

ManualsPlus.com

SERVICE MANUAL

IC-R71

ICOM INCORPORATED

TABLE OF CONTENTS

| | |
|--|----------------|
| SECTION 1 SPECIFICATIONS | 1 - 1 |
| SECTION 2 CONTROLS AND THEIR FUNCTIONS | 2 - 1 ~ 4 |
| FRONT PANEL | 2 - 1 |
| REAR PANEL | 2 - 4 |
| SECTION 3 INSIDE VIEWS | 3 - 1 ~ 2 |
| SECTION 4 BLOCK DIAGRAM | 4 - 1 ~ 2 |
| SECTION 5 OPERATION | 5 - 1 ~ 15 |
| RF UNIT | 5 - 1 |
| MAIN UNIT | 5 - 2 |
| PLL UNIT | 5 - 5 |
| DRIVER (LOGIC) UNIT | 5 - 9 |
| SECTION 6 DISASSEMBLY | 6 - 1 ~ 8 |
| SECTION 7 ADJUSTMENTS | 7 - 1 ~ 3 |
| PLL ADJUSTMENT | 7 - 1 |
| RECEIVER ADJUSTMENT | 7 - 2 |
| FM UNIT ADJUSTMENT | 7 - 3 |
| SECTION 8 CIRCUIT AND VOLTAGE DIAGRAMS | 8 - 1 ~ 11 |
| SECTION 9 IC RATINGS | 9 - 1 ~ 7 |
| SECTION 10 PARTS LIST | 10 - 1 ~ 20 |
| SECTION 11 SCHEMATIC DIAGRAM | 11 - 1 |
| SECTION 12 BOARD LAYOUT | SEPARATE |

SECTION 1 SPECIFICATIONS

GENERAL

| | | |
|---------------------------|--|-----|
| Number of Semiconductors | : Transistors | 90 |
| | : FETs | 19 |
| | : ICs (Including CPU) | 47 |
| | : Diodes | 237 |
| Frequency Coverage | : 0.1 MHz ~ 30 MHz (Australian version: 2.0 MHz ~ 30.0 MHz) (German version: 0.15 MHz ~ 26.1 MHz) Thirty 1-MHz segments | |
| Frequency Control | : CPU based 10-Hz step digital PLL synthesizer with dual VFO system | |
| Frequency Readout | : 6-digit 100-Hz readout | |
| Frequency Stability | : Less than 200 Hz after switch ON 1 min. to 60 mins., and less than 30 Hz after 1 hour. Less than 500 Hz in the range of 0°C to +50°C | |
| Power Supply Requirements | : 117 V or 235 V \pm 10% 50 ~ 60 Hz 30 VA (100V/200V/220V use requires internal modification) | |
| Antenna Impedance | : 50 ohms unbalanced (Single wire can be used on 0.1 ~ 1.6 MHz) | |
| Weight | : 7.5 kg (16.5 lbs.) | |
| Dimensions | : 111 (H) \times 286 (W) \times 276 (D) mm (4-3/8 \times 11-1/4 \times 10-7/8 inches) | |

RECEIVER

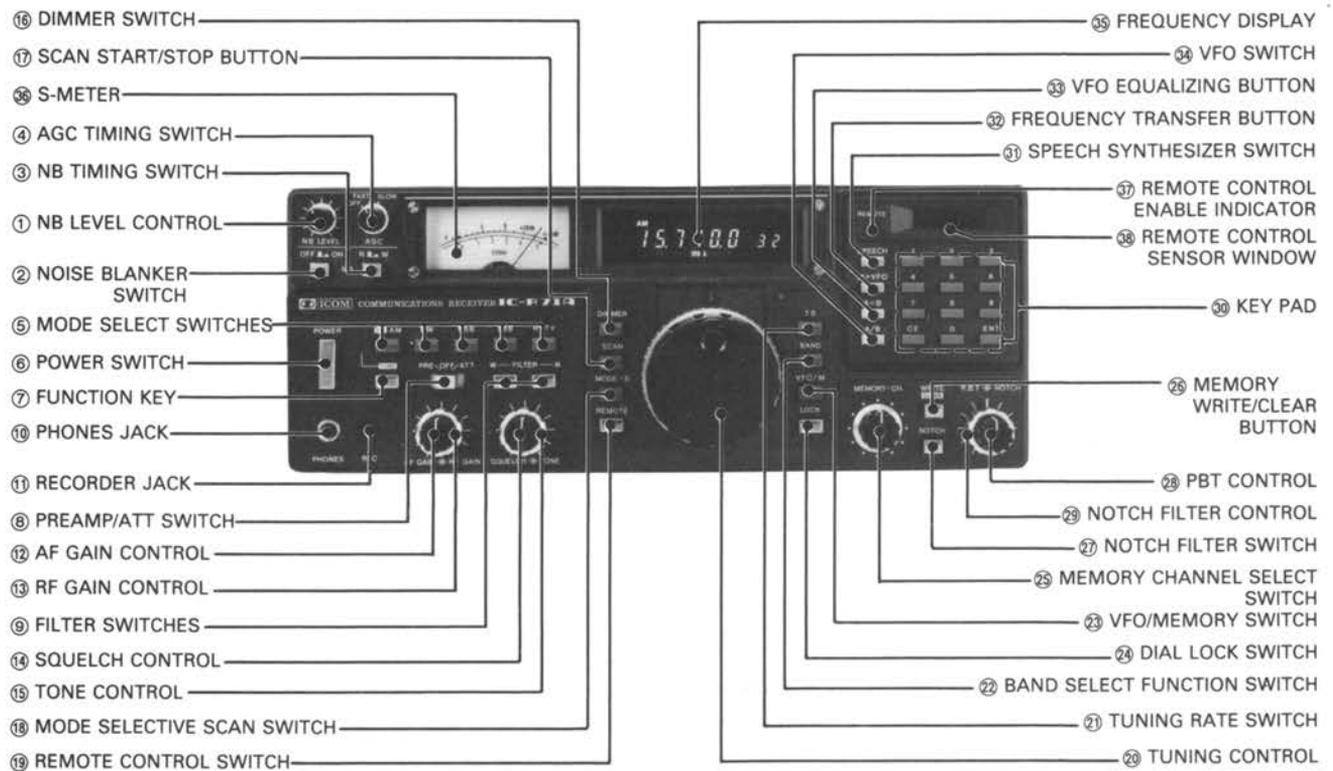
| | |
|---------------------------------------|---|
| Receiving System | : Quadruple conversion superheterodyne with continuous bandwidth control (F ₃ *: triple conversion superheterodyne) |
| Receiving Modes | : A ₁ , A ₃ J (USB, LSB), F ₁ (output FSK audio signal), A ₃ , F ₃ * |
| IF Frequencies | : 1st 70.4515 MHz 2nd 9.0115 MHz 3rd 455 kHz 4th 9.0115 MHz (except F ₃ *) |
| 2nd IF Center Frequency | : SSB (A ₃ J) AM (A ₃) 9.0115 MHz CW (A ₁) RTTY (F ₁) 9.0106 MHz FM* (F ₃) 9.0100 MHz |
| Sensitivity (when preamplifier is ON) | : SSB, CW, RTTY Less than 0.15 microvolt (0.1 ~ 1.6 MHz: 1 microvolt) for 10 dB S+N/N AM Less than 0.5 microvolt (0.1 ~ 1.6 MHz: 3 microvolts) FM* Less than 0.3 microvolt for 12 dB SINAD (1.6 ~ 30 MHz) |
| Selectivity | : SSB, CW, RTTY 2.3 kHz at -6 dB (adjustable to 500 Hz min) 4.3 kHz at -60 dB CW-N, RTTY-N 500 Hz at -6 dB 1.5 kHz at -60 dB AM 6 kHz at -6 dB (adjustable to 2.7 kHz min) 15 kHz at -50 dB FM* 15 kHz at -6 dB 25 kHz at -60 dB |
| Spurious Response Rejection Ratio | : More than 60 dB |
| Audio Output | : More than 3 watts |
| Audio Output Impedance | : 8 ohms |

* When optional FM unit is installed.

Specifications are approximate and are subject to change without notice or obligation.

SECTION 2 CONTROLS AND THEIR FUNCTIONS

FRONT PANEL

**1. NB LEVEL CONTROL**

Controls the threshold level of the noise blanker. Adjust the controls so that incoming noises will be eliminated.

2. NB (NOISE BLANKER) SWITCH

When pulse-type noise such as automobile ignition noise is present, push this switch in. The noise will be reduced to provide comfortable reception.

3. NB TIMING SWITCH

The noise blanker blanking time can be selected (NORMAL and WIDE) by this switch. It will be effective against any types of noise.

4. AGC TIMING SWITCH

For changing the time-constant of the AGC (Automatic Gain Control) circuit. By setting this switch to the slow position, the AGC voltage is released more slowly. Set the switch to provide comfortable reception.

When the switch is at the OFF position, the AGC function is turned OFF and the S-meter does not move even if a signal is being received. (The AGC does not actuate in the FM mode.)

5. MODE SELECT SWITCHES

Any one of five operating modes can be selected by simply pushing the desired switch. Additionally, the AM switch has dual functions, as follows.

1. AM For AM operation.

2. FM By pushing the FUNCTION key first, then the AM switch, the FM mode is selected.

6. POWER SWITCH

This switch is a push-lock type switch which controls the input AC power to the set. When the switch is pushed in and locked, power is supplied to the set. When the switch is pushed again and released, the power to all circuits is cut.

7. FUNCTION KEY

Increase the function of the AM MODE SELECT and the MEMORY WRITE switches by pushing this key switch first.

8. PREAMP/ATT (Attenuator) SWITCH

Switches RF preamplifier and attenuator in the RF circuit.

When the switch is at the OFF position, both preamplifier and attenuator are removed from the circuit, and incoming signals will be fed to the receiver directly.

When using a small antenna or receiving a weak signal, set the switch in the "PRE" position; the preamplifier is inserted in the RF circuit and provides higher sensitivity.

When nearby signals interfere with reception, or when receiving a very strong signal, set this switch to the "ATT" position. This removes the

- preamplifier from the circuit and inserts the attenuator into the circuit. This gives about 20 dB attenuation.
- For normal operation leave this switch at the "OFF" position.
9. **FILTER SWITCH**
Selects one of the second IF (9 MHz) filters to improve the selectivity.
 10. **PHONES JACK**
Accepts a standard ¼ inch headphone plug for headphones of 4 ~ 16 ohms. Stereo phones can be used without modification.
 11. **RECORDER JACK**
Accepts a 3.5 mm mini plug for a tape recorder to record receiving signals. The output is a fixed level regardless of the position of the AF GAIN control.
 12. **AF GAIN CONTROL**
Controls the audio output level. Clockwise rotation increases the level.
 13. **RF GAIN CONTROL**
Controls the gain of the RF section. Clockwise rotation gives the maximum gain. As the control is rotated counterclockwise, the needle of the METER rises, and only signals stronger than the level indicated by the needle will be heard.
 14. **SQUELCH CONTROL**
Sets the squelch threshold level. To turn OFF the squelch function, rotate this control completely counterclockwise. To set the threshold level higher, rotate the control clockwise.
 15. **TONE CONTROL**
Controls the receiver audio tone. Adjust the control to provide comfortable reception.
 16. **DIMMER SWITCH**
By pushing this switch in, the intensity of the meter illumination and frequency display is reduced. Use this in the dark to prevent glare.
 17. **SCAN START/STOP BUTTON**
Starts and stops any of the scan functions. When depressing it again to restart the scan, it will start from the stopped frequency in the programmed scan, or from the highest memory channel in memory scan.
 18. **MODE SELECTIVE SCAN SWITCH**
When this switch is pushed, only memory channels stored the operating mode which is displayed on the frequency display just prior to pushing this switch are selected by turning the tuning control or scanning.
 19. **REMOTE CONTROL SWITCH**
Switches the optical remote controller circuit (option). When this switch is pushed in and locked, the remote controller circuit will be turned on and the REMOTE CONTROL ENABLE INDICATOR will illuminate.
 20. **TUNING CONTROL**
Rotating this control clockwise increases the frequency or the memory channel number, while rotating it counterclockwise decreases it. The frequency changes by 10 Hz in any mode. If, at the 10-Hz step tuning rate, the tuning control is turned faster, the 50-Hz step tuning rate is automatically selected. This makes it very convenient to change frequency quickly over a wide range.
This control is also used to select the operating band while the BAND SELECT FUNCTION switch is depressed.
 21. **TUNING RATE SWITCH**
By pushing in this switch, the operating frequency is changed to correspond to 1 kHz increments in any mode.
At the same time, the 100 Hz digit on the display is cleared to show "0". When this switch is pushed again and released, the frequency is changed normally. This switch allows you to quickly change over a great frequency range.
 22. **BAND SELECT FUNCTION SWITCH**
By pushing in this switch, the operating band is changed by turning the TUNING CONTROL. The operating frequency is changed in 1 MHz steps but the lower digits do not change.
 23. **VFO/MEMORY SWITCH**
Switches between VFO operation and MEMORY CHANNEL operation.
 24. **DIAL LOCK SWITCH**
After the IC-R71 is set to a certain frequency by pushing the DIAL LOCK switch, the VFO is electronically locked at the display frequency, thus inactivating the operation of the tuning knob. To change frequency, the dial lock must first be disengaged by pushing and releasing the DIAL LOCK switch again.
 25. **MEMORY CHANNEL SELECT SWITCH**
Selects any one of 32 memory channels in the MEMORY CHANNEL operation. The selected channel number is displayed on the frequency display. By turning the switch clockwise, the channel number is increased, and when counterclockwise is decreased.
 26. **MEMORY WRITE/CLEAR BUTTON**
By pushing this button, the displayed frequency and selected mode are stored into the memory channel which is selected by the MEMORY CHANNEL SELECT switch.
By pushing the FUNCTION KEY first and then this button, the secondary function is selected and the memorized frequency and mode in the displayed memory channel will be cleared.
 27. **NOTCH FILTER SWITCH**
Switches the notch filter function ON and OFF.
 28. **P.B. TUNE (PASS BAND TUNING) CONTROL**
Allows continuous tuning of the pass-band selectivity by moving the filter up to 800 Hz from the upper or lower side in SSB, CW and RTTY. Not only improves selectivity, but also can improve the audio tone. Normal position is in the center (12 o'clock) position and is 2.3 kHz wide in SSB.
 29. **NOTCH FILTER CONTROL**
Shifts the notch filter frequency. Adjust the control so that interference is reduced.

30. KEY PAD

There are ten numerical keys, and the cancelling and entering keys for setting an operating frequency.

31. SPEECH SYNTHESIZER SWITCH

When the optional speech synthesizer unit is installed, this switch turns on the unit which announces the displayed frequency in English.

32. FREQUENCY TRANSFER BUTTON

In the VFO operating mode, the frequency and mode stored in a memory channel (channel number displayed on frequency display), are transferred to the selected VFO.

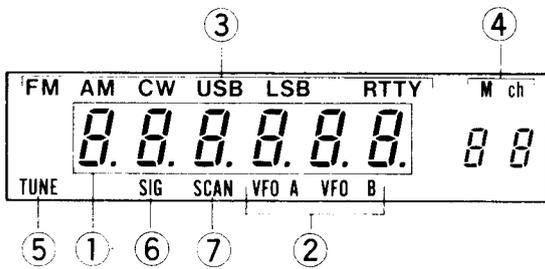
33. VFO EQUALIZING BUTTON

Instantly sets the frequency and mode of a VFO to the same as those of the other VFO.

34. VFO SWITCH

Selects either VFO, "A" or "B", for tuning. Each push of this button selects VFO A and B alternately.

35. FREQUENCY DISPLAY



The frequency of the IC-R71 is displayed on a luminescent display tube. Since the 1 MHz and 1 kHz decimal points are displayed, the frequency can easily be read. The frequency indicated is the carrier frequency of each mode, USB, LSB, CW, AM and FM, and the mark frequency in RTTY.

The FREQUENCY DISPLAY shows not only the operating frequency but also the mode, selected VFO or memory channel, and SCAN mode.

- ① Shows operating frequency in 6 digits between 10 MHz and 100 Hz.
- ② Shows selected VFO: VFO A or VFO B.
- ③ Shows operating mode: FM, AM, CW, USB, LSB or RTTY.
- ④ Shows whether the set is in the MEMORY CHANNEL MODE or not, and the selected memory channel number. When the set is in the MEMORY CHANNEL MODE, "M ch" is displayed here.
- ⑤ Shows that the set is tuned to an incoming signal frequency within 1 kHz in the FM mode. At this time, "TUNE" is displayed here, (if optional FM unit is installed).
- ⑥ Shows that the squelch is opened. When the squelch is opened, "SIG" is displayed here.
- ⑦ Shows that the set is in the SCAN mode. When the set is in the SCAN mode, "SCAN" is displayed here.

36. S-METER

Signal strength of an incoming signal is indicated on a scale of S1 ~ S9 and S9 to S9+40 dB, and a linear scale divided into five.

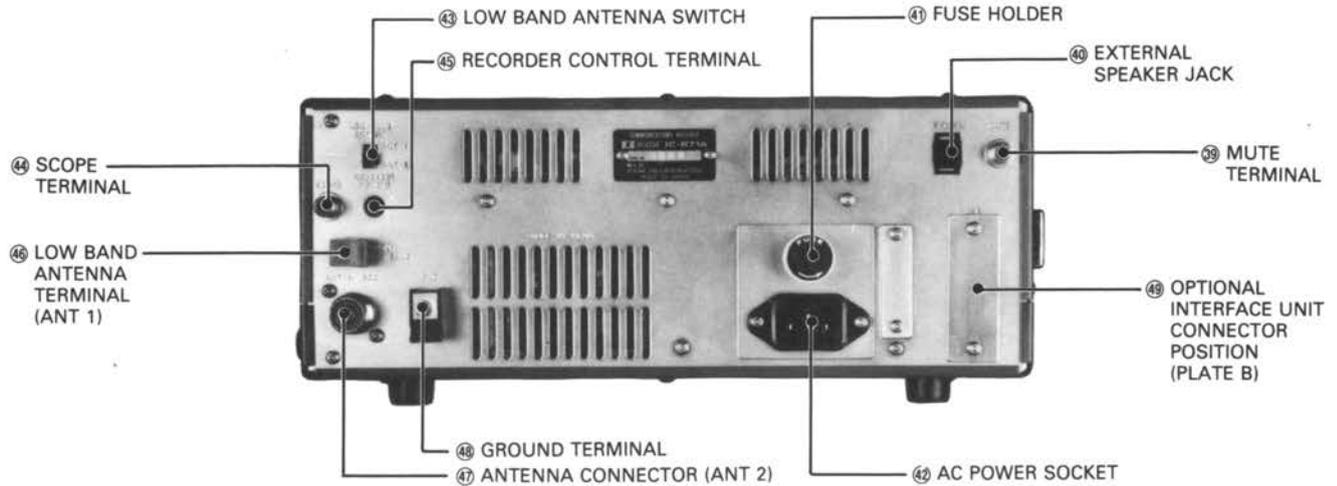
37. REMOTE CONTROL ENABLE INDICATOR

Illuminates when the REMOTE CONTROL SWITCH is pushed in.

38. REMOTE CONTROL SENSOR WINDOW

An infrared sensor is installed under this window. This sensor detects infrared rays emitted from the optical remote controller to control the operating frequency, mode audio volume, speech synthesizer, etc.

REAR PANEL

**39. MUTE TERMINAL**

When you wish to use the set together with a transmitter or transceiver, ground this terminal in the transmit mode, and the set is muted.

40. EXTERNAL SPEAKER JACK

When an external speaker is used, connect it to this jack. Use a speaker with an impedance of 8 ohms. When the external speaker is connected, the built-in speaker does not function.

41. FUSE HOLDER

This holds a fuse for the AC power circuit. If the fuse is blown, replace it with a new 1A fuse for 100/117V operation, or 0.5A fuse for 200/220/235V operation after checking the cause. Open the fuse holder with a Philips-head screwdriver.

42. AC POWER SOCKET

For connection of the supplied AC power cable.

43. LOW BAND ANTENNA SWITCH

Switches the low band (1600 kHz and below) antenna terminals: ANT 1 (④ LOW BAND ANTENNA TERMINAL) for a high impedance antenna such as a long wire antenna, and ANT 2 (④ 50 ohm ANTENNA CONNECTOR) for a 50 ohm coaxial cable.

44. SCOPE TERMINAL

This terminal brings out the 70.4515-MHz IF signal from the mixer in the receiver. Not only observation of the received signal, but also the signals of a selected band width is possible by using a panadaptor or panascope.

45. RECORDER CONTROL TERMINAL

This terminal is grounded when the squelch is opened. This can be used to control a tape recorder so that the recorder works only when the squelch is opened and a signal is received.

46. LOW BAND ANTENNA TERMINAL (ANT 1)

For connection of a low band antenna to receive 1600 kHz and below. When the operating frequency goes to 1600 kHz and below, the antenna terminal will be changed from the ④ ANTENNA CONNECTOR to this terminal automatically (when the ④ LOW BAND ANTENNA SWITCH is set at the ANT 1 position).

47. ANTENNA CONNECTOR (ANT 2)

This is used to connect the antenna to the set. Its impedance is 50 ohms and connects with a PL-259 connector.

48. GROUND TERMINAL

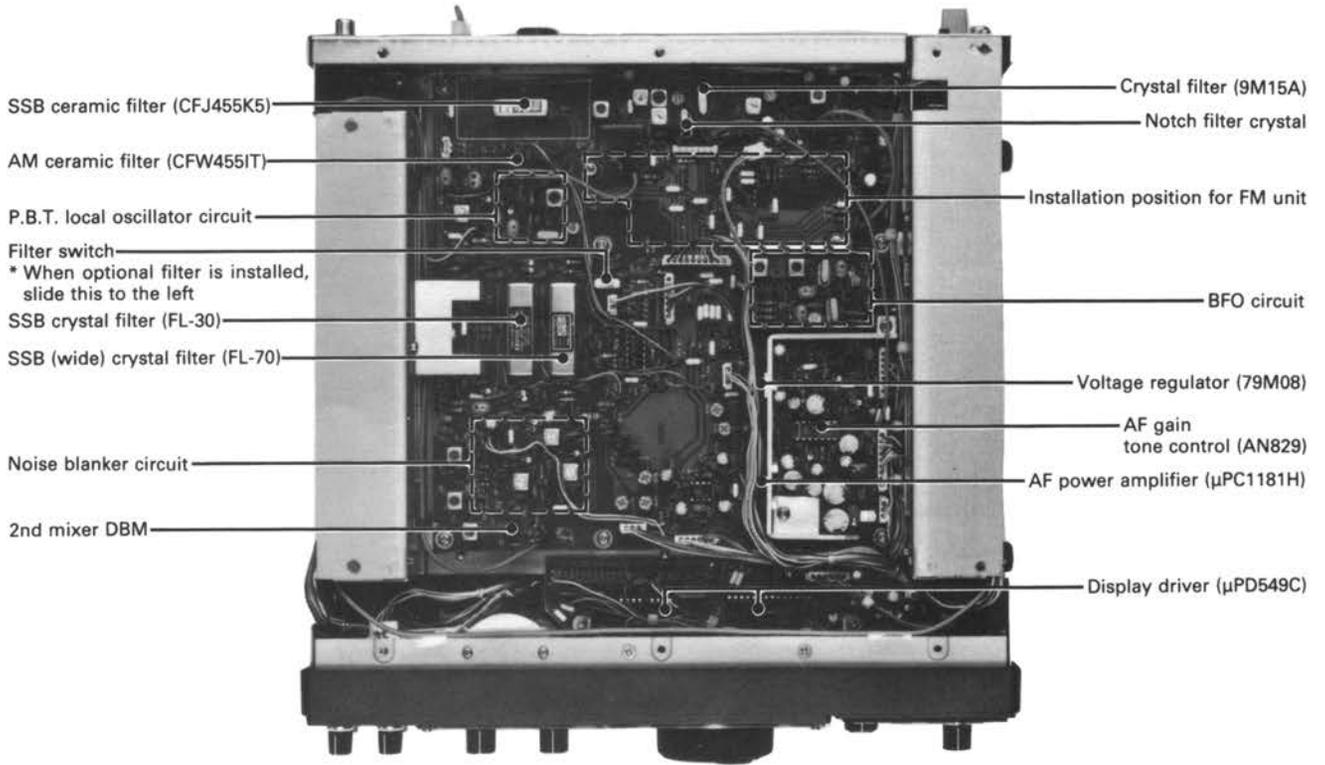
To prevent electrical shock and other problems, be sure to ground the equipment through the GROUND TERMINAL. For best results use as heavy gauge wire or strap as possible and make the connection as short as possible.

49. OPTIONAL INTERFACE UNIT CONNECTOR POSITION (PLATE B)

This position is provided to install the connector of the optional interface unit.

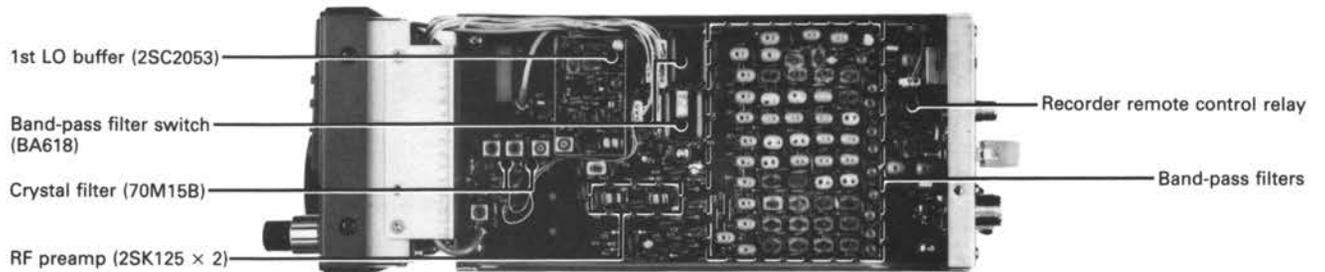
SECTION 3 INSIDE VIEWS

MAIN UNIT

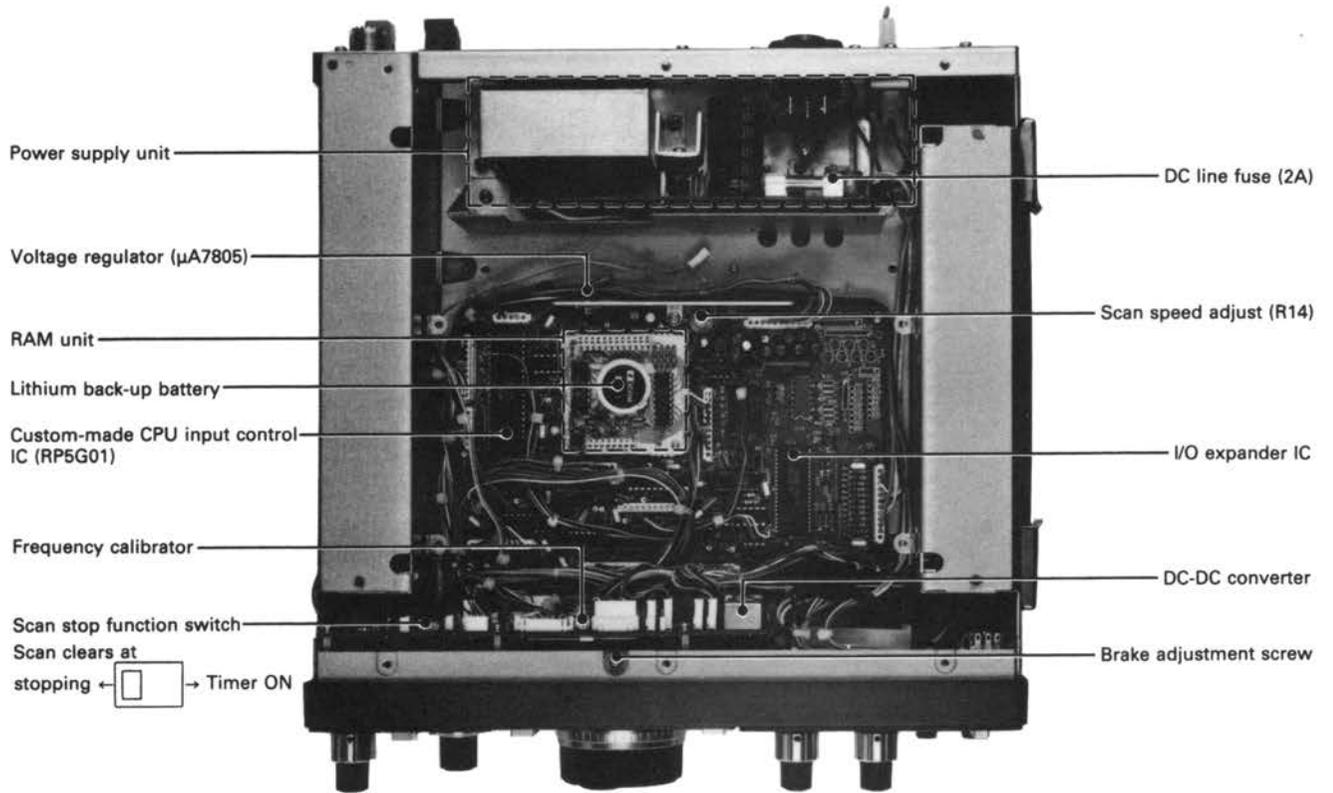


* Don't tamper with the rotatable coil cores, trimmer capacitors, trimmer resistors, etc.

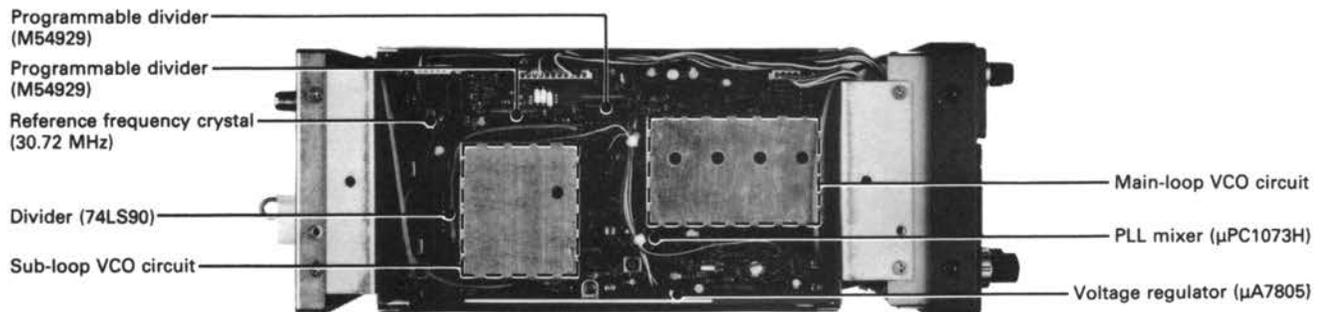
RF UNIT



BOTTOM VIEW

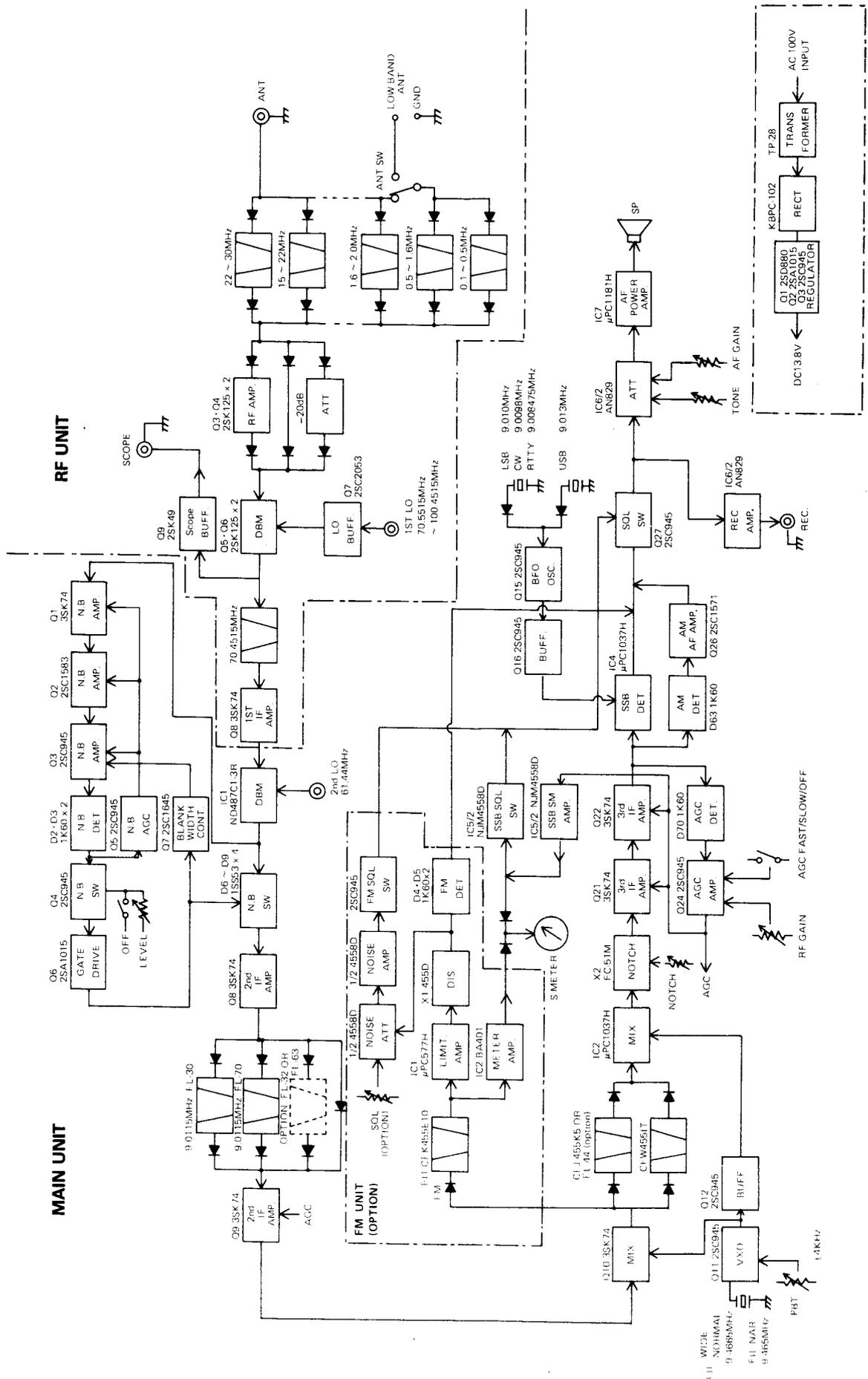


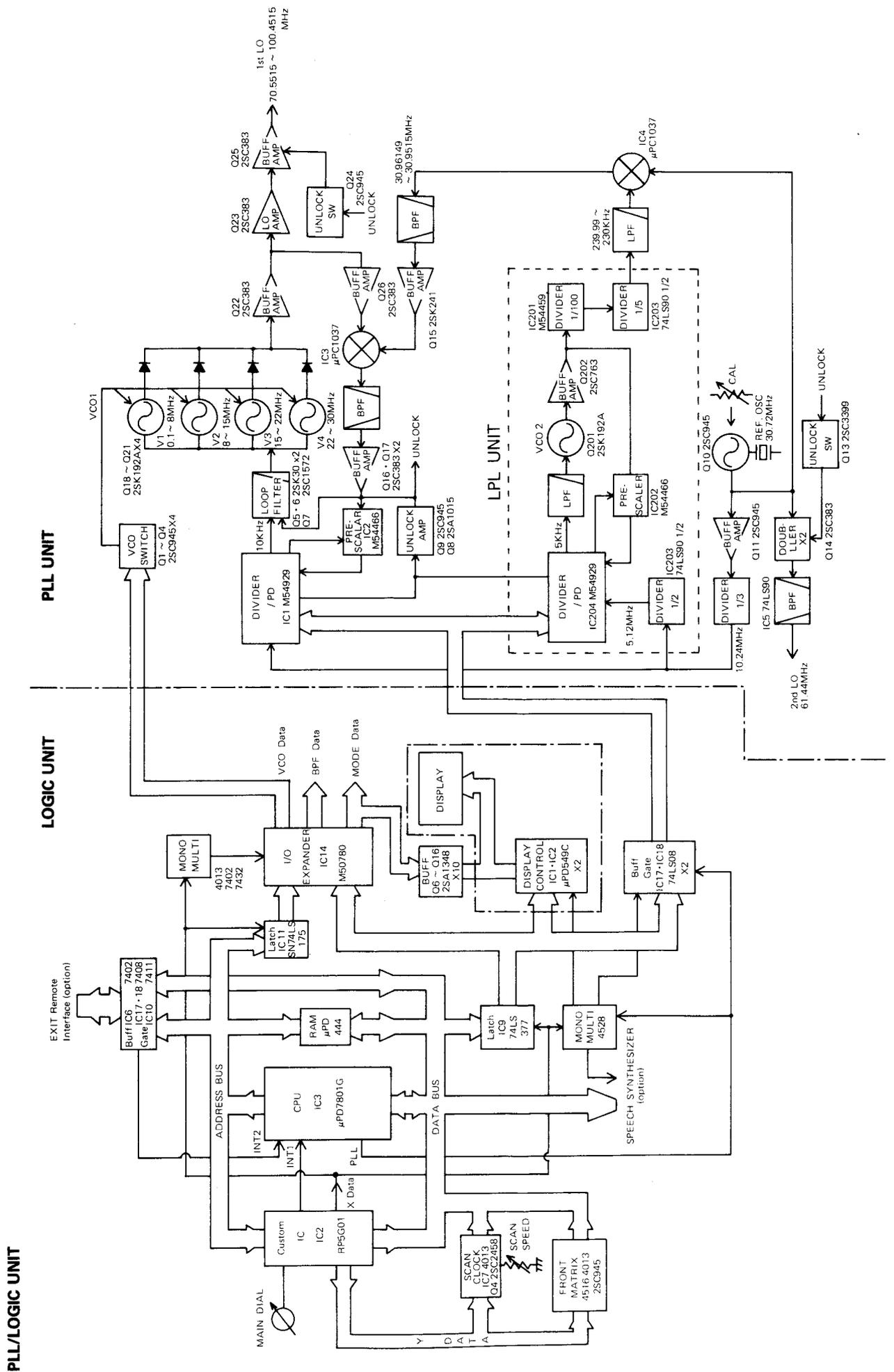
PLL UNIT



SECTION 4 BLOCK DIAGRAM

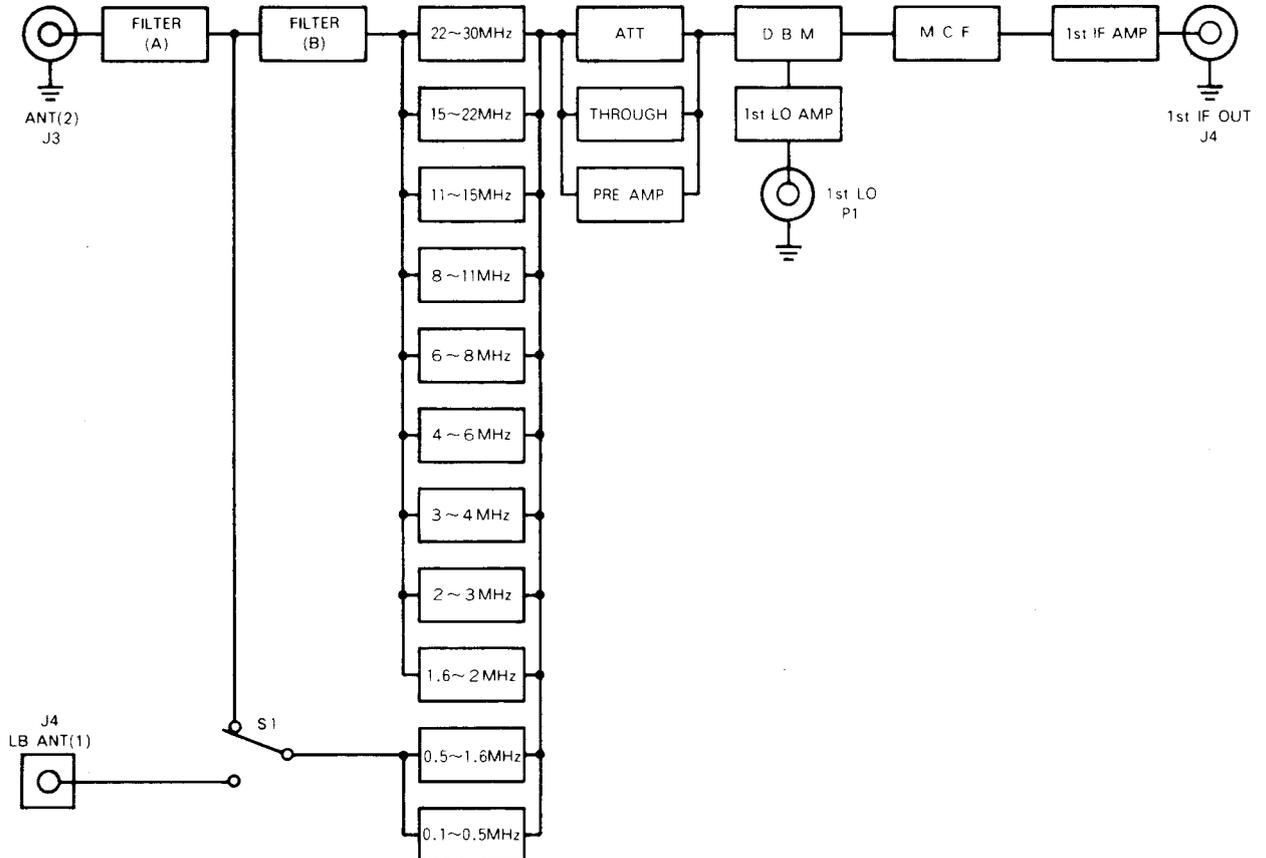
RF/MAIN UNIT





SECTION 5 OPERATION

RF UNIT



1. RF Circuits

Signals (100 kHz ~ 30 MHz) from the ANT (2) terminal pass through the filter (A), and are divided into 100 kHz ~ 1.6 MHz and 1.6 MHz ~ 30 MHz.

Frequencies of 1.6 MHz and below are fed to one of the two low-pass filters. Frequencies of 1.6 MHz and higher pass through the filter (B), and are fed to one of the nine bandpass filters.

Filter (A) is a 5-element Chebyshev low-pass filter which attenuates frequencies of 30 MHz and higher by about 40 dB. This serves to improve the image ratio, and to reduce the 1st local oscillator signal (70.4515 ~ 100.4515 MHz) radiation from the antenna terminal.

Filter (B) is a high-pass filter which attenuates frequencies of 1.6 MHz and below. This is in order to reduce intermodulation distortion caused by strong broadcast signals, which are in the 1.6 MHz range and below. Note that the above-mentioned filters are selected for an operating filter band according to the band data output from the logic unit.

In addition, a high-impedance antenna, such as a wire antenna for 1.6 MHz and below, connected to the ANT (1) terminal, can be switched by S1 (antenna switch).

Signals which have passed through filters are fed to the preamplifier or attenuator. This switching is by the PREAMP/ATT switch on the front panel.

When the setting is to the PRE AMP position, the signals are fed to the broad-band amplifier (composed of Q3 and Q4) and amplified about 10 dB. When the signals are 1.6 MHz and below, they are by-passed the preamplifier (THROUGH) in order to reduce intermodulation distortion generated at the following stage, mixer, by strong signals.

When the setting is to the ATT position, the signals are fed to the T-type attenuator (composed of R22 ~ R24) which attenuates the signals about 20 dB.

2. 1st IF Circuits

Signals which have passed through the preamplifier or attenuator, or fed directly, and the 1st local oscillator signal (70.4515 ~ 100.4515 MHz) buffer-amplified at Q7 are fed to the 1st mixer.

The 1st mixer employs a DBM (double-balanced mixer), composed of Q9 and Q10, FETs, which feature, compared to the diode type, superior multi-signal characteristics, low conversion loss, etc.

The signals converted by the 1st mixer to the 70.4515 MHz IF pass through the FI 1 (± 7.5 kHz, -3 dB) MCF (monolithic crystal filter), and are amplified by the Q8 dual-gate FET. Note that AGC is applied at the second gate.

The amplified signals pass through J4 and are fed to the main unit.

MAIN UNIT

1. 2nd ~ 4th IF Circuits

The 70 MHz band 1st IF signals input from P1 pass through the T-type attenuator (composed of R1 ~ R3), are mixed by the IC1 double-balanced mixer with the injected 2nd local oscillator signal (61.44 MHz), thereby converting them to the 2nd IF (9.0115 MHz).

The signals converted to the 2nd IF pass through the NB gate (composed of D6 ~ D9) and, after amplification by Q8, pass through the filter (FI1 ~ FI3) corresponding to the reception mode and are then amplified by Q9.

The amplified IF signals are mixed by Q10 with the 3rd LO (9.4665 MHz \pm pass band tuning change) oscillated by Q11 and X1, and are then converted to the 3rd IF (455 kHz \pm pass band tuning change).

Pass band tuning is accomplished by varying the 3rd IF signals by 3rd LO of the degree of multiplicity of the 455 kHz filters (FI4 and FI5) and the 9 MHz filters (FI1 ~ FI3).

Signals to the optional FM unit are taken out as broadband signals without change by connector J10 prior to the 455 kHz filter.

SSB, CW, RTTY and AM signals which have passed through the 455 kHz filter are led to the IC2 double-balanced mixer. They are mixed with the 3rd LO (9.4665 MHz \pm pass band tuning change), the same one for Q10, and then become the 4th IF (9.0115 MHz \pm pass band tuning change).

They are then led to the notch filter (composed of L17, L18, D54, and X2).

Because this is a crystal filter, IF band characteristics are not lost and deep attenuation is obtained.

A bias voltage provided by the "NOTCH" control (on the front panel) is applied to D54 to change the notch frequency. Note that the variable width is ± 1.3 kHz. Signals which have passed through the notch filter have, at FI6, the spurious components (which were generated by mixer IC2) removed; then, after amplification at Q21 and Q22, are tuned at L26, and are divided into three parts and led to the detectors.

The signals are then led as follows: C102, AM detection circuit; C105, SSB and CW detection circuit; and from L26 secondary side to the AGC detection circuit.

2. AF Circuits

SSB, CW and RTTY signals led to IC4 through C105, are mixed with BFO signals, and are detected.

AM signals input to D63 through C102, are detected, and are amplified at Q26.

Note that, during any mode other than the AM mode, Q25 performs switching, and detection by D63 is stopped. During the AM and FM modes, BFO is stopped by Q14, D31, D32, D34 and D35, and is not output to IC4.

Signals detected by the optional FM unit pass through J9 and are led to Q27.

Squelch is applied by Q27 to detection signals, and, by varying the 0 ~ 4V control voltage of the IC6A electronic-attenuator by using the "AF GAIN" control (on the front panel), a volume change of approximately 80 dB can be obtained. Moreover, tone control is also accomplished by using the frequency compensation terminal (pin 2). Note that IC6B is used as a buffer amplifier, and the AF OUT signal is taken for the REC terminal on the front panel.

The output of IC6A is amplified at IC7 and is led to the speaker.

3. Other circuits

(a) Noise-blanker circuit

In order to make it possible for both high sensitivity relative to noise and high input characteristics to coexist, a dual-gate MOS-FET is used in the first stage (Q1) of the noise amplifier, and a dual transistor is used as a differential amplifier (Q2) in the next stage, leading signals to Q3.

Because AGC is applied to Q1 ~ Q3, a stable noise-blanking effect is obtained throughout a wide range of noise levels, from low-level noise to strong noises.

Especially with regard to pulse noises, by setting the AGC attack time-constant and delay time-constant longer than previously, operation is possible in a wide dynamic range (over 100 dB) without saturation of the noise-amplifier circuit.

Noise signals from Q3 are divided in two after rectified at D2 and D3, and one part controls, by Q5, the AGC line of the noise-amplifier circuit. As a result, the output level of the noise-amplifier circuit is maintained at a fixed level, and there is a sufficient time-constant for "woodpecker noise", etc. Noise signals rectified at D2 and D3 are applied to the Q4 base. Q4 is switched ON only when pulse noise voltage is higher than $V_{BE} + V_E$ voltage, and 8V is then output from the Q6 collector. The blanker level can be adjusted by varying the Q4 emitter voltage i.e., Q4 compare voltage by the "NB LEVEL" control (on the front panel).

Q7 is for blanking time control; when the noise-blanker timing switch (on the front panel) is set to "narrow", the maximum blanking time is approximately 1 msec.; when it is set to "wide", the time is approximately 5 msec., thus preventing distortion in receiving audio.

(b) Filter select circuit

D47 ~ D53 and D72 are turned ON, respectively, according to the mode signals input from J12 and J13, and according to the position of the filter switches on the front panel.

One of the gates of IC3 is turned ON, by input data from pins 9 ~ 11. That output voltage is applied to the appropriate diodes of D36 ~ D42 to select the desired filter.

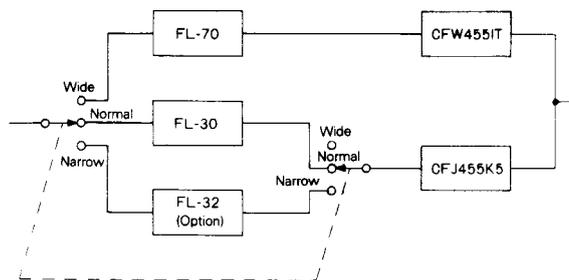
In the FM mode, IC3 pin 1 and pin 4 are turned ON by the filter switches (on the front panel), but, because they are not connected to any diode, and the filter selection does not change.

IC3 input/output relationships by mode

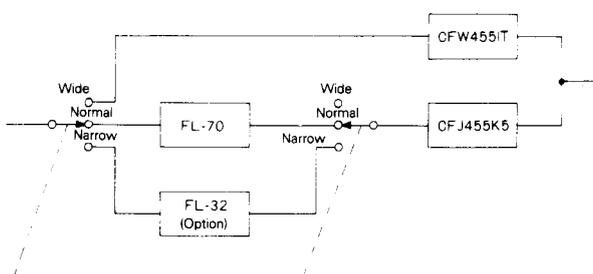
| Mode | | Input pin | | | Output pin |
|-------------------|----------|-----------|----|----|------------|
| | | 9 | 10 | 11 | |
| SSB CW RTTY | Normal | L | L | H | 14 |
| | Wide | H | L | H | 3 |
| | * Narrow | L | H | H | 12 |
| AM | Normal | L | H | L | 15 |
| | Wide | H | H | L | 2 |
| | * Narrow | L | H | H | 12 |
| FM | Normal | H | L | L | 1 |
| | Wide | H | L | L | 1 |
| | * Narrow | H | H | H | 4 |

* If option filter switch (S1) is ON

DURING SSB/CW/RTTY



DURING AM



Filter Table

| | No. | Name | IF | 6 dB band width | 60 dB band width | Insertion loss | Application |
|----------|----------|-----------------------|------------|-----------------|------------------|----------------|--|
| Standard | CFJ455K5 | SSB ceramic filter | 455 kHz | Approx. 2.8 kHz | 4.5 kHz or less | 6 dB or less | During normal reception (SSB, CW, RTTY, AM modes) |
| | CFW455IT | AM ceramic filter | 455 kHz | Approx. 6 kHz | 15 kHz or less | 7 dB or less | During wide reception (SSB, CW, RTTY, AM modes) |
| | FL-30 | SSB filter | 9.0115 MHz | 2.3 kHz or more | 4.2 kHz or less | 6 dB or less | During normal reception (SSB, CW, RTTY, AM modes) |
| | FL-70 | SSB wide filter | 9.0115 MHz | 2.8 kHz or more | 5 kHz or less | 6 dB or less | During wide reception (SSB, CW, RTTY modes) and normal reception (AM normal) |
| Option | FL-44A | SSB high-grade filter | 455 kHz | 2.4 kHz or more | 4 kHz or less | 6dB or less | During narrow reception (SSB, CW, RTTY, AM mode) for sharp characteristics |
| | FL-32 | CW filter | 9.0106 MHz | 500 Hz or more | 1.6 kHz or less | 8 dB or less | Narrow-band filter for CW and RTTY |
| | FL-63 | CW narrow filter | 9.0106 MHz | 250 Hz or more | 1.1 kHz or less | 12 dB or less | Super-narrow-band filter for CW and RTTY |

(c) AGC circuit

After signals output from the L26 secondary side are detected at D70, the detected voltage is controlled by Q24 and Q19, and AGC voltage is output from the Q19 emitter to the 2nd gates of the IF amplifiers. During no signal, the AGC voltage is offset to the voltage (approx. 4V) set by R107 and R119. When a signal is received, Q24 and Q19 are switched ON, AGC voltage is decreased, and thus the gain of each amplifier is decreased.

The AGC time-constant; the attack time is set by R106 and R206, and the release time is set by R105 and R206. And, for full break-in, Q23 is switched ON by a voltage through D60 during transmission in order to prevent the receiver from being blocked when switching from transmit to receive.

(d) S-meter circuit and squelch circuit

AGC voltage fed to IC5A pin 2 is inverted and amplified, resulting in wide dynamic range and high linearity of S-meter operation.

A part of the S-meter voltage is fed to IC5B pin 6, and this squelch comparator circuit performs an excellent squelch operation even for modes other than FM. Note that Q30 and Q31 are the circuit to produce squelch voltage.

(e) BFO circuit

The BFO frequency is shifted according to the mode by the mode signal supplied through J12. The BFO is oscillated by Q15 with X3 or X4 and buffer amplification at Q16, after which the signals are led to IC4.

(f) Other

IC8 produces a regulated 8V for supply to each section.

D69 and Q32 ~ Q34 are provided to produce T8V for use with a transmitter. T8V is used to mute the receiver operation, and is controlled by the signal from the SEND terminal.

Q28 stops Q9 operation by the mute signal from the PLL.

Q35 and Q36 are a circuit which, during AM, moves the notch frequency to outside of the pass-band.

PLL UNIT

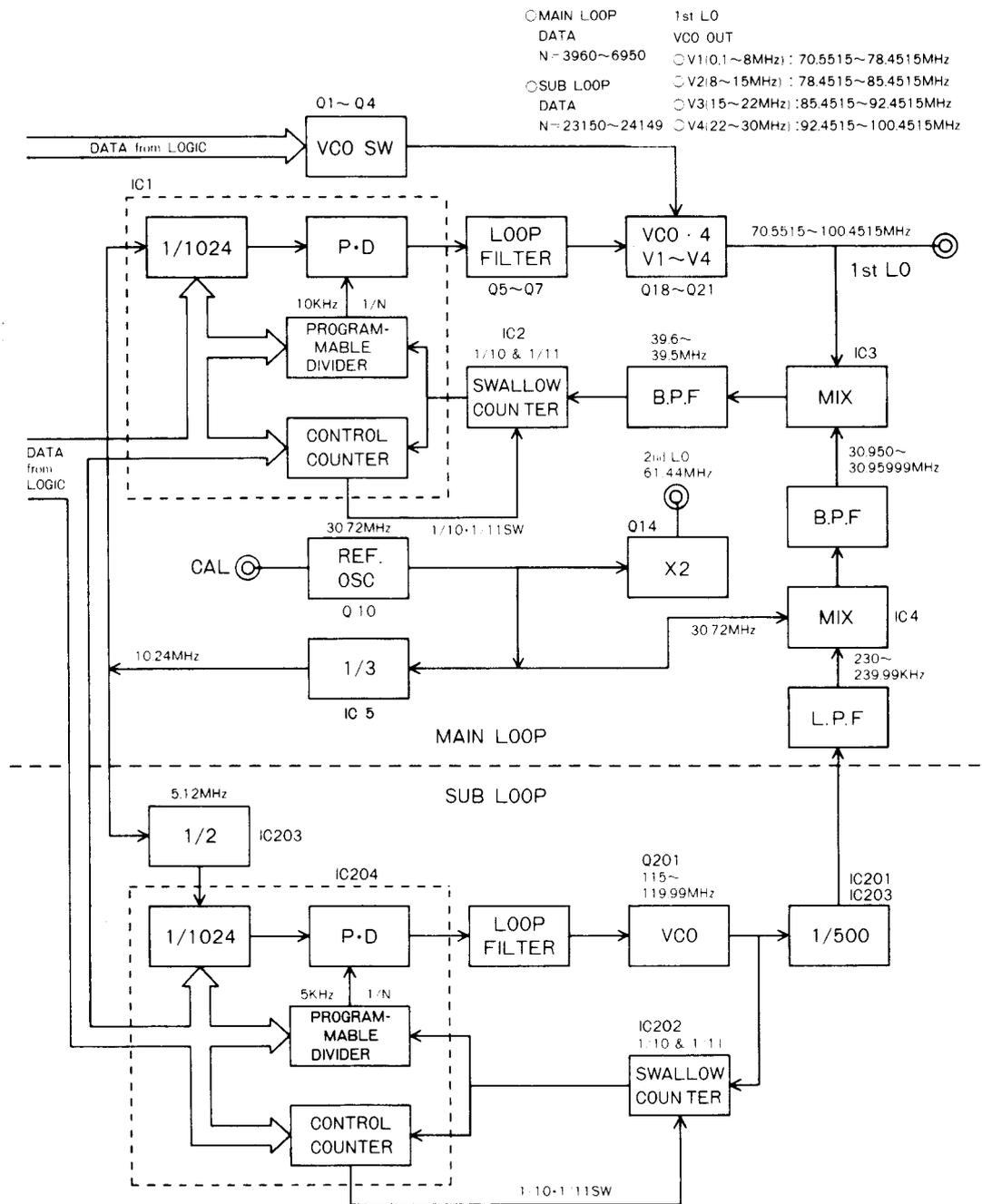
This unit is composed of the 1st LO circuit and the 2nd LO circuit of the receiver.
 The 1st LO oscillates 70.55 ~ 100.45 MHz range with two locked loops and the 2nd LO oscillates a fixed frequency at 61.44 MHz.

1. Reference oscillation circuit

The standard reference oscillator output (30.72 MHz) is used for the local oscillator signal for a loop, for the reference frequency of the main and sub loops, and for the 2nd Local Oscillator.
 For the reference frequencies for the PLL loops, the main loop reference frequency is 10 kHz, and the sub loop reference frequency is 5 kHz. Because the respective frequency-dividers (IC1 and IC201) are 1/1024, the standard reference oscillation frequency is divided into 1/3 (10.24 MHz) by IC5, and then divided into 1/2 (5.12 MHz) by IC203 is supplied to the sub loop.
 The main loop uses the output (10.24 MHz) of IC5 as it is, without change.

2. 2nd local-oscillation circuit

After the standard reference oscillator output (30.72 MHz) is multiplied by 2 at Q14, the 61.44 MHz from which spurious has been sufficiently removed at L3 ~ L5 filters is supplied to the 2nd mixer. Note that the output level is approximately 3 dBm/50Ω. In addition, the muting signal during unlock, etc. is applied to Q13 to shunt the signal.



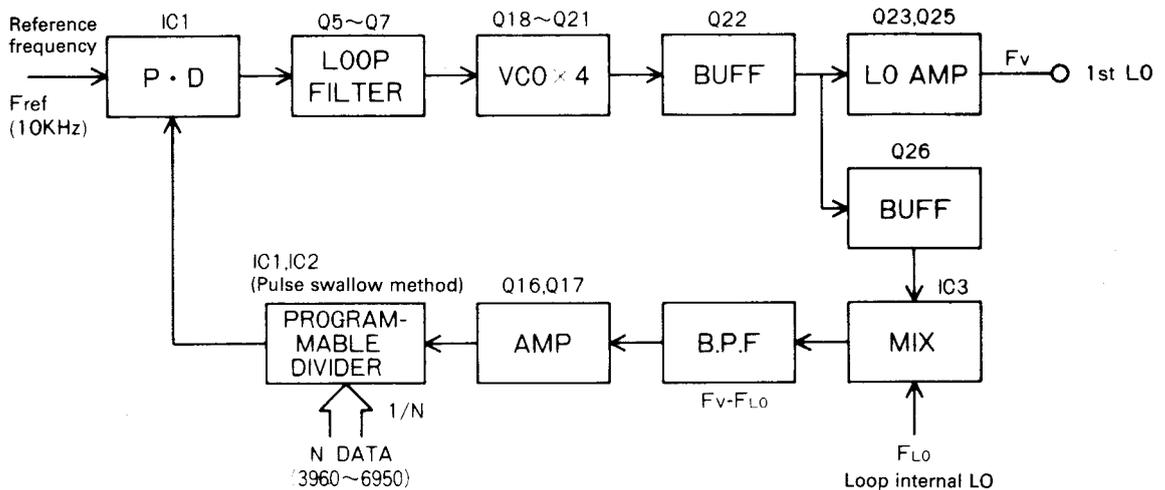
3. Main loop

The main loop, which is the output for the 1st LO, is a composite of mixed down and divided method. Note that the VCO output frequency (F_v) is obtained from the following formula.

$$F_v = F_{LO} + N \times F_{ref}$$

Frequency changes are made by changing F_{LO} and N .

The reference frequency (F_{ref}) is 10 kHz, and, VCO is controlled in 10-kHz steps by changing the frequency-division ratio N of the programmable divider. Frequency between this step (less than 10 kHz) is obtained by F_{LO} which controls the VCO. Note that F_{LO} is changed 9.99-kHz range in 10-Hz steps, and in this way the 30-MHz range of the PLL overall can be varied in 10-Hz steps.



(a) PLL ICs

IC1 (M54929P) is a multi-function IC with built-in phase comparator, programmable divider, reference-frequency divider and swallow-counter controller.

In combination with the IC2 (M5466L) swallow counter, pulse swallow frequency division is possible. This method makes a large frequency-division ratio possible, so that it functions as a programmable divider which can be used up to higher frequency. Compared to previous models, it has a small configuration, and 10 Hz steps PLL output can be obtained.

(b) Loop filter and muting circuit

The phase detected signal from IC1 is fed to the Q6 and Q7 active loop filter.

The loop filter is important to the PLL, together with the VCO, and determines lock-up time and C/N (Carrier Noise ratio). These two have a conflicting relationship: if the time-constant of the loop filter is set so that the lock-up time becomes faster, the C/N deteriorates.

In order to solve this problem, the PLL in this unit has an FET (Q5) at the loop filter. The result is that, when the frequency suddenly changes more than a certain degree, the time-constant of the loop filter is made smaller and lock-up time becomes faster. Note, however, that usually the time-constant is large and C/N is improved. In addition, Q5, which changes the time-constant, is driven by the muting signal. The muting signal converts the lock signals (output from IC1 (pin 8) of the main loop and IC201 (pin 8) of the sub loop) to the appropriate time-constant and voltage at Q8 and Q9, and these are supplied to Q5. These signals are also led to Q13 and Q24, and they switch the output amplifier base, stopping the 1st LO and 2nd LO outputs.

When these operations unlock the PLL or cause a large frequency movement, or reception on unwanted frequencies is prevented and, at the same time, lock is applied quickly.

(c) VCO circuit

Because VCO performance is critical to the PLL, and in order to obtain a high C/N and stabilized oscillation output, the VCOs are divided 4 segments, so that the frequency coverage for any one VCO is suitable.

The VCO power supply is, in the same way as the reference oscillation circuit, provided with double stabilization by the 5V zener diode; a coreless coil is used for the oscillation coil, thus giving a high Q and also suppressing external induction. This circuit features a carefully planned pattern (earth point and components layout) and a strong shielding case for an excellent C/N characteristic.

(d) Loop system

The VCO output passed through the Q22 buffer amplifier is divided in two.

One part is amplified at Q23, and, after impedance conversion at Q25, is output to the RF unit as the 1st local oscillator signal. Note that the output level is approximately 0 dBm/50Ω.

The other part passes through the Q26 buffer amplifier and is fed back to the PLL loop. This buffer amplifier employs a grounded base circuit with high isolation so that the signals in the PLL loop don't leak into the 1st local oscillator signal as spurious. This VCO signal is mixed with the local oscillator signal from the sub-loop at IC3 and is mixed down.

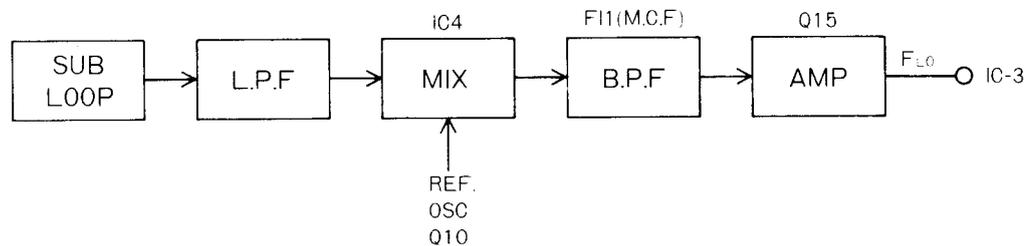
This signal passes through the band-pass filter (band width approximately 35 ~ 75 MHz), and, after spurious is removed, is amplified to the necessary level at the Q16 and Q17 cascade amplifier and is input to IC2, forming the locked loop. The D10 and D11 limiter is used at the IC2 input in order to prevent over driving.

(e) Local oscillator circuit

The local oscillator is provided to mix down the VCO signal and obtain the 10-Hz step tuning.

Because the sub loop output (230.00 ~ 239.99 kHz) is too low as the LO frequency, it is mixed with the reference oscillator signal (30.72 MHz) at IC4.

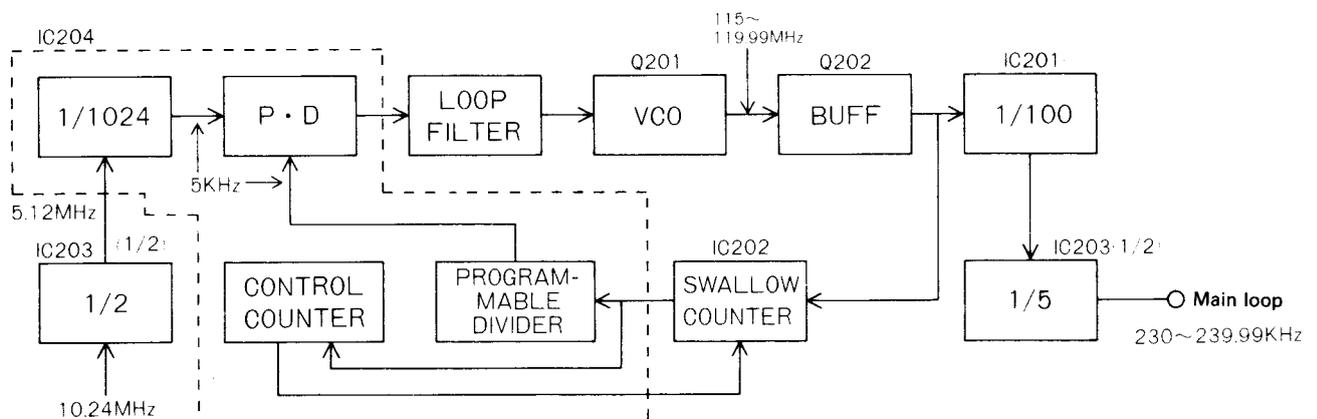
Spurious is removed from the mixed signal (30.950 ~ 30.960 MHz) at the monolithic filter (FI1), after which the signal is amplified at Q15 and then fed to IC3, the main loop mixer.

**4. Sub loop**

This loop is the divider type locked loop, and is used to produce 10-Hz steps LO signals.

The VCO locks the range of 4.995 MHz (from 115 ~ 119.995 MHz) in 5-kHz steps. This signal is divided into 1/500 at IC204 and IC203, to obtain a signal to change the range of 9.99 kHz (from 230 ~ 239.99 kHz) in 10-Hz steps, and is supplied to the mixer in the main loop.

A part of the VCO signal is fed to IC202, the swallow counter. This output is fed to the PLL IC, IC204, and then the loop filter, to lock the VCO. This uses the pulse swallow method by the combination of IC204 and IC202 (the same as the main loop). And, by changing the frequency-division ratio of the programmable divider, the frequency is changed. Note that the 5.12-MHz input from IC203 is divided into 1/1024 as the reference frequency (5 kHz) by the divider inside IC204.



5. PLL data

The data for setting the frequency-division ratio ("N") of the programmable divider and the VCO switching signal are fed from the logic unit; the former is supplied by the dynamic method and the latter by the static method.

Because IC1 can also vary the frequency-division ratio of the reference-frequency divider, that data (fixed at 1/1024) is also supplied at the same time.

(a) How N data are obtained

The set employs two locked loops, thus two types of N data are necessary, and, even if the PLL output frequencies are the same, the display frequency differs according to the operating mode. Note that LSB and FM are the same; for RTTY and CW, the display frequency shifts -600 Hz; for AM it shifts -1.5 kHz; and for USB it shifts $+3$ kHz.

For LSB and FM, the N data can be obtained by the following formula.

Example: 14.075 MHz

Main loop

The 10 kHz and upper digits of the displayed frequency are used as F1.

The formula is as follows:

$$N = F1 \times 100 + 3950$$

For the example frequency, N therefore becomes as follows:

$$N = 14.07 \times 100 + 3950 = 5357$$

Sub loop

The 1 kHz and lower digits of the displayed frequency are used as F2.

The formula is as follows:

$$N = F2 \times 100 + 23000$$

For the example frequency, N therefore becomes as follows:

$$N = 5.00 \times 100 + 23000 = 23500$$

Note that, in this case, the 10-Hz digit is not displayed.

Calculation made by adding, to the display frequency, $+600$ Hz for RTTY and CW, $+1.5$ kHz for AM, or -3 kHz for USB.

By providing the N data obtained as described above, the programmable divider frequency-division ratio becomes $1/N$.

LOGIC UNIT

This handles processing for frequency control, BPF switching and mode setting, and producing data to the PLL unit, and data to the display unit, etc. It is composed of an 8-bit N-MOS CPU, a 4-bit × 1k-word C-MOS RAM, a multi-function custom IC, an I/O expander IC, etc.

1. CPU

The CPU terminals operate to allot functions.

In addition, the tuning and remote controls use the interrupt terminal for priority handling.

All peripheral devices including ROM and RAM, are allotted their addresses.

The figures below show the allocation of CPU ports and the memory map. (See Fig. 1 and Fig. 2.)

2. CPU input control circuit

This circuit is composed of a multi-function custom IC and the input matrix circuit. (For additional information concerning the input matrix, refer to the section concerning the matrix unit.)

(a) Multi-function custom IC

This is a C-MOS type 40-pin DIL package multi-function custom IC.

The clock signals is obtained by an L and C externally connected to pins 18 and 19, and cause an oscillation of approximately 100 kHz.

Pin 32, ATS, is used as a strobe signal for the tuning step of the input matrix. When the tuning control is rotated at a speed higher than a certain speed, ATS becomes H level. This switching point can be set by C6 and R7, which are connected to the pin 21 TC terminal.

Pin 38 and pin 37, M1 and M2, function to determine the input pulse speed multiple of the tuning control. For this unit, 200 pulses per rotation is obtained at a speed multiple of 4 times 50 pulses. Note that the pin 2, pin 3, pin 33 and pin 34 RIT/XIT functions are not used on this unit.

Fig. 1: CPU port allocation

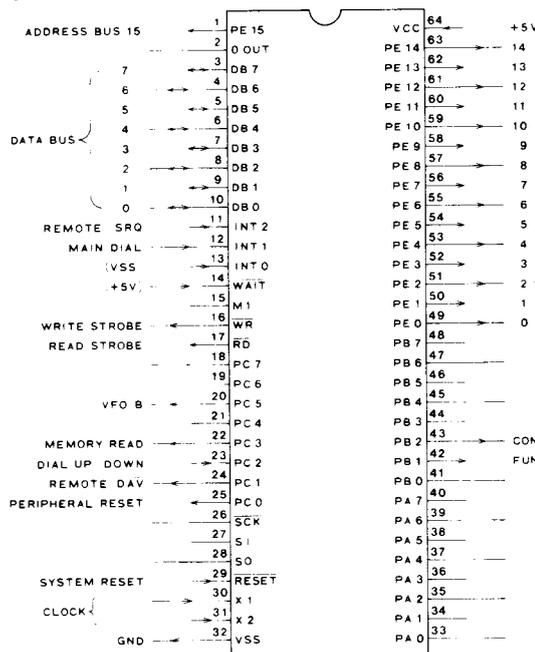
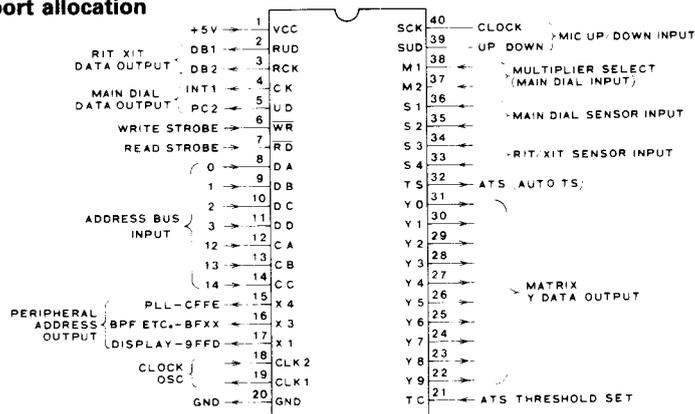


Fig. 2: CPU memory map

| | |
|------|--------------------------------|
| 0000 | CPU INTERNAL ROM |
| 0FFF | 8bit × 4096W |
| 7FFF | REMOTE CONTROL |
| 8FF0 | 1 |
| | 2 |
| | 3 |
| | 4 Input |
| | 5 Matrix |
| | 6 |
| | 7 |
| | 8 |
| 8FF9 | |
| 9FF0 | Display Data Out (μPD549c × 2) |
| BFF9 | BPF (High) |
| | A BPF (Mid.) |
| | B BPF (Low.) |
| | C MODE (High) |
| | D MODE (Low) |
| | E ALL F |
| BFFF | MS.PS |
| CFFF | PLL Data Out (M54929 × 2) |
| F800 | EXTERNAL RAM |
| | 4bit × 1024W (μPD444C) |
| FBFF | |
| FF80 | CPU INTERNAL RAM |
| | 8bit × 128W |
| FFFF | |

Fig. 3: Custom IC port allocation



3. I/O expander circuit

This circuit provides the BPF, PLL-VCO and MODE data outputs. The relationship is shown in the table.

Data output

| Frequency | BPF | PLL VCO |
|---------------|-----|---------|
| 0.1 ~ 0.5 MHz | 1 | |
| 0.5 ~ 1.6 MHz | 2 | |
| 1.6 ~ 2 MHz | 3 | |
| 2 ~ 3 MHz | 4 | 1 |
| 3 ~ 4 MHz | 5 | |
| 4 ~ 6 MHz | 6 | |
| 6 ~ 8 MHz | 7 | |
| 8 ~ 11 MHz | 8 | 2 |
| 11 ~ 15 MHz | 9 | |
| 15 ~ 22 MHz | 10 | 3 |
| 22 ~ 30 MHz | 11 | 4 |

4. Display timing

8-digit data and load signals (8 CTL pulses) are fed, to the ICs (IC1 and IC2) for display drive of the display unit from J13 of the LOGIC unit. Note that the data of T₇ (IC1) and of T₀ ~ T₂ and T₅ ~ T₇ (IC2) are not used.

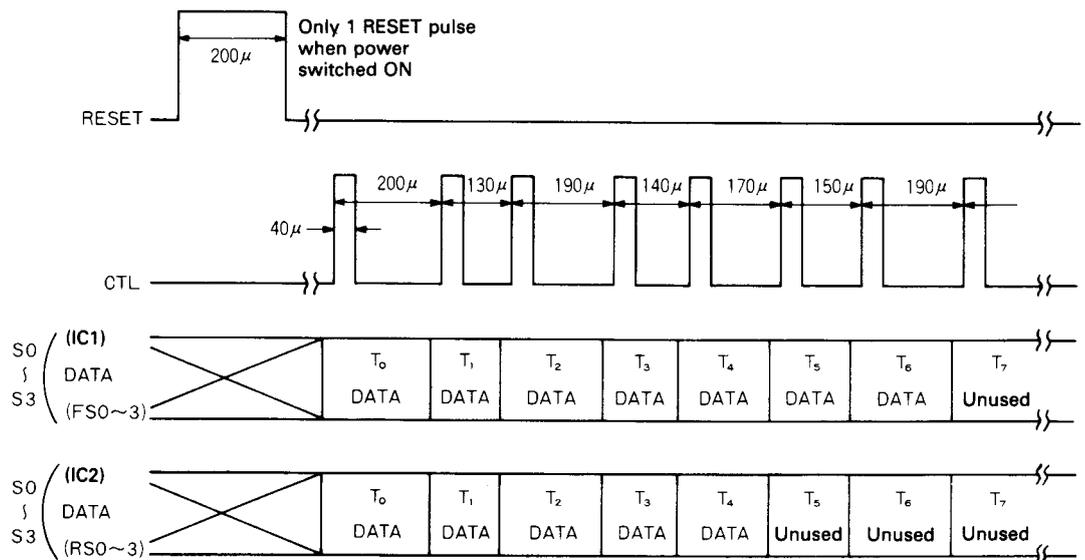
These data for display are sent only for operations related to the display, such as when the frequency is changed, the memory channel is switched, etc.

5. N data

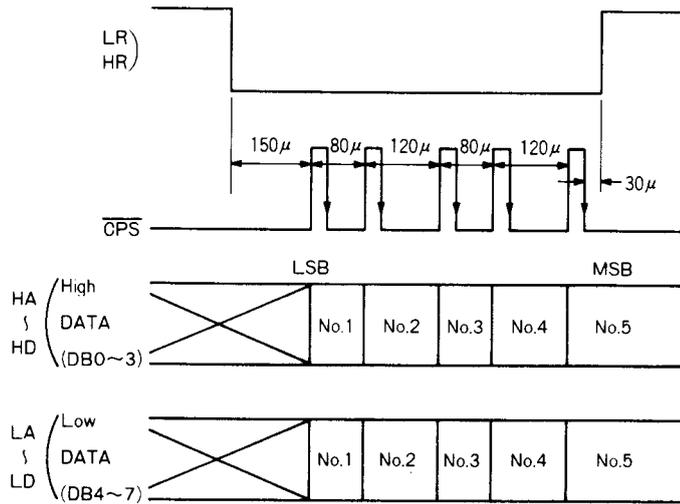
Because the PLL has a 2-loop configuration, two types of N data, high (HA ~ HD) and low (LA ~ LD), are sent from logic unit J₁₁ to the PLL unit.

IC17 and IC18 are gate switches for data lines HA ~ HD and LA ~ LD. The data lines are commonly used for PLL, BPF, display, etc.; therefore, the switches are switched. When the data are sent to the PLL to prevent noises being mixed in the VCO.

Display data timing



N data output timing



Note: $\overline{\text{CPS}}$ pulse intervals are actual measured values (clock 4 MHz).

High and low N data

| High N-DATA ×10M, ×1M, ×100K, ×10K | | Low N-DATA ×1K, ×100Hz, ×10Hz | |
|---------------------------------------|--------|----------------------------------|--------|
| Disp. freq. | N-DATA | Disp. freq. | N-DATA |
| 0.10MHz | 3960 | 0Hz | 23000 |
| 0.11MHz | 3961 | 10Hz | 23001 |
| 0.12MHz | 3962 | 20Hz | 23002 |
| 0.13MHz | 3963 | 50Hz | 23005 |
| 0.14MHz | 3964 | 100Hz | 23010 |
| 0.15MHz | 3965 | 1kHz | 23100 |
| 1MHz | 4060 | 2kHz | 23200 |
| 10MHz | 4950 | 3kHz | 23300 |
| 20MHz | 5950 | 4kHz | 23400 |
| 30MHz | 6950 | 5kHz | 23500 |
| | | 9.99kHz | 23999 |

* For FM mode; N data (with display frequency as standard)

6. Other circuits

(a) Scan circuit

This circuit is composed of Q4, IC7b and R14, and is used to control the programmed scan, mode-selected scan, memory scan, etc. Note that R14 is the trimmer for adjustment of the scan speed.

(b) Matrix unit

This unit functions for handling signal relay between units and input matrices related to the front panel, and generating -10V DC supplied to the MAIN unit.

The matrices used by this unit and their operations are as follows.

Matrix table

IC 2 RP5G01 007

| Y 0 | Y 1 | Y 2 | Y 4 | Y 5 | Y 6 | Y 7 | Y 9 | |
|-----------------|-------------|--------------------|------|----------------|-------------|-----------|------------|------|
| TEN KEY 1 | | | LSB | MEMORY CH 1 | MODE SELECT | REMOTE RP | SCAN CLOCK | DB 0 |
| 2 | | | USB | 2 | PITCH CLEAR | REMOTE WP | | DB 1 |
| 3 | | | AM | 3 | | SQL | | DB 2 |
| 4 | | | CW | 4 | | | | DB 3 |
| SCAN START/STOP | VFO A/B | VFO A=B | RTTY | 5 | | 1 | | DB 4 |
| | MEMORY READ | | | | | 2 | 10SEC SET | DB 5 |
| | HAM/ALL | MW 1 (DISP → MEMO) | | | | 3 | | DB 6 |
| | | MW 2 (MEMO → DISP) | | | | 4 | TIMER SCAN | DB 7 |
| | | | | | | | | |

C P U • D A T A • B U S

DIAL PITCH

- ① Y0 → DB0 ~ DB3 (TEN KEY)
Sets frequencies by key entering of ten-key unit.
- ② Y0 → DB4 (SCAN START/STOP)
Used for start and stop of scan by SCAN switch.

③ Y1 → DB4 (VFO A/B)

Matrix for VFO A/B switching; CPU pin 20 becomes high level at VFO B condition.

④ Y1 → DB5 (MEMORY READ)

Matrix for VFO/M (memory) switching; CPU pin 22 becomes high level at memory read condition.

⑤ Y2 → DB4 (VFO A = B)

Matrix for VFO A = B VFO equalization; operation is as in table below for various FUNC (function) switch combinations.

| VFO \ Op'n. | A = B | FUNC + A = B |
|-----------------|---------------|---------------|
| When VFO A used | VFO A → VFO B | VFO B → VFO A |
| When VFO B used | VFO B → VFO A | VFO A → VFO B |

⑥ Y2 → DB6 (MW1/DISP → MEMO)

⑦ Y2 → DB7 (MW2/MEMO → DISP)

The above ⑥ and ⑦ are matrices for memory operation by WRITE/CLEAR switch and M → VFO switch; operation is as shown in the table below. Note that a combination of FUNC switch and WRITE switch or M → VFO switch will erase unnecessary memory channel data, so that it becomes a blank channel.

| VFO/M SW. | Operation | Description |
|----------------|-----------|---|
| VFO A or VFO B | WRITE | VFO (A or B) data are entered into displayed memory channel. |
| | M → VFO | Displayed memory channel data are entered into VFO in operation |
| MEMORY-CH | WRITE | Displayed data are entered into memory channel in operation |
| | M → VFO | Displayed data are entered into VFO immediately prior to switching to memory channel. |

⑧ Y4 → DB0 (LSB)

Matrix for LSB; I/O expander IC pin 19 becomes high level.

⑨ Y4 → DB1 (USB)

Matrix for USB; I/O expander IC pin 20 becomes high level.

⑩ Y4 → DB2 (AM)

Matrix for AM; I/O expander IC pin 31 becomes high level; becomes FM mode and I/O expander IC pin 22 becomes high level by combination with FUNC switch.

⑪ Y4 → DB3 (CW)

Matrix for CW mode; I/O expander IC pin 21 becomes high level; becomes CW narrow and I/O expander IC pin 32 becomes high level by combination with FUNC switch.

⑫ Y4 → DB4 (RTTY)

Matrix for RTTY mode; I/O expander IC pin 33 becomes high level; becomes RTTY narrow and I/O expander IC pin 34 becomes high level by combination with FUNC switch.

⑬ Y5 → DB0 ~ DB4 (MEMORY CH.)

Y5 data supplied by custom IC of logic unit are distributed by Q8 ~ Q12 of matrix unit to DB0 ~ DB4 and a memory channel is selected.

| Memory channel | DB0 | DB1 | DB2 | DB3 | DB4 | Memory channel | DB0 | DB1 | DB2 | DB3 | DB4 |
|----------------|-----|-----|-----|-----|-----|----------------|-----|-----|-----|-----|-----|
| 1 | 0 | 0 | 0 | 0 | 0 | 10 | 1 | 0 | 0 | 1 | 0 |
| 2 | 1 | 0 | 0 | 0 | 0 | 11 | 0 | 1 | 0 | 1 | 0 |
| 3 | 0 | 1 | 0 | 0 | 0 | 12 | 1 | 1 | 0 | 1 | 0 |
| 4 | 1 | 1 | 0 | 0 | 0 | 13 | 0 | 0 | 1 | 1 | 0 |
| 5 | 0 | 0 | 1 | 0 | 0 | 14 | 1 | 0 | 1 | 1 | 0 |
| 6 | 1 | 0 | 1 | 0 | 0 | 15 | 0 | 1 | 1 | 1 | 0 |
| 7 | 0 | 1 | 1 | 0 | 0 | 16 | 1 | 1 | 1 | 1 | 0 |
| 8 | 1 | 1 | 1 | 0 | 0 | 32 | — | — | — | — | 1 |
| 9 | 0 | 0 | 0 | 1 | 0 | | 1 | 1 | 1 | 1 | 1 |

⑭ Y6 → DB0 (MODE-SELECT SCAN)

Matrix for MODE-S switch; memory-selected scan is available when a memory channel is selected and memory scan.

⑮ Y6 → DB1 (PITCH CLEAR)

Matrix for frequency steps clear input; currently used frequency steps and all below are cleared to "0" when TS switch is switched ON.

⑰ Y7 → DB0 (REMOTE RP)

Matrix for remote-control read pulse.

⑱ Y7 → DB1 (REMOTE WP)

Matrix for remote-control write pulse.

⑲ Y7 → DB2 (SQL)

One pulse enters, only when squelch is ON, to identify squelch condition; used for control of each scan.

⑳ Y7 → DB4 ~ DB7 (DIAL PITCH 1 ~ 4)

Matrix for selection of frequency steps for distribution of Y7 data to DB4 ~ DB7 according to the TS switch setting; BAND switch has priority.

| TS SW | Main dial |
|-------|--|
| OFF | 10-Hz steps (2 kHz/rotation) Becomes 50-Hz steps if turned quickly. |
| ON | 1-kHz steps (200 kHz/rotation) Display of 100 Hz and less cleared. |

| Y7 → DATA | | | | Steps and BAND switching |
|-----------|-----|-----|-----|-----------------------------|
| DB4 | DB5 | DB6 | DB7 | |
| 0 | 0 | 0 | 0 | 10 Hz |
| 0 | 1 | 1 | 1 | 50 Hz |
| 1 | 0 | 0 | 0 | 1 kHz |
| 0 | 0 | 1 | 1 | BAND |

㉑ Y9 → DB0

Matrix for scan clock; clock input during scan

㉒ Y9 → DB5, DB7 (10 sec. SET/TIMER SCAN)

Used as matrix for 10-second timer when scan stop, and for timer ON/OFF switching.

Note that scan stop switching (restart 10 sec. after scan stop) can be set by S1.

(c) Display unit

This unit is composed of the display tube and its driver, and the DC-DC converter.

The fluorescent display tube (DS1) is driven by IC1 and IC2; the display shows the frequency, mode, memory channel, VFO A/B, scan, etc. by dynamic illumination.

Note that IC1 and IC2 are ICs which include the functions of data latch, clock oscillation circuit, timing counter, segment decoder, etc. IC2 drives the memory channel display, and IC1 drives the other displays.

C2 and C6 determine the timing of the clock oscillation circuit. The SIG signal, the TUNE signal and the DS1 and DS0 signals for dimmer are fed from the matrix unit; other signals are from the logic unit; of these, the SCAN signal and RES signal are passed to the matrix unit.

The IC3 voltage 3 regulator produces the +5V for IC1 and IC2; the DC-DC converter (composed of T1, Q1 and Q2) produces the -5V for IC1 and IC2 and the -35V for the display tube; the AC 3.5V for the display tube filaments is also taken out here.

After Q3 ~ Q5 are switched ON, -35V is switched at Q4, the display data latch signal (CTL) is sent from the logic unit, and the display tube is turned off for approximately 2 seconds until reset is completed.

(d) REG unit

After noise has been removed by the line by-pass capacitors (C1 and C2), AC voltage input from J1 passes through fuse F1, through the power switch of the front panel, and is input to step-down transformer T1.

The AC voltage stepped-down by T1 is rectified with single-phase full-wave rectification by the D1 bridge-type rectifier. After the rectified output is smoothed at C7, it becomes direct current, passes through F2, and is led to the regulator circuit.

The regulator circuit of this unit is the closed-circuit type. Output voltage is constantly monitored and, if there is a fluctuation, there is immediate feedback to the control circuit and the fluctuation is eliminated. If there is a drop of output voltage, when the Q3 base voltage (voltage divided by R4 ~ R6) drops, base current and collector current are also reduced at the same time. As a result, the voltage across R3 (connected to the emitter) drops, and the emitter and collector voltages also drop at the same time.

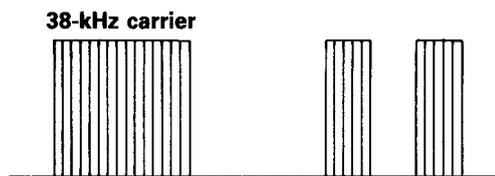
As a result, Q2 base voltage drops and current is increased, and collector current is also increased. Consequently, Q1 base current is increased, collector current is also increased, and output voltage rises. When output voltage rises, operation becomes the opposite. Note that R2 functions to reduce the Q1 load.

The regulated DC output is led to J2 and P2, passes through L1, through the front panel power switch, and is supplied to the unit.

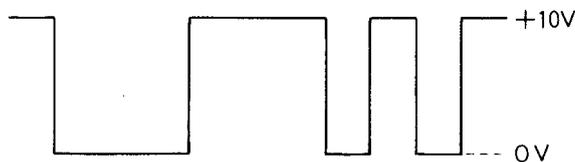
(e) Remote-control reception circuitry (ten key unit)

This circuitry is composed of the high-gain amplification circuit, the detection circuit and the output waveform rectification circuit (on a 1-chip IC), and the receptor diode, level converter, etc. The IC1 output is negative polarity (high level during the no-signal condition), and is open collector output. Note that the output waveform is as shown below.

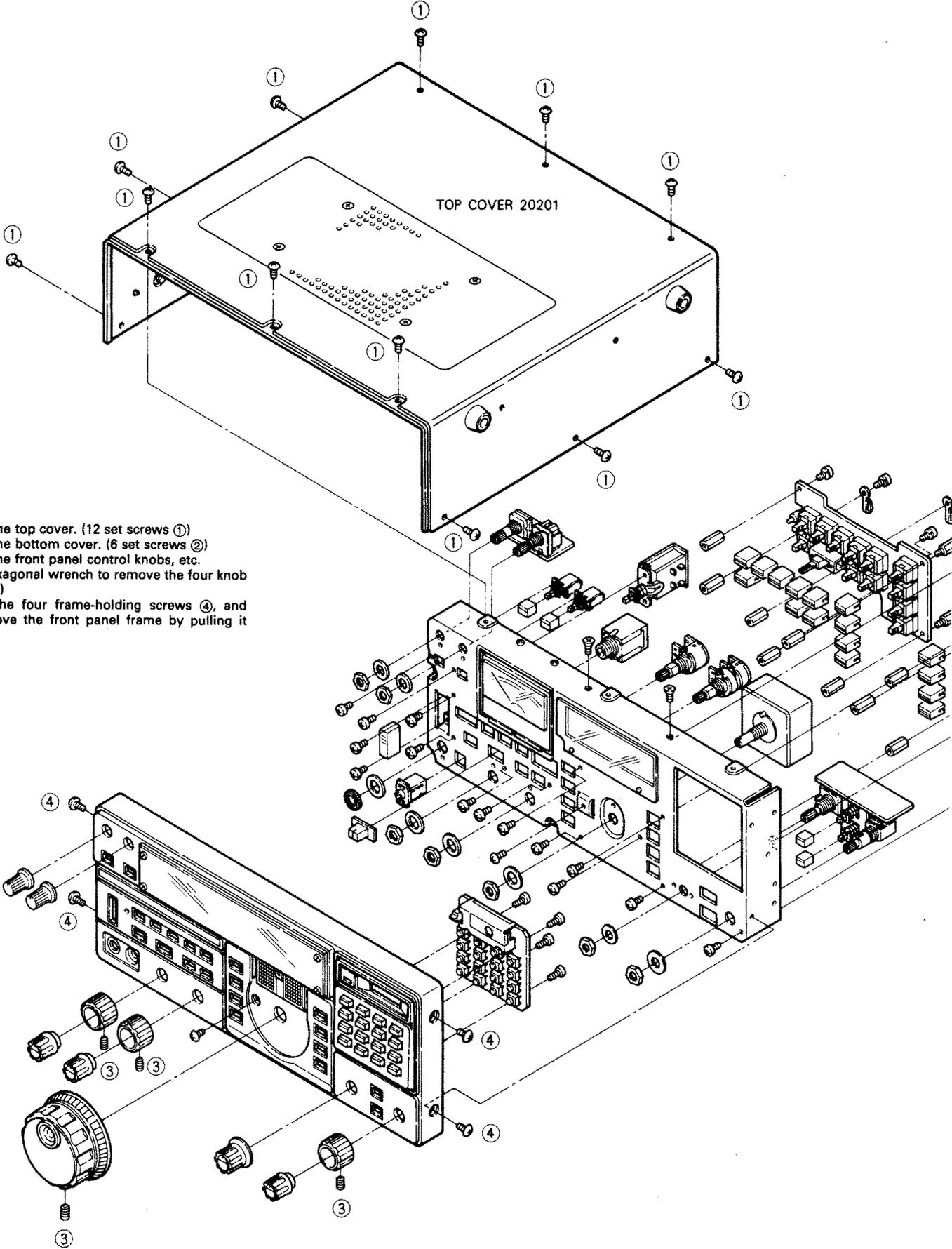
Transmission output waveform



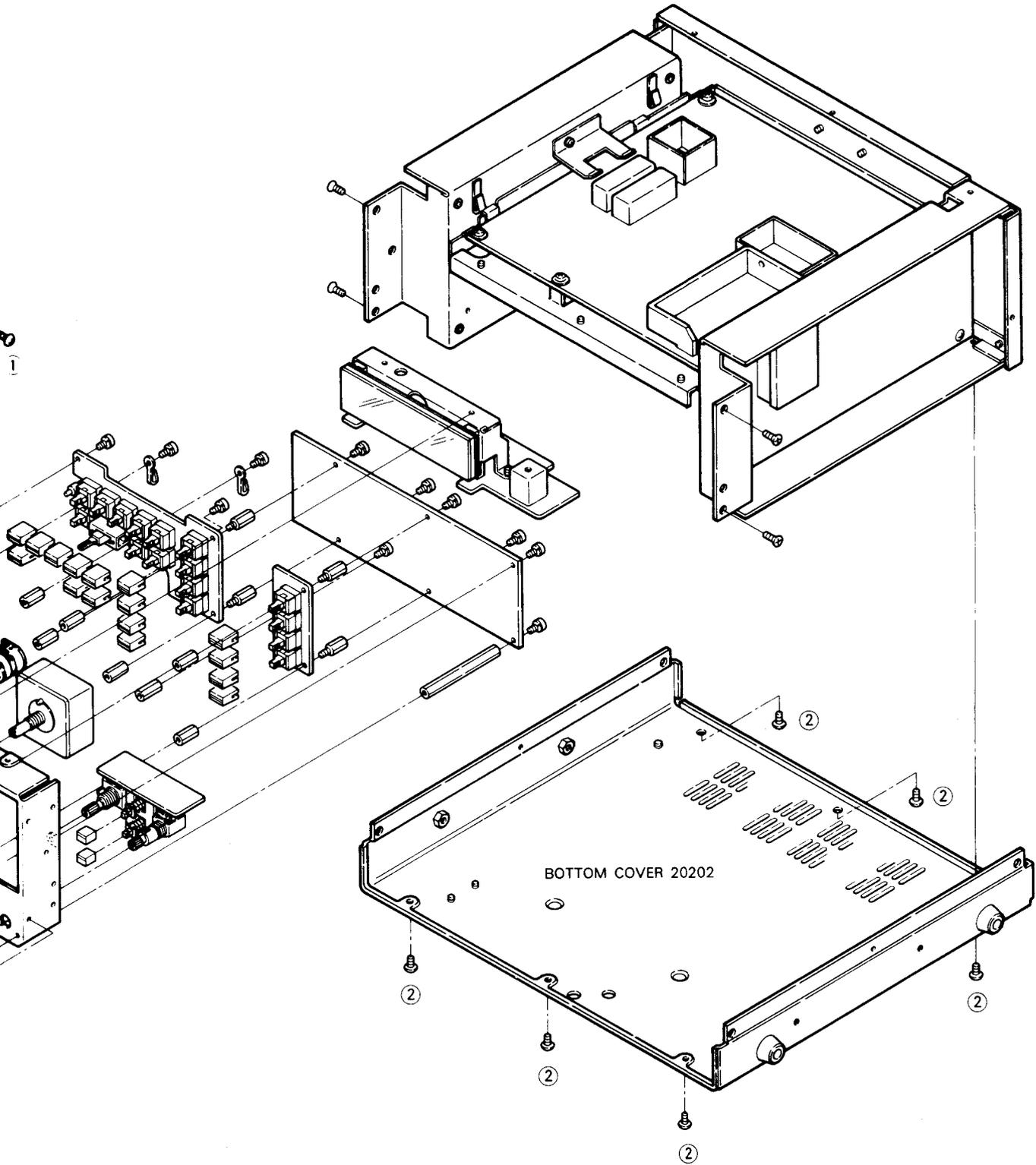
IC1 output waveform



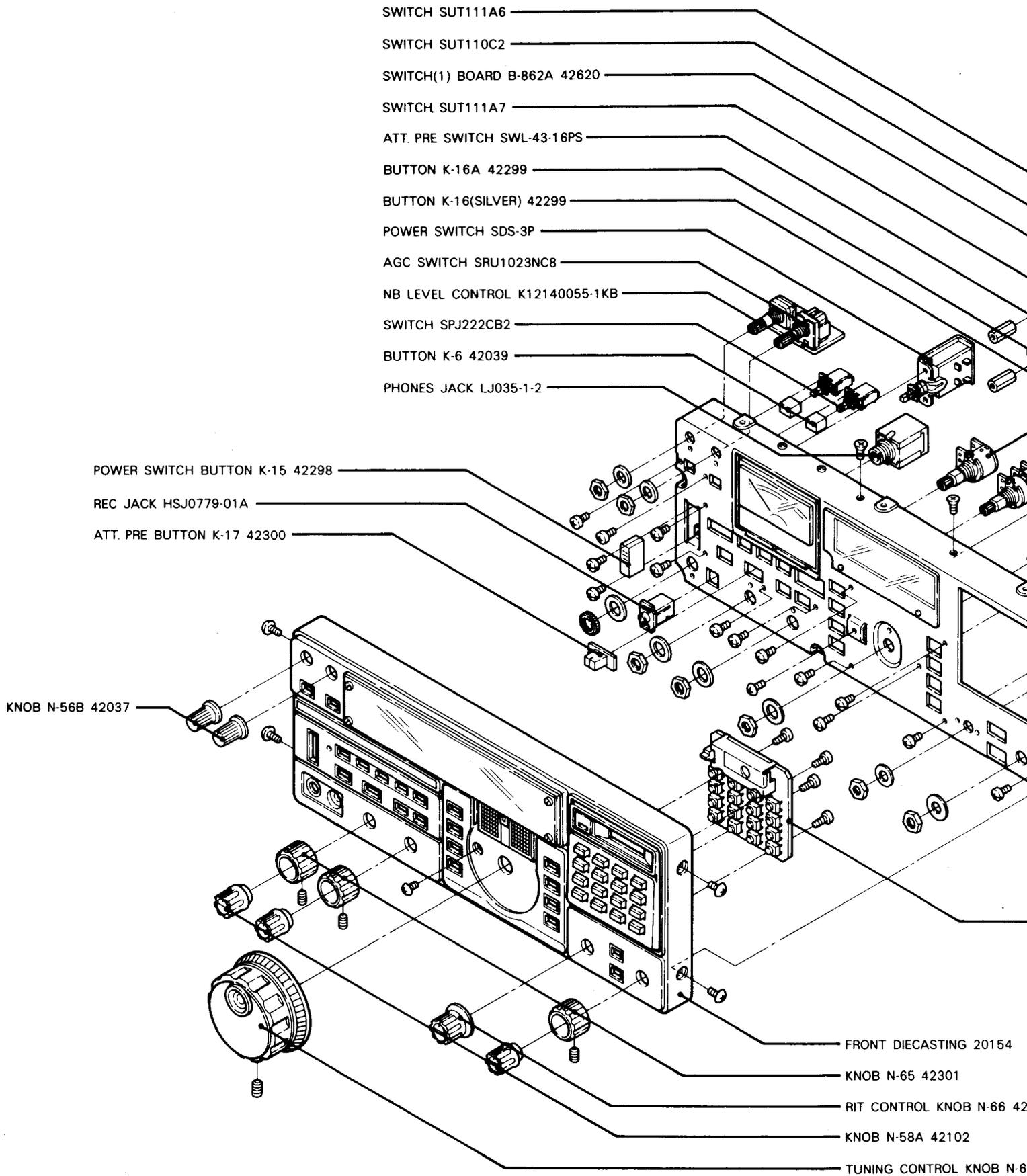
SECTION 6 DISASSEMBLY

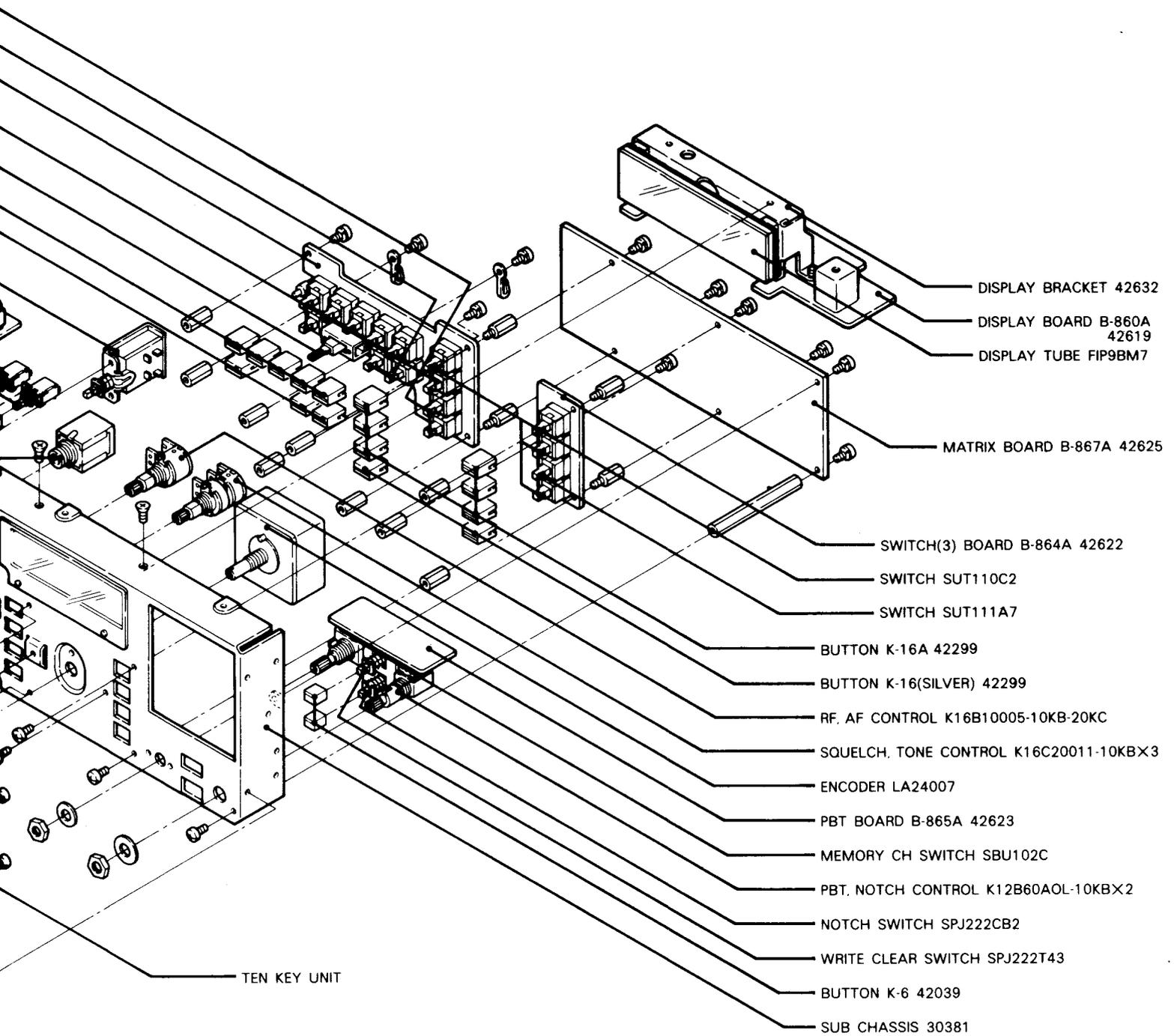


- 1. Remove the top cover. (12 set screws ①)
- 2. Remove the bottom cover. (6 set screws ②)
- 3. Remove the front panel control knobs, etc. (Use a hexagonal wrench to remove the four knob screws ③.)
- 4. Remove the four frame-holding screws ④, and then remove the front panel frame by pulling it forward.



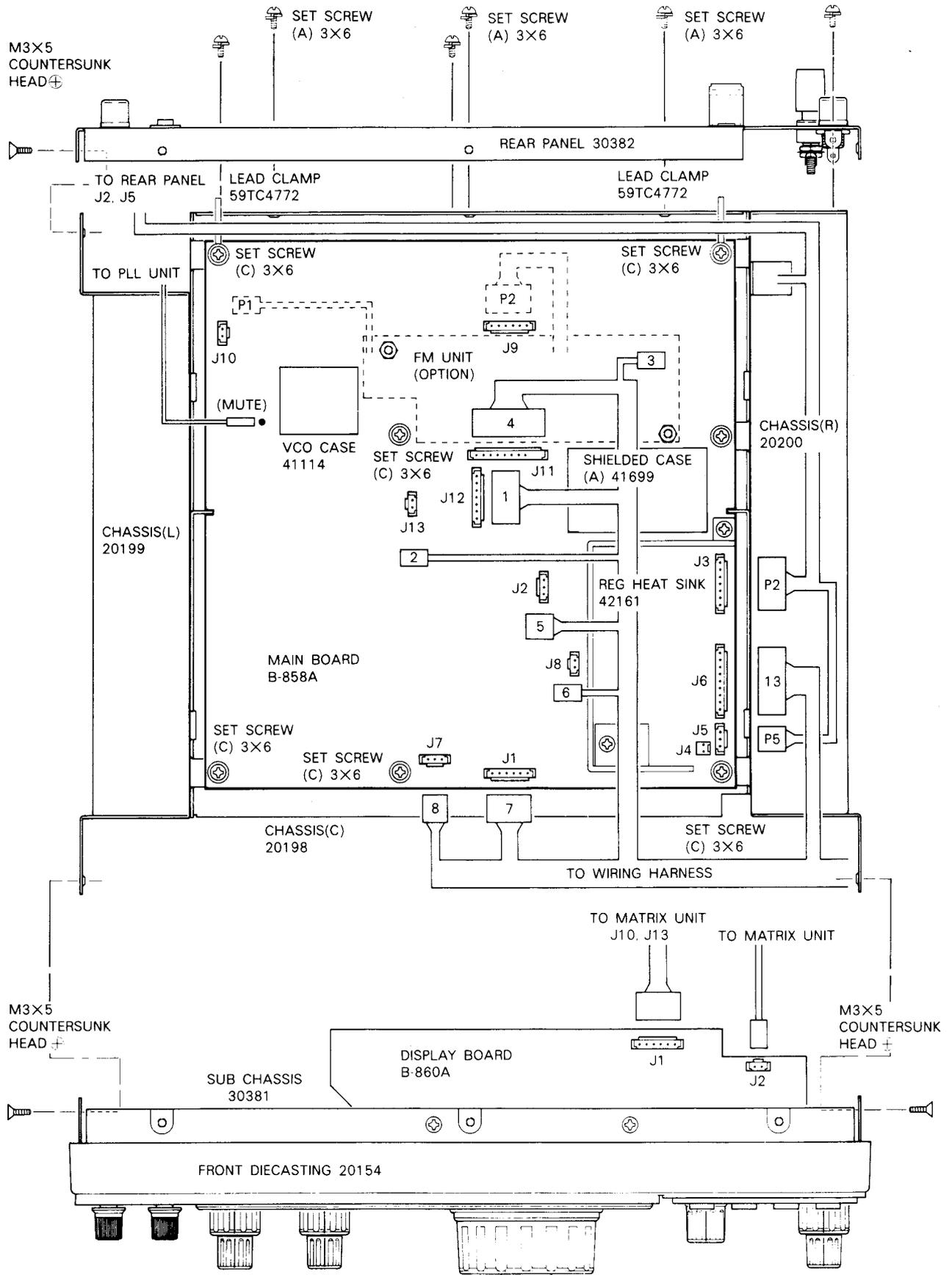
FRONT PANEL PARTS



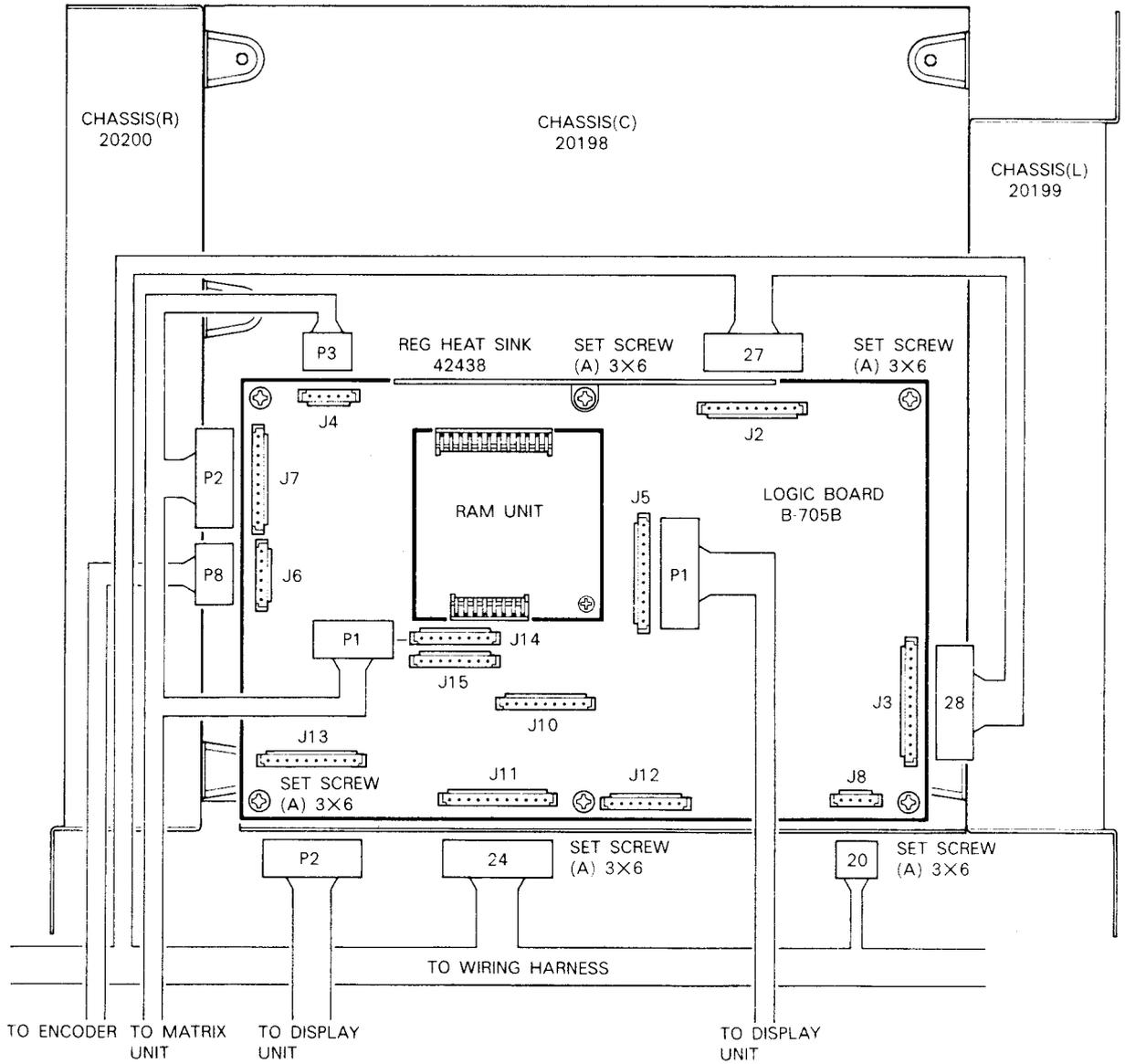


- FRONT DIECASTING 20154
- KNOB N-65 42301
- RIT CONTROL KNOB N-66 42302
- KNOB N-58A 42102
- TUNING CONTROL KNOB N-68 42392

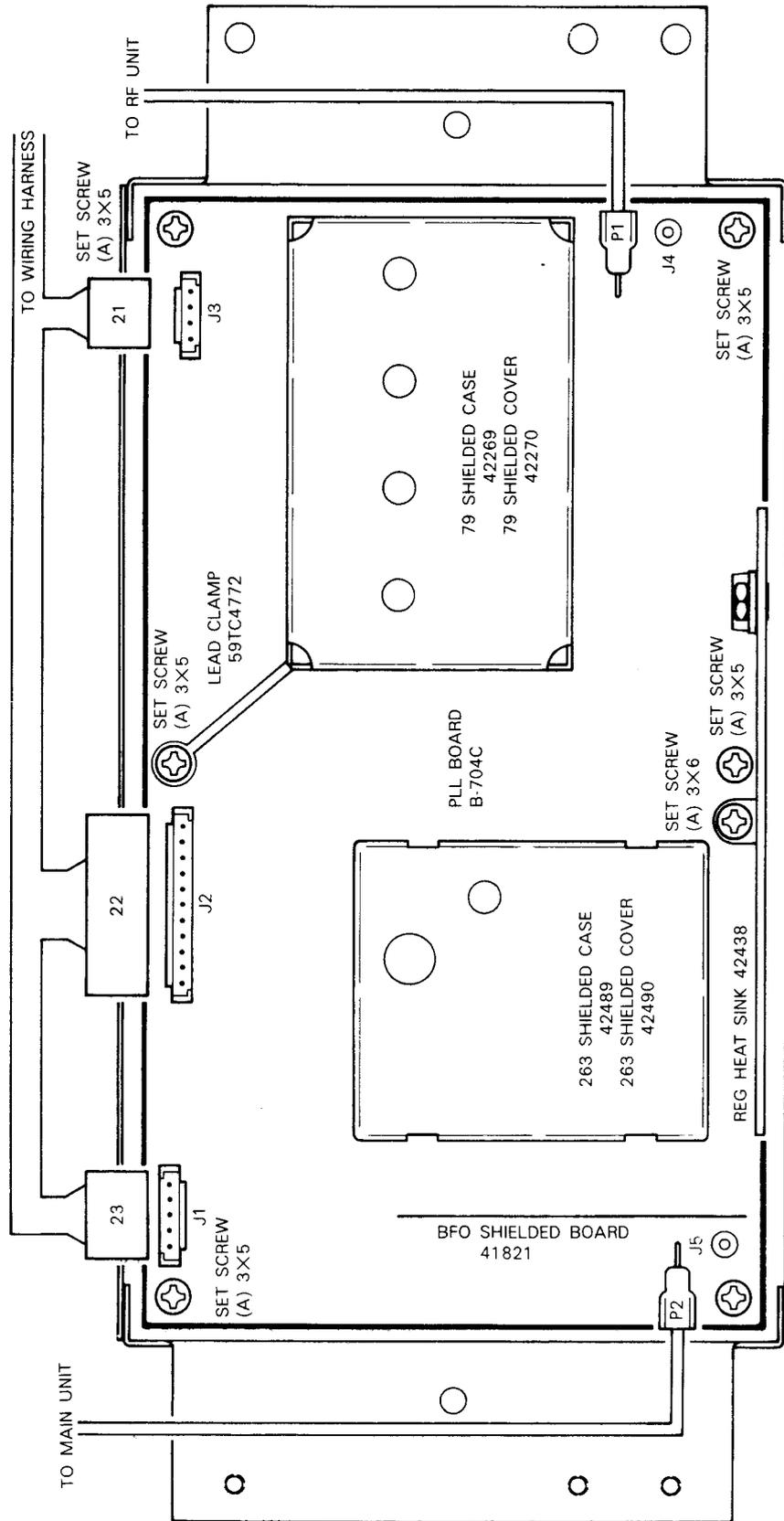
**CONNECTOR CONNECTIONS
MAIN UNIT**



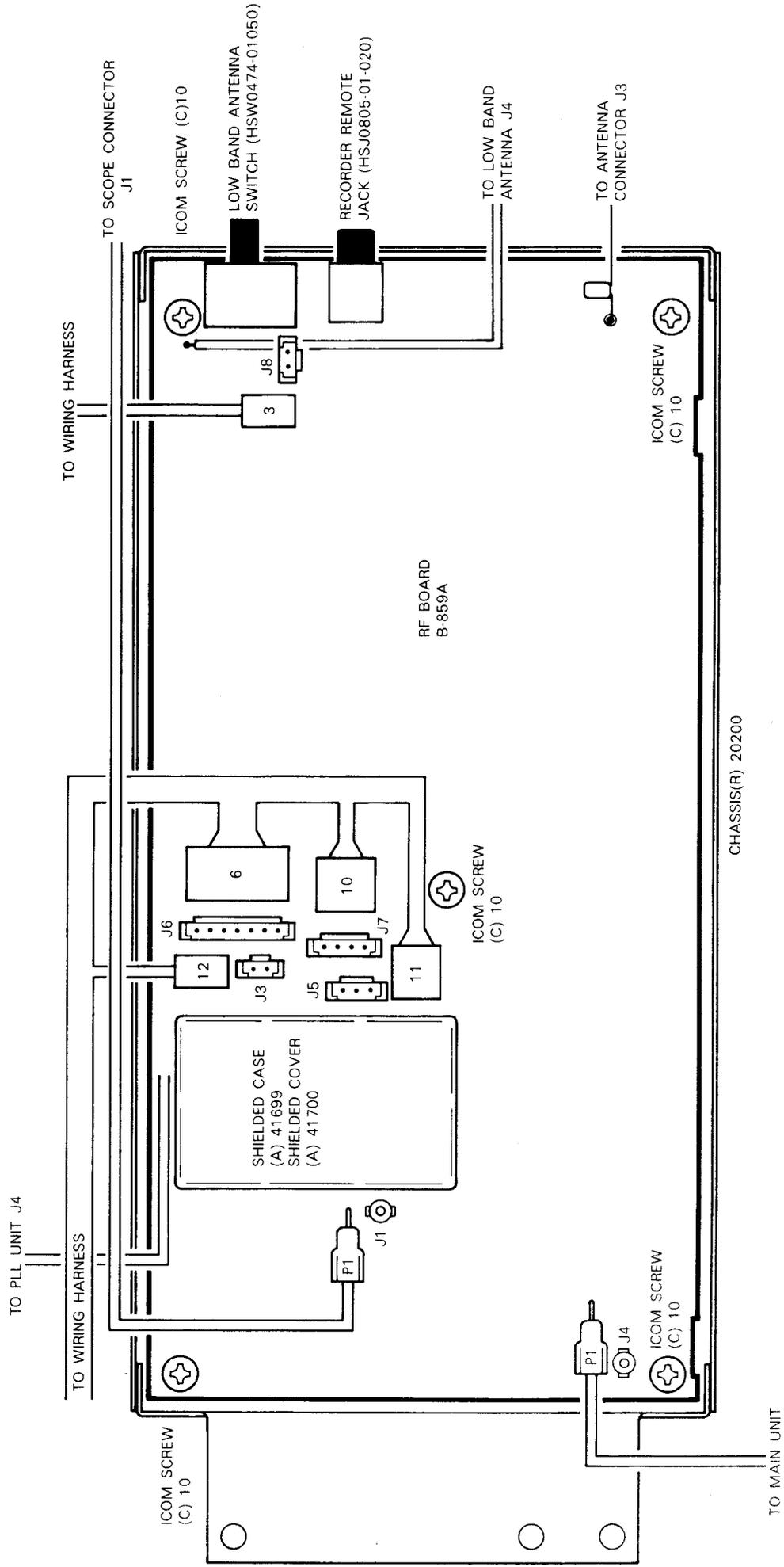
**CONNECTOR CONNECTIONS
LOGIC UNIT**



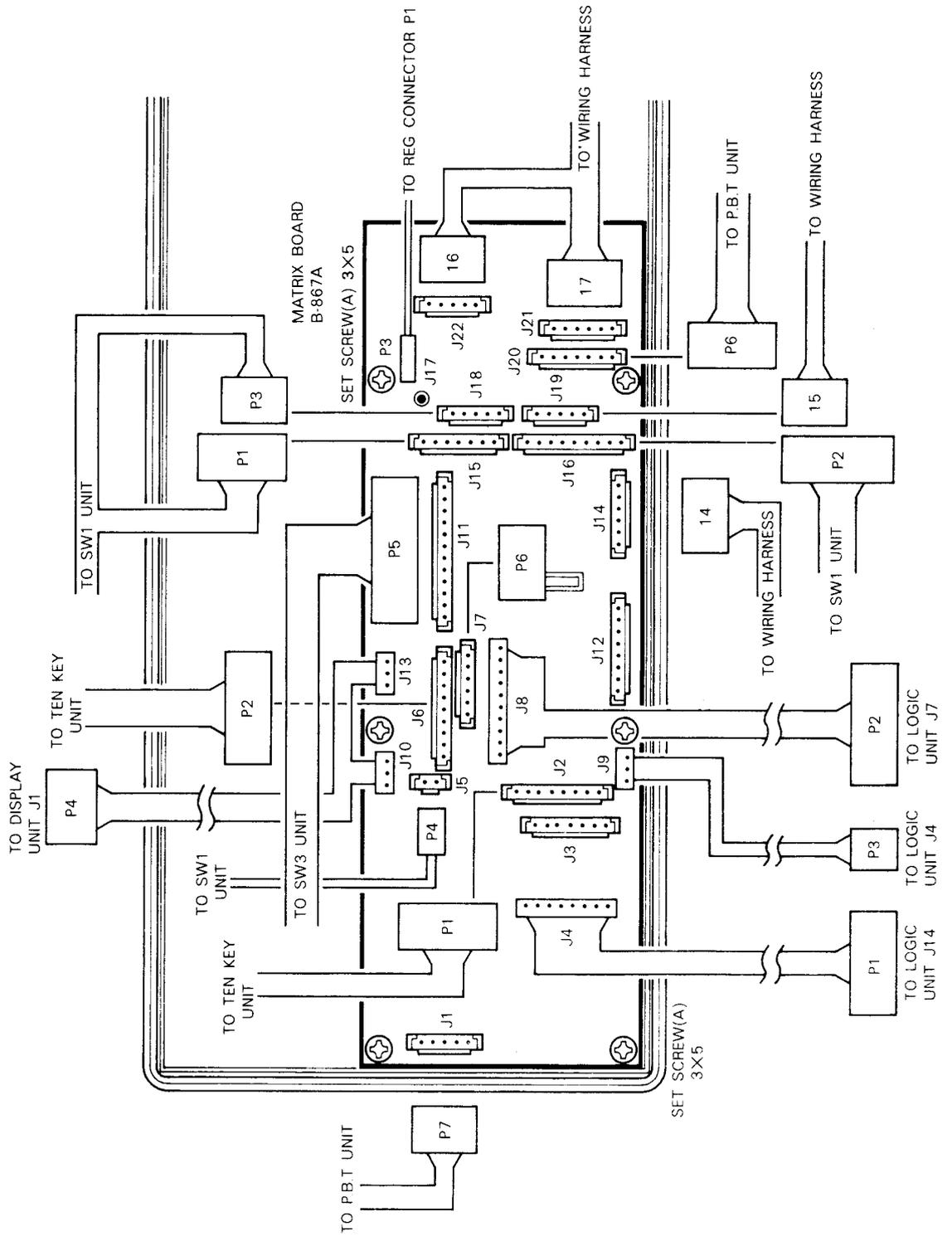
**CONNECTOR CONNECTIONS
PLL UNIT**



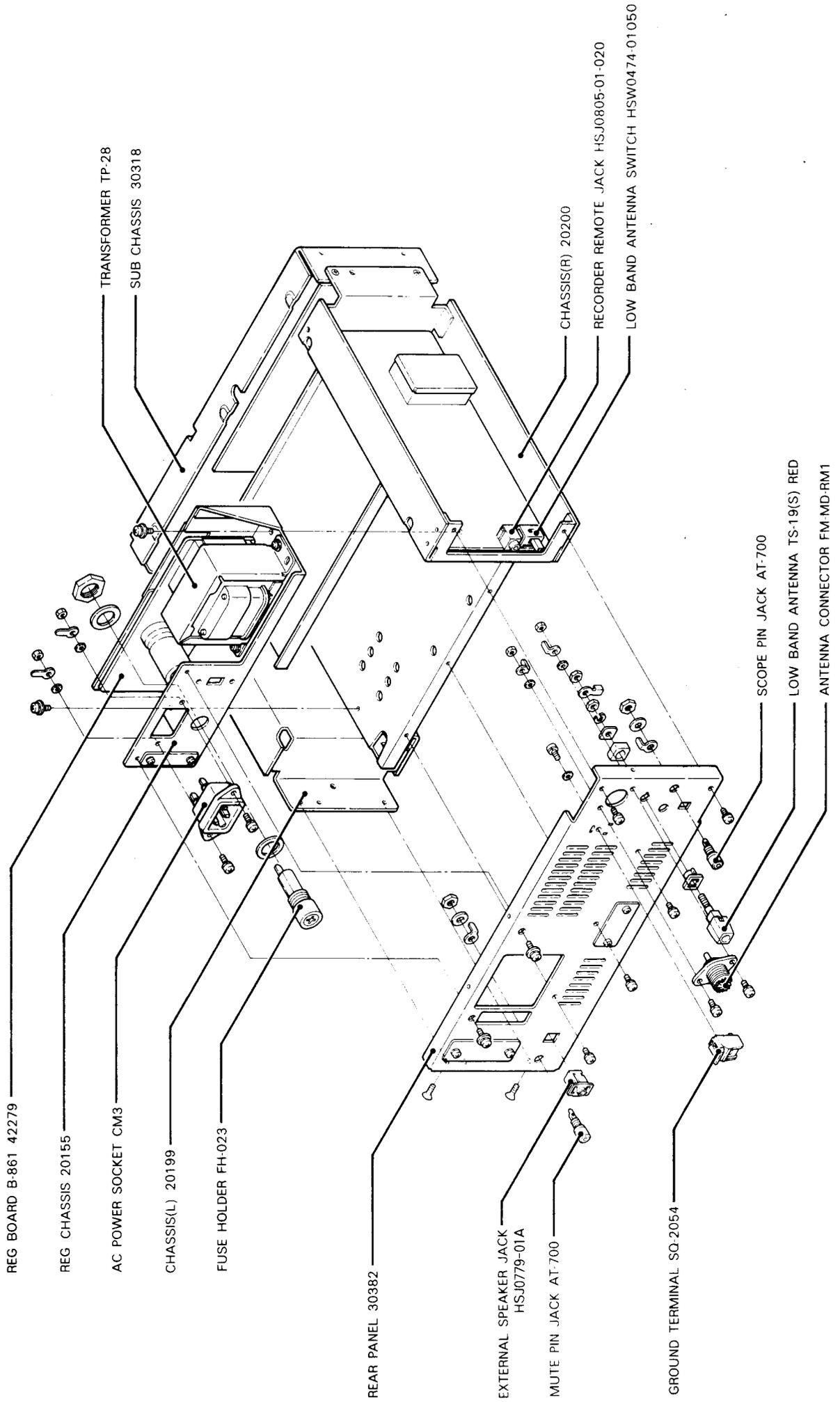
**CONNECTOR CONNECTIONS
RF UNIT**



**CONNECTOR CONNECTIONS
MATRIX UNIT**



REAR PANEL PARTS

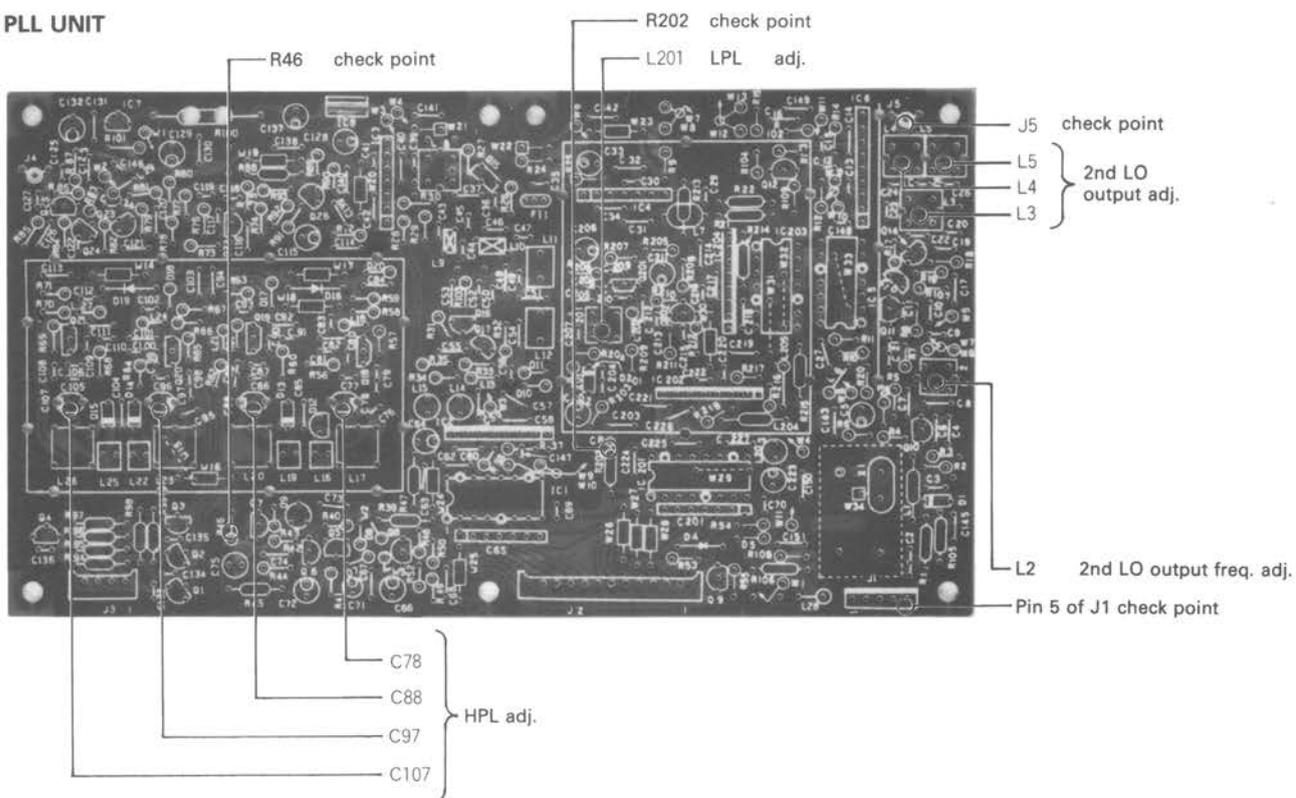


SECTION 7 ADJUSTMENTS

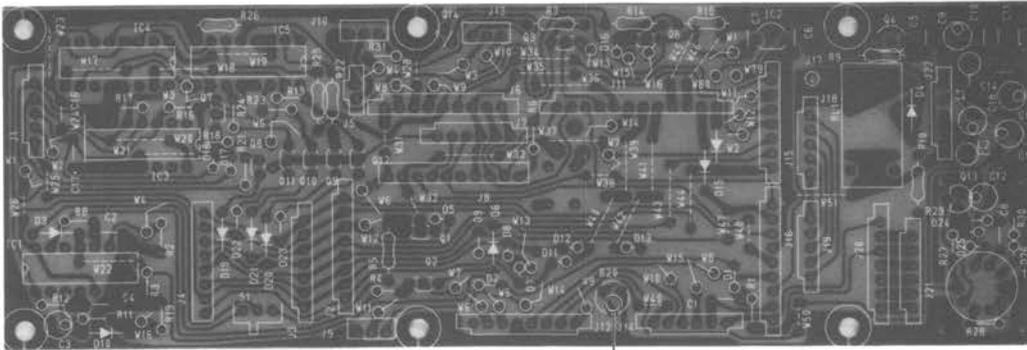
PLL ADJUSTMENT GUIDE

| Adjustment | Adjustment conditions | Unit | Measurement location | Adjustment value | Unit | Adjustment location |
|-------------------------|---|------|-----------------------------------|---------------------------|--------|---------------------|
| 2nd LO output frequency | 1. <ul style="list-style-type: none"> • Mode: any • Display frequency: any • PBT: center | PLL | Connect DC voltmeter to J1 pin 5. | 3V | MATRIX | R20 |
| | 2. | MAIN | Connect frequency counter to R1. | 61.4400 MHz | PLL | L2 |
| | 3. | PLL | Connect RF milli-voltmeter to J5. | Adjust to maximum output. | | L3 ~ L5 |
| LPL | 1. <ul style="list-style-type: none"> • Mode: LSB • Display frequency: 8.0000 MHz | PLL | Connect DC voltmeter to R202. | 3V | PLL | L201 |
| | 2. <ul style="list-style-type: none"> • Display frequency: 7.9999 MHz | | | Approx. 2V | | Verify |
| HPL | 1. <ul style="list-style-type: none"> • Mode: LSB • Display frequency: 7.9999 MHz | PLL | Connect DC voltmeter to R46 | 6.5V | PLL | C78 |
| | 2. <ul style="list-style-type: none"> • Display frequency: 14.9999 MHz | | | C88 | | |
| | 3. <ul style="list-style-type: none"> • Display frequency: 21.9999 MHz | | | C97 | | |
| | 4. <ul style="list-style-type: none"> • Display frequency: 29.9999 MHz | | | C107 | | |
| | 5. <ul style="list-style-type: none"> • Display frequency: 8.0000 MHz | | | 2 ~ 3 V or less | | Verify |
| | 6. <ul style="list-style-type: none"> • Display frequency: 15.0000 MHz | | | | | |
| | 7. <ul style="list-style-type: none"> • Display frequency: 22.0000 MHz | | | | | |
| | 8. <ul style="list-style-type: none"> • Display frequency: 0.1000 MHz | | | | | |
| BFO frequency | 1. <ul style="list-style-type: none"> • Display frequency: any • Mode: USB | MAIN | Connect frequency counter to R139 | 9.0130 MHz | MAIN | C78 |
| | 2. <ul style="list-style-type: none"> • Mode: LSB | | | 9.0100 MHz | | L20 |
| | 3. <ul style="list-style-type: none"> • Mode: RTTY | | | 9.008475 MHz | | L22 |
| | 4. <ul style="list-style-type: none"> • Mode: CW | | | 9.0098 MHz ± 200 Hz | | Verify |

PLL UNIT

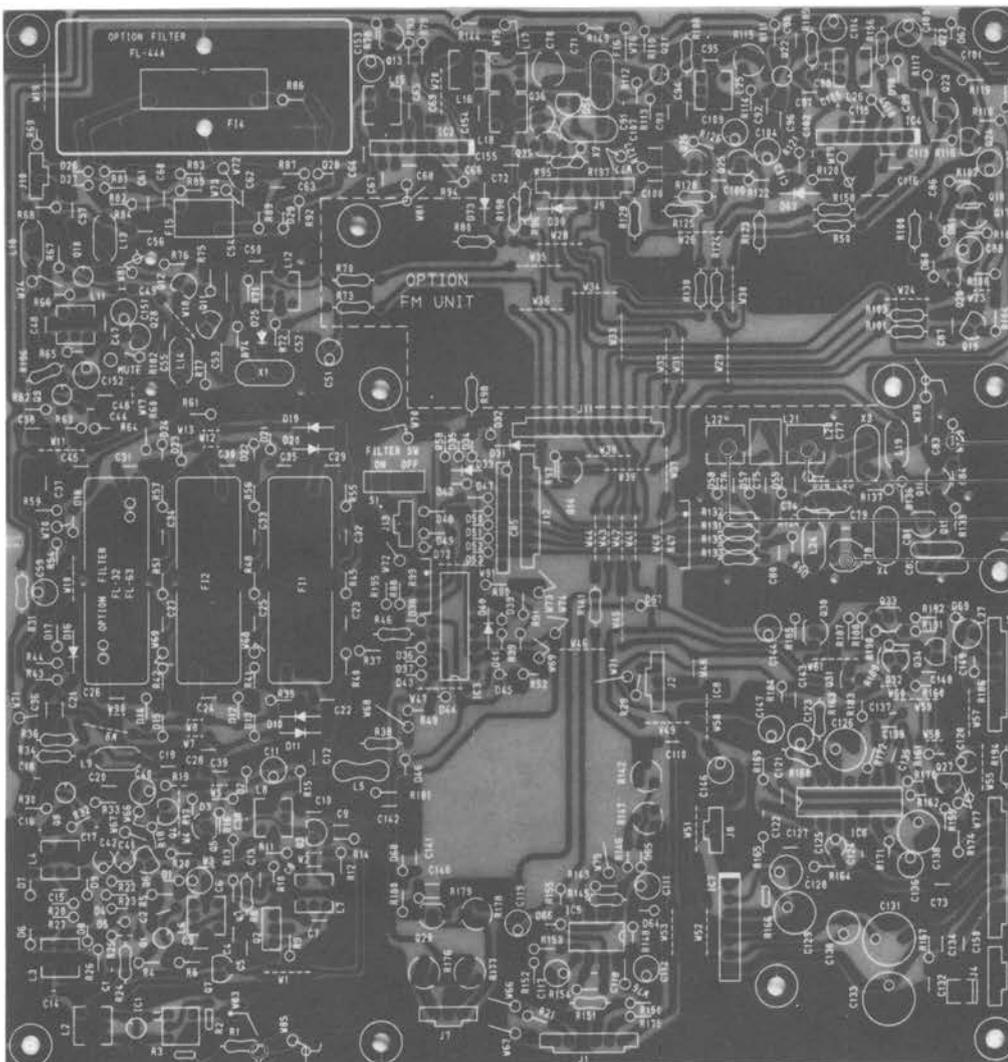


MATRIX UNIT



R20 2nd LO output freq. adj.

MAIN UNIT



BFO freq. adj.

R139 check point

L20 LSB 9.0100MHz

L22 RTTY 9.008475MHz

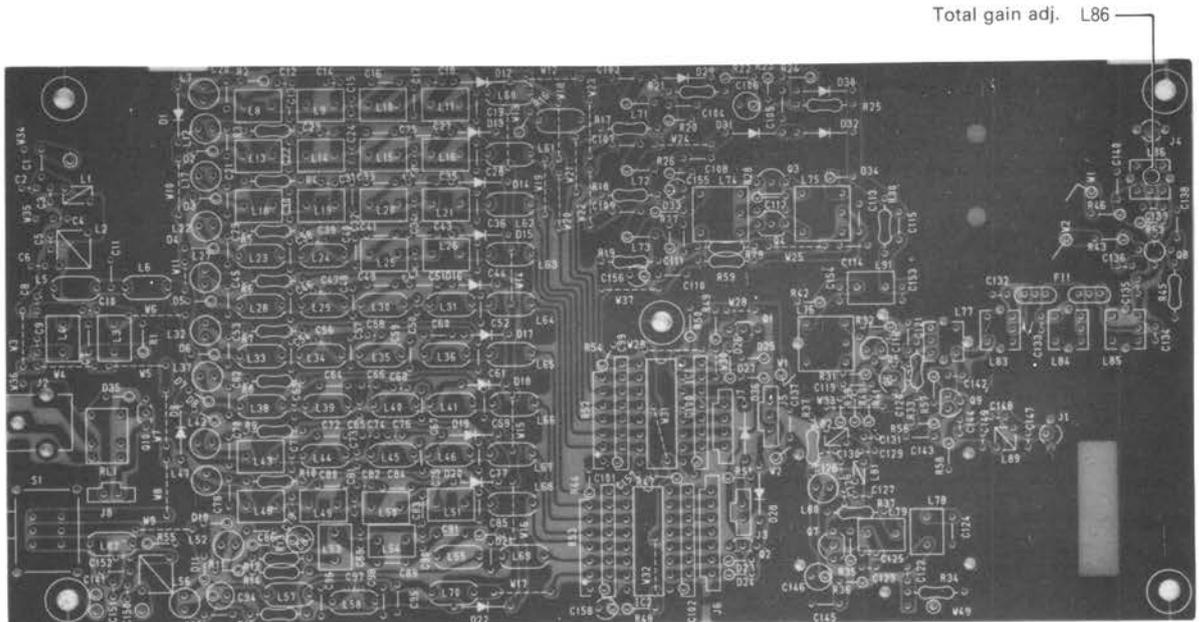
C78 USB 9.0130MHz

J1 check point

RECEIVER ADJUSTMENT GUIDE

| Adjustment | Adjustment conditions | Unit | Measurement location | Adjustment value | Unit | Adjustment location |
|------------------------------------|---|------|-------------------------|--|-------------|---|
| Connection of measuring instrument | 1. Connect signal generator (SSG) to rear panel ANT connector, and connect speaker (8Ω) and AF voltmeter (AC M.M.) to EXT SP terminal. SSG output value shows loaded condition | | | | | |
| Total gain | 1. <ul style="list-style-type: none"> Mode: LSB Band: 7 MHz PRE AMP: ON RF GAIN: to extreme right NOTCH: OFF PBT: center TONE: center SQL: to extreme left AGC: FAST NB: ON (center) Input -16 dBμ signal from SSG. | | AC M.M | Adjust audio level to maximum. | RF MAIN | L86 L2 ~ 4, L11, L15 L16, L25 L26 |
| | 2. <ul style="list-style-type: none"> PRE AMP: OFF Input +34 dBμ signal from SSG | | | Set audio level to 2.5 V. | Front panel | AF GAIN |
| | 3. SSG output: OFF (when no signal) | | | Set noise output 30 dB down (approx. 80 mV) from 2.5V. | MAIN | R115 |
| S meter | 1. SSG output: OFF (when no signal) | | S meter built into unit | Adjust to where S meter begins to swing. | MAIN | R147 |
| | 2. SSG output: +74 dBμ | | | S9 + 40 dB | | R142 |
| | 3. SSG output: +34 dBμ | | | S9 | | Verify |
| | 4. Repeat 1. ~ 3. Check to be sure that S meter indication is approximately +10 dB (during PRE) and approximately -20 dB (during ATT). | | | | | |

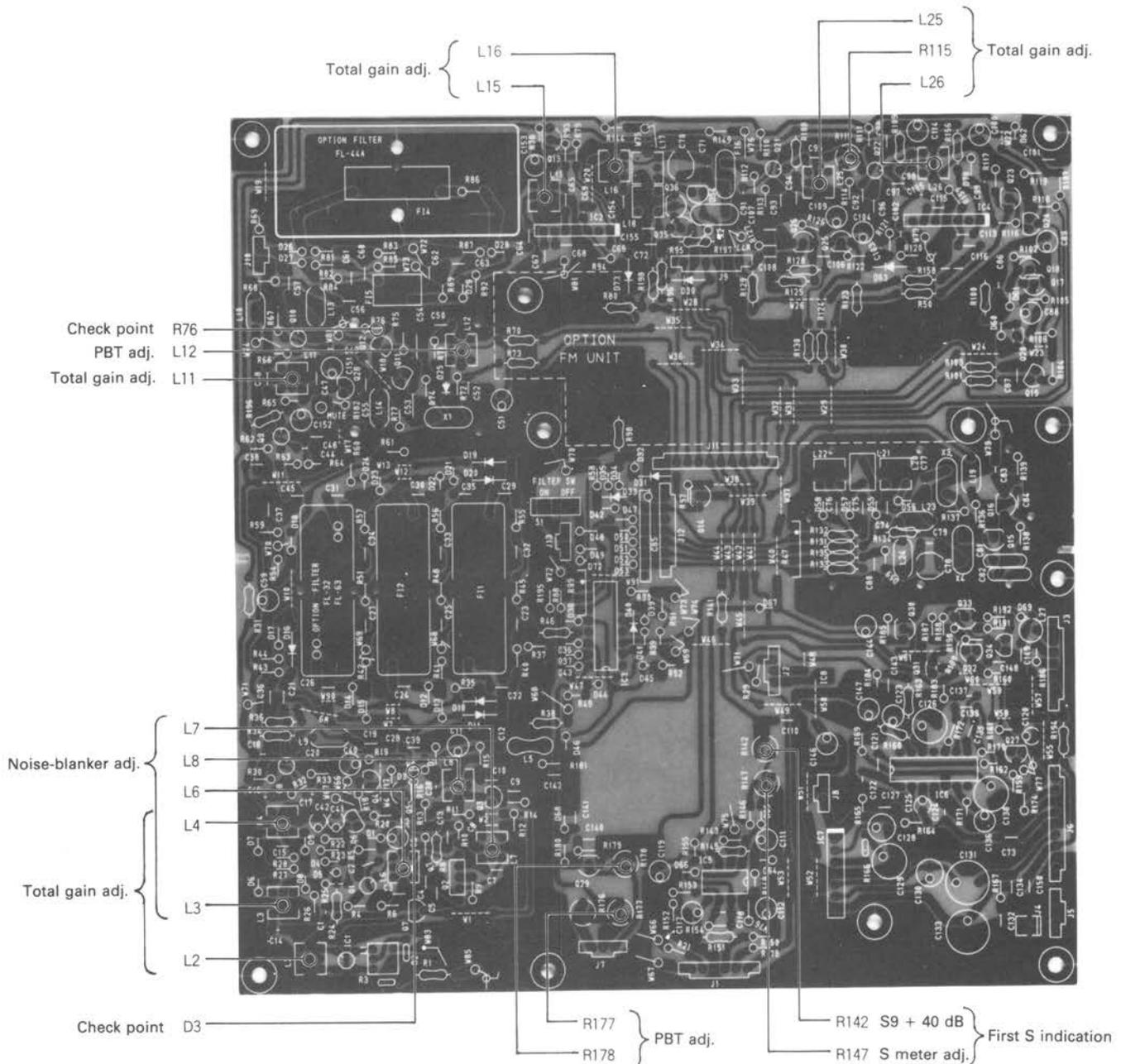
RF UNIT



RECEIVER ADJUSTMENT GUIDE

| Adjustment | Adjustment conditions | Unit | Measurement location | Adjustment value | Unit | Adjustment location |
|---------------|--|------|-----------------------------------|-----------------------------------|------|---------------------|
| Noise blanker | 1. ● NB: OFF Input pulse-like noise from ANT. | MAIN | Connect oscilloscope to D3. | Pulse-like noise waveform maximum | MAIN | L6 ~ L8 |
| | 2. ● NB: ON | | | Pulse-like noise waveform minimum | | L3, L4 |
| | 3. If the 2. adjustment position is turned too much, this will affect reception sensitivity, and it will have to be checked and total gain readjusted. | | | | | |
| PBT frequency | 1. ● FILTER: N (narrow) ON ● PBT: to extreme left | MAIN | Connect frequency counter to R76. | 9.46200 MHz | MAIN | L12 |
| | 2. ● PBT: center | | | 9.46500 MHz | | R177 |
| | 3. ● PBT: to extreme right | | | 9.46800 MHz ± 200 Hz | | Verify |
| | 4. ● FILTER: OFF (normal) ● PBT: center | | | 9.46650 MHz | | R178 |
| | 5. ● PBT: turn to left and right | | | Approx. ±2.5 kHz | | Verify |
| * NOTCH | 1. Special tool is needed for adjustment; please contact our service center. | | | | | |

MAIN UNIT

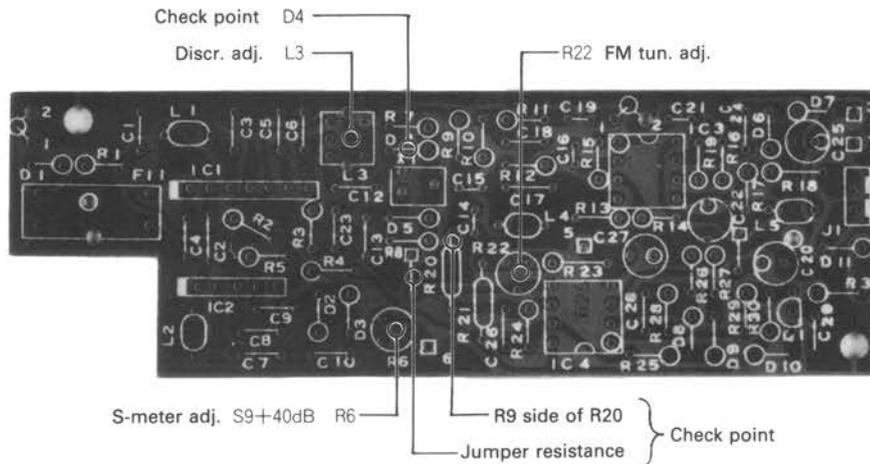


FM UNIT ADJUSTMENT GUIDE

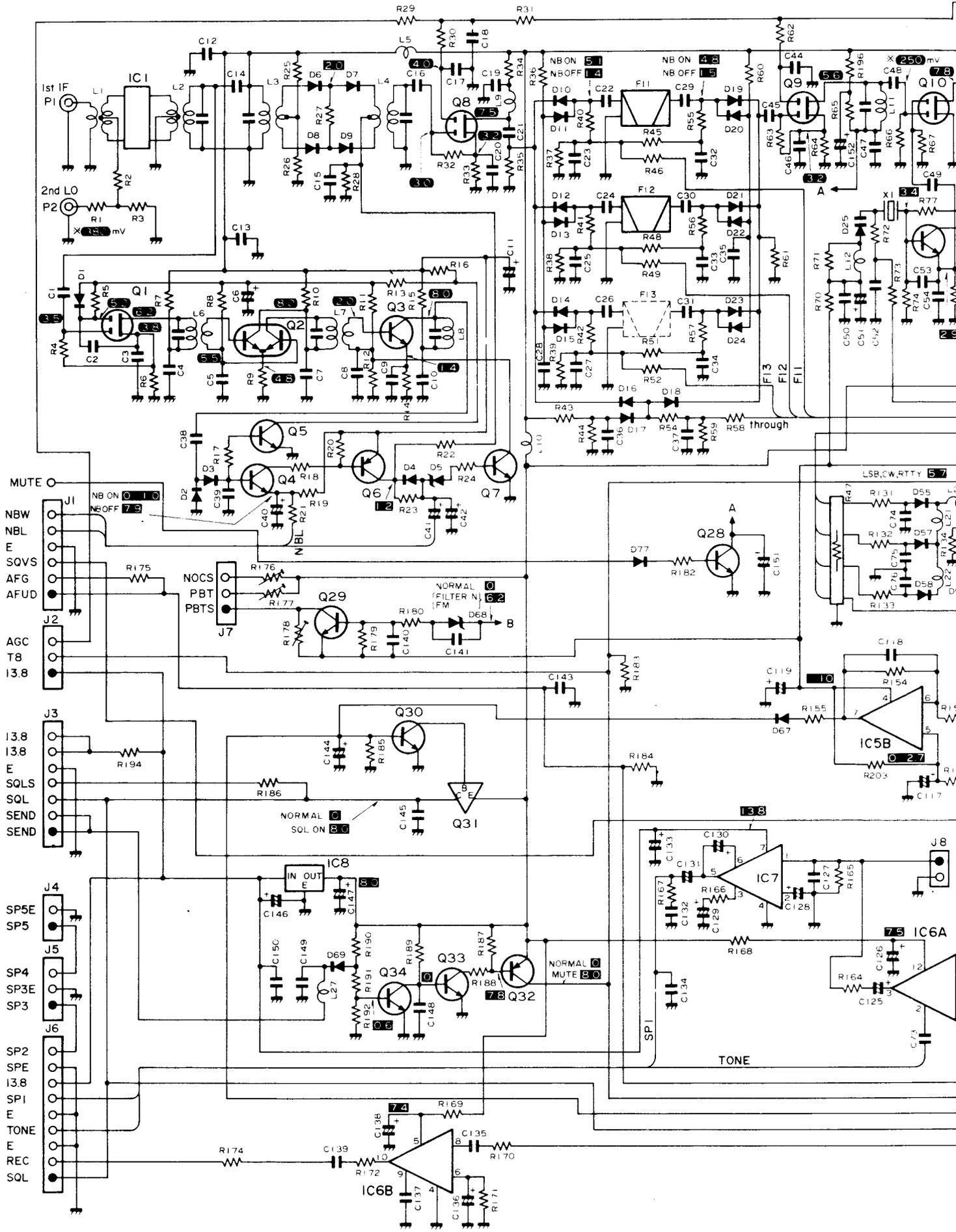
OPTION

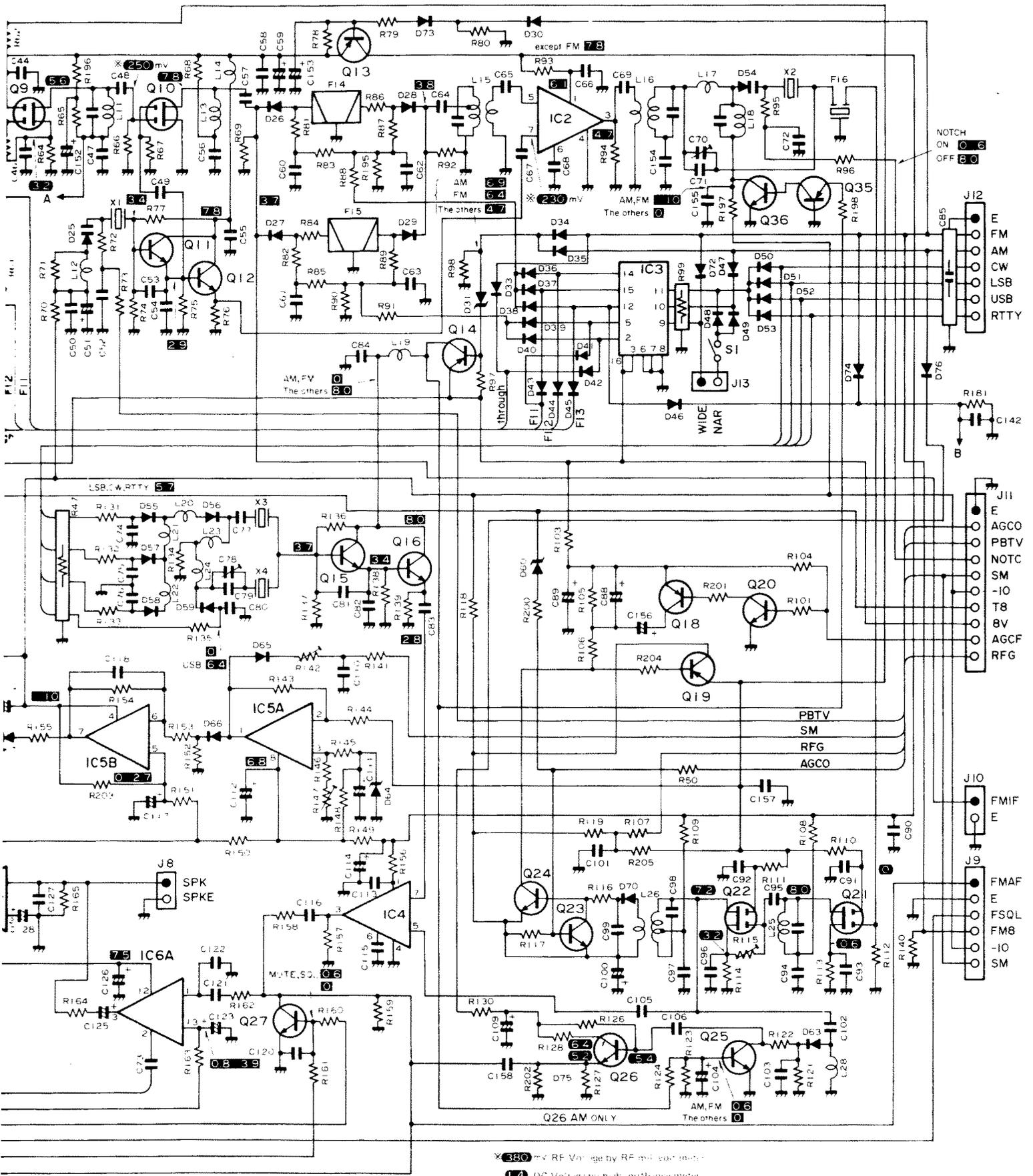
| Adjustment | Adjustment conditions | Unit | Measurement location | Adjustment value | Unit | Adjustment location |
|------------------|--|------|---|----------------------------|-------------|---------------------|
| Reception gain | 1. <ul style="list-style-type: none"> ● Display frequency: 28 MHz vicinity ● PRE/ATT: PRE ON ● RF GAIN: to extreme right ● NOTCH: OFF ● MODE: FM ● TONE: center ● PBT: center ● SQL: to extreme left ● AGC: FAST Switch SSG output OFF (when no signal). | | AC M.M | Adjust noise level to 2.5V | Front panel | AF GAIN |
| ③ Discrimination | 2. Input +14 dBμ unmodulated signal from SSG. | FM | Connect DC voltmeter between R20 (R9 side) and the jumper resistance at its left. | 0V | FM | L3 |
| | Note: SSG output in 2. must be zeroed-in to within 100 Hz relative to display frequency. | | | | | |
| FM TUNE | 1. Input a +14 dBμ modulated signal from SSG. | FM | Connect frequency counter to D4. | 455 kHz | Front panel | Tuning control |
| | 2. | | FM TUNE LED | Illumination | FM | R22 |
| | 3. Verification: FM TUNE LED illuminates within ±1 kHz from frequency displayed at adjustment 1; LED extinguishes if ±1 kHz is exceeded; illuminates again if continued movement away. | | | | | |
| S meter | 1. Set SSG output to +34 dBμ. | | Built-in S meter | S9+40dB | FM | R6 |

FM UNIT



MAIN UNIT CIRCUIT AND VOLTAGE DIAGRAM





NOTCH ON OFF

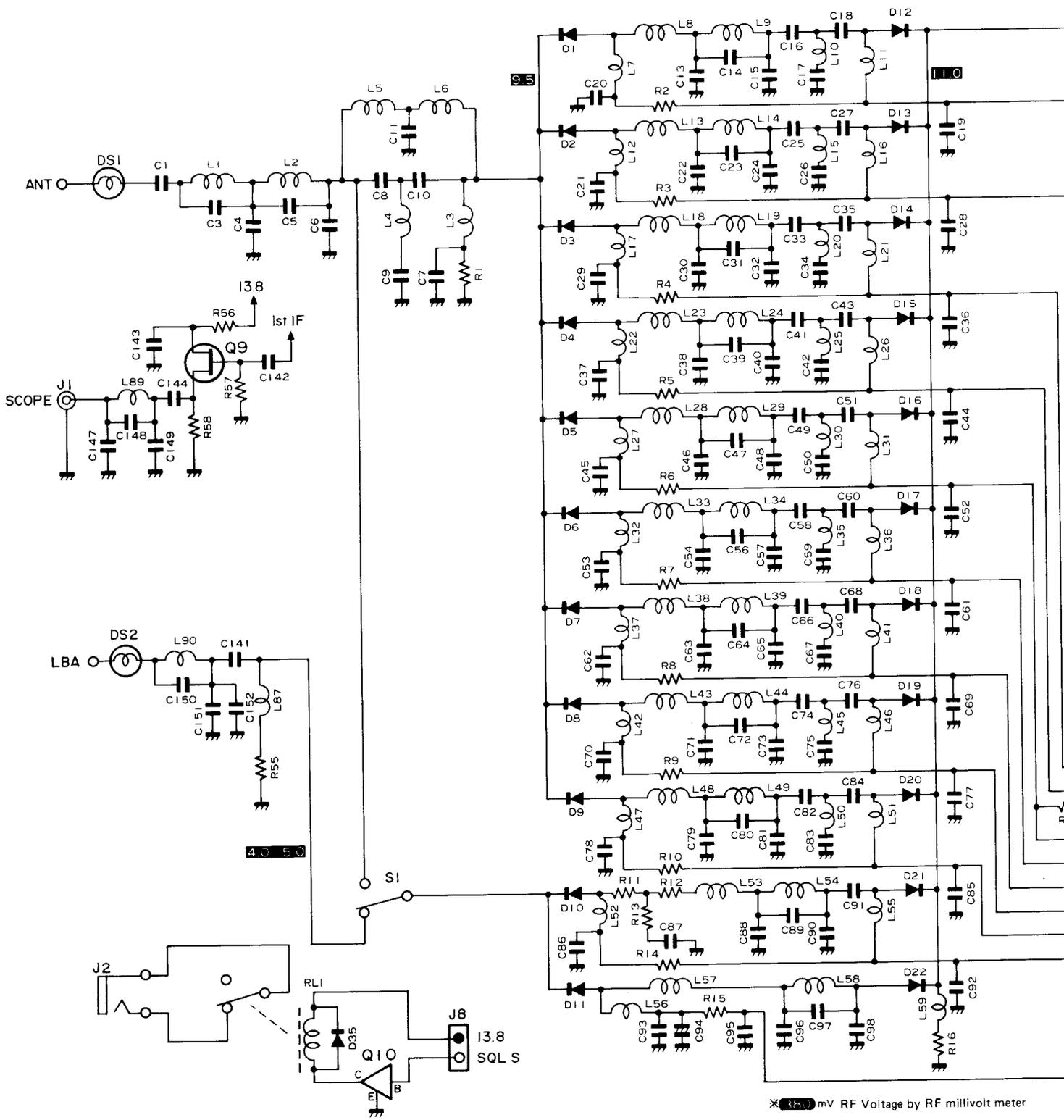
E FM
 AM
 CW
 LSB
 USB
 RTTY

E
 AGCO
 PBT
 NOTC
 SM
 -10
 T8
 8V
 AGCF
 RFG

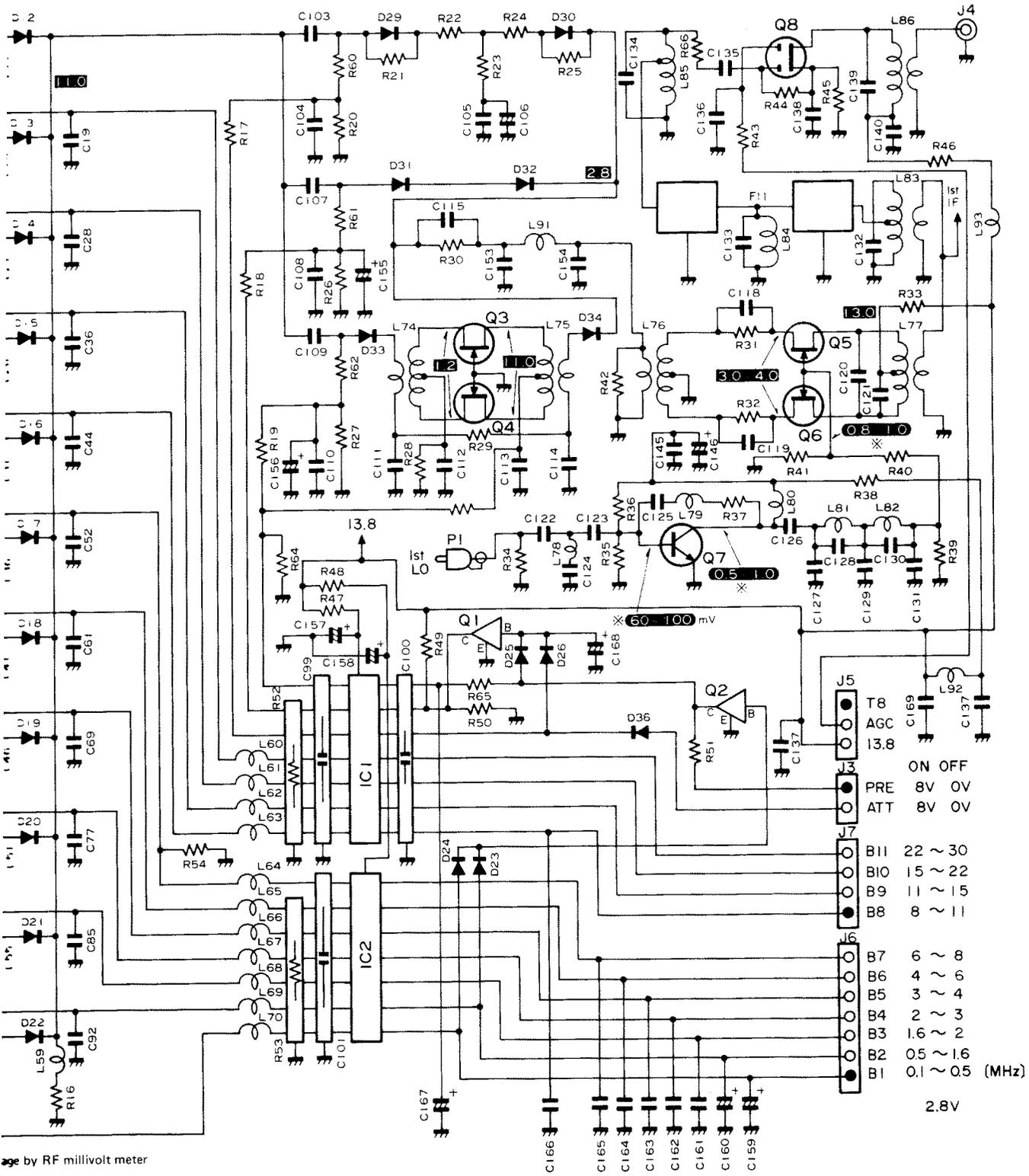
J10 FMIF
 E

J9 FMAF
 E
 FSQ
 FMS
 -10
 SM

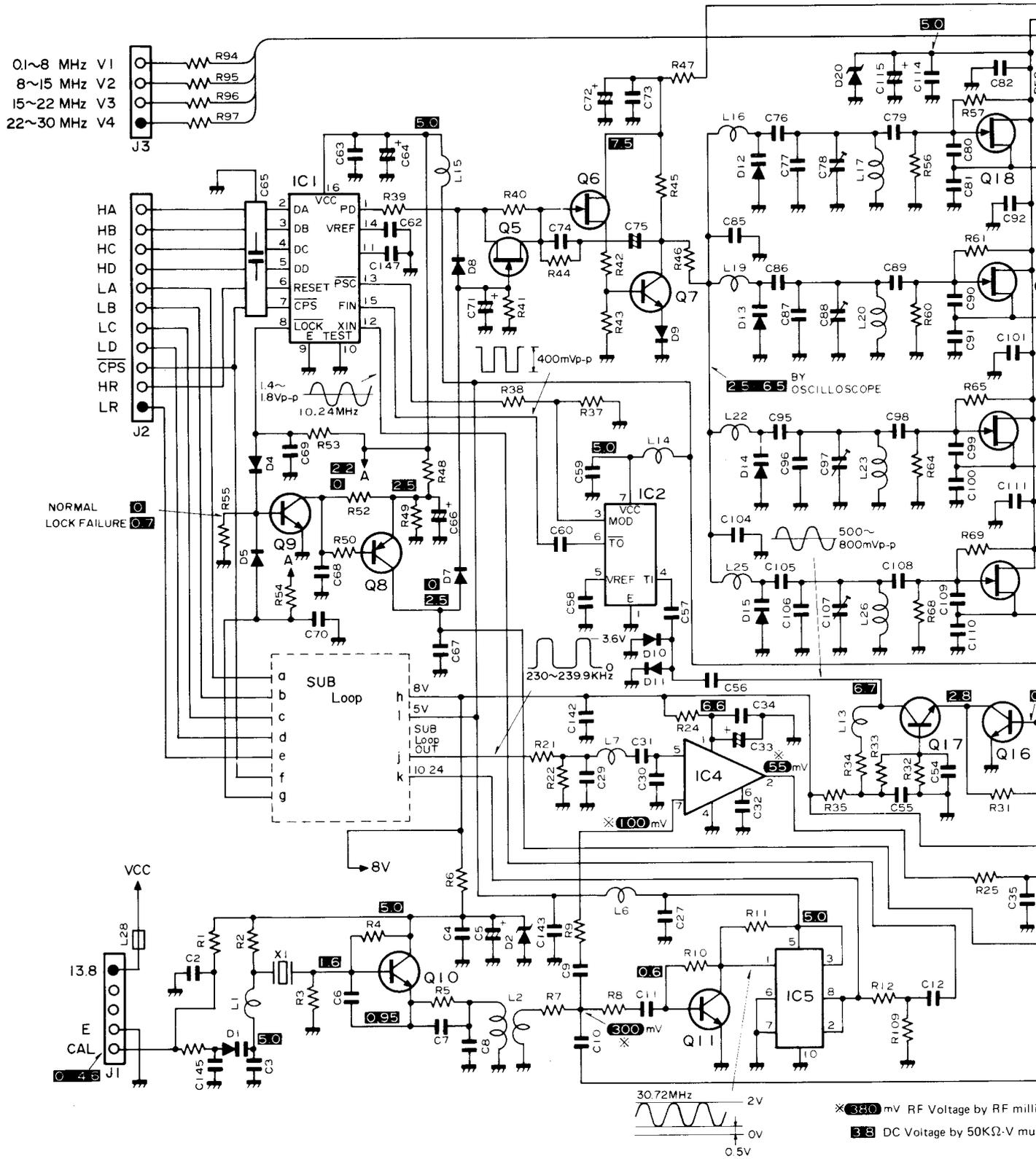
RF UNIT CIRCUIT AND VOLTAGE DIAGRAM

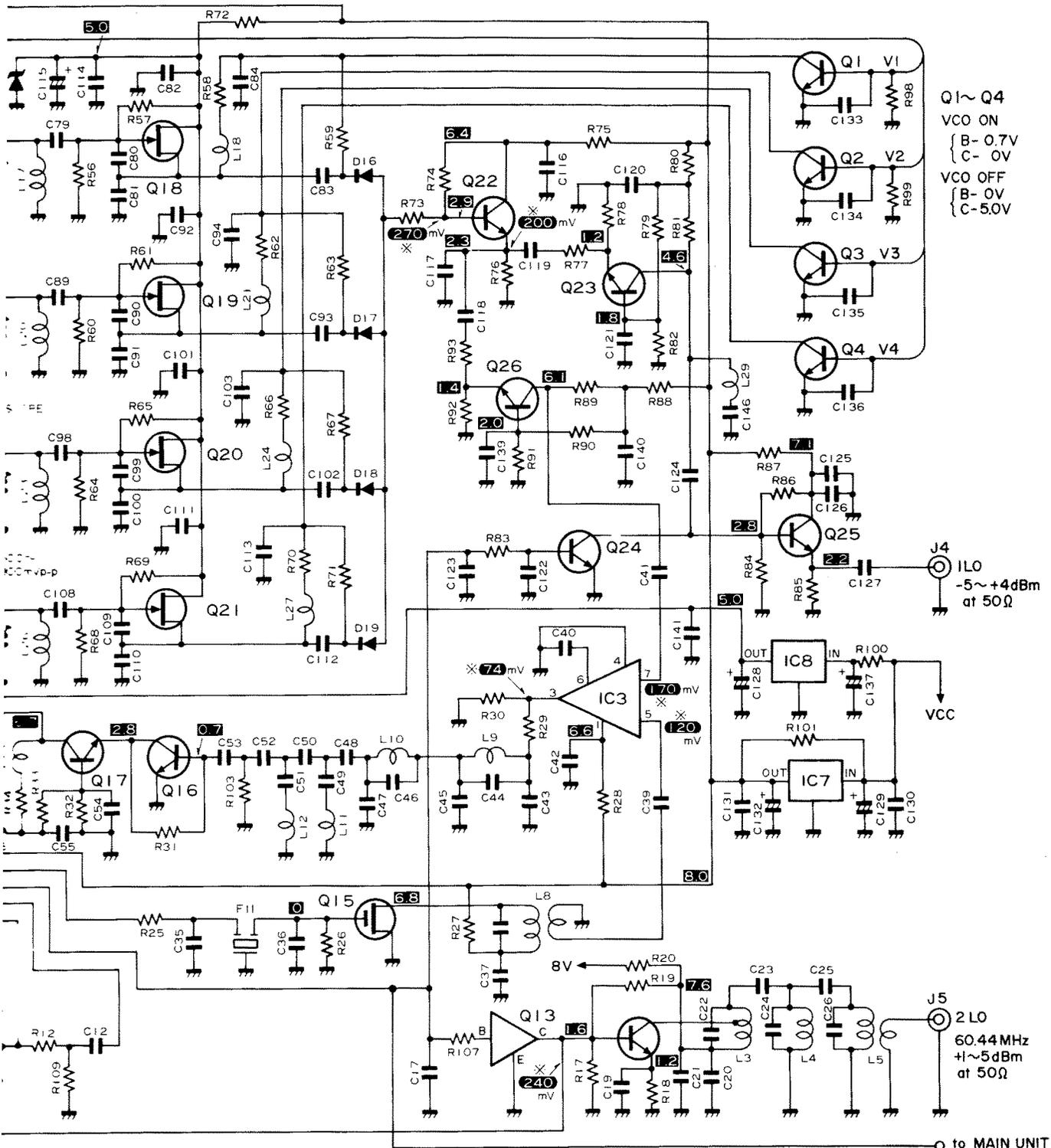


350 mV RF Voltage by RF millivolt meter
13.8 DC Voltage by 50K Ω -V multimeter



PLL UNIT CIRCUIT AND VOLTAGE DIAGRAM





Q1~ Q4
 VCO ON
 { B- 0.7V
 C- 0V
 VCO OFF
 { B- 0V
 C- 5.0V

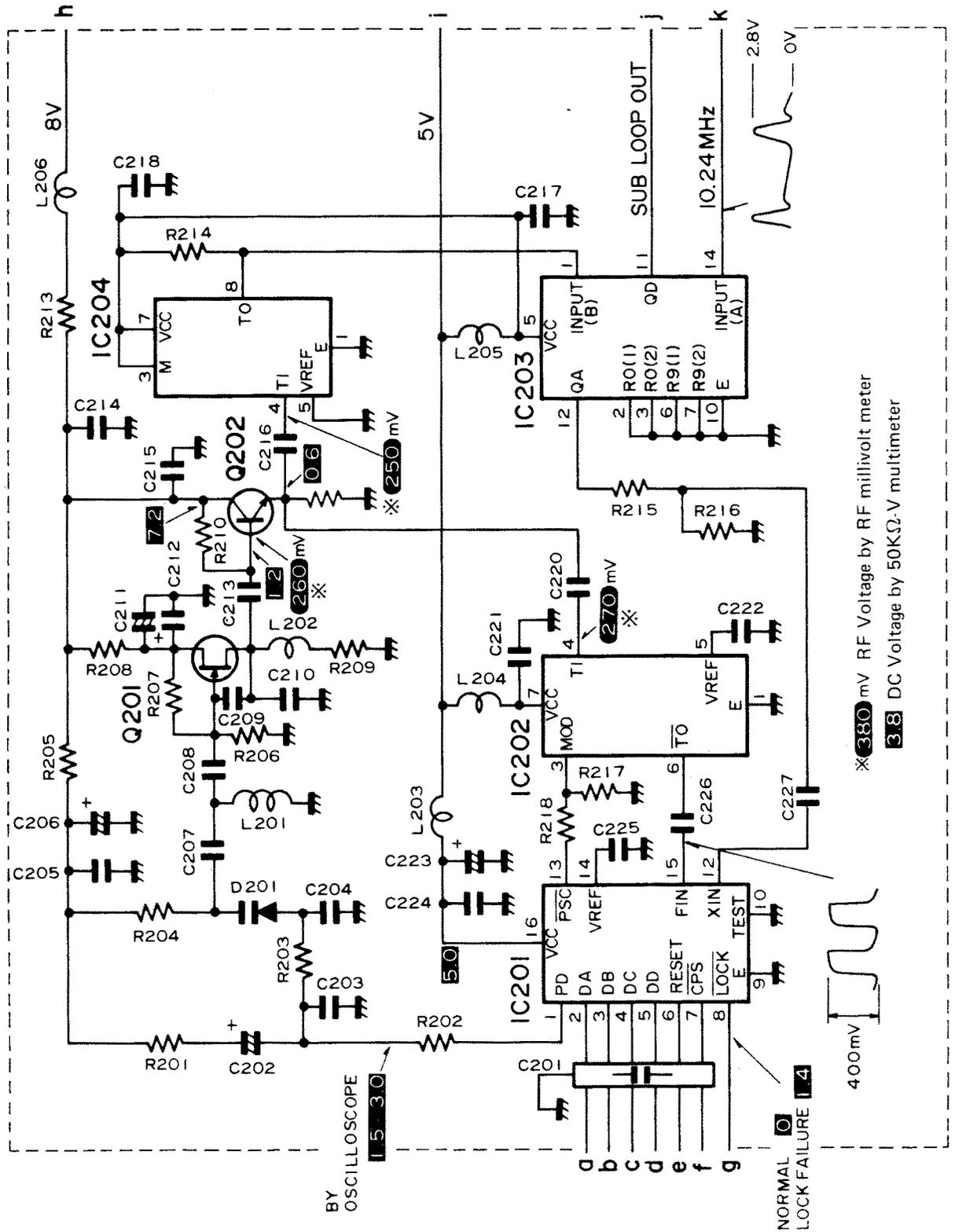
J4 ILO
 -5~+4dBm
 at 50Ω

J5 2 LO
 60.44MHz
 +/-5dBm
 at 50Ω

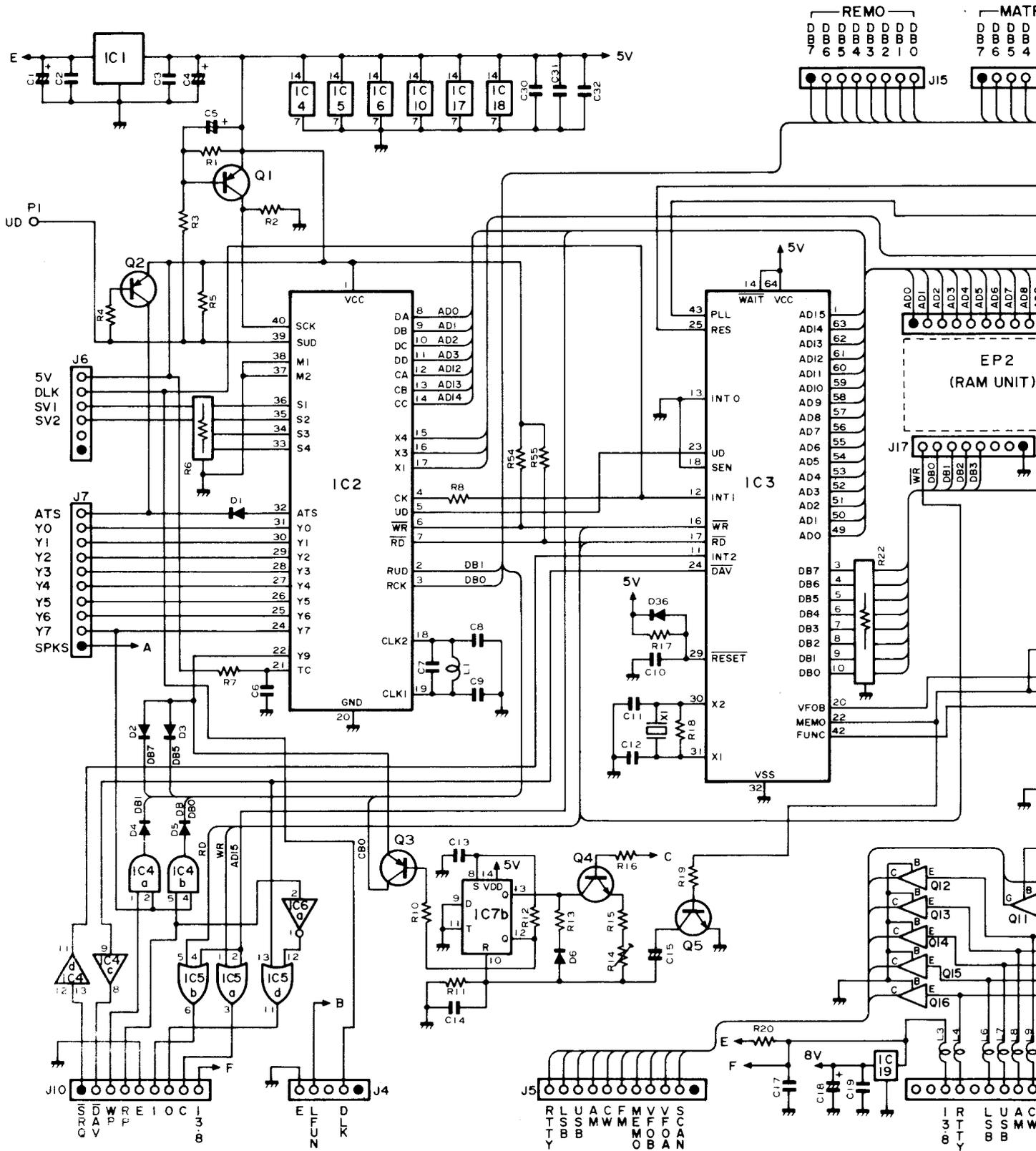
to MAIN UNIT
 MUTE

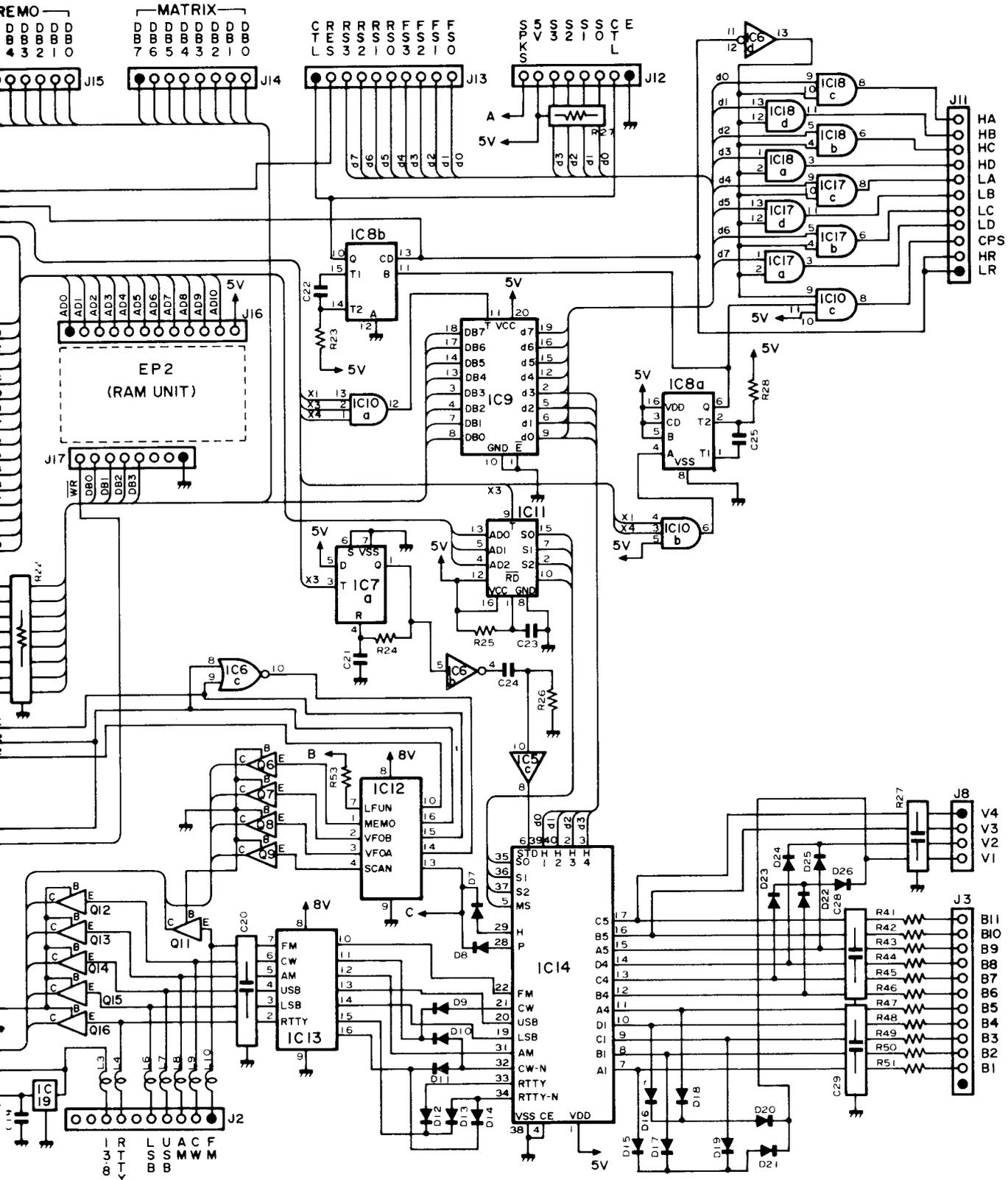
mV RF Voltage by RF millivolt meter
 DC Voltage by 50KΩ-V multimeter

PLL SUB LOOP UNIT CIRCUIT AND VOLTAGE DIAGRAM

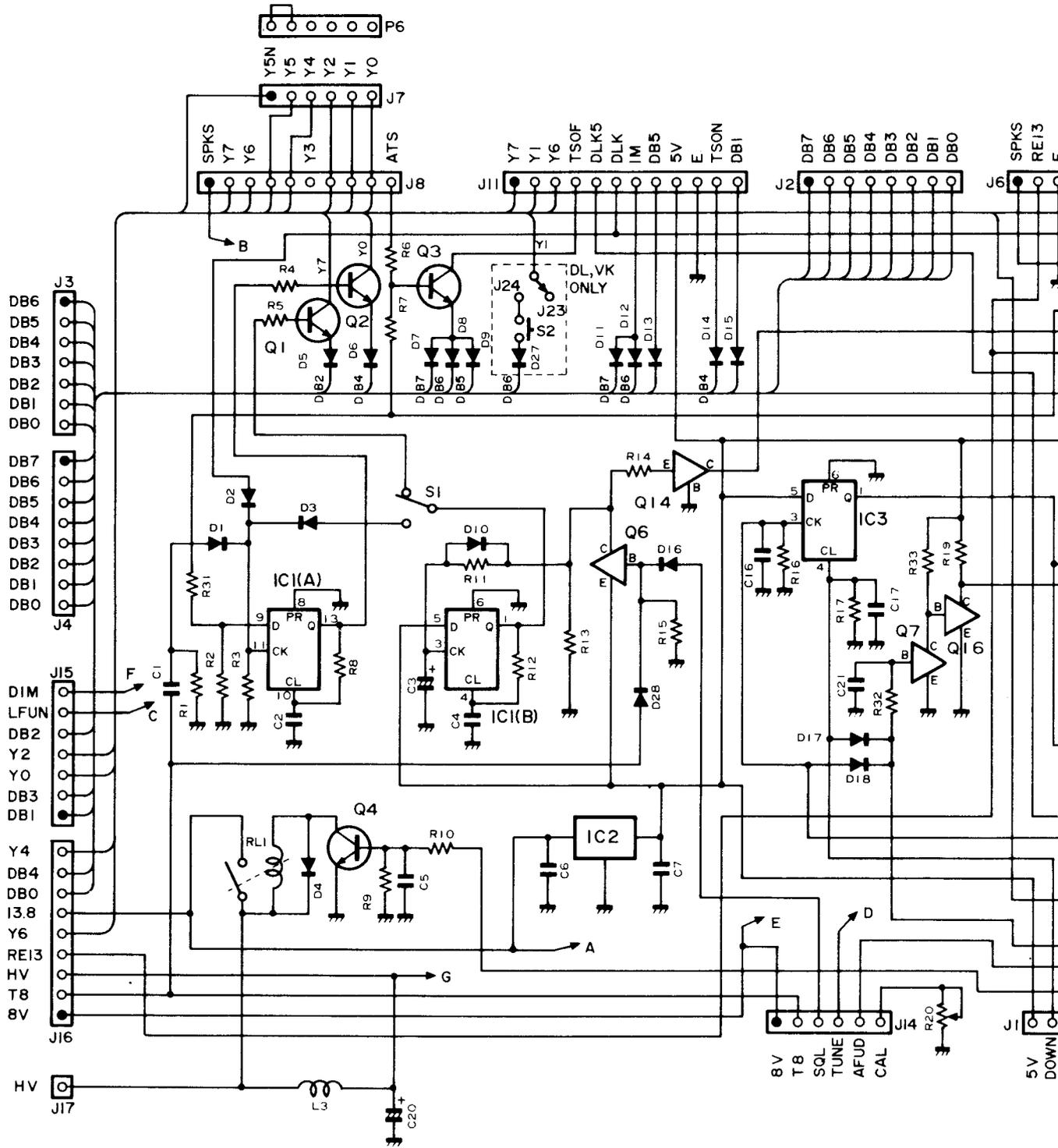


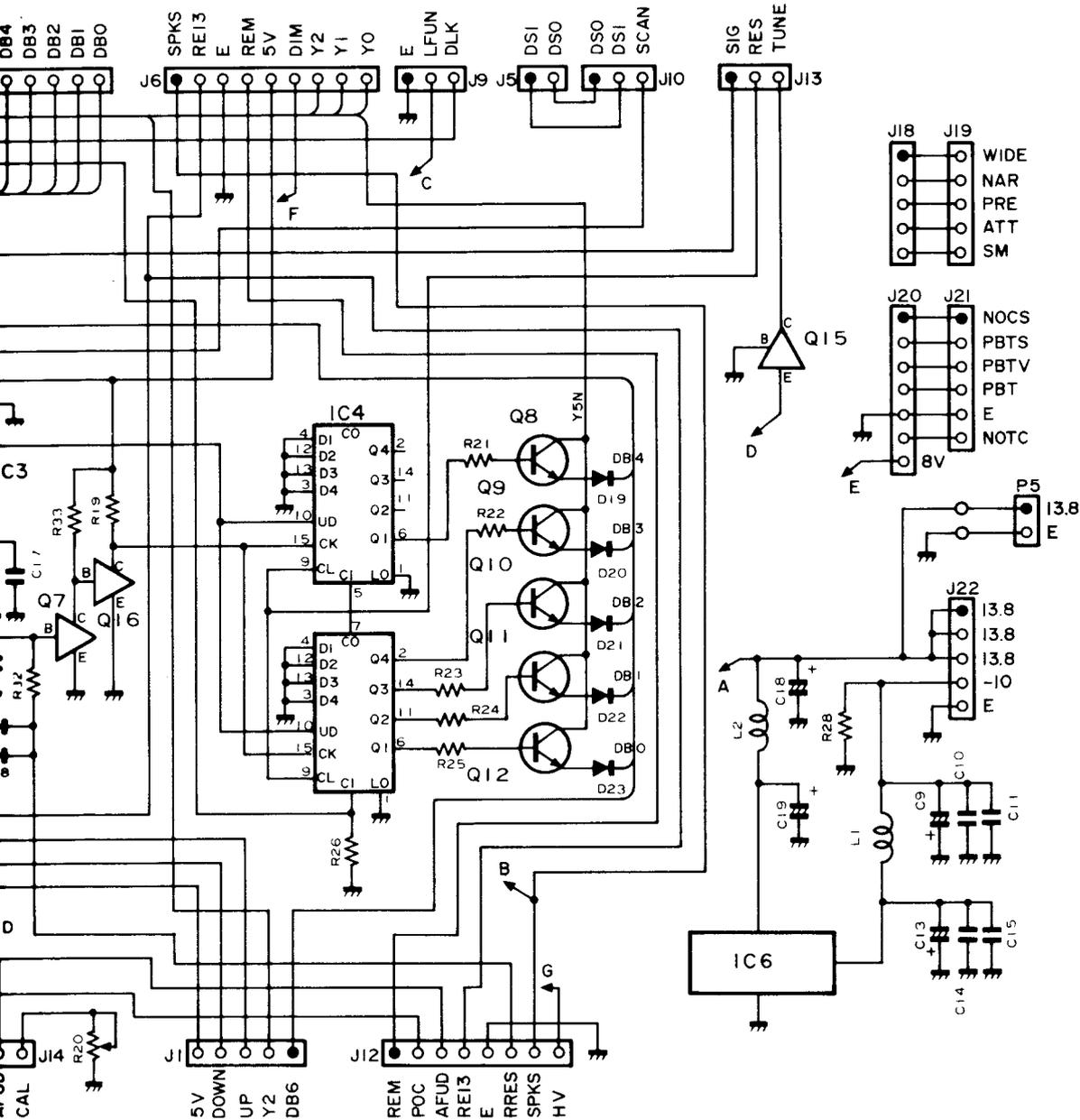
LOGIC UNIT CIRCUIT DIAGRAM



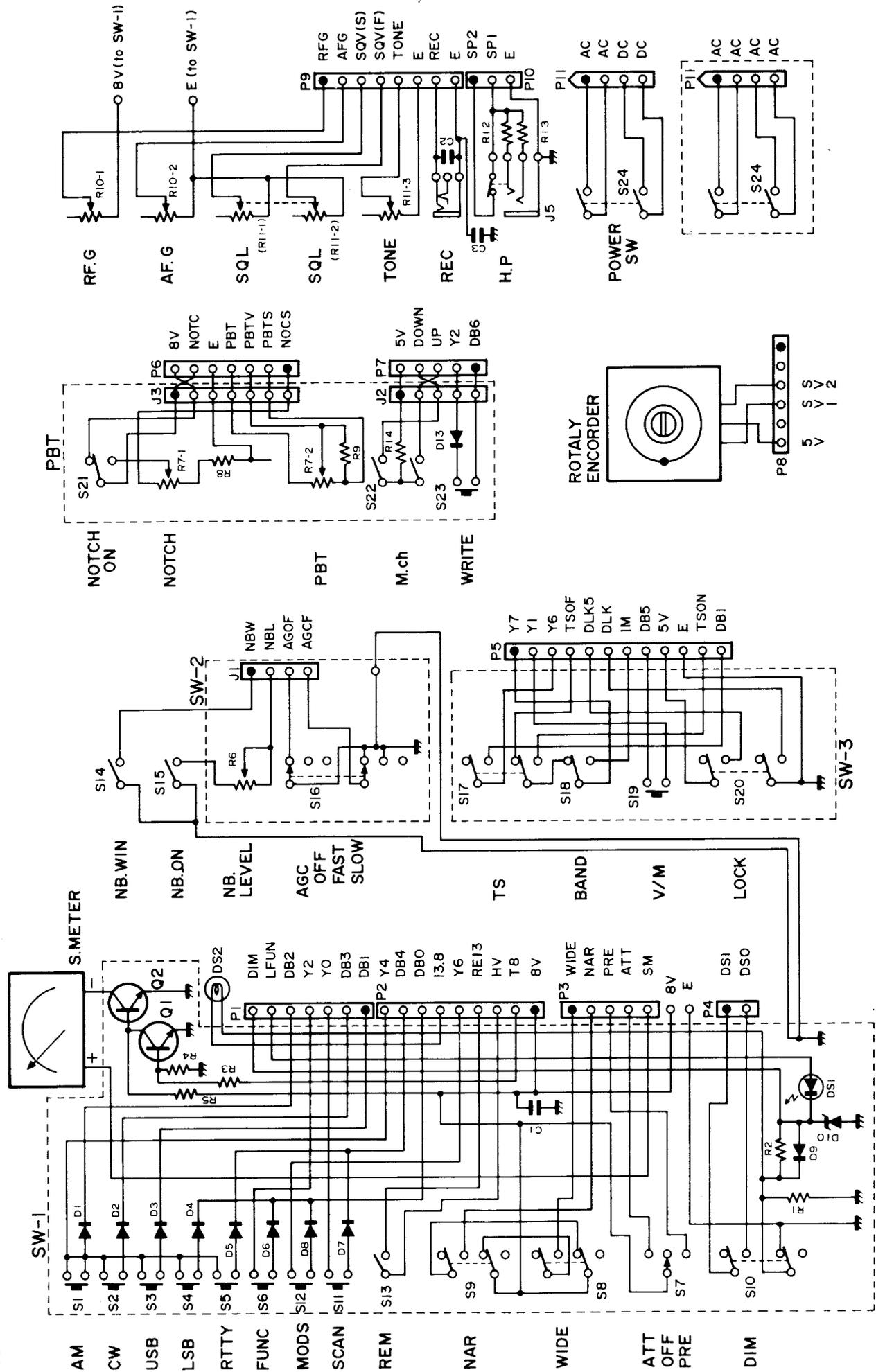


MATRIX UNIT CIRCUIT AND VOLTAGE DIAGRAM

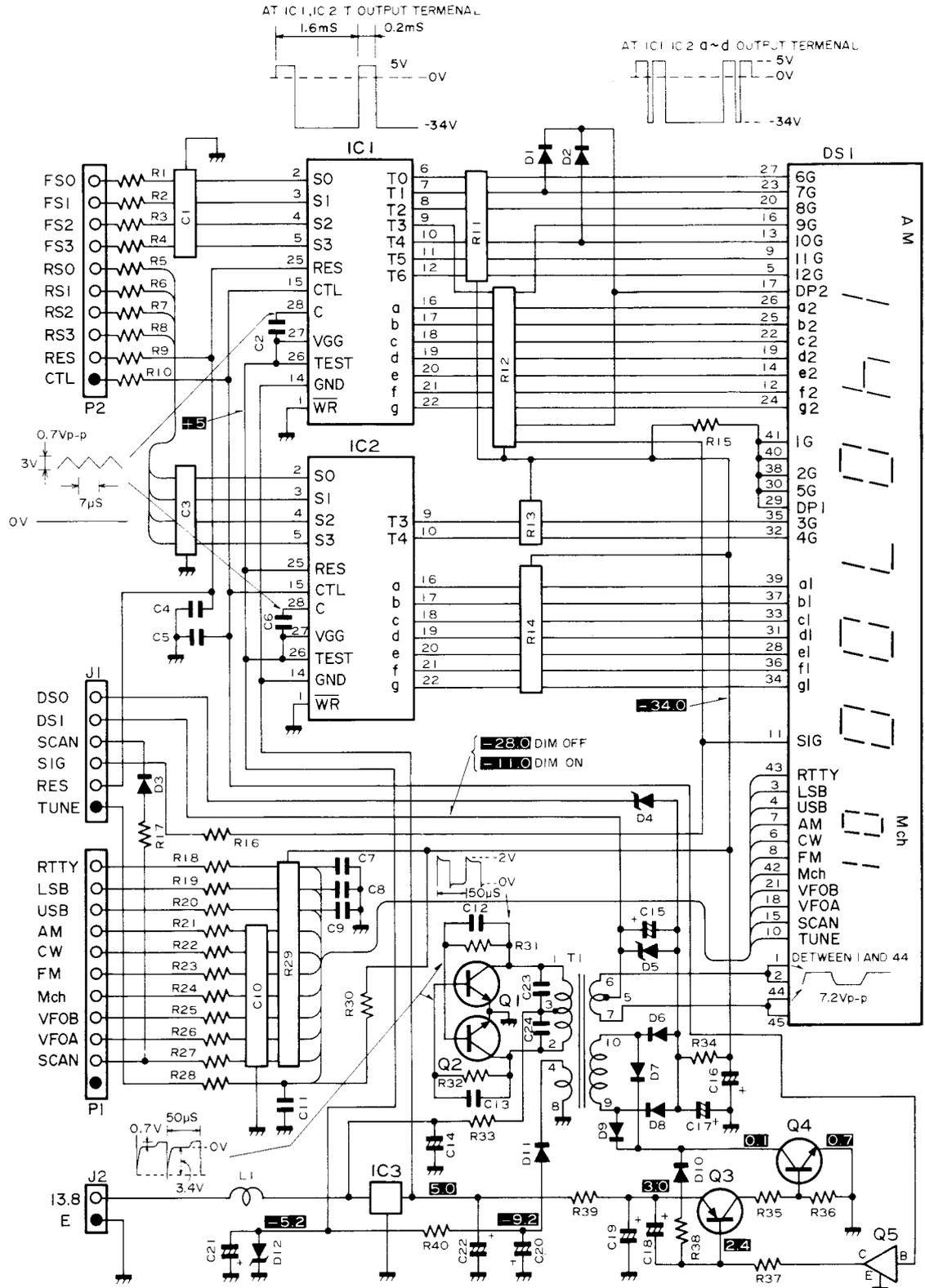




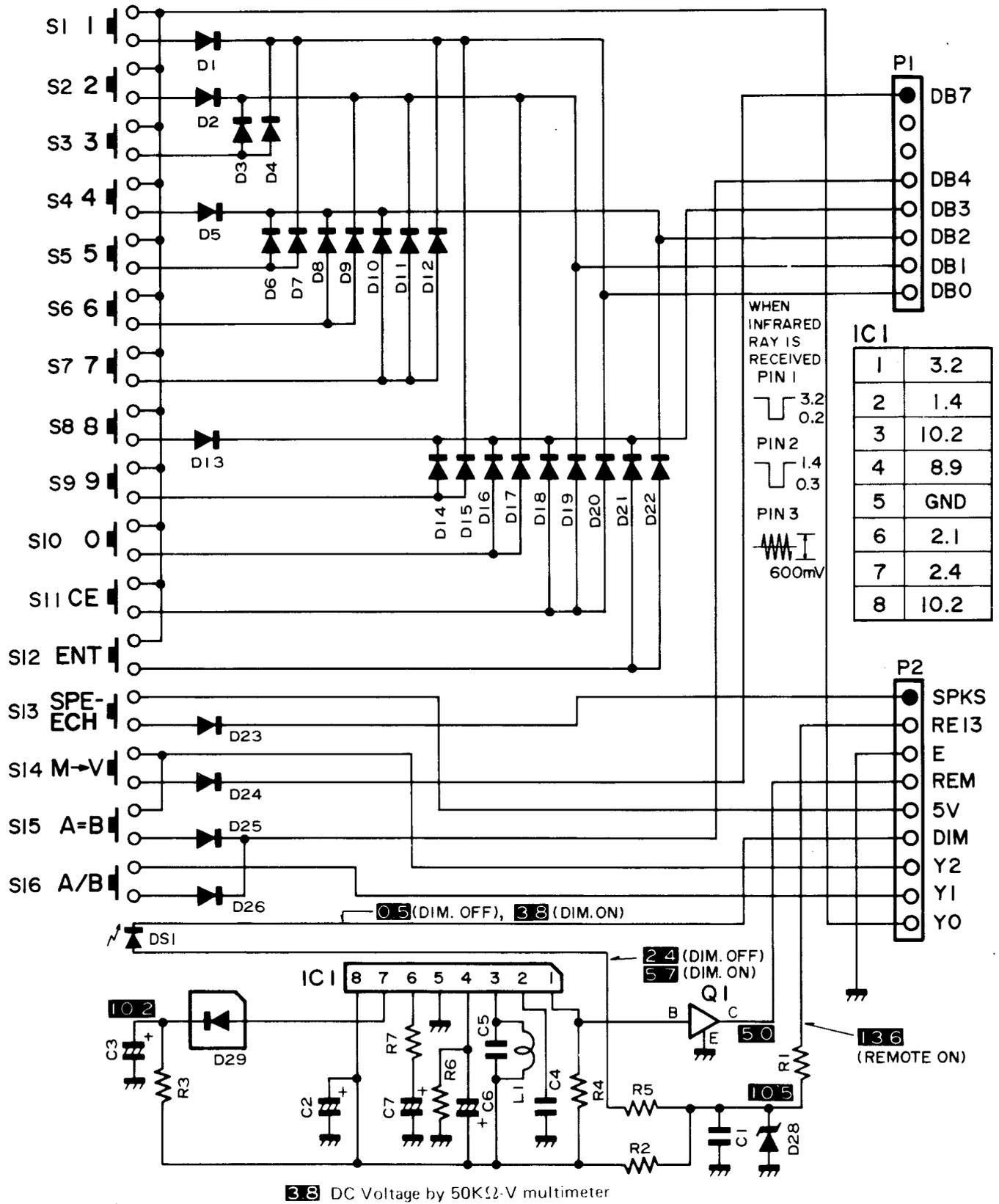
FRONT UNIT CIRCUIT DIAGRAM



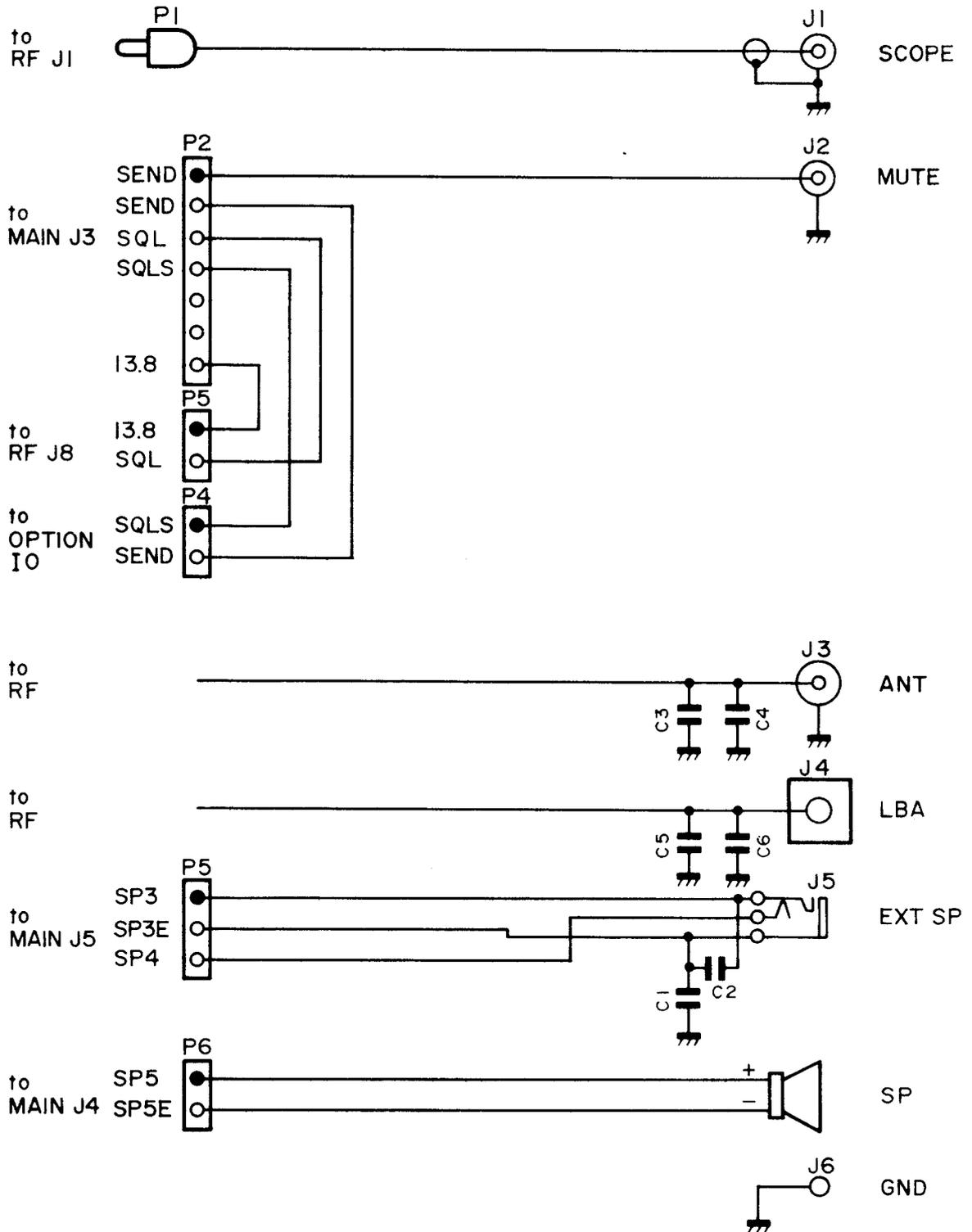
DISPLAY UNIT CIRCUIT AND VOLTAGE DIAGRAM



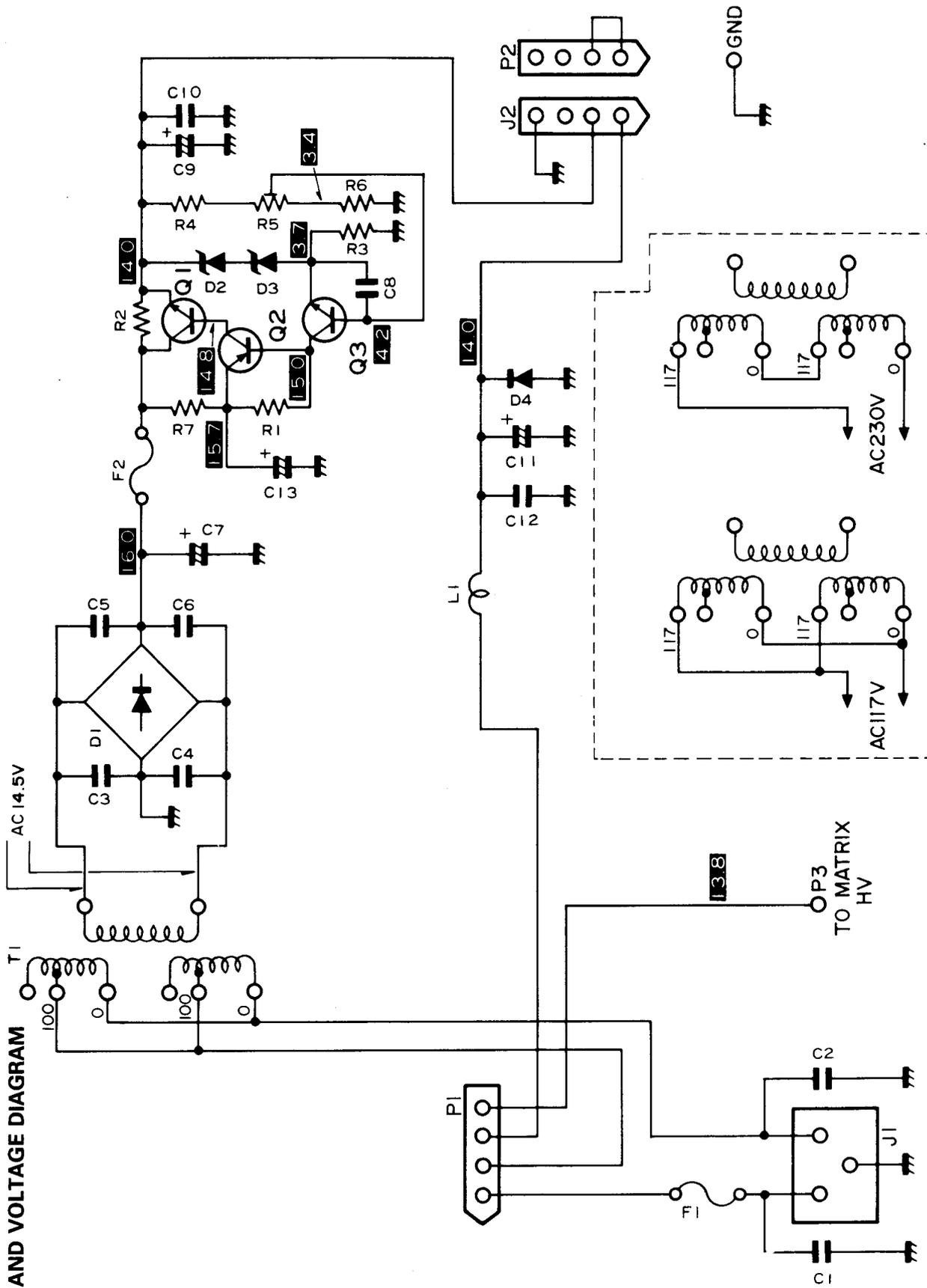
TEN KEY UNIT CIRCUIT DIAGRAM



EF UNIT CIRCUIT DIAGRAM



REG UNIT CIRCUIT AND VOLTAGE DIAGRAM

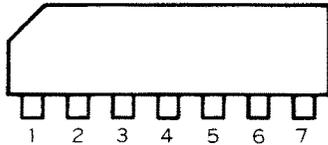


3.8 DC Voltage by 50KΩ-V multimeter

SECTION 9 IC RATINGS

μPC1037H (DOUBLE BALANCED MODULATOR)

PIN CONNECTION



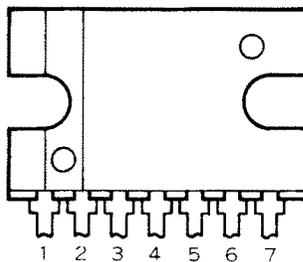
| Terminal no. | Connection |
|--------------|-----------------|
| 1 | V _{CC} |
| 2 | Output 1 |
| 3 | Output 2 |
| 4 | GND |
| 5 | Signal Input |
| 6 | Bypass |
| 7 | Carrier Input |

Maximum Ratings

| Item | Symbol | Rating | Unit |
|------------------------|------------------|------------|------|
| Power supply voltage | V _{CC} | 9 | V |
| Package allowable loss | P _D | 270 | mW |
| Operation temperature | T _{OPT} | -30 ~ +65 | °C |
| Storage temperature | T _{STG} | -40 ~ +125 | °C |

μPC1181H (AUDIO POWER AMPLIFIER)

PIN CONNECTION



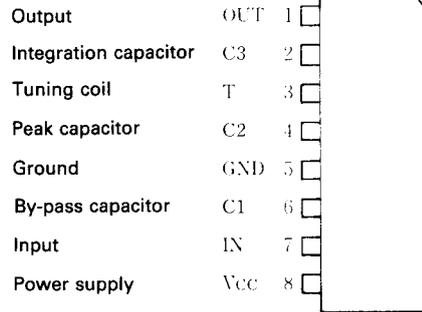
Maximum Ratings

| Item | Symbol | Rating | Unit |
|--|------------------------|------------|------|
| Peak power supply voltage (200 ms) | V _{CC(SURGE)} | 40 | V |
| Power supply voltage (when no signal) | V _{CC1} | 25 | V |
| Power supply voltage (during operation) *1 | V _{CC2} | 18 | V |
| Circuit current | I _{CC(PEAK)} | 4.5 | A |
| Package allowable loss | P _D | 12 | W |
| Operation ambient temperature *2 | T _{OPR} | -30 ~ +75 | °C |
| Storage temperature | T _{STG} | -55 ~ +150 | °C |

*1 *2 Aluminum heat sink (100 × 100 × 1 mm)

μPC1373H (PRE AMP. FOR REMOTE CONTROL)

PIN CONNECTION

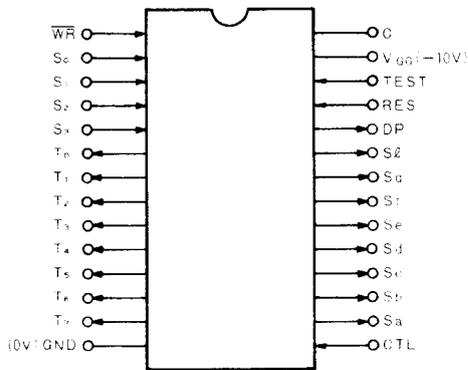


Maximum Ratings

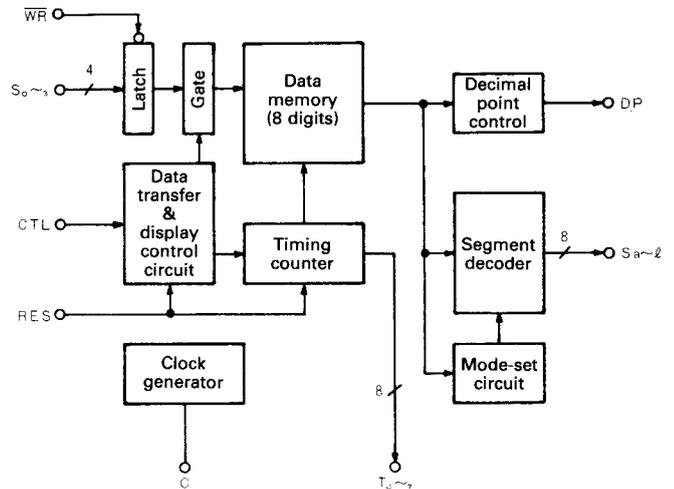
| Item | Symbol | Rating | Unit |
|-----------------------|-----------------|------------|------|
| Power supply voltage | $V_{DD}-V_{SS}$ | 15.0 | V |
| Power consumption | P_D | 270 | mW |
| Operation temperature | T_{OPT} | -20 ~ +75 | °C |
| Storage temperature | T_{STG} | -40 ~ +125 | °C |

μPD549C (PROGRAMMABLE DISPLAY CONTROLLER)

PIN CONNECTION



BLOCK DIAGRAM

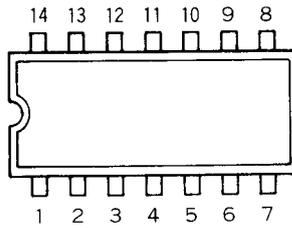


Maximum Ratings

| Item | Symbol | Rating | Unit |
|-----------------------|-----------|------------|------|
| Power supply voltage | V_{GG} | -15 ~ +0.3 | V |
| Input voltage | V_I | -20 ~ +0.3 | V |
| Output voltage | V_O | -42 ~ +0.3 | V |
| Operation temperature | T_{OPT} | -10 ~ +70 | °C |
| Storage temperature | T_{STG} | -40 ~ +125 | °C |

TC4013 (DUAL D-TYPE FLIP FLOP)

PIN CONNECTION

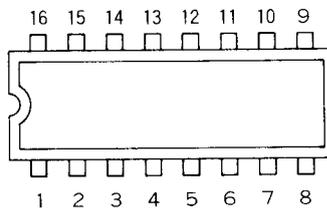


Maximum Ratings

| Item | Symbol | Rating | Unit |
|---------------------------|-----------|----------------------------------|-------------|
| Power supply voltage | V_{DD} | $V_{SS} - 0.5 \sim V_{SS} + 20$ | V |
| Input voltage | V_{IN} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| Output voltage | V_{OUT} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| Input current | I_{IN} | ± 10 | mA |
| Allowable loss | P_D | 300 | mW |
| Storage temperature | T_{STG} | $-65 \sim 150$ | $^{\circ}C$ |
| Read temperature and time | T_{SOL} | 260 $^{\circ}C \cdot 10$ sec. | |

4051BP (SINGLE 8-CHANNEL MULTIPLEXER/DEMULTIPLEXER)

PIN CONNECTION

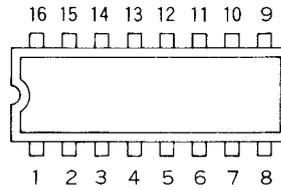


Maximum Ratings

| Item | Symbol | Rating | Unit |
|---|-------------------|----------------------------------|-------------|
| Power supply voltage | $V_{DD} - V_{SS}$ | $-0.5 \sim 20$ | V |
| | $V_{DD} - V_{EE}$ | $-0.5 \sim 20$ | V |
| Control input voltage | V_{IN} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| Switch input/output voltage | V_{IN}/V_{OUT} | $V_{EE} - 0.5 \sim V_{DD} + 0.5$ | V |
| Control input current | I_{IN} | ± 10 | mA |
| Input/output potential difference when ON | V_{I-O} | $-0.5 \sim +0.5$ | V |
| Storage temperature | T_{STG} | $-65 \sim 150$ | $^{\circ}C$ |
| Read temperature and time | T_{SOL} | 260 $^{\circ}C \cdot 10$ sec. | |

TC4516BP (BINARY UP/DOWN COUNTER)
TC4528BP (DUAL MONOSTABLE MULTIVIBRATOR)

PIN CONNECTION

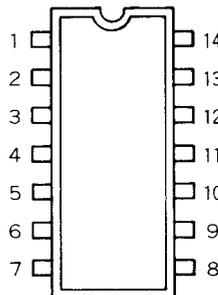


Maximum Ratings

| Item | Symbol | Rating | Unit |
|---------------------------|-----------|----------------------------------|-------------|
| Power supply voltage | V_{DD} | $V_{SS} - 0.5 \sim V_{SS} + 20$ | V |
| Input voltage | V_{IN} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| Output voltage | V_{OUT} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| Input current | I_{IN} | ± 10 | mA |
| Allowable loss | P_D | 300 | mW |
| Storage temperature | T_{STG} | $-65 \sim 150$ | $^{\circ}C$ |
| Read temperature and time | T_{SOL} | 260 $^{\circ}C \cdot 10$ sec. | |

SN74LS02N (QUADRUPLE 2-INPUT POSITIVE NOR GATE)
SN74LS08N (QUADRUPLE 2-INPUT POSITIVE AND GATE)
SN74LS11N (TRIPLE 3-INPUT POSITIVE AND GATE)
SN74LS32N (QUADRUPLE 2-INPUT POSITIVE OR GATE)

PIN CONNECTION



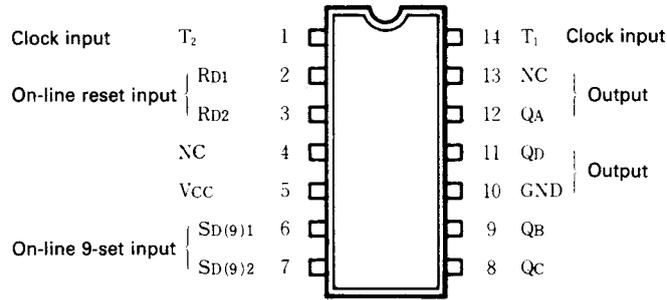
Maximum Ratings

| Item | Symbol | Rating | Unit |
|-------------------------------|-----------|--------------------|-------------|
| Power supply voltage | V_{CC} | $-0.5 \sim +7$ | V |
| Input voltage | V_I | $-0.5 \sim +15$ | V |
| Output voltage *1 | V_O | $-0.5 \sim V_{CC}$ | V |
| Operation ambient temperature | T_{OPR} | $-20 \sim +75$ | $^{\circ}C$ |
| Storage temperature | T_{STG} | $-65 \sim +150$ | $^{\circ}C$ |

*1 When output is H

SN74LS90N (DECODE COUNTER)

PIN CONNECTION



Maximum Ratings

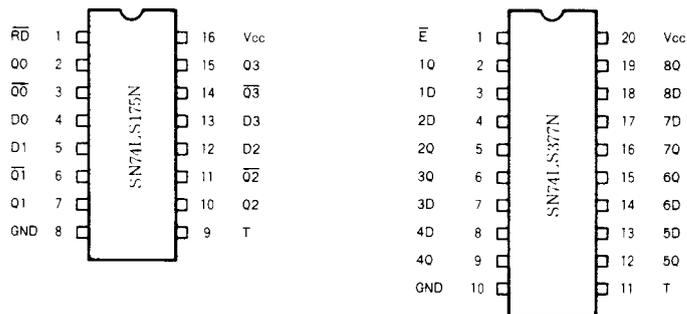
| Item | Symbol | Rating | Unit |
|-------------------------------|-----------|-----------------|------|
| Power supply voltage | V_{CC} | -0.5 ~ +7 | V |
| Input voltage *1 | V_I | -0.5 ~ +5.5 | V |
| | V_I | -0.5 ~ +15 | |
| Output voltage *1 | V_O | -0.5 ~ V_{CC} | V |
| Operation ambient temperature | T_{OPR} | -20 ~ +75 | °C |
| Storage temperature | T_{STG} | -65 ~ +150 | °C |

*1 Inputs T_1 and T_2

*2 Inputs R_{D1} , R_{D2} , $S_{D(9)1}$ and $S_{D(9)2}$

SN74LS175N (QUADRUPLE D-TYPE FLIP FLOP WITH RESET)
SN74LS377N (OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH ENABLE)

PIN CONNECTION



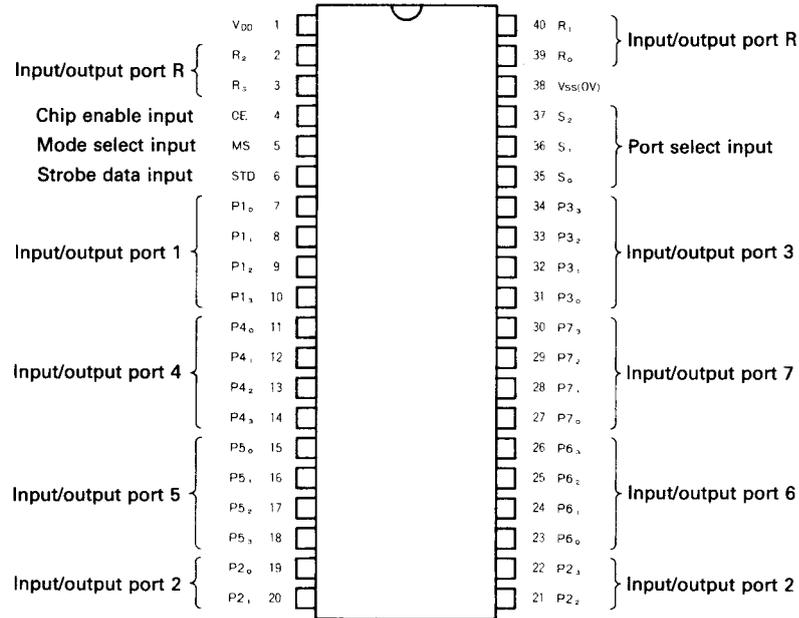
Maximum Ratings

| Item | Symbol | Rating | Unit |
|-------------------------------|-----------|-----------------|------|
| Power supply voltage | V_{CC} | -0.5 ~ +7 | V |
| Input voltage *1 | V_I | -0.5 ~ +15 | V |
| Output voltage *1 | V_O | -0.5 ~ V_{CC} | V |
| Operation ambient temperature | T_{OPR} | -20 ~ +75 | °C |
| Storage temperature | T_{STG} | -65 ~ +150 | °C |

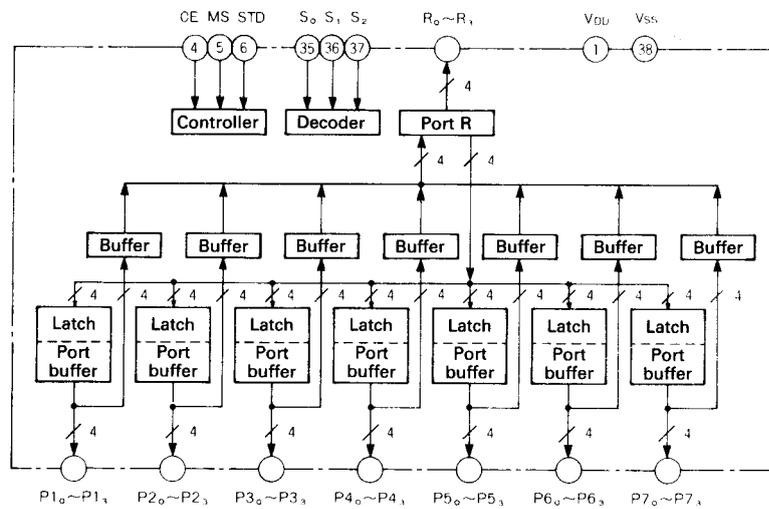
*1 When output is H

M50780SP (INPUT/OUTPUT EXPANDER)

PIN CONNECTION



BLOCK DIAGRAM



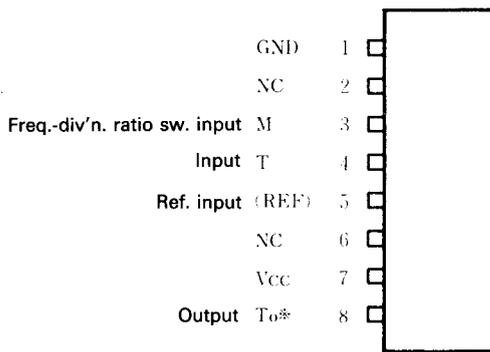
Maximum Ratings

| Item | Symbol | Rating | Unit |
|-------------------------------|-----------|----------------------------------|------|
| Power supply voltage | V_{DD} | -0.3 ~ 15 | V |
| Input voltage | V_I | $V_{SS} - 0.3 \sim V_{DD} + 0.3$ | V |
| Output voltage *1 | V_O | $V_{SS} - 0.3 \sim V_{DD} + 0.3$ | V |
| Maximum power consumption *2 | P_D | 600 | mW |
| Operation ambient temperature | T_{OPR} | -10 ~ +70 | °C |
| Storage temperature | T_{STG} | -40 ~ +125 | °C |

*1 If V_{SS} terminal is standard
 *2 $T_a=25^\circ\text{C}$

M54459L (1/20, 1/100 HIGH SPEED DIVIDER)

PIN CONNECTION



* Open collector output
 NC unconnected

Frequency-division ratio switching input (M) and frequency division ratio

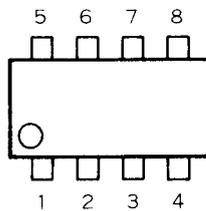
| M | L | H |
|--------------------|------|-------|
| Freq.-div'n. ratio | 1/20 | 1/100 |

Maximum Ratings

| Item | Symbol | Rating | Unit |
|-------------------------------|-----------|------------|------|
| Power supply voltage | V_{CC} | 7 | V |
| Input voltage | V_I | 2.5 | V |
| Output voltage | V_O | 5.5 | V |
| Power consumption | P_D | 1.33 | W |
| Operation ambient temperature | T_{OPR} | -10 ~ +75 | °C |
| Storage temperature | T_{STG} | -55 ~ +125 | °C |

NJM4558D (DUAL LOW NOISE AMP.)

PIN CONNECTION



Maximum Ratings

| Item | Symbol | Rating | Unit |
|-----------------------|-----------|------------|------|
| Power supply voltage | V_{DD} | 18 | V |
| Input voltage | V_{IN} | 15 | V |
| Operation temperature | T_{OPT} | -20 ~ +75 | °C |
| Storage temperature | T_{STG} | -40 ~ +125 | °C |

AN829 (DUAL ATTENUATOR)

Maximum Ratings

| Item | Symbol | Rating | Unit |
|-----------------------|-----------|------------|------|
| Power supply voltage | V_{CC} | 18 | V |
| Control input voltage | V_C | 0 ~ 6 | V |
| Allowable loss | P_D | 450 | mW |
| Operation temperature | T_{OPR} | -20 ~ +75 | °C |
| Storage temperature | T_{STG} | -55 ~ +150 | °C |

SECTION 10 PARTS LIST

| [EF UNIT] | | | | [FRONT UNIT] | | | |
|-----------|-------------|------------------|-----|--------------|-------------|---------------------|-------|
| REF. NO. | DESCRIPTION | PART NO. | | REF. NO. | DESCRIPTION | PART NO. | |
| C1 | Ceramic | 0.0047 | 50V | Q1 | Transistor | 2SC945P | |
| C2 | Ceramic | 0.0047 | 50V | Q2 | Transistor | 2SC945P | |
| C3 | Ceramic | 33P | 50V | D1 | Diode | 1SS53 | |
| C4 | Ceramic | 33P | 50V | D2 | Diode | 1SS53 | |
| C5 | Ceramic | 68P | 50V | D3 | Diode | 1SS53 | |
| C6 | Ceramic | 68P | 50V | D4 | Diode | 1SS53 | |
| J1 | Connector | AT-700 | | D5 | Diode | 1SS53 | |
| J2 | Connector | AT-700 | | D6 | Diode | 1SS53 | |
| J3 | Connector | FM-MD-RM1 | | D7 | Diode | 1SS53 | |
| J4 | Connector | T-19 (S) RED | | D8 | Diode | 1SS53 | |
| J5 | Connector | HSJ 0779-01A | | D9 | Diode | 1SS53 | |
| J6 | Connector | SQ-2054 | | D10 | Diode | RD3.9EB2 | |
| P1 | Connector | (TMP-P01X-A1) W1 | | D13 | Diode | 1SS53 | |
| P2 | Connector | TL-25H-07-B1 | | R1 | Resistor | 150 | R50X |
| P3 | Connector | TL-25H-02-B1 | | R2 | Resistor | 220 | ELR25 |
| P4 | Connector | TL-25H-02-B1 | | R3 | Resistor | 4.7K | R25 |
| P5 | Connector | TL-25H-03-B1 | | R4 | Resistor | 2.2K | R25 |
| P6 | Connector | 5250-2A | | R5 | Resistor | 10K | R25 |
| SP1 | Speaker | C090K10I0851 | | R6 | Variable | K1214003W-1KB | |
| | | | | R7 | Variable | K12B60A0L-10KB x 2 | |
| | | | | R8 | Resistor | 100 | R25 |
| | | | | R9 | Resistor | 8.2K | R25 |
| | | | | R10 | Variable | K16B10005-10KB-20KC | |
| | | | | R11 | Variable | K16C20011-10KB x 3 | |
| | | | | R12 | Resistor | 100 | R25 |
| | | | | R13 | Resistor | 100 | R25 |
| | | | | R14 | Resistor | 1K | ELR25 |
| | | | | C1 | Ceramic | 0.0047 | 50V |
| | | | | C2 | Ceramic | 0.0047 | 50V |
| | | | | C3 | Ceramic | 0.0047 | 50V |
| | | | | J1 | Connector | TL25P-04-L1 | |
| | | | | J2 | Connector | TLB-P05-H-B1 | |
| | | | | J3 | Connector | TLB-P07-H-B1 | |
| | | | | J4 | Connector | HSJ0779-01A | |
| | | | | J5 | Connector | HLJ0035-01-010 | |
| | | | | P1 | Connector | TL25H-07-B1 | |
| | | | | P2 | Connector | TL25H-09-B1 | |
| | | | | P3 | Connector | TL25H-05-B1 | |
| | | | | P4 | Connector | TL25H-02-B1 | |
| | | | | P5 | Connector | TL25H-12-B1 | |
| | | | | P6 | Connector | TL25H-07-B1 | |
| | | | | P7 | Connector | TL25H-05-B1 | |
| | | | | P8 | Connector | TL25H-06-B1 | |
| | | | | P9 | Connector | SMR-08V-B | |
| | | | | P10 | Connector | SMR-03V-B | |
| | | | | P11 | Connector | 3191-04P1 | |
| | | | | DS1 | LED | SLC-26UR | |
| | | | | DS2 | Lamp | BQ044-32582A | |
| | | | | M1 | Meter | M-79 | |
| | | | | S1 | Switch | SUT111A7 | |
| | | | | S2 | Switch | SUT111A7 | |
| | | | | S3 | Switch | SUT111A7 | |
| | | | | S4 | Switch | SUT111A7 | |
| | | | | S5 | Switch | SUT111A7 | |

[FRONT UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|-------------|
| S6 | Switch | SUT111A7 |
| S7 | Switch | SLW-43-16PS |
| S8 | Switch | SUT110C2 |
| S9 | Switch | SUT110C2 |
| S10 | Switch | SUT110C2 |
| S11 | Switch | SUT111A7 |
| S12 | Switch | SUT111A6 |
| S13 | Switch | SUT111A6 |
| S14 | Switch | SPJ222CB2 |
| S15 | Switch | SPJ222CB2 |
| S16 | Switch | SRU1023ND3 |
| S17 | Switch | SUT110C2 |
| S18 | Switch | SUT110C2 |
| S19 | Switch | SUT111A7 |
| S20 | Switch | SUT110C2 |
| S21 | Switch | SPJ222CB2 |
| S22 | Switch | SBU102C |
| S23 | Switch | SPJ222T43 |
| S24 | Switch | SDS-3P |
| | Encoder | LA24007 |
| B1 | P.C. Board | B-862A |
| B2 | P.C. Board | B-863A |
| B3 | P.C. Board | B-864A |
| B4 | P.C. Board | B-865A |
| W1 | Jumper | JPW-02H |
| W3 | Jumper | JPW-02A |
| W4 | Jumper | JPW-02A |
| W5 | Jumper | JPW-02A |
| W6 | Jumper | JPW-02A |
| W7 | Jumper | JPW-02A |
| W8 | Jumper | JPW-02A |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|-------------------|
| IC1 | IC | ND487C1-3R |
| IC2 | IC | μ PC1037H |
| IC3 | IC | TC-4051BP |
| IC4 | IC | μ PC1037H |
| IC5 | IC | NJM4558D |
| IC6 | IC | AN829 |
| IC7 | IC | μ PC1181H |
| IC8 | IC | 78M08 |
| Q1 | FET | 3SK74M |
| Q2 | Transistor | 2SC1583G |
| Q3 | Transistor | 2SC945P |
| Q4 | Transistor | 2SC945P |
| Q5 | Transistor | 2SC945P |
| Q6 | Transistor | 2SA1015Y |
| Q7 | Transistor | 2SC1645 |
| Q8 | FET | 3SK74M |
| Q9 | FET | 3SK74M |
| Q10 | FET | 3SK74M |
| Q11 | Transistor | 2SC763C |
| Q12 | Transistor | 2SC945P |
| Q13 | Transistor | 2SB562C |
| Q14 | Transistor | 2SA1015Y |
| Q15 | Transistor | 2SC18150 |
| Q16 | Transistor | 2SC18150 |
| Q18 | Transistor | 2SA1015Y |
| Q19 | Transistor | 2SA1015Y |
| Q20 | Transistor | 2SC945P |
| Q21 | FET | 3SK74M |
| Q22 | FET | 3SK74M |
| Q23 | Transistor | 2SC945P |
| Q24 | Transistor | 2SC945P |
| Q25 | Transistor | 2SC945P |
| Q26 | Transistor | 2SC1571G |
| Q27 | Transistor | 2SC1740 |
| Q28 | Transistor | 2SC945P |
| Q29 | Transistor | 2SC1740 |
| Q30 | Transistor | 2SC945P |
| Q31 | Transistor | 2SA1348 |
| Q32 | Transistor | 2SB562C |
| Q33 | Transistor | 2SC945P |
| Q34 | Transistor | 2SC945P |
| Q35 | Transistor | 2SA1015Y |
| Q36 | Transistor | 2SC2878 (2SC1636) |
| D1 | Diode | 1SS53 |
| D2 | Diode | 1K60 |
| D3 | Diode | 1K60 |
| D4 | Diode | 1SS53 |
| D5 | Diode | MZ304B |
| D6 | Diode | 1SS53 |
| D7 | Diode | 1SS53 |
| D8 | Diode | 1SS53 |
| D9 | Diode | 1SS53 |
| D10 | Diode | 1SS53 |
| D11 | Diode | 1SS53 |
| D12 | Diode | 1SS53 |
| D13 | Diode | 1SS53 |
| D14 | Diode | 1SS53 |
| D15 | Diode | 1SS53 |
| D16 | Diode | 1SS53 |
| D17 | Diode | 1SS53 |
| D18 | Diode | 1SS53 |
| D19 | Diode | 1SS53 |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|-------------------|
| D20 | Diode | 1SS53 |
| D21 | Diode | 1SS53 |
| D22 | Diode | 1SS53 |
| D23 | Diode | 1SS53 |
| D24 | Diode | 1SS53 |
| D25 | Varicap | 1SV50E |
| D26 | Diode | 1SS53 |
| D27 | Diode | 1SS53 |
| D28 | Diode | 1SS53 |
| D29 | Diode | 1SS53 |
| D30 | Diode | 1SS53 |
| D31 | Zener | RD3.6EB1 |
| D33 | Diode | 1SS53 |
| D34 | Diode | 1SS53 |
| D35 | Diode | 1SS53 |
| D36 | Diode | 1SS53 |
| D37 | Diode | 1SS53 |
| D38 | Diode | 1SS53 |
| D39 | Diode | 1SS53 |
| D40 | Diode | 1SS53 |
| D41 | Diode | 1SS53 |
| D42 | Diode | 1SS53 |
| D43 | Diode | 1SS53 |
| D44 | Diode | 1SS53 |
| D45 | Diode | 1SS53 |
| D46 | Diode | 1SS53 |
| D47 | Diode | 1SS53 |
| D48 | Diode | 1SS53 |
| D49 | Diode | 1SS53 |
| D50 | Diode | 1SS53 |
| D51 | Diode | 1SS53 |
| D52 | Diode | 1SS53 |
| D53 | Diode | 1SS53 |
| D54 | Varicap | FC51M |
| D55 | Diode | 1SS53 |
| D56 | Diode | 1SS53 |
| D57 | Diode | 1SS53 |
| D58 | Diode | 1SS53 |
| D59 | Diode | 1SS53 |
| D60 | Zener | RD12EB2 |
| D62 | Diode | 1SS53 |
| D63 | Diode | 1K60 |
| D64 | Zener | RD6.2EB2 |
| D65 | Diode | 1SS53 |
| D66 | Diode | 1SS53 |
| D67 | Diode | 1SS53 |
| D68 | Zener | RD12EB2 |
| D69 | Diode | 1SS53 |
| D70 | Diode | 1K60 |
| D72 | Diode | 1SS53 |
| D73 | Diode | 1SS53 |
| D74 | Diode | 1SS53 |
| D75 | Diode | 1SS53 |
| D76 | Diode | 1SS53 |
| D77 | Diode | 1SS53 |
| F11 | MC | FL-70 |
| F11 | MC | FL-30 |
| F14 | Ceramic | CFJ455K-5 |
| F15 | Ceramic | CFW455IT |
| F16 | MC | FL-23 9M15A |
| X1 | Xtal | CR-1 (9.4665MHz) |
| X2 | Xtal | CR-48 (9.0115MHz) |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|-------------------|
| X3 | Xtal | CR-48 (9.0115MHz) |
| X4 | Xtal | CR-49 (9.0145MHz) |
| L1 | Coil | LR-116 |
| L2 | Coil | LS-90A |
| L3 | Coil | LS-90A |
| L4 | Coil | LS-90A |
| L5 | Coil | LAL04NA 101K |
| L6 | Coil | LS-175 |
| L7 | Coil | LS-175 |
| L8 | Coil | LS-175 |
| L9 | Coil | EL0810SKI-101K |
| L10 | Coil | EL0810SKI-101K |
| L11 | Coil | LS-175 |
| L12 | Coil | LS-133A |
| L13 | Coil | EL0810SKI-102K |
| L14 | Coil | EL0810SKI-101K |
| L15 | Coil | LS-20 |
| L16 | Coil | LS-175 |
| L17 | Coil | LS-133A |
| L18 | Coil | LS-175 |
| L19 | Coil | EL0810SKI-101K |
| L20 | Coil | LS-168 |
| L21 | Coil | R65K LB4 |
| L22 | Coil | LS-260 |
| L23 | Coil | EL0810SKI-101K |
| L24 | Coil | EL0810SKI-101K |
| L25 | Coil | LS-175 |
| L26 | Coil | LS-67 |
| L27 | Coil | FL-5H 102J |
| L28 | Coil | FL-5H 101J |
| R1 | Resistor | 15 R25 |
| R2 | Resistor | 15 R10 |
| R3 | Resistor | 68 R10 |
| R4 | Resistor | 100K ELR25 |
| R5 | Resistor | 1M ELR25 |
| R6 | Resistor | 470 ELR25 |
| R7 | Resistor | 220 ELR25 |
| R8 | Resistor | 22K R25 |
| R9 | Resistor | 1K ELR25 |
| R10 | Resistor | 100 ELR25 |
| R11 | Resistor | 150K ELR25 |
| R12 | Resistor | 100K ELR25 |
| R13 | Resistor | 6.8K ELR25 |
| R14 | Resistor | 1K ELR25 |
| R15 | Resistor | 100 ELR25 |
| R16 | Resistor | 68K ELR25 |
| R17 | Resistor | 47K ELR25 |
| R18 | Resistor | 10K ELR25 |
| R19 | Resistor | 8.2K ELR25 |
| R20 | Resistor | 100K ELR25 |
| R21 | Resistor | 100 ELR25 |
| R22 | Resistor | 100 ELR25 |
| R23 | Resistor | 10K ELR25 |
| R24 | Resistor | 1K R25 |
| R25 | Resistor | 2.2K ELR25 |
| R26 | Resistor | 2.2K ELR25 |
| R27 | Resistor | 220 ELR25 |
| R28 | Resistor | 1K ELR25 |
| R29 | Resistor | 4.7K ELR25 |
| R30 | Resistor | 10K ELR25 |
| R31 | Resistor | 470K R25 |
| R32 | Resistor | 47K ELR25 |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|-------------|----------|-------|
| R33 | Resistor | 470 | ELR25 |
| R34 | Resistor | 100 | R25 |
| R35 | Resistor | 4.7K | ELR25 |
| R36 | Resistor | 10K | R25 |
| R37 | Resistor | 2.2K | ELR25 |
| R38 | Resistor | 2.2K | R25 |
| R39 | Resistor | 2.2K | ELR25 |
| R40 | Resistor | 820 | ELR25 |
| R41 | Resistor | 820 | ELR25 |
| R42 | Resistor | 820 | ELR25 |
| R43 | Resistor | 3.3K | ELR25 |
| R44 | Resistor | 2.2K | ELR25 |
| R45 | Resistor | 470 | ELR25 |
| R46 | Resistor | 100 | R25 |
| R47 | Array | RM4-473 | |
| R48 | Resistor | 470 | ELR25 |
| R49 | Resistor | 100 | ELR25 |
| R50 | Resistor | 47K | R25 |
| R51 | Resistor | 470 | ELR25 |
| R52 | Resistor | 100 | ELR25 |
| R54 | Resistor | 1K | ELR25 |
| R55 | Resistor | 820 | ELR25 |
| R56 | Resistor | 820 | ELR25 |
| R57 | Resistor | 820 | ELR25 |
| R58 | Resistor | 100 | ELR25 |
| R59 | Resistor | 2.2K | ELR25 |
| R60 | Resistor | 10K | ELR25 |
| R61 | Resistor | 4.7K | ELR25 |
| R62 | Resistor | 100K | ELR25 |
| R63 | Resistor | 100K | R25 |
| R64 | Resistor | 470 | ELR25 |
| R65 | Resistor | 120 | ELR25 |
| R66 | Resistor | 3.3K | ELR25 |
| R67 | Resistor | 100K | ELR25 |
| R68 | Resistor | 100 | ELR25 |
| R69 | Resistor | 10K | ELR25 |
| R70 | Resistor | 1K | R25 |
| R71 | Resistor | 33K | ELR25 |
| R72 | Resistor | 100K | ELR25 |
| R73 | Resistor | 1K | R25 |
| R74 | Resistor | 47K | ELR25 |
| R75 | Resistor | 2.2K | ELR25 |
| R76 | Resistor | 470 | R25 |
| R77 | Resistor | 47K | ELR25 |
| R78 | Resistor | 4.7K | ELR25 |
| R79 | Resistor | 6.8K | ELR25 |
| R80 | Resistor | 3.3K | R25 |
| R81 | Resistor | 4.7K | ELR25 |
| R82 | Resistor | 4.7K | ELR25 |
| R83 | Resistor | 330 | ELR25 |
| R84 | Resistor | 470 | ELR25 |
| R85 | Resistor | 330 | ELR25 |
| R86 | Resistor | 470 | ELR25 |
| R87 | Resistor | 4.7K | ELR25 |
| R88 | Resistor | 100 | ELR25 |
| R89 | Resistor | 4.7K | ELR25 |
| R90 | Resistor | 47K | ELR25 |
| R91 | Resistor | 100 | ELR25 |
| R92 | Resistor | 10K | ELR25 |
| R93 | Resistor | 100 | ELR25 |
| R94 | Resistor | 3.3K | ELR25 |
| R95 | Resistor | 100K | R25 |
| R96 | Resistor | 4.7K | R25 |
| R97 | Resistor | 10K | ELR25 |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|-------------|----------|---------|
| R98 | Resistor | 4.7K | R25 |
| R99 | Array | RM3-473 | |
| R101 | Resistor | 10K | ELR25 |
| R103 | Resistor | 100 | R25 |
| R104 | Resistor | 10K | ELR25 |
| R105 | Resistor | 3.3M | R25 |
| R106 | Resistor | 15K | EFR25 |
| R107 | Resistor | 4.7K | ELR25 |
| R108 | Resistor | 100 | R25 |
| R109 | Resistor | 100 | R25 |
| R110 | Resistor | 10K | ELR25 |
| R111 | Resistor | 10K | ELR25 |
| R112 | Resistor | 3.9K | R25 |
| R113 | Resistor | 470 | ELR25 |
| R114 | Resistor | 470 | ELR25 |
| R115 | Trimmer | 1K | H0651A |
| R116 | Resistor | 10K | ELR25 |
| R117 | Resistor | 47K | ELR25 |
| R118 | Resistor | 100 | ELR25 |
| R119 | Resistor | 18K | ELR25 |
| R121 | Resistor | 470K | ELR25 |
| R122 | Resistor | 470K | ELR25 |
| R123 | Resistor | 4.7K | R25 |
| R124 | Resistor | 22K | R25 |
| R126 | Resistor | 1M | ELR25 |
| R127 | Resistor | 10K | ELR25 |
| R128 | Resistor | 1K | R25 |
| R130 | Resistor | 220 | R25 |
| R131 | Resistor | 1K | R25 |
| R132 | Resistor | 1K | R25 |
| R133 | Resistor | 1K | R25 |
| R134 | Resistor | 4.7K | R25 |
| R135 | Resistor | 1K | R25 |
| R136 | Resistor | 47K | ELR25 |
| R137 | Resistor | 47K | ELR25 |
| R138 | Resistor | 10K | ELR25 |
| R139 | Resistor | 470 | R25 |
| R140 | Resistor | 1K | R25 |
| R141 | Resistor | 1K | R25 |
| R142 | Trimmer | 47K | H0651A |
| R143 | Resistor | 10M | ERC14GJ |
| R144 | Resistor | 10M | ERC14GJ |
| R145 | Resistor | 10K | R25 |
| R146 | Resistor | 1K | ELR25 |
| R147 | Trimmer | 10K | H0651A |
| R148 | Resistor | 100 | ELR25 |
| R149 | Resistor | 100 | ELR25 |
| R150 | Resistor | 12K | ELR25 |
| R151 | Resistor | 10K | R25 |
| R152 | Resistor | 10K | ELR25 |
| R153 | Resistor | 47K | ELR25 |
| R154 | Resistor | 3.3M | ELR25 |
| R155 | Resistor | 22K | ELR25 |
| R156 | Resistor | 100 | R25 |
| R157 | Resistor | 3.3K | ELR25 |
| R158 | Resistor | 15K | R25 |
| R159 | Resistor | 470K | ELR25 |
| R160 | Resistor | 10K | ELR25 |
| R161 | Resistor | 10K | ELR25 |
| R162 | Resistor | 22K | ELR25 |
| R163 | Resistor | 470 | R25 |
| R164 | Resistor | 1.5K | ELR25 |
| R165 | Resistor | 1K | ELR25 |
| R166 | Resistor | 15 | R10 |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|----------|--------|
| R167 | Resistor | 2.2 | ELR25 |
| R168 | Resistor | 100 | R25 |
| R169 | Resistor | 100 | ELR25 |
| R170 | Resistor | 22K | ELR25 |
| R171 | Resistor | 18K | ELR25 |
| R172 | Resistor | 100 | ELR25 |
| R174 | Resistor | 10K | ELR25 |
| R175 | Resistor | 3.3K | ELR25 |
| R176 | Trimmer | 10K | H0651A |
| R177 | Trimmer | 3.3K | H0651A |
| R178 | Trimmer | 4.7K | H0651A |
| R179 | Resistor | 47K | ELR25 |
| R180 | Resistor | 47K | ELR25 |
| R181 | Resistor | 47K | ELR25 |
| R182 | Resistor | 470 | R25 |
| R183 | Resistor | 2.2K | ELR25 |
| R184 | Resistor | 220K | ELR25 |
| R185 | Resistor | 22K | ELR25 |
| R186 | Resistor | 4.7K | ELR25 |
| R187 | Resistor | 10K | ELR25 |
| R188 | Resistor | 2.2K | ELR25 |
| R189 | Resistor | 22K | ELR25 |
| R190 | Resistor | 4.7K | ELR25 |
| R191 | Resistor | 47K | ELR25 |
| R192 | Resistor | 15K | ELR25 |
| R194 | Resistor | 47 | R25 |
| R195 | Resistor | 47K | ELR25 |
| R196 | Resistor | 220 | R25 |
| R197 | Resistor | 100K | R25 |
| R198 | Resistor | 10K | R25 |
| R200 | Resistor | 10K | R25 |
| R201 | Resistor | 10K | R25 |
| R202 | Resistor | 100K | R25 |
| R203 | Resistor | 220K | R25 |
| R204 | Resistor | 1M | R25 |
| R205 | Resistor | 22K | ELR25 |
| C1 | Ceramic | 3P | 50V |
| C2 | Barrier Lay | 0.1 | 16V |
| C3 | Ceramic | 0.0047 | 50V |
| C4 | Ceramic | 0.0047 | 50V |
| C5 | Ceramic | 0.0047 | 50V |
| C6 | Tantalum | 3.3 | 16V |
| C7 | Ceramic | 0.0047 | 50V |
| C8 | Barrier Lay | 0.047 | 25V |
| C9 | Ceramic | 0.0047 | 50V |
| C10 | Ceramic | 0.0047 | 50V |
| C11 | Electrolytic | 47 | 10V |
| C12 | Ceramic | 0.0047 | 50V |
| C13 | Ceramic | 0.0047 | 50V |
| C14 | Ceramic | 1P | 50V |
| C15 | Ceramic | 0.0047 | 50V |
| C16 | Ceramic | 0.001 | 50V |
| C17 | Ceramic | 0.001 | 50V |
| C18 | Mylar | 0.022 | 50V |
| C19 | Ceramic | 0.0047 | 50V |
| C20 | Ceramic | 0.0047 | 50V |
| C21 | Ceramic | 0.0047 | 50V |
| C22 | Ceramic | 0.0047 | 50V |
| C23 | Barrier Lay | 0.047 | 25V |
| C24 | Ceramic | 0.0047 | 50V |
| C25 | Barrier Lay | 0.047 | 25V |
| C26 | Ceramic | 0.0047 | 50V |
| C27 | Barrier Lay | 0.047 | 25V |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|-----------|---------|
| C28 | Ceramic | 0.0047 | 50V |
| C29 | Ceramic | 0.0047 | 50V |
| C30 | Ceramic | 0.0047 | 50V |
| C31 | Ceramic | 0.0047 | 50V |
| C32 | Barrier Lay | 0.047 | 25V |
| C33 | Barrier Lay | 0.047 | 25V |
| C34 | Barrier Lay | 0.047 | 25V |
| C35 | Barrier Lay | 0.047 | 25V |
| C36 | Barrier Lay | 0.047 | 25V |
| C37 | Ceramic | 0.0047 | 50V |
| C38 | Ceramic | 0.001 | 50V |
| C39 | Ceramic | 330P | 50V |
| C40 | Electrolytic | 10 | 16V |
| C41 | Tantalum | 2.2 | 35V |
| C42 | Tantalum | 0.22 | 35V |
| C44 | Mylar | 0.022 | 50V |
| C45 | Ceramic | 0.0047 | 50V |
| C46 | Ceramic | 0.0047 | 50V |
| C47 | Ceramic | 0.0047 | 50V |
| C48 | Ceramic | 0.0047 | 50V |
| C49 | Ceramic | 47P | 50V |
| C50 | Ceramic | 0.0047 | 50V |
| C51 | Electrolytic | 10 | 16V |
| C52 | Ceramic | 0.0047 | 50V |
| C53 | Dip Mica | 330P | 50V |
| C54 | Dip Mica | 220P | 50V |
| C55 | Ceramic | 0.0047 | 50V |
| C56 | Ceramic | 0.0047 | 50V |
| C57 | Ceramic | 0.0047 | 50V |
| C58 | Barrier Lay | 0.1 | 25V |
| C59 | Electrolytic | 10 | 16V |
| C60 | Barrier Lay | 0.047 | 25V |
| C61 | Barrier Lay | 0.047 | 25V |
| C62 | Barrier Lay | 0.047 | 25V |
| C63 | Barrier Lay | 0.047 | 25V |
| C64 | Ceramic | 0.0047 | 50V |
| C65 | Barrier Lay | 0.047 | 25V |
| C66 | Barrier Lay | 0.1 | 16V |
| C67 | Ceramic | 47P | 50V |
| C68 | Barrier Lay | 0.1 | 16V |
| C69 | Ceramic | 120P | 50V |
| C70 | Trimmer | CTZ51C | |
| C71 | Dip Mica | 10P | 50V |
| C72 | Ceramic | 0.0047 | 50V |
| C73 | Mylar | 0.1 | 50V |
| C74 | Ceramic | 0.0047 | 50V |
| C75 | Ceramic | 0.0047 | 50V |
| C76 | Ceramic | 0.0047 | 50V |
| C77 | Dip Mica | 33P | 50V |
| C78 | Trimmer | CTZ51F | |
| C79 | Dip Mica | 51P | 50V |
| C80 | Ceramic | 0.0047 | 50V |
| C81 | Dip Mica | 150P | 50V |
| C82 | Dip Mica | 150P | 50V |
| C83 | Ceramic | 100P | 50V |
| C84 | Ceramic | 0.0047 | 50V |
| C85 | Array | C0111-32N | |
| C88 | Electrolytic | 0.47 | 50V RC2 |
| C89 | Electrolytic | 47 | 10V |
| C90 | Ceramic | 0.0047 | 50V |
| C91 | Ceramic | 0.001 | 50V |
| C92 | Ceramic | 0.0047 | 50V |
| C93 | Ceramic | 0.0047 | 50V |
| C94 | Ceramic | 0.0047 | 50V |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|--------------|-----|
| C95 | Ceramic | 0.0047 | 50V |
| C96 | Ceramic | 0.0047 | 50V |
| C97 | Ceramic | 0.0047 | 50V |
| C98 | Ceramic | 100P | 50V |
| C99 | Ceramic | 100P | 50V |
| C100 | Electrolytic | 47 | 10V |
| C101 | Ceramic | 0.0047 | 50V |
| C102 | Ceramic | 100P | 50V |
| C103 | Ceramic | 100P | 50V |
| C104 | Electrolytic | 0.47 | 50V |
| C105 | Ceramic | 10P | 50V |
| C106 | Barrier Lay | 0.047 | 16V |
| C109 | Electrolytic | 33 | 16V |
| C110 | Ceramic | 0.0047 | 50V |
| C111 | Electrolytic | 10 | 16V |
| C112 | Electrolytic | 47 | 10V |
| C113 | Ceramic | 0.0047 | 50V |
| C114 | Electrolytic | 47 | 10V |
| C115 | Ceramic | 0.0047 | 50V |
| C116 | Mylar | 0.022 | 50V |
| C117 | Electrolytic | 0.47 | 50V |
| C118 | Mylar | 0.022 | 50V |
| C119 | Electrolytic | 47 | 10V |
| C120 | Ceramic | 0.0047 | 50V |
| C121 | Barrier Lay | 0.1 | 16V |
| C122 | Mylar | 0.0047 | 50V |
| C123 | Electrolytic | 0.47 | 50V |
| C125 | Electrolytic | 0.22 | 50V |
| C126 | Electrolytic | 220 | 10V |
| C127 | Barrier Lay | 0.1 | 16V |
| C128 | Electrolytic | 47 | 16V |
| C129 | Electrolytic | 220 | 10V |
| C130 | Electrolytic | 47 | 16V |
| C131 | Electrolytic | 470 | 16V |
| C132 | Mylar | 0.1 | 50V |
| C133 | Electrolytic | 470 | 16V |
| C134 | Ceramic | 0.0047 | 50V |
| C135 | Barrier Lay | 0.1 | 16V |
| C136 | Electrolytic | 0.47 | 50V |
| C137 | Mylar | 0.01 | 50V |
| C138 | Electrolytic | 220 | 10V |
| C139 | Barrier Lay | 0.1 | 16V |
| C140 | Barrier Lay | 0.1 | 16V |
| C141 | Barrier Lay | 0.047 | 25V |
| C142 | Ceramic | 0.0047 | 50V |
| C143 | Ceramic | 0.0047 | 50V |
| C144 | Electrolytic | 22 | 16V |
| C145 | Ceramic | 0.0047 | 50V |
| C146 | Electrolytic | 10 | 16V |
| C147 | Electrolytic | 0.47 | 50V |
| C148 | Ceramic | 0.0047 | 50V |
| C149 | Ceramic | 0.0047 | 50V |
| C150 | Barrier Lay | 0.1 | 16V |
| C151 | Electrolytic | 22 | 16V |
| C152 | Electrolytic | 100 | 10V |
| C153 | Electrolytic | 10 | 16V |
| C154 | Ceramic | 0.0047 | 50V |
| C155 | Ceramic | 0.0047 | 50V |
| C156 | Electrolytic | 2.2 | 50V |
| C157 | Barrier Lay | 0.1 | 16V |
| C158 | Barrier Lay | 0.1 | 16V |
| J1 | Connector | TL-25P-06-V1 | |
| J2 | Connector | TL-25P-03-V1 | |

[MAIN UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|-------------------|
| J3 | Connector | TL-25P-07-V1 |
| J4 | Connector | 5045-2A |
| J5 | Connector | TL-25P-03-V1 |
| J6 | Connector | TL-25P-09-V1 |
| J7 | Connector | TL-25P-03-V1 |
| J8 | Connector | TL-25P-02-V1 |
| J9 | Connector | TL-25P-06-V1 |
| J10 | Connector | TL-25P-02-V1 |
| J11 | Connector | TL-25P-10-V1 |
| J12 | Connector | TL-25P-07-V1 |
| J13 | Connector | TL-25P-02-V1 |
| P1 | Connector | (TMP-P01X-A1) W83 |
| P2 | Connector | (TMP-P01X-A1) W85 |
| S1 | Switch | SSS312 |
| S01 | Socket | 2-332095-6 |
| B1 | P.C.Board | B-858A |

| [RF UNIT] | | |
|-----------|-------------|----------------|
| REF NO. | DESCRIPTION | PART NO. |
| IC1 | IC | BA618 |
| IC2 | IC | BA618 |
| Q1 | Transistor | 2SC3402 |
| Q2 | Transistor | 2SC3402 |
| Q3 | FET | 2SK125 |
| Q4 | FET | 2SK125 |
| Q5 | FET | 2SK125 |
| Q6 | FET | 2SK125 |
| Q7 | Transistor | 2SC2053 |
| Q8 | FET | 3SK74M |
| Q9 | FET | 2SK49H2 |
| Q10 | Transistor | 2SC3402 |
| D1 | Diode | 1SS53 |
| D2 | Diode | 1SS53 |
| D3 | Diode | 1SS53 |
| D4 | Diode | 1SS53 |
| D5 | Diode | 1SS53 |
| D6 | Diode | 1SS53 |
| D7 | Diode | 1SS53 |
| D8 | Diode | 1SS53 |
| D9 | Diode | 1SS53 |
| D10 | Diode | 1SS53 |
| D11 | Diode | 1SS53 |
| D12 | Diode | 1SS53 |
| D13 | Diode | 1SS53 |
| D14 | Diode | 1SS53 |
| D15 | Diode | 1SS53 |
| D16 | Diode | 1SS53 |
| D17 | Diode | 1SS53 |
| D18 | Diode | 1SS53 |
| D19 | Diode | 1SS53 |
| D20 | Diode | 1SS53 |
| D21 | Diode | M1204 |
| D22 | Diode | M1204 |
| D23 | Diode | 1SS53 |
| D24 | Diode | 1SS53 |
| D25 | Diode | 1SS53 |
| D26 | Diode | 1SS53 |
| D29 | Diode | 1SS53 |
| D30 | Diode | 1SS53 |
| D31 | Diode | 1SS53 |
| D32 | Diode | 1SS53 |
| D33 | Diode | 1SS53 |
| D34 | Diode | 1SS53 |
| D35 | Diode | 1SS53 |
| D36 | Diode | 1SS53 |
| F11 | MC | FL-64 |
| L1 | Coil | LA-245 |
| L2 | Coil | LA-256 |
| L3 | Coil | LB4 3R3 |
| L4 | Coil | LB4 3R9 |
| L5 | Coil | EL0810SKI-102K |
| L6 | Coil | EL0810SKI-102K |
| L7 | Coil | FL5H 101K |
| L8 | Coil | LB4 R36 |
| L9 | Coil | LB4 R30 |
| L10 | Coil | LB4 R36 |
| L11 | Coil | LB4 R34 |
| L12 | Coil | FL5H 101K |
| L13 | Coil | LB4 R54 |

| [RF UNIT] | | |
|-----------|-------------|----------------|
| REF NO. | DESCRIPTION | PART NO. |
| L14 | Coil | LB4 R50 |
| L15 | Coil | LB4 R50 |
| L16 | Coil | LB4 R50 |
| L17 | Coil | FL5H 101K |
| L18 | Coil | LB4 R83 |
| L19 | Coil | LB4 R70 |
| L20 | Coil | LB4 R65 |
| L21 | Coil | LB4 R54 |
| L22 | Coil | FL5H 101K |
| L23 | Coil | EL0810SKI-1R0K |
| L24 | Coil | EL0810SKI-1R0K |
| L25 | Coil | LB4 R83 |
| L26 | Coil | LB4 R70 |
| L27 | Coil | FL5H 101K |
| L28 | Coil | EL0810SKI-1R2K |
| L29 | Coil | EL0810SKI-1R2K |
| L30 | Coil | EL0810SKI-1R2K |
| L31 | Coil | EL0810SKI-1R0K |
| L32 | Coil | FL5H 101K |
| L33 | Coil | EL0810SKI-1R8K |
| L34 | Coil | EL0810SKI-1R8K |
| L35 | Coil | EL0810SKI-1R5K |
| L36 | Coil | EL0810SKI-1R5K |
| L37 | Coil | FL5H 101K |
| L38 | Coil | EL0810SKI-1R0K |
| L39 | Coil | EL0810SKI-2R2K |
| L40 | Coil | EL0810SKI-1R8K |
| L41 | Coil | EL0810SKI-1R8K |
| L42 | Coil | FL5H 102K |
| L43 | Coil | LB4 R83 |
| L44 | Coil | EL0810SKI-3R3K |
| L45 | Coil | EL0810SKI-2R7K |
| L46 | Coil | EL0810SKI-2R7K |
| L47 | Coil | FL5H 102K |
| L48 | Coil | LB4 6R2 |
| L49 | Coil | LB4 5R1 |
| L50 | Coil | LB4 4R3 |
| L51 | Coil | LB4 3R6 |
| L52 | Coil | FL5H 102K |
| L53 | Coil | LB4 5R1 |
| L54 | Coil | LB4 6R2 |
| L55 | Coil | EL0810SKI-102K |
| L56 | Coil | FL5H 102K |
| L57 | Coil | EL0810SKI-220K |
| L58 | Coil | EL0810SKI-220K |
| L59 | Coil | EL0810SKI-101K |
| L60 | Coil | EL0810SKI-101K |
| L61 | Coil | EL0810SKI-101K |
| L62 | Coil | EL0810SKI-101K |
| L63 | Coil | EL0810SKI-101K |
| L64 | Coil | EL0810SKI-101K |
| L65 | Coil | EL0810SKI-101K |
| L66 | Coil | EL0810SKI-101K |
| L67 | Coil | EL0810SKI-102K |
| L68 | Coil | EL0810SKI-102K |
| L69 | Coil | EL0810SKI-102K |
| L70 | Coil | EL0810SKI-102K |
| L74 | Coil | LR-129 |
| L75 | Coil | LR-130 |
| L76 | Coil | LR-129 |
| L77 | Coil | LS-198 |
| L78 | Coil | LB4 R15 |
| L79 | Coil | LB4 R50 |
| L80 | Coil | FL5H 101K |

[RF UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|-------------|----------------|-------|
| L81 | Coil | LA-233 | |
| L82 | Coil | LA-235 | |
| L83 | Coil | LS-254 | |
| L84 | Coil | LS-254 | |
| L85 | Coil | LS-254 | |
| L86 | Coil | LS-114 | |
| L87 | Coil | EL0810SKI-102K | |
| L89 | Coil | LA-236 | |
| L90 | Coil | LA-256 | |
| L91 | Coil | LB4 R41 | |
| L92 | Coil | BT01RN1-A61 | |
| L93 | Coil | LAL03NA100K | |
| R1 | Resistor | 470 | ELR25 |
| R2 | Resistor | 100 | ELR25 |
| R3 | Resistor | 100 | R25 |
| R4 | Resistor | 100 | R25 |
| R5 | Resistor | 100 | R25 |
| R6 | Resistor | 100 | R25 |
| R7 | Resistor | 100 | R25 |
| R8 | Resistor | 100 | R25 |
| R9 | Resistor | 100 | R25 |
| R10 | Resistor | 100 | R25 |
| R11 | Resistor | 27 | ELR25 |
| R12 | Resistor | 27 | R25 |
| R13 | Resistor | 33 | ELR25 |
| R14 | Resistor | 100 | R25 |
| R15 | Resistor | 100 | R25 |
| R16 | Resistor | 220 | ELR25 |
| R17 | Resistor | 100 | R25 |
| R18 | Resistor | 100 | R25 |
| R19 | Resistor | 100 | R25 |
| R20 | Resistor | 22K | ELR25 |
| R21 | Resistor | 100K | R25 |
| R22 | Resistor | 39 | ELR25 |
| R23 | Resistor | 10 | ELR25 |
| R24 | Resistor | 39 | ELR25 |
| R25 | Resistor | 100K | R25 |
| R26 | Resistor | 22K | ELR25 |
| R27 | Resistor | 22K | ELR25 |
| R28 | Resistor | 22 | ELR25 |
| R29 | Resistor | 100 | R25 |
| R30 | Resistor | 150 | R25 |
| R31 | Resistor | 470 | ELR25 |
| R32 | Resistor | 470 | ELR25 |
| R33 | Resistor | 22 | R25 |
| R34 | Resistor | 470 | R25 |
| R35 | Resistor | 680 | ELR25 |
| R36 | Resistor | 8.2K | ELR25 |
| R37 | Resistor | 560 | R25 |
| R38 | Resistor | 100 | R25 |
| R39 | Resistor | 68 | ELR25 |
| R40 | Resistor | 33 | ELR25 |
| R41 | Resistor | 220 | ELR25 |
| R42 | Resistor | 470 | ELR25 |
| R43 | Resistor | 10K | ELR25 |
| R44 | Resistor | 100K | R25 |
| R45 | Resistor | 220 | R25 |
| R46 | Resistor | 100 | R25 |
| R47 | Resistor | 2.2 | ELR10 |
| R48 | Resistor | 2.2 | ELR10 |
| R49 | Resistor | 10K | ELR25 |
| R50 | Resistor | 10K | ELR25 |
| R51 | Resistor | 2.2K | ELR25 |

[RF UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|-------------|-----------------|-------|
| R52 | Array | 10K | RM6 |
| R53 | Array | 10K | RM6 |
| R54 | Resistor | 10K | ELR25 |
| R55 | Resistor | 100 | ELR25 |
| R56 | Resistor | 100 | ELR25 |
| R57 | Resistor | 100K | ELR25 |
| R58 | Resistor | 220 | ELR25 |
| R59 | Resistor | 22 | R25 |
| R60 | Resistor | 330 | ELR25 |
| R61 | Resistor | 330 | ELR25 |
| R62 | Resistor | 330 | ELR25 |
| R63 | Resistor | 4.7K | ELR25 |
| R64 | Resistor | 10K | ELR25 |
| R65 | Resistor | 3.3K | R25 |
| R66 | Resistor | 47 | R10 |
| C1 | Barrier Lay | 0.047 | 25V |
| C3 | Ceramic | 33P | 50V |
| C4 | Ceramic | 100P | 50V |
| C5 | Ceramic | 12P | 50V |
| C6 | Ceramic | 75P | 50V |
| C7 | Barrier Lay | 0.1 | 16V |
| C8 | Barrier Lay | TBD04V182K-L0B | |
| C9 | Barrier Lay | UAT05X562K | |
| C10 | Barrier Lay | TBD04V152K-L0B | |
| C11 | Barrier Lay | 0.1 | 16V |
| C13 | Ceramic | 150P | 50V |
| C14 | Ceramic | 56P | 50V |
| C15 | Ceramic | 100P | 50V |
| C16 | Ceramic | 330P | 50V |
| C17 | Barrier Lay | UFD08SA821K-L2A | |
| C18 | Ceramic | 120P | 50V |
| C19 | Barrier Lay | 0.047 | 25V |
| C20 | Barrier Lay | 0.047 | 25V |
| C21 | Barrier Lay | 0.047 | 25V |
| C22 | Ceramic | 220P | 50V |
| C23 | Ceramic | 24P | 50V |
| C24 | Ceramic | 120P | 50V |
| C25 | Ceramic | 220P | 50V |
| C26 | Barrier Lay | TBD04V122K-L0B | |
| C27 | Ceramic | 150P | 50V |
| C28 | Barrier Lay | 0.047 | 25V |
| C29 | Barrier Lay | 0.047 | 25V |
| C30 | Ceramic | 390P | 50V |
| C31 | Ceramic | 39P | 50V |
| C32 | Ceramic | 220P | 50V |
| C33 | Ceramic | 220P | 50V |
| C34 | Barrier Lay | TBD04V222K-L0B | |
| C35 | Ceramic | 180P | 50V |
| C36 | Barrier Lay | 0.047 | 25V |
| C37 | Barrier Lay | 0.047 | 25V |
| C38 | Ceramic | 390P | 50V |
| C39 | Ceramic | 51P | 50V |
| C40 | Ceramic | 150P | 50V |
| C41 | Ceramic | 330P | 50V |
| C42 | Barrier Lay | TBD04V222K-L0B | |
| C43 | Ceramic | 300P | 50V |
| C44 | Barrier Lay | 0.047 | 25V |
| C45 | Barrier Lay | 0.047 | 25V |
| C46 | Barrier Lay | UFD08SA681K-L24 | |
| C47 | Ceramic | 82P | 50V |
| C48 | Ceramic | DD109SL511J50V2 | |
| C49 | Ceramic | DD109SL471J50V2 | |
| C50 | Barrier Lay | TBD05V272K-L0B | |

[RF UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|-----------------|--------|
| C51 | Ceramic | 390P | 50V |
| C52 | Barrier Lay | 0.047 | 25V |
| C53 | Barrier Lay | 0.047 | 25V |
| C54 | Barrier Lay | UFD08SA821K-L2A | |
| C56 | Ceramic | 100P | 50V |
| C57 | Barrier Lay | UFD08SA681K-L2A | |
| C58 | Barrier Lay | TBD04V102K-L0B | |
| C59 | Barrier Lay | TBD06V562K-L2A | |
| C60 | Barrier Lay | UFD08SA561K-L2A | |
| C61 | Barrier Lay | 0.047 | 25V |
| C62 | Barrier Lay | 0.047 | 25V |
| C63 | Barrier Lay | UAT04X122K | |
| C64 | Ceramic | 180P | 50V |
| C65 | Barrier Lay | TBD04V102K-L0B | |
| C66 | Barrier Lay | UAT04X152K | |
| C67 | Barrier Lay | UAT06X123K | |
| C68 | Barrier Lay | TBD04V102K-L0B | |
| C69 | Barrier Lay | 0.047 | 25V |
| C70 | Barrier Lay | 0.047 | 25V |
| C71 | Barrier Lay | TBD04V152K-L0B | |
| C72 | Ceramic | 200P | 50V |
| C73 | Barrier Lay | TBD04V152K-L0B | |
| C74 | Barrier Lay | UAT04X182K | |
| C75 | Barrier Lay | UAT06X183K | |
| C76 | Barrier Lay | TBD04V122K-L0B | |
| C77 | Barrier Lay | 0.047 | 25V |
| C78 | Barrier Lay | 0.047 | 25V |
| C79 | Barrier Lay | TBD04V222K-L0B | |
| C80 | Ceramic | 300P | 50V |
| C81 | Barrier Lay | TBD04V222K-L0B | |
| C82 | Barrier Lay | TBD04V182K-L0B | |
| C83 | Barrier Lay | TBD08V123K-L2A | |
| C84 | Barrier Lay | TBD04V152K-L0B | |
| C85 | Barrier Lay | 0.047 | 25V |
| C86 | Barrier Lay | 0.1 | 16V |
| C87 | Electrolytic | 1 | 50V BP |
| C88 | Barrier Lay | TBD05V332K-L0B | |
| C89 | Ceramic | 390P | 50V |
| C90 | Barrier Lay | TBD05V332K-L0B | |
| C91 | Barrier Lay | 0.047 | 25V |
| C92 | Barrier Lay | 0.1 | 16V |
| C93 | Barrier Lay | 0.1 | 16V |
| C94 | Electrolytic | 10 | 16V |
| C95 | Barrier Lay | 0.1 | 16V |
| C96 | Barrier Lay | TBD06V822K-L2A | |
| C97 | Barrier Lay | TBD04V102K-L0B | |
| C98 | Barrier Lay | TBD06V682K-L2A | |
| C99 | Array | B8ZC0111N-32N | |
| C100 | Array | B8ZC0111N-32N | |
| C101 | Array | B8ZC0111N-32N | |
| C103 | Barrier Lay | 0.047 | 25V |
| C104 | Barrier Lay | 0.1 | 16V |
| C105 | Barrier Lay | 0.1 | 16V |
| C106 | Electrolytic | 1 | 50V BP |
| C107 | Barrier Lay | 0.047 | 25V |
| C108 | Barrier Lay | 0.1 | 16V |
| C109 | Barrier Lay | 0.047 | 25V |
| C110 | Barrier Lay | 0.1 | 16V |
| C111 | Barrier Lay | 0.047 | 25V |
| C112 | Barrier Lay | 0.047 | 25V |
| C113 | Barrier Lay | 0.047 | 25V |
| C114 | Barrier Lay | 0.047 | 25V |
| C115 | Barrier Lay | 0.047 | 25V |
| C118 | Barrier Lay | 0.1 | 16V |

[RF UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|----------------|---------|
| C119 | Barrier Lay | 0.1 | 16V |
| C120 | Ceramic | 10P | 50V |
| C121 | Barrier Lay | 0.1 | 16V |
| C122 | Ceramic | 39P | 50V |
| C123 | Ceramic | 39P | 50V |
| C124 | Ceramic | 220P | 50V |
| C125 | Ceramic | 0.001 | 50V |
| C126 | Ceramic | 0.001 | 50V |
| C127 | Ceramic | 27P | 50V |
| C128 | Ceramic | 56P | 50V |
| C129 | Ceramic | 51P | 50V |
| C130 | Ceramic | 15P | 50V |
| C131 | Ceramic | 43P | 50V |
| C132 | Ceramic | 12P | 50V |
| C133 | Ceramic | 10P | 50V |
| C134 | Ceramic | 3P | 50V |
| C135 | Ceramic | 0.001 | 50V |
| C136 | Ceramic | 0.001 | 50V |
| C137 | Ceramic | 0.0047 | 50V |
| C138 | Ceramic | 0.0047 | 50V |
| C139 | Ceramic | 6P | 50V |
| C140 | Ceramic | 0.0047 | 50V |
| C141 | Barrier Lay | 0.047 | 25V |
| C142 | Ceramic | 3P | 50V |
| C143 | Ceramic | 0.0047 | 50V |
| C144 | Ceramic | 470P | 50V |
| C145 | Barrier Lay | 0.047 | 25V |
| C146 | Electrolytic | 2.2 | 50V |
| C147 | Ceramic | 51P | 50V |
| C148 | Ceramic | 39P | 50V |
| C149 | Ceramic | 51P | 50V |
| C150 | Ceramic | 20P | 50V |
| C151 | Ceramic | 68P | 50V |
| C152 | Ceramic | 68P | 50V |
| C153 | Ceramic | 120P | 50V |
| C154 | Ceramic | 120P | 50V |
| C155 | Electrolytic | 0.47 | 50V RC2 |
| C156 | Electrolytic | 0.47 | 50V RC2 |
| C157 | Electrolytic | 10 | 16V |
| C158 | Electrolytic | 10 | 16V RC2 |
| C159 | Electrolytic | 1 | 50V RC2 |
| C160 | Electrolytic | 1 | 50V RC2 |
| C161 | Barrier Lay | 0.1 | 16V |
| C162 | Barrier Lay | 0.1 | 16V |
| C163 | Barrier Lay | 0.1 | 16V |
| C164 | Barrier Lay | 0.1 | 16V |
| C165 | Barrier Lay | 0.1 | 16V |
| C166 | Barrier Lay | 0.1 | 16V |
| C167 | Electrolytic | 1 | 50V RC2 |
| C168 | Electrolytic | 2.2 | 50V RC2 |
| C169 | Ceramic | 470P | 50V |
| RL1 | Relay | FBR21D12-P | |
| J1 | Connector | TMP-J01X-V1 | |
| J2 | Connector | HSJ0805-01-020 | |
| J3 | Connector | TL-25P-02-V1 | |
| J4 | Connector | TMP-J01X-V1 | |
| J5 | Connector | TL-25P-03-V1 | |
| J6 | Connector | TL-25P-07-V1 | |
| J7 | Connector | TL-25P-04-V1 | |
| J8 | Connector | TL-25P-02-V1 | |
| P1 | Connector | TMP-P01X-A1 | |

| [RF UNIT] | | | [LOGIC UNIT] | | |
|-----------|-------------|---------------|--------------|-------------|-------------------|
| REF NO. | DESCRIPTION | PART NO. | REF NO. | DESCRIPTION | PART NO. |
| B1 | P. C. Board | B-859A | IC1 | IC | μ A78M05 |
| W3 | Jumper | IPS-1041-4 | IC2 | IC | RP5G01 007 |
| W4 | Jumper | IPS-1041-4 | IC3 | IC | μ PD7801G 114 |
| W5 | Jumper | IPS-1041-4 | IC4 | IC | SN74LS08N |
| W6 | Jumper | IPS-1041-4 | IC5 | IC | SN74LS32N |
| W7 | Jumper | IPS-1041-4 | IC6 | IC | SN74LS02N |
| W8 | Jumper | IPS-1041-4 | IC7 | IC | 4013B |
| W9 | Jumper | IPS-1041-4 | IC8 | IC | TC4528BP |
| W10 | Jumper | IPS-1041-4 | IC9 | IC | SN74LS377N |
| W11 | Jumper | JPW-02H | IC10 | IC | SN74LS11N |
| W12 | Jumper | IPS-1041-4 | IC11 | IC | SN74LS175N |
| W13 | Jumper | IPS-1041-4 | IC12 | IC | BA618 |
| W14 | Jumper | IPS-1041-4 | IC13 | IC | BA618 |
| W15 | Jumper | IPS-1041-4 | IC14 | IC | M50780SP |
| W16 | Jumper | IPS-1041-4 | IC17 | IC | SN74LS08N |
| W17 | Jumper | IPS-1041-4 | IC18 | IC | SN74LS08N |
| W18 | Jumper | IPS-1041-4 | IC19 | IC | μ A78L82AWC |
| W19 | Jumper | IPS-1041-4 | Q1 | Transistor | 2SA1048Y |
| W20 | Jumper | IPS-1041-4 | Q2 | Transistor | 2SA1048Y |
| W21 | Jumper | IPS-1041-4 | Q3 | Transistor | 2SA1048Y |
| W22 | Jumper | IPS-1041-4 | Q4 | Transistor | 2SC2458GR |
| W23 | Jumper | IPS-1041-4 | Q5 | Transistor | 2SC2458GR |
| W24 | Jumper | IPS-1041-4 | Q6 | Transistor | 2SA1348 |
| W25 | Jumper | IPS-1041-4 | Q7 | Transistor | 2SA1348 |
| W28 | Jumper | JPW-02H | Q8 | Transistor | 2SA1348 |
| W29 | Jumper | IPS-1041-4 | Q9 | Transistor | 2SA1348 |
| W30 | Jumper | JPW-02H | Q11 | Transistor | 2SA1348 |
| W31 | Jumper | IPS-1041-4 | Q12 | Transistor | 2SA1348 |
| W32 | Jumper | IPS-1041-4 | Q13 | Transistor | 2SA1348 |
| W33 | Jumper | IPS-1041-4 | Q14 | Transistor | 2SA1348 |
| W34 | Jumper | JPW-02A | Q15 | Transistor | 2SA1348 |
| W35 | Jumper | JPW-02A | Q16 | Transistor | 2SA1348 |
| W36 | Jumper | JPW-02A | D1 | Diode | 1SS53 |
| W37 | Jumper | JPW-02A | D2 | Diode | 1SS53 |
| S1 | Switch | HSW0474-01050 | D3 | Diode | 1SS53 |
| | | | D4 | Diode | 1SS53 |
| | | | D5 | Diode | 1SS53 |
| | | | D6 | Diode | 1SS53 |
| | | | D7 | Diode | 1SS53 |
| | | | D8 | Diode | 1SS53 |
| | | | D9 | Diode | 1SS53 |
| | | | D10 | Diode | 1SS53 |
| | | | D11 | Diode | 1SS53 |
| | | | D12 | Diode | 1SS53 |
| | | | D13 | Diode | 1SS53 |
| | | | D14 | Diode | 1SS53 |
| | | | D15 | Diode | 1SS53 |
| | | | D16 | Diode | 1SS53 |
| | | | D17 | Diode | 1SS53 |
| | | | D18 | Diode | 1SS53 |
| | | | D19 | Diode | 1SS53 |
| | | | D20 | Diode | 1SS53 |
| | | | D21 | Diode | 1SS53 |
| | | | D22 | Diode | 1SS53 |
| | | | D23 | Diode | 1SS53 |
| | | | D24 | Diode | 1SS53 |
| | | | D25 | Diode | 1SS53 |
| | | | D26 | Diode | 1SS53 |
| | | | D36 | Diode | 1SS53 |
| | | | X1 | Ceralock | CSA400MT |

[LOGIC UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|-------------|--------|
| L1 | Coil | FL5H | 102K |
| L3 | Coil | BT01RN1-A61 | |
| L4 | Coil | FL5H | 102K |
| L6 | Coil | FL5H | 102K |
| L7 | Coil | FL5H | 102K |
| L8 | Coil | FL5H | 102K |
| L9 | Coil | FL5H | 102K |
| L10 | Coil | FL5H | 102K |
| R1 | Resistor | 4.7K | ELR25 |
| R2 | Resistor | 47K | R25 |
| R3 | Resistor | 10K | ELR25 |
| R4 | Resistor | 47K | ELR25 |
| R5 | Resistor | 470 | ELR25 |
| R6 | Array | RM-4 | 104 |
| R7 | Resistor | 120K | ELR25 |
| R8 | Resistor | 10K | R25 |
| R10 | Resistor | 47K | R25 |
| R11 | Resistor | 3.3M | ELR25 |
| R12 | Resistor | 1M | ELR25 |
| R13 | Resistor | 33 | ELR25 |
| R14 | Trimmer | 1M | H1051C |
| R15 | Resistor | 220K | ELR25 |
| R16 | Resistor | 47K | ELR25 |
| R17 | Resistor | 1M | R25 |
| R18 | Resistor | 1M | R25 |
| R19 | Resistor | 47K | R25 |
| R20 | Resistor | 10 | R50 |
| R22 | Array | RM-8 | 472 |
| R23 | Resistor | 68K | ELR25 |
| R24 | Resistor | 4.7K | ELR25 |
| R25 | Resistor | 10K | R25 |
| R26 | Resistor | 1K | ELR25 |
| R27 | Array | RM-4 | 472 |
| R28 | Resistor | 47K | ELR25 |
| R41 | Resistor | 10K | R25 |
| R42 | Resistor | 10K | R25 |
| R43 | Resistor | 10K | R25 |
| R44 | Resistor | 10K | R25 |
| R45 | Resistor | 10K | R25 |
| R46 | Resistor | 10K | R25 |
| R47 | Resistor | 10K | R25 |
| R48 | Resistor | 10K | R25 |
| R49 | Resistor | 10K | R25 |
| R50 | Resistor | 5.6K | R25 |
| R51 | Resistor | 5.6K | R25 |
| R53 | Resistor | 1.2K | ELR25 |
| R54 | Resistor | 10K | R25 |
| R55 | Resistor | 10K | R25 |
| C1 | Electrolytic | 33 | 16V |
| C2 | Barrier Lay | 0.1 | 16V |
| C3 | Barrier Lay | 0.1 | 16V |
| C4 | Electrolytic | 47 | 10V |
| C5 | Electrolytic | 1 | 50V |
| C6 | Barrier Lay | 0.1 | 16V |
| C7 | Mylar | 0.0022 | 50V |
| C8 | Mylar | 0.001 | 50V |
| C9 | Mylar | 0.001 | 50V |
| C10 | Barrier Lay | 0.1 | 16V |
| C11 | Ceramic | 33P | 50V |
| C12 | Ceramic | 33P | 50V |
| C13 | Barrier Lay | 0.1 | 16V |
| C14 | Barrier Lay | 0.047 | 25V |

[LOGIC UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|--------------|--------|
| C15 | Electrolytic | 1 | 50V BP |
| C17 | Barrier Lay | 0.1 | 16V |
| C18 | Electrolytic | 47 | 10V |
| C19 | Barrier Lay | 0.1 | 16V |
| C20 | Array | B8ZC0111-32N | |
| C21 | Ceramic | 470P | 50V |
| C22 | Ceramic | 0.001 | 50V |
| C23 | Barrier Lay | 0.1 | 16V |
| C24 | Ceramic | 0.0022 | 50V |
| C25 | Ceramic | 0.001 | 50V |
| C27 | Array | B5RC0124-32N | |
| C28 | Array | B7ZC0711-32N | |
| C29 | Array | B7ZC0711-32N | |
| C30 | Barrier Lay | 0.1 | 16V |
| C31 | Barrier Lay | 0.1 | 16V |
| C32 | Barrier Lay | 0.1 | 16V |
| J2 | Connector | TL-25P-10-V1 | |
| J3 | Connector | TL-25P-12-V1 | |
| J4 | Connector | TL-25P-05-V1 | |
| J5 | Connector | TL-25P-11-V1 | |
| J6 | Connector | TL-25P-06-V1 | |
| J7 | Connector | TL-25P-10-V1 | |
| J8 | Connector | TL-25P-04-V1 | |
| J10 | Connector | TL-25P-09-V1 | |
| J11 | Connector | TL-25P-11-V1 | |
| J12 | Connector | TL-25P-08-V1 | |
| J13 | Connector | TL-25P-10-V1 | |
| J14 | Connector | TL-25P-08-V1 | |
| J15 | Connector | TL-25P-08-V1 | |
| J16 | Connector | 3022-12B | |
| J17 | Connector | 3022-08B | |
| B1 | PC. Board | B-705B | |
| | RAM UNIT | EX-314 | |
| W15 | Jumper | IPS-1041-4 | |
| W16 | Jumper | JPW-02A | |
| W17 | Jumper | JPW-02H | |
| W19 | Jumper | JPW-02H | |
| W20 | Jumper | JPW-02A | |
| W21 | Jumper | IPS-1041-4 | |
| W22 | Jumper | IPS-1041-4 | |
| W23 | Jumper | JPW-02H | |
| W24 | Jumper | JPW-02A | |
| W25 | Jumper | JPW-02A | |
| W26 | Jumper | IPS-1041-4 | |
| W27 | Jumper | IPS-1041-4 | |
| W28 | Jumper | IPS-1041-4 | |
| W29 | Jumper | IPS-1041-4 | |
| W30 | Jumper | IPS-1041-4 | |
| W31 | Jumper | JPW-02H | |
| W32 | Jumper | IPS-1041-4 | |
| W33 | Jumper | IPS-1041-4 | |
| W34 | Jumper | JPW-02H | |
| W35 | Jumper | JPW-02A | |
| W36 | Jumper | JPW-02H | |
| W37 | Jumper | JPW-02A | |
| W38 | Jumper | JPW-02A | |
| W39 | Jumper | JPW-02H | |
| W40 | Jumper | JPW-02A | |
| W41 | Jumper | JPW-02A | |
| W42 | Jumper | JPW-02H | |
| W43 | Jumper | IPS-1041-4 | |

[LOGIC UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|------------|
| W44 | Jumper | JPW-02A |
| W45 | Jumper | JPW-02H |
| W46 | Jumper | JPW-02H |
| W47 | Jumper | IPS-1041-4 |
| W48 | Jumper | IPS-1041-4 |
| W49 | Jumper | JPW-02A |
| W50 | Jumper | JPW-02A |
| W51 | Jumper | JPW-02H |
| W52 | Jumper | JPW-02H |
| W53 | Jumper | JPW-02H |
| W54 | Jumper | JPW-02A |
| W55 | Jumper | JPW-02A |
| W56 | Jumper | JPW-02A |
| W57 | Jumper | JPW-02A |
| W58 | Jumper | IPS-1041-4 |
| W59 | Jumper | IPS-1041-4 |
| W60 | Jumper | IPS-1041-4 |
| W61 | Jumper | JPW-02H |
| W63 | Jumper | JPW-02A |
| W64 | Jumper | IPS-1041-4 |
| W65 | Jumper | IPS-1041-4 |
| W66 | Jumper | IPS-1041-4 |
| W67 | Jumper | IPS-1041-4 |
| W68 | Jumper | IPS-1041-4 |
| W69 | Jumper | IPS-1041-4 |
| W70 | Jumper | IPS-1041-4 |
| W71 | Jumper | JPW-02A |
| W72 | Jumper | JPW-02A |
| W73 | Jumper | JPW-02A |
| W74 | Jumper | JPW-02A |
| W75 | Jumper | JPW-02A |
| W76 | Jumper | JPW-02A |
| W77 | Jumper | IPS-1041-4 |
| W78 | Jumper | JPW-02H |
| W79 | Jumper | JPW-02H |
| W80 | Jumper | JPW-02H |
| W81 | Jumper | IPS-1041-4 |
| W82 | Jumper | IPS-1041-4 |
| W83 | Jumper | IPS-1041-4 |
| W84 | Jumper | JPW-02A |
| W85 | Jumper | JPW-02A |
| W86 | Jumper | JPW-02A |
| W87 | Jumper | IPS-1041-4 |
| W88 | Jumper | JPW-02A |
| W89 | Jumper | IPS-1041-4 |
| W90 | Jumper | IPS-1041-4 |
| W91 | Jumper | IPS-1041-4 |
| W92 | Jumper | IPS-1041-4 |
| W93 | Jumper | JPW-02A |
| W94 | Jumper | JPW-02H |
| W95 | Jumper | JPW-02H |
| W96 | Jumper | IPS-1041-4 |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|------------------|
| IC1 | IC | M54929P |
| IC2 | IC | M54466L |
| IC3 | IC | μPC1037H |
| IC4 | IC | μPC1037H |
| IC5 | IC | SN74LS90N |
| IC7 | IC | TA78L008AP |
| IC8 | IC | 7805 |
| IC201 | IC | M54929P |
| IC202 | IC | M54466L |
| IC203 | IC | SN74LS90N |
| IC204 | IC | M54459L |
| Q1 | Transistor | 2SC945P |
| Q2 | Transistor | 2SC945P |
| Q3 | Transistor | 2SC945P |
| Q4 | Transistor | 2SC945P |
| Q5 | FET | 2SK30A-Y |
| Q6 | FET | 2SK30A-Y |
| Q7 | Transistor | 2SC1571G |
| Q8 | Transistor | 2SA1015Y |
| Q9 | Transistor | 2SC945P |
| Q10 | Transistor | 2SC945R |
| Q11 | Transistor | 2SC383TM |
| Q13 | Transistor | 2SC3399 |
| Q14 | Transistor | 2SC383TM |
| Q15 | FET | 2SK241-Y |
| Q16 | Transistor | 2SC383TM |
| Q17 | Transistor | 2SC383TM |
| Q18 | FET | 2SK192A-GR |
| Q19 | FET | 2SK192A-GR |
| Q20 | FET | 2SK192A-GR |
| Q21 | FET | 2SK192A-GR |
| Q22 | Transistor | 2SC383TM |
| Q23 | Transistor | 2SC383TM |
| Q24 | Transistor | 2SC945P |
| Q25 | Transistor | 2SC383TM |
| Q26 | Transistor | 2SC383TM |
| Q201 | FET | 2SK192A-GR |
| Q202 | Transistor | 2SC763C |
| D1 | Varicap | 1SV50-E |
| D2 | Zener | RD5.1EB2 |
| D4 | Diode | 1SS53 |
| D5 | Diode | 1SS53 |
| D7 | Diode | 1SS53 |
| D8 | Diode | 1SS53 |
| D9 | Diode | 1SS53 |
| D10 | Diode | 1SS53 |
| D11 | Diode | 1SS53 |
| D12 | Varicap | FC52M |
| D13 | Varicap | 1SV50-E |
| D14 | Varicap | 1SV50-E |
| D15 | Varicap | 1SV50-E |
| D16 | Diode | 1SS53 |
| D17 | Diode | 1SS53 |
| D18 | Diode | 1SS53 |
| D19 | Diode | 1SS53 |
| D20 | Zener | RD5.1EB2 |
| D201 | Varicap | 1SV50-E |
| FI1 | MC | FL-69 (30M15A) |
| X1 | Xtal | CR-21 (30.72MHz) |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|---------------|
| L1 | Coil | LW-19 |
| L2 | Coil | LS-94 |
| L3 | Coil | LS-114 |
| L4 | Coil | LS-114 |
| L5 | Coil | LS-114 |
| L6 | Coil | LAL04NA102K |
| L7 | Coil | EL0810SKI-101 |
| L8 | Coil | LS-162 |
| L9 | Coil | LA-244 |
| L10 | Coil | LA-254 |
| L11 | Coil | LB4 R36 |
| L12 | Coil | LB4 R23 |
| L13 | Coil | LW-17 |
| L14 | Coil | FL5H101K |
| L15 | Coil | FL5H101K |
| L16 | Coil | LR-79 |
| L17 | Coil | LB-135 |
| L18 | Coil | LW-19 |
| L19 | Coil | LR-79 |
| L20 | Coil | LB-135 |
| L21 | Coil | LW-19 |
| L22 | Coil | LR-79 |
| L23 | Coil | LB-135 |
| L24 | Coil | LW-19 |
| L25 | Coil | LR-79 |
| L26 | Coil | LB-135 |
| L27 | Coil | LW-19 |
| L28 | Coil | BT01RN1-A61 |
| L29 | Coil | LAL03NAR56M |
| L30 | Coil | LAL04NA101K |
| L201 | Coil | LB-113 |
| L202 | Coil | LW-19 |
| L203 | Coil | FL5H 101K |
| L204 | Coil | LAL04NA101K |
| L205 | Coil | LAL04NA101K |
| L206 | Coil | LAL04NA101K |
| R1 | Resistor | 1K R25 |
| R2 | Resistor | 2.2K ELR25 |
| R3 | Resistor | 4.7K ELR25 |
| R4 | Resistor | 10K ELR25 |
| R5 | Resistor | 470 ELR25 |
| R6 | Resistor | 220 ELR25 |
| R7 | Resistor | 47 R25 |
| R8 | Resistor | 47 ELR25 |
| R9 | Resistor | 100 ELR25 |
| R10 | Resistor | 15K ELR25 |
| R11 | Resistor | 1K R25 |
| R12 | Resistor | 470 ELR25 |
| R17 | Resistor | 10K ELR25 |
| R18 | Resistor | 220 ELR25 |
| R19 | Resistor | 22K ELR25 |
| R20 | Resistor | 100 ELR25 |
| R21 | Resistor | 8.2K R25 |
| R22 | Resistor | 1K R25 |
| R24 | Resistor | 100 ELR25 |
| R25 | Resistor | 100 ELR25 |
| R26 | Resistor | 470 ELR25 |
| R27 | Resistor | 220 ELR25 |
| R28 | Resistor | 100 ELR25 |
| R29 | Resistor | 47 ELR25 |
| R30 | Resistor | 3.3K ELR25 |
| R31 | Resistor | 47K ELR25 |
| R32 | Resistor | 10K ELR25 |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|------------|
| R33 | Resistor | 10K ELR25 |
| R34 | Resistor | 220 ELR25 |
| R35 | Resistor | 220 ELR25 |
| R37 | Resistor | 2.7K ELR25 |
| R38 | Resistor | 390 ELR25 |
| R39 | Resistor | 3.3K R25 |
| R40 | Resistor | 4.7K ELR25 |
| R41 | Resistor | 1.8M ELR25 |
| R42 | Resistor | 1K ELR25 |
| R43 | Resistor | 1.2K ELR25 |
| R44 | Resistor | 4.7K ELR25 |
| R45 | Resistor | 1K R25 |
| R46 | Resistor | 4.7K R25 |
| R47 | Resistor | 100 R25 |
| R48 | Resistor | 2.2K ELR25 |
| R49 | Resistor | 2.2K ELR25 |
| R50 | Resistor | 10K ELR25 |
| R52 | Resistor | 27K ELR25 |
| R53 | Resistor | 22K ELR25 |
| R54 | Resistor | 22K ELR25 |
| R56 | Resistor | 100K ELR25 |
| R57 | Resistor | 100K ELR25 |
| R58 | Resistor | 150 ELR25 |
| R59 | Resistor | 3.3K ELR25 |
| R60 | Resistor | 100K ELR25 |
| R61 | Resistor | 100K ELR25 |
| R62 | Resistor | 150 ELR25 |
| R63 | Resistor | 3.3K ELR25 |
| R64 | Resistor | 100K ELR25 |
| R65 | Resistor | 100K ELR25 |
| R66 | Resistor | 150 ELR25 |
| R67 | Resistor | 3.3K ELR25 |
| R68 | Resistor | 100K ELR25 |
| R69 | Resistor | 100K ELR25 |
| R70 | Resistor | 150 ELR25 |
| R71 | Resistor | 3.3K ELR25 |
| R72 | Resistor | 180 ELR25 |
| R73 | Resistor | 33 ELR25 |
| R74 | Resistor | 4.7K ELR25 |
| R75 | Resistor | 220 ELR25 |
| R76 | Resistor | 330 ELR25 |
| R77 | Resistor | 22 ELR25 |
| R78 | Resistor | 220 ELR25 |
| R79 | Resistor | 22K ELR25 |
| R80 | Resistor | 100 ELR25 |
| R81 | Resistor | 560 ELR25 |
| R82 | Resistor | 10K ELR25 |
| R83 | Resistor | 47K ELR25 |
| R84 | Resistor | 10K ELR25 |
| R85 | Resistor | 220 ELR25 |
| R86 | Resistor | 10K ELR25 |
| R87 | Resistor | 100 ELR25 |
| R88 | Resistor | 100 R25 |
| R89 | Resistor | 220 ELR25 |
| R90 | Resistor | 22K ELR25 |
| R91 | Resistor | 10K ELR25 |
| R92 | Resistor | 470 ELR25 |
| R93 | Resistor | 47 ELR25 |
| R94 | Resistor | 10K R25 |
| R95 | Resistor | 10K R25 |
| R96 | Resistor | 10K R25 |
| R97 | Resistor | 10K R25 |
| R98 | Resistor | 47K R25 |
| R99 | Resistor | 47K R25 |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. | | |
|---------|--------------|----------|-------|----|
| R100 | Resistor | SRW | 1P 10 | |
| R101 | Resistor | 120 | R50 | |
| R103 | Resistor | 47 | ELR25 | |
| R105 | Resistor | 1K | R25 | |
| R106 | Resistor | 47K | ELR25 | |
| R107 | Resistor | 47K | ELR25 | |
| R109 | Resistor | 3.3K | ELR25 | |
| R201 | Resistor | 10K | ELR25 | |
| R202 | Resistor | 1K | R25 | |
| R203 | Resistor | 2.7K | ELR25 | |
| R204 | Resistor | 33K | ELR25 | |
| R205 | Resistor | 10K | ELR25 | |
| R206 | Resistor | 470K | ELR25 | |
| R207 | Resistor | 470K | ELR25 | |
| R208 | Resistor | 180 | ELR25 | |
| R209 | Resistor | 150 | ELR25 | |
| R210 | Resistor | 5.6K | ELR25 | |
| R211 | Resistor | 1.2K | ELR25 | |
| R212 | Resistor | 330 | ELR25 | |
| R213 | Resistor | 150 | R25 | |
| R214 | Resistor | 4.7K | R25 | |
| R215 | Resistor | 2.2K | R25 | |
| R216 | Resistor | 2.7K | ELR25 | |
| R217 | Resistor | 2.7K | ELR25 | |
| R218 | Resistor | 390 | ELR25 | |
| C2 | Ceramic | 0.0047 | 50V | |
| C3 | Ceramic | 10P | 50V | CH |
| C4 | Ceramic | 0.0047 | 50V | |
| C5 | Electrolytic | 10 | 16V | |
| C6 | Ceramic | 82P | 50V | TH |
| C7 | Ceramic | 0.0047 | 50V | |
| C8 | Ceramic | 82P | 50V | TH |
| C9 | Ceramic | 10P | 50V | |
| C10 | Ceramic | 68P | 50V | |
| C11 | Ceramic | 47P | 50V | |
| C12 | Ceramic | 100P | 50V | |
| C17 | Ceramic | 0.0047 | 50V | |
| C19 | Ceramic | 0.001 | 50V | |
| C20 | Ceramic | 0.001 | 50V | |
| C21 | Ceramic | 0.0047 | 50V | |
| C22 | Ceramic | 8P | 50V | |
| C23 | Ceramic | 1P | 50V | |
| C24 | Ceramic | 8P | 50V | |
| C25 | Ceramic | 1P | 50V | |
| C26 | Ceramic | 8P | 50V | |
| C27 | Barrier Lay | 0.047 | 25V | |
| C29 | Ceramic | 470P | 50V | |
| C30 | Ceramic | 470P | 50V | |
| C31 | Barrier Lay | 0.1 | 16V | |
| C32 | Ceramic | 0.0047 | 50V | |
| C33 | Electrolytic | 47 | 10V | |
| C34 | Ceramic | 0.0047 | 50V | |
| C35 | Ceramic | 6P | 50V | |
| C36 | Ceramic | 6P | 50V | |
| C37 | Ceramic | 0.0047 | 50V | |
| C39 | Ceramic | 47P | 50V | |
| C40 | Ceramic | 0.0047 | 50V | |
| C41 | Ceramic | 0.001 | 50V | |
| C42 | Ceramic | 0.0047 | 50V | |
| C43 | Ceramic | 43P | 50V | |
| C44 | Ceramic | 51P | 50V | |
| C45 | Ceramic | 82P | 50V | |
| C46 | Ceramic | 15P | 50V | |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. | | |
|---------|--------------|----------|-----|-----|
| C47 | Ceramic | 62P | 50V | |
| C48 | Ceramic | 150P | 50V | |
| C49 | Ceramic | 120P | 50V | |
| C50 | Ceramic | 56P | 50V | |
| C51 | Ceramic | 330P | 50V | |
| C52 | Ceramic | 68P | 50V | |
| C53 | Ceramic | 150P | 50V | |
| C54 | Ceramic | 0.0047 | 50V | |
| C55 | Ceramic | 0.0047 | 50V | |
| C56 | Ceramic | 0.001 | 50V | |
| C57 | Ceramic | 0.0047 | 50V | |
| C58 | Ceramic | 0.0022 | 50V | |
| C59 | Ceramic | 0.0047 | 50V | |
| C60 | Ceramic | 0.0047 | 50V | |
| C62 | Ceramic | 0.0047 | 50V | |
| C63 | Ceramic | 0.0047 | 50V | |
| C64 | Electrolytic | 47 | 10V | |
| C65 | Array | B7ZC0717 | 32N | |
| C66 | Electrolytic | 47 | 10V | |
| C67 | Barrier Lay | 0.047 | 25V | |
| C68 | Barrier Lay | 0.1 | 16V | |
| C69 | Ceramic | 330P | 50V | |
| C70 | Ceramic | 0.001 | 50V | |
| C71 | Electrolytic | 1 | 50V | |
| C72 | Electrolytic | 100 | 10V | |
| C73 | Ceramic | 0.0047 | 50V | |
| C74 | Barrier Lay | 0.047 | 25V | |
| C75 | Electrolytic | 0.47 | 50V | B.P |
| C76 | Ceramic | 56P | 50V | |
| C77 | Ceramic | 24P | 50V | |
| C78 | Trimmer | CTZ51C | | |
| C79 | Ceramic | 56P | 50V | CH |
| C80 | Ceramic | 12P | 50V | CH |
| C81 | Ceramic | 12P | 50V | CH |
| C82 | Ceramic | 0.0047 | 50V | |
| C83 | Ceramic | 1P | 50V | |
| C84 | Ceramic | 0.0047 | 50V | |
| C85 | Barrier Lay | 0.047 | 25V | |
| C86 | Ceramic | 56P | 50V | |
| C87 | Ceramic | 15P | 50V | |
| C88 | Trimmer | CTZ51C | | |
| C89 | Ceramic | 47P | 50V | CH |
| C90 | Ceramic | 12P | 50V | CH |
| C91 | Ceramic | 12P | 50V | CH |
| C92 | Ceramic | 0.0047 | 50V | |
| C93 | Ceramic | 1P | 50V | |
| C94 | Ceramic | 0.0047 | 50V | |
| C95 | Ceramic | 47P | 50V | |
| C96 | Ceramic | 10P | 50V | |
| C97 | Trimmer | CTZ51A | | |
| C98 | Ceramic | 47P | 50V | CH |
| C99 | Ceramic | 12P | 50V | CH |
| C100 | Ceramic | 8P | 50V | CH |
| C101 | Ceramic | 0.0047 | 50V | |
| C102 | Ceramic | 1P | 50V | |
| C103 | Ceramic | 0.0047 | 50V | |
| C104 | Barrier Lay | 0.047 | 25V | |
| C105 | Ceramic | 39P | 50V | |
| C106 | Ceramic | 7P | 50V | |
| C107 | Trimmer | CTZ51A | | |
| C108 | Ceramic | 33P | 50V | CH |
| C109 | Ceramic | 12P | 50V | CH |
| C110 | Ceramic | 5P | 50V | CH |
| C111 | Ceramic | 0.0047 | 50V | |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|--------------|---------|
| C112 | Ceramic | 1P | 50V |
| C113 | Ceramic | 0.0047 | 50V |
| C114 | Barrier Lay | 0.047 | 25V |
| C115 | Electrolytic | 100 | 10V |
| C116 | Ceramic | 0.0047 | 50V |
| C117 | Ceramic | 22P | 50V |
| C118 | Ceramic | 22P | 50V |
| C119 | Ceramic | 47P | 50V |
| C120 | Ceramic | 0.0047 | 50V |
| C121 | Ceramic | 0.0047 | 50V |
| C122 | Ceramic | 0.001 | 50V |
| C123 | Ceramic | 0.0047 | 50V |
| C124 | Ceramic | 5P | 50V |
| C125 | Ceramic | 0.001 | 50V |
| C126 | Ceramic | 0.0047 | 50V |
| C127 | Ceramic | 47P | 50V |
| C128 | Electrolytic | 47 | 10V |
| C129 | Electrolytic | 100 | 16V |
| C130 | Ceramic | 0.0047 | 50V |
| C131 | Ceramic | 0.0047 | 50V |
| C132 | Electrolytic | 47 | 10V |
| C133 | Barrier Lay | 0.047 | 25V |
| C134 | Barrier Lay | 0.047 | 25V |
| C135 | Barrier Lay | 0.047 | 25V |
| C136 | Barrier Lay | 0.047 | 25V |
| C137 | Electrolytic | 10 | 16V |
| C139 | Ceramic | 0.0047 | 50V |
| C140 | Ceramic | 0.0047 | 50V |
| C141 | Ceramic | 0.0047 | 50V |
| C143 | Ceramic | 0.0047 | 50V |
| C145 | Ceramic | 0.0047 | 50V |
| C146 | Ceramic | 100P | 50V |
| C147 | Ceramic | 5P | 50V |
| C201 | Array | B7ZC0717-32N | |
| C202 | Electrolytic | 0.22 | 50V RC2 |
| C203 | Barrier Lay | 0.047 | 25V |
| C204 | Ceramic | 0.0022 | 50V |
| C205 | Ceramic | 0.001 | 50V |
| C206 | Electrolytic | 47 | 10V |
| C207 | Ceramic | 39P | 50V UJ |
| C208 | Ceramic | 22P | 50V |
| C209 | Ceramic | 4P | 50V |
| C210 | Ceramic | 4P | 50V |
| C211 | Electrolytic | 47 | 10V |
| C212 | Ceramic | 0.0022 | 50V |
| C213 | Ceramic | 1P | 50V |
| C214 | Ceramic | 0.0047 | 50V |
| C215 | Ceramic | 0.001 | 50V |
| C216 | Ceramic | 47P | 50V |
| C217 | Ceramic | 0.0022 | 50V |
| C218 | Ceramic | 0.0047 | 50V |
| C219 | Barrier Lay | 0.047 | 25V |
| C220 | Ceramic | 470P | 50V |
| C221 | Ceramic | 0.0047 | 50V |
| C222 | Ceramic | 0.001 | 50V |
| C223 | Electrolytic | 47 | 10V |
| C224 | Ceramic | 0.0047 | 50V |
| C225 | Ceramic | 0.0047 | 50V |
| C226 | Ceramic | 0.0047 | 50V |
| C227 | Ceramic | 0.0047 | 50V |
| J1 | Connector | TL-25P-05-V1 | |
| J2 | Connector | TL-25P-11-V1 | |
| J3 | Connector | TL-25P-04-V1 | |

[PLL UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|----------------|
| J4 | Connector | TMP-J01X-V1 |
| J5 | Connector | TMP-J01X-V1 |
| B1 | P.C. Board | B-704C (42443) |
| W14 | Jumper | JPW-02A |
| W15 | Jumper | IPS-1041-4 |
| W16 | Jumper | JPW-02A |
| W17 | Jumper | JPW-02A |
| W18 | Jumper | JPW-02A |
| W19 | Jumper | JPW-02A |
| W20 | Jumper | JPW-02A |
| W21 | Jumper | JPW-02H |
| W24 | Jumper | JPW-02A |
| W25 | Jumper | JPW-02A |
| W26 | Jumper | JPW-02A |
| W27 | Jumper | JPW-02A |
| W28 | Jumper | JPW-02A |
| W29 | Jumper | IPS-1041-4 |
| W30 | Jumper | JPW-02A |
| W31 | Jumper | IPS-1041-4 |
| W32 | Jumper | IPS-1041-4 |
| W33 | Jumper | IPS-1041-4 |
| W34 | Jumper | JPW-02A |

[DISPLAY UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|-------------|----------|-------|
| IC1 | IC | μPD549C | |
| IC2 | IC | μPD549C | |
| IC3 | IC | μA78L05 | |
| Q1 | Transistor | 2SC1214 | |
| Q2 | Transistor | 2SC1214 | |
| Q3 | Transistor | 2SA1015Y | |
| Q4 | Transistor | 2SC945P | |
| Q5 | Transistor | 2SC3402 | |
| D1 | Diode | 1SS55 | |
| D2 | Diode | 1SS55 | |
| D3 | Diode | 1SS55 | |
| D4 | Zener | RD6.2EB2 | |
| D5 | Zener | RD24EB2 | |
| D6 | Diode | 1SS55 | |
| D7 | Diode | 1SS55 | |
| D8 | Diode | 1SS55 | |
| D9 | Diode | 1SS55 | |
| D10 | Diode | 1SS55 | |
| D11 | Diode | 1SS53 | |
| D12 | Zener | RD5.1EB2 | |
| L1 | Coil | FL9H102K | |
| R1 | Resistor | 1K | R25 |
| R2 | Resistor | 1K | R25 |
| R3 | Resistor | 1K | R25 |
| R4 | Resistor | 1K | R25 |
| R5 | Resistor | 1K | ELR25 |
| R6 | Resistor | 1K | ELR25 |
| R7 | Resistor | 1K | ELR25 |
| R8 | Resistor | 1K | ELR25 |
| R9 | Resistor | 1K | ELR25 |
| R10 | Resistor | 1K | ELR25 |
| R11 | Array | RM-6 | 473 |
| R12 | Array | RM-10 | 473 |
| R13 | Array | RM-3 | 473 |
| R14 | Array | RM-8 | 473 |
| R15 | Resistor | 47K | ELR25 |
| R16 | Resistor | 2.7K | ELR25 |
| R17 | Resistor | 220 | ELR25 |
| R18 | Resistor | 2.7K | ELR25 |
| R19 | Resistor | 2.7K | ELR25 |
| R20 | Resistor | 2.7K | ELR25 |
| R21 | Resistor | 2.7K | ELR25 |
| R22 | Resistor | 2.7K | ELR25 |
| R23 | Resistor | 2.7K | ELR25 |
| R24 | Resistor | 2.7K | ELR25 |
| R25 | Resistor | 2.7K | ELR25 |
| R26 | Resistor | 2.7K | ELR25 |
| R27 | Resistor | 2.7K | ELR25 |
| R28 | Resistor | 2.7K | ELR25 |
| R29 | Array | RM-10 | 473 |
| R30 | Resistor | 47K | ELR25 |
| R31 | Resistor | 3.3K | ELR25 |
| R32 | Resistor | 3.3K | ELR25 |
| R33 | Resistor | 2.2 | ELR25 |
| R34 | Resistor | 47 | ELR25 |
| R35 | Resistor | 2.2K | ELR25 |
| R36 | Resistor | 2.2K | ELR25 |
| R37 | Resistor | 1K | ELR25 |
| R38 | Resistor | 100K | ELR25 |
| R39 | Resistor | 2.2K | ELR25 |

[DISPLAY UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|--------------|---------|
| R40 | Resistor | 82 | ELR25 |
| C1 | Array | B5RC0124-32N | |
| C2 | Ceramic | 0.001 | 50V |
| C3 | Array | B5RC0124-32N | |
| C4 | Ceramic | 0.001 | 50V |
| C5 | Ceramic | 0.001 | 50V |
| C6 | Ceramic | 0.001 | 50V |
| C7 | Ceramic | 0.0047 | 50V |
| C8 | Ceramic | 0.0047 | 50V |
| C9 | Ceramic | 0.0047 | 50V |
| C10 | Array | B8ZC0111-32N | |
| C11 | Ceramic | 0.0047 | 50V |
| C12 | Ceramic | 330P | 50V |
| C13 | Ceramic | 330P | 50V |
| C14 | Electrolytic | 33 | 16V |
| C15 | Electrolytic | 4.7 | 25V RC2 |
| C16 | Electrolytic | 3.3 | 50V RC2 |
| C17 | Electrolytic | 3.3 | 50V RC2 |
| C18 | Electrolytic | 0.1 | 50V RC2 |
| C19 | Electrolytic | 10 | 16V RC2 |
| C20 | Electrolytic | 10 | 16V RC2 |
| C21 | Electrolytic | 10 | 16V RC2 |
| C22 | Electrolytic | 10 | 16V RC2 |
| C23 | Ceramic | 0.0047 | 50V |
| C24 | Ceramic | 0.0047 | 50V |
| J1 | Connector | TL-25P-06-V1 | |
| J2 | Connector | TL-25P-02-V1 | |
| P1 | Connector | TL-25H-11-B1 | |
| P2 | Connector | TL-25H-10-B1 | |
| DS1 | FLD | FIP9BM7 | |
| T1 | Transformer | TO-9 | |
| B1 | P.C. Board | B-860A | |
| W17 | Jumper | JPW-02H | |
| W18 | Jumper | JPW-02H | |
| W19 | Jumper | JPW-02H | |
| W20 | Jumper | JPW-02A | |
| W21 | Jumper | JPW-02H | |
| W22 | Jumper | JPW-02A | |
| W23 | Jumper | JPW-02H | |
| W24 | Jumper | JPW-02H | |
| W25 | Jumper | IPS-1041-4 | |
| W26 | Jumper | IPS-1041-4 | |
| W27 | Jumper | IPS-1041-4 | |
| W28 | Jumper | IPS-1041-4 | |
| W29 | Jumper | IPS-1041-4 | |
| W30 | Jumper | IPS-1041-4 | |
| W31 | Jumper | IPS-1041-4 | |
| W32 | Jumper | IPS-1041-4 | |
| W33 | JUmpers | JPW-02A | |
| W34 | Jumper | JPW-02A | |
| W35 | Jumper | IPS-1041-2 | |
| W36 | Jumper | IPS-1041-4 | |
| W37 | Jumper | IPS-1041-4 | |
| W38 | Jumper | JPW-02A | |
| W39 | Jumper | JPW-02H | |
| W40 | Jumper | JPW-02H | |
| W41 | Jumper | IPS-1041-4 | |

[DISPLAY UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|------------|
| W42 | Jumper | IPS-1041-4 |
| W43 | Jumper | IPS-1041-4 |
| W44 | Jumper | IPS-1041-4 |
| W45 | Jumper | IPS-1041-4 |
| W46 | Jumper | IPS-1041-4 |
| W47 | Jumper | JPW-02A |
| W48 | Jumper | JPW-02A |
| W49 | Jumper | JPW-02A |
| W50 | Jumper | JPW-02A |
| W51 | Jumper | JPW-02A |
| W52 | Jumper | JPW-02H |

[MATRIX UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|--------------|
| IC1 | IC | TC4013BP |
| IC2 | IC | μ A78L05 |
| IC3 | IC | TC4013BP |
| IC4 | IC | TC4516BP |
| IC5 | IC | TC4516BP |
| IC6 | IC | DP-2 |
| Q1 | Transistor | 2SC2458GR |
| Q2 | Transistor | 2SC2458GR |
| Q3 | Transistor | 2SC2458GR |
| Q4 | Transistor | 2SC945P |
| Q6 | Transistor | 2SA1345 |
| Q7 | Transistor | 2SC3402 |
| Q8 | Transistor | 2SC2458GR |
| Q9 | Transistor | 2SC2458GR |
| Q10 | Transistor | 2SC2458GR |
| Q11 | Transistor | 2SC2458GR |
| Q12 | Transistor | 2SC2458GR |
| Q14 | Transistor | 2SA1345 |
| Q15 | Transistor | 2SA1345 |
| Q16 | Transistor | 2SC3402 |
| D1 | Diode | 1SS133 |
| D2 | Diode | 1SS133 |
| D3 | Diode | 1SS133 |
| D4 | Diode | 1N4002 |
| D5 | Diode | 1SS133 |
| D6 | Diode | 1SS133 |
| D7 | Diode | 1SS133 |
| D8 | Diode | 1SS133 |
| D9 | Diode | 1SS133 |
| D10 | Diode | 1SS133 |
| D11 | Diode | 1SS133 |
| D12 | Diode | 1SS133 |
| D13 | Diode | 1SS133 |
| D14 | Diode | 1SS133 |
| D15 | Diode | 1SS133 |
| D16 | Diode | 1SS133 |
| D17 | Diode | 1SS133 |
| D18 | Diode | 1SS133 |
| D19 | Diode | 1SS133 |
| D20 | Diode | 1SS133 |
| D21 | Diode | 1SS133 |
| D22 | Diode | 1SS133 |
| D23 | Diode | 1SS133 |
| D27 | Diode | 1SS133 |
| D28 | Diode | 1SS133 |
| L1 | Coil | LAL04NA102 |
| L2 | Coil | LAL04NA102 |
| L3 | Coil | LAL04NA102 |
| R1 | Resistor | 100K ELR25 |
| R2 | Resistor | 47K ELR25 |
| R3 | Resistor | 47K ELR25 |
| R4 | Resistor | 47K ELR25 |
| R5 | Resistor | 47K R25 |
| R6 | Resistor | 47K ELR25 |
| R7 | Resistor | 47K R25 |
| R8 | Resistor | 1M ELR25 |
| R9 | Resistor | 47K R25 |
| R10 | Resistor | 1K R25 |
| R11 | Resistor | 150K ELR25 |
| R12 | Resistor | 1M ELR25 |

[MATRIX UNIT]

| REF NO. | DESCRIPTION | PART NO. | |
|---------|--------------|--------------|---------|
| R13 | Resistor | 47K | ELR25 |
| R14 | Resistor | 1K | R25 |
| R15 | Resistor | 47K | R25 |
| R16 | Resistor | 47K | ELR25 |
| R17 | Resistor | 47K | ELR25 |
| R19 | Resistor | 10K | ELR25 |
| R20 | Trimmer | 10K | H0651A |
| R21 | Resistor | 220K | ELR25 |
| R22 | Resistor | 220K | R25 |
| R23 | Resistor | 220K | ELR25 |
| R24 | Resistor | 220K | ELR25 |
| R25 | Resistor | 220K | R25 |
| R26 | Resistor | 47K | R25 |
| R28 | Resistor | 1K | R25 |
| R31 | Resistor | 22K | ELR25 |
| R32 | Resistor | 10K | R10 |
| R33 | Resistor | 10K | R25 |
| C1 | Ceramic | 0.01 | 50V (Z) |
| C2 | Barrier Lay | 0.1 | 16V |
| C3 | Electrolytic | 0.47 | 50V RC2 |
| C4 | Barrier Lay | 0.1 | 16V |
| C5 | Ceramic | 0.0047 | 50V |
| C6 | Barrier Lay | 0.1 | 16V |
| C7 | Barrier Lay | 0.1 | 16V |
| C9 | Electrolytic | 100 | 10V |
| C10 | Barrier Lay | 0.1 | 16V |
| C11 | Ceramic | 0.0047 | 50V |
| C13 | Electrolytic | 100 | 10V |
| C14 | Barrier Lay | 0.1 | 16V |
| C15 | Ceramic | 0.0047 | 50V |
| C16 | Ceramic | 0.0047 | 50V |
| C17 | Ceramic | 0.0047 | 50V |
| C18 | Electrolytic | 47 | 16V |
| C19 | Electrolytic | 47 | 16V |
| C20 | Electrolytic | 4.7 | 50V |
| C21 | Barrier Lay | 0.1 | 16V |
| RL1 | Relay | FBR221D012 | |
| J1 | Connector | TL-25P-05-V1 | |
| J2 | Connector | TL-25P-08-V1 | |
| J3 | Connector | TL-25P-07-V1 | |
| J4 | Connector | TLB-P08H-B1 | |
| J5 | Connector | TL-25P-02-V1 | |
| J6 | Connector | TL-25P-09-V1 | |
| J7 | Connector | TL-25P-06-V1 | |
| J8 | Connector | TLB-P10H-B1 | |
| J9 | Connector | TLB-P03H-B1 | |
| J10 | Connector | TLB-P03H-B1 | |
| J11 | Connector | TL-25P-12-V1 | |
| J12 | Connector | TL-25P-08-V1 | |
| J13 | Connector | TLB-P03H-B1 | |
| J14 | Connector | TL-25P-06-V1 | |
| J15 | Connector | TL-25P-07-V1 | |
| J16 | Connector | TL-25P-09-V1 | |
| J17 | Connector | RT-01T-1.3B | |
| J18 | Connector | TL-25P-05-V1 | |
| J19 | Connector | TL-25P-05-V1 | |
| J20 | Connector | TL-25P-07-V1 | |
| J21 | Connector | TL-25P-06-V1 | |
| J22 | Connector | TL-25P-05-V1 | |
| J23 | Connector | RT-01T-1.0B | |
| J24 | Connector | RT-01T-1.0B | |

[MATRIX UNIT]

| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|----------------|
| P1 | Connector | TL-25H-08-B1 |
| P2 | Connector | TL-25H-10-B1 |
| P3 | Connector | TL-25H-05-B1 |
| P4 | Connector | TL-25H-06-B1 |
| P5 | Connector | TL-25H-02-B1 |
| P6 | Connector | TL-25H-06-B1 |
| S1 | Switch | SSS212 Type B |
| S2 | Switch | HKW0269-01-200 |
| B1 | P.C.Board | B-867A |
| W17 | Jumper | IPS-1041-4 |
| W18 | Jumper | IPS-1041-4 |
| W19 | Jumper | IPS-1041-4 |
| W20 | Jumper | IPS-1041-4 |
| W21 | Jumper | IPS-1041-4 |
| W22 | Jumper | IPS-1041-4 |
| W23 | Jumper | IPS-1041-4 |
| W24 | Jumper | IPS-1041-4 |
| W25 | Jumper | JPW-02H |
| W26 | Jumper | JPW-02H |
| W28 | Jumper | JPW-02H |
| W31 | Jumper | JPW-02H |
| W32 | Jumper | JPW-02H |
| W33 | Jumper | JPW-02A |
| W34 | Jumper | JPW-02A |
| W35 | Jumper | JPW-02A |
| W36 | Jumper | JPW-02A |
| W37 | Jumper | ISP-1041-4 |
| W38 | Jumper | JPW-02H |
| W39 | Jumper | JPW-02A |
| W40 | Jumper | JPW-02A |
| W41 | Jumper | JPW-02A |
| W42 | Jumper | JPW-02A |
| W43 | Jumper | JPW-02A |
| W44 | Jumper | JPW-02A |
| W45 | Jumper | JPW-02A |
| W46 | Jumper | JPW-02A |
| W47 | Jumper | JPW-02H |
| W48 | Jumper | IPS-1041-2 |
| W49 | Jumper | JPW-02H |
| W50 | Jumper | JPW-02H |
| W51 | Jumper | ISP-1041-4 |
| W83 | Jumper | JPW-02A |
| W84 | Jumper | JPW-02A |

[TEN-KEY UNIT]

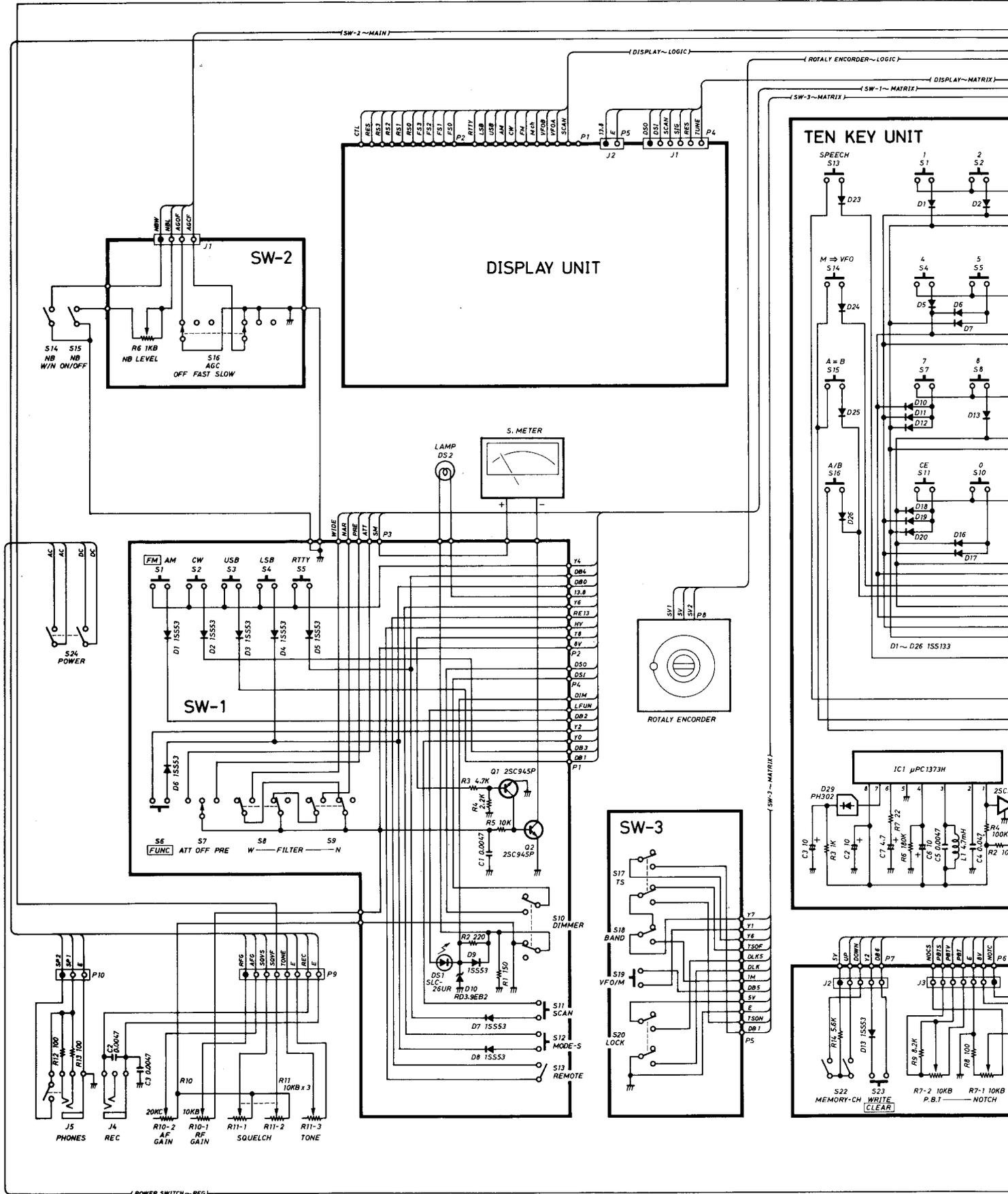
| REF NO. | DESCRIPTION | PART NO. |
|---------|--------------|----------------|
| IC1 | IC | μ PC1373H |
| Q1 | Transistor | 2SC3399 |
| D1 | Diode | 1SS133 |
| D2 | Diode | 1SS133 |
| D3 | Diode | 1SS133 |
| D4 | Diode | 1SS133 |
| D5 | Diode | 1SS133 |
| D6 | Diode | 1SS133 |
| D7 | Diode | 1SS133 |
| D8 | Diode | 1SS133 |
| D9 | Diode | 1SS133 |
| D10 | Diode | 1SS133 |
| D11 | Diode | 1SS133 |
| D12 | Diode | 1SS133 |
| D13 | Diode | 1SS133 |
| D14 | Diode | 1SS133 |
| D15 | Diode | 1SS133 |
| D16 | Diode | 1SS133 |
| D17 | Diode | 1SS133 |
| D18 | Diode | 1SS133 |
| D19 | Diode | 1SS133 |
| D20 | Diode | 1SS133 |
| D21 | Diode | 1SS133 |
| D22 | Diode | 1SS133 |
| D23 | Diode | 1SS133 |
| D24 | Diode | 1SS133 |
| D25 | Diode | 1SS133 |
| D26 | Diode | 1SS133 |
| D28 | Zener | RD11EB1 |
| D29 | Photo | PH302 |
| L1 | Coil | FL-7H 472 |
| R1 | Resistor | 470 R25 |
| R2 | Resistor | 100 R25 |
| R3 | Resistor | 1K ELR10 |
| R4 | Resistor | 100K ELR10 |
| R5 | Resistor | 2.7K R25 |
| R6 | Resistor | 100K ELR10 |
| R7 | Resistor | 5.6 ELR10 |
| C1 | Ceramic | 0.0047 50V |
| C2 | Electrolytic | 10 16V RC2 |
| C3 | Electrolytic | 10 16V RC2 |
| C4 | Barrier Lay | 0.1 16V |
| C5 | Ceramic | 0.0047 50V |
| C6 | Electrolytic | 10 16V RC2 |
| C7 | Electrolytic | 4.7 25V RC2 |
| P1 | Connector | TL-25H-08-B1 |
| P2 | Connector | TL-25H-09-B1 |
| DS1 | LED | LN233RP |
| S1 | Switch | HKW0269-01-200 |
| S2 | Switch | HKW0269-01-200 |
| S3 | Switch | HKW0269-01-200 |
| S4 | Switch | HKW0269-01-200 |
| S6 | Switch | HKW0269-01-200 |
| S7 | Switch | HKW0269-01-200 |
| S8 | Switch | KHW0269-01-200 |

[TEN-KEY UNIT]

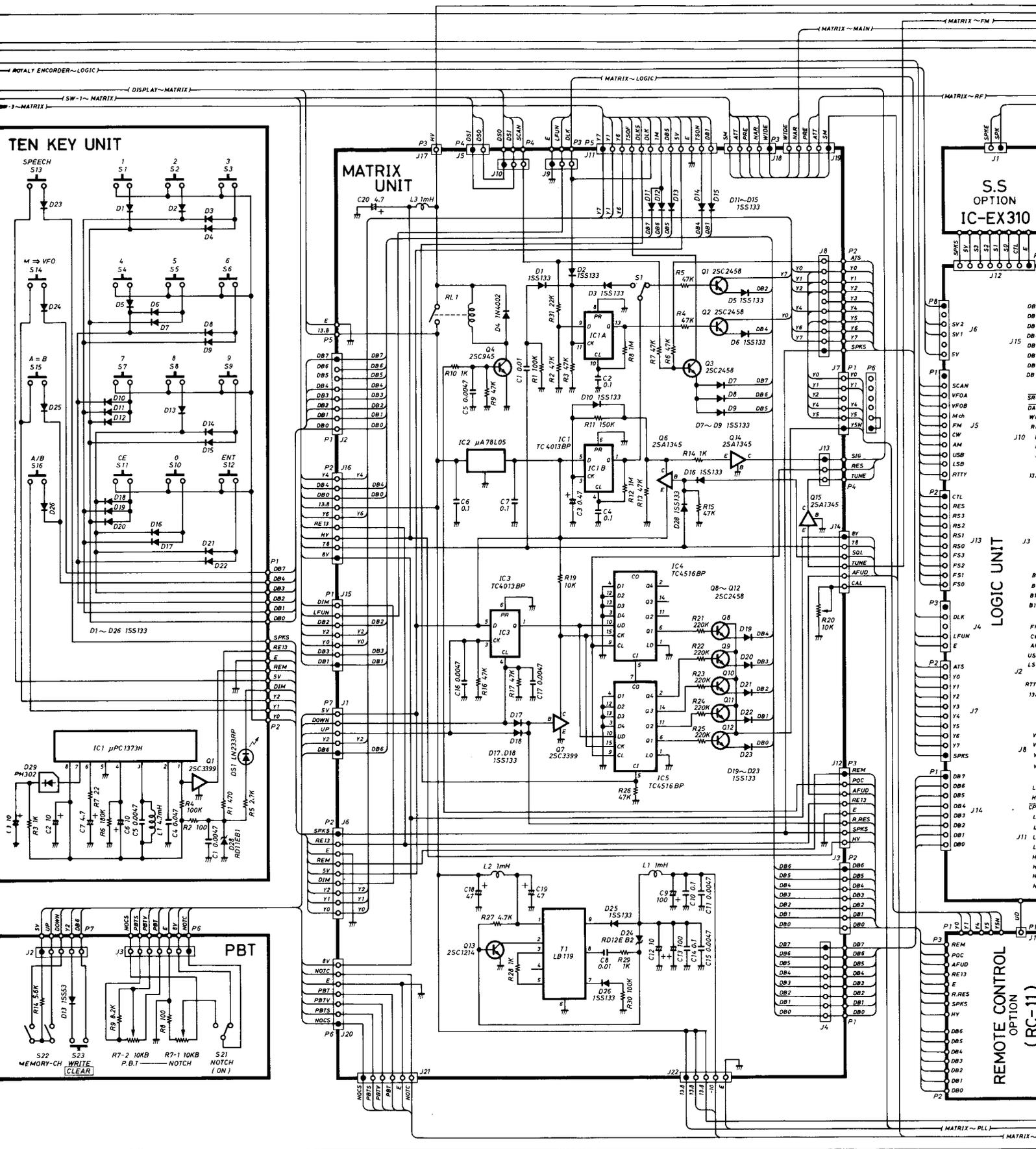
| REF NO. | DESCRIPTION | PART NO. |
|---------|-------------|----------------|
| S9 | Switch | HKW0269-01-200 |
| S10 | Switch | HKW0269-01-200 |
| S11 | Switch | HKW0269-01-200 |
| S12 | Switch | HKW0269-01-200 |
| S13 | Switch | HKW0269-01-200 |
| S14 | Switch | HKW0269-01-200 |
| S15 | Switch | HKW0269-01-200 |
| S16 | Switch | HKW0269-01-200 |
| B1 | P.C.Board | B-866A |
| W1 | Jumper | JPW-02A |
| W2 | Jumper | JPW-02A |
| W3 | Jumper | JPW-02A |

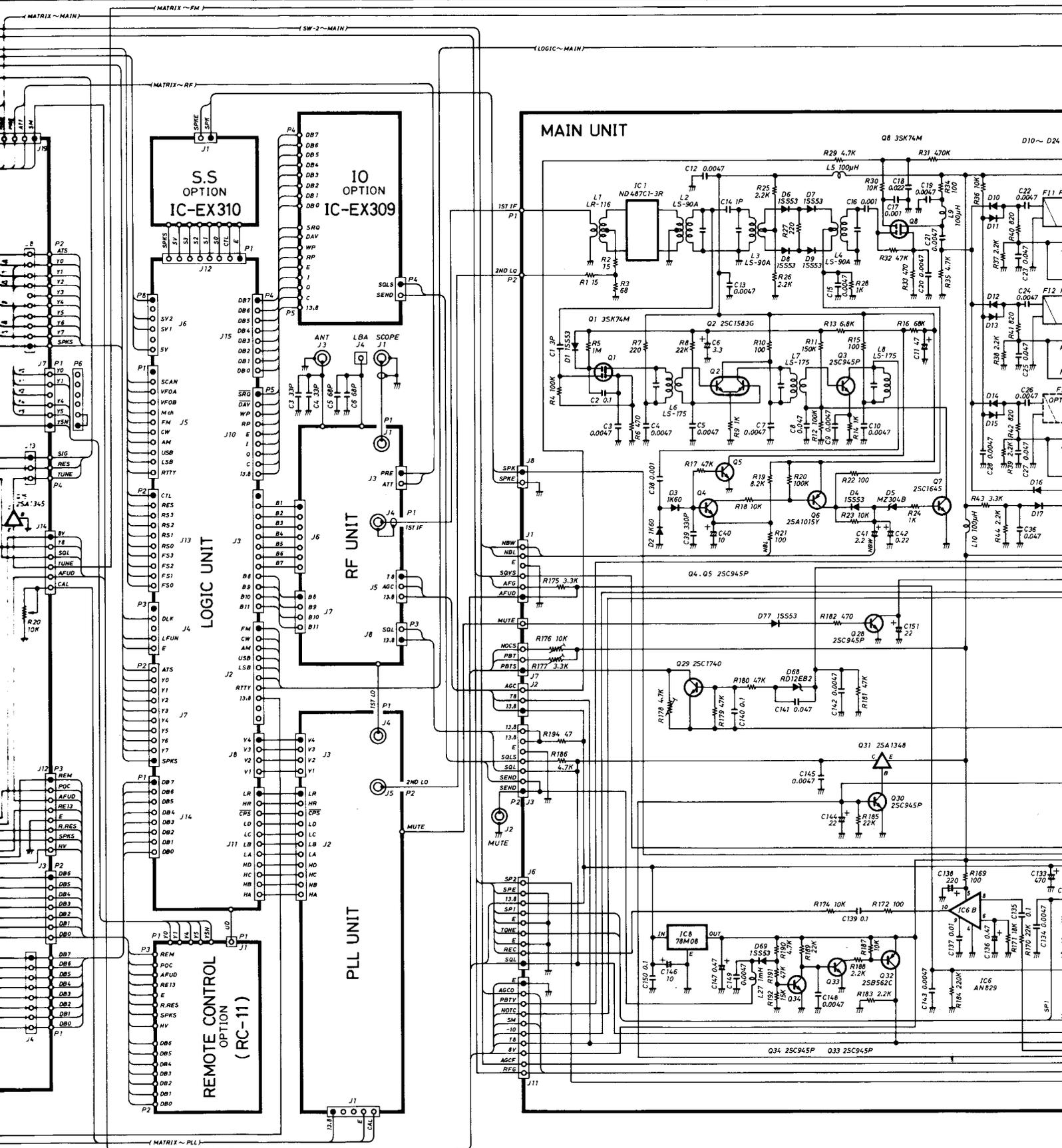
| [REG UNIT] | | | [DL-REG UNIT] | | |
|------------|--------------|-------------------|---------------|--------------|----------------------|
| REF NO. | DESCRIPTION | PART NO. | REG NO. | DESCRIPTION | PART NO. |
| Q1 | Transistor | 2SD880 | Q1 | Transistor | 2SD880 |
| Q2 | Transistor | 2SA1015Y | Q2 | Transistor | 2SA1015Y |
| Q3 | Transistor | 2SC945P | Q3 | Transistor | 2SC945P |
| D1 | Diode | KBPC102 | D1 | Diode | KBPC102 |
| D2 | Zener | RD5.1E B2 | D2 | Zener | RD5.1EB2 |
| D3 | Zener | RD5.1E B2 | D3 | Zener | RD5.1EB2 |
| D4 | Diode | U05B | D4 | Diode | U05B |
| L1 | Coil | LW-16 | L1 | Coil | LW-16 |
| R1 | Resistor | 10K ELR25 | R1 | Resistor | 10K ELR25 |
| R2 | Resistor | SRW3P100-J | R2 | Resistor | SRW3P100-J |
| R3 | Resistor | 100 R25 | R3 | Resistor | 100 R25 |
| R4 | Resistor | 2.7K ELR25 | R4 | Resistor | 2.7K ELR25 |
| R5 | Trimmer | EVN5AC500 | R5 | Trimmer | EVN5AC500 |
| R6 | Resistor | 1K ELR25 | R6 | Resistor | 1K ELR25 |
| R7 | Resistor | 4.7 R25 | R7 | Resistor | 4.7 ELR25 |
| C1 | Ceramic | DE7090B102KVA1-KC | C1 | Ceramic | DE1110E102MACT4K-KD |
| C2 | Ceramic | DE7090B102KVA1-KC | C2 | Ceramic | DE1110E102MACT4K-KD |
| C3 | Ceramic | DD112B103K50V02 | C3 | Ceramic | DD112B103K50V02 |
| C4 | Ceramic | DD112B103K50V02 | C4 | Ceramic | DD112B103K50V02 |
| C5 | Ceramic | DD112B103K50V02 | C5 | Ceramic | DD112B103K50V02 |
| C6 | Ceramic | DD112B103K50V02 | C6 | Ceramic | DD112B103K50V02 |
| C7 | Electrolytic | 4700 25V | C7 | Electrolytic | RPE-25V472M |
| C8 | Barrier Lay | 0.1 16V | C8 | Barrier Lay | 0.1 16V |
| C9 | Electrolytic | 470 16V | C9 | Electrolytic | 470 16V |
| C10 | Ceramic | 0.0047 50V | C10 | Ceramic | 0.0047 50V |
| C11 | Electrolytic | 470 16V | C11 | Electrolytic | 470 16V |
| C12 | Barrier Lay | 0.1 16V | C12 | Barrier Lay | 0.1 16V |
| C13 | Electrolytic | 100 25V | C13 | Electrolytic | 100 25V |
| J1 | Connector | CM-3 | J1 | Connector | CM-3 |
| J2 | Connector | 1490-4P | | | |
| P1 | Connector | 3191-04R1 | P1 | Connector | 3191-04R1 |
| P2 | Connector | 1490-4R1 | P3 | Connector | 1P-SMF01T-1.3 |
| P3 | Connector | 1P-SMF 01T-1.3 | P4 | Connector | SPRING CONNECTOR (Y) |
| | | | P5 | Connector | SPRING CONNECTOR (Y) |
| F1 | Fuse Holder | FH-032 | P6 | Connector | 1625-03R1 |
| F1 | Fuse | 100 ~ 117V 1A | P7 | Connector | 1625-03P1 |
| F1 | Fuse | 230V 0.5A | F1 | Fuse Holder | FH-033 |
| F2 | Fuse | 2A | F1 | Fuse | 0.5A (F.G.M.S.) |
| F3 | Fuse Holder | S-N5051 | F2 | Fuse | 2A |
| F4 | Fuse Holder | S-N5051 | F3 | Fuse Holder | S-N5051 |
| | | | F4 | Fuse Holder | S-N5051 |
| T1 | Transformer | TP-28 | T1 | Transformer | TP-33 |
| B1 | P.C.Board | B-861 | B1 | P. C. Board | B-868 |
| W13 | Jumper | IPS-1041-4 | W1 | Jumper | JPW-02A |
| | | | W2 | Jumper | JPW-02A |

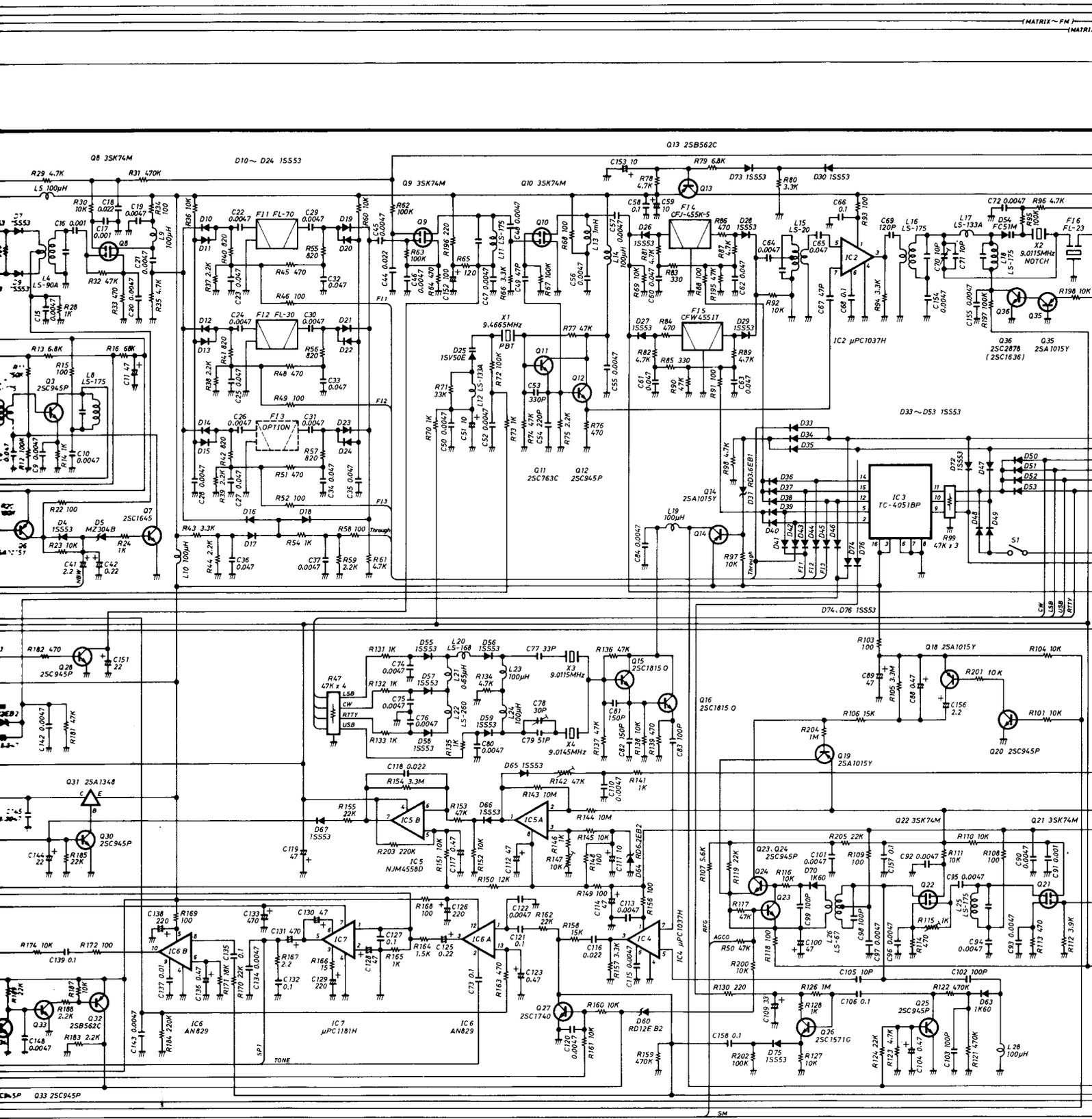
IC-R71 (A·E) SCHEMATIC

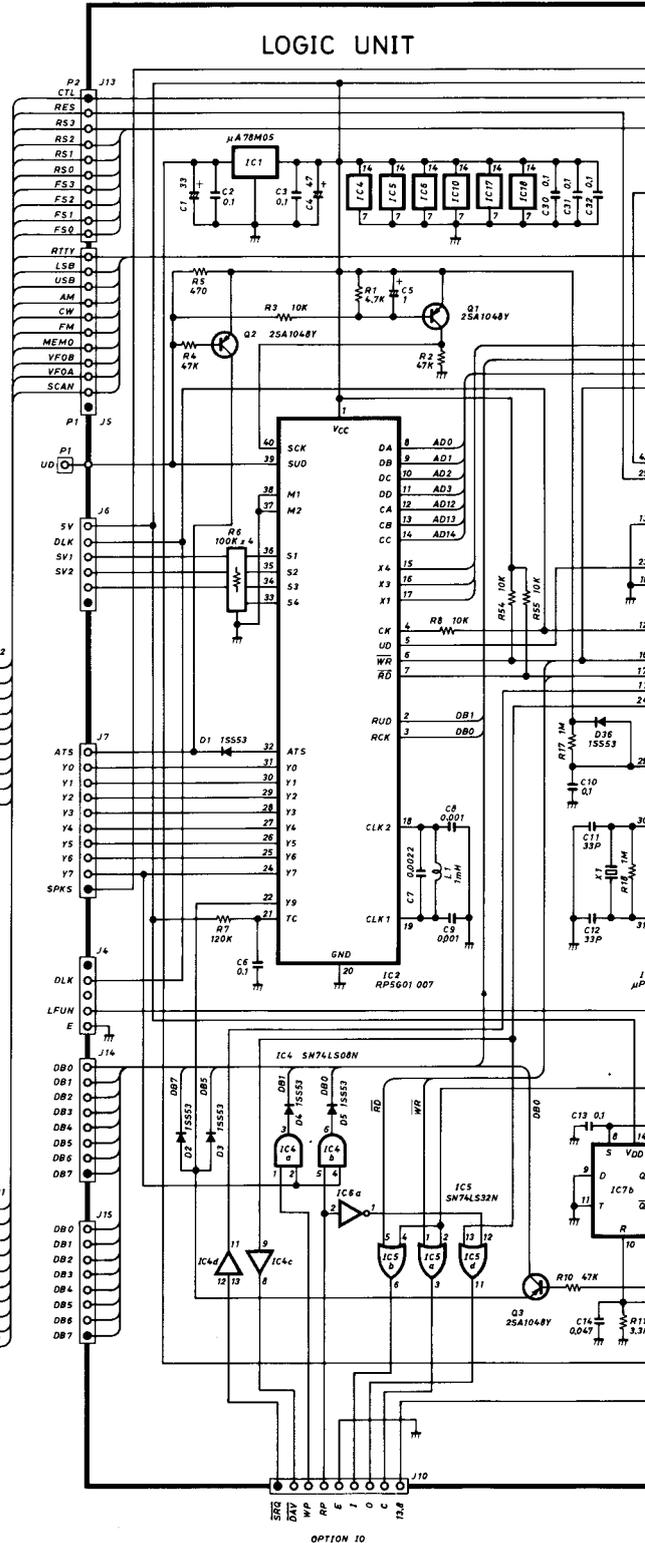
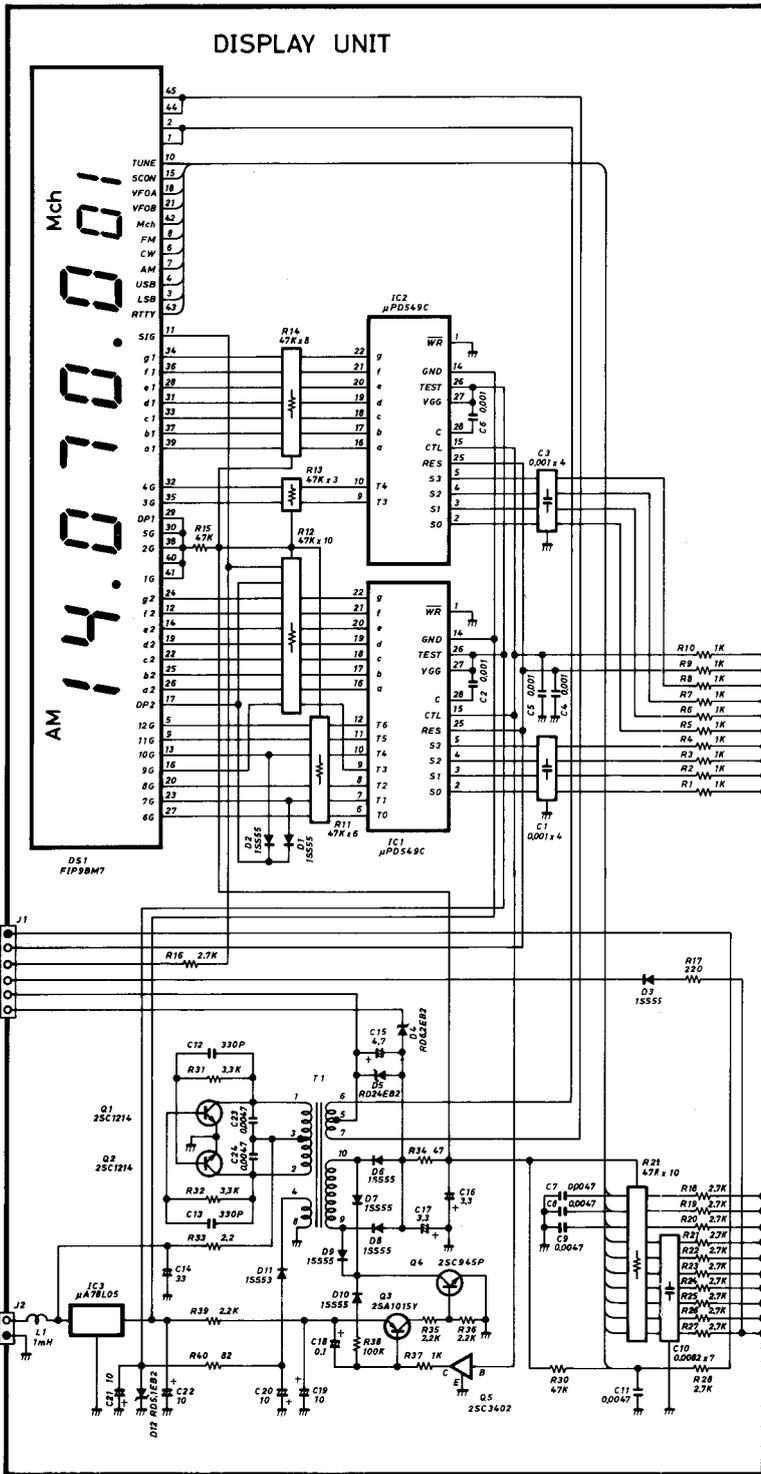


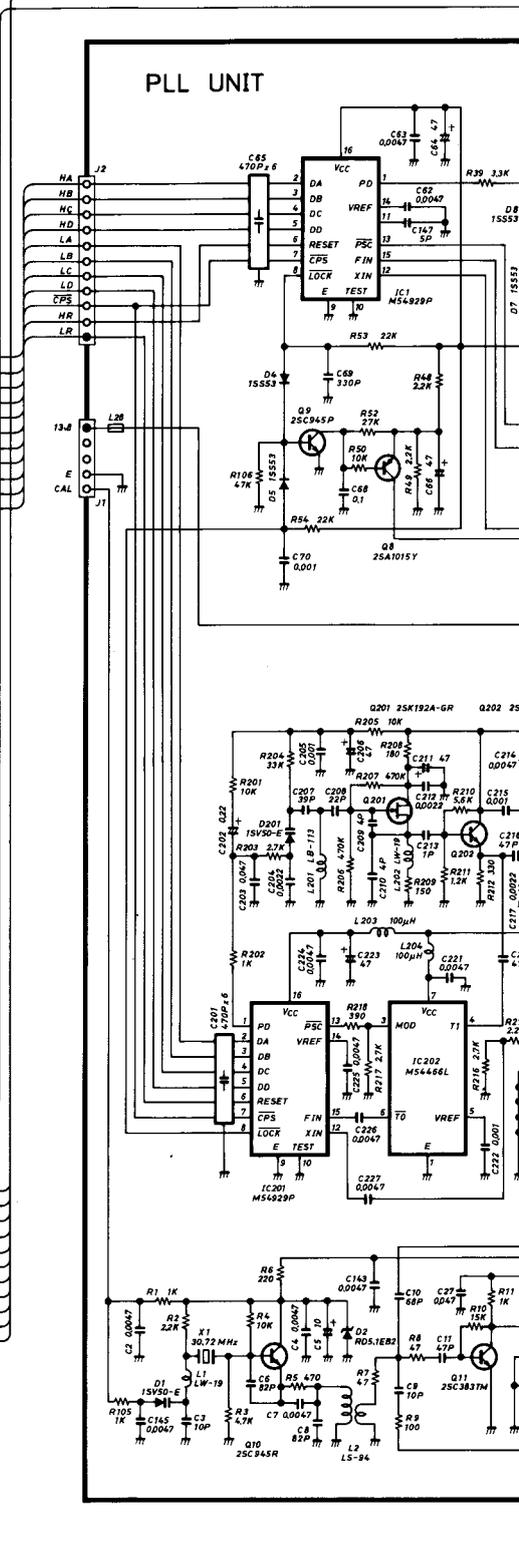
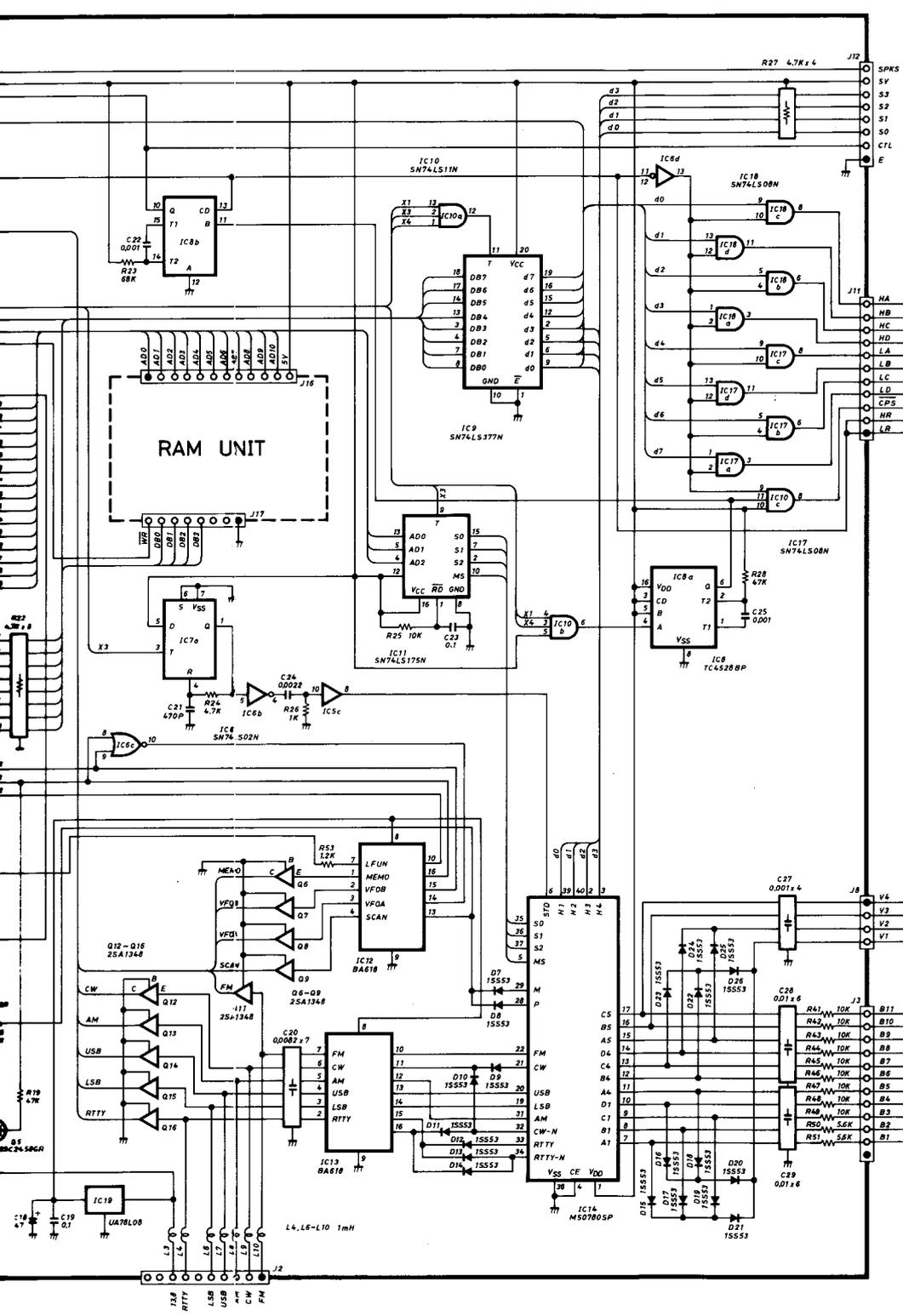
CHEMATIC DIAGRAM

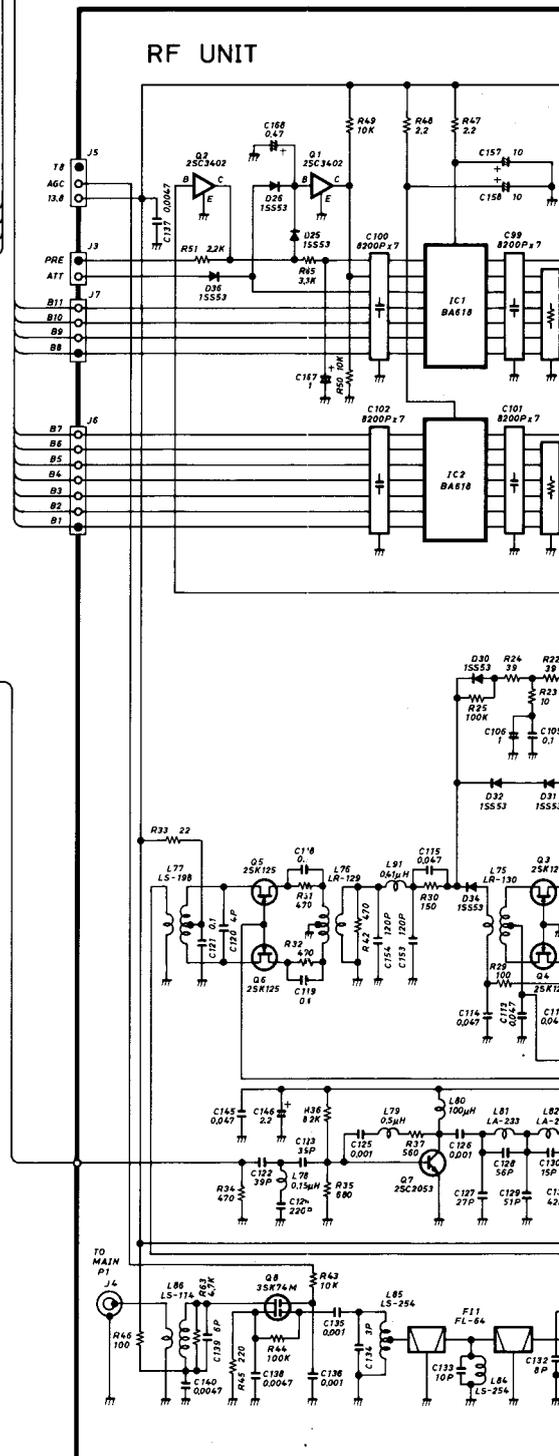
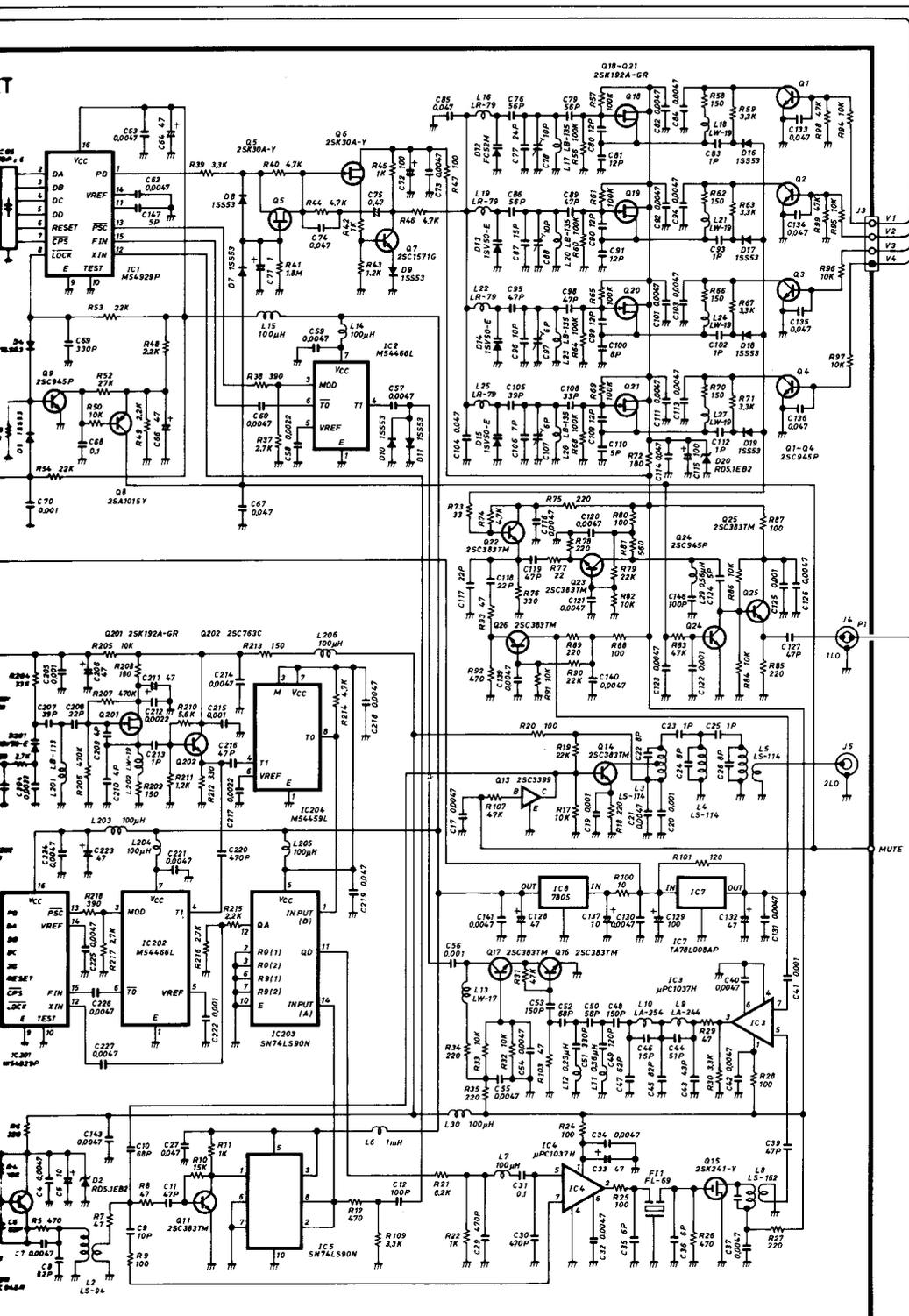


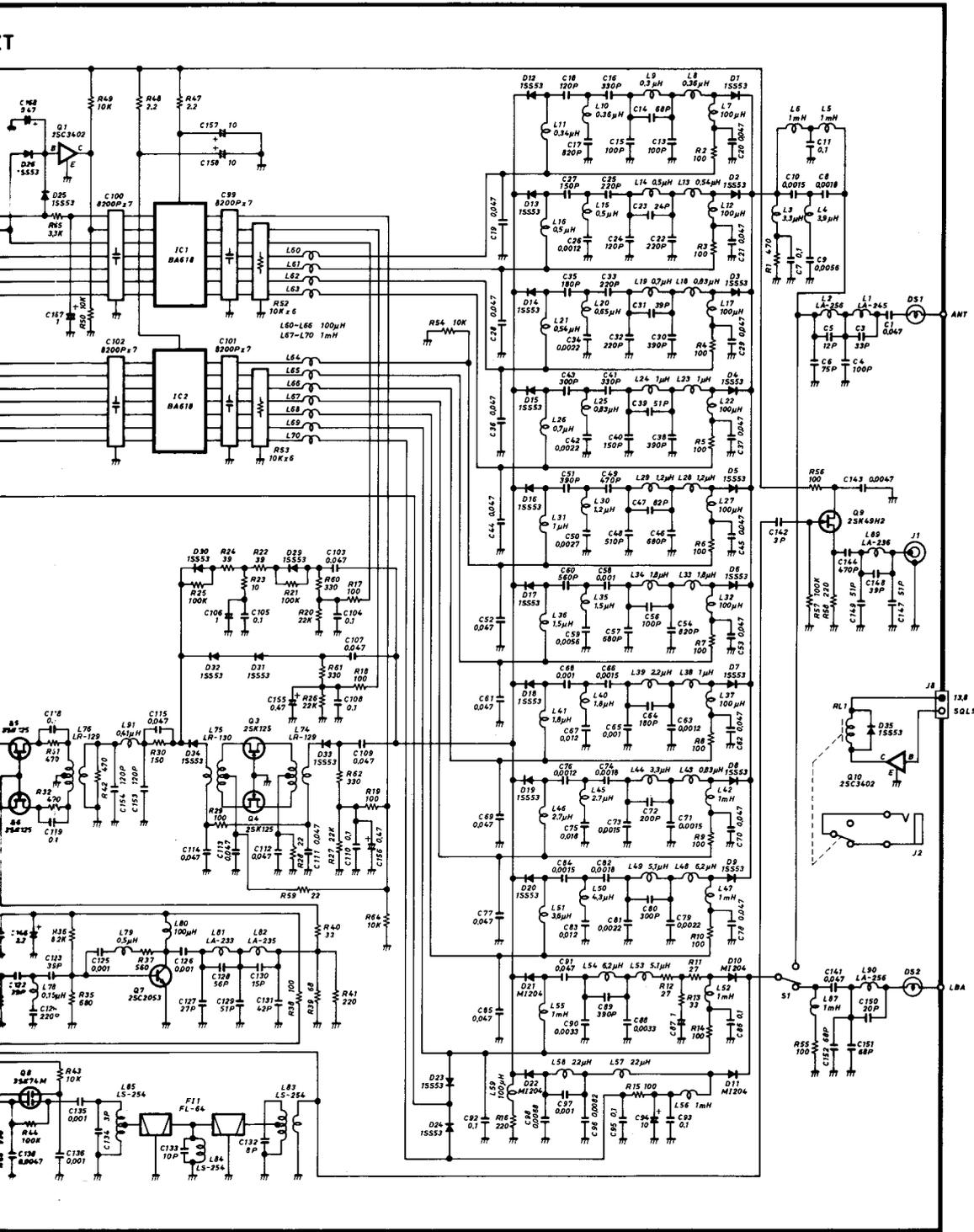














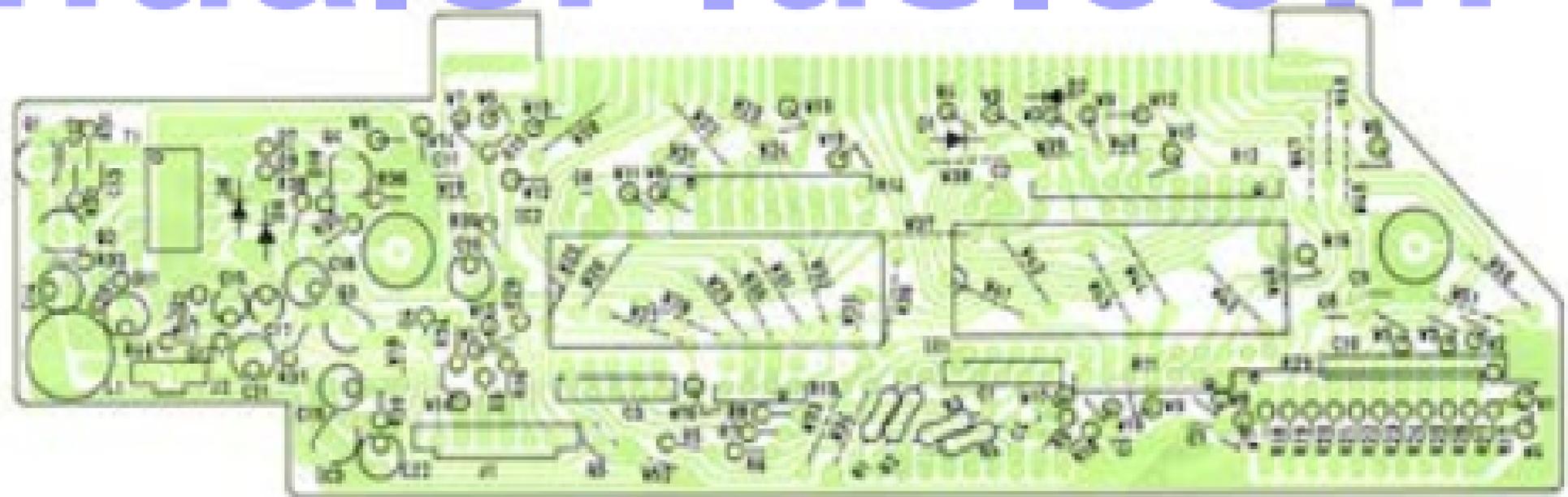
ICOM

IC-R71A/E/D

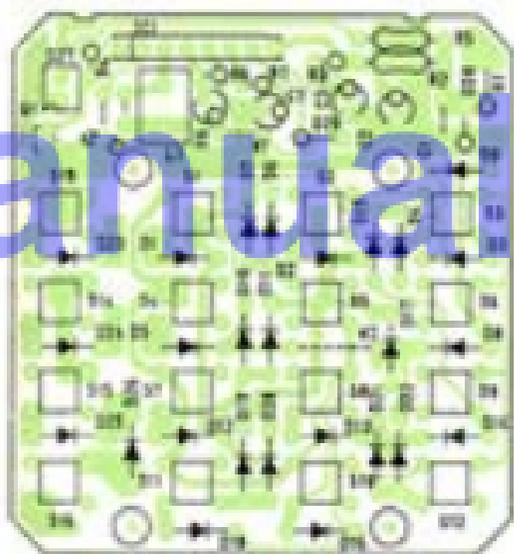
FRONT UNIT

■ **DISPLAY BOARD**

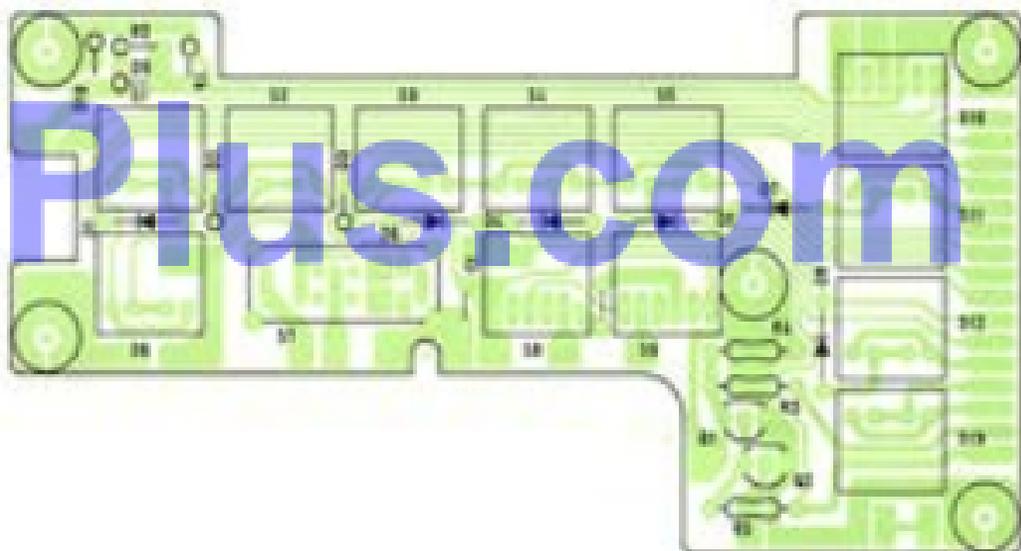
anualsPlus.com



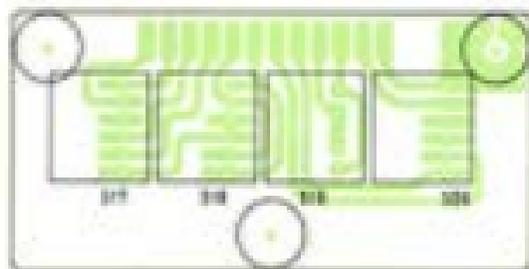
■ TEN KEY BOARD



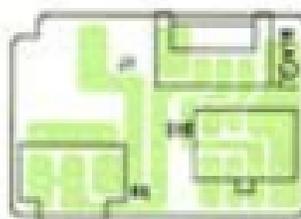
■ SW1 BOARD



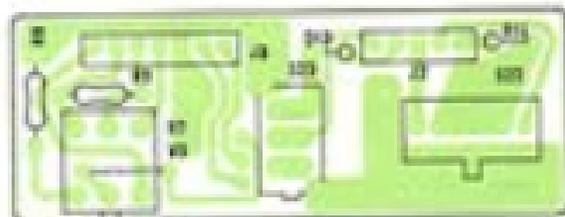
■ SW3 BOARD



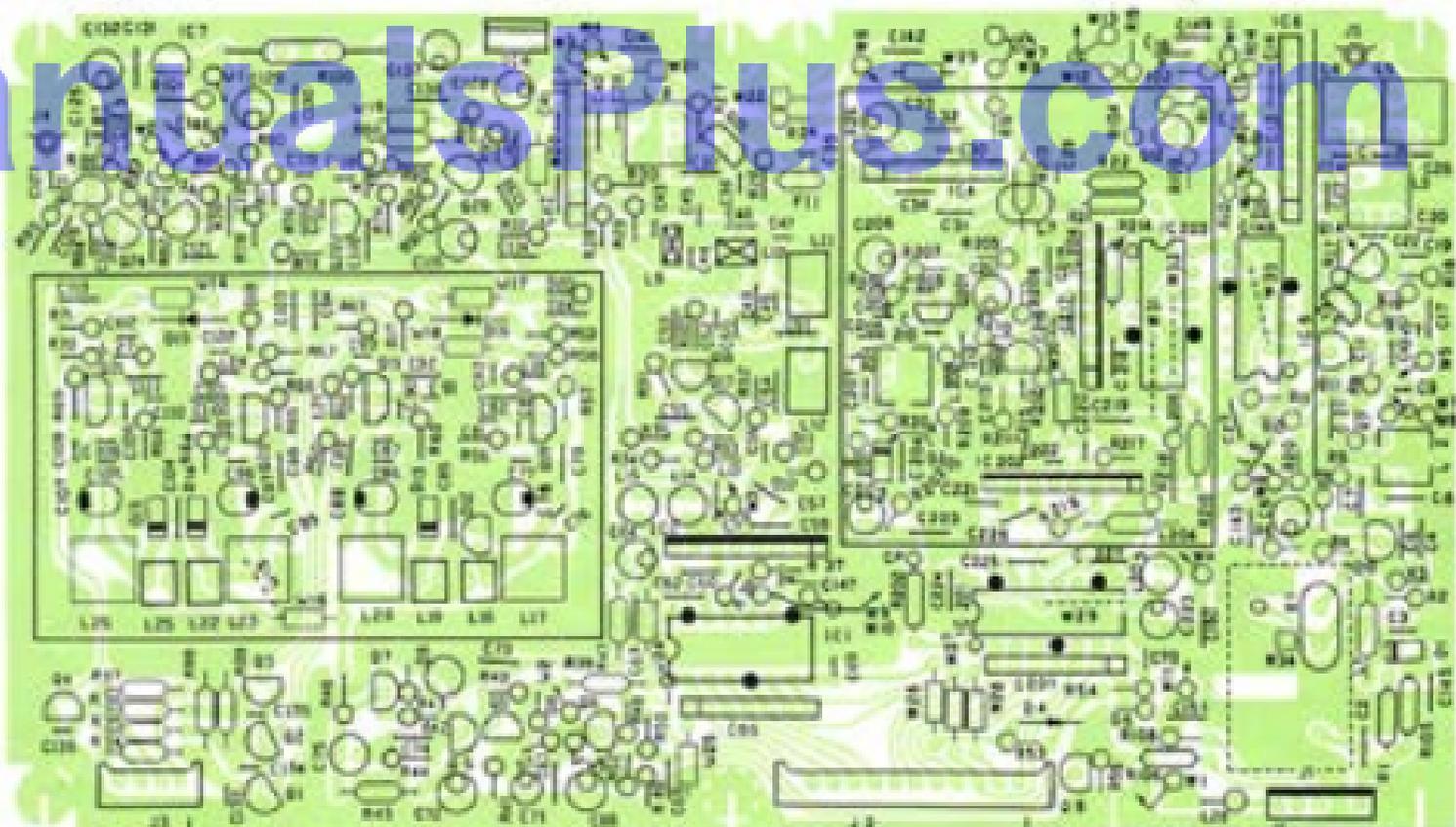
■ SW2 BOARD



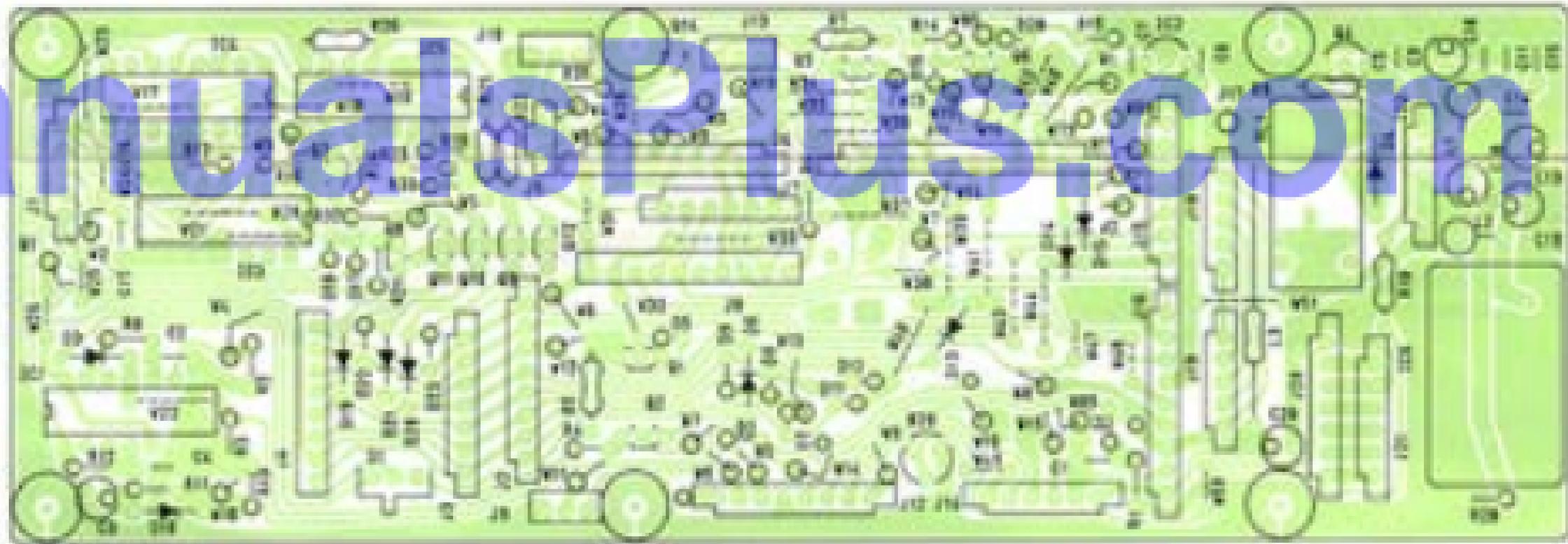
■ P.B.T. BOARD



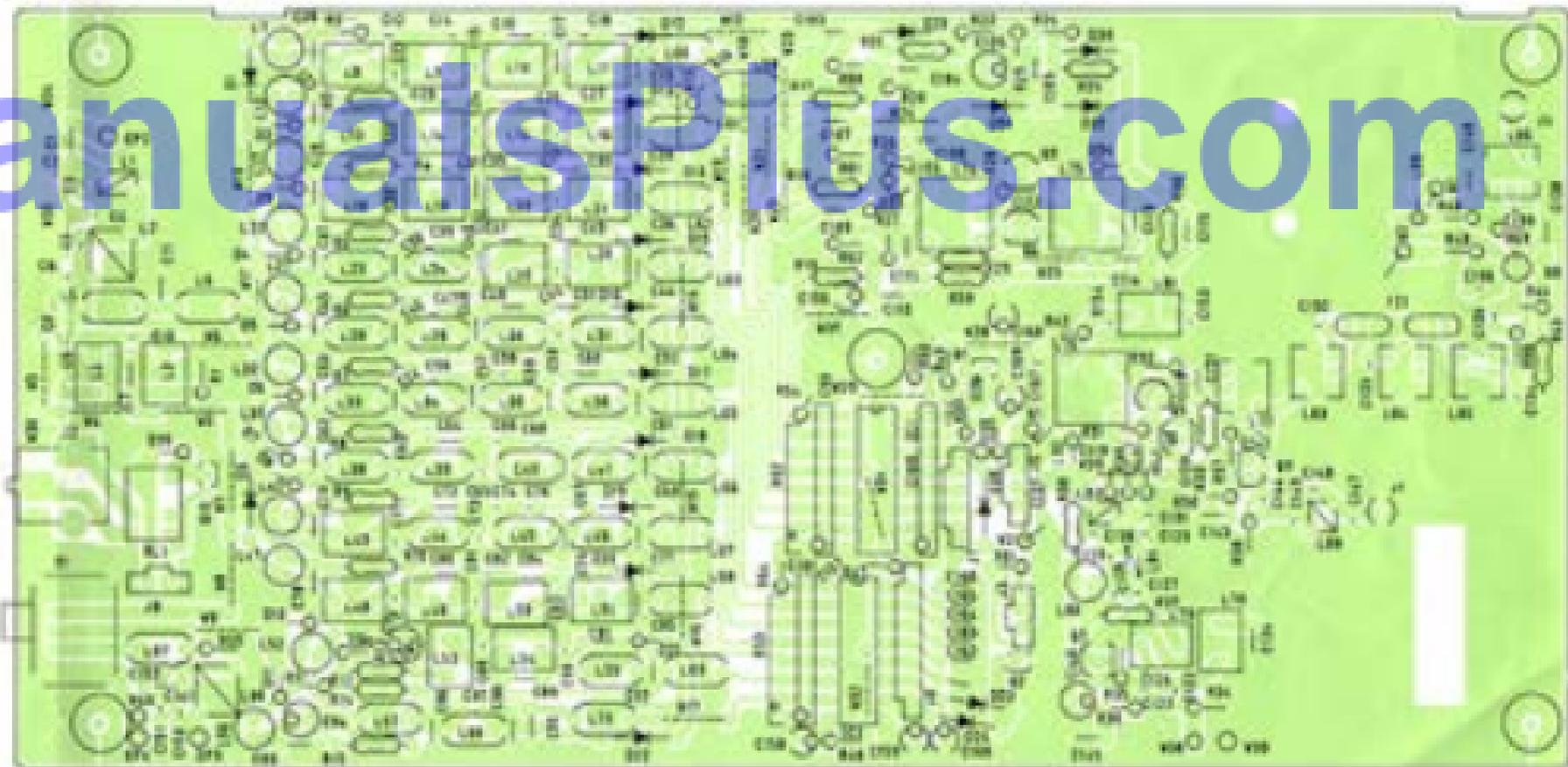
PLL UNIT



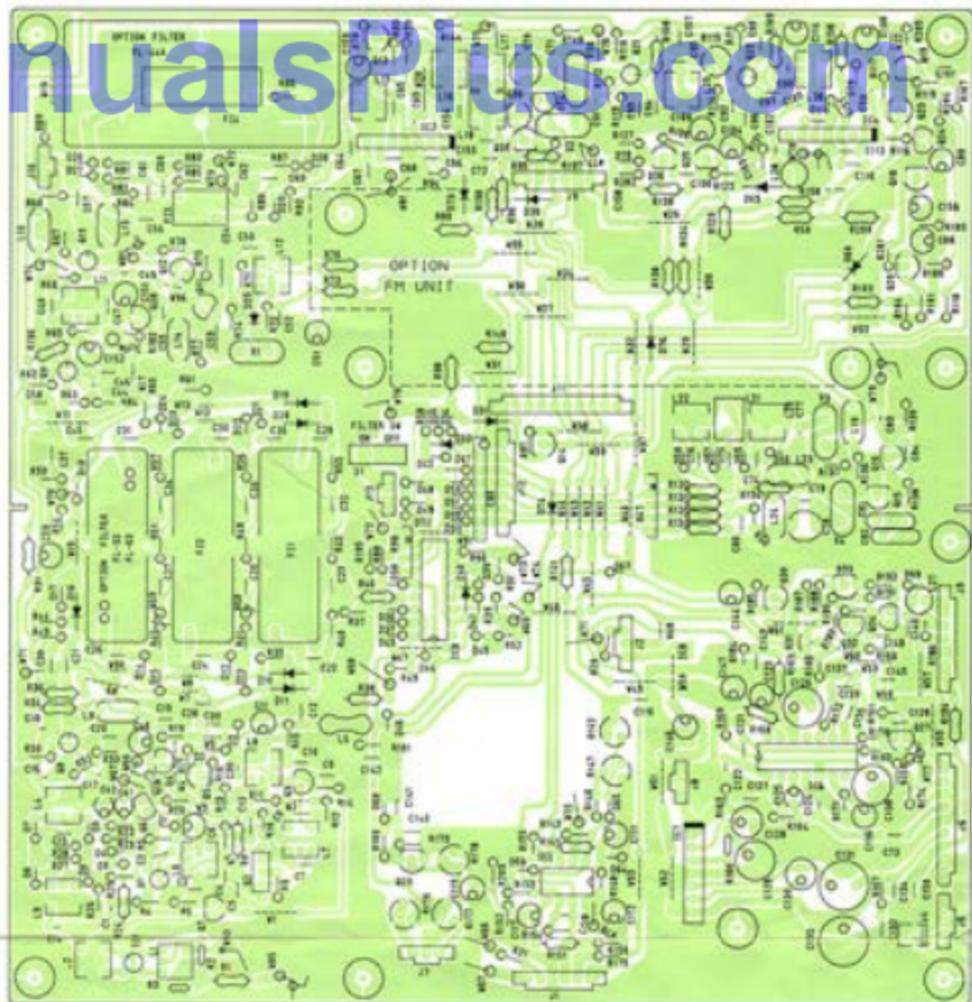
MATRIX UNIT



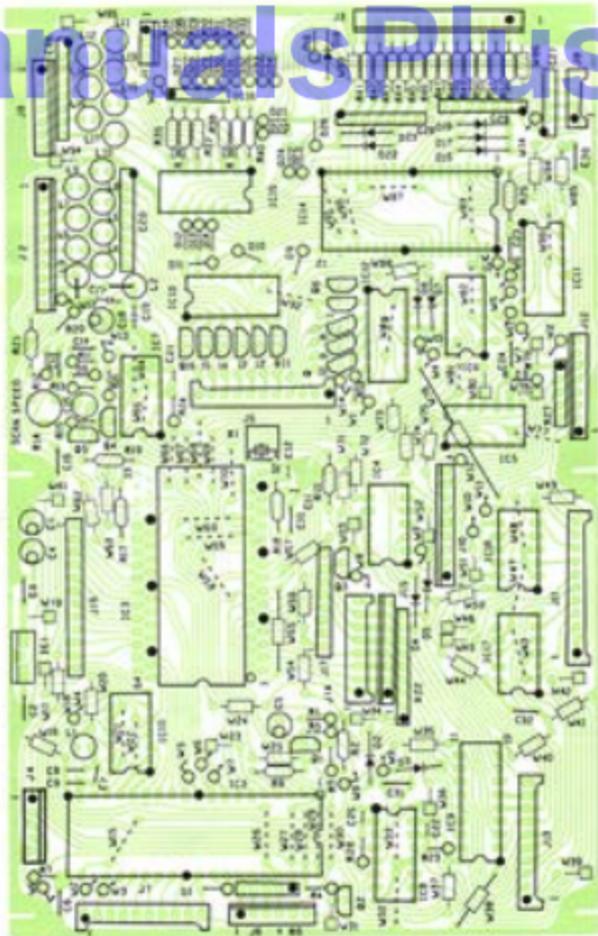
RF UNIT



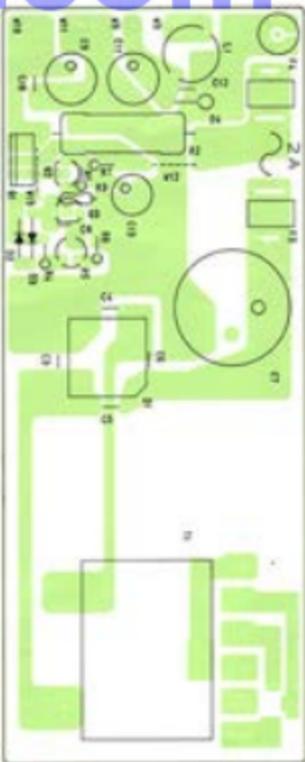
Manuals Plus.com



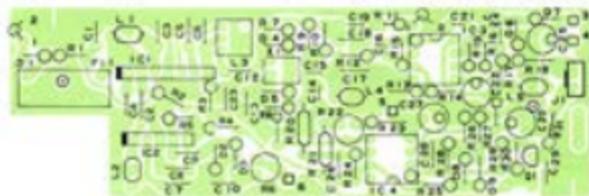
LOGIC UNIT



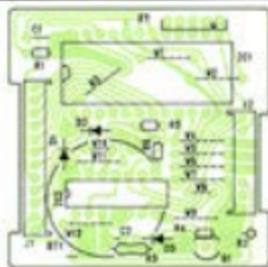
REGULATOR UNIT



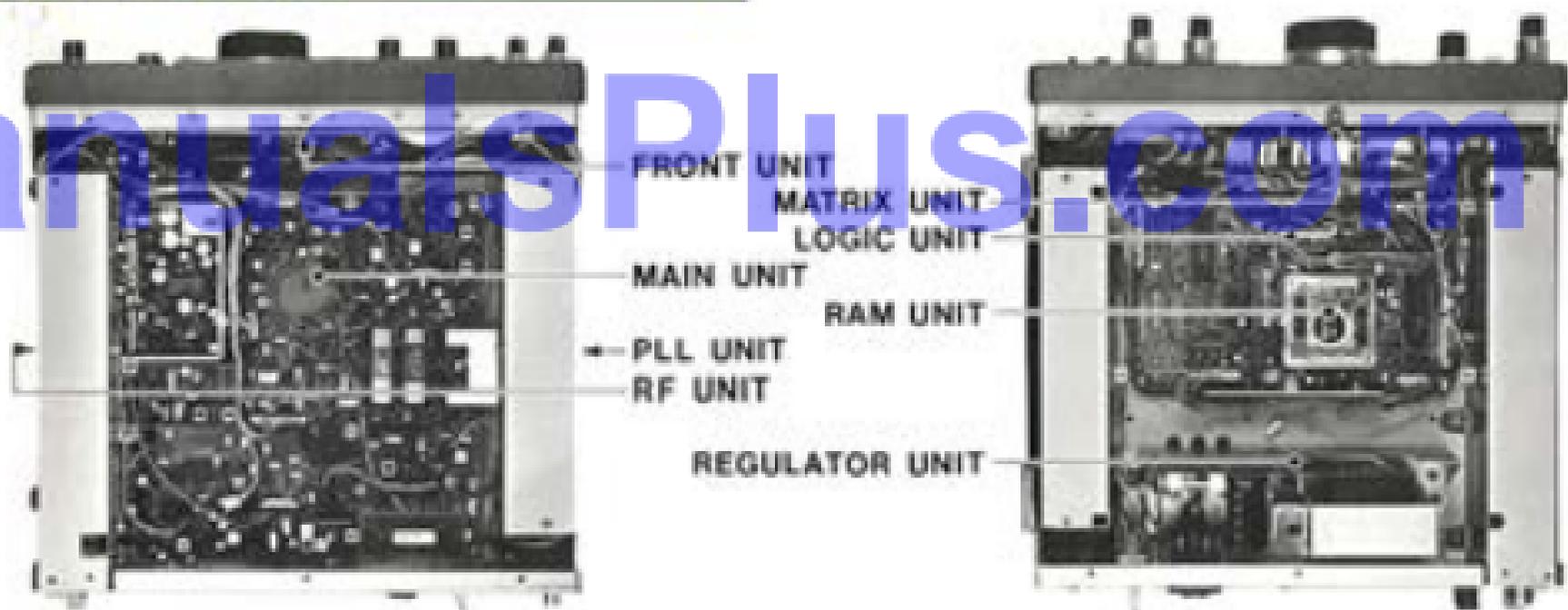
FM UNIT (OPTION)



RAM UNIT



UNIT LAYOUT



ICOM INCORPORATED

Some components subject to change for
an improvement without notice.

Printed in Japan