FM Scanning Monitor Receiver

VHF : 148 — 174 MHz

PRO-7B

OWNER'S MANUAL

PLEASE READ BEFORE USING THIS EQUIPMENT

REALISTIC®

CAT. NO. 20-173

CUSTOM MANUFACTURED FOR RADIO SHACK TC A TANDY CORPORATION COMPANY

Your **PATROLMAN PRO-7B** scanning receiver is a completely transistorized 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, mobile telephone, forestry and weather, plus many other industrial radio services. These and many other services share this band of frequencies from 148 to 174 MHz.

The PRO-7B 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 PRO-7B is remarkably easy to use, yet its up-to-date, complex circuit consists of 26 separate transistors (one of which is a Field Effect Transistor), four integrated circuits (which incorporate the equivalent of hundreds of components), 21 diodes and one zener diode.

WARRANTY: The **Radio Shack** limited warranty is stated on the Warranty Card packed with your PRO-7B. 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 the PRO-7B receiver to a DC power supply, check the voltage polarity. Attempting to operate the negative-ground PRO-7B 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 the PRO-7B can be used again. The Radio Shack warranty does not apply to any damage caused by this, inadequate lightning protection, or other improper connections.

SPECIFICATIONS

FREQUENCY COVERAGE	148 – 174 MHz
CHANNELS OF OPERATION	Eight—as determined by any one of 8 crystals operating in the frequency range
FREQUENCY BAND	8 MHz for maximum sensitivity (153 MHz ± 4 MHz)
SENSITIVITY	Better than 1μV for 20 dB quieting
SELECTIVITY	-60 dB (±25 kHz) -6 dB (± 8 kHz)
SPURIOUS REJECTION	Greater than 50 dB
IMAGE REJECTION	Greater than 40 dB
SCANNING SPEED	12 channels/second
DELAY TIME	1.5 to 3 seconds
MODULATION ACCEPTANCE	±7 kHz
I.F. FREQUENCY	10.7 MHz and 455 kHz
FILTER	Ceramic filters (10.7 MHz and 455 kHz)
SQUELCH SENSITIVITY	Less than 1.0 microvolt to approximately 30 microvolts
AUDIO POWER	2 watts maximum
CRYSTAL REQUIREMENTS	Standard HC-25/U, 3rd overtone
BUILT-IN-SPEAKER	2" x 6" oval speaker
POWER REQUIREMENTS	AC—120 volts, 60 Hz, 16 watts maximum DC—12-15 volts, **Negative Ground only**, 10 watts maximum

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

PREPARING FOR USE

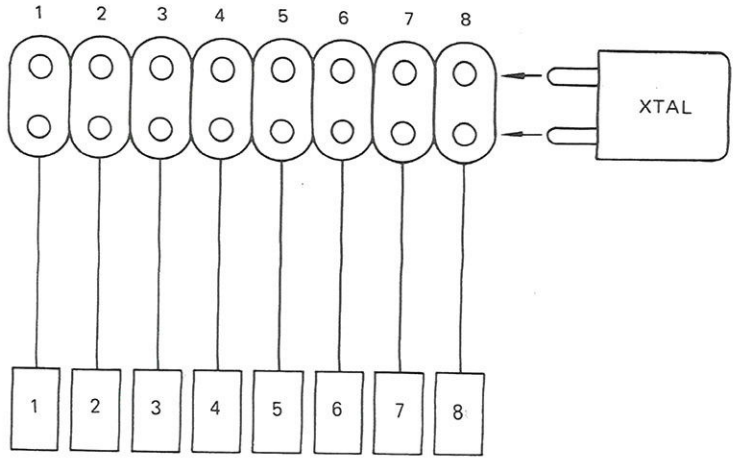
To use your PRo-7B, you must do three things:

Connect power
Install from 1 to 8 crystals
Connect an antenna

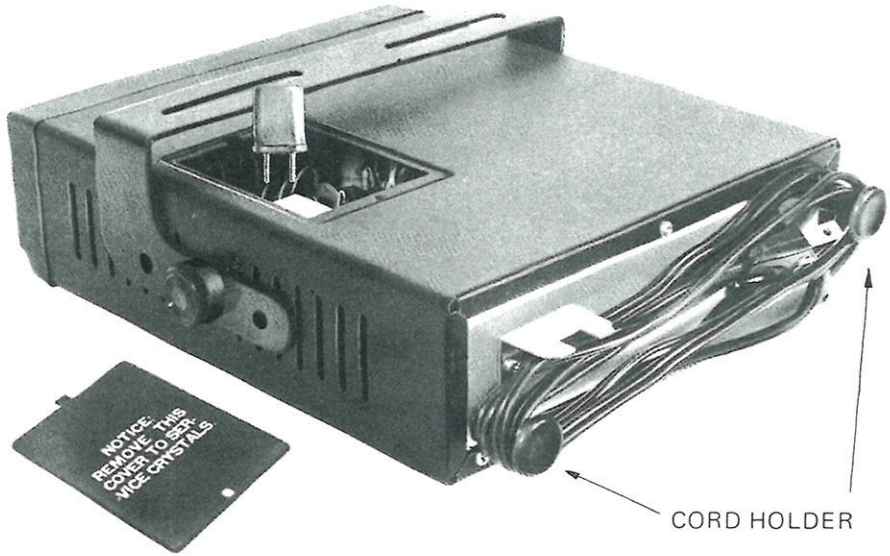
To make a quick check, you can just connect the Line Cord to a source of 120 volts, 60 Hz, AC power. If you intend to use a 12 volt source, you must connect the 12 volt DC power plug wires as noted later on under "Mobile Installation". With an antenna connected and a crystal installed, turn the Receiver 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.

Crystal Socket



Channel Lock-Out Buttons



Remove the screw from the Crystal Compartment Cover to expose the crystal sockets. Provision is made to install 8 crystals. Follow the illustration provided for proper installation of each 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).

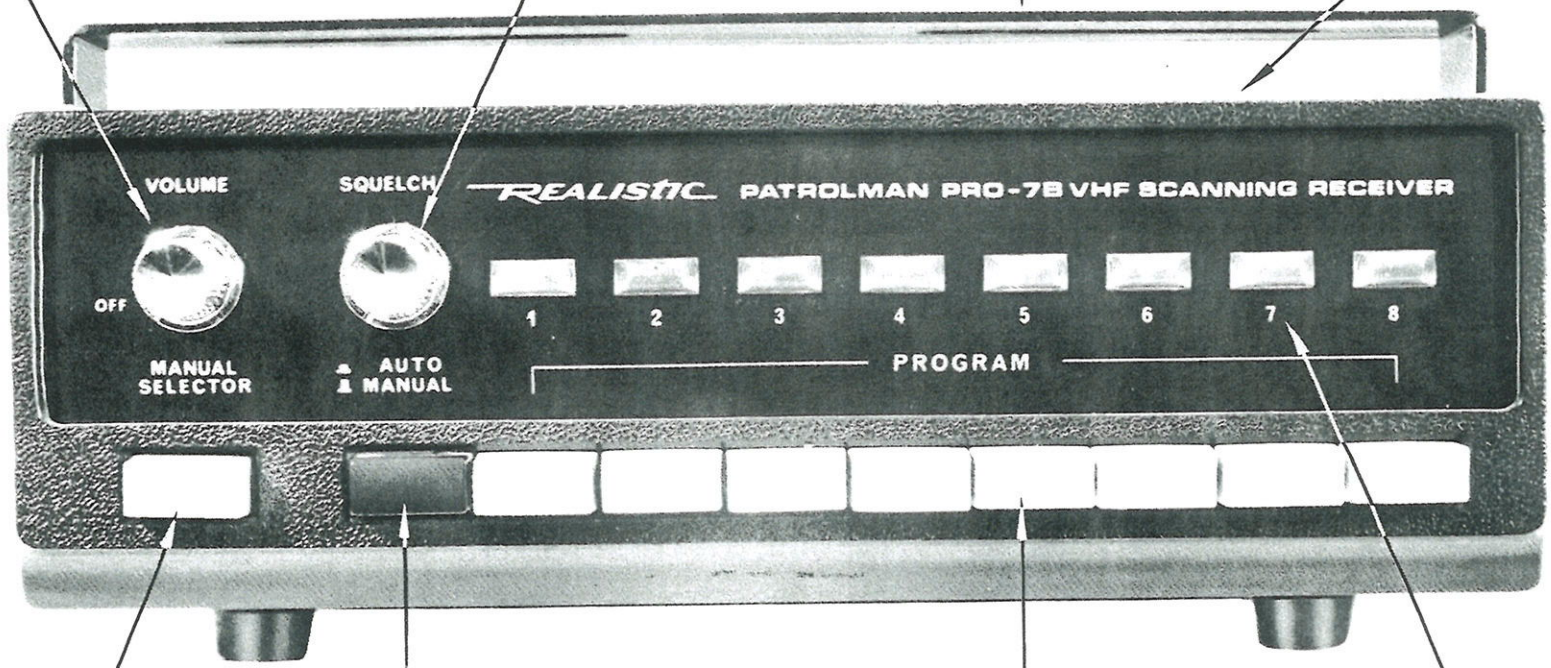
CONTROL FUNCTIONS

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 and 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.

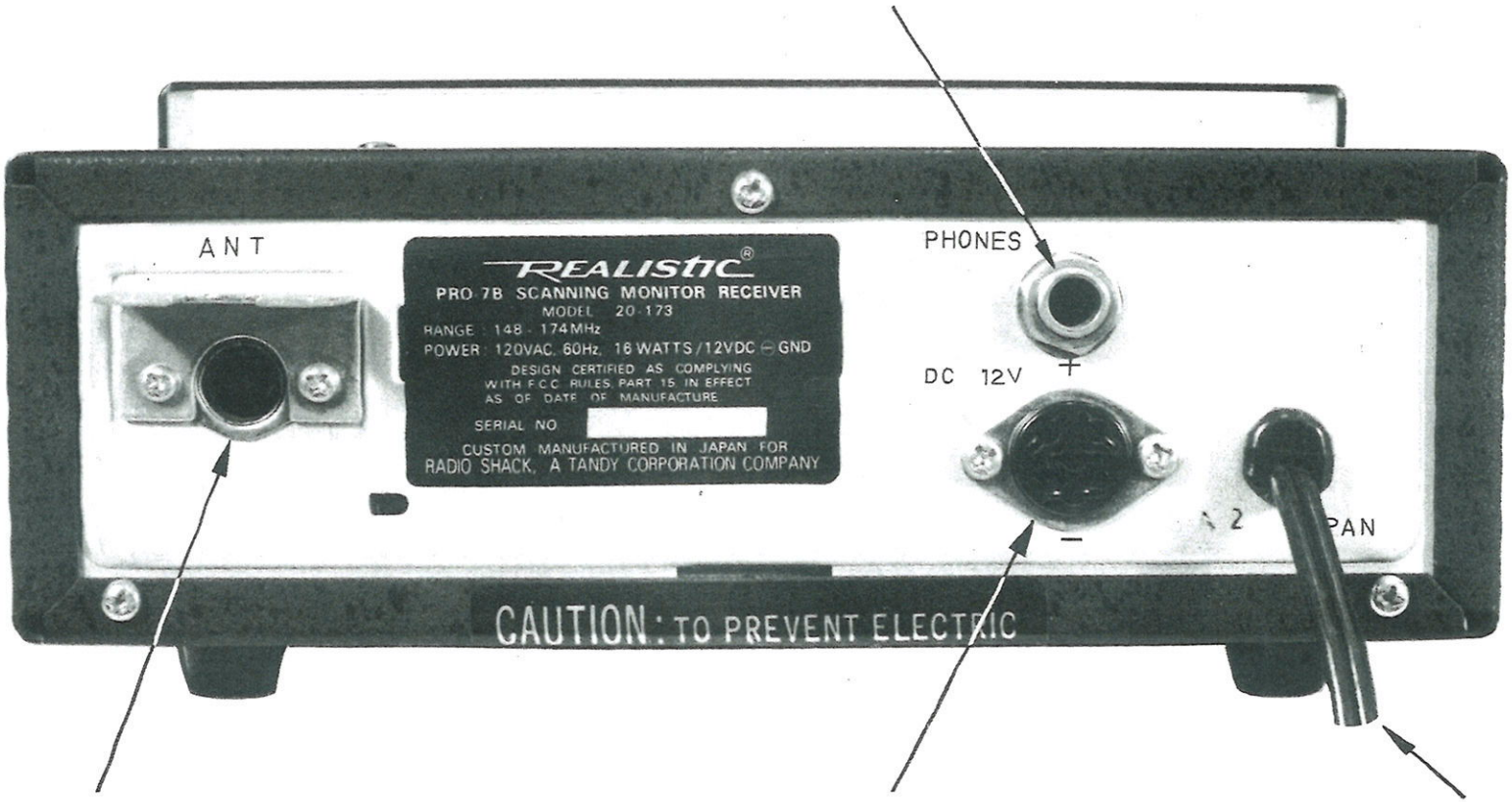
AUTO/MANUAL Button—use to determine the scanning function. In the AUTO (in) position, each channel will be scanned automatically. In the MANUAL (out) position, the PRO-7B will not scan, but will remain tuned to the channel indicated by a Lighted Channel Indicator.

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.

Channel Indicator Lights—these lights show which channel(s) is active. During scanning, these lights light up in sequence; when the receiver is operative on one of the channels, the light for that channel will go on. When the Channel Lock-out Button for that channel is out, that Light will not light.

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 jack. Use an antenna such as Radio Shack Catalog Number 20-161 (indoor operation).

DC Power Jack and Cable—use for DC operation; connect to an external source of 12 volts DC, Negative Ground. This will permit you to use the PRO-7B in a vehicle or boat. Connect Black to negative (-) and Red to positive (+).

Line Cord—use for AC operation; plug into a source of 120 volts, 60 Hz AC power.

INSTALLATION

A good installation will make the most of the PRO-7B's capabilities. Don't loose 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 that you choose, and how you install it, will have a great effect on how well your Receiver will work.

BASE INSTALLATION

For a base installation, you 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) 20-181 for quality reception. Use RG 8/U coaxial lead-in cable to assure maximum transfer of the tiny signals. Use Motorola adapter plugs as appropriate (278-208).

The only other thing you need to do is connect the 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 different models of base Monitor antennas. Some of the most popular antennas combine several frequency bands.

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

Monitor enthusiasts with both high and low VHF units, prefer 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.

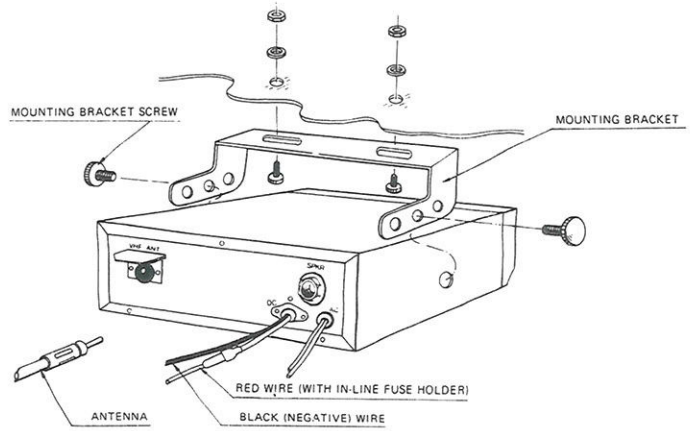
MOBILE INSTALLATION

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.

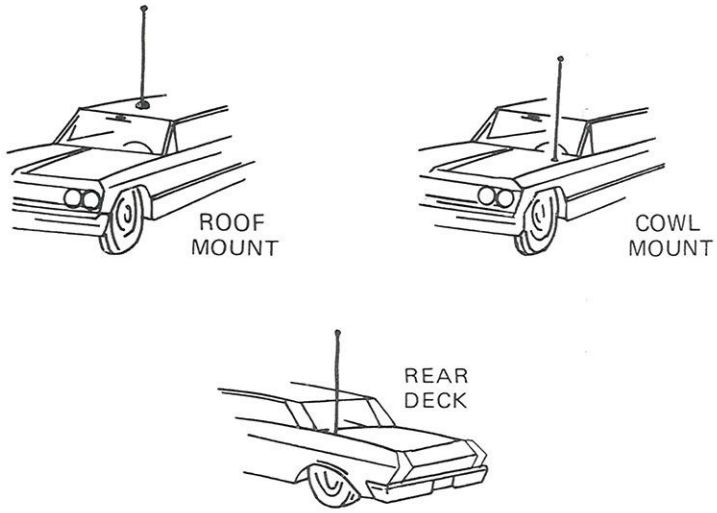
The PRO-7B is designed to operate from a **negative ground** 12 volt DC source. Be sure you connect power leads with the correct polarity. Use the DC Power cable provided. The other end of these wires can be connected to an Auto Cigarette Lighter Plug, Catalog Number 274-331; or you can make the connections 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 do 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. It is easier to mount and may double, with the special antenna, as both a CB and a VHF antenna. Ask about our 21-930 Cowl Mount antenna which can be used with CB operation and Hi-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 μf 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 Monitor 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 PRO-7B 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 PRO-7B 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 PRO-7B 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.

SCAN DELAY CIRCUIT:

The PRO-7B 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.

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).

FREQUENCY COVERAGE:

For maximum sensitivity, the channel frequencies you choose should be within 4 MHz of 153 MHz (that is, in the spread of 149 to 157 MHz). The PRO-7B will function very adequately down to 148 and up to 174 (but with reduced sensitivity). The superior reception spread of 8 MHz (±4 MHz) can be moved up or down in this band of frequencies by special realignment of the front end circuitry of the 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.

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 PRO-7B 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 PRO-7B, 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.

ACCESSORIES

Your PRO-7B 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, solder the wires directly to + and - source of 12 volts. Be sure to observe correct polarity.

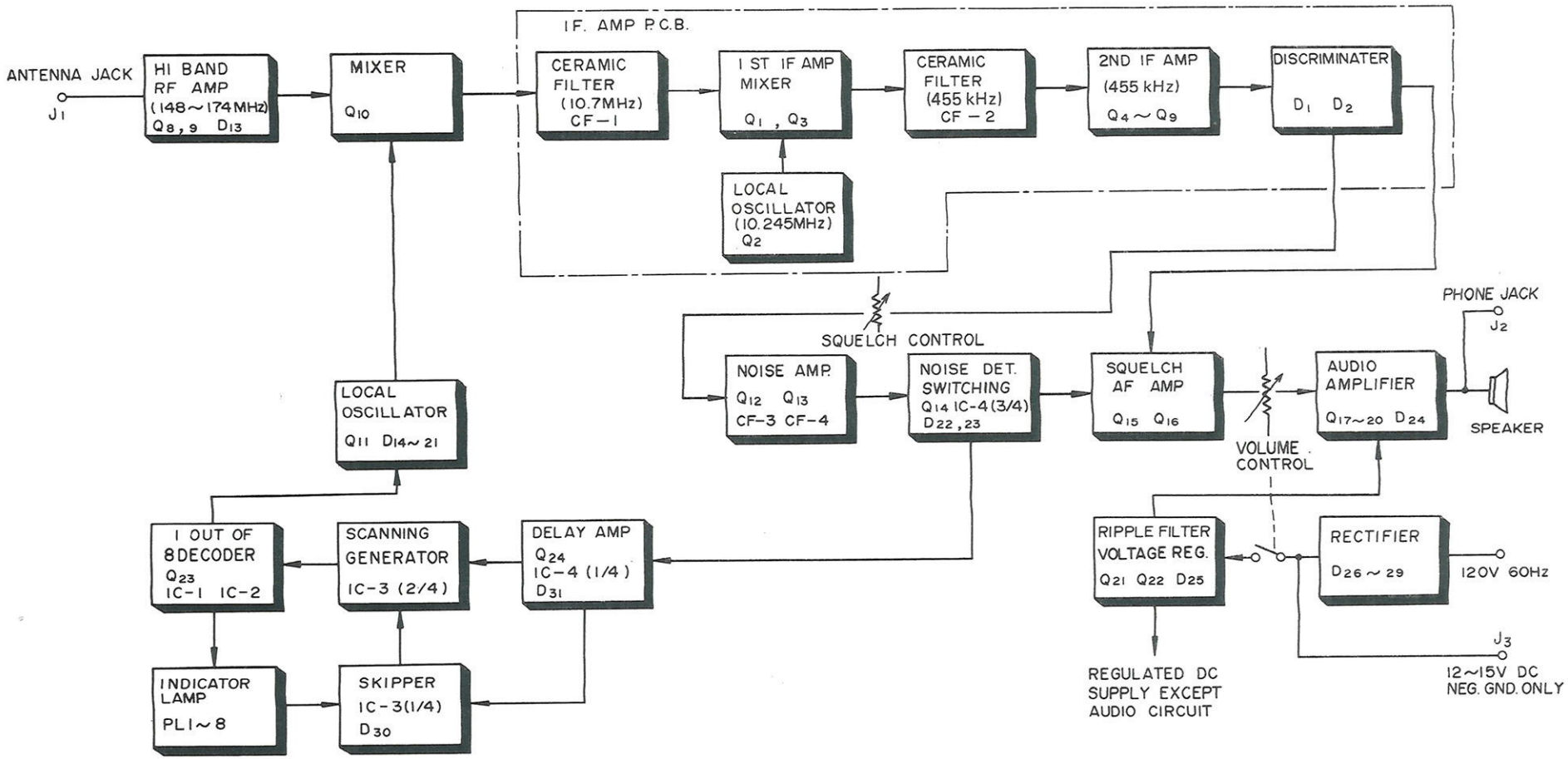
A pair of headphones can be a very useful accessory. In areas where a high noise level is present (in a factory, at the scene of a fire or accident, etc.), or when you want to listen privately, use headphones. Your Radio Shack store has a couple of very fine selections for your PRO-7B. Just plug them 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.

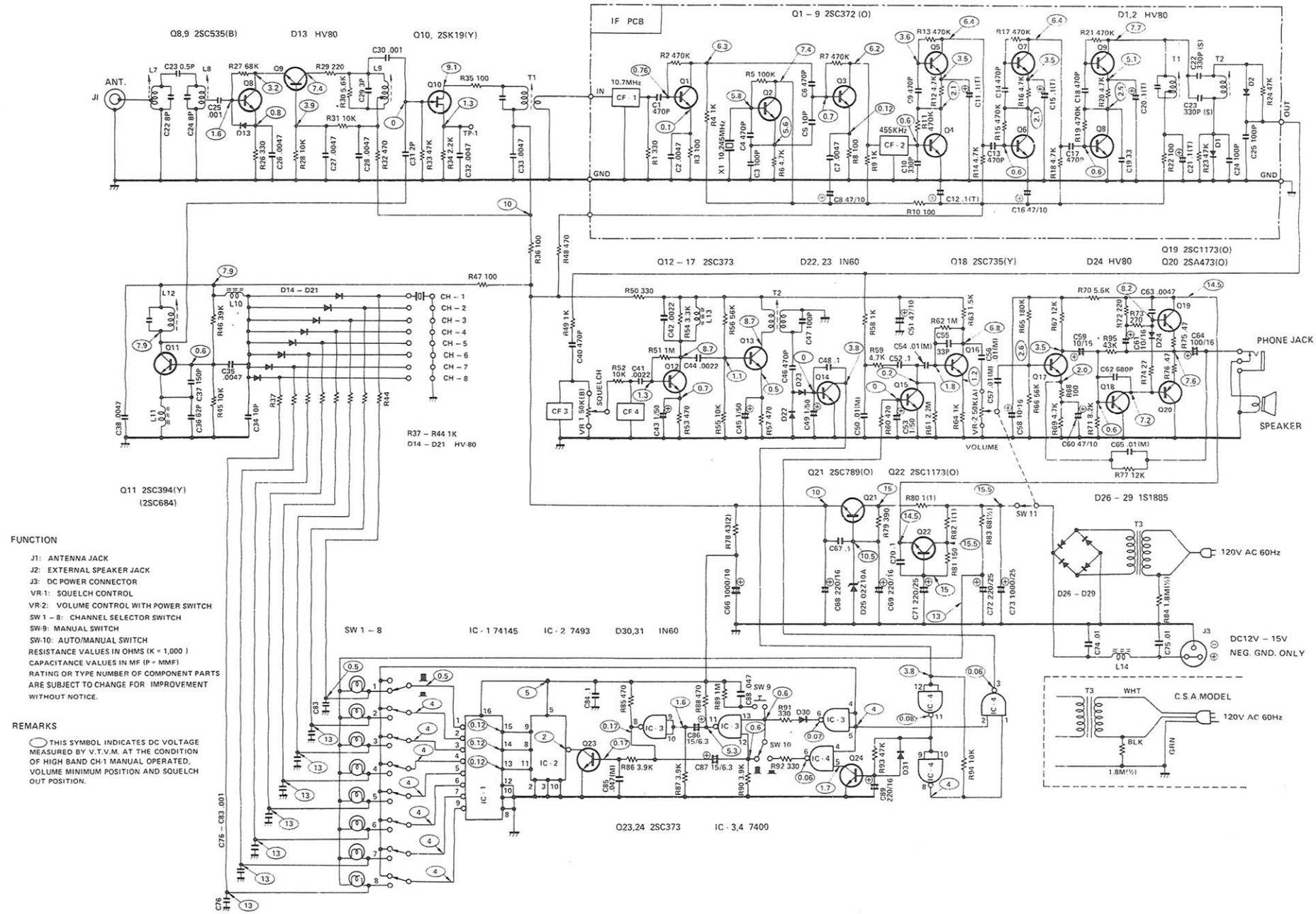
MAINTENANCE

The PRO-7B 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



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

U S A: FORT WORTH, TEXAS 76107
CANADA: BARRIE, ONTARIO, CANADA L4M 4W5

TANDY INTERNATIONAL ELECTRONICS

AUSTRALIA	BELGIUM	U. K.
280-316 VICTORIA ROAD RYDALMERE, N.S.W. 2116	PARC INDUSTRIEL DE NANINNE 5140 NANINNE	BILSTON ROAD WEDNESBURY, STAFFS WF10 7JN

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