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TECHNICAL MANUAL  
for  
SOLID STATE RECEIVER  
MODEL SMR-2



THE TECHNICAL MATERIEL CORPORATION  
MAMARONECK, N. Y.

OTTAWA, CANADA



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When ordering replacement parts, the following information must be included in the order as applicable:

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2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

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THE TECHNICAL MATERIEL CORPORATION  
Engineering Services Department  
700 Fenimore Road  
Mamaroneck, New York



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3010-1

Figure 1-1. Solid State Receiver, Model SMR

## SECTION 1

### GENERAL DESCRIPTION

#### 1-1. FUNCTIONAL DESCRIPTION.

Solid State Receiver, Model SMR-2 (figure 1-1) is a completely transistorized superheterodyne communications receiver that operates on any one of eight selectable crystal-controlled channels in the range of 2 to 32 mc. It can be used alone or as part of a communications system.

The SMR is capable of receiving amplitude modulation (AM), amplitude modulation (AME), and modulated continuous wave (MCW transmissions).

Operating frequencies for the r-f section of the SMR are determined by fixed-tuned, crystal-controlled, plug-in modules (model TTRR). Various combinations of these modules may be used to provide frequency coverage in accordance with operating requirements (refer to paragraph 1-4). Each TTRR module employed in the SMR has two selectable, local oscillator frequencies that permit transmission on either of two frequencies (F1 or F2) within the r-f bandpass of the module, without necessitating realignment. Field change to new operating frequencies is easily accomplished (refer to section 5 and to the TTRR manual). Other features of the SMR include:

- a. High sensitivity for good reception under weak signal conditions.
- b. A sharp cutoff bandpass filter for optimum selectivity.
- c. Double conversion for a high image rejection.

- d. Local or remote selection of LSB or USB reception.
- e. An adjustable squelch circuit that mutes the audio output (except for the 600-ohm line output) when no input signal is being received. This circuit also provides an external output (for alarm purposes) to indicate that the receiver is squelched.
- f. A built-in meter for monitoring the r-f and audio signal levels.
- g. Low power consumption and subsequent low heat dissipation.
- h. External oven supplies can be connected for crystal ovens that operate on **voltages** other than the unit's primary a-c supply.

The SMR **produces** two separate audio outputs. These are 500 milliwatts into 4 ohms for speaker or front-panel phone jack, and 1 milliwatt into a 600-ohm balanced load. The 600-ohm output level can be adjusted by means of a **LINE LEVEL** control. The speaker and earphone output levels can be varied by means of a **VOLUME** control. The speaker is automatically disconnected when the phone jack is used.

Performance specifications and other reference data for the SMR are given in paragraph 1-3. Table 1-1 lists the equipment supplied with the SMR.

TABLE 1-1. EQUIPMENT SUPPLIED.

NAME	DESIGNATION	FUNCTION	QUANTITY
Solid State Receiver	SMR-2	Communications Receiver	1
Cable assembly*	CA555-4	A-c power cord	1
Fanning strip	TM105-16AL	Aid for rear panel wiring	1
R-f connector plug	UG88*/U	Facilitates coaxial cable connection to r-f input jack	1

\*This cable can be ordered with terminations other than the 115 V polarized plug normally provided.

1-2. PHYSICAL DESCRIPTION.

a. EXTERNAL. - The SMR is designed for mounting in a standard 19-inch rack or in a sturdy metal case. Two handles are located on the front panel for ease of handling. Dust covers protect the unit when it is rack mounted.

All of the operator's controls are located on the front panel, and are described and illustrated in section 3 of this manual. A terminal board mounted on the rear panel provides for most input and output connections. A BNC connector is provided at the rear panel for connecting the r-f input coaxial cable. In addition, the rear panel contains power connectors, input power and power supply fuses, and an oven power-source selector switch. Figure 2-2 illustrates the rear-panel components.

b. INTERNAL. - Most of the smaller components in the SMR are located on printed circuit boards that are mounted to the chassis. There are four of these boards not including those in the TTRR modules; refer to figure 5-1. These are the receiver i-f board, the receiver audio board, the power supply board, and the meter board. The larger components of the receiver are chassis-mounted.

TABLE 1-2. SEMICONDUCTOR COMPLEMENT

REFERENCE DESIGNATION	TYPE	FUNCTION
CR302 & CR303	1N34A	Audio detectors
CR910, CR911, CR913, CR914	1N547	Rectifiers
CR912, CR915	1N3022B	Voltage references
CR1500	1N294	Gate
CR1801	1N294	Detector
CR1802	1N294	Noise limiter
CR1803, CR1804 CR1805	1N68	AGC detector
Q900, Q901	2N350A	Regulators
Q1613	TX107/2N1370-4	First audio amplifier
Q1614, Q1615	TX107/2N1370-4	Second audio amplifier
Q1616, Q1617	2N1039	Power amplifier
Q1618	TX108/2N1370-4	Line amplifier

TABLE 1-2. SEMICONDUCTOR COMPLEMENT (CONT)

REFERENCE DESIGNATION	TYPE	FUNCTION
Q1619, Q1620	TX107/2N1370-4	Squelch trigger
Q1621	2N2001	Relay driver
Q1801	TX109/2N2084	First i-f amplifier
Q1802	TX109/2N2084	Mixer
Q1803	TX109/2N2084	I-F emitter follower
Q1804	TX109/2N2084	Second i-f amplifier
Q1805	2N404	Audio emitter follower
Q1806, Q1807	TX109/2N2084	Intermediate frequency oscillators
Q1808	TX109/2N2084	Buffer
Q1809	2N1190	AGC i-f amplifier
Q1810	2N697	First AGC amplifier
Q1811	2N697	Second AGC amplifier

1-3. TECHNICAL SPECIFICATIONS.

Frequency range	2 to 32 mc divided into four bands using the following TTRR modules. Band 1: 2-4 mc, TTRR-1 Band 2: 4-8 mc, TTRR-2 Band 3: 8-16 mc, TTRR-3 Band 4: 16-32 mc, TTRR-4
Number of channels	8 (each having a separate TTRR module).

### 1-3. TECHNICAL SPECIFICATIONS (CONT)

Tuning System	Each TTRR module is fixed-tuned to a particular frequency within its band. The receiver is tuned by selecting one of the different modules (channels).
Frequency control	Crystal-controlled oscillators are used throughout the receiver.
Types of reception	AM, AME, and MCW.
Sensitivity	3 uv, modulated 30%, for 10 db signal + noise so noise ratio.
I-f selectivity	4 kc, centered 1.325 kc from received carrier frequency.
I-f frequency	Double conversion from 1.75 mc to 250 kc on all bands.
Image rejection	A minimum of 50 db from 2-to 28-mc, a minimum of 40 db from 28- to 32-mc.
AGC	No more than 5 db increase in output for input variations from 3 uv to 100,000 uv.
Hum and noise level	At least 40 db down from full output.
Antenna input impedance	50 ohms (nominal) unbalanced.
Audio output	1. 500 milliwatts into 4 ohms for speaker or earphone. 2. 1 milliwatt in 600-ohm balanced load.
Temperature range	0° C (32° F) to 50° C (122° F).
Dimensions	Depth: 16 inches. Width: 19 inches. Height: 7 inches.
Weight, uncrated	Rack mounted: 50 pounds. Cabinet mounted: 70 pounds.



## SECTION 2

### INSTALLATION

#### 2-1. UNPACKING AND HANDLING.

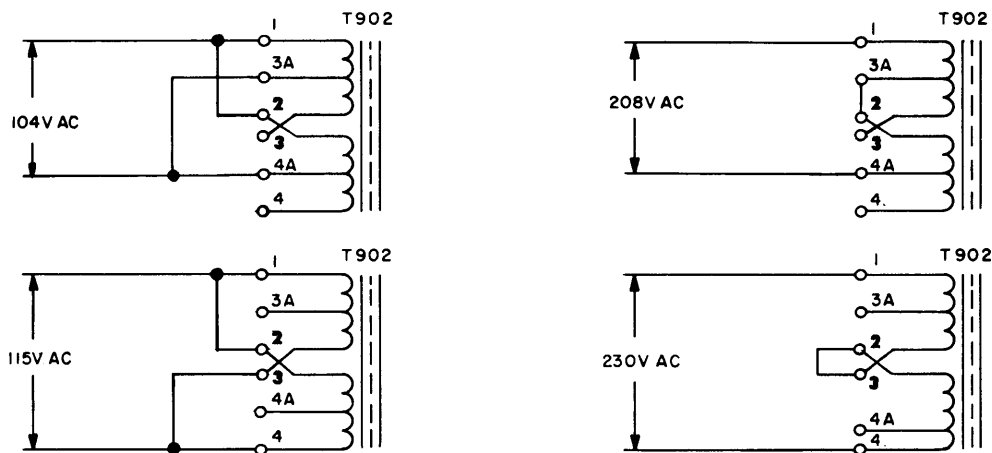
Each SMR is thoroughly checked at the factory prior to shipment, and is carefully packaged to prevent damage during transit. Upon receipt of the equipment, inspect the packing case and its contents for damage that might have occurred during transit. Unpack the equipment carefully, and inspect all packing material for parts that may have been shipped as loose items. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

#### 2-2. POWER REQUIREMENT.

The SMR operates on 104, 115, 208, or 230 volts a-c power. The receiver is normally shipped for operation with 115 vac +10%. If the receiver is to operate from a power source other than 115 vac, the wiring of power transformer T902 must be modified (see figure 2-1). It is recommended that a .125 ampere fuse be used with 104 and 115 volts, and a .062 ampere fuse be used with 208 and 230 volts.

#### NOTE

If ovens are used in the TTRR modules, the voltage rating of the ovens must be the same as the main power input or an external oven supply is required. It is most important to make sure that the oven supply power is correct before energizing the unit.



3014-2

Figure 2-1. Power Transformer Wiring

### 2-3. MECHANICAL INSTALLATION.

Regardless of whether the SMR is contained in a cabinet or is intended for rack mounting, sufficient clearance in back of the unit for access to rear-panel connections and sufficient space for withdrawal of the unit from the rack for servicing are prime considerations when determining ultimate location. The SMR is equipped with a standard 19-inch wide front panel, and is 7 inches high and 16 inches deep.

When supplied as part of a rack-mounted system, the SMR is equipped with tilt-slide mechanisms. To install the SMR, proceed as follows:

(1) Set SMR chassis slide mechanism in tracks.

(2) Slide chassis in tracks until rearward release finger engages holes in track.

(3) Make necessary cable and electrical connections as described in paragraph 2-4.

(4) Press forward release fingers and slide chassis into cabinet; secure front-panel of SMR to rack with screws.

#### 2-4. ELECTRICAL INSTALLATION. (Figure 2-2)

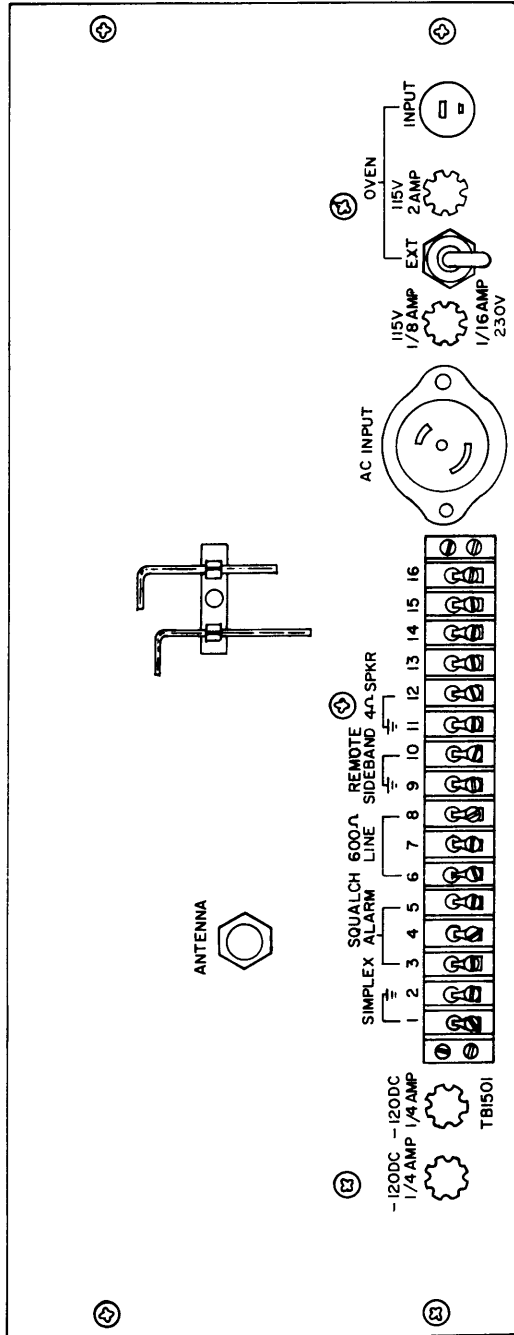
All connections to the SMR are made at the rear of the unit; proceed as outlined below. If the SMR is employed as part of a receiver system, refer to the applicable system cabling diagram while making connections.

a. Connect a-c power cable to POWER INPUT jack.

#### NOTE

Ovens mentioned in step b below are optional equipment. Refer to TTRR instruction manual.

b. If ovens in TTRR modules are compatible with primary a-c line voltage, set OVEN switch at INT. If ovens in TTRR modules are not compatible with primary a-c line voltage, set OVEN switch at EXT, and connect appropriate oven supply to OVEN INPUT jack.



3010-2

Figure 2-2. Rear View, SMR

c. Using 50-ohm coaxial cable, connect antenna to ANTENNA jack.

d. In accordance with operational requirements, make following connections at terminal block E1501.

(1) Terminals 6 and 8 of E1501 are provided for connection of a 600-ohm telephone line or similar audio load; if the line is balanced, terminal 7 should be grounded.

(2) For remote sideband selection, connect remote selector switch between terminals 9 and 10 of E1501.

(3) For simplex operation, connect associated transmitter's muting relay contacts to terminals 1 and 2 of E1501.

(4) Connect a 4-ohm loudspeaker or 3.2-ohm resistor between terminals 11 and 12 of E1501.

(5) For remote squelch alarm, connect alarm device across terminals 3 and 4 or across terminals 4 and 5 of E1501; SMR provides dry contacts for operating alarm device.

## 2-5. PERFORMANCE CHECK.

Immediately after the SMR has been installed, it should be checked for proper operation by attempting to receive signals on each channel; refer to the operating procedures given in section 3 of this manual. When signals are received, LSB and USB reception and the operation of the VOLUME, LINE LEVEL, and SQUELCH controls should be checked.

### SECTION 3

#### OPERATOR'S SECTION

##### 3-1. CONTROLS AND INDICATORS.

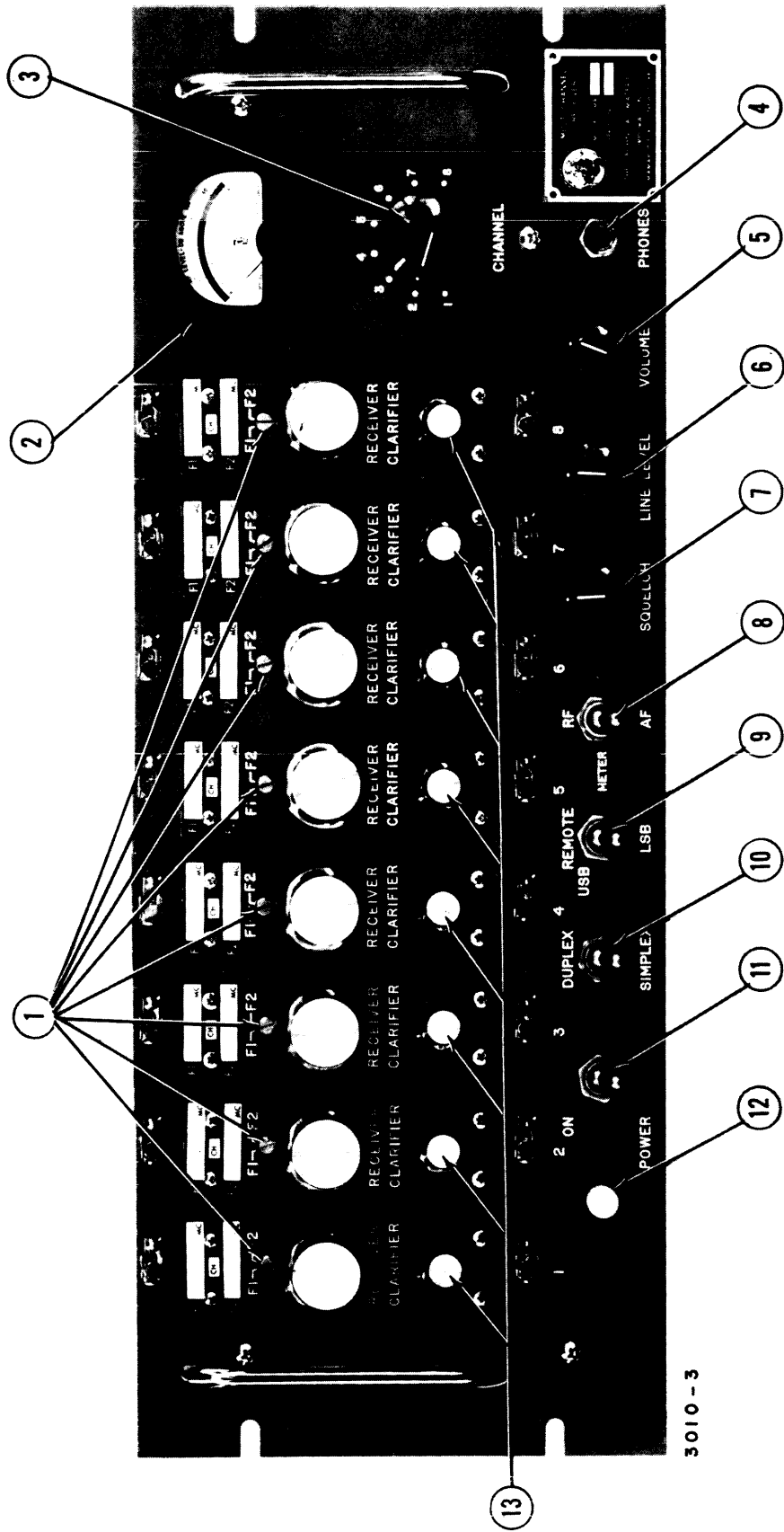
Before attempting to operate the SMR, the operator should familiarize himself with the controls and indicators listed in table 3-1 and shown in figure 3-1. It is important to stress that descriptions given in table 3-1 are not operating instructions; for specific operating instructions, refer to paragraph 3-2.

##### NOTE

Operating instructions for the TTRR modules are included in this section as part of the overall operating procedure for the receiver.

TABLE 3-1. OPERATOR'S CONTROLS AND INDICATORS

Item No. (Figure 3-1)	Designation	Function
1	F1/F2 switch (one on each TTRR module)	Selects operating frequency in conjunction with CHANNEL switch (item 3).
2	Meter (M1501)	Indicates r-f input level or 600-ohm audio output level as selected by METER switch (item 8).
3	CHANNEL switch (S1515)	Selects operating frequency with F1/F2 switches (item 1).
4	PHONES jack (J1516)	Permits connection of headphones to receiver; when phones are used, the speaker output is disabled.



3010-3

Figure 3-1. SMR, Front View

**TABLE 3-1. OPERATOR'S CONTROLS AND INDICATORS (CONT)**

Item No. (Figure 3-1)	Designation	Function
5	VOLUME control (R1515)	Controls level of audio signal applied to speaker and PHONES jack.
6	LINE LEVEL control (R1518)	Controls level of audio signal applied to 600-ohm output.
7	SQUELCH control (R1547)	Determines level of r-f input signal required to enable loud-speaker and phone audio output circuits.
8	METER switch (S1516)	Connects meter (item 2) to indicate r-f input level or 600-ohm audio output level.
9	LSB/USB REMOTE switch (S1513)	Selects lower sideband or upper sideband reception; when set at USB REMOTE, sideband may be selected remotely.
10	SIMPLEX/DUPLEX switch (S1514)	When set at SIMPLEX, enables remote controlled receiver muting circuit, when set at DUPLEX, disables muting circuit.
11	POWER switch (S901)	When set at ON, energizes receiver power supply circuit.
12	POWER lamp (DS1501)	Lights when receiver's power supply is energized.
13	RECEIVER CLARIFIER control (one on each TTRR module)	Permits fine tuning of HFO in TTRR module.



### 3-2. OPERATING PROCEDURES.

a. Set controls at positions given below:

<u>CONTROL</u>	<u>SETTING</u>
SIMPLEX/DUPLEX switch	Depends upon type of operation desired.
LSB/USB REMOTE switch	Sideband to be received. If sideband to be received is not known, set at USB REMOTE. If sideband is to be selected remotely, set at USB REMOTE.
SQUELCH control	Fully clockwise.
LINE LEVEL control	Fully counterclockwise.
VOLUME control	Fully counterclockwise.
CHANNEL switch	Channel to be received.
F1/F2 switch	At appropriate position to receive incoming signal.
RECEIVER CLARIFIER control	Any

b. Turn VOLUME control clockwise until comfortable signal level is obtained.

#### NOTE

If no signal is obtained, reduce the volume and set LSB/USB REMOTE switch to LSB. Repeat Step (2).

c. Adjust appropriate RECEIVER CLARIFIER control for maximum voice clarity.

d. Adjust SQUELCH control by waiting until no signal is being received, and then turning control slowly counterclockwise until noise from speaker disappears.

### 3-3. CHANGING TTRR MODULES.

- a. Deenergize SMR.
- b. Slide catches located on each end of module to left to release module.
- c. Pull module out of SMR. A knob is provided in the center of the module for this purpose.

#### CAUTION

Before continuing, be sure that voltage rating of crystal oven (if used) in TTRR module to be inserted is same as voltage rating for crystal oven in TTRR module just removed.

- d. Insert new module.
- e. Slide catches located on each end of module to right to lock module in place.

SECTION 4  
PRINCIPLES OF OPERATION

4-1. GENERAL.

The SMR comprises six major assemblies: main chassis assembly, receiver converter module (TTRR), receiver i-f assembly, receiver audio assembly, meter board, and the power supply. Circuit analysis given in this manual for the TTRR module is limited to inputs, outputs, and generalized information. Detailed circuit analysis for the TTRR can be found in the TTRR instruction manual.

4-2. CIRCUIT ANALYSES. (See Figures 4-1 and 7-1)

a. GENERAL. - The SMR is basically a double-conversion super-heterodyne AM receiver.

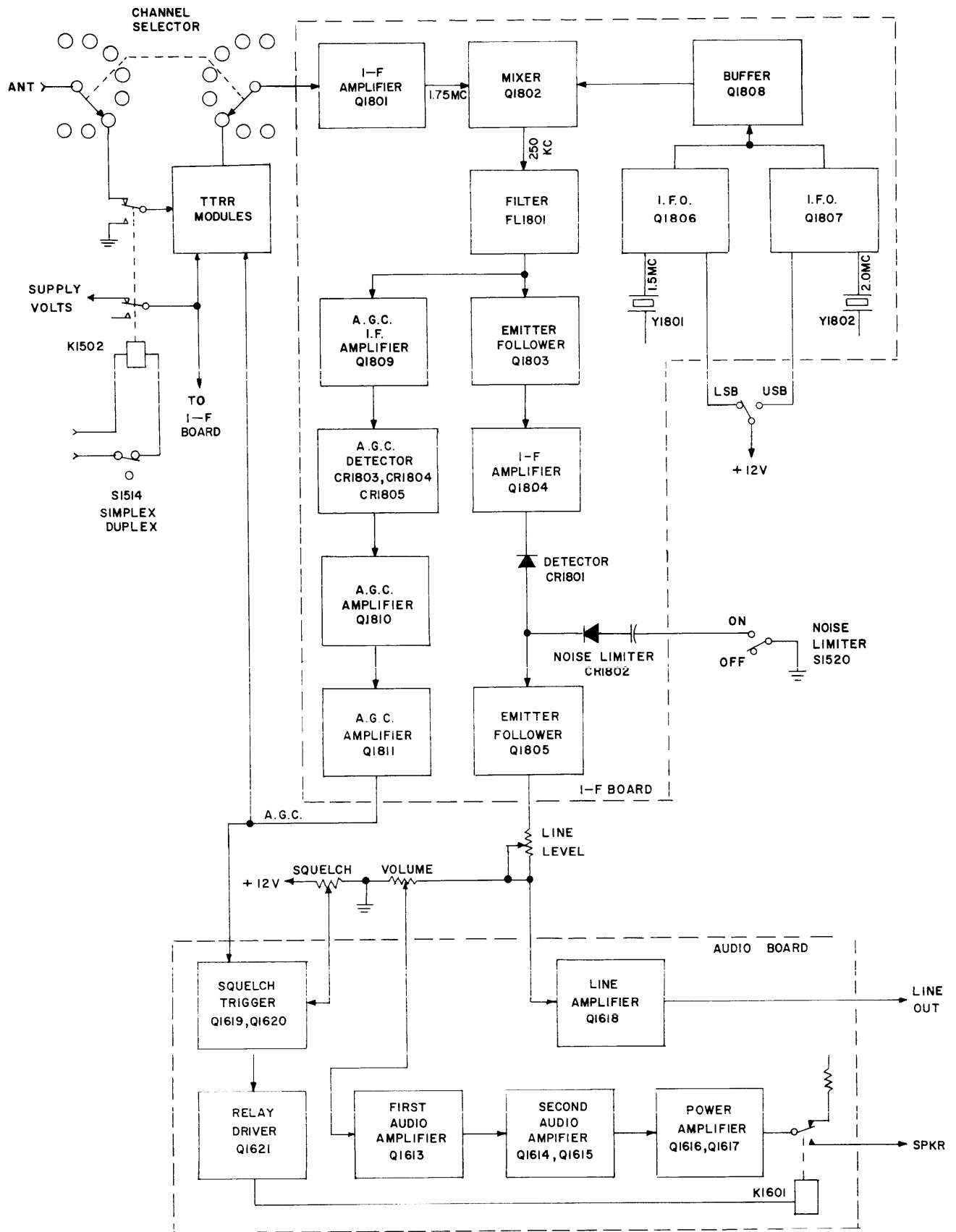
b. INPUT CIRCUITS. - The r-f input to the SMR is supplied from ANTENNA jack J1502 to one of eight possible TTRR plug-in r-f modules through a normally closed contact of simplex/duplex relay K1502 and CHANNEL switch S1515. Each TTRR module is fixed-tuned to a different frequency so that the SMR can receive signals on any one of eight frequencies (determined by the TTRR module selected by S1515). Additional sections of switch S1515 provide operating voltages and delayed agc voltage to the selected TTRR module.

In simplex operation, the normally open contact of the transmit/receive relay in an associated transmitter is connected across terminals 1 and 2 of TB1502 so that relay K1502 is energized whenever the transmitter is keyed. When relay K1502 is energized and SIMPLEX/DUPLEX switch S1514 is set at SIMPLEX, the antenna input

is interrupted, the receiver input is grounded, and the operating voltages for the receiver are interrupted. Thus, the receiver is muted. When S1514 is set at DUPLEX, the operating voltages are not interrupted. For duplex operation (or use without an associated transmitter), no connection is made to terminals 1 and 2 of TB1502. Thus, relay K1502 is always deenergized so that the antenna is connected to the receiver input and operating voltages are present.

c. TTRR PLUG-IN MODULES. - The TTRR module (comprising three r-f amplifiers, a mixer and a local oscillator) amplifies the selected r-f signal and converts it to the first i-f frequency. The bandwidth of the r-f amplifiers is sufficient to pass both sidebands of a received signal (if both are present). The local oscillator is tuned 1.75 mc above the carrier frequency of the received signal. Thus, the spectrum of the received frequencies is inverted (the highest frequencies in the sideband(s) produce the lowest difference frequency). The carrier frequency of the i-f output from a TTRR module is 1.75 mc.

d. I-F AND MIXER STAGES. - The output of the TTRR module is the first of the two i-f frequencies used in the receiver. This signal is supplied through i-f amplifier Q1801 to mixer Q1802. The mixer is also supplied with the output of either the LSB oscillator (1.5 mc) or the USB oscillator (2.00 mc) depending upon the setting of the LSB/USB switch. If the LSB oscillator output (250 kc below the carrier frequency of the i-f signal) is supplied to the mixer, the frequency spectrum of the input signal is not inverted. If the USB oscillator output (250 kc above the carrier



3010J-1

Figure 4-1. Block Diagram, SMR

frequency of the i-f signal) is supplied to the mixer, the frequency spectrum of the input signal is inverted.

LSB oscillator Q1806 (figure 7-1, sheet 2) and USB oscillator Q1807 are modified Colpitts oscillators. Q1806 is tuned to exactly 1.5 mc by C1832 whereas Q1807 is tuned to exactly 2.0 mc by C1834. The output of each oscillator is taken from its base. When LSB/USB switch S1503 is set at LSB position, +12 v is applied across LSB ADJ R1554. The positive voltage is supplied by R1554 to the emitter of Q1806 forward biases Q1806. Oscillator Q1807 is not forward biased and is cutoff. The magnitude of the emitter voltage determines the magnitude of the oscillator output; maximum output occurs when the oscillator is biased at its maximum gain point. When S1503 is set at USB, Q1807 is forward biased, and Q1806 is cutoff.

The output of the selected oscillator (Q1806 or Q1807) is supplied to mixer Q1802 through buffer amplifier Q1808, which minimizes the loading of the oscillator so that its frequency and output magnitude are stable. The output of the mixer is the second i-f frequency and is supplied to crystal bandpass filter FL1801. Filter FL1801 is a highly selective filter with a bandpass of 4 kc, centered at 251.325 kc. The output of the filter, the transmitted carrier and one sideband, is supplied to two stages: emitter follower Q1803 and i-f amplifier Q1809 in the AGC circuit.

e. DETECTOR AND NOISE LIMITER CIRCUIT. - The 250-kc i-f signal from emitter follower Q1803 is amplified by Q1804 and is then applied to detector CR1801. The output of CR1801, a nega-

time-going audio signal is applied to emitter follower Q1805.

The output signal of emitter follower Q1805 is developed across VOLUME CONTROL, R1515 LINE LEVEL control R1518. Potentiometer R1822 is set to limit the level applied to these controls.

f. AUDIO AMPLIFIERS. - The signal developed across R1518 is applied to line amplifier Q1818; Q1818 supplies the balanced 600-ohm output. The signal developed across R1546 is amplified by first audio amplifier Q1613, second audio amplifier Q1614/Q1615 (a combined phase-inverter and push-pull amplifier), and power amplifier Q1616/Q1617. The output of the power amplifier is supplied through a contact of squelch relay K1601 (when K1601 is energized) to the 4-ohm speaker terminals and to the phone jack. The phone jack is wired so that if phones are used, the speaker is disconnected.

g. AGC AND SQUELCH CIRCUITS. - I-f amplifier Q1809 amplifies the output of the crystal filter FL1801; the output of Q1809 is then applied to agc detector CR1803 and CR1804. The agc detector produces a delayed agc voltage which is supplied through first and second agc amplifiers Q1810 and Q1811 to the TTRR module and to the squelch circuit.

Bistable amplifier Q1619 and Q1620 controls relay driver Q1621, which in turn controls squelch relay K1601. When a signal above a predetermined level is being received by the SMR, the bistable amplifier changes to its squelched state and relay driver Q1621 turns off.

When the relay driver is on, relay K1601 is energized, and

the output of the audio power amplifier is connected to the phone jack and speaker. When relay driver Q1621 is off, K1601 is deenergized and the output of the audio power amplifier (Q1616 and Q1617) is disconnected from the speaker and phone jack, and is connected instead to dummy load R1660. Thus, the receiver output is muted when a received signal is not present and only noise is being generated by the receiver. The other set of contacts of relay K1601 can be used to provide squelched and non-squelched indications for external alarm circuitry.

h. METER CIRCUIT. - Meter M1501 can indicate the level of either the r-f signal input of the 600-ohm line output depending upon the position of METER switch S1516. When S1516 is set at RF, the agc voltage produces a current through diode gate CR1500 and M1501 that causes a meter deflection proportional to the agc voltage and, hence, the r-f signal level. When S1516 is set at AF, a portion of the 600-ohm line output is full-wave rectified by CR302 and CR303 to produce a current through the meter. This current causes a meter deflection proportional to the output level.

i. POWER SUPPLY. - The power supply produces regulated +12 vdc and -12 vdc outputs for the operation of the SMR. The power supply is energized by POWER switch S901. OVEN switch S902 permits the selection of an externally generated oven-supply voltage connected to OVEN input jack J905.



## SECTION 5

### MAINTENANCE

#### 5-1. PREVENTIVE MAINTENANCE.

Preventive maintenance of the SMR consists of routine visual inspection and cleaning. Cleaning is necessary, because dust may accumulate on certain components and not only reduce the efficiency of the SMR, but also increase component wear. Either a vacuum cleaner or a compressed air hose is the quickest and most effective method of cleaning the unit.

Visually checking the unit when it is opened for cleaning can prevent downtime due to component failure. Often a deteriorating component will look bad before it actually affects the operation of the unit. Some indications of trouble are: discolored components, leaking transformers and capacitors, dirty or pitted switch and relay contacts, warped printed circuit boards, and damaged wiring. Any components found in this condition should be replaced. In addition, all hardware should be checked for tightness.

#### 5-2. TROUBLESHOOTING.

Test equipment required for troubleshooting the SMR is listed in table 5-1. Refer to figures 5-1, 5-2, and 5-3 to locate components on the printed circuit boards or chassis of the SMR.

##### a. QUICK TEST USING FRONT PANEL CONTROLS.

(1) CHANNEL TEST. - Try to operate the receiver on all eight frequencies selected by the CHANNEL switch. If the receiver

operates on some but not all channels, the TTRR module for the inoperative channel is probably defective.

(2) SIDEBAND TEST. - Try to receive signals with the LSB-USB/remote switch alternately set at both of its positions. If reception is possible on lower sideband only, the USB oscillator is probably defective.

TABLE 5-1. TEST EQUIPMENT.

ITEM	MANUFACTURER
R-F Signal Generator	Hewlett Packard, Model 606A, or equivalent
Oscilloscope	Tektronix, Model 545, or equivalent
A-C VTVM,	Ballantine Model 314, or equivalent
Volt-Ohm-Milliameter	Simpson, Model 260, or equivalent
Frequency Counter	Hewlett Packard, Model 524C, or equivalent
3.2 ohm, 1 watt resistor, or 4 ohm loudspeaker	
600 ohm, 1/2 watt resistor	

b. SYSTEMATIC TROUBLESHOOTING.

(1) Disconnect all wiring from TB1502 and the antenna jack.

(2) Terminate the audio line output (terminals 6 and 8 of TB1502) with a 600-ohm resistor; terminate the speaker audio output (terminals 11 and 12 of TB1502) with a 3.2 ohm resistor.

(3) Connect frequency counter to oscilloscope vertical amplifier output; connect oscilloscope probe to emitter of Q1802. Set USB/LSB switch at USB; observed signal should be 2 megacycles  $\pm$  2 cps at 1.2 volts peak-to-peak. Set USB/LSB switch at LSB; observed signal should be 1.5 megacycles  $\pm$  2 cps at 1.2 volts peak-to-peak. If these signals are not obtained, check buffer Q1808 and the applicable I.F.O, Q1806 or Q1807.

(4) Connect r-f signal generator to ANT jack; adjust generator to deliver receiver's operating frequency (F1 or F2) at 100  $\mu$ v, modulated 30% with 1000 cps. Check signal level at pin 1 of i-f board; level should be at least 50 mv peak-to-peak at 1.75 mc. If this signal is not obtained, check TTRR module as outlined in TTRR technical manual.

#### NOTE

Before troubleshooting the TTRR module, make sure that the AGC circuiting is operating properly. Check level of AGC signal at pin 2 of J1511; level should be approximately +3 vdc.

(5) Check signal level at collector of Q1801; level should be approximately 1.1 volts peak-to-peak. If this level is not obtained, check i-f amplifier Q1801.

(6) Connect a 47 ohm resistor between terminal 12 of i-f board and ground; connect r-f voltmeter across resistor. Level should be approximately 2mv; if this level is not present, check mixer Q1802, Filter FL1801, and emitter follower Q1803.

(7) Check signal level at collector of Q1804; level should be approximately 1.2 volts peak-to-peak. If this level is not observed, check i-f amplifier Q1804.

(8) Check level at collector of Q1809; level should be approximately 2.8 volts peak-to-peak.

(9) Check level at terminal 10 of i-f board; level should be at least 10mv. If this signal is not obtained, check detector and audio emitter follower components (Q1805).

(10) Levels through the audio amplifiers should be as follows with VOLUME control and LINE LEVEL control set at maximum.

#### NOTE

Loudspeaker output should be terminated with a 3-2-ohm resistor at 4-ohm speaker; line output should be terminated with 600 ohms.

- (a) Collectors of Q1614 and Q1615, 1 volt peak-to-peak.
- (b) Collectors of Q1616 and Q1617, 10 volts peak-to-peak.
- (c) Loudspeaker output, 0.5 v rms.
- (d) Line output, 0.78 v rms.

#### 5-3. REPAIR.

Repair of STR consists of component replacement and resoldering wire connections. The following precautions should be observed:

a. Use replacement components identical to defective component (same part number), and position the replacement component in exact place on the board or the chassis.

NOTE

After a component has been repaired or replaced, the STR may require alignment (refer to paragraph 5-4).

b. Use long-nosed pliers or alligator clips when soldering wire leads in order to transfer heat from the junction and thus prevent damage to the component.

NOTE

Use 50-watt soldering iron for soldering all wire leads and connections. Use suitable flux remover to clean soldered joints.

CAUTION

Excess heat near the board surfaces may damage the printed circuit wiring.

5-4. ALIGNMENT.

a. Remove channel 1 TTRR module; set CHANNEL switch at 1. Disconnect external wiring from TB1502. Connect 600 ohm resistor between terminals 3 and 5 of TB1502; connect 4 ohm loudspeaker or 3.2 ohm resistor between terminals 9 and 10.

b. Rotate SQUELCH fully clockwise, and turn on SMR with VOLUME control.

c. Connect frequency counter to oscilloscope vertical amplifier output; connect oscilloscope to emitter of Q1802. Set USB/LSB switch at USB. Adjust R1555 to obtain maximum signal level; adjust C1834 until frequency is 2000 kc  $\pm$  2 cps. Set USB/LSB switch at LSB. Adjust R1554 to obtain maximum signal level; adjust C1832 until frequency is 1500 kc  $\pm$  2 cps.

d. Connect signal generator to terminal 1 of i-f board; adjust generator to deliver 1750 kc at 50 mv (50,000  $\mu$ v) with 30% modulation at 1000 cps.

e. Connect oscilloscope to base of Q1804; adjust C1802 and C1804 to obtain maximum signal.

f. Connect signal generator to ANTENNA jack; replace channel 1 TTRR module. Adjust generator to deliver the channel 1 operating frequency at a level of 3  $\mu$ v, modulated 30% at 1000 cps.

g. Rotate LINE LEVEL control fully clockwise. Adjust R1822 on i-f board to obtain 0.78 v rms at 600-ohm output.

h. Set METER switch at LINE; adjust R1551 until front panel meter indicates 0db on audio scale.

i. Set METER switch at RF; adjust R1548 until front panel meter indicates 0db on r-f scale.

j. Disconnect all test equipment and return receiver to service.

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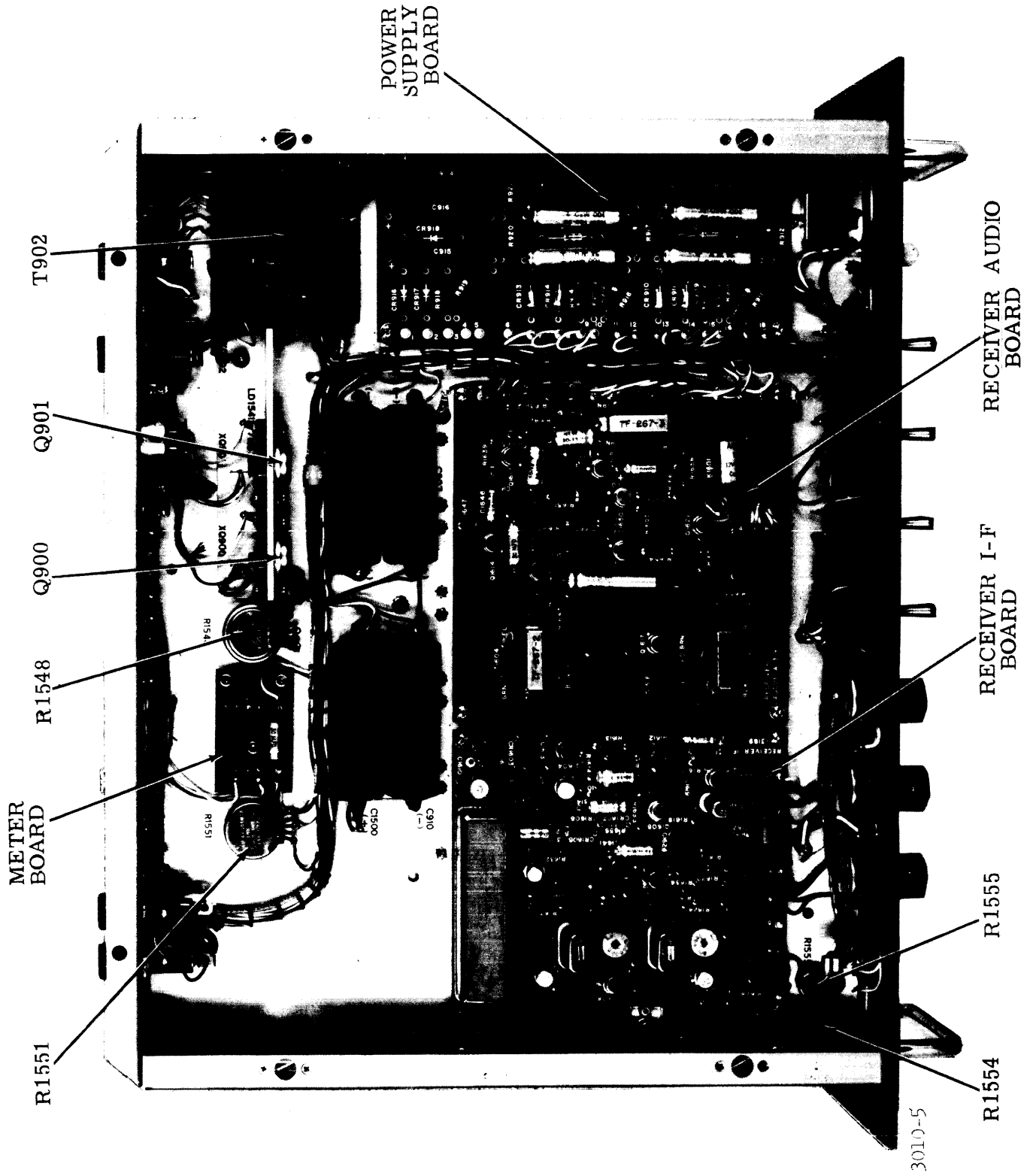


Figure 5-1. Bottom View, SMR

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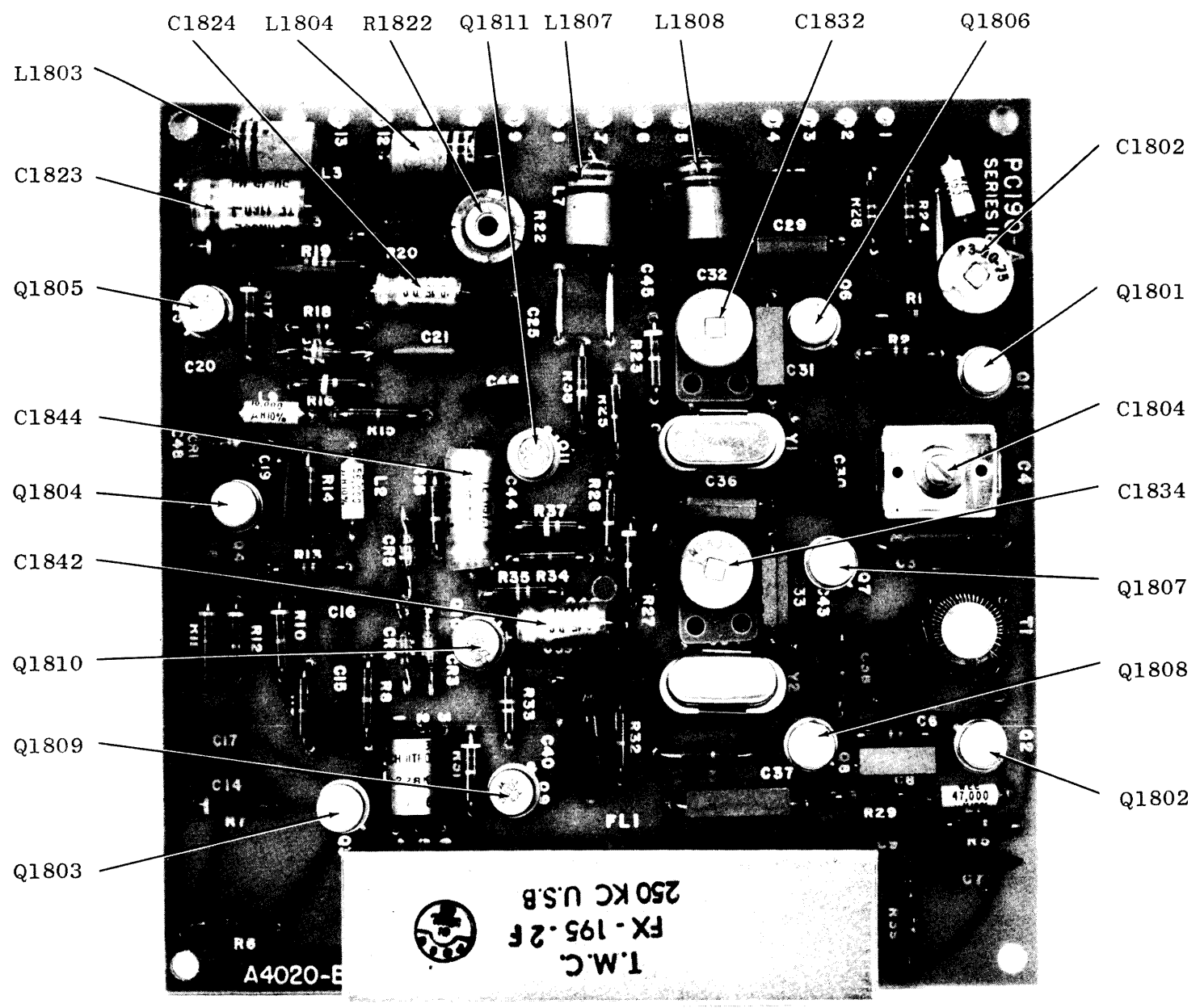


Figure 5-2. Receiver I-f Board, Top View



612.16-3

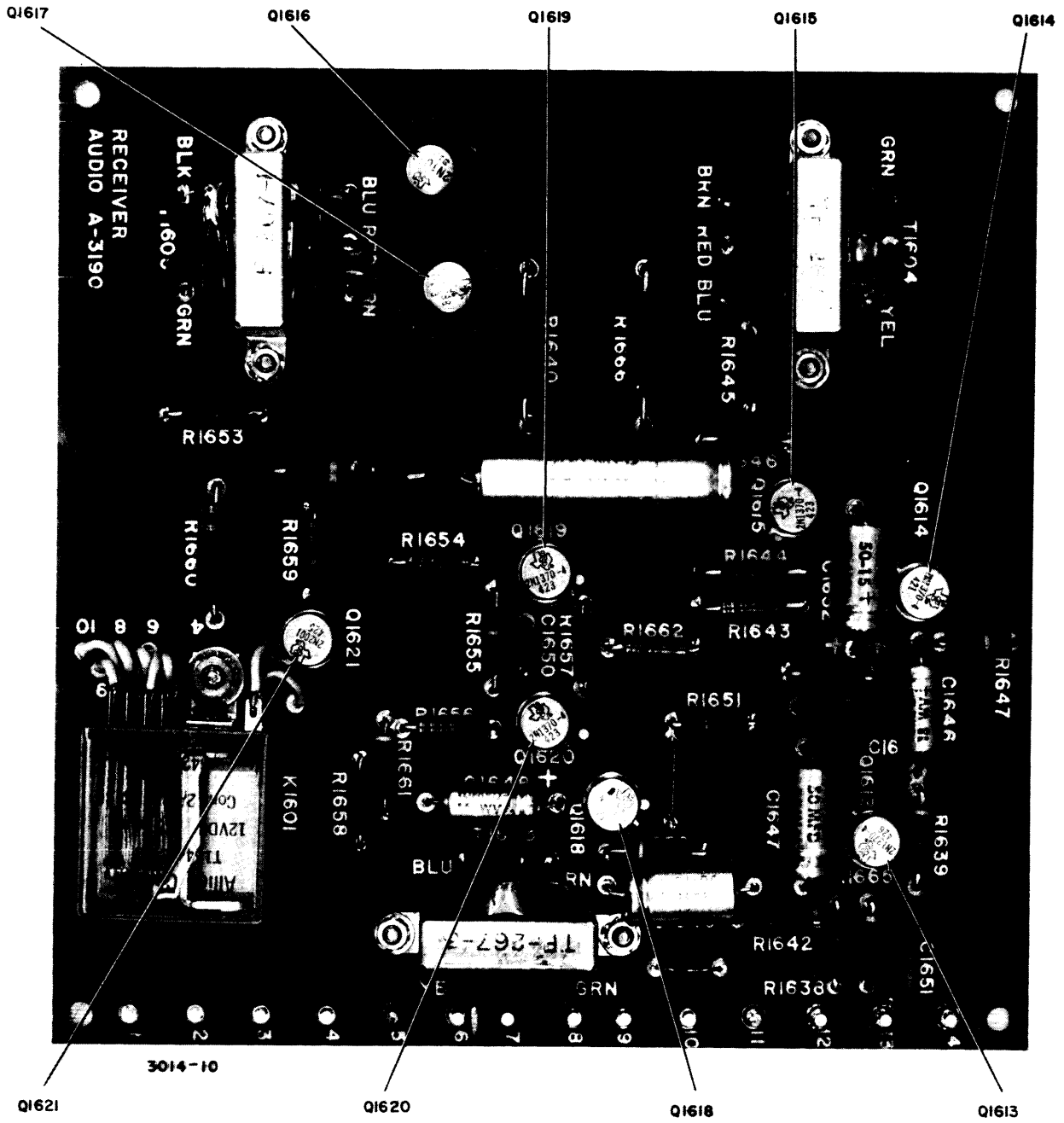


Figure 5-3. Receiver Audio Board, Top View

## SECTION 6

### PARTS LIST

#### 6-1. INTRODUCTION.

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Generic name.
- b. Reference designation.
- c. TMC part number.
- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment name-plate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation  
Attention: Sales Department  
700 Fenimore Road  
Mamaroneck, New York

<u>ASSEMBLY OR SUBASSEMBLY</u>	<u>Page</u>
Meter Printed Circuit Board .....	6-2
Power Supply, Main Chassis .....	6-3
Main Chassis, SMR-2 .....	6-7
Receiver Audio Frequency .....	6-11
Receiver Intermediate Frequency .....	6-15

## PARTS LIST

## METER PRINTED CIRCUIT BOARD

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C300 thru C306	NOT USED	
C307	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polar- ized; insulated tubular case.	CE105-50-15
CR300	NOT USED	
CR301	NOT USED	
CR302	SEMICONDUCTOR DEVICE, DIODE: germanium; max. peak inverse voltage 60 V; continuous aver- age forward current 50 ma; max. peak for- ward current 150 ma; max. surge current 500 ma; max. inverse current 500 ua at 50 volts or 30 ua at 10 volts.	1N34A
CR303	Same as CR302.	
R300 thru R311	NOT USED	
R312	RESISTOR, FIXED, COMPOSITION: 2,200 ohms +5%; 1/2 watt.	RC20GF222J
R313	Same as R312.	

## PARTS LIST (CONT)

## POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C900 thru C906	NOT USED	
C907	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 uf; 25 WVDC; max. temperature range 0°C to +85°C; polarized; hermetically sealed aluminum case with clear vinyl plastic sleeve.	CE116-5VN
C908	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, -10% +150% at 120 cps at 25°C; 25 WVDC; polarized; insulated tubular case.	CE105-100-25
C909	Same as C908.	
C910	Same as C907.	
C911	Same as C907.	
C912	Same as C908.	
C913	Same as C908.	
C914 thru C918	NOT USED	
C919	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf, +80% -20%; 500 WVDC.	CC100-24
C920	Same as C919.	
CR900 thru CR909	NOT USED	
CR910	SEMICONDUCTOR DEVICE, DIODE: silicon; 600 V max. peak inverse voltage; 0.75 max. DC forward amperes at 150°C.	1N547
CR911	Same as CR910.	
CR912	SEMICONDUCTOR DEVICE, DIODE: silicon; 12 V; max. power dissipation 1 watt at 25°C; current rating 21 ma; max. impedance 90 ohms; hermetically sealed metal case.	1N3022B
CR913	Same as CR910.	
CR914	Same as CR910.	

PARTS LIST (CONT)

POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR915	Same as CR912.	
F900 thru F906	NOT USED	
F907	FUSE, CARTRIDGE: 1/8 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (For 115 V operation)	FU102-.125
F907	FUSE, CARTRIDGE: 1/16 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (For 230 V operation)	FU102-.062
*F908	FUSE, CARTRIDGE: _____ amp; quick acting; 1-1/4" long x 1/4" dia.	FU100-( )
F909	FUSE, CARTRIDGE: 1/4 amp; quick acting; 1-1/4" long x 1/4" dia.	FU100-.250
F910	Same as F909.	
J900 thru J903	NOT USED	
J904	CONNECTOR, RECEPTACLE, ELECTRICAL: male; AC power; 2 contacts, 250 V at 10 amps or 125 V at 15 amps; polarized; twist lock.	JJ175
J905	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 male prong, flat contacts, straight type.	JJ119-1
L900	NOT USED	
L901	NOT USED	
L902	COIL, RADIO FREQUENCY: fixed; 3 PI; 1 mh inductance; 23 ohms, +10% resistance; current rating 75-100 ma max.	CL101-2
L903	Same as L902.	
Q900	TRANSISTOR: germanium; base 50 V; emitter 40 V; power dissipation 90 watts at 25°C; normal operating temperature range -65°C to +100°C; load resistance 2.2 ohms, collector current 3 amps, base current 0.013 amp; male plug-in type.	2N350A
Q901	Same as Q900.	

\* Value for fuse F908 will be dependent upon the type of OC-100 oven specified by customer.

## PARTS LIST (CONT)

## POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R900 thru R908	NOT USED	
R909	RESISTOR, FIXED, WIREWOUND: 10 ohms, <u>+5%</u> ; 3 watts.	RW123-100J
R910	Same as R909.	
R911	RESISTOR, FIXED, COMPOSITION: 100 ohms, <u>+5%</u> ; 1 watt.	RC32GF101J
R912	Same as R911.	
R913	NOT USED	
R914	Same as R909.	
R915	Same as R909.	
R916	Same as R911.	
R917	Same as R911.	
S900	NOT USED	
S901	SWITCH, TOGGLE: DPST; rated at 6 amps, 250 VAC; 28° angle of throw, solder lug terminals.	ST22K
S902	SWITCH, TOGGLE: DPDT; rated at 6 amps, 250 VAC; 28° angle of throw, solder lug terminals.	ST22N
T900	NOT USED	
T901	NOT USED	
T902	TRANSFORMER, POWER, STEP-DOWN: primary input (#1) 104/115 or 208/230 VAC; secondary (#1, #2) 24 volts at 300 ma, (#3) 80 volts at 100 ma, CT; 15 solder lug type terminals; open frame case.	TF298
XF900 thru XF906	NOT USED	

## PARTS LIST (CONT)

## POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF907	FUSEHOLDER: extractor post type; accommodates cartridge fuse 1-1/4" long x 1/4" dia; rated for 15 amps, 250 volts max.; o/a length 1-3/4"; bushing mounted.	FH103
XF908 thru XF910	Same as XF907.	
XQ900	SOCKET, SEMICONDUCTOR DEVICE: 2 pin contact accommodation, 0.040 or 0.050 dia.; polarized; 1 terminal lug grounding strap; o/a dimensions 1-37/64" x 1" max.	TS166-S1
XQ901	Same as XQ900.	

## PARTS LIST (CONT)

MAIN CHASSIS, SMR-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1500	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 uf; 25 WVDC; max. temperature range 0°C to +85°C; polarized; hermetically sealed alumium case with clear vinyl plastic sleeve.	CE116-5VN
CR1500	SEMICONDUCTOR DEVICE, DIODE: germanium; min. peak inverse voltage for zero dynamic impedance 70 V; continuous reverse working voltage 60 V; average forward current 60 ma; recurrent peak forward current 150 ma; forward surge current (1 sec.) 500 ma.	1N294
DS1500	NOT USED	
DS1501	LAMP, INCANDESCENT: single contact, rated for 28.0 VAC/VDC, 0.04 amp; T-3-1/4 bulb.	BI110-7
J1500	NOT USED	
J1501	NOT USED	
J1502	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	JJ172
J1503 thru J1515	NOT USED	
J1516	JACK: phone.	JJ315-1
J1517	CONNECTOR, RECEPTACLE, ELECTRICAL: printed circuit board type; 20 female contacts, 5 amps continuous current rating; 600 V RMS.	JJ287-20
J1518 thru J1524	Same as J1517.	
K1500	NOT USED	
K1501	RELAY, ARMATURE: miniature; coil- 200 ohms DC resistance, nom. voltage 12.6 VDC, min. operating amps 0.034, dissipation 1 watt at 125°C or 1.5 watts at 25°C; DPDT type contacts rated for 3 amps, 26.5 VDC, resistance 0.030 ohm max. per contact; solder hook type terminals; hermetically sealed; back filled with dry nitrogen.	RL143-3



## PARTS LIST (CONT)

## MAIN CHASSIS, SMR-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K1502	RELAY, ARMATURE: 4PDT; 185 ohms, +10% DC resistance; operating voltage 12 VDC; current rating 60 ma; 700 mu at 25°C; 14 contacts rated for 2 amps at 20 VDC resistance; clear high impact styrene dust cover case.	RL156-2
M1500	NOT USED	
M1501	METER: AF/RF; 50 ua movement; approx. resistance 2,000 ohms; standard rectangular steel case.	MR182
R1500 thru R1514	NOT USED	
R1515	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, +10%; 2 watts; taper A.	RV4NAYSA-103AYY
R1516	NOT USED	
R1517	NOT USED	
R1518	Same as R1515.	
R1519	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, +5%; 1/2 watt.	RC20GF102J
R1520 thru R1533	NOT USED	
R1534	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, +5%; 1/2 watt.	RC20GF472J
R1535 thru R1544	NOT USED	
R1545	RESISTOR, FIXED, COMPOSITION: 3.3 ohms, +5%; 1 watt.	RC32GF3R3J
R1546	NOT USED	
R1547	RESISTOR, VARIABLE, COMPOSITION: 5,000 ohms, +10%; 2 watts; taper A.	RV4NAYSA-502AYY
R1548	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, +10%; 2 watts; taper A.	RV4LAYSA-503A

## PARTS LIST (CONT)

MAIN CHASSIS, SMR-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1549	Same as R1519.	
R1550	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, +5%; 1/2 watt.	RC20GF104J
R1551	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, +10%; 2 watts; taper A.	RV4LAYSAL-103A
R1552	NOT USED	
R1553	NOT USED	
R1554	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, +10%; continuous power rating 0.5 watt at 70°C; 350 V RMS; linear taper.	RV106UX8B-503A
R1555	Same as R1554.	
R1556	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, +5%; 1 watt.	RC32GF333J
S1500 thru S1512	NOT USED	
S1513	SWITCH, TOGGLE: DPDT; rated at 6 amps, 250 VAC; 28° angle of throw, solder lug type terminals.	ST22N
S1514	SWITCH, TOGGLE: SPST; rated at 6 amps, 125 VAC; 28° angle of throw, solder lug type terminals.	ST12A
S1515	SWITCH, ROTARY: 5 section, 8 position, 30° angle of throw; 360° rotation, no stops; 5 non-shorting and 5 silver plated brass type contacts; rated for 28 VDC, 115 VAC max., 1 amp DC, 1.5 amps AC.	SW368
S1516	Same as S1513.	
TB1500	NOT USED	
TB1501	NOT USED	
TB1502	TERMINAL BOARD, BARRIER: 16 terminals; 6-32 thd. x 1/4" long binder head screws; phenolic black bakelite.	TM100-16

## PARTS LIST (CONT)

## MAIN CHASSIS, SMR-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XDS1500	NOT USED	
XDS1501	LIGHT, INDICATOR: with white translucent lens; sub-miniature type.	TS153-5
XK1500	NOT USED	
XK1501	NOT USED	
XK1502	SOCKET, RELAY: with retainer; 12 contacts; solder type terminals; black pherolic socket.	TS171-3

## PARTS LIST (CONT)

## RECEIVER AUDIO FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1600 thru C1638	NOT USED	
C1639	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C1640 thru C1645	NOT USED	
C1646	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-10-15
C1647	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-50-15
C1648	Same as C1646.	
C1649	Same as C1647.	
C1650	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, GMV; 500 WVDC.	CC100-29
C1651	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, +80% -20%; 100 WVDC.	CC100-28
C1652	Same as C1647.	
C1653 thru C1659	NOT USED	
C1660	CAPACITOR, FIXED, ELECTROLYTIC: 200 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-200-15
EQ1600 thru EQ1615	NOT USED	
EQ1616	HEAT SINK: transistor heat dissipating element.	HD101
EQ1617	Same as EQ1616.	
K1600	NOT USED	

## PARTS LIST (CONT)

## RECEIVER AUDIO FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K1601	RELAY, ARMATURE: 4PDT; 185 ohms, +10% DC resistance; operating voltage 12 VDC; current rating 60 ma; 700 mu at 25°C; 14 contacts rated for 2 amps at 20 VDC resistance; clear high impact styrene dust cover case.	RL156-2
Q1600 thru Q1612	NOT USED	
Q1613	TRANSISTOR: germanium; PNP; JEDEC type 2N1370-4 transistor with a controlled hfe limit of 60-75; JEDEC type T09 case.	TX107/ 2N1370-4
Q1614	Same as Q1613.	
Q1615	Same as Q1613.	
Q1616	TRANSISTOR: germanium; PNP; collector to base and collector to emitter voltage 60 V; emitter to base voltage 20 V; collector current 3 amps, base current 1 amp; junction-storage temperature range -55°C to +100°C; power dissipation 20 watts at 25°C.	2N1039
Q1617	Same as Q1616.	
Q1618	TRANSISTOR: germanium; PNP; JEDEC type 2N1370-7 transistor with a controlled hfe limit of 120-150; JEDEC type T05 case.	TX108/ 2N1370-7
Q1619	Same as Q1613.	
Q1620	Same as Q1613.	
Q1621	TRANSISTOR: germanium; PNP; max. collector dissipation 300 mw; Fab. equals 6 Mc; collector current 1 ma, collector cut-off current 100 ua; hfe limit 80.	2N2001
R1600 thru R1637	NOT USED	
R1638	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, +5%; 1/2 watt.	RC20GF103J
R1639	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, +5%; 1/2 watt.	RC20GF472J

## PARTS LIST (CONT)

## RECEIVER AUDIO FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1640	RESISTOR, FIXED, COMPOSITION: 22 ohms, <u>+5%</u> ; 2 watts.	RC42GF220J
R1641	RESISTOR, FIXED, COMPOSITION: 3,300 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF332J
R1642	Same as R1638.	
R1643	Same as R1641.	
R1644	Same as R1641.	
R1645	RESISTOR, FIXED, COMPOSITION: 680 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF681J
R1646	RESISTOR, FIXED, COMPOSITION: 10 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF100J
R1647	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF104J
R1648 thru R1650	NOT USED	
R1651	Same as R1638.	
R1652	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF392J
R1653	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF222J
R1654	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF102J
R1655	Same as R1647.	
R1656	Same as R1641.	
R1657	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF223J
R1658	Same as R1653.	
R1659	RESISTOR, FIXED, COMPOSITION: 33 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF330J
R1660	RESISTOR, FIXED, COMPOSITION: 3.3 ohms, <u>+5%</u> ; 1 watt.	RC32GF3R3J

## PARTS LIST (CONT)

## RECEIVER AUDIO FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1661	RESISTOR, FIXED, COMPOSITION: 470 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF471J
R1662	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF182J
R1663	NOT USED	
R1664	NOT USED	
R1665	Same as R1639.	
R1666	Same as R1640.	
R1667	RESISTOR, FIXED, COMPOSITION: 27 ohms, <u>+5%</u> ; 1/2 watt.	RC20GF270J
T1600 thru T1602	NOT USED	
T1603	TRANSFORMER, AUDIO FREQUENCY: fixed; primary impedance 4,000 ohms, CT; DC resistance 370 ohms, <u>+20%</u> ; secondary impedance 600 ohms, CT; DC resistance 60 ohms, <u>+20%</u> ; operating frequency range 200-15,000 cps; frequency response <u>+3</u> db at 250 to 3,500 cps.	TF267-3
T1604	TRANSFORMER, AUDIO FREQUENCY: fixed; primary impedance 3,000 ohms, CT; DC resistance 260 ohms, <u>+20%</u> ; secondary impedance 1,000 ohms, CT; DC resistance 105 ohms, <u>+20%</u> ; operating frequency range 200-15,000 cps; frequency response <u>+3</u> db at 250 to 3,500 cps.	TF267-2
T1605	TRANSFORMER, AUDIO FREQUENCY: fixed; primary impedance 500 ohms, CT; DC resistance 26 ohms, <u>+20%</u> ; secondary impedance 3.2 ohms; DC resistance 0.3 ohm, <u>+20%</u> ; operating frequency range 150-45,000 cps, frequency response <u>+0.2</u> db at 1,000 cps, ref; 150-45,000 cps.	TF267-5

## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1800	NOT USED	
C1801	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100, 000 uuf, +80% -20%; 100 WVDC.	CC100-28
C1802	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 10-75 uuf; operating temperature range -55°C to +85°C; 350 WVDC.	CV109-8
C1803	CAPACITOR, FIXED, MICA DIELECTRIC: 1,800 uuf, +2%; 500 WVDC.	CM100-13
C1804	CAPACITOR, VARIABLE, MICA DIELECTRIC: 280 uuf max. when tight, 25 uuf max. at 3 turns; 175 WVDC.	CV114-1
C1805	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 200, 000 uuf, +80% -20%; 25 WVDC.	CC100-33
C1806	CAPACITOR, FIXED, MICA DIELECTRIC: 10 uuf, +5%; 500 WVDC; char. C.	CM15C100J
C1807	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 25,000 uuf, +80% -20%; 500 WVDC.	CC100-25
C1808	CAPACITOR, FIXED, MICA DIELECTRIC: 510 uuf, +5%; 500 WVDC; char. B.	CM15B511J
C1809	Same as C1801.	
C1810 thru C1813	NOT USED	
C1814	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 470, 000 uuf, +20%; peak working voltage 100 VDC; radial lead type.	CC112R474M
C1815	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, +10%; 500 WVDC.	CC100-9
C1816 thru C1818	Same as C1814.	
C1819	Same as C1815.	
C1820	Same as C1815.	
C1821	Same as C1814.	



## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1822	Same as C1814.	
C1823	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-50-15
C1824	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-10-15
C1825	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C1826 thru C1828	Same as C1801.	
C1829	CAPACITOR, FIXED, MICA DIELECTRIC: 270 uuf, +5%; 500 WVDC; char. F.	CM15F271J
C1830	Same as C1805.	
C1831	CAPACITOR, FIXED, MICA DIELECTRIC: 24 uuf, +5%; 500 WVDC; char. C.	CM15C240J
C1832	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 8-50 uuf; operating temperature range -55°C to +85°C; 350 WVDC.	CV109-6
C1833	Same as C1831.	
C1834	Same as C1832.	
C1835	Same as C1801.	
C1836	Same as C1829.	
C1837	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, +5%; 500 WVDC; char. F.	CM20F102J
C1838	Same as C1805.	
C1839	Same as C1801.	
C1840	Same as C1825.	
C1841	Same as C1805.	

## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1842	CAPACITOR, FIXED, ELECTROLYTIC: 6 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-6-15
C1843	Same as C1805.	
C1844	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-25-15
C1845	Same as C1801.	
C1846	Same as C1825.	
C1847	Same as C1801.	
C1848	Same as C1815.	
CR1800	NOT USED	
CR1801	SEMICONDUCTOR DEVICE, DIODE: germanium; min. peak inverse voltage for zero dynamic impedance 70 V; continuous reverse working voltage 60 V; average forward current 60 ma; recurrent peak forward current 150 ma; forward surge current (1 sec.) 500 ma.	1N294
CR1802	Same as CR1801.	
CR1803	SEMICONDUCTOR DEVICE, DIODE: silicon; forward current 5 ma at 1 volt; reverse current 625 ua at 100 volts, 25°C.	1N68
CR1804	Same as CR1803.	
CR1805	Same as CR1803.	
FL1800	NOT USED	
FL1801	FILTER, BANDPASS: operating frequency 250 Kc; bandwidth 249.325 - 253-325 Kc; input and output impedance 10K ohms nom.; hermetically sealed brass case.	FX195-2
L1800	NOT USED	
L1801	COIL, RADIO FREQUENCY: fixed; 47,000 uh, +5%; 452 ohms DC resistance; current rating 27 ma; molded case.	CL275-473

## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L1802	COIL, RADIO FREQUENCY: fixed; 56,000 uh, +5%; 499 ohms DC resistance; current rating 26 ma; molded case.	CL275-563
L1803	COIL, RADIO FREQUENCY: fixed; 220 uh, $\pm 10\%$ ; current rating 200 ma; molded case.	CL140-6
L1804	Same as L1803.	
L1805	NOT USED	
L1806	COIL, RADIO FREQUENCY: fixed; 1,000 uh, +5%; 16.0 ohms DC resistance; current rating 140 ma; molded case.	CL275-102
L1807	Same as L1803.	
L1808	Same as L1803.	
L1809	COIL, RADIO FREQUENCY: fixed; 10,000 uh, +5%; 76.6 ohms DC resistance; current rating 66 ma; molded case.	CL275-103
L1810	COIL, RADIO FREQUENCY: fixed; 150 uh, +5%; 3.3 ohms DC resistance; current rating 315 ma; molded case.	CL275-151
Q1800	NOT USED	
Q1801	TRANSISTOR: germanium; PNP; JEDEC type 2N2084 transistor with a controlled hfe limit of 100-150; JEDEC type T033 case.	TX109/2N2084
Q1802 thru Q1804	Same as Q1801.	
Q1805	TRANSISTOR: germanium; PNP; JEDEC type 2N1370-7 transistor with a controlled hfe limit of 120-150; JEDEC type T05 case.	TX108/ 2N1370-7
Q1806 thru Q1808	Same as Q1801.	
Q1809	TRANSISTOR: germanium; PNP; collector to base voltage 45 V; collector to emitter voltage 30 V; emitter to base voltage 15 V; collector current (continuous) 5 ma DC; collector dissipation 200 mw; junction-storage temperature range $-65^{\circ}\text{C}$ to $+100^{\circ}\text{C}$ .	2N1190

## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q1810	TRANSISTOR: germanium; NPN; JEDEC type 2N1308 transistor with a controlled hfe limit of 80-150; JEDEC type T05 case.	TX106/2N1308
Q1811	TRANSISTOR: NPN; silicon mesa; collector to base voltage 60 V; collector to emitter voltage 40 V; emitter to base voltage 5 V; collector current 175 ma; power dissipation 2 watts at 25°C; junction temperature 175°C; hermetically sealed metal case.	2N697
R1800	NOT USED	
R1801	RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF221J
R1802	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF103J
R1803	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF102J
R1804	Same as R1802.	
R1805	Same as R1803.	
R1806	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF123J
R1807	RESISTOR, FIXED, COMPOSITION: 470 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF471J
R1808	RESISTOR, FIXED, COMPOSITION: 5,600 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF562J
R1809	RESISTOR, FIXED, COMPOSITION: 560 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF561J
R1810	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF470J
R1811	Same as R1807.	
R1812	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF472J
R1813	Same as R1802.	

## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1814	RESISTOR, FIXED, COMPOSITION: 330 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF331J
R1815	RESISTOR, FIXED, COMPOSITION: 8,200 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF822J
R1816	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF104J
R1817	Same as R1812.	
R1818	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF153J
R1819	RESISTOR, FIXED, COMPOSITION: 39,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF393J
R1820	Same as R1808.	
R1821	Same as R1812.	
R1822	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, $\pm 10\%$ ; nom. power rating 0.25 watt at 70°C; Linear taper.	RV111U503A
R1823	Same as R1812.	
R1824	Same as R1802.	
R1825	Same as R1803.	
R1826	Same as R1803.	
R1827	Same as R1812.	
R1828	Same as R1802.	
R1829	Same as R1809.	
R1830	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF682J
R1831	Same as R1807.	
R1832	Same as R1803.	
R1833	Same as R1802.	
R1834	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF272J

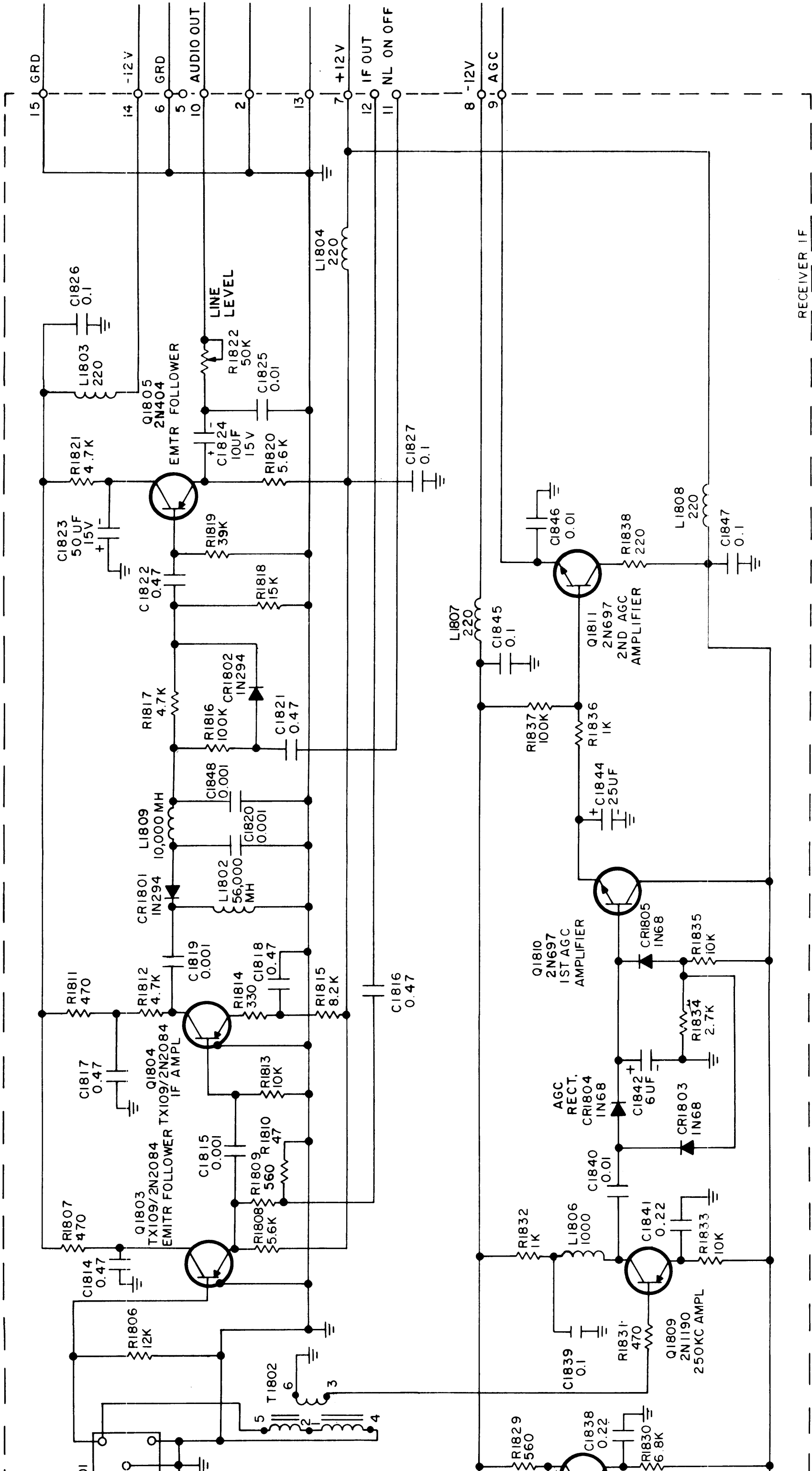
## PARTS LIST (CONT)

## RECEIVER INTERMEDIATE FREQUENCY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1835	Same as R1802.	
R1836	Same as R1803.	
R1837	Same as R1816.	
R1838	Same as R1801.	
R1839	Same as R1806.	
T1800	NOT USED	
T1801	TRANSFORMER, INTERMEDIATE FREQUENCY: fixed; operating frequency 1.75 Mc; nom. primary inductance 4.5 uhy, $\pm 0.200$ uhy; 4 wire lead type terminals.	TZ126
T1802	TRANSFORMER, PULSE: 3 windings; winding (#1) 4.7 mh; turns ratio 5:5:1.	TF228K15
XY1800	NOT USED	
XY1801	SOCKET, CRYSTAL: 2 silver plated beryllium copper contacts, for crystals having a 0.050 pin dia. and 0.486 spacing.	TS104-2
XY1802	Same as XY1801.	
Y1800	NOT USED	
Y1801	CRYSTAL UNIT, QUARTZ: 1.4999 Mc, $\pm 0.005\%$ ; operating temperature range $-55^{\circ}\text{C}$ to $+30^{\circ}\text{C}$ ; max. capacitance 7.0 uuf; parallel resonance; load capacitance 32.0 uuf, $\pm 0.5$ uuf; HC-6/U type holder.	CR18A/U 1.4 999 MC
Y1802	CRYSTAL UNIT, QUARTZ: 1.9999 Mc, $\pm 0.005\%$ ; operating temperature range $-55^{\circ}\text{C}$ to $+30^{\circ}\text{C}$ ; max. capacitance 7.0 uuf; parallel resonance; load capacitance 32.0 uuf, $\pm 0.5$ uuf; HC-6/U type holder.	CR18A/U 1.9 999 MC

SECTION 7

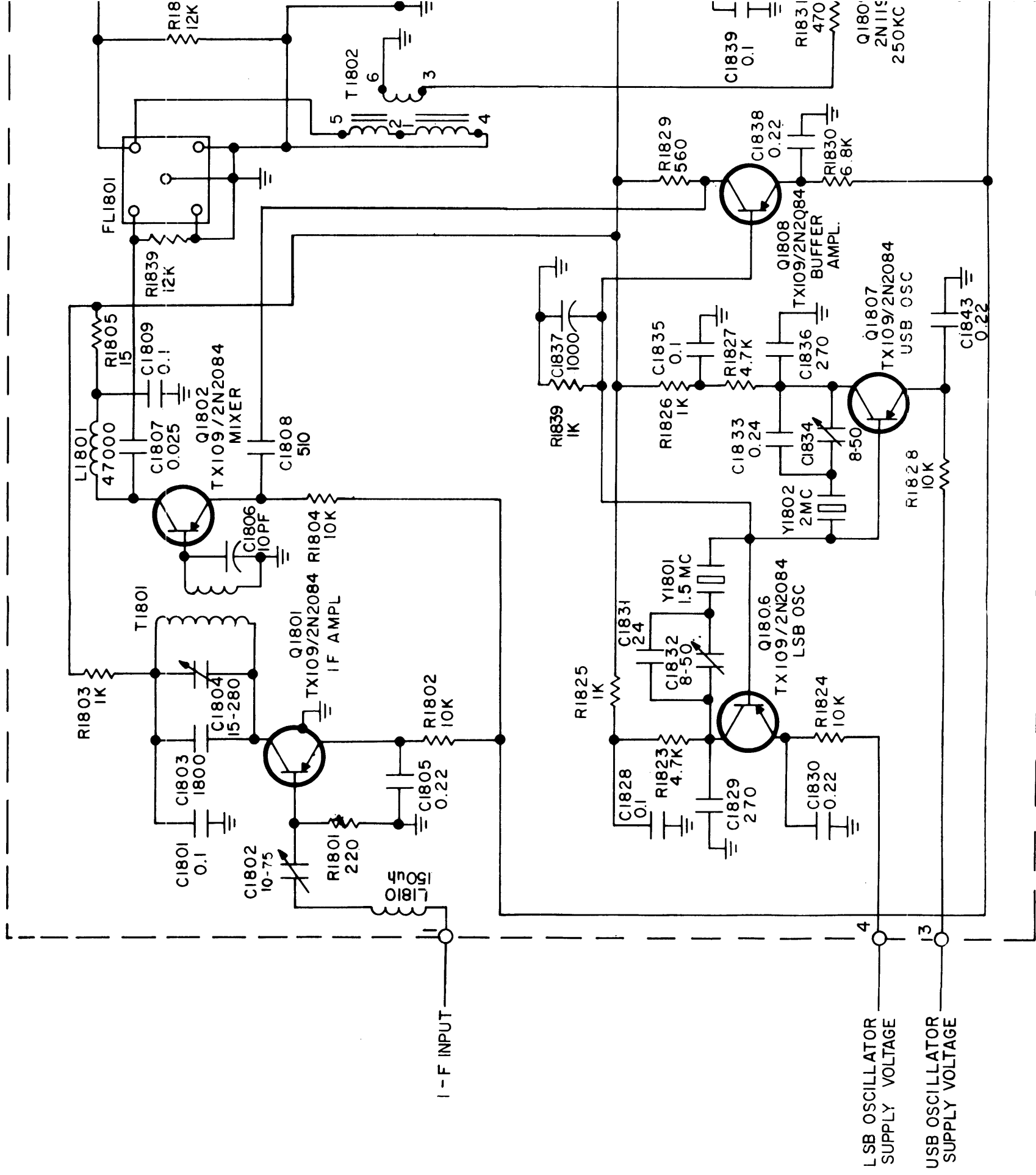
SCHEMATIC DIAGRAMS



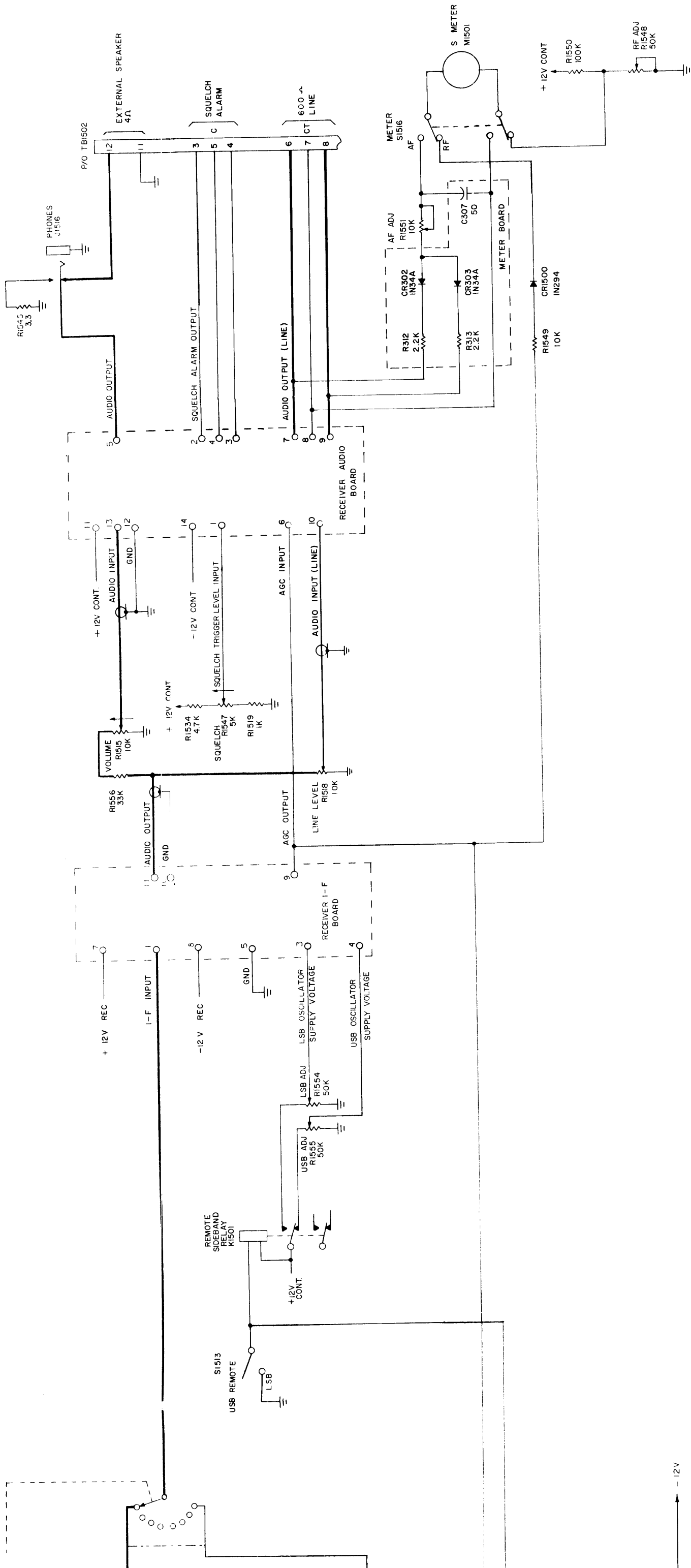
RECEIVER IF

Figure 7-1. Schematic Diagram, SMR-2 (Sheet 1 of 3)





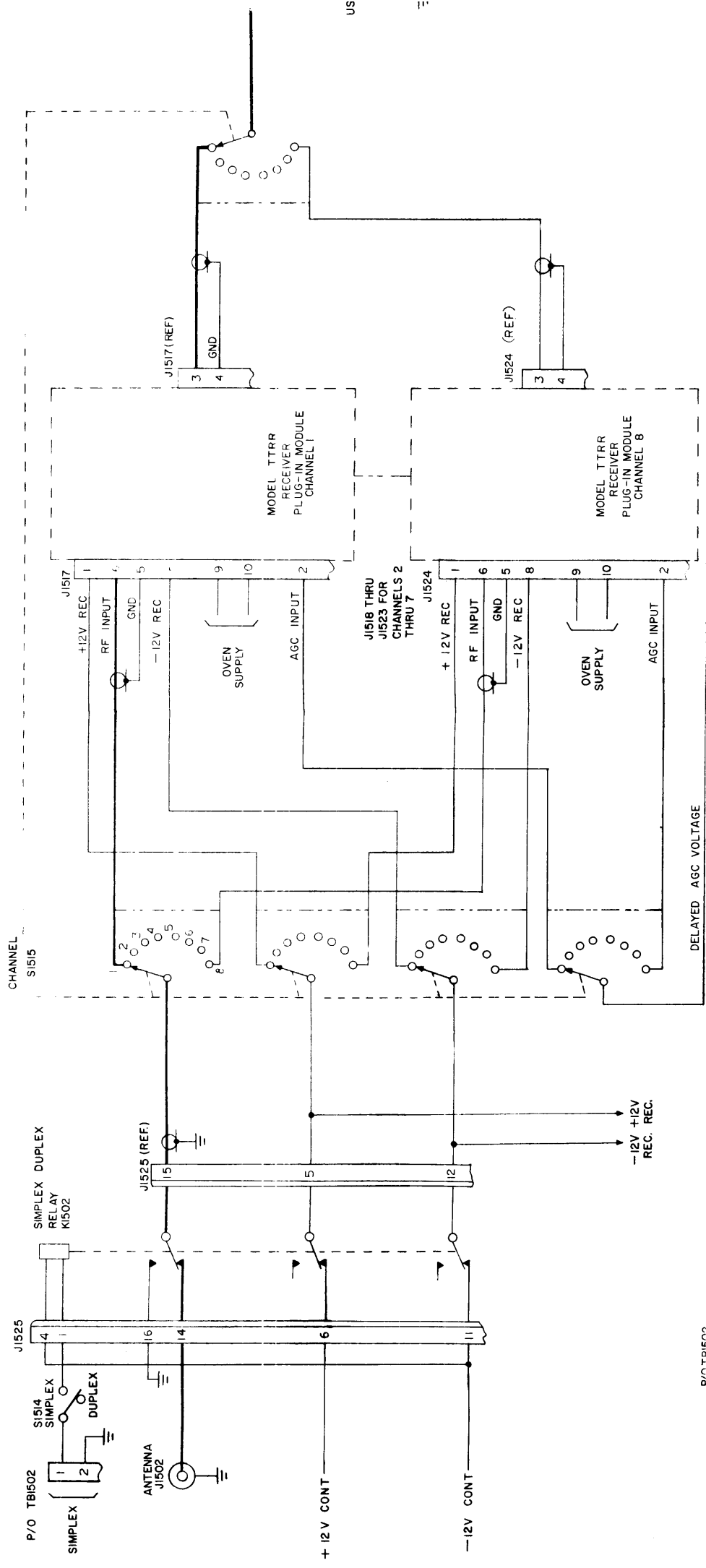
3010J-3 (CK-933A)



NOTES

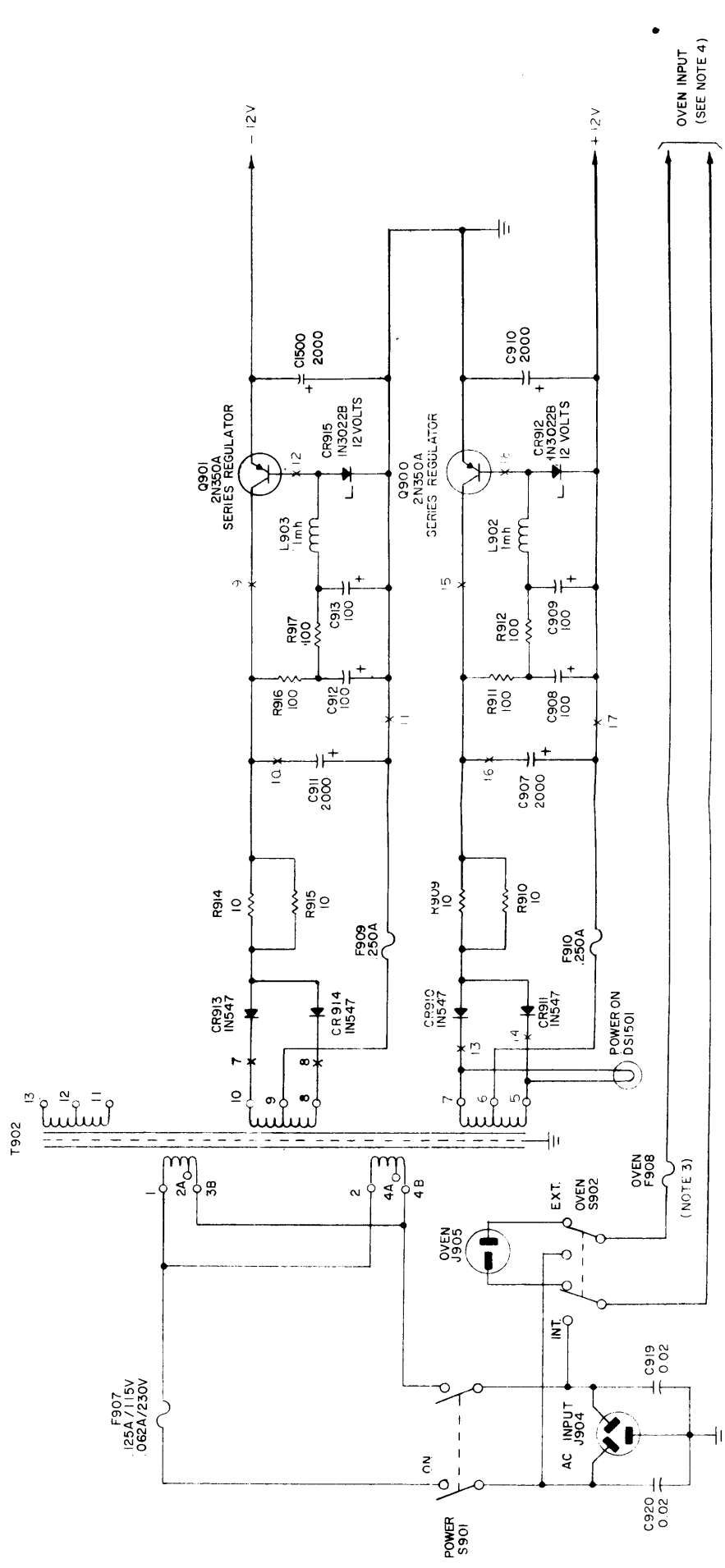
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. X DENOTES TERMINAL ON POWER SUPPLY BOARD.
3. THE VALUE OF F30F DEPENDS UPON THE TYPE OF CRYSTAL OVENS USED.
4. THE OVEN SUPPLY SHOWN IS FOR 115VAC OVENS.

Figure 7-1. Schematic Diagram, SMR-2 (Sheet 2 of 3)

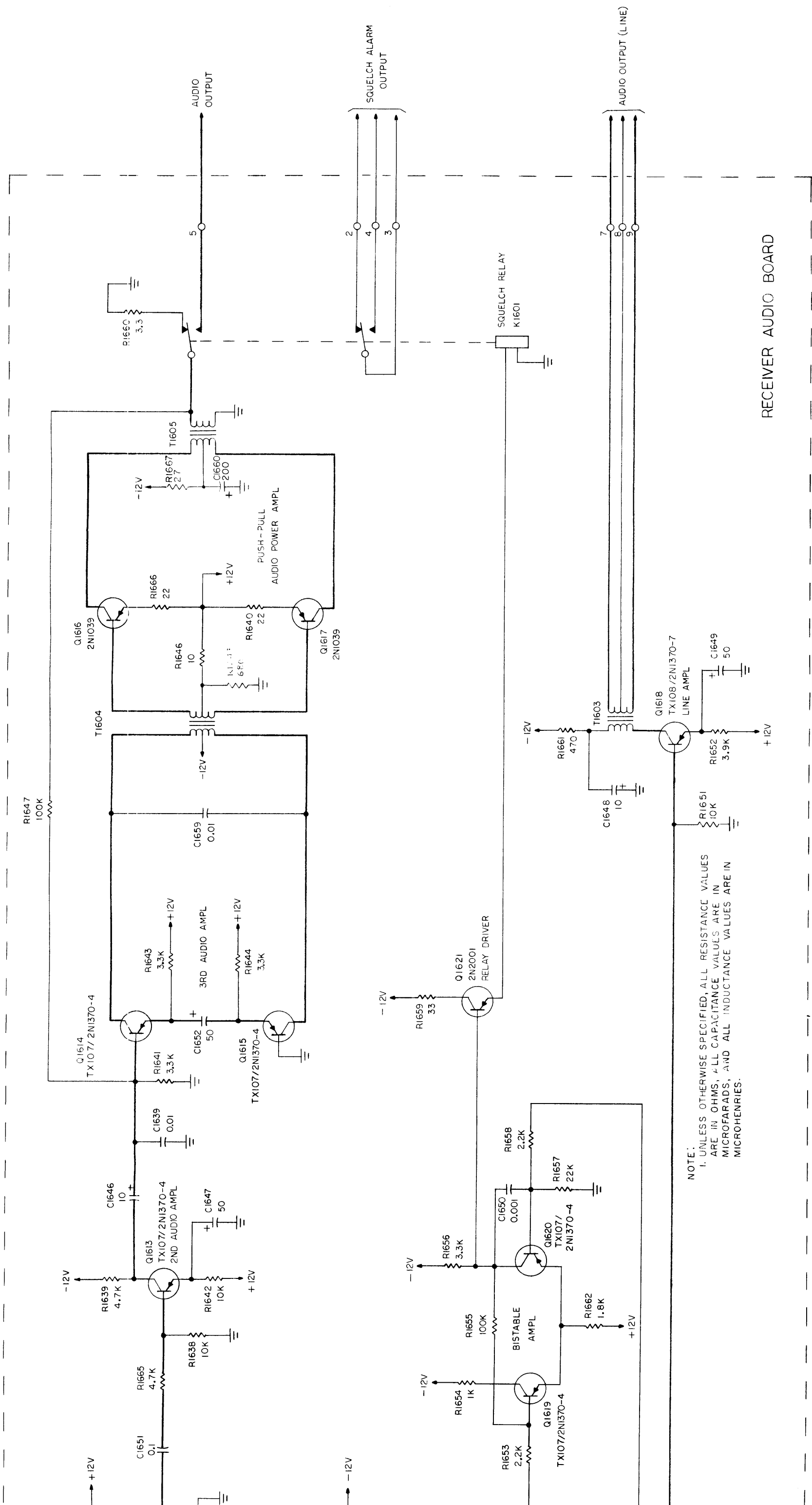


P/O TB1502

REMOTE SIDEBAND

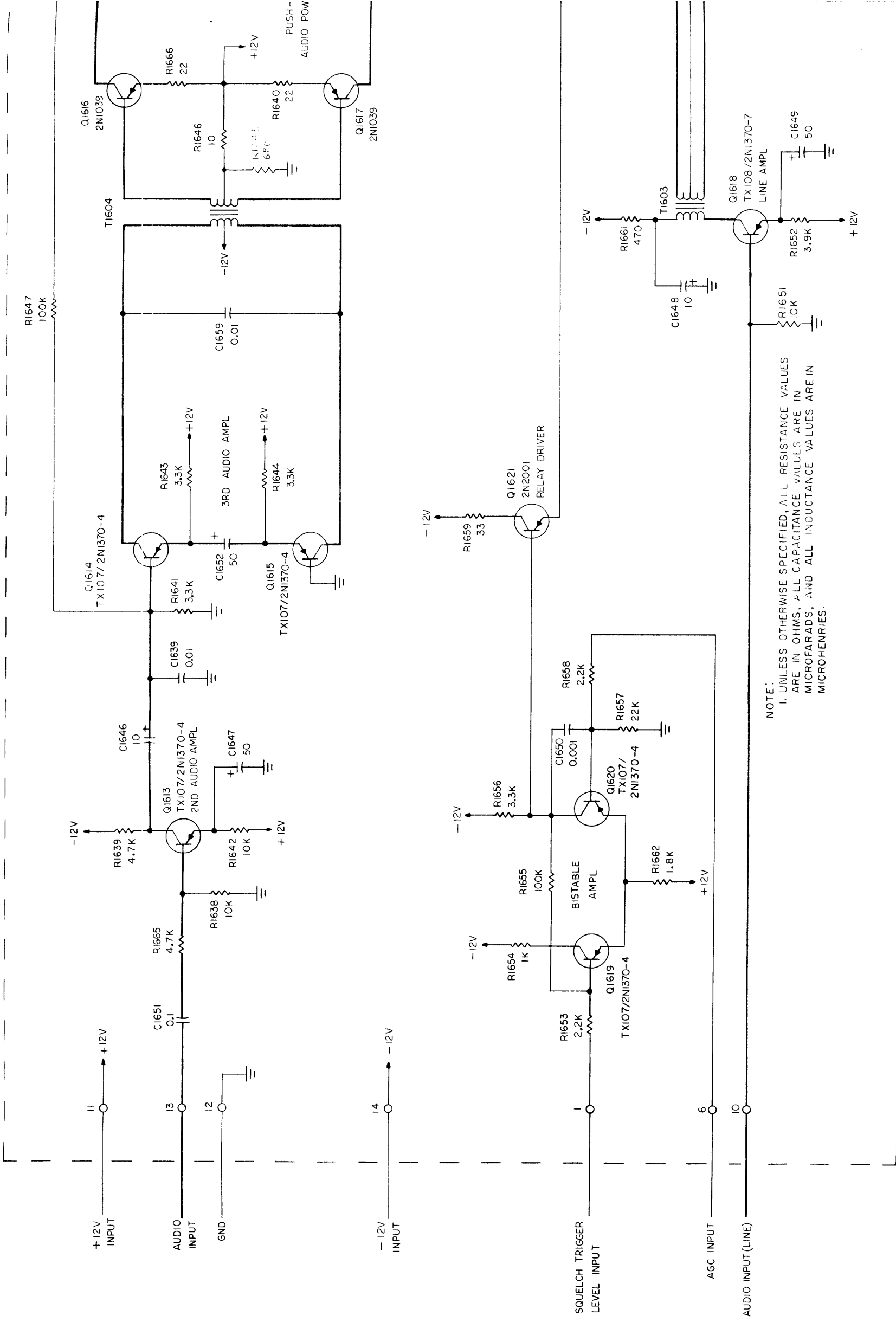


30100-4 (CK-953A)



NOTE:  
 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

Figure 7-1. Schematic Diagram, SMR-2  
 (Sheet 3 of 3)  
 7-7/7-8



NOTE:  
 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.