



2m FM

SYNTHESIZED

HAND-HELD TRANSCEIVER

**Model TR-2500**



**INSTRUCTION MANUAL**

## INTRODUCTION

You are the owner of our newest product, the TR-2500 Transceiver. Please read this instruction manual carefully before placing your transceiver in service.

The unit has been carefully engineered and manufactured to rigid quality standards, and should give you satisfactory and dependable operation for many years.

### AFTER UNPACKING;

Save the boxes and packing material in the event your unit needs to be transported for remote operation, maintenance, or service.

The following explicit definitions apply in this manual:

**NOTE:** If disregarded, inconvenience only, no risk of equipment damage or personal injury.

**CAUTION:** Equipment damage may occur, but not personal injury.

**CAUTION: DO NOT CONNECT AN EXTERNAL DC SUPPLY DIRECTLY TO THE CHARGE TERMINAL.**

Use only the supplied charger unit, optional base stand ST-2, or mobile stand MS-1. Extensive damage will occur if this is disregarded.

**CAUTION: DO NOT ATTEMPT TO MODIFY OR OTHERWISE TOUCH CMOS LSI CIRCUITS.** Leave all service to a qualified, experienced technician.

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# SPECIFICATIONS

**[GENERAL]**

**Frequency Range** ..... 144.000 – 145.995 MHz  
**Memory Channels** ..... 10 CH  
**Mode** ..... FM (F3)  
**RPT. Tone frequency** ..... 1,750 Hz  
**Operating voltage Range**  
    **and operating Range** ..... 8.4 V DC ± 25%  
**Power Requirement** ..... 8.4 V, 400 mA (Ni-Cd battery pack)  
                                      9 V AAA manganese battery 6 pcs. (option)  
**Back-up Power Requirement** ..BR-2325 type Lithium battery  
**Current Drain**.....Less than 30mA in receive mode with no input signal  
                                  Less than 800mA in HI transmit mode (at 8.4 V)  
                                  Less than 400 mA in Low transmit mode (at 8.4 V)  
                                  Less than 1 $\mu$ A for memory back-up  
**Grounding**.....Negative  
**Operating Temperature** ..... – 20°C to + 50°C  
**Antenna Impedance**.....50  $\Omega$   
**Semiconductors**.....Microcomputer    1  
                                      ICs                 5  
                                      FET                1  
                                      Transistors     51  
                                      Diodes            40  
                                      LCD               1  
                                      LED               1  
**Dimensions** .....With Ni-Cd battery: 66(2.6)W x 168(6.7)H x 40(1.6)D mm(inch)  
                                  With manganese battery: 66(2.6)W x 176(7.0)H x 40(1.6)D mm(inch)

**Weight** .....With Ni-Cd battery: 540 g (1.2 lbs.)  
                          With manganese battery: 530 g (1.2 lbs.)

**[TRANSMITTER]**

**RF Output Power**.....HI = 2.5 W  
  LOW = 0.3 W approx.  
**Modulation**.....Variable reactance direct shift  
**Frequency Tolerance** .....Less than  $\pm 20 \times 10^{-6}$   
  (– 10°C ~ + 50°C)  
**Maximum Frequency**  
    **Deviation** .....  $\pm 5$  kHz  
**Spurious Radiation** .....Less than – 60 dB  
**[RECEIVER]**  
**Circuitry** .....Double conversion superheterodyne  
**Intermediate Frequency**.....1st IF = 10.7 MHz  
  2nd IF = 455 kHz  
**Sensitivity**.....Better than 1 $\mu$ V for S/N 30 dB  
  Less than 0.2 $\mu$ V for 12 dB SINAD  
**Pass-Band Width**.....More than 12 kHz (– 6 dB)  
**Selectivity** .....Less than 24 kHz (– 60 dB)  
**Supuious Response** .....Better than 50 dB  
**Squelch Sensitivity**.....Less than 0.25 $\mu$ V (threshold)  
**Audio Output Power** .....More than 400 mW (at 10% distortion and 8  $\Omega$  load)

**Note:** Circuit and ratings may change without notice due to developments in technology.

# Section 1 PREPARATION FOR USE

## ACCESSORIES

Carefully unpack your TR-2500 transceiver and check that it is supplied with the following accessories

Accessory	Part Numbers:
Rubber Flex Antenna	T90-0329-05
Ni-Cd Battery Pack	W09-0320-05
AC Charger	W09-0317-05
External Speaker Plug	E12-0401-05
External Mic Plug	E12-0001-05
Hand Strap	J69-0303-04

## BATTERY NOTE

The supplied battery pack is not charged at the factory. Charge the pack for about 15 hours before use.

### 1. OPERATING TIME:

Normal operating time of TR-2500 is 110 minutes for 1 minute transmission and 3 minutes reception using Hi Power mode. The following illustration shows the voltage/power versus time characteristics.

### 2. BATTERY LOADING

To load the battery pack, slide the pack onto the transceiver until the catch engages ("clicks"). To change or remove the battery pack, press the release button and slide the pack off to the left.

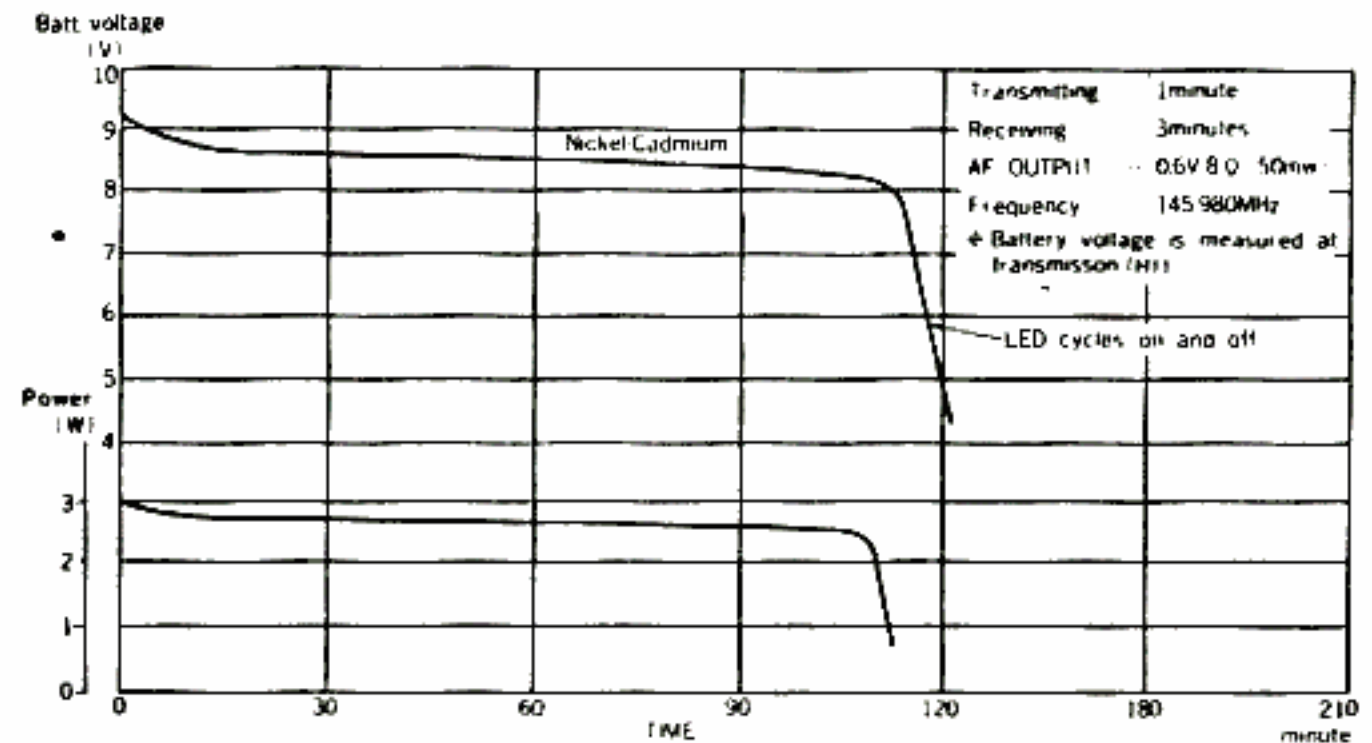


Fig. 1-1 Operating time

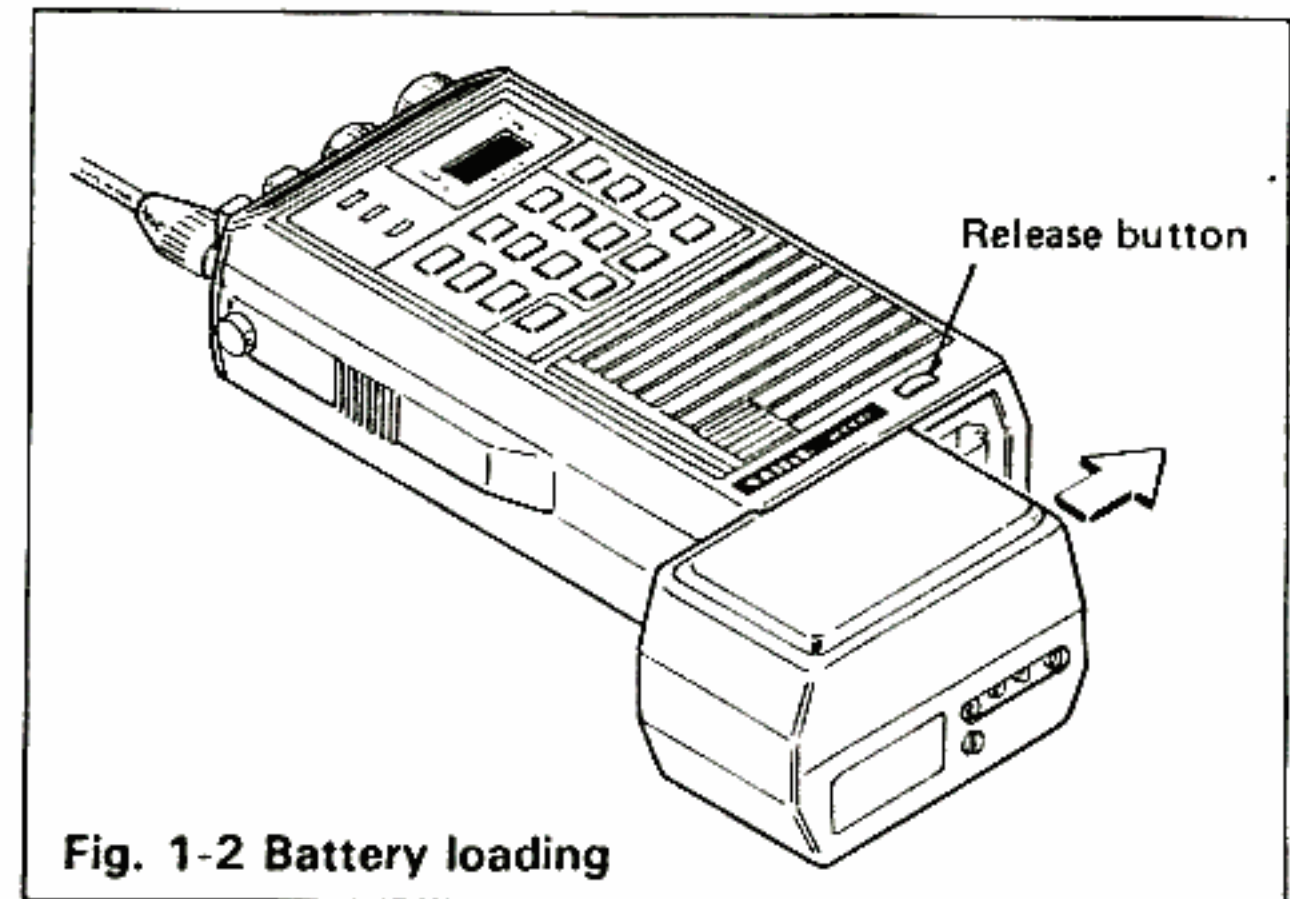


Fig. 1-2 Battery loading

### 3. CHARGING

When the battery LED indicator flashes on and off, the battery should be charged using the supplied AC wall charger.

Charger: LED indicates charger is delivery current to the battery pack. It does not indicate full charge. Disconnect after 15 hours charging time.

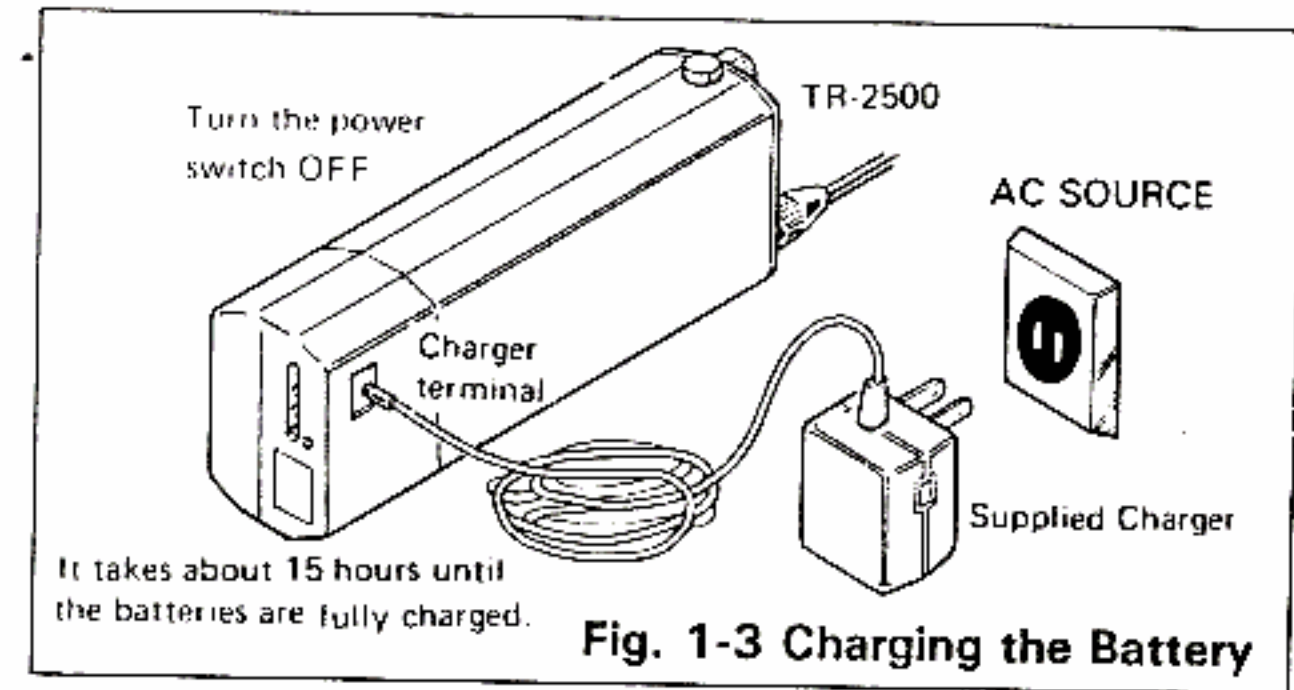
During charge with the supplied charger, DC power to the TR-2500 is automatically OFF, so the TR-2500 can not be operated. The battery may be charged using a MODEL MS-1 mobile stand or MODEL ST-2 base stand, available as optional accessories.

A fully charged battery will last for about 110 minutes when used at the rate or 1 minute transmission and 3 minutes reception (squelch ON, Hi Power.).

**NOTE 1:** The batteries will charge in 10 to 15 hours, depending on usage. We suggest you establish a charging schedule based on your personal operating habits. You may need to charge the pack every day, or only every other day. Experiment to determine your needs.

**NOTE 2:** To help you obtain long life from the battery pack do not always keep the cells "topped", or fully charged. They will develop what is known as a "memory". When you do not exercise NiCad's through normal charge-discharge cycles, they will not perform when needed. They will drain sooner, and may not recharge after heavy use. To insure good operation, EXERCISE the batteries.

**NOTE 3:** Use low power to obtain maximum operating time.



**CAUTION:** This is a **Charge terminal only**. Do not direct wire this terminal to an external power supply.

**NOTE 1:** The battery indicator will light momentarily when the power switch is turned off. This is not an indication that the battery is low.

**NOTE 2:** Battery Charge Time: Batteries will charge within 10 to 15 hours. That is, the radio is supplied with a 400mAh pack. Rule of thumb is charge at 1/10 the pack rating, for approximately 14 hours. Light discharge will require a shorter charge time.

**CAUTION:** When the batteries have been fully charged, do not attempt to continue charging. The batteries should be charged at temperatures of 0°C ~ 45°C.

#### 4. BATTERY REPLACEMENT

The TR-2500 is supplied with rechargeable nickel-cadmium batteries and an AC charger, eliminating the need for battery replacement. However, if it should become necessary to replace the batteries, use another PB-25 pack, only.

#### 5. MEMORY BACK-UP

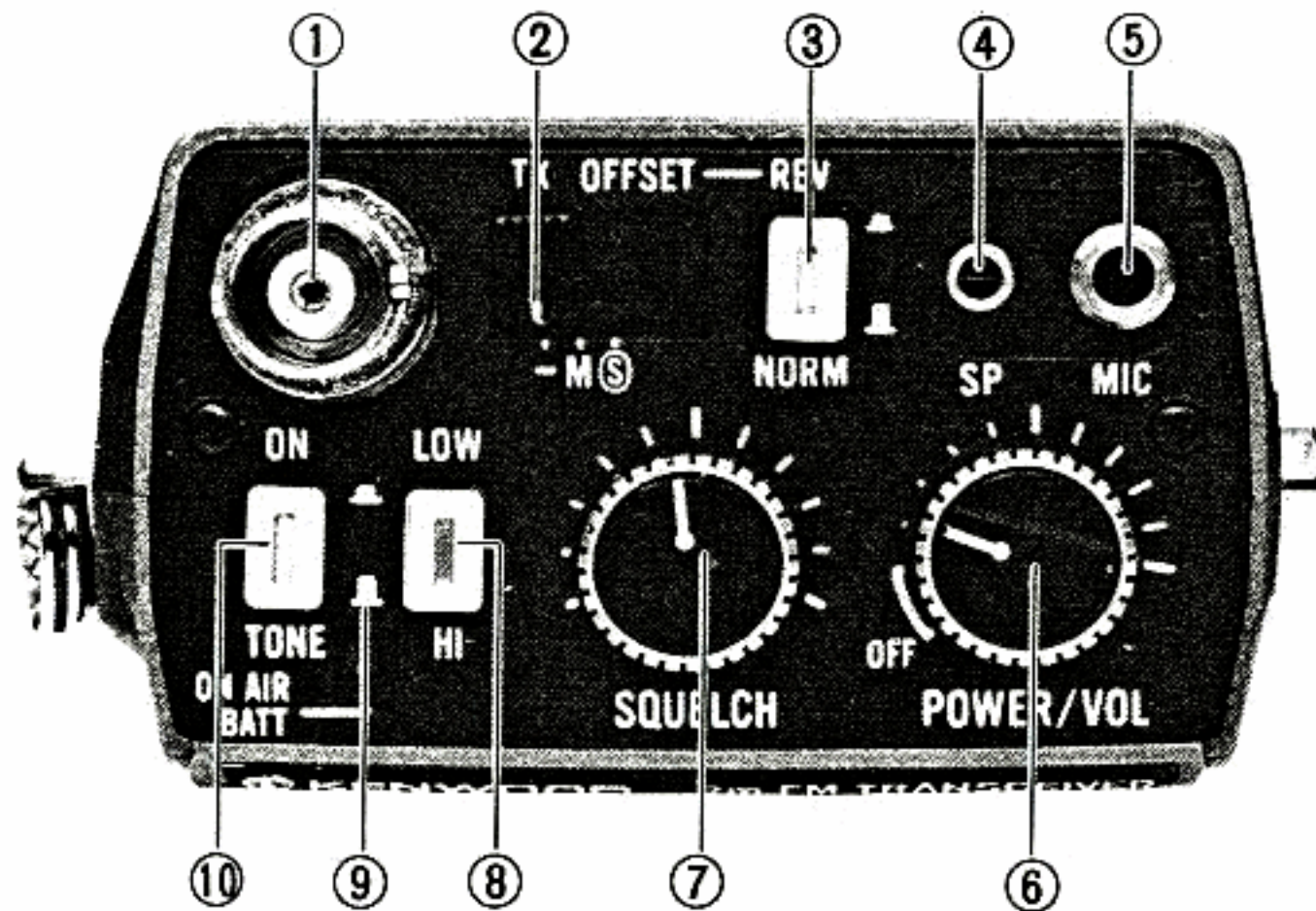
The TR-2500 includes a lithium (L<sub>1</sub>) back-up battery to retain memory in the microprocessor. When changing batteries, or if the NiCd batteries should fully

discharge, memory will always be retained. Back-up battery life is estimated at about 5 years.

#### 6. MICROPROCESSOR RESET

If the display should, for some reason, display invalid numbers, simply reset the microprocessor. Momentarily press the reset microswitch accessible through the rear case. (All memories are erased in this case.) This may indicate the lithium battery needs replacement. This should be performed by an authorized Kenwood service facility—either a Kenwood dealer, or the factory.

## Section 2 CONTROLS AND TERMINALS



### 1. Antenna Connector

Connect the supplied rubber-flex antenna with the BNC connector.

### 2. TX-OFFSET Switch

Shifts the transmit frequency for repeater operation.

“S” : Simplex (receive and transmit frequencies are the same).

“M” : The transmitter operates on a preset frequency in MEMORY channel O, while the receiver

frequency doesn't shift.

Any frequency can be preset in the channel O for repeater operation.

“-” : Switches the transmit frequency down 600 kHz from the receive frequency.

### 3. NORM-REV Switch

This non-locking push switch is used to check the repeater input before switching to simplex operation by interchanging the receive and transmit-frequencies. To operate reverse, keep this switch depressed while transmitting and receiving. The REV annunciator will light on the LCD.

### 4. SP Jack

To connect an earphone, external speaker, or an SMC-25 SPEAKER/MIC.

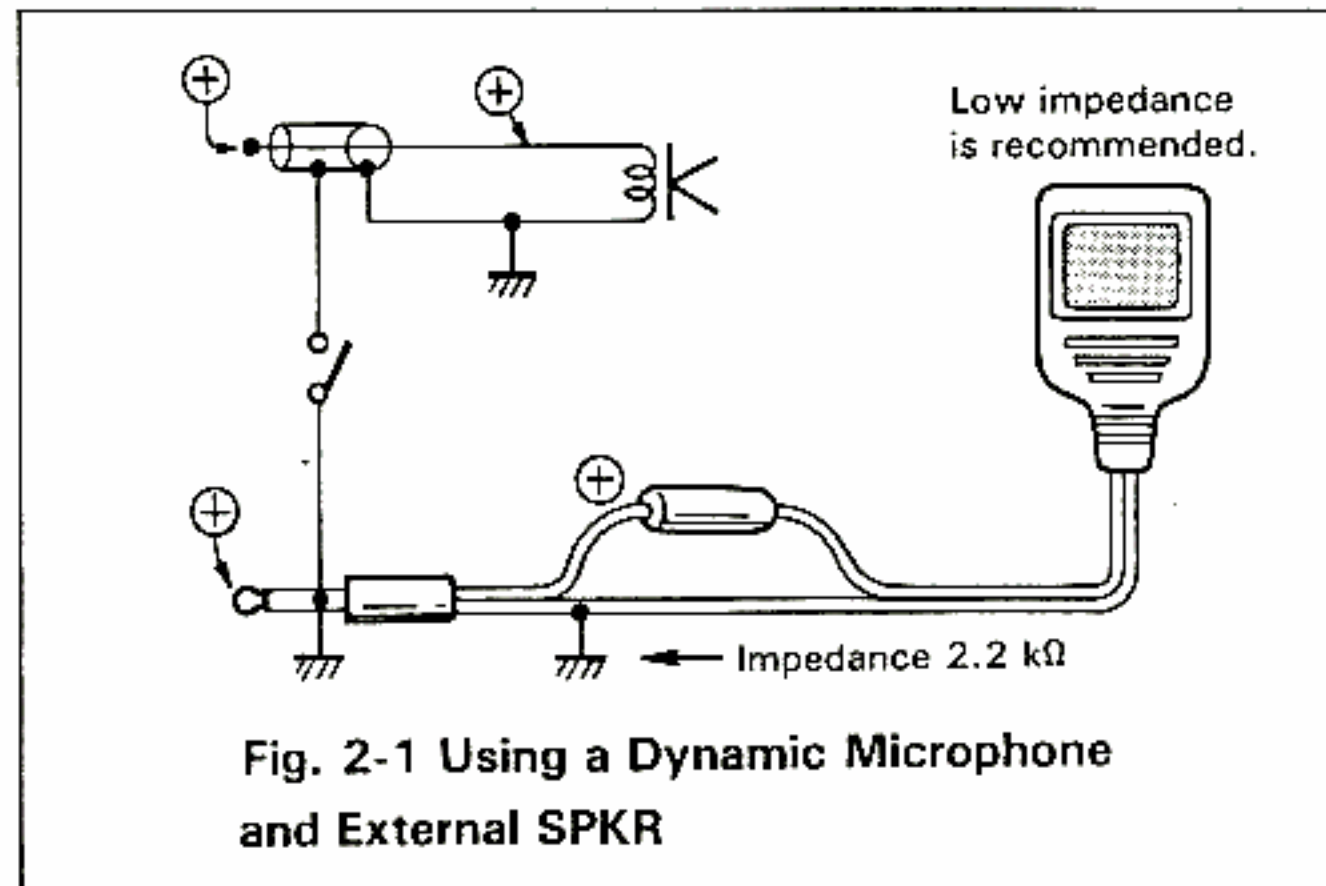
### 5. MIC Jack

Connect your external microphone using the supplied MIC plug.

**NOTE 1:** For direct connection of a condenser microphone. Input impedance is 2 k $\Omega$  and DC output is 7 V.

When a dynamic microphone is used, connect it through a capacitor (0.47  $\mu$ F ~ 1  $\mu$ F) to block DC voltage.

**NOTE 2:** If your microphone is equipped with a P.T.T. switch, connect it between the MIC, and SPKR grounds.



**6. Power Switch and Volume Control**

Volume control with Power ON/OFF switch. Power is turned off at the full counterclockwise position.

**7. SQL Control**

Used to silence receive noise at no signal condition. Adjust clockwise until the noise threshold is reached when no signal is present. For scan operation, this control must be set to the threshold point.

**8. HI/LOW Switch**

This switch is used to set transmit output power to either 2.5 W (high) or 300 mW (low). Power is high at the normal out position (■), and is low at the position (■).

**9. ON AIR/BATT Indicator**

This LED (Light Emitting Diode) will indicate transmit mode. Low battery will indicate by the LED flashing ON and OFF.

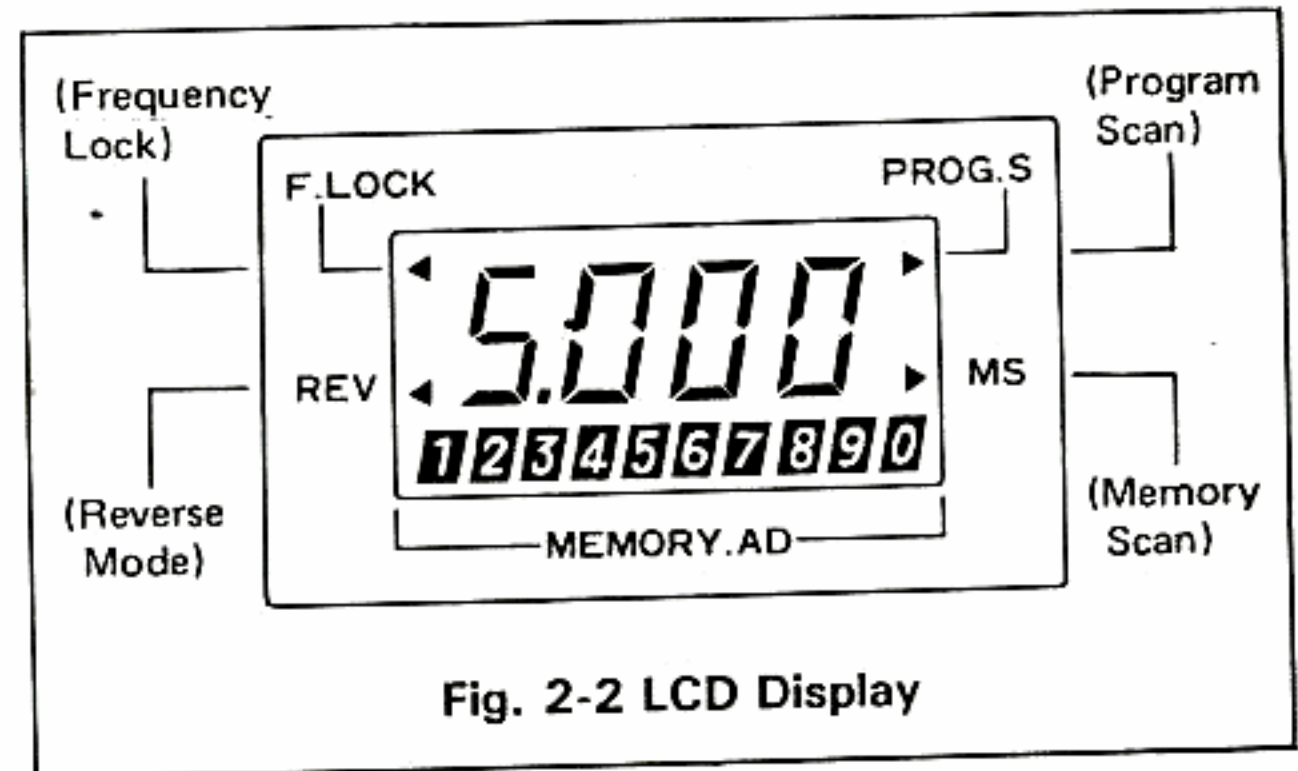
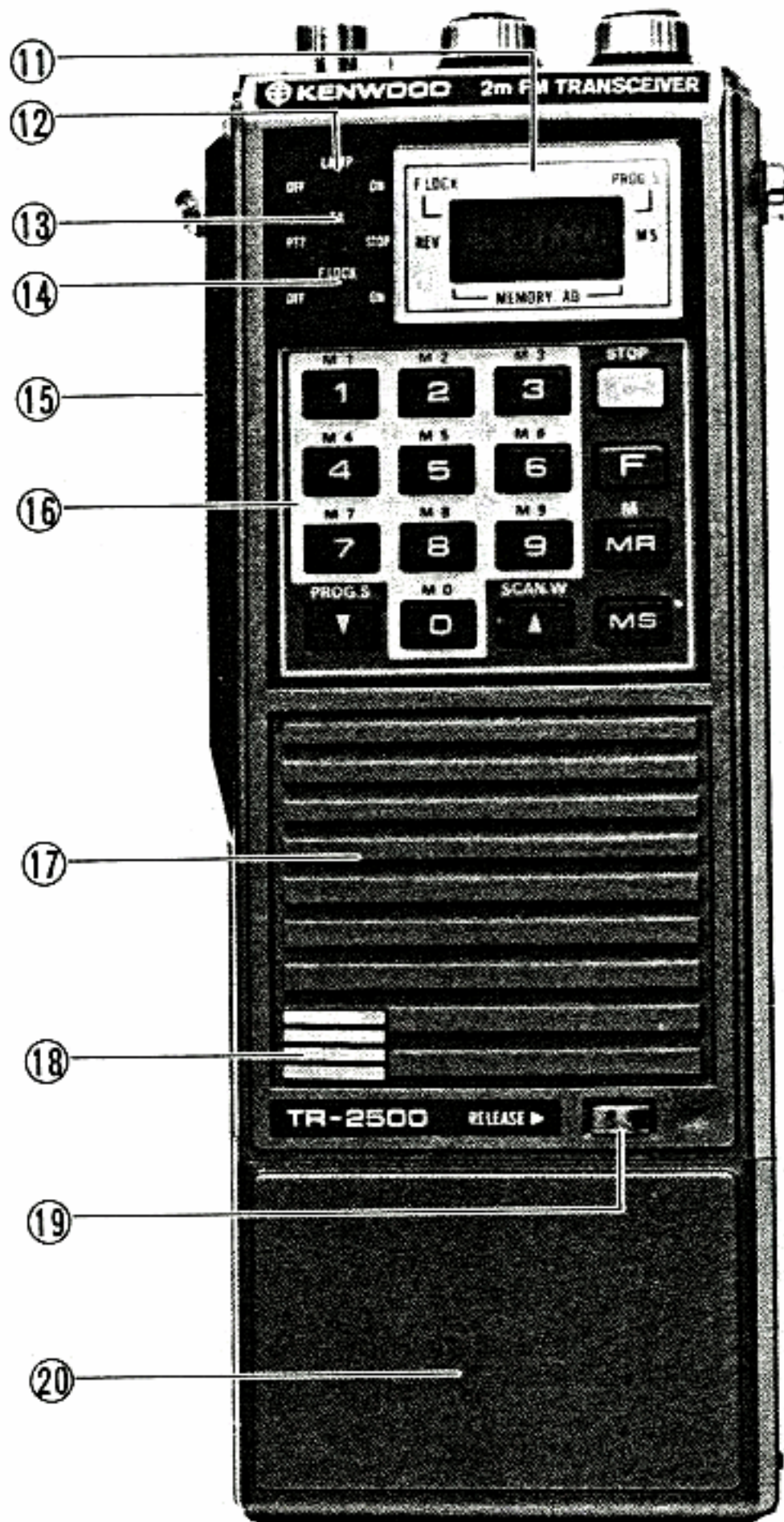
**10. TONE Switch**

This switch is used to transmit a TONE signal. When this switch is pressed, the repeater control tone signal (1,750 Hz) circuit is activated, and the transceiver is set in the transmit mode.

**11. LCD (liquid crystal Display) Panel**

Displays frequency in 4 digits (for example, 146.940 MHz is displayed as 6940). Displays memory channel address numbers 0~9. The night lamp is controlled by the LAMP switch. Annunciators also indicate frequency lock, reverse, program scan and memory scan.





### 12. LAMP Switch

This switch controls the night lamp on the LCD panel. Observe the red flag at lamp ON.

**NOTE:** At LAMP switch ON battery drain will be accelerated. Do not use this feature unnecessarily.

### 13. TX Switch

Place this switch to STOP and the transceiver will not transmit. Use this feature when carrying the transceiver.

#### 14. F. LOCK Switch

Place this switch ON and the displayed frequency will remain unchanged by keyboard operation.

The F. LOCK annunciator will light on the LCD.



This feature is convenient when carrying the transceiver.



#### 15. PTT Switch

For transmission, press this switch and speak into the microphone.

#### 16. Key Board Switches

(refer to "Key Board Operation"):

 ~  **Set Key:**


Used to preset operating frequencies and channels to be memorized (refer to ,  Keys).



 **Clear/Stop Key:**

By pressing this key, the preset frequency goes off and 5000 (145.000 MHz) is displayed.





When this key is pressed during Memory or Program scan, scanning stops.







 **Function Key:**

Used to store and erase the memory with the  key, to preset the scan width and scan step for program scan with


the  key, and to program scan (busy stop) with the  key.


 **(Memory/Memory Recall) Key:**


Press the  key and then the  key. All stored memory address channel numbers are displayed on the LCD. (At initial condition, no channel address numbers are displayed.) Press the desired set key ( ~ ). The frequency displayed will be memorized in that channel and the channel number displayed.


Press the  key and all stored memory address channel numbers are displayed. Press the desired channel address number set key ( ~ ). The preset frequency and the channel number are displayed. When the TX-OFFSET Switch is placed in the "M" position, the frequency memorized in channel "0" is transmitted simply by pressing the PTT switch. In the case of no entered frequency, the display will indicate 5000 (145.000 MHz). To erase memory, press    then the channel address number to be erased. A "Beep" will sound. The erased channel number will display.

 **(Memory Scan) Key:**


By pressing this key, scan operation starts at a speed of 1 channel per second and stops at channel where signal is present. The scan resumes approximately 2 seconds after the incoming signal disappears. Press the  key to resume scan while stopped on a signal.

 **(UP/SCAN. W) Key:**

By pressing the UP key, the frequency on the display shifts up 1 step (5 kHz). When this key is kept depressed for more than 1 second, the frequency is manually scanned. The radio will not stop on a signal-you must stop. If you overshoot, back up with the alternate key. This is also used with the  key to set the scan width and scan step for program scan operation. The scan step must be 5 kHz or more, in 5 kHz step increments (ie. 5, 10... 25, 30 kHz).

 **(DOWN/PROG. S) Key:**

By pressing the DOWN key, the displayed frequency shifts down one 5 kHz step. When this key is kept depressed for more than 1 second, the frequency is scanned. This is a MANUAL scan. The radio will not stop on a signal- you must stop. If you over-

shoot, back up with the alternate key. This key is also used with the  key for program scan operation. Scan width and scan step must first be preset.

During transmit, all 16 keys are automatically a tone pad.

**17. Speaker**

Miniature speaker for personal listening.

**18. Microphone**

An electret condenser mic. Maintain 4~10 cm distance to the mic.

**19. RELEASE Button**

Used to release the battery case for removal. Depress this button, and slide the battery case to the left.

**20. Battery Case**

Contains seven Ni-Cd rechargeable batteries. Refer to page 5 for charging.



**21. Belt-clip attachment point**

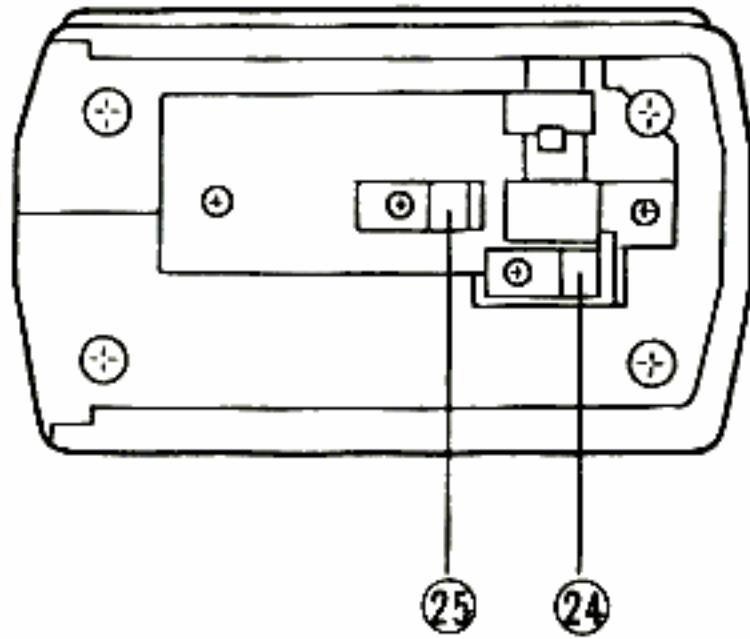
To secure a belt-clip supplied with an optional soft case SC-4.

**22. Reset Switch**

Used to reset the microcomputer when replacing the backup lithium battery.

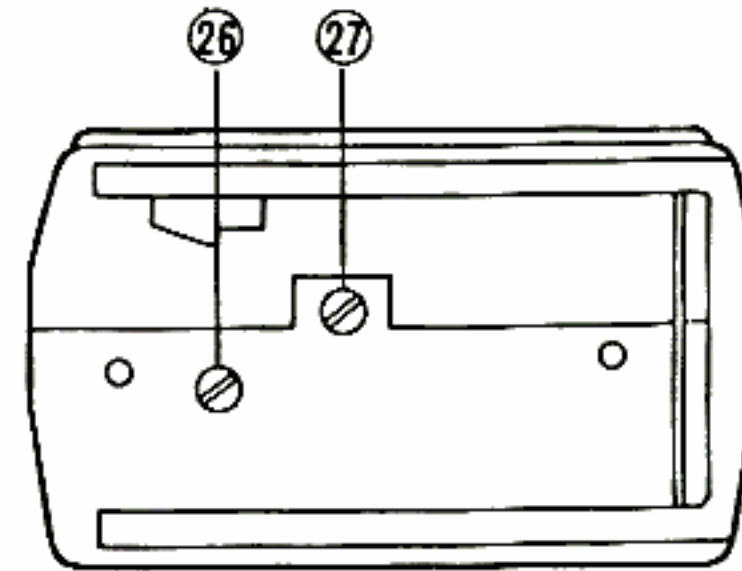
**23. Charge Terminal**

For charging the battery using the supplied AC charger. During charge DC power to the TR-2500 is automatically open (radio goes off).



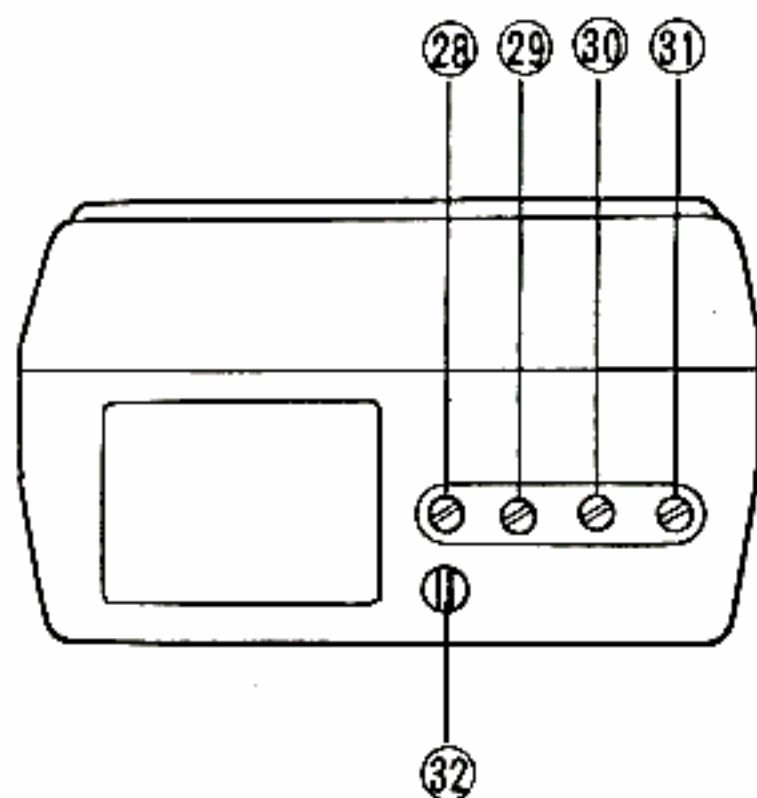
24. Battery ⊕ Terminal

25. Battery ⊖ Terminal



26. ⊕ Terminal of Ni-Cd battery

27. ⊖ Terminal of Ni-Cd battery



**28. Ground Terminal**

This is used as a ground terminal when charging from the optional accessory mobile stand or base stand.

**29. DC Terminal**

8.4 V DC independent of charging power is supplied to the TR-2500 through this terminal from the optional accessory mobile stand MS-1 or base stand ST-2.

**30. Sensor Terminal**

The battery charged voltage is detected through this terminal, when charged from the optional accessory mobile stand MS-1 or base stand ST-2.

**31. Charge Terminal**

The battery pack is charged through this terminal from the optional accessory mobile stand MS-1 or base stand ST-2.

**32. Micro Switch**





This switch serves to open the line feeding DC power from the batteries to the TR-2500 when the transceiver is charged from the optional accessory mobile stand MS-1 or base stand ST-2.


## Section 3 KEY BOARD OPERATION

The TR-2500 employs a 16-key channel selection system. These instructions cover the basic operation of the key board.

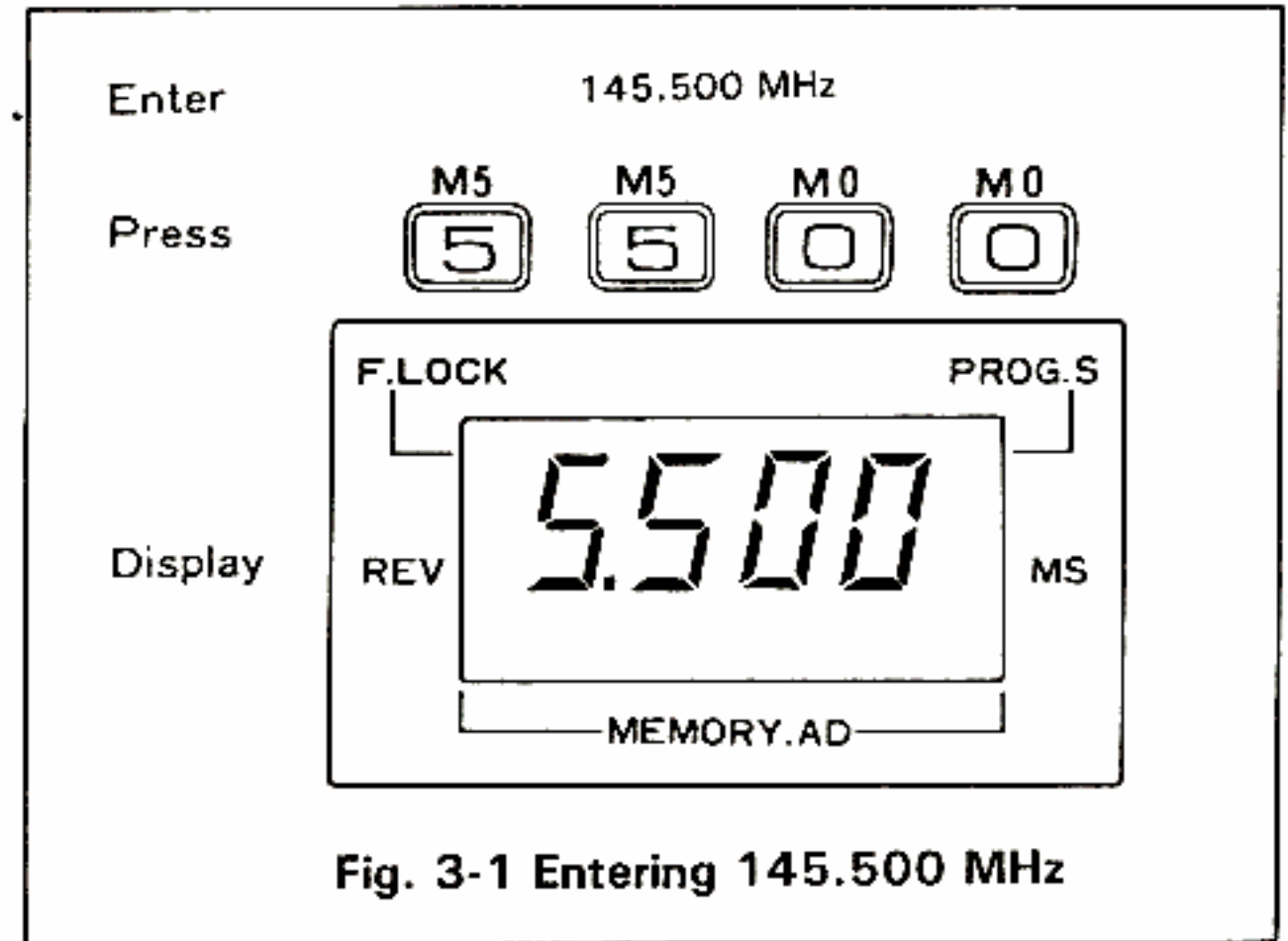
It is also advisable to refer to Section 4 "OPERATION".

### CHANNEL SELECTION

Frequencies are entered in 4 digits, so 4 Set keys should be used. For example, when entering 145.500 MHz, press keys    and  in that order.



If the key setting is found to be incorrect after pressing 4 keys, press the correct keys once again. To correct the setting before all the 4 keys are pressed, press the  key and then press the correct Set keys.



**NOTE:** If a new frequency is not completely entered, the transceiver will continue to operate on the previously retained frequency. Be certain to enter all 4 digits for a new frequency.

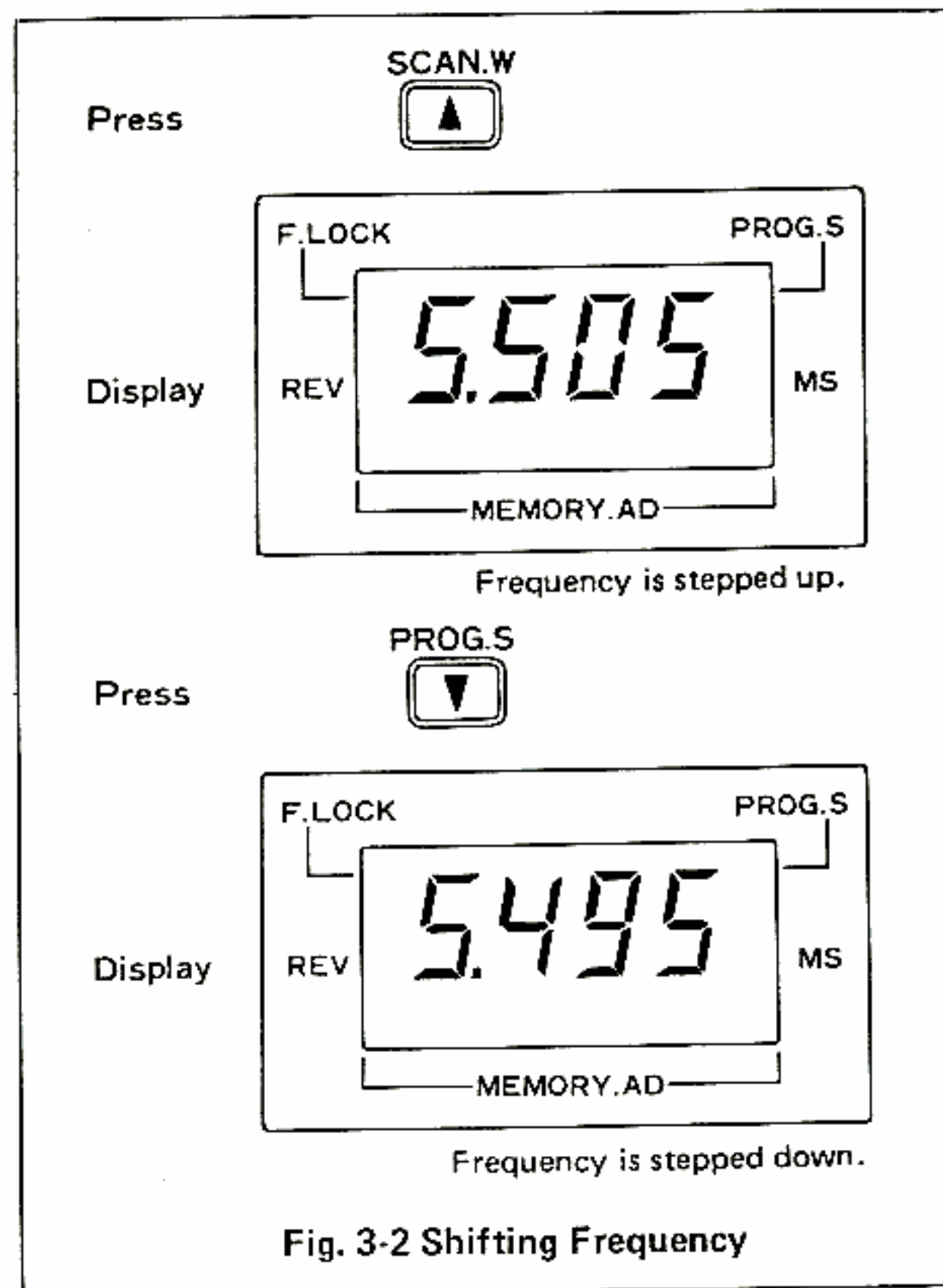


## SHIFTING FREQUENCY

To shift frequency, proceed:

Press the Set keys as outlined previously, or press the  or  key.

The frequency shifts up or down by 5 kHz at each press of the  or  key; frequency is scanned when either key is kept depressed for more than 1 second.





## MEMORIZING FREQUENCY

First display the frequency to be memorized by pressing Set keys, then press the **F** **MR** keys. Memorized channels are displayed on the LCD. Empty channels will not display their memory address. They will be set at the preset frequency, 145.000 MHz. Next, press a Set key (**M1** - **M8**) to select a storage channel. (See Fig. 3-3) A "beep" shows that the frequency is memorized in that channel. With the frequency "5500" displayed, press the **F** **MR** keys. Only memorized channel addresses are displayed on the LCD panel. Press the **M3** key. A beep is heard and 145.500 MHz is memorized into channel 3. The frequency "5500" and memory address number 3 are displayed on the LCD panel.

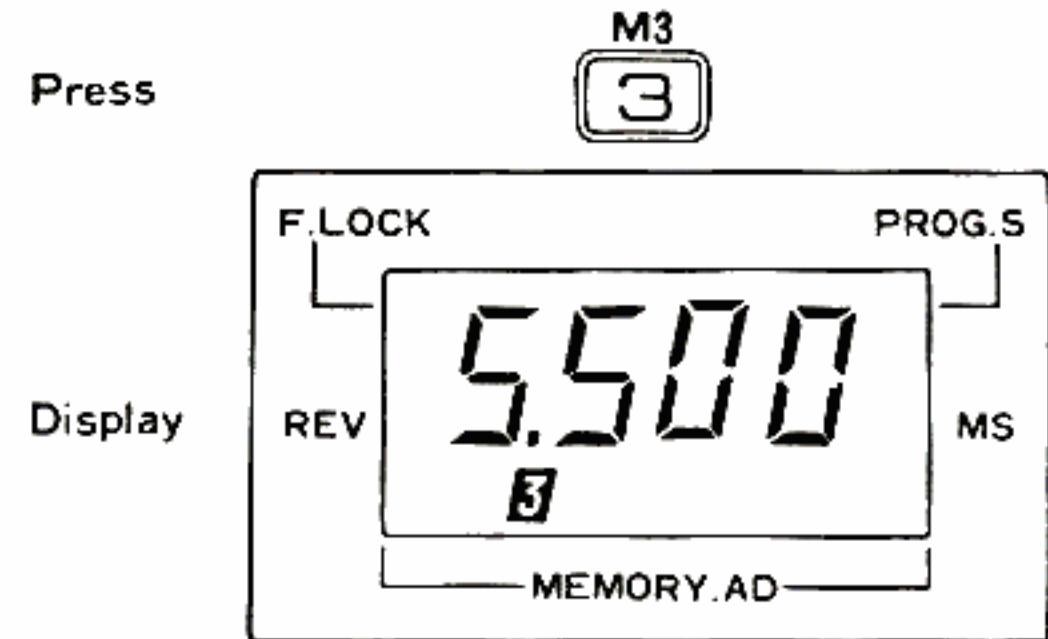
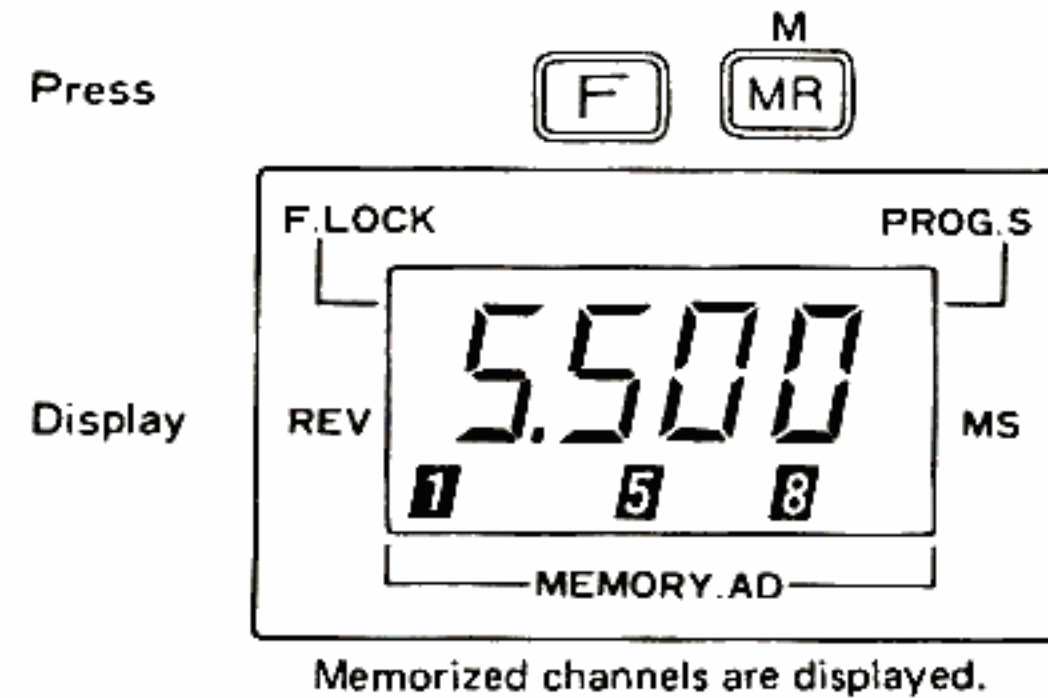
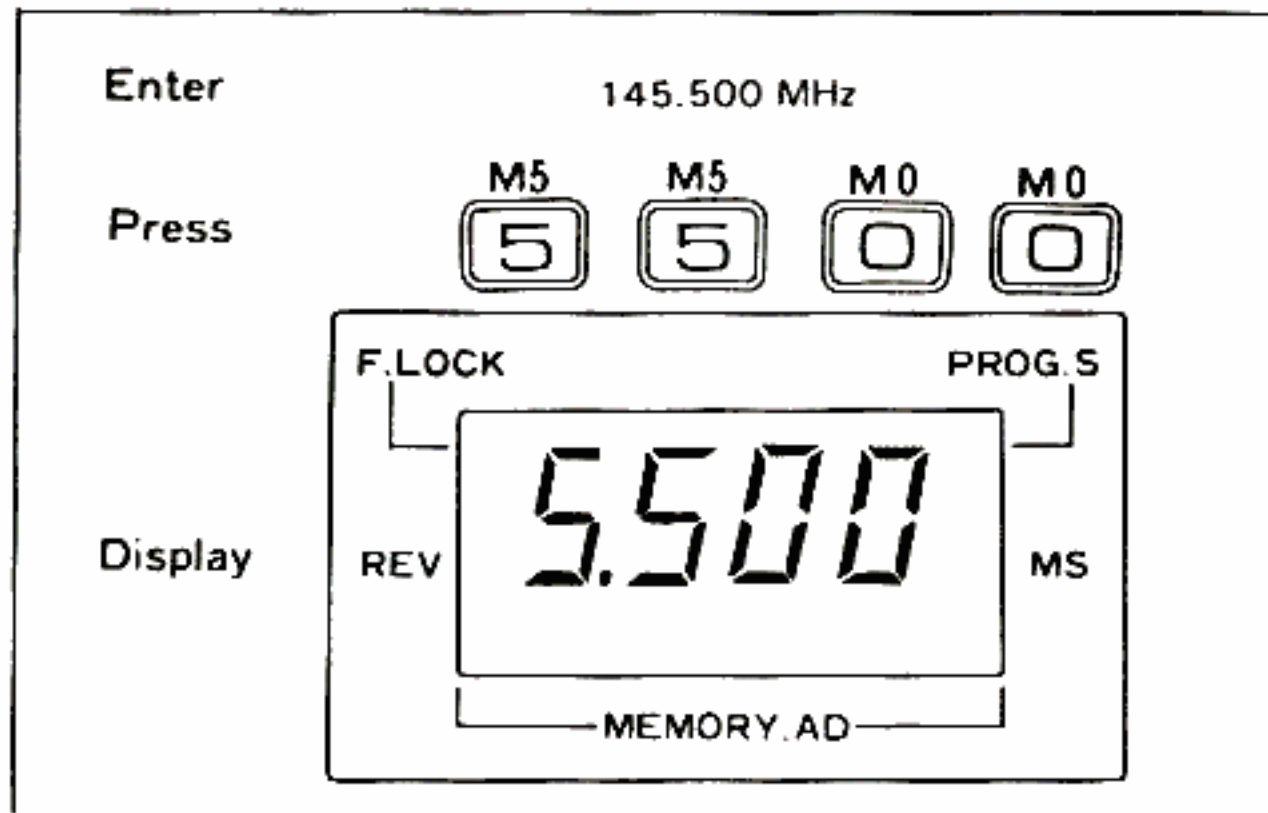
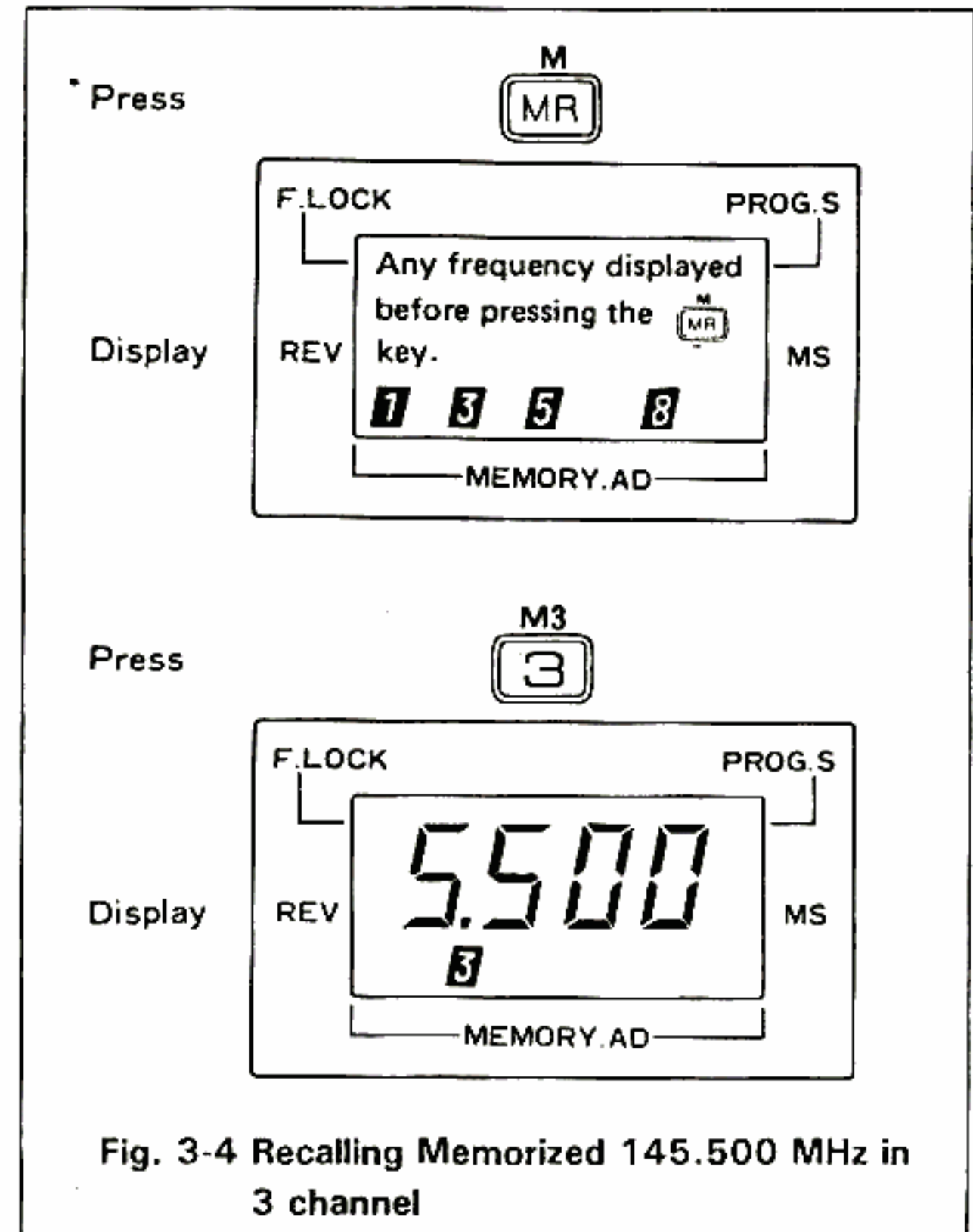


Fig. 3-3 Memorizing 145.500 MHz into 3 channel

## RECALLING MEMORIZED FREQUENCY

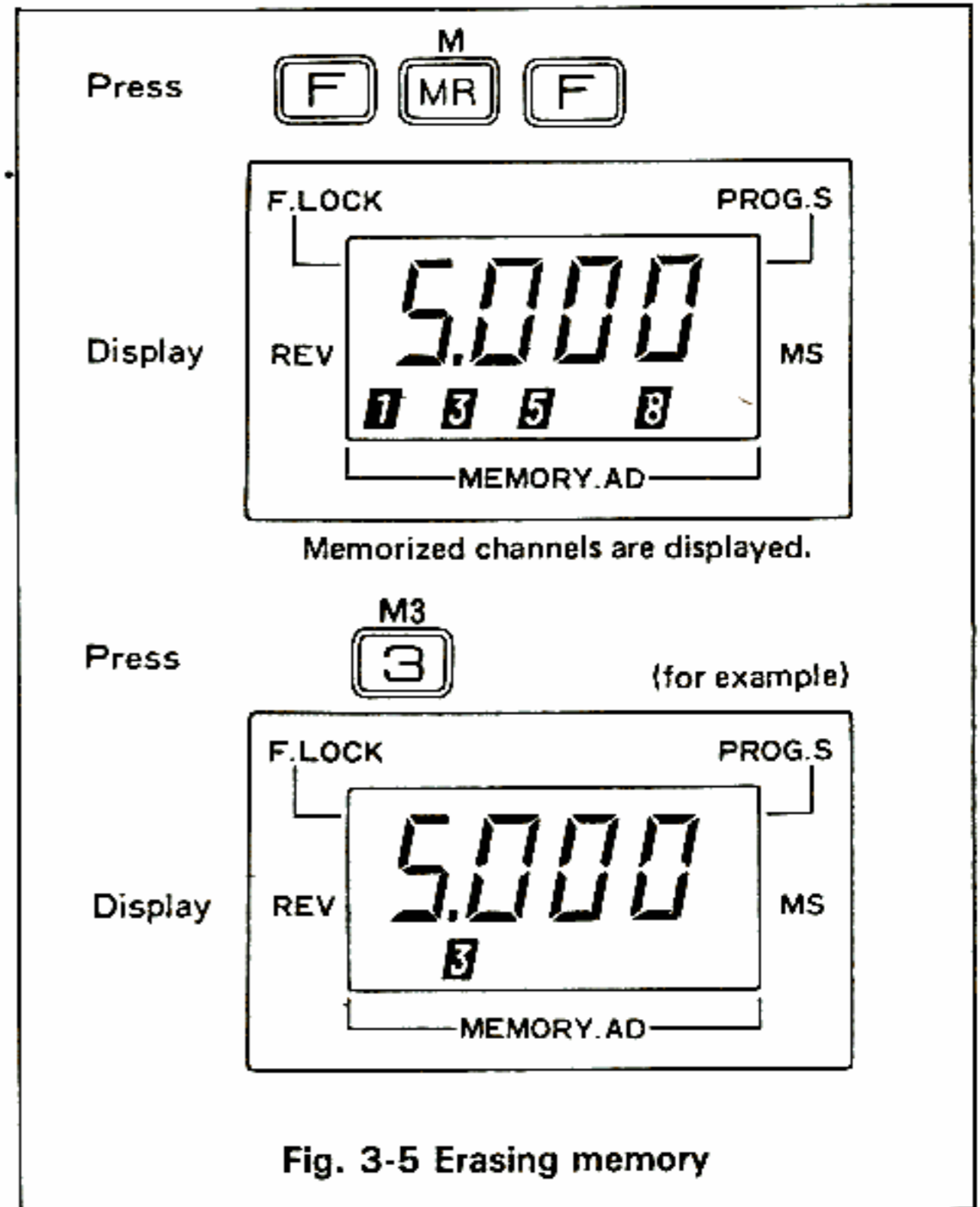
Press the MR key, and all memorized channel address numbers are displayed. Next, press a set key (  $\overset{M1}{\square}1$  -  $\overset{M0}{\square}0$  ) for the desired channel. The frequency and channel number will be displayed, and a "beep" will sound, indicating this programming step is complete.

**NOTE 1:** When a frequency memorized in the 0 channel is recalled, it should be noted that the  $\overset{M0}{\square}0$  key is interlocked with the TX-OFFSET switch. With the TX-OFFSET switch set in the "M" position, the frequency memorized in the 0 channel is transmitted by simply pressing the PTT switch, without having to press the  $\overset{M}{\square}MR$  and  $\overset{M0}{\square}0$  keys. Therefore, the 0 channel may be set up for a repeater split frequency other than - 600 kHz. In all other TX-OFFSET switch positions, operating procedure for memory channels  $\overset{M1}{\square}1$  -  $\overset{M9}{\square}9$  is standard.



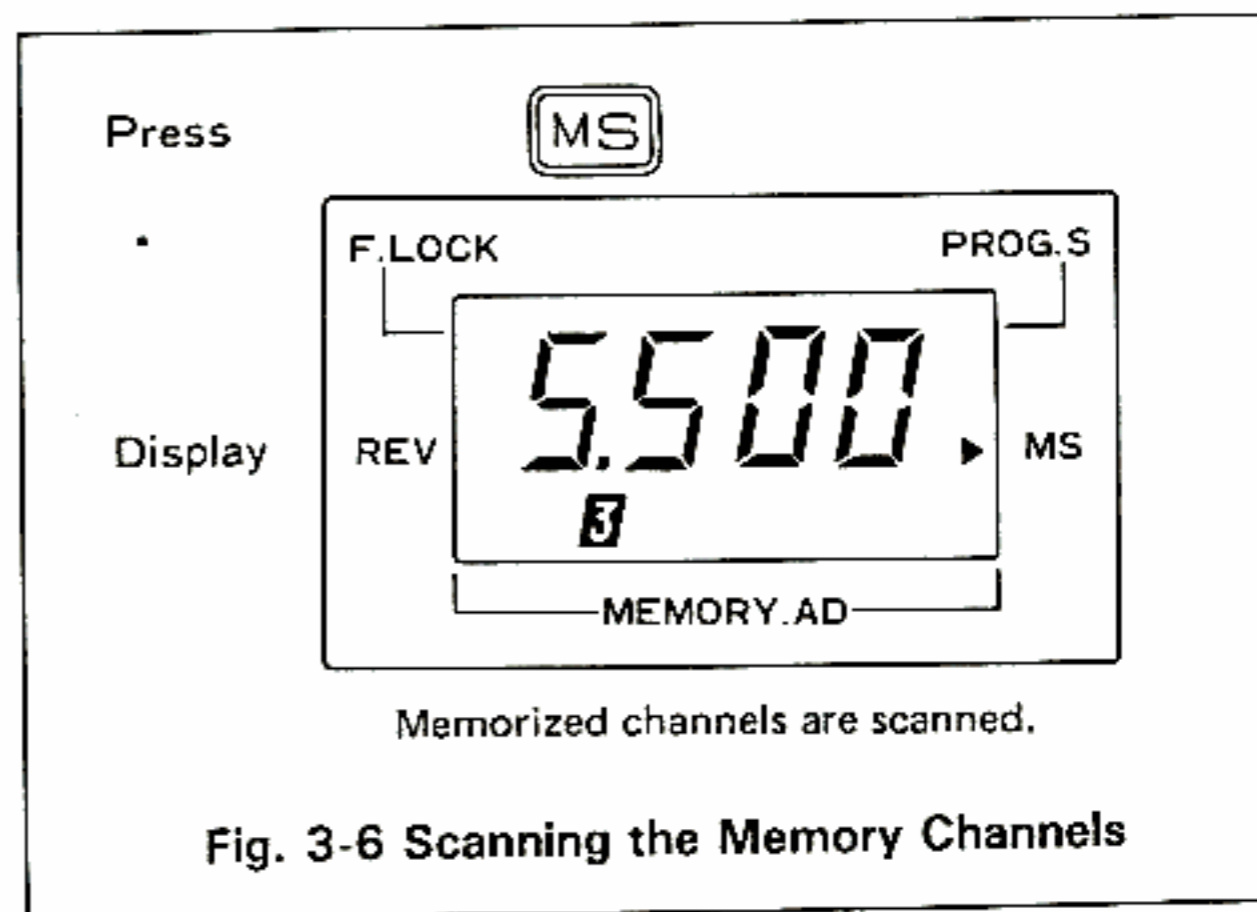
## ERASING MEMORY

To erase a memory, press **F**, **MR**, **F**, then the channel address number to be erased. A "beep" will sound. The erase channel number will display. More efficient memory scan operation may be enjoyed by erasing unwanted channels. The TR-2500 will scan only occupied channels. To clear all memories, use the reset feature on the rear panel.



## SCANNING THE MEMORY CHANNELS

With the **[MS]** key pressed, only memorized channels are scanned. The channel (memory address) and frequency are displayed, and the MS indicator is ON. The frequencies are scanned at a fixed speed of 1 second per channel. Scan speed is NOT adjustable. By setting the SQUELCH control to the threshold level, scan stops at a channel where signal is present and resumes 2 seconds after the signal goes off. If you wish to continue the scan while a signal is present, press the **[MS]** key. The scan is released when the **[STOP]** key is pressed. To resume scanning, press the **[MS]** key once again. Scan operation is also released when you transmit.



## PROGRAM (BAND) SCAN

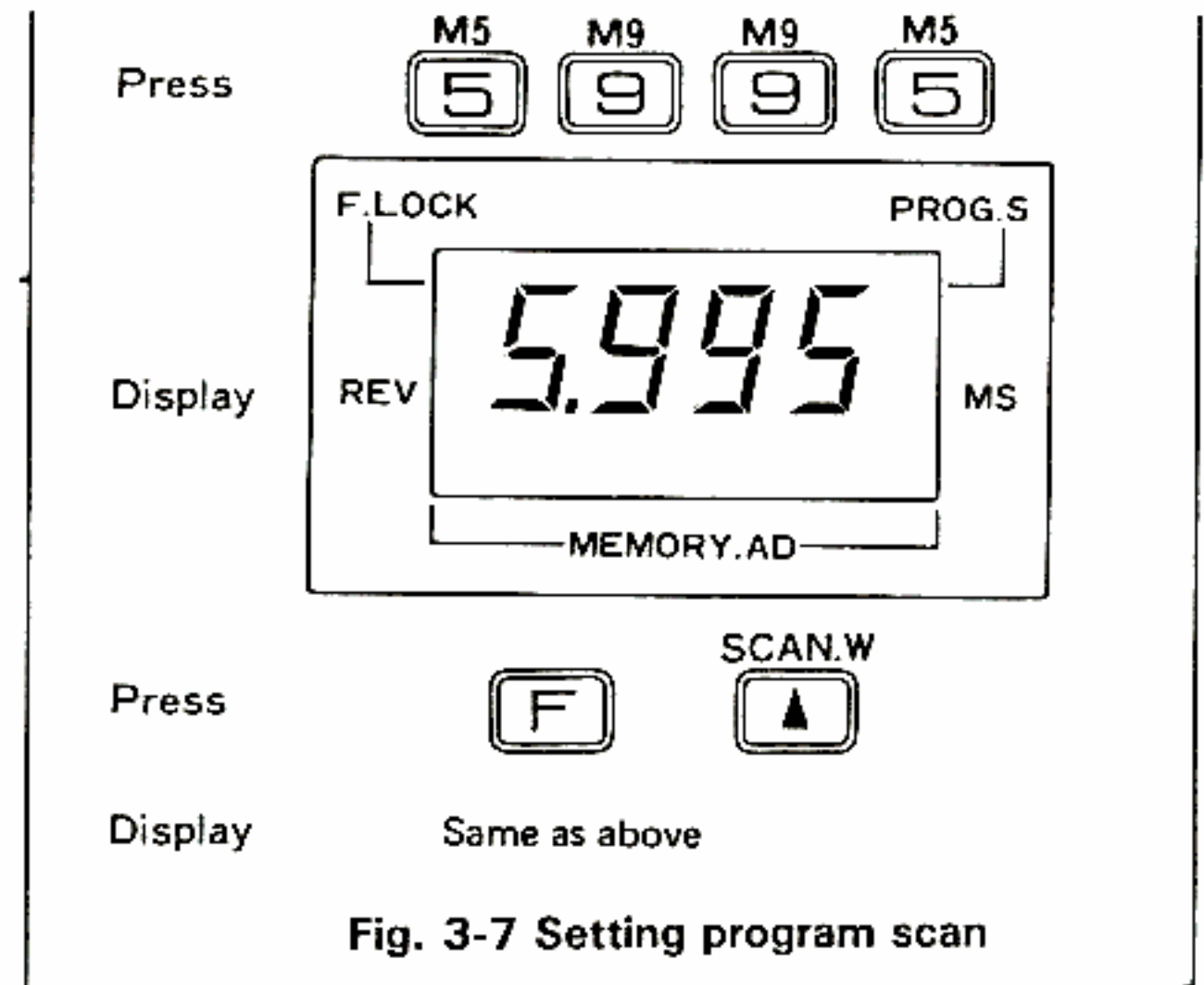
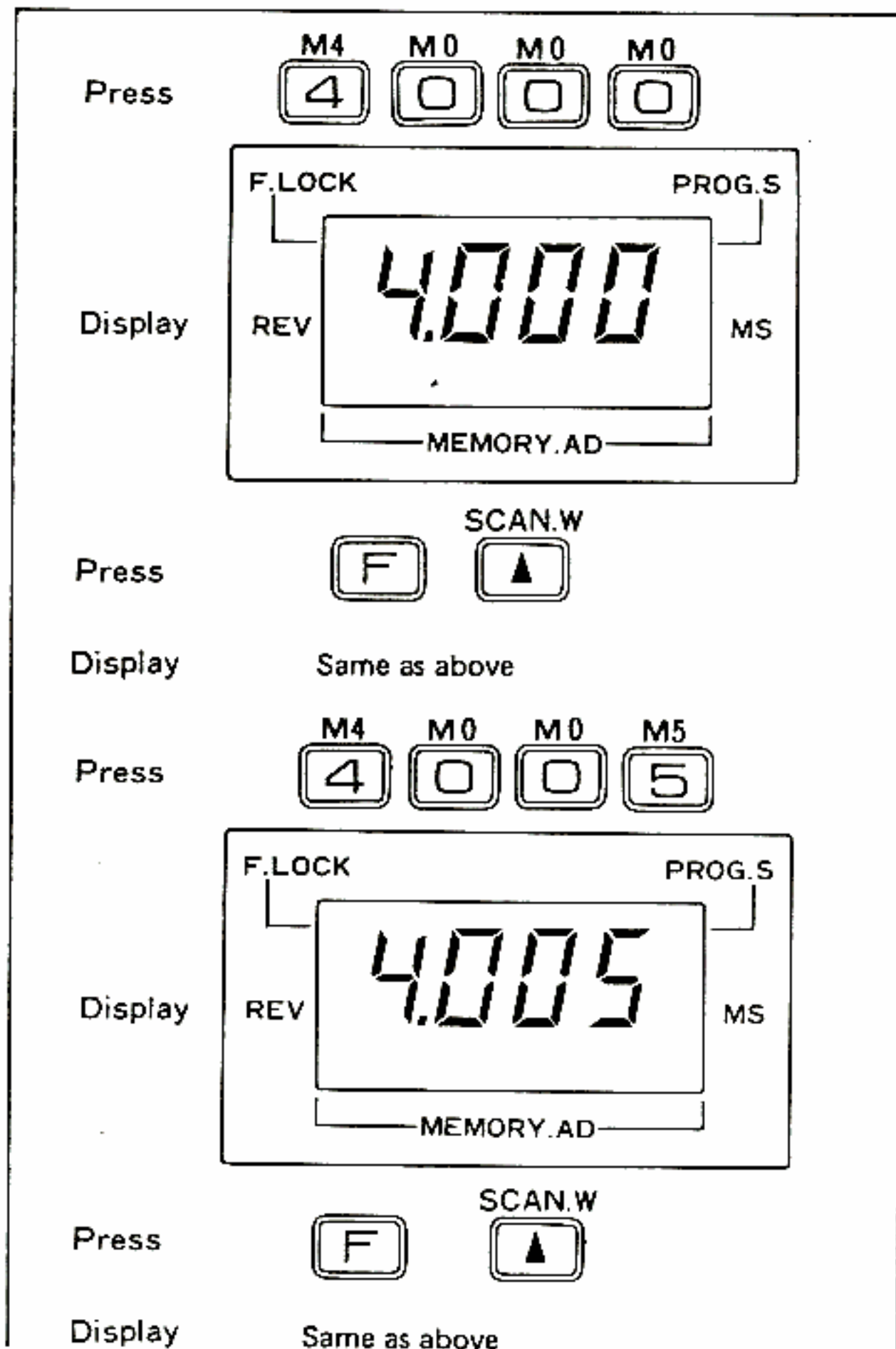
### SETTING SCAN WIDTH AND SCAN STEP

To set the lower frequency limit:

1. Enter the low frequency by 4 set keys.
2. Press **[F]** **[SCAN W]**.

To set the scan step:

1. Enter the next highest frequency with the desired channel spacing (5, 10....25, 30 kHz) by either the set keys or the **[SCAN W]** button.
2. Press **[F]** **[SCAN W]**.



To set the upper frequency limit:

1. Enter the upper scan frequency by 4 set keys.
2. Press F SCAN.W ▲. A "beep" will sound indicating programming is complete.



Fig. 3-7 shows an example.

Lower frequency limit is 144.000 MHz.




Frequency step is 5 kHz.


Upper frequency limit is 145.995 MHz.

## PROGRAM SCAN OPERATION

To operate program scan, press  .

By setting the SQUELCH control to the threshold level, scan stops at a channel where signal is present and resumes approximately 2 seconds after the signal goes off.

If you wish to continue the scan while a signal is present, press the  key once again. The scan is released when the  key is pressed. To resume scanning, press the .

 key once again. Scan operation is also released when you transmit.

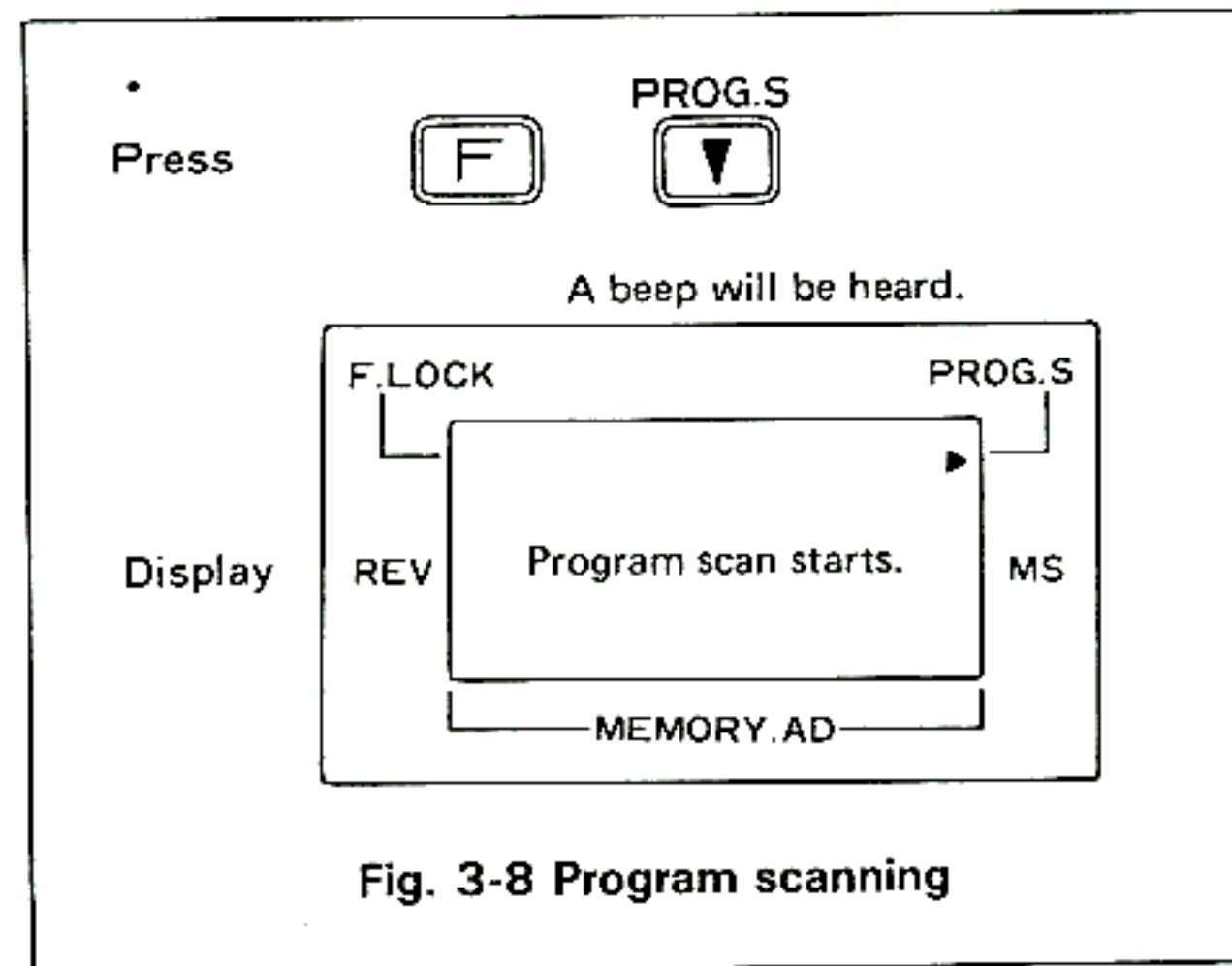






Fig. 3-8 Program scanning

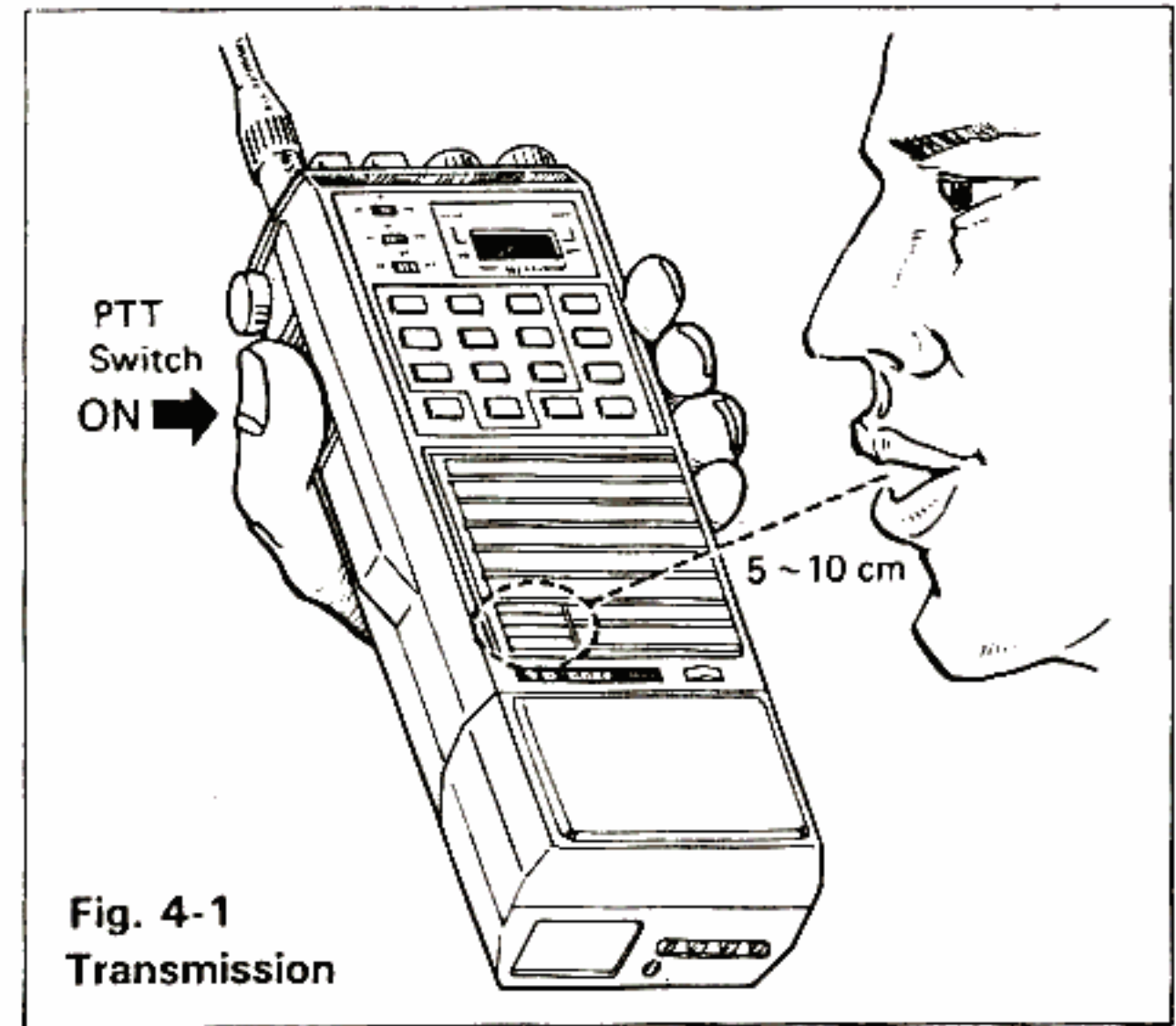
## Section 4 OPERATION

### RECEPTION

1. Turn the power switch ON.
2. Turn the squelch control just past the threshold point.
3. Adjust the VOL control clockwise for desired audio output level.
4. Select the desired channel or frequency by using the Set keys (  -  ),  and  keys, or by entering a frequency (refer to "Section 3 KEY BOARD OPERATION").

### TRANSMISSION

1. Select the desired channel or frequency.
2. Set the TX-OFFSET switch to the appropriate position.
3. Select either Low Power (300 mW) or High Power (2.5 W).
4. Press the PTT switch and speak into the microphone. The ON AIR indicator will light. For optimum results, recommended distance to the microphone is 5-10 cm.



## **TX-OFFSET SWITCH**

The TX-OFFSET switch, used for selecting simplex or repeater operation, has four positions.

- : Transmitter frequency is 600 kHz lower than the receive frequency.
- M: With the TX-OFFSET switch in the M position, the transmit frequency **only** is preset in memory channel 0.  
(To preset the transmit frequency, refer to "MEMORIZING FREQUENCY" in Section 3).  
This function allows the TR-2500 to operate any repeater frequency split.
- S: Your TR-2500 operates in the usual simplex mode. That is, receive and transmit frequencies are the same.

## **REPEATER OPERATION**

Set the TX-OFFSET switch to "—" or "M" position. Depress the TONE switch and the repeater station is operated by 1,750 Hz modulation signal.



## Section 5 OPTIONAL ACCESSORIES

### 1. ST-2 Base Stand

- Built in quick charger about 1.5 hours with full charge indicator.
- Full operation while charging.  
Separate Battery Trickle charge and power feed for extended base operation.
- Drop-in connections.



ST-2



SMC-25

### 2. MS-1 Mobile Stand

- Cigar Plug for instant connection.
- Full operation while charging (trickle charge only)  
Separate power feed for extended base operation. Built-in illumination for front keyboard.
- Drop-in connections.



MS-1

### 3. PB-25 Ni-Cd Battery Pack



PB-25

### 4. SMC-25 Speaker Microphone

### 5. SC-4 Soft Case with Belt Hook

### 6. VB-2530 RF Power Amplifier

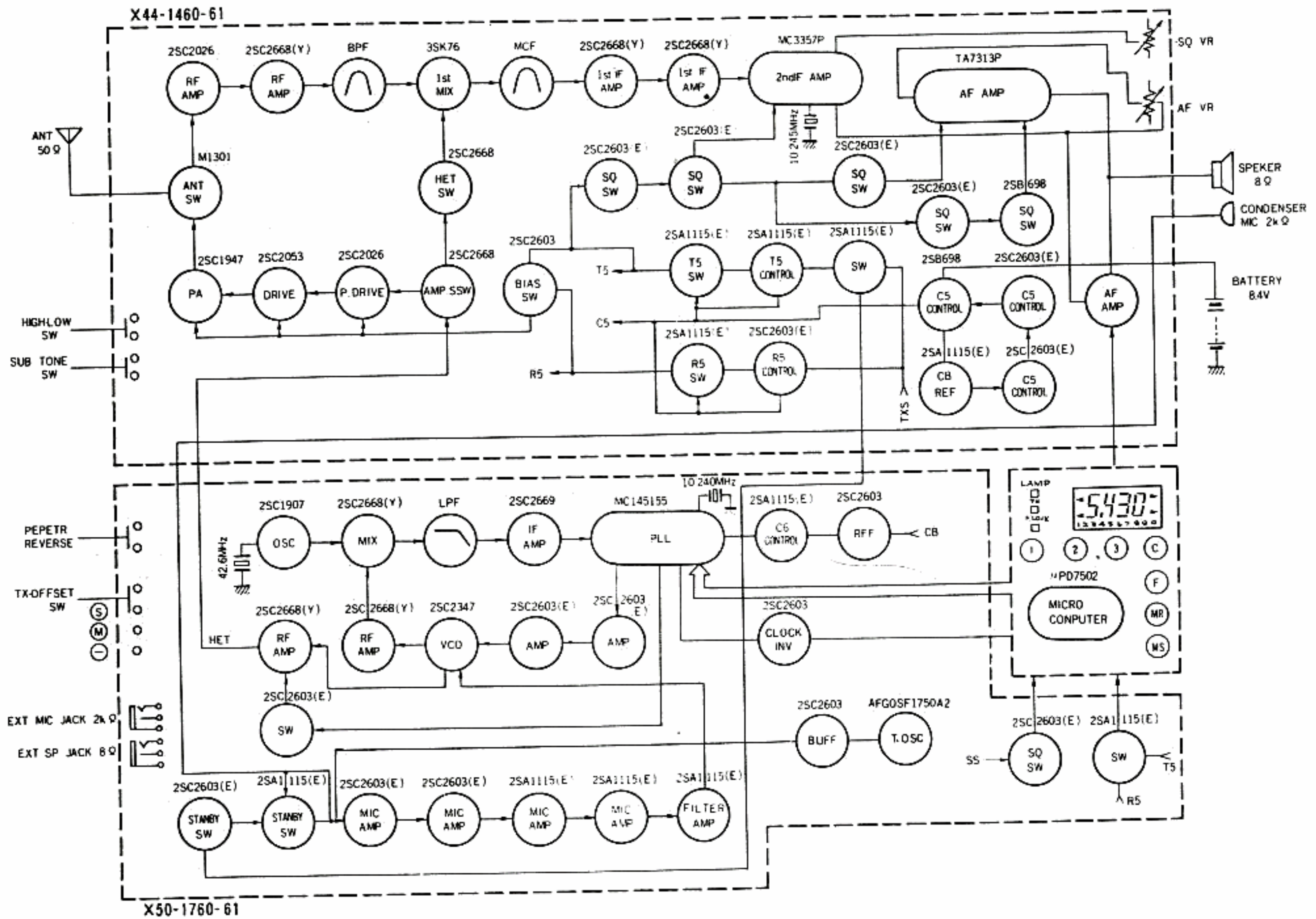
### 7. BT-1 Manganese battery case

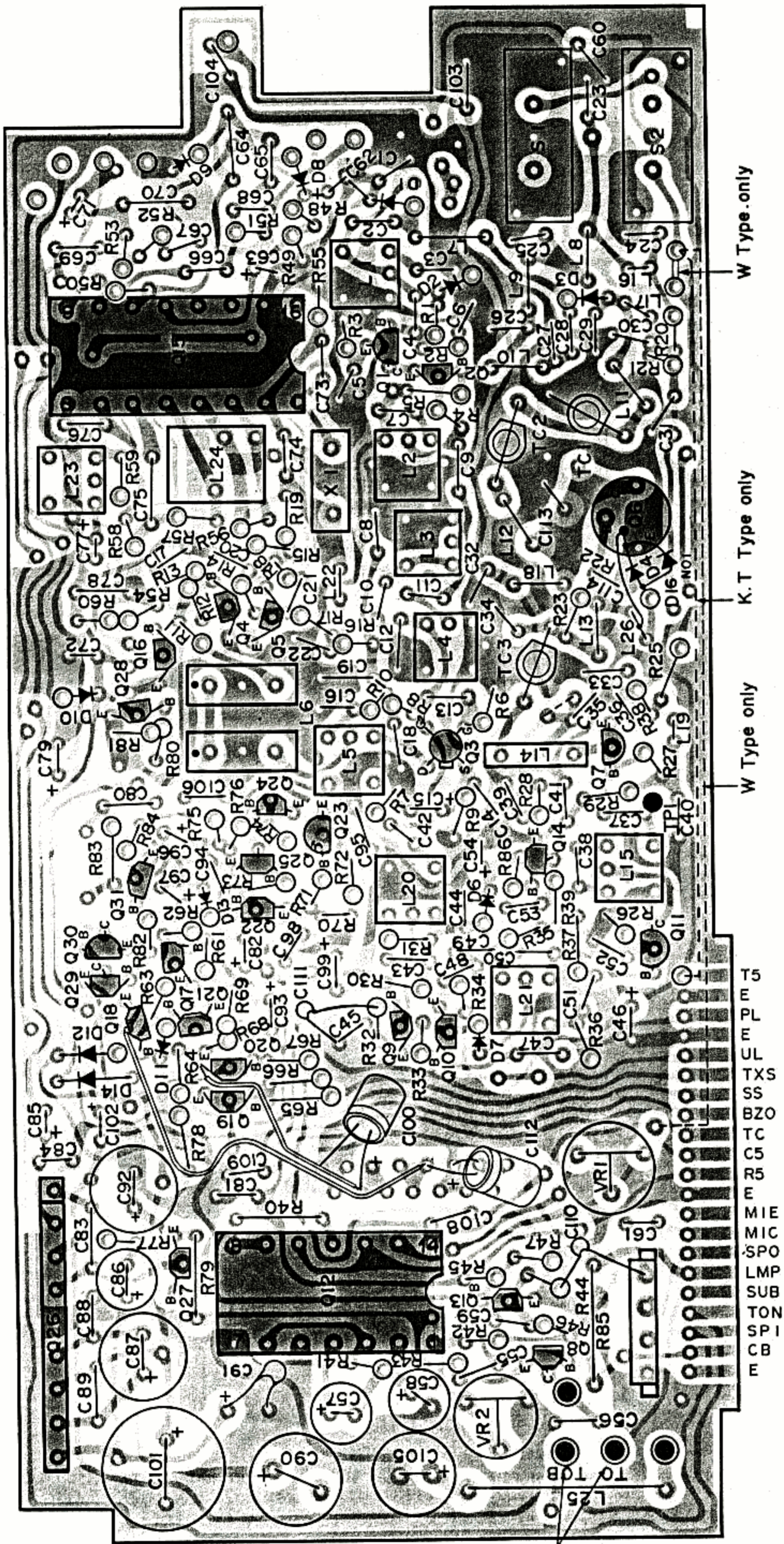


SC-4



BT-1





W Type only

K.T Type only

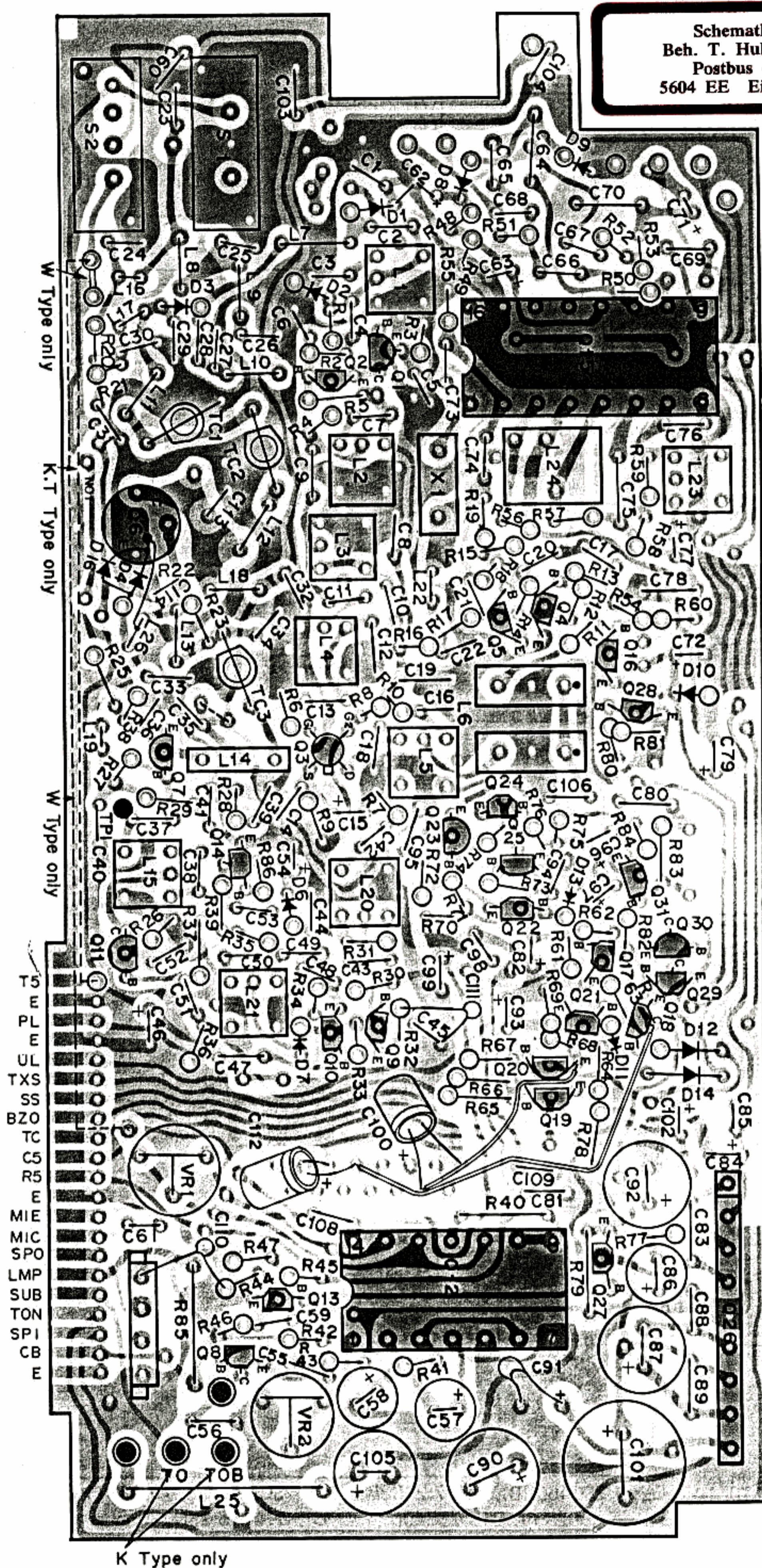
W Type only

- T5
- E
- PL
- E
- UL
- TXS
- SS
- B20
- TC
- C5
- R5
- E
- MIE
- MIC
- SPO
- LMP
- SUB
- TON
- SPI
- CB
- E

K Type only

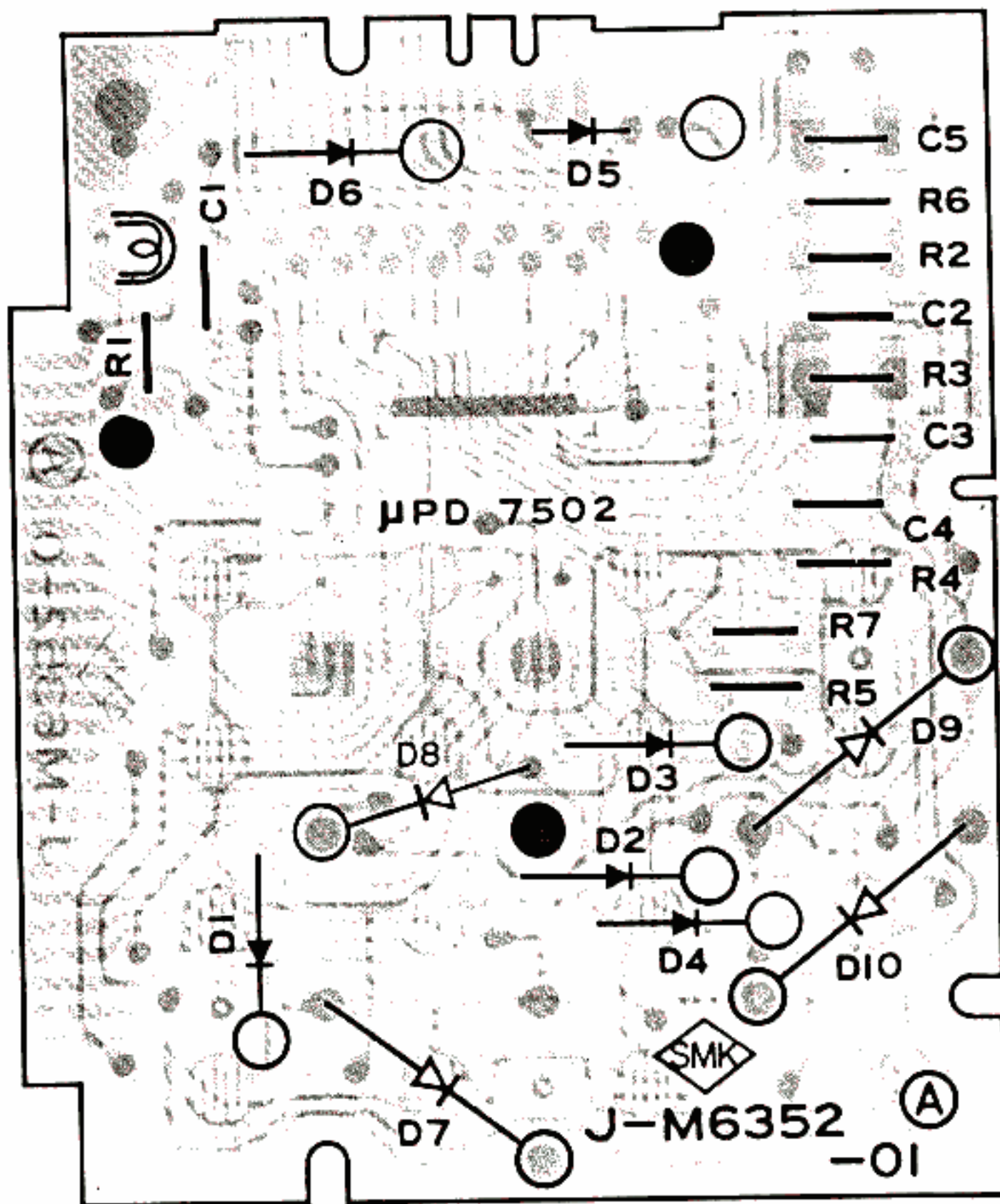
▲ TX-RX UNIT (X44-1460-10,-61,-51)  
Foil Side View

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A TX-RX UNIT (X44-1480-10,-61,-51)  
 Component Side View

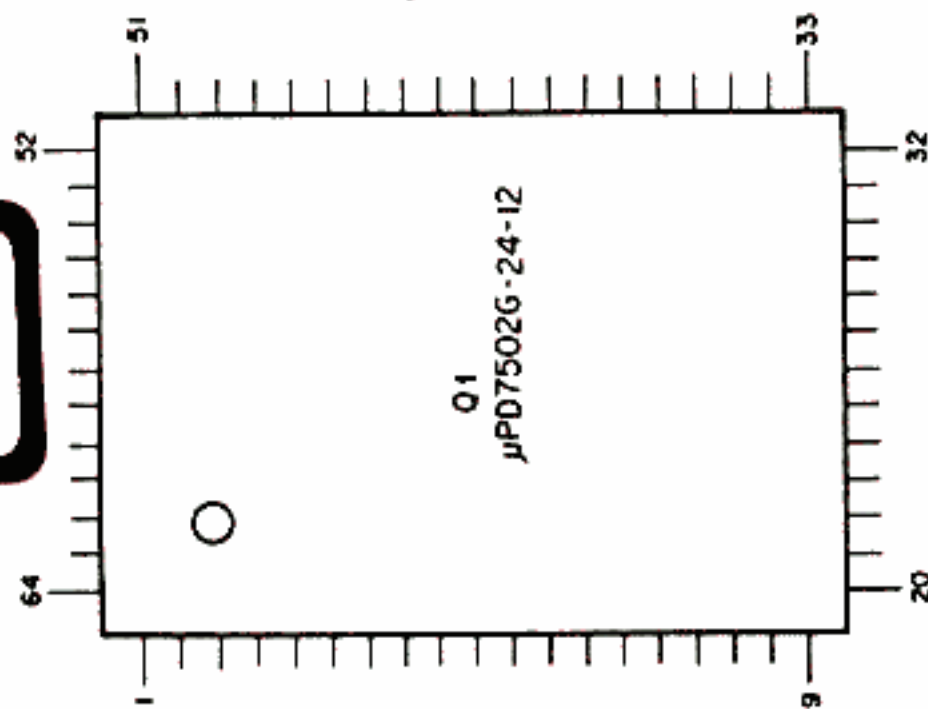
▼ KEY BOARD



Q1: μPD7502G-24-12  
 D1~6: 1S1555  
 D7~10: 1N60  
 V1: P2179-30

μPD7502G-24-12

Top View



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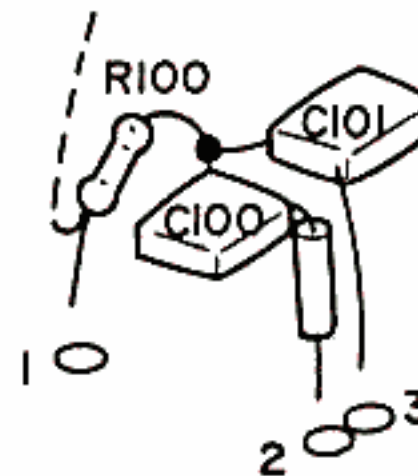
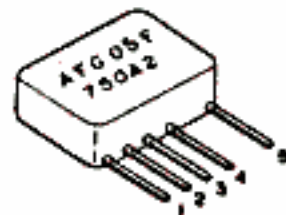
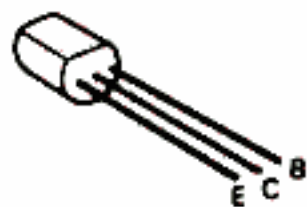
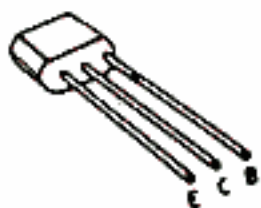
PLL Unit

Q1: 2SC2347 Q2,10,11: 2SC2668(Y) Q3: 2SC2669(Y)  
 Q4~6,12,14,15,20,22,24,26(W,T), 29(T): 2SC2603(E)  
 Q7,8,13,16~19,27(W), 28(T): 2SA1115(E) Q9: 2SC2347  
 Q21: MC145155P\*J(W,T) MC145155P\*K(K) Q23(K): MK5087N  
 Q25(K): NJM2902N Q25(W,T): AFG05F1750A2  
 D1,12,13,14(K),15~18,23(T),24(T): 1S1555  
 D2,3,5,6: 1S2208 D4,19: 1S2588 D7: 05Z5.1-Y  
 D8~11(K),20,21: 1N60

2SA1115  
 2SC2603  
 2SC2668  
 2SC2669

2SC2347

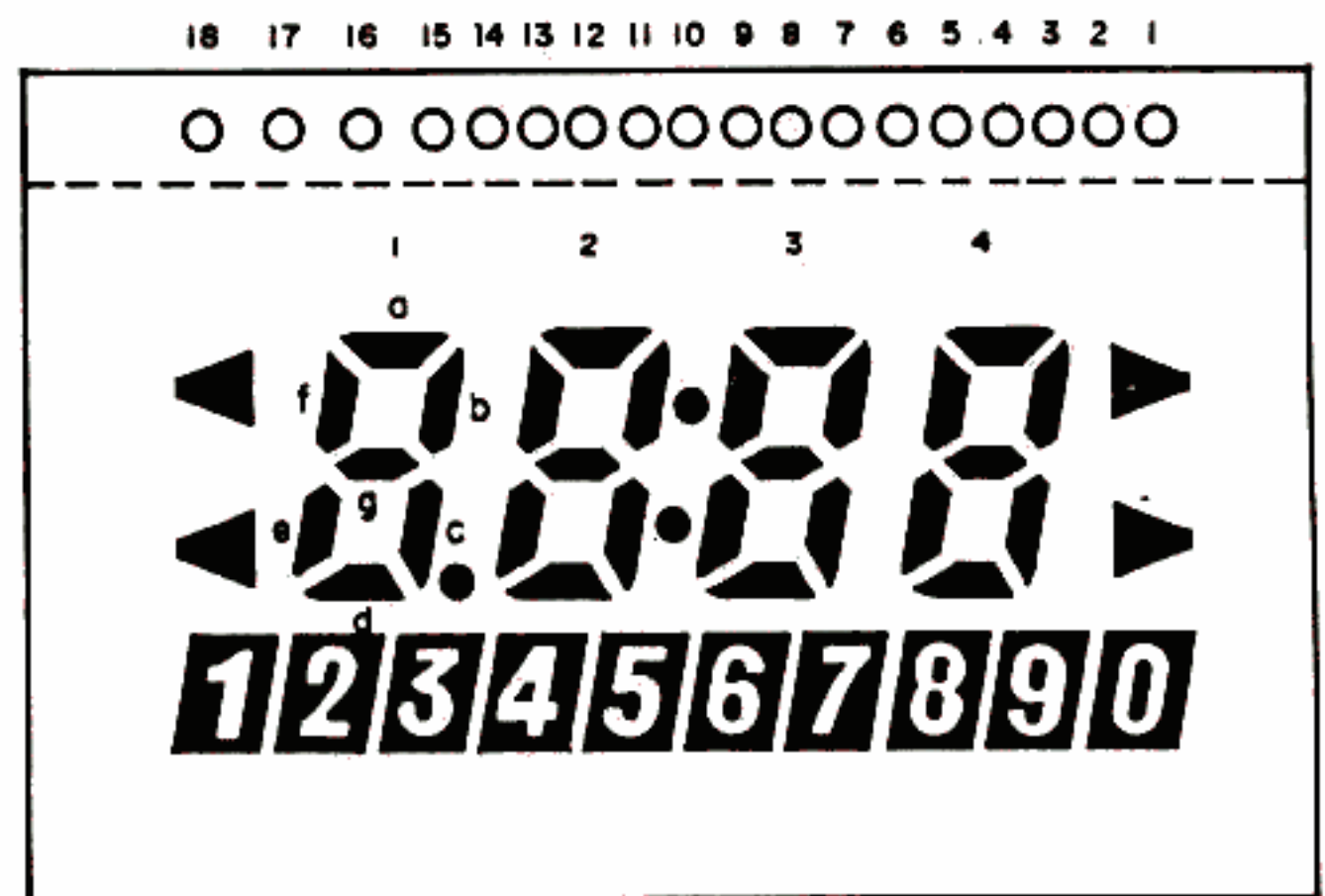
AFG05F1750A2



LCD PIN CONNECTION

Pin No.	Segment	Pin No.	Segment
1	▷,▷,0	12	1bcp
2	4bc,9	13	1agd
3	4agd	14	1fe,2
4	4fe,8	15	◁,◁,1
5	3bc,7	16	◁ (Upper) 1fab, 2fab, COL (Upper) 3fab, 4fab, ▷ (Upper)
6	3agd	17	◁ (Lower) 1egc, 2egc, COL (Lower) 3egc, 4egc, ▷ (Lower)
7	3fe,6	18	1,2,1dp,3,2d,4,5,6,3d, 7,8,4d,9,0
8	COL,5		
9	2bc,4		
10	2agd		
11	2fe,3		

Pin connection



LCD F2179-30 (Display unit V1)  
 Max rating (Absolute max. rating)

Item	Symbol	Min.	Max.	Unit
Storage temperature	Tstg	-20	60	°C
Operation temperature	Top	-20	40	°C
Applied voltage			10	V
Allowable DC voltage			0.5	V

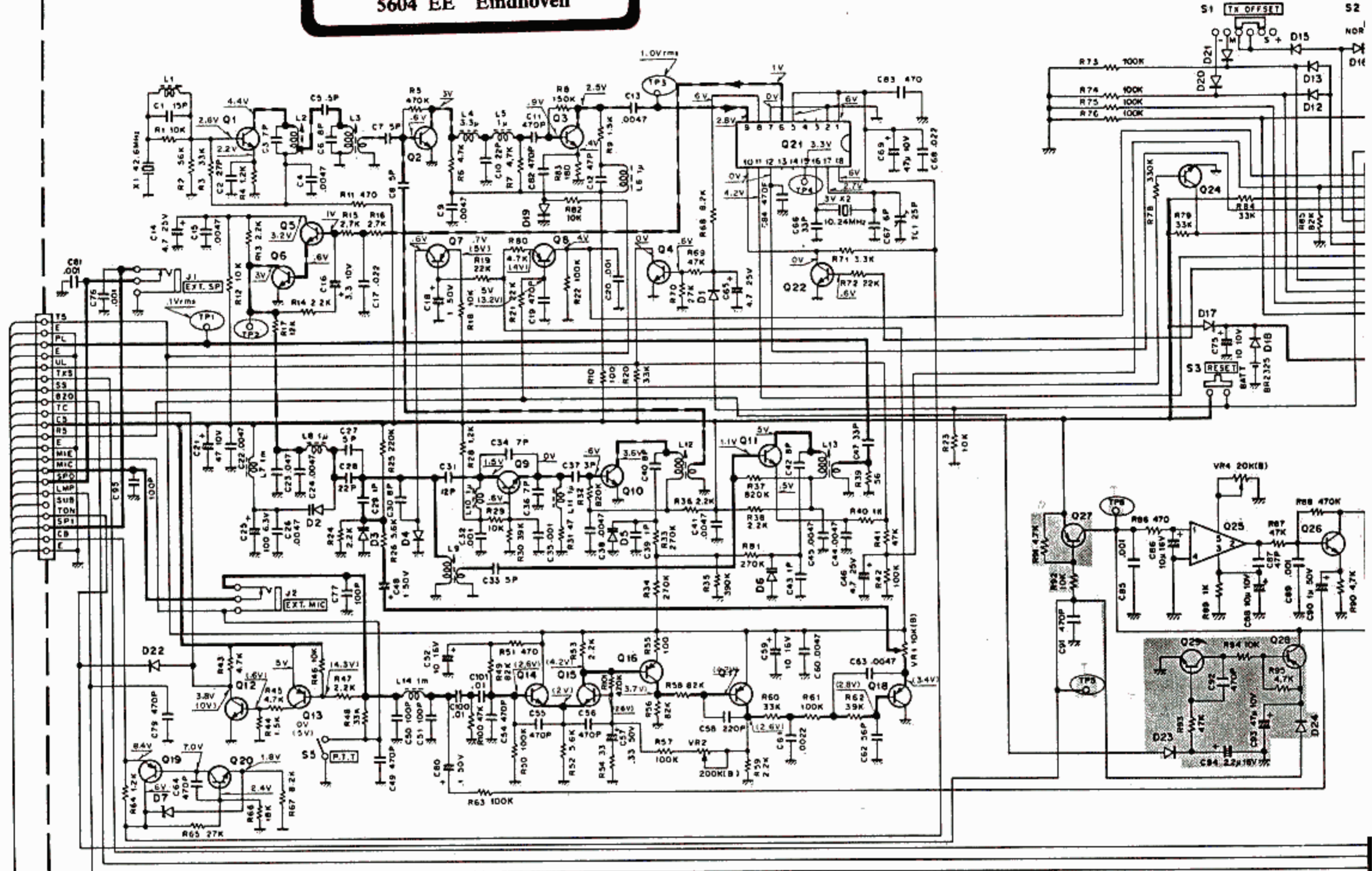
Recommendable operating condition

Item	Symbol	Min.	Norm.	Max.	Unit
Operating voltage	Vop	2.95	3.1	3.25	V
Operating frequency	fop	80	100	200	Hz
Operating temperature	Top	0	25	40	°C

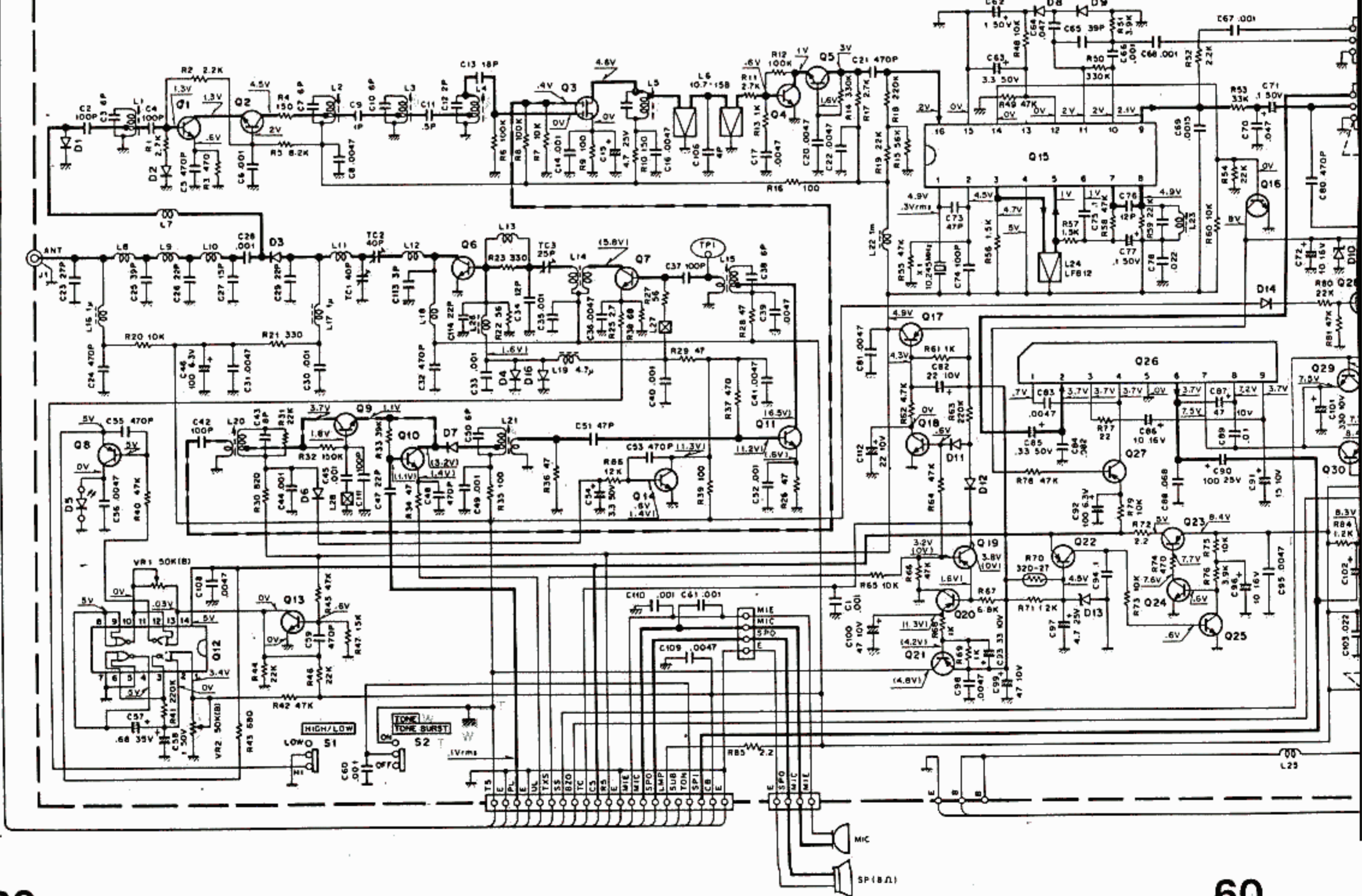
T-W

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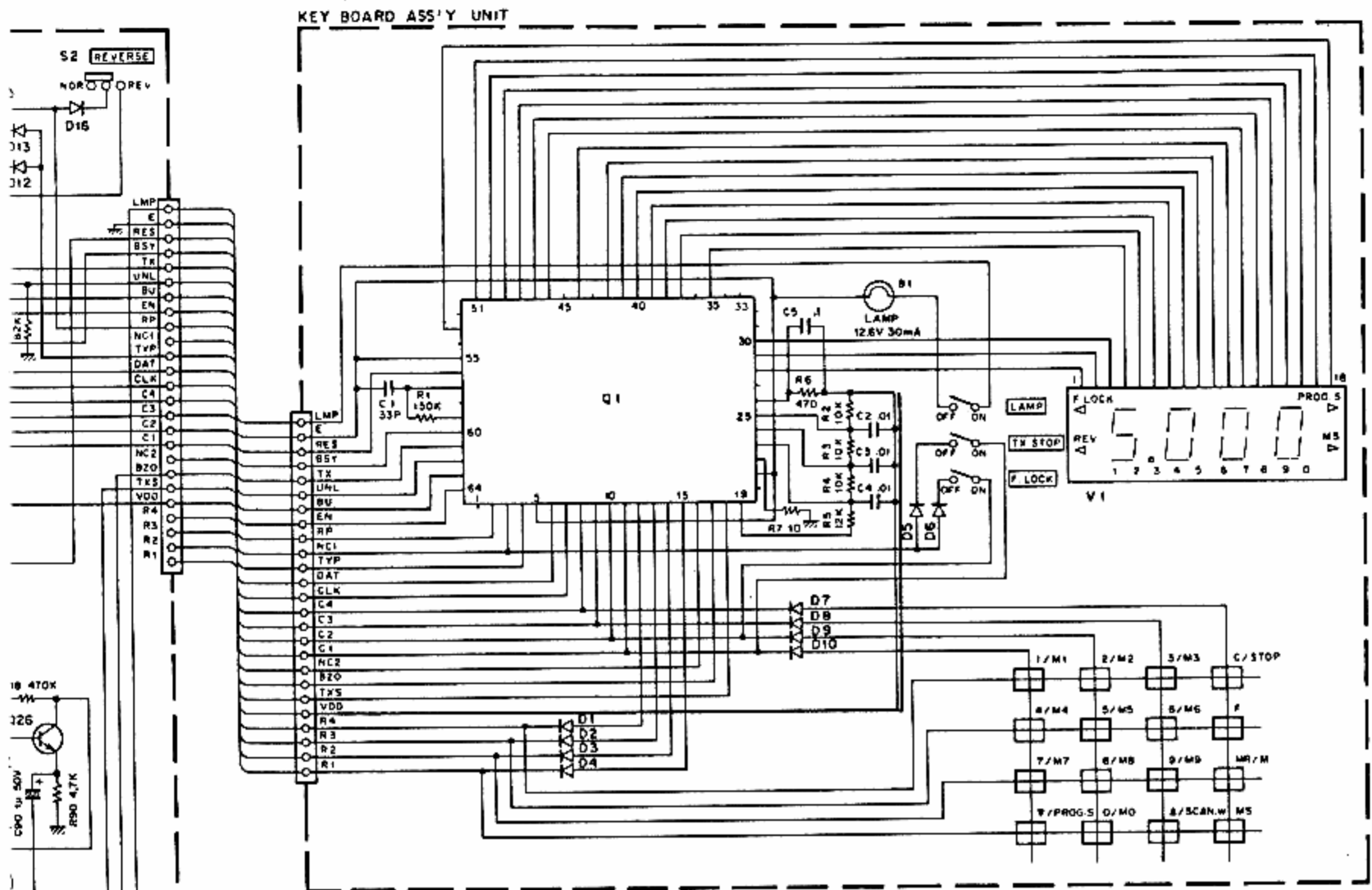
PLL UNIT (X50-1760-51-61)



TX-RX UNIT (X44-1460-51-61)



TW



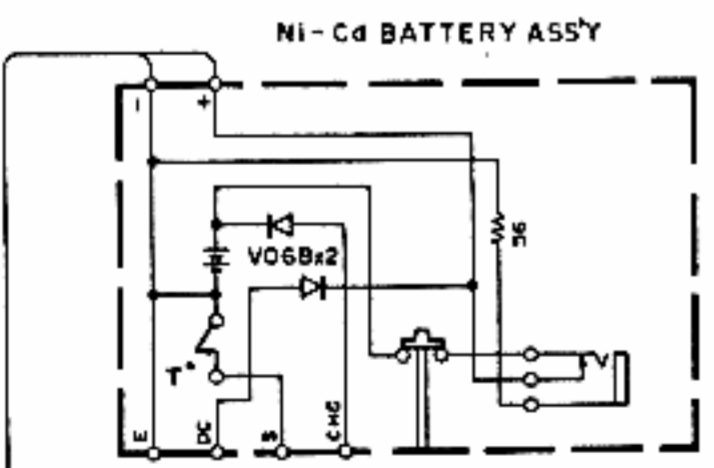
- Q1 :  $\mu$ P07502G-24-12
- D1 ~ 6 : 1S1555
- D7 ~ 10 : 1N60
- V1 : F2179-30
- |   |                               |
|---|-------------------------------|
| Q2, 10, 11 : 2SC2668(Y)                             | D 1, 12 ~ 18, 23, 24 : 1S1555 |
| Q3 : 2SC2669(Y)                                     | D 2, 3, 5, 6 : 1S2208         |
| Q4 ~ 6, 12, 14, 15, 20, 22, 24, 26, 29 : 2SC2603(E) | D 4, 19 : 1S2588              |
| Q7, 8, 13, 16 ~ 19, 27, 28 : 2SA1115(E)             | D 7 : 05Z5.1-Y                |
| Q9, 1 : 2SC2347                                     | D 20, 21 : 1N60               |
| Q21 : MC145155P                                     | D 22 : 1S5106                 |
| Q25 : AFG05F1750A2                                  |                               |

- |  |                            |
|--|----------------------------|
| Q1, 11 : 2SC2026                                 | D 1, 7 : 1S2588            |
| Q2, 4, 5, 9, 10 : 2SC2668(Y)                     | D 2, 4, 6, 14, 16 : 1S1555 |
| Q3 : 3SK76                                       | D 3 : MI-301               |
| Q6 : 2SC1947                                     | D 5 : SR538D               |
| Q7 : 2SC2053                                     | D 8, 9 : 1N60              |
| Q8, 17, 19 ~ 22, 27 : 2SA1115(E)                 | D 10 : WZ-081              |
| Q12 : TC4001BP                                   | D 11, 12 : 1S5106          |
| Q13, 14, 16, 18, 24, 25, 28, 29, 31 : 2SC2603(E) | D 13 : 05Z5.1-Y            |
| Q15 : MC3357P                                    |                            |
| Q23, 30 : 2SB698                                 |                            |
| Q26 : TA7313AP                                   |                            |

— Signal line  
 - - - Control line  
 — Common DC line

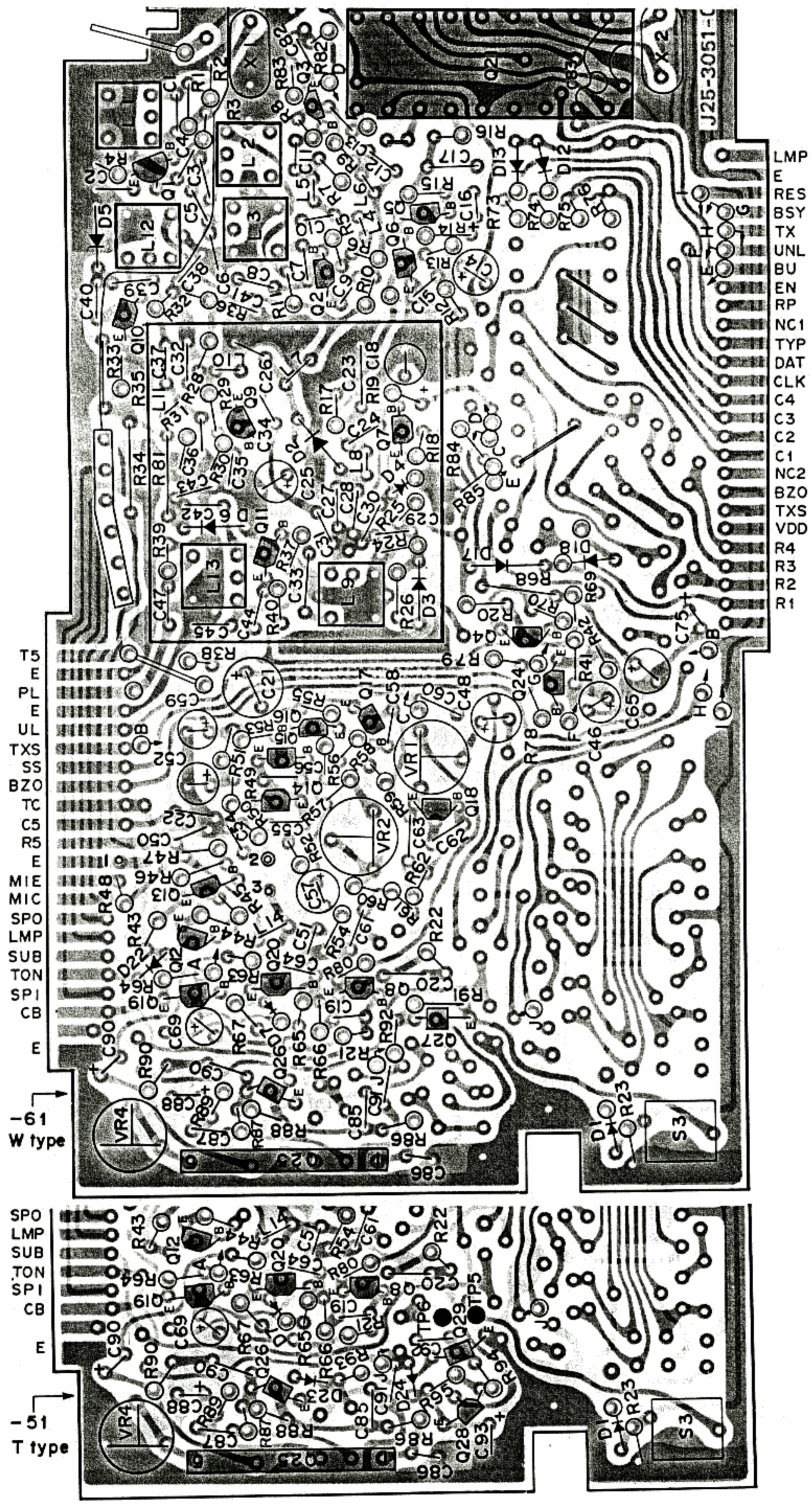
Voltage measurement conditions.  
 F = 145.000 MHz  
 ( ) : TX

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TR-2500(W,T)

[W,T TYPE]

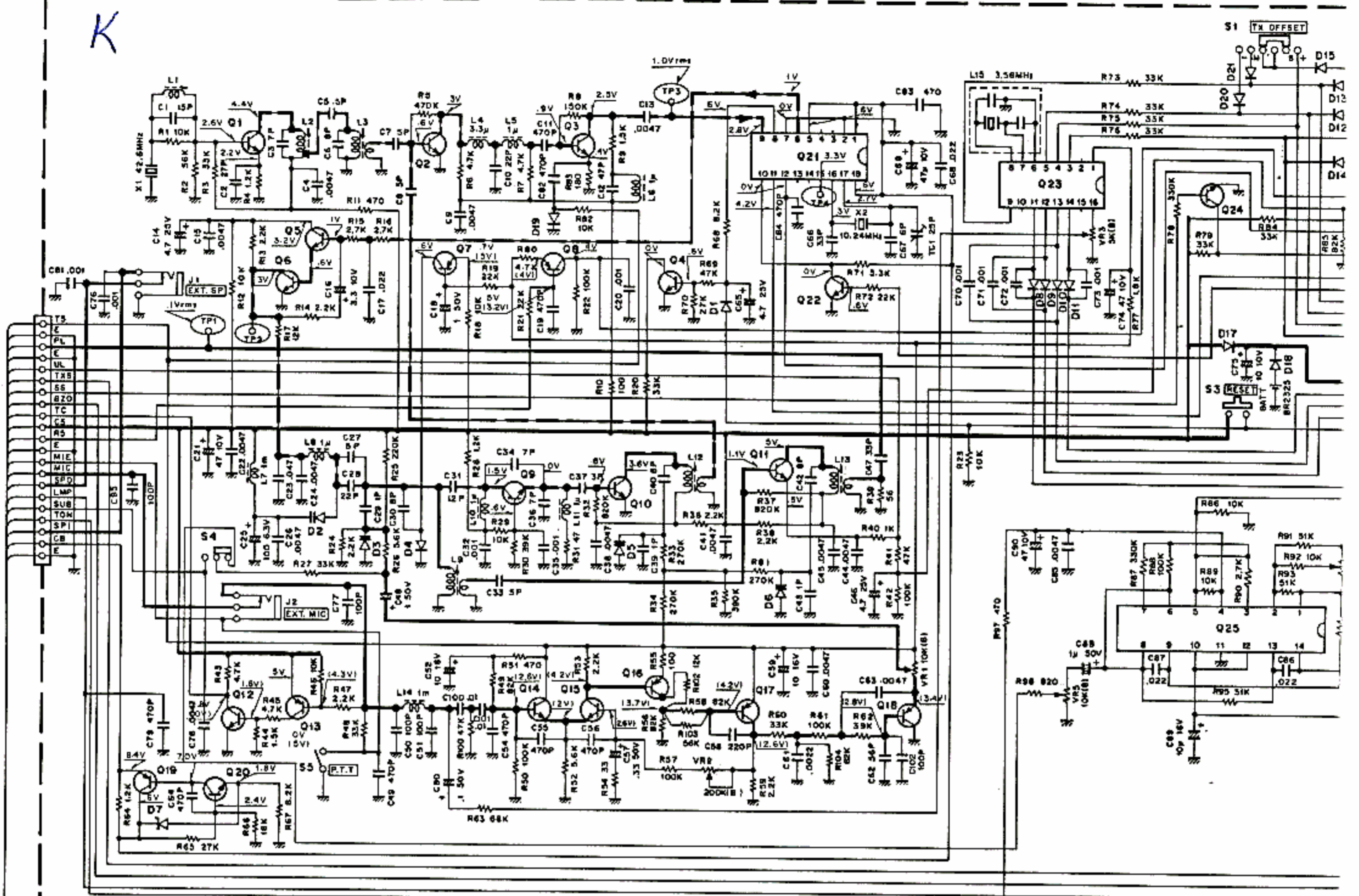


▲ PLL UNIT (X50-1760-61,-51) Foil Side View

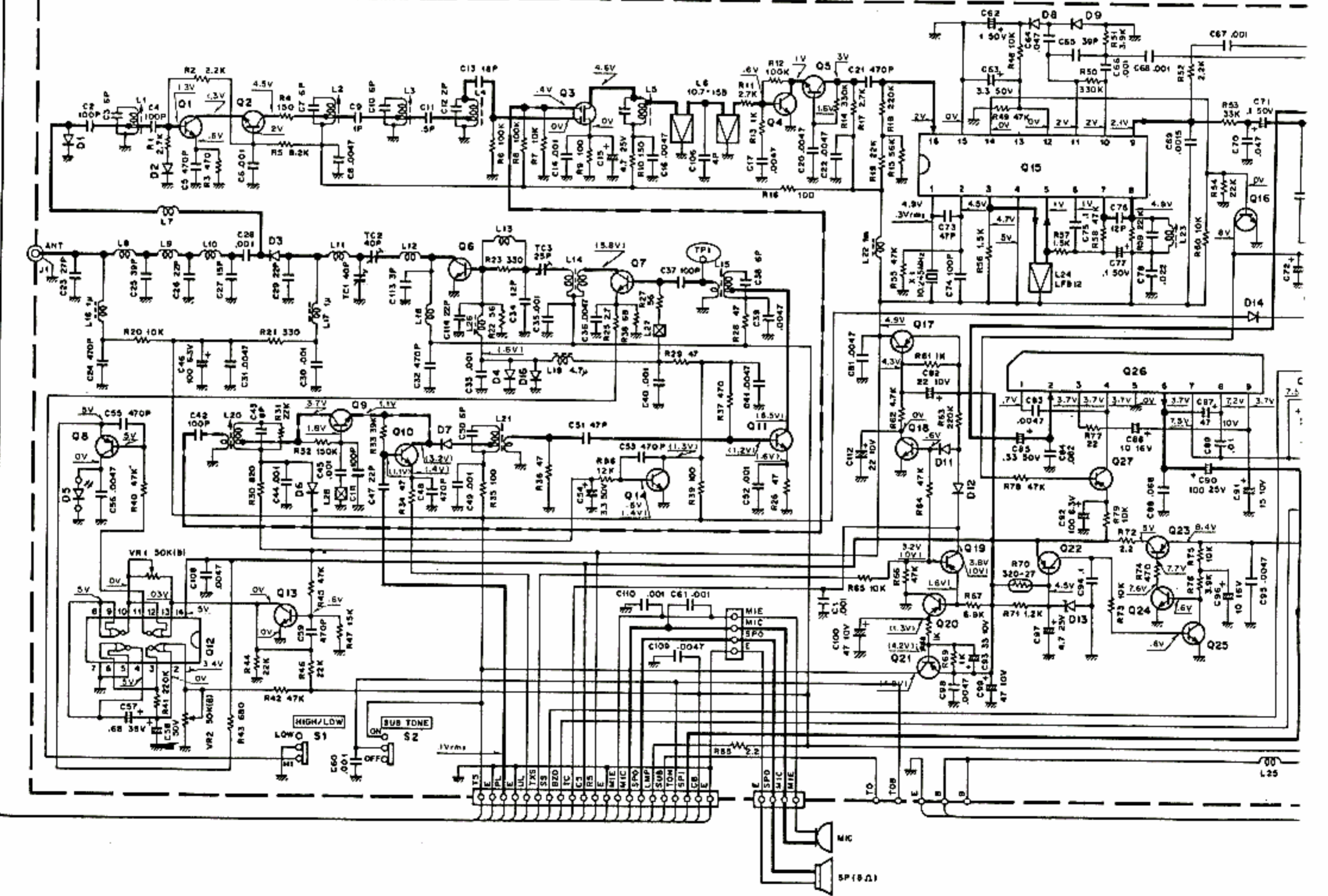


PLL UNIT (X50-1760-10)

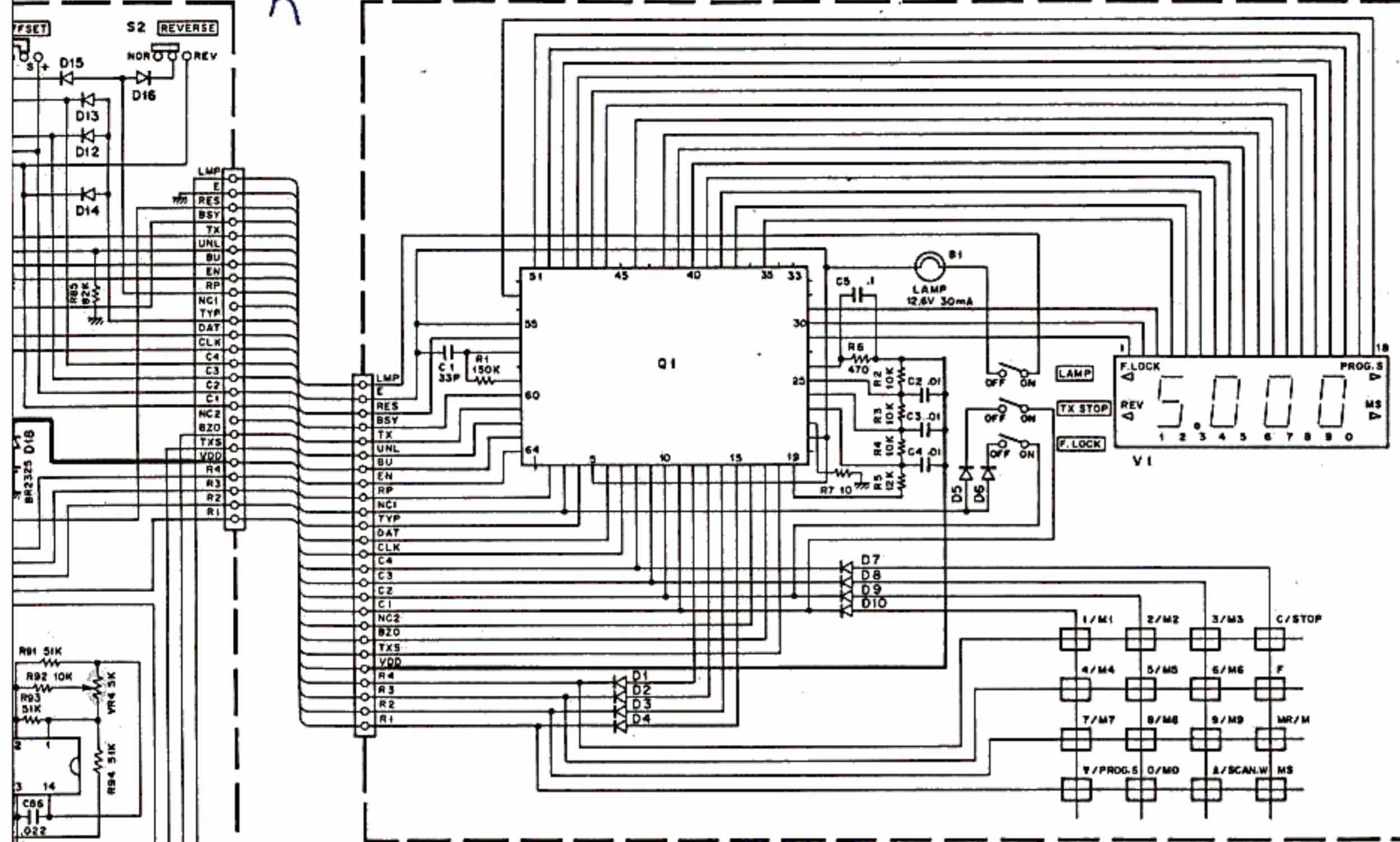
K



TX-RX UNIT (X44-1460-10)



KEY BOARD ASS'Y UNIT



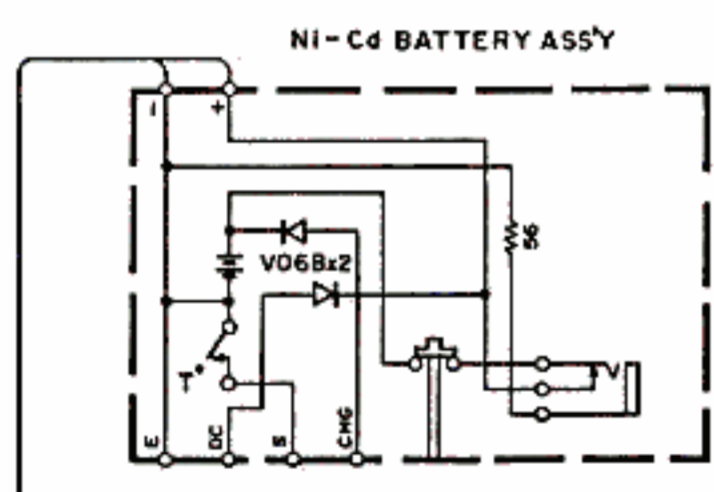
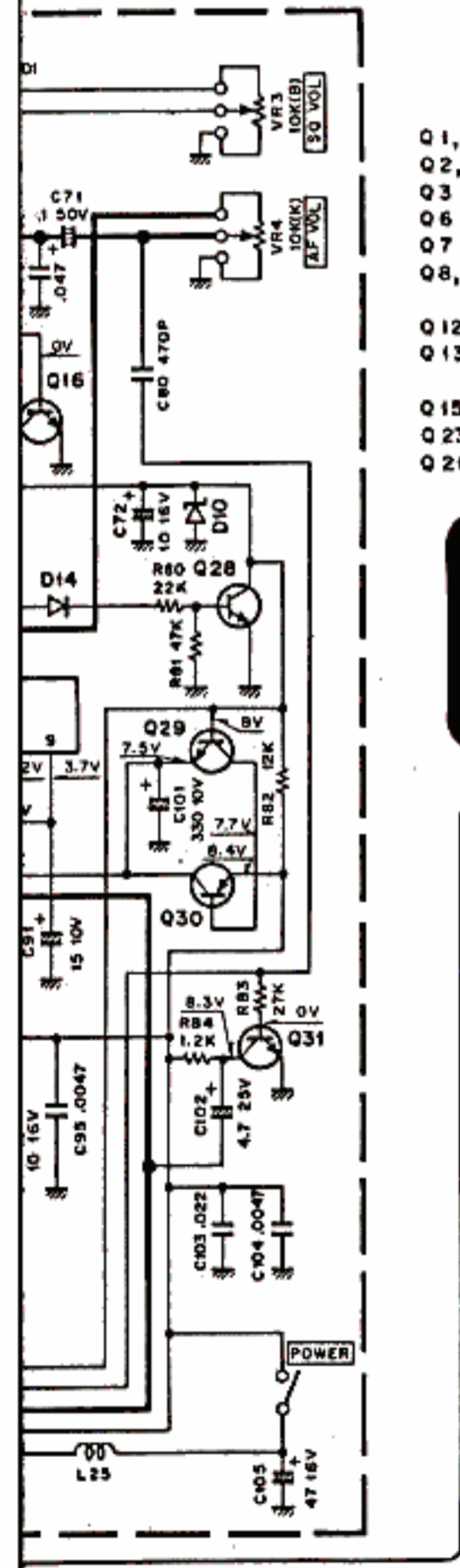
- Q2,10,11 : 2SC2668(Y)
- Q3 : 2SC2669(Y)
- Q4~6,12,14,15,20,22,24 : 2SC2603(E)
- Q7,8,13,16~19 : 2SA1115 (E)
- Q9,1 : 2SC2347
- Q21 : MC145155P
- Q23 : MK5087N
- Q25 : NJM2902N
- D1,12~18 : 1S1555
- D2,3,5,6 : 1S2208
- D4,19 : 1S2588
- D7 : 05Z5.1-Y
- D8-11,20,21 : 1N60

- Q1 : µPD7502G-24-12
- D1~6 : 1S1555
- D7~10 : 1N60
- V1 : F2179-30

- Q1,11 : 2SC2026
- Q2,4,5,9,10 : 2SC2668(Y)
- Q3 : 3SK76
- Q6 : 2SC1947
- Q7 : 2SC2053
- Q8,17,19~22,27 : 2SA1115(E)
- Q12 : TC4001BP
- Q13,14,16,18,24,25,28,29,31 : 2SC2603(E)
- Q15 : MC3357P
- Q23,30 : 2SB698
- Q26 : TA7313AP
- D1,7 : 1S2588
- D2,4,6,14,16 : 1S1555
- D3 : M1-301
- D5 : SR538D
- D8,9 : 1N60
- D10 : WZ-081
- D11,12 : 1S5106
- D13 : 05Z5.1-Y

——— Signal line  
 - - - Control line  
 ——— Common DC line  
 Voltage measurement conditions.  
 F = 145.000 MHz  
 ( ) : TX

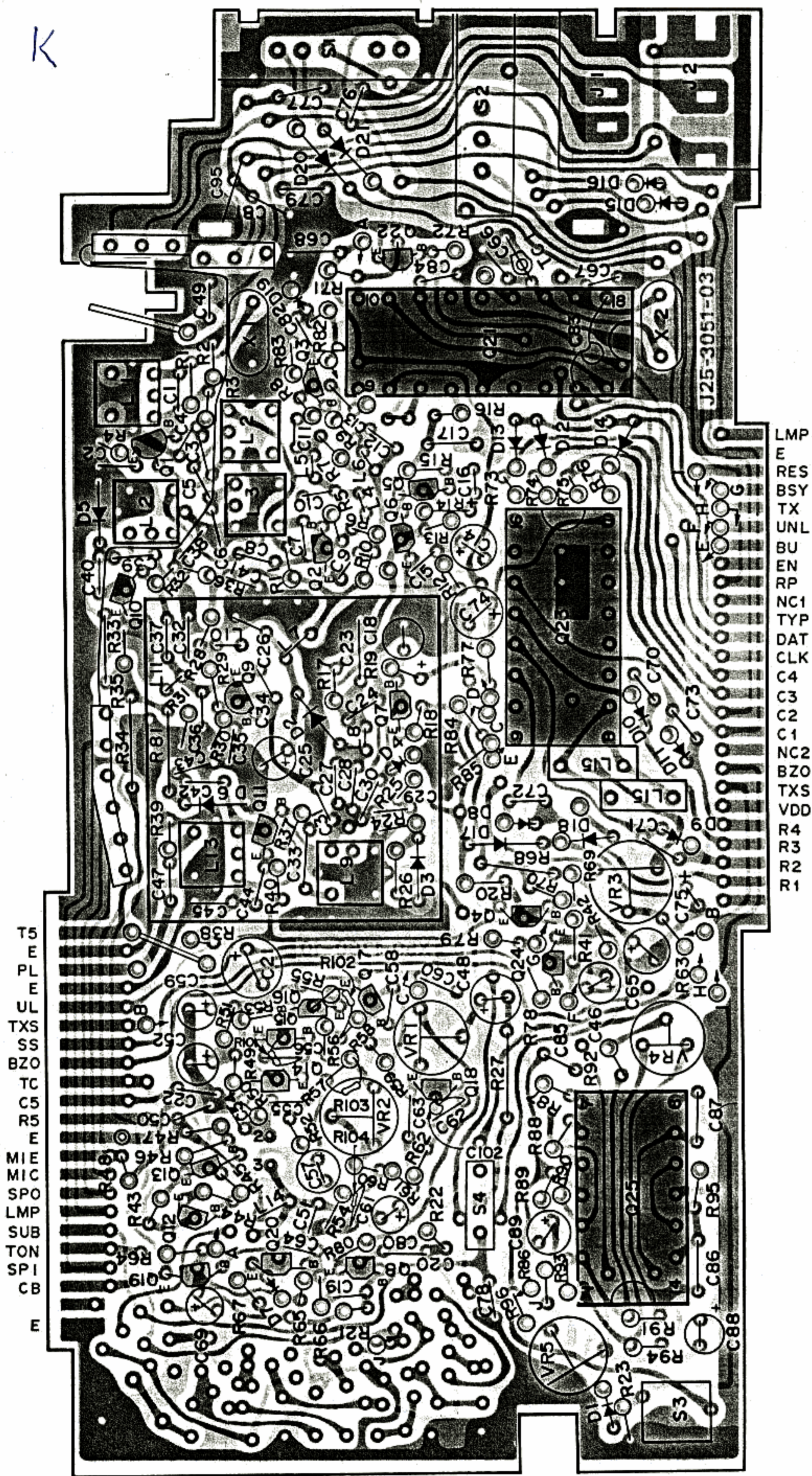
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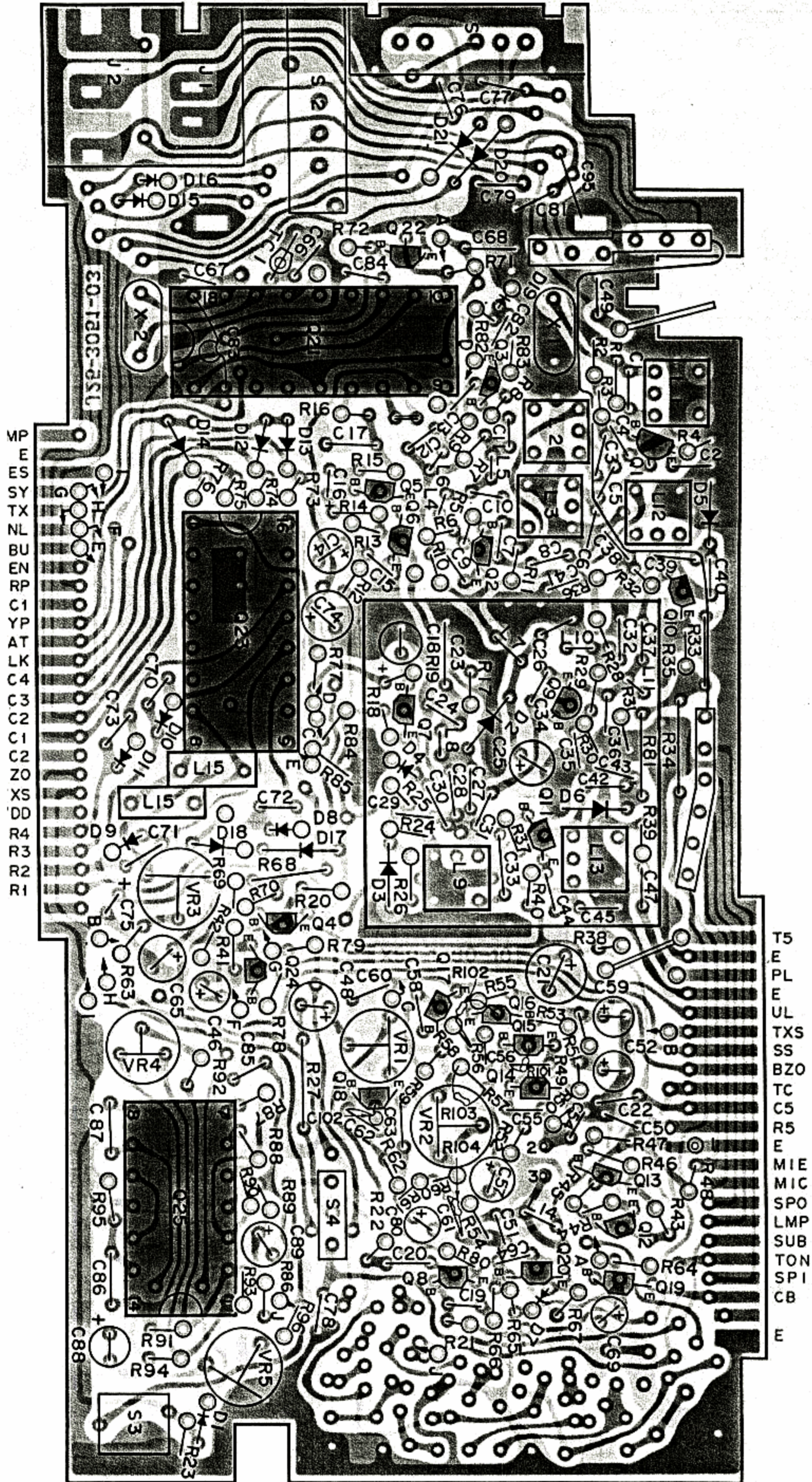
TR-2500(K)

[K,M1,M2,X TYPE]

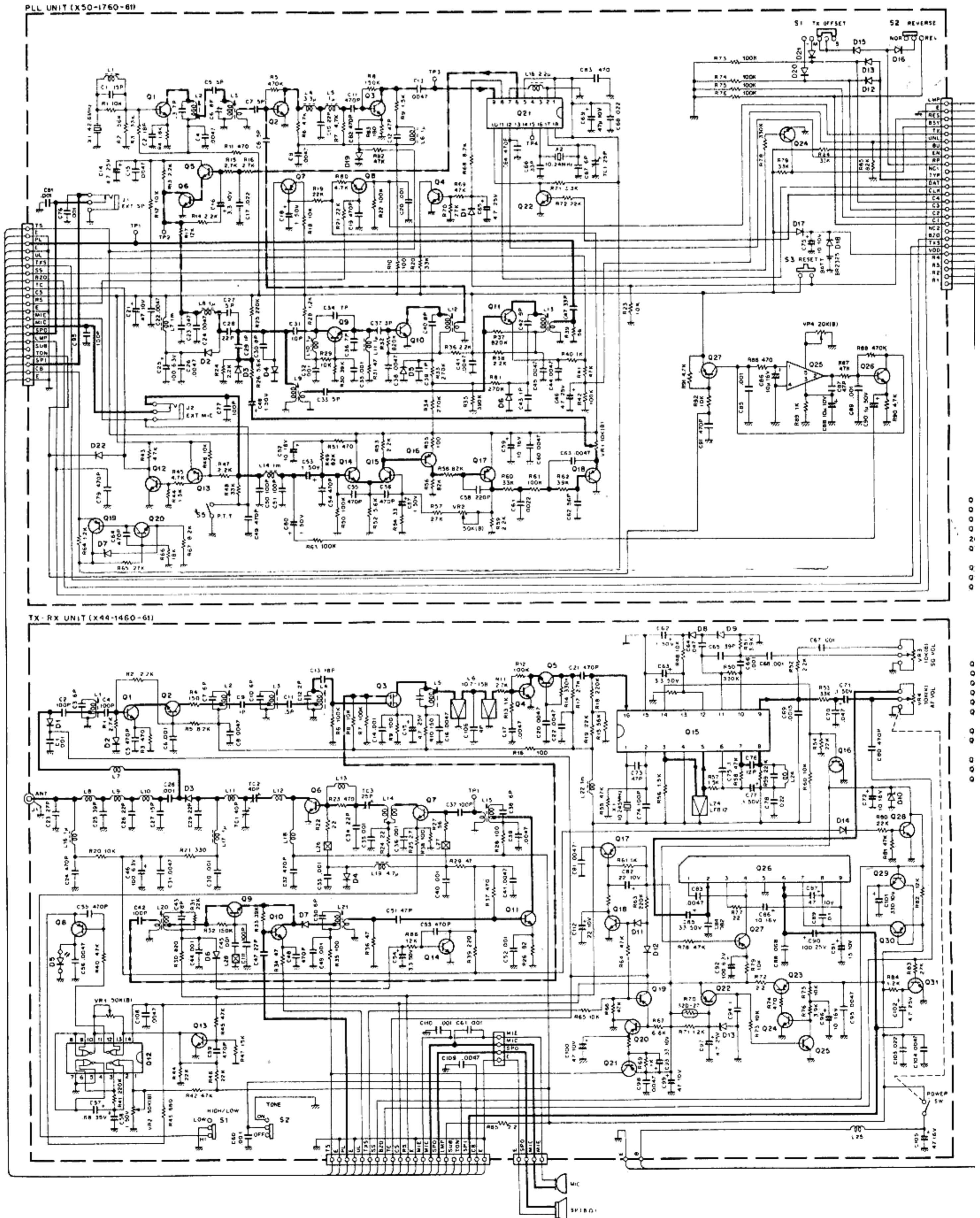
K



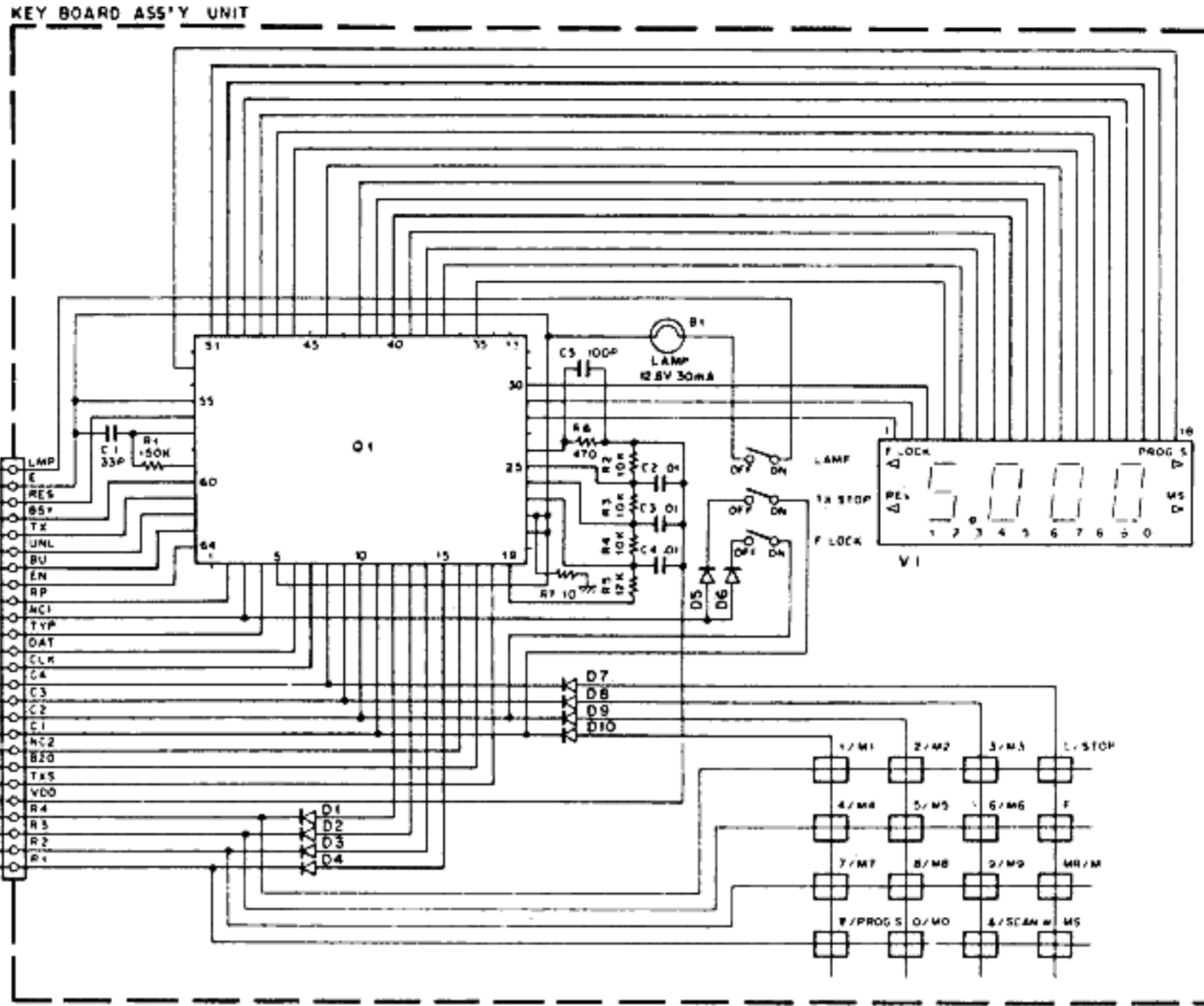
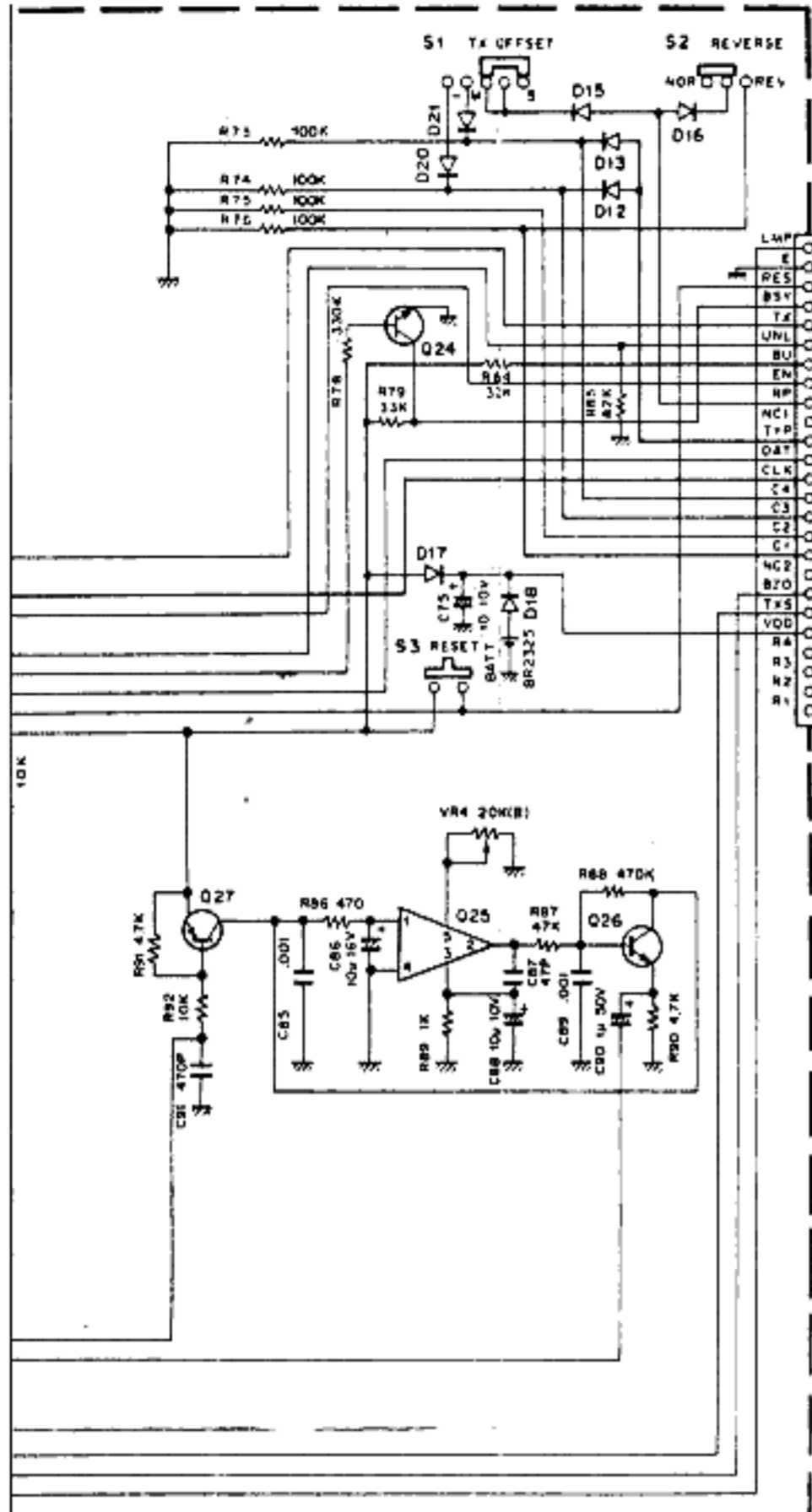
▲ PLL UNIT (X50-1760-10) Foil Side View



# 2500 SCHEMATIC DIAGRAM



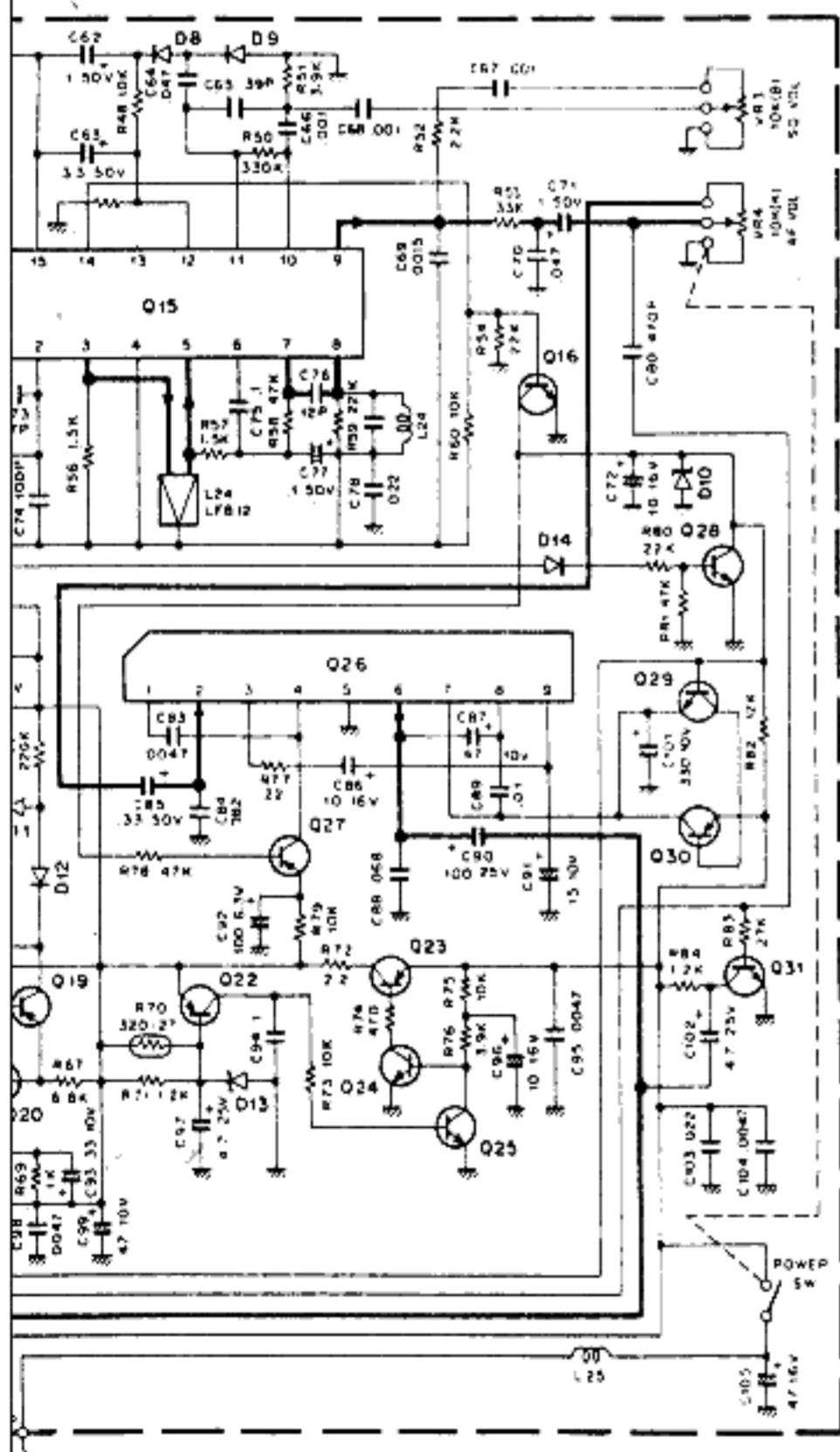
Note: Circuit and ratings may change without notice due to developments in technology.



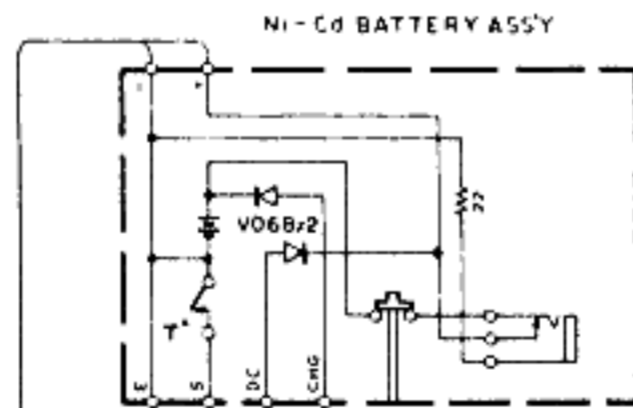
- |                                 |                |              |             |
|---------------------------------|----------------|--------------|-------------|
| Q1                              | : 25C1907      | D 1, 12 ~ 18 | : 1S1555    |
| Q2, 10, 11                      | : 25C2668(Y)   | D 2, 3, 5, 6 | : 1S2208    |
| Q3                              | : 25C2669(Y)   | D 4, 19      | : 1S2588    |
| Q4 ~ 6, 12, 14, 15, 20, 22, 24, |                | D 7          | : XZ-055 M1 |
| 26                              | : 25C2603(E)   | D 20, 21     | : 1N60      |
| Q7, 8, 13, 16 ~ 19, 27          |                | D 22         | : 1S1106    |
| Q9                              | : 25A1115 IE1  |              |             |
| Q9                              | : 25C2347      |              |             |
| Q21                             | : MC145155P    |              |             |
| Q25                             | : AFG05F1750A2 |              |             |

- Q1 :  $\mu$ PD7502G-024-12  
 D 1 ~ 6 : 1S1555  
 D 7 ~ 10 : 1N60  
 V1 : F2179-30

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- |                                     |               |               |           |
|-------------------------------------|---------------|---------------|-----------|
| Q1, 11                              | : 25C2026     | D 1, 7        | : 1S2588  |
| Q2, 4, 5, 9, 10                     | : 25C2668(Y)  | D 2, 4, 6, 14 | : 1S1555  |
| Q3                                  | : 35K76       | D 3           | : M1-301  |
| Q6                                  | : 25C1947     | D 5           | : SR-5380 |
| Q7                                  | : 25C2053     | D 8, 9        | : 1N60    |
| Q8, 17, 19 ~ 22, 27                 |               | D 10          | : WZ-081  |
| Q12                                 | : 25A1115 IE1 | D 11, 12      | : 1S1106  |
| Q13, 14, 16, 18, 24, 25, 28, 29, 31 |               | D 13          | : XZ-055  |
| Q15                                 | : TC4001BP    |               |           |
| Q23, 30                             | : 25C2603(E)  |               |           |
| Q26                                 | : MC3357P     |               |           |
|                                     | : 25B698      |               |           |
|                                     | : TA7313AP    |               |           |



TR-2500(W)