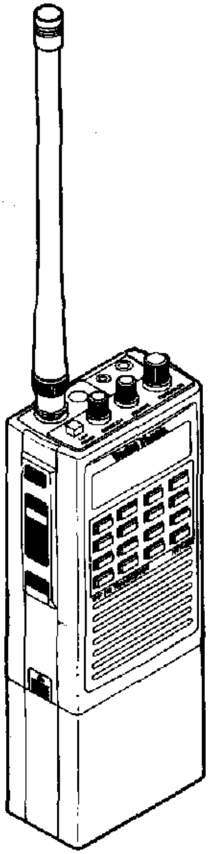
OWNER'S MANUAL

HTX-202
2-METER FM TRANSCEIVER

Please read before using this equipment



Cat. No. 19-1120

Radio Shack®

FEATURES

The Radio Shack HTX-202 Two-Meter Handheld Transceiver offers both the newlylicensed Tech and the experienced amateur some of the most advanced features ever presented in a handheld transceiver. Be sure to read this entire manual to learn about all of your transceiver's capabilities.

Note: You must have a Technician Class or higher Amateur Radio Operator's License and a call sign issued by the FCC to legally transmit using this transceiver. Transmitting without a license carries heavy penalties. Getting a license is easier than ever. See "Introduction to Amateur Radio" for more information.

True FM Modulation—provides a more natural-sounding signal, with high clarity and better performance on packet systems.

16 Frequency Memories—include one calling-frequency memory, three priority-frequency memories, and 12 standard memories.

Individually Programmable Repeater Offsets—let you program a different repeater offset frequency for each memory, and a default repeater offset for manually-tuned frequencies.

Subaudible Tone Transmit and Decode (CTCSS)—let you transmit the subaudible tone required by some repeaters, and also let you set a subaudible tone that your transceiver must receive to open the squelch.

Touch-Tone Page—lets you set a sequence of up to five touch tones your transceiver must receive to sound an alert tone and open the squelch.

16-Digit DTMF Output—lets you transmit all touch tones (0-9, #, *, and A-D).

Dual-Power Transmitter—lets you select between 1-Watt and 6-Watt to preserve battery power.

Programmable Power Saver—extends battery life by setting the receiver to standby when squelched.

Five DTMF Memory Sequences—let you store five touch-tone sequences of up to 15 digits each so that you can quickly transmit the sequences you commonly use to activate repeaters or autopatches, or other stations equipped with touch-tone page.

Multi-Function Scanning—lets you scan standard memories, priority-frequency memories, or a frequency range, and automatically resume scanning when the carrier drops, resume scanning after 10 seconds, or stop scanning when a carrier is detected.

Programmable Frequency Step—lets you set the frequency step for tuning or scanning to 5, 10, 15, 20, 25, 50, or 100 kHz.

CONTENTS

MANUAL CONVENTIONS

Your transceiver's buttons each have two or more functions. The abbreviation for the function is printed on the button, above the button, to the left of the button, or below the button. For functions below or to the left of the button, the function is printed in orange. To make this manual clearer, buttons are referred to by the function being used. For example, the lower right button on the keypad is referred to in different sections as **D**, **CLR**, **VF**, and **M→VFO**.

To activate certain transceiver features you must press **F**(function) plus another button. Such key combinations are printed with a + between the button names. For example, **F+BEEP** means press and hold down **F** while you press **BEEP**.

Also, this manual uses the following text conventions:

Button names are printed in small, bold, capital letters: **BEEP**, **DTMF**, and so on.

Words, symbols, and numbers that appear on the display are printed in a distinctive typeface: 146.940, M-CH, and so on.

INTRODUCTION TO AMATEUR RADIO

We designed your HTX-202 handheld transceiver to be the perfect first radio for anyone entering the exciting world of amateur radio and a great additional transceiver for experienced amateur radio operators. From almost anywhere you will find that your transceiver opens a door to the world! All you need is an Amateur Radio Operator's License, Technician Class or higher, issued by the Federal Communications Commission (FCC). If you do not have a license, you will find that it is easy to get one, and that there is much help available. Here are a few tips to help you get started.

First, go ahead and turn on your transceiver and use the receiver to tune around on the band to hear what is going on. **Do not even think of transmitting until you get your license.** That is very important. Transmitting without a license is a violation of federal law that can lead to severe penalties. Also, ham operators take the FCC rules very seriously and want nothing to do with **bootleggers** — their term for people who operate without a license.

Second, find out if there is a ham radio club in your area. There are thousands of clubs across the country, so there is probably at least one in or near your own community. The people at the Radio Shack store where you bought your transceiver might be able to tell you. If not, and if you do not hear anyone talking about a local club in your area as you tune around the band with your transceiver, write to the American Radio Relay League (ARRL) for information on how to contact their local affiliate. Most clubs welcome newcomers and are glad to help you get your license.

Next, start studying for your license. Do not let the word **study** scare you, because most people can go from knowing absolutely nothing about amateur radio to passing the Novice and Technician written exams in less than a month. The exams test your knowledge of basic radio regulations and elementary radio theory. While Morse code is no longer required for a Technician Class license, we encourage you to learn Morse now, so that you can advance to additional operating privileges. Many clubs teach license classes (a fun and easy way to learn about amateur radio), and there are good books, cassette tapes, computer programs, and many other study aids available. Radio Shack stores sell FCC License Preparation study guides for Novice, Technician, and General Class licenses.

When you are ready to take the test, you do not have to go to an imposing Federal office building in a big city to take the test, because these days the FCC has authorized ham volunteers to give all the exams. The examiners for a Novice license test can be any two ham operators with general or higher class licenses that are at least 18 years old and are not related to you. And, the Novice exam is free. If you pass the Novice exam, you can immediately take the Technician exam. You must pay a small fee to take the Technician exam, and the test must be administered by a three-member Volunteer Examiner Team. You can get a schedule of exam opportunities in your area from the ARRL.

The Technician Class license lets you use the entire range of your HTX-202 to communicate directly with other operators, communicate through repeaters, or connect to a terminal-node controller and use packet to directly send and receive information with a computer.

We have mentioned the ARRL several times. That is because the League is the national organization that represents amateur radio in the United States. The League has more than 150,000 members; most of them are ham operators, but many are ham operators-to-be. Here is the address of ARRL headquarters.

The American Radio Relay League
225 Main Street
Newington, CT 06111

The ARRL staff helped us prepare this section of the owner's manual, and they would be glad to hear from you if you need more information, or if you would like to join!

Amateur radio is a great hobby that has enriched the lives of millions of people all over the world. We take pride in bringing to you the HTX-202 to enrich your life.

POWER SOURCES

You can operate your transceiver from any of the following power sources:

- Rechargeable power pack (supplied with charger)
- Six alkaline AA batteries (using the supplied alkaline pack)
- Vehicle battery power (using an optional adapter)
- AC power (using an optional adapter)

Operating from the Rechargeable Power Pack

You can use the supplied rechargeable power pack to power your transceiver. This power pack provides 7.2 volts, and can operate your transceiver at 2.5 watts (typical power) with the **LOW POWER** button out. As supplied, the power pack is fully discharged. You need to fully charge the pack using the supplied charger before you operate the transceiver from the rechargeable pack. Follow these steps to charge the pack.

1. If the pack is attached to the transceiver, turn off the transceiver. Do not operate the transceiver while you charge the power pack.

   Note: You can remove the power pack from the transceiver to charge it, and operate the transceiver from one of the other power sources.

2. Plug the supplied charger's barrel plug into the **CHARGE** jack on the back of the power pack.
3. Plug the charger into a standard AC outlet. The **CHARGE** indicator lights.

It takes about 10 hours to charge the power pack.

When power is low, **BATT** appears on the display when you press **PTT**.

You can buy extra power packs through your local Radio Shack store.

Note: Nickel-cadmium batteries deliver more power if you occasionally let them completely discharge. To do this, use the transceiver until **BATT** appears on the display when you press PTT. Then,fully charge the batteries. If you do not occasionally do this, the batteries can temporarily lose the ability to deliver full power. Also, to ensure a full charge, be sure the batteries are at room temperature (above 65°F) when you charge them. Cold batteries do not fully charge.

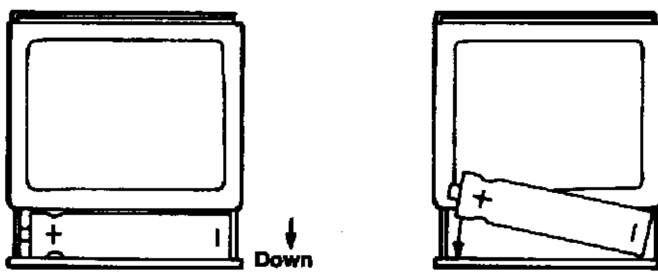
Cautions:

- To prevent permanent nickel-cadmium power loss, never charge the power pack in an area where the temperature is above about 80°F.
- Never use a charger other than the one supplied to charge the power pack. Even chargers with the same voltage and current ratings could permanently damage the transceiver or the power pack. You can order a replacement charger at your local Radio Shack store.

Using Alkaline Batteries

You can operate the transceiver from six AA batteries (not supplied) using the supplied alkaline battery holder. This battery holder supplies 9 volts and can operate your transceiver at 4 watts (typical power) with the LOW POWER button out. Follow these steps to load or replace batteries in the alkaline battery holder.

1. Hold the outer battery holder case and push down on the center of the battery holder, as shown.



2. Remove old batteries, if necessary, and install six fresh AA alkaline batteries, observing correct polarity as indicated by the markings (+ and −) in the battery holder.

3. Press the battery holder into the battery holder case.

When power is low, **BATT** appears when you press **PTT**. Be sure to use six fresh AA alkaline batteries. Never mix different types of batteries, and never mix old and new batteries.

Operating from Vehicle Battery Power

You can operate the transceiver from vehicle battery power using a DC power cord (Radio Shack Cat. No. 270-1533). This cord supplies 13.8 volts (typical) to your transceiver and can operate your transceiver at 6 watts (typical power) with the **LOW POWER** button out. Follow these steps to operate from vehicle battery power.

1. Plug the power cord's barrel plug into the transceiver's **EXT DC** jack.

   Caution: Never plug the power cord into the rechargeable power pack's **CHARGE** jack. Doing so can damage the power pack and the transceiver.

2. Plug the power cord's cigarette-lighter plug into your vehicle's cigarette-lighter socket.

If the transceiver does not operate, remove the power cord's plug from the cigarette-lighter socket and check the socket for debris. Clean the socket, if necessary, and try again.

Operating from AC Power

You can operate the transceiver from AC power using either the 1-amp 12-volt DC adapter (Cat. No. 273-1653) or our regulated 2.5-amp power supply (Cat. No. 22-120). The 2.5-amp power supply lets you operate your transceiver at 5 watts (typical power) with the **LOW POWER** button out and is better isolated from 60Hz noise. The 1-amp adapter connects very quickly and requires no soldering, but only operates your transceiver at about 2 watts with the **LOW POWER** button out.

Follow these steps to power the transceiver from the 1-amp, 12 volt DC adapter.

1. Connect the barrel plug with the tip set to positive.
2. Insert the adapter's barrel plug into the transceiver's **EXT DC** jack.

Caution: Never insert the adaptor's barrel plug into the rechargeable power pack's **CHARGE** jack. Doing so can damage the power pack and the transceiver.

3. Plug the adapter into an AC outlet.

Follow these steps to power the transceiver from the regulated 2.5-amp power supply.

Note: You need the following materials to use the regulated 2.5-amp power supply:

- Power supply (Cat. No. 22-120)
- Two-conductor 18-gauge wire (Cat. No. 278-567)
- DC power connector (Cat. No. 274-1567)
- Soldering iron and solder
- Voltmeter or multimeter

1. Cut the 2-conductor wire to the length power cord you need.
2. Strip about 1/2-inch of insulation from each end of both conductors.
3. Solder one end of the wire to the DC power connector, with the red lead connected to the center terminal, and the black lead connected to the outer casing.
4. Melt a small amount of solder onto the other end of the wire. Then, connect the red lead to the power supply's + terminal and connect the black lead to the power supply's – terminal.
5. Plug in the power supply and turn it on. Use the meter to confirm that you have correctly wired the power connector so that the tip is positive and the outer case is negative.
6. Turn off the power supply and plug the power connector into the transceiver **EXT DC** jack.

   Caution: Never plug the power connector into the rechargeable power pack's **CHARGE** jack. Doing so can damage the power pack and the transceiver.

7. Turn on the power supply.

Backup Battery

Your transceiver uses a lithium battery to keep stored options in memory when you disconnect the transceiver from a power source. This battery should last 3 to 5 years, under normal conditions. When the transceiver frequently displays ER1, the backup battery needs to be replaced.

Note: To clear the error, reset the transceiver. See "Resetting the Transceiver."

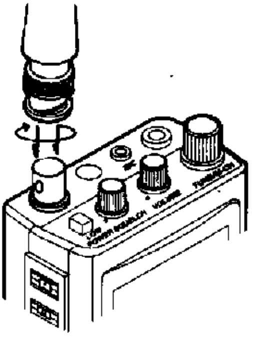
The backup battery is not user-serviceable. Take the transceiver to your local Radio Shack store to have the battery replaced by a Radio Shack repair center.

This product contains a rechargeable nickel cadmium (Lead acid) battery. At the end of the battery's useful life, it must be recycled or disposed of properly. Contact your local, county, or state hazardous waste management authorities for information on recycling or disposal programs in your area. Some options that might be available are: Municipal curb-side collection, drop-off boxes at retailers, recycling collection centers, and mail-back programs.

CONNECTING THE ANTENNA

Your transceiver comes with a flexible antenna. You must connect an antenna to your transceiver before you transmit. The transceiver's BNC antenna connector makes it easy to connect other types of antennas. Radio Shack stores sell a 5/8-wave magnetic mount antenna for mobile operation (Cat. No. 19-210), a discone antenna (Cat. No. 20-013), and a center-loaded telescoping whip antenna (Cat. No. 20-006) that you can also use with your transceiver.

To use the supplied antenna, slip the antenna's connector over the BNC jack and twist the antenna to lock it in place.

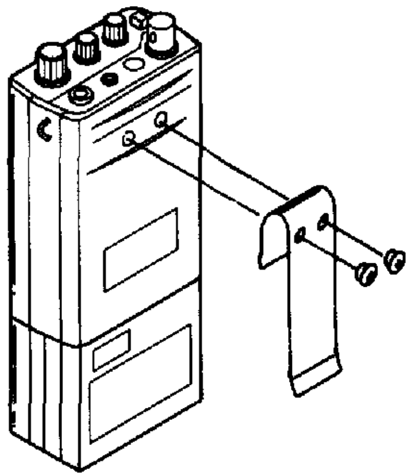


To use an external antenna, if necessary, attach the appropriate connector adapter to the end of the antenna cable. Then, slip the connector over the BNC jack and twist the connector to lock it in place.

Warning: When installing or removing an outdoor antenna, use extreme caution. If the antenna starts to fall, let it go! It could contact overhead power lines. If the antenna touches the power line, contact with the antenna, mast, cable, or guy wires can cause electrocution and death! Call the power company to remove the antenna. Do not attempt to do so yourself.

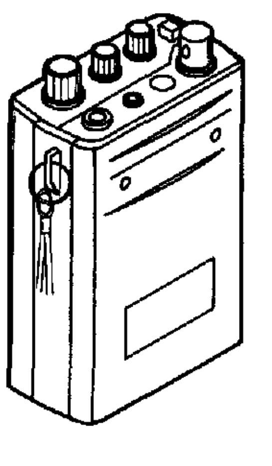
ATTACHING THE BELT CLIP

You can attach the provided belt clip to your transceiver. Use the supplied screws as shown.



ATTACHING THE HAND STRAP

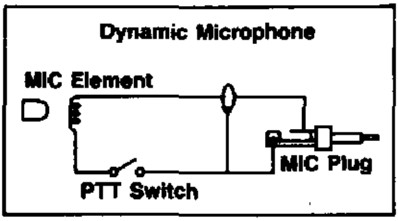
Loop the supplied hand strap's key ring through the hand strap tab, as shown.

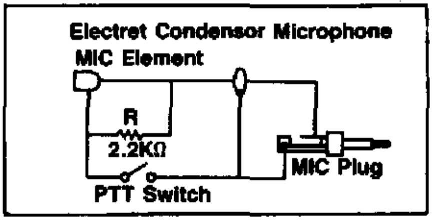


USING AN EXTERNAL MICROPHONE

You can use an external microphone with your transceiver. When you connect an external microphone, the internal microphone does not work, but the internal PTT is not affected. If your microphone has a 3/32-inch (2.5 mm) submini plug, plug the microphone cable into the transceiver's MIC jack.

See the following two diagrams for specific microphone connections.





USING AN EXTERNAL SPEAKER

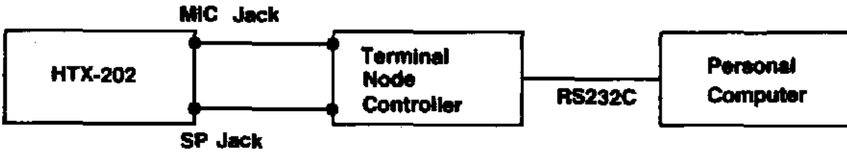
In a noisy area, an external speaker, positioned in the right place, might provide more comfortable listening. Radio Shack stores sell an extension speaker (Cat. No. 21-549) and an amplified communications extension speaker (21-541). Plug the speaker cable's 1/8-inch (3.5mm) mini plug into the transceiver's SP jack. This disconnects the internal speaker.

For the most efficient operation when you carry the transceiver on your belt, connect a combination speaker/microphone (such as Cat. No. 19-310) to your transceiver and hang the mic/speaker on your collar.

If your vehicle has a cassette player, you can easily connect your transceiver to your vehicle's audio system using a CD-to-cassette adapter (Cat. No. 12-1951) and a mono-to-stereo audio plug (Cat. No. 274-368). Simply insert the adapter in your vehicle's cassette player, connect the adapter's plug to the mono-to-stereo plug, insert the plug in the transceiver's SP jack, and turn on your cassette player.

USING THE TRANSCEIVER WITH PACKET RADIO

You can connect your transceiver directly to a packet radio terminal node controller. See the following diagram for a suggested connection.

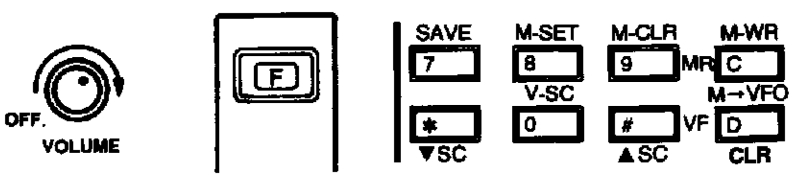


RESETTING THE TRANSCEIVER

When you first use the transceiver, if the transceiver displays ER1, or if you ever want to reset the transceiver's options to the factory defaults and clear all memories, follow these steps.

Warning: This procedure clears all stored information from the transceiver.

1. Turn off the transceiver.
2. Press and hold down **F+CLR**. Then, turn on the transceiver.



USING THE LIGHT

Press L on the side of the transceiver to turn to the display light for about 5 seconds. To turn off the light sooner, press L again. If you want the light to stay turned on, press F+L at the same time. The light stays on until you press **L** or turn off the transceiver.

SETTING SQUELCH AND VOLUME

Rotate **VOLUME** clockwise and **SQUELCH** counterclockwise until you hear a hissing sound. Then, slowly rotate **SQUELCH** clockwise until the noise stops. Leave **VOLUME** set to a comfortable level.

If the transceiver picks up unwanted weak transmissions, rotate **SQUELCH** clockwise to decrease the transceiver's sensitivity to signals.

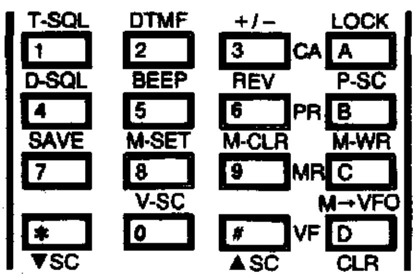
SELECTING A FREQUENCY

You can use any of three methods to select a frequency to communicate on.

- Direct entry
- Tune control
- Scanning for frequencies

Tuning Using Direct Entry

Your transceiver transmits and receives on frequencies between 144.000 and 148.000 MHz. To quickly tune to a frequency, enter the frequency using the keypad.



1. Turn on the transceiver.
2. Press **VF**.
3. Use the keypad to enter the last four digits of the frequency. For example, to enter 146.940, press 6940.

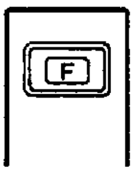
Notes:

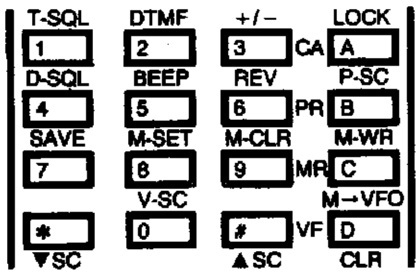
- If you make a mistake, press **CLR** and repeat this step.
- The transceiver rounds the last digit down to 0 or 5.

Tuning Using the Tune Control

You can quickly tune to a nearby frequency by rotating **TUNE** on top of the transceiver.

1. Turn on the transceiver.
2. Press **VF**.
3. Rotate **TUNE** counterclockwise to tune down or clockwise to **TUNE** up.The transceiver tunes up or down one frequency step per click. To change the frequency step, see "Setting the Frequency Step Rate."





Scanning for Active Frequencies

You can search for activity on a frequency by pressing and holding down **▲SC** or **▼SC** for at least 1 second. The transceiver begins to scan up or down the full frequency range, and stops on active frequencies. To scan only a selected frequency range press **F** + **▲SC** or **F** + **▼SC**. See "Setting the Scan Options" to see how to change the scanning range, the frequency step, the scan resume condition, and the scan delay time. The following are the factory presets for these options.

Frequency Step :	15KHz
Scan Resume Condition :	Resumes scanning in 10 seconds, regardless of absence or presence of carrier.
Scan Delay :	Not activated.
Scan Limits :	144 MHz to 148 MHz

To stop scanning, press **▼SC**, **▲SC**, **CA**, **PR**, **MR**, **VF**, or turn off the transceiver.

Scanning for a Vacant Frequency

In some areas where the 2-meter band is being used heavily, you might have trouble quickly finding a frequency not being used. To quickly scan for a vacant frequency, press **F + V - SC**. The transceiver scans up or down from the current-frequency to the first unused frequency. To change the vacant scan direction, see "Setting the Vacant Scan Direction."

RECEIVING TRANSMISSIONS

To receive transmissions, turn on the transceiver, adjust the volume and squelch, and tune to a frequency.

TRANSMITTING

There are two basic types of communication you can use with this transceiver. These types are sometimes referred to as **simplex** and **duplex**. With simplex transmissions, you transmit and receive on the same frequency. With duplex transmission, you transmit on one frequency and receive on another. Duplex transmission is the communications type you use when you communicate using a repeater. You transmit to the repeater on one frequency (the input frequency), and the repeater retransmits the signal at a different frequency (the output frequency).

Caution: Do not transmit if you do not have a Technician Class or higher license issued by the FCC. Doing so is illegal.

Follow these steps to communicate using simplex communications.

1. Turn on the transceiver.
2. Select the desired frequency.
3. If + or − is on the display, repeatedly press **F + +/−** until neither symbol appears.
4. Press **LOW POWER** so that the button is down. In this position, your transceiver transmits at about 1 watt.
5. Begin communications.

If the other party advises that you need to improve your signal (QRO), press **LOW POWER** so that the button is up. In this position, your transceiver transmits at the highest power it can, depending on the power source. See "Power Sources" or "Specifications" for these power levels. Remember to switch back to low power whenever possible, to comply with the FCC rules that require you to use the minimum power necessary to maintain communications.

Follow these steps to communicate using duplex communications.

1. Turn on the transceiver.
2. Tune to the desired receive (output) frequency.
3. If the transmit (input) frequency is 600 kHz **above** the receive frequency, press **F+ +/–** so that + apears in the display. If the transmit frequency is 600 kHz **below** the receive frequency, press **F+ +/–** so that – appears on the display. If the frequency separation is not 600 kHz, either set a new default frequency separation or store the frequency pair in one of the scanner's memories (See "Using Memory Channels" and "Setting the Duplex Separation").

LOCKING THE KEYPAD

To lock the transceiver's keypad so that you do not accidentally change a setting, press **F+LOCK**. **LOCK** appears on the display. This locks all front-panel buttons and the tune control. The **PTT**, **VOLUME**, and **SQUELCH** still operate. To release the lock, press **F+LOCK** again.

SETTING THE KEY ENTRY BEEP

Each time you press a key, the transceiver sounds a beep. To turn off the beep, press **F+BEEP**. The key beep does not sound for this or subsequent key presses. To turn on the key beep, press **F+BEEP** again.

REVERSING THE OFFSET

To reverse the transmit and receive frequencies when you are operating duplex, press **F+REV**. For example, if you are set to 146.94 with a – offset pressing **F+REV** makes the transceiver receive on 146.14 and transmit on 146.94.

USING MEMORY CHANNELS

Your transceiver has 16 memory channels in three groups.

- One calling-frequency memory
- Three priority-frequency memories
- 12 standard memories

Using the Calling-Frequency Memory

The calling-frequency memory provides a single memory that you can quickly jump to at any time. Follow these steps to save a frequency in the calling-frequency memory.

1. Press **VF**.
2. Tune to the frequency you want to save.
3. Press **CA**.
4. If the frequency is for a repeater that requires subaudible tone access or if you want to use incoming subaudible tone squelch with frequency, press **F + T-SQL** so that **T-SQL** appears on the display.

   Note: If you turn on T-SQL you must correctly set both the transmit subaudible tone and the receive subaudible tone as described in steps 8 through 11.
5. Press and hold down **F + M − WR** for at least 1 second.

   The transceiver stores the tuned frequency in the calling-frequency memory, plus the frequency separation (for duplex operation) and subaudible transmit and receive tones. For more information about subaudible tones, see "Using Subaudible Tone Squelch (CTCSS)."

6. If you want to set a different transmit frequency or change the subaudible tones, press **F+M-SET**. The transceiver displays **TF** followed by the transmit frequency.
7. Rotate **TUNE** to change the transmit frequency.
8. To set a transmit subaudible tone frequency, press **▼SC**. The transceiver displays **TC** followed by the transmit subaudible tone frequency.
9. Rotate **TUNE** to set the transmit subaudible tone frequency.

   Note: If you do not want to transmit a subaudible tone, rotate **TUNE** to set the transmit subaudible tone to **OFF**.

10. To set a receive subaudible tone frequency, press **▼SC**. The transceiver displays **RC** followed by the receive subaudible tone frequency.
11. Rotate **TUNE** to set the receive subaudible tone frequency.

    Note: If you do not want to use incoming tone squelch, rotate **TUNE** to set the receive subaudible tone to **OFF**. Otherwise, you do not hear transmissions unless the subaudible tone is present.

12. Press **PTT** to save the settings and return to the calling-frequency memory display.

To use the calling frequency memory, press **CA** at any time. The transceiver immediately goes to the calling frequency and sets the transmit frequency, subaudible tones, and tone squelch to the settings you programmed. To return to the previous settings, press **CA** again.

Using the Priority-Frequency Memories

The transceiver has three priority-frequency memories. The transceiver can periodically scan these frequencies during manual, calling-frequency memory, or standard memory operation. Follow these steps to store a frequency in the priority-frequency memories.

1. Press **VF** and tune to the frequency you want to save.
2. Press **F** and rotate **TUNE** until either **P1**, **P2**, or **P3** appears to the left of the tuned frequency.

3. If the frequency is for a repeater that requires subaudible tone access or if you want to use incoming subaudible tone squelch with this frequency, press **F + T-SQL** so that **T-SQL** appears on the display.
4. Press **F + M – WR** for at least 1 second to store the tuned frequency in the selected priority-frequency memory.
5. To change the frequency separation or subaudible tones, press **PR** and rotate **TUNE** to select the priority-frequency memory you want to change. Then, refer to steps 6 through 12 under "Using the Calling-Frequency Memory." Each priority frequency memory can have different settings.

To set the transceiver to a priority frequency, press **PR**. Then rotate **TUNE**, press **▲SC**, **▼SC**, 1, 2, or 3 to select one of the three memories.

To have the scanner check the priority-frequency memories for activity, press **VF**. Then, press **F+P–SC** for at least 1 second. The transceiver checks the priority-frequency memories every 4 seconds. To change the priority scan time, see "Setting the Priority Scan Time."

To continuously scan the three priority frequency memories, press **PR**. Then, press and hold down **▲SC** or **▼SC** at least 1 second.

Note: You must store more than one priority frequency in memory to continuously scan priority-frequency memories.

Using the Standard Memories

Your transceiver has 12 standard memories into which you can store frequently-accessed frequencies for quick access. Follow these steps to store frequencies in standard memories.

1. Press **VF** and tune to a frequency you want to store.

2. Press **F** and rotate **TUNE** until the memory number to the left of the frequency display shows the standard memory you want to store into.

3. Press **F+M−WR** for at least 1 second to store the tuned frequency into the selected standard memory.

4. To change the frequency separation or subaudible tones, press **MR** and rotate **TUNE** to select the standard memory you want to change. Then, refer to steps 6 through 12 under "Using the Calling-Frequency Memory. "Each standard memory can have different settings.

To set the transceiver to a standard memory, press **MR**. Then, rotate **TUNE** or press **▲SC** or **▼SC** to select one of the 12 memories.

To continuously scan standard memories, press **MR.** Then, press and hold down **▲SC** or **▼SC** for at least 1 second.

Note: The transceiver stops scanning according to the scan options you have set. See "Setting the Scan Options" for more information.

Clearing Memories

Follow these steps to clear a memory.

1 Press **PR** or **MR** and select the memory you want to clear.

2. Press **F + M − CLR** to clear the settings stored in the current memory.

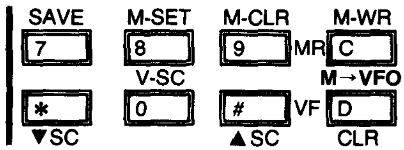
Note: You cannot clear Standard Memory 1 or the calling-frequency memory. You can only change the memory settings for these memories.

Moving a Memory Channel to the Manual Mode

Follow these steps to quickly move a memory channel to the manual (**VF**) mode.

1. Select the memory channel.

2. Press **F + M→VFO.**

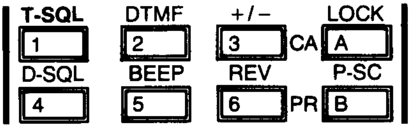


All settings for the selected memory move to the **VF** mode.

REVIEWING PROGRAMMED OPTIONS

Follow these steps to view the transmit frequency and the subaudible transmit and receive tone settings for a memory or the tuned **VF** frequency.

1. Press **CA, PR, MR,** or **VF** and select the memory or frequency you want to check.
2. If you want to check the subaudible tone settings, press **F + T – SQL** so that **T-SQL** appears on the display.



3. Press M (located above **PTT**). The transceiver's squelch opens, and the display shows the transmit frequency for about 1 second, followed by the subaudible transmit tone and the subaudible receive tone.

UNDERSTANDING THE CONFIGURATION MENU

Your transceiver has a configuration menu that lets you modify operation settings. Each of the following sections explains how and when to use each configuration setting. Follow these steps to turn on the configuration menu and select options.

1. Press **VF**.
2. Press **F + M – SET**. The first menu item appears.
3. Press **▼SC** or **▲SC** to step down or up through the menu items. Rotate **TUNE** to change the setting for any menu item.
4. Press **PTT** to exit the configuration menu and save all settings.

The configuration menu appears in the following order:

Code	Factory Default	Explanation
oS	**0.600**	Duplex separation (offset)
tc	**oFF**	Transmit subaudible tone
rc	**oFF**	Receive subaudible tone
Sr	**15**	Frequency step
Sc	**ti**	Scan resume
Sd	**2.0**	Scan delay time
S1	**144.000**	Lower scan range limit
S2	**148.000**	Upper scan range limit
ud	**dn**	Vacant channel scan direction
PS	**1-16**	Power save duty cycle
tE	**oFF**	Transmit inhibit
to	**oFF**	Transmit time-out
Lb	**4**	Priority-frequency channel lookback time
Ar	**oFF**	Touch-tone auto-reply

See the following sections for complete information regarding these functions.

SETTING THE DUPLEX SEPARATION DEFAULT

The duplex separation default (offset) controls the offset between the transmit frequency and the receive frequency when you use the transceiver in duplex mode, as with a repeater. Typically, on the 2-meter band, repeaters receive at a frequency 600 kHz lower or higher than they retransmit (repeat) on. For example, if a repeater's input frequency is 146.340 MHz, its output frequency is 146.940 MHz. The following is a list of the most commonly used repeater pairs.

Input Frequency	Output Frequency
146.07 MHz	146.67 MHz
146.13 MHz	146.73 MHz
146.16 MHz	146.76 MHz
146.22 MHz	146.82 MHz
146.25 MHz	146.85 MHz
146.28 MHz	146.88 MHz
146.31 MHz	146.91 MHz
146.34 MHz	146.94 MHz
146.37 MHz	146.97 MHz
146.40 MHz	147.00 MHz

To operate with a repeater, you must transmit on the repeater's input frequency and receive on the repeater's output frequency. If you frequently use a repeater that does not have a 600 kHz offset, we recommend you program the repeater frequency into one of the transceiver's memories. You can override the default offset for each memory.

To change the default offset, follow the steps in "Understanding the Configuration Menu" to display the **oS** menu item, and rotate **TUNE** to change the offset. The transceiver lets you set the offset to be in the range from 0 MHz to 4 MHz in steps as set by the frequency step option.

USING SUBAUDIBLE TONE SQUELCH (CTCSS)

Some repeaters require that you transmit a subaudible tone to key-up the repeater. You can set your transceiver to transmit any of the 38 standard subaudible tones. You can also limit incoming calls by setting your transceiver to open the squelch only when someone transmits a subaudible tone you set.

tc oFF	rc oFF

To set a subaudible transmit tone, follow the steps in "Understanding Configuration Menu" to display **tc**. Then, rotate **TUNE** to select the subaudible tone. If you do not want to transmit a subaudible tone, rotate **TUNE** to select **OFF**.

To set a subaudible receive tone, follow the steps in "Understanding the Configuration Menu" to display **rc**. Then, rotate **TUNE** to select the subaudible tone. If you do not want to use the receive subaudible tone squelch, but are using transmit subaudible tone to activate a repeater, rotate **TUNE** to select **OFF**. Otherwise, you only hear transmissions that have the correct subaudible tone when you activate tone squelch.

To turn on the subaudible tone feature, press **F + T – SQL**. When you transmit, the transceiver includes the subaudible tone in the signal. To receive, the incoming signal must have the correct subaudible tone. You can override the default subaudible tones for any memory.

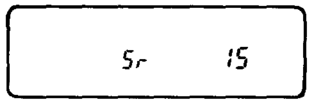
Code	Freq.(Hz)	Code	Freq.(Hz)	Code	Freq.(Hz)	Code	Freq.(Hz)	Code	Freq.(Hz)
XZ	67.0	ZZ	91.5	3Z	123.0	5B	162.2	M3	218.1
XA	71.9	ZA	94.8	3A	127.3	6Z	167.9	M4	225.7
WA	74.4	1Z	100.0	3B	131.8	6A	173.8	M5	233.6
XB	77.0	1A	103.5	4Z	136.5	6B	179.9	M6	241.8
WB	79.7	1B	107.2	4A	141.3	7Z	186.2	M7	250.3
YZ	82.5	2E	110.9	4B	146.2	7A	192.8		
YA	85.4	2A	114.8	5Z	151.4	M1	203.5		
YB	88.5	2B	118.8	5A	156.7	M2	210.7		

SETTING THE SCAN OPTIONS

Several configuration menu items control how your transceiver operates when you scan frequencies or memories. The following sections describe how to set the frequency step rate, the scan resume condition, the scan delay duration, and the scan limits.

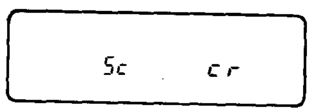
Setting the Frequency Step Rate

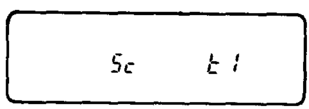
The frequency step rate affects the scanning mode, the **TUNE** control, and **▲SC** or **▼SC** tuning. The factory default for the frequency step is 15kHz. Each time you rotate **TUNE** one click or press or **▼SC** or **▲SC** the frequency changes by 15 kHz. When scanning, the transceiver scans up or down 15 kHz per step. To change the frequency step rate, follow the steps in "Understanding the Configuration Menu" to display the **Sr** menu item, and rotate **TUNE** to change the frequency step rate. You can set the step rate to 5, 10, 15, 20, 25, 50, or 100 kHz.

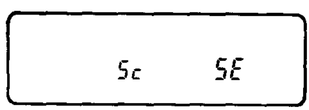


Setting the Scan Resume Condition

When you have set the transceiver to scan either standard memories or VF mode, the transceiver stops whenever it encounters a signal strong enough to break squelch. At the factory setting, the transceiver resumes scanning in 10 seconds, regardless of the presence of a continued signal. You can set the scan resume configuration item to one of the following.







ti Resumes scanning in 10 seconds

cr Resumes scanning after the carrier drops and the scan delay expires (See "Setting the Scan Delay.")

SE Does not resume scanning

To change the scan resume condition, follow the steps in "Understanding the Configuration Menu" to display **Sc**. Then, rotate **TUNE** to select the scan resume condition.

Note: The scan resume option does not affect priority scan. Priority scan always resumes scanning after the carrier drops.

Setting the Scan Delay Duration

When you set the scan resume condition to **cr** (carrier), the transceiver resumes scanning after the carrier drops. The scan delay option lets you set the transceiver to pause before resuming, so you can hear any reply. The factory default for this option is 2 seconds.

To change the scan delay duration, follow the steps in "Understanding the Configuration Menu" to display **Sd**. Then, rotate **TUNE** to select the scan delay duration. You can set the delay to 0.5, 1, 2, or 4 seconds.

Note: The scan delay option also affects priority scan.

Setting the Scan Limits

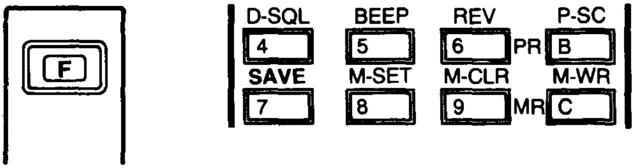
When you press **F** + **▼SC** or **F** + **▲SC** the transceiver scans only those frequencies within a range you set with the scan limit options. To set the scan limits, follow the steps in "Understanding the Configuration Menu" to display **S1**. Use either **TUNE** or the key pad to enter one of the frequency limits. Then, press **▼SC** to display **S2** and enter the other frequency limit. You can enter the higher frequency as either limit.

Setting the Vacant Scan Direction

The transceiver's factory default for vacant scan is to scan down until it finds an unused frequency. To change the vacant scan direction, follow the steps in "Understanding the Configuration Menu" to display **ud**. Then, rotate **TUNE** to select either **UP** or **DN**.

USING THE POWER-SAVE FEATURE

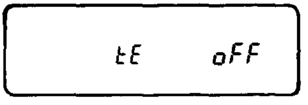
To set the transceiver to save power press **F + SAVE** so that **SAVE** appears on the display. In the power-save mode, the transceiver turns on the receiver for about 32 milliseconds to check for any activity, and then turns off the receiver for the time you set with the power-save configuration setting. The factory default for this setting is to use only 1/16 the normal power. To change the power save setting, follow the steps in "Understanding the Configuration Menu" to display **PS**. Then, rotate **TUNE** to select the power save setting. You can set the power-save setting to **1-2**, **1-4**, **1-8**, or **1-16** (1/2, 1/4, 1/8, or 1/16 normal power usage).



Press **F + SAVE** again to turn off power save. Power save temporarily turns off while scanning.

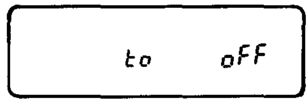
PREVENTING TRANSMISSIONS

To prevent any transmissions using the transceiver, turn on the transmit inhibit function. To turn on this function, follow the steps in "Understanding the Configuration Menu" to display **tE**. Then, rotate **TUNE** to select **ON**. To enable transmissions, set this option to **OFF**.



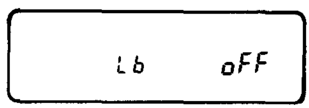
LIMITING TRANSMISSION DURATION

When you communicate on the 2-meter band, you should keep your transmissions as brief as possible. Most repeaters have built-in timers that limit single transmissions to 3 minutes or less. You can set the transceiver to stop transmitting and sound a beep if you exceed a set time limit with a single transmission. To set a transmit limit, follow the steps in "Understanding the Configuration Menu" to display **to**. Then, rotate **TUNE** to select **OFF 30**, **60**, or **120** seconds.



SETTING THE PRIORITY SCAN TIME

When you turn on priority scan, the transceiver checks the programmed priority-frequency memories periodically to see if there is any activity. As factory set, the transceiver checks the priority-frequency memories every 4 seconds. To change the priority scan time, follow the steps in "Understanding the Configuration Menu" to display **Lb**. Then, rotate **TUNE** to select 4, 8 12, or 16 seconds.



USING TOUCH-TONE FEATURES

Your transceiver has a built-in 16-key touch-tone encoder. You can manually send touch tones, or send the tones from one of five DTMF memories. You can also set your transceiver so that it is silent until it receives a specific sequence of touch tones.

Manually Sending Touch Tones

Some repeaters require you to enter a touch-tone code to key-up the repeater. Also, some repeaters have autopatch devices that let you make telephone calls through the repeater. To manually send the required tones, press and hold down **PTT**. Then, enter the touch-tone digits.

Notes:

- You must press **D** twice to send the D digit.
- If the auto-reply feature is turned off, you can release **PTT** after you enter the first digit. The transceiver continues to accept and transmit the touch-tone signals until you pause at least 1 second.

Storing a DTMF Memory Sequence

You can store frequently-used touch-tone sequences in the transceiver's five DTMF memories. Each memory can hold up to 15 digits. Follow these steps to store touch-tone sequences.

1. Press and hold down **F+DTMF** for at least 1 second. The display changes to show the first DTMF memory.
2. Press **D**. Then, press a digit from **1-5** to select one of the DTMF memories.
3. Enter the touch-tone sequence. If the sequence is less than 15 digits, press **D**, then press a digit from **1** to **5** to select a different DTMF memory or press **PTT** to exit the DTMF memory store mode.

Note: To enter a D, press **D** twice.

Transmitting a DTMF Memory Sequence

To send a DTMF memory sequence, press and hold down **PTT**. Then, press **D** followed by the DTMF memory number you want to transmit (1-5). The transceiver transmits the tones.

The transceiver has two DTMF memory sequence transmit speeds. To switch between fast and slow, press and hold down **PTT**. Press **D**. Then, press **O**.

Note: If the auto-reply feature is turned off, you can release **PTT** after you press **D**. Enter the DTMF memory number within 1.5 seconds.

Using DTMF Squelch for Paging

The DTMF squelch feature lets you set your transceiver to release the squelch only if it receives a specific touch-tone sequence. Follow these steps to set the touch-tone sequence.

1. Press **F + D − SQL** for at least 1 second.

   The transceiver displays the previous sequence or — if you have never programmed a sequence.

2. Enter the sequence (up to five digits).

3. Press **PTT** to save the sequence.

To turn on the DTMF squelch, press **F + D − SQL** for less than 1 second. **DTMF** appears in the display.

Your transceiver remains silent until it receives the correct touch-tone sequence. Then, it beeps and returns to normal operation. To cancel **DTMF** squelch, press **F + D − SQL** for less than 1 second so that **DTMF** disappears from the display.

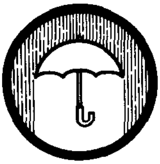
Automatically Sending a DTMF Reply

You can set your transceiver to automatically transmit the touch-tone digit (#) when you have enabled **DTMF** squelch and the transceiver receives the correct touch-tone sequence. To turn on the **DTMF** auto-reply, follow the steps in "Understanding the Configuration Menu" to display **Ar**. Then, rotate **TUNE** to select **on**.

You should also set this option to **on** if you expect an auto reply from an autopatch or another HTX-202 or other transceiver that has this feature.

CARE AND MAINTENANCE

Your HTX-202 2-Meter Handheld Transceiver is an example of superior design and craftsmanship. The following suggestions will help you care for your transceiver so that you can enjoy it for years.



Keep the transceiver dry. If it does get wet, wipe it dry immediately. Liquids can contain minerals that corrode the electronic circuits.

Use and store the transceiver only in normal temperature environments. Temperature extremes can shorten the life of electronic devices and distort or melt plastic parts.

Handle the transceiver gently and carefully. Dropping it can damage circuit boards and cases and can cause the transceiver to work improperly.

Keep the transceiver away from dust and dirt, which can cause premature wear of parts.

Wipe the transceiver with a dampened cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the transceiver.

Modifying or tampering with your transceiver's internal components can cause a malfunction and might invalidate its warranty and void your FCC authorization to operate the transceiver. If your transceiver is not performing as it should, take it to your local Radio Shack store. Our personnel can assist you and arrange for service if needed.

ERROR CODES

Your transceiver has two error code displays. Refer to the following for an explanation of each error code.

Er1: Internal RAM Error

Er1 indicates the transceiver has detected an error in its battery-backed up option memory. This is most commonly caused by a low lithium backup battery, but can also be caused by static discharge, or a physical shock. To clear the error, reset the transceiver by turning it off, then holding down **F+D** while you turn it on again. This clears and reinitializes memory.

If the transceiver frequently displays the error, have the battery replaced by an authorized Radio Shack service center.

Er2: PLL Unlock Error

Er2 indicates the transceiver's PLL section has *unlocked*. Have the transceiver repaired by an authorized Radio Snack service center.

SPECIFICATIONS

GENERAL

Frequency Range .... 144.000-148.000 MHz
Frequency Step .... 5/10/15/20/25/50/100 KHz
Frequency Stability .... +/− 10 ppm
Antenna Impedance .... 50 Ohms Unbalanced
Speaker .... 8 Ohms
Microphone .... condenser Mic. 1.2 Kohms
Channel Display .... LCD 8 digits
Operating Temperature .... 14°F to 140°F (−10°C to 60°C)
Size .... $2^9/_{16} \times 4^5/_8 \times 1^7/_8$ Inches (65×117×37 mm)
Weight .... 1 lbs 3 ozs (540g)
Supply Voltage:
  Alkaline Battery Pack .... 9 VDC
  Ni-Cad Battery Pack (600mAh) .... 7.2 VDC
  External Power Jack .... 7.2 to 13.8 VDC

RECEIVER

Intermediate frequency
  1st IF 21.4MHz
  2nd IF 455KHz
Sensitivity:
  12dB SINAD 0.2μV
  20 dB NQ 0.35μV
(pd: Potential Difference)
Squelch sensitivity:
  Threshold 0.1μV
  Tight .... 10dB above threshold
Spurious response attenuation 80dB
Intermodulation attenuation 70dB
Adjacent channel rejection (25KHz) 70dB
Modulation acceptance Bandwith 8KHz
Hum and Noise 50dB
Audio output power (10% THD):
  7.2V DC 0.3W
  9V DC 0.5W
  12V DC 1W
  13.8V DC 1W
Audio distortion 2%
Audio response .... −6dB/oct

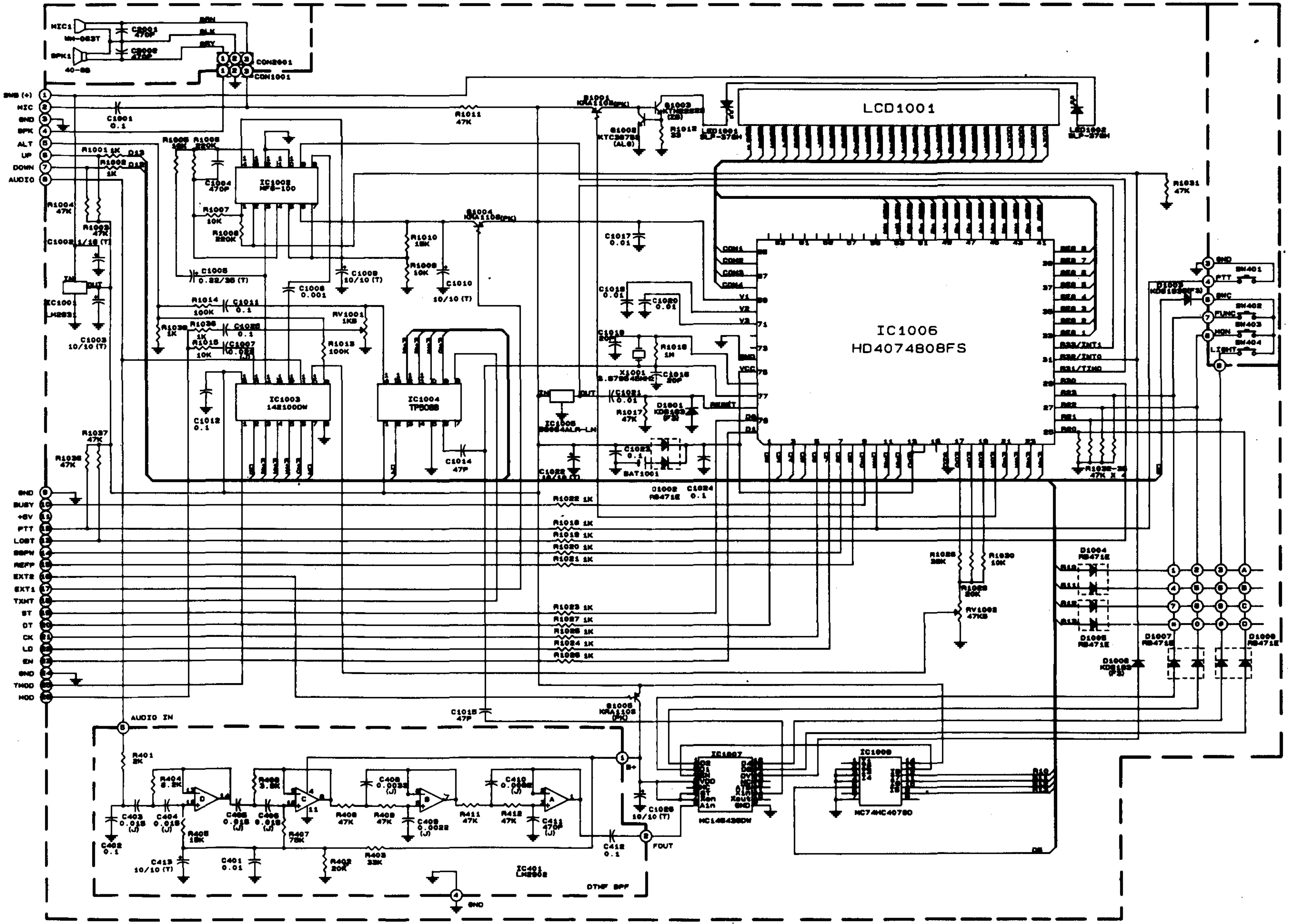
Current drain:	
Stand-by without power save	35mA
Stand-by power save	25mA
CTCSS Sensitivity	0.15μV
DTMF Squelch sensitivity	0.2μV

TRANSMITTER

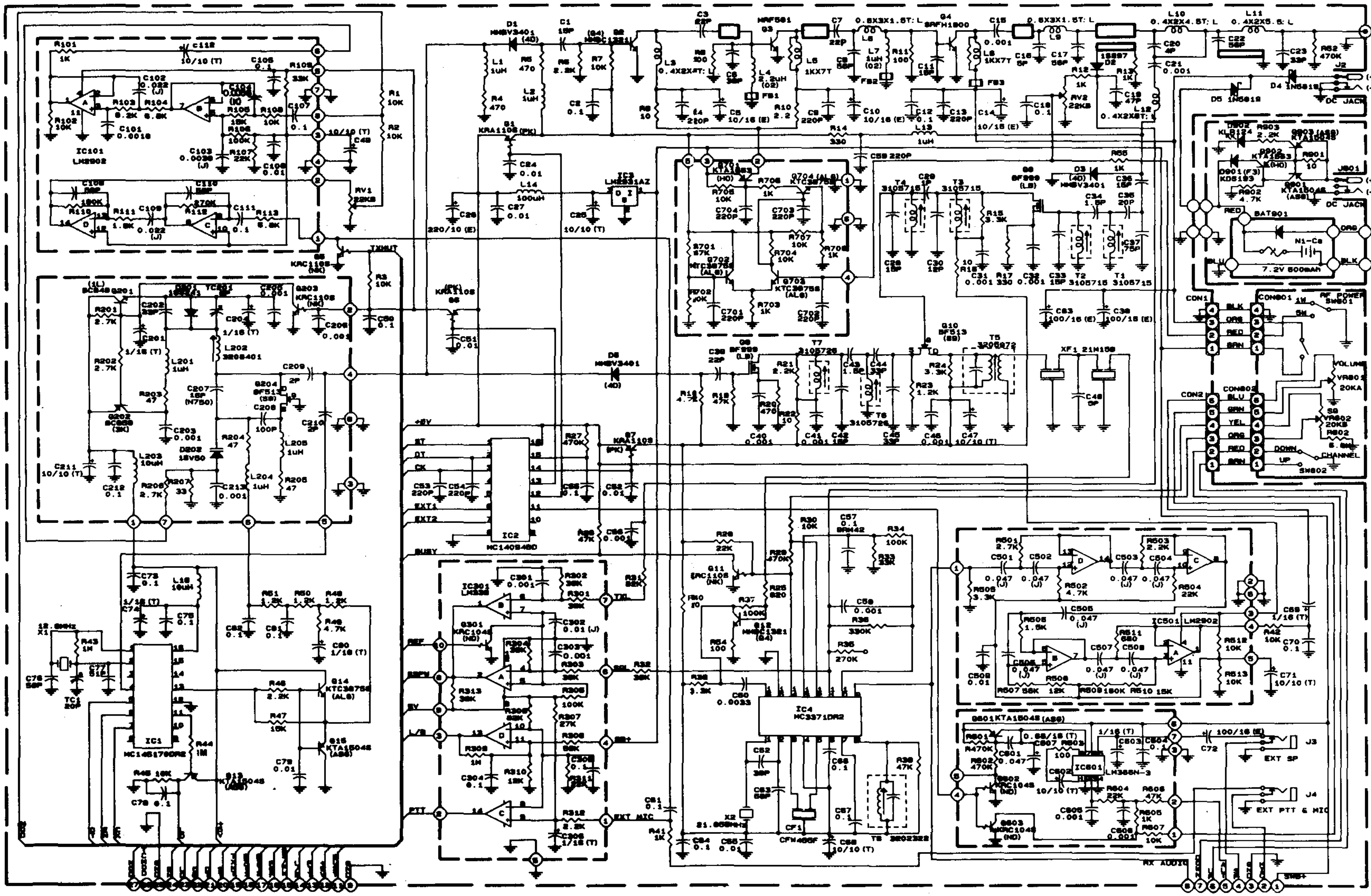
RF Power output:	
7.2V DC	2.5W
9V DC	4W
12V DC	5W
13.8V DC	6W
Low Power	1W
Maximum deviation	4.5KHz
Hum and Noise	42dB
Audio distortion	0.5%
Audio response	+6dB/oct
Spurious and harmonic emissions	70dB
Frequency error	±0.0005%
Mic. Sensitivity	4mVrms
CTCSS Tone deviation	0.7KHz
DTMF Tone deviâtion	3.5KHz
Current drain:	
7.2V DC	0.8A
9V DC	0.95A
12VDC	1A
13.8VDC	1.1A
Lower Power	0.46A

The above specifications are nominal. An individual unit's performance might vary slightly from these specifications.

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



KEY INDEX

LOCK CA A	**PTT+A** - Transmit DTMF **A**. Page 33. **F+LOCK** - Keyboard lock. Page 19. **CA** - Calling Memory. Page 20.
P-SC PR B	**PTT+B** - Transmit DTMF **B**. Page 33. **F+P−SC** - Priority scan. Page 22. **PR** - Priority Memories. Page 22.
M-WR MR C	**PTT+C** - Transmitt DTMF **C**. Page 33. **F+M−WR** - Memory write. Pages 20-23. **MR** - Standard Memories. Page 23.
M→VFO VF D CLR	**PTT+D** - Transmit DTMF **D**. Follow with 1-5 to send a DTMF sequence. Pages 33 and 34. **F+M→VFO** - Write memory to VFO. Page 24. **VF** - VFO mode. Page 16. **CLR** - Clear partially entered frequency in VFO mode. Page 16.
T-SQL 1	**PTT+1** - Transmit DTMF **1**. Page 33. **F+T−SQL** - Tone-squelch. Page 28. **1** - In Standard Memory mode, 1st digit of selecting memory 10, 11, or 12, Page 23. In VFO mode, enter a frequency. Page 16. In Priority Memory mode, select Priority Memory 1. Page 22.
D-SQL 4	**PTT+4** - Transmit DTMF **4**. Page 33. **F+D−SQL** - DTMF-squelch. Page 34. **4** - In Standard Memory mode, select Memory 4. Page 23. In VFO mode, enter a frequency. See Page 16.
SAVE 7	**PTT+7** - Transmit DTMF **7**. Page 33. **F+SAVE** - Power-save option. Page 31. **7** - In Standard Memory mode, select Memory 4. Page 23. In VFO mode, enter a frequency. Page 16.
* ▼SC	**PTT+∗** - Transmit DTMF **∗**. Page 33. **F+▼SC** - In VFO mode, scan down in the selected range. Page 30. **▼SC** - In VFO, Priority-Memory, or Standard-Memory mode, scan down. Pages 17, 22, and 23. In memory-set mode, next menu item. Page 26.

DTMF
2

PTT+2 - Transmit DTMF **2**. Page 33.
F+DTMF - Store DTMF memory sequence Page 33.
2 - In Standard Memory mode, select Memory 2. Page 23. In VFO mode, part enter frequency. Page 16. In Priority Memory mode, select Priority Memory 2. Page 22.

BEEP
5

PTT+5 - Transmit DTMF **5**. Page 33.
F+BEEP - Key entry beep. Page 19.
5 - In Standard Memory mode, select Memory 5. Page 23. In VFO mode, enter a frequency. Page 16.

M-SET
8

PTT+8 - Transmit DTMF**8**. Page 33.
F+M-SET - In VFO mode, memory set. Page 26. In Standard Memory, Priority memory, and Calling-Frequency memory mode, change options for memory channel. Page 21.
8 - In Standard Memory mode, select Memory 8. Page 19. In VFO mode, enter a frequency. Page 18.

V-SC
0

PTT+0 - Transmit DTMF 0. Page 33.
F+V-SC - Vacant scan. Page 18.
0 - In Standard Memory mode. 1st digit to select Memory 01. Page 23. In VFO mode, enter a frequency.Page 16.

+/−
3

PTT+3 - Transmit DTMF **3**. Page 33.
F+ +/− - Duplex offset. Page 18.
3 - In Standard Memory mode, select Memory 3. Page 26. In VFO mode, enter a frequency. Page 16. In Priority Memory mode, select Priority Memory 3. Page 22.

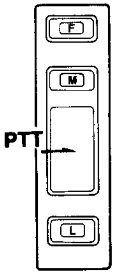
REV
6

PTT+6 - Transmit DTMF **6**. Page 33.
F+REV - Reverse transmit and receive frequencies. Page 19.
6 - In Standard Memory mode, select Memory 6. Page 26. In VFO mode, enter a frequency. Page 16.

M-CLR
9

PTT+9 - Transmit DTMF **9**. Page 33.
F+M-CLR - Memory clear. Page 24.
9 - In Standard Memory mode, select Memory 9. Page 26. In VFO mode, enter a frequency. Page 16.

PTT-# - Transmit DTMF #. Page 33.
F+▲SC- In VFO mode, scan up selected range. Page 30.
▲SC - In VFO, Priority-Memory, or Standard-Memory mode, scan up. Pages 17, 22, and 23. In memory-set mode, previous menu item. Page 26.



F - Select the 2nd function of a key.
M - Monitor a channel without squelch. In Standard, Priority, or calling Memory mode, display memory's programmed options. Page 25.
PTT - Push-to-talk (transmit button)
L - Turn on the light for 5 seconds. Page 15.
F+L - Turn on the light until you press L again to turn it off. Page 15.

RADIO SHACK LIMITED WARRANTY

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REALISTIC®

Service Manual

19-1120

HTX-202

2-Meter Amateur VHF·FM Transceiver

Catalog Number: 19-1120

Contents

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	0.2μV	0.25μV
20 dB NQ.	0.35μV	0.4μV
Squelch Sensitivity:		
Threshold	0.1μV	0.2μV
Tight	2μV	4 ~ 1μV
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	0.15μV	0.2μV
DTMF Squelch Sensitivity	0.2μV	0.25μV

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

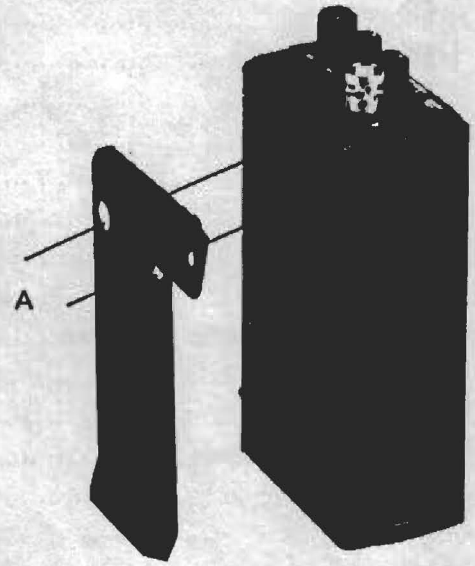
Dimensions without battery .... (W)2 9/16"(65mm) × (H)4 5/8"(117mm) × (D)1 7/16" (37mm)

Weight .... 1 lbs 3 ozs (540g)

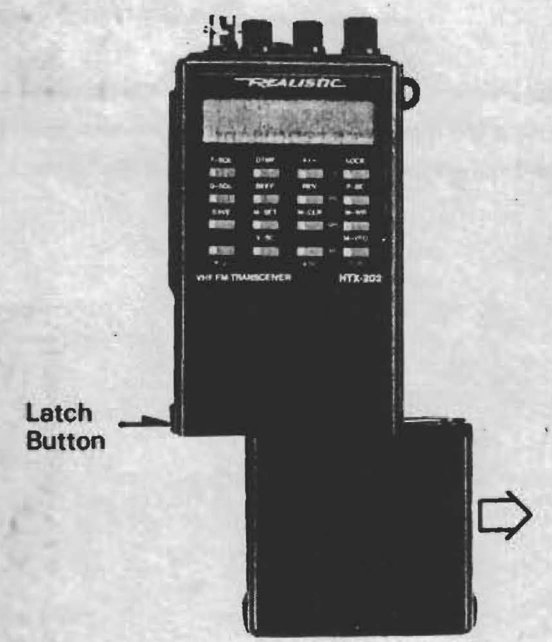
Note: Nominal specs represent the design specs. All units should be able to approximate these-some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit fail to meet limit specs.

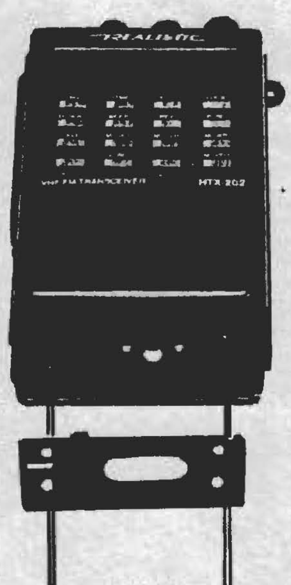
DISASSEMBLY INSTRUCTIONS

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

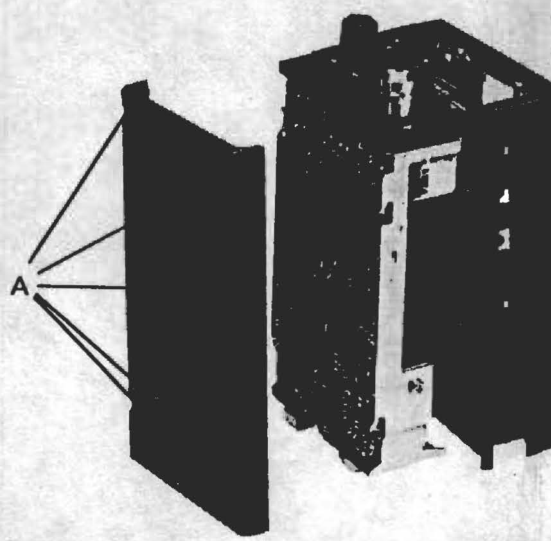


2. To remove the battery ground plate:
   A: Remove the battery pack.
   B: Remove four screws (A) from the battery ground plate.
   This also release the latch mechanism.
   Note the position of the latch plate in the latch button.
   Then, remove the latch mechanism and button.

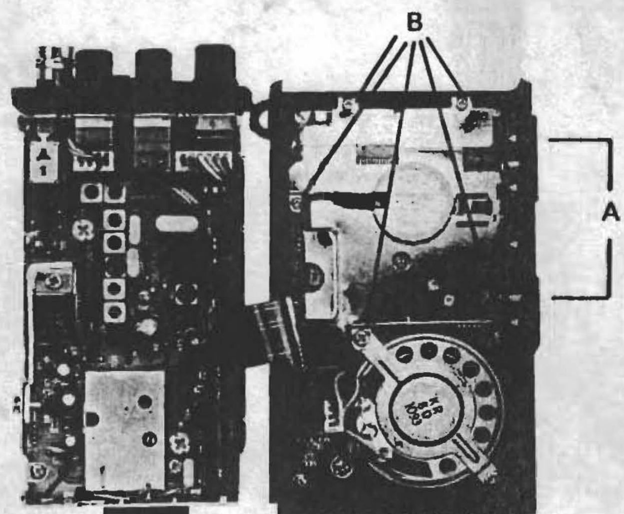




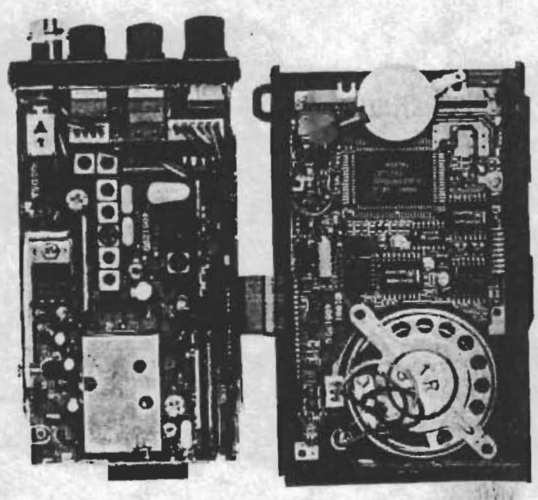
3. To access the RF board, remove five screws(A) from the back cover, and lift off the back cover. Then, pull the RF section out from the top, and lift it out of the case. Take care not to pull the ribbon trace from either assembly when you remove the RF section.



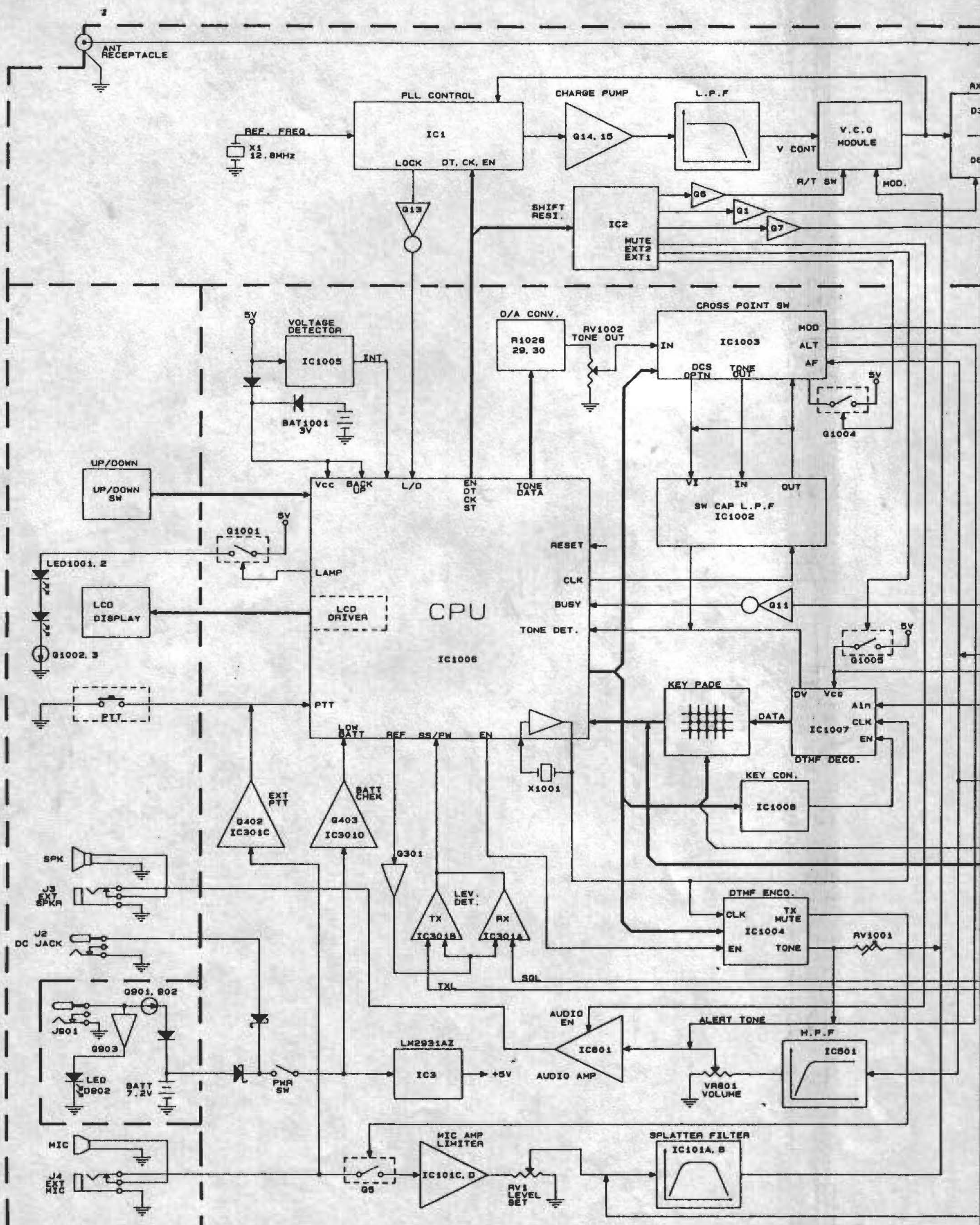
4. To access the Digital board:
   A. Remove two screws (A) from the PTT button.
   B. Then, remove five screws (B) from the shield plate.
   C. Desolder the lithium battery from the shield plate.
   D. Solder the lithium battery to ground on the RF board for testing.



5. To reassemble, reverse the above steps.

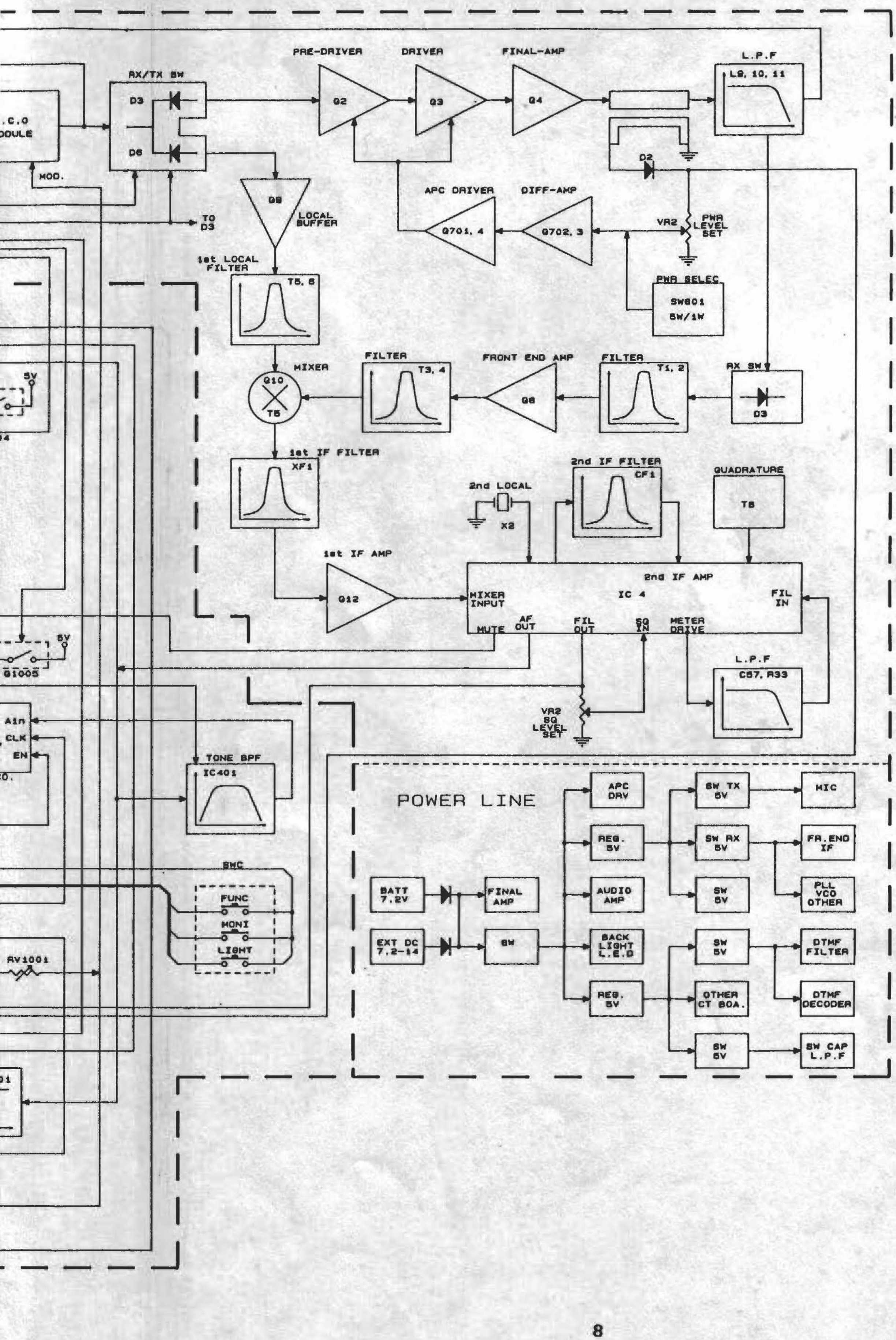


BLOCK DIAGRAM



DIAGRAM

Cat. No.: 19-1120



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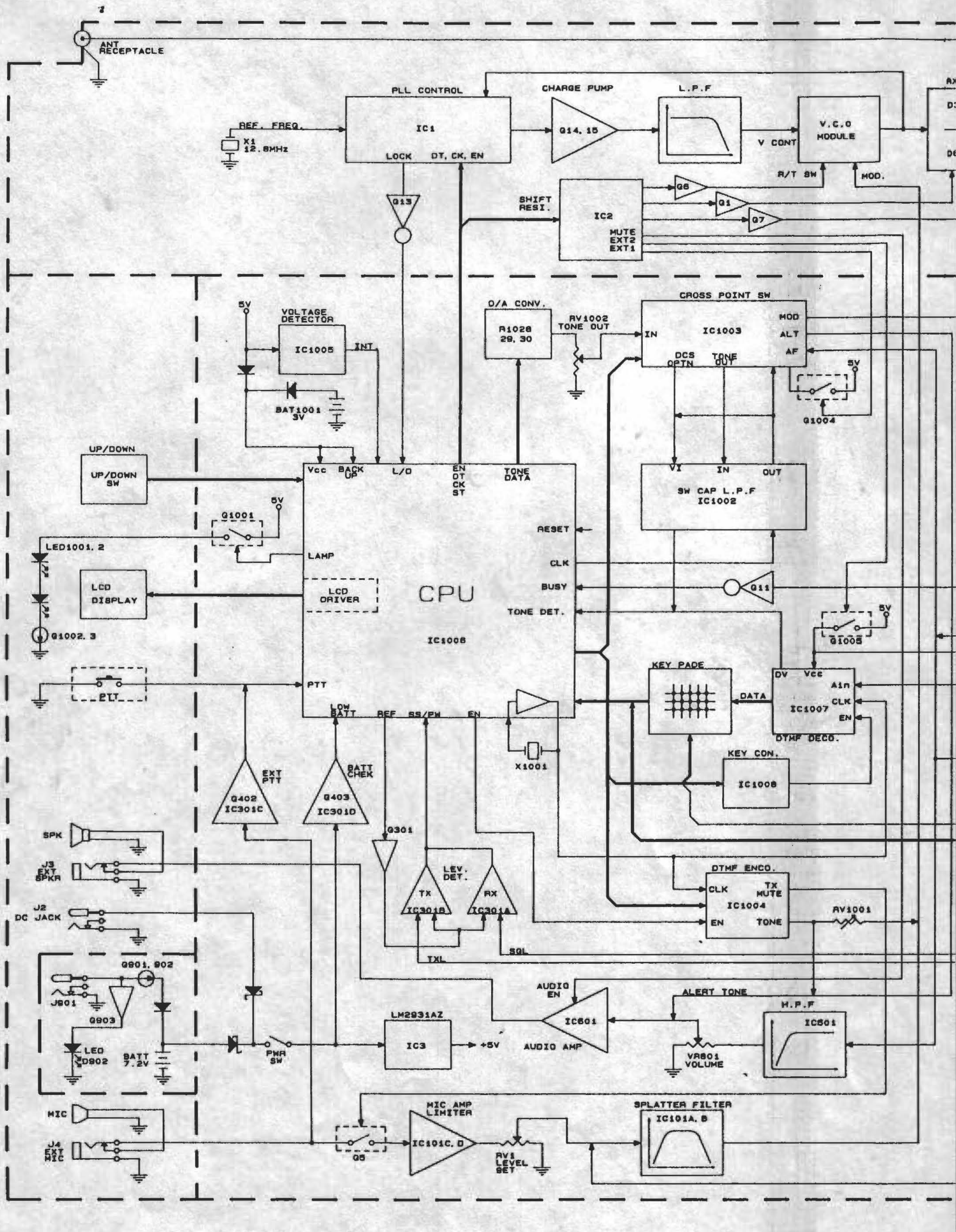

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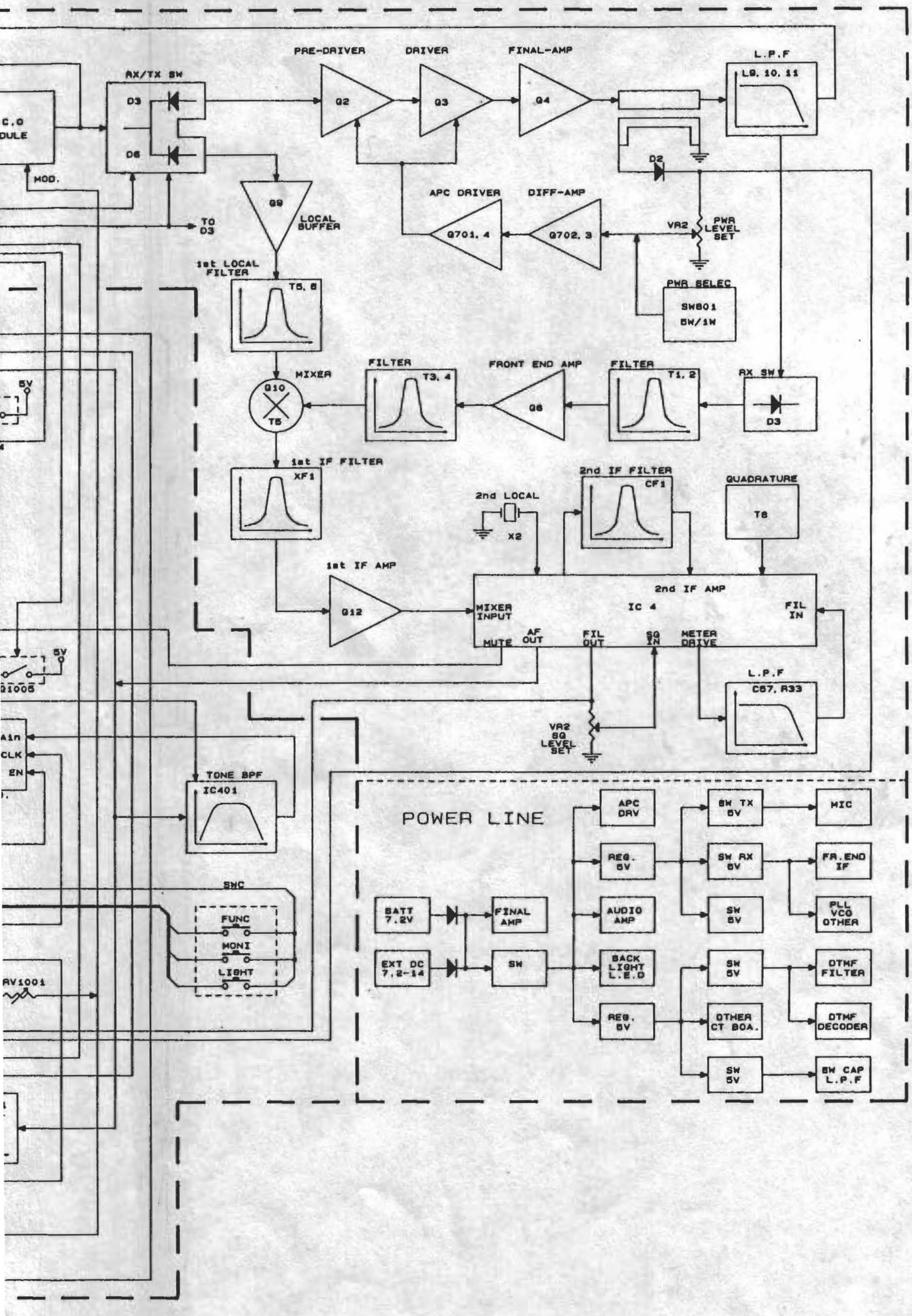


THEORY OF OPERATION

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 modulized 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 (vid 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, pin6.

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 Fv<Fr and positive pulses when Fv>Fr. When Fv=Fr 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 Fr and Fv 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 amplfier 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 2μA 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 disable 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

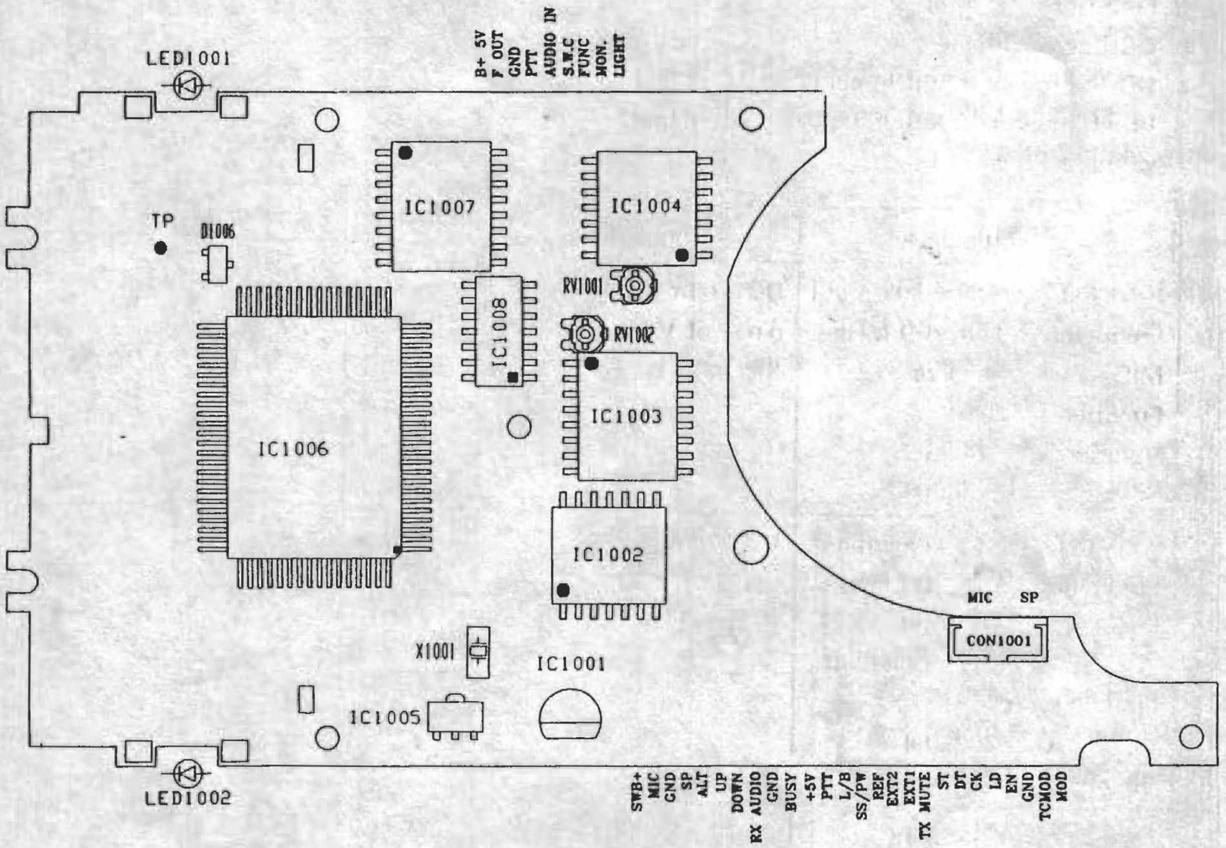
The transmitted signal is applied to the level PCB IC301 B via a direction coupler D2, RV3 and R31 to compare with the reference TX level and is passed to the level PCB pin 8 for the input to the microprocessor. The Microprocessor then enables the TX level indicated on the display.

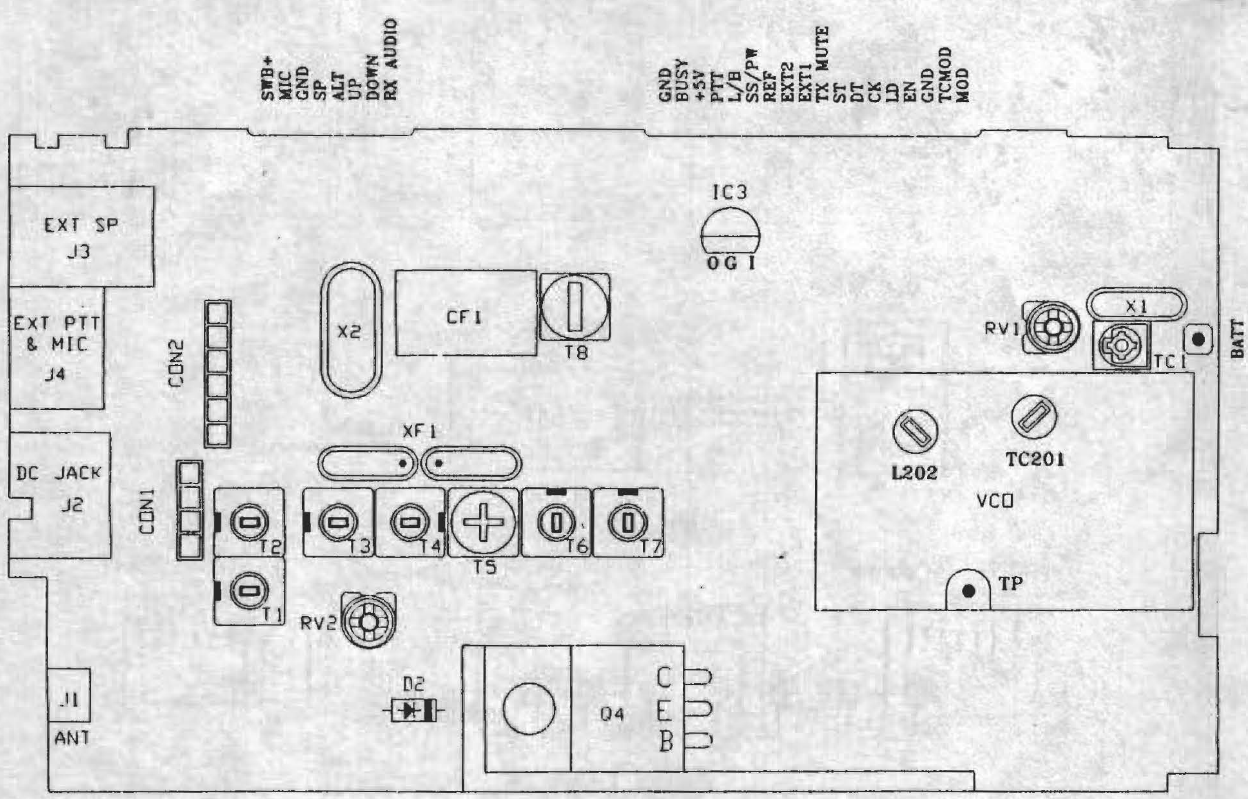
Battery low indicator circuit

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

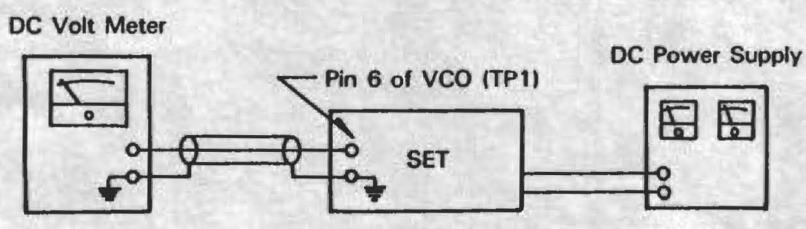
b. DC Power Supply

c. DC Voltmeter (Input Impedance 10 ohms)

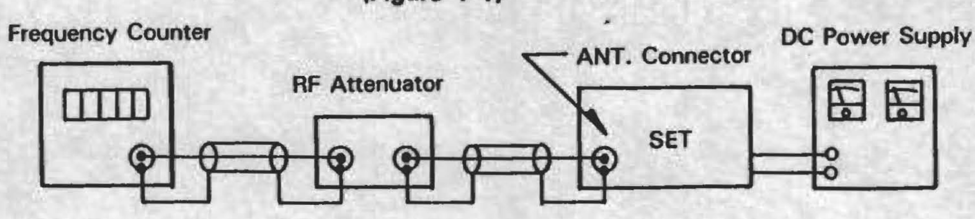
d. RF attenuator (20dB, Impedance 50 ohms)

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

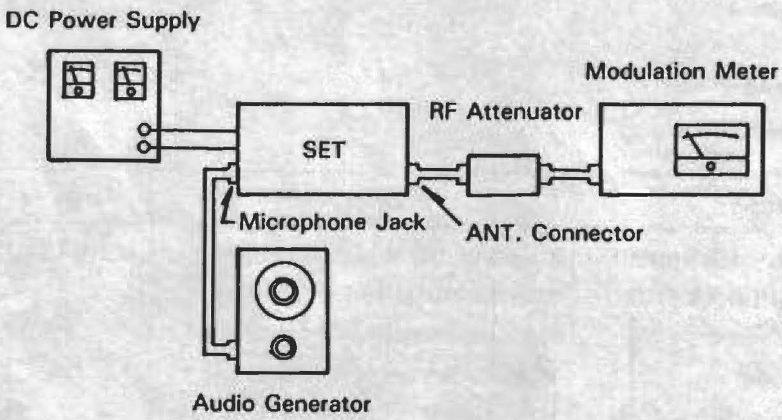
A. Test Equipment Required

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)

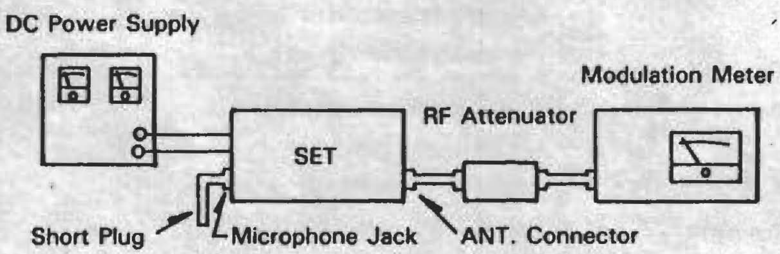
B. Alignment Procedure

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

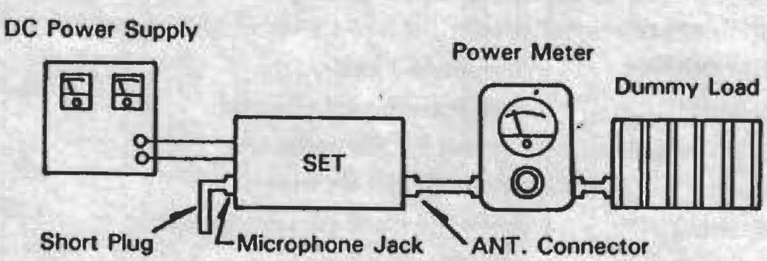
4	Low power adjustment Frequency : 146.000MHz MIC : Transmit Function : None Volume : Optional Squelch : Optional RF power selection: Low	Connect the short plug to microphone jack. Connect the dummy load to EXT-ANT jack on the set through RF power meter. (Figure 2-3)	RV2	1W (0.8 ~ 1.2W)



(Figure 2-1)



(Figure 2-2)



(Figure 2-3)

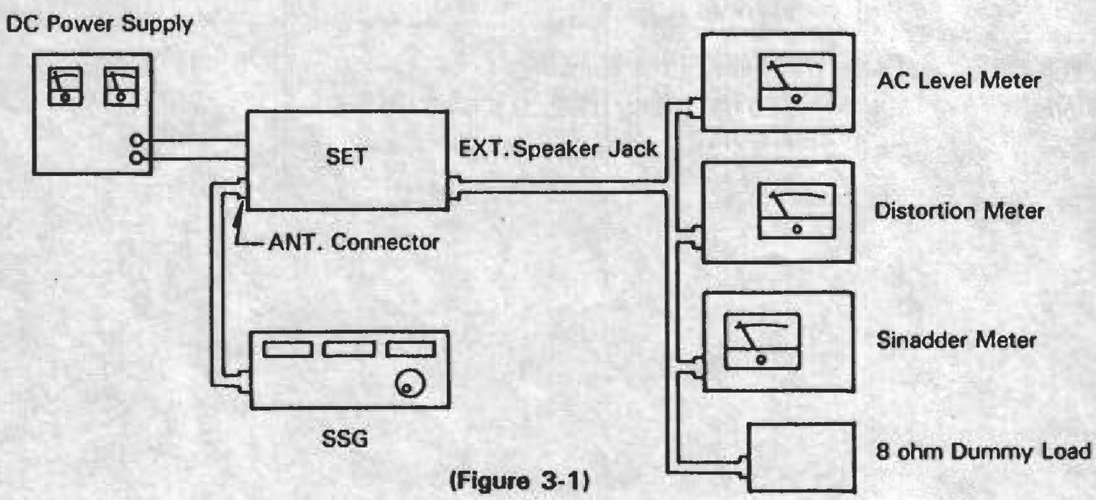
4. Receiver Section

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 ProcedureA

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	1. Defective power switch VR801 2. Defective Diode D4, D5 3. Broken DC power cord	1. Replace 2. Replace defective component (s) 3. Replace
No output from speaker at all	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	1. Repair or Replace 2. Repair or Replace 3. Repair or Replace 4. Replace
No noise on speaker	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	1. Repair or Replace 2. Replace defective component (s)
Squelch does not work	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	1. Replace defective component (s)
No modulation	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.	1. Replace 2. Replace 3. Replace defective component (s)
LCD Display does not work	1. Measure all the voltage of IC1005, D1001, X1001 (pin 77 of IC1006)	1. Replace defective component (s)
Back light does not work	1. Defective the components of LED1001, LED1002, Q1001, Q1002, Q1003.	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.

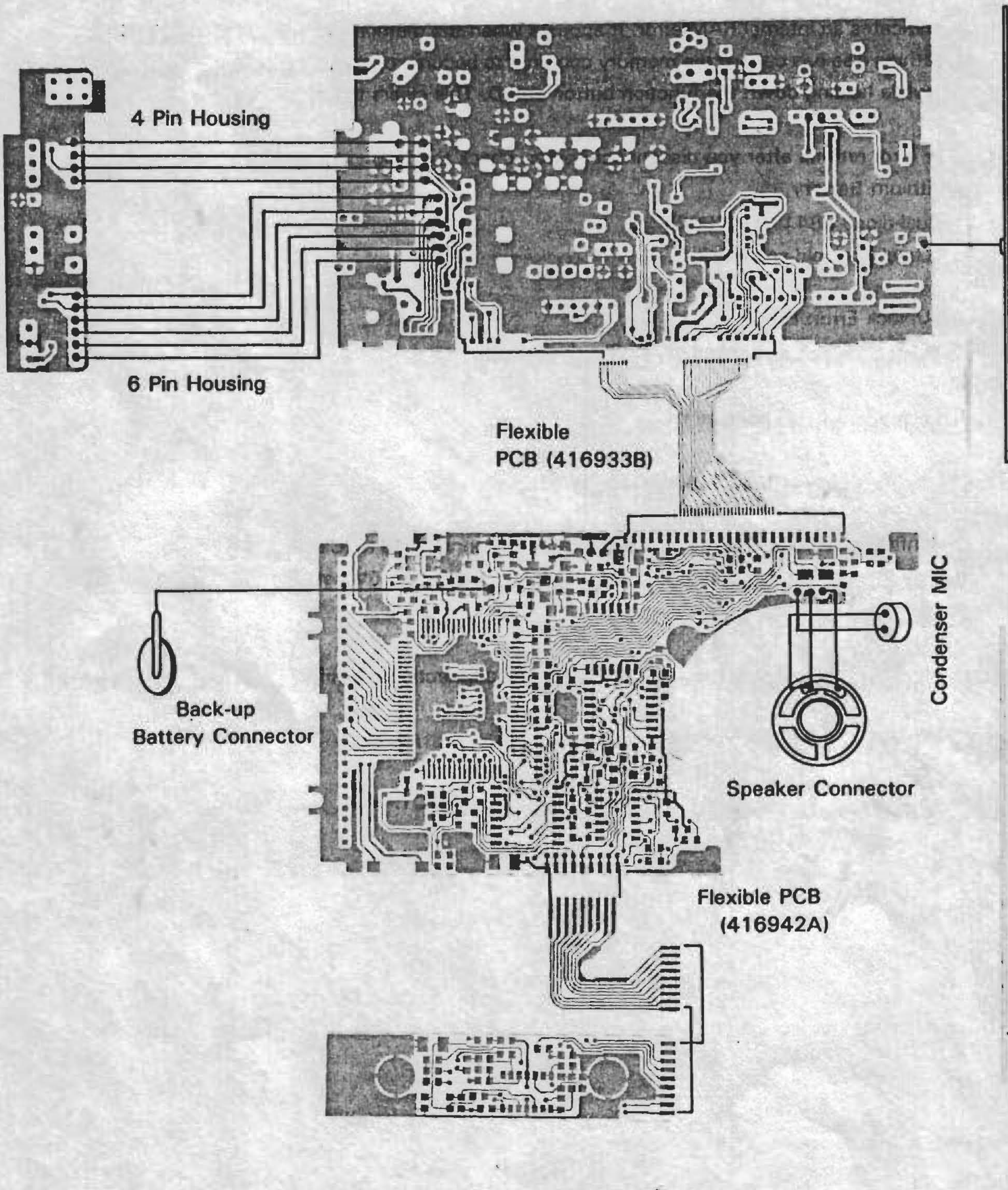
   C. Confirm that X1 is oscillating. If not, check the connections to IC1, pins 1 and 2. If the connection is good, check for 5V at IC1, pin16. If 5V not present, check connections to L16 and power.

   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.

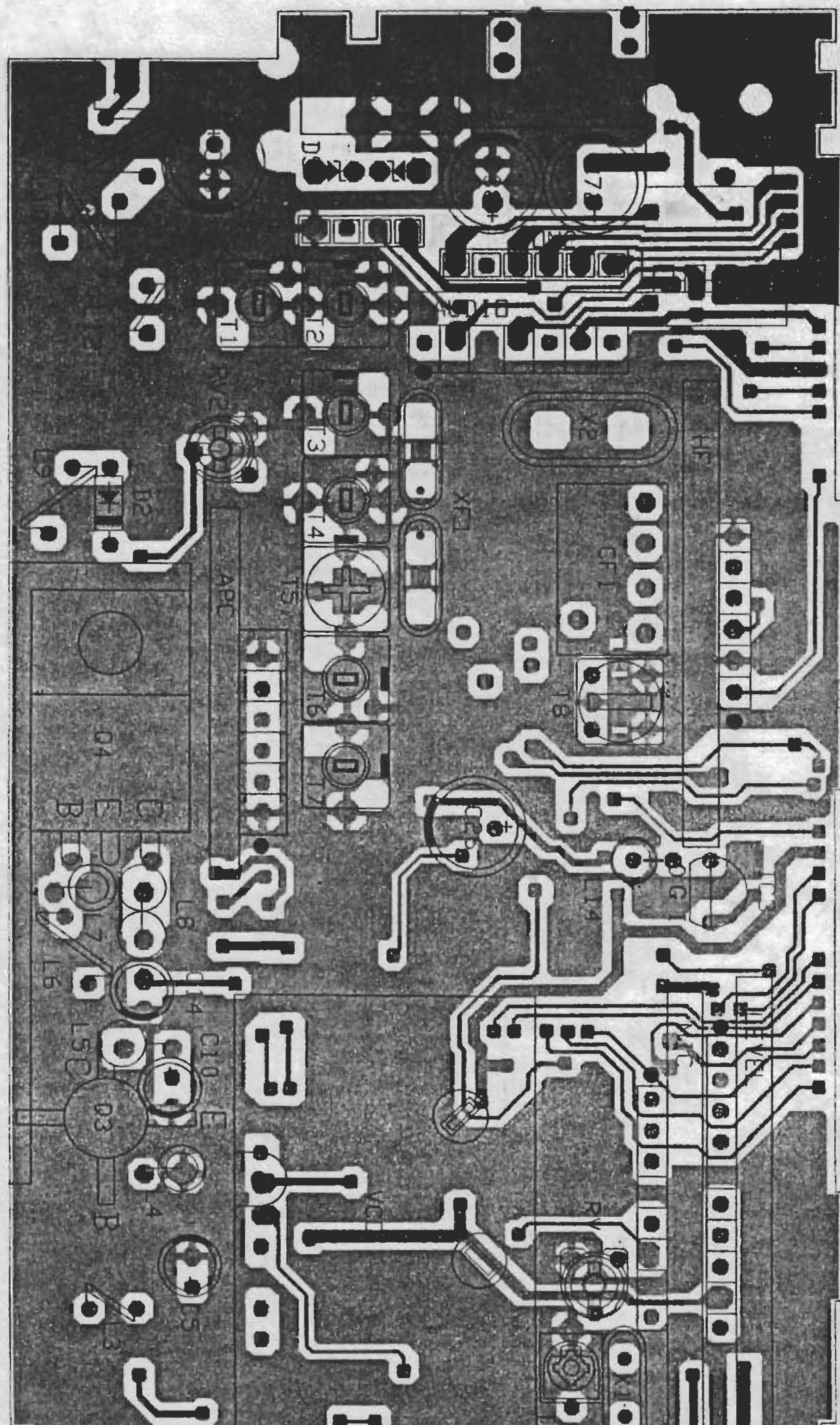
   If the above checks do not correct the problem, replace IC1.

WIRING DIAGRAM

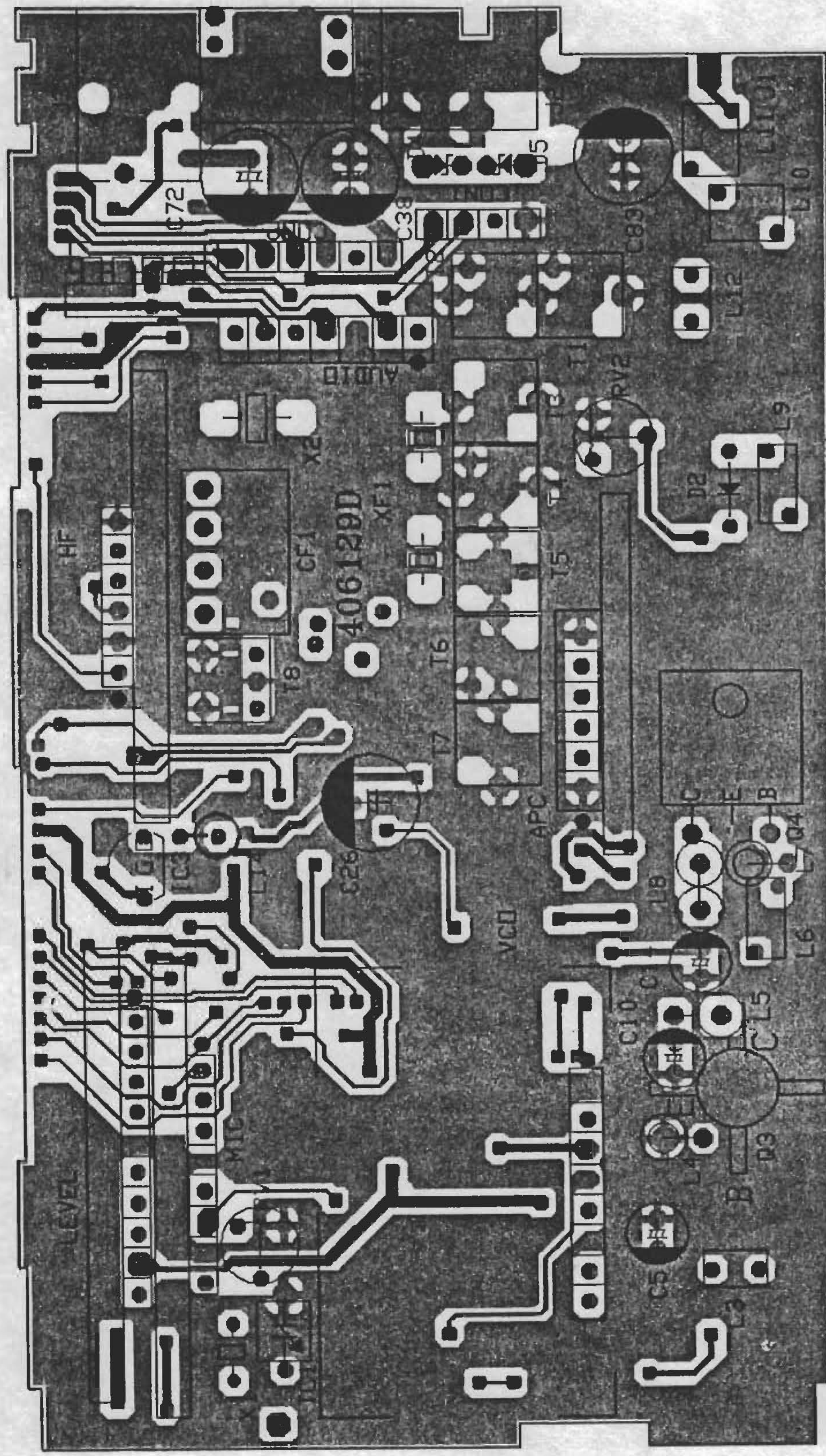


PRINTED CIRCUIT BOARD VIEWS

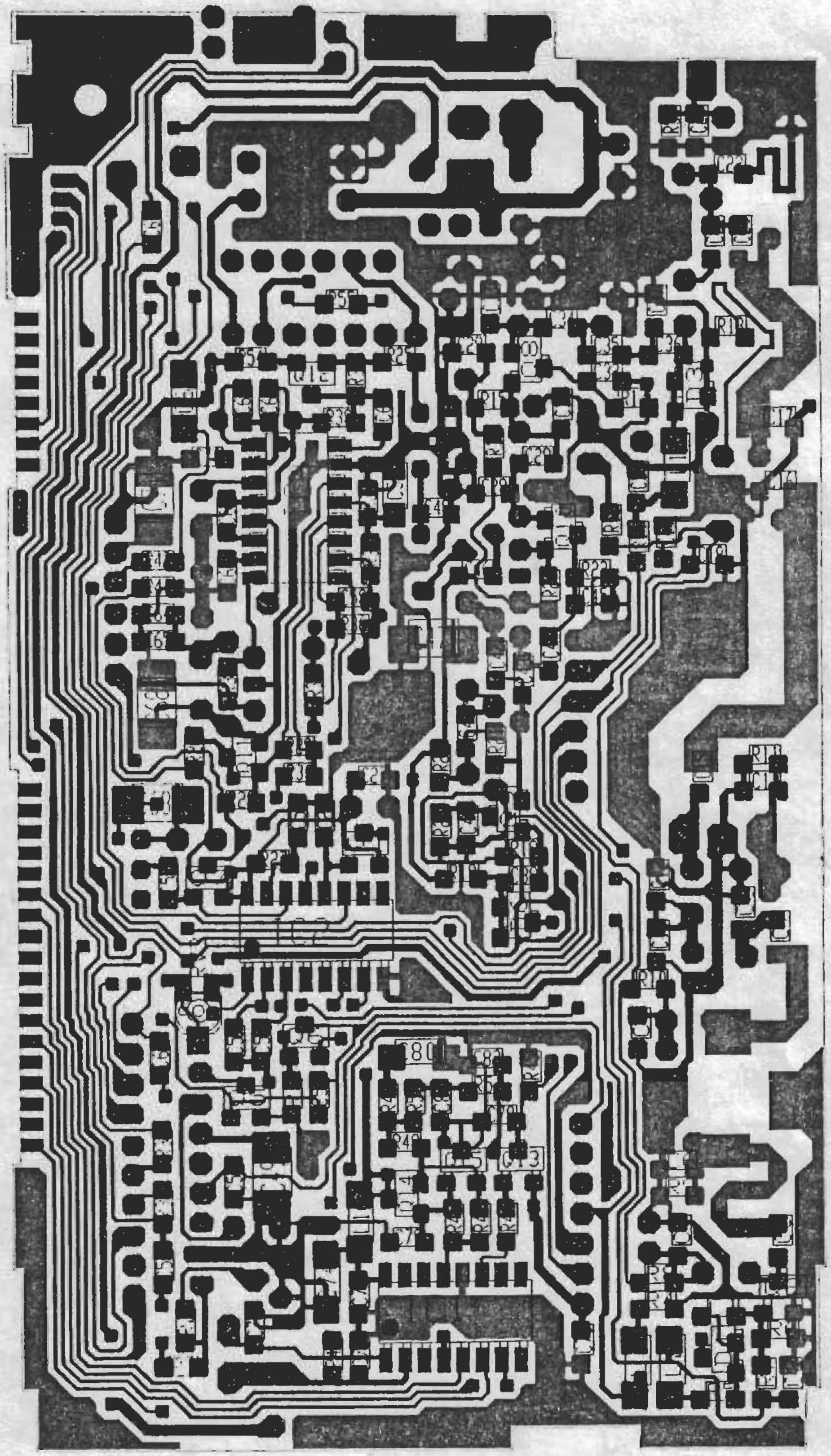
RF PCB: Top View



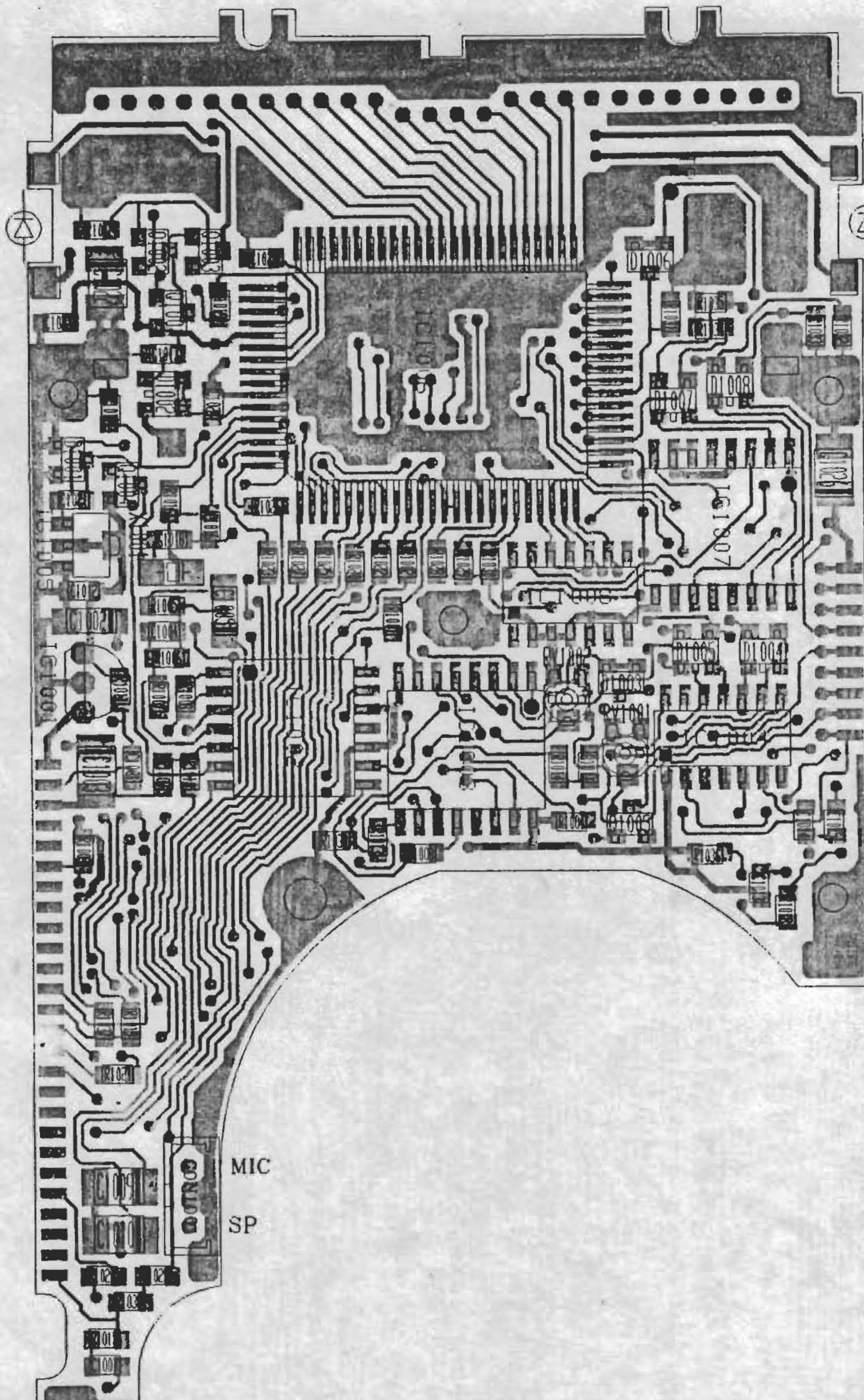
RF PCB: Bottom View



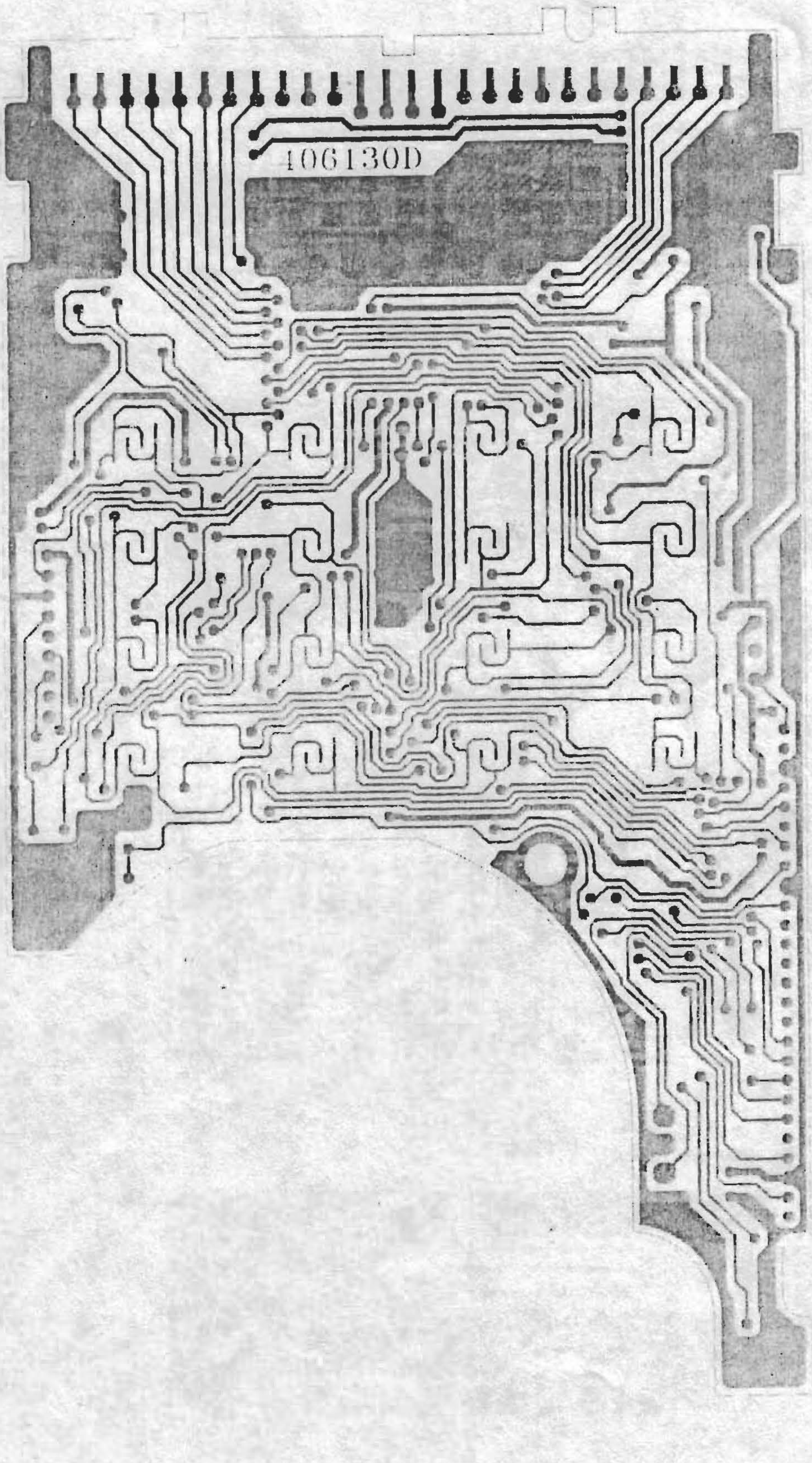
RF PCB: Chip Component Side View



Digital PCB: Keypad Side View (Top View)

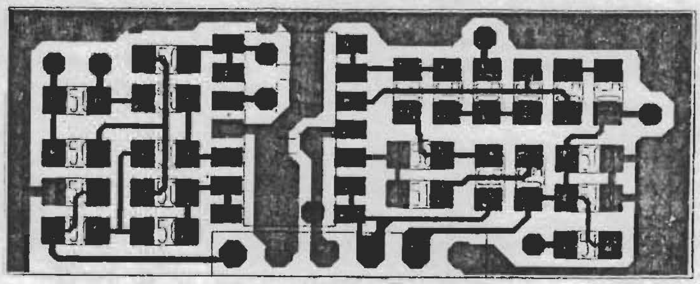


Digital PCB: Keypad Side View (Bottom View)

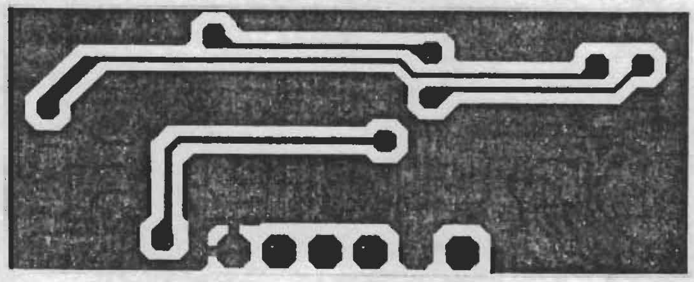


High Press Filter PCB:

(Top View)

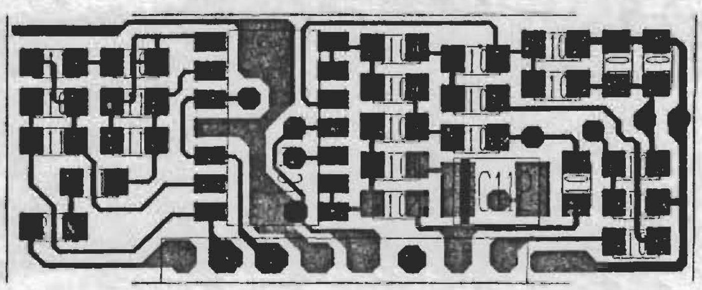


(Bottom View)

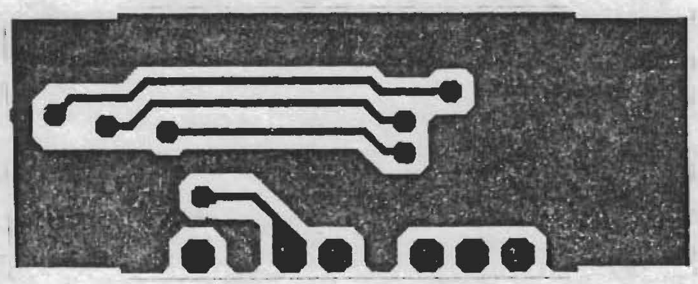


MIC PCB:

(Top View)

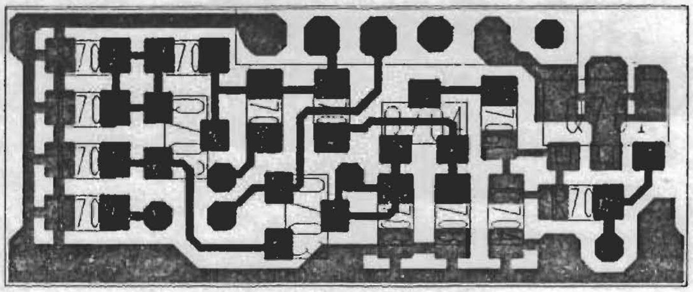


(Bottom View)

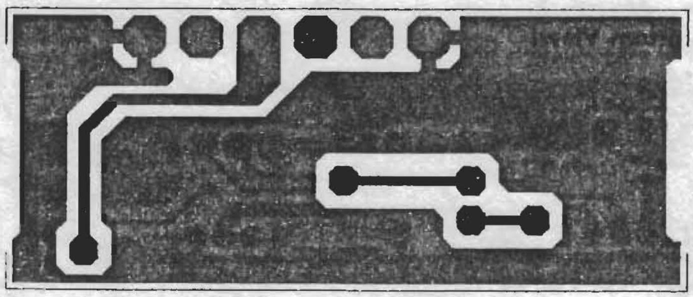


Auto Power Control PCB:

(Top View)

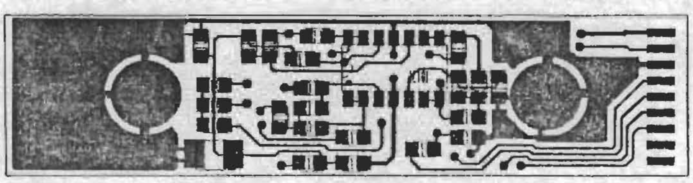


(Bottom View)

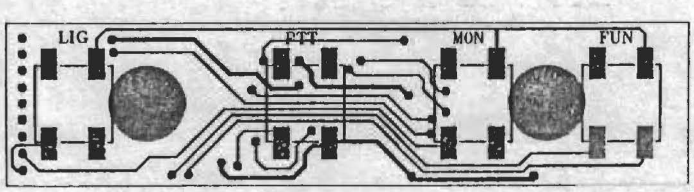


PTT PCB:

(Top View)

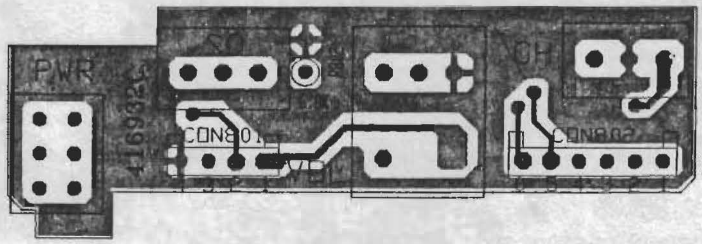


(Bottom View)

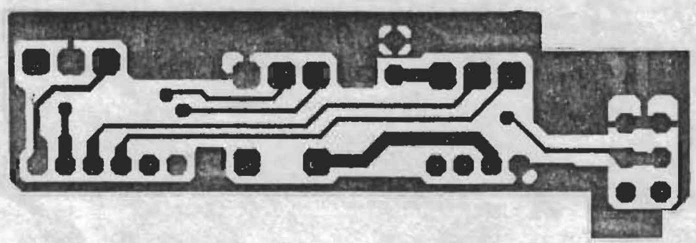


Top PCB:

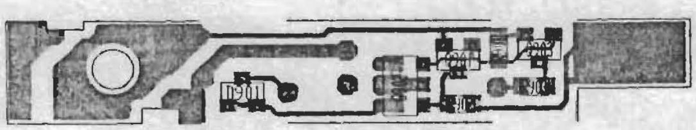
(Top View)



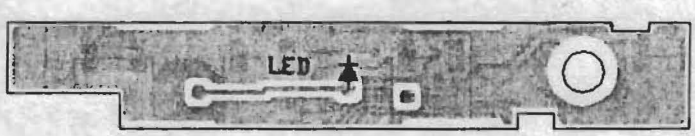
(Bottom View)



(Top View)

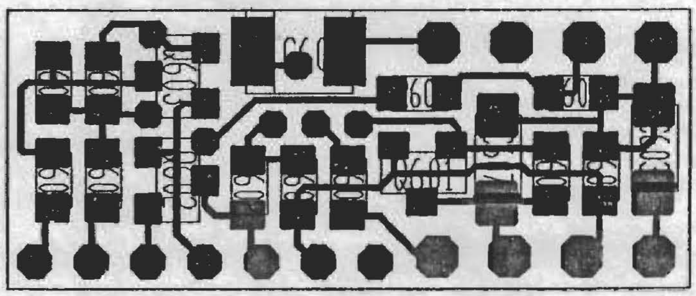


(Bottom View)

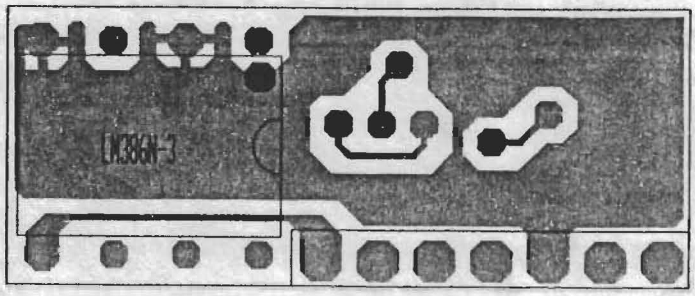


Audio PCB:

(Top View)

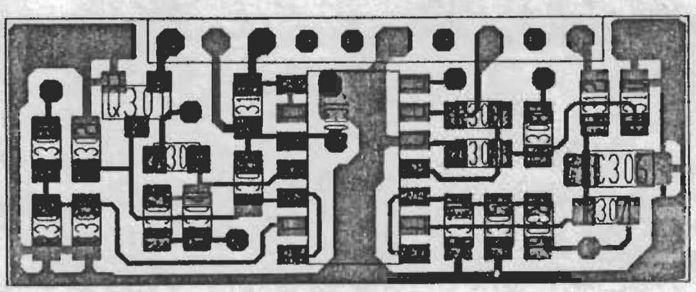


(Bottom View)

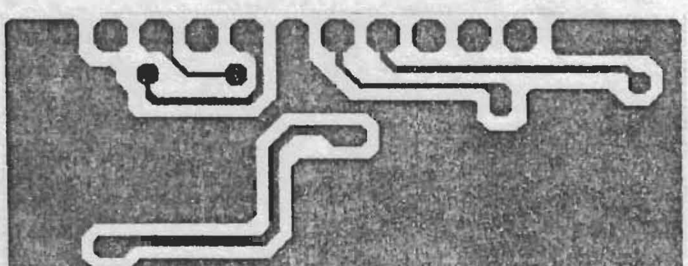


Level PCB:

(Top View)

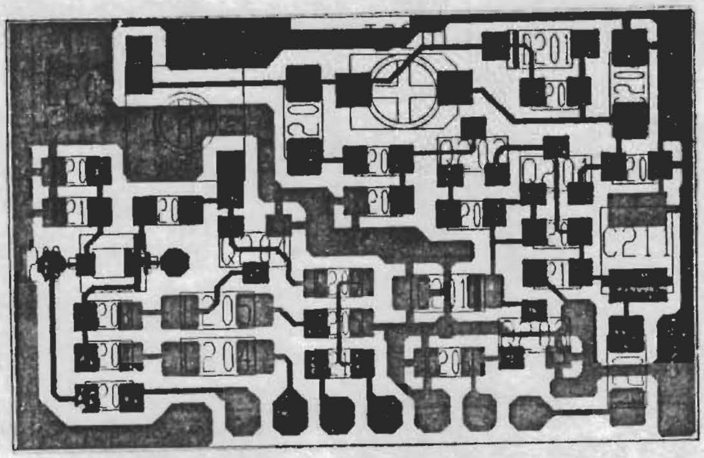


(Bottom View)

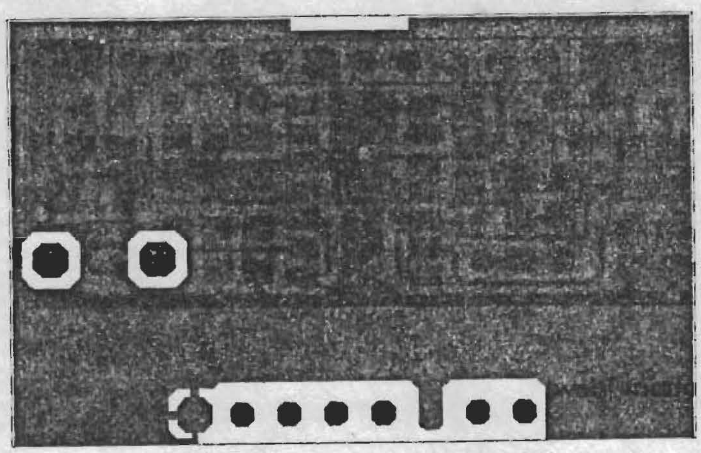


VCO PCB:

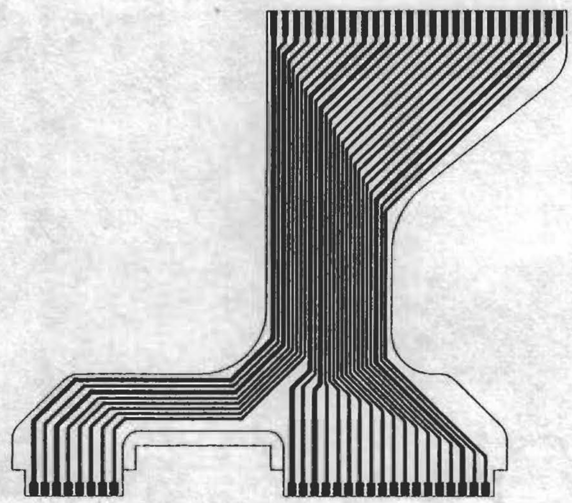
(Top View)



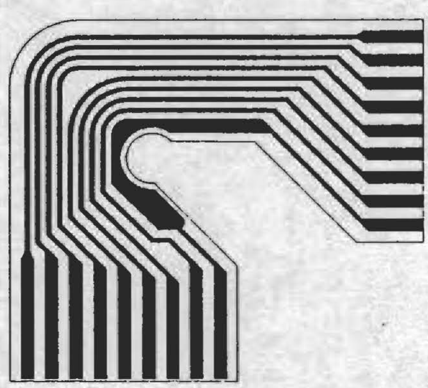
(Bottom View)



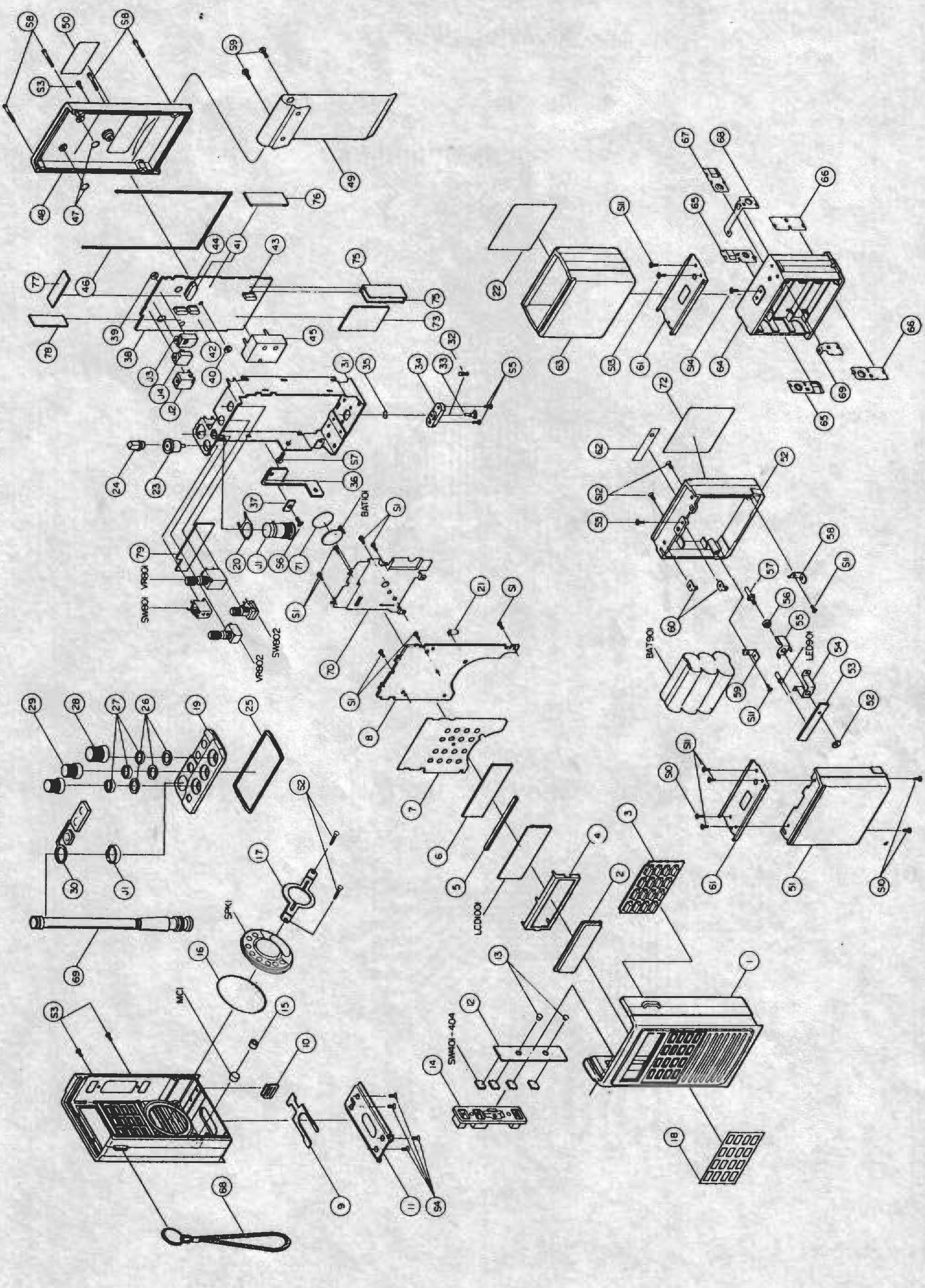
Flexible PCB: (RF VS DIGITAL)



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 × 3, Ni-Plating, White		853-026
41	Rubber Cap, Silicon, 11 × 4.4 × 4.3, Clear		894-785
42	Rubber Cap, Silicon, 7.5 × 2.9 × 8.5, Clear		894-786
43	Rubber Holder, Silicon, 9.6 × 4.2, Clear		894-787
44	Rubber Holder, Silicon, 7 × 2.8, Clear		894-788
45	Shield Can, BsP 30 × 20 × 9, Sn-Plating, White		772-010
46	Gasket, Silicon Rubber, 270mm, Black		891-370
47	Insulator, Felt, D6 × 0.3, Black		906-335
48	Cover Bottom A1, 107 × 63 × 10.4, Black		718-359
49	Belt Hook, Sus 304, Black		721-821
50	Label Name, Polyester, 35 × 18, Black		958-944-A
51	Upper Cover (Battery), PC, 67 × 60 × 18, Black		718-361
52	Bottom Cover (Battery), PC, 67 × 60 × 18 ×, Black		718-370
53	Ass'y, Battery PCB		593-170
54	Bracket, SPC, 20 × 6 × 12, Ni-Plating, White		723-741
55	Spring Flat PBsP 6 × 9 × 11, Ni-Plating, White		881-529
56	Bushing, Acetal, D6 × 2, White		853-025
57	Pin Contact, BsBM, D2 × 15, Ni-Plating, White		860-136
58	Terminal (Input" + "), SPC, 10 × 5 × 7, Ni-Plating, White		752-543
59	Terminal (Input" − "), SPC, 10 × 5 × 7, Ni-Plating, White		752-545
60	Terminal (Output " + ", " − "), SPC, 6 × 5, 5 × 5, Ni-Plating, White		752-583
61	Plate Tension, Sus, 57 × 26, 5 × 2.5, Natural Color		771-935
62	Overlay, PVC, 30.9 × 8.8 × 0.5t, Black		795-414
63	Housing Battery (Dry), PC, 65 × 52 × 25, Black		718-360
64	Holder Battery (Dry), PC, 61 × 5 × 29, Black		732-753
65	Terminal "A", Sus, 27 × 11.5, Natural		752-547
66	Terminal "B", Sus, 27 × 11.5, Natural		752-546
67	Terminal "C", Sus, 24.5 × 13, Natural		752-548
68	Terminal " + ", Sus, 27 × 13 × 11.5, Natural		752-549
69	Terminal " − ", Sus, 12.7 × 11.5 Natural		752-550
70	Shield Plate, CNP3, 66 × 54 × 0.15t, White		772-009
71	Insulation Plate, Mylar, D16 × 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 × 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 × 4-2S, Ni-Plating, White		628-094
S2	Screw Tapping (PH), D2.6 × 6, Ni-Plating White		621-026
S3	Screw Machine (PH), M2 × 5, Black		612-285
S4	Screw Machine (FH), M2.6 × 7, Ni-Plating, White		611-310
S5	Screw Machine (RH), M2 × 4, Ni-Plating, White		612-286
S6	Screw Machine, M2.6 × 8, Ni-Plating White		661-077
S7	Screw Machine (PH), M2, 6 × 5, Ni-Plating, White		611-032
S8	Screw Tapping (PH), D2 × 17, Black		622-205
S9	Screw Machine (BH), M3 × 4, Black		613-536
S10	Screw Machine (PH), M2 × 4, Ni-Plating, White		612-018
S11	Screw Tapping (PH), D2 × 4-2S, Ni-Plating, White		622-204
S12	Screw machine (FH), M2 × 5, Black		612-230
S13	Screw Taptite (PH), D2 × 4, Ni-Plating, White		600-724
S14	Screw Taptite(RH), D2 × 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 × 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
LCD1001	LCD, LE-0802A, Display		252-092-0
LCD901	LED Lamp, KRA124, Red		251-007-9
BAT1001	Battery, Lithium, 3V, 3.8 × 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, ±5%		131-511-0
C2	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C3	Ceramic, Chip, 22pF 50V, 0805, ±5%		132-223-5
C4	Ceramic, Chip, 220pF 50V, 0805, ±5%		132-220-2
C5	Elect, 10μF 16V, 4DIAX7, ±20%		101-043-5
C6	Ceramic, Chip, 39pF 50V, 0805, ±5%		133-911-8
C7	Ceramic, Chip, 22pF 50V, 0805, ±5%		132-223-5
C8	Ceramic, Chip, 56pF 50V, 0805, ±5%		135-613-9
C9	Ceramic, Chip, 220pF 50V, 0805, ±5%		132-220-2
C10	Elect, 10μF 16V,4DIAX7,±20%		101-043-5
C11	Ceramic, Chip, 15pF 50V, 0805, ±5%		131-511-0
C12	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C13	Ceramic, Chip, 220pF 50V, 0805, ±5%		132-220-2
C14	Elect, 10μF 16V, 4DIAX7, ±20%		101-043-5
C15	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C16	Ceramic, Chip, 5pF 50V, 0805, ±0.25pF		135-010-4
C17	Ceramic, Chip, 56pF 50V, 0805, ±5%		135-613-9
C18	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C19	Ceramic, Chip, 47pF 50V, 0805, ±5%		134-721-8
C20	Ceramic, Chip, 4pF 50V, 0805, ±0.25pF		134-007-7
C21	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C22	Ceramic, Chip, 56pF 50V, 0805, ±5%		135-613-9
C23	Ceramic, Chip, 33pF 50V, 0805, ±5%		133-314-9
C24	Ceramic, Chip, 0.01μF 50V, 0805, ±5%		130-172-2
C25	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C26	Elect, 220μF 10V, 6.3DIAX7, ±20%		102-288-5
C27	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C28	Ceramic, Chip, 15pF 50V, 0805, ±5%		131-511-0
C29	Ceramic, Chip, 1pF 50V, 0805, ±0.25pF		131-030-2
C30	Ceramic, Chip, 12pF 50V, 0805, ±5%		131-208-7
C31	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C32	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C33	Ceramic, Chip, 15pF 50V, 0805, ±5%		131-511-0
C34	Ceramic, Chip, 1.5pF 50V, 0805, ±0.25pF		131-559-4
C35	Ceramic, Chip, 20pF 50V, 0805, ±5%		132-012-1
C36	Ceramic, Chip, 15pF 50V, 0805, ±5%		131-511-0
C37	Ceramic, Chip, 75pF 50V, 0805, ±5%		137-504-4

Ref. No.	Description	RS Part No.	MFR. Part No.
C38	Elect, 100μF 16V, 6.3DIAX7, ±20%		101-093-0
C39	Ceramic, Chip, 22pF 50V, 0805, ±5%		132-223-5
C40	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C41	Ceramic, Chip, 0.001μF 50V, 0805, ±5%		130-184-4
C42	Ceramic, Chip, 15pF 50V, 0805, ±5%		131-511-0
C43	Ceramic, Chip, 1.5pF 50V, 0805, ±0.25pF		131-559-4
C44	Ceramic, Chip, 33pF 50V, 0805, ±5%		133-314-9
C45	Ceramic, Chip, 33pF 50V, 0805, ±5%		133-314-9
C46	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C47	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C48	Ceramic, Chip, 5pF 50V, 0805, ±0.25pF		135-010-4
C49	Tantalum, Chip, 10μF 10V, B, 20%		141-046-0
C50	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C51	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C52	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C53	Ceramic, Chip, 220pF 50V, 0805, ±5%		132-220-2
C54	Ceramic, Chip, 220pF, 220pF 50V, 0805, ±5%		132-220-2
C55	Ceramic, Chip, 0.1μF 25V, 0805, +80%-20%		130-185-5
C56	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C57	Ceramic, Chip, 0.1μF 50V, 1206, ±10%		130-197-5
C58	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C59	Ceramic, Chip, 220pF 50V, 0805, ±5%		132-220-2
C60	Ceramic, Chip, 0.0033μF 50V, 0805, ±10%		130-315-6
C61	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C62	Ceramic, Chip, 39pF 50V, 0805, ±5%		133-911-8
C63	Ceramic, Chip, 68pF, 0805, ±5%		136-816-5
C64	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C65	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C66	Ceramic, Chip, 0.1μF 25V, 0805,+80%−20%		130-185-5
C67	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C68	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C69	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
C70	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C71	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C72	Elect, 100μF 16V, 6.3DIAX7, ±20%		101-093-0
C73	Ceramic, Chip, 0.1μF 25V, 0805, +80%−205		130-185-5
C74	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
C75	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C76	Ceramic, Chip, 56pF 50V, 0805, ±5%		135-613-9

Ref. No.	Description	RS Part No.	MFR. Part No.
C77	Ceramic, Chip, 51pF 50V, 0805, ±5%		135-103-5
C78	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C79	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C80	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
C81	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C82	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C83	Elect, 100μF 16V, 6.3DIAX7, ±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, 1μH, 01, ±20%		310-657-0
L2	Inductor, Chip, 1μH, 01, ±20%		310-657-0
L3	Choke, MK-4, 2×0.4×8t:L		310-092-9
L4	Inductor, Axial, 2.2μH, 02, ±20%		310-378-7
L5	Resistor-Choke, 1Kohm×10t		310-213-7
L6	Spring, 3×0.65×1.5t:L		310-224-2
L7	Inductor, Axial, 1μH, 02, ±20%		310-298-4
L8	Resistor-Choke, 1Kohm×10t		310-218-7
L9	Spring, 3×0.65×1.5t:L		310-224-2
LIO	Spring, 2×0.4×4.5t:L		310-573-7
L11	Spring, 2×0.4×5.5t:L		310-574-8
L12	Choke,MK-4, 12×0.4×8t:L		310-092-9
L13	Inductor, Chip, 1μH, 01, ±20%		310-657-0
L14	Inductor, Axial, 100μH, 04, ±10%		310-221-9
L15	Not Used.		
L16	Inductor, Chip, 10μH, 01, ±10%		310-659-2
FB1	Bead Core, FC3×2		320-253-1
FB2	Bead Core, FC3×2		320-253-1
FB3	Bead Core, FC3×2		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, ±5%		060-103-8
R2	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R3	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R4	Chip, 470 ohm, 1/10W, 0805, ±5%		060-471-0
R5	Chip, 470 ohm, 1/10W, 0805, ±5%		060-471-0
R6	Chip, 2.2Kohm, 1/10W, 0805, ±5%		060-222-2
R7	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R8	Chip, 10 ohm, 1/10W, 0805, ±5%		060-100-5
R9	Chip, 100 ohm, 1/10W, 0805, ±5%		060-101-6
R10	Chip, 22 ohm, 1/10W, 0805, ±5%		060-229-9
R11	Chip, 100 ohm, 1/10W, 0805, ±5%		060-101-6
R12	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R13	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R14	Chip, 330 ohm, 1/10W, 0805, ±5%		060-331-7
R15	Chip, 3.3K ohm, 1/10W, 0805, ±5%		060-332-8
R16	Chip, 10 ohm, 1/10W, 0805, ±5%		060-100-5

Ref. No.	Description	RS Part No.	MFR. Part No.
R17	Chip, 330 ohm, 1/10W, 0805, ±5%		060-331-7
R18	Chip, 4.7K ohm, 1/10W, 0805, ±5%		060-472-1
R19	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R20	Chip, 470 ohm, 1/10W, 0805, ±5%		060-471-0
R21	Chip, 2.2K ohm, 1/10W, 0805, ±5%		060-222-2
R22	Chip, 10 ohm, 1/10W, 0805, ±5%		060-100-5
R23	Chip, 1.2K ohm, 1/10W, 0805, ±5%		060-122-5
R24	Chip, 3.3K ohm, 1/10W, 0805, ±5%		060-332-8
R25	Chip, 820 ohm, 1/10W, 0805, ±5%		060-821-3
R26	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R27	Chip, 470K ohm, 1/10W, 0805, ±5%		060-474-3
R28	Chip, 22K ohm, 1/10W, 0805, ±5%		060-223-3
R29	Chip, 470K ohm, 1/10W, 0805, ±5%		060-474-3
R30	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R31	Chip, 82K ohm, 1/10W, 0805, ±5%		060-823-5
R32	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3
R33	Chip, 33k ohm, 1/10W, 0805, ±5%		060-333-9
R34	Chip, 100K ohm, 1/10W, 0805, ±5%		060-104-9
R35	Chip, 270K ohm, 1/10W, 0805, ±5%		060-274-9
R36	Chip, 330K ohm, 1/10W, 0805, ±5%		060-334-0
R37	Chip, 100K ohm, 1/10W, 0805, ±5%		060-104-9
R38	Chip, 3.3K ohm, 1/10W, 0805, ±5%		060-332-6
R39	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R40	Chip, 10 ohm, 1/10W, 0805, ±5%		060-100-5
R41	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R42	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R43	Chip, 1M ohm, 1/10W, 0805, ±5%		060-105-0
R44	Chip, 1M ohm, 1/10W, 0805, ±5%		060-105-0
R45	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R46	Chip, 2.2K ohm, 1/10W, 0805, ±5%		060-222-2
R47	Chip, 15K ohm, 1/10W, 0805, ±5%		060-153-3
R48	Chip, 1.2K ohm, 1/10W, 0805, ±5%		060-122-5
R49	Chip, 4.7K ohm, 1/10W, 0805, ±5%		060-472-1
R50	Chip, 1.2K ohm, 1/10W, 0805, ±5%		060-122-5
R51	Chip, 1.2K ohm, 1/10W, 0805, ±5%		060-122-5
R52	Chip, 470K ohm, 1/10W, 0805, ±5%		060-474-3
R53	Not used		060-474-3
R54	Chip, 100 ohm, 1/10W, 0805, ±5%		060-101-6
R55	Chip, 1K ohm, 1/10W, 0805, ±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, 0.1μF 25V, 0805, +80% – 20%		130-185-5
C1002	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
C1003	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C1004	Ceramic, Chip, 470pF 50V, 0805, ±5%		134-761-4
C1005	Tantalum, Chip, 0.22μF 35V, A, ±20%		140-204-1
C1006	Not Used.		
C1007	Ceramic, Chip, 0.022μF 50V, 0805, ±5%		130-234-5
C1008	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C1009	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C1010	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C1011	Ceramic, Chip, 0.1μF 25V, 0805, +80% – 20%		130-185-5
C1012	Ceramic, Chip, 0.1μF 25V, 0805, +80% – 20%		130-185-5
C1013	Not Used.		
C1014	Ceramic, Chip, 47pF 50V, 0805, ±5%		134-721-8
C1015	Ceramic, Chip, 47pF 50V, 0805, ±5%		134-721-8
C1016	Ceramic, Chip, 20pF 50V, 0805, ±5%		130-012-2
C1017	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C1018	Ceramic, Chip, 20pF 50V, 0805, ±5%		130-012-1
C1019	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2

Ref. No.	Description	RS Part No.	MFR. Part No.
C1020	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C1021	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C1022	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
C1023	Ceramic, Chip, 0.1μF 25V, 0805, +80% −20%		130-185-5
C1024	Ceramic, Chip, 0.1μF 25V, 0805, +80% −20%		130-185-5
C1025	Ceramic, Chip, 0.1μF 50V, 0805, +80% −20%		130-185-5
C1026	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-0
	Connectors		
CON1001	Waffer, 8283-0312, 3pin, 2mm		422-275-2
	Film, flexible, 65.25×59.2×0.25		416-933-B
	Film, Flexible, 27×21.5×0.25		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, ±5%		060-102-7
R1002	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1003	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1004	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1005	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8

Ref. No.	Description	RS Part No.	MFR. Part No.
R1006	Chip, 220K ohm, 1/10W, 0805, ±5%		060-224-4
R1007	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R1008	Chip, 220K ohm, 1/10W, 0805, ±5%		060-224-4
R1009	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R1010	Chip, 15K ohm, 1/10W, 0805, ±5%		060-153-3
R1011	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1012	Chip, 33 ohm, 1/10W, 0805, ±5%		060-330-6
R1013	Chip, 100K ohm, 1/10W, 0805, ±5%		060-104-9
R1014	Chip, 100K ohm, 1/10W, 0805, ±5%		060-104-9
R1015	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R1016	Chip, 1M ohm, 1/10W, 0805, ±5%		060-105-0
R1017	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1018	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1019	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1020	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1021	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1022	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1023	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1024	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1025	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1026	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1027	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1028	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3
R1029	Chip, 20K ohm, 1/10W, 0805, ±5%		060-203-5
R1030	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
R1031	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1032	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1033	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1034	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1035	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1036	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R1037	Chip, 47K ohm, 1/10W, 0835, ±5%		060-473-2
R1038	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R1039	Chip, 1K ohm, 1/10W, 0805, ±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, ±5%		060-474-3
R602	Chip, 470K ohm, 1/10W, 0805, ±5%		060-474-3
R603	Chip, 100 ohm, 1/10W, 0805, ±5%		060-101-6
R604	Chip, 22K ohm, 1/10W, 0805, ±5%		060-223-3
R605	Chip, 1K ohm, 1/10W, 0805, ±5%		060-102-7
R606	Chip, 47K ohm, 1/10W, 0805, ±5%		060-473-2
R607	Chip, 10K ohm, 1/10W, 0805, ±5%		060-103-8
	Capacitors		
C601	Ceramic, Chip, 0.047μF 50V, 0805, ±10%		130-417-4
C602	Tantalum, Chip, 10μF 10V, B, ±20%		141-046-1
C603	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
C604	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C605	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C606	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C607	Tantalum, Chip, 0.68μF 16V, A, ±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, 0.001μF 50V, 0805, ±10%		130-184-4
C302	Ceramic, Chip, 0.01μF 50V, 0805, ±5%		130-198-6
C303	Ceramic, Chip, 0.001μF 50V, 0805, ±10%		130-184-4
C304	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C305	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C306	Tantalum, Chip, 1μF 16V, A, ±20%		141-036-1
	Resistors Carbon		
R301	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3

Ref. No.	Description	RS Part No.	MFR. Part No.
R302	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3
R303	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3
R304	Chip, 39K ohm, 1/10W, 0805, ±5%		060-393-3
R305	Chip, 100K ohm, 1/10W, 0805, ±5%		060-104-9
R306	Chip, 82K ohm, 1/10W, 0805, ±5%		060-823-5
R307	Chip, 27K ohm, 1/10W, 0805, ±5%		060-273-8
R308	Chip, 56K ohm, 1/10W, 0805, ±5%		060-563-0
R309	Chip, 1M ohm, 1/10W, 0805, ±5%		060-105-0
R310	Chip, 12K ohm, 1/10W, 0805, ±5%		060-123-6
R311	Chip, 22K ohm, 1/10W, 0805, ±5%		060-223-3
R312	Chip, 2.2K ohm, 1/10W, 0805, ±5%		060-222-2
R313	Chip, 39K ohm, 1/10W, 0805, ±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, 0.047μF 25V, 0805 ±5%		130-425-1
C502	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C503	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C504	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C505	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C506	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C507	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C508	Ceramic, Chip, 0.047μF 25V, 0805, ±5%		130-425-1
C509	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
	Resistors Carbon		
R501	Chip, 2.7K ohm, 1/10W, 0805, ±5%		060-272-7
R502	Chip, 4.7K ohm, 1/10W, 0805, ±5%		060-472-1
R503	Chip, 2.2K ohm, 1/10W, 0805, ±5%		060-222-2
R504	Chip, 22K ohm, 1/10W, 0805, ±5%		060-223-3
R505	Chip, 3.3K ohm, 1/10W, 0805, ±5%		060-332-8
R506	Chip, 1.5K ohm, 1/10W, 0805, ±5%		060-152-2
R507	Chip, 56K ohm, 1/10W, 0805, ±5%		060-563-0
R508	Chip, 12K ohm, 1/10W, 0805, ±5%		060-123-6
R509	Chip, 180K ohm, 1/10W, 0805, ±5%		060-184-1
R510	Chip, 15K ohm, 1/10W, 0805, ±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, 0.0018μF 50V, 0805, ±10%		130-A22-0
C102	Ceramic, Chip, 0.022μF 50V, 0805, ±10%		130-234-5
C103	Ceramic, Chip, 0.0038μF 50V, 0805, ±10%		130-329-8
C104	Ceramic, Chip, 0.0056μF 50V, 0805, ±10%		130-513-7
C105	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C106	Ceramic, Chip, 0.01μF 50V, 0805, ±10%		130-172-2
C107	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C108	Chramic, Chip, 56pF 50V, 0805, ±5%		135-613-9
C109	Ceramic, Chip, 0.022μF 50V, 0805, ±10%		130-234-5
C110	Ceramic, Chip, 56pF 50V, 50V, 0805, ±5%		135-613-9
C111	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C112	Tantalum, Chip, 10μF 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, 0.01μF 50V, 0805, ±10%		130-172-2
C402	Ceramic, Chip, 0.1μF 25V, 0805, +80−20%		130-185-5
C403	Ceramic, Chip, 0.015μF 50V, 0805, ±5%		130-A143
C404	Ceramic, Chip, 0.015μF 50V, 0805, ±5%		130-A14-3
C405	Ceramic, Chip, 0.015μF 50V, 0805, ±5%		130-A14-3
C406	Ceramic, Chip, 0.015μF 50V, 0805, ±5%		130-A14-3
C407	Not Used		130-328-7
C408	Ceramic, Chip, 0.0033μF 50V, 0805, ±5%		130-328-7
C409	Ceramic, Chip, 0.0022μF 50V, 0805, ±5%		130-237-8
C410	Ceramic, Chip, 0.0082μF 50V, 0805, ±5%		130-805-1
C411	Ceramic, Chip, 470pF 50V, 0805, ±5%		134-726-3
C412	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C413	Tantalum, Chip, 10μF 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
	Switchs		
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, ±5%		131-027-0
C209	Ceramic, Chip, 2pF 50V, 0805, ±5%		132-011-0
C210	Ceramic, Chip, 2pF 50V, 0805, ±5%		132-011-0
C211	Trintalum, Chip, 10μF 10V, B, ±20%		141-046-0
C212	Ceramic, Chip, 0.1μF 25V, 0805, +80%−20%		130-185-5
C213	Ceramic, Chip, 0.001μF 25V, 0805, ±10%		130-184-4
TC201	Trimmer, Chip, 6pF, Blue, 3.2×4.5		176-012-3
	Coils		
L201	Inductor, Chip, 1μH, 01, ±20%		310-657-0
L202	Transformer Molded, Chip, 6.5t		320-840-1
L203	Inductor, Chip, 10μH, 01, ±10%		310-659-2
L204	Inductor, Chip, 1μH, 01, ±20%		310-657-0
L205	Inductor, Chip, 1μH, 01, ±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, ±5%		060-272-7
R202	Chip, 2.7K ohm, 1/10W, 0805, ±5%		060-272-7
R203	Chip, 47 ohm, 1/10W, 0805, ±5%		060-470-9
R204	Chip, 47 ohm, 1/10W, 0805, ±5%		060-470-9
R205	Chip, 47 ohm, 1/10W, 0805, ±5%		060-470-9
R206	Chip, 2.7K ohm, 1/10W, 0805, ±5%		060-272-7
R207	Chip, 33 ohm, 1/10W, 0805, ±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, ±5%		060-100-5
R902	Chip, 4.7K ohm, 1/10W, 0805, ±5%		060-472-1

Ref. No.	Description	RS Part No.	MFR. Part No.
R903	Chip, 2.2K ohm, 1/10W, 0805, ±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, ±10%		134-726-3
C2002	Ceramic, 470pF 50V, ±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, 3.8×15mm		420-564-3
	End of Miscellaneous		

SEMICONDUCTOR VOLTAGE CHART

- Frequency : 146.100MHz
- 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 1000μV)
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 0.25μVpd)

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

Transistor

Ref. No.	Receive					
	D-SQL OFF			D-SQL ON		
	E	B	C	E	B	C
Q1005	4.93	4.95	0.00	4.92	0.31	4.85

Ref. No.	Transmit					
	Normal			With DTMF		
	E	B	C	E	B	C
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

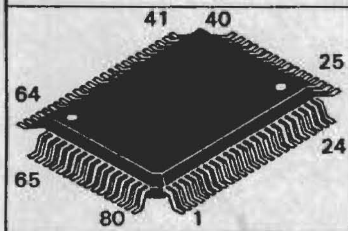
Mic : Receive (Squelch)

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

<table>
<tr><th>Base Diagram</th><th>Manufacturer's NBR</th><th>Schematic Ref NBR</th><th></th></tr>
<tr><td rowspan="3">
</td><td>HD404808FS</td><td>IC1006</td><td>CPU Mask ROM</td></tr>
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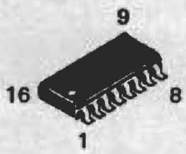
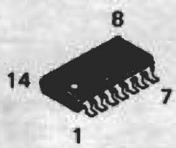
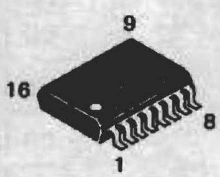
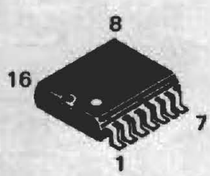
<tr><td rowspan="3">
</td><td>MC145170DR2</td><td>IC1</td><td>PLL</td></tr>
<tr><td>MC14094BD</td><td>IC2</td><td>Shift Registor</td></tr>
<tr><td>MC3371DR2</td><td>IC4</td><td>IF</td></tr>
<tr><td rowspan="3">
</td><td>LM339M</td><td>IC301</td><td>Quad Comparator</td></tr>
<tr><td>MC74HC4078D</td><td>IC1008</td><td>8 Input Nor Gate</td></tr>
<tr><td>LM2902</td><td>IC101, IC401, IC501</td><td>Quad OP Amp</td></tr>
<tr><td rowspan="3">
</td><td>MC142100DW</td><td>IC1003</td><td>Cross Point Switch</td></tr>
<tr><td>MC145436DW</td><td>IC1007</td><td>DTMF Receiver</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td rowspan="3">
</td><td>MF6CWM-100</td><td>IC1002</td><td>Switched Capacitor</td></tr>
<tr><td>TP5088</td><td>IC1004</td><td>DTMF Generator</td></tr>
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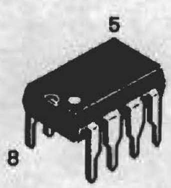
<tr><td rowspan="3">
</td><td>LM386N3</td><td>IC601</td><td>Audio Amp</td></tr>
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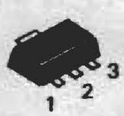
<tr><td rowspan="2">

1: OUT
2: V_{DD}
3: V_{SS}</td><td>S8054ALR-LN (LN)</td><td>IC1005</td><td>Voltage Detector</td></tr>
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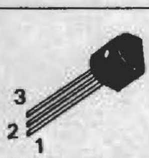
<tr><td rowspan="2">

1: OUT
2: GND
3: IN</td><td>LM2931AZ</td><td>IC3, IC1001</td><td>5V Regulator</td></tr>
<tr><td></td><td></td><td></td></tr>
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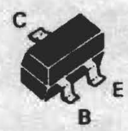
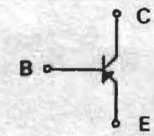
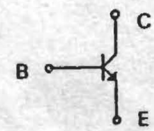
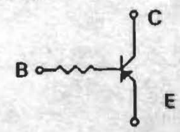
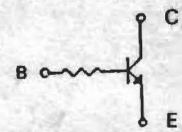
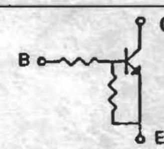
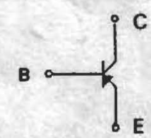
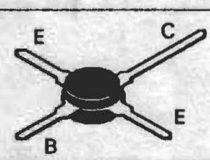
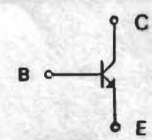
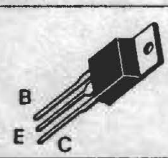
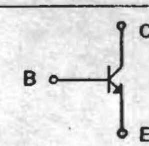
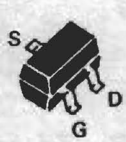
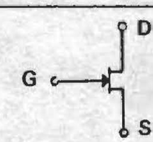
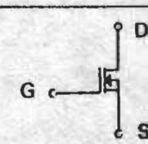
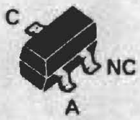
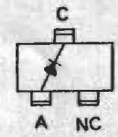
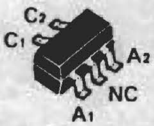
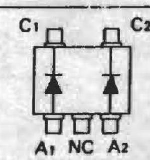
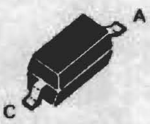
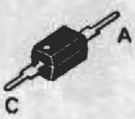
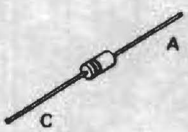
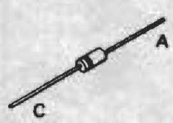
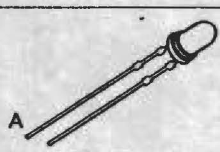
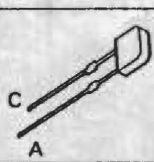
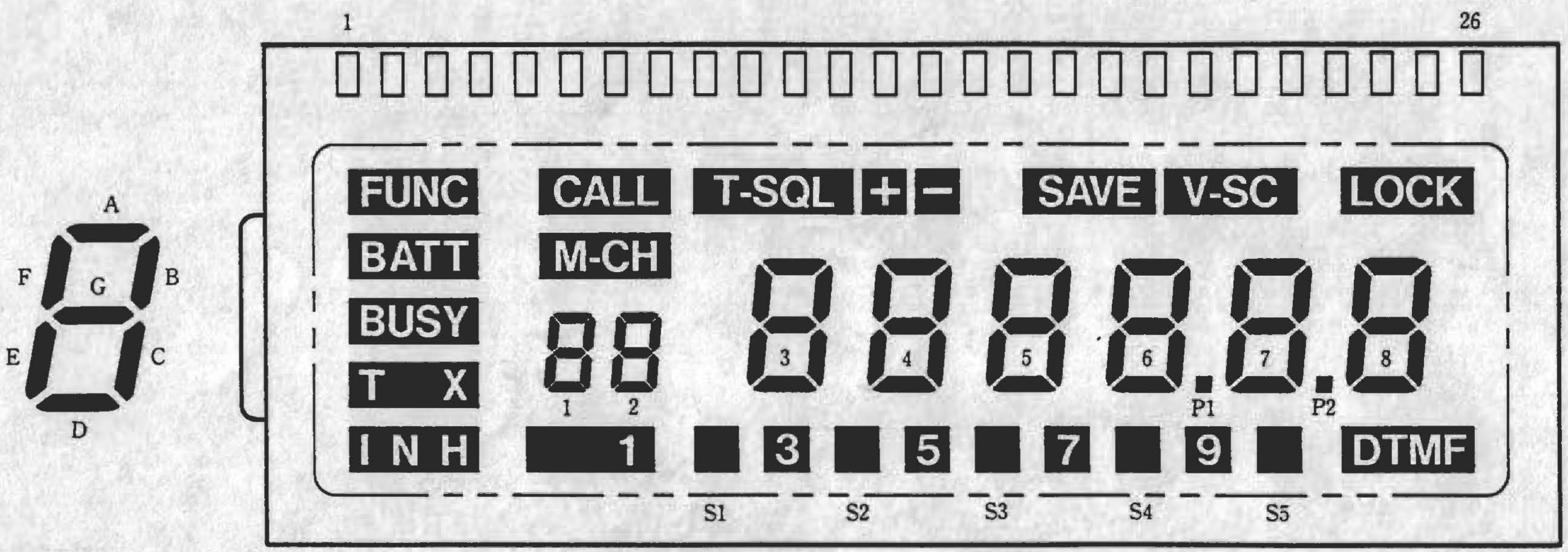
B: Base C: Collector D: Drain
E: Emitter G: Gate S: Source

Base Diagram	Manufactur'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	

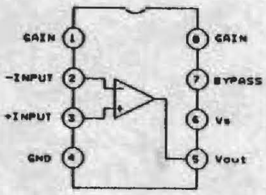
A: Anode B: Cathode
NC: No Connection

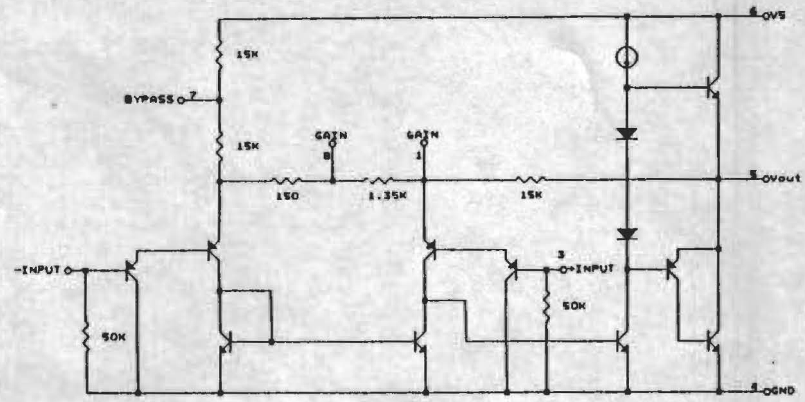
Base Diagram	Manufactur's NBR	Schematic REF NBR	
	MMBV3401 (4D)	D1,D3,D6	
	KDS193S (F3)	D901,D1001,D1003,D1006	
	RB471E (D3G)	D1002,D1004,D1005,D1007 D1008	
	1SS241 (TY)	D201	
	1SV50	D202	
	1SS97	D2	
	1N5819	D4,D5	
	KLR124	D902	
	SLP-378H	LED1001, LED1002	

	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

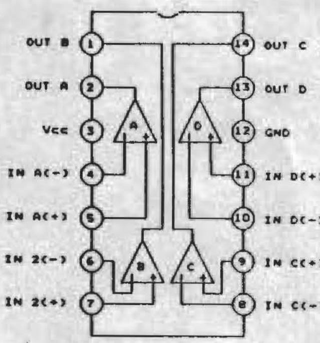


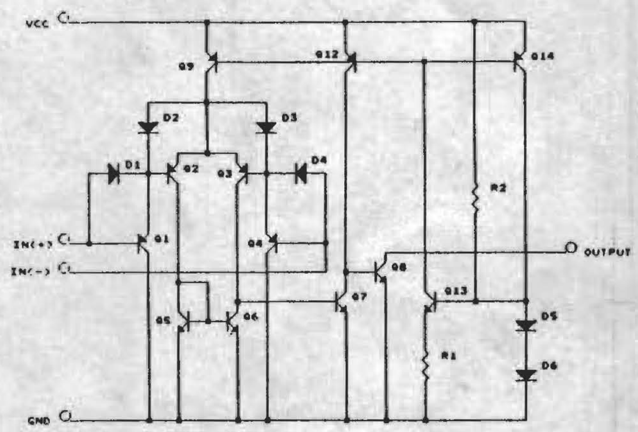
IC INTERNAL CONNECTION



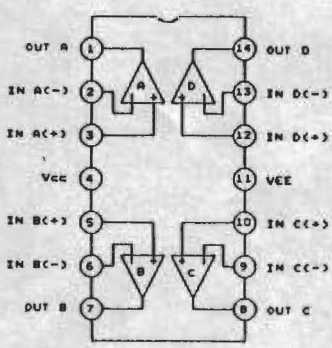


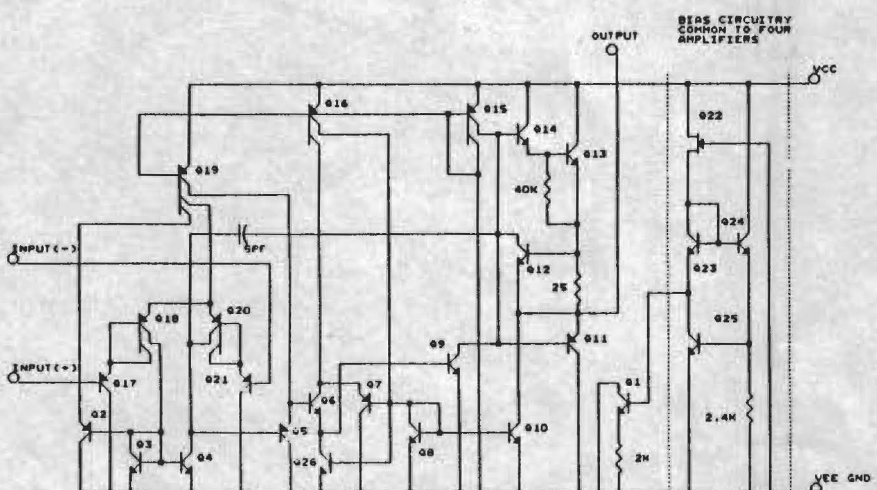
LM386-N3



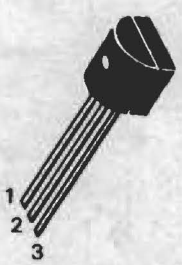


LM339M

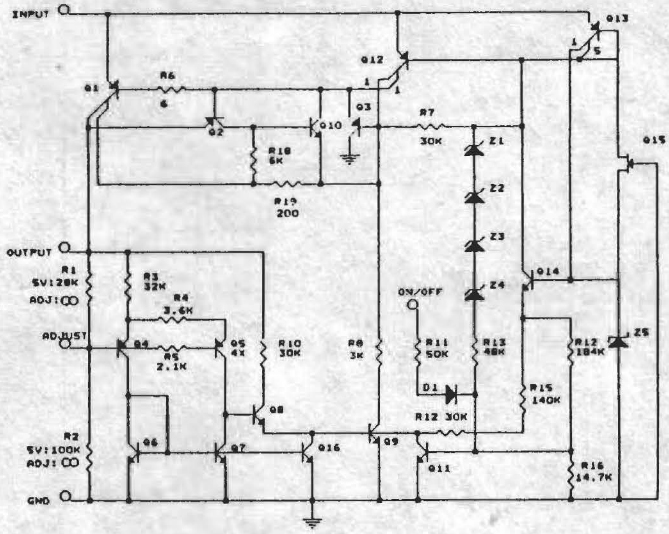




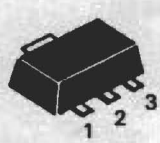
LM2902M



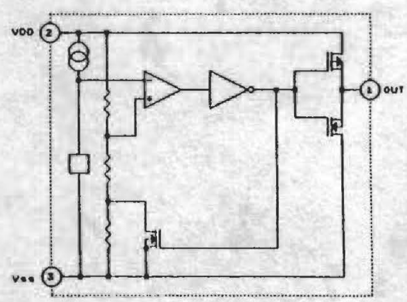
1: OUT
2: GND
3: IN



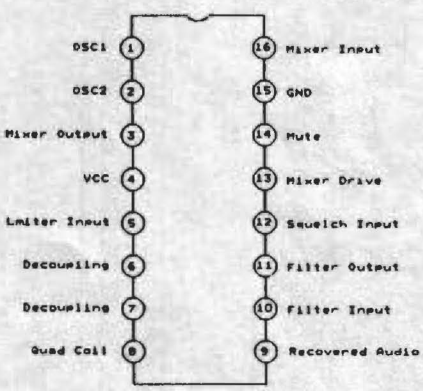
LM2931AZ

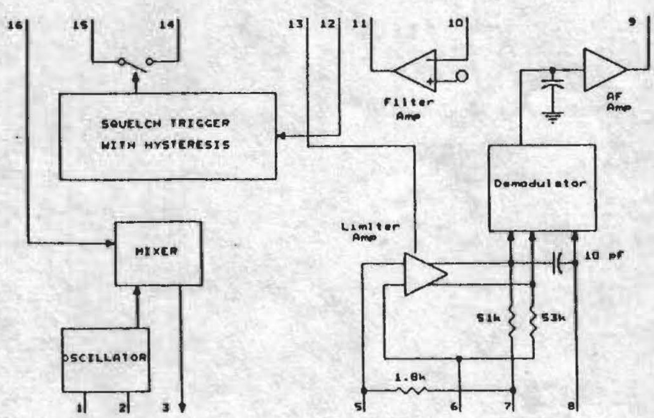


1: OUT
2: V_{DD}
3: V_{SS}

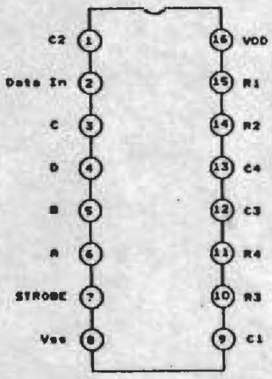


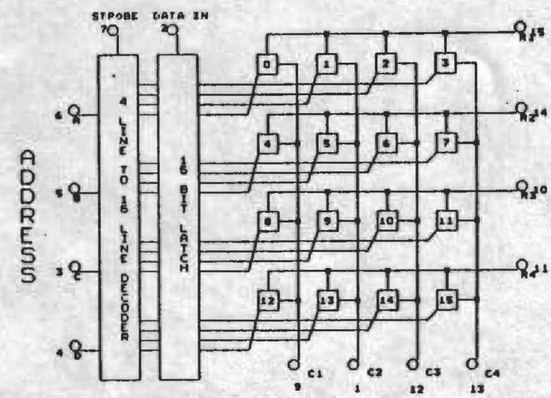
S80554ALR-LN



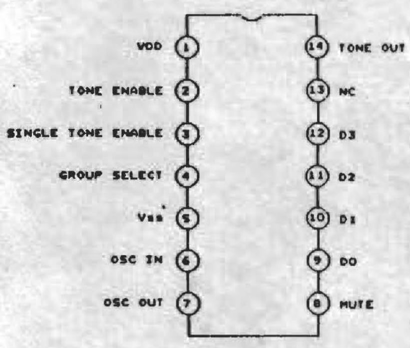


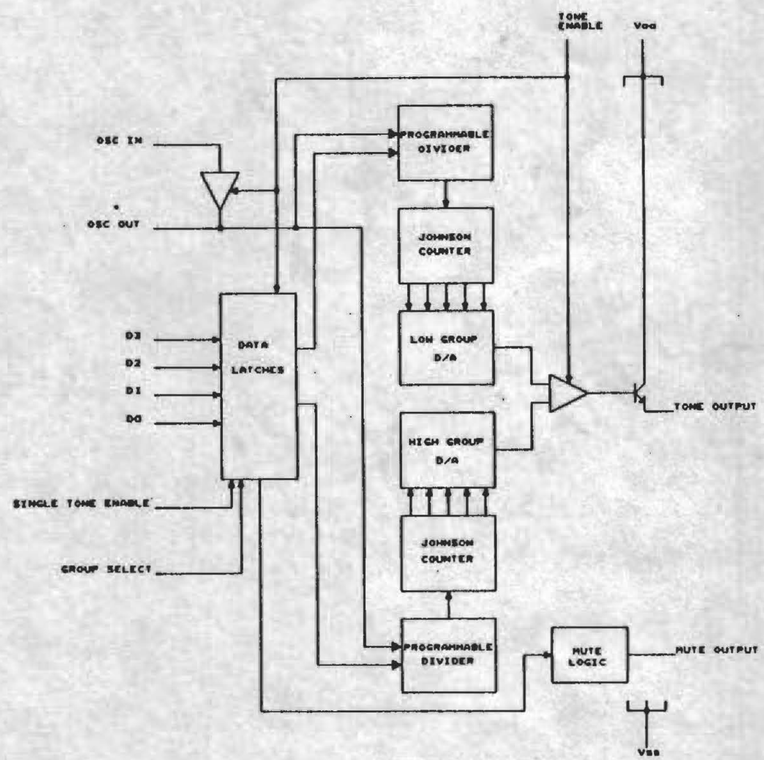
MC3371DR2



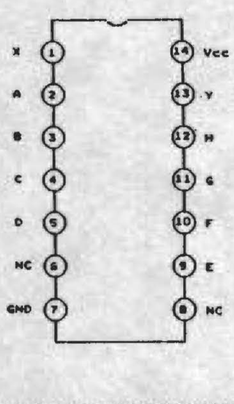


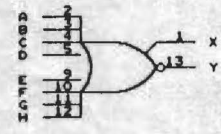
MC142100DW





TP5088



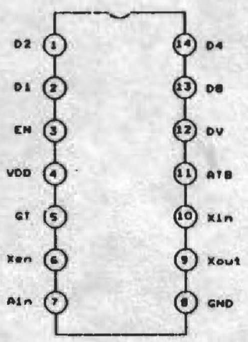


Y=A+B+C+D+E+F+G+H

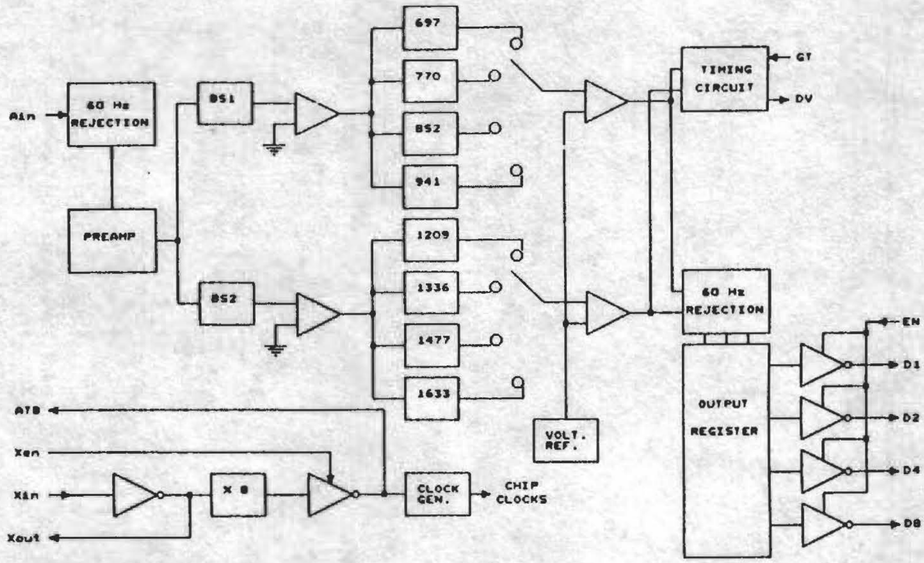
X=A+B+C+D+E+F+G+H

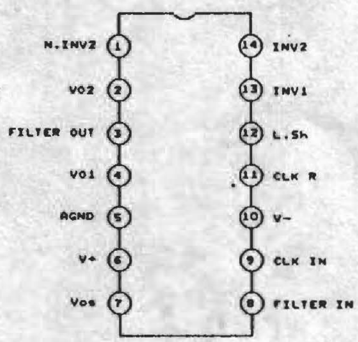
PIN 14 = Vcc
PIN 7 = GND
PINS 6,8 = NO CONNECTION

MC74HC4078D



MC145436DW





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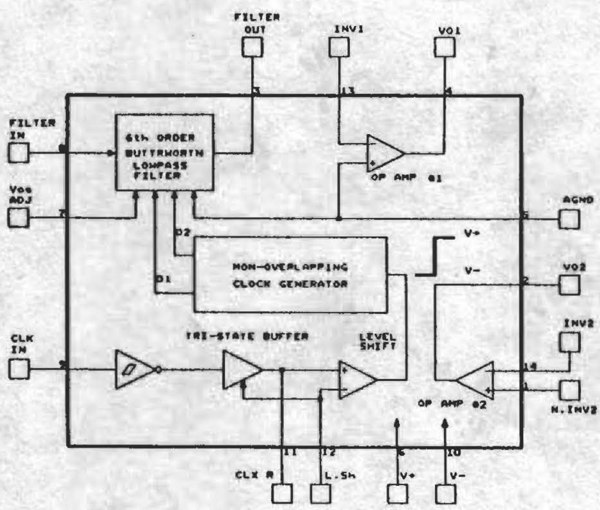
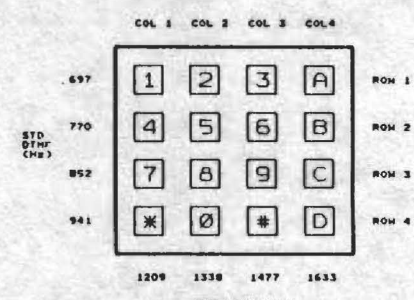
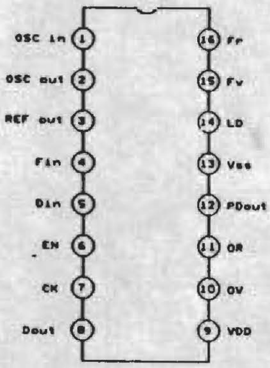


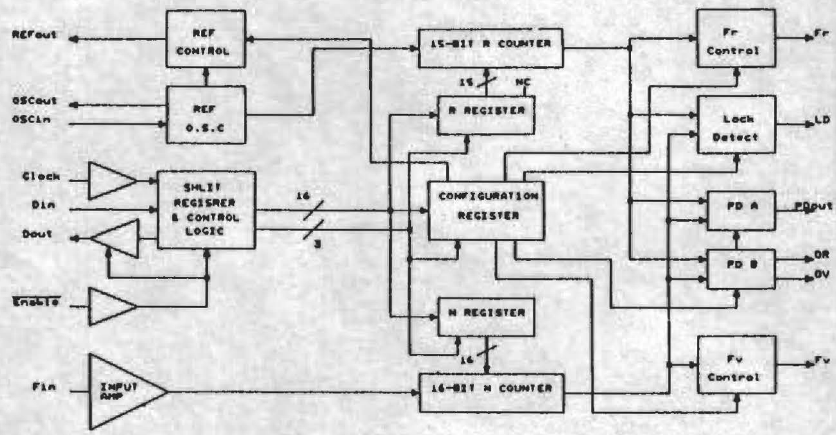
Hexadecimal Codes

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
■	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 × 4 Keyboard Matrix





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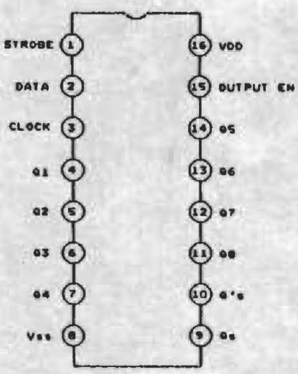
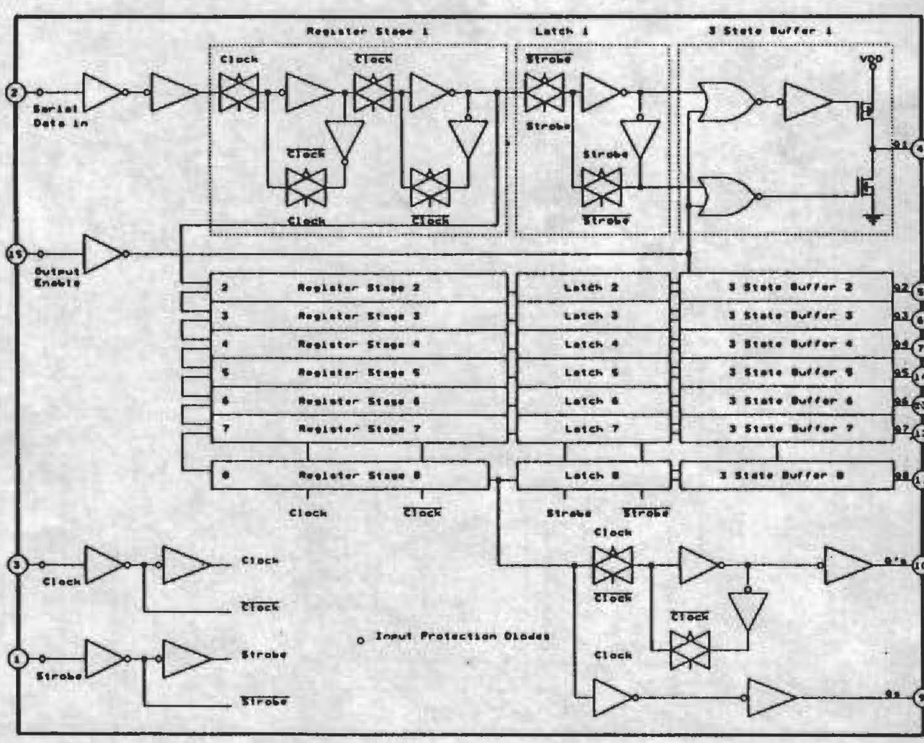
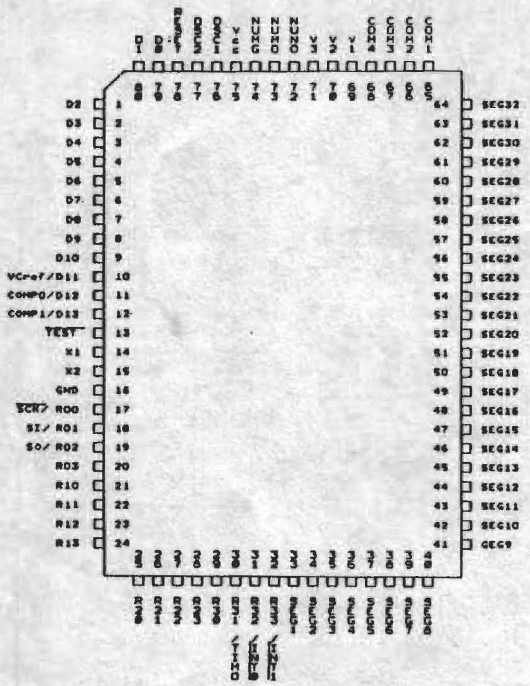




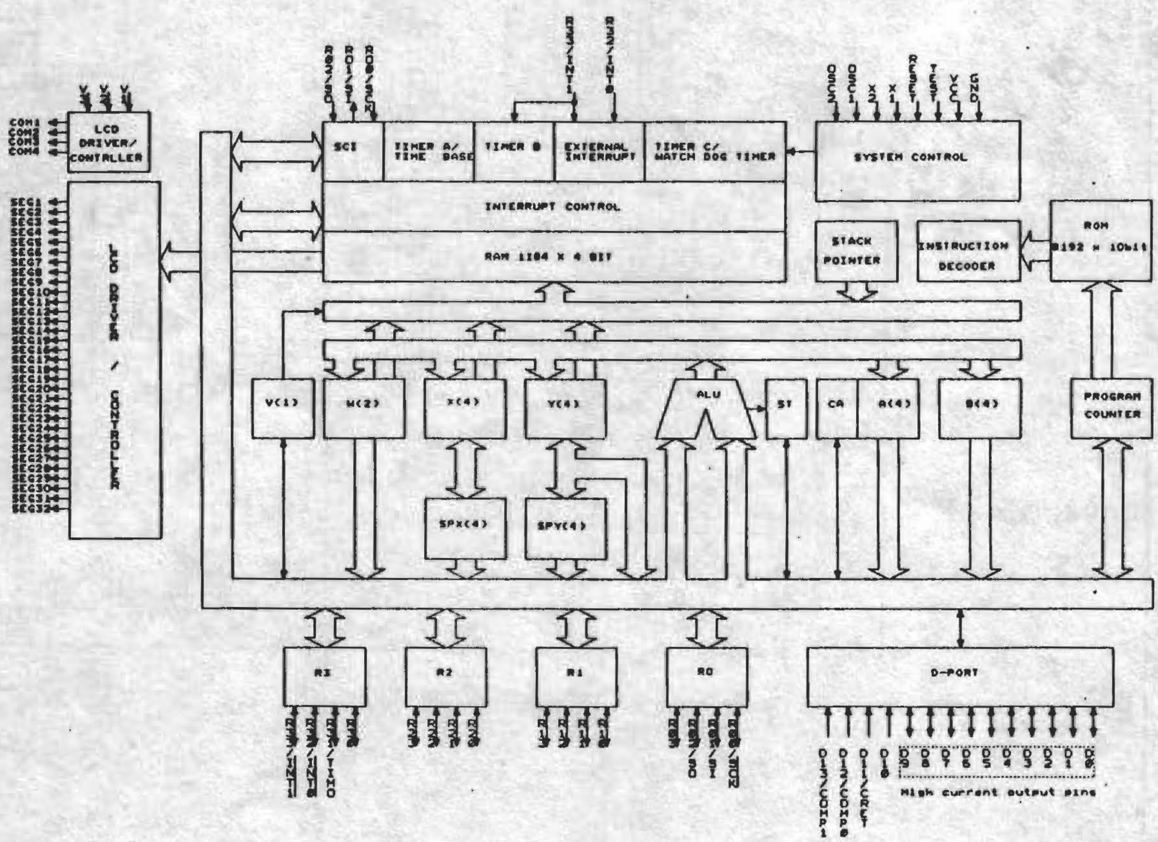
MC14094BD



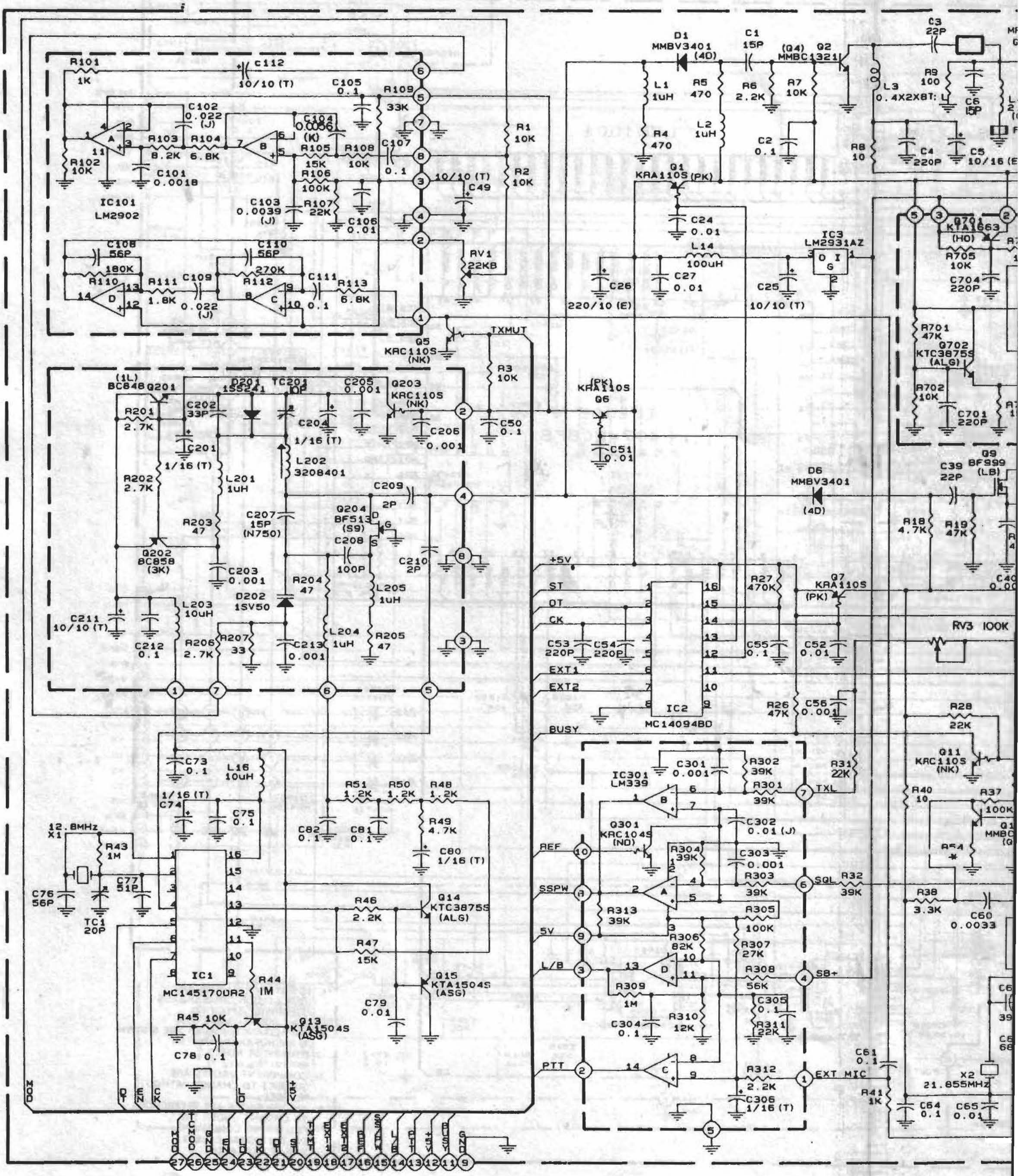
PIN NO.	PIN NAME	I/O	PIN NO.	PIN NAME	I/O
1	D2	I/O	41	SEG9	O
2	D3	I/O	42	SEG10	O
3	D4	I/O	43	SEG11	O
4	D5	I/O	44	SEG12	O
5	D6	I/O	45	SEG13	O
6	D7	I/O	46	SEG14	O
7	D8	I/O	47	SEG15	O
8	D9	I/O	48	SEG16	O
9	D10	I	49	SEG17	O
10	D11 /VCref		50	SEG18	O
11	D12 /COMP0		51	SEG19	O
12	D13 /COMP1		52	SEG20	O
13	$\overline{TEST}$		53	SEG21	O
14	X1		54	SEG22	O
15	X2	O	55	SEG23	O
16	GND		56	SEG24	O
17	R00 /$\overline{SCK}$	I/O	57	SEG25	O
18	R01 /SI	I/O	58	SEG26	O
19	R02 /SO	I/O	59	SEG27	O
20	R03	I/O	60	SEG28	O
21	R10	I/O	61	SEG29	O
22	R11	I/O	62	SEG30	O
23	R12	I/O	63	SEG31	O
24	R13	I/O	64	SEG32	O
25	R20	I/O	65	COM1	O
26	R21	I/O	66	COM2	O
27	R22	I/O	67	COM3	O
28	R23	I/O	68	COM4	O
29	R30	I/O	69	V1	
30	R31 /TIMO	I/O	70	V2	
31	R32 /$\overline{INT0}$	I/O	71	V3	
32	R33 /$\overline{INT1}$	I/O	72	NUMO	
33	SEG1	O	73	NUMO	
34	SEG2	O	74	NUMG	
35	SEG3	O	75	Vcc	
36	SEG4	O	76	OSC1	I
37	SEG5	O	77	OSC2	O
38	SEG6	O	78	RESET	I
39	SEG7	O	79	D0	I/O
40	SEG8	O	80	D1	I/O

I : INPUT PIN
O : OUTPUT PIN
NUMO : OPEN
NUMG : GND

HD404808FS

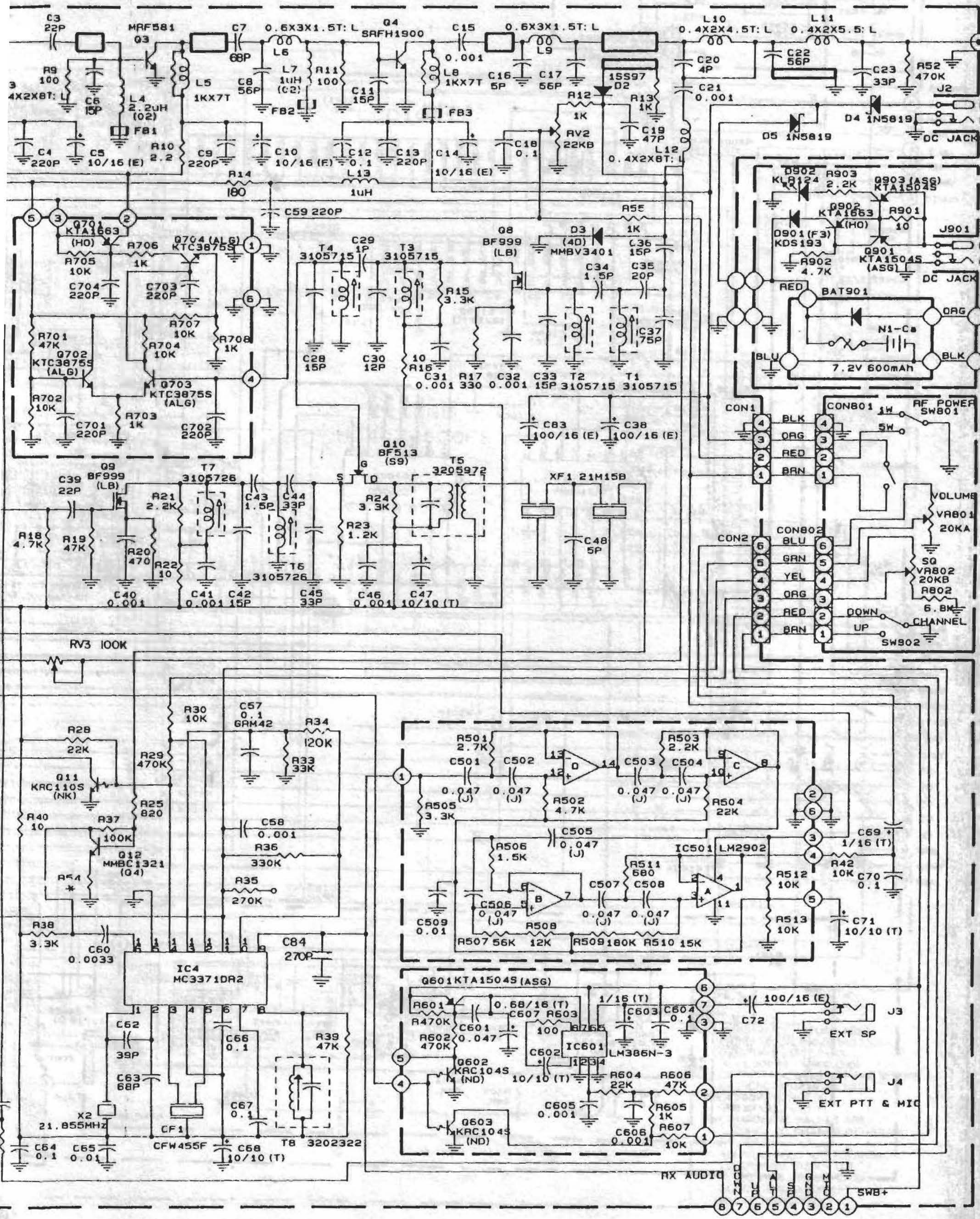


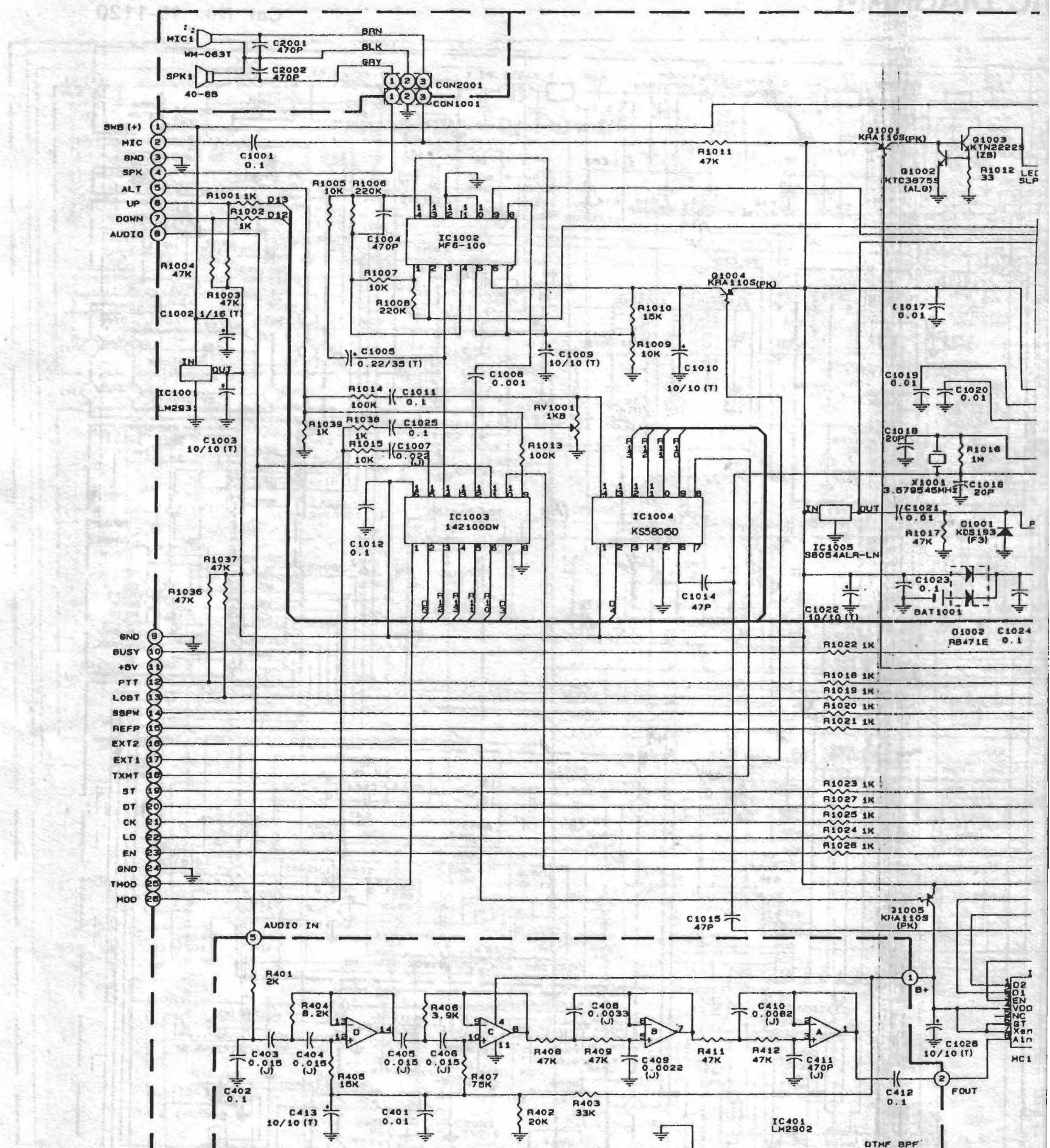
SCHEMATIC DIAG



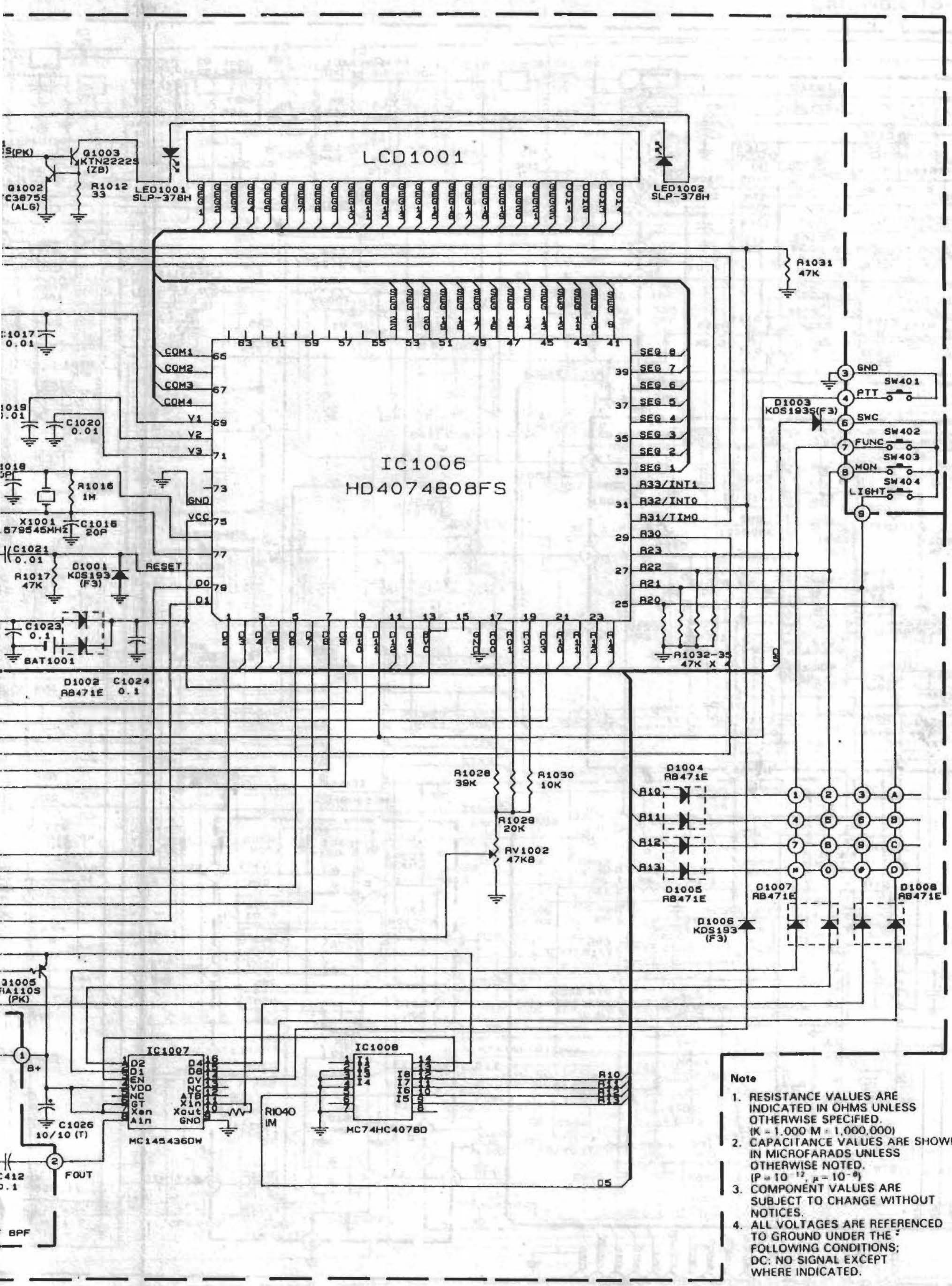
IC DIAGRAM

Cat. No.: 19-1120




MIC1
WM-063T
SPK1
40-8B
C2001 470P
C2002 470P
BRN
BLK
GRY
CON2001
CON1001
SWB (+)
MIC
GND
SPK
ALT
UP
DOWN
AUDIO
C1001 0.1
R1001 1K
D13
R1002 1K
D12
R1004 47K
R1003 47K
C1002 1/16 (T)
IN
OUT
IC1001 LM2931
C1003 10/10 (T)
R1005 10K
R1006 220K
C1004 470P
IC1002 MF6-100
R1007 10K
R1008 220K
C1005 0.22/35 (T)
C1006 0.001
R1014 100K
C1011 0.1
R1039 1K
R1038 1K
C1025 0.1
R1015 10K
C1007 0.022
RV1001 1KB
R1013 100K
C1012 0.1
IC1003 142100DW
C1009 10/10 (T)
R1010 15K
R1009 10K
C1010 10/10 (T)
Q1004 KRA110S(PK)
IC1004 KS5805D
C1014 47P
R1011 47K
Q1001 KRA110S(PK)
Q1003 KTN2222S (ZB)
Q1002 KTC3875S (ALG)
R1012 33
LED
SLP
C1017 0.01
C1019 0.01
C1020 0.01
C1018 20P
R1016 1M
X1001 3.579545MHz
C1016 20P
IC1005 S8054ALR-LN
C1021 0.01
R1017 47K
D1001 KDS193 (F3)
C1022 10/10 (T)
C1023 0.1
BAT1001
D1002 RB471E
C1024 0.1
R1036 47K
R1037 47K
GND
BUSY
+8V
PTT
LOBT
SSPW
REFP
EXT2
EXT1
TXMT
ST
DT
CK
LD
EN
GND
TMOD
MOD
R1022 1K
R1018 1K
R1019 1K
R1020 1K
R1021 1K
R1023 1K
R1027 1K
R1025 1K
R1024 1K
R1026 1K
Q1005 KRA110S (PK)
C1015 47P
AUDIO IN
R401 2K
R404 8.2K
R406 3.9K
C408 0.0033 (J)
C410 0.0082 (J)
C403 0.015 (J)
C404 0.015 (J)
C405 0.015 (J)
C406 0.015 (J)
R405 15K
R407 75K
R408 47K
R409 47K
C409 0.0022 (J)
R411 47K
R412 47K
C411 470P (J)
C402 0.1
C413 10/10 (T)
C401 0.01
R402 20K
R403 33K
IC401 LM2902
C412 0.1
B+
FOUT
C1026 10/10 (T)
D2
D1
EN
VDD
NC
ST
Xen
Ain
MC1
DTMF BPF
GND

Cat. No.: 19-1120



Note

1. RESISTANCE VALUES ARE INDICATED IN OHMS UNLESS OTHERWISE SPECIFIED. (K = 1,000 M = 1,000,000)
2. CAPACITANCE VALUES ARE SHOWN IN MICROFARADS UNLESS OTHERWISE NOTED. ($P = 10^{-12}$, $\mu = 10^{-6}$)
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.

The Radio Shack HTX-202 Two-Meter Handheld Transceiver offers both the newly licensed Tech and the experienced amateur some of the most advanced features ever presented in a handheld transceiver.

NOTE: You must have a Technician Class or higher Amateur Radio Operator's License and a call sign issued by the FCC to legally transmit using this transceiver. Transmitting without a license carries heavy penalties. Getting a license is easier than ever.

True FM Modulation -	provides a more natural-sounding signal, with high clarity and better performance with packet systems.
16 Frequency Memories -	include one calling-frequency memory, three priority-frequency memories, and 12 standard memories.
Individually Programmable Repeater Offsets -	let you program a different repeater offset frequency for each memory, and default repeater offset for manually-tuned frequencies.
Sub-audible Tone Transmit and Decode (CTCSS) -	let you transmit the Sub-audible tone required by some repeaters, and also lets you set a Sub-audible tone that your transceiver must receive to open squelch.
Touch-Tone Page -	lets you set a sequence of up to five touch-tones your transceiver must receive to sound an alert tone to open the squelch.
16-Digit DTMF Memory Sequences -	lets you transmitt all touch tones (0-9, #, *, and A-D).
Dual Power Transmitter -	lets you select between 1-Watt and 6-Watt to preserve battery power.
Five DTMF Memory Sequences -	lets you store five touch-tone sequences of up to 15 digits each so that you can quickly transmit the sequences you commonly used to activate repeaters or autopatches, or other stations equipped with touch-tone page.
Multi-Function Scanning -	lets you scan the standard memories, priority frequency memories, or a frequency range, and automatically resume scanning when the carrier drops, resume scanning after 10 seconds, or stop scanning when carrier is detected.
Programmable Frequency Step -	lets you set the frequency step for tuning or scanning to 5, 10, 15, 20, 25, 50, or 100 kHz.

Your HTX-202 2-Meter Handheld Transceiver is an example of superior design and craftsmanship. The following suggestions will help you care for your transceiver so that you can enjoy it for years.

Keep the transceiver dry. If it does get wet, wipe it dry immediately. Liquids can contain minerals that can corrode the electronic circuits.

Use and store the transceiver only in normal temperature environments. Temperature extremes can shorten the life of electronic devices and distort or melt plastic parts.

Handle the transceiver gently and carefully. Dropping it can damage circuit boards and cases and can cause the transceiver to work improperly.

Keep the transceiver away from dust and dirt, which can cause premature wear of parts.

Wipe the transceiver with a dampened cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the transceiver.

Modifying or tampering with your transceiver's internal components can cause a malfunction and might invalidate its warranty and void your FCC authorization to operate the transceiver. If your transceiver is not performing as it should, take it to your local Radio Shack store.

You can operate your transceiver from any of the following sources:

Rechargeable power pack (supplied with charger)

Six alkaline AA batteries (using the supplied alkaline pack)

Vehicle battery power (using optional adapter)

OPERATING FROM THE RECHARGEABLE POWER PACK

You can use the supplied rechargeable power pack to power your transceiver. This power pack provides 7.2 volts and can operate your transceiver at 2.5 watts(typical power) with the low power button out. As supplied, the power pack is fully discharged. You need to fully charge the pack using the supplied charger before you operate the transceiver from the rechargeable pack. Follow these steps to charge the pack.

1. If the pack is attached to the transceiver, turn off the transceiver. Do not operate the transceiver while charging the pack.

   NOTE: You can remove the power pack from the transceiver to charge it, and operate the transceiver from one of the other power sources.

2. Plug the supplied charger's barrel plug into the CHARGE jack on the back of the power pack.

3. Plug the charger into a standard AC outlet. The CHARGE indicator lights.

   It takes about 10 hours to charge the power pack.

   When power is low, BATT appears on the display when you press PTT. You

can buy extra power packs through your local Radio Shack store.

NOTES: Nickel-cadmium batteries deliver more power if you occasionally let them completely discharge. To do this, use the transceiver until BATT appears on the display when you push the PTT. Then fully charge the batteries. If you do not occasionally do this, the batteries temporarily lose the ability to deliver full power. Also, to ensure a full charge, be sure the batteries are at room temperature (above 65 degrees F) when you charge them. Cold batteries do not fully charge.

Even when the battery is fully charged, the battery power meter will not read full scale. However, it will indicate full scale when being powered from the cigarette lighter adapter.

CAUTIONS: To prevent permanent nickel-cadmium power loss, never charge the power pack in an area where the temperature is above about 80 degrees F.

Never use a charger other than the one supplied to charge the power pack. Even chargers with the same voltage and current ratings could permanently damage the transceiver or the power pack. You can order a replacement charger at your local Radio Shack store.

USING ALKALINE BATTERIES

You can operate the transceiver from 6 AA alkaline batteries (not supplied) using the supplied alkaline battery holder. This battery holder supplies 9 volts and can operate your transceiver at 4 watts (typical power) with the low power button out. Follow these steps to load or replace batteries in the alkaline battery holder.

1. Hold the outer battery holder case and push down on the center of the battery holder.

2. Remove old batteries, if necessary, and install six fresh AA alkaline batteries, observing the correct polarity as indicated by the markings (+ and -) in the battery holder.

3. Press the battery holder into the battery holder case.

When power is low, BATT appears when you press PTT. Be sure to use six fresh AA alkaline batteries. Never mix different types of batteries, and never mix old and new batteries.

OPERATING FROM VEHICLE BATTERY POWER

You can operate the transceiver from vehicle battery using a DC power cord (Radio Shack Cat. No. 270-1533). This cord supplies a 13.8 volts (typical) to your transceiver and can operate your transceiver at 6 watts (typical power) with the LOW POWER button out. Follow these steps to operate from the vehicles battery power.

1. Plug the power cord's barrel plug into the transceiver's EXT DC jack.

   CAUTION: Never plug the power cord into the rechargeable power pack's CHARGE jack. Doing so can damage the power pack and the transceiver.

2. Plug the power cord's cigarette-lighter plug into your vehicle's cigarette-lighter socket.

If the transceiver does not operate, remove the power cord's plug from the cigarette-lighter and check for debris. Clean the socket, if necessary, and try again.

OPERATING FROM AC POWER

You can operate the transceiver from AC power using either the 1-amp 12 volt DC adapter(Cat. No. 273-1653) or our regulated 2.5-amp power supply (Cat. No. 22-120). The 2.5-amp power supply lets you operate your transceiver at 5 watts (typical power) with the low power button out and is better isolated from 60 Hz noise. The 1-amp adapter connects very quickly and requires no soldering but only operates your transceiver at about 2 watts with the LOW POWER button out.

Follow these steps to power the transceiver from the 1-amp, 12 volt DC adapter.

1. Connect the barrel plug with the tip set to positive.

2. Insert the adapter's barrel plug into the transceiver's EXT DC jack.

CAUTION: Never insert the adapter's barrel plug into the rechargeable power pack's CHARGE jack. Doing so can damage the power pack and transceiver.

3. Plug the adapter into an AC outlet.

Follow these steps to power the transceiver from the regulated 2.5 amp power supply.

NOTE: You need the following materials to use the regulated 2.5 amp power supply:

Power supply (Cat. NO. 22-120)

Two-conductor 18-gauge wire (Cat. No. 278-5670

DC power connector (Cat. No. 274-1567)

Soldering iron and solder

Volt meter or multimeter

1. Cut the two-conductor wire to the length power cord you need.

2. Strip about 1/2 inch of insulation from each end of both conductors.

3. Solder one end of the wire to the DC power connector, with the red lead connected to the center terminal, and the black lead connected to the outer casing.

4. Melt a small amount of solder onto the other end of the wire. Then, connect the red lead to the power supply's + terminal and connect the black lead to the power supply's - terminal.

5. Plug in the power supply and turn it on. Use the meter to confirm you have correctly wired the power connector so that the tip is + and the case is -.

6. Turn off the power supply and plug the connector into the transceiver EXT DC jack.

   CAUTION: Never plug the power connector into the rechargeable power pack's CHARGE jack. Doing so can damage the power pack and the transceiver.

7. Turn on the power supply.

BACKUP BATTERY

Your transceiver uses a lithium battery to keep stored options in memory when you disconnect the transceiver from a power source. This battery should last 3 to 5 years, under normal conditions. When the transceiver frequently displays ER1, the back up battery needs to be replaced.

NOTE: To clear the error, reset the transceiver. See "Resetting the Transceiver."

The backup battery is not user-serviceable. Take the transceiver to your local Radio Shack store to have the battery replaced by a Radio Shack repair center.

This product contains a rechargeable nickel-cadmium (lead acid) battery. At the end of the battery's useful life, it must be recycled or disposed of properly. Contact your local, county, or state hazardous waste management authorities for information on recycling or disposal programs in your area. Some options that might be available are: Municipal curb-side collection, drop-off boxes at retailers, recycling collection centers, and mail back programs.

CONNECTING THE ANTENNA

Your transceiver comes with a flexible antenna. You must connect an antenna to your transceiver before you transmit. The transceivers BNC antenna connector is easy to connect other types of antennas. Radio Shack stores sell a 5/8 wave magnetic mount antenna for mobile operation (Cat. No. 19-210), a discone antenna (Cat. No. 20-013), and a center-loaded telescoping whip antenna (Cat. No.20-006) that you can use with your transceiver.

To use the supplied antenna, slip the antenna's connector over the BNC jack and twist the antenna to lock it in place.

To use an external antenna, if necessary, attach the appropriate connector adapter to the end of the antenna cable. Then, slip the connector over the BNC jack and twist the connector to lock it in place.

WARNING: When installing or removing an outdoor antenna, use extreme caution. If the antenna starts to fall, let it go! It could contact overhead power lines. If the antenna touches the power line, contact with the antenna, mast, cable, or guy wires can cause electrocution and death! Call the power company to remove the antenna. Don't attempt to do so yourself.

ATTACHING THE BELT CLIP

You can attach the provided belt clip to your transceiver. Use the supplied screws.

ATTACHING THE HAND STRAP

Loop the supplied hand strap's key ring through the hand strap tab.

USING AN EXTERNAL MICROPHONE

You can use an external microphone with your, transceiver. Then you connect an external microphone, the internal microphone does not work, but the internal PTT is not affected. If your microphone has a 3/32 inch(2.5 mm) submini plug, plug the microphone cable into the transceiver's MIC jack.

USING AN EXTERNAL SPEAKER

In a noisy area, an external speaker, positioned in the right place, might provide more comfortable listening. Radio Shack stores sell an extension speaker (Cat. No. 21-549) and an amplified communication extension speaker

(Cat. No. 21-541). Plug the speaker cable's 1/8 inch(3.5 mm) mini plug into the transceiver's SP jack. This disconnects the internal speaker.

For the most efficient operation when you carry the transceiver on your belt, connect a combination speaker/microphone (such as Cat. No. 19-310) to your transceiver and hang the mic/speaker on your collar.

If your vehicle has a cassette player, you can easily connect your transceiver to your vehicle's audio system using a CD-to-cassette adapter (Cat. No. 19-1951) and a mono-to-stereo audio plug (Cat. No. 274-368). Simply insert the adapter in your vehicle's cassette player, connect the adapter's plug to the mono-to-stereo plug, insert the plug in the transceiver's SP jack, and turn on your cassette player.

USING THE TRANSCEIVER WITH PACKET RADIO

You can connect your transceiver directly to a packet radio terminal mode controller.

RESETTING THE TRANSCEIVER

When you first use the transceiver, if the transceiver displays ER1, or if you ever want to reset the transceiver's options to the factory defaults and clear all memories, follow these steps.

WARNING: This procedure clears all the stored information from the transceiver.

1. Turn off the transceiver.

2. Press and hold down F+CLR. Then, turn on the transceiver.

USING THE LIGHT

Press L on the side of the transceiver to turn on the display light for about 5 seconds. To turn the light off sooner, press L again. The light stays on until you press L or turn off the transceiver.

SETTING SQUELCH AND VOLUME

Rotate VOLUME clockwise and SQUELCH counterclockwise until you hear a hissing sound. Then, slowly rotate SQUELCH clockwise until the noise stops. Leave VOLUME set to a comfortable level.

If the transceiver picks up unwanted weak transmissions, rotate SQUELCH clockwise to decrease the transceiver's sensitivity to signals.

SELECTING A FREQUENCY

You can use any of three methods to select a frequency to communicate on.

- Direct entry
- Tune control
- Scanning for frequencies

TUNING USING DIRECT ENTRY

Your transceivers transmits and receives on frequencies between 144.000 and 148.000 MHz. To quickly tune to a frequency, enter the frequency using the keypad.

1. Turn on the transceiver.
2. Press VF.
3. Use the keypad to enter the last four digits of the frequency. For example, to enter 146.940, press 6940.

NOTES: If you make a mistake, press CLR and repeat this step.

The transceiver rounds the last digit down to 0 or 5.

TUNING USING THE TUNE CONTROL

You can quickly tune to a nearby frequency by rotating TUNE on top of the transceiver.

1. Turn on the transceiver.

2. Press VF.

3. Rotate TUNE counterclockwise to tune down or clockwise to tune up. The transceiver tunes up or down one frequency step per click, see "Setting the Frequency Rate."

SCANNING FOR ACTIVE FREQUENCIES

You can scan for activity on a frequency by pressing and holding down /\SC or \/SC for at least 1 second. The transceiver begins to scan up or down the full frequency range, and stops on active frequencies. To scan only a selected frequency range press F+/\SC or F+ \/SC. See "Setting the Scan Options" to see how to change the scanning range, the frequency step, the scan resume condition, and the scan delay time. The following are the factory presets for these options.

Frequency Step:	15KHz
Scan Resume Condition:	Resumes scanning in 10 seconds, regardless of absence or presence of a carrier.
Scan Delay:	Not activated.
Scan limits:	144 MHz to 148 MHz

To stop scanning, press \/SC, /\SC, CA, PR, VF, or turn off the transceiver.

SCANNING FOR A VACANT FREQUENCY

In some areas where the 2-meter band is being used heavily, you might have trouble quickly finding a frequency not being used. To quickly scan for a vacant frequency, press F+V - SC. The transceiver scans up or down from the current frequency to the first unused frequency. To change the vacant scan direction, see "Setting the Vacant Scan Direction."

RECEIVING TRANSMISSIONS

To receive transmissions, turn on the transceiver, adjust the volume and squelch, and tune to a frequency.

TRANSMITTING

There are two basic types of communication you can use with this transceiver. These types are sometimes referred to as SIMPLEX and DUPLEX. With simplex transmissions, you transmit and receive on the same frequency. With duplex transmissions, you transmit on one frequency and receive on another. Duplex transmission is the communication type you use when you communicate using a repeater. You transmit to the repeater on one frequency (the input frequency), and the repeater retransmits the signal at a different frequency (the output frequency).

CAUTION: Do not transmit if you do not have a Technician Class or higher license issued by the FCC. Doing so is illegal.

Follow these steps to communicate using simplex communications.

1. Turn on the transceiver.

2. Select the desired frequency.

3. If + or - is on the display, repeatedly press F & + / - until neither symbol appears.

4. Press LOW POWER so that the button is down. In this position, your transceiver transmits at about 1 watt.

5. Begin communications.

If the other party advises that you need to improve your signal (QRO), press LOW POWER so that the button is up. In this position, your transceiver transmits at the highest power it can, depending on the power source. Remember to switch back to low power whenever possible, to comply with the FCC rules that require you to use the minimum power necessary to maintain communications.

Follow these steps to communicate using duplex communications.

1. Turn on the transceiver.

2. Tune to the desired receive (output) frequency.

3. If the transmit (input) frequency is 600 kHz ABOVE the receive frequency, press F+ +/- so that the + appears in the display. If the transmit frequency is 600 kHz BELOW the receive frequency, press F+ +/- so that - appears on the display. If the frequency separation is not 600 kHz, either set a new default frequency or store the frequency pair in one of the scanner's memories (See "Using Memory Channels" and "Setting the Duplex Separation").

LOCKING THE KEYPAD

To lock the transceiver's keypad so that you do not accidently change a

setting, press F+LOCK. LOCK appears on the display. This locks all front-panel buttons and the tune control. The PTT, VOLUME, and SQUELCH still operate. To release the lock, press F+LOCK again.

SETTING THE KEY ENTRY BEEP

Each time you press a key, the transceiver sounds a beep. To turn off the beep, press F+BEEP. The key beep does not sound this and subsequent key presses. To turn on the key beep, press F+BEEP again.

REVERSING THE OFFSET

To reverse the transmit and receive frequencies when you are operating duplex, press F+REV. For example, if you are set to 146.94 with a - offset pressing F+REV makes the transceiver receive on 146.14 and transmit on 146.94.

USING MEMORY CHANNELS

Your transceiver has 16 memory channels in three groups.

One calling-frequency memory

Three priority-frequency memories

12 standard memories

USING THE CALLING-FREQUENCY MEMORY

The calling-frequency memory provides a single memory that you can quickly jump to at any time. Follow these steps to save a frequency in the calling-frequency memory.

Press VF.

Tune to the frequency you want to save.

Press CA.

If the frequency is for a repeater that requires subaudible tone access or if you want to use incoming subaudible tone squelch with frequency, press F+T-SQL so that T-SQL appears on the display.

NOTE: If you turn on T-SQL you must correctly set both the transmit subaudible tone as described in steps 8 through 11.

Press and hold down F+M-WR for at least 1 second.

The transceiver stores the tuned frequency in the calling-frequency memory, plus the frequency separation (for duplex operation) and subaudible transmit and receive tones. For more information about subaudible tones, see "Using Subaudible Tone Squelch" (CTCSS)."

If you want to set a different transmit frequency or change the subaudible tones, press F+M-SET. The transceiver displays TF followed by the transmit frequency.

Rotate TUNE to change the transmit frequency.

To set a transmit subaudible tone frequency, press \/SC. The transceiver displays TC followed by the transmit subaudible tone frequency.

Rotate TUNE to change the transmit frequency.

NOTE: If you do not want to transmit subaudible tone, rotate TUNE to

set the transmit subaudible tone to OFF.

10. To set a receive subaudible tone frequency, press \/SC. The transceiver displays RC followed by the receive subaudible tone frequency.

11. Rotate TUNE to set the receive subaudible tone frequency.

    NOTE: If you do not want to use incoming tone squelch, rotate TUNE to set the receive subaudible tone to OFF. Otherwise, you do not hear transmissions unless the subaudible tone is present.

12. Press the PTT to save the settings and return to the calling-frequency memory display.

To use the calling frequency memory, press CA at any time. The transceiver immediately goes to the calling frequency and sets the transmit frequency, subaudible tones, and tone squelch to the settings you programmed. To return to the previous settings, press CA again.

USING THE PRIORITY-FREQUENCY MEMORIES

The transceiver has three priority-frequency memories. The transceiver can periodically scan these frequencies during manual, calling-frequency memory, or standard memory operation. Follow these steps to store a frequency in the priority-frequency memories.

1. Press press VF and tune to the frequency you want to save.

2. Press F and rotate TUNE until either P1, P2, or P3 appears to the left of the tuned frequency.

3. If the frequency is a repeater that requires subaudible tone access or if you want to use subaudible tone squelch with this frequency, press F+T-SQL so that T-SQL appears on the display.]

4. Press F+M-WR for at least 1 second to store the tuned frequency in the selected priority-frequency memory.

5. To change the frequency separation or subaudible tones, press PR and rotate TUNE to select the priority-frequency memory you want to change. Then, refer to steps 6 through 12 under "Using the Calling-Frequency Memory." Each priority frequency can have different settings.

To set the transceiver to a priority frequency, press PR. Then rotate TUNE, press /\SC, \/SC, 1, 2, 3, to select one of the three memories.

To have the scanner check the priority-frequency memories for activity, press VF. Then, press F+P-SC for at least 1 second. The transceiver checks the priority-frequency memories every 4 seconds. To change the priority scan time, see "Setting the Priority Scan Time."

To continuously scan the three priority frequency memories, press PR. Then, press and hold down /\SC or \/SC at least 1 second,

NOTE: You must store more than one priority frequency in memory to continuously scan priority-frequency memories.

USING THE STANDARD MEMORIES

Your transceiver has 12 standard memories into which you can store frequently-accessed frequencies for quick access. Follow these steps to store a frequencies in standard memories.

1. Press VF and tune to a frequency you want to store.

2. Press F and rotate TUNE until the memory number to the left of the frequency display shows the standard memory you want to store into.

3. Press F+M-WR for at least 1 second to store the tuned frequency into the selected standard memory.

4. To change the frequency separation or subaudible tones, press MR and rotate TUNE to select the standard memory you want to change. Then, refer to steps 6 through 12 under "Using the Calling-Frequency Memory." Each standard memory can have different settings.

To set the transceiver to a standard memory, press MR. Then, rotate TUNE or press /\SC or \/SC to select one of the 12 memories.

To continuously scan standard memories, press MR. Then, press and hold down /\SC or \/SC for at least 1 second.

NOTE: The transceiver stops scanning according to the scan options you have set. See "Setting the Scan Options" for more information.

CLEARING MEMORIES

Follow these steps to clear a memory.

1. Press PR or MR and select the memory you want to clear.

2. Press F+M-CLR to clear the settings stored in the current memory.

NOTE: You cannot clear Standard Memory 1 or the calling-frequency memory. You can only change the settings for these memories.

MOVING A MEMORY CHANNEL TO THE MANUAL MODE

Follow these steps to quickly move a memory channel to the manual (VF) mode.

1. Select the memory channel.

2. Press F+M-VFO.

All settings for the selected memory move to the VF mode.

REVIEWING PROGRAMMED OPTIONS

Follow these steps to view the transmit frequency and subaudible tone settings for a memory or the tuned VF frequency.

1. Press CA, PR, MR, or VF and select the memory or frequency you want to check.

2. If you want to check the subaudible tone settings, press F+T-SQl so that T-SQL appears on the display.

3. Press M (located above PTT). The transceiver's squelch opens, and the display shows the transmit frequency for about 1 second, followed by the subaudible transmit tone and the subaudible receive tone.

UNDERSTANDING THE CONFIGURATION MENU

Your transceiver has a configuration menu that lets you modify operation settings. Each of the following sections explain how and when to use each configuration menu and select options.

1. Press VF.

2. Press F+M-SET. The first menu item appears.

3. Press \/SC or /\SC to step down or up through the menu items. Rotate TUNE to change the menu settings for any menu item.

4. Press PTT to exit the configuration menu and save all settings.

The configuration appears in the following order:

CODE	FACTORY DEFAULT	EXPLANATION
oS	0.600	Duplex separation (offset)
tc	oFF	Transmit subaudible tone
rc	oFF	Receive subaudible tone
Sr	15	Frequency step
Sc	ti	Scan resume
Sd	2.0	Scan delay time
S1	144.000	Lower scan range limit
S2	148.000	Upper scan range limit
ud	dn	Vacant channel scan direction
PS	1-16	Power save duty cycle
tE	oFF	Transmit inhibit
to	oFF	Transmit time-out
Lb	4	Priority-frequency channel lookback time
Ar	oFF	Touch-tone auto-reply

SETTING THE DUPLEX SEPARATION DEFAULT

The duplex separation default (offset) controls the offset between the transmit frequency and the receive frequency when you use the transceiver

in duplex mode, as with a repeater. Typically, on the 2-meter band, repeaters receive at a frequency 600 kHz lower or higher than they retransmit (repeat) on. For example, if a repeater's input frequency is 146.340 MHz, its output frequency is 146.949 MHz. The following is a list of the most commonly used repeater pairs.

INPUT FREQUENCY	OUTPUT FREQUENCY
146.07 MHz	146.67 MHz
146.13 MHz	146.73 MHz
146.16 MHz	146.76 MHz
146.22 MHz	146.82 MHz
146.25 MHz	146.85 MHz
146.28 MHz	146.88 MHz
146.31 MHz	146.91 MHz
146.34 MHz	146.94 MHz
146.37 MHz	146.97 MHz
146.40 MHz	147.00 MHz

To operate with a repeater, you must transmit on the repeater's input frequency and receive on the repeater's output frequency. If you frequently use a repeater that does not have a 600 kHz offset, we recommend you program the repeater frequency into one of the transceiver's memories. You can override the default offset for each memory.

To change the default offset, follow the steps in "Understanding the Configuration Menu." to display the oS menu item, and rotate TUNE to change the offset. The transceiver lets you set the offset to be in the range from 0 MHz to 4 MHz in steps as set by the frequency step option.

USING SUBAUDIBLE TONE SQUELCH (CTCSS)

Some repeaters require that you transmit subaudible tone to key-up the

repeater. You can set your transceiver to transmit any of the 38 standard subaudible tones. You can also limit incoming calls by setting your transceiver to open the squelch only when someone transmits a subaudible tone you set.

```
----------------        ----------------
|  tc     oFF  |        |  rc      oFF  |
----------------        ----------------
```

To set a subaudible transmit tone, follow the steps in "Understanding Configuration Menu" to display tc. Then, rotate TUNE to select the subaudible tone. If you do not want to transmit a subaudible tone, rotate TUNE to select OFF.

To set a subaudible receive tone, follow the steps in "Understanding the Configuration Menu" to display rc. Then, rotate TUNE to select the subaudible tone. If you do not want to use the receive subaudible tone squelch, but are using transmit subaudible tone to activate a repeater, rotate tune to select OFF. Otherwise, you only hear transmissions that have the correct subaudible tone when you activate tone squelch.

To turn on the subaudible tone feature, press F+T-SQL. When you transmit, the transceiver includes the subaudible tone in the signal. To receive, the incoming signal must have the correct subaudible tone. You can override the default subaudible tones for any memory.

Code	Freq.(Hz)	Code	Freq.(Hz)	Code	Freq.(Hz)
XZ	67.0	2A	114.8	7Z	186.2
XA	71.9	2B	118.8	7A	192.8
WA	74.4	3Z	123.0	M1	203.5
XB	77.0	3A	127.3	M2	210.7
WB	79.7	3B	131.8	M3	218.1
YZ	82.5	4Z	136.5	M4	225.7
YA	85.4	4A	141.3	M5	233.6

YB	88.5	4B	146.2	M6	241.8
ZZ	91.5	5Z	151.4	M7	250.3
ZA	94.8	5A	156.7		
1Z	100.0	5B	162.2		
1A	103.5	6Z	167.9		
1B	107.2	6A	173.8		
2E	110.9	6B	179.9		

SETTING SCAN OPTIONS

Several configuration menu items control how your transceiver operates when you scan frequencies or memories. The following sections describe how to set the frequency step rate, the scan condition, the scan delay duration, and the scan limits.

SETTING THE FREQUENCY STEP RATE

The frequency step rate affects the scanning mode, the TUNE control, and /\SC or \/SC tuning. The factory default for the frequency step is 15kHz. Each time you rotate TUNE one click or \/SC or /\SC the frequency changes by 15 kHz. When scanning, the transceiver scans up or down 15 kHz step. To change the frequency step rate, follow the steps in "Understanding the Configuration Menu" to display the Sr menu item, and rotate TUNE to change the frequency step rate. You can set the step rate to 5, 10, 15, 25, 50, or 100 kHz.

SETTING THE SCAN RESUME CONDITION

When you have set the transceiver to receive either standard memories or VF mode, the transceiver stops whenever it encounters a signal strong enough to break squelch. At the factory setting, the transceiver resumes scanning in 10 seconds, regardless of the of the presence of a continued signal. You can set the scan resume configuration item to one of the following.

ti Resumes scanning in 10 seconds
cr Resumes scanning after the carrier drops and the scan delays expires (See "Setting the Scan Delay.")
SE Does not resume scanning

To change the resume condition, follow the steps in "Understanding the Configuration Menu" to display Sc. Then, rotate TUNE to select the resume condition.

NOTE: The resume option does not affect the priority scan. Priority scan always resumes scanning after the carrier drops.

SETTING THE DELAY DURATION

When you set the scan resume condition to cr (carrier), the transceiver resumes scanning after the carrier drops. The scan delay option lets you set the transceiver to pause before resuming, so you can hear any reply. The factory default for this option is 2 seconds.

To change the scan delay duration, follow the steps in "Understanding the Configuration Menu" to display Sd. Then, rotate TUNE to select the scan delay duration. You can set the delay to 0.5, 1, 2, or 4 seconds.

NOTE: The scan delay option also affects priority scan.

SETTING THE SCAN LIMITS

When you press F+\/SC or F+/\SC the transceiver scans only those frequencies within a range you set with scan limit options. To set the scan limits, follow the steps in "Understanding the Configuration Menu" to display S1. Use either TUNE or the key pad to enter one of the frequency limits. Then, press \/SC to display S2 and enter the other frequency

limit. You can enter the higher frequency as either limit.

SETTING THE VACANT SCAN DELAY

The transceiver's factory default for vacant scan is to scan down until it finds an unused frequency. To change the vacant scan direction, follow the steps in "Understanding the Configuration Menu" to display ud. Then, rotate TUNE to select either UP or DN.

USING THE POWER SAVE FEATURE

To set the transceiver to save power press F+SAVE so that SAVE appears on the display. In the power-save mode, the transceiver turns on the receiver for about 32 milliseconds to check for any activity, and then turns off the receiver for the time you set with the power-save configuration setting. The factory default for this setting is to use only 1/16 normal power. To change the power save setting, follow the steps in "Understanding the Configuration Menu" to display PS. Then, rotate TUNE to select the power save setting. You can set the power-save setting to 1-2, 1-4, 1-8, or 1-16 (1/2, 1/4, 1/8. or 1/16 normal power usage.

Press F+SAVE again to turn off power save. Power save temporarily turns off while scanning.

PREVENTING TRANSMISSIONS

To prevent any transmissions using the transceiver, turn on the transmit inhibit function. To turn on this function, follow the steps in "Understanding the Configuration Menu" to display tE. Then, rotate TUNE to select ON. To enable transmissions, set this option to OFF.

LIMITING TRANSMISSION DURATION

When you communicate on the 2-meter band, you should keep your transmission

as brief as possible. Most repeaters have built-in timers that limit single transmissions to 3 minutes or less. You can set the transceiver to stop transmitting and sound a beep if you exceed a set time limit with a single transmission. To set a transmit limit, follow the steps in "Understanding the Configuration Menu" to display to. Then, rotate TUNE to select OFF 30, 60, or 120 seconds.

SETTING THE PRIORITY SCAN TIME

When you turn on PRIORITY scan, the transceiver checks the preprogrammed priority-frequency memories periodically to see if there is any activity. As factory set, the transceiver checks the priority-frequency memories every 4 seconds. To change the PRIORITY scan time, follow the steps in "Understanding the Configuration Menu" to display Lb. Then, rotate TUNE to select 4, 8, 12, or 16 seconds.

USING TOUCH-TONE FEATURES

Your transceiver has a built-in 16-key touch-tone encoder. You can manually send touch tones, or send tones from one of the five DTMF memories. You can also set your transceiver so that it is silent until it receives a specific sequence of touch tones.

MANUALLY SENDING TOUCH TONES

Some repeaters require you to enter a touch-tone code to key-up the repeater. Also, some repeaters have autopatch devises that let you make telephone calls through the repeater. To manually send the required tones, press and hold down PTT. Then, enter the touch-tone digits.

NOTES: You must press D twice to send the D digit.

If the auto-reply feature is turned off, you can release PTT after

you enter the first digit. The transceiver continues to accept and transmit the touch-tone signals until you pause at least 1 second.

STORING A DTMF MEMORY SEQUENCE

You can store frequently-used touch-tone sequences in the transceiver's five DTMF memories. Each memory can hold up to 15 digits. Follow these steps to store touch-tone frequencies.

1. Press and hold down F+DTMF for at least 1 second. The display changes to show the first DTMF memory.

2. Press D. Then, press a digit from 1-5 to select one of the DTMF memories.

3. Enter the touch-tone sequence. If the sequence is less than 15 digits, press D, then press a digit from 1 to 5 to select a different DTMF memory or press PTT to exit the DTMF memory store mode.

NOTE: To enter a D, press D twice.

TRANSMITTING A DTMF MEMORY SEQUENCE

To send a DTMF memory sequence, press and hold down PTT. Then, press D followed by the DTMF memory number you want to transmit (1-5). The transceiver transmit the tones.

The transceiver has two DTMF memory sequence transmit speeds. To switch between fast and slow, press and hold down PTT. Then, press 0.

NOTE: If the auto-reply feature is turned off, you can release PTT after you press D. Enter the DTMF memory number within 1.5 seconds.

USING DTMF SEQUENCE FOR PAGING

The DTMF squelch feature lets you set your transceiver to release squelch only if it receives a specific touch-tone sequence. Follow these steps to set the touch-tone sequence.

1. Press F+D-SQL for at least 1 second.

   The transceiver displays the previous sequence or - if you have never programmed a sequence.

2. Enter the sequence (up to five digits).

3. Press PTT to save the sequence.

To turn on the DTMF squelch, press F+D-SQL for less than 1 second. DTMF appears on the display.

Your transceiver remains silent until it receives the correct touch-tone sequence. Then, it beeps and returns to normal operation. To cancel DTMF squelch, press F+D-SQL for less than 1 second so that the DTMF disappears from the display.

AUTOMATICALLY SENDING A DTMF REPLY

You can set your transceiver to automatically transmit the touch-tone digit (#) when you have enabled DTMF squelch and the transceiver receives the correct touch-tone sequence. To turn on the DTMF auto-reply, follow the steps in "Understanding the Configuration Menu" to display Ar. Then, rotate TUNE to select on.

You should also set this option to on if you expect an auto reply from an auto patch or another HTX-202 or other transceiver that has this feature.

Q: Unit beeps when pushing PTT.

A: Try resetting unit by turning off the transceiver, pressing and holding down F and CLR, and then turning on the transceiver. This clears all stored information.

Hints and Tips

This radio is likely to get an ERR2 when running off a cigarette lighter. This is due to RF feedback which travels from radio to rubber duck to power cord and back to radio. The best way to fix the ERR2 is to use an external antenna.

When pressing f/3, it only comes up with a negative offset. In order to come up with a positive offset, check the offset by entering VFO mode and pressing function/8. The display reads os and a number. That number is normally 600. It will not give any offset that puts it out of the legal limits of 144-148 MHz.

This radio cannot be modified for expanded frequencies.

Error Codes

Your transceiver has two error code displays. Refer to the following for an explanation of each error code.

Er1: INTERNAL RAM ERROR

Er1 indicates the transceiver has detected an error in its battery-backed up operation memory. This is the most commonly caused by a low lithium backup battery, but can also be caused by static discharge, or a physical shock. To clear the error--

1. Turn off the unit.
2. Press FUNCTION and CLR (the D key).
3. While holding these keys, turn unit on.

This will reset unit and clear memories.

If the transceiver frequently displays the error, have the battery replaced by an authorized Radio Shack service center.

ER2:PLL UNLOCK ERROR

Er2 indicates the transceiver's PPL section has unlocked. Have the transceiver repaired by an authorized Radio Shack service center.

Specifications

GENERAL

Frequency Range:.......................................144.000-148.000MHz
Frequency Step:...................................5/10/15/20/25/50/100KHz
Frequency Stability:.......................................+/- 10ppm
Antenna Impedance:...................................50 Ohms Unbalanced
Speaker:..8 Ohms
Microphone:....................................condenser Mic. 1.2 Kohms
Channel Display:.......................................LCD 8 digits
Operating Temperature:......................14 F to 140 F (-10 C to 60 C)
Size:....................2 9/16 X 4 5/8 X 1 7/8 Inches (65 X 117 X 37mm)
Weight:...1 lbs 3 oz. (540g)
Supply Voltage:
- Alkaline Battery Pack:...................................9V DC
- Ni-Cad Battery Pack (600 mAh):...............................7.2V DC
- External Power Jack:.............................7.2 to 13.8 VDC

DC Adapter...Cat. No. 273-1653
Regulated Power Supply.................................Cat. No. 220-0120
Vehicle Battery Power:.................................Cat. No. 270-1533

NOTE: This unit also has a Lithium Battery as a backup battery to keep stored options in memory. Only Radio Shack authorized repair centers can replace this battery.

RECEIVER

Intermediate frequency
- 1st IF:...21.4 MHz
- 2nd IF:...455KHz

Sensitivity:
- 12dB SINAD:..0.2uV
- 20 dB NQ:..0.35uV

Squelch sensitivity;
- Threshold:...0.1uV
- Tight:...10 dB above threshold

Spurious response attenuation:..................................80dB
Inter-modulation attenuation:....................................70dB
Adjacent channel rejection (25KHz):.............................70dB
Modulation acceptance Bandwith:.................................8KHz
Hum and Noise:..50dB
Audio output power(10% THD):
- 7.2V DC:...0.3W
- 9V DC:...0.5W
- 12V DC:...1W
- 13.8V DC:...1W

Audio distortion:..... ....2%
Audio response:........ ....-6dB/oct
Current drain:
- Stand-by without power save:...................................35mA
- Stand-by power save:...25mA

CTCSS Sensitivity:..0.15uV
DTMF Squelch sensitivity:..0.2uV

TRANSMITTER

RF Power output:
- 7.2VDC:..2.5W
- 9VDC:..4W
- 12VDC:...5W
- 13.8VDC:...6W
- Low Power:...1W

Maximum deviation:.....................................4.5KHz
Hum and Noise:..42dB
Audio distortion:.......................................0.5%
Audio response:......................................+6dB/oct
Spurious and harmonic emissions:........................70dB
Frequency error:.....................................+-0.0005%
Mic. Sensitivity:.....................................4mVrms
CTCSS Tone deviation:...................................0.7KHz
Current drain:
     7.2V DC:...0.8A
     9V DC:...0.95A
     12V DC:..1A
     13.8:..1.1A
     Lower Power:.......................................0.46A

The above specifications are nominal. An individual unit's performance might vary from these specifications.