

**INSTRUCTION
MANUAL
FT-301**

YAESU MUSEN CO., LTD.

TOKYO JAPAN.

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GETTING ACQUAINTED WITH YOUR YAESU FT-301

After you unpack the unit, spend some time with this manual so that you have a good understanding of what each switch, knob and control is for.

It will make your operation easier, possibly keep you from accidentally damaging something, and give you the basic information you need to put the unit to work in the way that will provide you maximum pleasure.

Solid state equipment has enormous reliability. The statisticians have not yet developed life expectancies of many components simply because "end-of-life" cannot be established. Transistors and IC's just keep on going IF THE RATINGS ARE NOT EXCEEDED. If you observe some basic precautions, the FT-301 will provide you with many years of reliable operation.

This manual is revised for the units produced starting with Lot No. 003 and the lots produced subsequently.

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ALL SOLID STATE HF TRANSCEIVER

FT-301



The model FT-301 is a precision built, all solid state, compact high performance transceiver of advanced design providing SSB (USB, LSB selectable), CW, AM and FSK modes of operation covering 160m - 10m bands.

All circuits are fully transistorized with IC's and FET's for increased reliability. Instant operation, immediately after power is turned "on", provides tremendous convenience for mobile operation with minimum power consumption.

The power amplifier employs power transistors with extremely good linearity and large heat dissipation capability. A wide band tuning system, with preset pass band tuning combined with wide band amplifier techniques, eliminates the necessity of final amp tuning for each band change. In addition, the double protection circuit ensures protection of the components from damage due to antenna mismatch or failures.

The well established YAESU RF mu-tuning system is geared with a precision built vernier mechanism which provides bandspread tuning over a 16 kHz segment of the band per turn. The extremely stable VFO, combined with this vernier mechanism, permits precise tuning of the SSB signal. Rejection tuning utilizes an extremely sharp resonance characteristic of a crystal tunable over the entire IF pass band to reject interference.

The active filter in the audio circuit limits audio spectrum sharply within 3 kHz, which improves readability of the signal being received by eliminating interferences.

The noise blanker, with the latest noise detecting circuit, eliminates pulse type noise which has an extremely small amplitude for noise free reception. All features, such as VOX, semi-break-in CW with side tone, 25/100 kHz calibrator, noise blanker, speaker, fast/slow AGC, and clarifier are integral parts of the unit.

The built-in RF speech processor will be operative with installation of an optional crystal filter. It will provide increased talk power improving the intelligibility at the receiving end.

For mobile operation, fixed crystal controlled channels may be preferred. The FT-301 accepts 11 fixed channel crystals easily selectable from the front panel. The FT-301 offers wide versatility when used in conjunction with an external VFO, the FV-301.

Plug-in modules are employed for the main circuit systems permitting an orderly arrangement of the circuit signal flow with excellent isolation. This allows simplified service and alignment, while assuring unsurpassed stability. When operated on DC (13.5V), the transceiver requires no external power supply, as is required for hybrid type HF transceivers. This compact, light weight, yet feature packed transceiver is well suited for base or mobile operation. The AC power supply, FP-301 or FP-301D, is available for base station set-up.

Please read the operating manual carefully before attempting to operate the transceiver as it contains useful information which will assist you in achieving the maximum satisfaction from your YAESU FT-301.

SPECIFICATIONS

Frequency Range	:	160 m through 10 m (WWV/JJY, CB -- Receive only)
Emission	:	LSB, USB, CW, AM, FSK
Power Input	:	SSB 200 watts PEP CW 200 watts AM, FSK 50 watts (Slightly lower on 10 and 160 meter bands)
Carrier Suppression	:	Better than 40 dB
Sideband Suppression	:	Better than 50 dB
Transmitter Frequency Response	:	300 Hz ~ 2700 Hz -6 dB
Spurious Radiation	:	Less than -40 dB
Distortion Products	:	Better than -31 dB
Frequency Stability	:	Less than 100 Hz drift in any 30 minutes
Antenna Output Impedance	:	50 ohms unbalanced
Sensitivity	:	0.25 μ V at S/N 10 dB
Image Ratio	:	1.9 ~ 21.0 MHz Better than 60 dB 28 MHz Better than 50 dB
IF Interference	:	Better than -70 dB
Selectivity	:	SSB 2.4 kHz at -6 dB 4.0 kHz at -60 dB CW, FSK 0.6 kHz at -6 dB 1.2 kHz at -60 dB AM 6 kHz at -6 dB 12 kHz at -60 dB
Audio Output	:	3 watts at 10 % THD
Output Impedance	:	4 ohms
Power Requirement	:	DC 13.5 V negative ground
Power Consumption	:	TX(max) 280 watts (21 A) RX 12 watts (1.1 A)
Size	:	280(W) x 125(H) x 370(D) mm
Weight	:	9 kgs approx.

SEMICONDUCTOR COMPLEMENT

Transistors:

2SA564A	1	2SC784R	5
2SA695D	1	2SC1000GR	2
2SB529D	1	2SC1383	1
2SC372Y	10	2SC1589	1
2SC373	8	2SD359D	1
2SC536D	2	MPSA13	1
2SC711F	1	S10-12	2
2SC735Y	6	S2535	2
2SC741	1	BY1-1	1

TA7120P	1	TP4011	1
TIL306	3	μ PC14305	1
TIL308	3	μ PC14308	1

Diodes:

1N60	24	BZ090	1
1S1007	12	WZ050	1
1S1555	40	WZ090	7
10D10	2	WZ110	1
1S2209	1	YZ033	1
1S2236	1		

Field Effect Transistors:

2SK19GR	13	3SK40M	7
3SK35Y	1		

Thyristor:

CW01B	1
	1

Integrated Circuits:

34013PC	1	SN7490AN	1
LD3141	1	SN74160N	1
MC1496G	2	SN74560P	1
MSL980Y2	1	SN76514N	1
MSM5564	1	TA7060P	1
SN7400N	3	TA7089M	1
SN7404N	2		

Varistor:

MV5W	
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MODEL CHART FOR YAESU FT-301 SERIES

FT-301 is supplied complete with cable, connectors, fuse and microphone as shown below.

<u>Model</u>	<u>Power Input</u>	<u>Frequency Readout</u>
FT-301S	20W	Dial
FT-301SD	20W	Digital
FT-301	200W	Dial
FT-301D	200W	Digital

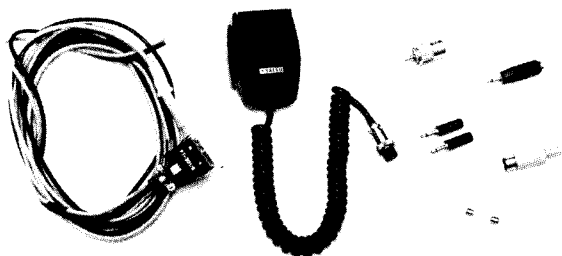


Figure 1

CONTROLS AND SWITCHES

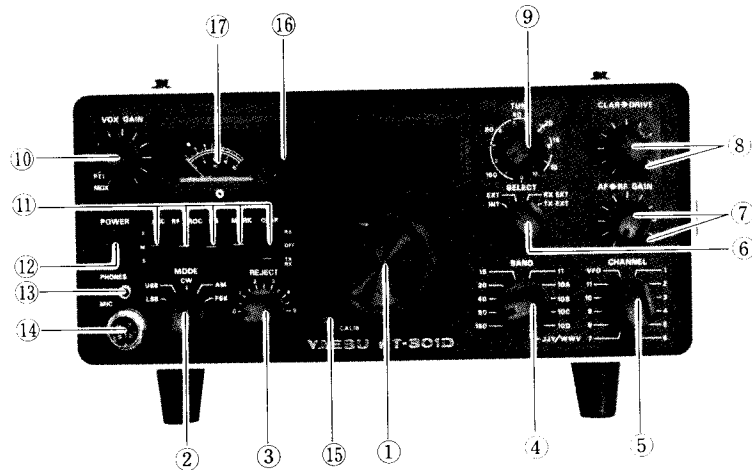


Figure 2 Front Panel Controls & Switches

(1) TUNING KNOB

The tuning knob varies receive and transmit frequencies over a continuous 500 kHz segment of a band. It is connected to the VFO through a precision built VFO drive mechanism. This vernier provides 16 kHz per turn allowing precise tuning for SSB signal.

(2) MODE

This switch selects the mode of operation: LSB (lower sideband SSB), USB (upper sideband SSB), CW (code operation), AM (amplitude modulation) and FSK (frequency shift keying).

(3) REJECT

This control varies resonance frequency of a crystal to reject interference. The control should normally be in the 9 o'clock position to avoid distortion of the received signal which may be caused by a sharp bandwidth.

(4) BAND

The eleven-position switch selects the desired band from 160m – 10m bands, plus JYJ/WWV. The wave length of each selectable band is shown on the panel.

(5) CHANNEL

The channel switch selects any one of the 11 crystal positions used for fixed crystal controlled operation. This switch also selects the VFO for continuous tuning with the main tuning knob.

(6) SELECT

The select switch provides selection of the controll-

ing VFO, either internal or external, or a combination for various splits.

INT The internal VFO controls both receive and transmit frequencies.

EXT The external VFO controls both receive and transmit frequencies.

RX-EXT The external VFO controls the receive frequency and the internal VFO controls the transmit frequency.

TX-EXT The external VFO controls the transmit frequency and the internal VFO controls the receive frequency.

Whenever the internal VFO is active, the sub dial lights up in red, indicating that the internal VFO is in operation.

(7) RF/AF GAIN

The RF gain lever allows manual control of the gain of the receiver RF and IF amplifiers. Clockwise rotation increases the sensitivity of the receiver. The AF gain knob control varies audio output level to the speaker and phone jack.

(8) DRIVER/CLAR

The drive lever controls the drive level in transmit. Clockwise rotation increases the transmit power output. The clarifier control varies receive frequency only up to 3 kHz on either side of the dial frequency affecting the transmit frequency. It is particularly useful in "net" operation where several participants may be transmitting slightly off frequency. The clarifier control functions in conjunction

with the CLAR switch. When the CLAR switch is turned on, the CLAR indicator will light up, and the CLARIFIER is energized. The CLAR switch should normally be in the "off" position until the initial contact is made. The CLARIFIER control may then be used to zero-in and correct any drift on the received signal. The CLARIFIER control must also be set to "off" while calibrating the dial.

(9) TUNE

The tune switch peaks the receiver and transmitter circuits by means of a mu-tuning system coupled to a vernier mechanism. It provides continuous permeability tuning throughout the frequency range of the transceiver.

(10) VOX GAIN

Selects MOX, PTT and VOX (voice controlled operation) as well as adjusting the sensitivity of VOX operation. The PTT position provides push-to-talk operation. The MOX position provides manual transmit. It must be returned to PTT position for receiver recovery.

(11) FUNCTION SWITCHES – (AGC, RF PROC, NB MARK, CLAR)

AGC This switch selects AGC time constant – fast, slow and "off".

RF PROC . . RF speech processor is placed into the circuit to increase the modulation power with the switch "on" position.

NOTE: An optional crystal filter is required for this operation.

NB Inserts the noise blanker into the (Noise IF circuit to eliminate pulse type Blanker) noise.

CLAR With the clarifier switch in RX position, the CLARIFIER control varies the receive frequency slightly. With the CLARIFIER switch in TXRX position, both transmit and receive frequencies are varied slightly by the CLARIFIER control.

MARK . . . The marker oscillator generates signals every 100/25 kHz for calibration of the dial with MARK switch "on".

(12) POWER

The power switch turns the transceiver "on" and "off".

(13) PHONES

The phones jack accepts the headphone plug. The internal or external speaker in the FP-301 (if used) is disabled whenever a headphone is plugged in. Use low impedance (4 ohm) headphones.

(14) MIC

The microphone jack has a four-pin connector and is used for microphone input as well as PTT control.

(15) CALIB

The CALIB knob shifts display frequency for calibration of the frequency display.

(16) CLAR/FIX/VFO

CLAR lights up when the CLAR switch is turned on, indicating the clarifier is in use. VFO lights up indicating tuning dial is in operation. FIX lights up indicating fixed crystal controlled channel is in operation and the VFO is disabled.

(17) METER

Functions as an "S" meter on receive and reads collector current of the PA on transmit.

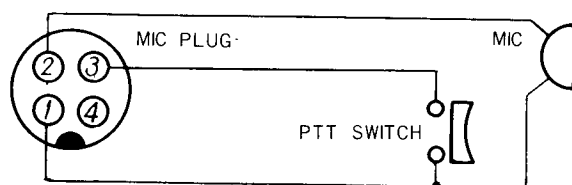


Figure 3 Microphone Plug Connection

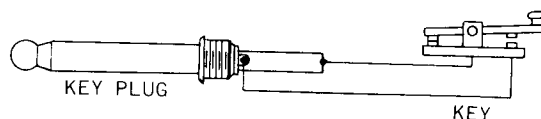


Figure 4 Key Plug Connection

REAR PANEL CONNECTIONS

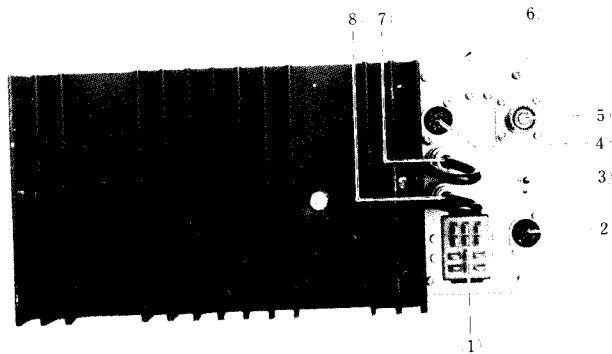


Figure 5

(1) POWER

- DC power supply receptacle. For AC operation use FP-301 power supply with built-in speaker. When the transceiver is used together with the FP-301, the speaker in the transceiver is disabled.

(2) EXT VFO

- interface for external VFO unit. Supplies power to the FV-301, external VFO unit (if used).

(3) KEY

- key jack for code operation. Keying is through closure of a +5V DC line. If electronic keyers are used, polarity should be checked.

(4) ACC

- accessory socket. Provides +13.5V for control of an external relay.

(5) ANTENNA

- coaxial connection for antenna.

(6) PO ADJ

- meter sensitivity adjustment for relative power output reading.

(7) OUT

- RF output is obtained from the driver stage for final linear amplifier at this jack. This output may also be used for optional equipment such as a 6 or 2 meter transverter.

(8) IN

- input jack for a low pass filter. Booster amplifier is connected here.

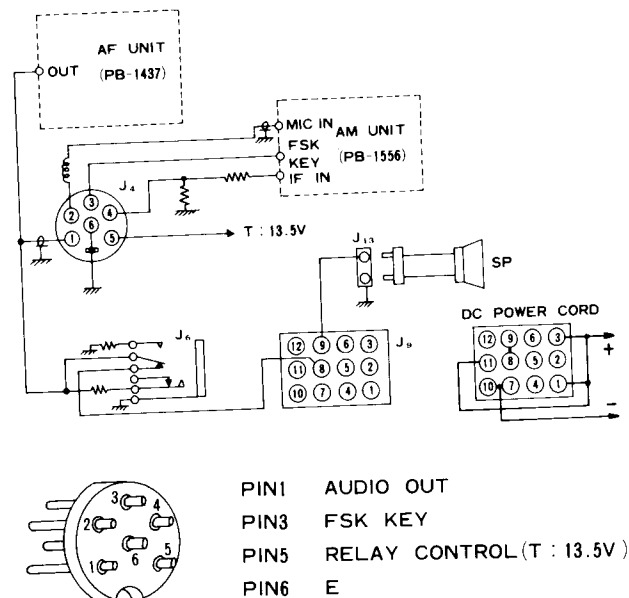


Figure 6 ACC Plug Connection

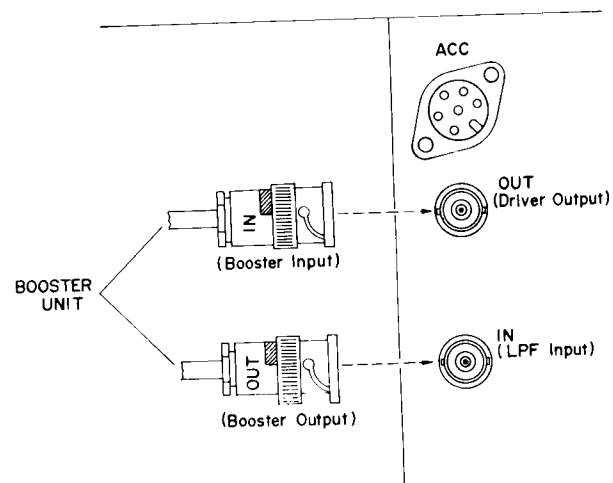


Figure 7

PREPARATION FOR OPERATION

ANTENNA

The transceiver is designed for use with a resonant antenna having an impedance of 50 ohms resistive. Any of the common antenna systems designed for use on the HF amateur bands may be used as long as its impedance is 50 ohms. If an antenna other than 50 ohms is used, a suitable antenna matching device should be used between the antenna terminal and the transmission line to assure proper matching of the antenna to the transceiver.

In either case, the antenna must be properly adjusted so that SWR becomes less than 1.5. A high SWR will cause reduction in power due to overloading of the power transistors.

The antenna matching is the most critical part of the transceiver installation, especially in mobile operation, as the installation of antenna is often confined. Peak performance of the equipment will largely depend upon how well the antenna is matched to the transceiver.

It is very important that the antenna has a fairly close to 52 ohm non-reactive load. An automatic drive control circuit will work to reduce the drive when the SWR is high.

The power output is decreased as much as 50% when the SWR is 2:1. Refer to the following:

SWR	POWER OUTPUT
1.0	100%
1.5	80%
2.0	50%
3.0	20%

INSTALLATION

To achieve maximum performance, location of the transceiver installation is very important. Allow adequate space on all sides of the unit to assure proper ventilation around the cabinet.

Avoid installation in the following places:

- Under direct sunlight or near a heating system.
- Humid areas.
- Dusty places.
- Poorly ventilated areas.
- Unstable places.

POWER SUPPLY

The transceiver will operate satisfactorily from any 13.5V DC negative ground battery source or equivalent.

For mobile operation, connect the red DC power cable to the positive and the black to the negative side of a battery.

For base station installation, use of the FP-301 AC power supply with built-in speaker is recommended.

CAUTION

PERMANENT DAMAGE WILL RESULT IF IMPROPER SUPPLY VOLTAGE AND POLARITY ARE APPLIED TO THE TRANSCEIVER. WARRANTY DOES NOT COVER THE DAMAGE CAUSED BY IMPROPER SUPPLY VOLTAGE AND POLARITY.

INITIAL PREPARATION

Prior to initial operation of the transceiver, be sure to read the operating manual carefully to familiarize yourself with the proper operation of the controls. Simulate operation without connecting the power cable until you become thoroughly familiar with all the functions of the knobs and switches.

Connect a non-reactive dummy load (50 ohms) to the antenna terminal (5). The YP-150 dummy load with power meter is suitable for tune-up practice.

NEVER TRANSMIT WITHOUT HAVING PROPER ANTENNA OR DUMMY LOAD CONNECTED TO THE TRANSCEIVER, OR SERIOUS DAMAGE MAY OCCUR TO THE UNIT.

Connect the microphone furnished with this transceiver or any other low impedance dynamic microphone in the 400-600 ohm range. Refer to Fig. 3 for the microphone plug connection.

For CW operation, insert the plug into the key jack (3) on the rear panel. Refer to Fig. 4 for the key plug connection.

OPERATION

Receive Operation

Connect the power cable supplied to an appropriate power source, such as a car battery or FP-301 AC power supply. Make sure that the power switch of the transceiver is turned off while making the wiring connections. Connect an antenna to (5) using the connector supplied. Do not plug or unplug the power cable while the unit is on, or serious damage may result from transient voltage pulses.

Follow the steps below:

- (1) Preset the controls and switches as indicated -

POWER OFF
VOX GAIN PTT
MODE DESIRED MODE
REJECT 9 O'CLOCK POSITION
AGC S
RF PROC OFF
NB OFF
CLAR OFF
DRIVE FULLY CCW POSITION
MARK OFF
AF GAIN FULLY CCW POSITION
RF GAIN FULLY CW POSITION
CLARIFIER 12 O'CLOCK POSITION
DIAL DESIRED OPERATING
FREQUENCY
TUNE DESIRED BAND
SEGMENT
SELECT INT
BAND DESIRED BAND
CHANNEL VFO

NOTE: It is customary to use LSB below 7 MHz, and USB above 14 MHz.

- (2) Turn the power switch "on" (if the AC power supply FP-301 is used, turn on the power switch of that unit as well).
- (3) The meter will light up and the operating frequency will display in the dial window. As you turn the AF GAIN control clockwise, noise or signal will be heard.
- (4) Adjust the TUNE control to the maximum noise or signal level.

- (5) Turn the dial to the desired signal of frequency.
- (6) Adjust the AF GAIN control to the desired level.
- (7) Readjust the TUNE control after setting the dial for maximum received signal or noise if no signal is present.
- (8) Use the CLARIFIER if the received signal is drifting. This control provides a means of off-setting the receive frequency approximately 3 kHz to either side of the transmitting frequency. The CLAR indicator will light up whenever the clarifier is in use.
- (9) When pulse type noise interferes with reception of the signal, turn the NB (Noise Blanker) on. It will eliminate the noise effectively enabling you to enjoy noise free reception.
- (10) When interference by another signal exists, adjust the REJECT control to tune out interfering signal.
- NOTE:** 11 meter band is set for receive only.
- (11) When a headphone is connected to the PHONE jack, the internal speaker is disabled. Use headphones with 4 - 8 ohm impedance.

RECEPTION OF JJY/WWV (STANDARD SIGNAL)

Reception of the standard signal requires an optional fixed frequency crystal to receive 5 MHz. The signal is heard with zero beat regardless of the dial setting.

BAND JJY/WWV
TUNE 2 OF THE UNIT SCALE
MODE LSB

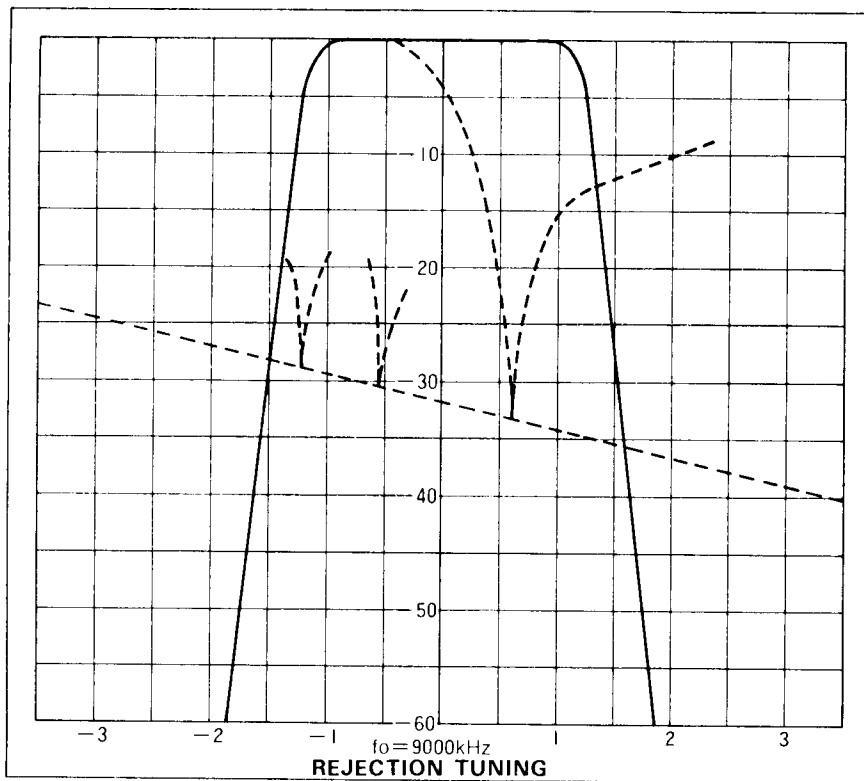


Figure 8 Tunable Rejection Tuning

PRESETTING FOR TRANSMIT

It is necessary to preset the transceiver regardless of mode of operation.

- (1) Set the controls and switches to the positions indicated.
MODE CW
RF PROC OFF
DIAL DESIRED FREQUENCY
TUNE DESIRED BAND SEGMENT
SELECT INT
BAND DESIRED BAND
DRIVE FULLY CCW
CHANNEL VFO
- (2) Turn the power switch "on". (If the AC power supply FP-301 is used, turn on the power switch of that unit too).
- (3) By setting the VOX GAIN to the MOX position, the FT-301 will transmit until the switch is returned to the PTT position.
- (4) Rotate the DRIVE control until the meter

indicates 10 amps, then adjust the TUNE control for maximum meter deflection. The meter indicates 15 amps at full input.

- (5) If a dummy load or an antenna with SWR less than 1.5 is used, you may increase the DRIVE control until the maximum power output is attained.
- (6) If the SWR of the load or antenna system is higher than 1.5, the power output automatically decreases to protect the final amplifier transistor.
- (7) With an appropriate load (or antenna) the meter will normally read 15 when the DRIVE is fully clockwise.
- (8) Return the VOX GAIN control to the PTT position.

NOTE: With the key plugged into the rear key jack, transmitter does not load up unless key is down.

SSB OPERATION

After completion of presetting the transceiver, follow this procedure to transmit in SSB.

- (1) Connect the mike plug to the MIC jack.
- (2) Place the MODE switch to the USB or LSB position, as desired.
- (3) Turn the DRIVE control fully clockwise.
- (4) Speak into the microphone while pressing the PTT switch on the mike. The meter should indicate $\frac{1}{3}$ – $\frac{1}{2}$ as compared to the CW position.
- (5) If the meter reading does not fall into the specified range, adjust the MIC GAIN control (located inside the cabinet) for proper reading of the meter.
- (6) By releasing the PTT switch, the unit will return to receive mode.
- (7) By turning the RF PROC switch on, the RF speech processor is inserted into the circuit. (The optional crystal filter must be installed). The RF speech processor will increase talk power which is particularly effective in DX contacts. For local contacts, operation without RF speech processor is recommended.

The RF Processor increases talk power to cut through the pile-ups without addition of a linear amplifier.



Figure 9 RF Processor "OFF"

CW OPERATION

After completion of presetting the transceiver, follow the procedure to transmit in CW.

Keying is accomplished by closing the DC 5V line to ground. The current that flows in the KEY is around 6mA. Use caution when an Electronic Keyer is used, to be sure polarity reversals or excessive voltages do not cause damage to one or both units.

- (1) Insert a properly wired key plug into the KEY jack on the rear panel.
See illustration on Page 5.
- (2) Set the MODE switch to CW position.
- (3) Closing the circuit will transmit CW when the VOX GAIN control is placed on the MOX position. The meter reading should be zero when the key is open, and 15 when the key is closed. The receiver will be disabled until the MOX switch is returned to PTT.
- (4) You may monitor the keying. (The monitor circuit is built in the VOX unit).
- (5) Repositioning the VOX GAIN control to the PTT position will return the unit to receive.

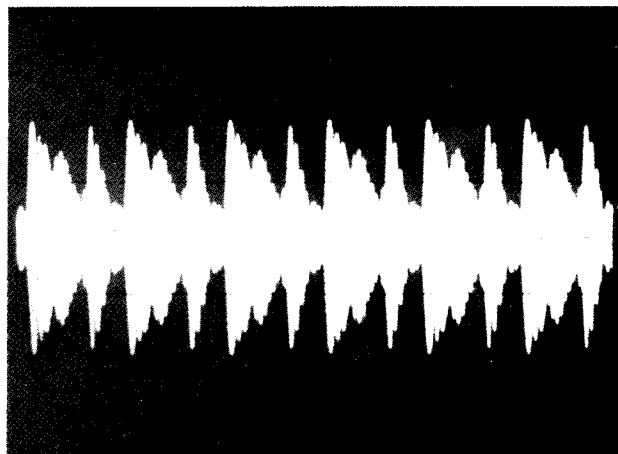


Figure 10 RF Processor "ON"

RECEIVE-TRANSMIT SWITCHING

There are several ways to activate the unit for receive-transmit switching.

MOX (MANUAL) OPERATION

Setting the VOX GAIN control to MOX or PTT position will transmit or receive respectively. This is convenient for continuous transmit on RTTY, or for transmitter adjustment.

PTT (PUSH-TO-TALK) OPERATION

The PTT switch accompanied by microphone is used for keying. Pressing the PTT switch will transmit and releasing will receive. The VOX GAIN control must be set to the PTT position.

VOX (VOICE CONTROLLED) OPERATION OR CW BREAK-IN

VOX or CW break-in operation is available to the operators as follows:

- (1) For SSB VOX operation, adjust the VOX GAIN control on the front panel until your voice actuates the transmitter while speaking normally into the microphone.
- (2) Set the ANTI TRIP control located inside the cabinet to the minimum point in order to prevent the speaker output from tripping the VOX circuit. Do not use more VOX GAIN or ANTI TRIP gain than necessary.
- (3) Adjust the DELAY control for a suitable release time.
- (4) For CW operation, break-in is available by use of the VOX circuit. As you stop keying, the unit will automatically return to receive, and you can hear the other station between your dots and dashes. Adjust the DELAY control for suitable release/delay time.

DIAL CALIBRATION

The dial of the transceiver is designed to indicate the carrier frequencies, therefore, there will be 3 kHz difference between USB and LSB. When calibrating the dial, the CLAR switch must always be set to the "off" position.

SSB MODE

- (1) Select the desired mode (USB, LSB), band and frequency.
- (2) Turn the MARK switch on the front panel to "on", which will activate the marker oscillator. The marker frequency is selectable for either 25 kHz or 100 kHz by the switch S601 located on the VOX unit.
- (3) As you turn the dial knob, a beat will be heard every 25 kHz or 100 kHz depending on the position of S601. Set the dial to the 25 kHz or 100 kHz point nearest to the desired frequency.
- (4) Tune the dial knob for a zero beat (lowest pitch frequency). Adjust CALIB control for correct frequency indication in the dial window.

CW OPERATION

The procedure is similar to that of SSB operation except the calibration points will differ by bands.

- (1) All bands except 80 meter band -
Set the MODE to CW
Tune the dial knob for a zero beat. Adjust CALIB control until the display frequency becomes 800 Hz lower.
- (2) The 80 meter band -
Tune the dial knob for zero beat. Adjust CALIB control until the displayed frequency shows 800 Hz higher.
- (3) If an optional CW filter is installed, the calibration should be taken by reading the maximum S meter deflection instead of zero beat.

SELECT SWITCH

The SELECT switch provides selection of a companion FV-301 external VFO, which is very useful in DX work because it provides the operator with split frequency capability.

- INT The internal VFO controls both receive and transmit frequencies of the FT-301.
- EXT The external VFO controls both receive and transmit frequencies of the FT-301.
- RX The external VFO controls the receive frequency of the FT-301 and the internal VFO controls the receive frequency.
- TX The external VFO controls the transmit frequency of the FT-301 and the internal VFO controls the receive frequency.

The FIX indicator will light up when a crystal controlled channel is used.

CRYSTAL CONTROLLED OPERATION AND CRYSTAL FREQUENCIES

Fixed frequency crystals must be placed in the crystal holders on the FIX UNIT located inside the cabinet in order to operate on a fixed frequency within a band. The crystal sockets correspond to CH-1, CH-2 CH-11, counting from the one nearest the front panel. The last one, 12th socket, is an auxiliary. When the CHANNEL switch is in the VFO position, the internal VFO is controlling the transceivers, and when the switch is on any other position between 1-11, the corresponding fixed crystal frequency controls the transceiver.

CALCULATION OF CRYSTAL FREQUENCIES

The crystal holders accept standard HC-25/U type crystals. All crystal frequencies must fall between 5,000–5,500 kHz.

The correct crystal frequency for any desired operating frequency may be determined by using the following formula:

$$F_x = F_1 - F_0$$

- where F_x : crystal frequency
 F_0 : operating frequency
 F_1 : constant taken from Table 1

MODE BAND	U S B	L S B	CW · AM
			F S K
160m	6998.5	7001.5	7000.7
80m	8998.5	9001.5	8999.3
40m	12498.5	12501.5	12500.7
20m	19498.5	19501.5	19500.7
15m	26498.5	26501.5	26500.7
10mA	33498.5	33501.5	33500.7
10mB	33998.5	34001.5	34000.7
10mC	34498.5	34501.5	34500.7
10mD	34998.5	35001.5	35000.7

Table 1 F_1 (kHz)

Example (1) – To find the proper crystal for 7099 kHz LSB operation -

From Table 1, F_1 for the 40 meter band LSB is 12501.5

Therefore, $F_x = 12501.5 - 7099 = 5402.5$ kHz

Example (2) – Find the crystal frequency for 21420 kHz USB operation -

From the table, $F_1 = 26498.5$

Therefore, $F_x = 26498.5 - 21420 = 5078.5$

CAUTION

The crystal that is intended to operate on a specific frequency will still be active when the band is switched to other bands. For example, with the same crystal (5078.5 kHz) as in example 2, the unit will operate on 7423 kHz LSB or 7420 kHz USB, well above the 40 meter band amateur allocation. Note that these frequencies are completely out of the normal band and should never be operated, unless you are authorized to do so.

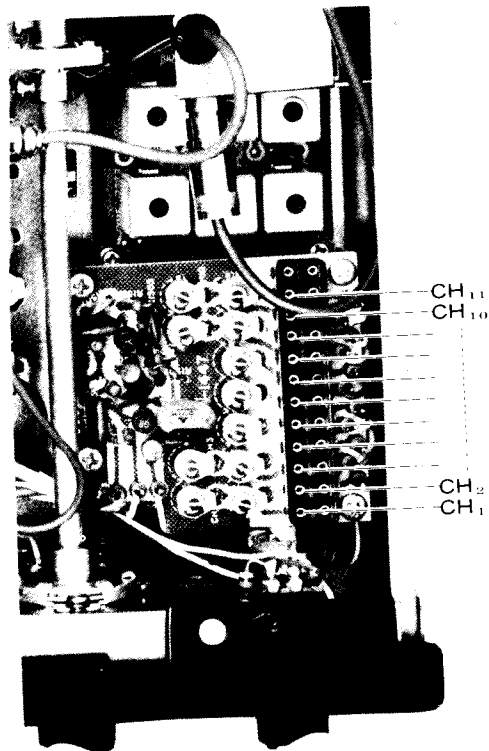
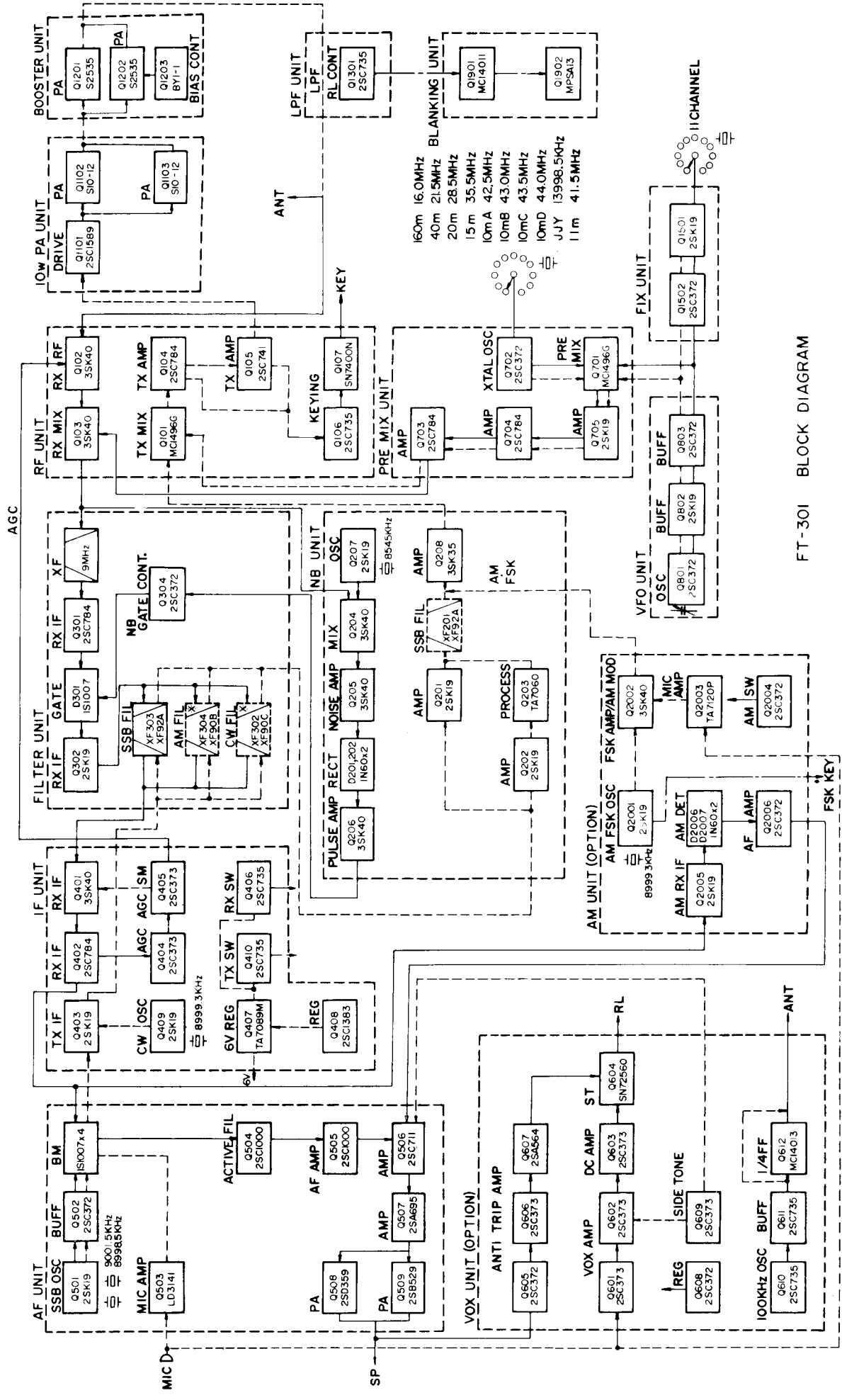


Figure 11

If ordering non YAESU fixed crystals from a crystal manufacturer, be sure to specify the crystal correlation information shown below, in addition to the frequency of the crystal.

TYPE HC-25/U
 LOAD CAPACITANCE ... 30 PF
 SERIES RESISTANCE ... 25 ohms or less
 STATIC CAPACITANCE . 7 PF or less
 DRIVE LEVEL 5 mW

BEFORE BEGINNING ANY PROCEDURE DESCRIBED, READ THE INSTRUCTIONS THROUGH COMPLETELY AND KNOW AND UNDERSTAND IN ADVANCE WHAT IS BEING ACCOMPLISHED.



FT-301 BLOCK DIAGRAM

Figure 12 Block Diagram

CIRCUIT DESCRIPTION

The block diagram and the circuit description that follows, will provide you with a detailed understanding of this transceiver design. Computer type plug-in modular construction is used throughout the transceiver for RF isolation, service and alignment purposes.

The transceiver consists of a pre-mix type single conversion system with a 9 MHz IF for all modes of operation.

RECEIVER

The RF input signal from the antenna is fed to pin 4 of the RF unit (PB-1443) through RL-1 (relay), trap T1401/C1413 in the trimmer unit and T1, the permeability tuned RF input coil.

RF UNIT (PB-1433)

The incoming signal is amplified by the RF amplifier Q₁₀₂, 3SK40M FET, and then fed to the gate of the mixer Q₁₀₃, 3SK40M, where the input RF signal is heterodyned with a local signal delivered from pre-mix circuit (PB-1439), producing an IF signal of 9 MHz at pin 11, through T102.

The input and output of the RF amplifier are permeability tuned circuits which provide high sensitivity with excellent rejection of unwanted out-of-band signals.

FILTER UNIT (PB-1435)

The IF signal received at pin 2 is passed through the monolithic filter XF-301 which has a ± 10 kHz

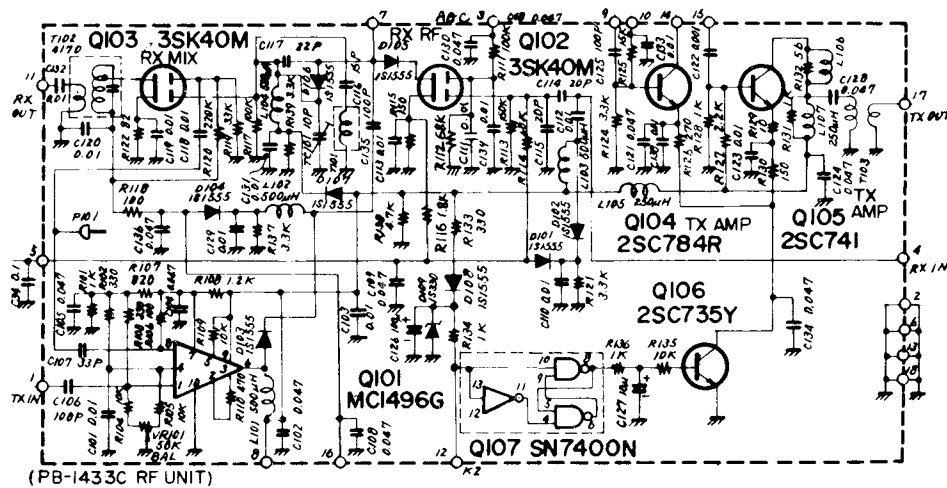


Figure 13 RF Unit (PB-1433)

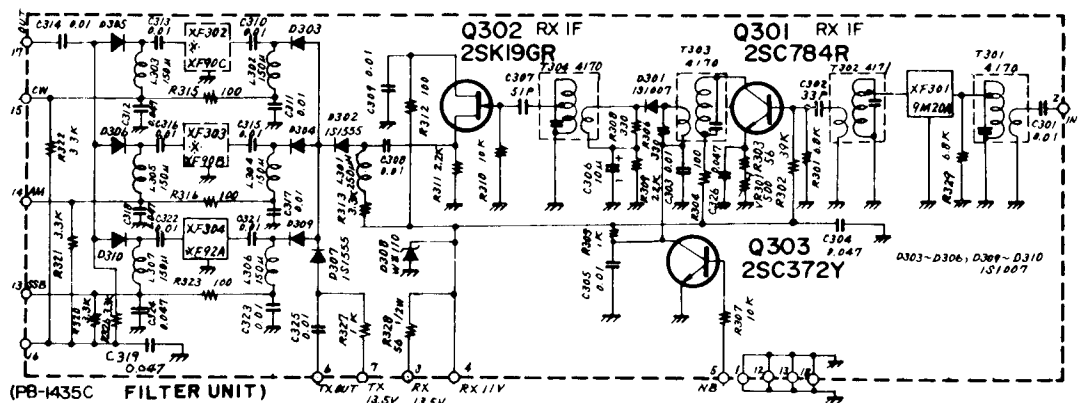


Figure 14 Filter Unit (PB-1435B)

bandwidth, providing additional selectivity. enough delay time is designed into the filter circuit to match the timing with the noise blanker output.

The noise blanker diode D_{301} , **1S1007**, is placed between the two IF amplifiers Q_{301} , **2SC784R**, and Q_{302} , **2SK19GR**. The noise blanker diode D_{301} functions as ON/OFF switch which is controlled by the noise blanker driver Q_{303} , **2SC372Y**.

The output from the source of Q_{302} is passed through the SSB or CW (option) filter which has been selected by diode switches $D_{303}-D_{306}$, **1S1007**, depending on the mode of operation. The filtered out clean IF signal is transferred to the IF unit (PB-1436) through pin 17.

IF UNIT (PB-1436)

The IF signal from pin 17 of the FILTER UNIT appears at pin 14 of the IF UNIT (PB-1436). The signal is further amplified by Q_{401} , **3SK40M**, and Q_{402} , **2SC784R**. The output from Q_{402} is coupled to a rejection tuning circuit to eliminate the interference, then supplied to the AF unit from pin 5.

A portion of the IF signal is picked up by C_{408} , 10 PF, and is rectified by D_{407} , **1S1555** to produce AGC voltage. It is further amplified by the DC amplifier Q_{404} and Q_{405} . The DC output voltage is then fed to the gates of Q_{102} , RF amp, and Q_{401} , IF amp to control the gain of these stages for AGC purposes.

The AGC voltage produced at the emitter of Q_{405} , **2SC373** is used for S-meter indication.

The RF GAIN control on the front panel varies the AGC voltage, applied to the base of Q_{404} , **2SC373** providing manual control of the gain of the RF and IF stages.

Also, assembled onto the IF UNIT board is a 6V regulated power supply for the CARRIER, VFO, FIX, and LOCAL circuits.

DC 13.5V is applied to the collector of Q_{408} , **2SC1383**. The base voltage of Q_{408} , **2SC1383** being fixed by the zener diode D_{409} , **WZ 090**, DC 8.5V is generated from the emitter, which is further stabilized by Q_{407} , regulator IC **TA7089M** to produce 6V DC.

Q_{406} and Q_{410} , **2SC735Y** are transistor switches. On receive, Q_{406} conducts to supply 6V to an external receive VFO through pin 8. On transmit, Q_{410} conducts to supply 6V to an external transmit VFO through pin 16.

AM UNIT (CPB-1556)

The signal from IF unit is also fed to AM unit from pin 12 for AM detection. The signal is amplified by Q_{2005} , **2SK19GR** and applied to a diode detector consisting of D_{2006} and D_{2007} , **IN60**. Detected audio signal is amplified by Q_{2006} , **2SC372Y** and fed through AUDIO GAIN control to the AF unit.

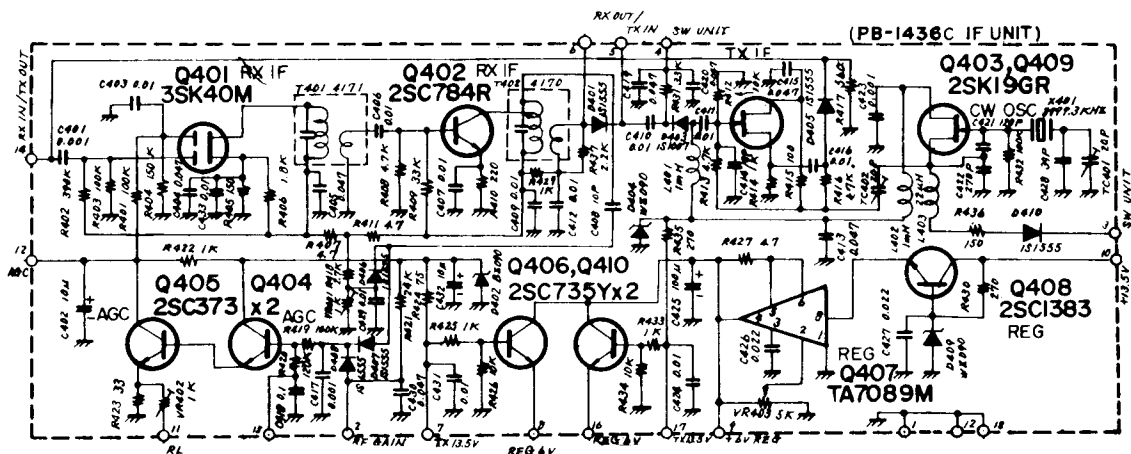


Figure 15 IF Unit (PB-1436B)

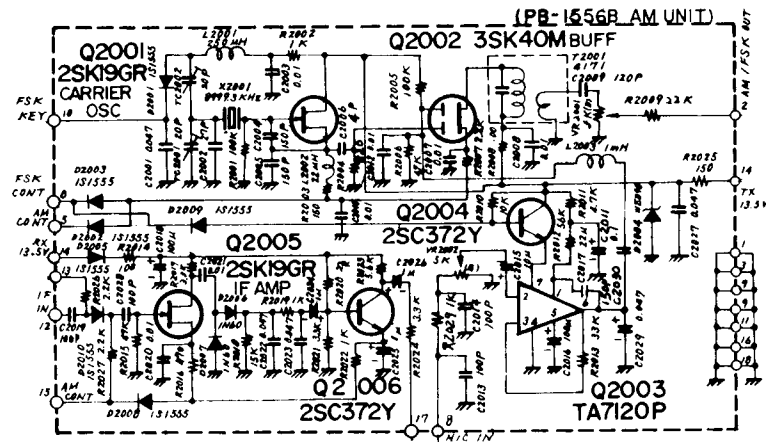


Figure 16 AM Unit (PB-1556)

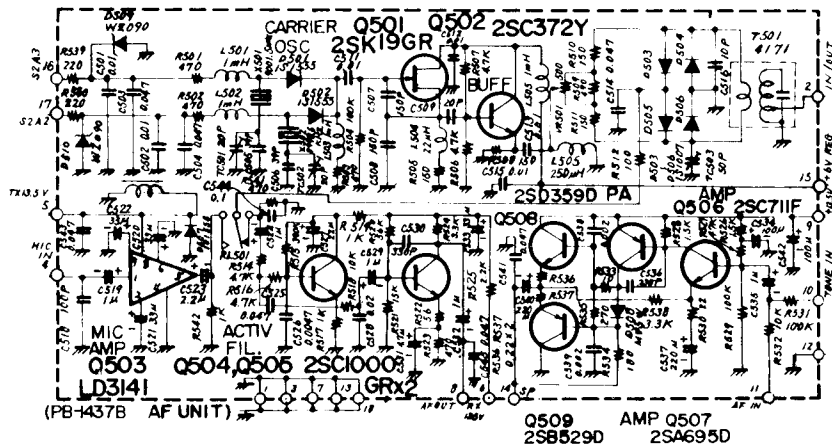


Figure 17 AF Unit (PB-1437)

AF UNIT (PB-1437)

The 9 MHz IF signal is delivered to pin 2 from PB-1436. A balanced demodulator circuit consisting of D₅₀₃ – D₅₀₆, 1S-1007 demodulates the 9 MHz IF signal into audio using the appropriate USB or LSB frequency being applied from Q₅₀₁, 2SK19GR, carrier oscillator and Q₅₀₂, 2SC372Y, buffer amp. The demodulated audio then goes through relay contacts to an active low pass filter, Q₅₀₄, 2SC1000GR. The audio spectrum is shaped by the decay curve so that it has an attenuation slope of –3dB at 2.3 kHz and –6dB at 2.6 kHz.

The filtered audio is amplified by Q₅₀₅, 2SC1000GR, and the signal travels from pin 8 to pin 11 through the AF GAIN control, providing manual audio level control. The audio signal returned to pin 11 is amplified by Q₅₀₆, 2SC711A, Q₅₀₇, 2SA695D, and

finally by OTL power amplifier Q₅₀₈, 2SD359D and Q₅₀₉, 2SB529D producing a maximum of 3 watts audio output into the speaker.

The carrier oscillator Q₅₀₁, 2SK19GR is followed by a buffer amplifier Q₅₀₂, 2SC372Y. It oscillates either 8998.5 kHz with X502 or 9001.5 kHz with X501 depending on the mode of operation. The crystal selection is made by diode switches D₅₀₁ and D₅₀₂, 1S1555. The carrier is then injected into the balanced demodulator through VR₅₀₁.

The diode D₅₀₂ conducts to activate the crystal for 8998.5 kHz, used for LSB on 160, 40, 20, 15, 10 and USB on 80 meter band on both transmit and receive – 8998.5 kHz is also used for CW receive on all bands.

The diode D₅₀₁ conducts to activate the crystal for 9001.5 kHz for USB on 160, 40, 20, 15, 10 and

LSB 80 meter bands.

For CW transmit, the oscillator in the IF UNIT (PB-1436) oscillates at 8999.3 kHz carrier frequency.

NB UNIT (PB-1434)

A portion of unfiltered 9 MHz IF is fed to pin 5, and appears at Q₂₀₄, 3SK40M, where the 8545 kHz signal generated by X201 and Q₂₀₇, 2SK19GR is mixed with the incoming IF signal to produce 455 kHz. The 455 kHz is then amplified by Q₂₀₅, 3SK40M.

When a carrier, or noise free modulated signal is received, the 455 kHz signal with its corresponding strength, is rectified by D₂₀₁ and D₂₀₂ to charge C₂₂₁. There is no discharge loop for C₂₂₁, therefore, signals which exceed the charged voltage established by the reference voltage on C₂₂₁ will not pass through D₂₀₁ and D₂₀₂, 1N60. Accordingly, there will be no voltage drop across R₂₂₆, and Q₂₀₆, 3SK40M, will conduct as the gate voltage approaches zero potential. When Q₂₀₆ conducts, the drain voltage at pin 2 of printed board will drop.

The drain of Q₂₀₆ is directly connected to the base of Q₃₀₃, 2SC372Y in the FILTER UNIT. As the drain voltage of Q₂₀₆ drops, the base voltage of Q₃₀₃ drops, as well, which will turn off Q₃₀₄. The collector voltage will then increase and it will produce a forward bias to D₃₀₁. As D₃₀₁ conducts, the signals will pass normally through the circuit.

When pulse type noise, which exceeds the charged reference voltage established by C₂₂₁ is received, D₂₀₁ and D₂₀₂ will permit negative going pulses to turn Q₂₀₆ off. The drain voltage will rapidly increase as it turns off.

As the drain voltage increases, Q₃₀₃ will become "on" and the collector voltage will decrease. Accordingly, D₃₀₁, 1S 1007 will be biased to block the signal. Whenever pulse type noise is received, it will blank off the signal passage momentarily.

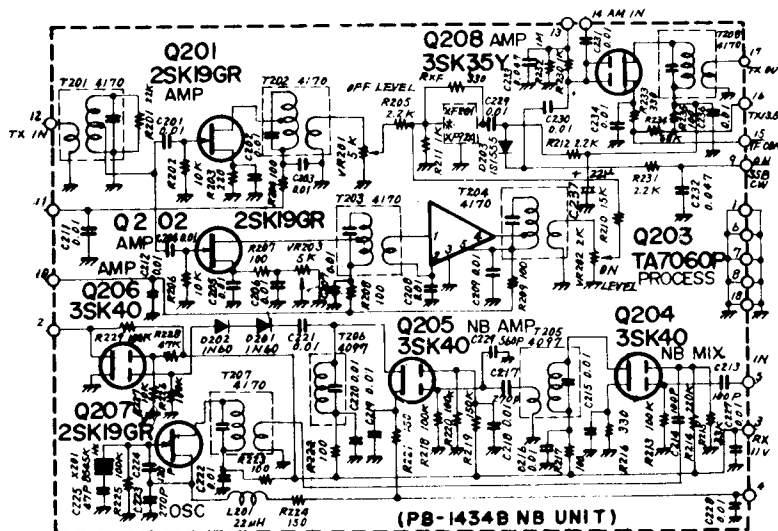


Figure 18 NB Unit (PB-1434)

TRANSMIT CIRCUIT

Audio signals pass through the MIC jack, J8 and go to pin 4 of the AF UNIT through VR₁₉₀₁, MIC GAIN control.

AF UNIT (PB-1437)

From pin 4, the audio signal passes through Q₅₀₃, LD3141, is amplified, then is applied through RL501 into a balanced modulator D₅₀₃ through D₅₀₆, 1S1007, where the carrier generated by X₅₀₁ or X₅₀₂ is modulated by the audio. The output becomes a 9 MHz DSB signal and is fed to the IF UNIT.

AM UNIT (PB-1556)

For AM (amplitude modulation), the microphone signal is fed through a level set potentiometer VR₂₀₀₂ to a microphone amplifier Q₂₀₀₃, TA7120P which is controlled by Q₂₀₀₄, 2SC372Y. Q₂₀₀₄ supplies the base voltage to Q₂₀₀₃ when the MODE switch is set to an AM position.

Carrier oscillator, Q₂₀₀₁, 2SK19GR generates a crystal controlled carrier frequency of 8999.3 kHz. The carrier and microphone signals are fed to an AM modulator Q₂₀₀₂, 3SK40M. The amplitude modulated signal is fed through pin 2 to pin 14 of NB unit and amplified by Q₂₀₈, 3SK35Y.

The carrier frequency is shifted 170 Hz for FSK and the signal is then applied through Q₂₀₀₂ which works as a buffer amplifier to Q₂₀₈ in the NB unit.

IF UNIT (PB-1436)

The 9 MHz DSB signal enters into pin 5 and is amplified by Q₄₀₃, 2SK19GR. It then goes into the FILTER UNIT from pin 14. The function of Q₄₀₉, 2SK19GR is to oscillate 8999.3 kHz carrier for CW transmit. The carrier is amplified by Q₄₀₃, 2SK19GR and then goes into pin 17 of the FILTER UNIT from pin 14 of the IF UNIT.

FILTER UNIT (PB-1435)

In the FILTER UNIT, the DSB signal is converted into SSB by the filter, XF-303 by removing the unwanted sideband. From pin 6 the SSB signal is fed into pin 12 of the NB UNIT (PB-1434B). The signal is fed to the speech processor circuit which is built into this NB unit.

NB UNIT (PB-1434)

When the RF PROC switch is "OFF", the SSB signal entered at pin 12 is amplified by Q₂₀₁, 2SK19GR and then is applied to the XF-201 filter which is optional.

When the RF PROC switch is "on", the SSB signal is amplified by Q₂₀₂, 2SK19GR and is further amplified by the limiter IC, Q₂₀₃, TA7060P where the signals that exceed the clipping level are sliced out.

The clipping level may be adjusted by VR₂₀₃, VR₂₀₁ and VR₂₀₂ to adjust the signal level differences caused by the PROCESSOR "on" or "off". This highly clipped SSB signal is then followed by a selective filter XF-201 to remove RF harmonics and out of band intermodulation products that result from signal clipping.

The filtered out clean signal is amplified by Q₂₀₈, 3SK35Y and fed to pin 1 of the RF UNIT (PB-1433).

RF UNIT (PB-1433)

The signal from pin 1 is applied to the double balanced mixer Q₁₀₁, MC1496G where the SSB signal is heterodyned to the desired RF frequency by injection of the local signal which is supplied from the PRE-MIX UNIT (PB-1439) through P101.

The RF output from Q₁₀₁ passes through T2, then into the two stage amplifier on board PB-1433, Q₁₀₄, 2SC784R and Q₁₀₅, 2SC741 to drive the 10W power amplifier, PB-1443.

The transformers T2 and T3 are permeability tuned type which are used for both receive and transmit to provide unsurpassed selectivity in both modes.

In CW operation, the emitter voltage of Q₁₀₄ and Q₁₀₅ are controlled by the keying switch transistor Q₁₀₆, 2SC735Y.

A flip-flop circuit consisting of Q₁₀₇, SN7400N, is employed to shape perfect waveforms for keyclick free CW operation at any speed.

Q₁₀₆ and Q₁₀₇ also function as the protection switch when the protection circuit on the LPF UNIT (PB-1445) is activated for any reason, such as excessive SWR, short, etc.

POWER AMP UNIT (PB-1443)

The exciter output from pin 17 of the RF UNIT (PB-1433) is amplified by the driver Q_{1101} , 2SC1589, to drive the push-pull power amplifier, Q_{1102} and Q_{1103} S10-12, to produce a nominal power output of 10 watts.

A non-resonant, broad band type power amplifier, utilizing ferrites and the most advanced circuitry is used to eliminate the nuisance tuning process usually required for each band. These techniques also protect the power transistors from erroneous tuning procedures.

The zener diode D_{1101} YZ033 sets the bias for $Q_{1101} - Q_{1103}$ at exactly 3V. The silicon diodes D_{1102} and D_{1103} , 10D10 are mounted on the power transistors Q_{1102} and Q_{1103} to compensate bias, as well as to protect them from thermal runaway.

The negative feedback circuit delivers a clean signal to the following booster amplifier.

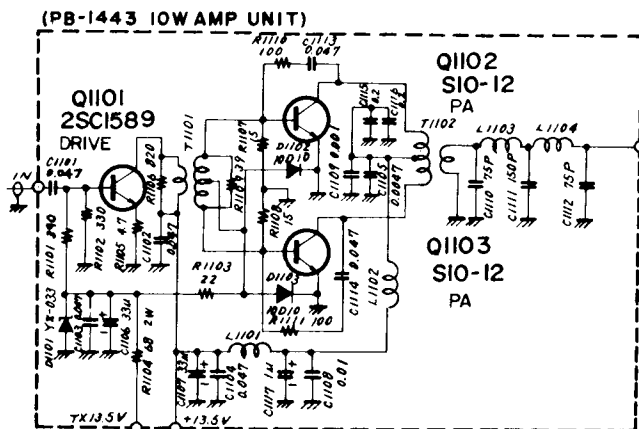


Figure 19 10W Amp Unit (PB-1443)

BOOSTER UNIT (PB-1444)

The booster unit is built in the heat sink which is attached to the rear panel of the transceiver. The 10 watts signal is fed through an input network to a pair of S-2535, Q_{1201} and Q_{1202} which are connected in push-pull amplifier configuration.

This circuit is a non-resonant broad band type amplifier covering 160 through 10 meter bands. A part of output energy is feedbacked in negative polarity to the input circuit.

This negative feedback circuit improves tremendously the linearity of the amplifier.

Q_{1203} , BY1-1 is used to sterilize the bias voltage to the final amplifier. The amplified signal is fed into the two stage low pass filter consisting of L_{1205} , L_{1206} , C_{1214} , C_{1215} and C_{1216} to alternate the frequency beyond 35 MHz.

The RF output from the secondary winding of the output transformer is fed into the low pass filter, composed of L_{1103} , L_{1104} , C_{1110} , C_{1111} and C_{1112} to eliminate frequencies beyond 35 MHz.

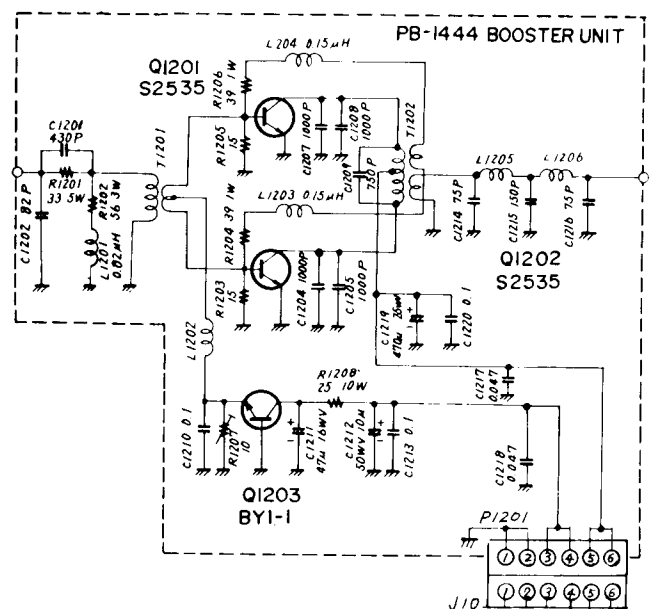


Figure 20 Booster Unit (PB-1444)

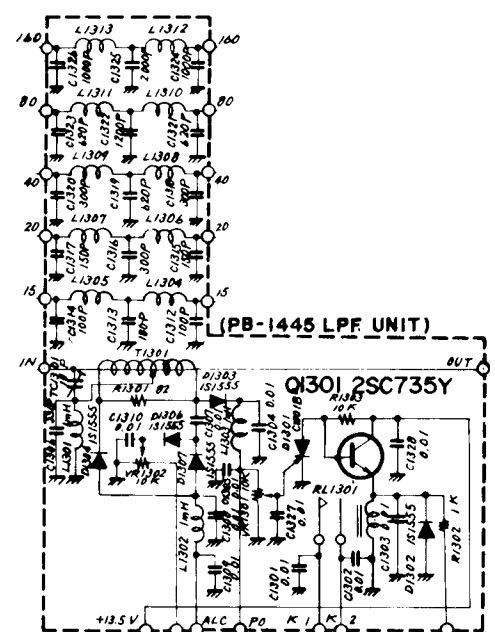


Figure 21 LPF Unit (PB-1445)

LPF UNIT (PB-1445)

The jacks, J2 and J3, are connected by a jumper wire for the 10 watts model. The band switches, S₂B₁ and S₂B₂, select the proper low pass filter network for the band in use.

The signal passes through T₁₃₀₁, an output detector, and the antenna relay (RL1) to the antenna terminal, J1.

T₁₃₀₁ detects the forward and reflected waves. The forward wave is rectified by D₁₃₀₃, 1S 1555. When the forward power exceeds safety level, it will trigger the thyristor D₁₃₀₁, CW01B which will, in turn, shut down Q₁₃₀₁, 2SC735Y and the protection relay RL₁₃₀₁ will be released.

When the relay opens, the voltage on the output side of Q₁₀₇, SN7400N on the RF UNIT (PB-1433) becomes low and Q₁₀₆, 2SC735Y will turn off. As Q₁₀₆ turns off, the emitter circuit for Q₁₀₄, 2SC784R and Q₁₀₅, 2SC741 will become wide open and these transistors will turn off. As a result, no signal will be delivered to the power amplifier.

The forward wave is also rectified by D₁₃₀₆ and D₁₃₀₇, 1S 1555 to obtain ALC voltage. The ALC voltage is fed back to the base of Q₂₀₈, 3SK35Y in the NB UNIT to control the gain of that stage. At peak transmission, the ALC voltage will reduce the gain of Q₂₀₈ to prevent overloading or distortion.

The output of the reflected wave from T₁₃₀₁ is rectified by D₁₃₀₄, 1S 1555 to obtain ALC voltage. When there is an excessive amount of reflected power due to an antenna mismatch, the reflected wave is rectified by D₁₃₀₅, 1S 1555 and the voltage is used for ALC to reduce the gain of Q₂₀₈ which will also reduce the corresponding input level to the power transistors.

BLANKING UNIT (PB-1451)

While the protection circuit is activated, Q₁₃₀₁ will be off and there will be no voltage drop across the relay coil connected to the emitter. This lack of emitter voltage (0V) is used to activate the BLANKING UNIT.

Under normal operating conditions, the output of the bi-stable Q₁₉₀₁, TP4011 is in HIGH level which will turn Q₁₉₀₂, MPSA13 on allowing current to

flow through the meter lamp for meter illumination.

When the protection circuit is activated, the input to the BLANKING UNIT becomes zero volts. The bi-stable will then oscillate to blink the meter lamp indicating existence of problem and alerting the operator to this fact.

Also on the board are the MIC GAIN control VR₁₉₀₁ and the clarifier zero adjustment pot, VR₁₉₀₂.

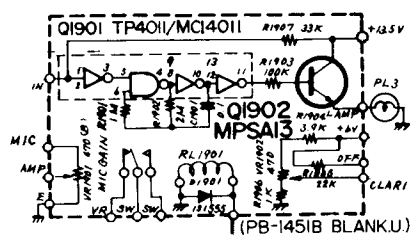


Figure 22 Blanking Unit (PB-1451)

VOX UNIT (PB-1438)

(1) VOX (Voice Controlled Operation)

A portion of the mike input is delivered to pin 10 of the VOX UNIT. The signal is amplified by Q₆₀₁ and Q₆₀₂, 2SC373, is then rectified by D₆₀₁, 1N60 to produce positive DC at the base of Q₆₀₃, 2SC373 causing it to conduct, thus reducing the voltage at pin 6 of Q₆₀₄, SN72560P. The output at pin 4 will be zero which will then actuate the VOX relay, RL1.

Q₆₀₄ is a level detector having a hysteresis characteristic and a transistor switch built in.

(2) ANTITRIP CIRCUIT

The ANTITRIP circuit provides a bucking voltage to prevent the speaker output from tripping the transceiver into the transmit mode. The receiver audio output is connected through the ANTITRIP potentiometer, VR₆₀₁, to the antitrip amplifier, Q₆₀₅, 2SC372Y and rectified by D₆₀₂, 1N60 to produce positive DC voltage at the base of Q₆₀₆, 2SC373. When there is no antitrip input Q₆₀₆ will be off as will Q₆₀₇, 2SA564A.

On receive, signal comes into pin 6 of the VOX UNIT and Q₆₀₆ and Q₆₀₇ will conduct causing the collector voltage of Q₆₀₇ to increase, thus maintaining Q₆₀₄ in an off state on receive mode. This provides the necessary antitrip threshold.

Input signal from the mike will turn Q₆₀₃ on, discharging C₆₁₃, yet the input of Q₆₀₄ will be kept in HIGH level preventing the transceiver from tripping, thus providing very stable VOX operation.

As the input to the mike stops, Q₆₀₃ will become off and C₆₁₃ will be charged according to the time constant set up by VR₆₀₂ and R₆₂₃. When the input voltage of Q₆₀₄ reaches the preset level, the output will become off, thus returning the unit to receive mode.

The VOX GAIN control (VR1) on the front panel provides adjustment for relay sensitivity, and VR₆₀₁ for antitrip sensitivity. Relay hold time is determined by the delay control, VR₆₀₂.

The tone oscillator, Q₆₀₉, 2SC373 operates when the MODE switch is in the CW position. It is a phase-shift oscillator operating at approximately 800 Hz.

The tone output is activated by the keying circuit through the emitter of Q₆₀₉ and coupled to the base of Q₆₀₂, 2SC373 for break-in CW operation. The output is also fed to the base of Q₅₀₆ in the AF UNIT through VR₆₀₃ for CW monitoring. The VR₆₀₃ adjusts the sidetone level.

(3) MARKER CIRCUIT

Located on the VOX UNIT (PB-1438), the crystal marker generator, Q₆₁₀, 2SC735Y generates a basic 1 MHz signal, with its output fed through a buffer amplifier Q₆₁₁, 2SC735Y to a frequency divider Q₆₁₂, 34013PC. The divider output provides either 100 kHz or 25 kHz marker signals as selected by S601 for dial calibration of the FT-301.

The marker signals are then fed to the antenna input from pin 3 of the VOX UNIT. TC₆₀₁ is used to set the 1 MHz basic oscillator precisely to WWV or JJY.

Q₆₀₈, 2SC372Y is to stabilize the 8.5V DC power supply to the VOX and sidetone generator.

VOX UNIT (PB-1440)

A modified Colpitts type oscillator is used to generate a 5.0 MHz to 5.5 MHz signal to produce a stable 500 kHz tuning range. The frequency is varied by VC₈₀₁ which is geared to a precision built dial tuning mechanism.

The VC₈₀₁ consists of two sections. The sub blades compensate the capacitance variation of the main blades caused by temperature changes. Frequency drift is minimized through the use of a temperature compensation circuit utilizing a differential trimmer capacitor, TC₈₀₁.

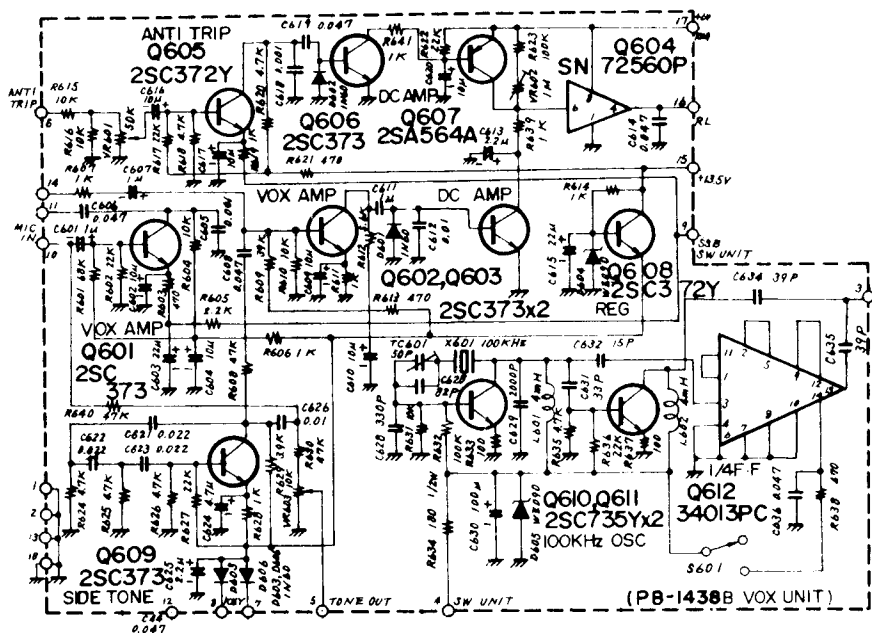


Figure 23

VOX Unit (PB-1438)

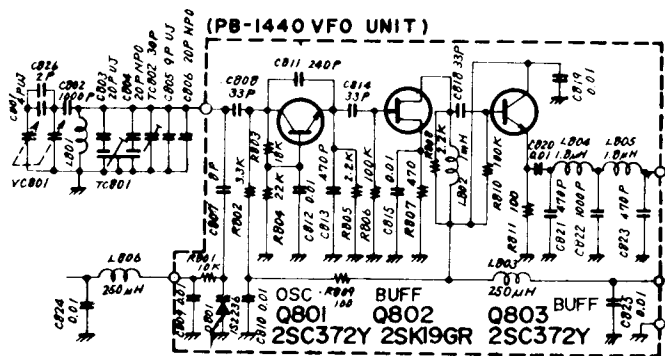


Figure 24 VFO Unit (1440)

The varactor diode D_{801} , 1S 2236 is in series with C_{807} , and the combination is in parallel with VC_{801} . By closing the clarifier switch S_{1805} , a portion of the regulated 6V is applied, shifting the frequency ± 3 kHz, depending on the setting of clarifier control VR5. The VR_{1902} on PB-1451 blanking unit is used to establish the zero set for the clarifier.

The VFO output signal is fed through the amplifier/buffer stage, Q_{802} , 2SK19GR and Q_{803} , 2SK372Y, and the low pass filter to the OUT terminal. From there, the signal goes to the PRE-MIX UNIT.

FIX UNIT (PB-1447)

In addition to normal VFO operation, 11 crystals may be used for crystal controlled operation. The selector switch located on the front panel of the transceiver selects the crystal in use. The trimmer capacitors, $TC_{1501} - TC_{1511}$, are for fine adjustment of each crystal frequency.

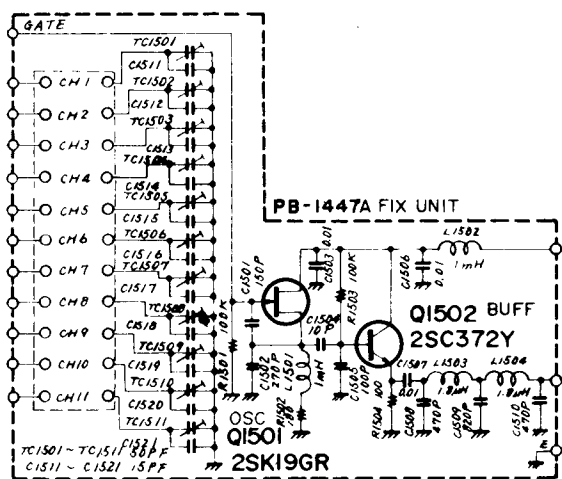


Figure 25 FIX Unit (PB-1447)

The FIX channel crystal oscillator Q_{1501} , 2SK19GR oscillates at the frequency of the crystal selected by the CHANNEL switch. The frequencies of the crystals must fall between 5.0 MHz – 5.5 MHz.

The crystal signal is fed through the amplifier/buffer stage Q_{1502} , 2SK372Y and a low pass filter to the OUT terminal on PB-1447 (FIX UNIT).

PRE-MIX UNIT (PB-1439) CRYSTAL UNIT (PB-1441) & BPF UNIT (PB-1442)

The FT-301 transceiver utilizes a unique technique of premix to minimize the signal distortion. The VFO signal is premixed with a local crystal oscillator signal and then fed to the mixer stages of the transmitter and receiver.

Crystal oscillator Q_{702} , 2SK372Y produces a heterodyne signal selected by the band switch. The signal is fed to the double balanced mixer Q_{701} , MC1496G where the signal is mixed with a signal from the VFO or FIX oscillator to produce the local signal for each band. The local signal is then fed to the wideband buffer amplifier stage Q_{705} , 2SK19GR, Q_{704} and Q_{703} , 2SK784R through the bandpass filter unit (PB-1442). The local signal or the premix output is obtained at J701.

For 80 meter, the VFO signal is directly coupled, through the buffer stage, to the transmitter and receiver mixer in the RF unit.

For reception of WWV, a 13.9985 MHz crystal is used for the crystal oscillator Q_{702} . The 5 MHz standard signal may be heard with zero beat without use of the VFO. The BAND switch must be set to WWV/JJY and the MODE to LSB.

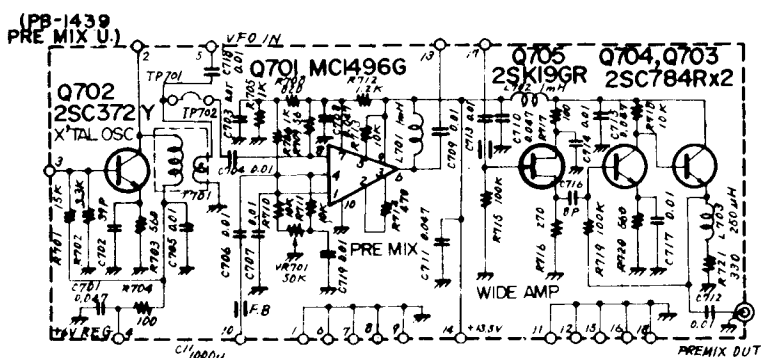


Figure 26 PREMIX UNIT (PB-1439)

AC POWER SUPPLY

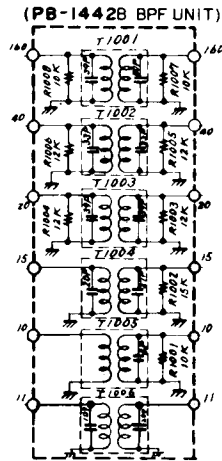
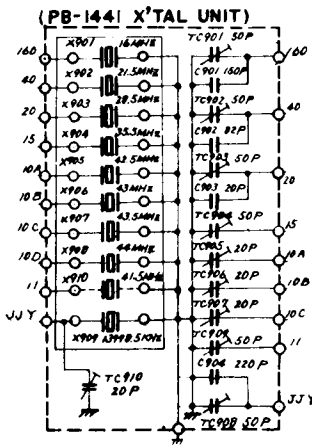


Figure 27
Crystal unit (PB-1441)

Figure 28
BPF Unit (PB-1442)

The frequency relation of the FT-301 is shown in Table 2.

Band	Frequency	Crystal	Premix out
160m	MHz MHz 1.5 ~ 2.0	MHz 16.0	MHz MHz 10.5 ~ 11.0
80m	3.5 ~ 4.0	—	5.5 ~ 5.0
40m	7.0 ~ 7.5	21.5	16.0 ~ 16.5
20m	14.0 ~ 14.5	28.5	23.0 ~ 23.5
15m	21.0 ~ 21.5	35.5	30.0 ~ 30.5
11m	27.0 ~ 27.5	41.5	36.0 ~ 36.5
10mA	28.0 ~ 28.5	42.5	37.0 ~ 37.5
10mB	28.5 ~ 29.0	43.0	37.5 ~ 38.0
10mC	29.0 ~ 29.5	43.5	38.0 ~ 38.5
10mD	29.5 ~ 30.0	44.0	38.5 ~ 39.0
JJY	5.0	13.9985	13.9985

Table 2 VFO: 5.0 ~ 5.5MHz IF: 9MHz

A study of the block diagram on Page 12 will also prove useful in tracing the various signal paths through the transceiver.

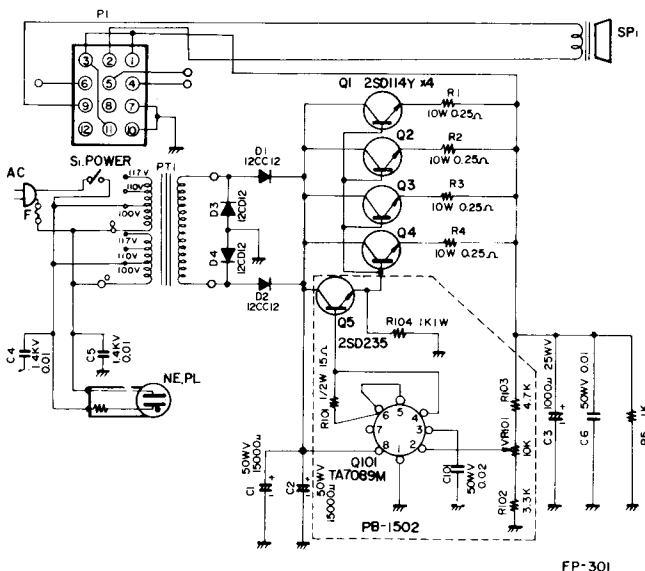


Figure 29 FP-301 Circuit Diagram

The FP-301 AC power supply is designed for base operation of the FT-301 SSB transceiver. However, this high current regulated power supply can also be used for other purposes such as when there is a requirement for a regulated 13.5 volt DC supply from AC power sources.

MODEL

FP-301
FP-301D

SPECIFICATIONS

Output 13.5V DC – Max 25
Amps for FT-301 or FT-301D
Output 13.5V DC – Max 25
Amps for FT-301 or FT-301D
with automatic ID and digital
clock

CIRCUIT DESCRIPTION

The power supply is designed to operate from either 100, 110, 117, 200, 220 or 234 Volts AC, 50 or 60 Hz.

A transformer is energized by two primary windings which can be connected in series for 200, 220 and 234 Volts and in parallel for 100, 110 and 117 Volts operation. A secondary output voltage is rectified by a full wave bridge rectifier consisting of diodes, D₁, D₂, D₃ and D₄, 12CD12.

The rectified DC voltage is stabilized by a voltage regulator consisting of Q₁ through Q₄, 2SD114Y, Q₅, 2SD235 and Q₁₀₁, TA7089M.

The regulator Q₁₀₁ works as a current limiter to protect the over current failure of the regulator transistors.

The FP-301D has a built-in digital clock and automatic identification circuits. The digital clock displays the time in hours, minutes and seconds and is synchronized to the supply voltage frequency, 50 Hz or 60 Hz. The frequency can be selected by changing the internal windings. The display can be selected for either a 24-hour or 12-hour system with a switch at the front panel.

The call sign for automatic ID will be programmed into an integrated circuit by our authorized dealer at a minimum cost.

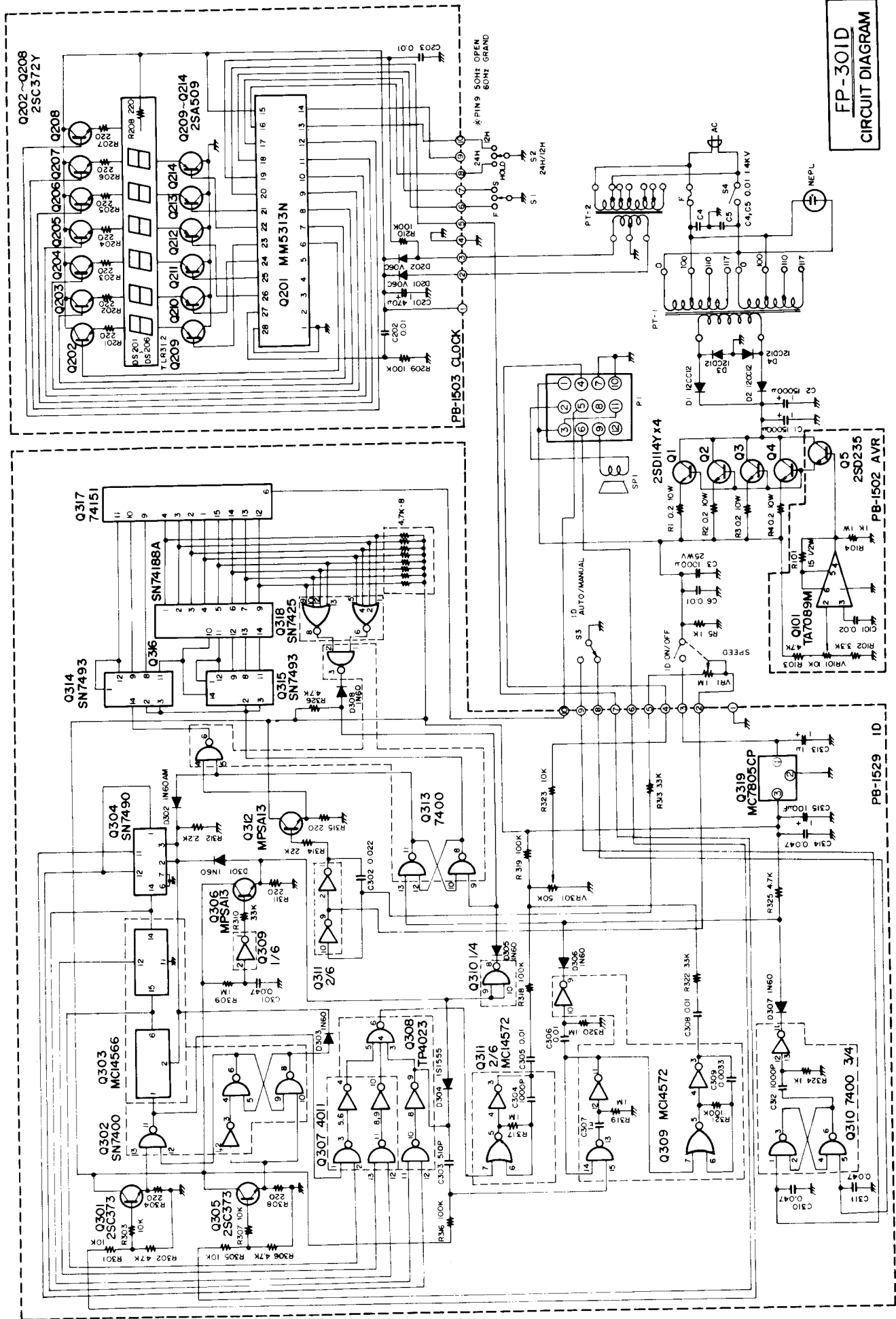


Figure 30 FP-301D Circuit Diagram

FREQUENCY COUNTER UNITS

A frequency counter is incorporated for accurate and easy frequency readout by the display diode.

The frequency readout unit consists of a counter unit, frequency converter unit and a display unit by LED (Light Emitting Diode) to display operating frequency in the dial window.

The counter device utilizes LED to display the lowest digit of 100 Hz, however, the counter unit counts to 10 Hz to avoid the annoyance of flicker of the last digit.

The diode matrix circuit selects MHz display which corresponds to the setting of the BAND switch. The VFO frequency of 5 to 5.5 MHz is connected to 13.0 – 13.5 MHz and the counter counts this frequency.

COUNTER MIXER UNIT (PB-1541)

The heterodyne oscillator Q_{2202} , **2SK19GR** oscillates at 18.5 MHz crystal frequency. A varactor diode, D_{2211} , **1S2209** is connected in series with a crystal and shifts the crystal frequency to calibrate frequency from front panel. The varactor diode voltage is supplied through the potentiometer marked CA4B. The oscillator output is fed through a buffer amplifier Q_{2204} , **2SK19GR** to the mixer, Q_{2203} , **SN76514** where the incoming VFO from pin 5 of printed board is heterodyned to 13.0 – 13.5 MHz signal.

The diode matrix circuit consists of a read memory IC, Q_{2201} , **MSL-980Y2** and diodes D_{2201} – D_{2210} , **1N60AM** for preset counter adding 500 kHz to the VFO frequency and for 7 MHz, 5 MHz, 10 MHz and 20 MHz display.

The diodes are grounded by the BAND switch in order to make BCD input terminal "L". The matrix circuit is so composed that unnecessary BCD code is grounded as BCD input of Q_{2101} – Q_{2106} are "H" level.

Q_{2106} , **TIL308** is only used to display 1 or 2 for 10 MHz and 20 MHz so that A or B of BCD input terminal is set to "H" through inverter Q_{2112} , **SN7404** for 10 or 20 MHz display.

For 5 MHz JJY or WWV signal, the counter displays 5,000 kHz, regardless of VFO frequency, by closing gate 1 of the counter input.

The clock signal is oscillated by C MOS IC Q_{2204} , **MSM5564** which also contains 18 stages of the binary counter. The 655.36 kHz signal is then divided by the binary counter into a 5 Hz signal which is amplified by a buffer amplifier Q_{2205} , **2SC373** and is used as a gate signal for counter gate 2.

DISPLAY LOGIC UNIT (PB-1542)

The heterodyned 13.0 – 13.5 MHz signal is wave shaped and inverted by Q_{2110} , **SN7404N** and then fed to gate 1 of Q_{2109} , **SN7400N**. Gate 1 closes when the BAND switch is set to JJY/WWV position but opens for other positions.

Gate 2 is controlled by a 5 Hz gate signal and counts the number of pulses passing through the gate. The output from Q_{2109} is then fed to Q_{2107} , **SN7490N** which counts 10 Hz. Q_{2107} generates a pulse each time it counts 10 pulses.

This pulse is fed to Q_{2101} which displays a 100 Hz digit. The pulse is also used as a clock pulse for Q_{2102} , Q_{2103} and Q_{2108} to count 1 kHz, 10 kHz and 100 kHz pulses.

Q_{2101} – Q_{2103} , **TIL306** contains counter, latch decoder, driver and LED in one package. Q_{2108} , **SN74160** is used as a preset counter to add 500 kHz for such bands starting from 800 kHz. The BCD code output from Q_{2108} is fed to Q_{2104} , **TIL308**. **TIL308** does not contain counter circuit. Q_{2112} , **SN7404N** is used as inverter. A part of gate pulse is fed to Q_{2111} , **SN7400N** to generate reset and memory signals.

dis-
by

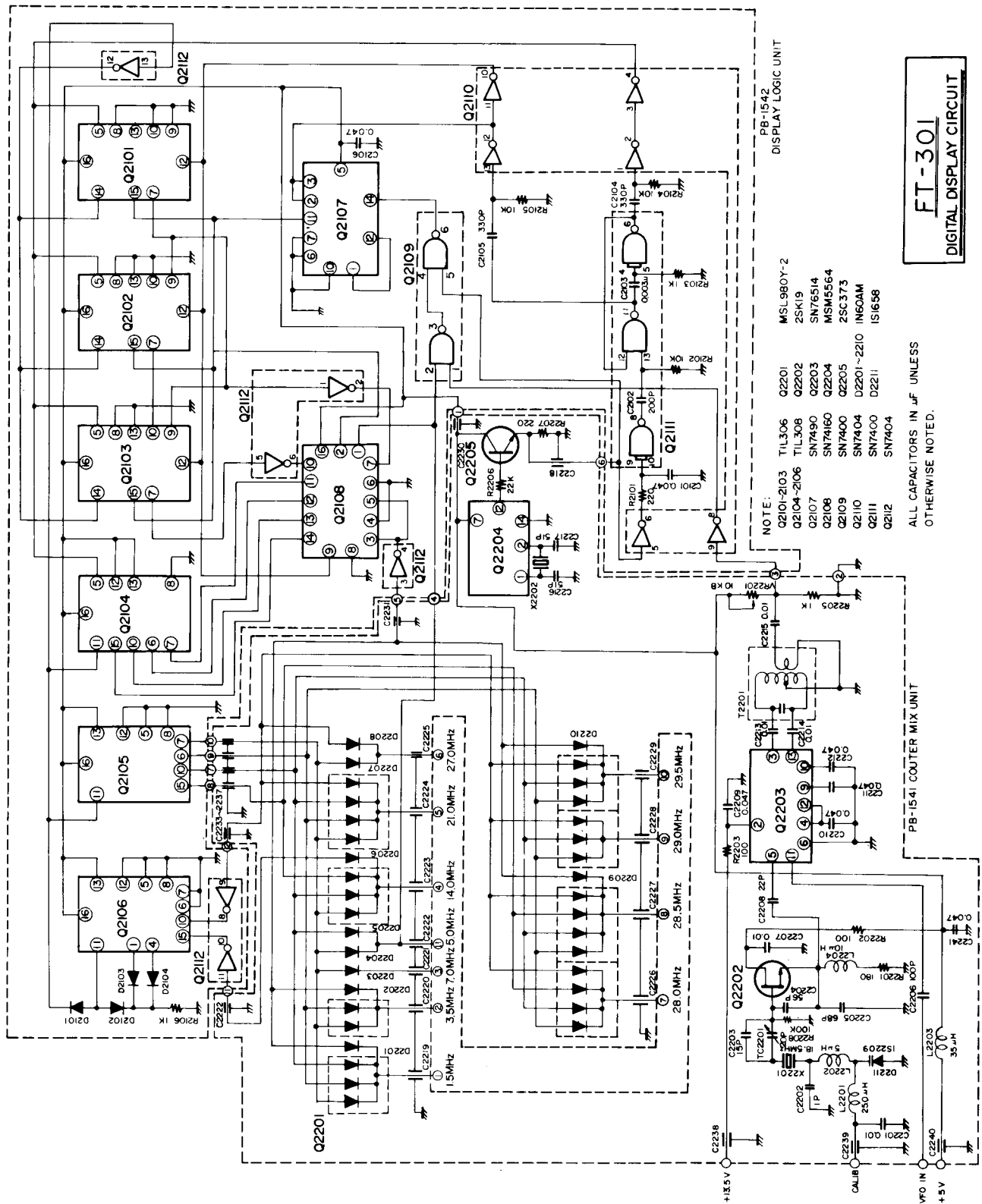


Figure 3-1 Digital Display Circuit (Counter Mixer Unit, Logic Display Unit)

MAINTENANCE & ALIGNMENT

GENERAL

This transceiver has been carefully aligned and tested at the factory prior to shipment. The reliability of the solid state devices used in the FT-301 should provide years of trouble-free service if the equipment is not abused and proper routine maintenance carried out.

Do not attempt to align the transmitter without having the proper antenna or a dummy load con-

nected to the transceiver. We recommend off the air testing as a courtesy to other operators.

The following alignment procedure requires certain test equipment such as an RF signal generator, an audio oscillator, a sweep generator, an oscilloscope and a VTVM. Without proper test equipment, do not attempt to adjust cores or potentiometers.

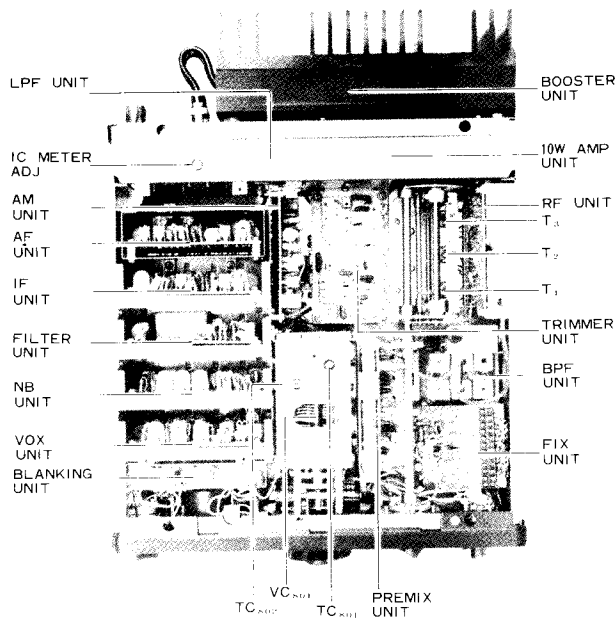


Figure 32 FT-301 Top View

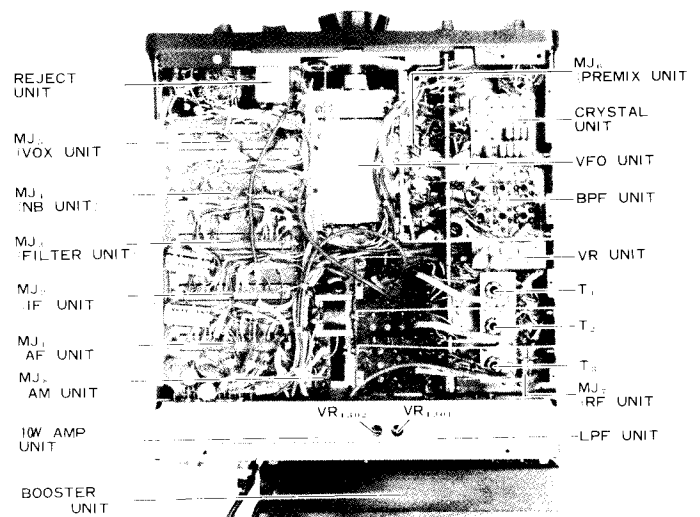


Figure 33 FT-301 Bottom View

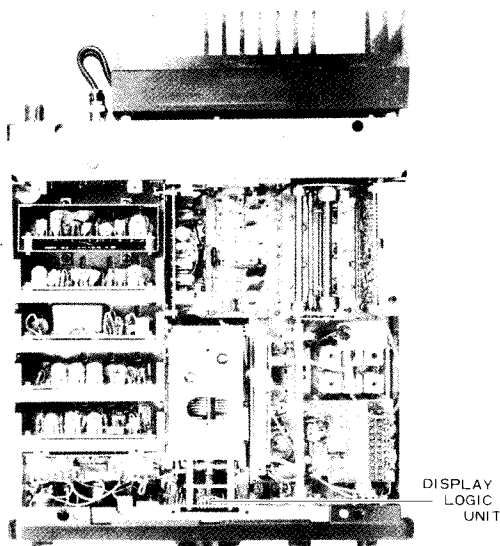


Figure 34 FT-301D Top View

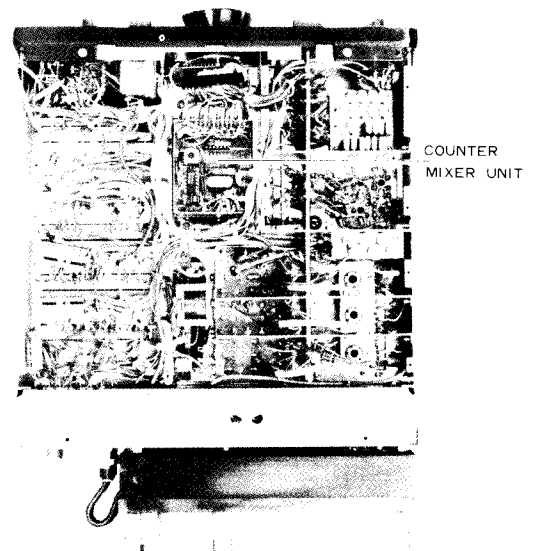


Figure 35 FT-301D Bottom View

AF UNIT

(1) SSB CARRIER POINT ADJUSTMENT (TC₅₀₁, TC₅₀₂)

(a) Settings:

BAND 20

DIAL 14.25 MHz

MODE CW

Tune to transmit at the maximum power.

(b) Connect the output of an audio oscillator to the microphone input. Set the frequency at 1 kHz and transmit on USB. Adjust the MIC GAIN control for 50 watts RF output to the dummy load.

(c) Shift the audio frequency to 300 Hz without changing the audio output level or MIC GAIN control.

(d) Switch between USB and LSB while adjusting TC₅₀₁ for USB and TC₅₀₂ for LSB to obtain 12.5 watts output on each sideband. (For the 80 meter band, USB and LSB will reverse but you are on 20 meters now.)

(e) Return to receive mode. Switch the MODE selector back and forth between USB and LSB to verify that the tone quality of the noise on the two sideband modes sounds alike.

(2) CARRIER BALANCE

(a) Settings:

BAND 20

DIAL 14.25 MHz

MODE USB

No input to the mike jack.

(b) Connect a dummy load to the antenna receptacle and the RF probe of a VTVM to the antenna receptacle, J1. Adjust TC₅₀₃ and VR₅₀₁ alternately to minimize the VTVM reading.

(c) If no VTVM is available, use a monitor receiver and adjust TC₅₀₃ and VR₅₀₁ for the minimum S meter reading.

(d) Repeat this procedure until a minimum reading is obtained equally for both sidebands.

FILTER UNIT, IF UNIT

IF GAIN (VR₃₀₁), S METER ZERO SET (VR₄₀₁) S METER FULL SCALE SET (VR₄₀₂)

(a) Settings:

BAND 20

DIAL 14.25 MHz

TUNE 20 METER

SELECT INT

CHANNEL VFO

RF GAIN MAX

(FULLY CLOCKWISE)

Connect the output to a stable signal generator to the antenna receptacle. Set the signal generator output to 0 dB and frequency to other than 14.25 MHz.

(b) Set VR₄₀₂ to a fully clockwise position. Adjust VR₄₀₁ until the S meter indicates zero.

(c) Set the generator frequency to 14.25 MHz at 0 dB output. Adjust the TUNE and DIAL for maximum sensitivity, then adjust VR₃₀₁ until the S meter again indicates zero.

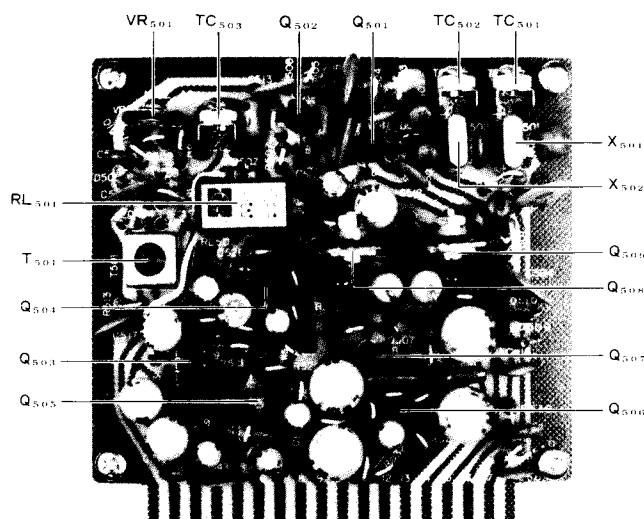


Figure 36 AF Unit (PB-1437)

- (d) Increase the generator output to 80 dB. Adjust VR₄₀₂ for a full scale indication of the S meter.
- (e) Repeat above procedures as required to achieve correct zero and maximum indications.

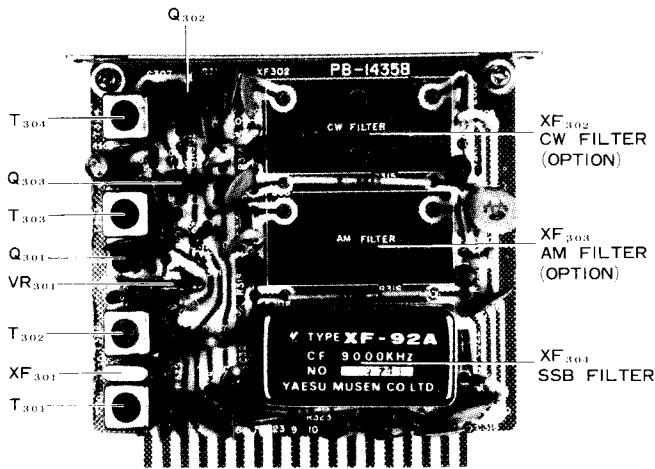


Figure 37 Filter Unit (PB-1435)

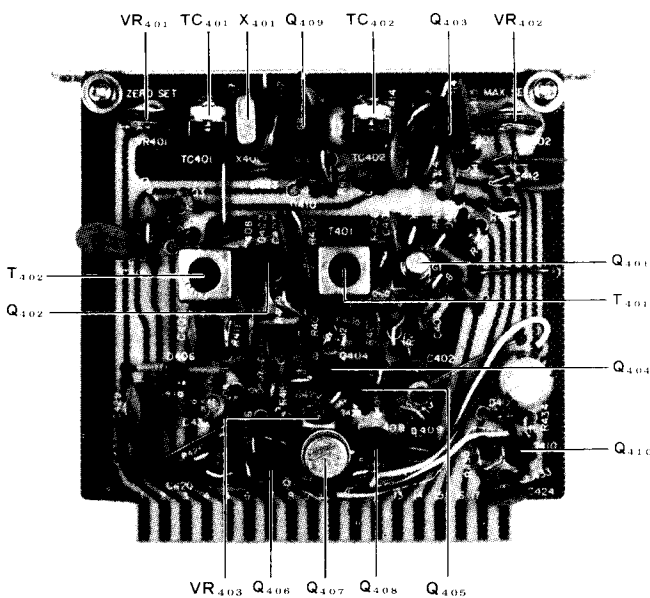


Figure 38 IF Unit (PB-1436)

VOX UNIT

(1) ANTITRIP INPUT LEVEL (VR₆₀₁)

- (a) Tune in a signal on SSB and adjust the AF GAIN control to a normal listening level.
- (b) With microphone positioned near the speaker, increase VOX GAIN control until it switches to transmit automatically.

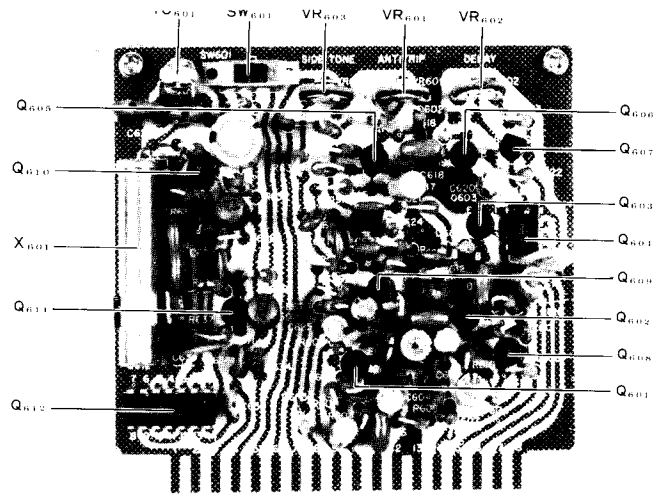


Figure 39 VOX Unit (PB-1438) (Option)

- (c) Set the ANTITRIP control VR₆₀₁ to the minimum point that will prevent the speaker output from tripping the VOX relay.
- (d) Speak into the microphone normally to see if it activates the relay to transmit mode. If not, VR₆₀₁ may be turned too far.

(2) VOX DELAY TIME (VR₆₀₂)

- (a) Adjust the delay control, VR₆₀₂, for suitable release time. Turning clockwise will give a longer delay time and counter-clockwise will give a shorter delay time.
- (b) For a break-in CW operation, VR₆₀₂ should be adjusted for a suitable delay time as well.

(3) CW SIDETONE LEVEL

In CW operation, the sidetone circuit is activated for monitoring and the CW sidetone level may be adjusted with potentiometer VR₆₀₃.

(4) MARKER GENERATOR FREQUENCY (TC₆₀₁)

- (a) Settings:
 - BAND JJY/WWV
 - TUNE 2
 - MODE LSB
- (b) Receive WWV with zero beat by adjusting TC₉₀₁ on the crystal unit.
- (c) Turn the MARKER switch on and zero beat the marker signal against WWV by adjusting TC₆₀₁.

RF SPEECH PROCESSOR

The optional crystal filter XF₂₀₁ is required to operate with the RF SPEECH processor.

- (1) Level adjustment when the processor is used (VR₂₀₂, VR₂₀₃)
 - (a) Adjust the MIC GAIN control to a proper setting. Refer to blanking unit adjustment on Page 31.
 - (b) Apply a 2 mV, 1 kHz signal to the mike input jack.
 - (c) Connect a VTVM to pin 11 of the FILTER unit while VR₂₀₃ is turned fully clockwise.
 - (d) Adjust VR₂₀₂ so that the VTVM reads 40 mV.
- (2) Level adjustment when the processor is "off" (VR₂₀₁)

Turn the RF PROC switch "off" and adjust VR₂₀₁ so that the VTVM reads 40 mV.

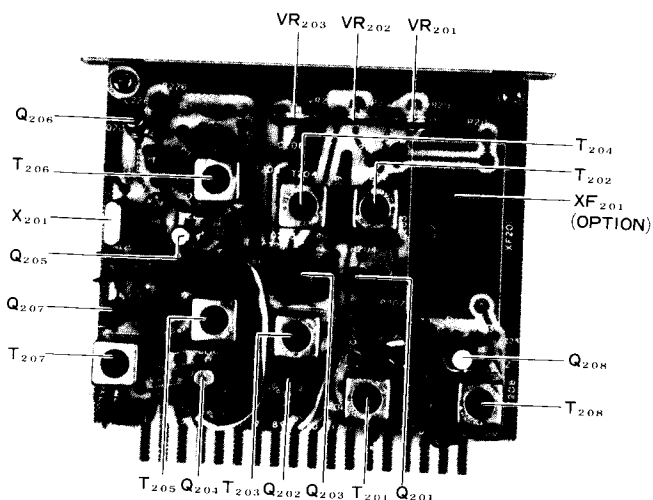


Figure 40 NB Unit (PB-1434)

VFO UNIT

It requires skilled technique and knowledge to align the VFO unit. It is, therefore, recommended to refer all VFO work to qualified personnel should a case develop where a repair is needed on the VFO unit.

TC₈₀₁ A split type trimmer capacitor for temperature compensation.

TC₈₀₂ Band setting trimmer capacitor.

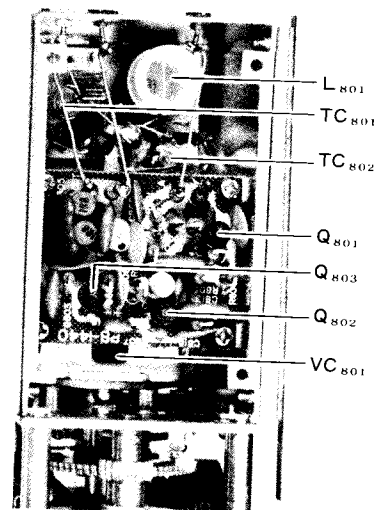


Figure 41 VFO Unit

PREMIX UNIT, CRYSTAL UNIT

The 160 mA, 10 mA, 10 mD and WWV crystals are optional and their corresponding fine frequency setting trimmers have been factory adjusted with the standard crystals.

PREMIX CRYSTAL OSCILLATOR

(T₇₀₁, TC₉₀₁ - TC₉₁₀)

When optional crystals are installed, no alignment of T₇₀₁ is required. Should T₇₀₁ need an adjustment for some reason, all other trimmers (TC₉₀₁ - TC₉₁₀) have to be realigned.

- (a) To align T₇₀₁, set the BAND switch to 10D and connect the RF probe of a VTVM to TP₇₀₁ of the PREMIX unit (junction of C₇₁₈ and C₇₀₄).
- (b) Peak T₇₀₁ for a maximum VTVM reading, and then rotate the core counter clockwise until the VTVM reading indicates 50 mV. (Do not rotate the core more than one full turn.)
- (c) Set the BAND switch to 10C and adjust TC₉₀₇ for a 50 mV reading.
- (d) Repeat the same procedure as step (c) on TC₉₀₆ - TC₉₀₁ for 10B through 160 meter bands respectively so that the VTVM readings indicate 50 mV. (There is no trimmer capacitor for the 80 meter band.)

- (e) Set the BAND switch to JJY/WWV. Preset TC₉₀₁ to its mid point (at half capacitance) and adjust TC₉₀₈ for a 100 mV VTVM reading. Set the MODE to LSB and the TUNE to 2 of the unity scale, and then adjust TC₉₁₀ for a zero beat reception of WWV.

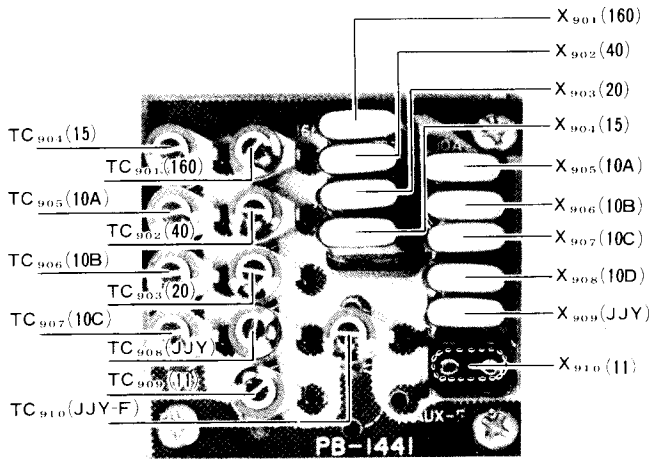


Figure 42 Crystal Unit (PB-1441)

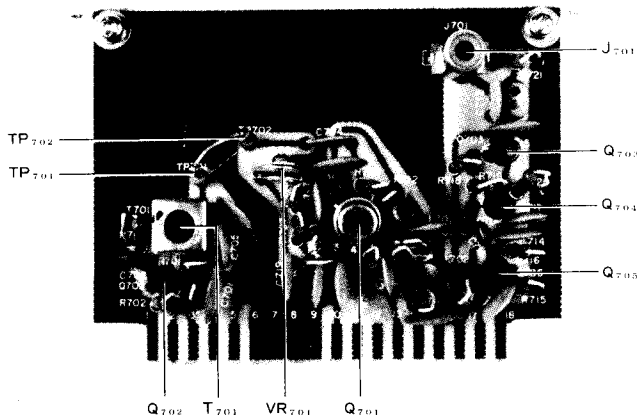


Figure 43 PREMIX Unit (PB-1439)

BPF UNIT (PB-1442)

(1) BANDPASS FILTER (T₁₀₀₁ - T₁₀₀₅)

The adjustment of the bandpass filters is critical to the spurious response. It requires a sweep generator and a scope for proper alignment.

- Remove the jumper wire between TP₇₀₁ and TP₇₀₂ on the PREMIX unit. (TP₇₀₂ is not shown on schematic, refer to Fig 43)
- Connect the output of a sweep generator to TP₇₀₂ and the RF probe of a scope to TP₇₀₁.
- Set the VFO SELECT to EXT to disconnect the VFO from the circuit. Apply 30 dB sweep output to TP₇₀₂.

- Monitor the wave patterns on the scope by offsetting the balancing pot VR₇₀₁ on the PREMIX UNIT.

- Adjust T₁₀₀₁ - T₁₀₀₅ so that the passband characteristics become as flat as possible within the passband range specified.

BAND	BPF PASSBAND
160	10.5 - 11.0 MHz
40	16.0 - 16.5 MHz
20	23.0 - 23.5 MHz
15	30.0 - 30.5 MHz
10	37.0 - 39.0 MHz

- When completed, re-install the jumper wire between TP₇₀₁ and TP₇₀₂.

(2) PREMIX BALANCE (VR₇₀₁)

- Set the BAND switch to 10 mD. Connect the RF probe of a VTVM to the pinjack, J₇₀₁, and adjust VR₇₀₁ for a minimum reading.
- Return the VFO SELECT to INT and make sure that the VTVM reading indicates between 0.7 - 0.9V.

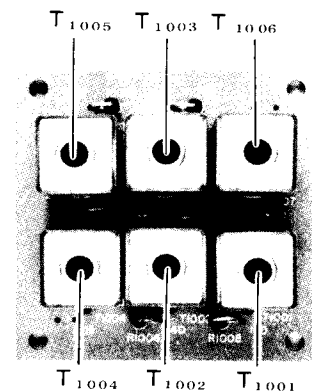


Figure 44 BPF Unit (PB-1442)

FIX UNIT (PB-1447)

The trimmer capacitors TC₁₅₀₁ - TC₁₅₁₁ are provided for fine frequency tuning of fixed channel crystals. The 12th socket is for auxiliary and it is not connected to the switch.

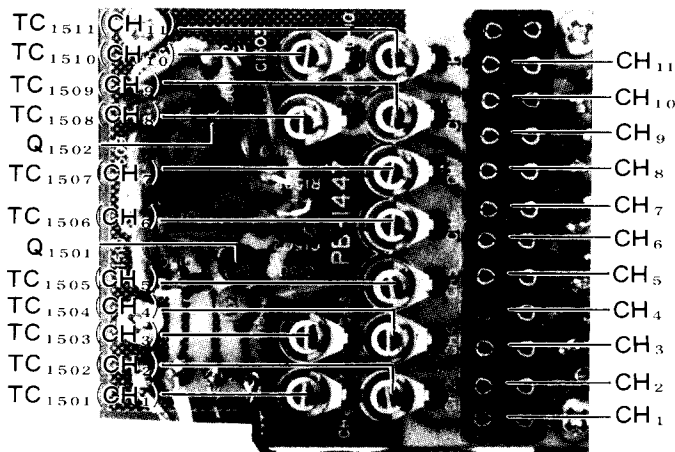


Figure 45 Fix Unit (PB-1447)

RF UNIT (PB-1433)

(1) TRANSMITTER MIXER BALANCE (VR₁₀₁)

- (a) Transmit on the 80 meter band in CW mode with the TUNE set to 6 of the unity scale.
- (b) Adjust VR₁₀₁ for a minimum power output.

(2) RECEIVER MIXER (T₁₀₂)

Tune the transceiver to the internal marker signal and peak T₁₀₂ for a maximum S meter indication.

(3) 9 MHz TRAP (T₁₀₁, T₁₄₀₁)

- (a) Set the BAND switch to the 40 meter band and tune the transceiver for maximum sensitivity with the TUNE control.

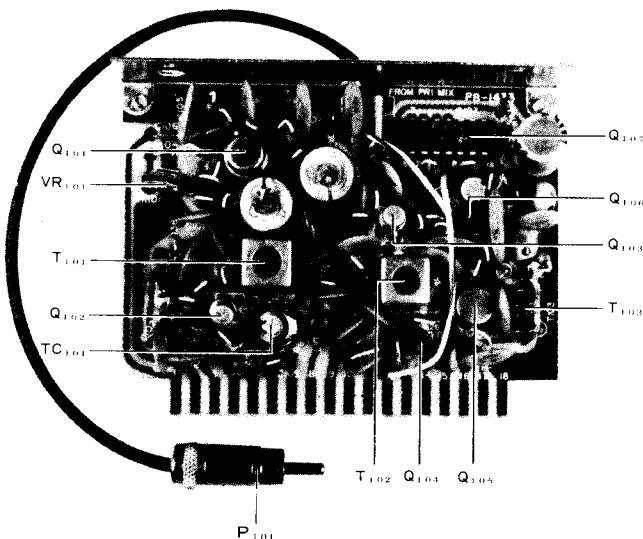


Figure 46 RF Unit (PB-1433)

- (b) Connect the output of a signal generator set to exactly 9 MHz, and apply enough output so that the S meter indicates S6 – S8.
- (c) Adjust T₁₀₁ on the RF UNIT and T₁₄₀₁ on the TRIMMER UNIT for a minimum S meter reading.
- (d) Increase the output of the generator and repeat step (c) until the lowest S meter reading is achieved.

BLANKING UNIT

(1) SETTING OF MIC VR (VR₁₉₀₁)

- (a) Connect the output of an audio generator to the mike input jack and a VTVM to pin 5 of the IF unit. Tune the transceiver to transmit on the 20 meter band in USB.
- (b) Transmit with a signal input of 2 mV at 1 kHz and adjust the MIC GAIN control, VR₁₉₀₁, for an 80 mV VTVM reading.
- (c) If using a microphone other than the one furnished with the unit, it will be necessary to readjust the MIC GAIN control.

(2) CLARIFIER ZERO SETTING (VR₁₉₀₂)

- (a) Tune the transceiver to the marker or signal generator on any band.
- (b) Set the clarifier control to its centre (12 o'clock position). With the CLAR switch turned on, tune the dial for zero beat.
- (c) Turn the CLAR switch off and zero beat by adjusting VR₁₉₀₂.

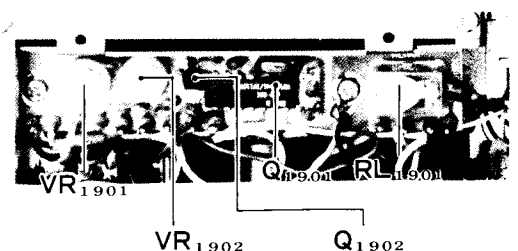


Figure 47 Blanking Unit (PB-1451)

LPF UNIT (PB-1445)

(1) BALANCING OF OUTPUT DETECTOR TRANSFORMER (TC₁₃₀₁)

- (a) Set the ALC level control, VR₁₃₀₂ to fully clockwise position. Connect a dummy load to antenna terminal and tune the transmitter to full output on CW mode at 80 meter band.
- (b) Peak TC₁₃₀₁ for a maximum power output.

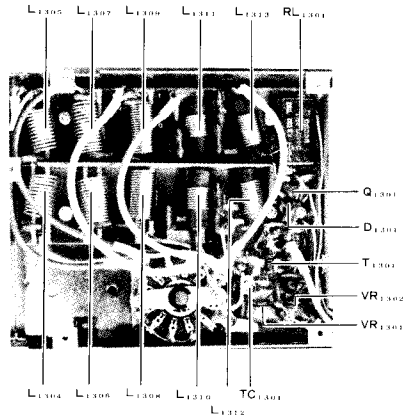


Figure 48 LPF Unit (PB-1445)

(2) ALC LEVEL (VR₁₃₀₂)

- (a) Transmit on the 80 meter band as described above. Slowly advance VR₁₃₀₂ in a counter-clockwise direction and set the VR₁₃₀₂ to the point where the power output starts to decrease.
- (b) A care must be taken when adjusting VR₁₃₀₂ as a high SWR due to the antenna mismatch will cause improper setting of VR₁₃₀₂.

(3) OVERDRIVE PROTECTOR (VR₁₃₀₁)

- (a) Transmit on the 20 meter band in CW with 100 watts output.
- (b) Change the MODE switch to USB and while speaking into the microphone normally, rotate VR₁₃₀₁ slowly until the protection circuit activates. This will be indicated by blinking of the S meter lamp.
- (c) Stop transmitting, then return the control counter-clockwise 1/8 of a turn. This point is the proper setting for the overdrive protection circuit. Be sure not to return the control more than specified.

- (d) Turn the POWER switch off once to restore a normal condition.

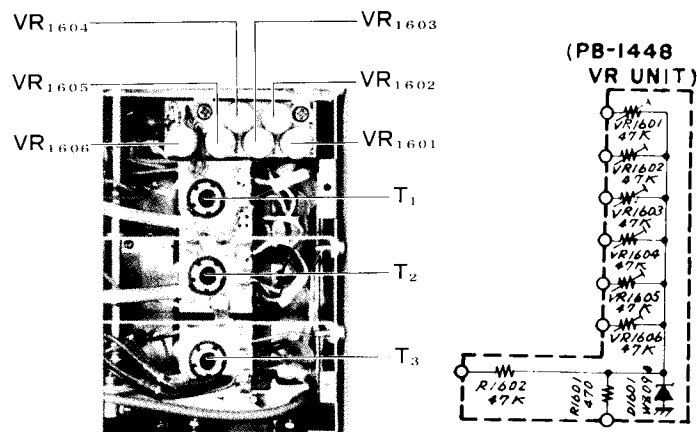
VR UNIT (PB-1448)

(1) EXCITER, DRIVE LEVEL (VR₁₆₀₁ – VR₁₆₀₆)

- (a) Settings:
 - BAND 160 M
 - DIAL 500 (on white scale)
 - TUNE 160 METER
 - DRIVE Fully clockwise
 - MODE CW
 - VR₁₃₀₂ on the ... Fully clockwise LPF unit

- (b) Adjust the TUNE control for a peak output while transmitting. Adjust VR₁₆₀₁ for 100 watts output. It is necessary to retune the TUNE control as you adjust VR₁₆₀₁.

- (c) Switch the BAND from 80m through 10D and repeat the same procedure as step (b) for the corresponding potentiometers VR₁₆₀₂ – VR₁₆₀₆ for 100 watts output.



VR Unit (PB-1448) Figure 49

**AM UNIT (PB-1556)
AM Unit (PB-1556)**

(1) AM CARRIER FREQUENCY (TC₂₀₀₁)

- (a) Connect a frequency counter to pin 2 of multi-connector.

- (b) Set the MODE switch to AM position and key the transmitter.
- (c) Adjust TC₂₀₀₁ until crystal frequency becomes 8999.3 kHz.

(2) FSK SHIFT FREQUENCY (TC₂₀₀₂)

- (a) Connect a frequency counter to pin 2 of multi-connector.
- (b) Set the MODE switch to FSK position and key the transmitter. Adjust TC₂₀₀₂ until crystal frequency shift is 170 Hz (8999.13 kHz) when pin 3 and pin 6 of accessory socket are connected.

(3) AM OUTPUT LEVEL (VR₂₀₀₁)

Set the BAND switch to 10B, MODE switch to AM and DRIVE control to fully CW position. Key the transmitter and adjust VR₂₀₀₁ for 25 watts output.

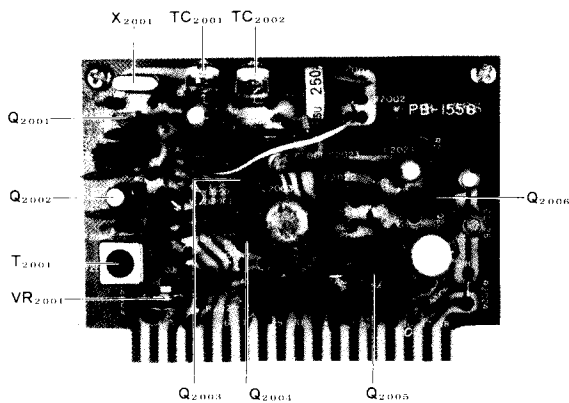


Figure 50 AM Unit (PB-1556)

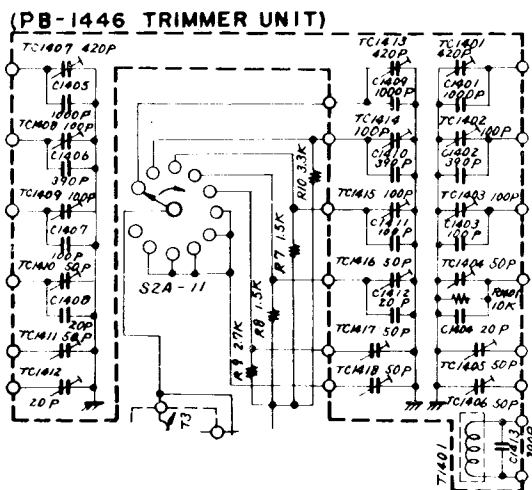


Figure 51

(4) AM MIC GAIN (VR₂₀₀₂)

Observe the transmitted signal on oscilloscope and adjust VR₂₀₀₂ for 100% modulation.

RF TRACKING

Preselector Coils (T₁–T₃) and Trimmer Unit (TC₁₄₀₁–TC₁₄₁₈)

- (a) Turn the TUNE control fully counter-clockwise and make sure that the knob indicates 0 on the unity scale. At 3.5 of the unit scale, the upper ends of the cores and the coil bobbins should line up with each other.
- (b) Set the BAND switch to 10 mD, the VFO to 30 MHz, and the TUNE control to the upper end of 10m segment (9.5 of the unity scale), then adjust TC₁₄₁₂ and TC₁₄₁₈ on the TRIMMER UNIT for maximum power output.
- (c) After completing step (b), return to receive mode and adjust TC₁₀₁ on the RF UNIT for maximum sensitivity. Do not change the VFO and TUNE settings once set up in step (b).
- (d) Set the BAND switch to 80m, the VFO to 3.5 MHz, and the TUNE control to the lower end of 80m segment (3 of the unity scale), then adjust TC₁₄₀₈ and TC₁₄₁₄ for the maximum power output. Return to receive mode and adjust TC₁₄₀₂ for maximum sensitivity.

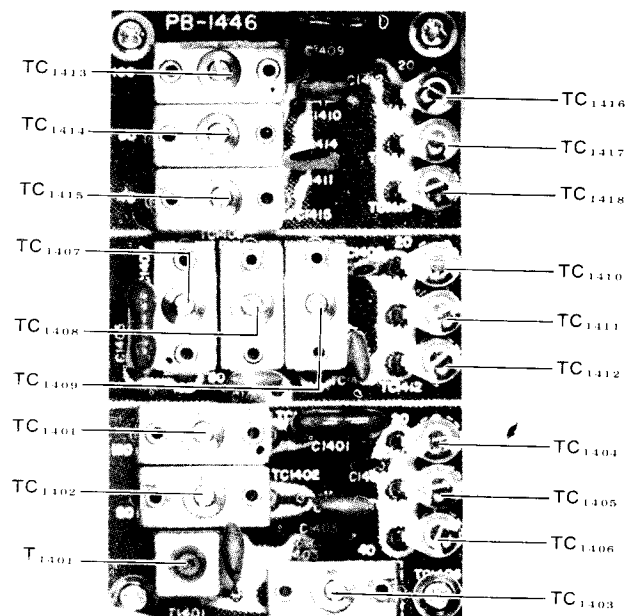


Figure 52 Trimmer Unit (PB-1446)

- (e) Shift the VFO to 4.0 MHz and the TUNE control to the upper end of 80m segment (4.1 of the unity scale), then adjust T_2 and T_3 for maximum power output. Return to receive and adjust T_1 for maximum sensitivity.
- (f) Repeat steps (d) and (e).
- (g) Repeat steps (b) and (c) and readjust TC_{1406} , TC_{1412} , TC_{1418} and TC_{101} .
- (h) Set the BAND switch to 15m, the VFO to 21.0 MHz and the TUNE control to 7.5 of the unity scale. Then adjust TC_{1405} , TC_{1411} and TC_{1417} for maximum receive and transmit.
- (i) Set the BAND switch to 20m, the VFO to 14.0 MHz and the TUNE control to 6.5 of the unity scale. Then adjust TC_{1404} , TC_{1410} and TC_{1416} for maximum receive and transmit.
- (j) Set the BAND switch to 40m, the VFO to 7.0 MHz and the TUNE control to 5 of the unity scale. Then adjust TC_{1403} , TC_{1409} and TC_{1415} for maximum receive and transmit.
- (k) Set the BAND switch to 160m, the VFO to 2.0 MHz and the TUNE control to 3 of the unity scale. Then adjust TC_{1401} , TC_{1407} and TC_{1413} for maximum receive and transmit.

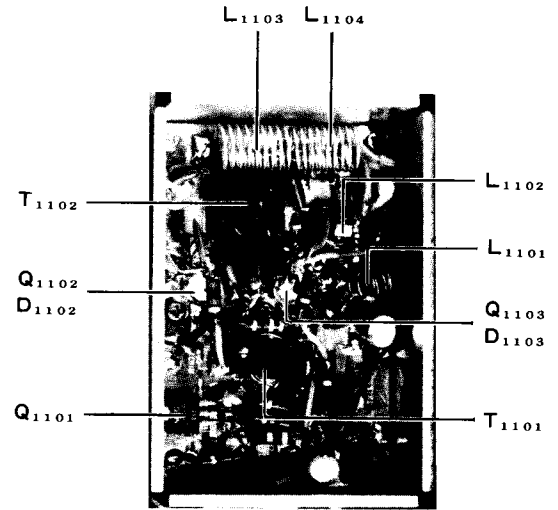


Figure 53 10W Amp Unit (PB-1443)

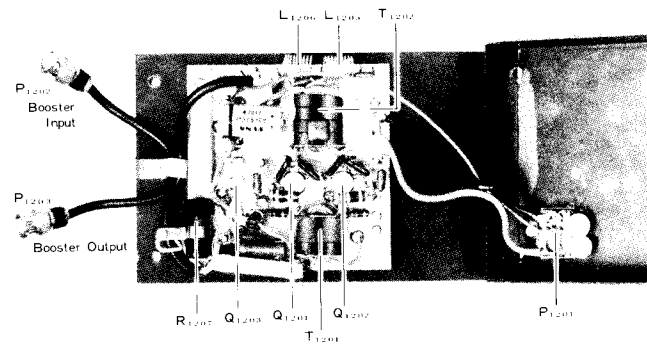


Figure 54 Booster Unit (PB-1444)

When completed, replace all shields, covers, etc. removed for access to the various adjustments and test points.

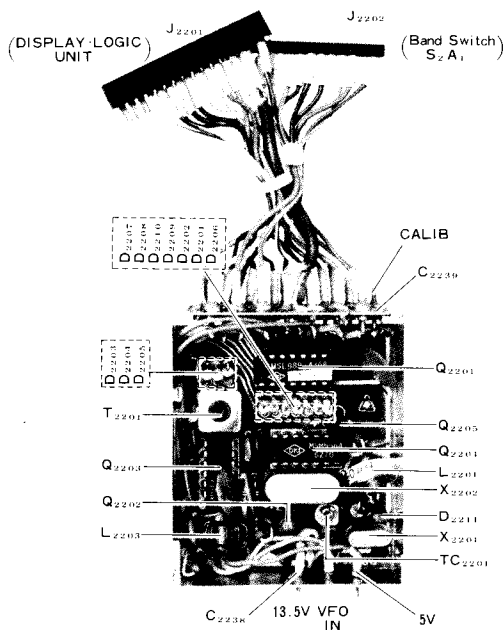


Figure 55 Counter-Mixer Unit (PB-1541)

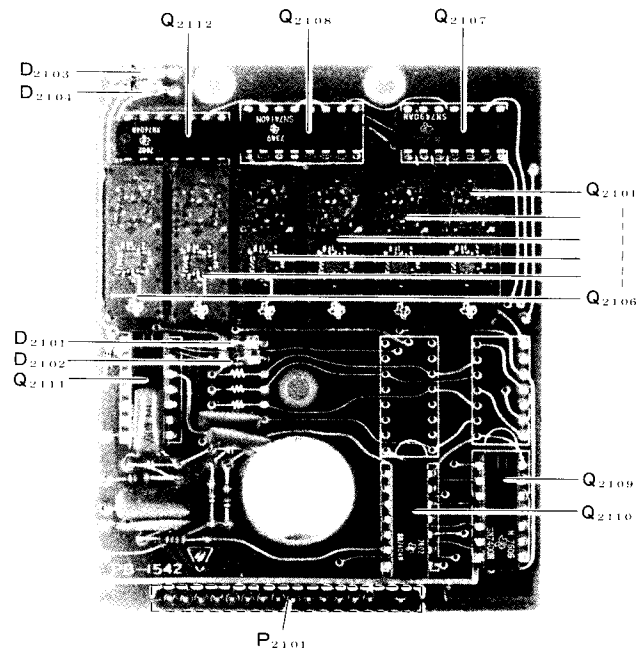


Figure 56 Display-Logic Unit (PB-1542)

PARTS LIST

★DIGITAL

MAIN CHASSIS				M	METER	
PB PRINTED CIRCUIT BOARD				1	KH-002	#
1576(A~Z) REJECT BOARD						
Q IC				SP	SPEAKER	
1 ★		μPC14308 GP		1	SA-70	
2 ★		μPC14305 GP		RL	RELAY	
				1	RAB K4P DC12V-104T	
D DIODE				RLS	RELAY SOCKET	
7,8		Ge 1N60FM		1	RAB	
1~6		Si 1S1555				
X CRYSTAL				S	SWITCH	
1		HC-18/U 8996.9kHz	#210027	1	SP-2022	
R RESISTOR				2A		#002975A
CARBON COMPOSITION				2B		#002981
5		1/2W	3.3Ω	3	ESR-E22CR15	
3		"	10Ω	4	ESR-E124R20	
4		"	100Ω	5	ESR-E365R20	
12		"	270Ω	P	PLUG	
13		"	470Ω	1,4	SQ4052	
14 ★		"	1KΩ	2	CN1463	
7,8		"	1.5KΩ	3 ★	M-31-15-60-124S	
6,9		"	2.7KΩ	5	CN-3965P	
10,15		"	3.3KΩ			
1		"	4.7KΩ	J	RECEPTACLE	
11		"	27KΩ	1	JSO-239	
VR POTENTIOMETER				2,3	UG-625 B/U	
4		EVH-BOAR 05B52	500ΩB	4	CS-260	
2		EVK-A2AR 10B53	5KΩB/5KΩB	5~7	SG-8018	
1		EVH-BOGR 20A14	10KΩA(S)	8	FM-144S	
5		EVK-A2AR 10339	5KΩA/5KΩB	9	QMS-AB12M	
6 ★		EVR-K8AS 11B53	5KΩB	10	QMS-AB6F	
C CAPACITOR				11	CS-250	
CERAMIC DISC				12	CN-7017	
29		50WV	15PF (CH)	13	CN-1463 (P-2)	
40		"	0.001μF			
1~6,30,31,35~37		"	0.047μF	MJ	MULTI JACK	
44,47,48,50,51		"		1~8	3305-018-011	
8,9,34,38		"	0.1μF	PL	PILOT LAMP	
				1~3	BQ15A-30423A	
CERAMIC FEED THRU				DS	INDICATOR	
12~28,43		50WV	0.001μF	1	CLAR RD-4	
				2	FIX GD-4	
MYLAR						
33		250WV	0.047μF			
ELECTROLYTIC						
41 ★		16WV	100μF		COIL SUPPORT	
10,11		"	1000μF		T1 Assembly (PB-1449)	
49		25WV	100μF		T2 Assembly (")	
					T3 Assembly (")	
				RF UNIT		
VC VARIABLE CAPACITOR				PB	PRINTED CIRCUIT BOARD	
1		TSN-150×40	40PF	1433(A~Z)		
L INDUCTOR				Q	IC, FET & TRANSISTOR	
1,2		RF CHOKE 35μH	#220017	101	IC	MC1496G
4,5		" 250μH		107	"	SN7400N
6		" 1mH		102,103	FET	3SK40M
CH AF CHOKE				106	Tr	2SC735Y
1		#50-11 15mH 0.4A		105	"	2SC741
				104	"	2SC784R
T RF TRANSFORMER				D	DIODE	
1~3		#220015		101~108	Si	1S1555

109 Zener WZ050				NB UNIT			
R RESISTOR				PB PRINTED CIRCUIT BOARD			
CARBON FILM				1434(A~Z)			
129	1/4W		10Ω	Q	IC & FET		
122	"		82Ω	203	IC	TA7060P	
106, 118	"		100Ω	204~206	FET	3SK40M	
115, 130	"		150Ω	201, 202, 207	"	2SK19GR	
126	"		270Ω	208	"	3SK35Y	
102, 103, 122, 133	"		330Ω				
110	"		470Ω	D	DIODE		
107	"		820Ω	201, 202	Ge	1N60FM	
101, 128, 131, 134, 136	"		1KΩ	203	Si	1S1555	
108	"		1.2KΩ				
116	"		1.8KΩ				
127	"		2.2KΩ	X	CRYSTAL		
121, 124, 137, 139	"		3.3KΩ	201	HC-18/U	8545kHz	# 210023
138	"		4.7KΩ				
104, 105, 109, 135	"		10KΩ	XF	CRYSTAL FILTER		
125	"		15KΩ	201	XF-92A		
123	"		22KΩ				
119	"		33KΩ	R	RESISTOR		
112	"		68KΩ		CARBON FILM		
111, 117	"		100KΩ	204, 207~209, 217, 222	1/4W	100Ω	
113	"		150KΩ	223, 235	"	150Ω	
120	"		220KΩ	221, 224	"	220Ω	
114	"		680KΩ	203	"	330Ω	
				216, 233	"	1KΩ	
				211, 230	"	2.2KΩ	
VR	POTENTIOMETER			205, 212, 231	"	10KΩ	
101	V10K8-1-2	50KΩB		202, 206, 227	"	15KΩ	
				210	"	22KΩ	
C	CAPACITOR			201, 234	"	33KΩ	
	DIPPED MICA			215	"	47KΩ	
135	50WV	100PF		228	"	68KΩ	
				234	"	100KΩ	
	CERAMIC DISC			213, 218, 220, 225, 226, 229	"	150KΩ	
107	50WV	10PF(CH)		219	"	220KΩ	
116	"	15PF()		214	"	1MΩ	
114, 115	"	20PF()		232	"		
117	"	22PF()					
107	"	33PF()					
106, 125	"	100PF()		R _{XF} (FT-301S)	1/2W	330Ω	
122	500WV	0.001μF					
101, 103, 110~113	50WV	0.01μF		VR	POTENTIOMETER		
118~120, 123, 129				202	V10K8-1-2	2KΩB	
131~133, 138, 139				201, 203	"	5KΩB	
102, 104, 105, 108, 109	50WV	0.047μF					
121, 124, 128, 130, 134, 136							
				C	CAPACITOR		
	ELECTROLYTIC				CERAMIC DISC		
127	16WV	10μF		225	50WV	47PF(CH)	
126	"	100μF		213, 214	"	100PF()	
				224	"	120PF()	
TC	TRIMMER CAPACITOR			217, 223	"	270PF()	
101	ECV-1ZW 10×32	10PF		210	"	560PF(SL)	
				201~209, 211, 212, 215	"	0.01μF	
L	INDUCTOR			216, 218~222, 227, 228	"		
106		# 220029		230, 231, 234~236	"		
105, 107	RF CHOKE 250μH			232	"	0.047μF	
101~104	" 500μH	# 220028					
T	TRANSFORMER				MYLAR		
101	R12-4172	# 220142		233	50WV	0.047μF	
102	R12-4170	# 220140					
103	4:1 Balun	# 220016					
				T	TRANSFORMER		
P	PLUG			205, 206	R12-4097	# 220101	
101	CN-7017			201~204, 207, 208	R12-4170	# 220140	

L	INDUCTOR			407	IC	TA7089M	
201	RF CHOKE	22 μ H		401	FET	3SK40M	
				403, 409	"	2SK19GR	
				404, 405	Tr	2SC373	
				406, 410	"	2SC735Y	
				402	"	2SC784R	
				408	"	2SC1383	
FILTER UNIT							
PB	PRINTED CIRCUIT BOARD						
	1435(A~Z)						
Q	FET & TRANSISTOR			D	DIODE		
302	FET	2SK19GR		403	Ge	1S1007	
303	Tr	2SC372Y		401, 405~408, 410	Si	1S1555	
301	"	2SC784R		402	Zener	BZ090	
				404, 409	"	WZ090	
D	DIODE			X	CRYSTAL		
301, 303~306, 310	Ge	1S1007		401	HC-18/U8999.3kHz		
302, 307	Si	1S1555					
308	Zener	WZ110					
XF	CRYSTAL FILTER			R	RESISTOR		
301	9M-20A				CARBON FILM		
302	CW	XF-90C (OPTION)		407, 411, 427	$\frac{1}{4}$ W	4.7 Ω	
303	AM	XF-90B (OPTION)		423	"	33 Ω	
304	SSB	XF-92A		424	"	75 Ω	
				415	"	100 Ω	
				405, 436	"	150 Ω	
				410	"	220 Ω	
				430, 435	"	270 Ω	
				417	"	560 Ω	
				414, 422, 425, 429, 433	"	1K Ω	
				406	"	1.8K Ω	
				437	"	2.2K Ω	
				418	"	2.7K Ω	
				431	"	3.3K Ω	
				408, 413, 416	"	4.7K Ω	
				412, 426, 434	"	10K Ω	
				421	"	24K Ω	
				409	"	33K Ω	
				401, 403, 419, 432	"	100K Ω	
				420	"	120K Ω	
				404	"	150K Ω	
				402	"	390K Ω	
R	RESISTOR						
	CARBON FILM						
303	$\frac{1}{4}$ W	56 Ω					
304, 312, 315, 316, 323	"	100 Ω					
306, 308	"	330 Ω					
305, 327	"	1K Ω					
309, 311	"	2.2K Ω					
313, 320, 321, 322, 326	"	3.3K Ω					
301, 329	"	6.8K Ω					
307, 310	"	10K Ω					
302	"	39K Ω					
	CARBON COMPOSITION						
328	$\frac{1}{2}$ W	56 Ω					
VR	POTENTIOMETER			VR	POTENTIOMETER		
301	V10K8-1-2	500 Ω B		401, 402	V10K8-1-2	1K Ω B	
				403	"	5K Ω B	
C	CAPACITOR			C	CAPACITOR		
	CERAMIC DISC				CERAMIC DISC		
302	50WV	33PF(CH)		408	50WV	10PF(CH)	
307	"	51PF(")		414	"	18PF(")	
301, 303, 305, 308~311	"	0.01 μ F		428	"	39PF(")	
313~317, 321~323, 325	"			421	"	120PF(")	
304, 312, 318, 319, 324	"	0.047 μ F		422	"	270PF(")	
326				401, 417, 423	"	0.001 μ F	
				403, 406, 407, 409~412	"	0.01 μ F	
				416, 424, 429, 431, 433	"		
				404, 405, 413, 415, 419	"	0.047 μ F	
				420, 429, 430	"		
					MYLAR		
				426, 427	50WV	0.022 μ F	
				418	"	0.1 μ F	
					ELECTROLYTIC		
				402, 432	16WV	10 μ F	
				425	"	100 μ F	
PB	PRINTED CIRCUIT BOARD			TC	TRIMMER CAPACITOR		
	1436(A~Z)			401, 402	ECV-1ZW 20 \times 40	20PF	
Q	IC, FET & TRANSISTOR						

L	INDUCTOR		505, 506	50WV	39PF(CH)
403	RF CHOKE	22 μ H	518	"	100PF()
401, 402	"	1mH	507, 508	"	150PF()
T	TRANSFORMER		501, 502, 511 ~ 513, 515		0.01 μ F
401	R12-4171	# 220141	503, 504, 514, 543		0.047 μ F
402	R12-4170	# 220140		MYLAR	
			538, 539	50WV	0.0022 μ F
			526	"	0.0047 μ F
			528	"	0.022 μ F
PB	PRINTED CIRCUIT BOARD		525, 541, 545	"	0.047 μ F
1437(A~Z)			544	"	0.1 μ F
Q	IC, FET & TRANSISTOR			ELECTROLYTIC	
503	IC	LD3141	519, 524, 529, 532, 534	16WV	1 μ F
501	FET	2SK19GR	523	"	2.2 μ F
507	Tr	2SA695D	531	"	4.7 μ F
509	"	2SB529D	527	"	22 μ F
502	"	2SC372Y	520 ~ 522, 533	"	33 μ F
506	"	2SC711F	534, 542	16WV	100 μ F
504, 505	"	2SC1000GR	537, 540	"	220 μ F
508	"	2SD359D			
D	DIODE		TC	TRIMMER CAPACITOR	
503 ~ 506	Ge	1S1007	501, 502	ECV-1ZW 20 \times 40	20PF
501, 502, 507	Si	1S1555	503	ECV-1ZW 50 \times 40	50PF
508	"	MV-5W			
509, 510	Zener	WZ090	L	INDUCTOR	
X	CRYSTAL		504	RF CHOKE	
501	HC-18/U	9001.5kHz	506		22 μ H
502	"	8998.5kHz	501 ~ 503, 505	"	250 μ H
					1mH
R	RESISTOR		T	TRANSFORMER	
	CARBON FILM		501	R12-4171	# 220141
533	$\frac{1}{4}$ W	10 Ω	RL	RELAY	
530	"	22 Ω	501	G2E 12V DC	
522	"	56 Ω			
512	"	100 Ω			
505, 508, 510, 511	"	150 Ω			
534	"	180 Ω			
539, 540	"	220 Ω	PB	PRINTED CIRCUIT BOARD	
535	"	270 Ω	1438(A~Z)		
501 ~ 503, 509, 523, 541	"	470 Ω	Q	IC & TRANSISTOR	
517, 519, 542	"	1K Ω	604	IC	SN72560P
526, 528	"	1.5K Ω	612	"	34013(MC-14013CP)
525	"	2.2K Ω	607	Tr	2SA564A
524, 538	"	3.3K Ω	605, 608	"	2SC372Y
506, 507, 514, 516	"	4.7K Ω	601 ~ 603, 606, 609	"	2SC373
518, 532	"	10K Ω	610, 611	"	2SC735 Y
521	"	15K Ω			
527	"	47K Ω	D	DIODE	
520	"	56K Ω	601 ~ 603, 606	Ge	1N60FM
504, 529, 531	"	100K Ω	604, 605	Zener	WZ090
515	"	390K Ω	X	CRYSTAL	
			601	HC-13/UW	100kHz
			R	RESISTOR	
				CARBON FILM	
VR	POTENTIOMETER		633, 637	$\frac{1}{4}$ W	100 Ω
501	VI0K8-1-2	500 Ω B	603, 613, 621, 638	"	470 Ω
C	CAPACITOR		606, 607, 611, 614, 619, 628, 639, 641	"	1K Ω
	DIPPED MICA		605	"	2.2K Ω
530, 536	50WV	330PF	629	"	3.9K Ω
	CERAMIC DISC		618, 620, 624 ~ 626, 635	"	4.7K Ω
516	50WV	10PF(CH)	612	"	5.6K Ω
509	"	20PF()	604, 610, 615, 616, 631	"	10K Ω
			602, 617, 622, 627, 636	"	22K Ω
			609	"	39K Ω

608, 630, 640	1/4W	47KΩ	714	1/4W	470Ω
601	"	68KΩ	703, 720	"	560Ω
623, 632	"	100KΩ	708	"	820Ω
CARBON COMPOSITION			705~707	"	1KΩ
634	1/2W	180Ω	712	"	1.2KΩ
VR POTENTIOMETER			702	"	3.3KΩ
603	V10K8-1-2	10KΩB	710, 711, 713, 718	"	10KΩ
601	"	50KΩB	701	"	15KΩ
602	"	1MΩB	715, 719	"	100KΩ
C CAPACITOR			VR POTENTIOMETER		
DIPPED MICA			701	V10K8-1-2	50KΩB
628	50WV	330PF	C CAPACITOR		
629	"	2000PF	DIPPED MICA		
CERAMIC DISC			702	50WV	39PF
632	50WV	15PF(CH)	CERAMIC DISC		
631	"	33PF(")	716	50WV	8PF(CH)
634, 635	"	39PF(")	703~707, 709, 712~714	"	0.01μF
627	"	82PF(")	717, 719	"	"
614, 636	"	0.047μF	701, 708, 710, 711, 715	"	0.047μF
MYLAR			L INDUCTOR		
605, 618	50WV	0.001μF	703	RF CHOKE	250μH
612, 626	"	0.01μF	701, 702	"	1mH
621~623	"	0.022μF	T TRANSFORMER		
606, 608	"	0.047μF	701		# 220017
TANTALUM			J JACK		
613	50WV	2.2μF	701	SQ3056	
602, 609	"	10μF	FB FERRITE BEADS		
ELECTROLYTIC			4A-RI 3×3-1		
601, 607, 611, 619	16WV	1μF	VFO UNIT		
625	"	2.2μF	PB PRINTED CIRCUIT BOARD		
624	"	4.7μF	1440(A~Z)		
604, 610, 616, 617, 620	"	10μF	Q FET & TRANSISTOR		
603	"	22μF	802	FET	2SK19GR
615	"	47μF	801, 803	Tr	2SC372Y
630	"	100μF	D DIODE		
TC TRIMMER CAPACITOR			801	Varactor	1S2236
601	ECV-1ZW 50×40 50PF		R RESISTOR		
L INDUCTOR			CARBON FILM		
601, 602	RF CHOKE	4mH	809, 811	1/4W	100Ω
SW SWITCH			807	"	470Ω
601	SS-12-04		805, 808	"	2.2KΩ
PREMIX UNIT			802	"	3.3KΩ
PB PRINTED CIRCUIT BOARD			801	"	10KΩ
1439(A~Z)			803	"	18KΩ
Q IC. FET & TRANSISTOR			804	"	22KΩ
701	IC	MC1496G	806, 810	"	100KΩ
705	FET	2SK19GR	C CAPACITOR		
702	Tr	2SC372Y	DIPPED MICA		
703, 704	"	2SC784R	826	50WV	2PF
R RESISTOR			807	"	8PF
CARBON FILM			808, 814, 818	"	33PF
709	1/4W	56Ω	811	"	240PF
704, 711	"	100Ω	813, 821, 823	"	470PF
716	"	270Ω	802, 822	"	1000PF
721	"	330Ω			

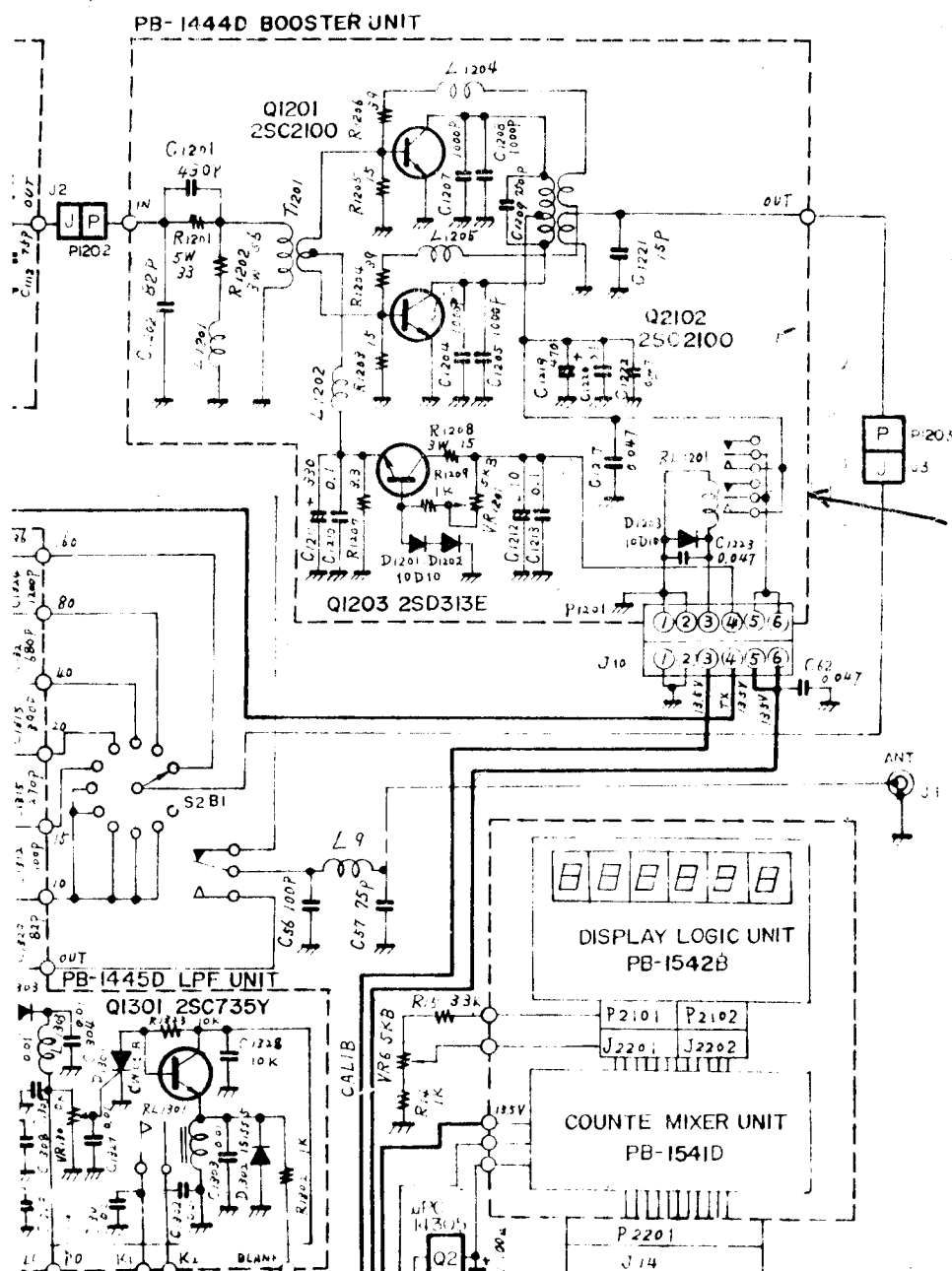
CERAMIC DISC				T TRANSFORMER	
809, 810, 812, 815, 819	50WV	0.01 μ F		1001 (160m)	# 220018
820, 824, 825				1002 (40m)	# 220019
CERAMIC T. C				1003 (20m)	# 220020
801	50WV	4PF	UJ	1004 (15m)	# 220021
805	"	9PF	UJ	1005 (10m)	# 220022
803	"	20PF	UJ	1006 (11m)	# 220043
804, 806	"	20PF	NPO		
VC VARIABLE CAPACITOR				10W AMP UNIT	
801	BS240DS114			PB PRINTED CIRCUIT BOARD	
				1443(A~Z)	
TC TRIMMER CAPACITOR				Q TRANSISTOR	
801	TSN 170C			1101	2SC1589
802	TSN 150C			1102, 1103	S10-12
L INDUCTOR				D DIODE	
801	Oscillator Coil		# 220030	1102, 1103	Si 10D10
804, 805	RF CHOKE		1.8 μ H	1101	Zener YZ33
803, 806	"		250 μ H		
802	"		1mH	R RESISTOR	
J RECEPTACLE				CARBON COMPOSITION	
801	CN-3561			1105	$\frac{1}{2}$ W 4.7 Ω
802	CN-3965S			1107, 1108	" 15 Ω
				1103	" 22 Ω
				1109	" 39 Ω
				1110, 1111	" 100 Ω
				1101	" 180 Ω
				1102	" 330 Ω
				1106	" 820 Ω
				1104	2W 82 Ω
CRYSTAL UNIT					
PB PRINTED CIRCUIT BOARD					
1441(A~Z)					
X CRYSTAL					
901 (160m)	HC-25/U	16.0MHz		C CAPACITOR	
902 (40m)	"	21.5MHz		DIPPED MICA	
903 (20m)	"	28.5MHz		1110, 1112	500WV 75PF
904 (15m)	"	35.5MHz		1111	" 150PF
905 (10mA)	"	42.5MHz		CERAMIC DISC	
906 (10mB)	"	43.0MHz		1109	500WV 0.001 μ F
907 (10mC)	"	43.5MHz		1105	" 0.007 μ F
908 (10mD)	"	44.0MHz		1101, 1108	" 0.01 μ F
909 (WWV/JJY)	"	13998.5kHz		1102, 1104, 1113, 1114	" 0.047 μ F
910 (11m)	"	41.5MHz		MYLAR	
XS CRYSTAL SOCKET				1115, 1116	50WV 0.2 μ F
901	S-20				
902	S-19				
C CAPACITOR				ELECTROLYTIC	
DIPPED MICA				1117	50WV 1 μ F
904	50WV	220PF		1106, 1107	16WV 33 μ F
CERAMIC DISC				L INDUCTOR	
903	50WV	20PF(CH)		1101	RF CHOKE # 220031
902	"	82PF(")		1102	" # 220032
901	"	150PF(")		1103, 1104	Lowpass Coil # 220033
TC TRIMMER CAPACITOR				T TRANSFORMER	
901~904, 908, 909	ECV-1ZW	50 \times 32	50PF	1101	# 220023
905~907, 910	ECV-1ZW	20 \times 32	20PF	1102	# 220024
BPF UNIT					
100W AMP UNIT					
PB PRINTED CIRCUIT BOARD				PB PRINTED CIRCUIT BOARD	
1442(A~Z)				1444(A~Z)	
R RESISTOR				Q TRANSISTOR	
1001, 1007, 1008	$\frac{1}{4}$ W	10K Ω		1201, 1202	S-2535
1003~1006	"	12K Ω		1203	BY-1-1
1002	"	15K Ω			

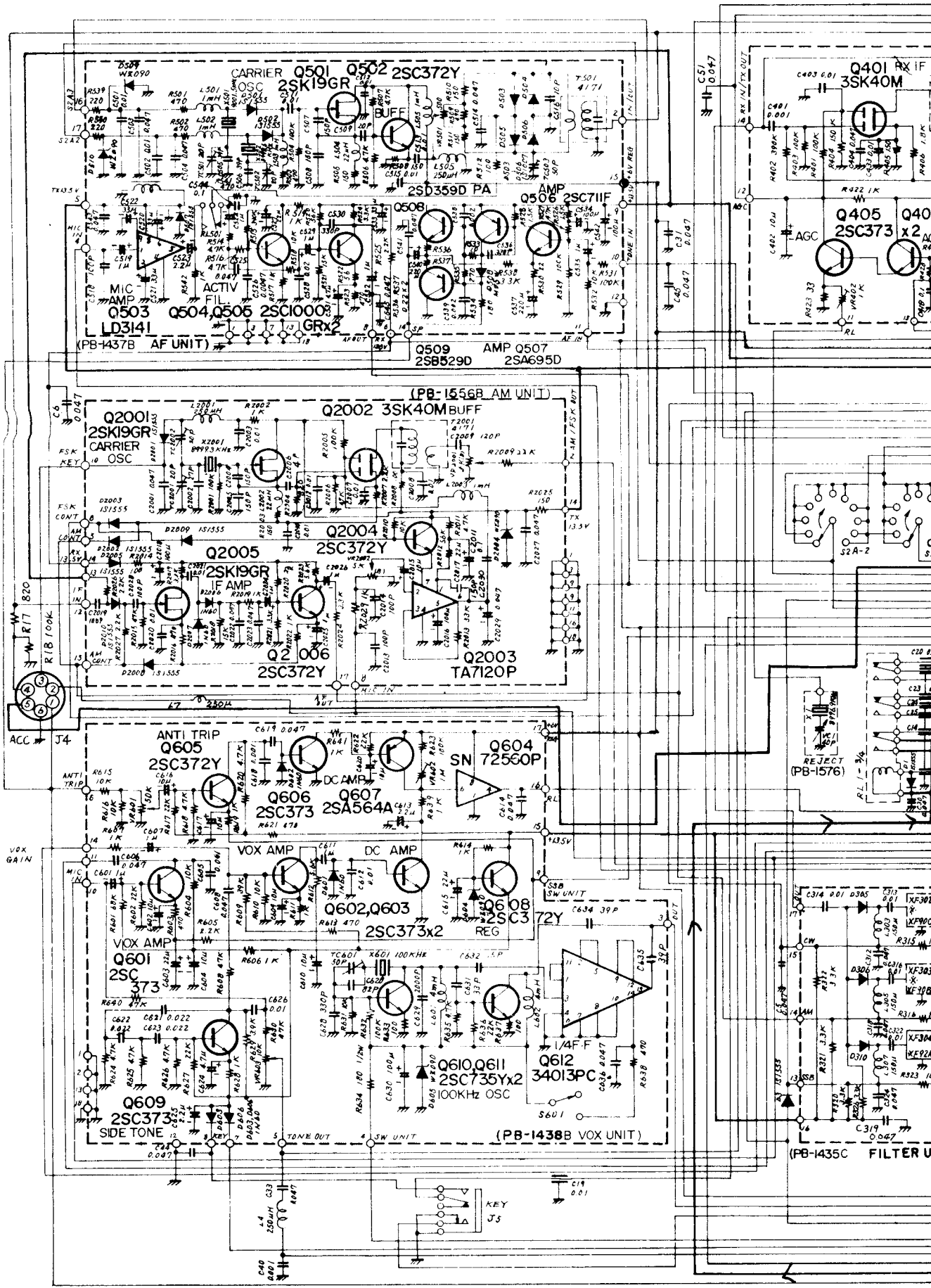
R	RESISTOR			1301, 1302	V10K8-1-2	10KΩB
	CARBON COMPOSITION					
1210	1/2W	2.2Ω				
1203, 1205		15Ω				
	METALIC FILM					
1206, 1207	1/2W	39Ω				
1202	2W	56Ω				
1201	5W	33Ω				
	CEMENT					
1208	10W	25Ω				
VR	POTENTIOMETER					
1201	EVW-RIAB 01B11	10Ω				
C	CAPACITOR					
	DIPPED MICA					
1214, 1216	500WV	75PF				
1202	"	82PF				
1215	"	150PF				
1201	"	430PF				
1209	"	750PF				
1204, 1205, 1207, 1208	"	1000PF				
	CERAMIC DISC					
1217, 1218	50WV	0.047μF				
1210, 1213, 1220	"	0.1μF				
	ELECTROLYTIC					
1212	50WV	10μF				
1211	16WV	47μF				
1219	25WV	470μF				
L	INDUCTOR					
1201		# 220034				
1202		# 220041				
1205, 1206		# 220033				
1203, 1204		# 220035				
T	TRANSFORMER					
1201		# 220025				
1202		# 220026				
P	PLUG					
2, 3	UG-88					
1201	QMS-AB6M					
	LPF UNIT					
PB	PRINTED CIRCUIT BOARD					
1445(A~Z)						
Q	TRANSISTOR					
1301	2SC735Y					
D	DIODE					
1301	Thyristor CW01B					
1302~1307	Si 1S1555					
R	RESISTOR					
	CARBON FILM					
1301	1/4W	82Ω				
1302	"	1KΩ				
1303	"	10KΩ				
VR	POTENTIOMETER					
C	CAPACITOR					
	DIPPED MICA					
1306	50WV	330PF				
1312, 1314	500WV	100PF				
1315, 1317	"	150PF				
1313	"	180PF				
1316, 1318, 1320	"	300PF				
1319, 1321, 1323	"	620PF				
1324, 1326	"	1000PF				
1322	"	1200PF				
1325	"	2000PF				
	CERAMIC DISC					
1301~1305, 1307~1311	50WV	0.01μF				
1327, 1328						
TC	TRIMMER CAPACITOR					
1301	ECV-1ZW 10×32	10PF				
L	INDUCTOR					
1301~1303	RF CHOKC	1mH				
1304, 1305	(15m)	# 220036				
1306, 1307	(20m)	# 220037				
1308, 1309	(40m)	# 220038				
1310, 1311	(80m)	# 220039(# 220103)				
1312, 1313	(160m)	# 220040(# 220104)				
T	TRANSFORMER					
1301	CM Coupler	# 220027				
RL	RELAY					
1301	UPM-12012H					
	TRIMMER UNIT					
PB	PRINTED CIRCUIT BOARD					
1446(A~Z)						
R	RESISTOR					
	CARBON FILM					
1401	1/4W	10KΩ				
C	CAPACITOR					
	DIPPED MICA					
1406, 1410, 1413	50WV	350PF				
1402	"	390PF				
1401, 1405, 1409	"	1000PF				
	CERAMIC DISC					
1404, 1408, 1412	50WV	20PF(CH)				
1403, 1407, 1411	"	100PF()				
TC	TRIMMER CAPACITOR					
1412	ECV-1ZW 20×32	20PF				
1404~1406, 1410, 1411	ECV-1ZW 50×32	50PF				
1416~1418						
1402, 1403, 1408, 1409	B-2P-Y	100PF				
1414, 1415						
1401, 1407, 1413	B-7P	420PF				
T	TRANSFORMER					
1401	R12-4435	# 220143				
	FIX UNIT					
PB	PRINTED CIRCUIT BOARD					

1447(A~Z)				BLANKING UNIT			
Q FET & TRANSISTOR				PB PRINTED CIRCUIT BOARD			
1501 FET 2SK19GR				1451(A~Z)			
1502 Tr 2SC372Y				Q ID & TRANSISTOR			
X CRYSTAL				1901 IC TP4011(MC14011)			
1501~1511 HC-25/U (OPTION)				1902 Tr. MPSA13			
XS CRYSTAL SOCKET				D DIODE			
1501 S-14-12P				1901 Si 1S1555			
R RESISTOR				R RESISTOR			
CARBON FILM				CARBON FILM			
1504 1/4W 100Ω				1906 1/4W 1KΩ			
1502 " 180Ω				1904 " 3.9KΩ			
1501,1503 " 100KΩ				1905 " 22KΩ			
				1907 " 33KΩ			
				1903 " 100KΩ			
				1901 " 1MΩ			
				1902 " 2MΩ			
C CAPACITOR				VR POTENTIOMETER			
DIPPED MICA				1901 SR-19R(D) 470ΩB			
1508,1510 50WV 470PF				1902 SR-19R 470ΩB			
1509 " 820PF				C CAPACITOR			
CERAMIC DISC				MYLAR			
1504 50WV 10PF(CH)				1901 50WV 0.1μF			
1511~1521 " 15PF(")							
1505 " 100PF(")							
1501 " 150PF(")							
1502 " 270PF(")							
1503,1506,1507 " 0.01μF							
TC TRIMMER CAPACITOR				RL RELAY			
1501~1511 ECV-1ZW 50×32 50PF				1901 G2E 12V DC			
L INDUCTOR				AM UNIT			
1503,1504 RF CHOKE 1.8μH				PB PRINTED CIRCUIT BOARD			
1501 " 22μH				1556(A~Z)			
1502 " 1mH				Q IC, FET & TRANSISTOR			
				2003 IC TA7120P			
				2001,2005 FET 2SK19GR			
				2002 " 3SK40M			
				2004,2006 Tr. 2SC372Y			
VR UNIT				D DIODE			
PB PRINTED CIRCUIT BOARD				2006,2007 Ge 1N60FM			
1448(A~Z)				2001~2003,2005 Si 1S1555			
D DIODE				2008~2010			
1601 Zener WZ090				2004 Zener WZ090			
R RESISTOR				X CRYSTAL			
CARBON FILM				2001 HC-18/U 8999.3kHz #210015			
1601 1/4W 470Ω				R RESISTOR			
1602 " 47KΩ				CARBON FILM			
VR POTENTIOMETER				2008,2014 1/4W 100Ω			
1601~1606 SR19R 47KΩB				2003,2025 " 150Ω			
				2016 " 470Ω			
				2002,2019,2022 " 1KΩ			
				2007 " 1.2KΩ			
				2026,2027 " 2.2KΩ			
				2009,2017,2021,2024 " 3.3KΩ			
				2004,2006,2011 " 4.7KΩ			
				2023 " 5.6KΩ			
				2010 " 10KΩ			
				2018 " 15KΩ			
				2009,2020 " 22KΩ			
				2013 " 33KΩ			
				2015 " 47KΩ			
SW UNIT							
PB PRINTED CIRCUIT BOARD							
1450(A~Z)							
C CAPACITOR							
TANTALUM							
1801 35WV 0.47μF							
1802 " 1.5μF							
S SWITCH							
1801,1805 SLE-14301							
1802,1804 SLE-12201							

2012	1/4W	56KΩ	P	PIN PLUG	
2001,2005	"	100KΩ	2101	M-31-15-60-114P	
			QS	IC SOCKET	
VR	POTENTIOMETER		2101~2006	316-AG37D	
2001,2002	V10K8-1-2	5KΩB			
C	CAPACITOR		COUNTER MIXER UNIT *		
	CERAMIC DISC		PB	PRINTED CIRCUIT BOARD	
2002	50WV	27PF(CH)	1541(A~Z)		
2006	"	33PF()	Q	IC, FET & TRANSISTOR	
2013,2014,2019,2028	"	100PF()	2201	IC	MSL980Y-2
2009	"	120PF()	2204	"	MSM5564
2004,2005	"	150PF()	2203	"	SN76514
2003,2007,2008,2010,2012	"	0.01μF	2202	FET	2SK19GR
2020,2021	"		2205	Tr	2SC373
2001,2022,2023,2029	"	0.047μF			
	MYLAR		D	DIODE	
2027	50WV	0.0047μF	2201~2210	Ge	1N60AM
2011	"	0.1μF	2211	Varactor	1S2209
	ELECTROLYTIC		X	CRYSTAL	
2011,2024~2026	16WV	1μF	2201	HC-18/U	18.5MHz #210024
2015	"	10μF	2202	HC-14/W	655.36kHz #210025
2017	"	22μF			
2016,2018	"	100μF	R	RESISTOR	
TC	TRIMMER CAPACITOR			CARBON COMPOSITION	
2001,2002	ECV-1ZW 20×40	201PF	2205	1/8W	1KΩ
L	INDUCTOR			CARBON FILM	
2002	RF CHOKE	22μH	2202,2203	1/4W	100Ω
2001	"	250μH #220100	2201	"	180Ω
2003	"	1mH	2207	"	220Ω
2004	"	4mH	2206	"	22KΩ
			VR	POTENTIOMETER	
			2201	EVL-S3AA	00B14 10KΩB
			C	CAPACITOR	
				DIPPED MICA	
			2216,2217	50WV	511PF
				CERAMIC DISC	
Q	IC		2202	50WV	1PF(CH)
2101~2103		TIL306	2203	"	15PF()
2104~2106		TIL308	2208	"	22PF()
2109,2111		SN7400N	2204	"	56PF()
2110,2112		SN7404N	2205	"	68PF()
2107		SN7490AN	2206	"	100PF(SL)
2108		SN74160N	2201,2207,2213~2215	"	0.01μF
D	DIODE		2209,2212,2241	"	0.047μF
2101~2104	Ge	1N60AM			
R	RESISTOR			CERAMIC FEED THRU	
	CARBON COMPOSITION		2218~2240	ECK-YIH 102WE	0.001μF
2101	1/8W	220Ω	TC	TRIMMER CAPACITOR	
2103,2106	"	1KΩ	2201	ECV-1ZW 20×53	201PF
2102,2104,2105	"	10KΩ	C	CAPACITOR	
				DIPPED MICA	
2102	50WV	2001PF	2102	50WV	3301PF
2104,2105	"				
				CERAMIC DISC	
2101,2106	50WV	0.047μF	L	INDUCTOR	
			2201	RF CHOKE	250μH #220100
			2202	"	5.6μH #220145
			2203	"	35μH #220031
			2204	"	10μH
			T	TRANSFORMER	
			2201	T1005A	#220144
			J	PIN PLUG, JACK	
2103	50WV	0.0033μF	2201	M-31-15-60-124S	

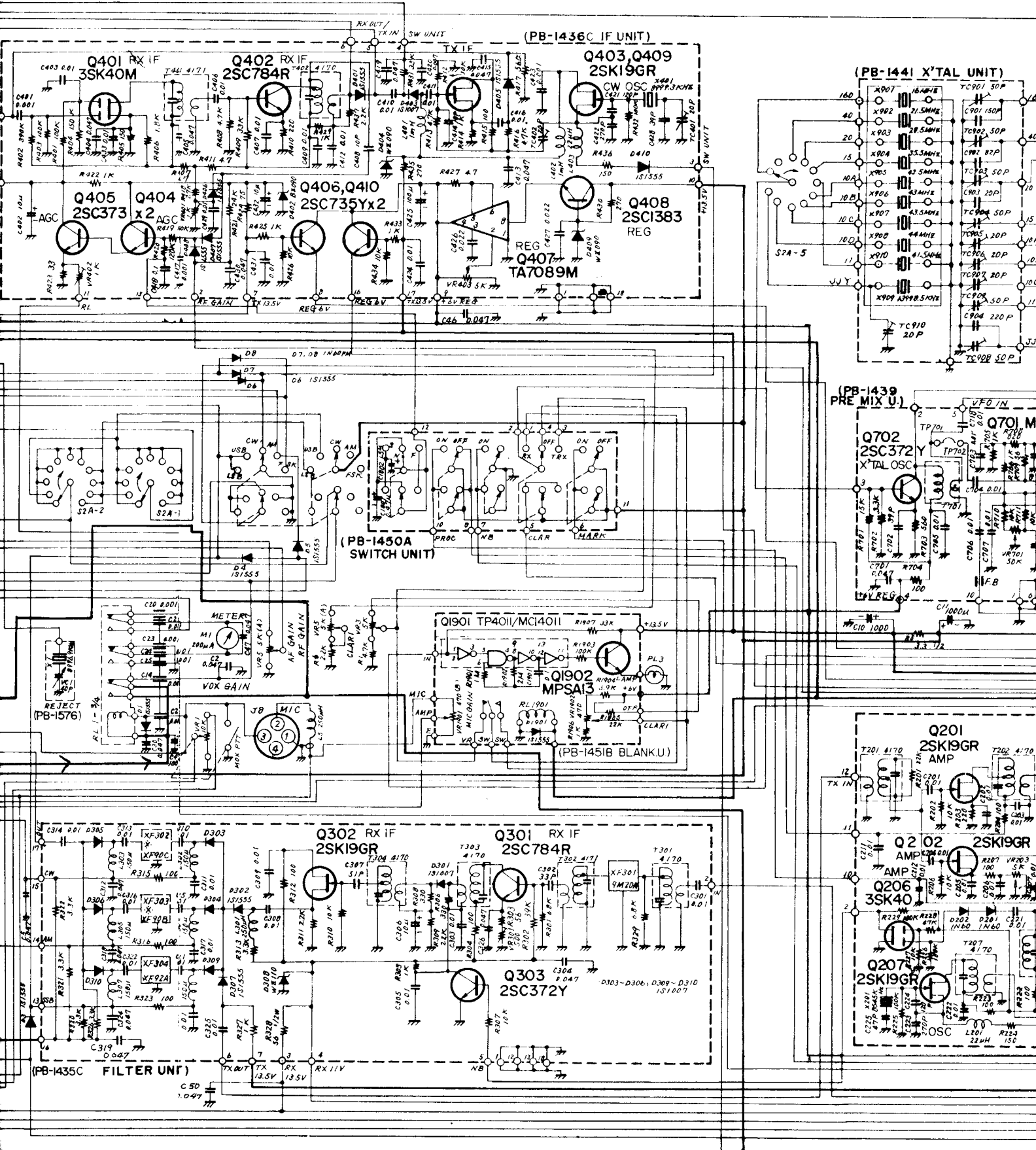
2202	M-31-15-60-114P	CARBON COMPOSITION		
		2301, 2302	1/8W	10KΩ
LED UNIT		PL	LAMP	
PB	PRINTED CIRCUIT BOARD	2301~2303	BQ041-32404A	12V 40mA
1471(A~Z)				
D	DIODE	LAMP BOARD B		
2401	LED TLR-108	PB	PRINTED CIRCUIT BOARD	
		1646(A~Z)		
R	RESISTOR			
	CARBON FILM	Q	TRANSISTOR	
2401	1/4W	470Ω	2501	2SC5361D
LAMP BOARD A *		R	RESISTOR	
PB	PRINTED CIRCUIT BOARD	CARBON COMPOSITION		
1565(A~Z)		2501	1/8W	10KΩ
Q	TRANSISTOR	LAMP		
2301, 2302	2SC536D	2501, 2502	BQ041-32404A	12V 40mA
R	RESISTOR			



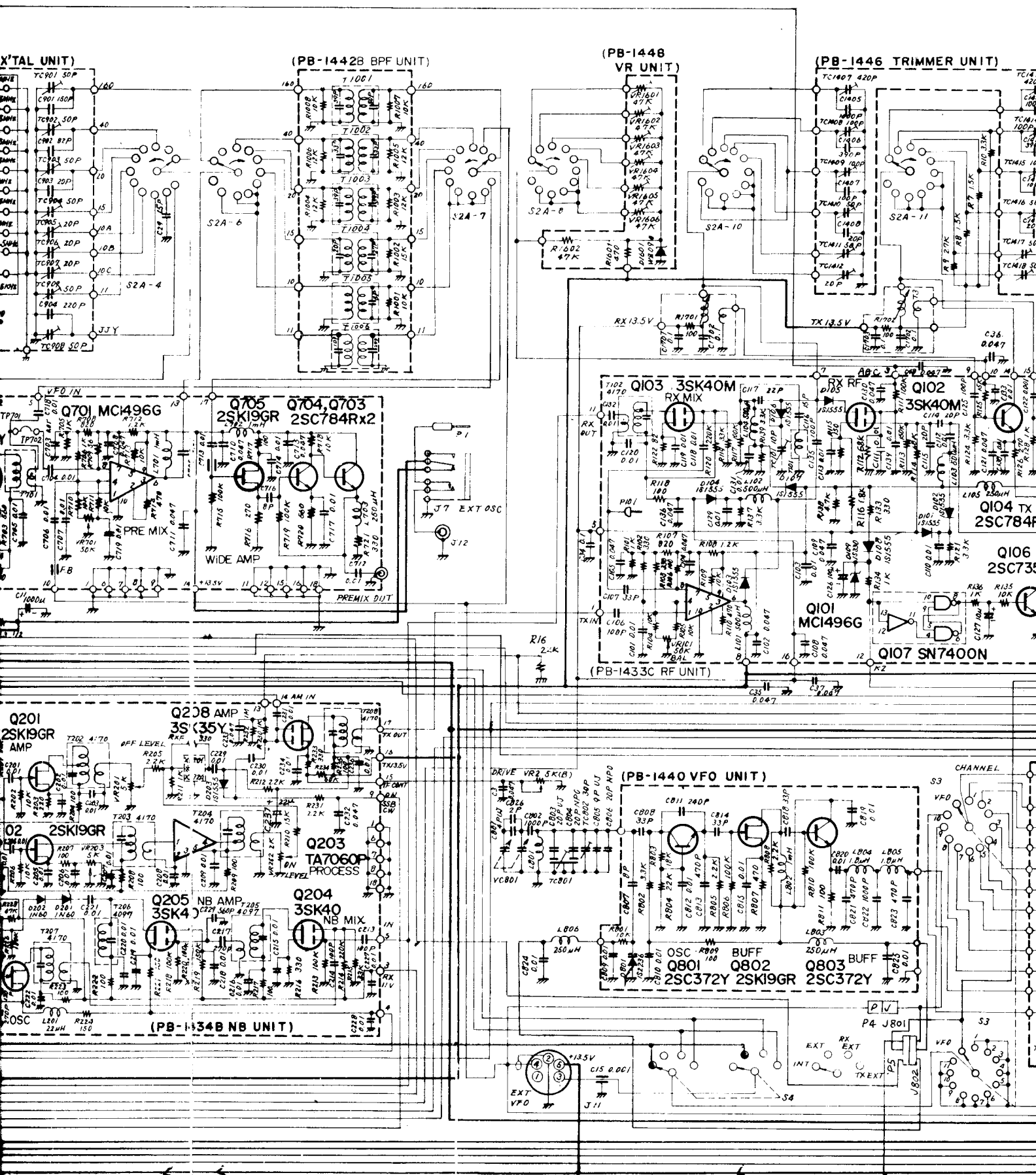


+13.8 V TX

+6V. REG.

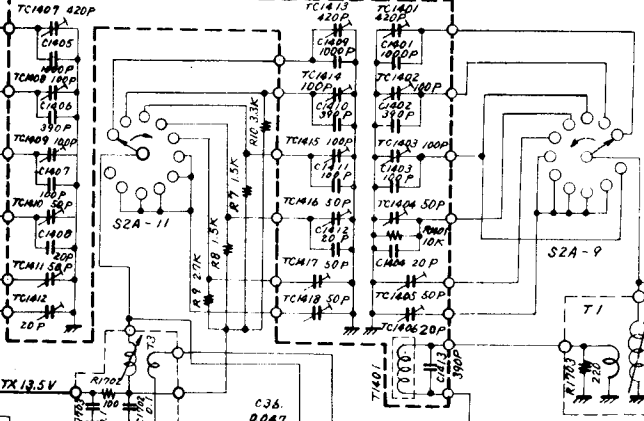


Note on Processor
 1) Remove RxF 330-
 2) Remove white jump
 on Q203

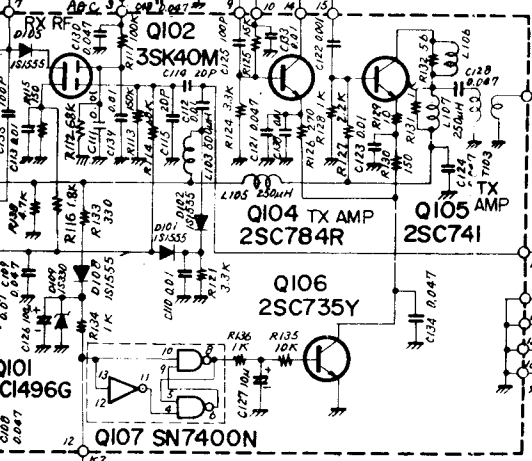
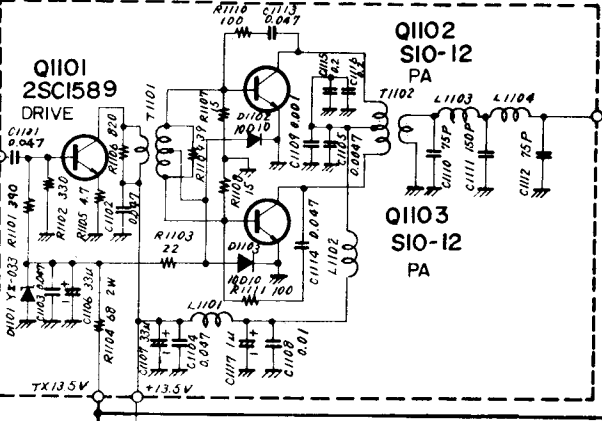


Processor Filter XF92A
 RxF 330000 series Filter
 white jumper on unit to pin 2

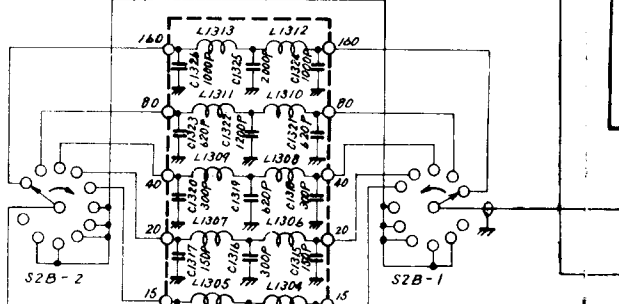
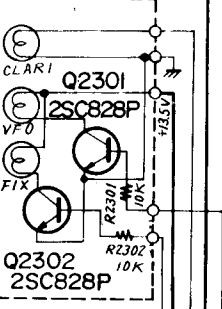
(PB-1446 TRIMMER UNIT)



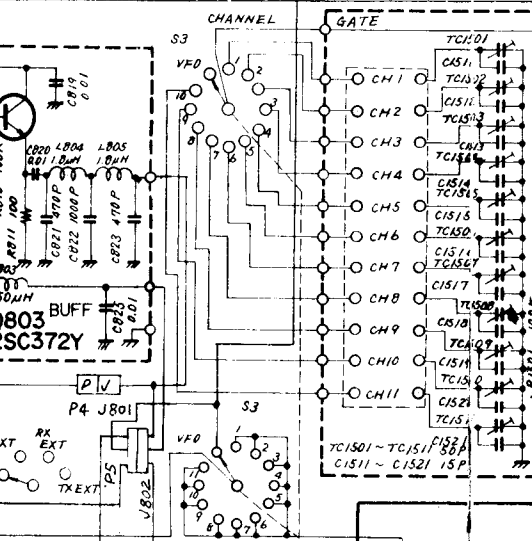
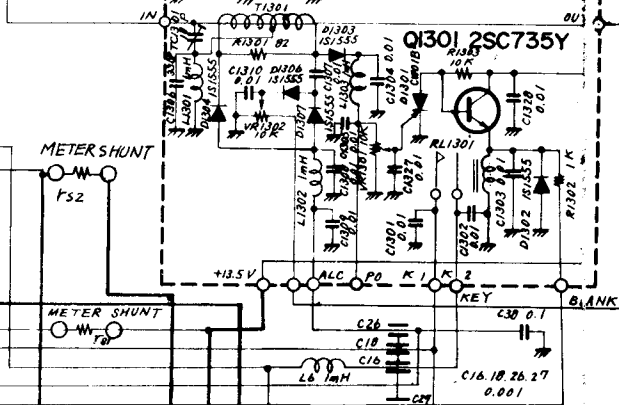
(PB-1443 IOW AMP UNIT)



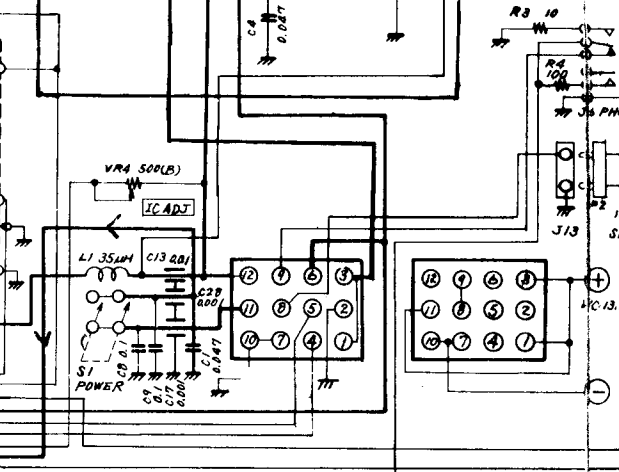
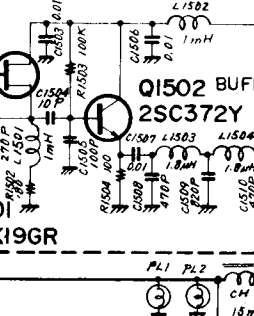
PB-1565



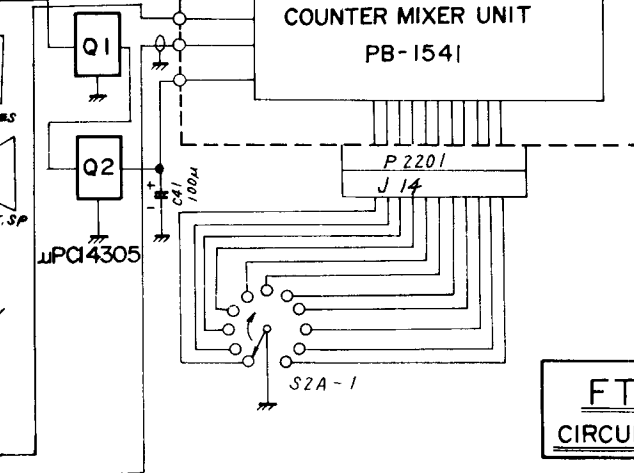
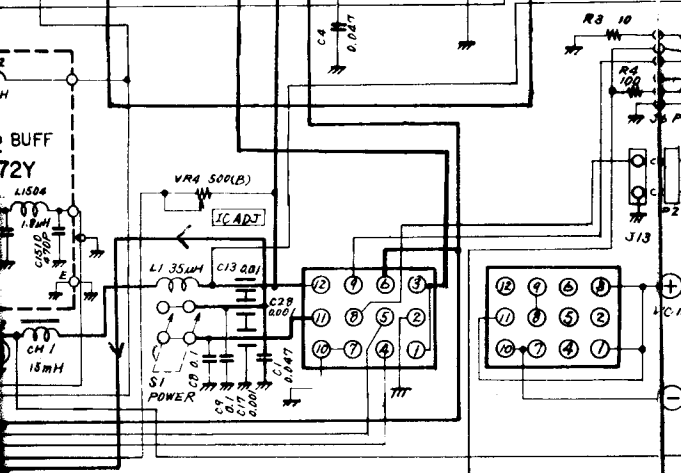
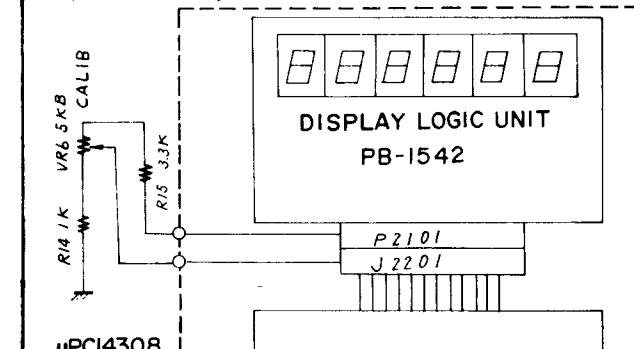
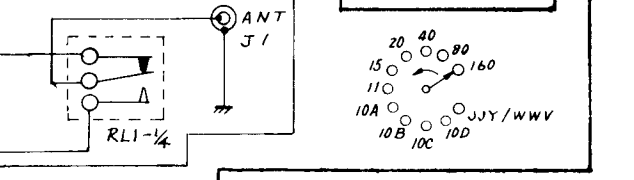
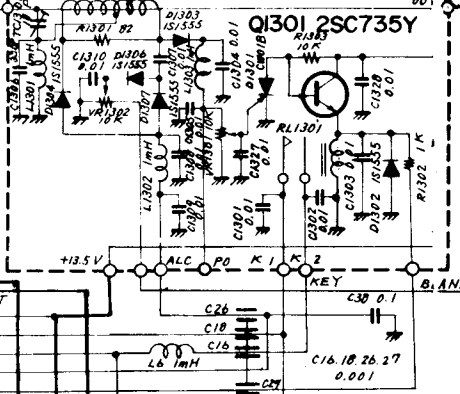
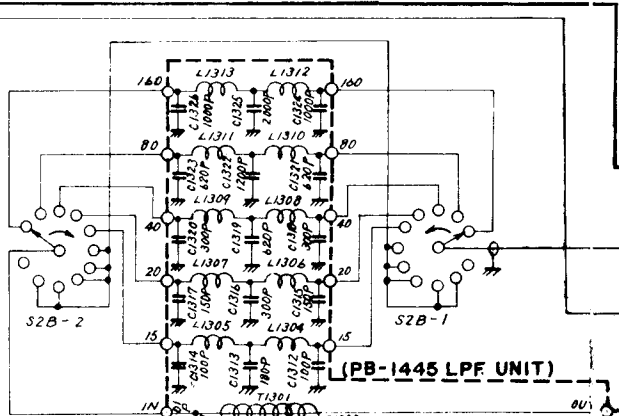
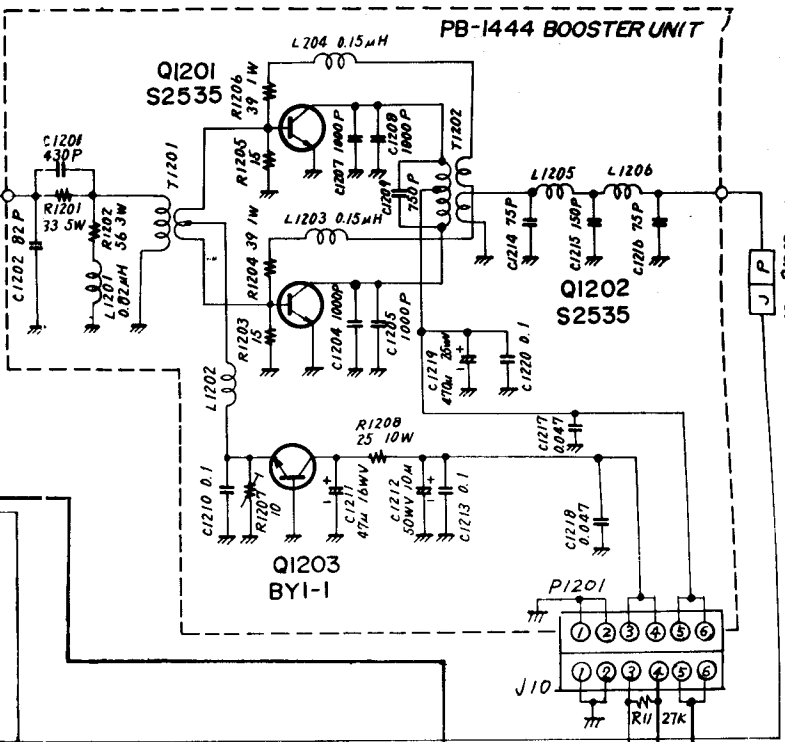
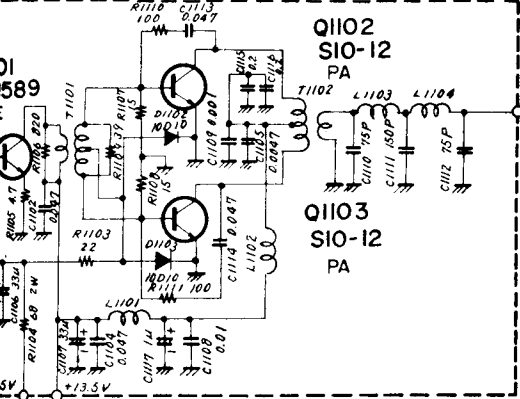
(PB-1445 LPF UNIT)



PB-1447A FIX UNIT



43 IOW AMP UNIT)



FT-301D
CIRCUIT DIAGRAM