

REALISTIC[®]

Service Manual

19-1120

HTX-202

2-Meter Amateur VHF·FM Transceiver

Catalog Number: 19-1120

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SPECIFICATIONS

General

| | |
|--------------------------------------|---|
| Transmitter | PLL synthesizer, Frequency Modulation |
| Receiver | PLL synthesizer, superheterodyne system |
| Communication Frequency Range | 144~148MHz (5KHz step) |
| Operating Voltage | 6~14V DC (negative ground) |
| Temperature and Humidity range | 14°F~140°F (-10°C~+60°C) and 10%~90% |
| Transmitter/Receiver switching | Electrical |

Standard Test Conditions

| | |
|--|------------------------|
| Battery supply voltage | 7.2V DC |
| Modulation | 3KHz |
| Receiver output impedance | 8 ohms, non-inductive |
| ANT. load impedance of transmitter | 50 ohms, non-inductive |
| Ambient conditions: | |
| Temperature | 63°F~91°F (17°C~33°C) |
| Humidity | 40%~70% |

Receiver

| Description | Nominal | Limit |
|--|--------------|-------------------|
| Intermediate Frequency | | |
| 1st IF | 21.4MHz | |
| 2nd IF | 455 KHz | |
| Sensitivity: | | |
| 12 dB SINAD | 0.2 μ V | 0.25 μ V |
| 20 dB NQ. | 0.35 μ V | 0.4 μ V |
| Squelch Sensitivity: | | |
| Threshold | 0.1 μ V | 0.2 μ V |
| Tight | 2 μ V | 4~1 μ V |
| Spurious Response Attenuation | 80dB | 60dB |
| Intermodulation Attenuation | 70dB | 60dB |
| Adjacent Channel Rejection (25KHz) | 70dB | 60dB |
| Modulation Acceptance Bandwidth | 8KHz | 7.5KHz |
| Hum and Noise | 50dB | 40dB |
| Audio Output Power (10% THD): | | |
| 7.2V DC | 0.3W | 0.25W |
| 9V DC | 0.5W | 0.4W |
| 12V DC | 1W | 0.7W |
| Audio Distortion | 2% | 10% |
| Audio Response | -6dB/oct | +1/-3dB, -6dB/oct |
| Current Drain: | | |
| Stand-by without Power Save | 35mA | 45mA |
| Stand-by Power Save | 25mA | 30mA |
| CTCSS Sensitivity | 0.15 μ V | 0.2 μ V |
| DTMF Squelch Sensitivity | 0.2 μ V | 0.25 μ V |

Transmitter

| Description | Nominal | Limit |
|---|---|----------------------|
| RF Power output: | | |
| 7.2V DC | 2.2W | 2W |
| 9V DC | 3.5W | 3W |
| 12V DC | 6W | 5W |
| 13.8V DC | 7.5W | 6W |
| Maximum deviation | 4.5KHz | 5KHz |
| Hum and Noise | 42dB | 40dB |
| Audio distortion | 0.5% | 3% |
| Audio response | + 6dB/oct | + 1/- 3dB, + 6dB/oct |
| Spurious and Harmonics emission | 70dB | 60dB |
| Frequency error | ±0.0005% | ±0.001% |
| MIC. Sensitivity | 4mVrms | 10mVrms |
| CTCSS Tone deviation | 0.7KHz | 0.5~ 1KHz |
| DTMF Tone deviation | 3.5KHz | 3~ 4KHz |
| Current drain: | | |
| 7.2V DC | 0.8A | 1A |
| 9V DC | 0.95A | 1.2A |
| 12V DC | 1.4A | 1.55A |
| 13.8V DC | 1.55A | 1.7A |
| Lower Power | 0.46A | 0.6A |
| Stability variation against antenna impedance | Satisfactory when dummy antenna is varied from 40 ohms to 200 ohms. | |

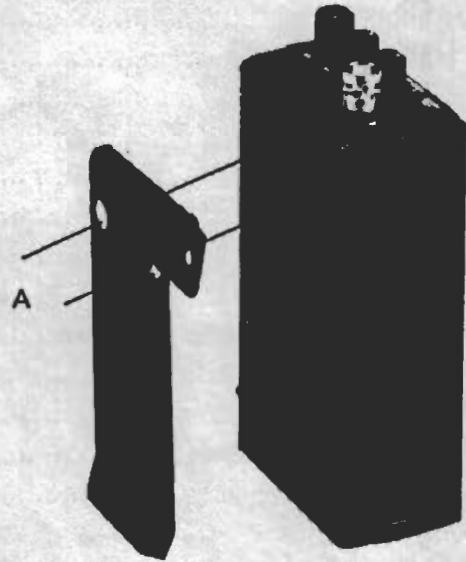
Other Items

| | |
|----------------------------------|---|
| General power requirement | 6~ 14V DC |
| Dimensions without battery | (W)2 9/16" (65mm) x (H)4 5/8" (117mm) x (D)1 7/16" (37mm) |
| Weight | 1 lbs 3 ozs (540g) |

Note: Nominal specs represent the design specs. All units should be able to approximate these-some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit fail to meet limit specs.

DISASSEMBLY INSTRUCTIONS

1. To remove the belt clip, remove two screws(A).



2. To remove the battery ground plate:

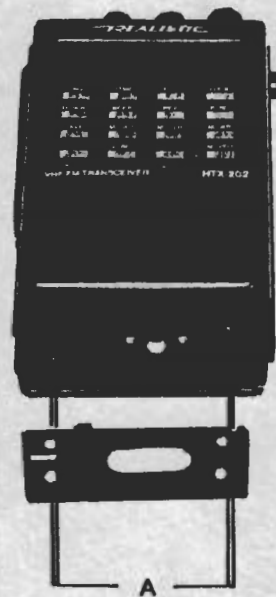
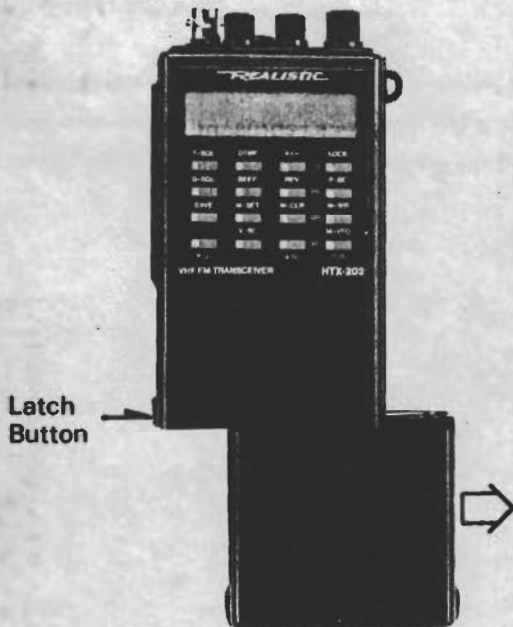
A: Remove the battery pack.

B: Remove four screws (A) from the battery ground plate.

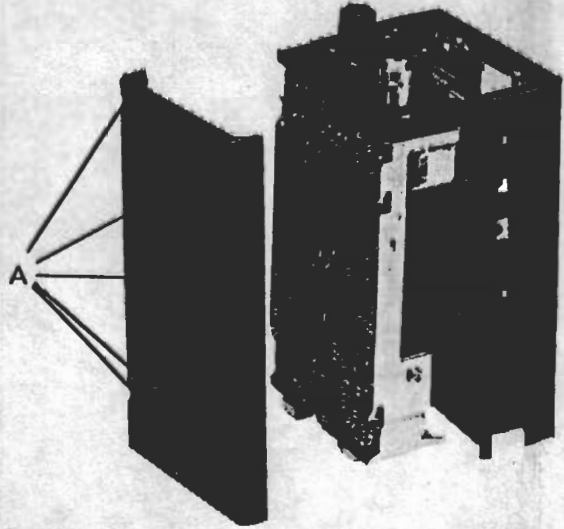
This also release the latch mechanism.

Note the position of the latch plate in the latch button.

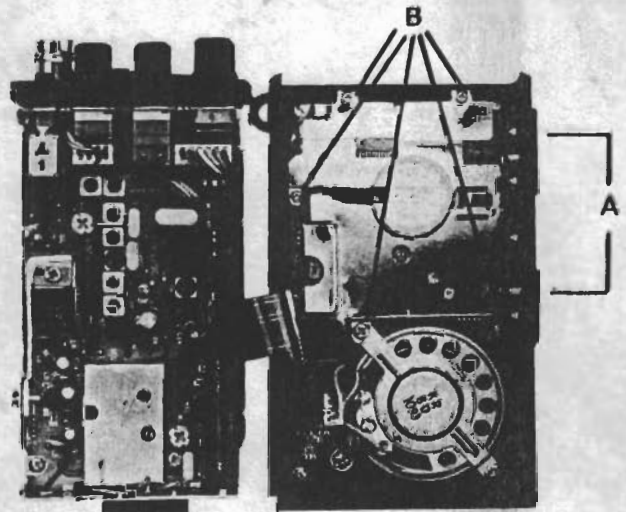
Then, remove the latch mechanism and button.



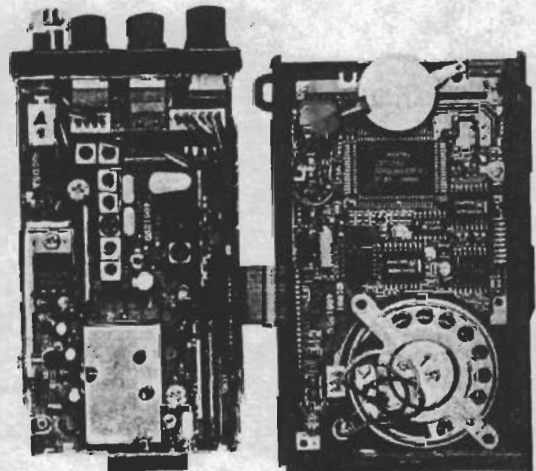
3. To access the RF board, remove five screws(A) from the back cover, and lift off the back cover. Then, pull the RF section out from the top, and lift it out of the case. Take care not to pull the ribbon trace from either assembly when you remove the RF section.

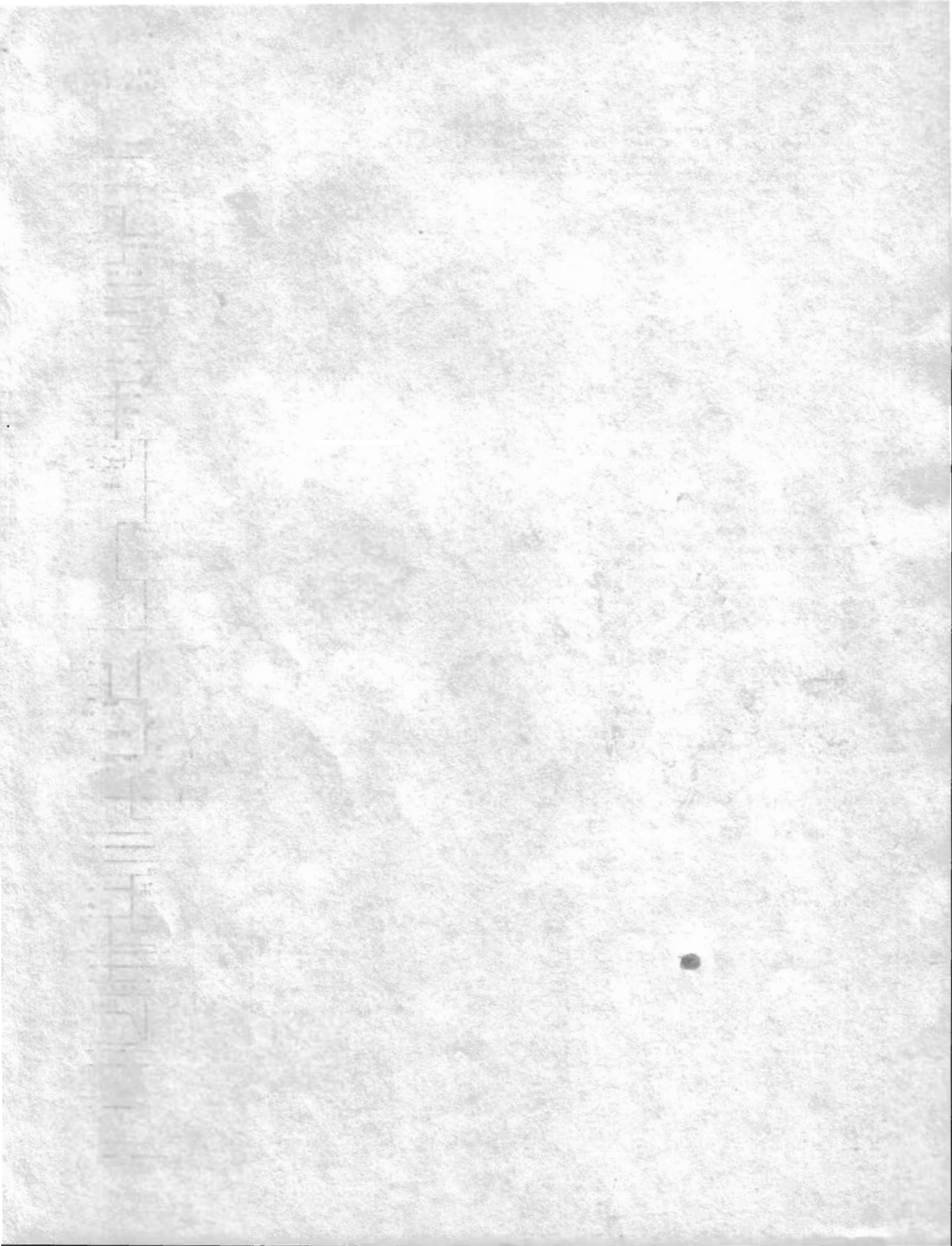


4. To access the Digital board:
A. Remove two screws (A) from the PTT button.
B. Then, remove five screws (B) from the shield plate.
C. Desolder the lithium battery from the shield plate.
D. Solder the lithium battery to ground on the RF board for testing.

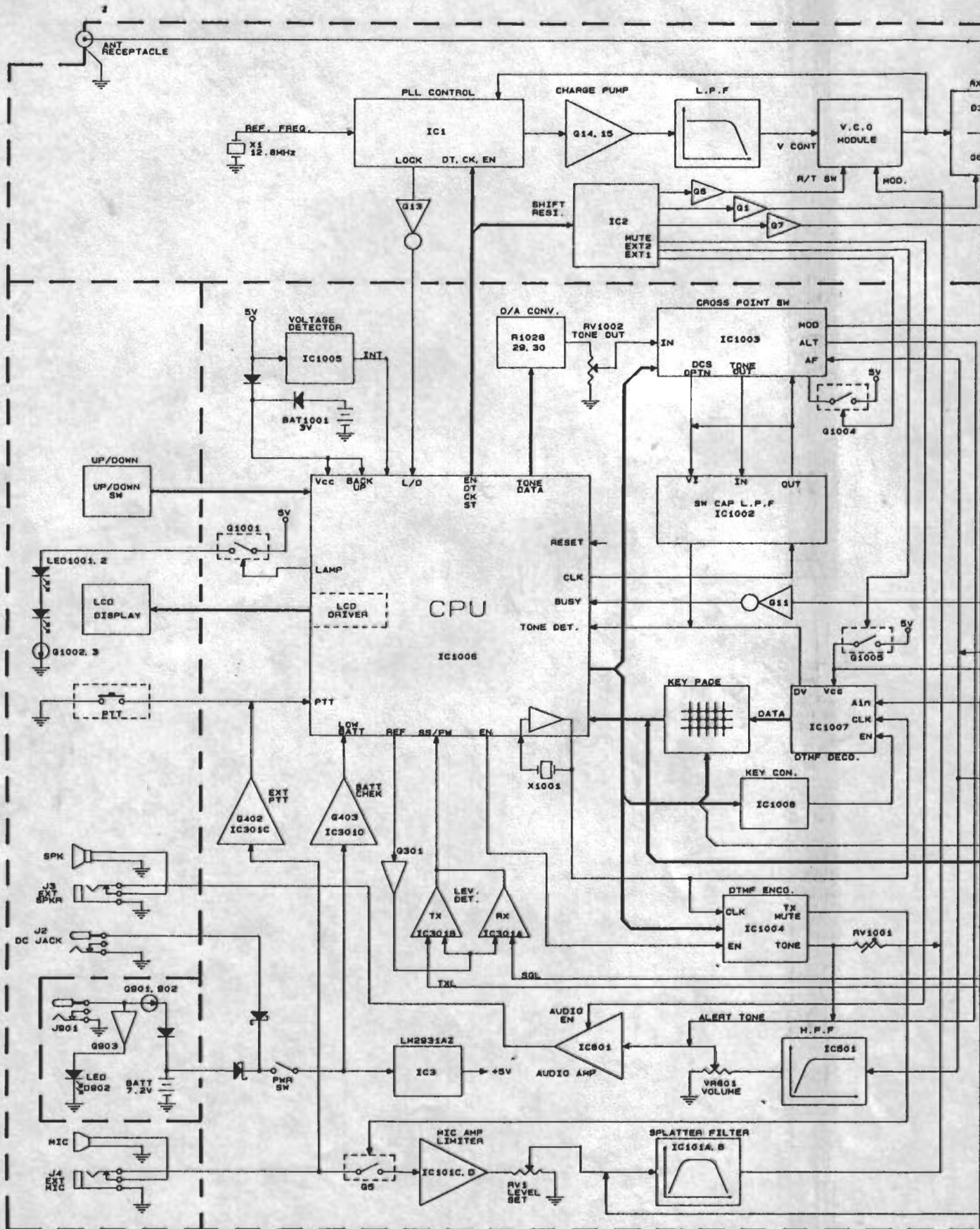


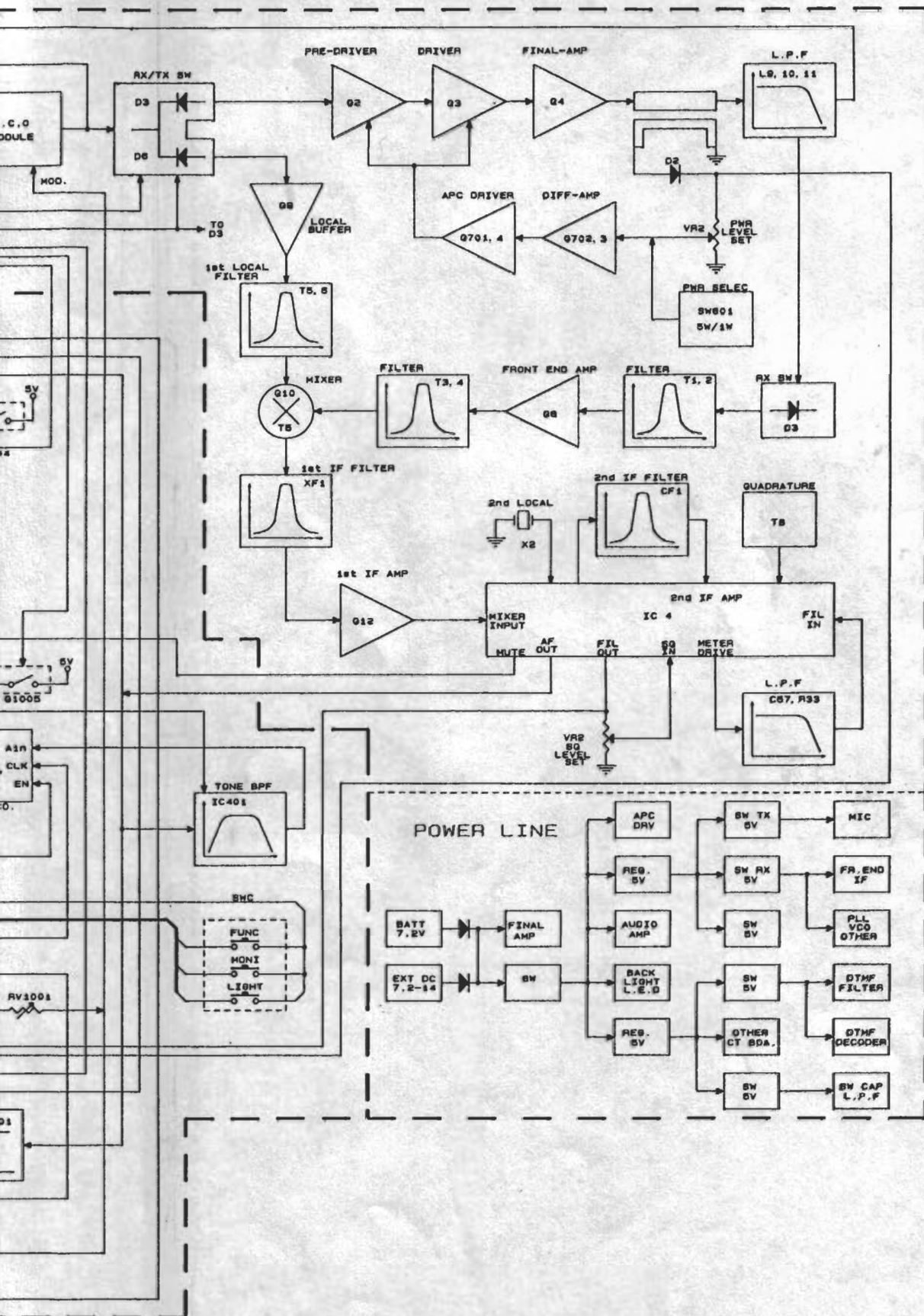
5. To reassemble, reverse the above steps.



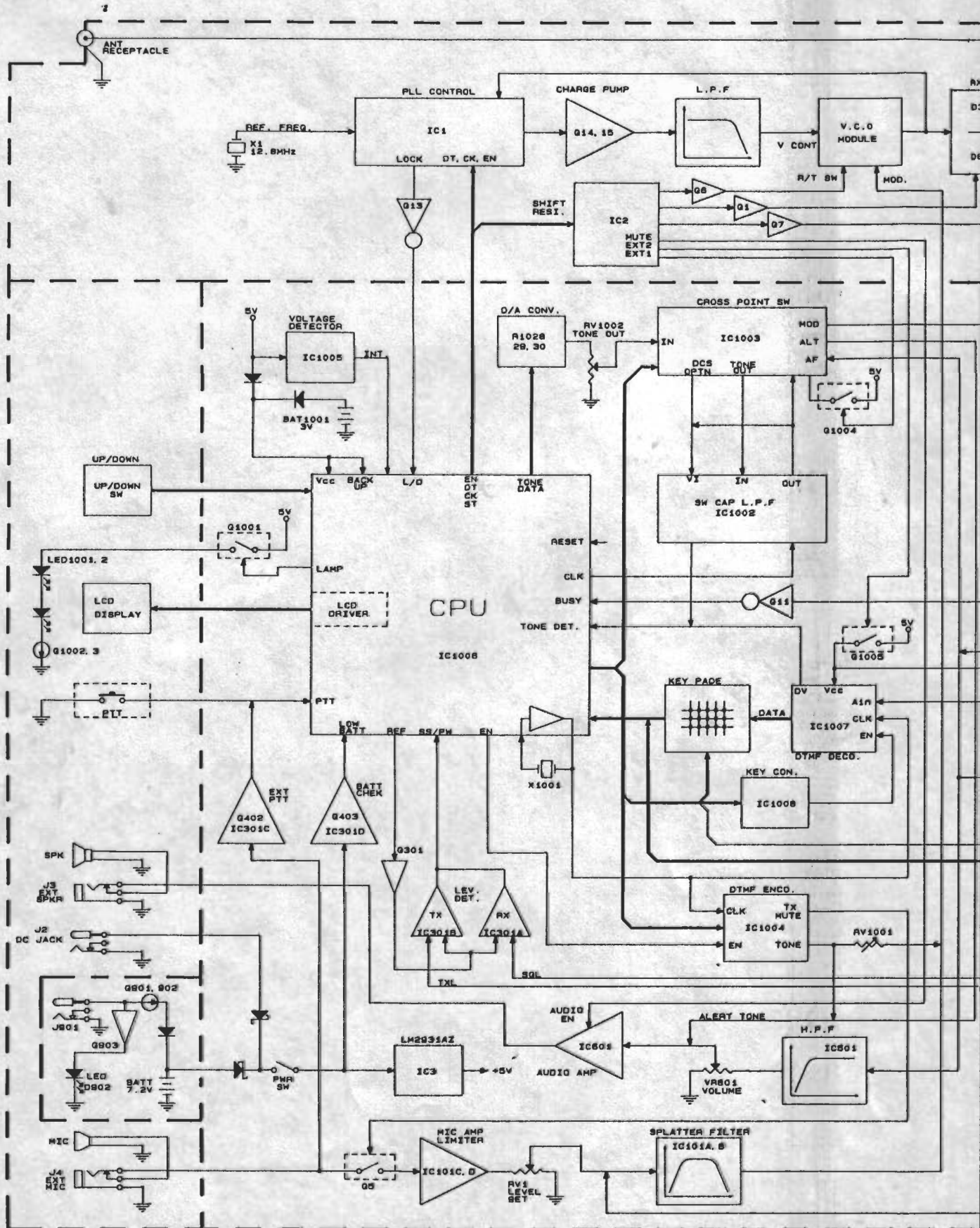


BLOCK DIAGRAM



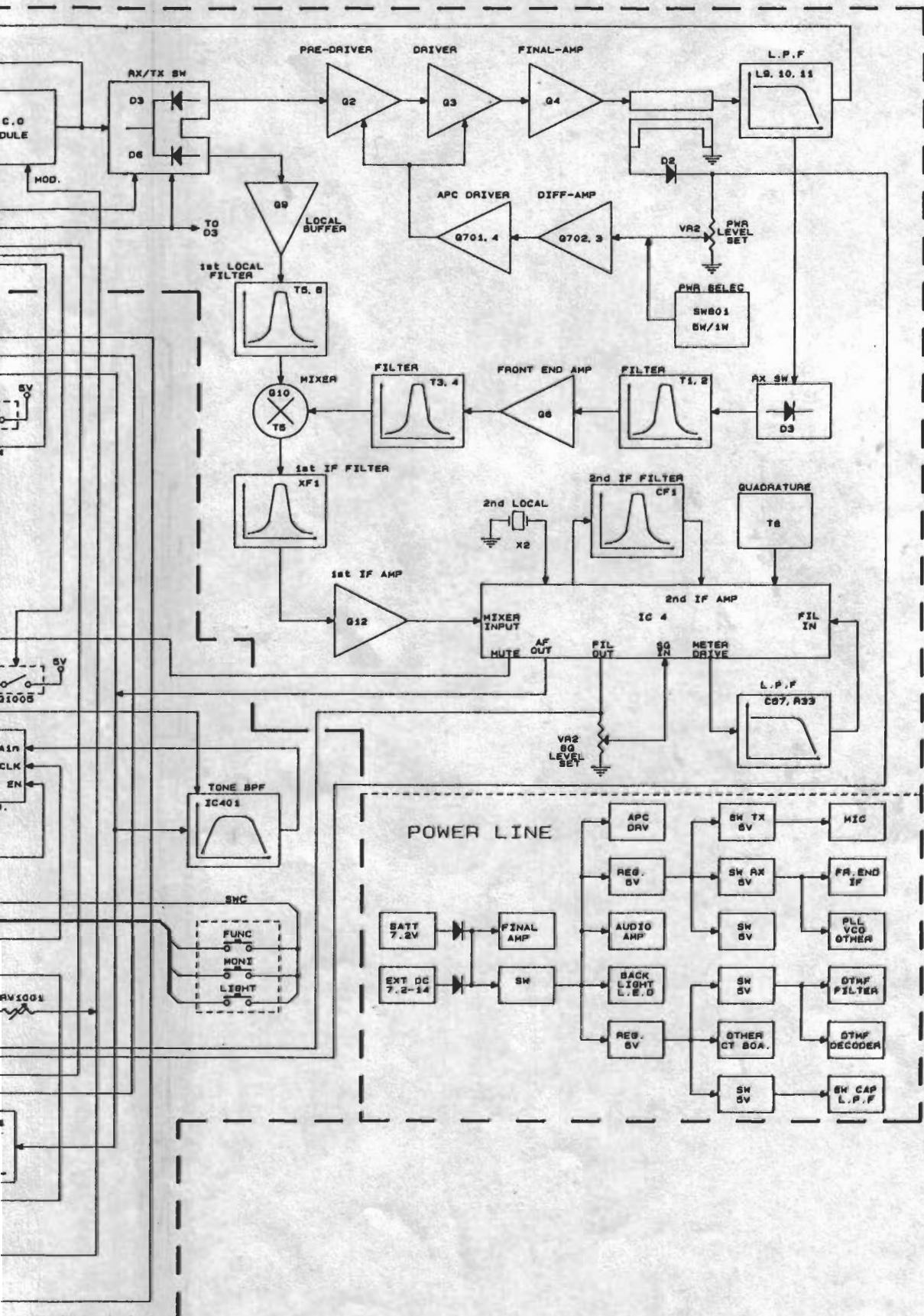


BLOCK DIAGRAM



DIAGRAM

Cat. No.: 19-1120



THEORY OF OPERATION

The 19-1120 radios are comprised of two main populated PCBs (an RF PCB and a Control PCB). The RF PCB contains the Transmitter and Receiver circuits. The control PCB contains the Microprocessor controller and associated digital circuits and the Keypad PCB.

TRANSMITTER

The transmitter is comprised of:

- a Microphone Audio Circuit
- a Transmitter Stage and Harmonic Filter
- an automatic Power Control
- and a Frequency Synthesizer Circuit

Microphone audio circuit

The audio signals from the microphone (via CON1001, pin3) or the external microphone via Mic jack J4, flexible pin 2 are amplified, pre-emphasized, and limited by IC101 and associated components. The AF microphone signal is applied to MIC module to produce an amplified and pre-emphasized audio signal. The signal is limited by IC101C/D and applied via VR1 to a lowpass filter (IC1-1A/B). The lowpass filter rejects frequencies above 3kHz (outside the voice spectrum). The filtered signal is applied to the VCO pin 7 (within the frequency synthesizer circuit). RV1 is used to adjust voice deviation.

Transmitter stage and harmonic filter

The power amplifier contains transistors Q2 to Q4. When in transmit mode of operation diode D1 is forward biased enabling the RF signal to pass to the input buffer Q2. The buffered RF signal is further amplified by power amplifier driver transistor Q3. C3 couples Q2 to Q3. L3, C3 and C6 are configured to provide filtering with impedance matching. The output from Q3 is impedance matched by C7, C8, L6 and C11 and passed to the power amplifier Q4. Diode D3 is reverse biased inhibiting the TX signal through the receiver stage. The amplified RF signal passes through the stripline coupler and is fed to the harmonic lowpass filter comprising C17 and L10, C22, L11, C23, and then to the antenna connector (ANT).

The coupler provides a sample of the RF signal for the automatic power control.

Automatic power control

The automatic power control is modulated as the combination of Q701 to Q704 and contains the stripline coupler, diode D2 and variable resistor VR2, two comparators (Q703 and Q702) and transistors Q704 and Q701. The RF signal present in the coupler is rectified by D2, to produce a DC voltage that is passed to VR2. The DC voltage is also applied to pin 3 of Q703 via VR2. The voltage TX 5V is applied to the base of Q702 via a potential divider. Q702 and Q703 determines the RF power level by producing a difference signal. The difference signal is passed to Q701 and Q704 to produce a constant power output to the antenna connector ANT. VR2 is used to adjust the RF power level.

Frequency synthesizer circuit

With data received from the microprocessor (IC1006), the frequency synthesizer circuit controls and produces the RF carrier frequency for the transmitter during transmit and the local oscillator frequency for the receiver.

The frequency synthesizer circuit is comprised of

- a RX and TX Voltage controlled Oscillator Module
- a Loop Filter
- a PLL frequency synthesizer & prescaler chip

RX and TX voltage controlled oscillator module

A VCO module produces carrier frequencies during transmit and the local oscillator frequency during receive. The module also has a power line filter.

RX and TX power line filter

Transistor Q201 is configured as 5V (module, pin 1) power supply ripple filter.

RX VCO

The RX VCO is comprised of JFET Q204, coil L202 and varactor D202 and is configured as a Colpits oscillator. D202 produces a change in frequency with a change in DC voltage and is controlled by the phase detector signal (via module pin 6) present at the anode. The local oscillator signal at the drain of Q204 is applied to pin 4 of the module, when diode D1 is reverse biased and D6 is forward biased. L202 is used for PLL alignment.

TX VCO

The TX VCO is comprised of JFET Q204, coil L202 and varactor D202 and trimmer capacitor TC202 and is configured as a Colpits oscillator. The AF signal at Mic Amp. module pin 6 is applied to the anode of D202 via pin 3 of the module. The control voltage from the loop filter is applied to the cathode of D202 (via a module pin 6). The TX RF modulated signal produced at the drain of Q204 (module, pin 4) is passed to the power amplifier and harmonic filter via the buffer amplifier (Q2), when diode D1 is forward biased and D6 is reverse biased. TC201 is used for PLL alignment.

Loop filter

Transistors Q14 and Q15 and resistors R46 to R51 and capacitors C79 to C82 form the loop filter. The phase detector from pin 13 of IC1 is filtered to remove any reference frequency harmonics and then applied to the RX and TX voltage controlled oscillator module, pin 6.

PLL frequency synthesizer

The PLL frequency synthesizer contains an oscillator for the reference crystal, a reference divider, a programmable divider, a phase/frequency comparator, an out of lock detector and a prescaler.

Reference oscillator

The reference oscillator of IC1 along with a 12.8MHz crystal X1, TC1, C76, C77 produces a 12.8MHz reference signal at pin 1 & 2 of IC1.

Programmable dividers

IC1 has two dividers, a data programmable divider and a programmable reference divider.

Phase detector

The phase detector (pin13) produces negative pulses when $F_v < F_r$ and positive pulses when $F_v > F_r$. When $F_v = F_r$ and phase is the same the phase detector presents a high impedance at pin 13. The signal at pin 13 is applied to the VCO via the loop filter.

Out of lock detector

The out of lock detector produces a high logic level when F_r and F_v are in the same phase and frequency, or low logic level pulses when the loop is out of lock at pin 11 of IC1. The signals at pin 11 of IC1 are buffered by Q13 then integrated by R45 and C78. The product of the integrating circuit is fed to flexible PCB 22.

Prescaler

The internal prescaler divides the VCO frequency by 16 or 17.

RECEIVER

The Receiver uses dual-conversion superheterodyne techniques and comprised of:

- an RF Amplifier
- a First Mixer and First IF Amplifier
- a Second Mixer, Second IF Amplifier and FM Detector
- a Receiver Audio circuit
- a Mute (Squelch) circuit

RF amplifier

The receiver RF amplifier contains coils T1 to T4 and MOS FET Q8. Coils T1 to T4 are T3, T4 are configured as 2-pole bandpass filter. The RF signal passes through the tuned circuit T1 and T2, RF amplifier Q8 and T3 and T4, enabling the RF signal at the operating frequency to pass to the first mixer.

First mixer and first IF amplifier

FET Q9, Q10 and crystal filter XF1 and coils T5 to T7 from the First IF amplifier. The VCO local oscillator signal, via buffer transistor Q9, is filtered by T6 and T7. Q10 produces a difference frequency of 21.4 MHz at the drain connection, from the filtered RF signal at the gate connection and the filtered VCO local oscillator signal at the source connection. The 21.4MHz difference frequency is filtered by the 2-pole crystal filter XF1. The tuned circuit T5 and associated components provide matching of the crystal filter to insure good passband response and sensitivity. The IF signal is amplified by Q12 and passed to the second mixer, second IF, and FM detector.

Second mixer, second IF, and FM detector

A single conversion FM receiver integrated chip, IC4 contains the second mixer, second IF, and FM detector functions. The second local oscillator frequency is determined by the crystal X2 connected to pin 1 of IC4. The IF signal is received at pin 16 of IC4 via R38 and coupling capacitor C60. The second IF frequency of 455 KHz is produced when the difference frequency is applied to the mixer via pin 6. The output of the second mixer via pin 3 is applied to a 455 KHz bandpass filter, CF1. The output of CF1 is passed to a high gain IF amplifier (limiter) in IC4 via pin 5. The amplified signal is coupled to the adjustable quadrature detector T8. Any detected signal is produced at pin 9 of IC4 and applied to the receiver audio circuit.

Receiver audio circuit

The receiver audio circuit is comprised of an audio and a high pass filter module and de-emphasis circuit on the RX/TX PCB.

High pass filter module

CTCSS signals from the recovered audio signal is removed by the high pass filter. The high pass filter is a 8-pole active filter that is comprised of IC501 and associated components. The de-emphasis is provided by resistor R42 and capacitor C70. The de-emphasized audio signal at CON2, connection 6 is fed to the audio amplifier on the RX/TX PCB, via the volume PCB's VR801.

Audio amplifier module

IC601 is the audio amplifier. The audio signal at CON2, pin5 is passed to IC601, pin3 via variable resistor VR801 (located on the front panel). The gain of the amplifier is set by resistor R603 and C602. The amplified audio signal at pin 5 of IC601 is applied to the internal speaker SPKR by flexible PCB (pin 5). The external speaker connection is via the connector JACK 3.

Mute (squelch) circuit

The squelch circuit switches off the audio power amplifier in the absence of RF signals. The squelch circuit is comprised of internal carrier detector, squelch control and VR802.

Internal detector circuit

The carrier signal is detected by IC4 pin 13 and regulated by C57 and R33, and then DC amplified by the internal amplifier circuit via IC4, pin 10. The amplified signal is applied to IC4 pin 12 via SQ VR802 and then is converted to Logic Level by internal comparator of IC4. The output level is buffered and reverse phased by Q12 and is applied as the busy signal to the microprocessor by flexible PCB pin 10.

MICROPROCESSOR CONTROLLER

The default of all functions in the radio is preset by the internal programmed microprocessor and any other user's options including the frequencies of Receive and Transmit are available by the microprocessor and associated interfacing circuit.

Microprocessor

The microprocessor is a high speed Hitachi HD404808 4K-byte ROM with 4-bit access. It contains the LCD Driver, I/O Controller, Voltage Comparator. When the radio turns on, the microprocessor is power-on reset by C1021 of pin 78 to operate in the preset order in the masked ROM. When the radio turns off, the data in RAM are kept stored by the backup battery with about 2 μ A current from BAT1001 to pin 13.

POWER SWITCHING CIRCUIT

When the PTT switch is pressed, the enable and clock data are forwarded by the microprocessor to IC1 pin 5, 6, 7, and to IC2 pin 1, 2, 3. When IC2 receives the enable and clock data, it holds pin 2 low, causing Q1 to turn on, and holds pin 14 high, causing Q7 to turn off. It reverses this in receive mode.

CTCSS/DTMF ENCODE AND DECODE CIRCUIT

CTCSS Receive

The detected audio signal is applied to IC1003 pin 11 for being switched out to pin 12, and then applied to pin 8 to compare with OP AMP and passed to pin 3 to be applied to pin 13 through C1005 and R1005. It is further amplified and referenced by OP AMP to be passed to pin 14. Again by the same procedure it is forwarded in to pin 1 and out to pin 2 to apply to the microprocessor pin 31 for the microprocessor control.

CTCSS Transmit

The data received from the microprocessor pin 17, 18, and 19 are applied to IC1003, pin 10 via R1028, R1029, R1030, and RV1002 for being switched at IC1003. The signal received at IC1002 pin 8 via pin 12 is filtered to pass to pin 3 and then to pin 14 for being switched to transmit by flexible PCB pin 26 via pin 25.

DTMF Decoding circuit

The audio detection output supplied to the Control Board is also applied to the bandpass filter pin 5 and passed to the DTMF Decoding IC (IC1007, pin 8) through the 8th active filter. With a data received from IC1008 it is forwarded to pin 14 to apply to the microprocessor pin 31 for the microprocessor control.

DTMF Encoding circuit

When transmit DTMF is selected, the microprocessor pin 21, 22, 23, 24, and 24 send out the data which is forwarded into IC1004. The cross point switching IC (IC1003) forwards the switched data to IC1004 pin 14 to transmit the DTMF signal through flexible PCB pin 26 via RV1001, C1025 and R1038.

CONTROL AND INDICATOR CIRCUIT

External PTT control circuit

When the external microphone is connected at the MIC Jack on the front panel, the internal microphone is disabled and converted to the external microphone by MIC AMP Jack, which is applied to VCO via C61 and also applied to the level PCB pin 1, to output to the level PCB pin 2. Then the microprocessor pin 11, being pulled as logic high via R1036, becomes logic low to enable it to operate like the internal PTT circuit.

Channel select circuit

The channel switch encodes the channel number selected into binary word. The binary word is passed through RF flexible PCB and top panel PCB to the microprocessor pin 12, 13 for microprocessor control.

Signal level indicator

The received signal is applied to IC4, pin 11 to compare with the reference level via R32 and is passed to the level PCB pin 8 for the input to the microprocessor. The microprocessor then displays the TX level.

TX level indicator

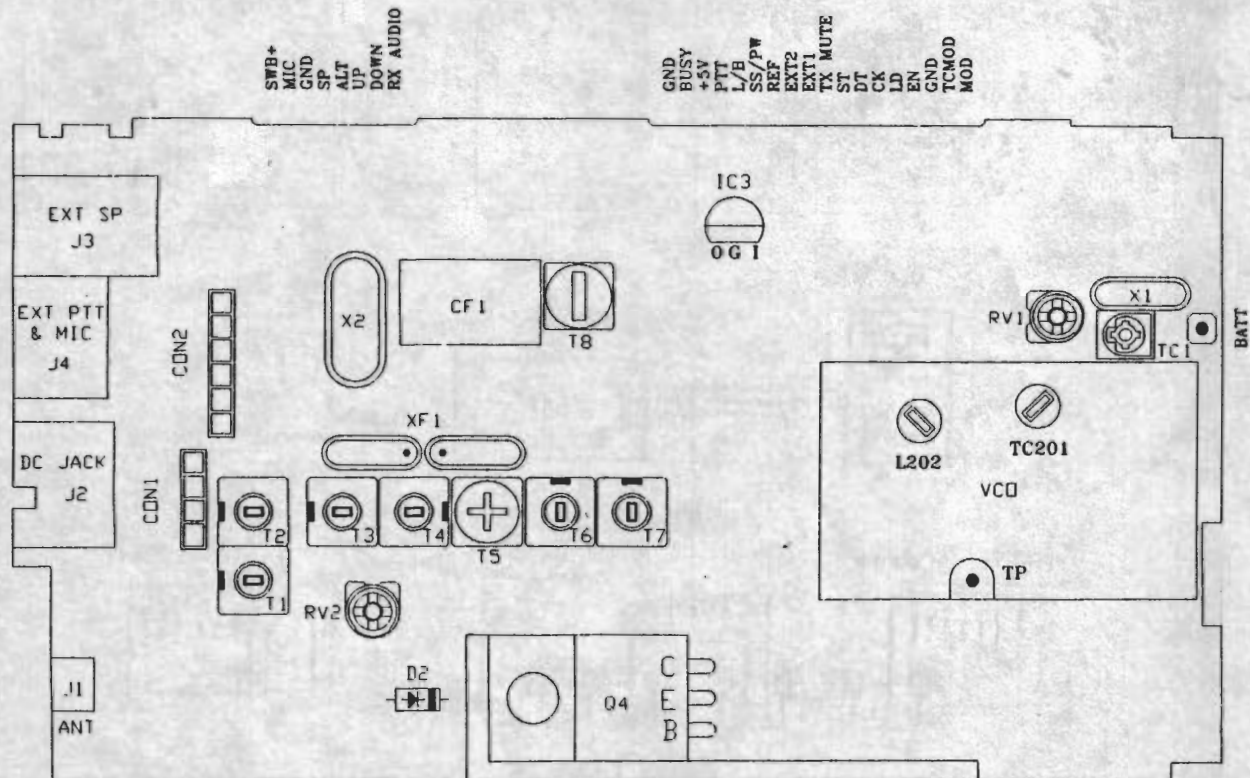
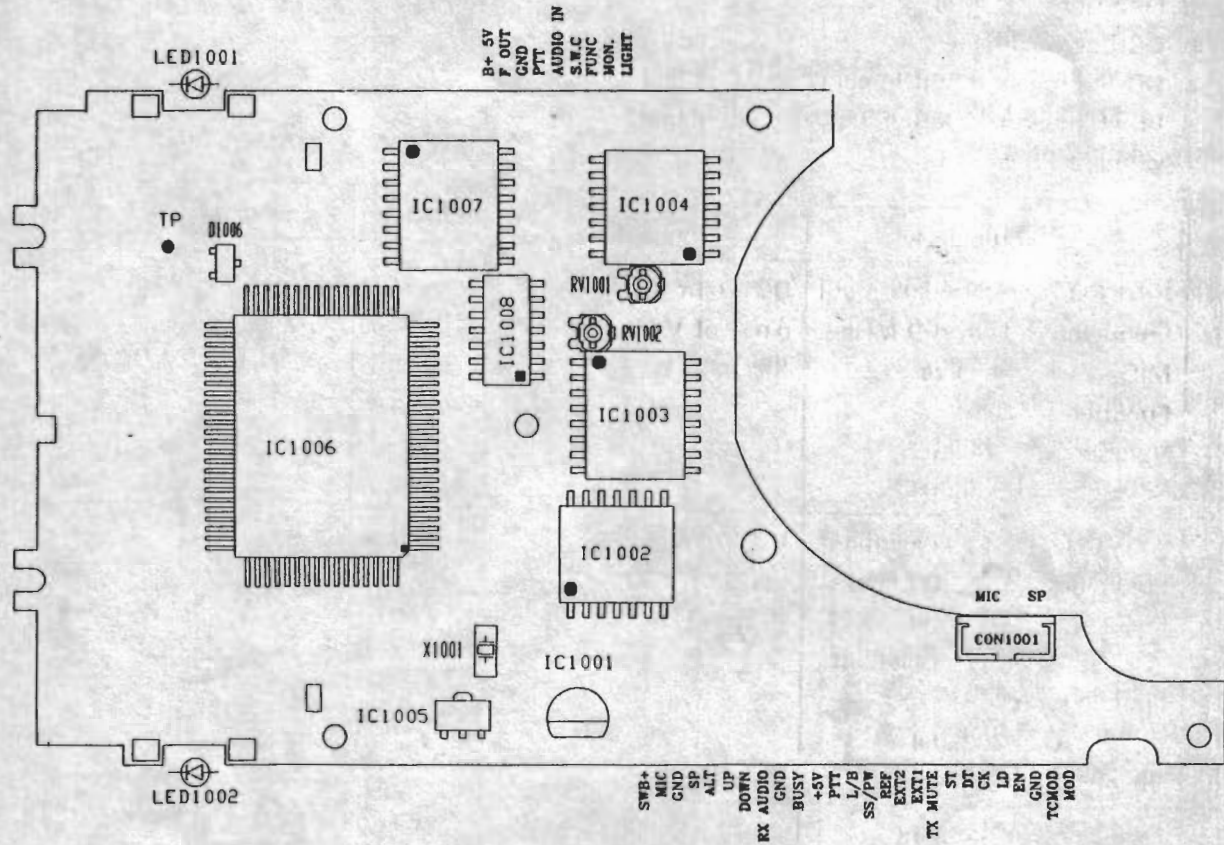
The transmitted signal is applied to the level PCB IC301 B via a direction coupler D2, RV3 and R31 to compare with the reference TX level and is passed to the level PCB pin 8 for the input to the microprocessor. The Microprocessor then enables the TX level indicated on the display.

Battery low indicator circuit

In case the battery voltage drops below 6V approximately (it may depend on the voltage of the battery or power supply), the voltage comparator is applied to the level PCB pin 4 via R308 to compare with the reference and is passed to the level PCB pin 3. The microprocessor then enables BATT LOW indicated on the display.

ALIGNMENT INSTRUCTIONS

1. Alignment Test Point and Parts Locations



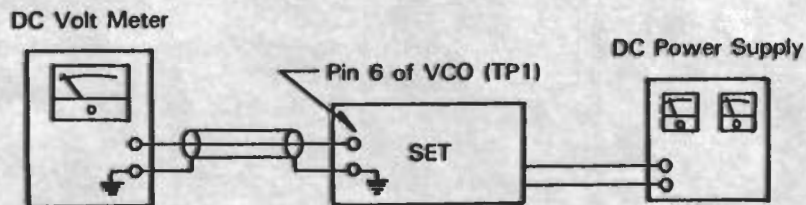
2. Phase Locked Loop and CPU Section

A. Test Equipment Required

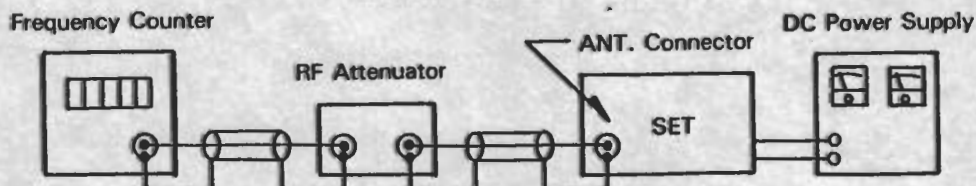
- a. Frequency Counter
- b. DC Power Supply
- c. DC Voltmeter (Input Impedance 10 ohms)
- d. RF attenuator (20dB, Impedance 50 ohms)

B. Allignment Procedure

| Step | Setting | Connection | Adjust | Adjust for |
|------|---|--|--------|--|
| 1 | RX VCO Voltage adjustment Frequency : 144.200 MHz MIC : Receive Function : None Volume : Optional Squelch : Optional | DC Voltmeter to pin 6 of VCO (figure 1-1) | L202 | 1.6-1.8V DC |
| 2 | TX VCO Voltage adjustment Frequency : 144.200 MHz MIC : Transmit (unmodulation) Function : None Volume : Optional Squelch : Optional | DC Voltmeter to pin 6 of VCO (figure 1-1) | TC201 | 1.8-2V DC |
| 3 | Frequency adjustment Frequency : 146.000MHz MIC : Transmit (unmodulation) Function : None Volume : Optional Squelch : Optional | ANT. to frequency counter, through attenuator (figure 1-2) | TC1 | 1.7V DC (1.6-1.8V DC) and 1.9V DC (1.8-2V DC) |



(Figure 1-1)



(Figure 1-2)

3. Transmitter Section

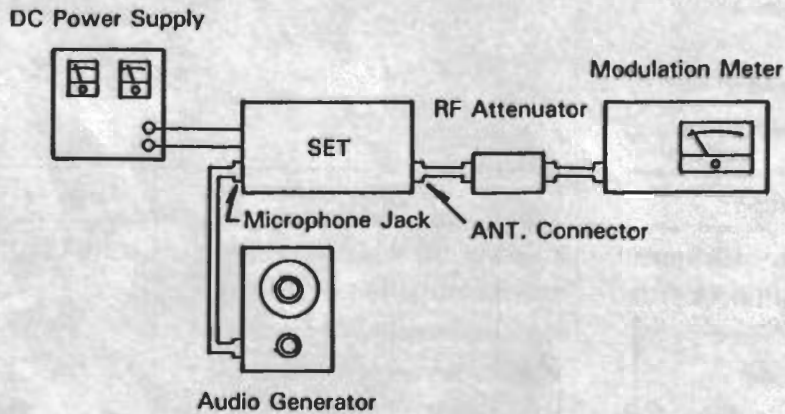
A. Test Equipment Required

- a. RF Power meter (RF SSVM)
- b. 50 ohm dummy load (non-inductive)
- c. RF Attenuator (50 ohms: non-inductive)
- d. Oscilloscope
- e. Audio Generator
- f. DC Power Supply
- g. Spectrum Analyzer
- h. Frequency Counter
- i. Coupler
- j. Modulation meter (FM)

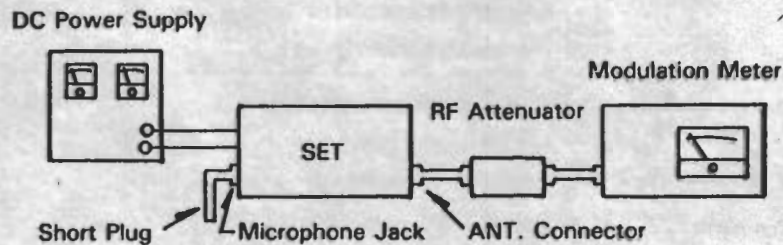
B. Alignment Procedure

| Step | Setting | Connection | Adjust | Adjust for |
|------|--|---|--------|----------------------|
| 1 | <p>AF. Modulation adjustment</p> <p>Frequency : 146.000MHz</p> <p>MIC : Transmit</p> <p>Function : None</p> <p>Volume : Optional</p> <p>Squelch : Optional</p> <p>RF Power selection : High</p> | <p>Connect the audio generator (Set to 1KHz) to the microphone jack. Connect the modulation meter through the RF attenuator to the ANT jack. Adjust the audio signal level to obtain 3KHz deviation.</p> <p>When you increase the audio signal by 20dB, the deviation should not exceed 5KHz deviation (Figure 2-1)</p> | RV1 | 3.8KHz (3.5~4K) |
| 2 | <p>CTCSS modulation adjustment</p> <p>Frequency : 146.000MHz</p> <p>MIC : Transmit</p> <p>Function : Tone squelch mode (CTCSS: 100Hz)</p> <p>Volume : Optional</p> <p>Squelch : Optional</p> <p>RF power selection: High</p> | <p>Connect the short plug to microphone jack.</p> <p>Connect modulation meter through RF attenuator.</p> <p>Connect RF power meter to EXT-ANT jack on the set. (Figure 2-2)</p> | RV1002 | 0.7KHz (500~1KHz) |
| 3 | <p>DTMF modulation adjustment</p> <p>Frequency : 146.000MHz</p> <p>MIC : Transmit</p> <p>Function : DTMF squelch mode</p> <p>Volume : Optional</p> <p>Squelch : Optional</p> <p>RF power selection: High</p> | <p>Connect the short plug to microphone jack.</p> <p>Connect modulation meter through RF attenuator to EXT-ANT jack on the set.</p> <p>Press a number button on the set. (Figure 2-2)</p> | RV1001 | 3.8KHz (3.5~4K) |

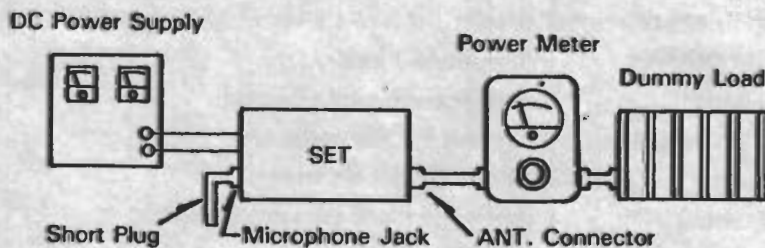
| | | | | |
|---|--|--|-----|------------------|
| 4 | Low power adjustment Frequency : 146.000MHz MIC : Transmit Function : None Volume : Optional Squelch : Optional RF power selection: Low | Connect the short plug to microphone jack. Connect the dummy load to EXT-ANT jack on the set through RF power meter, (Figure 2-3) | RV2 | 1W (0.8~1.2W) |
|---|--|--|-----|------------------|



(Figure 2-1)



(Figure 2-2)



(Figure 2-3)

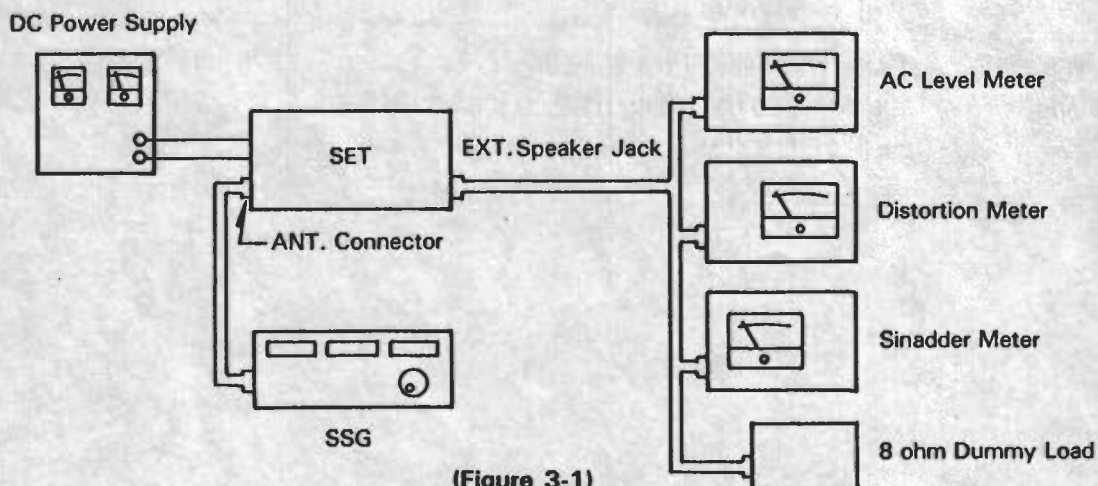
4. Receiver Section

A. Test Equipment Required

- a. Standard Signal Generator (SSG)
- b. AC Level meter
- c. Distortion meter
- d. DC Power Supply
- e. 12dB Sinadder meter

B. Alignment Procedure

| Step | Setting | Connection | Adjust | Adjust for |
|------|---|---|--|---|
| 1 | RX sensitivity adjustment Frequency : 144MHz-148MHz MIC : Receive Function : None Volume : Adjust for 1V on the level meter. Squelch : Turn fully counterclockwise SSG: Audio 1KHz Modulation 3KHz | Connect standard signal generator to EXT-ANT jack. Connect AC volt level meter, distortion meter and sinadder meter across EXT speaker jack with 8 ohm dummy load. (Figure 3-1). | T8 T7 T6 T4 T3 T2 T1 | Maximum indication on AC level meter. Maximum sensitivity indication on 12dB sinadder meter. In the above condition, sensitivity is flat for 144 - 148MHz |
| 2 | Distortion adjustment Frequency : 146.100MHz MIC : Receive Function : None Volume : Adjust for 1V on the AC level meter Squelch : Turn to counterclockwise SSG: Audio 1KHz Modulation 3KHz | Connect standard signal generator to EXT-ANT jack. Connect AC volt level meter, distortion meter across EXT speaker jack with 8 ohm dummy load. (Figure 3-1) | T5 | Maximum indication on distortion meter. |



(Figure 3-1)

TROUBLESHOOTING HINTS

| Symptom | Probable Cause | Remedy |
|-------------------------------|--|--|
| Unit does not work at all | <ol style="list-style-type: none"> 1. Defective power switch VR801 2. Defective Diode D4, D5 3. Broken DC power cord | <ol style="list-style-type: none"> 1. Replace 2. Replace defective component (s) 3. Replace |
| No output from speaker at all | <ol style="list-style-type: none"> 1. Defective external speaker jack 2. Poor connection on microphone Connector 3. Measure all the voltage of sub board of audio PCB 4. Defective internal speaker | <ol style="list-style-type: none"> 1. Repair or Replace 2. Repair or Replace 3. Repair or Replace 4. Replace |
| No noise on speaker | <ol style="list-style-type: none"> 1. Measure all the voltage of audio PCB. 2. Defective squelch circuit components. (VR802, C57, C58, R28, R29, R30, R33, R34, R36, R1022, Q11, pin 9 of IC1006) Compare with the voltage chart | <ol style="list-style-type: none"> 1. Repair or Replace 2. Replace defective component (s) |
| Squelch does not work | <ol style="list-style-type: none"> 1. Defective squelch circuit components (VR802, C57, C58, R28, R29, R30, R33, R34, R36, R1022, Q11 pin 9 of IC1006) Compare with the voltage chart | <ol style="list-style-type: none"> 1. Replace defective component (s) |
| No modulation | <ol style="list-style-type: none"> 1. Defective microphone 2. Measure all the voltage of sub board of MIC PCB 3. Defective TX mute circuit components (Q5, R3 pin 8 of IC1004) compare with the voltage chart. | <ol style="list-style-type: none"> 1. Replace 2. Replace 3. Replace defective component (s) |
| LCD Display does not work | <ol style="list-style-type: none"> 1. Measure all the voltage of IC1005, D1001, X1001 (pin 77 of IC1006) | <ol style="list-style-type: none"> 1. Replace defective component (s) |
| Back light does not work | <ol style="list-style-type: none"> 1. Defective the components of LED1001, LED1002, Q1001, Q1002, Q1003. | <ol style="list-style-type: none"> 1. Replace |

ERROR DISPLAY

1. Internal RAM Error: Er1

Er1 indicates an internal RAM error. It appears when the memory backup battery is dead or when something else has caused the memory contents to become corrupt. To clear the error, turn on the unit while holding down the function button and D. This clears the memory.

If the error returns after you disconnect power, check the following components:

Lithium Battery

Dual-diode RB417E (D1002)

and check for cold solder joints.

2. PLL Unlock Error: Er2

Er2 indicates the PLL has unlocked. Check the following:

A. PLL alignment (from page 17).

B. Check for 5V at Q13, Q14, and VCO pin 1.

C. Confirm that X1 is oscillating. If not, check the connections to IC1, pins 1 and 2.

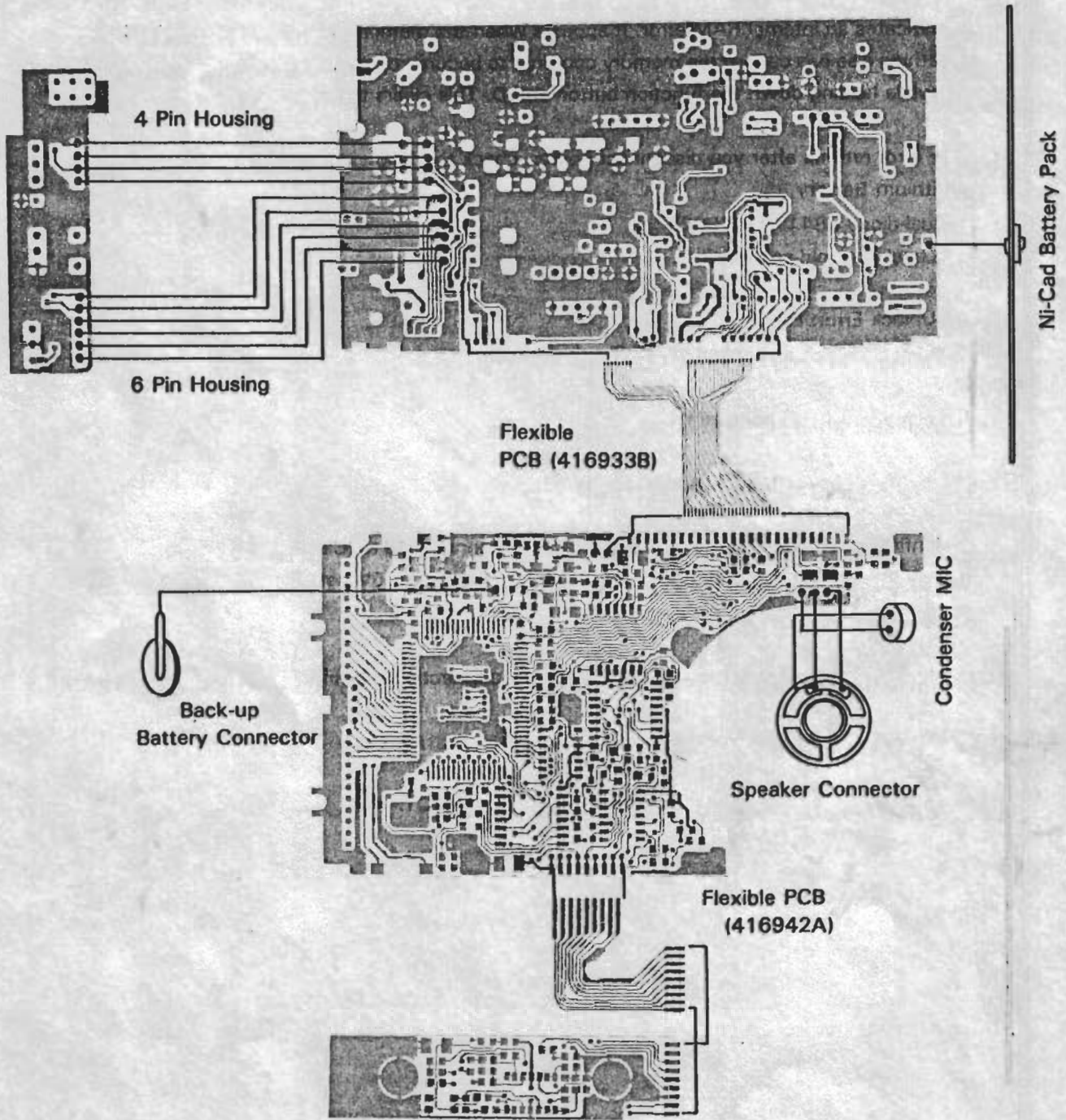
If the connection is good, check for 5V at IC1, pin16. If 5V not present, check connections to L16 and power.

D. Confirm 5KHz signal at IC1, pin11. If not, check connections to pin 5 (DT), pin 6 (EN), and pin 7 (CK).

E. See if Q13 is in normal condition.

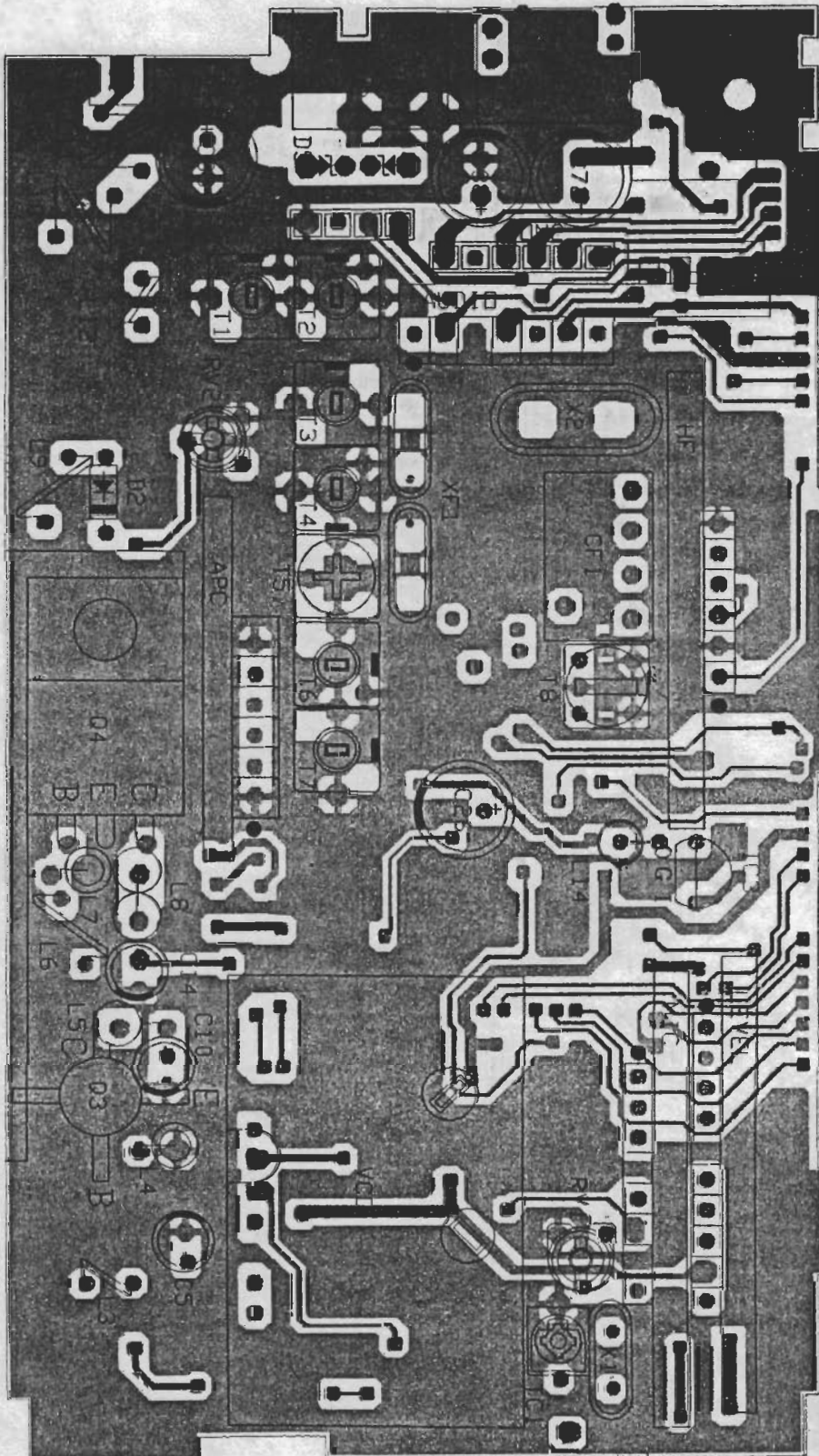
If the above checks do not correct the problem, replace IC1.

WIRING DIAGRAM

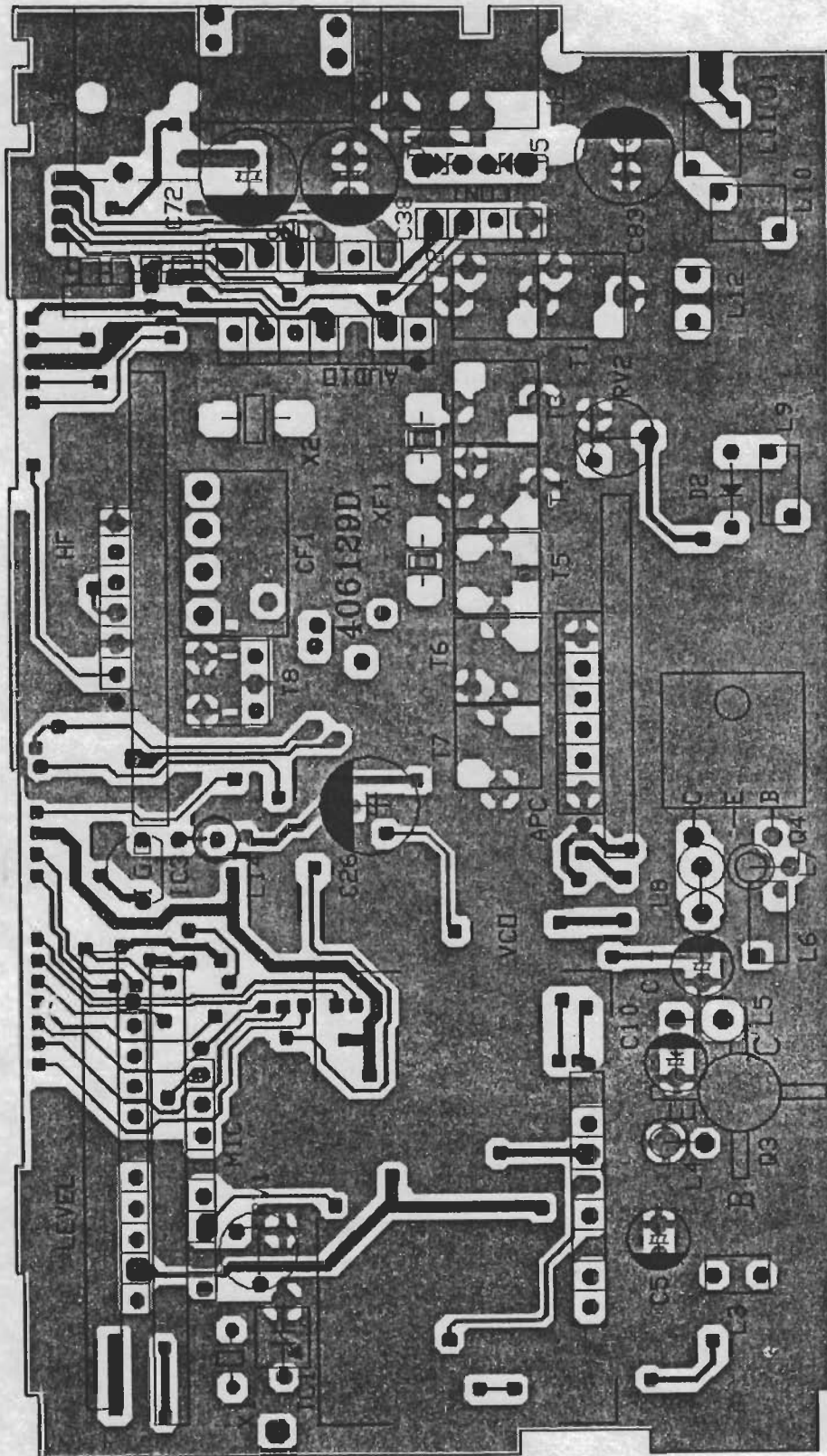


PRINTED CIRCUIT BOARD VIEWS

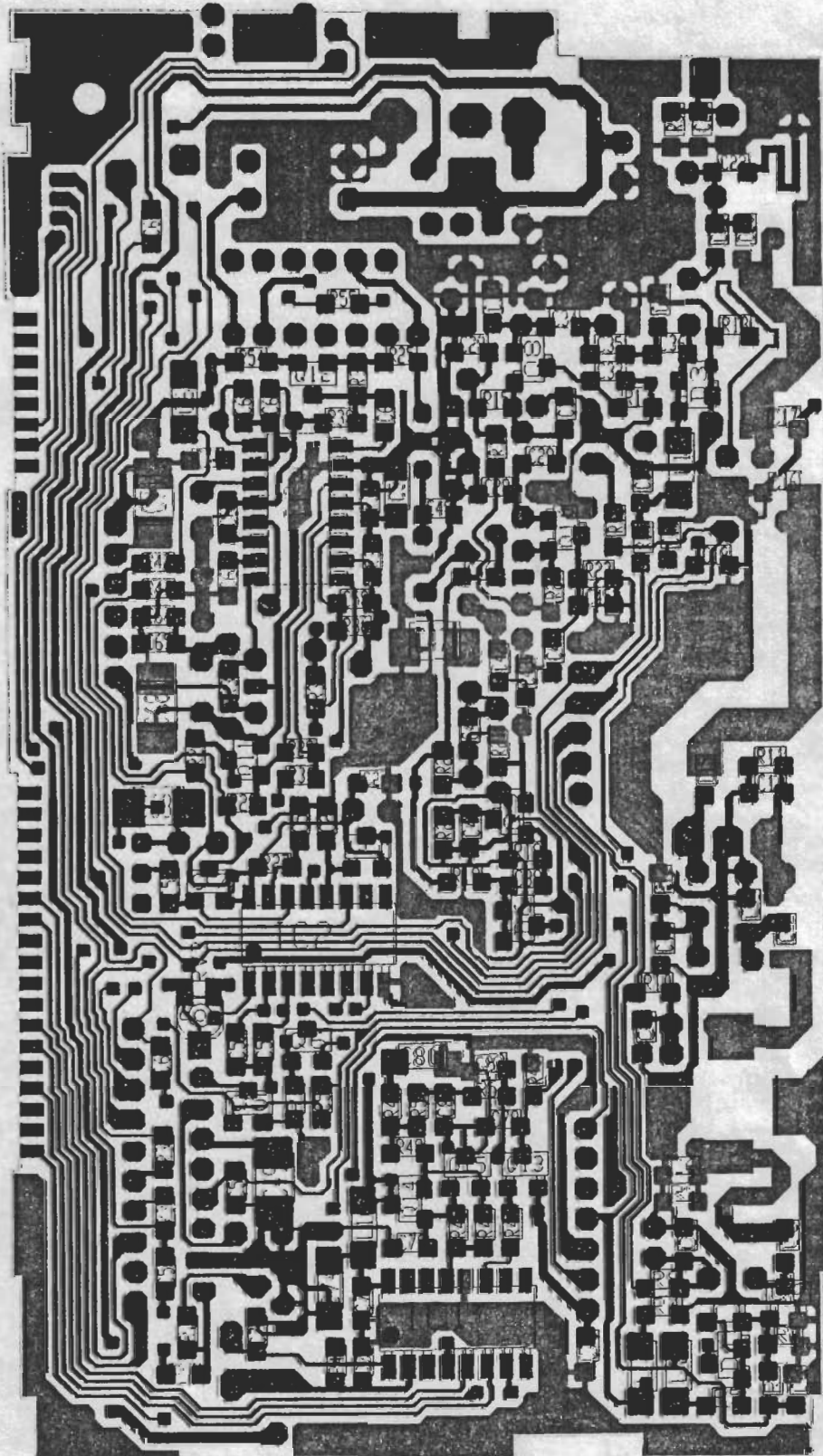
RF PCB: Top View



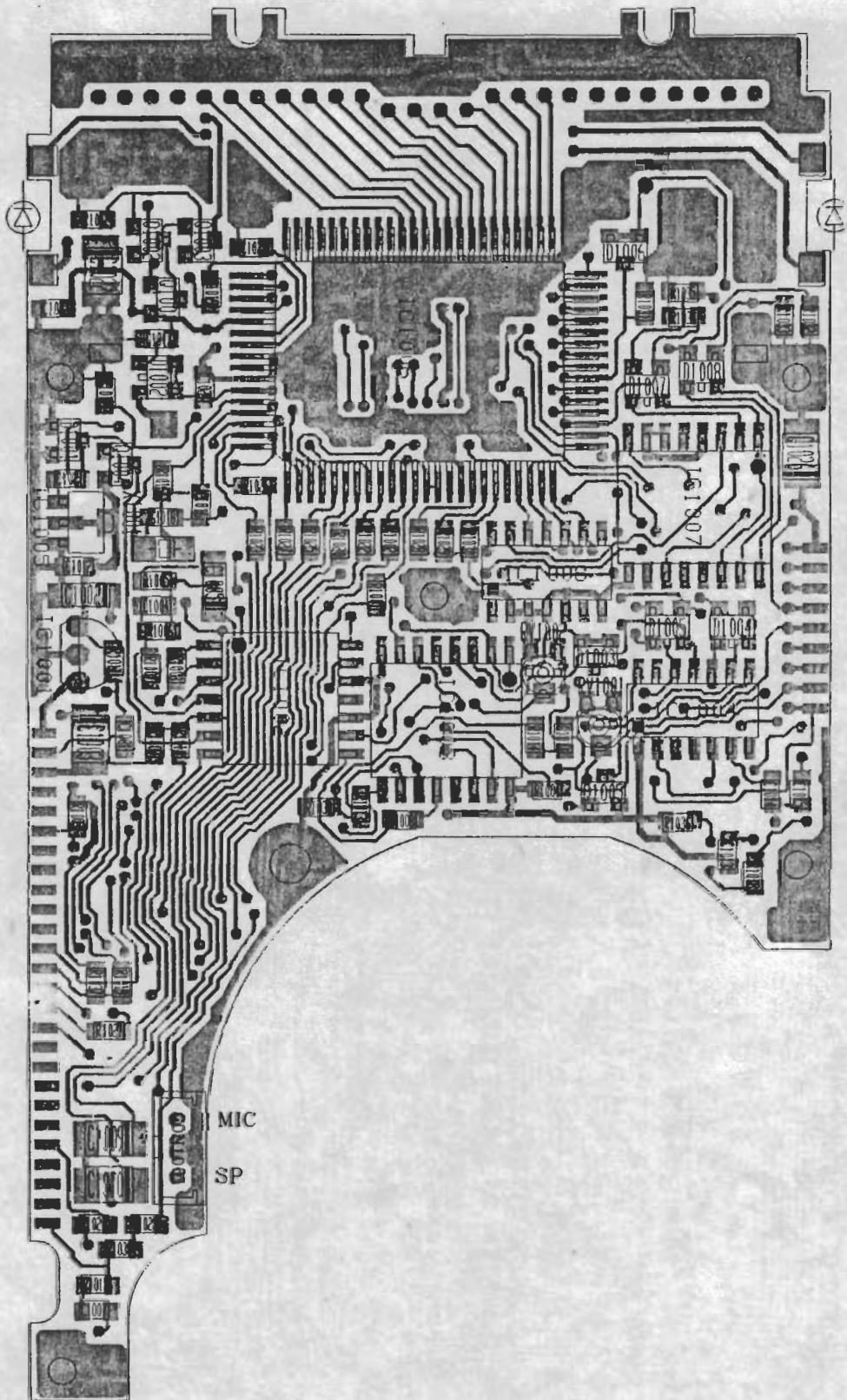
RF.PCB: Bottom View



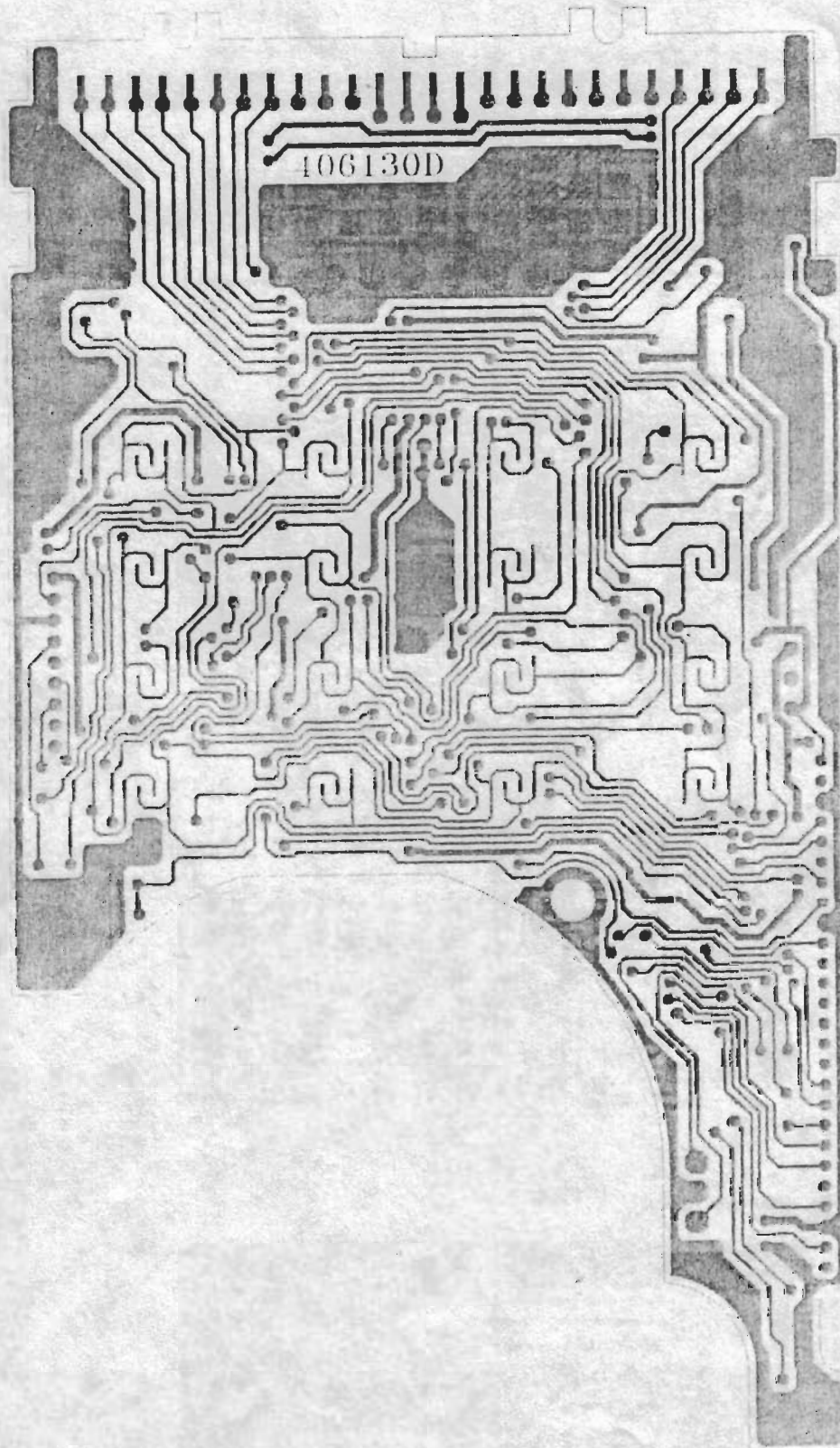
RF PCB: Chip Component Side View



Digital PCB: Keypad Side View (Top View)

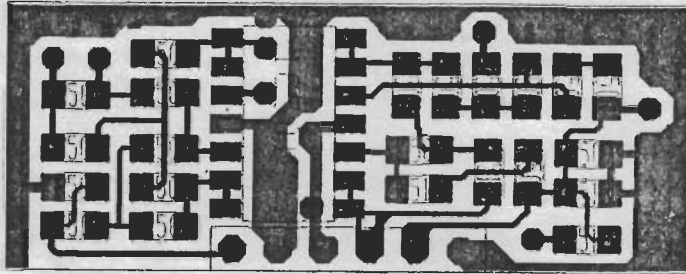


Digital PCB: Keypad Side View (Bottom View)

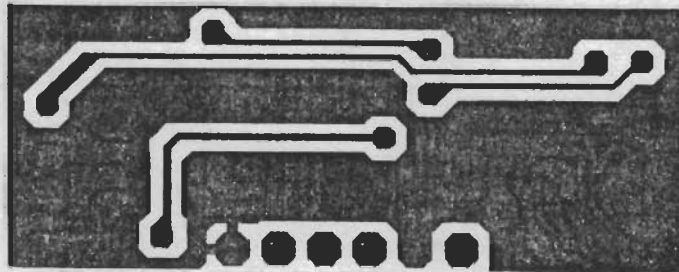


High Press Filter PCB:

(Top View)

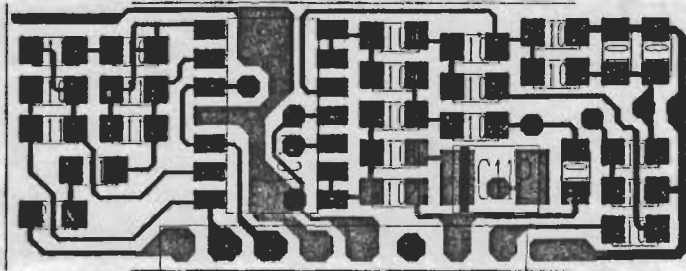


(Bottom View)

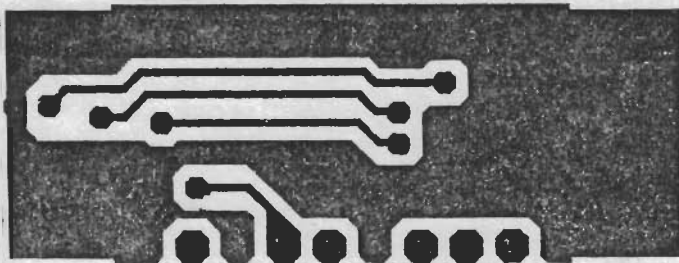


MIC PCB:

(Top View)

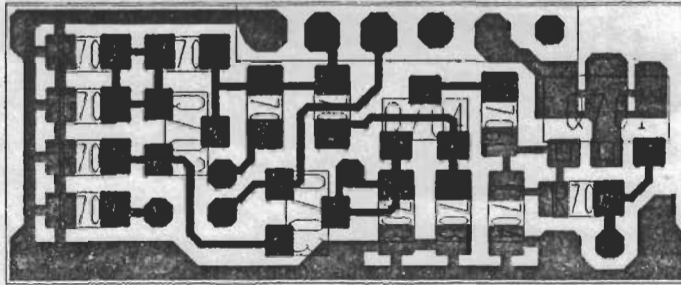


(Bottom View)

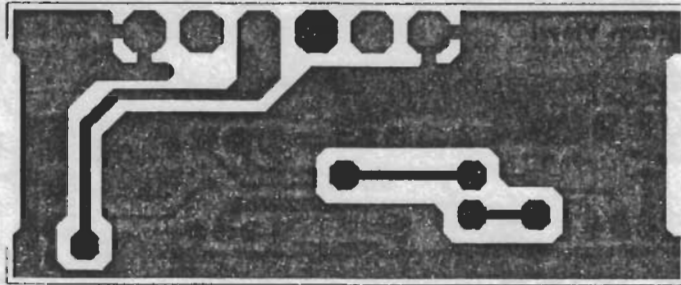


Auto Power Control PCB:

(Top View)

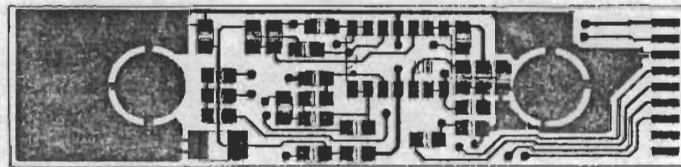


(Bottom View)

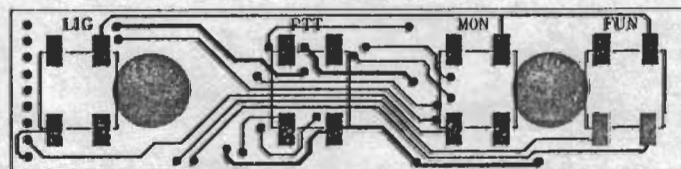


PTT PCB:

(Top View)

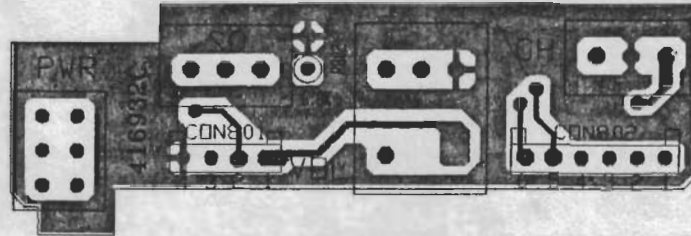


(Bottom View)

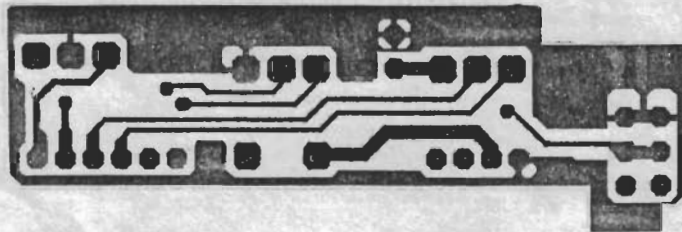


Top PCB:

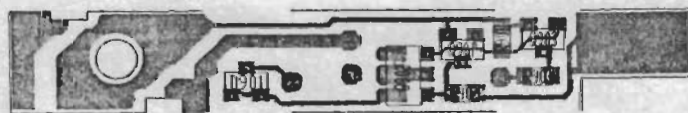
(Top View)



(Bottom View)



(Top View)

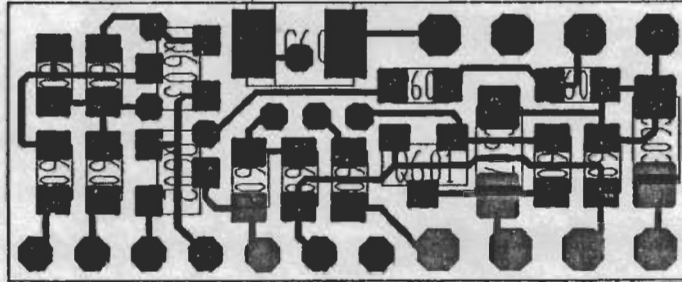


(Bottom View)

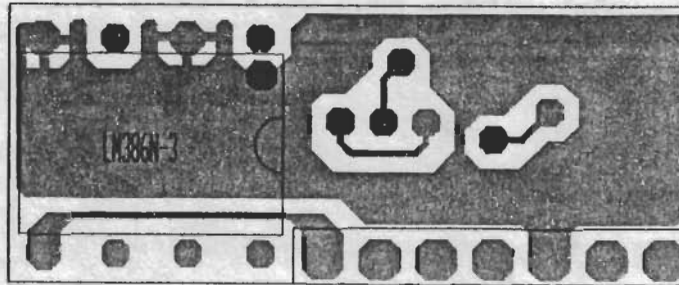


Audio PCB:

(Top View)

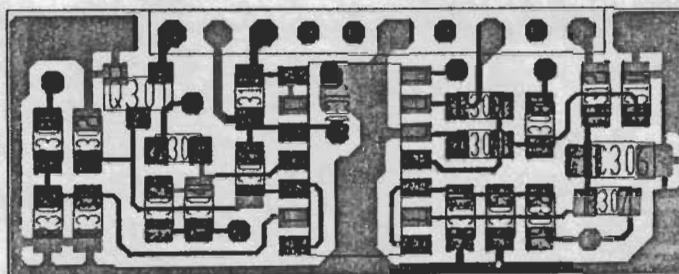


(Bottom View)

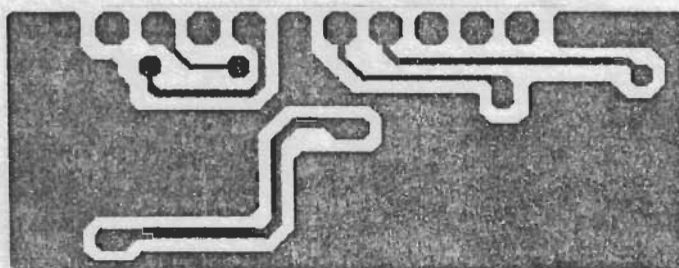


Level PCB:

(Top View)

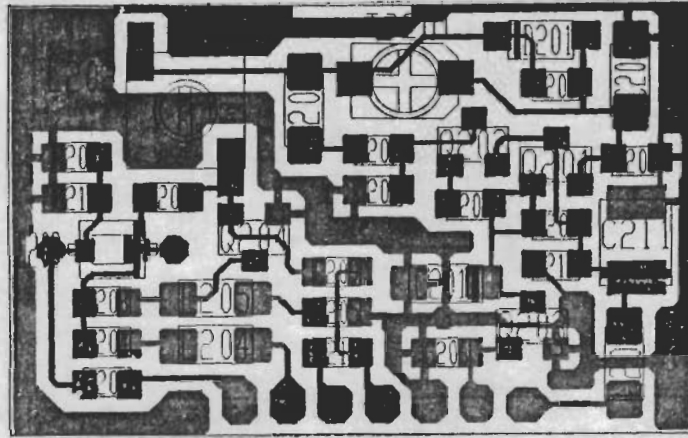


(Bottom View)

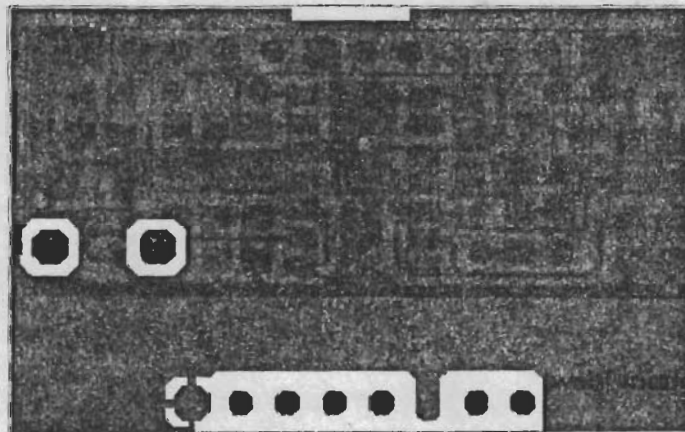


VCO PCB:

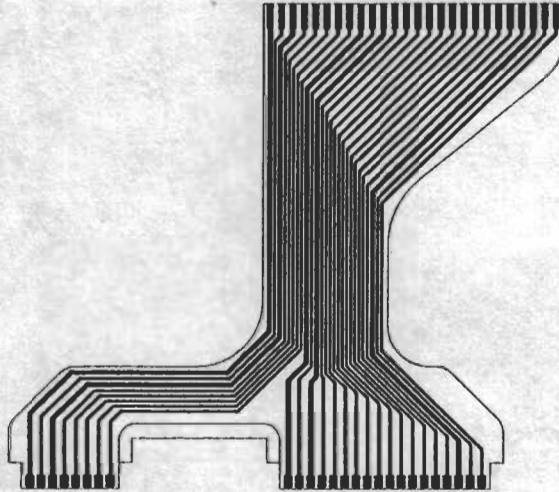
(Top View)



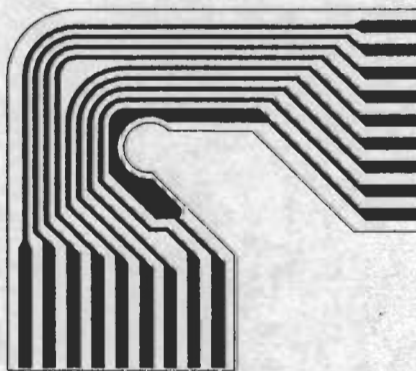
(Bottom View)



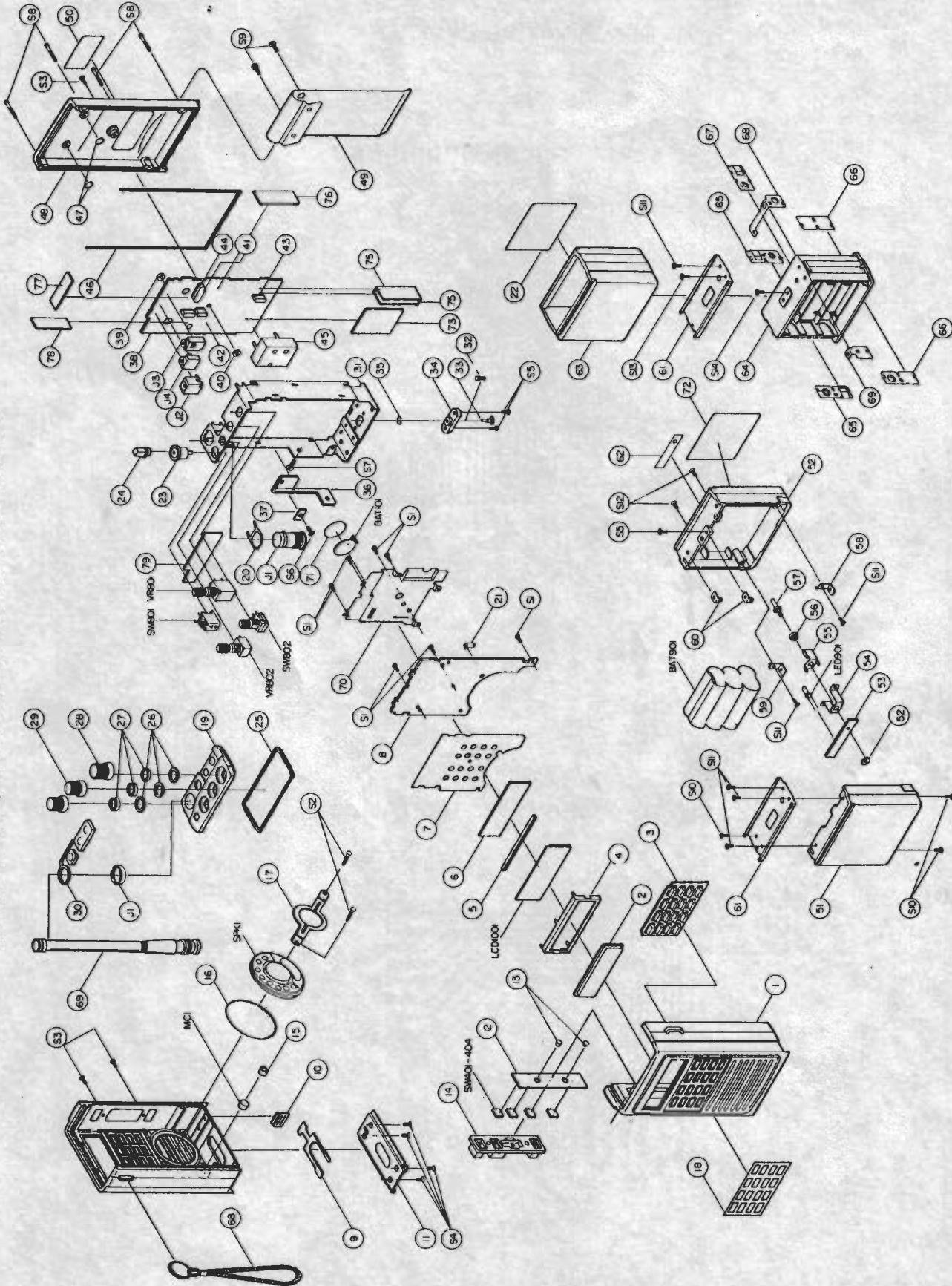
Flexible PCB: (RF VS DIGITAL)



Flexible PCB: (PTT VS DIGITAL)



EXPLODED VIEW



EXPLODED VIEW PARTS LIST

| Ref. No. | Description | RS Part No. | MFR's Part No. |
|----------|--|-------------|----------------|
| 1 | Cover Upper Lexan141 70022 | | 718-358 |
| 2 | Lens Acryl, 60×17×2.6t, Clear | | 813-765 |
| 3 | Pad Key, Silicon Rubber, 52.5×32×6.4, Gray | | 894-641 |
| 4 | Holder LCD, SPTE 52.6×20.7, White | | 732-751 |
| 5 | Zebra, LCD, YS-0.18, 52×2.6×1.9 | | 422-390-2 |
| 6 | Plate Illuminator, Acryl, 52×17, Clear/White Silk Screen | | 795-177 |
| 7 | Sticker, Silver Paper, 70×52, Silver | | 906-335 |
| 8 | Ass'y, Digital PCB | | 593-160 |
| 9 | Stopper, Sus, 41.6×18×t0.8 Natural | | 752-544 |
| 10 | Latch, PC, 10.8×13×3, Black | | 825-755 |
| 11 | Plate Guide, Sus, 57×24.5×0.8t, Natural | | 771-934 |
| 12 | Ass'y, PTT PCB | | 593-166 |
| 13 | Bushing, BsBM, D4×4.4, Sn-Plating, White | | 852-979 |
| 14 | Pad PTT, Silicon Rubber, 57×14×7.7, Gray | | 894-640 |
| 15 | Bushing Mic, NBR Rubber, D7×5, Black | | 850-924 |
| 16 | Filter Speaker, Felt, D36.5×0.1t, Black | | 906-336 |
| 17 | Holder Speaker, SPC, D24.5×48×0.8t, Ni-Plating, White | | 732-702 |
| 18 | Overlay (KEY), PVC, 51×33.5×0.5t, Black | | 795-176 |
| 19 | Panel Top PC, 60×30×5.7, Black | | 702-307 |
| 20 | Washer Ground, SPTE d14.5×0.3t, Natural | | 660-996 |
| 21 | Holder Rubber, Silicon, D4×9.5, Gray | | 894-722 |
| 22 | Label | | |
| 23 | Packing (RF Power), Silicon Rubber, D10×11.5, Gray | | 894-642 |
| 24 | Knob-RF Power, ABS D6.6×11.4, Black | | 852-758 |
| 25 | Packing Jacks, Silicon Rubber, Black | | 894-643 |
| 26 | Ring, Silicon Rubber, D10×0.8t, Black | | 894-650 |
| 27 | Nut Ring, BsBM, D9.5×2, Brown | | 650-330 |
| 28 | Knob-Channel, ABS D12×12, Black | | 852-757 |
| 29 | Knob-Volume, ABS D11×11, Black | | 852-756 |
| 30 | Dust Cap, Neporene Rubber, Black | | 830-899 |
| 31 | Frame, SPTE, 96×55×24, Ni-Plating, White | | 718-362 |
| 32 | Spring Coil, Sus, D3.5×6, Natural | | 881-504 |
| 33 | Pin Contact, BsBM, D4.9×10, Ni-Plating, White | | 860-130 |
| 34 | Holder Battery Contact, ABS 21×8×5 | | 732-751 |
| 35 | "E" Ring, D1.5, Black | | 655-018 |
| 36 | Heat Sink, Cu 41×12, Sn-Plating, White | | 761-725 |
| 37 | Washer, Cu-Plate, 9.8×6×2.5t, Brown | | 660-900 |
| 38 | Ass'y, RF PCB | | 593-159 |
| 39 | Bushing, BsBM, D4.7×2.6, Sn-Plating, White | | 852-994 |

| Ref. No. | Description | RS Part No. | MFR's Part No. |
|----------|--|-------------|----------------|
| 40 | Bushing, BsBM, D4 x 3, Ni-Plating, White | | 853-026 |
| 41 | Rubber Cap, Silicon, 11 x 4.4 x 4.3, Clear | | 894-785 |
| 42 | Rubber Cap, Silicon, 7.5 x 2.9 x 8.5, Clear | | 894-786 |
| 43 | Rubber Holder, Silicon, 9.6 x 4.2, Clear | | 894-787 |
| 44 | Rubber Holder, Silicon, 7 x 2.8, Clear | | 894-788 |
| 45 | Shield Can, BsP 30 x 20 x 9, Sn-Plating, White | | 772-010 |
| 46 | Gasket, Silicon Rubber, 270mm, Black | | 891-370 |
| 47 | Insulator, Felt, D6 x 0.3, Black | | 906-335 |
| 48 | Cover Bottom A1, 107 x 63 x 10.4, Black | | 718-359 |
| 49 | Belt Hook, Sus 304, Black | | 721-821 |
| 50 | Label Name, Polyester, 35 x 18, Black | | 958-944-A |
| 51 | Upper Cover (Battery), PC, 67 x 60 x 18, Black | | 718-361 |
| 52 | Bottom Cover (Battery), PC, 67 x 60 x 18 x, Black | | 718-370 |
| 53 | Ass'y, Battery PCB | | 593-170 |
| 54 | Bracket, SPC, 20 x 6 x 12, Ni-Plating, White | | 723-741 |
| 55 | Spring Flat PBsP 6 x 9 x 11, Ni-Plating, White | | 881-529 |
| 56 | Bushing, Acetal, D6 x 2, White | | 853-025 |
| 57 | Pin Contact, BsBM, D2 x 15, Ni-Plating, White | | 860-136 |
| 58 | Terminal (Input " + "), SPC, 10 x 5 x 7, Ni-Plating, White | | 752-543 |
| 59 | Terminal (Input " - "), SPC, 10 x 5 x 7, Ni-Plating, White | | 752-545 |
| 60 | Terminal (Output " + ", " - "), SPC, 6 x 5, 5 x 5, Ni-Plating, White | | 752-583 |
| 61 | Plate Tension, Sus, 57 x 26, 5 x 2.5, Natural Color | | 771-935 |
| 62 | Overlay, PVC, 30.9 x 8.8 x 0.5t, Black | | 795-414 |
| 63 | Housing Battery (Dry), PC, 65 x 52 x 25, Black | | 718-360 |
| 64 | Holder Battery (Dry), PC, 61 x 5 x 29, Black | | 732-753 |
| 65 | Terminal "A", Sus, 27 x 11.5, Natural | | 752-547 |
| 66 | Terminal "B", Sus, 27 x 11.5, Natural | | 752-546 |
| 67 | Terminal "C", Sus, 24.5 x 13, Natural | | 752-548 |
| 68 | Terminal " + ", Sus, 27 x 13 x 11.5, Natural | | 752-549 |
| 69 | Terminal " - ", Sus, 12.7 x 11.5 Natural | | 752-550 |
| 70 | Shield Plate, CNP3, 66 x 54 x 0.15t, White | | 772-009 |
| 71 | Insulation Plate, Mylar, D16 x 0.3t, Clear | | 906-233 |
| 72 | Label | | |
| 73 | Ass'y, VCO PCB | | 593-168 |
| 74 | Ass'y, MIC PCB | | 593-164 |
| 75 | Ass'y Level PCB | | 593-162 |
| 76 | Ass'y, High Pass Filter PCB | | 593-163 |
| 77 | Ass'y, Audio PCB | | 593-161 |

| Ref. No. | Description | RS Part No. | MFR's Part No. |
|----------|--|-------------|----------------|
| 78 | Ass'y, Auto Power Control PCB | | 593-165 |
| 79 | Ass'y, Top PCB | | 593-167 |
| 80 | Insulator Clear | | 906-360 |
| 81 | Bushing Rubber Sponge, D14.5 x 1t, Black | | 894-545 |
| 82 | Strap Carrying With Ring, 200mm, Black | | 906-337 |
| 83 | Nut, BsBM, M2, Hexagon, Brown | | 651-015 |
| 84 | Antenna Rod, Flexible, Black | | 420-402-3 |
| S1 | Screw Tapping (PH), D1.8 x 4-2S, Ni-Plating, White | | 628-094 |
| S2 | Screw Tapping (PH), D2.6 x 6, Ni-Plating White | | 621-026 |
| S3 | Screw Machine (PH), M2 x 5, Black | | 612-285 |
| S4 | Screw Machine (FH), M2.6 x 7, Ni-Plating, White | | 611-310 |
| S5 | Screw Machine (RH), M2 x 4, Ni-Plating, White | | 612-286 |
| S6 | Screw Machine, M2.6 x 8, Ni-Plating White | | 661-077 |
| S7 | Screw Machine (PH), M2, 6 x 5, Ni-Plating, White | | 611-032 |
| S8 | Screw Tapping (PH), D2 x 17, Black | | 622-205 |
| S9 | Screw Machine (BH), M3 x 4, Black | | 613-536 |
| S10 | Screw Machine (PH), M2 x 4, Ni-Plating, White | | 612-018 |
| S11 | Screw Tapping (PH), D2 x 4-2S, Ni-Plating, White | | 622-204 |
| S12 | Screw machine (FH), M2 x 5, Black | | 612-230 |
| S13 | Screw Taptite (PH), D2 x 4, Ni-Plating, White | | 600-724 |
| S14 | Screw Taptite(RH), D2 x 5, Ni-Plating, white | | 632-002 |
| J1 | Connector, Ant., BNC-RB (M3), SW1850 | | 421-651-3 |
| J2 | DC Power Ext., MOJ-D15 | | 420-709-5 |
| J3 | Miniature, Speaker, HSJ0836-01-50 | | 420-706-2 |
| J4 | Miniature, Mike, HSJ1102-01-510 | | 420-709-6 |
| SW801 | Push Lock, SPPJ422BP011, RF Power Sw | | 432-027-8 |
| SW802 | Rotary, EC09P20-04, Channel Sw | | 430-063-0 |
| VR801 | Variable, 20KA, Audio Volume/Switch | | 450-523-5 |
| VR802 | Variable, 20KB, Squelch Volume | | 450-524-6 |
| SPK1 | Speaker, 8 ohm, 0.5W, 40mm | | 420-164-5 |
| MC1 | Mike, Condensor WH-063T, 6DIA | | 420-206-0 |
| SW401 | Switch, Tact, Chip, SKHUPF 7.2 x 8.5 | | 436-030-0 |
| SW402 | Switch, Tact, Chip, SKHUPF 7.2 x 8.5 | | 436-030-0 |
| SW403 | Switch, Tact, Chip, SKHUPF 7.2 x 8.5 | | 436-030-0 |
| SW404 | Switch, Tact, Chip, SKHUPF 7.2 x 8.5 | | 436-030-0 |
| LCD1001 | LCD, LE-0802A, Display | | 252-092-0 |
| LCD901 | LED Lamp, KRA124, Red | | 251-007-9 |
| BAT1001 | Battery, Lithium, 3V, 3.8 x 15mm | | 420-564-3 |
| BAT901 | Battery, Ni-Cad, 7.2V 600mAh, 6VEAA | | 420-567-6 |

ELECTRICAL PARTS LIST

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|----------------------|--|-------------|---------------|
| Ass'y, RF PCB | | | |
| Capacitors | | | |
| C1 | Ceramic, Chip, 15pF 50V, 0805, $\pm 5\%$ | | 131-511-0 |
| C2 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C3 | Ceramic, Chip, 22pF 50V, 0805, $\pm 5\%$ | | 132-223-5 |
| C4 | Ceramic, Chip, 220pF 50V, 0805, $\pm 5\%$ | | 132-220-2 |
| C5 | Elect, 10 μ F 16V, 4DIAX7, $\pm 20\%$ | | 101-043-5 |
| C6 | Ceramic, Chip, 39pF 50V, 0805, $\pm 5\%$ | | 133-911-8 |
| C7 | Ceramic, Chip, 22pF 50V, 0805, $\pm 5\%$ | | 132-223-5 |
| C8 | Ceramic, Chip, 56pF 50V, 0805, $\pm 5\%$ | | 135-613-9 |
| C9 | Ceramic, Chip, 220pF 50V, 0805, $\pm 5\%$ | | 132-220-2 |
| C10 | Elect, 10 μ F 16V, 4DIAX7, $\pm 20\%$ | | 101-043-5 |
| C11 | Ceramic, Chip, 15pF 50V, 0805, $\pm 5\%$ | | 131-511-0 |
| C12 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C13 | Ceramic, Chip, 220pF 50V, 0805, $\pm 5\%$ | | 132-220-2 |
| C14 | Elect, 10 μ F 16V, 4DIAX7, $\pm 20\%$ | | 101-043-5 |
| C15 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C16 | Ceramic, Chip, 5pF 50V, 0805, ± 0.25 pF | | 135-010-4 |
| C17 | Ceramic, Chip, 56pF 50V, 0805, $\pm 5\%$ | | 135-613-9 |
| C18 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C19 | Ceramic, Chip, 47pF 50V, 0805, $\pm 5\%$ | | 134-721-8 |
| C20 | Ceramic, Chip, 4pF 50V, 0805, ± 0.25 pF | | 134-007-7 |
| C21 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C22 | Ceramic, Chip, 56pF 50V, 0805, $\pm 5\%$ | | 135-613-9 |
| C23 | Ceramic, Chip, 33pF 50V, 0805, $\pm 5\%$ | | 133-314-9 |
| C24 | Ceramic, Chip, 0.01 μ F 50V, 0805, $\pm 5\%$ | | 130-172-2 |
| C25 | Tantalum, Chip, 10 μ F 10V, B, $\pm 20\%$ | | 141-046-0 |
| C26 | Elect, 220 μ F 10V, 6.3DIAX7, $\pm 20\%$ | | 102-288-5 |
| C27 | Ceramic, Chip, 0.01 μ F 50V, 0805, $\pm 10\%$ | | 130-172-2 |
| C28 | Ceramic, Chip, 15pF 50V, 0805, $\pm 5\%$ | | 131-511-0 |
| C29 | Ceramic, Chip, 1pF 50V, 0805, ± 0.25 pF | | 131-030-2 |
| C30 | Ceramic, Chip, 12pF 50V, 0805, $\pm 5\%$ | | 131-208-7 |
| C31 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C32 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C33 | Ceramic, Chip, 15pF 50V, 0805, $\pm 5\%$ | | 131-511-0 |
| C34 | Ceramic, Chip, 1.5pF 50V, 0805, ± 0.25 pF | | 131-559-4 |
| C35 | Ceramic, Chip, 20pF 50V, 0805, $\pm 5\%$ | | 132-012-1 |
| C36 | Ceramic, Chip, 15pF 50V, 0805, $\pm 5\%$ | | 131-511-0 |
| C37 | Ceramic, Chip, 75pF 50V, 0805, $\pm 5\%$ | | 137-504-4 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|----------|--|-------------|---------------|
| C38 | Elect, 100 μ F 16V, 6.3DIAX7, \pm 20% | | 101-093-0 |
| C39 | Ceramic, Chip, 22pF 50V, 0805, \pm 5% | | 132-223-5 |
| C40 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 10% | | 130-184-4 |
| C41 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 5% | | 130-184-4 |
| C42 | Ceramic, Chip, 15pF 50V, 0805, \pm 5% | | 131-511-0 |
| C43 | Ceramic, Chip, 1.5pF 50V, 0805, \pm 0.25pF | | 131-559-4 |
| C44 | Ceramic, Chip, 33pF 50V, 0805, \pm 5% | | 133-314-9 |
| C45 | Ceramic, Chip, 33pF 50V, 0805, \pm 5% | | 133-314-9 |
| C46 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 10% | | 130-184-4 |
| C47 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C48 | Ceramic, Chip, 5pF 50V, 0805, \pm 0.25pF | | 135-010-4 |
| C49 | Tantalum, Chip, 10 μ F 10V, B, 20% | | 141-046-0 |
| C50 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C51 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C52 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C53 | Ceramic, Chip, 220pF 50V, 0805, \pm 5% | | 132-220-2 |
| C54 | Ceramic, Chip, 220pF, 220pF 50V, 0805, \pm 5% | | 132-220-2 |
| C55 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80%-20% | | 130-185-5 |
| C56 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 10% | | 130-184-4 |
| C57 | Ceramic, Chip, 0.1 μ F 50V, 1206, \pm 10% | | 130-197-5 |
| C58 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 10% | | 130-184-4 |
| C59 | Ceramic, Chip, 220pF 50V, 0805, \pm 5% | | 132-220-2 |
| C60 | Ceramic, Chip, 0.0033 μ F 50V, 0805, \pm 10% | | 130-315-6 |
| C61 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C62 | Ceramic, Chip, 39pF 50V, 0805, \pm 5% | | 133-911-8 |
| C63 | Ceramic, Chip, 68pF, 0805, \pm 5% | | 136-816-5 |
| C64 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C65 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C66 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C67 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C68 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C69 | Tantalum, Chip, 1 μ F 16V, A, \pm 20% | | 141-036-1 |
| C70 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C71 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C72 | Elect, 100 μ F 16V, 6.3DIAX7, \pm 20% | | 101-093-0 |
| C73 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C74 | Tantalum, Chip, 1 μ F 16V, A, \pm 20% | | 141-036-1 |
| C75 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C76 | Ceramic, Chip, 56pF 50V, 0805, \pm 5% | | 135-613-9 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|-------------------|---|-------------|---------------|
| C77 | Ceramic, Chip, 51pF 50V, 0805, $\pm 5\%$ | | 135-103-5 |
| C78 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C79 | Ceramic, Chip, 0.01 μ F 50V, 0805, $\pm 10\%$ | | 130-172-2 |
| C80 | Tantalum, Chip, 1 μ F 16V, A, $\pm 20\%$ | | 141-036-1 |
| C81 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C82 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C83 | Elect, 100 μ F 16V, 6.3DIAX7, $\pm 20\%$ | | 101-093-0 |
| TC1 | Trimmer, 20pF (ECR-LA020E52V), +50% - 0% | | 172-019-0 |
| CONNECTORS | | | |
| CON1 | Lead/Housing Ass'y, 4P, 50mm | | 504-808 |
| CON2 | Lead/Housing Ass'y, 6P, 50mm | | 504-809 |
| COILS | | | |
| L1 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| L2 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| L3 | Choke, MK-4, 2 \times 0.4 \times 8t:L | | 310-092-9 |
| L4 | Inductor, Axial, 2.2 μ H, 02, $\pm 20\%$ | | 310-378-7 |
| L5 | Resistor-Choke, 1Kohm \times 10t | | 310-213-7 |
| L6 | Spring, 3 \times 0.65 \times 1.5t:L | | 310-224-2 |
| L7 | Inductor, Axial, 1 μ H, 02, $\pm 20\%$ | | 310-298-4 |
| L8 | Resistor-Choke, 1Kohm \times 10t | | 310-218-7 |
| L9 | Spring, 3 \times 0.65 \times 1.5t:L | | 310-224-2 |
| L10 | Spring, 2 \times 0.4 \times 4.5t:L | | 310-573-7 |
| L11 | Spring, 2 \times 0.4 \times 5.5t:L | | 310-574-8 |
| L12 | Choke, MK-4, 12 \times 0.4 \times 8t:L | | 310-092-9 |
| L13 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| L14 | Inductor, Axial, 100 μ H, 04, $\pm 10\%$ | | 310-221-9 |
| L15 | Not Used. | | |
| L16 | Inductor, Chip, 10 μ H, 01, $\pm 10\%$ | | 310-659-2 |
| FB1 | Bead Core, FC3 \times 2 | | 320-253-1 |
| FB2 | Bead Core, FC3 \times 2 | | 320-253-1 |
| FB3 | Bead Core, FC3 \times 2 | | 320-253-1 |
| T1 | Transformer, Rx Molded, 140MHz 5.5t | | 310-571-5 |
| T2 | Transformer, Rx Molded, 140MHz 5.5t | | 310-571-5 |
| T3 | Transformer, Rx Molded, 140MHz 5.5t | | 310-571-5 |
| T4 | Transformer, Rx Molded, 140MHz 5.5t | | 310-571-5 |
| T5 | Transformer, Rx Mixer, 21.4MHz | | 320-597-2 |
| T6 | Transformer, Rx Molded, 130MHz 6.5t | | 310-572-6 |
| T7 | Transformer, Rx Molded, 130MHz 6.5t | | 310-572-6 |
| T8 | Transformer, Detector 455KHz | | 320-232-2 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|----------|--|-------------|---------------|
| | CRYSTALS | | |
| X1 | 12.8MHz, 5PPM, Nr-2B | | 262-256-5 |
| X2 | 21.855MHz, 30PPM, HC39/T | | 262-213-6 |
| | DIODES | | |
| D1 | MMBV3401(4D), SOT-23, Pin | | 243-012-0 |
| D2 | 1SS97, Axial, Schottky Detector | | 243-026-3 |
| D3 | MMBV3401(4D), SOT-23, Pin | | 243-012-0 |
| D4 | IN5819, Axial, Rectifier | | 245-024-1 |
| D5 | IN5819, Axial, Rectifier | | 245-024-1 |
| D6 | MMBV3401(4D), SOT-23Pin | | 243-012-0 |
| | FILTERS | | |
| CF1 | Ceramic, CFW455F, 455KHz | | 270-027-8 |
| XF1 | Crystal, 21M15BU, 21.4MHZ | | 271-002-0 |
| | IC'S | | |
| IC1 | MC145170DR2, SO-16, PLL | | 223-422-1 |
| IC2 | MC14094BD, SO-16, SHIFT-RESISTOR | | 223-233-7 |
| IC3 | LM2931AZ, TO-226AA, 5V REGULATOR | | 231-024-9 |
| IC4 | MC337IDR2, SO-16, FM IF | | 223-421-0 |
| | JACKS | | |
| J2 | DC Power, Ext., MOJ-D15 | | 420-709-5 |
| J3 | Miniature, Speaker, HSJ0836-01-50 | | 420-706-2 |
| J4 | Miniature, Mike, HSJ1102-01-510 | | 420-709-6 |
| | RESISTORS CARBON | | |
| R1 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R2 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R3 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R4 | Chip, 470 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-471-0 |
| R5 | Chip, 470 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-471-0 |
| R6 | Chip, 2.2Kohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| R7 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R8 | Chip, 10 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-100-5 |
| R9 | Chip, 100 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-101-6 |
| R10 | Chip, 22 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-229-9 |
| R11 | Chip, 100 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-101-6 |
| R12 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R13 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R14 | Chip, 330 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-331-7 |
| R15 | Chip, 3.3K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-332-8 |
| R16 | Chip, 10 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-100-5 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|----------|--|-------------|---------------|
| R17 | Chip, 330 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-331-7 |
| R18 | Chip, 4.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-472-1 |
| R19 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R20 | Chip, 470 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-471-0 |
| R21 | Chip, 2.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| R22 | Chip, 10 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-100-5 |
| R23 | Chip, 1.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-122-5 |
| R24 | Chip, 3.3K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-332-8 |
| R25 | Chip, 820 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-821-3 |
| R26 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R27 | Chip, 470K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-474-3 |
| R28 | Chip, 22K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-223-3 |
| R29 | Chip, 470K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-474-3 |
| R30 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R31 | Chip, 82K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-823-5 |
| R32 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| R33 | Chip, 33k ohm, 1/10W, 0805, $\pm 5\%$ | | 060-333-9 |
| R34 | Chip, 100K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-104-9 |
| R35 | Chip, 270K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-274-9 |
| R36 | Chip, 330K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-334-0 |
| R37 | Chip, 100K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-104-9 |
| R38 | Chip, 3.3K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-332-6 |
| R39 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R40 | Chip, 10 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-100-5 |
| R41 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R42 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R43 | Chip, 1M ohm, 1/10W, 0805, $\pm 5\%$ | | 060-105-0 |
| R44 | Chip, 1M ohm, 1/10W, 0805, $\pm 5\%$ | | 060-105-0 |
| R45 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R46 | Chip, 2.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| R47 | Chip, 15K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-153-3 |
| R48 | Chip, 1.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-122-5 |
| R49 | Chip, 4.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-472-1 |
| R50 | Chip, 1.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-122-5 |
| R51 | Chip, 1.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-122-5 |
| R52 | Chip, 470K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-474-3 |
| R53 | Not used | | 060-474-3 |
| R54 | Chip, 100 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-101-6 |
| R55 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| RV1 | Resistor-Semifixed, 22Kb, 6Dia | | 071-223-1 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|---------------------------|---|-------------|---------------|
| RV2 | Resistor-Semifixed, 22Kb, 6Dia | | 071-223-1 |
| | TRANSISTORS/FET'S | | |
| Q1 | KRA110S(PK), SOT-23, PNP | | 202-092-5 |
| Q2 | MMBC1321(Q4), SOT-23, NPN | | 203-096-4 |
| Q3 | MRF581, 317-01(MACR-X), NPN | | 203-055-7 |
| Q4 | SRFH1900, TO-220Ab, NPN | | 203-043-6 |
| Q5 | KRC110S(NK), Sot-23, NPN | | 202-096-9 |
| Q6 | KRA110S(PK), Sot-23, PNP | | 202-092-5 |
| Q7 | KRA110S(PK), Sot-23, PNP | | 202-092-5 |
| Q8 | BF999(LB), Sot-23, N-MOSFET | | 213-001-3 |
| Q9 | BF999(LB), Sot-23, N-MOSFET | | 213-001-1 |
| Q10 | BF513(59), Sot-23, N-JFET | | 200-024-4 |
| Q11 | KRC110S(NK), Sot-23, NPN | | 202-096-9 |
| Q12 | MMBC1321(Q4), Sot-23, NPN | | 203-096-4 |
| Q13 | KTA1504S(ASG), Sot, 23, NPN | | 202-082-6 |
| Q14 | KTC3875S(ALG), Sot-23, NPN | | 202-083-7 |
| Q15 | KTA1504S(ASG), Sot-23, NPN | | 202-082-6 |
| | End of Ass'y-RF PCB | | |
| Ass'y, Digital PCB | | | |
| | Capacitors | | |
| C1001 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C1002 | Tantalum, Chip, 1 μ F 16V, A, \pm 20% | | 141-036-1 |
| C1003 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C1004 | Ceramic, Chip, 470pF 50V, 0805, \pm 5% | | 134-761-4 |
| C1005 | Tantalum, Chip, 0.22 μ F 35V, A, \pm 20% | | 140-204-1 |
| C1006 | Not Used. | | |
| C1007 | Ceramic, Chip, 0.022 μ F 50V, 0805, \pm 5% | | 130-234-5 |
| C1008 | Ceramic, Chip, 0.001 μ F 50V, 0805, \pm 10% | | 130-184-4 |
| C1009 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C1010 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C1011 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C1012 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C1013 | Not Used. | | |
| C1014 | Ceramic, Chip, 47pF 50V, 0805, \pm 5% | | 134-721-8 |
| C1015 | Ceramic, Chip, 47pF 50V, 0805, \pm 5% | | 134-721-8 |
| C1016 | Ceramic, Chip, 20pF 50V, 0805, \pm 5% | | 130-012-2 |
| C1017 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C1018 | Ceramic, Chip, 20pF 50V, 0805, \pm 5% | | 130-012-1 |
| C1019 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|--------------------------|---|-------------|---------------|
| C1020 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C1021 | Ceramic, Chip, 0.01 μ F 50V, 0805, \pm 10% | | 130-172-2 |
| C1022 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| C1023 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C1024 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C1025 | Ceramic, Chip, 0.1 μ F 50V, 0805, +80% - 20% | | 130-185-5 |
| C1026 | Tantalum, Chip, 10 μ F 10V, B, \pm 20% | | 141-046-0 |
| Connectors | | | |
| CON1001 | Waffer, 8283-0312, 3pin, 2mm | | 422-275-2 |
| | Film, flexible, 65.25 \times 59.2 \times 0.25 | | 416-933-B |
| | Film, Flexible, 27 \times 21.5 \times 0.25 | | 416-942-A |
| X1001 | Crystal, 3.579545MHz, 50PPM, TC-38A | | 262-253-2 |
| Diodes | | | |
| D1001 | KDS193S(F3), Sot-23, Switching | | 234-052-6 |
| D1002 | RB471E, FMD(DUAL), Schottky Rectifier | | 249-043-8 |
| D1003 | KDS193S(F3), Sot-23, Switching | | 234-052-6 |
| D1004 | RB471E, FMD(DUAL), Schottky Rectifier | | 249-043-8 |
| D1005 | RB471E, FMD(DUAL), Schottky Rectifier | | 249-043-8 |
| D1006 | KDS193S(F3), Sot-23, Switching | | 234-052-6 |
| D1007 | RB471E, FMD(DUAL), Schottky Rectifier | | 249-043-8 |
| D1008 | RB471E, FMD(DUAL), Schottky Rectifier | | 249-043-8 |
| IC'S | | | |
| IC1001 | LM2931AZ, TO-226AA, 5V Regulator | | 231-024-9 |
| IC1002 | MF6CWM-100, SO-16L, Switched Capacitor | | 231-073-3 |
| IC1003 | MC142100DW, SO-16L, Crosspoint Switch | | 223-378-5 |
| IC1004 | TP5088, SO-16L, DTMF Generator | | 231-069-9 |
| IC1005 | S8054ALR-LN, SOT-89, Voltage Detector | | 229-446-3 |
| IC1006 | HD 404808FS, FP-808, CPU, MASK ROM | | 227-033-3 |
| IC1007 | MC14536DW, SO-16L, DTMF Receiver | | 223-419-9 |
| IC1008 | MC74HC4078D, SO-14, 8-Input Nor-/Or Gate | | 223-420-9 |
| LCD1001 | LCD, LE-0802A, Display | | 252-092-0 |
| LED1001 | LED Lamp, SLP-378H, Backlight Green | | 251-184-5 |
| LED1002 | LED Lamp, SLP-378H, Backlight Green | | 251-184-5 |
| Resistors, Carbon | | | |
| R1001 | Chip, 1K ohm, 1/10W, 0805, \pm 5% | | 060-102-7 |
| R1002 | Chip, 1K ohm, 1/10W, 0805, \pm 5% | | 060-102-7 |
| R1003 | Chip, 47K ohm, 1/10W, 0805, \pm 5% | | 060-473-2 |
| R1004 | Chip, 47K ohm, 1/10W, 0805, \pm 5% | | 060-473-2 |
| R1005 | Chip, 10K ohm, 1/10W, 0805, \pm 5% | | 060-103-8 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|--------------------|--|-------------|---------------|
| R1006 | Chip, 220K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-224-4 |
| R1007 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R1008 | Chip, 220K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-224-4 |
| R1009 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R1010 | Chip, 15K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-153-3 |
| R1011 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1012 | Chip, 33 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-330-6 |
| R1013 | Chip, 100K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-104-9 |
| R1014 | Chip, 100K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-104-9 |
| R1015 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R1016 | Chip, 1M ohm, 1/10W, 0805, $\pm 5\%$ | | 060-105-0 |
| R1017 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1018 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1019 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1020 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1021 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1022 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1023 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1024 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1025 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1026 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1027 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1028 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| R1029 | Chip, 20K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-203-5 |
| R1030 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| R1031 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1032 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1033 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1034 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1035 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1036 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R1037 | Chip, 47K ohm, 1/10W, 0835, $\pm 5\%$ | | 060-473-2 |
| R1038 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R1039 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| RV1001 | Resistor-Semifixed Chip, 1KB ohm, 4mm | | 067-102-2 |
| RV1002 | Resistor-Semifixed Chip, 47KB ohm, 4mm | | 067-473-7 |
| Transistors | | | |
| Q1001 | KRA110S(PK), Sot-23, PNP | | 200-092-5 |
| Q1002 | KTC3875S(ALG), Sot-23, NPN | | 202-083-7 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|-------------------------|--|-------------|---------------|
| Q1003 | KTN222S(ZB), Sot-23, NPN | | 202-158-2 |
| Q1004 | KRA110S(PK), Sot-23, PNP | | 200-092-5 |
| Q1005 | KRA110S(PK), Sot-23, PNP | | 200-092-5 |
| | End of Ass'y-Digital PCB | | |
| Ass'y, Audio PCB | | | |
| | Resistors, Carbon | | |
| R601 | Chip, 470K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-474-3 |
| R602 | Chip, 470K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-474-3 |
| R603 | Chip, 100 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-101-6 |
| R604 | Chip, 22K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-223-3 |
| R605 | Chip, 1K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-102-7 |
| R606 | Chip, 47K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-473-2 |
| R607 | Chip, 10K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-103-8 |
| | Capacitors | | |
| C601 | Ceramic, Chip, 0.047 μ F 50V, 0805, $\pm 10\%$ | | 130-417-4 |
| C602 | Tantalum, Chip, 10 μ F 10V, B, $\pm 20\%$ | | 141-046-1 |
| C603 | Tantalum, Chip, 1 μ F 16V, A, $\pm 20\%$ | | 141-036-1 |
| C604 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C605 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C606 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C607 | Tantalum, Chip, 0.68 μ F 16V, A, $\pm 20\%$ | | 140-606-1 |
| | Transistors | | |
| Q601 | KTA1504S(ASG), Sot-23, PNP | | 202-082-6 |
| Q602 | KRC104S(ND), Sot-23, NPN | | 202-095-8 |
| Q603 | KRC104S(ND), Sot-23, NPN | | 202-095-8 |
| CON601 | Connector Pin, Angle, 7Pin, 2mm Pitch | | 422-374-8 |
| IC601 | IC, LM386-N3, Dip-8, Audio Amp. | | 231-008-4 |
| | End of Ass'y-Audio PCB | | |
| Ass'y, Level PCB | | | |
| | Capacitors | | |
| C301 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C302 | Ceramic, Chip, 0.01 μ F 50V, 0805, $\pm 5\%$ | | 130-198-6 |
| C303 | Ceramic, Chip, 0.001 μ F 50V, 0805, $\pm 10\%$ | | 130-184-4 |
| C304 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C305 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C306 | Tantalum, Chip, 1 μ F 16V, A, $\pm 20\%$ | | 141-036-1 |
| | Resistors Carbon | | |
| R301 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|------------------------------------|---|-------------|---------------|
| R302 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| R303 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| R304 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| R305 | Chip, 100K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-104-9 |
| R306 | Chip, 82K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-823-5 |
| R307 | Chip, 27K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-273-8 |
| R308 | Chip, 56K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-563-0 |
| R309 | Chip, 1M ohm, 1/10W, 0805, $\pm 5\%$ | | 060-105-0 |
| R310 | Chip, 12K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-123-6 |
| R311 | Chip, 22K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-223-3 |
| R312 | Chip, 2.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| R313 | Chip, 39K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-393-3 |
| CON301 | Connector Pin, Angle, 10Pin, 2mm Pitch | | 422-373-7 |
| IC301 | IC, LM339M, So-14, Quad Comparator | | 228-029-5 |
| Q301 | Transistor, KRC110S(ND), NPN | | 202-095-8 |
| End of Ass'y-Level PCB | | | |
| Ass'y. High Pass Filter PCB | | | |
| Capacitors | | | |
| C501 | Ceramic, Chip, 0.047 μ F 25V, 0805 $\pm 5\%$ | | 130-425-1 |
| C502 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C503 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C504 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C505 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C506 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C507 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C508 | Ceramic, Chip, 0.047 μ F 25V, 0805, $\pm 5\%$ | | 130-425-1 |
| C509 | Ceramic, Chip, 0.01 μ F 50V, 0805, $\pm 10\%$ | | 130-172-2 |
| Resistors Carbon | | | |
| R501 | Chip, 2.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-272-7 |
| R502 | Chip, 4.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-472-1 |
| R503 | Chip, 2.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| R504 | Chip, 22K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-223-3 |
| R505 | Chip, 3.3K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-332-8 |
| R506 | Chip, 1.5K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-152-2 |
| R507 | Chip, 56K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-563-0 |
| R508 | Chip, 12K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-123-6 |
| R509 | Chip, 180K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-184-1 |
| R510 | Chip, 15K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-153-3 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|--|--|-------------|---------------|
| R511 | Chip, 680 ohm, 1/10W, 0805, ± 5% | | 060-681-3 |
| R512 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R513 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| CON501 | Connector Pin, Angle, 6Pin, 2mm Pitch | | 422-371-5 |
| IC501 | IC, LM2902M, So-14, Quad Op Amp | | 231-082-0 |
| End of Ass'y-High Pass Filter PCB | | | |
| Ass'y, Mic PCB | | | |
| Capacitors | | | |
| C101 | Ceramic, Chip, 0.0018 μ F 50V, 0805, ± 10% | | 130-A22-0 |
| C102 | Ceramic, Chip, 0.022 μ F 50V, 0805, ± 10% | | 130-234-5 |
| C103 | Ceramic, Chip, 0.0038 μ F 50V, 0805, ± 10% | | 130-329-8 |
| C104 | Ceramic, Chip, 0.0056 μ F 50V, 0805, ± 10% | | 130-513-7 |
| C105 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C106 | Ceramic, Chip, 0.01 μ F 50V, 0805, ± 10% | | 130-172-2 |
| C107 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C108 | Chramic, Chip, 56pF 50V, 0805, ± 5% | | 135-613-9 |
| C109 | Ceramic, Chip, 0.022 μ F 50V, 0805, ± 10% | | 130-234-5 |
| C110 | Ceramic, Chip, 56pF 50V, 50V, 0805, ± 5% | | 135-613-9 |
| C111 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C112 | Tantalum, Chip, 10 μ F 10V, B, ± 20% | | 141-046-0 |
| Resistors Carbon | | | |
| R101 | Chip, 1K ohm, 1/10W, 0805, ± 5% | | 060-102-7 |
| R102 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R103 | Chip, 8.2K ohm, 1/10W, 0805, ± 5% | | 060-822-4 |
| R104 | Chip, 6.8K ohm, 1/10W, 0805, ± 5% | | 060-682-4 |
| R105 | Chip, 15K ohm, 1/10W, 0805, ± 5% | | 060-153-3 |
| R106 | Chip, 100K ohm, 1/10W, 0805, ± 5% | | 060-104-9 |
| R107 | Chip, 22K ohm, 1/10W, 0805, ± 5% | | 060-223-3 |
| R108 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R109 | Chip, 33K ohm, 1/10W, 0805, ± 5% | | 060-333-9 |
| R110 | Chip, 180K ohm, 1/10W, 0805, ± 5% | | 060-184-1 |
| R111 | Chip, 1.8K ohm, 1/10W, 0805, ± 5% | | 060-182-9 |
| R112 | Chip, 270K ohm, 1/10W, 0805, ± 5% | | 060-274-9 |
| R113 | Chip, 6.8K ohm, 1/10W, 0805, ± 5% | | 060-662-A |
| CON101 | Connector Pin, Angle, 8 Pin, 2mm Pitch | | 422-372-6 |
| IC101 | IC, LM2902M, So-14, Quad Op Amp | | 060-103-8 |
| End of Ass'y-MIC PCB | | | |

| Ref. No. | Description | RS Part No. | MFR Part No. |
|--|--|-------------|--------------|
| Ass'y, Auto Power Control PCB | | | |
| C701 | Capacitors, Ceramic, Chip, 220pF 50V, 0805, ± 5% | | 132-220-2 |
| C702 | Capacitors, Ceramic, Chip, 220pF 50V, 0805, ± 5% | | 132-220-2 |
| C703 | Capacitors, Ceramic, Chip, 220pF 50V, 0805, ± 5% | | 132-220-2 |
| C704 | Capacitors, Ceramic, Chip, 220pF 50V, 0805, ± 5% | | 132-220-2 |
| Resistors Carbon | | | |
| R701 | Chip, 47K ohm, 1/10W, 0805, ± 5% | | 060-473-2 |
| R702 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R703 | Chip, 1K ohm, 1/10W, 0805, ± 5% | | 060-102-7 |
| R704 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 231-082-0 |
| R705 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R706 | Chip, 1K ohm, 1/10W, 0805, ± 5% | | 060-102-7 |
| R707 | Chip, 10K ohm, 1/10W, 0805, ± 5% | | 060-103-8 |
| R708 | Chip, 1K ohm, 1/10W, 0805, ± 5% | | 060-102-7 |
| CON701 | Connector Pin. Angle, 6 Pin, 2mm Pitch | | 422-371-5 |
| Transistors | | | |
| Q701 | KTA1663(HO), Sot-89, PNP | | 202-163-6 |
| Q702 | KTC3875S(ALG), Sot-23, NPN | | 202-083-7 |
| Q703 | KTC3875S(ALG), Sot-23, NPN | | 202-083-7 |
| Q704 | KTC3875S(ALG), Sot-23, NPN | | 202-083-7 |
| End of Ass'y-Auto Power Control PCB | | | |
| Ass'y, PTT PCB | | | |
| Capacitors | | | |
| C401 | Ceramic, Chip, 0.01 μ F 50V, 0805, ± 10% | | 130-172-2 |
| C402 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80 - 20% | | 130-185-5 |
| C403 | Ceramic, Chip, 0.015 μ F 50V, 0805, ± 5% | | 130-A143 |
| C404 | Ceramic, Chip, 0.015 μ F 50V, 0805, ± 5% | | 130-A14-3 |
| C405 | Ceramic, Chip, 0.015 μ F 50V, 0805, ± 5% | | 130-A14-3 |
| C406 | Ceramic, Chip, 0.015 μ F 50V, 0805, ± 5% | | 130-A14-3 |
| C407 | Not Used | | 130-328-7 |
| C408 | Ceramic, Chip, 0.0033 μ F 50V, 0805, ± 5% | | 130-328-7 |
| C409 | Ceramic, Chip, 0.0022 μ F 50V, 0805, ± 5% | | 130-237-8 |
| C410 | Ceramic, Chip, 0.0082 μ F 50V, 0805, ± 5% | | 130-805-1 |
| C411 | Ceramic, Chip, 470pF 50V, 0805, ± 5% | | 134-726-3 |
| C412 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% - 20% | | 130-185-5 |
| C413 | Tantalum, Chip, 10 μ F 10V, B, ± 20% | | 141-046-0 |
| Resistors Carbon | | | |
| R401 | Chip, 2K ohm, 1/10W, 0805, ± 5% | | 060-202-4 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|-----------------------------|---|-------------|---------------|
| R402 | Chip, 20K ohm, 1/10W, 0805, ± 5% | | 060-203-5 |
| R403 | Chip, 33K ohm, 1/10W, 0805, ± 5% | | 060-333-9 |
| R404 | Chip, 8.2K ohm, 1/10W, 0805, ± 5% | | 060-822-4 |
| R405 | Chip, 15K ohm, 1/10W, 0805, ± 5% | | 060-153-3 |
| R406 | Chip, 3.9K ohm, 1/10W, 0805, ± 5% | | 060-392-2 |
| R407 | Chip, 75K ohm, 1/10W, 0805, ± 5% | | 060-753-5 |
| R408 | Chip, 47K ohm, 1/10W, 0805, ± 5% | | 060-473-2 |
| R409 | Chip, 47K ohm, 1/10W, 0805, ± 5% | | 060-473-2 |
| R411 | Chip, 47K ohm, 1/10W, 0805, ± 5% | | 060-473-2 |
| R412 | Chip, 47K ohm, 1/10W, 0805, ± 5% | | 060-473-2 |
| IC401 | IC, LM2902M, So-14, Quad Op Amp | | 231-082-0 |
| SW401 | Switch, Tact, Chip, SKHUPF, 7.2 × 8.5 | | 436-030-0 |
| SW402 | Switch, Tact, Chip, SKHUPF, 7.2 × 8.5 | | 436-030-0 |
| SW403 | Switch, Tact, Chip, SKHUPF, 7.2 × 8.5 | | 436-030-0 |
| SW404 | Switch, Tact, Chip, SKHUPF, 7.2 × 8.5 | | 436-030-0 |
| End of Ass'y-PTT PCB | | | |
| Ass'y, Top PCB | | | |
| | Resistors | | |
| R802 | Fixed, Metalfilm, 6.6K ohm, 1/8W, ± 5% | | 001-682-1 |
| VR801 | Variable, 20KA, Audio Volum/Switch | | 450-523-5 |
| VR802 | Variable, 20KB, Squelch Volume | | 450-524-6 |
| | Connectors | | |
| CON801 | Waffer, 8263-0412, 4 Pin, 2mm Pitch | | 422-265-3 |
| CON802 | Waffer, 8283-0612, 6 Pin, 2mm pitch | | 422-266-4 |
| | Switches | | |
| SW801 | Push Lock, SPPJ422BP011, RF Power SW | | 432-027-8 |
| SW802 | Rotary, EC09P20-04, Channel SW | | 430-063-0 |
| End of Ass'y-Top PCB | | | |
| Ass'y, VCO PCB | | | |
| | Capacitors | | |
| C201 | Tantalum, Chip, 1μF 16V, A, ± 20% | | 141-036-1 |
| C202 | Ceramic, Chip, 33pF 50V, 0805, ± 5% | | 133-314-9 |
| C203 | Ceramic, Chip, 0.001μF 25V, 0805, ± 10% | | 130-184-4 |
| C204 | Tantalum, Chip, 1μF 16V, A, ± 20% | | 141-036-1 |
| C205 | Ceramic, Chip, 0.001μF 25V, 0805, ± 10% | | 130-184-4 |
| C206 | Ceramic, Chip, 0.001μF 25V, 0805, ± 10% | | 130-184-4 |
| C207 | Ceramic, Chip, 15pF(N750) 50V, 0805, ± 5% | | 131-567-1 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|-----------------------------|--|-------------|---------------|
| C208 | Ceramic, Chip, 100pF 50V, 0805, $\pm 5\%$ | | 131-027-0 |
| C209 | Ceramic, Chip, 2pF 50V, 0805, $\pm 5\%$ | | 132-011-0 |
| C210 | Ceramic, Chip, 2pF 50V, 0805, $\pm 5\%$ | | 132-011-0 |
| C211 | Trintalum, Chip, 10 μ F 10V, B, $\pm 20\%$ | | 141-046-0 |
| C212 | Ceramic, Chip, 0.1 μ F 25V, 0805, +80% -20% | | 130-185-5 |
| C213 | Ceramic, Chip, 0.001 μ F 25V, 0805, $\pm 10\%$ | | 130-184-4 |
| TC201 | Trimmer, Chip, 6pF, Blue, 3.2 \times 4.5 | | 176-012-3 |
| Coils | | | |
| L201 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| L202 | Transformer Molded, Chip, 6.5t | | 320-840-1 |
| L203 | Inductor, Chip, 10 μ H, 01, $\pm 10\%$ | | 310-659-2 |
| L204 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| L205 | Inductor, Chip, 1 μ H, 01, $\pm 20\%$ | | 310-657-0 |
| CON201 | Connector Pin, Straight, 8 Pin, 2mm Pitch | | 422-391-3 |
| Diodes | | | |
| D201 | Pin, 1SS241, R/TX Switching | | 243-073-5 |
| D202 | Varicap, 1SV50, OSC | | 243-025-2 |
| Resistors Carbon | | | |
| R201 | Chip, 2.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-272-7 |
| R202 | Chip, 2.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-272-7 |
| R203 | Chip, 47 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-470-9 |
| R204 | Chip, 47 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-470-9 |
| R205 | Chip, 47 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-470-9 |
| R206 | Chip, 2.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-272-7 |
| R207 | Chip, 33 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-330-6 |
| Transistor/FET | | | |
| Q201 | BC848C(1L), Sot-23, NPN | | 200-001-3 |
| Q202 | BC858B(3K), Sot-20, PNP | | 200-002-4 |
| Q203 | KRC110S(NK), NPN | | 202-096-9 |
| Q204 | BF513(S9), N-JFET | | 200-024-4 |
| End of Ass'y-Vco PCB | | | |
| Ass'y. Pack Ni-Cad | | | |
| Ass'y. Battery PCB | | | |
| D901 | Diode, KDS193S(F3), Sot-23, Switching | | 243-052-6 |
| LED901 | LED Lamp, KRA124, Red | | 251-007-9 |
| Resistors Carbon | | | |
| R901 | Chip, 10 ohm, 1/10W, 0805, $\pm 5\%$ | | 060-100-5 |
| R902 | Chip, 4.7K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-472-1 |

| Ref. No. | Description | RS Part No. | MFR. Part No. |
|----------------------|--|-------------|---------------|
| R903 | Chip, 2.2K ohm, 1/10W, 0805, $\pm 5\%$ | | 060-222-2 |
| | Transistors | | |
| Q901 | KTA1504S(ASG), Sot-23, PNP | | 202-082-6 |
| Q902 | KTA1663(HD), Sot-89, PNP | | 202-163-6 |
| Q303 | KTA1504S(ASG), Sot-23, PNP | | 202-082-6 |
| | End of Ass'y-Battery PCB | | |
| BAT901 | Battery, Ni-Cad, 7.2V, 600m AH, 6VEAA | | 420-567-6 |
| | End of Ass'y-Pack Ni-Cad | | |
| Miscellaneous | | | |
| | Capacitors | | |
| C2001 | Ceramic, Chip, 470pF 50V, 0805, $\pm 10\%$ | | 134-726-3 |
| C2002 | Ceramic, 470pF 50V, $\pm 10\%$ | | 134-710-6 |
| CON2001 | Connector, Lead, Housing, 3P, 5mm Speaker | | 504-807 |
| SPK1 | Speaker, 8 ohm, 0.5W, 40mm | | 420-164-5 |
| MIC1 | Mike, Condenser, WH-063T, 6 Dia | | 420-206-0 |
| BAT1001 | Battery, Lithium, 3V, 3.8 \times 15mm | | 420-564-3 |
| | End of Miscellaneous | | |

SEMICONDUCTOR VOLTAGE CHART

- Frequency : f46.100MHz
- Power Supply : 7.2V DC
- Unit : Volts (average)

1. Normal Function

Transistor

| Ref. No. | Receive | | | Transmit | | |
|----------|---------|------|------|----------|------|------|
| | E | B | C | E | B | C |
| Q1 | 4.95 | 4.95 | 0.00 | 4.93 | 0.32 | 4.79 |
| Q2 | 0.00 | 0.00 | 0.00 | 2.80 | 2.80 | 2.00 |
| Q3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 6.32 |
| Q4 | 0.00 | 0.00 | 6.93 | 0.00 | 0.00 | 6.40 |
| Q6 | 4.95 | 4.95 | 0.00 | 4.92 | 0.32 | 4.89 |
| Q7 | 4.95 | 0.32 | 4.85 | 4.93 | 4.93 | 0.00 |
| Q12 | 0.10 | 0.80 | 1.73 | 0.00 | 0.00 | 0.00 |
| Q13 | 4.95 | 4.85 | 0.00 | 4.92 | 4.83 | 0.00 |
| Q14 | 2.57 | 2.57 | 4.95 | 2.90 | 2.90 | 4.92 |
| Q15 | 2.57 | 2.57 | 0.00 | 2.90 | 2.90 | 0.00 |

JET

| Ref. No. | Receive | | | Transmit | | |
|----------|---------|------|------|----------|------|------|
| | S | G | D | S | G | D |
| Q8 | 0.68 | 0.00 | 4.83 | 0.00 | 0.00 | 0.00 |
| Q9 | 0.83 | 0.00 | 4.83 | 0.00 | 0.00 | 0.00 |
| Q10 | 2.20 | 0.00 | 4.85 | 0.00 | 0.00 | 0.00 |

Diode

| Ref. No. | Receive | | Transmit | |
|----------|---------|------|----------|------|
| | A | C | A | C |
| D1 | 0.00 | 0.40 | 2.80 | 2.00 |
| D2 | 0.00 | 0.00 | 0.84 | 0.00 |
| D3 | 7.20 | 6.98 | 7.20 | 6.80 |
| D4 | 7.20 | 6.98 | 7.20 | 6.80 |
| D5 | 1.13 | 0.37 | 0.00 | 2.00 |

IC

| Pin No. | Receive | | | | Transmit | | | |
|---------|---------|------|------|------|----------|------|------|------|
| | IC1 | IC2 | IC3 | IC4 | IC1 | IC2 | IC3 | IC4 |
| 1 | 2.37 | 0.00 | 6.95 | 4.78 | 2.37 | 0.00 | 6.80 | 0.00 |
| 2 | 2.43 | 4.70 | 0.00 | 4.18 | 2.42 | 4.70 | 0.00 | 0.00 |
| 3 | 0.00 | 0.00 | 5.00 | 3.93 | 0.00 | 0.00 | 5.00 | 0.00 |
| 4 | 2.58 | 4.95 | — | 4.80 | 2.68 | 4.92 | — | 0.00 |
| 5 | 4.70 | 4.95 | — | 3.83 | 4.70 | 4.92 | — | 0.00 |
| 6 | 4.70 | 4.95 | — | 3.82 | 4.70 | 4.92 | — | 0.00 |
| 7 | 0.00 | 4.95 | — | 3.82 | 0.00 | 4.92 | — | 0.00 |
| 8 | 0.10 | 0.00 | — | 4.10 | 0.10 | 0.00 | — | 0.00 |
| 9 | 0.00 | 4.95 | — | 2.30 | 0.00 | 4.92 | — | 0.00 |
| 10 | 0.00 | 4.95 | — | 0.63 | 0.00 | 4.92 | — | 0.00 |
| 11 | 4.92 | 4.88 | — | 2.50 | 4.90 | 4.86 | — | 0.00 |
| 12 | 0.00 | 4.95 | — | 1.28 | 0.00 | 0.33 | — | 0.00 |
| 13 | 2.71 | 4.95 | — | 0.51 | 2.90 | 0.33 | — | 0.00 |
| 14 | 4.93 | 0.32 | — | 1.34 | 4.90 | 4.92 | — | 0.00 |
| 15 | 4.93 | 4.72 | — | 0.00 | 4.90 | 4.70 | — | 0.00 |
| 16 | 4.93 | 4.92 | — | 1.71 | 4.90 | 4.92 | — | 0.00 |

Transistor

| Ref. No. | Unsquelch | | | Squelch | | |
|----------|-----------|------|------|---------|------|------|
| | E | B | C | E | B | C |
| Q11 | 0.00 | 0.00 | 4.92 | 0.00 | 1.34 | 0.00 |

IC

| Pin No. | Unsquelch | Squelch |
|-----------|-----------|---------|
| IC2 of 11 | 0.00 | 4.88 |

2. Tone Squelch Function

CTCSS Tone : 100Hz, Only T-SQL ON, Squelch volume must be turned counterclockwise

MIC : Receive (SSG: AF 100Hz, Modulation 700Hz, RF level 1000 μ V)

Transmit (Unmodulation)

IC

| Pin No. | Receive | | | | Transmit | |
|---------|--------------|--------|-----------|--------|----------|--------|
| | Without Tone | | With Tone | | IC1002 | IC1003 |
| | IC1002 | IC1003 | IC1002 | IC1003 | | |
| 1 | 1.98 | 0.11 | 1.98 | 0.07 | 1.98 | 1.53 |
| 2 | 2.00 | 4.70 | 1.96 | 4.70 | 1.96 | 4.70 |
| 3 | 1.55 | 4.70 | 1.52 | 4.70 | 1.53 | 4.70 |
| 4 | 1.98 | 4.70 | 1.98 | 4.70 | 1.98 | 4.70 |
| 5 | 1.98 | 4.70 | 1.98 | 4.70 | 1.98 | 4.70 |
| 6 | 4.89 | 4.70 | 4.89 | 4.70 | 4.98 | 4.70 |
| 7 | 1.98 | 0.00 | 1.98 | 0.00 | 1.98 | 0.00 |
| 8 | 0.84 | 0.00 | 0.28 | 0.00 | 0.40 | 0.00 |
| 9 | 4.85 | 0.00 | 4.58 | 0.00 | 4.58 | 0.00 |
| 10 | 0.00 | 0.98 | 0.00 | 0.98 | 0.00 | 0.76 |
| 11 | 0.12 | 2.23 | 0.12 | 2.13 | 0.12 | 0.00 |
| 12 | 0.00 | 2.23 | 0.00 | 2.12 | 0.00 | 0.75 |
| 13 | 1.98 | 0.14 | 1.98 | 0.09 | 1.98 | 0.14 |
| 14 | 1.98 | 1.58 | 1.98 | 1.52 | 1.98 | 1.53 |
| 15 | — | 0.00 | — | 0.00 | — | 1.53 |
| 16 | — | 4.93 | — | 4.93 | — | 4.93 |

Transistor

| Ref. No. | T-SQL OFF | | | T-SQL ON | | |
|----------|-----------|------|------|----------|------|------|
| | E | B | C | E | B | C |
| Q1004 | 4.93 | 4.95 | 0.00 | 4.93 | 0.33 | 4.89 |

3. DTMF Squelch Function

DTMF Tone : Only D-SQL ON, squelch volume must be turned counterclockwise

MIC : Receive (SSG: AF1 69Hz, AF2 1209Hz, Modulation 3.5KHz, RF level 0.25 μ Vpd)

Transmit (Press a button of number "1" continuously)

Transistor

| Ref. No. | Receive | | | | | | Ref. No. | Transmit | | | | | |
|----------|-----------|------|------|----------|------|------|----------|----------|------|------|-----------|------|------|
| | D-SQL OFF | | | D-SQL ON | | | | Normal | | | With DTMF | | |
| | E | B | C | E | B | C | | E | B | C | E | B | C |
| Q1005 | 4.93 | 4.95 | 0.00 | 4.92 | 0.31 | 4.85 | Q5 | 0.00 | 0.00 | 0.00 | 4.95 | 4.90 | 0.00 |

Diode (Receive)

| Ref. No. | D-SQL OFF | | D-SQL ON | |
|----------|-----------|------|----------|------|
| | A | C | A | C |
| D1006 | 0.23 | 0.00 | 4.00 | 3.54 |

IC/PTT PCB (Band Pass Filter)

| Pin No. | Receive | | | | Transmit | |
|---------|-----------|---------|----------|---------|----------|-----------|
| | D-SQL OFF | | D-SQL ON | | Normal | With DTMF |
| | IC1007 | PTT PCB | IC1007 | PTT PCB | IC1004 | IC1004 |
| 1 | 0.08 | 0.000 | 0.00 | 4.85 | 4.93 | 4.93 |
| 2 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 4.70 |
| 3 | 0.00 | 0.00 | 4.68 | 2.10 | 4.90 | 4.90 |
| 4 | 0.00 | — | 4.85 | 0.00 | 4.90 | 4.90 |
| 5 | 0.31 | 2.10 | 4.03 | 2.10 | 0.00 | 0.00 |
| 6 | 0.17 | — | 0.00 | — | 0.02 | 2.23 |
| 7 | 0.00 | — | 4.58 | — | 4.93 | 1.97 |
| 8 | 0.00 | — | 0.00 | — | 0.08 | 1.95 |
| 9 | 0.00 | — | 0.00 | — | 4.70 | 4.55 |
| 10 | 0.15 | — | 1.00 | — | 4.70 | 4.56 |
| 11 | 0.03 | — | 0.36 | — | 4.70 | 4.49 |
| 12 | 0.24 | — | 2.02 | — | 4.70 | 4.49 |
| 13 | 0.00 | — | 0.00 | — | 0.00 | 0.00 |
| 14 | 0.24 | — | 4.00 | — | 0.00 | 2.04 |
| 15 | 0.08 | — | 0.00 | — | — | — |
| 16 | 0.20 | — | 0.17 | — | — | — |

4. Back Light Function

Transistor

| Ref. No. | Back Light OFF | | | Back Light ON | | |
|----------|----------------|------|------|---------------|------|------|
| | E | B | C | E | B | C |
| Q1001 | 4.93 | 4.70 | 0.05 | 4.92 | 0.05 | 1.42 |
| Q1002 | 0.00 | 0.00 | 0.05 | 0.00 | 0.76 | 1.44 |
| Q1003 | 0.00 | 0.05 | 4.12 | 0.75 | 1.42 | 2.75 |

Diode

| Ref. No. | Back Light OFF | | Back Light ON | |
|----------|----------------|------|---------------|------|
| | A | B | A | C |
| D1001 | 5.63 | 4.12 | 4.89 | 2.75 |
| D1002 | 7.16 | 5.63 | 7.10 | 4.89 |

5. Sub Board PCB

Function : Normal

Mic : Receive (Squelch)

Transmit (Unmodulation)


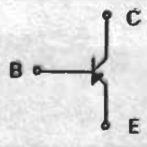
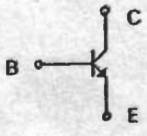
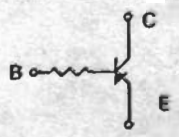
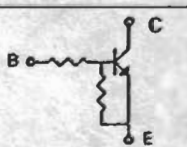

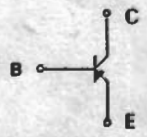
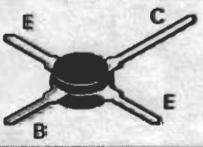
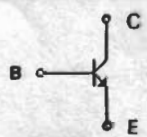
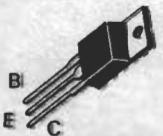
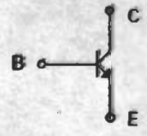

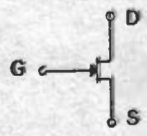

Sub PCB's

| Pin No. | Receive | | | | | | | Transmit | | | | | | |
|---------|---------|-------|------|------|-------|------|------|----------|------|-------|------|-------|------|------|
| | APC | Audio | | HPF | Level | MIC | VCO | APC | | Audio | HPF | Level | MIC | VCO |
| | | UnSQ. | SQ. | | | | | High | Low | | | | | |
| 1 | 0.00 | 0.00 | 0.00 | 2.24 | 4.93 | 0.00 | 4.95 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 4.92 |
| 2 | 0.20 | 0.00 | 0.00 | 0.00 | 4.90 | 0.00 | 0.00 | 6.75 | 4.44 | 0.00 | 0.00 | 0.00 | 1.96 | 4.88 |
| 3 | 6.94 | 0.00 | 0.00 | 4.95 | 0.00 | 0.00 | 0.00 | 6.82 | 6.80 | 0.00 | 4.93 | 4.15 | 1.96 | 0.00 |
| 4 | 0.00 | 0.00 | 4.88 | 2.48 | 7.10 | 0.00 | 0.37 | 0.23 | 0.94 | 4.86 | 2.47 | 6.84 | 0.00 | 2.57 |
| 5 | 0.00 | 6.36 | 0.00 | 2.47 | 0.00 | 0.00 | 2.58 | 4.79 | 4.79 | 0.00 | 2.47 | 0.00 | 4.89 | 2.90 |
| 6 | 0.00 | 6.95 | 7.14 | 0.00 | 1.65 | 0.00 | 2.70 | 0.00 | 0.00 | 6.85 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | -- | 3.52 | 1.30 | -- | 0.00 | 0.00 | 0.00 | -- | -- | 1.29 | -- | 1.00 | 0.00 | 0.00 |
| 8 | -- | -- | -- | -- | 0.00 | 0.00 | 0.00 | -- | -- | -- | -- | 0.00 | 0.68 | -- |
| 9 | -- | -- | -- | -- | 4.95 | -- | -- | -- | -- | -- | -- | 4.92 | -- | -- |
| 10 | -- | -- | -- | -- | 4.57 | -- | -- | -- | -- | -- | -- | 4.57 | -- | -- |




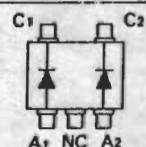








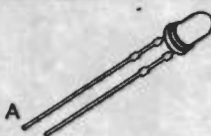



SEMICONDUCTOR LEAD IDENTIFICATION

| Base Diagram | Manufacturer's NBR | Schematic Ref NBR | |
|--------------|--------------------|---------------------|--------------------|
| | HD404808FS | IC1006 | CPU Mask ROM |
| | | | |
| | | | |
| | MC145170DR2 | IC1 | PLL |
| | MC14094BD | IC2 | Shift Register |
| | MC3371DR2 | IC4 | IF |
| | LM339M | IC301 | Quad Comparator |
| | MC74HC4078D | IC1008 | 8 Input Nor Gate |
| | LM2902 | IC101, IC401, IC501 | Quad OP Amp |
| | MC142100DW | IC1003 | Cross Point Switch |
| | MC145436DW | IC1007 | DTMF Receiver |
| | | | |
| | MF6CWM-100 | IC1002 | Switched Capacitor |
| | TP5088 | IC1004 | DTMF Generator |
| | | | |
| | LM386N3 | IC601 | Audio Amp |
| | | | |
| | | | |
| | S8054ALR-LN (LN) | IC1005 | Voltage Detector |
| | | | |
| | LM2931AZ | IC3, IC1001 | 5V Regulator |
| | | | |

B: Base C: Collector D: Drain
 E: Emitter G: Gate S: Source

| Base Diagram | Manufacturer's NBR | Schematic Ref NBR | |
|---|--------------------|--------------------------------|---|
|  | KTA1504S (ASG) | Q13,Q15,Q601,Q901,Q903 |  |
| | BC858 (3K) | Q202 | |
| | MMBC1321 (Q4) | Q2,Q12 |  |
| | KTC3875S (ALG) | Q14,Q702,Q703,Q704,Q1002 | |
| | KTN2222S (ZB) | Q1003 | |
| | BC848 (1L) | Q201 | |
| | KRA110S (PK) | Q1,Q6,Q7,Q1001,Q1004, Q1005 |  |
| | KRC110S (NK) | Q5,Q11,Q203 | |
| | KRC104S (ND) | Q301,Q602,Q603 |  |
| | | | |
|  | KTA1663 (HO) | Q701,Q902 |  |
|  | MRF581 | Q3 |  |
|  | SRFH1900 | Q4 |  |
|  | BF513 (S9) | Q10,Q203 |  |
| | BF999 (LB) | Q8,Q9 |  |
| | | | |

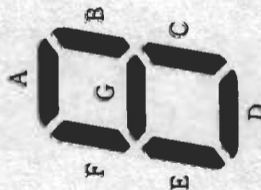
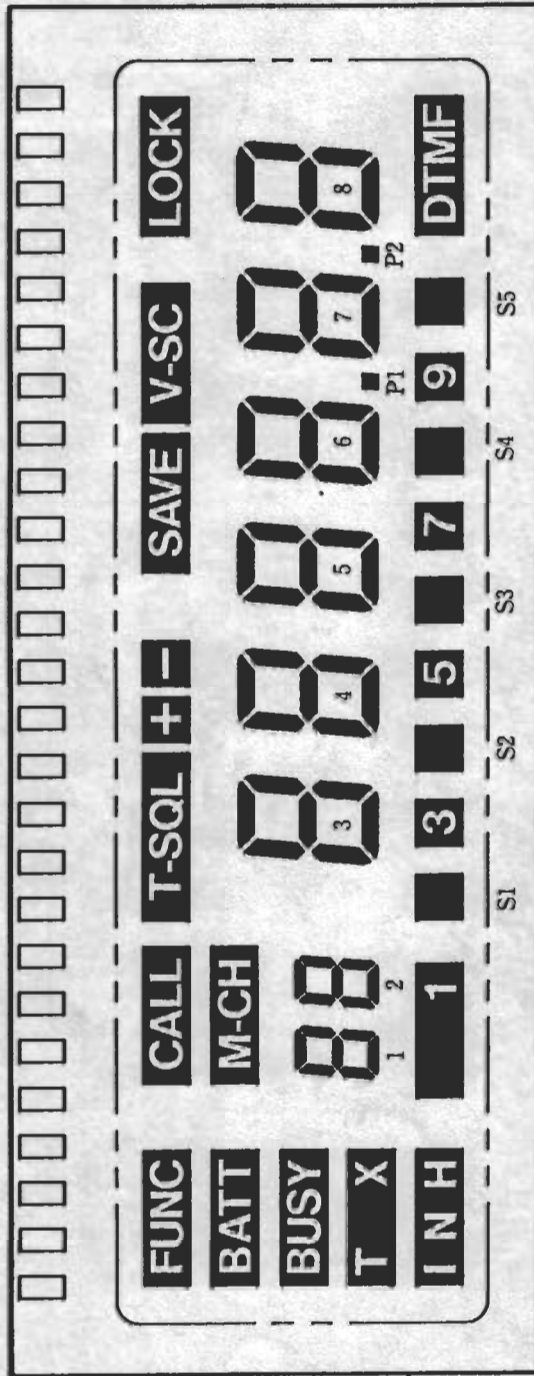
A: Anode B: Cathode
 NC: No Connection

| Base Diagram | Manufacturer's NBR | Schematic REF NBR | |
|---|--------------------|----------------------------------|---|
|  | MMBV3401 (4D) | D1,D3,D6 |  |
| | KDS193S (F3) | D901,D1001,D1003,D1006 | |
|  | RB471E (D3G) | D1002,D1004,D1005,D1007 D1008 |  |
|  | 1SS241 (TY) | D201 |  |
| | | | |
|  | 1SV50 | D202 |  |
| | | | |
|  | 1SS97 | D2 |  |
| | | | |
|  | 1N5819 | D4,D5 |  |
| | | | |
|  | KLR124 | D902 |  |
| | | | |
|  | SLP-378H | LED1001, LED1002 |  |
| | | | |

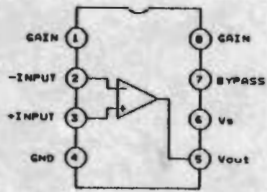
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|---|------|-------|------|------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| com1 | 1 | - | - | V-SC | T X | - | 1A | - | 2A | - | 3A | - | 4A | - | 5A | - | 6A | - | 7A | - | 8A | - | com1 | - | - | - |
| com2 | s1 | 3 | LOCK | + | SAVE | BUSY | M-CH | 1F | 1B | 2F | 2B | 3F | 3B | 4F | 4B | 5F | 5B | 6F | 6B | 7F | 7B | 8F | 8B | - | com2 | - |
| com3 | s2 | 5 | DTMF | - | P1 | BATT | INH | 1G | 1C | 2G | 2C | 3G | 3C | 4G | 4C | 5G | 5C | 6G | 6C | 7G | 7C | 8G | 8C | - | com3 | - |
| com4 | s3 | 7 | 9 | T-SQL | P2 | FUNC | CALL | 1E | 1D | 2E | 2D | 3E | 3D | 4E | 4D | 5E | 5D | 6E | 6D | 7E | 7D | 8E | 8D | - | - | com4 |

26

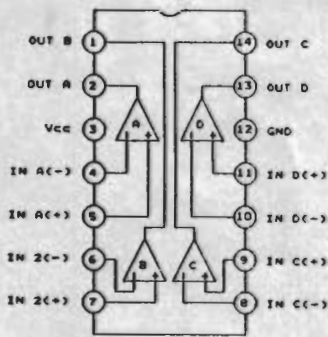
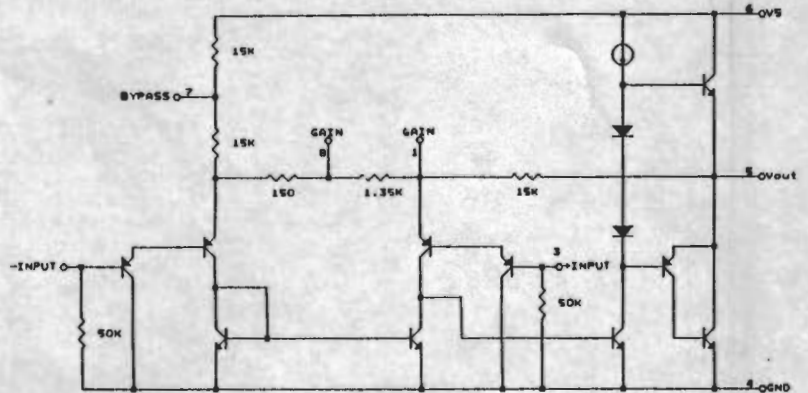
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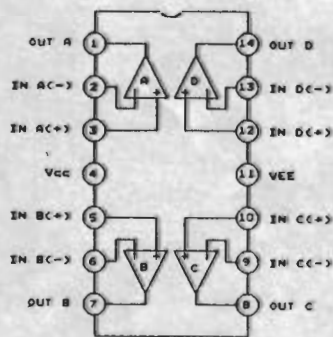
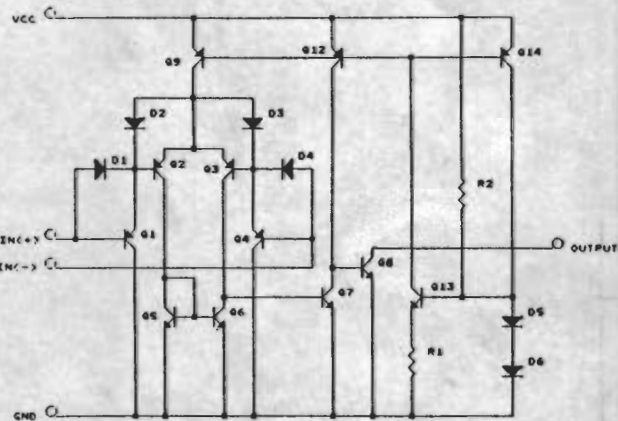
IC INTERNAL CONNECTION



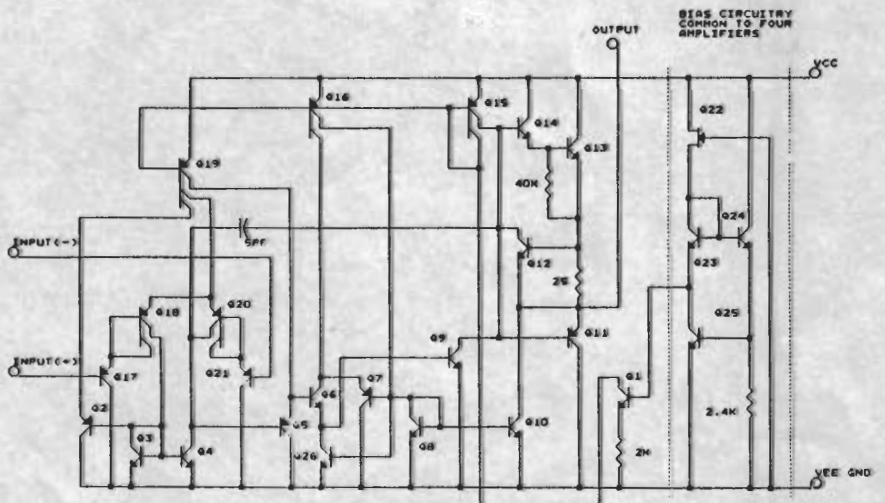
LM386-N3



LM339M



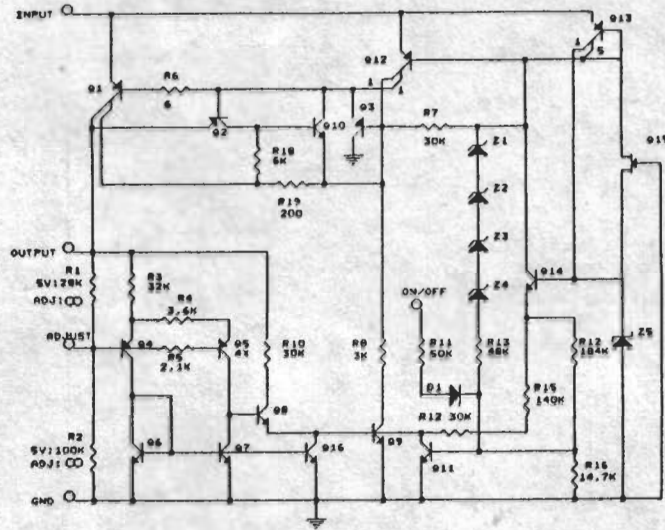
LM2902M





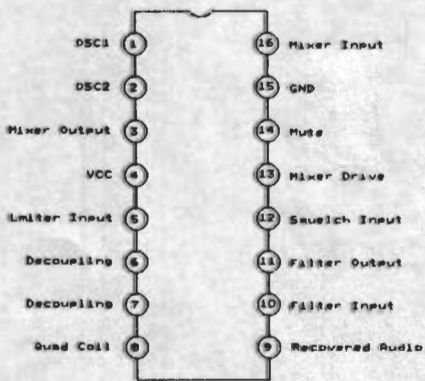
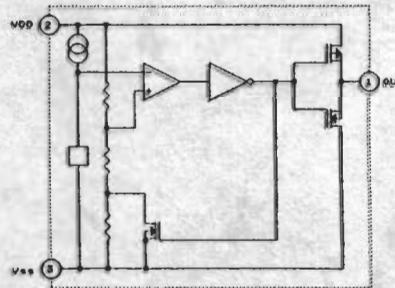
1: OUT
2: GND
3: IN

LM2931AZ

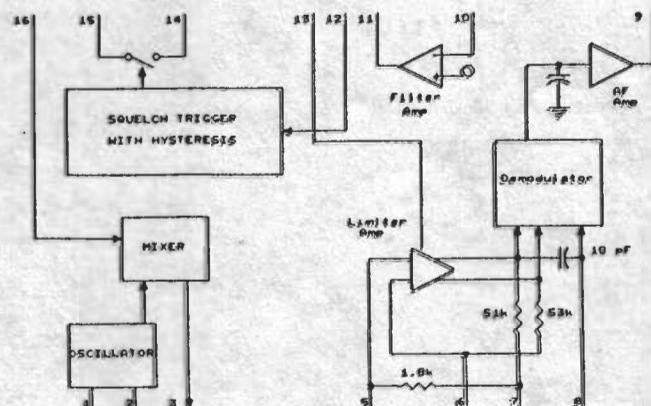


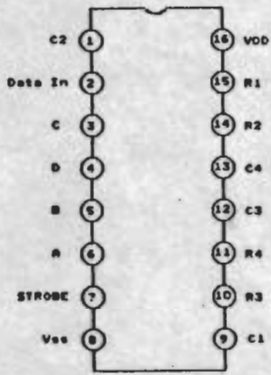
1: OUT
2: VDD
3: VSS

S80554ALR-LN

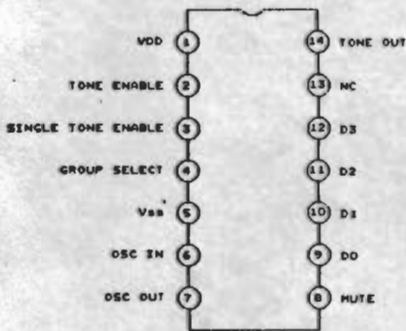
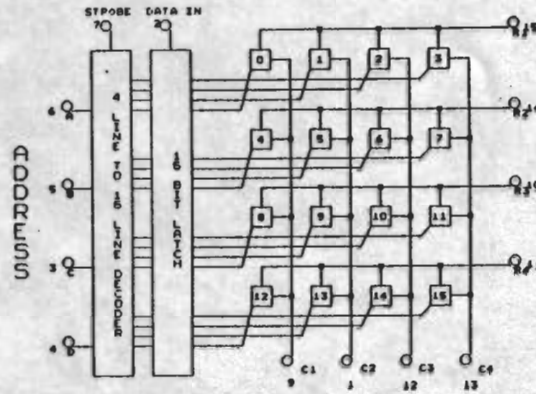


MC3371DR2

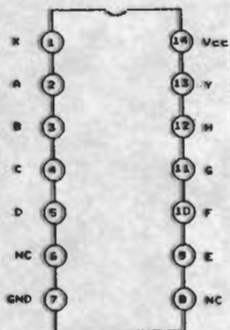
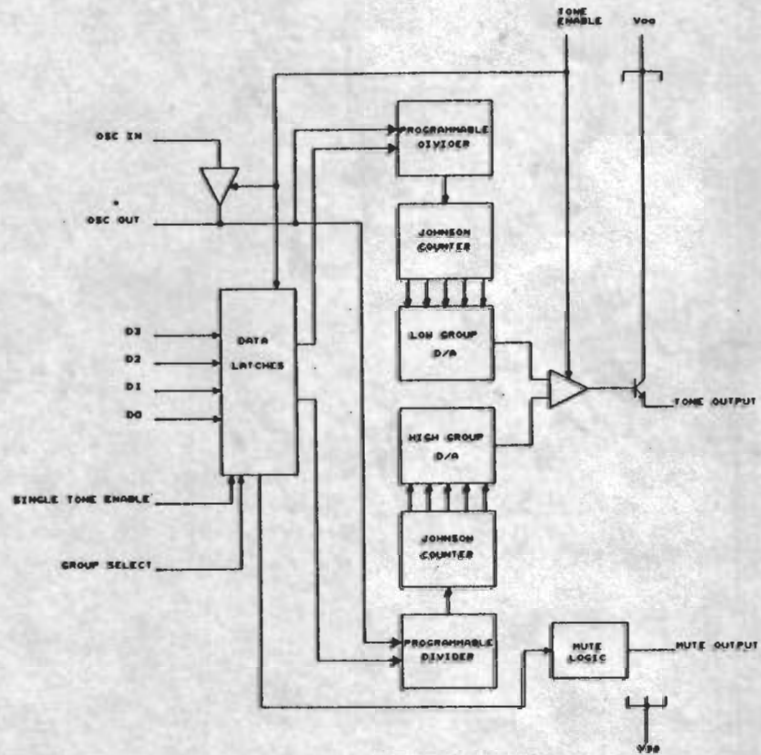




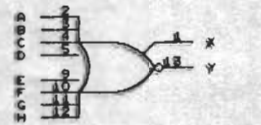
MC142100DW



TP5088



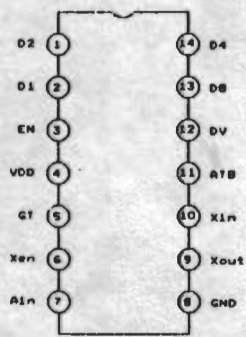
MC74HC4078D



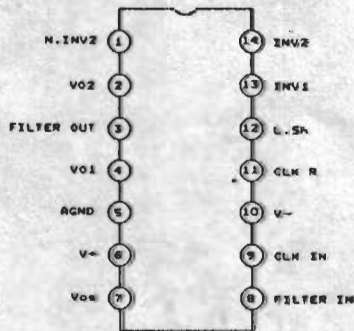
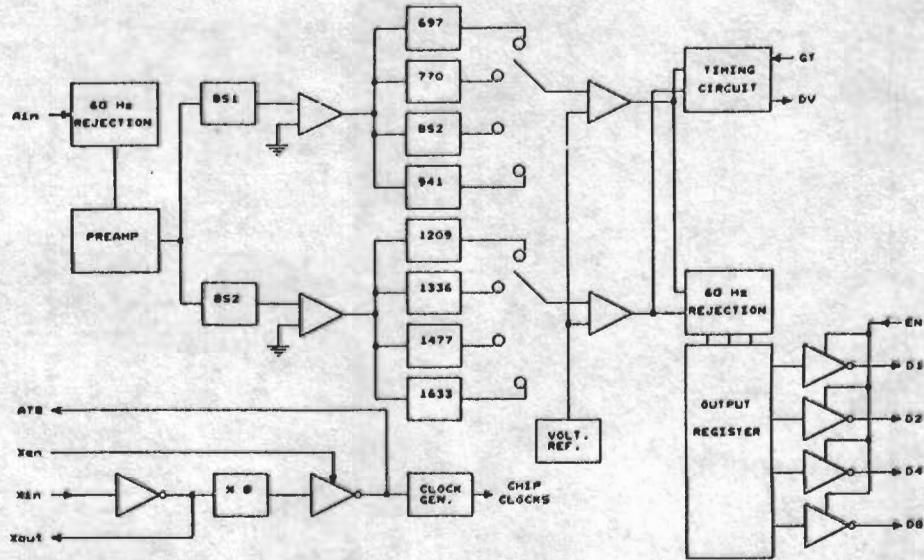
$$Y = A + B + C + D + E + F + G + H$$

$$X = A + B + C + D + E + F + G + H$$

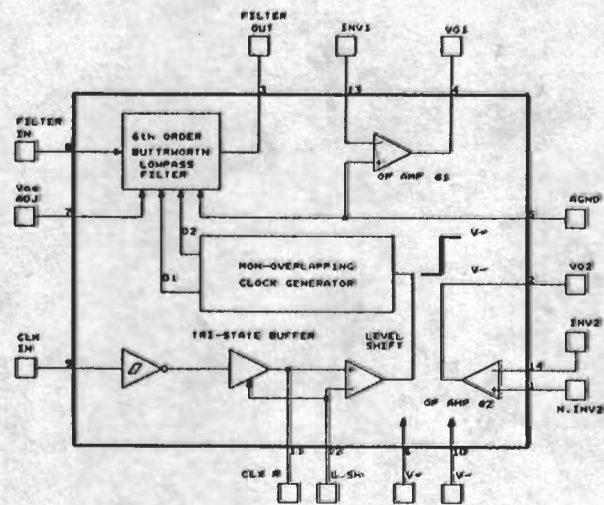
PIN 14 = VCC
PIN 7 = GND
PINS 6, 8 = NO CONNECTION



MC145436DW

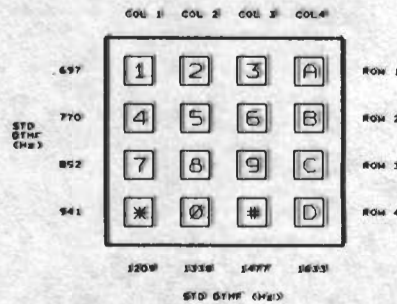


MF6CWM-100

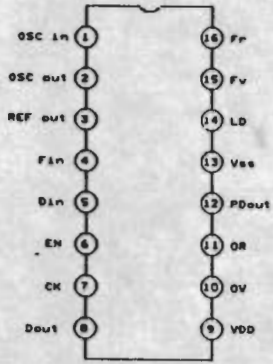


Hexadecimal Codes

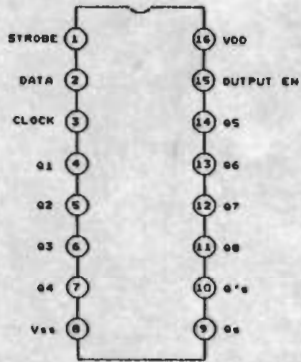
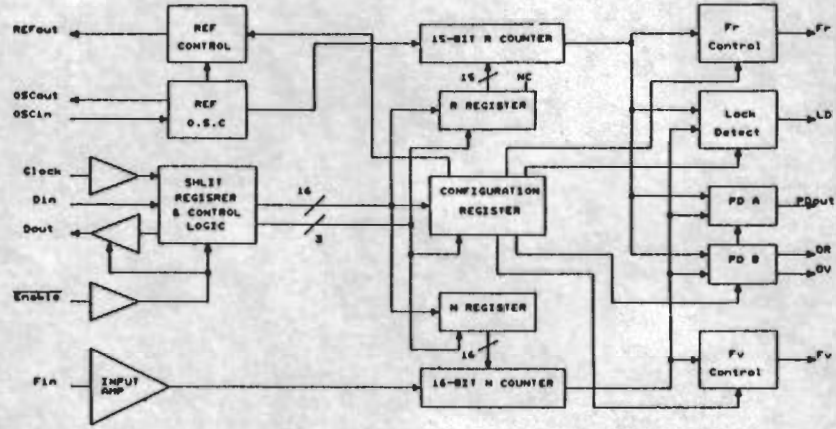
| DIGIT | OUTPUT CODE | | | |
|-------|-------------|----|----|----|
| | D8 | D4 | D2 | D1 |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 |
| 3 | 0 | 0 | 1 | 1 |
| 4 | 0 | 1 | 0 | 0 |
| 5 | 0 | 1 | 0 | 1 |
| 6 | 0 | 1 | 1 | 0 |
| 7 | 0 | 1 | 1 | 1 |
| 8 | 1 | 0 | 0 | 0 |
| 9 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| A | 1 | 0 | 1 | 1 |
| # | 1 | 1 | 0 | 0 |
| A | 1 | 1 | 1 | 0 |
| B | 1 | 1 | 1 | 0 |
| C | 1 | 1 | 1 | 1 |
| D | 0 | 0 | 0 | 0 |



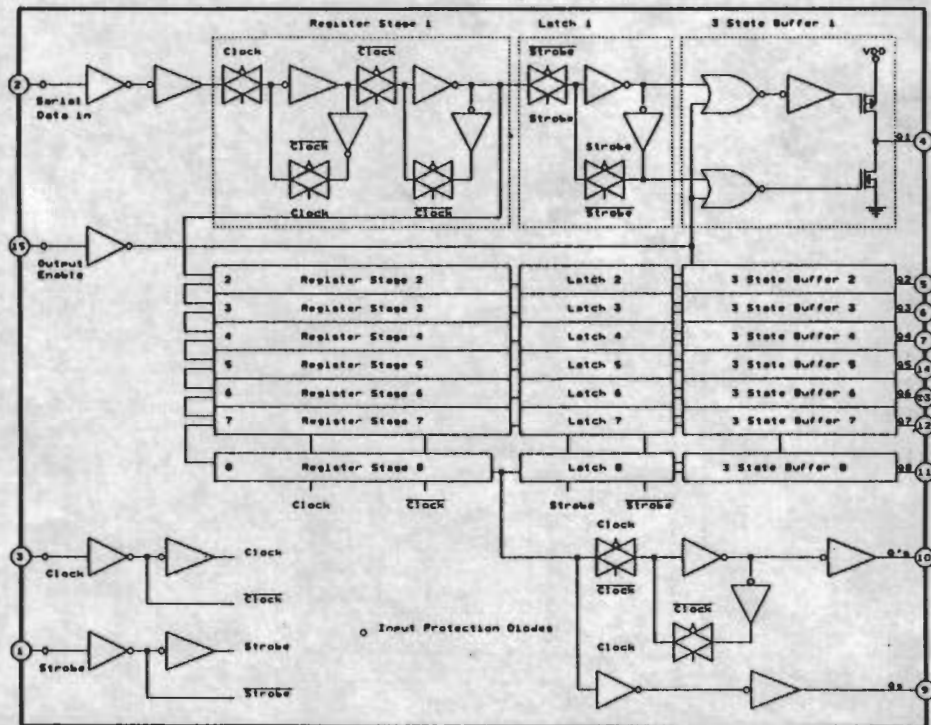
4 x 4 Keyboard Matrix

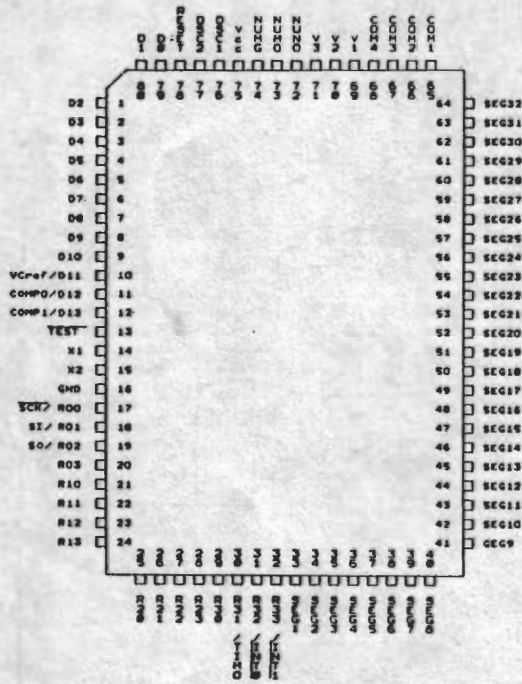


MC145170DR2



MC14094BD

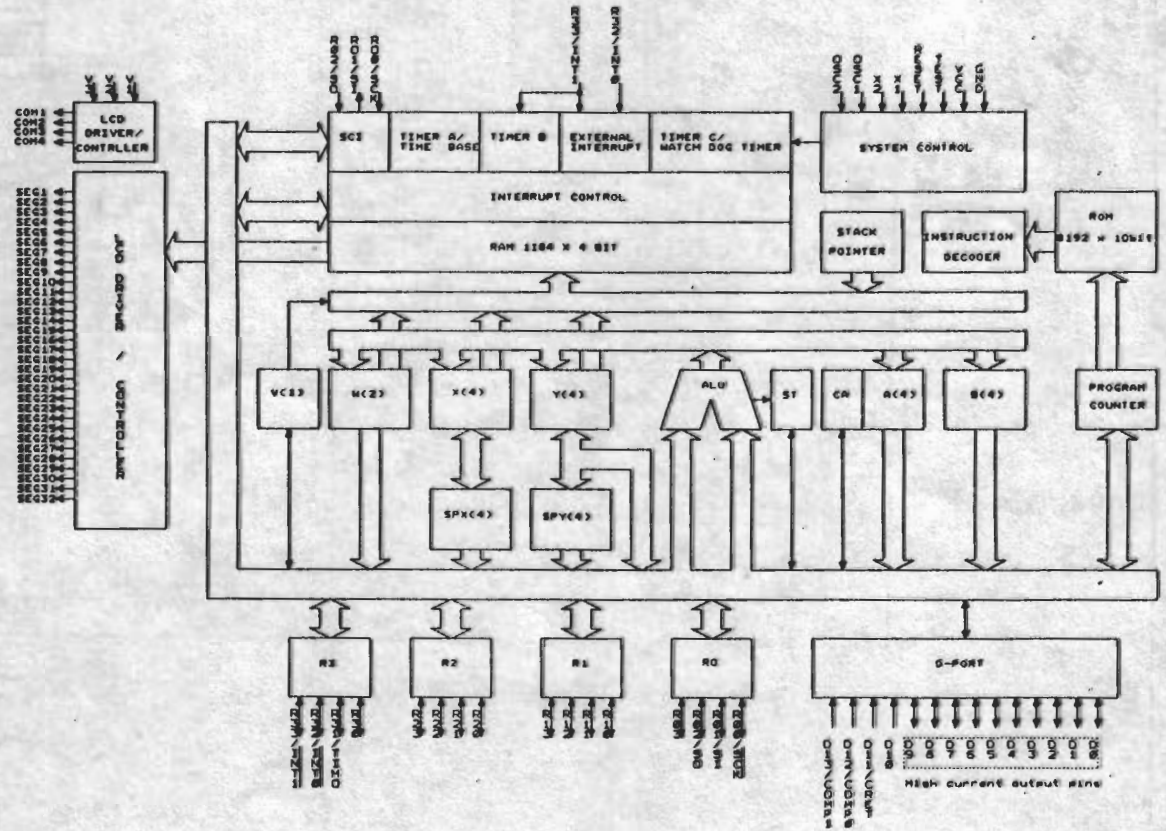




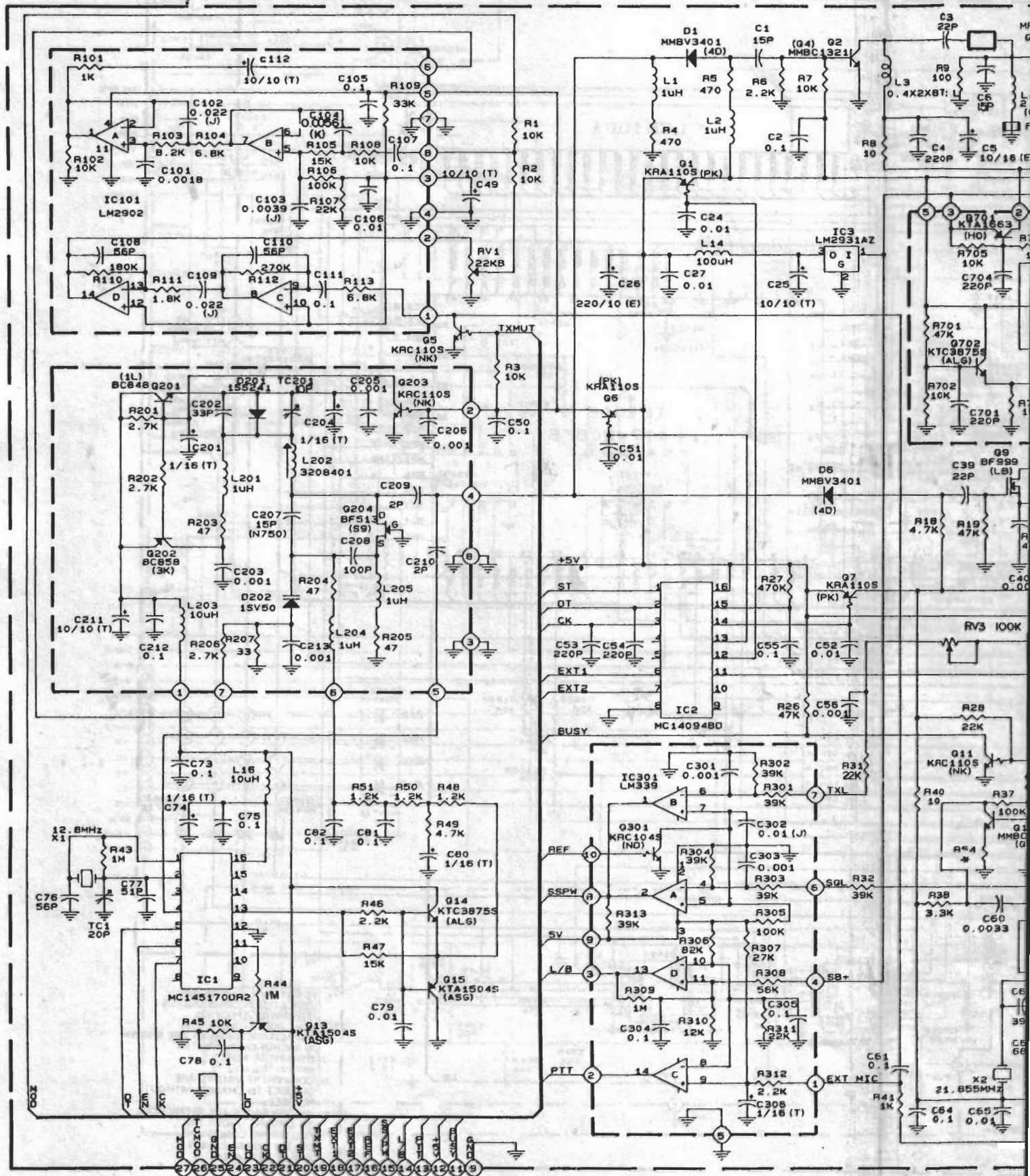
| PIN NO. | PIN NAME | I/O | PIN NO. | PIN NAME | I/O |
|---------|-----------------------|-----|---------|----------|-----|
| 1 | D2 | I/O | 41 | SEG9 | 0 |
| 2 | D3 | I/O | 42 | SEG10 | 0 |
| 3 | D4 | I/O | 43 | SEG11 | 0 |
| 4 | D5 | I/O | 44 | SEG12 | 0 |
| 5 | D6 | I/O | 45 | SEG13 | 0 |
| 6 | D7 | I/O | 46 | SEG14 | 0 |
| 7 | D8 | I/O | 47 | SEG15 | 0 |
| 8 | D9 | I/O | 48 | SEG16 | 0 |
| 9 | D10 | I | 49 | SEG17 | 0 |
| 10 | D11 /V _{ref} | | 50 | SEG18 | 0 |
| 11 | D12 /COMPO | | 51 | SEG19 | 0 |
| 12 | D13 /COMPI | | 52 | SEG20 | 0 |
| 13 | TEST | | 53 | SEG21 | 0 |
| 14 | X1 | | 54 | SEG22 | 0 |
| 15 | X2 | 0 | 55 | SEG23 | 0 |
| 16 | GND | | 56 | SEG24 | 0 |
| 17 | RO0 /SCR | I/O | 57 | SEG25 | 0 |
| 18 | RO1 /SI | I/O | 58 | SEG26 | 0 |
| 19 | RO2 /SO | I/O | 59 | SEG27 | 0 |
| 20 | RO3 | I/O | 60 | SEG28 | 0 |
| 21 | R10 | I/O | 61 | SEG29 | 0 |
| 22 | R11 | I/O | 62 | SEG30 | 0 |
| 23 | R12 | I/O | 63 | SEG31 | 0 |
| 24 | R13 | I/O | 64 | SEG32 | 0 |
| 25 | R20 | I/O | 65 | COM1 | 0 |
| 26 | R21 | I/O | 66 | COM2 | 0 |
| 27 | R22 | I/O | 67 | COM3 | 0 |
| 28 | R23 | I/O | 68 | COM4 | 0 |
| 29 | R30 | I/O | 69 | V1 | |
| 30 | R31 /TRM0 | I/O | 70 | V2 | |
| 31 | R32 /TRM1 | I/O | 71 | V3 | |
| 32 | R33 /TRM2 | I/O | 72 | NUM0 | |
| 33 | SEG1 | 0 | 73 | NUM0 | |
| 34 | SEG2 | 0 | 74 | NUMC | |
| 35 | SEG3 | 0 | 75 | Vcc | |
| 36 | SEG4 | 0 | 76 | OSC1 | I |
| 37 | SEG5 | 0 | 77 | OSC2 | 0 |
| 38 | SEG6 | 0 | 78 | RESET | I |
| 39 | SEG7 | 0 | 79 | D0 | I/O |
| 40 | SEG8 | 0 | 80 | D1 | I/O |

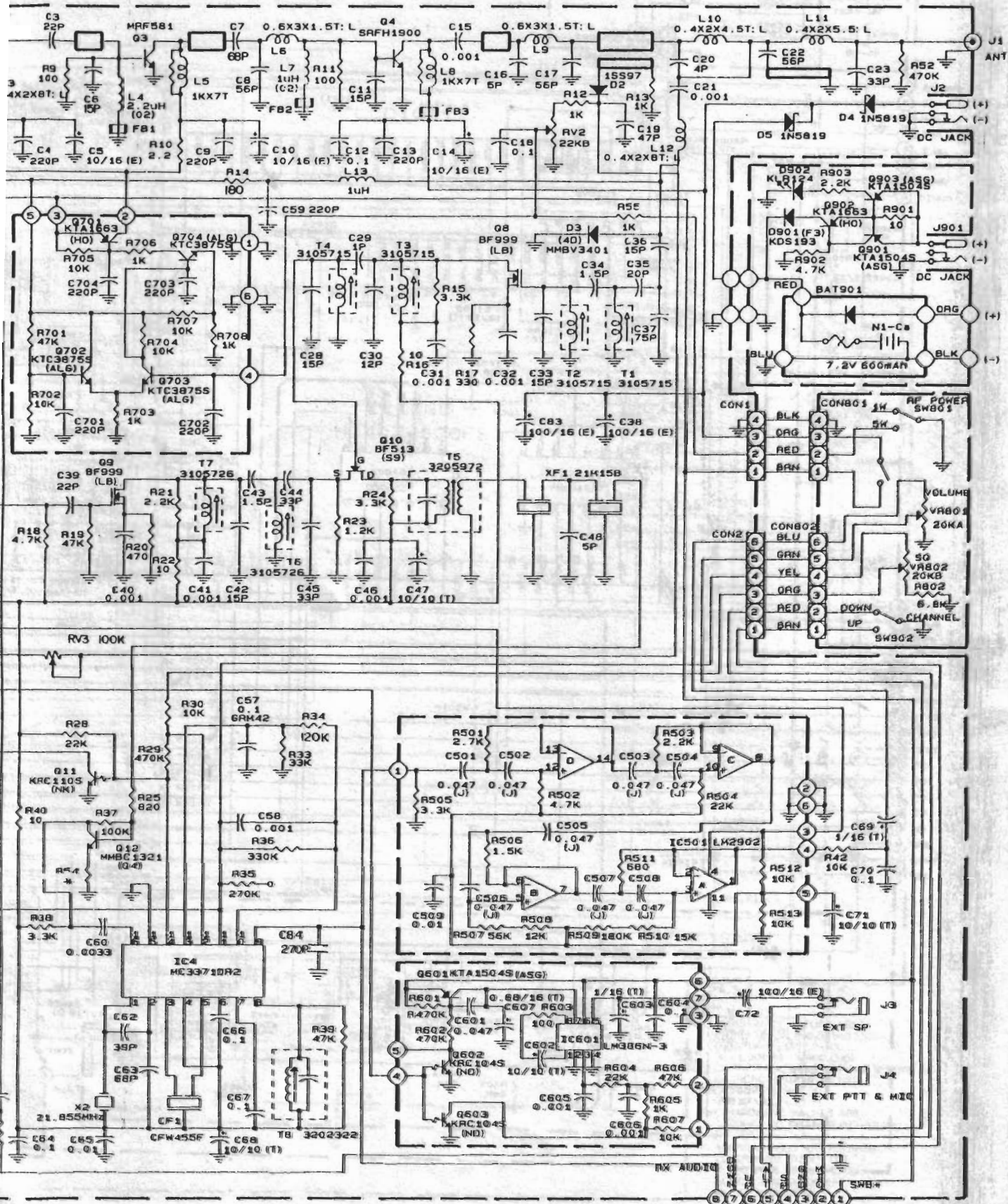
I : INPUT PIN
 O : OUTPUT PIN
 NUM0 : OPEN
 NUMC : GND

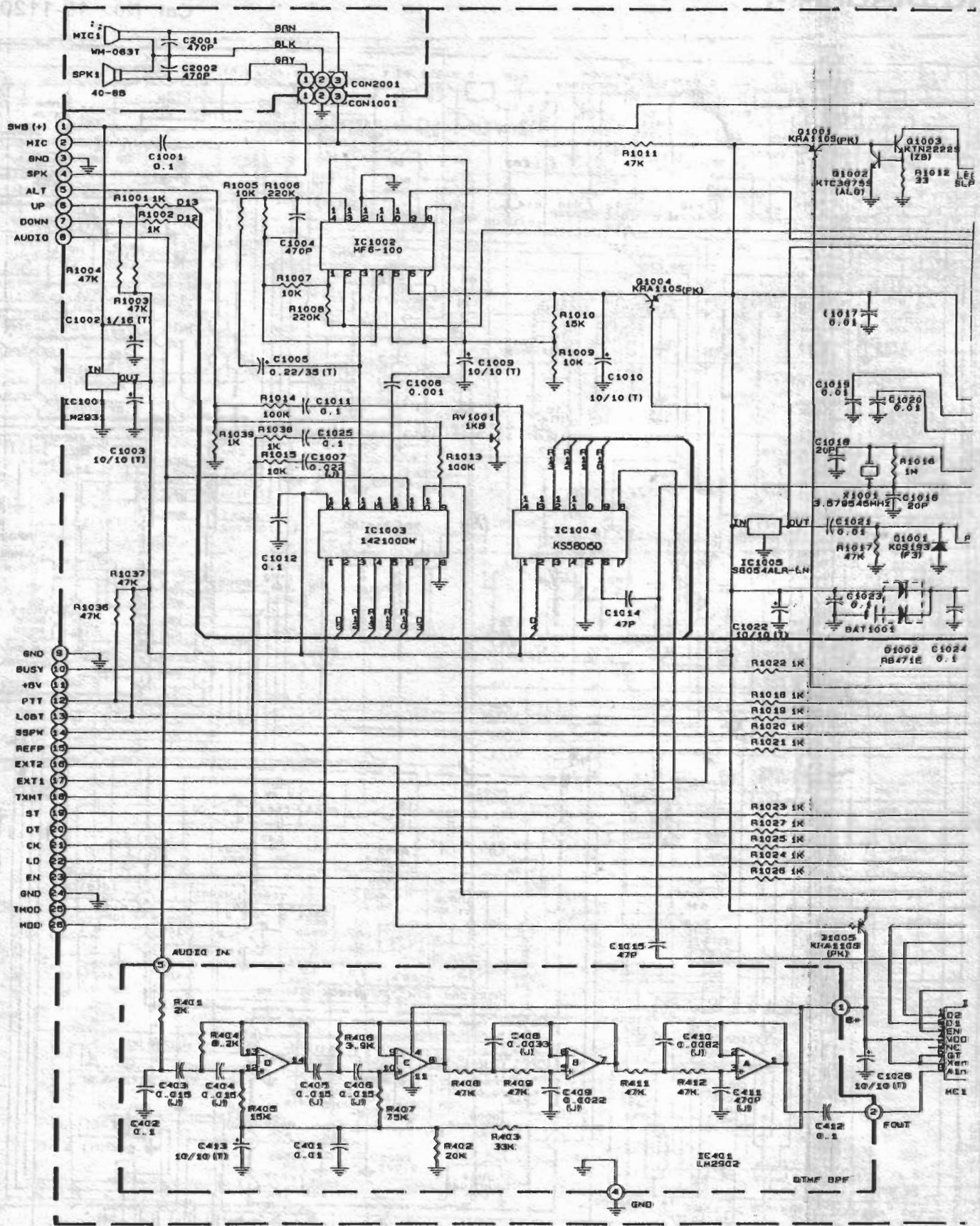
HD404808FS

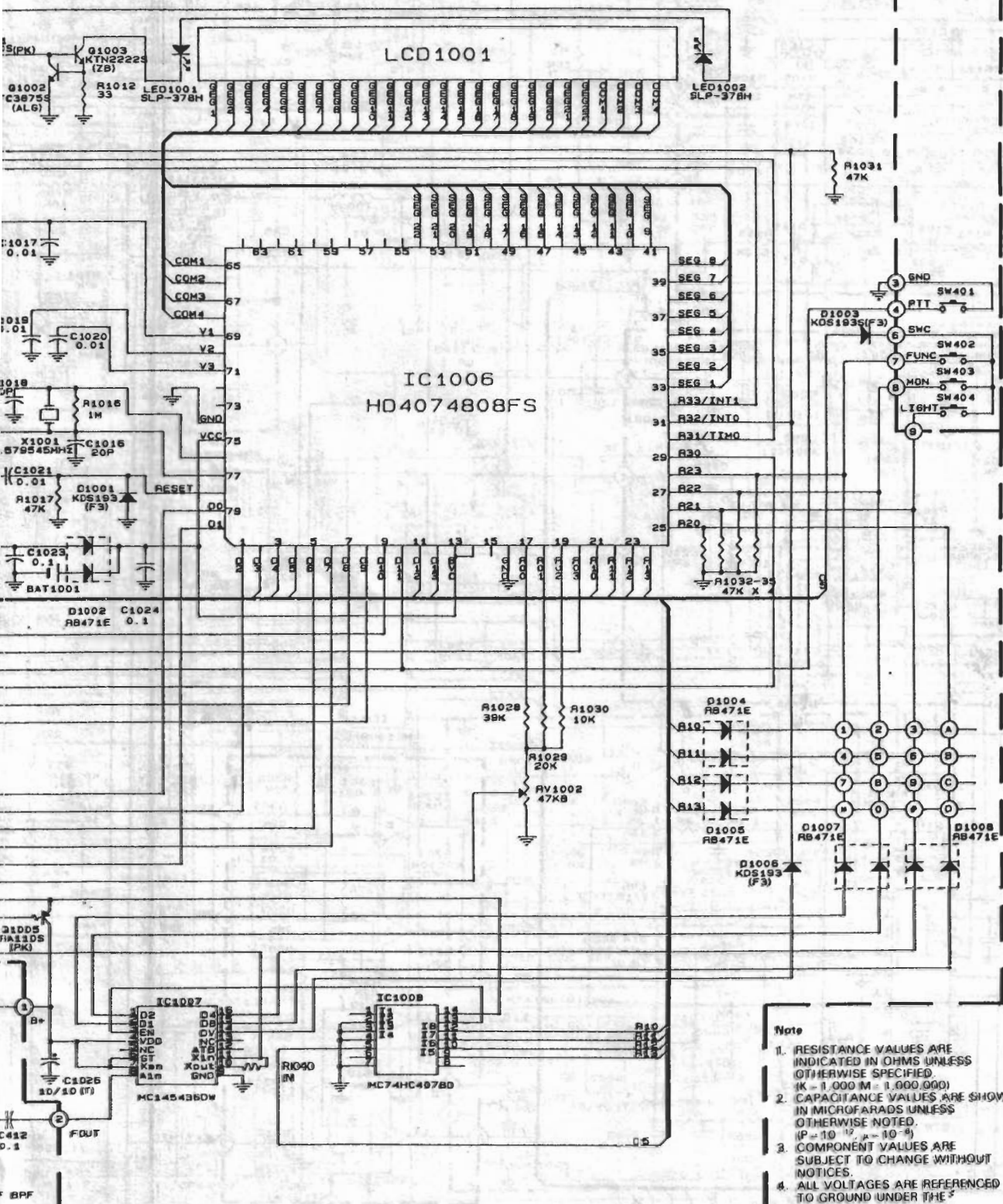


SCHEMATIC DIAG









Note

1. RESISTANCE VALUES ARE INDICATED IN OHMS UNLESS OTHERWISE SPECIFIED (1K = 1,000 Ω = 1,000,000)
2. CAPACITANCE VALUES ARE SHOWN IN MICROFARADS UNLESS OTHERWISE NOTED. (P = 10⁻¹², μ = 10⁻⁶)
3. COMPONENT VALUES ARE SUBJECT TO CHANGE WITHOUT NOTICES.
4. ALL VOLTAGES ARE REFERENCED TO GROUND UNDER THE FOLLOWING CONDITIONS; DC: NO SIGNAL EXCEPT WHERE INDICATED.