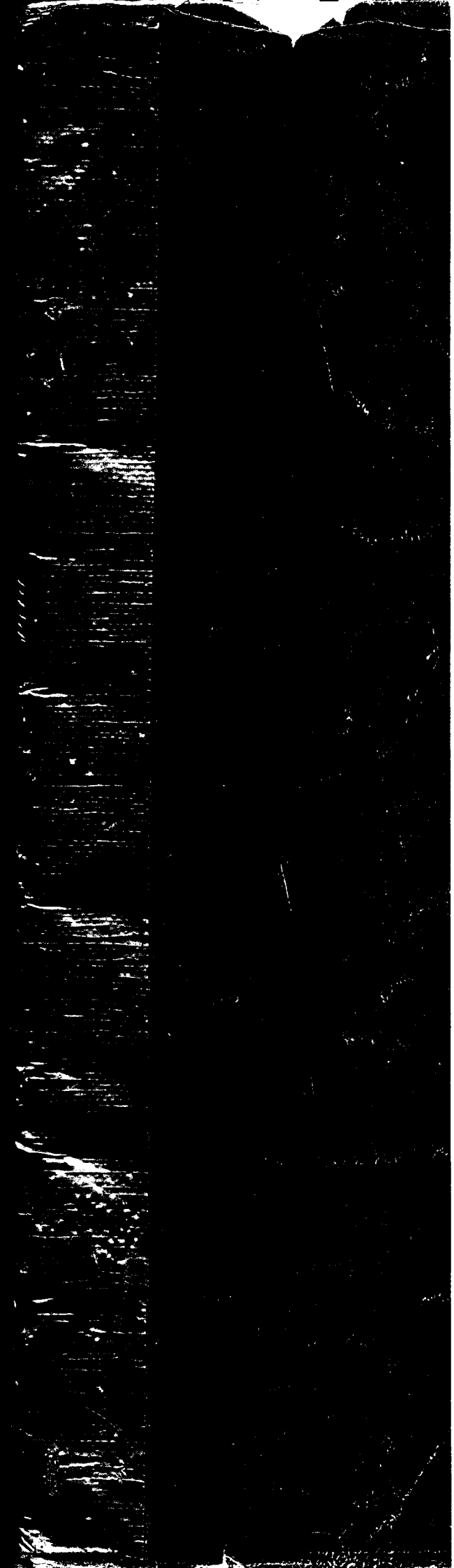


INSTRUCTION MANUAL

FT-301

Shop

YAESU MUSEN CO., LTD.

TOKYO JAPAN.

TABLE OF CONTENTS

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.

ALL SOLID STATE HF TRANSCEIVER
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 μV 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

Field Effect Transistors:

2SK19GR	13	3SK40M	7
3SK35Y	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		
TA7120P	1	TP4011	1
TIL306	3	μPC14305	1
TIL308	3	μPC14308	1

Diodes:

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

Thyristor:

CW01B	1

Varistor:

MV5W	1

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

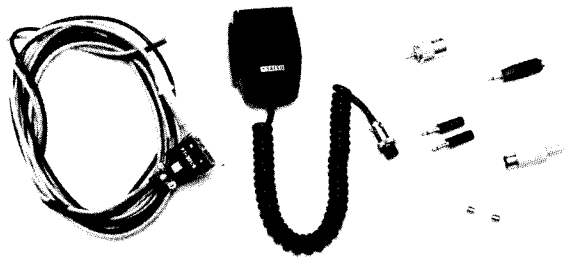
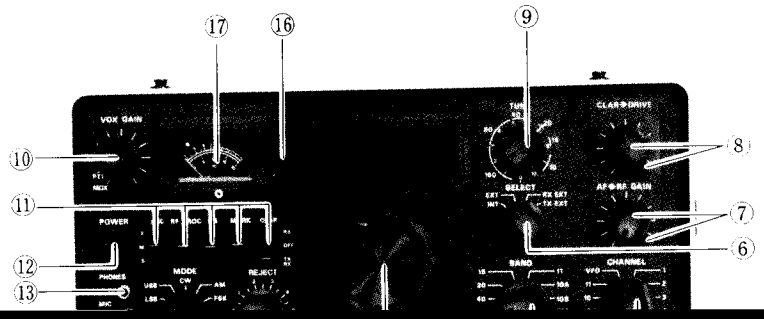


Figure 1

MODEL CHART FOR YAESU FT-301 SERIES

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

CONTROLS AND SWITCHES



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

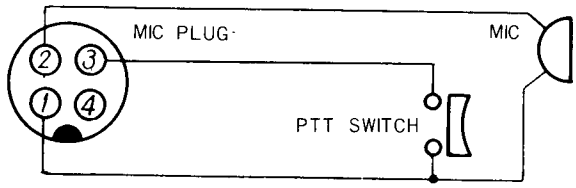


Figure 3 **Microphone Plug Connection**

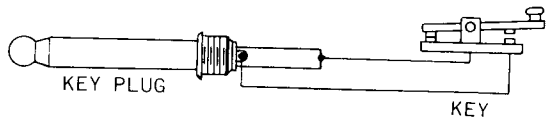


Figure 4 **Key Plug Connection**

REAR PANEL CONNECTIONS

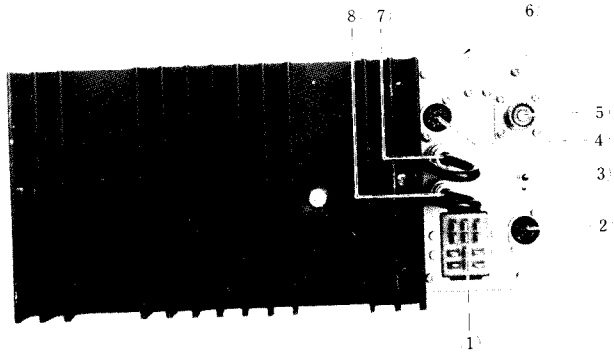


Figure 5

(1) **POWER**

- DC power supply receptacle. For AC opera-

AF UNIT

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

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 IM-

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

(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 offsetting 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)

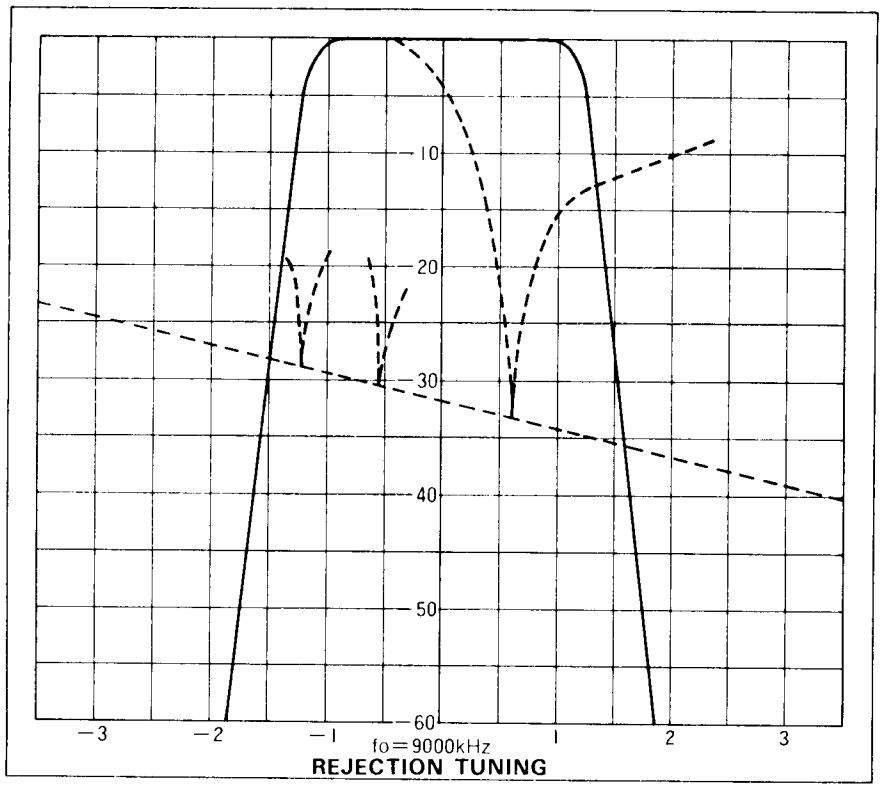


Figure 8 **Tunable Rejection Tuning**

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.

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 [illegible]

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 FSK
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 -

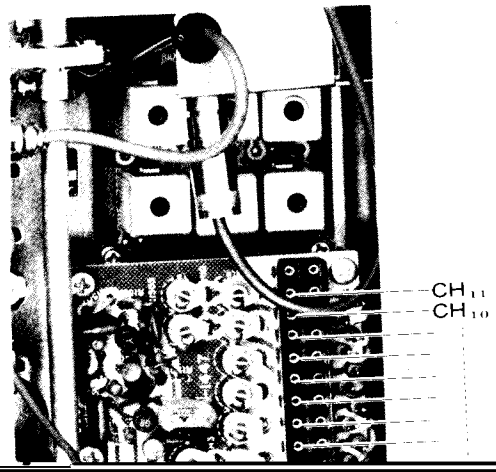
From Table 1, F_1 for the 40 meter band LSB is 12501.5
Therefore, F_X = 12501.5 – 7099 = 5402.5 kHz

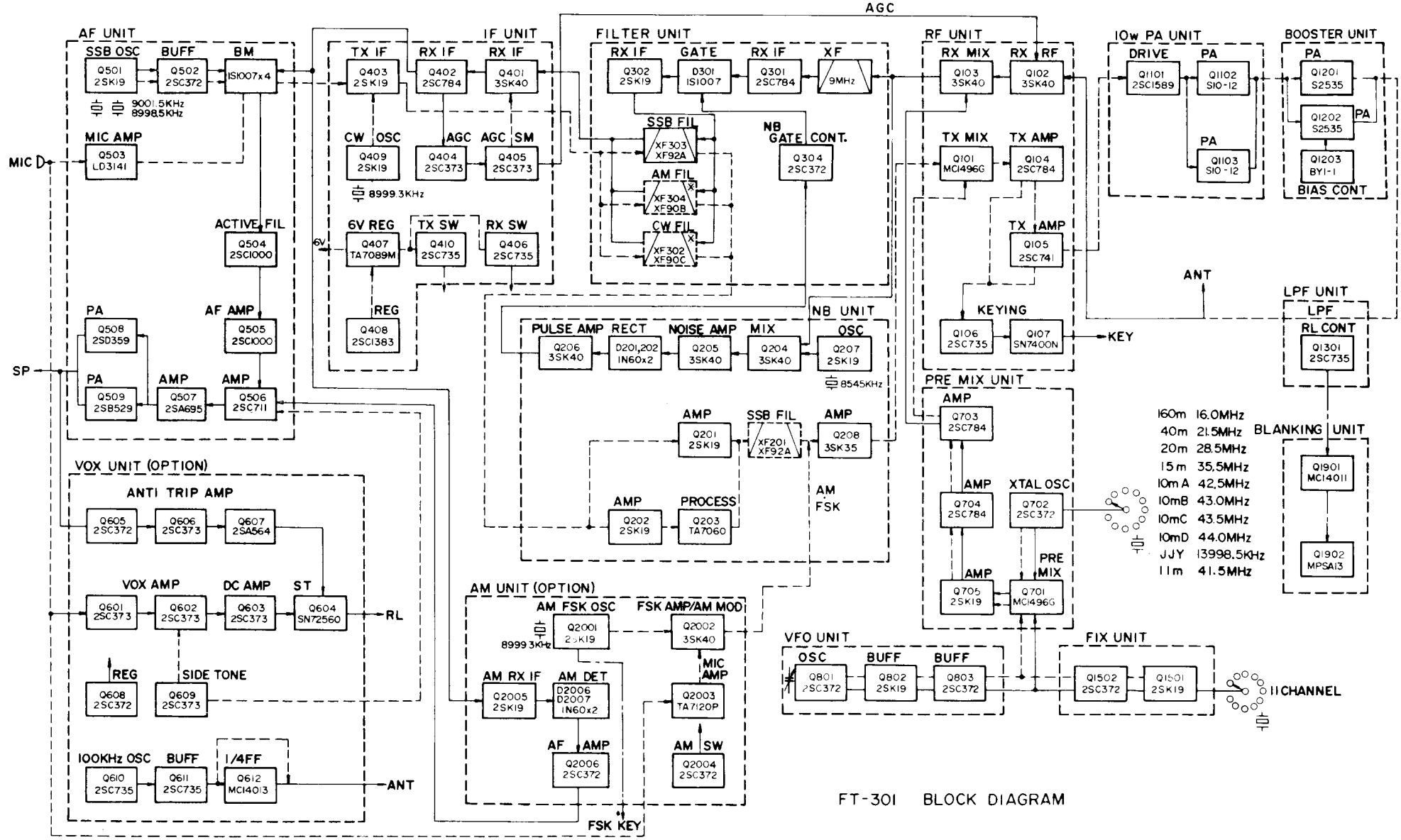
Example (2) – Find the crystal frequency for 21420 kHz USB operation -

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.


CH11
CH10



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 premix 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 permiability tuned RF input coil.

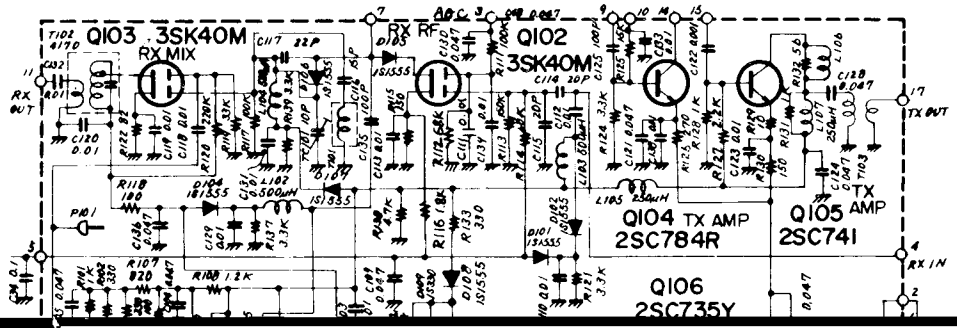
RF UNIT (PB-1433)

The incoming signal is amplified by the RF amplifier Q_{102}, **3SK40M** FET, and then fed to the gate of the mixer Q_{103}, **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 permiability 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



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},

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)

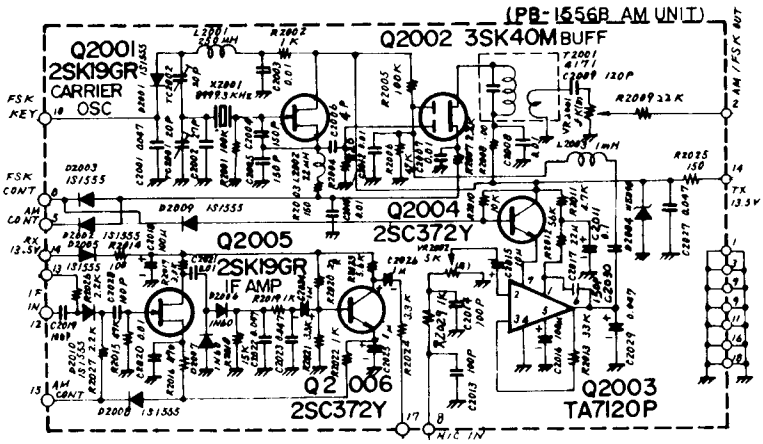


Figure 16 **AM Unit (PB-1556)**

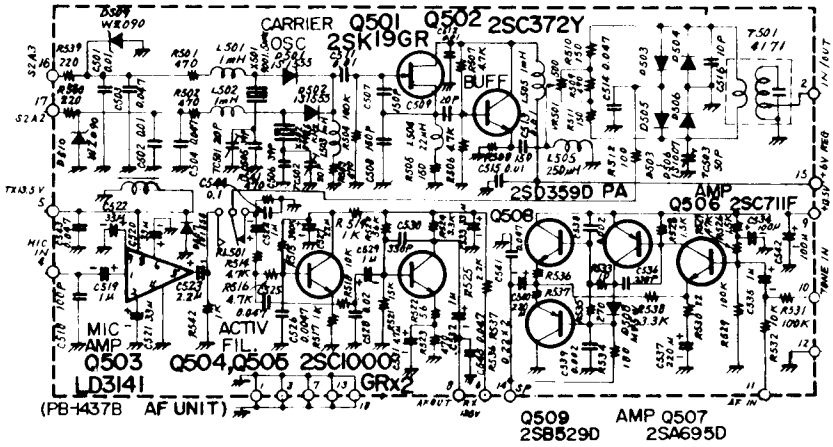


Figure 17 **AF Unit (PB-1437)**

AF UNIT (PB-1437)

The 9 MHz IF signal is delivered to pin 2 from PB-1436. A balanced demodulator circuit consisting of D_{503} – D_{506}, **1S-1007** demodulates the 9 MHz IF signal into audio using the appropriate USB or LSB frequency being applied from Q_{501}, **2SK19GR**, carrier oscillator and Q_{502}, **2SC372Y**, buffer amp. The demodulated audio then goes through relay contacts to an active low pass filter, Q_{504}, **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 Q_{505}, **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 amplfied by Q_{506}, **2SC711A**, Q_{507}, **2SA695D**, and finally by OTL power amplifier Q_{508}, **2SD359D** and Q_{509}, **2SB529D** producing a maximum of 3 watts audio output into the speaker.

The carrier oscillator Q_{501}, **2SK19GR** is followed by a buffer amplifier Q_{502}, **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 D_{501} and D_{502}, **1S1555**. The carrier is then injected into the balanced demodulator through VR_{501}.

The diode D_{502} 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 D_{501} 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 Q_{204}, **3SK40M**, where the 8545 kHz signal generated by **X201** and Q_{207}, **2SK19GR** is mixed with the incoming IF signal to produce 455 kHz. The 455 kHz is then amplified by Q_{205}, **3SK40M**.

When a carrier, or noise free modulated signal is received, the 455 kHz signal with its corresponding strength, is rectified by D_{201} and D_{202} to charge C_{221}. There is no discharge loop for C_{221}, therefore, signals which exceed the charged voltage established by the reference voltage on C_{221} will not [illegible] through $D_{[illegible]}$ and $D_{[illegible]}$ **1N60**. Accordingly,

The drain of Q_{206} is directly connected to the base of Q_{303}, **2SC372Y** in the FILTER UNIT. As the drain voltage of Q_{206} drops, the base voltage of Q_{303} drops, as well, which will turn off Q_{304}. The collector voltage will then increase and it will produce a forward bias to D_{301}. As D_{301} conducts, the signals will pass normally through the circuit.

When pulse type noise, which exceeds the charged reference voltage established by C_{221} is received, D_{201} and D_{202} will permit negative going pulses to turn Q_{206} off. The drain voltage will rapidly increase as it turns off.

As the drain voltage increases, Q_{303} will become "on" and the collector voltage will decrease. Accordingly, D_{301}, **1S 1007** will be biased to block the signal. Whenever pulse type noise is received, it will blank off the signal passage momentarily.

TRANSMIT CIRCUIT

Audio signals pass through the MIC jack, J8 and go to pin 4 of the AF UNIT through VR_{1901}, MIC GAIN control.

AF UNIT (PB-1437)

From pin 4, the audio signal passes through Q_{503}, **LD3141**, is amplified, then is applied through RL501 into a balanced modulator D_{503} through D_{506}, **1S1007**, where the carrier generated by X_{501} or X_{502} is modulated by the audio. The output

[redacted]

NB UNIT (PB-1434)

When the RF PROC switch is "OFF", the SSB signal entered at pin 12 is amplified by Q_{201}, **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 Q_{202}, **2SK19GR** and is further amplified by the limiter IC, Q_{203}, **TA7060P** where the signals that exceed the clipping level are sliced out.

The clipping level may be adjusted by VR_{203}, [redacted]

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.

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.

LPF UNIT (PB-1445)

The jacks, J2 and J3, are connected by a jumper wire for the 10 watts model. The band switches, S_2B_1 and S_2B_2, select the proper low pass filter network for the band in use.

The signal passes through T_{1301}, an output detector, and the antenna relay (RL1) to the antenna

[redacted]

T_{1301} detects the forward and reflected waves. The forward wave is rectified by D_{1303}, **1S 1555**. When the forward power exceeds safety level, it will trigger the thyristor D_{1301}, **CW01B** which will, in turn, shut down Q_{1301}, **2SC735Y** and the protection relay RL_{1301} will be released.

When the relay opens, the voltage on the output side of Q_{107}, **SN7400N** on the RF UNIT (PB-1433) becomes low and Q_{106}, **2SC735Y** will turn off. As Q_{106} turns off, the emitter circuit for Q_{104}, **2SC784R** and Q_{105}, **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 D_{1306} and D_{1307}, **1S 1555** to obtain ALC voltage. The ALC voltage is fed back to the base of Q_{208}, **3SK35Y** in the NB UNIT to control the gain of that stage. At peak transmission, the ALC voltage will reduce the gain of Q_{208} to prevent overloading or distortion.

The output of the reflected wave from T_{1301} is rectified by D_{1304}, **1S 1555** to obtain ALC voltage. When there is an excessive amount of reflected

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.

VR_{1901} and the clarifier zero adjustment pot, VR_{1902}.

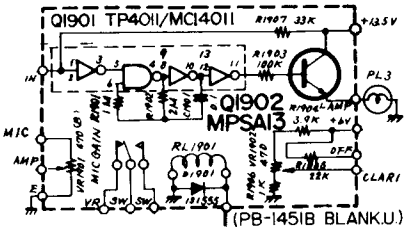


Figure 22 **Blanking Unit (PB-1451)**

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 Q_{601} and Q_{602}, **2SC373**, is then rectified by D_{601}, 1N60 to produce positive DC at the base of Q_{603}, **2SC373** causing it to conduct, thus reducing the voltage at pin 6 of Q_{604}, **SN72560P**. The output at

On receive, signal comes into pin 6 of the VOX UNIT and Q_{606} and Q_{607} will conduct causing the collector voltage of Q_{607} to increase, thus maintaining Q_{604} in an off state on receive mode. This provides the necessary antitrip threshold.

Input signal from the mike will turn Q_{603} on, discharging C_{613}, yet the input of Q_{604} will be kept in HIGH level preventing the transceiver from tripping, thus providing very stable VOX operation.

As the input to the mike stops, Q_{603} will become off and C_{613} will be charged according to the time constant set up by VR_{602} and R_{623}. When the input voltage of Q_{604} 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 VR_{601} for antitrip sensitivity. Relay hold time is determined by the delay control, VR_{602}.

The tone oscillator, Q_{609}, **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 Q_{609} and coupled to the base of Q_{602}, **2SC373** for break-in CW operation. The output is also fed to the base of Q_{506} in the AF UNIT through VR_{603} for CW monitoring. The VR_{603} adjusts the sidetone level.

(3) MARKER CIRCUIT

Located on the VOX UNIT (PB-1438), the crystal marker generator, Q_{610}, **2SC735Y** generates a basic 1 MHz signal, with its output fed through a buffer amplifier Q_{611}, **2SC735Y** to a frequency divider Q_{612}, **34013PC**. The divider output provides either 100 kHz or 25 kHz marker signals as selected by S601 for dial calibration of the FT-301.

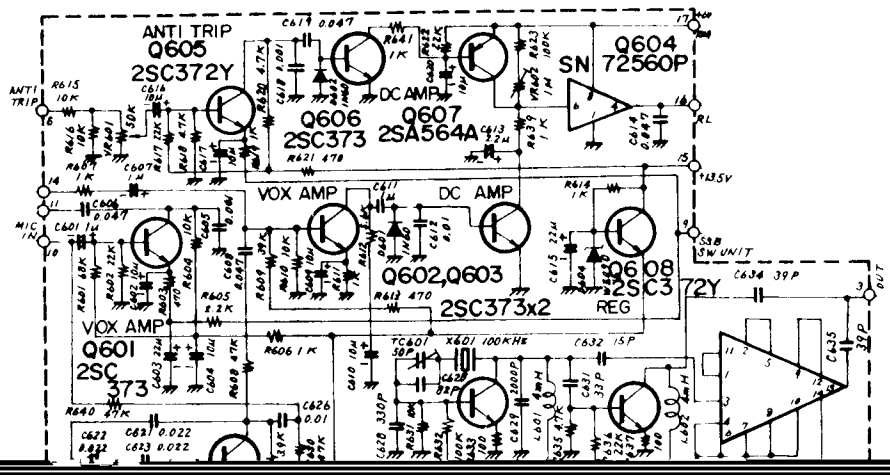
The marker signals are then fed to the antenna input from pin 3 of the VOX UNIT' TC_{601} is used to set the 1 MHz basic oscillator precisely to WWV or JJY.

Q_{608}, **2SC372Y** is to stabilize the 8.5V DC power supply to the VOX and sidetone generator.

VFO 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 VC_{801} which is geared to a precision built dial tuning mechanism.

The VC_{801} 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, TC_{801}.



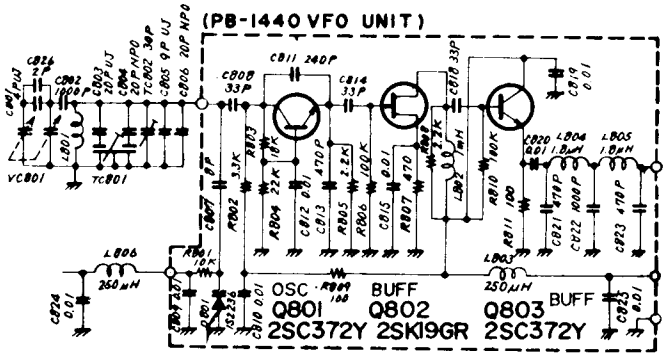


Figure 24 VFO Unit (1440)

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}, 2SC372Y, 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.

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}, **2SC372Y** 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}, **2SC372Y** 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}, **2SC784R** 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.

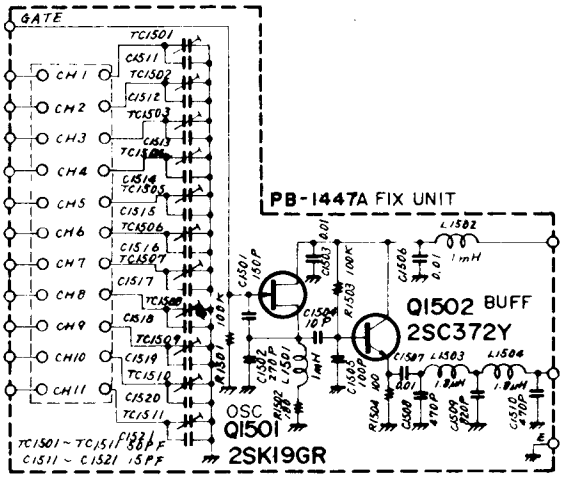


Figure 25 FIX Unit (PB-1447)

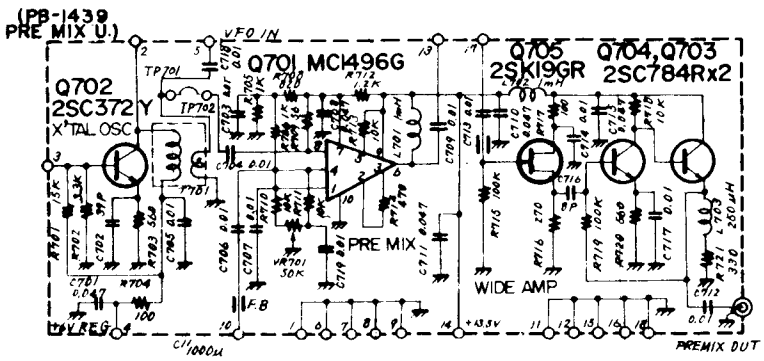
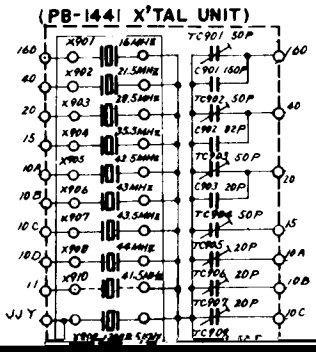
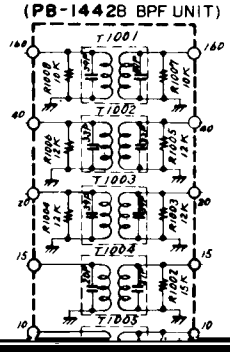


Figure 26 PREMIX UNIT (PB-1439)





AC POWER SUPPLY

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.

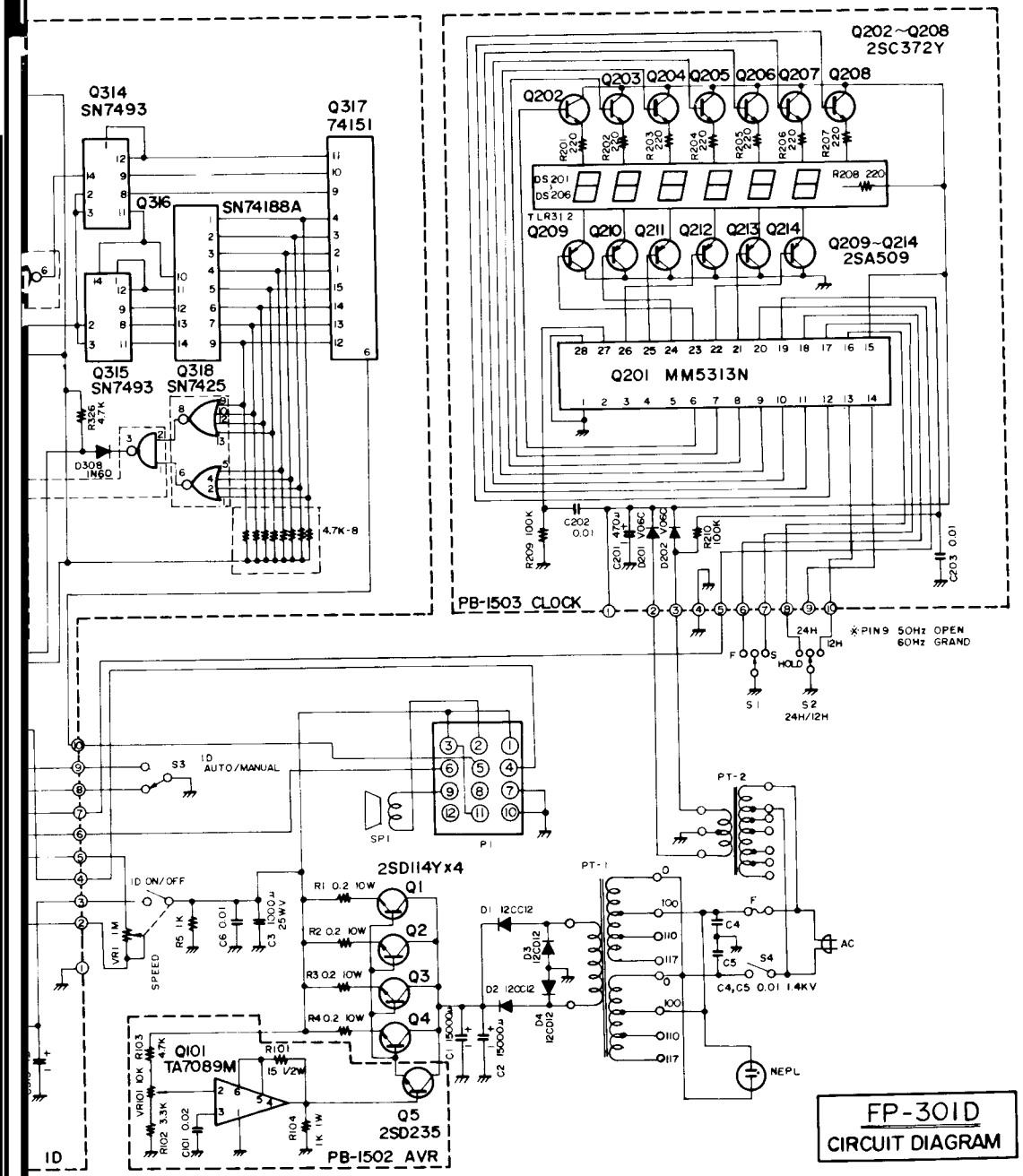


Figure 30 FP-301D Circuit Diagram

FREQUENCY COUNTER UNITS

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

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},

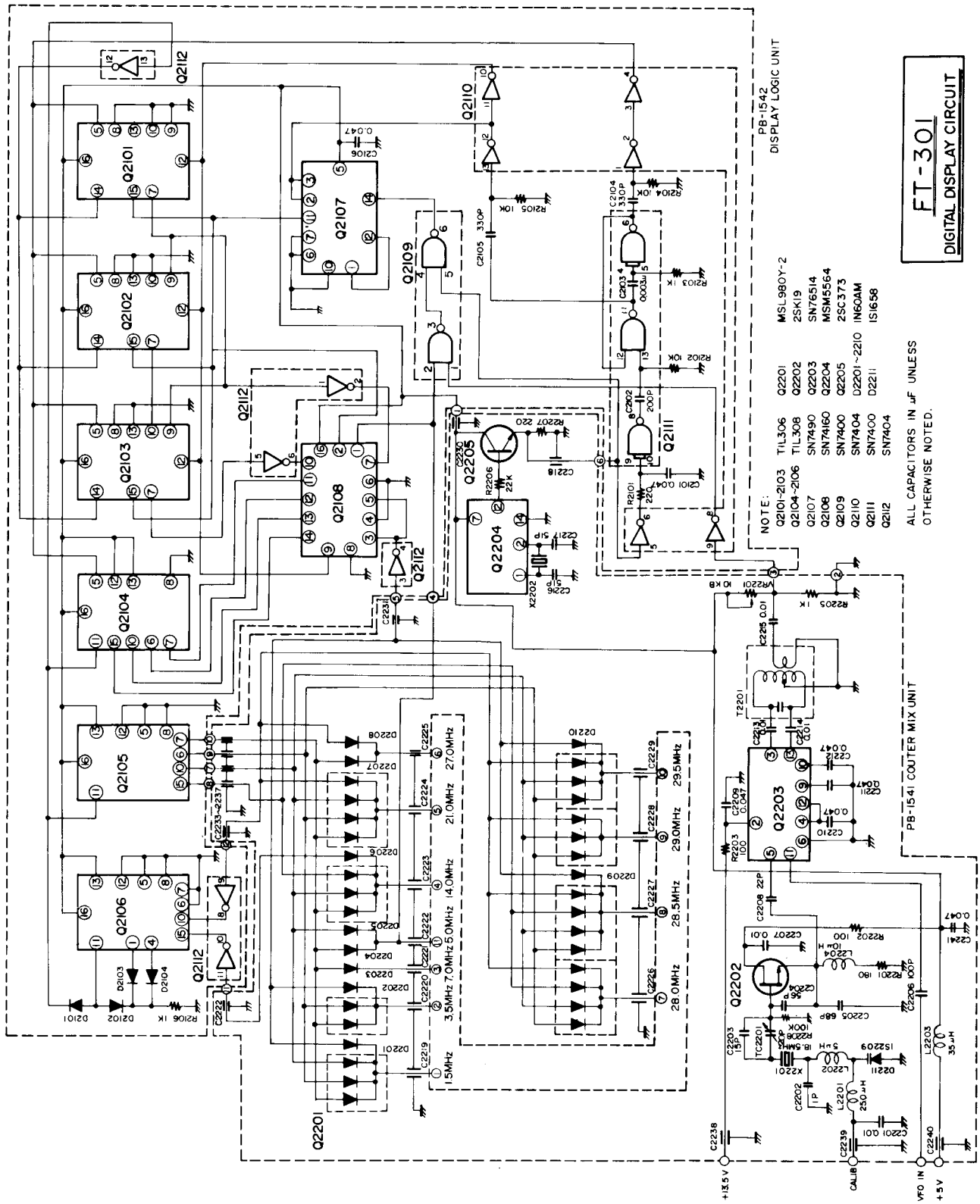


Figure 31 Digital Display Circuit (Counter Mixer Unit, Logic Display Unit)

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 connected 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.

AF UNIT

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

(a) Settings:

BAND 20

DIAL ..... 14.25 MHz

MODE ..... CW

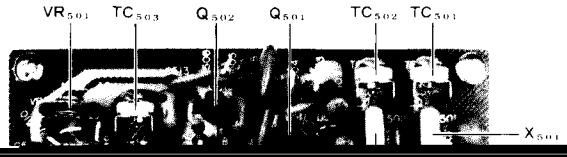
Tune to transmit at the maximum power.

(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 TC_{501} for USB and TC_{502} 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 TC_{503} and VR_{501} alternately to minimize the VTVM reading.

(c) If no VTVM is available, use a monitor receiver and adjust TC_{503} and VR_{501} 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 (VR_{301}), S METER ZERO SET (VR_{401}) S METER FULL SCALE SET (VR_{402})

(a) Settings:

BAND 20

DIAL ..... 14.25 MHz

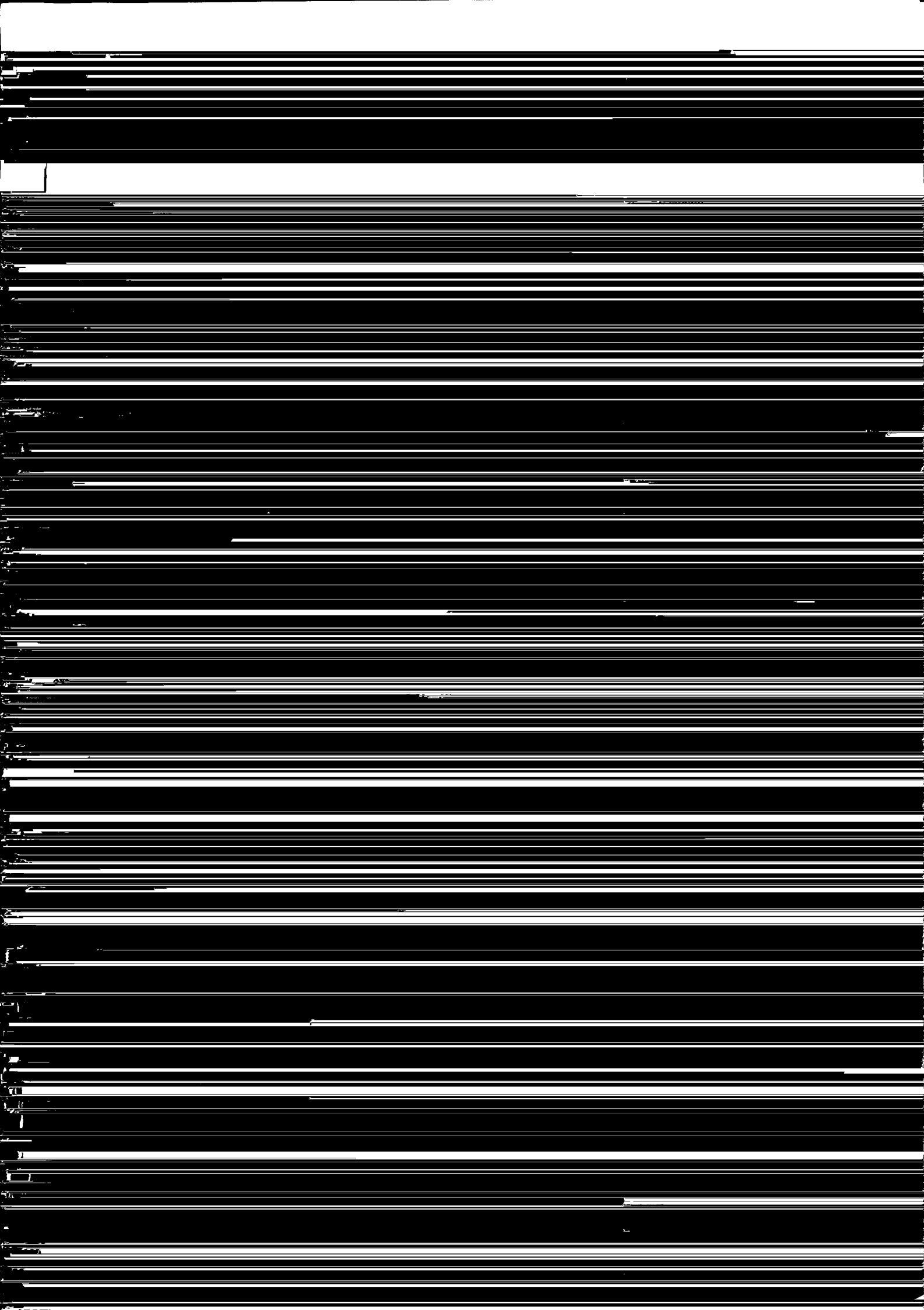
TUNE ..... 20 METER

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



RF SPEECH PROCESSOR

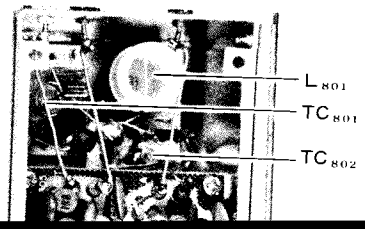
The optional crystal filter XF_{201} is required to operate with the RF SPEECH processor.

(1) Level adjustment when the processor is used (VR_{202}, VR_{203})

(a) Adjust the MIC GAIN control to a proper setting. Refer to blanking unit adjustment on

TC_{801} .... A split type trimmer capacitor for temperature compensation.

TC_{802} .... Band setting trimmer capacitor.



(e) Set the BAND switch to JJY/WWV. Preset TC_{901} to its mid point (at half capacitance) and adjust TC_{908} for a 100 mV VTVM reading. Set the MODE to LSB and the TUNE to 2 of the unity scale, and then adjust TC_{910} for a zero beat reception of WWV.

(d) Monitor the wave patterns on the scope by offsetting the balancing pot VR_{701} on the PREMIX UNIT.

(e) Adjust T_{1001} – T_{1005} so that the passband characteristics become as flat as possible within the passband range specified.

BAND BPF PASSBAND

(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.

LPF UNIT (PB-1445)

(1) BALANCING OF OUTPUT DETECTOR TRANSFORMER (TC_{1301})

(a) Set the ALC level control, VR_{1302} to fully

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

VR UNIT (PB-1448)

(1) EXCITER DRIVE LEVEL

(b) Set the MODE switch to AM position and key the transmitter.

(c) Adjust TC_{2001} until crystal frequency becomes 8999.3 kHz.

(2) **FSK SHIFT FREQUENCY (TC_{2002})**

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

(b) Set the MODE switch to FSK position and key the transmitter. Adjust TC_{2002} until crystal frequency shift is 170 Hz (8999.13 kHz) when pin 3 and pin 6 of accessory socket are connected.

(4) **AM MIC GAIN (VR_{2002})**

Observe the transmitted signal on oscilloscope and adjust VR_{2002} for 100% modulation.

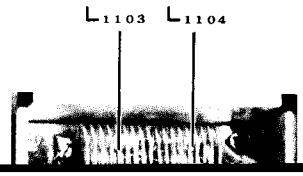
RF TRACKING

Preselector Coils ($T_1 - T_3$) and Trimmer Unit ($TC_{1401} - TC_{1418}$)

(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

(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.



PARTS LIST

★DIGITAL

MAIN CHASSIS			
PB	PRINTED CIRCUIT BOARD		
1576(A～Z)	REJECT BOARD		
Q	IC		
1 ★		μPC14308 GP	
2 ★		μPC14305 GP	
D	DIODE		
7,8		Ge 1N60FM	
1～6		Si 1S1555	
X	CRYSTAL		
1		HC-18/U 8996.9kHz	#210027
R	RESISTOR		
		CARBON COMPOSITION	
5		½W	3.3Ω
3		〃	10Ω

M	METER	
1	KH-002	#
SP	SPEAKER	
1	SA-70	
RL	RELAY	
1	RAB K4P DC12V-104T	
RLS	RELAY SOCKET	
1	RAB	
S	SWITCH	
1	SP-2022	
2A		#002975A
2B		#002981
3	ESR-E22CR15	
4	ESR-E124R20	
5	ESR-E365R20	

109	Zener WZ050	
R	RESISTOR	
	CARBON FILM	
129	¼W	10Ω
122	〃	82Ω
106, 118	〃	100Ω
115, 130	〃	150Ω
126	〃	270Ω
102, 103, 122, 133	〃	330Ω

NB UNIT

PB PRINTED CIRCUIT BOARD

1434(A～Z)

Q	IC & FET	
203	IC	TA7060P
204～206	FET	3SK40M
201, 202, 207	〃	2SK19GR
208	〃	3SK35Y

L	INDUCTOR	
201	RF CHOKE	22μH

FILTER UNIT

PB	PRINTED CIRCUIT BOARD	
1435(A~Z)		

Q	FET & TRANSISTOR		
302		FET	2SK19GR
303		Tr	2SC372Y
301		〃	2SC784R

D	DIODE	
301,303~306,310	Ge	1S1007
302,307	Si	1S1555
308	Zener	WZ110

XF	CRYSTAL FILTER	
301		9M-20A
302	CW	XF-90C (OPTION)
303	AM	XF-90B (OPTION)
304	SSB	XF-92A

R	RESISTOR		
	CARBON FILM		
303		¼W	56Ω
304,312,315,316,323		〃	100Ω
306,308		〃	330Ω
305,327		〃	1KΩ
309,311		〃	2.2KΩ
313,320,321,322,326		〃	3.3KΩ
301,329		〃	6.8KΩ
307,310		〃	10KΩ
302		〃	39KΩ
	CARBON COMPOSITION		
328		½W	56Ω

VR	POTENTIOMETER	
301	V10K8-1-2	500ΩB

C	CAPACITOR		
	CERAMIC DISC		
302		50WV	33PF(CH)
307		〃	51PF(〃)
301,303,305,308~311 313~317,321~323,325		〃	0.01μF
304,312,318,319,324 326		〃	0.047μF
	ELECTROLYTIC		
306		16WV	10μF

L	INDUCTOR	
301	RF CHOKE	250μH
302~307	〃	150μH

T	TRANSFORMER	
301,303,304	R12-4170	#220140
302	R12-4171	#220141

IF UNIT

PB	PRINTED CIRCUIT BOARD
1436(A~Z)	

Q	IC, FET & TRANSISTOR	
407	IC	TA7089M
401	FET	3SK40M
403,409	〃	2SK19GR
404,405	Tr	2SC373
406,410	〃	2SC735Y
402	〃	2SC784R
408	〃	2SC1383

D	DIODE	
403	Ge	1S1007
401,405~408,410	Si	1S1555
402	Zener	BZ090
404,409	〃	WZ090

X	CRYSTAL	
401		HC-18/U8999.3kHz

R	RESISTOR		
	CARBON FILM		
407,411,427		¼W	4.7Ω
423		〃	33Ω
424		〃	75Ω
415		〃	100Ω
405,436		〃	150Ω
410		〃	220Ω
430,435		〃	270Ω
417		〃	560Ω
414,422,425,429,433		〃	1KΩ
406		〃	1.8KΩ
437		〃	2.2KΩ
418		〃	2.7KΩ
431		〃	3.3KΩ
408,413,416		〃	4.7KΩ
412,426,434		〃	10KΩ
421		〃	24KΩ
409		〃	33KΩ
401,403,419,432		〃	100KΩ
420		〃	120KΩ
404		〃	150KΩ
402		〃	390KΩ

VR	POTENTIOMETER	
401,402	V10K8-1-2	1KΩB
403	〃	5KΩB

C	CAPACITOR		
	CERAMIC DISC		
408		50WV	10PF(CH)
414		〃	18PF(〃)
428		〃	39PF(〃)
421		〃	120PF(〃)
422		〃	270PF(〃)
401,417,423		〃	0.001μF
403,406,407,409~412 416,424,429,431,433		〃	0.01μF
404,405,413,415,419 420,429,430		〃	0.047μF
	MYLAR		
426,427		50WV	0.022μF
418		〃	0.1μF
	ELECTROLYTIC		
402,432		16WV	10μF
425		〃	100μF

TC	TRIMMER CAPACITOR		
401,402		ECV-1ZW 20×40	20PF

L	**INDUCTOR**	
403	RF CHOKE	22μH
401,402	〃	1mH
T	**TRANSFORMER**	
401	R12-4171	#220141
402	R12-4170	#220140

AF UNIT

PB	**PRINTED CIRCUIT BOARD**	
1437(A～Z)		
Q	**IC, FET & TRANSISTOR**	
503	IC	LD3141
501	FET	2SK19GR
507	Tr	2SA695D
509	〃	2SB529D
502	〃	2SC372Y
506	〃	2SC711F
504,505	〃	2SC1000GR
508	〃	2SD359D
D	**DIODE**	
503～506	Ge	1S1007
501,502,507	Si	1S1555
508	〃	MV-5W
509,510	Zener	WZ090
X	**CRYSTAL**	
501	HC-18/U	9001.5kHz
502	〃	8998.5kHz
R	**RESISTOR**	
	CARBON FILM	
533	¼W	10Ω
530	〃	22Ω
522	〃	56Ω
512	〃	100Ω
505,508,510,511	〃	150Ω
534	〃	180Ω
539,540	〃	220Ω
535	〃	270Ω
501～503,509,523,541	〃	470Ω
517,519,542	〃	1KΩ
526,528	〃	1.5KΩ
525	〃	2.2KΩ
524,538	〃	3.3KΩ
506,507,514,516	〃	4.7KΩ
518,532	〃	10KΩ
521	〃	15KΩ
527	〃	47KΩ
520	〃	56KΩ
504,529,531	〃	100KΩ
515	〃	390KΩ
	WIRE WOUND	
536,537	½W	0.22Ω
VR	**POTENTIOMETER**	
501	V10K8-1-2	500ΩB
C	**CAPACITOR**	
	DIPPED MICA	
530,536	50WV	330PF
	CERAMIC DISC	
516	50WV	10PF(CH)
509	〃	20PF(〃)
505,506	50WV	39PF(CH)
518	〃	100PF(〃)
507,508	〃	150PF(〃)
501,502,511～513,515		0.01μF
503,504,514,543		0.047μF
	MYLAR	
538,539	50WV	0.0022μF
526	〃	0.0047μF
528	〃	0.022μF
525,541,545	〃	0.047μF
544	〃	0.1μF
	ELECTROLYTIC	
519,524,529,532,534	16WV	1μF
523	〃	2.2μF
531	〃	4.7μF
527	〃	22μF
520～522,533	〃	33μF
534,542	16WV	100μF
537,540	〃	220μF
TC	**TRIMMER CAPACITOR**	
501,502	ECV-1ZW 20×40	20PF
503	ECV-1ZW 50×40	50PF
L	**INDUCTOR**	
504	RF CHOKE	22μH
506	〃	250μH
501～503,505	〃	1mH
T	**TRANSFORMER**	
501	R12-4171	#220141
RL	**RELAY**	
501	G2E 12V DC	

VOX UNIT

PB	**PRINTED CIRCUIT BOARD**	
1438(A～Z)		
Q	**IC & TRANSISTOR**	
604	IC	SN72560P
612	〃	34013(MC-14013CP)
607	Tr	2SA564A
605,608	〃	2SC372Y
601～603,606,609	〃	2SC373
610,611	〃	2SC735 Y
D	**DIODE**	
601～603,606	Ge	1N60FM
604,605	Zener	WZ090
X	**CRYSTAL**	
601	HC-13/UW 100kHz	
R	**RESISTOR**	
	CARBON FILM	
633,637	¼W	100Ω
603,613,621,638	〃	470Ω
606,607,611,614,619,628,639,641	〃	1KΩ
605	〃	2.2KΩ
629	〃	3.9KΩ
618,620,624～626,635	〃	4.7KΩ
612	〃	5.6KΩ
604,610,615,616,631	〃	10KΩ
602,617,622,627,636	〃	22KΩ
609	〃	39KΩ

608, 630, 640	¼W	47KΩ	714	¼W	470Ω
601					

CERAMIC DISC		
809,810,812,815,819 820,824,825	50WV	0.01μF

CERAMIC T. C		
801	50WV	4PF UJ
805	〃	9PF UJ
803	〃	20PF UJ
804,806	〃	20PF NPO

VC	VARIABLE CAPACITOR	
801	BS240DS114	

TC	TRIMMER CAPACITOR	
801	TSN 170C	
802	TSN 150C	

L	INDUCTOR	
801	Oscillator Coil	#220030
804,805	RF CHOKE	1.8μH
803,806	〃	250μH
802	〃	1mH

J	RECEPTACLE	
801	CN-3561	
802	CN-3965S	

CRYSTAL UNIT

PB PRINTED CIRCUIT BOARD
1441(A～Z)

X	CRYSTAL		
901	(160m)	HC-25/U	16.0MHz
902	(40m)	〃	21.5MHz
903	(20m)	〃	28.5MHz
904	(15m)	〃	35.5MHz
905	(10mA)	〃	42.5MHz
906	(10mB)	〃	43.0MHz
907	(10mC)	〃	43.5MHz
908	(10mD)	〃	44.0MHz
909	(WWV/JJY)	〃	13998.5kHz
910	(11m)	〃	41.5MHz

XS	CRYSTAL SOCKET	
901	S-20	
902	S-19	

C	CAPACITOR	
	DIPPED MICA	
904	50WV	220PF
	CERAMIC DISC	
903	50WV	20PF(CH)
902	〃	82PF(〃)
901	〃	150PF(〃)

TC	TRIMMER CAPACITOR		
901～904,908,909	ECV-1ZW	50×32	50PF
905～907,910	ECV-1ZW	20×32	20PF

BPF UNIT

PB PRINTED CIRCUIT BOARD
1442(A～Z)

R	RESISTOR	
1001,1007,1008	1/4W	10KΩ
1003～1006	〃	12KΩ
1002	〃	15KΩ

T	TRANSFORMER	
1001	(160m)	#220018
1002	(40m)	#220019
1003	(20m)	#220020
1004	(15m)	#220021
1005	(10m)	#220022
1006	(11m)	#220043

10W AMP UNIT

PB PRINTED CIRCUIT BOARD
1443(A～Z)

Q	TRANSISTOR	
1101		2SC1589
1102,1103		S10-12

D	DIODE		
1102,1103		Si	10D10
1101		Zener	YZ33

R	RESISTOR		
	CARBON COMPOSITION		
1105		1/2W	4.7Ω
1107,1108		〃	15Ω
1103		〃	22Ω
1109		〃	39Ω
1110,1111		〃	100Ω
1101		〃	180Ω
1102		〃	330Ω
1106		〃	820Ω
1104		2W	82Ω

C	CAPACITOR		
	DIPPED MICA		
1110,1112		500WV	75PF
1111		〃	150PF
	CERAMIC DISC		
1109		500WV	0.001μF
1105		〃	0.007μF
1101,1108		〃	0.01μF
1102,～1104,1113,1114		〃	0.047μF
	MYLAR		
1115,1116		50WV	0.2μF
	ELECTROLYTIC		
1117		50WV	1μF
1106,1107		16WV	33μF

L	INDUCTOR	
1101	RF CHOKE	#220031
1102	〃	#220032
1103,1104	Lowpass Coil	#220033

T	TRANSFORMER	
1101		#220023
1102		#220024

100W AMP UNIT

PB PRINTED CIRCUIT BOARD
1444(A～Z)

Q	TRANSISTOR	
1201,1202		S-2535
1203		BY-1-1

R	RESISTOR	
	CARBON COMPOSITION	
1210	½W	2.2Ω
1203, 1205		15Ω
	METALIC FILM	
1206, 1207	½W	39Ω
1202	2W	56Ω
1201	5W	33Ω
	CEMENT	
1208	10W	25Ω

1301, 1302	V10K8-1-2	10KΩB
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

1447(A～Z)

Q	FET & TRANSISTOR		
1501		FET	2SK19GR
1502		Tr	2SC372Y

X	CRYSTAL		
1501～1511		HC-25/U	(OPTION)

XS	CRYSTAL SOCKET	
1501		S-14-12P

R	RESISTOR		
	CARBON FILM		
1504		¼W	100Ω
1502		〃	180Ω
1501,1503		〃	100KΩ

C	CAPACITOR		
	DIPPED MICA		
1508,1510		50WV	470PF
1509		〃	820PF
	CERAMIC DISC		
1504		50WV	10PF(CH)
1511～1521		〃	15PF(〃)
1505		〃	100PF(〃)
1501		〃	150PF(〃)
1502		〃	270PF(〃)
1503,1506,1507		〃	0.01μF

TC	TRIMMER CAPACITOR		
1501～1511		ECV-1ZW 50×32	50PF

L	INDUCTOR		
1503,1504		RF CHOKE	1.8μH
1501		〃	22μH
1502		〃	1mH

VR UNIT

PB	PRINTED CIRCUIT BOARD	
1448(A～Z)		

D	DIODE		
1601		Zener	WZ090

R	RESISTOR		
	CARBON FILM		
1601		¼W	470Ω
1602		〃	47KΩ

VR	POTENTIOMETER		
1601～1606		SR19R	47KΩB

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

BLANKING UNIT

PB	PRINTED CIRCUIT BOARD	
1451(A～Z)		

Q	ID & TRANSISTOR		
1901		IC	TP4011(MC14011)
1902		Tr.	MPSA13

D	DIODE		
1901		Si	1S1555

R	RESISTOR		
	CARBON FILM		
1906		¼W	1KΩ
1904		〃	3.9KΩ
1905		〃	22KΩ
1907		〃	33KΩ
1903		〃	100KΩ
1901		〃	1MΩ
1902		〃	2MΩ

VR	POTENTIOMETER		
1901		SR-19R(D)	470ΩB
1902		SR-19R	470ΩB

C	CAPACITOR		
	MYLAR		
1901		50WV	0.1μF

RL	RELAY	
1901		G2E 12V DC

AM UNIT

PB	PRINTED CIRCUIT BOARD	
1556(A～Z)		

Q	IC, FET & TRANSISTOR		
2003		IC	TA7120P
2001,2005		FET	2SK19GR
2002		〃	3SK40M
2004,2006		Tr.	2SC372Y

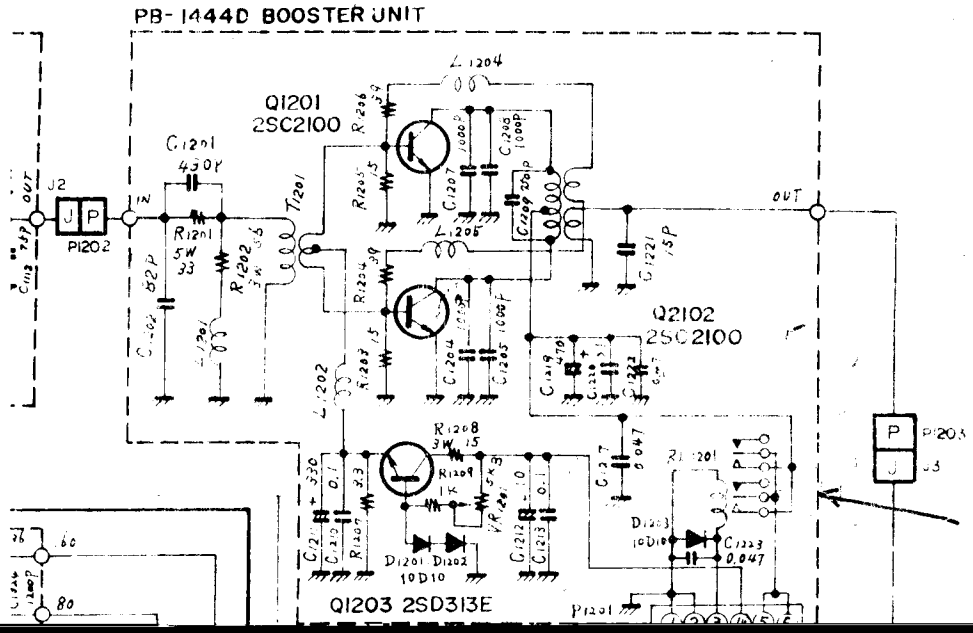
D	DIODE		
2006,2007		Ge	1N60FM
2001～2003,2005 2008～2010		Si	1S1555
2004		Zener	WZ090

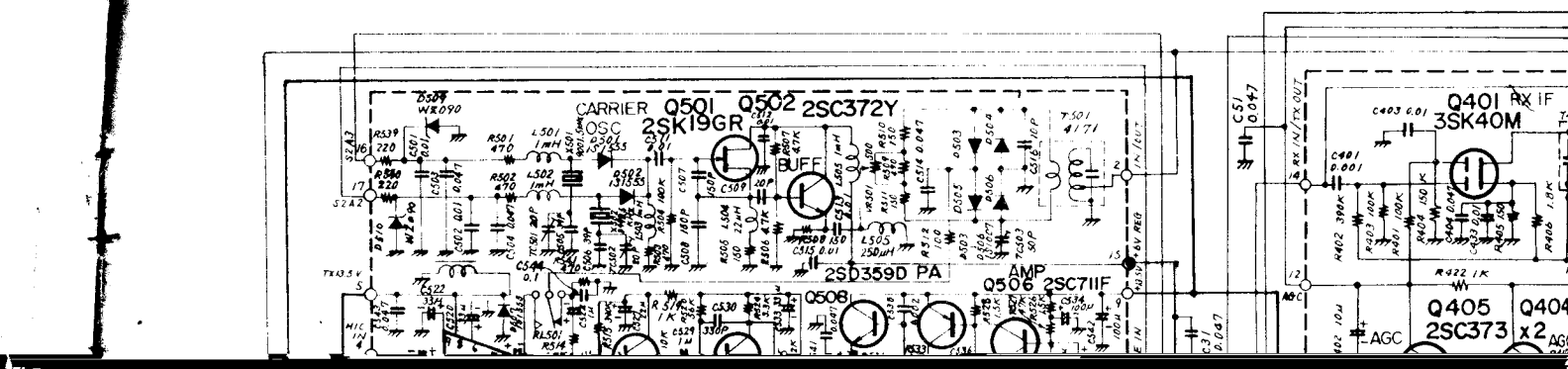
X	CRYSTAL			
2001		HC-18/U	8999.3kHz	#210015

R	RESISTOR		
	CARBON FILM		
2008,2014		¼W	100Ω
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

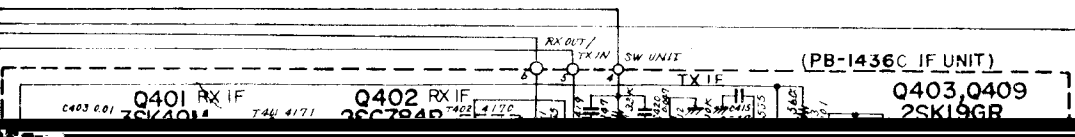
2012	¼W	56KΩ	P	PIN PLUG
2001~2005	〃	100KΩ	2101	M-31-15-60-114P

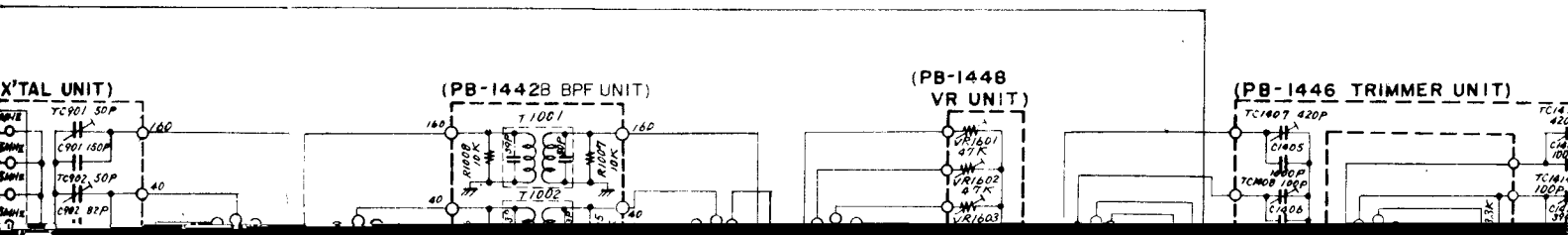
2202	M-31-15-60-114P		
LED UNIT			
PB	PRINTED CIRCUIT BOARD		
1471(A~Z)			
D	DIODE		
2401	LED	TLR-108	
R	RESISTOR		
	CARBON FILM		
2401	1/4W	470Ω	
LAMP BOARD A ★			
PB	PRINTED CIRCUIT BOARD		
1565(A~Z)			
Q	TRANSISTOR		
2301,2302	2SC536D		
R	RESISTOR		
	CARBON COMPOSITION		
2301,2302	1/8W	10KΩ	
PL	LAMP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

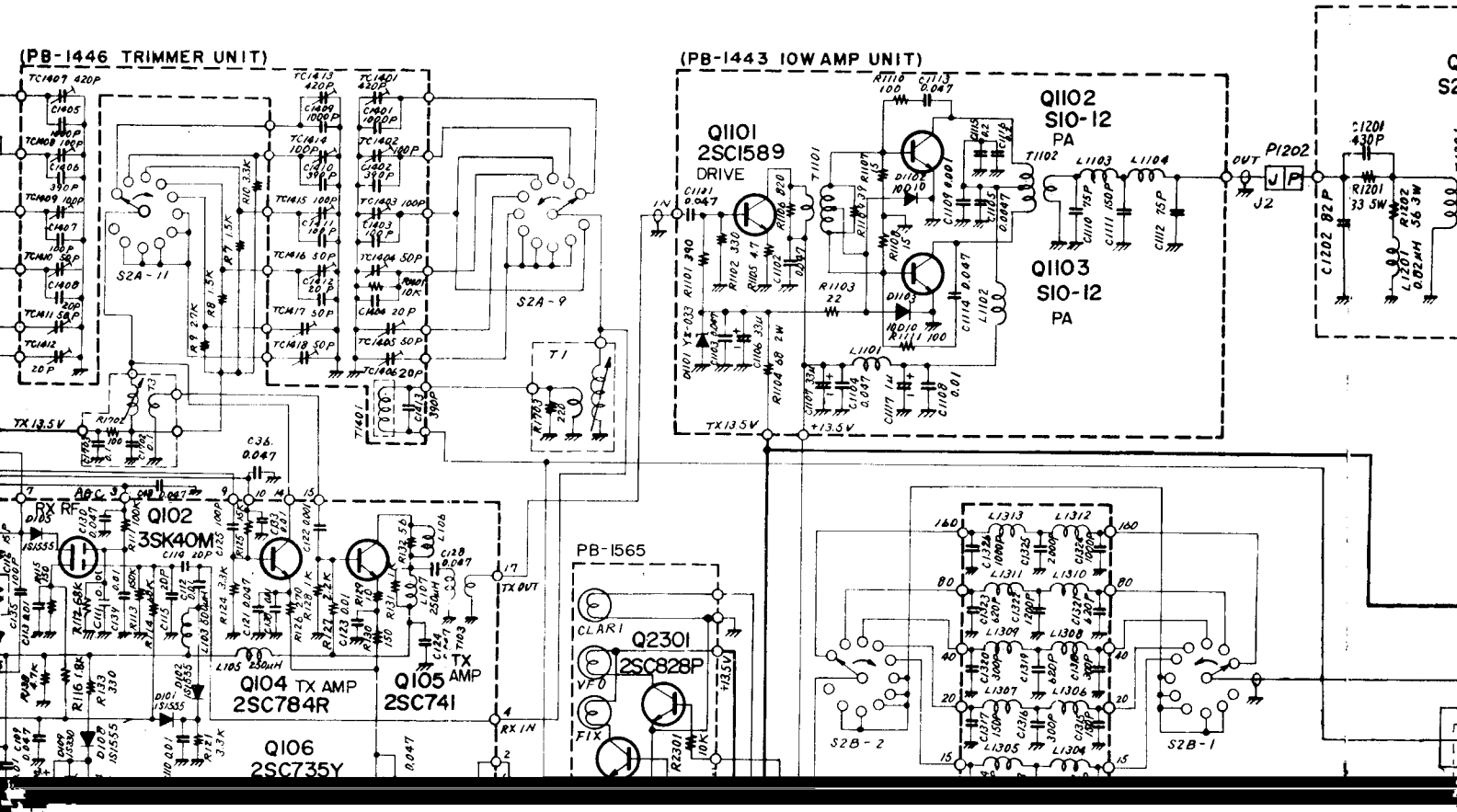


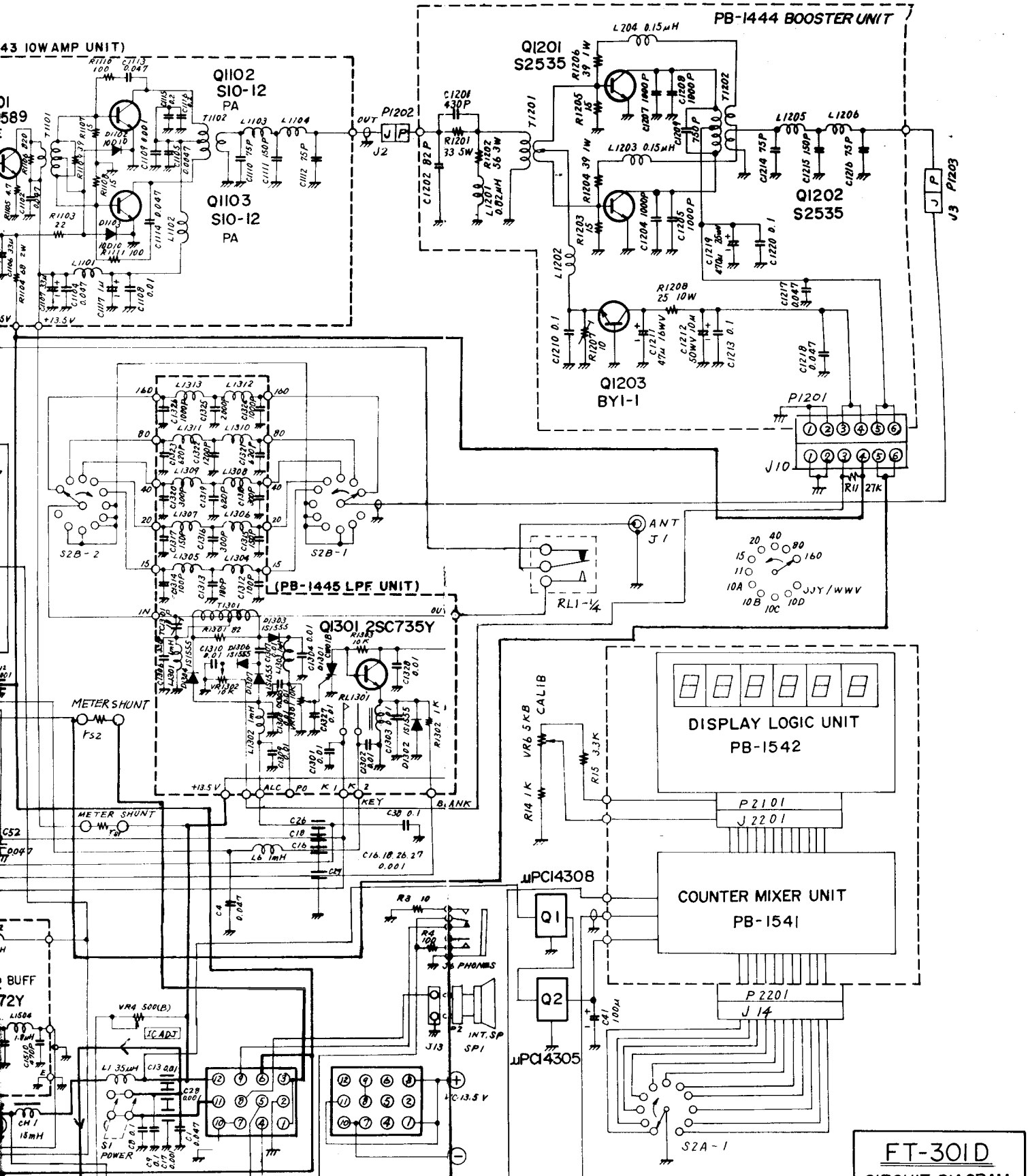

CARRIER Q501 Q502 2SC372Y
OSC 2SK19GR
BUFF
2SD359D PA
AMP
Q506 2SC711F
Q508
Q401 RX IF
3SK40M
Q405
2SC373
x2
Q404
AGC

+13.8 V TX . +6V. REG.




X'TAL UNIT)
(PB-1442B BPF UNIT)
(PB-1448
VR UNIT)
(PB-1446 TRIMMER UNIT)


(PB-1446 TRIMMER UNIT)
(PB-1443 10W AMP UNIT)
Q1101
2SC1589
DRIVE
Q1102
S10-12
PA
Q1103
S10-12
PA
P1202
J2
OUT
IN
TX 13.5V
+13.5V
T1
T1101
T1102
T1401
S2A-11
S2A-9
RX RF
Q102
3SK40M
Q104 TX AMP
2SC784R
Q105 AMP
2SC741
Q106
2SC735Y
TX OUT
RX IN
PB-1565
Q2301
2SC828P
CLAR
VFO
FIX
S2B-2
S2B-1


PB-1444 BOOSTER UNIT
43 10W AMP UNIT)
Q1102
S10-12
PA
Q1103
S10-12
PA
Q1201
S2535
Q1202
S2535
Q1203
BY1-1
P1202
J2
P1203
J3
P1201
J10
ANT
J1
RL1-1/4
S2B-2
S2B-1
(PB-1445 LPF UNIT)
Q1301 2SC735Y
METER SHUNT
DISPLAY LOGIC UNIT
PB-1542
P2101
J2201
COUNTER MIXER UNIT
PB-1541
P2201
J14
μPC14308
μPC14305
Q1
Q2
VR4 500(B)
IC ADJ
INT. SP
SP1
J13
S1
POWER
S2A-1
+13.5V
FT-301D
CIRCUIT DIAGRAM