INSTRUCTION MANUAL

FT-680R

YAESU MUSEN CO., LTD.

TOKYO JAPAN

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FT-680R
MICROPROCESSOR CONTROLLED
6 METER ALL—MODE TRANSCEIVER

GENERAL DESCRIPTION

The FT-680R is a revolutionary, high performance SSB, AM, FM, and CW transceiver for the most demanding 6-meter operator. Controlled by a NMOS 4-bit microprocessor, the FT-680R features full PLL synthesis in 10 Hz, 100 Hz, 1 kHz, 20 kHz, and 100 kHz steps. The extremely compact size of the FT-680R makes this model particularly well suited for mobile use.

The microprocessor chip allows never-before-possible operating flexibility. As many as four memory channels may be programmed to your favorite frequencies, and by switching to the MEMORY SCAN position, all four memory channels will be scanned.

Digital display of the operating frequency is provided. The front panel meter consists of a string of bright LED's, for easy monitoring of the received signal strength and transmit output.

The standard microphone features the normal PTT switch, up/down scanning controls plus a tone call button for repeater operation.

Among the convenience features of your FT-680R are receiver offset tuning for CW, AM and SSB, and a digitally synthesized dual VFO system.

We recommend that you read this manual in its entirety, so as to derive maximum benefit from your new FT-680R, an exciting breakthrough from the communications experts . . . Yaesu.

SPECIFICATIONS

GENERAL

Frequency coverage:
50.00000–53.99999 MHz

Modes of operation:
SSB (USB), CW, AM and FM

Synthesizer steps:

SSW, AM, CW	10 Hz, 100 Hz, 1 kHz
FM	1 kHz, 20 kHz, 100 kHz

Power requirements:
13.8 volts DC, negative ground

Current consumption:
DC 0.5 amps receive
DC 3.0 amps transmit

Antenna impedance:
50 ohms

Case size:
60 (H) x 180 (W) x 240 (D) mm

Weight:
Approx. 2.9kg

TRANSMITTER

Power input:

SSB	20 watts PEP
FM/CW	20 watts DC
AM	8 watts DC

Carrier suppression:
Better than 40 dB

Unwanted sideband suppression:
Better than 40 dB

Spurious emission (SSB):
At least 60 dB down

Frequency response:
300–2700 Hz (–6 dB)

FM Deviation:
±5 kHz

Microphone impedance:
600 ohms

RECEIVER

Sensitivity:

SSB, CW	0.5 μV for 20 dB S/N
FM	0.35 μV for 20 dB QS
AM	1.0 μV for 10 dB S/N (@ 400 Hz, 30% MOD)

Selectivity:

SSB, CW	2.4 kHz at 6 dB down
	4.1 kHz at 60 dB down
FM	14 kHz at 6 dB down
	25 kHz at 60 dB down
AM	4 kHz at 6 dB down
	15 kHz at 60 dB down

Image response:
Better than –60 dB

Audio output impedance:
8 ohms nominal

Audio output:
2.0 watts @ 10% THD

SEMICONDUCTORS

IC:

MC1496G	1
MC14011B	4
MC14560B	2
MC14028B	1
MC14069B	1
MC14002B	1
μA78L05	3
μPC7808H	1
μPC577H	1
μPC1037H	1
μPC2002V	1
μPC7805H	1
μPD4094B	3
μPD1511-11	1
TC9122P	2
TC5081P	2
TC5082P	2
SN16913P	2
SN76514N	1
HD10551	2
MB8718A	1
TA7612AP	1

FET:

2SK19TM-Y	1
2SK19TM-GR	3
3SK30AY	1
2SK51	1
3SK59Y	2
3SK73Y	8

Transistor:

2SA715C	1
2SA733P/Q	20
2SC535A	5
2SC535B	3
2SC732TM-BL	1
2SC733P	1
2SC945P	1
2SC945Q	37
2SC945K	1
2SC1383R	2
2SC1583	3
2SC1674L	2
2SC1815Y	5
2SC1815GR	3
2SC1945	1
2SC2002L	1
2SC2053	1
2SC2166	1
MPSA13	2

Diode:

1S188FM	18
1S1007	4
1S1555	1
1S2209	14
U05B	1
1SS53	92
10D1	3
MV104	2
HZ11B-1	1

LED:

TLG-205	2
TLR-205	2
TLR-226	3
TLY-226	2
TLG-226	5

FCD:

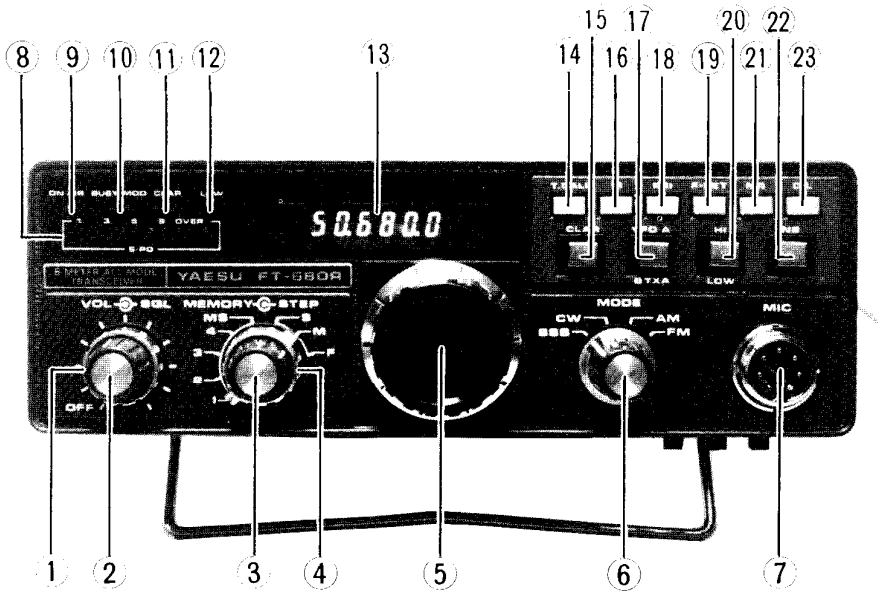
LD8231/F1P9C5	1

Specifications subject to change without notice or obligation.

ACCESSORIES

1.	Microphone	(M3090028)	1 ea.
2.	Power Cord	(T9002805)	1 ea.
3.	Spare Fuses (5A)	(Q0000005)	2 ea.
4.	Stand	(R0062300A)	1 ea.
5.	Miniature Phone Plug	(P0090034)	2 ea.
6.	Mobile Mounting Bracket	(R0062900)	1 ea.
7.	TONE IN Connector	(P0090174)	1 ea.

FRONT PANEL CONTROLS AND SWITCHES



The FT-680R has been designed for ease of operation. However, the operator may not be familiar with some controls since the FT-680R utilizes modern computer technology. Be sure you thoroughly understand the function of each control and indicator before operating the equipment.

(1) SQL

The squelch control quiets the receiver in the absence of a signal on FM. It should be set to the point where the background noise just disappears, in order to provide maximum sensitivity.

(2) VOL

This control is the main ON/OFF switch for the transceiver, and it also sets the audio output level to the speaker. Clockwise rotation increases the audio output level.

(3) STEP

The 3 positions of this switch control the tuning rate of the MAIN DIAL, as shown in Table 1.

STEP SWITCH POSITION	MAIN DIAL FREQUENCY COVERAGE PER STEP	
	SSB/AM/CW	FM
S	10 Hz	1 kHz
M	100 Hz	20 kHz
F	1 kHz	100 kHz

Table 1

(4) MEMORY

This switch selects the MS mode (Memory Scan) or one of the four frequencies that the operator has programmed into memory. Memory scan control is exercised via the UP/DOWN switches on the microphone.

(5) MAIN TUNING KNOB

The tuning knob is used to control the receive and transmit frequencies over the entire 6 meter amateur band. It is activated when the DIL button is pushed.

When the transceiver is initially turned on, the display will indicate 50.000.0 MHz , and the dial may be turned from that point to the desired operating frequency.

(6) MODE

This switch selects the mode of operation: SSB (Single Sideband), AM (Amplitude Modulation), CW (code operation), and FM (frequency modulation).

(7) MIC

The MIC jack is used for the microphone input, PTT control, and scanner control lines.

(8) S/PO

A string of LEDs provides indication of signal strength and relative power output.

(9) ON AIR

This indicator lights up during transmission.

(10) BUSY/MOD

This indicator has a dual function: it will light up when the channel is occupied, or indicate modulation during FM transmissions.

(11) CLAR Indicator

This lamp lights when the clarifier switch is pushed.

(12) LOW

This lamp lights when the HI/LOW switch is in the LOW position.

(13) Digital Display

The digital display indicates the operating frequency. In the priority mode, the character "P" will be illuminated at the far right-hand side of the window. Also, memory channels will be indicated for easy frequency reference.

(14) T.CALL

When this switch is pushed, the PTT line will close, and an 1800 Hz tone will be transmitted for accessing repeaters.

(15) CLAR

The clarifier switch allows ±10 kHz offset of the receive frequency from the dial or memory frequency. Clarifier tuning is accomplished via the main tuning dial. When the CLAR switch is pushed, the scanning step selector should be set to 10 Hz or 100 Hz; if not, control will be returned to the main dial, with the clarifier being disabled.

(16) M (Memory)

This switch is used for programming a frequency into memory.

(17) VFO A/B TXA

This switch, when pressed, allows split operation using the two internal VFOs.

(18) PRI

While operating in the dial tuning mode, the PRIORITY switch allows scanning of the main dial and one of the memorized frequencies every 5 seconds. The SCAN switch controls the stopping of the scanner on a busy or clear channel.

(19) F.SET

This switch, when pressed, clears all digits of the operating frequency below the step frequency you are using.

(20) HI/LOW

This switch, when pressed, reduces the transmitter power from 10 watts to 1 watt RF output.

(21) MR (Memory Recall)

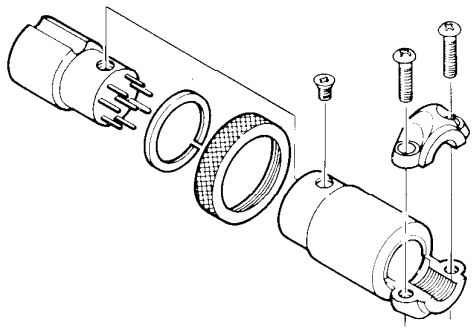
This button transfers frequency control from the main dial to the memory channels.

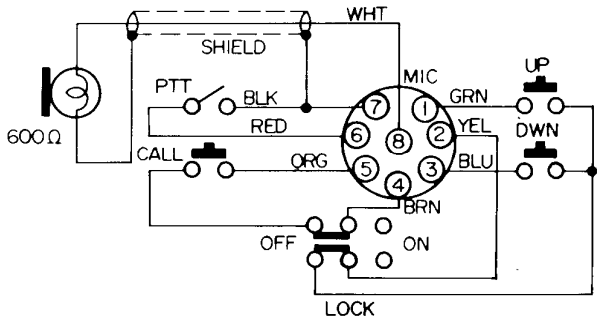
(22) NB (Noise Blanker)

This switch, when pressed, activates the noise blanker for minimizing pulse-type noise.

(23) DIL (Dial)

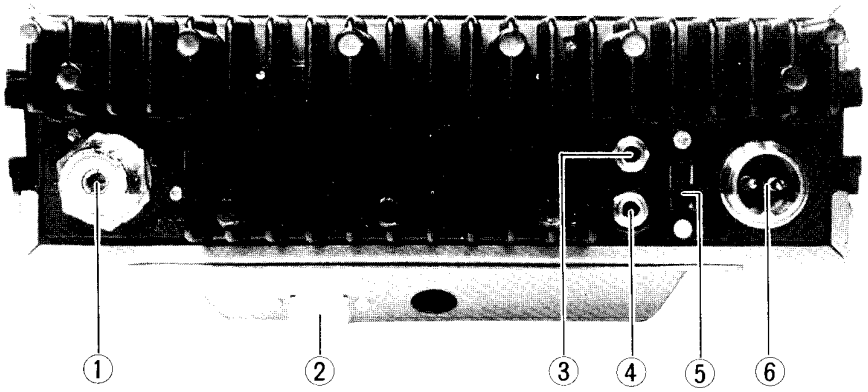
This switch, when pressed, transfers frequency control from the memory channels to the main tuning dial.





YM-40 MICROPHONE CONNECTIONS

REAR PANEL CONNECTIONS AND SWITCH



(1) ANT

This is the main antenna connector.

(2) TONE IN CONNECTOR

This connector is provided for the (optional) external FTS-64E Tone Encoder, which synthesizes 32 CTCSS or Tone-burst frequencies.

(3) KEY

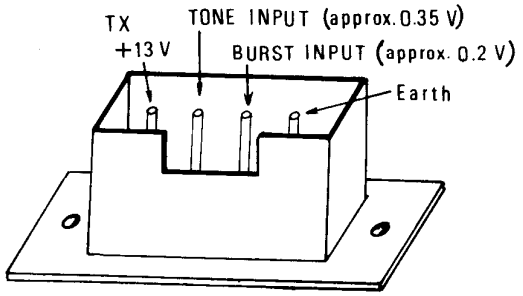
This is the key jack for CW operation.

(4) EXT SP

This is a miniature phone jack for connection to an external speaker. Insertion of a plug into this jack automatically cuts off the internal speaker.

(5) BACKUP

When this switch is placed in the ON position, and DC power is still connected to the POWER connector, the memory circuit will still be held in operating condition. If DC power is removed, though, the memorized frequency will be lost.

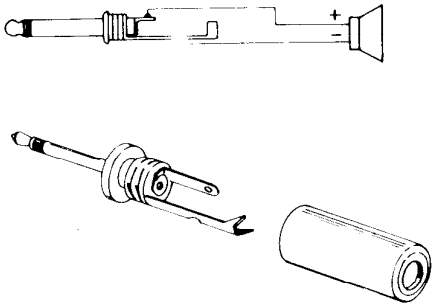


TONE IN CONNECTOR

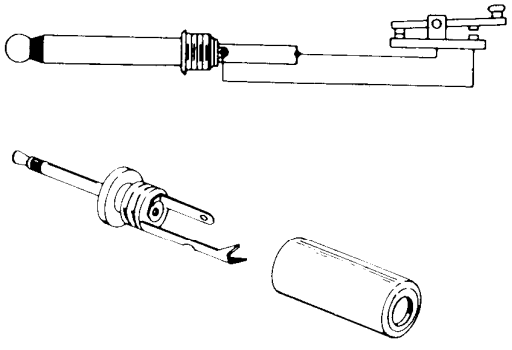
(6) POWER

This receptacle accommodates the power cord. A fuse rated at 5 amps is located in the power cord.

WHEN REPLACING FUSES, BE CERTAIN TO USE A FUSE OF 5 AMP RATING. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY USE OF AN IMPROPER FUSE.

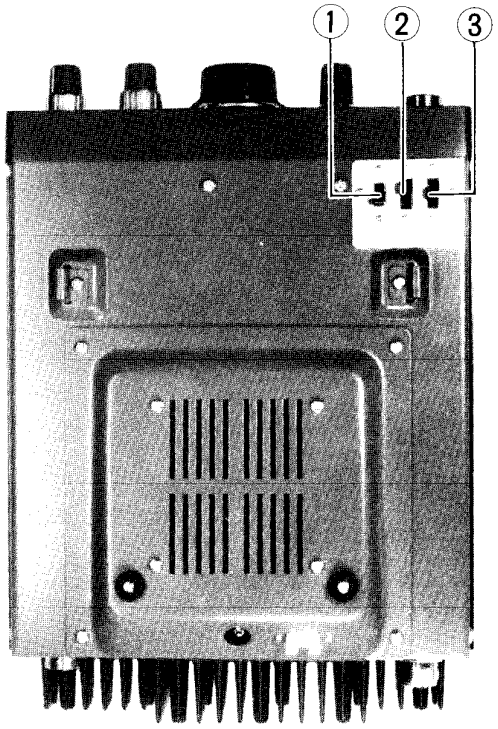


EXTERNAL SPEAKER CONNECTIONS



KEY CONNECTIONS

UNDERSIDE CABINET SWITCHES



(1) SAT (Satellite)

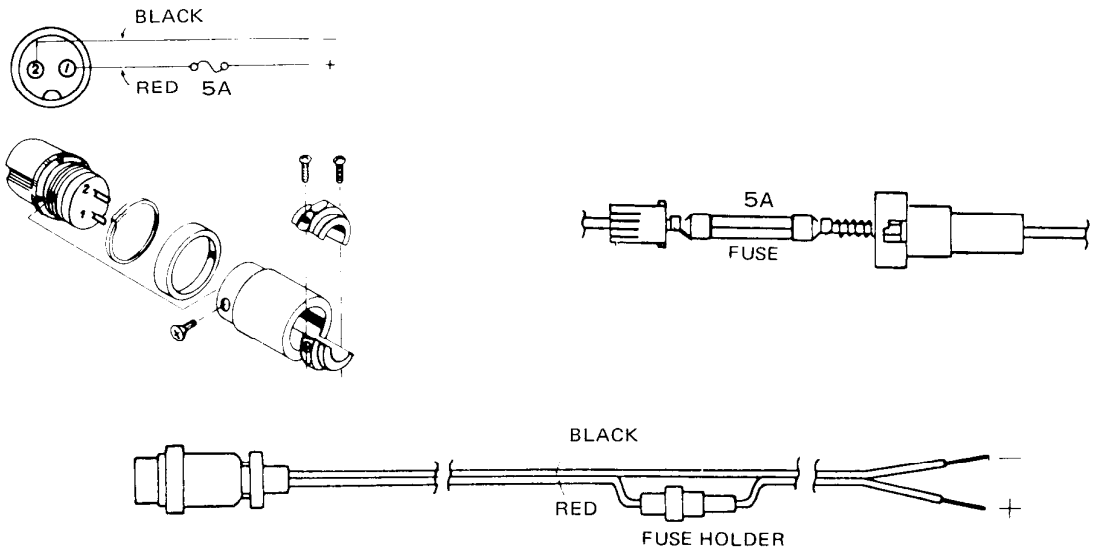
This switch allows the operating frequency to be changed while transmitting. This feature is useful especially for satellite operation, for it allows the operator to zero on the proper frequency within the satellite passband. Neither VFO A/B TXA nor the CLARIFIER function works when the SAT switch is placed in the ON position.

(2) SCAN

This switch will select scanning stop on a busy or clear channel in the FM mode. Manual scanning stop is also provided on all modes.

(3) RPT (Repeater)

The switch will shift the transmitting frequency +1 MHz or −1 MHz for repeater operation.



POWER CORD CONNECTIONS

INSTALLATION

ANTENNA CONSIDERATIONS

The FT-680R is designed for operation using an antenna presenting a 50 ohm resistive load. The automatic final transistor protection circuitry will reduce the power output to protect the transistors when a high antenna SWR is encountered. The SWR on the antenna should, if possible, be kept below 1.5 : 1 at all times to secure full output from the transceiver.

In most cases, coverage is a function of antenna height. The antenna for base station operation should be located as high and in the clear as possible. Vertical polarization is standard for FM communications in most areas, so be sure that your antenna is oriented appropriately. Popular antennas for base station use include the 5/8 wavelength vertical or one of the many stacked dipole arrays. For accessing repeaters a long distance away, a Yagi or other high gain directional array may be required.

Do not economize on coaxial cable, as much power can be wasted in lossy transmission line. For mobile use, the RG-58A/U type of coax may be used. To minimize loss, use the shortest length that is possible. For base stations, use type RG8A/U coaxial cable. For very long runs, type RG17A/U, aluminum-jacketed "foamflex" coax, or air dielectric "heliax" cable may be used.

The optional antenna duplexer AD-1 allows the operation on both 50 and 144 MHz using a single antenna (RSL-50 or RSL145).
See your Yaesu dealer.

MOBILE INSTALLATION

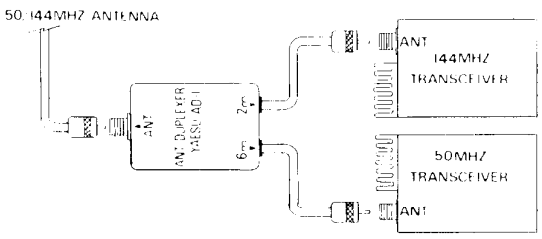
For mobile service, the FT-680R should be installed where the digital display, controls, and microphone are easily accessible for operation. The transceiver may be installed in any position without loss of performance. A suitable location would be atop the transmission tunnel. A universal bracket is supplied with your transceiver for mobile installation. Refer to Fig. 1 for mounting details.

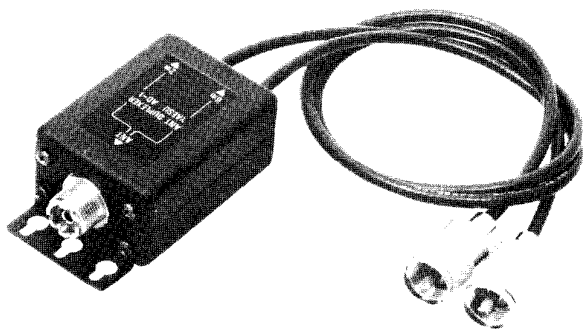
1. Use the universal mounting bracket as a template for positioning the mounting holes. Use a 3/16" diameter bit for drilling these holes, allowing clearance for the transceiver, its cables and microphone, and its controls. Secure the mounting bracket with the screws, washers, and nuts supplied, as shown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

2. Ease the transceiver into the guide rail, and slide it into the desired position. Tighten the knobs on the outside of the universal bracket to secure the transceiver.

3. The microphone hanger may be installed wherever convenient for access to the microphone.

Power connections should be made directly to the automobile battery. Routing through the cigarette lighter may cause the lighter fuse to blow if the fuse is not of sufficient rating. As well, connection directly to the battery allows the memory circuits to remain activated when the ignition is turned off, using the BACKUP switch.





AD-1 ANTENNA DUPLEXER

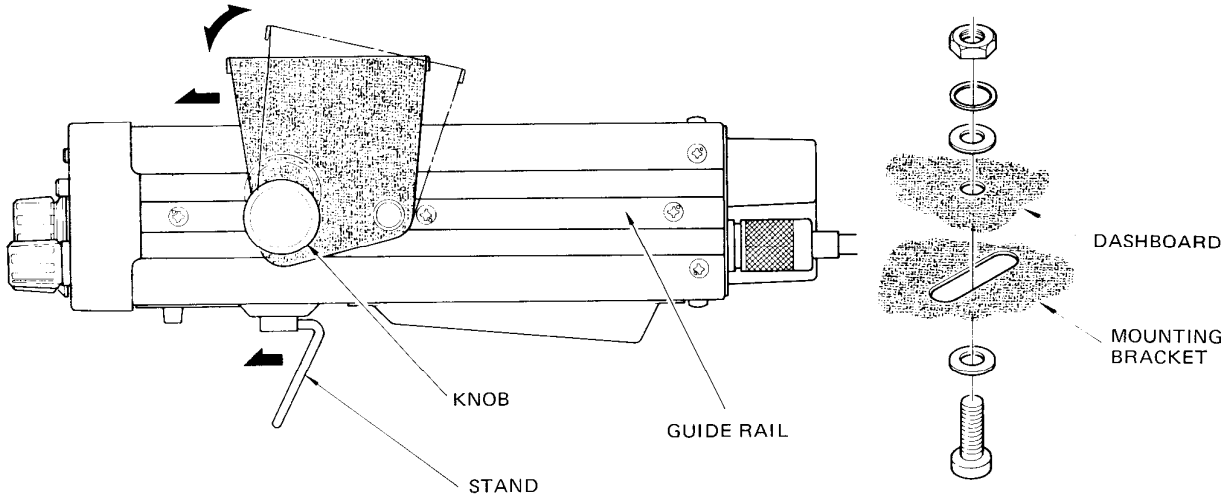


Figure 1

Connect the RED lead of the power cord to the POSITIVE (+) battery terminal, and connect the BLACK lead to the NEGATIVE (−) terminal. If it is necessary to extend the power cable, use #16 AWG insulated copper wire, and use the minimum length practicable to reduce voltage drop.

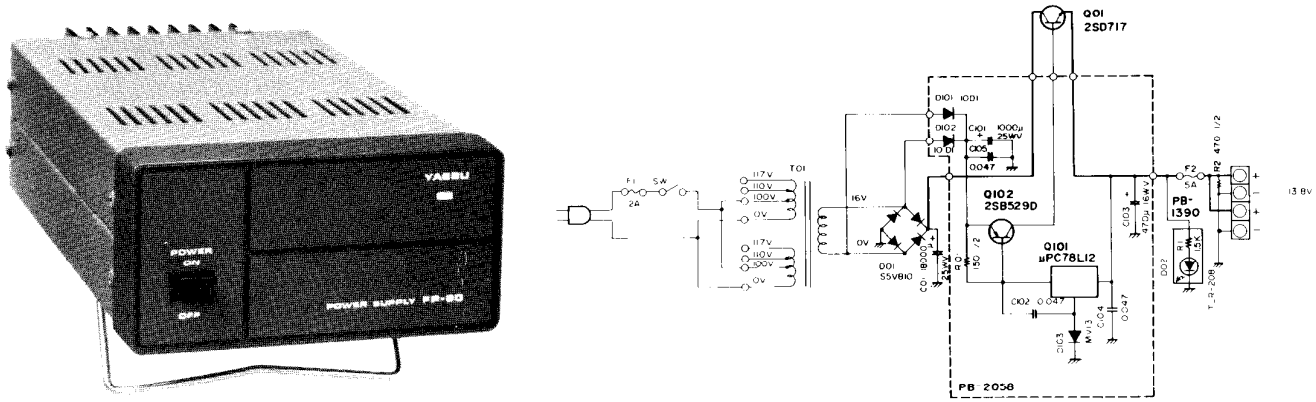
WARNING

NEVER APPLY AC POWER TO THE REAR PANEL POWER JACK OF THE TRANSCEIVER. NEVER CONNECT A DC POWER SOURCE OF GREATER THAN 15 VOLTS TO THE REAR PANEL POWER JACK. ALWAYS REPLACE FUSES WITH A FUSE OF THE PROPER RATING. FAILURE TO OBSERVE THESE SIMPLE PRECAUTIONS WILL VOID ALL WARRANTIES ON THIS EQUIPMENT.

Connect the power cable to the POWER receptacle on the rear apron, connect the coaxial cable from the antenna to the rear apron ANT receptacle, and connect the microphone to the jack appropriate for the microphone in use. An external speaker may be connected to the rear apron SP jack, if desired. Use the speaker plug supplied with the transceiver. Insertion of a plug into this jack automatically cuts off the internal speaker.

BASE STATION INSTALLATION

A base station mounting stand is supplied with your transceiver, to provide easier viewing of the display and controls. A power supply capable of supplying 5 amps at 13.8 VDC is required for operation from AC mains. The FP-80 AC power supply option provides the required 13.8 VDC for the FT-680R transceiver. See your Yaesu dealer.



FP-80 POWER SUPPLY

OPERATION

The all solid-state design of the FT-680R means that tuning procedures are very simple. The following paragraphs will describe the tuning procedures for receiver and transmitter operation.

INITIAL CHECK

Before connecting the transceiver to the power supply, be certain that a fuse of the proper rating is in use, and that a 50 ohm antenna has been connected to the antenna jack.

FREQUENCY SELECTION USING MAIN DIAL

When the transceiver is initially turned on, the digital display will read the preset frequency 50.000.0 MHz, and frequency control will be via the main tuning dial. After memory, scanning, or priority operation, pressing the DIL button will return control to the main dial. Rotate the dial to secure the operating frequency desired. Since tuning steps depend on the combination of the MODE switch and STEP switch as shown in Table 1, use the synthesizer step for easy tuning. When the upper or lower bandedge is reached the next synthesizer step will automatically be to the opposite bandedge. Thus, after 53.999.9 MHz, the next step is 50.000.0 MHz. While transmitting, the operation frequency can not be changed in any operation modes except the satellite mode.

RECEIVER OPERATION

Preset the controls and switches as follows:

MODE . . . . . Desired mode
SQL . . . . . Fully counterclockwise
STEP . . . . . Desired synthesizer step
VFO A/B TXA . . . VFO"A" position
SCAN . . . . . MAN position
RPT . . . . . SIMP position
All other switches should be turned off initially.

Rotate the VOL control clockwise to turn the transceiver on and adjust for a comfortable level.

(1) SSB and AM modes

Using the main tuning dial, tune in an SSB or AM signal. The STEP switch should be set to M or F position so that you can secure the operating frequency desired in 100 Hz or 1 kHz steps. When you get close to the desired frequency, set the STEP switch to S position for 10 Hz step in order to tune in the signal smoothly. When pulse type noise such as ignition noise is encountered, press the NB (noise blanker) switch.

(2) CW mode

With the clarifier off, tune in a CW signal. When the incoming signal is tuned to a beat note of 800 Hz, your transmit frequency will coincide with that of the other station. If another beat note is desired, or if the other station drifts, then use the clarifier function.

(3) FM mode

Using the main tuning control, tune in an FM signal for a maximum and steady S-meter reading and a clear, natural voice output from the speaker.

Set the STEP switch to the M (20 kHz) position, as almost all FM stations use 20 kHz steps. When you change the operating mode from SSB/AM/CW to FM, all the digits of the operating frequency below 10 kHz will clear by pressing the F.SET button.

When the channel is clear, rotate the SQL control to the point where the background noise is just silenced. Do not rotate the SQL control much beyond this threshold point, or else the receiver will not respond to weak signals. The BUSY/MOD lamp will light up when the squelch circuit is opened. If the S-meter wobbles, or if it is impossible to obtain clear audio, it is possible that the incoming signal is on another mode such as SSB.

TRANSMITTER

Before transmission, be certain that the frequency on which you are going to operate is clear to prevent interruption of the other station's operation. It is important that an antenna or dummy load be connected to the antenna jack at all times.

(1) SSB mode

Set the MODE switch to SSB and close the microphone PTT switch. The ON AIR lamp should light up and if you speak into microphone in a normal voice, the S.PO LEDs will light up according to the relative output power.

(2) AM mode

Set the MODE switch to AM and close the micro-

phone PTT switch, 3-4 LEDs will light up without modulation. Speak into the microphone in a normal voice and the string of LEDs will light up according to the voice signal.

(3) CW mode

Plug a key into the KEY jack on the rear panel. In the key-down condition, the 8--9 LEDs of the indicator will light up. Since the semi-break-in circuit is furnished, when the key is closed, your keying activates the transmitter, and the 800 Hz side tone will be heard from the speaker. With the HI/LOW switch pressed, the power output of 10 watts may be reduced to 1 watt, and the LOW lamp will light up.

(4) FM mode

Set the MODE switch to FM, and close the microphone PTT switch. When transmitting, 8–9 LEDs will light up to show relative output power, and BUSY/MOD lamp will be illuminated according to the voice input. On this mode, 10 watts of RF output power can also be reduced to 1 watt by pressing the HI/LOW button.

MEMORY OPERATION

A total of four memory channels are available for operation. Storage and recall of memory channels allows considerable operating flexibility. The storage and recall procedure is extremely simple.

(1) Rotate the main tuning dial to the desired frequency, for example 50.640.0 MHz. Now rotate the MEMORY switch to position 1. Press the M button to store 50.640.0 MHz into memory channel position 1.

(2) Now rotate the main tuning dial to another frequency (for example 50.360.0 MHz). For instant return to 50.640.0 MHz, press MR button, the 50.640.0 1 will be displayed on the digital readout.

(3) To return again to 50.360.0 MHz, press DIL, and you will be operating on 50.360.0 MHz.

(4) Memory channels 2, 3 and 4 may be programmed and recalled as above.

(5) When you push the MR button, the far right LED on the readout will illuminate, indicating the memory channel.

(6) To return frequency control to the main tuning dial, push the DIL button.

(7) Set the STEP switch to the desired step before activating the clarifier in the memory operation. Changing the synthesizer step with the CLAR switch ON will lock the operating frequency.

SCANNER OPERATION

Fingertip switches, located on the microphone, allow conveinent frequency control, while driving. The simple operating procedure is described below.

(1) Set the bottom panel SCAN switch to MAN position. Push the DIL switch to select operation on the dial frequency.

(2) Press the microphone UP switch for an instant to shift the frequency up by one step. If you hold the UP button for more than 1/2 second, the scanner will be activated. To stop the scan, press the PTT switch or one of the scanning controls on the microphone. If you push the PTT switch, no transmission will occur; release the PTT switch, then press it again for normal transmission.

(3) To scan lower in frequency, use the same procedure, but press the DWN button.

(4) In the FM mode, to halt the scan automatically on a busy channel, set the bottom panel SCAN switch to BUSY. In this mode, when the scanner encounters a signal strong enough to open the receiver squelch, scanning will stop. When the bottom panel switch is placed in the CLEAR position, the scan will stop when a clear channel (one where the squelch will not open) is found.

(5) To scan only the memory channels, rotate the MEMORY switch to MS (memory scan) position. Now press the UP or DWN switch on the microphone. The scanning rate for memory scan will be approximately two channels per second. The scan may be halted in any of the ways discussed previously. The BUSY and CLEAR positions of the SCAN

switch are particularly helpful when scanning the memory channels in the FM mode.

PRIORITY CHANNEL OPERATION

A priority channel may be used in conjunction with a memory channel for increased flexibility. Here is how to set up the FT-680R for priority operation.

(1) First program one or more memory channels for priority use. For example, store 50.640.0 MHz into memory channel 1. Set the bottom panel SCAN switch to MAN. Rotate the main dial to the desired frequency (for example 50.360.0 MHz).

(2) Now set the MEMORY switch to 1 and push MR to recall 50.640.0 MHz and then push the PRI (priority) switch. The display will indicate 50.360.0 P, and every 5 seconds the display will switch to 50.640.0 MHz allowing you to check it for activity.

(3) If you have other frequencies stored in memory, you may rotate the MEMORY switch to select one for use with the priority channel.

(4) In the FM mode, you may use the SCAN switch to good advantage during priority operation, as described in SCANNER OPERATION.

(5) If you wish to return to normal operation from the priority mode, push the DIL button. Now control is shifted back to the main dial.

REPEATER OPERATION

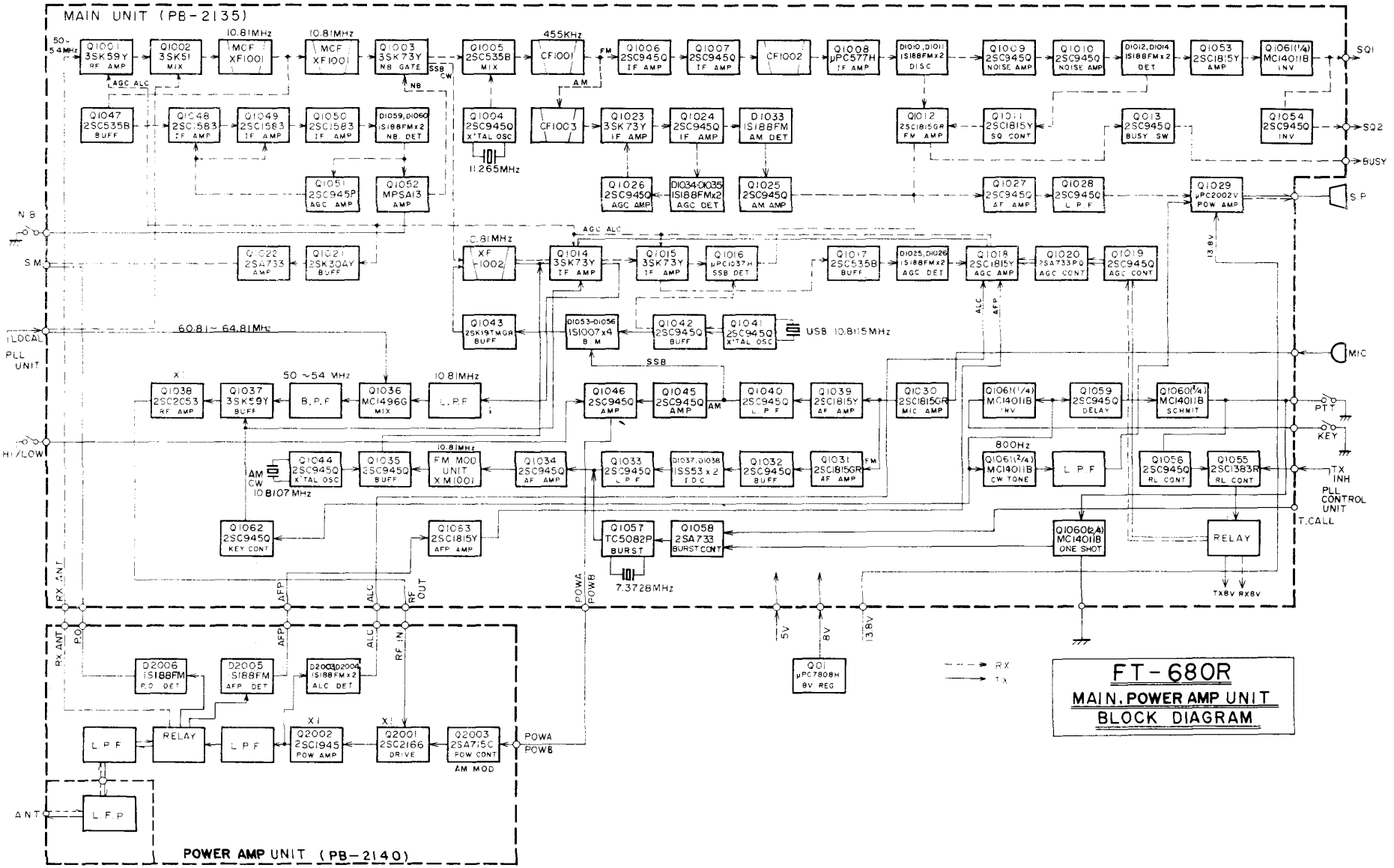
(1) Repeater shifts of +1 MHz, and −1 MHz are built into the FT-680R. To select these shifts, set the bottom panel RPT switch to the + or − position respectively.

(2) To cover unusual repeater splits, you can use the VFO A/B TXA feature.
Example: receive frequency 50.640 MHz with 1.2 MHz split. Rotate the main tuning dial to the 51.840 MHz and press the VFO A/B TXA button on the front panel; now the transmit frequency, · 51.840 MHz, is memorized. Rotate the main tuning dial to 50.640 MHz for receiving. If you close the PTT switch, your transmit frequency will be shifted to 51.840 MHz.

(3) An 1800 Hz tone generator is included with your transceiver for accessing a repeater requiring such a tone. When the T.CALL switch is pushed, a tone will be superimposed on your transmitted signal. This switch also activates the PTT function, and transmits the access tone, for as long as the switch is held. An external tone or burst generator, optional FTS-64E may be connected through the rear panel TONE IN CONNECTOR.

INITIALIZING FREQUENCY/BACKUP FEATURE

The FT-680R includes a backup feature which will hold all memory frequencies, as well as dial frequency, when the front panel power switch is turned off. So long as the DC power to the rear apron power jack is not interrupted, these frequency will be held. When the power is again turned on, the frequency and mode (memory priority, dial, etc.) last used will be recalled, but scanning mode is automatically reset to dial mode. However, if the power cord is connected to 13.8 VDC circuit that is switched off along with the automobile ignition, all memory channels as well as the dial frequency will be reset to the preset frequency.


MAIN UNIT (PB-2135)
50~54MHz
Q1001 3SK59Y RF AMP
Q1002 3SK51 MIX
10.81MHz MCF XF1001
10.81MHz MCF XF1001
Q1003 3SK73Y NB GATE
SSB
CW
NB
AGC ALC
Q1005 2SC535B MIX
455KHz CF1001
FM
AM
Q1006 2SC9450 IF AMP
Q1007 2SC9450 IF AMP
CF1002
Q1008 μPC577H IF AMP
D1010, D1011 1S188FM x2 DISC
Q1009 2SC9450 NOISE AMP
Q1010 2SC9450 NOISE AMP
D1012, D1014 1S188FM x2 DET
Q1053 2SC1815Y AMP
Q1061(1/4) MC14011B INV
SQ1
Q1047 2SC535B BUFF
Q1048 2SC1583 IF AMP
Q1049 2SC1583 IF AMP
Q1050 2SC1583 IF AMP
D1059, D1060 1S188FM x2 NB DET
Q1004 2SC9450 X'TAL OSC
11.265MHz
CF1003
Q1023 3SK73Y IF AMP
Q1024 2SC9450 IF AMP
D1033 1S188FM AM DET
Q1012 2SC1815GR FM AMP
Q1011 2SC1815Y SQ CONT
Q1013 2SC9450 BUSY SW
Q1054 2SC9450 INV
SQ2
BUSY
Q1051 2SC945P AGC AMP
Q1052 MPSA13 AMP
Q1026 2SC9450 AGC AMP
D1034-D1035 1S188FM x2 AGC DET
Q1025 2SC9450 AM AMP
Q1027 2SC9450 AF AMP
Q1028 2SC9450 L P F
Q1029 μPC2002V POW AMP
S P
13.8V
N B
S M
Q1022 2SA733 AMP
Q1021 2SK30AY BUFF
10.81MHz XF1002
AGC ALC
Q1014 3SK73Y IF AMP
Q1015 3SK73Y IF AMP
Q1016 μPC1037H SSB DET
Q1017 2SC535B BUFF
D1025, D1026 1S188FM x2 AGC DET
Q1018 2SC1815Y AGC AMP
Q1020 2SA733PQ AGC CONT
Q1019 2SC9450 AGC CONT
ALC
AFP
Q1043 2SK19TMGR BUFF
D1053-D1056 1S1007 x4 B M
Q1042 2SC9450 BUFF
Q1041 2SC9450 X'TAL OSC
USB 10.8115MHz
SSB
LOCAL
PLL UNIT
60.81~64.81MHz
MIC
X1
Q1038 2SC2053 RF AMP
Q1037 3SK59Y BUFF
50~54 MHz
B.P.F
Q1036 MC1496G MIX
10.81MHz
L.P.F
Q1046 2SC9450 AMP
Q1045 2SC9450 AMP
AM
Q1040 2SC9450 L P F
Q1039 2SC1815Y AF AMP
Q1030 2SC1815GR MIC AMP
Q1061(1/4) MC14011B INV
Q1059 2SC9450 DELAY
Q1060(3/4) MC14011B SCHMIT
PTT
KEY
H/LOW
AM CW
Q1044 2SC9450 X'TAL OSC
10.8107 MHz
Q1035 2SC9450 BUFF
10.81MHz FM MOD UNIT XM1001
Q1034 2SC9450 AF AMP
Q1033 2SC9450 L P F
D1037, D1038 1SS53 x 2 IDC
Q1032 2SC9450 BUFF
Q1031 2SC1815GR AF AMP
FM
800Hz
Q1061(2/4) MC14011B CW TONE
L P F
Q1056 2SC9450 RL CONT
Q1055 2SC1383R RL CONT
TX INH
PLL CONTROL UNIT
T.CALL
Q1062 2SC9450 KEY CONT
Q1063 2SC1815Y AFP AMP
Q1057 TC5082P BURST
Q1058 2SA733 BURST CONT
7.3728MHz
Q1060(2/4) MC14011B ONE SHOT
RELAY
TX8V RX8V
RX ANT
AFP
ALC
RF OUT
POWA
POWB
5V
8V
13.8V
Q01 μPC7808H 8V REG
RX
TX
FT-680R
MAIN, POWER AMP UNIT
BLOCK DIAGRAM
RX ANT
P.O
AFP
ALC
RF IN
D2006 1S188FM P.O DET
D2005 1S188FM AFP DET
D2003,D2004 1S188FM x2 ALC DET
L P F
RELAY
L P F
X1
Q2002 2SC1945 POW AMP
X1
Q2001 2SC2166 DRIVE
Q2003 2SA715C POW CONT
AM MOD
POWA
POWB
ANT
L.P.F
POWER AMP UNIT (PB-2140)

CIRCUIT DESCRIPTION

The block diagram, and circuit description to follow will provide you with a better understanding of this transceiver. Please refer to the block and schematic diagram for specific circuit details.

RECEIVER

The RF signal from the antenna jack is applied to the MAIN UNIT through a low pass filter and the antenna relay, RL_{2001}. The signal is amplified by Q_{1001} **(3SK59Y)**, a dual gate MOS FET with excellent rejection of cross modulation and intermodulation. The amplified signal is fed to the 1st mixer, Q_{1002} **(3SK51-03)**, where the RF signal is mixed with a local signal delivered from the PLL UNIT, resulting in a 10.81 MHz first IF signal.

The first IF signal is passed through a monolithic crystal filter, XF_{1001} **(10BM30B)**, which has ±15 kHz bandwidth, and amplified by Q_{1003} **(3SK73Y)**, which acts as a switch driven by the NB (noise blanker) circuit. The amplified signal from Q_{1003} is fed to IF amplifiers for each mode.

FM and AM mode signals are fed to 2nd mixer Q_{1005} **(2SC535B)**, where the signal is mixed with an 11.265 MHz local signal, resulting in a 455 kHz 2nd IF signal. The 2nd IF signal is passed through a ceramic filter, CF_{1001}, which has a ±4.5 kHz bandwidth, and then fed to the FM or AM mode IF amplifier.

In the FM mode, the filtered signal is amplified by Q_{1006} and Q_{1007} **(2SC945Q)** and passed through CF_{1002}, which has a ±7.5 kHz bandwidth. The filtered FM signal is amplified by Q_{1008} **(μPC577H)** and demodulated by CD-1 and D_{1010}, D_{1011}. The demodulated FM signal is amplified by Q_{1012} **(2SC1815GR)** and then fed to the AF amplifier.

In the AM mode, the filtered signal is again passed through a ceramic filter CF_{1003} which has a ±2 kHz bandwidth and amplified by Q_{1023} **(2SK73Y)** whose gain is controlled by AGC circuit, and further amplified by Q_{1024} **(2SC945Q)**. The amplified signal is AM-detected by D_{1033}, and the detected signal is amplified by Q_{1025} **(2SC945Q)** and fed to the AF amplifier.

SSB and CW mode signals from the Q_{1003} are passed through a crystal filter, XF_{1002}, which has a very high shape factor, to improve adjacent frequency selectivity. The filtered SSB signal is amplified by Q_{1014} and Q_{1015} **(3SK73Y)**, and then fed to the balanced demodulator, Q_{1016} **(μPC1037H)**, where a carrier signal is applied from the carrier oscillator Q_{1041}/Q_{1042} **(2SC945Q)**; the detected audio output is then fed to the AF amplifier.

The audio signals from each demodulator are passed to the active lowpass filter, which consists of Q_{1027} and Q_{1028} **(2SC945Q)** to eliminate the unwanted noise portion of the signal. The audio signal is then fed, through the AF gain control, to the audio output amplifier, Q_{1029} **(μPC2002V)**, providing about 2 watts of audio output to the speaker.

S-METER CIRCUIT

A portion of the amplified IF signal is fed to Q_{1017} **(2SC535B)**, a buffer amplifier, through C_{1080}. The amplified signal is then applied to the AGC detector, D_{1025}/D_{1026}. The rectified signal is amplified by DC amplifier Q_{1018} **(2SC1815Y)** for AGC control. This AGC voltage is delivered to the front panel S.PO indicator to illuminate LEDs according to the input signal strength.

SQUELCH CIRCUIT

A portion of the demodulated FM signal from the ceramic discriminator (CD_1, D_{1010}, D_{1011}) is fed to noise amplifiers Q_{1009} and Q_{1010} **(2SC945Q)** through VR_{1002} and the SQ Control **(VR_{16})**, and then rectified by D_{1012} and D_{1014}, a voltage doubling circuit. The rectified signal is fed to the base of Q_{1011} **(2SC1815)**, the squelch control circuit.

When no carrier is present, the rectified DC voltage is applied to the base of Q_{1011}, to turn Q_{1012} **(2SC1815GR)** on. With conduction of Q_{1011}, the base of Q_{1012} is grounded, squelching the audio amplifier.

When a carrier is present, the rectified DC voltage is reduced, the audio amplifier Q_{1012} then recovers to normal operation. The BUSY lamp switch, Q_{1013} **(2SC945Q)**, is also activated by the rectified voltage from the demodulator to illuminate the BUSY lamp when a carrier is present.

NB (Noise Blanker) CIRCUIT

A portion of the IF signal from monolithic filter XF_{1001} is amplified by Q_{1047} **(2SC535B)**, Q_{1048}, Q_{1049}, and Q_{1050} **(2SC1583)**. The output signal is rectified by D_{1059} and D_{1060}, producing a DC voltage. This DC voltage is amplified by Q_{1052} **(MPSA13)** and fed to gate 2 of Q_{1003}, the noise blanker gate. A portion of the DC voltage is amplified by Q_{1051}, and then fed to Q_{1048}, Q_{1049} **(2SC1583)** as a noise blanker AGC voltage. When impulse-type noise is received, the induced DC voltage reduces the gain of Q_{1003}, and blocks the signal path momentarily. The noise AGC control voltage is not induced by such impulse-type noise, because the time constant of C_{1243}/R_{1273} is long. Normal signals, though, induce the noise blanker AGC voltage, and reducing the gain of the noise amplifier, allowing normal signal path at Q_{1003}.

TRANSMITTER

The discussion of the signal flow on transmit will be on a mode by mode basis.

SSB

The audio input signal from the microphone is amplified by Q_{1030} **(2SC1815GR)** and Q_{1039} **(2SC1815Y)**. The audio level is adjusted to the proper level by VR_{1007}, and is applied through an active low-pass filter, Q_{1040} **(2SC945Q)**, to the ring modulator, D_{1053}–D_{1056}. Here the audio signal modulates the 10.81 MHz carrier signal delivered from the carrier oscillator Q_{1041} **(2SC945Q)** and buffer Q_{1042} **(2SC945Q)**, resulting in a 10.81 MHz double-sideband signal. The signal is amplified by Q_{1043} **(2SK19TMGR)** and fed to XF_{1002}, a crystal filter, where the unwanted sideband is sliced out. The SSB signal is then fed to mixer Q_{1036} **(MC1496G)** and mixed with a local signal from the PLL Unit, resulting in a 50–54 MHz SSB signal.

The SSB signal is passed through T_{1010}–T_{1014}, which are tuned exactly to the operating frequency by varactor diodes, thus minimizing spurious radiation. The signal is then amplified by Q_{1037} **(3SK70)**, and Q_{1038} **(2SC2053)** to the proper level for driving the power amplifier circuit.

FM

The output audio signal of Q_{1030} is amplified by Q_{1031} **(2SC1815GR)** and Q_{1032} **(2SC945Q)** and fed to IDC circuit, consisting of D_{1037} and D_{1038}, which clips both positive and negative peaks to control the maximum possible deviation; the clipped signal is then passed through an active low-pass filter to eliminate harmonics above the speech range caused by clipping. The output signal is amplified by Q_{1034} **(2SC945Q)** to a sufficient audio level and applied to the FM modulation module XM-1 for modulation, and the maximum deviation is adjusted by VR_{1006} prior to delivery to Q_{1014}. The signal path is then identical to that of the SSB signal.

AM

The output audio signal from Q_{1040} is further amplified by Q_{1045}, Q_{1046} **(2SC945Q)** and fed to Q_{2003} **(2SA715C)** in the Power Amplifier Unit, which controls the collector voltage of Q_{2001} and produces an amplitude modulation signal. As on the other modes, the produced AM signal is amplified by Q_{2002} to the desired power.

The carrier for AM is generated by Q_{1044} **(2SC945Q)**, oscillating at 10.8107 MHz, and amplified by buffer Q_{1035} **(2SC945Q)** and fed to IF amplifier Q_{1014}. The signal path is then identical to that of the SSB signal.

CW

For CW, the 10.8107 MHz carrier signal is generated by Q_{1044} **(2SC945Q)**, amplified by Q_{1035} **(2SC945Q)**, and fed to IF amplifier Q_{1014}. The signal path is then identical to that of the SSB signal.

The key line is connected to switching transistor Q_{1062} **(2SC945Q)** through inverter Q_{1061} **(MC14011B)**, which controls the gate voltages at Q_{1014} **(3SK73)** and Q_{1037} **(3SK59Y)**, and thus turning the RF signal on and off.

An RC circuit connected to the base of Q_{1062} produces an ideal keying waveshape for click-free CW operation. The key line is also connected to side tone oscillator Q_{1061} **(MC14011B)** for monitoring of the code signal during CW operation. In order to operate on semi-break-in, the Schmitt trigger and delay circuit at Q_{1060} **(MC14011B)** activates the RX-TX changeover relay.

POWER AMPLIFIER CIRCUIT

The RF signal from the Main Unit is amplified by Q_{2001} **(2SC2166)** and Q_{2002} **(2SC1945)** in the Power Amplifier Unit, delivering approximately 10 watts of RF output to the antenna through a lowpass filter.

POWER CONTROL CIRCUIT

When the HI/LOW switch is set to the LOW position, the base of Q_{1046} is grounded through VR_{1012}, and the collector current of Q_{1046} is decreased. Because the output power of Q_{2001} is controlled by Q_{2003}, the drive level to Q_{2002} is decreased, thus reducing the RF output power to approximately 1 watt.

TONE BURST CIRCUIT

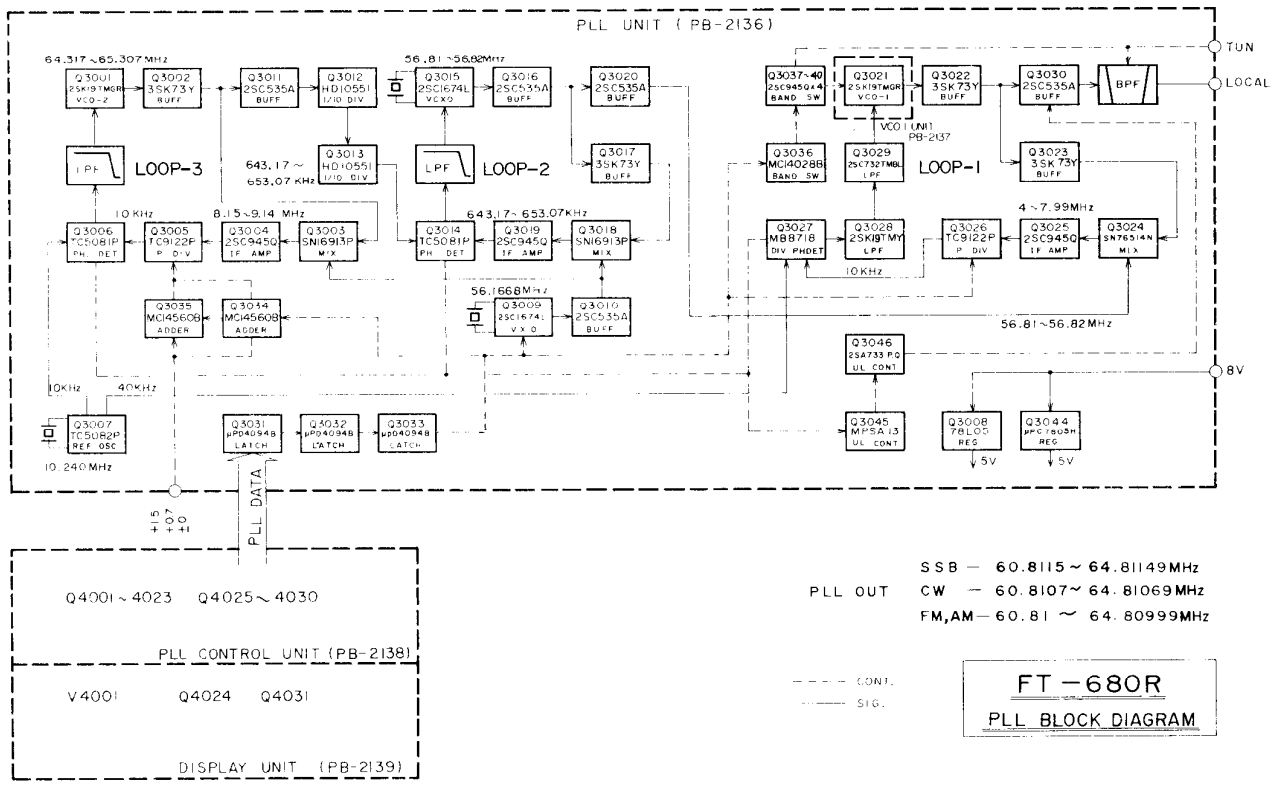
When the T.CALL switch is pressed, the base of Q_{1058} **(2SA733P)** is grounded, and DC voltage is applied to tone burst oscillator Q_{1057} **(TC5082P)** to generate an 1800 Hz tone signal. The tone is superimposed on the transmit signal as long as the switch is held.

ALC (Automatic Level Control) CIRCUIT

A portion of the output power from Q_{2002} is applied through C_{2020} to rectifiers D_{2001} and D_{2002} producing a DC voltage. The DC voltage is amplified by DC amplifier Q_{1018} **(2SC1815Y)** and fed to gate 2 of Q_{1014} to control its gain, and thus preventing overdrive. The ALC level is adjusted by VR_{1003} for proper drive level to Q_{2002}.

AFP (Automatic Final Protection) CIRCUIT

If the transmitter is activated without an antenna being connected, or if a high VSWR is present at the antenna jack, the reflected power is detected through T_{2001} and D_{2003}. The detected AFP voltage is applied through VR_{2002} to Q_{1063} **(2SC1815Y)** in the Main Unit. As the reflected power increases, the AFP voltage also increases, and consequently Q_{1063} conducts. The voltage at gate 2 of Q_{1014} **(3SK73Y)** then decreases, resulting in lower output power. When the transceiver is correctly matched to an antenna, full power output will be obtained.



PLL CIRCUIT

The PLL circuit is comprised of three PLL oscillators each consisting of a reference crystal oscillator, a programmable divider, a prescaler, and a phase comparator. The PLL produces local signals for the receiver and transmitter stages, using a synthesis scheme which produces 10 Hz steps.

PLL Circuit Configuration

The local signal 60.81000 MHz – 64.80999 MHz is generated by Q_{3021} **(2SK19TMGR)** VCO-1 in the PLL Loop 1, amplified by buffers Q_{3022} **(3SK51)** and Q_{3030} **(2SC535A)**, and passed through BPF circuit to eliminate spurious radiation. The signal is then coupled to the Main Unit.

A portion of the signal from the buffer Q_{3022} is amplified by Q_{2023} **(3SK51)** and applied to the mixer Q_{2024} **(SN76514N)**, where the signal is mixed with a heterodyne signal of 56 MHz from PLL Loop 2, and its frequency is divided by programmable divider Q_{3026} **(TC9122P)**. The digital phase comparator Q_{3027} **(MB8718)** compares the phase of signal from the programmable divider with that of 40 kHz reference frequency obtained from crystal oscillator Q_{3007} **(TC5082P)** (via a 1/4 divider), producing an error-correction DC voltage. The output DC voltage is passed through an active lowpass filter consisting of Q_{3028} **(2SK19TMY)** and Q_{3029} **(2SC732TMBL)**, and fed to the VC0-1 to control its oscillation frequency.

In PLL Loop 2, a 56 MHz signal generated by the VCXO Q_{3015} **(2SC1674L)** is amplified by buffer amplifiers Q_{3016} and Q_{3020} **(2SC535A)** and fed to the mixer in PLL Loop 1. A portion of the output from Q_{3016} is further amplified by Q_{3017} **(3SK73Y)** and applied to a mixer Q_{3018} **(SN16913P)**, where the signal is mixed with a 56 MHz signal generated by VXO Q_{3009} **(2SC1674L)**, resulting in a 600 kHz signal. The 600 kHz signal is amplified by Q_{3019} **(2SC945Q)** and fed to phase comparator Q_{3014} **(TC5081P)**, which compares the phase of signal with that of the 600 kHz signal from PLL Loop 3, producing an error-correction DC voltage. The DC voltage is passed through a low-pass filter and fed to the VXCO to control its oscillation frequency.

In PLL Loop 3, a 60 MHz signal is generated by VCO-2 Q_{3001} **(2SK19TMGR)** and applied through buffers Q_{3002} **(3SK73Y)** and Q_{3011} **(2SC535A)** to prescalers, Q_{3012}/Q_{3013} **(HD10551)**, which divides its frequency by 1/100, thus producing a 600 kHz signal. A portion of the output of Q_{3002} is fed to a mixer Q_{3003} **(SN16913P)**, where the signal is mixed with a 56 MHz signal which is generated by Q_{3009} **(2SC1674L)**, and applied through a programmable divider to phase comparator Q_{3006} **(TC5081P)** which compares the phase of the signal with that of 10 kHz signal which is generated by Q_{3007} **(TC5082P)**, and produces an error-correction DC voltage. The DC voltage is passed through a lowpass filter and fed to the VCO-2 Q_{3001} to control its oscillation frequency.

The frequency control signal from the PLL Control Unit is fed to Serial/Parallel converters Q_{3031} – Q_{3033} **(μPC4094B)** and converted into BCD code to control the dividing ratio of the programmable dividers and the oscillating frequency of VCO and VXCO in each PLL loops.

When any VCO is unlocked, an unlock signal from the phase comparater is fed to the unlock control circuit consisting of Q_{3045} **(MPSA13)** and Q_{3046} **(2SA733)**, which controls buffer Q_{3030} **(2SC535A)** to mute the output from the PLL oscillator to prevent spurious radiation.

PLL Control Circuit

In the PLL Control Unit, a 4-bit parallel processing CPU is used to control the operating frequency, UP/DOWN scanning, priority channel, or memory channel selections. The CPU has one input port, three I/O ports and four output ports. The CPU processes input data by means of the main dial or other control switches in accordance with the program stored in an ROM for control of the PLL frequency, indication of the operating frequency, or memory channels on digital display. The CPU is also furnished with a function to halt transmission when any VCO is unlocked, resulting in a fail-safe system.

MAINTENANCE AND ALIGNMENT

This equipment has been carefully aligned and tested at the factory prior to shipment. If the instrument is not abused, it should not require other than the usual attention given to electronic equipment.

Service or replacement of a major component may require considerable realignment. 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 rather than part failure. Service work must only be performed by experienced personnel using the proper test equipment.

Never align this transceiver without having a 50 ohm dummy load connected to the antenna jack, unless otherwise noted. Troubleshooting using an antenna can result in misleading indications on test equipment.

EQUIPMENT REQUIRED

(1) RF Signal Generator: Hewlett-Packard Model 8640B or equivalent, with one volt output at 50 ohms, and frequency coverage to 150 MHz.

(2) Vacuum Tube Voltmeter (VTVM): Hewlett-Packard Model 410B or equivalent, with an RF probe good to 150 MHz.

(3) Dummy Load/Wattmeter: Yaesu Model YP-150Z or equivalent.

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

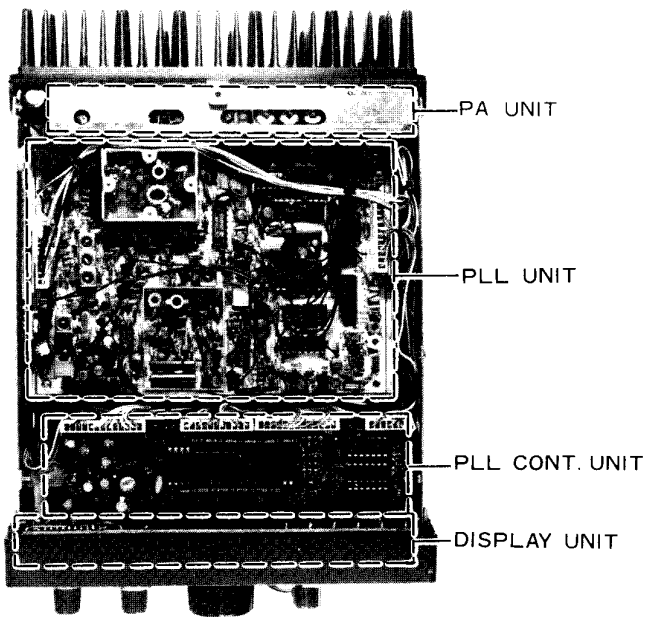
(5) IF Sweep Generator: capable of output at 10.81 MHz.

(6) RF Sweep Generator: capable of output at 49–55 MHz.

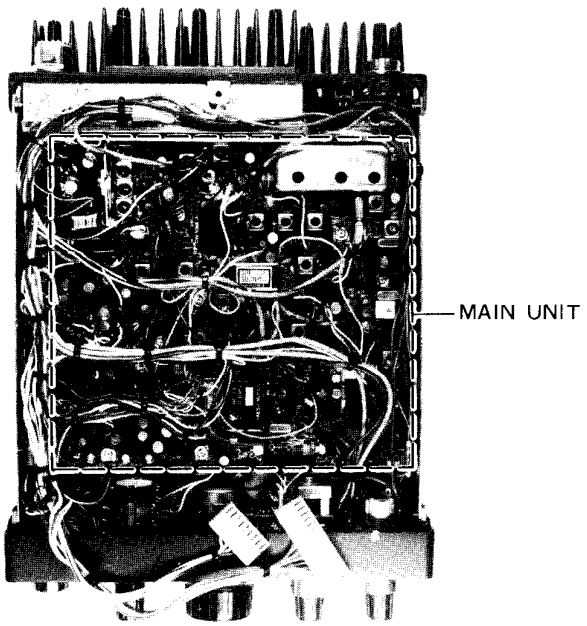
(7) Oscilloscope: Hewlett-Packard Model 1740A or equivalent.

(8) FM Deviation Meter

(9) Precision Frequency Counter: Yaesu Model YC-500 or equivalent, with resolution to 0.01 kHz and frequency coverage to 150 MHz.



Top View



Bottom View

UNIT LOCATIONS

PERFORMANCE CHECKS

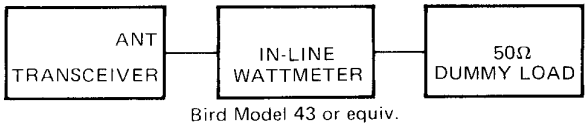
Make all performance checks at 13.8 VDC under load.

Check the transmitter power output as follows:

(a) Connect a suitable dummy load/wattmeter to the antenna jack.

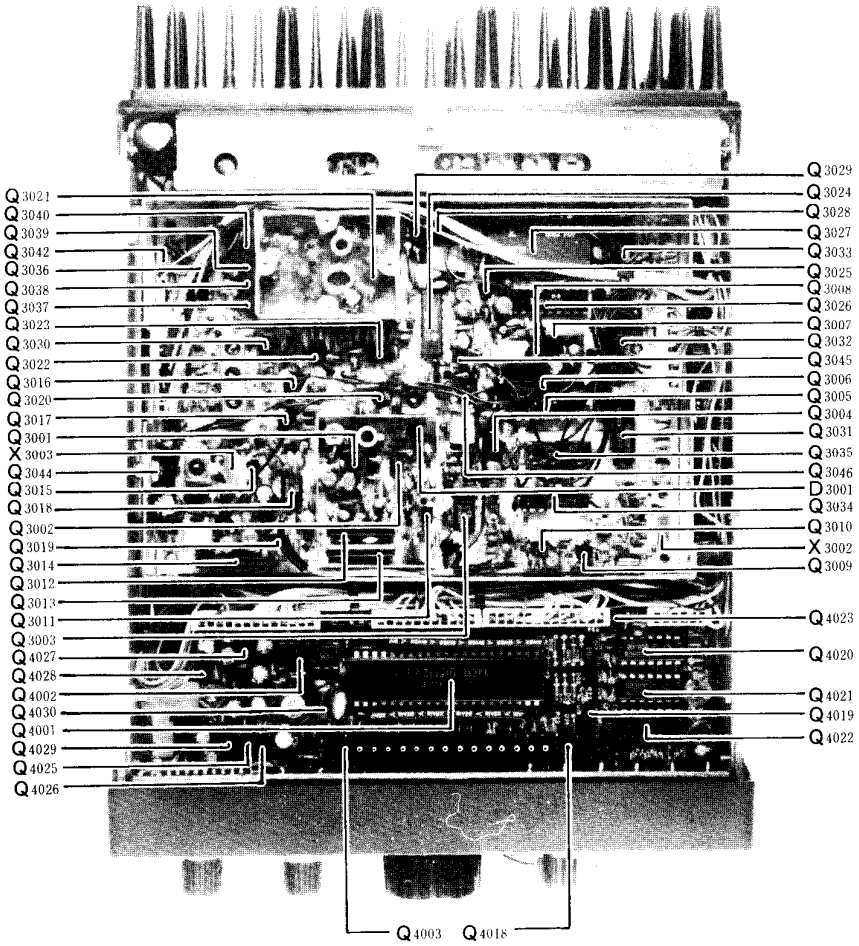
(b) Set the MODE switch to the FM position, and key the transceiver while observing the power output, which should be approximately 10 watts. At full power output, 8–9 LED's will light up on the S/PO indicator.

(c) Set the MODE switch to SSB, and key the transmitter. Speak in a normal voice into the microphone, 8–9 LED's should light up.



Bird Model 43 or equiv.

PO TEST SETUP



PART LOCATIONS (Top View)

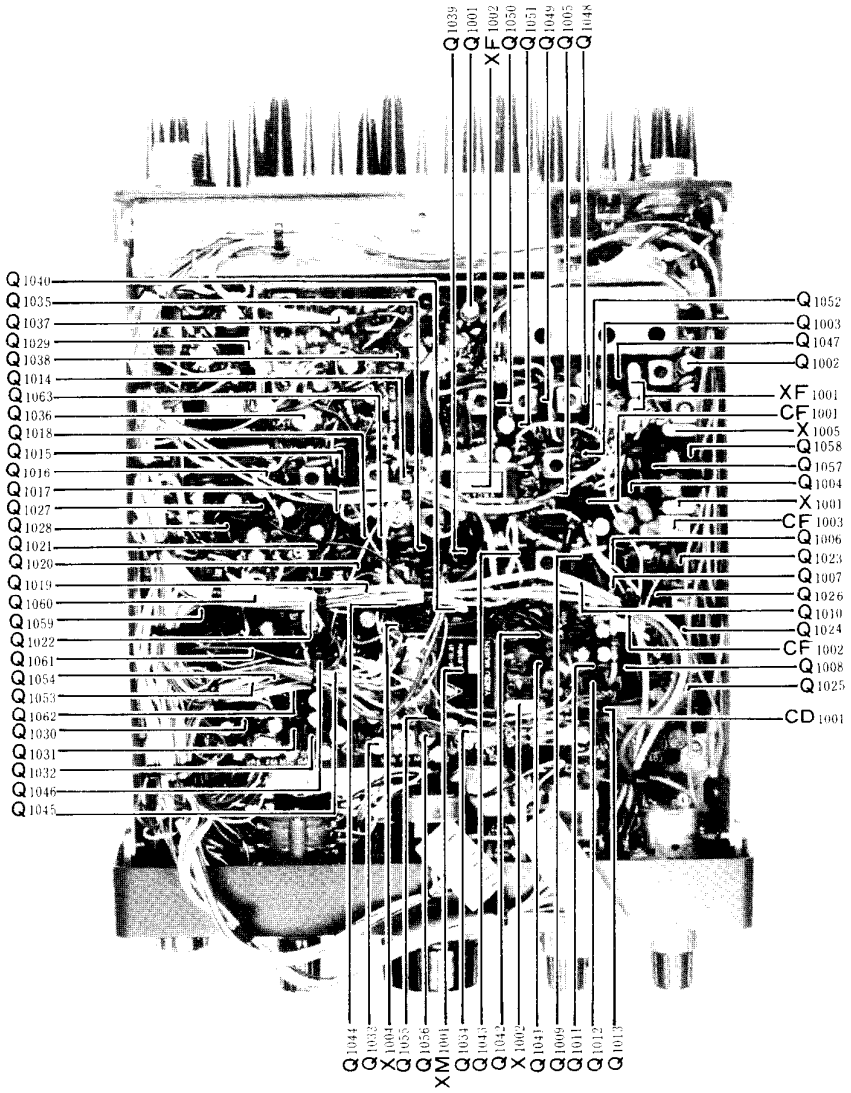
Check the receiver sensitivity as follows:

(a) Connect an AC VTVM to the SP jack. Set the MODE switch to the FM position and rotate the SQUELCH control fully counterclockwise.

(b) Connect the RF output of a precision VHF signal generator to the antenna jack and note the VTVM reading with no signal input. Adjust the AF GAIN control and the VTVM range, as required, to obtain full scale VTVM reading. DO NOT change the setting of the AF GAIN control after this calibration has been made.

RX SENSITIVITY TEST SETUP

(c) Set the signal generator to the receiver frequency of the transceiver, and adjust the output amplitude of the signal generator until the VTVM reads 20 dB (1/10 voltage) below the reading in step (b). The signal generator output voltage at this point is the 20 dB quieting sensitivity, and it should be approximately 0.35 μV.



PART LOCATIONS (Bottom View)

(d) Set the MODE switch to SSB and connect the AC VTVM to the speaker output. Apply an unmodulated 0.5 μV signal from the signal generator, and tune the transceiver main dial for a maximum VTVM reading.

(e) Adjust the AF GAIN control for a reading of 450 mV on the VTVM.

(f) Reduce the signal generator output and read the VTVM: the VTVM reading should be 45 mV for a 20 dB S/N ratio.

If the above check indicates a need for realignment, it is recommended that the unit be returned to the dealer for servicing. The sophisticated CPU and control circuitry, in particular, are so critical that they should not be touched by other than an experienced technician. Attempts to realign the transceiver tuned circuits without the proper equipment may result in degraded transceiver performance.

RECEIVER SECTION

(1) 2nd Local Oscillator

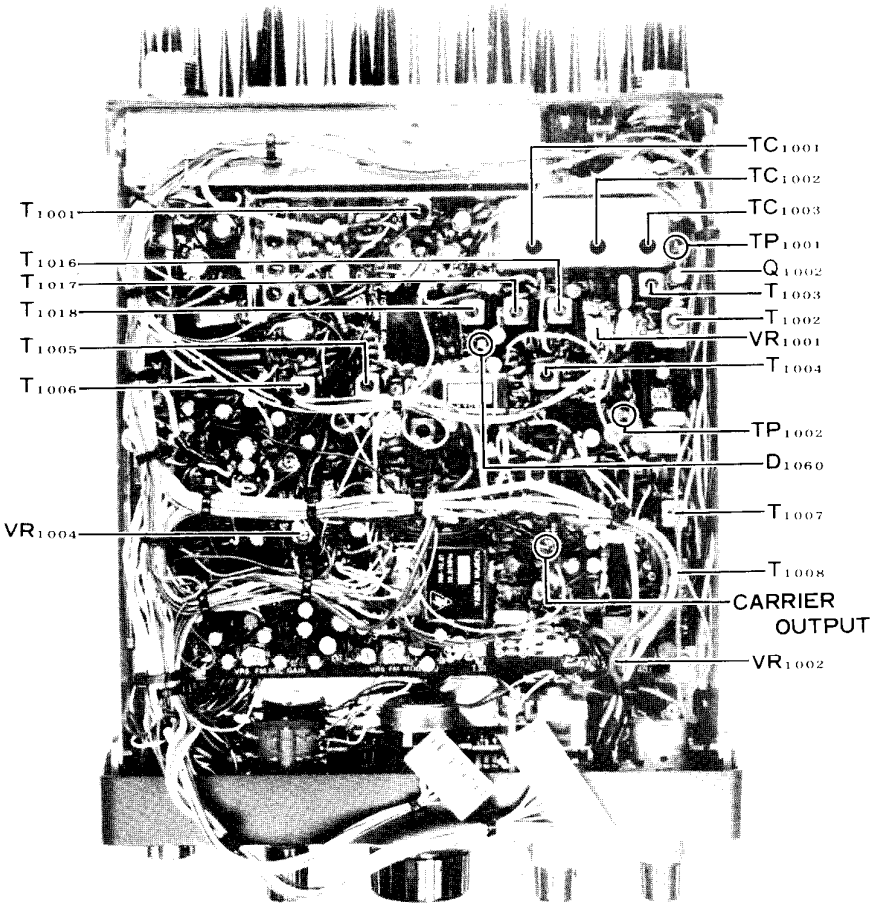
a) Set the MODE switch to FM, and connect the RF probe of a VTVM to TP_{1002}.

b) Measure the RF injection voltage. A nominal value is 0.5 V – 0.7 VRMS.

c) Connect a frequency counter to TP_{1002} and check to see that the oscillation frequency is correct: 11.265 MHz.

(2) 1st IF Amplifier

a) Set the MODE switch to FM, and adjust VR_{1001} to the fully counterclockwise position.



ALIGNMENT AND TEST POINTS FOR RECEIVER

b) Connect a sweep generator to gate 1 of Q_{1002} (TP_{1001}). Connect a oscilloscope, through a detector, to the secondary winding of T_{1004}.

c) Set the frequency of the sweep generator to 10.81 MHz, and apply output from the generator.

d) Adjust T_{1003} and T_{1004} until the scope pattern illustrated in Fig. 2 is obtained.

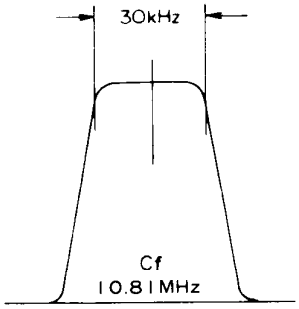


Figure 2

(3) SSB Carrier Oscillator

a) Set the MODE switch to SSB.

b) Connect the RF probe of the VTVM to the CARRIER OUTPUT terminal on the Main Unit (where C_{1212} and a shielded cable are connected), and measure the oscillation level. A nominal value is 170–230 mV RMS.

(4) SSB IF Circuit

a) Set the mode switch to SSB.

b) Connect a signal generator to TP_{1001}, and set its output level to 15 dBμ (5.62 μV) at 10.81 MHz.

c) Peak T_{1004}, T_{1005}, and T_{1006} for a maximum S.PO indication.

(5) AM IF Circuit

a) Set the MODE switch to AM.

b) Connect an AC VTVM to the external speaker terminals in parallel with an 8 ohm resistor or speaker.

c) Connect a signal generator to the antenna jack, and set its output level and frequency to approximately 10 dBμ (3.16 μV) with 30% modulation (1 kHz) at 52.0 MHz.

d) Tune the receiver frequency to 52.0 MHz, and adjust T_{1007}, T_{1008} for a maximum reading on the AC VTVM.

(6) RF Amplifier

a) Set the receiver frequency to 50.50 MHz, and generator to 10 dBμ (3.16 μV) at 50.50 MHz.

b) Set the receiver frequency to 146 MHz, and adjust T_{1001}, T_{1002}, TC_{1001}– TC_{1003} for a maximum S.PO indication.

(7) S-Meter Full Scale Setting

a) Rotate VR_{1004} fully clockwise to make sure that six LED's on the S-meter scale are illuminated.

b) Set VR_{1004} to the point where all the LED's go off.

c) Apply a 4 dBμ (1.584 μV) signal from the signal generator and adjust VR_{1001} so that only one LED is illuminated.

(8) Noise-Blanker Adjustment

a) Set the MODE switch to SSB.

b) Set the receiver frequency to 52.00 MHz.

c) Adjust the output level and frequency of the signal generator to 5–10 dBμ (1.78 μV–3.16 μV) at 52.00 MHz. Temporarily connect TP_{1002} to ground with a clip lead, in order to disable the 2nd local oscillator.

d) Connect a voltmeter (full scale: 2.5V) to the cathode of D_{1060} and ground. Adjust T_{1016}, T_{1017}, and T_{1018} for a maximum reading on the voltmeter scale.

(9) Squelch Adjustment

a) Set the MODE switch to FM.

b) Set the front panel SQL control to the 9 o'clock position.

c) Adjust VR_{1002} so that the receiver is just muted. Now apply a signal from the signal generator. A signal of approximately –13 dBμ (0.224 μV) with ±3.5 kHz deviation at 1 kHz should be required to trip the squelch.

TRANSMITTER SECTION

Unless otherwise indicated, always perform transmitter alignment with a dummy load connected to the antenna jack. If the AFP circuits are being aligned, an improper load impedance at a critical time could result in the destruction of the final transistors.

(1) TX Strip Trimmer Adjustment

a) Set the MODE switch to FM, and the transmitter frequency to 52.00 MHz.

b) With a dummy load/wattmeter connected to the antenna jack, advance VR_{2001} and VR_{1003} fully counterclockwise.

c) Squeeze the microphone PTT switch, and adjust TC_{2001} –TC_{2004} * for maximum power output as indicated on the wattmeter.

* TC_{2001} –TC_{2004} require no realignment unless final transistors are replaced.

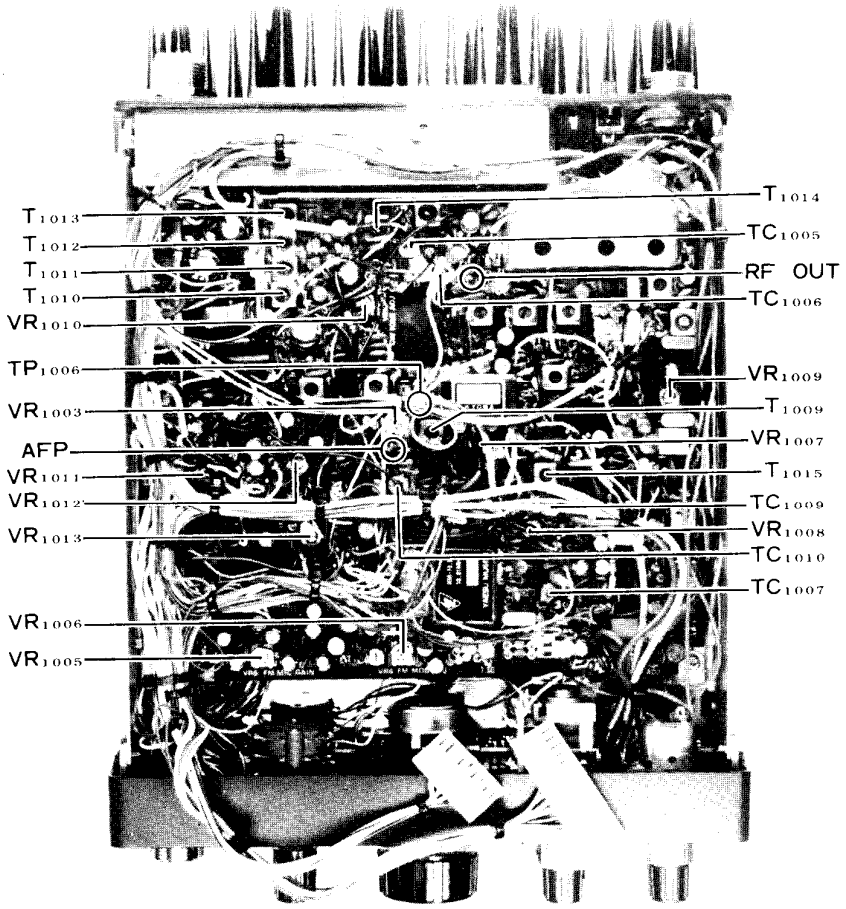
(2) Mixer/Interstage Alignment

a) Temporarily disconnect the RF OUT cable from the Main Unit.

b) Terminate the RF OUT terminals with a 50 ohm resistor, and connect the RF probe of a VTVM to the RF OUT terminals.

c) Set the transmitter frequency to 51.5 MHz, MODE to FM, and key the transceiver.

d) Adjust T_{1010} –T_{1014}, TC_{1005}, and TC_{1006} for a maximum reading on the VTVM.



ALIGNMENT AND TEST POINTS FOR TRANSMITTER

(3) CW/AM Carrier Oscillator

a) Set the MODE switch to CW.

b) Connect the RF probe of a VTVM to TP_{1006} and key the transceiver.

c) Adjust T_{1009} for a reading of 100 mV RMS on the VTVM.

d) Connect a frequency counter to TP_{1006}, and adjust TC_{1010} for a reading of exactly 10.8093 MHz on the counter.

(4) ALC/PO Adjustment

a) Set the MODE switch to FM.

b) With a dummy load/wattmeter connected to the antenna jack. Key the transceiver.

c) Adjust VR_{1003} for an output of 10 watts on the wattmeter.

d) Adjust VR_{2003} so as to illuminate 9 LED's on the S.PO indicator.

(5) AFP Adjustment

a) Connect a DC voltmeter to the AFP terminal on the Main Unit and ground.

b) Rotate VR_{2002} fully counterclockwise.

c) Set the MODE switch to FM.

d) Adjust VR_{2002} for minimum indication on the DC voltmeter.

e) Disconnect the 50 ohm dummy load, and connect a 165 ohm, 10 watt dummy load to the antenna jack. Key the transceiver.

f) Adjust VR_{2001} so as to illuminate 8 LED's on the S.PO indicators.

g) Remove the dummy load from the antenna jack, and check to see that the current consumption is less than 2 amps.

(6) Low Power Output Setting

a) Set the HI/LOW switch to the LOW position, and key the transmitter in the FM mode.

b) Adjust VR_{1012} for an output of 1 watt on the wattmeter.

(7) FM Modulator Adjustment

a) Refer to Fig. 3, and set up the transceiver and test equipment as shown.

b) Set VR_{1005}, located on the Main Unit, to the center of its range, and apply a 1 kHz, 15 mV signal from the audio generator to the mic jack.

c) Adjust VR_{1006} for a deviation of ±4.5 kHz while observing the signal waveform on the scope.

d) Now reduce the audio generator output level to 1.5 mV, and adjust VR_{1005} for a deviation of ±3.5 kHz. Check to see that the waveform on the scope is not distorted.

e) Turning the audio generator on and off, make sure that the BUSY/MOD indicator illuminates along with the changing audio input.

(8) Tone Burst Adjustment

a) Set up the test equipment as specified in Fig. 3.

b) Set the MODE switch to FM, and push the front panel T.CALL switch.

c) Adjust VR_{1009} for a deviation of ±3.5 kHz on the deviation meter.

d) Connect a frequency counter to the detector output terminal of the deviation meter, and confirm that the burst signal is of the proper frequency (1800 Hz for the USA model, etc.).

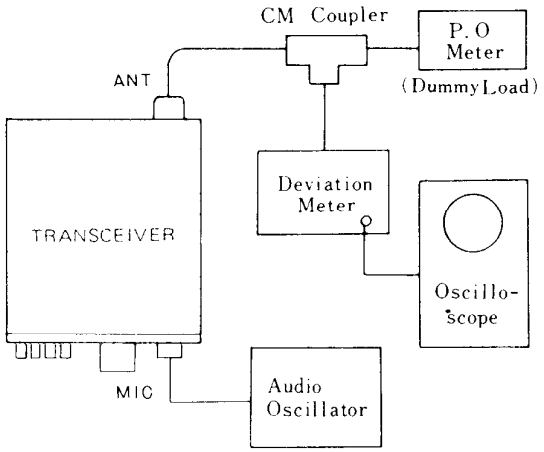


Figure 3

(9) SSB Modulator Adjustment

(A) Balanced Modulator Output Transformer Adjustment

a) With a dummy load/wattmeter connected to the antenna jack, set the MODE switch to SSB.

b) Set VR_{1007} to the center of its range, and apply a 1 kHz, 1 mV signal from the audio generator to the mic jack.

c) Adjust T_{1015} for maximum power output.

(B) SSB Carrier Point Adjustment

a) Apply a 1 kHz, 1.2 mV signal from the audio generator to the mic jack, and adjust VR_{1007} for an output of 8 watts.

b) Set the frequency of the audio generator to 300 Hz. Adjust TC_{1007} for an output of 2 watts.

(C) Carrier Balance Adjustment

a) Temporarily short the mic input terminal of the mic jack (pin 8) to ground with a clip lead.

b) While monitoring the carrier on a monitor receiver, adjust VR_{1008} and TC_{1009} for a minimum S-Meter reading (or minimum signal level if no S-Meter reading occurs).

(10) AM Modulator Adjustment

a) Set the MODE switch to AM.

b) Adjust VR_{1013} for an output of 2.5 watts without modulation.

c) Since the microphone gain adjustment is identical to that of the SSB modulator, refer to the SSB Modulator Adjustment step (B) of this section.

(11) CW Side Tone Frequency/Semi-break-in Delay Adjustment

a) Adjust VR_{1010} for the desired monitoring level on CW operation.

b) Adjust VR_{1011} for the desired CW VOX relay hang time.

PLL SECTION

NOTE: The PLL circuit is very critical in its adjustment. Alignment must only be performed by an experienced technician. All alignment should be performed at a temperature within the range 15°–30°C, preferably near the center of this range.

(1) VCV Line Adjustment

(A) PLL 1 Adjustment

a) Set the STEP switch to "M," the MODE switch to FM, and tune the transceiver to 51.9900 MHz.

b) Connect the DC probe of the VTVM to TP_{3012}, and adjust TC_{3004} for a reading of exactly 6.5 V.

(B) PLL 2 Adjustment

a) Set the STEP switch to "M," the MODE switch to SSB, and tune the transceiver to 51.0099 MHz.

b) Connect the DC probe of the VTVM to TP_{3009}, and adjust L_{3017} to secure a reading of 4 V.

(C) PLL 3 Adjustment

a) Set the STEP switch to "M," MODE switch to SSB, and tune the transceiver to 51.0099 MHz.

b) Connect the DC probe of the VTVM to TP_{3001}, and adjust TC_{3001} to secure a reading of 3.5 V.

(2) Buffer Stage Adjustment

a) Set the STEP switch to "M," the MODE switch to SSB, and tune the transceiver to 51.0099 MHz.

b) Connect the RF probe of the VTVM to TP_{3014}, and adjust T_{3001} for a maximum reading on the VTVM.

(3) PLL Output Bandpass Filter Adjustment

a) Set the STEP switch to "F," the MODE switch to FM, and tune the transceiver to 51.4000 MHz.

b) Connect the RF probe of the VTVM to TP_{3016}, and peak T_{3002}, T_{3003}, and T_{3004} for a maximum meter reading.

(4) PLL Local Frequency

a. Connect a frequency counter to TP_{3016}.

b) Set the STEP switch to "S," the MODE switch to SSB, and tune the transceiver to 50.00000 MHz.

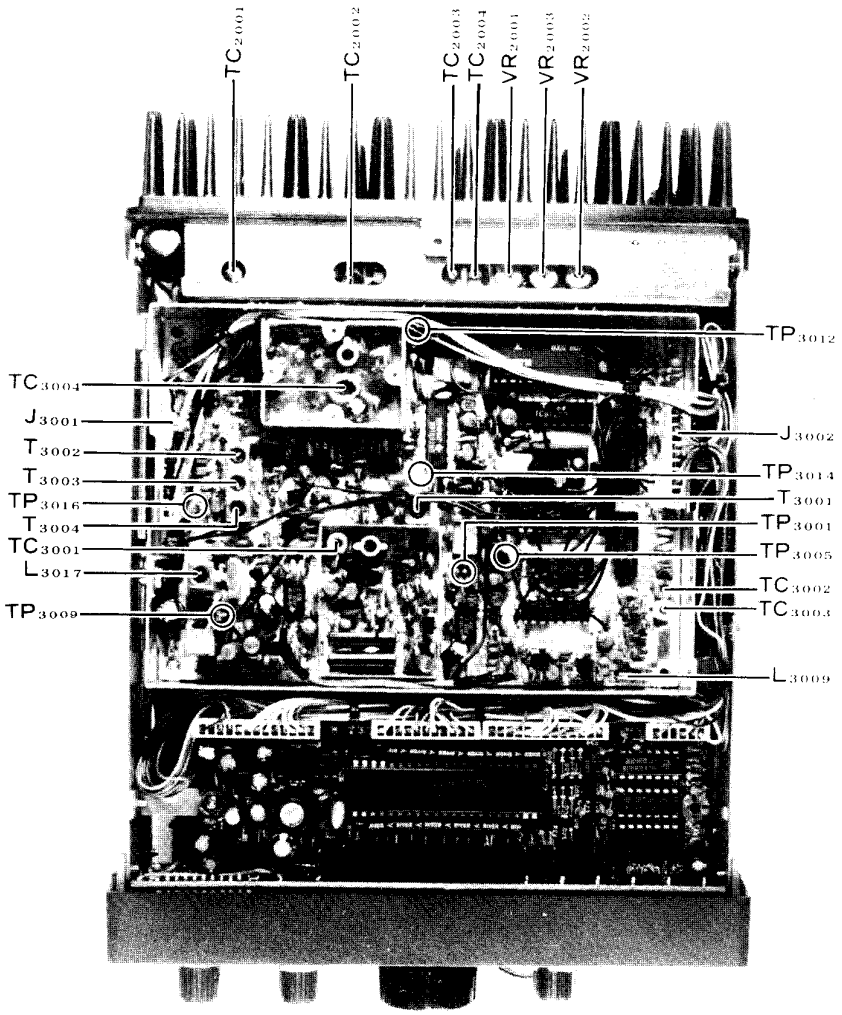
c) Adjust TC_{3002} for a reading of exactly 68.81150 MHz on the frequency counter.

d) Change the transceiver display frequency to 50.00009 MHz, using the Main Dial.

e) Adjust TC_{3003} for a reading of exactly 68.81159 MHz on the frequency counter.

f) Repeat steps (b), (c), (d) and (e) several times to ensure complete frequency adjustment.

NOTE: In order to achieve the specified frequencies for the above alignment steps, some presetting of the display will be required (because the 10 Hz digit is not displayed). Push the F.SET button, then switch to SSB. Set the STEP switch to "S." The precise frequency may then be set using the main dial.



ALIGNMENT AND TEST POINTS FOR PLL

MEMO

PARTS LIST

MAIN CHASSIS

Symbol No.	Part No.	Description
PB-2143	F0002143	Printed Circuit Board (for S03)
PB-2132	F0002132	Printed Circuit Board (for J08)
		IC
Q01	G1090294	μPC7808H
		DIODE
D01	G2090034	U05B
		POTENTIOMETER
VR01 (with S09)	J62800084	DM11A5M1112
		RESISTOR
R01	J02245103	Carbon film 1/4W SJ 10kΩ
R02	J02245104	" " " " 100kΩ
		CAPACITOR
C01,02	K40170105	Electrolytic 50WV 1μF (50RL1)
C03	K40129006	" 16WV 470μF (16RE470)
		SPEAKER
SP01	M4090047	SS-77KYH
		SWITCH
S01	N0190066	SBU-2045
S02	N0190067	SRN-3094N
S03	Q9000083A	EWT-XD2 S3550B
S03 (with Board)	C0021430	
S04,08	N6090004	SSF-22-08B
S06,07	N6090002	SSH-23-08
		RECEPTACLE
J01	P0090158	FM-214-8SS
J02	P0090010	FM-142S
J03	P1090028	MBR06D
J04	P1090005	SG8050
J06,11	P0090054	5048-07A
J07,09,10	P0090036	5048-14A
J08	P0090173	EMCS0450M
J08 (with Board)	C0021320	
		PLUG
P01	T9203130B	5208-07
P02	T9203140B	5208-10
P03	T9203150A	5208-12
P04	T9203160A	5208-04
P06	T9203170	5208-12
P07	T9203180	5208-5
P08	T9203340A	5208-07
P09	T9203230B	5208-14
P10	T9203290A	
P11	T9203300A	
P12	T9203280A	

MAIN UNIT

Symbol No.	Part No.	Description
PB-2135	F0002135	Printed Circuit Board
	C0021350	PCB with Components
		IC
Q1008	G1090072	μPC577H
Q1016	G1090101	μPC1037H
Q1029	G1090284	μPC2002V
Q1036	G1090061	MC1496G
Q1060,1061	G1090068	MC14011B
Q1057	G1090239	TC5082P
		FET
Q1001,1037	G4800590Y	3SK59Y
Q1002	G4800510C	3SK51-03
Q1003,1014,1015, 1023	G4800730Y	3SK73Y
Q1021	G3800301Y	3SK30AY
Q1043	G3090035	2SK19TMGR
		TRANSISTOR
Q1004,1006,1007, 1009,1010,1013, 1019,1024–1028, 1032–1035, 1040–1042, 1044–1046,1054, 1056,1059,1062	G3309450Q	2SC945Q
Q1005,1017,1047	G3305350B	2SC535B
Q1011,1018,1039, 1053,1063	G3318150Y	2SC1815Y
Q1012,1030,1031	G3318150G	2SC1815GR
Q1020,1022,1058	G3107331P	2SA733 P or Q
Q1038	G3320530	2SC2053
Q1048,1049,1050	G3315830	2SC1583
Q1051	G3309450P	2SC945P
Q1055	G3313830R	2SC1383R
Q1052	G3090005	MPSA13
		DIODE
D1002,1006,1008, 1009,1015, 1016–1024, 1027–1029,1031, 1032,1036–1043, 1049,1050,1057, 1058,1061–1065, 1067–1072, 1074–1076,1079, 1081–1083	G2090027	1SS53
D1010–1012,1014, 1025,1026,1030, 1033–1035, 1044–1048,1059, 1060	G2001880F	1S188FM
D1013	G2015550	1S1555
D1001,1003–1005, 1007,1044–1048	G2022090	1S2209
D1053–1056	G2010070	1S1007
D1066	G2090001	10D1
		CRYSTAL
X1001	H0101100A	11.265 MHz
X1002	H0100992	10.8115 MHz
X1004	H0100993	10.8107 MHz
X1005	H0101983	7.3728 MHz

		CRYSTAL FILTER	
XF1001	H1102021	108M30B	
XF1002	H1102022	10F-2D	
		CERAMIC FILTER	
CF1001	H3900220	LF-H12S	
CF1002	H3900030	LF-B15	
CF1003	H3900020	LF-B4	
		CERAMIC DISCRIMINATOR	
CD1001	H7900040	455-DW-8	
		MODULATOR MODULE	
XM1001	H9500390	XM-10.81	
		RESISTOR	
R1141	J02245010	Carbon film 1/4W SJ 1Ω	
R1140	J02245229	" " " " 2.2Ω	
R1211	J02245100	" " " " 10Ω	
R1025	J02245223	" " " " 47Ω	
R1007,1013,1017, 1078,1084,1204, 1207	J02245560	" " " " 56Ω	
R1063	J01245560	" " " TJ 56Ω	
R1173	J02245680	" " " SJ 68Ω	
R1188	J02245820	" " " " 82Ω	
R1028,1044,1085, 1097,1112,1117, 1175,1179,1190, 1231,1235,1236, 1242,1245,1257, 1260,1263,1267	J02245101	" " " " 100Ω	
R1024,1064,1065, 1073,1182,1183, 1326,1333	J01245101	" " " TJ 100Ω	
R1005,1021,1076, 1083,1109,1147	J02245151	" " " SJ 150Ω	
R1139,1172,1234, 1237,1238	J02245221	" " " " 220Ω	
R1060	J01245471	" " " " 330Ω	
R1059	J02245391	" " " " 390Ω	
R1066,1193,1240, 1253,1266,1322	J02245471	" " " " 470Ω	
R1330	J01245471	" " " TJ 470Ω	
R1070,1178,1323	J02245561	" " " SJ 560Ω	
R1012	J02245681	" " " " 680Ω	
R1185	J02245821	" " " " 820Ω	
R1006,1022,1027, 1033,1062,1071, 1072,1077,1082, 1087,1090,1091, 1110,1123,1130, 1149,1157,1174, 1184,1192,1208, 1213,1241,1244, 1250,1256,1258, 1259,1261,1262, 1274,1325,1331	J02245102	" " " " 1kΩ	
R1212	J10246102	" composition " GK 1kΩ	
R1115	J02245122	" film " SJ 1.2kΩ	
R1054,1102,1103, 1121,1191,1205, 1210,1217,1230	J02245152	" " " " 1.5kΩ	
R1061,1121	J02245182	" " " " 1.8kΩ	
R1015,1034,1037, 1039,1041–1043, 1067–1069,1099, 1106,1129,1165, 1187,1221,1249	J02245222	" " " " 2.2kΩ	
R1251,1254,1308	J02245222	Carbon film 1/4W SJ 2.2kΩ	
R1035,1036,1050, 1052,1086,1105, 1131,1143,1166, 1186,1289,1298, 1302	J02245332	" " " " 3.3kΩ	
R1209,1216	J02245392	" " " " 3.9kΩ	
R1018,1032,1118, 1136,1146,1218, 1305–1307,1329	J02245472	" " " " 4.7kΩ	
R1023,1029,1030, 1045,1046,1053, 1100,1152,1159, 1163,1181,1277, 1283,1299,1310, 1327	J02245562	" " " " 5.6kΩ	
R1016,1088	J02245682	" " " " 6.8kΩ	
R1148	J02245822	" " " " 8.2kΩ	
R1026,1055,1079, 1093,1094,1096, 1104,1119,1125, 1134,1135,1137, 1154,1177,1180, 1229,1232,1243, 1265,1269,1275, 1279,1282,1284, 1293,1303,1304, 1311,1322	J02245103	" " " " 10kΩ	
	J10216103	Carbon composition 1/8W 10kΩ	
R1126,1219,1233	J02245123	Carbon film 1/4W SJ 12kΩ	
R1286,1290	J02245153	" " " " 15kΩ	
R1114,1169	J02245183	" " " " 18kΩ	
R1031,1047,1048, 1171,1220,1246, 1264,1272,1276, 1278,1287,1309	J02245223	" " " " 22kΩ	
R1144,1162,1164	J02245273	" " " " 27kΩ	
R1176,1248,1268, 1291	J02245333	" " " " 33kΩ	
R1004,1020,1075, 1080,1108,1202, 1324	J02245393	" " " " 39kΩ	
R1011,1025,1058, 1151,1228,1247, 1280,1281	J02245473	" " " " 47kΩ	
R1056,1168,1252	J02245563	" " " " 56kΩ	
R1113,1127,1128, 1145,1158	J02245683	" " " " 68kΩ	
R1133	J02245823	" " " " 82kΩ	
R1001,1003, 1008–1010,1014, 1019,1074,1081, 1095,1107,1111, 1116,1124,1127, 1132,1138,1150, 1156,1161,1170, 1194–1199,1201, 1206,1270,1273, 1292	J02245104	" " " " 100kΩ	
R1318	J10246104	" composition 1/4W GK 100kΩ	
R1332	J01245104	" film 1/4W TJ 100kΩ	
R1057,1155,1160, 1215	J02245124	" " " " 120kΩ	
R1038,1040,1049, 1051	J02245154	" " " " 150kΩ	
R1089,1214,1255	J02245184	" " " " 180kΩ	
R1200	J02245224	" " " " 220kΩ	
R1239,1294	J02245334	" " " " 330kΩ	
R1120	J02245394	" " " " 390kΩ	
R1271,1297	J02245564	" " " " 560kΩ	

R1288	J02245684	Carbon film 1/4W SJ 680kΩ	C1204	K02179011	Ceramic 50WV CH27pF (DD104CH270J50V02)
R1285,1296	J02245824	" " " " 820kΩ			
R1098,1295,1101, 1300	J02245105	" " " " 1MΩ	C1181,1220,1241, 1248,1249	K00175330	" " SL 33pF (DD104SL330J50V02)
R1092,1301	J02245155	" " " " 1.5MΩ	C1002,1174,1176, 1180,1186	K06175330	" " UJ 33pF (DD104UJ330J50V02)
R1002	J02245225	" " " " 2.2MΩ			
			C1034	K00175390	" " " 39pF (DD104SL390J50V02)
		THERMISTOR			
TH1001	G9090001	SDT-250	C1059	K00175470	" " " 47pF (DD104SL470J50V02)
		POTENTIOMETER	C1217	K02175470	" " CH47pF (DD106CH470J50V02)
VR1001	J51730222	P6-S3NA 2.2kΩ			
VR1002–1006, 1009,1010, 1013	J51730103	P6-S3NA 10kΩ	C1010,1011,1012	K06175470	" " UJ 47pF (ECC-D1H470UJ2)
			C1167,1168	K06175680	" " UJ 68pF (ECC-D1H680JU2)
VR1007,1012	J51730223	P6-S3NA 22kΩ			
VR1008	J51737221	3321P 220Ω	C1015–1017	K02175820	" " CH82pF (DD107CH820J50V02)
VR1011	J51730104	P6-S3NA 100kΩ			
VR1014	J51729503	RV8-FAN 50kΩ	C1077,1093,1094, 1113,1189,1234, 1271	K00175101	" " SL 100pF (DD105SL101J50V02)
		CAPACITOR			
	K00179001	Ceramic 50WV SL 0.5pF (DD104SL0R5C50V02)	C1157,1159	K00175221	" " " 220pF (DD107SL221J50V02)
C1175	K00172010	" " " 1pF (DD104SL010C50V02)	C1242	K00175331	" " " 330pF (DD107SL331J50V02)
	K00172020	" " " 2pF (DD104SL020C50V02)	C1158	K00176471	" " " 470pF (DD109SL471J50V02)
C1020	K02179003	" " CH2pF (DD104CK020C50V02)	C1003,1004,1006, 1019,1023,1026, 1033,1065,1071, 1085,1124,1131, 1132,1151,1183, 1190,1193,1218, 1228,1230,1245, 1261,1264,1266, 1273,1274	K13170102	" " 0.001μF (DB200YF102Z75L2)
C1224	K00172030	" " SL 3pF (DD104SL030C50V02)			
	K00172040	" " " 4pF (DD104SL040C50V02)			
C1032	K00172050	" " SL 5pF (DD104SL050C50V02)			
C1187	K02172050	" " CH5pF (DD104CH050C50V02)	C1005,1007,1008, 1009,1014,1022, 1024,1025,1030, 1037,1066–1068, 1073,1076, 1082–1084, 1086–1088,1090, 1092,1098,1100, 1127,1152,1154, 1155,1156,1169, 1160–1165,1171, 1182,1185,1188, 1191,1192,1199, 1200,1206,1209, 1211,1213,1214, 1215,1219,1223, 1229,1251,1263	K13170103	" " 0.01μF (DB201YF103Z5L5)
	K06173060	" " UJ 6pF (ECC-D1H060DV)			
	K00173060	" " SL 6pF (DD104SL060D50V02)			
C1269	K00173070	" " SL 7pF (DD104SL070D50V02)			
	K06173080	" " UJ 8pF (DD104UJ080D50V02)			
C1069	K02173080	" " SL 8pF (DD104SL080D50V02)			
C1080	K00173100	" " " 10pF (DD104SL100D50V02)			
C1001,1166,1179, 1216	K02173100	" " CH10pF (DD104CH100D50V02)			
C1021	K00175120	" " SL 12pF (DD104SL120J50V02)			
C1173,1177	K02175120	" " CH12pF (DD104CH120J50V02)			
C1038,1153,1276	K00175150	" " SL 15pF (DD104SL150J50V02)			
	K02175150	" " CH15pF (DD104CH150J50V02)			
	K02175180	" " 18pF (DD104CH180J50V02)			
C1210,1212	K00175220	" " SL 22pF (DD104SL220J50V02)			
C1172,1178	K00175270	" " " 27pF (DD104SL270J50V02)			
C1027,1042,1043, 1051,1072,1109, 1145,1197,1252	K19149026	(UAT04V102K-L05AE) 25WV 0.001μF			
C1078,1110,1120, 1270	K19149005	(UAT04X222K-L05AE) 25WV 0.0022μF			
C1136,1144,1196	K19149007	(UAT05X332K-L05AE) 25WV 0.0033μF			
C1055,1056,1060, 1070,1096,1101, 1105,1111,1119, 1232,1235,1237, 1239,1257	K19149013	(UAT05X103K-L05AE) 25WV 0.01μF			
C1146	K19149015	(UAT08X153K-L45AE) 25WV 0.015μF			
C1052–1054,1246	K19149017	(UAT04X223K-L05AE) 25WV 0.022μF			
C1028,1029,1031, 1039–1041, 1044–1050,1074	K19149021	(UAT08X473K-L45AE) 25WV 0.047μF			

C1075,1079,1081, 1102–1104,1106, 1107,1114,1227, 1233,1236,1238, 1240,1253,1254, 1279	K19149021	(UAT08X473K-L45AE) 25WV 0.047μF	T1008	L0020422	
					CHOKE COIL
			CH1001	L2030067	FR14/7/5-2001F
C1058,1063,1129	K19149025	(UAT13X104K-L46AE) 25WV 0.1μF			**RELAY**
			RL1001	M1190006	FBR221D012
		Electrolytic			
C1258	K40179005	50WV 0.47μF (50RC2-R4)		L9190001	Ferrite Beads RI 3x3-1
C1091,1097, 1116–1118,1121, 1123,1133,1137, 1138,1140,1141, 1143,1147,1148, 1150,1194,1225, 1243,1247,1256, 1260	K40170105	" 1μF (50RL1)			
				Q5000026	Terminal TP-E
C1268	K40179001	" 1μF (50RC2-1)			
C1255	K40149001	25WV 4.7μF (25RE4R7)	**PA UNIT**		
C1061,1062	K40149011	" 4.7μF (25RC2-4R7)	Symbol No.	Part No.	Description
C1250,1262,1265	K40120106	16WV 10μF (16RL10)	PB-2140	F0002140	Printed Circuit Board
C1115	K40129004	" 10μF (16RE10)		C0021400	PCB with Components
C1184	K40120226	" 22μF (16RL22)			
C1108,1112	K40129002	" 47μF (16RE47)			**TRANSISTOR**
C1064,1089,1134, 1135,1139,1142, 1149,1195,1198, 1226,1244,1259	K40109002	10WV 47μF (10RE47)	Q2001	G3321660	2SC2166
			Q2002	G3319450	2SC1945
			Q2003	Q3107150C	2SA715C
C1122	K40109001	" 100μF (10RE100)			**DIODE**
C1125	K40109007	" 220μF (10RE220)	D2003–2007	G2001880F	Germanium 1S188FM
C1128	K40129001	16WV 330μF (16RE330)	D2001,2002	G2090001	Silicon 10D1
C1130	K40129003	" 1000μF (16RL1000 KOHO)			
					RESISTOR
		Tantalum	R2009	J01245220	Carbon film 1/4W TJ 22Ω
C1201	K70167474	35WV 0.47μF (CS15E1VR47)	R2001	J02245470	" " " SJ 47Ω
C1099	K70127225	16WV 2.2μF (CS15E1C2R2M)	R2003,2006	J10276560	"composition1/2W 56Ω
		Styrol	R2002	J10276221	" " 1/2W 220Ω
C1036,1208,1222	K51176101	50WV 100pF (50SU101K)	R2007	J10246271	" " 1/4W 270Ω
C1035,1207,1221	K51176221	" 220pF (50SU221K)	R2008	J02245222	" film " SJ 2.2kΩ
			R2010	J01245104	" " " TJ 100kΩ
		TRIMMER CAPACITOR			
TC1001–1003 1007,1009, 1010	K91000075	20pF (TZ03T200A)			**POTENTIOMETER**
			VR2002	J50716201	RV8FAS 200Ω
			VR2003	J50716502	" 5kΩ
TC1005,1006	K91000076	40pF (TZ03R450E)	VR2001	J50716503	" 50kΩ
		INDUCTOR			**CAPACITOR**
L1010,1011	L1190006	(FL4H1R2M 1.2μH) 1.2μH	C2012	K00179001	Ceramic 50W SL 0.5pF (DD104SL0R5C50V02)
L1004,1009	L1190035	(FL7H392J) 3.9μH			
L1016	L1190013	(FL4H6R8K 6.8μH) 6.8μH	C2025,2027	K00172010	" 50W SL 1pF (DD104SL010C50V02)
L1001	L1190070	(FL4H8R2M 8.2μH) 8.2μH			
L1003	L1190117	(S4-150) 15μH	C2001	K00175220	" " " 22pF (DD104SL220J50V02)
L1007,1008,1014, 1015,1017	L1190016	(FL5H101K) 100μH	C2002	K00175270	" " " 27pF (DD104SL270J50V02)
L1005,1006	L1190040	(S-4 1mH) 1mH			
L1012	L0020826		C2018,2020–2022, 2029,2032	K00175470	" " " 47pF (DD104SL470J50V02)
L1013	L0020827				
L1002	L0020586		C2017	K00175560	" " " 56pF (DD104SL560J50V02)
			C2007,2016	K00175820	" " " 82pF (DD104SL820J50V02)
		TRANSFORMER			
T1001,1002, 1010–1014	L0020825		C2019,2030,2031	K00175101	" " " 100pF (DD105SL101J50V02)
T1003,1005,1006, 1015	L0020187		C2006	K00175151	" " " 150pF (DD104SL151J50V02)
T1004,1009, 1016–1018	L0190001		C2008	K00175221	" " " 220pF (DD107SL221J50V02)
T1007	L0020420				

C2004,2005,2010, 2011,2014,2015, 2024,2028,2033	K13170103	Ceramic 50WV 0.01μF (DB201YF103Z5L5)	
C2034	K19149013	(UAT05X103K-L05AE) 25WV 0.01μF	
		Electrolytic	
C2035	K40170105	50WV 1μF (50RL1)	
C2003,2009,2013	K40129016	16WV 22μF (16RE22)	
		TRIMMER CAPACITOR	
TC2001,2002	K91000023	ECV-1ZW 50x40 50pF	
TC2003,2004	K91000058	2222-808-61809 80pF	
		INDUCTOR	
L2001	L0020823		
L2002	L1020469		
L2003,2004	L0020674		
L2005	L0020828		
L2006,2008–2013	L0020824		
L2007	L0020678		
L2014	L1190014	FL-4H 100K 10μH	
		TRANSFORMER	
T2001	L0020584		
		RELAY	
RL2001	M1190006	FBR221-D012	
	Q5000016	Terminal TP-E	

PLL UNIT

Symbol No.	Part No.	Description	
PB-2136C	F0002136C	Printed Circuit Board	
	C0021360	PCB with Components	
		IC, FET and TRANSISTOR	
Q3003,3018	G1090012	IC	SN16913P
Q3005,3026	G1090247	"	TC9122P
Q3006,3014	G1090048	"	TC5081P
Q3007	G1090239	"	TC5082P
Q3008	G1090084	"	μPC78L05
Q3012,3013	G1090296	"	HD10551
Q3024	G1090062	"	SN76514N
Q3027	G1090153	"	MB8718
Q3031–3033	G1090297	"	μPD4094B
Q3034,3035	G1090298	"	MC14560B
Q3036	G1090088	"	MC14028B
Q3044	G1090299	"	μPC7805H
Q3001	G3090035	FET	2SK19TMGR
Q3022,3023	G4800510C	"	3SK51-03
Q3002,3017,	G4800730Y	"	3SK73Y
Q3028	G3090034	"	2SK19TMY
Q3004,3019,3025, 3037–3040	G3309450Q	Tr	2SC945Q
Q3009,3015	G3316740L	"	2SC1674L
Q3010,3011,3016, 3020,3030	G3305350A	"	2SC535A
	G3307100	"	2SC710
Q3029	G3307320G	"	2SC732TMBL
3023			

Q3046	G3107331P /Q	Tr	2SA733 P or Q
Q3045	G3090005	"	MPS-A13
		IC SOCKET	
QS3001	P3090034	116-24-30-114	
		DIODE	
D3002–3007, 3019–3022,3015	G2090027	Silicon	1SS53
D3001	G2090043	Varactor	MV104
D3016–3018,3008	G2022090	"	1S2209
		CRYSTAL	
X3001	H0100910		10.240 MHz
X3002	H0102292		56.1668 MHz
X3003	H0102290		56.81 MHz
		RESISTOR	
R3011,3056,3077	J02245100	Carbon film	1/4W SJ 10Ω
R3005,3009,3012, 3018,3028,3046, 3054,3057,3063, 3073,3081,3083, 3090,3098	J02245101	" "	" " 100Ω
R3087	J02245151	" "	" " 150Ω
R3031,3036,3049, 3062,3096	J02245221	" "	" " 220Ω
R3004	J02245331	" "	" " 330Ω
R3027,3045	J02245471	" "	" " 470Ω
R3016,3116	J02245681	" "	" " 680Ω
R3014,3015,3039, 3059,3085,3089, 3102–3104,3129, 3130	J02245102	" "	" " 1kΩ
R3075,3118	J02245122	" "	" " 1.2kΩ
R3038,3088	J02245152	" "	" " 1.5kΩ
	J02245182	" "	" " 1.8kΩ
R3091	J02245222	" "	" " 2.2kΩ
R3120	J02245272	" "	" " 2.7kΩ
R3092	J02245332	" "	" " 3.3kΩ
	J02245392	" "	" " 3.9kΩ
R3017,3042	J02245472	" "	" " 4.7kΩ
R3093	J02245562	" "	" " 5.6kΩ
	J02245822	" "	" " 8.2kΩ
R3019–3022,3024, 3029,3035,3040, 3044,3048,3061, 3076,3095,3101, 3128	J02245103	" "	" " 10kΩ
R3122	J02245183	" "	" " 18kΩ
R3023,3025,3043, 3086,3105,3106, 3108–3110, 3113–3115,3117, 3119,3121,3127	J02245223	" "	" " 22kΩ
R3111	J01245223	" "	" TJ 22kΩ
R3030,3034,3047, 3060,3094	J02245333	" "	" SJ 33kΩ
R3001–3003, 3006–3008,3041, 3051–3053, 3070–3072, 3078–3080,3097, 3099,3100	J02245104	" "	" " 100kΩ
R3013,3058,3084	J02245184	" "	" " 180kΩ

		THERMISTOR
TH3001	G9090008	31D26
		CAPACITOR
C3165	K00179001	Ceramic 50WV SL 0.5pF (ED06J0.5PSL)
C3074	K06179025	" " UJ 2pF (DD104UJ020C50V02)
	K02179003	" " CH2pF (DD104CK020C50V02)
C3052,3082,3135	K00172020	" " SL 2pF (DD104SL020C50V02)
C3160	K02179004	" " CH3pF (DD104CH030C50V02)
C3060,3063,3085, 3096,3100,3138	K00172030	" " SL 3pF (DD104SL030D50V02)
C3166,3169	K02172040	" " CH4pF (DD104CH040C50V02)
C3011,3131	K02172050	" " CH5pF (DD104CH050C50V02)
C3054,3057,3149	K00172050	" " SL 5pF (DD104SL050C50V02)
C3003	K02173060	" " CH6pF (DD104CH060D50V02)
C3006	K06173060	" " UJ 6pF (DD104UJ060D50V02)
	K06173070	" " UJ 7pF (DD104UJ070D50V02)
C3170	K00173080	" " SL 8pF (DD104SL080D50V02)
C3161,3167,3168	K06173090	" " UJ 9pF (ECC-D1H090DU)
C3002,3042,3080	K02173100	" " CH10pF (DD104CH100D50V02)
C3014,3158	K00173100	" " SL 10pF (DD104SL100D50V02)
C3005	K06173100	" " UJ 10pF (DD104UJ100D50V02)
C3099	K02175120	" " CH12pF (DD104CH120J50V02)
	K00175120	" " SL 12pF (DD104SL120J50V02)
C3015,3016,3064, 3065,3139,3140, 3184	K00175150	" " SL 15pF (DD104SL150C50V02)
C3030,3031,3043	K02175150	" " CH15pF (DD104CH150J50V02)
C3147,3163	K00175180	" " SL 18pF (DD104SL180J50V02)
C3004,3191	K02175180	" " CH18pF (DD104CH180J50V02)
C3044	K02179009	" " CH22pF (DD104CH220J50V02)
	K06175220	" " UJ 22pF (ECC-D1H220-JU)
	K00175220	" " SL 22pF (DD104SL220J50V02)
C3024	K00175270	" " SL 27pF (DD104SL270J50V02)
C3010,3048,3051, 3075,3076	K06175330	" " UJ 33pF (DD104UJ330J50V02)
	K02179013	" " CH33pF (DD105CH330J50V02)
C3022,3148	K00175390	" " SL 39pF (DD104SL390J50V02)
C3045	K02175390	Ceramic 50WV CH39pF (DD105-257CH390J50V02)
C3055,3056,3058, 3059,3086,3087	K00175470	" " SL 47pF (DD104SL470J50V02)
C3073	K06175470	" " UJ 47pF (ECC-D1H470JU2)
C3023	K00175680	" " SL 68pF (DD104SL680J50V02)
	K00175101	" " SL 100pF (DD105SL101J50V02)
C3093,3094	K00175391	" " SL 390pF (DD104SL391J50V02)
C3050	K12171102	" " 0.001μF (DD105E102P50V02)
C3066,3077	K10179016	" " 0.001μF (DD201YB102K5L5)
C3001,3007,3012, 3013,3017–3021, 3025,3026,3028, 3032,3035–3041, 3049,3053,3061, 3062,3067,3078, 3079,3081,3083, 3084,3088, 3090–3092,3097, 3098,3101,3102, 3132–3134,3136, 3137,3141–3146, 3150,3151,3153, 3156,3159,3162, 3164,3171,3173, 3179,3181	K13170103	" " 0.01μF (DD107F103Z50V02)
C3070,3072,3089, 3095	K19149013	" " 0.01μF (UTA05X103M-L05AE)
C3155,3175,3182	K19149021	" " 0.047μF (UAT08X473M-245AE)
C3029,3069,3154	K54200001	Polyester film 100V 1μF (B32561-A-1105J)
C3027,3033,3068, 3071,3152,3157, 3172	K70127106	Tantalum 16V 10μF (CS15E1C100M)
C3180	K40170105	Electrolytic 50V 1μF (50RL105)
C3008,3034,3178, 3186–3188	K40120106	" 16V 10μF (16RL106)
C3174	K40120476	" 16V 47μF (16RL476)
		TRIMMER CAPACITOR
TC3001,3003	K91000074	TZ03T110A 10pF
TC3002	K91000075	TZ03R200A 20pF
		INDUCTOR
L3012,3013,3021	L1190113	(FL3HR22M) 0.22μH
L3004,3015,3034	L1190109	(FL3HR33M) 0.33μH
L3002,3010,3018	L1190004	(FL4HR68M) 0.68μH
L3005,3006	L1190111	(FL4H5R6K) 5.6μH
L3035,3036	L1190015	(FL5H120J) 12μH
L3041	L1190016	(FL5H101K) 100μH
L3022	L1190038	(FL5H271K) 270μH
L3007,3008,3016, 3023,3024, 3037–3040	L1190017	(FL5H102K) 1mH
L3003,3009,3011, 3014,3019,3020, 3032,3033	L0020774	
L3017	L0020821	
L3001	L0190017	

		TRANSFORMER
T3001–3004	L0020825	
		CONNECTOR
J3001	P0090054	5048-07A
J3002	P0090052	5048-10A

VCO 1 UNIT

Symbol No.	Part No.	Description
PB-2137A	F0002137A	Printed Circuit Board
	C0021370	PCB with Components
		FET
Q3021	G3090035	2SK19TMGR
		DIODE
D3009–3012	G2090027	1SS53
D3014	G2090043	MV104
		RESISTOR
R3064	J00245101	Carbon film 1/4W VJ 100Ω
R3065	J00245331	" " " " 330Ω
R3069	J00245102	" " " " 1kΩ
R3066–3068	J00245104	" " " " 100kΩ
		THERMISTOR
TH3002	G9090008	31D26
		CAPACITOR
C3110	K06172040	Ceramic 50WV UJ 4pF (DD104UJ040D50V02)
C3117	K02172050	Ceramic 50WV CH5pF (DD104CH050J50V02)
C3107	K06173060	" " UJ 6pF (DD104UJ060D50V02)
C3112	K02173090	" " CH9pF (DD104CH090D50V02)
C3108,3116	K02173100	" " CH10pF (DD104CH100J50V02)
C3113	K02175120	" " CH12pF (DD104CH120J50V02)
C3115	K02175180	" " CH18pF (DD105-257CH180J50V02)
C3114	K02179012	" " CH30pF (DD107CH30J50V02)
C3105	K06175330	" " UJ 33pF (DD104UJ330J50V02)
C3103,3111, 3119–3122	K14179002	" " 3m/m 0.01μF (DD204YM103Z50V)
C3106,3124	K13170103	" " 5m/m 0.01μF (DD107F103Z50V02)
C3126–3129	K70147105	Tantalum 16V 1μF (CS15E1E010M)
C3125	K70127106	Tantalum 16V 10μF (CS151C100M)
C3104	K40120106	Electrolytic 16V 10μF (16RL106)
		TRIMMER CAPACITOR
TC3004	K91000056	TZ03Z070A 7pF

		INDUCTOR
L3025	L1190004	(FL4HR68M) 0.68μH
L3027–3030	L1190110	(FL3H4R7K) 4.7μH
L3026	L0190017	

PLL CONTROL UNIT

Symbol	Part No.	Description
PB-2138A	F0002138A	Printed Circuit Board
	C0021380	PCB with Components
		IC
Q4001	G1090300	μPD1511-011
Q4002,4021	G1090068	MC14011B
Q4020	G1090126	MC14069B
Q4022	G1090174	MC14002B
Q4027,4028	G1090084	78L05
		TRANSISTOR
Q4003–4018	G3107331P /Q	2SA733 P or Q
Q4019,4023,4025	G3309450Q	2SC945Q
Q4026	G3309450K	2SC945K
Q4029	G3313830R	2SC1383R
Q4030	G3320020L	2SC2002L
		IC SOCKET
QS4001	P3090037	116-42-30-144
		DIODE
D4001–4005,4007, 4008,4013–4027, 4034,4036,4054	G2090027	Si 1SS53
D4033	G2001880F	Ge 1S188FM
D4035	G2090143	Zener HZ11B-1
		CERAMIC
X4001	H7900080	CSA2.56M 2.56 MHz
		RESISTOR
R4044	J10276829	Carbon composition 1/2W 8.2Ω
R4042	J10276221	" " " 220Ω
R4043	J02245271	Carbon film 1/4W SJ 270Ω
R4041	J02245331	" " " " 330Ω
R4039	J02245471	" " " " 470Ω
R4046	J02245122	" " " " 1.2kΩ
R4047	J02245152	" " " " 1.5kΩ
R4023,4035	J02245222	" " " " 2.2kΩ
R4037,4040	J02245472	" " " " 4.7kΩ
R4004,4006,4056	J02245103	" " " " 10kΩ
R4024,2055	J02245223	" " " " 22kΩ
R4003	J02245273	" " " " 27kΩ
R4057	J01215333	" " 1/8W TJ 33kΩ
R4029,4032	J02245393	" " 1/4W SJ 39kΩ
R4007–4022	J02245473	" " " " 47kΩ
R4045	J02245563	" " " " 56kΩ
R4001,4005,4025, 4026,4033,4034, 4038	J02245104	" " " " 100kΩ
R4027,4030	J02245334	" " " " 330kΩ
R4028,4031	J02245684	" " " " 680kΩ
R4002	J02245105	" " " " 1MΩ

		BLOCK RESISTOR
RB4001	Q80000003	22k x 15/5.6k x 1
RB4002	Q80000004	22k x 10/10k x 5/100k x 1
		CAPACITOR
C4010,4013,4016, 4019,4020,4026	K10176103	Ceramic 50WV 5m/m 0.01μF (DB205YR103Z5L5)
C4002,4003	K00175101	" " SL 100pF (DD105SL101J50V02)
C4005–4008	K10176471	" " 470pF (DD104B471K50V02)
C4023	K50177152	Mylar " 0.0015μF (50F2U152M)
C4004	K50177103	" " 0.01μF (50F2U103M)
C4001	K50177473	" " 0.047μF (50F2U473M)
C4011,4012	K40170105	Electrolytic 50WV 1μF (50RL1)
C4009,4014,4015, 4017,4018,4021, 4022	K40120106	" 16WV 10μF (16RL10)
C4024	K40170106	" 50WV 10μF (50RL10)
		DC-DC CONVERTER
T4001	L3030078	0392-1030-063
		CONNECTOR
J4001,4004	P0090038	5048-12A
J4003	P0090052	5048-10A
J4005	P0090042	5048-05A
J4002	P0090050	5048-04A
	Q5000007	Terminal F

DISPLAY UNIT

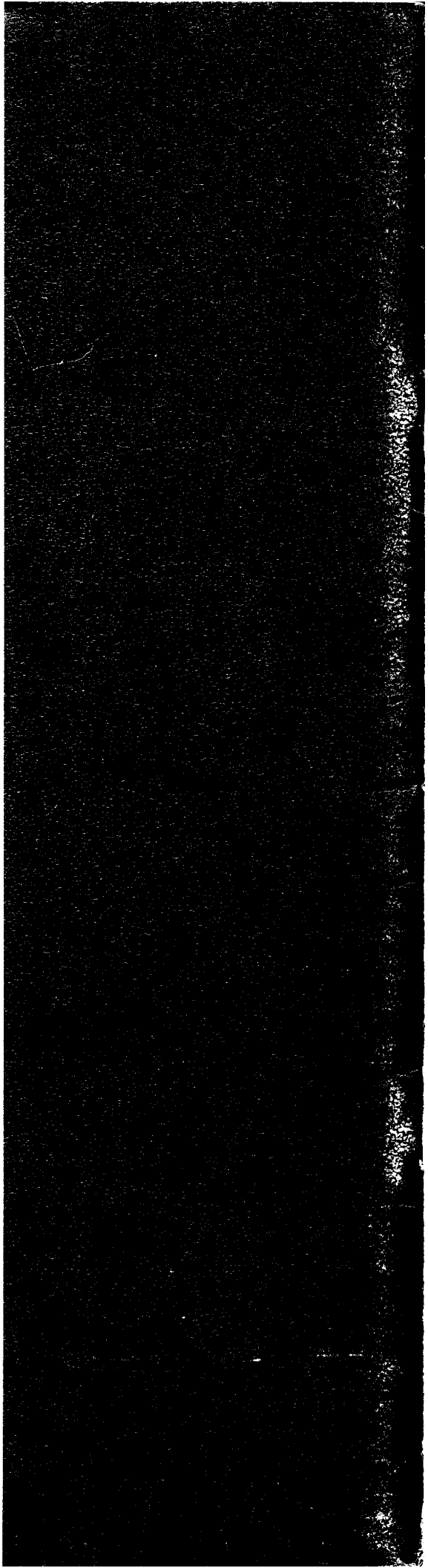
Symbol No.	Part No.	Description
PB-2139B	F0002139B	Printed Circuit Board
	C0021390	PCB with Components
		DISPLAY TUBE
V4001	G6090008	LD8231/F1P9C5
		IC
Q4031	G1090241	TA7612AP
		TRANSISTOR
Q4024	G3309450Q	2SC945Q
		DIODE
D4028–4031	G2090027	1SS53
		LED
D4037–4041	G2090144	TLG226
D4042,4043	G2090145	TLY226
D4044–4046	G2090142	TLR226
D4047,4049	G2090137	TLR205
D4048,4050	G2090136	TLG205

R4052	J01245471	**RESISTOR** Carbon film 1/4W TJ 470Ω
R4053	J02245102	" " " SJ 1kΩ
R4051	J01245122	" " " TJ 1.2kΩ
R4048	J02245152	" " " SJ 1.5kΩ
R4036,4049	J02245103	" " " " 10kΩ
R4050	J02245393	" " " " 39kΩ
R4054	J01245224	" " " TJ 220kΩ
		BLOCK RESISTOR
RB4003,4004	Q80000001	100k x 9
RB4005	Q80000002	1.5k x 3/680 x 2/470 x 5
		CAPACITOR
C4025	K13170103	Ceramic 50WV 0.01μF (DB201YF103Z5L5)
		SWITCH
S4001–4004	N4090036	SUT-110
S4005–4010	N5090003	KFE10901

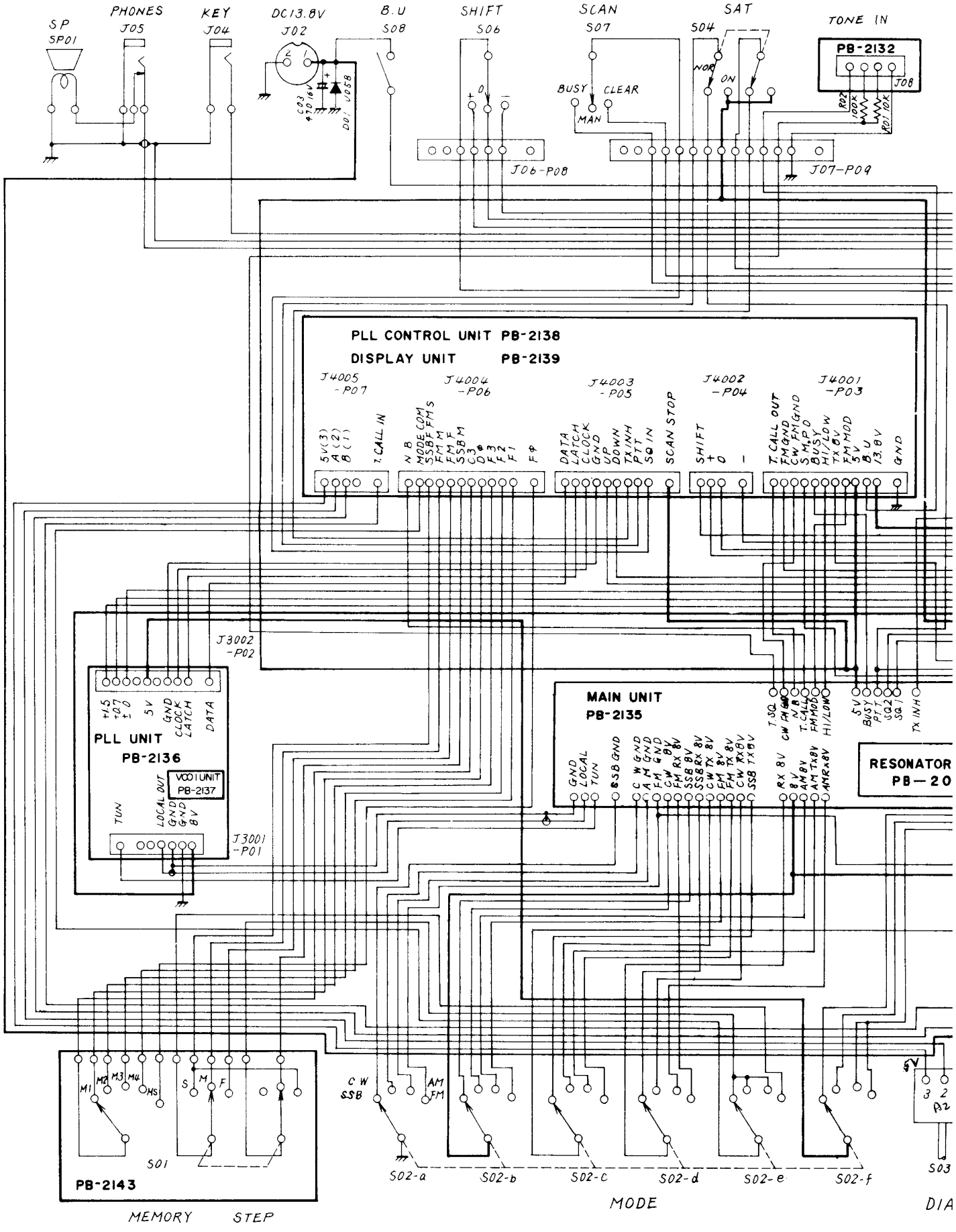
ACCESSORIES

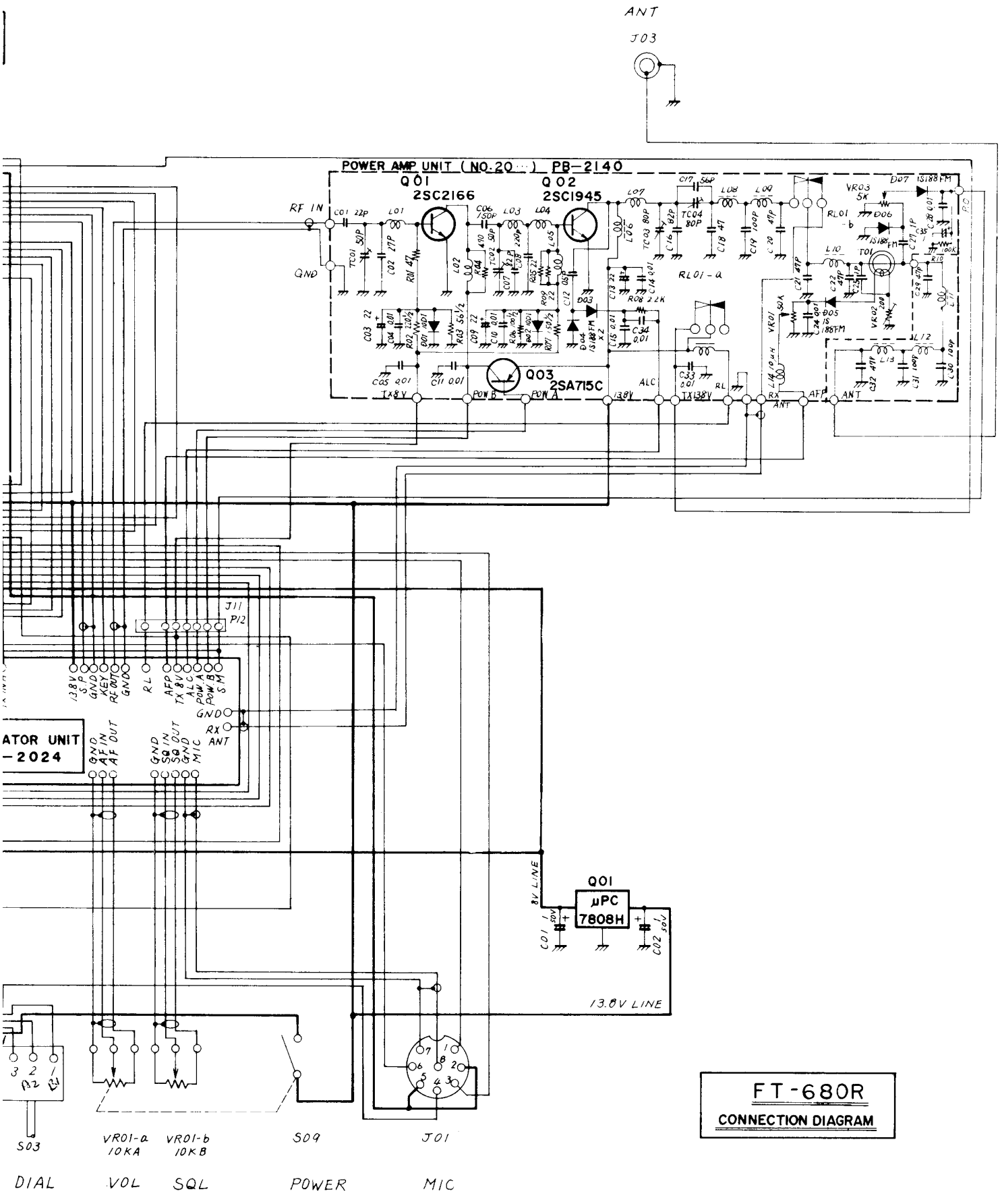
Symbol No.	Part No.	Description
	M3090028	Microphone YM-40
	T9002805	Power Cord Assembly
	Q0000005	Fuse 5A
	P0090034	External Speaker Plug P-2240
	R0062300A	Stand A
	R0062900	Mobile Bracket Assembly
		TONE IN PLUG
	P0090174	EMCHUM0401W (Housing)
	Q5000034	EMCKNM01D (Contact)

MEMO



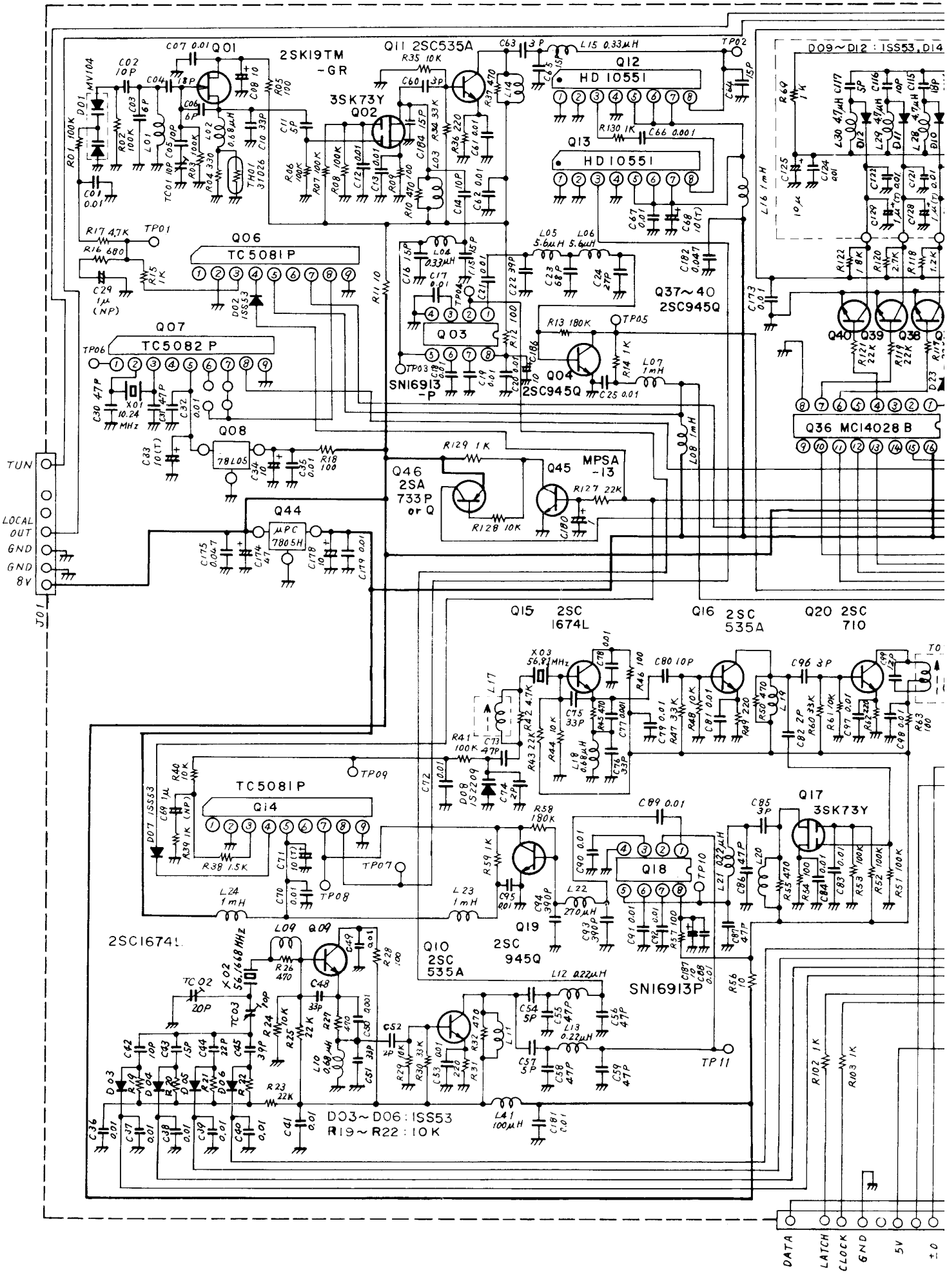
8007—E

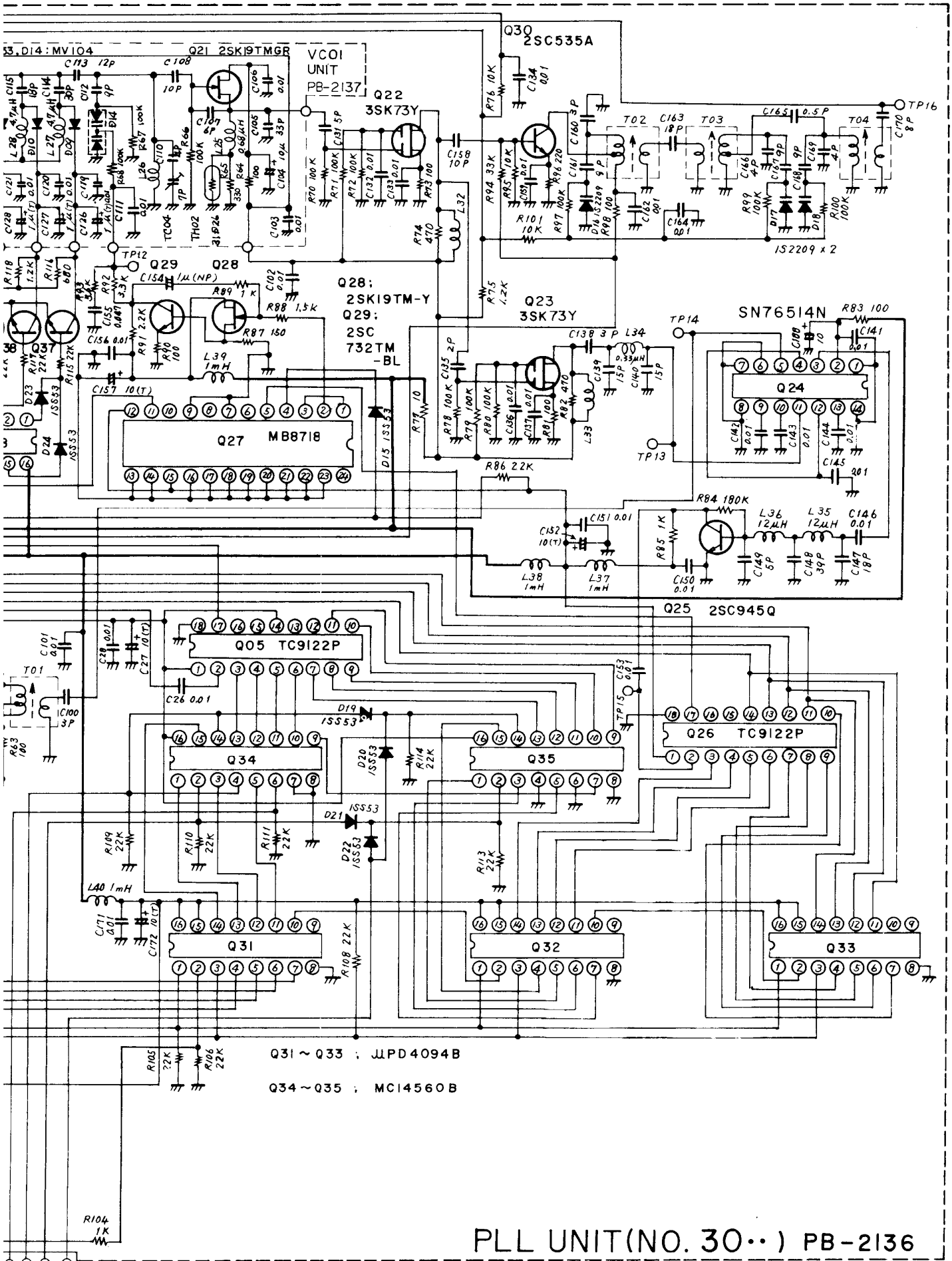

SP
SP01
PHONES
J05
KEY
J04
DC13.8V
J02
B.U
S08
SHIFT
S06
SCAN
S07
SAT
S04
TONE IN
PB-2132
J08
BUSY
CLEAR
MAN
NOR
ON
J06-P08
J07-P09
PLL CONTROL UNIT PB-2138
DISPLAY UNIT PB-2139
J4005 -P07
J4004 -P06
J4003 -P05
J4002 -P04
J4001 -P03
T. CALL IN
SCAN STOP
SHIFT
T. CALL OUT
J3002 -P02
PLL UNIT
PB-2136
VCO I UNIT
PB-2137
J3001 -P01
MAIN UNIT
PB-2135
RESONATOR
PB—20
PB-2143
S01
S02-a
S02-b
S02-c
S02-d
S02-e
S02-f
S03
MEMORY
STEP
MODE
DIA

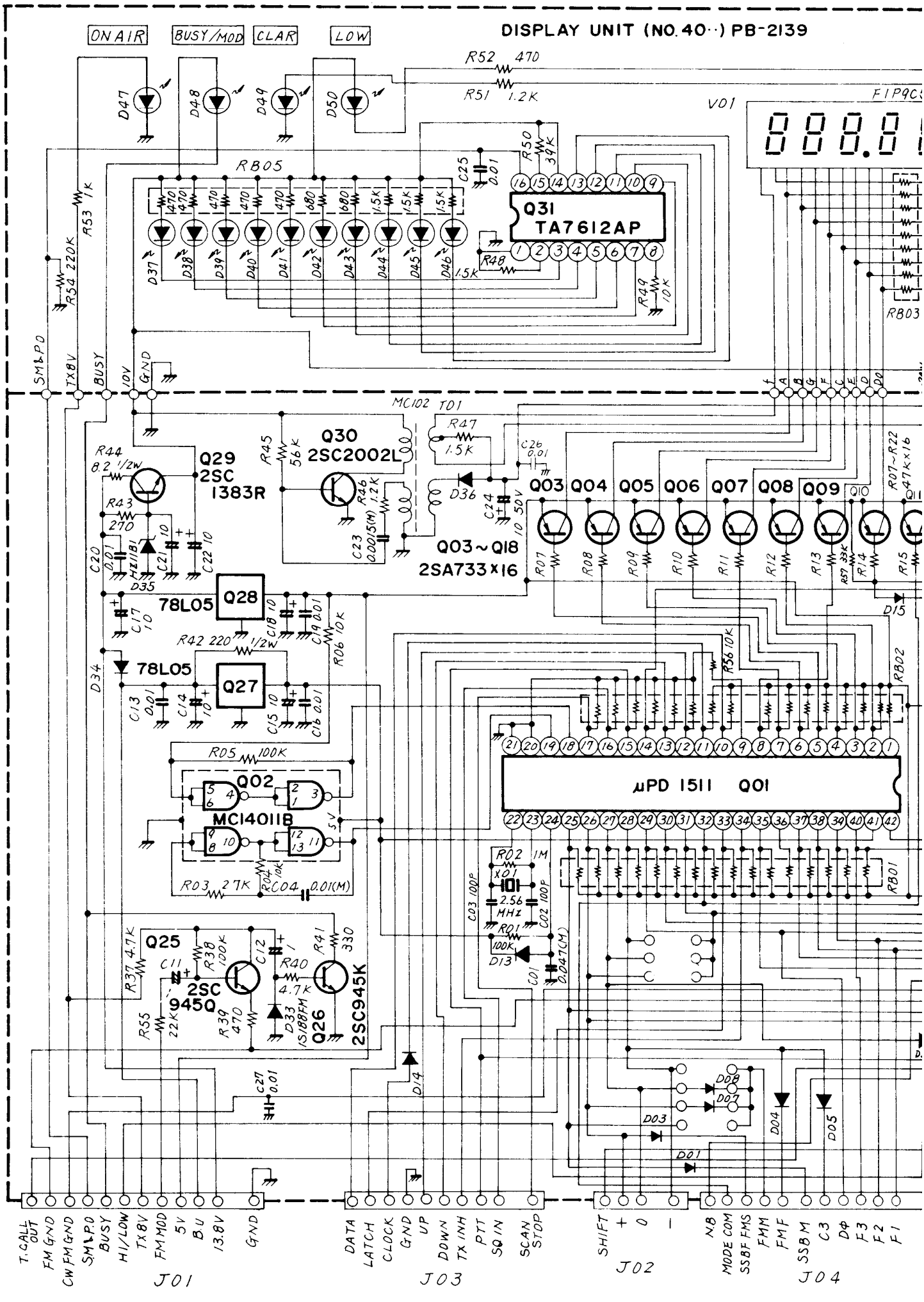


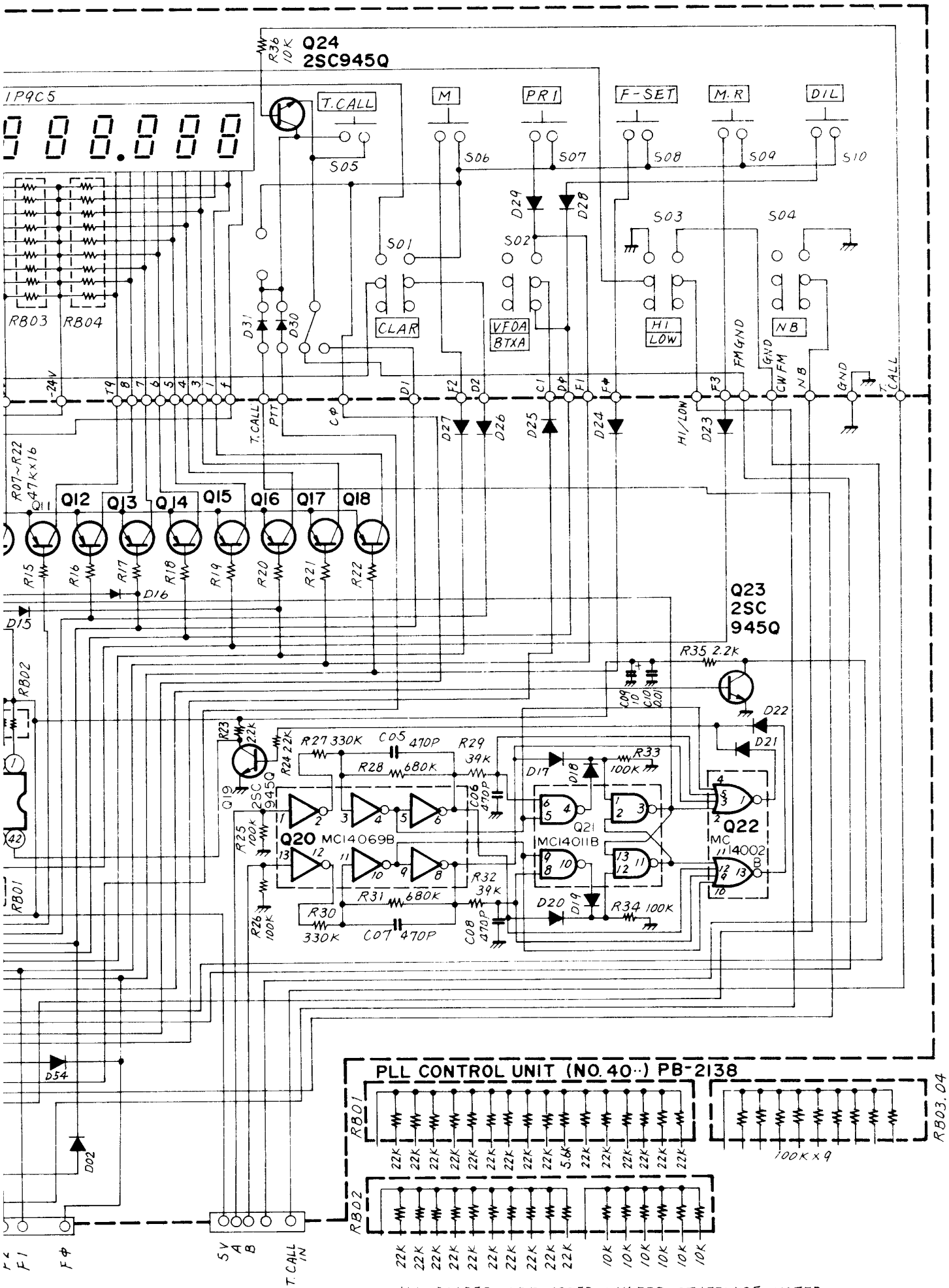
FT-680R

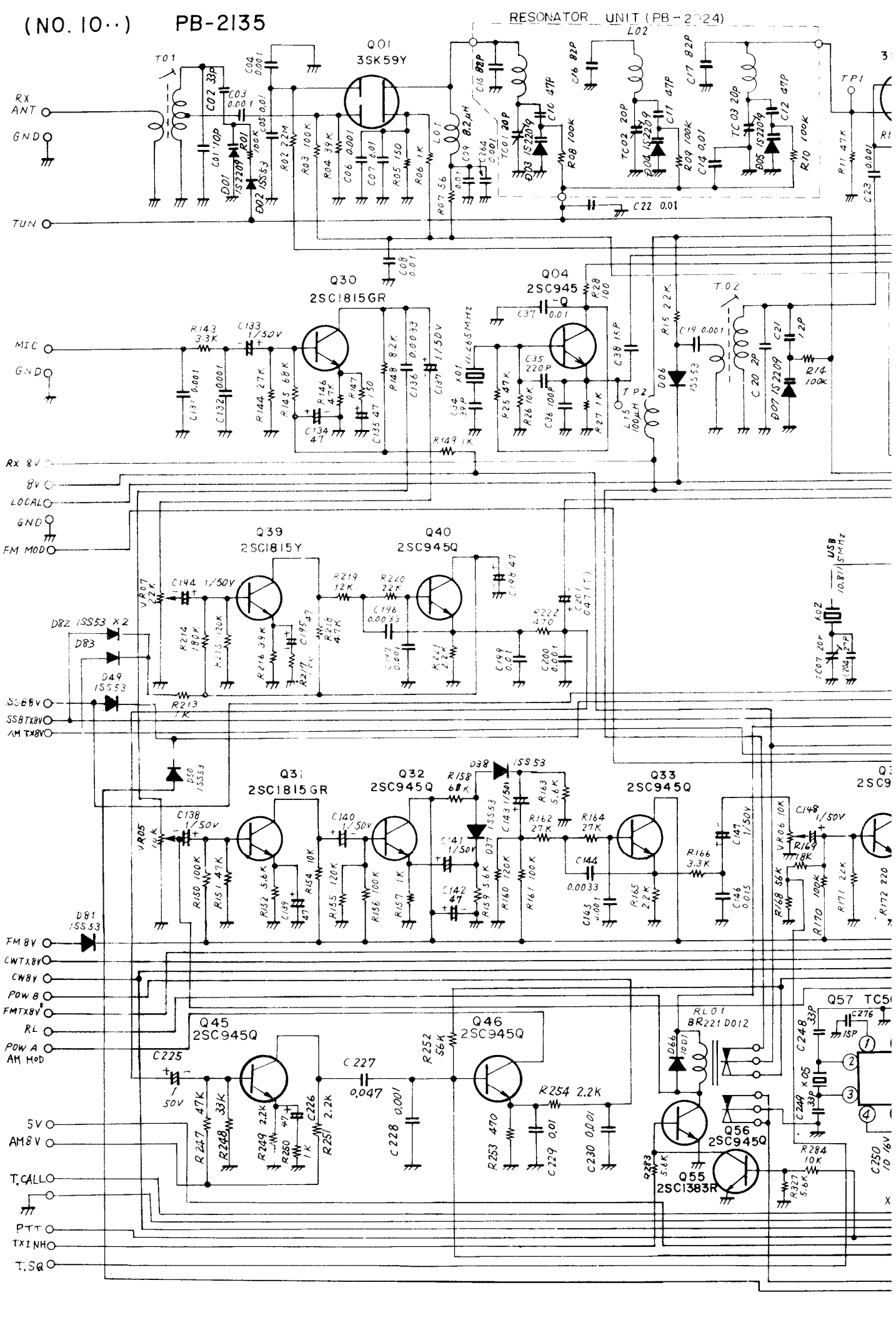
CONNECTION DIAGRAM

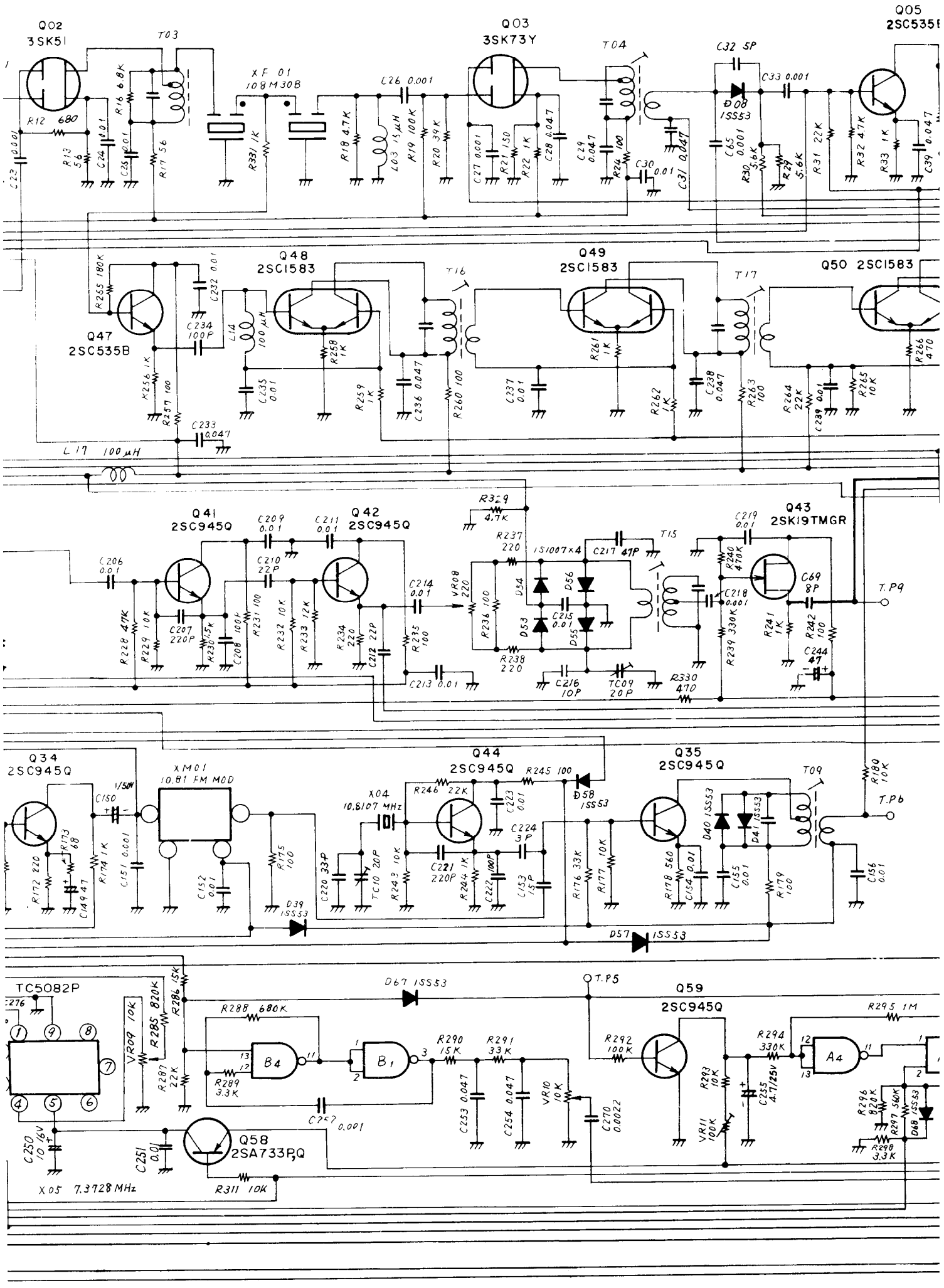

Q01 2SK19TM -GR
Q11 2SC535A
Q12 HD 10551
Q13 HD 10551
Q02 3SK73Y
Q03 SN16913 -P
Q04 2SC945Q
Q06 TC5081P
Q07 TC5082 P
Q08 78L05
Q44 μPC 7805H
Q45 MPSA -13
Q46 2SA 733P or Q
Q37~40 2SC945Q
Q36 MC14028 B
Q40 Q39 Q38
Q14 TC5081P
Q15 2SC 1674L
Q16 2SC 535A
Q20 2SC 710
Q17 3SK73Y
Q18
Q19
Q10 2SC 535A
2SC945Q
2SC1674L
SN16913P
D09~D12 : ISS53, D14
D03~D06 : ISS53
R19~R22 : 10K
TUN
LOCAL OUT
GND
GND
8V
J01
DATA
LATCH
CLOCK
GND
5V
+B

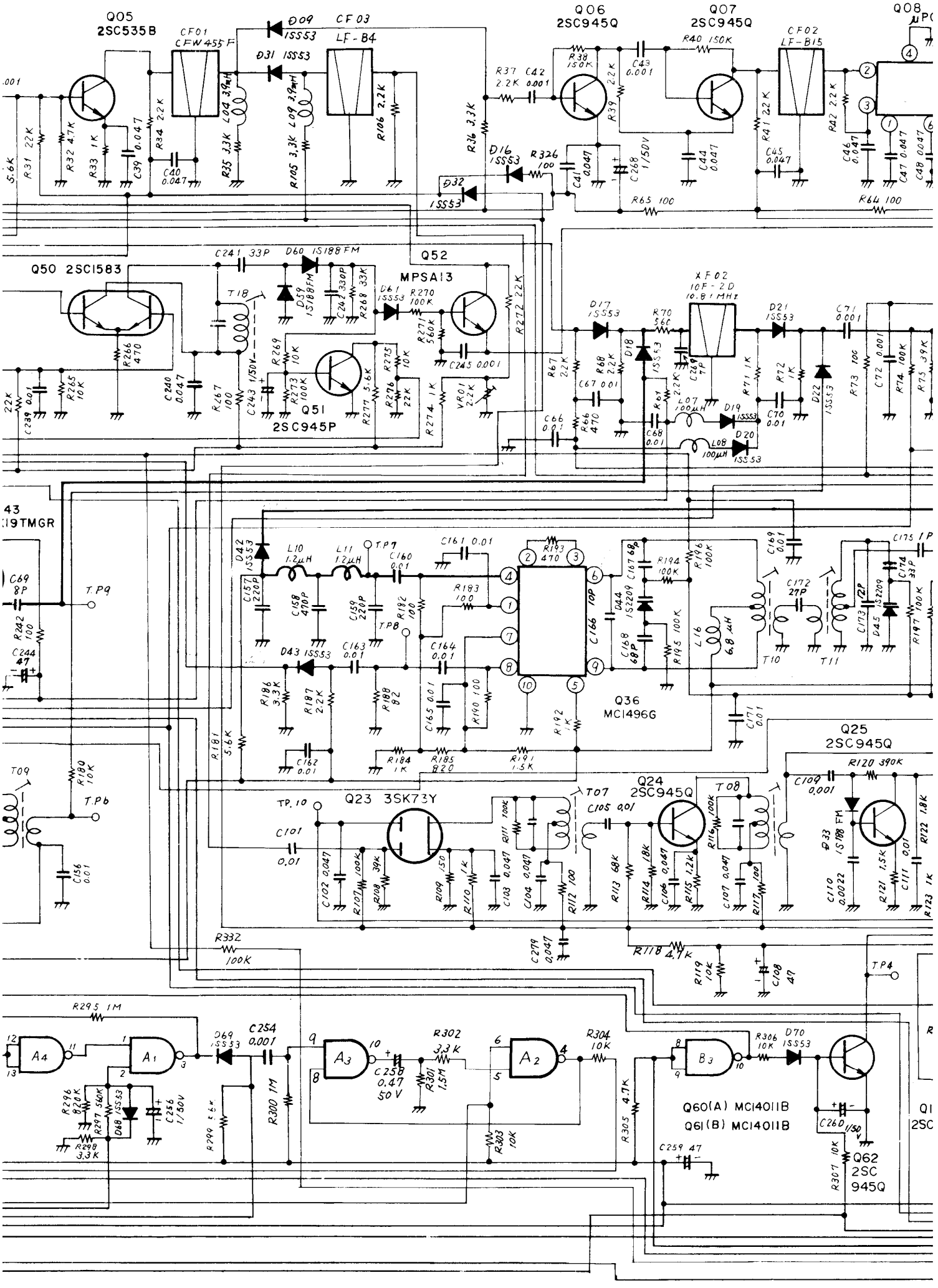

VCO1 UNIT PB-2137
Q22 3SK73Y
Q30 2SC535A
Q23 3SK73Y
Q28: 2SK19TM-Y
Q29: 2SC 732TM -BL
SN76514N
Q24
Q27 MB8718
Q25 2SC945Q
Q05 TC9122P
Q26 TC9122P
Q34
Q35
Q31
Q32
Q33
Q31 ~ Q33 ; μPD4094B
Q34 ~ Q35 ; MC14560B
J02
PLL UNIT(NO. 30··) PB-2136

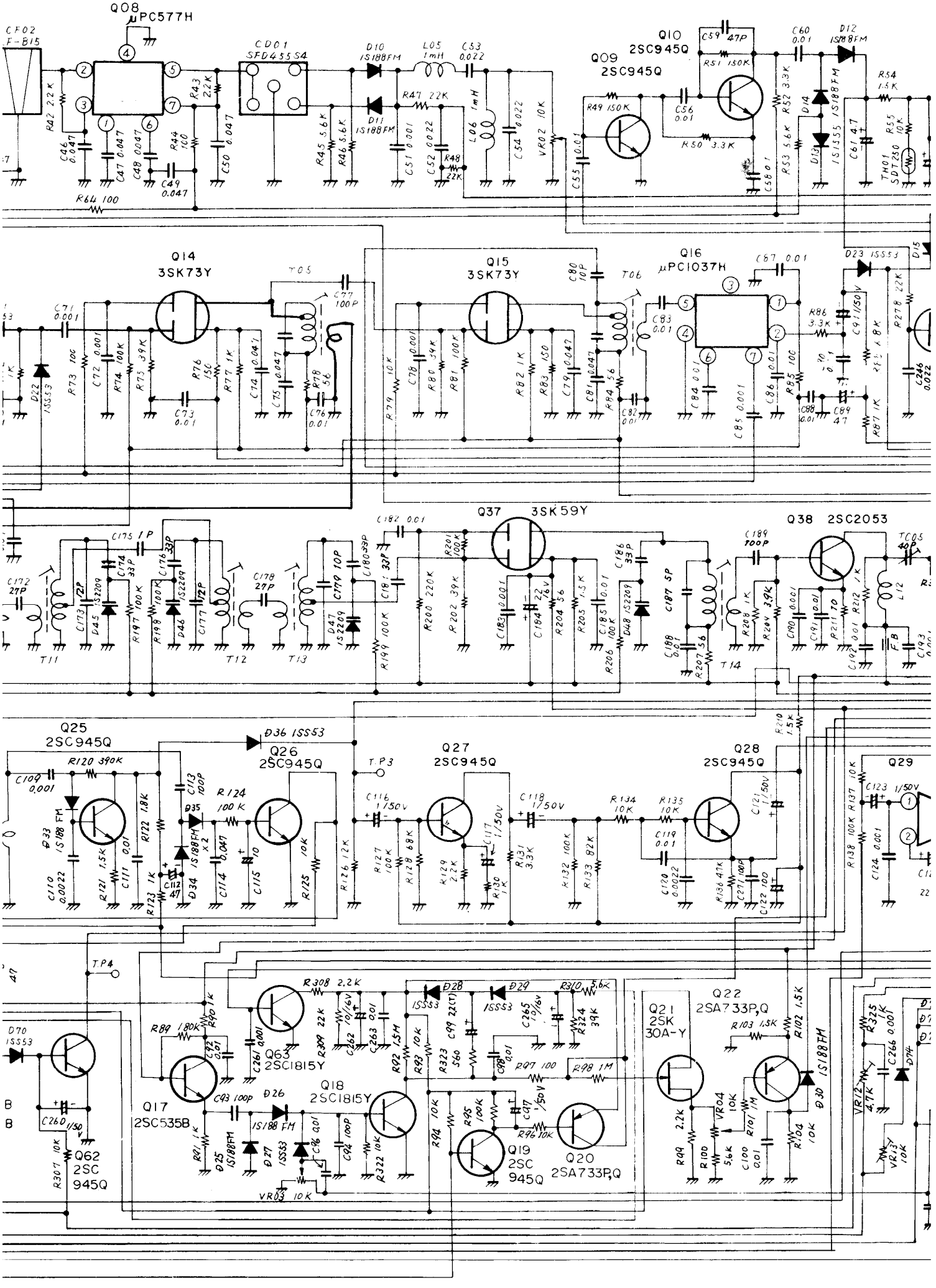

DISPLAY UNIT (NO.40··) PB-2139
ON AIR
BUSY/MOD
CLAR
LOW
D47
D48
D49
D50
R52 470
R51 1.2K
V01
RB05
R50 39K
C25 0.01
Q31
TA7612AP
R48 1.5K
R49 10K
D37
D38
D39
D40
D41
D42
D43
D44
D45
D46
R53 1K
R54 220K
SM&PO
TX8V
BUSY
10V
GND
MC102 T01
Q30
2SC2002L
R45 56K
R46 1.2K
C23 0.0015(M)
R47 1.5K
C26 0.01
D36
C24 10 50V
Q03~Q18
2SA733×16
Q03 Q04 Q05 Q06 Q07 Q08 Q09
R07~R22
47K×16
R44 8.2 1/2W
Q29
2SC 1383R
R43 270
D35
HZ11B1
C20 0.01
C21 10
C22 10
78L05 Q28
C17 10
C18 10
C19 0.01
R06 10K
R42 220 1/2W
D34
78L05 Q27
C13 0.01
C14 10
C15 10
C16 0.01
R05 100K
Q02
MC14011B
R04 10K
R03 27K
RC04 0.01(M)
5V
R36 10K
RB02
μPD 1511 Q01
RB01
R02 1M
X01
2.56 MHz
C03 100P
C02 100P
R01 100K
D13
C01 0.047(M)
Q25
2SC 945Q
R37 4.7K
C11
R38 100K
C12 1
R41 330
R40 4.7K
R55 22K
R39 470
D33 1S188FM
Q26
2SC945K
C27 0.01
D14
D08
D07
D04
D05
D03
D01
T.CALL OUT
FM GND
CW FM GND
SM&P.O
BUSY
HI/LOW
TX8V
FM MOD
5V
B.U
13.8V
GND
J01
DATA
LATCH
CLOCK
GND
UP
DOWN
TX INH
PTT
SQ IN
SCAN STOP
J03
SHIFT
+
0
−
J02
N.B
MODE COM
SSB F MS
FM M
FM F
SSB M
C3
DΦ
F3
F2
F1
J04

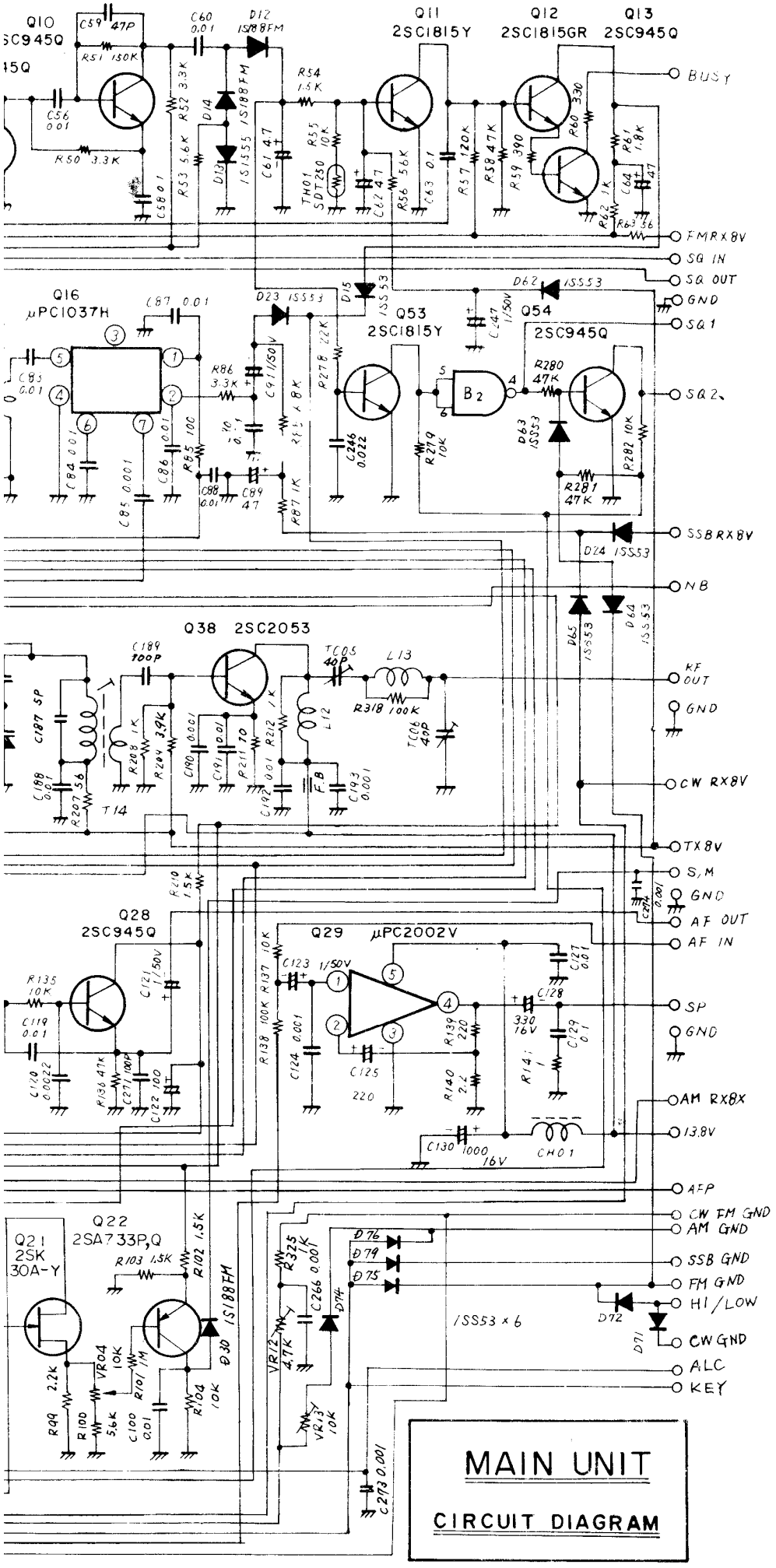

Q24
2SC945Q
T.CALL
M
PRI
F-SET
M.R
DIL
S05
S06
S07
S08
S09
S10
S01
S02
S03
S04
CLAR
VFOA
BTXA
HI
LOW
NB
RB03
RB04
D31
D30
D29
D28
D27
D26
D25
D24
D23
-24V
PTT
FMGND
GND
CW FM
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
R07~R22
47K×16
R15
R16
R17
R18
R19
R20
R21
R22
D16
D15
Q23
2SC
945Q
R35 2.2K
C09 10
C10 0.01
D22
D21
RB02
R23 22K
R24 22K
R27 330K
C05 470P
R28 680K
R29 39K
C06 470P
Q19
2SC945Q
Q20 MC14069B
Q21
MC14011B
Q22
MC14002
D17
D18
R33 100K
R25 100K
R26 100K
R30 330K
R31 680K
R32 39K
C07 470P
C08 470P
D20
D19
R34 100K
RB01
D54
D02
PLL CONTROL UNIT (NO.40··) PB-2138
RB01
RB02
22K
5.6K
10K
100K×9
RB03.04
5V
A
B
T.CALL IN
F1
F4
J05
ALL DIODES ARE 1SS53 UNLESS OTHERWISE NOTED.


(NO. 10··) PB-2135
RESONATOR UNIT (PB-2024)
RX ANT
GND
TUN
MIC
GND
Rx 8V
8V
LOCAL
GND
FM MOD
SSB8V
SSBTX8V
AM TX8V
FM 8V
CWTX8V
CW8V
POW B
FMTX8V
RL
POW A
AM MOD
5V
AM8V
T.CALL
PTT
TXINH
T.SQ
Q01 3SK59Y
Q30 2SC1815GR
Q04 2SC945Q
Q39 2SC1815Y
Q40 2SC945Q
Q31 2SC1815GR
Q32 2SC945Q
Q33 2SC945Q
Q45 2SC945Q
Q46 2SC945Q
Q56 2SC945Q
Q55 2SC1383R
Q57
D82 1SS53 X2
D83
D49 1SS53
D50 1SS53
D38 1SS53
D81 1SS53
D01 1S2209
D02 1SS53
D04 1S2209
D05 1S2209
D07 1S2209
D06 1SS53
D66 1001
RL01 BR221D012
T01
T02
TP1
TP2
L01 8.2μH
L02
L15 100μH
X01 10.695MHz
X02 10.815MHz
X05
USB


Q02
3SK51
T03
XF 01
10.8M30B
Q03
3SK73Y
T04
Q05
2SC535
C32 5P
D08
1SS53
C33 0.001
C65 0.001
R30 5.6K
R29 5.6K
R31 22K
R32 47K
R33 1K
C39 0.047
R12 680
R13 5.6
C24 0.01
C25 0.01
R16 6.8K
R17 56
C23 0.001
R331 1K
R18 4.7K
L03 15μH
R19 100K
R20 39K
C26 0.001
C27 0.001
R21 150
R22 1K
C28 0.047
C29 0.047
R24 100
C30 0.01
C31 0.047
Q47
2SC535B
R255 180K
C232 0.01
C234 100P
R256 1K
R257 100
C233 0.047
L17 100μH
Q48
2SC1583
L14 100μH
R258 1K
C235 0.01
R259 1K
C236 0.047
R260 100
T16
Q49
2SC1583
R261 1K
C237 0.01
R262 1K
C238 0.047
R263 100
T17
Q50 2SC1583
R266 470
R264 22K
C239 0.01
R265 10K
Q41
2SC945Q
C209 0.01
C211 0.01
Q42
2SC945Q
C206 0.01
C210 22P
R228 47K
R229 10K
C207 220P
R230 1.5K
C208 100P
R231 100
R232 10K
R233 12K
R234 220
C212 22P
C214 0.01
R235 100
C213 0.01
R329 4.7K
R237 220
VR08 220
R236 100
R238 220
1S1007×4
D54
D56
D53
D55
C215 0.01
C217 47P
T15
C216 10P
TC09 20P
R330 470
Q43
2SK19TMGR
C219 0.01
R240 470K
C218 0.001
C69 8P
T.P9
R241 1K
R242 100
C244 47
R239 330K
Q34
2SC945Q
C150 1/50W
XM01
10.81 FM MOD
R173 68
R174 1K
C149 47
C151 0.001
R172 220
C152 0.01
R175 100
D39
1SS53
Q44
2SC945Q
R245 100
D58
1SS53
X04
10.8107 MHz
R246 22K
C223 0.01
C224 3P
C220 33P
TC10 20P
C221 220P
R243 10K
R244 1K
C222 100P
C153 15P
Q35
2SC945Q
T09
D40 1SS53
D41 1SS53
R178 560
C154 0.01
C155 0.01
R179 100
R176 33K
R177 10K
C156 0.01
R180 10K
T.P6
D57
1SS53
TC5082P
C276
VR09 10K
R285 820K
R286 15K
R287 22K
R288 680K
B4
B1
R289 3.3K
C257 0.001
R290 15K
R291 33K
C253 0.047
C254 0.047
VR10 10K
C270 0.0022
D67 1SS53
T.P5
Q59
2SC945Q
R292 100K
R293 10K
VR11 100K
R294 330K
C255 4.7/25V
A4
R295 1M
R296 820K
R297 560K
D68 1SS53
R298 3.3K
C250 10/16V
C251 0.01
Q58
2SA733P,Q
R311 10K
X05 7.3728 MHz


Q05
2SC535B
CF01
CFW455F
D09
1SS53
D31
1SS53
CF03
LF-B4
Q06
2SC945Q
Q07
2SC945Q
Q08
CF02
LF-B15
D16
1SS53
D32
1SS53
Q50 2SC1583
Q52
MPSA13
Q51
2SC945P
XF02
10F-2D
10.81MHz
Q36
MC1496G
Q25
2SC945Q
Q24
2SC945Q
Q23 3SK73Y
T07
T08
T09
T10
T11
A4
A1
A3
A2
B3
Q60(A) MC14011B
Q61(B) MC14011B
Q62
2SC
945Q


Q08 μPC577H
CF02 F-B15
CD01 SFD455S4
D10 1S188FM
D11 1S188FM
L05 1mH
L06 1mH
C53 0.022
Q09 2SC945Q
Q10 2SC945Q
C59 47P
R51 150K
C60 0.01
D12 1S188FM
R54 1.5K
D14
D13 1S1555
C61 47
R55 10K
TH01 SDT230
R49 150K
C56 0.01
R50 3.3K
R52 3.3K
R53 5.6K
C58 0.01
C55 0.01
VR02 10K
R64 100
Q14 3SK73Y
Q15 3SK73Y
Q16 μPC1037H
T05
T06
C77 100P
C80 10P
C67 0.01
D23 1SS53
D15
C83 0.01
R86 3.3K
C91 1/50V
R278 22K
C246 0.022
C89 47
C88 0.01
R87 1K
C84 0.01
C85 0.001
C86 0.01
R85 10K
C82 0.01
C81 0.0047
R84 56
C79 0.0047
R83 150
R82 1K
R81 100K
C78 0.001
R80 34K
R79 10K
C76 0.01
R78 56
C75 0.0047
C74 0.0047
R77 1K
R76 150
C73 0.01
R75 39K
R74 100K
C72 0.001
R73 10K
C71 0.001
D22 1SS53
Q37 3SK59Y
Q38 2SC2053
C182 0.001
R201 100K
R200 220K
R202 39K
C183 0.001
C184 22 16V
R204 56
R205 1.5K
C185 0.01
C186 33P
R206 100K
D48 1S2209
C187 5P
C188 0.01
R207 56
T14
C189 100P
TC05 40P
R208 1K
R209 3.9K
C190 0.001
C191 0.01
P211 10
R212 1K
C192 0.01
F.B
C193
L12
C175 1P
C176 33P
C174 33P
C172 27P
C173 12P
D45 1S2209
R197 100K
T11
C178 27P
C177 12P
D46 1S2209
R198 100K
T12
C179 10P
C180 33P
C181 33P
D47 1S2209
R199 100K
T13
Q25 2SC945Q
Q26 2SC945Q
Q27 2SC945Q
Q28 2SC945Q
Q29
D36 1SS53
R120 390K
C109 0.001
D33 1S188FM
C110 0.0022
R121 1.5K
C111 0.01
R122 1.8K
C113 100P
D35
D34 1S188FM X2
C112 47
R123 1K
R124 100K
C114 0.047
C115 10
R125 10K
R126 12K
T.P3
C116 1/50V
R127 100K
R128 68K
R129 2.2K
C117 1/50V
R130 1K
R131 3.3K
C118 1/50V
R132 100K
R133 82K
R134 10K
R135 10K
C119 0.01
C120 0.0022
R136 47K
C121 1/50V
C122 100
R210 1.5K
R137 10K
C123 1/50V
R138 100K
C124 0.001
T.P4
D70 1SS53
R307 10K
Q62 2SC 945Q
C260 1/50V
R240 1K
R308 2.2K
D28 1SS53
D29 1SS53
R310 5.6K
C262 10/16V
C263 0.01
C265 10/16V
R324 39K
R309 22K
C261 0.001
Q63 2SC1815Y
R89 180K
C92 0.01
R91 1K
D25 1S188FM
D26 1S188FM
D27 1SS53
C96 0.01
C94 100P
R322 10K
VR03 10K
Q17 2SC535B
C93 100P
Q18 2SC1815Y
R92 1.5M
R93 10K
R323 560
C99 22(T)
C98 0.01
R97 100
R98 1M
R94 10K
R95 100K
C97 1/50V
R96 10K
Q19 2SC 945Q
Q20 2SA733P,Q
Q21 2SK 30A-Y
Q22 2SA733P,Q
R103 1.5K
R102 1.5K
D30 1S188FM
R99 2.2K
R100 5.6K
C100 0.01
VR04 10K
R101 1M
R104 10K
R335 1K
C266 0.001
VR12 4.7K
VR13 10K


Q10
Q11 2SC1815Y
Q12 2SC1815GR
Q13 2SC945Q
BUSY
FMRX8V
SQ IN
SQ OUT
GND
SQ1
SQ2
SSBRX8V
NB
Q16 µPC1037H
Q53 2SC1815Y
Q54 2SC945Q
Q38 2SC2053
RF OUT
GND
CW RX8V
TX8V
S,M
GND
AF OUT
AF IN
Q28 2SC945Q
Q29 µPC2002V
SP
GND
AM RX8V
13.8V
AFP
CW FM GND
AM GND
SSB GND
FM GND
HI/LOW
CW GND
ALC
KEY
Q21 2SK30A-Y
Q22 2SA733P,Q
1SS53 x 6
MAIN UNIT
CIRCUIT DIAGRAM