

# RADIO SOUND SYSTEMS

# 3V

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### GENERAL

All Jeep radios are transistorized and have an output impedance of 3.2 ohms. They operate with the ignition switch in the On or Accessory positions. All models use non-adjustable, whip-style antennas. Antennas used with CB radios are slightly longer than those used with other radios.

On radios with pushbutton tuning the AM or FM stations may be preselected, using the five pushbuttons, or manually tuned. On all radios, the left-hand knob controls power (on and off) and volume. The right-hand knob controls station selection. All radios also have adjustment for the bass and treble tone quality.

AM/FM radios have a slide switch to select AM or FM reception and controls for left-right, front-rear speaker balance. During stereo reception, a small indicator light glows. The light is off during FM monaural reception. Cherokee and Wagoneer models use four speakers with the stereo radio. A speaker is mounted in each front door and rear quarter trim panel. A front-to-rear speaker fader control is used with the four-speaker system. It is located behind the manual station tuning knob. CJ and truck models use a two-speaker system with the stereo radio. On truck models a speaker is mounted in each front door. On CJ models a speaker is mounted on each side of the instrument panel.

In addition to the above features, all Citizen Band (CB) radios have a switch to change from broadcast band radio listening into the CB receive or transmit mode.

**CAUTION:** Do not operate the CB radio with the antenna disconnected. Radio damage can result.

The radio manufactured date, model and serial number are stamped on the radio case.

### Setting the Pushbuttons

To set each pushbutton for automatic tuning, proceed as follows:

- (1) Move vehicle outside building and away from high tension lines.
- (2) Permit radio to warm up for several seconds.
- (3) Pull pushbutton out about 1/2 inch to unlock tuner.
- (4) Select station with manual tuning knob.
- (5) Push pushbutton in as far as it goes (to lock the tuner) and then release it. This station is now set for automatic tuning.
- (6) Follow the same procedure for the remaining pushbuttons.

### Radio Polarity

When servicing the radio, the A (power) lead must be connected to the positive side of the power source. If connected to the negative side, the radio will not operate and damage to components will result.

The radio is grounded internally. The ground return circuit is completed by grounding the radio chassis to the instrument panel. When testing on the bench, a ground jumper wire must be attached between the radio chassis and the negative terminal of a 12-volt battery or power supply to complete the power circuit.

**ANTENNA TRIMMER**

Antenna trimmer adjustment is necessary to match the vehicle radio circuit to the vehicle antenna. The adjustment should be made after installation of a radio or antenna, or after repair to a radio. The adjustment also should be checked whenever radio reception is unsatisfactory.

**Adjuster Location**

- AM and AM/FM radio: just above the tuning control.
- AM/FM stereo with tape player: in the tape cartridge slot.
- AM/FM/CB: just left of pushbuttons on face plate.

**Trimmer Adjustment**

The trimmer adjustment should be made when the radio is tuned to a very weak station. It is not necessary to be able to receive an understandable station. The object is to obtain the greatest volume while the volume control is at a medium setting.

- (1) Switch radio to the AM broadcast band.
- (2) Turn on radio and allow to warmup for several seconds.
- (3) Turn station control knob to 1400 KC range and obtain radio station signal. Turn to medium volume.
- (4) On AM and AM/FM radios, remove inner and outer station tuning control knobs (radios without tape player). On AM/FM/Tape radios, open tape door. On AM/FM/CB radio the AM adjustment is on the face of the radio. The CB adjustment procedure is found in the Tuning Antenna Splitter section.
- (5) Engage small slotted screw head with standard screwdriver.
- (6) Turn screw left or right until the greatest volume can be obtained **without touching the volume control.**
- (7) Install inner and outer tuning control knobs, if removed.

**CONTROLS**

**AM Radio**

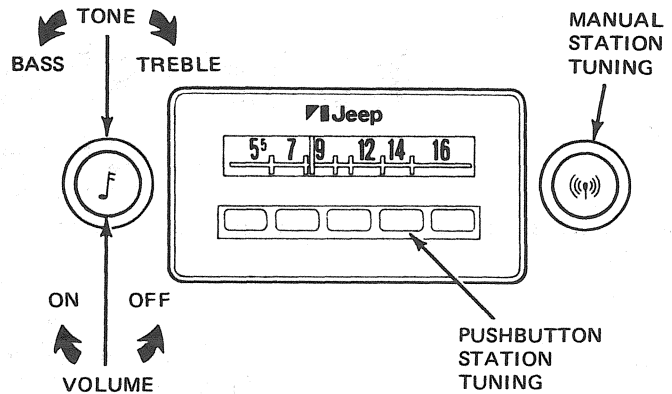
The AM radio (fig. 3V-1) has one dash-mounted speaker as standard equipment. The dial bulb is controlled by the on-off switch; therefore, the bulb has no brilliance control.

**AM/FM Multiplex Radio**

An optional AM/FM two-speaker stereo radio is available on CJ and truck models. Both speakers are mounted in the instrument panel on CJ models and in the doors on truck models (fig. 3V-2).

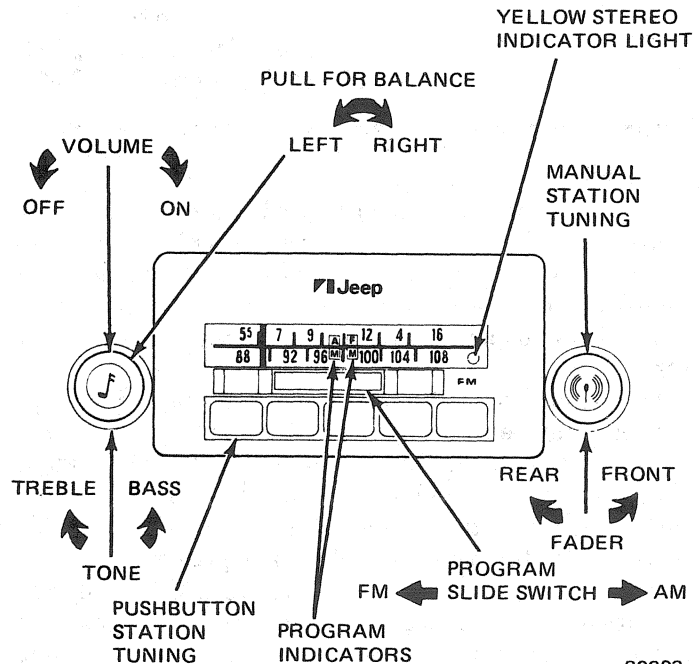
All Cherokee and Wagoneer models have optional four-speaker systems, one speaker in each front door with rear speakers mounted in the rear trim panels.

The radio has external fader and balance controls (fig. 3V-2). An indicator light will come on whenever the radio is receiving a stereo signal.



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Fig. 3V-1 AM Radio Controls



80203

Fig. 3V-2 AM/FM/ Stereo Radio Controls

**AM/FM Multiplex Tape Radio**

The AM/FM multiplex radio has a built-in, 8-track stereo tape player (fig. 3V-3). AM or FM program selection is made by moving the slide switch (located on the right of the dial face) up or down for the desired programming. Left to right balance has been preset for equal balance and should not require any adjustment. However, should it become necessary to adjust for left-to-right balance, the balance control is located in the tape cartridge slot and is adjustable with a small standard screwdriver (fig. 3V-4).

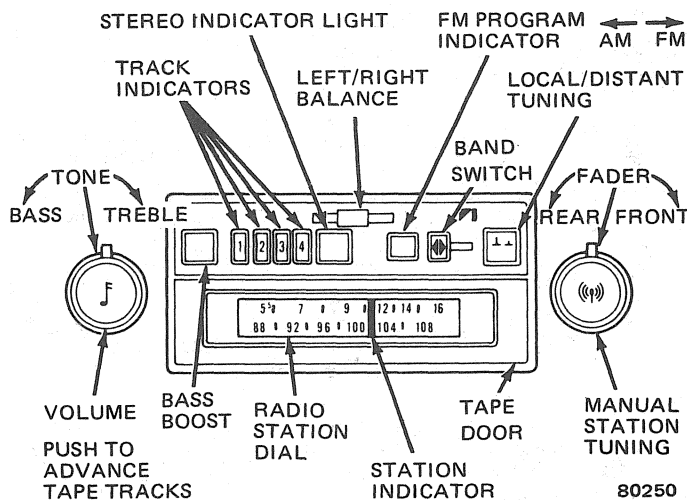


Fig. 3V-3 AM/FM Multiplex Tape Radio

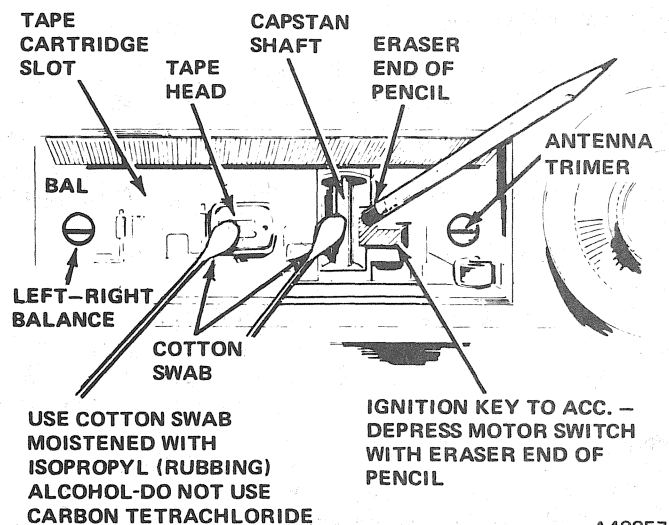


Fig. 3V-4 Tape Head and Capstan Cleaning Procedure

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**Tape Player Operation**

To operate the tape player, place the tape cartridge, open tape end first and labeled side up, in the slot and push in until it is firmly seated. The unit will play the selection on the inserted tape.

To manually change selections, push in and release the left-hand volume control. Each program track will automatically change and play in succession without pushing control.

To turn the tape player off, pull the tape cartridge out approximately one inch.

**Stereo Test Tape**

A Stereo Test Tape Cartridge, J-22683-01, is available for checking the operation of the tape player. This tape provides a means of checking the player for proper tape speed, crosstalk and sound. Follow the instructions on the tape cartridge.

**Tape Head and Capstan Cleaning**

One major cause of improper tape player operation is oxide buildup on the head. During normal operation, iron oxide particles are loosened from the tape and built up on the head. This accumulation of oxide can cause poor playback and some up and down tape travel. The head and drive capstan should be cleaned whenever the unit is serviced, or when poor playback or tape travel is noted.

Cleaning may be done either in the vehicle or on a service bench. To clean the head, use a cotton swab moistened with commercially available tape head cleaner or isopropyl alcohol. Wipe capstan and tape head dry (fig. 3V-4). If a commercial tape head cleaner is used, follow the manufacturer's recommended cleaning procedure.

**AM/FM/Cassette Stereo Radio**

The stereo cassette player (fig. 3V-5) uses cassette cartridges. To operate, insert cartridge into cartridge door. With power on, the cassette will begin playing in the direction of the arrow located on either side of the fast-forward/rewind control. To play the other side of the tape, push the left-hand control knob. The auto-reverse mechanism will automatically begin playing the opposite side of the tape when the first side is completed. To advance or rewind the tape, slide the fast-forward/rewind knob to the desired position. The knob will remain in either position until it is moved back to the center position. To eject a cartridge, push the right-hand control knob. The cartridge will automatically eject when the radio is turned off or the ignition switch is turned off.

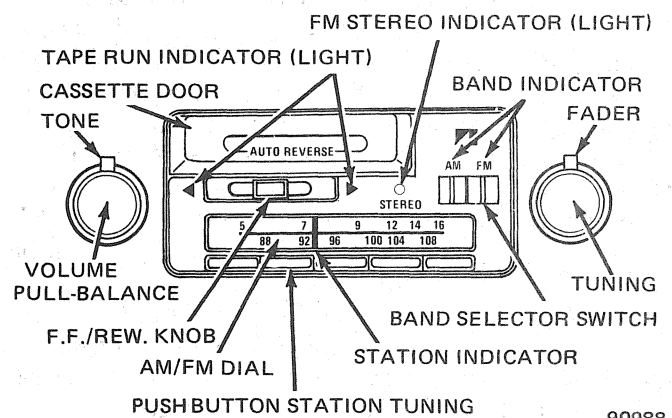


Fig. 3V-5 AM/FM/Cassette Stereo Radio

**Bulb Replacement**

The radio bulb can be replaced by an authorized radio service station.

## Tape Head and Capstan Cleaning

One major cause of improper tape player operation is oxide buildup on the head. During normal operation, iron oxide particles are loosened from the tape and built up on the head. This accumulation of oxide can cause poor playback and some up and down tape travel. The head and drive capstan should be cleaned whenever the unit is serviced, or when poor playback or tape travel is noted.

Cleaning may be done by using a head cleaning tape. If problem still exists it will be necessary to remove the radio for cleaning by an authorized radio service station.

## Trimmer Adjustment

The antenna trimmer adjusting screw is located above the manual station turning knob. It is necessary to disconnect the front of the radio and push the radio forward to gain access to the trimmer adjusting screw.

## Cassette Test Tape

A cassette test tape J-23724 is available for checking the operation of the cassette player. This tape provides a means of checking the player for proper tape speed. Follow the instructions on the cassette test tape.

## CB Radios

### CB Radio Controls

Refer to figures 3V-6 and 3V-7.

- *S-RF Meter*: indicates output power when transmitting and the input signal strength when receiving.
- *Stand-By Mode Switch*: permits listening to the AM or FM broadcast band until receiving a CB call. In the STAND-BY position, the radio automatically receives CB transmission. The operator can also transmit while in the STAND-BY mode or return to radio listening by operating the microphone switch. When another CB call occurs, the radio will receive the call. In the RADIO position, only AM or FM broadcasts will be heard without CB interruption. Calls cannot be transmitted in the RADIO position. In the CB position, calls can be transmitted but there will be no AM or FM reception.
- *CB Gain Control*: controls the volume of CB reception independent of the AM/FM volume control.
- *Squelch Control*: affects the sensitivity of the receiver and eliminates receiver background noise when no signal or a weak signal is being received.

### CB Operation—To Receive

- (1) Center speaker balance control.
- (2) Rotate squelch control fully counterclockwise.
- (3) Set Radio/CB selector switch to CB position.

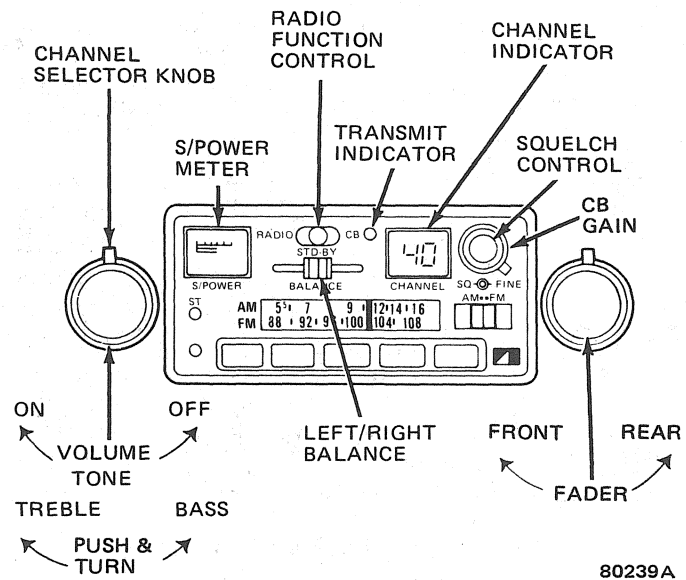


Fig. 3V-6 AM/FM/CB Radio—CB Controls

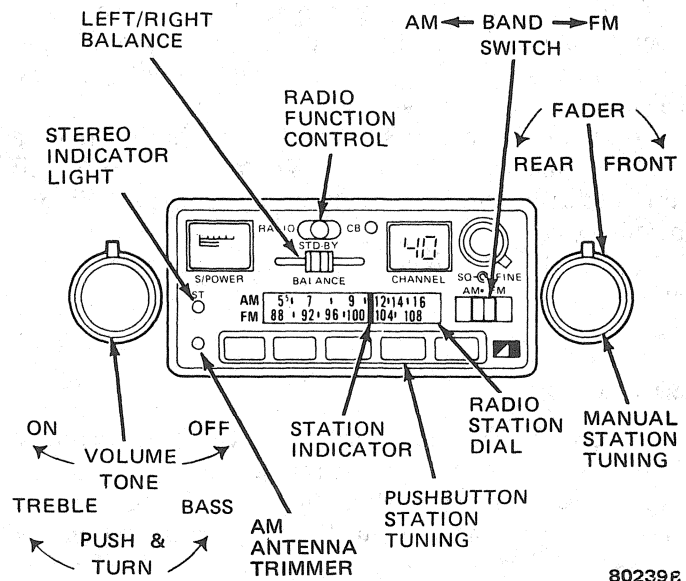


Fig. 3V-7 AM/FM/CB Radio—AM/FM/Controls

- (4) Rotate On-Off switch clockwise until noise or signal is heard in speaker.
- (5) Check to see that CB Channel indicator light is illuminated.
- (6) Select desired channel.
- (7) Rotate CB squelch control slowly clockwise until background noise just disappears. Do not advance control too far as weaker signals will not be heard.

### CB Operation—To Transmit

- (1) Select desired channel for transmitting.
- (2) Depress microphone button and speak in a normal voice.
- (3) Check relative output power on S-RF meter.
- (4) To receive, release microphone button.

### Premium Audio System

The premium audio system is used in conjunction with the AM/FM/CB, AM/FM/8-Track Tape Stereo or AM/FM/Cassette Stereo Radios.

The premium sound system provides an improved treble and bass range along with increased volume. The system is turned on and off by the ON/OFF/FADER switch located on the instrument panel. The amplifier is located on the passenger side of the vehicle above the air conditioning housing. When the system is On, the indicator lamp next to the switch will illuminate. To control the front to rear speaker balance, rotate the ON/OFF/FADER switch.

Refer to Wiring Diagrams at the end of this manual for circuit details.

### RADIO RECEPTION CHARACTERISTICS

#### Definitions of Frequently Used Terms

**AM (Amplitude Modulation):** Common system of radio broadcasting (520 to 1610 kHz).

**Antenna:** Device used for transmitting and receiving radio signals.

**Circular Polarization:** A technique of transmitting radio signals to minimize the affects of fading.

**Distortion:** False reproduction of the original transmitted signal.

**FM (Frequency Modulation):** System of radio broadcasting (88 to 108 mHz) with the added advantage of wider audio frequency response.

**Fading:** Variation of intensity of received radio signals.

**Flutter:** Momentary loss of received radio station, sometimes referred to as *picket-fencing*.

**Hertz:** Cycles per second.

**Ignition Noise:** Undesirable radio signals or noises transmitted from the automobile or an adjacent automobile that interfere with the reception of desired radio signal.

**Monaural:** A system utilizing a single signal on a single radio frequency (station) as distinguished from a dual channel system (FM stereo).

**Multipath Reception:** Signal loss or reduction due to a direct signal and a reflected signal arriving at the antenna simultaneously.

**Selectivity:** The ability of a radio receiver to accept the signal of one station while rejecting signals of undesirable adjacent stations.

**Sensitivity:** The ability of the radio receiver to receive weak stations.

### AM and FM Reception

The following is a brief explanation of AM and FM reception characteristics.

### Signal Transmission

The range of normal hearing is approximately 30 Hz (cycles per second) to 14,000 Hz. AM has a range of 50 to 5000 Hz. While FM, covers the entire range of normal hearing. Both AM and FM are received on a regular radio as a monaural signal.

FM Stereo receivers are capable of receiving both monaural and FM stereophonic broadcasts. These stereo broadcasts are sometimes referred to as multiplex.

**Fading**—Fading is not usually a problem with AM because of its long distance reception capability (fig. 3V-8). FM, on the other hand, is limited to line-of-sight reception (25 to 40 miles) under average conditions of terrain and transmitted power (fig. 3V-9). The area of good FM Stereo reception may even be slightly less than that of regular FM because of stronger signal requirements. Figure 3V-10 illustrates fading of an FM signal due to differences in terrain. Reception behind hills may be noisy (hissing or popping). This noisy reception is sometimes referred to as flutter or picket fencing.

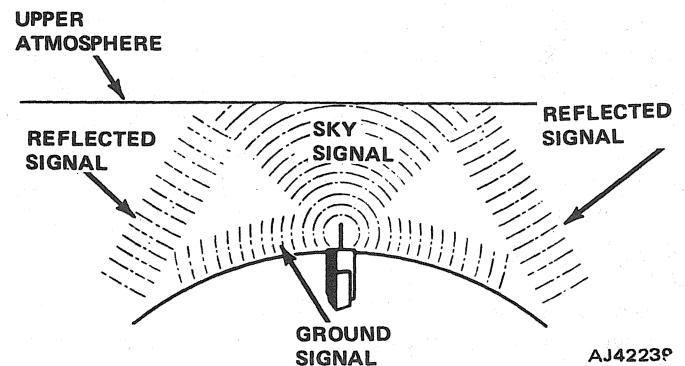


Fig. 3V-8 AM Reception—Long Distance; Follows Curvature of Earth; Reflected by Upper Atmosphere

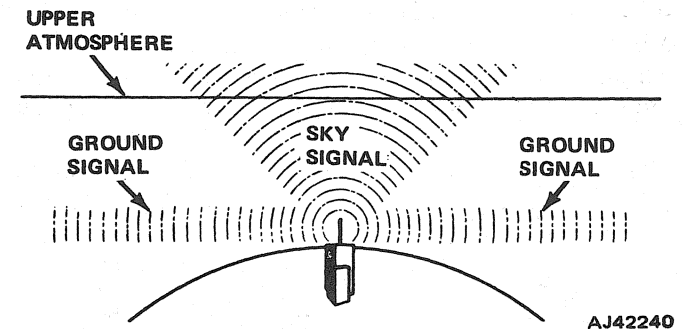


Fig. 3V-9 FM Reception—Shorter Distance; Does Not Follow Curvature of Earth; Not Reflected by Upper Atmosphere

Flutter is produced in the fringe area when objects come between the station and the receiver. The signal will be lost momentarily, then it will return. The rate which the flutter occurs is dependent upon the vehicle's speed in passing objects. The effect is very similar to the way a television set flutters in the fringe area when an airplane passes between it and the station.

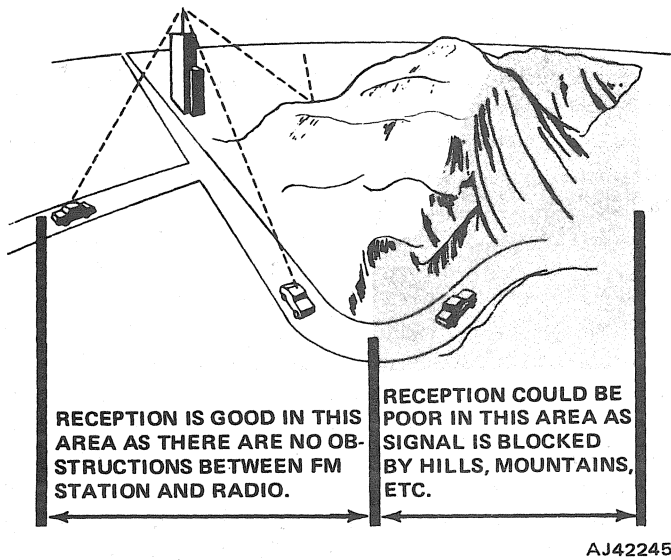


Fig. 3V-10 FM Fading

**Multipath Reception**—The fact that FM can be received quite well between tall buildings can unfortunately cause a detrimental side effect, namely multipath reception (fig. 3V-11). It is caused by a direct signal and a reflected one arriving at the vehicle's antenna causing distortion, partial or complete loss of the station, or poor FM Stereo reception. This type of interference is usually of short duration since the area of interference is usually only a few inches or feet across. It is mostly encountered in downtown areas.

**Interference and Ignition Noise**—AM reception is susceptible to certain types of electrical interference. These include power lines, thunderstorms, and other situations where electrical charges in the air cause disturbances resulting in buzzing and static.

**Ignition Noise Interference**—FM does not usually suffer from the electrical disturbances that can affect an AM receiver. Ignition noise is more prevalent when listening to weaker stations. The noise also occurs if the radio is tuned off-station slightly. To improve reception,

make sure the radio is tuned exactly to the station or tune to a station with a strong signal. This increases station signal strength, the FM circuit rejects the noise, and it disappears. Noise will not be noticed in metropolitan areas or within approximately 25 miles of the station.

**Other FM Interference**—Occasionally, when listening to a station while driving in the vicinity of another station (especially one with a strong signal), the possibility of receiving both stations simultaneously can exist. The phenomenon is called adjacent channel interference or cross-modulation.

**Using Control Effectively**—Proper use of radio controls will enhance listening pleasure.

(1) Always fine-tune radio manually for clearest sound and minimum noise.

(2) Weak FM Stereo signals are inherently noisier than monaural ones when received on an FM stereo radio. To prevent this type of noise from being heard, the FM Stereo radio automatically switches from stereo to the monaural mode. The Stereo-Indicator light goes out, both speakers still operate, but without the stereo effect. When the signal strength increases to a noise-free level, the receiver switches back to the stereo mode. This action is automatic and requires no adjustment.

(3) Occasionally, conditions will be such that noise-free reception simply cannot be attained. If this occurs, set the tone control to the bass (counterclockwise) position to reduce the noise level. When out of the noisy area, set the tone control back to its normal position.

### CB Radio Reception

The range of CB broadcasts and reception depends on weather conditions, amount of air traffic, strength and condition of transmitter and receiver, and the adjustment of antenna and splitter box. Range also depends on the movement between the transmitter and receiver. Reception will be clearer in open spaces with little air traffic than in congested metropolitan areas. Hilly terrain may also affect operation. Electrical interference affects reception similar to AM broadcasts.

Reception should not be fuzzy or screechy unless the network is congested.

### RADIO INTERFERENCE DIAGNOSIS

#### General

The object of this diagnosis is to present a systematic approach to troubleshooting interference (noise) problems. First, determine if the noise is normal by referring to Radio Reception Characteristics. If the noise is abnormal, the following procedures outline methods of determining interference point of entry and elimination.

There are two major ways interference enters the radio—the antenna and the A-line or power feed wire to the radio.

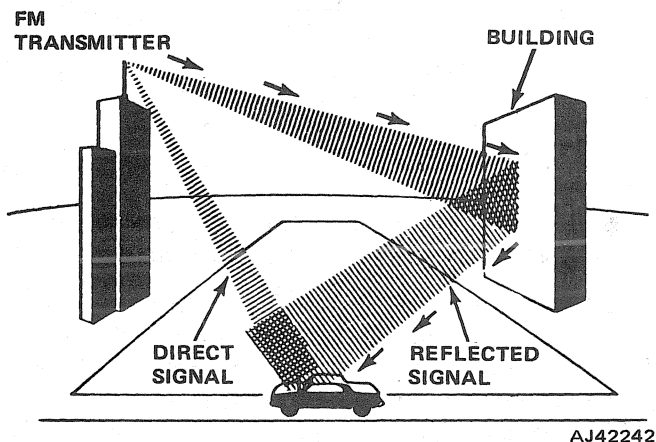


Fig. 3V-11 Multipath Reception

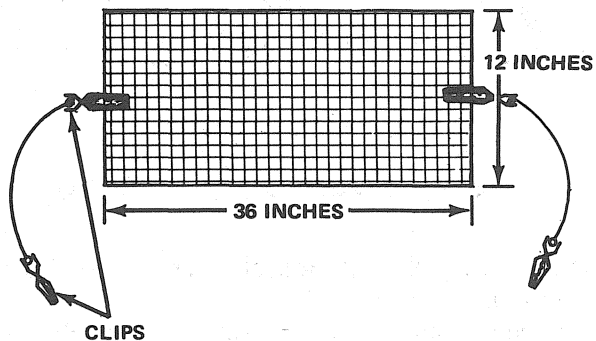
### Interference Entry—Antenna

Disconnect the antenna. If this causes the noise to stop, the problem is reduced to three possibilities:

- A defective antenna; refer to Radio Antenna Ohm-meter Tests
- Noise radiated upward from the dash
- Noise radiated from the engine compartment

### Noise Radiated Upward from Dash

This noise can be determined by fabricating a tool out of a piece of aluminum or copper screen approximately 36 inches by 12 inches (fig. 3V-12).



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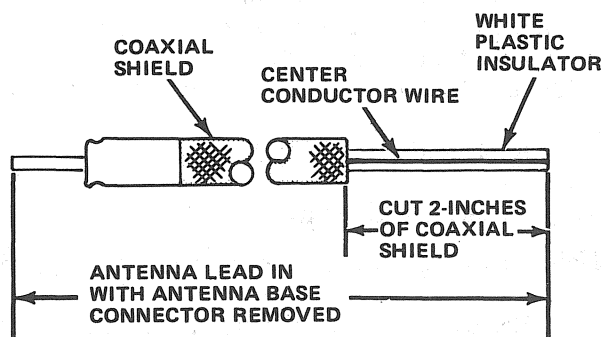
Fig. 3V-12 Improvised Noise Suppression Tool

Lay the screen across the top of the dash and attach the clips to body grounds. If the noise is diminished or disappears, the noise is being radiated up through the dash.

To determine exactly where the noise source is, a useful noise probe can be improvised from an antenna lead-in cable.

To make the probe, cut or remove the lead-in from the antenna at the antenna, remove approximately 2 inches of the outer plastic covering and the woven wire shield (fig. 3V-13).

(1) Disconnect original antenna lead-in and plug in noise probe.



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Fig. 3V-13 Noise Probe Fabrication

(2) Turn radio on and use probe to discover hotspot or source of noise. Do not touch the end of the probe with your hand as this would give an incorrect indication. As the probe comes closer to the noise source, the loudness of the noise will increase.

(3) If the source is found to be a switch, connect a 0.5-mfd capacitor from the power feed side of the switch to a good chassis ground.

(4) Gauges and sender units generally can be silenced by installing 0.5-mfd capacitors at their terminals. Install a 0.5-mfd capacitor at the battery terminal of the CVR or a 0.1-mfd, radio-type capacitor directly across the CVR terminals.

(5) If the source is found to be a wire, reroute the wire, or wrap a piece of screen around the wire or wire harness and attach one or more ground leads to the wire screen. It also may be possible to screen off the area found to be radiating noise. Be sure to ground the screen.

(6) If the noise is found to be an electric motor, install a 0.25-mfd coaxial (feed-through) capacitor in series with the motor.

### Noise Radiated from the Engine Compartment

These noises can be separated into three areas:

- Primary Ignition Noise
- Secondary Ignition Noise
- Alternator Whine (Antenna)

### Primary Ignition Noise

This type of noise generally affects the AM band. The noise usually appears as:

- Frequency varying with engine rpm
- Loudness varying with engine rpm
- Stops instantly when the ignition is turned to the Off position and turned to Accessory position

The first two classifications are usually the result of poor grounds on the coil capacitors or a wire routing problem. Cleaning the grounds or rerouting the wires may solve the problem.

An extra long antenna lead-in may be prepared as shown in figure 3V-12, and used as a hotspot probe.

Remove the ignition coil and its mounting bracket. Clean the paint off the bracket and the engine block, then assemble tightly. In many cases, this helps reduce the amount of interference radiated from the ignition system. Also, the installation of a hood bonding strap or device will help reduce interference radiated from the ignition system. Be sure to check the coil polarity.

In some rare cases, extra suppression may be required if the vehicle is operating in fringe areas. For those special cases perform the following steps:

(1) Install a 0.1-mfd coaxial capacitor as close as possible to the coil battery terminal, not the distributor terminal. Do not use an ordinary bypass capacitor.

(2) Install a 0.005-mfd, 1000-volt ceramic disc capacitor at the coil distributor terminal.

(3) Install a 0.5-mfd coaxial capacitor at the alternator output terminal. Be sure it is rated to handle the maximum alternator voltage.

### Secondary Ignition Noise

Secondary ignition noise will always affect FM and, if severe enough, may also affect AM. Normally one of two conditions will be found in the radio.

- Ignition noise all across FM band (and possible on AM)
- Ignition noise (loud) in between stations but not on a strong station

When these conditions exist in the radio, the problem is more than likely the result of:

- Distributor cap carbon ball eroded, or cracked or loose cap
- Rotor with a burned carbon contact spot
- Secondary wire not seated in the coil or distributor
- Defective coil
- An oil film on some of the lead terminals
- Copper core secondary wiring
- Defective or improper spark plugs

If a wire was found not seated, remove the wire and check for carboned end. It is not advisable to repair an end terminal on carbon core wire; replace the entire cable.

If the noise in question sounds like one or two cylinders and definitely not all of them, then the problem is after the coil. Using the fabricated noise probe, which plugs into the radio, have someone sit in the vehicle and listen to the radio. Move the probe from plug to plug. The person in the vehicle should notice an appreciable increase in the plug noise when the defective plug is reached.

It is a good idea to install resistor spark plugs when experiencing spark plug noise. If the vehicle has copper core secondary wiring, these wires should be replaced with original equipment, carbon core resistor wires.

### Alternator Whine (Antenna)

Alternator whine can be described as an annoying, high-pitched whistle, or a siren-type sound that increases and decreases with engine rpm.

Methods of eliminating alternator whine and engine interference noise:

- (1) Install front fender ground straps.
- (2) Install hood bonding strap or device.
- (3) Run offending wire through a shielded (grounded) cable.
- (4) Clean slip rings and be sure the brushes are making good contact.

### A-Line (Power Feed Wire to Radio)

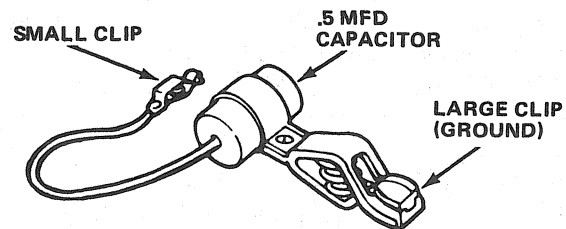
If disconnecting the antenna did not eliminate radio noise, the noise is probably on the A-line.

Motor noise on the A-line is usually the result of voltage spikes on this line being so large that the input filter circuit in the radio cannot handle them. There are two ways to handle this problem:

(1) Locate the cause of line noise and eliminate it.

(2) Add external filters to reduce the spikes to a point where the radio filter can handle the spikes.

A grounded capacitor touched to all hot electrical connections will often identify the offenders (fig. 3V-14).



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Fig. 3V-14 Interference Eliminator Test Device

The fabricated antenna probe (fig. 3V-13) also can be used to find hotspots.

In general, any adjacent metal parts which are separated by mastic or paint must be connected together electrically.

Effective bonding requires more than physically clean surfaces and self-tapping screws. Tooth-type lock-washers must be used to cut into the surface layers of metal. Grounding straps must be as short and as heavy as possible.

A-line noise is normally the result of:

- Alternator whine (A-line)
- Wiring harness too close to ignition wiring
- Radio noise suppressor
- Poor radio grounding

### Alternator Whine (A-Line)

Alternator whine does not stop instantly when the key is turned quickly to the accessory position at fast idle. It is a high pitched whine which increases with rpm. Correct alternator whine as follows:

- (1) Install a 0.5 to 2.0 mfd bypass capacitor from the alternator output terminal to ground.
- (2) Install a coaxial capacitor in alternator output wire.
- (3) Replace alternator diodes.

### Wiring Harness Close to Ignition Wiring

Noise carried to the radio normally can be corrected as follows:

- (1) Relocate harness wiring away from ignition wires.
- (2) Install 0.5-mfd capacitors on each fuse panel lead. Be sure capacitor is grounded.



### Instrument Cluster Radio Noise Suppressor

A noise suppressor is installed on Cherokee, Wagoneer and Truck models equipped with a radio. This suppressor (choke) is plugged into the back of the cluster on a printed circuit board. Be sure the choke has not been installed over the copper strip installed on vehicles not originally equipped with a radio.

Tap on the instrument panel with the ignition in the ON position and the ACC position to activate the CVR point movement. If noise only occurs in the ON position, repair noise suppressor as follows:

- (1) Remove radio choke.
- (2) Remove plastic covering.
- (3) Unsolder one end of coil wire and remove approximately 6-1/2 inches of wire.
- (4) Resolder wire end.
- (5) Wrap coil with several turns of plastic electrical tape and install choke.

### Poor Radio Ground

To check for a poor ground, attach a jumper wire to the radio case and connect to a good chassis ground. If there is no change in radio noise, the radio has a good ground.

If noise changed, check for loose mounting screws and a poor ground.

### Other Sources of Interference

#### Speaker Leads

To determine if speaker leads are inducing or picking up noise, lay the wires on top of the carpet with the wires separated. If the noise is gone, the harness is at fault. Perform one or more of the following:

- (1) Separate coil wires by installing a loom over each of the wires.
- (2) Install a 0.001-mfd, thumbnail-type capacitor across each speaker.
- (3) Remove ground wire from harness and ground each rear speaker at the rear of vehicle.

Speaker-induced noise will normally not occur on front-mounted instrument panel speaker systems. It is more apt to occur on four-speaker systems and when the fader control is in the mid-position.

### Defective Radio

Exchange with a known good radio to determine if the radio is defective.

### Direct Entry into the Radio

- (1) Be sure radio has a good ground.
- (2) Tighten all radio chassis screws.

### Wheel and Tire Static

Wheel static is another source of interference. This is a running noise most likely to be encountered when the vehicle is in motion on a hard, dry-surfaced road. The noise will remain when the vehicle is coasting with the engine and all electrical equipment turned off. The static occurs in the front wheels due to insulating film produced by the lubricant in the wheel bearings.

In some instances, static discharges take place between the tire and the road surface. An anti-static powder kit is available from radio supply houses which applies conducting material to the inside surface of the tire to eliminate noise from this source. Tire static can be checked by washing the tire with water. The water provides a conduction path to ground for the discharges. Tire static is most likely to be encountered during hot, dry seasons.

### Turn and Stop Signals

The flasher in the turn signals and the switch in the stop signal may cause popping noises in the radio. In most cases, the noises are interference due to arcing in the contacts. The correction is a 0.5-mfd bypass capacitor installed at the battery connection of the switch or the flasher. It is less likely, but possible, that the low frequency components of the interruptions are reaching audio stages of the radio. The test is to check if the noise is present with the volume control turned down. If so, install a 1,000-mfd condenser.

### Horn Noise

The diagnosis and cure for a growling noise in the radio when the horn is operated is the same as for Turn and Stop Signals detailed above. The suppressor capacitors are installed at the point where the battery lead feeds the horn relay.

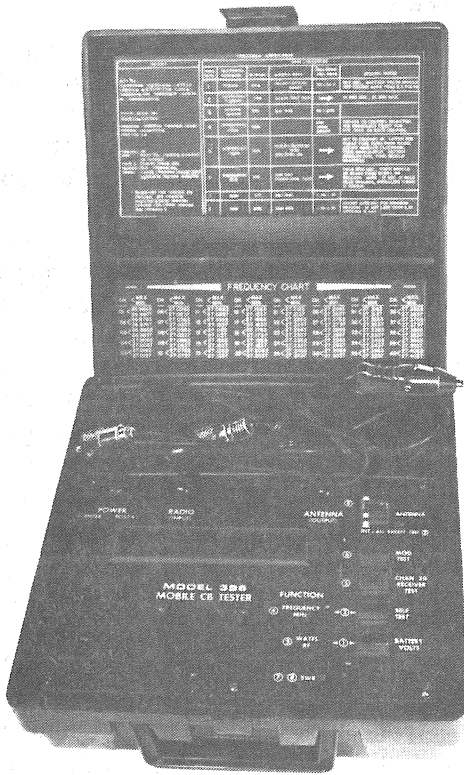
Be sure the horn relay cover is not loose.

### Accessories

Electric windshield wipers, blower motors, window regulator motors, or any brush-type motors, generally can be suppressed by installing 0.25-mfd capacitors at the terminals.

## CB RADIO DIAGNOSIS

For possible CB radio problems, refer to *CB Radio Reception* to determine if the condition is normal. If problem still exists, use CB Radio test instruments (fig. 3V-15) to diagnose trouble.



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Fig. 3V-15 Amserv AMX 386S Mobile CB Tester

## RADIO REPLACEMENT

### CJ Models

**NOTE:** If equipped with air conditioning, remove screws attaching evaporator assembly to instrument panel and lower evaporator assembly.

- (1) Disconnect battery negative cable.
- (2) Remove radio control knobs, attaching nuts, and bezel.
- (3) Disconnect radio support bracket from instrument panel.
- (4) Remove radio by tilting it downward and toward steering wheel.
- (5) Disconnect antenna lead, speaker wires, and feed wire.
- (6) Remove bracket from radio and install on replacement radio.
- (7) Connect antenna lead, speaker wires, and feed wire to replacement radio.
- (8) Install radio in instrument panel.
- (9) Connect radio support bracket to instrument panel.
- (10) Install radio bezel, attaching nuts, and control knobs.
- (11) Connect battery negative cable.

### Cherokee-Wagoneer-Truck Models

- (1) Open glove box door and remove glove box liner and lock striker.
- (2) Disconnect microphone lead from radio, if equipped.
- (3) Disconnect antenna lead(s).
- (4) Disconnect feed wire from fuse panel.
- (5) Disconnect speaker leads from radio.
- (6) Disconnect rear support bracket from radio.
- (7) Remove radio control knobs and attaching nuts.
- (8) Push radio back to clear instrument panel and remove it through glove box opening.
- (9) Install radio in instrument panel.
- (10) Install radio attaching nuts and control knobs.
- (11) Connect rear support bracket.
- (12) Connect feed wire to fuse panel.
- (13) Connect speaker leads to radio.
- (14) Connect antenna lead(s).
- (15) Connect microphone lead to radio, if equipped.
- (16) Install glove box liner and lock striker.

## BULB REPLACEMENT

### All Models

**NOTE:** AM/FM/CB radio bulb replacement is accomplished by exchanging the radio.

- (1) Remove radio.
- (2) Remove radio dial cover retainers and cover.
- (3) Rotate manual tuning control to move pointer to extreme left or right.
- (4) Remove dial light reflector clips and deflector.
- (5) Remove bulb and bulb diffuser.
- (6) Install diffuser on bulb and install bulb.
- (7) Install dial light deflector.
- (8) Install dial cover.
- (9) Install radio.

## ANTENNA

### AM and AM/FM Models

All antennas must have good ground to eliminate static noises. The mast of the antenna is not grounded except through the radio. The base of the antenna is grounded to the vehicle sheet metal. The coaxial shield (the wire mesh) surrounding the center conductor wire of the antenna lead-in cable is grounded to the radio and the antenna base.

### Tests

There are three antenna tests to be made with the use of an ohmmeter:

- Mast to ground
- Tip of mast to tip of conductor
- Body ground to battery ground

Refer to figure 3V-17.

Operating Instructions for Amserv AMX 386S Mobile CB Tester

NOTES
<p><b>CAUTION:</b> Do not key microphone without antenna connected or antenna button in int. position if antenna is not connected.</p> <p><b>RADIO UNDER TEST CONTROL SETTINGS</b> Squelch — Minimum (audible noise) Volume — Mid-Range Channel — 2</p> <p><b>FAILURE OF —</b> Test 1 — Probable Faulty Battery or Harness Test 2,7 — Faulty Model 386S Tests 3 to 6 — Faulty CB Test 8 — After antenna adjustment indicates faulty antenna.</p> <p>*Limits set for typical CB systems. See specific manufacturers specifications for other radio's and antenna's.</p>

TEST PROCEDURE					
Test Step	Function Setting	Antenna	Instructions	*Readings Min.-Max.	Special Notes
1	Watts	Int.	Press-Battery Volts	12.0-16.0	Key mic., battery volts should not change more than 0.5 volts.
2	Frequency MHZ	Int.	Press-Self Test	➔	27,2035 min., 27,2065 max.
3	Watts RF	Int.	Key Mic.	03.0 Min.	
4	Frequency MHZ	Int.	Key Mic.	See Freq. Chart	Rotate CB channel selector. See frequency chart for min./max. on each channel.
5	Frequency MHZ	Int.	Press-Receiver Test (Channel 20)	➔	Set to channel 20. Listen for clear tone (1kHz) from radio. Adjust squelch clockwise, tone should reappear.
6	Frequency MHZ	Int.	Key Mic. Press-Mod. Test	➔	Talk into mic., voice should be heard from Model 386 speaker. Note - if mic. is held near speaker, squealing sound is normal.
7	SWR	Int.	Key Mic.	1.00-1.20	
8	SWR	Ext.	Key Mic.	1.00-3.50	Adjust antenna for minimum reading.

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CB RADIO FREQUENCY CHART

CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.	CH. < MAX. MIN.
01 < 26.9663 26.9637	06 < 27.0263 27.0237	11 < 27.0863 27.0837	16 < 27.1563 27.1537	21 < 27.2163 27.2137	26 < 27.2663 27.2637	31 < 27.3163 27.3137	36 < 27.3663 27.3637
02 < 26.9763 26.9747	07 < 27.0363 27.0337	12 < 27.1063 27.1037	17 < 27.1663 27.1637	22 < 27.2263 27.2237	27 < 27.2763 27.2737	32 < 27.3263 27.3237	37 < 27.3763 27.3737
03 < 26.9863 26.9837	08 < 27.0563 27.0537	13 < 27.1163 27.1137	18 < 27.1763 27.1737	23 < 27.2363 27.2337	28 < 27.2863 27.2837	33 < 27.3363 27.3337	38 < 27.3863 27.3837
04 < 27.0063 27.0037	09 < 27.0663 27.0637	14 < 27.1263 27.1237	19 < 27.1863 27.1837	24 < 27.2463 27.2437	29 < 27.2963 27.2937	34 < 27.3463 27.3437	39 < 27.3963 27.3937
05 < 27.0163 27.0137	10 < 27.0763 27.0737	15 < 27.1363 27.1337	20 < 27.2063 27.2037	25 < 27.2563 27.2537	30 < 27.3063 27.3037	35 < 27.3563 27.3537	40 < 27.4063 27.4037

80700

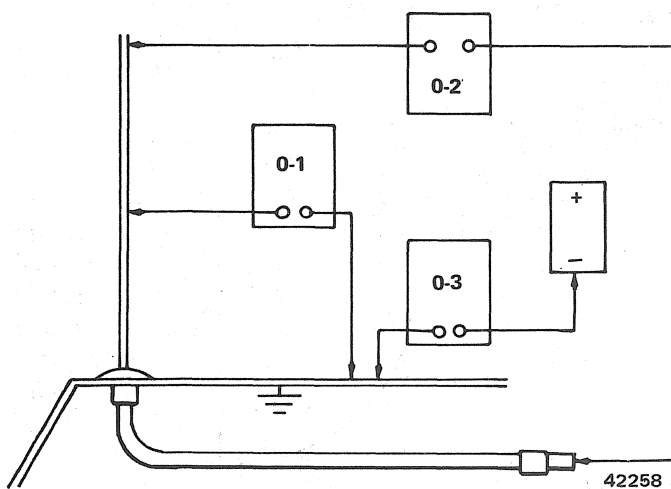


Fig. 3V-16 Antenna Ohmmeter Test

Mast-to-Ground Test

This test verifies that the antenna is making electrical contact with the radio and that the mast is insulated from the base.

(1) Touch one ohmmeter prod to tip of antenna mast and other prod to antenna base (0-1). With antenna installed in radio, there should be continuity (approximately 15 ohms).

(2) Disconnect antenna from radio and repeat step (1). There should not be any continuity with antenna disconnected from radio.

Tip of Mast-to-Tip of Conduct Test

This test verifies that the antenna does not have an open circuit.

(1) Disconnect antenna from radio.

(2) Touch one ohmmeter prod to mast tip and other prod to tip of lead-in (part inserted into the radio) (0-2). There should be continuity (fraction of an ohm).

Body Ground-to-Battery Ground Test

This test verifies that the antenna base has a good ground. Touch one ohmmeter lead to the fender and the remaining prod to the battery negative post (0-3). The resistance should be extremely low (less than one ohm).

**AM/FM/CB Radio**

VSWR is a measurement of the magnetic fields which reflect back into the antenna. Besides limiting the range of the transmitter, these also cause a heat build-up which can damage the transmitter circuitry. A high VSWR reading indicates a high level of reflected magnetic fields. A reading less than 2.0:1 is excellent. A reading above 3.5:1 is excessive and requires adjustment (see VSWR Reading by CB Channels chart). VSWR readings can vary depending upon atmospheric conditions. VSWR can also vary with respect to surrounding objects that affect reflection and conductivity.

**VSWR Reading by CB Channels**

CB CHANNELS	VSWR READING
1 thru 5	Less Than 3.5:1
6 thru 10	Less Than 3.0:1
11 thru 15	Less Than 2.5:1
16 thru 25	Less Than 2.0:1
26 thru 30	Less Than 2.5:1
31 thru 35	Less Than 3.0:1
36 thru 40	Less Than 3.5:1

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**Tuning the CB Antenna/Splitterbox**

Tuning the CB antenna or splitterbox involves reducing the SWR level by using a VSWR meter or the Am-serv AMX 386S Mobile CB Tester and chart covering operating instructions for Am-serv AMX 386S Mobile CB Tester. Trim the antenna/splitterbox as follows:

**NOTE:** When checking SWR, vehicle should be located out-of-doors and at least 100 feet from other vehicles, people, or buildings. Doors of test vehicle should be closed.

- (1) Disconnect coaxial cable at inline connection near splitterbox.
- (2) Connect transmitter end of coaxial cable to a jumper coaxial cable.

**NOTE:** Jumper should not exceed 18 inches.

- (3) Connect jumper coaxial cable to transmitter terminal of test instrument.
- (4) Connect splitterbox end of coaxial cable to antenna terminal of test instrument.

**NOTE:** If a VSWR meter is used, it is recommended to connect a 50-ohm dummy load to VSWR meter antenna connection. Radio will not transmit with a dummy load.

- (5) With engine running, turn radio on, key mike, and measure SWR on channels 1 and 40 following test instrument manufacturer's instructions.

(a) If SWR reading on test instrument is less than 3.5 between channels 1 and 40 and within 0.5 of one another, no further adjustment is required.

(b) If SWR reading on test instrument is more than 3.5 between channels 1 and 40 adjust splitterbox.

(6) Adjust splitterbox using a 5/64-inch hexagon nonmetallic alignment tool (available at most radio/television repair shops).

**NOTE:** If a metal Allen wrench is used for the adjustment, remove the wrench from the splitterbox before reading the test instrument.

(a) Insert alignment tool into splitterbox adjusting slug.

(b) Turn slug clockwise or counterclockwise, in one quarter turn increments, until SWR reading on test instrument is less than 3.5 between channels 1 and 40 and within 0.5 of one another, no further adjustment is required.

(c) If desired SWR reading cannot be obtained the antenna base slug must be adjusted.

(7) Turn transmitter channel selector to channel 20 and record SWR reading.

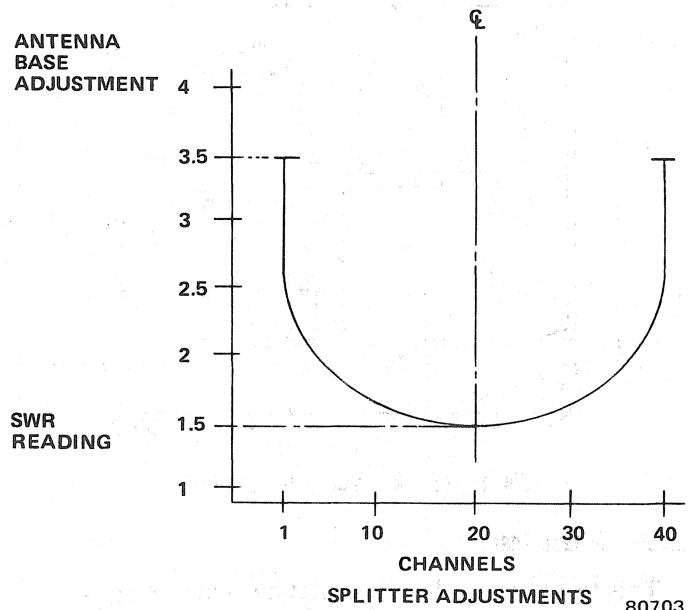
(8) Disconnect antenna mast from base and remove protective mylar tape from antenna base.

(9) Adjust antenna base slug using a 5/64-inch Allen wrench at least 3-1/2-inches long.

(a) With antenna mast installed, insert wrench into antenna base slug and turn slug clockwise or counterclockwise, in one quarter turn increments, to obtain lowest possible SWR reading on test instrument.

(b) Readjust splitterbox as outlined above.

Changing the splitterbox adjustment will lower or raise the frequency of the best channel match. Changing the load coil adjustment in the antenna base will raise or lower the SWR curve (fig. 3V-17).



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**Fig. 3V-17 Typical SWR Curve**

**NOTE:** Although you are not talking while checking VSWR, a carrier signal is being transmitted which can eliminate another transmission. Try to pick a time when the channel is not in use to check VSWR.

## SPEAKERS

Speakers have an impedance of either 3.2 or 8 ohms. A speaker should be replaced with a speaker having the proper part number. If the exact replacement is not available, select a speaker which matches the ohm value stamped on the radio chassis with a black ink stamp.

AM/FM stereo radios are more critical in the selection of a speaker than are AM radios. A noticeable deterioration in sound will be noticed if the correct speaker is not used.

Stereo speakers are paired together for a truer stereo sound, right front with right rear, left front with left rear.

### Speaker Repairs

A speaker, once it has been damaged, is usually not repairable and should be replaced. Defective speakers usually have one or more of the following symptoms:

- Loose mounting.
- Screws or other objects stuck to back of magnet.
- Audio distortion, particularly on the low frequency notes and at high volume.
- Rattles and buzzes caused by foreign material hitting or rubbing against the speaker cone.
- Raspy noises caused by foreign matter inside the speaker restricting free movement of the speaker cone.
- Muffled sound caused by speaker opening obstruction.

Use a light to check the speaker opening(s).

If the entire speaker is not visible through the speaker grille openings, remove the obstruction as follows:

#### Front Door Speakers

- (1) Remove door trim panel lower screws.
- (2) Carefully lift the door trim panel away from door to expose speaker.
- (3) Cut out excess water dam paper around speaker.
- (4) Install door trim panel lower screws.

**NOTE:** Be sure the speaker mounting screws are tightened securely.

### Speaker Harness Test

#### Ground Condition

- (1) Disconnect speaker feed wires at radio connector and each individual speaker.

**NOTE:** When reconnecting the speaker harness to the radio, be sure the antenna lead-in cable is fully engaged in the radio socket.

- (2) Connect one lead of an ohmmeter to the speaker feed wire and the other lead to a good ground. An infinity reading should be indicated. Check each individual speaker wire in this manner.

- (3) If resistance is indicated on the ohmmeter, the wire being checked is grounded.

**NOTE:** Grounded speaker harnesses are generally caused by screws piercing wire harness.

#### Short Condition

- (1) Disconnect speaker feed wires at the radio connector and at each individual speaker.

- (2) Connect ohmmeter leads to speaker feed wires at the radio connector.

- (3) An infinity reading should be indicated.

- (4) If resistance is indicated on ohmmeter, the feed wires being checked are shorted.

### Speaker Test

Speakers may be isolated for grounds by testing the impedance with an ohmmeter. Connect ohmmeter between the two speaker leads. The specified value should match the ohm value stamped on the radio chassis.

### Speaker Replacement

#### CJ Models

To remove the AM speaker, remove the four attaching nuts from the mounting studs.

**NOTE:** On vehicles equipped with air conditioning, the evaporator must be lowered for removal of the speaker.

On models equipped with the two-speaker stereo radio system, the speakers can be removed by removing the four retaining nuts from each speaker.

**NOTE:** On vehicles equipped with air conditioning the evaporator must be lowered for removal of the passenger side speaker.

#### Cherokee-Wagoner-Truck Models

The AM speaker is located above the radio. To remove the speaker, remove the radio, then remove the four attaching nuts from the speaker mounting studs.

On vehicles equipped with a stereo radio, interior trim panels must be removed for access to the speaker.

**PREMIUM AUDIO SYSTEM**

**Fader Switch**

**Removal**

- (1) Disconnect negative battery cable.
- (2) Remove screws attaching switch housing to instrument panel or evaporator housing. Lower housing.
- (3) Disconnect wires from fader switch.
- (4) Disconnect lamp wires.
- (5) Remove control knob.
- (6) Remove retaining nut from switch.
- (7) Remove switch.

**Installation**

- (1) Position fader switch into housing.
- (2) Install fader switch retaining nut.
- (3) Connect lamp wires.
- (4) Connect wires to fader switch.
- (5) Position switch housing on instrument panel or evaporator housing and install attaching screws.
- (6) Install control knob.
- (7) Connect negative battery cable.
- (8) Reset clock, if equipped.

**Indicator Lamp**

**Removal**

- (1) Disconnect negative battery cable.
- (2) Remove screws attaching switch housing to instrument panel or evaporator housing. Lower housing.
- (3) Disconnect lamp wires.
- (4) Remove lamp.

**Installation**

- (1) Install lamp.
- (2) Connect lamp wires.
- (3) Position switch housing on instrument panel or evaporator housing and install attaching screws.
- (4) Connect negative battery cable.
- (5) Reset clock, if equipped.

**Amplifier**

**Removal**

- (1) Disconnect negative battery cable.
- (2) Remove evaporator housing attaching screws and lower housing, if equipped.
- (3) Disconnect amplifier wiring harness from fader switch.
- (4) Remove amplifier attaching hardware.
- (5) Remove amplifier assembly using care not to damage wiring harness.

**Installation**

- (1) Position amplifier assembly in vehicle.
- (2) Install amplifier attaching hardware.
- (3) Route wiring harness to switch and connect.
- (4) Position evaporator housing and install attaching screws, if equipped.
- (5) Connect negative battery cable.
- (6) Reset clock, if equipped.

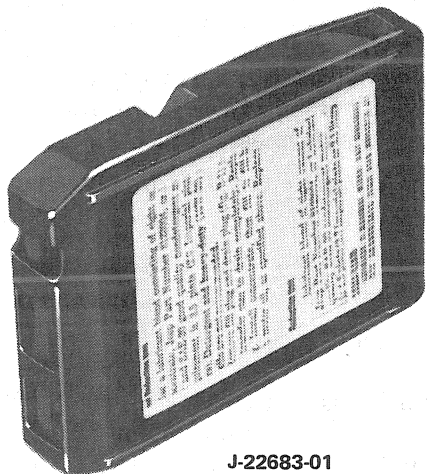
**SPECIFICATIONS**

**Radio Bulb Chart**

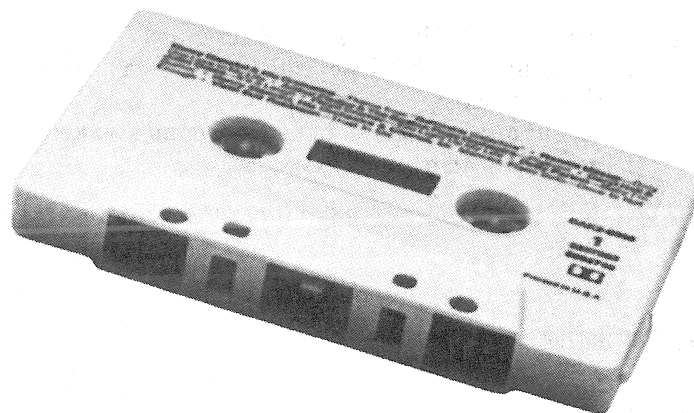
	Number of Bulbs/ Bulb Trade Number
CJ . . . . .	1/1892
Cherokee-Wagoneer-Truck . . . . .	1/1893

70320

**Tools**



J-22683-01  
STEREO TEST TAPE



J-23724  
CASSETTE TEST TAPE

70319