HIGH—PERFORMANCE HF TRANSCEIVER
YAESU FT-101ZD

GENERAL DESCRIPTION

The FT-101ZD is a precision engineered, high-performance HF transceiver of advanced design, providing all band (160 - 10 meters) operation on SSB, CW, and AM. This transceiver operates at an input power of 180 watts.

Advanced features include digital plus analog frequency display, continuously variable IF bandwidth (300 Hz - 2.4 kHz), a superb noise blanker with threshold adjustment, and an effective RF speech processor. The receiver boasts excellent dynamic range, despite its high sensitivity, for reliable operation in the presence of strong signals.

Built into every FT-101ZD are VOX, semi-break-in CW with sidetone, a 25 kHz crystal calibrator, selectable AGC, and a 10 dB/20 dB RF attenuator in the incoming signal path.

The FT-101ZD has been engineered for use. Controls and switches are laid out in an efficient and logical manner, so you won't have to fumble for a switch or knob when you need it quickly. And Yaesu designers have now made it possible for you to switch sidebands without recalibrating the display.

All circuits, except the transmitter driver and final amplifier stages, are solid state. Solid state devices provide extremely high reliability and high component density, along with low power drain. The FT-101ZD may be operated from a variety of AC voltages, from 100 to 234 volts. A DC-DC converter, providing operation from a 13.5 VDC power source, is an available option.

For the economy FT-101Z, the counter unit is an available option, providing digital display capability should you want to upgrade your transceiver at a later date. Optional equipment on both models FT-101ZD and FT-101Z are the cooling fan, DC-DC converter, 600 Hz CW filter, and microphone.

A diecast front panel, and the heavy-duty case, provide maximum protection for your transceiver. If the ratings of this unit are not exceeded, it will provide the owner with many years of satisfying operation. Please read this manual carefully before commencing operation, in order to derive maximum satisfaction from your new YAESU transceiver.

SPECIFICATIONS

Frequency coverage:

160 m	1.8 - 2.0 MHz
80 m	3.5 - 4.0 MHz
40 m	7.0 - 7.5 MHz
30 m	10.0 - 10.5 MHz
20 m	14.0 - 14.5 MHz
17 m	18.0 - 18.5 MHz
15 m	21.0 - 21.5 MHz
12 m	24.5 - 25.0 MHz
10 m	28.0 - 29.9 MHz

Power requirements:

AC 100/110/117/200/220/234 volts, 50/60 Hz
DC 13.5 volts ± 10%
(DC-DC converter optional)

Power consumption:

AC 85 VA receive
(73 VA HEATER OFF)
330 VA transmit
DC 5.5 amps receive
(1.1 amps HEATER OFF)
21 amps transmit

Size:

345 (W) x 157 (H) x 326 (D) mm

Weight:

Approx. 15 kg.

TRANSMITTER

Emission type:

LSB, USB, CW, AM

Power input:

180 watts DC (SSB, CW)
50 watts DC (AM)

Carrier suppression:

Better than 40 dB

Unwanted sideband suppression:

Better than 40 dB (14 MHz, 1 kHz)

Spurious radiation:

Better than 40 dB down

Transmitter frequency response:

300 - 2700 Hz (–6 dB)

Third order distortion products:

Better than 31 dB down

Transmitter frequency stability:

Less than 300 Hz after 10 minute warmup; less than 100 Hz after 30 minute warmup.

Antenna output impedance:

50 - 75 ohms, unbalanced

Microphone input impedance:

500 - 600 ohms (low impedance)

RECEIVER

Sensitivity:

0.25 μV for S/N 10 dB (SSB, CW)
0.5 μV for S/N 10 dB (AM)

Image rejection:

Better than 60 dB (160 - 12 m)
Better than 50 dB (10 m)

IF rejection:

Better than 70 dB (160, 80, 20 - 10 m)
Better than 60 dB (40 m, 30 m)

Selectivity:

SSB, AM 2.4 kHz at 6 dB down, 4.0 kHz at 60 dB down
CW (with optional CW filter) 600 Hz at 6 dB down, 1.2 kHz at 60 dB down

Bandwidth control:

Continuous from 2.4 kHz to 300 Hz

Audio output impedance:

4 - 16 ohms

Audio output:

3 watts at 10% THD, 4 ohm load

Specifications subject to change without notice.

TUBES AND SEMICONDUCTORS

Vacuum Tubes

12BY7A	1
6146B	2

Transistors

T20A6	2
2SA495	1
2SA496Y	2
2SA564A	3
2SA639	1
2SA733	1
2SA952LB	14
2SB616	1
2SC372Y	15
2SC373	1
2SC380TMY	15
2SC535A	1
2SC732TMGR	1
2SC1000GR	2
2SC1383	1
2SC1583	2
2SC1674	1
2SC1815GR	1
2SC1815Y	6
2SC2407	2
MPSA13	1

Field Effect Transistors

2SK19GR	8
2SK19BL	1
3SK40M	1
3SK51-03	7
3SK73	1
J310	2

Integrated Circuits (IC)

μPA54H	1
μPC7505H	1
μPC78L12	1
μPC14308	1
μPC2002H	1
MC3403P	1
MC14024B	1
MSM9520RS	1
NJM78L05	1
SN76514N	1
SN74LS123N	1
TA7060P	1
TA7063P	1

Germanium Diodes

1N60	11
1S1007 (GB)	12

Silicon Diodes

1S1555	65
10D1	7
10D10	8
V06B	2
1SS53	25

Schottky Barrier Diode

ND487C2-3R (Ring Module)	1

Zener Diodes

WZ061	1
WZ090	2

Varactor Diodes

1S2209	1
1S2236	1
FC63	1

Light Emitting Diodes

GD4-203SRD	9

LED Display

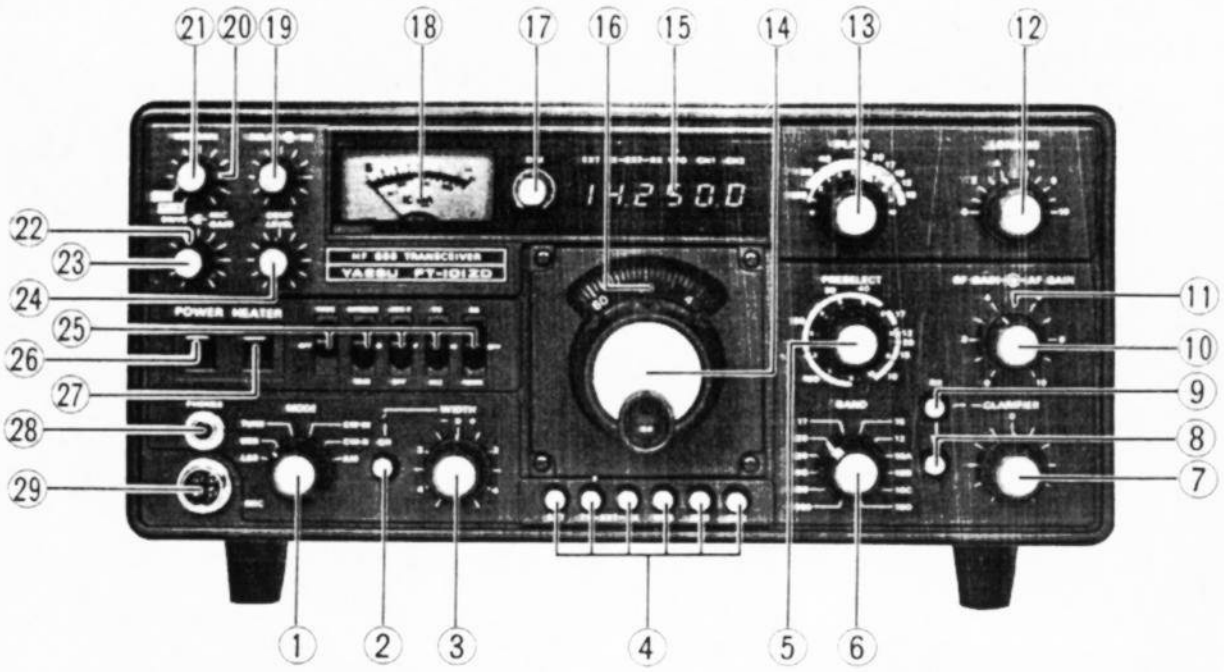
HP-5082-7623	6

FT-101ZD SERIES MODEL CHART

O = BUILT-IN FEATURE X = AVAILABLE OPTION

FEATURE	FT-101ZD	FT-101Z
ALL BAND CRYSTALS	O	O
COUNTER UNIT	O	X
DC-DC CONVERTER	X	X
CW FILTER	X	X
MICROPHONE	X	X
RF PROCESSOR	O	O
COOLING FAN	X	X

CONTROLS AND SWITCHES



(1) MODE

Selection of LSB, USB, CW-W (SSB filter), CW-N (optional CW filter) and AM is provided.

(2) WIDTH ON

When this button is pressed, the variable bandwidth function is activated.

(3) WIDTH

This control varies the IF bandwidth from 2.4 kHz down to 300 Hz. When the WIDTH switch is OFF, the bandwidth is fixed by the filter selected at the MODE switch.

(4) SELECT switches

When using the optional FV-901DM synthesized, scanning external VFO, these switches determine which component will control the transmit, receive, or transceive frequency.

EXT . . . . . This switch, when pressed, shifts control of the transceive frequency to the external VFO.

TX EXT. . . This switch, when pressed, shifts control of the transmit frequency to the external VFO.

RX EXT. . . This switch, when pressed, shifts control of the receive frequency to the external VFO.

VFO . . . . . This switch selects control of the transceive frequency on the FT-101ZD internal VFO.

CH1, CH2. . These switches select optional fixed channels, transceive only.

(5) PRESELECT

The preselector control peaks the RF and IF stages for the frequency in use.

(6) BAND

The bandswitch selects the frequency band in use: 160 - 10 meters.

(7) CLARIFIER

The clarifier control allows offset of ±2.5 kHz from the frequency established by the main tuning dial.

(8) (9) CLARIFIER SELECT switches

Press the RX button for offset of the receive frequency.

Press the TX button for offset of the transmit frequency.

Press both buttons for offset of the transceive frequency.

(10) AF GAIN

The AF GAIN control varies the output level of the audio amplifier stages. Clockwise rotation increases the audio output level.

(11) RF GAIN

The RF GAIN control varies the gain of the RF and IF stages. Clockwise rotation increases the gain of these stages.

(12) LOADING

This control tunes the output circuit of the final amplifier pi network to match the feedpoint impedance of the load.

(13) PLATE

This control tunes the plate circuit of the final amplifier.

(14) MAIN TUNING KNOB

Rotation of this knob selects the operating frequency, in conjunction with the setting of the bandswitch. One revolution of the dial produces a frequency change of approximately 17 kHz.

(15) DIGITAL DISPLAY

The digital display reads out the operating frequency, with resolution to 100 Hz. The display unit is built into the FT-101ZD, and is an available option for the FT-101Z.

(16) ANALOG DIAL

The analog dial allows readout of the operating frequency to better than 1 kHz. The combination of the precision dial mechanism and drive unit provides zero backlash at slow tuning rates.

(17) DIM

This control allows dimming of the meter and dial lamps.

(18) METER

The meter displays final amplifier cathode current (IC), relative power output (PO), and ALC feedback voltage.

(19) NB

This control varies the threshold point for the noise blanker, and should be set to the minimum point that provides the desired blanking action.

(20) DELAY

This control sets the delay time for the VOX relay. For voice-actuated SSB, or semi-break-in CW, the operator may select the delay time most suitable for his or her operating habits.

(21) VOX GAIN

The threshold level for the VOX (voice operated relay) system can be varied using this control. In the PTT position, PTT (push to talk) control is provided, for relay control via the microphone PTT switch or footswitch.

(22) DRIVE

This control sets the carrier level for CW/AM and tuning purposes. When the RF processor is ON, this control varies the RF output on SSB, as well.

(23) MIC GAIN

This control sets the output level of the microphone amplifier stage. Clockwise rotation increases the mic gain level.

(24) COMP LEVEL

This control varies the compression level for the built-in RF speech processor. The processor does not function in the AM mode.

(25) FUNCTION switches

PROC ..... This switch activates the RF speech processor.

ATT ..... This switch allows the insertion of 10 or 20 dB attenuators in the incoming signal path.

AGC S/F/OFF .. This switch allows selection of the desired AGC decay time. In the OFF position, the AGC is switched off, and the S-meter will not function.

PO/IC/ALC .... In the PO position, relative power output is displayed on the meter. In the IC position, final amplifier cathode current is displayed. In the ALC position, ALC voltage is displayed. Regardless of the setting of the meter switch, the meter functions as an S-meter on receive.

NB/MARK ..... In the NB position, the noise blanker is activated. In the MARK position, the internal crystal calibrator is activated.

(26) POWER

This is the main ON/OFF switch for the transceiver.

(27) HEATER

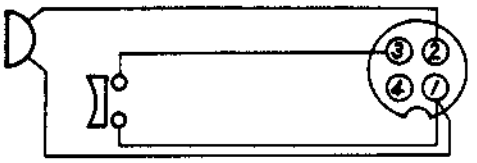
With the HEATER switch on, heater voltage is applied to the driver and final amplifier tubes. This switch may be turned off during periods of RX, when energy conservation is critical.

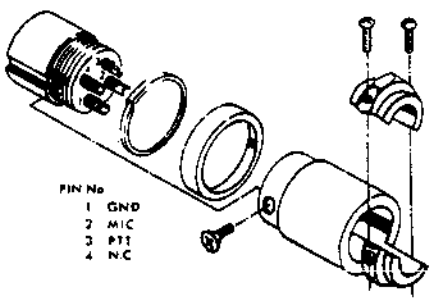
(28) PHONES

This is a standard ¼" phone jack for use with headphones.

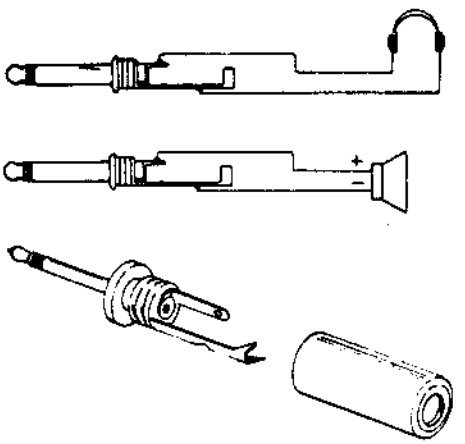
(29) MIC

This is a 4 conductor jack for microphone and PTT input.

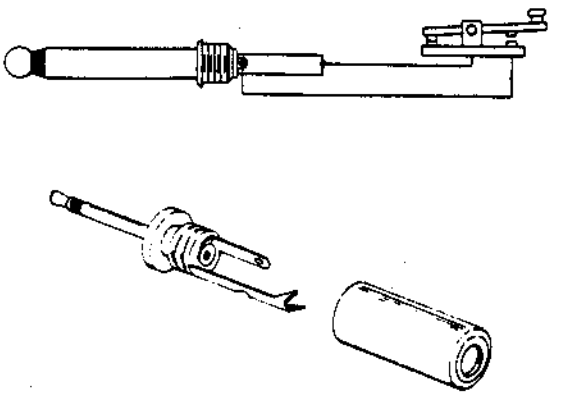




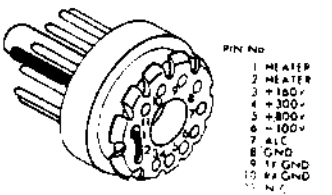
Mic plug



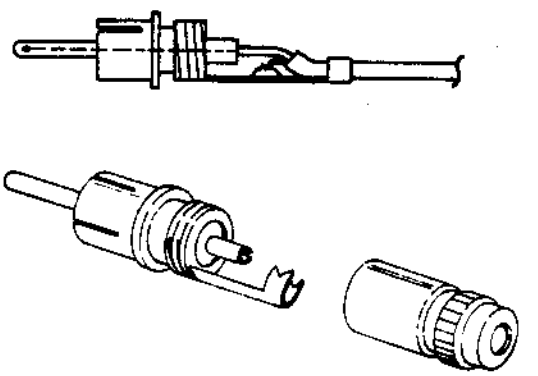
Headphone and external speaker plug



Key plug

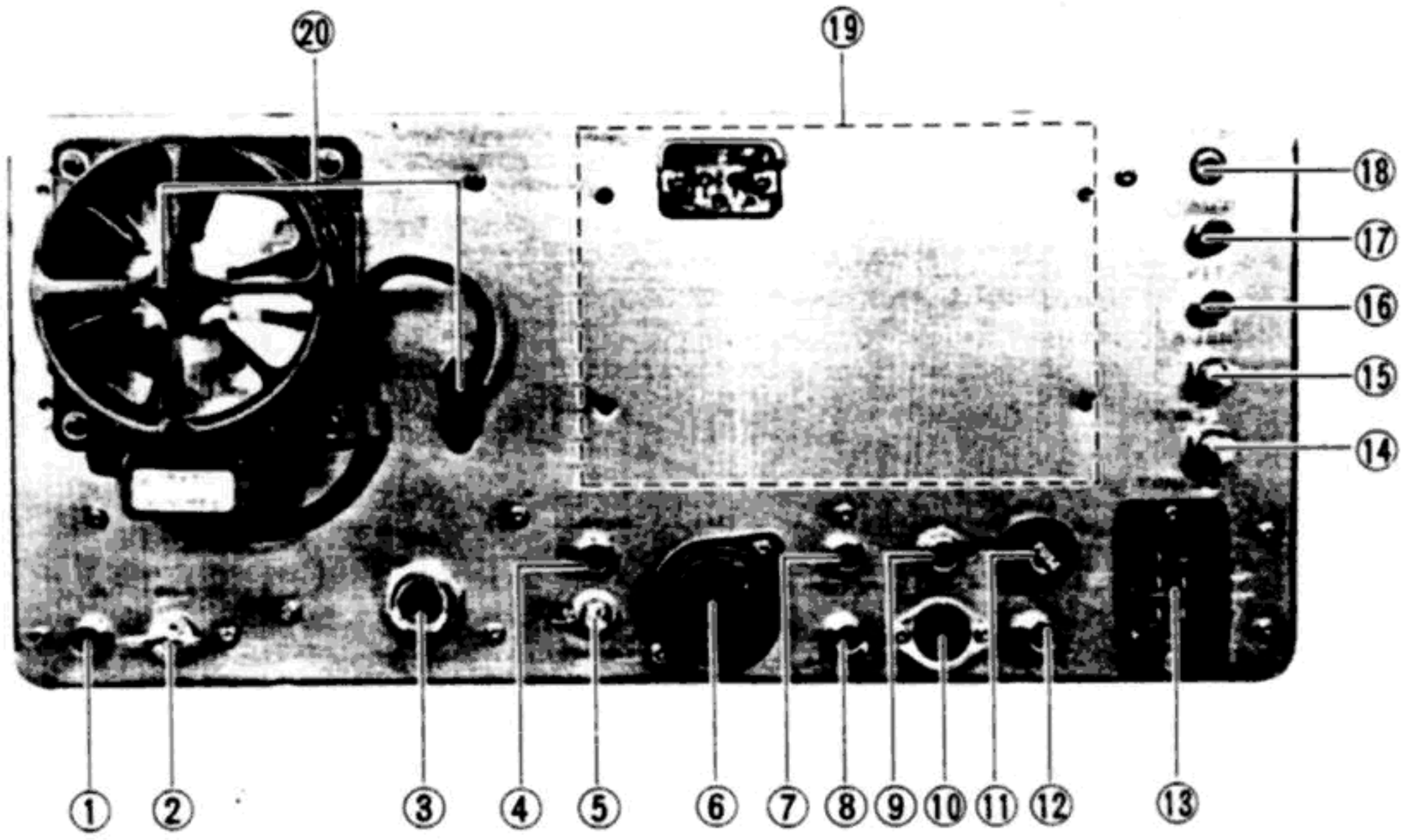


ACC plug



Pin plug

REAR APRON



(1) RF OUT

RF output of 3 volts RMS is available at this jack for use with a transverter. Output is from the driver stage.

(2) GND

For best transceiver performance, as well as protection from electrical shock, a good ground connection should be made at this point, using a heavy, braided wire of the shortest length possible.

(3) ANT

Standard "UHF" connector for the antenna.

(4) RCV ANT

This jack is switched in parallel with the ANT jack on receive, for use with an external receiver.

(5) PO ADJ

This control adjusts the relative power output meter.

(6) ACC

Transceiver operating voltages and relay connections can be accessed through the accessory jack. Please insert the ACC plug at all times, to provide heater voltage for the driver and final amplifier tubes.

(7) TONE OUT

The CW sidetone may be fed to an external receiver through this jack.

(8) A TRIP IN

Anti-trip input from an external receiver may be made via this jack, to prevent the receiver audio output from tripping the FT-101ZD VOX.

(9) KEY

The CW key may be connected at this point. Key-up voltage is 7 volts, and key-down current is 1.5 mA. Be sure your electronic keyer's output switch will handle these levels.

(10) EXT VFO

Connection of an external VFO, such as the FV-101Z or FV-901DM, can be made at this jack.

(11) FUSE

This is the fuse holder. For 100 - 117 volts, replace with only a 5 amp use. For 200 - 234 volts, use a 3 amp fuse. Replace fuses only with a fuse of the proper rating.

(12) IF OUT

Wideband IF output is available at this jack for use with a spectrum analyzer, etc.

(13) POWER

Connect the AC power cord at this point, being certain that your AC supply voltage matches the voltage specification for your transceiver. See the transformer primary connection chart. When using the optional DC-DC converter, the DC supply is connected at this point. DO NOT CONNECT THE AC POWER CORD TO A DC POWER SOURCE. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY SUCH IMPROPER POWER CONNECTIONS.

(14) TONE

This control varies the CW sidetone output level.

(15) A TRIP

This control varies the level of the VOX anti-trip circuit.

(16) PTT

External control of the transceiver PTT (push to talk) system may be made at this jack, for use with a footswitch, etc.

(17) PATCH

Microphone or phone patch input may be made at this jack. Impedance is 500 ohms.

(18) EXT SP

This is a miniature phone jack for speaker output. When a plug is inserted into this jack, the transceiver internal speaker will be cut off. Impedance is 4 - 16 ohms.

(19) DC-DC CONVERTER (OPTION)

The optional DC-DC converter allows operation from a 13.5 volt DC power source.

(20) COOLING FAN (OPTION)

The optional cooling fan keeps the tubes at a safe operating temperature, when they are used in a hot environment. The 2 pin fan power jack supplies 100 volts to the fan.

ACCESSORIES

The following accessories are included with your new transceiver:

(1) AC POWER CORD 1

The power cord comes equipped with a 6-prong connector for connection to the AC supply.

(2) ACC PLUG 1

The accessory plug allows access to relay contacts and transceiver operating voltages. The ACC plug must be inserted in the accessory socket for proper operation of the transceiver, whether or not external connections are being made.

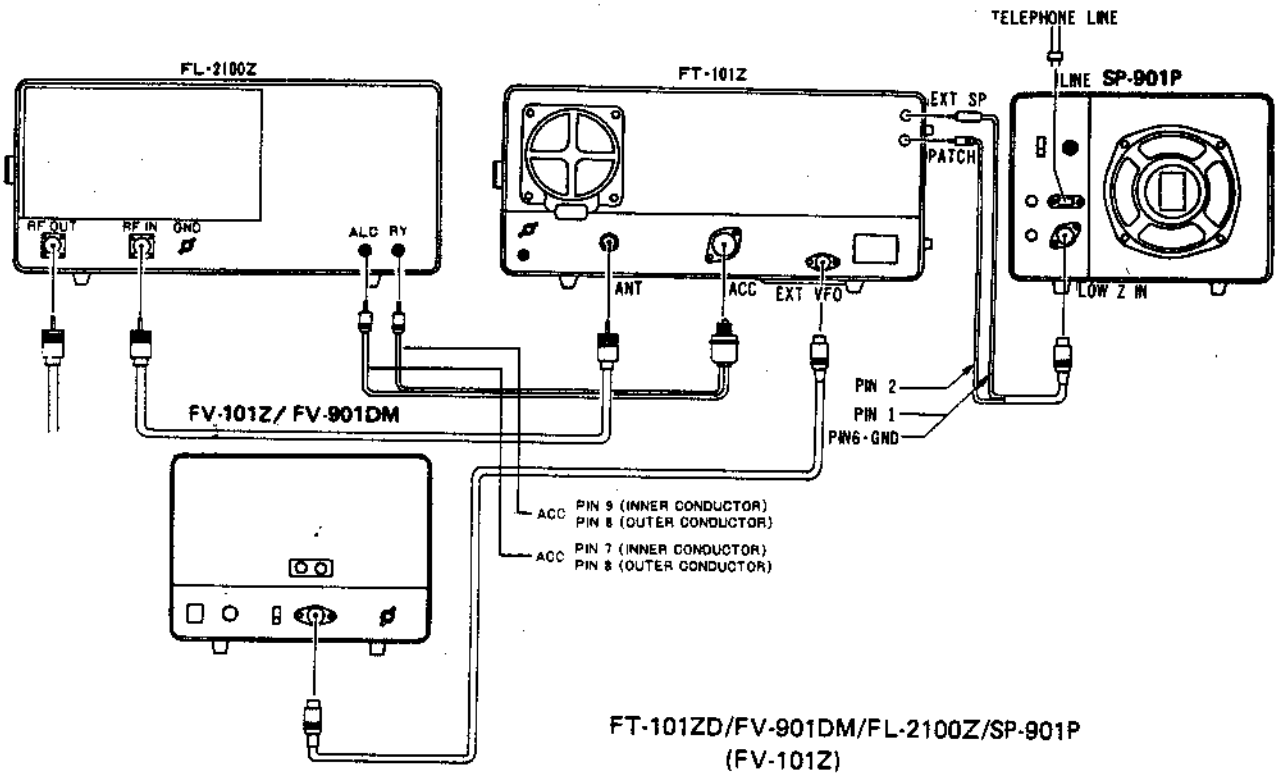
(3) PHONO PLUG 2

Use these plugs for interface with station equipment via the FT-101ZD rear panel.

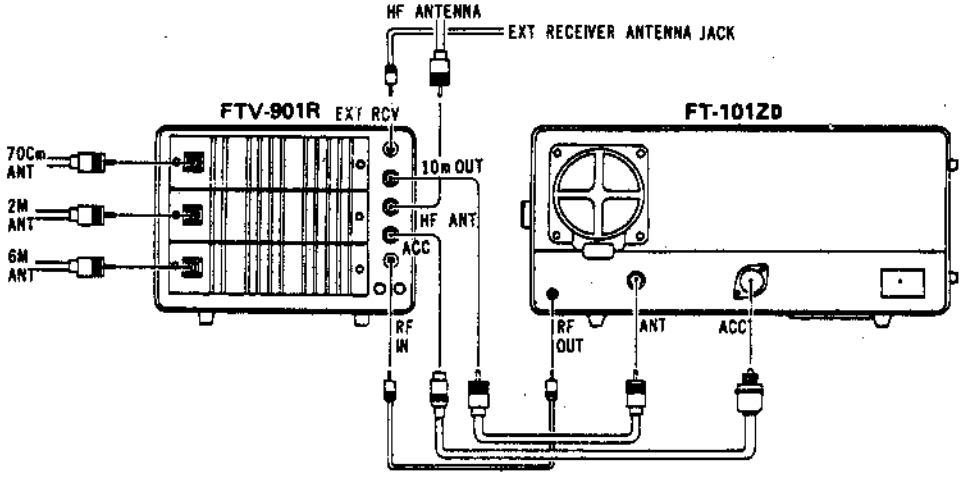
(4) SPARE FUSES 5A (3A) 1 each

When replacing fuses, be absolutely certain to use a fuse of the proper rating. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER FUSE REPLACEMENT. For 100 - 117 volt AC operation, use a 5 amp fuse. For 200 - 234 volt operation, use a 3 amp fuse.

INTERCONNECTIONS



FT-101ZD/FV-901DM/FL-2100Z/SP-901P
(FV-101Z)



FT-101ZD/FTV-901R

INSTALLATION

The FT-101ZD is designed to be a single-unit station for fixed or portable operation from AC power. Power supply connections providing for operation from a variety of source voltages are available. Please read the following sections carefully, so as to ensure proper installation of your new transceiver.

PRELIMINARY INSPECTION

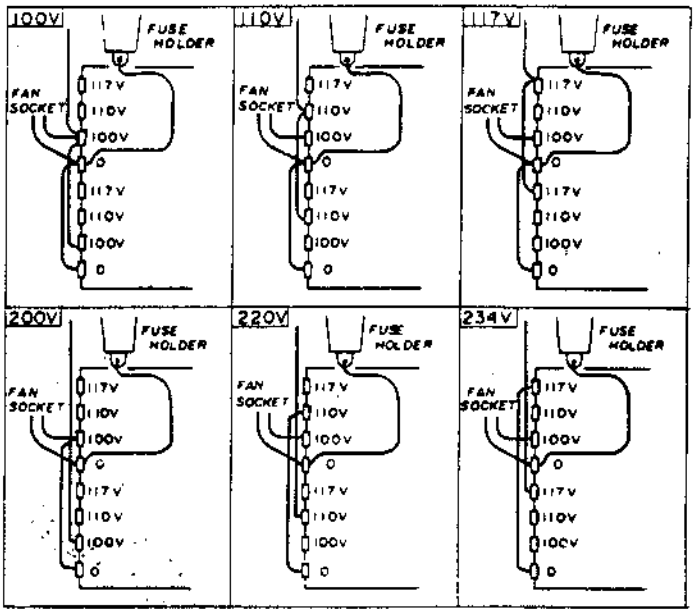
Upon opening the packing carton, immediately give the transceiver a thorough visual inspection. Check to see that all controls and switches are working freely, and inspect the cabinet for any signs of damage. If any damage has been sustained, immediately contact the shipping company, and document the damage completely. Save the packing carton and foam packing material for possible use at a later date.

BASE STATION INSTALLATION

The FT-101ZD is designed for use in many areas of the world, using supply voltages that may differ from your local supply voltage. For this reason, be absolutely certain that the voltage specification marked on the rear of the transceiver agrees with the local AC supply voltage. THIS INSPECTION MUST BE MADE BEFORE CONNECTING THE AC POWER CORD TO THE REAR APRON OF THE TRANSCEIVER.

CAUTION

PERMANENT DAMAGE WILL RESULT IF IMPROPER AC SUPPLY VOLTAGE IS APPLIED TO THE TRANSCEIVER. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY APPLICATION OF IMPROPER SUPPLY VOLTAGE. DO NOT CONNECT THE AC POWER CORD TO A DC POWER SOURCE.



The transceiver should be connected to a good earth ground. The ground lead should be made of a heavy, braided wire, and should be connected to the GND terminal on the rear apron of the transceiver.

MOBILE INSTALLATION

(Note: The DC-DC converter described herein is optional equipment. See your Yaesu dealer.)

When the optional DC-DC converter is installed, the FT-101ZD will operate satisfactorily from a 13.5 volt DC power source capable of providing the required current. The DC power cord is included with the DC-DC converter kit.

For under-dash mobile mounting, a special mobile mounting bracket is an available option for your transceiver. The FT-101ZD should be located away from heater ducts, and a minimum of two inches of air space on all sides is recommended, to allow proper air flow around the cabinet. Never stack other units above or below the FT-101ZD, as the accumulated heat from both units could cause damage.

The transceiver requires an average of 14 amps on transmit, with 20 amps on voice peaks. The DC power cable comes equipped with a 20 amp fuse. Be certain to use only a 20 amp fuse when making replacement.

When making battery connections, be absolutely certain that the RED lead is connected to the POSITIVE battery terminal, and the BLACK lead is connected to the NEGATIVE battery terminal. Reversed connections could cause permanent damage to the transceiver. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER SUPPLY CONNECTIONS.

It is recommended that the power connections be made directly to the battery, instead of to the ignition switch, etc. The battery provides considerable filtering action against ignition noise, and connection to the ignition switch can place the power line in a noisy circuit. Keep the power lead as short as possible, and keep the lead away from ignition cables.

Before connecting the DC power cable to the transceiver, check the battery voltage with the engine running (battery charging). If the voltage exceeds 15 volts DC, the vehicle voltage regulator should be adjusted, so as to limit the highest charging rate to less than 15 volts. As well, do not operate the transceiver if the DC supply voltage is less than 12 volts. The transceiver should always be turned off when the car is started, to prevent voltage transients from damaging the power supply components.

ANTENNA CONSIDERATIONS

The FT-101ZD is designed for use with an antenna system presenting a 50 - 75 ohm resistive load at the antenna jack. While the transmitter output circuitry is designed for uniform response within this impedance range, significant departures from the 50 - 75 ohm specification will result in seriously degraded transceiver performance, and may result in damage to the final amplifier tubes.

If an open-wire feedline is used, or if the input impedance of the antenna system presents a higher or lower impedance than specified, some sort of antenna tuner must be used to provide the proper impedance for the transceiver. See your Yaesu dealer for details of the FC-902 antenna coupler.

For mobile operation, most of the commercially-available antennas will provide satisfactory results, if care is taken to tune the antenna for minimum SWR. The outer conductor of the coaxial cable should be securely grounded to the automobile chassis at the antenna mount. See your Yaesu dealer for details on the RSL series of mobile antennas.

OPERATION

The tuning procedure for this transceiver is not complicated. However, care should be exercised when tuning so that peak performance of the equipment is secured. The following paragraphs describe the procedure for receiver and transmitter tuning.

INITIAL CHECK

Before connecting the transceiver to the power source, be certain that the voltage specification marked on the rear of the transceiver matches your local supply voltage, and also confirm that a fuse of the proper rating is being used.

FREQUENCY SELECTION

Frequency readout on the FT-101ZD is by digital as well as analog displays. The FT-101Z uses analog display only. The analog readout dial provides resolution to 1 kHz, while the FT-101ZD digital display provides resolution to 100 Hz. The digital display may be added to the FT-101Z as an option. See your Yaesu dealer for details.

RECEIVE OPERATION

(1) Preset the controls and switches as follows:
POWER . . . . . OFF
HEATER . . . . OFF
VFO. . . . . Switch pushed
VOX GAIN . . PTT position
RF GAIN . . . . Fully clockwise
AF GAIN . . . Adjust later for comfortable level
BAND . . . . . Desired band
MODE . . . . . Desired mode
PRESELECT . Desired band segment
AGC. . . . . OFF
ATT. . . . . OFF
MARK/NB . . . OFF

(2) Turn the power switch to ON. The meter will light up, and the operating frequency will be displayed on the dial window (FT-101ZD). Adjust the AF GAIN control for a comfortable listening level, and adjust the PRESELECT control for maximum receiver noise or signal level. The PRESELECT control may require repeaking as the transceiver is tuned across the band.

(3) The RX CLARIFIER may be utilized if the received signal is drifting. Push the RX button, and rotate the CLARIFIER control for offset of up to 2.5 kHz. A red LED indicator will light up when the clarifier is in use.

(4) When pulse-type noise is encountered, the NB (Noise Blanker) switch should be activated. Advance the noise blanker level control (located on the front panel) to the point which provides the desired blanking. Do not advance the level control beyond the point required to eliminate the noise pulses.

(5) For varying the width of the IF passband, press the WIDTH button, and rotate the WIDTH control. In the IF, two 8-pole crystal filters are used. One filter is fixed, and presents a boundary for the bandwidth. The center frequency is then varied across the passband of the second filter, using a mixing scheme that provides no change of pitch in the received signal.

The result is continuously variable bandwidth, from 2.4 kHz down to approximately 300 Hz. When the WIDTH switch is turned OFF, the second IF filter is instantly aligned with the first filter, returning the receiver to a 2.4 kHz bandwidth.

(6) For extremely strong signals, the ATT (attenuator) switch may be activated, providing 10 dB or 20 dB of attenuation on the incoming signal path, depending on the position of the ATT switch.

TRANSMITTER TUNING

The following tuning procedure must be performed prior to commencing operation on the desired mode. See the paragraphs relating to the specific mode after basic transmitter tune-up has been accomplished.

Be certain that a dummy load or matched antenna is connected to the antenna receptacle on the rear apron of the transceiver. It is possible to damage the final amplifier components of this equipment if this simple precaution is not followed prior to commencing transmission.

Do not exceed 10 seconds of key-down time while tuning.

As well, be certain that the ACC plug is inserted into the rear apron ACC jack. Without this plug, there will be no power applied to the tube heaters. Heater voltage is applied through pins 1 and 2 of the accessory socket.

(1) Preset the controls and switches as follows:
MODE ..... TUNE
DRIVE ..... Fully counterclockwise
DELAY ..... Fully counterclockwise
MIC GAIN..... Fully counterclockwise
COMP LEVEL ... Fully counterclockwise
HEATER ..... ON
PROC ..... OFF
PO/IC/ALC IC
PLATE ..... Set to desired band segment
LOADING 0
PRESELECT ..... Peaked on receive for maximum response
TX CLARIFIER .. OFF (button not pushed)

(2) Turn the HEATER switch ON, and wait 1 minute for the tube heaters to warm up.

(3) Set the VOX GAIN switch to the MOX position. Observe the reading on the IC meter: it should read 50 mA with no drive applied. If it is not, adjust the PB-1968 BIAS control for a resting current of 50 mA on the IC meter. Refer to the BIAS Adjustment on Page 37. Be certain that the DRIVE control is fully counterclockwise for this adjustment.

(4) Set the VOX GAIN switch to MOX. Advance the DRIVE control for a reading of 150 mA.

(5) Peak the PRESELECT control for a maximum meter reading. If the meter reading exceeds 150 mA, reduce the setting of the DRIVE control.

(6) Rotate the PLATE control for a minimum reading ("dip") on the IC meter. Return the transceiver to the receive mode by rotating the VOX GAIN switch out of the MOX position.

LOADING POSITIONS

BAND	FREQUENCY	POSITION
160m	1.8MHz	2.5
	2.0MHz	6.0
80m	3.5MHz	3.0
	4.0MHz	6.0
40m	7.0MHz	6.0
	7.5MHz	6.5
30m	10.0MHz	7.0
	10.5MHz	8.0
20m	14.0MHz	3.0
	14.5MHz	4.0
17m	18.0MHz	2.0
	18.5MHz	2.0
15m	21.0MHz	2.0
	21.5MHz	2.5
12m	24.5MHz	3.0
	25.0MHz	3.0
10m A	28.0MHz	2.0
10m B	28.5MHz	2.0
10m C	29.0MHz	2.0
10m D	29.5MHz	2.0

NOTE: LOADING positions are nominal. Minor variations from positions shown are to be expected.

FINAL TUNING

Final transmitter tuning uses the relative power output setting of the METER switch. At full rated output, using a 50 ohm load, the PO meter will indicate between 1/2 and 2/3 of full scale deflection. If the PO reading is too high (off scale) or too low (1/4 scale or less), and if the load impedance is very close to 50 ohms, the PO ADJ control on the rear apron may be varied to provide the proper deflection. Once the PO meter is calibrated, off-scale deflections are the result of reflected power (high SWR), and corrective action may be required in the antenna system.

Set the controls as follows for final tuning:

(1) Set the METER switch to PO. Rotate the DRIVE control to the 9 o'clock position.

(2) Rotate the VOX GAIN control to the MOX position, and rotate the PRESELECT control for a maximum meter reading.

(3) Rotate the LOADING control for a maximum meter reading. Rotate the PLATE control for a maximum meter reading.

(4) Again rotate the LOADING control and PLATE control, each time advancing the

DRIVE control approximately 2 steps, until the DRIVE control is fully clockwise. The transmitter is now tuned for maximum power output. Do not exceed the maximum tuning time stipulated previously. Return the VOX GAIN switch to the VOX position (out of the MOX position), return the METER switch to IC, and return the DRIVE control to the fully counterclockwise position.

SSB OPERATION

After completing the above tuning procedure, set the MODE switch to USB or LSB as desired. Set the VOX GAIN control to PTT, and activate the transmitter by pushing the microphone PTT switch or the footswitch, if used. With the METER switch set to the ALC position, speak into the microphone in a normal voice. Advance the MIC GAIN control until the meter kicks up to the midscale of the green-colored portion of the meter scale.

Note: When the METER switch is set to IC, voice modulation peaks will indicate 150 - 200 mA. Actual peak current, though, is approximately 2 times the indicated value.

To set the sensitivity of the VOX (voice-operated T/R switching) system, advance the VOX GAIN control slowly while speaking into the microphone. Advance the VOX GAIN control to the point where the speech signal activates the transmitter.

Set the antitrip potentiometer on the rear apron to the minimum point which prevents the speaker output from tripping the VOX. Do not use more VOX gain nor antitrip than is necessary. Adjust the front panel DELAY control for the desired relay recovery time.

RF SPEECH PROCESSOR ADJUSTMENT

The FT-101ZD RF speech processor, when correctly adjusted, will improve the intelligibility threshold at the receiving end, by increasing the average SSB power output. RF clipping is applied to the IF signal, which is then filtered to remove harmonics and out of band intermodulation products. RF envelope clipping causes much less distortion than that caused by an equivalent amount of AF clipping, and the result is an output signal with more "punch".

Set the PROC switch to OFF, and set the MIC GAIN control as described previously (voice peaks falling within the green zone of the ALC meter scale). Now set the PROC switch to ON, and set the COMP LEVEL control to the 10 o'clock position. Advance the DRIVE control so that the desired power output is obtained, and be sure that the ALC meter indication is within the green zone.

With the RF speech processor activated, the ALC meter indication may not be quite as high as when the processor is off. This is entirely normal, because the average power output is higher with the processor, although the peaks are being clipped.

Setting the COMP LEVEL control up to the 3 o'clock position will provide up to 10 dB of compression. Advancing the control beyond the 10 o'clock point may, however, degrade the voice-to-noise ratio, so caution is recommended.

CW OPERATION

After completing the tuning procedure, insert the key line into the KEY jack on the rear panel.

The operator may select any power output desired by advancing the DRIVE control. Once the maximum power output level has been reached, the DRIVE control should not be advanced further.

The transmitter may be activated by the VOX circuit, or by the PTT or MOX systems. The TONE control on the rear apron of the transceiver sets the CW sidetone level.

The key-up voltage at the key jack is 7 volts, and the key-down current is 1.5 mA.

For receiving, two positions of selectivity are provided. When the optional CW filter is installed, the operator may select between the 600 Hz bandwidth of the CW filter and the 2.4 kHz bandwidth of the SSB filter. The WIDTH control may be used with either position of the MODE switch: CW-W or CW-N.

AM OPERATION

AM operation of the transmitter is accomplished by setting the MODE switch to the AM position and inserting the proper amount of carrier with the DRIVE control.

After completing basic transmitter tune-up, place the MODE switch in the AM position. Activate the transmitter, and rotate the DRIVE control until the meter reads .10 (100 mA) in the IC position of the METER switch. While speaking into the microphone in a normal voice, increase the MIC GAIN control until the meter indicates very slight movement with voice peaks. Care must be exercised that the DRIVE control is not advanced too far. Do not exceed .10 (100 mA) meter indication during AM operation or damage to the transmitter final amplifier tubes may result.

SELECT SWITCHES

The SELECT switches allow selection of internal or external VFO frequency control, as well as selection of up to 2 optional crystal-controlled channels.

When the crystal-controlled channels are installed, they may be selected by pressing CH1 or CH2, as desired. See the crystal information elsewhere for full information on crystal requirements.

The external VFO, FV-101Z and FV-901DM, which provide versatile operations with your FT-101ZD, are available from your Yaesu dealer.
Because there is no calibrated dial for the FV--901DM, it can't be used with the analog FT -101Z.

For transceive frequency control on the external VFO, press EXT. For external VFO control of the transmit frequency, with receive frequency control on the FT-101ZD, press TX EXT. For receive frequency control on the external VFO, and transmit frequency control on the FT-101ZD, press RX EXT. For full transceive control on the FT-101ZD, press VFO.

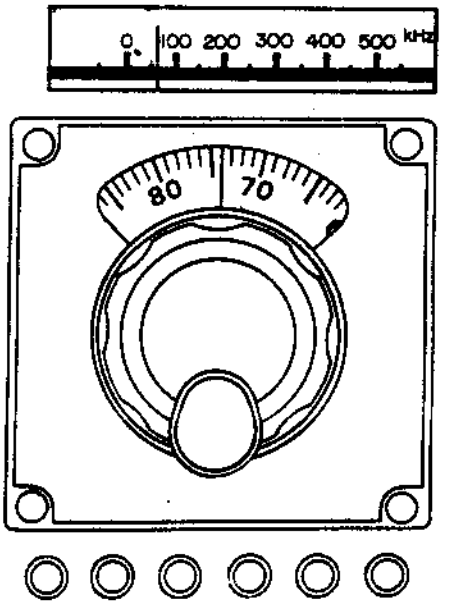
DIAL CALIBRATION AND FREQUENCY DETERMINATION

The FT-101ZD mixing scheme accounts for the difference in carrier frequencies between USB and LSB. For this reason, no recalibration is required. Once the calibration is properly aligned (at the factory, or in shop), no further adjustment is required for accurate frequency derivation. The 25 kHz calibrator is included largely for alignment purposes, as it provides a useful reference signal for signal peaking, etc.

Frequency readout on the FT-101ZD digital display is straightforward. The full operating frequency is displayed, with resolution to 100 Hz.

The analog display on the FT-101Z and FT-101ZD transceivers provides easy determination of the operating frequency. The frequency displayed on the analog sub dial (and the main display window, for the FT-101Z) is added to the lower band edge frequency.

For example, if the analog dial indicates 074, as shown in the example, and the BAND switch is on 40 meters (lower band edge: 7000 kHz), the operating frequency will be 7074 kHz. By rotating the BAND switch, this position of the analog display will produce 14074 kHz for 20 meters, 21074 for 15 meters, etc. For 80 and 12 meters, the lower band edges are 3500 kHz and 24500 kHz, while for 160 meters the band edge is 1.5 MHz. Therefore, the dial should read 074 to produce 3574 kHz, but 374 for 1874 kHz. Be careful so as not to operate outside the amateur bands.



FIXED CHANNEL CRYSTAL INFORMATION

Two fixed channels may be used with your FT-101ZD, using optional crystals. Crystals are available from your Yaesu dealer. Crystals must meet the specifications shown in Table 2 , and must fall within the operating range 5500 - 5000 kHz. Frequency calculation is made from the formula

$$F_X = F_1 - F_0$$

where F_X is the crystal frequency
F_1 is a constant derived from Table 1
F_0 is the operating frequency.

For example, let us say it is desired to operate on 7199 kHz LSB. Referring to Table 1, we see that for 40 meter LSB, F_1 is 12501.5 kHz. Subtracting F_0 (7199 kHz) from F_1 (12501.5 kHz) yields 5302.5 kHz, the crystal frequency (F_X).

For operation on 21420 kHz USB, compute the crystal frequency as follows:
$F_X = 26498.5 - 21420 = 5078.5$ kHz.

Inspection of the values of F_1 in Table 1 will reveal that the 7199 kHz crystal for LSB will work on 14199 kHz, 21199 kHz, etc. Of course, LSB is not normally used on these bands. If the operator switches to USB, the operating frequency will be moved 3 kHz (in this case, to 14196 kHz, 21196 kHz, etc.). If the move is made from LSB to CW, the frequency will move 2.3 kHz down.

MODE / BAND	U S B	L S B	C W
160m	6998.5	7001.5	6999.2
80m	8998.5	9001.5	8999.2
40m	12498.5	12501.5	12499.2
30m	15498.5	15501.5	15499.2
20m	19498.5	19501.5	19499.2
17m	23498.5	23501.5	23499.2
15m	26498.5	26501.5	26499.2
12m	29998.5	30001.5	29999.2
10m A	33498.5	33501.5	33499.2
10m B	33998.5	34001.5	33999.2
10m C	34498.5	34501.5	34499.2
10m D	34998.5	35001.5	34999.2

Table 1

Type	HC-25/U
Load Capacitance	30pF
Series Resistance	25 Ohms or less
Static Capacitance	7pF or less
Drive Level	5mW

Table 2

CW FILTER INSTALLATION (OPTION)

(1) Remove the top cover of the transceiver case, as shown in Fig. 1.

(2) Refer to Fig. 2, and locate the NB-FIX circuit board. Remove its mounting screws, because this board is obstructing the removal of the IF unit.

(3) Remove the 12-pin, 13-pin, and 15-pin plugs from their sockets on the IF unit. Remove the IF unit mounting screws, and remove the IF unit from the transceiver case.

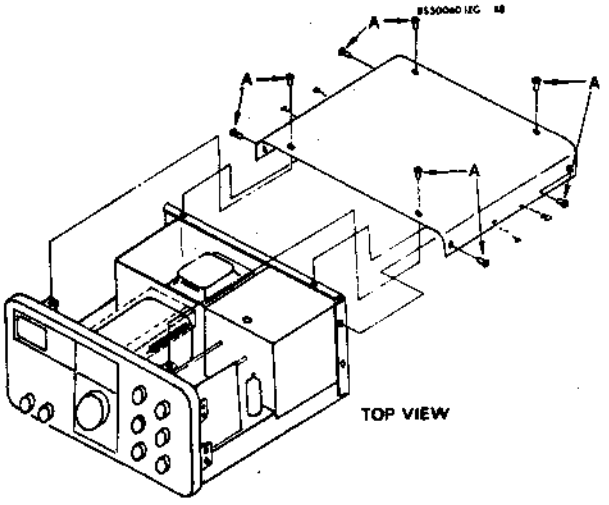


Figure 1

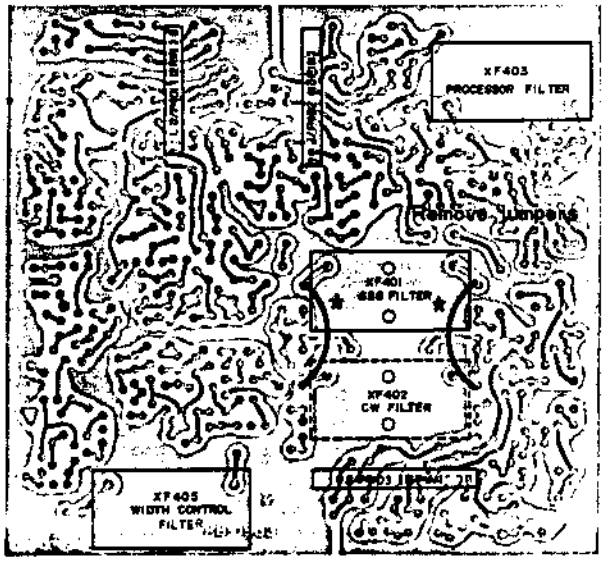


Figure 3

(4) Install the optional CW filter as shown in the foil side view of the IF unit (Fig. 3). Make the fastening nuts snug, and solder the pins of the filter to the circuit board, and remove the 2 jumper wires shown in Figure 3.

(5) Re-install the IF unit, being careful to connect the 12-pin, 13-pin, and 15-pin plugs in the correct sockets. Refer to Fig. 2 to be sure. Re-install the NB-FIX unit, and replace the top cover of the transceiver.

(6) When the optional CW filter is installed, the CW-N position of the mode switch will activate this filter. In the CW-W position, the SSB 2.4 kHz filter will be in use. The WIDTH control is usable in all modes.

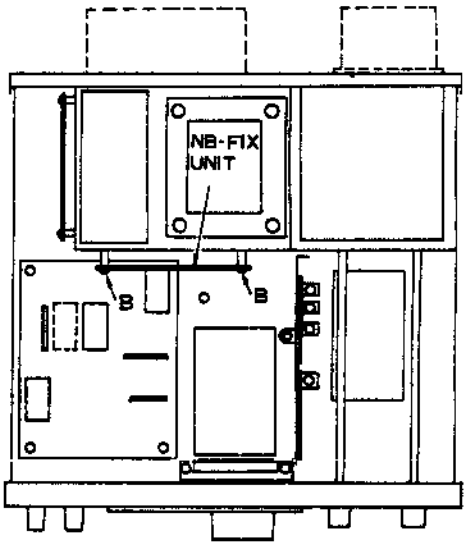


Figure 2

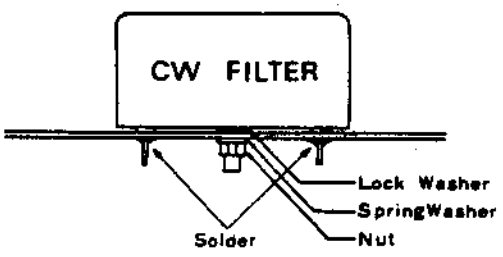


Figure 4

DC-DC CONVERTER INSTALLATION (OPTION)

The optional DC-DC converter is easy to install in a matter of minutes. Please follow the instructions carefully, in order to make the proper connections.

(1) Install the DC-DC converter module as shown in the drawing. Use the four screws supplied with the kit. Do not force the plug into the socket, as the connection should be smooth, yet solid.

(2) Check the DC cable fuse socket, located in the positive (red) lead, to be certain that a 20 amp fuse is installed.

(3) When making connections to the battery, be absolutely certain that the proper polarity is observed. The RED lead should be connected to the POSITIVE (+) battery terminal, and the BLACK lead should be connected to the NEGATIVE (−) terminal. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY REVERSED POLARITY CONNECTIONS.

(4) Before connecting the DC power cable to the transceiver, check the automobile voltage regulator level with the engine running (battery charging). The maximum charging rate should be 15 volts or less. If the voltage is higher than this level, please adjust the voltage regulator for a maximum of 15 volts. This precaution applies, as well, to bench power supplies, which should be adjusted in the same fashion. Also, the transceiver should not be operated from a supply voltage of less than 12 volts.

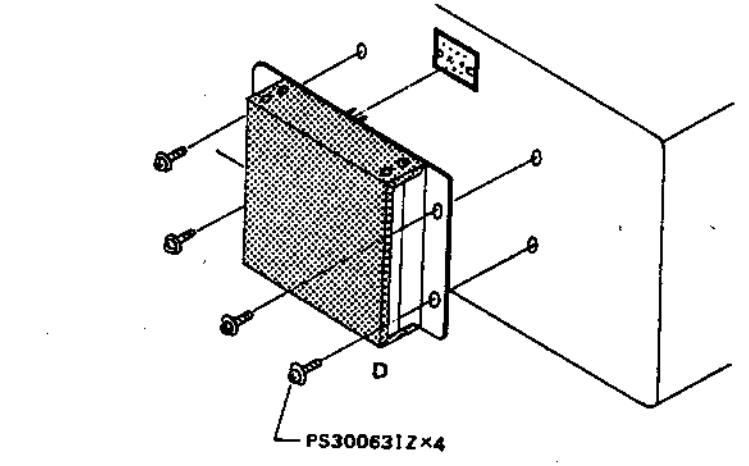
(5) Connect the DC cable to the transceiver. Power connections are made automatically when the DC cable is connected to the POWER jack.

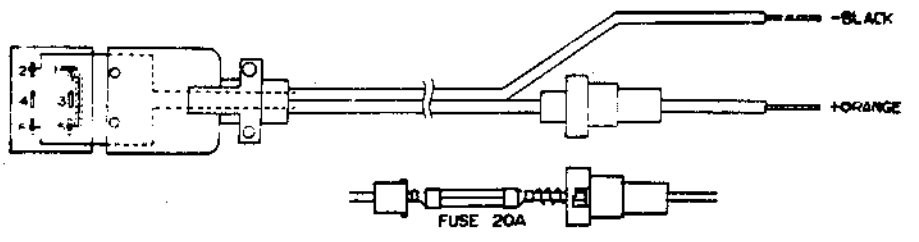
NOTES ON MOBILE INSTALLATION

Be certain that sufficient room is provided for free air circulation around the transceiver. If the transceiver must be placed on the car seat, set it on a board or other rigid object, in order to provide the necessary air circulation (and to avoid possible heat damage to the uphoulstery.

A special mobile mounting bracket is available from your YAESU dealer.

The DC supply should be capable of providing 20 amps on voice peaks, 14 amps continuous. The HEATER switch may be turned off during long periods of reception, for energy conservation.



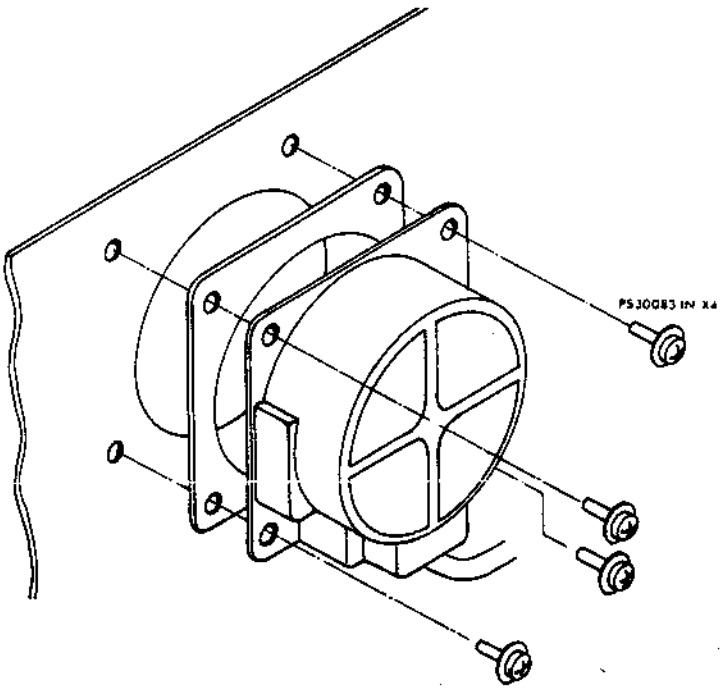


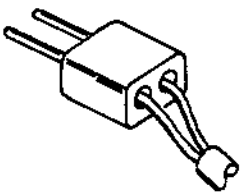
COOLING FAN INSTALLATION (OPTION)

The FT-101ZD cooling fan may be used with other models of Yaesu equipment. Installation is easily accomplished in minutes.

Hold the fan up to the rear panel in its proper location. Determine the proper length of the two-wire power lead to the motor. Solder the leads to the 2-pin plug supplied with the fan. The 4-pin plug is not needed for FT-101ZD installation.

Install the fan onto the rear panel of the transceiver, as shown in the drawing. Insert the power lead from the fan into the fan socket on the rear panel.





Fan plug

COUNTER UNIT INSTALLATION ON FT-101Z

This section will deal with the installation of the COUNTER UNIT and digital display, which are optional equipment for the economy FT-101Z model.

PARTS NEEDED

Optical Filter with double-face tape	(1)
Counter Module	(1)
Guide Pins	(2)
Support Tower	(1)
Vinyl Tubes	(2)

(1) Remove the top cover of the transceiver, according to the drawing on page 17.

(2) Remove the screws marked "A" in Figure 1. These screws support the LED board.

(3) Remove the screws marked "B" in Figure 1, as well as the tension spring, and remove the analog display panel.

(4) Locate the analog display lamp. Cut the leads to this lamp, insert 1 lead each into the vinyl tube supplied with the counter kit, and position these leads out of the way of the VFO gears, etc.

(5) Install the orange optical filter on the inside of the front panel of the transceiver, in the position formerly occupied by the analog display panel. Be sure that it is correctly centered. The filter is held in place by the double-face tape included with the filter.

(6) Install the two guide pins into the holes previously occupied by the "A" screws. When doing this, install the LED board in its previous position. Install the support tower into the hole marked "C" in Figure 1.

(7) Remove the 820 ohm (Gray-Red-Brown) resistor from the terminal strip marked "E" in Figures 1 and 2.

(8) Install the COUNTER UNIT. The connection to the guide pins should not be forced. Use the screws previously installed at "A" for securing the counter module at points "C" (support) and "D" in Figure 1. Connect the COUNTER UNIT 9-pin plug into the 9-pin socket on the transceiver at point "G" in the drawing. The coaxial cable from the COUNTER UNIT is connected to point "F" in Figure 1.

(9) Close the transceiver. No alignment of the unit is necessary, unless some change in the preset carrier frequencies is required for a special application. In this case, refer to the section on the COUNTER UNIT in the "ALIGNMENT" chapter of this manual.

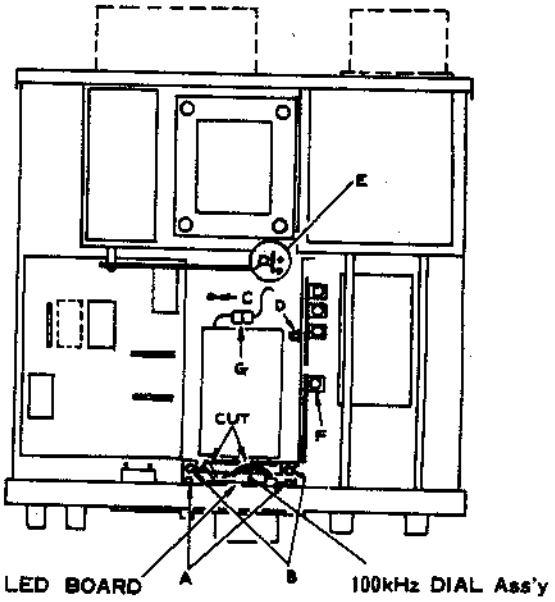
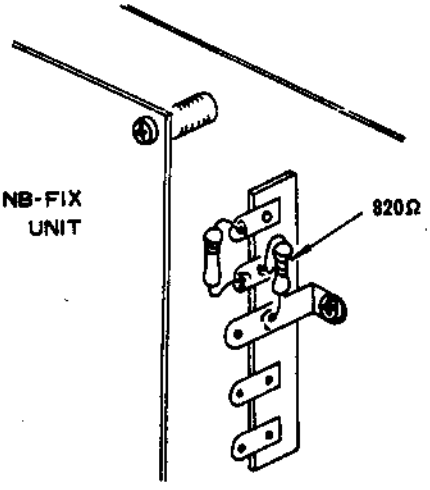


Figure 1



(Enlarged) Part E

Figure 2

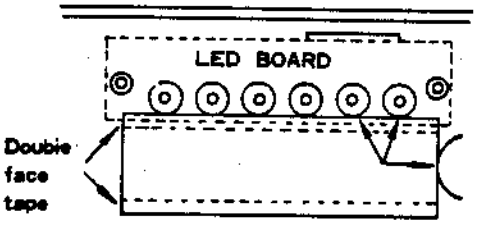
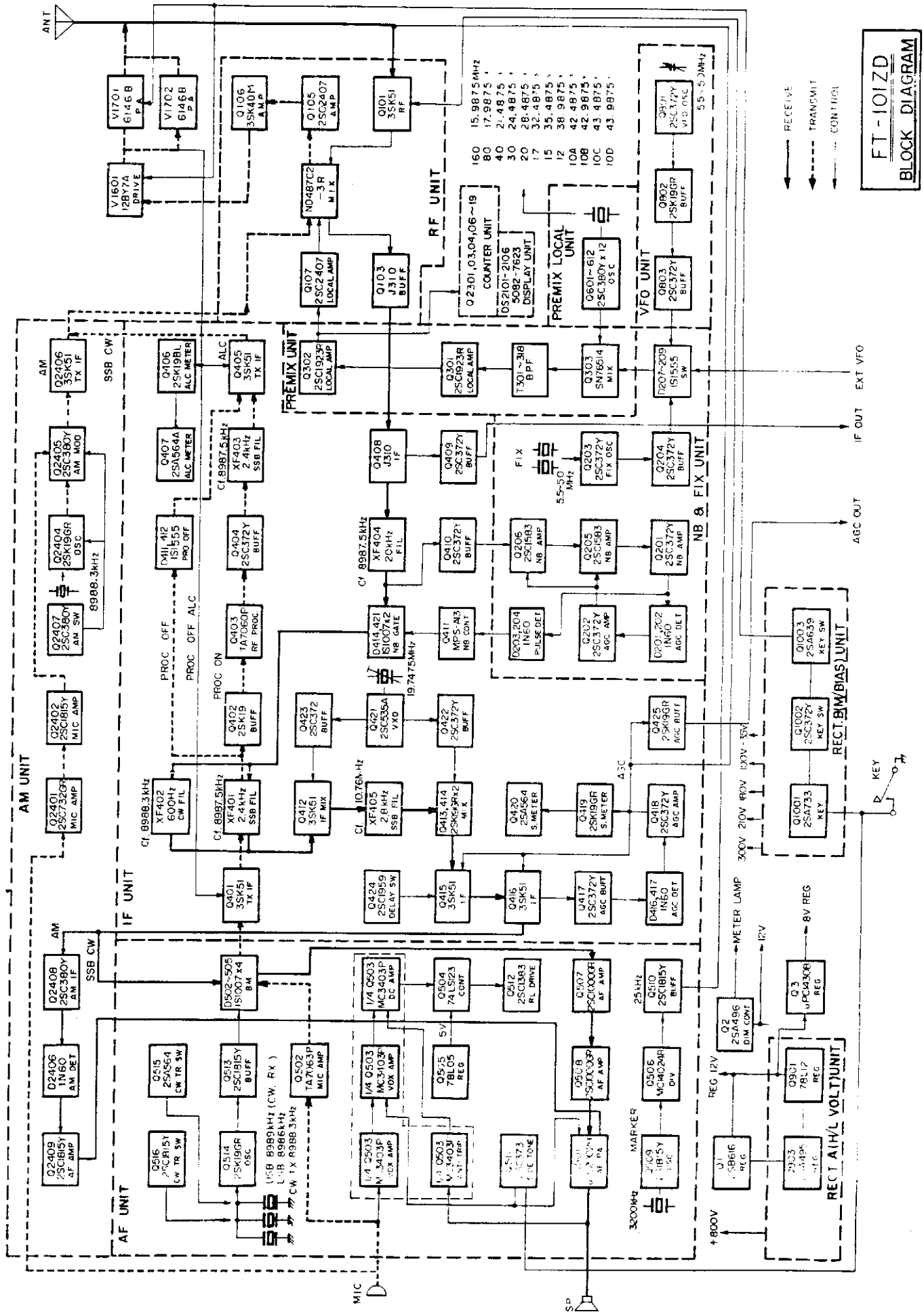


Figure 3



CIRCUIT DESCRIPTION

The block diagram and following circuit description will provide you with a better understanding of the design of this transceiver. The circuit description is tailored to the full-feature FT-101ZD, and the reader should note that the counter unit and digital display are optional features for the FT-101Z.

The FT-101ZD consists of a premix-type single conversion system, using a 9 MHz IF for all modes of operation.

RECEIVER

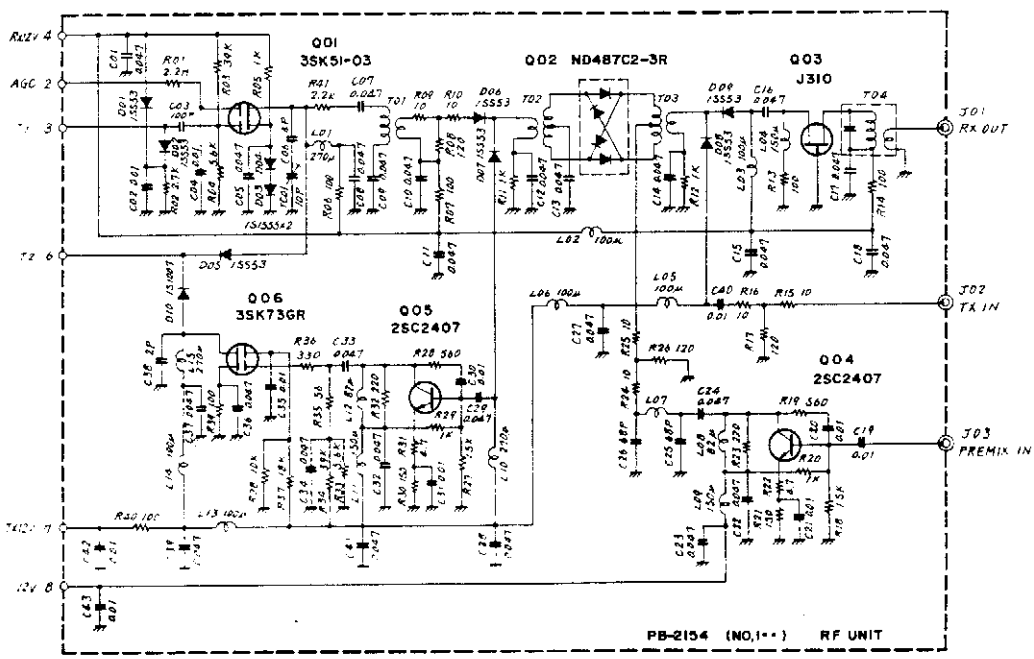
The RF input signal from the antenna is fed through antenna relay RL_2, lamp fuse FH_2, attenuator switch S_{2004} (located on the LEVER SW unit, PB-1975), 9 MHz trap L_{2101} and C_{1207} (located on the TRIMMER A UNIT), and input transformer T_1 to pin 3 of the RF UNIT.

RF UNIT (PB-2154)

The incoming signal is amplified by the RF amplifier, Q_{101} (3SK51-03), a dual-gate MOS FET with excellent rejection of cross modulation and intermodulation. The amplified signal is fed to the Schottky barrier diode module, Q_{102} (ND487C2-3R), where the RF signal is mixed with a local signal delivered from Q_{104} (2SC2407), resulting in a first IF of 8.9875 MHz. The IF signal is then amplified by Q_{103} (J310) and fed to J_{101}.

IF UNIT (PB-1963)

The IF signal at pin 9 of J_{403} is amplified by Q_{408} (J310) and passed through a monolithic filter, XF_{404}, which has a ±10 kHz bandwidth. The monolythic filter provides early protection from IMD, while providing a wide-bandwidth point for noise blanking. The IF signal is then fed to noise blanker gate D_{404} (1S1007), which functions as an ON/OFF switch controlled by noise blanker driver Q_{411} (MPSA13).



The IF signal is then passed through the SSB filter XF_{401} (or optional CW filter XF_{402}). Selection of the filter to be used is made by diodes D_{405} - D_{408} (**1S1007**), depending on the mode of operation.

The IF signal is then fed to the IF first mixer, Q_{412} (**3SK51-03**), where the incoming signal is heterodyned with a 19.7475 MHz ±Δf local signal delivered from crystal oscillator Q_{421} (**2SC535A**) and buffer amplifier Q_{423} (**2SC372Y**), resulting in a signal of 10.76 MHz ±Δf.

The new 10.76 MHz ±Δf signal is fed through filter XF_{405} to the IF second mixer, Q_{413}/Q_{414} (**2SK19GR**), where the filtered signal is heterodyned with the 19.7475 MHz ±Δf signal delivered from Q_{422} (**2SC372Y**), resulting in an 8.9875 MHz IF signal, the same as the original IF.

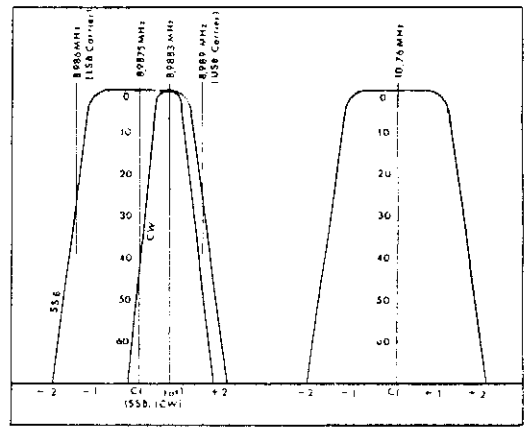
This process varies the IF signal across the passband of the second IF filter. The combination of the two filters, XF_{401} and XF_{405}, provides continuously variable width of the IF passband. The frequency of crystal oscillator Q_{421} is varied by varactor diode D_{418} (**1S2209**).

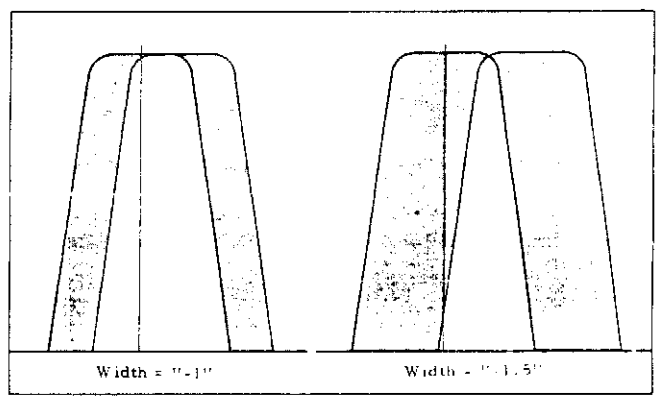
The output from the IF second mixer is fed to a two-stage IF amplifier, consisting of Q_{415} and Q_{416} (**3SK51-03**), and delivered through diode switch D_{401} (**1S1555**) to the AF UNIT.

A portion of the output from Q_{416} is rectified by D_{416} and D_{417} (**1N60**) to produce AGC voltage. Q_{417} (**2SC372Y**) provides the necessary buffering between the IF and AGC circuits. The AGC voltage is amplified by Q_{418} (**2SC372Y**), and applied to gate 2 of the RF and IF amplifiers, to control the gain of these stages. The AGC voltage is also amplified by Q_{419} (**2SK19GR**) for S-meter indication.

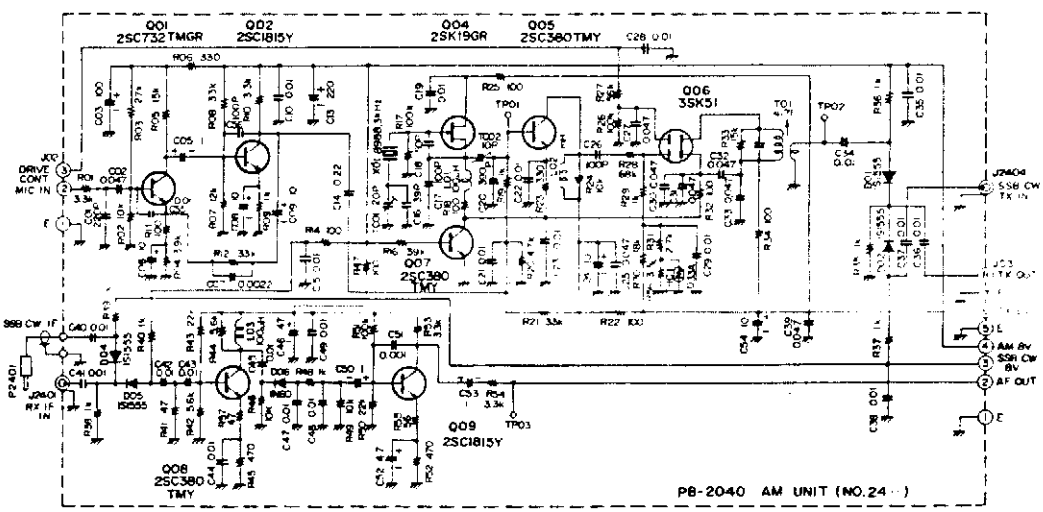
For use with the FV-101Z or FV-901DM scanning VFO, or other optional equipment, the AGC voltage is fed through buffer Q_{425} (**2SK19GR**) and fed to the AGC OUT terminal on the EXT VFO jack, located on the rear panel.

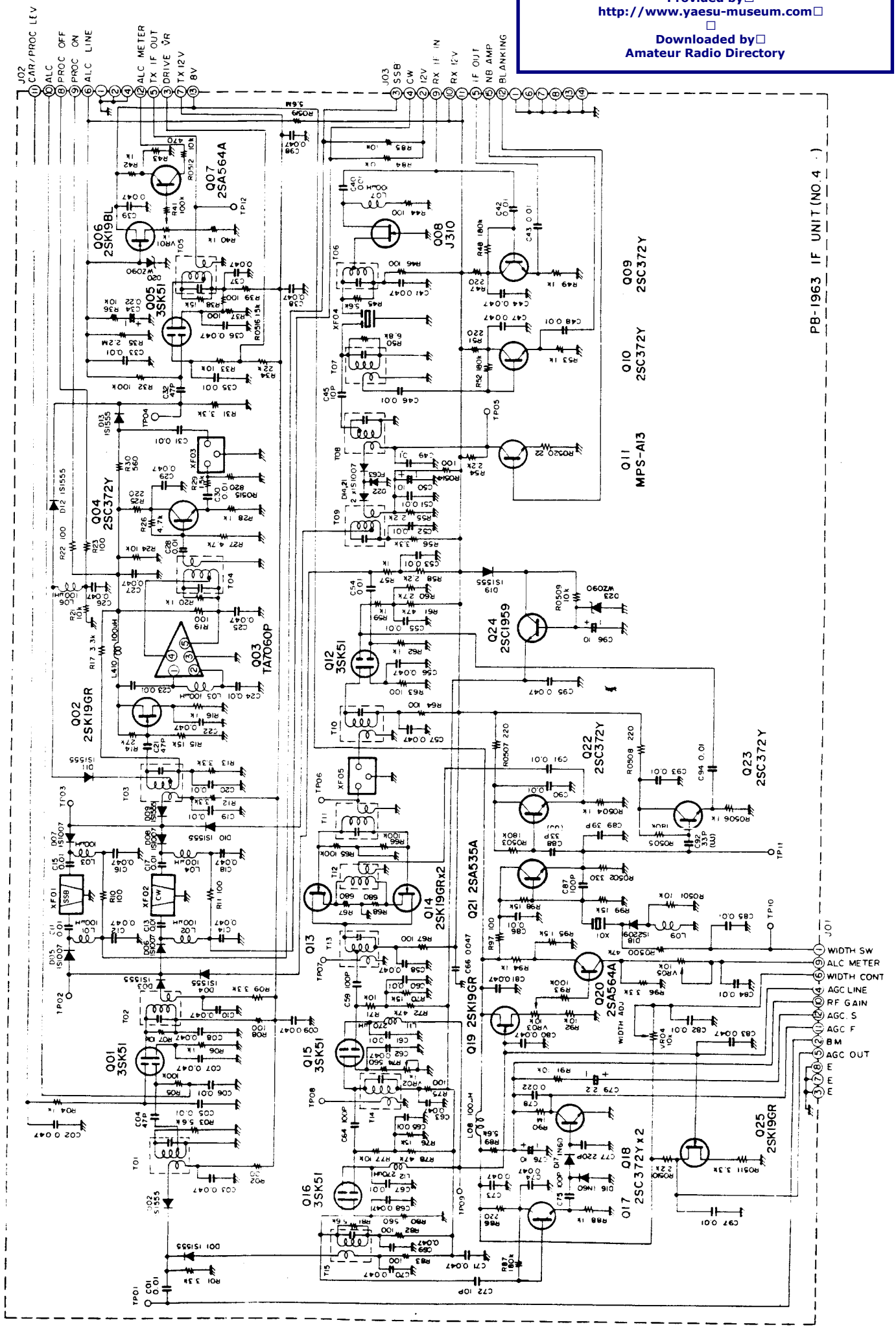
On AM, the output signal from Q_{416} is amplified by Q_{2408} (2SC380Y) and passed to the AM detector, D_{2406} (1N60). The resulting audio signal is amplified by Q_{2409} (2SC1815Y) and delivered to the final audio stage.





Width Control Action





NB-FIX UNIT (PB-1961)

A portion of the 8.9 MHz IF signal is fed through buffer Q_{410} (2SC372Y) and amplified by Q_{206} and Q_{205} (2SC1583).

When a carrier of noise-free modulated signal is received, the IF signal is rectified by D_{201} and D_{202} (1N60), producing a DC voltage. This DC voltage is amplified by Q_{202} (2SC372Y), which charges C_{214}, for AGC purposes. The AGC voltage is used to control the gain of Q_{206} and Q_{205}.

When impulse-type noise is received, D_{203} and D_{204} (1N60) rectify the IF signal, producing a DC voltage which controls the NB switch Q_{411} (2SC372Y).

Noise pulses have a very short duration, but high amplitude. Because of the very slow time constant of the C_{214}/R_{212} discharge path, AGC voltage is not induced by these short-duration pulses. Therefore, Q_{206} and Q_{205} operate at full gain, providing maximum voltage to the base of Q_{411}. When a pulse is received, Q_{411} biases D_{414} to block the signal path momentarily. When a desired signal and a noise pulse are received simultaneously, the blanking action is not impaired, because the relative amplitude difference between the desired signal and the noise pulse is still high. The front panel noise blanker level control varies the DC voltage applied to the base of Q_{411}.

AF UNIT (PB-1964)

The IF signal from pin 2 is fed through T_{501} to the ring demodulator, consisting of D_{502} - D_{505} (1S1007), where the IF signal is demodulated into audio, using the carrier signal delivered from Q_{503} (2SC1815Y). The carrier signal is generated by oscillator Q_{514} (2SK19GR), and it oscillates at one of the following frequencies:

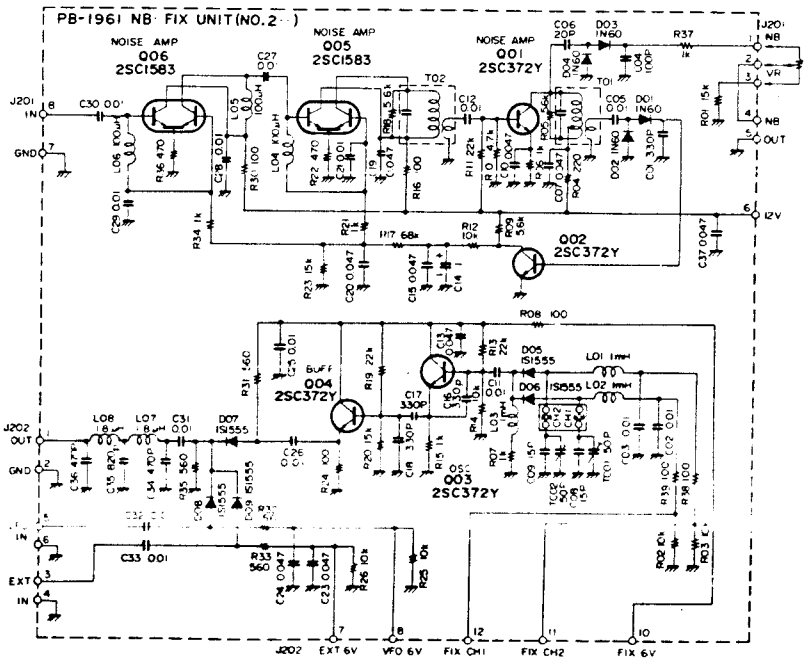
USB, CW-RX	8989 KHz
LSB	8986 KHz
CW-TX	8988.3 KHz

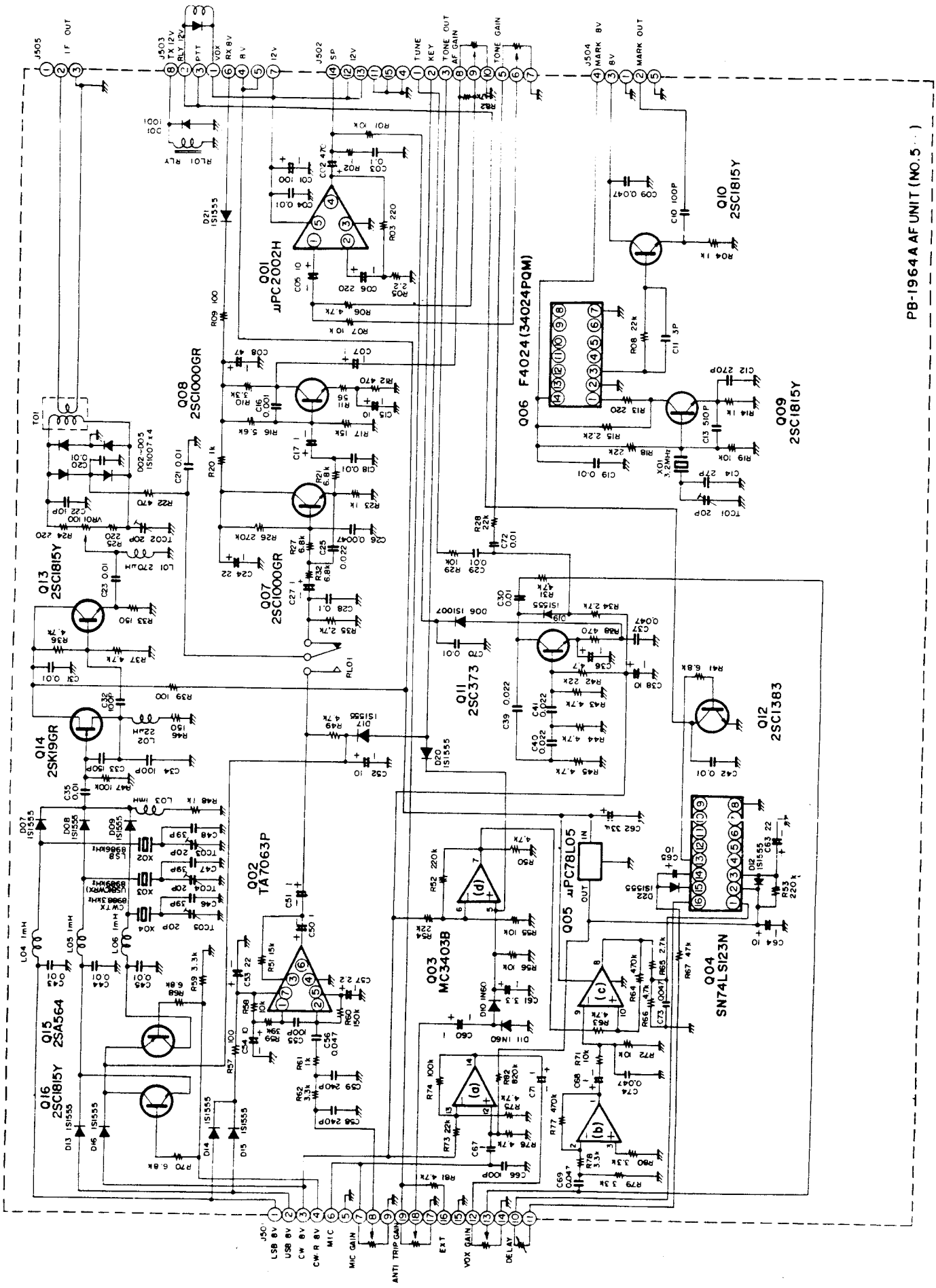
The audio signal is then amplified by audio amplifiers Q_{507}, Q_{508} (2SC1000GR), and Q_{509} (μPC2002), delivering 3 watts of audio output to the speaker.

The audio spectrum is shaped by an active low-pass filter of f_0 = 2.7 kHz, −12 dB/octave.

MARKER GENERATOR

A 25 kHz marker signal is provided, for alignment and testing purposes. Marker generator Q_{509} (2SC1815Y) generates a basic 3200 kHz signal, which is divided into 25 kHz multiples by Q_{506} (MC14024B), a binary counter.




PB-1964A AF UNIT (NO.5)
Q01 μPC2002H
Q02 TA7063P
Q03 MC3403B
Q04 SN74LS123N
Q05 μPC78L05
Q06 F4024(34024PQM)
Q07 2SC1000GR
Q08 2SC1000GR
Q09 2SC1815Y
Q10 2SC1815Y
Q11 2SC373
Q12 2SC1383
Q13 2SC1815Y
Q14 2SK19GR
Q15 2SA564
Q16 2SC1815Y
J501 LSB 8V
USB 8V
CW 8V
CW R 8V
MIC
MIC GAIN
ANTI TRIP GAIN
EXT
VOX GAIN
DELAY
J502 SP
TUNE
KEY
TONE OUT
AF GAIN
TONE GAIN
J503 TX 12V
RLY 12V
PTT
VOX
RX 8V
8V
12V
J504 MARK 8V
8V
MARK OUT
J505 IF OUT

TRANSMIT CIRCUIT

SSB MODE

The output from microphone jack J_2 is fed through the MIC GAIN control VR_{3a} to pin 8 of the AF UNIT.

AF UNIT (PB-1964A)

The speech signal from pin 8 is amplified by microphone amplifier Q_{502} (TA7063P) and fed through relay RL_{501} to the ring modulator, D_{502} - D_{505}, where the speech signal modulates the carrier signal delivered from Q_{513}. The resulting double sideband signal is fed to the IF UNIT.

IF UNIT (PB-1963)

The 8.9875 MHz double sideband signal is amplified by Q_{401} (3SK51-03) and passed through sideband filter XF_{401} by diode switches D_{403}, D_{409} (1S1555), D_{405}, and D_{407} (1S1007). Here the signal is converted to a single sideband signal by removal of the unwanted sideband.

The signal is then fed to buffer amplifier Q_{402} (2SK19GR). When the RF speech processor is OFF, diode switches D_{411} and D_{412} (1S1555) feed the IF signal to IF amplifier Q_{405} (3SK51-03). When the RF speech processor is ON, the SSB signal is amplified by buffer amplifier Q_{402} (2SK19GR) and further amplified by limiter Q_{403} (TA7060P), where signals that exceed the preset clipping level are sliced out.

This highly clipped SSB signal is amplified by buffer amplifier Q_{404} (2SC372Y) and passed through a selective filter, XF_{403}, which removes RF harmonics that result from signal clipping. The signal is then fed to IF amplifier Q_{405}, and subsequently delivered to the RF UNIT. The front panel COMP LEVEL control, VR_4, controls the voltage at gate 2 of Q_{401}, thus setting the processor level.

The return of the grid circuit of the final amplifier tubes is fed to Q_{406} (2SK19BL), which produces ALC voltage. This voltage is fed to gate 1 of Q_{405}, controlling the gain of this stage. When the RF processor is off, ALC voltage is also fed to gate 1 of Q_{401}. Q_{407} (2SA564) amplifies the ALC voltage for indication on the front panel meter.

RF UNIT (PB-2154)

The IF signal from J_{102} is delivered to the Schottky barrier diode module Q_{102} (ND487C2-3R), where the IF signal is mixed with a local signal delivered from Q_{104} (2SC2407), producing the RF output signal. The RF signal is then amplified by Q_{105} (2SC2407) and Q_{106} (3SK40M), and fed through diode switch D_{110} (1S1007) to the DRIVE UNIT.

DRIVE UNIT (PB-1714), PA UNIT (PB-1715)

The RF signal is amplified by driver V_{1601} (12BY7A), and delivered to PA UNIT final amplifier tubes V_{1701} and V_{1702} (6146B). The output from the final tubes is fed to the antenna jack.

A portion of the RF signal is coupled through C_{14} to the cathode of the 12BY7A driver, for the purpose of improving the linearity of the final amplifier. This technique is known as RF negative feedback.

CW MODE

For CW, the 8.9883 MHz carrier is generated by oscillator Q_{514} at the frequency set by X_{504}. The carrier signal is fed through buffer Q_{513} and fed to the ring modulator. The same carrier frequency is used in the tune mode.

DC voltage is applied through diode switch D_{517} (1S1555) and relay RL_{501}, unbalancing the ring modulator for CW operation. The carrier signal is then fed to the IF UNIT. The signal path is identical to that on SSB, up to the DRIVE UNIT.

DRIVE UNIT (PB-1714), PA UNIT (PB-1715)

Keying of the transmitter is accomplished by changing the bias voltage to the driver and final tubes. During "key up," the tubes are cut off by application of −35 volts to V_{1601} and −110 volts to V_{1701} and V_{1702}. These cutoff voltages are

reduced to −0.1 volt and −60 volts, respectively, during "key down" conditions.

The key is connected to the KEY 2 terminal on the RECT B board, PB-1968. When the key is closed, the base of Q_{1001} (2SA733) is grounded, causing Q_{1002} (2SC372Y) to conduct. The base of Q_{1003} (2SA639) is thus set to 0 when the transistor conducts. Under these circumstances, the bias voltage applied to V_{1601}, V_{1701}, and V_{1702} places these tubes in the normal operating condition.

VOX circuit

A portion of the microphone input signal is amplified by three stages of Q_{503} (MC3403P), which drive the VOX control gate, Q_{504} (SN74LS123N). The output from pin 13 of Q_{504} is fed to the base of Q_{512} (2SC1383), switching the VOX relay on and off according to the presence or absence of a speech signal.

A portion of the speaker output is detected by D_{510} and D_{511} (1N60), providing a bucking voltage which is fed to Q_{503}, preventing the speaker output from tripping the VOX.

The VOX delay may be set by adjusting VR_{2b} for the desired delay time.

CW SIDETONE

CW sidetone oscillator Q_{511} (2SC373) oscillates at a frequency of approximately 800 Hz. The output from Q_{511} is amplified by the final audio amplifier, Q_{501}, for delivery to the speaker. The output from the sidetone oscillator is also fed to VOX amplifier Q_{503}, providing semi-break-in operation for CW.

AM MODE

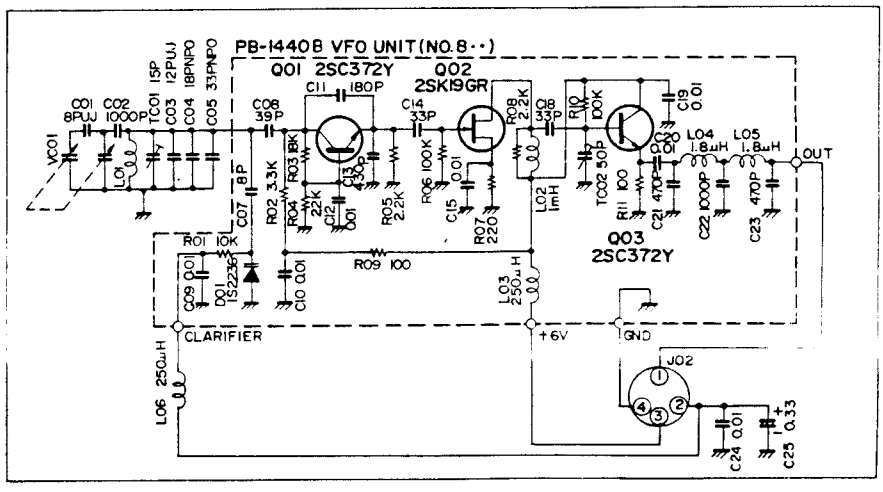
The speech signal from the microphone is amplified by Q_{2401} (2SC732GR) and Q_{2402} (2SC1815Y) and passed to modulator Q_{2405} (2SC380Y), where the speech signal modulates the AM carrier signal at 8988.3 kHz delivered from Q_{2404} (2SK19GR). The modulated signal is amplified by Q_{2406} (3SK51) and delivered to transmit mixer Q_{105}/Q_{106}.

COMMON CIRCUITS

VFO UNIT (PB-1440B-3420)

A modified Colpitts-type oscillator is used to generate a 5.0 - 5.5 MHz VFO signal, thus producing a 500 kHz tuning range. The oscillator signal generated by Q_{801} (2SC372Y) is varied by VC_{801}, which is geared to a precision-built dial tuning mechanism. VC_{801} consists of two sections; the sub-blades compensate for the capacitance variation of the main blades, which may result from extreme temperature change.

Varactor diode D_{801} (1S2209) may be varied by tuning L_{806}, providing ±2.5 kHz offset from the dial frequency (clarifier).



The VFO signal is amplified by buffer amplifiers Q_{802} (2SK19GR) and Q_{803} (2SC372Y), and passed to the PREMIX UNIT.

NB & FIX UNIT (PB-1961)

Two crystal-controlled channels are provided for operation with this transceiver. The oscillator signal is generated by Q_{203} (2SC372Y) and amplified by Q_{204} (2SC372Y), and delivered to the PREMIX UNIT. Crystals X_{201} and X_{202} oscillate in the 5.0 - 5.5 MHz range.

PREMIX LOCAL UNIT (PB-2153)

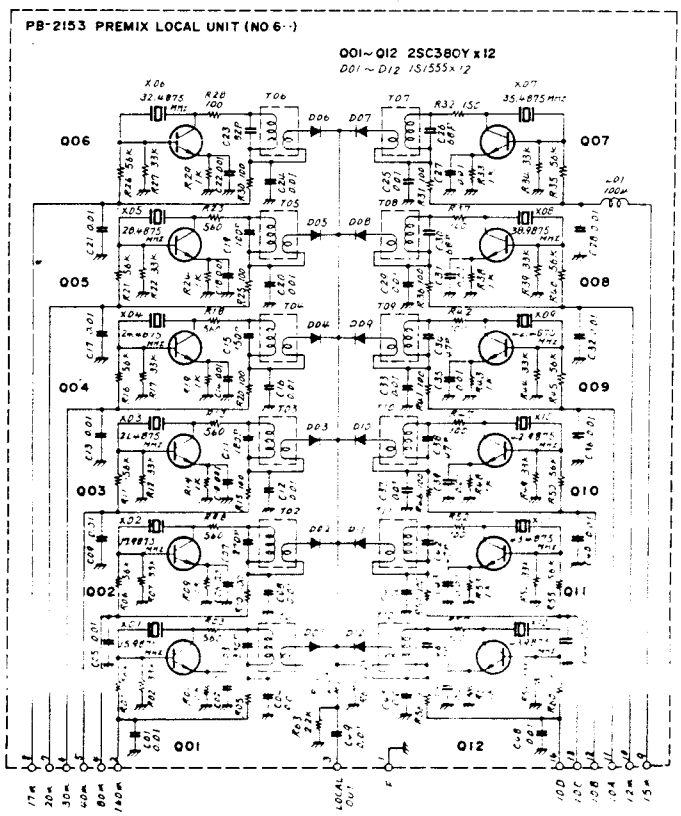
Crystal oscillators Q_{601}–Q_{612} (2SC380Y) generate the premix local signal at the frequencies shown in Table 3. Diode switches D_{601}–D_{612} (1S1555) select the proper local signal for the band in use. The local signal is then delivered to the PREMIX UNIT.

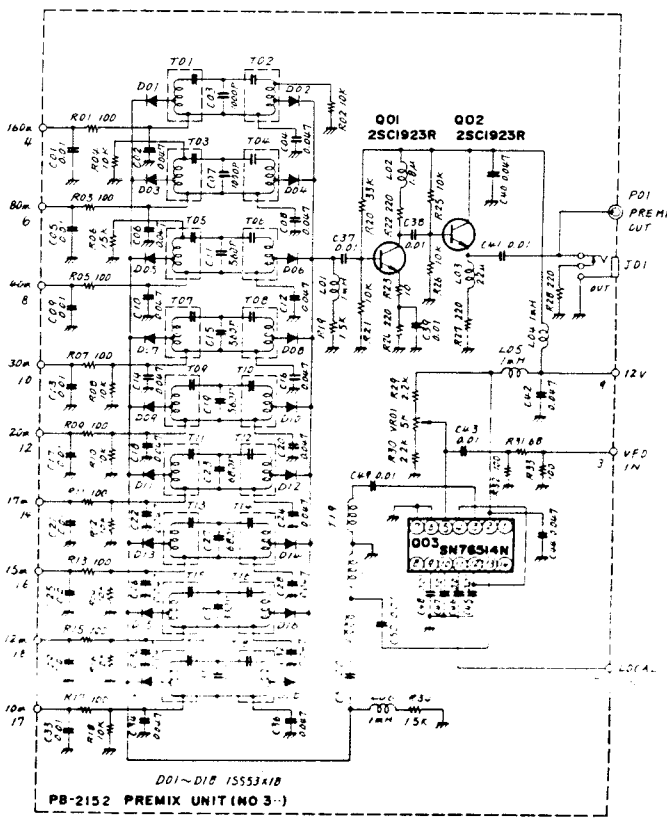
PREMIX UNIT (PB-2152)

The premix signal is produced at Q_{303} (SN76514N), a double-balanced mixer, where the premix local signal from Q_{601}–Q_{612} is mixed with the VFO or crystal controlled 5 MHz signal. The premix output frequencies are shown in Table 3. The premix signal is passed through bandpass filter T_{301}–T_{304}, and amplified by Q_{301}, Q_{302} (2SC1923R). The amplified signal is then fed to the RF UNIT, where the signal is further amplified by Q_{107} for delivery to the transmitter and receiver mixers.

		XCO Frequency	PREMIX OUT Frequency
160m	X_{601}	15.9875MHz	10.4875~10.9875MHz
80m	X_{602}	17.9875MHz	12.4875~12.9875MHz
40m	X_{603}	21.4875MHz	15.9875~16.4875MHz
30m	X_{604}	24.4875MHz	18.9875~19.4875MHz
20m	X_{605}	28.4875MHz	22.9875~23.4875MHz
17m	X_{606}	32.4875MHz	26.9875~27.4875MHz
15m	X_{607}	35.4875MHz	29.9875~30.4875MHz
12m	X_{608}	38.9875MHz	33.4875~33.9875MHz
10m A	X_{609}	42.4875MHz	36.9875~37.4875MHz
10m B	X_{610}	42.9875MHz	37.4875~37.9875MHz
10m C	X_{611}	43.4875MHz	37.9875~38.4875MHz
10m D	X_{612}	43.9875MHz	38.4875~38.9875MHz

Table 3





COUNTER UNIT (PB-2086A-3420/PB-2098)

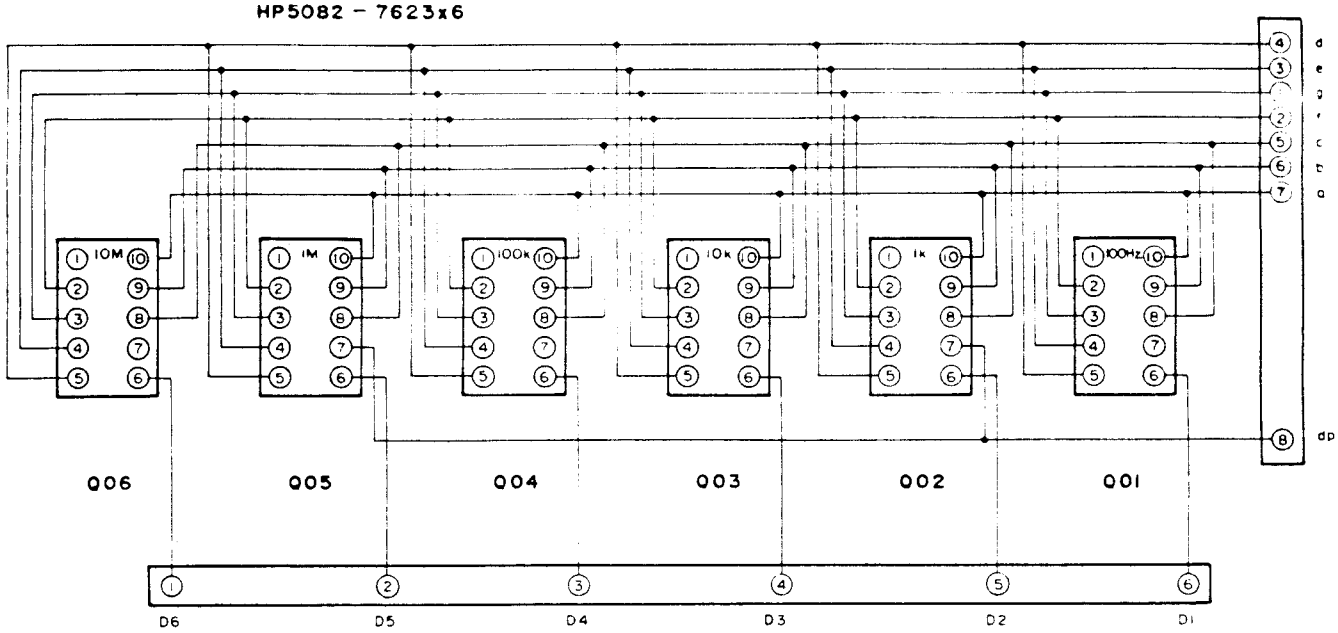
The local oscillator signal is applied to Large-Scale Integrated Circuit (LSI) chip for display on the front panel digital display.

The premix signal as shown in Table 4 from the LOCAL Unit, is amplified by Q_{2301}. The amplified signal is further amplified by Q_{2303} (2SC1674) and delivered to the LSI counter chip, Q_{2312} (MSM9520RS). A portion of the output from Q_{2303} is amplified by Q_{2304} (2SC1815Y) and fed to gate 2 of Q_{2301} controlling the gain of those amplifiers.

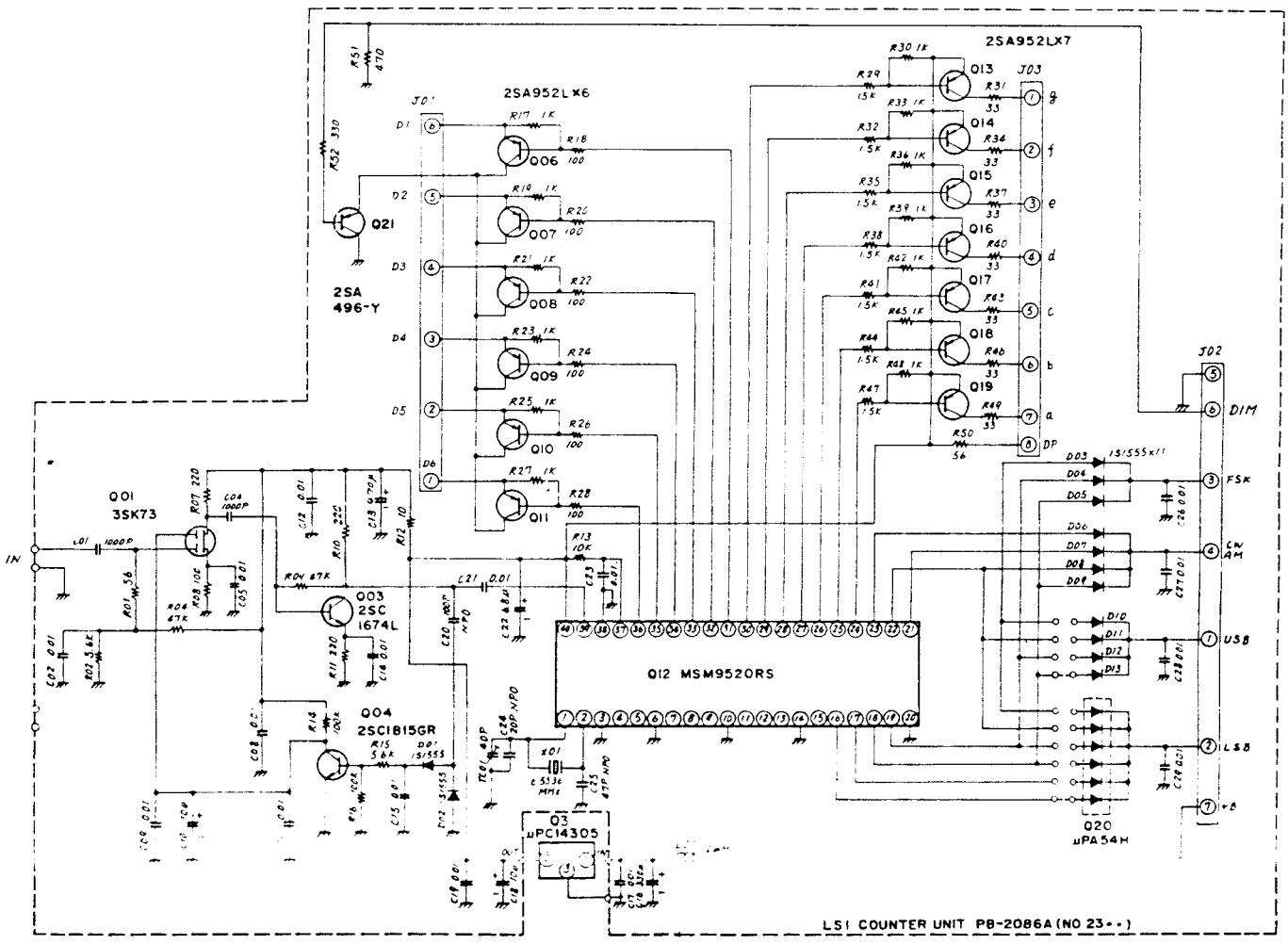
The output from the LSI is fed to the display. The output from pins 24 through 30 is delivered to segment drivers Q_{2313}–Q_{2319} (2SA952L) and digit drivers Q_{2306}–Q_{2311} (2SA952L) through a dynamic drive configuration. Display is performed by D_{2201}–D_{2206} (HP5082-7623), seven-segment light-emitting diodes.

	Nominal Premix Local Frequency	L S B	U S B	C W, A M
160m	10.4875—10.9875(MHz)	10.486—10.986(MHz)	10.489—10.989(MHz)	10.4883—12.9883(MHz)
80m	12.4875—12.9875	12.486—12.986	12.489—12.989	12.4883—12.9883
40m	15.9875—16.4875	15.986—16.486	15.989—16.489	15.9883—16.4883
30m	18.9875—19.4875	18.896—19.486	18.989—19.489	18.9883—19.4883
20m	22.9875—23.4875	22.986—23.486	22.989—23.489	22.9883—23.4883
17m	26.9875—27.4875	26.986—27.486	26.989—27.489	26.9883—27.4883
15m	29.9875—30.4875	29.986—30.486	29.989—30.489	29.9883—30.4883
12m	33.4875—33.9875	33.486—33.986	33.489—33.989	33.4883—33.9883
10m A	36.9875—37.4875	36.986—37.486	36.989—37.489	36.9883—37.4883
10m B	37.4875—37.9875	37.486—37.986	37.489—37.989	37.4883—37.9883
10m C	37.9875—38.4875	37.986—38.486	37.989—38.489	37.9883—38.4883
10m D	38.4875—38.9875	38.486—38.986	38.489—38.989	38.4883—38.9883

Table 4



DISPLAY UNIT PB-2098



DISPLAY/COUNTER UNIT

POWER SUPPLY

The power supply is designed to operate from 100/110/117/200/220/234 volts AC. A DC-DC converter is an available option, providing operation from 13.5 volts DC. Insertion of the appropriate power plug into the rear panel receptacle makes the necessary connections for AC or DC operation.

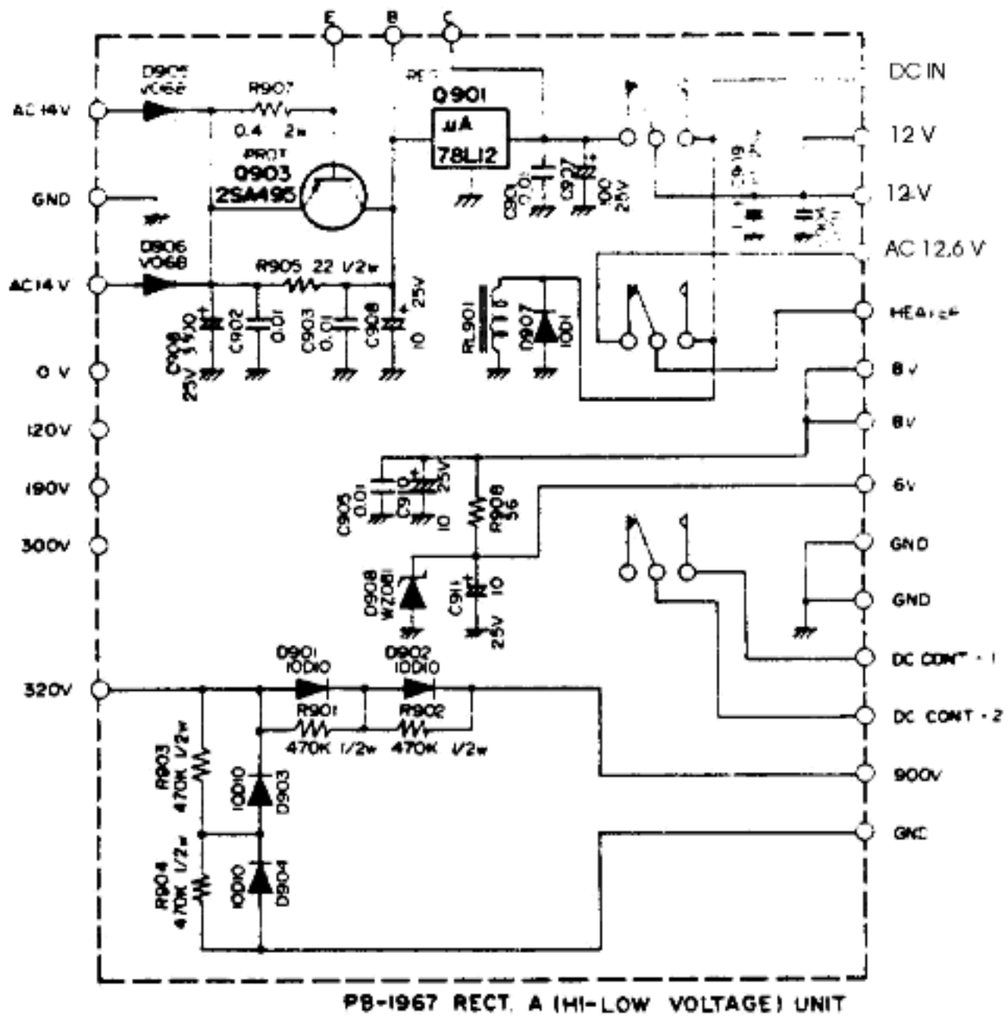
When the transceiver is operated from a DC 13.5 volt power source, using the optional DC-DC converter, transistors Q_{3201} and Q_{3202} **(T20A6)** function as a low frequency oscillator, providing AC voltage at approximately 80 Hz to the power transformer. All of the tube heaters receive their power through the HEATER switch on the front panel. When the HEATER switch is OFF, voltage is still supplied to the receiver section, thus allowing continuous reception with reduced power consumption. The heaters of the two 6146B are connected in series to operate at 12 volts DC.

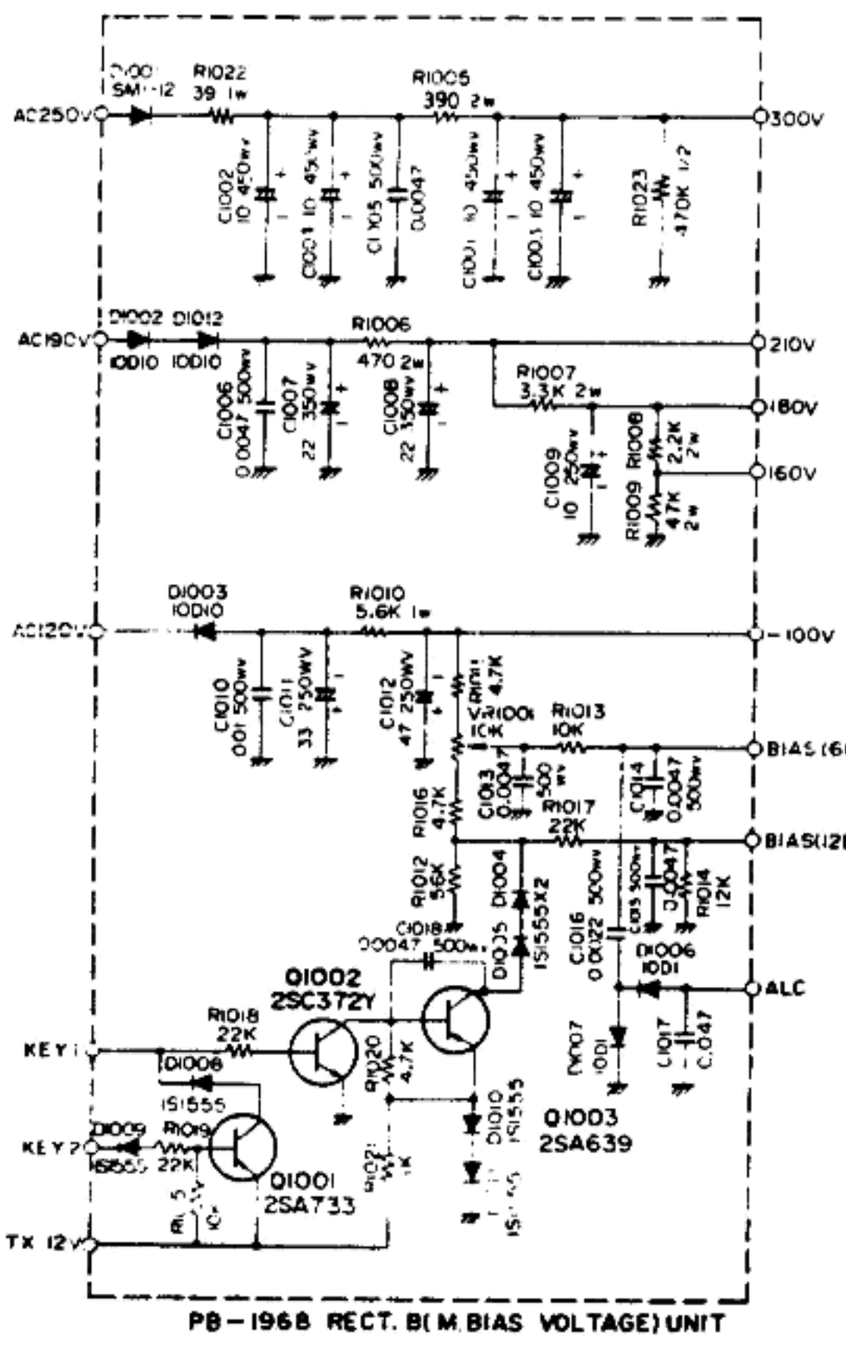
The 14 volt AC power delivered from the secondary winding of the power transformer is rectified by D_{905} and D_{906} **(V06B)**. Voltage regulators Q_1 **(2SB616)**, Q_{901} **(78L12)**, and Q_{903} **(2SA495)** stabilize the DC supply at 12 volts. The supply voltage is further stabilized at 8 volts by Q_3 **(μPC14308)** for delivery to the counter, AF, and other units. The 6 volt supply for the VFO is provided through zener diode D_{908} **(WZ061)**, while the 5 volt supply for the TTL integrated circuits is provided by Q_{505} **(78L05)**.

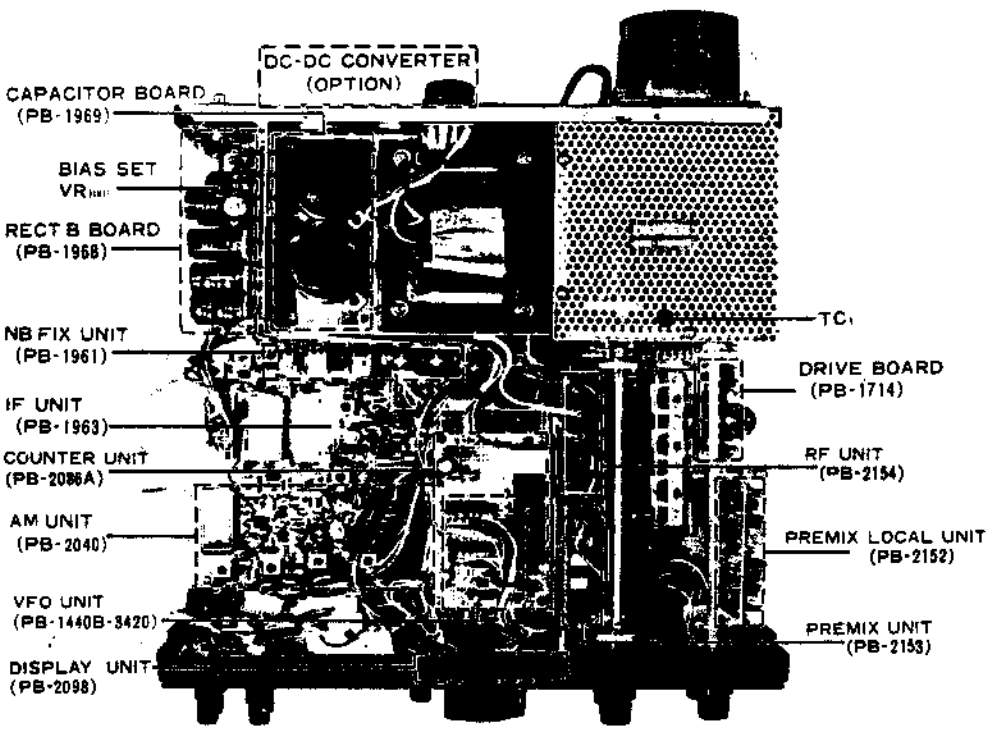
The power amplifier plate voltage of +800 volts is supplied from the bridge-controlled doubler, located on the RECT. A UNIT, and consisting of D_{901} - D_{904} **(10D10)**.

AC 190 volts is rectified by D_{1002} **(10D10)**, producing 210 volts for the screen grid supply of the power amplifier tubes. The screen grid voltage for the driver tube is obtained by rectifying 250 volts AC at D_{1001} **(10D10)**, producing 300 volts. This voltage is dropped to 180 volts by a resistor for delivery to the driver tube screen grid.

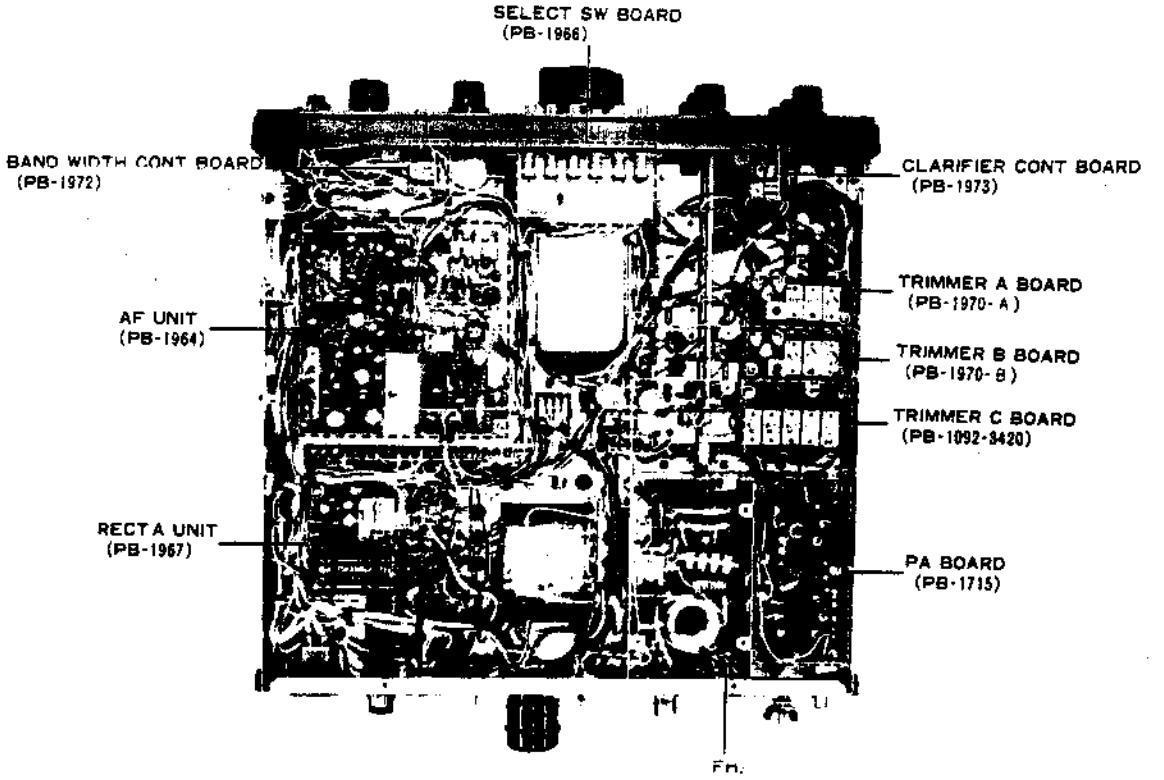
The 120 volt AC power from the transformer secondary winding is rectified by D_{1003} **(10D10)** in order to obtain −140 volts for the driver and final amplifier tube grid bias.







TOP VIEW



BOTTOM VIEW

MAINTENANCE AND ALIGNMENT

WARNING

DANGEROUS VOLTAGES ARE PRESENT WITHIN THIS TRANSCEIVER. USE EXTREME CAUTION WHEN WORKING ON THE TRANSCEIVER WITH THE COVERS REMOVED. DISCHARGE ALL CAPACITORS BY SHORTING THEM TO GROUND WITH AN INSULATED SCREWDRIVER AFTER POWER HAS BEEN REMOVED. OBSERVE NORMAL SAFETY PRECAUTIONS AT ALL TIMES.

CAUTION

Never operate this transceiver in the transmit mode without a matched antenna or dummy load connected to the antenna receptacle on the rear panel. It is possible to damage the final amplifier tubes and the pi network components if the transmitter is operated without the proper load termination.

GENERAL

This transceiver has been carefully aligned and tested at the factory. With normal use, it should not require other than the usual attention given to electronic equipment. Service or realignment of a major component may require substantial adjustment; under no circumstances, though, should realignment be attempted unless the operation of the transceiver is fully understood, the malfunction has been carefully analyzed, and the fault has definitely been traced to misalignment. Sudden difficulties are almost always caused by component failure rather than misalignment.

Service work should only be performed by experienced personnel, using the proper test equipment.

EQUIPMENT REQUIRED

(1) RF Signal Generator: Hewlett-Packard Model 606A or equivalent, with one volt output at 50 ohms, and frequency coverage to 30 MHz.

(2) Vacuum Tube Voltmeter (VTVM): Hewlett-Packard Model 410B or equivalent, with an RF probe good to 40 MHz.

(3) Dummy Load: Yaesu Model YP-150 or equivalent, with 50 ohm non-reactive load impedance, rated to 150 watts average power.

(4) AF Signal Generator: Hewlett-Packard Model 200AB or equivalent.

(5) A general coverage receiver covering 3 to 30 MHz, with a 100 kHz crystal calibrator.

(6) A frequency counter, Yaesu Model YC-500 or equivalent, with resolution to 0.01 kHz and frequency coverage to 30 MHz.

(7) An oscilloscope, Hewlett-Packard Model 1740A or equivalent.

AF UNIT ALIGNMENT

VOX Circuit

A. Antitrip level setting

1. Tune in a signal on the FT-101ZD receiver, and adjust the AF GAIN control for a normal listening level. Position the microphone near the speaker, with the MODE switch in the SSB mode. Increase the VOX GAIN control on the front panel until the speaker output causes the VOX relay to switch the transceiver to transmit. Set the ANTITRIP control VR_8, located on the rear apron, to the point that will just prevent the speaker output from tripping the VOX relay.
2. Now place the microphone in the normal operating position, and speak into the microphone to see if your voice will activate the VOX relay. If not, VR_9 may be advanced too far.

B. VOX relay delay setting

1. Adjust the DELAY control VR_{2b}, located on the front panel, for the desired delay time. This may require a different setting for phone and CW operation, owing to differing operating techniques. For CW or phone operation using a footswitch, the VOX GAIN control may be rotated fully counter-clockwise to the PTT position.

CW Sidetone

1. The CW sidetone level may be adjusted by means of VR_{10}, located on the rear apron.

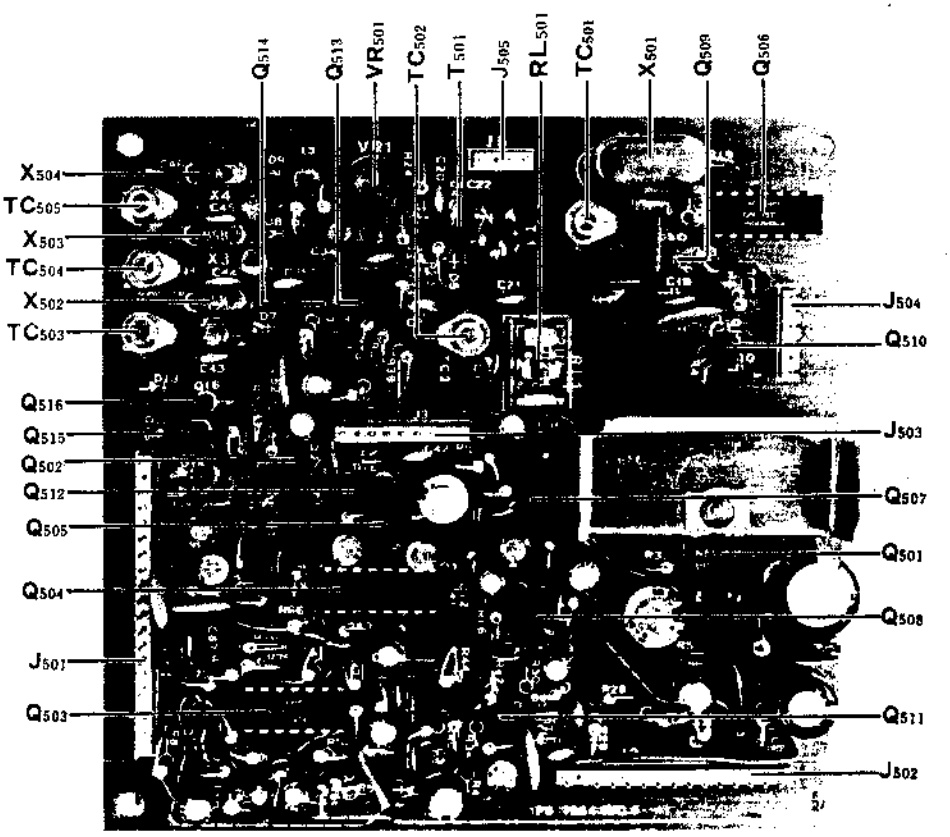
Marker Frequency setting

1. Preset the controls as follows:
   BAND . . . . . 30 m
   DIAL . . . . . 10 MHz
   PRESELECT . Peaked for maximum response
   MODE . . . . . TUNE
2. Place the NB/MARK switch in the MARK position. Tune in the WWV or JJY signal, and adjust TC_{501} for an exact zero beat with the carrier of the incoming signal.

Carrier Frequency Adjustment

A. SSB Carrier Point

1. Tune up the transmitter on 20 meters, LSB mode, into a dummy load. Apply a 1 kHz audio signal to the microphone input, and adjust the audio generator output until the transmitter power output is 60 watts, as indicated on the dummy load wattmeter.
2. Shift the audio generator output frequency to 300 Hz, without changing the output level. Adjust TC_{503} for a power output reading of 15 watts on the wattmeter.
3. Shift the MODE switch to USB. Adjust TC_{504} for an identical 15 watt reading on the wattmeter.



AF UNIT(PB-1964)

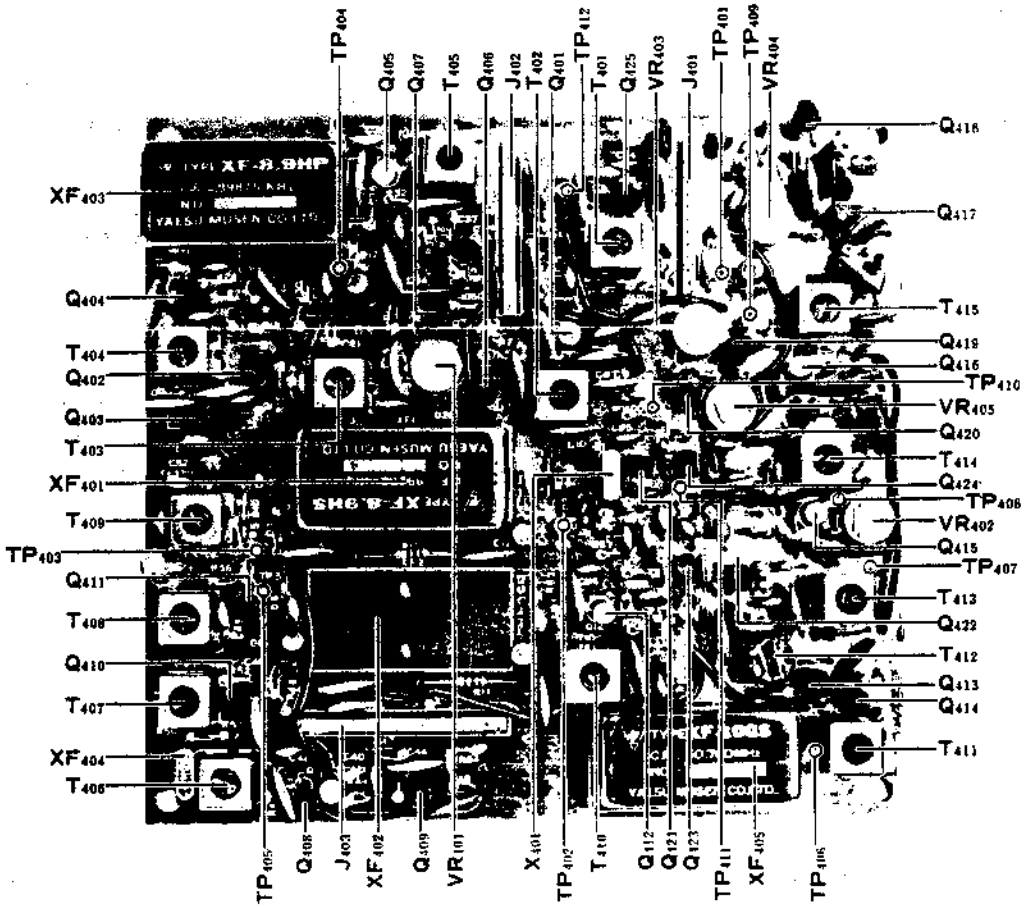
4. Recheck the LSB adjustment, as well as the carrier balance adjustment, after performing the carrier point alignment. The background noise, when switching between USB and LSB, should not change.

B. Carrier Balance

1. Tune up the transceiver on 20 meters, USB mode, into a dummy load. Set the main tuning dial to 14.250 MHz. Connect the RF probe of the VTVM to the antenna jack. Disconnect all microphones, etc., from the microphone jack.
2. Activate the transmitter by placing the VOX GAIN control into the MOX position. Adjust VR_{501} and TC_{502} for a minimum VTVM reading.
3. If a VTVM is unavailable, use an external monitor receiver, tuned to the transmitter frequency, and adjust VR_{501} and TC_{502} for a minimum S-meter reading on the external receiver.
4. This adjustment should be repeated several times on LSB and USB, in order to ensure complete carrier nulling.

C. CW Carrier Point

1. Connect a frequency counter to TP_{402}, located on the IF UNIT. Place the MODE switch in the TUNE position.
2. Adjust TC_{505} for a frequency counter reading of exactly 8988.3 kHz.
3. When using the optional CW filter, a substantial loss on transmit, when in the CW-N position, may indicate the need for adjustment as indicated in steps 1 and 2.



IF UNIT(PB-1963)

IF UNIT ALIGNMENT

S-Meter Sensitivity Adjustment

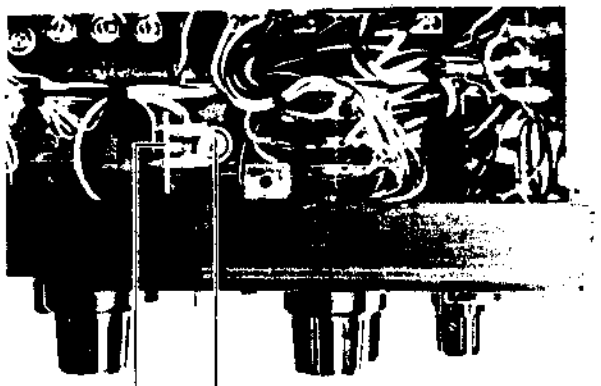
1. Set the BAND switch to 20 meters, the main dial to 14.250 MHz, and set the RF GAIN fully clockwise.
2. Set the signal generator to 14.250 MHz, and set its output to 6 dB. Tune the signal generator signal on the receiver, and peak the preselector for maximum signal strength. The S-meter should just begin to move with the 6 dB input.
3. Adjust VR_{403} for a reading of 0 on the S-meter.
4. Set the generator output to 100 dB, and adjust VR_{405} for a reading of S9 + 60 dB on the S-meter. Confirm that the preselector is peaked.
5. Return the signal generator output to 6 dB, and recheck the adjustment of VR_{402}.

Variable IF Bandwidth Alignment

1. Set the controls as follows:
   BAND . . . . . 20 m
   DIAL . . . . . 14.200 MHz
   RF GAIN . . . . . Fully clockwise
   WIDTH switch . . OFF
   MODE . . . . . USB
   Peak the preselector for maximum response against the marker signal or background noise.
2. Connect the frequency counter to TP_{411}. Adjust VR_{1501} for a reading of exactly 19.7475 MHz.
3. Place the WIDTH switch ON. Make sure that the WIDTH control is exactly in the 12 o'clock position. Adjust VR_{404} for a reading of exactly 19.7475 MHz on the frequency counter.
4. Switch between USB and LSB, and observe the background noise. If there is any difference, adjust VR_{1501} until the background noise is the same.

ALC Meter Alignment

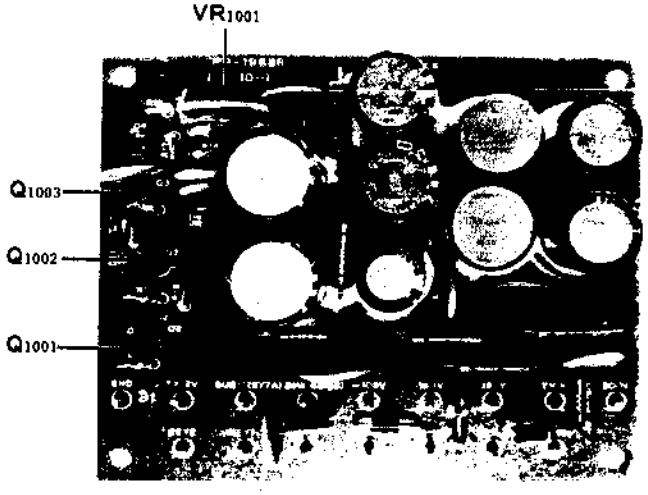
1. On any band, set the MODE switch to USB. Set the meter switch to ALC.
2. With no speech input, activate the transmitter. Adjust VR_{401} for a 0 reading on the ALC meter scale.



RECTIFIER B UNIT

Bias Adjustment

1. Set the MODE switch to USB or LSB, and set the MIC GAIN control fully counterclockwise.
2. Place the METER switch in the IC position, and set the VOX GAIN control to VOX. Adjust the BIAS control located on the RECT, B UNIT (PB-1968) VR_{1001}, for a reading of 50 mA. For 10 watt models, the correct meter reading is 25 mA.



RECT B UNIT(PB-1968)

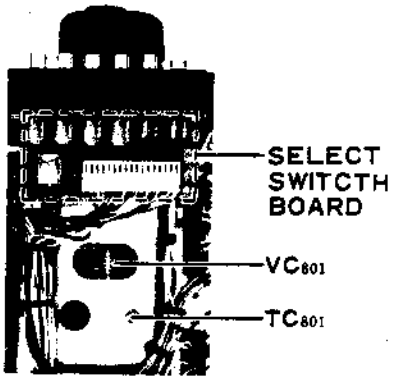
VFO UNIT

The VFO UNIT is very critical in its adjustment. As well, this is not an area which should ever require alignment. Questions regarding drift, etc., usually can be traced to other areas of the transceiver (instability in the supply voltage, etc.). For this reason, all cases regarding VFO repair should be referred to an experienced service technician.

The following components are of interest from a service standpoint:

TC_{801} is the band set trimmer.
TC_{802} is the VFO level set trimmer.

To confirm proper VFO injection, connect the VTVM to the VFO output. Adjust TC_{802} for a reading of 100 mV.



BAND	CRYSTAL	FREQUENCY	TRANS-FORMER
160m	X_{601}	15.9875MHz	T_{601}
80m	X_{602}	17.9875	T_{602}
40m	X_{603}	21.4875	T_{603}
30m	X_{604}	24.4875	T_{604}
20m	X_{605}	28.4875	T_{605}
17m	X_{606}	32.4875	T_{606}
15m	X_{607}	35.4875	T_{607}
12m	X_{608}	38.9875	T_{608}
10m A	X_{609}	42.4875	T_{609}
10m B	X_{610}	42.9875	T_{610}
10m C	X_{611}	43.4875	T_{611}
10m D	X_{612}	43.9875	T_{612}

Table 6

NB-FIX UNIT

Fixed Channel Frequency Alignment

When the optional fixed channel crystals are being used, they may be placed exactly on the correct frequency by adjusting TC_{201} (for channel 1) and TC_{202} (for channel 2). Confirmation of the correct frequency may be made with an external receiver or by loosely coupling a probe from the frequency counter to the transmitter output. A 1-turn loop is usually sufficient to provide indication on the counter.

PREMIX LOCAL UNIT

Premix Local Alignment

1. Connect the RF probe of the VTVM to pin 1 of MJ_3.
2. Refer to Table 6, and adjust the appropriate transformer for a level of 300 mV for each band and crystal, as shown in the table.

PREMIX UNIT

For this alignment, a wideband (not peak) sweep generator, as well as an oscilloscope, should be used.

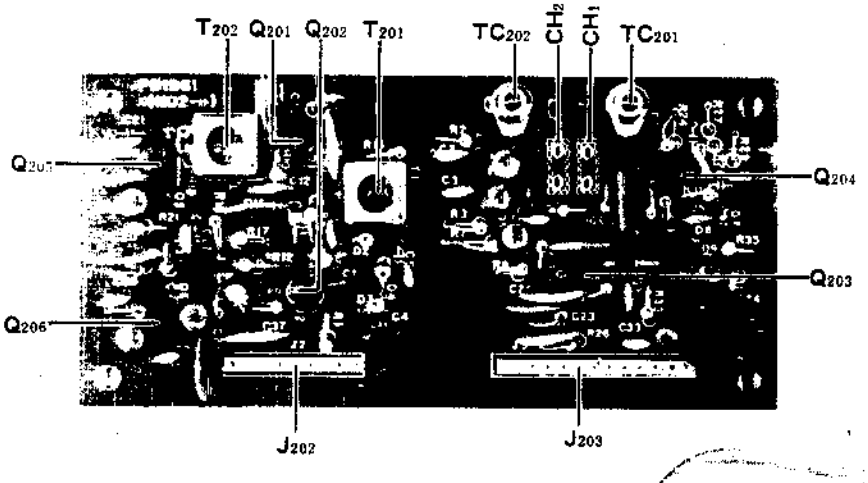
1. Press the EXT select switch. Apply 5.0 - 5.5 MHz sweep output to the VFO output terminal at the rear apron external VFO jack. Connect a high-impedance probe of an oscilloscope to J_{301}.
2. Adjust the transformers shown in Table 7 for a flat response across the entire passband. If you have never adjusted a bandpass filter previously, this may take some practice. Perform the adjustments on each band, according to the chart.

BAND	TRANS-FORMER	PASSBAND
160m	T_{301}, T_{302}	10.4—11.0(MHz)
80m	T_{303}, T_{304}	12.4—13.0
40m	T_{305}, T_{306}	15.9—16.5
30m	T_{307}, T_{308}	18.9—19.5
20m	T_{309}, T_{310}	22.9—23.5
17m	T_{311}, T_{312}	26.9—27.5
15m	T_{313}, T_{314}	29.9—30.5
12m	T_{315}, T_{316}	33.5—34.0
10m A	T_{317}, T_{318}	36.9—39.0

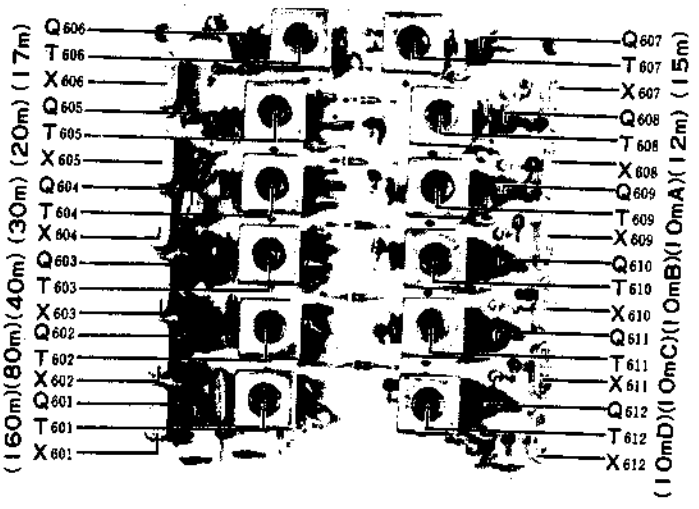
Table 7

AM UNIT

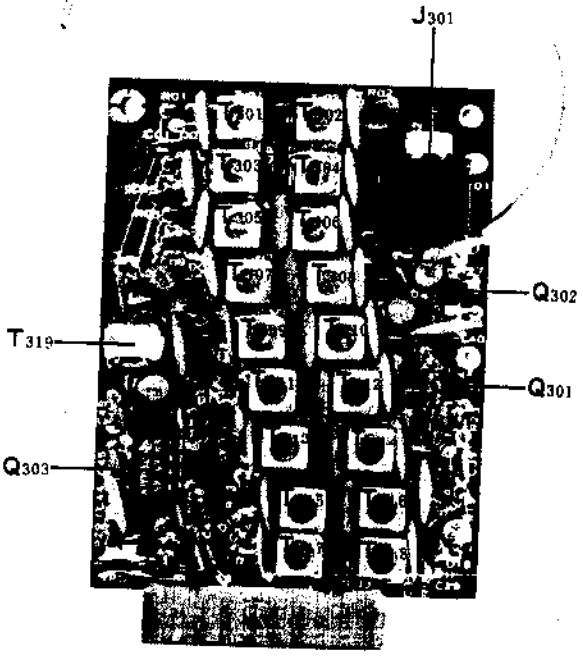
1. Set the BAND switch to 40, the MODE switch to AM, and the DRIVE control to the 3 o'clock position. Tune up the transmitter in the usual fashion. Now adjust the core of T_{2401} for maximum power output into the dummy load/wattmeter.
2. Connect a frequency counter to TP_{2402}. Adjust TC_{2401} for a counter reading of exactly 8988.3 kHz while transmitting.
3. Connect the RF probe of the VTVM to TP_{2401}, and adjust TC_{2402} for a reading of 50 mV while transmitting.



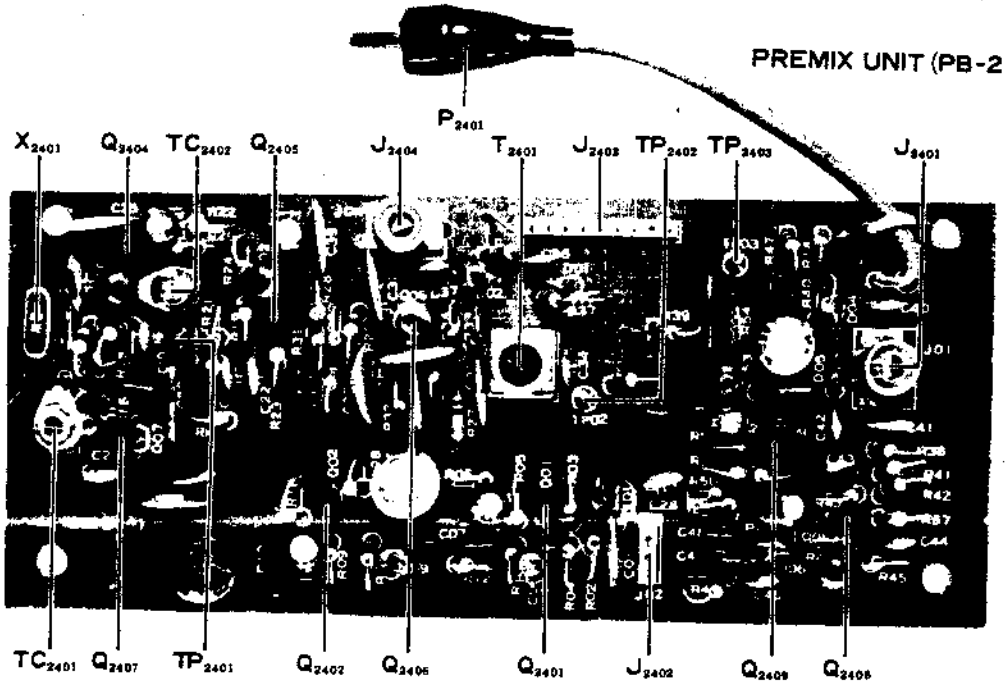
NB·FIX UNIT(PB-1961)



PREMIX LOCAL(XTAL)UNIT (PB-2153)



PREMIX UNIT (PB-2152)

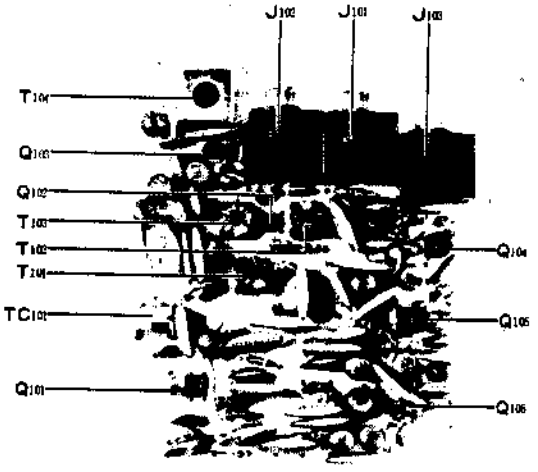


AM UNIT (PB-2040)

TRANSMIT RF/IF TRANSFORMER ALIGNMENT

(1) Connect a dummy load to the antenna jack, and connect an audio signal generator to the microphone input. Tune up the transmitter at 14.2 MHz, and adjust the audio generator output for approximately 50 watts output into the dummy load, single-tone, SSB mode.

(2) Peak T_{401} - T_{403} and T_{405} (IF UNIT) for maximum power output. Switch the RF processor on, and adjust the COMP LEVEL control for approximately 50 watts output. Peak T_{404} for maximum power output.



RF UNIT (PB-2154)

RECEIVER RF/IF/NB TRANSFORMER ALIGNMENT

(1) Tune in the marker generator signal at 14.2 MHz, with a dummy load connected to the antenna jack. Peak the preselector for maximum S-meter indication.

(2) Peak T_{104} (RF UNIT) for maximum S-meter indication.

(3) Peak T_{406} - T_{411} and T_{413} - T_{415} for maximum S-meter indication.

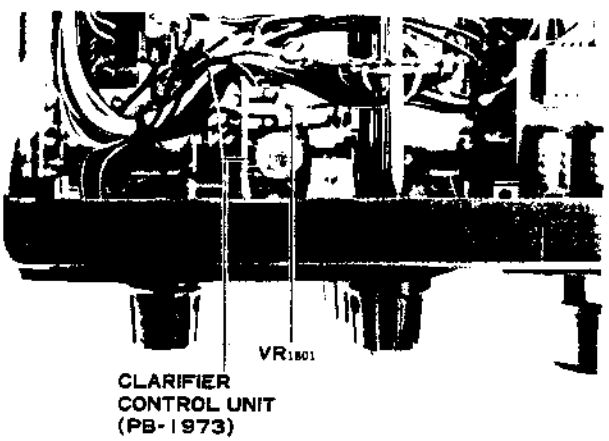
(4) Connect the RF probe of a VTVM to the collector of Q_{202} (NB-FIX UNIT). Reduce the RF GAIN control somewhat, and tune T_{201} and T_{202} for a dip in the VTVM indication. If no dip is observed, reduce the RF GAIN control further.

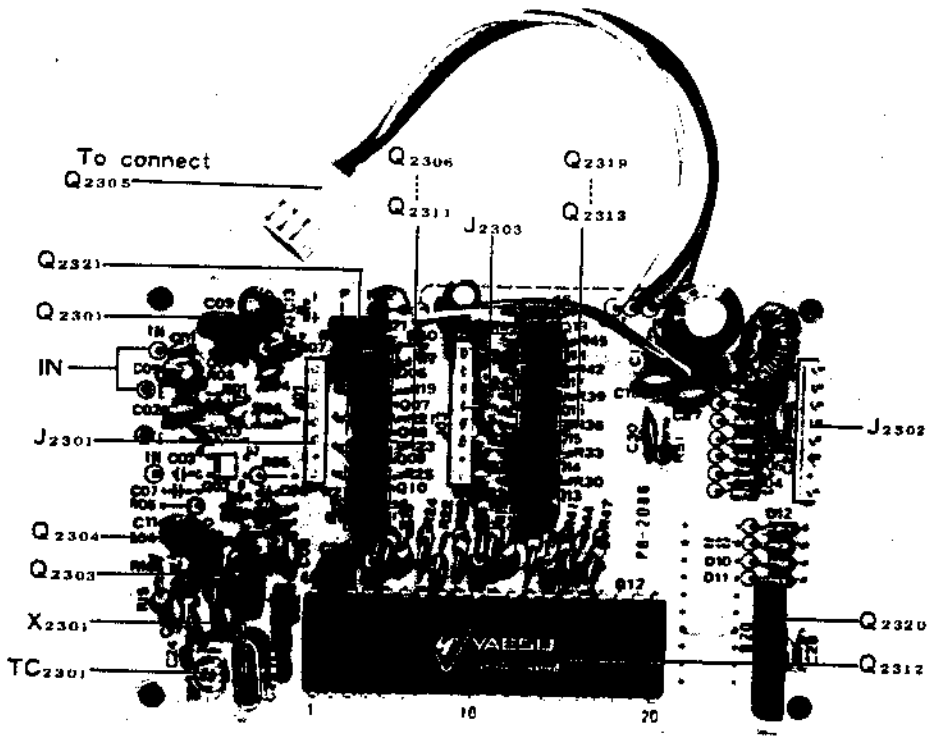
CLARIFIER ALIGNMENT

1. Tune in the marker generator signal on any band, and peak the preselector on the marker signal.

2. With the CLARIFIER control OFF, make sure that the CLARIFIER knob is exactly at the 12 o'clock position. Note the tone of the marker signal.

3. Switch the RX CLARIFIER to ON, and observe the tone of the marker signal. If it is different from when the clarifier was turned off, adjust VR_{1801} for an identical tone with the CLARIFIER knob exactly on the zero mark.





COUNTER UNIT (PB-2086A)

FINAL AMPLIFIER NEUTRALIZATION

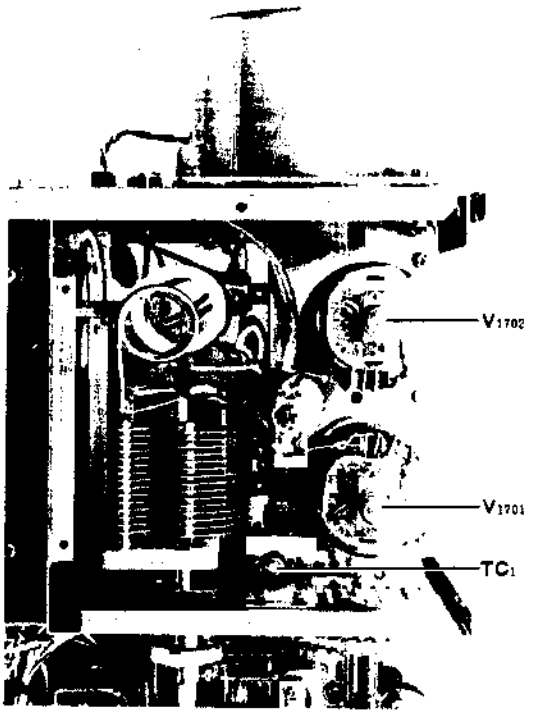
Important Note: For this alignment, use a NON-METALLIC tuning wand.

1. Set the BAND switch to 10C, set the tuning dial to 29 MHz, and tune into a dummy load for approximately 70% full output power.

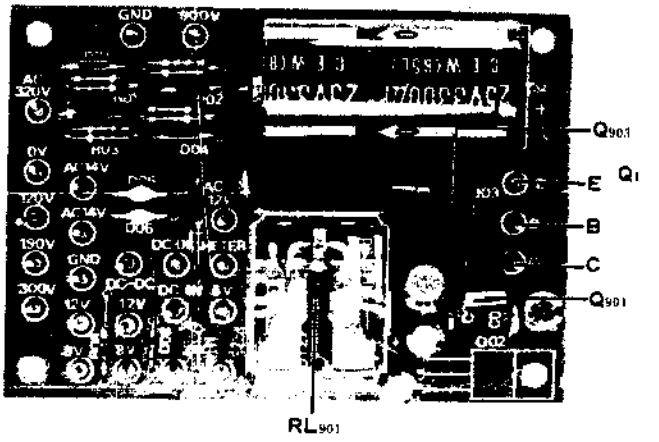
2. Set the METER switch to IC, and observe the dip in the cathode current. The dip should occur at the same point that maximum power output (measured on the dummy load watt-meter) occurs. If this is not the case, adjust TC_1, located inside the final amplifier cage, for the required coincidence of maximum power output and dip on the IC meter.

CAUTION: HIGH VOLTAGES ARE PRESENT ON THE UNDERSIDE OF THE CHASSIS AND INSIDE THE FINAL AMPLIFIER COMPARTMENT. USE GREAT CARE WHILE MAKING ADJUSTMENTS IN AREAS OF EXPOSED WIRING.

Note: The final amplifier enclosure must be in place to provide the required RF shielding during the neutralization procedure.



Final Amplifier Compartment



RECT A UNIT(PB-1967)

MAIN CHASSIS

Symbol No.	Parts No.	Description
		IC, TRANSISTOR
Q2	G3104960Y	TR 2SA496(Y)
Q1	G3206160R	" 2SB616R(S)
Q4	G3402350O	" 2SD235(O)
Q3	G1090070	IC μPC14308
Q5	G1090080	" μPC78L08
		DIODE
D1	G2090029	Ge 1N60
D2–5	G2015550	Si 1S1555
D6	G2090001	" 10D1
		RESISTOR
R22, 24	J01245220	Carbon film 1/4W TJ 22 Ω
R23	J00245330	" " " VJ 33 Ω
R14	J01245560	" " " TJ 56 Ω
R7, 11	J01245101	" " " " 100 Ω
R18	J01245821	" " " " 820 Ω
R4, 5	J01245102	" " " " 1 kΩ
R6	J01245152	" " " " 1.5 kΩ
R19	J01245182	" " " " 1.8 kΩ
R17	J01245222	" " " " 2.2 kΩ
R20	J01245474	" " " " 470 kΩ
R2	J10276100	Carbon composition 1/2W GK 10 Ω
R9, 10 (with L5, L6)	–	" " 1W " 56 Ω
R3	J10276101	" " " " 100 Ω
R1	J10276222	" " " " 2.2 kΩ
R25	J30356150	Cement 3W 15 Ω
		POTENTIOMETER
VR1	J60800035	VM11AB06A5M1112 10 kΩB
VR2	J62800032	DM10A039A 500 kΩB/20 kΩB
VR3	J62800033	DM10A039A 5 kΩA/5 kΩB
VR4	J60800043	VM10A592A 5 kΩA
VR5, 6	J60800036	VM10A592A 5 kΩB
VR7	J62800034	DM10A39A 5 kΩB/5 kΩA
VR8	J60800037	VM10A654A 1 kΩB
VR9, 10	J60800038	VM10A654A 5 kΩB
VR11	J60800039	VM10AB08A 5 kΩB
		CAPACITOR
		Dipped mica 500 WV 5 pF
C13, 19, 21	K30276271	" " " 270 pF (LCQ1727271K5)
C8	K30276331	" " 500 WV 330 pF (DM-15-331K5)
C7	K30276621	" " 500 WV 620 pF (DM19D621K5)
C6	K30279052	" " 500 WV 1100 pF (DM19-112K5)

C5	K30279062	Dipped mica 500 WV 3000 pF (DM19-302K5)
C59, 66	K31306800	Moulded mica 1 KWV 80 pF
C17	K02279001	Ceramic 500 WV 1 pF
C10	K02279002	" " 5 pF
C18	K02279003	" " 47 pF
C11	K00279001	" " 200 pF
C20	K00279002	" " 470 pF
C16	K0030003	" 1 KV 3 pF
C15	K02309002	" " 5 pF
C14	K02309003	" " 100 pF
C3	K00329002	" 1.5 KWV 460 pF
C9	K00359001	" 3 KV 100 pF
C1	K12359001	" " 1000 pF
C73–75	K13170102	50WV 0.001 μF
C29, 34, 35, 41, 64	K13170103	" 50 WV 0.01 μF
C12, 22–24, 39, 40, 56, 58, 60, 68, 69	K13170473	" " 0.047 μF
C27, 28, 36	K12279004	" 500 WV 0.0047 μF
C30,32,33,54, 55, 61	K12279002	" " 0.01 μF
C2, 25, 26	K12329002	" 1.4 KV 0.0047 μF
C31, 37	K12329001	" " 0.01 μF
C42–51	K21270002	Feed thru 500 WV 0.001 μF (ECK-L2H102PE)
C63	K40120476	Electrolytic 16 WV 47 μF
C72	K40120107	" 50WV 100 μF
C65	K40120337	" " 330 μF
C70	K40120106	" " 10 μF
C67	K40100336	" 10 WV 33 μF
C71	K50177104	Mylar 50 WV 0.1 μF
		VARIABLE CAPACITOR
VC1	K90000026	YB-250 250 pF
VC2	K90000016	C134E125
		TRIMMER CAPACITOR
TC1	K91000007	TSN120C 10P x 2
		INDUCTOR
L1	L0020534C	
L2	L0020611	
L3	L1020065	
L4	L1020064	
L5, L6 (R9, R10)	L1020308A	
L7	L1190001	EL0710-251K 250 μH
L8	L1190017	FL-5H-102J 1 mH
L9	L0020705	

		TRANSFORMER			
T1	L0020544				
T2, T3	L0020074				
					MULTI JACK
			MJ1	P4090001	121S-10B-105A
			MJ2	P4090007	220D-20B-205A
			MJ3	P4090002	121S-14B-105A
		METER			
M1	M0090002	Y-45-02			
					PLUG
			P1	P1090079	5047-12A (with wire T9201410B)
		SPEAKER	P2	P1090080	5047-13A (" " T9201300D)
SP1	M4090005	SA-92Y 4 Ω 3 W	P3	P1090082	5047-15A (" " T9201310D)
			P4	P1090086	5047-19A
			P5	P1090082	5047-15A (with wire T9201330C)
			P6	P1090075	5047-08A
		POWER TRANSFORMER	P7	P1090072	5047-05A (with wire T9201350A)
PT1	L3030028	52-74	P8	P1090082	5047-08A
			P9	P1090079	5047-12A (" " T9201310C)
			P10	P1090083	5047-16A
			P18	P1090070	5047-03A (with wire T9201420A)
		RELAY	P11, 14, 22	P0090045	SQ4052
RL1	M1190004	FRL-263 D012/04CS01	P15	P0090002	SI5908
RL2	M1090002	MX2P	P16	P0090005	SI-7502
			P19	P1090070	5047-03A
			P20	P1090075	5047-08A
			P21	P0090075	P-7015
		RELAY SOCKET			
RLS1	M1490010	263H204			**FUSE**
RLS2	M1490001	PX08	F1	Q0000005	5 A (100V–117V)
				Q0000004	3 A (200V–234V)
		SWITCH			
S1	N0190070	#250041 (SRS)			**FUSE HOLDER**
S2	N0190071	#250044 (RS2-4-11)	FH1	P2000001	SN1001 #2
S3 *(Lot 1–7)	N0190025	ESR-E485R20	FH2	P2000003	F3265
S3 *(Lot 8→)	N0190037	ESR-E486R20			
S4, 5	N7090005	WD9223			
					PILOT LAMP
		COOLING FAN	PL1	Q1000026	M1041.5.9 (BF311-04071A)
FAN1	M2090001	2SB10A	PL2–5	Q1000033	K0252-6-8 (BQ054-32732B)
		RECEPTACLE			
J1	P1090004	SG7814		Q5000010	Thru terminal FT-SM1
J3	P1090134	SG7627		Q4000002	" A339 (HV)
J2	P0090011	FM144S		Q6000042	Terminal block ML-3182 20P
J4	P1090033	D6-701B00		Q6000004	Term nal board 1L2PS (2-0)
J5	P1090075	5047-08 (with wire T9203200)		Q6000007	" 1L3PS (2-0-1)
J6	P1090014	SI7501-1		Q6000	" 1L5PS (4-0-1)
J7	P1090028	M-BR-06B		Q6000003	" 1L2PS (1-0-1)
J8	P1090040	SA607B00		Q6000008	" 1L3P (3-0)
J9–14, 18	P1090025	STR-01			" 1L3PS (1-0-2)
J15	P1090005	SG-8050			
J16	P1090045	AC9-PF			
J17	P0090047	QS-DB6-ML			
J19	P1090111	J-7015			

	★★★★★ LED B BOARD ★★★★★	
PB-1390	F0001390	P.C. Board
D9	G2090060	GD4-203-SRD

RF UNIT

Symbol No.	Parts No.	Description
PB-2154	F0002154	Printed Circuit Board
	C0021540	P.C.B. with components
		IC, FET & TRANSISTOR
Q102	G2090135	IC (Ring Module) ND487C2-3R
Q106	G4800400M	FET 3SK40M
Q101	G4800510C	" 3SK51-03
Q103	G3090019	" J310
Q104, 105	G3324070	TR 2SC2407
		DIODE
D110	G2010070	Ge 1S1007
D103, 104	G2015550	Si 1S1555
D101, 102, 105–109	G2090027	" 1SS53
		RESISTOR
R122, 131,	J00245479	Carbon film ¼W VJ 4.7 Ω
R109, 110, 115, 116, 124, 125		" " " " 10 Ω
R135	J00245560	" " " " 56 Ω
R106, 107, 113, 114, 139, 140	J00245101	" " " " 100 Ω
R108, 117, 126	J00245121	" " " " 120 Ω
R121, 130	J00245151	" " " " 150 Ω
R123, 132	J00245221	" " " " 220 Ω
R136	J00245331	" " " " 330 Ω
R119, 128	J00245561	" " " " 560 Ω
R105, 111, 112, 120, 129	J00245102	" " " " 1 kΩ
R118, 127	J00245152	" " " " 1.5 kΩ
R141	J00245222	" " " " 2.2 kΩ
R102	J00245272	" " " " 2.7 kΩ
R104, 134	J00245562	" " " " 5.6 kΩ
R138	J00245103	" " " " 10 kΩ
R137	J00245183	" " " " 18 kΩ
R103, 133	J00245393	" " " " 39 kΩ
R101	J00245225	" 2.2 MΩ
		CAPACITOR
C138	K02179003	Ceramic 50WV CH 2 pF
C106	K02172040	" " " 4 pF
C125, 126	K00175680	" " SL 68 pF
C103	K00175101	" " " 100 pF
C102, 104, 116, 119–121, 130, 131, 135, 140	K13170103	" " 0.01 μF
C101, 105, 107–115, 117, 118, 122–124, 127–129, 132–134, 136, 137, 139	K13170473	" " 0.047 μF
		TRIMMER CAPACITOR
TC101	K91000019	ECV-1ZW 10 x 40 10 pF
		INDUCTOR
L107	L0020491	0.32 μH
L108, 112	L1190033	FL5H-820K 82 μH
L102, 103, 105, 106, 113, 114	L1190016	FL5H-101K 100 μH
L104, 109, 111	L1190020	FL5H-151K 150 μH
L101, 110, 115	L1190038	FL5H-271K 270 μH
		TRANSFORMER
T101–103	L0020788A	
T104	L0020221	
		JACK
J101–103	P1090018	SQ-3081

NB-FIX UNIT

Symbol No.	Parts No.	Description
	C0019610	NB-FIX unit with components
PB-1961B	F0001961B	P.C. Board
		TRANSISTOR
Q201–204	G3303720Y	2SC372Y
Q205, 206	G3315830	2SC1583
		DIODE
D201–204	G2090029	Ge 1N60
D205–209	G2015550	Si 1S1555
		RESISTOR
R208,216,224, 230,238,239,	J00245101	Carbon film 1/4W VJ 100 Ω
R204	J00245221	" " " " 220 Ω
R222, 236	J00245471	" " " " 470 Ω
R231–233,235	J00245561	" " " " 560 Ω
R206,215,221, 234,237	J00245102	" " " " 1 kΩ
R207	J00245222	" " " " 2.2 kΩ

R210, 240	J00245472	Carbon film 1/4W VJ	4.7 kΩ
R205,209,218	J00245562	" " " "	5.6 kΩ
R202,203,212, 214,225,226	J00245103	" " " "	10 kΩ
R201,220,223	J00245153	" " " "	15 kΩ
R211,213,219	J00245223	" " " "	22 kΩ
R217	J00245683	" " " "	68 kΩ
		CAPACITOR	
C201,216–218	K30176331	Dipped mica 50WV	330 pF
C234, 236	K30176471	" " "	470 pF
C235	K30176821	" " "	820 pF
C208, 209	K02175150	Ceramic 50WV NPO	15 pF
C206	K00179005	" " SL	20 pF
C204	K00175101	" " "	100 pF
C202,203,205, 211,212,221, 225–227, 229–233	K13170103	" "	0.01 μF
C207,210,213, 215,219,220, 223,224,228, 237	K13170473	" "	0.047 μF
C214	K40170105	Electrolytic 50WV	1 μF
C238	K40140475	" 10WV	4.7 μF
		TRIMMER CAPACITOR	
TC201, 202	K91000016	ECV-1ZW 50 x 32	50 pF
		INDUCTOR	
L207, 208	L1190007	FL-4H 1R8K	1.8 μH
L204–206	L1190016	FL-5H 101K	100 μH
L201–203	L1190017	FL-5H 102K	1 mH
		TRANSFORMER	
T201, 202	L0020140	R12-4170	
		CRYSTAL SOCKET	
XS201	P3090025	S-14 2P	
		MINI CONNECTOR	
J201	P0090037	5048-08A	
J202	P0090038	5048-12A	

PREMIX UNIT

Symbol No.	Parts No.	Description
	C0021520	PREMIX unit with components
PB-2152	F0002152	P.C. Board
		IC, FET, TRANSISTOR
Q303	G1090062	IC SN76514N
Q301	G3319230R	TR 2SC1923R
		DIODE
D301–318	G2090027	Si 1SS53

		RESISTOR
R323	J00245100	Carbon film ¼W VJ 10 Ω
R331	J00245680	" " " " 68 Ω
R301, 303, 305, 307, 309, 311, 313, 315, 317, 332, 333	J00245101	" " " " 100 Ω
R322, 324, 327, 328	J00245221	" " " " 220 Ω
R319, 334	J00245152	" " " " 1.5 kΩ
R329, 330	J00245222	" " " " 2.2 kΩ
R302, 304, 308, 310, 312, 314, 316, 318, 321, 325, 326	J00245103	" " " " 10 kΩ
R306	J00245153	" " " " 15 kΩ
R320	J00245333	" " " " 33 kΩ
		POTENTIOMETER
VR301	J50710502	V10K-8-1-2 5 kΩB
		CAPACITOR
C335	K30176271	Dipped mica 50WV 270 pF
C331	K30176331	" " " 330 pF
C311, 315, 319	K30176561	" " " 560 pF
C323, 327	K30176680	" " " 680 pF
C301, 305, 309, 313, 317, 321, 325, 329, 333, 337–339, 341, 343, 345–351	K13170103	Ceramic " 0.01 μF
C302, 304, 306, 308, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 340, 342, 344	K13170103	Ceramic 50WV 0.047 μF
C303, 307	K50177102	Mylar " 0.001 μF
		INDUCTOR
L302	L1190007	FL4H-1R8M 1.8 μH
L303	L1190023	FL5H-220K 22 μH
L301, 304–306	L1190017	FL5H-102K 1 mH
		TRANSFORMER
T301, 302	L0020500	
T303, 304	L0020501	
T305, 306	L0020502	
T307, 308	L0020835	

T309, 310	L0020504	
T311, 312	L0020836	
T313, 314	L0020837	
T315, 316	L0020838	
T317, 318	L0020839	
T319	L0020210	
		JACK
J301	P1090018	SQ3081
P301	P0090045	SQ4052

IF UNIT

Symbol No.	Parts No.	Description
	C0019630	IF unit with components
PB-1963C	F0001963C	P.C. Board
		IC, FET, TRANSISTOR
Q403	G1090063	IC TA7060P
Q406	G3800190B	FET 2SK19BL
Q402,413,414, 419, 425	G3800190G	" 2SK19GR
Q401,405,412, 415, 416	G4800510C	" 3SK51-03
Q408	G3090019	" J310
Q407, 420	G3105641	TR 2SA564A
Q404,409,410, 417, 418, 422–424	G3303720Y	" 2SC372Y
Q421	G3305350A	" 2SC535A
Q411	G3090005	" MPSA13
		DIODE
D416, 417	G2090029	Ge 1N60
D405–408, 414, 421	G2010070	" (GB) 1S1007
D401–404, 409–413, 419, 424	G2015550	Si 1S1555
D418	G2022090	Varactor 1S2209
D422	G2090040	" FC63
D420, 423	G2090010	Zener WZ090
		CRYSTAL
X401	H0100431	HC-18/U 19.7475 MHz
		CRYSTAL FILTER
XF401	H1100860	XF8.9HS
XF402(Option)	H1100880	XF8.9HC
XF403	H1100890	XF8.9HP
XF404	H1100470	8.9M20A
XF405	H1100900	XF10GS (XF-10HW)
		THERMISTOR
TH401	G9090003	D-33A
		RESISTOR
R0517, 0518, 0520	J00245220	Carbon film 1/4W VJ 22 Ω
R410, 411	J01245101	" " " TJ 100 Ω
R402,408,422, 423,437,439, 444,446,463, 464,469,475, 482,483,497	J00245101	" " " VJ 100 Ω
R419,425,447, 451,486, 0507,0508	J00245221	" " " " 220 Ω
R0502	J00245331	" " " " 330 Ω
	J00245391	390 Ω
R443	J00245471	" " " " 470 Ω
R474,480,0522	J00245561	" " " " 560 Ω
R467, 468	J00245681	" " " " 680 Ω
	J00245821	" " " " 820 Ω
R406,416,428, 437,440,442, 449,453,457, 459,462,488, 494,0504, 0506,0515	J00245102	" " " " 1 kΩ
R429	J00245122	" " " " 1.2 kΩ
R495	J00245152	" " " " 1.5 kΩ
R0516	J01245152	" " " TJ 1.5 kΩ
R454,455,458, 0510	J00245222	" " " VJ 2.2 kΩ
R460	J00245272	" " " " 2.7 kΩ
R401,409,412, 413,431,456, 496,0511	J00245332	" " " " 3.3 kΩ
R426,427,476	J00245472	" " " " 4.7 kΩ
R403,445,478, 489	J00245562	" " " " 5.6 kΩ
R434, 450	J00245682	" " " " 6.8 kΩ
R404,407,420, 421,424,436, 471,477,481, 484,485,491, 492, 0501, 0509, 0512	J00245103	" " " " 10 kΩ
R433	J01245103	" " " TJ 10 kΩ
R470	J00245123	" " " VJ 12 kΩ
R415,498,499 499	J00245153	" " " " 15 kΩ
R414	J00245273	" " " " 27 kΩ
R461,472 0500	J00245473	" " " " 47 kΩ
R405,465,466	J00245104	" " " " 100 kΩ
R493	J00245154	" " " " 150 kΩ
R448,452,487, 0503, 0505	J00245184	" " " " 180 kΩ
	J00245334	" " " " 330 kΩ

R0521	J01245274	Carbon film	1/4W TJ 270 kΩ	L409	L0020145	5.2 μH #220145
R432	J00245684	" "	" VJ 680 kΩ			
R490	J00245105	" "	" " 1 MΩ			
	J00245225	" "	" " 2.2 MΩ			
R0519	J10246565	" composition	" GK 5.6 MΩ			**TRANSFORMER**
				T410	L0020150	R12-4074
				T402,403,404, 407,409,413, 414	L0020140	R12-4170
		POTENTIOMETER				
VR401, 402	J51723102	SR-19R	1 kΩB	T401,406,408, 415	L0020141	R12-4171
VR403, 404	J51723103	"	10 kΩB			
VR405	J51723473	"	47 kΩB	T405	L0020221	
VR407	J50705502	EVN-A1A-A00B53	5 kΩB	T411	L0020460	
VR406	J50705504	EVN-A1A-A00B55	500 kΩB	T412	L0020209	
		CAPACITOR				
C477	K30176221	Dipped mica 50WV	220 pF			
C445, 472	K02173100	Ceramic "	CH 10 pF			**MINI CONNECTOR**
C488, 492	K06175330	" "	UJ 33 pF	J401	P0090038	5048-12A
C489	K06175390	" "	UJ 39 pF	J402	P0090039	5048-13A
C404,421,432	K02175470	" "	CH 47 pF	J403	P0090040	5048-15A
C487	K06175101	" "	UJ 100 pF			
C459,464,475	K02175101	" "	CH 100 pF			
C401,405,406, 411,413,415, 417,419,420, 423,424,428, 430,431,433, 435,440,442, 443,446,448, 451–455, 460,465,482, 484–486, 490,491,493, 494,497	K13170103	" "	0.01 μF	TP401–412	Q5000011	Wrapping terminal C
C402,403,407, 408,410,412, 414,416,418, 422,425–427, 429,436–438, 441,444,447, 457,458,462, 463,468–471, 473,474,495, 498	K13170473	" "	0.047 μF			
C449	K14179003	" "	0.1 μF	Q515	G3105641	TR 2SA564A
C461, 467	K50177103	Mylar 50WV	0.01 μF	Q511	G3303730	" 2SC373
C478	K50177223	" "	0.022 μF	Q507, 508	G3310000G	" 2SC1000GR
C409,439,456, 466,480,481, 483	K50177473	" "	0.047 μF	Q512	G3313830	" 2SC1383
				Q509,510,513, 516	G3318150Y	" 2SC1815Y
C434	K70167224	Tantalum 35WV	0.22 μF			
C479	K70127225	" "	2.2 μF			
C450,476,496	K40120106	Electrolytic 16WV	10 μF			
						DIODE
				D510, 511	G2090029	Ge 1N60
		INDUCTOR		D502–506	G2010070	Ge (GB) 1S1007
L401–408, 410, 413	L1190016	FL-5H 101K	100 μH	D507–509, 512–517, 519–522	G2015550	Si 1S1555
L411, 412	L1190038	FL-5H 271K	270 μH			

AF UNIT

Symbol No.	Parts No.	Description
	C0019640	AF unit with components
PB-1964A	F0001964A	P.C. Board
		IC, FET, TRANSISTOR
Q503	G1090077	IC MC3403P (μPC324C)
Q506	G1090064	" MC14024B
Q504	G1090100	" SN74LS123N
Q502	G1090086	" TA7063P
Q501	G1090164	" μPC2002H
Q505	G1090120	" NJM78L05
Q514	G3800190G	FET 2SK19GR

D501, 518	G2090001	Si 10D1			**CAPACITOR**
			C513	K30176511	Dipped mica 50WV 510 pF
			C511	K02172050	Ceramic 50 WV CH 5 pF
			C522	K02173100	" " " 10 pF
			C514	K02179011	" " " 27 pF
		CRYSTAL	C546–548	K02175390	" " " 39 pF
X501	H0100260	HC-6/W 3200 kHz #210026	C510,532,534, 555,566	K02175101	" " " 100 pF
X502	H0100421	HC-18/U 8986 kHz #210042-1			
X503	H0100422	" 8989 kHz #210042-2	C533	K02175151	" " " 150 pF
X504	H0100423	" 8988.3 kHz #210042-3	C558, 559	K00179020	" " SL 240 pF
			C512	K06175271	" " UJ 270 pF
			C504,519–521, 523,531,535, 542–545, 570	K13170103	" " 0.01 μF
		RESISTOR			
R511	J00245560	Carbon film 1/4W VJ 56 Ω			
R509,539,557	J00245101	" " " " 100 Ω	C509,537,574	K13170473	" " 0.047 μF
R533, 546	J00245151	" " " " 150 Ω	C516	K50177102	Mylar 50 WV 0.001 μF
R503.513.524, 525	J00245221	" " " " 220 Ω	C526	K50177472	" " 0.0047 μF
			C518,529,530, 572	K50177103	" " 0.01 μF
R512,522,538	J00245471	" " " " 470 Ω			
R504,514,520, 523,548,561	J00245102	" " " " 1 kΩ	C525,539–541	K50177223	" " 0.022 μF
			C528,556,569, 573,574	K50177473	" " 0.047 μF
R515	J00245222	" " " " 2.2 kΩ			
R534,535,565	J00245272	" " " " 2.7 kΩ	C503	K50177104	" " 0.1 μF
R510.562.569, 578–580	J00245332	" " " " 3.3 kΩ	C507,517,527, 550,551,560, 567,568,571	K40170105	Electrolytic " 1 μF
R583	J01245472	" " " TJ 4.7 kΩ			
R501,506,531, 536,537,542, 544,545,549, 550,563,566, 575,576,581	J00245472	" " " VJ 4.7 kΩ	C557	K40170225	" " 2.2 μF
			C561	K40170335	" " 3.3 μF
			C536	K40140475	" 25 WV 4.7 μF
			C505,515,538, 552,554,564, 565	K40126106	" 16 WV 10 μF
R521,527,532	J00245562	" " " " 5.6 kΩ			
R541,568,570	J00245682	" " " " 6.8 kΩ	C524,553,563	K40126226	" " 22 μF
R507,519,529, 555,556,558, 571, 572	J00245103	" " " " 10 kΩ	C508	K40126476	" " 47 μF
			C501	K40126107	" " 100 μF
			C506	K40126227	" " 220 μF
R517, 551	J00245153	" " " " 15 kΩ	C502	K40126477	" " 470 μF
R508,518,528, 540,554,573	J00245223	" " " " 22 kΩ	C562	K40126336	" " 33 μF
R559	J00245393	" " " " 39 kΩ			
R567	J00245473	" " " " 47 kΩ			**TRIMMER CAPACITOR**
R516	J00245563	" " " " 56 kΩ	TC501–505	K91000013	ECV-1ZW 20 x 32 20 pF
R547, 574	J00245104	" " " " 100 kΩ			
R560	J00245154	" " " " 150 kΩ			
R552, 553	J00245224	" " " " 220 kΩ			**INDUCTOR**
R526	J00245274	" " " " 270 kΩ	L502	L1190023	FL-5H 220 22 μH
R564, 577	J00245474	" " " " 470 kΩ	L501	L1190038	FL-5H 271 270 μH
R582	J00245824	" " " " 820 kΩ	L503–506	L1190017	FL-5H 102 1 mH
R505	J10276229	" composition 1/2W GK 2.2Ω			
R502	J32276010	Wire wound 1W 1 Ω			
					TRANSFORMER
			T501	L0020209	#220209
		POTENTIOMETER			
VR501	J51727101	CR-19R 100 ΩB			
					RELAY
			RL501	M1190002	FBR211A D012M

		MINI CONNECTOR
J501	P0090043	5048-19A
J502	P0090040	5048-15A
J503	P0090037	5048-08A
J504	P0090042	5048-05A
J505	P0090041	5048-03A
	R0042800	HEAT SINK

PREMIX LOCAL UNIT

Symbol No.	Parts No.	Description
	C0021530	PREMIX LOCAL unit with
		components
PB-2153	F0002153	P.C. Board
		TRANSISTOR
Q601–612	G3303800Y	2SC380TMY
		DIODE
D601–612	G2015550	Si 1S1555
		RESISTOR
R605, 610, 615, 620, 625, 628, 630, 631, 636, 637, 641, 642, 646, 647, 651, 652, 656, 657	J00245101	Carbon film ¼W VJ 100Ω
R632	J00245151	" " " " 150 Ω
R605, 608, 613, 618, 623	J00245561	" " " " 560 Ω
R604, 609, 614, 619, 624, 629, 633, 638, 643, 648, 653, 658	J00245102	" " " " 1 kΩ
R661–663	J00245222	" " " " 2.2 kΩ
R602, 607, 612, 617, 622, 627, 634, 639, 644, 649, 654, 659	J00245333	" " " " 33 kΩ
R601, 606, 611, 616, 621, 626, 635, 640, 645, 650, 655, 660	J00245563	" " " " 56 kΩ

		CAPACITOR
C607	K30176271	Dipped mica 50WV 270 pF
C603	K30176331	" " " 330 pF
C634, 638, 642, 646	K02175470	Ceramic " CH 47 pF
C626, 630	K02175680	" " " 68 pF
C623	K02175820	" " " 82 pF
C619	K02175101	" " " 100 pF
C615	K02175151	" " " 150 pF
C611	K02179023	" " " 180 pF
C601, 602, 604–606, 608–610, 612–614, 616–618, 620–622, 624, 625, 627–629, 631–633, 635–637, 639–641, 643–645, 647–649	K13170103	" " 0.01 μF
		CRYSTAL
X601	H0100411	HC-18/U 15.9875 MHz
X602	H0101480	" 17.9875 MHz
X603	H0101490	" 21.4875 MHz
X604	H0102294A	" 24.4875 MHz
X605	H0101500	" 28.4875 MHz
X606	H0102295A	" 32.4875 MHz
X607	H0101510	" 35.4875 MHz
X608	H0102296A	" 38.9875 MHz
X609	H0101520	" 42.4875 MHz
X610	H0101530	" 42.9875 MHz
X611	H0101540	" 43.4875 MHz
X612	H0101550	" 43.9875 MHz
		TRANSFORMER
T601–612	L0020017	
		INDUCTOR
L601	L1190016	FL5H-101K 100 μH

SELECT SWITCH UNIT

Symbol No.	Parts No.	Description
	C0019660	SELECT SW unit with components
PB-1966C	F0001966C	P.C. Board
		DIODE
D701	G2090001	Si 10D1
		RELAY
RL701	M1190002	FBR211A D012M
		SWITCH
S701	M4090006	6B0003CC2060

		MINI CONNECTOR			TRIMMER CAPACITOR
J701	P0090049	5048-16A	TC801	K90000001	TSN-100D15 15 pF
			TC802	K91000016	ECV-1ZW 50 x 32 50 pF

VFO UNIT		
Symbol No.	Parts No.	Description
	C0014400	VFO assembly 3420
		PCB with components
PB-1440B	F0001440B	P.C. Board
		FET & TRANSISTOR
Q802	G3800190G	FET 2SK19GR
Q801, 803	G3303720Y	Transistor 2SC372Y
		DIODE
D801	G2022360	Varactor 1S2236
		RESISTOR
R809, 811	J00245101	Carbon film 1/4W VJ 100 Ω
R807	J00245221	" " " " 220 Ω
R805, 808	J00245222	" " " " 2.2 kΩ
R802	J00245332	" " " " 3.3 kΩ
R801	J00245103	" " " " 10 kΩ
R803	J00245183	" " " " 18 kΩ
R804	J00245223	" " " " 22 kΩ
R806, 810	J00245104	" " " " 100 kΩ
		CAPACITOR
C807	K02173080	Ceramic disc 50WV CH 8 pF
C801	K06173080	" " " UJ 8 pF
C803	K06175120	" " " " 12 pF
C804	K02175180	" " " CH 18 pF
C805, 814	K02179013	" " " " 33 pF
C808, 818	K02175390	" " " " 39 pF
C811	K02179023	" " " " 180 pF
C821, 823	K00175471	" " " " 470 pF
C809,810,812, 815,819,820, 824,826	K13170103	" " " 0.01 μF
C813	K30176431	Dipped mica " 430 pF
C802, 822	K30209001	" " " 1000 pF
C825	K70167334	Tantalum 10WV 0.33 μF
		VARIABLE CAPACITOR
VC801	K90000024	CS21 R112

		INDUCTOR
L801	L0020268	#220268
L804, 805	L1190007	Micro inductor FL-4H 1.8 μH
L803, 806	L1190001	" " 250 μH
L802	L1190040	" " S4 102K 1 mH
		RECEPTACLE
J801	P1090012	SI-6303-1
		TERMINAL
	Q5000005	Lighthouse type
	Q5000011	Wrapping terminal C

RECT. B UNIT		
Symbol No.	Parts No.	Description
	C0019670	RECT. A unit with components
PB-1967	F0001967	P.C. Board
		IC, TRANSISTOR
Q901	G1090162	IC μPC78L12
Q903	G3104950O	TR 2SA495(O)
		DIODE
D907	G2090001	Si 10D1
D901–904	G2090002	" 10D10
D905, 906	G2090003	" V06B
D908	G2090007	Zener WZ061
		RESISTOR
R908	J01245560	Carbon film 1/4W TJ 56 Ω
R905	J10276220	" composition 1/2W GK 22 Ω
R901–904	J10276474	" " " 470 kΩ
R907	J20339001	Metallic film 2W 0.4 Ω
		CAPACITOR
C901–905	K13170103	Ceramic 50WV 0.01 μF
C908–911	K40140106	Electrolytic 25WV 10 μF
C907	K40140107	" " 100 μF

C906	K41140338	Electrolytic 25WV 3300 μF
		RELAY
RL901	M1190003	FRL-264 D012/04CS-01
	Q5000011	Wrapping terminal C
	Q5000004	Test point D

RECT. B UNIT

Symbol No.	Parts No.	Description
	C0019680	RECT. B unit with components
PB-1968B	F0001968B	P.C. Board
		TRANSISTOR
Q1003	G3106390	2SA639
Q1001	G3107330	2SA733
Q1002	G3303720Y	2SC372Y
		DIODE
D1004, 1005, 1008–1011	G2015550	Si 1S1555
D1002, 1003, 1012	G2090002	" 10D10
D1006, 1007	G2090001	" 10D1
D1001	G2090081	" SM1-12
		RESISTOR
R1021	J00245681	Carbon film 1/4W VJ 680 Ω
R1011, 1016, 1020	J00245472	" " " " 4.7 kΩ
R1013, 1015	J00245103	" " " " 10 kΩ
R1014	J00245123	" " " " 12 kΩ
R1017–1019	J00245223	" " " " 22 kΩ
R1012	J00245563	" " " " 56 kΩ
R1010	J20306562	Metallic film 1W 5.6 kΩ
R1022	J20306390	" " " 39 Ω
R1005	J20336391	" " 2W 390 Ω
R1006	J20336471	" " " 470 Ω
R1008	J20336222	" " " 2.2 kΩ
R1007	J20336332	" " " 3.3 kΩ
R1009	J20336473	" " " 47 kΩ
R1023	J10276474	Carbon composition ½W GK 470 kΩ
		POTENTIOMETER
VR1001	J50708103	V18K3-2 10 kΩB

		CAPACITOR
C1017	K13170473	Ceramic 50WV 0.047 μF
C1016	K12279003	" 500WV 0.0022 μF
C1005, 1006, 1013–1015, 1018	K12279004	" " 0.0047 μF
C1010	K12279002	" " 0.01 μF
C1009	K40240106	Electrolytic 250WV 10 μF
C1011	K40240336	" " 33 μF
C1012	K40240476	" " 47 μF
C1001–1004	K40270106	" 450WV 10 μF
C1007, 1008	K40260226	" 350WV 22 μF
	Q5000011	Wrapping terminal C

CAPACITOR UNIT

Symbol No.	Parts No.	Description
	C0019690	CAPACITOR unit with components
PB-1969A	F0001969A	P.C. Board
		RESISTOR
R1101, 1102	J10276474	Carbon composition 1/2W GK 470 kΩ
		CAPACITOR
C1101, 1102	K43270003	Electrolytic 500WV 200 μF (CE-62LW)

TRIMMER A UNIT

Symbol No.	Parts No.	Description
	C0019700	TRIMMER A unit with components
PB-1970	F0001970	P.C. Board
		CAPACITOR
C1203	K30176271	Dipped mica 50WV 270 pF
C1208	K30176391	" " " 390 pF
C1202	K30176651	" " " 650 pF
C1207	K30209001	" " " 1000 pF
C1201	K30209003	" " " 1500 pF
C1206	K02173100	Ceramic 50WV CH 10 pF
C1205	K02179012	" " " 30 pF
C1204	K02175820	" " " 82 pF

		TRIMMER CAPACITOR	
TC1203	K91000032	B2PY	100 pF
TC1202	K91000052	B4PY	220 pF
TC1201	K91000033	B7PY	470 pF
TC1206	K91000013	ECV-1ZW 20 x 32	20 pF
TC1204, 1205	K91000016	" 50 x 32	50 pF
		INDUCTOR	
L1201	L0020545	Trap coil #220545	

TRIMMER B BOARD

Symbol No.	Parts No.	Description
	C0019701	TRIMMER B unit with components
PB-1970	F0001970	P.C. Board
		CAPACITOR
C1303	K30176221	Dipped mica 50WV 220 pF
C1306	K30176391	" " " 390 pF
C1302	K30176621	" " " 620 pF
C1301	K30209003	" " " 1500 pF
	K02173080	Ceramic 50WV CH 8 pF
C1304	K02175680	" " " 68 pF
		TRIMMER CAPACITOR
TC1303	K91000032	B2PY 100 pF
TC1302	K91000052	B4PY 220 pF
TC1301	K91000033	B7PY 420 pF
TC1306	K91000012	ECV-1ZW 10 x 32 10 pF
TC1304, 1305	K91000016	" 50 x 32 50 pF

TRIMMER C BOARD

Symbol No.	Parts No.	Description
	C0010920	TRIMMER C unit with components
PB-1092	F1001092	P.C. Board
		CAPACITOR
C1406	K30276100	Dipped mica 500WV 10 pF
C1405	K30276820	" " " 82 pF
C1403	K30276221	" " " 220 pF
C1407	K30276391	Dipped mica 500WV 390 pF
C1402	K30276651	" " " 650 pF
C1401	K30279055	" " " 1500 pF
		TRIMMER CAPACITOR
TC1404, 1405	K91000031	B1PY 40 pF
TC1402, 1403	K91000032	B2PY 100 pF
TC1401	K91000033	B7PY 420 pF

BAND WIDTH CONTROL UNIT

Symbol No.	Parts No.	Description
	C0019720	B.W. CONT. unit with components
PB-1972	F0001972	P.C. Board
		LED
D1501	G2090060	GD4-203 SRD
		RESISTOR
R1501	J00245152	Carbon film 1/4W VJ 1.5 kΩ
		POTENTIOMETER
VR1501	J50710502	V10K8-1-2 5 k ΩB
		SWITCH
S1501	N4090008	1B0001AC2060

DRIVER BOARD

Symbol No.	Parts No.	Description
	C0017140	Driver board with components (without vacuum tube)
PB-1714A	F0001714A	P.C. Board
		VACUUM TUBE
V1601	G6090002	12BY7A
		VACUUM TUBE SOCKET
VS1601	P3090022	SB-9403

		RESISTOR			**CAPACITOR**
R1605	J10276470	Carbon composition 1/2W GK 47 Ω	C1703	K12279001	Ceramic disc 500WV 0.001 μF
R1602, 1604	J10276560	" " " " 56 Ω	C1704, 1710	K12279002	" " " 0.01 μF
R1603	J10276101	" " " " 100 Ω	C1705–1709, 1711, 1712	K13170473	" " 50WV 0.047 μF
R1601	J10276473	" " " " 47 kΩ			
			C1701	K31306102	Moulded mica 1kWV 1000 pF
			C1702	K30273050	Dipped mica 500WV 5 pF
		CAPACITOR			
C1601, 1602	K12279002	Ceramic disc 500WV 0.01 μF			
C1603, 1604, 1606	K13170473	" " 50WV 0.047 μF			**INDUCTOR**
			L1701	L1190020	Micro inductor 150 μH
C1605	K30279051	Dipped mica 500WV 1000 pF	L1704	L1190039	" " 560 μH
			L1702, 1703 (R1701,1702)	L1020307	RF choke #220307
		INDUCTOR			
L1601	L1190020	Micro inductor FL5H 150 μH			
L1602(R1602)	L1020029	#220029		Q5000011	Wrapping terminal C
	Q5000011	Wrapping terminal C			

FINAL BOARD

Symbol No.	Parts No.	Description
	C0017151	Final board with components (without vacuum tube)
PB-1715B	F0001715B	P.C. Board
		VACUUM TUBE
V1701, 1702	G6090001	6146B
		VACUUM TUBE SOCKET
VS1701, 1702	P3090024	SB-3606
		DIODE
D1701	G2090002	Si 10D10
		RESISTOR
R1701, 1702 (L1702, 1703)	J10276560	Carbon composition 1/2W GK 56 Ω
R1703, 1704, 1705	J10276101	" " " " 100 Ω
R1706	J31333010	Meter shunt 2W 1 Ω

CLARIFIER CONTROL UNIT

Symbol No.	Parts No.	Description
	C0019730	CLAR.CONT. unit with components
PB-1973B	F0001973B	P.C. Board
		DIODE
D1801	G2090001	Si 10D1
D1802	G2090060	LED GD4-203SRD
		RESISTOR
R1803	J00245102	Carbon film 1/4W VJ 1 kΩ
R1804, 1805	J00245152	" " " " 1.5 kΩ
R1802	J00245332	" " " " 3.3 kΩ
R1801	J00245472	" " " " 4.7 kΩ
		POTENTIOMETER
VR1801	J50710501	V10K8-1-2 500 ΩB
		CAPACITOR
C1801–1803	K13170473	Ceramic 50WV 0.047 μF
		RELAY
RL1801	M1190002	FBR211A D012M

		SWITCH
SW1801	N4090011	2B0005FC206

LED BOARD

Symbol No.	Parts No.	Description
	C0019740	LED board with components
PB-1974A	F0001974A	P.C. Board
		LED
D1901–1906	G2090060	GD4-203SRD
		RESISTOR
R1901, 1902	J01245102	Carbon film 1/4W TJ 1 kΩ

LEVER SWITCH BOARD

Symbol No.	Parts No.	Description
	C0019750	LEVER SW board with components
PB-1975A	F0001975A	P.C. Board
		RESISTOR
R2006	J01245560	Carbon film 1/4W TJ 56 Ω
R2005	J01245101	" " " " 100 Ω
R2001	J01245121	" " " " 120 Ω
R2002	J01245391	" " " " 390 Ω
R2008	J00245562	" " " VJ 5.6 kΩ
R2004	J01245683	" " " TJ 68 kΩ
		SWITCH
S2001–2004	N3090002	SLE62301
S2005	N3090008	SLE64251

DISPLAY UNIT (3420)

Symbol No.	Parts No.	Description
PB-2098A	F0002098A	Printed Circuit Board
	C0020982	P.C.B. with components
		DISPLAY LED
D2201–2206	G2090069	HP5082-7623

		PLUG
P2201	P1090073	5047-06 (with wire T9202430)
P2202	P1090075	5047-08 (" " T9202440A)

COUNTER UNIT (3420)

Symbol No.	Parts No.	Description
PB-2086A	F0002086A	Printed Circuit Board
	C0020862	P.C.B. with components
		IC, FET & TRANSISTOR
Q2312	G1090249	IC MSM9520RS
Q2320	G1090079	" μPA54H
Q2305	G1090299	" μPC7805H
Q2301	G4800730	FET 3SK73
Q2321	G3104960Y	TR 2SA496Y
Q2306–2311, 2313–2319	G3109520L	" 2SA952L
Q2303	G3316740L	" 2SC1674L
Q2304	G3318150G	" 2SC1815GR
		DIODE
D2301–2313	G2015550	Si 1S1555
		CRYSTAL
X2301	H0102272	HC-18/U 6.5536 MHz
		RESISTOR
R2312	J00245100	Carbon film ¼W VJ 10 Ω
R2331, 2334, 2337, 2340, 2343, 2346, 2349	J00245330	" " " " 33 Ω
R2350	J00245560	" " " " 56 Ω
R2308, 2318, 2320, 2322, 2324, 2326, 2328	J00245101	" " " " 100 Ω
R2301	J01245221	" " " TJ 220 Ω
R2307, 2311, 2312	J00245221	" " " VJ 220 Ω
R2352	J00245331	" " " " 330 Ω
R2351	J00245471	" " " " 470 Ω
R2317, 2319, 2321, 2323, 2325, 2327, 2330, 2333, 2336, 2339, 2342, 2345, 2348	J01245102	" " " TJ 1 kΩ
R2329, 2332, 2335, 2338, 2341, 2344, 2347	J00245152	" " " VJ 1.5 kΩ
R2302, 2315	J00245562	" " " " 5.6 kΩ

R2313	J00245103	Carbon film ¼W VJ	10 kΩ
R2304, 2309	J01245473	" " " TJ	47 kΩ
R2314	J01245104	" " " "	100 kΩ
R2316	J00245104	" " " VJ	100 kΩ
		CAPACITOR	
C2324	K02179008	Ceramic 50WV CH	20 pF
C2325	K02175470	" " "	47 pF
C2320	K02175101	Electrolytic 16WV "	100 pF
C2301, 2304	K13170102	Ceramic 50WV CH	0.001 μF
C2302, 2305, 2308, 2309, 2311, 2312, 2314, 2315, 2317, 2319, 2321, 2323, 2326–2330	K13170103	" " "	0.01 μF
C2323	K50177103	Mylar "	0.01 μF
C2322	K71137685	Tantalum 20WV	6.8 μF
C2310, 2318	K40120106	Electrolytic 16WV	10 μF
C2313	K40109011	" 10WV	33 μF
C2316	K40129001	" 16WV	330 μF
		TRIMMER CAPACITOR	
TC2301	K91000030	ECV-1ZW 40 x 53	40 pF
		INDUCTOR	
L2301	L2030068		
		CONNECTOR	
J2301	P0090051	5048-06A	
J2302	P0090054	5048-07A	
J2303	P0090037	5048-08A	
P2301, 2302	P0090045	SQ4052	
P2303	P1090186	3021-03 (with wire T9201380A)	

DC-DC CONVERTER (OPTION)

Symbol No.	Parts No.	Description
		TRANSISTOR
Q3201, 3202	G3090002	T20A6 with insulator
		RESISTOR
R3202	J31306339	Wire wound 1W 3.3 Ω
R3201	J20376221	Metallic film 5W 220 Ω
		CAPACITOR
C3202	K52247474	Metallized paper 250WV 0.047 μF
C3201	K41140227	Electrolytic 25WV 220 μF
		CONNECTOR
P3201	P0090066	AC9M
	T9012720	DC POWER CORD
	Q0000009	FUSE 20 A

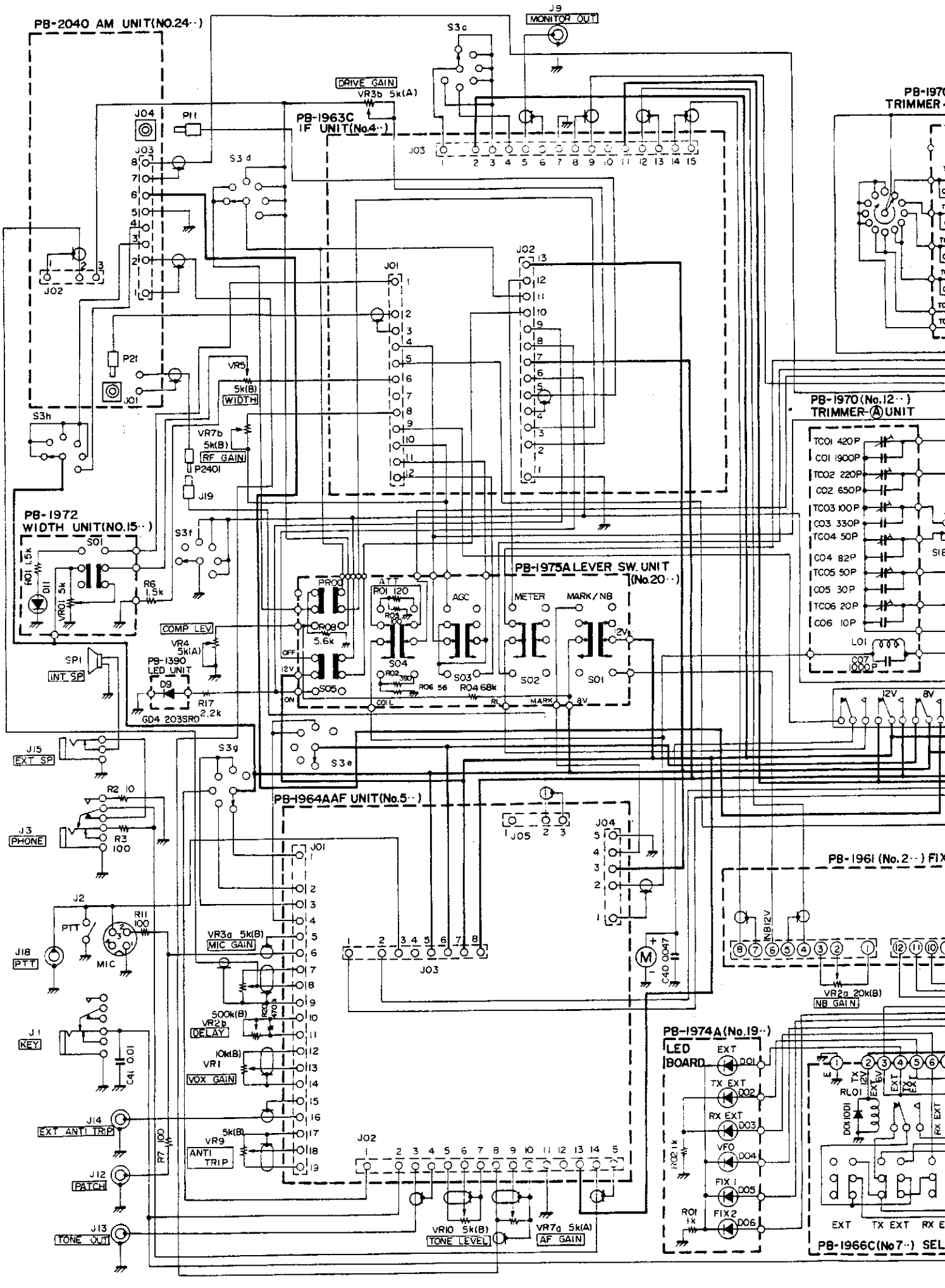
ACCESSORIES

Symbol No.	Parts No.	Description
		AC POWER CORD
	T9012380A	2 wire, 2 prong plug
	T9012481A	3 wire without plug
	T9012582A	3 wire, 3 prong plug (UL)
	T9012484	3 wire, 3 prong Australian plug
	T9012683A	3 wire, 2 prong EU plug
	P0090065	CONNECTOR PLUG QS-P6FL
	P0090018	PIN PLUG STP58
	P0090035	ACC PLUG PA602B04
	Q0000005	FUSE (100V–117V) 5A
	Q0000004	" (200V–234V) 3A

AM UNIT

Symbol No.	Parts No.	Description
	C0020400	AM unit with components
PB-2040	F0002040	P.C. Board
		FET & TRANSISTOR
Q2404	G3800190G	FET 2SK19GR
Q2406	G4800510C	" 3SK51-03
Q2405,2406, 2407	G3303800Y	TR 2SC380TM-Y
Q2401	G3307320G	" 2SC732TM-GR
Q2402, 2409	G3318150Y	" 2SC1815Y
		DIODE
D2406	G2090029	Ge. 1N60
D2401, 2402, 2404, 2405	G2015550	Si. 1S1555
		CRYSTAL
X2401	H0100423	HC-18/U 8988.3 kHz
		RESISTOR
R2441, 2457	J00245470	Carbon film ¼W VJ 47 Ω
R2455	J00245560	" " " " 56 Ω
R2411, 2414, 2418, 2422, 2425, 2432, 2434, 2447	J00245101	" " " " 100 Ω
R2406, 2423	J00245331	" " " " 330 Ω
R2445, 2452	J00245471	" " " " 470 Ω
R2409, 2419, 2435, 2436, 2438–2440	J00245102	" " " " 1 kΩ
R2437	J01245102	" " " TJ 1 kΩ
R2431	J00245272	" " " VJ 2.7 kΩ
R2401, 2410, 2453, 2456	J00245332	" " " " 3.3 kΩ
R2454	J01245332	" " " TJ 3.3 kΩ
R2404	J00245392	" " " VJ 3.9 kΩ
R2420,2429	J00245472	" " " " 4.7 kΩ
R2442, 2444	J00245562	" " " " 5.6 kΩ
R2402, 2424, 2446,2449,2458	J00245103	" " " " 10 kΩ
R2407	J00245123	" " " " 12 kΩ
R2405, 2433	J00245153	" " " " 15 kΩ
R2430	J00245183	" " " " 18 kΩ
R2443, 2450	J00245223	" " " " 22 kΩ
R2403	J00245273	" " " " 27 kΩ
R2408, 2412, 2421	J00245333	" " " " 33 kΩ
R2416	J00245393	" " " " 39 kΩ
R2427	J00245563	" " " " 56 kΩ
R2428	J00245683	" " " " 68 kΩ
R2417, 2426, 2451	J00245104	" " " " 100 kΩ
		THERMISTOR
TH2401	G9090003	D33A

		CAPACITOR
C2420	K30176331	Dipped mica 50 WV 390 pF
C2416	K02175390	Ceramic " CH 39 pF
C2417, 2426	K02175101	" " " 100 pF
C2418	K02175151	" " " 150 pF
C2401	K02175221	" " " 220 pF
C2419, 2421–2423, 2428, 2429, 2434, 2436, 2437–2440, 2445–2447 2449	K13170103	" " " 0.01 μF
C2425, 2427, 2430–2433, 2436, 2439	K13170473	" " 0.047 μF
C2451	K50177102	Mylar " 0.001 μF
C2407	K50177222	" " 0.0022 μF
C2410, 2415, 2435, 2438, 2447, 2449	K50177103	" " 0.01 μF
C2402	K50177473	" " 0.047 μF
C2414	K50177224	" " 0.22 μF
C2405, 2450, 2453	K40170105	Electrolytic " 1 μF
C2452	K40140475	" 25 WV 4.7 μF
C2406, 2408, 2409, 2424, 2454	K40126106	" 16 WV 10 μF
C2446	K40126476	" " 47 μF
C2403	K40126107	" " 100 μF
C2413	K40126227	" " 220 μF
		TRIMMER CAPACITOR
TC2402	K91000012	ECV 1ZW 10 x 32 10 pF
TC2401	K91000013	" 20 x 32 20 pF
		INDUCTOR
L2401, 2403	L1190016	FL5H-101K 100 μH
L2402	L1190017	FL5H-102K 1 mH
		TRANSFORMER
T2401	L0020141	R12-4171
		CONNECTOR
J2401, 2404	P1090016	SQ3056
J2402	P0090041	5048-03A
J2403	P0090037	5048-08A
P2401	P0090075	P-7015
	Q5000011	Wrapping terminal C
	B4025945B	P.C.B. support D


PB-2040 AM UNIT(NO.24··)
PB-1963C IF UNIT(No.4··)
PB-1972 WIDTH UNIT(NO.15··)
PB-1975A LEVER SW. UNIT (No.20··)
PB-1964AAF UNIT(No.5··)
PB-1970(No.12··) TRIMMER-Ⓐ UNIT
PB-1974A(No.19··) LED BOARD
PB-1966C(No.7··) SEL
PB-1961 (No.2··) FIX
PB-1390 LED UNIT
GD4 2035RD
MONITOR OUT
DRIVE GAIN
VR3b 5k(A)
WIDTH
RF GAIN
COMP LEV
INT SP
EXT SP
PHONE
PTT
MIC
MIC GAIN
DELAY
VOX GAIN
KEY
EXT ANTI TRIP
ANTI TRIP
PATCH
TONE OUT
TONE LEVEL
AF GAIN
NB GAIN
PROC
ATT
AGC
METER
MARK/NB
NB
LED BOARD
EXT
TX EXT
RX EXT
VFO
FIX1
FIX2