

CIRCUIT BOARD DESCRIPTION

The FT-101 Transceiver has adopted computer type plug-in modules. These modules are ; High frequency unit, High frequency IF unit, LOW frequency IF unit, Audio unit, Modulator unit, and Power regulator unit. In addition, the VFO unit, crystal controlled oscillator unit and rectifier unit are built-in to the main chassis.

(1) HF UNIT (PB-1077B)

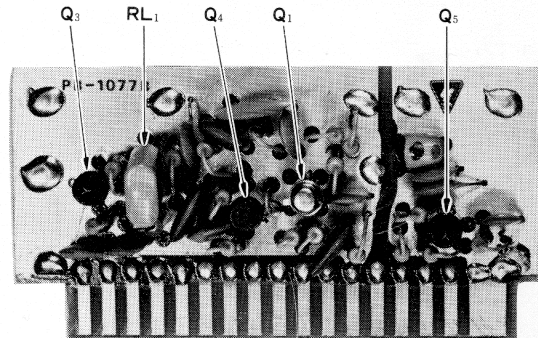
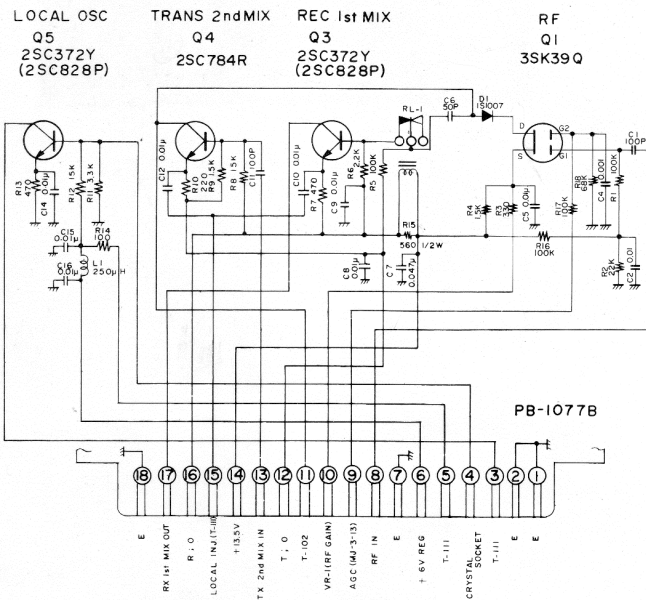
This module contains the receiver RF amplifier, receiver 1st mixer, transmitter 2nd mixer and heterodyne oscillator circuit. The signal from the antenna coil is fed to the gate of Q1 (field effect transistor 3SK39Q) through terminal 8 of the module.

The AGC (automatic gain control) voltage which is obtained from the low frequency IF unit, is applied to the gate circuit of Q1 from pin 9 to control the gain of this stage. A manual RF gain control on the front panel is connected to the source of Q1 through pin 10.

Signal output from the Q1 is then coupled to the receiver first mixer Q3, 2SC372Y where the incoming signal is mixed with a signal from the heterodyne

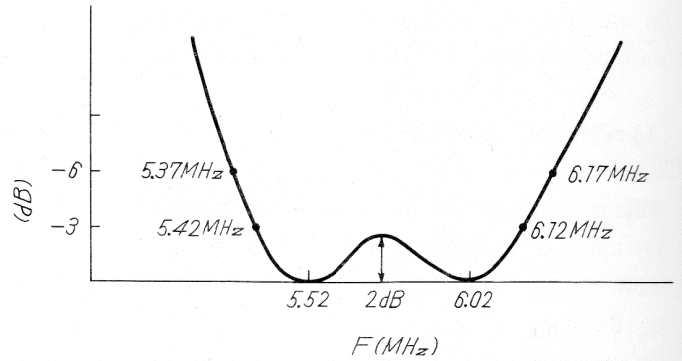
oscillator Q5, 2SC372Y. The product of the first mixer is applied from the pin 17 to the high frequency IF unit.

Transmitter signal is fed to the base of transmitter 2nd mixer Q4, 2SC373 from pin 13. The signal from the heterodyne oscillator is applied to the emitter of the mixer Q4, through pin 15 from output transformer T111. This arrangement converts the high frequency IF signal to the desired transmitting frequency. This transmitting signal is fed to T102 through pin 11. The base circuit of the receiver mixer Q3 is disconnected in transmit by a relay to avoid the lowering the Q of the circuit. Crystal sockets and all coils are mounted on the main chassis.

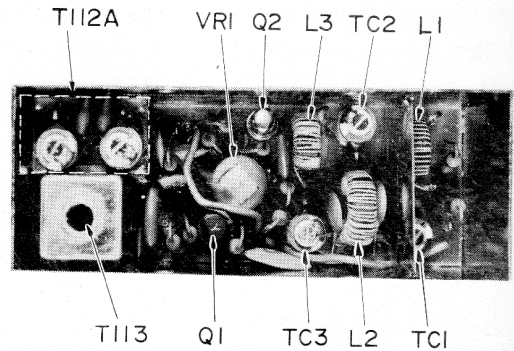
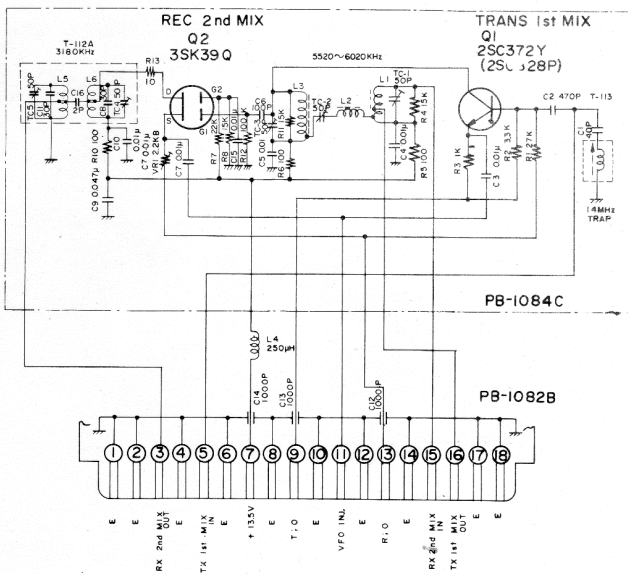


(2) HIGH FREQUENCY IF UNIT (PB-1084C)

The module contains the transmitter first mixer Q1, 2SC372Y, the receiver second mixer Q2, 3SK39Q, and 5520 to 6020 KHz bandpass network. The signal from the receiver first mixer is fed to the gate of the mixer through the bandpass network L1, L2, and L3, from pin 15. VFO voltage is also applied to the source of Q2 from pin 11. The signal is converted to 3180 KHz low frequency IF and fed to the following stage from pin 3 through an output transformer T112. On transmit, the 3180 KHz signal is fed to the base of the mixer, from pin 5. A 14 MHz trap coil T113 is connected in the base circuit of Q1. The VFO signal is fed to the emitter of the Q1 which produces the 5520 to 6020 KHz high frequency IF signal. This signal is fed to the following stage from pin 16 through the bandpass network.



BANDPASS NETWORK CHARACTERISTICS



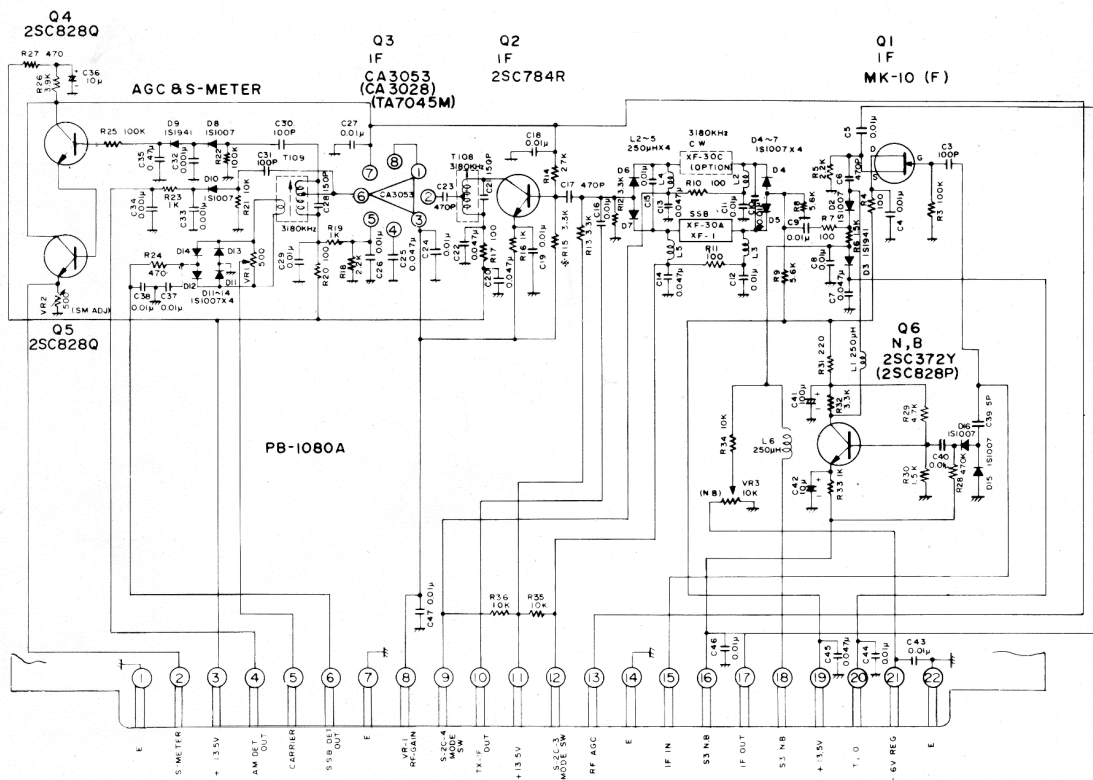
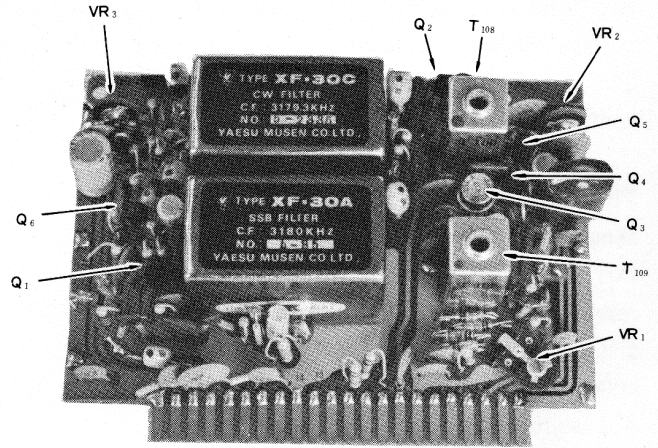
(3) LOW FREQUENCY IF UNIT (PB-1080A)

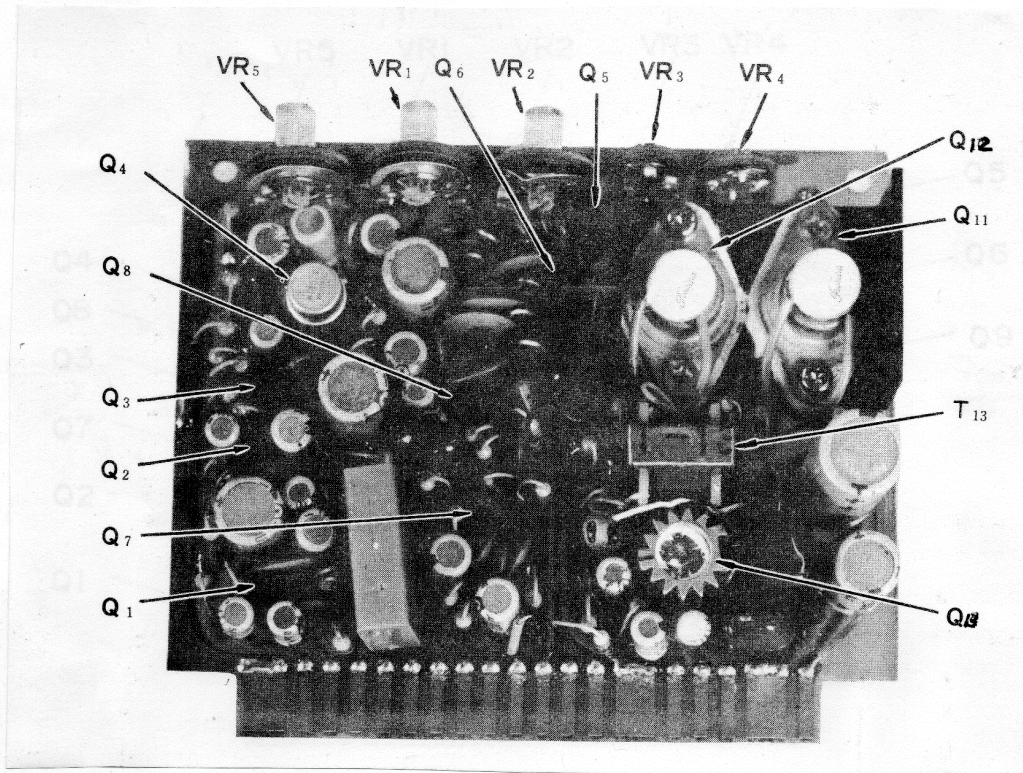
This module contains the low frequency IF amplifier, filter, noise blanker, detector and AGC/S meter circuits.

On receive, a 3180 KHz signal is fed to the gate of Q1 MK-10(F), FET from pin 15 of the module. Noise pulses on the 3180 KHz signal are rectified by D15 and D16, 1S1007 and are then amplified by the noise amplifier Q6, 2SC372Y.

The output from Q1 is fed to the crystal filter XF-1, through the noise blanker diode D2, 1S1007. The diode disconnects the input of the crystal filter each time there is noise pulse. The diode switch is driven by the noise amplifier Q6. The switching level is adjusted by the noise blanker threshold control VR3. At the most effective blanking position, there may be slight distortion on the received signal due to mixing at the switching diode. This effect can be reduced by adjusting the threshold control slightly.

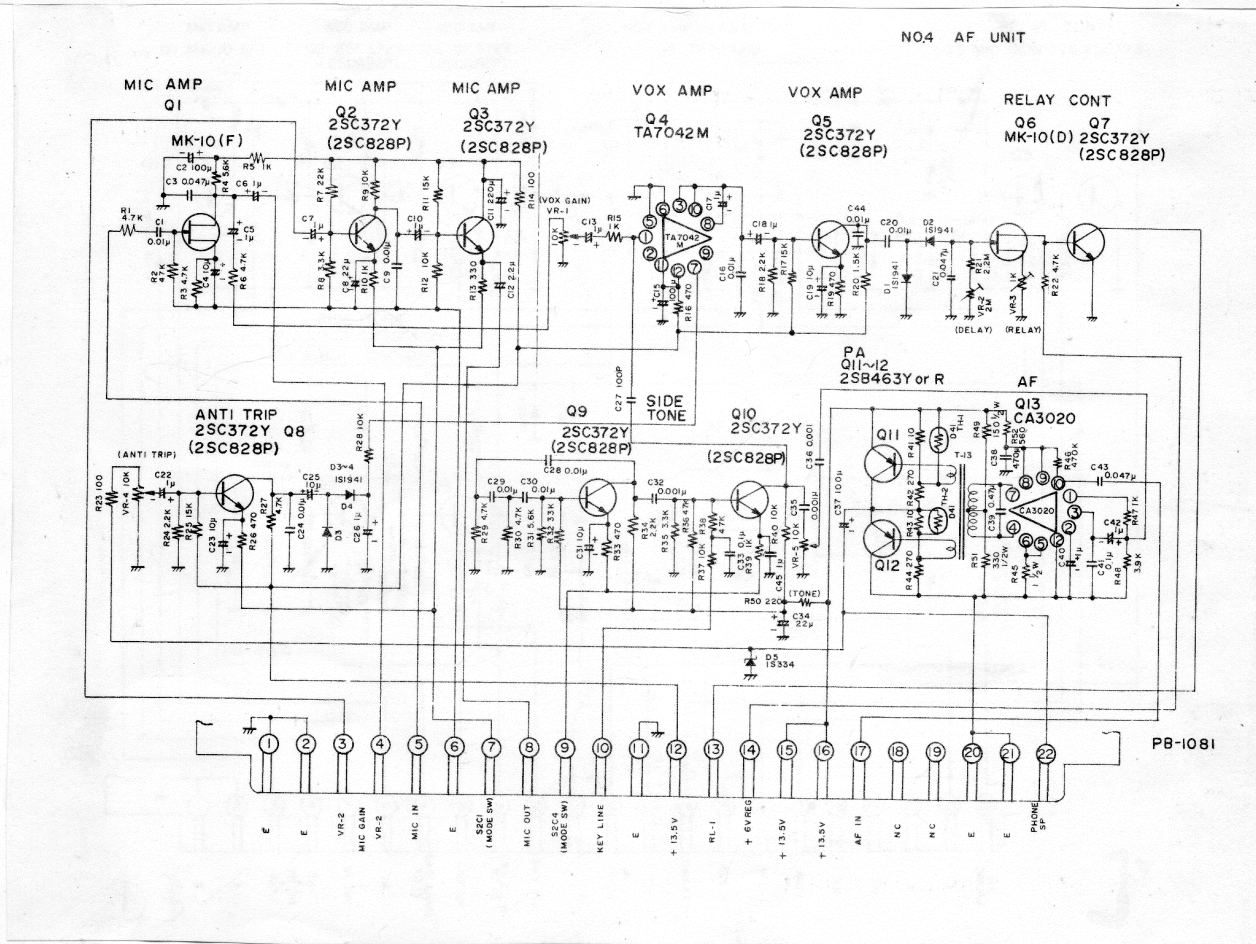
D4-D7 are diode switches which select the crystal filter for SSB or CW reception. The 600 Hz CW filter XF-30C is an optional feature available at additional





The ANTITRIP circuit provides a threshold voltage to prevent the speaker output from tripping the transceiver into the transmit function. The receiver audio output voltage is connected through ANTITRIP control VR5 to the antitrip amplifier Q4, and fed to rectifiers D3 and D4, 1S1941. Negative DC output voltage from

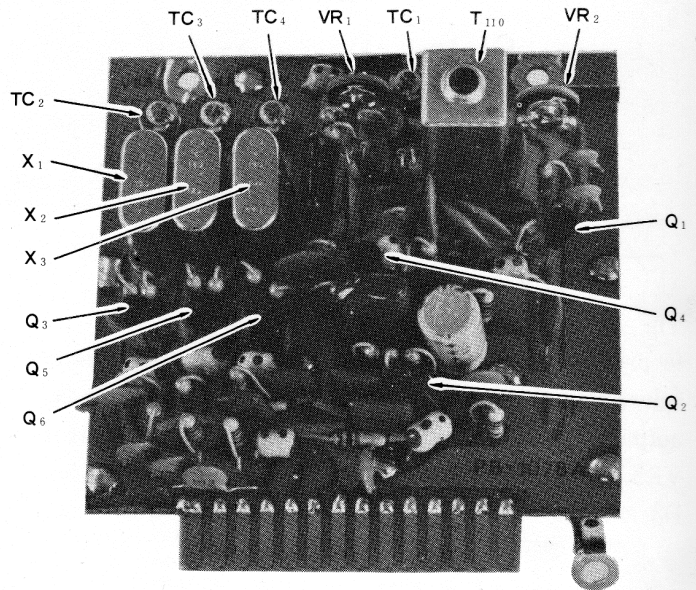
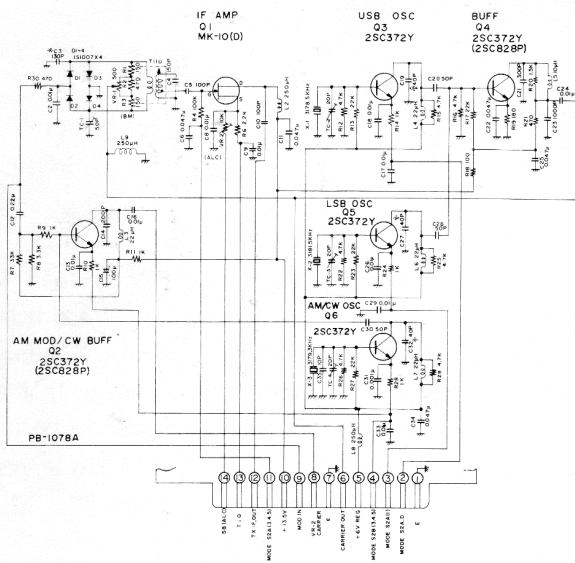
the rectifier, connected to the gate of Q5, reduces the gain of the VOX control transistor providing the necessary antitrip threshold. ANTITRIP control VR5 adjusts the value of the antitrip voltage threshold so that the loud speaker output will not produce excessive positive DC output from the VOX rectifier to exceed the nega-



tive DC output from the antitrip rectifier and cause the control transistor to actuate the relay. When speaking into the microphone normally the positive voltage will exceed the negative antitrip voltage and actuate the relay. VR3 provides course adjustment for relay sensitivity.

Relay hold time will be determined by DELAY control VR2.

The tone oscillator Q7, 2SC373 and Q8, 2SC372Y operate when the MODE switch is in CW position. It is a phaseshift oscillator operating at approximately 800 Hz. The uone output is cativated by the keying circuit and coupled through SIDETONE LEVEL control VR4 to the receiver audio amplifier for sidetone monitoring in CW operation. The output from Q8 is also coupled to the VOX amplifier Q4 for break-in CW operation.



(5) MODULATOR UNIT (PB-1078A)

The MODULATOR UNIT contains the carrier oscillators, the ring modulator circuit for SSB, and AM modulator. The carrier oscillator oscillates either 3178.5 KHz for USB or 3181.5 KHz for LSB, depending upon whether Q3, 2SC372Y or Q5, 2SC372Y is selected by the MODE switch. The MODE switch disconnects the emitter circuit of either transistor when not in use. The output from the oscillator is fed to the buffer amplifier Q4, 2SC372Y, and then to the balanced ring modulator D1-D4. The carrier signal is also fed to the ring demodulator from pin 6 for receive. These crystal frequencies are matched to the bandpass of the crystal filter to place the carrier frequency approximately 25 db down on the skirt of the filter response.

For AM and CW operation, the 3179.3 KHz crystal controlled oscillator Q6, 2SC372Y operates to produce the carrier signal, and Q3 and Q5 are disconnected.

Q2, 2SC372Y operates as a modulator for AM operation and as a buffer stage for CW operation. The speech signal is fed to the balanced ring modulator and AM modulator Q2 from pin 9.

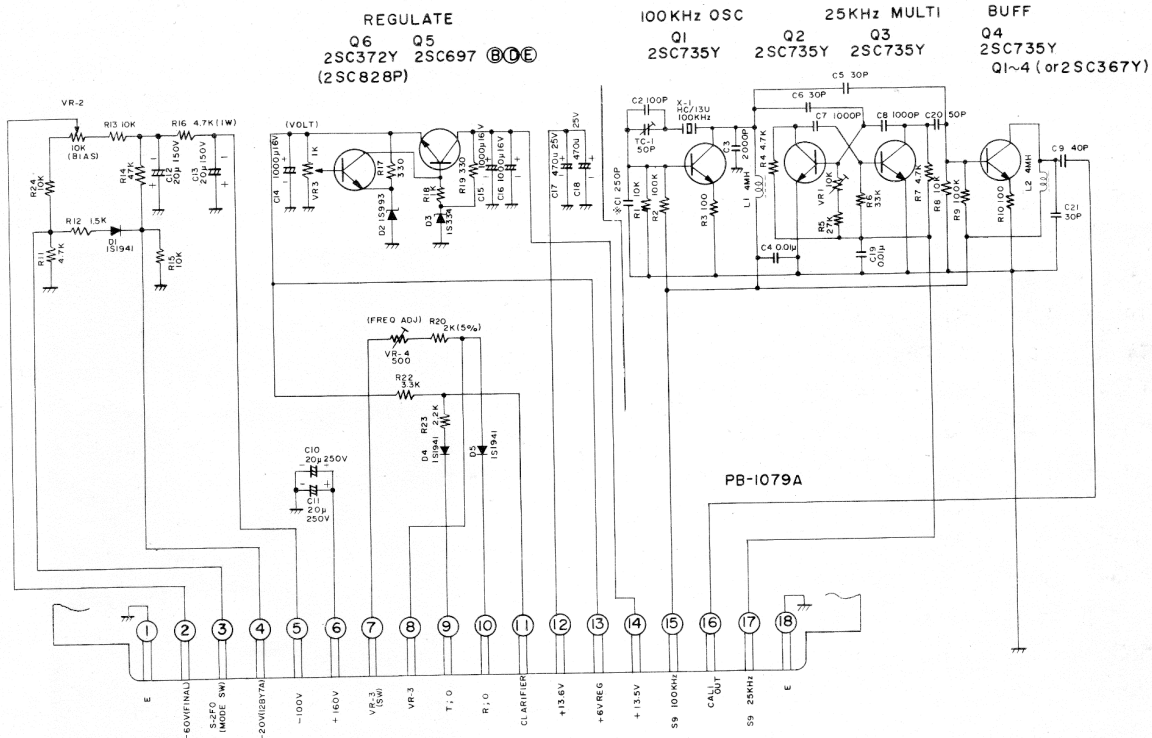
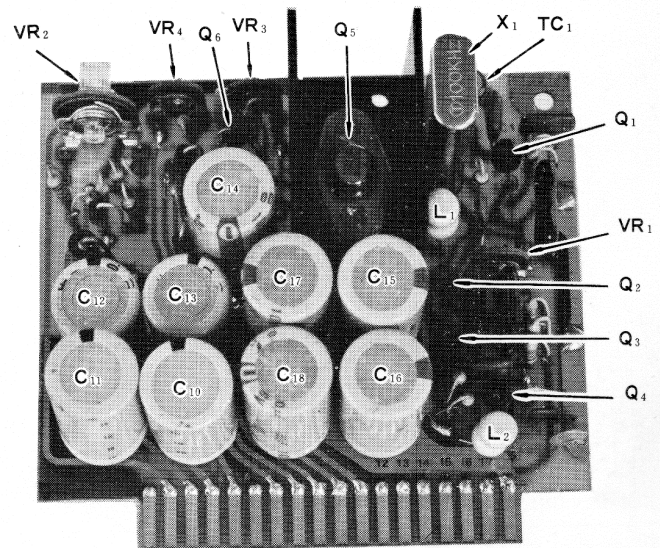
Carrier balance is obtained by a potentiometer VR1 and a trimmer capacitor, TC1 Double-sideband, suppressed-carrier output from the balanced modulator is amplified through T110 by the IF amplifier Q1, MK-10 (D), and fed to the low frequency IF unit pin 12. For AM and CW, the output signal from Q2 is fed to the high frequency IF unit, through CARRIER potentiometer VR2 on the front panel.

(6) POWER REGULATOR UNIT (PB-1079A)

The DC 13.6 volts from the rectifier unit is supplied through pin 14 to the voltage regulator circuit Q5, 2SC697 and Q6, 2SC372Y in this unit to obtain extremely stable 6 volt DC supply which is then fed to the various circuits from pin 13. The regulated voltage is supplied to the CLARIFIER control to offset the receive frequency ± 5 KHz either side of the transmitted signal. VR4 permits adjustment of controls to the receive and transmit frequency to coincide at the CLARIFIER zero or OFF position. A -100 volt negative voltage is delivered from pin 5 to the unit. VR2 sets the operating bias at approximately -50 volts for the final amplifier tubes. This bias voltage is -60 volts on receive and supplies the grid circuit of the final tubes on the main chassis from pin 2. The bias for the driver tube 12BY7A is also supplied from pin 4. This voltage is -20 volts on receive and -3.5 volts for transmit.

This module also contains the 100 KHz/25 KHz marker generator. Crystal controlled oscillator Q1, 2SC735Y oscillates at the 100 KHz crystal frequency for dial calibration. Trimmer capacitor, TC1 is used to calibrate

100 KHz against WWV or JJY. Output from the oscillator is fed to into 25 KHz multivibrator Q2 and Q3, 2SC735Y which generates a marker signal every 25 KHz. VR1 is used to synchronize the multivibrator to 25 KHz. The multivibrator operates when the supply voltage is applied through pin 17 from the switch on the front panel. The calibrator output is fed through the buffer amplifier Q4, 2SC735Y to the receiver antenna circuit from pin 16.



(7) VFO UNIT (PB-1056)

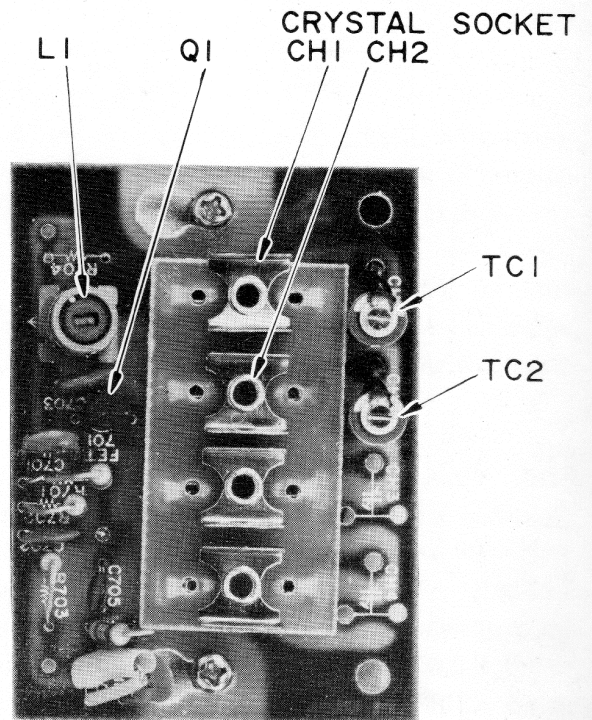
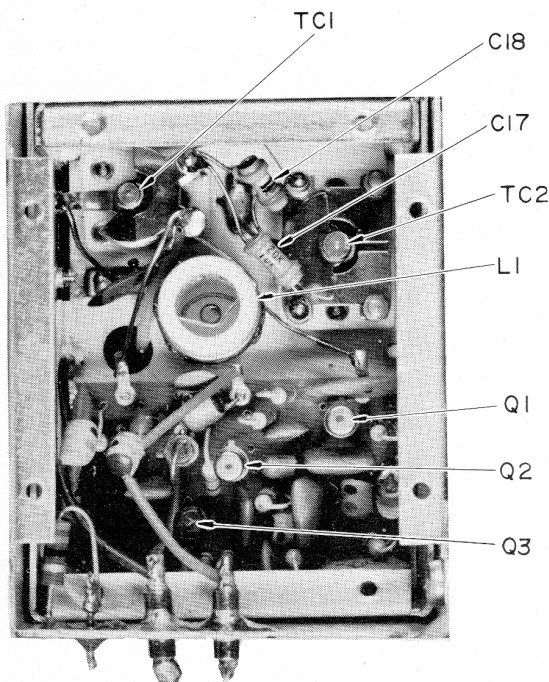
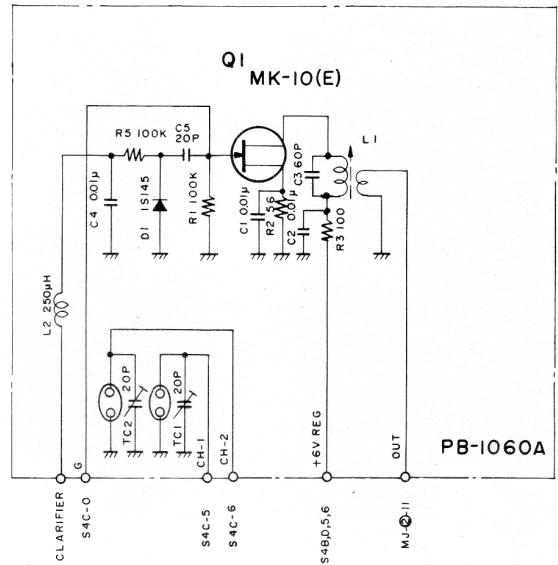
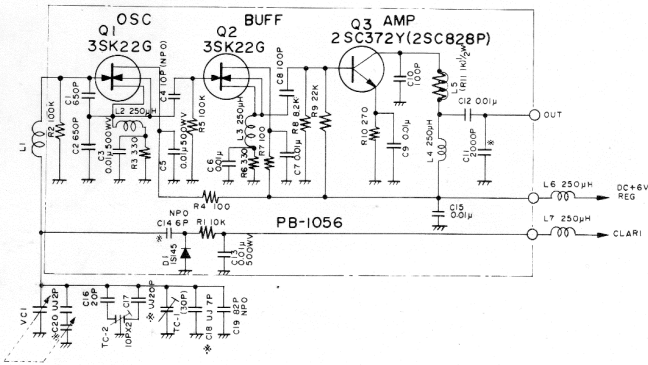
The VFO module board is installed in the VFO chassis. The VFO uses FET transistors Q1, 3SK22G and Q2, 3SK22G first buffer. Q3, 2SC372Y buffer provides isolation and amplification of the VFO signal.

The VFO oscillation frequency is 8700 KHz to 9200 KHz and covers the tunable IF range of 500 KHz. Varactor diode D1, 1S145 in series with capacitor C14 is switched into the circuit by the clarifier switch and the relay contacts to shift the VFO frequency for receiver offset tuning.

(8) CRYSTAL CONTROL UNIT (PB-1060A)

In addition to VFO operation, the FT-101 features crystal controlled tranceive capability. The circuit features FET crystal oscillator Q1, MK-10 for stable operation.

Two crystals may be selected by the selector switch on the transceiver front panel. The oscillator board is located under the top cover and mounted directly on the VFO. Two of the crystal sockets in this board are not used.

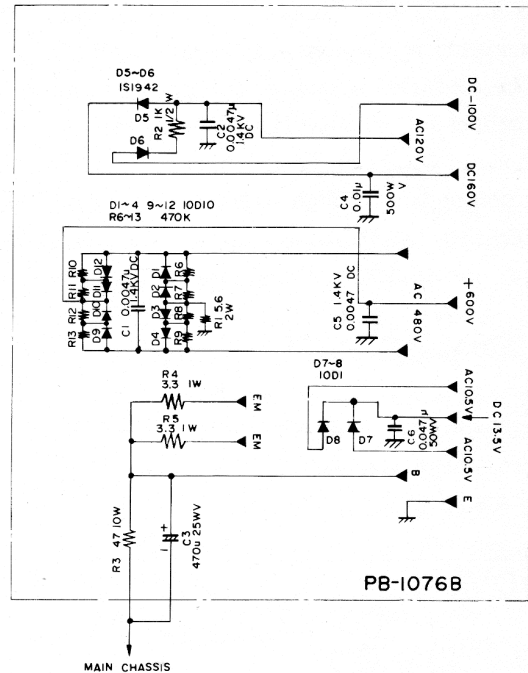


(9) RECTIFIER UNIT (PB-1076B)

The rectifier unit PB-1076B is located under the main chassis in the power supply compartment, and delivers four different DC voltages. The power amplifier plate voltage (600 Volts DC) is supplied from the bridge connected silicon rectifiers D1–D4 and D9–D12. 300 Volts DC is also obtained from this circuit for the driver plate supply.

160 Volts DC and –100 Volts DC are obtained through D5 and D6. D5 supplies the final tubes screen grid voltage, and D6 is used for the bias supply.

10.5 Volt AC is rectified by D7 and D8 for the transistor supply voltage.



(10) MAIN CHASSIS (Refer to Main Chassis Schematic)

The main chassis contains the power supply, transmitter driver, final amplifier and other associated circuits. All sockets for plug-in modules are mounted on the main chassis.

(A) POWER SUPPLY

The power supply is designed to operate from either 100/110/117/200/220/234 volts AC or 12 volts DC (negative ground). Inserting the appropriate power plug into the rear panel receptacle makes the necessary connections to operate the supply in either mode, AC or DC.

When the transceiver is operated from a 12 volt DC power source, transistors Q1 and Q2, DTG110B function as a low frequency oscillator to provide AC to the power transformer. Starting bias for the oscillator is obtained from divider resistors R3, R4 and R5. All of the tubes heaters and input voltage to the DC converter are supplied through the HEATER switch.

(B) PRESELECT

The preselect control adjusts three gang-tuned coils T101, T102 and T103. T101 tunes the receiver front end. T102 provides interstage tuning on receive as well as driver grid tuning on transmit. T103 tunes

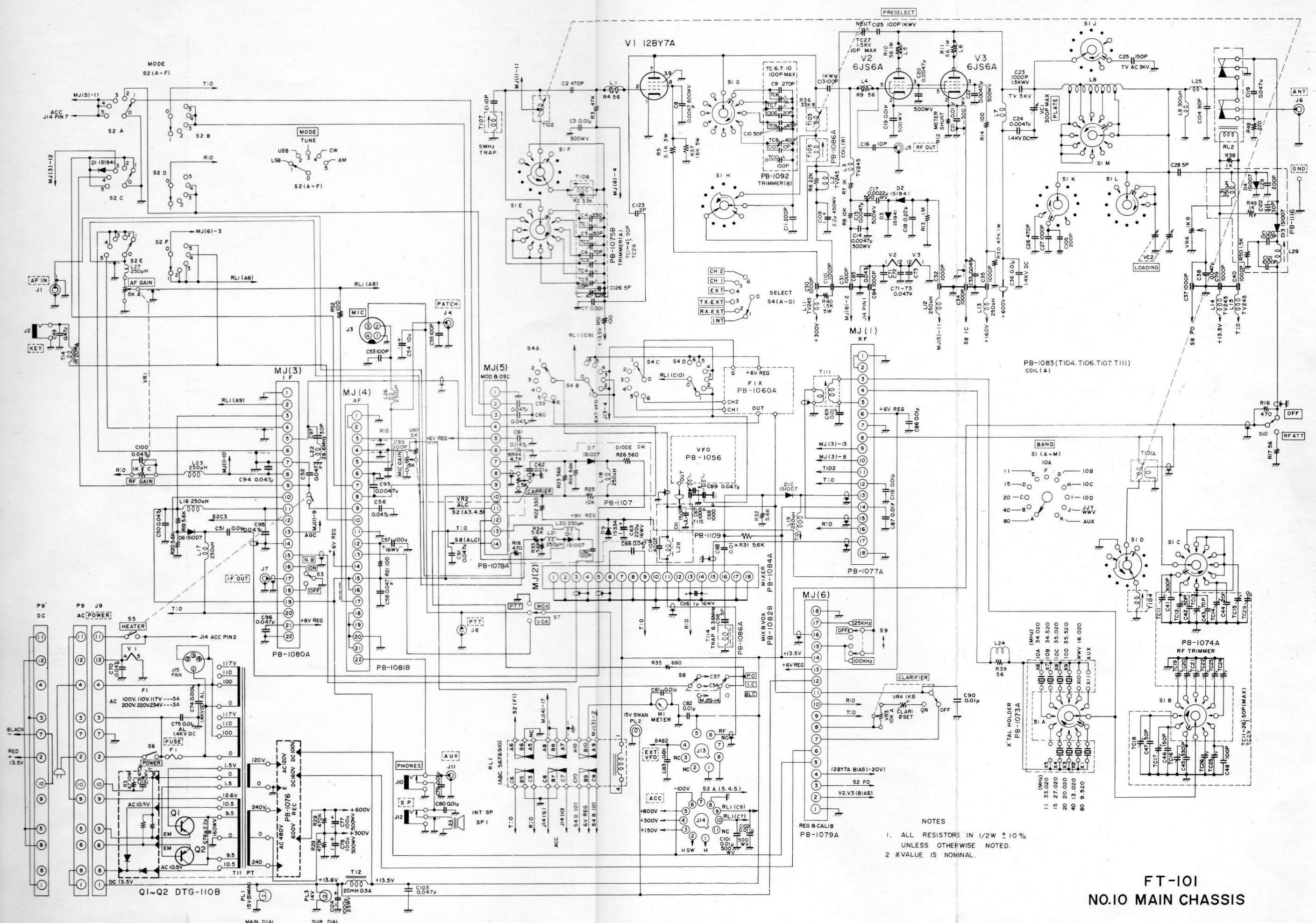
the driver plate circuit. T104, T105 and T106 are placed in the circuit when the band switch is in 80 and 40 meter band to obtain a proper impedance match for minimum distortion.

T111 is connected to the heterodyne crystal X1–X11 through the band switch and delivers the signal from the secondary to the mixer stages.

Diode switches are used in several locations for isolation of the circuits. D8 and D10, 1S1007 disconnect the feed-back loop of the IF signal to prevent oscillation in receive. D7 isolates the carrier signal from the circuit in SSB transmission. D11, 1S1007 prevents the carrier signal from entering the IF circuit when in the receive mode.

With the heater switch in the “OFF” position, voltage is still supplied to the receiver section, which allows continuous reception at reduced power consumption levels.

The high-voltage winding of the power transformer T11 is connected to a bridge-type solid state rectifier D1–D4 (10D1) to supply approximately +600 volts and +300 volts to the transmitter tubes. Output from the 120 volt tap is rectified by D5 and D6, 1S1942



NOTES
 1. ALL RESISTORS IN 1/2W ±10%
 UNLESS OTHERWISE NOTED.
 2. X-VALUE IS NOMINAL.

**FT-101
 NO.10 MAIN CHASSIS**