets from the back of the chassis.

☐ Align the transmitter as instructed on Page 22 before installing the unit into the cabinet.

☐ Place the chassis into the cabinet. Fasten with six self-tapping screws.

☐ Insert the fuse into the fuse holder.

OPERATING INSTRUCTIONS

NOTE: You must have a license issued by the Federal Communications Commission to operate this transmitter on the air.

CRYSTAL OPERATION

- ☐ Plug the desired crystal in to the receptacle on the front panel.
- ☐ Set the BAND switch to the desired band of frequencies.
- ☐ Place the XTAL-VFO switch in the XTAL position.
- ☐ Perform the TUNING instructions.

VFO OPERATION

- ☐ Set the BAND switch to the desired band of frequencies.
- ☐ Place the XTAL—VFO switch in the desired band setting; 80 for 80 meter operation; 40—10 for either 40, 20, 15 or 10 meter operation; 6 for 6 meter operation.
- ☐ Perform the TUNING instructions.

TUNING

NOTE: The tune-up is the same for either AM or CW operation.

- ☐ Place the FUNCTION switch in the OFF position and plug the line cord in a 117 volt, 60 cycle, AC power outlet.

✶ **CAUTION:** NEVER REMOVE THE TRANSMITTER FROM THE CASE OR TOUCH ANY OF THE WIRES WHILE THE UNIT IS PLUGGED INTO A POWER OUTLET.

- ☐ Connect an antenna or suitable dummy load—preferably not a light bulb—to the antenna jack on the rear of the chassis. **NEVER turn the transmitter on without a dummy load or antenna connected.**
- ☐ Set the FUNCTION switch in the VFO SPOT position. Allow approximately 30 seconds for the transmitter to warm up.
- ☐ Set the METER switch to the BUFFER GRID position.
- ☐ Adjust the OSCILLATOR TUNE control for a maximum meter reading.
- ☐ Place the METER switch in the FINAL GRID position.
- ☐ Adjust the BUFFER TUNE control for a maximum meter reading (not to exceed 10 ma).
- ☐ Set the METER switch to the RELATIVE OUTPUT position.
- ☐ Place the FUNCTION switch in the AM position.
- ☐ Simultaneously adjust the FINAL TUNE and LOAD controls for a maximum meter reading.

NOTE: If for any reason the transmitter is loaded in the CW position, without first tuning in the AM position, turn the load control fully counterclockwise before placing the FUNCTION switch in the CW position. This will insure that the final tubes do not draw an excessive amount of current.

- ☐ Place the FUNCTION switch in the CW position for the following adjustment. Do this adjustment as quickly as possible and return the FUNCTION switch to the STAND-BY position.
- ☐ Simultaneously adjust the FINAL TUNE and LOAD controls for a maximum Relative OUTPUT meter reading. The maximum power output may occur at a point other than minimum plate current. Therefore tune for maximum power output without exceeding the maximum permissible plate current of 250 ma.
- ☐ Place the FUNCTION switch in the STAND-BY position if you have not already done so.

CW OPERATION

- ☐ Place the key in the KEY jack.
- ☐ Set the FUNCTION switch to the CW position.

AM OPERATION

- ☐ Connect a microphone to the MIC jack.
- ☐ Place the FUNCTION switch in the AM position.

FREQUENCY COVERAGE

The chart below lists the frequencies of operation for the different bands.

BAND (Meters)	Frequency of Crystal or VFO (MC)	Transmitter Freq. Range (MC)
80	3.5 to 4.0	3.5 to 4.0
40	7.0 to 7.3	7.0 to 7.3
20	7.0 to 7.175	14.0 to 14.35
15	7.0 to 7.150	21.0 to 21.45
10	7.0 to 7.425	28.0 to 29.7
6	8.334 to 9.0	50.0 to 54.0

From the above information you can select the crystals for the bands in which you wish to operate.

CIRCUIT DESCRIPTION

VARIABLE FREQUENCY OSCILLATOR (VFO)

V-1, the 12BY7 is used as a Series-Tuned Colpitts (commonly called Clapp) oscillator. The tube is tapped across only a small portion of the oscillating tank circuit, resulting in very loose coupling between the tube and circuit. The taps are provided by C-10 and C-11 in series across the coil. In addition these large capacitors (750 $\mu\mu$f) shunt the tube capacitances, so the effects of the tube—changes in electrode voltages and loading—are still further reduced. The output frequencies are developed across L-1 and C-1A for the 6 meter band; L-2 and C-1B for the 10, 15, 20 and 40 meter bands and L-3 and C-1C for the 80 meter band. Three trimmer capacitors are in parallel with C-1 to calibrate the VFO.

CRYSTAL OSCILLATOR

V-2, the 6CL6 serves a dual purpose in the transmitter. When the XTAL-VFO switch is in the VFO position V-2 acts as an amplifier for the signal from V-1, the VFO. When the switch is in the crystal position V-1 is cut off and V-2 acts as a modified Pierce type crystal controlled oscillator. In this circuit the screen grid is used as the plate in a triode oscillator. Power output is taken from the tuned circuit in the actual plate circuit. The tuned plate circuit consists of C-18 and L-6 for the 80 meter band; C-18 and L-7 for the 40, 20 and 15 meter band; C-18 and L-8 for the 10 meter band and C-18 and L-9 for the 6 meter band.

MULTIPLIER/BUFFER

A multiple of the input frequency to V-3 (7189) the Multiplier/Buffer stage can be obtained by tuning the output circuit — C-21 and coils L-10 through L-15 (depending on the band used) — to a harmonic of the exciting frequency instead of the fundamental. The circuit otherwise is the same as that of a straight amplifier, thereby serving the dual purpose of a buffer amplifier and a multiplier.

AM OPERATION

The input signal from the microphone is amplified by both sections of V-4, the 12AX7 dual triode, and then applied to the input of V-5A. V-5A is zero biased, and thus with modulation, grid rectification results causing the grid voltage to rise. V-5A being directly coupled to the grid of V-5B causes the cathode voltage of V-5B to vary at a rate proportional to the applied modulation. C-42 and ~~R-47~~ R-27 determine the time constant at which this variation takes place.

A portion of the cathode voltage of V-5B is applied to the screens of V-7 and V-8, the two RF Output Amplifiers. This voltage varies at an audio rate proportional to the amount of modulation; thus modulating the screens of V-7 and V-8 while simultaneously increasing the average DC potential on the screens.

CW OPERATION

The cathodes of V-1, V-2, V-3, V-7 and V-8 are keyed for CW operation. To prevent excessive voltage at the key terminals R-21, a 2.2K resistor is connected across the key jack. The voltage developed across this resistor acts as a bias for V-1. During the "Key-up" period when the output amplifiers are cut off the tubes are still drawing some current through R-21, which helps to stabilize the DC power supply.

RF OUTPUT AMPLIFIER

V-7 and V-8, the two 6146 output amplifiers are connected in parallel.

The plate circuits of the tubes have separate chokes to eliminate any parasitic oscillations.

POWER SUPPLY

Transformer T-1 supplies 6.3 VAC for the tube filaments and a high AC voltage to rectifiers CR-1 and CR-2. The rectifiers are connected in a full-wave voltage doubler circuit to supply the necessary high voltage for the transmitter.

V-6, the Voltage ~~Rectifier~~ Regulator is an OA2 gas-filled, cold-cathode voltage regulator. It has a practically constant internal voltage drop across which the load requiring voltage regulation is connected.

PARTS LIST

CAPACITORS

Symbol Number	Description	Part Number
All capacitors ceramic disc, 20% tolerance unless otherwise specified.		
C-1	3-section variable, VFO	286055
C-2	7-45 $\mu\mu$f trimmer	284002
C-3	7-45 $\mu\mu$f trimmer	284002
C-4	7-45 $\mu\mu$f trimmer	284002
C-5	39 $\mu\mu$f, 500 volts, 5% mica	266552
C-6	47 $\mu\mu$f, 500 volts, 5% mica	296066
C-7	39 $\mu\mu$f, 500 volts, 5% mica	266552
C-8	.005 μf, 600 volts	296000
C-9	.005 μf, 600 volts	296000
C-10	750 $\mu\mu$f, 300 volts, 5% mica	266551
C-11	750 $\mu\mu$f, 300 volts, 5% mica	266551
C-12	470 $\mu\mu$f, 600 volts	276478
C-13	.001 μf, 600 volts	276016
C-14	.005 μf, 600 volts	296000
C-15	470 $\mu\mu$f, 600 volts	276478
C-16	1-section variable	286053
C-17	.005 μf, 600 volts	296000
C-18	.005 μf, 600 volts	296000
C-19	.005 μf, 600 volts	296000
C-20	.005 μf, 600 volts	296000
C-21	1-section variable	286053
C-22	.02 μf, 600 volts	277025
C-23	100 $\mu\mu$f, 500 volts, 10% mica	266014
C-24	.005 μf, 600 volts	296000
C-25	.005 μf, 600 volts	296000
C-26	.005 μf, 600 volts	296000
C-27	.001 μf, 600 volts	276016
C-28	.001 μf, 600 volts	276016
C-29	.005 μf, 600 volts	296000
C-30	.005 μf, 600 volts	296000
C-31	.005 μf, 1000 volts	277054
C-32	2-section variable	286057
C-33	.005 μf, 1000 volts	277054
C-34	.005 μf, 600 volts	296000
C-35	2-section variable	286054
C-36	.005 μf, 600 volts	296000

CAPACITORS (Cont.)

Symbol Number	Description	Part Number
C-37	.005 μf, 600 volts	296000
C-38	.02 μf, 600 volts	277025
C-39	47 μμf, 500 volts	276479
C-40	.005 μf, 600 volts	296000
C-41	.1 μf, 400 volts, tubular	245014
C-42	.001 μf, 600 volts	276016
C-43	.1 μf, 400 volts, tubular	245014
C-44	.001 μf, 600 volts	276016
C-45	.001 μf, 600 volts	276016
C-46	40 μf, 450 volt, electrolytic	205400
C-47	40 μf, 450 volt, electrolytic	205400
C-48	40/40 μf, 450 volt, electrolytic	248151
C-49	.005 μf, 600 volts	296000
C-50	.02 μf, 600 volts	277025
C-51	.005 μf, 600 volts	296000
C-52	.005 μf, 600 volts	296000
C-53	.005 μf, 600 volts	296000
C-54	.005 μf, 600 volts	296000
C-55	.02 μf, 600 volts	277025

COILS

L-1	VFO coil, 6 meter, orange dot	162157
L-2	VFO coil, 40 meter, yellow dot	162158
L-3	VFO coil, 80 meter, red dot	162159
L-4	RF choke, 5 mh	161001
L-5	RF choke, 5 mh	161001
L-6	Osc. coil, 80 meter, violet dot	142051
L-7	Osc. coil, 40 meter, gray dot	162167
L-8	Osc. coil, 10 meter, black dot	162166
L-9	Osc. coil, 6 meter, white dot	162165
L-10	Mult. coil, 6 meter	152154
L-11	Mult. coil, 10 meter, orange dot	162161
L-12	Mult. coil, 15 meter, green dot	162162
L-13	Mult. coil, 20 meter, blue dot	162163
L-14	Mult. coil, 40 meter, yellow dot	162164
L-15	Mult. coil, 80 meter, red dot	142052
L-16	Parasitic suppressor	162160
L-17	Parasitic suppressor	162160
L-18	RF choke (final)	162156
L-19	Output coil, 6 meter	152153

COILS (Cont.)

Symbol Number	Description	Part Number
L-20	Final tank coil	152155
L-21	Line filter, 2.2 μh	152005
L-22	Line filter, 2.2 μh	152005
L-23	Choke, 2.2 μh	152005

DIODES

CR-1	Silicon rectifier	630053
CR-2	Silicon rectifier	630053
CR-3	Diode	630057

JACKS

J-1	8-pin	501180
J-2	11-pin	502200
J-3	Microphone	502122
J-4	Key	509051
J-5	Crystal	509053
J-6	Crystal	509053
J-7	Antenna	502222

PLUGS

P-1	8-pin	502181
P-2	11-pin	502100

RESISTORS

All resistors 10% tolerance, ½ watt unless otherwise specified.

R-1	15K	301153
R-2	1500 Ω	301152
R-3	100K	301104
R-4	1K, 1 watt	304102
R-5	39K	301393
R-6	390 Ω	301391
R-7	~~100K~~ 39K	301104
R-8	510 Ω, 5% 560Ω 5%	302511
R-9	390 Ω, 1 watt	304391
R-10	1000 Ω, 2 watt	307102
R-11	510 Ω, 5% 560Ω 5%	302511
R-12	22K, 2 watt	307223
R-13	10 Ω	301100

RESISTORS (Cont.)

Symbol Number	Description	Part Number
R-14	10 Ω	301100
R-15	10 Ω, 1 watt, 5%	305100
R-16	100K control, 30%, long shaft	392162
R-17	4700 Ω	301472
R-18	1500 Ω	301152
R-19	4700 Ω	301472
R-20	2.2 meg	301225
R-21	2.2K, 2 watt	307222
R-22	470K	301474
R-23	100K control, 30%	392151
R-24	470K	301474
R-25	1500 Ω	301152
R-26	270K	301274
R-27	10 meg	301106
R-28	1 meg	301105
R-29	470K	301474
R-30	12K, 2 watt	307123
R-31	47K, 1 watt	304473
R-32	10 Ω, 20 watt, wire wound	317851
R-33	150 Ω, 20 watt, wire wound	317852
R-34	150 Ω, 20 watt, wire wound	317852
R-35	12K, 2 watt	307123
R-36	39K, 2 watt	307393
R-37	7K, 10 watt, wire wound 4K 20W W.W.	379053
R-38	~~22K, 2 watt~~ 68K 2W	307223
R-39	1K, 2 watt 8.2K 2W	307102
R-40	10K EACH	
R-41		
R-42,43,	47K EACH	
R-44	22K	

SWITCHES

S-1	3-wafer, Function	437062
S-2	4-wafer, Band	437064
S-3	2-wafer, Xtal-VFO	437063
S-4	Single wafer, Meter	437061

TERMINAL STRIPS

TS-1	5 ~~4~~-terminal	440505
TS-2	6-terminal, standup	442403
TS-3	3-terminal	440301
TS-4	3-terminal	440301
TS-5	3-terminal	440302

TERMINAL STRIPS (Cont.)

Symbol Number	Description	Part Number
TS-6	2-terminal	440201
TS-7	2-terminal	440203
TS-8	3 ~~2~~-terminal	440202
TS-9	5-terminal	440501
TS-10	4-terminal	440401
TS-11	2-terminal	440203
TS-12	1-terminal	440102
TS-13, 16	2-terminal	440202
TS-14, 15	3-terminal	440301

TUBES

V-1	12BY7	610070
V-2	6CL6	610016
V-3	7189	610069
V-4	12AX7	611012
V-5	6DR7	611033
V-6	OA2	610019
V-7	6146	614153
V-8	6146	614153

MISCELLANEOUS

Description	Quantity	Part Number
Base, Shield	4	511001
Bracket, control	1	470462
Bracket, large L	1	470463
Bulb, pilot #47	1	640002
Cabinet	1	702056
Chassis	1	463475
Chassis, tuning TUNING	1	470465
Chassis, tuning sub	1	470466
Clip, plate	2	501193
Collar, threaded	1	470253
Cover, 11-pin plug	1	511003
Dial	1	870151
Foot, rubber	4	831001
Fuse, 4 amp., 3AG	1	491005
Grommet, small	1	830100
Grommet, medium	4	830200

MISCELLANEOUS (Cont.)

Description	Quantity	Part Number
Grommet, large	1	830700
Holder, fuse	1	492200
Knob, small	6	765054
Knob, medium	3	765053
Knob, large	1	765052
Label	1	750283
Leg, support	2	470467
Manual, instruction	1	750383
Meter	1	659252
Panel, front	1	463474
Plate, capacitor mounting	1	501542
Plate, plastic	1	770051
Ring, lock	1	532002
Socket, 7-pin	1	501170
Socket, 8-pin	2	501180
Socket, 9-pin	5	501190
Socket, pilot light	1	501194
Shield, large tube	3	510014
Shield, small tube	1	511001
Spacer	2	940008
Transformer	1	107256

HARDWARE

Lockwasher, #4	25	582200
Lockwasher, #6	45	582300
Lockwasher, 3/8"	3	582700
Lockwasher, 1/2"	1	582800
Nut, 4-40	25	570221
Nut, 6-32	36	570340
Nut, 8-32	5	570440
Nut, 10-32	1	570540
Nut, 1/4"	2	579751
Nut, 3/8"	13	570840
Nut, 1/2"	1	570960
Nut, wing	1	572540
Screw, 4-40 x 1/4"	25	560222
Screw, 4-40 x 3/8"	6	560224
Screw, 6-32	47	560342
Screw, 8-32	4	560442
Screw, 10-32	1	560547
Screw, self-tapping	14	562393

HARDWARE (Cont.)

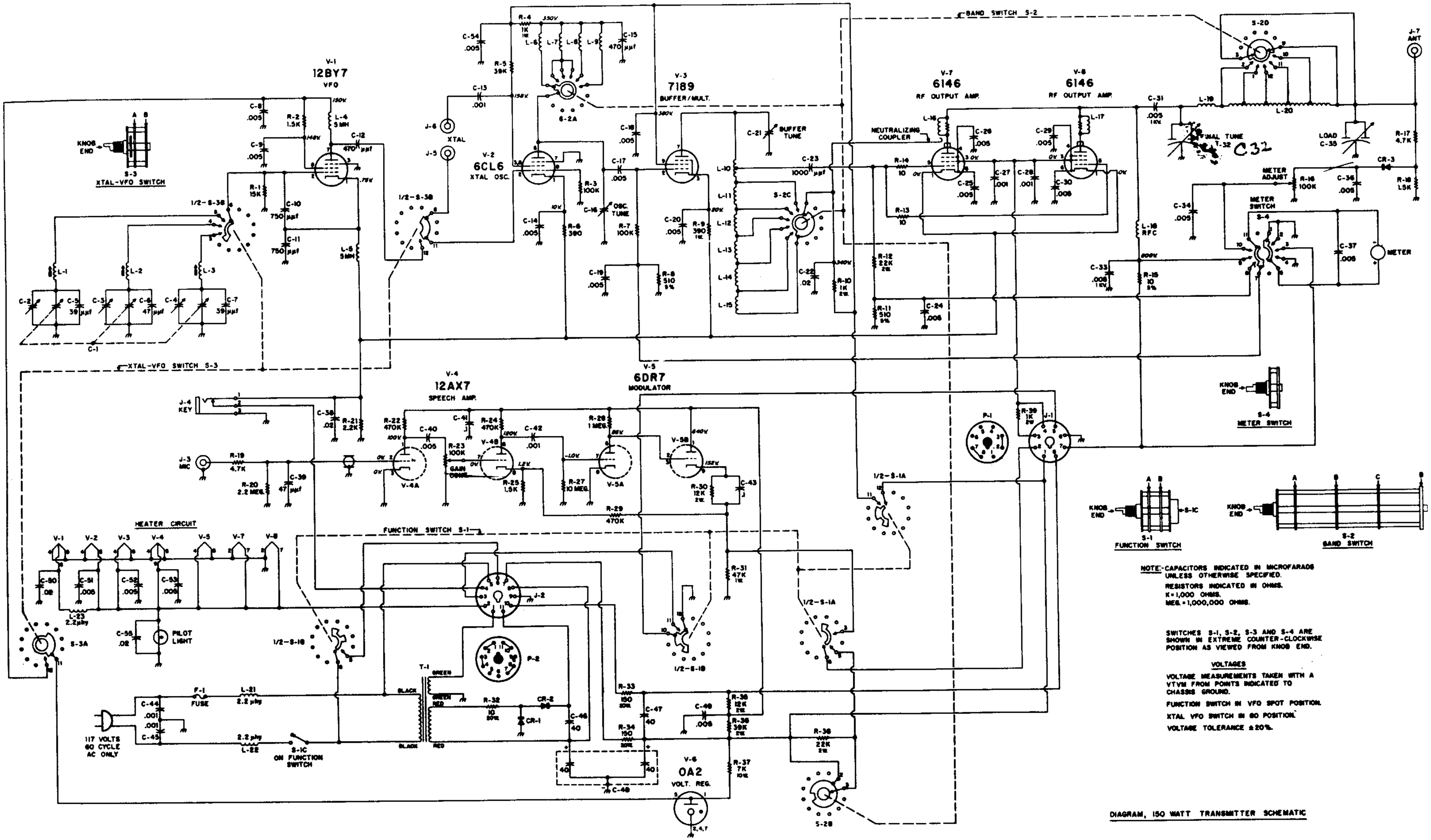
Description	Quantity	Part Number
Screw, set	1	563343
Solder lug, #6	4	553005
Solder lug, #8	9	553002
Solder lug, #10	2	553004
Washer, flat metal, 3/8"	1	580702
Washer, flat fiber	1	590400
Washer, shouldered fiber	1	591401

.WIRE, SOLDER AND TUBING

Cable, 4" piece	1	809054
Line cord	1	802004
Solder, 10' length	2	930005
Tubing, small, 10" length	1	812024
Tubing, large, 36" length	1	812003
Tubing, large, 8" length	1	812020
Wire, 2" red	24	801002
Wire, 3" orange	15	801003
Wire, 4" yellow	16	801004
Wire, 5" green	9	801005
Wire, 6" blue	7	801006
Wire, 7" violet	7	801007
Wire, gray	3	801008
Wire, 9" white	3	801009
Wire, 10" brown	2	801010
Wire, 11" brown-white	1	801011
Wire, 12" red-white	6	801012
Wire, 14" yellow-white	2	801014
Wire, 15" green-white	2	801015
Wire, stranded, 3 1/2" black-white	1	804093
Wire, stranded, 4 1/4" red-white	2	804091
Wire, large bare, 20" length	1	806620
Wire, small bare, 12" length	2	806012

TOOLS NEEDED FOR CONSTRUCTION

Stock Number	Description	Price*
46 N 852	Soldering iron, pencil type	$ 5.78
50 N 132	Long-nose pliers, 6"	2.10
50 N 133	Diagonal cutters, 5"	1.84
45 N 378	Screwdriver, 6"	.68



NOTE:-CAPACITORS INDICATED IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
RESISTORS INDICATED IN OHMS.
K = 1,000 OHMS.
MEG. = 1,000,000 OHMS.

SWITCHES S-1, S-2, S-3 AND S-4 ARE SHOWN IN EXTREME COUNTER-CLOCKWISE POSITION AS VIEWED FROM KNOB END.

VOLTAGES

VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM POINTS INDICATED TO CHASSIS GROUND.

FUNCTION SWITCH IN VFO SPOT POSITION.

XTAL VFO SWITCH IN 80 POSITION.

VOLTAGE TOLERANCE ± 20%.

DIAGRAM, 150 WATT TRANSMITTER SCHEMATIC

FIGURE 32. SCHEMATIC DIAGRAM OF T-150