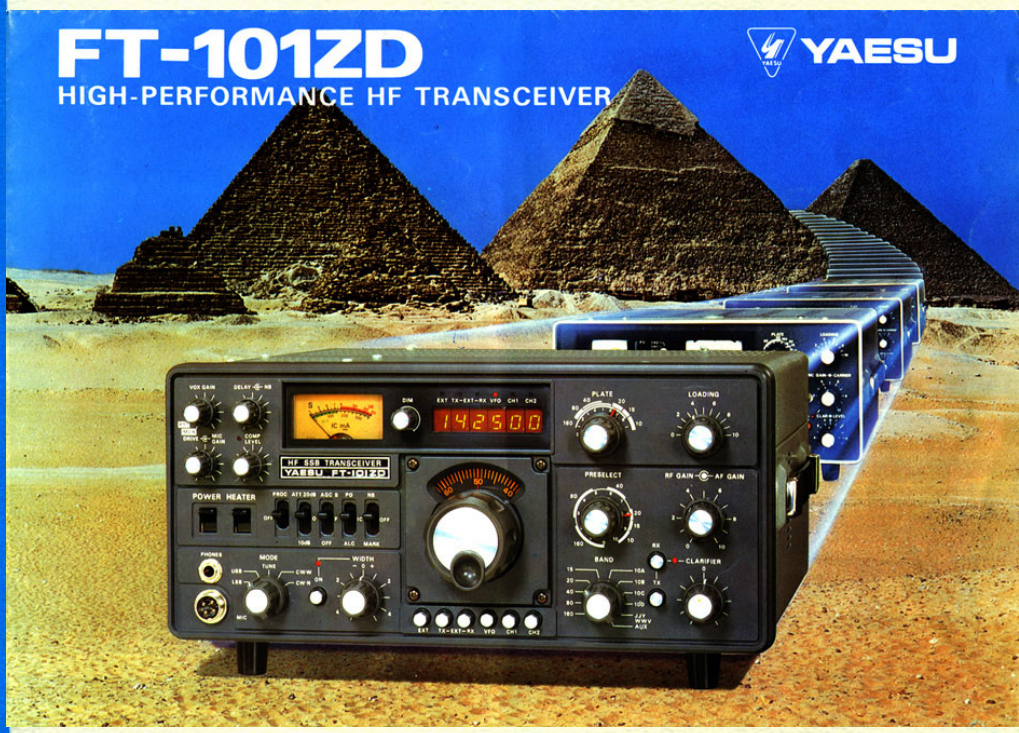
PAØPGA

INSTRUCTION MANUAL

FT-101ZD



YAESU MUSEN CO., LTD.

TOKYO JAPAN

TABLE CONTENTS

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, plus WWV/JJY) operation on SSB and CW. 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
20 m	14.0 - 14.5 MHz
15 m	21.0 - 21.5 MHz
10 m	28.0 - 29.9 MHz
WWV/JJY	5.0 - 5.5 MHz

Power requirements:

AC 100/110/117/200/220/234 volts, 50/60 Hz
DC 13.5 volts ±10%

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

Power input:

180 watts DC

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

Image rejection:

Better than 60 dB (160 - 15 m)
Better than 50 dB (10 m)

IF rejection:

Better than 70 dB (160, 80, 20, 15, 10 m)
Better than 60 dB (40 m)

Selectivity:

SSB 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
2SA496Y	1
2SA564A	3
2SA639	1
2SA733	1
2SB616	1
2SC372Y	25
2SC373	2
2SC535A	1
2SC1000GR	2
2SC1383	1
2SC1583	2
2SC1815Y	4
2N4427	1
MPS3640	1
MPSA13	1

Field Effect Transistors

2SK19GR	10
2SK19BL	1
3SK40M	2
3SK51-03	7
J310	2

Integrated Circuits (IC)

μPC78L05	1
μPC78L12	1
μPC14305	1
μPC14308	1
μPC2002H	1
MC3403P	1
MC10116	1
MC14024B	1
MSM561RS	6
MSM5564	1
SN76514N	1
SN74LS04N	1
SN74LS123N	1
SN74196N	1
SN74LS196N	6
TA7060P	1
TA7063P	1

Germanium Diodes

1N60	10
1S1007 (GB)	10

Silicon Diodes

1S1555	92
10D1	4
10D10	8
V06B	2

Zener Diodes

WZ061	1
WZ090	1

Varactor Diodes

1S2209	1
1S2236	1

Light Emitting Diodes

GD4-203SRD	9

LED Display

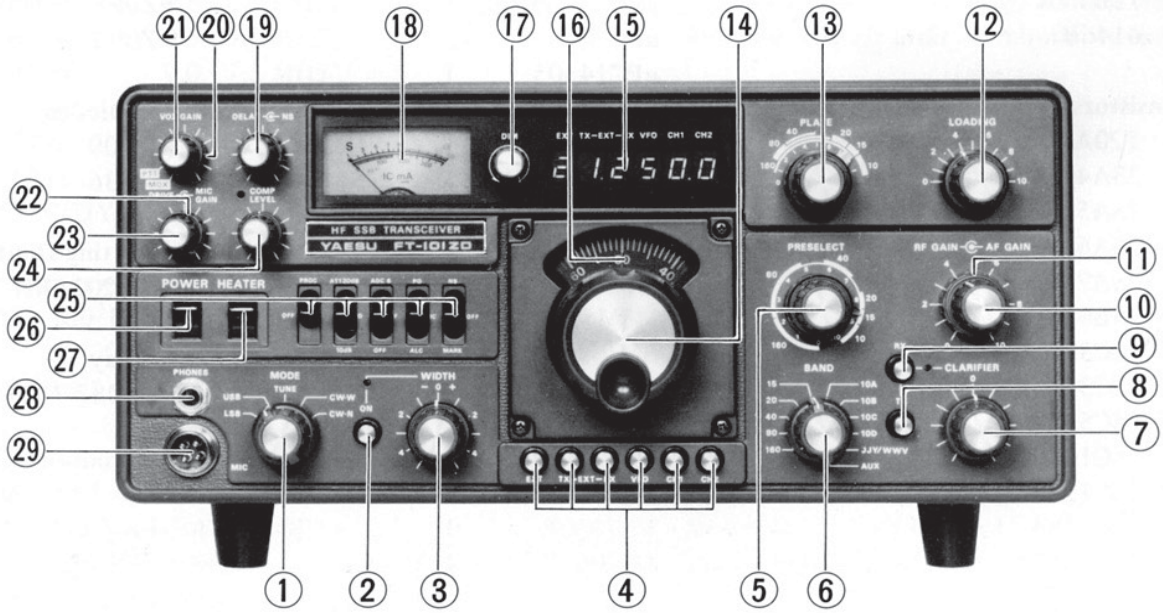
HP-5082-7623	6

FT-101ZD SERIES MODEL CHART

○ = BUILT-IN FEATURE X = AVAILABLE OPTION

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

CONTROLS AND SWITCHES



(1) MODE

Selection of LSB, USB, CW-W (SSB filter), and CW-N (optional CW filter) 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, plus WWV/JJY 5 MHz.

(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 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.

(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

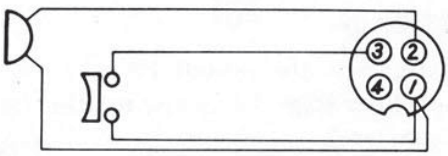
With the HEATER switch on, heater voltage is applied to the driver and final amplifier tubes. This switch may be turned off during periods of RX, when energy conservation is critical.

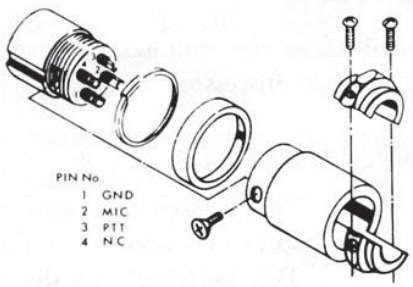
(28) PHONES

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

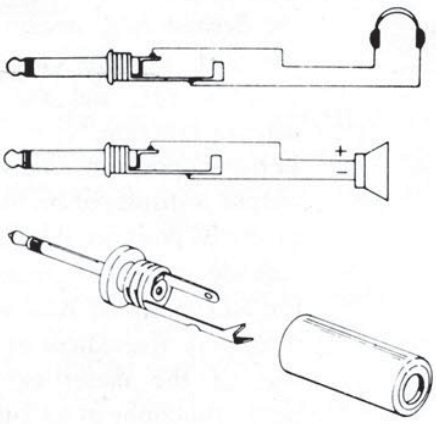
(29) MIC

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

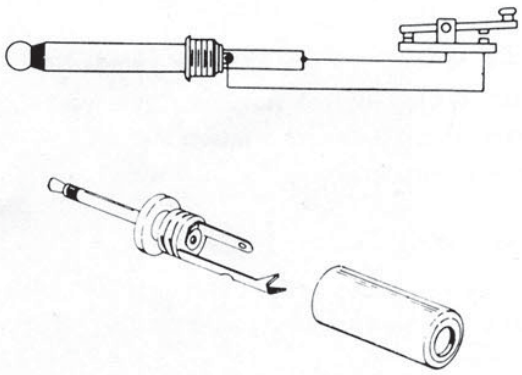




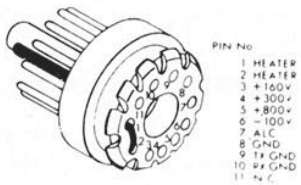
Mic plug



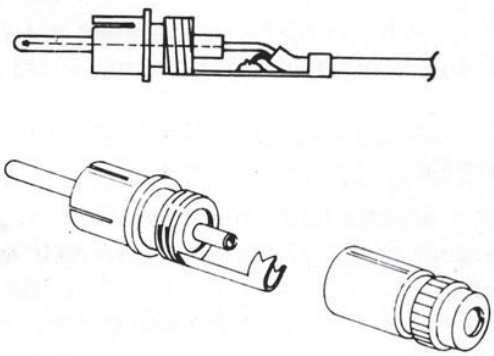
Headphone and external speaker plug



Key plug

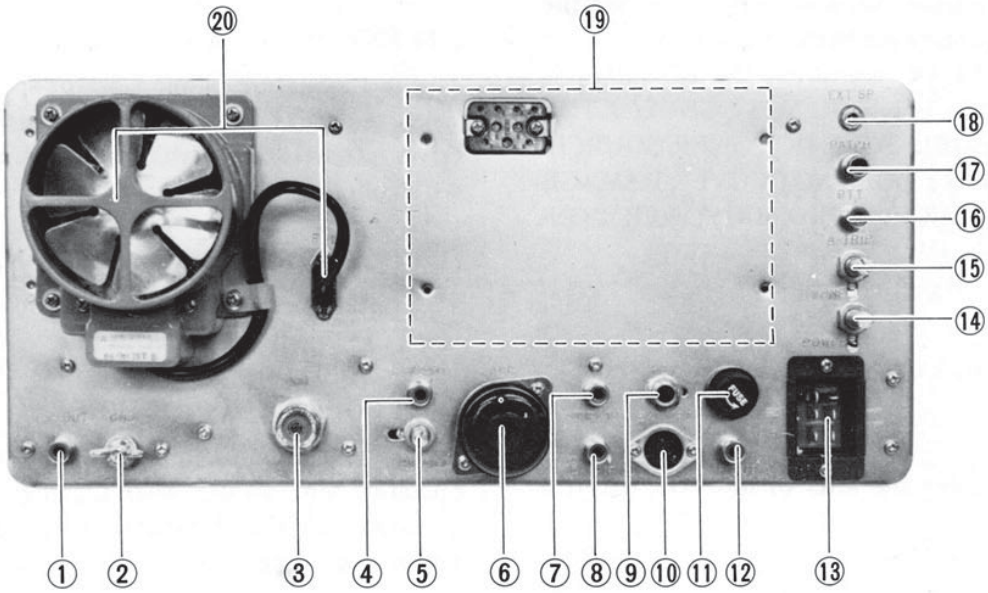


ACC plug



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-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.

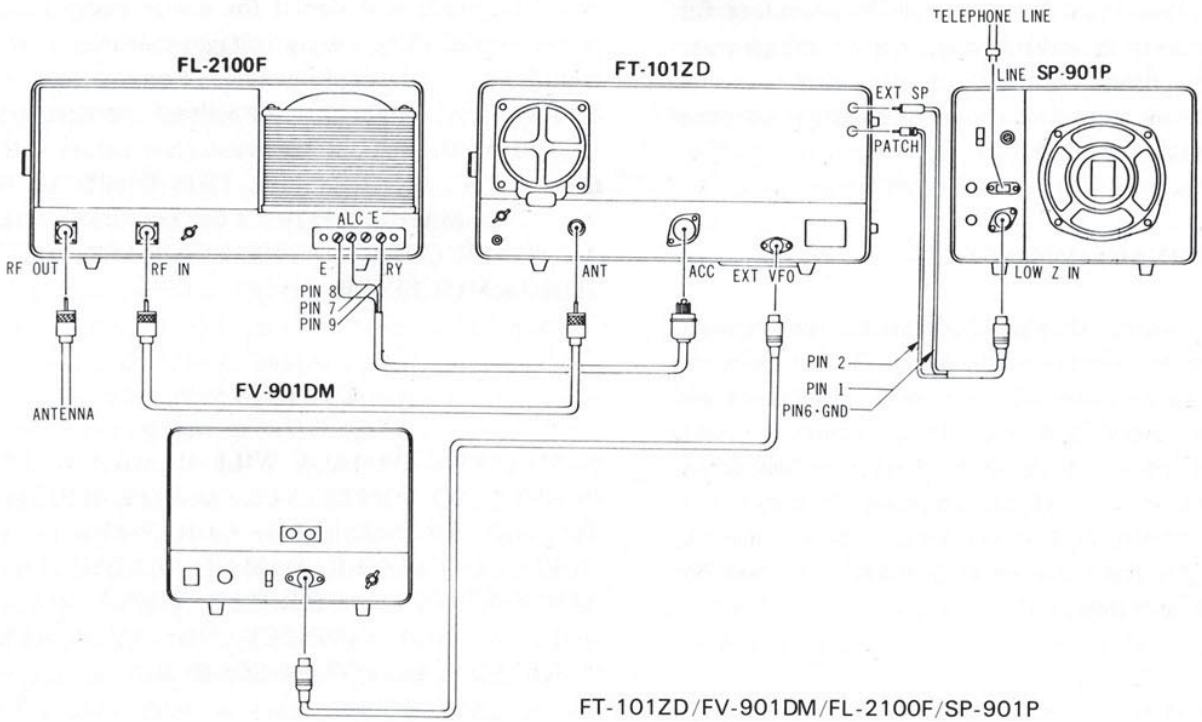
(3) PHONO PLUG 2

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

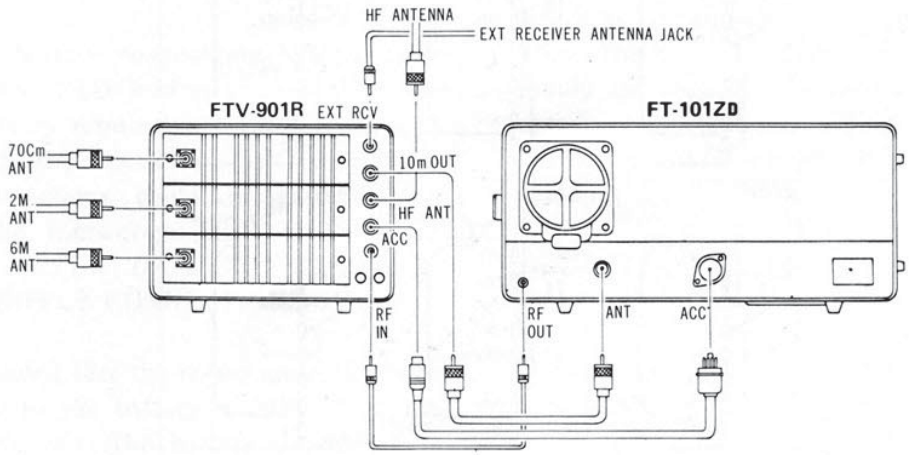
(4) SPARE FUSES 5A (3A) 1 each

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-2100F/SP-901P



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

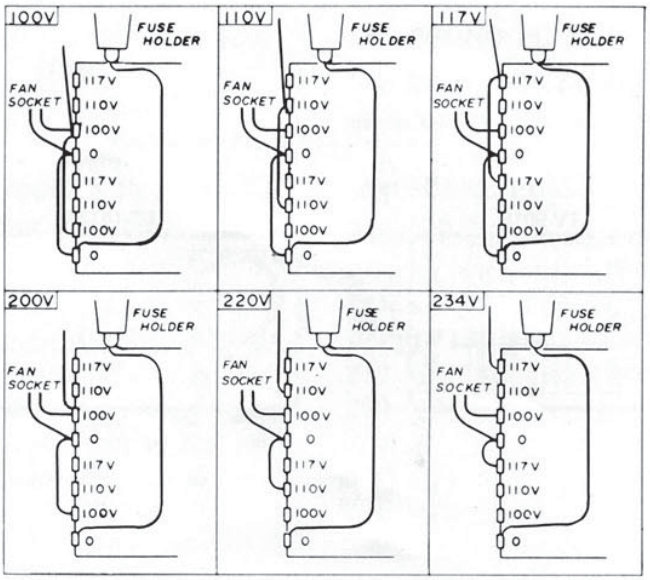
Upon opening the packing carton, immediately give the transceiver a thorough visual inspection. Check to see that all controls and switches are working freely, and inspect the cabinet for any signs of damage. If any damage has been sustained, immediately contact the shipping company, and document the 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 2 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-901 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.

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 rear panel BIAS control for a resting current of 50 mA on the IC meter. 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.

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 12 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.

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.

When using the FV-901DM synthesized, scanning external VFO, available from your Yaesu dealer, your FT-101ZD will have available a 40-frequency memory bank, as well as a three-speed scanner. Because there is no calibrated display for the FV-901DM, the FV-901DM cannot 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.

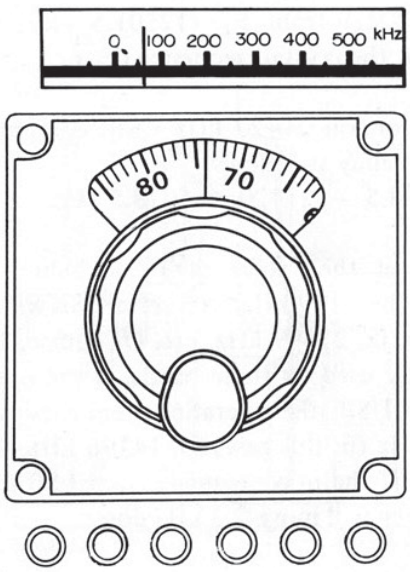
DIAL CALIBRATION AND FREQUENCY DETERMINATION

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 meters, the lower band edge is 3500 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 than 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 2 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
20m	19498.5	19501.5	19499.2
15m	26498.5	26501.5	26499.2
10m A	33498.5	33501.5	33499.2
10mB	33998.5	34001.5	33999.2
10mC	34498.5	34501.5	34499.2
10mD	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.

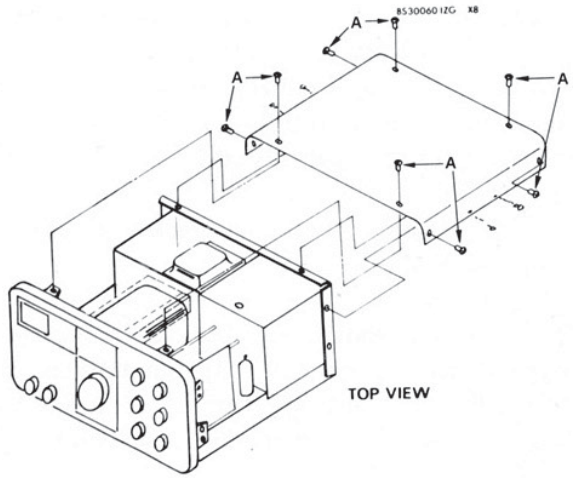


Figure 1

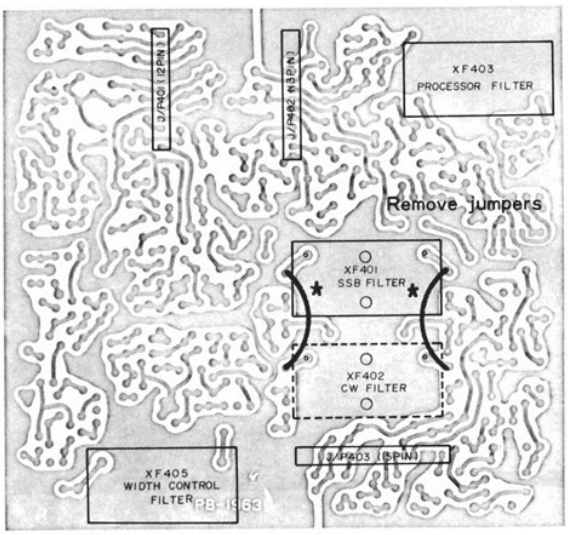


Figure 3

(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.

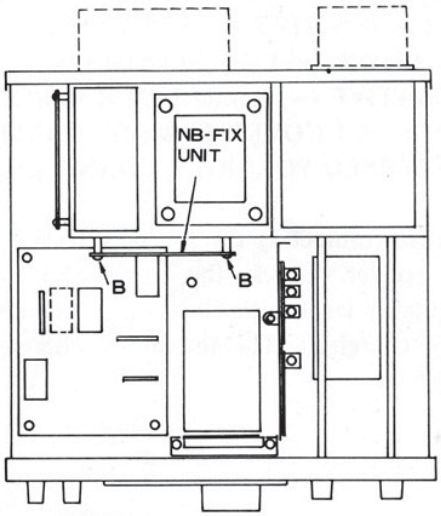


Figure 2

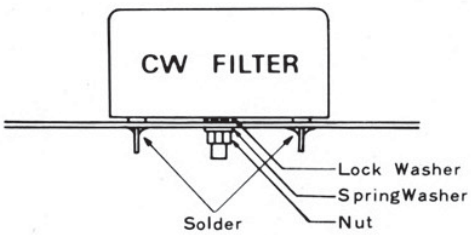


Figure 4

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.

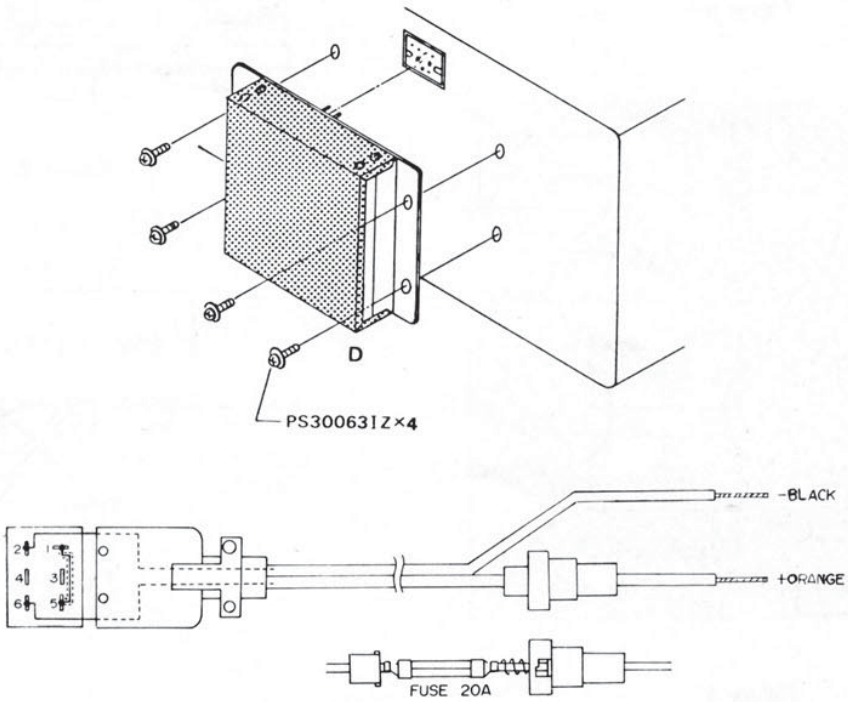
(5) Connect the DC cable to the transceiver. Power connections are made automatically when the DC cable is connected to the POWER jack.

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.

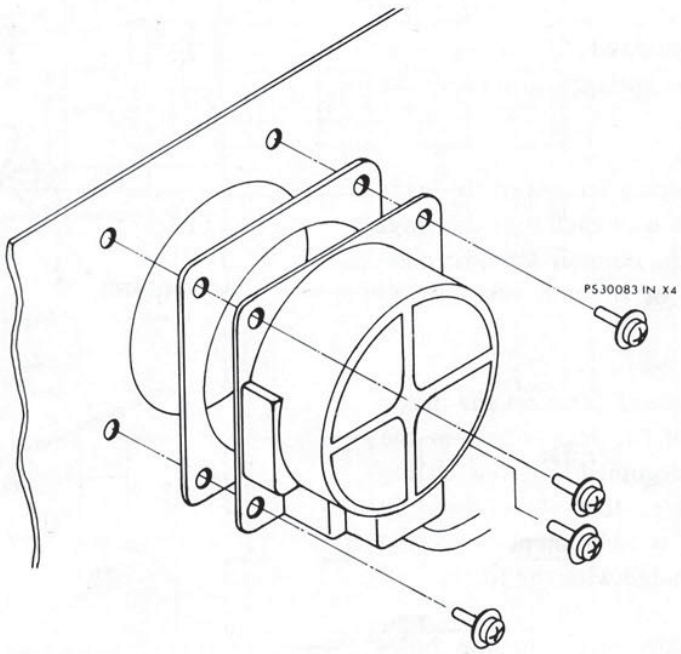


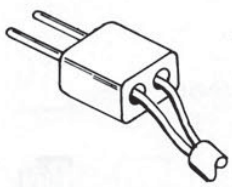
COOLING FAN INSTALLATION (OPTION)

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.

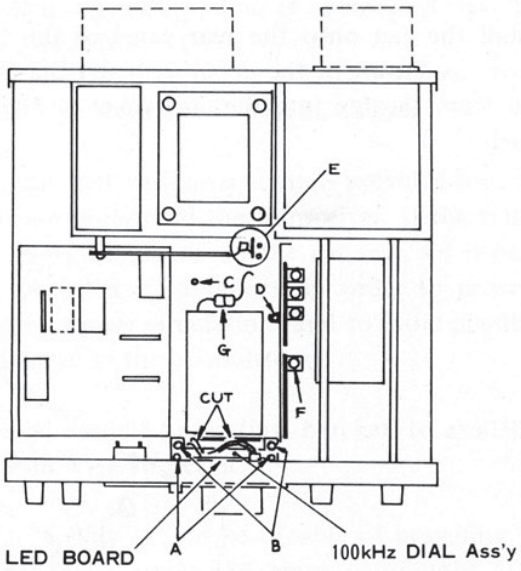
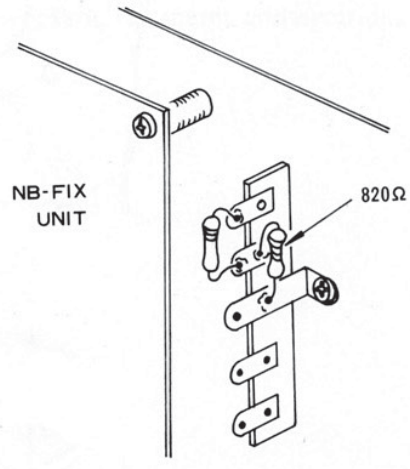


Figure 1



(Enlarged) Part E

Figure 2

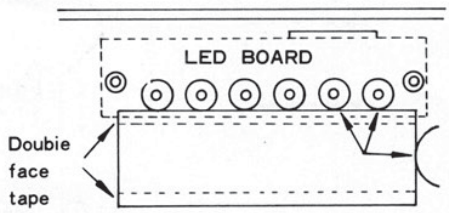
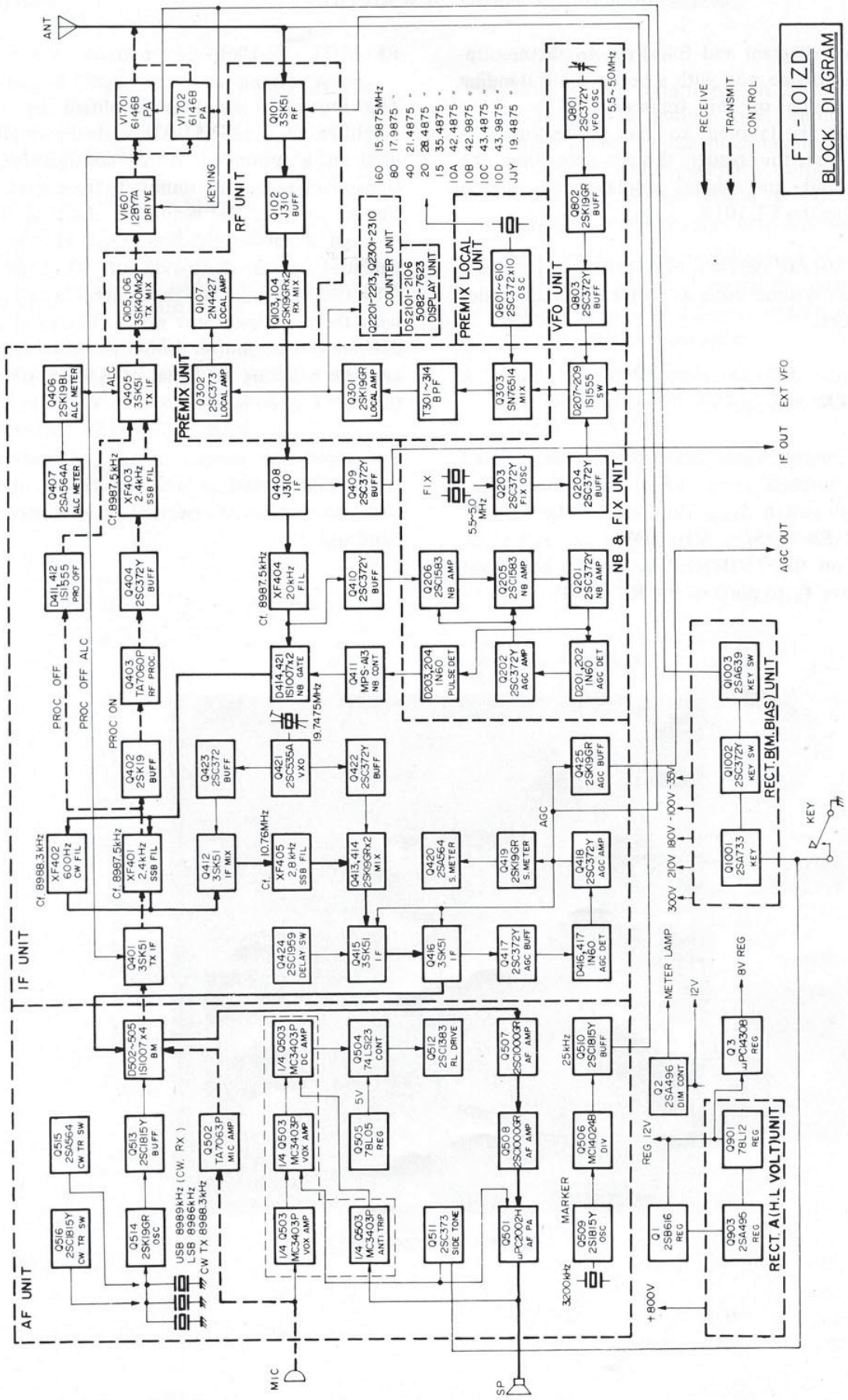


Figure 3



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.

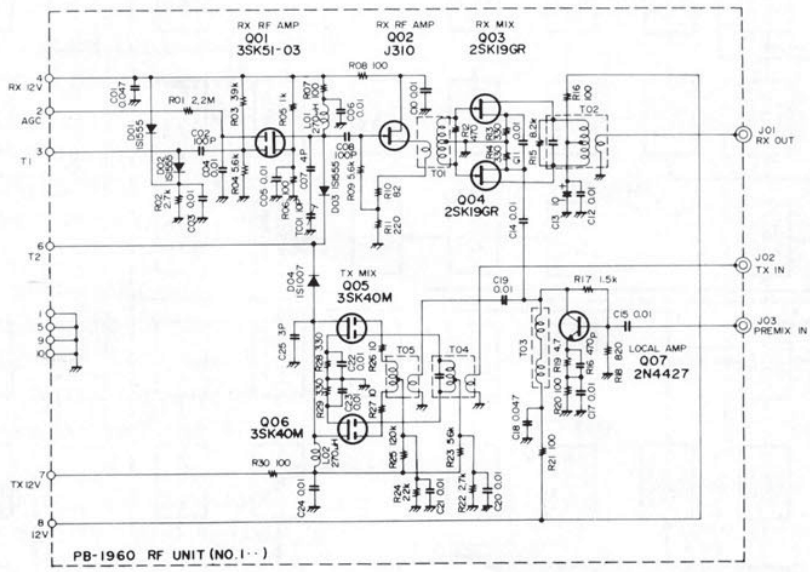
RECEIVER

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-1960)

The incoming signal is amplified by the RF amplifier, Q_{101} **(3SK51-03)**, a dual-gate MOSFET used in a grounded source configuration. This transistor has superior immunity from intermodulation distortion. The amplified signal is then fed through a source follower, Q_{102} **(J310)**, to the balanced mixer consisting of Q_{103} and Q_{104} **(2SK19GR)**, where the input signal is heterodyned with the local oscillator signal. The local signal is delivered from buffer amplifier Q_{107} **(2N4427)**, and the resulting IF signal of 8.9875 MHz is fed through T_{102} to J_{101}.

The input and output of the RF amplifier are permeability-tuned circuits, resulting in high sensitivity and excellent rejection of unwanted out-of-band signals.



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.

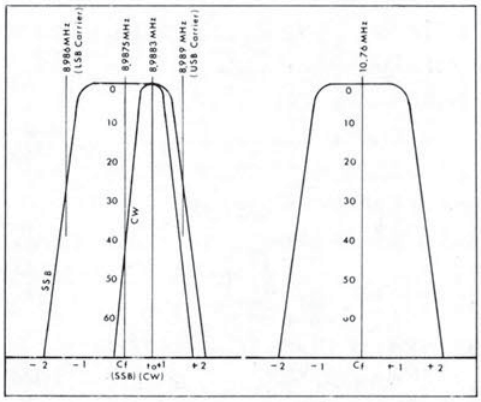
The new 10.76 MHz ±Δf signal is fed through filter XF_{405} to the IF second mixer, Q_{413}/Q_{414} **(2SK19GR)**, where the filtered signal is heterodyned with the 19.7475 MHz ±Δf signal delivered from Q_{422} **(2SC372Y)**, resulting in an 8.9875 MHz IF signal, the same as the original IF.

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)**.

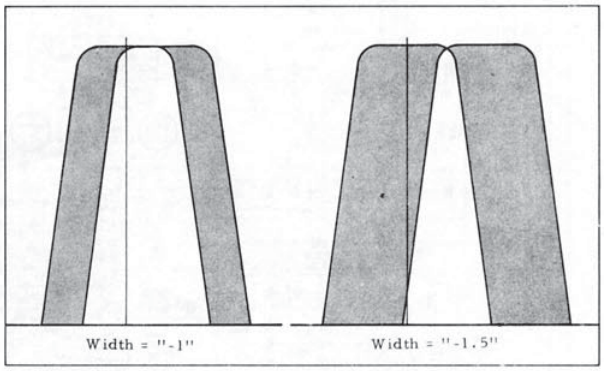
The output from the IF second mixer is fed to a two-stage IF amplifier, consisting of Q_{415} and Q_{416} **(3SK51-03)**, and delivered through diode switch D_{401} **(1S1555)** to the AF UNIT.

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.

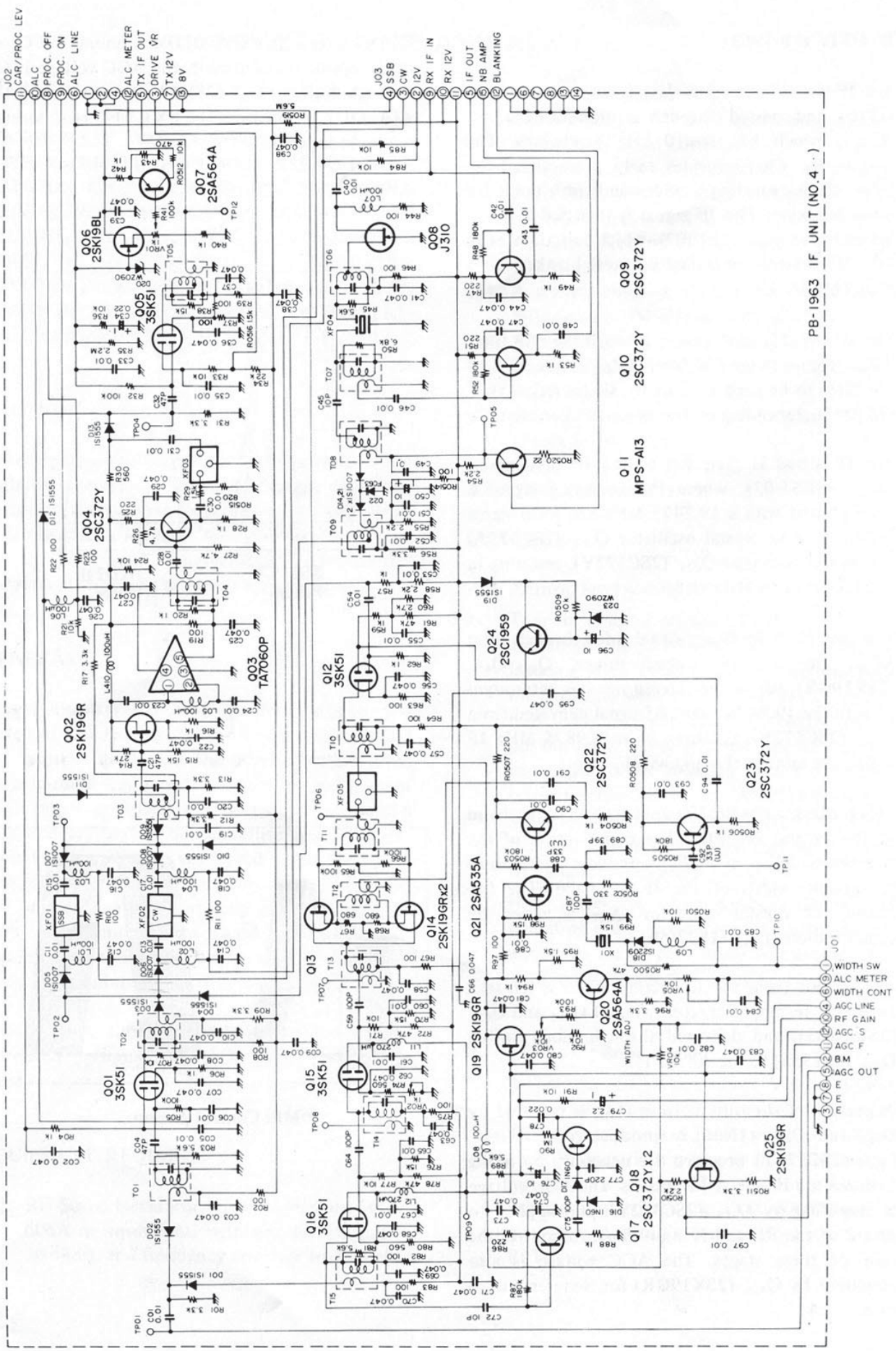
For use with the FV-901DM scanning VFO, or other optional equipment, the AGC voltage is fed through buffer Q_{425} **(2SK19GR)** and fed to the AGC OUT terminal on the EXT VFO jack, located on the rear panel.



SSB, CW Filters **WIDTH Filter**



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:

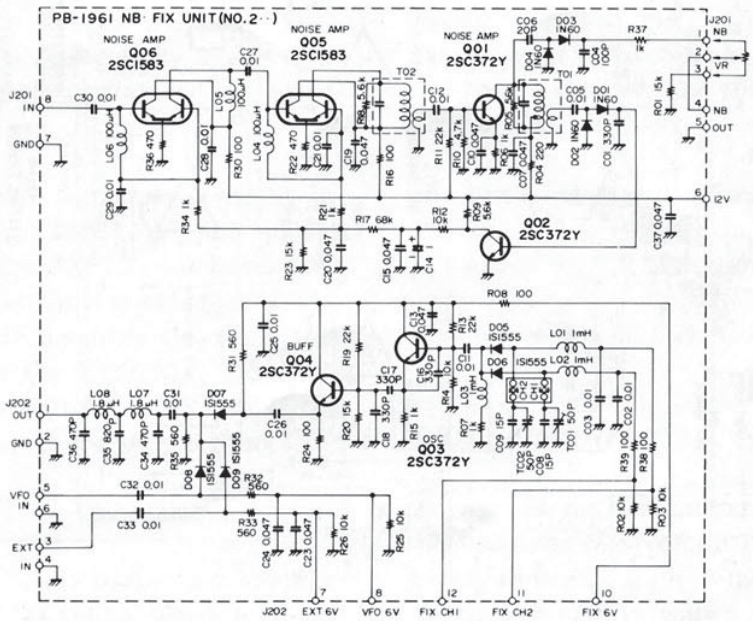
USB, CW·RX	8989 KHz
LSB	8986 KHz
CW·TX	8988.3 KHz

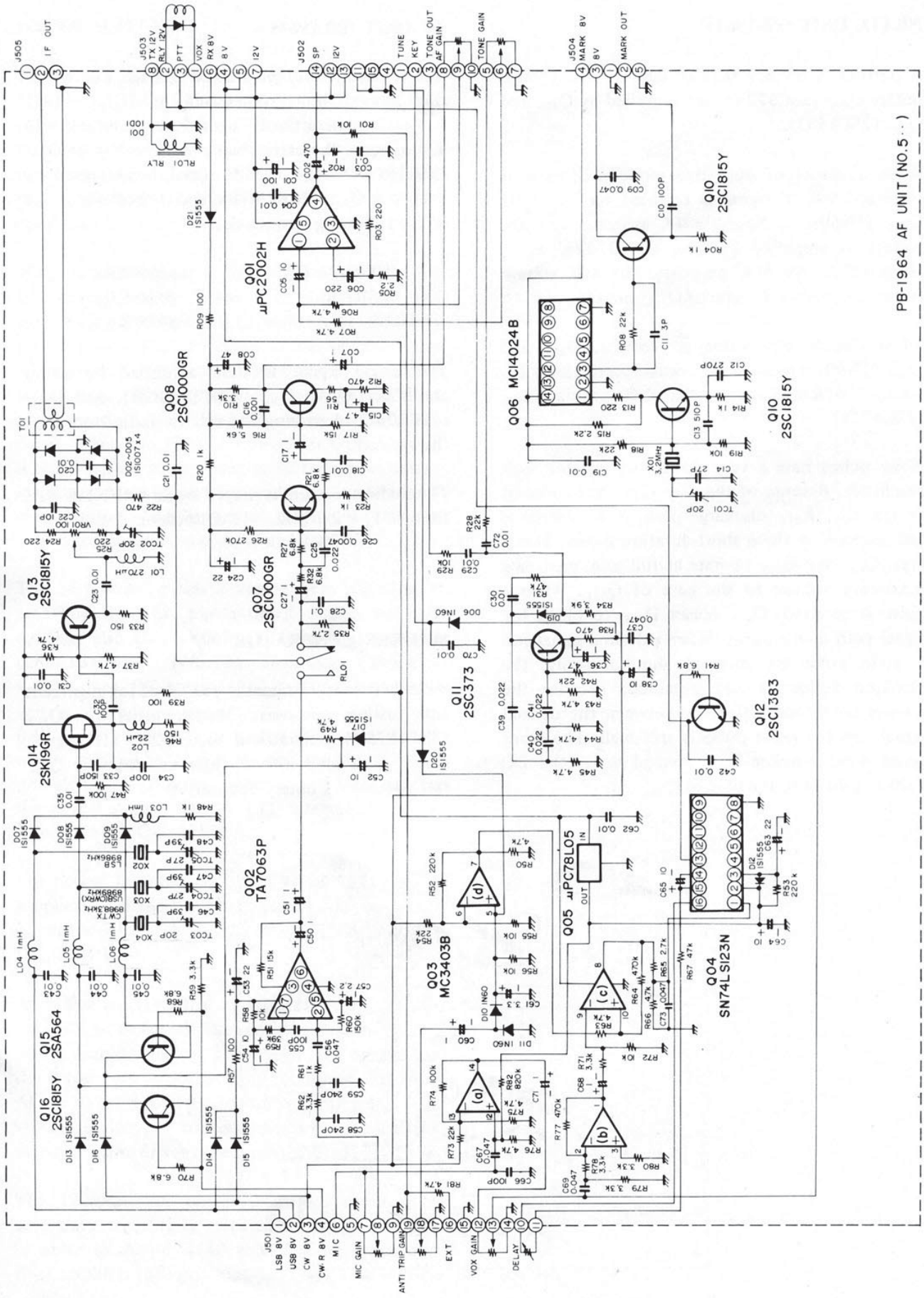
The audio signal is then amplified by audio amplifiers Q_{507}, Q_{508} **(2SC1000GR)**, and Q_{509} **(μPC2002)**, delivering 3 watts of audio output to the speaker.

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.





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-1964)

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-1960)

The IF signal is fed through T_{104} to the transmit mixer, consisting of parallel-connected Q_{105} and Q_{106} **(3SK40M)**, where the IF signal at gate 1 is mixed with the local signal fed to gate 2, producing the RF output signal. The RF signal is then fed through diode switch D_{104} **(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.

COMMON CIRCUITS

VFO UNIT (PB-1440B-3420)

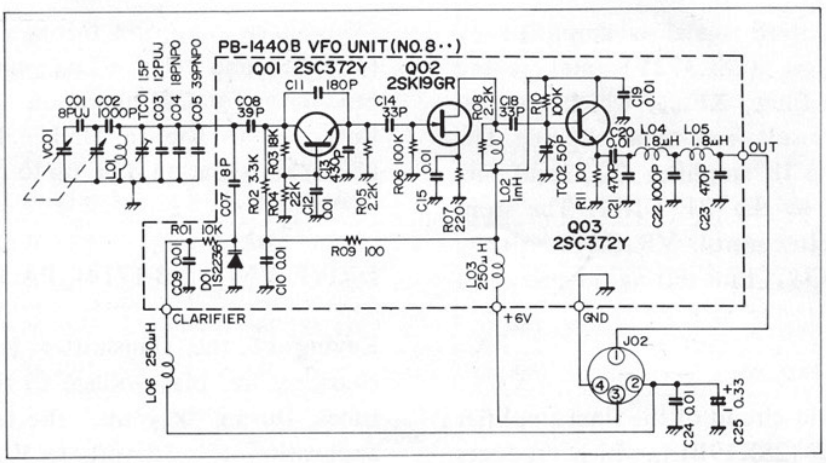
A modified Colpitts-type oscillator is used to generate a 5.0 - 5.5 MHz VFO signal, thus producing a 500 kHz tuning range. The oscillator signal generated by Q_{801} **(2SC372Y)** is varied by VC_{801}, which is geared to a precision-built dial tuning mechanism. VC_{801} consists of two sections; the 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-1711)

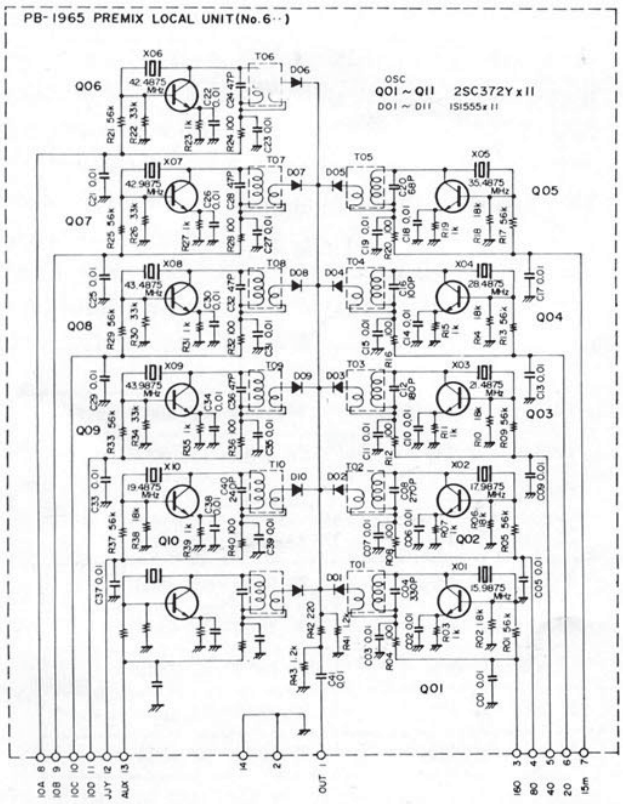
Crystal oscillators Q_{601} - Q_{610} **(2SC372Y)** generate the premix local signal at the frequencies shown in Table 3. Diode switches D_{601} - D_{610} **(1S1555)** select the proper local signal for the band in use. The local signal is then delivered to the PREMIX UNIT.

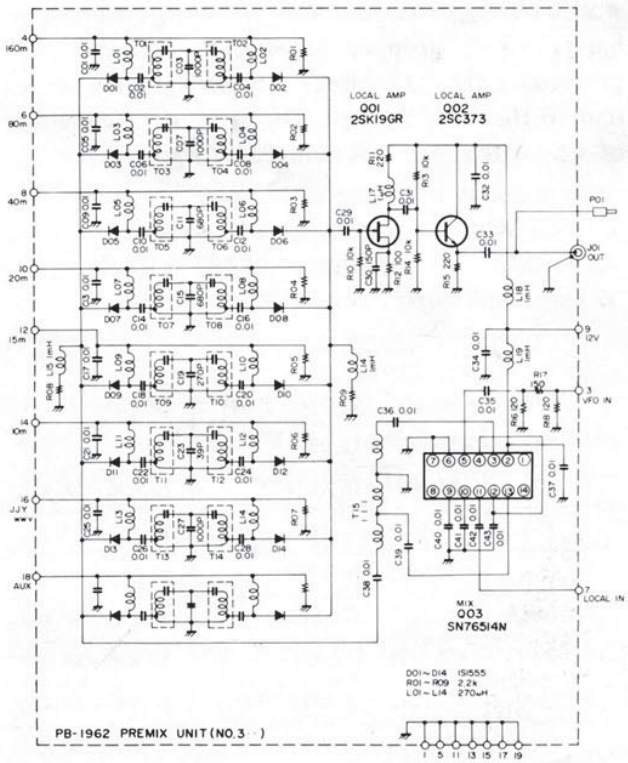
		XCO Frequency	PREMIX OUT Frequency
160m	X_{601}	15.9875MHz	10.4875~10.9875MHz
80m	X_{602}	17.9875MHz	12.4875~12.9875MHz
40m	X_{603}	21.4875MHz	15.9875~16.4875MHz
20m	X_{604}	28.4875MHz	22.9875~23.4875MHz
15m	X_{605}	35.4875MHz	29.9875~30.4875MHz
10mA	X_{606}	42.4875MHz	36.9875~37.4875MHz
10mB	X_{607}	42.9875MHz	37.4875~37.9875MHz
10mC	X_{608}	43.4875MHz	37.9875~38.4875MHz
10mD	X_{609}	43.9875MHz	38.4875~38.9875MHz
JJY/WWV	X_{610}	19.4875MHz	13.9875~14.4875MHz

Table 3

PREMIX UNIT (PB-1962)

The premix signal is produced at Q_{303} **(SN76514N)**, a double-balanced mixer, where the premix local signal from Q_{601} - Q_{610} 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} **(2SK19GR)** and Q_{302} **(2SC373)**. 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.





COUNTER UNIT (PB-1978, PB-1979, PB-1980)

The premix local signal from the PREMIX LOCAL circuit is fed to amplifier Q_{2301} **(3SK51-03)**, located on PB-1980. The amplified signal is then fed to waveshaper Q_{2302} **(MC10116)**. Q_{2303} **(MPS3640)** acts as an interface between Q_{2302} and the TTL circuitry. The signal is then fed to the counter gate, Q_{2304} **(SN74S00N)**.

The clock pulses are generated by Q_{2305} **(MSM5564)**, which produces a 655.36 MHz signal. The signal is divided by a factor of 2^{17}, producing a 5 Hz signal which is fed to the counter gate.

The pulses which pass through the gate are fed to decade counter Q_{2309} **(SN74196N)**, which counts 10 Hz digits. In turn, Q_{2302} - Q_{2307} **(SN74LS196N)** count 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, and 10 MHz digits. The BCD output signal from Q_{2302} - Q_{2307} is fed through drivers Q_{2208} - Q_{1213} **(MSM561)** to the display digits, DS_{2101} - DS_{2106} **(HP 5082-7623)**.

The system of presetting the counter can best be explained by example. For a frequency of 3.500 MHz LSB, the premix local frequency is 12.486 MHz. The LSB preset code is 91.014.0. 12.486 + 91.0140.0 = 103.500. The "1" digit on the left-hand side is dropped (overflow), and the "0" preceeding the "3" causes a blanking signal to be sent to the 10 MHz digit. The result is a frequency of 3.500 MHz, and this number is displayed.

For USB, the preset number is 91.011.0. For a frequency of 14.000 MHz USB, the manipulation is as follows: 91.011 + 22.989 (Premix freq.) = 114.000. The first digit is the overflow digit, and the remaining digits are displayed. Note that the second digit from the left is not zero, so no blanking signal is sent to the 10 MHz digit.

For a CW frequency of 21.000 MHz, the premix frequency is 29.9883, and the preset frequency is 91.011.7. The manipulation is: 91.011.7 + 29.9883 = 121.0000. The first digit is dropped, and the remaining digits are displayed.

The preset frequencies are programmed by Q_{2307} and Q_{2308} **(μPA54H)** and diode matrix D_{2306} - D_{2312} **(1S1555)**. Please refer to Table 5 for definition of the premix frequencies for the various bands.

The 5 volt supply is regulated by Q_{2310} **(μPC 14305)** for the TTL circuitry. The DIM control controls the emitter/collector voltage at Q_{2201} **(2SA496Y)**, to control the brightness of the digital display and lamps.

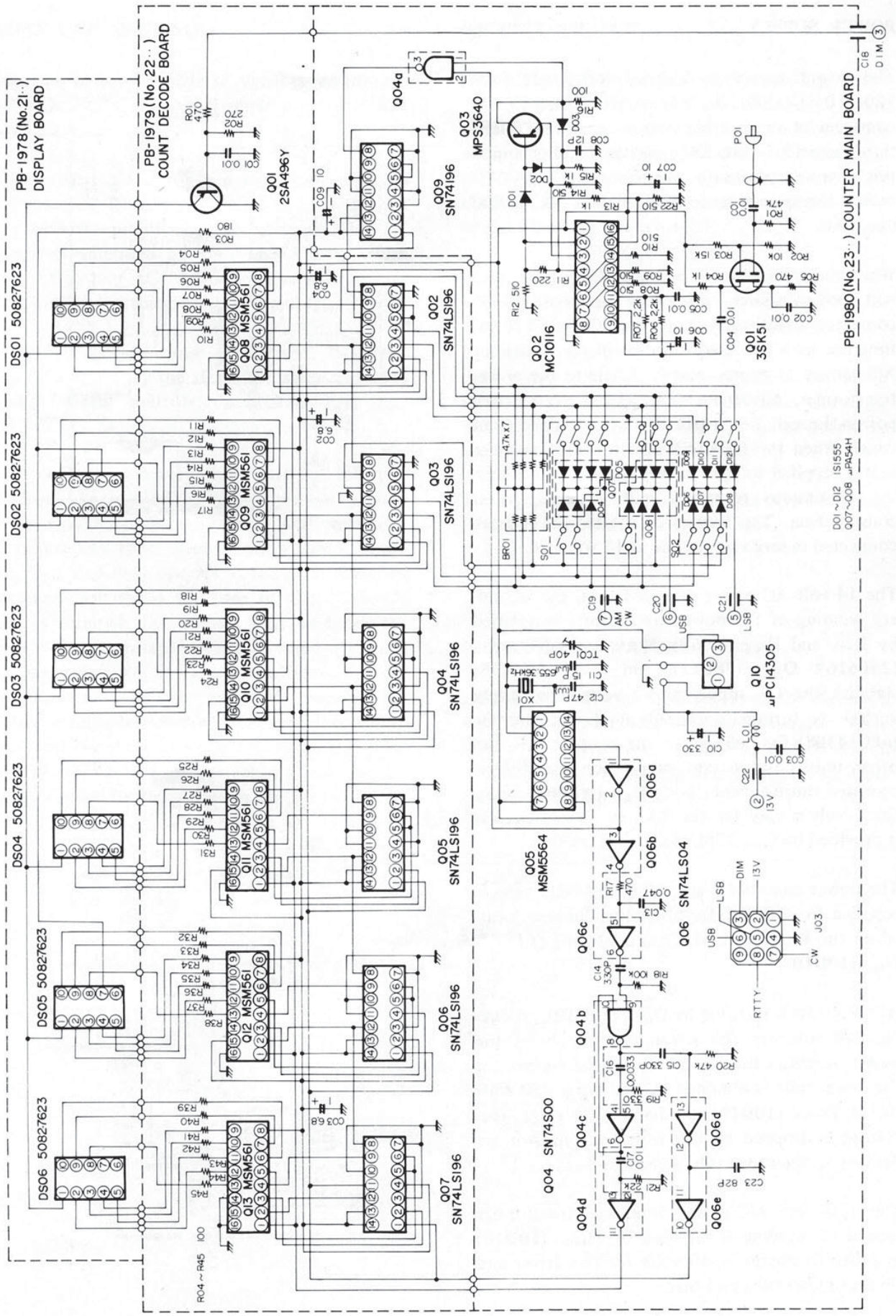
	10MHz	1MHz	100kHz	10kHz	1kHz	100Hz
	(Q_{2207})	(Q_{2206})	(Q_{2205})	(Q_{2204})	(Q_{2203})	(Q_{2202})
LSB	9	1	0	1	4	0
USB	9	1	0	1	1	0
CW	9	1	0	1	1	7

Preset Number

Table 4

	Nominal Premix Local Frequency	LSB	USB	CW
160m	10.4875－10.9875(MHz)	10.486－10.986(MHz)	10.489－10.989(MHz)	10.4883－10.9883(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
20m	22.9875－23.4875	22.986－23.486	22.989－23.489	22.9883－23.4883
15m	29.9875－30.4875	29.986－30.486	29.989－30.489	29.9883－30.4883
10mA	36.9875－37.4875	36.986－37.486	36.989－37.489	36.9883－37.4883
10mB	37.4875－37.9875	37.486－37.986	37.489－37.989	37.4883－37.9883
10mC	37.9875－38.4875	37.986－38.486	37.989－38.489	37.9883－38.4883
10mD	38.4875－38.9875	38.486－38.986	38.489－38.989	38.4883－38.9883

Table 5



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.

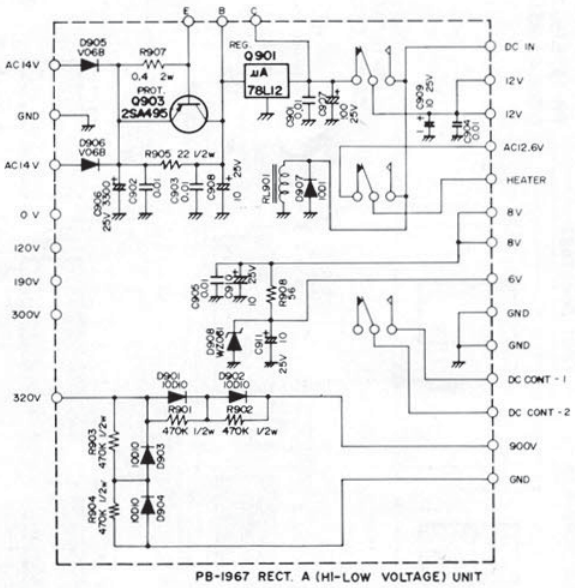
When the transceiver is operated from a DC 13.5 volt power source, using the optional DC-DC converter, transistors Q_{3201} and Q_{3202} **(T20A6)** function as a low frequency oscillator, providing AC voltage at approximately 80 Hz to the power transformer. All of the tube heaters receive their power 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.

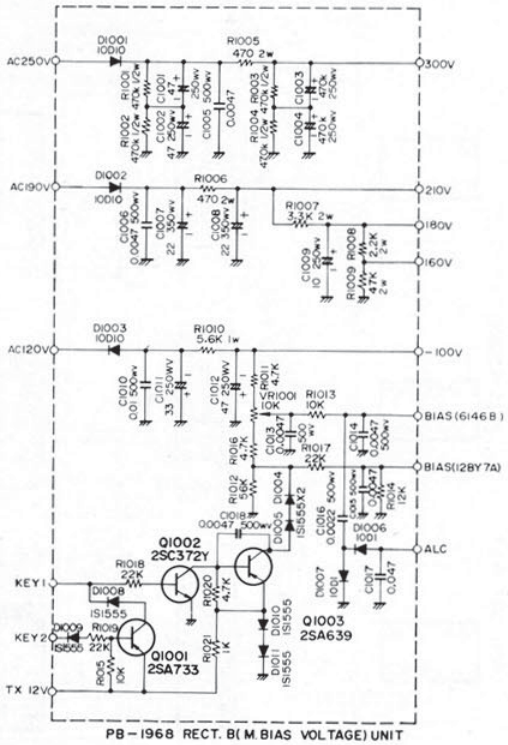
The 14 volt AC power delivered from the secondary winding of the power transformer is rectified by D_{905} and D_{906} **(V06B)**. Voltage regulators Q_1 **(2SB616)**, Q_{901} **(78L12)**, and Q_{903} **(2SA495)** stabilize the DC supply at 12 volts. The supply voltage is further stabilized at 8 volts 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)**.

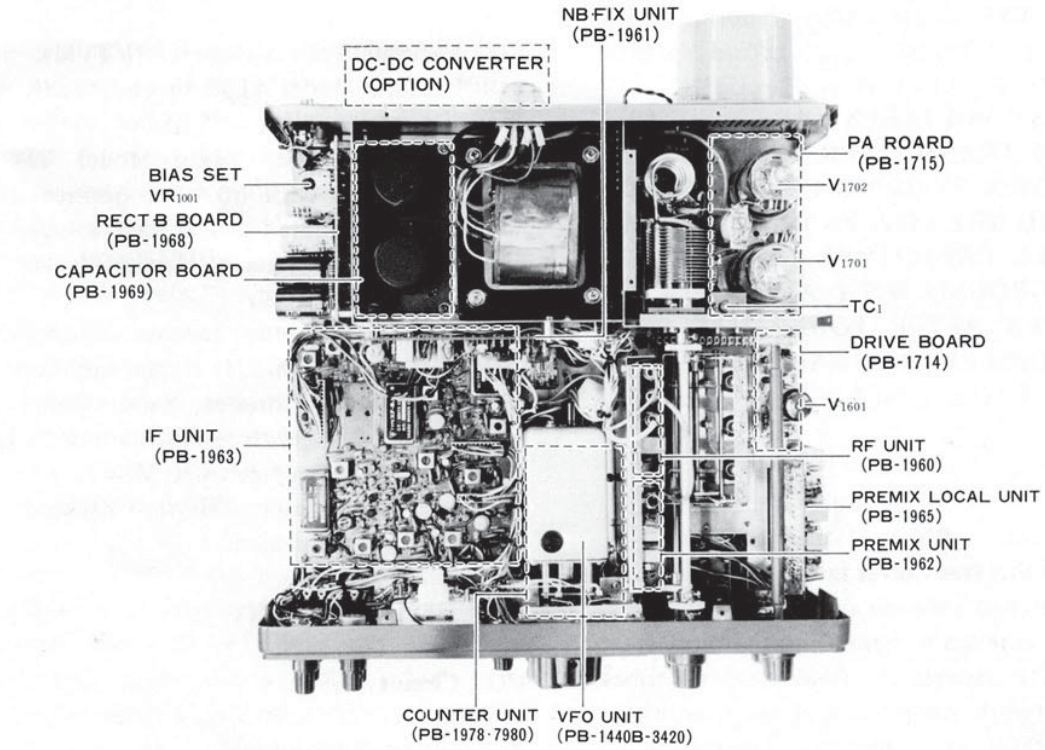
The power amplifier plate voltage of +800 volts is supplied from the bridge-controlled doubler, located on the RECT. A UNIT, and consisting of D_{901} - D_{904} **(10D10)**.

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.

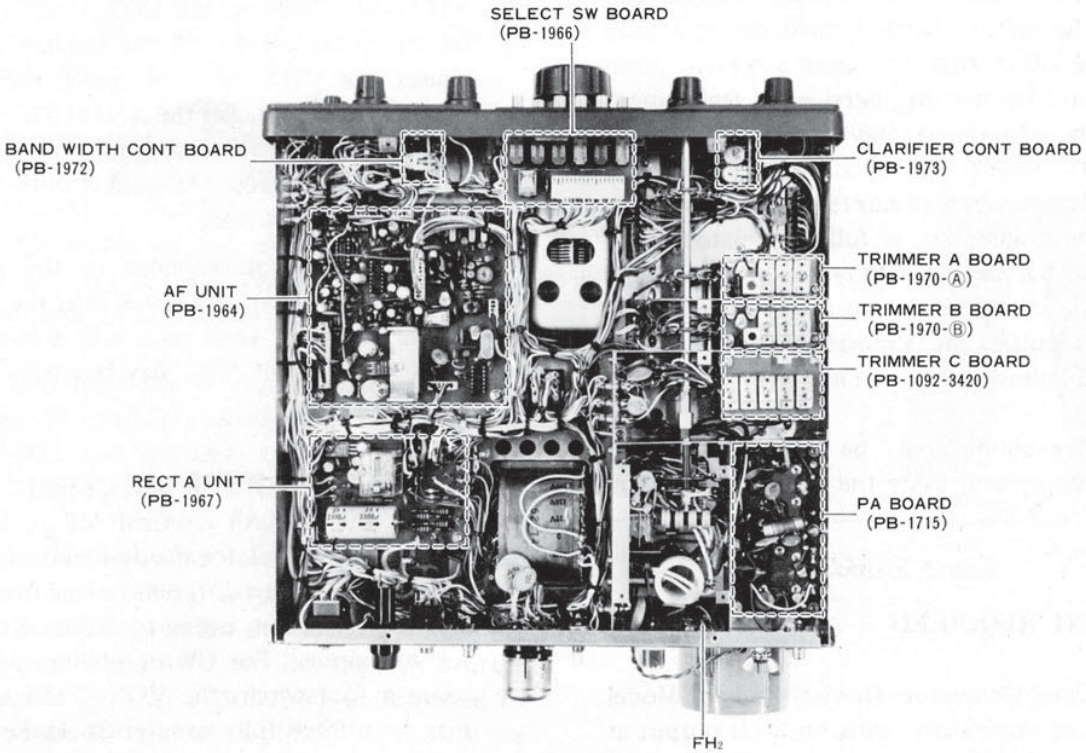
The 120 volt AC power from the transformer secondary winding is rectified by D_{1003} **(10D10)** in order to obtain −140 volts for the driver and final amplifier tube grid bias.







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_9, 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.

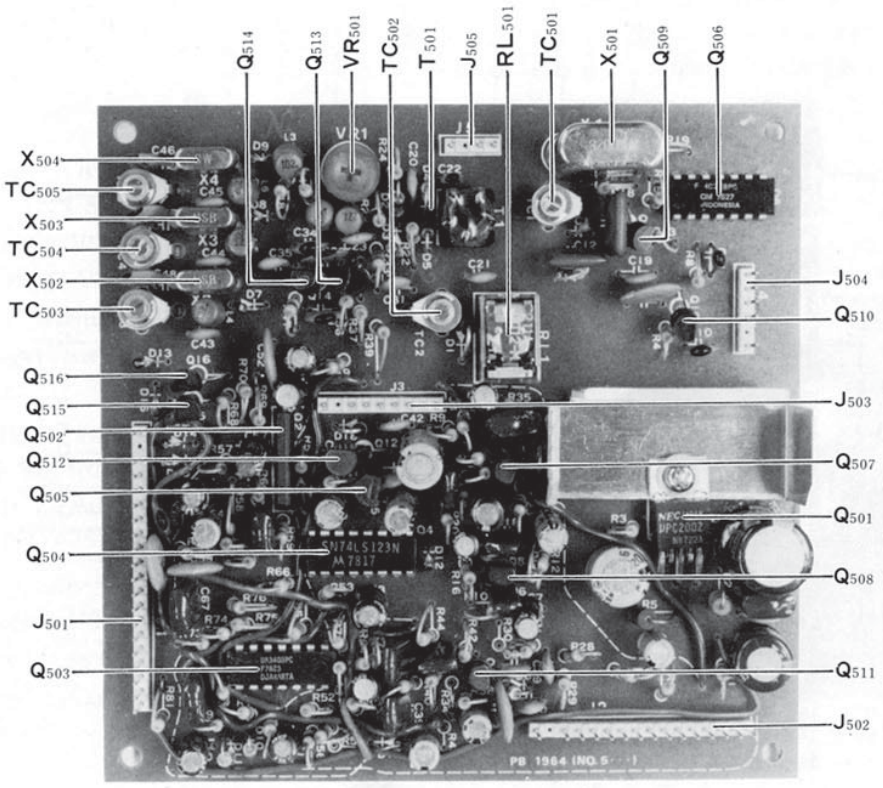
Marker Frequency setting

1. Preset the controls as follows:
   BAND . . . . . JJY/WWV
   DIAL . . . . . 5000.0 kHz
   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)

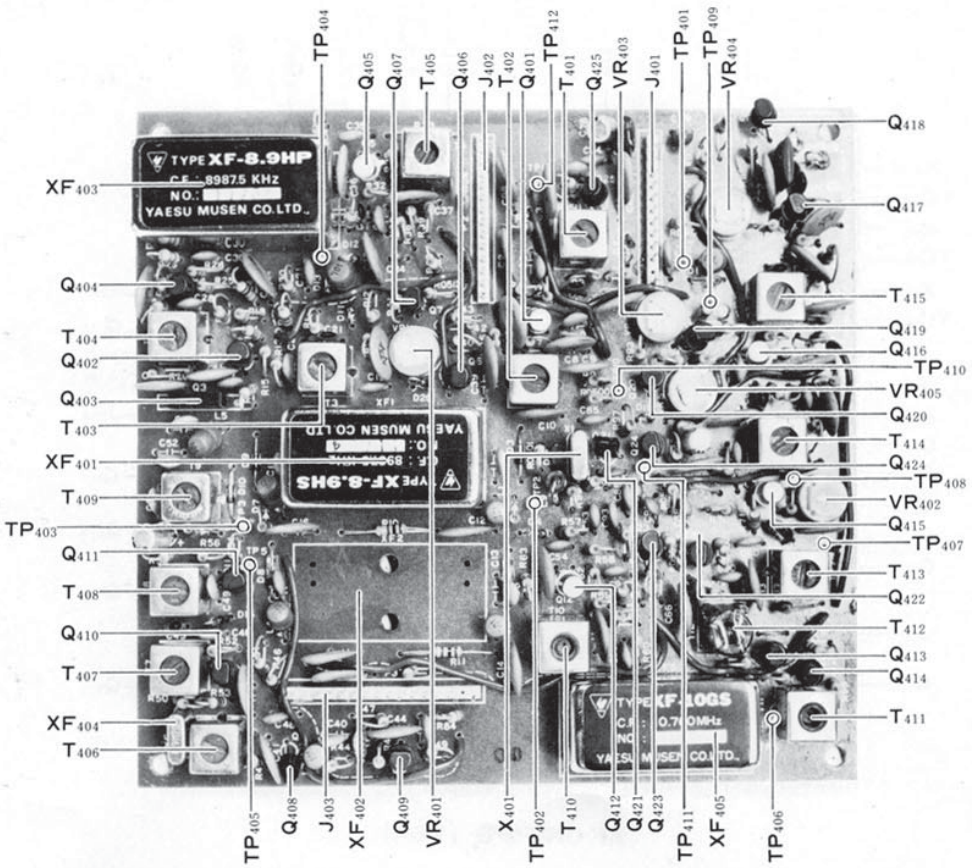
4. Recheck the LSB adjustment, as well as the carrier balance adjustment, after performing the carrier point alignment. The background noise, when switching between USB and LSB, should not change.

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

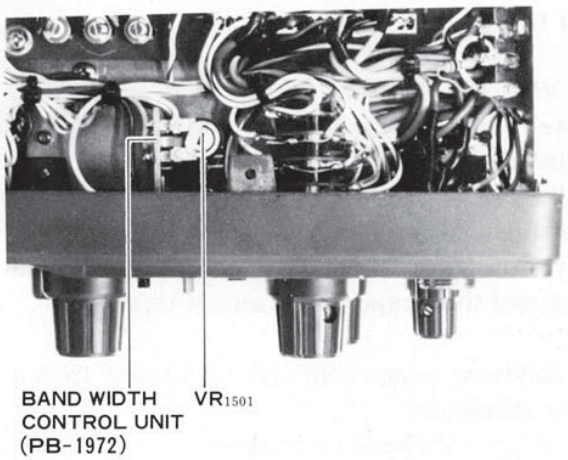
1. Set the BAND switch to 20 meters, the main dial to 14.250 MHz, and set the RF GAIN fully clockwise.
2. Set the signal generator to 14.250 MHz, and set its output to 6 dB. Tune the signal generator signal on the receiver, and peak the preselector for maximum signal strength. The S-meter should just 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_{403} .

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

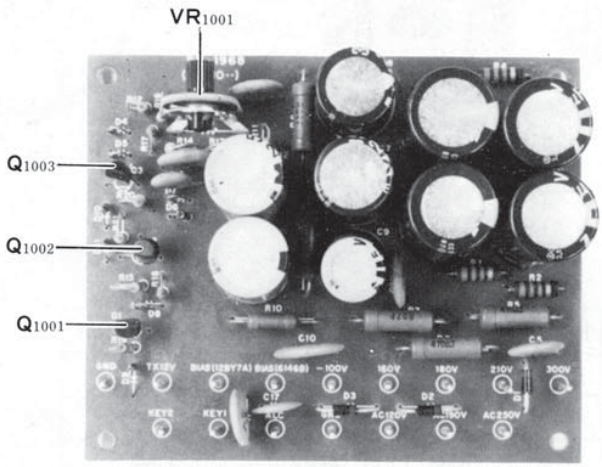
1. On any band, set the MODE switch to USB. Set the meter switch to ALC.
2. With no speech input, activate the transmitter. Adjust VR_{401} for a 0 reading on the ALC meter scale.



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 rear apron BIAS control, VR_{1001}, for a reading of 50 mA. For 10 watt models, the correct meter reading is 25 mA.



RECT.B UNIT(PB-1968)

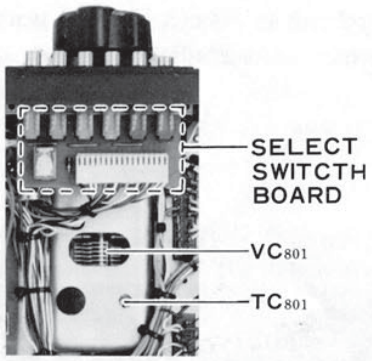
VFO UNIT

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	TRANSFORMER
160m	X_{601}	15.9875MHz	T601
80m	X_{602}	17.9875	T602
40m	X_{603}	21.4875	T603
20m	X_{604}	28.4875	T604
15m	X_{605}	35.4875	T605
10mA	X_{606}	42.4875	T606
10mB	X_{607}	42.9875	T607
10mC	X_{608}	43.4875	T608
10mD	X_{609}	43.9875	T609
JJY/WWY	X_{610}	19.4875	T610

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.

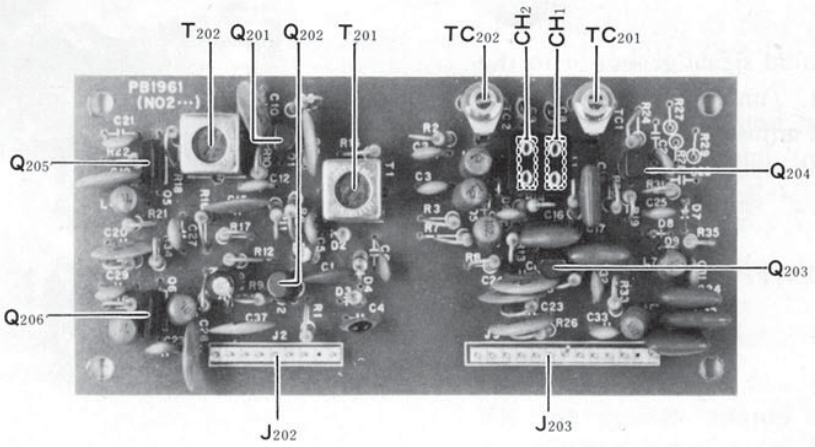
PREMIX UNIT

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

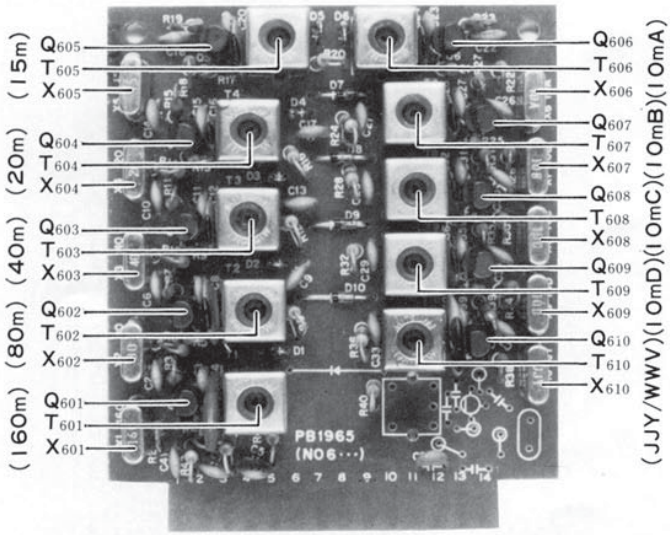
1. Press the EXT select switch. Apply 5.0 - 5.5 MHz sweep output to the VFO output terminal at the rear apron external VFO jack. Connect a high-impedance probe of an oscilloscope to J_{301}.
2. Adjust the transformers shown in Table 7 for a flat response across the entire passband. If you have never 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
20m	T_{307}, T_{308}	22.9—23.5
15m	T_{309}, T_{310}	29.9—30.5
10mA	T_{311}, T_{332}	36.9—39.0
JJY/WWV	T_{313}, T_{314}	13.9—14.5

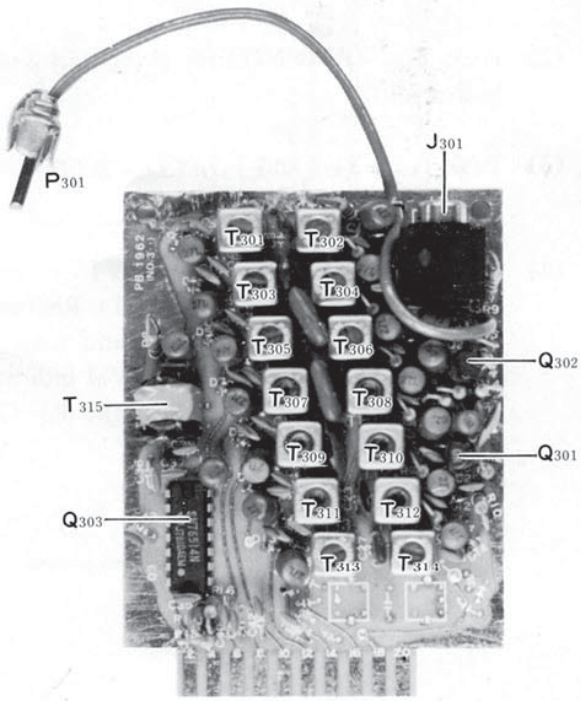
Table 7



NB·FIX UNIT(PB-1961)



PREMIX LOCAL(XTAL)UNIT(PB-1965)



PREMIX UNIT(PB-1962)

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_{104} (RF UNIT) for maximum power output.

(3) 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.

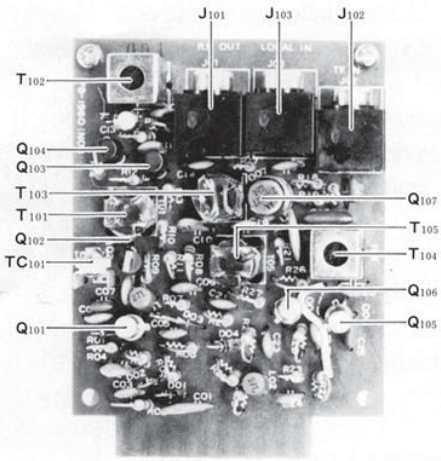
RECEIVER RF/IF/NB TRANSFORMER ALIGNMENT

(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_{102} (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.



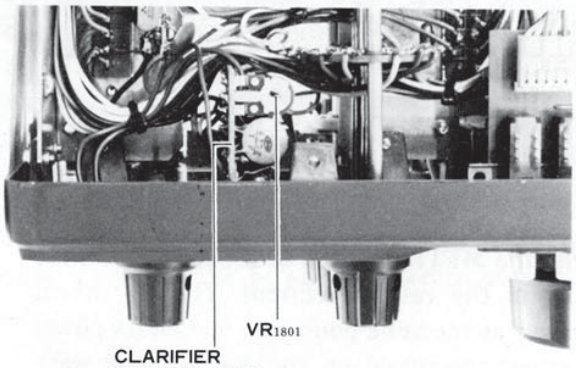
RF UNIT(PB-1960)

CLARIFIER ALIGNMENT

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

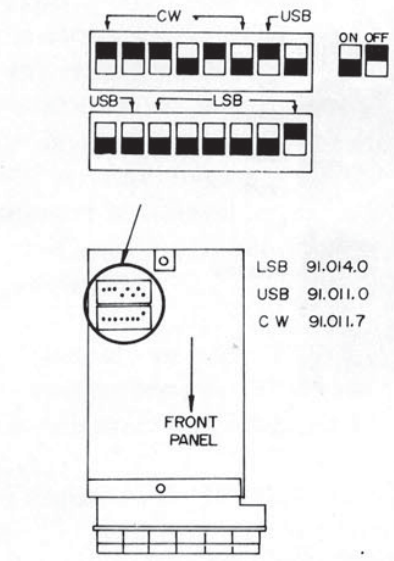
2. With the CLARIFIER control OFF, make sure that the CLARIFIER knob is exactly at the 12 o'clock position. Note the tone of the marker signal.

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.

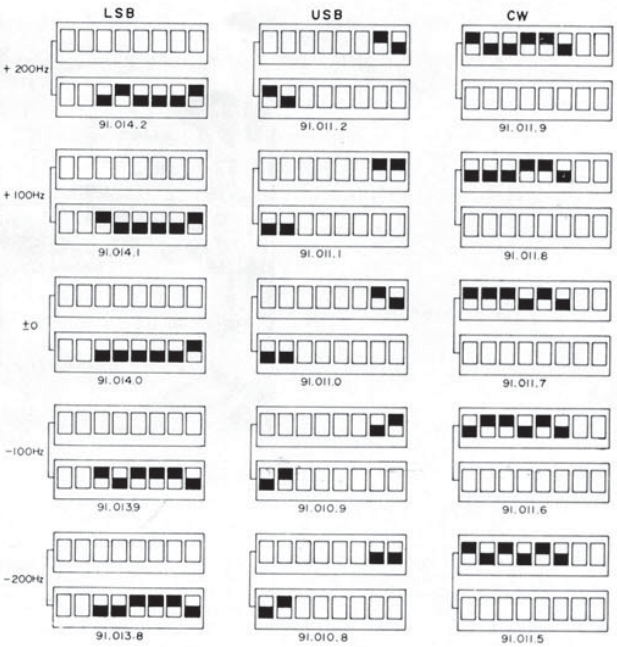


COUNTER UNIT

The carrier points for USB, LSB, and CW are preset as follows: USB = 91.011.0; LSB = 91.014.0; CW = 91.011.7. If, for some reason, it is desired to set these frequencies elsewhere, refer to the "Frequency Counter Preset Switch Position" drawing and chart. Adjustment of ±200 Hz is possible as shown. The adjustment is carried out on the miniature switch shown in the drawing.



FREQUENCY COUNTER PRESET SWITCH POSITION



FINAL AMPLIFIER NEUTRALIZATION

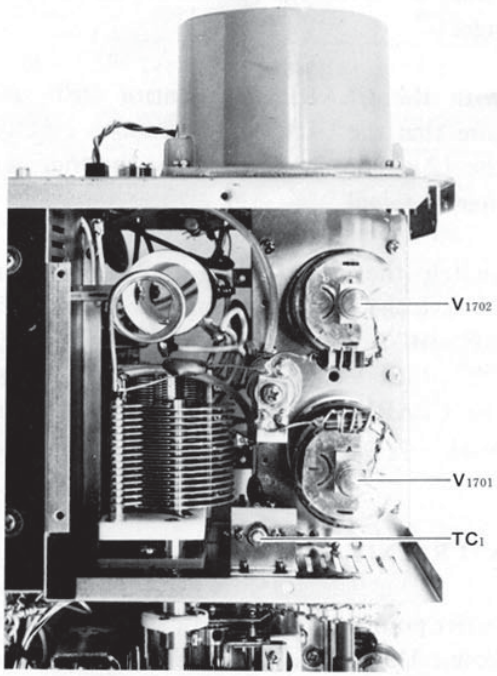
Important Note: For this alignment, use a NON-METALLIC tuning wand.

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.

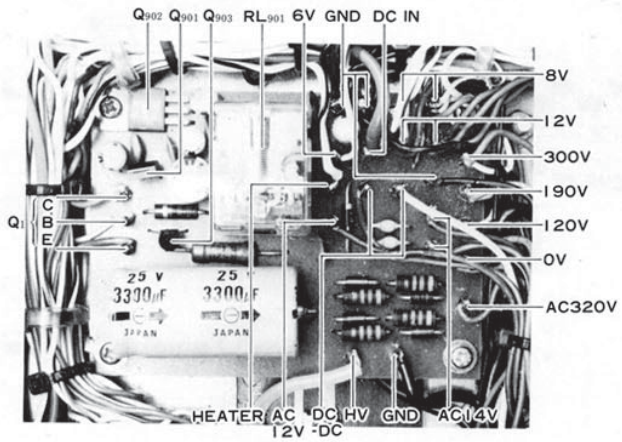
2. Set the METER switch to IC, and observe the dip in the cathode current. The dip should occur at the same point that maximum power output (measured on the dummy load watt-meter) occurs. If this is not the case, adjust TC_1, located inside the final amplifier cage, for the required coincidence of maximum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

PARTS LIST

MAIN CHASSIS

Symbol No.	Parts No.	Description
		IC, TRANSISTOR
Q2	22104960	2SA496
Q1	22206160	2SB616
Q3	25000116	μPC14308
		DIODE
D1	21090115	Ge 1N60
D2–5	21015550	Si 1S1555
D6	21090011	" 10D1
		RESISTOR
R22	40143220	Carbon film 1/4W TJ 22Ω
R14	41143560	" " " " 56Ω
R7,11	41143101	" " " " 100Ω
R18	41143821	" " " " 820Ω
R4,5	41143102	" " " " 1kΩ
R6	41143152	" " " " 1.5kΩ
R19	41143182	" " " " 1.8kΩ
R17	41143222	" " " " 2.2kΩ
R20	41143474	" " " " 470kΩ
R2	42124100	Carbon composition 1/2W GK
		10Ω
R9,10	42124560	" " " " 56Ω
(with L5,L6)		
R3	42124101	" " " " 100Ω
R1	42124222	" " " " 2.2kΩ
R21	42204229	Wire wound 1W 2.2Ω
		POTENTIOMETER
VR1	49800140	VM11AB06A5M1112 10kΩE
VR2	49800123	DM10A039A 500kΩB/20kΩB
VR3	49800124	DM10A039A 5kΩA/5kΩB
VR4	49800141	VM10A592A 5kΩA
VR5,6	49800125	VM10A592A 5kΩB
VR7	49800126	DM10A039A 5kΩB/5kΩA
VR8	49800127	VM10A654A 1kΩB
VR9,10	49800128	VM10A654A 5kΩB
VR11	49800129	VM10AB08A 5kΩB
		CAPACITOR
	33834050	Dipped mica 500WV 5pF
C13	33834271	" " " 270pF
		(Z18D 271K5)
C8	33834331	" " " 330pF
		(DM-15-331K5)
C7	33834621	" " 500WV 620pF
		(DM19D621K5)
C6	33834112	" " 500WV 1100pF
		(DM19 112K5)
C5	33834302	" " 500WV 3000pF
		(DM19 302K5)
	33834681	" " 500WV 680pF
		(LCQ21 681K5)
	33834122	" " 500WV 1200pF
		(LCQ21 122K5)
C17	31830010	Ceramic 500WV 1pF
C10	31830050	" " 5pF
C18	31830470	" " 47pF
C11	31830201	" " 200pF
C19,21	31830271	" " 270pF
C20	31830471	" " 470pF
C16	31844030	" 1KV 3pF
C15	31844050	" " 5pF
C14	31844101	" " 100pF
C3	31249461	1.5KWV 460pF
C9	31249101	" 3KV 100pF
C1	31249102	" " 1000pF
C29,34,35,41,	30820103	" 50WV 0.01μF
C12,22–24,39,	30820473	" " 0.047μF
40,56,58,60		
C27,28,36	30830472	" 500WV 0.0047μF
C30,32,33,54,	30830103	" " 0.01μF
55, 61		
C2,25,26	30240472	" 1.4KV 0.0047μF
C31,37,38,64	30240103	" " 0.01μF
C42–51	32830102	Feed thru 500WV 0.001μF
		(ECK-L2H102PE)
C63	34220476	Electrolytic 16WV 47μF
C62	34220228	" " 2200μF
		VARIABLE CAPACITOR
VC1	39000083	YB-230 230pF
VC2	39000061	C134E125
		TRIMMER CAPACITOR
TC1	39000072	TSN120C 10Px2
		INDUCTOR
L1	55003396	#220534A
L2	55003398	#220611
L3	54000050	#220065
L4	54000040	#220064
L5,L6	55003216	#220308
(R9,R10)		
L7	53010003	250μH
L8	53020001	1mH FL-5H-102J
		TRANSFORMER
T1	55003398	#220544
T2	55000460	#220011
T3	55000500	#220074
		METER
M1	74000430	Y-45-02 #250042
		SPEAKER
SP1	76000019	SA-92Y 4Ω 3W

			P18 (with wire)	68030008	5047-03A #240129
			P11,14	67020007	SQ4052
		POWER TRANSFORMER	P15	67040002	SI5908
PT1	52000054	52-74 (#230028)	P16	67020009	SI-7502
		RELAY			FUSE
RL1	70000037	FRL-263 D012/04CS01	F1	73000004	5A (100V–117V)
RL2	70000002	MX2P		73000003	3A (200V–234V)
		RELAY SOCKET			FUSE HOLDER
RLS1	69000011	263H204	FH1	69030007	SN1001 #2
RLS2	69000003	PX08	FH2	69030001	F3265
		SWITCH			PILOT LAMP
S1	61000620	#250041	PL1	14000027	BF311-04071A
S2	61000630	#250044	PL2–5	14000037	BQ054-32732B
S3	62000031	ESR-E485R20			
S4,5	64000006	WD9223			
				91100001	Thru terminal FT-SM1
				91001339	" A339 (HV)
		COOLING FAN		92200007	Terminal block ML-3182 20P
FAN1	75000004	2SB10A		90010001	Terminal board 1L2PS
				90010002	" 1L3PS
				90020002	" 1L4PS
		RECEPTACLE			
J1,3	68030002	SG7814			
J2	68040003	FM144S			LED B BOARD
J4	67060006	D6-701B00	PB-1390	60413900	P.C.Board
J5 (with wire)	68090039	1625-09R-1 (#240128)	D9	21090140	GD4-203-SRD
J6	68020010	SI7501-1			
J7	68000011	M-BR-06B			
J8	68110001	SA602B00			
J9–14	68020001	STR-01			
J15	68020012	SG-8050			
J16	67090003	AC9-PF	**RF UNIT**		
J17	68060021	QS-DB6-ML	Symbol No.	Parts No.	Description
				019601AZ	RF unit with components
			PB-1960A	60419601	P.C. Board
		MULTI JACK			
MJ1	68100009	121S-10B-105A			
MJ2	68200002	220D-20B-205A			FET & TRANSISTOR
MJ3	68140010	121S-14B-105A	Q103,104	22800195	FET 2SK19GR
			Q105,106	23800401	" 3SK40M
			Q101	23800513	" 3SK51-03
			Q102	22890021	" J310
		PLUG	Q107	22390006	TR 2N4427
P1 (with wire)	68120011	5047-12A #240129			
P2 (")	68130003	5047-13A #240130			
P3 (")	68150009	5047-15A #240131			
P4 (")	68190001	5047-19A #240132			DIODE
P5 (")	68150010	5047-15A #240133	D104	21010070	Ge (GB) 1S1007
P6 (")	68080010	5047-08A #240134	D101–103	21015550	Si 1S1555
P7 (")	68050009	5047-05A #240135			
P8 (")	68080009	5047-08A			
P9 (")		5047-12A #240137			
P10 (")		5047-16A			

		RESISTOR	NB·FIX UNIT		
			Symbol No.	Parts No.	Description
R119	40143479	Carbon film 1/4W VJ 4.7Ω		019612AZ	NB.FIX unit with components
R110	40143820	" " " " 82Ω	PB-1961B	60419612	P.C. Board
R106–108,	40143101	" " " " 100Ω			
116,120,121,					
130					
R111	40143221	" " " " 220Ω			
R113, 114,	40143331	" " " " 330Ω			TRANSISTOR
128,129			Q201–204	22303724	2SC372Y
R112	40143471	" " " " 470Ω	Q205,206	22315830	2SC1583
R118	40143821	" " " " 820Ω			
R105	40143102	" " " " 1kΩ			
R117	40143152	" " " " 1.5kΩ			
R102,109,122	40143272	" " " " 2.7kΩ			DIODE
R104,	40143562	" " " " 5.6kΩ	D201–204	21090115	Ge 1N60
R115	40143822	" " " " 8.2kΩ	D205–209	21015550	Si 1S1555
R124	40143223	" " " " 22kΩ			
R103	40143393	" " " " 39kΩ			
R123	40143563	" " " " 56kΩ			
R125	40143124	" " " " 120kΩ			RESISTOR
R101	42124225	Carbon composition 1/2W GK	R208,216,224,	40143101	Carbon film 1/4W VJ 100Ω
		2.2MΩ	230,238,239		
			R204	40143221	" " " " 220Ω
			R222,236	40143471	" " " " 470Ω
			R231–233,235	40143561	" " " " 560Ω
		CAPACITOR	R206,207,215,	40143102	" " " " 1kΩ
C125	33821030	Dipped mica 50WV 3pF	221,234,237		
C107	33821040	" " " 4pF	R210	40143472	" " " " 4.7kΩ
C116	33821471	" " " 470pF	R205,209,218	40143562	" " " " 5.6kΩ
C102,108	31829101	Ceramic 50WV SL 100pF	R202,203,212,	40143103	" " " " 10kΩ
C103–106,	30821103	" 50WV 0.01μF	214,225,226		
110–112,			R201,220,223	40143153	" " " " 15kΩ
114,115,117,			R211,213,219	40143223	" " " " 22kΩ
119–124			R217	40143683	" " " " 68kΩ
C101,118	30820473	" " 0.047μF			
C113	34220106	Electrolytic 16WV TT 10μF			
					CAPACITOR
			C216–218	33821331	Dipped mica 50WV 330pF
		TRIMMER CAPACITOR	C234,236	33821471	" " " 470pF
TC101	39000006	ECV-1ZW 10x40 10pF	C235	33821821	" " " 820pF
			C208,209	31820150	Ceramic 50WV NPO 15pF
			C206	31829200	" " SL 20pF
			C204	31829101	" " SL 100pF
		INDUCTOR	C201	31829331	" " " 330pF
L101,102	53020027	FL-5H 271K 270μH	C202,203,205,	30820103	" " 0.01μF
			211,212,221,		
			225–227,		
			229–233		
		TRANSFORMER	C207,210,213,	30820473	" " 0.047μF
T101,103,105	55003174	#220209	215,219,220,		
T102,104	55003175	#220221	223,224,228,		
			237		
			C214	34820105	Electrolytic 50WV 1μF
		JACK			
J101–103	68020021	SQ3081			
					TRIMMER CAPACITOR
			TC201,202	39000005	ECV-1ZW 50x32 50pF

		INDUCTOR	
L207,208	53020014	FL-4H 1R8K	1.8μH
L204–206	53020023	FL-5H 101K	100μH
L201–203	53020001	FL-5H 102K	1mH
		TRANSFORMER	
T201,202	54141700	R12-4170	
		CRYSTAL SOCKET	
XS201	69010007	S-14 2P	
		MINI CONNECTOR	
J201	67080006	5048-08A	
J202	67120010	5048-12A	

PREMIX UNIT

Symbol No.	Parts No.	Description
	019621AZ	PREMIX unit with components
PB-1962A	60419621	P.C. Board
		IC. FET. TRANSISTOR
Q303	25000104	IC SN76514N
Q301	22800195	FET 2SK19GR
Q302	22303730	TR 2SC373
		DIODE
D301–314	21015550	Si 1S1555
		RESISTOR
R312	40143101	Carbon film 1/4W VJ 100Ω
R316,318	40143121	" " " " 120Ω
R317	40143151	" " " " 150Ω
R311,315	40143221	" " " " 220Ω
R301–309	40143222	" " " " 2.2kΩ
R310,313,314	40143103	" " " " 10kΩ
		CAPACITOR
C323	33824390	Dipped mica 50WV 39pF
C319	33824271	" " " 270pF
C311,315	33824681	" " " 680pF
C330	31820151	Ceramic 50WV CH 150pF
C301, 302	30820103	" " 0.01μF
304–306,		
308–310,		
C312–314,	30820103	Ceramic 50WV 0.01μF
316–318,		
320–322,		
324–326,		
328, 329		
331–343		
C303,307,327	36825102	Mylar " 0.001μF
		INDUCTOR
L317	53020035	FL-4H 1R0M 1μH
L301–314	53020027	FL-5H 271K 270μH
L315,316,318,	53020001	FL-5H 102K 1mH
319		
		TRANSFORMER
T301,302	55003399	#220500
T303,304	55003400	#220501
T305,306	55003401	#220502
T307,308	55003403	#220504
T309,310	55003405	#220505
T311,312	55003406	#220506
T313,314	55003407	#220507
T315	55003409	#220210
		JACK
J301	68020021	SQ3081
P301	67020007	SQ4052

IF UNIT

Symbol No.	Parts No.	Description
	019632AZ	IF unit with components
PB-1963B	60419632	P.C. Board
		IC. FET. TRANSISTOR
Q403	25000105	IC TA7060P
Q406	22800196	FET 2SK19BL
Q402,413,414,	22800195	" 2SK19GR
419,425		
Q401,405,412,	23800513	" 3SK51-03
415,416		
Q408	22890021	" J310
Q407,420	22105641	TR 2SA564A
Q404,409,410,	22303724	" 2SC372Y
417, 418,		
422–424		
Q421	22305351	" 2SC535A
Q411	22390001	" MPSA13
		DIODE
D416,417	21090150	Ge 1N60
D405–408,	21010070	" (GB) 1S1007
414, 421		

D401–404,	21015550	Si	1S1555		R407,415,438,	40143153	" " " VJ 15kΩ
409–413,					476,498,499		
419						40143223	" " " " 22kΩ
D418	21022090	Varactor	1S2209		R414	40143273	Carbon film 1/4W TJ 27kΩ
D422	21090137	"	FC63		R461,472,478,	40143473	" " " " 47kΩ
D420, 423	21090034	Zener	WZ090		0500		
					R405,432,441,	40143104	" " " " 100kΩ
					465,466		
		CRYSTAL			R493	49143154	" " " " 150kΩ
X401	71800111	HC-18/U	19.7475MHz		R448,452,487,	40143184	" " " " 180kΩ
					0503,0505		
						40143224	" " " " 220kΩ
					R435, 490	40143105	" " " " 1MΩ
		CRYSTAL FILTER				40143225	" " " " 2.2MΩ
XF401	71000023		XF8.9HS		R0519	42144566	" Composition GK 5.6MΩ
XF402	71000021		XF8.9HC				
(OPTION)							
XF403	71000040		XF8.9HP				**POTENTIOMETER**
XF404	71200017		8.9M20A		VR401,402	49905102	SR-19R 1kΩB
XF405	71000024		XF10GS		VR403,404	49905103	" 10kΩB
					VR405	49905473	" 47kΩB
		RESISTOR					
R0517,0518,0520	40143220	Carbon film	1/4W VJ	22Ω			
R410, 411	41143101	"	" " TJ	100Ω			**CAPACITOR**
R402,408,419,	40143101	"	" " VJ	100Ω	C477	33824221	Dipped mica 50WV 220pF
422,423,437,					C445,472	31820100	Ceramic 50WV CH 10pF
439,444,446,					C488,492	31827330	" " UJ 33pF
463,464,469,					C489	31827390	" " UJ 39pF
475,482,483,					C404,421,432	31820470	" " CH 47pF
497,0514					C487	31827101	" " UJ 100pF
R425,447,451,	40143221	"	" " "	220Ω	C459,464,475	31820101	" " CH 100pF
486, 0507,					C401,405,406,	30820103	" " 0.01μF
0508					411,413,415,		
R0502	40143331	"	" " "	330Ω	417,419,420,		
	40143391	"	" " "	390Ω	423,424,428,		
R443	40143471	"	" " "	470Ω	430,431,433,		
R430,474,480	40143561	"	" " "	560Ω	435,440,442,		
R467,468	40143681	"	" " "	680Ω	443,446,448,		
R0515	40143821	"	" " "	820Ω	451–455,		
R406,416,428,	40143102	"	" " "	1kΩ	460,465,482,		
437,440,442,					484–486,		
449,453,457,					490,491,493,		
459,462,488,					494,497		
494,0504,					C402,403,407,	30820473	" " 0.047μF
0506					408,410,412,		
R429,495,	40143152	"	" " "	1.5kΩ	414,416,418,		
R0516	41143182	"	" " TJ	1.8kΩ	422,425–427,		
R454,455,458,	40143222	"	" " VJ	2.2kΩ	429,436–438,		
0510					441,444,447,		
R460	40143272	"	" " "	2.7kΩ	457,458,462,		
R401,409,412,	40143332	"	" " "	3.3kΩ	463,468–471,		
413,417,431,					473,474,495,		
456,496,0511					498		
R426,427	40143472	"	" " "	4.7kΩ	C449	30820104	" " 0.1μF
R403,445,481,	40143562	"	" " "	5.6kΩ	C461,467	36825103	Mylar 50WV 0.01μF
489					C478	36825223	" " 0.022μF
R434, 450	40143682	"	" " "	6.8kΩ	C409,439,456,	36825473	" " 0.047μF
R404,420,421,	40143103	"	" " "	10kΩ	466,480,481,		
424,436,470,					483		
471,477,484,					C434	36526224	Tantalum 35WV 0.22μF
485,491,492,					C479	36526225	" " 2.2μF
0501, 0509,					C450,476,496	34220106	Electrolytic 16WV 10μF
0512						34220336	" " 33μF
R433	41143103	"	" " TJ	10kΩ			

		INDUCTOR			
L401–408, 410	53020023	FL-5H 101K 100μH			**CRYSTAL**
			X501	71600032	HC-6/W 3200kHz #210026
L411, 412	53020027	FL-5H 271K 270μH	X502	71800085	HC-18/U 8986kHz #210042-1
L409	55003178	5.2μH #220145	X503	71800086	" 8989kHz #210042-2
			X504	71800087	" 8988.3kHz #210042-3
		TRANSFORMER			
T410	54140740	R12-4074			
T402,403,404, 407,409,413, 414	54141700	R12-4170			
					RESISTOR
T401,406,408, 415	54141710	R12-4171	R511	40143479	Carbon film 1/4W VJ 4.7Ω
			R509,539,557	40143101	" " " " 100Ω
T405	55003177	#220221	R533,546	40143151	" " " " 150Ω
T411	55003410	#220460	R503,513,524, 525	40143221	" " " " 220Ω
T412	55003174	#220209			
			R512,522,538	40143471	" " " " 470Ω
			R504,514,520, 523,548,561	40143102	" " " " 1kΩ
		MINI CONNECTOR	R515	40143222	" " " " 2.2kΩ
J401	67120010	5048-12A	R534,535,565	40143272	" " " " 2.7kΩ
J402	67130001	5048-13A	R510,562,569, 571,578–580	40143332	" " " " 3.3kΩ
J403	67150010	5048-15A			
				40143392	3.9kΩ
			R501,506,507, 531,536,537, 542,544,545, 549,550,563, 566,575,576, 581	40143472	" " " " 4.7kΩ
TP401–412	91100008	Wrapping terminal			
			R521,527,532, 541,568,570	40143682	" " " " 6.8kΩ
AF UNIT			R519,529,555, 556,558,572	40143103	" " " " 10kΩ
Symbol No.	Parts No.	Description			
	019641AZ	AF unit with components	R517,551	40143153	" " " " 15kΩ
PB-1964A	60419641	P.C. Board	R508,518,528, 540,554,573	40143223	" " " " 22kΩ
			R559	40143393	" " " " 39kΩ
			R567	40143473	" " " " 47kΩ
		IC. FET. TRANSISTOR	R516	40143563	" " " " 56kΩ
Q503	25000125	IC MC3403P	R547,574	40143104	" " " " 100kΩ
Q506	25000177	" MC14024B	R560	40143154	" " " " 150kΩ
Q504	25000151	" SN74LS123N	R553	40143224	" " " " 220kΩ
Q502	25000134	" TA7063P	R526	40143274	" " " " 270kΩ
Q501	25000210	μPC2002H	R552,564,577	40143474	" " " " 470kΩ
Q505	25000172	" 78L05	R582	40143824	" " " " 820kΩ
Q514	22800195	FET 2SK19GR	R505	42124229	" composition 1/2W GK 2.2Ω
Q515	22105640	TR 2SA564	R502	44104010	Wire wound 1W 1Ω
Q511	22303730	" 2SC373			
Q507,508	22310005	" 2SC1000GR			
Q512	22313830	" 2SC1383			
Q509,510,513, 516	22318154	" 2SC1815Y			
					POTENTIOMETER
			VR501	49918101	CR-19R 100ΩB
		DIODE			
D506,510,511	21090115	Ge 1N60			
D502–505	21010070	Ge (GB) 1S1007			
D507–509, 512–517, 520,519,521	21015550	Si 1S1555			**CAPACITOR**
			C512	33824271	Dipped mica 50WV 270pF
			C513	33824510	" " " 510pF
D501,518	21090011	" 10D1	C511	31820030	Ceramic 50WV CH 3pF
			C522	31820100	" " 10pF
			C514	31820270	" " 27pF

C546–548	31820390	Ceramic	50WV	39pF	PREMIX LOCAL UNIT			
C510,532,534, 555,566	31820101	"	"	100pF	Symbol No.	Parts No.	Description	
						019650AZ	PREMIX LOCAL unit with components	
C533	31820151	"	"	150pF				
C558,559	31820241	"	"	240pF	PB-1965	60419650	P.C. Board	
C504,519–521, 523,531,535, 542–545, 562,570	30820103	"	"	0.01μF				
							TRANSISTOR	
C509,537	30820473	"	"	0.047μF	Q601–610	22303724	2SC372Y	
C516	36825102	Mylar	"	0.001μF				
C526	36825472	"	"	0.0047μF				
C518,529,530, 572	36825103	"	"	0.01μF				
							DIODE	
C525,539–541	36825223	"	"	0.022μF	D601–610	21015550	Si 1S1555	
C556,567,569, 573	36825473	"	"	0.047μF				
C503,528	36825104	"	"	0.1μF				
C507,517,527, 550,551,560, 568,571	34820105	Electrolytic	"	1μF			RESISTOR	
					R604,608,612, 616,620,624, 628,632,636, 640	40143101	Carbon film 1/2W VJ 100Ω	
C557	34320225	"	25WV	2.2μF				
C561	34320335	"	"	3.3μF				
C536	34320475	"	"	4.7μF	R642	40143181	" " " " 180Ω	
C505,515,538, 552,554,564, 565	34220106	"	16WV	10μF	R603,607,611, 615,619,623, 627,631,635, 639	40143102	" " " " 1kΩ	
C524,553,563	34220226	"	"	22μF				
C508	34220476	"	"	47μF	R641,643	40143122	" " " " 1.2kΩ	
C501	34220107	"	"	100μF	R602,606,610, 614,618,638	40143183	" " " " 18kΩ	
C506	34220227	"	"	220μF				
C502	34220477	"	"	470μF	R622,626,630, 634	40143333	" " " " 33kΩ	
					R601,605,609, 613,617,621, 625,629,633, 637	40143563	" " " " 56kΩ	
		TRIMMER CAPACITOR						
TC501–505	39000002	ECV-1ZW	20x32	20pF				
		INDUCTOR						
L502	53020019	FL-5H 220		22μH				
L501	53020027	FL-5H 271		270μH			CAPACITOR	
L503–506	53020001	FL-5H 102		1mH	C624,628,632, 636	31820470	Ceramic 50WV CH47pF	
					C620	31820680	" " " 68pF	
					C616	31820101	" " " 100pF	
		TRANSFORMER			C612	31820181	" " " 180pF	
T501	55003174	#220209			C640	31820241	" " " 240pF	
					C608	31820271	" " " 270pF	
					C604	31820331	" " " 330pF	
					C601–603,	30820103	" " 0.01μF	
		RELAY			605–607,			
RL501	70000031	FBR211A D012M			609–611,			
					613–615,			
					617–619,			
					621–623,			
		MINI CONNECTOR			625–627,			
J501	67190001	5048-19A			629–631,			
J502	67150010	5048-15A			633–635,			
J503	67080006	5048-08A			637–639,641			
J504	67050005	5048-05A						
J505	67030005	5048-03A						
	80042800	HEAT SINK						

		CRYSTAL				DIODE	
X601	71800113	HC-18/U 15.9875MHz #210147		D801	21022360	Varactor	1S2236
X602	71800114	" 17.9875 " #210148					
X603	71800115	" 21.4875 " #210149					
X604	71800116	" 28.4875 " #210150					
X605	71800117	" 35.4875 " #210151				RESISTOR	
X606	71800118	" 42.4875 " #210152		R809, 811	40143101	Carbon film 1/4W VJ	100Ω
X607	71800119	" 42.9875 " #210153		R807	40143221	" " " "	220Ω
X608	71800120	" 43.4875 " #210154		R805, 808	40143222	" " " "	2.2kΩ
X609	71800121	" 43.9875 " #210155		R802	40143332	" " " "	3.3kΩ
X610	71800122	" 19.4875 " #210156		R801	40143103	" " " "	10kΩ
				R803	40143183	" " " "	18kΩ
				R804	40143223	" " " "	22kΩ
				R806, 810	40143104	" " " "	100kΩ
		TRANSFORMER					
T601–610	55003217	#220017					
						CAPACITOR	
				C807	31820080	Ceramic disc 50WV	8pF CH
SELECT SWITCH UNIT				C801	31827080	" " "	8pF UJ
Symbol No.	Parts No.	Description		C803	31827120	" " "	12pF UJ
	019663AZ	SELECT SW unit with		C804	31820180	" " "	18pF CH
		components		C814,	31820330	" " "	33pF CH
PB-1966C	60419663	P.C. Board		C805, 808, 818	31820390	" " "	39pF CH
				C809, 810, 812,	30820103	" " "	0.01μF
				815, 819, 820,			
				824, 826			
		DIODE		C811	33824181	Dipped mica "	180pF
D701	21090011	Si 10D1		C813	33824431	" " "	430pF
				C821, 823	33824471	" " "	470pF
				C802, 822	33824102	" " "	1000pF
				C825	36226334	Tantalum 10WV	0.33μF
		RELAY					
RL701	70000031	FBR211A D012M					
						VARIABLE CAPACITOR	
				VC801	39000027	C521	
		SWITCH					
S701	65000047	6B0003CC2060					
						TRIMMER CAPACITOR	
				TC801	39000070	TSN-100D15	15pF
		MINI CONNECTOR		TC802	39000005	ECV-1ZW 50x32	50pF
J701	67160003	5048-16A					
						INDUCTOR	
				L801	55003184	#220268	
				L804,805	53020014	Micro inductor FL-4H	1.8μH
VFO UNIT (3420)				L803,806	53010003	" "	250μH
Symbol No.	Parts No.	Description		L802	53030001	" " S4 102K	1mH
		VFO assembly 3420					
	014402BZ	PCB with components					
PB-1440B-3420	60414402	P.C. Board					
						RECEPTACLE	
				J801	68040001	SI-6303-1	
		FET & TRANSISTOR					
Q802	22800195	FET 2SK19GR					
Q801, 803	22303724	Transistor 2SC372Y				TERMINAL	
					90000000	Lighthouse type	
					91100008	Wrapping terminal C	

RECT. A UNIT

Symbol No.	Parts No.	Description
	019670AZ	RECT. A unit with components
PB-1967	60419670	P.C. Board
		IC. TRANSISTOR
Q901	25000209	IC μPC78L12
Q903	22104950	TR 2SA495
		DIODE
D907	21090011	Si 10D1
D901–904	21090019	" 10D10
D905,906	21090022	" V06B
D908	21090154	Zener WZ061
		RESISTOR
R908	40143560	Carbon film 1/4W VJ 56Ω
R905	42124100	" composition 1/2W GK 10Ω
R901–904	42124474	" " " " 470kΩ
R907	43204049	Metallic film 2W 0.4Ω
		CAPACITOR
C901–905	30820103	Ceramic 50WV 0.01μF
C908–911	34320106	Electrolytic 25WV 10μF
C907	34320107	" " 100μF
C906	34320338	" " 3300μF
		RELAY
RL901	70000036	FRL-264 D012/04CS-01
	91100008	Wrapping terminal
	91100005	Test point D

RECT. B UNIT

Symbol No.	Parts No.	Description
	019680AZ	RECT. B unit with components
PB-1968A	60419681	P.C. Board
		TRANSISTOR
Q1003	22106390	2SA639
Q1001	22107330	2SA733
Q1002	22303724	2SC372Y

		DIODE
D1004, 1005, 1008–1011	21015550	Si 1S1555
D1001–1003	21090019	" 10D10
D1006, 1007	21090011	" 10D1
		RESISTOR
R1021	40143102	Carbon film 1/4W VJ 1kΩ
R1011,1016, 1020	40143472	" " " " 4.7kΩ
R1013,1015	40143103	" " " " 10kΩ
R1014	40143123	" " " " 12kΩ
R1017–1019	40143223	" " " " 22kΩ
R1012	40143563	" " " " 56kΩ
R1001–1004	42143474	" composition 1/2W GK 470kΩ
R1010	43104562	Metallic film 1W 5.6kΩ
R1005,1006	43204471	" " 2W 470Ω
R1008	43204222	" " " 2.2kΩ
R1007	43204332	" " " 3.3kΩ
R1009	43204473	" " " 47kΩ
		POTENTIOMETER
VR1001	49910103	V18K3-2 10kΩB
		CAPACITOR
C1017	30820473	Ceramic 50WV 0.047μF
C1016	30830222	" 500WV 0.0022μF
C1005,1006, 1013–1015, 1018	30830472	" " 0.0047μF
C1010	30830103	" " 0.01μF
C1009	34330106	Electrolytic 250WV 10μF
C1011	34330226	" " 22μF
C1001–1004, 1012	34330476	" " 47μF
C1007,1008	34350226	" 350WV 22μF
	91100008	Wrapping terminal

CAPACITOR UNIT

Symbol No.	Parts No.	Description
	019691AZ	CAPACITOR unit with components
PB-1969A	60419691	P.C. Board
		RESISTOR
R1101,1102	42124474	Carbon composition 1/2W GK 470kΩ

		CAPACITOR			TRIMMER CAPACITOR	
C1101,1102	34839904	Electrolytic 500WV 200μF (CE-62L)	TC1303	39000016	B2PY	100pF
			TC1302	39000077	B4PY	220pF
			TC1301	39000018	B7PY	420pF
			TC1306	39000002	ECV-1ZW 10x32	10pF
			TC1304,1305	39000005	" 50x32	50pF

TRIMMER A UNIT

Symbol No.	Parts No.	Description
	019700AZ	TRIMMER A unit with components
PB-1970	60419700	P.C. Board

		CAPACITOR			INDUCTOR	
C1203	33824331	Dipped mica 50WV 330pF	L1301	55003222	Trap coil #220261	
C1208	33824401	" " " 400pF				
C1202	33824651	" " " 650pF				
C1207	33824102	" " " 1000pF				
C1201	33824152	" " " 1500pF				
C1206	31820100	Ceramic 50WV CH 10pF				
C1205	31820300	" " " 30pF				
C1204	31820820	" " " 82pF				

		TRIMMER CAPACITOR				
TC1203	39000016	B2PY 100pF				
TC1202	39000077	B4PY 220pF				
TC1201	39000018	B7PY 420pF				
TC1206	39000002	ECV-1ZW 20x32 20pF				
TC1204,1205	39000005	" 50x32 50pF				

		INDUCTOR				
L1201	55003397	Trap coil #220545				

TRIMMER B UNIT

Symbol No.	Parts No.	Description
	019700BZ	TRIMMER B unit with components
PB-1970	60419700	P.C. Board

		CAPACITOR				
C1303	33824281	Dipped mica 50WV 280pF				
C1306	33824401	" " " 400pF				
C1302	33824621	" " " 620pF				
C1301	33824152	" " " 1500pF				
C1305	31820080	Ceramic 50WV CH 8pF				
C1304	31820680	" " " 68pF				

TRIMMER C UNIT (3420)

Symbol No.	Parts No.	Description
	010920CZ	TRIMMER C unit with components
PB-1092	60410920	P.C. Board

		CAPACITOR			TRIMMER CAPACITOR	
C1406	33834100	Dipped mica 500WV 10pF	TC1403, 1405	39000017	B1PY	40pF
C1405	33834820	" " " 82pF	TC1402, 1404	39000016	B2PY	100pF
C1403	33834281	" " " 280pF	TC1401	39000018	B7PY	420pF
C1407	33834401	" " " 400pF				
C1402	33834651	" " " 650pF				
C1401	33834152	" " " 1500pF				

BAND WIDTH CONTROL UNIT

Symbol No.	Parts No.	Description
	019720AZ	B.W CONT. unit with components
PB-1972	60419720	P.C. Board

		LED			RESISTOR	
D1501	20900140	GD4-203 SRD	R1501	40143152	Carbon film 1/4W VJ 1.5kΩ	

		POTENTIOMETER
VR1501	49915502	V10K8-1-2 5kΩB

		SWITCH			**VACUUM TUBE**
S1501	65000034	1B0001AC2060	V1701,1702	10000026	6146B
					VACUUM TUBE SOCKET
			VS1701,1702	68080006	SB-3606

DRIVER BOARD

Symbol No.	Parts No.	Description
	017140AZ	Driver board with components (without vacuum tube)
PB-1714A	60417141	P.C. Board
		VACUUM TUBE
V1601	10000020	12BY7A
		VACUUM TUBE SOCKET
VS1601	68090006	SB-9403
		RESISTOR
R1605	42124470	Carbon composition 1/2W GK 47Ω
R1602,1604	42124560	" " " " 56Ω
R1603	42124101	" " " " 100Ω
R1601	42124473	Carbon composition 1/2W GK 47kΩ
		CAPACITOR
C1601,1602	30830103	Ceramic disc 500WV 0.01μF
C1603,1604, 1606	30820473	" " 50WV 0.047μF
C1605	33834102	Dipped mica 500WV 1000pF
		INDUCTOR
L1601	53020013	Micro inductor FL5H 150μH
L1602(R1602)	55003219	#220029
	91100008	Wrapping terminal B

FINAL BOARD

Symbol No.	Parts No.	Description
	017151AZ	Final board with components (without vacuum tube)
PB-1715A	60417151	P.C. Board
		RESISTOR
R1803	40143102	Carbon film 1/4W VJ 1kΩ
R1804,1805	40143152	" " " " 1.5kΩ
R1802	40143332	" " " " 3.3kΩ
R1801	40143472	" " " " 4.7kΩ
		RESISTOR
R1706	44201010	Meter shunt 2W 1Ω
		CAPACITOR
C1703,1704, 1710	30830103	Ceramic disc 500WV 0.01μF
C1705–1709, 1711,1712	30820473	" " 50WV 0.047μF
	30830102	" " 500WV 1000pF
C1701	33147102	Moulded mica 1kWV 1000pF
C1702	33831050	Dipped mica 500WV 5pF
		INDUCTOR
L1701	53020013	Micro inductor 150μH
L1704	53020015	Micro inductor 560μH
L1702,1703 (R1701,1702)	53003220	RF choke #220307
	91100008	Wrapping terminal C

CLARIFIER CONTROL UNIT

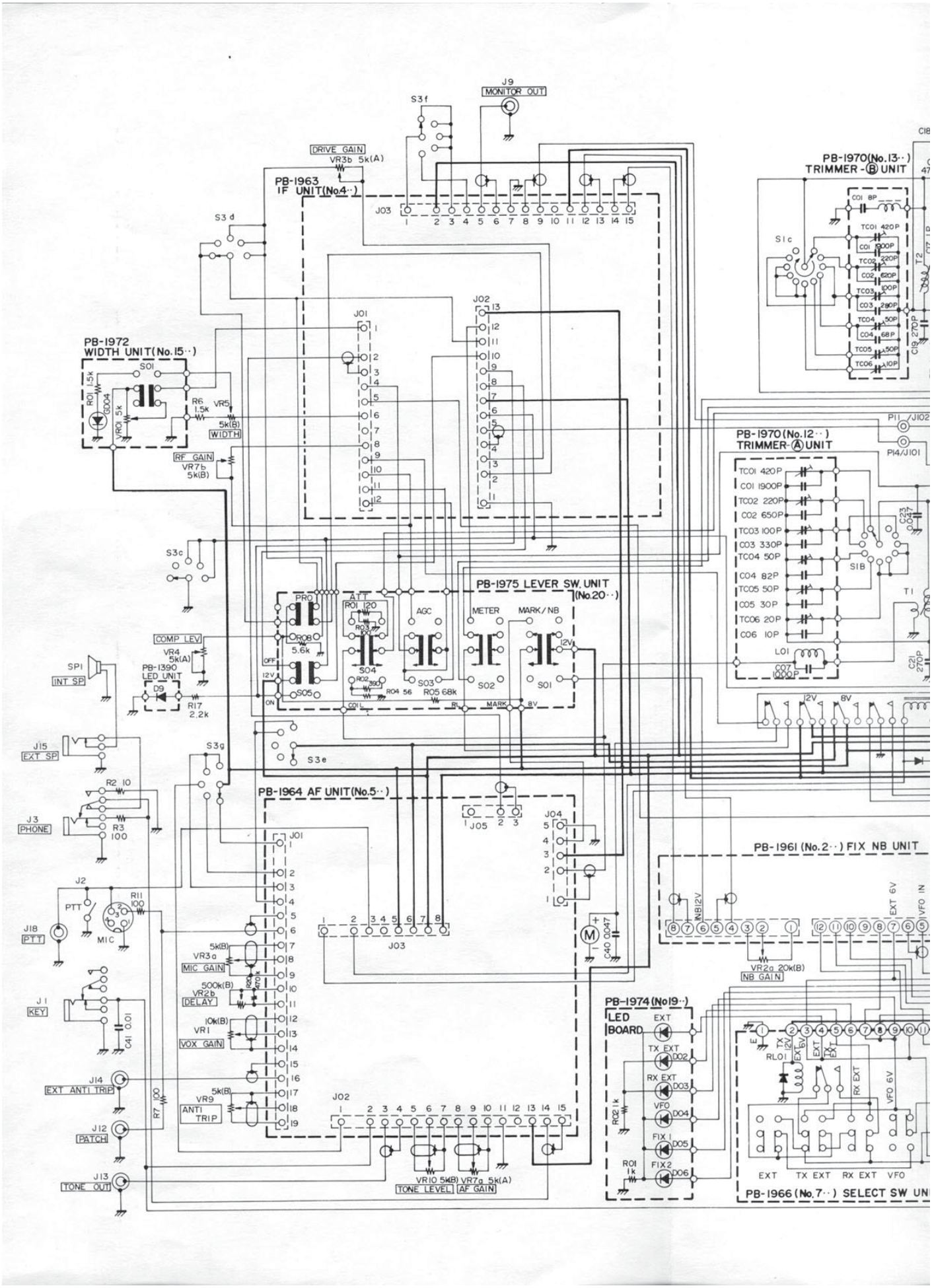
Symbol No.	Parts No.	Description
	019731AZ	CLAR CONT. unit with components
PB-1973A	60419731	P.C. Board
		DIODE
D1801	21090011	Si 10D1
D1802	20900140	LED GD4-203SRD

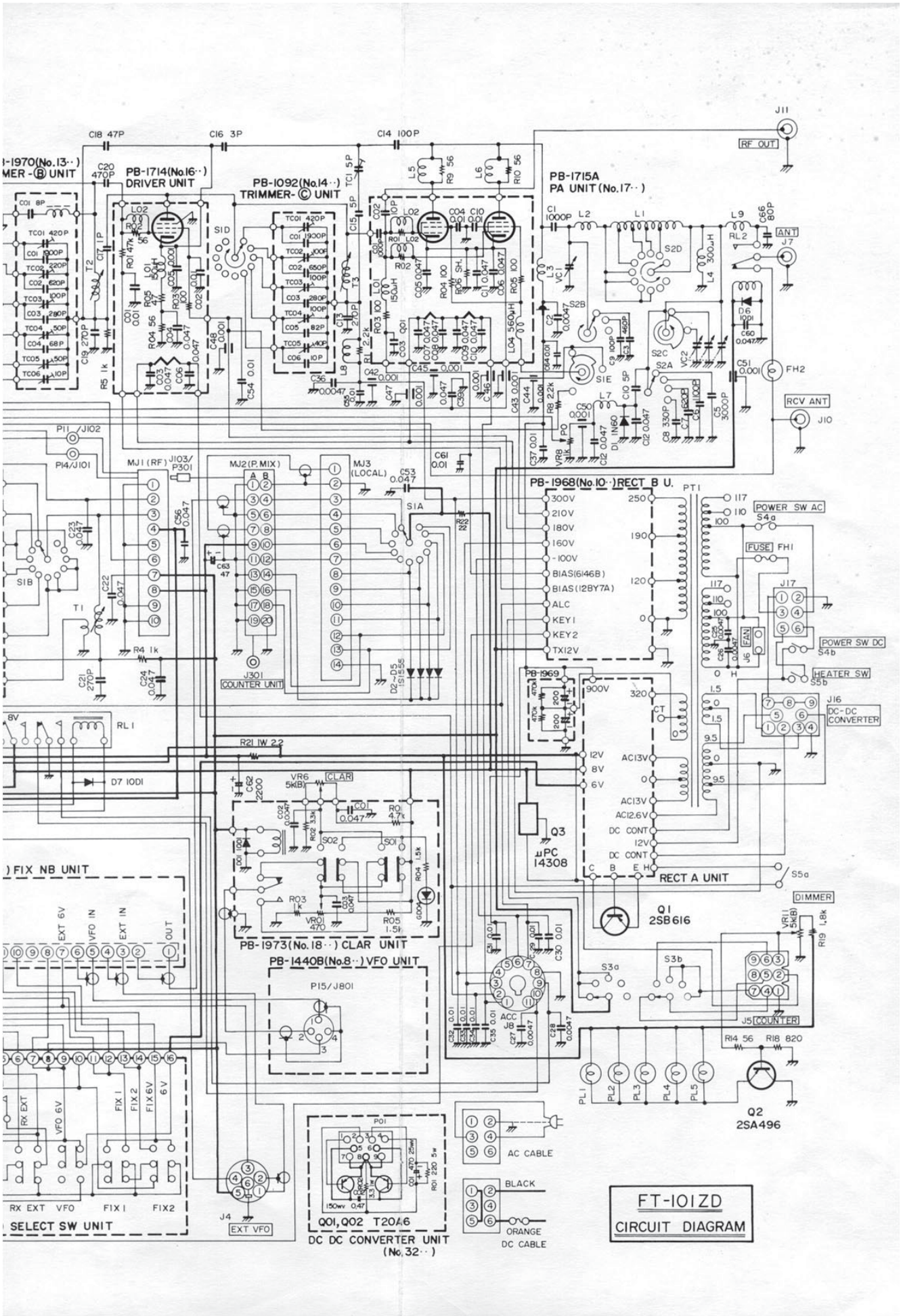
					SWITCH
			S2001–2005	64000109	SLE62351
			S2006	64000108	SLE64251
		POTENTIOMETER			
VR1801	49915471	V10K8-1-2 470Ω B			
			COUNTER UNIT		
		CAPACITOR	Symbol No.	Parts No.	Description
C1801–1803	30820473	Ceramic 50WV 0.047μF		019800AZ	COUNTER unit assembly
			PB-1978	–	(Display board)
			PB-1979	–	(Count, decode board)
			PB-1980	–	(Main board)
		RELAY			
RL1801	70000031	FBR211A D012M		DISPLAY board	
			PB-1978	60419780	P.C. Board
		SWITCH			
SW1801	65000046	2B0005FC206			**DISPLAY LED**
			DS2101–2106	21090153	HP5082-7623
LED BOARD					
Symbol No.	Parts No.	Description			**SOCKET**
	019741AZ	LED board with components	QS2101–2106	68140005	314AG-37D
PB-1974A	60419741	P.C. Board			
		LED		COUNT. DECODE board	
D1901–1906	20900140	GD4-203SRD	PB-1979	60419790	
		RESISTOR			**IC. TRANSISTOR**
R1901,1902	41143102	Carbon film 1/4W TJ 1kΩ	Q2208–2213	25000085	IC MSM561RS
			Q2202–2207	25000204	" SN74LS196N
			Q2201	22104964	TR 2SA496Y
LEVER SWITCH BOARD					**RESISTOR**
Symbol No.	Parts No.	Description	R2204–2245	40143101	Carbon film 1/4WS VJ 100Ω
	019751AZ	LEVER SW board with components	R2203	40143181	" " " " 180Ω
			R2202	40143271	" " " " 270Ω
PB-1975A	60419751	P.C. Board	R2201	40143471	" " " " 470Ω
					(ALL RD¼F(R2) TYPE)
		RESISTOR			
R2006	41143560	Carbon film 1/4W TJ 56Ω			
R2005	41143101	" " " " 100Ω			
R2001	41143121	" " " " 120Ω			**CAPACITOR**
R2002	40143391	" " " VJ 390Ω	C2201	30820103	Ceramic 50WV 0.01μF
R2008	41143562	" " " TJ 5.6kΩ			(2222-662-02-103)
R2007	40143103	" " " VJ 10kΩ	C2202–2204	36326685	Tantalum 6.3WV 6.8μF
R2004	40143683	" " " " 68kΩ			(CS99E0J6R8M)

		CONNECTOR	C2316	36825332	Mylar " 0.0033μF
J2201	68130004	3024-13C	C2317	36825103	" " 0.01μF
	67200003	Board Joint 163740	C2313	36825473	" 50WV 0.047μF
			C2306,2307, 2309	36226106	Tantalum 16WV 10μF
			C2310	34220107	Electrolytic " 100μF
			C2318–2322	32821102	Feed thru 50WV 0.001μF
	COUNTER MAIN board				
PB-1980	60419800	P.C. Board			
					INDUCTOR
			L2301	55003069	35μH #220012
		IC. FET. TRANSISTOR			
Q2301	25000205	IC MC10116			
Q2305	25000080	" MSM5564			**SWITCH**
Q2309	25000206	" SN74196N	S2301,2302	66000005	A10040-008
Q2304	25000207	" SN74S00N			
Q2306	25000141	" SN74LS04N			
Q2307,2308	25000208	" μPA54H			
Q2310	25000109	" μPC14305			
Q2301	23800513	FET 3SK51-03			**PLUG**
Q2303	22390015	TR MPS3640	P2301	67020007	SQ4052
			P2302 (with wire)	67090004	1625-09P-1 #240136
		DIODE			**CONNECTOR**
D2301–2312	21015550	Si 1S1555	J2301	67130002	3022-13A
			J2302	67030006	3021-03
		CRYSTAL			
X2301	71400001	HC-14/W 655.36kHz #210025			
			DC-DC CONVERTER (OPTION)		
		RESISTOR	Symbol No.	Parts No.	Description
R2316	40143101	Carbon film 1/4WS VJ 100Ω			**TRANSISTOR**
R2311	40143221	" " " " 220Ω	Q3201,3202	22290020	T20A6 with insulator
R2319	40143331	" " " " 330Ω			
R2305,2317	40143471	" " " " 470Ω			
R2308–2310, 2312,2314, 2322	40143511	" " " " 510Ω			**RESISTOR**
			R3202	43104332	Wire wound 1W 3.3Ω
R2304,2313, 2315	40143102	" " " " 1kΩ	R3201	43504221	Metallic film 5W 220Ω
R2306,2307	40143222	" " " " 2.2kΩ			
R2302	40143103	" " " " 10kΩ			
R2303	40143153	" " " " 15kΩ			
R2321	40143223	" " " " 22kΩ			
R2301,2320	40143473	" " " " 47kΩ			**CAPACITOR**
R2318	40143104	" " " " 100kΩ	C3202	38235473	Metallized paper 150WV 0.047μF
		(ALL RD¼F (R2) Type)			
			C3201	34320227	Electrolytic 25WV 220μF
		BLOCK RESISTOR			
RB2301	47000004	RK1/16B8R 4.7kΩK			
					CONNECTOR
			P3201	68090038	AC9M
		CAPACITOR			
C2308	31820120	Ceramic 50WV CH 12pF			
C2311,2312	31820470	" " " 47pF			
C2301–2305	30820103	" " 0.01μF		T9012720	DC POWER CORD
C2314,2315	36824331	Styrol " 330pF		73000007	FUSE 20A

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
	67060008	CONNECTOR PLUG QS-P6FL
	67020001	**PIN PLUG** STP58
	67110007	**ACC PLUG** PA602B01
	73000004	**FUSE** (100V–117V) 5A
	73000003	" (200V–234V) 3A





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