# FT-180A

# INSTRUCTION MANUAL

YAESU MUSEN CO., LTD.

C.P.O. BOX 1500
TOKYO, JAPAN

## INDEX



10.002.5 MHz

# YAESU
# FT-180A
# HF SSB SOLID STATE TRANSCEIVER


The FT-180A is a rugged, compact SSB transceiver for base or mobile HF applications. Designed to provide a typical PEP power output of 10, 50 or 100 watts over the 1.6 to 18 MHz range, the FT-180A employs modern FET and bipolar technology for state-of-the-art performance and reliability.

As many as 6 channels may be installed in the FT-180A. Once installation is completed, no further tuning procedure is required for full operation on each channel. The FT-180A is packaged in a heavy gauge metal case for excellent mechanical stability, and the final amplifier transistors are fully protected against possible damage from high antenna SWR.

Optional accessories include the FC-420 Remote Controlled Antenna Coupler, FH-180 Remote Controller with telephone-type handset, crystal oven for optimum frequency stability, and XF-10.7HL-A LSB filter.

# SPECIFICATIONS

## GENERAL

**Frequency coverage:**
1.6 – 18 MHz (except for ±1 MHz near the 10.7 MHz IF)

**Emission type:**
J3E (USB, LSB), H3E (AM)
(LSB filter optional)

**Number of channels:**
6 simplex or 3 semi-duplex

**Operating temperature range:**
−10°C to +50°C

**Power requirements:**
13.4 volts DC ±10% negative ground

**Power consumption:**
20 amps transmit,
1 amp receive (100W w/o oven ±10 PPM type)

**Case size:**
100W type: 95(H) x 240(W) x 310(D) mm √
50W type: 95(H) x 240(W) x 290(D) mm
10W type: 95(H) x 240(W) x 260(D) mm

**Weight:**
100W type: 6 kg. √
50W type: 5.5 kg.
10W type: 5.0 kg.

## TRANSMITTER

**Power output:**
As per power amplifiers
SSB – 100 watts; AM – 35 watts
SSB – 50 watts; AM – 17 watts
SSB – 10 watts; AM – 3.5 watts

**Unwanted sideband suppression:**
Better than 50 dB

**Carrier suppression:**
Better than 50 dB

**Spurious emissions:**
Better than 65 dB down

**Third order distortion products:**
Better than 31 dB down

**Transmitter frequency response:**
300 – 2700 Hz (−6 dB)

**Maximum bandwidth:**
3 kHz (SSB)

**Stability:**
Better than ±10 ppm

**Distortion products:**
−20 dB or better

**Microphone impedance:**
600 ohms (dynamic)

**Tone signal:**
1500 Hz

**Antenna output impedance:**
50 ohms nominal

## RECEIVER

**Sensitivity:**
SSB better than 1 μV for 20 dB S/N
AM better than 10 μV for 20 dB S/N

**Selectivity:**
SSB 2.4 kHz at −6 dB, 4.0 kHz at −60 dB
AM 6.0 kHz at −6 dB, 12 kHz at −50 dB

**Receiver type:**
Single superheterodyne

**Intermediate frequency:**
10.7 MHz

**IF rejection:**
Better than 60 dB

**Image rejection:**
Better than 60 dB

**Audio output power:**
2 watts @ 10% THD

**Audio output impedance:**
4 ohms

Specifications subject to change without notice.

AKH9TUFT-180A
FCC Rule Part No. 21.900(K)
74.402(D), 81, 83, 87 & 90

## SEMICONDUCTORS

**Integrated Circuits (IC):**

| | | |
|---|---|---|
| AN6551 | 1 | |
| ICL7660CPA | 1 | |
| MC1496P | 1 | |
| MC14016BCP | 1 | |
| MC14572UB | 1 | |
| μPC151A | 1 | |
| μPC2002V | 1 | |
| μPC7808H | 1 | *** |
| μPC78L08 | 2 | * |
| | 1 | ** |
| | 1 | *** |

**Field Effect Transistors:**

| | | |
|---|---|---|
| 2SK192AGR | 3 | |
| 2SK125 | 4 | |
| 3SK73GR | 9 | |

**Transistors:**

| | | |
|---|---|---|
| 2SA564Q | 2 | |
| 2SA564R | 1 | |
| 2SC496Y | 1 | *** |
| 2SC732GR | 2 | |
| 2SC732BL | 1 | |
| 2SC1583 | 3 | |
| 2SC1589 | 1 | ** |
| 2SC1815Y | 16 | |
| 2SC1815GR | 2 | |
| 2SC1815BL | 1 | |
| 2SC1923R | 3 | |
| 2SC1959Y | 2 | |
| 2SC2166 | 1 | *** |
| 2SC2290 | 2 | * |
| | | ** |
| 2SC2395 | 2 | * |
| | | ** |
| 2SC2407 | 2 | |
| 2SC2509 | 2 | *** |
| 2SD288K | 1 | * |
| | | ** |
| 2SD717O | 2 | |
| 2SD844K | 1 | |

**Diodes:**

| | | |
|---|---|---|
| 1N270 | 17 | |
| 1S1555 (Si) | 17 | |
| 1S2208 (Varactor) | 1 | |
| 1SS53 (Si) | 27 | |
| 1SS97 (Schottky barrier) | 22 | |
| 1N60 (Ge) | 9 | |
| 10E1 (Si) | 14 | |
| 10D10 (Si) | 4 | * |
| | | ** |
| BZ140 (Zener) | 1 | |
| HZ5C-1 (Zener) | 2 | |
| HZ9C1 (Zener) | 1 | |
| HZ3C1 (Zener) | 2 | * |
| | | ** |
| | (2) | *** |
| FC63 (Varactor) | 1 | |

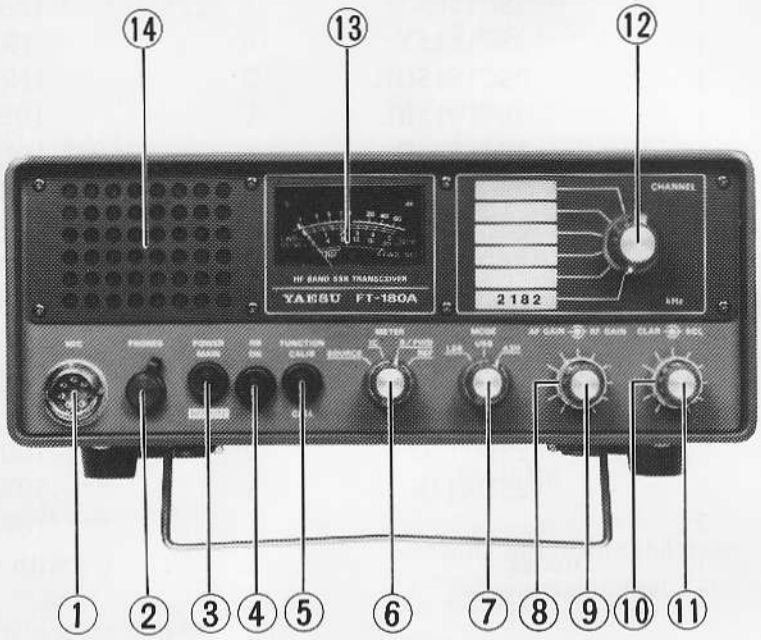
* 100W model
** 50W model
*** 10W model
( ) with crystal oven

## ACCESSORIES

| | | |
|---|---|---|
| Microphone (M3090026) | (YM-36) | 1 |
| DC Power Cord | | 1 |
| 10W model | (T9006806) | |
| 50W model | (T9006815) | |
| 100W model | (T9006820) | |
| Miniature External Speaker Plug (P2240) (P0090034) | | 1 |
| Headphone Plug (P0090007) | (SH3010) | 1 |
| Accessory Plug (P0090078) | (SC-12CM) | 1 |
| Coaxial Antenna Plug (P0090021) | (MP-5) | 1 |
| Spare Fuse | | 1 |
| 10W model | 6A (Q0000012) | |
| 50W model | 15A (Q0000008) | |
| 100W model | 20A (Q0000009) | |
| Remote Control Plug (P0090128) | (P-1620BA-CA) | 1 |

10.7 MHz
9.45 MHz

# FRONT PANEL CONTROLS AND SWITCHES




### (1) MIC

This eight-pin connector accepts the microphone input, as well as push-to-talk control (PTT) line. The microphone input impedance is 600 ohms.

### (2) PHONES

This is a standard phone jack for accommodation of the headphone plug. Audio output impedance is 8 ohms. Insertion of the headphone plug into this jack automatically disconnects the internal speaker.

### (3) POWER ON/OFF/REMOTE

This is the main ON/OFF switch for the transceiver and accessories, when used. The FH-180 Remote Controller is only switched on when this switch is set to the REMOTE (lower) position. The FC-420 Remote Controlled Antenna Coupler and/or optional crystal oven are switched on in either the ON (upper) or REMOTE position.

### (4) NB

This switch activates the noise blanker.

### (5) FUNCTION CALIB/CALL

This is a momentary switch used for sending tone calling signals, as well as for calibrating the transceiver for incoming signals.

### (6) METER

This switch selects the display function for the front panel meter. On receive, this meter functions as a signal strength meter (S-meter). On transmit, the source voltage, final amplifier collector current, relative power output or reflected power can be displayed.

### (7) MODE

This switch selects the operating mode: LSB, USB (J3E) or AM (H3E) (LSB filter optional). Do not operate this switch while transmitting.

### (8) RF GAIN

This is a manual gain control for the RF and IF stages of the receiver. Counterclockwise rotation decreases the RF and IF gain.

### (9) AF GAIN

This control sets the audio output (volume) level for the receiver. Clockwise rotation increases the volume level.

### (10) SQL

The squelch control quiets the receiver when no signals are being received. This control should be set to the point where the background noise just disappears, in order to retain maximum sensitivity.

### (11) CLAR

This control allows fine tuning of the signal received, for precise tracking of unstable or off-frequency signals.

### (12) CHANNEL

This switch selects the operating channel. Do not operate this switch while transmitting.

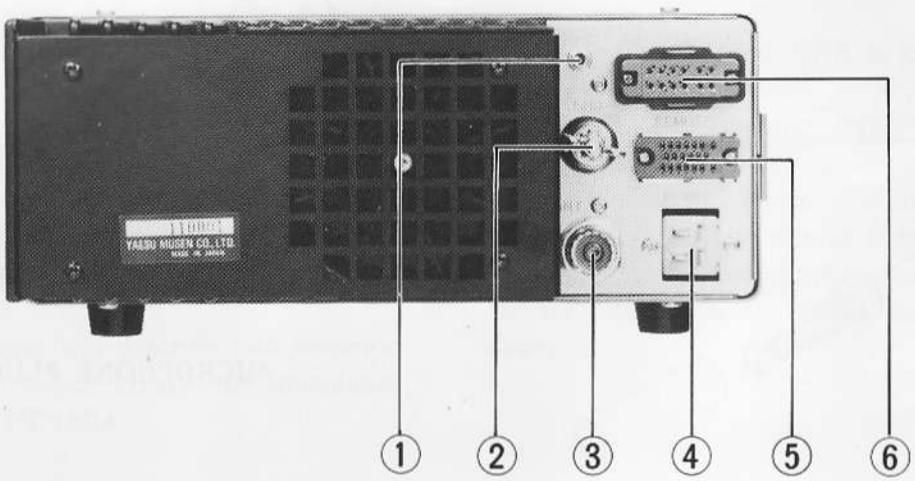
### (13) METER

This is the front panel S-meter, FWD/REF PO meter, IC meter and source voltage meter.

### (14) SPEAKER

This is the grill for the internal speaker.

## REAR PANEL CONNECTIONS




### (1) EXT SP

This is the external speaker output jack. Insertion of a plug into this jack automatically disconnects the internal speaker.

### (2) GND

For best performance and safety, a good ground should be connected at this point.

### (3) ANT

This SO-239 jack accepts the antenna cable connector.

### (4) POWER

Connect the DC power cord at this point. Never apply AC power or improper DC input voltages to this transceiver.

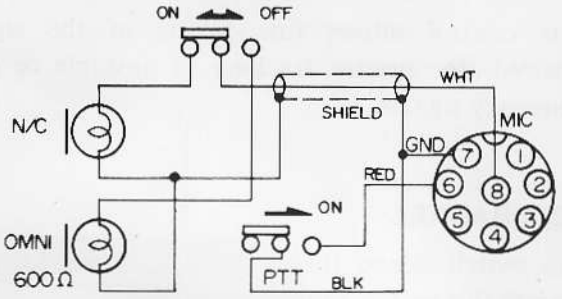
### (5) REMOTE

This blue, 20-pin connector accepts the power and control signals from the optional FH-180 Remote Controller, which provides remote control of the CHANNEL selector, AF GAIN and CLAR functions, as well as microphone input and audio output from a telephone handset and/or speaker. However, to use the FH-180, certain modifications must be made within the FT-180A, the details of which are described on page 42.

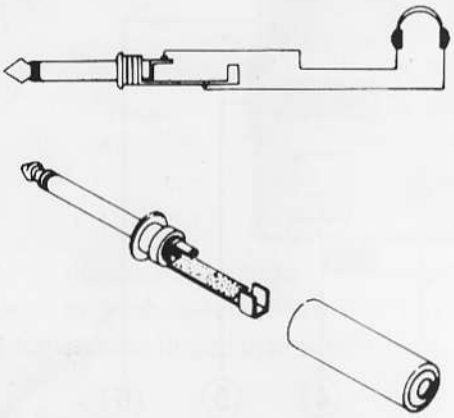
### (6) ANTENNA COUPLER

This 12-pin connector provides power and channel switching control signals for the optional FC-420 Remote Controlled Antenna Coupler, which will then match the antenna impedance for each channel as selected by the FT-180A or FH-180 CHANNEL selector.

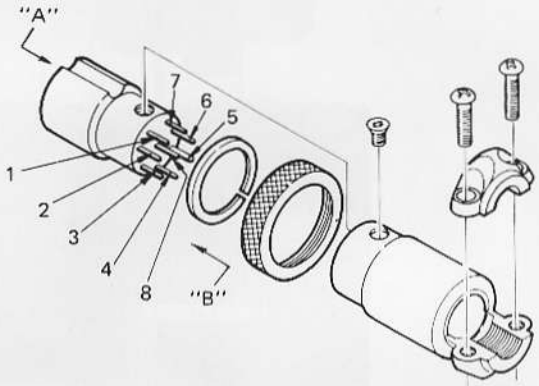
YM-36



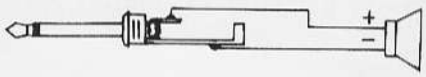

YM-36 MICROPHONE CONNECTIONS

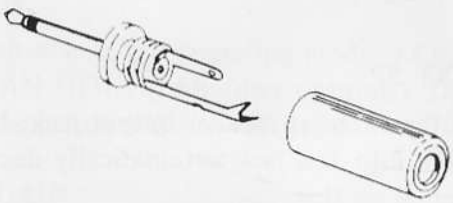


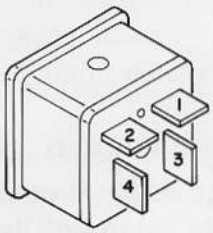
HEADPHONE CONNECTIONS

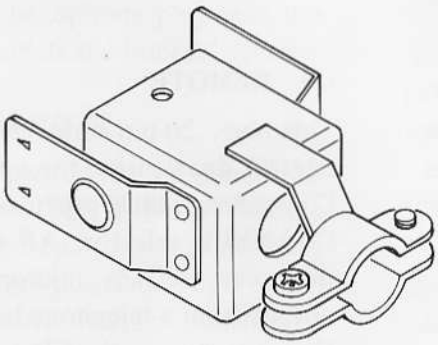



MICROPHONE PLUG

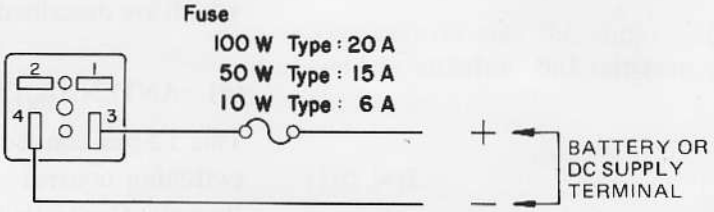






EXTERNAL SPEAKER CONNECTIONS




DC POWER CORD CONNECTIONS

# INSTALLATION

## ANTENNA CONSIDERATIONS

Next to the transceiver, the antenna is the most important component in a successful communications station, as the communication range is directly related to the efficiency of the antenna. Therefore, great care should be taken in the installation of the antenna system.

If a proper antenna is not otherwise available, see your Yaesu dealer for a specially factory adjusted YA-10 single band dipole antenna, YA-11 dual band dipole antenna, or RSL series antenna (for mobile installations). These antennas are capable of meeting most requirements.

The FT-180A requires a load impedance of 50 ohms at the operating frequency. If the load impedance differs greatly from this figure, the final amplifier protective circuit will cause the power output to decrease. If this impedance cannot be secured on all desired channels an antenna tuner must be employed in order to provide a 50-ohm load impedance for the transmitter.

The following section will describe two common types of antennas which satisfy the impedance requirement of the FT-180A.

### (1) Doublet Antenna

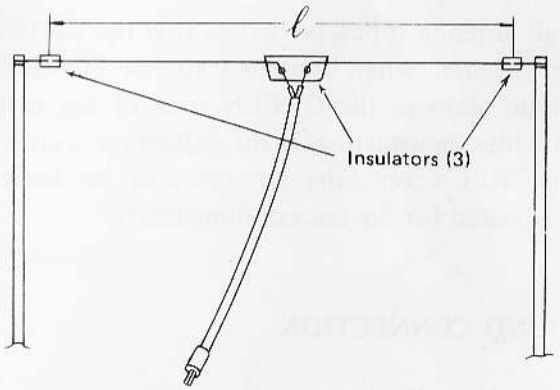
The Doublet, or Dipole antenna consists of a half-wavelength of wire, cut into two equal sections and fed at the center. At this feeding point, an antenna balun may be utilized to prevent unwanted radiation from the coaxial cable. Maximum radiation exists at right angles to the wire. Ceramic insulators should be installed on both ends of the antenna, and a suitable center insulator must also be used. However, some types of antenna baluns include mounting hooks for the antenna elements, thus eliminating the need for a center insulator. These parts may be obtained from your Yaesu dealer. The correct length for a doublet or dipole antenna can be determined by using one of the following formulas:

$$\text{Length} = \frac{468}{\text{Freq (MHz)}} \text{(feet)}$$

$$\text{Length} = \frac{142.5}{\text{Freq (MHz)}} \text{(meters)}$$

Cut the appropriate length of wire (allowing some extra length for fastening) into two equal pieces. Tie one end of each to a ceramic insulator, and connect the other ends to the antenna balun (or center insulator). Connect the coaxial feedline (type RG8A/U or equivalent) to the antenna balun. If an antenna balun is not being used, connect the center conductor of the coaxial feedline to one side of the center insulator's wire, and connect the shield of the coaxial line to the other side of the center insulator (there is no direct connection of one half of the dipole to the other). The far ends of the wire elements may then be secured, using nylon rope tied to the insulators. Using supporting poles, hoist the antenna as high an in the clear as possible.

Check to see that the SWR is less than 1:1.5 at the operating frequency. If so, the installation is complete. The dipole antenna works best if it is placed high and in the clear, so use the highest support possible. When building the supports, remember that they should form a line perpendicular to the line representing the shortest distance to the station with which communication is desired.




**Doublet Antenna**

### (2) Quarter Wave Wire Antenna

Usually constructed in a vertical configuration, the quarter wave antenna is sometimes used in base station installations. However, it is more commonly used on ships or yachts, especially when the space for a doublet antenna is not available. The length of the quarter wave antenna can be determined by using one of the following formulas:

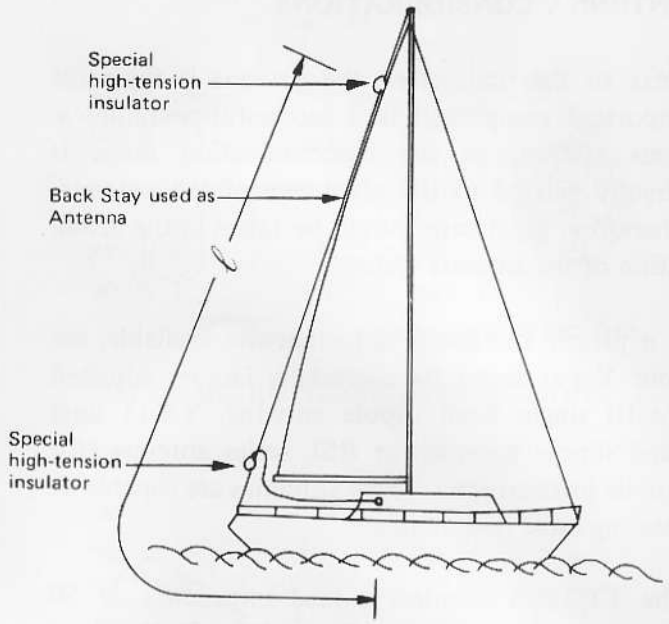
$$\text{Length} = \frac{234}{\text{Freq (MHz)}} \text{ (feet)}$$

$$\text{Length} = \frac{71.25}{\text{Freq (MHz)}} \text{ (meters)}$$

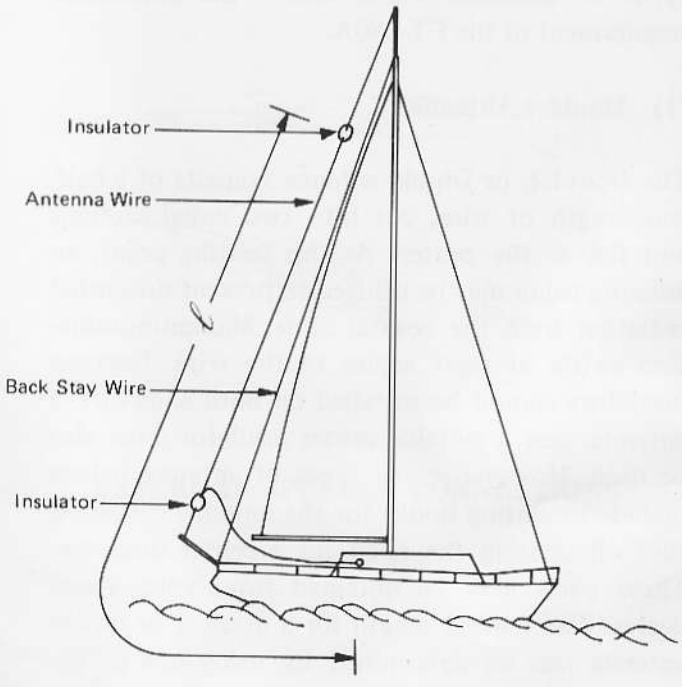
The wire has one end connected to a ceramic insulator, which is, in turn, hoisted up a non-metallic mast. The other end of the wire is connected to the center conductor of the coaxial cable. For base station installations at the higher frequency channels, the vertical element may be made of aluminum tubing (self-supporting).

The shield of the coax is connected to a good RF ground. The ground system may consist of six to twelve wires 3% longer than the radiator, extending radially from the center of the antenna and buried slightly beneath the surface of the ground. A cold water pipe may provide a usable ground in many instances. On yachts, the ground foil in the hull must be used. The vertical radiator must be insulated from ground, and it should not touch any trees, buildings, or rigging (on yachts).

For all antenna types, be certain that the FT-180A meter needle, when switched to the PO (REF) position, stays in the GREEN zone of the meter scale while transmitting. If the deflection is outside of the GREEN zone, the antenna must be checked or readjusted for the correct impedance.




**Back Stay used as Antenna Element**




**Antenna Element installed separately**

## GROUND CONNECTION

The FT-180A should be connected to a good earth ground for best performance and safety. Use a heavy braided wire, not more than 3 meters in length, for connection to the station ground bus. The ground connection at the transceiver should be made at the rear panel GND stud. When a vertical or single wire antenna is used, a good ground connection is essential.

## POWER SUPPLY CONNECTIONS

### DC OPERATION

The FT-180A comes equipped for operation from a DC supply. The DC supply should be capable of 20 amperes (100 watt model) for 13.4 volt operation.

Before connecting the power connector to the rear apron, be sure the power supply voltage does not exceed 15 volts. Adjust the power supply voltage, if necessary, to ensure a safe supply level.

A fuse is located in the DC cord for the transceiver. For 13.4 volt operation, a 20 ampere fuse is used. When replacing fuses, be absolutely certain to use a fuse of the proper rating. Before connecting the power connector to the transceiver, verify that a fuse of the proper rating has been installed.

**CAUTION**

Our warranty does not cover damage caused by the use of incorrect fuses. Unless otherwise specified, proper fuses are as follows:

| | |
|---|---|
| 100 watt model: | 20 ampere fuse |
| 50 watt model: | 15 ampere fuse |
| 10 watt model: | 6 ampere fuse |

Connect the RED power supply lead to the POSITIVE supply post, and connect the BLACK power supply lead to the NEGATIVE supply post. The DC cord is included with the transceiver.

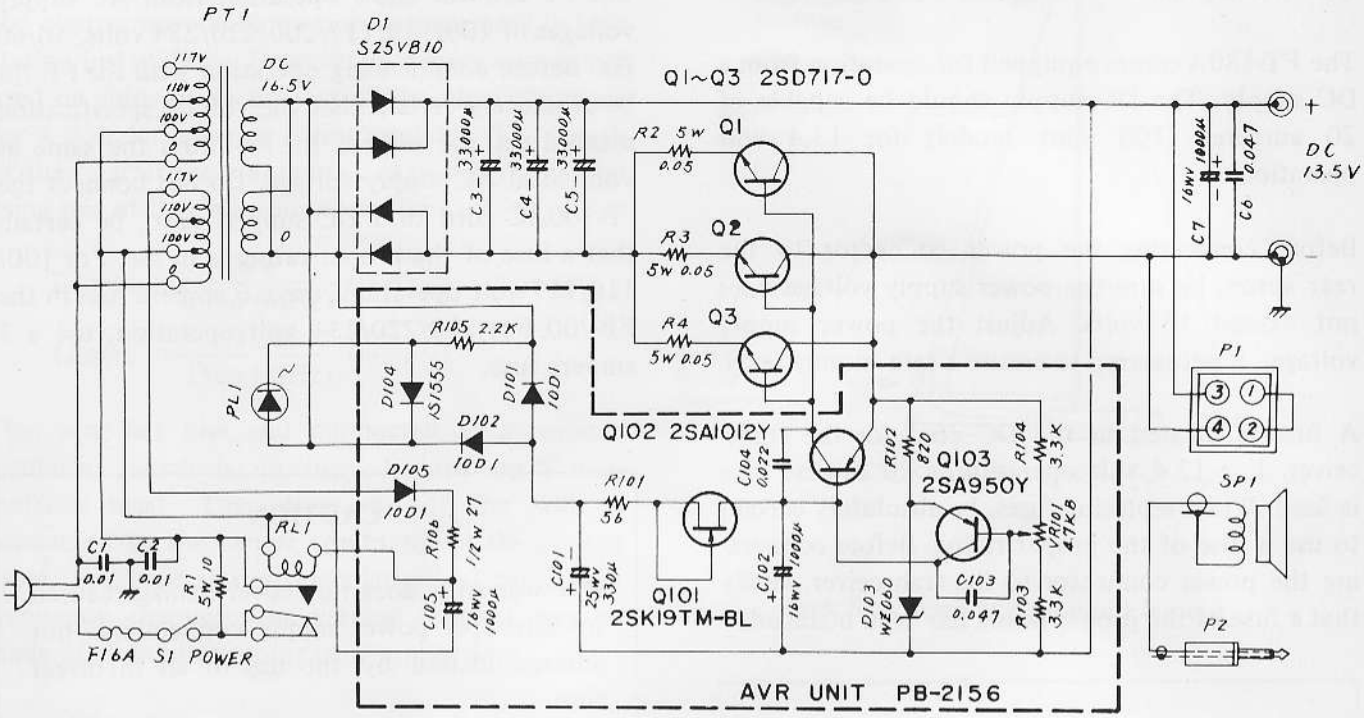
### AC OPERATION

The FP-700 will allow operation from AC supply voltages of 100/110/117/200/220/234 volts, 50/60 Hz. Before commencing operation with the FP-700, be absolutely certain that the voltage specification marked on the rear of the FP-700 is the same as your local AC supply voltage. Do not connect the FP-700AC cord to a DC supply. Also, be certain that a fuse of the proper rating is in use. For 100/110/117 volt operation, use a 6 ampere fuse in the FP-700. For 200/220/234 volt operation, use a 3 ampere fuse.

**CAUTION**

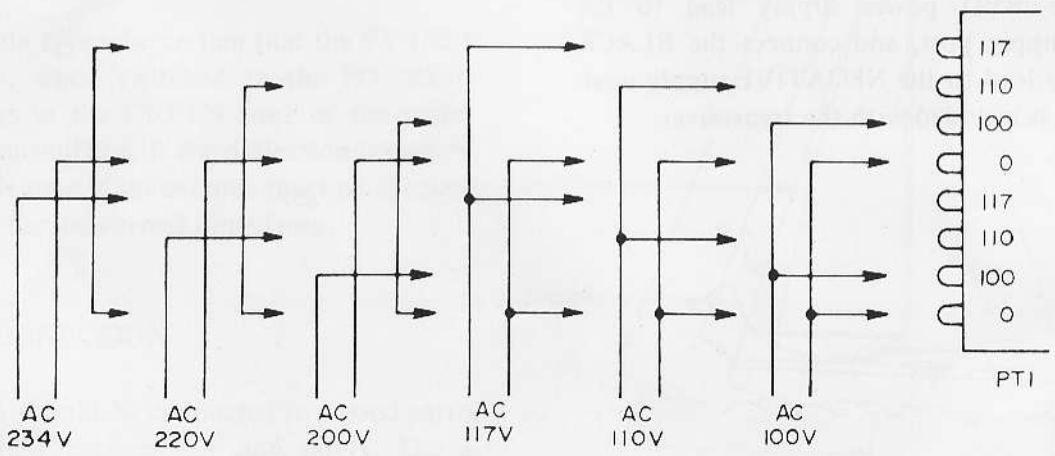
Our warranty does not cover damage caused by improper power supply connections, nor damage caused by the use of an incorrect fuse.

When all voltage inspections have been completed, connect the FP-700 output voltage cable to the FT-180A rear panel POWER jack. Plug the FP-700 power cord into the wall outlet. AC installation is now complete.




FP-700

CIRCUIT DIAGRAM




POWER TRANSFORMER PRIMARY CONNECTIONS

## MOBILE INSTALLATION

A DC cable for mobile installation is included with the transceiver. If the DC cable needs to be extended, a heavy, low resistance cable must be used to avoid excessive voltage drop in the cable.

For under-dash mounting, a special mobile mounting bracket is available from Yaesu dealers. This bracket, model MMB-2 (or MMB-16), allows easy mobile installation of the FT-180A.

The FT-180A should be mounted where there is adequate space around the heat sink to allow free circulation of air. Allow a space of about 20 cm behind and around the heat sink, and do not position the transceiver directly in the path of the heater ducts.

When making battery connections, be absolutely certain that the proper polarity of the power cord is observed.

**CAUTION**

Permanent damage will result if reversed polarity supply voltage is applied to this transceiver. Our warranty does not cover damage caused by reversed power supply connections.

Power connections should be made directly to the battery instead of to the ignition switch. The battery provides considerable filtering against ignition noise, while connection to the ignition switch can place the FT-180A in a noise-producing circuit. The power leads must be kept as short as possible, and should be kept away from ignition cables as much as possible.

When making battery connections, be certain to connect the RED power cable lead to the POSITIVE (+) battery terminal, and the BLACK lead to the NEGATIVE (–) terminal.

Before connecting the DC cable to the transceiver, check the battery voltage with the engine running fast enough to show a charge on the vehicle's ammeter, or immediately after starting the engine. If the voltage exceeds 15 volts, the automobile voltage regulator should be adjusted, so as to limit the maximum voltage to less than 15 volts.

This transceiver should not be operated from a power source of less than 12 volts. The transceiver should always be turned off when the car is started, to prevent transients in the automobile electrical system from damaging the transistor circuitry of the FT-180A.

**CAUTION**

Be certain to observe proper polarity of the power cord when making connections to the vehicle battery.

## MMB-2
## MOBILE MOUNT INSTALLATION

1. Listed below are the parts included in the MMB-2 kit. Only the parts shown with an asterisk (*) are required for FT-180A installation.

| | | | |
|---|---|---|---|
| *1) | Universal bracket MMB-2 | | 1 |
| 2) | Catch chip | (S5000038) | 2 |
| 3) | Right (90°) angle hinge | (R0061920) | 2 |
| *4) | Knob screws | | 8 |
| 5) | Screws for the catch clip | (M3x4) | 4 |
| 6) | Screws for right-angle hinge | (M3x6) | 4 |
| *7) | Screws for the MMB-2 | (M5x10) | 4 |
| *8) | Lock washers for the MMB-2 | | 4 |
| *9) | Flat washers for the MMB-2 | | 4 |
| *10) | Nut for the MMB-2 | | 4 |

2. Use the universal mounting bracket as a template for positioning the mounting holes. Use a 3/16" diameter bit for drilling these holes, allowing enough room for the transceiver, its cables, microphone and controls. Secure the mounting bracket with the screws, washers and nuts supplied, as shown in the drawing.

3. Using the slotted knob screws, attach the FT-180A to the MMB-2 universal bracket.

4. The angle of the transceiver may be adjusted to whatever position is most convenient and easily accessible.

**CAUTION**

If the FT-180A is installed in a car which has an Electronic Fuel Injection carburetor, we strongly recommend that the FT-180A be installed as far away as possible from any equipment related to the carburetor located within the passenger compartment.

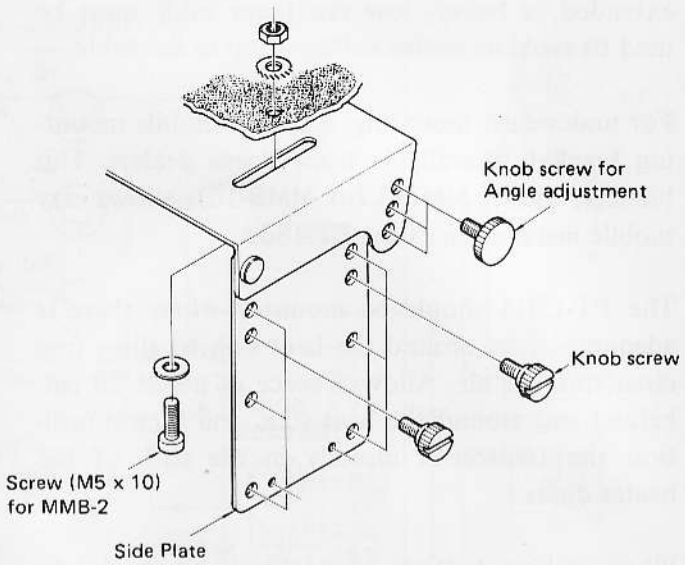



Figure 1

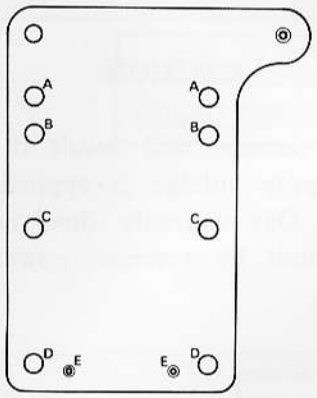



Figure 2

# OPERATION

(1) Make certain that all power supply and ground connections have been correctly made.

(2) Connect a 50-ohm antenna for the desired operating frequency to the rear panel ANT jack.

(3) Insert the microphone plug into the front panel MIC jack. If a non-standard microphone is used, be sure that the microphone has an impedance of 600 ohms. Connect headphones, if desired, to the front panel PHONE jack.

(4) Refer to the CAUTION notice on this page, and preset the controls and switches as follows:

| | |
|---|---|
| MODE | To desired mode |
| AF GAIN | Adjust later to comfortable level |
| RF GAIN | Fully clockwise |
| METER | S/FWD |
| CLAR | 12 o'clock position |
| CHANNEL | Desired channel |
| SQL | Fully counterclockwise |

(5) Turn the POWER switch ON. The panel lamps and indicators should become illuminated.

(6) Adjust the AF GAIN control to a comfortable listening level.

(7) Adjust the CLAR control for natural sounding reproduction of the incoming signal.

(8) Adjust the SQL control to the point where the background noise just disappears when the channel is clear, in order to provide maximum squelch sensitivity.

(9) If pulse-type noise is present on the incoming signal, turn the NB switch ON. Most pulse-type noises will be eliminated by the blanker, although some atmospheric and man-made white noise will not be totally removed.

(10) To transmit, press the microphone push-to-talk switch, and speak with a normal voice into the microphone. Release the switch for receiver recovery.

## SELECTIVE CALLING FEATURE

A 1500 Hz tone generator is available for selective calling. Calibration and operation using this feature are simple:

(1) When a 1500 Hz tone is received from another station, set the CALIB/CALL switch to CALIB and rotate the CLARIFIER control so your tone matches that of the incoming signal. Your set is now calibrated to the same frequency as that of the other station.

(2) To transmit the 1500 Hz tone, push the CALIB/CALL switch up to the CALL position. The transmitter will be activated and the 1500 Hz tone sent for as long as you hold this switch.

**CAUTION**

NEVER CHANGE CHANNELS OR MODES WHILE TRANSMITTING, AS DAMAGE TO THE TRANSCEIVER MAY RESULT. ALWAYS RELEASE THE PTT SWITCH AND/OR CALL SWITCH TO DEACTIVATE THE TRANSMITTER WHEN CHANGING CHANNELS OR MODES.

## FH-180 REMOTE CONTROLLER INSTRUCTIONS

The FH-180 Remote Controller is specifically designed for use with the FT-180A HF Transceiver, after the Transceiver has been appropriately modified. A ten meter cable is supplied with the FH-180 to allow complete control of the FT-180A from any convenient location, and the FC-420 Remote Antenna Coupler, when used with the FT-180A, is also controlled by the FT-180. The part number of the Modification Kit required for the FT-180A is D3000266, and the procedure is given on page 42.

### Specifications

**Power requirements:**
13.4 VDC at 1 A, and 8 VDC at 50 mA (supplied by the FT-180A)

**Functions:**
Power ON/OFF, Channel selection, AF gain control, Clarifier adjustment, Tone CALL, Microphone input, Receiver output (from Handset and Speaker), PTT (Push-To-Talk)

**AF Output:**
Speaker; 2 W (4 ohms)
Handset earpiece; 0.2 W (4 ohms)

**Handset Microphone:**
−68 dBm output (600 ohms)

**Dimensions (WHD):**
80 x 120 x 240 mm

**Weight:**
1.4 kg.

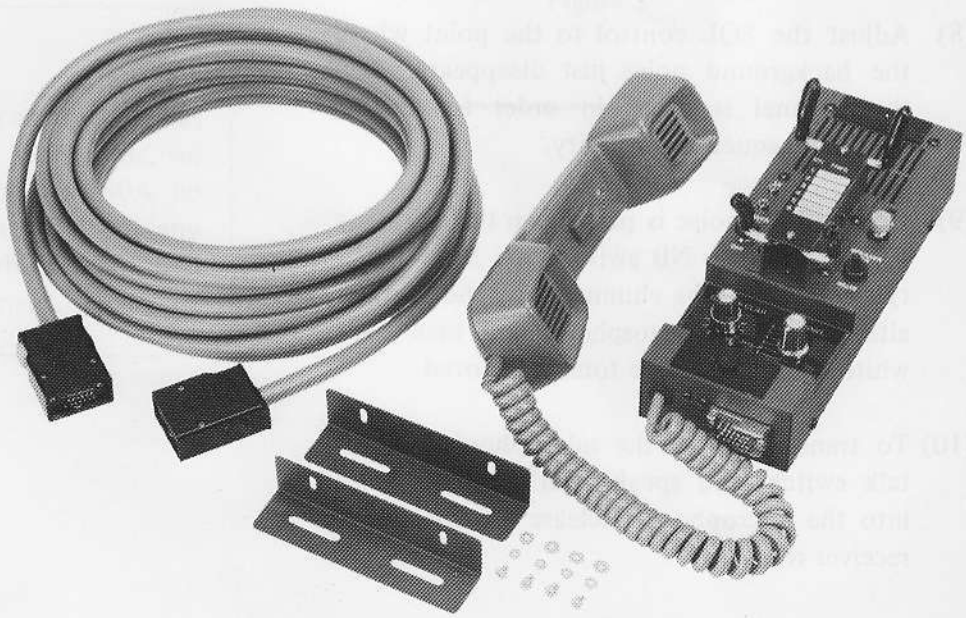
### Installation

The FH-180 can be installed in any desired mounting position, and on any surface.

1. The supplied mounting brackets can be positioned so that the mounting screws are either under the Controller, or on either side, according to individual requirements. If the mounting screws are to be located underneath the Controller, temporarily bolt the brackets to the Controller and hold it in the mounting position while marking the positions of the brackets on either side. Then remove the brackets from the Controller and use the brackets as templates for locating and drilling the mounting holes.

2. If the channel frequencies are not already shown on the channel plate beneath the handset, write the frequencies on the label paper and install it under the channel plate.

3. After the FT-180A has been modified, connect the female connector on the Controller Cable to the FH-180, and the male connector to the REMOTE jack on the modified FT-180A.



**Operation**

Set the POWER switch on the FT-180A to the REMOTE position, and set the FH-180 POWER switch to ON. The green lamp will light.

Select the desired channel using the CHANNEL selector on the FH-180. Set the SPEAKER switch to ON, and adjust the AF GAIN control for the desired volume level. This control and the AF GAIN control on the FT-180A function independently, so that only the control on the transceiver will affect the speaker in the transceiver, and only the control on the FH-180 will affect the volume from the FH-180 speaker or earpiece.

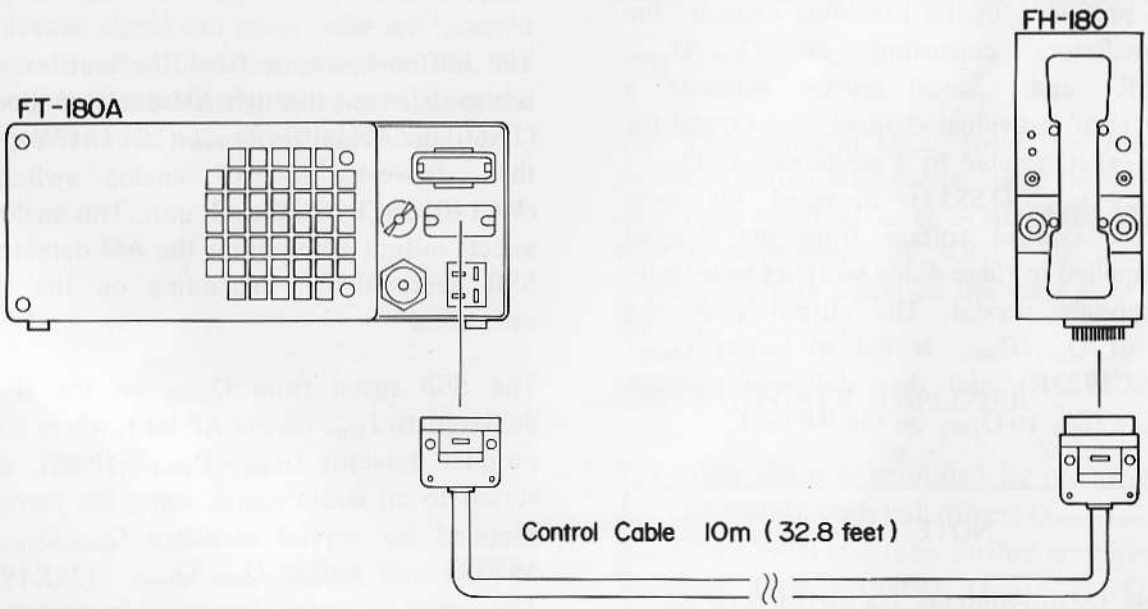
When privacy is desired, communications may be conducted only through the handset. To disable the FH-180 speaker, set the SPEAKER switch to the MUTE position. This will silence the FH-180 speaker when the handset is removed from the cradle, though the speaker will be reactivated when the handset is replaced.

To transmit when using the FH-180, squeeze the PTT switch on the inside center of the handset handle, and talk. Release this switch to return to receive.

The CALL and CLAR controls on the FH-180 function identically to their counterparts on the FT-180A.

**NOTE**

The handset must always be pressed snugly into the cradle when not in use. Otherwise the FH-180 speaker will be disabled if the SPEAKER switch is set to the MUTE position, and incoming calls may not be heard.



# CIRCUIT DESCRIPTION

The block diagrams and circuit description to follow will provide an understanding of the internal design of this transceiver. Please refer to the schematic diagrams for specific component details.

## RECEIVER

The RF input signal from the antenna is fed through relay $RL_{4011}$, lamp fuse $F_{4001}$, and then a highpass filter before delivery to pin 2 of $J_{1001}$ on the RF Unit.

The signal passes through individual antenna coils for each channel and a 10.7 MHz trap, and is then amplified by $Q_{1001}$ **(3SK73GR)**, a dual gate MOS FET with excellent freedom from cross modulation and intermodulation. The amplified signal is fed through an individual diode-switched tuned circuit, which protects the mixer from out-of-band signals.

The RF signal is buffered by $Q_{1004}$ **(2SK125)** and the output from the source of $Q_{1004}$ is fed to a single balanced mixer, consisting of $Q_{1005}$, $Q_{1006}$ **(2SK125)**, where the RF signal is mixed with a local signal delivered from $Q_{1007}$ **(2SC2407)**. This results in a 10.7 MHz IF signal which is delivered through $J_{1004}$ to the IF unit.

The local signal applied to the local amplifier, $Q_{1007}$, is produced in the following manner: the local oscillator, consisting of $Q_{601}/Q_{6001}$ **(2SC1923R)** and a local crystal, generate a signal for each individual channel. The crystal for each channel is selected by a diode switch, $D_{601}-D_{606}/D_{6001}-D_{6006}$ **(1SS53)** provided for each crystal. The control voltage from the channel switch is applied to these diode switches to activate the appropriate crystal. The output from the collector of $Q_{601}/Q_{6001}$ is fed to buffer $Q_{602}/Q_{6002}$ **(2SC1923R)**, and then delivered through $P_{605}$ ($P_{6005}$)/$J_{1005}$ to $Q_{1007}$ on the RF unit.

> **NOTE:**
>
> In order to discriminate CARRIER/LOCAL OSC Units with and without the optional crystal oven, units with the oven have part numbers of the form 6XX, and units without the oven have part numbers of the form 60XX.

The 10.7 MHz IF signal is fed to a common gate J-FET amplifier, $Q_{2007}$ **(2SK125)**, and the output passes through $XF_{2004}$, a 20 kHz bandwidth monolithic crystal filter, which provides early protection against IMD products while allowing enough bandwidth and delay time for the noise blanker circuit. The signal then passes through noise blanker diodes $D_{2016}-D_{2018}$, which act as switches driven by noise blanker controller $Q_{2018}$ **(2SC1815GR)**. The IF signal is amplified by $Q_{2006}$ **(2SK192AGR)**, and then delivered to a crystal filter for USB, LSB or AM, where unwanted adjacent signals are cut out. Finally, the IF signal from the crystal filter is fed through diode switches to a three-stage IF amplifier, $Q_{2003}-Q_{2005}$ **(3SK73GR)**, where the IF signal is amplified to a sufficient level to drive the SSB and AM detectors.

A portion of the output from $Q_{2003}$ is fed to buffer $Q_{2008}$ **(2SC1815Y)** and detected by $D_{2019}$, $D_{2020}$ **(1N60)**, resulting in a fluctuating DC voltage. This voltage is amplified by $Q_{2009}$ **(2SC1815Y)**, where the recovery time of this DC voltage is also determined. This DC voltage acts as the AGC control voltage, which is fed to gate 2 of the RF and IF amplifiers. This voltage is also delivered to S-meter buffer $Q_{2011}$ **(2SK192AGR)**. Output from the buffer is delivered to S-meter amplifier $Q_{2012}$ **(2SA564AR)** and squelch control amplifier $Q_{2013}$ **(AN6551)**.

The buffered output from the emitter of $Q_{2008}$ is also delivered through AM detector diode $D_{2021}$ **(1N60)** to AF buffer $Q_{2010}$ **(2SC1815Y)**, and it is then delivered to AF analog switch $Q_{3008}$ **(MC14016BCP)** on the AF unit. This analog switch selects output from either the AM detector or the SSB demodulator, depending on the mode of operation.

The SSB signal from $Q_{2003}$ on the IF unit is delivered to $J_{3004}$ on the AF unit, where it is fed to product detector $D_{3002}-D_{3005}$ **(1N60)**, and converted to an audio signal, using the carrier signal supplied by crystal oscillator $Q_{603}/Q_{6003}$ **(2SC1923R)** and buffer $Q_{604}/Q_{6004}$ **(2SK192AGR)**. The carrier oscillator changes its frequency depending on the activated mode, and clarifies the control voltage with diode switches $D_{607}/D_{6007}$, $D_{608}/D_{6008}$ **(1SS53)** and variable capacitor diode $D_{609}/D_{6009}$ **(1S2208)**.

The selected AF signal from analog gate $Q_{3008}$ is delivered to an active lowpass filter at $Q_{3009}$ (2SC1815Y), which eliminates any high-pitch noise on the audio signal. It is then delivered to buffer $Q_{3010}$ (2SC1815Y). Next, this signal passes through a potentiometer, which controls the AF output, to audio power amplifier $Q_{3012}$ ($\mu$PC2002V), and is then delivered through $J_{3006}$ to the speaker.

A portion of the RX IF signal from $Q_{2007}$ is delivered to three stages of noise amplifier, $Q_{2017}$, $Q_{2016}$ and $Q_{2014}$ (2SC1583). Each individual transistor contains two sections, which are configured as differential amplifiers. When a carrier or noise-free signal is received, the noise signal is rectified by $D_{2022}$, $D_{2023}$ (1N60), producing a DC voltage. This DC voltage is amplified by $Q_{2015}$ (2SC1815Y), which charges $C_{2120}$ for noise blanker AGC purposes. This AGC voltage is used to control the gain of $Q_{2017}$ and $Q_{2016}$. When pulse-type noise is received, $D_{2022}$ and $D_{2023}$ rectify the noise signal, which controls noise blanker switch $Q_{2018}$.

Noise pulses are of very short duration, but high amplitude. Because of the very short time constant of the $R_{2097}/C_{2118}$ discharge path, AGC voltage is not induced by these short duration pulses. Therefore, the noise amplifiers operate at full gain, providing maximum voltage to the base of $Q_{2018}$. When a desired signal and noise pulse are received simultaneously, the blanking action is not impaired, because the relative difference between the desired signal and the noise pulse is still high.

## TRANSMITTER

### SSB

The audio input signal from microphone jack $J_{01}$ is fed to $J_{3001}$ on the AF unit. The speech signal is amplified by $Q_{3001}$ (2SC732BL) and delivered through microphone gain control potentiometer $VR_{3001}$ to two stages of AF amplifier, $Q_{3003}$ (2SC732GR) and $Q_{3004}$ (2SC1815Y). The output from the emitter of $Q_{3004}$ is applied to double balanced modulator $Q_{3006}$ (MC1496P), where the amplified speech signal and applied carrier signal produce a DSB signal at the IF frequency (10.7 MHz). The balanced modulator provides high carrier suppression stability corresponding to various temperature changes. The signal is then fed to $J_{3002}$ for delivery to the IF unit.

The IF signal appearing at pin 2 of $J_{2001}$ is fed through buffer $Q_{2001}$ (3SK73GR) to the appropriate crystal filter for the mode in use (LSB, USB, A3h) according to the instructions from the mode selector. The resulting SSB signal is amplified by $Q_{2002}$ (3SK73GR) and then delivered to single balanced mixer $Q_{1008}$ and $Q_{1009}$ (3SK73GR) on the RF unit. Here the IF signal is mixed with the local signal from the local signal oscillator/buffer. Finally, the RF signal is amplified by $Q_{1002}$ (3SK73GR) and $Q_{1003}$ (2SC2407) in the PA unit.

### A3h

The USB signal at $Q_{2002}$ from the USB filter is joined by a 10.7 MHz carrier signal from the carrier oscillator, resulting in an A3h signal. The carrier level is determined by $VR_{2001}$ on the IF unit, sending the A3h signal on the same path followed for SSB.

## 100/50 W POWER AMPLIFIER

The input signal is amplified by pre-driver $Q_{8001}/_{9001}$ (2SC1589), push-pull drivers $Q_{8002}/_{9002}$, $Q_{8003}/_{9003}$ (2SC2395), and then further amplified by the push-pull final amplifier $Q_{8004}/_{9004}$, $Q_{8005}/_{9005}$ (2SC2290), which supplies approximately 100/50 watts of RF output. This RF signal is then fed through the LPF unit to the antenna.

NOTE:

Parts with numbers of the form 8XXX are used in the 50W model, while those with numbers of the form 9XXX are used in the 100W model.

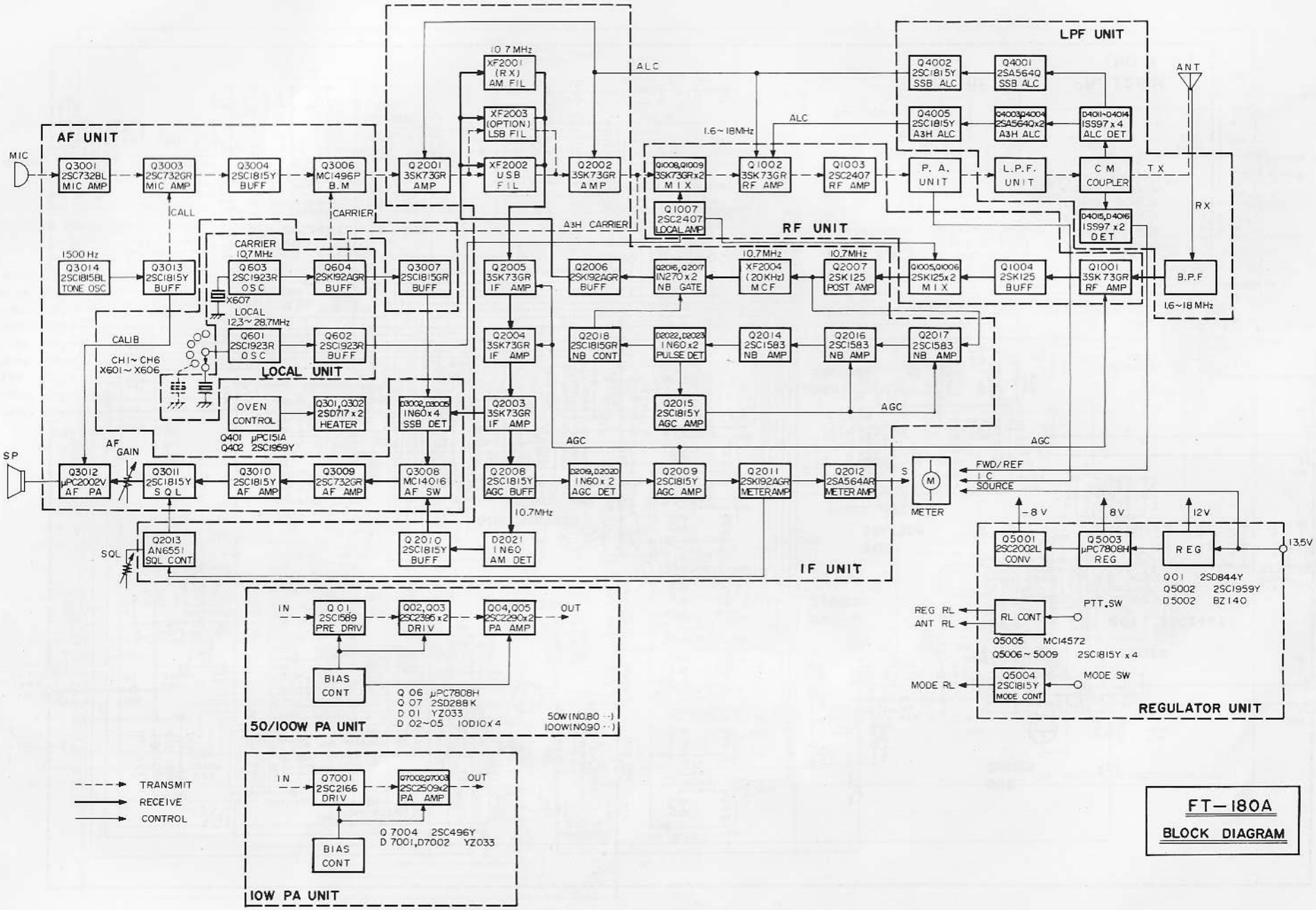
## 10 W POWER AMPLIFIER

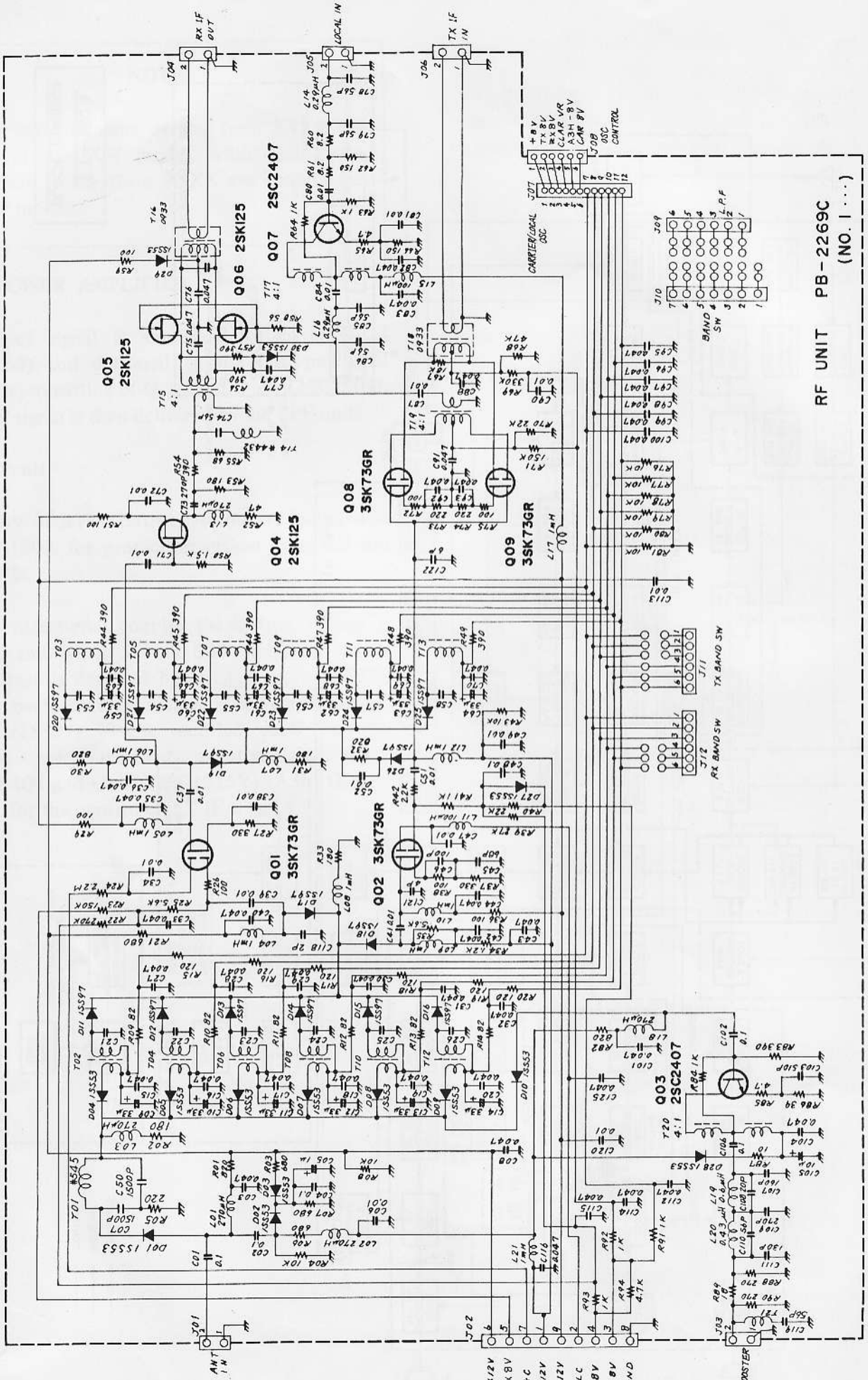
The input signal is amplified by driver $Q_{7001}$ (2SC2166) and delivered to the push-pull final amplifier, consisting of $Q_{7002}$ and $Q_{7003}$ (2SC2509). This RF signal is then delivered to the LPF unit.

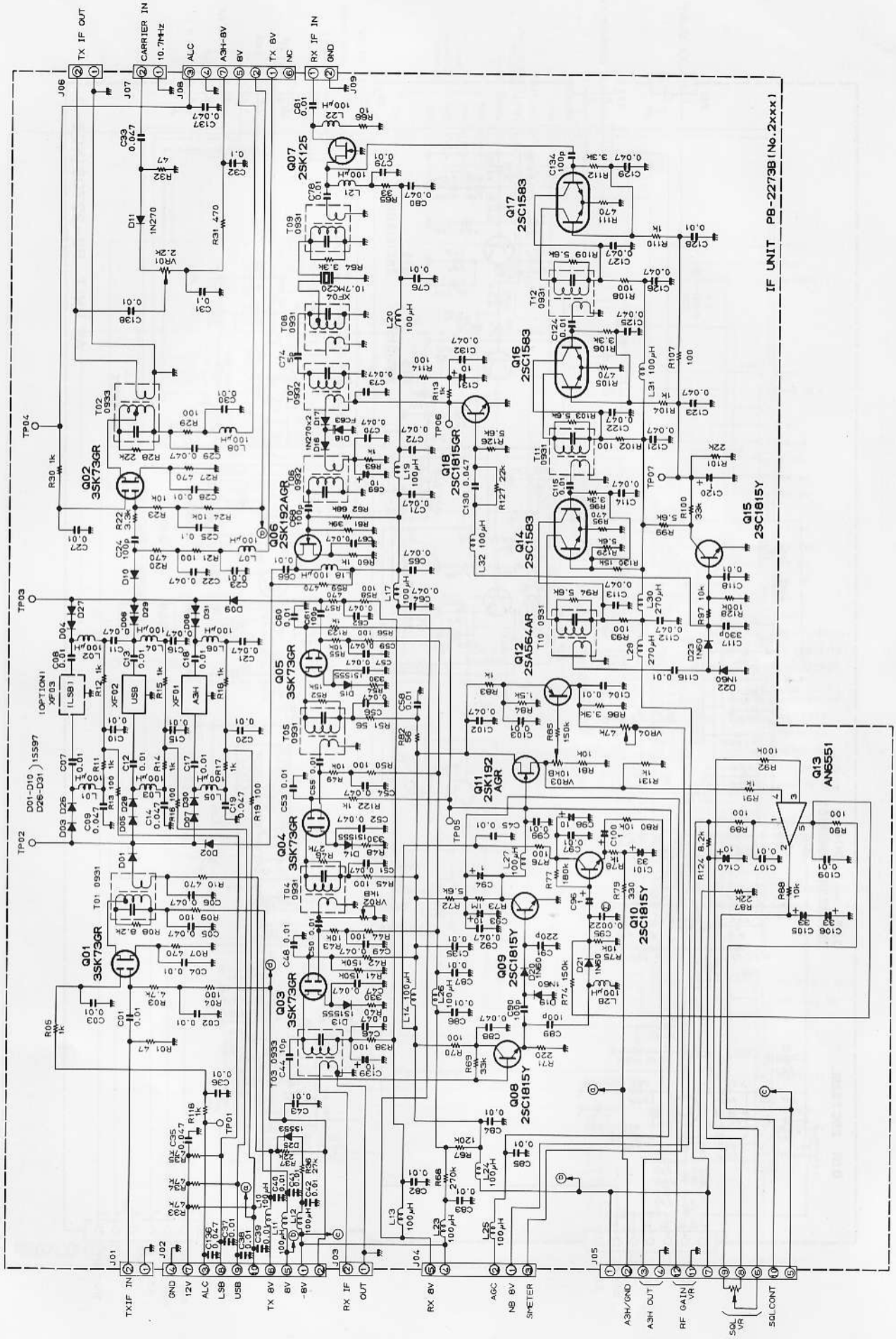
### ALC Circuit

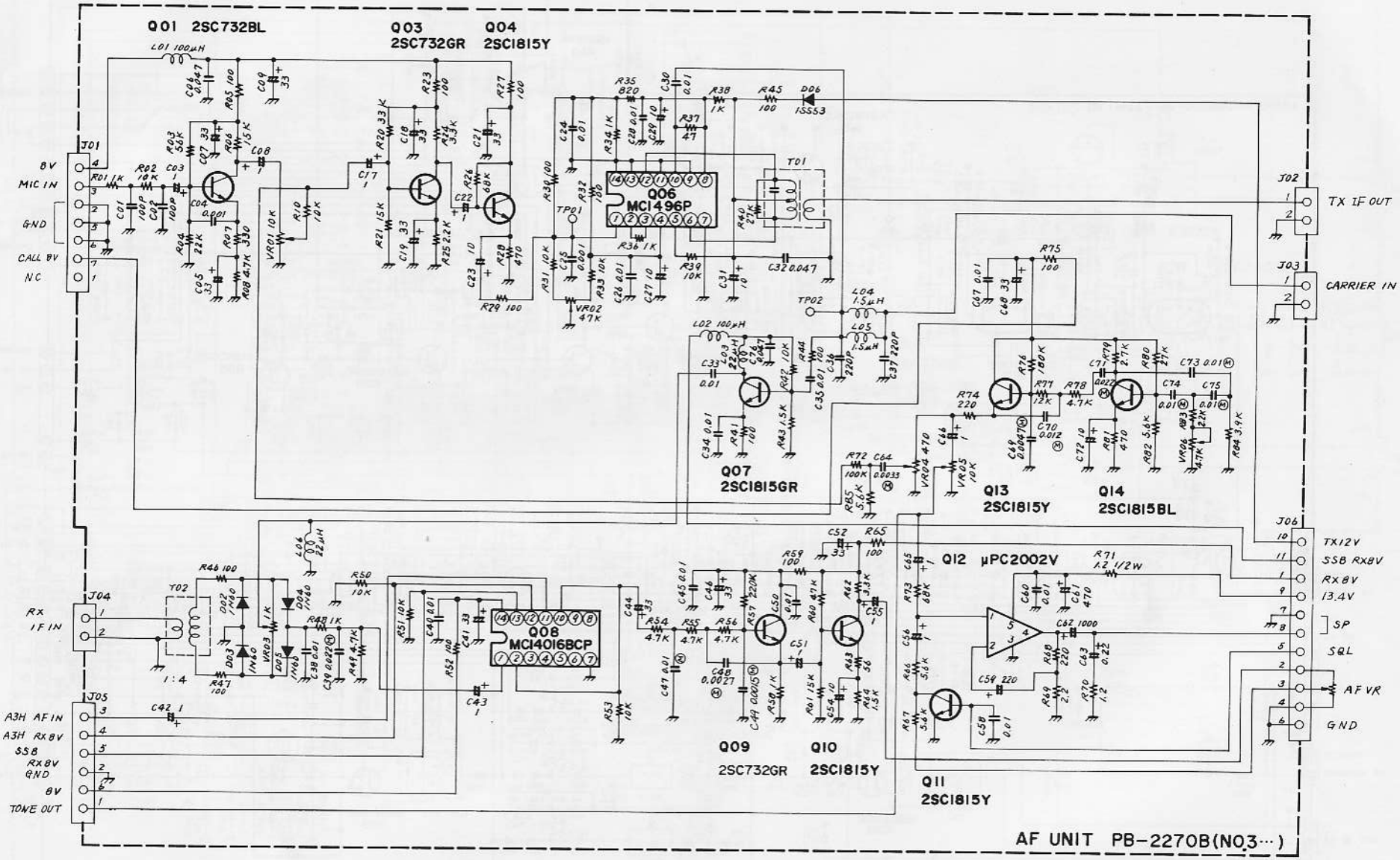
A variety of level control systems are included in the FT-180A for protection against overdrive and high SWR.

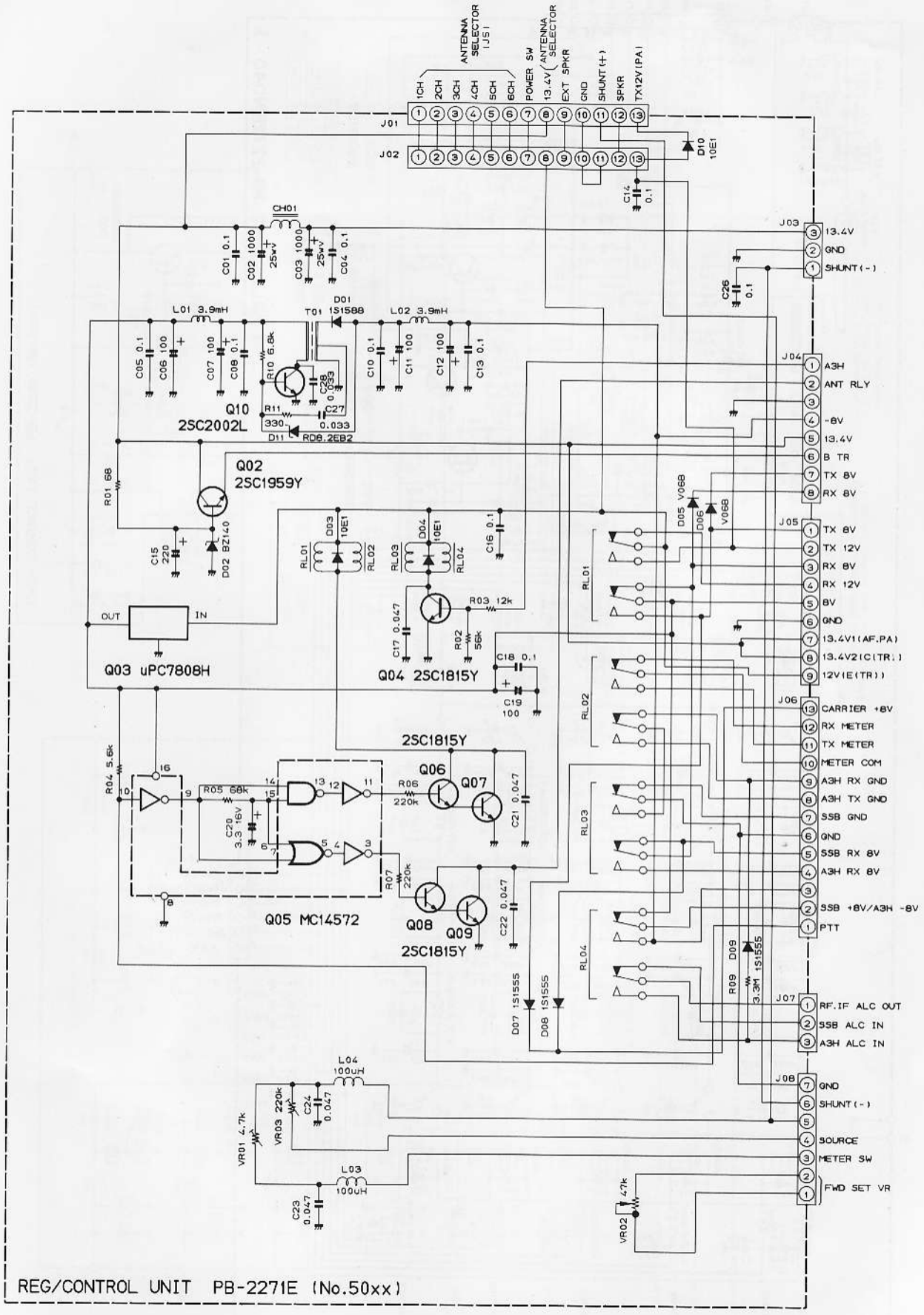
At the directional coupler the output voltage is sensed, and when a high SWR condition exists the voltage is detected by $D_{4011}$, $D_{4012}$ (1SS97), and the overdrive ALC voltage is detected by $D_{4013}$, $D_{4014}$ (1SS97). These rectified ALC control voltages are amplified together by $Q_{4001}$ (2SA564Q) and $Q_{4002}$ (2SC1815Y) (A3h: $Q_{4003}$ – $Q_{4005}$), for the control of TX IF stage.


AF UNIT
RF UNIT
LPF UNIT
IF UNIT
LOCAL UNIT
REGULATOR UNIT
50/100W PA UNIT
10W PA UNIT
MIC
SP
ANT
TX
RX
ALC
CALL
CARRIER
A3H CARRIER
CALIB
CH1~CH6
X601~X606
AF GAIN
SQL
AGC
METER
FWD/REF
I C
SOURCE
10.7MHz
1.6~18MHz
1500Hz
LOCAL
12.3~28.7MHz
OVEN CONTROL
Q401 μPC151A
Q402 2SC1959Y
Q3001 2SC732BL MIC AMP
Q3003 2SC732GR MIC AMP
Q3004 2SC1815Y BUFF
Q3006 MC1496P B.M
Q3014 2SC1815BL TONE OSC
Q3013 2SC1815Y BUFF
Q603 2SC1923R OSC
Q604 2SK192AGR BUFF
Q3007 2SC1815GR BUFF
Q601 2SC1923R OSC
Q602 2SC1923R BUFF
Q3012 μPC2002V AF PA
Q3011 2SC1815Y SQL
Q3010 2SC1815Y AF AMP
Q3009 2SC732GR AF AMP
Q3008 MC14016 AF SW
Q2013 AN6551 SQL CONT
Q301,0302 2SD717x2 HEATER
D3002,D3005 1N60x4 SSB DET
Q2001 3SK73GR AMP
Q2002 3SK73GR AMP
XF2001 (RX) AM FIL
XF2003 (OPTION) LSB FIL
XF2002 USB FIL
Q2005 3SK73GR IF AMP
Q2004 3SK73GR IF AMP
Q2003 3SK73GR IF AMP
Q2008 2SC1815Y AGC BUFF
Q2010 2SC1815Y BUFF
D2021 1N60 AM DET
Q2006 2SK192AGR BUFF
Q2018 2SC1815GR NB CONT
Q2015 2SC1815Y AGC AMP
D2019,D2020 1N60x2 AGC DET
D2022,D2023 1N60x2 PULSE DET
Q2016,Q2017 1N270x2 NB GATE
Q2009 2SC1815Y AGC AMP
Q2014 2SC1583 NB AMP
Q2016 2SC1583 NB AMP
Q2017 2SC1583 NB AMP
Q2011 2SK192AGR METER AMP
Q2012 2SA564AR METER AMP
Q1008,Q1009 3SK73GRx2 MIX
Q1007 2SC2407 LOCAL AMP
Q1002 3SK73GR RF AMP
Q1003 2SC2407 RF AMP
XF2004 (20KHz) MCF
Q2007 2SK125 POST AMP
Q1005,Q1006 2SK125x2 MIX
Q1004 2SK125 BUFF
Q1001 3SK73GR RF AMP
P.A. UNIT
L.P.F. UNIT
C.M COUPLER
B.P.F
D4015,D4016 1S997x2 DET
Q4002 2SC1815Y SSB ALC
Q4001 2SA564Q SSB ALC
Q4005 2SC1815Y A3H ALC
Q4003,Q4004 2SA564Q x2 A3H ALC
D4011~D4014 1S997x4 ALC DET
Q5001 2SC2002L CONV
Q5003 μPC7808H REG
REG
-8V
8V
12V
13.5V
Q01 2SD844Y
Q5002 2SC1959Y
D5002 BZ140
RL CONT
PTT.SW
REG RL
ANT RL
Q5005 MC14572
Q5006~5009 2SC1815Y x4
Q5004 2SC1815Y MODE CONT
MODE SW
MODE RL
IN
OUT
Q01 2SC1589 PRE DRIV
Q02,Q03 2SC2395x2 DRIV
Q04,Q05 2SC2290x2 PA AMP
BIAS CONT
Q06 μPC7808H
Q07 2SD288K
D01 YZ033
D02~05 1SD1Cx4
50W(NO.80··)
100W(NO.90··)
Q7001 2SC2166 DRIV
D7002,D7003 2SC2509x2 PA AMP
Q7004 2SC496Y
D7001,D7002 YZ033
TRANSMIT
RECEIVE
CONTROL
FT-180A
BLOCK DIAGRAM

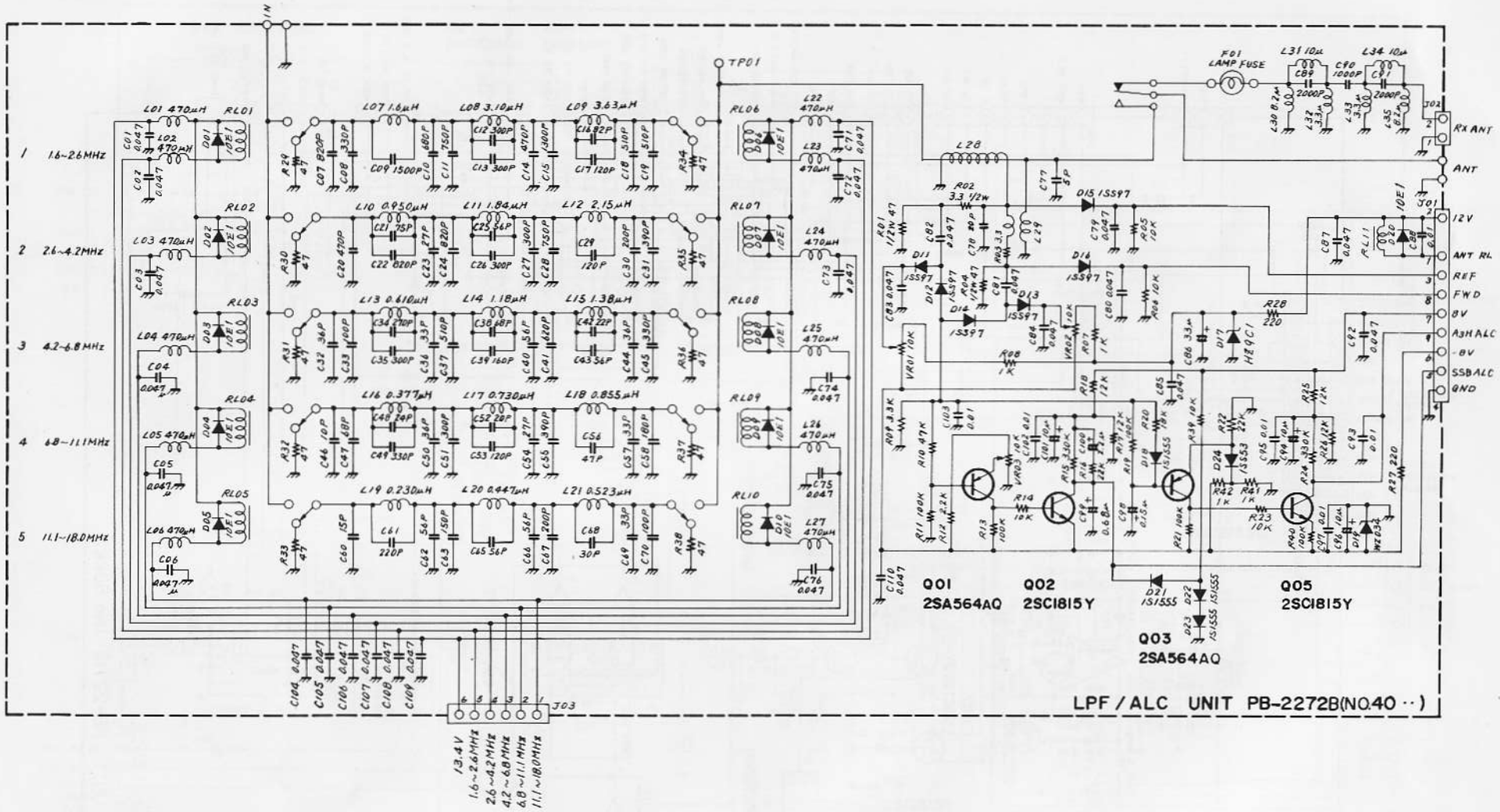

RF UNIT PB-2269C (NO. 1 ···)
Q01 3SK73GR
Q02 3SK73GR
Q03 2SC2407
Q04 2SK125
Q05 2SK125
Q06 2SK125
Q07 2SC2407
Q08 3SK73GR
Q09 3SK73GR
RX 1F OUT
LOCAL IN
TX 1F IN
CARRIER/LOCAL OSC
OSC CONTROL
BAND SW
L.P.F
TX BAND SW
RX BAND SW
ANT IN
BOOSTER
RX 12V
RX 8V
AGC
TX 12V
12V
ALC
-8V
TX 8V
GND

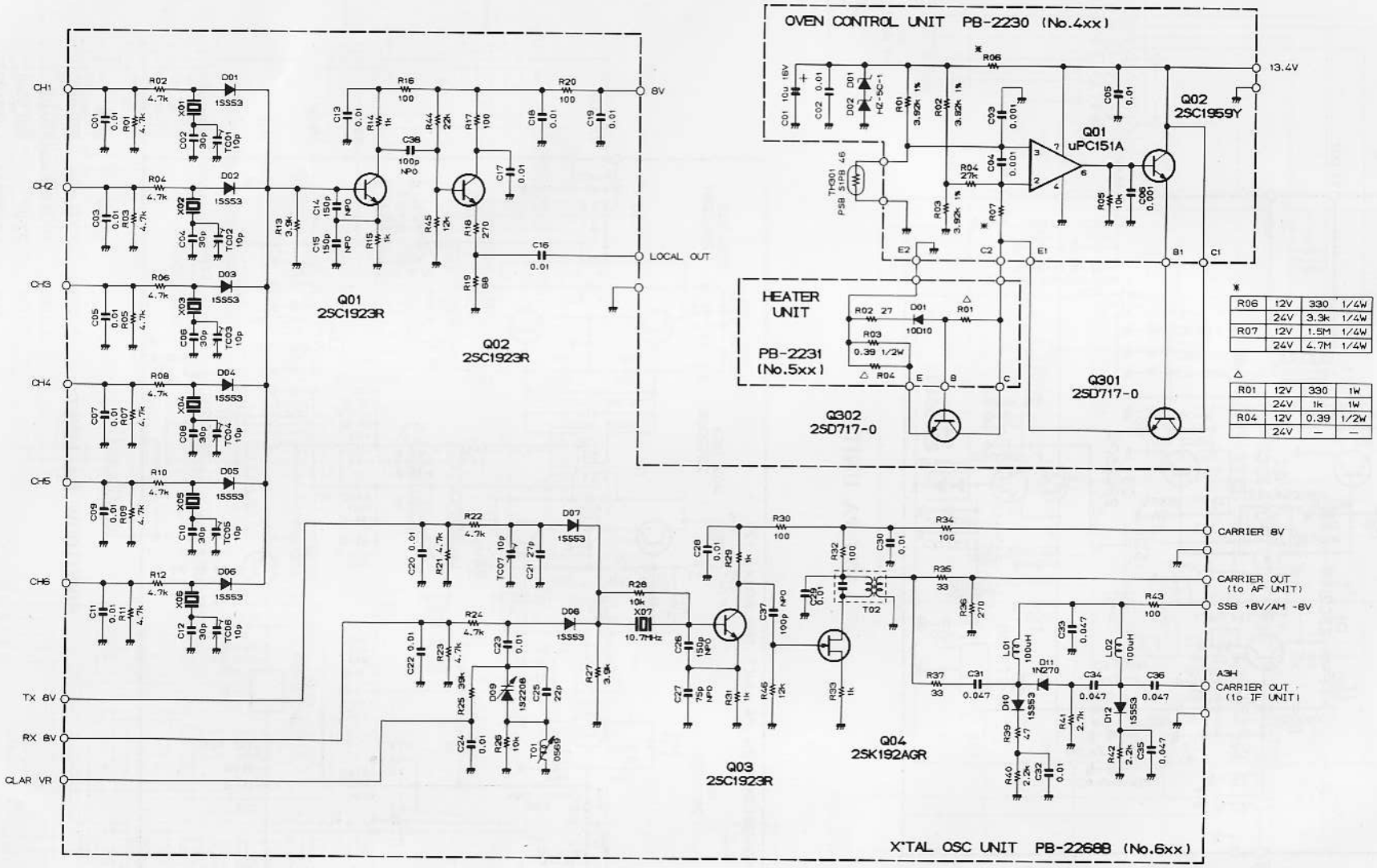

IF UNIT PB-2273B (No.2xxx)
TX IF OUT
CARRIER IN
10.7MHz
ALC
A3H-8V
8V
TX 8V
NC
RX IF IN
GND
Q01 3SK73GR
Q02 3SK73GR
Q03 3SK73GR
Q04 3SK73GR
Q05 3SK73GR
Q06 2SK192AGR
Q07 2SK125
Q08 2SC1815Y
Q09 2SC1815Y
Q10 2SC1815Y
Q11 2SK192 AGR
Q12 2SA564AR
Q13 AN6551
Q14 2SC1583
Q15 2SC1815Y
Q16 2SC1583
Q17 2SC1583
Q18 2SC1815GR
TXIF IN
GND
12V
ALC
LSB
USB
TX 8V
8V
-8V
RX IF OUT
RX 8V
AGC
NB 8V
SMETER
A3H/GND
A3H OUT
RF GAIN VR
SQL VR
SQL CONT


Q01 2SC732BL
Q03 2SC732GR
Q04 2SC1815Y
Q06 MC1496P
Q07 2SC1815GR
Q08 MC14016BCP
Q09 2SC732GR
Q10 2SC1815Y
Q11 2SC1815Y
Q12 μPC2002V
Q13 2SC1815Y
Q14 2SC1815BL
J01
J02
J03
J04
J05
J06
8V
MIC IN
GND
CALL 8V
NC
TX IF OUT
CARRIER IN
RX IF IN
A3H AF IN
A3H RX 8V
SSB RX 8V GND
8V
TONE OUT
TX 12V
SSB RX 8V
RX 8V
13.4V
SP
SQL
AF VR
GND
1:4
AF UNIT PB-2270B(NO.3···)




REG/CONTROL UNIT PB-2271E (No.50xx)


1 1.6~2.6MHz
2 2.6~4.2MHz
3 4.2~6.8MHz
4 6.8~11.1MHz
5 11.1~18.0MHz
IN
TP01
RL01
RL02
RL03
RL04
RL05
RL06
RL07
RL08
RL09
RL10
L01 470μH
L02 470μH
L03 470μH
L04 470μH
L05 470μH
L06 470μH
L07 1.6μH
L08 3.10μH
L09 3.63μH
L10 0.950μH
L11 1.84μH
L12 2.15μH
L13 0.610μH
L14 1.18μH
L15 1.38μH
L16 0.377μH
L17 0.730μH
L18 0.855μH
L19 0.230μH
L20 0.447μH
L21 0.523μH
L22 470μH
L23 470μH
L24 470μH
L25 470μH
L26 470μH
L27 470μH
L28
L29
L30 8.2μ
L31 10μ
L32 3.3μ
L33 3.3μ
L34 10μ
L35 8.2μ
F01 LAMP FUSE
J01
J02
J03
RX ANT
ANT
12V
ANT RL
REF
FWD
8V
A3H ALC
-8V
SSB ALC
GND
Q01 2SA564AQ
Q02 2SC1815Y
Q03 2SA564AQ
Q05 2SC1815Y
D11 1S397
D12 1S397
D13 1S397
D14 1S397
D15 1S397
D16 1S397
D17 HE9C1
D18 1S1555
D21 1S1555
D22 1S1555
D23 1S1555
D24 1S553
D25 WZ034
13.4V
1.6~2.6MHz
2.6~4.2MHz
4.2~6.8MHz
6.8~11.1MHz
11.1~18.0MHz
LPF / ALC UNIT PB-2272B(NO.40 ··)



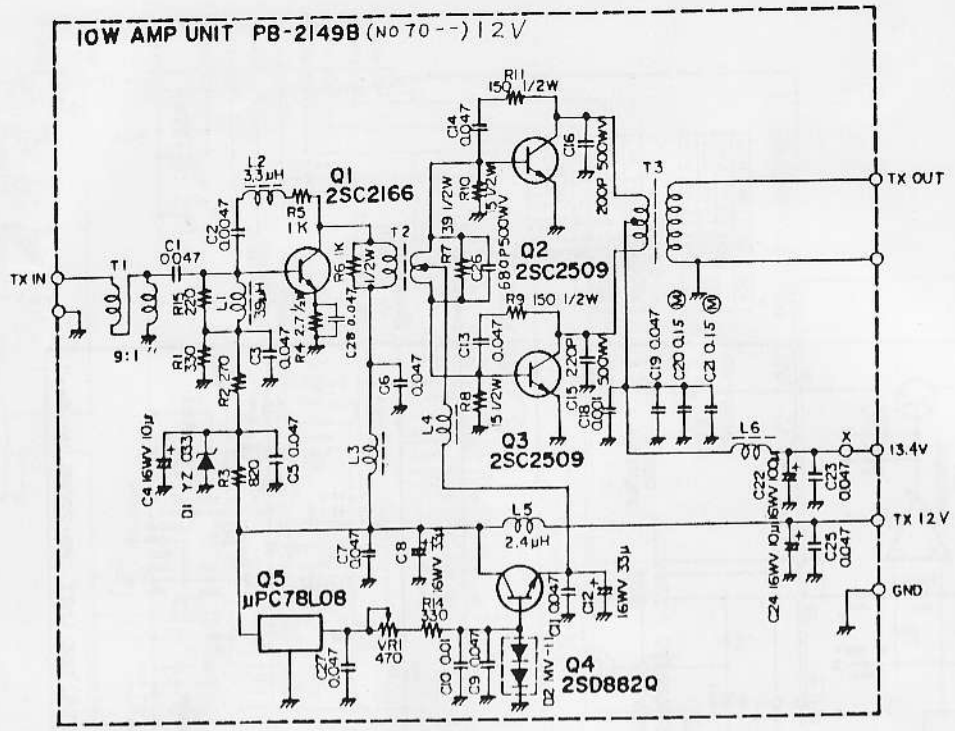

| * | | | |
|---|---|---|---|
| R06 | 12V | 330 | 1/4W |
| | 24V | 3.3k | 1/4W |
| R07 | 12V | 1.5M | 1/4W |
| | 24V | 4.7M | 1/4W |

| △ | | | |
|---|---|---|---|
| R01 | 12V | 330 | 1W |
| | 24V | 1k | 1W |
| R04 | 12V | 0.39 | 1/2W |
| | 24V | — | — |

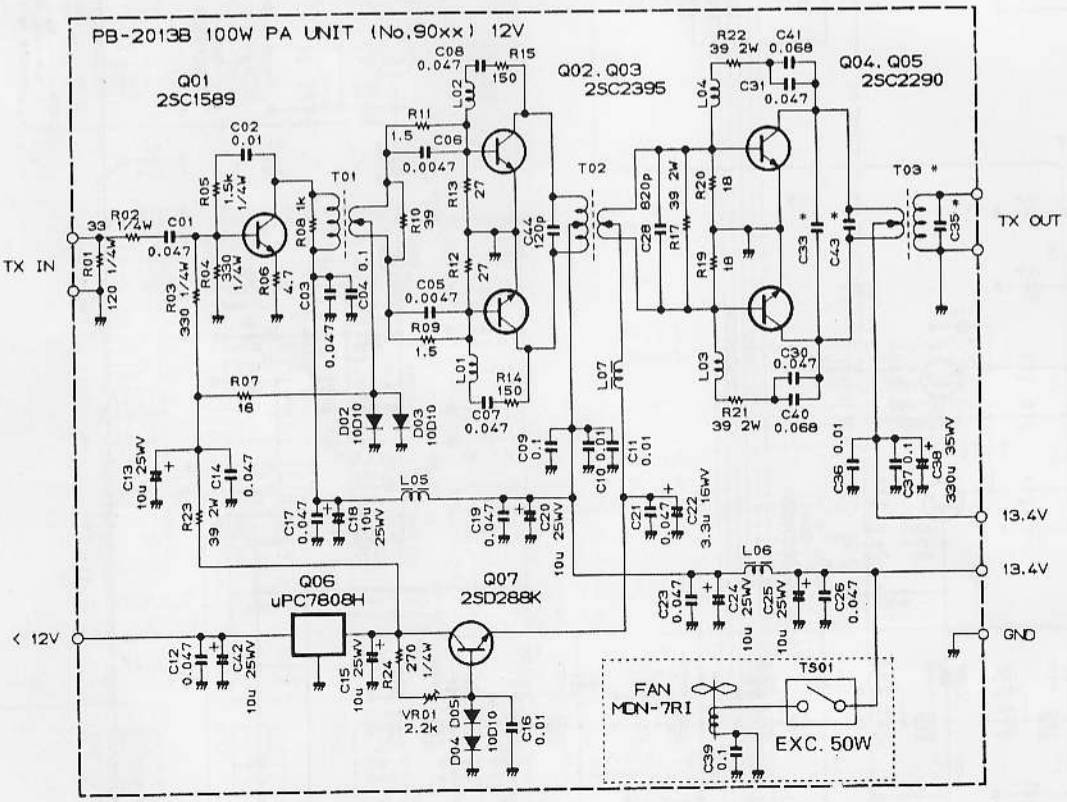
NOTE

1. W/O XTAL OVEN. The parts numbers should be read as 60xx.(NO.60..)

2. C02.04.06.08.10.12.21.25
   W/ XTAL OVEN. NPO
   W/O XTAL OVEN. UJ

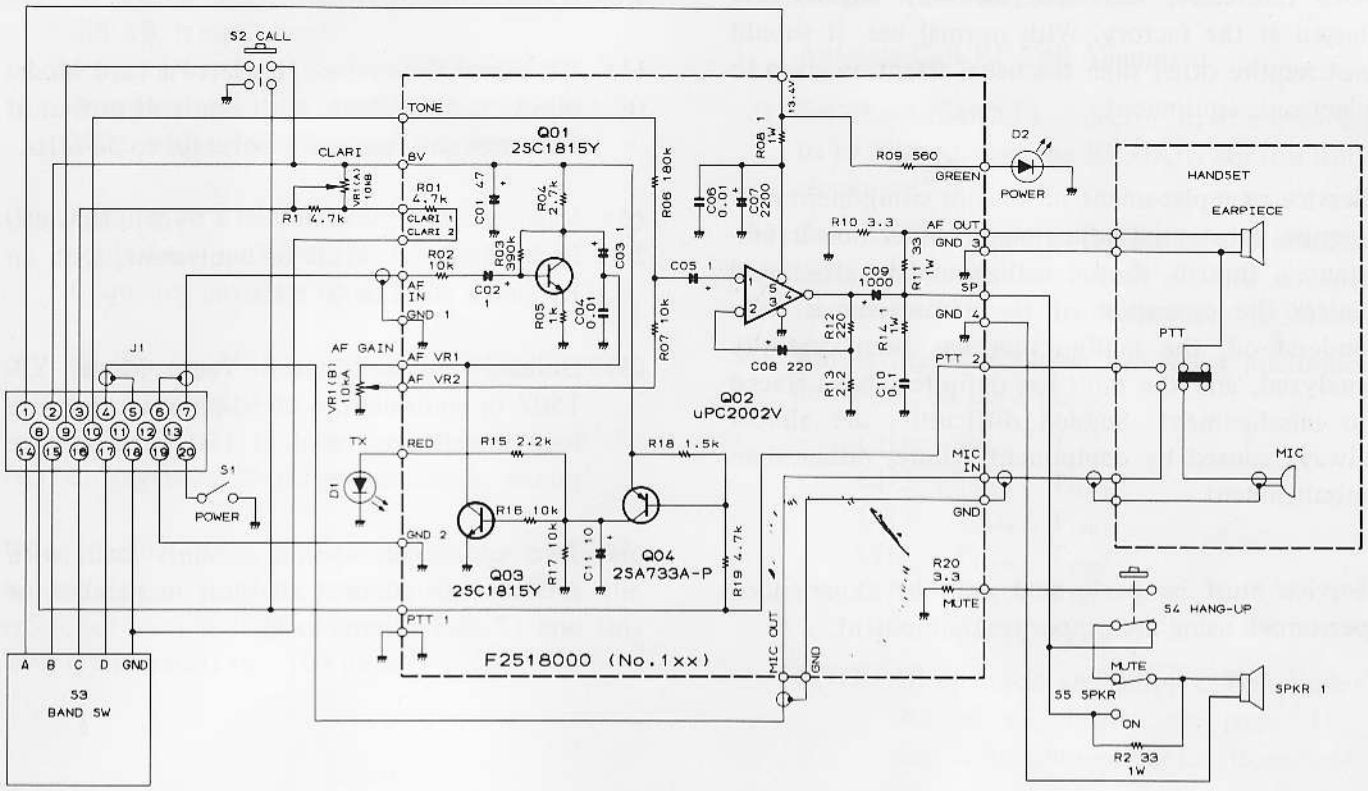



10W PA UNIT

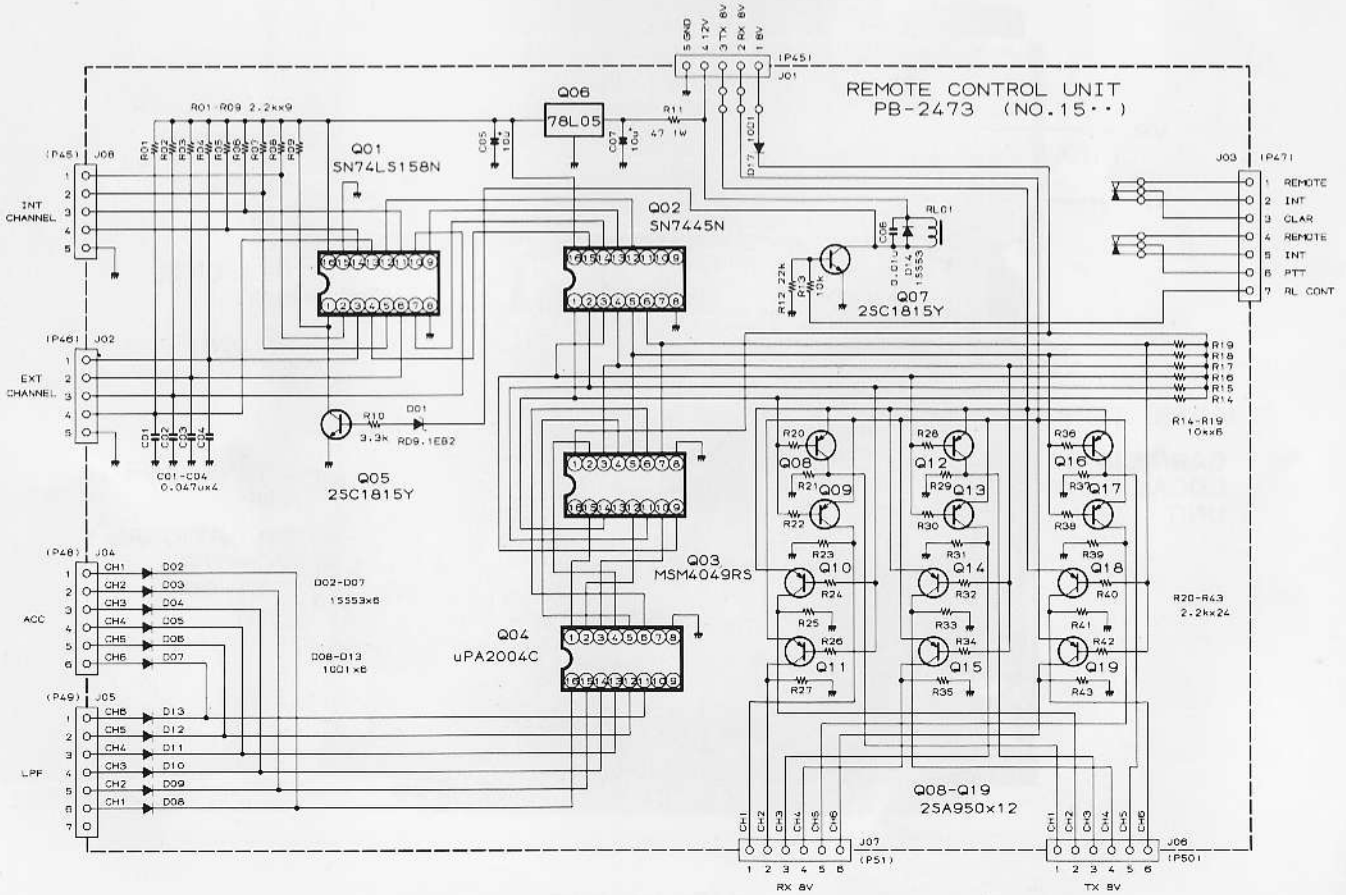



50W/100W PA UNIT

| | | 100W | 50W |
|---|---|---|---|
| * | C33 | 1200 pF | 820 pF |
| | C43 | 1000 pF | 470 pF |
| | C35 | 22 pF | Not used |
| | T03 | L0020632 | L0021284 |




FH-180
CIRCUIT DIAGRAM



# MAINTENANCE AND ALIGNMENT

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 replacement 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 must be performed only by experienced personnel, using the proper test equipment.

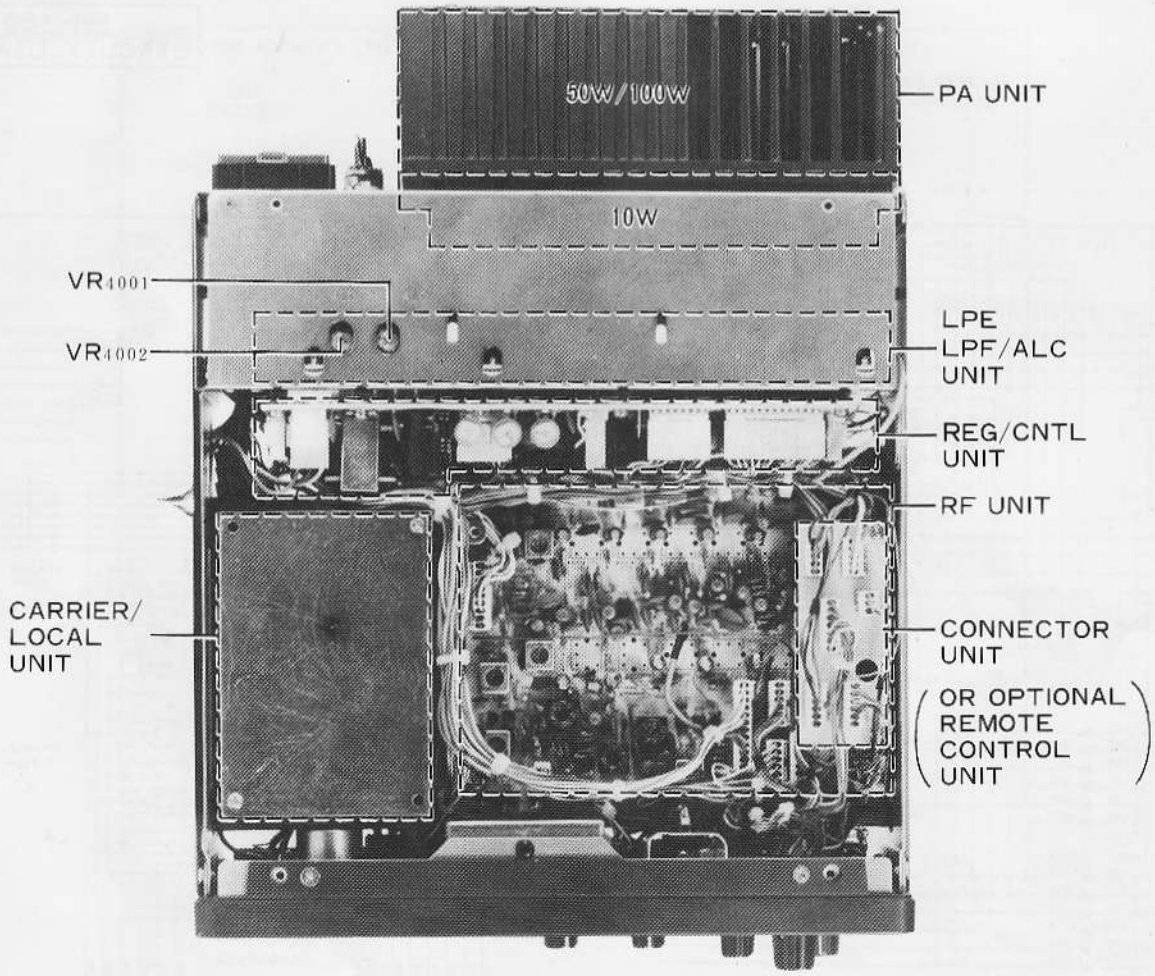
## EQUIPMENT REQUIRED

(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/wattmeter: Yaesu Model YP-150Z or equivalent, with 50-ohm non-reactive load impedance, rated at 150 watts average power.

(4) Two additional 50-ohm dummy loads with provision to connect all three in parallel, or one 17-ohm dummy load.




TOP VIEW

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

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

(7) Frequency Counter: Yaesu Model YC-500 or equivalent, with resolution to 0.01 kHz and frequency coverage to 50 MHz.

(8) Oscilloscope: Hewlett-Packard Model 1740A or equivalent.

**NOTE: Regarding Measurement Levels**

When decibel levels are quoted in the following section (e.g. "Apply a 90 dB signal . . ."), the reference used is 0 dB = 1 $\mu$V. At 50 ohms, this level is equivalent to −107 dBm.

## RECEIVER ALIGNMENT

### 1. Antenna Coil/RF Coil Alignment

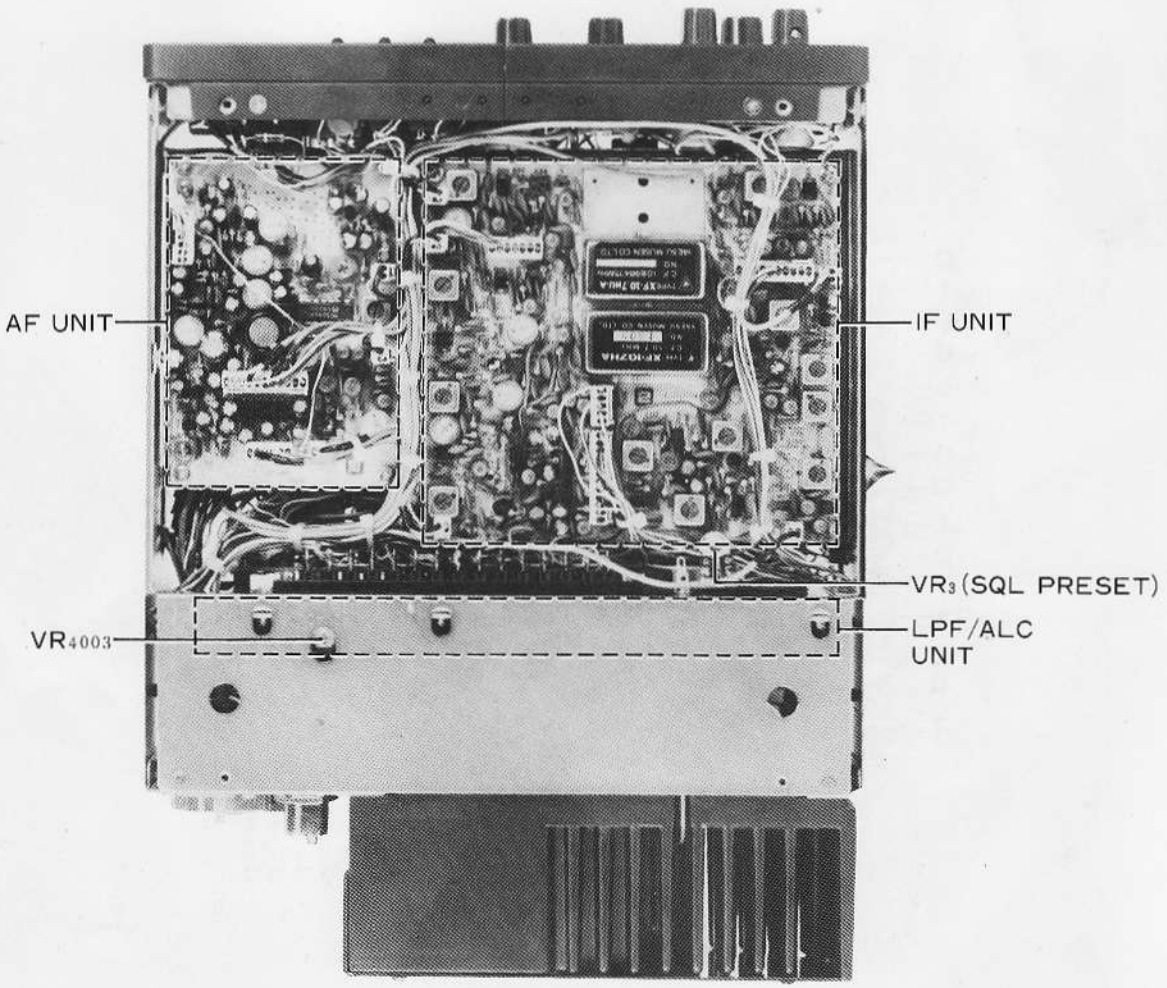
a) Set the CHANNEL selector to the channel to be aligned, and the RF GAIN control fully clockwise.

b) Connect the signal generator to the antenna jack, and tune its output to the channel frequency. Now set the output level to 90 dB.

c) Adjust the coils shown below for maximum deflection on the S-meter.

CH1: $T_{1002}$, $T_{1003}$
CH2: $T_{1004}$, $T_{1005}$
CH3: $T_{1006}$, $T_{1007}$
CH4: $T_{1008}$, $T_{1009}$
CH5: $T_{1010}$, $T_{1011}$
CH6: $T_{1012}$, $T_{1013}$

NOTE: All channels are simplex. For duplex channel alignment, see page 41, step 2, for transformer locations.




BOTTOM VIEW

## 2. RX Mixer Coil Alignment

a) Set the CHANNEL selector to any installed channel, and the RF GAIN control fully clockwise.

b) Set the signal generator exactly to the channel frequency, and apply a 90 dB signal.

c) Now adjust $T_{1016}$ for maximum deflection on the S-meter.

## 3. RX Trap Coil Alignment

a) Set the CHANNEL selector to any installed channel, and connect the audio voltmeter to the speaker jack.

b) Connect the signal generator to the antenna jack, and apply a 100 dB signal at 10.7 MHz. Adjust $T_{1001}$ and $T_{1014}$ a few times for minimum indication on the audio voltmeter and S-meter.

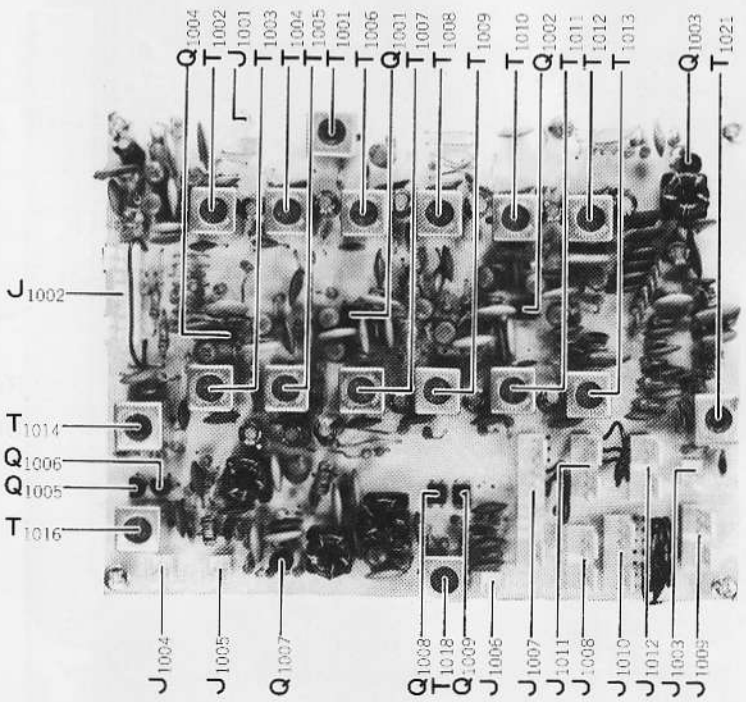
## 4. IF Coil Adjustment

a) Set the CHANNEL selector to any installed channel, and rotate the RF GAIN control fully clockwise.

b) Apply an 80 dB signal from the signal generator to the ANT jack. Adjust the following coils on the IF unit for a maximum reading on the S-meter.

$T_{2006} - T_{2007} - T_{2008} - T_{2009} - T_{2005} - T_{2004} - T_{2003}$

These coils should be aligned in the given order, or the correct peak may not be obtained. This procedure should also be repeated a few times to obtain correct alignment.




RF UNIT

## 5. NB Coil Adjustment

a) Set the CHANNEL selector to any installed channel, and connect the signal generator to the ANT jack.

b) Connect the DC voltmeter to $TP_{07}$ on the IF unit, and adjust the signal generator output to 40 dB on the channel frequency.

c) Now adjust $T_{2012}$, $T_{2011}$ and $T_{2010}$ for minimum deflection on the DC voltmeter.

## 6. S-Meter Alignment

a) Without applying any signal to the ANT jack, and with the RF GAIN control fully clockwise, adjust $VR_{2003}$ to the point where the S-meter just starts to deflect.

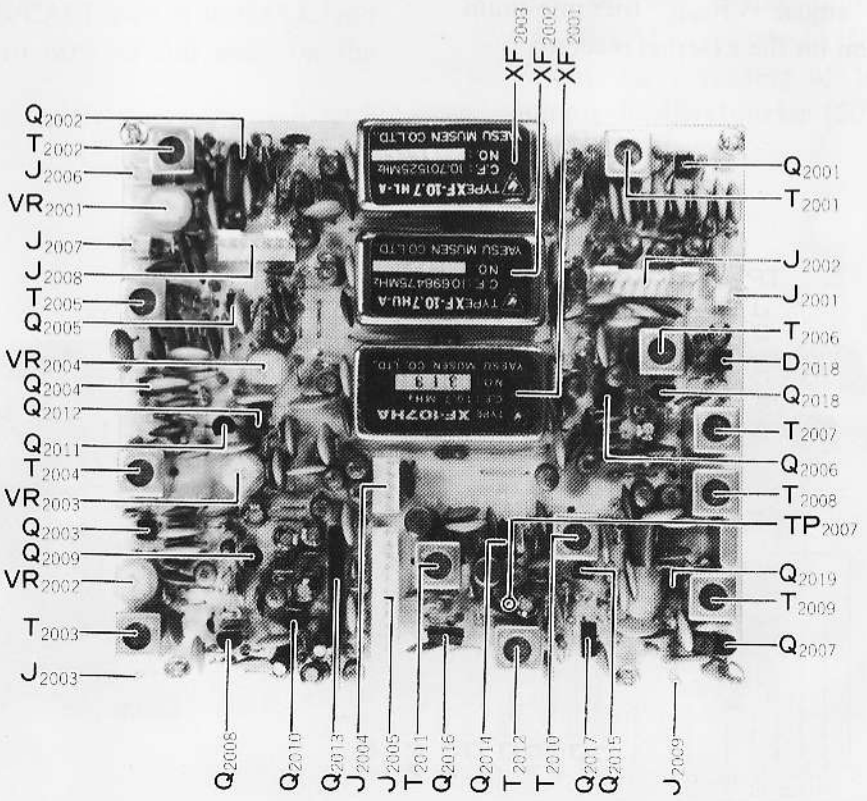
b) Apply a 90 dB signal from the signal generator to the ANT jack, and adjust $VR_{2004}$ for a deflection of S9+60 dB.

c) Reduce the amplitude of the signal generator to 10 dB, and adjust $VR_{2002}$ to the point where the S-meter just starts to deflect.

d) Repeat Steps b and c until the proper deflection is obtained.

## 7. Product Detector Alignment

Without applying any signal to the receiver, adjust $VR_{3003}$ for a minimum reading on the S-meter.




IF UNIT

## TRANSMITTER ALIGNMENT

While performing transmitter alignments, the ANT jack must be terminated by a 50-ohm load, unless otherwise specified in the steps. Failure to follow this precaution will void the warranty of this equipment.

### 1. Balanced Modulator Coil Alignment

a) Disconnect plug $P_{13}$ from its jack ($J_{2001}$) on the IF unit, and terminate $P_{13}$ with a 50-ohm resistor. Connect the RF probe of the VTVM to $P_{13}$.

b) Turn the CALIB/CALL switch to CALL, and adjust $T_{3001}$ for a maximum reading on the VTVM.

### 2. Carrier Null Alignment

a) Set the MODE switch to USB, $VR_{3001}$ fully counterclockwise, and set the CHANNEL selector to an installed channel.

b) With an external receiver tuned to the channel frequency, close the PTT switch on the microphone. Now adjust $VR_{3002}$ for minimum signal indication on the external receiver.

### 3. TX Mixer Coil Alignment

a) Set the CHANNEL selector to any installed channel, and disconnect $P_{03}$ from its jack ($J_{1003}$) on the RF unit. Connect the RF probe of the VTVM to $J_{1003}$.

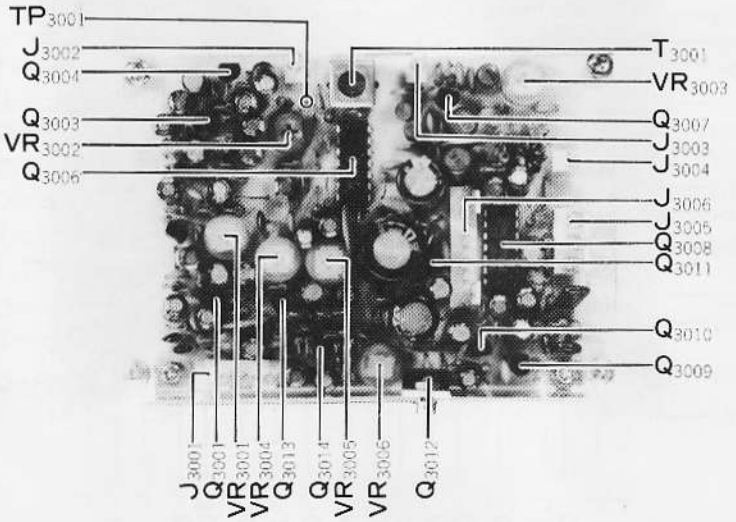
b) Now adjust $T_{1018}$ on the RF unit for a maximum reading on the VTVM.

### 4. TX IF Trap Coil Alignment

Note: If a spectrum analyzer is not available, do not proceed with this alignment, as the spurious on 10.7 MHz that may result cannot be properly observed.

a) Set the CHANNEL selector to the closest frequency to 10.7 MHz of the installed frequencies, and the MODE switch to A3h. Connect the spectrum analyzer to $J_{1003}$ on the RF unit.

b) Now close the PTT switch, and adjust $T_{1021}$ for a minimum spurious level at 10.7 MHz on the spectrum analyzer.




AF UNIT

## 5. TX IF Coil Alignment

a) Disconnect $P_{06}$ from its jack ($J_{1006}$) on the RF unit, and terminate $P_{06}$ with a 50-ohm resistor. Connect the RF probe of the VTVM to $P_{06}$.

b) Adjust $T_{2001}$ and $T_{2002}$ for maximum deflection on the VTVM.

## 6. IC Meter and Idling Current Alignment

a) Disconnect the +13.5 volt line to the PA unit, and connect an ammeter in series with the line. Turn the CALIB/CALL switch to CALL.

b) Adjust $VR_{5001}$ so that the reading on the IC meter will show the same value as that on the ammeter.

c) Now release the CALIB/CALL switch, and set $VR_{3001}$ fully counterclockwise. Press the PTT switch, and adjust $VR_{9001}$ (100W PA), $VR_{8001}$ (50W PA), or $VR_{7001}$ (10W PA) for a reading of 100 mA on the ammeter.

## 7. FWD Meter Setting

Turn the CALIB/CALL switch to CALL, and adjust $VR_{5002}$ to 80% of full scale on the S/FWD meter.

## 8. ALC Alignment

Note: Do not switch channels or modes during transmission.

a) Preset the potentiometers and MODE switch, as follows:

| | | |
|---|---|---|
| $VR_{3001}$ | AF Unit | Fully counterclockwise |
| $VR_{2001}$ | IF Unit | Fully clockwise |
| $VR_{4003}$ | LPF Unit | Fully clockwise |
| $VR_{4002}$ | LPF Unit | Fully counterclockwise |
| $VR_{4001}$ | LPF Unit | Fully counterclockwise |
| MODE switch | | A3h |

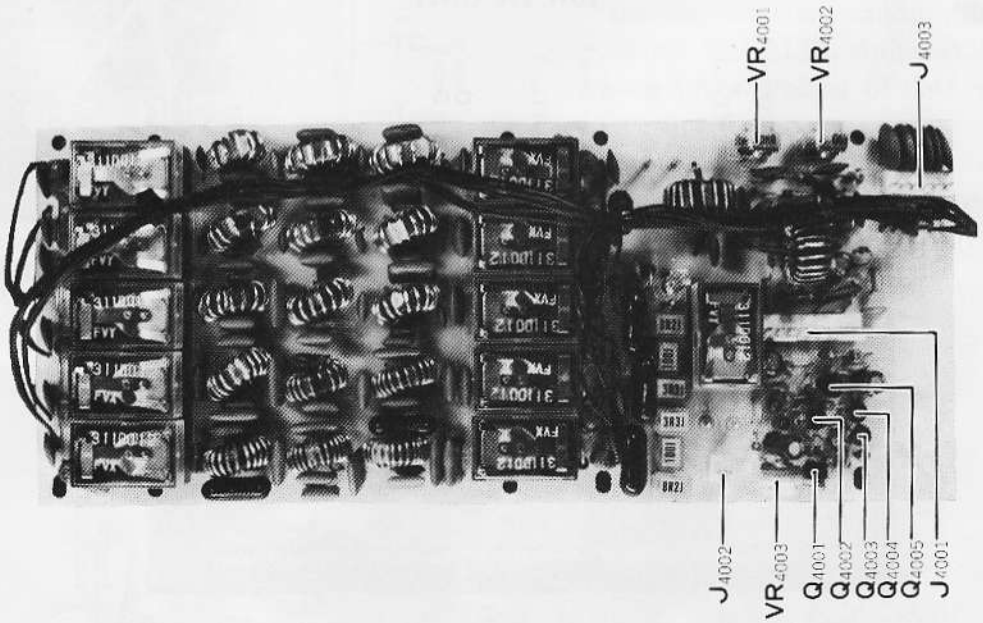
b) On any channel, close the PTT switch and adjust $VR_{2001}$ for a power output of 50 watts on the dummy load/wattmeter. (50W PA: 25 watts; 10W PA: 4 watts)

c) Check the power output for each frequency and set the CHANNEL selector to the channel at which minimum power is obtained.

d) Again adjust $VR_{2001}$ for a power output of 67 watts on the dummy load/wattmeter (50W PA: 33 watts; 10W PA: 7 watts).

e) Adjust $VR_{4002}$ for 35 watts on the wattmeter (50W PA: 18 watts; 10W PA: 4 watts).

f) Now set the MODE switch to USB, the CALIB/CALL switch to CALL, and adjust $VR_{4003}$ for a reading of 100 watts on the dummy load/wattmeter (50W PA: 50 watts; 10W PA: 10 watts).



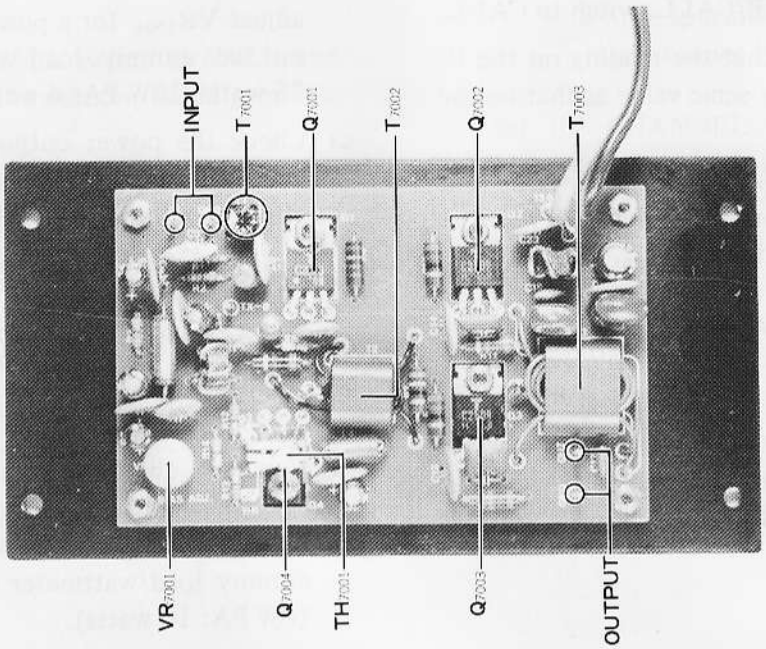

LPF/ALC UNIT

g) Release the CALIB/CALL switch, and apply a 2 mV 1000 Hz signal from the AF generator to the MIC connector. Set the MODE switch to SSB (USB or LSB).

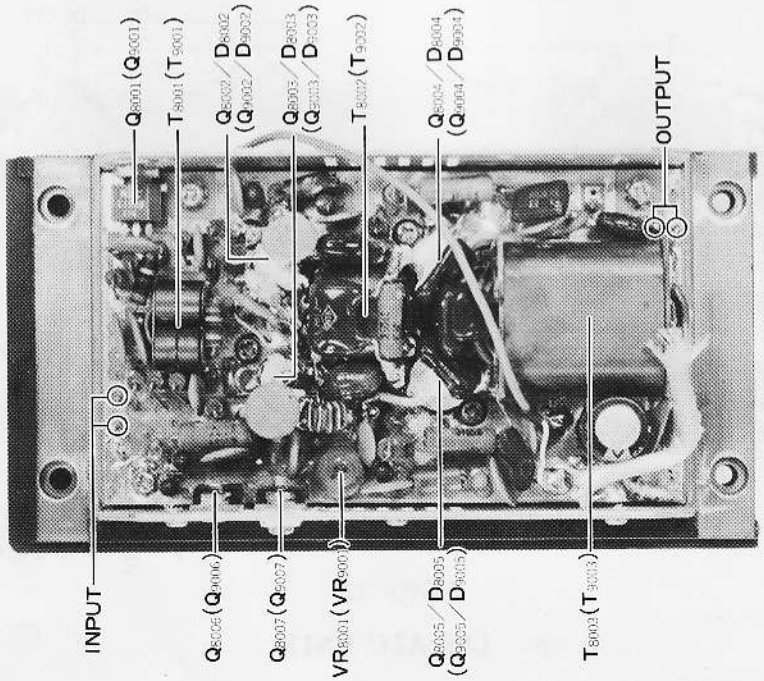
h) Adjust $VR_{3001}$ to the point where the specified power output is obtained on the dummy load/wattmeter.

i) Connect three 50-ohm dummy loads in parallel, so as to present a 17-ohm load to the amplifier (1:3 SWR with reference to 50 ohms). Turn the CALIB/CALL switch to CALL, and adjust $VR_{4001}$ for 75 watts power output, as indicated on the wattmeter (50W PA: 37.5 watts; 10W PA: 7.5 watts).

Note for 50W Model:
Never attempt to adjust $VR_{2001}$ or $VR_{4003}$ without performing the entire ALC alignment procedure, as this may cause the final transistors to exceed the specified power output, leading to damage by overheating.




10W PA UNIT




50W/100W PA UNIT

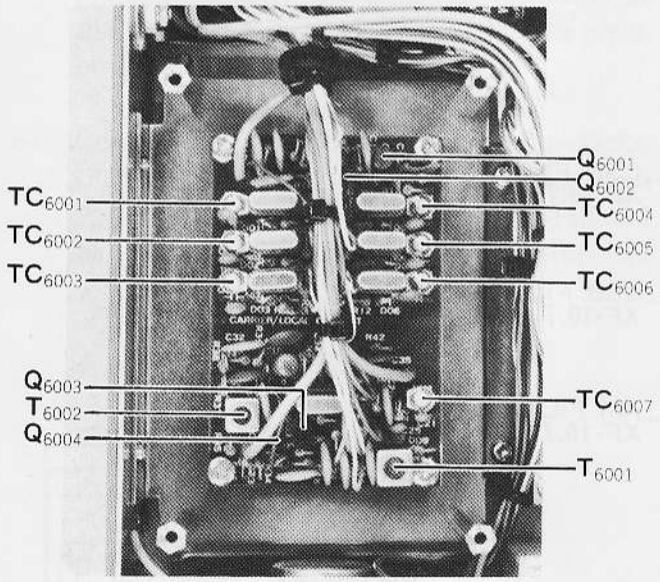
## COMMON CIRCUITS

### 1. Carrier/Local Oscillator Alignment

> Note: When the optional crystal oven is installed, there is a difference in the part numbers used in the FT-180A. Part numbers of the form 60XX should be read as 6XX (e.g., $D_{6006}$ → $D_{606}$).

a) Disconnect $P_{6024}$ from its jack ($J_{3003}$) on the AF unit, and connect the RF probe of the VTVM to $P_{6024}$.

b) Adjust $T_{6002}$ for maximum deflection on the VTVM. The nominal value is approximately 0.2 volts.




CARRIER/LOCAL UNIT

c) Remove the VTVM from $P_{6024}$ and connect the frequency counter to the plug.

d) Set the CLARIFIER control to the center position, and adjust the core of $T_{6001}$ for a reading of 10.700 MHz.

e) Now close the PTT switch and adjust $TC_{6007}$ for a reading of exactly 10.700 MHz.

f) Next, remove the counter from $P_{6024}$ and connect the frequency counter to $J_{1005}$ on the RF unit.

g) The local oscillator frequency must be adjusted by the appropriate trimmer capacitor, corresponding to the CHANNEL selector. Adjust the trimmer capacitors on the CARRIER/LOCAL OSC Unit as shown below, to the exact crystal frequencies.

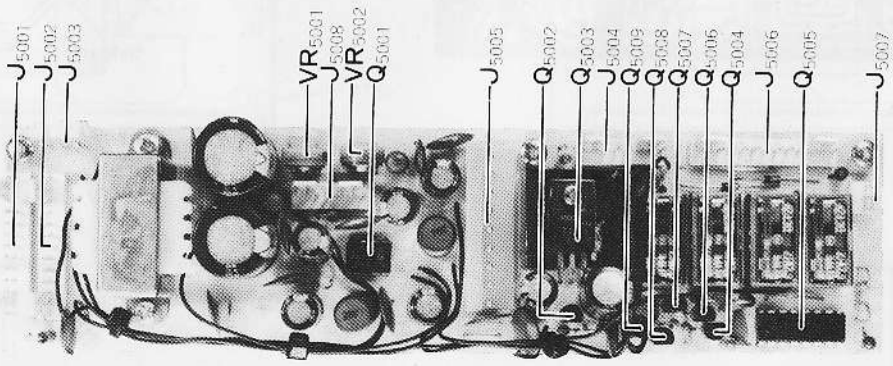
CH1: $TC_{6001}$
CH2: $TC_{6002}$
CH3: $TC_{6003}$
CH4: $TC_{6004}$
CH5: $TC_{6005}$
CH6: $TC_{6006}$

### 2. Tone Oscillator Alignment

a) Connect the frequency counter to $TP_{3001}$ on the AF unit, turn the CALIB/CALL switch to CALL, and adjust $VR_{3006}$ for a frequency of 1500 Hz ±20 Hz.

b) Connect the AF voltmeter to the internal speaker terminals, and turn the CALIB/CALL switch to CALIB. Adjust $VR_{3005}$ on the AF unit for a reading of 0.45 volts on the AF voltmeter.

c) Connect the AF voltmeter to $TP_{3001}$, turn the CALIB/CALL switch to CALL, and adjust $VR_{3004}$ for a reading of 80 mV on the AF voltmeter.




REGULATOR/CONTROL UNIT

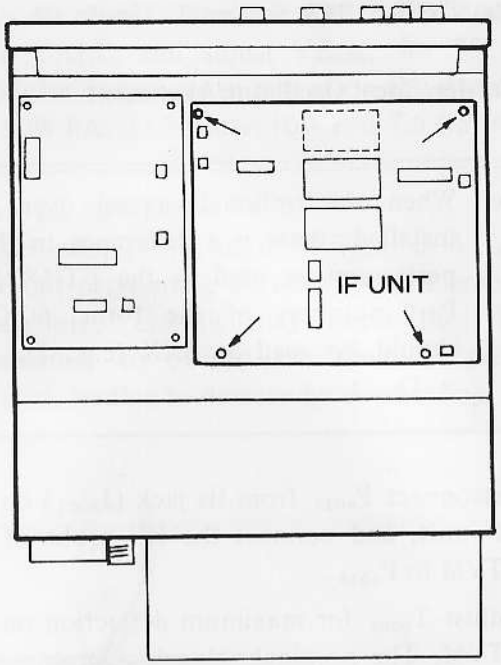
# MODIFICATIONS

## LSB FILTER INSTALLATION

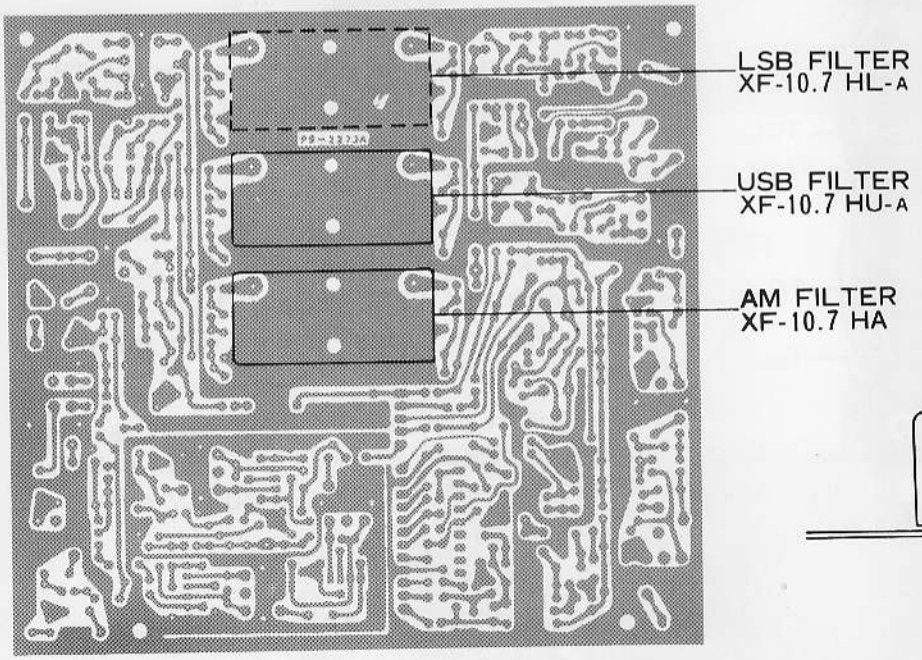
1) Remove the bottom cover of the transceiver, and carefully disconnect all connectors on the IF unit. Then, unscrew the four IF unit mounting screws on the corners of the unit.

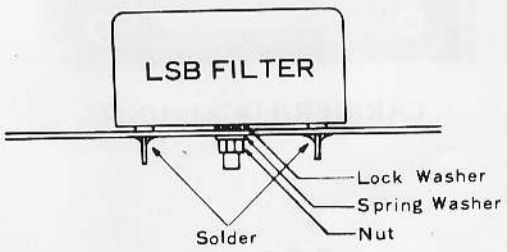
2) Install the LSB Filter on the IF unit using the nuts provided, in the space beside the existing IF filters. Solder the pins of the filter to the circuit board.

3) Install the IF Unit in exactly the same configuration as before, and secure it with the mounting screws. Connect all plugs to their jacks, and close the transceiver.




BOTTOM VIEW



## OPTIONAL CRYSTAL OVEN INSTALLATION

1) Remove the bottom and top covers from the chassis.

2) On the bottom side of the transceiver, disconnect $P_{19}$ on the IF unit, and $P_{24}$ on the AF unit. On the top side, disconnect $P_{05}$ and $P_{07}$ on the RF unit. (Refer to Figures 1 and 2.) Note: if the Remote Control Unit is installed over the RF Unit, it must be removed to access $P_{07}$ on the RF Unit.

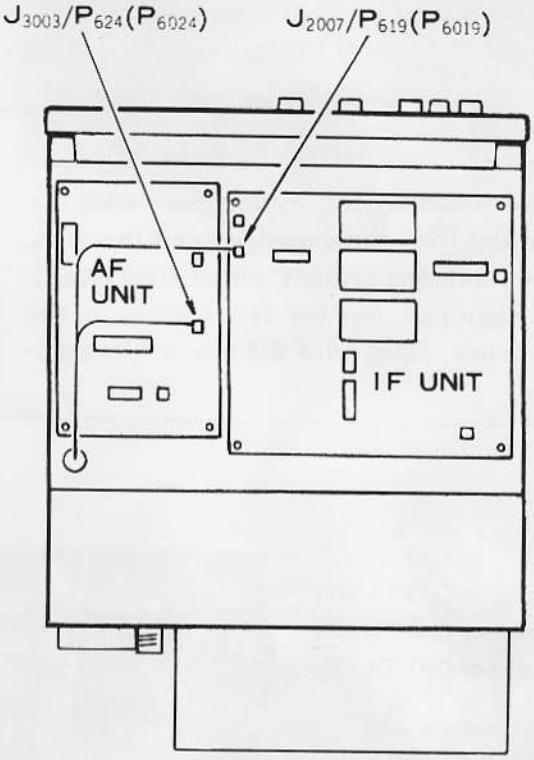
3) Unscrew the four CARRIER/LOCAL OSC Unit mounting screws marked A on Figure 2. Then remove the CARRIER/LOCAL OSC Unit mounting plate from the unit.

4) Affix the mounting plate to the crystal oven with the screws removed step 3.

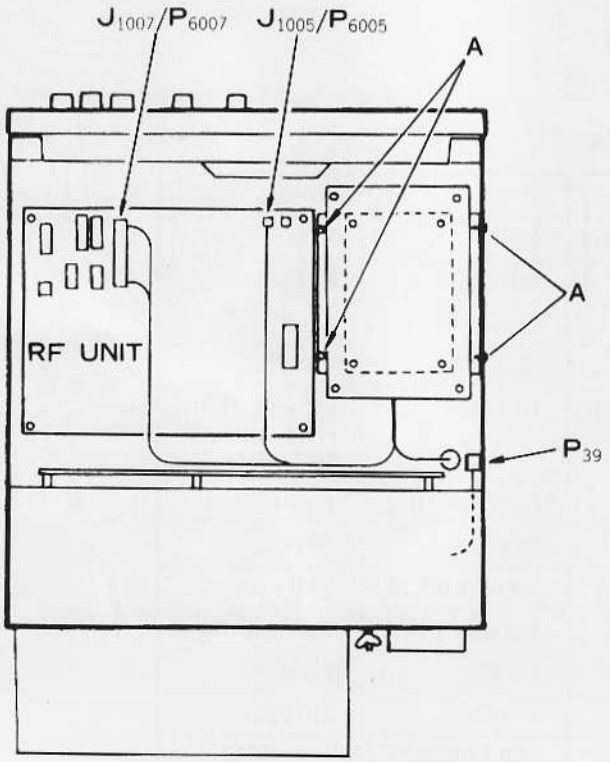
5) Secure the crystal oven with the mounting plate, in exactly the same configuration as the CARRIER/LOCAL OSC Unit with previously.

6) Connect all plugs to their appropriate jacks. ($P_{605}$ to $J_{1005}$, $P_{607}$ to $J_{1007}$, $P_{619}$ to $J_{2007}$ and $P_{624}$ to $J_{3003}$). The heater cable ($P_{640}$) should be connected to $P_{39}$. This connector had previously remained loose, near the CARRIER/LOCAL OSC Unit. (Refer to Figures 2 and 3.)

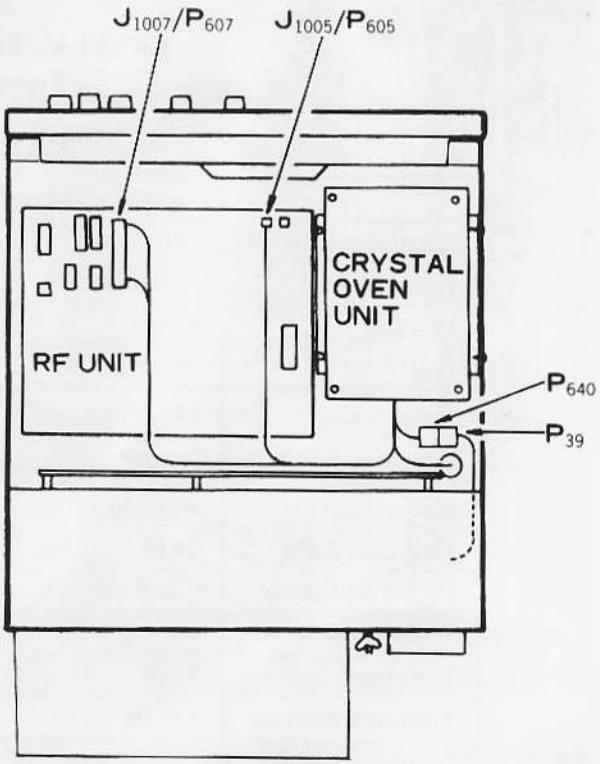
7) Crystals used in the oven differ from those used without, and so new crystals must be installed when the oven is added. See the procedure on the following page.




BOTTOM VIEW
Figure 1




TOP VIEW
Figure 2




TOP VIEW
Figure 3

## CHANNEL INSTALLATION PROCEDURE

The channel installation requires a channel crystal, capacitors, coils, and some jumper wires. The exact value of these parts should be determined in accordance with the following instructions.

The formula below is used to determine the exact crystal frequencies:

Crystal = Channel frequency + 10.7 MHz

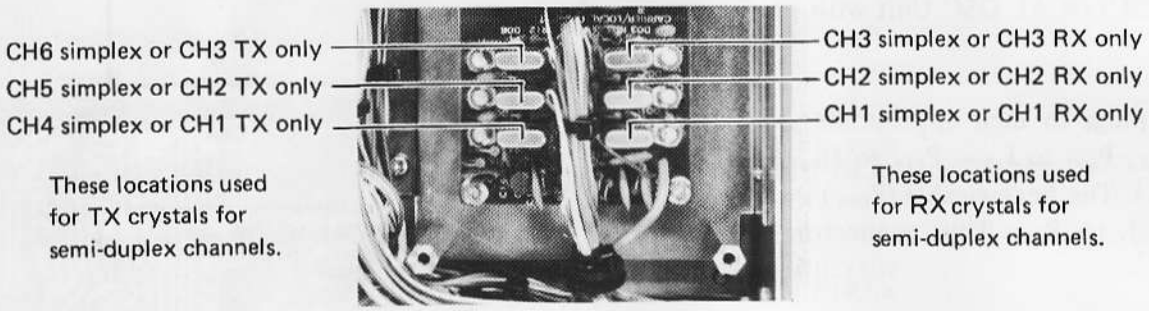
> **NOTE:**
> The specifications for crystals used with the oven differ from those used without the oven, so when ordering crystals, please state clearly the 8-digit part number (H...) given in the Table below, along with the channel frequency.

## SIMPLEX CHANNELS

1. Referring to Figure 4, install the crystals into the sockets on the CARRIER/LOCAL Unit. Be sure to install the correct crystal in each socket, according to the channel number. If the FT-180A is equipped with a crystal oven, the CARRIER/LOCAL Unit is located within the oven.

2. Unplug all connectors on the RF unit, unscrew the four mounting screws, and remove the RF Unit from the chassis.

3. Referring to Figures 5 and 6, notice that each of the six channels has two transformers, together with their associated capacitors, which must be selected to correspond with the desired channel frequency. Obtain the correct values for these transformers and capacitors from the BAND TABLE on page 44, and install in the correct locations on the RF Unit.




**CRYSTAL LOCATIONS**
**Figure 4**

**CRYSTAL DATA**

| | w/o OVEN | | w/OVEN | |
|---|---|---|---|---|
| Location number | X6007 | X6001–X6006 | X607 | X601–X606 |
| Part number | H0102387 | H0102391 | H0102730 | H0102390 |
| Function | Carrier | Local | Carrier | Local |
| Holder | HC-42/U | HC-42/U | HC-42/U | HC-42/U |
| Frequency | 10.7 MHz | CH + 10.7 (MHz) (12.3 MHz to 28.7 MHz) | 10.7 MHz | CH + 10.7 (MHz) (12.3 MHz to 28.7 MHz) |
| Mode | Fundamental | Fundamental | Fundamental | Fundamental |
| Load capacitance | 24 pF | 28 pF | 24 pF | 28 pF |
| Parallel capacitance | 3.4 pF ± 0.3 pF | 5 pF ± 0.5 pF | 3.4 pF ± 0.3 pF | 5 pF ± 0.5 pF |
| Effective resistance | less than 40Ω | less than 40Ω | less than 40Ω | less than 40Ω |
| Drive level | 1 mW | 1 mW | 1 mW | 1 mW |
| Frequency tolerance | ±50 Hz | ±10 ppm | ±50 Hz | ±10 ppm |
| Frequency stability | ±10 ppm (−10°C to 50°C) | | ±0.15 ppm/°C (70°C to 80°C) | |
| Oven temperature | – | | 75°C ± 3°C | |

For example; to install 2182 kHz into channel 1, find the values for 2.0–2.5 MHz in the BAND TABLE. There we find that the transformers should be part no. L0020973, and the capacitors, 100 pF. From Figures 5 and 6 we see that the transformers should be installed in locations $T_{1002}$ and $T_{1003}$, and the capacitors in locations $C_{1021}$ and $C_{1053}$ (for CH 1).

4. Part A in Figures 7 and 8 illustrates the jumper wires that must be connected between $J_{07}$ and $J_{11}$ or $J_{12}$ on the RF Unit (if all six channels are to be simplex). If some channels are to be semi-duplex, install only those jumpers corresponding to the simple channel(s).

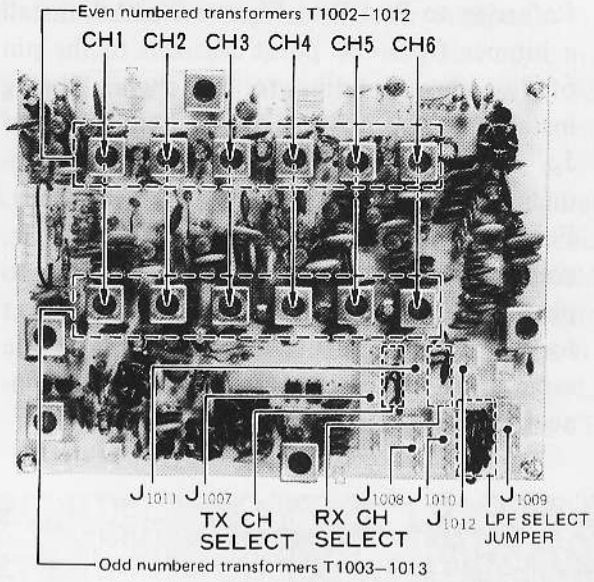
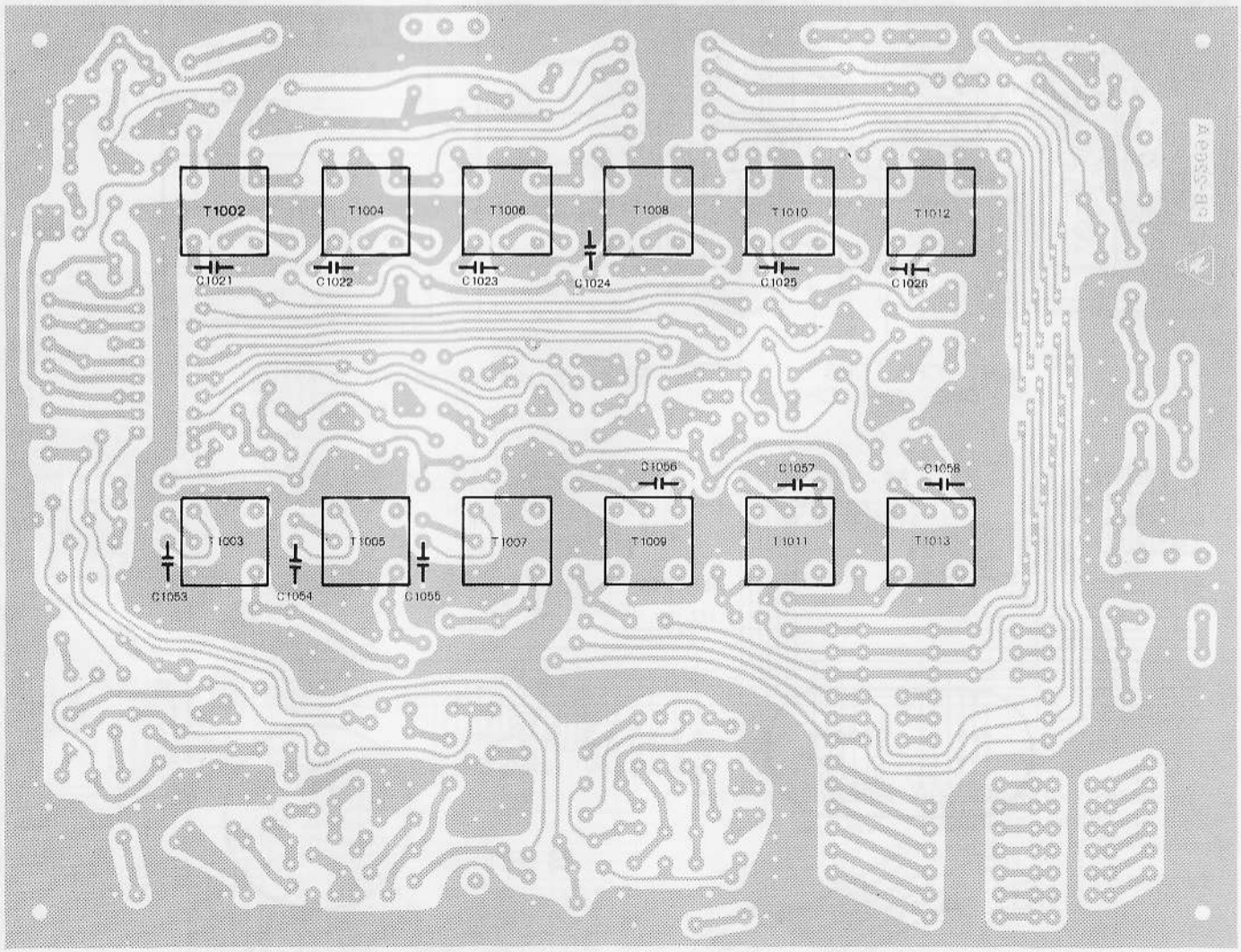



**Figure 5 RF Unit**




**RF Unit – component side**

**Figure 6**

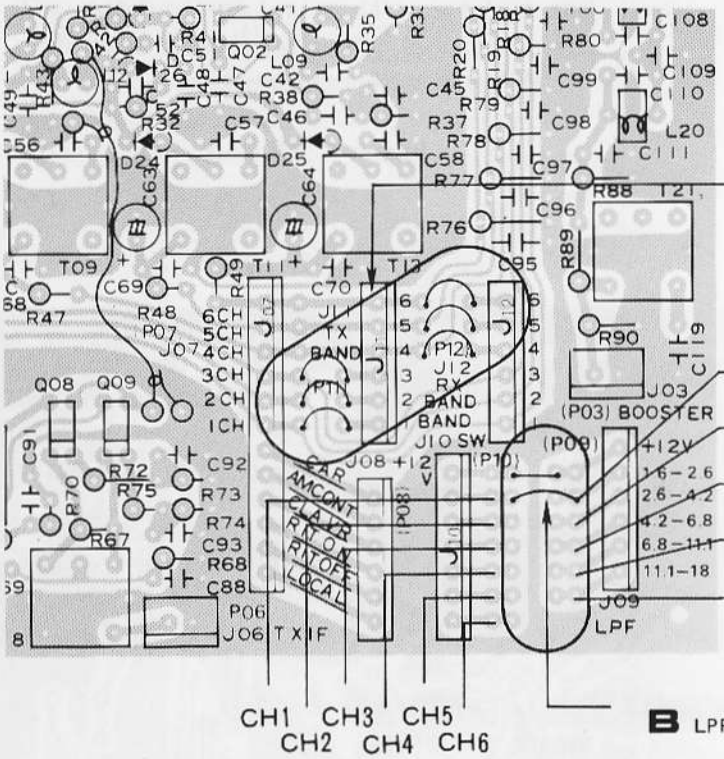
5. Referring to Part B in Figures 7 and 8, install a jumper from the point adjacent to the pin of $J_{10}$ corresponding to the channel being installed to the point connected to the pin of $J_{09}$ corresponding to the LPF whose frequency range includes the channel frequency. For example, if Channel 1 is to be 2182 kHz, connect the jumper from the point next to pin 2 of $J_{10}$ to the 1.6–2.6 MHz point next to $J_{09}$. If more than one channel is in the same LPF band, simply make multiple connections to the point adjacent to $J_{09}$.

**NOTE:**

Improper jumper connections may damage the lowpass filters and final transistors.

6. When all desired channels have been installed, return the RF Unit to its original position and replace the mounting screws and connectors.

Figure 7




| | LPF FREQUENCY RANGE |
|---|---|
| A | 1.6 MHz – 2.6 MHz |
| B | 2.6 MHz – 4.2 MHz |
| C | 4.2 MHz – 6.8 MHz |
| D | 6.8 MHz – 11.1 MHz |
| E | 11.1 MHz – 18.0 MHz |

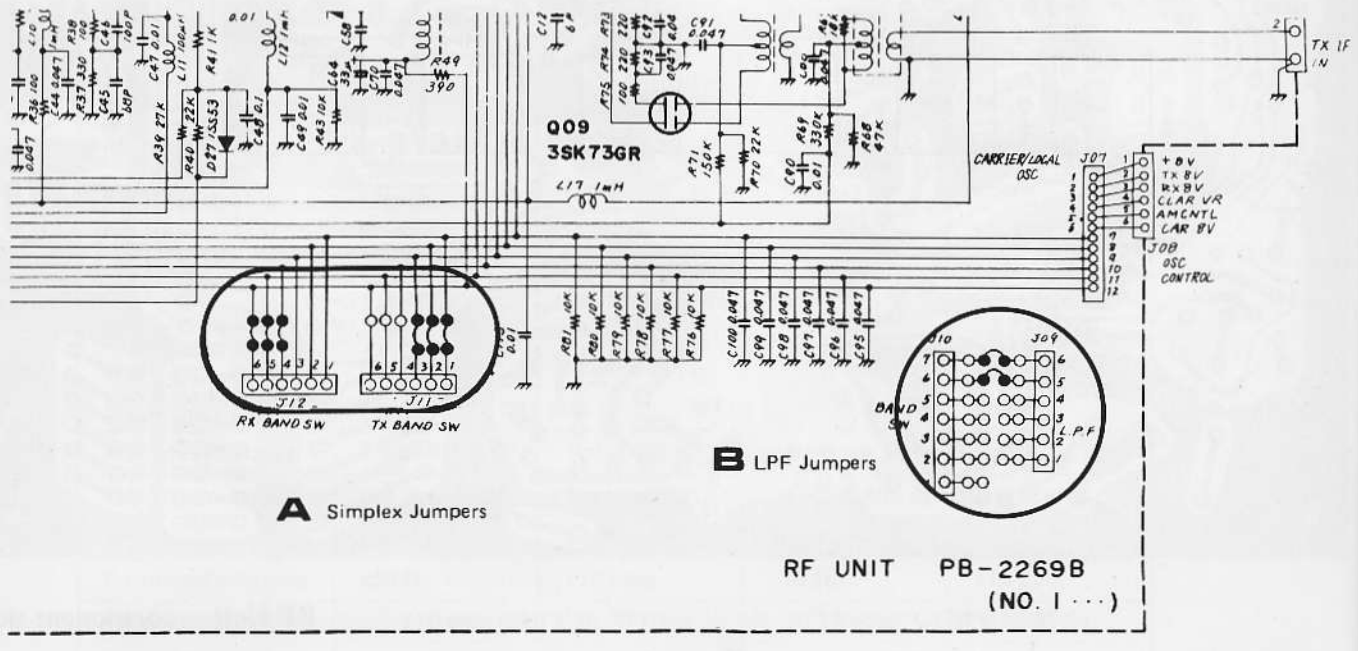



Figure 8

## SEMI-DUPLEX CHANNELS

1. Referring to Figure 4, on the CARRIER/ LOCAL Unit, install the RX crystal for the semi-duplex channel into location 1, 2 or 3; and the TX crystal into location 4, 5 or 6, respectively. That is, if CH 1 is to be semi-duplex, the TX crystal goes in the CH 4 position; CH 2 semi-duplex TX crystal in CH 5; and CH 3 semi-duplex TX crystal into CH 6.

2. Referring to the BAND TABLE on page 44, determine the values of the transformers and capacitors needed for the RX and TX frequencies. Install these parts in the locations listed below and shown in Figures 5 and 6.

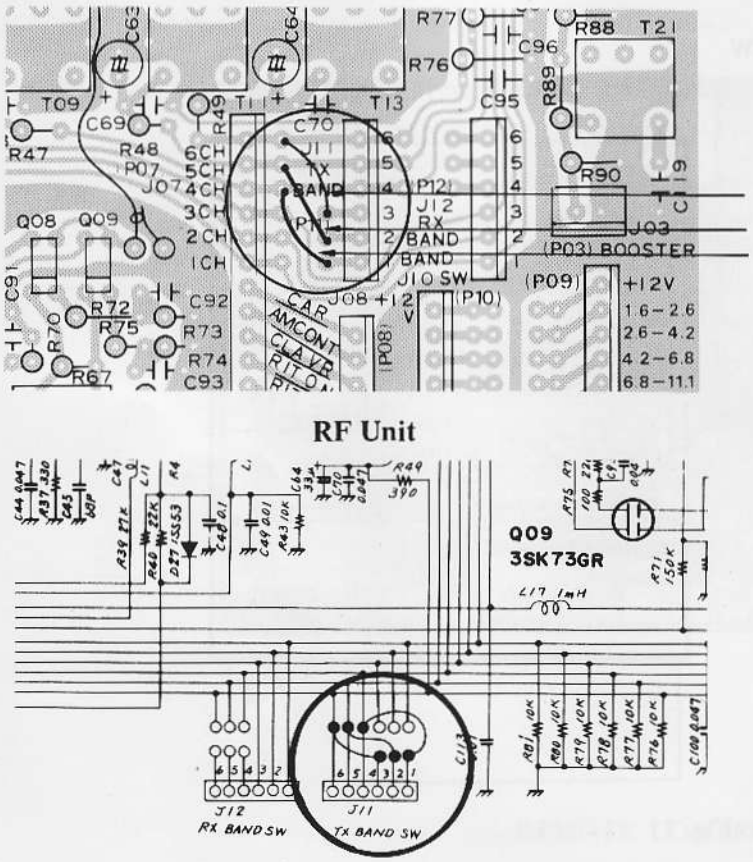
   CHANNEL 1:
   CH 1 (RX) $T_{1002}$, $T_{1003}$, $C_{1021}$, $C_{1053}$
   CH 4 (TX) $T_{1008}$, $T_{1009}$, $C_{1024}$, $C_{1056}$
   CHANNEL 2:
   CH 2 (RX) $T_{1004}$, $T_{1005}$, $C_{1022}$, $C_{1054}$
   CH 5 (TX) $T_{1010}$, $T_{1011}$, $C_{1025}$, $C_{1057}$
   CHANNEL 3:
   CH 3 (RX) $T_{1006}$, $T_{1007}$, $C_{1023}$, $C_{1055}$
   CH 6 (TX) $T_{1012}$, $T_{1013}$, $C_{1026}$, $C_{1058}$

3. Install the Channel Selector Jumper(s) from point adjacent to $J_{07}$ to the point adjacent to $J_{11}$ for the semi-duplex channel(s) being installed, as shown in Figure 9.

4. Referring to step 5 and Part B of Figures 7 and 8 in the Simplex Channel procedure, install the LPF jumper(s) for the TRANSMIT frequency in the CH1, CH2 or CH3 positions (points in common with pins 4, 5 and 6 of $J_{10}$, respectively). Do not install any LPF jumper for semi-duplex channels in the CH4, CH5 or CH6 positions.

5. Referring to Figure 10, cut the wire to connector $P_{11}$ that corresponds with the CH location that is being used as the transmit frequency for the semi-duplex channel. That is, if CH1 is to be semi-duplex, cut the wire to pin 4 (designated CH4 in Figure 10). For CH2 semi-duplex, cut the wire to pin 5 (CH5); and for CH3 semi-duplex, the wire to pin 6 (CH6).

**Figure 9** — **SEMI-DUPLEX JUMPER CONNECTIONS**



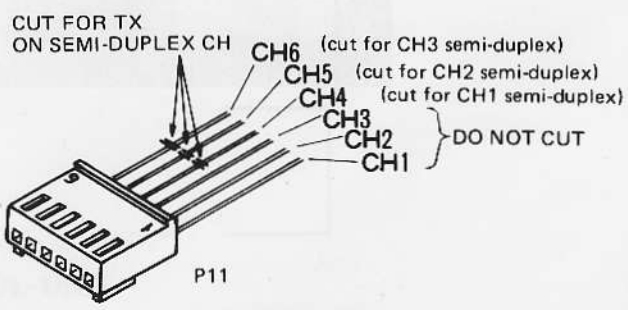




**Figure 10**

**FT-180A**
**MODIFICATION PROCEDURE**
**FOR USE WITH THE FH-180**

Kit required: Part number D3000266

1. Disconnect the FT-180A from the power source, and remove the 4 screws affixing the top cover. Loosen the side plate screws, and remove the cover.

2. Referring to Figure 11, locate the two screws affixing the Connector Unit. Remove these screws, but do not remove the connectors from the Unit yet.

3. Carefully disconnect plugs $P_{10}$, $P_{11}$ and $P_{12}$ from RF Unit (previously beneath the Connector Unit). Also disconnect plugs $P_{43}$ and $P_{44}$ from the Connector Unit.

4. Remove the CHANNEL selector knob, mounting nut and washer, and remove this switch and its wires disconnected in the previous step.

5. Install the new BCD switch supplied with the kit, with wires and plug $P_{52}$.

6. Connect one end of each of the supplied connection cables to the RF Unit: $P_{10}$ to $J_{1010}$, $P_{11}$ to $J_{1011}$, and $P_{12}$ to $J_{1012}$.

7. Referring to Figure 12, install the Remote Control Unit (supplied with the kit) using the the supplied mounting screws. Make sure that no wires or connectors are pinched or trapped beneath the Unit.

8. Connect the other ends of the new connection cables to the Remote Control Unit: $P_{49}$ to $J_{705}$, $P_{50}$ to $J_{706}$, and $P_{51}$ to $J_{707}$.

9. Disconnect the following plugs one at a time from the Connector Unit, and connect them to the jacks on the Remote Control Unit: $P_{45}$ to $J_{701}$, $P_{46}$ to $J_{702}$, $P_{47}$ to $J_{703}$ and $P_{48}$ to $J_{704}$.

10. Connect $P_{52}$ from the new CHANNEL selector switch to $J_{708}$ on the Remote Control Unit.

11. Replace the top cover and its 4 screws. This completes the modification.

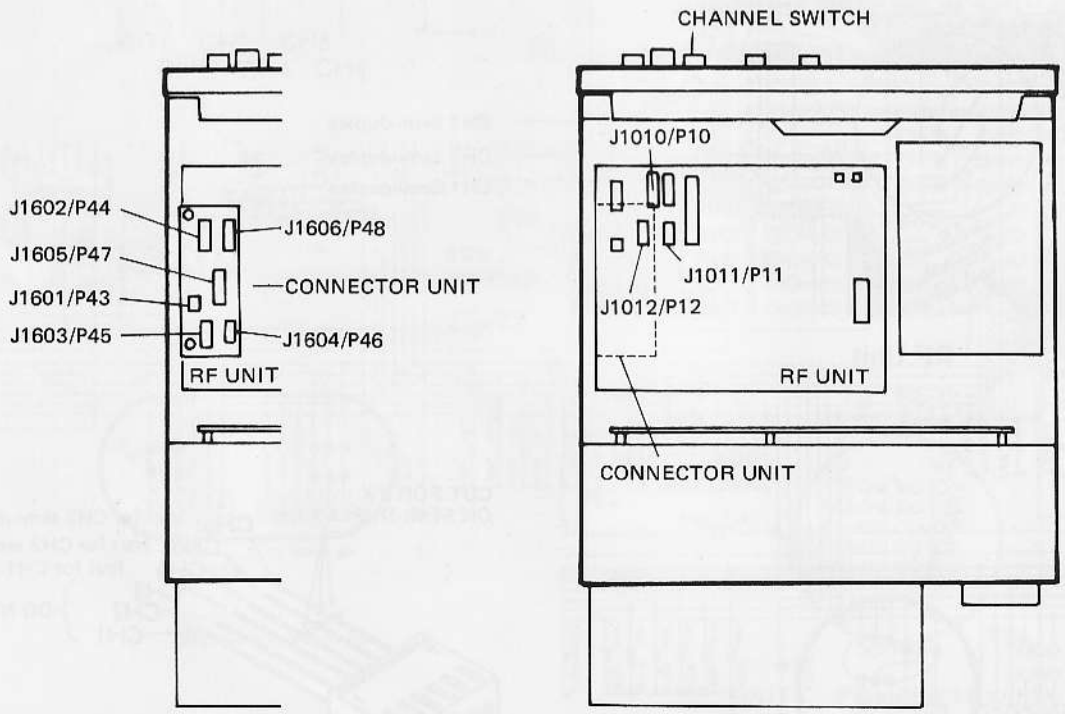
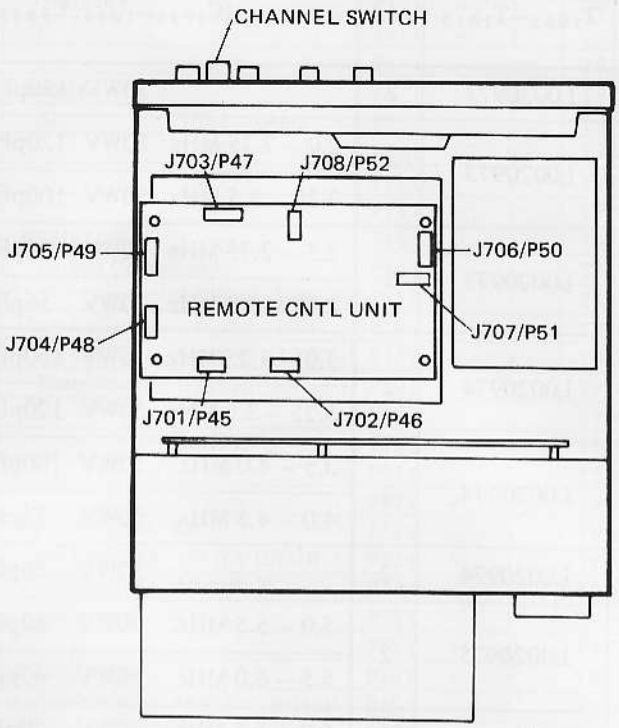
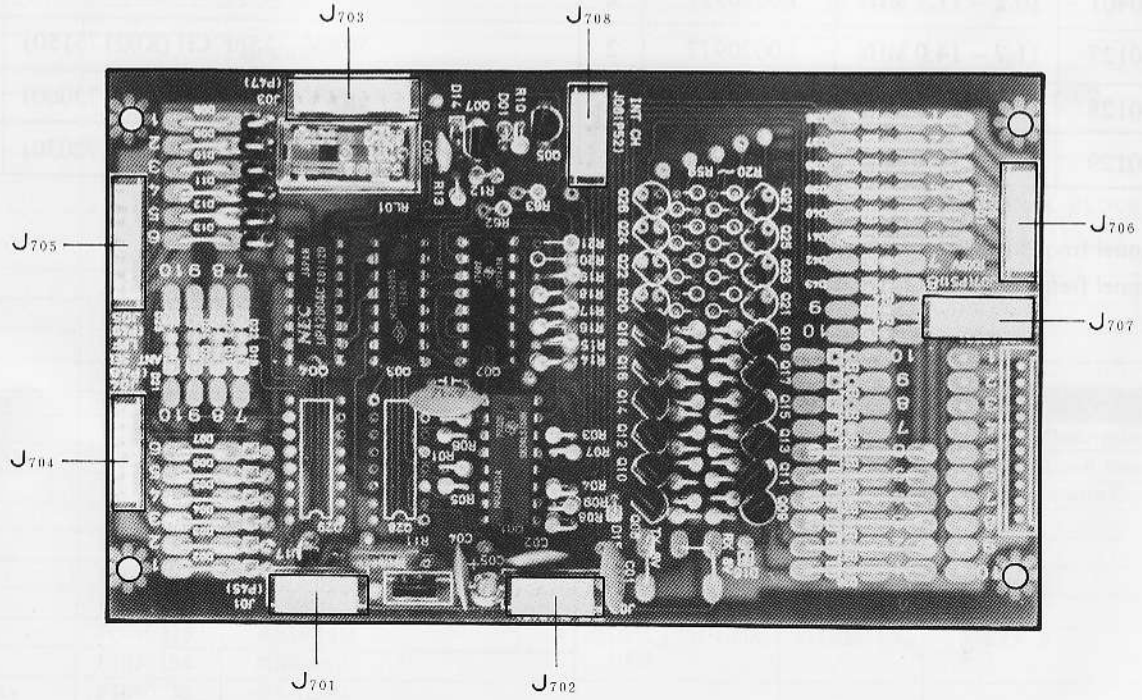



Fig. 11




TOP VIEW

Fig. 12




REMOTE CONTROL UNIT

# BAND TABLE

| FREQ. RANGE MODIFICATION KIT NO. | FREQUENCY RANGE | TRANSFORMERS $T_{1002}$–$T_{1013}$ | Qty | CERAMIC CAPACITORS ($C_{1021}$–$_{1026}$, $C_{1053}$–$_{1058}$) | Qty |
|---|---|---|---|---|---|
| D3000116 | 1.6 – 2.0 MHz | L0020973 | 2 | 50WV 180pF CH (K02175181) | 2 |
| D3000117 | 2.0 – 2.5 MHz | L0020973 | 2 | 2.0 – 2.25 MHz 50WV 120pF CH (K02175121) | 2 |
| | | | | 2.25 – 2.5 MHz 50WV 100pF CH (K02175101) | 2 |
| D3000118 | 2.5 – 3.0 MHz | L0020973 | 2 | 2.5 – 2.75 MHz 50WV 82pF CH (K02175820) | 2 |
| | | | | 2.75 – 3.0 MHz 50WV 56pF CH (K02175560) | 2 |
| D3000119 | 3.0 – 3.5 MHz | L0020974 | 2 | 3.0 – 3.25 MHz 50WV 150pF CH (K02175151) | 2 |
| | | | | 3.25 – 3.5 MHz 50WV 120pF CH (K02175121) | 2 |
| D3000120 | 3.5 – 4.5 MHz | L0020974 | 2 | 3.5 – 4.0 MHz 50WV 100pF CH (K02175101) | 2 |
| | | | | 4.0 – 4.5 MHz 50WV 75pF CH (K02179018) | 2 |
| D3000121 | 4.5 – 5.0 MHz | L0020974 | 2 | 50WV 56pF CH (K02175560) | 2 |
| D3000122 | 5.0 – 6.0 MHz | L0020975 | 2 | 5.0 – 5.5 MHz 50WV 62pF CH (K02179017) | 2 |
| | | | | 5.5 – 6.0 MHz 50WV 47pF CH (K02175470) | 2 |
| D3000123 | 6.0 – 7.0 MHz | L0020975 | 2 | 6.0 – 6.5 MHz 50WV 39pF CH (K02175390) | 2 |
| | | | | 6.5 – 7.0 MHz 50WV 33pF CH (K02175330) | 2 |
| D3000124 | 7.0 – 8.0 MHz | L0020976 | 2 | 50WV 51pF CH (K02179016) | 2 |
| D3000125 | 8.0 – 9.0 MHz | L0020976 | 2 | 50WV 39pF CH (K02175390) | 2 |
| *D3000126 | 9.0 – 10.2 MHz | L0020977 | 2 | 50WV 39pF CH (K02175390) | 2 |
| **D3000401 | 10.2 – 11.7 MHz | L0020977 | 2 | 50WV 27pF CH (K02175270) | 2 |
| D3000127 | 11.7 – 14.0 MHz | L0020977 | 2 | 50WV 15pF CH (K02175150) | 2 |
| D3000128 | 14.0 – 17.0 MHz | L0020977 | 2 | 50WV 6pF CH (K02173060) | 2 |
| D3000129 | 17.0 – 18.0 MHz | L0020977 | 2 | 50WV 3pF CH (K02172030) | 2 |

* Channel frequencies in this range cannot be installed in the special 9.1 MHz IF version.

** Channel frequencies in this range can only be installed in the special 9.1 MHz IF version.

# PARTS LIST

## MAIN CHASSIS

| Symbol No. | Part No. | Description |
|---|---|---|
| | | **TRANSISTOR** |
| Q1 | G3408440Y | 2SD844Y |
| | | |
| | | |
| | | **DIODE** |
| D1,2 | G2090306 | Si 10E1 (AM) |
| D3–8 | G2015550 | " 1S1555 |
| D9 | G2090027 | " 1SS53 |
| | | |
| | | **RESISTOR** |
| R1 | J10276100 | Carbon Composition 1/2W GJ 10Ω |
| R2 | J10276101 | " " " " 100Ω |
| R3,5 | J01245472 | Carbon film 1/4W TJ 4.7kΩ |
| R4 (10W model) | J32009003 | Meter Shunt 0.125Ω |
| R4 (50W model) | J32009004 | " " 0.025Ω |
| R4 (100W model) | J32009004 | " " 0.025Ω |
| | | |
| | | |
| | | **POTENTIOMETER** |
| VR1 | J62800059 | DM10A679A 10kΩA·10kΩB |
| VR2 | J62800058 | DM10A679A - 10kΩBx2 |
| VR3 | J50710502 | V10K-8-1-2 5KB |
| | | |
| | | **CAPACITOR** |
| C6–12,14 | K13179008 | Ceramic disc 50WV 0.01μF (DD106F103Z50V) |
| C1,2,13 | K13179009 | " " " 0.047μF (DD110F473Z50V) |
| C3,4 | K19149025 | " " 25WV 0.1μF (UAT13X104K-L46AE) |
| C5 | K40149006 | Electrolytic " 2200μF (25RE2200) |
| | | |
| | | **METER** |
| M1 | M0290025 | AP-170 |
| | | |
| | | **SPEAKER** |
| SP1 | M4090055 | SM-57P 4Ω |
| | | |
| | | **RELAY** |
| RL1 | M1090018 | G4W-11123A-B 12VDC |
| | | |
| | | **SWITCH** |
| S2 | N2090021 | 8A-1011 |
| S3 | N2090026 | 8A-2041 |
| S4 | N0190085 | SRN2044 |
| S5 | N0190059 | SRN1043 |
| S6 | N0190038 | SRN3066 |
| S6 (Remote) | N0190122 | 1-1-6 GS (BCD) |
| S1 (FT-180) | N2090021 | 8A-1011 |
| S1 (FT-180A) | N2090032 | 8A-3021 |
| | | |
| | | **RECEPTACLE** |
| J1 | P0090158 | FM214-8SS |
| J2 | P1090134 | SG7627 |
| J3 | P1090005 | SG8050 |
| J4 (FT-180) | P0090215 | RB19R4M |
| J6 | P1090194 | MBR-06B |
| J4 (FT-180A) | P1090036 | QS-AB4M |
| J5 (FT-180) | P0090158 | FM214-8SS |
| J5 (FT-180A) | P1090096 | SC-12HF |
| J7 (FT-180A) | P1090149 | S-1620A-STA |

| | | |
|---|---|---|
| | | **MINI CONNECTOR** |
| P1 (with wire) | T9204200 | 5251-02 |
| P2 ( " ) | T9204201 | 5251-09 |
| P3 ( " ) | T9204202A | 5251-02 |
| P4 ( " ) | T9204203 | 5251-02 |
| P6 ( " ) | T9204205 | 5251-02 |
| P8 ( " ) | T9204207 | 5251-06 |
| P9 ( " ) | T9204208 | 5251-06 |
| P10 ( " ) | T9204209B | 5251-07 |
| P11 ( " ) | T9204210B | 5251-06 |
| P12 ( " ) | T9204211B | 5251-06 |
| P13 ( " ) | T9204212 | 5251-02 |
| P14 ( " ) | T9204213A | 5251-10 |
| P15 ( " ) | T9204214 | 5251-02 |
| P16 ( " ) | T9204215 | 5251-05 |
| P17 ( " ) | T9204216A | 5251-12 |
| P20 ( " ) | T9204218A | 5251-07 |
| P22 ( " ) | T9204219B | 5251-07 |
| P26 ( " ) | T9204221 | 5251-06 |
| P27 ( " ) | T9204222 | 5251-11 |
| P29 ( " ) | T9204223 | 5251-09 |
| P31 ( " ) | T9204224 | 5251-13 |
| P32 ( " ) | T9204225A | 5251-13 |
| P33 ( " ) | T9204226 | 5239-03 |
| P34 ( " ) | T9204227 | 5251-08 |
| P35 ( " ) | T9204228 | 5239-09 |
| P36 ( " ) | T9204229A | 5251-13 |
| P37 ( " ) | T9204230 | 5251-03 |
| P38 ( " ) | T9204231 | 5251-07 |
| P39 ( " ) | T9204252A | SMR-03V-B |
| | | |
| | | |
| | | **LAMP** |
| PL1 | Q1000045 | 12V 15mA K0,303,60 |
| PL2 | Q1000039 | 14V 0.12A M1041·5·9 |
| | | |
| | | |
| | | |
| | | |
| | | **FUSE HOLDER** |
| FH1 | P2000004 | F-3294 |
| | | |
| | | |
| | | **TERMINAL BLOCK** |
| | Q6000061 | ML3182-15P |

## RF UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2269C | F0002269C | Printed Circuit Board |
| (10.7MHz) | C022690B | P.C. Board with Components |
| (9.1MHz) | C022690C | |
| | | |
| | | **FET** |
| Q1004–1006 | G3801250 | 2SK125 |
| Q1001,1002,1008, 1009 | G4800730G | 3SK73GR |
| | | |
| | | |
| | | **TRANSISTOR** |
| Q1003,1007 | G3324070 | 2SC2407 |

| | | DIODE | | | |
|---|---|---|---|---|---|
| D1001–1010, 1027–1030 | G2090027 | Si 1SS53 | | | |
| D1011–1026 | G2090118 | Schottky barrier 1SS97 | | | |
| | | | | | |
| | | | | | |
| | | RESISTOR | | | |
| R1065,1085 | J02245479 | Carbon film | 1/4W | SJ | 4.7Ω |
| R1060,1061 | J02245829 | " | " | " | 8.2Ω |
| R1087 | J02245100 | " | " | " | 10Ω |
| R1089 | J02245180 | " | " | " | 18Ω |
| R1086 | J02245390 | " | " | " | 39Ω |
| R1052 | J02245470 | " | " | " | 47Ω |
| R1058 | J02245560 | " | " | " | 56Ω |
| R1055 | J02245680 | " | " | " | 68Ω |
| R1009 | J02245820 | " | " | " | 82Ω |
| R1026,1029,1036, 1038 | J02245101 | " | " | " | 100Ω |
| R1015–1021 | J02245121 | " | " | " | 120Ω |
| R1062 | J02245151 | " | " | " | 150Ω |
| R1002,1031,1033, 1053 | J02245181 | " | " | " | 180Ω |
| R1073 | J02245221 | " | " | " | 220Ω |
| R1088,1090 | J02245271 | " | " | " | 270Ω |
| R1027,1037 | J02245331 | " | " | " | 330Ω |
| R1044–1049,1054, 1056,1057,1083 | J02245391 | " | " | " | 390Ω |
| R1003,1006,1007, 1021 | J02245681 | " | " | " | 680Ω |
| R1001,1030,1032, 1082 | J02245821 | " | " | " | 820Ω |
| R1041,1063,1064, 1084,1091–1093 | J02245102 | " | " | " | 1kΩ |
| R1034 | J02245122 | " | " | " | 1.2kΩ |
| R1050 | J02245152 | " | " | " | 1.5kΩ |
| R1042 | J02245222 | " | " | " | 2.2kΩ |
| R1094 | J02245472 | " | " | " | 4.7kΩ |
| R1025 | J02245562 | " | " | " | 5.6kΩ |
| R1004,1008,1043, 1076,1077–1081 | J02245103 | " | " | " | 10kΩ |
| R1067 | J02245183 | " | " | " | 18kΩ |
| R1040,1070 | J02245223 | " | " | " | 22kΩ |
| R1039 | J02245273 | " | " | " | 27kΩ |
| R1068 | J02245473 | " | " | " | 47kΩ |
| R1023,1071 | J02245154 | " | " | " | 150kΩ |
| | J02245224 | " | " | " | 220kΩ |
| R1022 | J02245274 | " | " | " | 270kΩ |
| R1069 | J02245334 | " | " | " | 330kΩ |
| R1024 | J02245225 | " | " | " | 2.2MΩ |
| | | CAPACITOR | | | |
| C1109 | K30176271 | Dipped mica 50WV 270pF (Z17D271K05) | | | |
| C1103 | K30176511 | " " " 510pF (Z18D511K05) | | | |
| C1007 | K30279092 | " " 500WV 750pF (DM19D751J5) | | | |
| C1118,1121 | K02172040 | Ceramic disc " 4pF (DD104CH040C50V) | | | |
| C1122 | K02173060 | " " " 6pF (DD104CH060D50V) | | | |
| C1108 | K02179009 | " " " 22pF (DD104CH220J50V) | | | |
| C1007,1074,1078, 1079,1085,1086, 1110,1119 | K02175560 | " " " 56pF (DD106CH560J50V) | | | |
| C1045 | K02175680 | Ceramic disc 50WV 68pF (DD107CH680J50V) | | | |
| C1046 | K02175101 | " " " 100pF (DD107CH101J50V) | | | |
| C1111 | K02179021 | " " " 130pF (DD109CH131J50V) | | | |
| C1107 | K02179022 | " " " 160pF (DD109CH161J50V) | | | |
| C1073 | K02179027 | " " " 270pF (DD112CH271J50V) | | | |
| C1006,1034, 1037–1039,1041, 1047,1049,1051, 1052,1071,1072, 1080,1081,1084, 1087,1090,1100, 1113,1120 | K10179024 | " " " 0.01μF (CDS080XB103K50) | | | |
| C1003,1008, 1015–1020, 1027–1033,1035, 1036,1040,1042, 1044,1065–1070, 1075,1076,1077, 1082,1083,1088, 1091–1093, 1095–1099,1101, 1103,1104,1112, 1114–1116 | K19149021 | " " 25WV 0.047μF (UAT08X473K-L45AE) | | | |
| C1001,1002,1004, 1048,1073,1102, 1106 | K19149025 | " " " 0.1μF (UAT13X104K-L46AE) | | | |
| C1005 | K40170105 | Electrolytic 50WV 1μF (50RL1) | | | |
| C1105 | K40120106 | " 16WV 10μF (16RL10) | | | |
| C1009–1014, 1059–1064 | K40129008 | " " 33μF (16RE33) | | | |
| C1021–1026, 1053–1058 | – | See BAND TABLE (page 44) | | | |
| | | INDUCTOR | | | |
| L1011,1015 | L1190016 | FL5H-101K 100μH | | | |
| L1001–1003,1013, 1018 | L1190038 | FL5H-271K 270μH | | | |
| L1004–1010,1012, 1017,1021 | L1190017 | FL5H-102K 1mH | | | |
| L1014,1016 | L0020952 | 0.29μH | | | |
| L1019 | L0020953 | 0.60μH | | | |
| L1020 | L0020954 | 0.43μH | | | |
| | | | | | |
| | | | | | |
| | | TRANSFORMER | | | |
| T1014,1021 | L0020178 | | | | |
| T1015,1017,1019, 1020 | L0020209 | | | | |
| T1016,1018 | L0020957 | | | | |
| T1002–1013 | – | See BAND TABLE (page 44) | | | |
| T1001 | L0020545 | | | | |
| | | | | | |
| | | MINI CONNECTOR | | | |
| J1001,1003–1006 | P0090218 | 5045-02A | | | |
| J1002 | P0090225 | 5045-09A | | | |
| J1007 | P0090228 | 5045-12A | | | |
| J1008,1009,1011, 1012 | P0090222 | 5045-06A | | | |
| J1010 | P0090223 | 5045-07A | | | |
| | | | | | |
| | | | | | |
| | Q5000011 | Wrapping terminal C | | | |

## IF UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2273B | F0002273B | Printed circuit board |
| (10.7MHz) | C022730A | P.C. Board with Components |
| (9.1MHz) | C022732A | |
| | | |
| | | **IC** |
| Q2013 | G1090248 | AN6551 |
| | | |
| | | **FET** |
| Q2006,2011 | G3801921G | 2SK192AGR |
| Q2007 | G3801250 | 2SK125 |
| Q2001–2005 | G4800730G | 3SK73GR |
| | | |
| | | **TRANSISTOR** |
| Q2012 | G3105641R | 2SA564AR |
| Q2014,2016,2017 | G3315830 | 2SC1583 |
| Q2008–2010,2015, 2019 | G3318150Y | 2SC1815Y |
| Q2018 | G3318150G | 2SC1815GR |
| | | |
| | | **DIODE** |
| D2011,2016,2017 | G2090093 | Ge 1N270 |
| D2001–2010, 2026–2031 | G2090118 | Schottky barrier 1SS97 |
| D2019–2023 | G2090029 | Ge 1N60 |
| D2013–2015,2025 | G2015550 | Si 1S1555 |
| | G2090027 | Si 1SS53 |
| D2018 | G2090040 | Varactor FC-63 |
| | | |
| | | **CRYSTAL FILTER** |
| XF2001 | H1102250 | XF-10.7HA 10.7AM |
| XF2002 | H1102030 | XF-10.7HUA 10.7USB |
| XF2003 (OPTION) | H1102031 | XF-10.7HLA 10.7LSB |
| | | |
| | | **MONOLITHIC FILTER** |
| XF2004 | H1102032 | 10.7MC20 |
| | | |
| | | **RESISTOR** |
| R2066 | J02245100 | Carbon film 1/4W SJ 10Ω |
| R2065 | J02245330 | 〃 〃 〃 〃 33Ω |
| R2001,2032 | J02245470 | 〃 〃 〃 〃 47Ω |
| R2051 | J02245560 | 〃 〃 〃 〃 56Ω |
| R2004,2038 | J02245101 | 〃 〃 〃 〃 100Ω |
| | J02245121 | 〃 〃 〃 〃 120Ω |
| R2071,2117 | J02245221 | 〃 〃 〃 〃 220Ω |
| R2040,2054 | J02245331 | 〃 〃 〃 〃 330Ω |
| R2007,2010,2020, 2027,2031,2057, 2059,2095,2105, 2111 | J02245471 | 〃 〃 〃 〃 470Ω |
| R2005,2011,2014, 2017,2030,2060, 2063,2078,2083, 2091,2104,2110, 2113,2118,2122, 2123,2131 | J02245102 | 〃 〃 〃 〃 1kΩ |
| R2012,2015,2018 | J01245102 | 〃 〃 〃 TJ 1kΩ |
| R2084,2050 | J02245152 | 〃 〃 〃 SJ 1.5kΩ |
| | J02245182 | 〃 〃 〃 〃 1.8kΩ |
| R2022,2064,2086 | J02245332 | 〃 〃 〃 〃 3.3kΩ |
| R2096,2106,2112, | J02245332 | Carbon film 1/4W SJ 3.3kΩ |
| R2003 | J02245472 | 〃 〃 〃 〃 4.7kΩ |
| R2094,2099,2103, 2019,2126,2129 | J02245562 | 〃 〃 〃 〃 5.6kΩ |
| R2008,2072,2124 | J02245822 | 〃 〃 〃 〃 8.2kΩ |
| R2023,2024,2043, 2049,2055,2075, 2080,2081,2088, 2097,2100,2125 | J02245103 | 〃 〃 〃 〃 10kΩ |
| R2052,2130 | J02245153 | 〃 〃 〃 〃 15kΩ |
| R2028,2037,2087, 2101,2127 | J02245223 | 〃 〃 〃 〃 22kΩ |
| R2036,2046 | J02245273 | 〃 〃 〃 〃 27kΩ |
| R2069,2100 | J02245333 | 〃 〃 〃 〃 33kΩ |
| R2061 | J02245393 | 〃 〃 〃 〃 39kΩ |
| R2033 | J02245473 | 〃 〃 〃 〃 47kΩ |
| R2062 | J02245683 | 〃 〃 〃 〃 68kΩ |
| R2092,2128 | J02245104 | 〃 〃 〃 〃 100kΩ |
| R2067 | J02245124 | 〃 〃 〃 〃 120kΩ |
| R2041 | J02245154 | 〃 〃 〃 〃 150kΩ |
| R2077 | J02245184 | 〃 〃 〃 〃 180kΩ |
| | J02245224 | 〃 〃 〃 〃 220kΩ |
| | J02245274 | 〃 〃 〃 〃 270kΩ |
| R2073 | J02245105 | 〃 〃 〃 〃 1MΩ |
| | | |
| | | **POTENTIOMETER** |
| VR2001 | J51723222 | H1051A009-2.2KB 2.2kΩB |
| VR2002 | J51723102 | H1051A007-1KB 1kΩB |
| VR2003 | J51723103 | H1051A013-10KB 10kΩB |
| VR2004 | J51723473 | H1051A017-47KB 47kΩB |
| | | |
| | | **CAPACITOR** |
| C2074 | K02172050 | Ceramic disc 50WV CH5pF (DD104CH050C50V) |
| C2044 | K02173100 | 〃 〃 〃 〃 10pF (DD104CH100D50V) |
| C2024,2061,2068, 2089,2090,2134 | K02175101 | 〃 〃 〃 〃 100pF (DD107CH101J50V) |
| C2091 | K02179025 | 〃 〃 〃 〃 220pF (DD111CH221J50V) |
| C2001–2004,2007, 2008,2010,2012, 2013,2015,2017, 2018,2020,2023, 2027,2028,2030, 2036–2043,2045, 2048,2050,2053, 2055,2058,2060, 2066,2075,2076, 2078,2079, 2081–2087,2097, 2099,2107,2109, 2115,2116,2118, 2124,2128,2134, 2135,2138 | K01079024 | 〃 〃 〃 0.01μF (CDS080XB103K50) |
| C2005,2006,2011, 2014,2016,2019, 2021,2022,2025, 2029,2035,2046, 2047,2049,2051, 2052,2054,2056, 2057,2059,2062, 2064,2065,2067, 2070–2073,2080, 2088,2092,2102, 2112,2113,2114, 2121–2113, 2125–2127,2129, 2130,2132,2133 | K19149021 | 〃 〃 25WV 0.047μF (UAT08X473K-L45AE) |

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|---|---|---|
| C2136,2137 | K19149021 | Ceramic disc 25WV 0.047μF (UAT08X473K-L45AE) |
| C2025,2031.2032 | K19149025 | " " " 0.1μF (UAT13X104K-L46AE) |
| C2117 | K30176331 | Dipped mica 50WV 330pF (Z17D331K05) |
| | K30176471 | " " " 470pF (Z18D471K05) |
| C2095 | K50177222 | Myler " 0.0022μF (50F2U222M) |
| C2094 | K70167105 | Tantalum 35WV 1μF (CS15E1V010M) |
| C2139,2140 | K70120002 | " 16WV 10μF (489D106X0016C1) |
| C2096 | K40170105 | Electrolytic 50WV 1μF (50RL1) |
| C2069,2093,2098, 2131 | K40120106 | " 16WV 10μF (16RL10) |
| C2101,2105,2106 | K40129008 | " " 33μF (25RE10) |
| | | |
| | | |
| | | **INDUCTOR** |
| L2001–2008, 2010–2014, 2017–2028,2031, 2032 | L1190016 | FL5H-101K 100μH |
| L2029,2030 | L1190088 | S4-271K 270μH |
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| | | **TRANSFORMER** |
| T2001 | L0020955 | |
| T2002 | L0020957 | |
| T2006,2007 | L0020956 | |
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| | | **MINI CONNECTOR** |
| J2001,2003,2006, 2007,2009 | P0090218 | 5045-02A |
| J2002 | P0090226 | 5045-10A |
| J2004 | P0090221 | 5045-05A |
| J2005 | P0090228 | 5045-12A |
| J2008 | P0090223 | 5045-07A |
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| | Q5000011 | Wrapping terminal C |
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## AF UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2270B | F0002270B | Printed Circuit Board |
| (10.7MHz) | C022700B | P.C. Board with components |
| (9.1MHz) | C022700C | |
| | | |
| | | **IC** |
| Q3006 | G1090340 | MC1496P |
| Q3008 | G1090124 | MC14016BCP |
| Q3012 | G1090284 | μPC2002V |
| | | |
| | | |
| | | **TRANSISTOR** |
| Q3003 | G3307320G | 2SC732GR |
| Q3001 | G3307320B | 2SC732BL |
| Q3004,3009–3011, 3013 | G3318150Y | 2SC1815Y |
| Q3007 | G3318150G | 2SC1815GR |
| Q3014 | G3318150B | 2SC1815BL |
| | | |
| | | |
| | | **DIODE** |
| D3006 | G2090027 | Si 1SS53 |
| D3002–3005 | G2090029 | Ge 1N60 |
| | | |
| | | |
| | | **RESISTOR** |
| R3070,3071 | J10276129 | Carbon composition 1/2W GK 1.2Ω |
| R3069 | J10276229 | " " " " 2.2Ω |
| R3037 | J02245470 | Carbon film 1/4W SJ 47Ω |
| R3063 | J02245560 | " " " " 56Ω |
| R3005 | J02245101 | " " " " 100Ω |
| | J02245151 | " " " " 150Ω |
| R3068,3074 | J02245221 | " " " " 220Ω |
| R3007 | J02245331 | " " " " 330Ω |
| R3028,3081 | J02245471 | " " " " 470Ω |
| | J02245681 | " " " " 680Ω |
| R3035 | J02245821 | " " " " 820Ω |
| R3001 | J02245102 | " " " " 1kΩ |
| | J02245152 | " " " " 1.5kΩ |
| R3025,3083 | J02245222 | " " " " 2.2kΩ |
| R3079 | J02245272 | " " " " 2.7kΩ |
| R3024,3062 | J02245332 | " " " " 3.3kΩ |
| R3084 | J02245392 | " " " " 3.9kΩ |
| R3008,3049,3054, 3055,3056,3078 | J02245472 | " " " " 4.7kΩ |
| R3066,3067,3082 | J02245562 | " " " " 5.6kΩ |
| R3002,3010,3031, 3033,3039,3042, 3050,3051,3053 | J02245103 | " " " " 10kΩ |
| R3077 | J02245123 | " " " " 12kΩ |
| R3006,3021,3061 | J02245153 | " " " " 15kΩ |
| R3004 | J02245223 | " " " " 22kΩ |
| R3040,3080 | J02245273 | " " " " 27kΩ |
| R3020 | J02245333 | " " " " 33kΩ |
| | J02245393 | " " " " 39kΩ |
| | J02245473 | " " " " 47kΩ |
| R3003 | J02245563 | " " " " 56kΩ |
| R3026,3027 | J02245683 | " " " " 68kΩ |
| R3072 | J02245104 | " " " " 100kΩ |
| R3057,3076 | J02245184 | " " " " 180kΩ |
| | | |
| | | |
| | | **POTENTIOMETER** |
| VR3004 | J51723471 | H1051A005-470B 470ΩB |
| VR3003 | J51723102 | H1051A007-1KB 1kΩB |
| VR3006 | J51723472 | H1051A011-4.7KB 4.7kΩB |
| VR3001,3005 | J51723103 | H1051A013-10KB 10kΩB |
| VR3002 | J51727473 | H1021A317-47KB 47kΩB |
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| | | |
| | | **CAPACITOR** |
| C3001,3002 | K02175101 | Ceramic disc 50WV CH 100pF (DD107CH101J50V) |
| C3036,3037 | K02179025 | " " " " 220pF (DD111CH221J50V) |
| C3004,3025 | K12171102 | " " " " 0.001μF (DD104E102P50V) |

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|---|---|---|
| C3024–3035,3038, 3040 | K13179008 | Ceramic disc 50WV 0.01μF (DD106F103Z50V) |
| C3006,3032,3076 | K13179009 | " " " 0.047μF (D110F473Z50V) |
| C3049 | K50177152 | Mylar " 0.0015μF (50F2U152M) |
| C3048 | K50177272 | " " 0.0027μF (50F2U272M) |
| C3064 | K50177332 | " " 0.0033μF (50F2U332M) |
| C3069 | K50177472 | " " 0.0047μF (50F2U472M) |
| C3047,3073–3075 | K50177103 | " " 0.01μF (50F2U03M) |
| C3070 | K50177123 | " " 0.012μF (50F2U123M) |
| C3039,3071 | K50177223 | " " 0.022μF (50F2U223M) |
| C3063 | K70167224 | Tantalum 35WV 0.22μF (CS15E1VR22MIS) |
| C3003,3008,3017, 3022,3042,3043, 3051,3055,3056, 3065,3066 | K40170105 | Electrolytic 50WV 1μF (50RL1) |
| C3005,3019,3023, 3027,3029,3031, 3054,3072 | K40120106 | " 16WV 10μF (16RL10) |
| C3007,3009,3018, 3021,3041,3044, 3046,3052,3068 | K40129008 | " " 33μF (16RE33) |
| C3059 | K40129009 | " " 220μF (16RE220) |
| C3061 | K40129006 | " " 470μF (16RE470) |
| C3062 | K40129021 | " " 1000μF (16R102S) |
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| | | |
| | | **INDUCTOR** |
| L3004 | L1190122 | FL4H-1R5K 1.5μH |
| L3006 | L1190023 | FL5H-220K 22μH |
| L3003 | L1190101 | S4-220K 22μH |
| L3001 | L1190016 | FL5H-101K 100μH |
| L3002 | L1190121 | S4-101K 100μH |
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| | | |
| | | **TRANSFORMER** |
| T3001 | L0020957 | |
| T3002 | L0020788A | |
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| | | **MINI CONNECTOR** |
| J3001 | P0090223 | 5045-07A |
| J3002–3004 | P0090218 | 5045-02A |
| J3005 | P0090222 | 5045-06A |
| J3006 | P0090227 | 5045-11A |
| | | |
| | | |
| | Q5000011 | Wrapping terminal C |
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| | | |
| | | **HEAT SINK** |
| | R0067920 | for μPC2002V |
| | | |

## LPF/ALC UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2272A | F0002272A | Printed Circuit Board |
| FT-180A | C022720B | P.C. Board with Components |
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| | | |
| | | **TRANSISTOR** |
| Q4001,4003,4004 | G3105641Q | 2SA564Q |
| Q4002,4005 | G3318150Y | 2SC1815Y |
| | | |
| | | |
| | | **DIODE** |
| D4001–4010,4020 | G2090001 | Si 10D1 |
| D4011–4016 | G2090118 | Shottky barrier 1SS97 |
| D4018,4021–4023 | G2015550 | Si 1S1555 |
| D4019 | G2090238 | Zener HZ3C3 |
| D4017 | G2090218 | Zener HZ9C1 |
| | | |
| | | |
| | | **RESISTOR** |
| R4002,4003 | J10276339 | Carbon composition 1/2W GK 3.3Ω |
| R4001,4004 | J10276470 | " " " " 47Ω |
| R4029 | J02245470 | Carbon film 1/4W SJ 47Ω |
| R4021 | J02245101 | " " " " 100Ω |
| R4027,4028 | J02245221 | " " " " 220Ω |
| R4007,4008 | J02245102 | " " " " 1kΩ |
| R4012 | J02245222 | " " " " 2.2kΩ |
| R4009 | J02245332 | " " " " 3.3kΩ |
| R4005,4006,4014, 4023,4039 | J02245103 | " " " " 10kΩ |
| R4017,4018,4025, 4026 | J02245123 | " " " " 12kΩ |
| R4020 | J02245183 | " " " " 18kΩ |
| R4016,4022 | J02245223 | " " " " 22kΩ |
| R4010 | J02245473 | " " " " 47kΩ |
| R4011,4013,4019, 4021,4040 | J02245104 | " " " " 100kΩ |
| R4015,4024 | J02245334 | " " " " 330kΩ |
| | | |
| | | |
| | | **POTENTIOMETER** |
| VR4001–4003 | J50709103 | H1052A013-10KB 10kΩB |
| | | |
| | | |
| | | **CAPACITOR** |
| C4046 | K30275100 | Dipped mica 500WV 10pF (LCQ11100J5) |
| C4069 | K30275180 | " " " 18pF (LCQ11180J5) |
| C4052,4059 | K30275200 | " " " 20pF (LCQ12200J5) |
| C4042,4060 | K30275220 | " " " 22pF (LCQ12220J5) |
| C4048 | K30275240 | " " " 24pF (LCQ12240J5) |
| C4023,4054 | K30275270 | " " " 27pF (LCQ12270J5) |
| C4064,4068 | K30275300 | " " " 30pF (LCQ12300J5) |
| C4036,4057 | K30275330 | " " " 33pF (LCQ12330J5) |
| C4032,4044,4050 | K30275360 | " " " 36pF (LCQ12360J5) |

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|---|---|---|---|---|---|
| C4056,4077,4078 | K30275470 | Dipped mica 500WV 47pF (LCQ12470J5) | C4094,4096,4101 | K40120106 | Electrolytic 10μF (16RL10) |
| C4007,4025,4040, 4043,4062,4064, 4066 | K30275560 | " " " 56pF (LCQ12560J5) | C4086 | K40129008 | Electrolytic 16WV 33μF (16RE33) |
| | | | | | **INDUCTOR** |
| C4038,4047 | K30275680 | " " " 68pF (LCQ12680J5) | L4032,4033 | L1190080 | LB4B-3R3J 3.3μH |
| | | | L4030,4035 | L1190093 | LB4B-8R2J 8.2μH |
| C4021 | K30275750 | " " " 75pF (LCQ12750J5) | L4031,4034 | L1190094 | LB4B-100J 10μH |
| C4016 | K30275820 | " " " 82pF (LCQ12820J5) | L4001–4006, 4022–4027 | L1190120 | FL5H-471K 470μH |
| | | | L4007 | L0020958 | 1.60μH 1.6–2.6MHz |
| C4033,4070 | K30275101 | " " " 100pF (LCQ12101J5) | L4008 | L0020959 | 3.10μH " |
| | | | L4009 | L0020960 | 3.63μH " |
| C4017,4029,4053 | K30275121 | " " " 120pF (LCQ17121J5) | L4010 | L0020961 | 0.95μH 2.6–4.2MHz |
| | | | L4011 | L0020962 | 1.84μH " |
| C4063 | K30275151 | " " " 150pF (LCQ17151J5) | L4012 | L0020963 | 2.15μH " |
| | | | L4013 | L0020964 | 0.61μH 4.2–6.8MHz |
| C4039 | K30275161 | " " " 160pF (LCQ17161J5) | L4014 | L0020965 | 1.18μH " |
| | | | L4015 | L0020966 | 1.38μH " |
| C4058 | K30275181 | " " " 180pF (LCQ17181J5) | L4016 | L0020967 | 0.377μH 6.8–11.1MHz |
| | | | L4017 | L0020968 | 0.730μH " |
| C4030,4067 | K30275201 | " " " 200pF (LCQ17201J5) | L4018 | L0020969 | 0.855μH " |
| | | | L4019 | L0020970 | 0.230μH 11.1–18.0MHz |
| C4020,4061 | K30275221 | " " " 220pF (LCQ17221J5) | L4020 | L0020971 | 0.447μH " |
| | | | L4021 | L0020972 | 0.523μH " |
| C4034 | K30275271 | " " " 270pF (LCQ17271J5) | L4028,4029 | L0020922 | |
| C4012,4013,4026, 4027,4035,4051 | K30275301 | " " " 300pF (LCQ17301J5) | | | |
| | | | | | **RELAY** |
| C4008,4045,4049 | K30275331 | " " " 330pF (LCQ17331J5) | RL4001 | M1190024 | FBR311D012Z 12V |
| C4031,4055 | K30275391 | " " " 390pF (LCQ17391J5) | | | |
| | | | | | **LAMP FUSE** |
| C4014 | K30275471 | " " " 470pF (LCQ17471J5) | F4001 | Q1000010 | 8V 100mA (BQ041-22803A) |
| C4018,4019,4037 | K30275511 | " " " 510pF (LCQ18511J5) | | | |
| | | | | | **MINI CONNECTOR** |
| C4041 | K30275621 | " " " 620pF (LCQ18621J5) | J4001 | P0090225 | 5045-09A |
| | | | J4002 | P0090218 | 5045-02A |
| C4010 | K30275681 | " " " 680pF (LCQ18681J5) | J4003 | P0090222 | 5045-06A |
| C4011 | K30275751 | " " " 750pF (LCQ18751J5) | | | |
| | | | | | **TP TERMINAL** |
| C4022,4024 | K30275821 | " " " 820pF (LCQ18821J5) | | P0090182 | RT-01-13B |
| C4090 | K30279051 | " " " 1000pF (DM19D102K5) | | Q5000011 | Wrapping terminal C |
| C4015 | K30279125 | " " " 1300pF (DM19D132J5) | | | |
| C4089 | K30279058 | " " " 2000pF (DM19D202K5) | | | |
| C4088,4093,4095, 4102,4103 | K13179008 | Ceramic disc 50WV 0.01μF (DD106F103Z50V) | | | |
| C4001–4006, 4071–4076, 4079–4085,4092, 4093,4110 4104–4109 | K19149021 | " " 25WV 0.047μF (UAT08X473K-L45AE) | **REG/CONTROL UNIT** | | |
| | | | Symbol No. | Part No. | Description |
| | | | PB-2271A | F0002271A | Printed Circuit Board |
| | | | | C022710A | P.C. Board with components |
| | K19149025 | Ceramic " 0.1μF (UAT13X104K-L46AE) | | | |
| | | | | | **IC** |
| C4098 | K70167154 | Tantalum 35WV 0.15μF (CS15E1VR15M) | Q5001 | G1090350 | ICL7660CPA |
| | | | Q5003 | G1090183 | μPC14308 |
| C4099 | K70167684 | " " 0.68μF (CS15E1VR68M) | Q5005 | G1090037 | MC14572 |
| C4099,4100 | K70127225 | " " 2.2μF (CS15E1C2R2M) | | | |

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| | | **TRANSISTOR** | |
| Q5004,5006–5009 | G3318150Y | 2SC1815Y | |
| Q5002 | G3319590Y | 2SC1959Y | |
| | | | |
| | | | |
| | | **DIODE** | |
| D5001 | G2015880 | Si | 1S1588 |
| D5003,5004,5010 | G2090001 | Si | 10D1 |
| D5007–5009 | G2015550 | " | 1S1555 |
| D5002 | G2090187 | Zener | BZ140 |
| D5005,5006 | G2090003 | Si | V06B |
| D5011 | G2090221 | Zener | RD8.2EB2 |
| | | **RESISTOR** | |
| R5001 | J02245680 | Carbon film | 1/4W SJ 68Ω |
| R5004 | J02245562 | " " | " " 5.6kΩ |
| R5003 | J02245123 | " " | " " 12kΩ |
| R5002 | J02245563 | " " | " " 56kΩ |
| R5005 | J02245683 | " " | " " 68kΩ |
| | J02245823 | " " | " " 82kΩ |
| R5006,5007 | J02245224 | " " | " " 220kΩ |
| R5009 | J02245335 | " " | " " 3.3MΩ |
| | | | |
| | | | |
| | | **POTENTIOMETER** | |
| VR5001 | J50709472 | H1052A011-4.7KB | 4.7kΩB |
| VR5002 | J50709473 | H1052A017-47KB | 47kΩB |
| VR5003 | J50709224 | H1052A021-220KB | 220kΩB |
| | | | |
| | | | |
| | | **CAPACITOR** | |
| C5017,5021–5024 | K19149021 | Ceramic 50WV 0.047μF (UAT08X473K-L45AE) | |
| C5001,5004,5005, 5008,5010,5013, 5014,5016,5018, 5026 | K19149025 | " 25WV 0.1μF (UAT13X104K-L46AE) | |
| C5027,5028 | K50177333 | Mylar 50WV 0.033μF (50F2U333M) | |
| | K70167224 | Tantalum 35WV 0.22μF (CS15E1VR22M) | |
| C5020 | K70127335 | " 16WV 3.3μF (CS15E1C3R3M) | |
| C5006,5007,5009, 5011,5012,5019 | K40129007 | Electrolytic " 100μF (16RE100) | |
| C5015 | K40149016 | " 25WV 220μF (25RE220) | |
| C5002,5003 | K40149005 | " " 1000μF (25RE1000) | |
| | | | |
| | | **INDUCTOR** | |
| L5001,5002 | L1190103 | S4-392K | 3.9mH |
| L5003,5004 | L1190016 | FL5H-101K | 100μH |
| | | | |
| | | **CHOKE TRANSFORMER** | |
| CH5001 | L2030069 | 1.7mH 2.5A | |
| | | | |
| | | | |
| | | **RELAY** | |
| RL5001–5004 | M1190015 | G2V-2 | 12V |
| | | | |
| | | | |
| | | **MINI CONNECTOR** | |
| J5001,5002,5006 | P0090229 | 5045-13A | |
| J5003 | P0090237 | 5273-03A | |
| J5004 | P0090224 | 5045-08A | |
| J5005 | P0090238 | 5273-09A | |
| J5007 | P0090219 | 5045-03A | |
| J5008 | P0090223 | 5045-07A | |
| | | | |
| | | **DC-DC CONV. TRANSFORMER** | |
| T5001 | L3030084 | MC-102C | |
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## CARRIER/LOCAL OSC UNIT–1

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2268B | F0002268B | Printed Circuit Board |
| (10.7MHz) | C022680A | P.C. Board with components without crystals |
| (9.1MHz) | C022680B | |
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| | | |
| | | **FET** |
| Q6004 | G3801921G | 2SK192AGR |
| | | |
| | | **TRANSISTOR** |
| Q6001–6003 | G3319230 | 2SC1923R |
| | | |
| | | **DIODE** |
| D6001–6008,6010, 6012 | G2090027 | Si 1SS53 |
| D6011 | G2010093 | Ge (GB) 1N270 |
| D6009 | G2022080 | Varactor 1S2208 |
| | | |
| | | |
| | | **CRYSTAL** |
| X6001–6006 | H0102391 | HC-42/u LOCAL (25°C) |
| X6007 | H0102387 | HC-42/u 10.7MHz (25°C) |
| | | |
| | | |
| | | **CRYSTAL SOCKET** |
| XS6001–6007 | P3090002 | SD0105 |
| | | |
| | | |
| | | **RESISTOR** |
| R6035,6037 | J02245330 | Carbon film 1/4W SJ 33Ω |
| R6039 | J02245470 | " " " " 47Ω |
| R6019 | J02245680 | " " " " 68Ω |
| R6016,6017,6020, 6030,6032,6034, 6043 | J02245101 | " " " " 100Ω |
| R6018,6036 | J02245271 | " " " " 270Ω |
| R6014,6015,6029, 6031,6033 | J02245102 | " " " " 1kΩ |
| R6040,6042 | J02245222 | " " " " 2.2kΩ |
| R6041 | J02245272 | " " " " 2.7kΩ |
| R6013,6027 | J02245392 | " " " " 3.9kΩ |
| R6001–6012, 6021–6024 | J02245472 | " " " " 4.7kΩ |
| R6026,6028 | J02245103 | " " " " 10kΩ |
| R6045,6046 | J02245123 | " " " " 12kΩ |
| R6044 | J02245223 | " " " " 22kΩ |
| R6025 | J02245393 | " " " " 39kΩ |
| | | |
| | | |
| | | **CAPACITOR** |
| C6025 | K06179004 | Ceramic disc 50WV UJ 20pF (DD104UJ200J50V) |
| C6021 | K06175270 | " " " " 27pF (ECC-D1H270JU) |
| | | |

| | | |
|---|---|---|
| C6002,6004,6006, 6008,6010,6012 | K06179006 | Ceramic disc 50WV UJ 30pF (DD104UJ300J50V) |
| C6037,6038 | K02175101 | " " " CH 100pF (DD107CH101J50V) |
| C6014,6015,6026 | K02175151 | " " " " 150pF (DD109CH151J50V) |
| C6001 | K10179024 | " " " " 0.01μF (CDS080XB103K50) |
| C6031,6033–6036 | K19149021 | " " 25WV 0.047μF (UAT08X473K-45AE) |
| | | |
| | | |
| | | **TRIMMER CAPACITOR** |
| TC6001–6007 | K91000028 | ECV1ZW 10x53N 10pF |
| | | |
| | | |
| | | **INDUCTOR** |
| L6001,6002 | L1190016 | FL5H-101K 100μH |
| | | |
| | | |
| | | **TRANSFORMER** |
| T6001 | L0020569 | |
| T6002 | L0020187 | |
| | | |
| | | |
| | | **MINI CONNECTOR** |
| P6005 (with wire) | T9204204 | 5251-02 |
| P6007 ( " ) | T9204206 | 5251-12 |
| P6019 ( " ) | T9204217 | 5251-02 |
| P6024 ( " ) | T9204220 | 5251-02 |
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## 10W PA UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2149A | F0002149B | Printed Circuit Board |
| | C021492A | P.C. Board with components |
| | | |
| | | |
| | | **TRANSISTOR** |
| Q7004 | G3408820Q | 2SD882Q |
| Q7001 | G3321660 | 2SC2166 |
| Q7002,7003 | G3325090 | 2SC2509 |
| Q7005 | G1090080 | μPC78L08 |
| | | |
| | | **DIODE** |
| D7001 | G2090217 | Zener HZ3C1 |
| D7002 | G9090017 | Varistor MV-11 |
| | | **RESISTOR** |
| R7004 | J10276279 | Carbon Composition 1/2W GJ 2.7Ω |
| R7008,7010 | J10276150 | " " " " 15Ω |
| R7007 | J10276390 | " " " " 39Ω |
| R7005 | J01245102 | Carbon film 1/4W TJ 1kΩ |
| R7009,7011 | J10276151 | " Composition 1/2W GJ 150Ω |
| R7015 | J02245221 | " film 1/4W SJ 220Ω |
| R7002 | J01245271 | " " " TJ 270Ω |
| R7001 | J01245331 | " " " " 330Ω |
| R7014 | J02245331 | " " " SJ 330Ω |
| R7003 | J01245821 | " " " TJ 820Ω |
| R7006 | J10276102 | " Composition 1/2W GJ 1kΩ |

| | | |
|---|---|---|
| | | **THERMISTOR** |
| | G9090008 | 31D26 1kΩ |
| | | |
| | | |
| | | **POTENTIOMETER** |
| VR7001 | J51727471 | H1021A305-470B 470ΩB |
| | | |
| | | |
| | | **CAPACITOR** |
| | K30276680 | Dipped mica 500WV 68pF (LCQ12680K5) |
| C7015,7016 | K30276221 | " " " 220pF (LCQ17221K5) |
| C7026 | K30276681 | " " " 680pF (LCQ17681K5) |
| C7018 | K10176102 | Ceramic disc 50WV 0.001μF (DD104B102K50V) |
| C7002 | K10179038 | " " " 0.0047μF (DD108B472K50V) |
| C7010 | K10179024 | " " " 0.01μF (CDS080XB103K50) |
| C7001,7003,7005, 7006,7007,7009, 7011,7013,7014, 7019,7023,7025, 7027,7028 | K13179009 | " " " 0.047μF (DD110F473Z50V) |
| C2020,2021 | K50177154 | Mylar " 0.15μF (50F2U154M) |
| C7004,7024 | K40129004 | Electrolytic 16WV 10μF (16RE10) |
| C7008,7012 | K40129008 | " " 33μF (16RE33) |
| C7022 | K40129007 | " " 100μF (16RE100) |
| | | |
| | | |
| | | **INDUCTOR** |
| L7002 | L1190009 | FL4H-3R3M 3.3μH |
| L7001 | L1190027 | FL5H-390K 39μH |
| L7003,7006 | L1020032 | |
| L7004 | L1020015 | |
| L7005 | L1020666 | |
| | | |
| | | |
| | | **TRANSFORMER** |
| T7001 | L0020789A | |
| T7002 | L0020833A | |
| T7003 | L0020834A | |
| | | |
| | | |
| | Q5000011 | Wrapping terminal C |
| | | |
| | | |
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## 50W PA UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2013B | F0002013B | Printed Circuit Board |
| | C020136A | P.C. Board with components |
| | | |
| | | |
| | | **IC** |
| Q8006 | G1090294 | μPC7808H |
| | | |
| | | |
| | | **TRANSISTOR** |
| Q8001 | G3315890 | 2SC1589 |

| | | |
|---|---|---|
| Q8004,8005 | G3322900O/R | 2SC2290-O/R |
| Q8002,8003 | G3323950O/R | 2SC2395-O/R |
| Q8007 | G3402880K | 2SD288K |
| | | |
| | | **DIODE** |
| D8002–8005 | G2090002 | Si 10D10 |
| D8001 | G2090217 | Zener HZ3C1 |
| | | |
| | | **RESISTOR** |
| R8009,8011 | J10276159 | Carbon composition 1/2W GJ 1.5Ω |
| R8006 | J10276479 | " " " " 4.7Ω |
| R8007,8019,8020 | J10276180 | " " " " 18Ω |
| R8012,8013 | J10276240 | " " " " 24Ω |
| R8002 | J02245330 | " film 1/4W SJ 33Ω |
| R8010 | J10276390 | " composition 1/2W GJ 39Ω |
| R8001 | J02245121 | " film 1/4W SJ 120Ω |
| R8014,8015 | J10276151 | " composition 1/2W GJ 150Ω |
| R8024 | J02245271 | " film 1/4W SJ 270Ω |
| R8003,8004 | J10276331 | " composition 1/2W GJ 330Ω |
| R8008 | J10276102 | " " " " 1kΩ |
| R8005 | J01245152 | " film 1/4W TJ 1.5kΩ |
| R8017,8021,8022, 8023 | J21339001 | Metallic film 2W NJ 39Ω |
| | J21339002 | " " " " 68kΩ |
| | | **POTENTIOMETER** |
| VR8001 | J51727222 | H1021A309-2.2KB 2.2kΩB |
| | | |
| | | **CAPACITOR** |
| | K30279024 | Dipped mica 500WV 56pF (DM15D560K5) |
| C8044 | K30275121 | " " " 91pF (LCQ17121J5) |
| C8043 | K30279122 | " " " 470pF (DM15D471J5) |
| | K30279045 | " " " 560pF (DM19D561K5) |
| | K30279046 | " " " 620pF (DM19D621K5) |
| C8028,8033 | K30279049 | " " " 820pF (DM19D821K5) |
| | K30279118 | " " " 5000pF (DM19D502J5) |
| C8005,8006 | K10176472 | Ceramic disc 50WV 0.0047μF (DM203YB472K5L5) |
| C8002,8010,8011, 8016,8036 | K10179024 | " " " 0.01μF (CDS080XB103K50) |
| C8001,8003,8007, 8008,8012,8014, 8017,8019,8021, 8023 8026,8030, 8031 | K13179009 | " " " 0.047μF (DD1.0F473Z50V) |
| C8037 | K19179001 | " " " 0.1μF (RSB305YF104Z6L5) |
| C8004,8009 | K23170002 | " chip " 0.1μF (GR43R5V104Z50V09) |
| C8040,8041 | K50177683 | Mylar " 0.068μF (50F2U683M) |
| C8022 | K70120006 | Tantalum 16WV 3.3μF (489D335X0016B1) |
| C8013,8015,8019, 8020,8024,8025, 8042 | K70120002 | Tantalum 16WV 10μF (489D106X0016C1) |
| C8038 | K40169003 | Electrolytic 35WV 330μF (35RE330) |
| | | |
| | | **INDUCTOR** |
| L8001–8004 | L1020035A | |
| L8005,8007 | L1020015 | |
| L8006 | L1020395A | |
| | | |
| | | **TRANSFORMER** |
| T8001 | L0020289A | |
| T8002 | L0021490 | |
| T8003 | L0021284 | |
| | | |
| | | |
| | Q5000011 | Wrapping terminal C |
| | | |
| | | |
| | R5067900 | HEAT SINK |

## 100W PA UNIT

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2013B | F0002013B | Printed Circuit Board |
| | C020132A | P.C. Board with components |
| | | |
| | | **IC** |
| Q9006 | G1090294 | μPC7808H |
| | | |
| | | **TRANSISTOR** |
| Q9001 | G3315890 | 2SC1589 |
| Q9004,9005 | G3322900 | 2SC2290 |
| Q9002,9003 | G3323950O/Y | 2SC2395 |
| Q9007 | G3402880K | 2SD288K |
| | | |
| | | **DIODE** |
| D9002–9005 | G2090002 | Si 10D10 |
| D9001 | G2090217 | Zener HZ3C1 |
| | | |
| | | **RESISTOR** |
| R9009 | J10276159 | Carbon composition 1/2W GJ 1.5Ω |
| R9006 | J10276479 | " " " " 4.7Ω |
| R9007,9019,9020 | J10276180 | " " " " 18Ω |
| R9012,9013 | J10276240 | " " " " 24Ω |
| R9002 | J02245330 | " " " " 33Ω |
| R9010 | J10276390 | " " " " 39Ω |
| R9001 | J02245121 | " film 1/4W SJ 120Ω |
| R9014,9015 | J10276121 | " composition 1/2W GJ 120Ω |
| R9024 | J02245271 | " film 1/4W SJ 270Ω |
| R9003,9004 | J10276331 | " composition 1/2W GJ 330Ω |
| R9008 | J10276102 | " " " " 1kΩ |

| | | |
|---|---|---|
| R9005 | J01245152 | Carbon film 1/4W TJ 1.5kΩ |
| R9017,9021,9022 | J21339001 | Metallic " 2W NJ 39Ω |
| R9023 | J21339002 | " " " " 68Ω |
| | | |
| | | **POTENTIOMETER** |
| VR9001 | J51727222 | H1021A309-2.2KB 2.2kΩB |
| | | |
| | | **CAPACITOR** |
| C9035 | K30279024 | Dipped mica 500WV 56pF (DM15D560K5) |
| C9044 | K30275910 | " " " 91pF (LCQ12910J5) |
| C9032,9034 | K30279122 | " " " 470pF (DM15D471J5) |
| C9043 | K30279045 | " " " 560pF (DM19D561K5) |
| C9033 | K30279046 | " " " 620pF (DM19D621K5) |
| C9028 | K30279092 | " " " 720pF (DM19D751J5) |
| C9027,9029 | K30279118 | " " " 5000pF (DM19D502J5) |
| C9005,9006 | K10179038 | Ceramic disc 50WV 0.0047μF (DD108B472K50V) |
| C9002,9010,9011, 9016,9036 | K10179024 | 0.01μF (DSX080XB103K50) |
| | | |
| | | |
| C9001,9003,9007, 9008,9012,9014, 9017,9019,9021, 9023,9026,9030, 9031 | K13179009 | " " " 0.047μF (DD110F473Z50V) |
| C9037 | K19179001 | " " " 0.1μF (RSB305YF104Z6L5) |
| C9004,9009 | K23170002 | " chip " 0.1μF (GR43Y5V104Z50V09) |
| C9040,9041 | K50177683 | Mylar " 0.068μF (50F2U683M) |
| C9039 | K50177104 | " " 0.1μF (50F2U104M) |
| C9022 | K70120006 | Tantalum 16WV 3.3μF (489D335X0016B1) |
| C9013,9015,9018, 9020,9024,9025, 9042 | K70120002 | " " 10μF (489D106X0016C1) |
| C9038 | K40169003 | Electrolytic 35WV 330μF (35RE330) |
| | | |
| | | **INDUCTOR** |
| L9001–9004 | L1020035A | |
| L9005,9007 | L1020015 | |
| L9006 | L1020395A | |
| | | |
| | | |
| | | **TRANSFORMER** |
| T9001 | L0020289A | |
| T9002 | L0020631B | |
| T9003 | L0020632 | |
| | | |
| | | |
| | Q5000011 | Wrapping terminal C |
| | | |
| | R4056950 | HEAT SINK |

| | | |
|---|---|---|
| | | **MOTOR** |
| | M2190004 | MDN-7R1 DC13.5V |
| | R3056970 | RADIAL FAN |
| | | **THERMAL GUARD** |
| TS9001 | N7090025 | OHD-60M |
| | | |

## CRYSTAL OVEN

*** * * * * CRYSTAL OVEN CHASSIS * * * * ***

| Symbol No. | Part No. | Description |
|---|---|---|
| | | **TRANSISTOR** |
| Q301,302 | G340717O | 2SD717-0 |
| | or | |
| | G3410640Q/R | 2SD1064Q/R |
| | | **THERMISTOR** |
| TH301 | G9090018 | PSB-S1 PB-46 |

*** * * * * OVEN CONTROL UNIT * * * * ***

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2230 | F0002230 | Printed Circuit Board |
| | C022301A | P.C. Board with components |
| | | |
| | | **IC** |
| Q401 | G1090353 | μPC151A |
| | | |
| | | **TRANSISTOR** |
| Q402 | G3319590Y | 2SC1959-Y |
| | | |
| | | **DIODE** |
| D401,402 | G2090188 | Zener HZ5C1 |
| | | |
| | | **RESISTOR** |
| R401–403 | J20249215 | Metallic film 1/4W 3.92kΩ |
| R406 | J01245331 | Carbon " " TJ 330Ω |
| R405 | J01245103 | " " " " 10kΩ |
| R404 | J01245273 | " " " " 27kΩ |
| R407 | J01245155 | " " " " 1.5MΩ |
| | | |
| | | **CAPACITOR** |
| C403, 404,406 | K12171102 | Ceramic disc 50WV 0.001μF (DD104E102P50V) |
| C402,405 | K13179008 | " " " 0.01μF (DD106F103Z50V) |
| C401 | K70120002 | Tantalum 16WV 10μF (489D106X0016C1) |

*** * * * * HEATER UNIT * * * * ***

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2231 | F0002231 | Printed Circuit Board |
| | C022311A | P.C. Board with components |

| | | DIODE | |
|---|---|---|---|
| D501 | G2090002 | Si | 10D10 |
| | | | |
| | | | |
| | | RESISTOR | |
| R503,504 | J20279007 | Metallic film | 1/2W NJ 0.39Ω |
| R502 | J01245180 | Carbon " | 1/4W TJ 18Ω |
| R501 | J10276391 | " Composition | 1/2W GK 390Ω |
| | | | |
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**★★★★★ CARRIER/LOCAL OSC UNIT–2 ★★★★★**

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2268B | F0002268B | Printed Circuit Board |
| (9.1MHz) | C022682B | P.C. Board with components without crystals |
| (10.7MHz) | C022682A | |
| | | |
| | | FET |
| Q604 | G3801921G | 2SK192AGR |
| | | |
| | | |
| | | TRANSISTOR |
| Q601–603 | G3319230R | 2SC1923R |
| | | |
| | | |
| | | DIODE |
| D601–608,610, 612 | G2090027 | Si 1SS53 |
| D611 | G2010093 | Ge (GB) 1N270 |
| D609 | G2022080 | Varactor 1S2208 |
| | | |
| | | |
| | | CRYSTAL |
| X601–606 | H0102390 | HC-42/u LOCAL (75°C) |
| X607 | H0102730 | HC-42/u 10.7MHz (75°C) |
| | | |
| | | |
| | | CRYSTAL SOCKET |
| XS601–607 | P3090002 | SD0105 |
| | | |
| | | |
| | | RESISTOR |
| R635,637 | J02245330 | Carbon film 1/4W SJ 33Ω |
| R639 | J02245470 | " " " " 47Ω |
| R619 | J02245680 | " " " " 68Ω |
| R616,617,620, 630,632,643 | J02245101 | " " " " 100Ω |
| R618,636 | J02245271 | " " " " 270Ω |
| R614,615,629, 631,633 | J02245102 | " " " " 1kΩ |
| R640,642 | J02245222 | " " " " 2.2kΩ |
| R641 | J02245272 | " " " " 2.7kΩ |
| R613,627 | J02245392 | " " " " 3.9kΩ |
| R601–612, 621–624 | J02245472 | " " " " 4.7kΩ |
| R626,628 | J02245103 | " " " " 10kΩ |
| R645,646 | J02245123 | " " " " 12kΩ |
| R644 | J02245223 | " " " " 22kΩ |
| R625 | J02245393 | " " " " 39kΩ |
| | | |
| | | |
| | | |

| | | CAPACITOR |
|---|---|---|
| C625 | K02179008 | Ceramic disc 50WV CH 20pF (DD104CH200J50V) |
| C621 | K02179011 | " " " " 27pF (DD104CH27J50V) |
| C602,604,606, 608,610,612 | K02179012 | " " " " 30pF (DD105CH300J50V) |
| C627 | K02179018 | " " " " 75pF (DD107CH750J50V) |
| C637,638 | K02175101 | " " " " 100pF (DD107CH101J50V) |
| C614,615,626 | K02175151 | " " " " 150pF (DD109CH151J50V) |
| C601,603,605, 607,609,611, 613,616–620, 622–624, 628–630,632 | K10179024 | " " " " 0.01μF (CDS080XB103K50) |
| C631,633–636 | K19149021 | " " 25WV 0.047μF (UAT08X473K-L45AE) |
| | | |
| | | |
| | | TRIMMER CAPACITOR |
| TH601–607 | K91000028 | ECV-1ZW-10x53N 10pF |
| | | |
| | | |
| | | INDUCTOR |
| L601,602 | L1190016 | FL5H-101K 100μH |
| | | |
| | | |
| | | TRANSFORMER |
| T601 | L0020569 | |
| T602 | L0020187 | |
| | | |
| | | |
| | | MINI CONNECTOR |
| P605 (with wire) | T9204204 | 5251-02 |
| P607 ( " ) | T9204206 | 5251-12 |
| P619 ( " ) | T9204217 | 5251-02 |
| P624 ( " ) | T9204220 | 5251-02 |
| P640 ( " ) | T9204253 | SMP-03V-B |

## ACCESSORIES

| Symbol No. | Part No. | Description |
|---|---|---|
| | M3090026 | Microphone assembly YM-36 |
| | P1090164 | (Microphone plug FM-148P) |
| | P0090021 | Antenna plug MP-5 |
| | P0090007 | Phone plug SH-3010 |
| | P0090034 | Ext. speaker plug P2240 |
| (FT-180) | P1090164 | ACC plug FM-148P |
| (FT-180A) | P0090078 | ACC Plug SC-12CM |
| (FT-180A) | P0090128 | Remote CNTR P-1620BA-CA |
| | | FUSE |
| | Q0000012 | 6A (10W TYPE) |
| | Q0000008 | 15A (50W TYPE) |
| | Q0000009 | 20A (100W TYPE) |
| | | |
| | | DC POWER CORD |
| (FT-180) | T9013606A | (10W model) |
| (FT-180) | T9013615A | (50W model) |
| (FT-180) | T9013620A | (100W model) |
| (FT-180) | P1090257 | (Power plug RB19P4F) |
| (FT-180) | Q20000001 | (Fuse holder SN-1101) |
| (FT-180A) | T9006806 | 10W model |
| | T9006815 | 50W model |
| | T9006820 | 100W model |

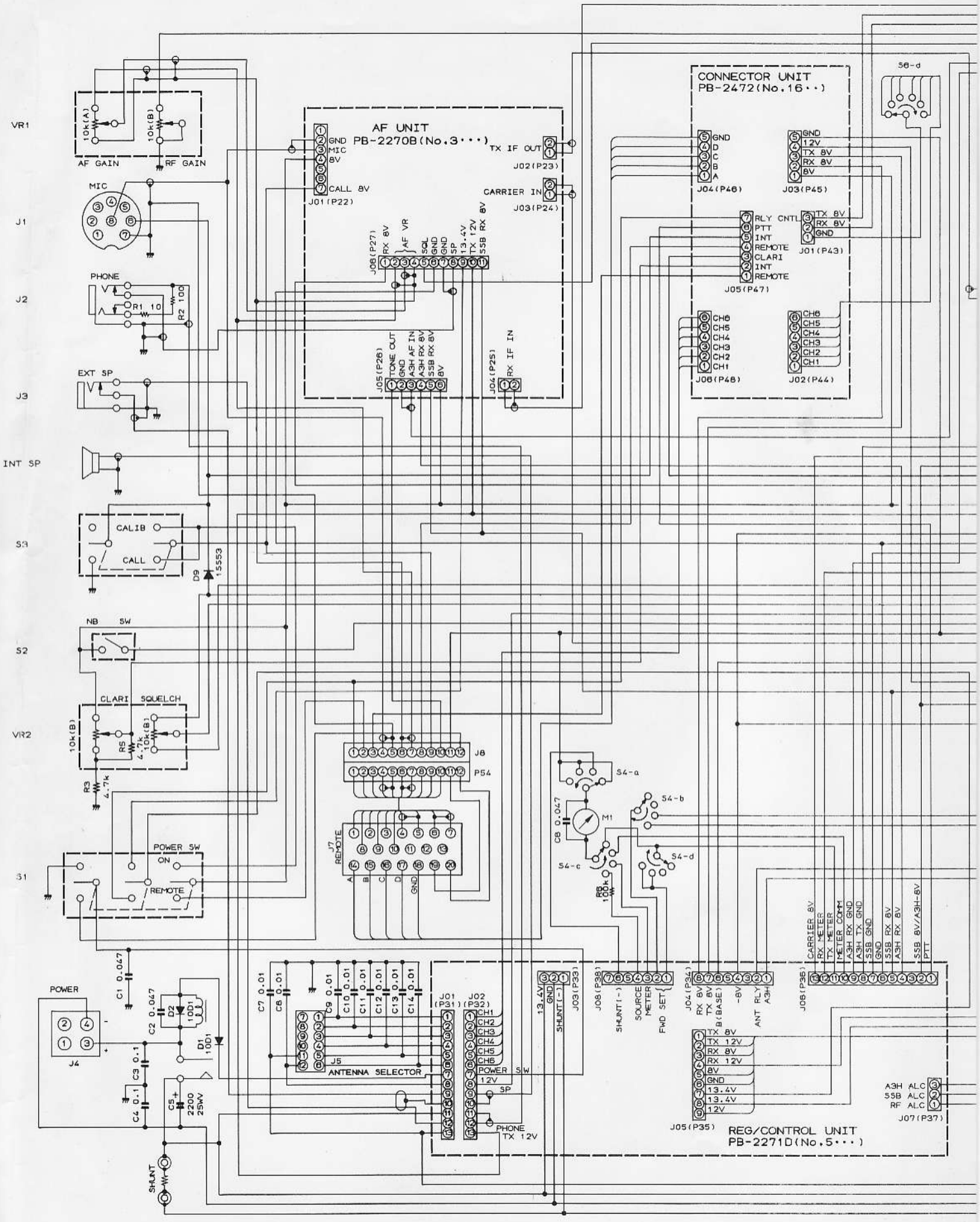
## CONNECTOR UNIT

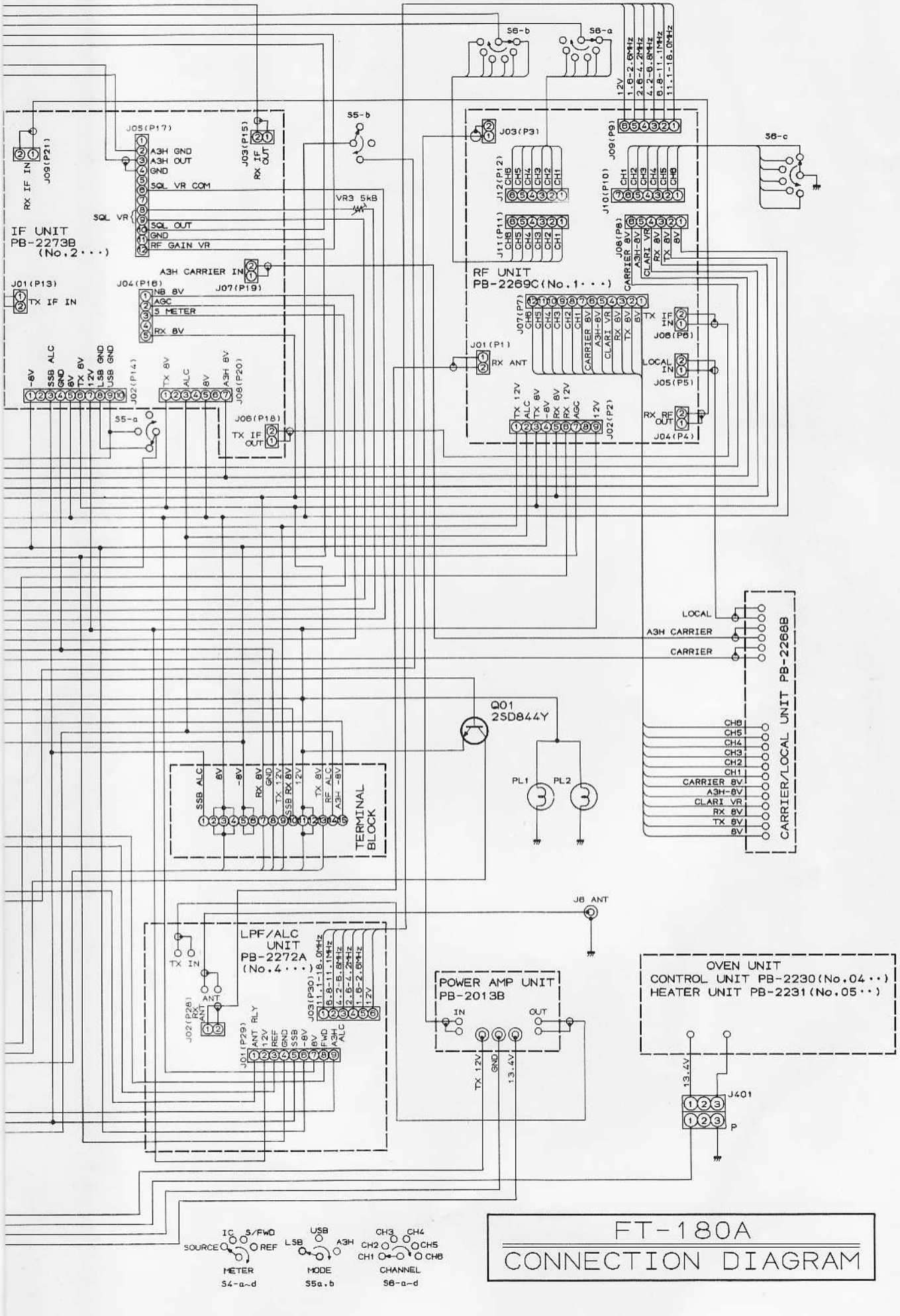
| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2472 | F0002472 | Printed Circuit Board |
| | C024720A | PCB with Components |
| | | |
| | | |
| | | **CONNECTOR** |
| J1601 | P0090219 | 5045-03A |
| J1602,1606 | P0090222 | 5045-06A |
| J1603,1604 | P0090221 | 5045-05A |
| J1605 | P0090223 | 5045-07A |

| | | |
|---|---|---|
| J701,702,708 | P0090221 | 5045-05 |
| J704,706,707 | P0090222 | 5045-06 |
| J703,705 | P0090223 | 5045-07 |
| | | |
| | | **CHANNEL SWITCH** |
| | N0190122 | 1-1-6 GS (BCD) with P52 |
| | | |
| | | **CONNECTION CABLE** |
| | T9204645 | P49-P10 |
| | T9204646 | P50-P11/P51-P12 |

## FH-180 REMOTE CONTROL MODIFICATION KIT (Option)

| Symbol No. | Part No. | Description |
|---|---|---|
| PB-2473 | F0002473 | Printed Circuit Board |
| | C0247301 | PCB with Components |
| | | |
| | | |
| | | **IC** |
| Q701 | G1090213 | SN74LS158N |
| Q702 | G1090004 | SN7445N |
| Q703 | G1090133 | MSM4049RS |
| Q704 | G1090094 | μPA2004C |
| Q706 | G1090084 | 78L05 |
| | | |
| | | |
| | | **TRANSISTOR** |
| Q705,707 | G3318150Y | 2SC1815Y |
| Q708–719 | G3109500O | 2SA950-O |
| | | |
| | | |
| | | **DIODE** |
| D702–707,714 | G2090027 | Si 1SS53 |
| D708–713,717 | G2090001 | " 10D1 |
| D701 | G2090155 | Zener RD9.1EB2 |
| | | |
| | | |
| | | **RESISTOR** |
| R711 | J20306470 | Metallic film 1W 47Ω |
| R701–709, 720–743 | J02245222 | Carbon " 1/4W SJ 2.2kΩ |
| R710 | J02245332 | " " " " 3.3kΩ |
| R713–719 | J02245103 | " " " " 10kΩ |
| R712 | J02245223 | " " " " 22kΩ |
| | | |
| | | |
| | | **CAPACITOR** |
| C706 | K13179008 | Ceramic 50WV F 0.01μF (DD106F103Z50V) |
| C701–704 | K13179009 | " " " 0.047μF (DD110F473Z50V) |
| C705,707 | K40129004 | Electrolytic 16WV 10μF (16RE10) |
| | | |
| | | |
| | | **RELAY** |
| RL701 | M1190015 | G2V-2 |


AF UNIT
PB-2270B(No.3···)
CONNECTOR UNIT
PB-2472(No.16··)
REG/CONTROL UNIT
PB-2271D(No.5···)
AF GAIN
RF GAIN
MIC
PHONE
EXT SP
INT SP
CALIB
CALL
NB SW
CLARI
SQUELCH
POWER SW
ON
REMOTE
POWER
ANTENNA SELECTOR
TX IF OUT
CARRIER IN
J01(P22)
J02(P23)
J03(P24)
J04(P25)
J05(P26)
J06(P27)
J04(P48)
J03(P45)
J05(P47)
J01(P43)
J06(P48)
J02(P44)
J05(P35)
J07(P37)
J08(P38)
J04(P34)
J06(P36)
J8
P54
J7
REMOTE
J5
J4
SHUNT
S1
S2
S3
VR1
VR2
J1
J2
J3
M1
S4-a
S4-b
S4-c
S4-d
D9
1S553
D1
D2
1OD1
C1 0.047
C2 0.047
C3 0.1
C4 0.1
C5 2200 25WV
C6 0.01
C7 0.01
C8 0.047
C9 0.01
C10 0.01
C11 0.01
C12 0.01
C13 0.01
C14 0.01
R1 10
R2 100
R3 4.7k
R5 4.7k
R6 10k
10k(A)
10k(B)
GND
MIC
8V
CALL 8V
TX 12V
RX 8V
SSB RX 8V
AF VR
SQL
SP
TONE OUT
A3H AF IN
A3H RX 8V
SSB RX 8V
RX IF IN
RLY CNTL
PTT
INT
REMOTE
CLARI
CH1
CH2
CH3
CH4
CH5
CH6
TX 8V
RX 8V
12V
13.4V
GND
SHUNT(-)
SOURCE
METER
FWD SET
RX METER
TX METER
METER COMM
A3H RX GND
A3H TX GND
SSB GND
SSB RX 8V
A3H RX 8V
SSB 8V/A3H-8V
PTT
CARRIER 8V
A3H ALC
SSB ALC
RF ALC
PHONE
TX 12V
POWER SW
SP


IF UNIT
PB-2273B
(No.2···)
RF UNIT
PB-2269C(No.1···)
LPF/ALC
UNIT
PB-2272A
(No.4···)
POWER AMP UNIT
PB-2013B
OVEN UNIT
CONTROL UNIT PB-2230(No.04··)
HEATER UNIT PB-2231(No.05··)
CARRIER/LOCAL UNIT PB-2268B
TERMINAL
BLOCK
Q01
2SD844Y
PL1
PL2
VR3 5kB
S5-a
S5-b
S6-a
S6-b
S6-c
J6 ANT
J401
FT-180A
CONNECTION DIAGRAM