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TECHNICAL MANUAL

for

COMMUNICATIONS RECEIVER

MODEL VLRC-1

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

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MAMARONECK, N.Y. **OTTAWA, CANADA**

IN 3017 ISSUE DATE: JAN. 1969

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

1. Quantity Required.
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.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

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SECTION 1

GENERAL INFORMATION

1-1. PURPOSE AND DESCRIPTION.

Communications Receiver Model VLRC-1 (figure 1-1) continuously covers the frequency range of 10 to 40 kc for the reception of AM, AME, CW, MCW, FAX and FSK signals (and ISB and SSB reception when used with Sideband Converter LFCA-1; FAX and FSK reception also require appropriate external equipment). Due to the low operating frequencies, receiver sideband intelligence is limited to system rf bandpass. The frequency coverage is divided into three tuning ranges of 10 to 16, 16 to 25, and 25 to 40 kc selectable from the front panel. The VLRC, hereinafter referred to as the Receiver, is a double-conversion superheterodyne type with a first i-f of 6.4 kc and a second i-f frequency of 100 kc. Bandpass of the 6.4 kc i-f is 8 kc; the second i-f has a selectable bandpass of 0.1 or 0.5 kc. The rf bandpass is a minimum of 0.5 kc on all bands.

An i-f type noise silencer circuit controllable from the front panel mutes the receiver during periods of impulse noise. An AGC circuit maintains the output signal constant within ±3 db for a 100 db change in input signal from 0.3 microvolts. The AGC has a fast attack time and an adjustable decay time (from the front panel) from 3.3 to 16.5 seconds. The AGC-controlled stages can be manually controlled either from the front panel or from external remote equipment. The Receiver contains two audio channels. One channel provides an audio output of 0 DBM across a 600-ohm balanced

center-tapped line. This channel output can be monitored by a front panel meter. The other audio channel provides 1/2 watt (average power) across a 4-ohm impedance for connection to a loudspeaker. A jack mounted on the front panel provides the means to monitor this audio channel output. The internal power supply requires 115/230 volts, 50/60 cps, single-phase power and provides dc output voltages of plus and minus 12 volts. In the event of ac power failure, the receiver automatically switches over to battery power (when connected to an external 24-volt battery supply).

The Receiver can be synthesizer-controlled over the complete tuning range in increments of 10 Hz (with external synthesizer equipment such as the TMC Model LFSB-1 and Frequency Standard TMC Model CSS-2). When operated without a synthesizer, the Reciver is continuously stable to 0.01% of the operating frequency after warm-up.

The Receiver is operated together with a sideband converter (such as TMC Model LFCA-1) for the reception of ISB, or SSB signals; connection facilities are provided for automatic frequency control of the local oscillator.

The unit is completely transistorized and utilizes modular construction consisting of a main chassis that houses the following modules:

(1) Three RF Band Modules (A4604-1, -2, -3)

(2) One Local Oscillator Module (A4605)

(3) One 6.5 MC Oscillator Module (A3655)

(4) One 6.4 MC I-F, AGC, and Noise Silencer Module (A3661)

(5) One 100 KC I-F Module (A4603)

(6) One BFO, Product Detector, and 600 Ohm Audio Amplifier Module (A3638).

(7) One Power Supply and Audio Amplifier (Monitor) Module (A3634).

1-2. TECHNICAL SPECIFICATIONS.

Table 1-1 lists technical specifications of the VLRC.

TABLE 1-1. TECHNICAL SPECIFICATIONS

RF Frequency Range	10 to 40 kc continuously in tuning ranges of 10 to 16, 16 to 25, and 25 to 40 kc.
Local Oscillator Frequency Range	110 to 140 kc.
Modes of Reception	AM, AME, CW, MCW, FAX and FSK (ISB, and SSB with external Sideband Converter)
Frequency Stability	0.01% of the operating frequency after warmup. When synthesizer controlled, stability is equal to that of the external Synthesizer.
Input Impedance	50 ohms nominal.
Sensitivity	With a bandwidth of 0.5 kc, a 0.3 uv signal at the antenna terminals produces a 15 db signal plus noise-to-noise ratio at the output of the audio amplifier.
Tuning	Continuously tuned with magnetic cores to give stable smooth tuning.
Bandpass:	
RF	A minimum of 0.5 kc on all bands.

TABLE 1-1. TECHNICAL SPECIFICATIONS (CONT)

Bandpass (cont):	
First I-F	8 kc at a center frequency of 6.4 mc.
Second I-F	0.1 and 0.5 kc at 3 db points, selectable from the front panel; the center frequency is 100 kc.
I-F Noise Silencer	A highly effective I-F type noise silencer removes impulse noise.
Image Ratio (In accordance with CCIR specifications)	At least 80 db down when referenced to a 0.3 uv input signal.
AGC Characteristics	With a 100 db increase from the 0.3 uv input signal, the output remains constant within ±3 db.
Audio Distortion	On standard two tone test, audio distortion is a minimum of 40 db down.
Signal Output:	
100 kcs I-F	1.5 millivolts across 50 ohms, available at a BNC connector.
Audio	0 DBM across a 600-ohm balanced center-tapped line; 1/2 watt (average power) across 4 ohms. Head set monitoring provided at front panel.
To External Synthesizer	6.5 mc at a level of approximately 5.0 millivolts across 50 ohms available at a BNC connector. A spectrum signal of 6.36 to 6.39 mc at a level of approximately 15 millivolts across 50 ohms available at a BNC connector.
Hum Level	Power supply hum at least 50 db below full audio output.
Environmental conditions	Operates in any ambient temperature of 0°C to 50°C and any value of humidity up to 90%.

TABLE 1-1. TECHNICAL SPECIFICATIONS (CONT)

Dimensions	7" high x 19" wide x 16" deep.
Weight	Approximately 15 lbs.
Power Supply	115/230V, 50/60 cps, single phase primary power, approximately 15 watts.
Battery Power (Optional)	Operates from external 24-volt battery supply. The battery supply is kept in a charged condition by a "trickle" charger built in to Receiver.

1-3. TRANSISTOR AND DIODE COMPLEMENT.

Table 1-2 lists the transistor and diode complement of the VLRC receiver.

TABLE 1-2. TRANSISTOR AND DIODE COMPLEMENT

REFERENCE SYMBOL	TYPE	FUNCTION
RF BAND MODULES A4604-1, -2, -3		
Reference Prefix:		
Band 1 - 700		
Band 2 - 800		
Band 3 - 1000		
Q1, Q2, Q3	2N396A	RF Amplifier
Q4	2N396A	Emitter Follower
Q5, Q6, Q7	2N863	Variable Impedance
CR1, CR2	1N627	AGC Limiter

TABLE 1-2. TRANSISTOR AND DIODE COMPLEMENT (CONT)

REFERENCE SYMBOL	TYPE	FUNCTION
	LOCAL OSCILLATOR A4605	
Q901	2N706	Band 1 Oscillator (110-116 kc)
Q902	2N706	Band 2 Oscillator (116-125 kc)
Q903	2N706	Band 3 Oscillator (125-140 kc)
Q904	2N706	Buffer Amplifier
CR901	1N961B	+10 Volt Reference Zener
CR902, CR903, CR904	V100	Varicaps
	6.5 MC OSCILLATOR MODULE A3655	
Q501	2N706	6.5 MC Oscillator
Q502	2N706	Buffer Amplifier
Q503	2N384	Current Source
Q504, Q505	2N384	Balanced Mixer
Q506, Q507	2N384	Amplifier
Q508	2N384	Emitter Follower
	6.4 MC IF, AGC, AND NOISE SILENCER MODULE A3661	
Q601, Q602	2N384	Balanced Mixer
Q603, Q604	2N384	Balanced Amplifier
Q605	2N384	Current Source
Q606	2N706	Gate
Q607	2N863	Variable Impedance
Q608	2N706	Noise Silencer Amplifier

TABLE 1-2. TRANSISTOR AND DIODE COMPLEMENT (CONT)

REFERENCE SYMBOL	TYPE	FUNCTION
6.5 MC IF, AGC, AND NOISE SILENCER MODULE A3661 (CONT)		
Q609	2N384	Noise Silencer Amplifier
Q610	2N706	P/o Noise Detector
Q611	2N706	Emitter Follower
Q612, Q613, Q617	2N706	Schmitt Circuit
Q614	2N706	Amplifier
Q615, Q616	2N863	DC Amplifier
CR601	1N34A	Protective Diode
CR602, CR603, CR607, CR608	1N34A	Noise Detector
CR604	1N34A	AGC Rectifier
CR605	1N34A	Protective Diode
CR606, CR609	1N957B	Zener Diode
CR610	1N961	+10 Volt Reference Zener
100 KC I-F MODULE A4603		
Q401	2N706	Mixer
Q403, Q407	2N706	100 KC Amplifier
Q408, Q409	2N706	Gate
Q10	2N706	Buffer Amplifier
Q11, Q12	2N706	"Q" Multiplier
Q13	2N706	"Q" Spoiler
Q16, Q17	2N706	100 KC Amplifier

TABLE 1-2. TRANSISTOR AND DIODE COMPLEMENT (CONT)

REFERENCE SYMBOL	TYPE	FUNCTION
BFO, PRODUCT DETECTOR, AND AUDIO AMPLIFIER MODULE A3638		
Q301, Q302	2N706	Amplifier
Q303	2N396A	Mixer
Q304, Q305	2N396A	Amplifier
Q306	2N706	BFO
Q307	2N396A	Amplifier
Q308, Q309	2N396A	Balanced Amplifier
CR301	1N34A	AM Detector
CR302	1N961	10 volt Reference Zener
CR304, CR305	1N34A	Full-wave Rectifier
POWER SUPPLY AND AUDIO AMPLIFIER MODULE A3634		
Q201	2N396A	Amplifier
Q202	2N396A	Audio Amplifier
Q203, Q204	2N1370	Push-Pull Audio Amplifier
CR201, CR202, CR203, CR204	1N2484	Bridge Rectifiers
CR205	1N2484	Isolator
CR206	1N961B	-10 Volt Reference Zener
MAIN CHASSIS		
Q101	2N2143	Series Regulator
CR101	VR101-24-S51	-12 Volt Reference Zener
CR102	1N2976B	+12 Volt Reference Zener

TABLE 1-2. TRANSISTOR AND DIODE COMPLEMENT (CONT)

REFERENCE SYMBOL	TYPE	FUNCTION
	MAIN CHASSIS (CONT)	
CR103	1N2978RB	-12 Volt Reference Zener
CR104	1N248A 1N2484	Protective Diode (Short circuits battery charging resistor when battery is used to power the Receiver.)

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION.

The Receiver is calibrated and tested at the factory prior to shipment. When it arrives at the operating site, inspect the packing case and contents for possible damage. Inspect all packing material for parts which 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.

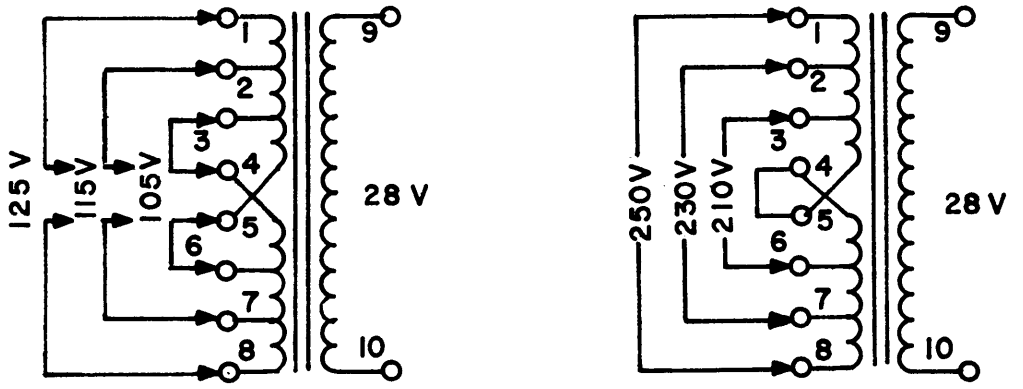
The equipment is shipped with all modules and other components installed. Check that all such components are properly positioned.

2-2. POWER REQUIREMENTS.

The Receiver is designed for operation with 105, 115, 125/210, 230, 250 volt, 50/60 cps single phase power. Unless specifically ordered, the unit is shipped wired for 115 volts operation. Figure 2-1 shows the power transformer primary winding connections for operation at each of the designated power sources. When operated at 210, 230, or 250 volts, AC fuse F101 located on the rear panel of the unit must be changed from 1/8 ampere to 1/16 ampere rating.

2-3. INSTALLATION.

a. MECHANICAL. - The Receiver has a standard 19-inch wide front panel, and is 7 inches high and approximately 16 inches deep. The unit is



115V, 50/60 CPS

230V, 50/60 CPS

Figure 2-1. Power Transformer Wiring

designed for both cabinet and rack installation. In either type of installation, adequate ventilation, sufficient clearance at the rear (for access to rear-panel connections) and sufficient space (for removal from the cabinet for servicing) are prime considerations in determining the ultimate location of the Receiver.

When intended for rack installation, the Receiver chassis is equipped with slide mechanisms. To install the unit in a rack, proceed as follows:

(1) Set chassis slide mechanism in tracks.

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

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

(4) Make necessary cable and electrical connections as described in paragraph b below.

b. ELECTRICAL. - All external connections except headphones are made to the jacks located on the rear panel (see figure 2-2). The headphones are connected to a jack on the front panel. Table 2-1 lists rear panel controls and jacks and the function of each. Proceed as follows:

(1) Check that POWER switch S108 is set to its off (down) position. Then connect 115 volt a-c power to the MAIN AC jack J111 pins A and C. Connect the a-c power ground to pin B.

(2) Connect the 50-ohm antenna to ANTENNA IN jack J1 mounted on the low pass filter.

(3) Connect the loudspeaker to E101 terminals 1 and 2 (SPEAKER 4 OHM).

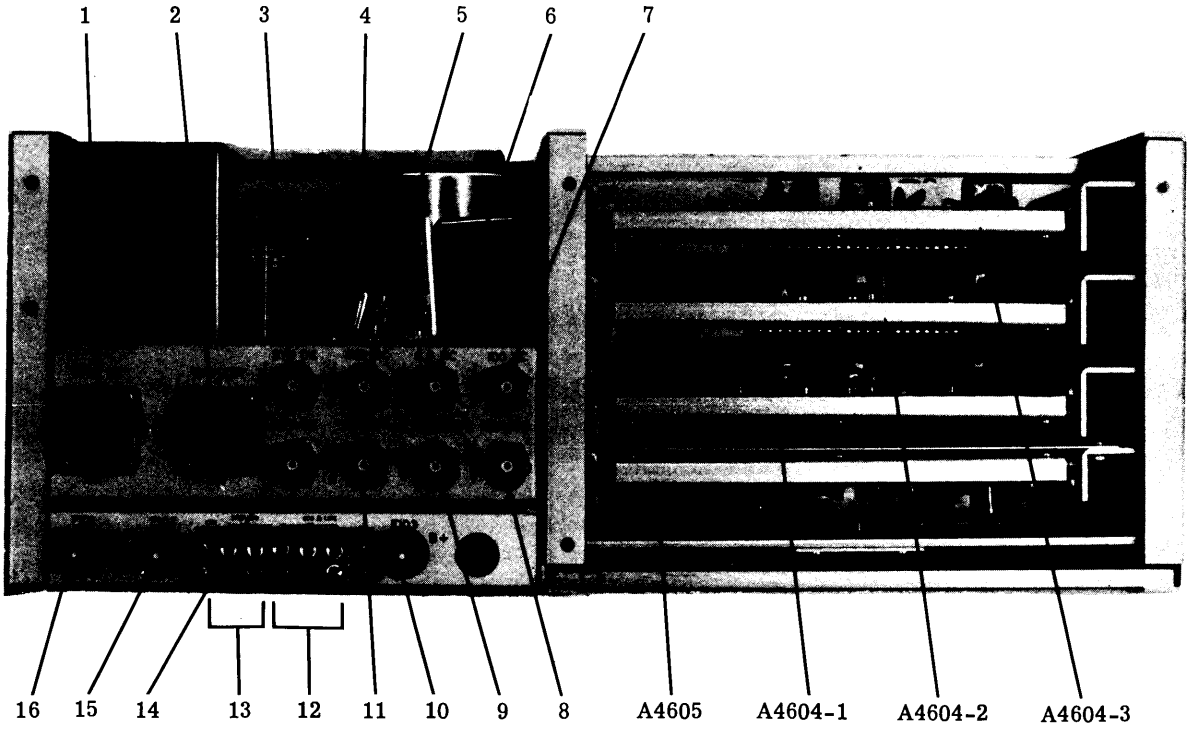


Figure 2-2. VLRC Receiver, Rear View

(4) Connect E101 terminals 3, 4, and 5 (600 OHM LINE) to the input circuits of an external signal frequency converter for FSK reception.

(5) Connect 110 KC jack J116 to the input circuits of an external sideband converter for ISB and SSB reception.

(6) Connect 6.5 MC jack J115 and jack J118 to the associated circuits of an external synthesizer for synthesizer-controlled operation. Connect the synthesizer d-c correction voltage output to the SYN DC jack J113.

(7) Connect SSB DC jack J114 to the d-c control voltage output of the external sideband converter for AFC operation.

(8) Connect REMOTE jack J117 to the AGC control voltage source from the external equipment for remote AGC control of the Receiver.

(9) For automatic power switching, ensure that BAT switch S109, mounted on the power supply just above the rear panel of the Receiver is set to IN, then connect the external 24-volt battery supply to the BATTERY jack J112 pins A and D (pin A is the positive terminal connection).

TABLE 2-1. REAR PANEL CONTROLS AND JACKS

FIGURE 2-2 INDEX NO.	PANEL AND COMPONENT DESIGNATION	FUNCTION
1	MAIN AC jack J111	Input receptacle for 115/230 volt ac power.
2	BATTERY jack J112	Input receptacle for external 24 volt battery.
	ANTENNA IN jack J112 (mounted on low pass filter network FL101 above rear panel, figure 5-1).	Input jack for 50 ohm antenna.

TABLE 2-1. REAR PANEL CONTROLS AND JACKS (CONT)

FIGURE 2-2 INDEX NO.	PANEL AND COMPONENT DESIGNATION	FUNCTION
3	SYN DC jack J113	Input jack for d-c correction voltage from external synthesizer.
4	BAT switch S109	A 2-position switch. At IN position connects external 24-volt battery to receiver power supply switching circuitry. At OUT position disconnects 24-volt battery from switching circuits.
5	SSB DC jack J114	Input jack for d-c correction voltage from external sideband converter.
	ANTENNA OUT jack J2 (mounted on low pass filter network FL101 above rear panel, figure 5-1).	Permits connection of low pass filter to rf module input circuits.
6	6.5 MC jack J115	Permits connection of 6.5 mc signal at a level of approximately 5.0 millivolts across 50 ohms to, external synthesizer.
7	100 KC jack J116	Permits connection of 100 kc i-f signal at a level of approximately 1.5 millivolts across 50 ohms to external sideband converter.
	Riser Card (mounted on module compartment cover at right of rear panels, figure 5-1).	Permits module components to be extended for test and adjustment.
8	REMOTE jack J117	Permits connection of external AGC voltage (plus 3 to 10 volts) from remote equipment.

TABLE 2-1. REAR PANEL CONTROLS AND JACKS (CONT)

FIGURE 2-2 INDEX NO.	PANEL AND COMPONENT DESIGNATION	FUNCTION
9	Jack J119	Permits connection of 6.36 to 6.39 mc spectrum signal at a level of approximately 15 millivolts across 50 ohms to external synthesizer.
10	B+ fuse F103	Protects +12 volt power supply components from overloads.
11	RF OUT jack J119	Not used.
12	E101, 600 OHM LINE	Terminals, 3, 4, and 5 permit connection of external equipment to Receiver line amplifier. Terminal 4 is the center tap.
13	E101, SPEAKER 4 OHM	Terminals 1 and 2 permit connections of external 4-ohm loudspeaker to Receiver audio amplifier. Terminal 2 is ground.
14	SYN RF jack J120	Permits monitoring the d-c correction voltage applied from the external synthesizer. Parallel-connected with jack J113.
15	B- fuse F102	Protects -12 volt power supply components from overloads.
16	AC fuse F101	Protects power supply components from internal short circuits.

2-4. INITIAL ADJUSTMENTS.

No initial adjustments are required prior to operation.

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL.

The operator should first familiarize himself with the front panel controls and indicators shown in figure 3-1 and listed in table 3-1.

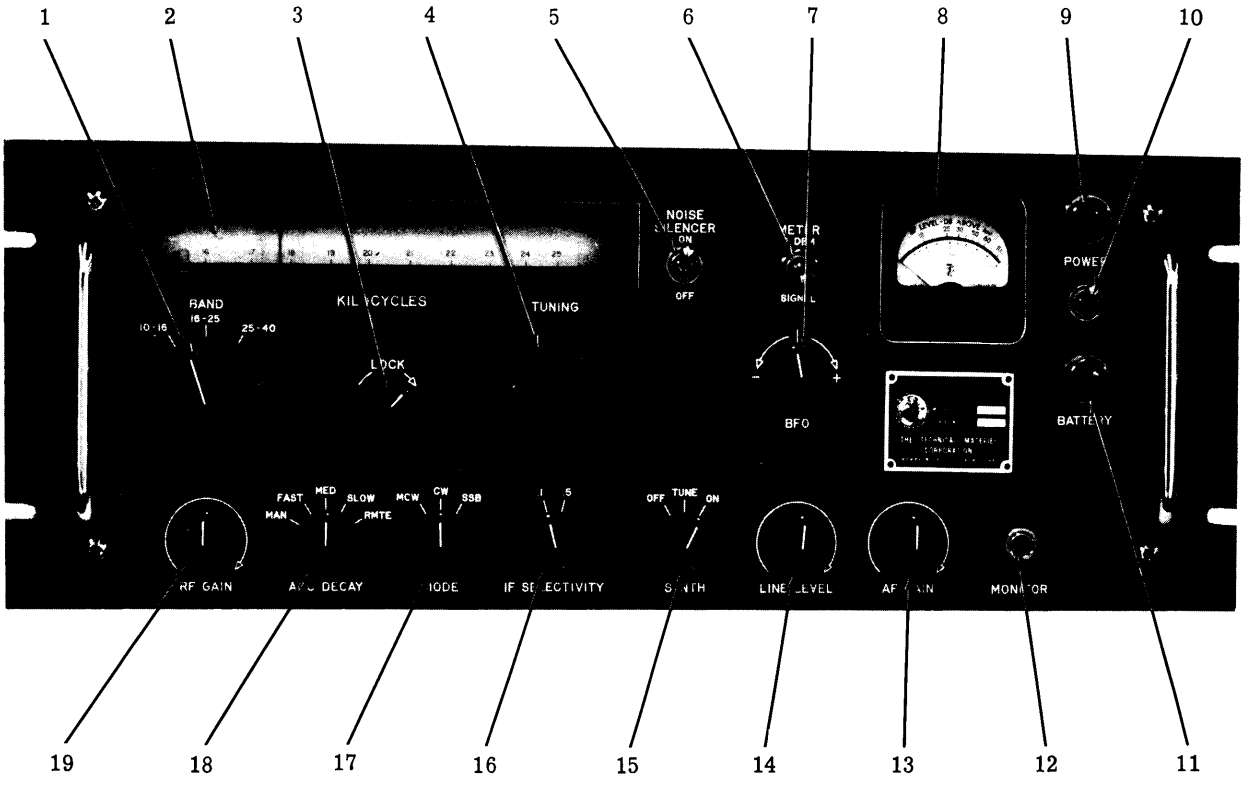


Figure 3-1. VLRC-1 Receiver Front Panel Operating Controls

TABLE 3-1. CONTROLS, JACKS, AND INDICATORS

FIGURE 3-1 INDEX NO.	PANEL DESIGNATION	FUNCTION
1	BAND switch S105	Selects desired rf band. The rf band tuning ranges are as follows: BAND 1 10-16 kc BAND 2 16-25 kc BAND 3 25-40 kc
2	KILOCYCLES dial	Displays rf band selected by BAND switch S105.
3	TUNING control	Tunes receiver to desired frequency. Moves KILOCYCLE dial pointer to indicate selected frequency.
4	LOCK	Locks TUNING control at selected position.
5	NOISE SILENCER switch S107.	In ON position activates noise silencer circuits; in OFF position disables noise silencer circuits.
6	METER switch S106	In 0 DBM position connects line amplifier audio output signal to front panel meter M101. In SIGNAL position connects AGC circuit to front panel meter.
7	BFO control R350	Adjusts BFO signal output frequency ±3 kc from center frequency of 100 kc.
8	Meter M101	Operates together with METER switch S106. In 0 DBM position measures level of line amplifier audio-signal in DBM across a 600 ohm line. In SIGNAL position displays AGC voltage as a function of incoming rf signal strength.

TABLE 3-1. CONTROLS, JACKS, AND INDICATORS (CONT)

FIGURE 3-1 INDEX NO.	PANEL DESIGNATION	FUNCTION
9	POWER lamp DS101	Indicates when AC power is applied to receiver internal power supply
10	POWER switch S108	Connects AC power to receiver internal power supply.
11	BATTERY lamp DS102	Indicates when the external 24-volt battery is used to power Receiver.
12	MONITOR jack J21	Permits headset monitoring of audio signal applied to loud-speaker.
13	AF GAIN control R230	Controls amplitude of audio signal applied to SPEAKER terminals of E101.
14	LINE LEVEL control R229	Controls amplitude of audio signal applied across 600 OHM terminals of E101.
15	SYNTH switch S101	A 3 position switch. In ON position connects dc input from external synthesizer to Receiver local oscillator d-c control line. In TUNE position connects ground line and permits zero beat of Receiver to external synthesizer. In OFF position connects d-c control line to MODE switch for SSB reception.
16	IF SELECTIVITY switch S102	A 2 position switch. Selects bandwidth of 100 kc second i-f stages. Bandwidths that may be selected are 0. 1 and 0. 5 kc.

TABLE 3-1. CONTROLS, JACKS, AND INDICATORS (CONT)

FIGURE 3-1 INDEX NO.	PANEL DESIGNATION	FUNCTION
17	MODE switch S103	A 3-position switch. In MCW position connects diode detector audio output to audio amplifier channels. In CW position connects product detector audio output signal to audio amplifier channels. In SSB position disconnects audio signals from audio amplifier channels and connects dc control line from rear panel SSB DC connector J114 to Receiver SYNTH switch S101.
18	AGC DECAY switch S104	A 5-position rotary switch. In MAN position disconnects AGC circuit and permits RF GAIN Control R537 to control the gain of AGC controlled stages. In FAST, MED, and SLOW positions, permits AGC circuit to control the gain of the rf and i-f stages. Also, permits selection of time constants that change the decay time of the AGC voltage as follows: FAST 3.3 seconds MED 9.9 seconds SLOW 16.5 seconds In RMTE position disconnects AGC circuit and permits external equipment to control gain of AGC controlled stages through rear panel REMOTE connector J117.
19	RF GAIN control R537	Operative when AGC DECAY switch is in the MAN position. Controls the gain of the AGC controlled stages.

3-2. PRELIMINARY OPERATION.

a. PRELIMINARY CONTROL SETTINGS. - Refer to figure 3-1 and set the controls as follows:

CONTROL	POSITION
NOISE SILENCER switch 5	OFF
METER switch 6	0 DBM
POWER switch 9	Down
BAND switch 1	At range that includes desired operating frequency.
LOCK knob 3	Fully counterclockwise
TUNING control 4	For desired operating frequency as indicated on KILOCYCLES dial 2.
RF GAIN control 19	Mid-range
AGC DECAY switch 18	MAN
IF SELECTIVITY switch 16	.5
LINE LEVEL control 14	Fully counterclockwise
AF GAIN control 13	Mid-range
*BAT switch	OUT

*The BAT switch controls input power when an external 24-volt battery is utilized; otherwise it should be left at the OUT position.

b. WARM-UP PROCEDURE. - Refer to figure 3-1. Set POWER switch 9 to on (up) and allow Receiver to warm up for a minimum of 1/2 hour.

c. LINE LEVEL ADJUSTMENT. - Refer to figure 3-1.

(1) Connect a modulated rf signal to input filter F101 and tune to 13 KC.

(2) Set METER switch 6 to SIGNAL position and adjust rf signal strength to produce a deflection of approximately 30 db above 1 uv on meter M101 8.

(3) Set METER switch 6 to 0 DBM position and adjust LINE LEVEL control 14 for 0 DBM meter M101 8.

3-3. AM AND MCW RECEPTION. - Refer to figure 3-1.

a. Make sure that controls are set according to paragraph 3-2.

b. Set MODE switch 17 to MCW.

c. Set SYNTH switch 15 to OFF.

NOTE

For synthesizer-controlled reception, set synthesizer to appropriate frequency, set SYNTH switch 15 to TUNE and adjust TUNING control 4 to zero beat the audio tone. Then set SYNTH switch 15 to ON.

d. Adjust RF GAIN control 19 and AF GAIN control 13 for minimum distortion and a comfortable listening level.

e. If AGC is desired, set AGC DECAY switch 18 to FAST, MED or SLOW for decay time of 3.3 seconds, 9.9 seconds, or 16.5 seconds respectively, as desired.

f. If noise silencing is desired, set NOISE SILENCER switch 5 to ON.

3-4. SSB AND ISB RECEPTION. - Refer to figure 3-1.

When used with an appropriate adapter, SSB and ISB reception is possible and AFC may be employed to maintain correct tuning.

a. Make sure controls are set as given in paragraph 3-2.

b. Set MODE switch 17 to SSB.

c. Set SYNTH switch 15 to OFF.

d. Adjust RF GAIN 19 for minimum distortion.

e. Adjust TUNING control 1 for maximum intelligibility.

NOTE

If AFC is employed adjust TUNING control 4 to zero beat the pilot carrier.

f. If AGC is desired, set AGC DECAY switch 18 to FAST, MED, or SLOW, for decay time of 3.3 seconds, 9.9 seconds, or 16.5 seconds, respectively.

NOTE

For synthesizer-controlled reception, set synthesizer to appropriate frequency SYNTH switch 15 to TUNE and adjust TUNING control 4 to zero beat audio tone. Then, set SYNTH switch 15 to ON.

3-5. CW, FSK, AND FAX RECEPTION.

NOTE

For FSK and FAX reception, an appropriate adapter is required.

a. Make sure that controls are set according to paragraph 3-2.

b. Set MODE switch 17 to CW.

c. Set SYNTH switch 15 to OFF.

d. Adjust BFO control 7 for desired tone of received signal.

e. Perform steps d, e, and f of paragraph 3-3.

NOTE

For synthesizer-controlled reception, set synthesizer to appropriate frequency SYNTH switch 15 to TUNE and adjust TUNING control 4 to zero beat audio tone. Then, set SYNTH switch 15 to ON.

3-6. SHUTDOWN PROCEDURE.

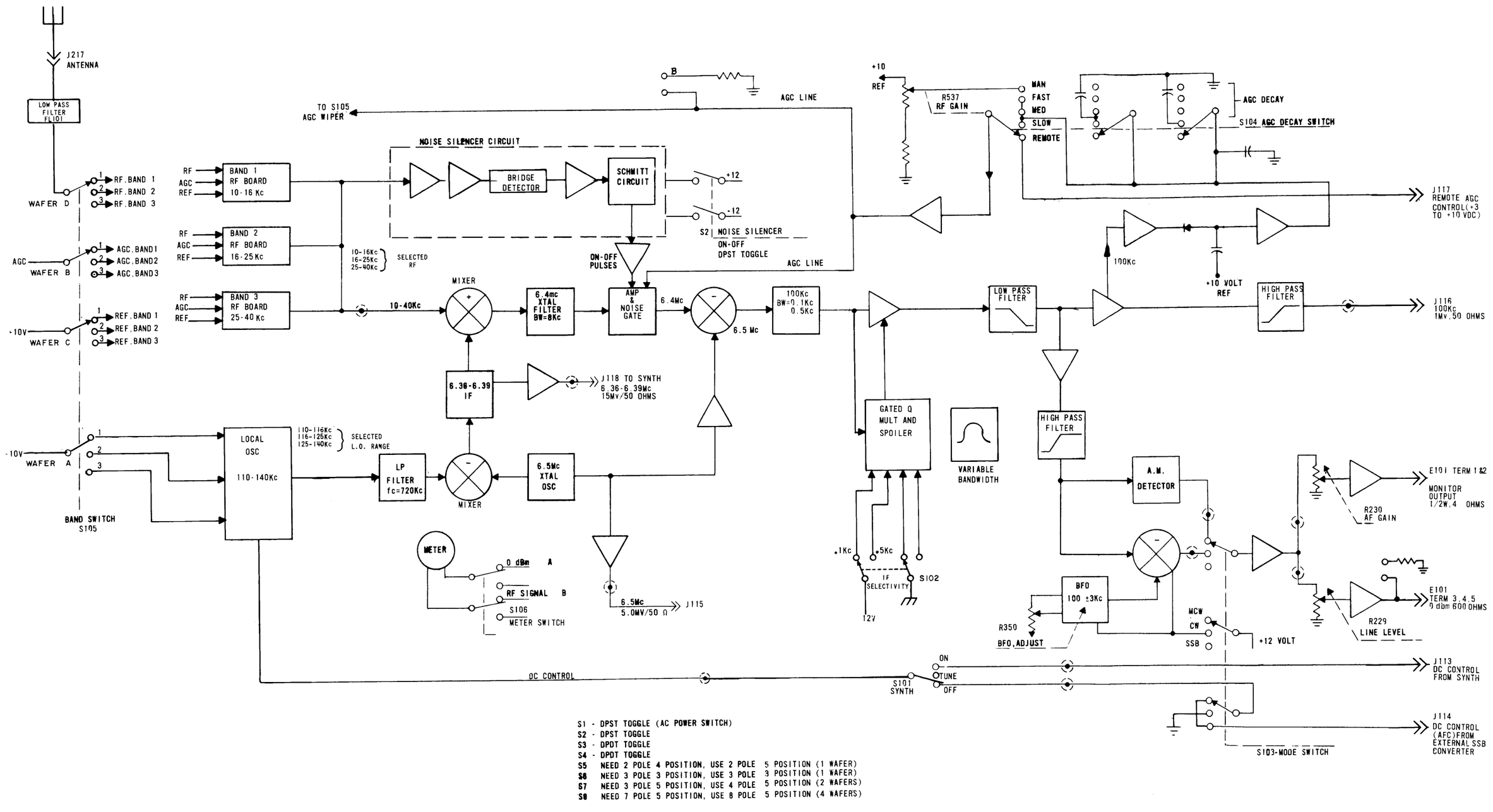
To shutdown the Receiver set the POWER switch 10 to its off (down) position. If an external 24 volt battery is connected set the BAT switch to OUT.

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVERALL FUNCTIONAL DESCRIPTION.

The VLRC-1 Receiver is a double-conversion superheterodyne receiver which provides continuous coverage over the frequency range of 10 to 40 kc in three rf bands. The Receiver features high selectivity, selectable i-f bandpass, in i-f type noise silencer circuit, AGC, BFO, and two audio channel outputs and associated AM and product detectors. A built-in front panel meter and associated switching enables signal monitoring. Facilities for external synthesizer-control of the Receiver is also featured. The following functional description proceeds on a signal flow basis. Refer to figure 4-1. An incoming rf signal received by the antenna is applied through the low pass filter and contacts of wafer D of the band switch to the selected rf board. Wafer A of the BAND switch selects the appropriate local oscillator output for the rf band selected. The frequency of the local oscillator is always 100 kc above the incoming rf. The local oscillator signal is mixed with a crystal controlled 6.5 mc oscillator signal to produce a signal within the spectrum of 6.39 to 6.36 mc. The specific spectrum frequency depends upon the frequency to which the Receiver is tuned. The 6.39 to 6.36 mc spectrum signal is mixed with the amplified rf signal to produce a 6.4 mc output, the first i-f. The 6.4 mc i-f signal is applied through a crystal filter to eliminate any signals outside the 8 kc bandpass and then amplified



S1 - DPST TOGGLE (AC POWER SWITCH)
S2 - DPST TOGGLE
S3 - DPDT TOGGLE
S4 - DPDT TOGGLE
S5 NEED 2 POLE 4 POSITION, USE 2 POLE 5 POSITION (1 WAFER)
S6 NEED 3 POLE 3 POSITION, USE 3 POLE 3 POSITION (1 WAFER)
S7 NEED 3 POLE 5 POSITION, USE 4 POLE 5 POSITION (2 WAFERS)
S8 NEED 7 POLE 5 POSITION, USE 8 POLE 5 POSITION (4 WAFERS)

Figure 4-1. VLRC Receiver Block Diagram

in the amplifier and noise gate. The amplified 6.4 mc i-f is mixed with the crystal controlled 6.5 mc oscillator signal to produce a 100 kc signal, the second i-f. This i-f has a variable bandpass of either 0.1 or 0.5 kc as selected by the front panel IF SELECTIVITY switch. The desired bandwidth is attained by gating of the Q multiplier and spoiler circuits into the 100 kc i-f amplifier.

The 100 kc i-f signal is amplified and applied through low and high pass filters to SSB DC connector J116 for connection to an external signal sideband converter or to the receiver audio amplifier circuits. The i-f signal applied to J114 is at a level of 1 mv across an impedance of 50 ohms. In MCW operation the 100 kc i-f signal is routed through a conventional diode AM detector to the receiver monitor and line amplifiers. In CW and FSK operation the 100 kc i-f signal is mixed with a variable BFO signal in a product detector. The BFO signal has a center frequency of 100 kc and is variable from 97 to 103 kc. The mixer audio output signal is applied simultaneously to the monitor and line amplifiers. The gain of the monitor and line amplifiers is such that full audio output is attained with a 30% modulated 0.3 microvolt rf input signal. The power output of the audio amplifier is approximately 1/2 watt across an impedance of four ohms. The power output of the line amplifier is 0 DBM across an impedance of 600 ohms.

The line amplifier output may be monitored by the front panel meter. With METER switch S106 in the 0 DBM position the power output of the line amplifier is indicated on the front panel meter.

AGC voltage is developed by rectifying the 100 kc i-f signal. This provides a dc voltage which is with respect to +10 volt. The dc voltage is amplified and routed to the controlled rf stages through wafer B of the stages BAND switch. The AGC output is also applied to the amplifier and noise gate circuitry. The AGC decay switch inserts capacitors into the AGC circuit in the FAST, MED, and SLOW switch positions. These capacitors determine the attack and decay time of the AGC voltage. In the MAN switch position the AGC system is defeated; in this case the RF GAIN control manually sets the level of the dc voltage applied to the AGC controlled stages. In the REMOTE switch position, an external dc voltage (3 to 10 volts) can be applied through rear panel connector J117 to control the AGC controlled stages. The AGC voltage may be monitored as a function of signal strength by the front panel meter. With the METER switch in the SIGNAL position, the meter indicates the strength of the rf input signal. Note that "signal" here is defined as signal plus noise.

The noise gate portion of the 6.4 mc i-f strip prevents noise impulses from passing through the 6.4 mc i-f. The noise gate receives an input from the AGC line and is controlled by the noise silencer circuit. The noise silencer receives an rf signal with impulse noise pulses (signal plus noise). The signal is amplified and applied to a noise detector. The noise detector converts impulse noise to positive pulses. The positive pulses are used to trigger a Schmitt trigger circuit. The Schmitt trigger output pulse turns off the gate amplifier which prevents noise pulses from appearing in the receiver

output signal. The AGC functions to set up a threshold level to prevent false gating by signal intelligence. The noise silencer circuit is turned on and off by the front panel NOISE SILENCER switch.

The receiver local oscillator can be controlled by an external equipment. A synthesizer unit such as the TMC Model or a sideband converter unit such as the TMC Model LFCA-1. When the external synthesizer is used, the receiver can be synthesized over the entire tuning range in increments of ten cycles. The lower frequencies of 10-16 kc, can be synthesized in increments of one cycle. The Receiver supplies a 6.5 mc output signal and an i-f spectrum signal of 6.36 to 6.39 mc to an external synthesizer. With the SYNTH switch in the ON position, the receiver local oscillator may be synthesizer-controlled by a d-c control voltage. This control voltage maintains the local oscillator frequency over its entire range. With the SYNTH switch at TUNE, the d-c control line is grounded, enabling the local oscillator to be tuned to the synthesizer frequency. The Receiver is tuned by zero beating with the synthesizer.

When an external sideband/AFC converter is used, automatic frequency control is accomplished as follows: The receiver supplies the a 100 kc i-f carrier signal to the converter at J116. This carrier signal is utilized in the converter to generate a d-c control voltage which is applied through the SSB position of the MODE switch and the OFF position of the SYNTH switch to correct receiver local oscillator frequency. When the

carrier signal is within 5 cycles of the external converter frequency, the system is locked. After the system is in lock, the frequency may change as much as ±0.15% before the system loses lock. When an external synthesizer is used for SSB reception the Receiver local oscillator is controlled by the synthesizer rather than to the sideband converter unit.

4-2. RF BAND MODULES A4604-1, -2, -3.

Refer to figure 4-1 and 7-2. Three RF Band modules are used to cover the three rf bands. The three rf modules cover the frequency range of 10 to 40 kc in three bands as listed in table 4-1.

TABLE 4-1. VLRC TUNING RANGE

BAND	RF FREQUENCY COVERAGE (KC)	OSCILLATOR FREQUENCY COVERAGE (KC)	RF MINIMUM BANDWIDTH (KC)
1	10-16	110-116	0.5
2	16-25	116-125	0.5
3	25-40	125-140	0.5

Each rf module consists of four tuned r-f amplifiers Q1, Q2, Q3, Q4 and three AGC controlled regulators Q5, Q6, and Q7. The three RF Band

modules are almost identical as indicated in figure 7-2. The reference designation symbol series for band 1, band 2, and band 3 modules are 700, 800 and 1000, respectively. The following discussion applies equally to all three modules.

The rf module contains three transformer coupled, variable impedance rf amplifier stages, Q1-Q5, Q2-Q6, and Q3-Q7, and a fourth amplifier Q4 whose output is not tuned. Interstage coils for each amplifier are located outside the module on the main chassis. (This permits using a basic module for all three bands.) Transistors Q5, Q6, and Q7 provide a variable impedance for Q1, Q2, and Q3. When r-f is present AGC voltage is developed and applied to the base of Q5, Q6, and Q7. This voltage reduces the forward bias on the base of Q5, Q6 and Q7, thus increasing its impedance and controlling the r-f output level in proportion to the received rf signal level.

4-3. LOCAL OSCILLATOR MODULE A4605.

Refer to figures 4-1 and 7-3. The Local Oscillator Module contains three oscillators Q901 through Q903 covering the range of frequencies from 110 to 140 kc in three steps. Table 4-1 lists the frequency coverage of each oscillator. The selected oscillator is energized through the BAND switch by the application of -10 volts dc. The oscillator output is capacitively coupled to Buffer Amplifier Q904, configured as an emitter follower. The amplified output of Q904 is connected to the 6.5 MC Oscillator Module.

A d-c control voltage from the external equipment may be applied to oscillator varicaps CR902 through CR904 (during synthesizer-control). This

d-c voltage varies the capacitance of the varicap and thus controls oscillator frequency.

4-4. 6.5 MC OSCILLATOR MODULE A3655.

Refer to figures 4-1 and 7-4. The 6.5 MC Oscillator Module contains the circuitry of the 6.5 mc oscillator and the 6.36 mc bandpass amplifier.

The 6.5 mc oscillator is crystal controlled and consists of Q501. Q501 supplies three 6.5 mc output signals; one output is coupled through C501 to the 100 KC I-F Module, a second 6.5 mc output is coupled through C506 to an external synthesizer unit. The third output is applied to buffer Q502. The 6.5 mc signal appearing at the collector of Q502 is coupled via Q503 to balanced mixer Q504 and Q505. Q503 serves as a current source in the emitter circuitry of Q504 and Q505. The balanced mixer also receives the 110 to 140 kc signal from the Local Oscillator Module via a low pass filter network. This filter network eliminates harmonics of the oscillator signal from appearing in the balanced mixer output circuit. Through mixing action in Q504 and Q505, the difference frequency between the two inputs (110 to 140 kc and 6.5 mc signals) results in a 6.36 to 6.39 mc bandpass signal. The bandpass signal is amplified by Q506 and Q507 and then applied to the 6.4 MC I-F, AGC, and Noise Silencer Module. Emitter follower Q508 provides a 6.36 to 6.39 mc bandpass signal at its output for use with an external synthesizer unit.

4-5. 6.4 MC I-F, AGC, AND NOISE SILENCER MODULE A3661.

Refer to figures 4-1 and 7-5. The 6.4 MC I-F, AGC and Noise Silencer Module contains the 6.4 mc mixer and bandpass circuitry, the noise silencer circuitry, and the AGC circuitry. This module receives a signal within the frequency spectrum of 6.36 to 6.39 mc from the 6.5 MC Oscillator Module, an r-f signal from 10 to 40 kc from one of three RF Band Modules, and 100 kc signal from the 100 KC I-F Module. The 6.36 to 6.39 mc and the 10 to 40 kc signals are mixed to produce a first i-f frequency of 6.4 mc. The 100 kc signal is used to develop the AGC voltage.

The 6.36 to 6.39 mc signal is applied via Q605 to the balanced mixer Q601 and Q602. Q605 serves as a current source in the emitter circuitry of Q601 and Q602. Q601 also receives the 10 to 40 kc signal from a selected Band Module. The product of the balanced mixer consists of a 6.4 mc first i-f frequency signal. This output is coupled through a 6.4 mc crystal filter to a balanced amplifier, Q603 and Q604. Q607 connected into the emitter circuit of the balanced (push-pull) amplifier serves as a variable impedance. The balanced amplifier output signal of 6.4 mc is applied to the 100 KC I-F Module.

The noise silencer circuitry consists of Q608 through Q613 and Q617. The noise silencer circuitry receives an rf signal with impulse noise from the selected RF Band Module. This signal is amplified by Q608 and Q609 and routed to a noise detector consisting of diodes CR602, CR603, CR607, CR608, and transistor Q610. The noise detector attenuates the rf signal and converts the impulse noise pulses to positive-going pulses. These pulses are applied via emitter follower Q611 to the Schmitt trigger circuit consisting of Q612,

Q613, to Q617. Positive-going pulses are generated at the collector of Q613 which energizes Q606 and effectively Q603 and Q604. This action cancels impulse noise present in the 6.4 mc output. The noise silencer is disabled by the action of transistor Q607 circuitry when signal impulses such as high speed CW or FSK are present. The noise silencer sees these signal impulses as noise, however, the voltage developed by Q607 in response to the AGC signal disables Q606, and prevents the signal impulse from reaching Q603 and Q604. The noise silencer circuitry is also disabled by removing the supply voltage by turning off the front panel NOISE SILENCER switch.

AGC voltage is developed by rectifying the 100 kc i-f signal. The 100 kc signal is amplified by Q614 and rectified by diode CR604. The rectified dc voltage is referenced to +10 volts by zener diode CR610. After rectification, the d-c voltage is amplified and buffered by Q615 and Q616 and routed as AGC to the controlled stages.

The collector circuit of Q615 contains the switched capacitors used in the SLOW, MEDIUM and FAST AGC DECAY positions. Slow decay corresponds to a time constant of 16.5 seconds, medium decay to a time constant of 9.9 seconds and fast decay to a time constant of 3.3 seconds. The slow and medium decay time capacitors are located on the 6.5 MC Oscillator Module.

When the METER switch is in the SIGNAL position the AGC voltage at the emitter of Q616 is applied to the front panel meter. The meter reading indicates the strength of the incoming rf signal.

4-6. 100 KC I-F MODULE A4603.

Refer to figures 4-1 and 7-6. The 100 KC I-F Module converts the first i-f signal of 6.4 mc to a second i-f signal at 100 kc. This module receives input signals of 6.5 mc and 6.4 mc from the 6.5 MC Oscillator Module and the 6.4 MC I-F, AGC, and Noise Silencer Module, respectively.

The 6.4 mc signal is applied to the base of transistor Q1, a mixer. The 6.5 mc input is coupled to Q1 with emitter injection through buffer amplifier Q10. The output at the collector of Q1 is a 100 kc difference i-f with a .5 kc passband. This output is coupled to the base of amplifier transistor Q3. The 100 kc output of Q3 is double tuned and transformer coupled (L3 and T3) to the base of amplifier Q7.

The amplified output at the collector of Q7 is connected to the base transistors Q8 or Q9, configured as negative emitter bias gates. Selection of the appropriate gate is achieved by IF SELECTIVITY switch S102, through the selection of a .1 or .5 kc bandwidth. The appropriate circuit is turned on by connection of the -12 volt supply through the switch. Q9 conducts when the .1 bandwidth is selected and the Q9 output is coupled to a Q multiplier and spoiler configuration consisting of Q11 through Q13. The Q9 output is applied to the base of Q11, amplified, and applied to the base of Q12. Q12 has a tuned base (T4) which receives positive feedback from its emitter circuit. Spoiler transistor Q13 is cut off (its base is left unconnected by S102) permitting the Q value of the circuit to be a function of the tuned circuit and feedback of the Q12 circuit. The output of Q multiplier Q12 is connected to the base of 100 kc amplifier Q16. When a .5 kc bandwidth is selected, Q8 is turned on by -12 volts dc from S102. The output of Q7 is amplified by Q8 and applied directly to the base of amplifier Q16, bypassing the Q multiplier and spoiler circuit. The base spoiler Q13 is grounded to inhibit the Q multiplier circuit and thus prevent .1 kc bandpass characteristics from affecting the 100 kc output. The output at the collector of Q16 supplies the 100 kc second i-f signal to the receiver detector circuits located in the

BFO Product Detector and Line Amplifier Module. The output at the collector of Q17 supplies the 100 kc i-f signal through transformer T1 to rear panel connector J116 for use by an external sideband converter. The Q17 emitter output supplies the 100 kc i-f to the AGC circuit located in the 6.4 MC I-F, AGC, and Noise Silencer Module.

4-7. BFO PRODUCT DETECTOR AND 600 OHM AUDIO AMPLIFIER MODULE A3638.

Refer to figures 4-1 and 7-7. The BFO Product Detector and Line Amplifier Module contains the AM detector, the beat frequency oscillator, the product detector and the line amplifier circuitry. This module detects the 100 kc second i-f signal received from the 100 KC I-F Module.

The 100 kc signal is amplified by Q301 and Q302. AM and MCW signals are detected by diode CR301 at the output of Q302. The resultant audio signals are applied to the MCW contact of MODE switch S103. CW, FAX, and FSK signals are taken from the emitter of Q302 and routed to the product detector Q303. In CW, Q303, Q304, Q305, and Q306 are turned on by the +12 volt supply switched through MODE switch S103. The beat frequency oscillator, Q306, is an LC oscillator that uses voltage controlled capacitor CR303 for tuning. The oscillator may be tuned from 97 to 103 kc. The front panel BFO control R350 varies the dc voltage applied to CR303. The oscillator output is amplified by Q305 and Q304 and provides the second input to product detector Q303. The product detector mixes the 100 kc second i-f signal from Q302 with the beat frequency oscillator signal from Q304. The resultant audio signal is routed via the MODE switch to an isolation amplifier located in the Power Supply and Audio Amplifier Module.

The line amplifier consists of transistors Q307 through Q309. This amplifier receives audio signals from the isolation amplifier in the Power Supply and Audio Amplifier Module via the front panel LINE LEVEL control R229. The audio signal is amplified by Q307 and applied to balanced amplifier Q308 and Q309. The audio output signal is applied across the 600-ohm secondary windings of transformer T303 and is available at terminals 3, 4, and 5 of E301 located on the rear panel.

When METER switch S106 is in the 0 DBM position, the audio output signal appearing across the secondary winding of T303 is rectified by diodes CR304 and CR305 and applied to M101. The audio output signal may be set to a level of 0 DBM with the LINE LEVEL control using the meter to monitor the level.

4-8. POWER SUPPLY AND AUDIO AMPLIFIER MODULE A3634.

Refer to figures 4-1 and 7-8. The Power Supply and Audio Amplifier Module contains an isolation amplifier, the 24-volt power supply, and an audio amplifier. Some power supply and audio amplifier components are located on the main chassis.

When the MODE switch is in the MCW or CW positions, isolation amplifier Q201 receives the detected audio or BFO audio from the BFO Product and Line Amplifier Module. The Q201 output is applied to the base of Q202, the input stage of the audio amplifier, via relay R202 and the AF GAIN control. LINE LEVEL control R229 is connected across the Q201 output and therefore adjusts the output level applied to the AF GAIN control. The Q202 output is further amplified by balanced amplifier Q203 and Q204 and transformer coupled to push-pull power amplifier Q102 and Q103 located on the

main chassis. The audio output signal across the 4-ohm secondary winding of transformer T102 is available at terminals 1 and 2 of E101 located on the rear panel of the unit. The audio output developed at the collector of power amplifier Q102 is applied, via d-c blocking capacitor C208 and resistor R219, to front panel MONITOR jack J121 for headset monitoring.

The power supply operates from a 115/230 volt, 50/60 cps, single-phase power source and develops output voltages of plus and minus 12 volts dc. Facilities are provided for automatic switchover to battery powered operation in the event of a-c power failure. The incoming a-c line voltage is stepped down to approximately 28 volts ac by power transformer T101 and rectified by bridge rectifiers CR201 through CR204. The d-c output voltage is filtered by capacitor C101 and energizes relay K101 via current limiting resistor R222. Energizing relay K101 turns on POWER lamp DS102.

The dc output is also applied through isolator diode CR205 and fuse F103 to the regulator circuit. Zener diode CR101 maintains a regulated 24 volts across its terminals; zener diodes CR102 and CR103 each provide a regulated 12 volts across their respective terminals. Series regulator Q101 keeps the -12 volt output voltage constant by varying its impedance directly in proportion to changes in output voltage.

In the event of a-c power failure, the receiver circuits can be powered automatically by an external 24-volt battery. With BAT switch S109 set to IN, the positive battery terminal is connected to the +12 volt output line. The negative battery terminal is connected to the collector of Q101. Q101 passes the negative supply to the -12 volt output line. Isolator diode CR205 is back

biased by the positive voltage at its cathode and K101 is de-energized. With relay K1 de-energized, BATTERY lamp DS101 is turned on. When normal ac power is used, the external battery is charged through limiting resistor R101. When the battery is used to power the receiver, diode CR104 conducts which shorts out resistor R101.

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

The Receiver has been designed to provide long-term, trouble-free operation under continuous duty conditions. However, in order to prevent failure of the equipment due to corrosion, dust, or other destructive elements, it is suggested that a schedule of preventive maintenance be followed.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloration or grease. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease from other parts with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

NOTE

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces due to its paint removing effects.

5-2. TROUBLESHOOTING.

Since the construction of the Receiver is modular, the first step in troubleshooting is that of localizing the malfunction to a specific module. The cause of the failure may be apparent, either from the symptoms present at the time of failure or prior to failure, or from logical deduction based on a knowledge of the equipment circuitry. For example, if the equipment functions normally on bands 1 and 2, but does not receive signals on band 3 (25 to 40 kc) the first module suspect is the RF Band 3 Module (A4604-3). The next suspect module Local Oscillator Module (A4605), and more specifically the Q903 circuitry. Following this, the band 3 oscillator coils, front panel BAND switching, and interconnecting wiring should be checked. The block diagram, figure 4-1, functional descriptions, and schematic diagrams figures 7-1 through 7-8 provide the information necessary in diagnosing and isolating malfunctions. The defective module should be isolated by a study of the symptoms and by careful and patient analysis of the malfunction before attempting to trace a trouble on a printed circuit board. Once the suspect module is identified, a checkout of the printed circuit board should be performed. Refer to paragraph 5-3 for printed circuit repair techniques. Refer to figures 2-2, and 5-1 for the location of circuit boards and components.

If the defective module or part cannot be isolated using usual trouble-shooting methods, a step-by-step test of the receivers functional circuits

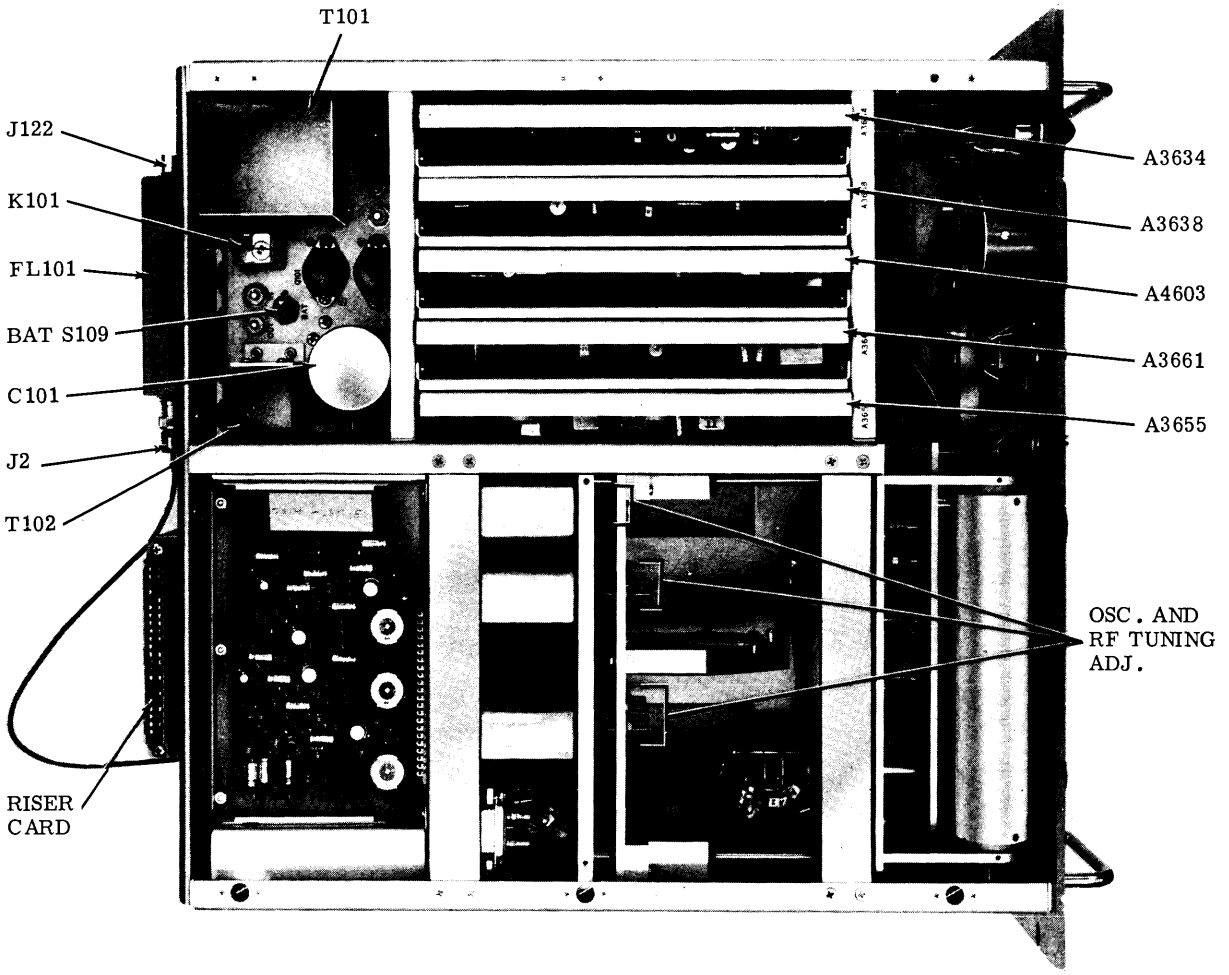


Figure 5-1. VLRC-1 Receiver Top View, Component Locations

should be performed. In paragraph 5-4 these tests are combined with alignment of the VLRC receiver and may be accomplished concurrently if required.

5-3. REPAIR OF PRINTED CIRCUITS.

a. GENERAL. - Although the troubleshooting procedure for printed circuits is similar to those for conventional circuits, the repair of printed circuits requires considerably more skill and patience. The printed circuits are small and compact; therefore, personnel should become familiar with the special servicing techniques required. Ascertain whether the conducting

strips are coated with a protective lacquer, epoxy resin, or similar substance.

Breaks in the conducting strip (foil) can cause permanent or intermittent trouble. In many instances, these breaks will be so small that they cannot be detected by the naked eye. These almost invisible cracks (breaks) can be located only with the aid of a powerful hand- or stand-held magnifying glass.

b. MULTIMETER CHECKOUT. - The most common cause of an intermittent condition is poorly soldered connections. Other causes are: broken boards, broken conducting strips, fused conducting strips, arc-over, loose terminals, etc.

To check out and locate trouble in the conducting strips of a printed circuit board, set up a multimeter using needle-point probes (one which does not use a current in excess of 1 ma) for making point-to-point resistance tests. Insert one point into the conducting strip, close to end of the terminal and place the other probe on the terminal opposite end of the conducting strip. The multimeter should indicate continuity. If the multimeter indicates an open circuit, move the probe along the strip (or if the conducting strip is coated puncture the coating at intervals) until the multimeter indicates continuity. Mark this area, then use a magnifying glass to locate the fault in the conductor.

CAUTION

Before using an ohmmeter for testing a circuit containing transistors or other voltage-sensitive semiconductors, check the current it passes under test on all ranges. DO NOT use a range that exceeds 1 ma.

c. HOW TO REPAIR THE BREAK. - If the break in the conducting strip is small, lightly scrape away any coating covering the defective area of the conducting strip. Clean the area with a frim-bristle brush and approved solvent. Then repair the cracked or broken area of the conducting strip by flowing solder over the break. Considerable care must be exercised to keep the solder from flowing onto an adjacent strip.

If a strip is burned out or fused, cut and remove the damaged strip. Connect a length of insulated wire across the breach or from solder-point to solder-point.

After the repairs are completed, clean the repaired area with a stiff brush and solvent. Allow the board to dry thoroughly, and then coat the repaired area with an epoxy resin or similar compound. This coating not only will protect the repaired area, but will help to strengthen it.

CAUTION

After repairs, always scrutinize the board for solder droppings that may cause possible shorts.

Frequently, a low-resistence leakage path will be created by moisture and/or dirt that has carbonized onto the phenolic board. This leakage can be detected by measuring the suspected circuit with a multimeter. To overcome this condition, thoroughly clean the carbonized area with solvent and stiff brush. If this does not remove it, use a scraping tool (spade end of a solder-aid tool or its equivalent) to remove the carbon, or drill a hole through the leakage path to break the continuity of the leakage. When the drilling method is used, be careful not to drill into a part mounted on the other side of the board.

5-4. TEST AND ALIGNMENT.

a. GENERAL. - The alignment procedures given in the following paragraphs are continuous and must be performed in the order given. A riser card must be used (figure 5-1) so that test and alignment of the plug-in printed circuit boards may be performed as an integral part of the VLRC. Refer to figures 2-2 and 5-1 for locations of cards and components.

CAUTION

When performing any of the procedures given in the following paragraphs, do not remove or insert the riser card with the power on.

b. TEST EQUIPMENT REQUIRED. - Table 5-1 lists the test equipment required to test and align the VLRC receiver.

TABLE 5-1. TEST EQUIPMENT REQUIRED FOR TEST AND ALIGNMENT

ITEM	MANUFACTURER, MODEL OR TYPE
AC VTVM	Ballantine Model 861-5 or equivalent
Frequency Counter	Hewlett-Packard Model 5245L or equivalent
Signal Generator	Marconi Model TF-144H or equivalent
Attenuator	Telonic Model TG-950 or equivalent
Scope	Tektronic Model 541A or equivalent

5-5. LOCAL OSCILLATOR TEST AND ALIGNMENT (110-140 KC).

a. BAND 1, 10-16 KC.

(1) Connect frequency counter input to AC VTVM output.

(2) Set POWER to OFF and install riser card to extend to Local Oscillator Module A4605.

(3) Set POWER to on.

(4) Set AGC DECAY switch to MAN and turn RF GAIN fully CW.

(5) Connect jumper across SYN DC jack J113.

(6) Connect AC VTVM to TP1 on A4605 board.

(7) Tune receiver to 16 kc and adjust L904 for 116 kc ±50 cps.

(8) Tune receiver to 10 kc and adjust C930 for 110 kc ±50 cps.

(9) Repeat steps 7 and 8 until both ends of the band are within ±50 cps.

NOTE

Adjust L901 if necessary to set tracking ±50 cps across band.

(10) Output at TP1 should be 5mv rms ±3 db.

b. BAND 2, 16-25 KC.

(1) Tune receiver to 25 kc and adjust L905 for 125 kc ±50 cps.

(2) Tune receiver to 16 kc and adjust C931 for 116 kc ±50 cps.

(3) Repeat steps 1 and 2 until both ends of the band are within ±50 cps.

(4) Output at TP1 should be 5mv rms ±3 db.

c. BAND 3, 25-40 KC.

(1) Tune receiver to 40 kc and adjust L906 for 140 kc ±50 cps.

(2) Tune receiver to 25 kc and adjust C932 for 125 kc ±50 cps.

(3) Repeat steps 1 and 2 until both ends of the band are within ±50 cps.

NOTE

Adjust L903 if necessary to set tracking ±50 cps across band.

(4) Output at TP1 should be 5mv rms ±3 db.

5-6. RF TEST AND ALIGNMENT - Disable Local Oscillator by removing module A4605 during the rf alignment and test.

a. ALIGNMENT, BAND 3 (25-40 KC)

(1) Set power to OFF and install riser card to extend RF Band 3 Module A4604-3. Set power to ON.

(2) Connect AC VTVM to TP2 (short to ground AGC line Jumper across C-25).

(3) Tune receiver to the center frequency, band 3 (33 kc).

(4) Connect signal generator to input filter FL101 and tune to 33 kc. Adjust for sufficient output for indication on AC VTVM.

(5) Tune T1001, T1002 and T1003 for maximum indication on AC VTVM.

(6) Tune the signal generator and receiver to the high end of band (40 kc).

(7) Tune L1001, L1002 and L1003 for maximum indication on AC VTVM.

(8) Repeat above until the module is tuned to maximum indication.

(9) Tune the receiver to the low end of the band (25 kc) and retune the signal generator for a maximum indication on the AC VTVM. It should be maximum at 25 kc +50 cps.

b. BANDWIDTH AND TRACKING TEST, BAND 3.

(1) Adjust the receiver to the low end of the band (25 kc).

(2) Adjust the generator so that the meter reads 10 db on the 0.1 volt scale.

(3) Decrease the generator frequency so that the meter decreases by 3 db. Record f1.

(4) Increase the generator frequency for the second 3 db point. Record f2.

(a) Record the following: $f2 - f1 =$ Bandwidth

$$\frac{f2 - f1}{2} + f1 = \text{True Center Frequency}$$

(b) Bandwidth should be greater than 500 cps.

(c) Check and record true center frequency for 29 kc, 33 kc, 36 kc and 40 kc. True center frequency should be ±50 cps with respect to the dial.

c. GAIN TEST, BAND 3.

(1) Set the receiver for the high end of the band (40 kc).

(2) Set the generator frequency for a peak, with 1 uv input to the antenna connector. Output should be 1.75 mv ±5 db.

d. RF ALIGNMENT, BAND 2 (16 KC - 25 KC)

(1) Set power to OFF and install riser card to extend RF Band 2 Module A4604-2. Set power ON.

(2) Connect AC VTVM to TP2. Connect generator to FL101.

(3) Tune the receiver and the generator to the center of the band (20.5 kc).

(4) Adjust T801, T802, T803 for maximum output on AC VTVM.

(5) Tune the receiver and generator to the high end of the band (25 kc).

(6) Tune L801, L802, L803 for maximum output on AC VTVM.

(7) Repeat Steps (3) to (6) until tuned for maximum output.

(8) Tune the receiver to the low end of the band, (16 kc). Tune the generator for maximum output. Check true center frequency. Frequency should be 16 kc ±50cps.

e. BANDWIDTH AND TRACKING TEST, BAND 2.

(1) Adjust the receiver to the low end of the band (16 kc).

(2) Adjust the generator so that the meter reads 10 db on the 0.1 volt scale.

(3) Decrease the generator frequency so that the meter decreases by 3 db. Record f1.

(4) Increase the generator frequency for the second 3 db point. Record f2.

(a) Record the following: $f2 - f1 =$ Bandwidth

$$\frac{f2 - f1}{2} + f1 = \text{True Center Frequency}$$

(b) Bandwidth should be greater than 500 cps.

(c) Check and record true center frequency for 18.5 kc, 20.5 kc, 22.5 kc, and 25 kc. True center frequency should be ± 50 CPS with respect to the dial.

f. GAIN TEST, BAND 2.

(1) Set the receiver for the high end of the band (25 kc).

(2) Set the generator frequency for a peak, with 1 uv input to the antenna connector. Output should be 1.75 mv ± 5 db.

g. RF ALIGNMENT BAND 1 (10KC - 16KC)

(1) Set Power to OFF and install riser card to extend RF Band 1 Module A4604-1.

(2) Connect AC VTVM to TP2. Connect generator to FL101.

(3) Tune the receiver and the generator to the middle of band (13 kc).

(4) Adjust T701, T702, T703 for maximum output on AC VTVM.

(5) Tune the receiver and generator to the high end of the band (16 kc).

(6) Tune L701, L702, L703 for maximum output on AC VTVM.

(7) Repeat Steps (3) to (6) until tuned for maximum output.

(8) Tune the receiver to the low end of the band (10 kc).

(9) Tune the generator for maximum output. Check true center frequency. Frequency should be 10 kc ±50 cps.

h. BANDWIDTH AND TRACKING TEST, BAND 1.

(1) Adjust the receiver to the low end of the band (10 kc).

(2) Adjust the generator so that AC VTVM reads 10 db on the 0.1 volt scale.

(3) Decrease the generator frequency so that AC VTVM decreases by 3 db. Record f1.

(4) Increase the generator frequency for the second 3 db point. Record f2.

(a) Record the following: $f2 - f1 =$ Bandwidth

$\frac{f2 - f1}{2} + f1 =$ True Center Frequency

(b) Bandwidth should be greater than 500 cps.

(c) Check and record true center frequency for 11.5 kc, 13 kc, 14.5 kc and 16 kc. True center frequency should be ±5 cps with respect to the dial.

i. GAIN TEST, BAND 1.

(1) Set the receiver for the high end of the band (16 kc).

(2) Set the generator frequency for a peak, with 1 uv input to the antenna connector. Output should be 1.75 mv ±5 db.

(3) Replace Local Oscillator Module A4605.

5-7. 6.5 MC AND 6.39 - 6.36 MC TEST AND ALIGNMENT.

a. 6.5 MC

(1) Set POWER to OFF and install riser card to extend 6.5 MC Module A3655.

(2) Connect either scope or meter and counter to TP1.

(3) Adjust C502 for a frequency indication of exactly 6.5000 mc.

(4) Adjust L501 for minimum voltage indication at TP1. The voltage at TP1 should be approximately 14 mv rms.

(5) Connect the meter to Pin 22 of A3655. The output should be 9 mv rms.

(6) Short TP1 of Local Oscillator A4605 to ground or remove module.

(7) Connect scope to collector of Q507 and adjust R513 for minimum indication on the scope.

(8) Adjust C502, T529 and C539 for minimum indication of 6.5 mc on the scope.

b. 6.36 to 6.39 Mc PASSBAND

(1) Remove short from TP1 on Local Oscillator Module.

(2) Place scope probe across R527.

(3) Set BAND switch to band 3 and tune receiver to the highest frequency (40 kc).

(4) Tune T501 and L506 for maximum response on scope.

(5) Switch to band 1 and tune T502 for maximum response on scope.

(6) Repeat Steps (3) through (5) until no further tuning is required.

(7) Set BAND switch to band 2 at (25 kc). Tune T504 for maximum response on scope.

(8) Place AC VTVM on J118.

(9) Check all bands and all frequencies. Output should vary from 12 mv to 18.5 mv rms. If output varies beyond these limits repeat Steps (3) through (7) until correct results are obtained.

(10) Remove riser card and install A3655 Module.

5-8. 100 KC IF TEST AND ALIGNMENT.

a. Set POWER to OFF and install riser card to extend 100 kc I-F Module A4603.

b. Connect scope to TP410 and adjust L407 for maximum output at 6.5 mc.

c. Short TP408 to ground (TP404) and connect signal generator to TP401. Set input signal to 100 kc.

d. Set IF SELECTIVITY switch to .5 kc.

e. Connect scope to TP405 and adjust L401 for maximum output.

f. Short TP406 to ground and adjust L403 for maximum output.

g. Disconnect short from TP406 and adjust T403 for minimum indication.

h. Connect AC VTVM to TP409. Adjust signal generator input for a 50 mv reading.

i. Set IF SELECTIVITY switch to 0.1KC position, and adjust R442 to center.

j. Connect scope to TP407 and adjust T404 for a maximum indication at 100 kc. Readjust R442 for a 0.1 kc bandwidth.

k. Repeat steps i and j until a maximum 100 kc signal with a bandwidth of 0.1 kc is obtained.

l. Connect scope to TP409. Check the 100 kc output for a 0.1 kc bandwidth.

m. Set IF SELECTIVITY switch to 0.5 kc. Observe the output at TP409. It should be 100 kc with a 0.5 kc bandwidth.

n. Remove short from TP408 and generator from TP401. Connect generator to ANTENNA IN connector J112 and adjust for 0.3 uv. The output at TP409 should be between 50 and 60 mv.

o. Connect AC VTVM to 100 kc output jack J116. Output should be 1.5 mv.

5-9. 6.4 MC I-F, AGC, AND NOISE SILENCER TEST AND ALIGNMENT.

a. Set POWER to OFF and install riser card to extend Module A3661.

b. Connect VTVM to TP605.

c. Set NOISE SILENCER switch to ON and adjust R637 for 0.5 volts dc at TP605.

d. Connect signal generator across terminals 4 (hot) and 5 (ground) of the 6.4 mc filter. Adjust output for 100 mv rms.

e. Ground AGC input (TP602) and connect meter to TP604.

f. Adjust T601 for maximum indication at TP604.

g. Remove short from TP602. Set AGC DECAY switch to the FAST position. Connect meter to TP405 on A4603. Adjust R646 until the signal at TP405 just begins to drop from full RF GAIN position.

h. For a quick comparison, set AGC DECAY switch back and forth from MAN to FAST position. The drop in level at TP405 should be just barely discernible between the two positions. Readjust R646, if necessary.

i. Vary signal generator output from 0.3 microvolts to 1.0 volts. Maximum variation of the test point voltage (TP405) should be 0.5 db.

j. Remove riser card and install module.

5-10. BFO AND 600 OHM AUDIO AMPLIFIER TEST AND ADJUSTMENT.

a. BFO

(1) Set POWER OFF and install riser card to extend A3638 Module.

(2) Turn the front panel BFO control completely counterclockwise.

(3) Set POWER switch to ON and MODE switch to CW.

(4) Short TP301 to ground.

(5) Connect AC VTVM and counter to TP303 and adjust L304 for 97 kc.

(6) Turn front panel BFO control completely clockwise. The frequency at TP303 should be 103 kc.

b. AUDIO METER ADJUSTMENT

(1) Connect 600 ohm resistor to 600 ohm output terminals on rear panel.

(2) Connect signal generator to antenna input; apply at 10 microvolts at any frequency within the Receiver range, tune Receiver to generator.

(3) Set MODE switch to CW and adjust BFO control for a 1 kc tone at audio output.

(4) Connect meter across dummy load (600 ohm) and adjust audio gain for +3 DBM (1.1 VRMS).

(5) Adjust R349 for +3 DBM on front panel meter.

c. SENSITIVITY TEST

(1) Set receiver to any frequency and generator to the same frequency. Adjust generator output for 0.3 uv at antenna input.

(2) Adjust LINE LEVEL control for a reading of 0 DBM. The voltage across 600 ohm load should be 0.779 volt ±10%.

5-11. FINAL TEST.

a. AUDIO

(1) Set Receiver to any frequency and generator to same frequency. Adjust generator output for 0.3 uv at antenna input. Connect a 4 ohm load across speaker output terminals. Connect scope across load.

(2) Set AF GAIN control until 1.4 peak-to-peak appears across load. Output should be a clean sine wave.

b. IMAGE REJECTION

(1) Set receiver and generator to 15 kc. Adjust generator for 0.3 uv at Receiver antenna input with 0 DBM reading on meter.

(2) Set generator to 30 kc and increase output until meter reads 0 DBM. Generator output should be at least 80 db above 0.3 uv.

c. AGC DECAY

(1) Set generator and receiver to same frequency. Adjust generator for 0.3 uv input and set the receiver to read 0 DBM on meter. Set AGC DECAY switch to MAN.

(2) Set METER switch to SIGNAL and observe signal reading.

(3) Switch the AGC DECAY to FAST position, and remove the RF input. It should take at least 3 seconds for meter to decay to zero.

(4) Switch AGC DECAY to MED position and repeat above procedure. With signal removed it should take at least 9 seconds for meter to decay to zero.

(5) Switch AGC DECAY to SLOW position and repeat above procedure. With signal removed it should take at least 16 seconds for meter to decay to zero.

d. MONITOR TEST. - Plug in head phones. With headphones connected, speaker voltage should drop to zero and a tone should be heard in the phones.

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. Reference symbol.

b. Description as indicated in parts list.

c. TMC part number.

d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

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

Assembly or Sub-Assembly — Page

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C201	CAPACITOR, FIXED, ELECTROLYTIC: 50 ufd, +150% -10%; 25 WVDC.	CE105-50-25
C202	CAPACITOR, FIXED, ELECTROLYTIC; 100 ufd, +150% -10%; 25 WVDC.	CE105-100-25
C203	CAPACITOR, FIXED, ELECTROLYTIC; 200 ufd, +150% -10%; 15 WVDC.	CE105-200-15
C204	CAPACITOR, FIXED, ELECTROLYTIC; 6 ufd, +150% -10%; 15 WVDC.	CE105-6-15
C205	CAPACITOR, FIXED, ELECTROLYTIC; 10 ufd, +150% -10%; 25 WVDC.	CE105-10-25
C206	Same as C201.	
C207	Same as C205.	
C208	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C209	Same as C203.	
C210	Same as C202.	
C211	CAPACITOR, FIXED, CERAMIC; 1,000 pf, GMV; 500 WVDC.	CC100-29
CR201 thru CR205	SEMICONDUCTOR DEVICE, DIODE; Silicon	1N2484
CR206	SEMICONDUCTOR DEVICE, DIODE; Zener, glass, silicon.	1N961B
Q201	TRANSISTOR; Germanium.	2N396A
Q202	Same as Q201.	
Q203	TRANSISTOR; Germanium alloy PNP.	2N1370
Q204	Same as Q203.	
R201	RESISTOR, FIXED, COMPOSITION; 680 ohms, $\pm$5%; 1/2 watt.	RC20GF681J
R202	RESISTOR, FIXED, COMPOSITION; 330 ohms, $\pm$5%; 1/2 watt.	RC20GF331J
R203	RESISTOR, FIXED, COMPOSITION; 1800 ohms, $\pm$5%; 1/2 watt.	RC20GF182J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R204	RESISTOR, FIXED, COMPOSITION; 18 ohms, ±5%; 1/2 watt.	RC20GF180J
R205	RESISTOR, FIXED, COMPOSITION; 1500 ohms, ±5%; 1/2 watt.	RC20GF152J
R206	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt.	RC20GF102J
R207	RESISTOR, FIXED, COMPOSITION; 150 ohms, ±5%; 1/2 watt.	RC20GF151J
R208	RESISTOR, FIXED, COMPOSITION; 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R209	RESISTOR, FIXED, COMPOSITION; 3900 ohms, ±5%; 1/2 watt.	RC20GF392J
R210	RESISTOR, FIXED, COMPOSITION; 8200 ohms, ±5%; 1/2 watt.	RC20GF822J
R211	RESISTOR, FIXED, COMPOSITION; 3300 ohms, ±5%; 1/2 watt.	RC20GF332J
R212	RESISTOR, FIXED, COMPOSITION; 220 ohms, ±5%; 1/2 watt.	RC20GF221J
R213	Same as R211.	
R214	Same as R211.	
R215	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt.	RC20GF101J
R216	Same as R215.	
R217	RESISTOR, FIXED, COMPOSITION; 1200 ohms, ±5%; 1/2 watt.	RC20GF122J
R218	Same as R217.	
R219	RESISTOR, FIXED, COMPOSITION; 22,000 ohms, ±5%; 1/2 watt.	RC20GF223J
R220	RESISTOR, FIXED, COMPOSITION; 15 ohms, ±5%; 1/2 watt.	RC20GF150J
R221	Same as R220.	
R222	RESISTOR, FIXED, COMPOSITION; 470 ohms, ±5%; 1 watt.	RC32GF471J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R224	RESISTOR, FIXED, COMPOSITION; 220 ohms, ±5%; 2 watts.	RC42GF221J
R225	RESISTOR, FIXED, COMPOSITION; 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R226	Same as R207.	
R227	RESISTOR, FIXED, COMPOSITION; 4.7 ohms, ±5%; 1/2 watt	RC20GF4R7J
R228	RESISTOR, FIXED, COMPOSITION; 2200 ohms, ±5%; 1/2 watt.	RC20GF222J
T201	TRANSFORMER, AF, DRIVER; frequency range 50-10,000 cps, primary 5K ohms, secondary, 600 ohms.	TF0271
TP201	TERMINAL, STUD.	TE0127-3

A-3638

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C301	CAPACITOR, FIXED, ELECTROLYTIC; 2 ufd, +150% -10%; 25 WVDC.	CE105-2-25
C302	CAPACITOR, FIXED, ELECTROLYTIC; 50 ufd, +150% -10%, 25 WVDC.	CE105-50-25
C303	Same as C301.	
C304	Same as C301.	
C305	CAPACITOR, FIXED, MICA; 240 pf, ±5%; 500 WVDC.	CM111F241J5S
C306	Same as C301.	
C307	Same as C301.	
C308	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C309	CAPACITOR, FIXED, MICA; 750 pf, ±5%; 300 WVDC.	CM111F751J3S
C310	CAPACITOR, FIXED, MICA; 10,000 pf, ±5%; 500 WVDC.	CM112E103J5S
C311	Same as C302.	
C312	CAPACITOR, FIXED, ELECTROLYTIC; 100 ufd, +150% -10%; 25 WVDC.	CE105-100-25
C313	Same as C312.	
C314	CAPACITOR, FIXED, MICA; 9100 pf, ±2%; 500 WVDC.	CM112F912G5S
C315	CAPACITOR, FIXED, MICA; 33 pf, ±5%; 500 WVDC.	CM111E330J5S
C316	Same as C314.	
C317	Same as C302.	
C318	Same as C301.	
C319	Same as C301.	
C320	CAPACITOR, FIXED, CERAMIC; 20,000 pf, +60% -40%; 150 WVDC.	CC100-35
C321 thru C323	Same as C301.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C324	CAPACITOR, FIXED, MICA; 2200 pf, ±1%; 300 WVDC.	CM112F222F3S
C325	Same as C301.	
C326	CAPACITOR, FIXED, MICA; 1500 pf, ±5%; 300 WVDC.	CM112F152J3S
C327	CAPACITOR, FIXED, MICA; 150 pf, ±5%; 500 WVDC.	CM111E151J5S
C328	Same as C310.	
C329	Same as C301.	
C330	Same as C308.	
C331	Same as C320.	
C332	CAPACITOR, FIXED, ELECTROLYTIC; 200 ufd, +150% -10%, 15 WVDC.	CE105-200-15
C333	Same as C302.	
C334	Same as C320.	
C335	Same as C312.	
C337	Same as C332.	
CR301	SEMICONDUCTOR DEVICE, DIODE; Germanium.	1N34A
CR302	SEMICONDUCTOR DEVICE, DIODE; Zener, Glass, Silicon.	1N961
CR303	CAPACITOR, VOLTAGE, VARIABLE; 100 ufd @ 4 VDC; Range 57-260 ufd, Q11.0 @ 4 VDC; 15 WVDC.	CX106-13
CR304	Same as CR302.	
CR305	SEMICONDUCTOR DEVICE, DIODE; Germanium.	1N34A
L301	COIL, FIXED, RF; 10,000 uh, ±10%; Q min 36; .079 MHz.	CL275-103
L302	Same as C302.	
L303	COIL, FIXED, RF; 56,000 uh; ±10%; Q min 25; .079 MHz.	CL275-563
L304	COIL, RF, ADJUST; 13.1mh ±.1mh, Q 250 KHz.	AC180
Q301	TRANSISTOR; Silicon, NPN.	2N706
Q302	Same as Q301.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q303	TRANSISTOR; Germanium.	2N396A
Q304 thru Q309	Same as Q303.	
R301	RESISTOR, FIXED, COMPOSITION; 220 ohms, ±5%; 1/2 watt.	RC20GF221J
R302	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt.	RC20GF101J
R303	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt.	RC20GF102J
R304	RESISTOR, FIXED, COMPOSITION; 3000 ohms, ±5%; 1/2 watt.	RC20GF302J
R305	RESISTOR, FIXED, COMPOSITION; 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R306	RESISTOR, FIXED, COMPOSITION; 1500 ohms, ±5%; 1/2 watt.	RC20GF152J
R307	RESISTOR, FIXED, COMPOSITION; 2200 ohms, ±5%; 1/2 watt.	RC20GF222J
R308	Same as R304.	
R309	Same as R302.	
R310	RESISTOR, FIXED, COMPOSITION; 390 ohms, ±5%; 1/2 watt.	RC20GF391J
R311	Same as R306.	
R312	RESISTOR, FIXED, COMPOSITION; 33,000 ohms, ±5%; 1/2 watt.	RC20GF333J
R313	Same as R303.	
R314	RESISTOR, FIXED, COMPOSITION; 15,000 ohms, ±5%; 1/2 watt.	RC20GF153J
R315	RESISTOR, FIXED, COMPOSITION; 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R316	RESISTOR, FIXED, COMPOSITION; 1800 ohms, ±5%; 1/2 watt.	RC20GF182J
R317	Same as R302.	
R318	Same as R305.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R319	Same as R302.	
R320	Same as R303.	
R321	Same as R302.	
R322	Same as R307.	
R323	Same as R303.	
R324	RESISTOR, FIXED, COMPOSITION; 5600 ohms, ±5%; 1/2 watt	RC20GF562J
R325	Same as R302.	
R326	Same as R305.	
R327	RESISTOR, FIXED, COMPOSITION; 39,000 ohms, ±5%; 1/2 watt.	RC20GF393J
R328	Same as R305.	
R329	RESISTOR, FIXED, COMPOSITION; 18,000 ohms, ±5%; 1/2 watt.	RC20GF183J
R330	RESISTOR, FIXED, COMPOSITION; 2700 ohms, ±5%; 1/2 watt.	RC20GF272J
R331	Same as R301.	
R332	Same as R303.	
R333	RESISTOR, FIXED, COMPOSITION; 8200 ohms, ±5%; 1/2 watt	RC20GF822J
R334	Same as R302.	
R335	Same as R327.	
R336	Same as R303.	
R337	RESISTOR, FIXED, COMPOSITION; 4700 ohms, ±5%; 1/2 watt	RC20GF472J
R338	Same as R302.	
R339	RESISTOR, FIXED, COMPOSITION; 5600 ohms, ±5%; 1/2 watt	RC20GF562J
R340	Same as R303.	
R341	Same as R330.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R342	Same as R306.	
R343	Same as R306.	
R344	RESISTOR, FIXED, COMPOSITION; 3300 ohms, ±5%; 1/2 watt	RC20GF332J
R345	Same as R344.	
R347	Same as R307.	
R348	Same as R307.	
R349	RESISTOR, VARIABLE, COMPOSITION; Tot. Res. 10,000 ohms ±10%; .25 watts.	RV111U103A
T301	TRANSFORMER, AF; Frequency range 100 Hz to 20,000 Hz, primary impedance 10,000 ohms; 1200 ohms DC.	TF0246-14X
T302	TRANSFORMER, AF; Frequency range 50-10,000 Hz; primary 10 K ohms; 1.5 K ohms.	TF0270
T303	Same as T302.	
TP-301 thru TP-304	TERMINAL, STUD;	TE0127-3

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C501	CAPACITOR, FIXED, MICA; 1000 pf, ±5%; 100 WVDC.	CM111F102J1S
C502	CAPACITOR, VARIABLE, CERAMIC;	CV109-9
C503	CAPACITOR, FIXED, CERAMIC; 20,000 pf, +60% -40%; 150 WVDC.	CC100-35
C504	CAPACITOR, FIXED, MICA; 680 pf, ±5%; 500 WVDC.	CM111F681J5S
C505	CAPACITOR, FIXED, MICA; 150 pf, ±5%; 500 WVDC.	CM111F151J5S
C506 thru C508	Same as C503.	
C509	Same as C501.	
C510 thru C512	Same as C503.	
C513	CAPACITOR, FIXED, MICA; 100 pf, ±5%; 500 WVDC.	CM111E101J5S
C514	CAPACITOR, FIXED, MICA; 1000 pf, ±5%; 500 WVDC.	CM112F102J5S
C515	Same as C503.	
C516	CAPACITOR, FIXED, MICA; 2700 pf, ±5%; 500 WVDC.	CM112F272F5S
C517	CAPACITOR, FIXED, MICA; 33 pf, ±5%; 500 WVDC.	CM111E330J5S
C518	CAPACITOR, FIXED, MICA; 8200 pf, ±5%; 300 WVDC.	CM112F822F3S
C519	CAPACITOR, FIXED, MICA; 620 pf, ±5%; 500 WVDC.	CM111F621J5S
C520	Same as C517.	
C521	Same as C516.	
C522	Same as C503.	
C523	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C524	Same as C503.	
C525	Same as C523.	
C526	Same as C523.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C527	CAPACITOR, FIXED, MICA; 82 pf, ±5%; 500 WVDC.	CM111E820J5S
C528	CAPACITOR, FIXED, MICA; 5 pf, ±1%; 500 WVDC.	CM111C050F5S
C529	Same as C502.	
C530	Same as C527.	
C531	Same as C503.	
C532	Same as C503.	
C533	Same as C513.	
C534	Same as C503.	
C535	Same as C503.	
C536	CAPACITOR, FIXED, MICA; 100 pf, ±10%; 500 WVDC.	CM111C100K5S
C537	CAPACITOR, FIXED, MICA; 47 pf, ±5%; 500 WVDC.	CM111E470J5S
C538	Same as C528.	
C539	Same as C502.	
C540	Same as C513.	
C541	Same as C503.	
C542	CAPACITOR, FIXED, MICA; 68 pf, ±5%; 500 WVDC.	CM111E680J5S
C543 thru C546	Same as C503.	
C547	CAPACITOR, FIXED, ELECTROLYTIC; 200 ufd, +150% -10%; 15 WVDC.	CE105-200-15
C548	Same as C547.	
C550	Same as C523.	
C551	Same as C503.	
L501	COIL, RF, ADJUST; 6.3 uh, ±1 uh at 7.9 MHz.	AC183
L502 thru L505	COIL, RF, FIXED; 680 uh, ±10%; Q min 60; .79 MHz.	CL275-681

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L506	COIL, RF, ADJUST; 7.9 MHz - 6.24 KHz, ±5 KHz.	AC185
L507	COIL, RF, ADJUST; 2.5 MHz - 17.85 KHz, ±25 KHz.	AC186
L508	Same as L507.	
Q501	TRANSISTOR; NPN, diffused silicon.	2N706
Q502	Same as Q501.	
Q503 thru Q508	TRANSISTOR; Germanium; PNP.	2N384
R501	RESISTOR, FIXED, COMPOSITION; 4700 ohms, ±5%; 1/2 watt	RC20GF472J
R502	RESISTOR, FIXED, COMPOSITION; 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R503	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt	RC20GF102J
R504	Same as R503.	
R505	RESISTOR, FIXED, COMPOSITION; 10 ohms, ±5%; 1/2 watt.	RC20GF100J
R506	RESISTOR, FIXED, COMPOSITION; 6800 ohms, ±5%; 1/2 watt	RC20GF682J
R507	RESISTOR, FIXED, COMPOSITION, 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R508	Same as R506.	
R509	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt	RC20GF101J
R510	Same as R502.	
R511	Same as R502.	
R512	RESISTOR, FIXED, COMPOSITION; 3300 ohms, ±5%; 1/2 watt	RC20GF332J
R513	RESISTOR, VARIABLE, COMPOSITION; 100 ohms, ±5%; 1 watt	RV113-1
R514	Same as R501.	
R515	RESISTOR, FIXED, COMPOSITION; 47 ohms, ±5%; 1/2 watt.	RC20GF470J
R516	Same as R501.	
R517	Same as R503.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R518	RESISTOR, FIXED, COMPOSITION; 680 ohms, ±5%; 1/2 watt.	RC20GF681J
R519	Same as R503.	
R520	RESISTOR, FIXED, COMPOSITION; 33,000 ohms, ±5%; 1/2 watt.	RC20GF333J
R521	RESISTOR, FIXED, COMPOSITION; 68 ohms, ±5%; 1/2 watt.	RC20GF680J
R522	Same as R506.	
R523	Same as R503.	
R524	Same as R503.	
R525	Same as R509.	
R526	Same as R506.	
R527	Same as R518.	
R528	RESISTOR, FIXED, COMPOSITION; 2200 ohms, ±5%; 1/2 watt.	RC20GF222J
R529	Same as R509.	
R530	Same as R507.	
R531	Same as R515.	
R532	Same as R501.	
R533	Same as R509.	
R534	Same as R503.	
R535	Same as R515.	
R536	Same as R512.	
T501	TRANSFORMER, RF, ADJUST; operating freq: 7.96 MHz, ±25 KHz.	TT229
T502	TRANSFORMER, RF, ADJUST; operating freq: 7.96 MHz, ±25 KHz.	TT230
T503	TRANSFORMER, RF, ADJUST; operating freq: 7.9 MHz, 6.24 KHz, ±5 MHz.	TT231

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T504	TRANSFORMER, RF, ADJUST; operating freq: 2.5 MHz, 10.1 KHz ±4 MHz.	TT232
TP501 thru TP506	TERMINAL, STUD;	TE0127-3
Y501 thru Y503	CRYSTAL UNIT, QUARTZ-6.5 mc;	CR116

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C601	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C602	Same as C601.	
C603	Same as C601.	
C604	CAPACITOR, FIXED, CERAMIC; 20,000 pf, +60% -40%; 150 WVDC.	CC100-35
C605	Same as C601.	
C606	CAPACITOR, FIXED, MICA; 100 pf, ±1%; 500 WVDC.	CM111F101F5
C607	CAPACITOR, FIXED, ELECTROLYTIC; 2 ufd, +150% -10%; 25 WVDC.	CE105-2-25
C608 thru C611	Same as C601.	
C612 thru C617	Same as C607	
C618	Same as C601.	
C619	Same as C601.	
C620	Same as C607	
C621	Same as C607.	
C623	CAPACITOR, FIXED, ELECTROLYTIC: 50 UFD: +50%; 25 WVDC.	CE105-50-25
C624 thru C627	Same as C607.	
C628	Same as C601.	
C629	Same as C607.	
C630	Same as C601.	
C631	CAPACITOR, FIXED, ELECTROLYTIC; 100 ufd, +150% -10%; 25 WVDC.	CE105-100-25
C632	Same as C631.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C633	Same as C604.	
C634	CAPACITOR, FIXED, MICA; 150 pf, ±1%; 500 WVDC.	CM111F151F5
C630	Same as C601.	
CR601 thru CR604	SEMICONDUCTOR DEVICE, DIODE; Germanium.	1N34A
CR605	SEMICONDUCTOR DEVICE, DIODE; Silicon.	1N463
CR606	SEMICONDUCTOR DEVICE, DIODE; Zener.	VR103-1A
CR607	Same as CR601.	
CR608	Same as CR601.	
CR609	SEMICONDUCTOR DEVICE, DIODE; Zener.	1N957B
CR610	SEMICONDUCTOR DEVICE, DIODE; Zener, glass, silicon.	1N961
Q601 thru Q605	TRANSISTOR; Germanium, PNP.	2N384
Q606	TRANSISTOR; Silicon, NPN.	2N706
Q607	TRANSISTOR; Silicon, PNP.	2N863
Q608	Same as Q606.	
Q609	Same as Q601.	
Q610 thru Q614	Same as Q606.	
Q615	Same as Q607.	
Q616	Same as Q607.	
Q617	Same as Q606.	
R601	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt.	RC20GF101J
R602	RESISTOR, FIXED, COMPOSITION; 47 ohms, ±5%; 1/2 watt.	RC20GF470J
R603	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt	RC20GF102J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R604	Same as R603.	
R605	Same as R602.	
R606	RESISTOR, FIXED, COMPOSITION; 3300 ohms, ±5%; 1/2 watt	RC20GF332J
R607	RESISTOR, FIXED, COMPOSITION; 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R608	Same as R607.	
R609	Same as R602.	
R610	Same as R606.	
R611	RESISTOR, FIXED, COMPOSITION; 150 ohms, ±5%; 1/2 watt	RC20GF151J
R612	Same as R602.	
R613	Same as R607.	
R614	RESISTOR, FIXED, COMPOSITION; 2200 ohms, ±5%; 1/2 watt	RC20GF222J
R615	RESISTOR, FIXED, COMPOSITION; 15,000 ohms, ±5%; 1/2 watt.	RC20GF153J
R616	RESISTOR, FIXED, COMPOSITION; 150,000 ohms, ±5%; 1/2 watt.	RC20GF154J
R617	Same as R603.	
R618	Same as R601.	
R619	Same as R601.	
R620	RESISTOR, FIXED, COMPOSITION; 470 ohms, ±5%; 1/2 watt	RC20GF471J
R621	RESISTOR, FIXED, COMPOSITION; 6800 ohms, ±5%; 1/2 watt.	RC20GF682J
R622	Same as R607.	
R623	Same as R602.	
R624	Same as R607.	
R625	Same as R607.	
R626	Same as R601.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R627	Same as R621.	
R628	Same as R620.	
R629	Same as R620.	
R630	Same as R621.	
R631	RESISTOR, FIXED, COMPOSITION; 5600 ohms, ±5%; 1/2 watt	RC20GF562J
R632	Same as R620.	
R633	Same as R603.	
R634	RESISTOR, FIXED, COMPOSITION; 100,000 ohms, ±5%; 1/2 watt.	RC20GF104J
R635	Same as R607.	
R636	Same as R603.	
R637	RESISTOR, VARIABLE, COMPOSITION; TOT RES 10,000 ohms, ±10%; .25 watts.	RV111U103A
R638	Same as R601.	
R639	Same as R615.	
R640	RESISTOR, FIXED, COMPOSITION; 1200 ohms, ±5%; 1/2 watt.	RC20GF122J
R641	Same as R606.	
R642	RESISTOR, FIXED, COMPOSITION; 68 ohms, ±5%; 1/2 watt.	RC20GF680J
R643	Same as R603.	
R644	Same as R606.	
R645	RESISTOR, FIXED, COMPOSITION; 33 ohms, ±5%; 1/2 watt.	RC20GF330J
R646	Same as R637.	
R647	Same as R603.	
R648	Same as R603.	
R649	Same as R601.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R650	Same as R621.	
R652	Same as R637.	
R654	RESISTOR, FIXED, COMPOSITION; 33,000 ohms, ±5%; 1/2 watt.	RC20GF333J
R655	Same as R601.	
R657	Same as R601.	
R658	RESISTOR, FIXED, COMPOSITION; 12,000 ohms, ±5%; 1/2 watt.	RC20GF123J
R659	Same as R615.	
R660	Same as R602.	
R661	Same as R614.	
R663	Same as R602.	
R664	Same as R607.	
R665	RESISTOR, FIXED, COMPOSITION; 22,000 ohms, ±5%; 1/2 watt.	RC20GF223J
R666	Same as R665.	
R667	Same as R614.	
R668	RESISTOR, FIXED, COMPOSITION; 4700 ohms, ±5%; 1/2 watt	RC20GF472J
R669	Same as R607.	
T601	TRANSFORMER, RF, ADJUST; 5.75uh (.05-7.9)	TT220
T602	TRANSFORMER, RF, ADJUST; 10,000 ohms, frequency range: 100 cps to 20 kc.	TF0246-14X
TP601 thru TP606	TERMINAL, STUD;	TE0127-3
Y601	FILTER, 6.4 MC	FX198

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C401	CAPACITOR, FIXED, CERAMIC; 20,000 pf, +60% -40%; 150 WVDC.	CC100-35
C402	CAPACITOR, FIXED, ELECTROLYTIC; 2 ufd, +150% -10%; 50 WVDC.	CE105-2-50
C403	CAPACITOR, FIXED, CERAMIC; 10,000 pf, ±20%; 50 WVDC.	CC100-42
C404	Same as C402.	
C405	Same as C403.	
C406	Same as C403.	
C407	Same as C402.	
C408	Same as C401.	
C409	Same as C402.	
C410	Same as C403.	
C411	Same as C403.	
C412	CAPACITOR, FIXED, MICA; 100 pf, ±1%; 500 WVDC.	CM111F101F5S
C413	CAPACITOR, FIXED, MICA; 1000 pf, ±1%; 100 WVDC.	CM112F102F1S
C420	Same as C402.	
C421	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C422	CAPACITOR, FIXED, PLASTIC; 10,000 pf, ±1%; 30 WVDC.	CX104-77
C423	CAPACITOR, FIXED, MICA; 33 pf, ±2%; 500 WVDC.	CM111F330G5S
C424	Same as C422.	
C425	Same as C402.	
C431	Same as C402.	
C432	Same as C421.	
C434	Same as C432.	
C435	Same as C402.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C436	Same as C402.	
C437	Same as C402.	
C438	Same as C421.	
C439	Same as C402.	
C440	Same as C402.	
C441	Same as C422.	
C442	Same as C421	
C443	Same as C421.	
C444	Same as C402.	
C445	Same as C421.	
C446	Same as C421.	
C447	Same as C421.	
C450	Same as C402.	
C451	Same as C421.	
C452	Same as C402.	
C453	CAPACITOR, FIXED, MICA; 250 pf, ±5%; 500 WVDC.	CM111F251J5S
C454	Same as C453.	
C455	Same as C421.	
C456	Same as C402.	
C457	Same as C453.	
C458	Same as C402.	
C459	Same as C421.	
L401	COIL, RF, ADJUST; Nom 261.3 uh, (46.1-282.7) Q40; 100 KHz.	AC221-1
L403	COIL, RF, ADJUST; Nom 275 uh (240-265) Q 325; 100 KHz	AC222-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L405	COIL, RF, FIXED; 10,000 uh, ±10%; Q min 36; .079 MHz.	CL275-103
L406	Same as L405.	
L407	COIL, RF, ADJUST; 6.3 uh, ±1%; 6.5 MHz.	AC223-1
L408	Same as L405.	
Q401	TRANSISTOR; Silicon, NPN.	2N706
Q403	Same as Q401.	
Q407 thru Q413	Same as Q401.	
Q416	Same as Q401.	
Q417	Same as Q401.	
R401	RESISTOR, FIXED, COMPOSITION; 150 ohms, ±5%; 1/2 watt.	RC20GF151J
R402	Same as R401.	
R403	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt	RC20GF102J
R404	RESISTOR, FIXED, COMPOSITION; 47 ohms.	RC20GF470J
R405	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt.	RC20GF101J
R406	RESISTOR, FIXED, COMPOSITION; 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R407	RESISTOR, FIXED, COMPOSITION; 6800 ohms, ±5%, 1/2 watt	RC20GF682J
R408	Same as R405.	
R409	RESISTOR, FIXED, COMPOSITION; 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R410	Same as R403.	
R416	Same as R403.	
R417	Same as R409.	
R418	RESISTOR, FIXED, COMPOSITION; 68,000 ohms, ±5%; 1/2 watt.	RC20GF683J
R419	RESISTOR, FIXED, COMPOSITION; 100,000 ohms, ±5%; 1/2 watt.	RC20GF104J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R420	Same as R405.	
R421	Same as R403.	
R422	Same as R407.	
R423	RESISTOR, FIXED, COMPOSITION; 4700 ohms, ±5%; 1/2 watt	RC20GF472J
R430	Same as R407.	
R431	Same as R407.	
R432	RESISTOR, FIXED, COMPOSITION; 120 ohms, ±5%; 1/2 watt.	RC20GF121J
R433	Same as R423.	
R434	Same as R406.	
R435	Same as R403.	
R436	Same as R423.	
R437	Same as R403.	
R438	Same as R406.	
R439	Same as R418.	
R440	Same as R423.	
R441	RESISTOR, FIXED, COMPOSITION; 12,000 ohms, ±5%; 1/2 watt.	RC20GF123J
R442	RESISTOR, VARIABLE, COMPOSITION; 5000 ohms, ±10%; .25 watts.	RV111U502A
R443	Same as R403.	
R444	Same as R406.	
R445	RESISTOR, FIXED, COMPOSITION; 5600 ohms, ±5%; 1/2 watt	RC20GF562J
R446	RESISTOR, FIXED, COMPOSITION; 8200 ohms, ±5%; 1/2 watt	RC20GF822J
R451	Same as R403.	
R452	RESISTOR, FIXED, COMPOSITION; 3900 ohms, ±5%; 1/2 watt	RC20GF392J
R453	Same as R423.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R454	RESISTOR, FIXED, COMPOSITION; 220 ohms, ±5%; 1/2 watt.	RC20GF221J
R455	Same as R406.	
R456	Same as R405.	
R457	Same as R406.	
R458	Same as R454.	
R459	Same as R403.	
R460	Same as R452.	
R461	Same as R452.	
T401	TRANSFORMER, RF, ADJUST; Nom 10 uh, (9.944-11.50) Q 250; 100 KHz.	TT291-1
T403	TRANSFORMER, RF, ADJUST; Nom 275 uh, (239.7-264.3) Q 325; 100 KHz.	TT292-1
T404	TRANSFORMER, RF, ADJUST; Nom 263.8 uh (245.5-270) Q 310; 100 KHz.	TT293-1
TP401	TERMINALS, STUD;	TE0127-2
TP402 thru TP408	Same as TP401.	

A4604-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C701	Capacitor, Fixed, Mica; 3900 pf, ±2%; 500 WVDC	CM112F392G5S
C702	Capacitor, Fixed, Mica; 22,000 pf, ±1%; 300 WVDC	CM112F223F1S
C703	Capacitor, Fixed, Electrolytic; 2 UFD, +150% -10%; 50 WVDC.	CE105-2-50
C704	Same as C703.	
C705	Same as C703.	
C706	Capacitor, Fixed, Ceramic; 100,000 pf, +80% -20%; 100 WVDC.	CC100-28
C707	Same as C703	
C708	Same as C701	
C709	Same as C702	
C710	Same as C706	
C711	Same as C703	
C712	Same as C706	
C713	Same as C703	
C714	Same as C703	
C715	Same as C701	
C716	Same as C702	
C717	Same as C703	
C718	Same as C706	
C719	Same as C703	
C720	Same as C703	
C721	Same as C703	
C722	Same as C706	
C723	Same as C703	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C724	Same as C703	
C725	Same as C703	
CR701	Silicon	IN627
CR702	Same as CR701	
L701	Coil, RF, Fixed; Nom 194UH, (181.8-201.7) Q60; 10KHz.	CL421-1
L702	Same as L701	
L703	Same as L701	
Q701	Transistor, Germanium	2N396A
Q702	Same as Q701	
Q703	Same as Q701	
Q704	Same as Q701	
Q705	Transistor; Silicon PNP	2N863
Q706	Same as Q705	
Q707	Same as Q705	
R701	Resistor, Fixed, Composition; 1000 ohms, ±5%; 1/2 W.	RC07GF102J
R702	Same as R701	
R703	Resistor, Fixed, Composition: 4700 ohms, ±5%; 1/2 W.	RC20GF472J
R704	Resistor, Fixed, Composition 10 Ohms, ±5%; 1/2 W.	RC20GF100J
R705	Resistor, Fixed, Composition; 3300 ohms, ±5%; 1/2 W.	RC20GF333J
R706	Resistor, Fixed, Composition; 220 ohms, ±5%; 1/2 W.	RC20GF221J
R707	Same as R701	
R708	Same as R701	
R709	Resistor, Fixed, Composition; 22 ohms, ±5%; 1/2 W.	RC20GF220J
R710	Resistor, Fixed, Composition; 8200 ohms, ±5%; 1/2 W.	RC20GF822J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R711	Same as R710	
R712	Same as R706	
R713	Resistor, Fixed, Composition; 68,000 ohms, ±5%; 1/2 W.	RC20GF683J
R714	Same as R701	
R715	Same as R701	
R716	Same as R709	
R717	Same as R710	
R718	Resistor, Fixed, Composition; 18000 ohms, ±5%; 1/2 W.	RC20GF183J
R719	Same as R706	
R720	Resistor, Fixed, Composition; 100 ohms, ±5% 1/2 W.	RC20GF101J
R721	Same as R701	
R722	Same as R701	
R723	Same as R701	
R724	Resistor, Fixed, Composition; 56 ohms, ±5%; 1/2 W.	RC20GF560J
R725	Resistor, Fixed, Composition; 3300 ohms, ±5%; 1/2 W.	RC20GF332J
R726*	Resistor, Fixed, Composition;	RC20GFXXXJ
R727*	Same as R726	
TP701	Terminal, Stud;	TE-0127-2
TP702	Same as TP701	

*NOTE: Value of R726, R727, and R728 is determined by test.

RF Amplifier Band 2

A4604-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C801	CAPACITOR, FIXED, MICA: 1800 pf, ±5%, 500 wvdc	CM112F182J5S
C803	CAPACITOR, FIXED, ELECTROLYTIC: 2 ufd, +150% -10%; 50wvdc	CE105-2-50
C804	Same as C803.	
C805	Same as C803.	
C806	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 wvdc.	CC100-28
C807	Same as C803.	
C808	Same as C801.	
C810	Same as C806.	
C811	Same as C803.	
C812	Same as C806.	
C813	Same as C803.	
C814	Same as C803.	
C815	Same as C801.	
C817	Same as C803.	
C818	Same as C806.	
C819	Same as C803.	
C820	Same as C803.	
C821	Same as C803.	
C622	Same as C806.	
C823	Same as C803.	
C824	Same as C803.	
C825	Same as C803.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR801	SEMICONDUCTOR DEVICE, DIODE; silicon.	1N627
CR802	Same as CR801.	
L801	COIL, RF, FIXED; Nom 348.8 uh, (345.0-381.2) Q60; kHz.	CL421-2
L802	Same as L801.	
L803	Same as L801.	
L804	Same as L801.	
Q801	TRANSISTOR; silicon, PNP	2N863
Q802	Same as Q801.	
Q803	Same as Q801.	
Q804	Same as Q801.	
Q805	Same as Q801.	
Q806	Same as Q801.	
Q807	Same as Q801.	
R801	RESISTOR, FIXED, COMPOSITION; 1000 ohms, ±5%; 1/2 watt.	RC20GF102J
R802	Same as R801.	
R803	RESISTOR, FIXED, COMPOSITION; 4700 ohms, ±5%; 1/2 watt.	RC20GF472J
R804	RESISTOR, FIXED, COMPOSITION; 10 ohms, ±5%; 1/2 watt.	RC20GF100J
R805	RESISTOR, FIXED, COMPOSITION; 33,000 ohms, ±5%; 1/2 watt.	RC20GF333J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R806	RESISTOR, FIXED, COMPOSITION; 220 ohms, ±5%; 1/2 watt.	RC20GF221J
R807	Same as R801.	
R808	Same as R801.	
R809	RESISTOR, FIXED, COMPOSITION; 22 ohms, ±5%; 1/2 watt.	RC20GF220J
R810	RESISTOR, FIXED, COMPOSITION; 8200 ohms, ±5%; 1/2 watt.	RC20GF822J
R811	Same as R810.	
R812	Same as R806.	
R813	RESISTOR, FIXED, COMPOSITION; 68,000 ohms, ±5%; 1/2 watt.	RC20GF683J
R814	Same as R801.	
R815	Same as R801.	
R816	Same as R809.	
R817	Same as R810.	
R818	RESISTOR, FIXED, COMPOSITION; 18,000 ohms ±5%; 1/2 watt.	RC20GF183J
R819	Same as R806.	
R820	RESISTOR, FIXED, COMPOSITION; 100 ohms, ±5%; 1/2 watt.	RC20GF101J
R821	Same as R801.	
R822	Same as R801.	
R823	Same as R801.	
R824	RESISTOR, FIXED, COMPOSITION; 56 ohms, ±5%; 1/2 watt.	RC20GF560J
R825	RESISTOR, FIXED, COMPOSITION; 3300 ohms, ±5%; 1/2 watt.	RC20GF332J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R826*	RESISTOR, FIXED, COMPOSITION;	RC20GF J
R827*	Same as R826.	
R828*	Same as R826.	
TP801	TERMINAL, STUD;	TE0127-2
TP802	Same as TP801.	

*NOTE: Value of R826, R827 and R828 is determined by test.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1001	CAPACITOR, FIXED, MICA: 3300pf, ±5%; 500 WVDC.	CM112F332J5S
C1002	CAPACITOR, FIXED, MICA: 22000 pf, ±5%; 500 WVDC.	CM112F223J5S
C1003	CAPACITOR, FIXED, ELECTROYLIC: 2 ufd, +150%,-10%; 50 WVDC.	CE105-2-50
C1004	Same as C1003	
C1005	Same as C1003	
C1006	CAPACITOR, FIXED, CERAMIC: 100,000pf ±80%-20%; 100 WVDC.	CC100-28
C1007	Same as C1003	
C1008	Same as C1001	
C1009	Same as C1002	
C1010	Same as C1006	
C1012	Same as C1006	
C1013	Same as C1003	
C1014	Same as C1003	
C1015	Same as C1001	
C1016	Same as C1002	
C1017	Same as C1003	
C1018	Same as C1006	
C1019	Same as C1003	
C1020	Same as C1003	
C1021	Same as C1003	
C1022	Same as C1006	
C1023	Same as C1003	
C1024	Same as C1003	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1025	Same as C1003	
CR1001	Semiconductor Device Diode; Silicon.	IN627
CR1002	Same as CR1001	
L1001	Coil, RF, Fixed;	CL421-3
L1002	Same as L1001	
L1003	Same as L1001	
Q1001	Transistor; Germanium.	2N396A
Q1002	Same as Q1001	
Q1003	Same as Q1001	
Q1004	Same as Q1001	
Q1005	Transistor; Silicon, PNP.	2N863
Q1006	Same as Q1005	
Q1007	Same as Q1005	
R1001	Resistor, Fixed, Composition; 1000 ohms, ±5%; 1/2 W.	RC20GF102J
R1002	Same as R1001	
R1003	Resistor, Fixed, Composition; 4700 ohms, ±5%; 1/2 W.	RC20GF472J
R1005	Resistor, Fixed, Composition; 33000 ohms, +5%; ½ W.	RC20GF333J
R1006	Resistor, Fixed, Composition; 220 ohms, ±5%; 1/2 W.	RC20GF221J
R1007	Same as R1001	
R1008	Same as R1007	
R1009	Resistor, Fixed, Composition; 22 ohms, ±5%; 1/2 W.	RC20GF220J
R1010	Resistor, Fixed, Composition; 8200 ohms, ±5%; 1/2 W.	RC20GF822J
R1011	Same as R1010	
R1012	Same as R1006	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1013	Resistor, Fixed, Composition; 68000 ohms, ±5%; 1/2W.	RC20GF683J
R1014	Same as R1001	
R1015	Same as R1001	
R1016	Same as R1009	
R1017	Same as R1010	
R1018	Resistor, Fixed, Composition; 18000 ohms, ±5%; 1/2 W.	RC20GF183J
R1019	Same as R1006	
R1021	Same as R1001	
R1022	Same as R1001	
R1023	Same as R1001	
R1024	Resistor, Fixed, Composition; 100 ohms, ±5%; 1/2 W.	RC20GF101J
R1025	Resistor, Fixed, Composition; 3300 ohms, ±5%; 1/2 W.	RC20GF332J
R1026*	Resistor, Fixed, Composition;	RC20GFXXXJ
R1027*	Same as R1026	
R1028*	Same as R1026	
TP1001	Terminal, Stud;	TE0127-2
TP1002	Same as TP1001	

*NOTE: Value for R1026, R1027 and R1028 is determined by test.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C901	CAPACITOR, FIXED, ELECTROLYTIC; 2 ufd, +150% -10%, 50 wvdc.	CE105-2-50
C902	Same as C901.	
C903	CAPACITOR, FIXED, MICA; 20,000 pf, ±2%; 500 wvdc.	CM112F203G5S
C904	CAPACITOR, FIXED, MICA; 330 pf, ±2%; 500 wvdc.	CM111F331G5S
C905	Same as C904.	
C906	CAPACITOR, FIXED, MICA; 3900 pf, ±1%; 300 wvdc.	CM112F392F3S
C907	Same as C903.	
C908	CAPACITOR, FIXED, CERAMIC; 100,000 pf, +80% -20%; 100 wvdc.	CC100-28
C909	Same as C901.	
C910	CAPACITOR, FIXED, MICA; 10,000 pf, ±1%; 100 wvdc.	CM112F103F1S
C911	CAPACITOR, FIXED, MICA; 270 pf, ±1%; 500 wvdc.	CM111F271F5S
C912	Same as C911.	
C913	CAPACITOR , FIXED, MICA; 2200 pf, ±1%; 500 wvdc.	CM112F222F5S
C914	Same as C910.	
C915	Same as C908.	
C916	Same as C901.	
C917	CAPACITOR, FIXED, MICA; 8200 pf, , ±1%; 500 wvdc.	CM112F822F5S
C918	CAPACITOR, FIXED, MICA; 180 pf, ±2%; 500 wvdc.	CM111F181G5S
C919	Same as C918.	
C920	CAPACITOR, FIXED, MICA; 1500 pf, ±1% 500 wvdc.	CM112F152F5S
C921	Same as C908.	
C922	Same as C908.	
C923	Same as C901.	
C924	Same as C901.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C925	Same as C901.	
C926	CAPACITOR, FIXED, MICA; 47 pf, ±2%; 500 wvdc.	CM111E470G5S
C927*	CAPACITOR, FIXED, MICA;	CM111FXXXXXX
C928	CAPACITOR, FIXED, MICA; 120 pf, ±2%; 500 wvdc.	CM111F121G5S
C929	Same as C917.	
C930	CAPACITOR, VARIABLE, CERAMIC; min 8 ufd, max 50 ufd min Q500; 1 MHz.	CV109-9
C931	Same as C930.	
C932	Same as C930.	
CR901	SEMICONDUCTOR DEVICE, DIODE; Zener, Glass Silicon	1N961B
CR902	CAPACITOR, VOLTAGE, VARIABLE; Silicon, 100 ufd at 4 vdc; Range 57 - 260 ufd; Q11.0 at 4 vdc; 15 wvdc.	CX106-13
CR903	Same as CR902.	
CR904	Same as CR902.	
L901	COIL, RF, FIXED; nom. 1.610 uh (1.48 - 1.625), Q200; 100 KHz.	CL422-1
L902	COIL, RF, FIXED; nom. 1.60 uh (1.548 - 1.706) Q200; 100 KHz.	CL422-2
L903	COIL, RF, FIXED; nom. 1.13 uh (1.050 - 1.162) Q200; 100 KHz.	CL422-3
L904	COIL, RF, FIXED; nom. 831uh, (797-879.5)	CL423-1
L905	COIL, RF, FIXED; nom. 1.426 uh (1.358 - 1.491) Q200; 100 KHz.	CL424-1
L906	COIL, RF, FIXED; nom. 1.615 uh (1.533 - 1.7) Q200; 100 KHz.	CL424-2
Q901	TRANSISTOR; Silicon, NPN	2N706
Q902	Same as Q901.	
Q903	Same as Q901.	

*NOTE; Value of C927 is determined by test.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q904	Same as Q901.	
R901	RESISTOR, FIXED, COMPOSITION; 330 ohm, ±5%; 1/2w	RC20GF331J
R902	RESISTOR, FIXED, COMPOSITION: 100,000 ohm, ±5%; 1/2w	RC20GF104J
R903	Same as R902.	
R904	RESISTOR, FIXED, COMPOSITION; 470 ohm, ±5%; 1/2w	RC20GF471J
R905	RESISTOR, FIXED, COMPOSITION; 180 ohm, ±5%; 1/2w.	RC20GF181J
R906	RESISTOR, FIXED, COMPOSITION; 4700 ohm, ±5%; 1/2w.	RC20GF472J
R907	RESISTOR, FIXED, COMPOSITION; 2200 ohms, ±5%; 1/2w	RC20GF222J
R908	Same as R902.	
R909	RESISTOR, FIXED, COMPOSITION; 10,000 ohm, ±5%; 1/2w.	RC20GF103J
R910	RESISTOR, FIXED, COMPOSITION; 27,000 ohm, ±5%; 1/2w.	RC20GF273J
R911	Same as R906.	
R912	Same as R905.	
R913	Same as R907.	
R914	Same as R902.	
R915	Same as R909.	
R916	RESISTOR, FIXED, COMPOSITION; 33,000 ohm, ±5%; 1/2w.	RC20GF333J
R917	Same as R906.	
R918	Same as R905.	
R919	Same as R907.	
R920	Same as R902.	
R921	Same as R909.	
R922	Same as R916.	
R923	RESISTOR, FIXED, COMPOSITION; 100 ohm, ±5%; 1/2w.	RC20GF101J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R924	RESISTOR, FIXED, COMPOSITION; 1000 ohm, ±5%; 1/2w.	RC20GF102J
R925	RESISTOR, FIXED, COMPOSITION; 150 ohm, ±5%; 1/2w.	RC20GF151J
R926	Same as R924.	
R927	Same as R902.	
TP901	TERMINAL, STUD;	TE0127-2

VLRC-1 SUB-ASSEMBLY

A4606

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C101	CPACITOR, FIXED, ELECTROLYTIC; 1,700 pf; 75 wvdc	CE112-2N
CR101	SEMICONDUCTOR DEVICE, DIODE; Silicon, Zener	VR101-24S51
CR102	SEMICONDUCTOR DEVICE, DIODE; Silicon	1N2976B
CR103	SEMICONDUCTOR DEVICE, DIODE; Germanium	1N2978R8
CR104	SEMICONDUCTOR DEVICE, DIODE; Silicon	1N2484
DS101	LAMP, INCANDESCENT; 28 volts, 0104 amp, bayonet base.	BI101-1819
DS102	Same as DS101.	
E101	TERMINAL STRIP BARRIER; 5 Terminals	TM100-5
E102	TERMINAL STRIP INSERT; Red	TM128-1-2
E103	TERMINAL STRIP INSERT; Orange	TM128-1-3
E104	TERMINAL STRIP INSERT; Yellow	TM128-1-4
E105	TERMINAL STRIP INSERT; Finish-Gold, Color-Green	TM126-10
F101	FUSE, CARTRIDGE; 1/2 amp: 115 volt AC	FU100-.500
F102	Same as F101.	
F103	Same as F101.	
J111	CONNECTOR, RECEPTACLE, MALE; 3 number 16 contacts	MS3102A14S1P
J112	CONNECTOR, RECEPTACLE, MALE; 4 contacts	MS3102A14S2P
J113 thru J120	CONNECTOR, RECEPTACLE, RF; 1 round female contact; straight type; series BNC.	JJ172
J121	JACK, TELEPHONE;	JJ034
J201 thru J205	CONNECTOR, RECEPTACLE, FEMALE; 3 amp, 1800 RMS, 22 contacts.	JJ293-22SFE
K101	RELAY, ALARM; DPDT, 700 ohms, ±10% DC, operations voltage 24 vdc.	RL156-1
K202	Same as K101.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M101	METER, INDICATOR; Movement 50 pf, Approximate Resistance 2000 ohms.	MR181
Q101	TRANSISTOR; Germanium	2N2143
Q102	Same as Q101.	
Q103	Same as Q101.	
R101	RESISTOR, FIXED, WIREWOUND; 100 ohms, current rating 223 ma; 5 watts.	RW107-18
R102	Same as R101.	
R103	RESISTOR, FIXED, COMPOSITION; 68000 ohms, ±5%, 1/2w.	RC20GF683J
R229	RESISTOR, VARIABLE, COMPOSITION; Total 500 ohm, ±10%; 2w.	RV4NAYSG501A
R230	Same as R229.	
R350	RESISTOR, VARIABLE, COMPOSITION; Total 25,000 ohms, ±10%, 2w.	RV4NAYSD253A
R537	RESISTOR, VARIABLE, COMPOSITION; Total 10,000 ohms, ±10%, 2w.	RV4NAYSG103A
S101	SWITCH, ROTARY; 1 Sec, 12 Contacts, 30% of throw.	SW362
S102	SWITCH, ROTARY; 1 Sec, 12 Contacts, 30% of throw.	SW365
S103	Same as S101.	
S104	SWITCH, ROTARY; 2 Sec, 12 Contacts, 30% of throw.	SW364
S106	SWITCH, TOGGLE-DPDT; 3 amp, 250 volts.	ST22N
S107	SWITCH, TOGGLE-DPST; 28¼ angle of throw.	ST22K
S108	Same as S107.	
S109	Same as S106.	
T101	TRANSFORMER, POWER-STEP DOWN; Primary input 105, 115, 125 or 210, 230, 250 volts; 50/60 cps	TF0269

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T102	TRANSFORMER, RF; 500 ohms, Current Range 50 to 16,000 cps.	TF0272
XDS101	LIGHT, INDICATOR-Green: Frosted Lens	TS106-3
XDS102	LIGHT, INDICATOR-Red: Frosted Lens	TS106-1
XF101	FUSEHOLDER; 15 amp, 250 volts.	FH103
XF102	Same as XF101.	
XF103	Same as XF101.	
XK101	SOCKET, RELAY; 12 Contacts	TS171-1
XK202	Same as XK101.	
XQ101	SOCKET, SEMICONDUCTOR DEVICE; 7 pin contact accomodation: 0.040 or 0.050 dia.	TS166-1
XQ102	Same as XQ101.	
XQ103	Same as XQ101.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS103	LAMP, INCANDESCENT; 5 to 6 volts, 0.063 amps.	BI114-2
DS104	Same as DS103	
DS105	Same as DS103	
DS106	Same as DS103	
J211-1	CONNECTOR, RECEPTACLE, FEMALE; 11 Contacts	JJ321-11SF
J212-1	CONNECTOR, RECEPTACLE, FEMALE; 7 Contacts	JJ321-7SF
J214-1	Same as J212-1	
J215-1	Same as J212-1	
MP101	CLUTCH, FRICTION	CZ101
P201	CONNECTOR, PLUG, RF, BNC; 1 Male Contact; Operations Voltage 500V	PL244-1
S105	SWITCH, ROTARY; 4 Sec, 12 Contacts, 30% of Throw	SW363

FIL, LP, 40KC

FX-211

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, METALLIZED; .15 mfd, 200 wvdc, ± .031.	CN112A154F1
C2	CAPACITOR, FIXED, METALLIZED; .1 mfd, 200 wvdc,	CN112A104F1
C3	Same as C1.	
J1	CONNECTOR, RECEPTACLE-BNC; female, 1 contact, chassis type.	UG625/U
J2	Same as J1.	
L1	COIL, RF, FIXED; inductance, 790 kHz, 360 uh	CL350
L2	COIL, RF, FIXED; inductance, 2.52 mhz	CL351
L3	Same as L2.	
L4	Same as L1.	

RF MODULATOR BAND 1

AX690

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J207	CONNECTOR, RECEPTACLE, FEMALE; 22 contacts.	JJ293-22SFE
P212	CONNECTOR, RECEPTACLE, FEMALE; 7 contacts.	JJ321-7P
T701	TRANSFORMER, RF;	TT289-1
T702	TRANSFORMER, RF:	TT290-3
T703	Same as T702.	

RF MODULATOR BAND 2

AX691

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J208	CONNECTOR, RECEPTACLE, FEMALE; 22 contacts.	JJ293-22SFE
J214	CONNECTOR, PLUG, MALE; 7 contacts.	JJ321-7P
T801	TRANSFORMER, RF;	TT289-2
T802	TRANSFORMER, RF;	TT290-1
T803	Same as T802.	

RF MODULATOR BAND 3

AX692

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J209	CONNECTOR, RECEPTACLE, FEMALE; 22 contacts.	JJ293-22SFE
J215	CONNECTOR, PLUG, MALE; 7 contacts.	JJ321-7P
T1001	TRANSFORMER, RF;	TT289-3
T1002	TRANSFORMER, RF;	TT290-2
T1003	Same as T1002.	

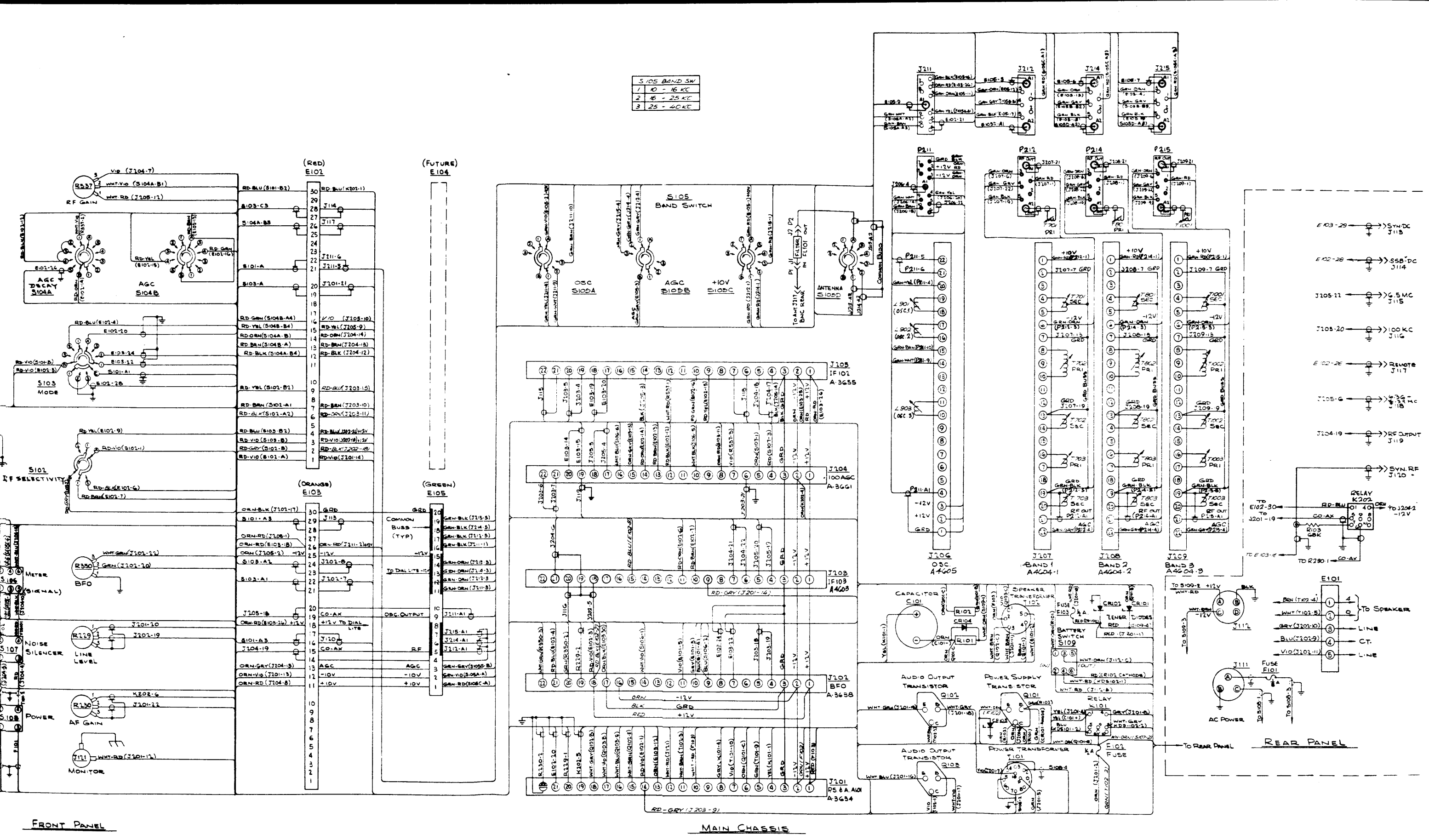
OSCILLATOR MODULE

AX693

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J206	CONNECTOR, RECEPTACLE, FEMALE; 22 contacts.	JJ293-22SFE
L901	TRANSFORMER, RF;	AC219-1
L902	Same as L907	
L903	Same as L907	
P206	CONNECTOR, RECEPTACLE, MALE; 11 contacts.	JJ321-11P

SECTION 7

SCHEMATIC DIAGRAMS



CK-1391C

Figure 7-1. Receiver Wiring Diagram 7-2

S101 SYNTH	
1	OFF
2	TUNE
3	ON

SK2 I.F SEL	
1	.1KC
2	.5KC

S103 MODE	
1	MCW
2	CW
3	SSB

S104 AGC	
1	MAN
2	FAST
3	MED
4	SLOW
5	RMTE

S105 BAND SW	
1	10 - 16 KC
2	16 - 25 KC
3	25 - 40 KC

S101 SYNTH.

S102 RF SELECTIVITY

S103 MODE

AGC DECAY S104A

AGC S104B

RF GAIN R337

METER M101

S106 METER (SIGNAL)

S107 NOISE SILENCER

S108 POWER

BATTERY LAMP XDS102

POWER ON LAMP XDS101

R350 BFO

R219 LINE LEVEL

R230 AF GAIN

J111 MONITOR

(RED) E101

(ORANGE) E103

(FUTURE) E104

(GREEN) E105

Common Buss (TYP)

OSC OUTPUT

S105 BAND SWITCH

OSC S105A

AGC S105B

+10V S105C

ANTENNA S105D

J211

P211

J105 IF 101 A-3655

J104 100 AGC A-3661

J106 OSC A4605

J103 IF 103 A4603

J102 BFO A-3658

J101 RS & A A101 A-3654

CAPACITOR C101

AUDIO OUTPUT TRANSISTOR Q107

AUDIO OUTPUT TRANSISTOR Q108

FRONT PANEL

MAIN CHASSIS

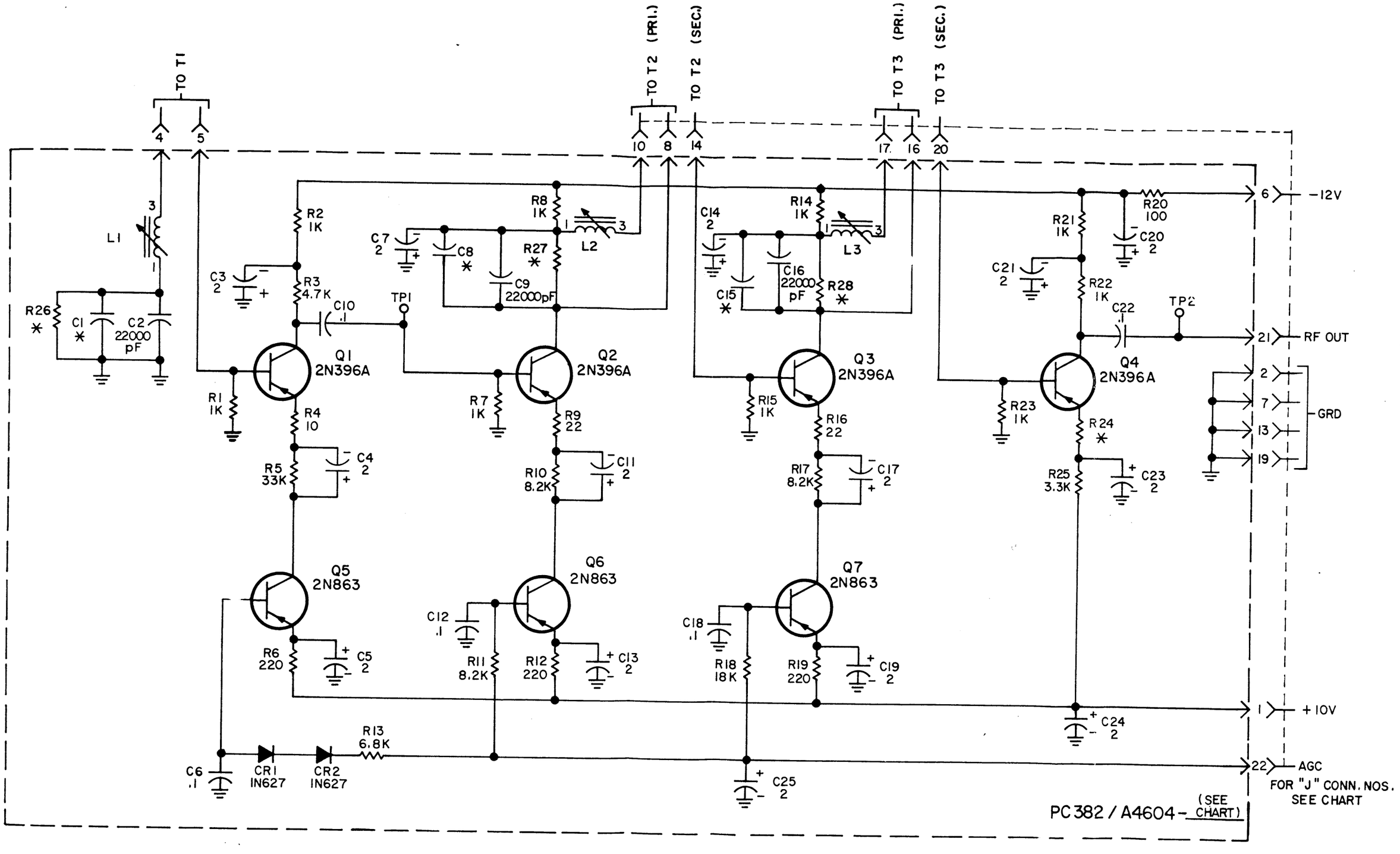
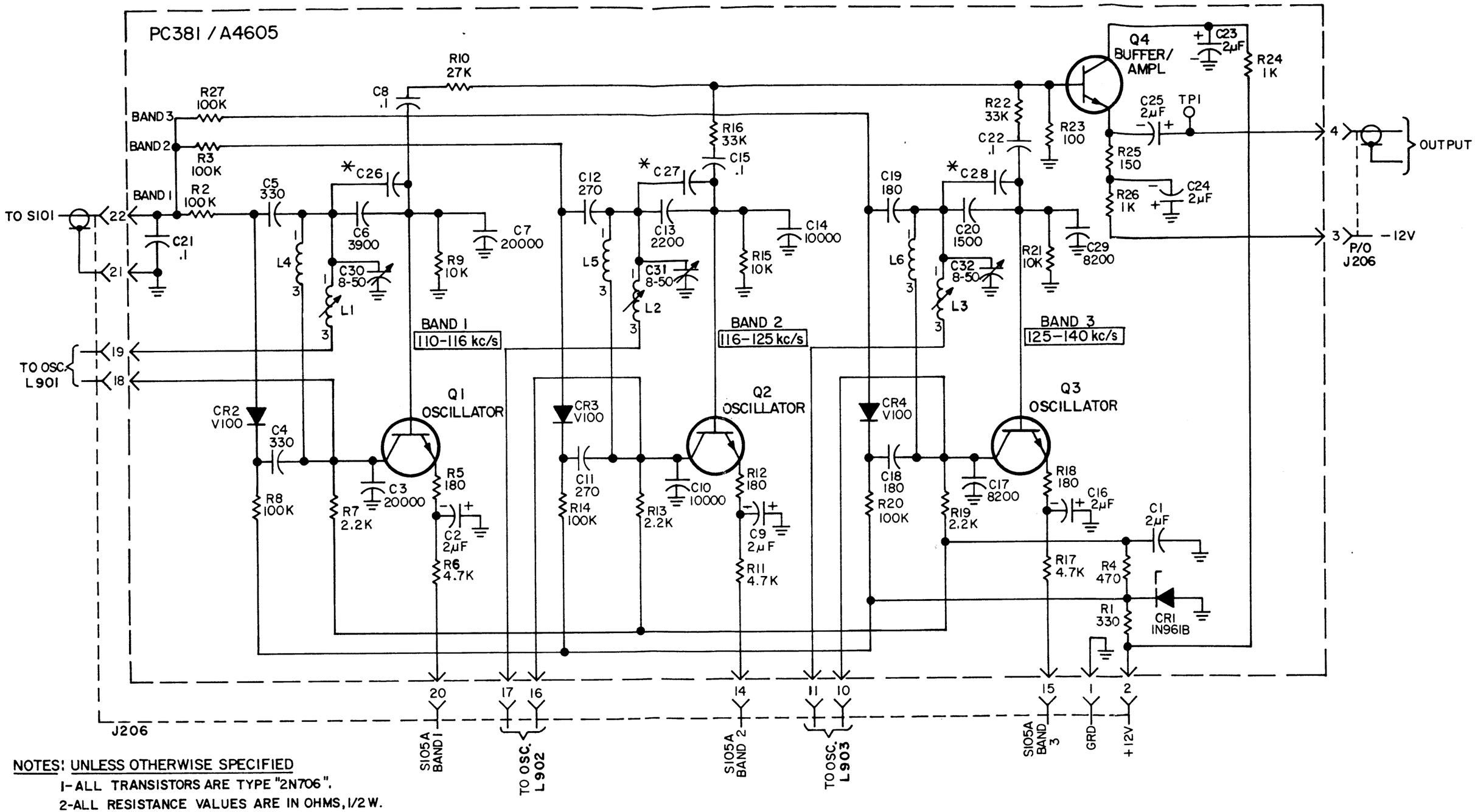


Figure 7-2. RF Band Modules 4604-1, -2, 03, Schematic Diagram



NOTES: UNLESS OTHERWISE SPECIFIED

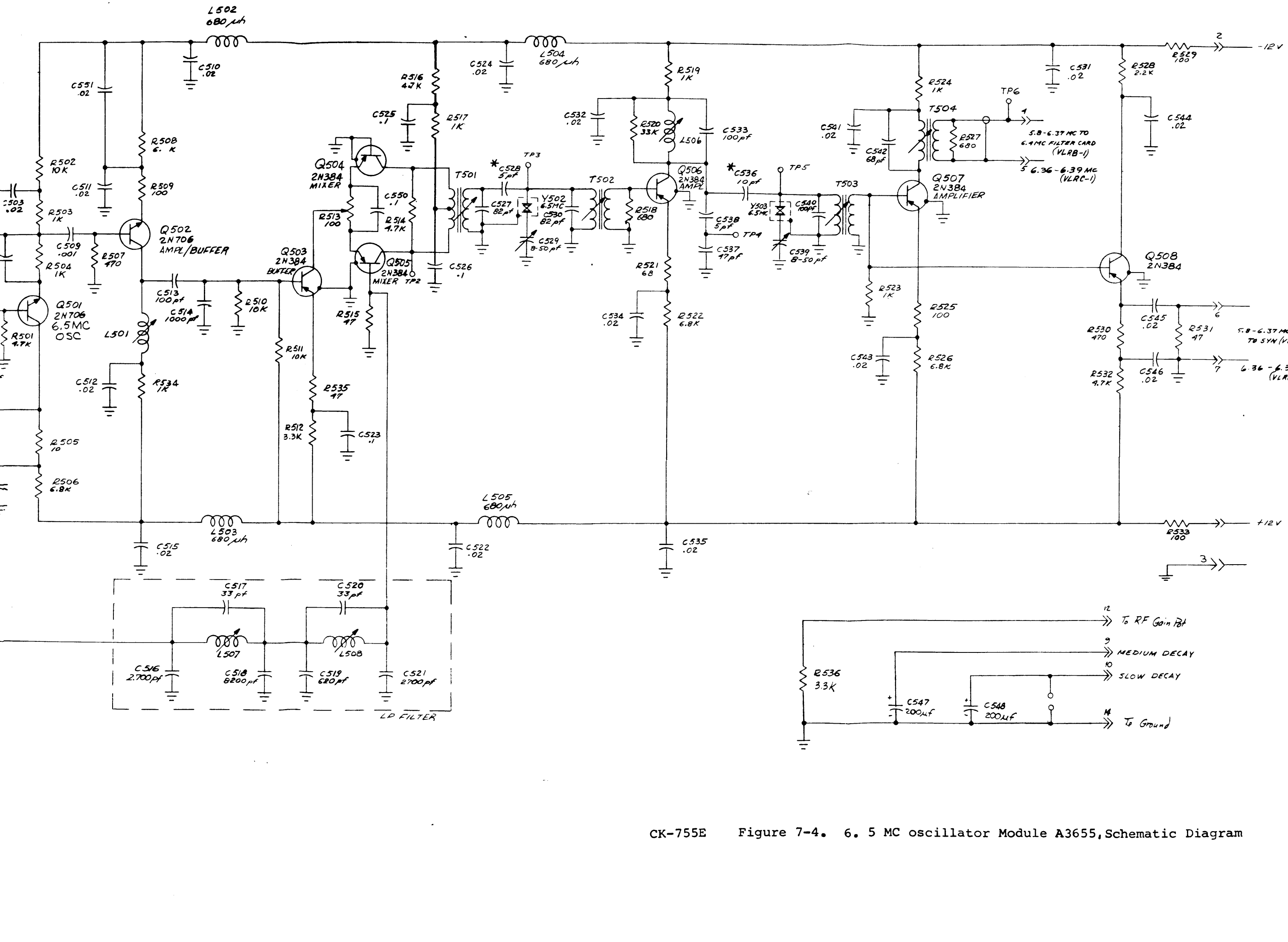
1-ALL TRANSISTORS ARE TYPE "2N706".

2-ALL RESISTANCE VALUES ARE IN OHMS, 1/2 W.

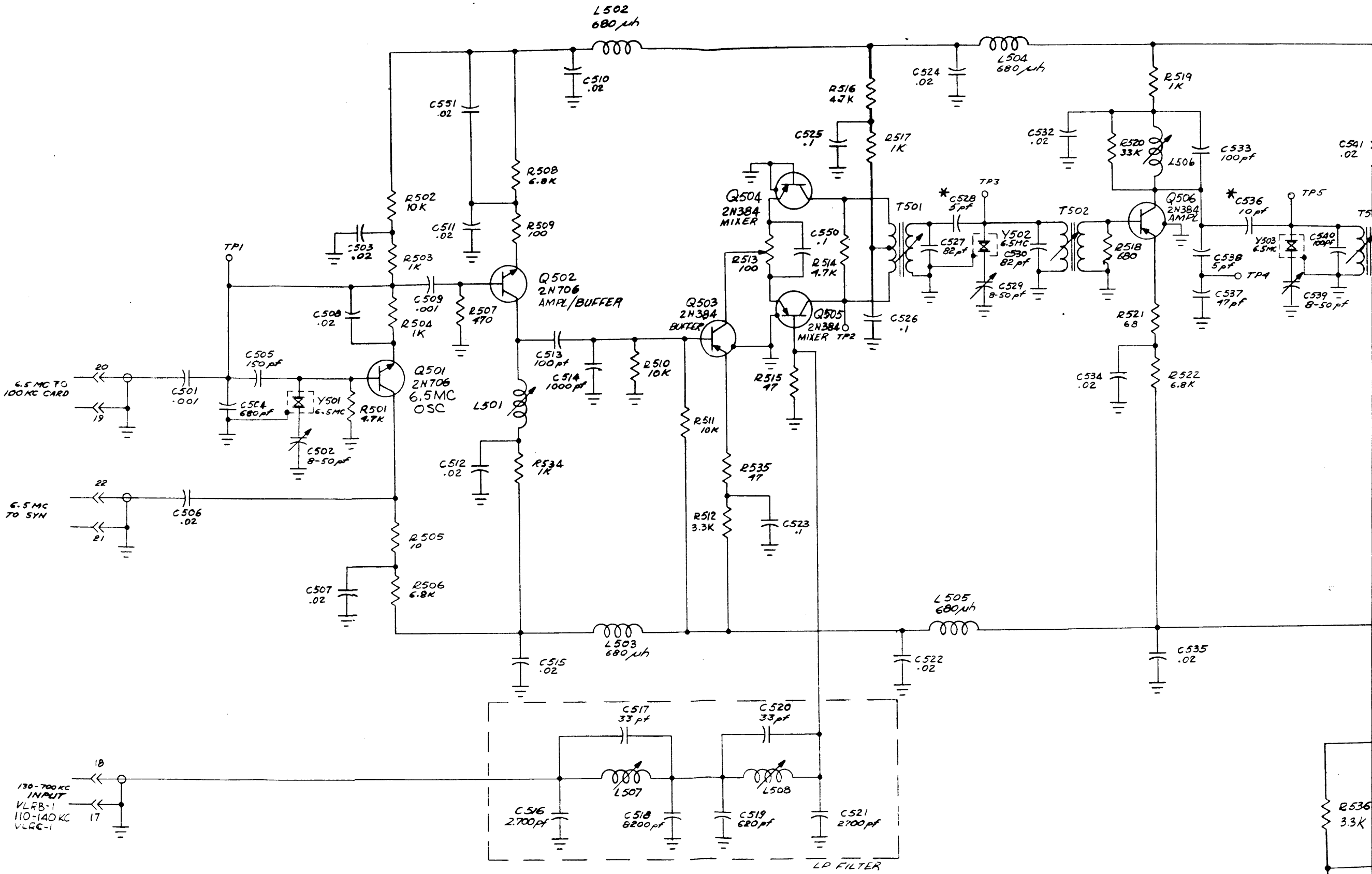
3-ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS.
ALL DECIMAL VALUES ARE MICROFARADS.

*4-VALUE SELECTED FOR OPTIMUM PERFORMANCE.

Figure 7-3 Local Oscillator Module A4605, Schematic Diagram



CK-755E Figure 7-4. 6.5 MC oscillator Module A3655, Schematic Diagram 7-5



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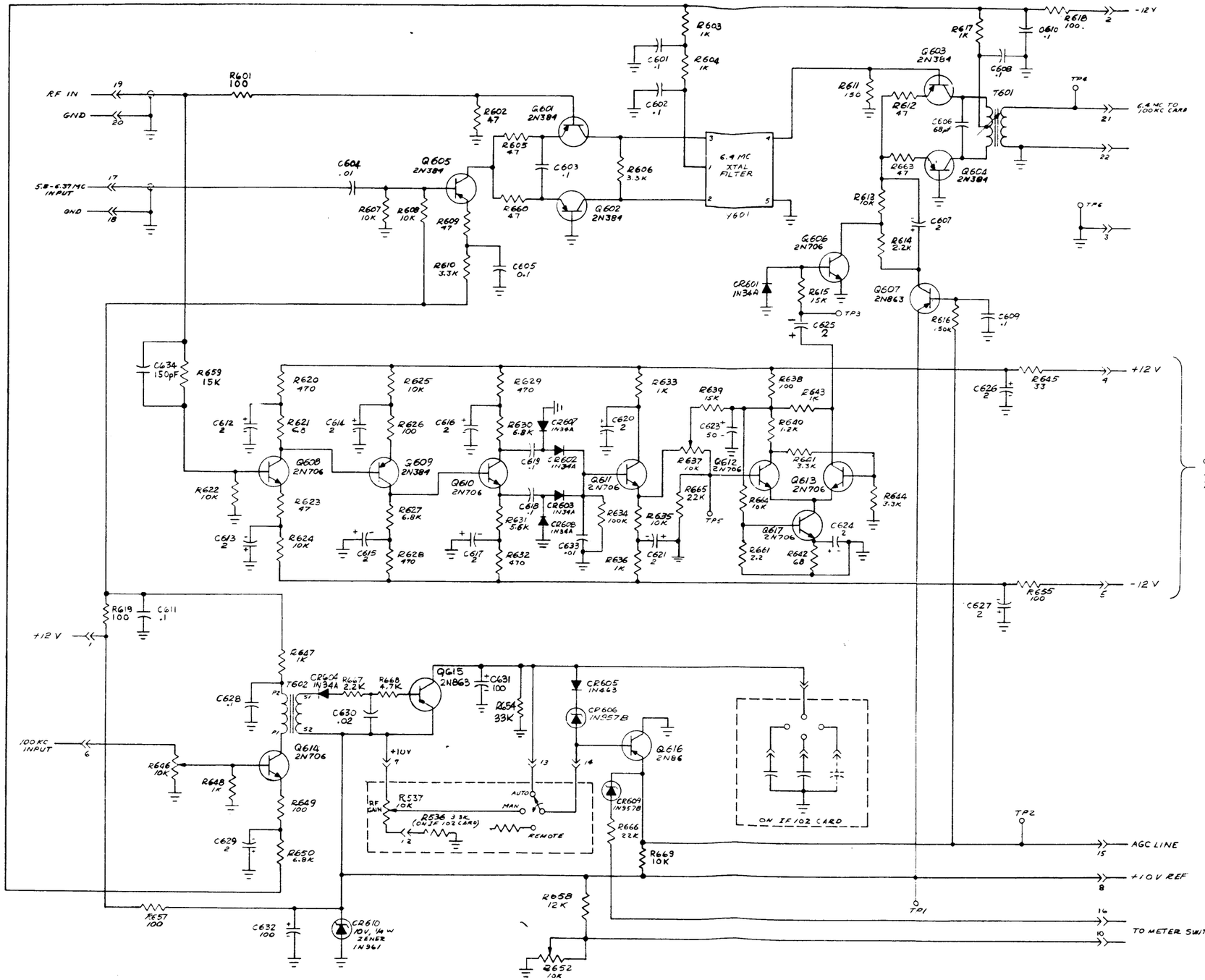
CK-755E Figure 7-4.



UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS ARE μf
ALL RESISTORS ARE IN OHMS, 1/2 W.

LAST SYMBOLS	MISSING SYMBOLS
R669	R653
C634	R656
CR610	C622
Q617	R651
T602	
Y601	R662

Figure 7-5, 6.4 MC IF, AGC and Noise Silencer Module A3661, Schematic Diagram

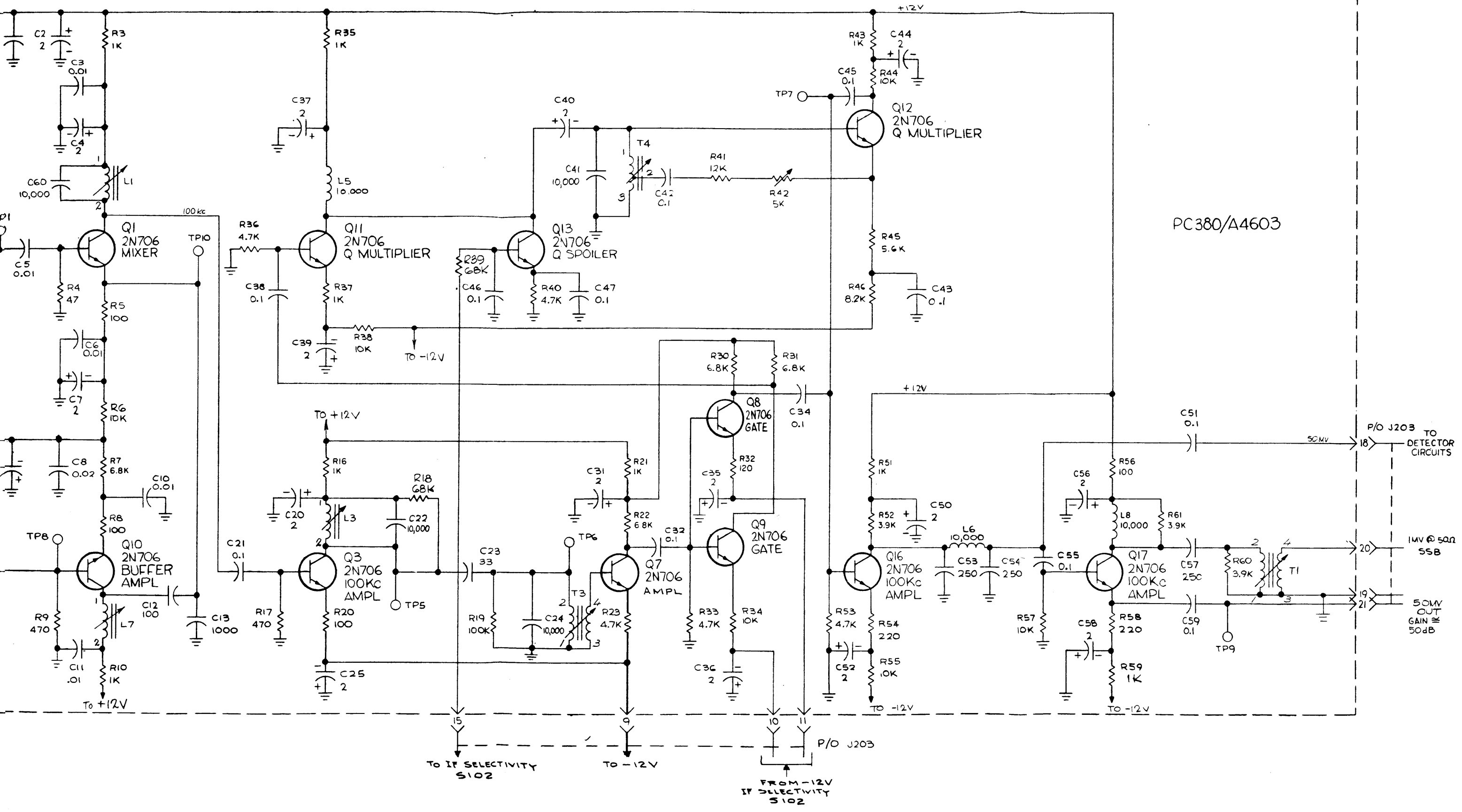
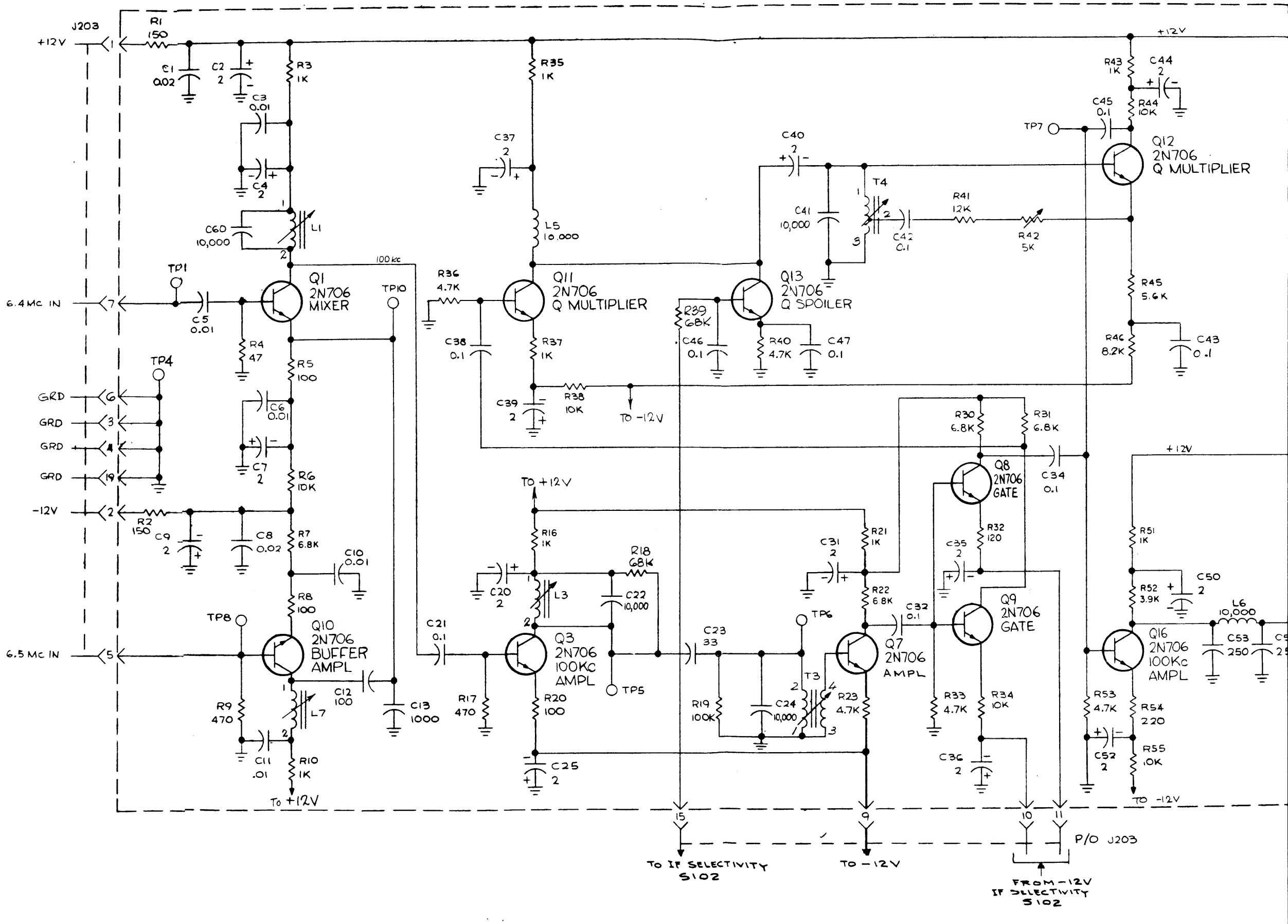
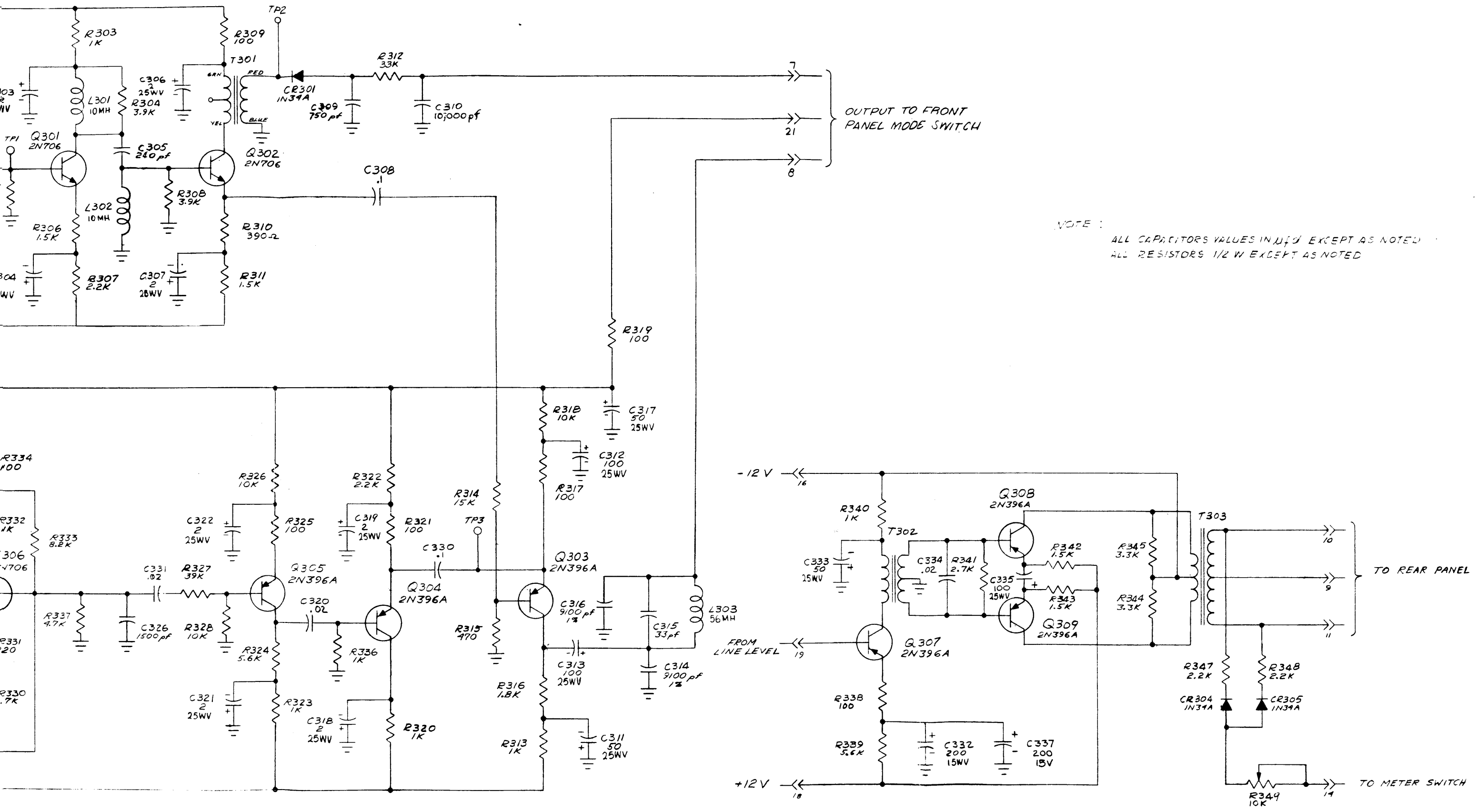


Figure 7-6. 100 KC I-F Module A4603, Schematic Diagram


J203
+12V
R1 150
C1 0.02
C2 2
C3 0.01
R3 1K
C4 2
C60 10,000
L1
TP1
6.4 Mc IN
C5 0.01
Q1 2N706 MIXER
100 kc
TP10
R4 47
R5 100
TP4
GRD
GRD
GRD
GRD
C6 0.01
C7 2
R6 10K
-12V
R2 150
C9 2
C8 0.02
R7 6.8K
C10 0.01
R8 100
TP8
6.5 Mc IN
Q10 2N706 BUFFER AMPL
R9 470
C12 100
L7
C11 .01
R10 1K
To +12V
C13 1000
R35 1K
C37 2
L5 10.000
R36 4.7K
Q11 2N706 Q MULTIPLIER
C38 0.1
R37 1K
C39 2
R38 10K
TO -12V
C40 2
C41 10,000
T4
R41 12K
R42 5K
C42 0.1
Q13 2N706 Q SPOILER
R39 68K
C46 0.1
R40 4.7K
C47 0.1
+12V
R43 1K
C44 2
C45 0.1
R44 10K
TP7
Q12 2N706 Q MULTIPLIER
R45 5.6K
R46 8.2K
C43 0.1
R30 6.8K
R31 6.8K
C34 0.1
Q8 2N706 GATE
R32 120
C35 2
Q9 2N706 GATE
C32 0.1
TO +12V
R16 1K
C20 2
L3
R18 68K
C22 10,000
C21 0.1
Q3 2N706 100Kc AMPL
R17 470
R20 100
TP5
C25 2
C23 33
R19 100K
C24 10,000
T3
TP6
R21 1K
C31 2
R22 6.8K
Q7 2N706 AMPL
R23 4.7K
R33 4.7K
R34 10K
C36 2
R51 1K
C50 2
R52 3.9K
L6 10,000
Q16 2N706 100Kc AMPL
C53 250
R53 4.7K
R54 220
C52 2
R55 10K
TO -12V
15
9
10
11
P/O J203
TO IF SELECTIVITY S102
TO -12V
FROM -12V IF SELECTIVITY S102

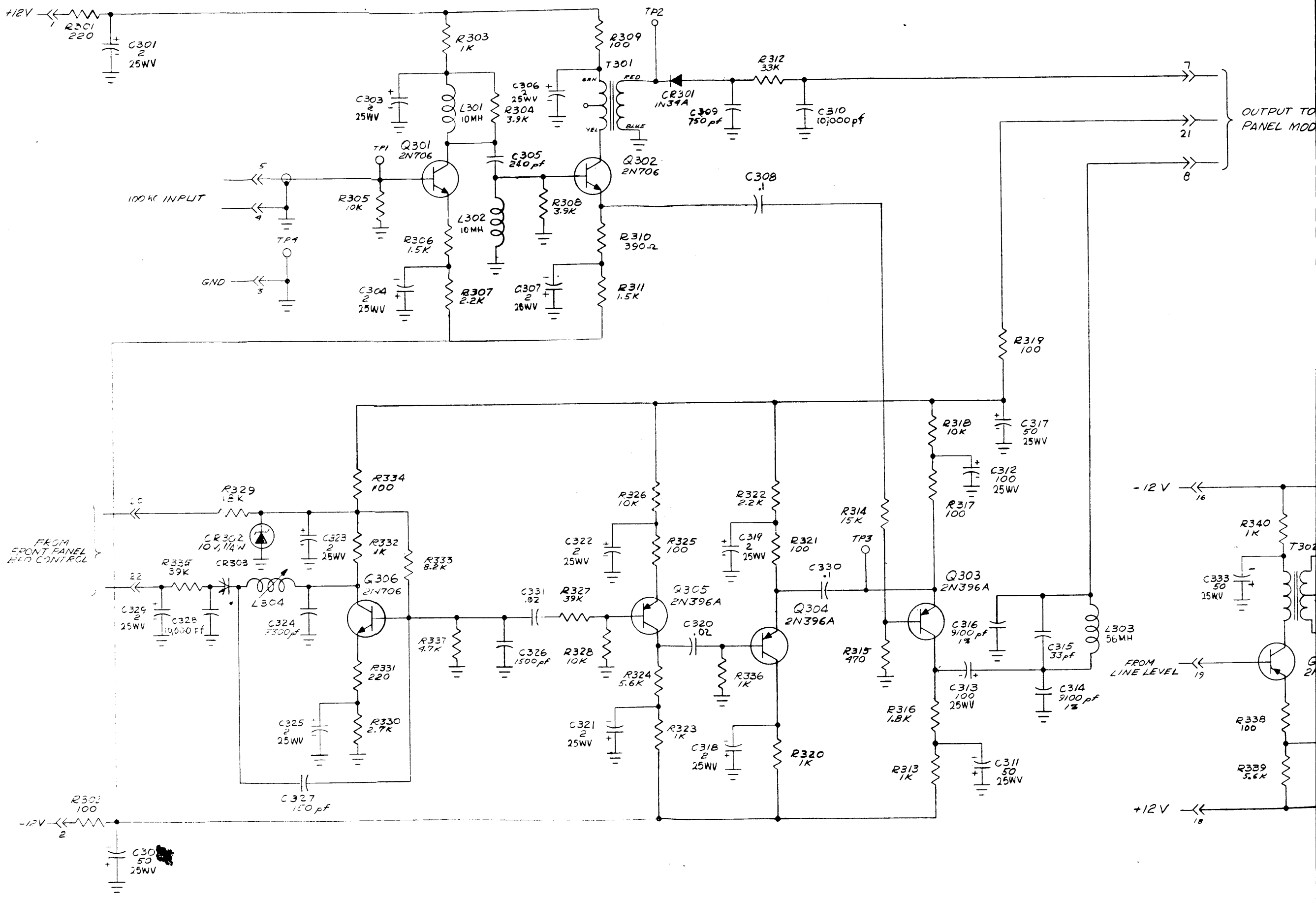
Figur



NOTE:

ALL CAPACITORS VALUES IN μf EXCEPT AS NOTED
ALL RESISTORS 1/2 W EXCEPT AS NOTED

Figure 7-7. BFO Product Detector and 600 Ohm Audio Amplifier Module A3638, Schematic Diagram


+12V
1
R301
220
C301
2
25WV
R303
1K
C303
2
25WV
L301
10MH
R304
3.9K
C306
2
25WV
TP2
R309
100
T301
GRN
RED
YEL
BLUE
CR301
IN34A
R312
33K
C309
750 pf
C310
10,000 pf
7
21
8
OUTPUT TO
PANEL MOD
TP1
Q301
2N706
C305
240 pf
Q302
2N706
5
100 KC INPUT
4
R305
10K
C308
.1
R308
3.9K
L302
10MH
R306
1.5K
TP4
R310
390Ω
GND
3
C304
2
25WV
R307
2.2K
C307
2
25WV
R311
1.5K
R319
100
R318
10K
C317
50
25WV
C312
100
25WV
R317
100
-12 V
16
R340
1K
T302
C333
50
25WV
FROM
LINE LEVEL
19
R338
100
R339
5.6K
+12V
18
R334
100
R329
18K
20
FROM
FRONT PANEL
BEO CONTROL
CR302
10 1/114 W
CR303
C323
2
25WV
R332
1K
R333
8.2K
22
R335
39K
C329
2
25WV
C328
10,000 pf
L304
C324
2200pf
Q306
2N706
R331
220
C325
2
25WV
R330
2.7K
C327
150 pf
R337
4.7K
C326
1500pf
C331
.02
R327
39K
R328
10K
R326
10K
C322
2
25WV
R325
100
Q305
2N396A
R324
5.6K
C321
2
25WV
R323
1K
C320
.02
Q304
2N396A
R336
1K
C318
2
25WV
R320
1K
R322
2.2K
C319
2
25WV
R321
100
C330
.1
TP3
R314
15K
R315
470
R316
1.8K
R313
1K
Q303
2N396A
C316
9100 pf
1%
C315
33pf
L303
56MH
C313
100
25WV
C314
9100 pf
1%
C311
50
25WV
R302
100
-12V
2
C30
50
25WV

001693017

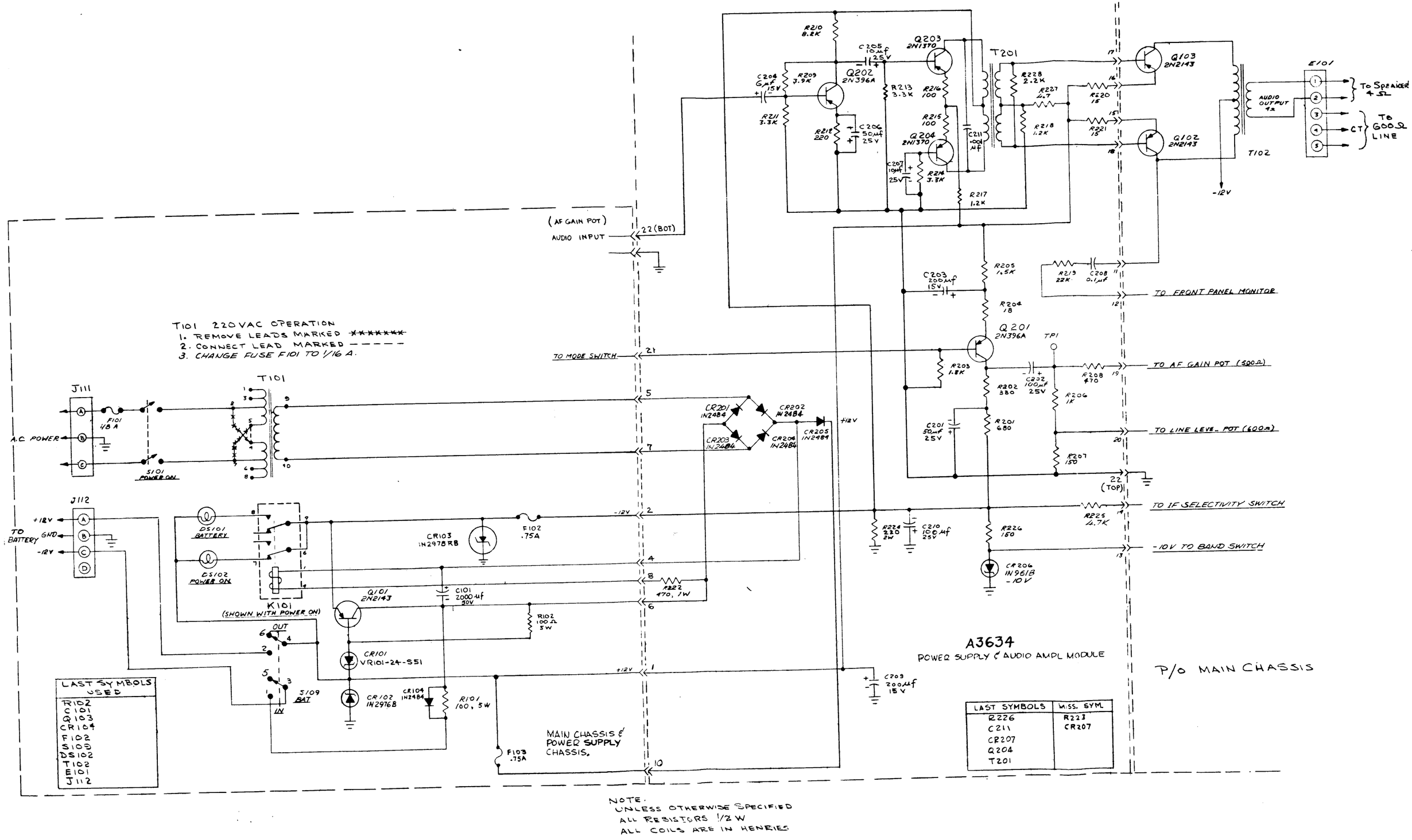


Figure 7-8. Power Supply and Audio Amplifer Module A3634, Schematic Diagram