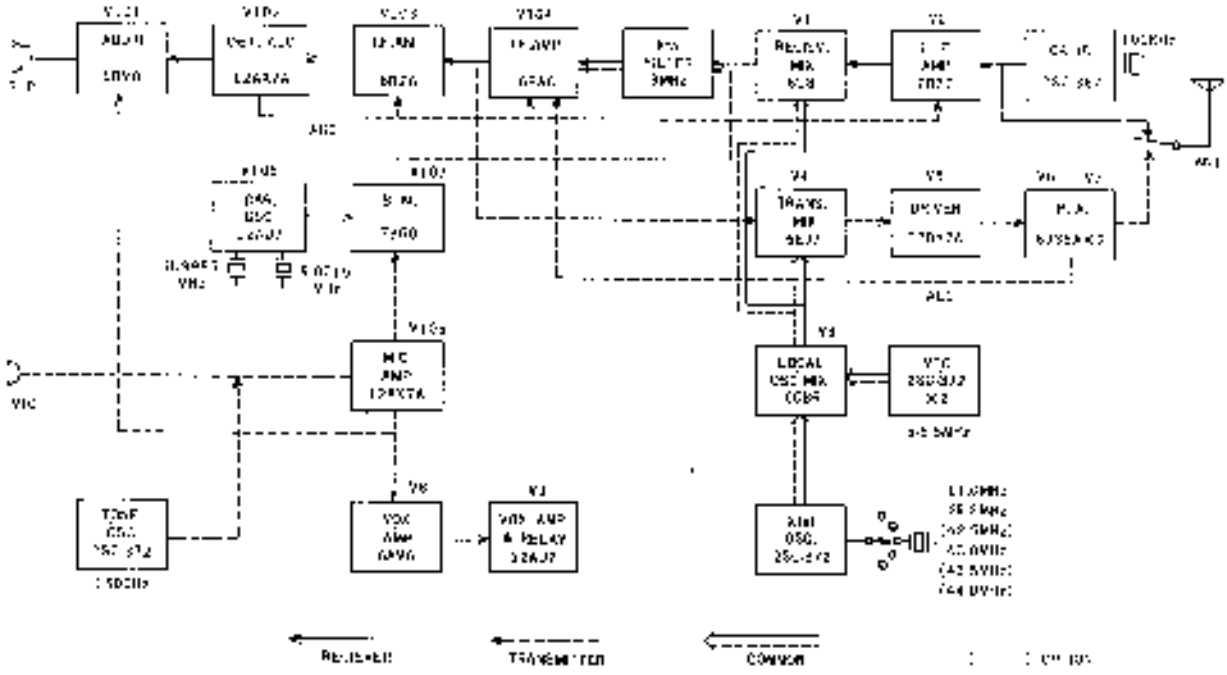
INSTRUCTION MANUAL

FT-200

YAESU MUSEN CO., LTD.

TOKYO JAPAN

BLOCK DIAGRAM



The YAESU model FT-200 Transceiver, for HF amateur bands 80 through 10 meters, is a precision built high performance transceiver providing SSB (USB and LSB selectable), CW and AM modes of operation, with a two-tone power of 240W (approx. 300W speech peak input).

High stability is obtained by use of a well designed heterodyne VFO, and the specially designed 9 MC crystal filter ensures good voice quality.

Its compact size, light weight, and attached carrying handle make it very suitable and convenient for both home and portable use.

Other features include VOX, 100 kc calibrator, 15 kc receiver offset (clarifier) tuning and easy connection for use of our FLDX-2000 Linear Amplifier.

YAESU FP-200 matching AC power supply with built-in speaker is especially designed for use with FT-200 Transceiver. A 12V DC supply, the DC-200, provides for mobile or field use.

GENERAL SPECIFICATIONS

Modes	A3J SSB (USB LSB), A3h (AM), A1 (CW)
Input power	240W
Frequency range	3.5—4; 7—7.5; 14—14.5; 21—21.5; 28.5—29. (crystals optionally available for ranges 28—28.5; 29—29.5; 29.5—30 MC)
Antenna impedance	50—75 ohms
Frequency stability	After warm-up, within 100 cps/ every 30 minutes
Carrier suppression	-40 dB
Sideband suppression	—50 dB at 1000 cps
Third order intermodulation products	30 dB (P.E.P.)
Bandwidth occupation	99.8%
A.F. bandwidth	300 -2700 cps
Receiver sensitivity	0.5 mV input S/N 10 dB
Selectivity	2.3 kc (- 6 dB), 4 kc (- 60 dB)
I.F. interference ratio	50 dB
Image ratio	50 dB
Audio output	1W at 10% distortion
Audio output impedance	8 ohms and 600 ohms
Power supply	AC or DC with separate power supplies
Tubes & sem conductors	16 tubes, 15 diodes, 7 transistors
Dimensions	13¾" (335m/m) wide, 5⅝" (140m/m) high, 11" (280m/m) deep
Weight	17.5 lbs (8 kg)

FP-200 SPECIFICATIONS

Semiconductors	13 diodes
Dimensions	8" (200m/m) wide, 5½" (140m/m) high, 11" (280m/m) deep
Weight	Approx. 22 lbs (10 kg)
Speaker (built-in)	12.8 × 7.7 cm
Supply voltage	100V/110V/117V/200V/220V/234V 50 - 60 cps

DC-200 SPECIFICATIONS

Matching DC power supply	
Semiconductors	4 transistors 9 diodes
Dimensions	8" wide, 2⅝" high, 6⅞" deep
Weight	Approx. 6.6 lbs
Power source	DC-12V, 12.5A (receive), 15A (transmit), 27A (transmit 100W peak)

CIRCUIT DESCRIPTION

It can be seen from the block diagram that many sections are common for both receiving and transmitting. For an easier understanding of the operation, the receiving and transmitting sections will be described separately.

Receiving Section

Signal from ANT terminal passes through antenna RX/TX relay to ANT input tuned circuit to grid 1 of RF amplifier tube V2, 6BZ6. Signal is amplified, and through the next tuned circuit on the grid of receiver mixer tube V1, 6U8, pentode section. Local oscillator signal is applied to cathode of this mixer and the I.F. signal appears at mixer plate. The I.F. signal then passes through the 9 MC crystal filter to the two stage amplifier; V104, 6BA6, V103, 6BZ6 and thence to V102A, ½12AX7 power grid detector. This detector acts as a product detector, with BFO signal applied to its cathode, when receiving CW and SSB. V102B, ½12AX7 functions as an anode detection type amplifier of AGC. With no signal applied plate current is zero with plate voltage zero. When signal is applied, plate current develops, resulting in a negative plate voltage which is applied through diode D103 to AGC line. Circuit provides suitable AGC characteristics of fast attack, slow decay for SSB and CW. Internal resistance of diode is low in forward direction and high in reverse direction. AGC voltage is applied to RF and IF stages so that a wide range of signal levels can be handled.

Detector output is fed to silicon diodes D101, D102, ANL, then via AF gain control, through 6BM8 AF output tube to speaker.

Transmitting Section

Output of carrier oscillator V10a, 12AU7 is injected to first grid of V10b, 12AU7 balanced modulator, and audio signal from mic. Amp. to modulating grid of BM. Suppressed carrier DSB is developed at plate of BM. This signal then passes through the crystal filter XF101 which eliminates one sideband thus resulting in a SSB signal, 9 MC.

For AM transmission (sideband with carrier insertion), the BM becomes unbalanced due to switching circuitry, permitting carrier to pass through, and also carrier frequency is shifted by means of a varicap diode circuit so that carrier passes freely through filter passband. Amount of carrier insertion level is adjustable by AM carrier control VR8.

For CW transmission, audio is disabled, and similarly as for AM, the BM is unbalanced and carrier frequency shifted to allow full carrier to pass through filter.

In the TUNE condition, a 1500 cps signal from the audio tone oscillator TR503 is applied to the BM. This provides a convenient tuning signal near filter center frequency. Level of signal is controled by mic. gain control.

The 9 MC signal after passing through the filter is amplified by IF amplifier tube V104, 6BA6, thence to grid of mixer tube V4, 6BJ7, together with local oscillator signal. The resultant difference between these two frequencies appears at plate tuned circuit of mixer and is the transmitting ham band output signal frequency. On 14 MC band, additive mixing is used.

This signal is amplified by V5, 12BY7 tuned driver and finally to power amplifier tubes V6/V7, 2 x 6JS6A, and antenna. Power amplifier V6/V7 operate in class AB2 for maximum power output.

The AC audio component of PA grid current, when overdriven by signal peaks, is rectified by diodes D4/D5 to provide an ALC (Automatic Level Control) voltage to the IF amp. stage thus reducing its gain and maintaining low distortion.

The PA Pi network plate circuit provides attenuation to the higher order harmonics and enables easy, flexible adjustment of impedance matching to antenna feedline.

On phone, PTT and VOX control is available. On VOX, a sample of signal from microphone is applied to grid of V8 then to V9A, rectified by diode D2, SH 1 producing a positive bias on to grid of V9B relay tube, causing plate current to flow and relay to actuate.

On CW, "straight" or "break-in" keying methods are available. Break-in produced by keying audio oscillator tone applied to VOX amp. as well as transmitter bias line. The relay switches bias on V107, V4, V5, V6 and V7.

Tone signal also can be heard from speaker while keying, thus providing sidetone monitoring.

OSCILLATOR CIRCUITS

In the FT-901 crystal oscillators are used for carrier generation and the bandswitched heterodyne oscillator, together with a self controlled oscillator for VFO which is at a frequency low enough to obtain good stability. Other oscillators included are 100 kc crystal calibrator and audio tone oscillator. An optional crystal oscillator and components are available for fixed channel operation.

1. **Carrier crystal oscillator**

V106, 12AU7 double triode with crystals 8998.5 kc and 9001.5 kc, one in each triode section. With sideband selector switch at NORMAL, carrier crystal 8998.5 is operative for 7 and 14 MC band, and 9001.5 for 3.5, 21 and 28 MC. When the selector switch is in REVERSE position then the carrier crystal oscillator sections are changed.

Carrier oscillator operates as the BFO when in receive mode.

On AM & CW, crystal 9001.5 is used and its frequency is lowered 200 cps by diode switch D104, 1S1007, bringing carrier into filter passband.

2. **Bandswitched heterodyne oscillator**

This is a crystal oscillator using silicon type 2SC372 transistor, and is operative on bands 7, 21 and 28 MC. 10 M band crystal is included for 28.5 - 29 MC, and positions are available for other three optional ranges for full coverage of 10 M.

3. **VFO self-oscillator**

A transistorised Colpitts circuit with 2SC372 oscillator and 2SC372 buffer. It has linear tuning over the range 5—5.5 MC. A passband filter circuit at output is tuned to pass the 5—5.5 MC range. Varicap diode D401, 1S145 permits CLARIFIER control ±5 kc on receiving.

4 **Crystal calibrator oscillator**

Transistor oscillator 2SC367 with 100 kc crystal, and diode type 1S1007 harmonic generator provides accurate check points every 100 kc on main dial.

5. **AF oscillator**

Phase shift type with 2SC372 transistor, generating audio tone signal at 1500 cps supplies transmitter tone up signal and CW sidetone monitoring.

LOCAL OSCILLATOR MIXER CIRCUIT

VFO output is applied to grid 1 of V3, 6CB6 mixer and heterodyne oscillator output to cathode. Resultant beat frequency is selected in plate tuned circuit.

METER CIRCUIT

Meter is 1 mA movement, and is connected to 2nd IF stage to read change in cathode voltage of V103, resulting from variations of AGC voltage, to indicate receiver "S" units. Meter is automatically switched by relay RL101, on transmitting, to indicate relative power output, PA cathode current, and ALC voltage. Meter scale is fully calibrated, and transmitter metering functions PO, IC and ALC are selected by panel mounted slide switch.

VOLTAGE REGULATOR CIRCUIT

The voltage regulator circuit, mounted on a "mini board", provides 9 volts for all transistor circuits. Two transistors are used, 2SC372 and 2SC536, together with two zener diodes (1S33 and 1S338). And voltage level can be set by adjustment of variable resistor VR501.

CONNECTIONS FOR USING FL DX 2000 LINEAR AMPLIFIER

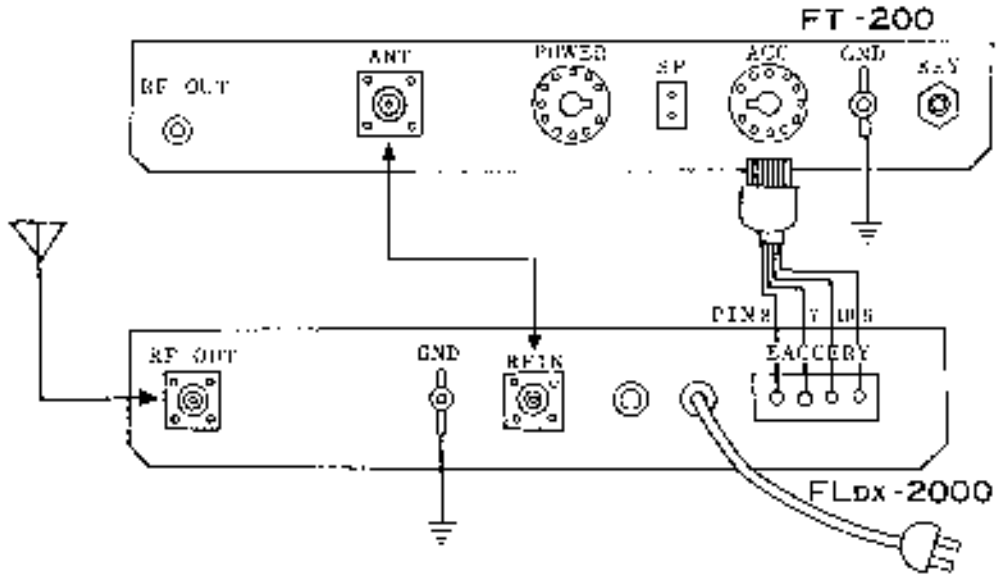
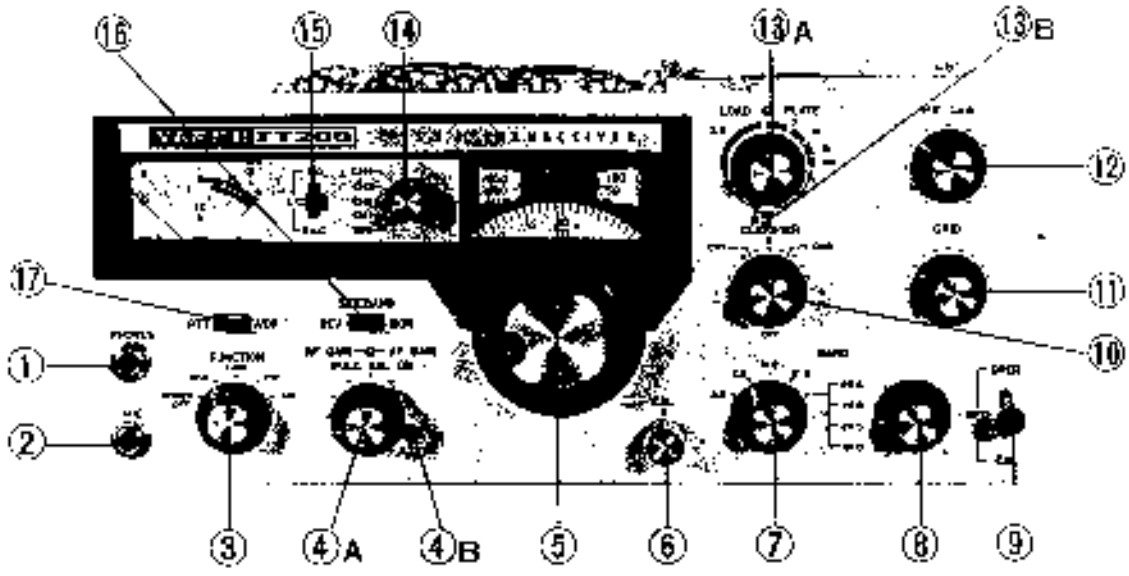


Diagram shows correct connections for using the FL DX 2000 Linear Amplifier with the FT-200.

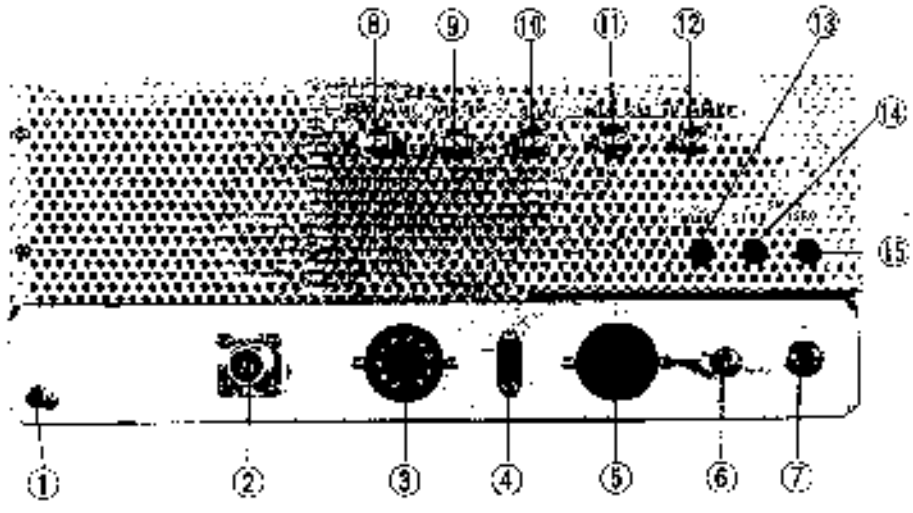
FRONT PANEL CONTROLS



1.	Phones	Headphone socket. When plug is inserted into socket, speaker is automatically disconnected
2.	Mic.	Microphone socket. 3 contact T.R.S. type.
3.	Function	Function switch. OFF AC power removed from power supply. SSB Selects SSB operation. TUNE Places TX in tune-up condition. CW Selects CW operation. AM Selects AM operation.
4A.	AF Gain. Pull-ANL-On	Knob
4B.	RF Gain	Level control
5.	VFO	Control knob and vernier drive. One revolution of knob covers approx. 15 kc. Upper windows give 50 kc points with 0 - 500 markings. The vernier scale is marked in 1 kc steps. 0 - 100.
6.	Cal	This is a locking knob used to set dial calibration in conjunction with the 100 kc calibrator. With transceiver in receiving condition, the vernier dial is turned to "0" and locked by a half turn of this CAL locking knob. 100 kc calibrator is switched on with control No. 9 then the VFO knob is rotated to a 100 kc point so that calibrator beat note is heard, then adjusted for zero-beat. Locking knob is then released.
7 & 8.	Band	Bandswitch, marked for bands in MC. Red colors indicate that red scale is to be used on VFO dial. The various 28 MC ranges are selected by knob No. 8, when No. 7 is at its fully lockwise position.
9.	Oper-Rec-Cal	Lever switch. Selects functions of calibrator receiving and transmitter operation.
10.	Clarifier	Clarifier adjustment. Provides ±5 kc variation of receiver tuning ("off-set-tuning") When switched to OFF, then receiving and transmitting frequencies are the same.

11.	Grid	Controls RF tuner of receiver and drive tuning of transmitter.
12.	Mic Gain	Controls microphone amp. level. On TUNE it becomes a tuning level control.
13A	Plate	Knob. Adjusts PA plate tuning.
13B.	Loading	Lever. Adjusts PA plate loading.
14	Fix	For switching from VFO to crystal control operation for fixed channel working. This knob is operative only when optional fixed channel switch and kit is installed.
15.	PO-IC-ALC	Meter selector switch. Switches meter functions for transmitter metering.
16.	Sideband	Sideband selector slide switch. In the NORMAL position, LSB is produced on 3.5 and 7 MC and USB on 14, 21 and 28 MC. In the REV position, USB is produced on 3.5 and 7 MC, and LSB on 14, 21 and 28 MC.
17.	PTT-VOX	Slide switch. Selects PTT or VOX functions.

REAR PANEL CONTROLS & CONNECTIONS



1.	RF Out	Provides low level RF drive for FTV-650 VHF transverter.
2.	ANT	Antenna coax socket.
3	Power Supply Connector	(see P. 18 for details)
4.	Speaker Socket	
5.	Accessory Socket	(see P. 18 for details)
6.	Earth Terminal	
7.	Key Socket	
8.	VOX Gain	Adjusts VOX sensitivity.
9	Anti-Trip	Adjusts VOX anti-trip level.
10.	Delay	Adjusts "hold-in" time of VOX
11.	Relay Sens	Adjusts operating level of VOX relay.
12	AM Carrier	Adjusts level of re-inserted carrier for AM operation.
13	Bias	Adjusts bias on PA tubes.
14.	Meter Sens	S-meter sensitivity control.
15.	Meter Zero	Adjusts S-meter zero setting.

OPERATION

Step 1 of Operation

FUNCTION	POWER OFF
RF-AF-GAIN	RF maximum clockwise
	AF about half on
BAND	Set to desired band
CLARIFIER	OFF
PLATE	Set to desired band
LOADING	Minimum loading
METER SWITCH	IC
OPER-REC	REC
SIDEBAND	NORMAL
MIC GAIN	OFF
CAL	In released position

1. **Set controls as shown below**

First check that all cable connections are correct and that antenna of correct frequency and impedance within the range of the Pi-net (50--100 ohms) coax output) is connected to the transceiver. AC power plug should not be connected until all preliminary checks are carried out.

Turn power on with function switch to SSB position. Panel lamps should light and S-meter needle will show a full scale reading then slowly return to "0" as set warms up. This can be accepted as an indication that the set is then ready for operation.

Tune GRID for noise peak.

Adjust main tuning dial for signal.

Peak GRID for maximum S-meter reading.

Careful tuning is necessary to obtain correct tone of SSB signal. If the received signal is on opposite sideband then move REV-NOR switch to REV.

A beat note indicates an AM signal being received. In this event turn function switch to AM.

Adjust AF gain for comfortable listening volume. Sometimes a slight reduction of RF gain will obtain clearer reception.

2. **Transmitter tuning**

Transmitter should be tuned into a 50 ohm dummy load, but it may be tuned on an antenna provided that the band is clear, and no interference will result to other stations. Take care to ensure that transmitter frequency is adjusted within limits of band in use.

DO NOT OPERATE TRANSMITTER with no load connected otherwise PA tubes could be damaged.

Disconnect microphone, meter switch to IC, MIC gain off, control switch to PTT, function SSB. Then when REC-OPER switch is moved to OPER, and using power supply of 600V HT, the meter will indicate the PA resting current.

This should be 60 MA, if not, then adjust bias control at rear.

Now turn FUNCTION switch to TUNE, advance MIC gain to obtain a small increase in meter reading, up to about 100 MA, and adjust GRID for maximum IC. Note that the setting for the GRID control will be virtually the same as was found for receiving. Reduce MIC gain if IC rises abnormally high.

Adjust PLATE for minimum dip in IC. Switch meter to P.O. and adjust PLATE and LOAD controls in turn for maximum RF power out. IC should dip to about 70/80% of the off-tune current for best loading condition. At maximum input the IC is about 350 MA, but refrain from using this high current for longer than a few seconds, therefore make all adjustments quickly. During tune up, switch REC-OPER switch off periodically to reduce the time transmitter is on with high IC.

While it is permissable to tune transmitter using meter on P.O. position, it is recommended that an external SWR meter be connected between antenna socket and feedline, not only to check matching of transceiver to antenna feedline and observation of

transmitter RF output, but so that transceiver meter can be left in IC position for constant monitoring of PA current. Any abnormal rise in IC can then be noted and quickly corrected.

3 Transmission

SSB (A3J)

Insert microphone plug of PTT microphone. (If microphone does not have a PTT switch, then short out PTT terminals on plug and control transceiver with REC-OPER panel switch.)

Turn REC-OPER switch to OPER.

While speaking, adjust MIC gain for correct IC meter "kick-up". Switch meter to ALC and check that needle does not rise above limit of green section of scale on speech peaks. Indicated IC will be about half the tuning IC, i.e. about 150 MA on peaks. Attempting to obtain more power by "forcing" or overdriving the transmitter will obtain only an insignificant increase in strength and will result in a distorted signal with possible radiation of spurious emissions. Keep MIC gain down, speak fairly closely to microphone to reduce background noise pick up, and try to maintain an even level of speech.

Do not have VOX gain control set too high otherwise operation will be unstable. If anti-trip control is advanced too far, then VOX will lose sensitivity. Set anti-trip to a position where it is just preventing speaker noise from "triggering" the VOX. If VOX fails to function, check that microphone has sufficient sensitivity and if OK then replace V9 and re-adjust relay sensitivity control

CW (A1)

Remove microphone plug. For CW operation on 7 and 14 MC, place Sideband switch in REV position otherwise drive will be low. The varicap diode is connected to only one carrier crystal (9501.5 kc) and this diode's operation shifts carrier within filter passband. Use clarifier control only for changing or tuning-in the received signal, e.g. small readjustment to retune a drifting signal or adjusting pitch of received signal. Once main VFO control has been set to frequency of desired contact it should not normally be altered, otherwise each station will be retuning and moving through the band.

For break-in operation set control switch to VOX, and adjust VOX delay, etc. to suit requirements. Do not hold key down for long periods otherwise PA tubes can be damaged. Use CW IC of 250 MA. MIC gain will control sidetone level.

AM (A3h)

Place function switch on AM, MIC gain to "0". Set AM carrier control at rear to give IC of 150 MA. Adjust MIC gain so that speech deflects meter a further 5 - 10 MA. As for CW set control to REV for 7 and 14 MC bands. PTT or VOX can be used in the same way as for SSB operation.

ALIGNMENT

The FT-200 has been correctly aligned at factory and, under normal circumstances, realignment should not be necessary except after a long period of use. The alignment of such a modern, sophisticated equipment as this requires the correct test instruments and should not be attempted unless one has had a reasonable amount of experience in such alignment techniques.

N.B. Before any work is attempted, remember that high voltages are employed in this equipment, so—TAKE CARE!

1. **Equipment required**
   VTVM with RF probe
   RF standard signal generator
   AF signal generator
   Circuit tester
   Frequency meter
   Dummy load 50 ohms
   Suitable alignment tools

2. **Voltage and resistance measurement**
   Refer to tables on Pages 20, 21 and 23
   Note that measurement figures obtained could vary slightly from those shown, particularly if low resistance testing meter is used. Always turn off power, remove AC plug, completely discharge all filter condensers, and wait until valves are cool before taking resistance measurements.

3. **Voltage regulator**
   The V.R. is mounted on a printed circuit board and supplies a regulated output of 9V adjustable by the preset type miniature pot VR501. If output cannot be brought up to the 9V level it may be due to a fault in components on the printed circuit board, e.g. transistors or zener diode, or supply voltage below 11V.

4. **VFO alignment**
   On the red scale, "0" = 5 MC and "500" = 5.5 MC.
   Switch off crystal heterodyne oscillator by placing bandswitch on 3.5 or 14 MC band, Clarifier OFF.
   Use frequency meter for alignment, although this can be done with care. If beats are heard every 100 kc using the crystal calibrator.
   Coarse alignment is by adjustment of trimmer TC401.
   The piston type trimmer TC402 is for adjustment of temperature compensation. If turned clockwise then compensation becomes greater. If TC402 is adjusted then TC401 must be re-adjusted to maintain calibration.
   For precise adjustment of dial linearity, careful adjustment by bending of end rotor plates of main tuning condenser as necessary.

VFO injection to grid 1 of V3, 6CB6 should be 0.5V or more over full VFO range, measured with VTVM and RF probe. To obtain same frequency of clarifier at "0" as at "OFF", adjust VR7.

5. **Heterodyne crystal oscillator**

Apply RF probe to Pin 2 of V3, and with bandswitch at 28 5, adjust T202 for maximum meter reading.

On 21 MC band adjust TC202.

On 7 MC band adjust TC201.

If optional 10 meter range crystals are added use type HC18U crystals with wire leads soldered into marked positions on heterodyne oscillator print board.

Adjust appropriate trimmer condensers for 10 meter crystals.

6. **Calibrator 100 kc**

Adjust frequency with TC301 by checking against WWV, with aid of separate receiver

Check against WWV on 7.5 mc.

7. **Pre-mixer (VFO mixer)**

This is V3, with output plate tuned circuit to select resultant beat of VFO and heterodyne oscillator (or VFO frequency in case of 3.5 and 14 MC bands).

This alignment should be carefully done as other frequencies can appear at output, VFO, etc. This alignment is explained in transmitter alignment section. Refer to chart, Page 14. for correct output frequencies.

RECEIVER ALIGNMENT

Band	Mixed Frequency
3.5	5 5.5 MHz
7.0	16 16.5 "
14.0	5 – 5.5 "
21.0	30 30.5 "
28.5	37.5 – 38 "
29.0	38 – 38.5 "
29.5	38.5 – 39 "

1. **Audio output stage**

Connect audio generator with 1000 cps output of 0.1V level to moving arm terminal of AF gain control, and with control at maximum volume, and output of 1 watt should be obtained from the 6BM8, V101.

2. **AGC**

Function switch to AM, RF gain maximum, then S-meter should read "0" with antenna socket shorted. Set VR102 (AGC adjust) so that it is at a point just before S-meter needle commences to rise above "0". Now adjust meter sensitivity control so that, with S.G. 50 uV signal to antenna socket meter will read S9. Open circuit output of

S.G. will be 100 uV dropping to 50 uV when S.G. is connected to antenna socket, due to loading effect of receiver. Now set function switch to SSB, short out antenna socket, and meter should read "0", but if not then adjust the compensation capacitance (C166) between pin 2 and pin 8 of V102 to make meter read minimum deflection.

3. **I.F. amplifier**

Connect signal generator at 9,000 kc and adjust tuning for maximum S-meter reading, at center of filter passband by observing S-meter at same time as tuning S.G. frequency. Now adjust L101, L102, L103, L104 for maximum meter reading.

4 **Receiver mixer**

This is V1 6U8 (alternative types 6EA8, 6GH8). Connect RF probe to pin 8, cathode of triode section, and adjust grid tuning. Oscillator injection should read greater than 0.5V on every band. Adjust trap coil L22 for minimum beat at 21.3 MC. This adjustment should occur within one turn of the core slug. L1 is trap coil for 3.5 and 14 MC bands and should be adjusted so that no oscillation in these bands. Use a plastic alignment tool so that no damage will result to the internal hexagon type slugs.

5. **RF amplifier**

Connect S.G. to antenna. On 3.5 MC band set VFO to "0" on black scale and GRID to second point up from its anticlockwise position. Apply 3500 kc signal and adjust L7 and L12 for maximum S-meter reading. Use plastic alignment tool. 7 MC band, VFO to "0" on red scale, GRID at same point as for 3.5 MC. S.G. at 7000 kc. Adjust TC1 and TC2 for maximum.

14 MC band, VFO to 250, GRID at center position. S.G. at 14250 kc. Adjust L10 and L15 for maximum.

21 MC band, VFO to 250, GRID at center, S.G. at 21250 kc. Adjust L9 and L14 for maximum.

28.5 MC band, VFO to 250, GRID one point back from center, S.G. at 28750 kc. Adjust L3 and L8 for maximum.

On either 7 or 14 MC bands, apply 9 MC signal of sufficient level to give a S-meter reading, then adjust L2 for minimum dip in S-meter reading.

TRANSMITTER ALIGNMENT

The transmitter uses many common receiver circuits, therefore it is necessary to first correctly align the receiver section. A 50 - 75 ohms dummy load must be used on the transceiver during transmitter alignment. Take care to avoid touching H.V. points!

1. **Balanced modulator**

Function switch to TUNE, meter to P.O., tune transmitter for maximum reading. (Keep IC down by use of MIC gain.)

Now function to SSB, MIC gain to zero, and adjust VR106 for minimum reading. For

most sensitive indication, connect RF probe to dummy load, or use another receiver and observe its S-meter reading.

Then switch to opposite sideband position, and readjust VR10a. Repeat several times for best result. If there is a marked difference between the two positions then adjustment of carrier oscillator or crystal filter may be required.

2. **Crystal filter**

The filter is aligned once in receiver alignment, but further alignment in this section (transmitting) is necessary

At the TUNE position adjust L103, L104 and L105 for maximum output. Keep drive reduced to a fairly low level for the most accurate determination of the maximum peak. In order to examine filter characteristics, set function to SSB and connect an A.F. generator to MIC jack, then take a curve of the A.F. response, (in effect, the filter passband), by plotting between 300- 2500 cps. If output level changes no more than 3 dB then it is OK. Repeat on reverse sideband. If the two curves do not match then slight adjustment of each carrier crystal frequency is necessary to bring the two curves together in their frequency limits. If carrier is too close to 9000 kc filter center frequency then high audio frequencies will be attenuated. If carrier too far removed then low frequencies will be attenuated. Carrier frequency adjustment is by TC101 and TC102.

3. **Driver stage**

Set up transmitter on TUNE, but keep level down to safe limit by adjustment of MIC gain control, then adjust driver coils and trimmer condensers for peak in output, as in receiver section alignment.

REDUCTION OF POWER OUTPUT TO 10W OR 50W LEVELS

The FT-200 is designed for 100W output but can be connected for lower output levels. For 50W, disconnect S.G. wire between V6 and V7, so that only V6 is then in use. IC readings will be half of those for 100W

For 10W, after carrying out above modification, then power transformer HT secondary must be tapped down from 480 to 240V

Chart shows operating conditions for the different power levels.

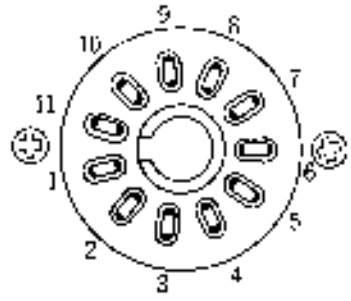
	100W	50W	10W
Final Tube	2 Tubes in Parallel	Single Tube	Single Tube
Voltage	600V	600V	300V
SSB Resting IC	60mA	30mA	30mA
TUNE Maximum IC	350 – 400mA	175 – 200mA	160 – 180mA
AM Operation IC	160mA	80mA	80mA

IMPORTANT:

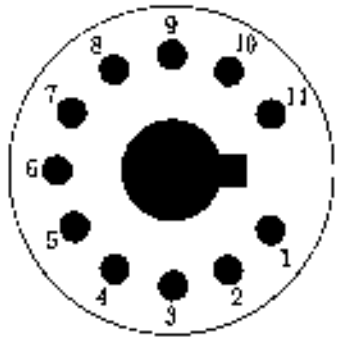
Heater voltage to final tubes 6JS6A is supplied through a jumper wire between pin 1 and 2 of accessory plug, so the accessory plug must be placed in the accessory socket to provide this heater voltage.

1. 6JS6A heater
2. 12.6V heater
3. +150V
4. +300V
5. +600V
6. -100V
7. ALC input
8. Ground
9. Relay close on transmit
10. Relay common
11. Relay close on receive

ACC OUT



Power socket connection



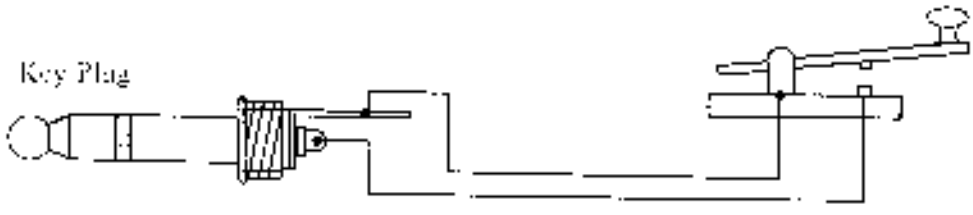
1. -100V
2. E
3. +300V
4. +600V
5. H COMMON
6. H AC 12.6V
7. H COMMON
8. H AC 12.6V
9. LINE
10. LINE
11. +150V

Plug connection

Mic Plug (P121)

Mic Plug

Key Plug

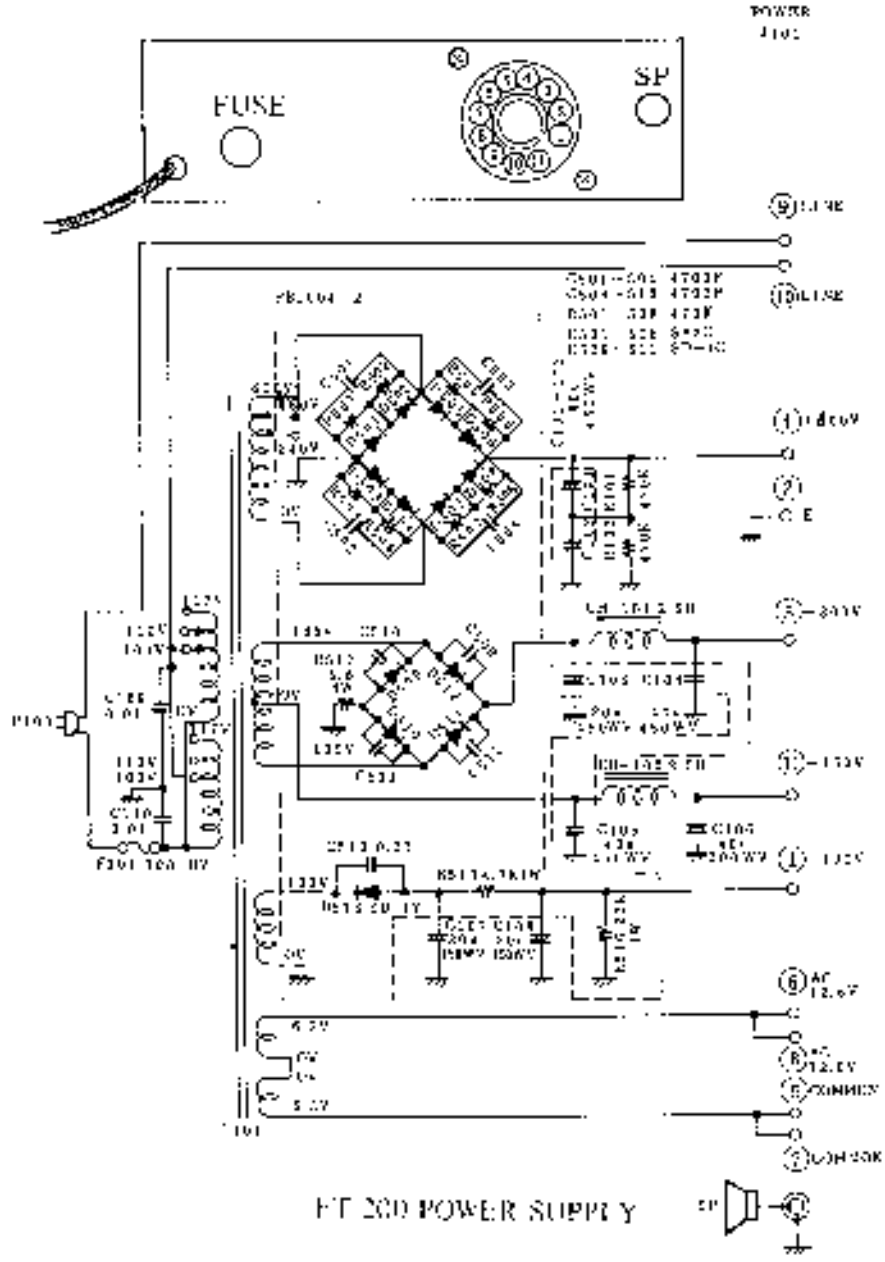


FP 200 POWER SUPPLY WITH SPEAKER

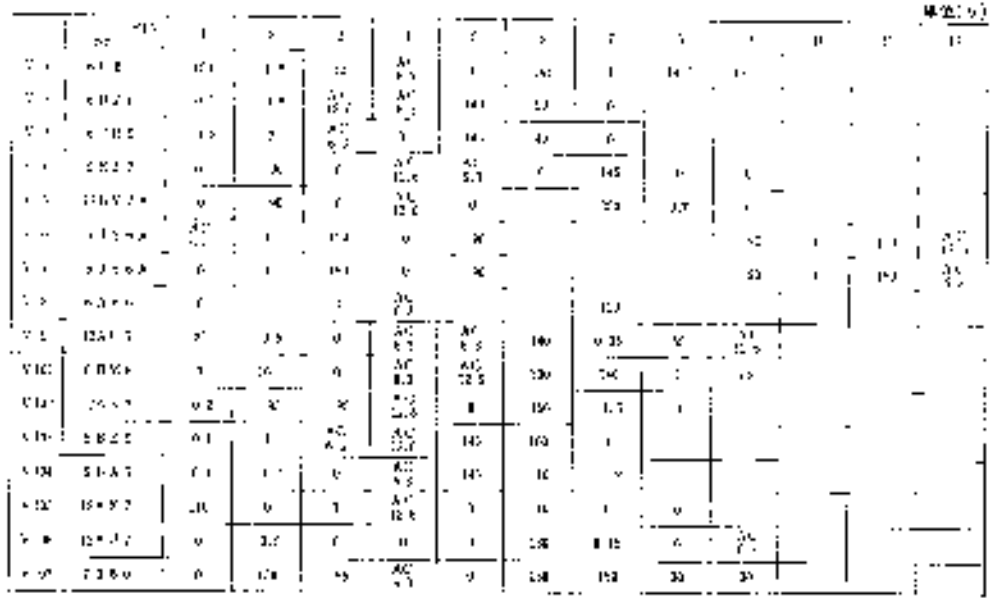
The FP-200 AC power supply is designed especially for the FT 200 Transceiver. A dynamic speaker is included within the power supply cabinet. Refer to circuit diagram below for details. Note that the major HT winding is tapped 240, 480 and 600, providing DC outputs of 300V, 600V or 800V to the final tubes. However, for the FT 200, 600V DC is sufficient for rated output. If 800V is used then the input will be excessive – use only on 600V DC maximum.

Bias section has only half wave rectifier as current drain is very small.

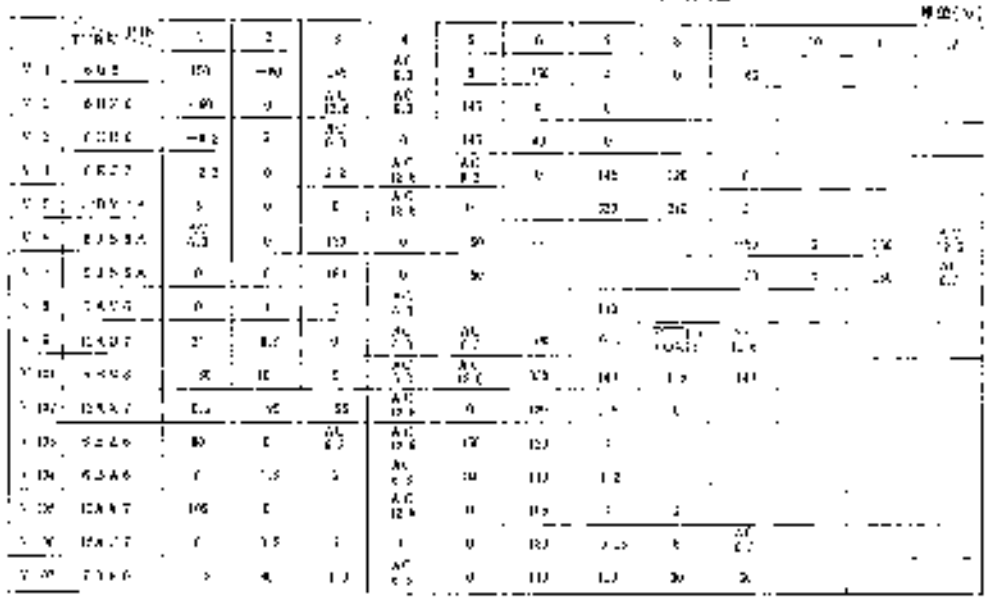
Heater winding, 2 x 6.3V, 6A, is connected in series to provide 12.6V at 6A.



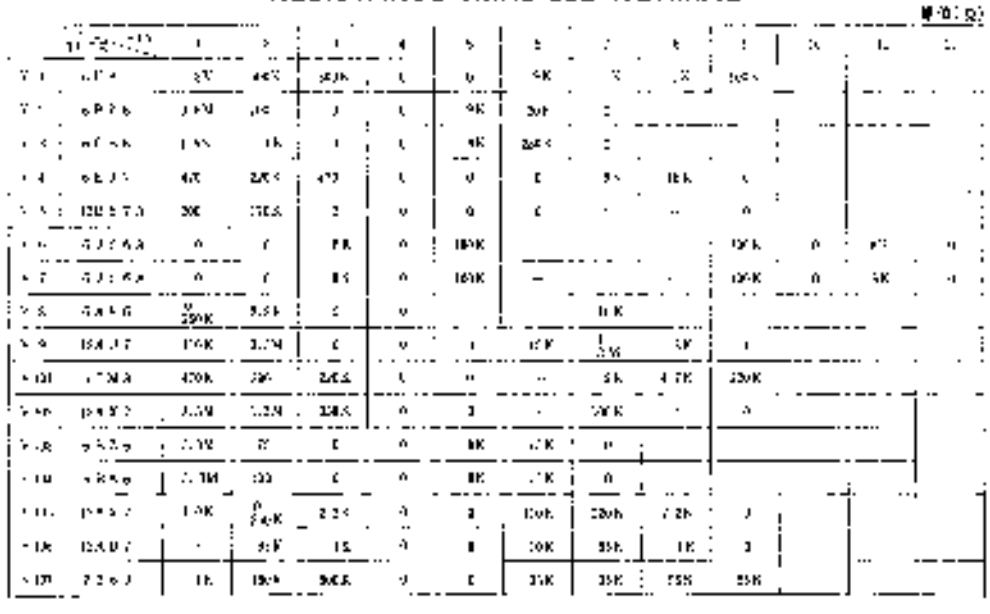
RECEIVE 7MHz SSB NORMAL



TRANSMIT 7MHz SSB NORMAL



RESISTANCE 7MHz SSB NORMAL



FT - 200 PARTS LIST

C - CAPACITOR

167	PM 27P 500WV ±10%
29, 61, 181	PM 33P 500WV ±10%
402	PM 56P 500WV ±10%
12, 13, 31, 32, 41, 112, 139	PM 100P 500WV ±10%
11, 99, 119, 131, 141, 403, 415	PM 200P 500WV ±10%
406	PM 300P 500WV ±10%
33, 62	PM 400P 500WV ±10%
22, 26, 36, 138, 190	PM 500P 500WV ±10%
91, 92, 604	PM 600P 500WV ±10%
38	PM 700P 500WV ±10%
134	PM 800P 500WV ±10%
16, 30, 34, 35, 49, 79, 80, 90 122, 127, 142, 113, 116, 117 123, 154	PM 1000P 500WV ±10%
39, 148, 149, 204, 305	PM 1500P 500WV ±10%
605	PM 1700P 500WV ±10%
42, 40	PM 2000P 500WV ±10%
406	PM 2500P 500WV ±10%
37, 133, 140, 611	PM 3000P 500WV ±10%
30, 601, 603	PM 3500P 500WV ±10%
409, 410	PM 4700P 500WV ±10%
2, 43, 64, 109, 110, 128, 163 168, 169, 303	PM 5000P 500WV ±10%
61, 415	PM 6800P 500WV ±10%
60	PM 10000P 500WV ±10%
33, 34, 201	PM 20000P 500WV ±10%
4, 14, 18, 68, 121, 144, 157	DISC 0.001 500WV
3, 9, 13, 15, 19, 24, 25, 27, 45 47, 48, 51, 53, 54, 56, 57, 65 66, 69, 78, 95, 78, 87, 88, 94 102, 105, 108, 114, 115, 118 120, 125, 126, 129, 130, 136 137, 143, 145, 146, 147, 150 152, 153, 156, 158, 159, 162 202	DISC 0.01 500WV
36, 50, 401, 405, 407, 411, 416 418, 504, 505, 507, 509, 510	DISC 0.01 50WV
72, 74, 80—83, 95, 96, 97, 151 205, 205, 206, 207, 304	DISC 0.05 50WV
684	DISC 0.005 500WV
506	DISC 0.001 50WV
59, 70, 71, 76	DISC 4700P 1.4KV
6, 62, 151	MYLAR 0.05 250WV
7, 8, 100, 107, 124, 502	MYLAR 0.1 50WV
41	MICA 50P 2KV
55	MICA 500P 1KV
56	MICA 50PP 3KV
413	CERAMIC 3P 500V CJ
414	CERAMIC 9P 500V CJ
404	CERAMIC 20P 500V CJ
131, 155, 160	ELECTROLYTIC 10μ 10WV
502, 503, 508	ELECTROLYTIC 10μ 25WV
5	ELECTROLYTIC 10μ 16WV
29	ELECTROLYTIC 20μ 400WV
86, 93	ELECTROLYTIC 1μ 250WV
101	ELECTROLYTIC 50μ 15WV
104	ELECTROLYTIC 30μ 150WV
111	ELECTROLYTIC 20μ 350WV
501	ELECTROLYTIC 470μ 16WV
98	CERAMIC 1400P 3KV
103	MP 0.01μ 400WV

R - RESISTOR

60	22Ω ½W
66, 68, 70, 71	56Ω ½W
59, 69	56Ω 1W
114	68Ω ½W
10, 25, 170, 411, 412, 513	100Ω ½W
60	120Ω 1W
48, 510	150Ω ½W
501, 408, 410	220Ω ½W
115, 203	330Ω ½W
101	390Ω 1W
15, 204	470Ω ½W
503, 505	560Ω ½W
21, 22, 35, 38, 53, 106, 117 123, 137, 138, 139, 148, 502	1 K ½W
29, 41, 132, 602, 504	1.5K ½W
3, 27, 43, 54, 59, 134, 160 405, 409	2.2K ½W
402	3.3K ½W
102, 126, 141, 159, 201, 505, 509	4.7K ½W
55	5 K 1/2W
406	6.2K ½W
1, 9, 30, 46, 52, 62, 64, 72, 73 111, 214, 118, 163, 302, 403	10 K ½W
57	10 K 1W
24	15 K ½W
39, 403	18 K ½W
130, 154, 512	20 K ½W
31, 407, 602	22 K ½W
30, 38, 404, 506, 511	33 K ½W
37, 39, 40, 42, 47, 119, 128 143, 144, 146, 149, 151—153 164—166, 507	47 K ½W
2, 5, 6, 10, 14, 50, 65, 110, 112 131, 133, 136, 140, 155, 156 303	100 K ½W
150	150 K ½W
103, 104, 108, 109, 116, 121	220 K ½W
135	330 K ½W
20, 23, 26, 105, 135, 141, 142 157, 158	470 K ½W
4, 8, 127	1 M ½W
35, 51	1.5M ½W
107	2.2M ½W
1, 124, 129	3.3M ½W

VC - VARIABLE CAPACITOR

1. PRESELECTOR	330P 20P) × 3
2. PLATE	390P
3. LOAD	340P × 2
401 VFO	30P × 2

TC - TRIMMER CAPACITOR

1, 2	50P MICA
3	10P 1.5KV. AIR
101, 102	40P CERAMIC
201—206	20P CERAMIC
305	50P CERAMIC
401	30P AIR
402	10P × 2 AIR

TR - TRANSISTOR

201, 401, 402, 502	2SC372
301, 503	2SC367 (2SC735Y)

501	2SC372

D - DIODE

1 - 5, 101, 102, 103, 106	SIL (1S1941) SILICON
6, 7, 104, 105, 301	1S1007 GER
401	1S145 VARICAP
501	1S336 ZENER
502	1S331 ZENER

VR - VARIABLE RESISTOR

1	AF GAIN - RF GAIN	500K-A 10K-C 1/8W
2	MIC GAIN	500K A 1/8W
3	ANTI TRIP	100K-B 1/4W
4	VOX GAIN	500K A
5	DELAY	2M-B 1/4W
6	CLARIFIER	50K-B 1/4W
7	RFA	20K-B 1/50W
8	CARRIER	3M-B 1/4W
9	RELAY SENS	3K-B 1/4W
101	ALC ADJ	2K-B 1/50W
102	AGC ADJ	10K B 1/50W
103	BIAS	30K-B 1/25W
104	SM SENS	5K-B 1/25W
105	SM ZERO	500 B 1/25W
106	CARRIER BALANCE	5K-B 1/50W
501	VOLT ADJ	1K B 1/50W
502	TONE OUT ADJ	10K-B 1/50W
503	TONE ADJ	10K B 1/50W
504	TONE OSC ADJ	10K-B 1/50W

RL - RELAY

1	ANT	AL3254 100V
101	VOX	AF3254 100V

XF - CRYSTAL FILTER

101	XF-9 9MC

X - CRYSTAL

101		HC-18/U 9001.5 KC
102		8998.5 KC
201	7 m	33.0 MC
202	21 m	35.0 MC
203	28 mA	42.5 MC
204	28 mB	43.0 MC
205	28 mC	43.5 MC
206	28 mD	44.0 MC
301	CAL	HC 13/U 100 KC

PL - PILOT LAMP

1, 2	15V

T - TRANSFORMER

1	OPT 5K:600, 8

M - METER

1	MRA 45 0.5mA

PB - PRINTED BOARD

PB-1047	GENERATOR
PB-1061	VFO
PB-1010	CALIBRATOR
PB-1044	VFO DPP
PB-1066	VOLT REG
PB-1045	HETERODYNE OSC

S - SWITCH

1	BAND SW 1	RS 5-6-5
2.	BAND SW 2	RS 1-3-4
3.	FUNCTION	RS 4-5-5
4.	SIDE BAND	
5.	VOX/PTT	
6.	OPR/REC/CAL	
7.	ALC/IC/PO	
8.	FIX SELECT (OPTION)	
9.	POWER	

—FP - 200—

C - CAPACITOR

101, 102	ELECTROLYTIC 47μ × 2 450WV
103 - 105	ELECTROLYTIC 33μ × 3 450WV
106	ELECTROLYTIC 10μ 200WV
107, 108	ELECTROLYTIC 20μ 150WV
109, 110	DISC 0.01 1.4KV
501 - 504, 509 - 513	DISC 4700P 1.4KV
513	0.01 500WV

R - RESISTOR

101, 102, 501, 502, 503, 504 505, 507	470K 5W
513	4.7Ω 1W
516	22K 1W
517	5.6Ω 2W

D - DIODE

501—508	10D10 SILICON
509—512	1S1914 SILICON
513	1S1943 SILICON

T - TRANSFORMER

101	POWER

CH - FILTER CHOKE

101, 102	2.5H 150mA

F - FUSE

101	5A (100V) 3A (200V)

—FIX CH OPTION—

TR - TRANSISTOR

701	2SC 372

D - DIODE

701 (A), 701 (B)	1S145

C - CAPACITOR

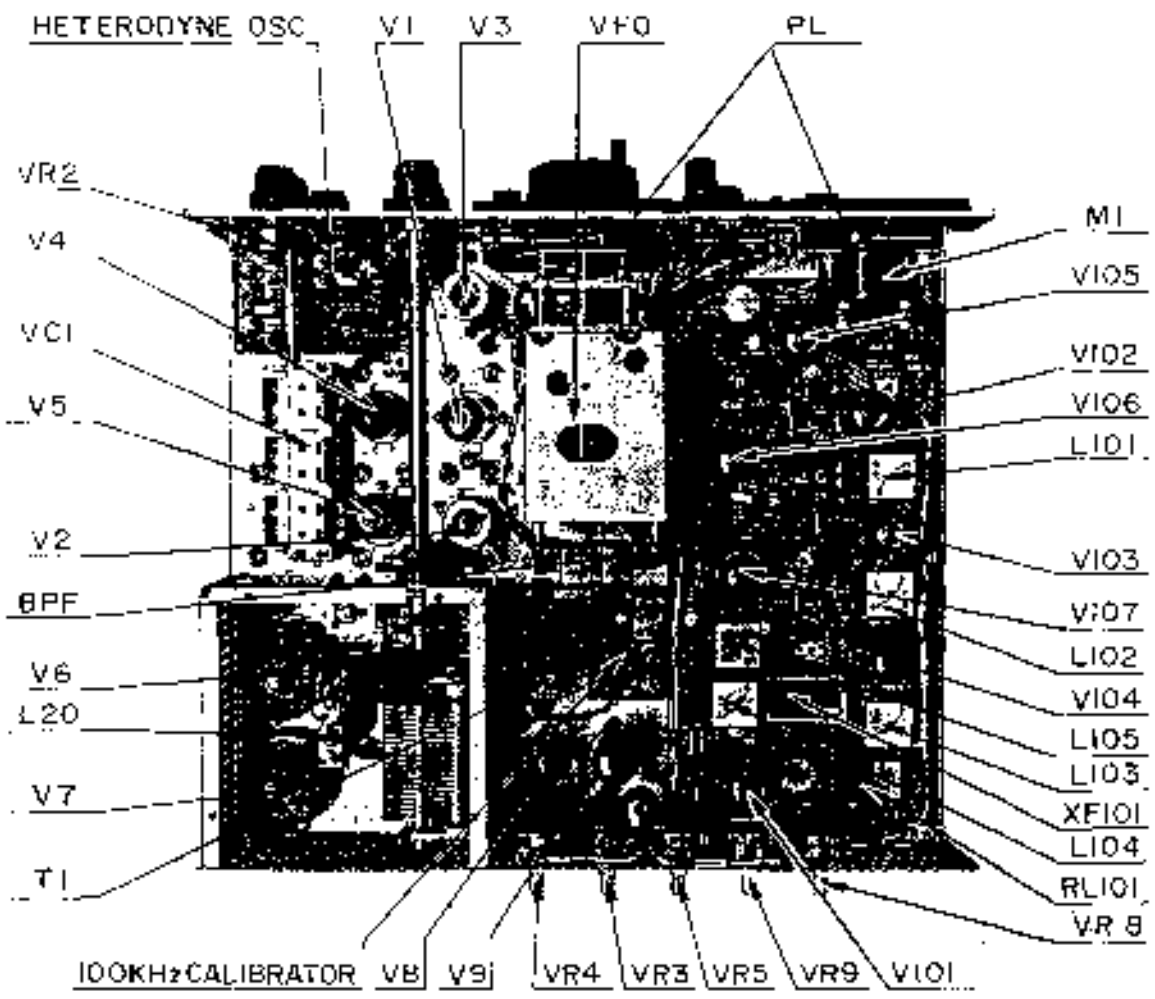
701	FM 100P 500WV
702, 703, 705	DISC 0.01 500WV
704	FM 250P 500WV

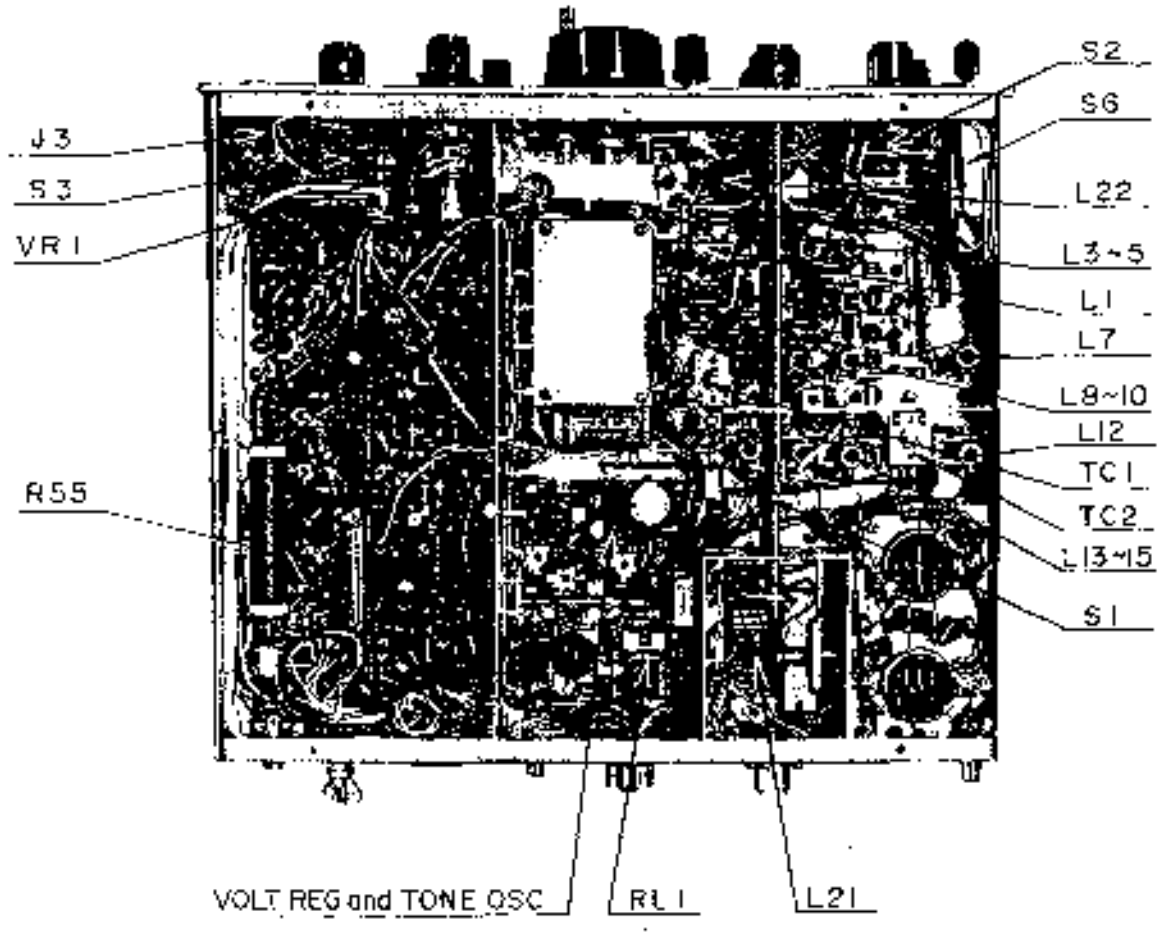
R - RESISTOR

701	22K 5W
702	3.3K 5W
703	220 5W
704	470 5W
705	10K 5W

TC - TRIMMER CAPACITOR

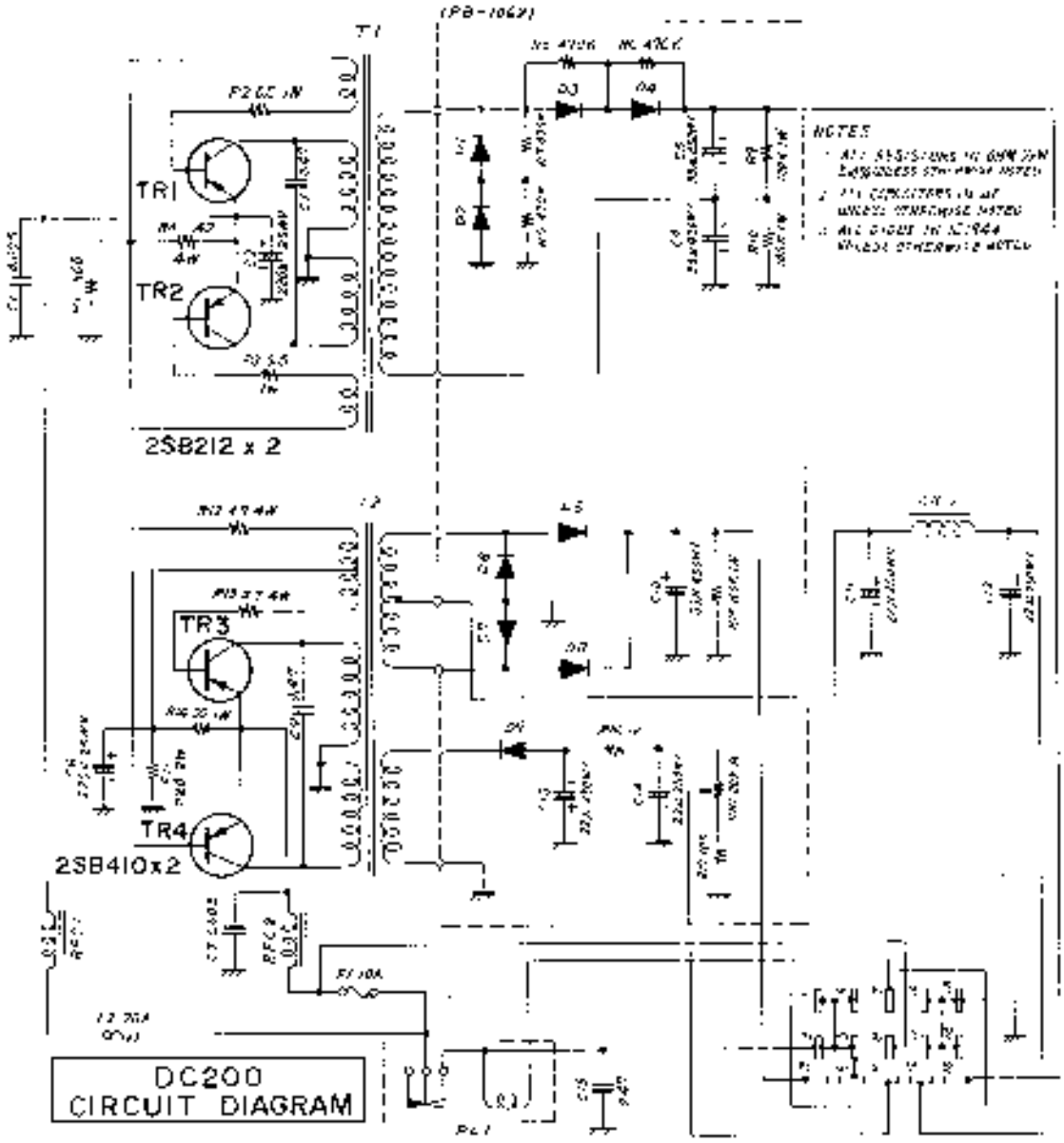
701 - 704	20P CERAMIC


HETERODYNE OSC
V1
V3
VFO
PL
VR2
V4
VC1
V5
V2
BPF
V6
L20
V7
T1
M1
V105
V102
V106
L101
V103
V107
L102
V104
L105
L103
XF101
L104
RL101
VR 8
100KHz CALIBRATOR
V8
V9
VR4
VR3
VR5
VR9
V101

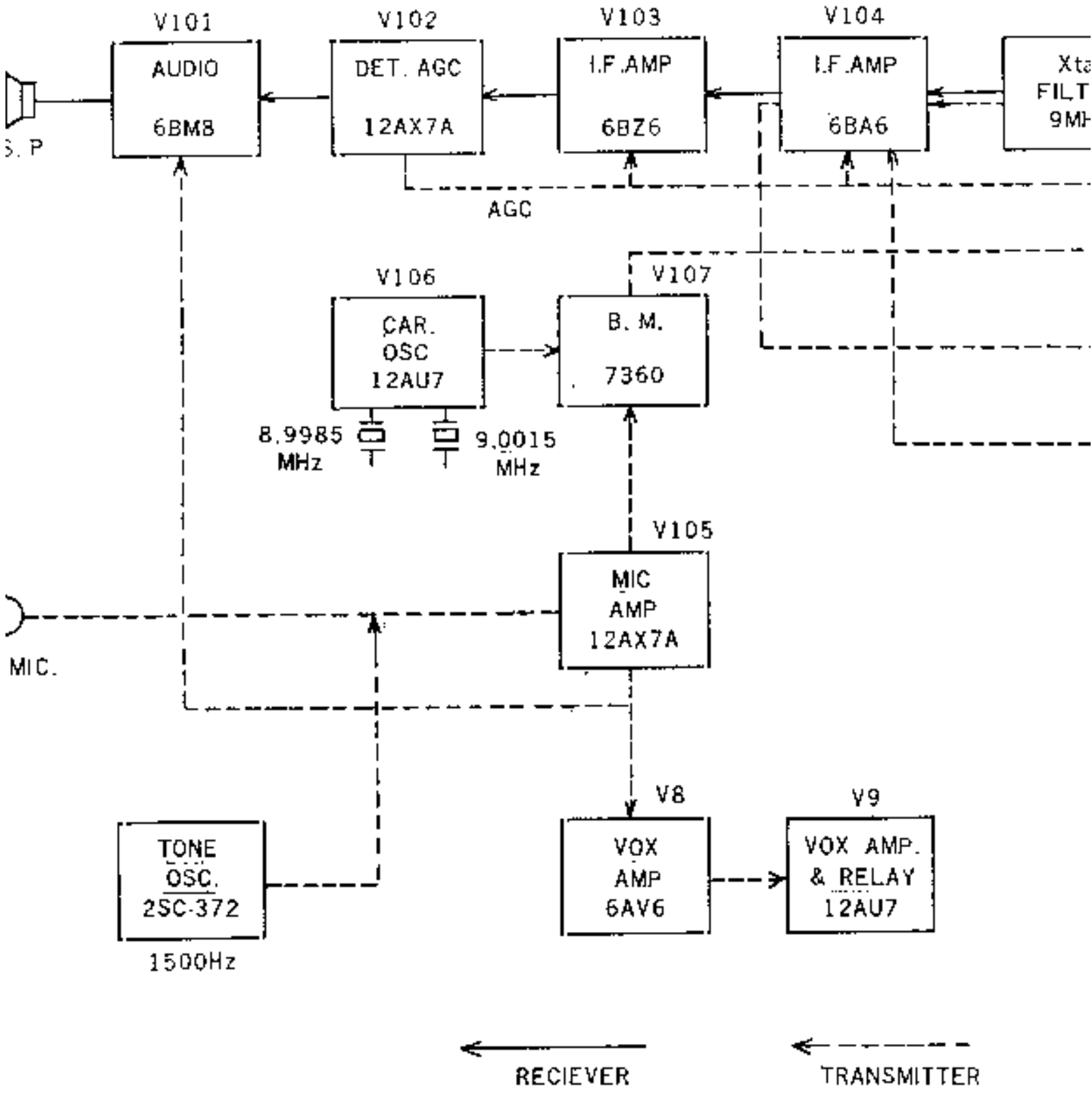

S2
S6
J3
S3
VR1
L22
L3~5
L1
L7
L8~10
L12
TC1
TC2
L13~15
S1
R55
VOLT REG and TONE OSC
RL1
L21

DC-200 DC POWER SUPPLY

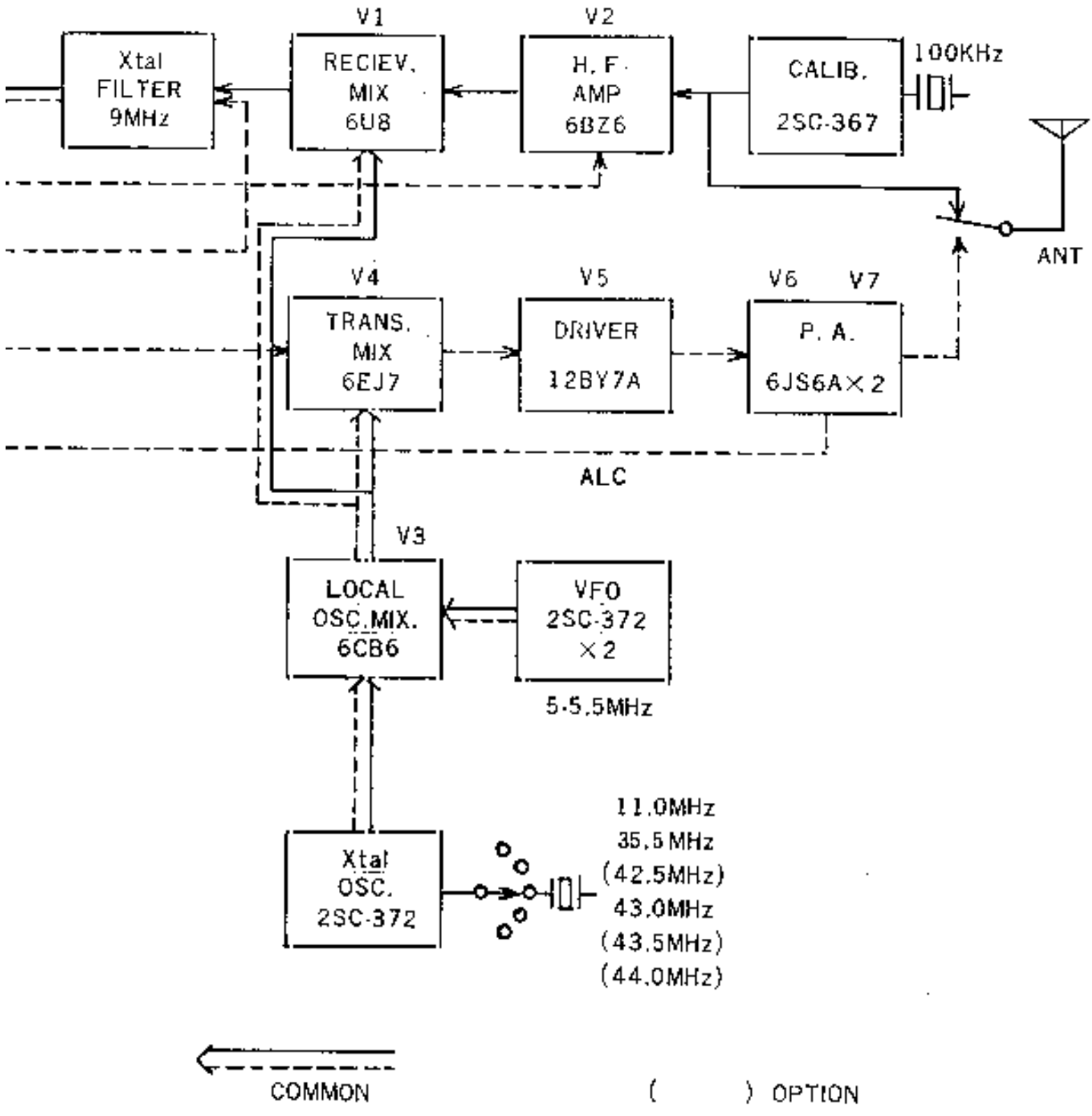
The DC-200 DC mobile supply is designed for the FT-200 Transceiver. This supply provides all necessary voltages from 12 volt battery for mobile operation.

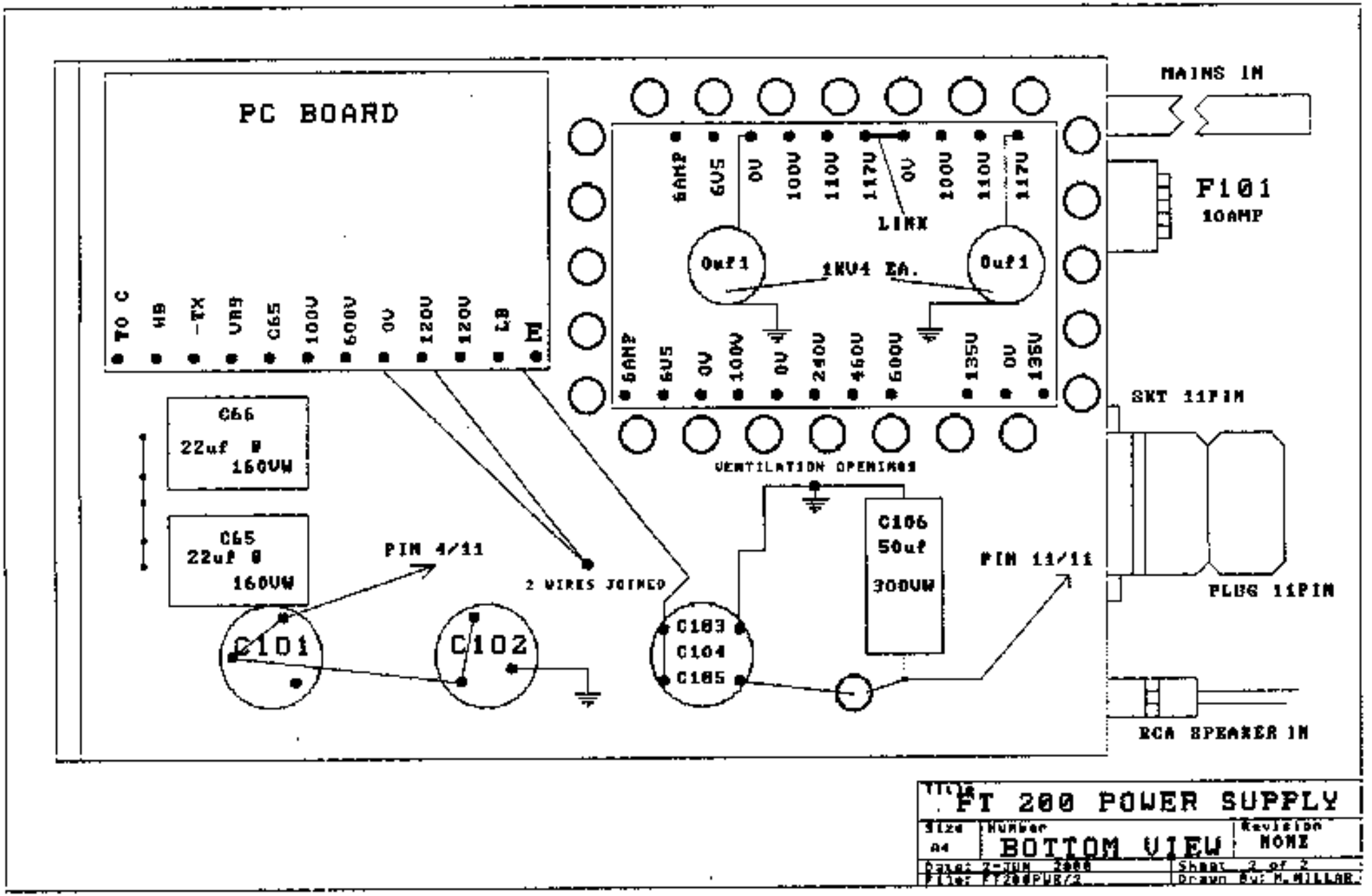


BLOCK DIA

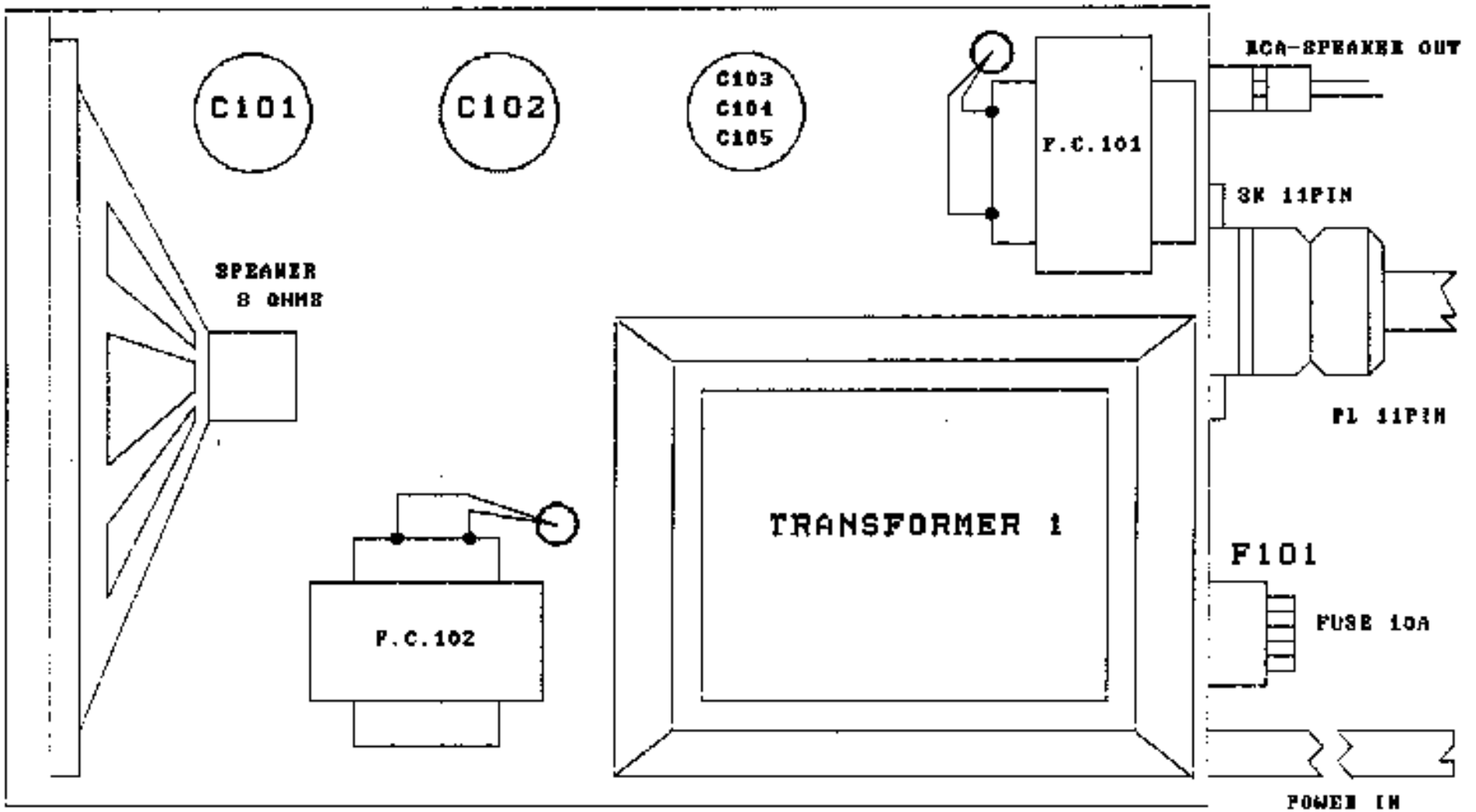

V101
AUDIO
6BM8
V102
DET. AGC
12AX7A
V103
I.F.AMP
6BZ6
V104
I.F.AMP
6BA6
Xta
FILT
9MH
S. P
AGC
V106
CAR.
OSC
12AU7
V107
B. M.
7360
8.9985
MHz
9.0015
MHz
V105
MIC
AMP
12AX7A
MIC.
V8
V9
TONE
OSC.
2SC-372
1500Hz
VOX
AMP
6AV6
VOX AMP.
& RELAY
12AU7
RECIEVER
TRANSMITTER

K DIAGRAM

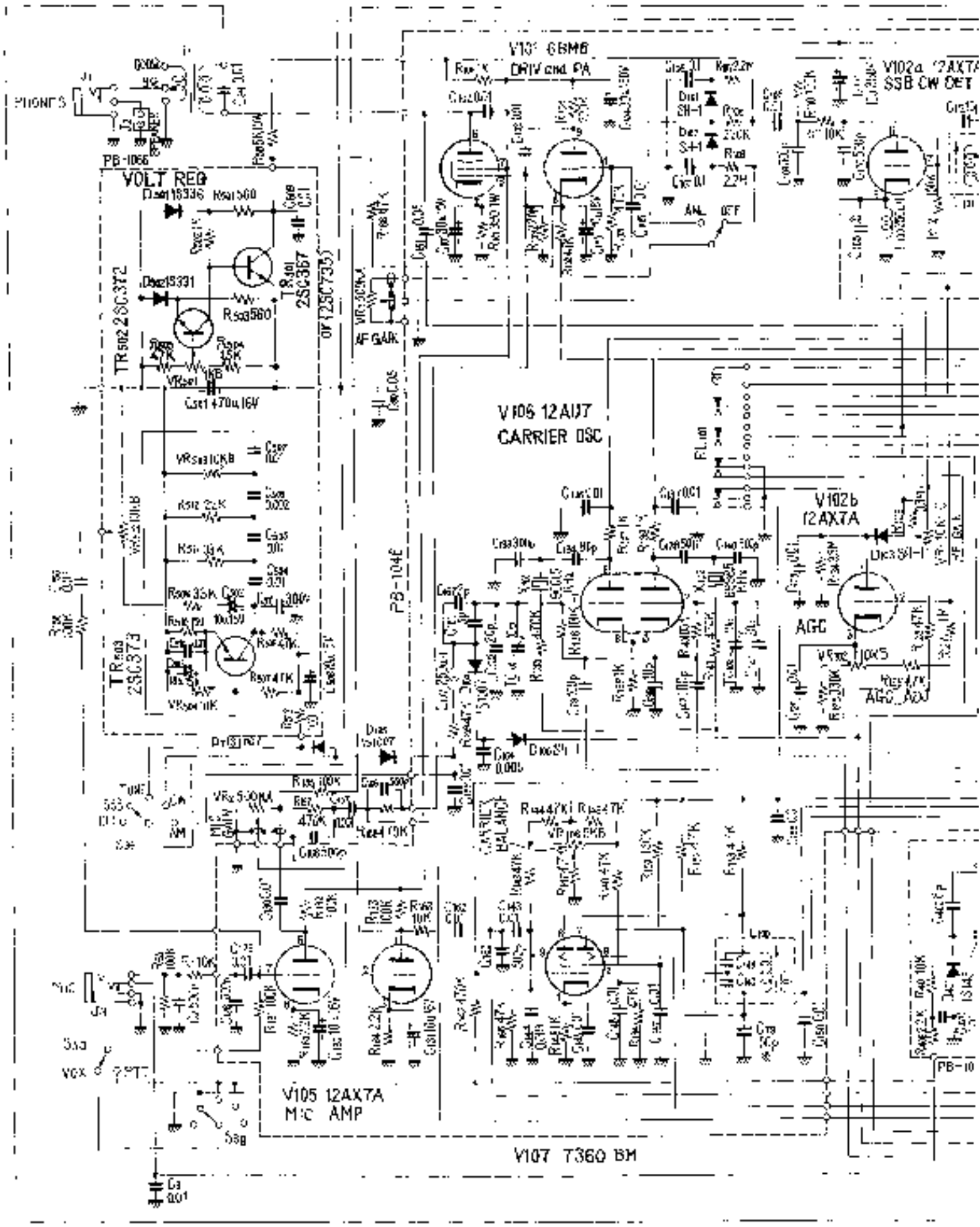

V1
V2
Xtal
FILTER
9MHz
RECIEV.
MIX
6U8
H. F.
AMP
6BZ6
CALIB.
2SC-367
100KHz
ANT
V4
V5
V6
V7
TRANS.
MIX
6EJ7
DRIVER
12BY7A
P. A.
6JS6A×2
ALC
V3
LOCAL
OSC.MIX.
6CB6
VFO
2SC-372
×2
5-5.5MHz
Xtal
OSC.
2SC-372
11.0MHz
35.5MHz
(42.5MHz)
43.0MHz
(43.5MHz)
(44.0MHz)
COMMON
( ) OPTION

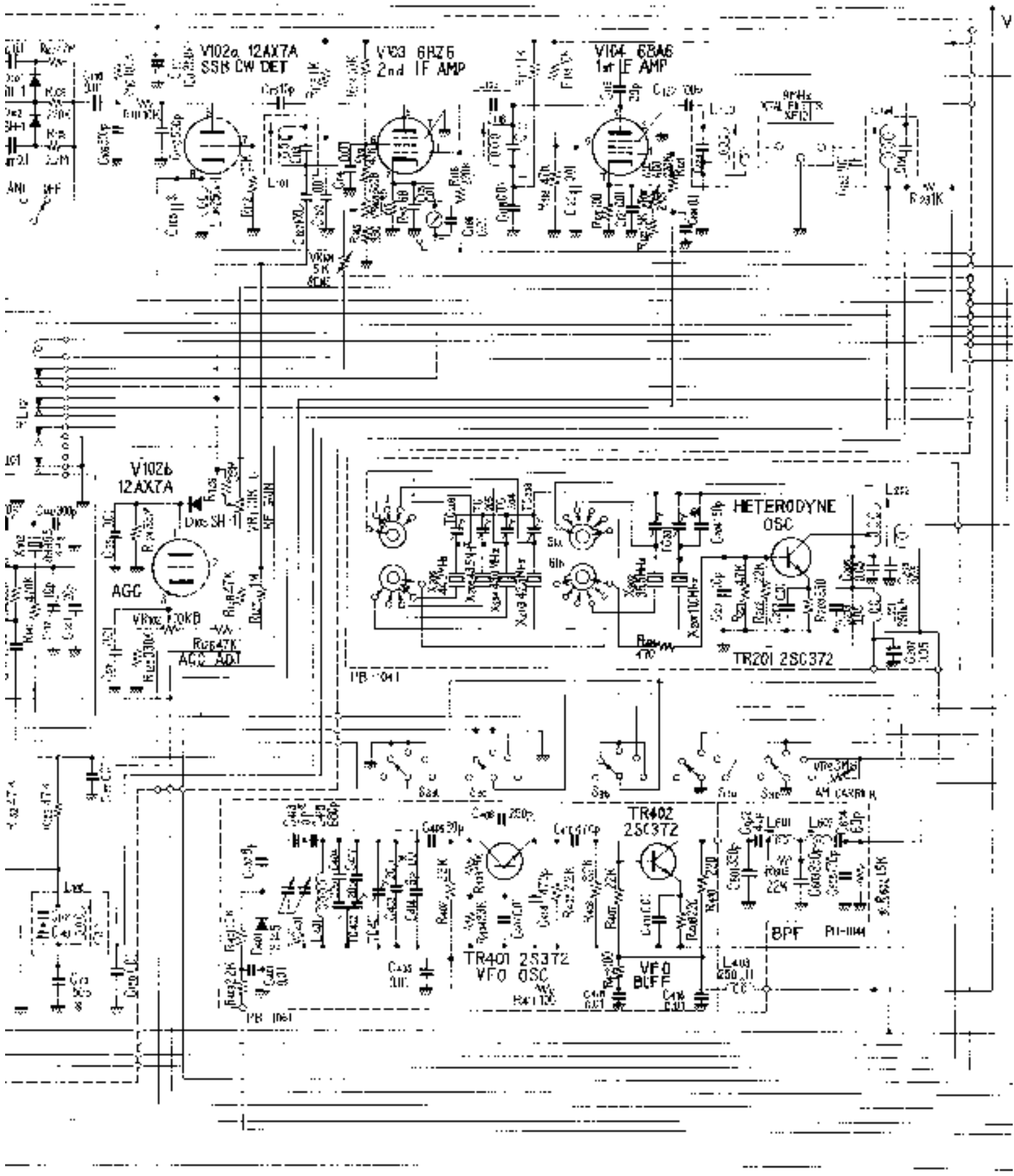


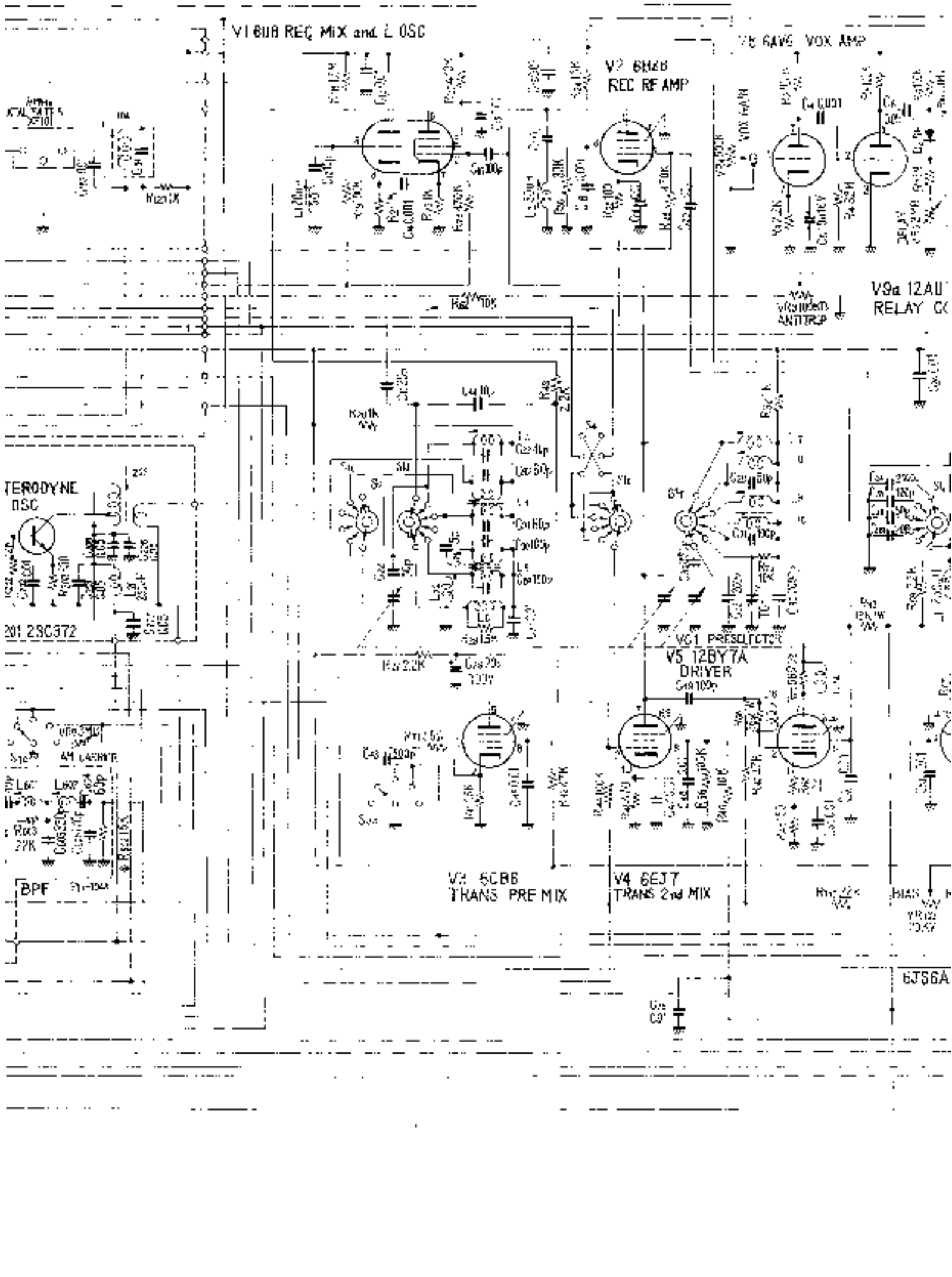
Title: FT 200 POWER SUPPLY		
Size: A4	Number: BOTTOM VIEW	Revision: NONE
Date: 7-JUN 2006		Sheet 2 of 2
File: FT200PWR/2		Drawn By: M.MILLAR.

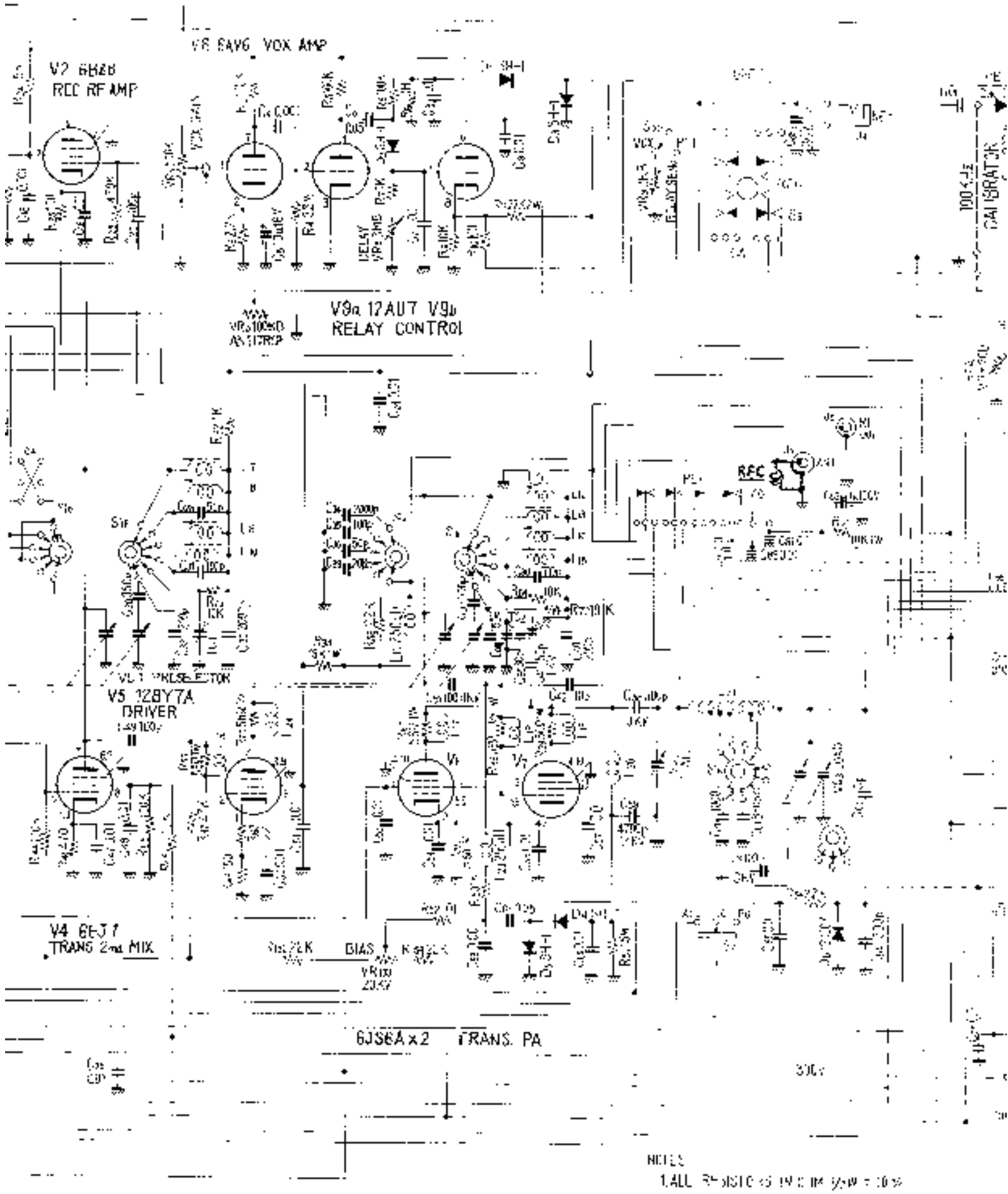


Title: FT 200 POWER SUPPLY		
Size: A4	Number: TOPVIEW	Revision: NONE
Date: 2-JUN-2002	Sheet 1 of 2	
File: FT200TOP1	Drawn By: P.MILLAR	


PHONES
PB-1066
VOLT REG
TR502 2SC372
TR501 2SC367
TR503 2SC373
AF GAIN
V106 12AU7
CARRIER OSC
PB-104E
V102b 12AX7A
AGC
V105 12AX7A
MIC AMP
V107 7360 BM
CARRIER BALANCE
FL101
PB-10

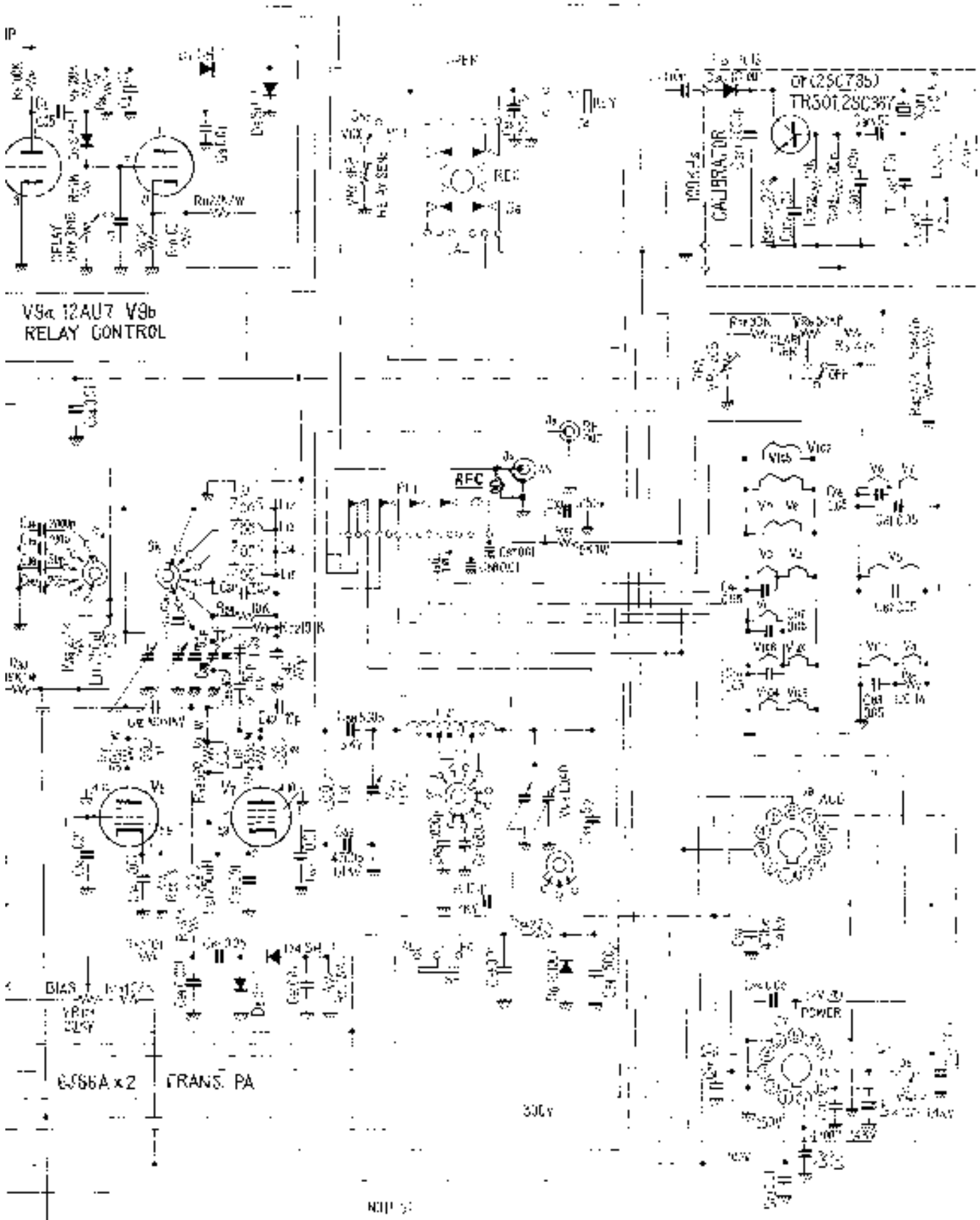

V102a 12AX7A
SSB CW DET
V103 6BZ6
2nd IF AMP
V104 6BA6
1st IF AMP
V102b
12AX7A
AGC
HETERODYNE
OSC
TR201 2SC372
TR402
2SC372
TR401 2SC372
VFO OSC
VFO
BUFF
BPF


V1 6U8 REC MIX and L OSC
V2 6BA6
REC RF AMP
V6 6AV6 VOX AMP
V9a 12AU
RELAY CC
VOX (+VH)
VOX ANTITRIP
TERODYNE
OSC
201 2SC372
VC1 PRESELECTOR
V5 12BY7A
DRIVER
AM CARRIER
BPF
V3 6CB6
TRANS PRE MIX
V4 6EJ7
TRANS 2nd MIX
BIAS
6JS6A



NOTES

1. ALL RESISTORS 1/4 W 5% UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS IN uF UNLESS OTHERWISE NOTED.
3. ✱ VALUES NOMINAL.

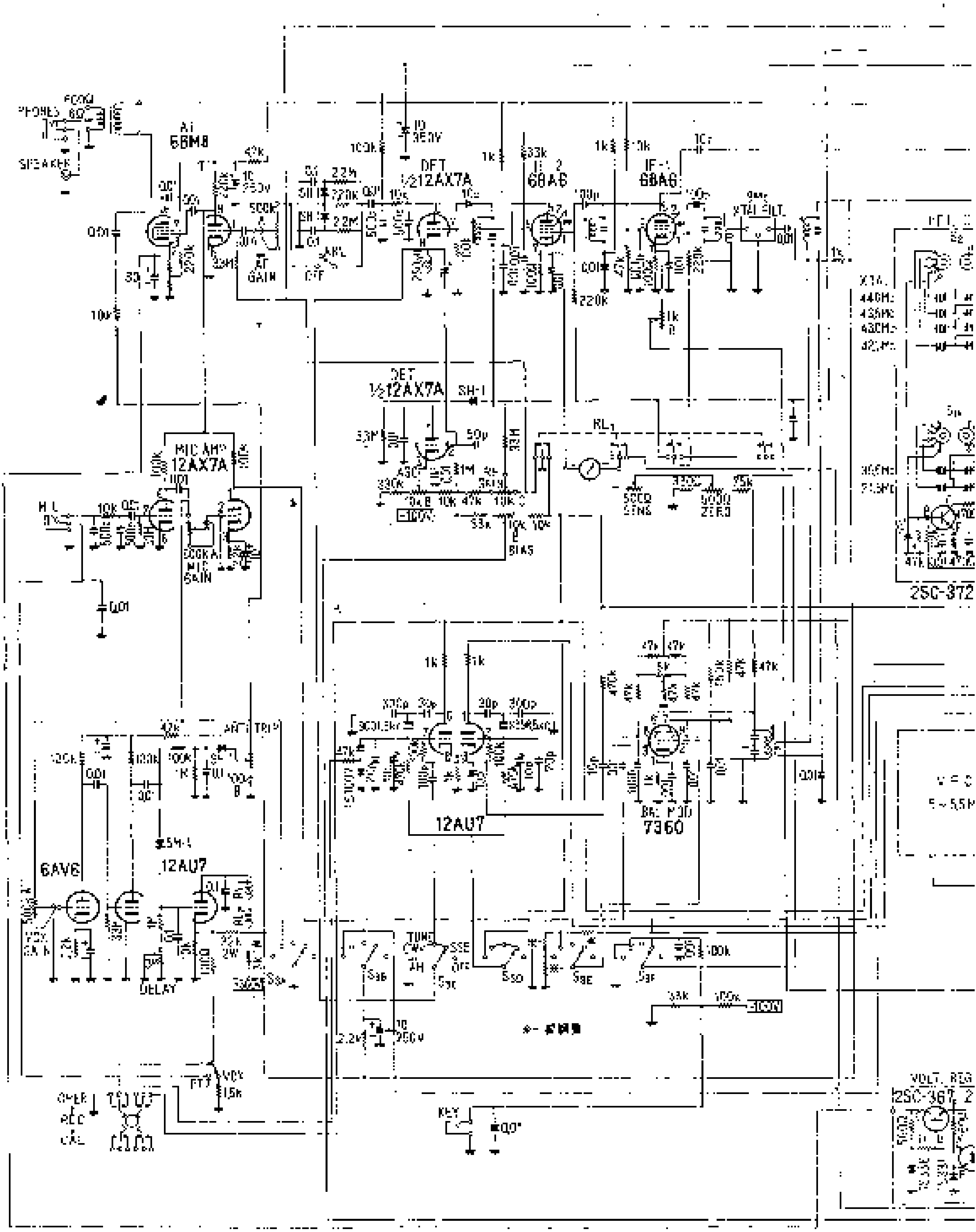


NOTE:

1. ALL RESISTANCE IS IN OHM 1/4W ±10%
   UNLESS OTHERWISE NOTED.
2. ALL CAPACITOR IN uF
   UNLESS OTHERWISE NOTED.
3. ( ) VALUE IS NOMINAL.

FT-200
CIRCUIT DIAGRAM

FT-200 SSB



PHONES
SPEAKER
6BM8
DET
1/2 12AX7A
6BA6
XTAL FILT
AF GAIN
DET
1/2 12AX7A
SH-1
RL1
MIC AMP
12AX7A
MIC GAIN
BIAS
ZERO
2SC-372
12AU7
BAL MOD
7360
6AV6
12AU7
VOX GAIN
DELAY
VFO
VOLT. REG
2SC-367
KEY
OPER
REC
CAL

SB