

DIRECTV
Standard Professional
Installation Guidelines

Updated March 30, 2006
Retail Version 2

The basic DIRECTV residential installation includes the following:

1. Confirmation of installation appointment. DIRECTV recommends that at a minimum, each customer should receive two (2) pre-calls from the retailer's installation company prior to any work being performed and one (1) post-call after work has been performed. Contact the customer:
 - Two (2) to three (3) days in advance of their scheduled installation to confirm both the appointment window and work to be performed.
 - Installer or dispatcher should phone the customer on the day of the scheduled appointment to confirm when they will arrive to begin the job. In the event that the agreed upon timeframe is in jeopardy, the customer should be contacted and notified of any changes.
 - Contact the customer within two (2) weeks post installation to confirm customer satisfaction.
2. Arrival at customer's residence within the designated window of time preferably wearing proper ID and uniform.
3. Completion of a site survey and planning the installation with the customer (Cable routing, antenna location, connection of devices). Refer to the DIRECTV Installation Manual.
4. Verification of services ordered and work to be performed with customer. Any non-standard/custom work with incremental costs associated must be communicated and agreed to in writing prior to commencement of installation.
5. Routing and properly attaching approved RG-6 cable through external and internal walls as needed. Routing of cable through attics and/or crawlspaces is considered standard. Refer to the DIRECTV Installation Manual.
6. Use of DIRECTV approved drop materials is required.
7. Grounding to meet Local / NEC requirements. Refer to the DIRECTV Installation Manual.
8. Properly mounting to customer's home, aligning and peaking satellite antenna for maximum signal strength. Standard mounting includes, but is not limited to the roof, eave, outside wall, balcony, deck and chimney. Refer to the DIRECTV Installation Manual.
9. A Pole Mount is considered standard on KAKU ODU's

10. A Monopole support mount must be installed on all wall and roof mounted KAKU ODU's.
11. In any market where local channels are delivered from the 101 110 or 119 orbital slots or on HD installs or upgrades, a TripleSat ODU is required on all installations.
12. A KAKU ODU is required in any market where High Definition local channels are delivered from the 99 or 103 orbital slots or on HD installs or upgrades.
13. Dual or Quad cable run is recommended from the ODU to the ground block or Multiswitch on single sat or triple sat installs.
14. Quad cable run is recommended from the ODU to the ground block or Multiswitch on all KAKU High Definition installs.
15. A "B band" converter must be installed to the "SAT IN" on all H20 IRD's
16. Dual cable must be run to all DIRECTV DVRs.
17. Installation of one or more DIRECTV System IRDs as indicated on the customer's work order.
18. All IRDs must be connected to a land based telephone line. Refer to the DIRECTV Installation Manual.
19. Connection of existing off-air antenna or active cable drop (enabling TV to function as it had prior to DIRECTV installation).
20. Connection of existing co-located devices (VCR, functioning surround sound, DVD, video games, etc.) and programming the DIRECTV Universal Remote Control to operate all applicable devices.
21. Completion of a system test verifying signal strength, access card match and telephone connectivity. Refer to the DIRECTV Installation manual
22. Activation of DIRECTV service with the customer on the phone.
23. Cleaning up any mess made during installation and removing debris from the customer's residence. This includes removal of empty equipment boxes at customer's request.
24. Customer education (min. 20 min) on system operation including soft and hard resets. and features (min. 20 minutes). Refer to the DIRECTV Installation Manual

25. Completion of all applicable forms (eg. Work order, Customer Installation Checklist, Certificate Program documents, etc) and obtaining customer's signature certifying the job was completed to their satisfaction.
26. Leaving installation company name and toll free telephone number if applicable with the customer enabling them to contact the Installation Company directly if there are any problems with the installation.
27. If, after arriving at a job the installation cannot be completed and is cancelled, the installer must explain to the customer in detail why they were not able to complete the job.

DIRECTV RECOMMENDED RATES FOR REQUESTED SERVICES BEYOND WHAT IS PROVIDED IN A STANDARD PROFESSIONAL INSTALLATION

The following list contains DIRECTV's recommended rates for additional services, applicable nation-wide. These rates were established after reviewing rates from multiple sources for similar services. We believe these rates are reasonably competitive. Of course, these rates are merely recommended rates and retailers are free to charge reasonable fees based upon the actual work to be rendered by them.

ADDITIONAL CHARGES TO BE PAID TO THE RETAILER OR INSTALLATION COMPANY UPON COMPLETION OF INSTALLATION:

	Not to Exceed
WALL FISH	\$60.00 per
POLE MOUNT REMOVAL DIG	\$65.00
POLE MOUNT REMOVAL CUT	\$20.00
POLE MOUNT/ PER CUSTOMERS REQUEST	\$75.00
SIDEWALK BORE	\$35.00
MIRROR OUTLET	\$45.00
ADDITIONAL OUTLETS WITHOUT RECEIVERS	\$45.00
ADDITIONAL OUTLETS WITH RECEIVERS	\$45.00
SEPARATE TRIP ADDITIONAL OUTLETS	\$85.00
NON -PENETRATING/ SLED MOUNT	\$65.00
BALCONY MOUNT/BRACKETS	\$30.00
FLAT CABLE JUMPER	\$ 5.00
BURY CABLE/ OUTLET	\$30.00
LINE AMPS	\$15.00
DIPLEXERS (2)	\$15.00
WIRELESS PHONE JACK	\$75.00
RELOCATE DISH (CUSTOMER REQUEST)	\$97.50

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1 INTRODUCTION

All employees, contractors or agents, working for a DIRECTV dealer/retailer/sales agent, are required to follow the practices, procedures and standards found in this manual. Any variation from these standards requires prior written approval from DIRECTV technical operations.

It is imperative each person representing DIRECTV provide the best products, prompt responses to problems and courtesy to all DIRECTV customers. The installation technician is often the only person associated with DIRECTV to have direct and personal contact with our customer.

The installer's efficiency, appearance and demeanor determine the customer's first impression of DIRECTV. It is therefore essential that the installer make a positive first impression that reflects well on him, his company and DIRECTV. It is the goal of DIRECTV for each customer contact to be exciting and friendly for the customer.

This manual will:

- Provide the information to ensure every installation is performed in an acceptable and professional manner.
- Ensure the installation standards are followed and maintained in accordance with DIRECTV requirements.

1.1 Pre-Call

- At a minimum, each customer should receive two (2) pre-calls from the retailer or Installation Company prior to any work being performed.
- Contact the customer two (2) to three (3) days in advance of their scheduled installation to confirm both the appointment window and work to be performed.
- Installer or dispatcher should phone the customer on the day of the scheduled appointment to confirm when they will arrive to begin the job. In the event that the agreed upon timeframe is in jeopardy, the customer should be contacted and notified of any changes.
- Contact the customer within two (2) weeks post installation to confirm customer satisfaction.

1.2 Identification

- The credibility of the installer and DIRECTV hinge on the first impression made with the customer.
- The installer must look and be professional in his or her actions, appearance and the appearance of his or her vehicle.
- All vehicles should be appropriate for installation work, undamaged and have proper identifiable signage.
- Upon arrival the installer should knock or ring the bell and step away from the door so he can be identified.
- While greeting the customer the installer should smile and introduce himself.
- The installer should show the customer proper identification.

- The installer must remain polite and courteous at all times.
- A picture ID card identifying the installer as a representative of the retailer should be plain view or, at a minimum, carried and displayed at the initial introduction and upon request.

1.3 Verification

The installer will:

- Verify services ordered and work to be performed with customer. Any non-standard / custom work with incremental costs associated must be communicated and agreed to in writing prior to commencement of installation.
- Ask if there are any known restrictions on satellite antennas in the area or if permission is required from a homeowner's association or landlord. If the customer does not own the property, the installer should receive a copy of the Landlord permission prior to beginning work.

1.4 Pre-Installation Process

The installer will:

- Involve the customer in selecting the best possible location for their DIRECTV antenna and the routing and placement of equipment.
- Explain the different types of mount options and advantages / disadvantages and ask the customer for their location preference. (Having photos of other installations will greatly enhance this presentation and ensure the customer understands the differences.)
- Always attempt to place the antenna and route the cable as inconspicuously as possible. (In locations where snow is common, an antenna placed on a high roof can be difficult or impossible to clean off.)
- Confirm that the customer or a representative for the customer, who is at least 18 years old and authorized to sign for work performed, must be home during the entire installation. It should be noted on the Work Order if the customer plans to have someone represent them.

2 SITE SURVEY

2.1 Preliminary Evaluation

As you approach the work site, be aware of the following:

- 1) Trees, bare trees that will produce foliage in the future and landscaping
- 2) Any large obstructions or potential problems such as:
 - a. Fences
 - b. Fence gates
 - c. Water or gas wells
 - d. Any young trees that may grow into the line of sight
 - e. Construction in progress or potential new construction (new housing development, commercial complex)
 - f. Gardens and flower beds
 - g. Animals such as dogs or horses that may damage the equipment

NOTE: Once inside, ask the customer of any planned future projects that may affect placement of the DIRECTV dish antenna such as additions or pools.

- 3) Note terrain: hilly, flat, wooded or clear
- 4) Type of neighborhood
- 5) Rural - vs.- urban
- 6) Residential - vs.- commercial
- 7) Generally zoned - vs.- Covenant-Restricted neighborhoods are more likely to have association restrictions
- 8) Location of house on property
- 9) Front or rear
- 10) North, South, East or West facing
- 11) Type of house
- 12) Style: ranch, raised ranch, colonial, split-level, etc.
- 13) Roof material type, condition and pitch
- 14) Type of siding: brick, wood, slate, etc.
- 15) Other structures to be aware of are:
- 16) Swimming pool or spa
- 17) Sidewalks or patio – especially in winter when they may be covered with snow
- 18) Deck
- 19) Other potential mounting structures such as garage, shed, barn or carport
- 20) Where electric and telephone service enter the home

2.2 Unobstructed Line of Sight

- Use a compass and inclinometer to locate a site with an unobstructed view to the desired satellite(s).
- Ensure that you have a 10-degree window around the charted location for the satellites. Remember the optimum window is for clear LINE OF SIGHT (LOS) from 10° left of the 101° satellite to 10° right of the 119° satellite. This is ~ a 40° window. If you only require LOS to the 101° satellite and the window will not allow the full 40° clearance, it is acceptable to proceed with the installation. Take into consideration future growth of trees that may impede the signal. If you cannot get a clear LOS, call your supervisor.

2.3 Ground Source

It is very important to access and bond the system to the best possible ground source (preferably the power ground). When looking for a site, the location of the ground is of utmost importance. The dish location should be coordinated with the ground source (keeping the ground as short as possible). If the house is not grounded, notify the customer and have them contact a Licensed Electrician. Contact your supervisor.

2.4 Access to Phone

Is a phone line behind the TV or will you have to install one? Will the phone line be run with the cable or by itself? Remember multiple DIRECTV Receivers must dial out on

the same phone number. Check each phone jack to insure you are using the same number for all DIRECTV Receivers. Any install without a phone line requires the approval of your supervisor.

2.5 Distribution Location

Is there a location in the basement by the furnace or a utility closet that may be suitable for present or future multiswitches? A location indoors is always better than routing several cables around the exterior of the home.

2.6 TV Set Location

Is the TV located on an interior or exterior wall? What cable routing is best to the TV set location?

2.7 Customer Concerns

- Always discuss the installation procedure, cable routing and antenna placement in detail with the customer before any work is performed.
- If cable must be routed on the outside of the house, does the customer agree with your planned cable or phone wire route? (Always route cable through a basement, attic or crawl space before placing it on or around the exterior of the house).
- Is your chosen antenna location going to be located where it would interfere with normal family activities or yard work?
- Is the aesthetics of the installation in keeping with the structure and neighborhood?

Note: The account can only be activated by the person listed on the account

2.8 Customer Walk Through: Walk Through the Installation in Detail

- Cover the services to be installed as noted on the Work Order and amount due.
- Provide the customer with an estimated completion time.
- Discuss location of the dish antenna.
- Discuss routing and entry of the cable and phone wire and note any holes that need to be drilled.
- Confirm location of the DIRECTV Receiver. ("This is where I would like to place the DIRECTV Receiver. Is it OK with you?")
- Discuss routing of cable or wire through the basement, crawl space or through the walls of the home plus any wires on the outside of the home.
- Question the customer as to options, i.e. "Is it OK to bring the cable up through the floor by the TV?"

Note: Inspect all areas where you will be working for existing damage that you could be blamed for later. If you should find damage, bring it to the attention of the customer and have them acknowledge it in writing before performing any work in that area.

- Check the customer's TV, VCR and any audio system that is connected prior to doing any work. Do not assume that they are in proper working order. Always check the reception quality of all off air signals.

Note: Ask the customer (adult) to turn the TV set, VCR, etc. on and show you the channels they receive and how their system works. If you turn the set on and it does not work or has a problem, the customer may claim that you are responsible for the problem.

- Point out any TV set problems to the customer immediately and confirm if problems are new or existing. Explain that DIRECTV System installation will not correct TV set related problems. They should receive better quality signals but a DIRECTV System will not correct a TV set problem.
- Verify that the customer still wants a DIRECTV System installed. If so, make a note on a work order referencing the TV problem and proceed with the installation.
- Follow established procedures regarding collection of any payment due. If payment is required, try to collect prior to installation. Always verify the amount and ask if payment will be by check or cash. This can alleviate potential problems; (e.g.) “My husband has the checkbook.”
- Other General Considerations:
 - Do you have a clear view to the satellite?
 - Has permission been granted if customer is not the owner of the property?

Note: It is the customer’s responsibility to obtain landlord permission for installation.

- Check for other restrictions: e.g., building permit required (depends on location – the burden is on the customer to obtain any such permits.) Refer to the zoning issues below.
- Have the customer remove objects from the top of or around the television set and anything in any work area which could sustain damage while you are working.
- Do not unplug anything for any reason without customer permission beforehand.

ZONING ISSUES (A BRIEF REVIEW)

Installation location on property may mean special local zoning laws apply.

Zoning varies widely by community.

Covenants exist in some subdivisions. These are important but different from zoning laws.

Use good common sense!

2.9 Installation Overview - Standard Installation

1. Confirmation of installation appointment. DIRECTV recommends that at a minimum, each customer should receive two (2) pre-calls from the retailer's installation company prior to any work being performed and one (1) post-call after work has been performed. Contact the customer:

- Two (2) to three (3) days in advance of their scheduled installation to confirm both the appointment window and work to be performed.
- Installer or dispatcher should phone the customer on the day of the scheduled appointment to confirm when they will arrive to begin the job. In the event that the agreed upon timeframe is in jeopardy, the customer should be contacted and notified of any changes.
- Contact the customer within two (2) weeks post installation to confirm customer satisfaction.

2. Arrival at customer's residence within the designated window of time preferably wearing proper ID and uniform.

3. Completion of a site survey and planning the installation with the customer (Cable routing, antenna location, connection of devices). Refer to the DIRECTV Installation Manual.

4. Verification of services ordered and work to be performed with customer. Any non-standard/custom work with incremental costs associated must be communicated and agreed to in writing prior to commencement of installation.

5. Routing and proper attachment of approved RG-6 cable through external and internal walls as needed. Routing of cable through attics and/or crawlspaces is considered standard. Refer to the DIRECTV Installation Manual.

6. Grounding to meet local/NEC requirements. Refer to the DIRECTV Installation Manual.

7. Proper mounting to customer's home of satellite dish antenna and aligning and peaking antenna for maximum signal strength. Standard mounting includes, but is not limited to the roof, eave, outside wall, balcony, deck and chimney. Refer to the DIRECTV Installation Manual.

- To receive programming from the 110° West Longitude (WL) or 119° WL orbital location (i.e. local channels programming, HD programming or DIRECTV PARA TODOS™ programming), a multi-satellite dish antenna is required.

- To receive programming from the 72.5° WL orbital location (i.e. local channels programming in certain markets), a second satellite dish antenna is required to receive local channels programming.
 - To receive programming from the 95° WL orbital location (i.e. WorldDirect™ services), a 36-inch satellite dish antenna is required.
8. Dual cable run is recommended from the dish antenna to the ground block on all installs.
 9. Dual cable must be run to all DIRECTV® DVR Receivers.
 10. Installation of one or more DIRECTV® Receivers, as indicated on the customer's work order.
 11. All DIRECTV Receivers must be connected to a land based telephone line. Refer to the DIRECTV Installation Manual.
 12. Connection of existing off-air antenna or active cable drop (enabling TV to function as it had prior to DIRECTV installation).
 13. Connection of existing co-located devices (VCR, functioning surround sound, DVD, video games, etc.) and programming of the DIRECTV Universal Remote Control to operate all applicable devices.
 14. Completion of a system test verifying signal strength, access card match and telephone connectivity. Refer to the DIRECTV Installation Manual.
 15. Activation of DIRECTV® service with the customer on the phone.
 16. Clean up of any mess made during installation and removal of debris from the customer's residence. This includes removal of empty equipment boxes at customer's request.
 17. Customer education (min. 20 minutes) on system operation and features, including soft resets and hard resets. Refer to the DIRECTV Installation Manual.
 18. Completion of all applicable forms and obtaining customer's signature certifying the job was completed to their satisfaction.
 19. Leaving retailer or installation company name and telephone number with the customer so that customer can contact the retailer or installation company directly if there are any problems with the installation.
 20. If after arriving at a job the installation cannot be completed and is cancelled, the installer must explain to the customer in detail why the job could not be completed.

If you encounter any trouble with the install, contact your supervisor immediately.

REMEMBER: It is the small things that make a great install and a great customer experience.

2.10 Non-Standard Installation

The following are considered non-standard installation services. Address added cost and prices with the customer prior to beginning the install:

- Yard or ground pole mount if requested by customer but not required for LOS
- Interior / Exterior wall fishes
- Mirror outlets (additional outlets)
- Line amplifiers or other accessories not included in the standard installation work order
- Sidewalk bore
- Any other situations that may incur additional incremental charges to customer

2.11 Safety Considerations

OSHA approved training is required for all contractors by DIRECTV and OSHA.

2.12 Working on Roof or Wall Mounts

- Look for obstacles that might hinder movement of a ladder.
- Look for overhead electrical, telephone or CATV wires.
- Look for tree branches or clothes lines.
- Use proper OSHA approved safety equipment like fiberglass ladders, lanyard and body harness.

2.13 Ground Mounts

Before you dig:

- Locate and identify underground electric or gas utilities.
- Locate and identify underground fuel oil or propane lines.
- Locate and identify water lines, sprinkler or sewage system.

Note: Always ask the customer about any underground systems!

2.14 Know Your Limitations!

- Do not attempt any procedure that you are not comfortable performing.
- Call your supervisor for assistance.
- Keep the customer informed of any problems. Never attempt to conceal a problem
- Do not attempt or perform unauthorized work.
- You should only handle DIRECTV-related work and not any other unrelated services (i.e., electrical, plumbing, etc.).

3 DISH ANTENNA INSTALLATION

3.1 Antenna Assembly

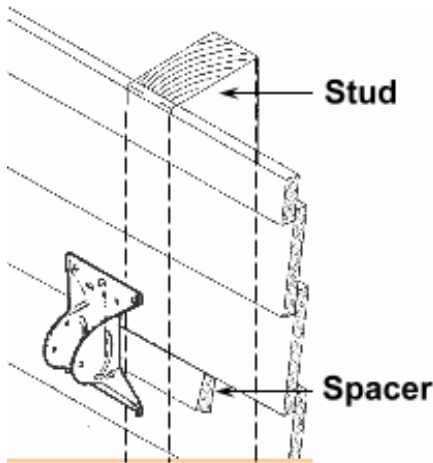
Refer to the specific dish antenna assembly manual included with every dish antenna for this application.

3.2 Wall Mounting – Wood

Locate a suitable wall to attach the base of the mount to using six lag screws (two 5/16”x 3” for the center holes and four 5/16”x 2” for the outside holes*).

A solid, clean, smooth surface will best facilitate the attachment of the mount base to the structure. Attach the base “plumb” using a torpedo level or post level and the mast will “plumb” much easier which will allow for a tighter alignment of the antenna. A shim may be necessary to achieve this when attaching the base to lap siding.

(* - Attaching hardware is not provided with the Antenna Kit.)

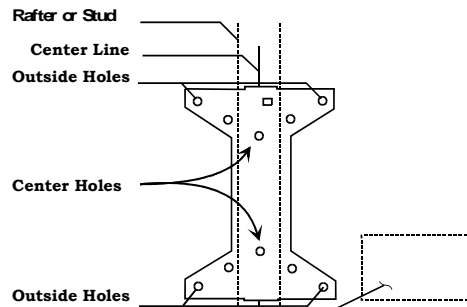


Look for a row of nails attaching the siding to the house to easily locate wall studs or use a stud finder. Loosen the bolts located in the curved slot on both sides of the mast and move the mast to a 90-degree angle from the base to allow access to the center holes. Align the two center holes in the base plate with the centerline of the stud (see diagram). With a pencil, mark the location of the top center hole on the mounting surface to indicate drilling point. Drill a 1/8” pilot hole at this location. Replace the base on the mounting surface and start one of the 5/16” lag bolts in the top center hole to hold the Uni-mount on the surface. Place a

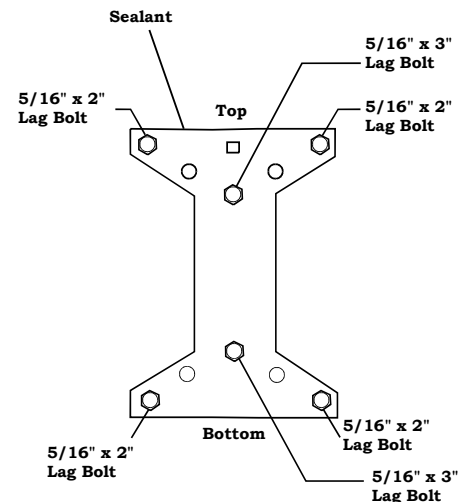
torpedo level alongside the base (from the top ear to the bottom ear), plumb the base on the wall and mark the location of the remaining five holes on the mounting surface.

For ease of drilling, remove the one lag bolt and the base from the surface and drill the remaining pilot holes with a 1/8” drill bit.

To prevent water from leaking into the house, apply silicone sealant around each of the



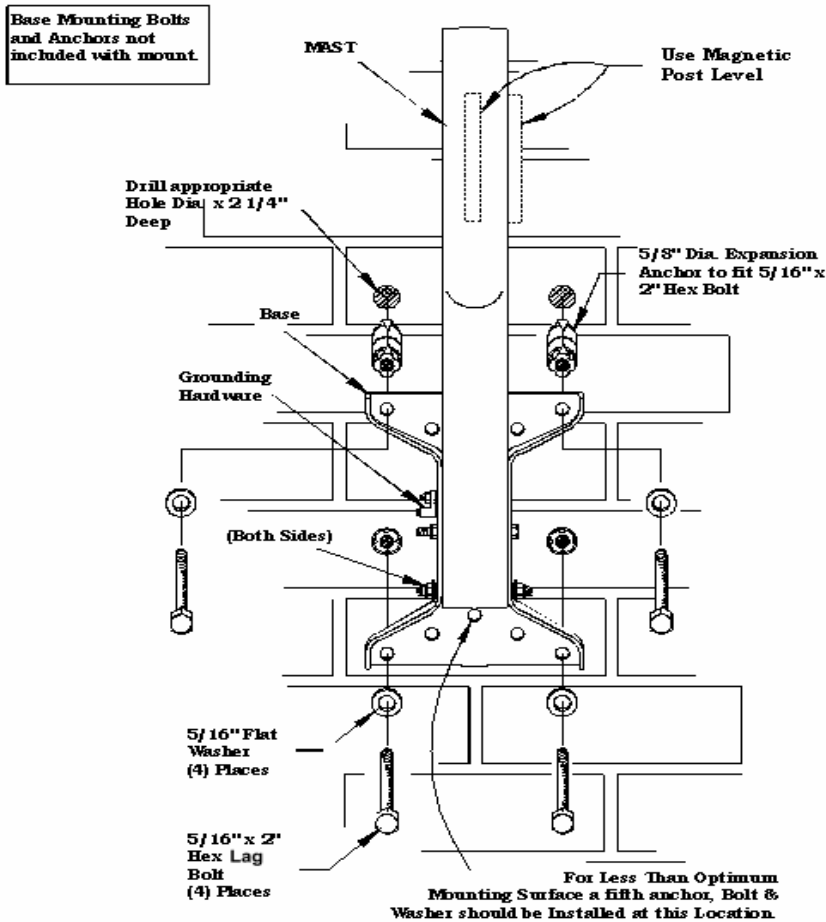
A shim may be necessary when mounting on uneven surface, such as lap siding.



six pilot holes. Replace the base on the mounting surface and install the two 5/16" x 3" lag bolts with flat washers in the center holes. Next install the four 5/16" x 2" lag bolts with flat washers in the outside holes. Torque the six lag bolts.

3.3 Brick Mount

Mount Installed on Brick or Masonry Wall



Locate a solid brick, concrete or block load-bearing wall, and make certain there are no protrusions preventing the Uni-mount from a flush attachment.

When attaching the mount to a brick or concrete wall, you will need four 5/8" x 2" lead anchors and four 5/16" x 2" lag bolts with flat washers. Place the base of the mount against the mounting surface with a torpedo level alongside the base as described above. Be certain that all four outside holes are located on a brick surface and not mortar. Mark the location of the four outside holes with a pencil.

Remove mount assembly from wall and pilot drill

the four marked locations with 1/4" diameter x 2 1/2" deep holes. Drill the pilot holes out to 5/8" diameter x 2 1/2" deep and clean out holes. Install the four lead anchors flush with the surface of the brick. Seal with a silicone sealant.

3.4 Roof Mount Assembly

Use the mounting assembly for a roof application. Generally, this mount may be used only on asphalt shingled roofs. Normally the maximum pitch should not exceed 35 degrees but the universal mount can be installed on roofs with a pitch as high as 53 degrees with the proper safety considerations. Do not install on roofs with wood, slate or tiled shingles.

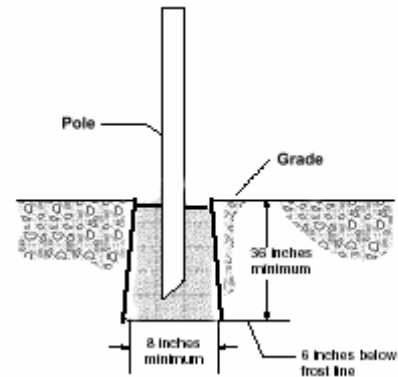
3.5 Positioning

Locate the rafters on the roof that faces southward and determine where the rafters are by using a tapping / listening method or reference point. To use the tapping method, you will need a hammer to tap across the roof area locating the center of the rafter. There will also be information for locating rafters in the manual that accompanies the dish antenna.

Attach the Universal Mounting Assembly using 5/16" x 3" lag bolts and sealing it with Bishops tape or tar patch. This mount can only be used on roofs and walls with a S, SE or SW facing surface and a clear unobstructed line of sight to the satellite. Roof mount procedures are the same as for the Wall with the exception of repositioning the mast foot. All unused holes will be sealed with silicon sealant. For further details, see manuals in each mount package.

3.6 Pole Mount - Hole Size and Location

Typically, the hole will be approximately 36" deep by 8" wide. The hole must be slightly wider at the bottom to prevent frost heave from displacing the pole during inclement weather. Place the flattened end of the pipe in the concrete to prevent rotation and attach the required ground wire to the punched hole. The pipe should extend at least 30" into the concrete pier. The use of "tall" poles is not an option.



3.7 Concrete

The use of Fast Set concrete is a must if the installation is being done the same day as the pole is being cemented. It is acceptable to mix regular concrete and Fast Set 50 / 50 prior to pouring concrete into the posthole. If regular concrete is being used, it must be left to cure 24 hours prior to installing the antenna on the pole.

Install Tip: Dig the hole and set the pole prior to digging the trench, cabling, grounding, etc. This way there will be more time for the concrete to set prior to placing the dish antenna on the post.

3.8 Trench / Drop Bury

- Bury the drop cable to a minimum 6-inch depth or to a depth required by local codes. The buried RG-6 cable must be a minimum of 12" from buried electrical services (NEC 810.18 A). All direct buried cables must be rated for underground use.
- Prior to digging the trench, ensure that there are no utilities in the proposed path. Mobile home parks and MDU projects can have many more obstructions.
- The trench should be prepared in such a way as to eliminate sharp bends in the cable and minimize the impact on the environment. Remember that less than a 6" minimum bend diameter may damage the cable. Under extreme rocky conditions, conduit may be required to protect the cable from damage.
- A service loop should be made at the dish antenna and be tie-wrapped near the antenna to protect it from damage and to conceal the cable.

Note: Any cable that is direct buried must be flooded underground rated cable.

3.9 Cable Run

- The cable must be run at right angles and follow the lines of the structure.
- Do not attach the cable to the roof of the structure with clips, nails or screws that could later cause leaks.
- Cable can NOT be attached to electrical entrance cables or electrical conduit.
- Cable must be kept 4" away from electrical wires on the exterior of the home and 2" away on the interior.
- Cable should be fastened every 18" on a horizontal run. Remember NO staples allowed.
- Drip loops and a feed through bushing are required at all entry points to prevent water migration into the home.

3.10 Dish Antenna Assembly

- Attach the AZ / EL to the dish antenna and torque to 4 PSF.
- Insert and seat the feed support into the bottom of the antenna and torque the assembly to 6 PSF.
- Mount the antenna assembly to the pole and align it to a southerly heading.
- Route the cable up into the AZ / EL cap, leaving extra cable for subsequent maintenance. (One loop will be sufficient.)
- The wire is then routed through the support ARM to the LNB.
- For further details, see manuals in each antenna package

4 GROUNDING & BONDING

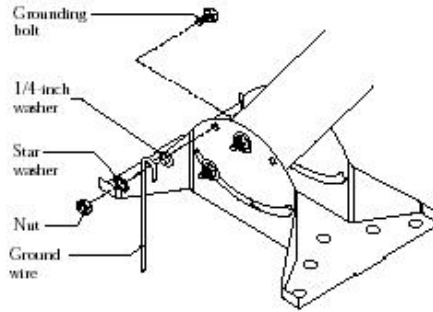
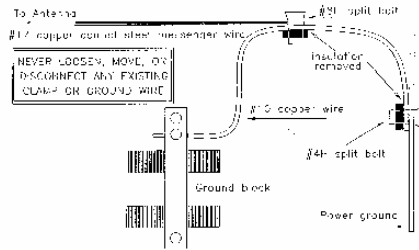
Pay close attention to this section.

It is absolutely necessary for the DIRECTV System to be grounded to the electrical ground of the house. Our equipment should not be on a different ground potential than the house electrical system. If the grounding rules and guidelines are followed, proper grounding will be assured as will customer safety.

The NEC (National Electric Code) states that an outside antenna metal support structure must be bonded to the electrical ground of the house.

Ground the RG-6 messenger wire to the foot of the Universal Assembly Mount. There are several locations that the ground may be attached using the nut, washer and bolt provided. If the foot of the mast is not used, you may attach the messenger wire to the pole with an approved ground lug. These are the only acceptable ground options at the dish antenna. Never use the face of the dish antenna or adjusting bolts to ground the system.

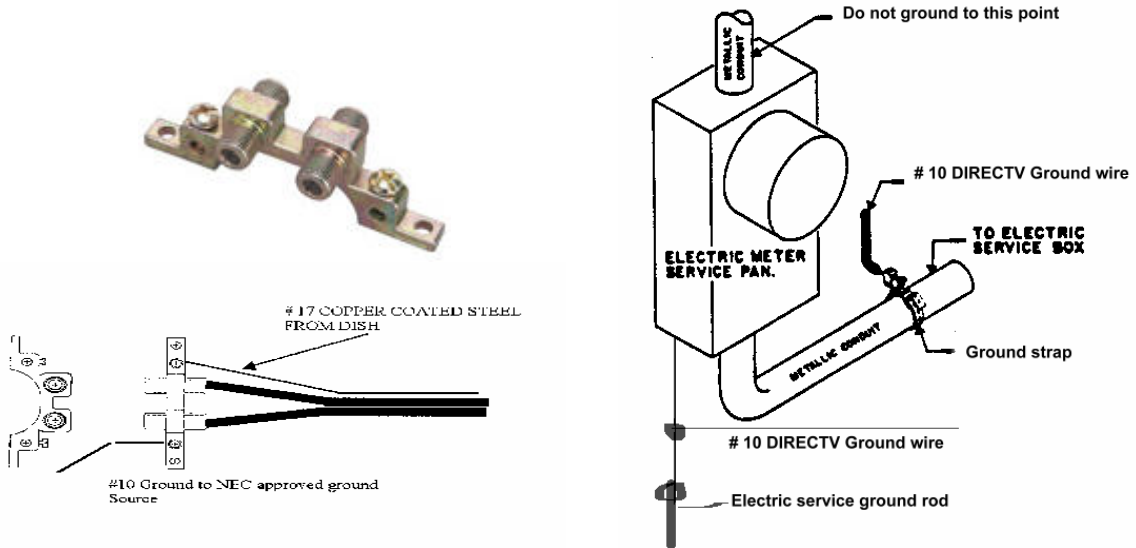
The ground screw **MUST** never be used for any purpose other than for grounding. **Never attach to adjustment bolt that may be loosened at any point.**



4.1 Ground Block

The length of the #10 wire from the ground block to the house ground should be as short as possible and in as straight a line as possible. Whenever possible it should also be shorter than the distance of the cable from the ground block to the DIRECTV Receiver. The maximum length of the #10 from the ground block to the house ground is 20 feet. (NEC 820.40 subsection 4) Use only Green jacketed wire as approved.

Attach the #17 wire from the dish antenna foot to the #10 wire with a #8H split bolt or connector that is NEC approved to accommodate more than one conductor. See the dual screw ground block information below. The dual screw ground block is the preferred method for this connection



4.2 Suitable Ground Sources

When attaching the ground wire from the ground block (#10) to the house electrical ground system, several options are available depending on how the grounding system was originally installed. Below is a list of options currently allowed by DIRECTV, based on NEC requirements:

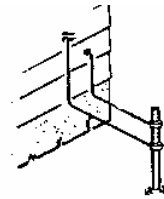
- The #4 or #6 Ground electrode (wire) from the meter base to the electrical service ground rod
- The house ground rod (Separate Attachment)
- The panel box or breaker box ground lug stud
- The metallic service entrance raceway (metal conduit) attached from the meter base (customer side of the meter) to the first main disconnect (breaker box or cut off switch)
- The grounded metal FRAME of the building (commercial or trailer)
- Sprinkler system of a commercial building
- A grounded interior metal cold water pipe within five feet of the point of entry to earth

4.3 #4 or #6 Ground Wire to Electrode

This bonding source is preferred. It is easy to attach and usually easy to access. Remember to take sandpaper or something similar and scrape off any paint or corrosion that might have built up on the wire. This is required to make a good connection. Never do anything that would damage or weaken any ground wire. Use a split bolt to attach the #10 from ground block to the ground electrode wire. Wrench tighten the connection.

4.4 Electrical Ground Rod

The primary ground source of the house electrical system, (usually a ground rod) provides the best ground source. A proper and separate clamp (rated for burial) must be used in attaching the DIRECTV bonding wire to an electrical power ground rod. You may have to dig down a little to expose a rod. If so, it may be necessary to do some cleaning at the point of attachment to ensure a good connection.



Note: Never attach the DIRECTV bonding wire to the existing clamp and never loosen any clamp when attaching the ground. This can be very dangerous as the electrical ground wire can have voltage and high current and this will sacrifice the integrity of the existing ground.

4.5 Panel Box Lug or Meter Base

On some meter bases and panel boxes (breaker boxes), there is a stud, usually at the bottom, where a lug can be attached to provide a grounding point for DIRECTV. If the box or panel does not have this stud, a corner clamp will allow you to attach the bond wire to the back corner of the box.

This clamp must be attached at the rear of the meter pan.

Some power companies will allow this, but you will need to be sure. Contact your local power provider to verify. It is imperative that this clamp can in no way impede or restrict removal of the electric meter cover.

Note: Use this clamp only as a last resort.

4.6 Metallic Service Raceway

This option may be used if there is no electrical ground conductor available to attach to, or if it is further away than the metallic conduit. It is preferable to utilize this option when the metallic conduit is the service entrance conduit and is continuously unbroken between the meter panel and the first main disconnect panel.

This type of connection will need to be made with an approved galvanized grounding strap (Sachs); 6-inch or 12 inch, depending on the diameter of the metallic conduit. The surface of the metallic conduit will need to be cleaned with sandpaper to provide a clean connection.

4.7 Grounded Metal Structure (Mobile Home)

The metal structure of a commercial building or a mobile home by NEC is a ground source and can be used only under the situations outlined in the below diagram. Use an approved beam clamp and take care to clean the metal where the attachment will be made to ensure a good connection.

Also, take care to check that the structure is indeed bonded to the electrical ground. This may be done with a continuity check (using a VOM).

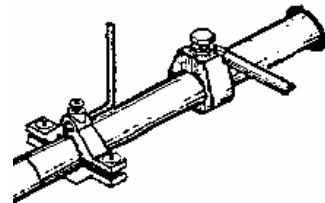
It is best to connect to the I-beam, which is directly grounded to the breaker box. Connection to breaker box must be verified – on doublewide mobile homes, the jumper between the two frames must be present. When using this attachment, the meter pole must be more than 30 feet from the trailer.

4.8 Sprinkler System – Commercial Buildings

When cabling a commercial complex, another ground source can be the fire sprinkler system. This option will offer a ground source, but use it only as a last resort. Remember to scrape off any paint, coating or corrosion on the pipe to be sure it is clean and a good connection is made.

4.9 Metal Underground Water Pipe

Water pipes should not be used for grounding if the point of connection is more than 5' from the point the pipe enters earth. See section 250.52 of the NEC below.



Section 250.52 of the NEC states: A metal underground water pipe in direct contact with the earth for 3.0 m (10 ft) 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 insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors. Interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall not be used as a part of the

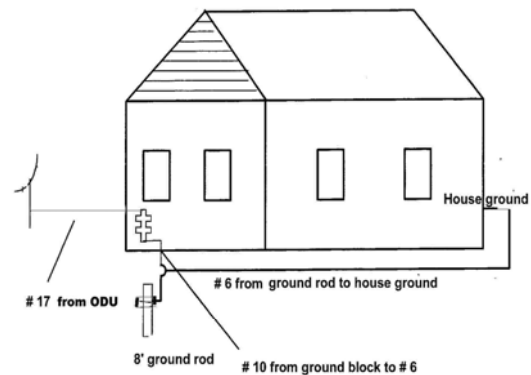
grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.

4.10 Supplemental Electrode Bonding Ground Rod

In most cases, careful planning of the installation will eliminate the need for supplemental electrode bonding.

Changes in the 2002 NEC code have reduced the maximum length of the #10 ground wire to 20 feet. In order to minimize the cable loss, this alternate bonding method may be required.

When the electrical ground is over 20 feet from the ground block, the following method for bonding will enable you to complete the installation by NEC requirements. (NEC 820.40 subsection 4)



The list below provides a step-by-step grounding process. Keep in mind this is a last resort for a ground source.

- 1) Once a suitable position is found for the dish antenna and the ground block, a ground rod will need to be driven into the earth within 20 wire feet of the location of the ground block.
- 2) The type of ground rod to be used is an 8 ft copper coated steel rod. The rod is required to be driven 8 ft into virgin soil. Dig a small hole a couple of inches down. Drive the ground rod except for the last 6 inches.
- 3) Once attachments are made, drive rod in below ground. This requires digging out around the clamp area so the clamp will not be disturbed when rod is set below ground level.
- 4) Use a ground rod clamp to attach the #6 to the ground rod. The #10 from the ground block may be attached to the #6 with a split bolt connector. The other end of the #6 must be connected to the electrical service ground conductor, (wire) or the electric service ground rod.
- 5) The #6 will be run to the house ground either underneath the house or buried if the house is built on a slab.
- 6) At the house electrical ground, the #6 can be bonded either to the house ground electrode with a split bolt rated for two wire connection or to the electrical ground rod with a separate ground rod clamp approved for burial. There are several things to keep in mind when using this method:

- Only one wire may be attached to each ground rod clamp

- This is a good option when the placement of the dish antenna is restricted by the landscape, the location of trees in the yard or the location of the house ground. Some ground sources are located on a pole far away from the house.
- This method can also be used to wrap a #6 wire around a row of apartments or condos where the electrical service and meters are at one end of the building. The ground rod should be placed at the opposite end from the electrical with the #6 between and the #10 attached to the #6 at each residence for bonding.

4.11 Summary of Grounding

This is an extremely important step in the installation of a DIRECTV System. If done correctly, it will provide protection against electrical shock for the customer. To ensure the continuing integrity of the grounding system you have set up at the customer's house, it is essential to attach a green ground warning tag at the connection to the house ground. This will tell the customer or any service technician to contact DIRECTV if the need arises to disconnect our ground from the grounding system of the house. Remember when configuring the ground run, the length of the ground wire must be as short as possible.

“DANGER: Never disconnect the house ground connection in attempts to connect your wire to the house grounding wire.”

Note: Changes in the 2002 NEC code have reduced the maximum length of the #10 ground wire to 20 feet. NEC code. (NEC 820.40 subsection 4)

Always comply with Local Electrical Code Requirements. For example the green ground warning tag may not be required when using #10 green coated ground wire.

5 CABLE ROUTING

After deciding the location of the DIRECTV Receiver(s), plan the routing of the cable. Several things should be considered:

- What type of house is it?
- Is it one or two story?
- Is the foundation conventional or slab?
- What type of siding is used?

When choosing a location for the ground block, choose one that is as close as possible to the house electrical ground to promote a short ground run. If feasible, also place it close to the point of entry for the cable run into the house. Once these are determined, it will be a matter of finding the shortest / best route to the TVs.

5.1 Conventional Foundation

- If the house is on a conventional foundation (basement or crawl space), the cable should be routed underneath the house for aesthetics. If this is the method chosen, make sure that the cable is not left lying on the ground.
- Attach cables up to the underside of the house by using dual clips or drive rings. If the cable route is through a basement, the cable should be through or attached to the joist but should not be attached to the bottom of a joist. If the cable is to be routed through the attic, use a feed through bushing sealed with a silicone sealant at the point of entry. The cable shall be sealed with a silicone sealant to the bushing.
- Take care to place the cable out of the way of traffic or away from anything that might damage it. Always fasten cable up out of the way to protect it. Preferred method is over ductwork and piping. Use caution around hot water pipes and hot water heat pipes. Cable lying on a hot water pipe can be damaged. Cable must have a 2-inch clearance from internal electrical wire.

5.2 Slab Foundation

If the house is on a slab foundation:

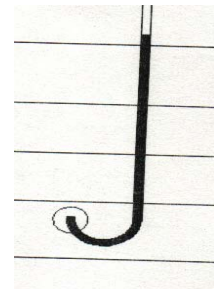
- It is preferable to route the cable through the attic for aesthetic reasons.
- The less showing on the outside, the better. If this is not possible, run the cable along the lines of the house, up either along the eave of the house or along the bottom where it will be easy to hide behind the shrubbery.
- When tacking the cable along the outside of a house, space the clips evenly so they are uniform and the cable maintains a straight line, not sagging. Recommended spacing for clips is 3' vertical and 12 to 18" horizontal.
- Use caution not to crush or compress the cable when installing cable clips.
- When running cable around corners, take care not to kink it in any way. Keep the bend radius (5-inch minimum diameter) in mind.

5.3 Cable Considerations

The proper type of cable must be used for each type of situation. All cables must be Series RG-6, sweep tested to 2050 MHz with a loop resistance of 2 ohms or less and solid copper center conductor. In addition, cable must be UL approved and meet CL2 and CMX ratings.

- Cable running from the dish antenna to the house shall be Series RG-6 Dual cable with #17 copper clad steel ground wire attached for bonding. This cable should never be spliced. No underground splices are permitted. Any cut cable must be entirely replaced.
- The run from the ground block should normally be non-flooded cable. It may be necessary to run flooded if part of the run will need to be buried. In these instances the cable must be converted back to non-flooded cable before it enters the living area of the home in another house box (on the outside) or behind the wall plate on an outside wall. If the cable enters the basement, a ground block may be used as a transition device.

- If a trailer is being installed, avoid bringing cables inside through the wall; instead always bring cables up through the floor. If this is not possible (outside wall), then drilling through the wall may be the only option. Care must be taken to avoid electrical wiring. At the point of entry, use a feed through bushing with silicone sealant.
- When bringing the cable in through a wall or down a wall from the attic, use a wall plate to bring the cable into the room. As a standard install, you can always use a 24-inch drill bit to drill down through the wall from the standard electrical outlet height down through the sill plate in the basement or crawl space. (This should be considered normal installation and NOT a wall fish).
- When the cable is brought up through a non-carpeted floor and the hole is larger than the cable, use a feed through bushing to seal the entry point. (e.g., 5/8" hole for dual RG-6 cable)
 - When the floor is carpeted, it is necessary to properly prepare the carpet for drilling. The recommended method is using a carpet punch. At a minimum, the carpet must be pulled back or out of the path of the drill bit.
 - Be sure the customer understands you will be placing the cable through the carpet. Do not try to drill through the carpeting as this may cause the carpeting strands to get caught on the drill bit and will snag the carpet and cause damage.
- The ground block should be located outside whenever possible.
- When bringing cable inside a structure, into the basement or attic, the method of drilling may differ. Always drill at an angle so that the outside hole is lower than the inside hole to prevent moisture from entering the wall space.
 - If drilling into the basement, it may be best to drill from the outside in.
 - If drilling into the room where the DIRECTV Receiver will be, it is usually best to drill from the inside out for hole placement.
 - Any time the cable runs down an outside wall or entering from above the hole into the house put a drip loop at the hole to prevent water from entering the wall. The loop in the cable must be at least a 4" diameter.



6 TELEPHONE LINE INSTALLATION AND TROUBLE-SHOOTING

Connection of the receiver to a telephone line is required. Every effort should be made to connect the receiver to the customer's telephone line. If the telephone outlet is within 25 feet of the requested location of the DIRECTV receiver, you should connect the receiver to the phone line. In the event that a customer doesn't have a telephone, DIRECTV does have the ability to authorize the unit in a "non-impulse" mode. However, programming packages available to the customer may be limited as not all services can be provided to a receiver not connected to a telephone line. Pay per view purchases must be made by calling customer service and are therefore more expensive than standard impulse

purchases when no telephone is connected to the DIRECTV Receiver. This information should be communicated clearly to the customer prior to beginning the install.

The telephone connection gives the customer the ability of purchasing PPV events by using the remote control (impulse PPV). It also gives DIRECTV access to DIRECTV Receiver information, such as signal quality and the signal history for trouble-shooting. At times, customers will not want the line connected to their DIRECTV Receiver or they will not have telephone service.

6.1 Installation

The preferred method is to home run the telephone line directly from the DIRECTV Receiver to the demarcation point outside the house if a modular jack is not available.

- Always check to see if an existing modular telephone jack is close to the DIRECTV Receiver. This requires a duplex telephone jack so the customer has telephone access at the jack. If the jack is not in close proximity to the DIRECTV Receiver, then make sure any jumper you install will not be in the way of any door or walking path.
- Installation must be completed with approved telephone station wire. Install a biscuit jack or combination wall plate behind the TV and use a modular telephone jumper to connect the jack to the DIRECTV Receiver.
- In some cases, it may be necessary to attach the station wire to an existing outlet. This is allowed when a home run is not practical; however, under no circumstances should the customer's wire be cut. The wire must be connected to an appropriate connection in the existing outlet.
- When connecting the telephone line to the terminals in the outside box, always observe correct polarity (red and green).
- Be careful not to disturb existing telephone connections.
- If the telephone line is installed underneath the house, be careful not to let the wire lay on the ground. It will need to be tacked up along the underside of the house to prevent possible damage
- If the phone line is attached along the outside of the house, run it along the lines of the house. Always try to keep it as well as the coax concealed as much as possible. It is sometimes feasible to run the telephone line underneath the coax thereby concealing it completely. The feed through bushing has a notch in it for routing of the telephone line with the coax. This will eliminate the need for an extra hole to be drilled.
- Biscuit-type telephone jacks can be attached with double-stick foam tape that comes with them or attached directly to the wall with screws.
- Another type of wall jack available has both the telephone and coaxial connection mounted on a wall plate. This device is attractive because it does not require a separate wall outlet for the phone connection; in most cases it requires installing a low voltage bracket in the wall.
- Make sure the customer understands the telephone line should be connected to the DIRECTV Receiver at all times to assure trouble-free service.
- Never splice a telephone line

- Never bury a telephone line that is not rated for direct burial. This type of wire has a thick black insulator type jacket and a flooding compound. Under no circumstances is the station wire to be plugged directly into the receiver by attaching an RJ-11 modular connector directly to the station wire. Modular connectors are designed specifically for satin modular phone line.
- When attaching the wires to the screws in the jack or the house telephone box, never wrap the wire all the way around the screw post overlapping it back onto itself. This can cause the wire to be cut when the screw is tightened. After installation, always check every phone line in the customer's home to ensure all lines are working.

6.2 Trouble-shooting Phone Lines

Many things can affect the operation of the telephone circuit connected to the DIRECTV System. Use the following trouble-shooting steps. If all trouble-shooting fails and no corrective action is found you may be forced to install the DIRECTV Receiver as non-impulse.

- 1) Check to make sure the phone line is connected to the receiver.
- 2) Run a system test. If phone line "not okay," connect a telephone in phone jack and check for dial tone.
- 3) If there is a dial tone, replace DIRECTV Receiver with a different receiver and run system test.
- 4) Check on hook voltage to be sure it is greater than 17 V DC. Typical voltage is ~50 V DC. This is done by reading across the red and green, tip & ring, of the phone line with a multi meter on DC volts.
- 5) Check off hook voltage by taking a phone off hook and reading the voltage the same as above. Off hook voltage must be less than 11 V DC. Typical off hook voltage is ~5 VDC.
- 6) If there is not a dial tone, contact local telephone company.

6.3 Valid Reasons for Non-Impulse DIRECTV Receivers

- No phone service, however, a phone line should still be run and connected to the phone demarcation point
- Customer objection only after explanation of the benefits and drawbacks for non-impulse. Customer MUST sign off.
- Phone line not available or not practical to run. If not practical to run, must be approved by supervisor and specific reasons noted on the Work Order. Wireless phone systems are not an option for all advanced product (e.g. TiVo, Ultimate TV) installations.
- DIRECTV Receiver failed the phone test and problem cannot be corrected. Details as to why phone test failed and specific trouble-shooting steps noted with voltages.
- Party line with operator intervention
- 800 block on customer's line

7 ACCESS CARDS

An access card is included in the purchase of a DIRECTV System and authorizes the programming for the customer's system. Once the customer has completed their DIRECTV System installation, the access card is added to the customer's account and services are authorized.

Access cards are non-transferable. They cannot be transferred from one customer or dealer account to another.

8 INTEGRATION WITH THE CUSTOMER'S EQUIPMENT

Key Points:

- The coaxial RF output used to connect the DIRECTV Receiver to the customer's TV does not provide an MTS stereo signal. If the customer has a stereo light or indicator on their TV, it will not indicate stereo even though the TV is receiving stereo. Connection preference order: Component, S-Video, Composite, RF.
- The L-R audio outputs (RCA Connectors) will provide stereo signal to the TV / VCR and the output level is fixed at 1 V P / P. Volume is controlled by the customer's TV or audio system if applicable.
- To use the DIRECTV Receiver's composite video and audio outputs to the TV, the TV must be capable of receiving this type of input and it must be set to the correct Video Input mode.

Note: This generally means that the stereo indicator on the TV will not light up even though the TV is receiving true stereo. The only time this light works is when the MTS stereo signal is being decoded by the TV from another source (i.e. off air antenna or cable).

- As above, if the VCR is connected to the DIRECTV Receiver using the audio and video jacks and the customer wishes to record in stereo, then the VCR will need to be set to the correct input. This input is usually labeled as Line1 or Line 2, VIDEO or AUX., depending on the number of inputs the particular VCR has as well as its make and model.
- The DIRECTV Receiver's S-Video output provides the best picture quality but the TV and / or VCR must be equipped with an S-Video jack. This requires a special cable that is not provided with all DIRECTV receivers. The S-Video output does not provide any audio output so the L-R audio jacks must be used in conjunction with the S-Video jack. Again, the TV and / or VCR must be set to the correct input mode to accommodate this hookup.
- The RF antenna input will only accommodate a 75-ohm cable. If the customer's antenna line is the 300-ohm type, (flat cable) then a 300-75 ohm transformer will be necessary.
- Set the channel selector switch located on the back of the DIRECTV Receiver, to the same channel as the TV and VCR. These outputs have a fixed output level to facilitate proper use with VCR and stereo hookups. Some DIRECTV Receivers

have a programmable output that is changeable through the DIRECTV Receiver installation and set-up menu.

8.1 Tuning VCRs

It is important that all new customers understand that recording procedures require that their VCR be tuned to the same channel the output on the DIRECTV Receiver is set for. Set the DIRECTV Receiver RF output for whichever channel, (either 3 or 4), that is not used for local programming.

To check for proper tuning – with the TV and DIRECTV Receiver on, turn the VCR on and set the channel display on the VCR to the same channel the output of the DIRECTV Receiver is set for (Channel 3 or 4). Press the TV / VCR button on the VCR. If the picture flicks but you do not see any significant change, then the VCR is properly set. If the picture goes to snow, blue screen or junk, then you need to tune the VCR with the VCR tuner.

e.g. IRD = Ch 4	VCR = Ch 4	TV = Ch 4
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Remember the VCR can also record from one of the Line inputs for better quality recording.

8.2 Stereo / Surround Sound

Most customers now have television sets equipped for stereo sound. Some will have a stereo audio system in addition to a stereo TV. It is essential that this equipment also be connected.

<i>Note: The customer must have a stereo receiver that is capable of processing the surround signal in Dolby Digital format. This does not mean that they can't enjoy the stereo signal that most receivers can process.</i>
--

<i>Note: Never connect an audio wire when the equipment is on!</i>
--

Always check the following for proper stereo hookup:

- Verify that the customer's stereo receiver has available inputs for the DIRECTV Receiver audio output. Most will have inputs labeled 'aux. input' or, if that is not available; you may use an input such as 'CD input' or 'tape input' if it is not being used.

<i>Note: Under no circumstances should you ever connect the DIRECTV Receiver audio to the PHONO input of a customer's amplifier. This usually causes severe damage to the amp and / or speakers.</i>
--

- Depending on which input is used, the stereo receiver will need to be set to the correct input selection to receive the audio signal from the DIRECTV Receiver.

- When connecting the DIRECTV Receiver to the stereo, the L&R audio outputs will be used.
- These closely match most VCR's audio output levels and all volume control is done with the customer's stereo system.
- Not all movies are encoded with the Dolby Digital & Surround Sound format. Make sure the customer understands this to avoid unnecessary service calls.
- If the customer has a hi-fi VCR, it is usually best if you connect the audio output from the DIRECTV Receiver through the VCR's audio in and then out of the VCR to the TV or stereo receiver. This will allow the customer to have surround and / or stereo sound from both DIRECTV and their VCR.
- If the customer has a TV or Sound system that has multiple inputs and outputs for audio and video, these usually act as a control center and all in / outputs should be connected through this device.

True digital stereo sound can still be enjoyed even if the customer does not have a surround sound receiver. Again, whenever possible connect the DIRECTV Receiver to the customer's stereo equipment. Detailed quality instruction should also be given to the customer on the system operations.

8.3 Picture-in-Picture (PIP)

Many television sets now come equipped with the PIP feature (watching two or more programs at the same time).

Most TVs with PIP require the additional input signals be supplied as base band audio / video signals. This signal can be provided by a variety of sources (e.g., DVD, Laser Disc or a VCR).

Newer high end TV / Monitors now allow multiple RF inputs as well as multiple A/V, composite and component inputs.

Television sets that offer PIP differ in how each picture is displayed. With this in mind, the customer may need to consult the owner's manual on PIP operations. Unless the customer requests otherwise, set up DIRECTV as the primary signal since it is usually the main video source. This also helps a great deal when trouble-shooting over the phone.

Note: Even if a customer has picture in picture, they will only be able to receive 1 DIRECTV signal at a time unless they have an advanced product DIRECTV Receiver or two (2) DIRECTV Receivers connected to the PIP TV.

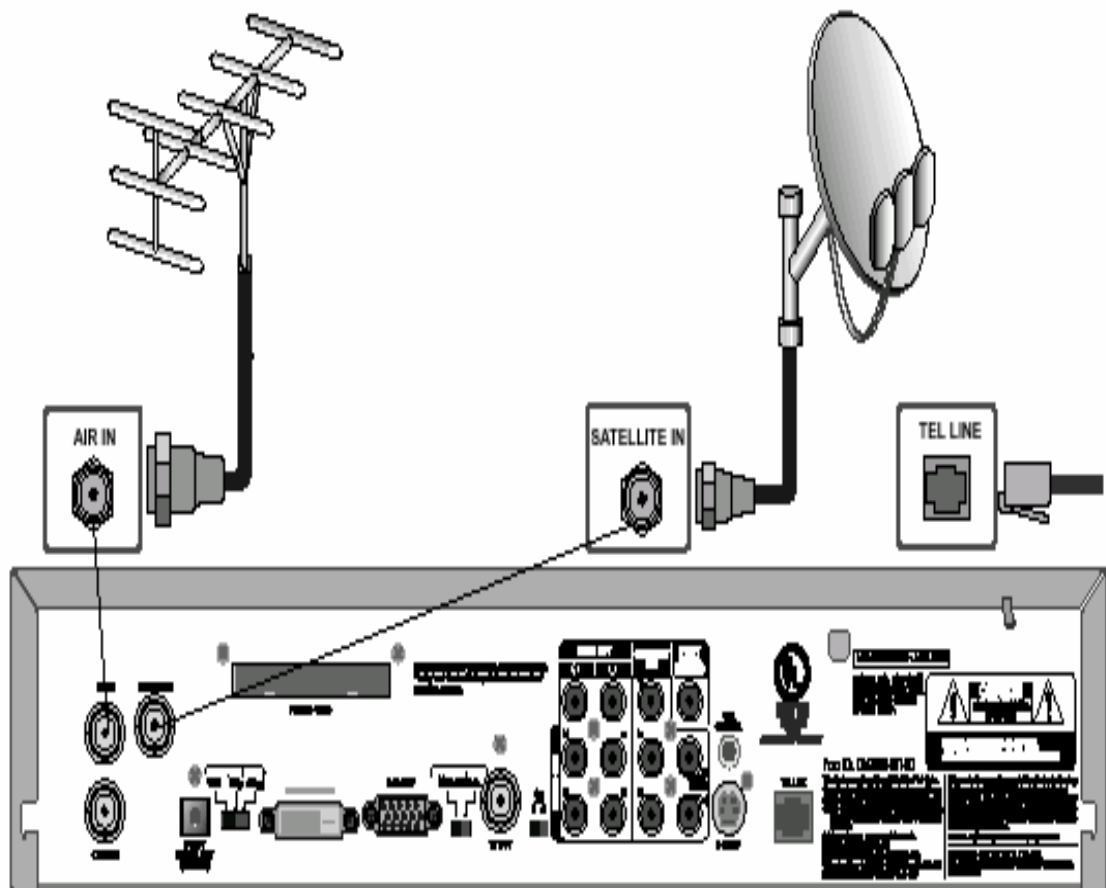
8.4 High Definition TV (HDTV)

In order to receive HDTV signals, you must have an HDTV receiver as well as an HDTV television / monitor.

The connection between the HDTV DIRECTV Receiver and the HDTV must be made with the best available connection (listed in descending order of preference): 1. DVI

connectors, 2. RGB connectors or 3. Component connectors. The channel 3 / 4 connection should always be made for trouble-shooting purposes.

A multi-sat dish antenna must be installed in order to access HDTV programming on the 110 / 119° satellites. If an older dish antenna is in place, make sure the c-kit is installed for the 110 feed.



9 DISH ANTENNA ALIGNMENT AND PEAKING

9.1 General

The dish antenna can be peaked by using a satellite signal strength meter (preferred) or the built in signal strength meter in the DIRECTV Receiver.

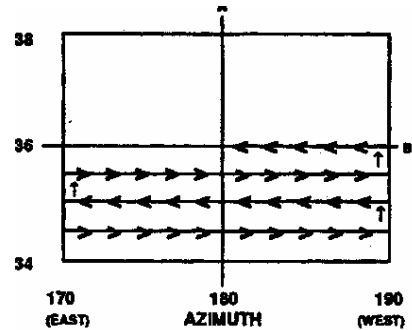
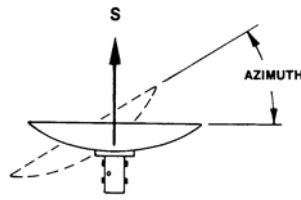
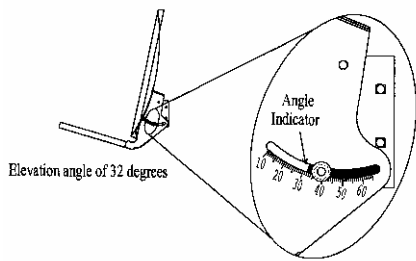
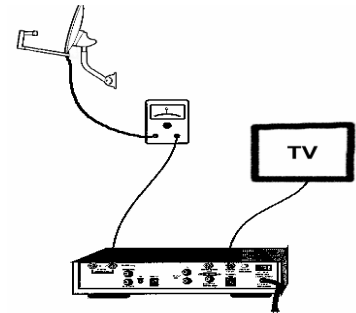
Prior to attempting alignment and peaking, the following must be established:

1. Clear line of sight
2. Antenna and mount installed and pole plumb
3. System connected to DIRECTV Receiver with DIRECTV Receiver plugged into active electrical outlet. Access internal installation and set-up menu to determine appropriate azimuth and elevation settings.

4. Dish antenna type has been selected in the DIRECTV Receiver installation and set-up menu

9.2 Signal Strength Meter – Alignment

- 1) Connect the signal meter between the LNB and the receiver. Use a temporary jumper ~ 3' long from the LNB to the meter.
- 2) In order to supply power to the meter and LNB the receiver must be installed and connected to a live electrical outlet or use a battery pack. The meter will pass power through to the LNB.
- 3) Set the elevation adjustment to ~ 4 degrees below the recommended setting for your area.
- 4) The dish antenna should be moved to the approximate azimuth for the zip code that you are installing in and then panned slowly to the left or right approximately 5 degrees. The meter should be set up to monitor signal strength at this point.



- 5) Pan the dish antenna in the direction of the expected azimuth angle slowly and monitor the meter for signal. If the dish antenna is moved 5-8 degrees past the expected azimuth and there is no signal, the elevation should be increased two (2) degrees and the sweep repeated. If signal is not acquired, the dish antenna elevation should be lowered an additional two (2) degrees and the sweep repeated. If acquisition is still unsuccessful, the dish antenna elevation should be raised two (2) more degrees and the sweep repeated. If no signal is found by this point the elevation should be reset to the expected degree and the process should be restarted.
- 6) If there is no signal after repeating this entire procedure, consider checking the plumb of the pole, meter settings, connections, LNB power / functionality and, field of view. Note that the farther you get from your expected settings the more likely you are to acquire an incorrect satellite. Remember to call your supervisor if you need help.
- 7) Once the satellite signal is identified, the fine peaking process begins.
- 8) The azimuth should be peaked first by moving the dish antenna left or right slightly to maximize the signal on the meter. When performing this step, the dish antenna should be moved past the peak signal and then reversed to the

maximum reading. The dish antenna azimuth bolts should be tightened at this point enough that the dish antenna will not easily swing left or right.

- 9) The elevation is set by adjusting the dish antenna up or down past the peak signal and then back to the peak signal setting. The elevation bolts should be tightened enough at this point to hold the elevation setting temporarily.
- 10) The final step to ensure peak signal strength has been achieved is to lightly push and pull the top of the dish antenna. If the elevation is maximized, the signal will go down. If it does not, the elevation bolts should be slightly loosened and re-peaked vertically.
- 11) The same test is performed to the left and right and should give the same results. Again if it does not, the azimuth bolts need to be loosened slightly and re-peaked in this plane.
- 12) Once you are confident the dish antenna is properly peaked, tighten the left and right pivot bolts in alternate sequence, making sure that the voltage or signal strength does not drop.
- 13) Torque to specifications noted in dish antenna manual and recheck signal to ensure that it has not dropped.
- 14) Remove the meter and connect the cable to the LNB.
- 15) Return to the receiver and check signal quality to ensure it is within specifications for your area. Re-peak if signal is not >80 or consistent with your area.
- 16) **Use a permanent marker to place a vertical reference alignment mark on the AZ / EL cap to the pole. Never scratch the paint, as this will cause the pole to rust.**

9.3 DIRECTV Receiver Signal Meter - Alignment

Exact steps to selecting the signal strength meter varies by manufacturer, however the general procedure is the same.

- 1) Use the DIRECTV Receiver menu to access the installation menu screen.
- 2) Select the signal strength meter option.
- 3) As you have not yet peaked the dish antenna, the signal strength meter is probably reading 0.
- 4) Refer to section 10.2, step 3 above and follow the same procedure as peaking with a signal strength meter for actual dish antenna alignment steps.

9.4 Peaking a Multi-Sat Dish Antenna

- 1) Go into the DIRECTV Receiver installation & set-up menu and select the appropriate Dish Antenna type. Remember that the azimuth and elevation settings provided are for the 110 slot. You must calculate accordingly to determine the settings for the 101° and 119° coordinates (+/- 9°).
- 2) The multi-sat dish antenna requires that the azimuth, elevation and tilt be set for both the A (101) slot and the B (119) slot. When these are peaked, the C (110) LNB (if applicable) is automatically peaked due to the construction of the dish antenna.
- 3) The azimuth of the Multi-sat dish antenna should be peaked first by panning the dish antenna left or right slightly to maximize the signal on the meter. The

22 KHz tone should be turned off at this point to peak the A (101) LNB. When performing this step, the dish antenna should be moved past the peak signal and then reversed to the maximum reading. The 22 KHz tone should be turned on and the step repeated for the B (119) LNB. The meter should be switched back and forth from A to B and back until both LNB's signals are maximized. The dish antenna's azimuth bolts should be tightened enough at this point that the dish antenna will not easily swing left or right.

- 4) The elevation of the Multi-sat is set by adjusting the dish antenna up or down past the peak signal (and then back to the peak signal reading). The 22 KHz tone should be turned off. When performing this step, the dish antenna should be moved past the peak signal and then reversed to the maximum reading. The 22 KHz tone should then be turned on and the step repeated for the B (119) LNB. The meter should be switched back and forth from A to B and back until both LNB's signals are maximized. The elevation bolts should be tightened enough at this point to hold the elevation setting temporarily.
- 5) The tilt of the Multi-sat dish antenna must also be peaked (with the 22 KHz tone turned off). As in previous steps, rotate the dish antenna clockwise or counterclockwise while passing peak signal and then back to the peak signal setting. The 22 KHz tone should then be turned on and the step repeated for the B 119 LNB. The meter should be switched back and forth from A to B and back until both LNB's signals are maximized.
- 6) The final step to ensure peak signal strength has been achieved is to lightly push and pull the top of the dish antenna. If the elevation is maximized, the signal will go down. Turn on the 22 KHz tone and repeat for the B LNB. If the signal doesn't go down, the elevation bolts should be slightly loosened and the dish antenna re-peaked vertically.
- 7) The same test is performed horizontally and rotationally. All tests should give the same results. If it does not, the bolts need to be loosened slightly and re-peaked in the plane which needs improvement.
- 8) After performing these final steps, all dish antenna hardware should be tightened while monitoring the meter to make sure the signal remains at its maximum level.
- 9) Remove the meter connections, reattach the LNB if it was disconnected and continue with the rest of the installation.
- 10) Verify signal strength on all satellites by utilizing the installation screen on the DIRECTV receiver.
 - Verify the 101° satellite by checking channels 490 (odd transponders) and 491 (even transponders)
 - Verify the 110° satellite by checking channel 494
 - Verify the 119° satellite by checking channels 492 (odd transponders) and 493 (even transponders)
 - Verify the 72.5° satellite by checking channel 496 (even transponders)
 - Verify the 95° satellite by checking channel 497
- 11) Use a permanent marker to place a vertical reference alignment mark on the AZ / EL cap. Never scratch the paint, as this will cause the pole to rust.

- 12) Document the signal strength on the work order and in the customer's DIRECTV Receiver owner's manual.

9.5 Peaking a Multi-Sat Dish Antenna with DIRECTV Receiver signal meter

- 1) Follow manufacturer's instructions to enter signal strength measurement menu.
- 2) Preset elevation and tilt / skew.
- 3) Sweep Az and lock on Sat A.
- 4) Maximize Sat A signal and mark Az and El on mast.
- 5) Switch to Satellite B, maximize Satellite B signal and mark Az and El on mast.
- 6) Split the difference and set Az and El (Signal levels should be approximately equal.)
- 7) Fine tune tilt / skew and elevation if necessary. (If fine tuning performed, you must repeat the above procedure.)

A minimum of 80 should be obtained on each satellite to be used.

10 CUSTOMER EDUCATION

The following topics should be explained to every customer:

10.1 Remote Control

- Basic operation of the Remote control. Refer to owner's manual for each specific manufacturer.
- The installer should program the remote control to work with the customer's TV, VCR and all applicable devices.
- Explain the DIRECTV Menus and On Screen Guide.
- Familiarize the customer with the remote control functions.

10.2 Operating the VCR with DIRECTV

- TV must be on and set to channel 3 or 4 or select A/V inputs.
- VCR must be on and set to channel 3 or 4 or select A/V inputs.
- Be prepared to refer the customer to their owner's manual if they have any questions regarding use of their own television, VCR, etc.

10.3 Explain How to Record DIRECTV Programming

- The DIRECTV Receiver must be on and the channel you wish to record must be selected.
- The VCR must be set to record either channel 3 or 4 (depending on 3/4 output switch on DIRECTV) or select A/V inputs.
- If customer wants to watch what they are recording, the TV channel should match the VCR recording channel (Channel 3 or 4).

- Recording with audio / video - Connect A/V cables to VCR and select A/V input on VCR. RF cable should always be connected so the customer has these options. This will reduce service calls.

10.4 Explain How to Record Off Air & Cable Programming

- The DIRECTV must be set to TV mode using the SAT / TV button. Powering the DIRECTV Receiver off will also default to TV mode.
- VCR must be tuned to the off-air / cable channel you wish to record.
- If customer wants to watch while recording, the TV and VCR must be tuned to the same channel.

10.5 Stereo Connection

- Explain the normal stereo operation – provide a quick overview for the customer.
- Explain / demonstrate to them which stereo input DIRECTV is connected to (e.g.) AUX / CD / etc.
- Other options - if the stereo is connected to the volume controlled audio out of the TV, DIRECTV, off air and VCR signals will pass to the stereo and be controlled by the TV.
- Explain any other reconfigured home electronics components you may have interfaced into the system (e.g., laser disk player etc.).

10.6 Menus – Refer to Owner's Manual for Each Specific DIRECTV Receiver

- Menu preferences – Allows customer to change style of displays.
- Purchase History and Status – Enables customer to monitor PPV activity and phone status.
- Rating and Channel Lockout – Controls the rating of programs allowed to be viewed.
- Explain rating codes – G, PG, PG-13, R, NR-MATURE & NC-17.
- Favorite Channel Lists – Enables quick access to channels most often watched.
- Program Times - Programs are similar to a VCR and should be explained along with the VCR. Daylight savings time changes are automatically set.
- Messages – DIRECTV notification of sun outages or upcoming events.
- Receiver status – Explain in detail so the customer can assist with future troubleshooting.
- Signal Quality – Explain how customer would use this information for troubleshooting with Technical Support personnel.
- Set or Change Password – This menu item needs to be discussed in detail to ensure proper instruction of previous menu items.
- Explain that the password is blank on new or reset units. Once set, it can only be reset by the customer once their password has been entered. Refer to manual for password reset instructions.
- The customer should know to call DIRECTV if they have a problem with the password.

10.7 Additional Customer Information

Sun Outages:

- Occur in spring and fall (March & October) due to the position of the sun in relation to the satellite. (The sun passes directly behind and in line with the satellite, interfering with the incoming signal for a few minutes a day during a two (2)-week period – this happens with all satellites.)

Rain Fade / Snow & Ice in Dish Antenna.

- Occurs during periods of inclement weather – remember that it does not have to be raining, as moisture in clouds may have the same effect. Explain that snow or ice in the dish antenna can cause loss of picture. This is most evident with “searching for satellite” message during or after inclement weather. During winter months, removing snow from dish antenna may clear this problem.

11 MULTISWITCHES

11.1 Purpose

Multiswitches can be used when the required number of outlets exceeds the available number of DIRECTV Receiver inputs from the dish antenna. A multiswitch is needed for three (3) or more DIRECTV Receiver inputs when using an 18” dish antenna and 5 or more inputs when using a Multi-Sat dish antenna. A second 4-way multiswitch or an 8-way is required for 5 or more DIRECTV Receiver inputs.

11.2 Types of Multiswitches

It is important to determine the correct switch for your application. Deciding factors:

- Number of DIRECTV Receiver inputs required
- Cable length and amplification
- Multiswitch may require AC power
- Integration of local channel source

Several companies manufacture multiswitches ranging from two (2) to 32 outlets (depending on configuration), both with and without antenna input ports for off-air integration. Always use DIRECTV approved products.

<i>Note: A multiswitch cannot be used with a single output LNB.</i>

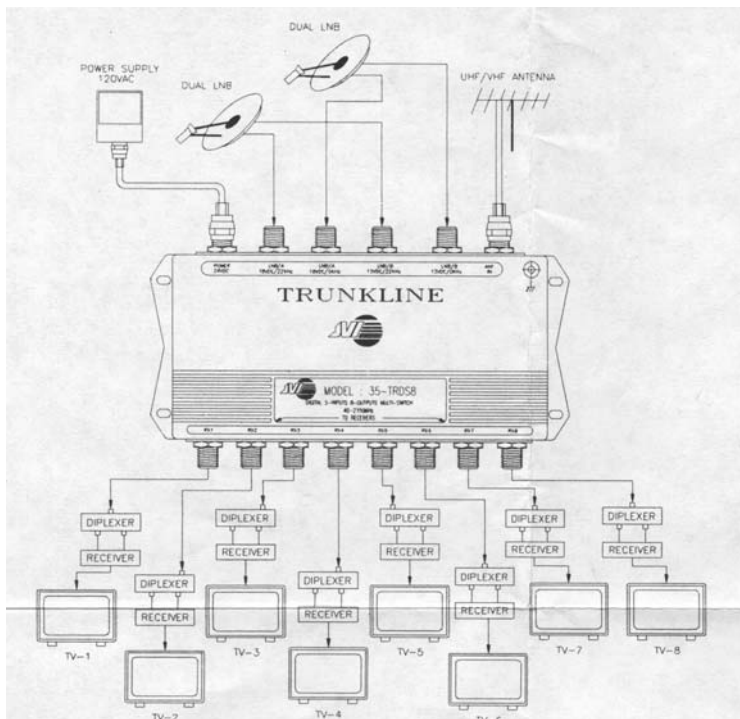
11.3 Multiswitch Functions

The multiswitch controls the selection of left and right hand polarized inputs from the LNB by sensing voltage from the DIRECTV Receiver. Thirteen (13) VDC causes the multiswitch to switch to a right hand polarized signal. Eighteen (18) VDC causes the multiswitch to switch to a left-hand polarized signal.

In multi-sat applications, the multiswitch also selects the LNB. A 22 KHz tone generated from the DIRECTV Receiver triggers the LNB selection.

All multiswitches pass power to the LNB. Some have external power supplies.

When diplexing / combining the off-air / cable signal with DIRECTV another separate diplexer will be needed. This is required to separate the off-air / cable signal from the DIRECTV signal.



- All powered Multiswitches polarity lock the LNBs
- The LNB is always locked in the 13V (right hand polarity) or 18V (left hand polarity)

Note: DIRECTV Receiver powered Multiswitches can sometimes cause micro blocking or momentary loss of picture. This may occur when all DIRECTV Receivers are tuned to a right hand polarity channel (13V) and then one DIRECTV Receiver is changed to a left hand polarity channel. This can be difficult to trouble-

shoot.

12 INDEPENDENT CONTRACTORS

12.1 Installation Contractors

To ensure consistent and positive customer experience, a retailer should implement the following when using installation contractors to perform DIRECTV System installations on your behalf.

- The contractor should be fully licensed, insured, bonded, and in compliance with the laws of each state in which it operates.
- Retailer should ensure that the installation contractors follow these guidelines.
- The retailer shall require the contractor to maintain, at a minimum, the same insurance coverage, in the same amounts, as the retailer is required to carry under its agreement with DIRECTV. The contractor's insurance policies shall name DIRECTV as an additional insured.
- Retailer shall ensure that installation contractor does not take any adverse action against the customers (e.g., such as threatening or placing any liens on customer's home or property).

Please note that DIRECTV will expect the retailer to be responsible and liable for any acts or omissions on the part of the installation contractors. As such, the retailer shall

indemnify and hold DIRECTV harmless from and against any and all claims, suits, liabilities, actions, liens and expenses (including reasonable attorneys' fees) arising out of or in connection with any acts or omissions of installation contractors utilized by retailer.

13 INSTALLATION TIPS / Common Installation Problems

13.1 Premature Rain Fade

This problem may be caused by the following:

- dish antenna not properly peaked
- Long drop with no line amp
- Bad piece of cable or non approved cable
- Corroded F connectors or water in ground block
- Several outlets with high insertion loss through splitters. (Signal quality may be good under blue skies)
- Electrical impulse noise from arcing insulator on High Voltage power lines
- Leaves of a tree drooping down when wet
- Obstruction in line of sight
- Water or insects in the feed horn / LNB
- Dish antenna under eave of home where water runs off roof on dish antenna

13.2 Useful Equipment for Trouble-shooting

- Satellite signal strength meter
- Digital VOM
- Spare DIRECTV Receiver (any model)
- Telephone test set
- Telephone polarity tester
- Extra phone cord. (10 to 25 feet)
- 100' RG-6 test cable (with connectors)
- Power strip

13.3 Locate DIRECTV Receiver's Main Menu and Perform "Systems Test"

- 1) Assess the situation by looking at overall configuration of installation. Note the number of outlets, length of drop, clear line of sight, etc.
- 2) Determine scope of problem.
- 3) Check signal quality to verify that it is greater than 80.
- 4) If signal quality is lower than expected, visually inspect the condition of the LNB.
- 5) Check dish antenna alignment, re-peak dish antenna, if necessary.
- 6) Run a temporary cable to the LNB to see if this corrects the problem. If this does correct the problem, move the temporary connection back to the ground block to further isolate the problem. This will allow you to determine which section of the cable may be bad.
- 7) If you suspect the LNB is bad, replace with a known good unit.

13.4 Signal Strength

Remember the key items:

- Every device has an insertion loss
- Signal loss occurs at a rate of approximately 8.5 dBm to every 100 feet of series 6 cable @ 1450 MHz
- Larger diameter cable has less attenuation
- Optimum signal required at the DIRECTV Receiver is between -25 and -65 dBm
- Typically, an 18" dish antenna has a -40 dBm output at the LNB

Some other helpful hints:

- Find a distribution point to amplify and distribute signal.
- Install an amplifier / power inserter to power the LNB prior to installing your splitters.
- Splitters should all be Diode protected and dual power passing.

13.5 Additional Trouble-shooting Tips

- Check for wireless phone jacks that may be plugged into the same electrical outlets with fluorescent lighting, halogen lamps or other devices that may cause surges in power. Never use wireless phone jacks with advanced products.
- Look for overloaded power strips.
- Check for loose telephone jacks with exposed or faulty wiring.
- Look for possible overheated DIRECTV Receiver (may be located in enclosed cabinet with other electronic equipment).
- Check DIRECTV Receiver cable connection.

14 TROUBLE-SHOOTING STEPS

For Retail assistance contact the Retail Services Department (800-323-1994).

For Customer Service assistance contact the Customer Service Department (800-531-5000).

Soft Boot – On most receivers, a Soft Boot is performed by simultaneously depressing the Down Arrow and the Power Button for twenty to thirty seconds. Release the buttons and the receiver will begin set-up. Cancel out of the set-up and check to see if the problem has been resolved.

Hard Boot – Unplug receiver and let sit for 10 minutes. Plug back in and power up. Check to see if problem is corrected.

15 RISK MANAGEMENT

15.1 Property Damage

Every technician is responsible to take appropriate precautions to avoid damage to a customer's property or belongings. In most cases damage and accidents happen when we:

- Lose concentration and skip necessary steps
- Get frustrated with a problem
- Lack of knowledge regarding general construction or proper installation techniques

If damage occurs, immediately notify your supervisor and have a note entered in the account. The customer must always be informed. A minor problem can escalate if not addressed immediately.

Immediate response to customer's claims of damage is required. Potentially harmful situations shall be resolved and repaired with the highest priority.

If the response time of the service provider is not satisfactory or if the situation warrants, the customer may have the problem repaired and the cost of the repair may be deducted from the invoice payment.

15.2 Irate Customers

At times, irate customers need to release their frustrations, especially when they feel they have been mistreated or their problems ignored. Listening to and addressing their frustration immediately can minimize problems and demonstrate to our customer that we value their business.

Never argue with a customer! Under no circumstances should a technician continue to work in a situation where physical threats have been made. The technician should leave the job site and contact their supervisor.

15.3 Customer Not Home

When the technician arrives and a customer is not home, review the following items:

- Am I early? Call the customer or have your dispatcher call them
- Review paperwork for accuracy
- Look around to see if customer is outdoors

Note: Under no circumstances should a private dwelling or apartment be entered without the customer, a representative of the customer or the homeowner being present.

If the customer is not home, leave a door hanger and contact your office and supervisor immediately. The dispatcher should note the account with a description of the home and time.

15.4 Late For Appointment - Greater than two (2) hours past the START of a window

If you are going to be late for an appointment, always call the customer and notify your office. Dispatch should note the account.

15.5 Technician Responsibility

The last person at a home is responsible for all compliance with DIRECTV standards. This includes but is not limited to NEC grounding and workmanship.

15.6 Clean Up After Installation ~ Small things make a big difference

The customer's house, yard and any work area shall be left CLEAN of any installation debris, including empty boxes, tie wraps, drilling dust, dirt, etc. Vacuum or sweep up any debris created by your installation.

ALWAYS SHOW PRIDE IN YOUR WORK

SHOW RESPECT FOR THE CUSTOMER'S TIME AND HOME

16 WORLDDIRECT™ INSTALLATION/UPGRADE

16.1 WorldDirect™ Installation Overview

1. Perform and review site survey with customer. Remember, the customer's programming selections will determine which orbital locations need to be visible.
 - From 95° WL: WorldDirect™
 - From 101° WL: core DIRECTV programming
 - From 110° WL: High Definition
 - From 119° WL: selected local channels markets, HD and DIRECTV PARA TODOS™ programming
 - From 72.5° WL: selected local channels markets
2. Identify dish antenna location(s) and line of site(s) needed for customer's programming selections.
3. Assemble and mount dish antenna(s). Standard mounting includes, but is not limited to the roof, eave, outside wall, balcony, deck and chimney.
4. Ground dish antenna(s) to meet NEC requirements.
5. Connect DIRECTV Receiver(s) to television(s).
6. Connect cables from dish antenna to multiswitch.
7. Connect cables from multiswitch to DIRECTV Receiver(s).
8. Run "auto configuration" from set up menu on each DIRECTV Receiver.
9. Check signal strength in the DIRECTV Receiver for 95° WL, 101° WL, 110° WL, 119° WL and/or 72.5° WL, depending on the customer's programming selections and market location.
10. Check test channels for satellite confirmation.
 - For 95° WL – Channel 497
 - For 101° WL – Channel 490 (odd) and Channel 491 (even)
 - For 110° WL – Channel 494
 - For 119° WL – Channel 492 (odd) and Channel 493 (even)
 - For 72.5° WL – Channel 496 (even)
 - For Macrovision- Channel 498
11. Provide customer education.

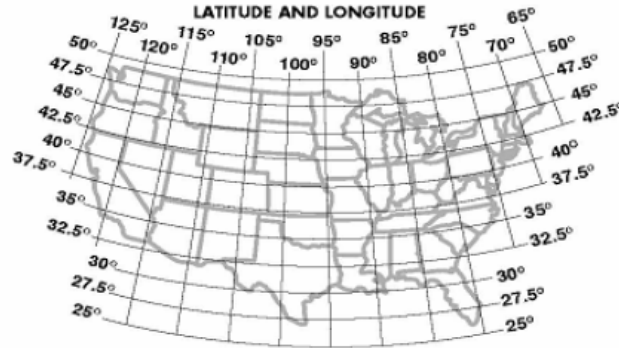
16.2 Satellite Dish Pointing Coordinates

66E ODU 95° Alignment Chart

Determine your site Latitude and Longitude. Use the map to the right or other reference source (e.g. atlas, GPS). Locate the grid point nearest to your site in the table (values are provided in 2.5° increments) and use the Azimuth, Elevation and Skew values for your antenna alignment in steps 2 and 9.

RECORD YOUR INFORMATION HERE

LATITUDE		LONGITUDE			
AZIMUTH		ELEVATION		SKEW	



ALIGNMENT CHART FOR SATELLITE @ 95° WEST LONGITUDE

LAT	LONG	TRUE AZ	MAG AZ	EL	SKEW	LAT	LONG	TRUE AZ	MAG AZ	EL	SKEW	LAT	LONG	TRUE AZ	MAG AZ	EL	SKEW	LAT	LONG	TRUE AZ	MAG AZ	EL	SKEW		
25.0	80.0	212	218	56	119	35.0	102.5	167	159	49	79	40.0	115.0	151	136	39	68	45.0	112.5	156	141	35	73		
25.0	82.5	208	211	58	115	35.0	105.0	163	153	48	76	40.0	117.5	147	132	38	65	45.0	115.0	153	137	34	71		
27.5	80.0	210	216	54	116	35.0	107.5	159	148	47	73	40.0	120.0	144	129	37	63	45.0	117.5	150	133	34	69		
27.5	82.5	206	201	55	113	35.0	110.0	155	143	46	70	40.0	122.5	141	125	36	61	45.0	120.0	147	130	33	67		
27.5	85.0	204	199	55	109	35.0	112.5	151	139	45	67	40.0	125.0	138	122	34	59	45.0	122.5	144	126	31	65		
27.5	87.5	195	196	54	103	35.0	115.0	148	135	44	64	42.5	70.0	215	231	35	115	45.0	125.0	141	123	30	63		
27.5	90.0	189	189	55	99	35.0	117.5	144	131	43	61	42.5	72.5	212	226	36	113	47.5	67.5	215	235	29	113		
27.5	92.5	183	183	55	94	35.0	120.0	141	127	41	59	42.5	75.0	208	222	37	110	47.5	70.0	212	231	30	111		
30.0	80.0	208	215	51	114	37.5	75.0	211	223	42	114	42.5	77.5	205	217	38	108	47.5	75.0	208	222	37	110		
30.0	82.5	204	209	52	111	37.5	77.5	207	217	43	111	42.5	80.0	202	211	39	106	47.5	77.5	205	217	38	108		
30.0	85.0	199	202	53	107	37.5	80.0	204	212	44	109	42.5	82.5	198	206	39	103	47.5	80.0	202	211	39	106		
30.0	87.5	195	196	54	103	37.5	82.5	200	206	45	106	42.5	85.0	195	200	40	101	47.5	82.5	198	206	39	103		
30.0	90.0	190	189	55	99	37.5	85.0	196	200	45	103	42.5	87.5	191	194	40	98	47.5	85.0	195	200	40	101		
30.0	92.5	185	183	55	94	37.5	87.5	192	194	46	100	42.5	90.0	187	188	41	95	47.5	87.5	191	194	40	98		
30.0	95.0	180	176	55	90	37.5	90.0	188	188	46	96	42.5	92.5	184	183	41	93	47.5	90.0	187	189	35	95		
30.0	97.5	175	163	55	86	37.5	92.5	184	182	46	93	42.5	95.0	180	177	41	90	47.5	92.5	183	183	35	92		
30.0	100.0	170	163	55	81	37.5	95.0	180	176	47	90	42.5	97.5	176	171	41	87	47.5	95.0	180	177	35	90		
30.0	102.5	165	157	54	77	37.5	97.5	176	171	45	87	42.5	100.0	173	166	41	85	47.5	97.5	177	172	35	88		
30.0	105.0	161	152	53	73	37.5	100.0	172	165	45	84	42.5	102.5	169	160	40	82	47.5	100.0	173	166	35	85		
32.5	80.0	207	214	49	112	37.5	102.5	168	159	46	80	42.5	105.0	165	155	40	79	47.5	102.5	169	160	35	83		
32.5	82.5	202	208	50	109	37.5	105.0	164	154	45	77	42.5	107.5	162	150	39	77	47.5	105.0	167	156	32	82		
32.5	85.0	198	201	51	105	37.5	107.5	160	149	45	74	42.5	110.0	158	146	39	74	47.5	107.5	164	151	31	80		
32.5	87.5	194	195	51	102	37.5	110.0	156	144	44	71	42.5	112.5	155	141	38	72	47.5	110.0	154	138	32	73		
32.5	90.0	189	189	52	98	37.5	112.5	153	140	43	69	42.5	115.0	152	137	37	70	47.5	112.5	150	136	31	71		
32.5	92.5	185	183	52	94	37.5	115.0	149	136	42	66	42.5	117.5	148	133	36	67	47.5	115.0	148	133	36	67		
32.5	95.0	180	176	52	90	37.5	117.5	146	132	41	63	42.5	120.0	145	129	35	65	47.5	117.5	145	127	29	67		
32.5	97.5	175	170	52	86	37.5	120.0	143	128	39	61	42.5	122.5	142	126	34	63	47.5	120.0	142	123	28	65		
32.5	100.0	171	164	52	82	37.5	122.5	140	124	38	59	42.5	125.0	139	123	32	61	47.5	122.5	142	123	28	65		
32.5	102.5	166	158	51	78	40.0	72.5	213	227	38	115	45.0	67.5	216	235	31	115	50.0	92.5	183	183	33	92		
32.5	105.0	162	153	51	75	40.0	75.0	210	222	39	112	45.0	70.0	213	231	33	113	50.0	95.0	180	179	33	90		
32.5	107.5	158	147	50	71	40.0	77.5	206	217	40	110	45.0	72.5	210	226	34	111	50.0	97.5	177	172	33	88		
32.5	110.0	154	142	49	68	40.0	80.0	203	212	41	107	45.0	75.0	207	222	34	109	50.0	100.0	173	166	32	86		
32.5	112.5	150	138	48	65	40.0	82.5	199	206	42	104	45.0	77.5	204	217	35	107	50.0	102.5	170	161	32	84		
32.5	115.0	146	133	46	62	40.0	85.0	195	200	43	102	45.0	80.0	201	213	36	105	50.0	105.0	167	156	32	82		
32.5	117.5	142	129	45	59	40.0	87.5	192	194	43	99	45.0	82.5	197	206	37	102	50.0	107.5	164	151	31	80		
35.0	77.5	209	218	45	113	40.0	90.0	188	188	43	96	45.0	85.0	194	200	37	100	50.0	110.0	161	146	31	78		
35.0	80.0	205	213	46	110	40.0	92.5	184	182	44	93	45.0	87.5	191	194	38	97	50.0	112.5	158	142	30	76		
35.0	82.5	201	207	47	107	40.0	95.0	180	177	44	90	45.0	90.0	187	189	38	95	50.0	115.0	155	138	30	74		
35.0	85.0	197	201	48	104	40.0	97.5	176	171	44	87	45.0	92.5	184	183	38	92	50.0	117.5	152	134	29	72		
35.0	87.5	193	195	49	101	40.0	100.0	172	165	43	84	45.0	95.0	180	177	38	90	50.0	120.0	149	130	28	70		
35.0	90.0	189	189	49	97	40.0	102.5	168	160	43	81	45.0	97.5	176	171	38	88	50.0	122.5	146	127	27	69		
35.0	92.5	184	182	49	94	40.0	105.0	165	155	43	78	45.0	100.0	173	166	38	85								
35.0	95.0	180	176	49	90	40.0	107.5	161	150	42	76	45.0	102.5	169	160	38	83								
35.0	97.5	176	170	49	86	40.0	110.0	157	145	41	73	45.0	105.0	166	155	37	80								
35.0	100.0	171	164	49	83	40.0	112.5	154	141	40	70	45.0	107.5	163	151	37	78								
												45.0	110.0	159	146	36	75								

NOTE: Use Magnetic Azimuth [MAG AZ] when aligning with a compass.
Use True Azimuth [TRUE AZ] when aligning to a known bearing or GPS.

16.3 Multiswitches

- When combining signal from the 72.5° WL and the 101° WL orbital locations, you must always use a 4x4 or 4x8 multiswitch.
 - Both coax cables from the 101° WL LNB must be connected to the Sat A 13V and 18V side.
 - Both coax cables from the 72.5° WL LNB must be connected to the Sat B 13V and 18V side.
- When combining signal from the 72.5° WL, 101° WL, 110° WL and 119° WL orbital locations, you must always use a 6x8 multiswitch.
 - All four coax cables coming from the multi-satellite dish antenna must be connected to the first four ports on the 6x8 multiswitch.
 - One coax cable from the 72.5 LNB must be connected to the Flex Port 1 on the 6x8 multiswitch. You only need one cable because each flex port supports both 13v and 18v.

17 72.5° WL INSTALLATION AND UPGRADE

17.1 72.5 Local channel Overview

1. Perform and review site survey with customer. Remember, the customer's programming selections will determine which orbital locations need to be visible.
 - From 72.5° WL: selected local channels markets
 - From 101° WL: core DIRECTV programming
 - From 110° WL: High Definition
 - From 119° WL: selected local channels markets, HD and DIRECTV PARA TODOS™ programming
 - From 95° WL: WorldDirect™
2. Identify dish antenna location(s) and line of site(s) needed for customer's programming selections.
3. Assemble and mount dish antenna(s). Standard mounting includes, but is not limited to the roof, eave, outside wall, balcony, deck and chimney.
4. Ground dish antenna(s) to meet NEC requirements.
5. Connect DIRECTV Receiver(s) to television(s).
6. Connect cables from dish antenna to multiswitch.
7. Connect cables from multiswitch to DIRECTV Receiver(s).
8. Run "auto configuration" from set up menu on each DIRECTV Receiver.
9. Check signal strength in the DIRECTV Receiver for 72.5° WL, 101° WL, 110° WL, 119° WL and/or 95° WL, depending on the customer's programming selections and market location.
10. Check test channels for satellite confirmation.
 - For 72.5° WL – Channel 496 (even)
 - For 101° WL – Channel 490 (odd) and Channel 491 (even)
 - For 110° WL – Channel 494
 - For 119° WL – Channel 492 (odd) and Channel 493 (even)
 - For 95° WL – Channel 497
 - For Macrovision- Channel 498
11. Provide customer education.

17.2 Satellite Dish Pointing Coordinates

DMA	Zip Code	72.5 AZ mag	72.5 EL	101 AZ mag	101 EL	Multi-sat AZ	Multi-sat EL	Multi-sat Tilt
Boise, ID	83702	110	23	143	37	165	39	96
Burlington, VT-Plattsburgh, NY	05401	194	39	242	27	244	27	58
Cedar Rapids-Waterloo, IA	52401	151	38	242	27	206	38	71
Champaign, IL	62701	158	40	211	39	210	40	67
Chattanooga, TN	37402	161	47	207	46	220	42	60
Columbia-Jefferson City, MO	65205	148	40	193	45	206	42	69
Davenport, IA	52801	154	38	196	40	209	37	70
Evansville, IN	47708	158	43	203	44	215	40	65
Fort Smith, AR	72901	141	43	188	48	202	46	69
Fort Wayne, IN	46808	166	40	209	40	220	36	64
Lincoln-Hastings, NE	68508	140	37	180	43	193	41	76
Sioux Falls, SD	57103	142	34	182	40	195	38	76
Springfield, MO	65802	145	41	190	46	204	43	70
Traverse City, MI	49684	167	37	207	36	218	33	68
Tri-Cities	37605	169	47	216	44	227	39	58
Waco-Temple-Bryan, TX	76702	133	44	184	53	200	50	70
Johnstown-Altoona, PA	15901	179	43	222	39	232	34	59
Toledo, OH	43604	170	40	211	39	223	35	64
Syracuse, NY	13202	187	40	227	35	237	30	59
Youngstown, OH	44512	176	41	218	38	229	34	61
Greenville, NC	27835	180	48	227	41	237	36	53
Charleston, SC	29401	173	50	222	46	234	40	52
Peoria-Bloomington, IL	61602	155	40	199	41	211	38	68
Wausau-Rhineland, WI	54403	157	35	197	37	209	34	71

17.3 Multiswitches

- When combining signal from the 72.5° WL and the 101° WL orbital locations, you must always use a 4x4 or 4x8 multiswitch.
 - Both coax cables from the 101° WL LNB must be connected to the Sat A 13V and 18V side.
 - Both coax cables from the 72.5° WL LNB must be connected to the Sat B 13V and 18V side.
- When combining signal from the 72.5° WL, 101° WL, 110° WL and 119° WL orbital locations, you must always use a 6x8 multiswitch.
 - All four coax cables coming from the multi-satellite dish antenna must be connected to the first four ports on the 6x8 multiswitch.
 - One coax cable from the 72.5 LNB must be connected to the Flex Port 1 on the 6x8 multiswitch. You only need one cable because each flex port supports both 13v and 18v.

18 KaKu INSTALLATION AND UPGRADE

18.1 KaKu Installation Overview

1. Perform and review site survey with customer. Remember, the customer's programming selections will determine which orbital locations need to be visible.
 - From 72.5° WL: selected local channels markets
 - From 99° WL Selected High Definition Local Channels
 - From 101° WL: core DIRECTV programming
 - From 103° WL Selected High Definition Local Channels
 - From 110° WL: High Definition
 - From 119° WL: selected local channels markets, HD and DIRECTV PARA TODOS™ programming
 - From 95° WL: WorldDirect™
2. Identify dish antenna location(s) and line of site(s) needed for customer's programming selections.
3. Assemble and mount dish antenna(s). Standard mounting includes, but is not limited to the roof, eave, outside wall, balcony, deck and chimney. A Pole Mount is considered standard.
4. A Monopole support mount must be used on all wall and roof installations.
5. Ground dish antenna(s) to meet NEC requirements.
6. Connect DIRECTV Receiver(s) to television(s).
7. Connect "B Band" Converter (BBC) to all H20 IRD's.
8. Connect cables from dish antenna to multiswitch.
9. Connect cables from multiswitch to DIRECTV Receiver(s).
10. Check signal strength in the DIRECTV Receiver for 72.5° WL, 99° WL , 101° WL, 103°, WL 110° WL, 119° WL and/or 95° WL, depending on the customer's programming selections and market location.
10. Check applicable test channels for satellite confirmation.
 - For 72.5° WL –Channel 496 (even)
 - For 101° WL – Channel 490 (odd) and Channel 491 (even)
 - For 110° WL – Channel 494
 - For 119° WL – Channel 492 (odd) and Channel 493 (even)
 - For 95° WL – Channel 497
 - For Macrovision- Channel 498
11. Provide customer education.

18.2 KaKu Pointing Coordinates

DMA	Representative Zip Code	Lat / Long	Ka/Ku Azimuth	Ka/Ku Elevation	Ka/Ku Tilt
Detroit	48304	42.6 / 83.2	212.9	37.6	71.6
New York	07458	41.1 / 74.1	231	35	62.6
Los Angeles	92307	34.6 / 117.1	140.0	46.3	111.9
Chicago	60467	41.6 / 87.8	203.8	40.1	75.6
Philadelphia	19145	39.9 / 75.2	228.5	36.7	62.5
San Francisco	94954	38.2 / 122.6	131.7	40.3	115.1
Boston	01460	42.5 / 71.5	234.8	32.6	61.7
Dallas-Fort Worth	75212	32.8 / 96.9	184.6	51.6	83.7
Washington, DC	20117	39.0 / 77.7	224.0	38.8	64.0
Atlanta	30341	33.9 / 84.3	212.2	46.7	113.2
Houston	77024	29.8 / 95.5	188.1	54.7	80.5
Tampa	33567	27.9 / 82.1	219.8	51.3	58.5
Seattle	98272	47.9 / 121.9	133.6	31.4	107.9
Minneapolis	55340	45.1 / 93.6	191.7	37.5	82.7
Miami	33196	25.6 / 80.7	224.7	52.5	54.1
Sacramento	95682	38.6 / 121.0	133.8	40.7	113.2
Pittsburgh	15221	40.4 / 79.9	219.6	38.5	67.1
Baltimore	21234	39.4 / 76.5	226.2	37.8	63.2
San Diego	92065	33.1 / 116.9	139.9	47.9	112.8
Hartford	06033	41.7 / 72.5	233.1	33.8	61.8
Charlotte	28206	35.3 / 80.8	218.9	43.7	64.0
Nashville	37204	36.1 / 86.8	206.4	45.5	71.4
West Palm B	33478	26.9 / 80.2	224.6	51.0	55.0
Birmingham	35214	33.6 / 86.9	206.7	48.1	69.9
Phoenix (Kaibeto)	85017 86053	33.5 / 112.1 36.5 / 111.3	150.1 152.6	49.3 46.3	106.2 103.6
Cleveland	44281	41.1 / 81.7	216.0	38.5	69.2
Denver	80112	39.6 / 104.9	166.9	44	94.7
Orlando	32707	28.7 / 81.3	220.9	50.1	58.4
St Louis	63105	38.6 / 90.3	198.7	43.9	76.9

18.2 KaKu Pointing Coordinates (cont.)

DMA	Representative Zip Code	Lat / Long	Ka/Ku Azimuth	Ka/Ku Elevation	Ka/Ku Tilt
Indianapolis	46220	39.9 / 86.1	207.3	41.3	72.9
Raleigh	27520	35.6 / 78.5	223.4	42.3	61.9
Kansas City	64056	39.1 / 94.3	190.1	44.2	81.8
Milwaukee	53089	43.1 / 88.2	202.9	38.6	76.7
Columbus	43004	40.0 / 82.8	214.0	40.1	69.6
Salt Lake (Aneth)	84119 84510	40.7 / 111.9 37.1 / 109.4	152.1 156.8	41.6 46.1	102.4 100.9
Fresno	93657	36.8 / 119.4	136.0	43.1	112.9

18.3 Multiswitch

- When combining signal from the 72.5° WL, 95° WL, 99° WL, 101° WL, 103° WL, 110° WL and 119° WL orbital locations, you must always use a wideband 6x8 multiswitch.
 - All four coax cables coming from the KaKu multi-satellite dish antenna must be connected to the first four ports on the wideband 6x8 multiswitch.
 - One coax cable from the 72.5 LNB must be connected to the Flex Port 1 on the 6x8 multiswitch.
 - One coax cable from the 95 LNB must be connected to the Flex Port 2 on the wideband 6x8 multiswitch.