Midland 13-770, 13-772 Service Manual

MIDLAND
ELECTRONICS COMPANY®

13-770-, 13-772

5 WATT TRANSCEIVER

SPECIFICATIONS

Circuit: 15 Transistors, 1 Integrated Circuit, 7 Diodes, 1 Thermistor.

Receive Section: Superheterodyne with RF amplifier. Sensitivity better than 1.2 uV.

Transmit Section: Crystal controlled oscillator system voice transmission.

Modulation System: AM maintained between 90 & 100%.

RF Input Power: 5 Watts.

Freq. Tolerance: ± 0.005%

Receiver Sensitivity: 1 uV at 10 db S/N.

Squelch Sensitivity: 1 - 100 Nominal (Variable).

Power Source: 12 Volts DC (8 1.5 Volt AA size pen-cells) or external 12 Volt DC source.

Accessory Jacks: External power-charger, earphone, external mike external PA, antenna.

Dimensions: 9-3/4"(H) x 3"(W) x 2-3/16"(D).

MIDLAND
INTERNATIONAL CORPORATION

GENERAL OFFICE: 1909 Vernon Street · North Kansas City, Missouri 64116 U.S.A.
Phone: 842-0511—Area Code 816

ALIGNMENT PROCEDURE

(A) SERVICE SUGGESTIONS

Use an external 8-ohm speaker or wire wound resistor connected to an earphone plug to provide a readily accessible connection for the AC voltmeter during receiver alignment.

(B) EQUIPMENT REQUIREMENTS

1. An AC voltmeter having at least a 0 to 2.5V range.
2. A 15uuF and a 0.01uf capacitor.
3. A signal generator capable of producing a 455KHz signal and a variable bias supply.
4. A DC ammeter having at least a 0 to 1A range.
5. A signal generator capable of producing the exact transmitter frequencies used in Class D Citizens Band transmitters.
6. A field strength meter designed for use in testing 5-watt type Class D Citizens Band transmitters.
7. A vacuum tube voltmeter having at least a 0 to 500mV range.
8. A power meter having at least a 0 to 3W range.

(C) RECEIVER IF ALIGNMENT PROCEDURES

1. Connect a 12V supply to the battery terminals.
2. Volume control set in maximum clockwise position.
3. Signal generator set to 455KHz.
4. Remove the receiver crystal.
5. Connect the AC voltmeter across an external load and plug into the earphone jack.
6. Connect output of signal generator through a 0.01uF capacitor to the telescopic antenna.
7. Adjust the slug in each of the IF transformers (IFT-A,B, & C) to maximum indication on the AC voltmeter. The output level of the signal generator must be reduced to point where the maximum indication will not exceed 0.5V RMS in order to prevent limiting action from affection alignment.
8. Adjust VT1- the 20K-ohm variable resistor - in IF circuit to make base voltages of TR1 to be 1.1V $\pm$0.2V and TR3 to be 1.25V$\pm$0.2V in respect to ground.
9. Reinsert receiver crystal (X-R)

(D) RECEIVER LOCAL OSCILLATOR ALIGNMENT PROCEDURES

1. Set volume control to maximum clockwise position.
2. Connect vacuum tube voltmeter (VTVM) to 2ry winding of local oscillator coil "15"
3. Turn back the slug of "L5" clockwise, slowly. The reading on VTVM wil reappear and increase sharply to its maximum point, then gradually decrease after passing peak point. Advance slug one turn clockwise beyond the peak point.
4. Turn slug of "L5" counterclockwise until the needle of VTVM drops to zero. (indicating oscillation has stopped.)
5. Observe the VTVM, reading should be between 300mV and 400mV.
6. Push " PUSH-TO-TALK" switch several times. Note if VTVM shows same value as obtained in step 5.
7. If the needle shows erratic action in step 6, advance slug of "L5" another ½ turn clockwise.
8. Disconnect VTVM from set.

(E) ANTENNA CIRCUIT ALIGNMENT PROCEDURES

1. Set volume control to maximum clockwise position.
2. Connect the AC voltmeter and external load to the earphone jack.
3. Connect output of signal generator through a 15uuF capacitor, to a short length of hook-up wire and loosely couple to the top of telescopic antenna and connect the ground lead of the output cable to the cabinet.
4. Set up a signal generator at the proper transmitting frequency.
5. Adjust the slug of antenna coil "L2" and RF coil "L3,L4" for the maximum indication on the AC voltmeter.

ALIGNMENT PROCEDURE

(F) TRANSMITTER ALIGNMENT PROCEDURES

1. Collapse telescopic antenna to minimum length.
2. Remove the jumper wire (TP-1) - located near transmitting crystal box.
3. Connect the DC ammeter to TP 1.
4. Set on the switch with volume control.
5. Connect power meter to external antenna jack.
6. Push "push-to-talk" button.
7. Turn the slug of transmitting oscillator coil "L6", buffer coil "L9" drive coil "L12", antenna filter coil "L13,L14," and loading coil "L1" counterclockwise until the power meter indicates zero. (indicating oscillation has stopped.)
8. While observing the DC ammeter, turn back slug of "L6" very slowly in clockwise direction. The needle of ammeter will rise sharply then gradually decrease reaching peak, turn back slug one turn clockwise from peak.
9. Adjust the slug of "L9,L12,L13, and L14 maximum reading on powermeter and read indication of DC ammeter.
10. Release and depress "push-to-talk" switch several times. The DC ammeter must show same steady current as obtained in Step 9 each time switch is pushed.
11. In Step 10, if reading is not steady or fails to reappear, advance the slug of "L6 another ½ turn counterclockwise.
12. Disconnect power meter from "Ext. Ant." then fully extend telescopic antenna.
13. Adjust the slug of "LI" for maximum reading on the field strength-meter.
14. Check whether DC ammeter indicated 500mA±015mA. If not, repeat from Step 8.
15. Disconnect DC ammeter from TP1 and connect jumper wire.

GUIDE TO ADJUSTMENT

TRANSMISSION:

.) Use only those crystals recommended for the circuitry of this unit. Otherwise, the specified channel frequency may not be attained. A check of the oscillation frequencies by frequency meter should be made.

(B) When the frequencies are close to each other, such as channel 1 and 2, no adjustment for frequency is necessary. If adjustment is necessary, please follow the instructions below:

(1) Extend the telescopic antenna to its full length. Never transmit without antenna fully extended as one or more transistors will be severely damaged and will not be covered by warranty.
(2) Make sure that battery voltage is 12 volts.
(3) Use a simple field strength meter.
(4) Install the crystals in the proper sockets for transmit and receive.
(5) Press the"TALK-LISTEN" switch to transmit, adjust the antenna load coil and tank coil for maximum indication on field strength meter or RF output meter.
(6) Input power can be controlled by adjusting the oscillator coil of the transmitter.
(7) Too much input power in relation to modulation capability can result in a low modulation percentage, therefore, decrease drive to obtain 85% modulation.

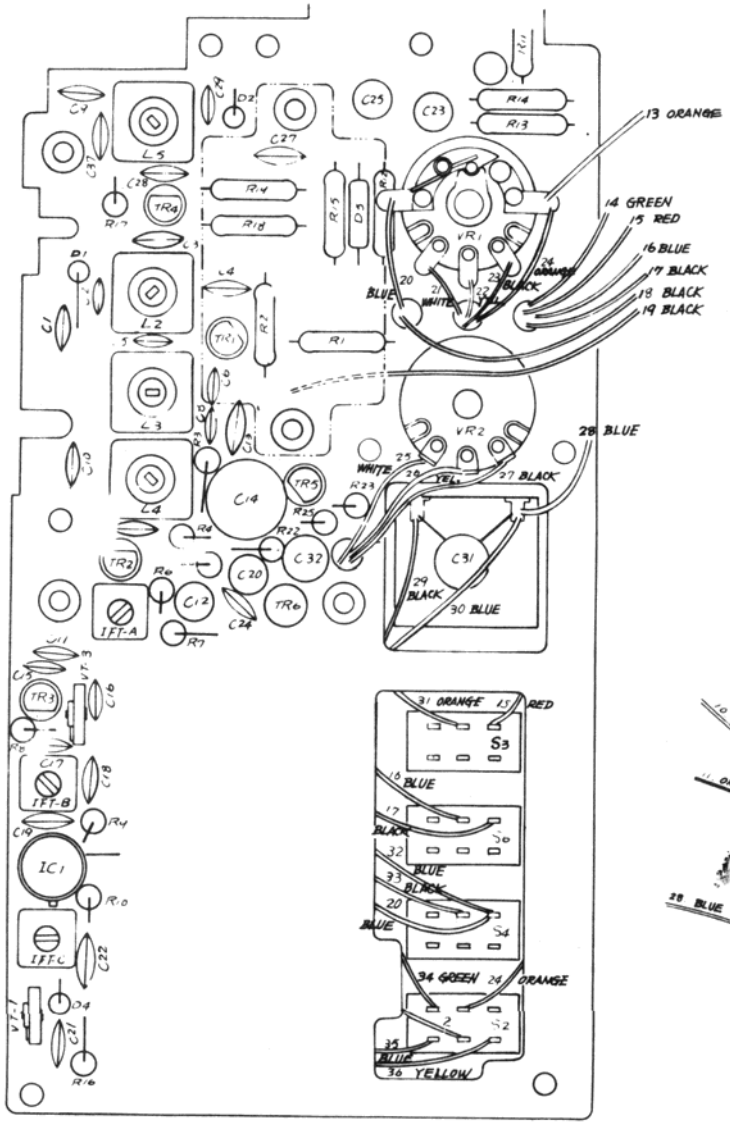
RECEPTION

(A) Adjust the intermediate frequency circuit to 455KHz from signal generator.
- Peak the IF transformers for maximum.

(B) Adjust the receiver antenna and oscillator coil for maximum reception or indication by instrument, using another tranceiver or transmitter as signal source.
(C) The above adjustment should be repeated several times to ascertain peak reception.

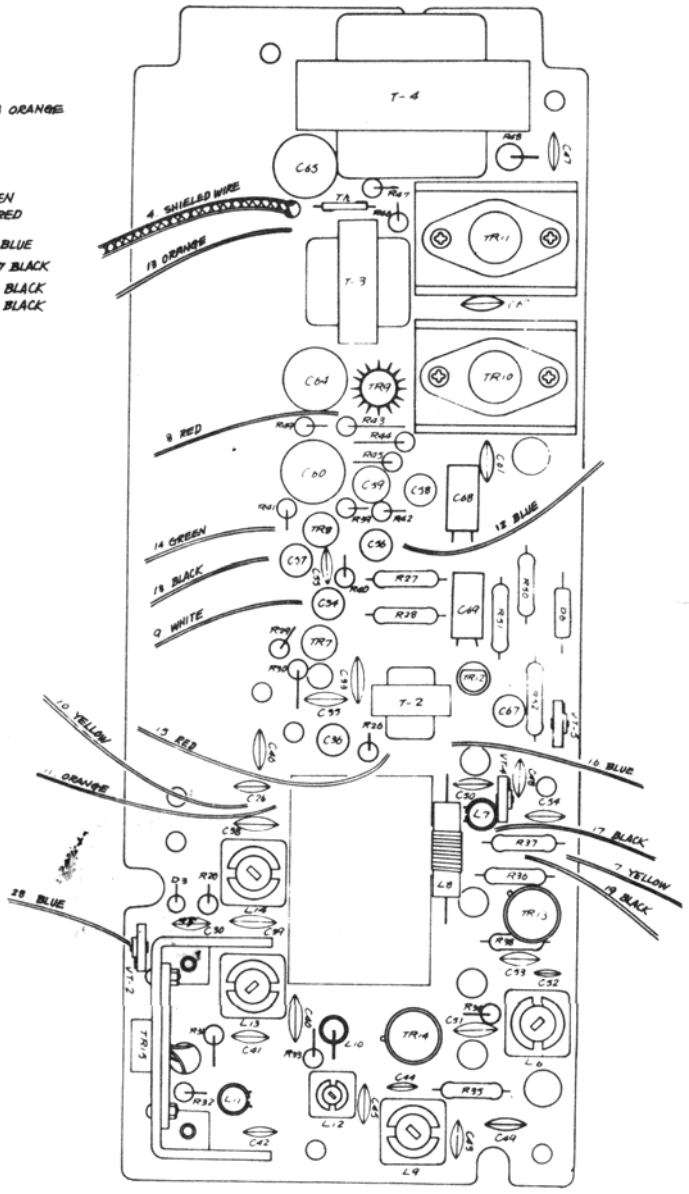
NOTE: It is best to choose channel numbers close to one another, as adjustments are not adequate for wide channel separation such as from channel 2 to 22.

COMPONENT VIEW TO RECEIVER SECTION



MIDLAND 13-770 5W, 6 CHANNEL TRANSCEIVER
&
MIDLAND 13-772 5W, 12 CHANNEL TRANSCEIVER

COMPONENT VIEW TO TRANSMITTER SECTION



MIDLAND 13-770 5W, 6 CHANNEL TRANSCEIVER
&
MIDLAND 13-772 5W, 12 CHANNEL TRANSCEIVER

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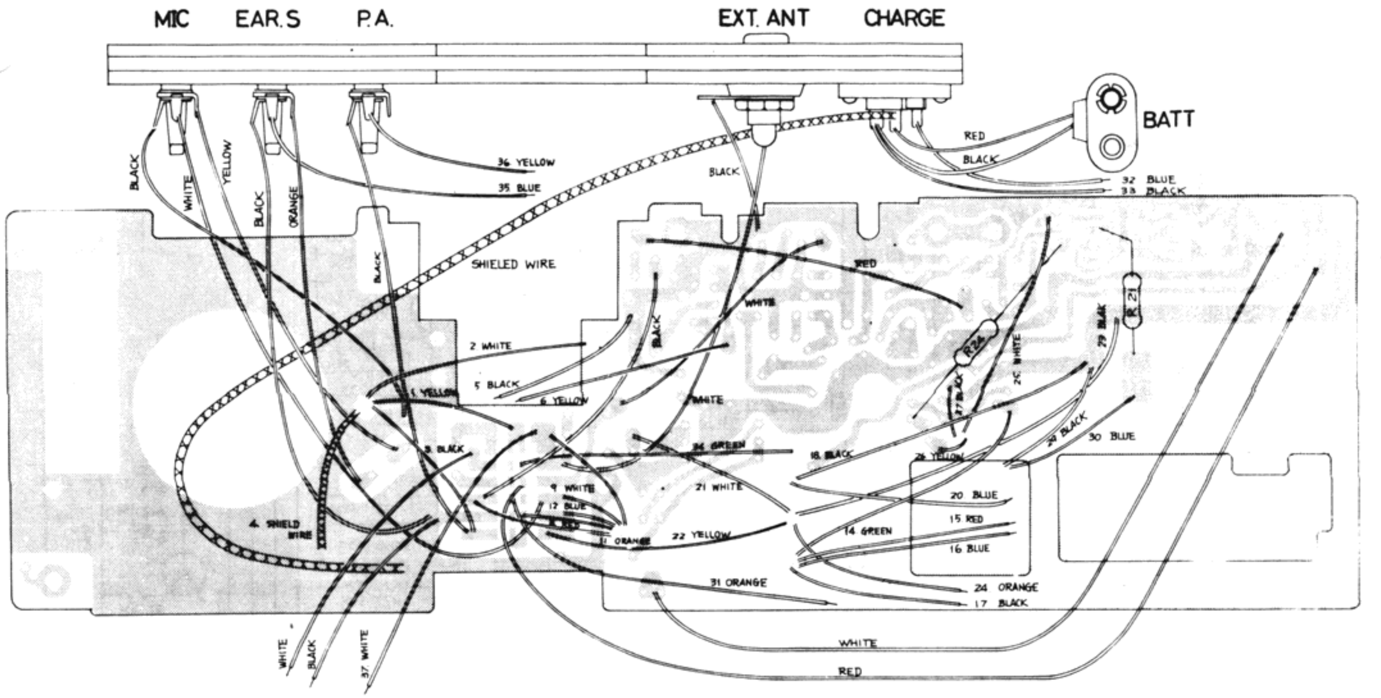
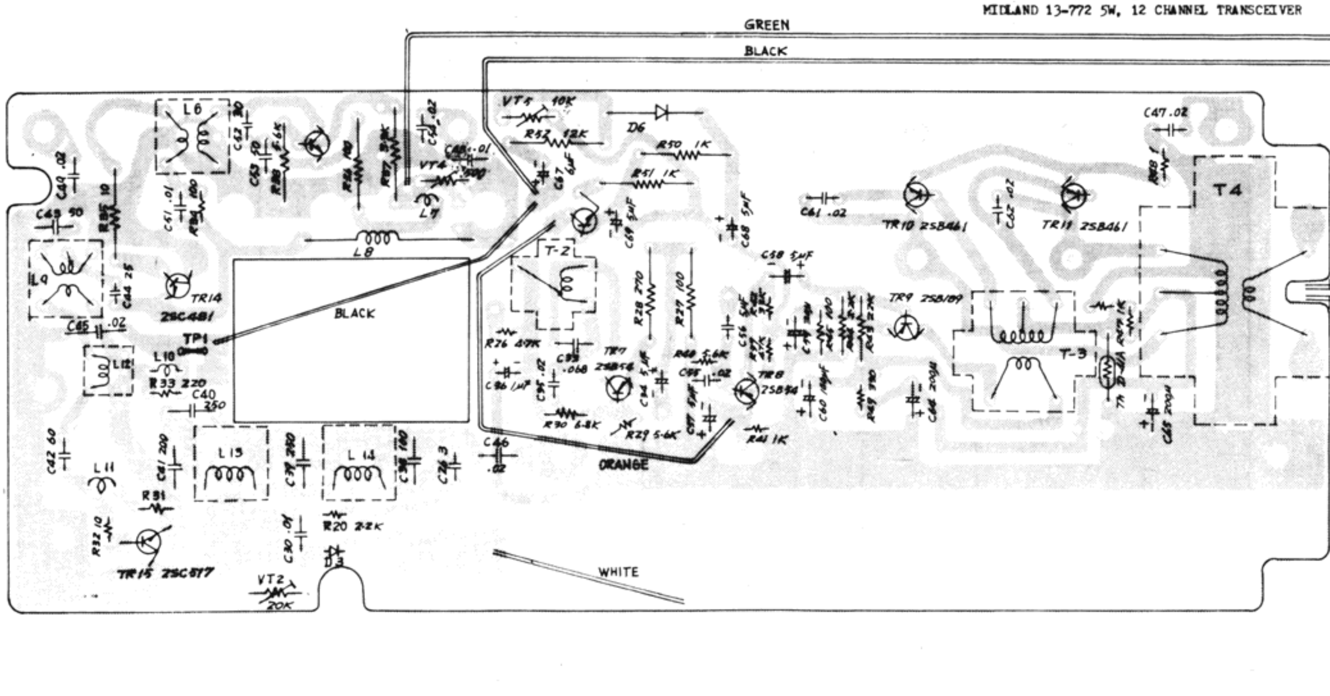
MIDLAND 13-770 5W, 6 CHANNEL TRANSCEIVER
&
MIDLAND 13-772 5W, 12 CHANNEL TRANSCEIVER



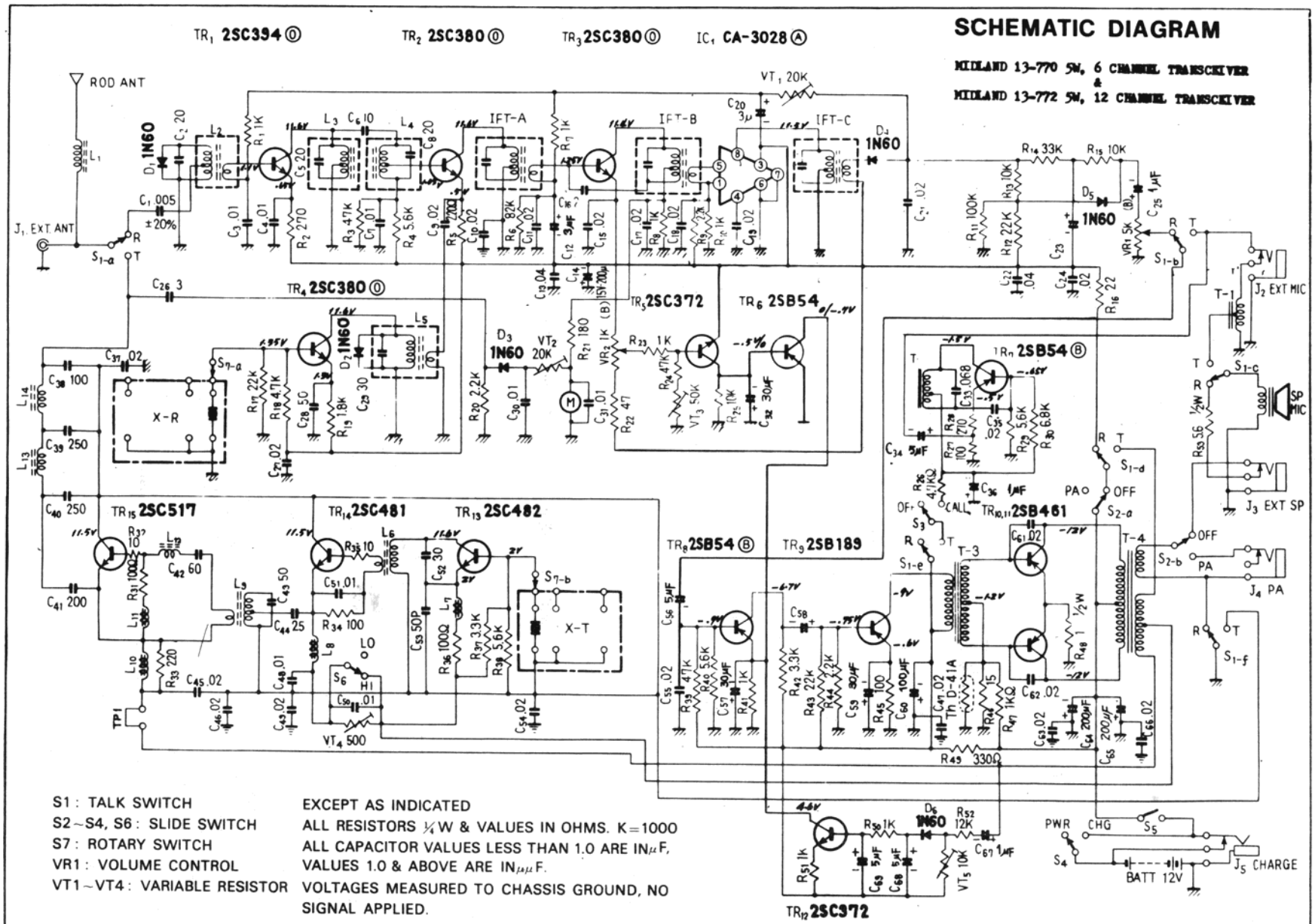
WIRING VIEW TO TRANSMITTER SECTION

MIDLAND 13-770 5W, 6 CHANNEL TRNASCEIVER
&
MIDLAND 13-772 5W, 12 CHANNEL TRANSCEIVER



SCHEMATIC DIAGRAM

MIDLAND 13-770 5W, 6 CHANNEL TRANSCEIVER
&
MIDLAND 13-772 5W, 12 CHANNEL TRANSCEIVER



S1 : TALK SWITCH
S2~S4, S6 : SLIDE SWITCH
S7 : ROTARY SWITCH
VR1 : VOLUME CONTROL
VT1~VT4 : VARIABLE RESISTOR

EXCEPT AS INDICATED
ALL RESISTORS ¼W & VALUES IN OHMS. K=1000
ALL CAPACITOR VALUES LESS THAN 1.0 ARE IN μF,
VALUES 1.0 & ABOVE ARE IN μμF.
VOLTAGES MEASURED TO CHASSIS GROUND, NO SIGNAL APPLIED.

PARTS LIST

MODEL NO. 13-770/13-772

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE
	CASE PARTS		
	Case, Front L/Trim	13-010118	$ 7.72
	Case, Rear L/Trim	13-013075	4.00
	Plate, Name	13-020319	.46
	Plate, Function (Black) (13-770 Only)	13-020320	.74
	Plate, Function (Silver) (13-772 Only)	13-020329	.74
	Plate, Feature (5W/6Ch.) (13-770 Only)	13-020321	.46
	Plate, Feature (5W/12Ch.) (13-772 Only)	13-020330	.46
	Label, Channel Indicator (13-772 Only) (Blue Label)	13-020331	.46
	Label, Channel Indicator (13-770 Only) (Red Label)	13-020322	.46
	Disc, Volume & Squelch Knobs	13-020323	.46
	Window, Channel Indicator	13-020324	.46
	Knob, Volume or Squelch (13-770 Only)	13-110093	.74
	Knob, Volume or Squelch (13-772 Only)	13-110094	.74
	Knob, Push-Talk	13-118065	.46
	Knob, Channel Selector	13-115020	.74
	Panel, Output & Input Jacks	13-020326	.74
	Plunger, P/T Knob	13-020327	.46
	Frame, P/T Knob	13-020328	.46
	Cover, Battery Compartment	13-018008	.96
	MISCELLANEOUS:		
S1	Switch, P/T	13-183104	1.66
S2	Switch, P.A.	13-183105	.74
S3	Switch, Call	13-183105	.74
S4	Switch, Charge	13-183105	.74
S6	Switch, High-Low	13-183105	.74
S7	Switch, Channel Selector (13-770 Only)	13-180050	2.30
S7	Switch, Channel Selector (13-772 Only)	13-180051	2.30
VR1	Control, Volume 5K	13-160060	.96
VT1, 2	Control, Sensitivity 20K	13-164050	.46
VT3	Control, Sensitivity 50K	13-164052	.46
VT4	Control, Sensitivity 500OHM	13-164053	.46
VT5	Control, Sensitivity 10K	13-164054	.46
VR2	Control, Squelch 1K	13-166051	.96

REF NO.	DESCRIPTION	PART NO.	LIST PRICE
SP	Speaker, 8 OHM	13-060057	$ 1.66
	Antenna, Telescope	13-040053	3.28
	Meter	13-200023	4.20
	Socket, Crystal	13-159029	.46
	Snap, Battery	13-154035	.46
	Collar, Antenna	13-157105	.46
	Box, Battery	13-030043	.96
	Case, Carry (Leather)	13-036044	6.19
	Earphone	13-038038	.74
	Insulator, Battery	13-033102	.46
X-R	Crystal, Receive	13-128019	4.00
X-T	Crystal, Transmit	13-128020	4.00
	COILS & TRANSFORMERS		
L1	Coil, Load	13-176229	.74
L2	Coil, Antenna Receive	13-176230	.96
L3	Coil, RF	13-176231	.96
L4	Coil, RF	13-176232	.96
L5	Coil, Local Oscillator	13-170141	.96
L6	Coil, Oscillator	13-170142	.74
L7	Coil, Micro Inductor	13-176233	.74
L8	Coil, Peaking	13-176234	.74
L9	Coil, Buffer	13-176235	.74
L10	Coil, Peaking	13-176236	.74
L11	Coil, Micro Inductor	13-176237	.74
L12	Coil, Drive	13-176238	.74
L13	Coil, Load	13-176239	.74
L14	Coil, Filter	13-176240	.74
IFTA	IFT - 1st	13-090153	.96
LFTB	IFT - 2nd	13-090154	.96
IFTC	IFT - 3rd	13-090155	.96
T1	Transformer, Matching	13-176241	.96
T2	Transformer, Matching	13-176241	.96
T3	Transformer, Input	13-096093	1.44
T4	Transformer, Output	13-096094	2.54
	HARDWARE		
J1	Jack, External Antenna	13-153010	.96
J2, 3, 4	Jack, Mic., E/P & PA	13-153060	.60
J5	Jack, Charge	13-153050	.74
	Button, Lock Battery Panel	13-151232	.46
	Spring, Leaf Battery Panel	13-152002	.46
	Mount-Bracket, Selector Switch	13-158158	.60
	Heatsink, Transistor, For 2SB0461	13-089029	.60
	Stud, PC Board, Long	13-156060	.46
	Stud, PC Board, Short	13-156061	.46
	Clamp, Speaker	13-158159	.30
	Heatsink, Transistor 2SC-517	13-089030	.74
	Screw, Ant. Base Mt.	13-151233	.12
	Screw, PC Board	13-151234	.12

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE
	Mount, Antenna, Base	13-158160	$ .46
	Mount, Bracket, Rec. Crystal	13-158161	.96
	Sockets		
	TRANSISTORS		
TR1	2SC-394	09-302003	2.40
TR2, 3, 4	2SC-380	09-302002	2.40
TR5	2SC-372	09-302039	2.10
TR6, 7, 8	2SB-54	09-301003	1.70
TR9	2SB-189	09-301054	1.70
TR10, 11	2SB-461	09-301031	2.90
TR12	2SC-372	09-302039	2.10
TR13	2SC-482	09-302055	3.54
TR14	2SC-481	09-302015	4.30
TR15	2SC-517	09-302056	8.36
	INTEGRATED CIRCUIT		
IC1	CA-3028A	09-308003	5.46
	DIODES		
1, 2, 3, 4, 5, 6	IN60	09-306019	.60
	THERMISTORS		
TH1	D-41A	09-307030	.96
	RESISTORS		
	ALL RESISTORS NOT SHOWN ON THIS PARTS LIST ARE CARBON TYPE, 1/4 WATT, REFER TO SCHEMATIC FOR SPECIFIC VALUES.		
R48	1 OHM, 1/2W., Carbon	77-102109	.30
R53	5.6 OHM, 1/2W., Carbon	77-102569	.30
	CAPACITORS		
	ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE STANDARD CERAMIC DISC TYPE, 50 W.V., REFER TO SCHEMATIC FOR SPECIFIC VALUES.		
C12, 20	.3MFD, 6V., Electrolytic	77-335304	.76
C14, 64, 65	200 MFD, 15 V., Electrolytic	77-331207	.96
C23, 25	.1 MFD, 6 V., Electrolytic	77-335104	.76
C32, 59	30 MFD, 6 V., Electrolytic	77-335306	.76
C34, 56, 57, 58, 68, 69	5 MFD, 6 V., Electrolytic	77-335505	.76

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE
C36, 67	1 MFD, 6 V., Electrolytic	77-335105	$ .76
C60	100 MFD, 15 V., Electrolytic	77-331107	.96

ALL PARTS AND PRICES ON THIS PARTS LIST ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.

   A. Name Item
   B. Model Number
   C. Serial Number

2. Best possible identification of the part itself.

   A. Part Number
   B. Part Name
   C. Quantity
   D. If necessary, return old part as sample.

3. Customer should use address listed below when ordering replacement parts.

MIDLAND ELECTRONICS COMPANY
Parts Department
110 West 12th Street
North Kansas City, Missouri 64116