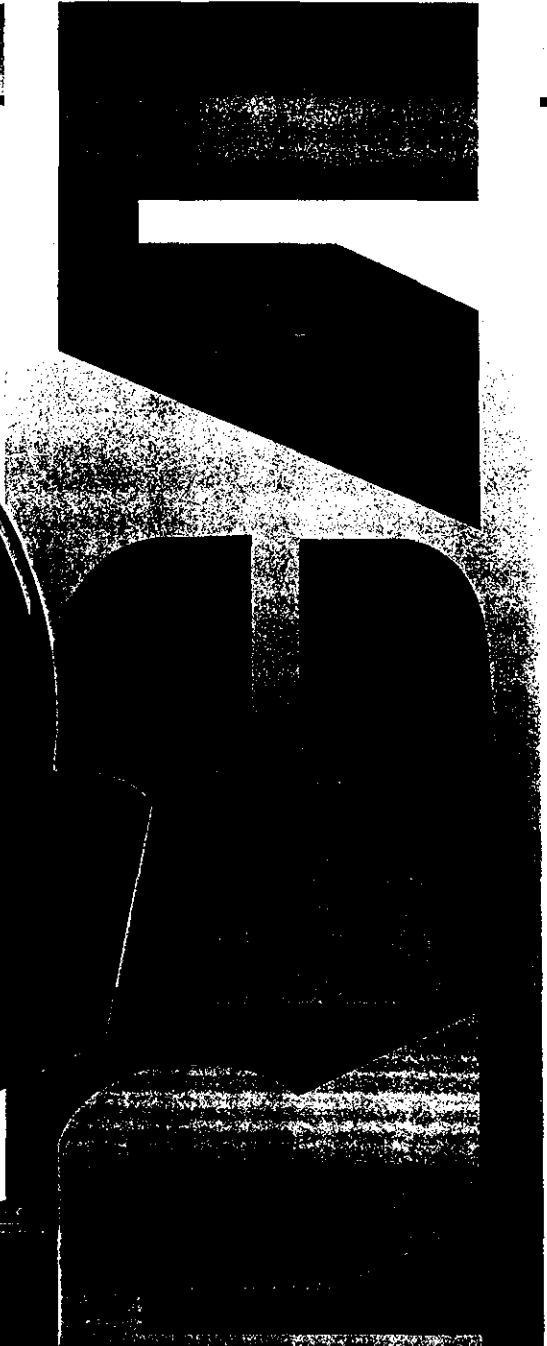
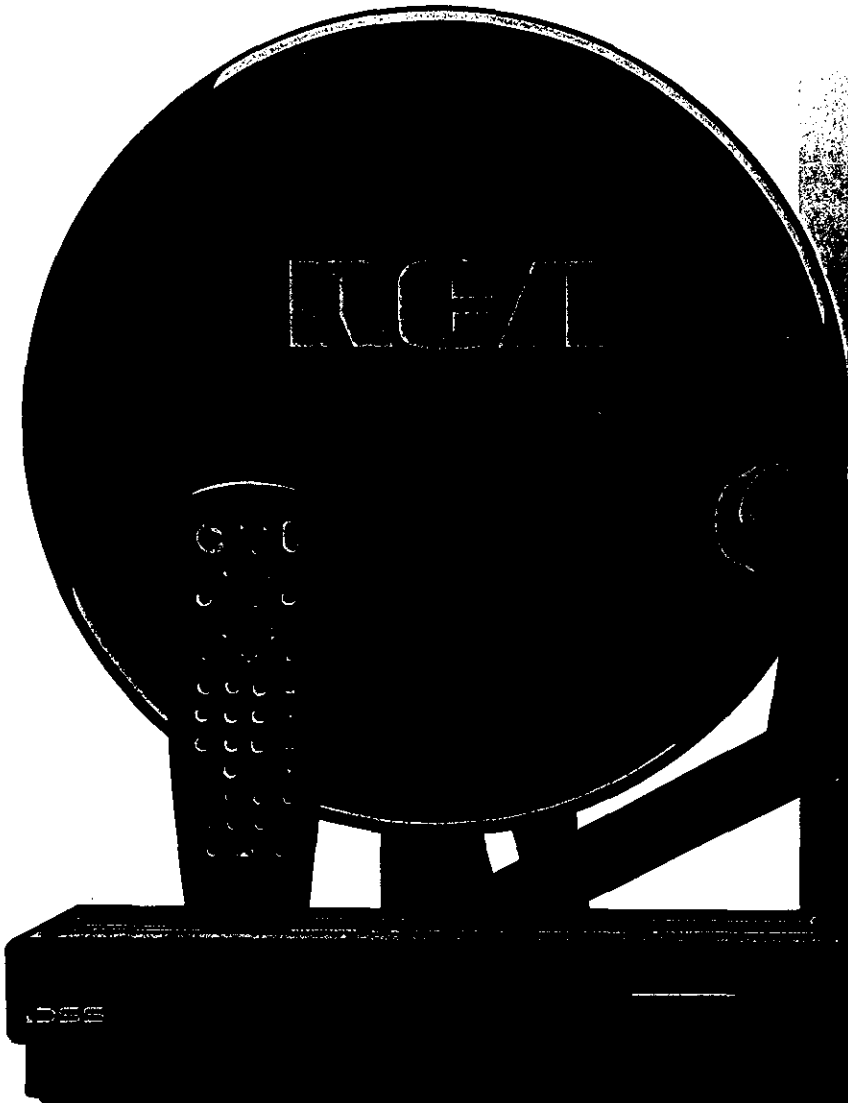


THOMSON TECHNICAL TRAINING



DSS System Installation



Training Manual

DSS™
DIGITAL SATELLITE SYSTEM

Foreword

This publication is intended to assist the installation technician installing the RCA brand DSS™ Digital Satellite System. In this publication, basic installation techniques are covered for most common situations. Included in each explanation is a suggested material and tool list. Also included is an overview of the DSS System plus a signal flow description of the DSS receiver. This information is included to help the technician install the system and explain its operation to their customers.

Safety Information!

DANGER Avoid Power Lines! When following the instruction in this guide to install and connect the satellite antenna and connections, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with these items may prove fatal.

Outdoor Dish Grounding: The outdoor dish used to receive satellite signals and the cable used to connect the outdoor dish to the indoor receiving unit are required to comply with local installation codes and the appropriate sections of the National Electrical Code (NEC), especially Article 810 and Article 820. These codes require proper grounding of the metal structure of the outdoor dish and grounding of the connecting cable at a point where it enters the house (or other building). The DSS System Installation Training Manual contains instructions on how to install the system in compliance with the National Electrical Code (NEC). If additional local installation codes apply, contact local inspection authorities.

Compliance with National Electrical and Local Codes: Before installing the Digital Satellite System, check the electrical codes in your area.

Restrictions: Before installing the dish, check the zoning codes, covenants, and community restrictions in your area. Some rules prohibit installing large satellite dishes, but may allow small ones. Also, there may be restrictions in your area that limit the mounting height of dishes.

If you encounter homeowner or community restriction's, call 1-800-679-4776. Personnel at this number can provide information that may be helpful when attempting to obtain permission to install the DSS Digital Satellite System on the property.

* DSS and Digital Satellite System is an official trademark of DIRECTV, Inc., a unit of GM Hughes Electronics.

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Satellite Communication Basics

All communications services, from ship-to-shore communications, radio and television to communications satellites are assigned unique bands of frequencies within the electromagnetic spectrum in which to operate.

To receive signals from the earth successfully and relay them back again, satellites use very high frequency radio waves operating in the microwave frequency bands—either the C-band or KU-band. C-band satellites generally transmit in the frequency band of 3.7 to 4.2 Gigahertz (GHz), in what is known as the Fixed Satellite Service band or FSS. However, these are the same frequencies occupied by ground-based point-to-point communications, making C-band satellite reception more prone to interference.

KU-band satellites may be classified into two groups: low and medium power KU-band satellites, transmitting signals in the 11.7 to 12.2 GHz FSS band; and the new high-power KU-band satellites transmitting in the 12.2 GHz to 12.7 GHz Direct Broadcast Satellite service (DBS) band.

Unlike C-band satellites, these newer KU-band DBS satellites have exclusive rights to the frequencies they occupy, and therefore have no microwave interference problems. The RCA DSS System will receive programming from high-power KU-band satellites operating in the DBS band.

Although C-band satellites are spaced 2° apart, high power KU-band satellites are spaced 9° apart, and transmit at 120 or more watts of power.

Because of their lower frequency and transmitting power capabilities, C-band satellites require a large receiving dish, anywhere from 6 to 10 feet in diameter. The higher power of KU-band satellites enables them to broadcast to a compact 18 inch diameter dish.

Satellite System

A satellite system is made up of three basic elements:

- An uplink facility, which beams programming signals to satellites orbiting over the equator.
- A satellite that receives the signals and re-transmits them back to earth.
- A receiving station including the satellite dish.

The picture and sound information originating from a studio or broadcast facility is first sent to an uplink site, where it is processed and combined with other signals for transmission on microwave frequencies. Next, a large uplink dish concentrates these outgoing microwave signals and beams them up to a satellite located 22,247 miles above the equator. The satellite's receiving antenna captures the incoming signals and sends them to a receiver for further processing. These signals, which contain the original picture and sound information, are converted to another group of microwave frequencies, then sent to an amplifier for transmission back to earth. This whole receiver/transmitter package is called a transponder. The outgoing signals from the transponder are then reflected off a transmitting antenna, which focuses the micro-

waves into a beam of energy that is directed toward the earth. A satellite dish on the ground collects the microwave energy containing the original picture and sound information, and focuses that energy into a low noise block converter or LNB. The LNB amplifies and converts the microwave signals to yet another lower group of frequencies that can be sent via conventional coaxial cable to a satellite receiver-decoder inside the user's house. The receiver tunes the individual transponders and converts the original picture and sound information into video and audio signals that can be seen and heard on a conventional television monitor and stereo system.

RCA DSS System

The RCA DSS System is a direct broadcast satellite system that enables millions of viewers to receive many channels of high quality digital video programs from anywhere in the continental United States. The complete system transports digital data, video and audio to the customer's home via high powered KU-band satellites. The program provider sends its program material to an uplink site where the signal is digitally encoded. The uplink site compresses the video and audio, encrypts the video and formats the information into data "packets." The signal is transmitted to the DBS satellites orbiting the earth at 22,247 miles above the equator at 101° west longitude. The signal is then relayed back to earth and decoded by the customer's receiver. The receiver connects to the customer's phone line and communicates with the subscription service computer providing billing information (see figure 1).

RCA DSS Hardware

The two DSS packages are *Basic* and *Deluxe*.

Basic Package:

- Antenna (or Dish) with a single output dual polarity, Low Noise Block Converter (LNB).
- Satellite Receiver.
- DSS/TV universal remote.

Deluxe Package:

- Sheet Molded Compound (SMC) antenna with a twin output dual polarity LNB.
- Satellite Receiver, incorporating a low speed data port and additional audio/video jacks
- A fully universal remote that cannot only control the satellite receiver, but also multiple brands of televisions, VCRs and cable boxes.

Basic Package

The model # DS1120RW (Basic Package) includes a DRD102RW Satellite Receiver, #217095 (CRK91A1) Remote, and a DSA100RW Antenna/LNB).

DRD102RW Satellite Receiver

- Revolutionary compact design that blends in with other consumer electronics entertainment products.
- Color-coded jack panel facilitates system integration and provides easy hook-up.

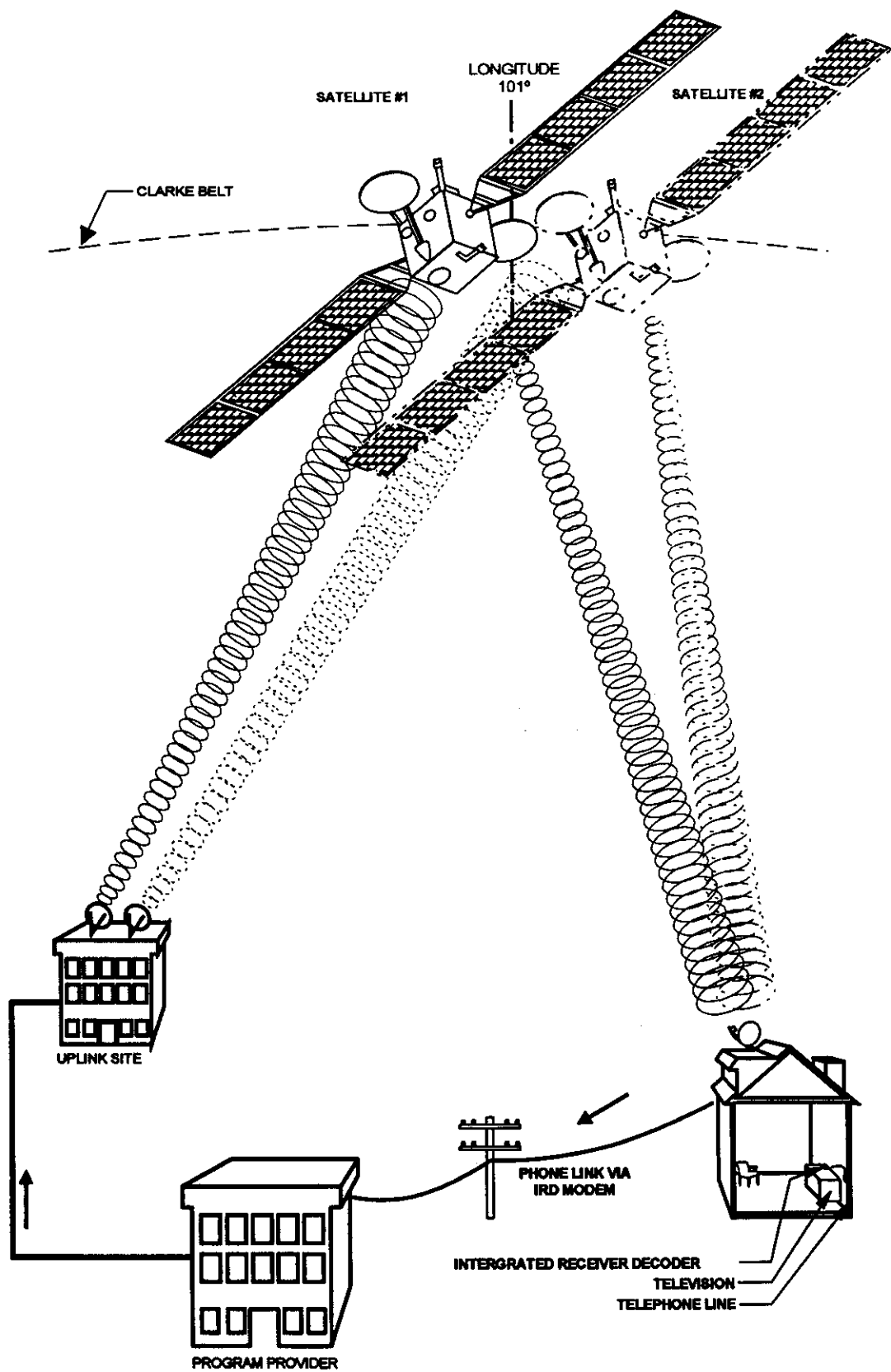


Figure 1, Digital Satellite System

Connections include:

Satellite in: Provides direct connection from the satellite antenna/LNB.

In from Ant: Provides connection from an off-air antenna or cable feed.

Out to TV: Provides connection to antenna input of television.

S-VIDEO: Provides direct Y/C output to compatible televisions and VCRs.

Video, R/L Audio: Provides direct video and audio signals to television receivers, VCRs and audio components.

Wideband Data Port: Enables reception of future services such as HDTV.

Phone: Provides connection to telephone line for program billing.

- **Indicators:** LED on front panel that indicates “on” and blinks when there’s a message waiting.
- **Local Controls:** Eight buttons on the Satellite Receiver’s front panel allow full operation of the satellite receiver, even without the remote control.
- **Access Card:** A special card inserted into a slot on the receiver’s front panel that provides the means to track subscriber service requests and enable “turn-on” and “turn-off” capability for subscription and pay-per-view events.
- **An electronic serial number unique to each card and satellite receiver enables the Satellite Receiver to receive electronic messages from the communications center. Messages are displayed on the television screen.**
- **16 x 9 widescreen format compatible:** Processes pan and scan commands from the video data in a 16 x 9 broadcast, allowing the viewer to watch on a 4 x 3 television.
- **Program Guide displays an electronically updated matrix of current and future programs sorted by service and time.**

The system also supports specific guides, such as pay-per-view, sent by program providers.

- **Additional capabilities include the ability to display individual categories of programming such as sports, news, movies, music, etc.**
- **Favorite (Multiple) Channel lists provide easy selection of all or up to two favorite groups of channels when utilizing the channel up/down buttons.**
- **Alternate audio selection capability provides access to any of the audio channels associated with each video channel. For example, foreign language audio may be available for certain programs.**
- **User Locks allow you to limit access to certain features, channels, select the rating limit of the system and to password-protect this limit with a four-digit PIN (Personal Identification Number).**

- Additional Menus provide:
Dish positioning and adjustment.
Diagnostics.
Access to help screens.
Ability to set-up and customize operation.
Review/cancel purchases and services.

217095 (CRK91A1) Infrared Remote Control

- 30-button keypad.
- Ergonomic design.
- Provides complete satellite receiver operation.
- Large color-coded buttons are clearly identified for easy operation.
- Pre-programmed codes control the primary functions of most television brands manufactured after 1984 utilizing infrared technology.

DSA100RW Antenna/LNB

- Small 18" parabolic reflector is lightweight and inconspicuous.
- Installation task is similar to "off-air" antenna.
- Designed to be easily mounted to the side of a home, deck rail, roof or chimney that provides an unobstructed view of the 101° West longitude position pointing toward Texas.

The model DS2430RW Deluxe Package includes a DRD203RW satellite receiver, #217094 (CRK91B1) remote and a DSA400RW antenna/LNB.

**Deluxe
Package**

DRD203RW Satellite Receiver

Includes all of the features of the DRD102RW plus:

- Second pair of A/V jacks on Satellite Receiver.
- Computer serial port for downloading data.

217094 (CRK91B1) Infrared Remote Control

Includes all of the features of the # 217095 remote with the following upgrades:

- 39-button keypad.
- Preprogrammed to control the primary functions of most manufacturers' brands of televisions, VCRs, laserdisc players and cable boxes utilizing infrared technology.

DSA400RW Antenna/LNB

Includes all of the features of the DSA200RW with the following upgrades/additions:

- Sheet molded compound (SMC) reflector — more durable than metal.
- Antenna/LNB developed with twin outputs capable of operating two or more compatible satellite receivers.

Technical Overview*Uplink*

The DSS System transports digital data, video and audio to the customer's home via a high powered KU-band satellite. The program provider sends its program material to the uplink site where the signal is digitally encoded. The "uplink" is the portion of the signal transmitted from the earth to the satellite. The uplink site compresses the video and audio, encrypts the video and formats the information into data "packets" that are transmitted. The signal is transmitted to a satellite where it is relayed back to the earth and decoded by the customer's receiver.

MPEG2 Compression

The video and audio signals are transmitted as digital signals instead of conventional analog. The amount of data required to code all the video and audio information would require a transfer rate well into the hundreds of Mbps (Mega-bits per second). This is too large and impractical a data rate to be processed in a cost effective way with current hardware. In order to minimize the data transfer rate, the data is compressed using MPEG2 compression. MPEG (Motion Pictures Expert Group) is an organization who has developed a specification for transportation of moving images over communication data networks. Fundamentally, the system is based on the principle that images contain a lot of redundancy from one frame of video to another - the background stays the same for many frames at a time. Compression is accomplished by predicting motion that occurs from one frame of video to another and transmitting motion vectors and background information. By coding only the motion and background difference instead of the entire frame of video information, the effective video data rate can be reduced from hundreds of Mbps to an average of 3 to 6 Mbps. This data rate is dynamic and will change depending on the amount of motion occurring in the video.

In addition to MPEG video compression, MPEG audio compression is also used to reduce the audio data rate. Audio compression is accomplished by eliminating soft sounds that are near loud sounds in the frequency domain. The compressed audio data rate can vary from 56 Kbs (Kilo-bits per second) on mono signals to 384 Kbps on stereo signals.

Data Encryption

To prevent unauthorized signal reception, the video signal is encrypted (scrambled) at the uplink site. A secure encryption "algorithm" or formula known as the Digital Encryption Standard (DES) is used to encode the video information. The keys for decoding the data are transmitted in the data packets. The customer's Access Card decrypts the keys which allows the receiver to decode the data. When an Access Card is activated in a receiver for the first time, the serial number of the receiver is encoded on the Access Card. This prevents the Access Card from activating any other receiver except the one in which it was initially authorized. *The receiver will not function with the Access Card removed.*

Data Packets

The program information is completely digital and is transmitted in data "packets." This concept is very similar to data transferred by a computer over a modem. Five

different types of data packets are Video, Audio, CA, PC compatible serial data and Program Guide. Video and audio packets contain the visual and audio information of the program. The CA (Conditional Access) packet contains information that is addressed to individual receivers. This includes customer E-Mail, Access Card activation information and which channels the receiver is authorized to decode. PC compatible serial data packets can contain any form of data the program provider wants to transmit, such as stock reports or software. The Program Guide maps the channel numbers to transponders and SCID's (more on this later). It also gives the customer TV program listing information.

Figure 2 shows a typical uplink configuration for one transponder. In the past, a single transponder was used for a single satellite channel. With digital signals, more than one satellite channel can be sent on the same transponder. The example shows three video channels, five stereo audio channels (one for each video channel plus two extra for other services such as a second language), and a PC compatible data channel. Audio and video signals from the program provider are encoded and converted to data packets. The configurations can vary depending on the type of programming. The data packets are then multiplexed into serial data and sent to the transmitter.

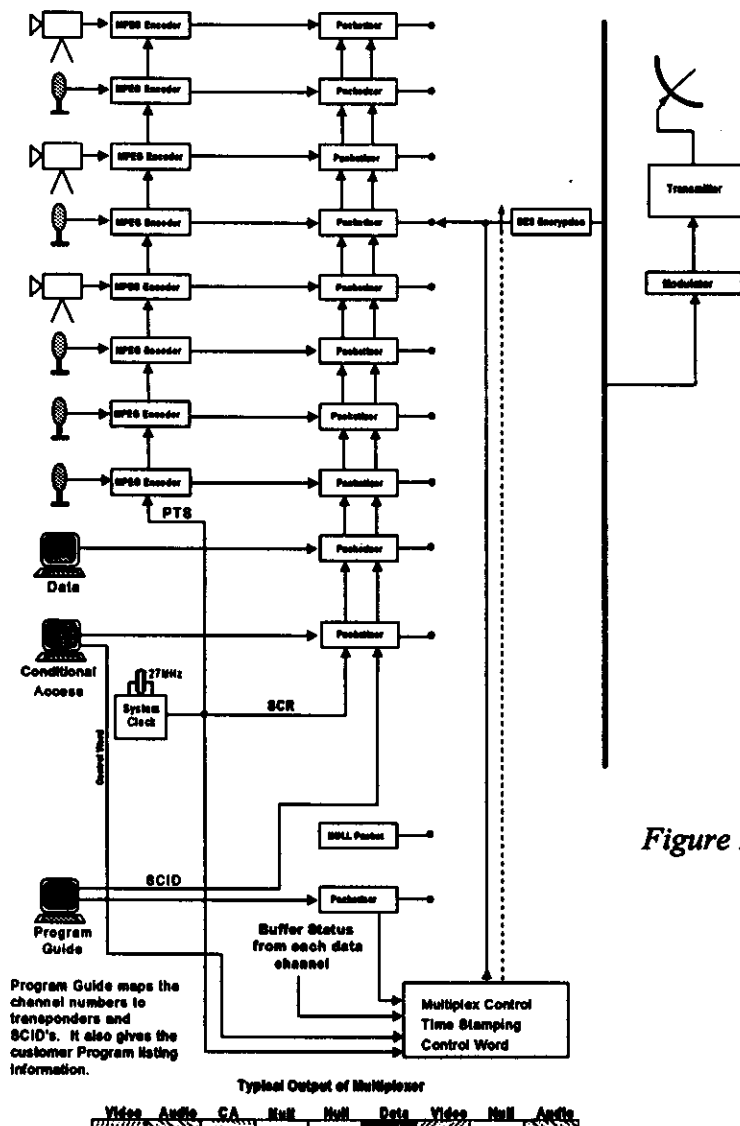


Figure 2, Uplink

Each data packet is 147 bytes long. The first two bytes (a byte is made up of 8 bits) of information contain the SCID and Flags. The SCID (Service Channel ID) is a unique 12 bit number from 0 to 4095 that uniquely identifies the packet's data channel. The Flags are made up of 4 bits used primarily to control whether or not the packet is encrypted and which key to use. The third byte of information is made up of a 4 bit Packet Type indicator and a 4 bit Continuity Counter. The Packet Type identifies the packet as one of four data types. When combined with the SCID, the Packet Type determines how the packet is to be used. The Continuity Counter increments once for each Packet Type and SCID. The next 127 bytes of information consists of the "payload" data which is the actual usable information sent from the program provider. (See figure 3.)

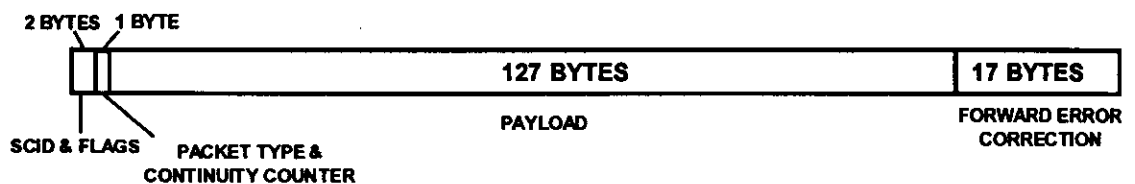


Figure 3, Data Packet

Satellites

Two high power KU-band satellites provide the DSS signal for the receiver. The satellites are located in a geostationary orbit in the "Clarke" belt, 22,247 miles above the equator. They are positioned less than .5° apart from each other with the center between them at 101° W. longitude. This permits a fixed antenna to be pointed at the 101° slot and receive signals from both satellites. The downlink frequency is in the K4 part of the KU-band at 12.2 GHz to 12.7 GHz. The total transponder channel bandwidth is 24 MHz per channel with channel spacing at 14.58 MHz. Each satellite has sixteen 120 watt transponders. The satellites have a life expectancy of 12 years.(See figure 5.)

Unlike C-band satellites that use horizontal and vertical polarization, the DSS satellites use circular polarization. The microwave energy is transmitted in a spiral-like pattern. The direction of rotation determines the type of circular polarization (Figure 4). In the DSS System, one satellite is configured for only right-hand circular polarized transponders and the other is configured for only left-hand circular polarized transponders. This nets 32 total transponders between two satellites.

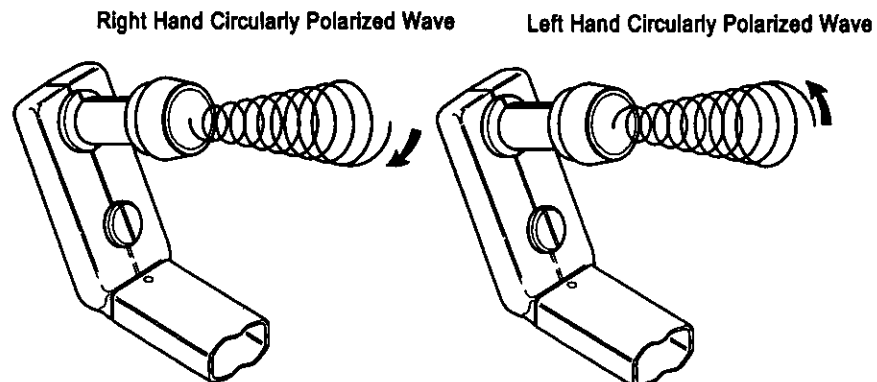


Figure 4, Right-hand and Left-hand Circular Polarization

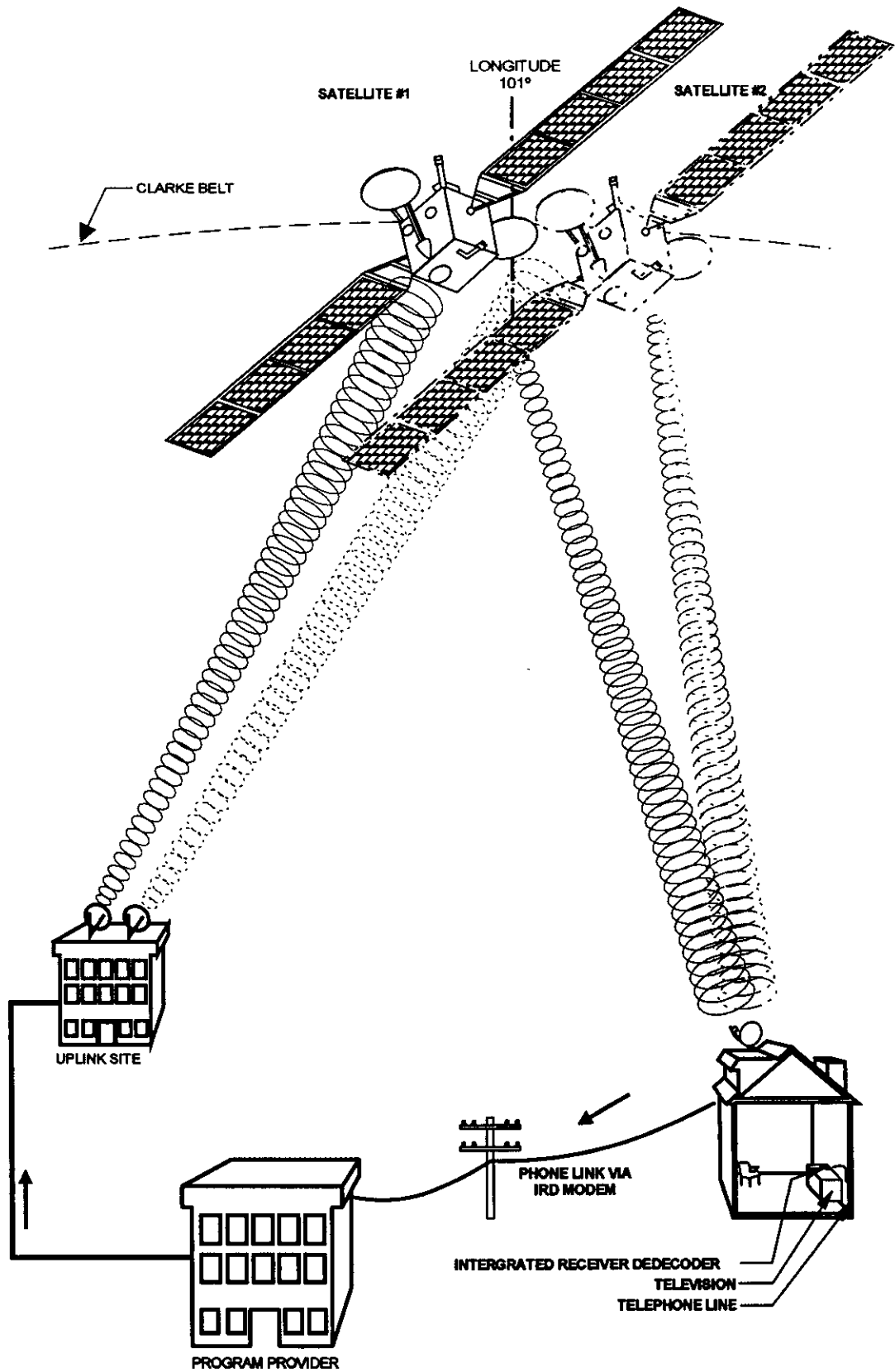


Figure 5, Digital Satellite System

Although there are only 16 transponders per satellite, the channel capabilities are far greater. Using data compression and multiplexing, the two satellites working together have the possibility of carrying over 150 conventional (non-HDTV) audio and video channels via 32 transponders.

Dish The “dish” is an 18 inch, slightly oval shaped KU-band antenna. The slight oval shape is due to the 22.5° offset feed of the LNB (Low Noise Block converter), figure 6. The offset feed positions the LNB out of the way so it does not block any surface area of the dish, preventing attenuation of the incoming microwave signal.

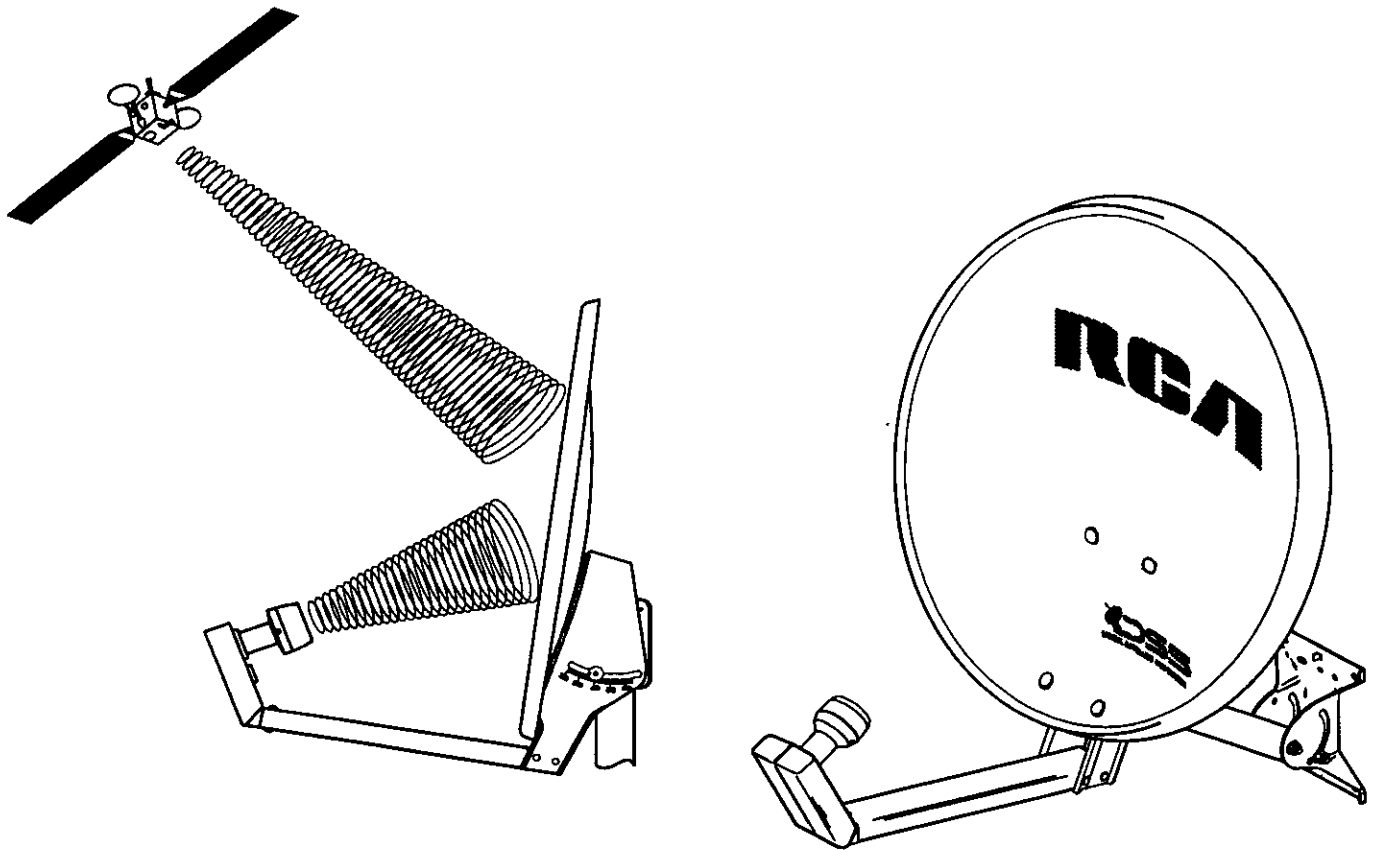


Figure 6, Satellite Dish

LNB

The LNB converts the 12.2 GHz to 12.7 GHz downlink signal from the satellites to the 950 MHz to 1450 MHz signal required by the receiver tuner. Two types of LNB's are available - dual and single output. The single output LNB has only one RF connector while the dual output LNB has two, figure 7. The dual output LNB can be used to feed a second receiver or other form of distribution system. The *Basic* package comes with the single output LNB. The *Deluxe* package comes with the dual output LNB.

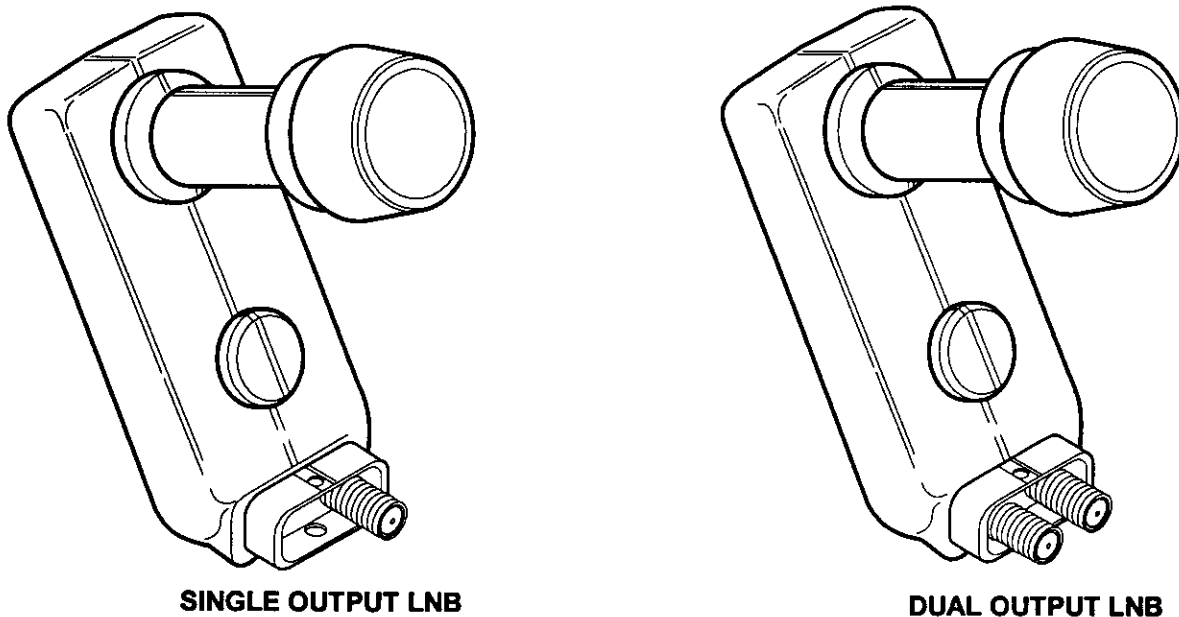


Figure 7, Single and Dual output LNB's

Both types of LNB's can receive both left and right-hand polarized signals. Polarization is selected electrically via a DC voltage sent on the center conductor of the cable from the receiver. Right-hand polarization is selected with +13 volts and left-hand polarization is selected with +17 volts.

Receiver Circuitry

The receiver is a complex digital signal processor. The amount and speed of data the receiver processes rivals even the faster personal computers on the market today. The information received from the satellite is a digital signal that is decoded and digitally processed. There are no analog signals to be found except for those exiting the NTSC video encoder and the audio DAC (Digital to Analog Converter).

The downlink signal from the satellite is downconverted from 12.7 - 12.2 GHz to 950 - 1450 MHz by the LNB (Low Noise Block) converter. The tuner then isolates a single digitally modulated 24 MHz transponder. The demodulator converts the modulated data to a digital data stream.

The data is encoded at the transmitter site by a process that enables the decoder to reassemble the data and verify and correct errors that may have occurred during transmission. This process is called Forward Error Correction (FEC). The error corrected data is output to the transport IC via an 8-bit parallel interface.

The transport IC is the heart of the receiver data processing circuitry. Data from the FEC block is processed by the transport IC and sent to respective audio and video decoders. The microprocessor communicates with the audio and video decoders through the transport IC. The access card interface is also processed through the transport IC.

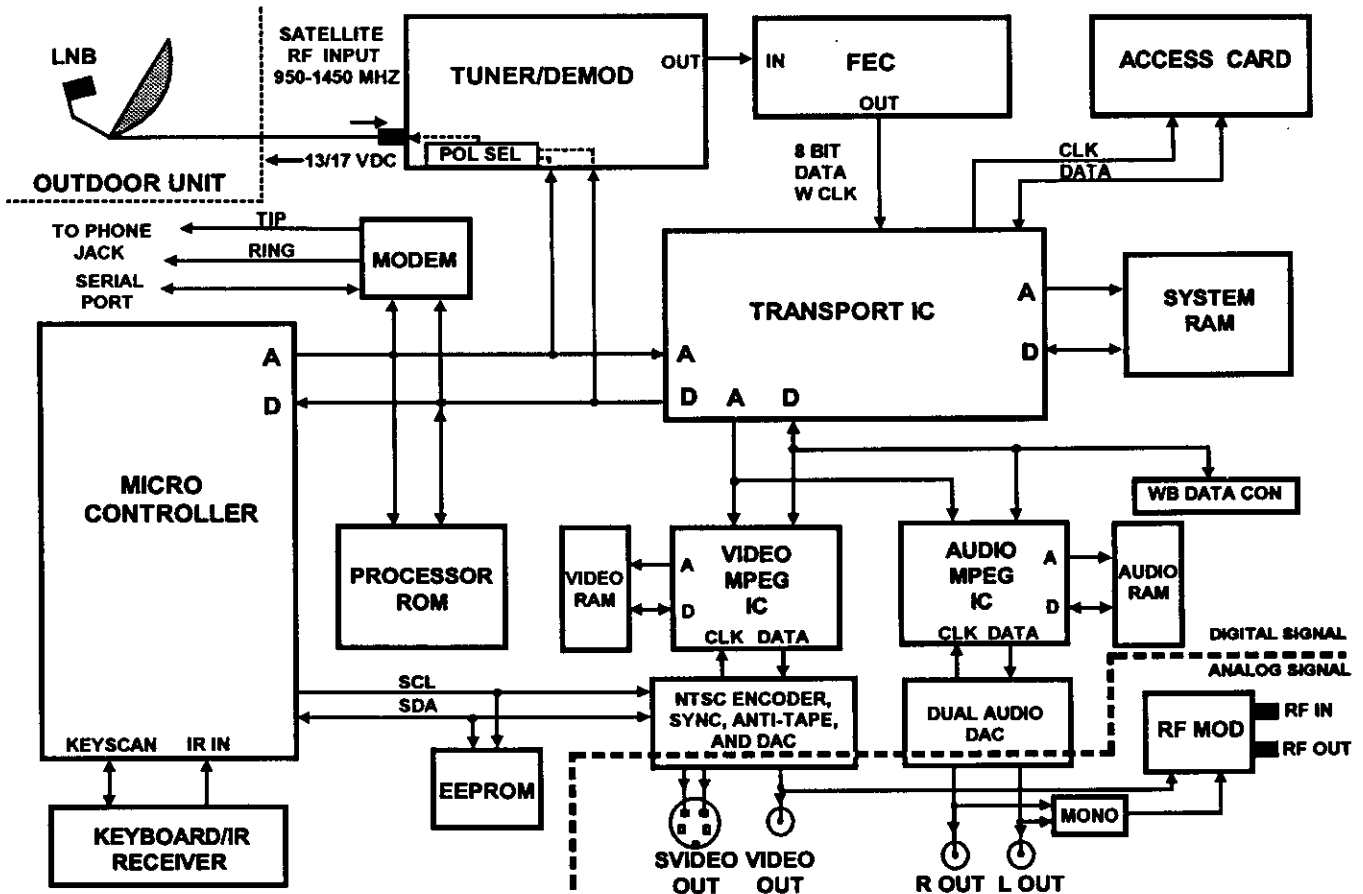


Figure 8, Receiver Block Diagram

The Access Card receives the encrypted keys for decoding a scrambled channel from the transport IC. The Access Card decrypts the keys and stores them in a register in the transport IC. The transport IC uses the keys to decode the data. The Access Card also handles the tracking and billing for these services

Video data is processed by the MPEG video decoder. This IC decodes the compressed video data and sends it to the NTSC encoder. The encoder converts the digital video information into NTSC analog video that is output to the S-Video and standard composite video output jacks.

Audio data is likewise decoded by the MPEG audio decoder. The decoded 16-bit stereo audio data is sent to the dual DAC (Digital to Analog Converter) where the left and right audio channel data are separated and converted back into stereo analog audio. The audio is output to the left and right audio jacks and is also mixed together to provide a mono audio source for the RF converter.

The microprocessor receives and decodes IR remote commands and front keyboard commands. Its program software is contained in the processor ROM (Read Only Memory). The microprocessor controls the other digital devices of the receiver via address and data lines. It is responsible for turning on the green LED on the ON/OFF button.

The modem connects to the customer's phone line and calls the program provider and transmits the customers program purchases for billing purposes. The modem operates at 1200 bps and is controlled by the microprocessor. When the modem first attempts to dial, it sends the first number as touch-tone. If the dial tone continues after the first number, the modems switches to pulse dialing and redials the entire number. If the dial tone stops after the first number, the modem continues to dial the rest of the number as a touch-tone number. The modem also automatically releases the phone line if the customer picks up another phone on the same extension.

The receiver contains two diagnostic test menus. The first test is a customer controlled menu that checks the signal, tuning, phone connection and access card. The second test menu is servicer controlled. It checks the majority of the receiver for problems.

Diagnostics

Customer Controlled Diagnostics

The customer controlled test helps the customer during installation or any time the receiver appears not to function properly.

- Signal test:** Checks the value of error bit number and the error rate to determine if the antenna connections are properly installed.
- Tuning test:** Checks to insure a transponder can be tuned. The test is considered successful and this part of the test is halted if proper tuning occurs on 1 of the 32 transponders.
- Phone test:** The phone test checks for dial tone and performs an internal loopback test.
- Access card test:** Sends a message to the access card and checks for a valid reply.

The response for all tests will be an “OK” display or an appropriate message informing the customer the general area of the problem.

To enter the System Test feature:

Select “*Options*” from the “*DSS Main Menu*.”

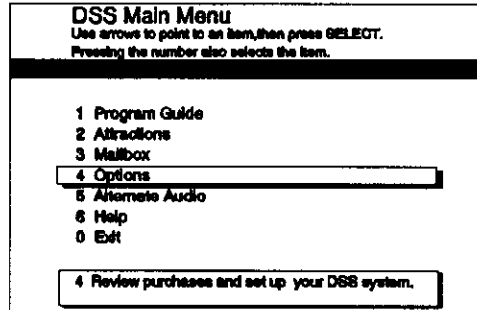


Figure 9, Main Menu

Select “*Setup*” from the “*Options*” menu.

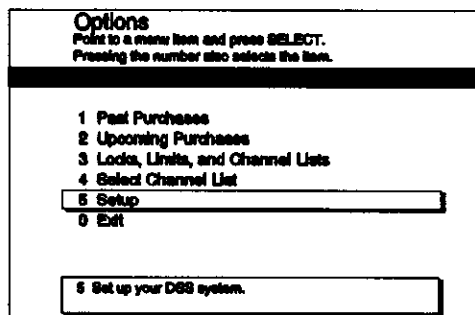


Figure 10, Options Menu

Select "System Test" from the "Setup" menu.

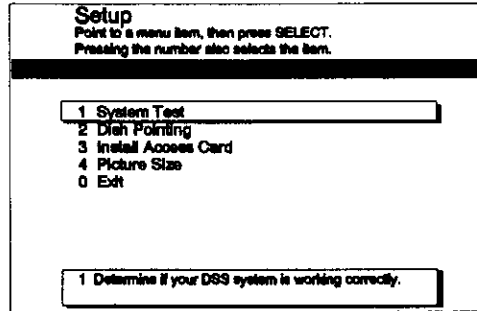


Figure 11, Setup Menu

Select "Test" from the "System Test" menu.

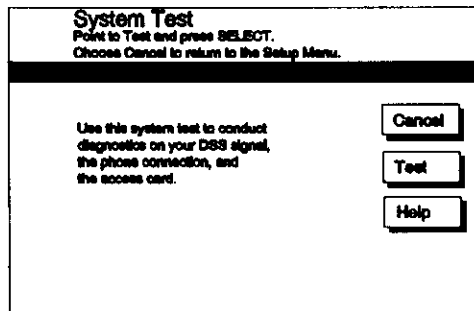


Figure 12, System Test Menu

The system test results are displayed automatically when the test is complete. The following two screens show whether the receiver passed or failed the test. If the access card passes the test, the access card ID number will be displayed in the window.

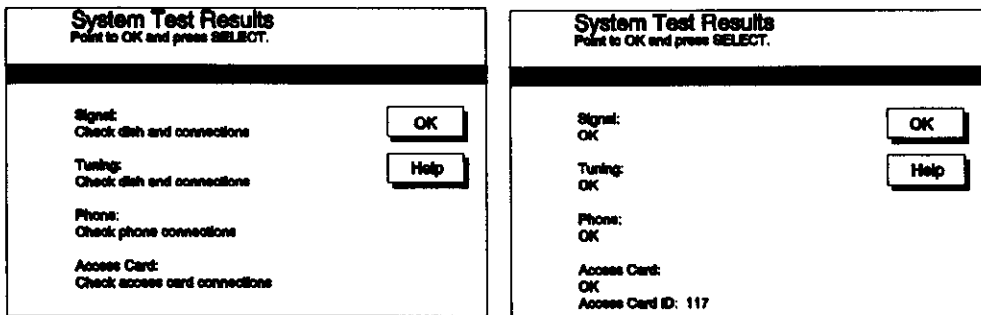


Figure 13, System Test Results

Service Controlled Diagnostics

The service controlled test provides a more in-depth analysis of the receiver for proper operation. The test pattern checks all possible connections between components as a troubleshooting aid. The following information is provided to the servicer:

1. IRD serial number
2. Demodulator vendor & version number
3. Signal Strength
4. ROM checksum results
5. SRAM test results
6. V-Ram test results
7. Telco callback results
8. Verifier Version
9. Access Card Test & Serial Number
10. IRD ROM version
11. EEprom test results

The response for all tests will indicate the test was successful or not successful.

In addition, this menu will allow entry into the phone prefix menu so the installer can set up a one digit phone prefix.

To Enter the Service Test Feature:

Simultaneously press the front panel “TV/DSS” and the “DOWN” arrow button. The following screen will appear.

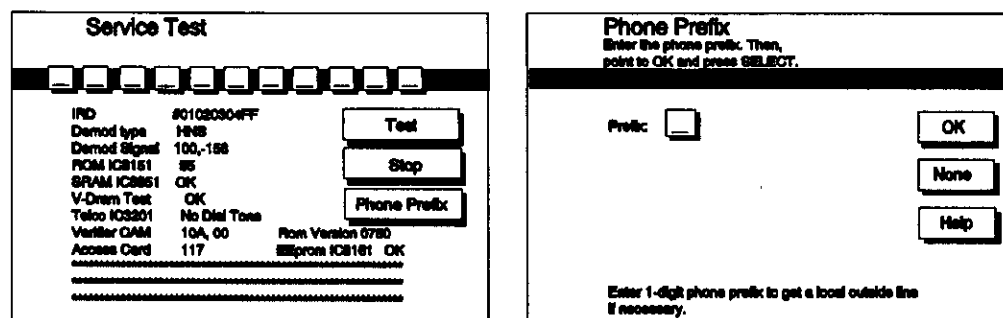


Figure 14, Service Test Menu

The test results are automatically displayed after the test is complete. The servicer is given the option to exit or run the test again.

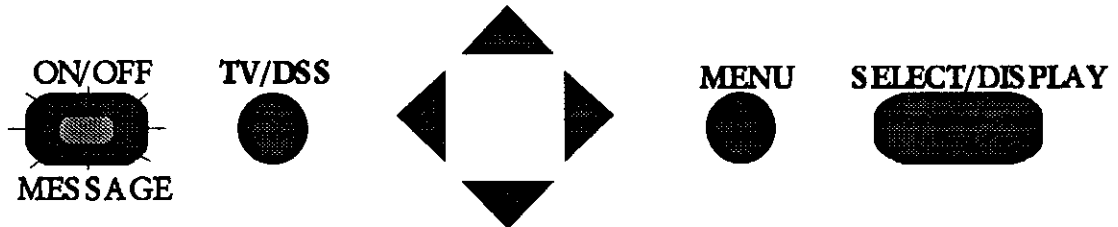


Figure 15, Front Panel Buttons

Also included in the Service Test Menu are provisions for testing the modem and setting a single digit prefix number. During the service test, the modem will dial the phone number that appears in the boxes at the top of the test menu. The phone number can be changed by using the "DOWN" arrow keys on the remote control or receiver to move the cursor past the "Prefix" prompt to the number boxes. Once the boxes are selected, the number can be entered or changed with the number keys on the remote or by using the "UP"/"DOWN" keys on the remote or the receiver. The prefix can be changed by selecting "Phone Prefix" on the display and changing the number with the number keys on the remote control or by using the arrow keys on the remote control and front panel.

**SITE
SURVEY**

The purpose of the site survey is to plan the installation of the Digital Satellite System. This planning includes the locations of the dish, receiver, and routing of cables. This helps to determine the tool and hardware requirements for the installation; plus, identifies any potential problems.

While performing the site survey, one of the most important things to do is involve the customer. An installation requires drilling holes and routing cables through their home. The customer may have specific locations they want this done. Involving them in the site survey provides you an opportunity to learn what these preferences are. It also enables you to explain why suggested locations may not work and help them to select alternative locations.

First Step

The site survey starts with the phone call to the customer to arrange the date and time of the installation. This phone call is your initial contact with the customer and most likely the only contact before the installation appointment. If possible, try to determine as much about the installation as you can during this phone call. Ask questions to help you anticipate the tool and equipment needs for the installation. These questions should include:

- How many televisions will be connected to the system?
- Will an audio system be connected?
- Are there any preferences for dish and receiver locations?

The more of this information you obtain before the installation appointment, the better your chances of having the right tools and mounting hardware needed to complete the installation decreasing the installation time.

Another question to ask the customer before the installation appointment is if there are any codes, covenants, regulations, and restrictions pertaining to the installation of the DSS dish. Knowing these covenants is the responsibility of the customer, but any input you can offer may reduce any problems that arise.

Second Step

The second step of the site survey occurs at the customer's home at the time of the installation. At this point, the installer and customer should work together to determine the details of the installation. These details include:

- A location for the dish.
- A dish mounting system (horizontal, vertical, chimney, or pole).
- A route for the cables that run from the dish to the receiver.
- How to Connect the Digital Satellite System to the Customer's Audio/Video Components.
- Evaluate off-air solution.

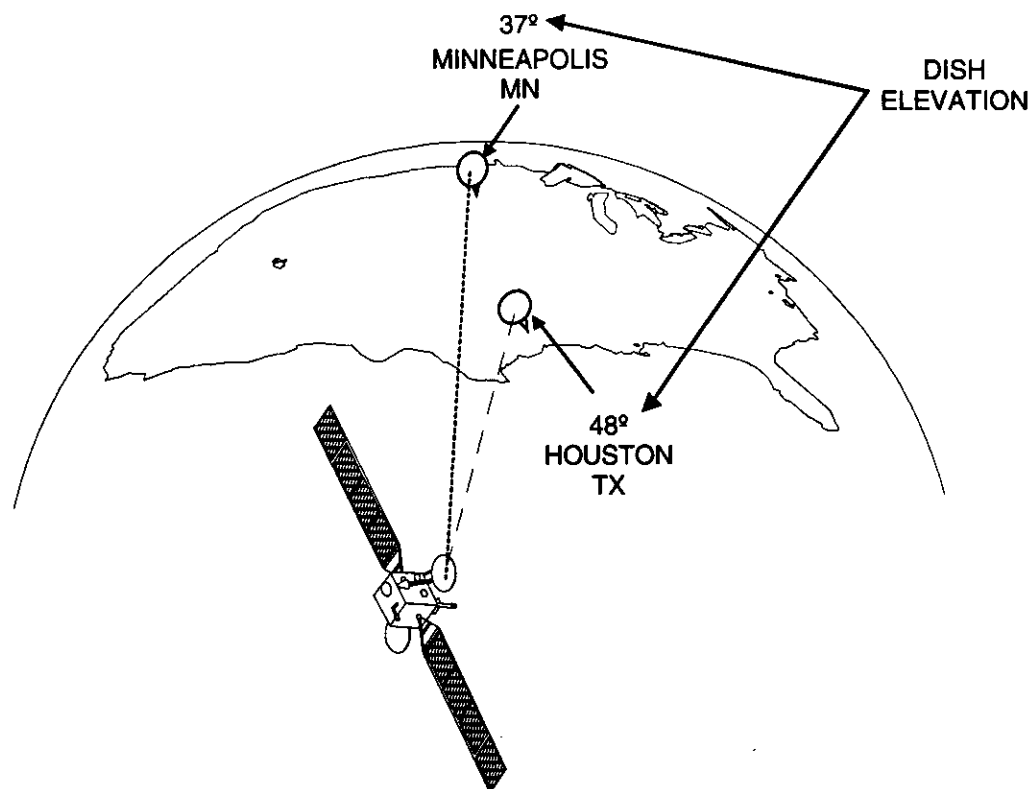


Figure 16, DSS Satellite Elevation

Determine a location for the Dish.

The first step in selecting a mounting site for the dish is to approximate the location of the DSS satellites in the sky. Then, select mounting site options that have the best possible view. Finally, select the best mounting location from the possible sites.

To determine the satellite's position in the sky, first determine the side to side (azimuth) and the up/down (elevation) bearings from your location to the satellites. These change with different locations across the United States. For example, the azimuth and elevation for Seattle, Washington are different than those for Syracuse, New York.

The differences in azimuth and elevation between Seattle and Syracuse are due to the DSS satellite's position in the geostationary orbit. As stated earlier, the DSS satellites are located over the equator at 101° west longitude. As an installation site moves north (away from the equator), the elevation of the dish lowers (towards the horizon) to point it at the DSS satellites. The azimuth of the dish also changes as you move either east

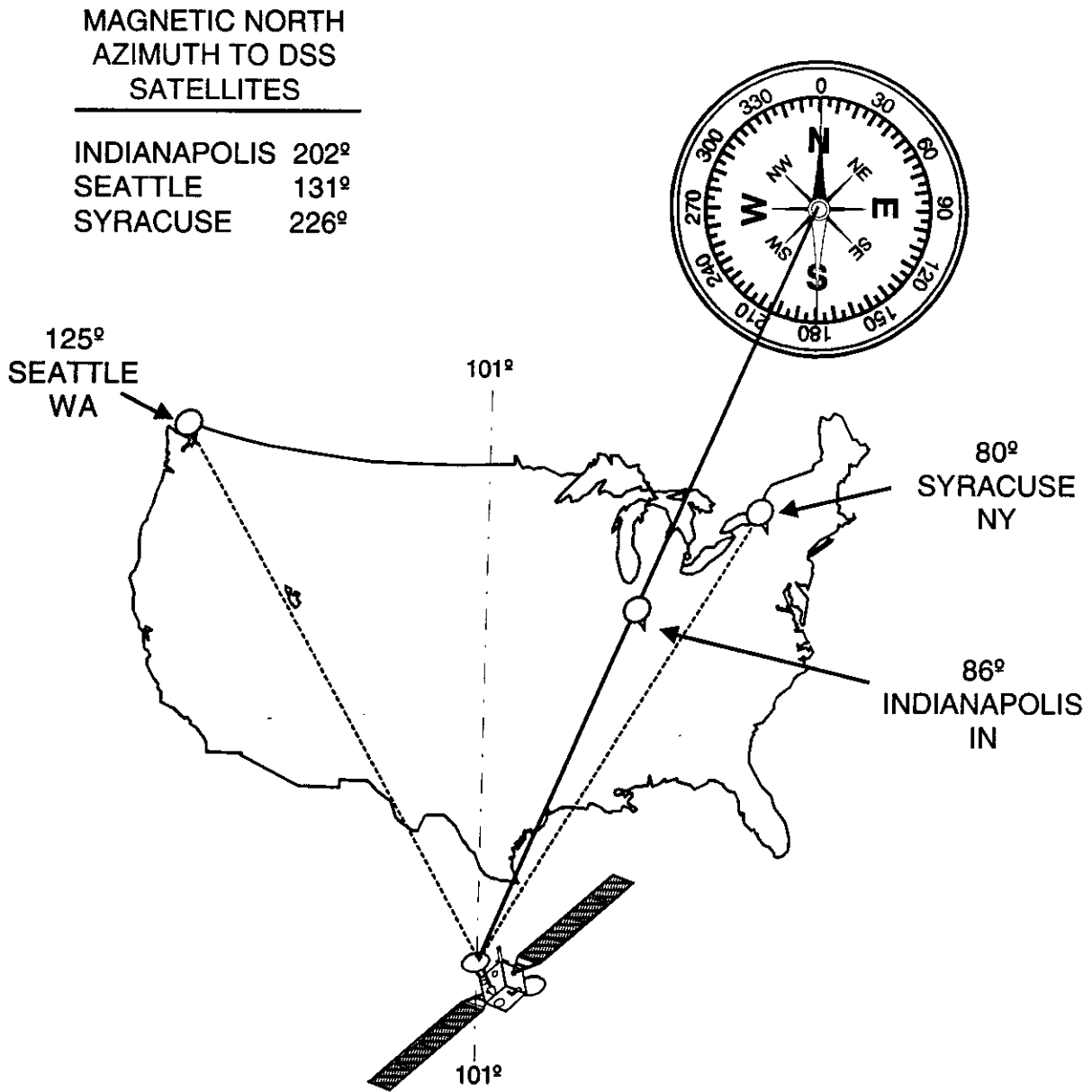


Figure 17, DSS Satellite Azimuth

or west of 101° west longitude. For example, Seattle is about 125° west longitude; therefore, a DSS dish must point east (about 131° from magnetic north) to point at the satellites. Syracuse is about 80° west longitude; therefore, a dish must point west (about 226° from magnetic north) to point at the DSS satellites. This may sound confusing, however, there are several simple methods to determine the azimuth and elevation bearings to the DSS satellites from the installation site. These methods are listed in appendix A of this manual.

With the azimuth and elevation known, use a compass and some type of angle finder to approximate the locations of the satellites for your installation site. To use the

compass, first align the arrow of the compass with magnetic north. With the compass aligned correctly, draw an imaginary line from the center of the compass to the azimuth of the satellites. This is the general direction the dish must point. If possible, pick a landmark in the distance that aligns with this bearing. If not, repeat this procedure whenever confirming possible locations for the dish.

To determine the elevation to the satellites, use some type of angle finder. An angle finder is a device that measures angles. A simple angle finder can be made with a protractor and bubble level. To do this, place the protractor on the level. With the level horizontal, the angles indicated on the protractor are elevations. There are also special angle finding devices. These devices are available at most hardware stores. Figure 18 is an example of a typical angle finder. To use this angle finder, place it on a level or straight edge. Then lift the front of the straight edge until the correct angle (or elevation) is indicated.

By using both the azimuth and elevation methods discussed previously, it is possible to view the line-of-sight path to the satellites. To do this, align a straight edge (used in the elevation procedure) with azimuth bearing. Then, using an angle finder, lift the

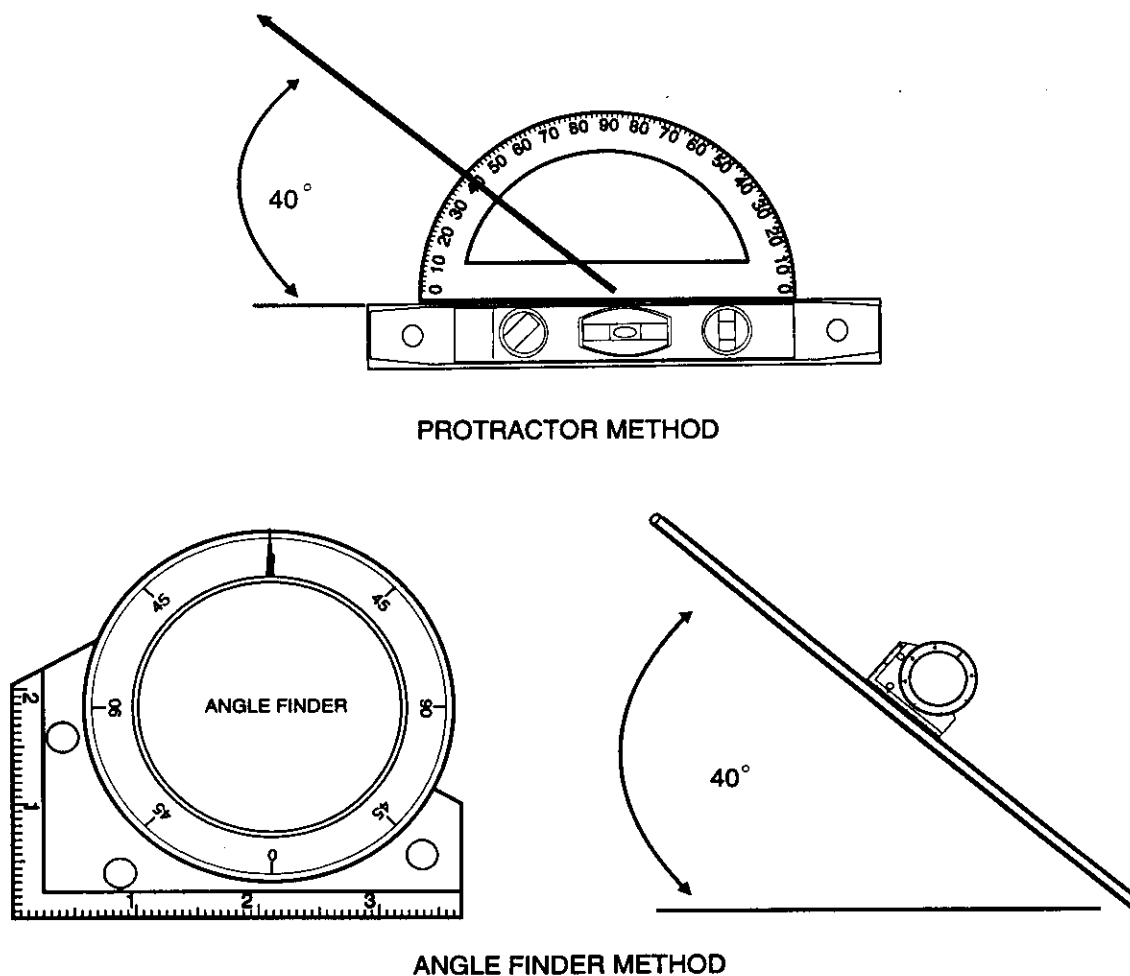


Figure 18, Measuring Elevation

front of the straight edge to the correct elevation. Sight along the upper edge of the straight edge to the satellites (see figure 19).

With the azimuth and elevation to the satellites known, select possible mounting sites for the dish. When selecting these sites, the first and foremost thing is to ensure that there is a clear and unobstructed view of the satellites. Before installing the dish at a selected site, check the line-of-sight path to the satellites. Be especially concerned about:

- Tree growth.
- Foliage.
- New buildings or additions to old buildings.

Each of these items can block or reduce the dish's view of the satellites.

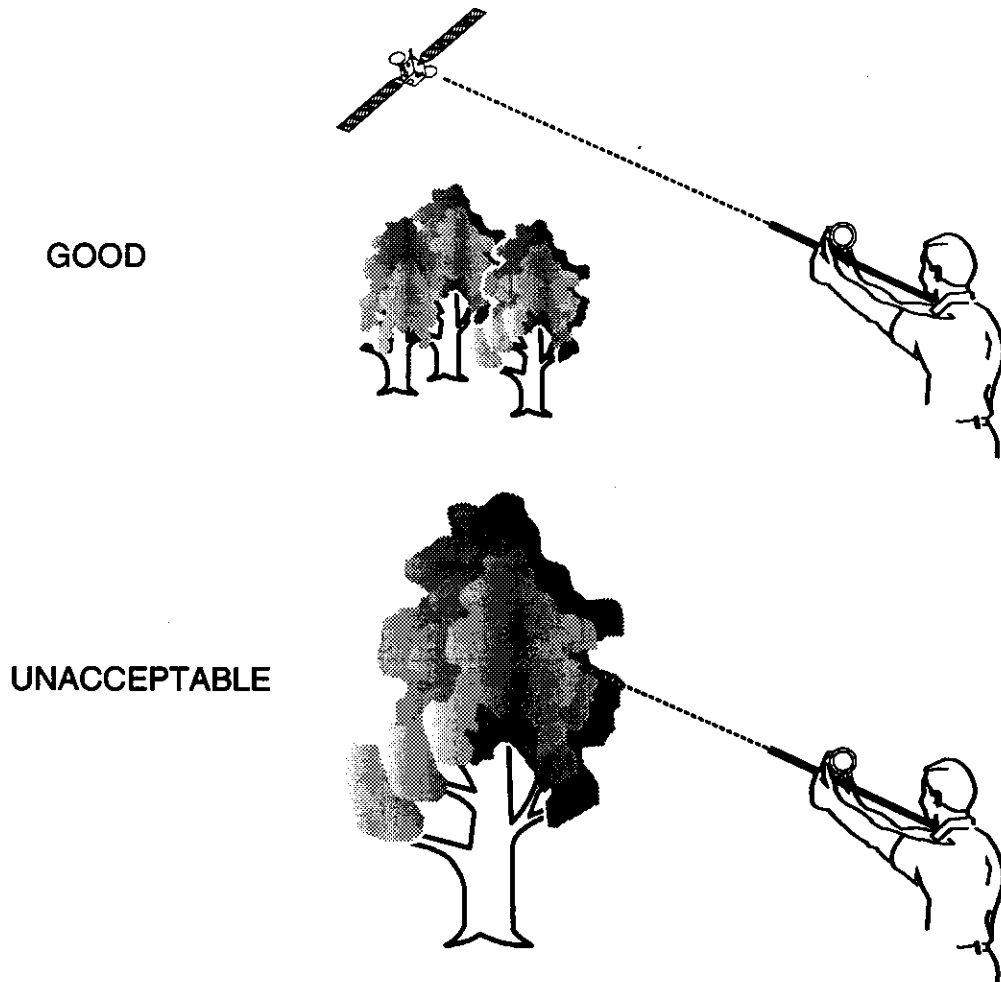


Figure 19, Confirming A Clear Line-of-Sight to DSS Satellites

Selecting a Mounting System for the Dish

There are several different mounting systems for the DSS dish. These include horizontal, vertical, and special. Use a horizontal mounting system for horizontal surfaces and vertical for vertical surfaces. Special mounting systems include pole and chimney mounts. When selecting a mounting system for the dish, consider these items:

- Safety.
- Line-of-sight path to the satellite.
- Mounting structure.

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Also, do not position the dish anywhere contact with one of these items may occur. When digging holes, be sure and contact the local utilities and have them locate any underground services.

How to check the line-of-sight path to the satellites from your installation site is covered earlier in this section. For each mounting system considered, the line-of-sight path must be checked for obstructions. If there is an obstruction, another mounting site may need to be considered.

Even though the DSS dish is relatively small, the surface it mounts to is very important. This surface must be structurally sound and not have an excessive amount of movement. A structurally sound surface can be the wall of a home, a deck rail, or a chimney. These surfaces should withstand at least several hundred pounds of force that the dish may place on it. This force is not constantly placed on the mounting surface, it is only present when wind pushes on the dish. Keep these forces in mind whenever installing a dish and selecting a mounting surface and system.

Identify a Route For the Cables that Run from the Dish to Receiver

Another important aspect of the site survey is the route of the LNB cable. This cable connects the dish to the satellite receiver. The site survey is the opportune time to plan the path of this cable. Also, if there are no phone jacks in the area of the receiver, plan the installation of a telephone cable. If possible, select the shortest possible path to the satellite receiver for each of these cables. Also try to take advantage of crawl, closet, and attic spaces. Using these spaces to your advantage can reduce the installation time by preventing the routing of cables through the inside of walls. The goal of any cable installation is to keep the cables out of sight and as short as possible.

Connecting the Receiver to the Customer's Audio-Video Components

One of the last items of the installation to consider is the connection of the receiver to the different video and audio components the customer may have. These components can include VCR's, laser disc players, and audio systems. Explain to the customer the best method of connecting their components to the receiver. If there are several

possibilities, explain them to the customer pointing out the advantages and disadvantages of each. If the customer is unsure of how they would like to connect the receiver, use your experience to recommend a hookup that will work best for them.

Evaluate Off-Air Solution

Local programming is not available via the DSS satellites. If the customer does not have an off-air (terrestrial) antenna or cable in the home, you may suggest the installation of one. If you need assistance in selecting the best antenna for your area, consult the DSS Accessories and Antenna Components Catalog (publication T-8743CM).

Third Step

One of the last items to consider during the site survey is whether the different details of the installation fall within the "basic" installation plan outlined by Thomson Consumer Electronics. If there are components of the installation that fall outside the "basic" installation guidelines, additional time and materials may be required. It is important to discuss any additional charges with the customer before the installation begins.

Thomson Consumer Electronics "basic" installation guidelines are:

- The dish unit can be mounted on a stable structure of the dwelling - a vertical wall, chimney, or roof, within a 100-foot cable length of the connected TV. Hardware necessary to mount the dish must be provided by the installer and included in "basic" installation price. This includes screws or bolts, grounding hardware, and an occasional inexpensive Thomson-approved chimney mount.
- The installer provides up to 100 feet of Thomson-approved RG-6 coaxial cable and up to 100 feet of telephone cable.
- The satellite receiver should be connected to one TV (and VCR is the VCR is located at connected TV location).
- The antenna is grounded to meet the National Electric Code (NEC) requirements.
- The coax cable routed through a normal frame structure or only one layer of masonry (brick or block).
- All cables should be routed to the TV either through an exterior wall or from a basement or crawl space.
- A telephone connection should be installed at the location of the DSS receiver. An existing phone outlet may be used if within a reasonable distance of the connected TV and acceptable to the consumer. The installer should assume that most installations will require a telephone cable hook-up.

- Providing up to 20 minutes of customer education on system operation.
- Estimated time to complete a “basic” installation is 2 hours.
- The “basic” install includes travel up to 25 miles (or 25 minutes in dense metro areas) for the installation without additional mileage charge to the consumer.

Any installation falling within these guidelines is considered a basic installation and no additional cost is passed on to the customer. If there are aspects of the installation that fall outside of these guidelines, additional cost can be quoted to the customer to cover the additional expense. Some examples of items that increase the cost of an installation are the installation of a pole mount system or using over 100 feet of cable. Remember, these costs must be explained to the customer before the installation starts. If the customer does not want pay the additional costs, another mounting site that falls within the basic guidelines must be found.

Here are some installation add-ons for which a customer may be charged by the Installer:

- The outdoor antenna unit must be mounted at significant distance from the dwelling, requiring lengthy underground cabling.
- Multiple masonry walls or a solid concrete wall must be penetrated.
- The satellite antenna unit must be installed at a location which requires more than 100 feet of coax cable to connect the TV and would require amplification.
- Multiple TVs are to be connected. This would probably require multiple satellite receivers.
- An off-air (VHF-UHF) antenna is needed to capture local signals.
- Complying with state and local codes for grounding more stringent than the National Electric Code.
- Fishing cable in the walls.
- Travel distance beyond that included with the “basic” installation.

Make certain the consumer understands the costs of any additional options before you begin the installation work.

Optional accessories are items that may be required for an installation but not included in the basic installation guidelines. Therefore, cost of these items can be passed on to the customer. Some example of optional accessories are:

- 12' A/V cables. There may be several types of cables required: stereo audio cables, video, and S-video.
- Telephone accessories. These accessories include a telephone extension cable and/or modular telephone connectors (in-line and T).
- Antenna system parts. Included in this category are indoor and outdoor antennas, in-line signal amplifiers, and signal combiners.
- AC and telephone surge protectors.

The tools required to complete a basic installation include:

- Drill and bits. Depending on the installation site, it may be necessary to use masonry bits.
- Assorted hand tools. These tools include pliers, wire cutters, hammer, flashlight, screwdrivers, etc.. These tools should also include coax cable strippers and crimping tools for the installation of "F" fittings on cable.
- Compass.
- Ladder. The length of this ladder must be enough to reach attics and roof tops as required for the installation. It is recommended that a fiberglass ladder be used.
- Cleaning equipment. This equipment should be enough to clean the debris resulting from the installation of the dish. Items in this list include a broom, dust pan, hand held vacuum cleaner, rags, and some type of cleaner.

Once the site survey is finished and the materials gathered, the installation of the system can begin. After reading this, it may appear as though the site survey requires too much time to do. Once you are experienced with doing site surveys, the whole process should not take over 15 minutes. Once the site survey is finished and the installation starts, you'll find that the steps taken during the site survey will save you both work and time.

NOTES

INSTALLATION

The two major components of the Digital Satellite System are the dish and receiver. These components are packed separately in the carton. The dish packaging contains five pieces. These are the dish, LNB support arm, foot and mast assembly, LNB, and a package that contains the nuts and bolts required to assemble the dish. The receiver packaging contains the receiver, remote control, RF cable, and a telephone cable. The deluxe system receiver (DRD203RW) contains the basic components listed above, plus audio, video, and S-video cables. The dish packaging is almost the same for both the deluxe and the basic (DS1120RW) systems. The difference between the two antenna systems is the LNB and dish. In the deluxe system, the LNB is a dual output while the basic system's LNB is a signal output. The dish used with the deluxe system is made of SMC material, while the basic package includes a metal dish. Before starting an installation, check for the presence of all pieces in the system packing.

In this section of the training manual, installation of the Digital Satellite System is divided into four steps. Each step forms a different section of this manual. The steps are:

1. Mounting the Dish (page 41)
2. Assembling the Dish (page 78)
3. Installing the Receiver (page 98)
4. Aligning the Dish (page 104)

Included in each of these sections are instructions for performing the step; plus, tool and material lists required for the step. To see what tools are needed to do a step, go to the section that matches your installation site. Then, look at the list of tools and materials.

To install the system, you must perform each of these steps. You may choose to perform these steps in a different order given than that in this manual and the way you install the system may vary. However, the goal is to install the system quickly and efficiently. The order you perform the steps should help you do this.

Mounting the Dish

This section addresses mounting the foot and mast assembly to a surface. There are three basic mounting systems for the dish: vertical, horizontal, and special. Both the vertical and horizontal mounting systems use the foot and mast assembly included with the Digital Satellite System. Special mounting systems include chimney and pole mounts. These systems require the use of hardware that is not included with the RCA Digital Satellite System, such as a metal pole and concrete for a pole mount system and a chimney bracket for a chimney mount system. In the explanations of the different mounting systems, the material lists include the additional hardware needed to install that system.

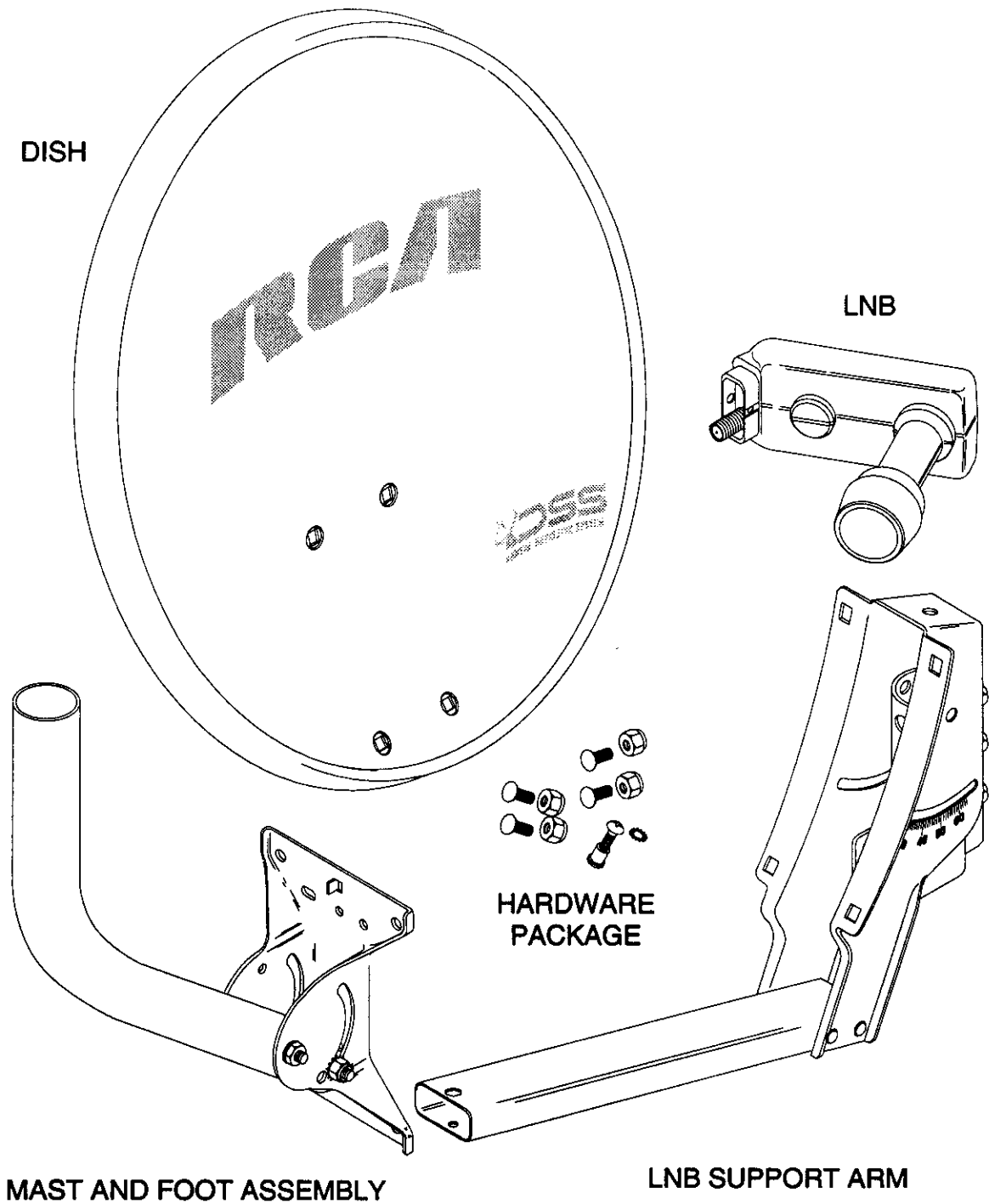


Figure 20, Dish Packaging

Before starting the installation, there some important things to remember about installing the system. First, never mount the dish on a surface that is not structurally sound. Excessive movement of the mounting surface will reduce the performance of the system. Second, whenever drilling holes in a home, follow the old rule of measure twice and drill once. Drilling a hole in the wrong place can be difficult and costly to repair. Finally, read and follow all the safety instructions at the start of this manual. These warnings are for both you and your customer's safety.

Leveling Basics

One of the key steps of the installation is leveling the mast. When mounting the foot and mast on any surface, the mast must be level both horizontally and vertically. If the mast is not level, alignment of the dish becomes difficult without the help of special sighting equipment.

Figure 21 is the mast and foot assembly. This assembly can mount on either a horizontal or vertical surface by adjusting the position of the mast on the foot. This is the only adjustment on the foot. Therefore, the position of the foot on a horizontal or vertical surface is important. Whenever positioning the foot on a nonlevel surface, orient the foot's adjustment in the direction of the pitch. This simplifies the leveling procedure and prevents the need of spacers to level the mast.

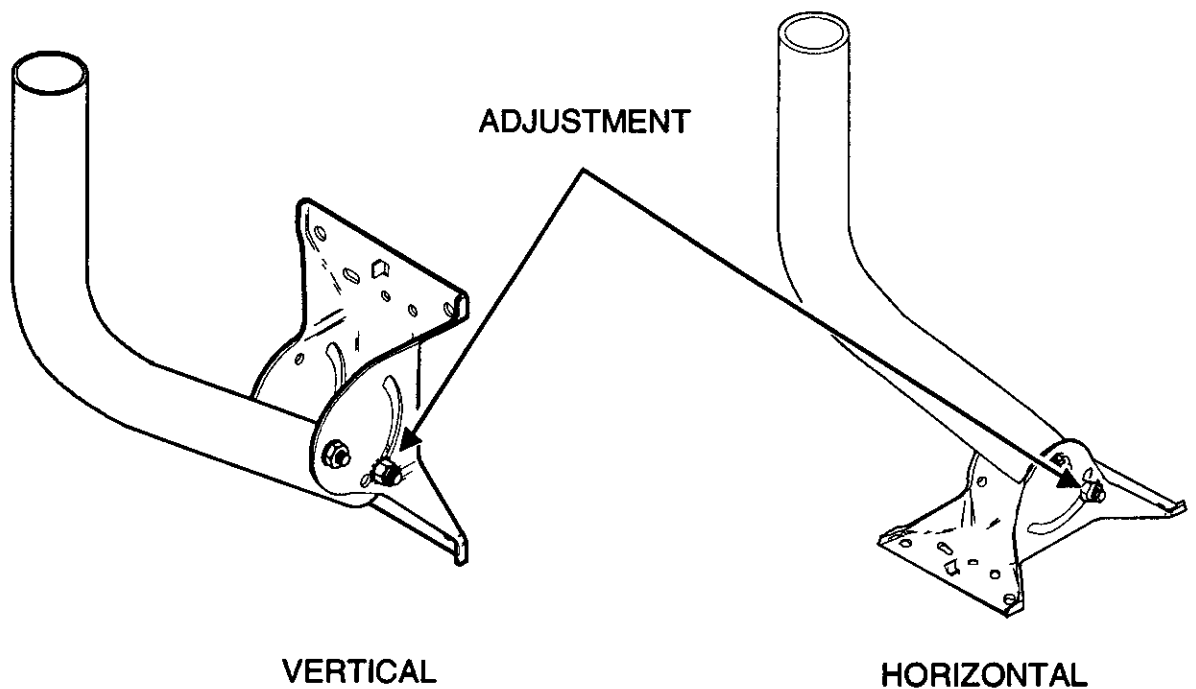


Figure 21, Mast and Foot Assembly Adjustment

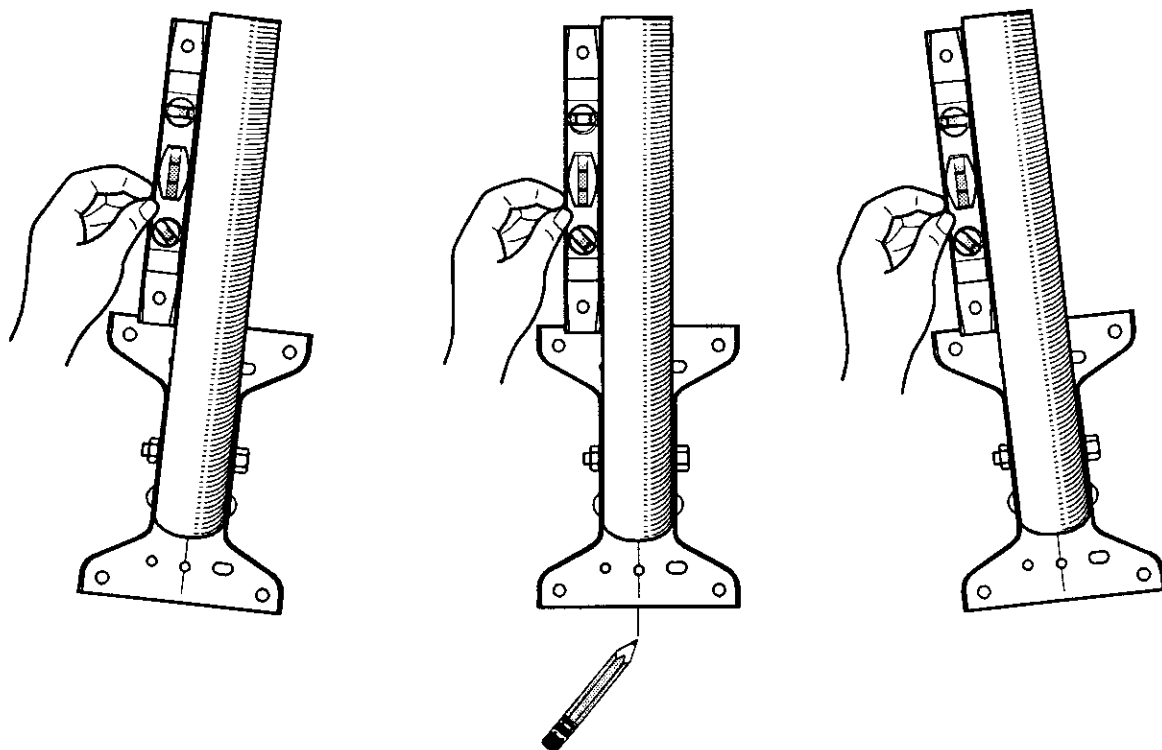


Figure 22, Horizontal Leveling with Bubble Level

There are two leveling procedures, one for mounting the foot on a vertical surface and the other for a horizontal surface. Leveling procedures for special mounting systems are provided in the specific mounting instructions given later in this manual.

The following leveling procedures gives a basic understanding of how to level the mast for each mounting system. Abbreviated leveling instructions are also given later in this manual in the instructions for different mounting surfaces.

Vertical Mounting System

With mounting the foot on a vertical surface, the mast is leveled horizontally (side to side) and vertically (up and down). Use either a bubble level or plumb line with the following procedures to level the mast.

Use the following procedure to level the mast with a bubble level.

1. Place the level on the mast as shown in figure 22. Move the bottom of the mounting foot to center the bubble in the window of the level.
2. With a pencil, draw line from the center line of the lower foot onto the wall. This line is a reference mark that enables the foot to be restored to level without using the level again. Before drilling the remaining holes required to install the foot, ensure this line aligns with the center line of the mounting foot.

When horizontal leveling with a plumb line, use the following procedure:

1. Hold the string of the plumb line over the top of the mast so it hangs as shown in figure 23.
2. Move the lower part of the foot until the plumb line aligns parallel to the side of the mast.
3. With a pencil, draw a line from center line of the mounting foot onto the wall. This line is a reference mark that enables the foot to be restored to level without using the plumb line again. Before drilling the remaining holes required to install the foot, ensure this line aligns with the center line of the mounting foot.

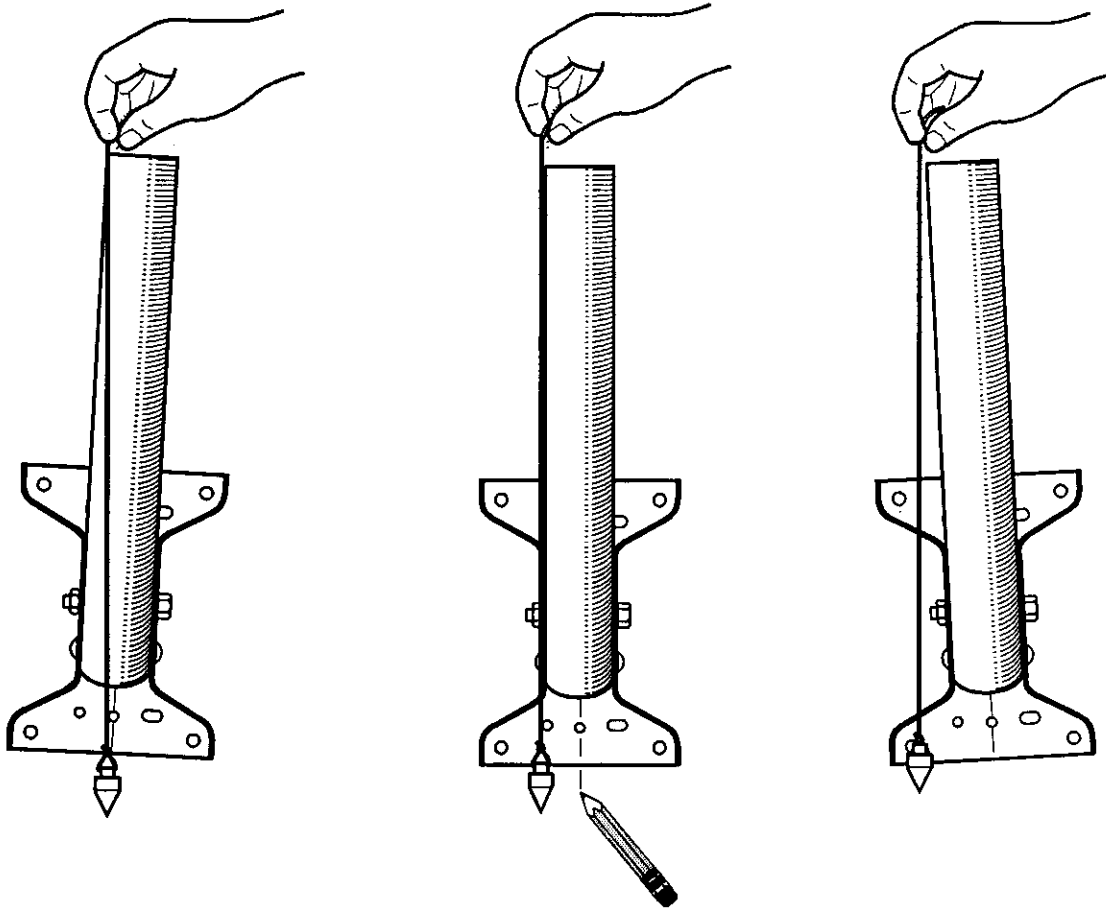


Figure 23, Horizontal Leveling with Plumb Line

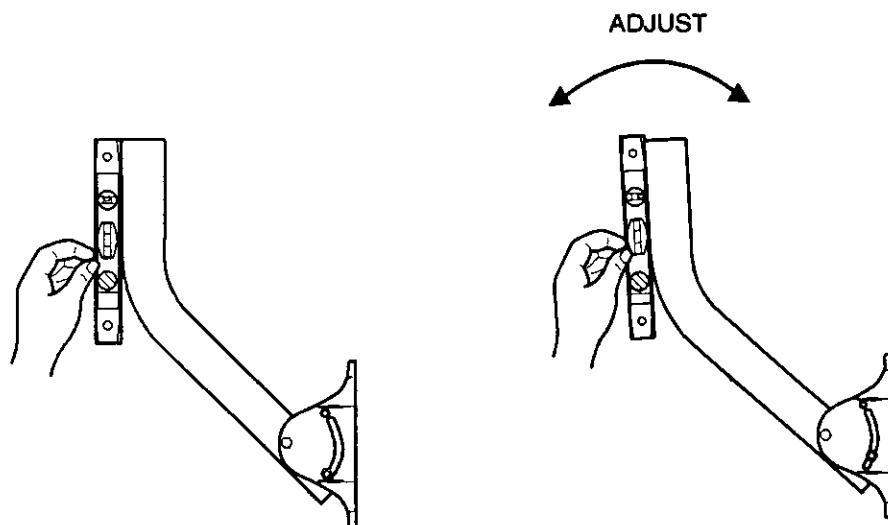


Figure 24, Vertical Plumbing with Bubble Level

To level the mast vertically with a bubble level, use the following procedure.

1. Loosen the two bolts holding the mast in position on the foot.
2. Place the level on the mast as shown in figure 24.
3. Move the mast vertically center the bubble in the window of the level.
4. Tighten the two mounting bolts securing the mast to the mounting foot.

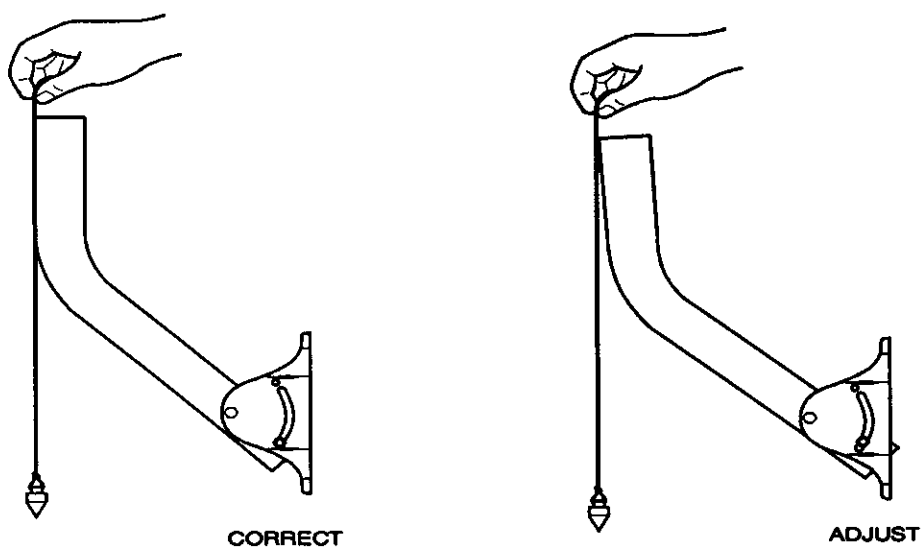


Figure 25, Vertical Leveling with Plumb Line

To level the mast vertically with a plumb line, use the following procedure:

1. Loosen the two bolts holding the mast in position on the foot. .
2. Hold the string of the plumb line over the top of the mast so it hangs as shown in figure 25.
3. Move the mast vertically until the plumb line hangs parallel with the mast.
4. Tighten the two mounting bolts securing the mast to the mounting foot.

Horizontal Mounting System

When mounting the foot on a horizontal surface, the mast must also be leveled. This leveling is different than the leveling done for a vertical surface. Instead of leveling in a horizontal and vertical direction as you do on vertical surfaces, horizontal surfaces require the mast be leveled vertically in all directions. To do this requires at least two measurements of the mast. Each measurement must be at right angles to the other measurement (see figure 26). Both a plumb line and a bubble level will work for making these measurements.

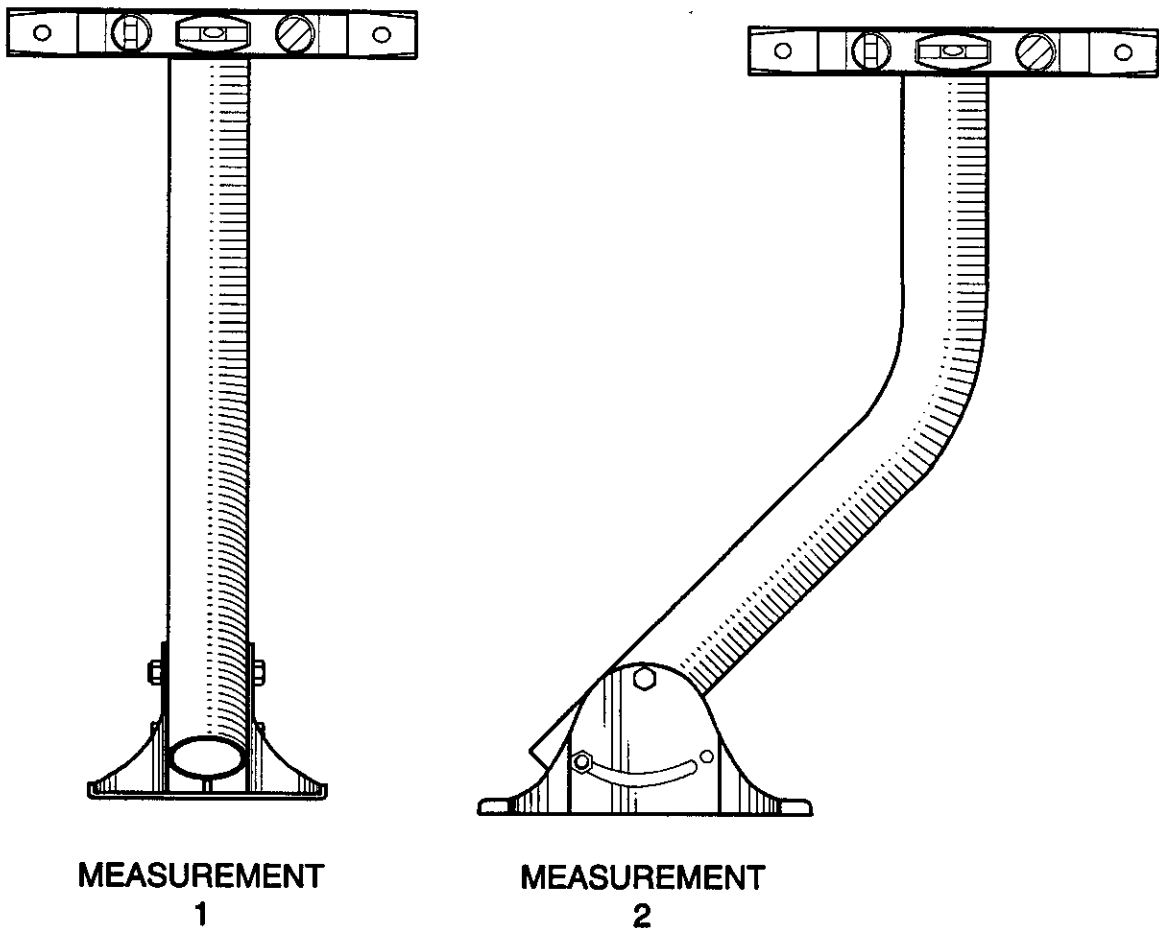


Figure 26, Measuring Level Horizontal Mounting System

The important thing in horizontal mast leveling is positioning of the foot on the mounting surface. This is due to the one adjustment of the foot. When positioning the foot on a horizontal surface, orient the adjustment in the direction that has the most angle to it. For example, if you are mounting the foot on a roof, orient the foot so the adjustment is parallel to the pitch of the roof (see figure 27).

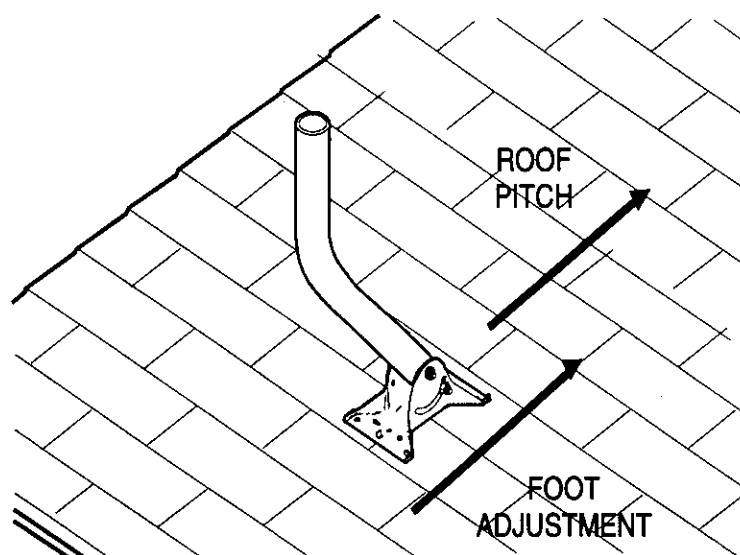


Figure 27, Orient the Mounting Foot on a Horizontal Surface

Use the following procedure to level the mast on a horizontal surface:

1. With a bubble level, check the level of the mounting surface. While doing this, check several different angles at the foot location. Mark the direction with the most angle.
2. Position the foot on the mounting surface, aligning the foot's adjustment with the direction marked in step one.
3. With the adjustment on the foot, level the mast (see figure 28).

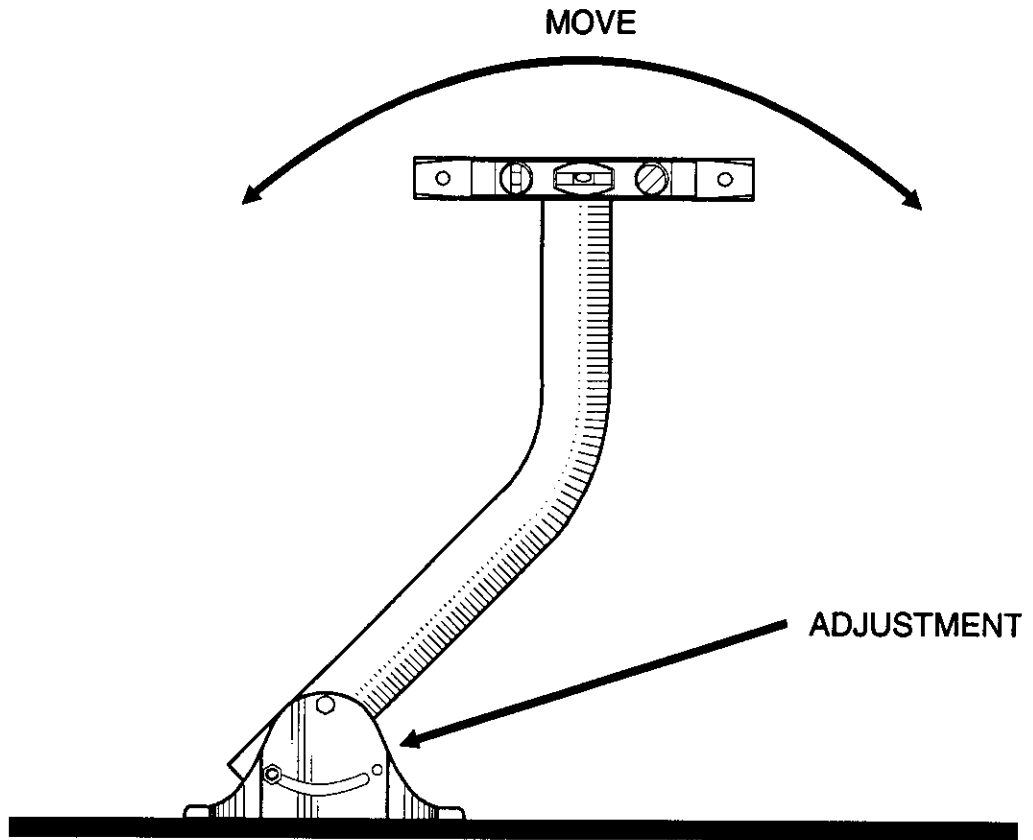


Figure 28, Horizontal Surface Mast Leveling with Foot Adjustment

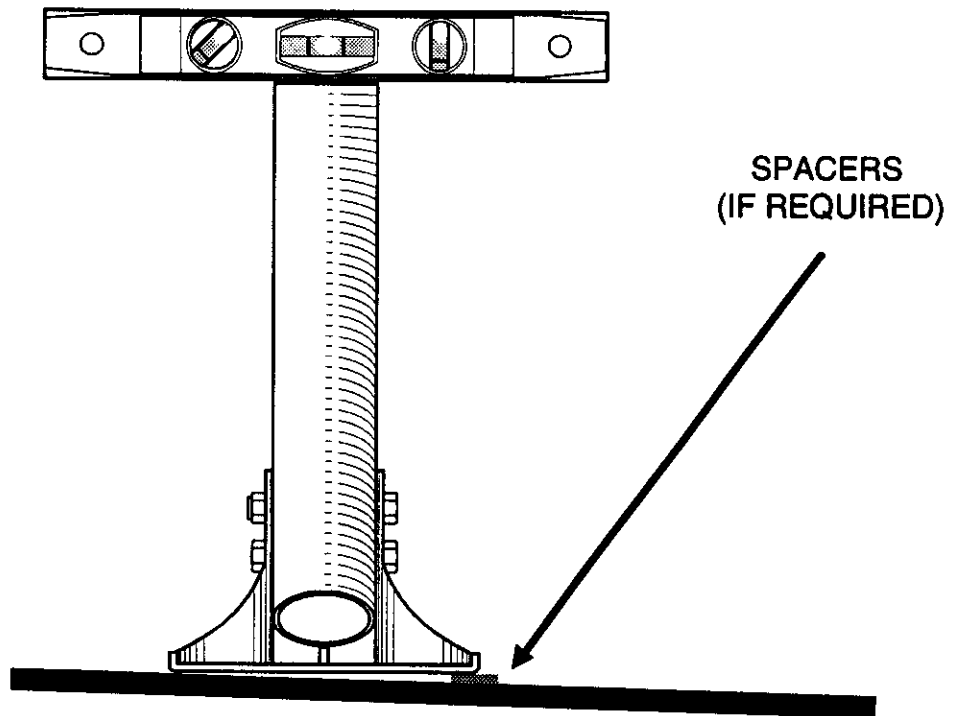


Figure 29, Horizontal Surface Side to Side Leveling

4. Move the bubble level (or plumb line) 90 degrees and measure. If level, double check both measurements and secure the foot (skip steps 5 and 6). If it is not level, continue to step 5.
5. If the side to side measurement of the mast is not level, use spacers to level it. To use spacers, determine the side that must be raised. Then, place 5/16 washers under the foot to level the mast. Position these washers under the mounting holes so the mounting bolts will secure them.
6. Once the side to side measurement is level, confirm the level of both measurements and secure the foot to the surface. Always double check the level of the mast after it is secured. If it is not level, re-adjustment may be necessary.

Instructions for leveling is also given in each horizontal system installation procedure.

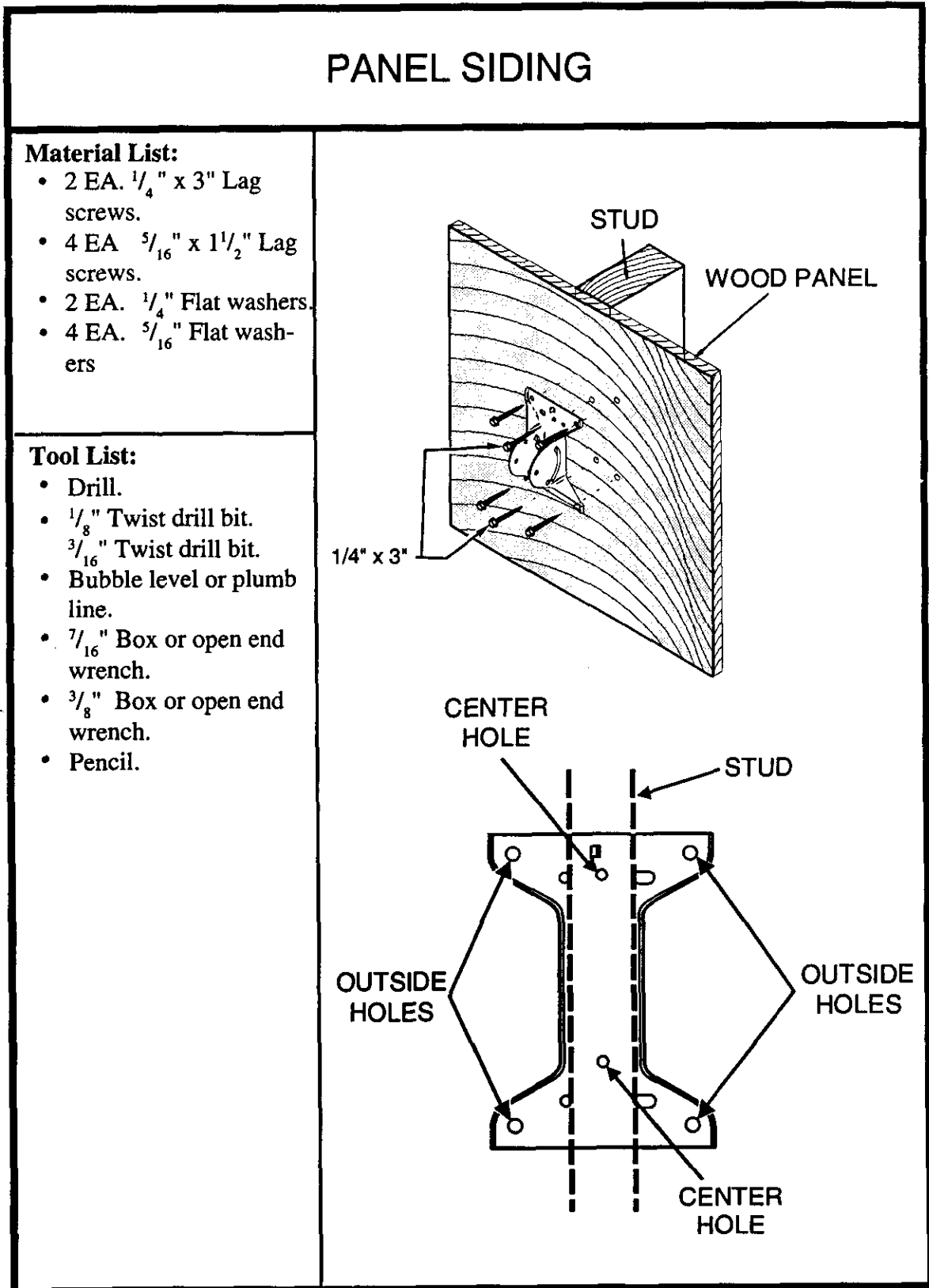


Figure 30, Panel Mounting Mast and Foot Assembly

Panel siding is typically a 4' x 8' sheet of material mounted over some type of insulating sub layer. The thickness of these panels varies from 3/8" to 5/8". Nails secure the panels to the frame structure of the home. Usually, the edges of panels are cut so that lap joints form where two panels meet. This provides a relatively flat mounting surface for the DSS dish.

Panel siding can be made of many different types of materials. These materials range from composite materials to solid wood or plywood. Do not mount the dish to any type of composite material. Composite materials include strand board, fiber board, and particleboard. Acceptable siding materials include solid wood panels and plywood. If you are unsure of the mounting material or its thickness, look at a cross sectional view of the material by removing the cover from an exterior electrical outlet.

Due to the variety of solid wood and plywood panels used in home construction, it is always recommended that the mounting foot be secured to one of the studs that make up the framework of the wall.

Use the following procedure to install the foot on panel type siding:

DANGER!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights and power circuits. Contact with power lines, lights, and circuits may prove fatal.

1. Locate a wall stud close to the area selected in the site survey. To locate a stud underneath panel siding, locate the nails securing the panel to the wall frame. These nails are driven into the studs and usually form a track vertically on the siding. This vertical track of nails aligns with the center of the stud and provides an easy guide to the locations of the studs.

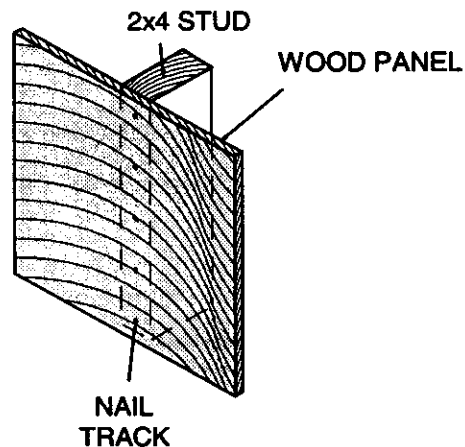


Figure 31, Finding Wall Stud

2. Place the mounting foot on the panel aligning the center holes with the center of the stud. With a pencil, mark the upper center hole of the mounting foot.
3. Remove the mounting foot and drill a 1/8" hole in the location just marked.
4. With a 1/4" x 3" lag screw and washer, attach the mounting foot to the wall using the hole drilled in step three. Tighten the lag bolt until it just holds the mounting foot to the wall. The lower half of the mounting foot should move slightly back and forth.
5. Horizontally level the mast using either a bubble level or a plumb line.

To horizontally level the mast, place the level or plumb line on the mast at an perpendicular angle to the wall. If you are using a bubble level, move the bottom of the mounting foot to center the bubble in the window of the level. If you are using a plumb line, move the lower part of the foot until the plumb line aligns parallel to the side of the mast. With a pencil, draw line from the center line of the lower foot onto the wall. For details on this procedure, see the Leveling the Dish section of this manual.

6. Using a 7/16" wrench, loosen the lower two nuts holding the mast onto the mounting foot. With these two nuts loose, move the mast to gain access to the lower center mounting hole.
7. Align the center mark of the mounting foot with the line drawn in the horizontal leveling procedure.
8. Drill a 1/8" pilot hole in the lower center mounting hole.
9. Insert a 1/4" x 3" lag screw with washer into the lower mounting hole. At this time tighten both top and bottom lag screws.
10. With a 3/16" bit in the drill, drill two pilot holes in opposite corners of the mounting foot.
11. Insert 5/16" x 1-1/2" lag screws with washers into the outside holes and tighten.

Note: Inserting lag screws into these holes in the four corners of the mounting foot is optional and only done to improve the appearance of the installation. A minimum of two lag screws in opposite corners of the mounting foot are

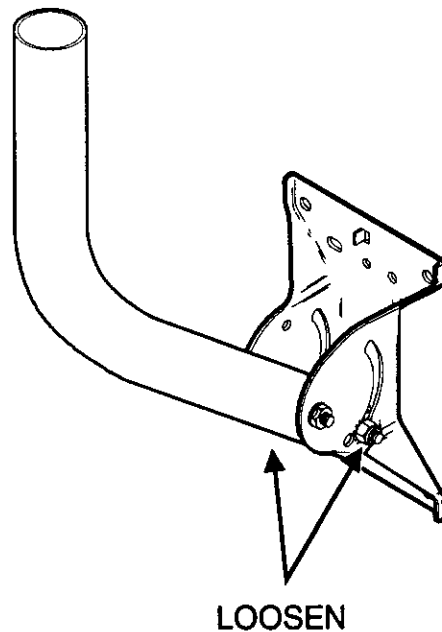


Figure 32, Loosening Lower Nuts

required for the installation. These screws reduce the side-to-side movement of the dish.

12. Vertically level the dish with a bubble level or plumb line.

To do this, place the level, or plumb line, on the mast at an parallel angle to the wall. If you have not loosened the two bolts securing the azimuth adjustment on the mounting foot, do it now. If you are using a bubble level, move the mast vertically to center the bubble in the window of the level. If you are using a plumb line, hold the string of the plumb line over the top of the mast so it hangs at a perpendicular angle to the mounting surface. Move the mast vertically until the plumb line hangs parallel to the side of the mast. Tighten the two mounting bolts securing the mast to the mounting foot. For a more detailed description of this procedure, see the Leveling the Dish section of this manual.

13. Check tightness of all bolts and proceed to the Assembling the Dish section.

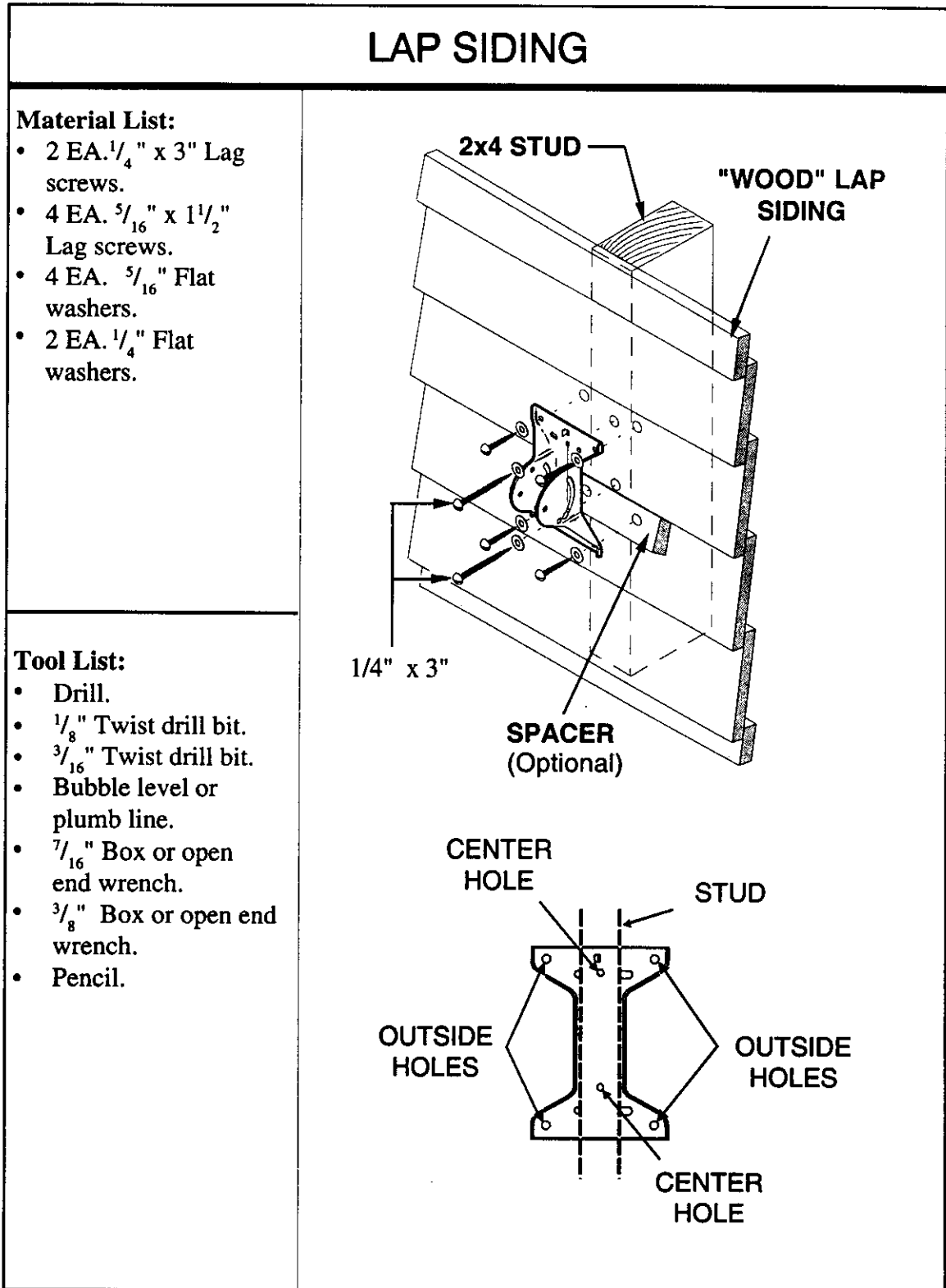


Figure 33, Mounting the Foot and Mast Assembly to a Lap Sided Wall

Lap sided walls are made up of many narrow boards stacked horizontally up the wall. Each board is lapped by the board above it. Usually, all the boards on one wall are the same width; however, the width of lap siding material can vary from 4 to 10 inches. Therefore, it is possible for one wall to use 5" boards and another wall to use 7" boards. This can make finding a location on the wall wide enough for the mounting foot difficult.

Another characteristic of lap sided walls is the siding style. Depending on this style, the wall surface is either flat or uneven. If the surface is uneven, each board's surface is not parallel to the vertical plane of the wall. Several common siding styles are drop, rustic, rabbetted, bevel (also called taper), and clapboard. The wall surfaces with drop and rustic siding styles are relatively flat. Rabbetted, bevel, and clapboard styles have uneven wall surfaces. Installing the dish on a wall with rustic and drop styles of siding is the same as installing it on panel siding. If you are installing the DSS dish on one of these siding styles, see the panel siding explanation in this manual. When installing the system on clapboard, bevel, and rabbetted styles of siding, the mounting process must change slightly.

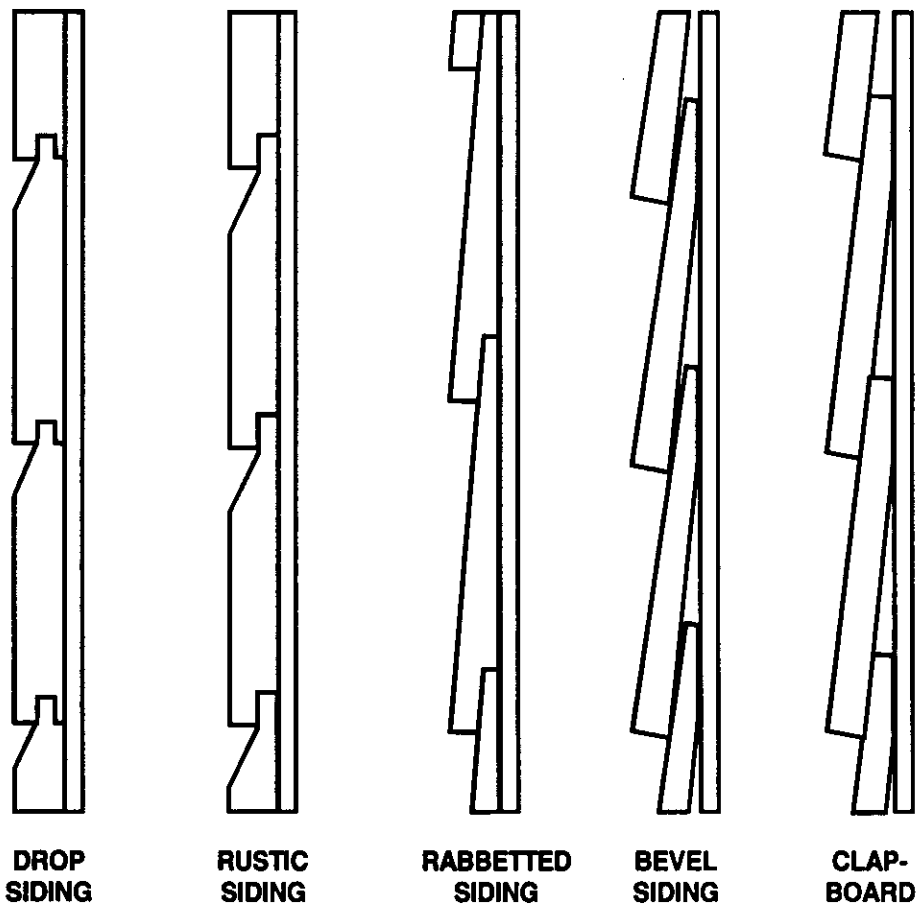


Figure 34, Lap Siding Styles

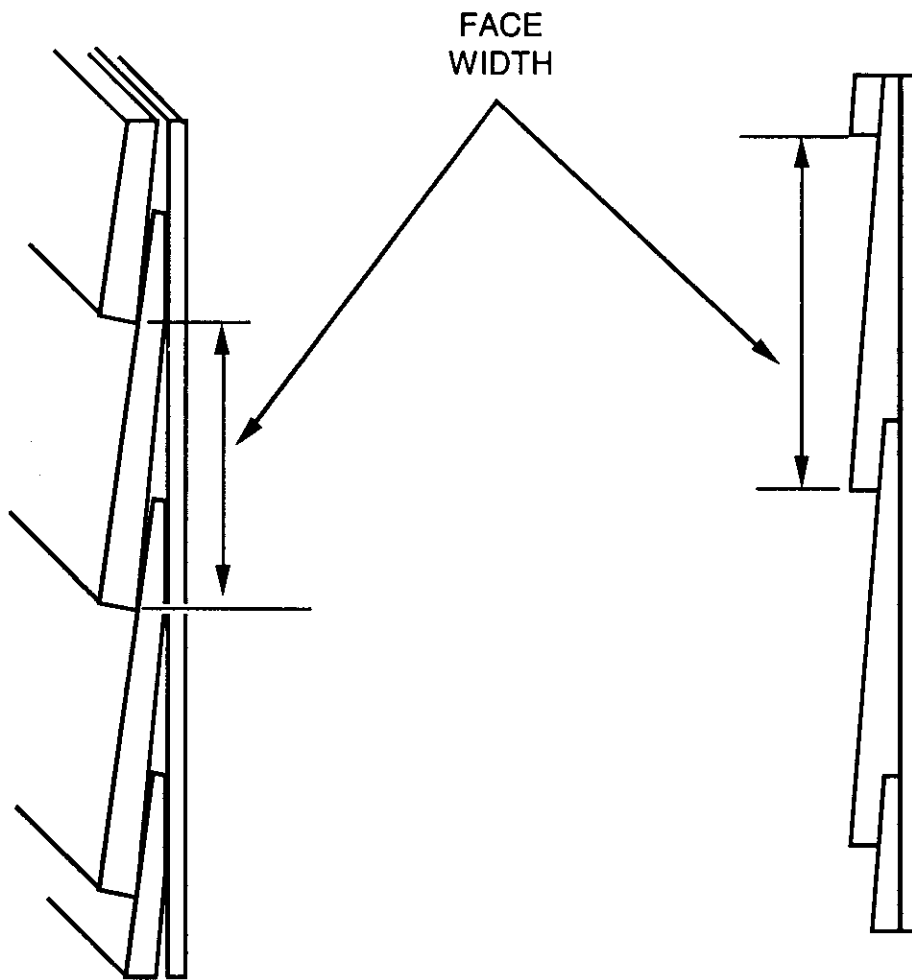


Figure 35, Lap Siding Face Width

Another difference with the siding styles that do not have flat surfaces is the different amount of exposed board, called the face width. For example, the face width of bevel and taper siding styles can vary from 3-1/2" to 9". This presents a problem when mounting the DSS foot to boards with the narrower face widths. The mounting foot is about 7" long and mounts across a board. When installing the foot on boards narrower than 7", a portion of the foot will not contact the wall. This often looks unprofessional and can reduce the strength of the installation. To install the mounting foot on siding with a face width less than 7", a spacer can be installed with the foot in the area of the overhang. This spacer keeps the foot securely fastened to the wall. The material used for this spacer can be wood or plastic and must be soft enough to have holes drilled into it. Once installed, the color of this spacer should match either the wall or mounting foot.

Lap siding can be made from many different types of materials. These materials range from solid wood to aluminum. **Do not mount the DSS Dish on any type of aluminum or vinyl siding.** We also do not recommend mounting the system on any type of composite material. This includes strand board, chip board, fiber board, and particleboard. An acceptable siding material is solid wood or plywood.

There are also several types of solid wood siding sold today. This wood varies in hardness and strength. Due to this, secure the mounting foot to one of the studs that make up the framework of the wall.

Use the following procedure to install the mounting foot on a lap sided wall:

DANGER!

When Following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with power lines, lights, and circuits may prove fatal.

1. Locate a wall stud close to the area selected in the site survey.

To locate a stud underneath the siding, locate the nails securing the siding to the wall frame. These nails are driven into the studs and usually form a vertical track on the wall. This vertical track of nails often aligns with the center of the stud and provides an easy guide to the location of the stud.

2. Place the mounting foot on the face of a siding board aligning the center holes of the foot with the center of the stud. With a pencil, mark the upper center hole of the mounting foot.

Note: If the foot is wider than the face of the siding board, a spacer must be installed under the part of the foot that does not touch the siding. Tips for installation of this spacer is given later in this section.

3. Remove the mounting foot and drill a 1/8" hole in the location just marked.
4. Use a 1/4" x 3" lag screw and washer to attach the mounting foot to the wall-- use the hole drilled in step three. Tighten the lag screw until it just holds the mounting foot to the wall. The lower half of the mounting foot should slightly back and forth.

5. Horizontally level the mast using either a bubble level or a plumb line.

To horizontally level the mast, place the level, or plumb line, on the mast at an perpendicular angle to the wall. If you are using a bubble level, move the bottom of the mounting foot to center the bubble in the window of the level. If you are using a plumb line, move the lower part of the foot until the plumb line hangs parallel to the side of the mast. With a pencil, draw a line from the center line of the lower foot onto the wall. For details on this procedure, see the leveling the dish section of this manual.

6. With a 7/16" wrench, loosen the lower two nuts holding the mast onto the mounting foot. With these two nuts loose, move the mast to gain access to the lower center mounting hole.
7. Align the center mark of the mounting foot with the line drawn in the horizontal plumb procedure.
8. Drill a 1/8" pilot hole in the lower center mounting hole.
9. Insert a 1/4" x 3" lag screws with washer into the lower mounting hole. At this time tighten both top and bottom lag screws.
10. With a 3/16" bit in the drill, drill holes in the four corners of the mounting foot.
11. Insert a 5/16" x 1-1/2" lag screws with washers into each of the four outside holes and tighten.

NOTE: Inserting lag screws into the four corners of the mounting foot is optional and only done to improve the appearance of the installation. A minimum of two lag screw in opposite corners of the mounting foot is required. These lag screws reduce the side-to-side movement of the dish.

12. Vertically level the dish with a bubble level or plumb line.

To do this, place the level, or plumb line, on the mast at an parallel angle to the wall. If you have not loosened the two bolts securing the azimuth adjustment on the mounting foot, do it now. If you are using a bubble level, move the mast vertically to center the bubble in the window of the level. If you are using a plumb line, hold the string of the plumb line over the top of the mast so it hangs at a perpendicular angle to the mounting surface. Move the mast vertically until the plumb line hangs parallel to the side of the mast. Tighten the two mounting bolts securing the mast to the mounting foot. For a more detailed description of this procedure, see the Leveling the Dish section of this manual.

13. Check the tightness of all bolts and proceed to the Assembling the Dish section.

Installing a Spacer (Optional)

If the siding is too narrow for the mounting foot, a spacer must be installed. The spacer can be held in place by the lower two mounting bolts of the mounting foot. To do this, use the following steps.

1. Remove the lag bolts from the lower outside holes of the mounting foot.
2. Insert the spacer under the mounting foot and mark the location of the two outside holes. If the space has not been previously sized, mark the size of the spacer using the mounting foot as a guide. Use these marks to trim the spacer to the correct size.
3. With a 1/4" drill bit, drill the two holes just marked.
4. Slide the spacer under the mounting foot and reinstall the two lag screws in the outside holes.
5. Once the spacer is installed, check tightness of all bolts and proceed to Assembling the Dish Components section.

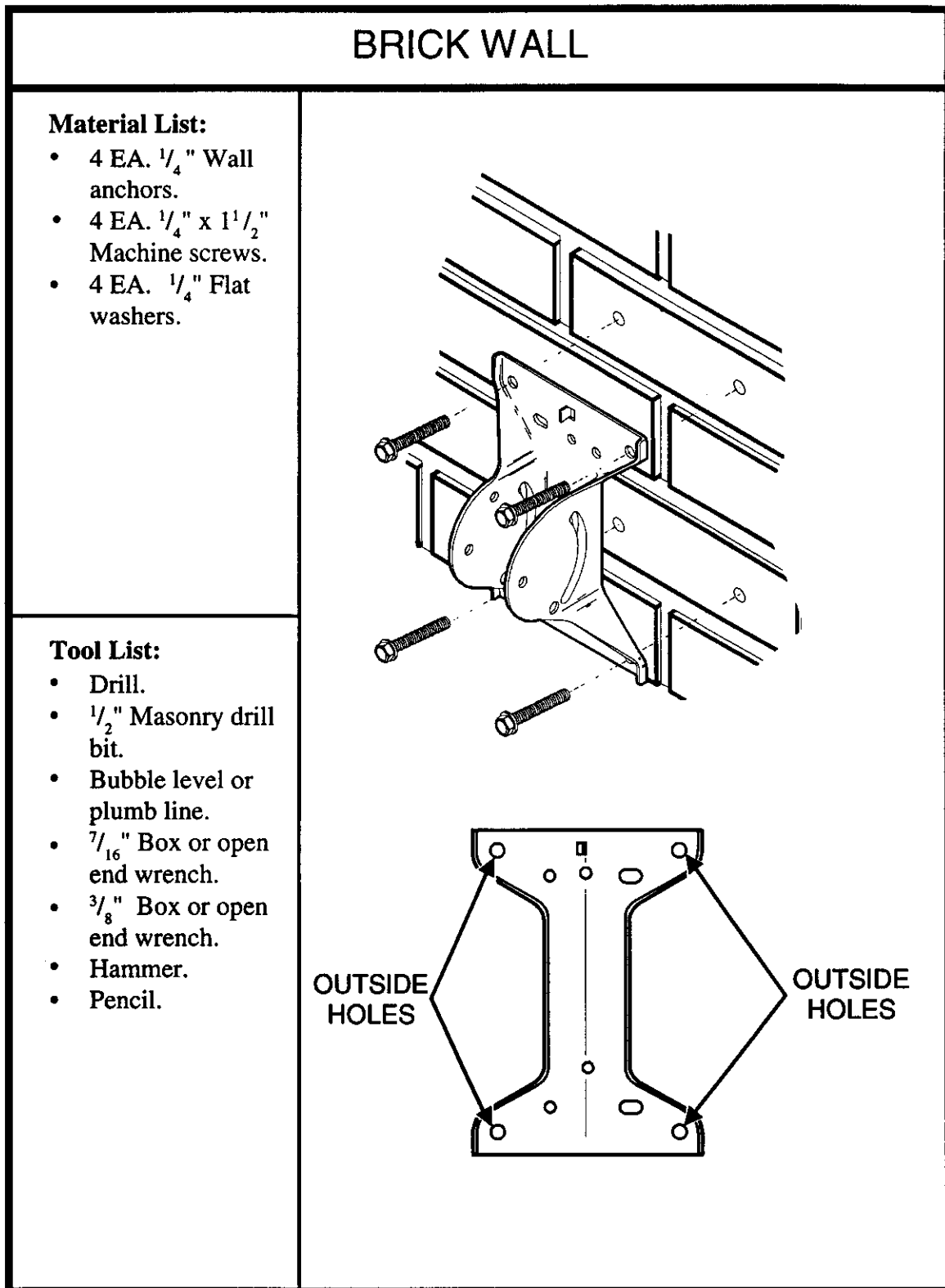


Figure 38, Mounting Foot and Mast Assembly to a Brick Wall

Using wall anchors, the foot can be mounted to most brick walls. Wall anchors insert into a hole drilled into the brick. These anchors come in a variety of types and sizes. When selecting a wall anchor to use, select one that will work in brick and has at least 300 pounds of pull out strength. An example of a wall anchor for the DSS dish is a 1/4" Rawl brand double expansion anchor (BB4015).

When installing the mounting foot in brick, use four wall anchors in the outside holes of the mounting foot. This is due to the different densities of various types of brick.

Use the following instructions install the mounting foot on a brick surface:

DANGER!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with power lines, lights, and power circuits may prove fatal.

1. Select a mounting location. This location should be relatively flat. A good way to check this is to hold the mounting foot on the wall. If the wall is flat, all four corners of the mounting foot will rest on the wall. If the wall is not flat, one or several corners will lift from the brick surface.
2. Hold the mounting foot in position and, using a pencil, mark one of the outside holes.
3. Remove the mounting foot. Then drill a 1/2" hole at the location just marked. This hole should be at least 1-3/4" deep (The depth of this hole depends on the length of the machine screws).

Note: A 1/2" hole is for a 1/4" expansion anchor. The size of hole you drill will depend on the wall anchor you use, follow the manufacturer's recommendations for drilling the correct size of hole.

4. With a brush or air, clean the dust from the hole.
5. Insert the wall anchor.
6. With a 1/4" x 20 x 1-1/2" machine screw and 1/4" washer, attach the mounting foot to the wall. This screw should be tightened until the mounting foot is snug against the wall.

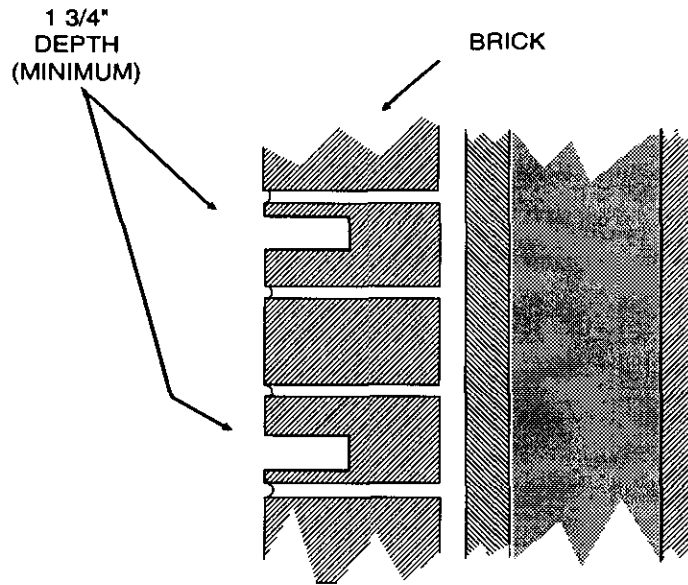


Figure 37, Drilling Holes for Wall Anchors

7. Horizontally level the mast with a bubble level or plumb line.

To horizontally level the mast, place the level, or plumb line, on the mast at an perpendicular angle to the wall. If you are using a bubble level, move the bottom of the mounting foot to center the bubble in the window of the level. If you are using a plumb line, move the lower part of the foot until the plumb line aligns parallel to the side of the mast. With a pencil, draw line from the center line of the lower foot onto the wall. For a details on this procedure, see the leveling the dish section of this manual.

8. Align the center mark of the mounting foot with the line drawn in the horizontal level procedure. With a pencil, mark the remaining three outside holes.
9. Remove the mounting foot. Then, drill three 1/2" holes at the locations just marked. These holes should be at least 1-3/4" deep (The depth of this hole depends on the length of the machine screws).
10. With a brush or air, clean the dust from the holes.

11. Insert expansion anchors in each hole.
12. Use four 1/4" x 20 x 1-1/2" machine screws and 1/4" washers to attach the mounting foot to the wall. Tighten all four screws.
13. Vertically Level the dish with a bubble level or plumb line.

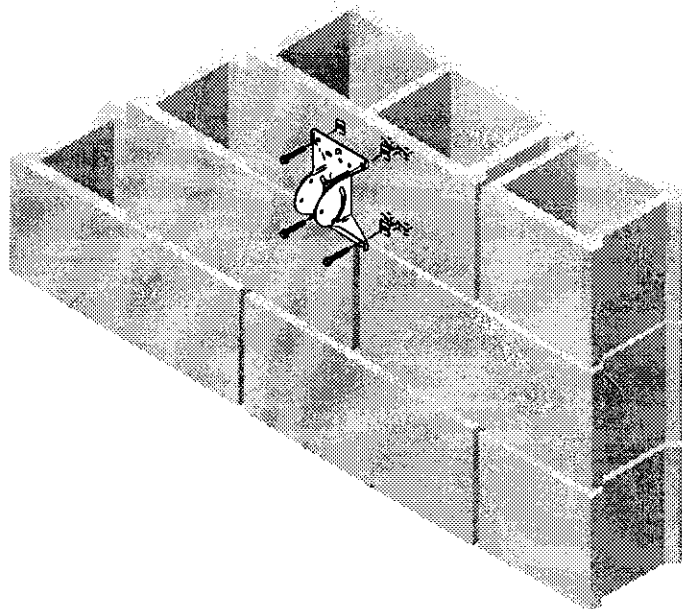
To do this, place the level, or plumb line, on the mast at an parallel angle to the wall. If you have not loosened the two bolts securing the azimuth adjustment on the mounting foot, do it now. If you are using a bubble level, move the mast vertically to center the bubble in the window of the level. If you are using a plumb line, hold the string of the plumb line over the top of the mast so it hangs at a perpendicular angle to the mounting surface. Move the mast vertically until the plumb line hangs parallel to the side of the mast. Tighten the two mounting bolts securing the mast to the mounting foot. For a more detailed description of this procedure, see the Leveling the Dish section of this manual.

14. Check tightness of all bolts and proceed to the Assembling the Dish Components section.

CINDER BLOCK WALL

Material List:

- 4 EA. $\frac{1}{4}$ " x 3" Machine screws.
- 4 EA. $\frac{1}{4}$ " Hollow wall anchors or togglers.
- 4 EA. $\frac{1}{4}$ " Flat washers.



Tool List:

- Drill.
- $\frac{1}{2}$ " Masonry drill bit.
- Bubble level or plumb line.
- $\frac{7}{16}$ " Box or open end
- Screw driver.
- Pencil.

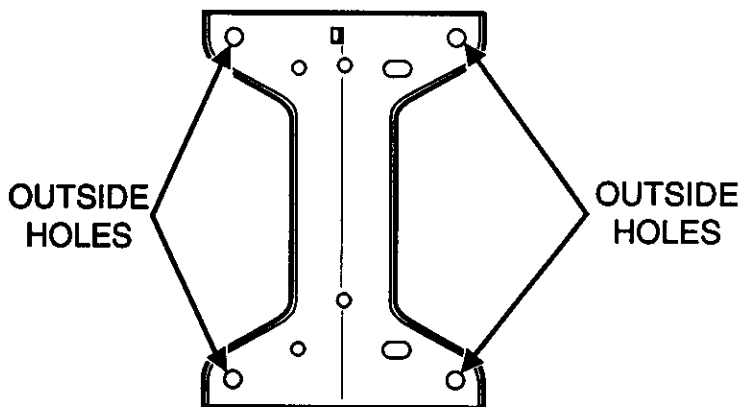


Figure 38, Mounting DSS foot and Mast Assembly to a Cinder Block Wall

Cinder blocks can come in a variety of sizes. These sizes vary in length and in the number of cores, or cavities, in the block. The block sizes are: three core (8" x 8" x 16"), two core (8" x 8" x 16"), and a smaller two core (8" x 8" x 12"). In many areas, the two core 16" block is the most common.

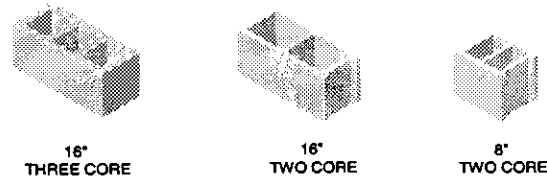


Figure 39, Types of Cinder Block

To install the DSS foot on a cinder block wall, you want to use some type of hollow wall anchor (we recommend the use of togglers) that will mount in the core of the cinder block. It is recommended that you use four anchors in the outside holes of the mounting foot.

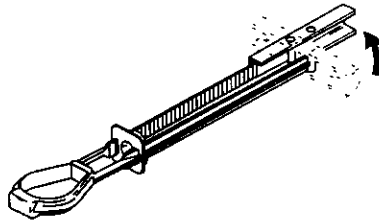


Figure 40, Toggler Type of Wall Anchor

When installing wall anchors in a cinder block wall, it is important to position them in the cores of the block. Figure 41 shows the optimum location for the mounting foot on a 16" two core block. In this position, the center of the foot aligns with center wall of the cinder block and the four outside holes of the foot land in the cores of the block. To position the foot on the wall, measure 7-1/2" from the edge to the center of a block. Center the foot at that location.

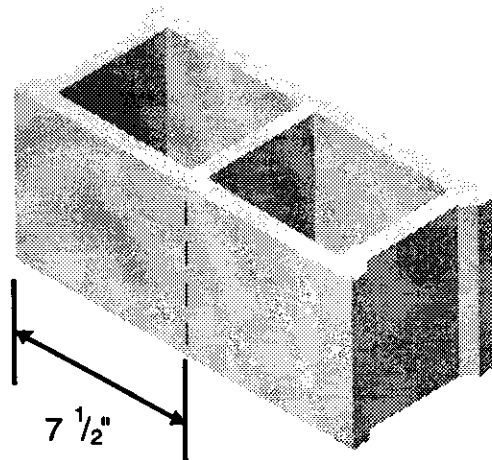


Figure 41, Locating Wall of Two Core Cinder Block

Installing the Mounting Foot on a Cinder Block Wall Using Toggles:

DANGER!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with power lines, lights, and circuits may prove fatal.

1. Select a mounting location. Remember to position the foot so the outside holes align with the hollow cores of the cinder block.
2. Hold the mounting foot in position and, using a pencil, mark one of the outside holes.
3. Remove the mounting foot. Then drill a 1/2" hole at the location just marked.
4. Install a toggler wall anchor.

Toggler Installation Steps:

- 4.1. Insert the metal channel end of the toggler into the hole. To do this, hold the metal channel alongside the plastic straps and slide it through the hole.

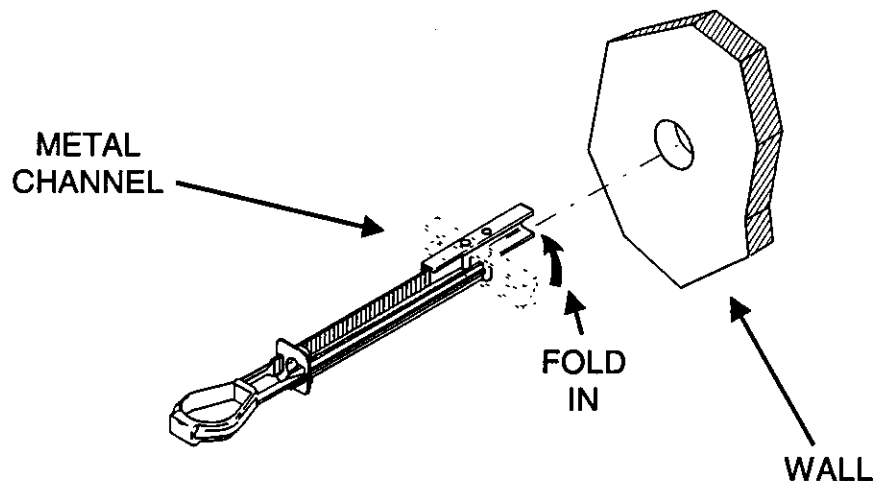


Figure 42, Toggler Installation Step 1

- 4.2. With one hand, pull the ring so the metal channel rests flush behind wall. With the other hand, slide the plastic cap along the straps until the flange of the cap is flush with the wall.

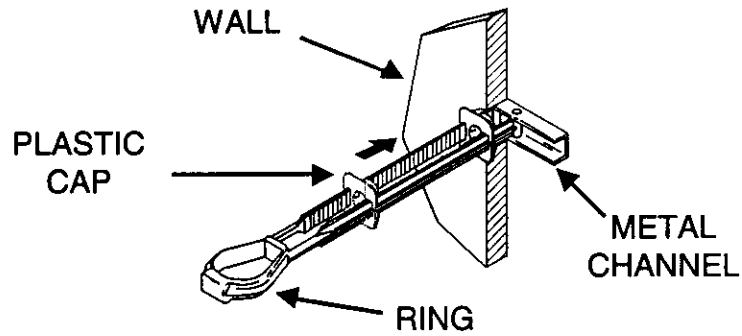


Figure 43, Toggler Installation Step 2

4.3. Place thumb between plastic straps. Push side to side snapping off straps flush with wall.

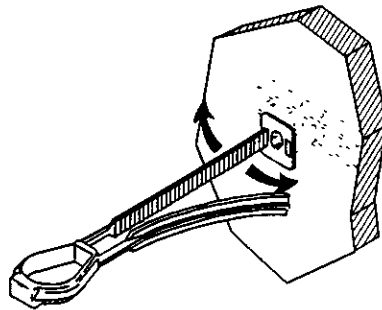


Figure 44, Toggler Installation Step 3

5. With the 1/4" x 20" x 1-1/2" machine screw and 1/4" washer, attach the mounting foot to the wall. This screw should be tightened until the mounting foot is snug against the wall (Do not overtighten).

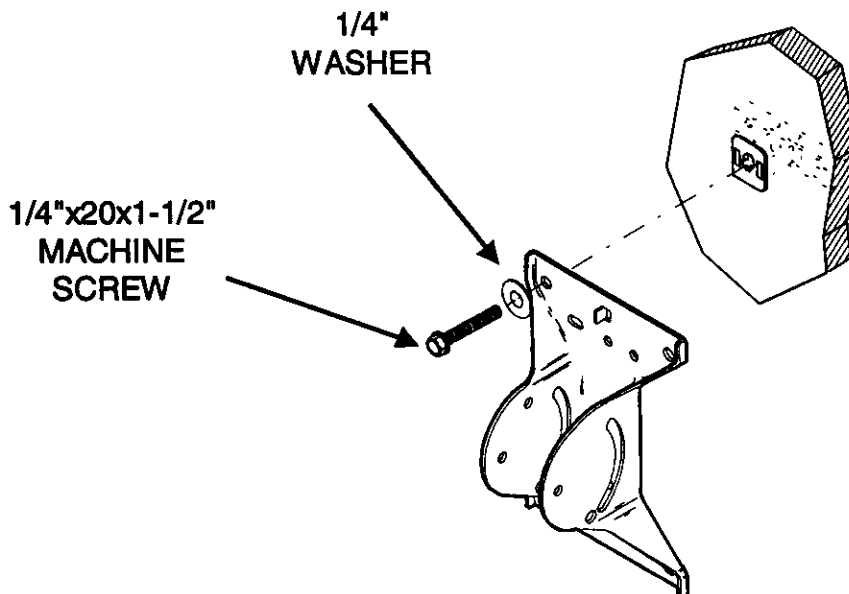


Figure 45, Attaching Mounting Foot to Wall

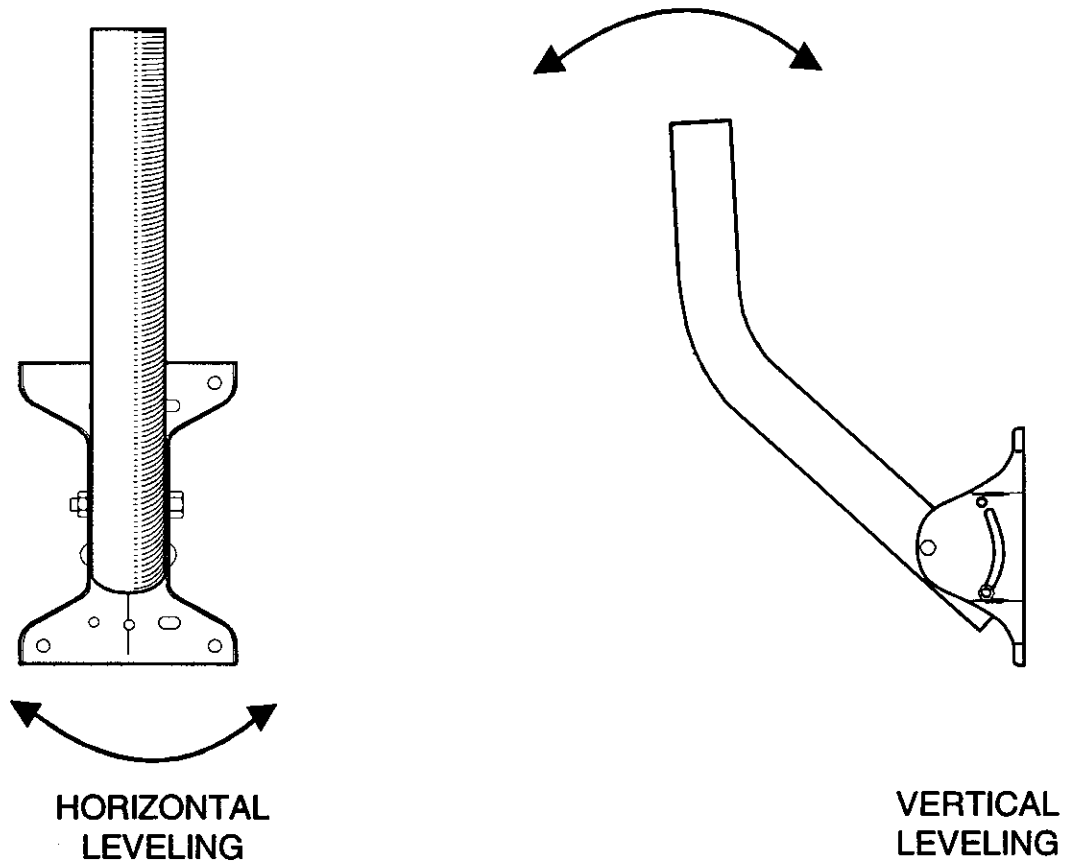


Figure 46, Horizontal and Vertical Leveling

6. Horizontally level the mast with a bubble level or plumb line.

To level the mast horizontally with either a bubble or plumb line, place them on the mast at an perpendicular angle to the wall. If you are using a bubble level, move the bottom of the mounting foot to center the bubble in the window of the level. If you are using a plumb line, move the bottom of the mounting foot until the line hangs parallel with the mast. Then, with a pencil, draw line from the center line of the lower foot onto the wall. For a detailed procedure on horizontal leveling, see pages 35 of this manual.

7. Align the center mark of the mounting foot with the line drawn in the horizontal level procedure, With a pencil, mark the remaining three outside holes.
8. Remove the mounting foot. Then drill three 1/2" holes at the locations just marked.
9. Install a wall anchor in each hole.
10. Use four 1/4" x 1-1/2" machine screws and 1/4" washers to attach the mounting foot to the wall. Tighten all four of these screws.
11. Vertically Level the dish.

First loosen the bolts on the mounting foot securing the vertical adjustment. Place the level, or plumb line, on the mast at an parallel angle to the wall. If you are using a bubble level, move the mast vertically to center the bubble in the window of the level. If you are using a plumb line, move the mast vertically until the line hangs parallel with the mast. Then, tighten the two mounting bolts securing the mast to the mounting foot. For a detailed explanation of vertical leveling, see page 35 of this manual.

12. Check tightness of all bolts and proceed to the Assembling the Dish Components section.

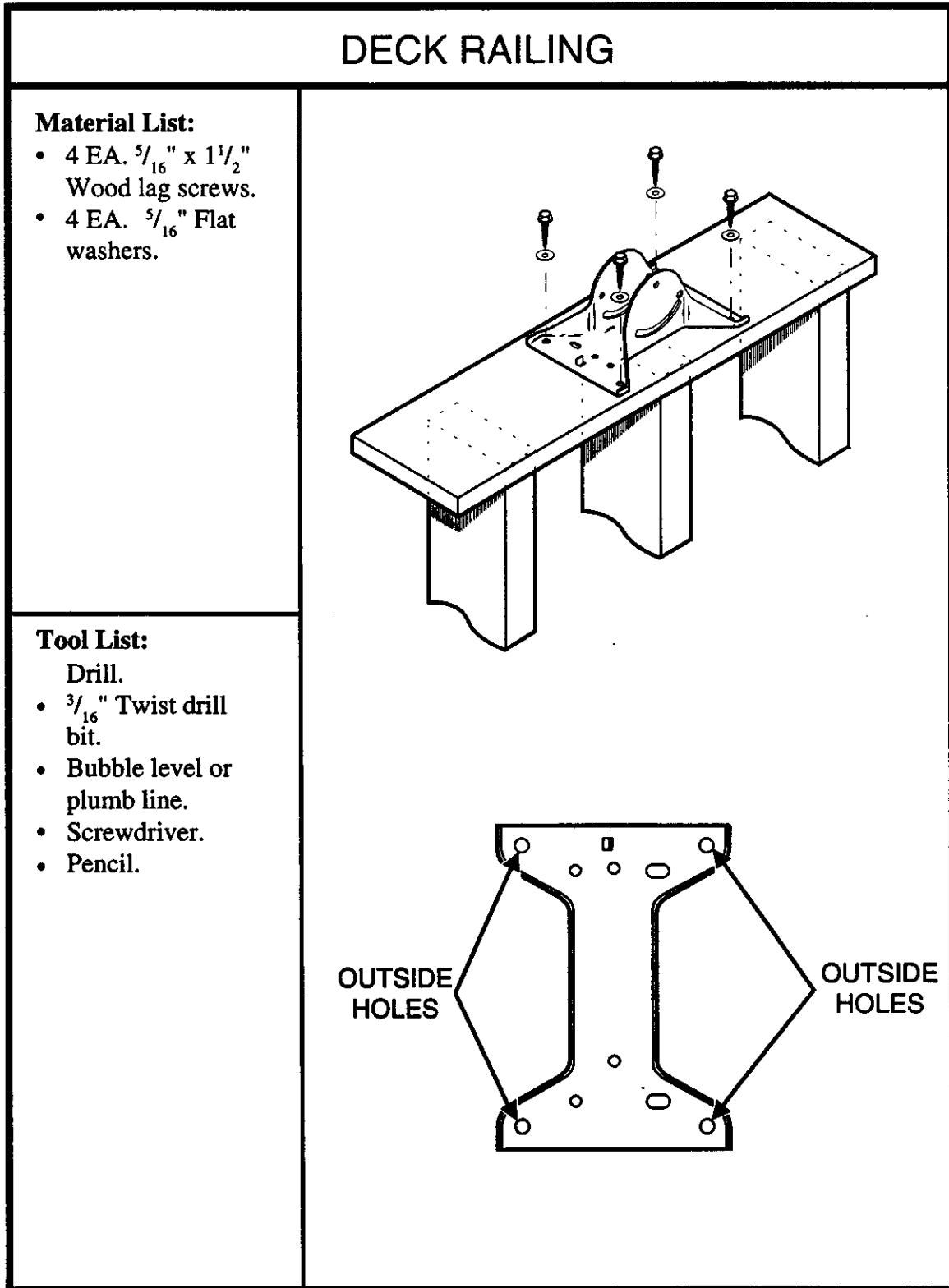


Figure 47, Mounting DSS Foot and Mast Assembly to a Deck Rail

**Horizontal
Mounting
Systems**

When selecting horizontal mounting surface for the DSS dish, select one that is both structurally sound and offers some protection from traffic. Do not position the dish where it may be used as a hand rail or have objects hung from it. Deck railings and floors are examples of good mounting surfaces for the system if the right location is chosen.

The type of mounting material the system mounts to, determines the number and location of the bolts used to secure the system. For example, if you mount the foot to a 2 x 4 or 2 x 6 board, you may want to use two 1/4" screws in the center holes. If you are mounting the foot to 3/4" plywood, you will want to use four screws in the outside holes.

Use the following procedure to install the DSS foot on a deck rail with four screws:

DANGER!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with power lines, lights, and power circuits may be fatal.

1. With a bubble level, check the level of the mounting surface. While doing this, check several different angles. Mark the direction with the most angle to it.
2. Position the foot and mast assembly on the mounting surface aligning the foot adjustment with the direction marked in step one. If the width of the mounting surface does not permit this, select a different site.
3. With the foot in position, mark the four outside holes.
4. Remove the foot and drill 3/16" pilot holes in the marked locations.
5. With four 5/16" x 1-1/2" lag bolts and washers, secure the foot to the mounting surface.
6. Using the adjustment on the foot, level the mast.
8. Tighten all bolts on and foot and mast before proceeding to the assembling the dish section.

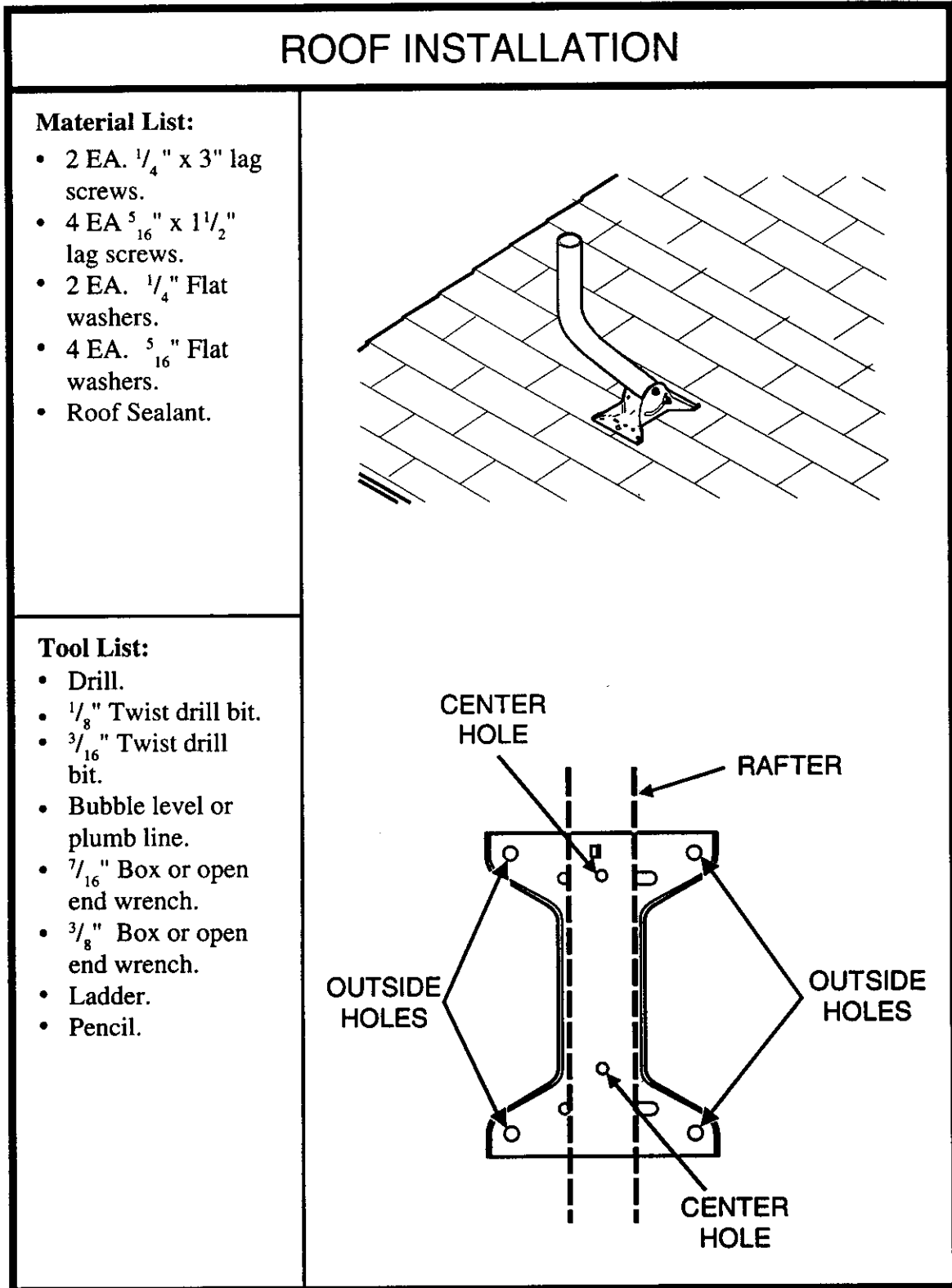


Figure 48, Mounting Foot and Mast Assembly to a Roof

Do a roof installation only if there is no other mounting option for that installation site. This is due to the difficulties of installing a satellite dish on a roof. These difficulties include damaging the roof by walking on it or causing leaks by not correctly sealing the mounting holes. These problems increase with the age of the roof and the type of roofing materials.

If you do install the dish on a roof, do it only on asphalt type shingles. Do not mount the dish on wooded shake or slate shingles. Also, do not mount the dish over the overhang of the roof. Finally, due to the different construction materials under a shingle roof, always secure the mounting foot to a rafter.

Use the following procedure to install the dish on a roof:

DANGER!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with power lines, lights, and power circuits may prove fatal.

1. Locate a rafter near the mounting location of the foot.

There are several methods to locate the rafters under the roof surface. One of the simplest is using the nails that hold the facing board of the roof as a reference. On most roofs, a facing board covers the end of the rafters. This board connects to the roof by nails driven through it into the rafters.

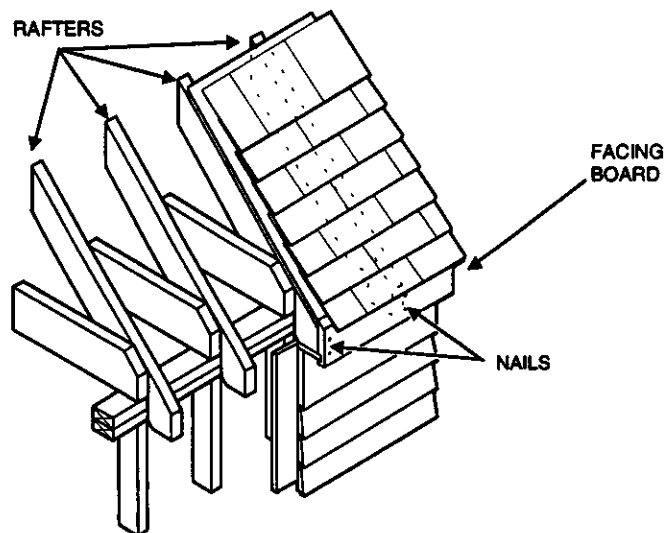


Figure 49, Locating Rafters

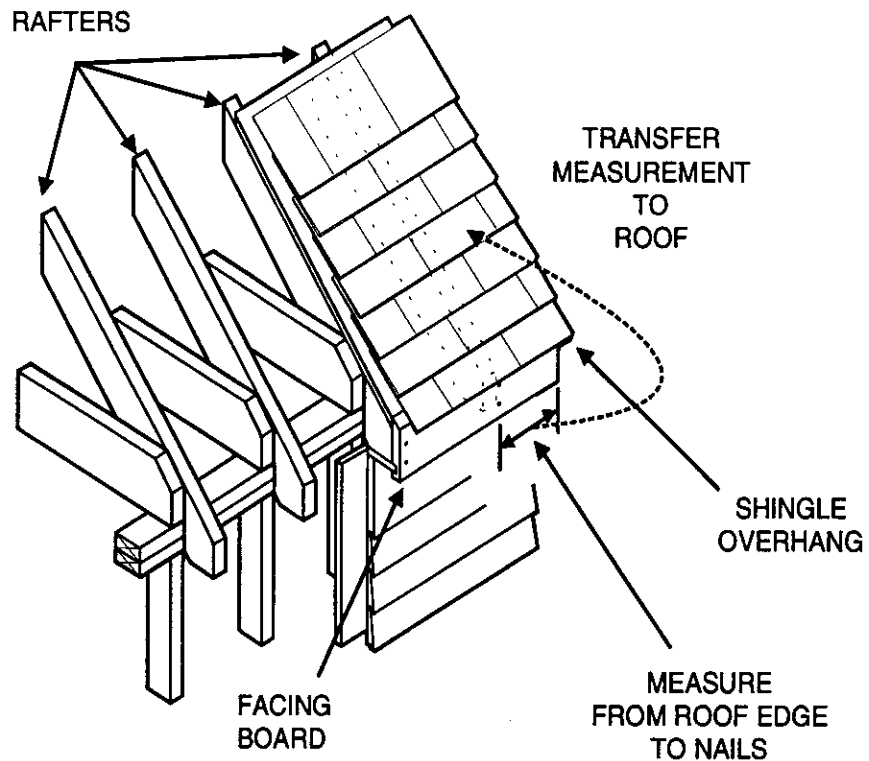
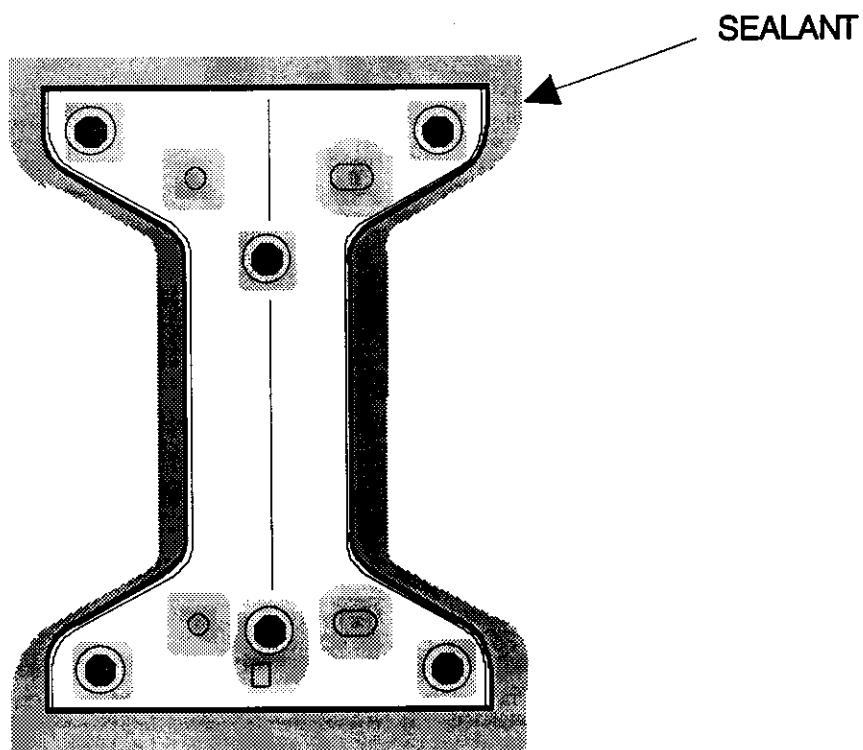


Figure 50, Locating Rafters

To locate the rafter near the mounting site, look at the facing board near the site. Locate the closest nails securing the facing board. Measure from the edge of the roof to the nails and record that distance. To find a rafter near the mounting location, transfer the previous measurement to the roof. Be sure to include any shingle overhang in your measurements.

Other methods of locating rafters include tapping on the roof and listening to the sound or climbing into the attic space and finding a reference point that can be located on the roof. Regardless of the method you use, the goal should be to find the center of the rafter and drill as few holes in the roof as possible.

2. Position the mounting foot so that the center two holes align with the center of the rafter.
3. Mark the two center holes (the mast may need to be repositioned for marking of the second hole).
4. Drill two 1/8" holes in the locations marked. Fill each hole with a small amount of roof sealant.
5. Attach the mounting foot to the roof with two 1/4" x 3" wood type screws and washers.
6. With a 3/16" drill bit in the drill, drill four pilot holes in the outside holes of the mounting foot. Fill each hole with a small amount of roof sealant.
7. Insert four 5/16" x 1-1/2" with washer into these holes.
8. With a roof type of sealant, seal the mounting foot to the roof. When applying the sealant, seal the areas marked in figure 51.
9. With a 7/16" wrench and bubble level, level the mast with the adjustment on the mounting foot.



SEAL ALL EDGES AND HOLES

Figure 51, Sealing Roof

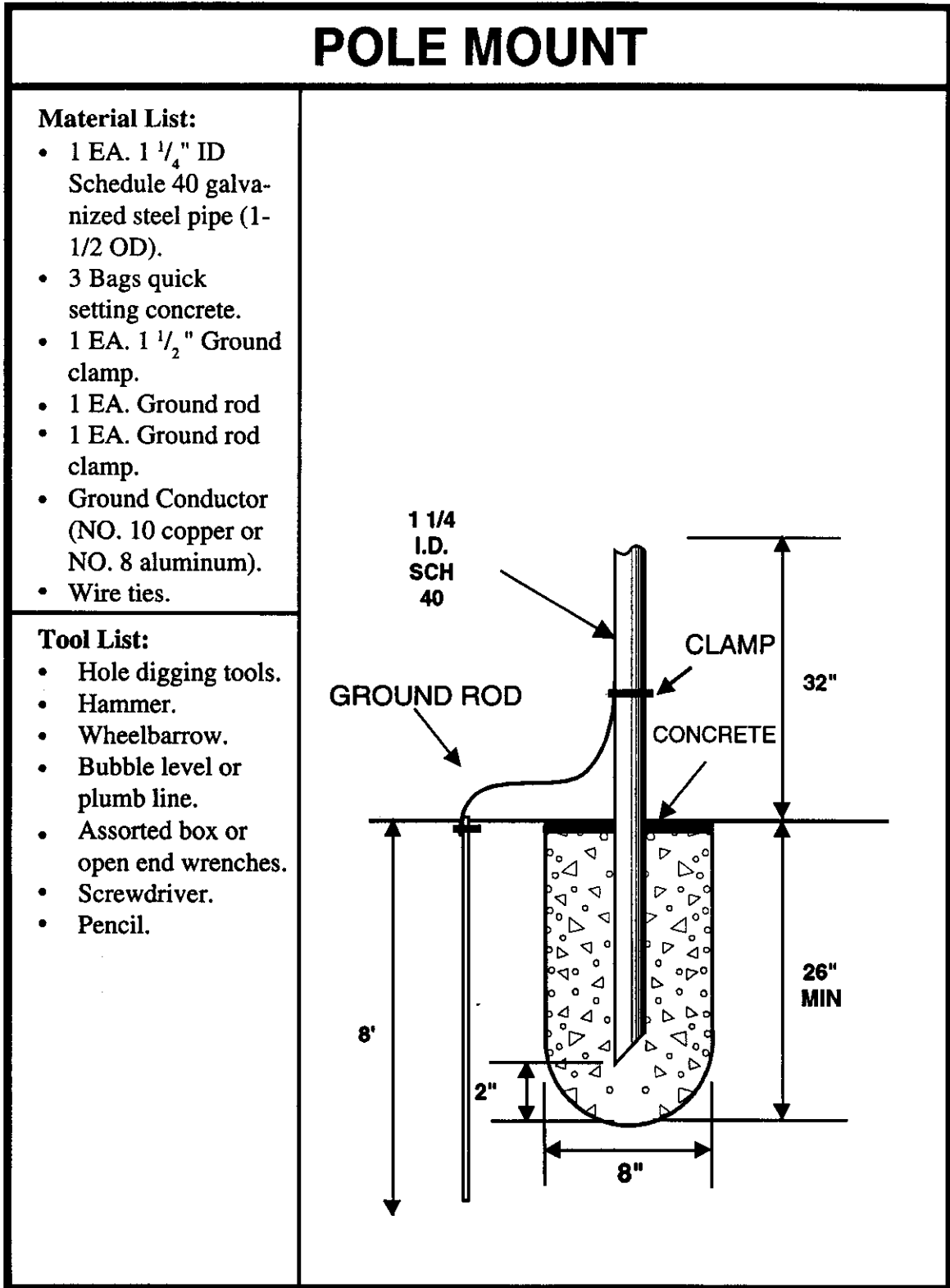


Figure 52, Pole Mounting DSS Dish

In this mounting system, a pole replaces the foot and mast assembly supplied with the DSS dish. This pole is placed in a hole and secured in the ground with concrete. The dish is held on the pole by the clamp of the LNB support arm. This clamp fits over the pole.

Before installing the dish on a pole, carefully read the following:

- Have the local utilities locate the power, telephone, cable, water, and sewer lines in the area before you do any digging.
- Components of the pole mount system, such as the pole and concrete, are not included in the basic installation outlined by Thomson Consumer Electronics.

To fit in the LNB support arm holder, the pole must have a 1-1/2" outside diameter. Pole and pipe sizes are measured by inside diameter and wall thickness. To obtain a pole with the correct outside diameter, look for a pole with an 1-1/4" inside diameter and a schedule 40 wall thickness.

The length of the pole varies with the depth of the hole and the height of the dish above ground. The depth of the hole must be enough to support the dish (a minimum 26") and extend at least 6" below the frost line. For most installations, a pole length of 6' is sufficient. This allows for a hole at least three feet deep and positions the dish three feet above the ground. In most areas in the Continental United States, a hole three feet deep will extend below the frost line.

One important step of a pole mount installation is grounding. Local electrical codes and the National Electrical Code require that the dish be connected to a grounding electrode. This rule applies to a pole mount system. The small area covered with dirt in a pole mount system does not satisfy the requirements of a grounding electrode. Therefore, connect the pole or mounting foot to a proper ground electrode (see appendix C of this manual for a list of grounding electrodes).

Use the following steps to install the DSS dish on a pole:

DANGER!

When Following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with these items and circuits may prove fatal.

1. Dig a 8" diameter hole at least 26" deep.

CAUTION:
Before you dig, call your local utility and phone company for help in locating underground utility lines.

2. With a hack saw, cut bottom edge of the pole to about a 45°. This prevents the pole from rotating in the concrete over time.

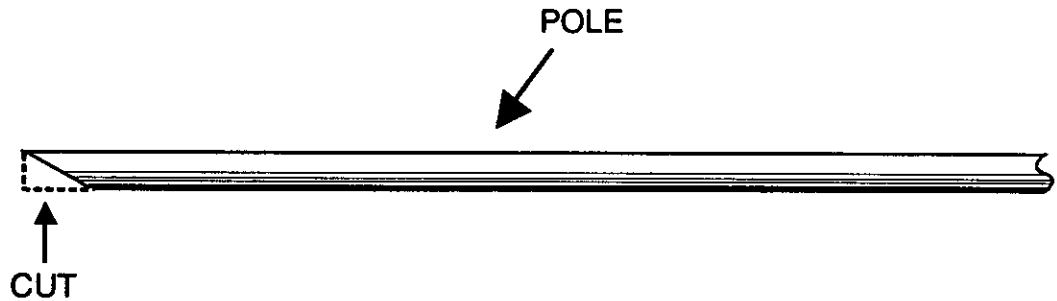


Figure 53, Cutting Bottom of Pole at an Angle

3. Place the pole in the hole and fill the hole with just enough dirt, or small stones, to hold it upright.
4. Level the mast.
To do this, use a bubble level or plumb line. Measure the level of the mast in at

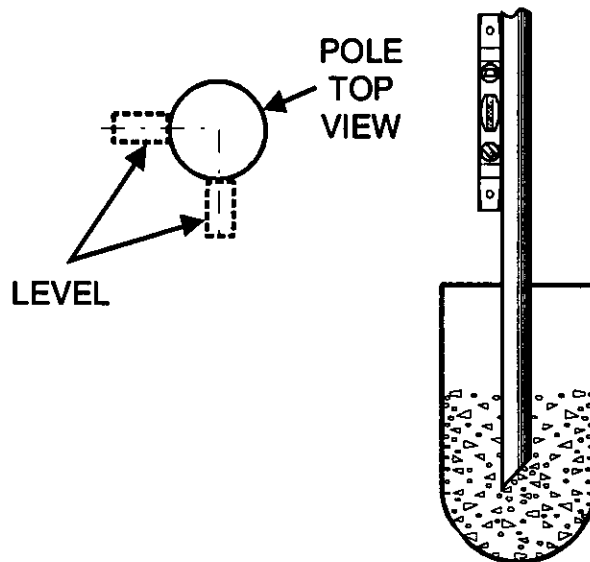


Figure 54, Leveling Pole

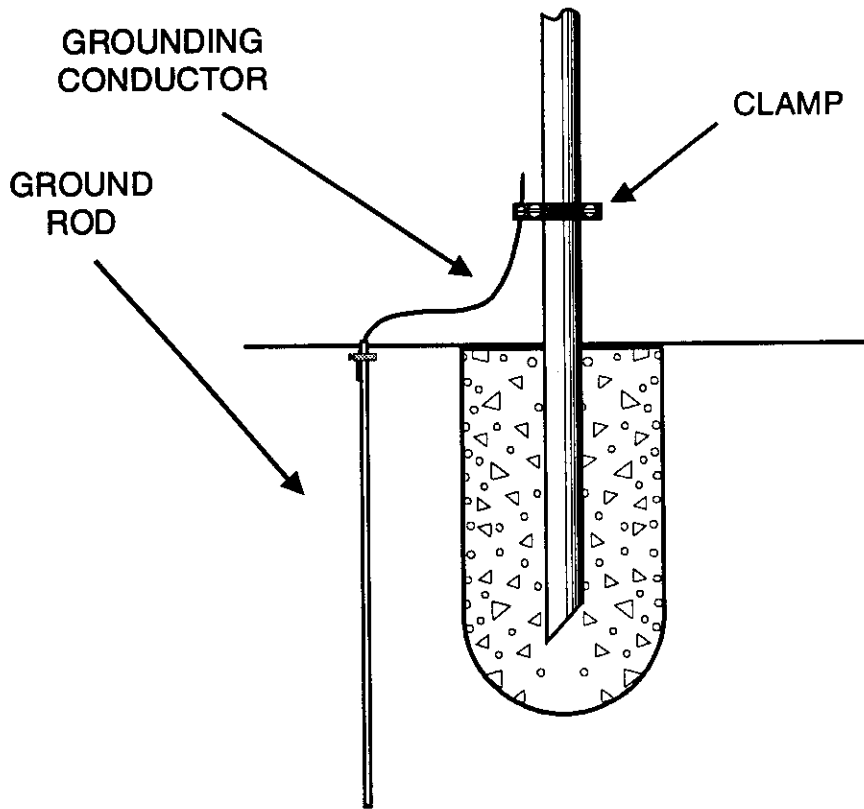


Figure 55, Grounding Pole

least two different locations on the side of the pole. These two measurements should be at right angles to each other.

Note: The dirt or stone placed in the hole in step two should hold the pole upright. If not, attach guy wires to the pole to keep it upright.

5. With prepared quick drying cement, fill the hole. Stop filling when the cement level is about two inches from the top of the hole.
6. Connect the pole to the grounding electrode.
Using a ground clamp, connect the grounding conductor to the pole. Then route the ground conductor to the grounding electrode. Connect the ground conductor to the ground electrode. A detailed list of grounding electrodes and how to connect to them is given in appendix C.
6. Let the cement completely dry before proceeding with mounting the dish to the pole.

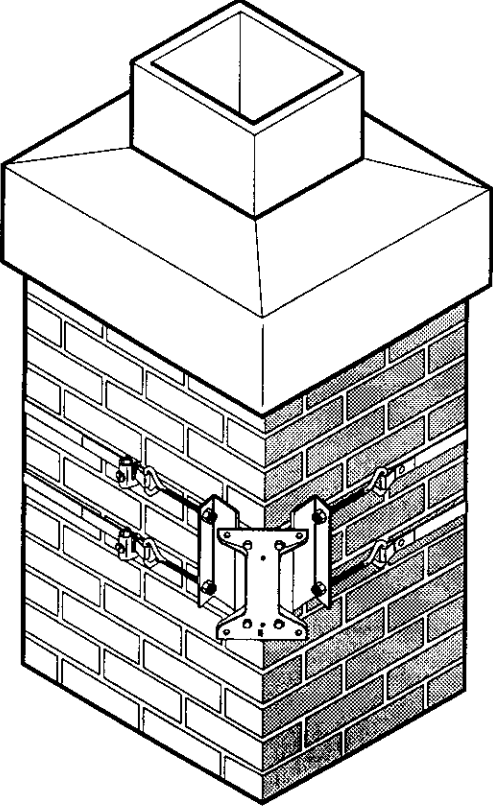
CHIMNEY INSTALLATION	
<p>Material List:</p> <ul style="list-style-type: none">• 1 EA. RCA D915 chimney mount kit.	
<p>Tool List:</p> <ul style="list-style-type: none">• Bubble level or plumb line.• $\frac{7}{16}$" Box or open end wrench.• Ladder.	

Figure 56, Chimney Mount Installation

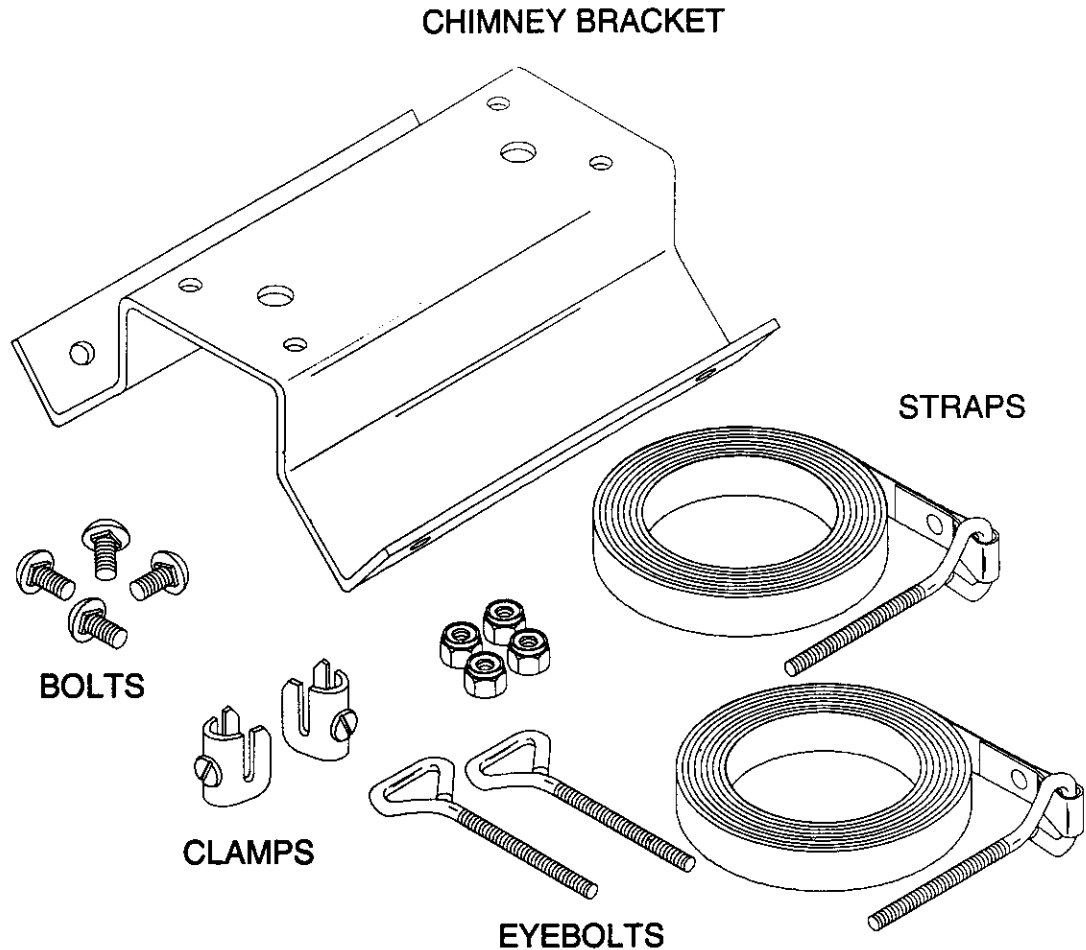


Figure 57, RCA (D915) Chimney Mount Kit

To mount the dish on a chimney requires the use of the chimney mount kit (RCA model number D915) and the foot and mast assembly included with the dish. The chimney mount kit includes a bracket, straps (2EA), eye bolts (2EA.), clamps (2 EA), and bolts (4 EA.). Confirm the presence of these pieces before starting the installation.

CAUTION!

Only use the chimney mount on structurally sound chimneys. Unstable chimneys can be damaged easily by the vibrations placed on them from the dish.

When mounting the dish on a chimney, make every attempt to keep it out of the soot and smoke coming out of the chimney. The chemicals in this smoke may prematurely corrode the dish reducing its life. To reduce the amount of smoke striking the dish, position it below the top of the chimney. Also, if possible, position the dish on the prevailing wind side of the chimney.

Before climbing a ladder, assemble the chimney mount kit. To do this, use the following steps:

1. From the chimney mount kit, locate the straps and chimney bracket. Each metal strap in the chimney mount kit has a pre-attached eyebolts. Insert both strap's eyebolts in the appropriate hole in the chimney bracket.
2. Thread a nut on the eyebolts and tighten it to about 1/2" from the end of the eyebolt.
3. Repeat steps 1 and 2 for the second metal strap.
4. Locate the remaining eyebolts in the chimney mount kit. Insert these eyebolts in the chimney bracket.
5. Thread a nut on the eyebolts and tighten to about 1/2" from the end of the eyebolt.
6. Locate the foot and mast assembly. Align the mounting foot's four outside holes with the four holes of the chimney bracket.

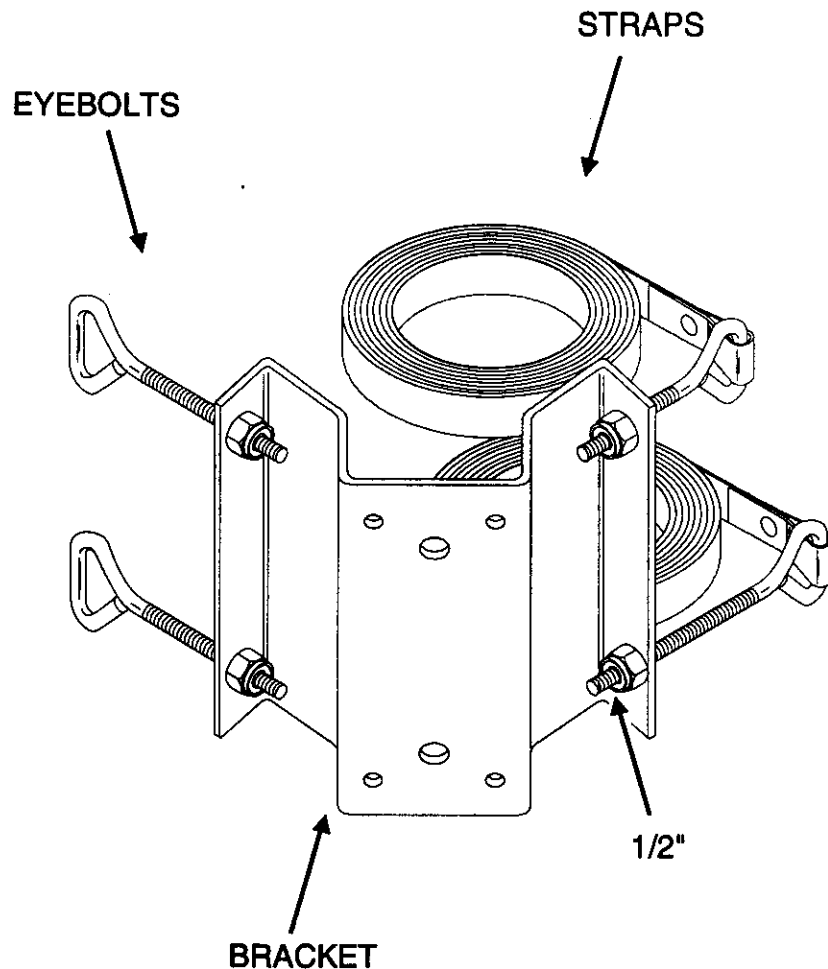


Figure 58, Assembly of Chimney Mount Kit Steps 1 through 5

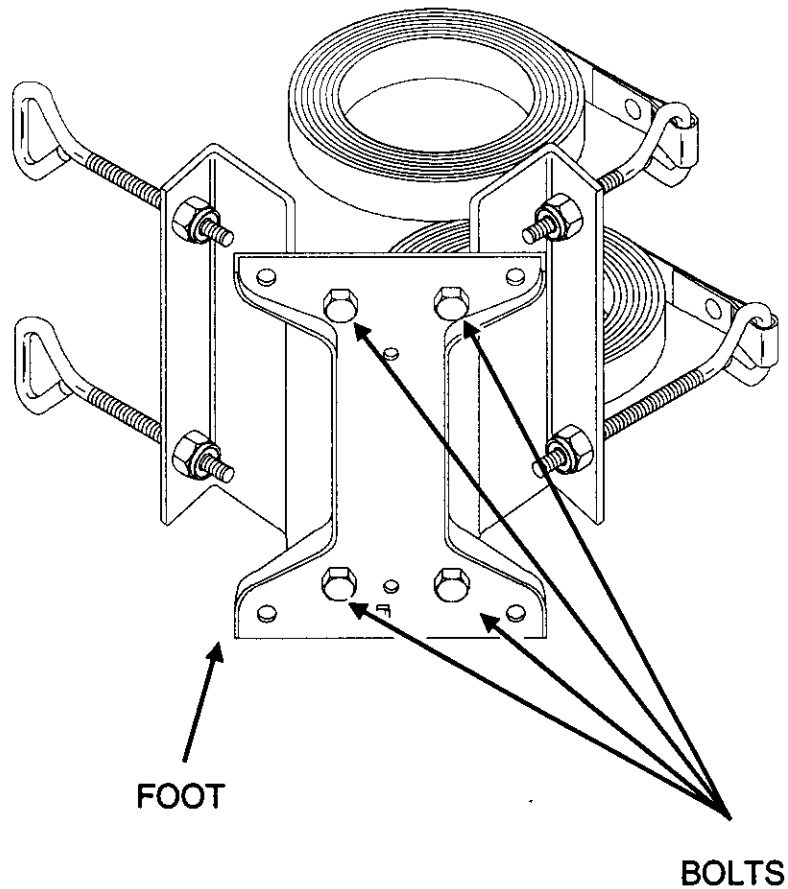


Figure 59, Assembly of Chimney Mount Kit Steps 6 and 7

7. Secure the mounting foot to the chimney bracket with the four bolts supplied with the chimney mount kit.

With the chimney mount assembled, install the mount on the chimney. Use the following steps to do this:

1. Place the chimney bracket on the corner of the chimney as shown.

Danger!

When following these instructions, take extreme care to avoid contact with overhead power lines, lights, and power circuits. Contact with these items and circuits may prove fatal.

2. Stretch one metal strap around the chimney. Do not allow the strap to twist.
3. Pull the strap tight around the chimney. Make sure the strap is horizontal all the way around.
4. Insert the free end of the strap through the eyebolt supplied with the kit. Then, attach the strap clamps as shown below.

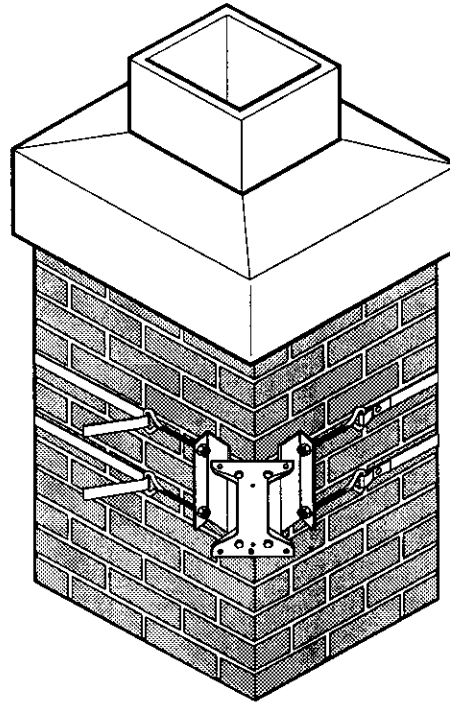


Figure 60, Attaching Mount to Chimney

5. Tighten the strap around the chimney by tightening its eyebolts.
6. Repeat steps 1 through 5 of this procedure to attach the second metal strap.

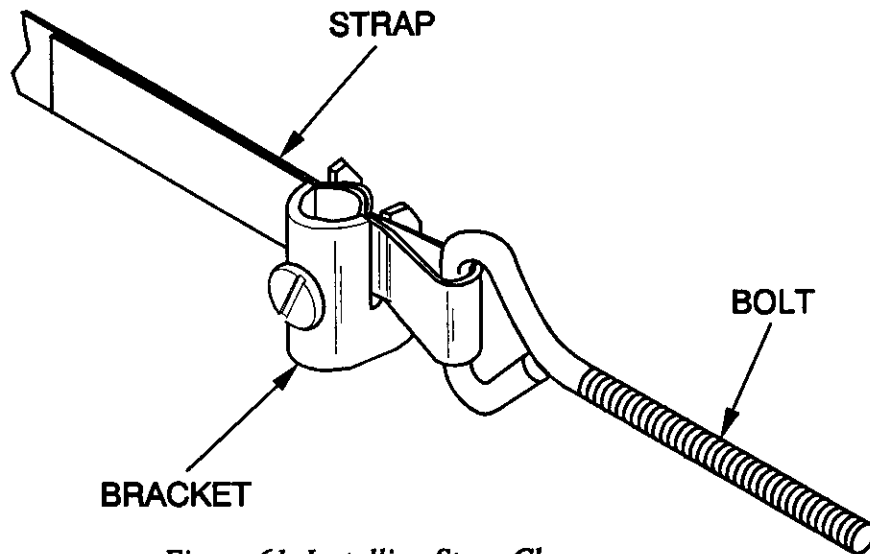


Figure 61, Installing Strap Clamps

7. With the mounting foot adjustment, vertically level the mast.

To do this, place the level, or plumb line, on the mast at an perpendicular angle to the chimney. If you have not loosened the two bolts securing the azimuth adjustment on the mounting foot, do it now. If you are using a bubble level, move the mast vertically to center the bubble in the window of the level. If you are using a plumb line, hold the string of the plumb line over the top of the mast so it hangs at a perpendicular angle to the mounting surface. Move the mast vertically until the plumb line hangs parallel to the side of the mast. Tighten the two mounting bolts securing the mast to the mounting foot. For a more detailed description of this procedure, see the Leveling the Dish section of this manual.

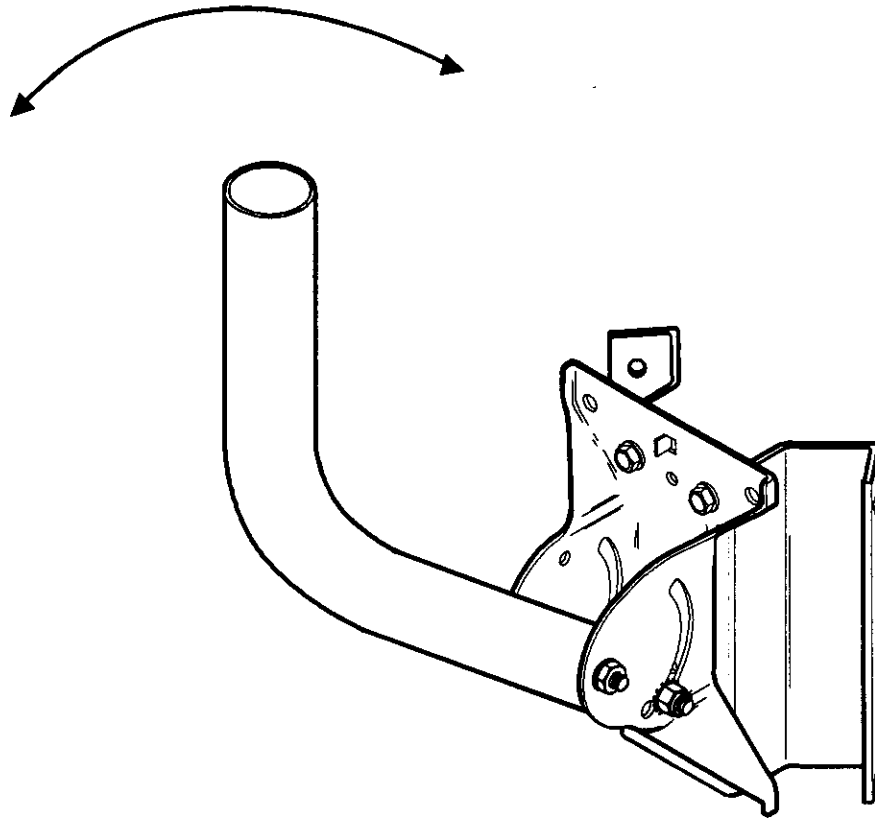


Figure 62, Vertically Aligning the Mast On a Chimney

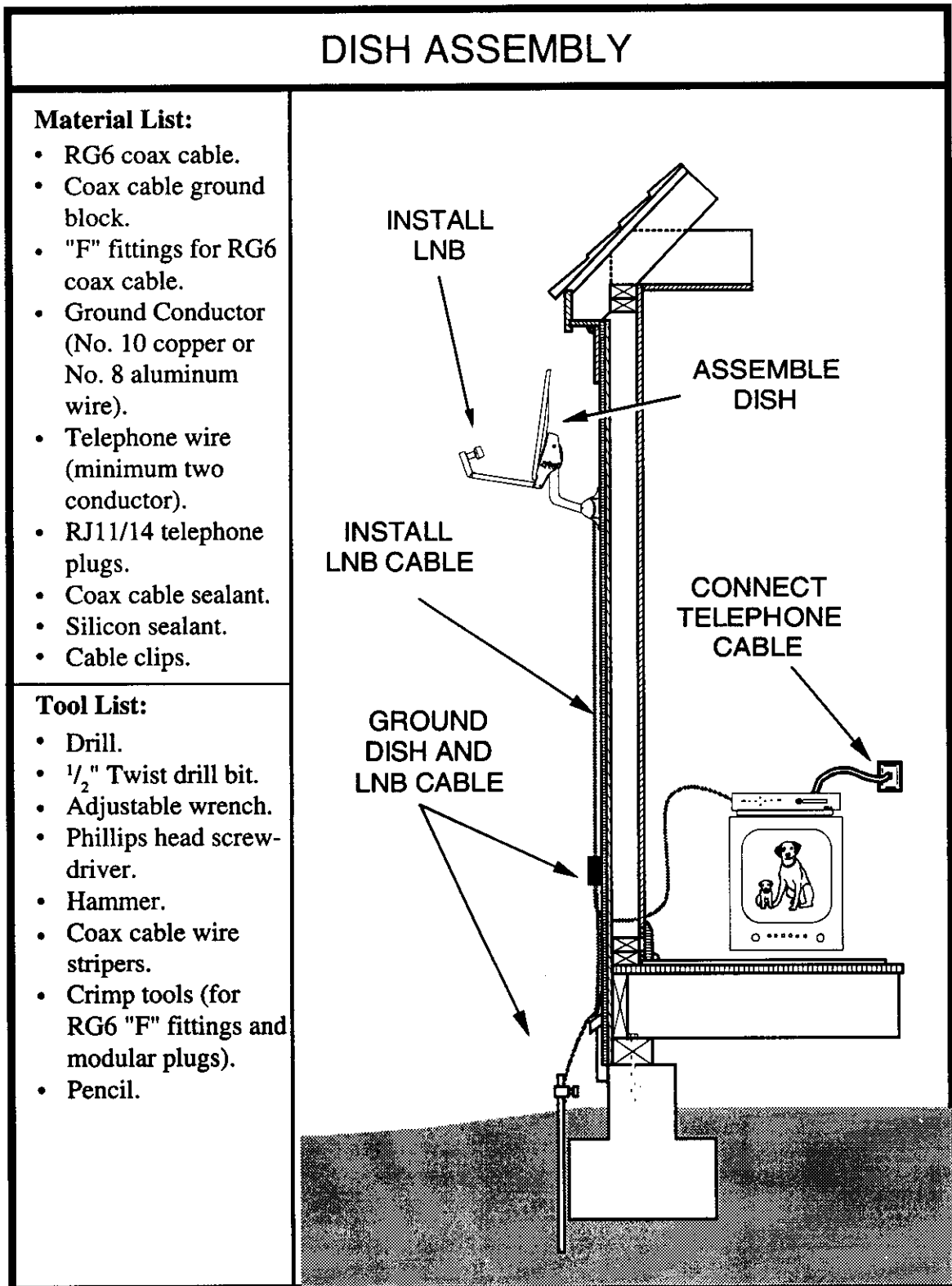


Figure 63, Assembling the Dish

This section uses four steps to assemble the different components of the DSS dish antenna. The first and second steps are assemble the dish and install the LNB cable. The third step explains the installation of the LNB. This includes connecting the LNB cable to the LNB and fastening the LNB to the dish. Finally, the fourth step points out the basics of installing a telephone cable. Once these steps are complete, all that remains to finish the installation is to point the dish at the satellites.

Assemble the Dish

Dish Assembly

In this part of the assembly, attach the dish to the LNB support arm. In most installations the location of the dish will be high above ground. In these cases, a ladder will generally be needed. To make assembly easier and prevent multiple trips up and down a ladder, do most of the assembly work on the ground. When the basic assembly is complete, lift the dish onto the mast.

Use the following steps to attach the dish to the LNB support arm:

1. Locate the dish, LNB support arm, and the four pan head bolts.

Note: The DSA400RW dish antenna uses a SMC dish with mounting studs molded into the SMC material.

2. Place the dish on the LNB support arm bracket aligning the four holes of the dish with the holes in the support arm.

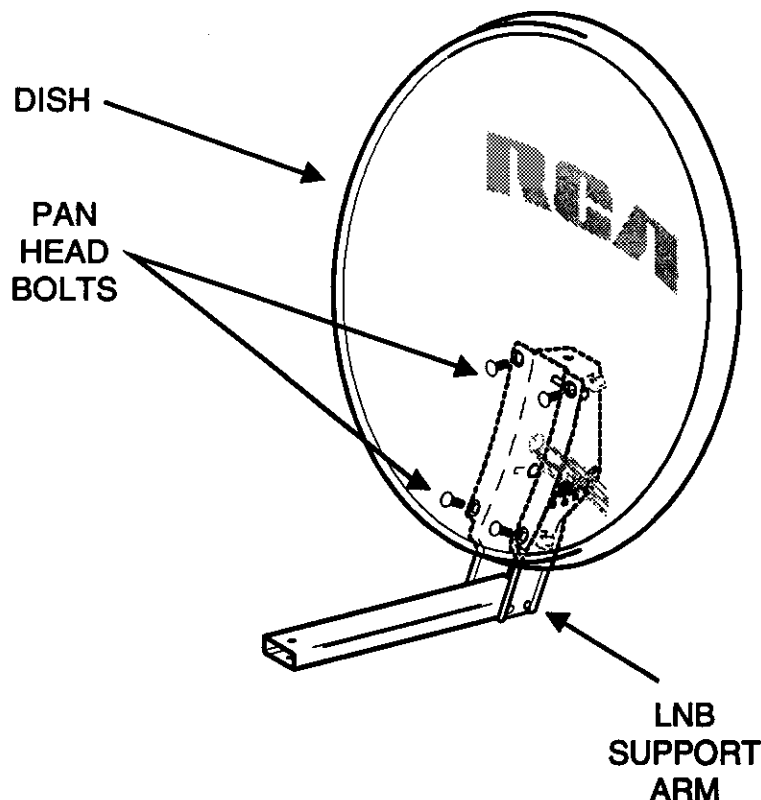


Figure 64, Attach Dish to LNB Support Arm

3. Insert a pan head bolt into one of the holes. Thread a nut onto this bolt.
4. Align the remaining three holes and nuts and bolts in each.
5. With a 7/16" wrench, tighten all four bolts. When tightening, use your thumb to hold the heads of the pan head bolts flat on the dish.
6. Mount the dish on the mast assembly. To do this, slide the mast clamp of the LNB support arm over the mast. At this point do not tighten the azimuth bolts.

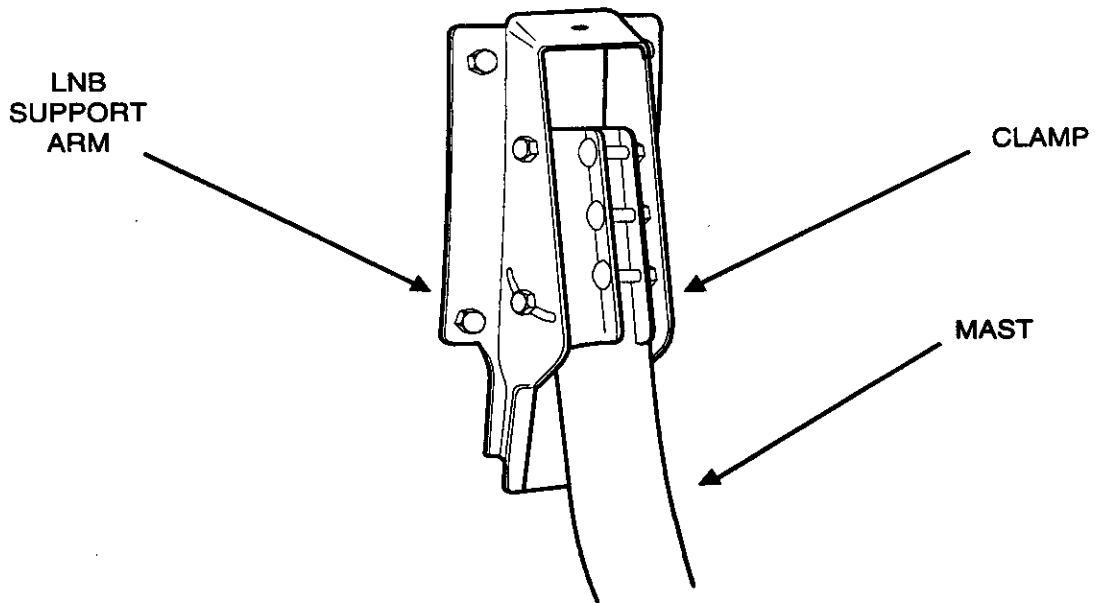


Figure 65, Mount Dish On Mast Assembly

Installing the LNB Cable

Depending on the installation site and the type of system installed, there may be up to three cables run into the home during the installation. If you are installing the basic system, there may be up to two cables. One cable is from the dish and carries the LNB signal to the receiver. The second cable is a telephone cable. If you are installing the deluxe system, two cables carry LNB signals to two different receivers while the third cable is a telephone cable. The following explanation describes the installation of a basic system. The installation of an advanced system is the same except for the addition of one LNB cable. A description of the telephone cable installation appears later in this manual.

The LNB cable carries signals from the LNB to the receiver. These signals are in the frequency range of 950 to 1450 MHz. It requires a cable with low signal loss to carry signals in this frequency range. A poor quality cable may allow noise to enter the system, reducing its performance. Minimum specifications for the LNB cable are:

Specification	Rating	General Comments
Cable Type	RG6	
Impedance	75 Ohms	
Shielding	Minimum Double Shield	Requires a minimum 100% foil shield covered with a 40% woven braid.
Outer Cover	PVC	Must be suitable for both indoor and outdoor use.

Figure 66, LNB Cable Specifications

Due to the frequency range of the signals carried by the LNB cable, this cable must be RG6 coax cable. RG6 cable has the correct impedance (75 ohms) and acceptable signal losses at 950 to 1450 MHz. When selecting an RG6 coax cable for the LNB signal, select a type that is double shielded with a 100% braid foil shield covered with at least 40% woven braid. If you are in an area that has a lot of RF noise, a woven braid shield of higher than 40% may be required. If you are unsure of your cable specifications, ask the cable supplier for the specifications of the cable you are using.

Depending on the routing of the LNB cable, you may want to use a type that can be buried. When normal coax cable is buried, soil decays its outer cover and shortens its life. Cables that are suitable to be buried use a special outer cover that resists breakdown. Some of these cables also place a special coating on the ground shield. This coating resists corrosion caused by water which could get in the cable. Anytime the LNB cable is buried, use cable that can be buried. It will save you problems in the future.

The goal of any cable installation should be to protect the cable from physical damage and moisture penetration. To protect the cable from physical damage, secure it to walls or any stable surface with cable clamps. This prevents the cable from sagging and being damaged by people stepping on it or running over it with yard equipment. Prevent moisture penetration by using weatherproof connectors or sealing any connection that is exposed to the elements. Drip loops add additional protection in the area of a connection. These loops stop moisture from traveling down the cable and entering the connection.

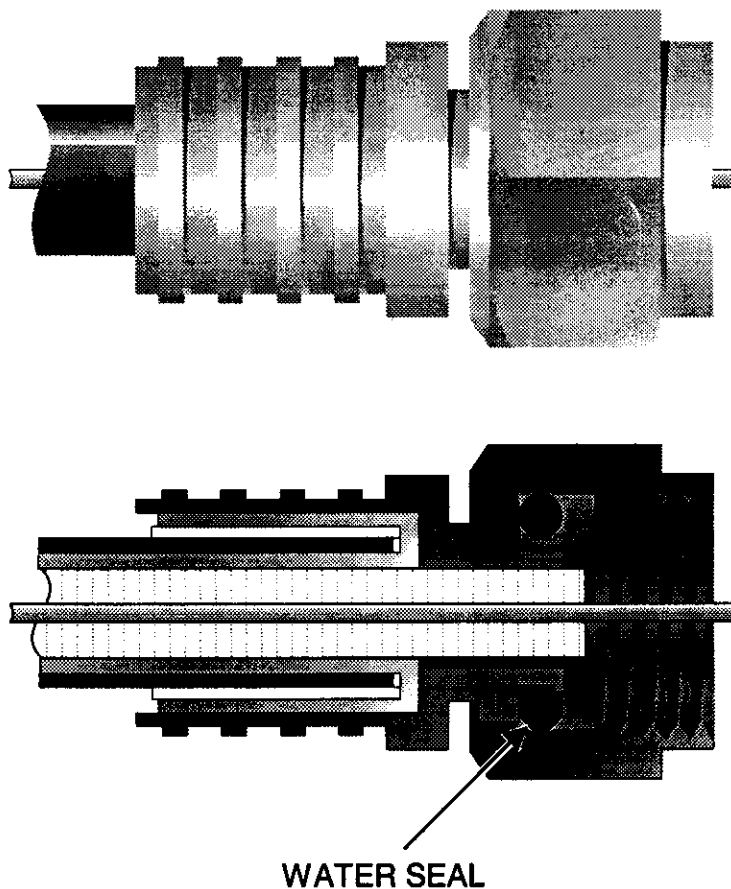


Figure 67, Weatherproof F-Fitting

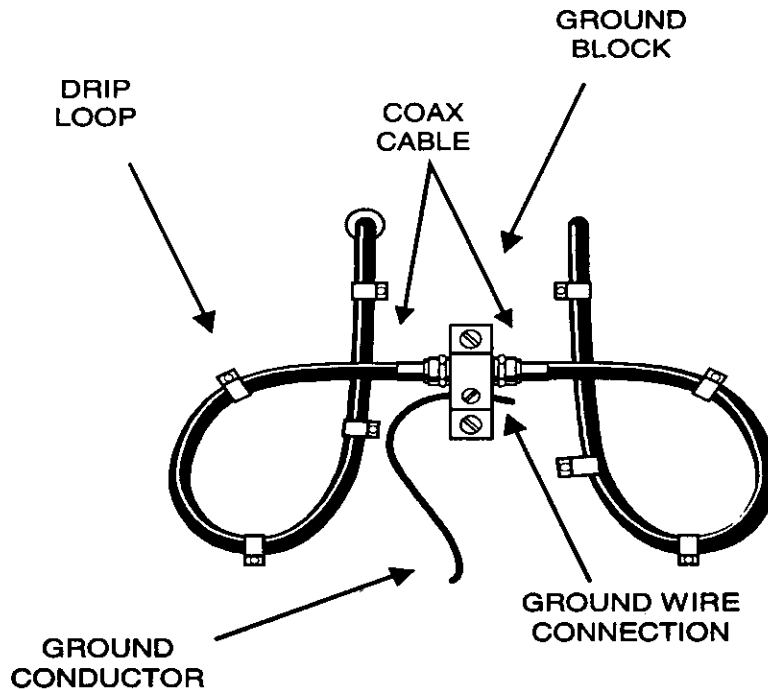


Figure 68, Coax Cable Ground Block and Drip Loops

The LNB cable supplies the signal from the LNB to the receiver. This cable also carries the DC power to the LNB from the receiver. For the LNB to receive power and operate, it is important that any splitters or amplifiers inserted in the LNB cable must pass DC.

Another important aspect of the LNB cable installation is grounding. The National Electrical Codes (Article 820-33) requires that any coax cable exposed to possible contact with lightning or power conductors must have the outer shield grounded. There also may be other rules regarding grounding in your area. It is important to consult and follow all codes and regulations in your area during the installation.

The best method of grounding the outer shield of a coax cable is with a ground block. This block is a barrel connector with a means to connect a ground conductor (like a terminal or a drilled hole and set screw). The terminal is where the outer conductor of the coax cable is connected to the grounding electrode. When installed, the ground block passes the LNB signal and DC voltages straight through it while grounding the outer conductor of the coax.

Where should the ground block be placed in the LNB cable? One factor determining the ground block location is the location of an acceptable ground electrode. The National Electrical Code specifies that the grounding conductor (the wire that runs

between the ground block and ground electrode) must be in a straight line, if possible, from the ground block to the grounding electrode. Also, splices in the conductor between the electrode and grounding block are prohibited. Article 820-33 of the National Electrical codes also states that, "Where coaxial cable is exposed to lightning . . . the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical." This can be either inside or outside the home. Therefore, when selecting a location for the grounding block, try to make the ground conductor as short and straight as possible and close to the cable entrance point into the home.

The National Electrical Code also has specifications for the size of the grounding conductor that connects to the ground electrode. This conductor must be a least a No. 10 copper wire or No. 8 aluminum wire. Insulation over the conductor wire is not required. As with any cable, the grounding conductor must be securely fastened to a surface to protect it from physical damage. If the conductor cannot be protected from damage, the size of the wire should increase to withstand any physical strain placed on it.

The National Electrical Code is also specific on acceptable ground electrodes. Some possible electrodes are:

- Grounded Interior Metal Water Piping (cold water).
- Ground Rod (must be driven at least 8 feet into the ground).
- Grounded Metallic Service Raceway.
- Grounded Electrical Service Equipment Enclosure.

There are also specific instructions for attaching the grounding conductor to grounding electrodes. For more details on this, consult the National Electrical Code handbook and any active codes in your area. Sections of the National Electrical codes that apply to the DSS system are printed in appendix C of this manual.

Use the Following Steps to Install the LNB Cable:

1. Determine the location of the ground block. Remember to position this block to allow a short and straight route for the ground conductor to the grounding electrode.
2. With two screws, secure the grounding block to a stable mounting surface.

3. Connect one end of the LNB cable to the grounding block.
4. Route the cable from the ground block to the dish mounting foot. Leave enough slack in the cable to form a 3" to 5" drip loop. Also, leave enough cable to reach the LNB from the mounting foot (about 3 feet).
5. Secure the cable with cable clips. Do not forget to form the drip loop and secure it with cable clips.
6. Install the ground conductor on the ground terminal of the coax-ground block.
7. Route the ground conductor to the grounding electrode. Remember to secure the cable to a wall or some surface to protect it.
8. Connect the ground conductor to the grounding electrode.

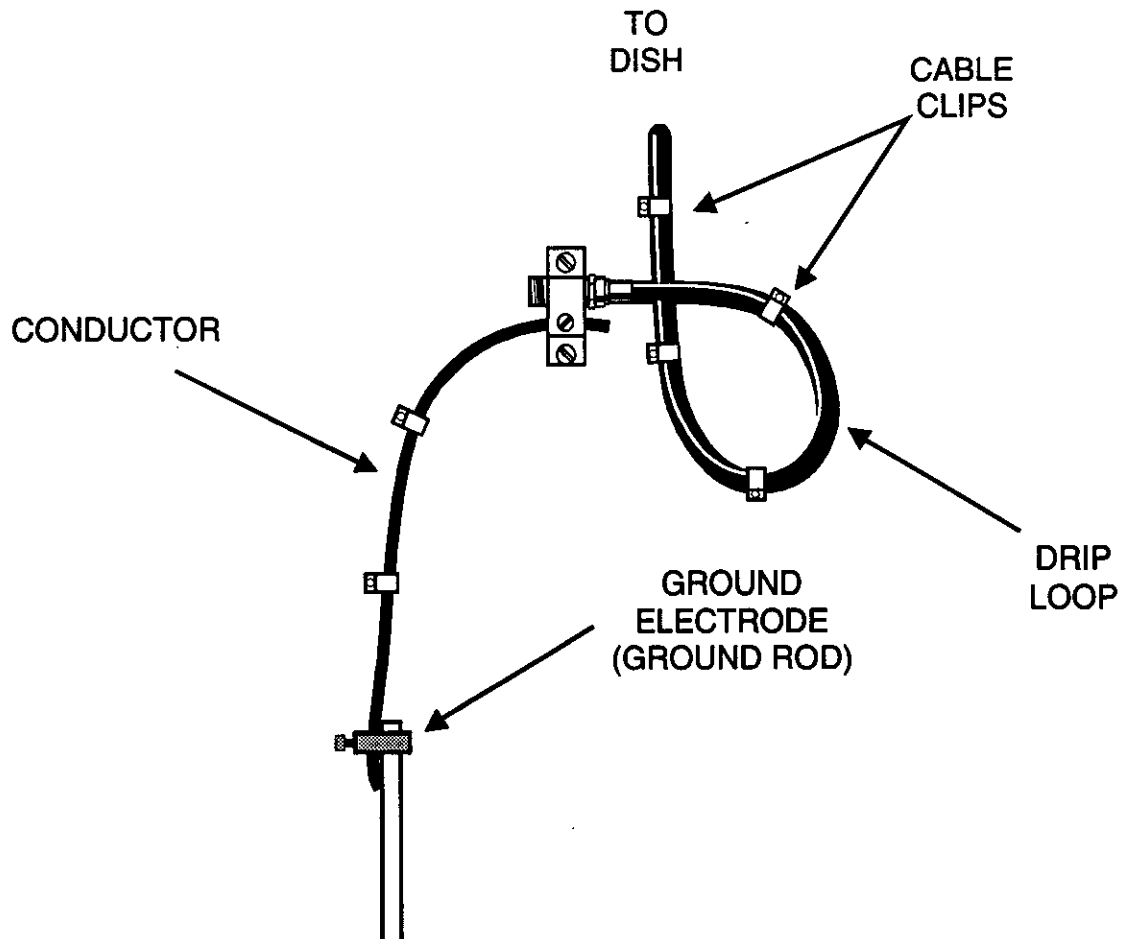


Figure 69, LNB Cable Installation

Attaching the LNB

The LNB attaches to the LNB support arm. To do this step, you will need the LNB mounting bolt, washer, and nut from the hardware packet. You will also need to remove the LNB from the packaging. The tools you will need are a Phillips head screwdriver and the tools required to install an F-type connector (you will only need this if the cable is not pre-terminated with an F-fitting). If the F-type connector you are using is not weatherproof, you will also need some type of coax cable sealant. This sealant prevents moisture from seeping into the LNB through the coaxial connector. Most LNB failures are due to moisture penetration. Therefore, always use some type of sealant or a weatherproof connector to protect this connection.

Use the following steps to install the LNB onto the LNB support arm:

1. Route the LNB cable through the foot, mast, and LNB support arm.

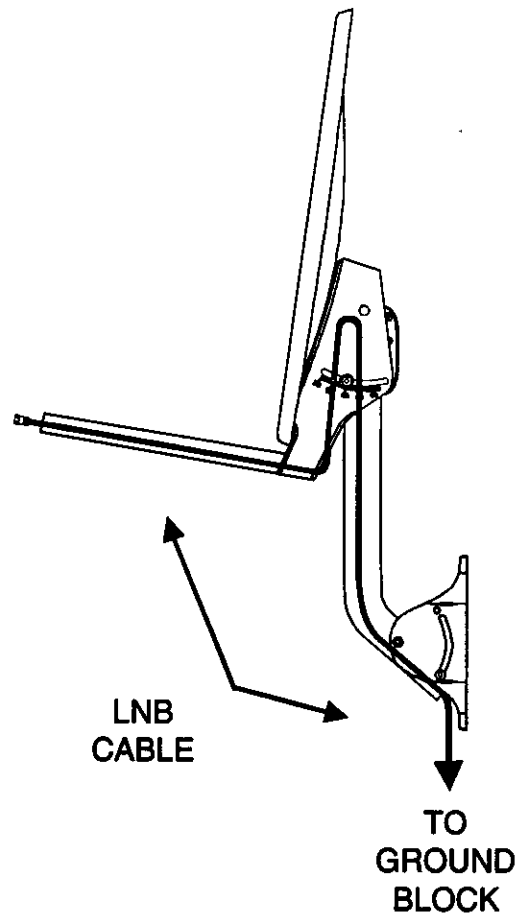


Figure 70, Routing Cable Through Dish

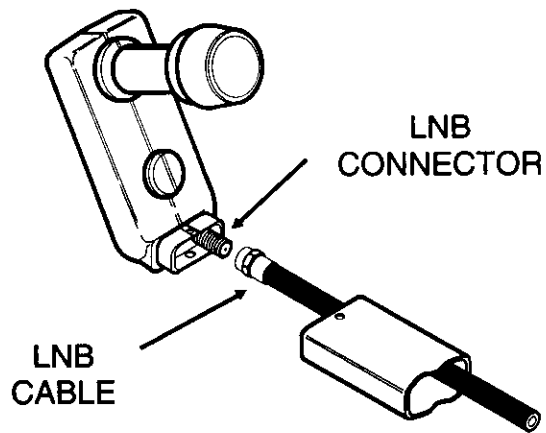


Figure 71, Connecting LNB Cable To LNB

2. Install an F-type connector on the end of the cable. If the cable already has a connector on it, disregard this step.
3. Thread the coax cable onto the LNB connector.
4. If the connector is not weatherproof, seal it.
5. Slide the end of the LNB into the rectangular opening of the LNB support arm. Position the LNB to align it with the hole in the support arm.
6. Insert in the LNB bolt into the hole on the bottom side of the LNB support arm.
7. Place the washer on the LNB nut and insert the nut into the hole on the top side of the LNB support arm.
8. Tighten the bolt with a Phillips head screwdriver.

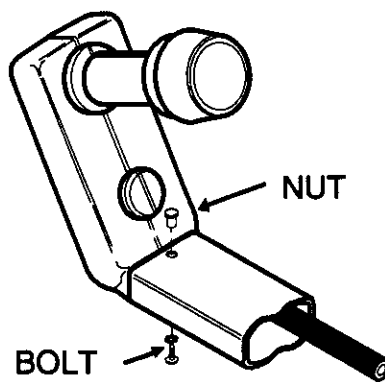


Figure 72, Attaching LNB

Attaching the LNB Cable to the Receiver

In the next step of the installation, route the LNB cable from the ground block to the receiver. In most installations, there is more than one way to get the LNB cable to the receiver from the grounding block. If the receiver is located on an outside wall, go through the wall. If the receiver is on an inside wall, use crawl, basement, or attic spaces. Whenever routing the LNB cable to the receiver, take the shortest possible path and always protect it from physical damage.

Use the following steps install the cable from the ground block to the receiver:

1. Drill a 1/2" hole in the home at the access point of the cable. Before drilling, ensure there are no wires or pipes in the area of the hole.
2. Connect one end of the cable to the ground block.
3. Form a 3 to 5 inch drip loop in the cable before inserting it in the access hole.

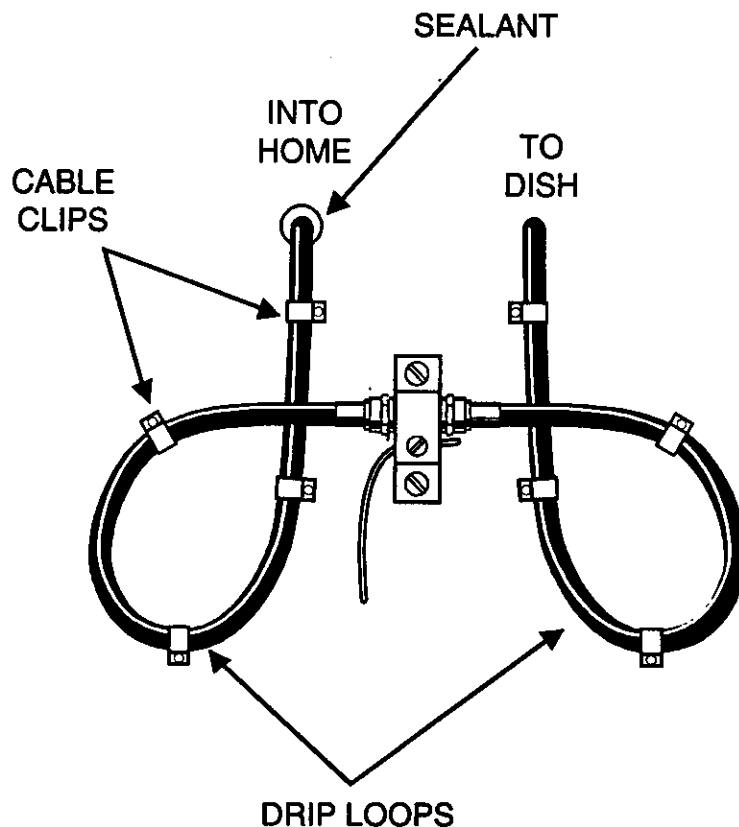


Figure 73, LNB Cable Installation

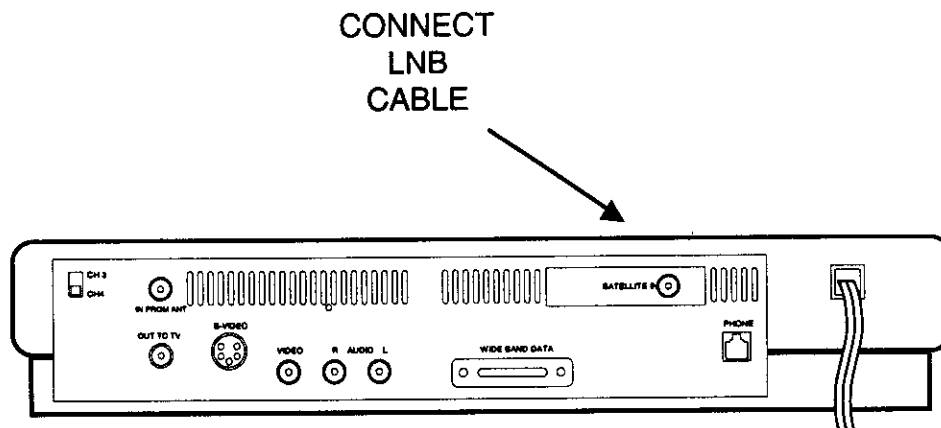


Figure 74, Connect LNB Cable to Receiver's "Satellite In" Jack

4. With cable clips, secure the drip loop and cable to the wall.
5. In the home, route the cable to the rear of the receiver. Depending on the installation site, this could be through a floor or directly to the rear of the receiver. If the cable goes straight through a wall, a wall plate may be used to dress up the access point. Remember, every attempt should be made to hide and protect the cable.
6. Connect the cable to the "SATELLITE IN" jack of the receiver.
7. If the connectors on the coax ground block are not weatherproof, seal them. This can be done with tape or other types of coax connector sealant.
8. Seal the access point into the home with silicon sealant.

Grounding the DSS dish

The National Electrical Codes requires masts and metal structures supporting antennas be grounded. These guidelines include the DSS dish. This grounding is similar to the ground required for the LNB cable. Basically, use a NO. 10 or larger copper wire (insulation is not required on the wire) connect it to the DSS foot and to a grounding electrode. As with the LNB cable ground conductor, the dish ground conductor must also be securely fastened to a wall or other surface to protect it from physical damage. This conductor must not be spliced and it must be correctly connected to a grounding electrode.

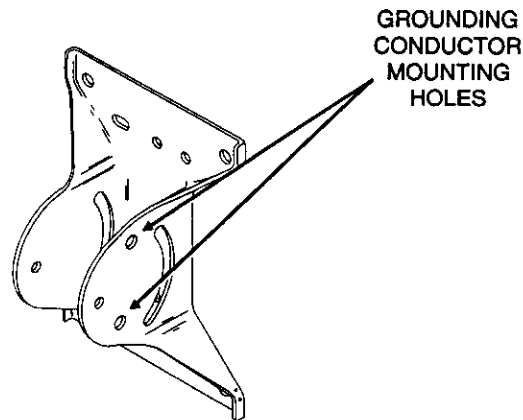


Figure 75, Attaching Grounding Conductor to Mounting Foot

The National Electrical code is also very specific on acceptable electrodes for the ground. Some possible grounding electrodes are:

- Grounded Interior Metal Water Pipe (cold water).
- Ground Rod (must be driven at least 8 feet into the ground).
- Grounded Metallic Service Raceway.
- Grounded Electrical Service Equipment Enclosure.

There are also specific instructions for the correct method of attaching to each ground electrode to the ground conductor. For more details on each of these grounding electrodes, consult the National Electrical Code handbook and any active codes in your area.

Note: Appendix C of this manual contains sections of the National Electrical Codes that apply to the installation DSS system.

There are two holes in the mounting foot for connecting a ground conductor. Hardware (a nut, bolt, and star washer) to connect the ground conductor to the foot is included in the hardware package.

Use the Following steps to connect the mast to a grounding electrode:

1. Attach the grounding conductor to the mounting foot with a bolt, nut, and star washer.

2. Route the grounding conductor to the grounding electrode. While doing this, use the shortest and straightest possible path.
3. Attach the grounding conductor to the grounding electrode. The method of attaching the conductor will vary with different grounding electrodes, use the correct method for the electrode you are connecting to.
4. Secure the grounding conductor to a wall or other surface. This conductor must be protected from physical damage.

Telephone Cable

There are many options available to connect the a phone line to the receiver. Three of the most common are:

- Use an existing phone jack.
- Install a phone jack.
- Use a wireless phone jack system.

To connect the receiver to an existing telephone jack, install a modular line cord between the receiver and the phone jack. The line cord has modular plugs on each end that insert into the receiver and telephone jack.

Usually, homes have telephone jacks in most rooms. These jacks often have a single output for one telephone. Often, there is a telephone already plugged into this jack leaving no place to connect the cable for the receiver. If you run into this, there are several ways to increase the number of outputs from a modular jack. The first of these is to use a modular duplex adapter. Another option is to replace the single wall plate with a dual type. Finally, use another phone jack that is located nearby. If you do this, remember to conceal the cord from view.

If a phone jack is not available or convenient, you may need to install a cable from a junction box or an existing phone jack. This cable can be run through crawl, attic, or garage spaces to the receiver. Once the cable is at the receiver, a modular connector or a wall plate may be installed. If a modular connector is used, plug it directly into the receiver. If you install a wall plate instead of a modular plug, use a modular extension cable between the wall plate and receiver.

To install telephone jack, it helps to understand some basics of the telephone system. The telephone company supplies a phone cable to each home. This cable connects directly to a junction block, or box, called the point of demarcation. This point divides the wiring responsibility between the customer and the telephone company. The

wiring from the telephone company to one side of this junction box is the telephone company's responsibility, while the wiring connected to the other side of the box is the customer's responsibility. The customer can add additional wiring and telephones to their home as long as they follow local and FCC guidelines and do not connect anything directly to the telephone company's side of the point of demarcation. Usually, the telephone company marks or seals their side of the demarcation point to prevent accidental connections.

The cable supplied to the home from the phone company normally consists of four wires. The color of these wires are red, green, yellow, and black. Homes that have only one telephone line in service use the red and green wires to carry signals. These two wires are called Ring (red wire) and Tip (green wire). The yellow and black wires can serve several purposes. Often they are the Ring and Tip wires to a second line. They may also provide power to telephone accessories. Every junction box has a terminals for each of these wires. These terminals are usually color coded. When installing telephone cables, it is important to follow the color code.

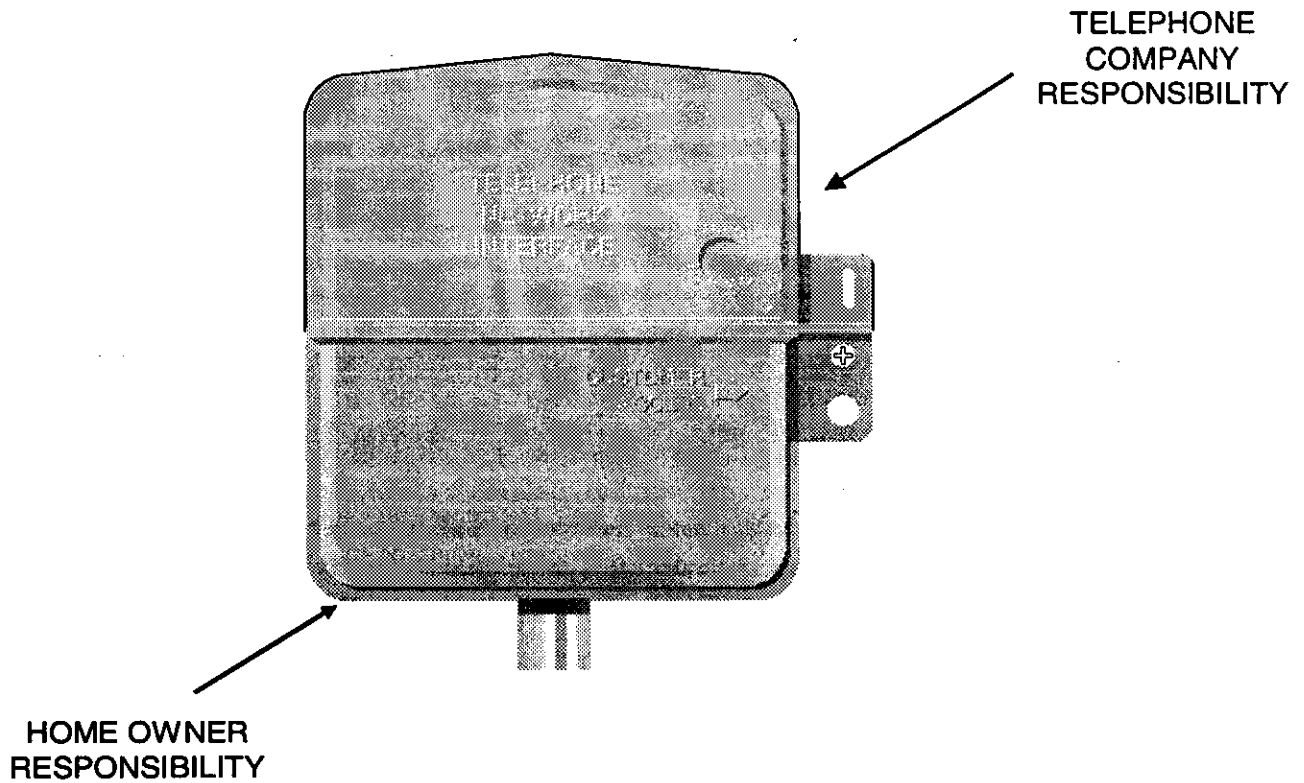


Figure 76, Telephone Junction box

COLORS	VARIATION 1	VARIATION 2	VARIATION 3
RED	BLUE WITH A WHITE STRIPE	BLUE WITH A WHITE STRIPE	BLUE
GREEN	WHITE WITH A BLUE STRIPE	WHITE WITH A BLUE STRIPE	WHITE
YELLOW	ORANGE WITH A WHITE STRIPE	ORANGE WITH A WHITE STRIPE	ORANGE
BLACK	WHITE WITH AN ORANGE STRIPE	WHITE WITH AN ORANGE STRIPE	WHITE WITH AN ORANGE STRIPE
N/A	GREEN WITH AN WHITE STRIPE		
N/A	WHITE WITH AN GREEN STRIPE		

Figure 77, Telephone Wire Color Code

There are cables that use a slight variation of the color code. The following table is a list of some various color codes. When connecting to the phone system with different cables, every attempt must be made to follow this color code.

The type of cable used in the phone jack installation can be critical to the performance of the system. If the cable run is short and not exposed to the weather, a typical four-conductor cable that is used for most telephone extension cables will work. If the installation requires a long cable run, select a cable that uses twisted pairs of wire. The twisting of the wires reduces the amount of noise picked up by the system. If the cable is outside and exposed to the weather, use a weatherproof type of cable.

Use the following procedure to install a telephone jack:

SAFETY NOTE:
Never work with active telephone lines. When the telephone is ringing, the current carried on these lines may shock you. While working on the telephone line, disconnect the wiring at the point of demarcation. If you are unable to do this, take all the telephone handsets off the hook.

1. Find an accessible telephone junction box (this could even be the point of demarcation). Plan the installation of the cable from that point to the receiver.
2. Remove the customer access cover on the junction box and connect the wires of the telephone cable to the terminals. Remember to follow the color code: red wires connect to red wires and green to green.
3. Route the cable to the receiver. Use crawl, attic, and garage spaces where ever possible. As you route this cable, secure it to walls and other supporting structures to prevent physical damage.
4. Install the modular plug or RJ11/14 type wall plate.

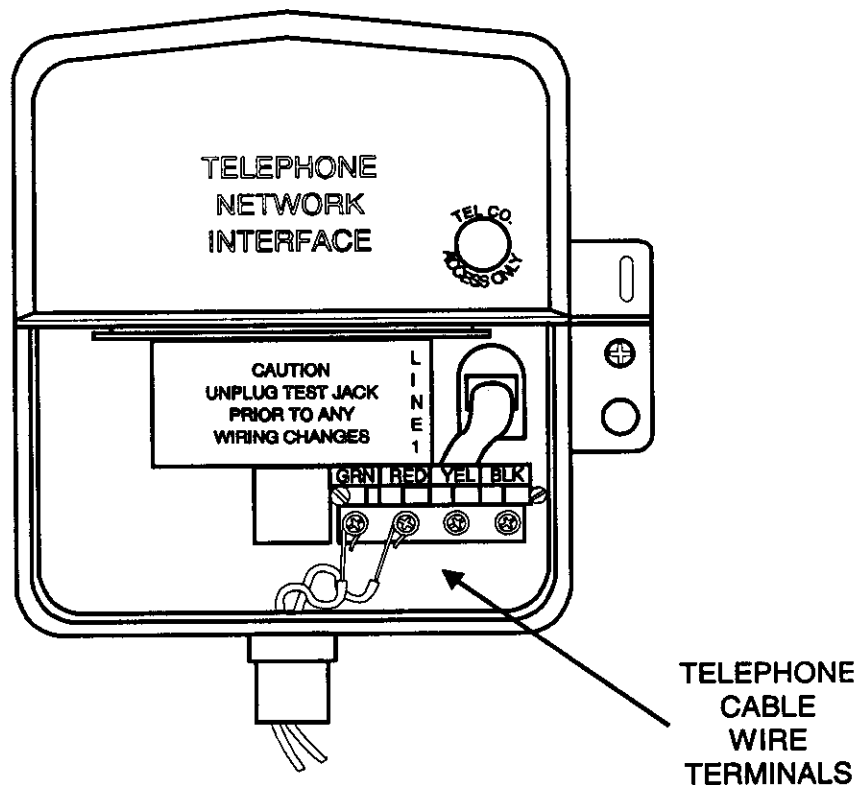


Figure 78, Telephone Junction Box Terminals

Modular Plug Installation

Different modular crimping tools have slightly different procedures. Follow the procedure the accompanies the crimping tool you are using.

1. With the cable cut to length, trim the ends so they are straight and not diagonal.
2. Strip approximately 3/8" from the outer conductor of the cable (this is for flat four-conductor telephone line and may vary slightly for twist and outdoor cable). Do not strip the insulation from the four inner wires of this cable (see figure 79)

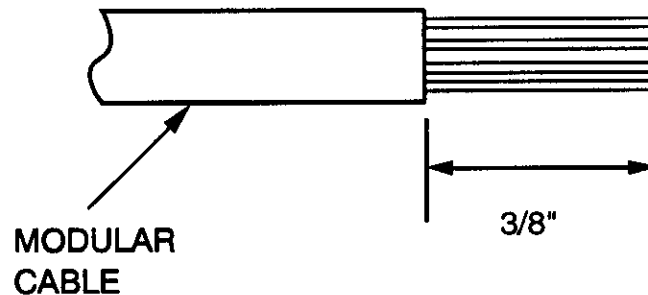


Figure 79, Modular Plug Installation Steps 1 and 2

3. Place the modular plug onto the prepared end of the cable. While doing this, make sure the cable is oriented correctly in the modular connector. If the connector is to be plugged into the receiver, follow the color code shown in figure 80.

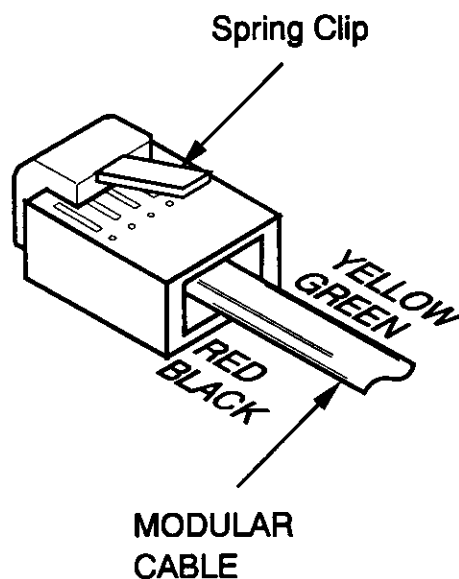


Figure 80, Modular Plug Installation Step 3

NOTE: In most installations, the other end of the telephone cable will be hardwired to a junction box. If you must install a modular connector on the other end of the cable, the orientation of the wire in the connector is different. Oriented this cable as shown in figure 81.

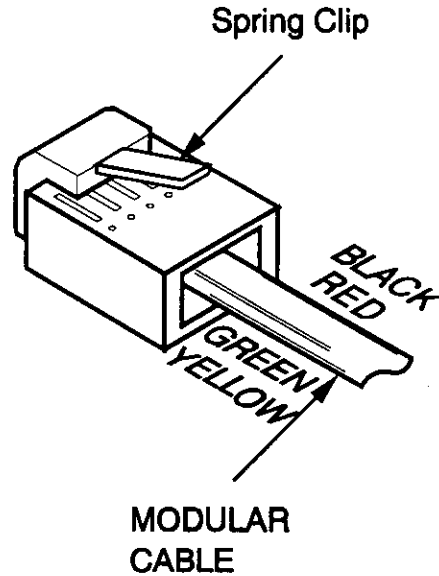


Figure 81, Installing a Modular Plug On a Modular Line Cord

4. With the wire positioned correctly in the modular connector, use a modular connector crimping tool the seat the connector on the wire.

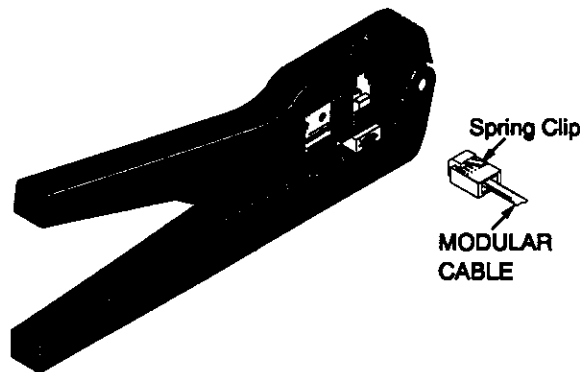


Figure 82, Crimping the Plug With the Crimp Tool

Wall Plate installation

To install the wall plate, follow the instructions that accompanies the plate you purchased. Remember to follow the color code included in the wall plate instructions.

5. Seal all entry points of the cable into the home and check to be sure it is secured and hidden from view where possible.

Use a Wireless Phone Adaptor

These units use the AC wiring of the home to connect a remote telephone or the DSS receiver to the telephone lines. Wireless phone adaptors usually include two pieces. One piece, called the base unit, plugs into an AC outlet near an existing phone jack. A modular telephone cable then connects between the existing phone jack the base unit. The second piece, called the extension jack, plugs into an AC outlet near a remote phone or the DSS receiver. The telephone or DSS receiver then plugs into the extension jack. This system allows new phone jacks to be installed quickly and easily.

**Installing
the
Receiver**

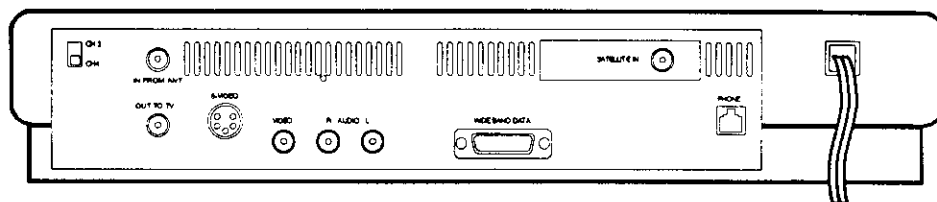


Figure 83, Rear Panel DRD102RW

All connections to the receiver are made at the back panel. These connections are slightly different for the two models of receiver's.

DRD102RW

Figure 83 is the rear panel of the DRD102RW receiver. Its connection can be divided in inputs and outputs. The following is a functional list of the jack panel connections:

INPUTS:

PHONE

This jack connects the to the telephone cable. The DSS receiver uses a toll free number to update the access card. This update usually last a few seconds and ensures continuous program service.

SATELLITE IN

This is the 950 to 1450 MHz input from the LNB. Also carries the DC voltages from the receiver to the LNB.

IN FROM ANT

Connect either a cable signal or an antenna to this connector.

OUTPUTS:

OUT TO TV

The RF out (either channel 3 or 4) of the receiver. This RF can be one of two signals. One signal, is RF signal applied to the IN FROM ANT connector. The other signal is the output of the receiver. The TV/DSS button on the front of the receiver determines which signal is present on the jack.

The RF channel output on this jack is controlled by the RF switch. When the switch is in the channel 3 position, the RF out will be channel 3. The same is true for channel 4.

S-VIDEO

This connector outputs an S-video signal to a compatible television or VCR. Only an S-video connector can be inserted into this jack.

VIDEO

This connector outputs the video signal from the receiver. This allows you to connect the receiver to a monitor type of television or a VCR.

AUDIO R (right) and AUDIO L (left)

This is left and right channel audio signal from the receiver. If you are connecting the receiver to a monitor type of television, connect these to the audio inputs. You can also connect these connectors to the audio input of a stereo amplifier.

Wide BAND DATA

This 15 pin connector is designed to be used in conjunction with future technology: such as high definition TV.

DRD203RW

Figure 84 is the rear panel of the DRD203RW receiver. Its connection can be divided in inputs and outputs. The following is a functional list of the jack panel connections:

INPUTS

PHONE

This jack connects the to the telephone cable. The DSS receiver uses a toll free number to update the access card. This update usually last a few seconds and ensures continuous program service.

SATELLITE IN

This is the 950 to 1450 MHz input from the LNB. Also carries the DC voltages from the receiver to the LNB.

IN FROM ANT

Connect either a cable signal or an antenna to this connector.

OUTPUTS

OUT TO TV

The is the RF out (either channel 3 or 4) of the receiver. This RF can be one of two signals. One signal, is RF signal applied to the IN FROM ANT connector. The other signal is the output of the receiver. The TV/DSS button on the front of the receiver determines which signal is present on the jack.

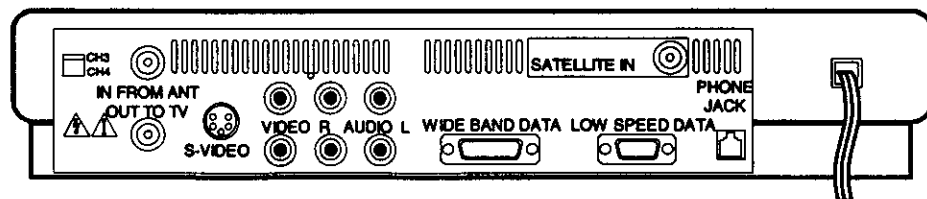


Figure 84, Rear Panel DRD203RW

The RF channel output on this jack is controlled by the RF switch. When the switch is in the channel 3 position, the RF out will be channel 3. The same is true for channel 4.

S-VIDEO

This connector outputs an S-video signal to a compatible television or VCR. Only an S-video connector can be inserted into this jack.

VIDEO

These two connectors are bridged in the receiver. Because they are bridged, both have the same signal on them. These connectors are the output the video signals from the receiver. One of these connectors can be connected to a monitor type of television while the other to VCR.

AUDIO R (right) and AUDIO L (left)

There are two connectors for the right channel and two for the left channels. The two connectors for the right channel are bridged together and the two for the left channel are bridged together. The signal on these connectors is the right and left channel audio signals from the receiver. If you are connecting the receiver to a monitor type of television, connect one set (a set is the right and left channel) to the audio inputs. The other set can go to a VCR or stereo amplifier. If the second video output is connected to a VCR, the second set of audio cable must also be connected to the VCR.

WIDE BAND DATA

This 15 pin connector is designed to be used in conjunction with future technology: such as high definition TV.

LOW SPEED DATA

This 9 pin serial interface is designed to be used in conjunction with data services.

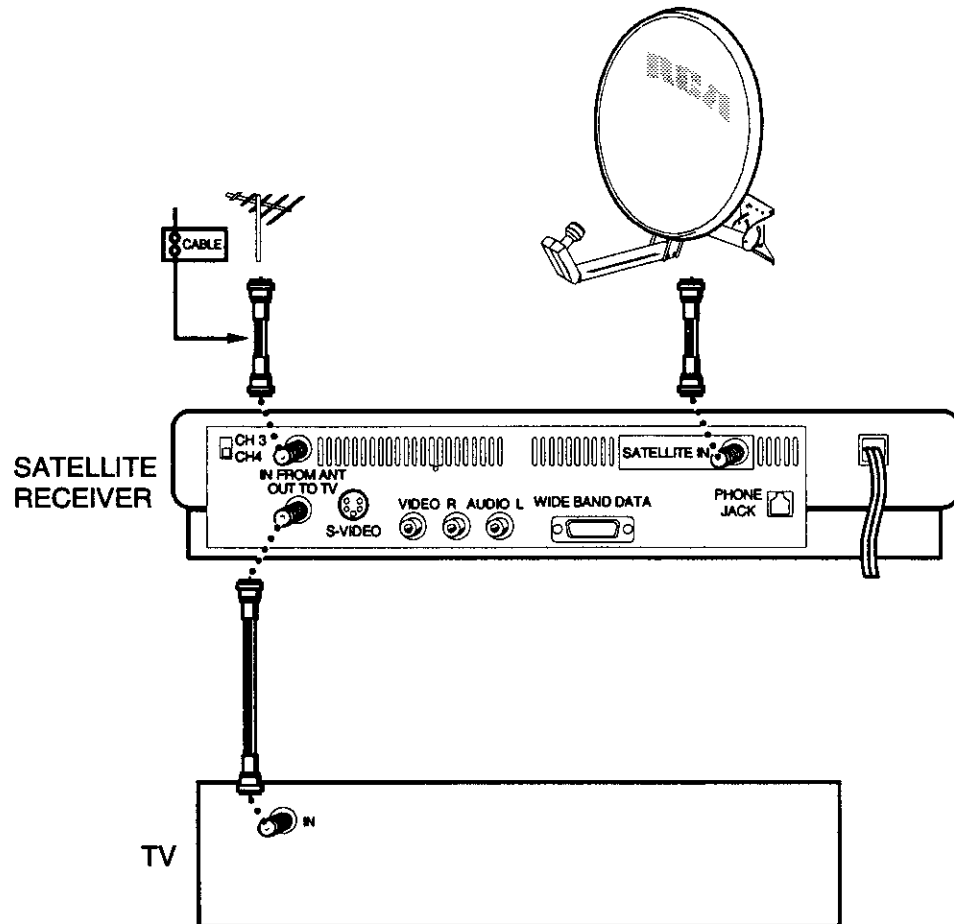
SYSTEM CONNECTIONS

Figure 85 is a basic connection system that will work with both the DRD102RW and DRD203RW. The connection system works with a standard television using RF cables. The TV/DSS button on the front of the receiver switches the RF signal applied to the television between the antenna, or cable, signal and the signal from the receiver.

If the television is capable of receiving video and audio signals from the receiver, add the video and audio cables. To watch the satellite signal select the monitor inputs to the television.

To connect a stereo amplifier to this system, there are several options. If you are using a standard television, connect a stereo audio cable to the AUDIO R and AUDIO L output of the receiver and to the inputs of the amplifier. If your television is a monitor and equipped with audio output jacks, with a stereo audio cable connect the television's audio output to the amplifier.

RECEIVER (DRD102RW) TO TV



Material List:

- 1 EA. RF Cable (must have screw type of Fconnectors).

Figure 85, Basic Hookup With Either DRD102RW or DRD203RW

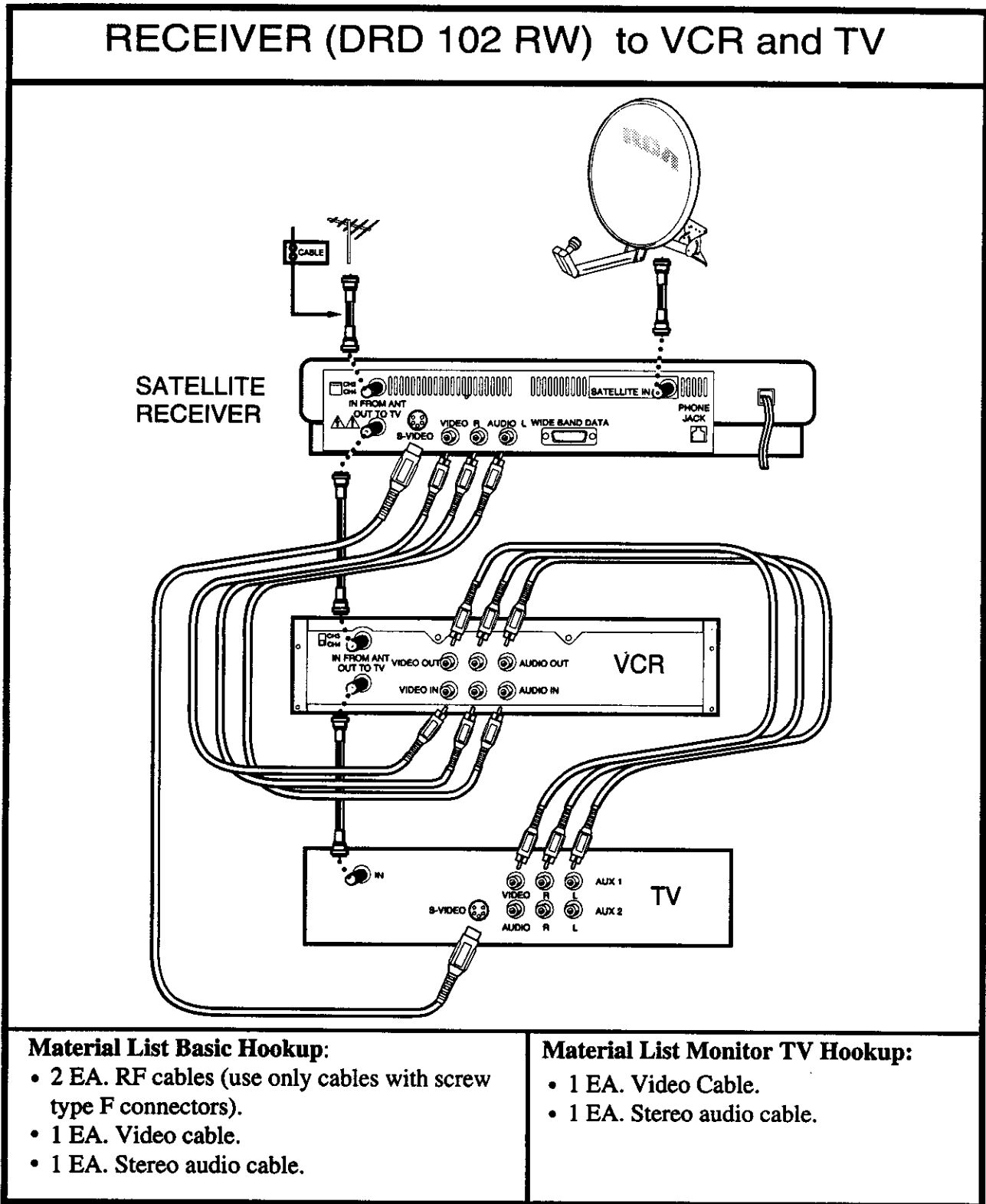
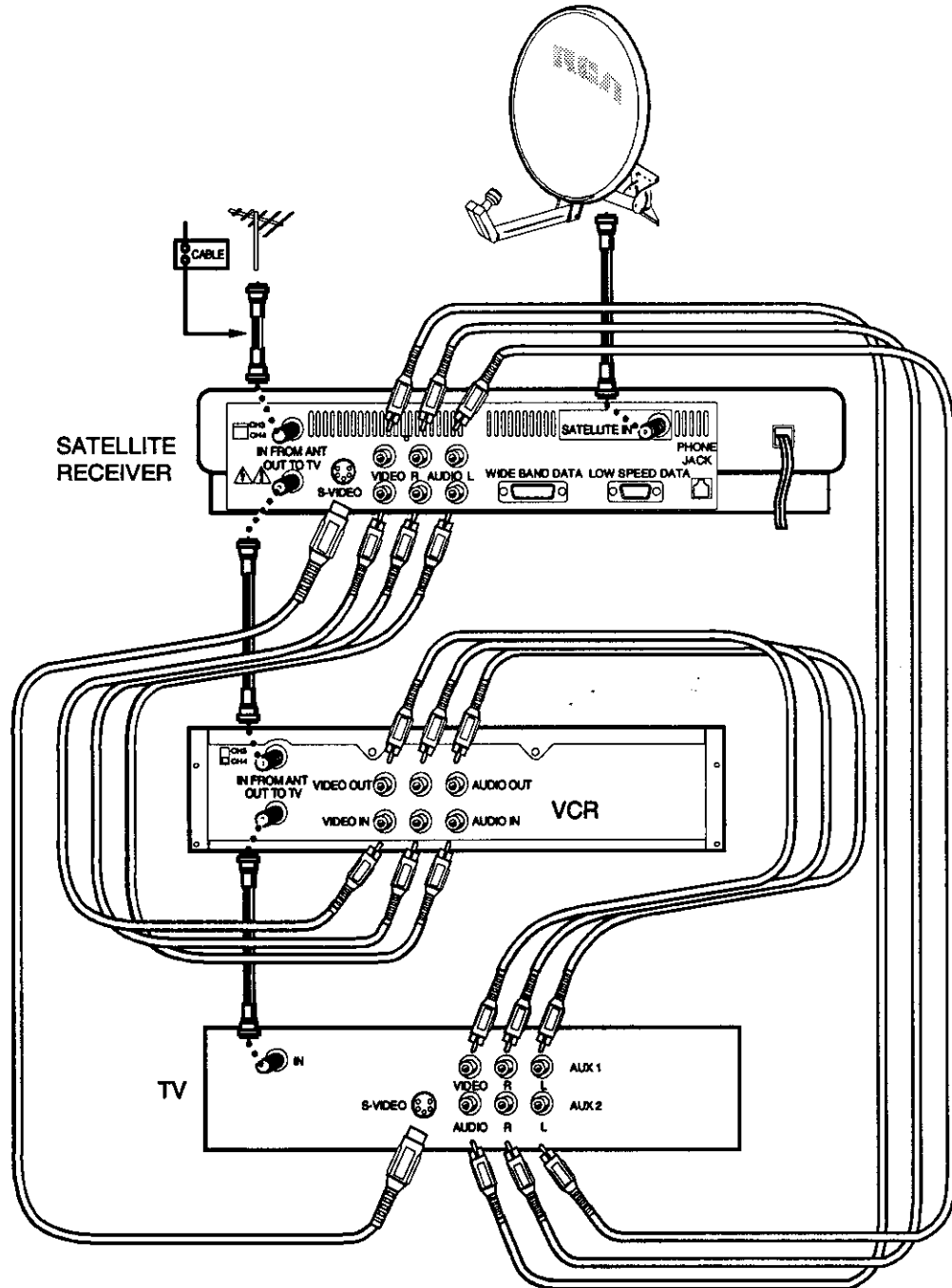


Figure 86, Hookup Of Receiver (DRD102RW), VCR, and Television

RECEIVER (DRD 203RW) to VCR and TV



Material List Basic Hookup:

- 2 EA. RF cables (use only cables with screw type F connectors).
- 1 EA. Video cable.
- 1 EA. Stereo audio cable.

Material List Monitor TV Hookup:

- 1 EA. Video Cable.
- 1 EA. Stereo audio Cable.

Figure 87, Hookup of Receiver (DRD203RW), VCR, and Television

Figure 86 incorporates a VCR in the connection system. This system is shown using the DRD102RW receiver. This connection system applies the RF signal from an antenna, or cable, to the RF in of the receiver. The RF output of the receiver is sent to the VCR ANT IN connector. The OUT TO TV connector of the VCR is connected to the ANT IN of the television. These RF connection enables the VCR to record either the antenna signal or the satellite signal. This is controlled with the TV/DSS button on the front of the receiver.

Better picture quality is achieved by using the audio video connections. To do this, connect a video cable from the VIDEO jack of the receiver to the VIDEO IN jack of the VCR. Also connect a stereo audio cable to the AUDIO L and AUDIO R jacks of the receiver. Connect the other end of the audio cable to the AUDIO IN connector of the VCR. To record the satellite signal, switch the VCR to a line input. This system also enables a satellite signal to be recorded while watching a program from the antenna or cable. To do this, place the receiver in the TV mode with the TV/DSS button. This place the VCR in the TV mode with the TV/VCR button. With the receiver and televisions the TV modes, the signal on the antenna cable will be routed to the television for viewing. At the same time, the receiver signal is applied to the audio and video input of the VCR which can be recording it. If the connection system shown in figure 86 is followed, recording one program while watching another can be done with switches on the receiver and VCR without changing how the system is connected.

Figure 87 is a connection system that can be used with the DRD203RW. Because there are two audio and video jacks on the receiver, a video and audio signal can be supplied to a second VCR or directly to the second input to the monitor or a stereo amplifier.

Aligning The Dish

This step of the installation accurately points the dish at the satellites. This alignment is critical to the performance of the system. When the dish is pointed directly at the satellites, the receiver receives a strong signal. Any drop outs in this signal would be small and corrected in the receiver. If the dish is not positioned properly, the signal is weak and the number of drop outs increases. Depending on the size and number of these drop outs, the receiver may not be able to correct for them and the picture will blank or freeze frame until a good signal is once again received. This would become worse on cloudy or windy days.

A significant difference between an analog satellite system and the Digital Satellite System is the dish alignment process. When aligning an analog satellite system, the dish could be adjusted while looking at the television picture. When you were close to a satellite, the picture would appear with sparkles. The closer you get, the clearer the picture becomes. With the Digital Satellite System, this does not happen. Instead, as you move the dish towards the satellites, the picture remains blank until a signal is received. Then the picture suddenly appears. This picture will not have black or white sparkles in it, even though the dish may not be accurately pointed at the satellites. This makes it impossible to accurately point the DSS dish just by looking at the quality of the television picture.

The DSS dish has two positioning adjustments. These adjustments are azimuth and elevation. The azimuth adjustment is the side to side movement of the dish. This is done by rotating the dish on the mounting post or mast. The elevation adjustment is done as an adjustment on the LNB support arm (see figure 88). This adjustment has a reference scale on the side of the dish that is calibrated in degrees. If the mast is correctly plumbed, this scale will be accurate.

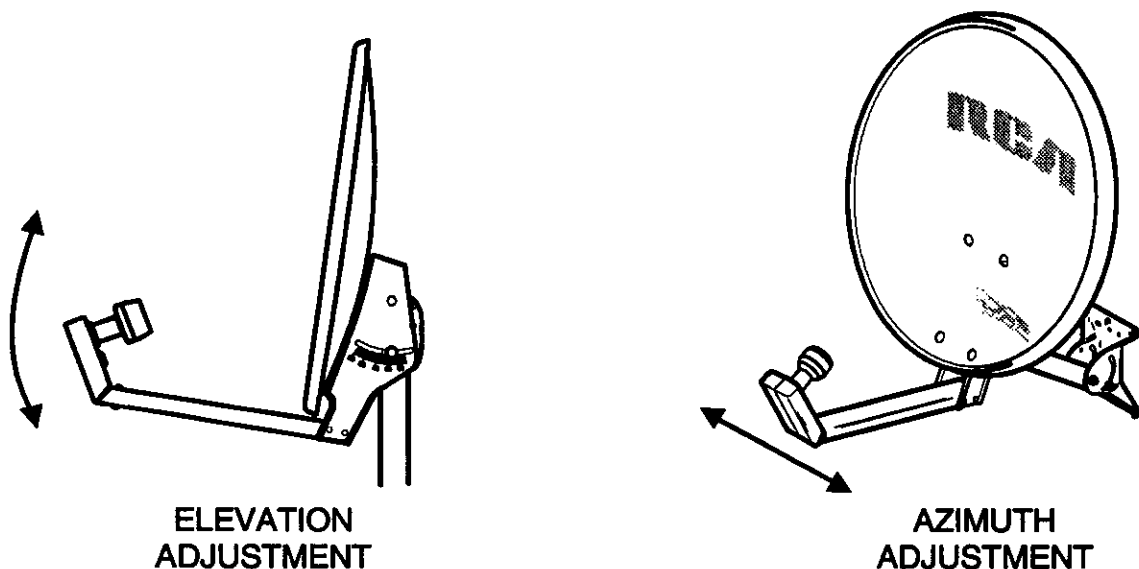


Figure 88, Elevation and Azimuth Adjustment

There are four steps to align the dish:

1. Determine the azimuth and elevation settings for your geographic location.
2. Adjust the elevation.
3. Adjust the azimuth.
4. Acquire and fine tune a signal.

To align the Digital Satellite System, first find the approximate position of the satellites at the installation site. Then adjust the azimuth and elevation to point the dish at the satellites. With the receiver connected to both the dish and television, use the receiver's alignment menus to accurately point the dish at the satellites. This alignment aid actually uses the errors detected in the received signal to determine signal quality. Naturally, when there is minimum number of errors in the received signal, the signal is the strongest and dish is correctly pointed.

Determine the Azimuth and Elevation Settings For Your Location

In this step, you determine the azimuth and elevation setting to point the dish at the satellites. These settings will vary depending on your location in the continental United States. There are several methods to determine these settings. The following is the simplest method (other methods are given in appendix A of this training manual).

The following method uses the dish positioning menus of the DSS receiver. To use these menus, connect either the S-video, video, or RF outputs of the DSS receiver to a television. Apply AC power to the receiver and tune the television to the correct input (S-video, video, or RF CH3 or 4).

Use the following procedure to get the proper azimuth and elevation:

1. Point and select through the menu system of the satellite receiver to get to the dish pointing menu. To do this, use either the remote control or the front panel buttons of the receiver. Once the first level of menus are on the screen, highlight the "Options" selection to bring up the second level of menus. Select the "Setup" option of this menu. In the next menu, select "Dish Pointing" to bring up the dish pointing menu.
2. Once at the dish pointing menu, there are two ways to determine the correct azimuth and elevation setting for your site. The first of these uses the zip code and the second uses the latitude and longitude coordinates of the installation site.

- To use the zip code method, select the "Pointing Dish using Zip Code" category of the menu. Once selected, the Enter Zip Code screen appears. Enter the installation site's five-digit zip code in the boxes provided and then select the OK box. The next screen that appears is the "Dish Pointing" screen. This screen gives both the azimuth and elevation.

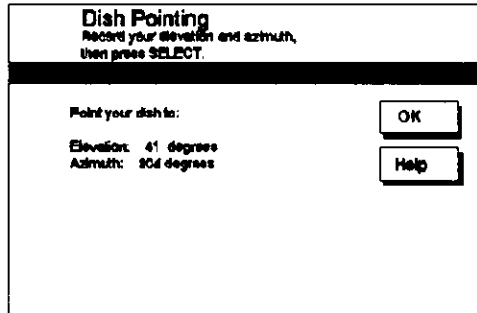


Figure 89, Dish Pointing Coordinates

- On a piece of paper, record the azimuth and elevation coordinates.

Adjust the Dish Elevation

- Loosen the two nuts securing the elevation movement of the dish. The dish should move up and down.
- Line up the elevation indicator with the tick mark corresponding to the elevation number for your installation site.
- When the elevation indicator aligns with the correct mark on the elevation indicator, tighten the two nuts securing the elevation movement of the dish (see figure 90).

Adjust the Azimuth of the Dish

To adjust the azimuth, you will need a compass and the azimuth coordinates to the satellites from the installation site.

- With the compass, approximate the direction to the satellites (see appendix B for instruction on compass operation).

Note: When using a compass, position it at least 6" away from the dish. This reduces the affect of the metal dish on the compass needle and improves the accuracy of the compass.

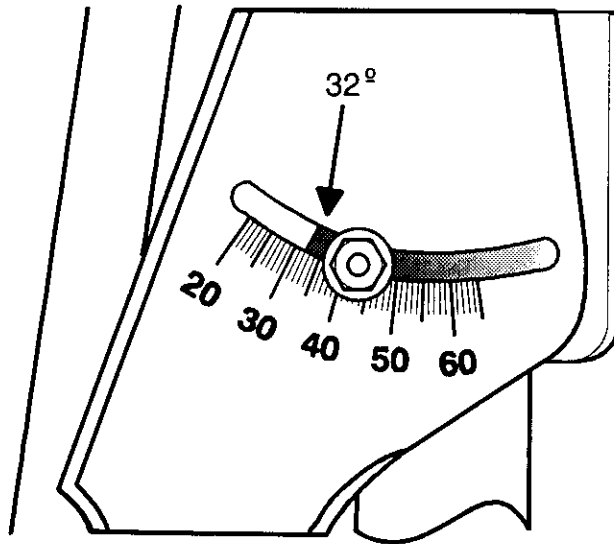


Figure 90, Elevation Adjustment

2. Move the dish to point the LNB in the direction of the satellites (this is the azimuth coordinate determined in step 1). This step assumes the azimuth bolts of the LNB support arm have not been tightened. If they are tight, loosen them until the dish moves from side to side freely.

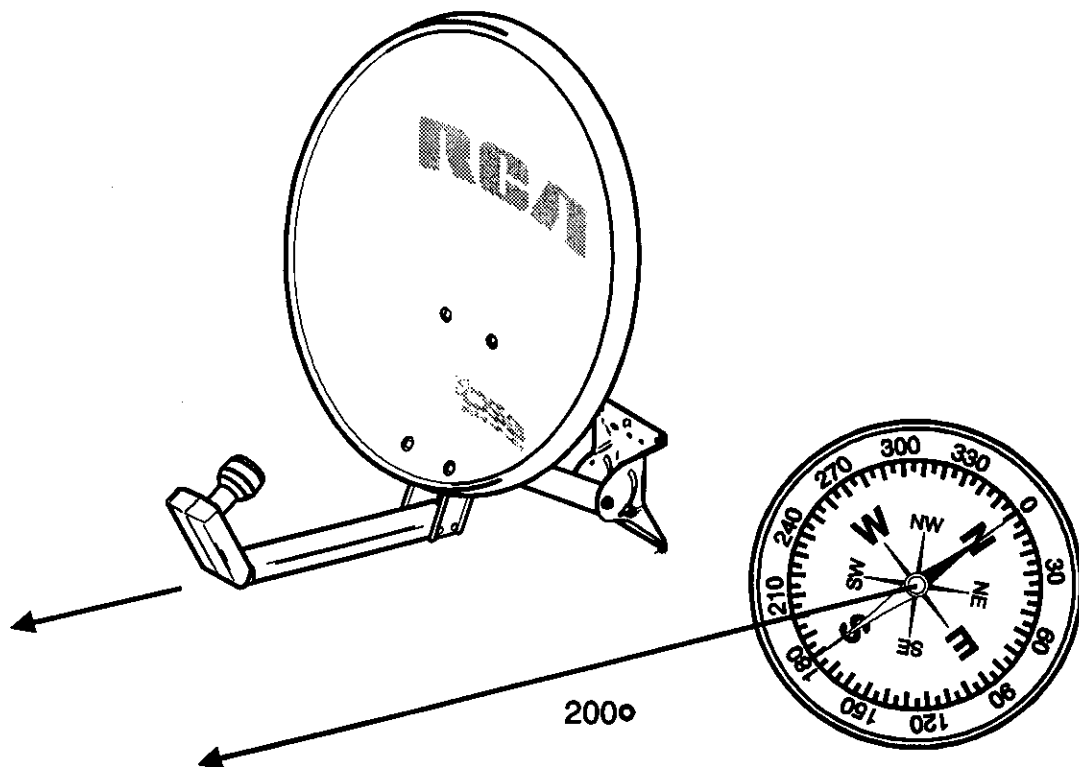


Figure 91, Azimuth Adjustment

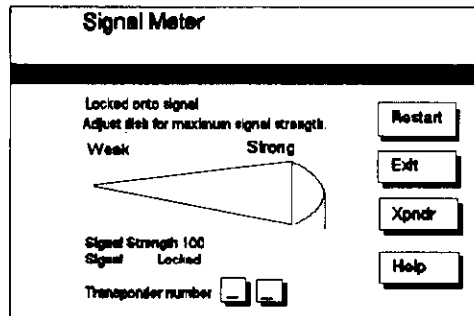


Figure 92, Signal Strength Menu

Acquiring and fine tuning the Dish Position.

In the previous steps, the azimuth and elevation were adjusted to point the dish in the general direction of the satellites. The next step of the installation uses the receiver's alignment system to fine tune the position of the dish.

The receiver's signal strength screen uses two systems to help you to fine tune the position of the dish. The first of these is an audio tone. To listen to this tone, connect a television, headphones, or amplifier to the appropriate jacks on the rear of the receiver. When the dish is not pointed at the satellites and not receiving the signal, the receiver outputs short bursts of the tone. Once the signal is received, this tone changes to a continuous tone. The second positioning system uses the television's on-screen display. This display includes both a bar display and a numeric display. The numeric display range is from 0 to 100. One hundred is a strong signal while zero is a weak signal. The bar display extends across the television screen--the stronger the signal, the farther the bar reaches across the screen. When aligning the dish, both the tone and on-screen display can be used to peak dish position.

TONE BURST	RECEIVER TUNING	CONTINUOUS TONE	REC TU
NOT RECEIVING SIGNAL		SIGNAL RECEIVED	

Figure 93, Aligning Dish with Audio Tone

When the signal strength screen is activated, the receiver uses a search routine to lock the tuner to a transponder. This search routine requires several seconds. The transponder the receiver searches for is displayed on the signal strength menu and is set at the factory. If this transponder is not active, another can be manually entered via the signal strength menu.

When aligning the dish, move the dish only after the receiver is finished with one complete search routine. Both the on-screen display and audio tone signal the end of a search routine. The video display will flash the "Rotate the Dish 3 Degrees" prompt every other search routine. This ensures the receiver has had the chance to complete one complete search operation before the dish is moved again. The receiver outputs a tone burst at the end of every search routine. When aligning the dish, move it every other tone burst. This ensures that the receiver has completed one search routine before the dish is moved. Keep in mind that once the DSS signal is received, the audio tone switches to a continuous tone.

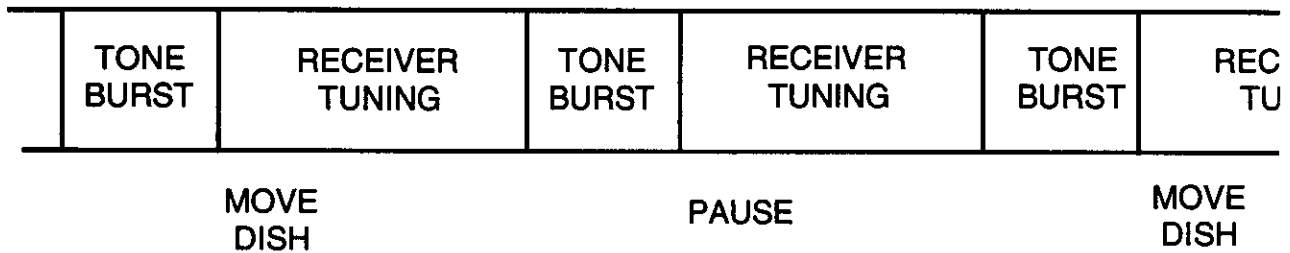


Figure 94, Audio Tone Operation

Aligning With the Video Display

To use the video display to align the dish, a television must be positioned within viewing distance. Do this by looking into a window or run an RF cable from the OUT TO TV connector of the receiver to a portable television. Position this television within viewing distance of the dish.

Use the Following Steps to Align the Dish With the Video Display:

1. Position a portable television in view of the DSS dish.
2. Turn the television on and tune to channel 3 or channel 4.
3. Gently turn the dish right or left one tick mark of the alignment tape and pause.
4. Watch the signal strength display shown on the television screen while the receiver goes through one complete tuning cycle. Once the "Rotate the Dish" display appears, move the dish another tick mark of the alignment tape and wait for one complete tuning cycle. The alignment tape on the mast of the DSS dish is marked in 3 degree increments. When you rotate the dish one tick mark, you are moving it 3 degrees.

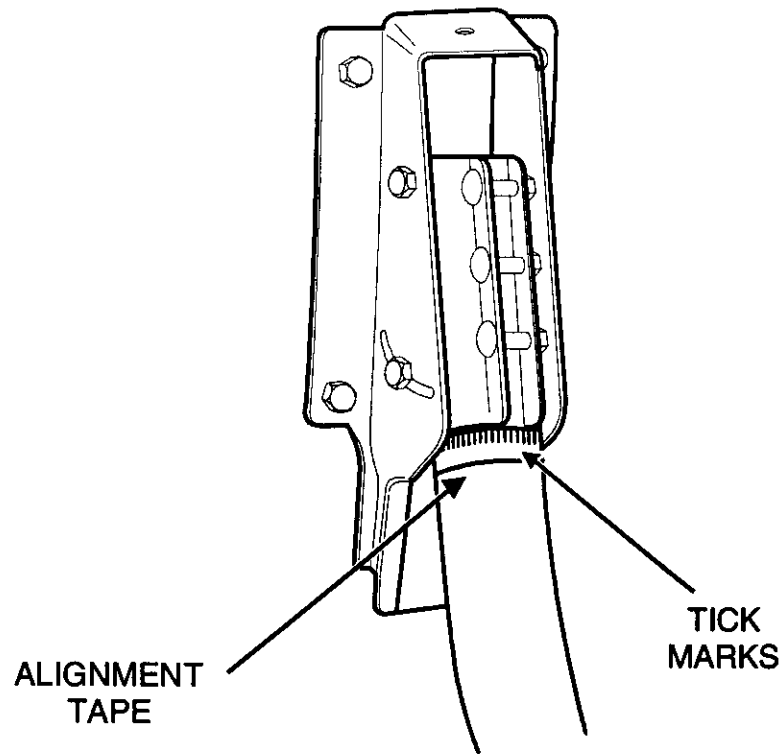


Figure 95, Adjusting Azimuth with Alignment Tape

5. Continue this sequence and stop at the signal strength display's largest number or the longest bar display. If you turn the dish all the way to one direction without locking on a good signal, move back to the starting point and repeat the same process in the opposite direction. If you do not get a signal, see the troubleshooting section of this manual.
6. Once the azimuth is aligned, fine tune the elevation. Start this by loosening the elevation bolts.
7. While watching the television display, move the dish up or down three degrees at a time. Once the elevation has been moved three degrees, wait for the "rotate" display to appear before moving it again.
8. Continue this sequence until the largest number or the longest bar display appears on the signal strength display. Then, tighten the both the azimuth and elevation bolts to secure the dish in position.

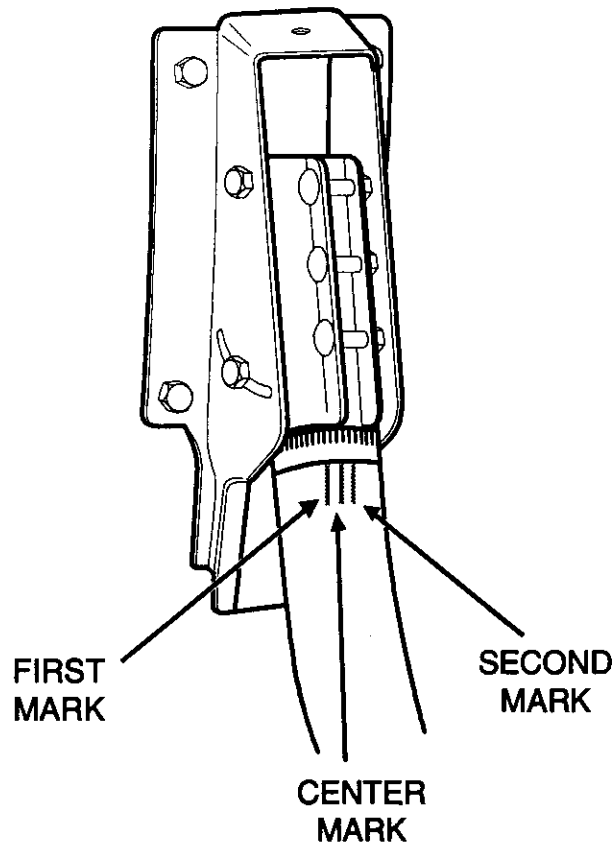


Figure 96, Azimuth Adjustment with Audio Tone

Aligning with the Audio Tone

1. To listen to the audio tone, use a television, stereo, or wireless headphones. Connect the satellite receiver's audio output connector to the device you are using.
2. Gently turn the dish either right or left one tick mark of the alignment tape and pause. If the receiver outputs a continuous tone, mark that position on the mast. If the receiver continues to output tone bursts, wait for one complete tuning cycle (listen for the audio tone to beep twice) and move the dish (in the same direction) 3 degrees. Continue this sequence until a continuous tone is heard, mark that position on the mast.

Note: If you move the dish about 30° in one direction, move back to the starting point and continue the same sequence moving the dish in the opposite direction.

3. Once a continuous tone is heard and the mast marked, continue rotating the dish three degrees (in the same direction) until the continuous tone stops. Mark that position on the mast.

Note: It is possible that a continuous tone is received immediately after you enter the signal strength menu. If so, move the dish in three degree increments until the tone stops. Mark that position on the mast and return the dish's position to the starting point. Now, rotate the dish in the opposite direction in three degree increments. Stop rotating the dish when the tone stops. Mark that position on the mast. Once that is done, continue to step 4.

4. Center the dish between the two marks. This is the optimum position of the dish. Tighten the bolts securing the LNB support arm to the mast.
5. Next, fine tune the elevation adjustment. To do this, record current position of the dish. Then, loosen the bolts securing the elevation adjustment.
6. While listening to the audio tone. Move the dish up in three degree increments. Stop moving the dish when the tone stops. Mark that position on the elevation scale.
7. Lower the dish to the starting point (elevation recorded in step 7).
8. While listening to the tone, lower the dish in three degree increments. Stop lowering the dish when the tones stops. Mark that position on the elevation scale.
9. Center the elevation of the dish between the upper and lower marks. This is the optimum elevation for the dish. Tighten the bolts securing the elevation adjustment.

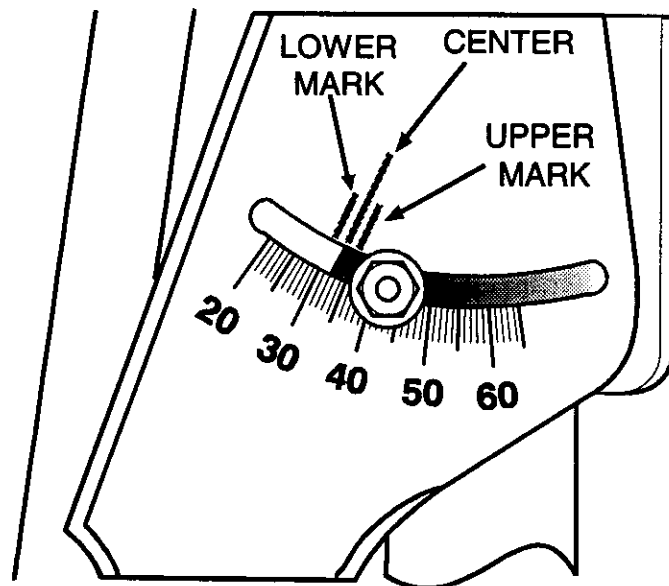


Figure 97, Adjustment of Elevation with Audio Tone

Troubleshooting To make troubleshooting easier, the DSS receiver has a diagnostic system built into it. This system makes several checks of key areas in the receiver to determine their status. The tests made are in the following areas:

- Signal
- Tuning
- Telephone
- Access Card

Once the receiver completes these checks, the on-screen menu displays the results of each check. For example, if the tuner checks good, the on-screen display will indicate it is OK. If it checks bad, the receiver displays a failure message. For example, it may say to check the dish and cables. Using the diagnostics menus, it is possible to localize most problems to either the receiver or other components of the Digital Satellite System.

Troubleshooting Procedures

One of the first things do to when troubleshooting a suspected Digital Satellite System problem is to confirm the connections between the receiver and television. When the receiver is on, it produces on-screen displays. If the television operates but will not display the on-screen menus from the DSS receiver, either the receiver is not functioning or the cable connections between the television and the receiver are bad. To determine which of the two is the problem, first substitute the cables. If that doesn't work, then replace the receiver.

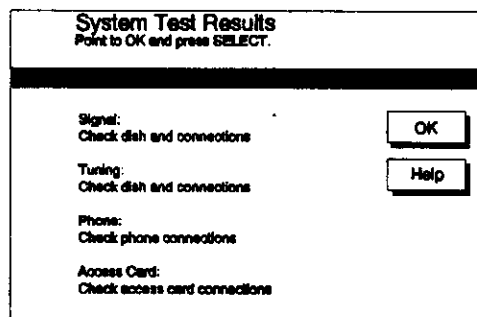


Figure 98, Consumer Diagnostics Menu

If the on-screen menus are visible on the television, use the receiver's diagnostics menus to help determine the problem. To do this, use the front panel controls or IR transmitter of the receiver to place it in the customer test mode. Once in the test mode, the receiver runs four tests. An explanation of these tests is in the technical overview section of this training manual.

If one of these test fail, use the following procedures to determine the cause of the failure:

Signal

If the signal test fails the display will indicate "Check Dish and Connections." When this occurs make the following checks:

CHECK	TEST
1	With a voltmeter, check the DC voltage applied to the LNB. To do this, remove the coax cable from the LNB and measure between the center conductor and shield of the cable. This voltage should be between 12 and 18 volts. If so, go to check 2. If not, suspect the LNB cable or receiver.
2	Verify the dish is pointed at the DSS satellites. To confirm this, use the signal strength meter in the DSS alignment menu. This menu has two indicators that are important to troubleshooting. These are signal strength and lock. The signal strength meter indicates the amount of signal received by the receiver. The lock indicator indicates whether the received signal is the DSS signal. If the receiver is locked to a DSS signal but signal strength is low, chances are good that there is a dish pointing error or a defective LNB. If the receiver is receiving a strong signals but not locked, either the dish is pointed at the wrong satellite or the receiver is defective. If the menu shows both the signal strength low and the lock indicator and unlocked, a defective receiver, LNB, or an error in dish pointing could be the problem.
3	Substitute the LNB. Once the LNB is substituted, once again check the operation of the receiver. Do this with the customer diagnostics menu. If the diagnostics menu signal strength indicator checks OK, the original LNB was defective. If the signal strength indicator still does not check OK, suspect the receiver.

Figure 99, Troubleshooting a No Signal Failure

Step 1 of this procedure verifies the LNB is receiving power from the receiver. If not, the next check would be at the "SATELLITE IN" jack at the rear of the receiver. To do this, unscrew the coax cable from this jack and measure between the center of the jack and the shield. If this voltage measures between 12 and 18 volts, suspect a short in the LNB cable. If the LNB voltage is missing, suspect a defective receiver.

Step 1

Step 2 Step 2 verifies the dish is pointed at the satellites. To confirm this, use the signal strength meter in the receiver's alignment menu. This menu has two indicators that are important to troubleshooting. These are signal strength and lock. The signal strength meter indicates the amount of signal received by the receiver. The lock indicator indicates whether the received signal is the DSS signal. If the receiver is locked to a DSS signal but the signal strength is low, chances are good that there is a dish pointing error or a defective LNB. If the receiver is receiving a strong signal but not locked, either the dish is pointed at the wrong satellite or the receiver is defective. If both the signal strength is low and unlocked, a defective receiver, LNB, or an error in dish pointing could be the problem.

First confirm the dish is pointed at the DSS satellites. Find the azimuth and elevation coordinates from the dish to the satellites. Then use a compass to verify the azimuth. Verify the elevation by checking the alignment of the indicator on the LNB support arm. When checking the dish alignment, be concerned about any bent pieces on the dish, plus any shifting of the mounting foot on the mounting surface. If nothing looks out of place, use a level or plumb line to confirm that the mounting foot and mast are level. If the dish is pointed correctly, proceed to step 3.

Step 3 In step 3, the LNB is substituted to determine if it is defective. Once the LNB is substituted, the operation of the receiver should be rechecked. Do this by activating the alignment screen. If the signal strength is good and locked, the original LNB was defective. If the signal still does not check good, suspect the receiver or the LNB cable.

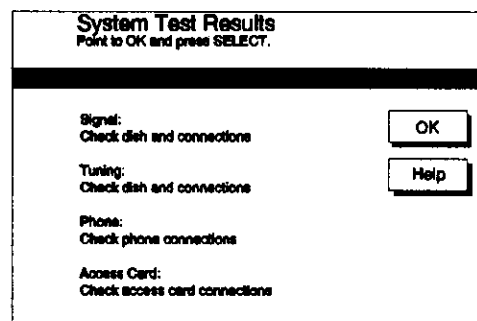


Figure 100, Consumer Diagnostics Menu (Repeated)

Tuning

The tuner check indicates whether the receiver's tuner is tuning to a satellite transponder. If the signal strength is good but the tuning test fails, suspect a defective receiver or LNB.

Phone

During the phone portion of the self test, the receiver checks for a dial tone and performs an internal loopback test. If the phone test detect a problem, it will put the message "Check phone connections" on the screen. If the phone check detects no problems, the message OK will appear on the screen.

If the phone check fails, you must confirm the operation of the telephone line connected to the receiver. Do this by unplugging the receiver and connecting a known good telephone in the receiver's place. If the telephone works, suspect a defective receiver. If the telephone doesn't work, suspect a defective connection or a bad cable between the junction box and the receiver's connecting point.

Access Card

During this test, the receiver sends a code to the access card and looks for a reply. If the card replies correctly, the card is OK. If the card doesn't answer back or answers incorrectly, the card is malfunctioning.

A coarse alignment of the satellite antenna to locate the satellite can be accomplished by using the following map and charts. The map shows latitude and longitude lines running through the United States. The additional curved lines on the map represent the magnetic variation of the earth's magnetic field. The charts show what azimuth and elevation to use when pointing the dish for a given location. Both the true north and magnetic north azimuths are provided.

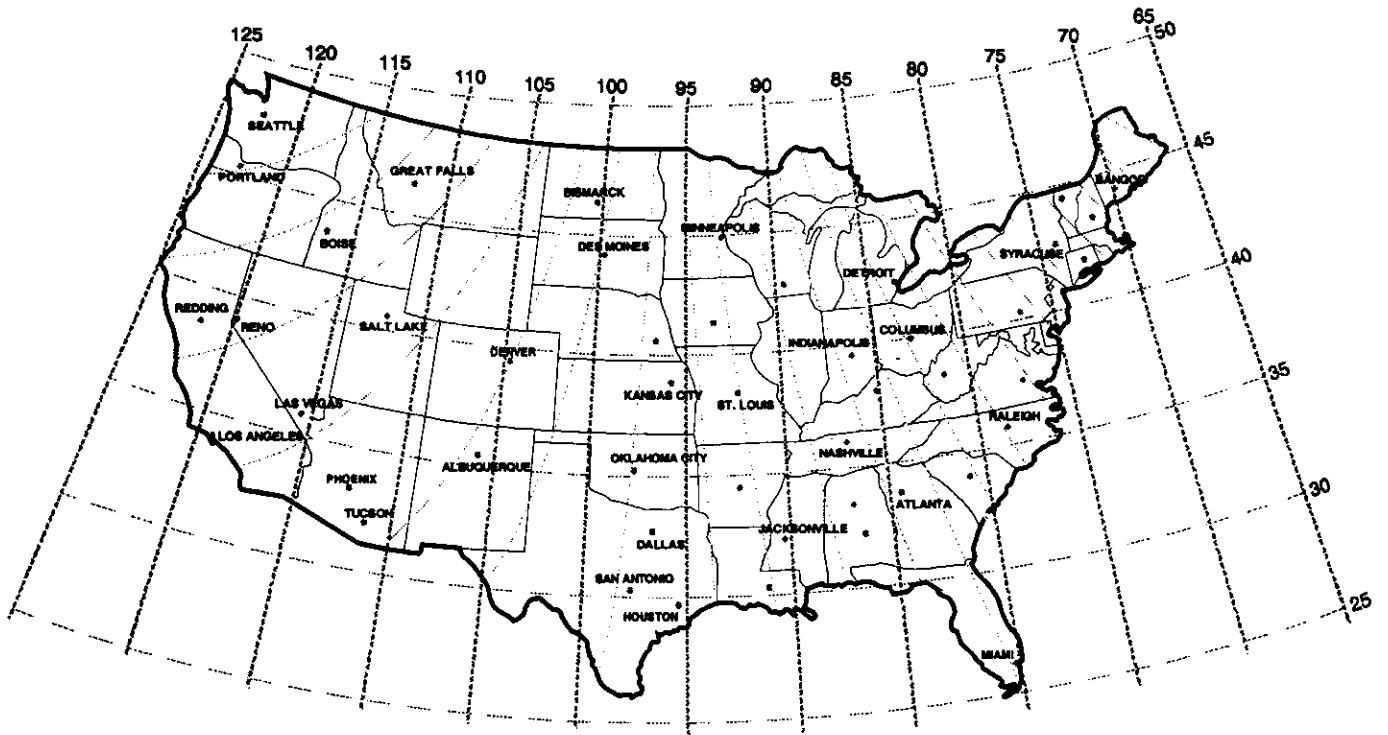
Because the earth's geographical north pole is not the same as the magnetic north pole, magnetic north and true north readings are not the same. A compass, being a magnetic device, will point to magnetic north, not true north. To point the dish in the right direction, the magnetic variation must be considered when calculating the azimuth. The charts show the magnetic variation, true north azimuth and the magnetic north azimuth. The magnetic north is the reading used when finding the azimuth with a compass.

To point the dish using the map and chart:

1. Find the approximate location of the installation site on the map.
2. Locate the nearest latitude (horizontal) line.
3. Locate the nearest longitude (vertical) line.
4. Find the row in the chart with the same latitude and longitude as found in steps 3 and 4. Use the magnetic north azimuth and its associated elevation to point the dish in the right direction.

For example, if the dish were being installed in Houston, Texas, the latitude would be approximately 30° and the longitude approximately 95° W. The magnetic north azimuth would be approximately 186° with an elevation of approximately 54.4°. Although these values are only approximate, they will get the dish pointed in the general direction so a fine alignment can be made using the pointing menus in the receiver.

The DSS receiver also calculates the azimuth and elevation to the DSS satellites from the installation site. It does this with two methods. One method, uses the Zip Code of the installation site while the other method uses the installation site's azimuth and elevation. Before you can use either of these methods, you must first connect your satellite receiver to a TV. Once the TV is connected to the receiver, use the following



Latitude Longitude Map of United States.

SATELLITE 101° WEST					
LATITUDE	LONGITUDE	*MAG. DECL.	TRUE NORTH AZ	*MAG. NORTH AZ	ELEV.
25	80	+2	222	224	52.5
25	85	0	214	214	55.7
25	90	-4	205	201	58.3
25	95	-6	194	188	60.0
25	100	-8	182	174	60.8
25	105	-9	171	163	60.4
25	110	-10	159	149	59.1
25	115	-12	149	137	56.8
30	80	+3	218	221	48.2
30	85	0	210	210	50.9
30	90	-3	201	198	53.0
30	95	-6	192	186	54.4
30	100	-8	182	174	56.2
30	105	-10	172	162	54.8
30	110	-11	162	151	53.7
30	115	-13	154	141	51.8
35	75	+7	220	227	40.9
35	80	+5	214	219	43.6
35	85	+1	207	208	45.9
35	90	+3	199	196	47.7
35	95	-6	190	184	48.9
35	100	-9	182	173	49.3
35	105	-11	173	154	49.1
35	110	-13	165	152	48.2
35	115	-14	157	143	46.7
35	120	-15	149	134	44.6
40	70	+16	223	239	33.8
40	75	+11	217	228	36.6
40	80	+7	211	218	38.9
40	85	+3	204	207	40.9
40	90	-2	197	195	42.4
40	95	-6	189	183	43.3
40	100	-9	182	172	43.7
40	105	-12	174	162	43.6
40	110	-14	166	152	42.8
40	115	-16	159	143	41.5
40	120	-17	152	135	39.8

SATELLITE 101° WEST					
LATITUDE	LONGITUDE	*MAG. DECL.	TRUE NORTH AZ	*MAG. NORTH AZ	ELEV.
45	65	+20	226	246	27.2
45	70	+18	220	238	29.8
45	75	+13	215	228	32.1
45	80	+8	209	217	34.1
45	85	+3	203	206	35.8
45	90	-1	195	194	37.0
45	95	-5	188	183	37.8
45	100	-10	181	171	38.2
45	105	-13	174	161	36.9
45	110	-16	167	151	37.4
45	115	-17	161	144	36.3
45	120	-18	154	136	34.8
45	125	-18	148	130	33.0
50	65	+23	223	246	23.4
50	70	+21	218	229	25.6
50	75	+16	212	228	27.6
50	80	+7	207	214	29.3
50	85	+5	201	206	30.7
50	90	+1	194	195	31.8
50	95	-4	188	184	32.4
50	100	-9	181	172	32.7
50	100	-14	175	161	32.6
50	105	-17	168	151	32.1
50	115	-20	162	142	31.2
50	120	-21	156	135	29.9
50	125	-22	150	128	28.9

***NOTE: THE MEG. DECLINATION VALUES ARE APPROXIMATE SINCE THE MEG. DECLINATION SHIFTS WESTWARD AT THE RATE OF 1° EVERY 8½ YEARS.**

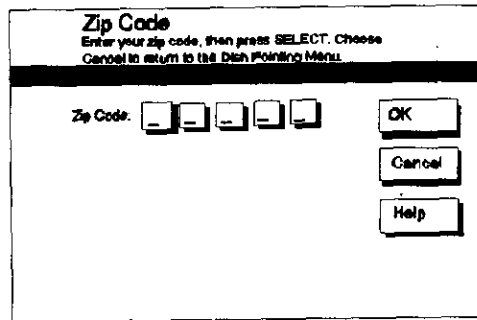
DSS Satellites Location Chart

steps to find determine the azimuth and elevation to the DSS satellites from your installation site.

Use the following procedure to find the DSS satellites azimuth and elevation with the installation site Zip Code:

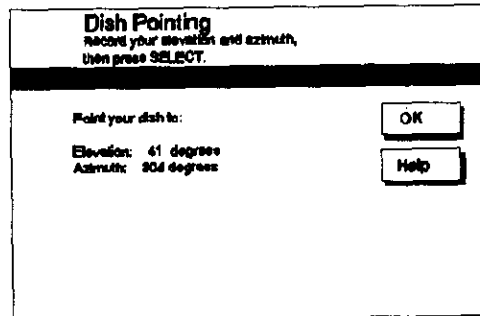
1. Turn on the TV and DSS receiver.
2. Tune your TV to channel 3 or 4, depending on the setting of the CH3/CH4 switch on the back of the receiver.

3. Press DSS on the receiver's remote control.
4. Press MENU on the remote control to bring up the Main menu.
Note: Each of the receiver's screens includes instructions that will help you use the menu system.
5. Select *Options*.
6. Select *Setup*.
7. Select *Dish Pointing*.
8. Select *Point Dish Using Your Zip Code* to bring up the Zip Code display screen.
9. Enter your zip code using the number keys on the remote control. Select OK when you have finished.



Zip Code Display Screen

Once the zip code is entered, the display screen gives you the correct azimuth and elevation for the installation site. Write both these numbers down so that you can refer to them later.



DSS Dish Azimuth and Elevation Screen

The DSS receiver can also use the latitude and longitude of the installation site to determine the azimuth and elevation to the DSS satellites. There two steps to do this. The first is to determine the latitude and longitude of the installation site. In the second step, that site's latitude and longitude are used to determine the azimuth and elevation to the DSS satellites.

Use the map on page 119 to determine the latitude and longitude of the installation site. Then connect either the RF output (or video output if you have a monitor type of television) and use the following procedure:

1. Turn on the TV and DSS receiver.
2. Tune your TV to channel 3 or 4, depending on the setting of the CH3/CH4 switch on the back of the receiver.
3. Press DSS on the receiver's remote control.
4. Press MENU on the remote control to bring up the Main menu.
Note: Each of the receiver's screens includes instructions that will help you use the menu system.
5. Select *Options*.
6. Select *Setup*.
7. Select *Dish Pointing*.
8. Select *Point Dish Using Latitude and Longitude* to bring up the latitude and longitude display screen.
9. Enter your latitude and longitude using the number keys on the remote control. Select OK when you have finished.

Latitude and Longitude
Enter your latitude and longitude, then press SELECT.
Choose Cancel to return to the Dish Pointing Menu.

Latitude: Longitude:

OK
Cancel
Help

Latitude and Longitude Display Screen

Once the latitude and longitude are entered, the display screen gives you the correct azimuth and elevation for the installation site. Write both these numbers down so that you can refer to them later.

**Finding the
Magnetic
Azimuth**

The magnetic azimuth is the directional reading in degrees taken directly from the compass. This reading represents the number of degrees off of magnetic north. For example:

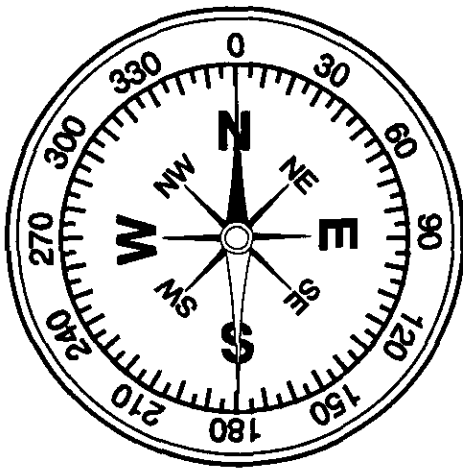
East - 90° Azimuth

West - 270° Azimuth

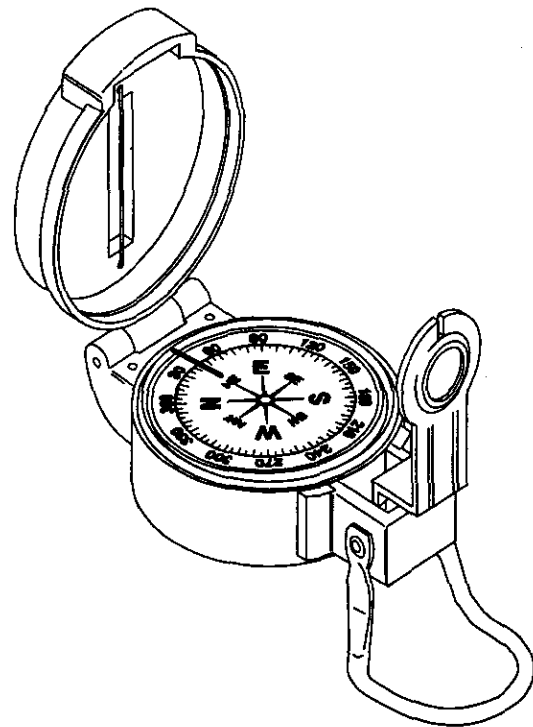
South - 180° Azimuth

North - 0° or 360° Azimuth

Two types of compasses are commonly used to find the magnetic azimuth. The “standard” compass has a fixed dial with a “needle” that always points toward magnetic north. Another type is a “lensatic” compass. This compass has a stationary reference mark with a moving dial and a lens that allows the user to focus on the dial while peering through a directional sight. Both types can be used to find the magnetic azimuth. However, the lensatic compass is more accurate and is the preferred choice.

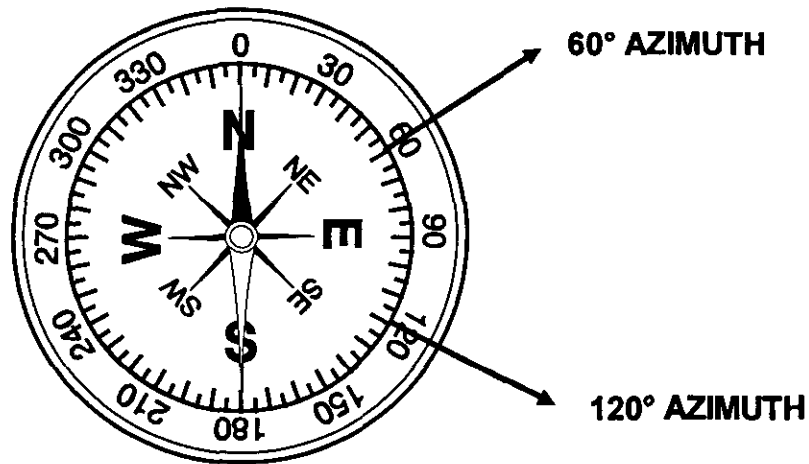


Standard Compass

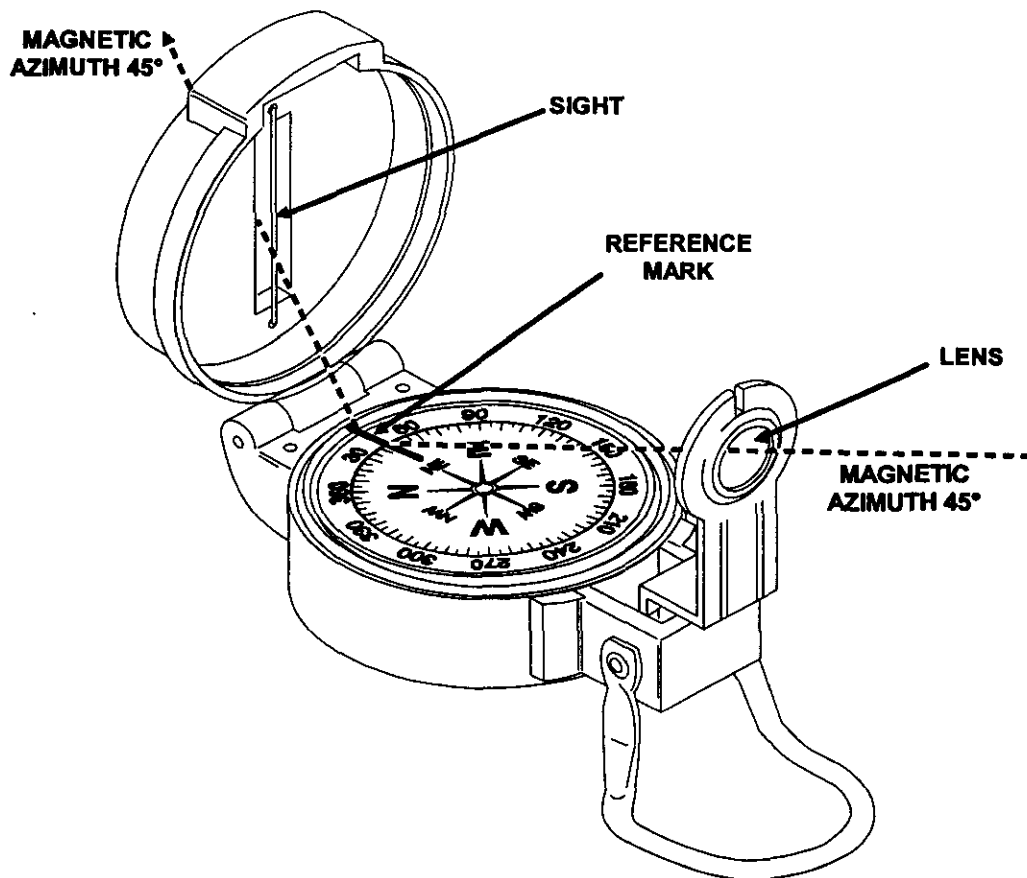


Lensatic Compass

To find the magnetic azimuth with the standard compass, rotate the compass so the needle lines up on the 0° (north) mark. The compass is now aligned with magnetic north and the azimuth degrees are the same as the degree markings on the dial.



To find the magnetic azimuth with a lensatic compass, first align the reference mark with the sight. Then look at the degree markings through the lens. The degree marking that falls under the reference mark is the magnetic azimuth of what is seen through the sight.



The following is the portions of the 1993 National Electrical Code that pertains to the installation of the Digital Satellite Systems. These are only pieces of the complete code and if there are any questions the National Electrical Code handbook should be consulted. Also, before doing any installations in an area, it is important to check for any local codes that would pertain the installation of the system.

250-1. Scope

This article cover general requirements for grounding and bonding of electrical installations, and specific requirements in (a) through (f) below.

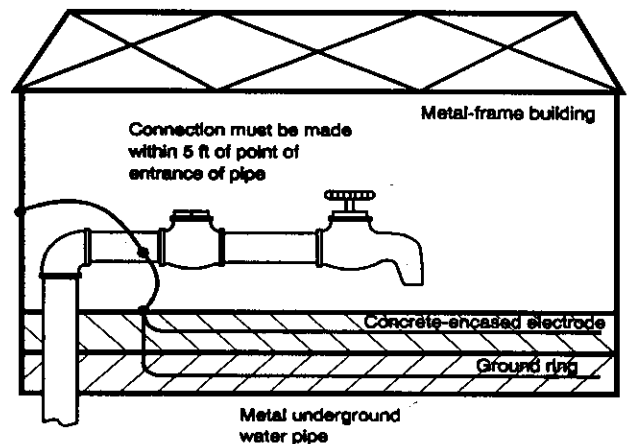
- (a) Systems, circuits, and equipment required, permitted, or not permitted to be grounded.
- (b) Circuit conductors to be grounded on grounded systems.
- (c) Location of grounding connections.
- (d) Types and sizes of grounding and bonding conductors and electrodes.
- (e) Methods of grounding and bonding.
- (f) Conditions under which guards, isolation, or insulation may be substituted for grounding.

250-81. Grounding Electrode System.

If available on the premises at each building or structure served, each item (a) through (d) below, and any made electrodes in accordance with Sections 250-83 (c) and (d), shall be bonded together to form the grounding electrode system. Interior metal water piping located more than 5 feet (152 cm) from the point of entrance to the building shall not be used as a conductor to interconnect the electrodes and the grounding electrode conductor. The bonding jumper shall be installed in accordance with Sections 250-92 (a) and (b), shall be sized in accordance with Section 250-94, and shall be connected in the manner specified in section 250-115. The unspliced grounding electrode conductor shall be permitted to run to any convenient grounding electrode available in the grounding electrode system. It shall be sized for the largest grounding electrode conductor required among all the available electrodes.

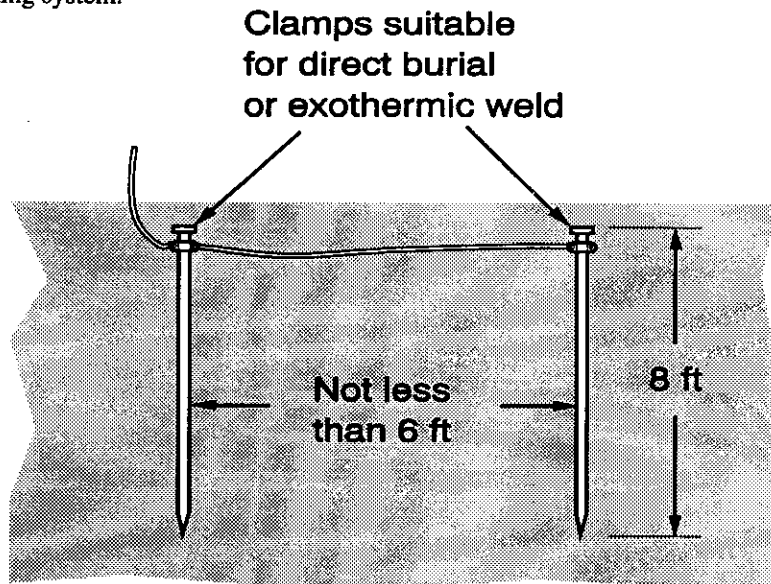
(a) Metal Underground Water Pipe.

A metal underground water pipe in direct contact with the earth for 10 feet (3.05m) or more (including any metal well casing effectively bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or sections or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in Section 250-81 or in Section 250-83. The supplemental electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the grounded service raceway, or any grounded service enclosure.



250-83. Made and Other Electrodes.

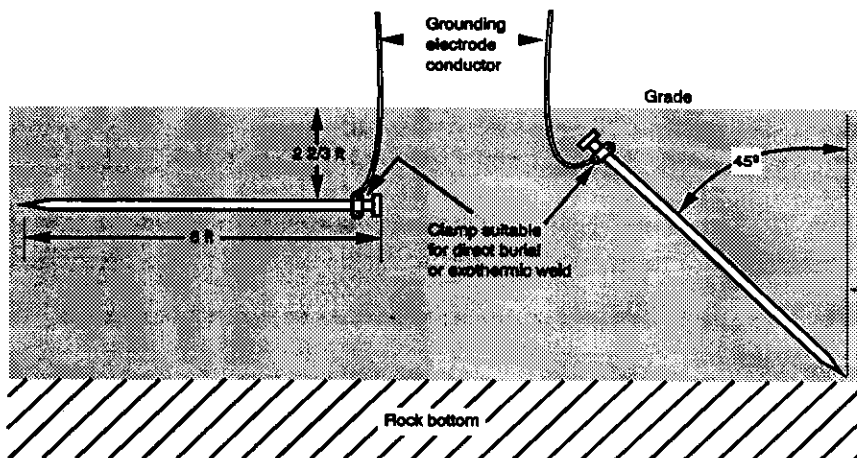
Where none of the electrodes specified in Section 250-81 is available, one or more of the electrodes specified in (b) through (d)* below shall be used. Where practicable, made electrodes shall be embedded below permanent moisture level. Made electrodes shall be free from nonconductive coatings, such as paint or enamel. Where more than one electrode is used, each electrode of one grounding system (including that used for lightning rods) shall not be less than 6 feet (1.83m) from any other electrode of another grounding system.



(c) Rod and Pipe Electrodes.

Rod and pipe electrodes shall not be less than 8 feet (2.44m) in length and shall consist of the following materials, and shall be installed in the following manner.

- (1) Electrodes of pipe or conduit shall not be smaller than 3/4-inch trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.
- (2) Electrodes of rods of iron or steel shall be at least 5/8 inch (15.87mm) in diameter. Stainless steel rods less than 5/8 inch (15.87) in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than 1/2 inch (12.7mm) in diameter.
- (3) The electrode shall be installed such that at least 8 feet (2.44m) of length is in contact with the soil. It shall be driven to a depth of not less than 8 feet (2.44m) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or shall be buried in a trench that is at least 2 1/2 feet (762mm) deep. The upper end of the electrode shall be flush with or below ground level unless the above ground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250-117.

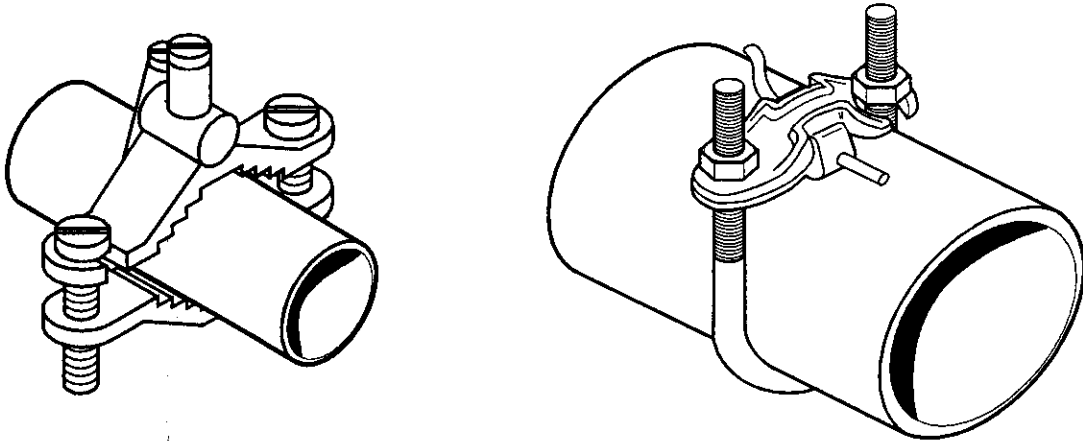


250-115. Connection to Electrodes.

The grounding conductor shall be connected to the grounding electrode by exothermic welding, listed lugs, listed pressure connectors, listed clamps, or other listed means. Connections depending on solder shall not be used. Ground clamps shall be listed for the materials of the grounding electrode and the grounding electrode conductor and, where used on pipe, rod, or other buried electrodes, shall also be listed for direct soil burial. Not more than one conductor shall be connected to the grounding electrode by a single clamp or fitting unless the clamp or fitting is listed for multiple conductors. One of the methods indicated in (a), (b), (c), or (d)* below shall be used.

(a) Bolted Clamp.

A listed bolted clamp of cast bronze or brass, or plain or malleable iron.



(b) Pipe Fitting, Pipe Plug, etc.

A pipe fitting, pipe plug, or other approved device screwed into a pipe or pipe fitting.

(c) Sheet-Metal-Strap Type Ground Clamp.

A listed sheet-metal-strap type ground clamp having a rigid metal base that seats on the electrode and having a strap of such material and dimensions that it is not likely to stretch during or after installation.

810-1. Scope.

This article covers radio and television receiving equipment and amateur radio transmitting and receiving equipment, but not equipment and antennas used for coupling carrier current to power line conductors.

810-15. Grounding

Masts and metal structures supporting antennas shall be grounded in accordance with Section 810-21.

810-21. Grounding Conductors - Receiving Stations

Grounding conductors shall comply with (a) through (j) below.

- (a) **Material.** The grounding conductor shall be of copper, aluminum, copper-clad steel, bronze, or similar corrosion-resistant material.
- (b) **Insulation.** Insulation on grounding conductors shall not be required.
- (c) **Supports.** The grounding conductors shall be securely fastened in place and shall be permitted to be directly attached to the surface wired over without the use of insulating supports.
- (d) **Mechanical Protection.** The grounding conductor shall be protected where exposed to physical damage, or the size of the grounding conductors shall be increased proportionately to compensate for the lack of protection.

- (e) **Run in Straight Line.** The grounding conductor for an antenna mast or antenna discharge unit shall be run in as straight a line a practicable from the mast or discharge unit to the grounding electrode.
- (f) **Electrode.** The grounding conductor shall be connected as follows:
- (1) To the nearest accessible location on the building or structure grounding electrode system as covered in Section 250-81, (2) the grounded interior metal water piping system as covered in Section 250-80(a), (3) the power service accessible means external to enclosures as covered in Section 250-71(b), (4) the metallic power service raceway, (5) the service equipment enclosure, or (6) the grounding electrode conductor or the grounding electrode conductor metal enclosures; or
 - (2) If the building or structure served has no grounding means, as described in (f)(1), to any one of the individual electrodes described in Section 250-81; or
 - (3) If the building or structure served has no grounding means, as described in (f)(1), or (f)(2), to (1) an effectively grounded metal structure or (2) to any of the individual electrodes described in Section 250-83.
- (g) **Inside or Outside Building.** The grounding conductor shall be permitted to be run either inside or outside the building.
- (h) **Size.** The grounding conductor shall not be smaller than No.10 copper or No. 8 aluminum or No. 17 copper-clad steel or bronze.
- (I) **Common Ground.** A single grounding conductor shall be permitted for both protective and operating purposes.
- (j) **Bonding of Electrodes.** A bonding jumper not smaller than No. 6 copper or equivalent shall be connected between the radio and television equipment grounding electrode and the power grounding electrode system at the building or structure served where separate electrodes are used.

DSS Reference Publications

<u>Publication/Description</u>	<u>Model #</u>	<u>Publication Number</u>
DSS Accessories & Antenna Components Catalog	N/A	T-8743CM
DSS System Customer Education Guide	N/A	T-DSSGUIDE-1
DSS System Installation Training Manual	N/A	T-DSSINSTALL-1
New Home "Prewiring" & Distribution Systems	N/A	T-DSSPREWIRE-1
Satellite Dish Installer Guide	DSA100RW	1Q57 406-01A
Satellite Dish Installer Guide	DSA400RW	1Q57 414-01A
Satellite Receiver User's Manual	DRD102RW	1Q57 407-01A
Satellite Receiver User's Manual	DRD203RW	1Q57 415-01A

NOTE: To obtain the publications listed above contact:

Thomson Consumer Electronics
10003 Bunsen Way
Louisville, KY 40299
Telephone: 502-491-8110

Thomson Consumer Electronics (RCA Brand DSS)

DSS Service Support Line 1-800-679-4776

Consumer should call this number to resolve service and use and care questions.

DSS Installation Support Line 1-800-377-3399

Installation technicians should call this number to resolve installation assignment questions and problems.

DSS Installer Certification (Fax service only) 1-317-781-4609

Use this number to request installation training materials and to submit completed certification exams.

If information must be mailed to the Installation Reimbursement Center, use this address:

**Thomson Consumer Electronics
P.O. Box 7020
Indianapolis, Indiana 46207-7020**

To order training packets or return completed installation certification exams, use this address:

**RCA DSS Certification Center
P.O. Box 33809
Indianapolis, Indiana 46209-0327**

When involved with a customer exchange, return the defective or used unit with the AUTHORIZATION NUMBER clearly marked on the outside of the carton to:

**TCE DSS Service
Product Rebuilding Operation
7125 Grayson Road
Harrisburg, Pennsylvania 17111**

Program Providers

DIRECTV

Customer Service 1-800-347-3288

Use this number to resolve programming and billing inquiries and to deactivate service.

Installer Activation 1-800-277-4388

Use this number to activate a newly installed system.

USSB

Customer Service 1-800-204-8772

Use this number to resolve programming and billing inquiries and to deactivate service.

Installer Activation 1-800-883-8772

Use this number to activate a newly installed system.

“BASIC” INSTALLATION GUIDE LINES

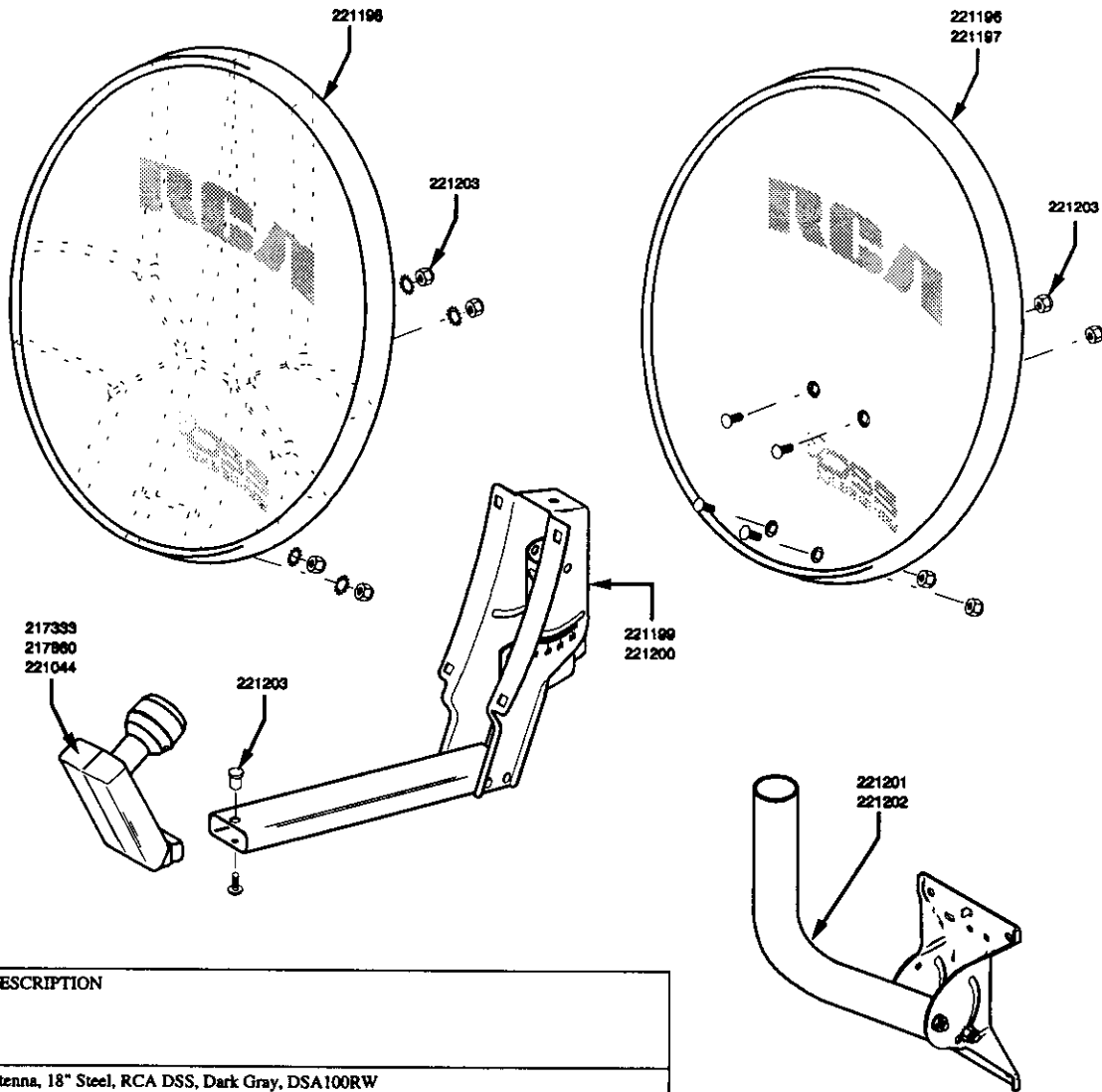
- The dish unit can be mounted on a stable structure of the dwelling - a vertical wall, chimney, or roof, within a 100-foot cable length of the connected TV. Hardware necessary to mount the dish must be provided by the installer and included in “basic” installation price. This includes screws or bolts, grounding hardware, and an occasional inexpensive Thomson-approved chimney mount.
- The installer provides up to 100 feet of Thomson-approved RG-6 coaxial cable and up to 100 feet of telephone cable.
- The satellite receiver should be connected to one TV and VCR (if the VCR is located at connected TV location).
- The antenna is grounded to meet the National Electric Code (NEC) requirements.
- The coax cable routed through a normal frame structure or only one layer of masonry (brick or block).
- All cables should be routed to the TV either through an exterior wall or from a basement or crawl space.
- A telephone connection should be installed at the location of the DSS receiver. An existing phone outlet may be used if within a reasonable distance of the connected TV and acceptable to the consumer. The installer should assume that most installations will require a telephone cable hook-up.
- Providing up to 20 minutes of customer education on system operation.
- Estimated time to complete a “basic” installation is 2 hours.
- The “basic” install includes travel up to 25 miles (or 25 minutes in dense metro areas) for the installation without additional mileage charge to the consumer.

INSTALLATION ADD-ONS

These items are some installation add-ons for which a customer may be charged by the Installer:

- The outdoor antenna unit must be mounted at significant distance from the dwelling, requiring lengthy underground cabling.
- Multiple masonry walls or a solid concrete wall must be penetrated.
- The satellite antenna unit must be installed at a location which requires more than 100 feet of coax cable to connect the TV and would require amplification.
- Multiple TVs are to be connected. This would probably require multiple satellite receivers.
- An off-air (VHF-UHF) antenna is needed to capture local signals.
- Complying with state and local codes for grounding more stringent than the National Electric Code.
- Fishing cable in the walls.
- Travel distance beyond that included with the “basic” installation.
- Make certain the consumer understands the costs of any additional options before you begin the installation work.

132 Appendix E / RCA DSS Dish Parts List



RCA STOCK NUMBER	DESCRIPTION
221197	Antenna, 18" Steel, RCA DSS, Dark Gray, DSA100RW
221196	Antenna, 18" Steel, DSS logo only, Dark Gray, DSA112NW/DSA212NW
221198	Antenna, 18" SMC, RCA DSS, Light Gray, DSA400RW
221199	Mounting Bracket Assembly, Dark Gray, (Steel Antenna), DSA100RW/112NW/212NW
221200	Mounting Bracket Assembly, Light Gray, (SMC Antenna), DSA400RW
221201	Base/Tube Assembly, Dark Gray, (Steel Antenna) DSA100RW/112NW/212NW
221202	Base/Tube Assembly, Light Gray, (SMC Antenna), DSA400RW
217333	LNB, Single, (Dark Gray), DSA100RW/DSA112NW
217660	LNB, Dual, (Dark Gray), DSA212NW
221044	LNB, Dual, (Light Gray), DSA400RW
221203	Hardware Kit, Nut, Bolt and Washer Assortment, 5 ea. of the following: all models
212050	LNB Mounting Nut, #8, Dark Gray, DSA100RW/DSA112NW/212NW
212051	LNB Mounting Nut, #8, Light Gray, DSA400RW
212052	LNB Mounting Screw w/Bushing, 8/32X3/4, Dark Gray, DSA100RW/DSA112NW/212NW
212053	LNB Mounting Screw w/Bushing, 8/32X3/4, Light Gray, DSA400RW
212054	Screw for Steel Antenna, 1/4", Dark Gray, DSA100RW/DSA112NW/212NW
212055	1/4" Hex Lock Nut for Steel Antenna, Dark Gray, DSA100RW/DSA112NW/212NW
212056	1/4" Hex Nut for SMC Antenna, Light Gray, DSA400RW
212057	1/4" Tooth Washer for SMC Antenna, Light Gray, DSA400RW

GLOSSARY

A Alignment

The process of adjusting the satellite dish to receive the strongest satellite signal.

Azimuth

Left and right adjustments to your satellite dish. Technically, the degrees of rotation on a compass, measured in a clockwise direction from true North. This information can be used to determine the location of the satellite's relative position to your home and help you to point the dish towards the satellite.

B Bullet Amplifier

Small device used to increase signal power and offset signal loss caused by coaxial cable and splitting devices.

C CATV

Community Antenna Television.

Coaxial Cable

A type of cable used to transmit high frequency signals. High-bandwidth cable that carries the satellite signal from the LNB to the DSS Receiver. The DSS system uses RG-6 cable to connect the satellite dish and the DSS Receiver.

CONUS

Abbreviation for Continental United States.

D DBS

Direct Broadcast Satellite

Dish

The part of the satellite dish antenna that collects, reflects, and focuses the satellite signal into the LNB.

Drip Loop

Several inches of slack in a cables that prevents water from collecting on the cable or running along the surface of the cable. A drip loop between the LNB and then entry point in to the building also allows some free movement of the dish while adjusting it.

DSS

Digital Satellite System.

DSS Receiver

Receives, processes, and converts the satellite signal into and picture and sound.

E Earth Ground

Conducting connection to the earth for an electrical charge so that the electrical charge is at zero potential with respect to earth.

Elevation

Up and down adjustments of you dish. Technically, the vertical angle that is measured from the horizon up to the satellite. This information helps you locate the satellite and point the dish toward it.

F F Connector

A special type of connector used commonly to terminate coaxial cable.

Feedhorn

The input of the LNB. Collects and focuses satellite signals reflected by the dish.

FSS

Fixed Satellite Service.

G Geostationary

Fixed orbit, approximately 22,300 miles above the earth's equator. Satellites parked in this orbit travel at the same speed as the rotation of the earth.

Grounding Block

Device that connects two coaxial cables and can be grounded to earth to prevent electrical surges through the coaxial cables.

Ground Rod

Metal pole eight feet long driven into the ground to connect an electrical current to earth.

Ground Wire (or Conductor)

Wire connecting an electrical circuit to a ground rod.

L LNB

Low Noise Block converter. Usually mounted at the focal point of the dish and used to amplify and convert satellite signals into frequencies sent to the DSS tuner.

Latitude

The distance, measured in degrees, between the location of the surface of the earth and the equator.

Longitude

The distance, measured in degrees, between a position on a the surface of the earth and the prime meridian.

M Main Menu

The first menu in the on-screen menu system. Menus are lists of choices that allow you to customize the DSS Receiver and access features available through the on-screen menu system.

Mast

Metal pipe attached to the mounting foot. Supports the LNB support arm and dish. In a pole mounting system, the metal pole is the mast.

P Plumb Line

String with an attached weight that provides a reference line perpendicular to the ground.

Pre-terminated Coaxial Cable

Cable with factory-installed weatherproof "F" connectors.

R Rafter

Timbers used to support a roof.

S Signal Meter

On-screen meter accessed through the Main Menu, which displays the relative strength of the satellites signal that is used to fine tune the dish. The signal meter also provides auditory feedback.

Stud

Vertical timber used to support a wall.

T Transponder

A communication channel on a satellite.

TVRO

Television Receive-Only earth station.

TVRO Amplifier

Television Receive only amplifier (see bullet amplifier).

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T-DSSINSTALL-1



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