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## SECTION 1 SPECIFICATIONS

### GENERAL

Number of Semiconductors	:	<table border="0" style="margin-left: 20px;"> <tr> <td>Transistors</td> <td style="text-align: right;">90</td> </tr> <tr> <td>FETs</td> <td style="text-align: right;">19</td> </tr> <tr> <td>ICs (Including CPU)</td> <td style="text-align: right;">47</td> </tr> <tr> <td>Diodes</td> <td style="text-align: right;">237</td> </tr> </table>	Transistors	90	FETs	19	ICs (Including CPU)	47	Diodes	237
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Frequency Coverage	:	<table border="0" style="margin-left: 20px;"> <tr> <td>0.1 MHz ~ 30 MHz</td> </tr> <tr> <td>(Australian version: 2.0 MHz ~ 30.0 MHz)</td> </tr> <tr> <td>(German version: 0.15 MHz ~ 26.1 MHz)</td> </tr> <tr> <td>Thirty 1-MHz segments</td> </tr> </table>	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				
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(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

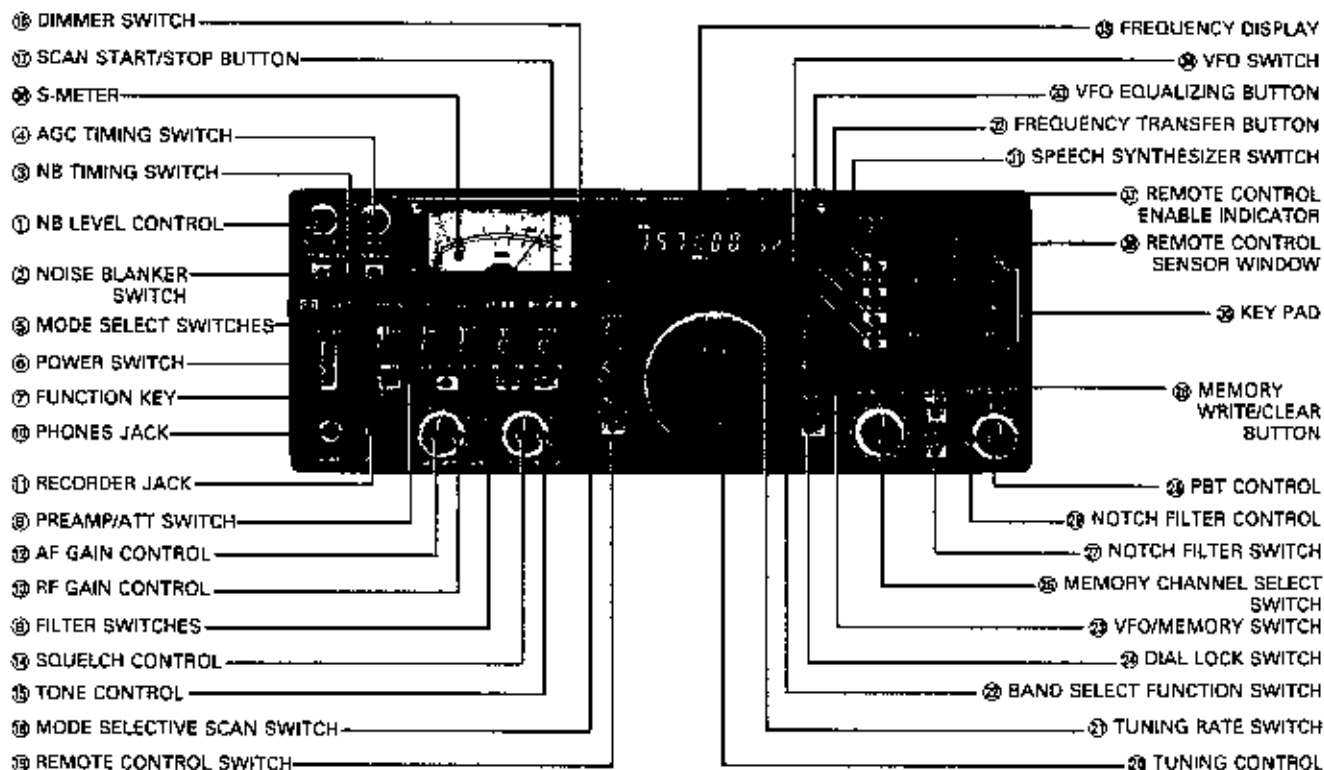
Receiving System	:	<table border="0" style="margin-left: 20px;"> <tr> <td>Quadruple conversion superheterodyne with continuous bandwidth control</td> </tr> <tr> <td>(F<sub>3</sub>*: triple conversion superheterodyne)</td> </tr> </table>	Quadruple conversion superheterodyne with continuous bandwidth control	(F <sub>3</sub> *: triple conversion superheterodyne)						
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Receiving Modes	:	A <sub>1</sub> , A <sub>2</sub> J (USB, LSB), F <sub>1</sub> (output FSK audio signal), A <sub>3</sub> , F <sub>3</sub> *								
IF Frequencies	:	<table border="0" style="margin-left: 20px;"> <tr> <td>1st</td> <td style="text-align: right;">70.4515 MHz</td> </tr> <tr> <td>2nd</td> <td style="text-align: right;">9.0115 MHz</td> </tr> <tr> <td>3rd</td> <td style="text-align: right;">455 kHz</td> </tr> <tr> <td>4th</td> <td style="text-align: right;">9.0115 MHz (except F<sub>3</sub>*)</td> </tr> </table>	1st	70.4515 MHz	2nd	9.0115 MHz	3rd	455 kHz	4th	9.0115 MHz (except F <sub>3</sub> *)
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2nd IF Center Frequency	:	<table border="0" style="margin-left: 20px;"> <tr> <td>SSB (A<sub>2</sub>J) AM (A<sub>3</sub>)</td> <td style="text-align: right;">9.0115 MHz</td> </tr> <tr> <td>CW (A<sub>1</sub>) RTTY (F<sub>1</sub>)</td> <td style="text-align: right;">9.0106 MHz</td> </tr> <tr> <td>FM* (F<sub>3</sub>)</td> <td style="text-align: right;">9.0100 MHz</td> </tr> </table>	SSB (A <sub>2</sub> J) AM (A <sub>3</sub> )	9.0115 MHz	CW (A <sub>1</sub> ) RTTY (F <sub>1</sub> )	9.0106 MHz	FM* (F <sub>3</sub> )	9.0100 MHz		
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CW (A <sub>1</sub> ) RTTY (F <sub>1</sub> )	9.0106 MHz									
FM* (F <sub>3</sub> )	9.0100 MHz									
Sensitivity (when preamplifier is ON)	:	<table border="0" style="margin-left: 20px;"> <tr> <td>SSB, CW, RTTY</td> <td style="text-align: right;">Less than 0.15 microvolt (0.1 ~ 1.6 MHz: 1 microvolt) for 10 dB S+N/N</td> </tr> <tr> <td>AM</td> <td style="text-align: right;">Less than 0.5 microvolt (0.1 ~ 1.6 MHz: 3 microvolts)</td> </tr> <tr> <td>FM*</td> <td style="text-align: right;">Less than 0.3 microvolt for 12 dB SINAD (1.6 ~ 30 MHz)</td> </tr> </table>	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)		
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Selectivity	:	<table border="0" style="margin-left: 20px;"> <tr> <td>SSB, CW, RTTY</td> <td style="text-align: right;">2.3 kHz at -6 dB (adjustable to 500 Hz min) 4.3 kHz at -60 dB</td> </tr> <tr> <td>CW-N, RTTY-N</td> <td style="text-align: right;">500 Hz at -6 dB 1.5 kHz at -60 dB</td> </tr> <tr> <td>AM</td> <td style="text-align: right;">6 kHz at -6 dB (adjustable to 2.7 kHz min) 15 kHz at -50 dB</td> </tr> <tr> <td>FM*</td> <td style="text-align: right;">15 kHz at -6 dB 25 kHz at -60 dB</td> </tr> </table>	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
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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 1/4 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.

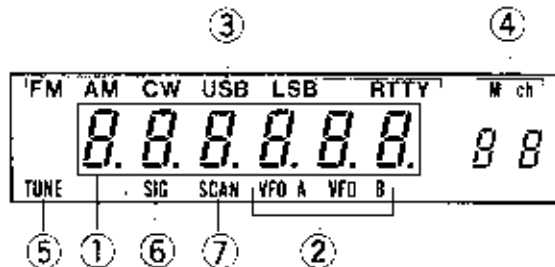
### 33. VFO EQUALIZING BUTTON

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.

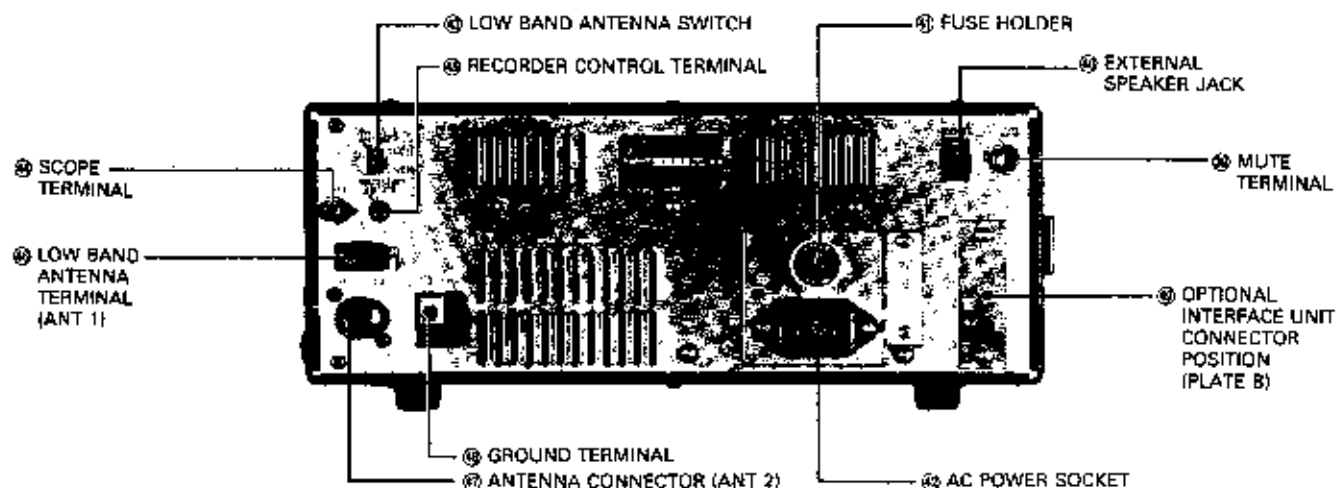
### 37. REMOTE CONTROL ENABLE INDICATOR

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 (46 LOW BAND ANTENNA TERMINAL) for a high impedance antenna such as a long wire antenna, and ANT 2 (47 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 panadapter 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 47 ANTENNA connector to this terminal automatically (when the 43 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

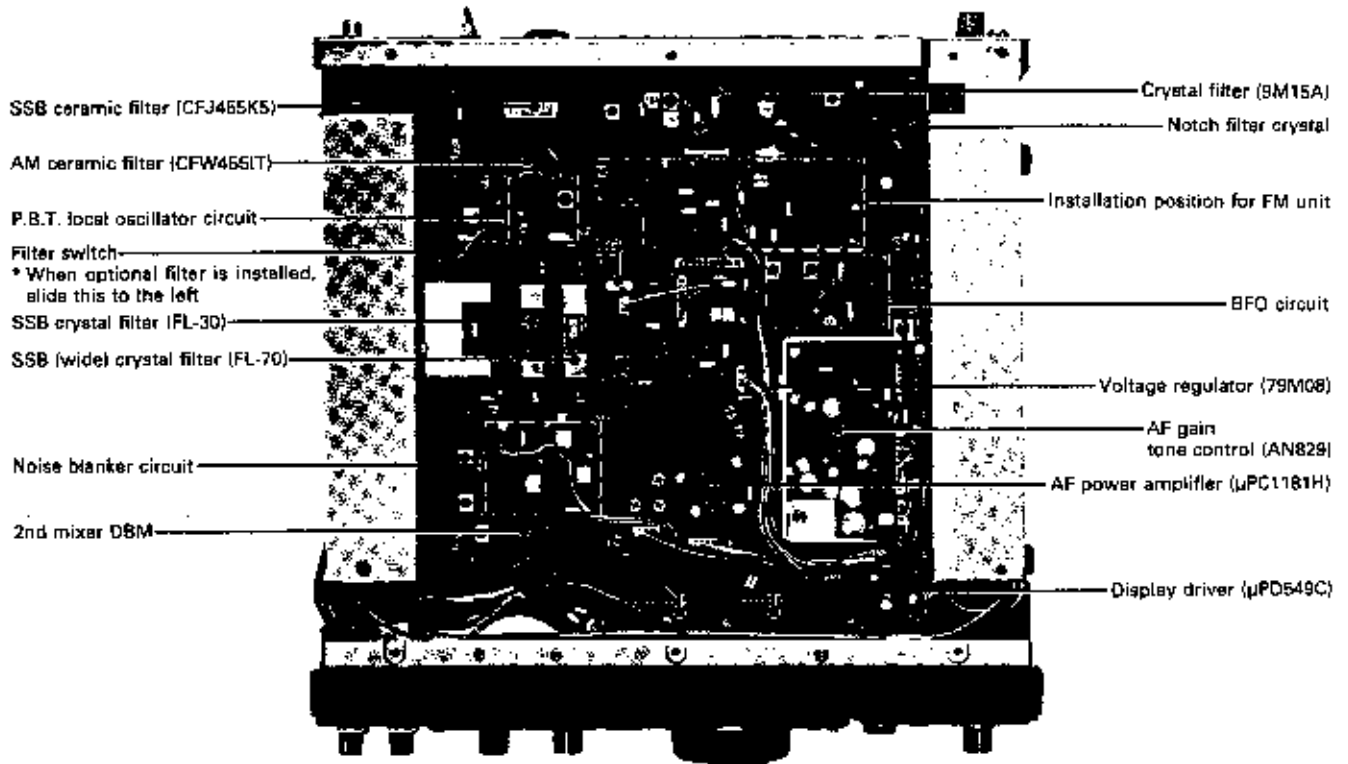
To prevent electrical shock and other problems, be sure to ground the equipment through the GROUND TERMINAL. For best results use as heavy gauge wire or strap as possible and make the connection as short as possible.

### 49. OPTIONAL INTERFACE UNIT CONNECTOR POSITION (PLATE B)

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

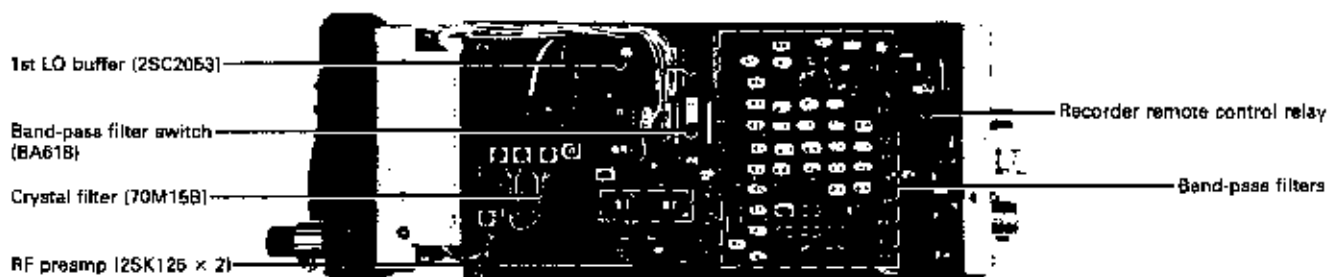
## SECTION 3 INSIDE VIEWS

### MAIN UNIT

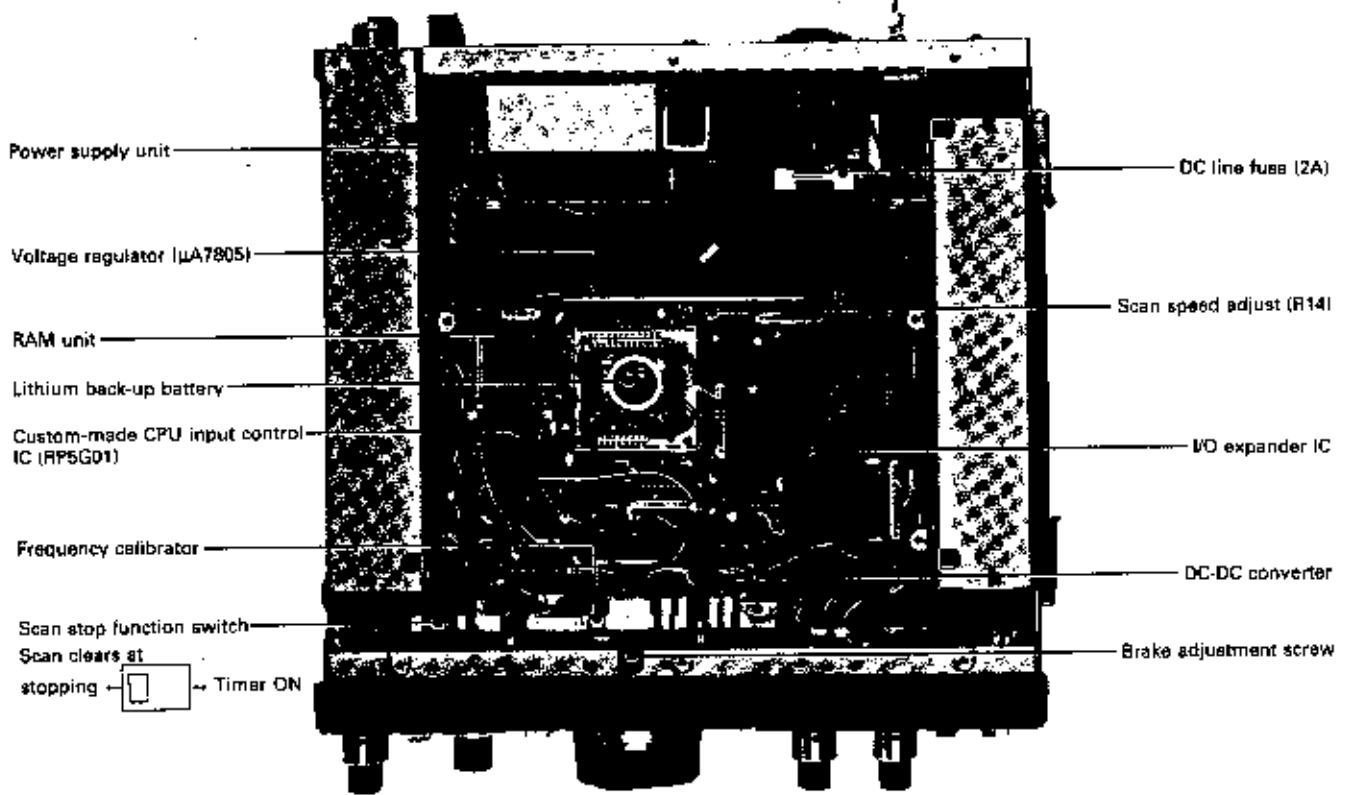


\* Don't tamper with the rotatable coil cores, trimmer capacitors, trimmer resistors, etc.

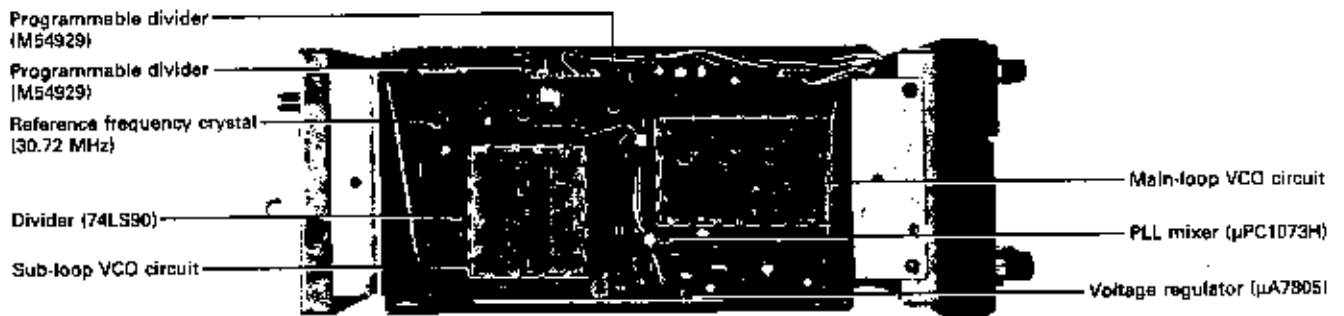
### RF UNIT



**BOTTOM VIEW**



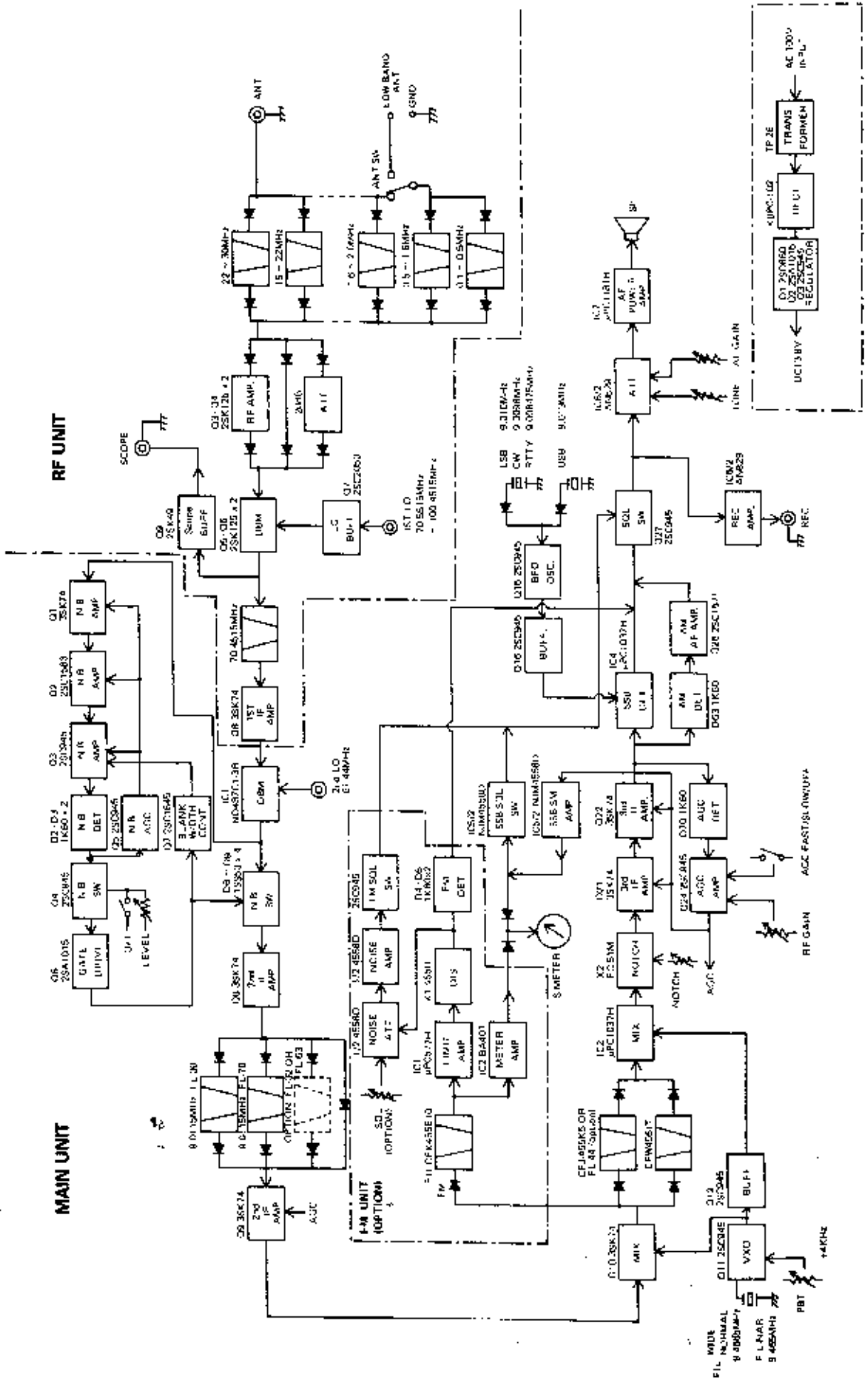
**PLL UNIT**



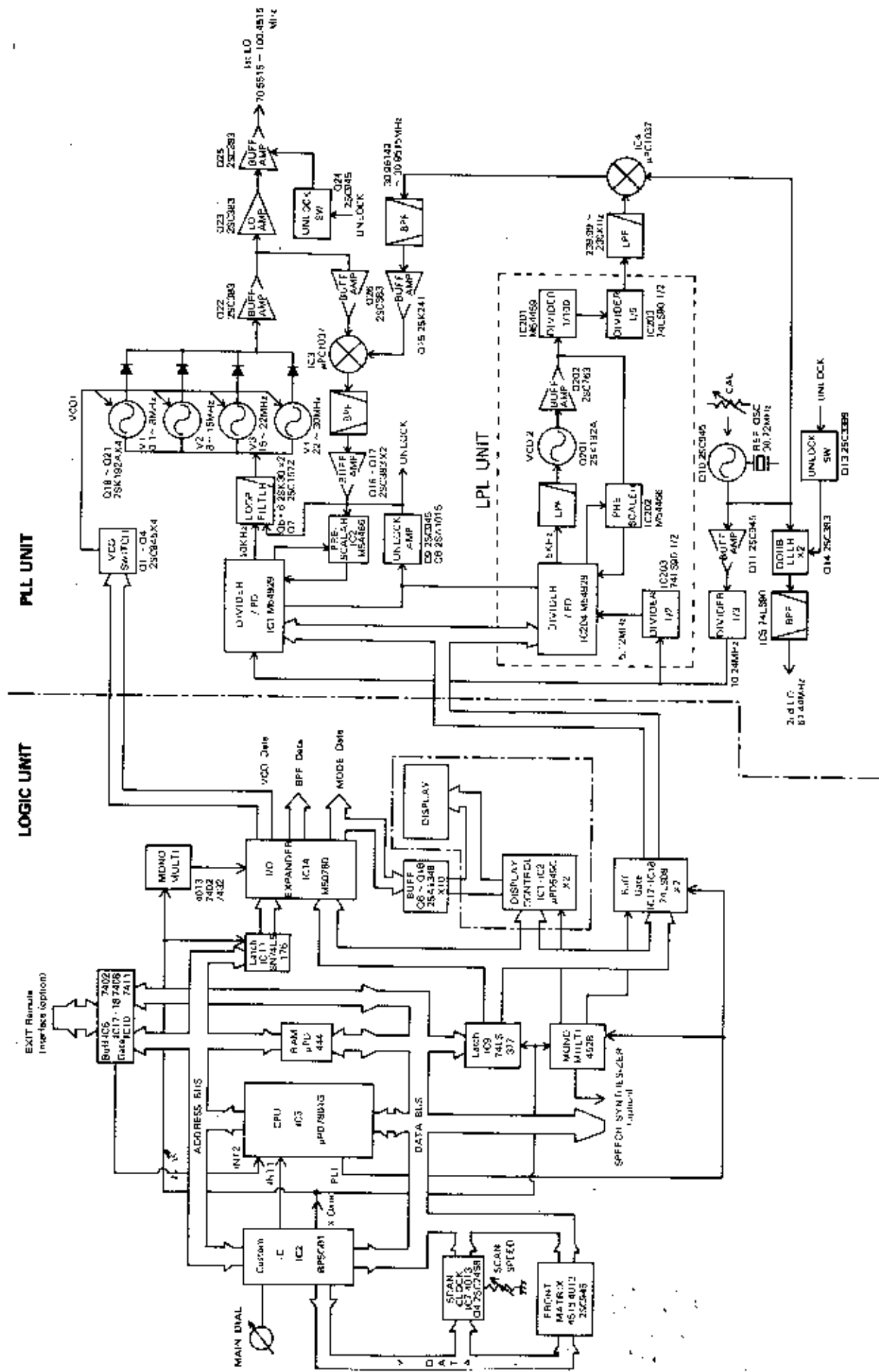


SECTION 4 BLOCK DIAGRAM

RF/MAIN UNIT

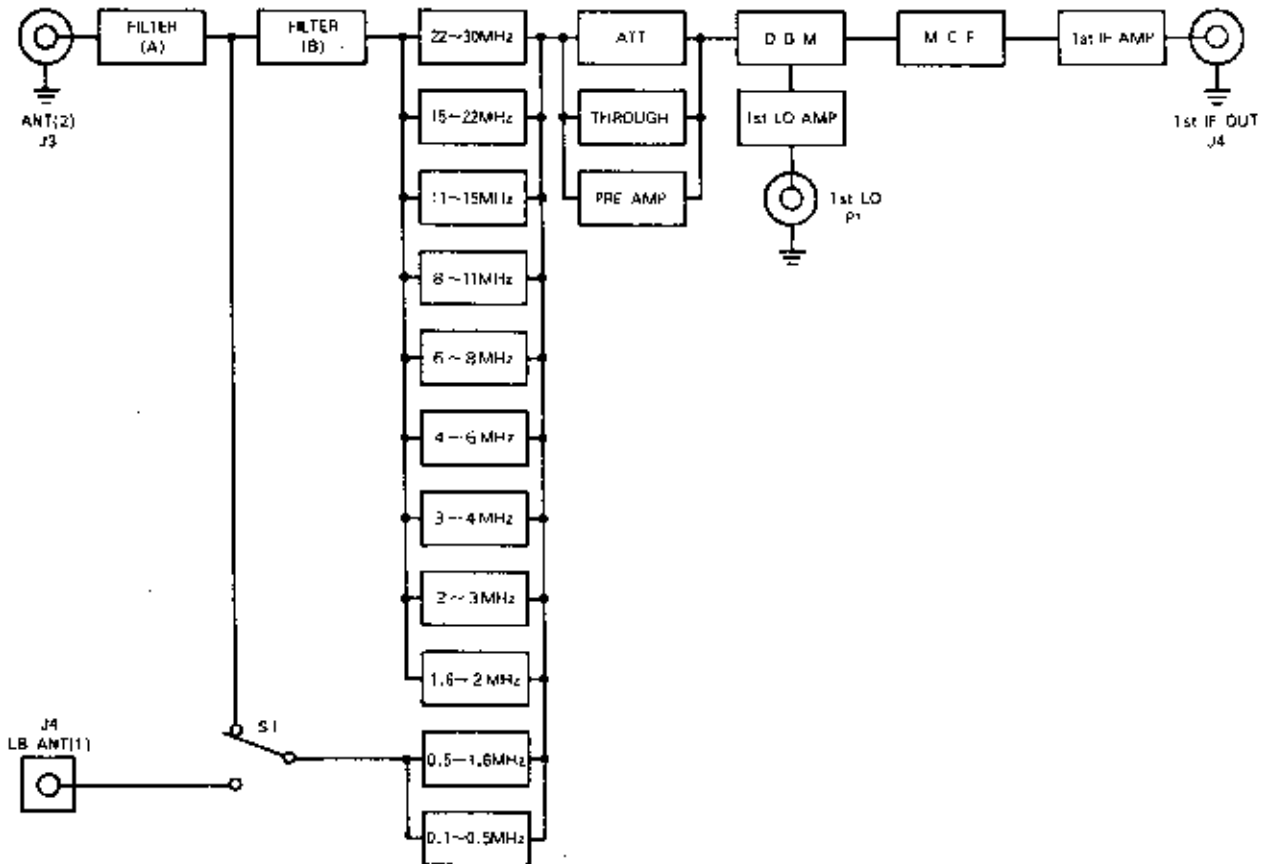


PLL/LOGIC UNIT



## 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 F1 (±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 (F11 ~ F13) 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 ± pass band tuning change) oscillated by Q11 and X1, and are then converted to the 3rd IF (455 kHz ± 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 (F14 and F15) and the 9 MHz filters (F11 ~ F13).

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 ± pass band tuning change), the same one for Q10, and then become the 4th IF (9.0115 MHz ± 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 F16, 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.

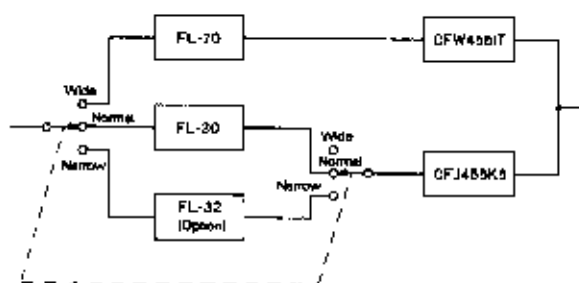
In the FM mode, IC3 pin 1 and pin 4 are turned ON by the filter switches (on the front panel), but, because they are not connected to any diode, and the filter selection does not change.

#### IC3 input/output relationships by mode

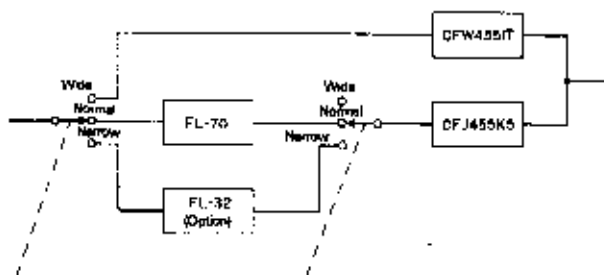
Mode		Input pin			Output pin
		9	10	11	
SSB CW RTTY	Normal	L	L	H	14
	Wide	H	L	H	3
	* Narrow	L	H	H	12
AM	Normal	L	H	L	15
	Wide	H	H	L	2
	* Narrow	L	H	H	12
FM	Normal	H	L	L	1
	Wide	H	L	L	1
	* Narrow	H	H	H	4

\* If option filter switch (S1) is ON

#### DURING SSB/CW/RTTY



#### DURING AM



**Filter Table**

	No.	Name	IF	8 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)
	CFW465IT	AM ceramic filter	455 kHz	Approx. 8 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

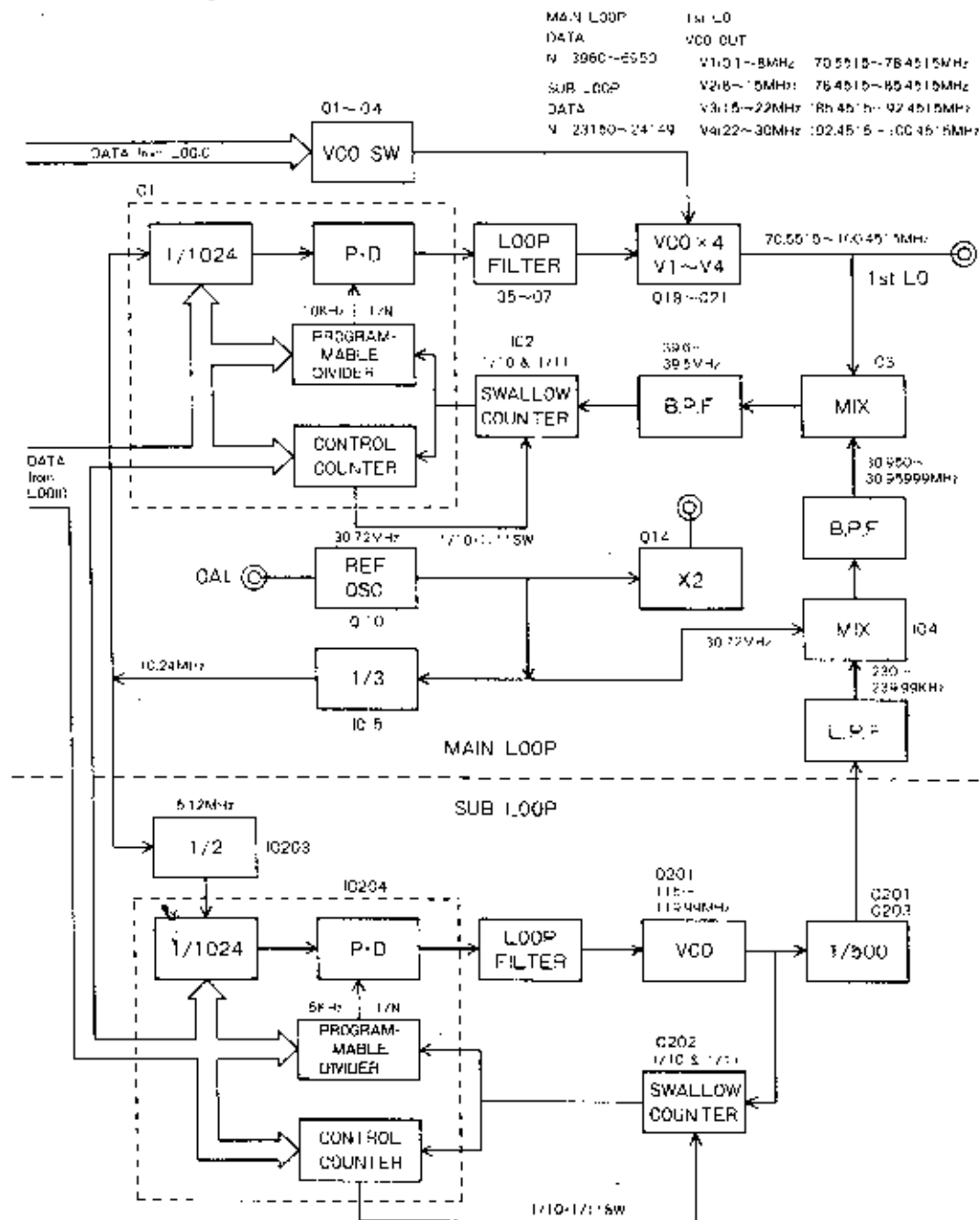
The standard reference oscillator output (30.72 MHz) is used for the local oscillator signal for a loop, for the reference frequency of the main and sub loops, and for the 2nd Local Oscillator.

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.



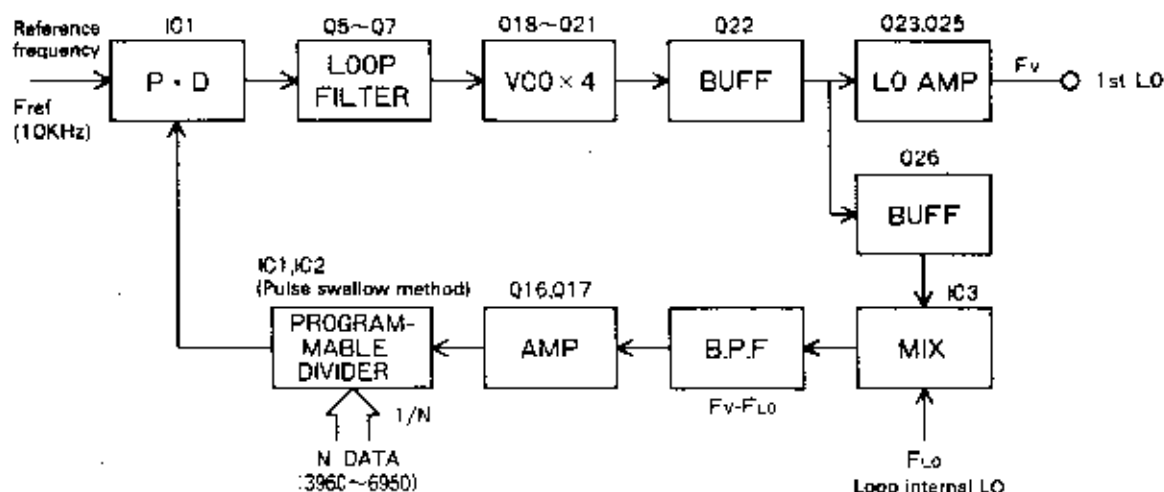
### 3. Main loop

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.

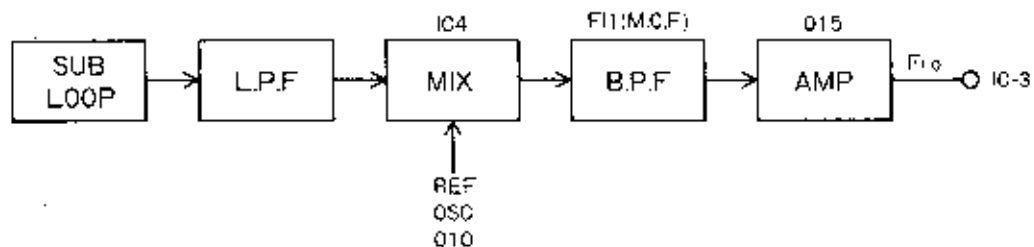
This signal passes through the band-pass filter (band width approximately 35 ~ 75 MHz), and, after spurious is removed, is amplified to the necessary level at the Q16 and Q17 cascade amplifier and is input to IC2, forming the locked loop. The D10 and D11 limiter is used at the IC2 input in order to prevent 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 (F11), after which the signal is amplified at Q15 and then fed to IC3, the main loop mixer.

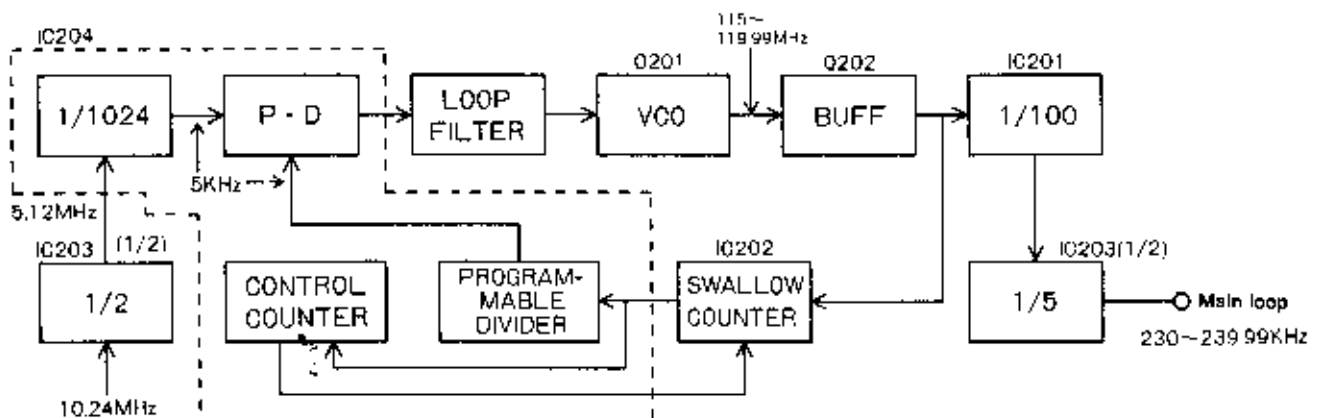


#### 4. Sub loop

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 counter, 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  $\times$  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

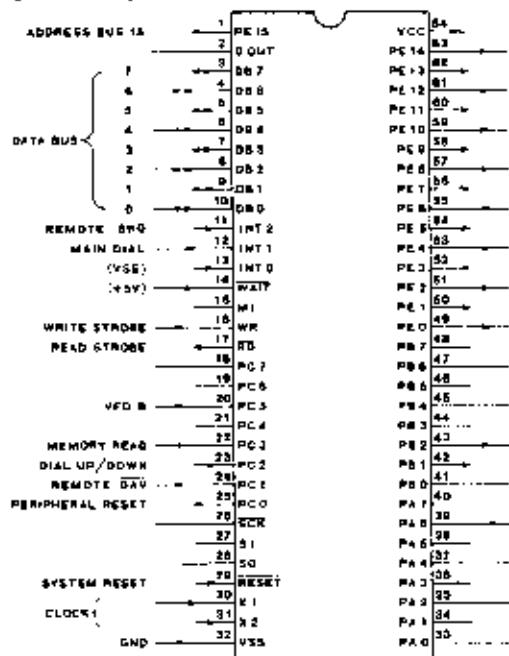
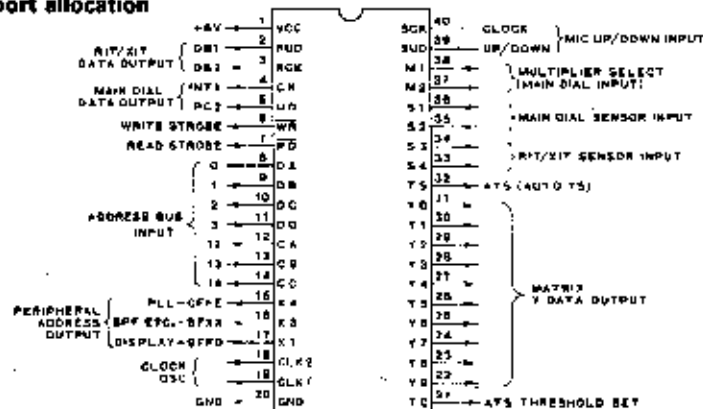


Fig. 2: CPU memory map

0000	CPU INTERNAL ROM
	Bit #4000h
0FFF	
7FFF	REMOTE CONTROL
8FFF	
1	
2	
3	
4	Matrix
5	Matrix
6	
7	
8	
8FFF	
9FFF	Display Data Unit (DPDS40x2)
B77B	BPF(High)
A	BPF(Mid)
B	BPF(Low)
C	MODE(High)
D	MODE(Low)
E	ALL P
BFFF	MS/PS
CFFF	PLL Data Out (MS4029x2)
F800	EXTERNAL RAM
	4Mx1024x16(P14M4)
F8FF	
F900	CPU INTERNAL RAM
	Bit #1200h
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 ~ 8 MHz	6	
8 ~ 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  $T_7$  (IC1) and of  $T_0 \sim T_2$  and  $T_5 \sim T_7$  (IC2) are not used.

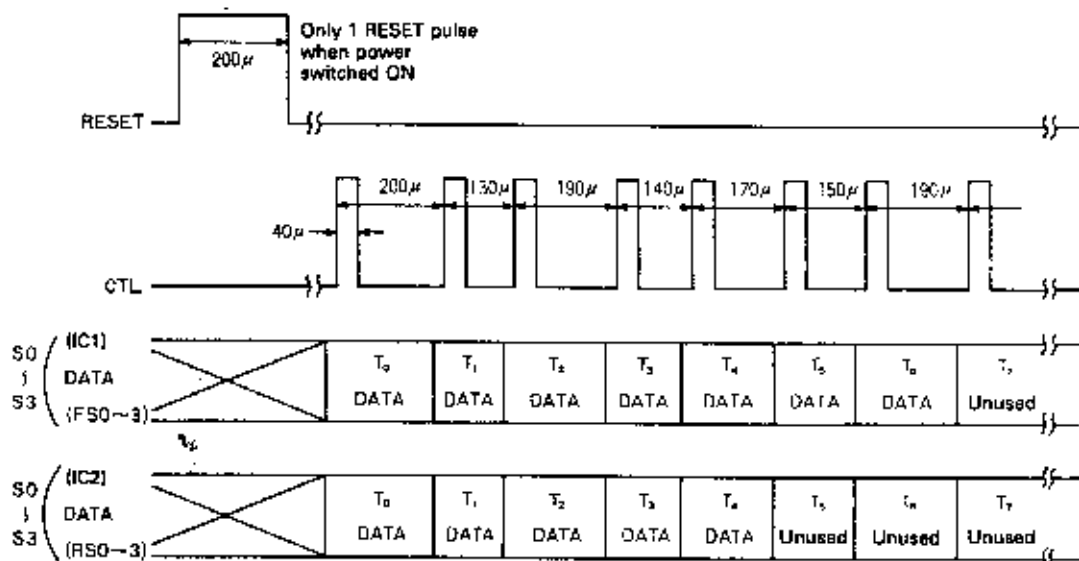
These data for display are sent only for operations related to the display, such as when the frequency is changed, the memory channel is switched, etc.

### 5. N data

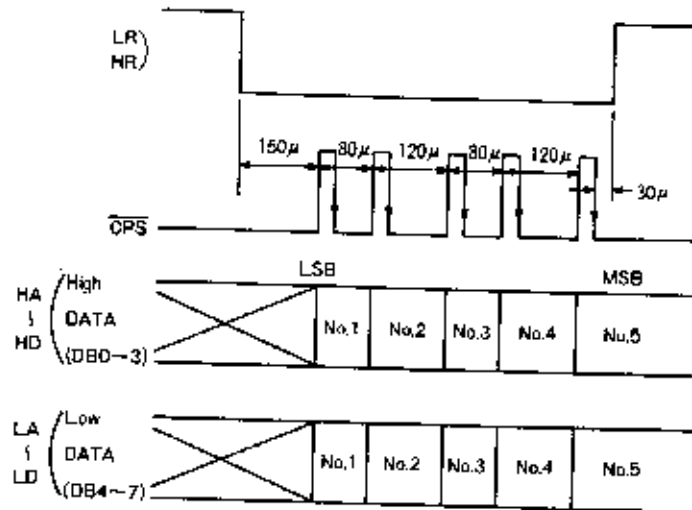
Because the PLL has a 2-loop configuration, two types of N data, high (HA ~ HD) and low (LA ~ LD), are sent from logic unit J<sub>11</sub> to the PLL unit.

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: 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	4960	3kHz	23300
20MHz	5960	4kHz	23400
30MHz	6960	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 8	
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
								DB 7

CPU DATA BUS

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
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	7	—	—	—	—	1
9	0	0	0	1	0	32	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.

⑯ Y7 → DB0 (REMOTE RP)

Matrix for remote-control read pulse.

⑰ Y7 → DB1 (REMOTE WP)

Matrix for remote-control write pulse.

⑱ 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.

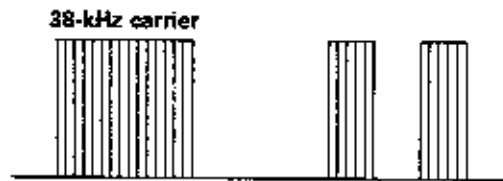
As a result, Q2 base voltage drops and current is increased, and collector current is also increased. Consequently, Q1 base current is increased, collector current is also increased, and output voltage rises. When output voltage rises, operation becomes the opposite. Note that R2 functions to reduce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

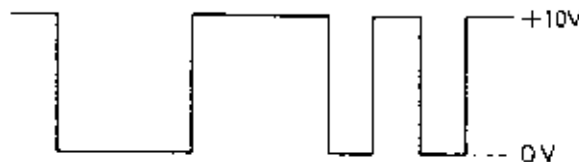
**(e) Remote-control reception circuitry (ten key unit)**

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.

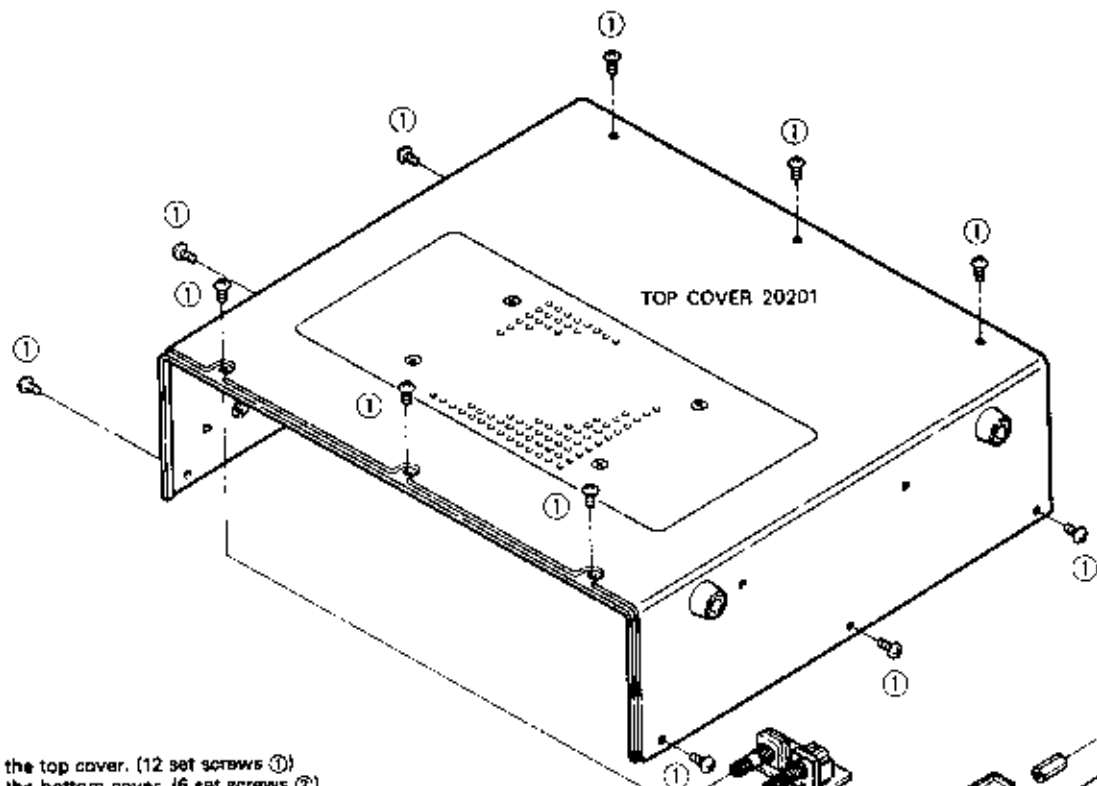
**Transmission output waveform**



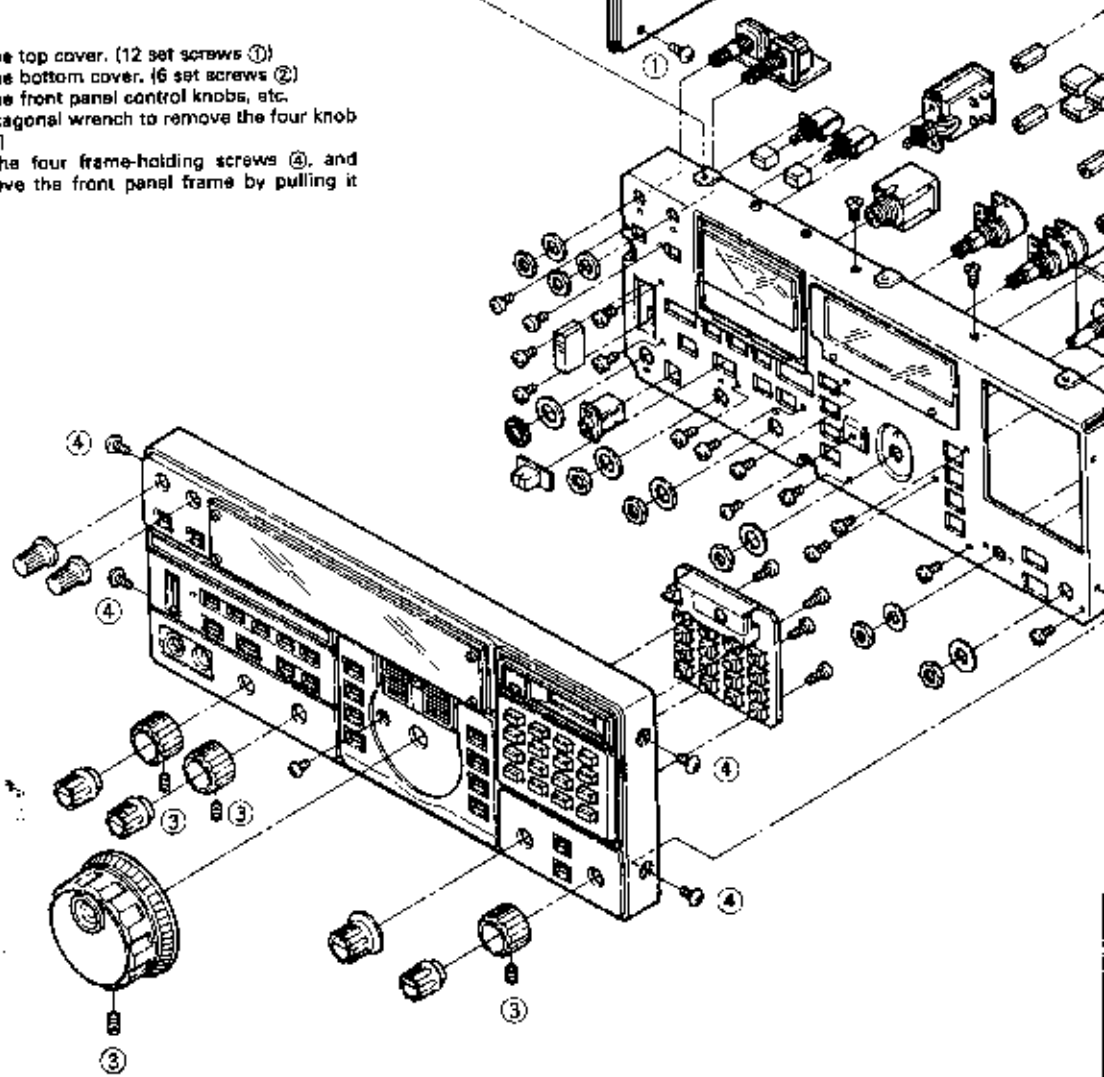
**IC1 output waveform**

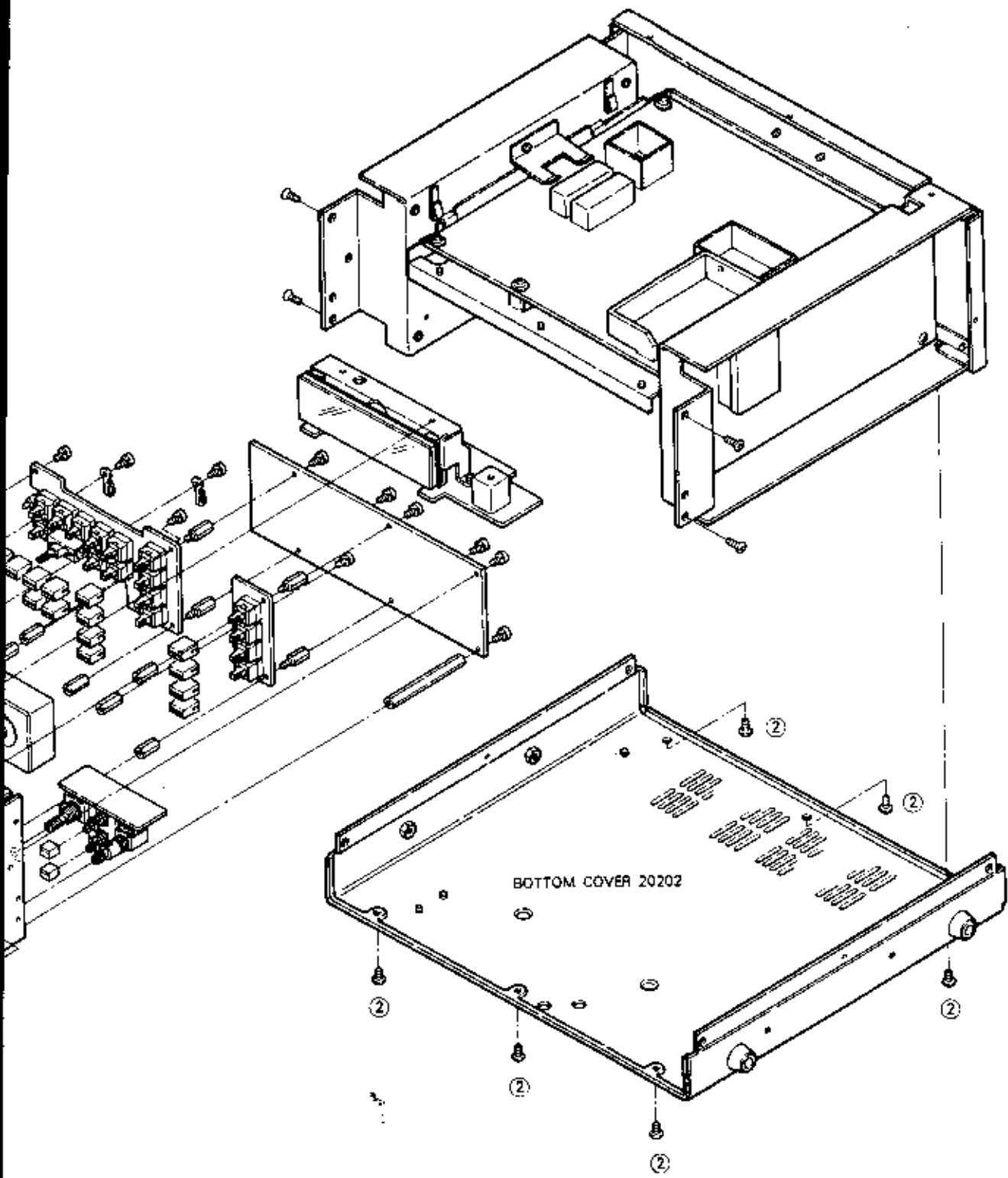


## SECTION 6 DISASSEMBLY

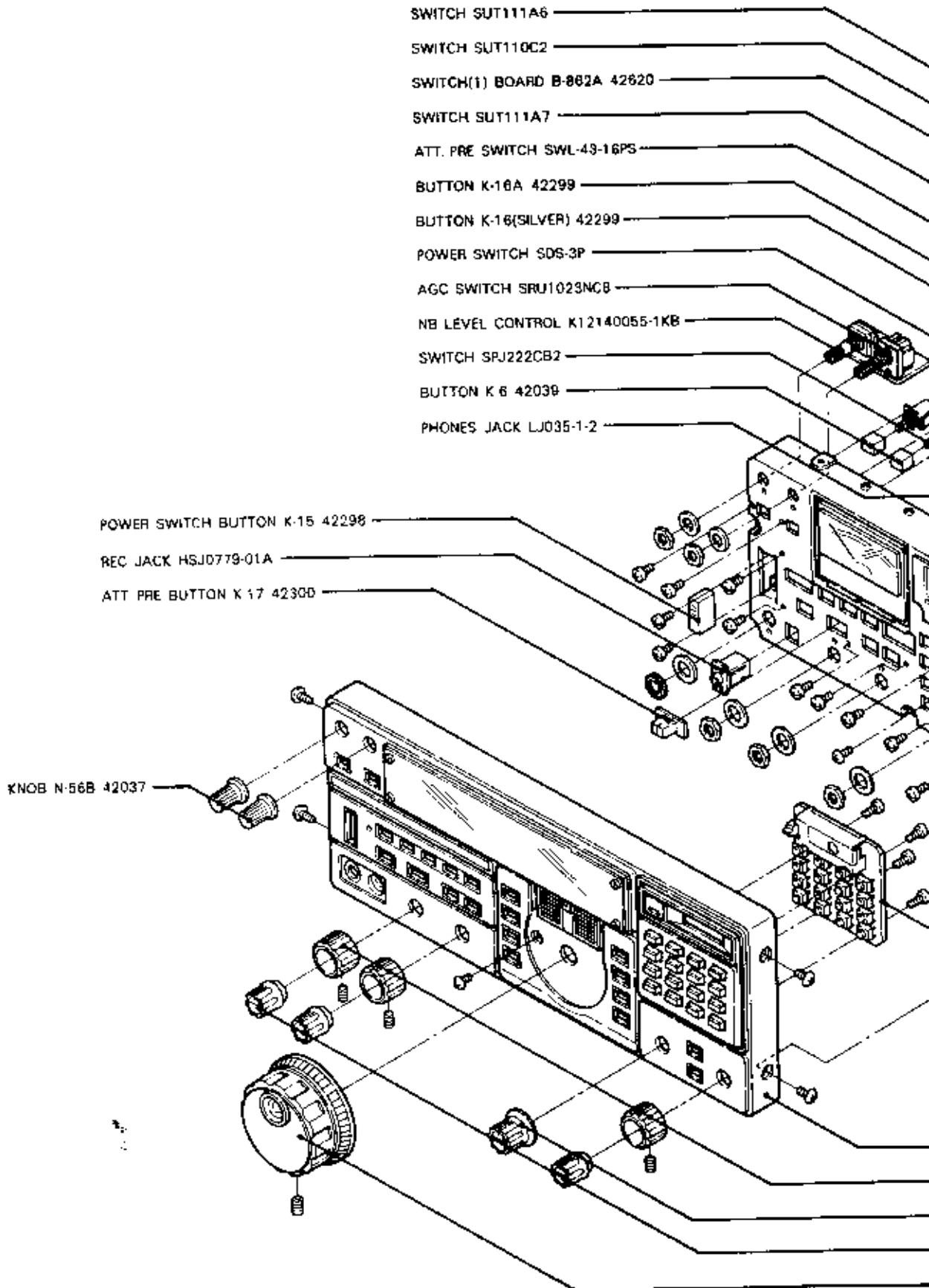


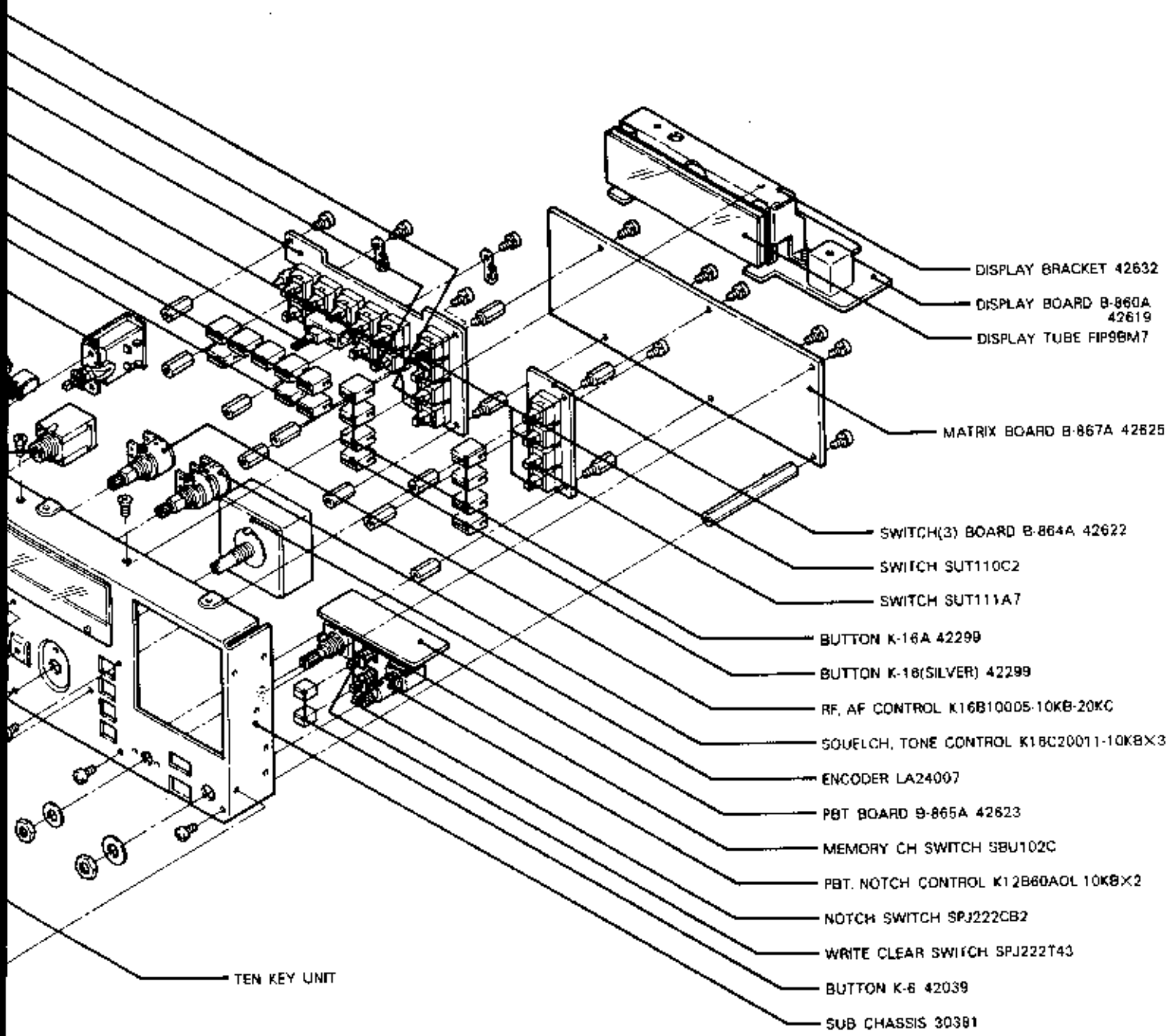
1. Remove the top cover. (12 set screws ①)
2. Remove the bottom cover. (6 set screws ②)
3. Remove the front panel control knobs, etc. (Use a hexagonal wrench to remove the four knob screws ③.)
4. Remove the four frame-holding screws ④, and then remove the front panel frame by pulling it forward.





# FRONT PANEL PARTS





DISPLAY BRACKET 42632  
 DISPLAY BOARD B-860A 42619  
 DISPLAY TUBE FIP96M7

MATRIX BOARD B-867A 42825

SWITCH(3) BOARD B-864A 42622

SWITCH SUT110C2

SWITCH SUT111A7

BUTTON K-16A 42299

BUTTON K-18(SILVER) 42299

RF, AF CONTROL K16B10005-10KB-20KC

SQUELCH, TONE CONTROL K18C20011-10KBX3

ENCODER LA24007

PBT BOARD 9-865A 42823

MEMORY CH SWITCH SBU102C

PBT, NOTCH CONTROL K12B60AOL 10KBX2

NOTCH SWITCH SPJ222CB2

WRITE CLEAR SWITCH SPJ222T43

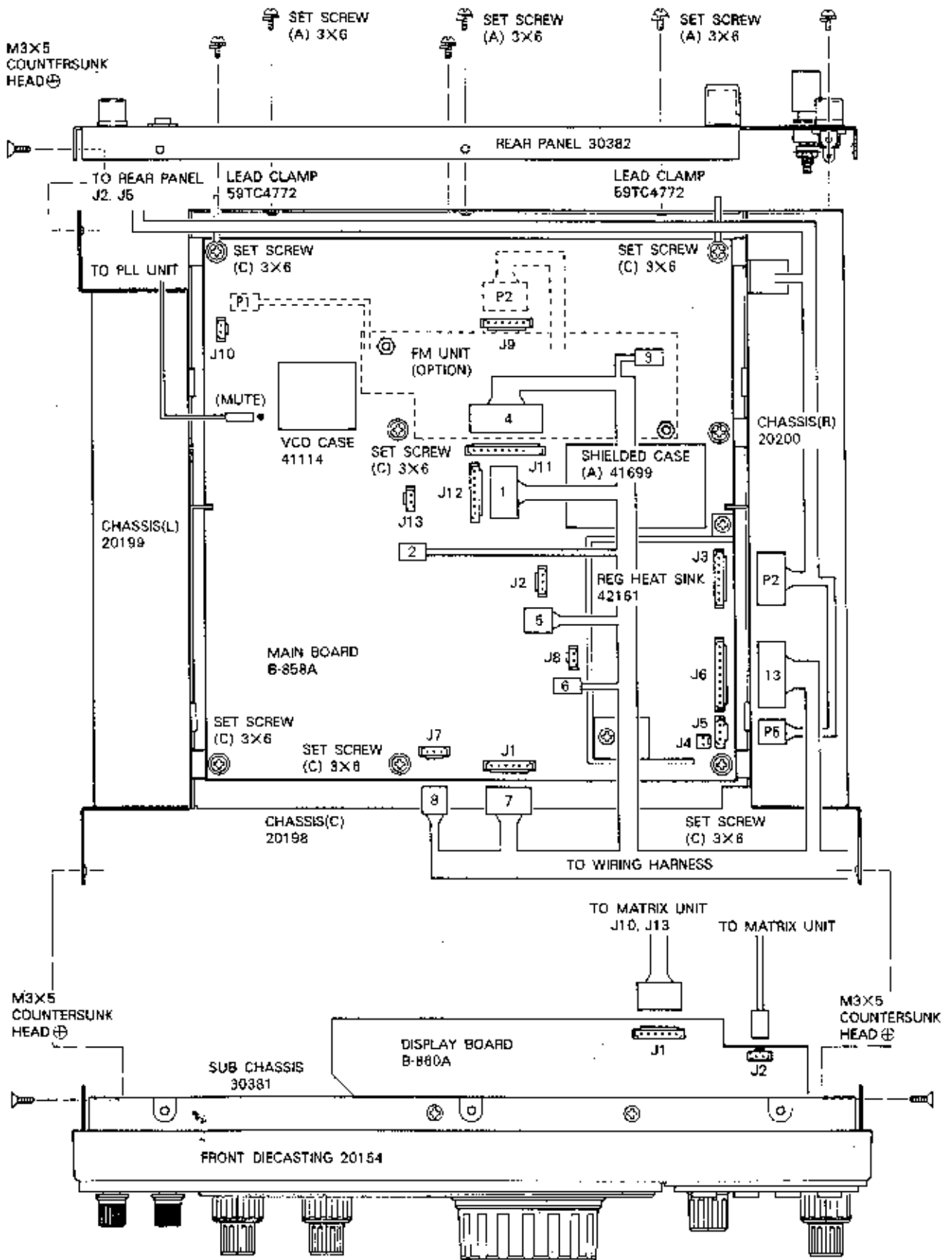
BUTTON K-6 42039

SUB CHASSIS 30381

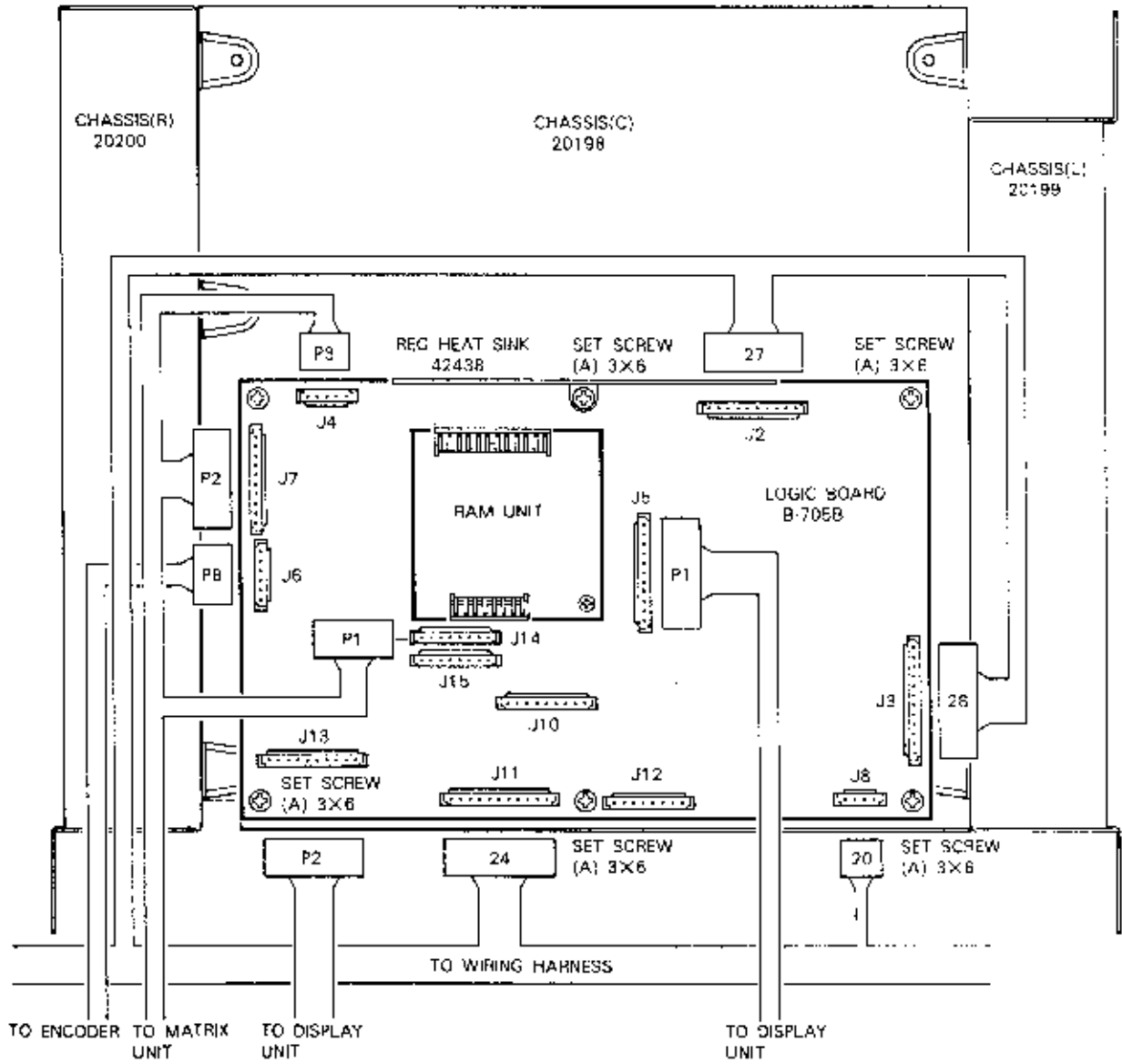
TEN KEY UNIT

FRONT DIECASTING 20154  
 KNOB N-65 42301  
 RIT CONTROL KNOB N-66 42302  
 KNOB N-58A 42102  
 TUNING CONTROL KNOB N-68 42382

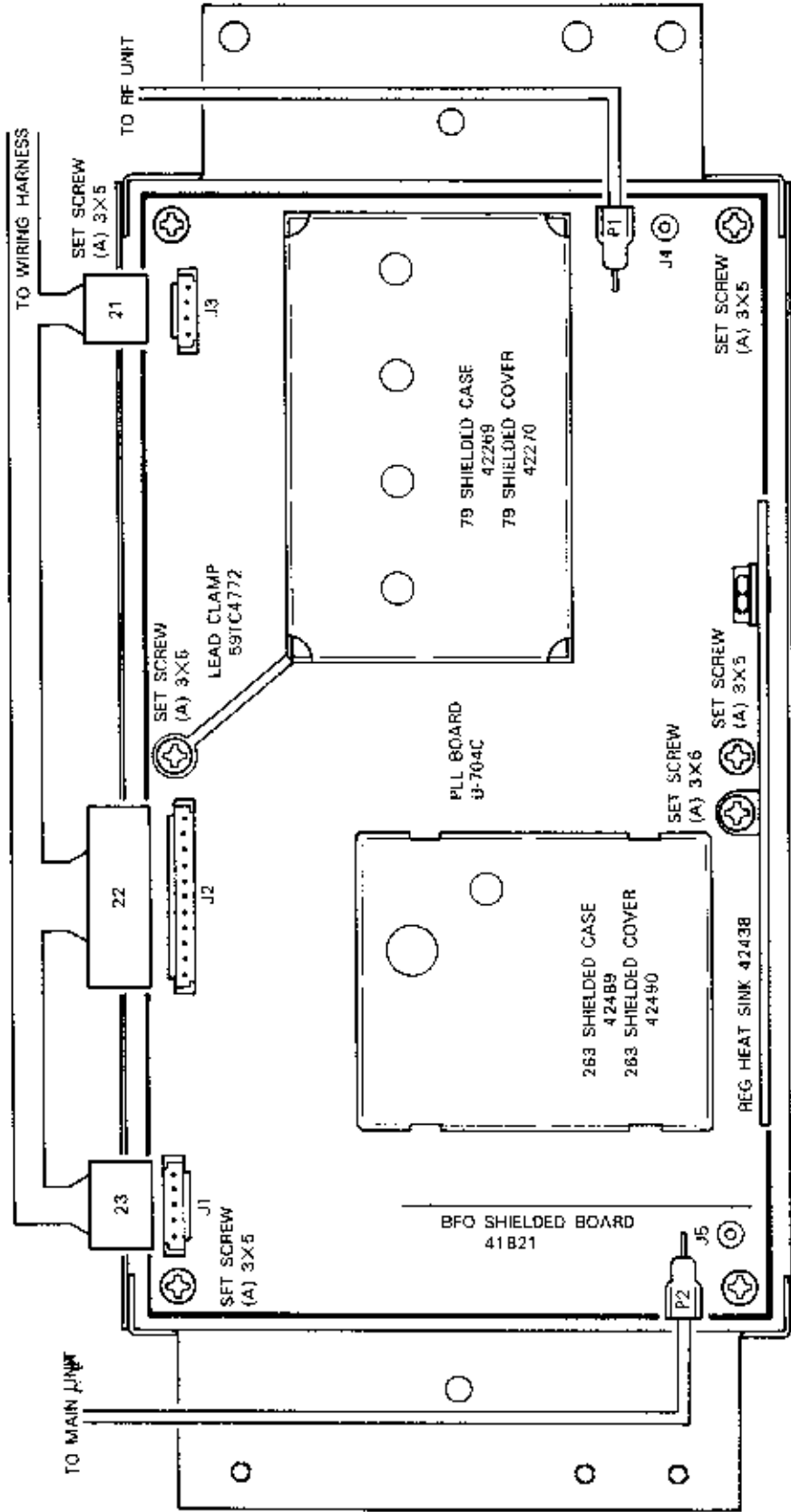
# CONNECTOR CONNECTIONS MAIN UNIT



# CONNECTOR CONNECTIONS LOGIC UNIT

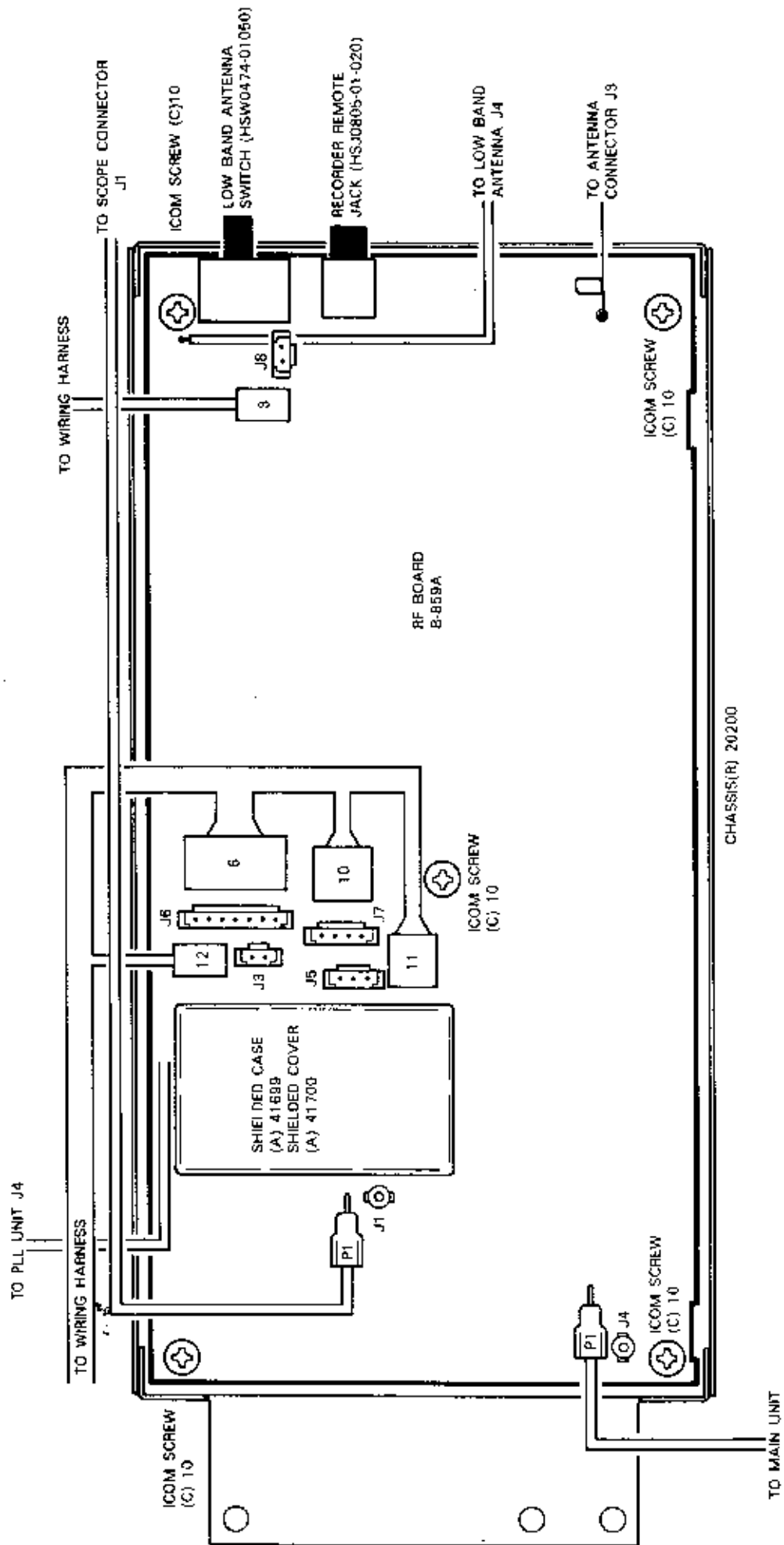


**CONNECTOR CONNECTIONS  
PLL UNIT**



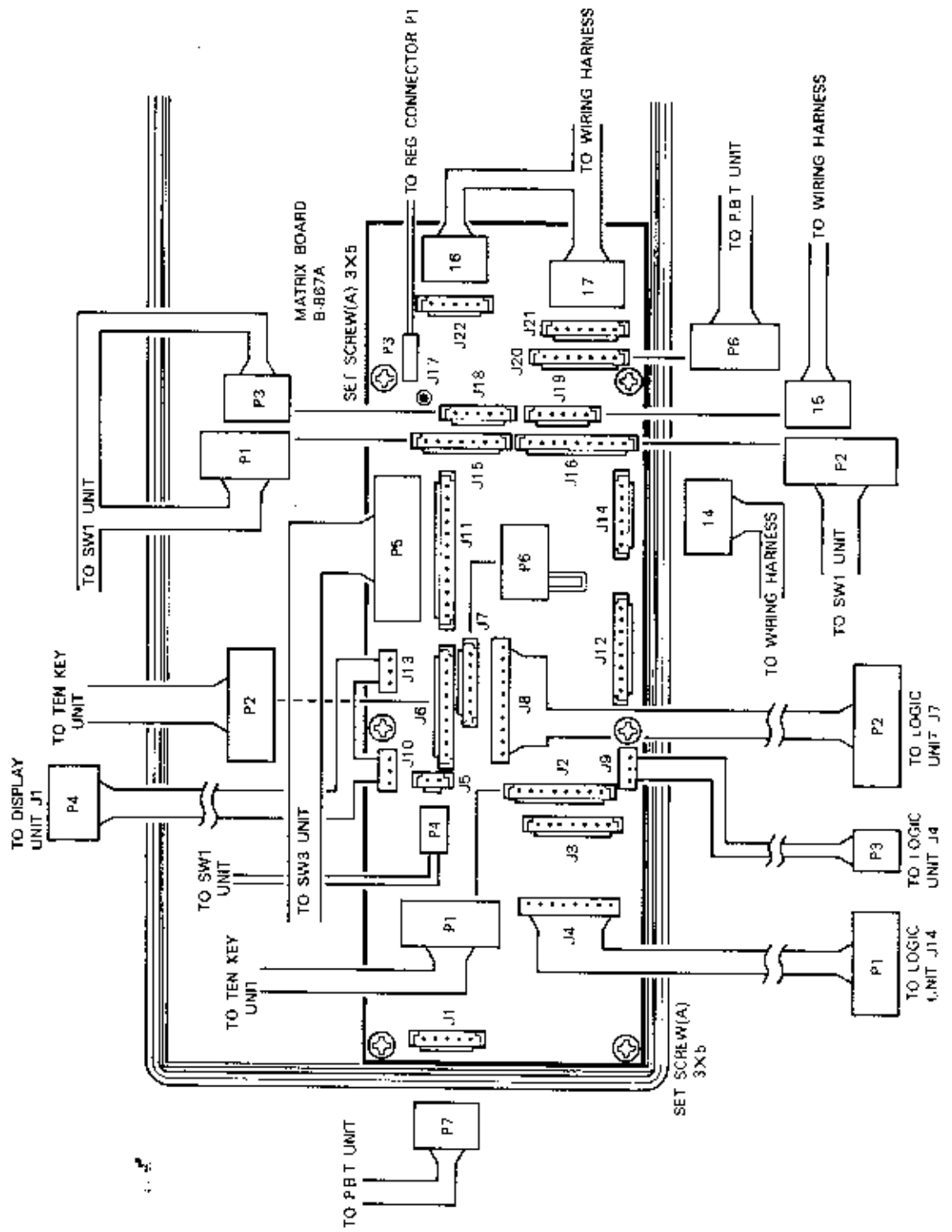


# CONNECTOR CONNECTIONS RF UNIT

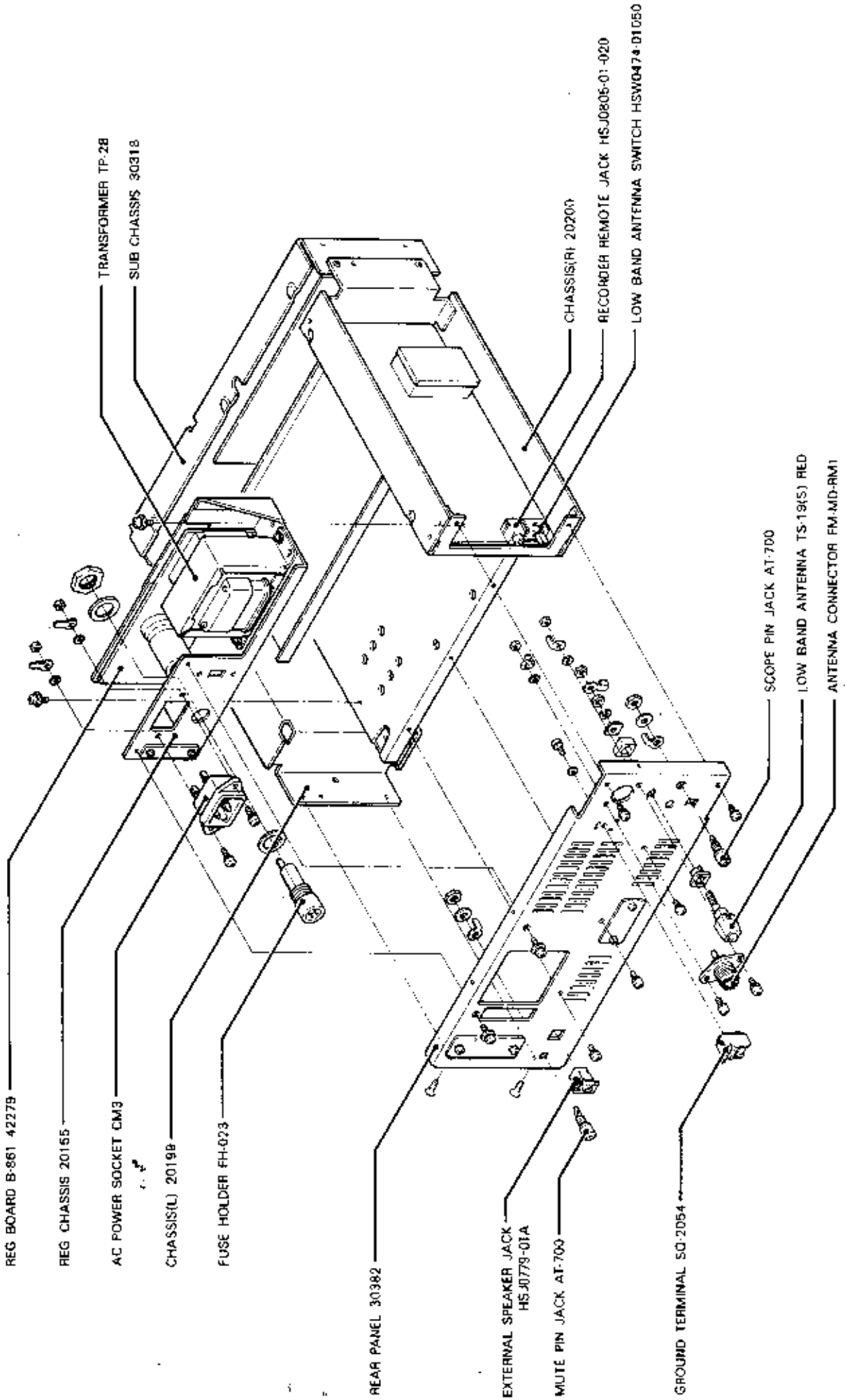


CHASSIS(R) 20200

**CONNECTOR CONNECTIONS  
MATRIX UNIT**



# REAR PANEL PARTS

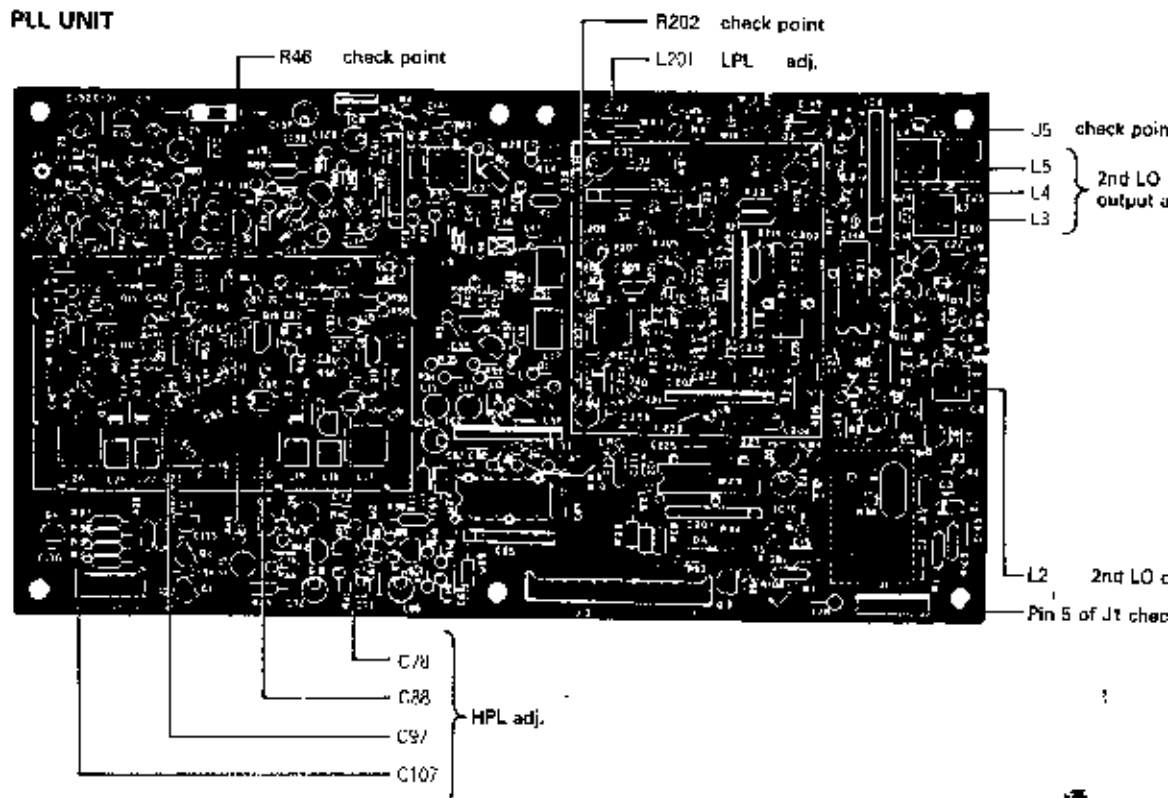


## SECTION 7 ADJUSTMENTS

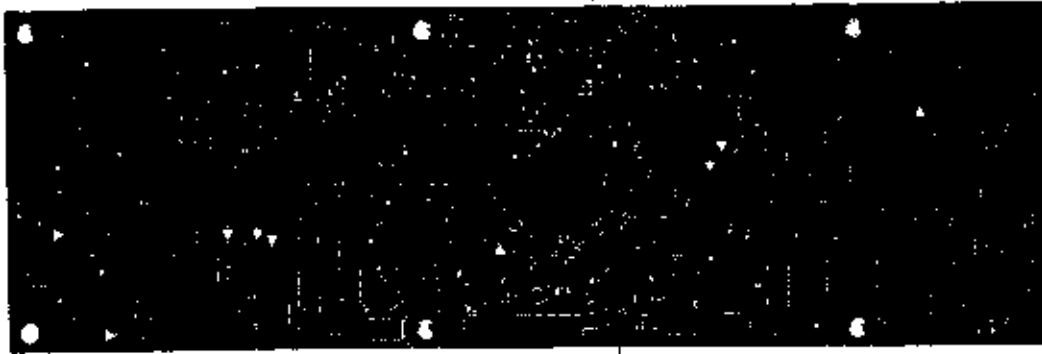
### PLL ADJUSTMENT GUIDE

Adjustment	Adjustment conditions	Unit	Measurement location	Adjustment value	Unit	Adjustment location
2nd LO output frequency	1. Mode: any Display frequency: any	PLL	Connect DC voltmeter to J1 pin 5.	3V	MATRIX	R20
	2. PBT: center	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. Mode: LSB Display frequency: 8.0000 MHz	PLL	Connect DC voltmeter to R202.	3V	PLL	L201
	2. Display frequency: 7.9999 MHz			Approx. 2V		Verify
HPL	1. Mode: LSB Display frequency: 7.9999 MHz	PLL	Connect DC voltmeter to R46	6.5V	PLL	C78
	2. Display frequency: 14.9999 MHz					C88
	3. Display frequency: 21.9999 MHz					C97
	4. Display frequency: 29.9999 MHz					C107
	5. Display frequency: 8.0000 MHz					Verify
	6. Display frequency: 15.0000 MHz					
	7. Display frequency: 22.0000 MHz					
	8. Display frequency: 0.1000 MHz					
SFO frequency	1. Display frequency: any Mode: USB	MAIN	Connect frequency counter to R139	9.0130 MHz	MAIN	C78
	2. Mode: LSB			9.0100 MHz		L20
	3. Mode: RTTY			9.008475 MHz		L22
	4. Mode: CW			9.0098 MHz $\pm$ 200 Hz		Verify

#### PLL UNIT

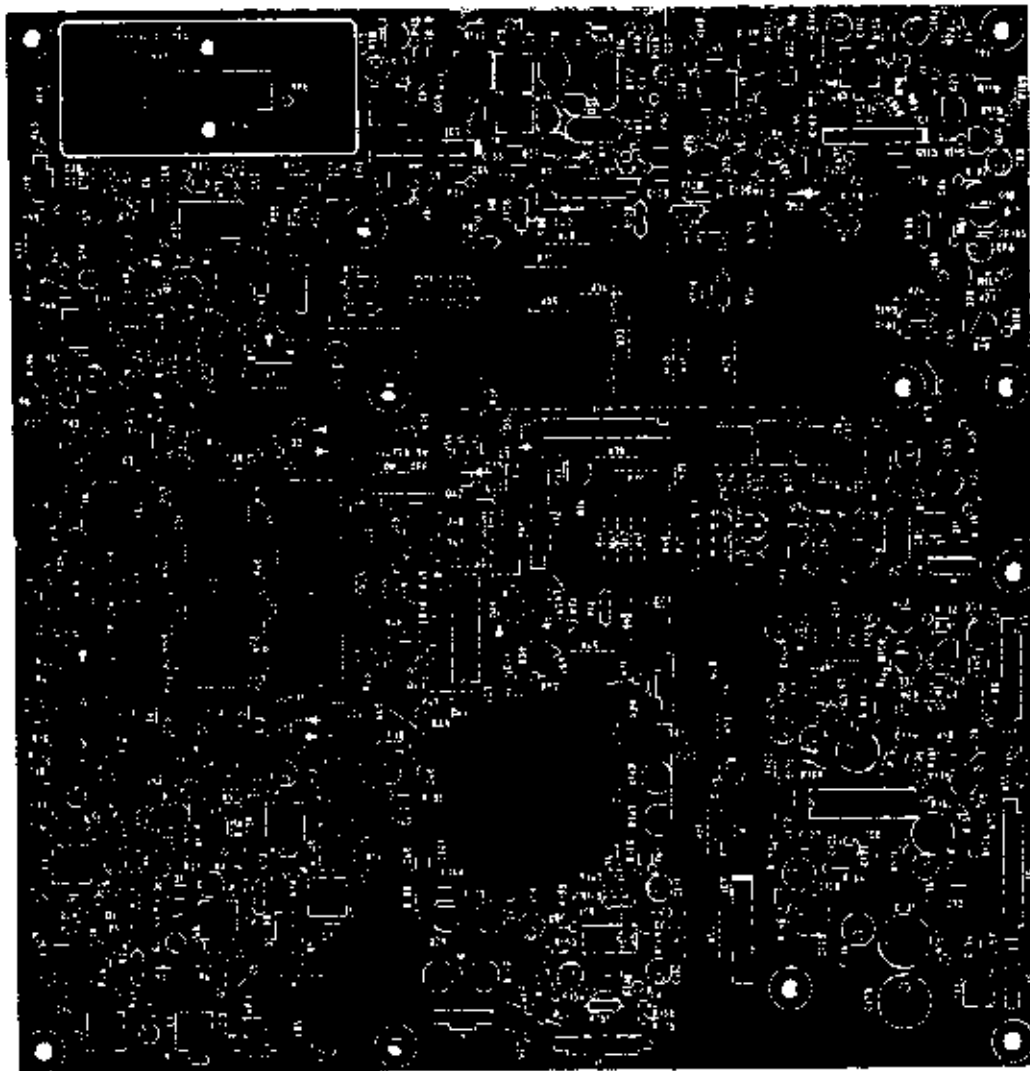


MATRIX UNIT



R20 2nd LO output freq. adj.

MAIN UNIT



BFO freq. adj.

H139 check point

L20 LSB 9.0100MHz

L22 RTTY 9.006475MHz

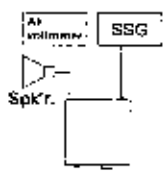
C7B USB 9.0130MHz

but freq. adj.

point

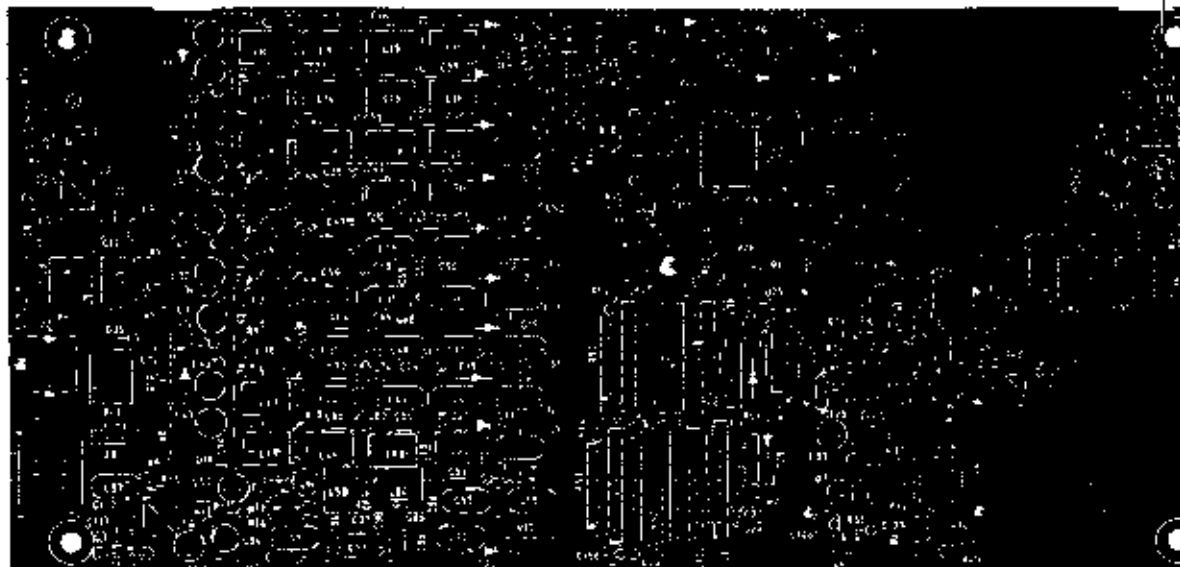
H1 check point

## 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 (SQ) 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"> <li>• Mode: LSB</li> <li>• Band: 7 MHz</li> <li>• PRE AMP: ON</li> <li>• RF GAIN: to extreme right</li> <li>• NOTCH: OFF</li> <li>• PBT: center</li> <li>• TONE: center</li> <li>• SQL: to extreme left</li> <li>• AGC: FAST</li> <li>• NB: ON (center)</li> <li>Input: -16 dBμ signal from SSG.</li> </ul>		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"> <li>• PRE AMP: OFF</li> <li>Input: -34 dBμ signal from SSG</li> </ul>			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
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

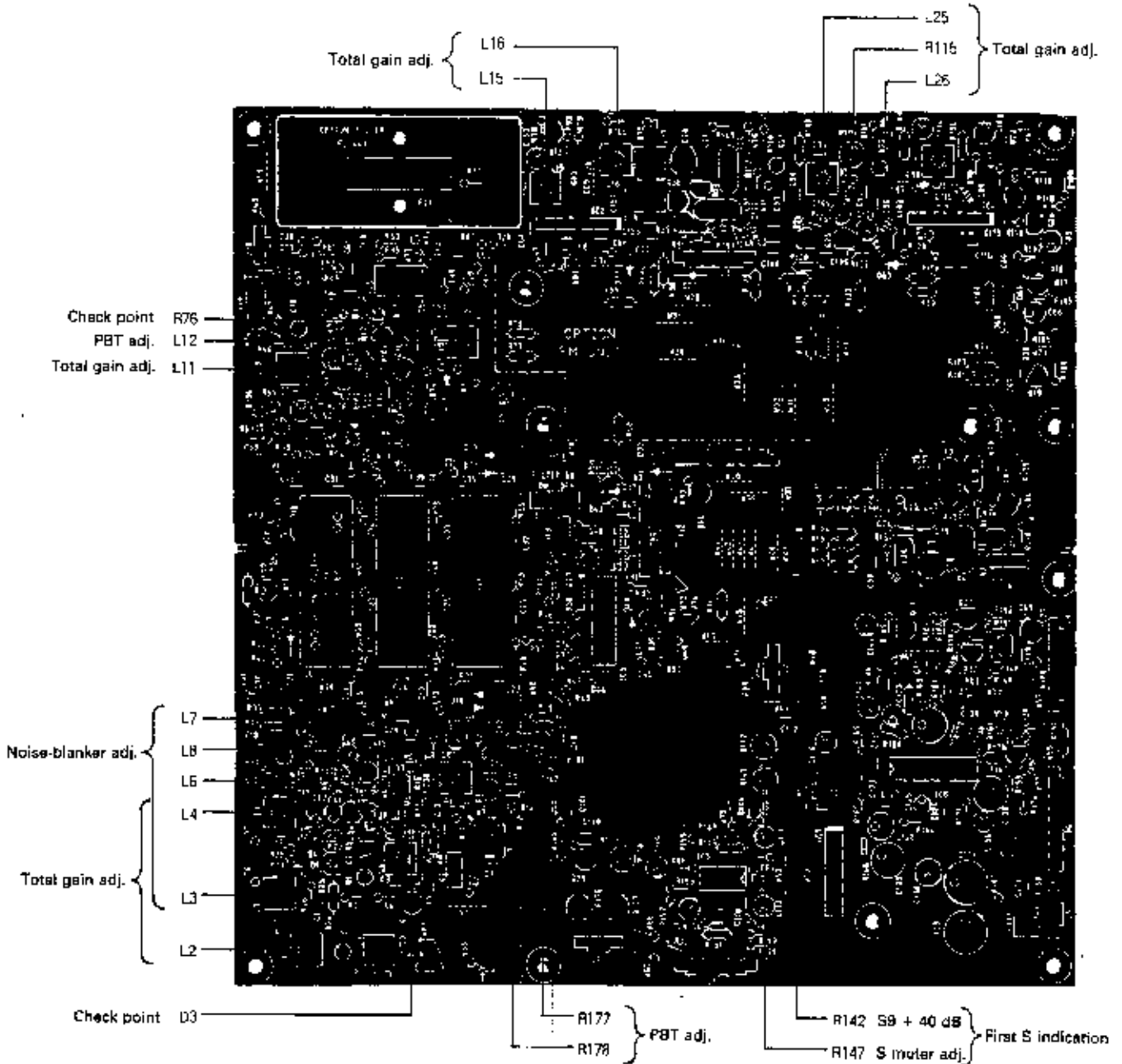
Total gain adj. L86



## 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

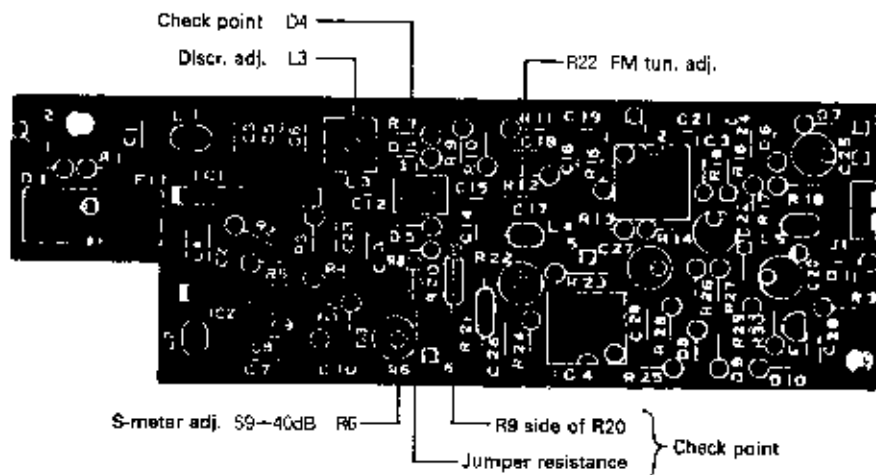


# FM UNIT ADJUSTMENT GUIDE

OPTION

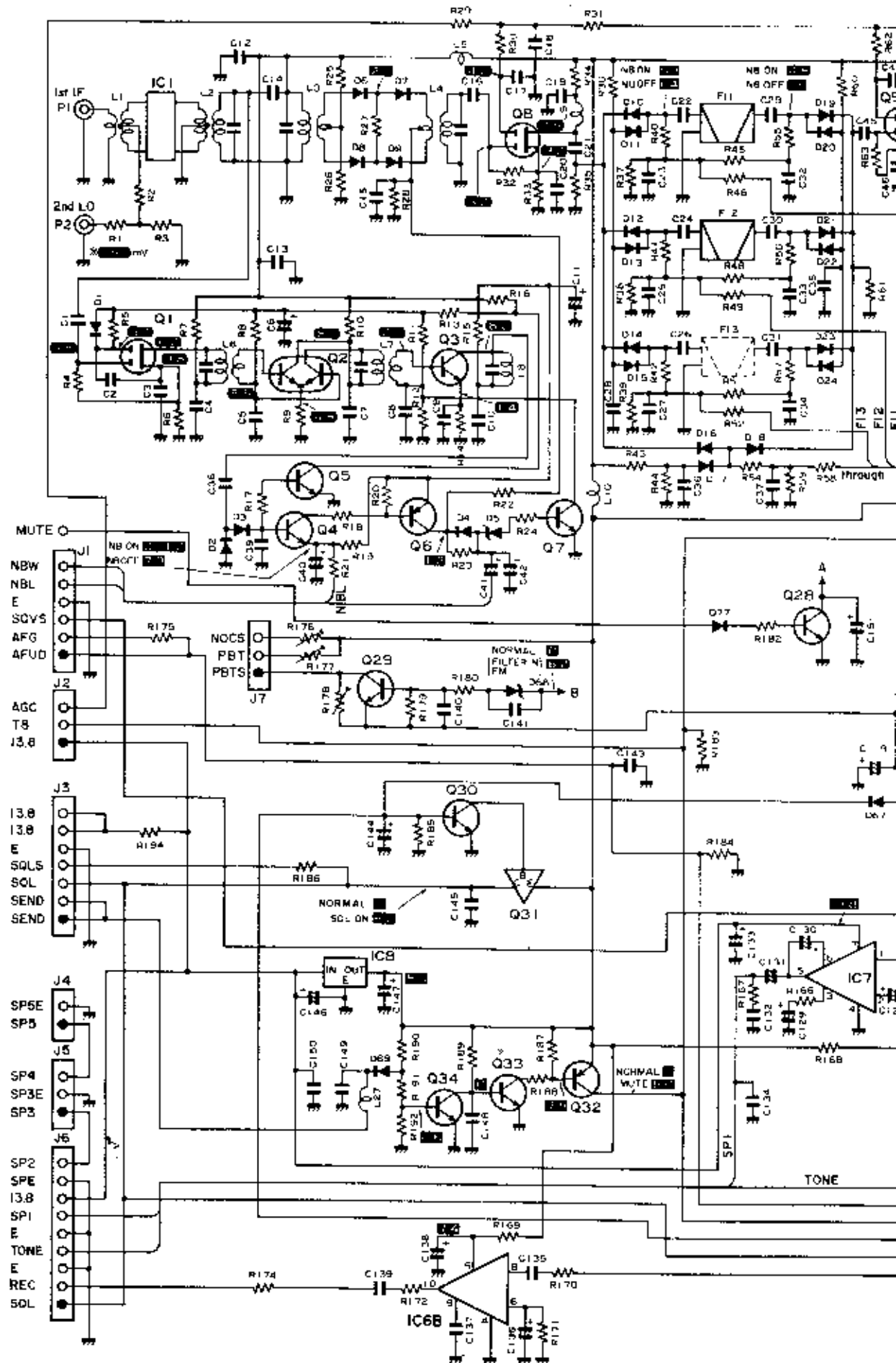
Adjustment	Adjustment conditions	Unit	Measurement location	Adjustment value	Unit	Adjustment location
Reception gain	1. <ul style="list-style-type: none"> <li>• Display frequency: 28 MHz vicinity</li> <li>• PREATT: PRE ON</li> <li>• RF GAIN: to extreme right</li> <li>• NOTCH: OFF</li> <li>• MODE: FM</li> <li>• TDNE: center</li> <li>• PBT: center</li> <li>• SQL: to extreme left</li> <li>• AGC: FAST</li> </ul> Switch SSG output OFF (when no signal).		AC M.M	Adjust noise level to 2.5V	Front panel	AF GAIN
Ⓞ 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

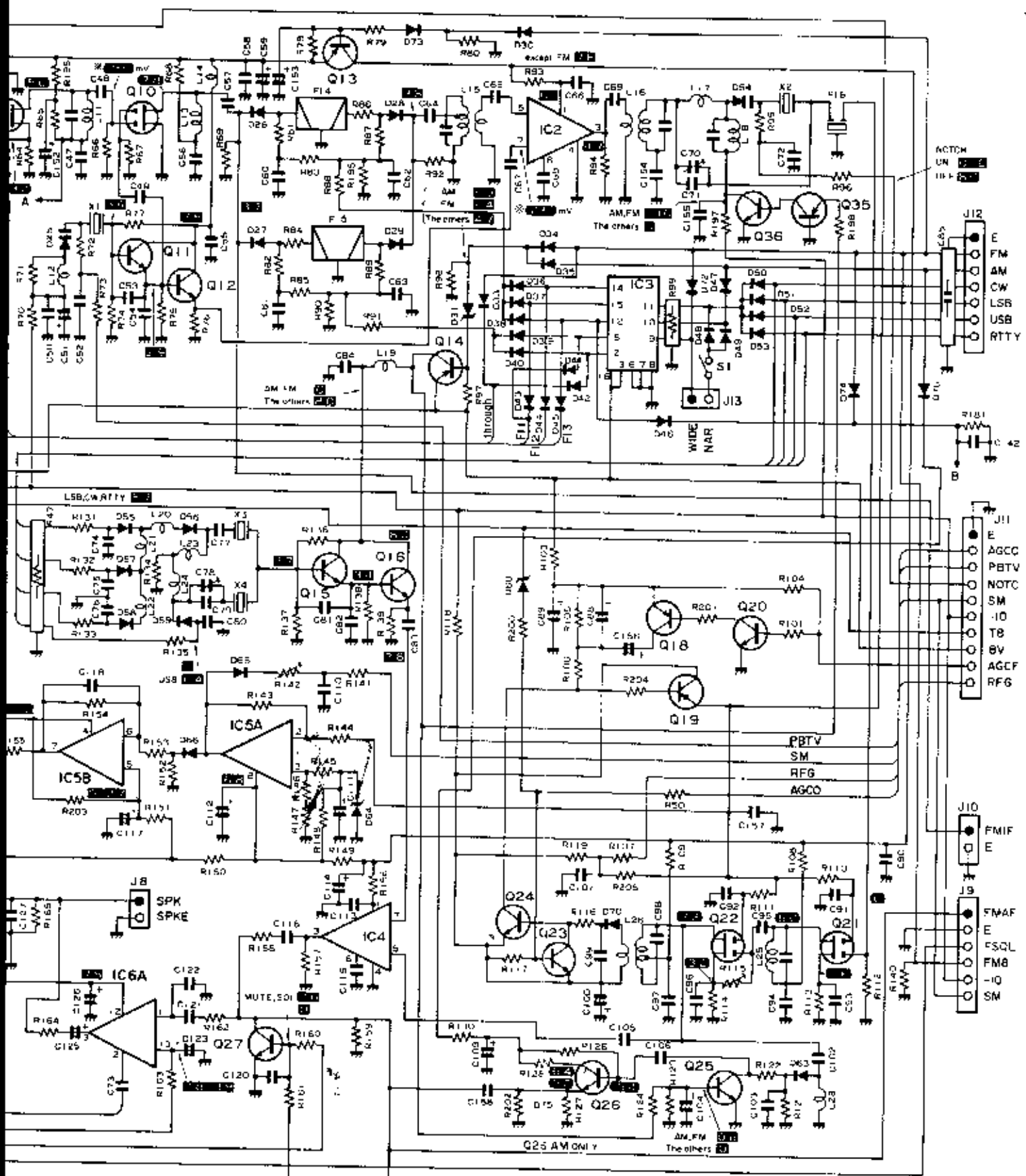
## FM UNIT



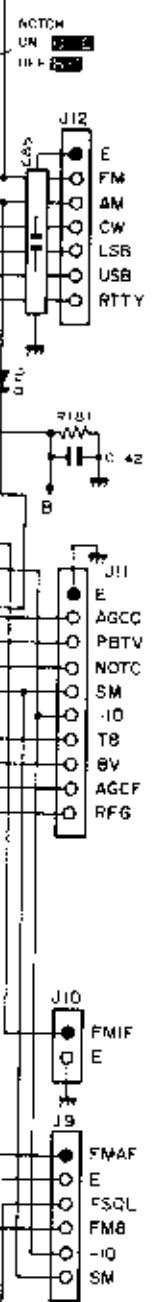


# MAIN UNIT CIRCUIT AND VOLTAGE DIAGRAM

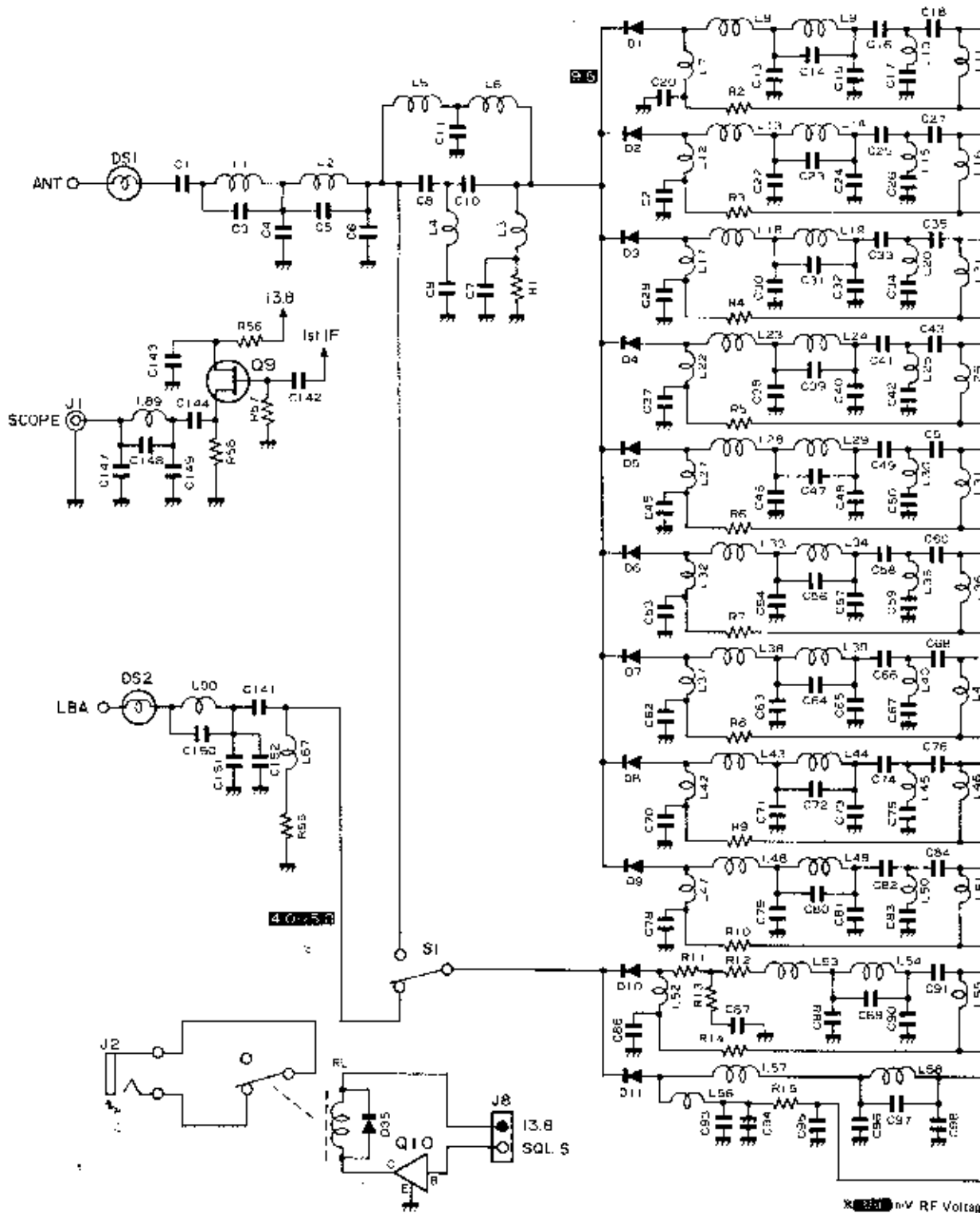




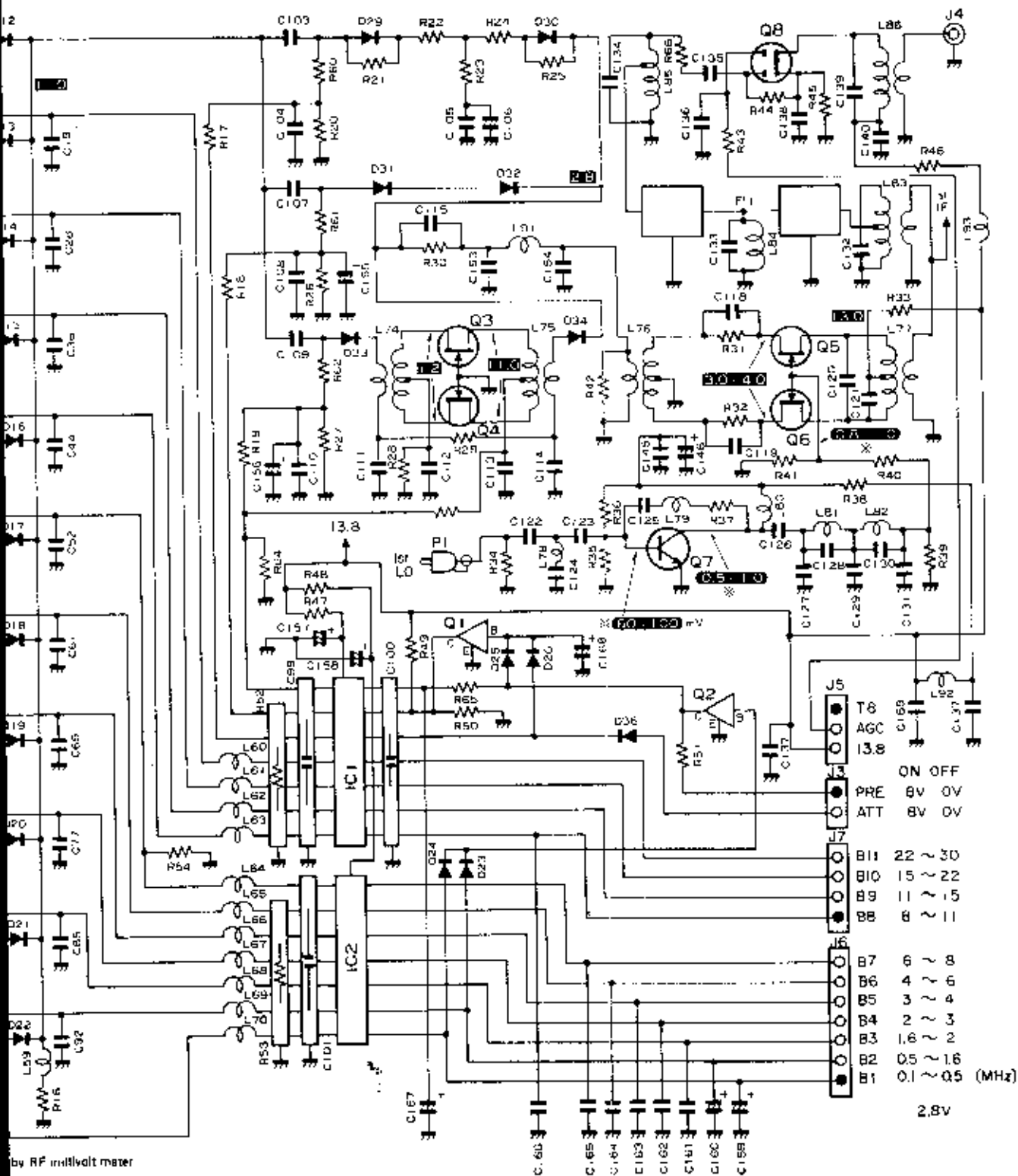
- X 500kV  $\times$  Voltage by 50kV multi meter
- D DC Voltage by high impedance meter
- 50 DC Voltage by 50kV  $\times$  multi meter



# RF UNIT CIRCUIT AND VOLTAGE DIAGRAM



X 200 mV RF Voltage  
 DC Voltage by



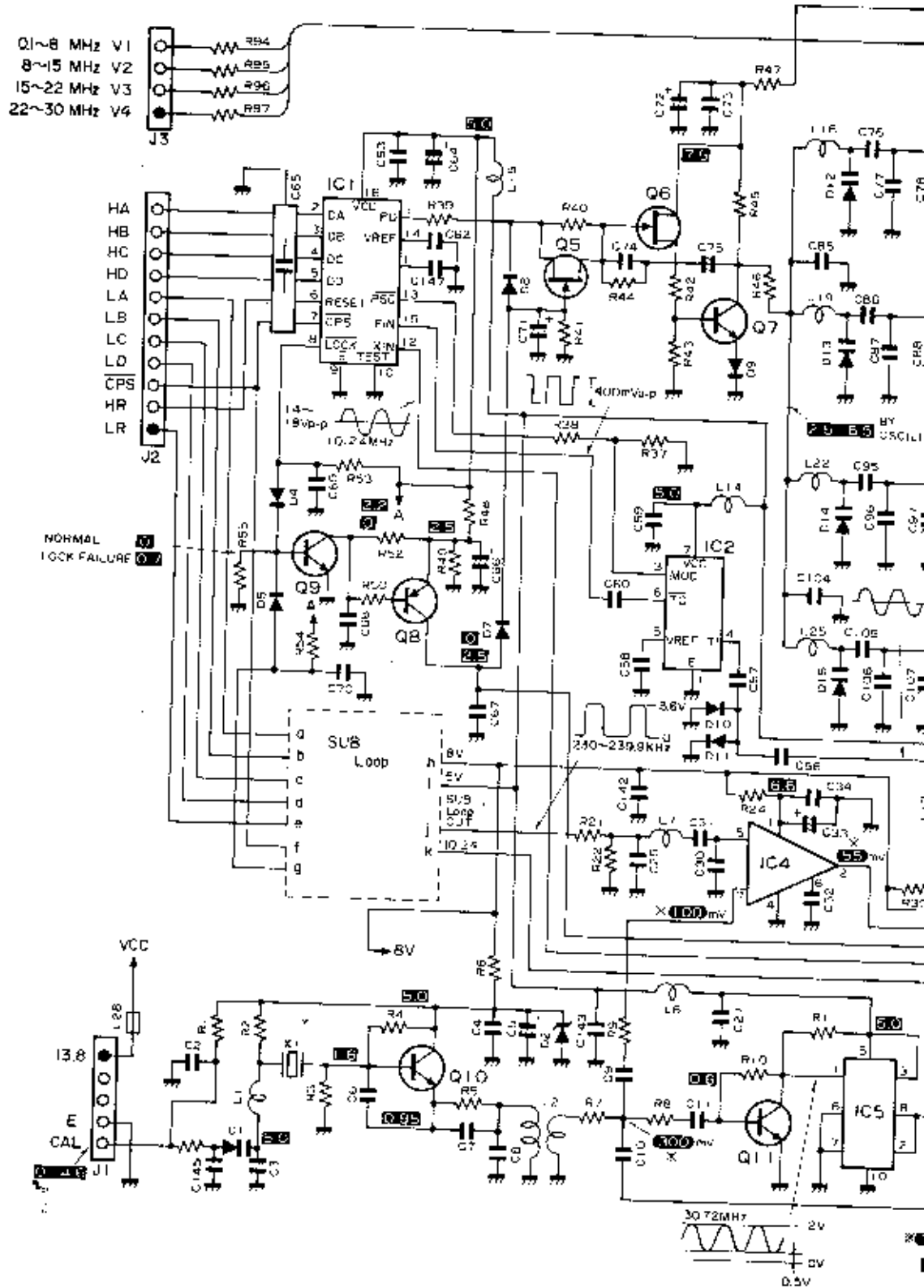
by RF millivolt meter  
 0KΩ-V multimeter

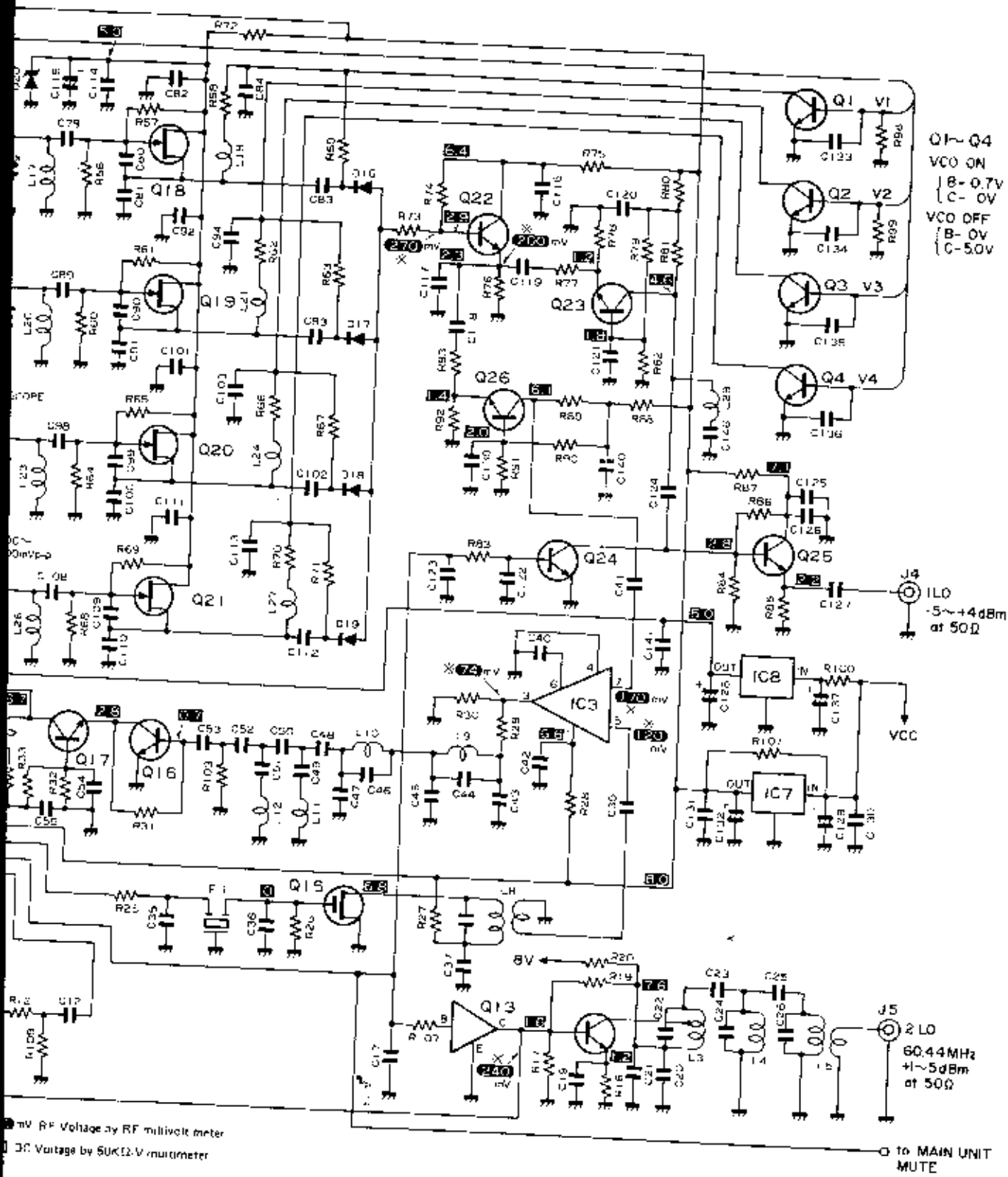
T6	AGC	13.8
ON	OFF	
PRE	8V	0V
ATT	8V	0V

B11	22	~	30
B10	15	~	22
B9	11	~	15
B8	6	~	11
B7	6	~	8
B6	4	~	6
B5	3	~	4
B4	2	~	3
B3	1.6	~	2
B2	0.5	~	1.6
B1	0.1	~	0.5 (MHz)

2.8V

# PLL UNIT CIRCUIT AND VOLTAGE DIAGRAM





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

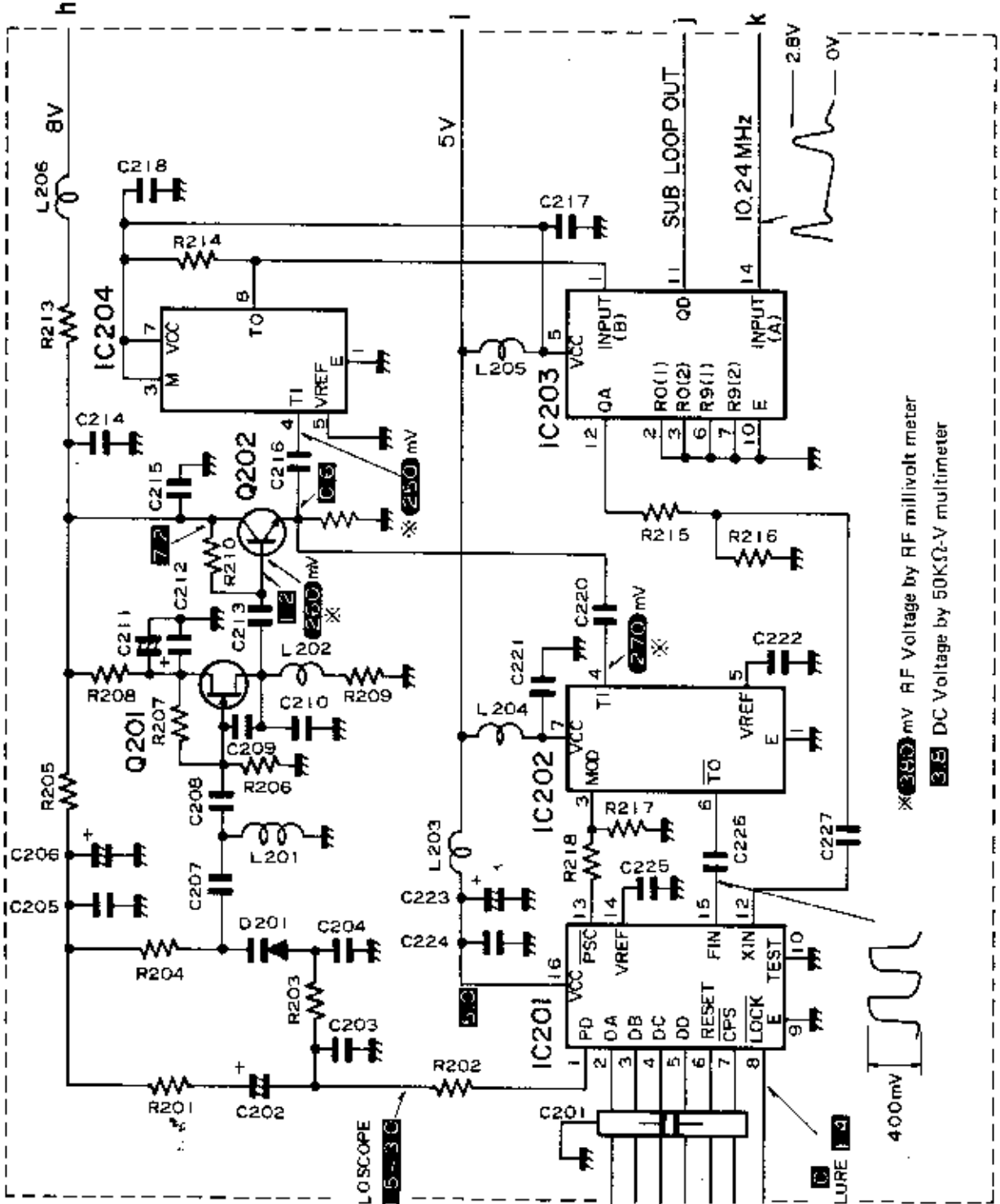
ILO  
 -5~+4dBm  
 at 500

2 LO  
 60.44MHz  
 +/-5dBm  
 at 500

mV RF Voltage by RF millivolt meter  
 DC Voltage by 50K12-V multimeter

O to MAIN UNIT  
 MUTE

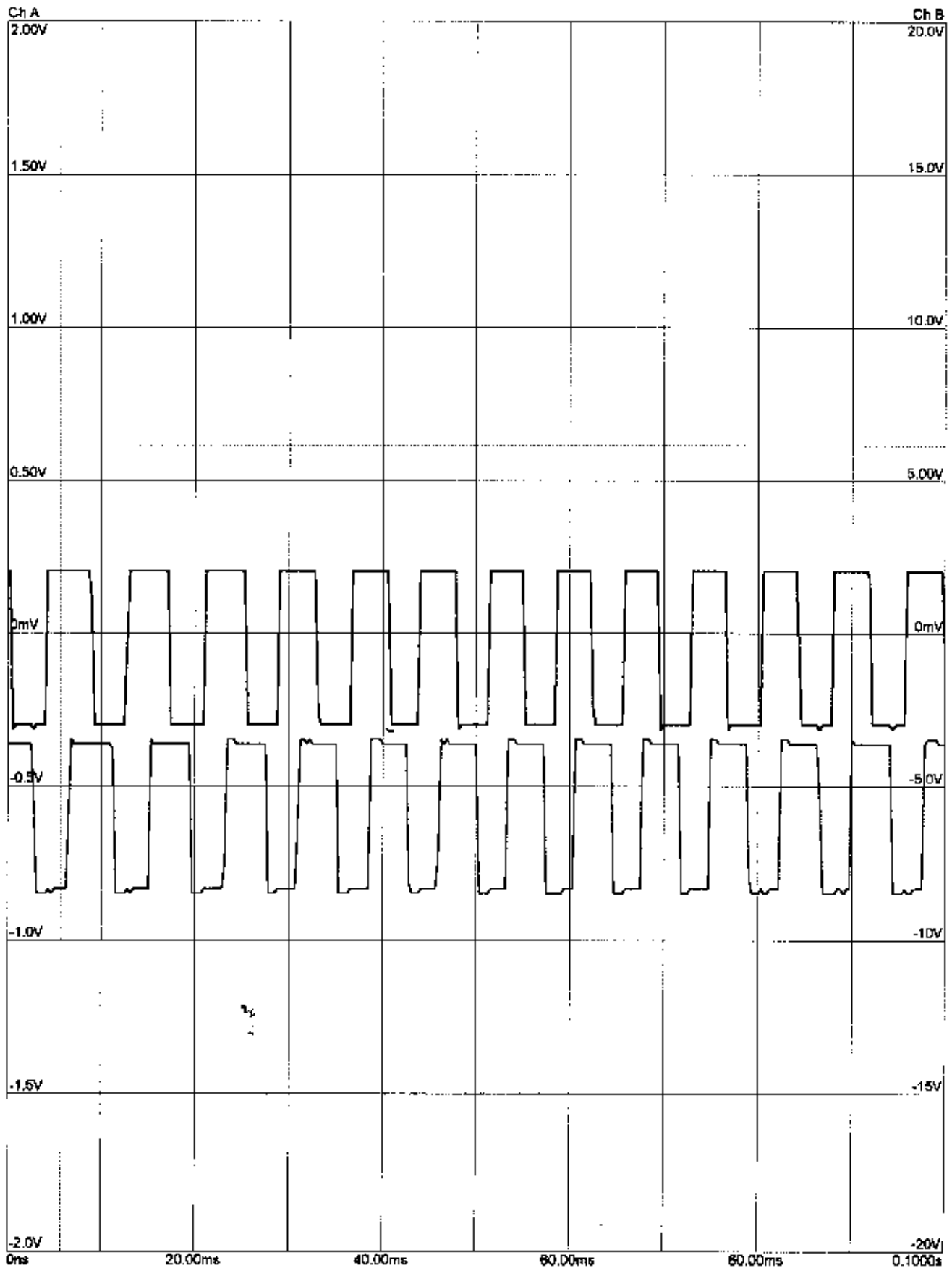
PLL SUB LOOP UNIT CIRCUIT AND VOLTAGE DIAGRAM



\* 350 mV RF Voltage by RF millivolt meter  
 3.5 DC Voltage by 50KΩ-V multimeter

NORMAL LOCK FAILURE

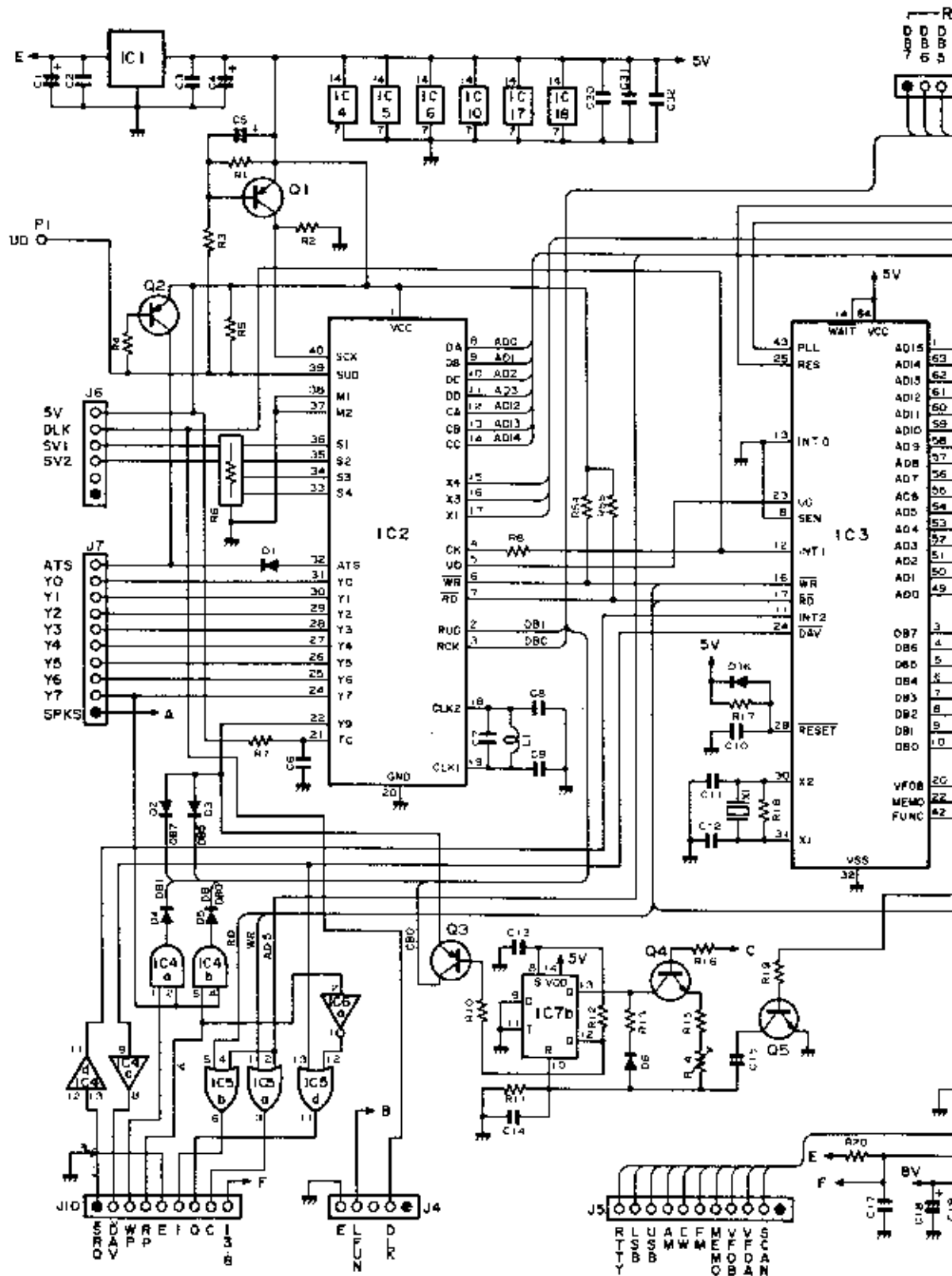
Device : Oscilloscope , Date (dd-mm-yyyy) : 08-10-1998, Time : 10:09, By : Ilpo J Leppänen / IJL-Elektronikka  
Samplefrequency : 3.200KHz  
Crosshair : (Tijd, Ch1, Ch2) : 5.696ms, 0.61V, 6.14V  
Thick line = Ch 1 , Thin line = Ch 2



*10.02.1998 enclavesin siirto (1.0.1998)*

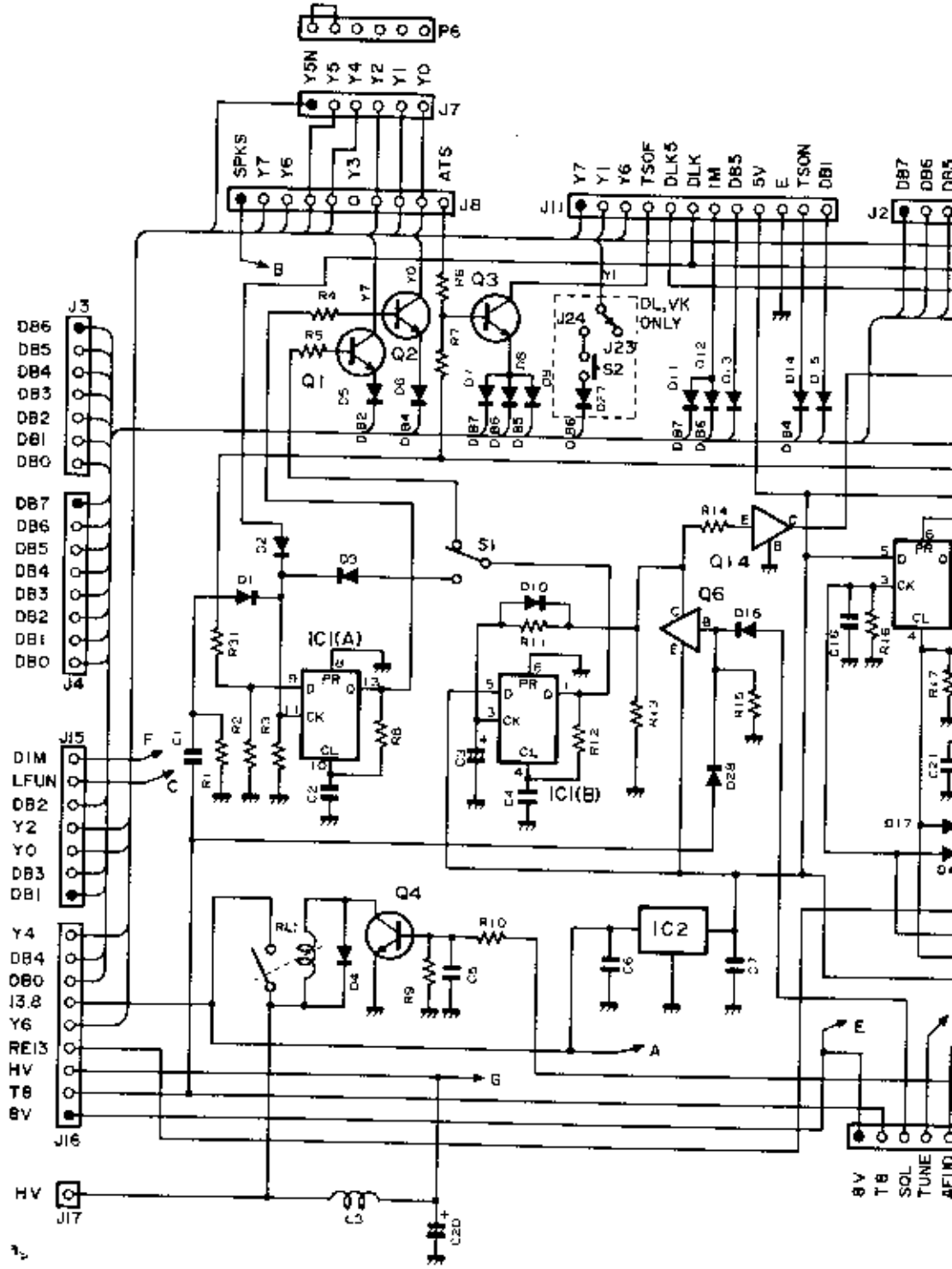


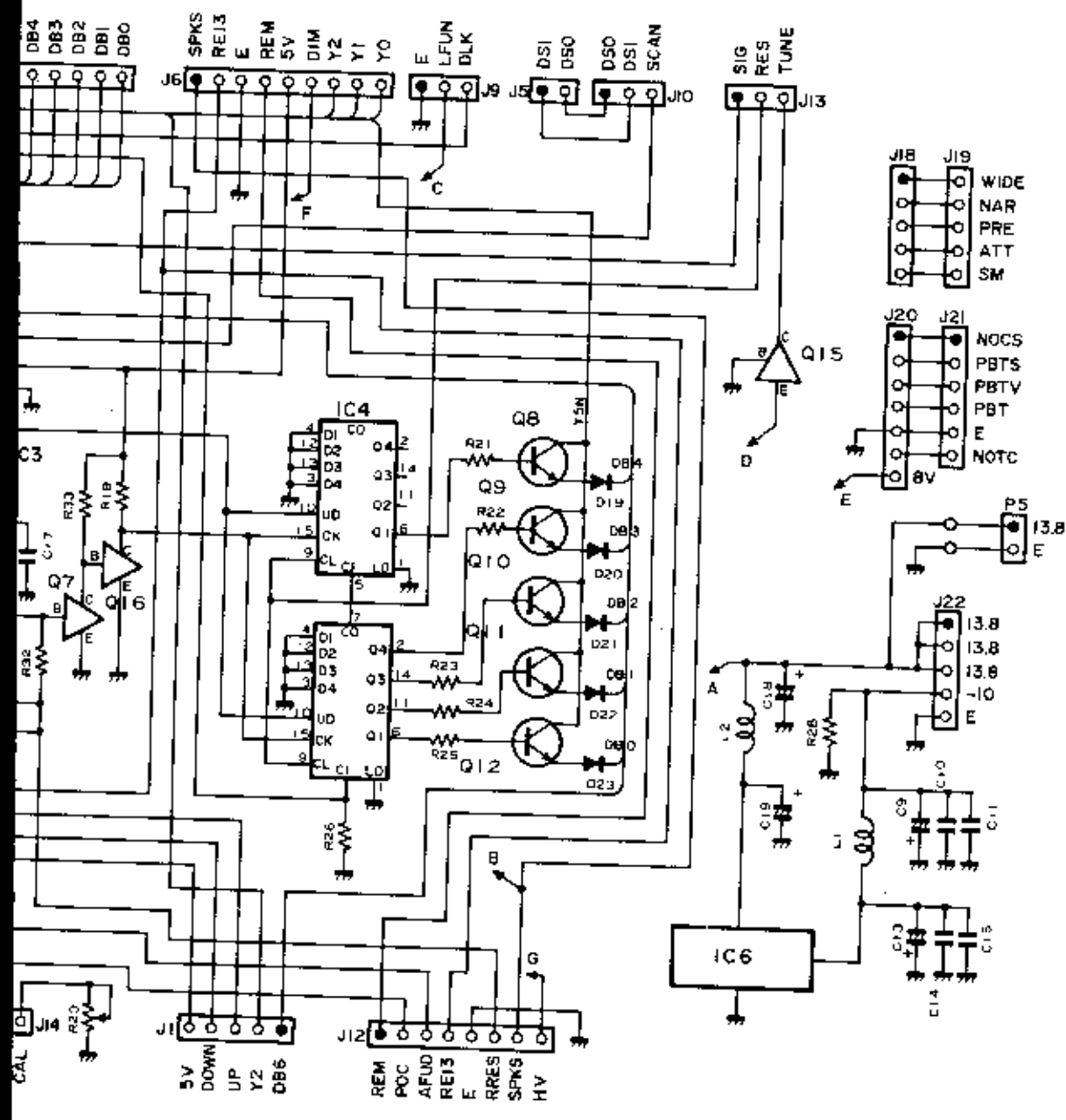
# LOGIC UNIT CIRCUIT DIAGRAM



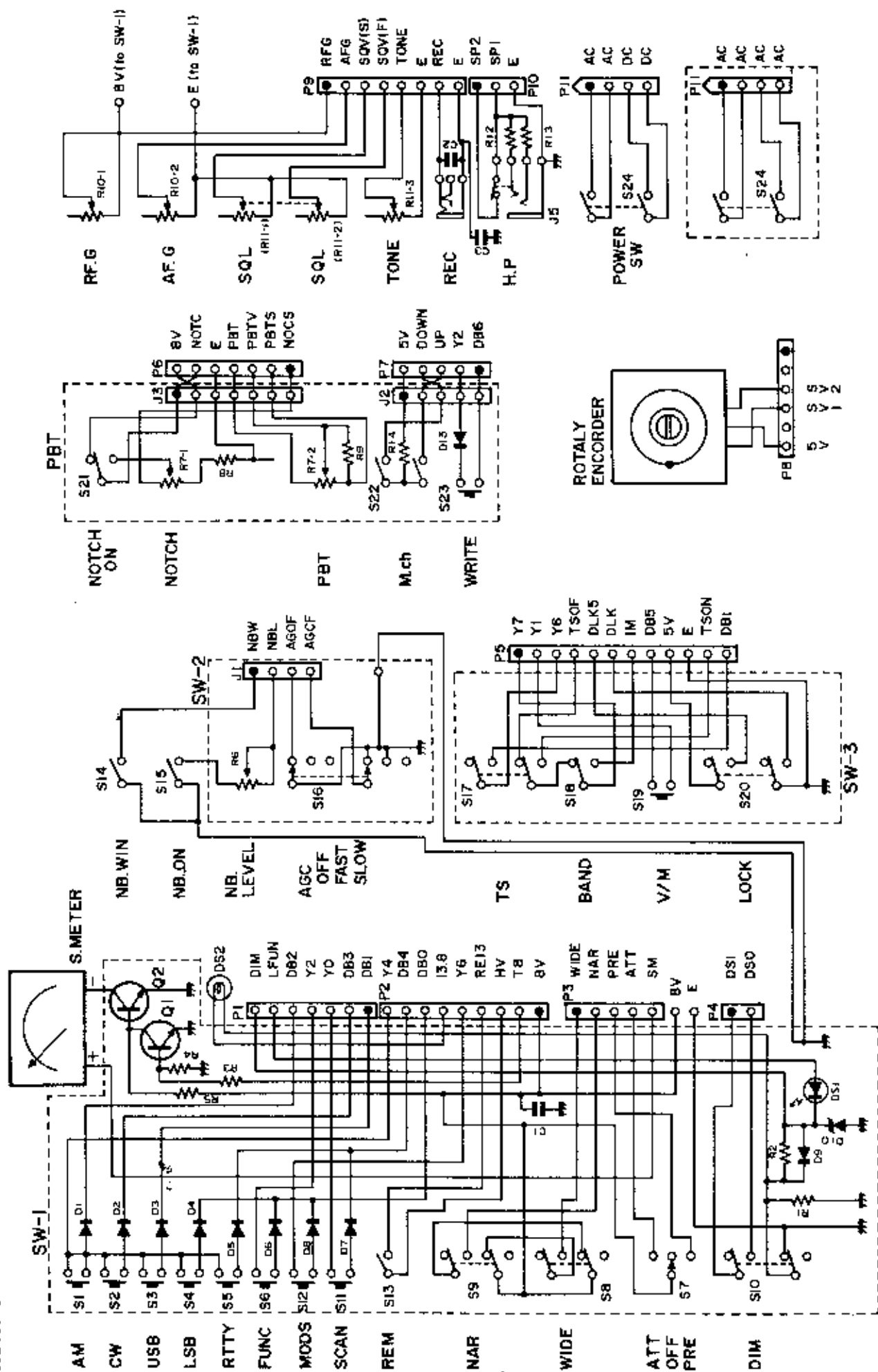


# MATRIX UNIT CIRCUIT AND VOLTAGE DIAGRAM

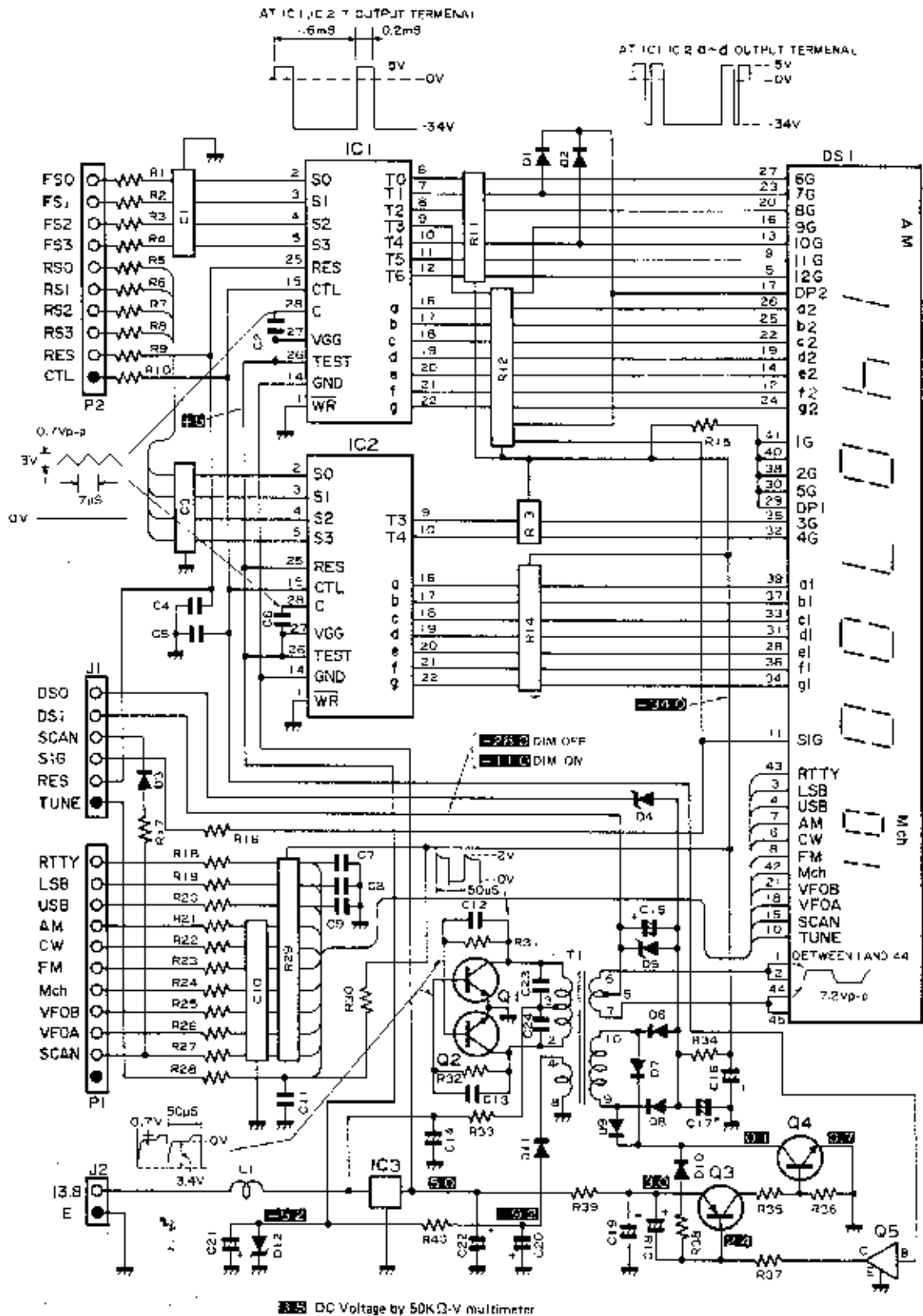




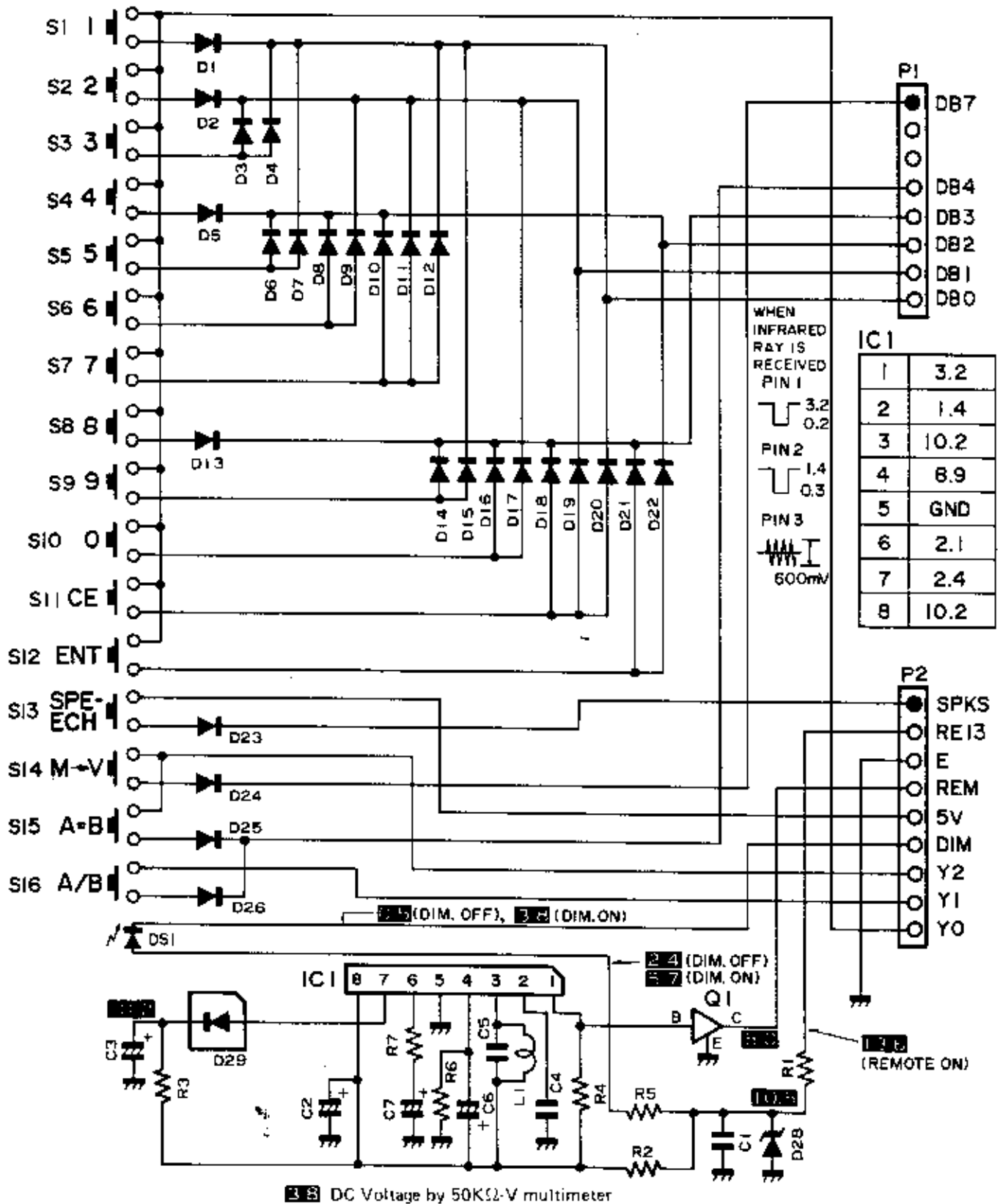
**FRONT UNIT CIRCUIT DIAGRAM**



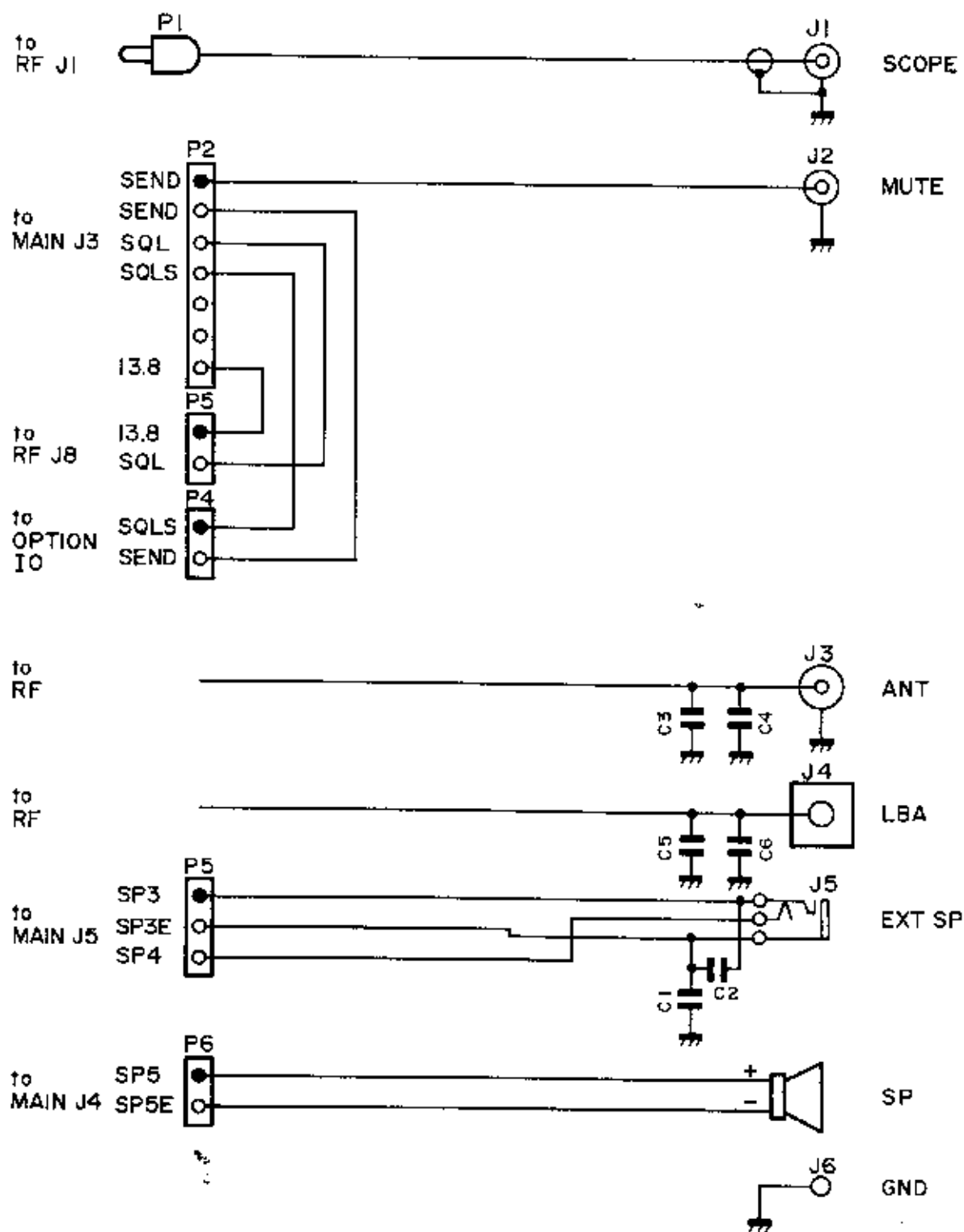
# DISPLAY UNIT CIRCUIT AND VOLTAGE DIAGRAM



# TEN KEY UNIT CIRCUIT DIAGRAM

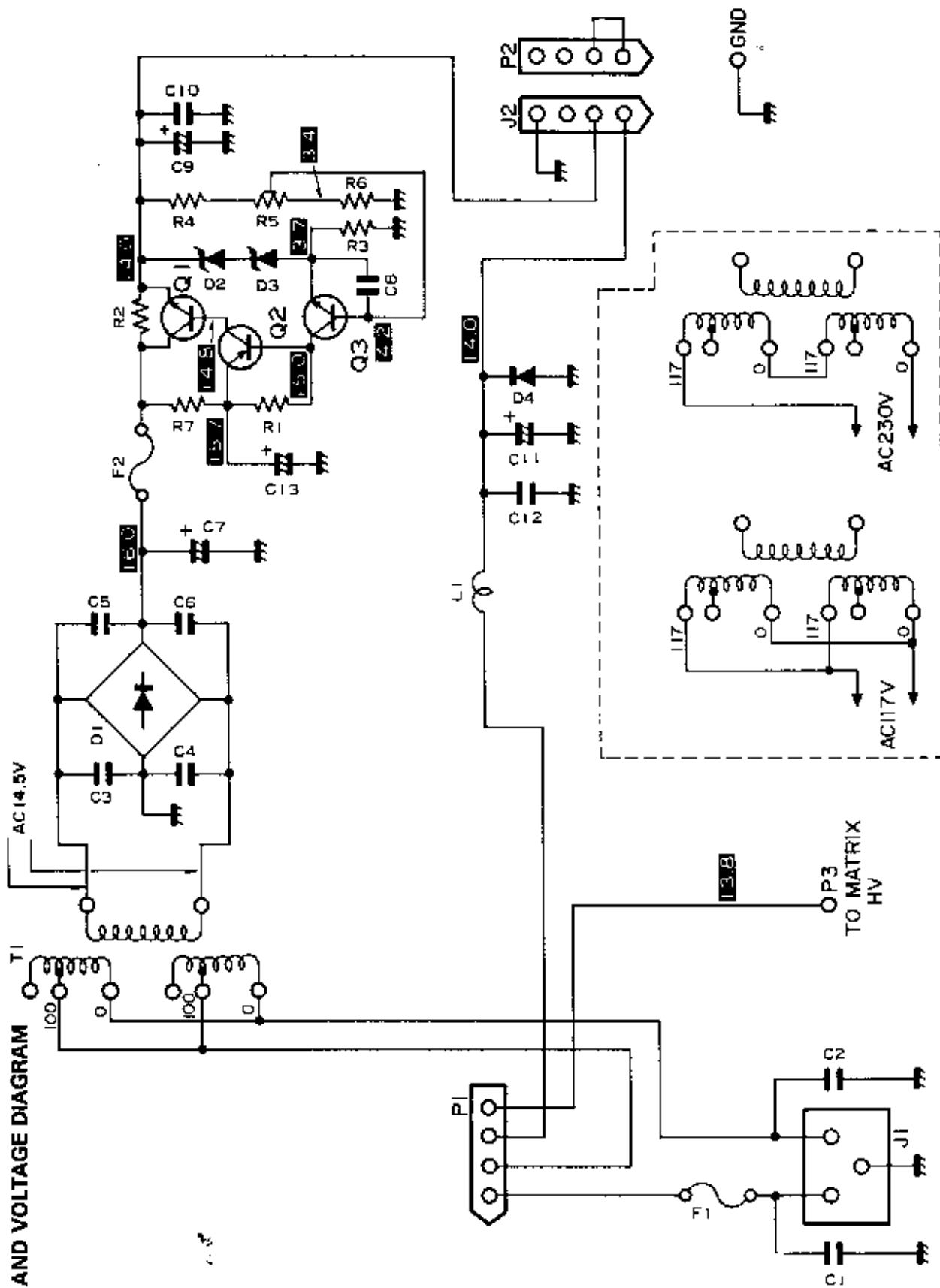


# EF UNIT CIRCUIT DIAGRAM





**REG UNIT CIRCUIT AND VOLTAGE DIAGRAM**



**3.8** DC Voltage by 50KΩ V multimeter

## SECTION 9 IC RATINGS

### μPC1037H (DOUBLE BALANCED MODULATOR)

#### PIN CONNECTION



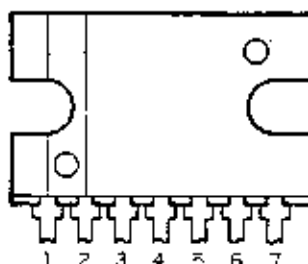
Terminal no.	Connection
1	Vcc
2	Output 1
3	Output 2
4	GND
5	Signal Input
6	Bypass
7	Carrier Input

#### Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	9	V
Package allowable loss	$P_D$	270	mW
Operation temperature	$T_{OPR}$	-30 ~ +65	°C
Storage temperature	$T_{STG}$	-40 ~ +125	°C

### μPC1181H (AUDIO POWER AMPLIFIER)

#### PIN CONNECTION



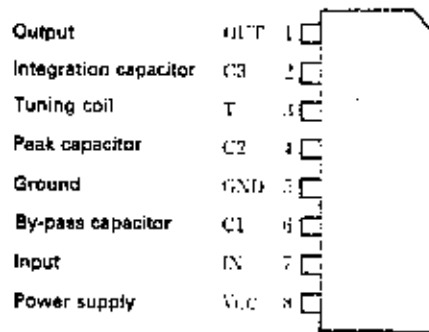
#### Maximum Ratings

Item	Symbol	Rating	Unit
Peak power supply voltage (200 ms)	$V_{CC(SURGE)}$	40	V
Power supply voltage (when no signal)	$V_{CC}$	25	V
Power supply voltage (during operation) *1	$V_{CC}$	18	V
Circuit current	$I_{OC(PEAK)}$	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

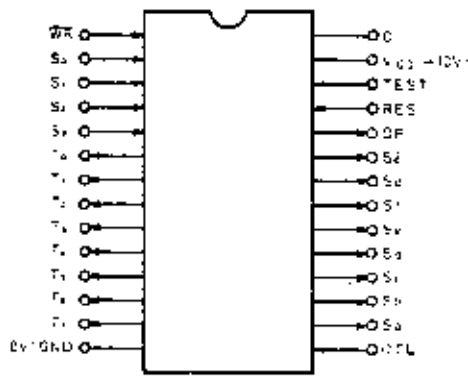


## Maximum Ratings

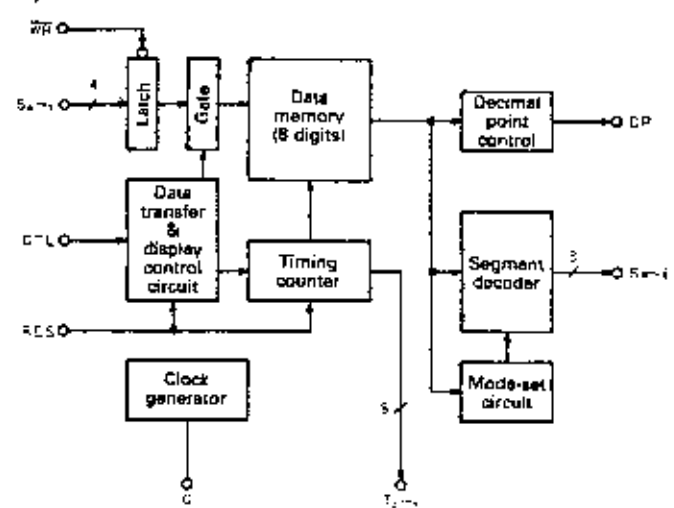
Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}-V_{SS}$	15.0	V
Power consumption	$P_D$	270	mW
Operation temperature	$T_{OPT}$	-20 ~ +75	°C
Storage temperature	$T_{STG}$	-40 ~ +125	°C

# μPD549C (PROGRAMMABLE DISPLAY CONTROLLER)

## PIN CONNECTION



## BLOCK DIAGRAM

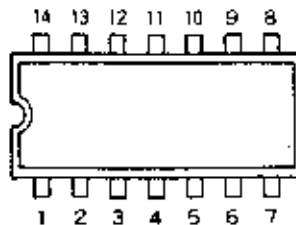


## Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-15 ~ +0.3	V
Input voltage $V_i$	$V_i$	-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

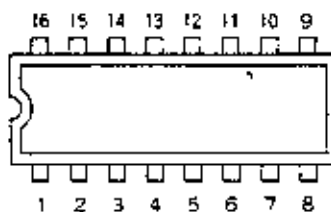


### Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	$V_{DD}$	$V_{SE} - 0.5 \sim V_{SS} + 20$	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	$I_{IN}$	$\pm 10$	mA
Allowable loss	$P_D$	300	mW
Storage temperature	$T_{STG}$	$-85 \sim 150$	$^{\circ}\text{C}$
Lead temperature and time	$T_{SOL}$	$260^{\circ}\text{C} \cdot 10 \text{ sec.}$	

# 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	$I_{IN}$	$\pm 10$	mA
Input/output potential difference when ON	$V_{I/O}$	$-0.5 \sim +0.5$	V
Storage temperature	$T_{STG}$	$-65 \sim 150$	$^{\circ}\text{C}$
Lead temperature and time	$T_{SOL}$	$260^{\circ}\text{C} \cdot 10 \text{ sec.}$	

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

**PIN CONNECTION**

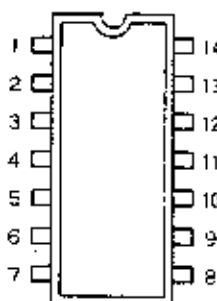


**Maximum Ratings**

Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	$V_{SS} - 0.5 - V_{SS} + 20$	V
Input voltage	$V_{IN}$	$V_{SS} - 0.5 - V_{DD} + 0.5$	V
Output voltage	$V_{OUT}$	$V_{SS} - 0.5 - V_{DD} + 0.5$	V
Input current	$I_{IN}$	$\pm 10$	mA
Allowable loss	$P_D$	300	mW
Storage temperature	$T_{STG}$	-85 ~ 150	°C
Lead temperature and time	$T_{SOL}$	250°C · 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**



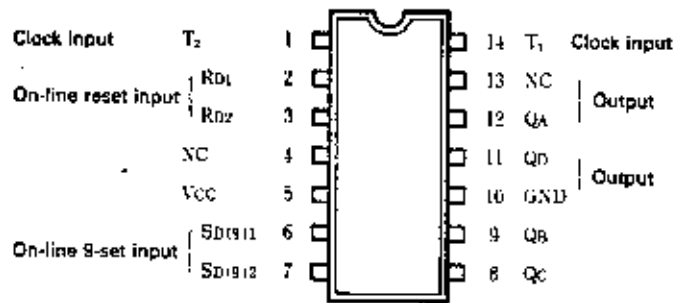
**Maximum Ratings**

Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5 ~ +7	V
Input voltage	$V_I$	-0.5 ~ +15	V
Output voltage *1	$V_O$	-0.5 ~ $V_{CC}$	V
Operation ambient temperature	$T_{OPR}$	-20 ~ +75	°C
Storage temperature	$T_{STG}$	-85 ~ +150	°C

\*1 When output is H

# SN74LS90N (DECODE COUNTER)

## PIN CONNECTION



### Maximum Ratings

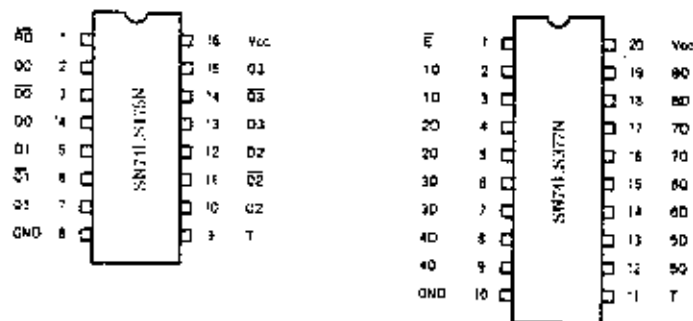
Item	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5 ~ +7	V
Input voltage	$V_I$	-0.5 ~ +5.5	V
	$V_I$	-0.5 ~ +15	
Output voltage *1	$V_O$	-0.5 ~ $V_{CC}$	V
Operation ambient temperature	$T_{OPR}$	-20 ~ +75	°C
Storage temperature	$T_{STG}$	-65 ~ +150	°C

\*1 Inputs  $T_1$  and  $T_2$

\*2 Inputs  $RD_1$ ,  $RD_2$ ,  $SD_{1/12}$  and  $SD_{2/13}$

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

## PIN CONNECTION



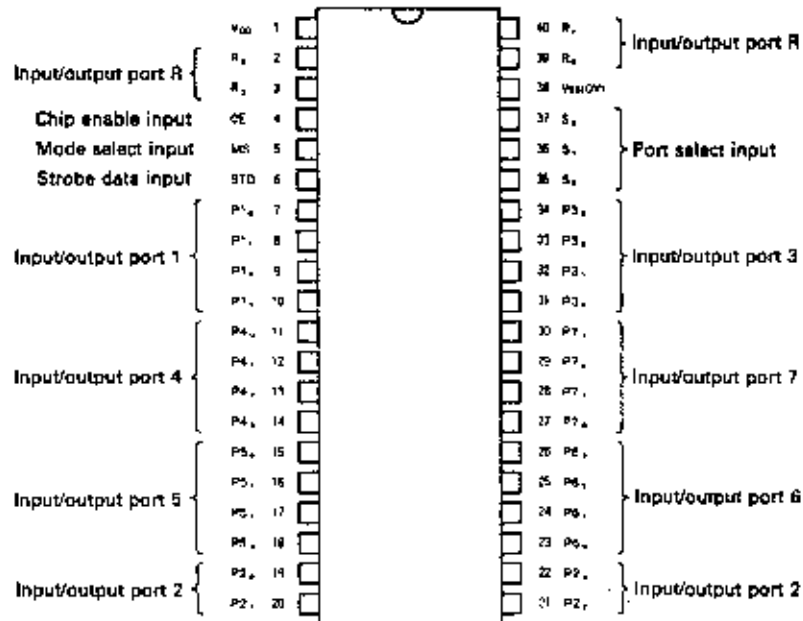
### Maximum Ratings

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

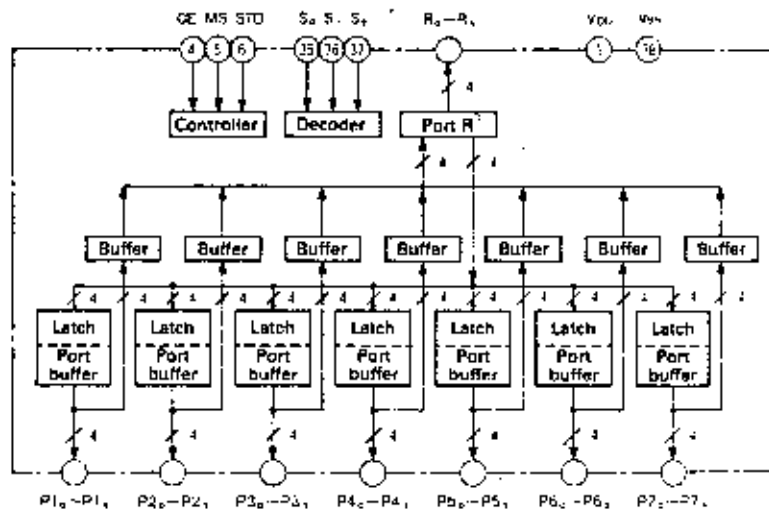
\*1 When output is H

# M50780SP (INPUT/OUTPUT EXPANDER)

## PIN CONNECTION



## BLOCK DIAGRAM



## Maximum Ratings

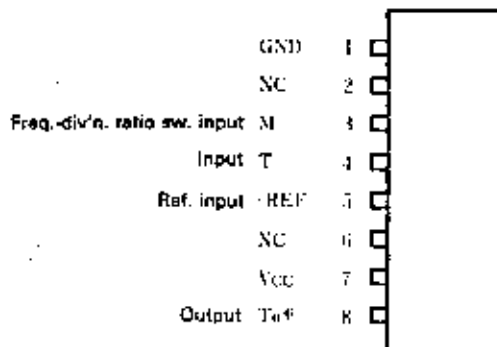
Item	Symbol	Rating	Unit
Power supply voltage	$V_{DD}$	-0.3 - 15	V
Input voltage	$V_I$	$V_{SS} - 0.3 - V_{DD} + 0.3$	V
Output voltage *1	$V_O$	$V_{SS} - 0.3 - V_{DD} + 0.3$	V
Maximum power consumption *2	$P_D$	600	mW
Operation ambient temperature	$T_{OPR}$	-10 - +70	°C
Storage temperature	$T_{STG}$	-40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

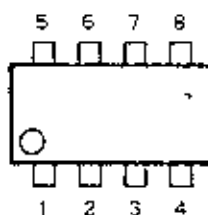
M	L	H
Freq.-div'n. ratio	1/20	1/100

### Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V <sub>CC</sub>	7	V
Input voltage	V <sub>I</sub>	2.5	V
Output voltage	V <sub>O</sub>	5.5	V
Power consumption	P <sub>O</sub>	1.33	W
Operation ambient temperature	T <sub>OPR</sub>	-10 ~ +75	°C
Storage temperature	T <sub>STG</sub>	-55 ~ +125	°C

## NJM4558D (DUAL LOW NOISE AMP.)

### PIN CONNECTION



### Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V <sub>DD</sub>	18	V
Input voltage	V <sub>IN</sub>	15	V
Operation temperature	T <sub>OPR</sub>	-20 ~ +75	°C
Storage temperature	T <sub>STG</sub>	-40 ~ +125	°C

## AN829 (DUAL ATTENUATOR)

### Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V <sub>DC</sub>	18	V
Control input voltage	V <sub>C</sub>	0 ~ 6	V
Allowable loss	P <sub>D</sub>	450	mW
Operation temperature	T <sub>OPR</sub>	-20 ~ +75	°C
Storage temperature	T <sub>STG</sub>	-55 ~ +150	°C



## SECTION 10 PARTS LIST

### [EF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C1	Ceramic	0.0047	50V
C2	Ceramic	0.0047	50V
C3	Ceramic	33P	50V
C4	Ceramic	33P	50V
C5	Ceramic	68P	50V
C6	Ceramic	68P	50V
J1	Connector	AT-700	
J2	Connector	AT-700	
J3	Connector	FM-MD-RM1	
J4	Connector	T-19 (S) RED	
J5	Connector	HSJ 0779-01A	
J6	Connector	SQ-2054	
P1	Connector	{TMP-P01X-A1} W1	
P2	Connector	TL-25H-07-B1	
P3	Connector	TL-25H-02-B1	
P4	Connector	TL-25H-02-B1	
P5	Connector	TL-25H-03-B1	
P6	Connector	5250-2A	
SP1	Speaker	C090K10I0851	

### [FRONT UNIT]

REF. NO.	DESCRIPTION	PART NO.	
Q1	Transistor	2SC945P	
Q2	Transistor	2SC945P	
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	RD3.9EB2	
D13	Diode	1SS53	
R1	Resistor	150	R50X
R2	Resistor	220	ELR25
R3	Resistor	4.7K	R25
R4	Resistor	2.2K	R25
R5	Resistor	10K	R25
R6	Variable	K1214003W-1KB	
R7	Variable	K12B80A0L-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-78	
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
WB	Jumper	JPW-02A

## [MAIN UNIT]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	ND487C1-3R
IC2	IC	μPC1037H
IC3	IC	TC-4051BP
IC4	IC	μPC1037H
IC5	IC	NJM4558D
IC6	IC	AN829
IC7	IC	μPC1181H
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	2SC1671G
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
D8	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 BP
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 RC2
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 RC2
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-06-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.
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	88ZC0111N-32N
C100	Array	88ZC0111N-32N
C101	Array	88ZC0111N-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]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	8A618
IC2	IC	8A618
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 R85
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
C8	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	DD108SL471J50V2	
C50	Barrier Lay	TBD05V272K-L0B	

## [RF UNIT]

REF NO.	DESCRIPTION	PART NO.
B1	P. C. Board	B-859A
W3	Jumper	IPS-1041-4
W4	Jumper	IPS-1041-4
W5	Jumper	IPS-1041-4
W6	Jumper	IPS-1041-4
W7	Jumper	IPS-1041-4
W8	Jumper	IPS-1041-4
W9	Jumper	IPS-1041-4
W10	Jumper	IPS-1041-4
W11	Jumper	JPW-02H
W12	Jumper	IPS-1041-4
W13	Jumper	IPS-1041-4
W14	Jumper	IPS-1041-4
W15	Jumper	IPS-1041-4
W16	Jumper	IPS-1041-4
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	IPS-1041-4
W28	Jumper	JPW-02H
W29	Jumper	IPS-1041-4
W30	Jumper	JPW-02H
W31	Jumper	IPS-1041-4
W32	Jumper	IPS-1041-4
W33	Jumper	IPS-1041-4
W34	Jumper	JPW-02A
W35	Jumper	JPW-02A
W36	Jumper	JPW-02A
W37	Jumper	JPW-02A
S1	Switch	HSW0474-01050

## [LOGIC UNIT]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	$\mu$ A78M05
IC2	IC	RP5G01 007
IC3	IC	$\mu$ PD7801G 114
IC4	IC	SN74LS08N
IC5	IC	SN74LS32N
IC6	IC	SN74LS02N
IC7	IC	4013B
IC8	IC	TC4528BP
IC9	IC	SN74LS377N
IC10	IC	SN74LS11N
IC11	IC	SN74LS175N
IC12	IC	BA618
IC13	IC	BA618
IC14	IC	M50780SP
IC17	IC	SN74LS08N
IC18	IC	SN74LS08N
IC19	IC	$\mu$ A78L82AWC
Q1	Transistor	2SA1048Y
Q2	Transistor	2SA1048Y
Q3	Transistor	2SA1048Y
Q4	Transistor	2SC2458GR
Q5	Transistor	2SC2458GR
Q6	Transistor	2SA1348
Q7	Transistor	2SA1348
Q8	Transistor	2SA1348
Q9	Transistor	2SA1348
Q11	Transistor	2SA1348
Q12	Transistor	2SA1348
Q13	Transistor	2SA1348
Q14	Transistor	2SA1348
Q15	Transistor	2SA1348
Q16	Transistor	2SA1348
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	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
R56	Resistor	10K R25
C1	Electrolytic	33 16V
C2	Barrier Lay	0.1 16V
C3	Barrier Lay	0.1 16V
C4	Electrolytic	47 10V
C6	Electrolytic	1 50V
C6	Barrier Lay	0.1 50V
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 RAM UNIT	B-705B 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	2SA1016Y
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	87ZC0717-32N	
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	60V
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	$\mu$ PD549C
IC2	IC	$\mu$ PD549C
IC3	IC	$\mu$ A78L05
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-11-81
P2	Connector	TL-25H-10-81
DS1	FLO	FIP98M7
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	Jumper	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	$\mu$ A78LQ5
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-02H
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	μPC1373H
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
S5	Switch	HKW0269-01-200
S6	Switch	HKW0269-01-200
S7	Switch	HKW0269-01-200
S8	Switch	HKW0269-01-200

## [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]

REF NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SD880
Q2	Transistor	2SA1015Y
Q3	Transistor	2SC945P
D1	Diode	KBPC102
D2	Zener	RD5.1E B2
D3	Zener	RD5.1E B2
D4	Diode	U05B
L1	Coil	LW-16
R1	Resistor	10K ELR25
R2	Resistor	SRW3P100-J
R3	Resistor	100 R25
R4	Resistor	2.7K ELR25
R5	Trimmer	EVN5AC500
R6	Resistor	1K ELR25
R7	Resistor	4.7 R25
C1	Ceramic	DE7090B102KVA1-KC
C2	Ceramic	DE7090B102KVA1-KC
C3	Ceramic	DD112B103K50V02
C4	Ceramic	DD112B103K50V02
C5	Ceramic	DD112B103K50V02
C6	Ceramic	DD112B103K50V02
C7	Electrolytic	4700 25V
C8	Barrier Lay	0.1 16V
C9	Electrolytic	470 16V
C10	Electrolytic	0.0047 50V
C11	Electrolytic	470 16V
C12	Barrier Lay	0.1 16V
C13	Electrolytic	100 25V
J1	Connector	CM-3
J2	Connector	1490-4P
P1	Connector	3191-04R1
P2	Connector	1490-4R1
P3	Connector	1P-SMF 01T-1.3
F1	Fuse Holder	FH-032
F1	Fuse	100 ~ 117V 1A
F1	Fuse	230V 0.5A
F2	Fuse	2A
F3	Fuse Holder	S-N5051
F4	Fuse Holder	S-N5051
T1	Transformer	TP-28
B1	P.C.Board	B-861
W13	Jumper	1PS-1041-4

## [DL-REG UNIT]

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