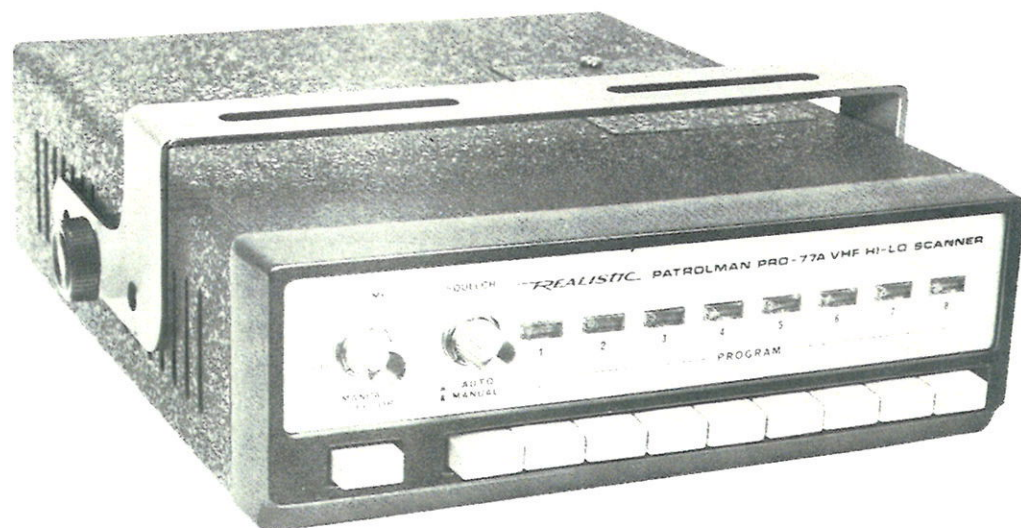


# Dual-Band FM Scanning Monitor Receiver

VHF Low : 30 - 50 MHz    VHF High : 148 - 174 MHz

PRO-77A



**OWNER'S  
MANUAL**

PLEASE READ BEFORE  
USING THIS EQUIPMENT

**REALISTIC®**

**CAT. NO.  
20-172**

CUSTOM MANUFACTURED FOR RADIO SHACK  A TANDY CORPORATION COMPANY

Your **PATROLMAN PRO-77A** scanning receiver is a completely transistorized Dual Band VHF superheterodyne receiver using dual conversion. It is capable of automatically scanning eight crystal-controlled channels. Some special features are: the ceramic filters, channel lock-out circuit, skipper circuit, scan delay circuit and AC or DC operation.

It is designed for use in the narrow-band FM channels of public service communications: VHF band police, fire, civil defense, radio telephone, forestry and weather service, plus many other industrial radio services. These and many other services share this band of frequencies from 30 to 50 MHz and 148 to 174 MHz.

The Receiver features both high sensitivity and selectivity and a sophisticated circuit which includes 10.7 MHz and 455 kHz ceramic filters to reduce or eliminate adjacent-channel or strong-signal interference. Such interference is often experienced when operating in urban and metropolitan areas or where very strong and closely placed signals are present.

An important engineering achievement, designed for practical applications, the Receiver is remarkably easy to use, yet its up-to-date, complex circuit consists of 33 separate transistors (two of which are Field Effect Transistors), four integrated circuits (which incorporate the equivalent of hundreds of components), 33 diodes and 1 zener diode.

**WARRANTY:** The **Radio Shack** limited warranty is stated on the Warranty Card packed with the unit. It is in effect from coast-to-coast. At any time, Radio Shack equipment can be restored to like-new condition with original parts, with **MINIMUM** delay, anywhere in the U.S.A.—normally right in your own neighborhood. In 98% of the cases, it is **NOT** necessary to return Radio Shack equipment to our Laboratories.

This Receiver is designed to operate from either 120 volts AC or 12 volts DC Negative Ground. If it fails to operate, and there is no clear reason for the failure, first check the "power" switch (part of **VOLUME** control). Also, before connecting your receiver to a DC power supply, check the voltage polarity. Attempting to operate this negative ground Receiver from one of the rare positive-ground automotive or boat electrical systems, or from a wrongly connected battery, will at least blow a fuse. It may do further damage, so that expensive and time-consuming repairs are necessary before your Receiver can be used again. The Radio Shack warranty does not apply to any damage caused by incorrect ground, inadequate lightning protection, or other improper connections.

## SPECIFICATIONS

<b>FREQUENCY COVERAGE</b>	30 — 50 MHz and 148 — 174 MHz
<b>CHANNELS OF OPERATION</b>	Eight—as determined by any one of 8 crystals operating in the frequency range
<b>FREQUENCY BAND</b>	
(LO)	6 MHz for maximum sensitivity (40 MHz $\pm$ 3 MHz)
(HI)	8 MHz for maximum sensitivity (153 MHz $\pm$ 4 MHz)
<b>SENSITIVITY</b>	Better than 1 $\mu$ V for 20 dB quieting
<b>SELECTIVITY</b>	-60 dB ( $\pm$ 25 kHz) -6 dB ( $\pm$ 8 kHz)
<b>SPURIOUS REJECTION</b>	
(LO)	Greater than 50 dB
(HI)	Greater than 50 dB
<b>IMAGE REJECTION</b>	
(LO)	Greater than 40 dB
(HI)	Greater than 35 dB
<b>SCANNING SPEED</b>	12 channels/second
<b>DELAY TIME</b>	1.5 to 3 seconds
<b>MODULATION ACCEPTANCE</b>	$\pm$ 7 kHz
<b>I.F. FREQUENCY</b>	10.7 MHz and 455 kHz
<b>FILTER</b>	Ceramic filters (10.7 MHz and 455 kHz)
<b>SQUELCH SENSITIVITY</b>	Variable from less than 1 micro-volt to approximately 30 micro-volts
<b>AUDIO POWER</b>	2 watts maximum
<b>CRYSTAL REQUIREMENTS</b>	Standard HC-25/U, 3rd overtone
<b>BUILT-IN SPEAKER</b>	2" x 6" oval speaker
<b>POWER REQUIREMENTS</b>	AC—120 volts, 60 Hz, 16 watts maximum DC—12-15 volts, <b>Negative Ground only</b> , 10 watts maximum

**WARNING:** To prevent fire or shock hazard. Do not expose this appliance to rain or moisture.

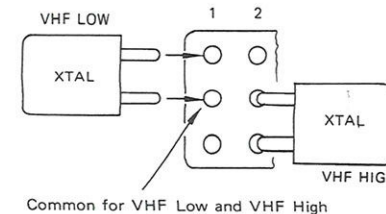
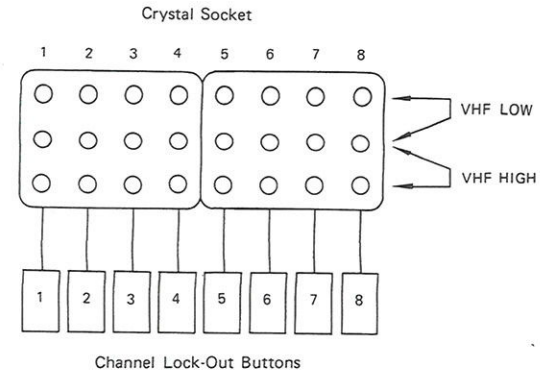
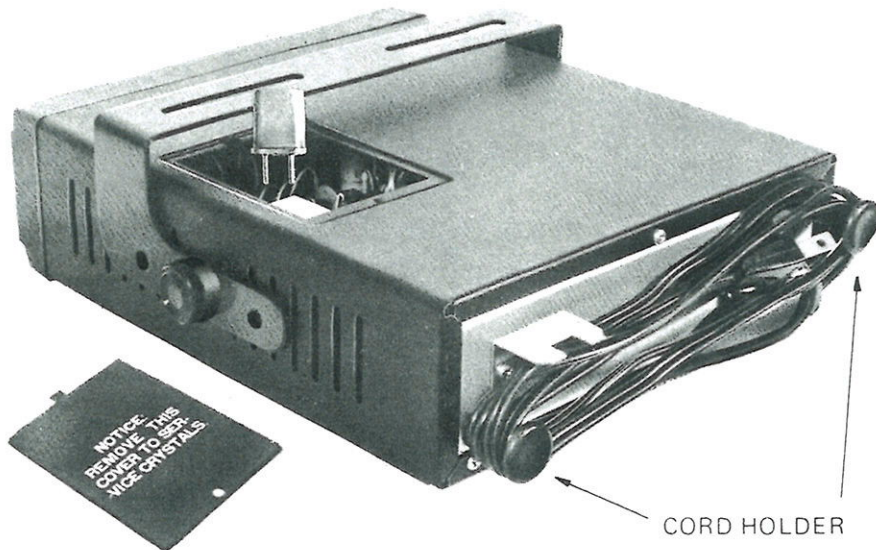
## PREPARING FOR USE

To use your Receiver, you must do three things:

- Connect power
- Install from 1 to 8 crystals
- Connect an antenna

To make a quick check, you can just connect the Line Cord to a source of 120 volts, 60 Hz., AC power. If you intend to use a 12 volt source, you must connect the 12 volt DC power plug wires as noted later on under "Mobile Installation". With an antenna connected and a crystal installed, turn the Receiver on by rotating VOLUME clockwise. Rotate SQUELCH maximum counterclockwise. You should hear a "rushing" sound in the speaker.

Crystals are not included with your Receiver because the frequencies are so numerous. The frequencies used in your part of the country will be different from those used in other areas. Order the crystals you want from your Radio Shack store—specify the catalog number of this unit and the frequency you want to receive.



Remove the screw from the Crystal Compartment Cover to expose the crystal sockets. Provision is made to install 8 crystals; each position can be used for either VHF HI or VHF LO. Follow the illustration provided for proper installation of each crystal.

For VHF LOW crystals, use the center and upper crystal socket holes. For VHF HIGH crystals, use the center and lower crystal socket holes. In the example shown, Channel 1 will have a VHF LOW crystal and Channel 2 will have a VHF HIGH crystal.

Ask the manager of your Radio Shack store what the most popular and active channels are in your area. He will be glad to advise you.

Since crystal frequencies must be extremely accurate and crystals should be matched for specific units, we recommend you obtain crystals for your Receiver only from Radio Shack. We can not be responsible for the poor or improper operation of crystals from another manufacturer(s).

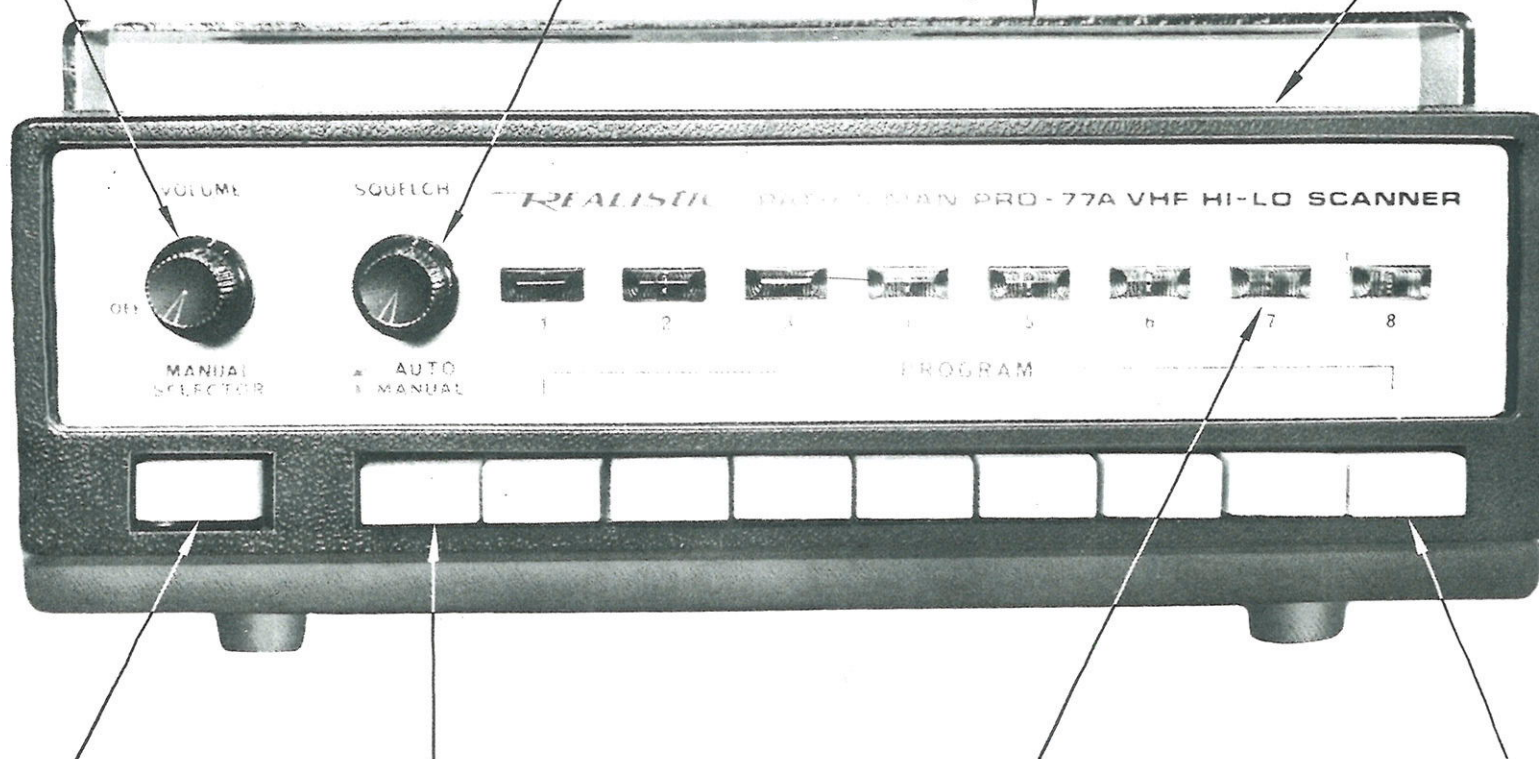
## CONTROL FUNCTIONS

**VOLUME**—turn clockwise to apply power to the unit and then adjust for desired level of sound.

**SQUELCH**—use to eliminate background noise when no signal is being received. When properly set, it allows signals to come through, but cuts off the receiver sound when no signal is being received.

**Mounting Bracket**—this universal type bracket is provided for quick and easy installation in a vehicle or boat or for permanent installation in a base station situation.

**Crystal Compartment**—remove screw to open the case top to install or replace crystals.



**MANUAL SELECTOR Button**—when the AUTO/MANUAL button is in the MANUAL position (out), use this button to advance the Receiver to the next channel in sequence. Each time you press this button, the Receiver will advance just one channel.

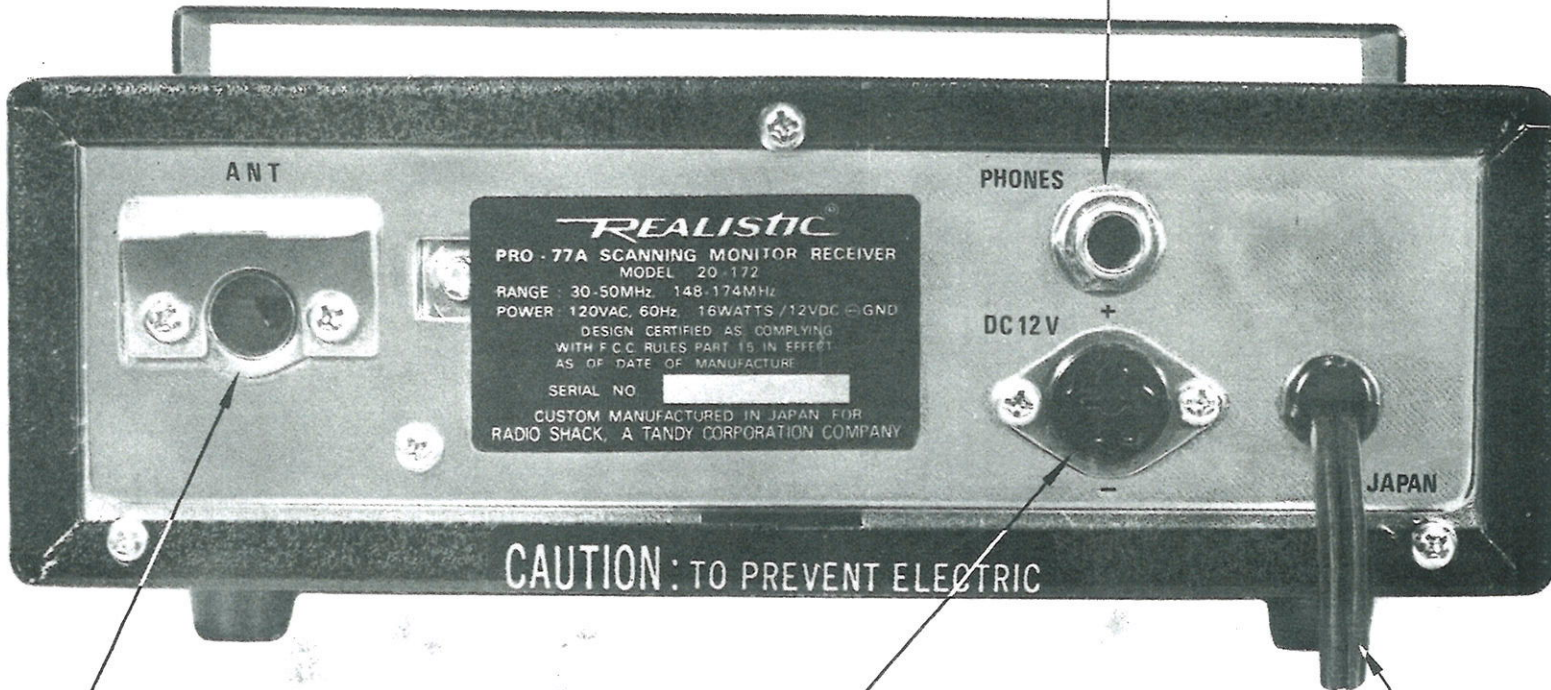
**AUTO/MANUAL Button**—use to determine the scanning function. In the AUTO (in) position, each channel will be scanned automatically. In the MANUAL (out) position, the Receiver will not scan, but will remain tuned to the channel indicated by a Lighted Channel Indicator.

**Channel Indicator Lights**—these lights show which channel is active. When the receiver is operating on one of the channels, the light for that channel will glow. When the Channel Lock-out Button for that channel is out, that Light will not glow.

**Channel Lock-out Buttons (PROGRAM)**—press button in to activate that channel. When you press the button again (to pop it "out"), that channel is automatically "locked out" and will not function.

## REAR PANEL

**Headphone/External Speaker (PHONES) Jack**—use to plug in a headphone or an external speaker of 8 ohms impedance. Use it for private listening, or in areas where background noise is excessive (in factories, at the scene of an accident or fire, in a vehicle, etc.). For remote listening, plug in a remote speaker. Connecting a plug to this jack automatically disconnects the internal speaker.



**Antenna Jack**—connect an antenna to this Motorola Type jack. Use an antenna such as Radio Shack Catalog Number 20-161 for indoor operation.

**DC Power Jack**—use the DC power cable supplied with the unit and connect it to an external source of 12 volts DC, Negative Ground. You can use the unit in a vehicle or boat.

**AC Power Line**—plug into a source of 120 volts, 60 Hz AC power.

# INSTALLATION

A good installation will make the most of the PRO-77A's capabilities. Don't lose any of the tiny signals by using an inadequate antenna or poor quality lead-in. Use an antenna of correct length and a good quality foam coaxial cable. The antenna you choose, and how you install it, will have a great effect on how well your receiver will work. Your PRO-77A is designed to utilize a Hi-Lo VHF antenna.

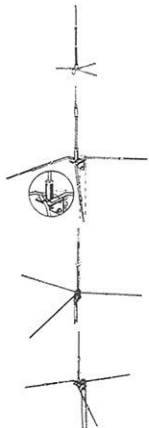
## BASE INSTALLATION

For a base installation, you only need two things. The most important is a good antenna. For superior reception, it is vital that you use the best antenna you can afford and then mount it properly. We recommend a Radio Shack (Catalog Number) 20-015 for excellent VHF reception. Use RG 8/U coaxial lead-in cable to assure maximum transfer of signal. Use Motorola adapter plugs as appropriate (278-208).

The only other thing you need to do is connect the AC Line Cord to a source of 120 volts, 60 Hz AC power.

## Base Antennas

Although there are only a few basic types of antennas, there are many models of base Monitor antennas. Some of the most popular antennas combine several frequencies.



If you are only concerned with Hi-VHF, an antenna such as our Hi-VHF Base Station 20-181 will provide excellent reception.

Since your Receiver tunes in both high and low VHF we suggest an antenna such as our Hi-Low VHF Ground Plane 20-015.

Those who own high VHF and UHF monitors or a monitor with combined capabilities, prefer an antenna like our Hi-VHF/UHF Ground Plane 20-176.

For the man with Citizens Band and low VHF equipment, we offer a CB/Low-VHF Ground Plane antenna 21-901.

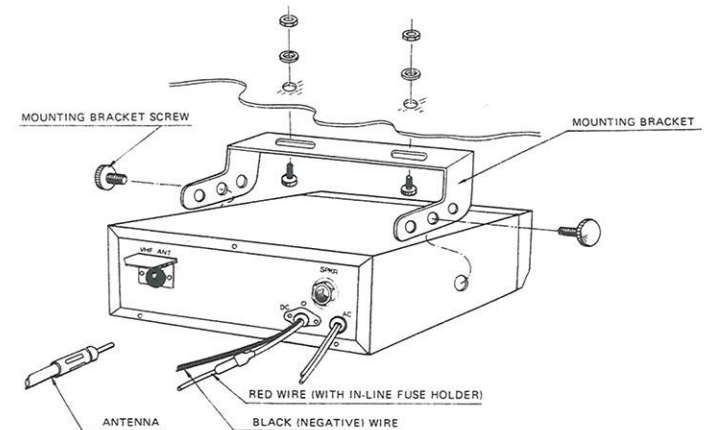
## MOBILE INSTALLATION

Safety and operating convenience are the primary factors to consider when you install any equipment in a vehicle. Be sure you can easily reach the Receiver's controls. Also, be sure the connecting cables do not interfere with the operation of the vehicle (brake, accelerator, etc.).

You can mount the Receiver to the underside of the dash or instrument panel in the vehicle or boat. Use the universal mounting bracket provided. Take care when drilling holes that you do not drill into existing wires or trim.

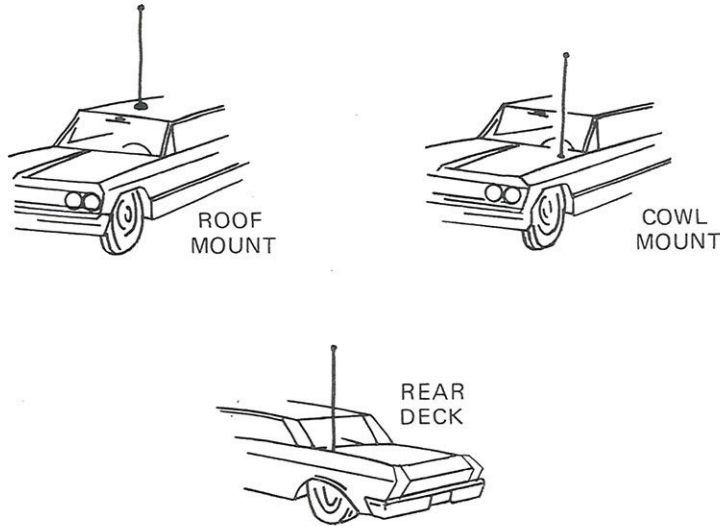
This Receiver is designed to operate from a **negative ground** 12 volt DC source. Be sure you connect power leads with the correct polarity. Use the DC Power cable provided. The other end of these wires can be connected to an Auto Cigarette Lighter Plug, Catalog Number 274-331; or you can make the connections directly to the fuse block of the vehicle or boat. Be sure to observe correct voltage polarity: + to + and - to -.

**IMPORTANT:** If your car has been burning out headlamps and other bulbs at a rapid rate, have the voltage regulator checked for proper output: excessive voltage (more than 16 volts) can cause serious damage to your receiver.



## Mobile Antennas

There are many possible mounting locations on a car. Three of the most popular locations for monitor antennas are shown below.



**ROOF MOUNT**—The antenna is mounted in the center of the roof. This position is considered the best by many, because it generally results in better reception than the other locations. Radio Shack's Hi-VHF Mobile Mount (Catalog Number) 20-180 comes complete, like all our monitor antennas, with low-loss coax cable.

**COWL MOUNT**—If you would rather not cut a hole in the center of your vehicle's roof, you may prefer this location. Ask about our 20-016 Cowl Mount antenna which is especially designed for Hi-Low VHF monitoring.

**REAR DECK**—Installation in this location, may result in less noise because it is further from the engine. Your Radio Shack salesman will help you select the antenna which is best for you.

Keep the following points in mind when installing your mobile antenna.

1. Mount the antenna as high as possible.
2. Mount it rigidly, so it will remain vertical while in motion.
3. Mount as far as possible from the engine compartment.

## MOBILE NOISE SUPPRESSION

This receiver is very sensitive, and will pick up signals that are extremely weak. With this extreme sensitivity, you will find that the receiver will amplify weak signals, along with any noise that may be present.

When operating a receiver in a vehicle, you will find that the vehicle generates noise, and this noise can become very objectionable. Mobile operation will not be as quiet as base station operation, but steps can be taken that will greatly improve the noise situation.

### ELECTRICAL SYSTEM:

Generally speaking, noise can be generated by any device or connection that carries electrical current. Any device that generates a spark should also be suspected. Bypass any suspected wire to ground with a high quality 1  $\mu$ f coaxial capacitor.

A very common source of noise is the generator or alternator. This type of noise will sound like a musical whine, and will also vary with speed of the engine. Generator and alternator noise can usually be reduced by connecting a coaxial-type capacitor from the armature terminal to the metal case.

### IGNITION SYSTEM:

The ignition system is the most common source of noise. This noise can be identified by the fact that its speed varies with the engine speed. Ignition noise will sound like a series of "popping" sounds, while the engine is idling, and will speed up to a buzzing sound as engine speed is increased.

There are a number of things that can be done for this type of noise.

1. Use radio suppression-type ignition wire and resistor spark plugs.
2. Check high-voltage wiring for leakage, cracks, etc. Replace any old wiring.
3. In extreme cases, obtain an ignition noise suppression kit—it should shield all ignition wiring. This will provide maximum noise suppression.

# OPERATION

After power and antenna connections are made and a crystal (or crystals) has been installed, your Receiver is ready to use.

Turn **VOLUME** "on" by rotating to the right. Rotate **SQUELCH** to the minimum position by rotating counterclockwise. Set all the Channel Lock-out Buttons "on" (press in). You should hear a rushing sound from the speaker. Now adjust **SQUELCH** clockwise until you no longer hear the rushing background noise (further explanation of **SQUELCH** adjustment is noted below).

If you want the Receiver to continuously scan the channels for which you have crystals installed, you must adjust **SQUELCH** as instructed above, then press **AUTO/MANUAL** button in, to the **AUTO** position. The Monitor will constantly scan each channel in sequence; when a signal appears on one of the channels, the receiver will lock onto that channel and you will hear the signal.

If you do not want automatic scanning on one or more channels, press their Channel Lock-out Buttons "off" (press in to release the button so it pops out).

If you want to stay tuned to one channel only, press **AUTO/MANUAL** button again to make it pop out to the **MANUAL** position. The Receiver will stop automatic scanning; now press **MANUAL SELECTOR** button to advance to the channel you want to listen to (as indicated by the Light above that **PROGRAM** Button). For **MANUAL** scanning, the receiver can be either "squelched" or "unsquelched", for **AUTOMATIC** scanning, **SQUELCH** must be set to eliminate the background noise.

To eliminate the annoying background noise, rotate **SQUELCH** clockwise until the background noise just stops. You can't adjust **SQUELCH** properly while listening to a station, so wait till signals cease. If you set **SQUELCH** as noted above, the Receiver will appear "dead" until a signal comes in; when a signal comes in, the **SQUELCH** circuit "opens up" and you hear the signal. When the signal ceases, the **SQUELCH** circuit "closes" and cuts out all sound until the next signal comes in.

## SKIPPER CIRCUIT:

Your scanner has a built-in skipper circuit which is fully automatic and can not be disabled. It works in both the **AUTO** and **MANUAL** modes of operation. This feature causes the unit to skip over a locked out channel(s) so that there is no possibility of the Receiver stopping on a locked out channel(s).

## SCAN DELAY CIRCUIT:

The Receiver has a built-in 2 second delay feature which virtually eliminates missed replies. This circuit holds the Receiver on the channel you are monitoring for a period of 2 seconds after the carrier has gone off the air before it resumes normal scanning operation.

## TYPES OF SIGNALS YOU'LL BE ABLE TO MONITOR

Your community is alive with action—action which is constantly being reported on the air waves. And your Receiver will automatically scan the air waves to bring you that action—your police force at work, a fire truck on a mission, Sheriff's department, State police, local air traffic control towers, the National Weather Service, Civil Air Patrol, aircraft distress, Ham Radio operators, highway and other emergency-type services, some industrial services, some transportation services (taxi, trucks, railroad), plus some Government services. Lots of things are going on that most of us just are never aware of. But, with the right frequency crystal in your Receiver, you can monitor such exciting signals. You'll have to do a little investigating in your community to find out what services are active and on what frequencies. You will find one of our books to be very interesting and helpful in this area: **REALISTIC GUIDE TO POLICE, FIRE AND AIRCRAFT RADIO**.

**What to listen for and where?** That is a little difficult for a specific answer. Each area of the country can and will use different channels. All we can do is give you some general pointers and then let you take it from there.

Find out if there is a local club which monitors these frequencies. Often a local electronics repair shop that does work on the equipment can give you the channel frequencies used by local radio services. A volunteer police or fire employee can also be a good source of this information.

An interesting service is the Mobile Telephone. FCC has assigned this service channels in the range of 152.51 to 152.81 MHz at every 0.030 MHz (channels are 30 kHz apart).

As a general rule on VHF, most activity will be concentrated between 153.785 and 155.98 and then again from 158.73 to 159.46 MHz. Here you'll find local government, police, fire and most such emergency services. If you are near a railroad yard or major railroad tracks, look around 160.0 to 161.9 for them.

## FREQUENCY COVERAGE

For maximum sensitivity, the channel frequencies you choose should be within 3 MHz of 40 MHz on the LO VHF band (that is, in the spread of 37 to 43 MHz). For the HI VHF band, stay within 4 MHz of 153 MHz (that is, 149 to 157 MHz). This Receiver will function very adequately down to 30 and up to 50 and from 148 to 175 MHz, but with reduced sensitivity. The superior reception spread of 6 or 8 MHz ( $\pm 3/4$  MHz) can be moved up or down in this band of frequencies by special realignment of the front end circuitry of this Receiver (which should be attempted only by qualified Electronics Service Technicians who have adequately calibrated, precision test equipment).

## NATIONAL WEATHER SERVICE RECEPTION

Continuous weather broadcasts are transmitted 24-hours-a-day in many parts of the country. If you are using a crystal set to one of the two channels assigned (162.55 or 162.40 MHz), your Receiver will automatically lock-in on that channel, since the broadcasts are continuous. To prevent automatic locking, set the channel lock-out button for that channel to the "off" position (button out). When you want a weather report, set the Lock-Out Button to the "on" position (press in) for that channel. In areas where two stations are close to each other, one will use 162.55 and the other will use 162.40 MHz. Check with your local FCC office or the Weather Bureau for the frequency used in your area.

## ACCESSORIES

Your Receiver can be powered either from 120 volts AC or from any source of 12 volts DC, negative ground. Radio Shack sells a special portable power pack with 8 D cell batteries, battery holder and adapter plug for a cigarette lighter socket. It's a handy accessory for portable or vehicle operation. For more permanent 12 volt installations, connect the wires directly to the fuse block or other source of 12 volts. Be sure to observe correct polarity.

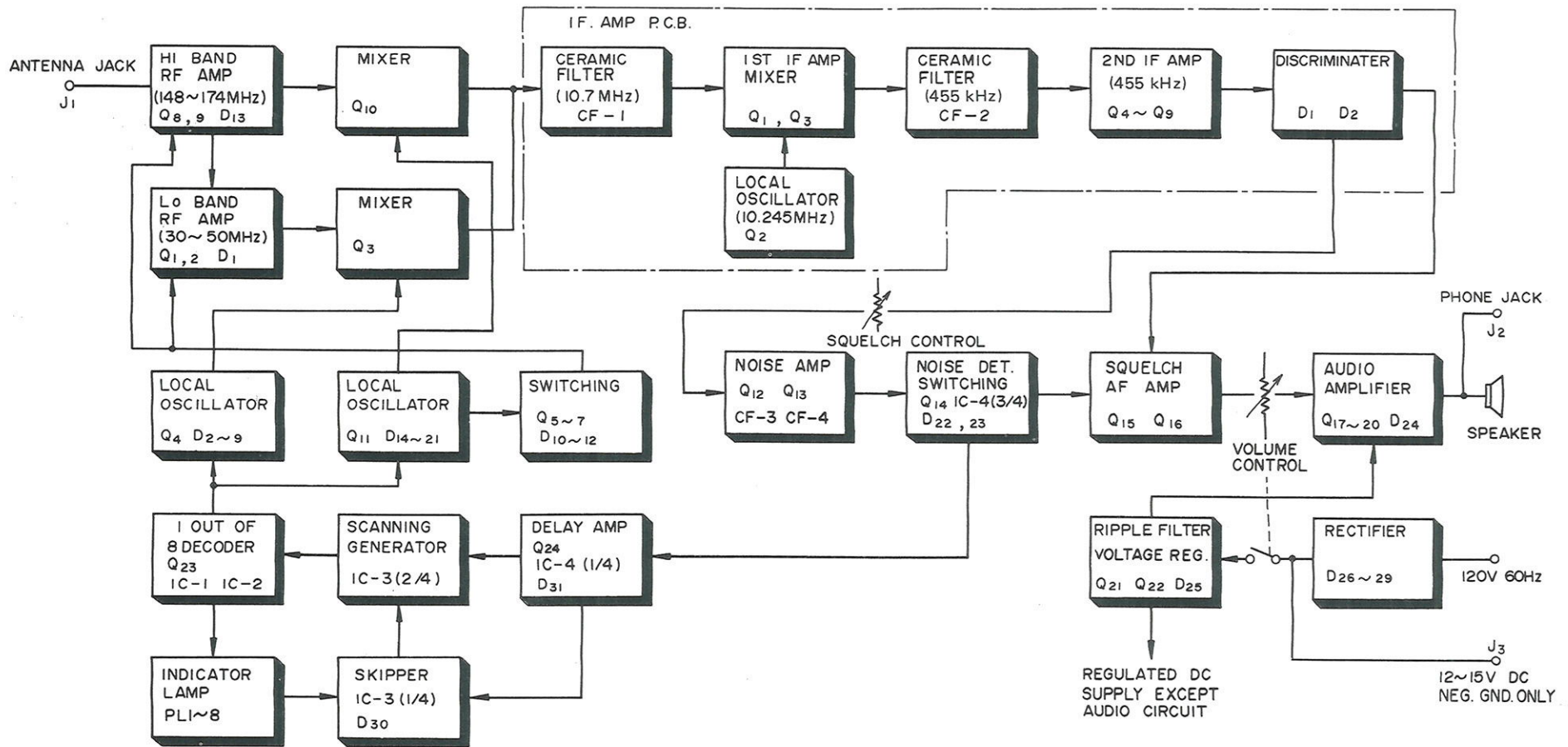
A pair of headphones can be a very useful accessory. In areas where a high noise level is present (in a factory, at the scene of a fire or accident, etc.), or when you want to listen privately, use headphones. Your Radio Shack store has a couple of very fine selections for your Receiver. Just plug them into the rear panel Speaker/Headphone jack.

If you want to listen to the Receiver from a remote position, or just want to use an external speaker, connect it to the Speaker/Headphone jack. Again, your Radio Shack store has some speakers specifically made for this purpose.

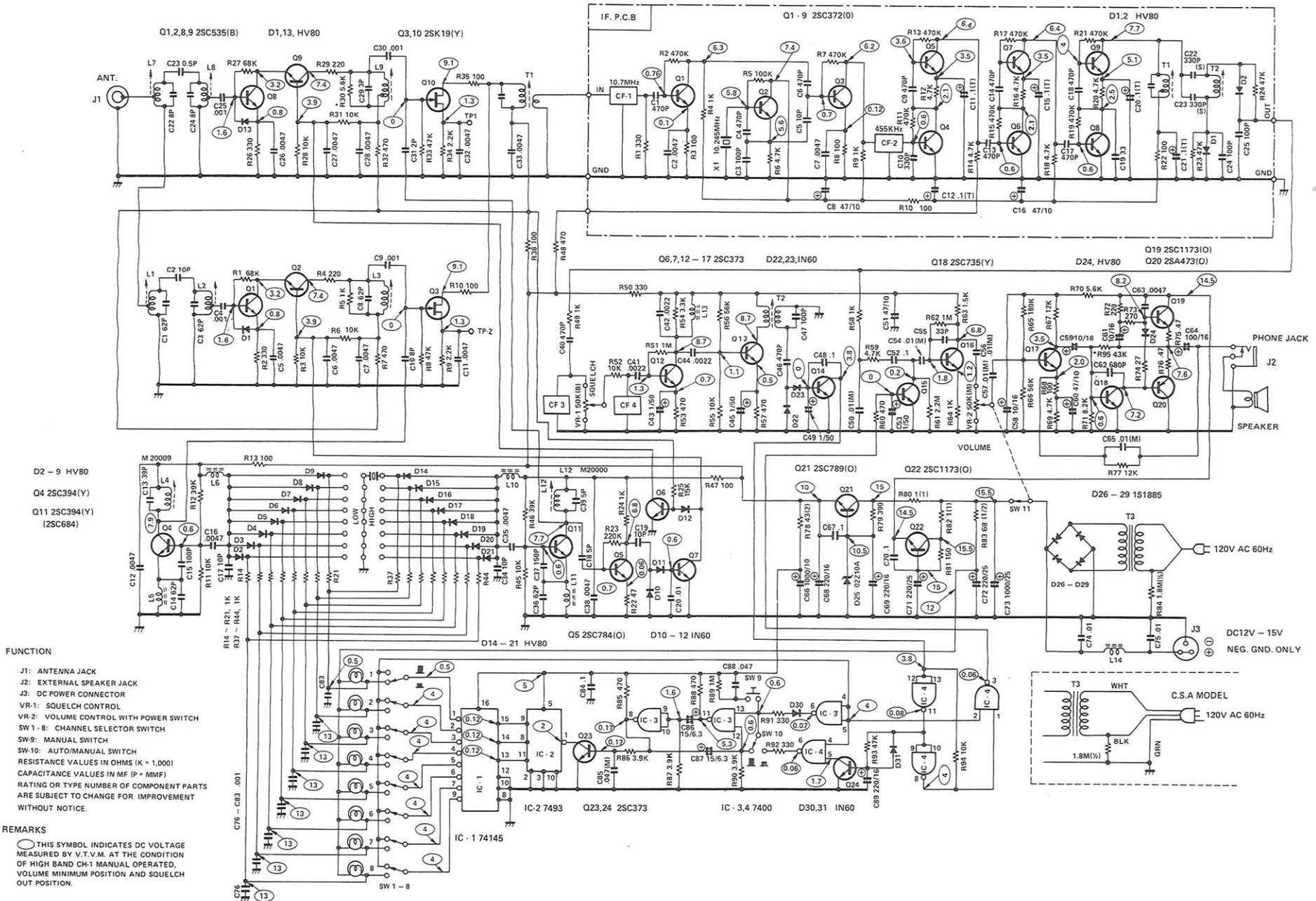
## MAINTENANCE

This Scanner is a ruggedly built electronic unit, with all parts conservatively rated. However, you should treat it with care; don't subject it to excessively rough handling. You will find it will give you long life if kept free from dirt and excessive humidity.

# BLOCK DIAGRAM



# SCHEMATIC DIAGRAM



- D2 - 9 HV80
- Q4 2SC394(Y)
- Q11 2SC394(Y) (2SC684)

- FUNCTION**
- J1: ANTENNA JACK
  - J2: EXTERNAL SPEAKER JACK
  - J3: DC POWER CONNECTOR
  - VR-1: SQUELCH CONTROL
  - VR-2: VOLUME CONTROL WITH POWER SWITCH
  - SW 1-8: CHANNEL SELECTOR SWITCH
  - SW-9: MANUAL SWITCH
  - SW-10: AUTO/MANUAL SWITCH
  - RESISTANCE VALUES IN OHMS (K = 1,000)
  - CAPACITANCE VALUES IN MF (P = MMF)
  - RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

- REMARKS**
- THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HIGH BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQUELCH OUT POSITION.

RADIO SHACK  A TANDY CORPORATION COMPANY

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CANADA: BARRIE, ONTARIO, CANADA L4M 4W5

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