

TRANSCEIVER INSTALLATION GUIDE

The installation of California Amplifier transceiver products should only be done by qualified personnel, and should be under the direct guidelines of the system operator. These installation instructions apply to California Amplifier products only. Use of these instructions to install other manufacturer's products may result in unknown hazards, damage and/or unacceptable performance.

The information contained in this applications note is intended to assist the operator in developing a set of installation guidelines and operating practices for the field personnel skilled in installing roof top subscriber equipment.

California Amplifier accepts no responsibility for claims of injury, death, destruction of property or loss of television service related to improper installation, or installation of equipment by staff not skilled in installing roof top cable television equipment.

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GENERAL INSTALLATION INSTRUCTIONS FOR TRANSCEIVER

NOTE to System Operator:

California Amplifier family of Transceiver products has been designed for installation by a licensed or qualified installer with experience in installing wireless antennas.

NOTE to INSTALLER:

1. Installation and operation of this family of Transceiver products require full compliance with FCC-adopted radio frequency exposure limits. It is in the responsibility of the installer to install these devices and their associated antennas so that RF exposure does not exceed $1.0\text{mW}/\text{cm}^2$. The following table summarizes the minimum distance required to satisfy these requirements.

P/N	Limits, Minimum	
	Integrated Planar (17 dBi)	Standalone (when used with 24 dBi)
520005-1	N/A	26 in. (66 cm)
520004-1	N/A	48 in. (122 cm)
520006-1	N/A	26 in. (66 cm)
520007-2	22 in. (55 cm)	N/A
520024-2	22 in. (55 cm)	N/A
520004-2	22 in. (55 cm)	N/A
520006-2	22 in. (55 cm)	N/A

2. When installing a standalone Transceiver, orient the FCC RF exposure label is facing the front of the Antenna This is a mandatory requirement by the FCC to comply with RF exposure compliance requirements. The label should not be obstructed when installation is complete. This will allow the warning label to be visible and readable. This is a mandatory requirement by the FCC to comply with RF exposure compliance requirements

INSTALLATION PRACTICES

In a customer installation, there are several factors that must be considered before the installation can take place: Signal contour strength and direction of the transmitting source, seasonal interference's such as foliage and trees, aesthetics of the outdoor installation, system performance and overall customer satisfaction with the final product.

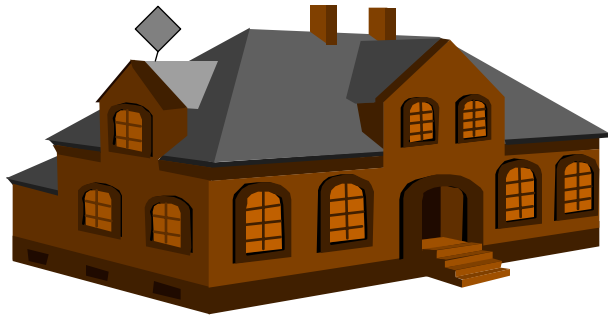
In each case the customer wants the very best signal quality with a minimum of construction and aesthetic impact to their home or business. This will dictate the use of a variety of antenna configurations in order to perform the task of providing adequate signal strength while maintaining low visual impact. The order of visual impact follows the height and size of the antenna. A wall or gutter mount will present a very low visual profile. This is followed by a short roof or chimney mount. When higher gain or foliage clearance is needed, then a tree mount or mast mount should be considered.

The following mounts are described and their general application:

Wall or Standoff Mount: These are used in high signal density areas where antenna aesthetics is of concern. It offers great flexibility in mounting angles and locations. The stand-off arms mount from the wall and or the eave and support the mast in the vertical position. The mast may be short in length so as to place the antenna above the roof line or a telescoping mast may be used in conjunction with a ground plate to extend the antenna height to above the roof peak.



Roof Mounts: The same basic hardware used for wall and eave mounts is used for a roof mount. This mounting bracket and pole is adjustable in the vertical plane and will raise the antenna about 24" above the mounting location. The bracket must be secured into a structural member, not simply into siding or shingles. All points of attachment must be properly waterproofed.



Chimney Mounts: Chimney mounts are one of the easiest types of mounts to install. In the application of brick-type chimneys, a dual band strap mount is best. The proper strap will securely fasten the mounting bracket and antenna. For wood over metal construction chimney, a version of the wall mount is best. Make sure the anchor bolts attach to a supporting stud member and not just the fascia board.



Tripod Mount: The tripod mount offers ease of installation, stable mounting structure, and signal visibility. It is however, bulky and not very aesthetic. The tripod mount comes in 3, 5, 10 and 15-foot sections. As with the roof mount installation, the mounting bolts must always be attached to roof joists and be properly sealed.



Tree Mounts: In regions of the country with heavy foliage, tree mounts are popular. This is a highly specialized installation and is beyond the scope of this installation guide. Specific instructions and practices can only be formatted by the individual operator in their region (not pictured).

Every installation must adhere to company policies, applicable specifications and drawings of the system operator. This requirement includes: the choice of antennas, the weatherproofing of all connections, all penetrations into the building and all grounding procedures, both at the antenna mount and at the point of drop entry into the building.

INSTALLATION PLANNING

In addition to meeting the highest standards of quality and workmanship, another valid goal is to minimize the amount of time spent on a customer's property, thus minimizing any disruption of a customer's schedule. Good planning helps an installer to be efficient and productive on each installation.

Site Survey

Although the general receive location may have been previously surveyed by a signal crew, a detailed, on-site survey is usually required prior to beginning an install. During this survey, signal readings must be recorded on the installation work order. The exact

components that were used as well as the mast height should be noted at this time. You should also create a simple drawing of the antenna installation, including structural supports and ground system relative to the layout of the house, generally drawn on the back of the work order.

Testing for Signal Strength with a Site Survey Rig

The first step of the site survey is to verify where the best signal reception is accommodated on the customer's home. Most installers are provided with a test kit that includes a lightweight, telescoping, fiberglass push-up mast with attached antenna. The antenna gain should be specified by the system engineering staff.

The most satisfactory method to ensure clear and adequate system performance is to achieve a signal-to-noise (S/N) ratio of at least 30 dB. This ratio is measured using a signal level meter/QAM analyzer and may be calculated for California Amplifier transceivers with reasonable accuracy, using the formula below:

$$\text{S/N} = 25 + \text{Transceiver IF Output Level (in dBmv)}$$

TECHNICAL TIP: When reading signal levels, an installer must always be aware of physical factors that can affect system performance. Microwave signals are highly susceptible to absorption by trees and other foliage. A wireless antenna thus cannot view the transmitter from behind a tree. Distant trees can also cause reception problems. While they may not be visible to an installer, they may still lie in the transmission path. **Signal fluctuations exceeding 2 dB during a survey may be an indication of distant foliage problems.**

Foliage from winter to summer will affect the strength of the received signal. Trees that are barren in the winter present very little signal attenuation. In the summer when the trees are full of foliage the attenuation can be as high as 10 dB per tree in the line sight path. NEVER attempt to receive a signal through a barren or partially barren tree.

Of course, hills and large buildings can completely obscure or deflect microwave signs. Still other interesting problems can result when the microwave beam grazes the top of a hill or building, partially deflecting the beam, or when reflective surfaces (bodies of water, buildings, etc.) cause multiple signal paths from the transmitter into the receive antenna, a problem known as "multi-path" can occur.

Never use a signal received from a reflection as its reception characteristics can change drastically over time. Only line-of-sight signals should be used.

GENERAL INSTALLATION GUIDELINES

CAUTION - EXTREME DANGER - OVERHEAD WIRES

When installing any outside antenna, be very aware of all overhead electrical wire and service feeds. Contact with power lines could be catastrophic and INJURY or DEATH may result. When faced with a difficult antenna installation location, do not proceed - contact your supervisor at once.

The following sections list installation procedures for various types of mounting schemes. The order of preference is as listed in these instructions. In other words, wall and eave mounts are preferable over roof mounts, and so on for aesthetic reasons. Note that you will need to evaluate various of the installation and mounting procedures listed in this guide in order to determine the one which provides the best aesthetics and still provides adequate signal quality for proper reception of signals.

SAFETY NOTE: Aluminum ladders are not to be used for field installation or repair service. Only ladders that have fiberglass rails may be used because of the possibility of contact with electrical wires or other energized conductors. Ladders should be checked weekly to make sure that they are in good repair and safe working order.

Instructions:

1. Determine the location of antenna. Choose a location and height for the antennas so that the radio frequency propagation path is not obstructed by tall trees, buildings, freeway overpasses, or any other large obstacle that may interfere or disperse the radio frequency signal. Refer to the network operator's coverage guidelines to determine coverage range where this product may be used.
2. Install a tripod or mast to the structure on which the antenna will be mounted. Refer to operator guidelines on allowable mount types and criteria to determine which is appropriate.
3. Mount the planar antenna to the mast using the mounting hardware provided. Be sure to observe the polarity indicating arrow cast into the antenna radome to ensure

correct antenna polarization. Do not over-tighten the antenna mounting hardware as damage to the antenna may result.

4. Connect the transceiver to a signal level meter and apply power to the unit (through the signal level meter internal power source). Align the antenna by peaking the signal level reading measured on the meter. If available, a QAM analyzer should be used to record the signal level, signal to noise ratio and the Bit Error Rate (BER). Always record these values on the work order.
5. Run a cable from the transceiver into the customer premises. Note: There are a number of established methods of running cables from outdoor installations to indoor locations while eliminating the potential for moisture ingress. It is beyond the scope of these instructions to recommend a method. Please check with the system operator's installation guidelines for recommended procedures.
6. Once inside the customer premises, the cable must be run to the location of the cable modem. At this location, add powering by connecting the cable to the power passing side of the power inserter and plug in the power supply into an appropriate outlet. Note: It may be advisable to use an uninterruptable power supply or surge suppressor to power the transceiver, to minimize power supply transients affecting the performance of the desired link.
7. The cable modem then is connected to the other end of the power inserter, the side that does not pass DC. **Important:** do not apply DC power to the cable modem. Refer to the system operators' instructions or cable modem supplier's instructions on proper operation and verification of cable modem functionality.

See attached diagram for connection configuration.

