GEONETCast Americas: Standard C-Band DVB-S Receive Station Setup

v.2.1.1

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Special thanks to:

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Particular thanks is owed to Paul Seymour for his partnership and relentless work documenting and understanding GEONETCast down to every bolt at the ground station to operation of the broadcast.

Finally, additional thanks to Dr. William Lawerence at the Bowie State University of Maryland for his setup and hosting of a ground station, as well as patience allowing multiple site visits.

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1 Introduction

This manual, as its name suggests, is a simple guide on the installation of GEONETCast Americas ground stations. GEONETCast Americas is a public service to provide earth science data and derivative products over a satellite broadcast. While internet and other communications means exist, satellite broadcasts are inexpensive to operate and provide a method of communication removed from other terrestrial network limitations or periodic failures.

Over the years I have installed a number of communication systems and devices in different parts of the world; many of these satellite broadcast systems. The common lesson of all of these installations is that nothing ever goes as planned. More to the point, while manuals come with all the equipment, typically these are not straightforward, lack detail, and don't provide real world advice. I am willing to bet most manuals are written in a lab or are based upon theory only.

In the case of GEONETCast, the system is designed to use commercial off the shelf components. Beyond the typical lackluster of many manuals, the challenge for this system is that while all these components are compatible with one another, I would not go so far as to say the components were specifically designed with one another in mind. If nothing else the manuals are separate and do not attempt to help you perform a complete ground station installation.

That is where this document comes into being. Each major component of your GEONETCast Americas ground station will have a manual. Read and understand these. What I try to provide here is a complete end-to-end guide that compliments the manuals. In some case the instructions deviate from the manual and offer an alternative solution for setup and installation.

You will note that particular emphasis is on the installation and setup of the dish antenna. This is for good reason as this piece of the station is the most difficult to put together and has the least tolerance for error. It is also the most expensive.

Overall, this manual attempts to relate the experience of several individuals who setup a temporary station; simply to better understand the process of setup, document an installation, and learn those little tricks and tips that never seem to make it into formal documentation. Fortunately for you when setting up our test dish, we ran into multiple problems. And those problems are documented here. It actually took four nearly all day long sessions over a two month period before we achieved success. The first obstacle was simply a lack of time. Photographing pieces and setup took longer than expected. On our second session, we found out that the milling of dish components isn't always well done. We couldn't fit parts together without a little drilling, grease (literal and elbow), and hammering of things that shouldn't be hammered. Nonetheless, we got it together and were able to take it outside for a little test. On the third session, well, we couldn't pick up the signal no matter how we pointed the dish. This was amazing as on the second session we managed to pick up a signal and lock the signal after dropping the dish. Luck has a cruel sense of humor. On the fourth session we achieved our goal.

Pictured here from left-to-right, mere minutes after successfully receiving the GNC-A broadcast on our temporary station setup, is Paul Seymour (Broadcast Manager for GNC-A), Kelly Sponberg (me), and Martin Steinson. Rosario Alfaro, who also helped with the test installation, is behind the camera.

As this manual is largely relating an experience setting up a ground station, it is written with specific equipment make and models in mind. Nonetheless, even if you use different equipment, there are likely many similarities and common lessons. To that end the manual should still be useful.

Finally, this manual is considered a living document. It will be updated from time to time to do basic tasks of improving the writing and correcting errors. However, as we gain experience with other installations or utilize different equipment, those lessons learned will also be incorporated into this document.

2 Extremely Brief Summary of Installation Steps for a GNC-A Ground Station

1. Identify location to place dish antenna.

2. Install mount / foundation for antenna at installation site.

3. Assemble and mount dish.

4. Run cable from dish indoors to location of computer workstation.

5. Install and configure DVB-S / S2 receiver card.

6. Attach cable.

7. Install Kencast Fazzt client.

8. Start up Fazzt client and receiver card.

9. Receive broadcast.

10. Smile.

3 Station Components

GEONETCast is currently designed to work with standard DVB-S; that is Digital Video Broadcasting over Satellite. This means that there are numerous off the shelf components and solutions, thereby making it easy to find equipment. So, while each GEONETCast-Americas (GNC-A) station will have common components, there are many makes and models for these standard components. There is no standard 'kit' for GNC-A ground receive stations. In addition, while individual pieces of equipment all work generally the same from manufacturer to manufacturer, beware that there are installation, setup, and configuration differences. Clearly there will be performance differences as well.

When setting up a station, It is helpful to have prior experience establishing DVB-S or even other satellite receive stations. It is even more helpful, however, to read and closely follow the manufacturer instructions of your equipment. Often the components associated with the dish antenna are heavy, large, and sometimes awkward to move. To avoid damaging the station, and more importantly causing injury to yourself or others, please read the installation and setup instructions carefully.

The following provides a high level overview of all the components necessary to install a GEONETCast Americas DVB-S receive ground station. **It is not a substitute for reading and following manufacturer instructions.**

3.1 Dish Antenna

The dish antenna is comprised of a few different sub-components or assembles. Every model of dish antenna will have an equivalent set of assembles, although the installation and look may differ slightly. The manufacturer may have different terms as well.

The reflector is the 'dish' portion of the antenna. It is a parabolic surface that reflects radio frequency (RF) signals to a focal point. At the collected focal point, the RF is 'fed' to an LNB and other receive equipment. For the dish antenna to work properly, the reflector must be put together well. Any warping or poor alignment will reduce the received signal strength; potentially to a point where the dish is not usable.

The support structure assembly is a brace or frame for the reflector. This manual is based upon a hard dish -- the General Dynamics 2.4 Meter Series 1252. In this case the support structure is used to hold the reflector to a mount, such as a pole. In some mesh dishes, the support structure is much more integral to shaping and forming the mesh to a parabolic form.

The feed support assembly holds the feed horn. During installation it is important to adjust the feed support correctly. The feed horn needs to be where the signal is collected at the focal point of the reflector. Having the feed support askew will again degrade your reception and potentially make it impossible to receive anything.

The feed horn sits at the focal point of the reflector. The LNB attaches to the feed horn. In the picture below, there are two mounting locations for different LNBs. This could be used if pointing the dish in different locations or receiving a signal from different transponders on the same satellite. Generally, however, you will block one LNB mounting location with a metal plate.

Installed GEONETCast Americas station at Bowie State University in Bowie, Maryland, USA. Profile shows reflector dish and focal point.

3.2 LNB

The LNB, low-noise block down-converter, is used to do a couple tasks. It amplifies the received signal, and then down-converts frequencies to frequencies that are more manageable via common coaxial cable and electronics in the receiver. An LNB is generally powered by the receiver via the connected coaxial cable. While rare you can damage an LNB if the power output from a receiver is incorrect, multiple and incomplete connections, etc. As might be guessed, the LNB must match the set of frequencies used by the satellite broadcast you wish to receive. The LNB is mounted on the feed horn of the dish antenna, which sits at the focal point of the reflector.

There are different types of LNBs. One, phase locked loop (PLL) provide better stability, particularly for low bitrate broadcasts, as it results in less frequency drift due to temperature or other changes. PLL LNBs do cost more than say a dielectric resonator oscillator (DRO) LNB. Issues of low-bitrate are not generally a problem with DVB-S services and that of GEONETCast, but for the added stability, at only a marginally greater cost, a PLL LNB is highly recommended.

Photo of Norsat LNB just opened from box. With the LNB is a gasket to help with seal to feed horn.

Photo of GNC-A dish installed at Bowie State University of Maryland, United States. The LNB shown attached to feed horn and properly mounted to reflector.

3.3 DVB-S / S2 Receiver

The DVB-S / S2 receiver converts the signal from the LNB to data that can be managed by a computer. The receiver also generally allows you to tune to specific content streams on the satellite, through a software interface. There are numerous internal (PCI) card receivers, that can be installed in a standard desktop computer. DVB-S receivers can also be purchased as external box units. Typically these connect via a USB or serial connection, although there are some that utilize an Ethernet port. External boxes are often preferred for ease of setup and maintenance over time, and if the computer configuration allows for it, a DVB-S receiver that connects via Ethernet is preferred even more. An Ethernet connected DVB-S receiver avoids potential USB driver issues.

Regardless of the receiver model or type, the receiver is connected to the LNB / dish antenna assembly via coaxial cable. Through this coaxial cable, it provides power to the LNB.

DVB-S means digital video broadcasting over satellite. DVB is an error and demodulation coding. DVB-S2 is the 'second generation' of DVB-S. Currently, GEONETCast Americas utilizes DVB-S. Many carriers are moving to DVB-S2 as new satellites are launched. In that case DVB-S2 could be utilized in GNC-A in the coming years. Most DVB-S2 receivers are backward compatible with DVB-S. DVB-S2 receivers are only slightly more expensive than DVB-S receivers, and so might be a better, early investment to future proof your ground station. At the same time, the cost of receivers is so low, that replacement or upgrade to DVB-S2, when and if necessary, should not be a major obstacle for even a large network of ground receive stations.

3.4 Computer

A computer is required to receive data and files broadcast over GEONETCast Americas. Requirements are quite minimal. Configurations under Windows operating systems (OS) have been tested, but due to limited support for Linux on many DVB-S cards, a Linux distribution has not been fully tested. Most computers built since Windows XP SP2 will be capable of running both the DVB-S receiver software, and the Kencast Fazzt Professional Client. Earlier tests and specifications for the ground stations called for the following requirements:

- 2.0 GHz Pentium IV;
- 1Gb RAM
- 36Gb internal disk;
- USB port;
- MS Internet Explorer 5.5+

My recommendation would be to ensure there is 100Gb or more in free disk space. The Kencast Fazzt Professional Client downloads broadcast content. And while you can set the client to purge content, as well as filter downloaded content, the broadcast can nonetheless fill up a hard disk quite quickly.

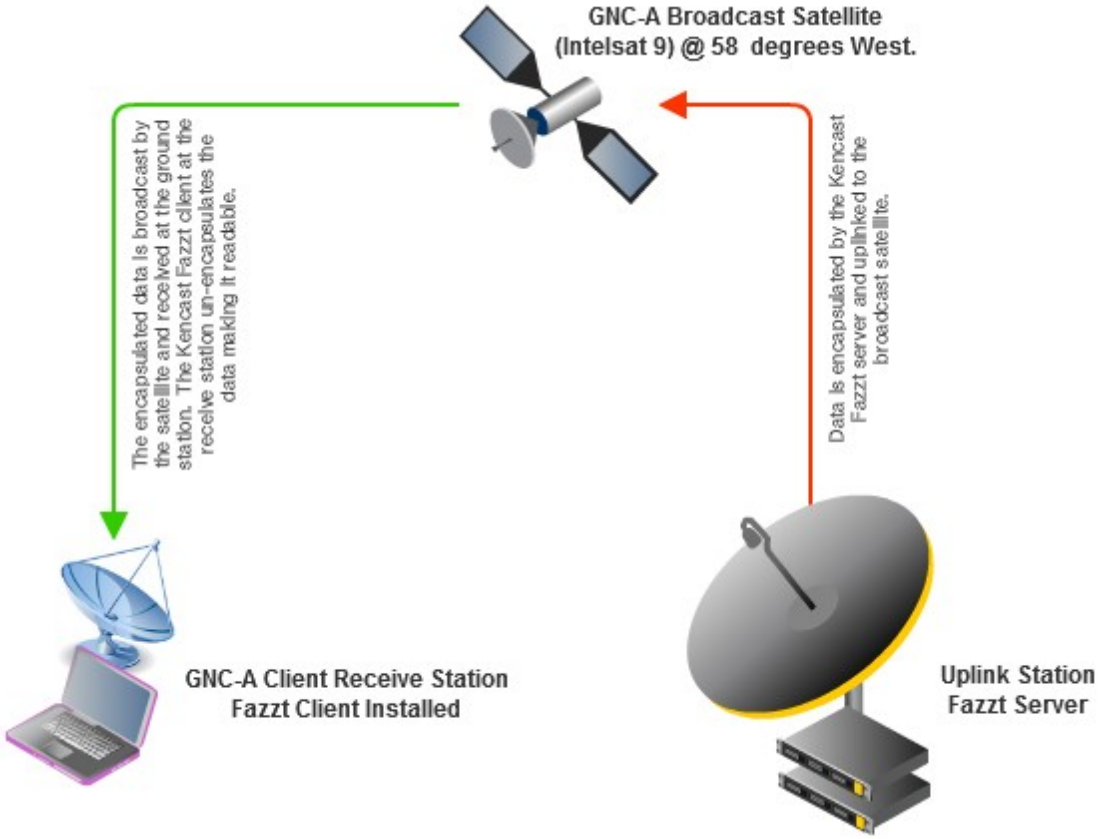
I also recommend upgrading Internet Explorer to the latest version, for security reasons, if not compatibility.

3.5 Client Software

GEONETCast Americas currently uses the Kencast Fazzt family of software to manage the satellite uplink, as well as the de-encapsulation of data at the client end.

What does that mean? On the up link side of the broadcast, there is a content management server.

This server places content on the proper sub-channels, and it performs a number of administrative tasks as logging, error checks, and bandwidth / bitrate management. One of its jobs is to encapsulate data, which in essence collects data together to help with management of data over networks. When these packages of data are transferred, something on the receive end has to un-encapsulate the data.



Basic system diagram of GEONETCast Americas.

So in short, Kencast Fazzt is used to manage the data broadcast at the uplink server. As a result, in order to view all received data, ground stations have to install the Kencast Fazzt client.

4 Dish Antenna Pre-Installation Preparation

The dish antenna in the GEONETCast receive station is the largest component, and therefore the most difficult piece of equipment to deploy. Its large size means that accuracy and precision in setup, placement, and pointing is critical; in comparison to a smaller dish antenna. Additionally, you will need to identify and prepare a proper site for the dish to ensure it complies with any land use / zoning regulations, building codes, and similar. Remember that dishes must be securely mounted, so that they do not become projectiles in cyclones and other high wind storms. If you are deploying a mesh dish, do not think it is immune from wind. High wind effectively treats mesh dishes as a solid surface. Some mesh dishes, due to an emphasis on light weight design and easy deployment, may actually have a lower wind survivability rating that a solid construction dish.

If cyclones and high wind storms are of concern in your area, look up the specification sheet for your dish. Generally there are two ratings. Operation and survival. Operation means the dish should reliably operate at wind speeds up to that listed. Otherwise it is likely to be put out of alignment and similar

twisting / warping that would cut the signal reception. Survival pretty well describes it. Winds over the survival rating are likely to break the dish; turning it into a projectile in the process.

In short it pays to plan when setting up the entire ground station, but it is particularly important for the dish antenna.

The station covered in this manual utilizes a General Dynamics 1252 Series 2.4 meter receive only antenna. While there are some specific tips for this antenna model, many antenna dishes of the same size have similar setup and deployment issues. I have provided here a list of tools we found either a must or extremely helpful during setup. You will most likely need these as well, regardless of your dish model, but check your dish installation manual and instructions for sizing of sockets / wrenches, as well as if you need screwdrivers, hex wrenches, or other tools not utilized in our installation.

4.1 Tool Check List

4.1.1 Hand and Eye Protection

Throughout the installation you will be working with heavy objects; some with sharp edges or unfinished metal edges. A pair of gloves per person is recommended. Similarly, you may need to use a portable drill or drill press. In this case be sure to have shop glasses to protect everyone's eyes.

- A Pair of Gloves for Each Person in Installation Team

- Safety Glasses / Eye Protection

4.1.2 Hand Tools

You can most likely install the dish with a simple set of spanner wrenches and pliers, however, we found at times we were using more that two tools at once; particularly on the feed horn. Therefore, extra wrenches and pliers of the required size are recommended. For our installation several wrench / socket sizes were required: SAE 5/16", 7/16", 9/16", 3/4", 15/16", 1-1/8". Similarly, assembly will go considerably faster if you have a ratchet set and locking pliers handy.

- Open Wrench / Spanner Wrench

- Pliers

- Ratchet (w/ appropriately sized sockets for your dish)

- Locking Pliers

4.1.3 Lubrication and Cleaning

We found that often the nuts and bolts provided with the dishes were poorly milled, such that there were burs of metal in the thread. A steel brush helps to clean these off, and a bit of oil ensures everything goes on smoothly. If you end up having to drill new or widen holes in any metal, having light weight oil will also be needed. I also recommend that you use white lithium grease or an equivalent on all the nuts, as well as the pointing / adjustment mechanisms near the mount. This will help ensure that the dish can be re-pointed or moved, if necessary. I also recommend a bit of silicon grease be used on the rubber gasket sealing the LNB to the feed horn. This is simply added protection against the elements. And finally, you might need some paper towels or rags to help wipe up extra lubricant.

- Wire Brush

- Light Weight Oil

- Silicon Grease

- White Lithium Grease

- Paper Towels or Rags

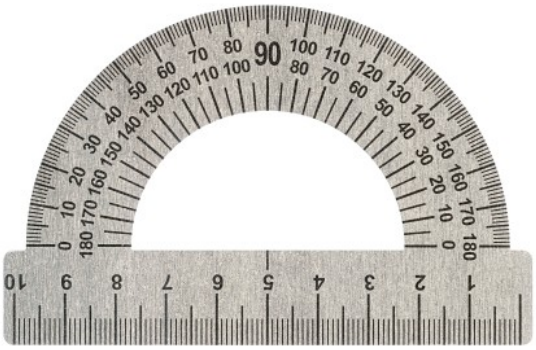
4.1.4 Measurement and Alignment

To help with proper pointing of the dish and assembly, you will need some measuring tools. You will also need some basic string. This can be used to measure if there is any warping on your dish. Scissors and a marker to help with measurements.

- **Bubble or Other Level**

- **Plumb Bob**

- **Protractor**



- Compass or GPS with Compass

- Tape Measure and/or Yard Stick

- String or Twine (at least 10')

- Scissors (or knife for cutting string / twine)

- Pencil or Marker

4.1.5 Support and Reach

The dish antenna is 2.4 meters. When tightening the components and mounting the dish, it will help to have saw horses (or equivalent) on which to steady the dish, as well as a ladder, to help you reach up to the dish in comfort.

- **Saw Horse or Equivalent (3-4)**

- **Ladder (8')**

4.1.6 Cabling

You will also need (likely) some extra coaxial cable and connectors. Of course you should also get some electrical tape and preferably heat shrink tubing. You will also want cable ties to secure the coaxial cable to the dish antenna, mount, and other structures as it makes its way into your building. Ensure that all your cable, tape, shrink tubing, and cable ties are ultra-violet (UV) rated. UV rated ties are generally black. To use heat shrink tubing you will also need either a soldering iron, lighter or heat gun. In the case of a lighter or soldering iron, neither the soldering tip nor flame should touch the shrink

tubing, but rather should be held in proximity. Run a few tests if you have not used shrink tubing before.

- Coaxial Cable

- Electrical Tape

- Heat Shrink Tubing

- Cable Ties

- Lighter / Heat Gun / Soldering Iron

4.1.7 Other

You may need a drill to help widen some holes and/or to create drainage on the dish. If widening existing holes, you should take pieces to a drill press to ensure precision, but if creating new holes for extra fastening or for drainage (water), then a simple drill will likely suffice. Be sure that the drill bits you utilize are rated for the material you are drilling. A drill bit for wood used in metal may not get the job done, and worse yet it could break and potentially cause injury. When drilling be sure to use eye and potentially hand protection. If drilling metal, you should use some light weight oil on the drill bit.

- Drill (w/ assorted bits appropriate for drilling metal, fiberglass, and other materials)

4.2 Site Check List (Days Prior to Installation)

- **Check installation site location for above ground obstructions.** Using a site like dishpointer.com, enter the coordinates of the proposed installation location. Check to ensure that

buildings, other structures, and heavy vegetation will not obstruct the line of site of the dish. Do not just look at the current conditions, but think about how conditions will change in the future. Is there an issue with seasonal vegetation? Is there likely to be construction adjacent to your dish that will cause interference?

- **Check installation site for below ground obstructions**. Assuming you are building a foundation to mount your dish, be sure that you have checked for buried cable, water or gas pipes, and similar obstructions.

- **Check for building and other codes.** Depending upon your location there may be building and other zoning codes that affect if and how you can place a dish antenna. Some of these regulations may be for safety. Others codes may be for aesthetic reasons. As emphasized repeatedly throughout this document, check with a local engineer, architect, or building inspector.

- **Prepare the dish mounting / foundation.** Be sure to read the instructions that came with your dish antenna before attempting to mount it either on the ground or on the roof of a building. For ground mounts generally a hole is dug and cement placed at the bottom to anchor a pole on which the antenna assembly is placed. The pole in the case our our dish had to be 5" diameter with a SCH of 40. SCH is wall thickness. Local welders and construction specialists should be able to help you identify the correct pipe.

  To anchor the pipe in the ground, you with an engineer, but generally one bag of cement should be used for each foot of pipe above ground. So for instance the General Dynamics dish we used suggests a 4.5 foot pipe above ground. That pipe should also extend 4.5 feet below ground. At the bottom of the hole, 5 bags of cement should be used to create an anchor. More may be necessary in certain soils and high wind areas. You may also choose to pour an anchor as described, along with a pad on the surface soil.

  Alternatively a pole may be bolted to a cement pad, but again, it is important to check with an engineer to ensure the dish is properly secured.

  It is also possible to place an antenna on a flat rooftop, and this may be the only way in an urban area to avoid obstructions. If placing on a building, be sure to get an engineer, architect, or other to ensure that the roof can support extra weight and that there is a plan to ensure the antenna survives high wind. You should also only place an antenna on a roof top if it is possible to access it, as you will need to periodically clean it and perhaps even re-point the dish. ***If you get special welding done for either a roof or ground mount location, be sure to communicate with the welder the weight and size of the dish. Also emphasize that the dish will be under wind stress at different angles.*** The weight of the dish and mounting hardware used in this installation is about 200 pounds.

- **Sort and ensure you have all component pieces.** Each dish, receiver, and other equipment will come with a packing slip. Read through the instructions and the packing slips to ensure you have all pieces. We found it helpful to sort all the small pieces into separate plastic bags. For instance we put bolts, washes, nuts for the dish construction in one bag. Those used for the feed horn were placed in another. And so forth.

4.3 Site Check List (Day of Installation)

- **Start early.** A dish installation, if everything has been prepared properly, need only take a few hours, but you should expect minor problems. Be sure to have a plan to pick up or leave equipment out, in case you can not finish.

- **Ensure workable weather.** You will be lifting heavy equipment, stringing cable, and will potentially

be standing up high on a ladder or rooftop. Ensure that the weather (rain, wind, extreme temperatures) will not interfere with your installation.

- **Grab a buddy; or two or three or four.** If you are working with a mesh dish, you will still need a partner or two to help the installation go smoothly. A solid dish will benefit from more hands. It is possible for two people to mount the dish, but to avoid injury to people or damage to the dish, we really recommend having four sets of hands available. Five is not unreasonable either.

- **Organize tools and equipment.** Ensure you have all the components laid and out organized by steps in the installation.

- **Review instructions with all your installation team.**

5 Dish Antenna Installation

Before preceding with the installation instructions, I will assume that you have already installed a mount for the dish antenna, either as a pole in the ground or a rack structure on a rooftop. If not, you should probably wait to proceed with constructing and installing the dish. Dish antenna are not really intended to be put together, dismantled and put together again; repeatedly. Avoid stressing the dish until you are ready for a final installation.

Also, it is important to note that all the instructions are in the manual that came with your dish. Be sure to read the original instructions. I provide instructions here as helpful tips and to relate a separate experience. In some cases I found it easier to deviate from the official instructions slightly. Read both instructions and determine what is best and safest for you.

5.1 Reflector Assembly

5.1.1 Steps

1. Slide petals of dish together, using flange and other alignment guides. Do so on a solid flat surface.

2. Move petals so that holes along ribs are aligned. There are five (5) holes for each joining edge of the petals.

3. Oil bolts and nuts. Push bolts through holes in ribs of petals, EXCEPT IN THE MIDDLE HOLE (THIRD HOLE) (REFERRED TO AS THE C POSITION IN THE DISH MANUAL).

4. Hand tighten nuts on bolts working from bottom holes (those on the outside of the dish) to top / center of the dish.

5. If dish appears properly aligned grease bolts and nuts with lithium or similar grease. Tighten fully using ratchet. Again start from bottom / outside of dish and work towards the top / center.

6. In preparation for the next phase of assembly, lift the dish up onto three or more saw horses (or equivalent support). This is best done with 3-4 people.

7. Install feed support assembly bolts into reflector in preparation of feed support assembly.

5.1.2 Tool Requirements and Suggestions

- Ratchet

- Pliers
- Light Oil
- Lithium Grease (or equivalent)
- Three or More Saw Horses (or equivalent supports)

5.1.3 Installation Instructions

The reflector in our dish is solid and made of three petals. Pictured here is a single petal.

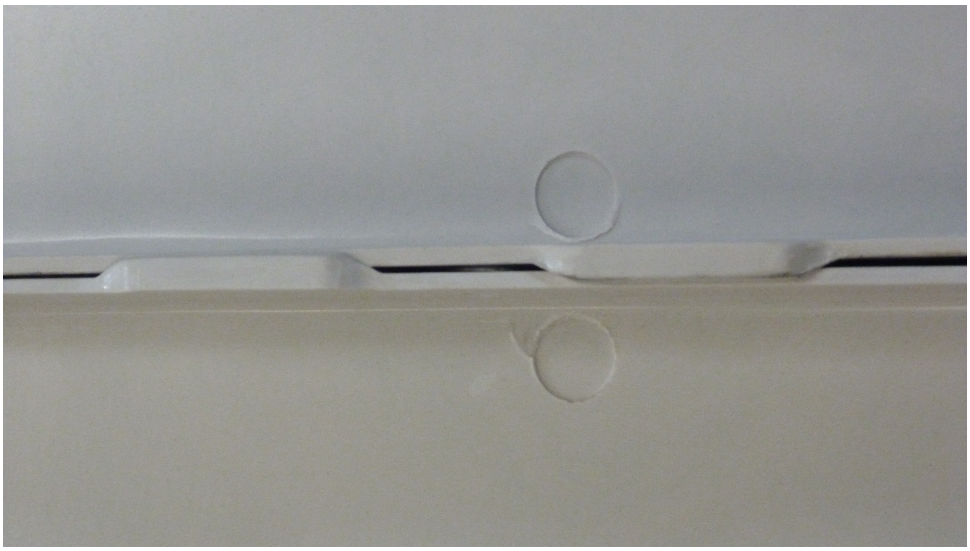
Reflector petal of C-Band satellite receive dish.

If you are using a different model dish, you could have many more petals, and your dish might be mesh. If it is a mesh dish, read the instructions to be sure, but generally the mount and support assembly for the reflector is constructed first, before the reflector is put in place.

As described in the instructions, begin attaching petals to one another by laying them face down on a flat surface.

It is important to have a solid flat surface so that your petals are properly aligned and that there is no warping.

Each petal on the General Dynamics dish we assembled has flanges / tabs. Your dish, if different, may or may not have these alignment aids.



A close up of two petals place side-by-side, with the alignment tabs of each petal.

With the dish petals aligned, next, insert the bolts (with washers) into each hole that connects the edges of one petal to another. As noted in the original instructions, ***insert bolts into only holes A,B,D, and E. Do not insert bolts yet into C, as this is where the angle braces from the center hub will be attached.***

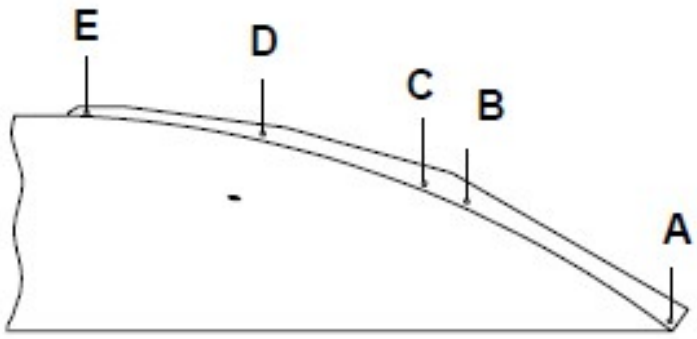


Image taken from General Dynamics Satcom Technologies 2.4 Meter Series 1252 Assembly Manual, 4096-356, July 14, 2009. The graphic shows side view / cross section of a single reflector petal. The bolt holes are labeled A through E. Hole C should not be used when initally attaching petals together, as it will be used to secure the angle braces.

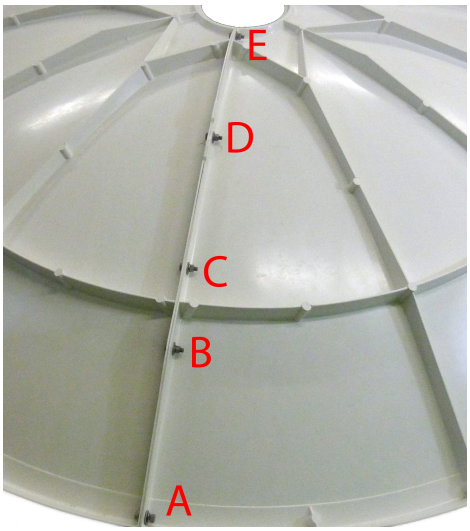
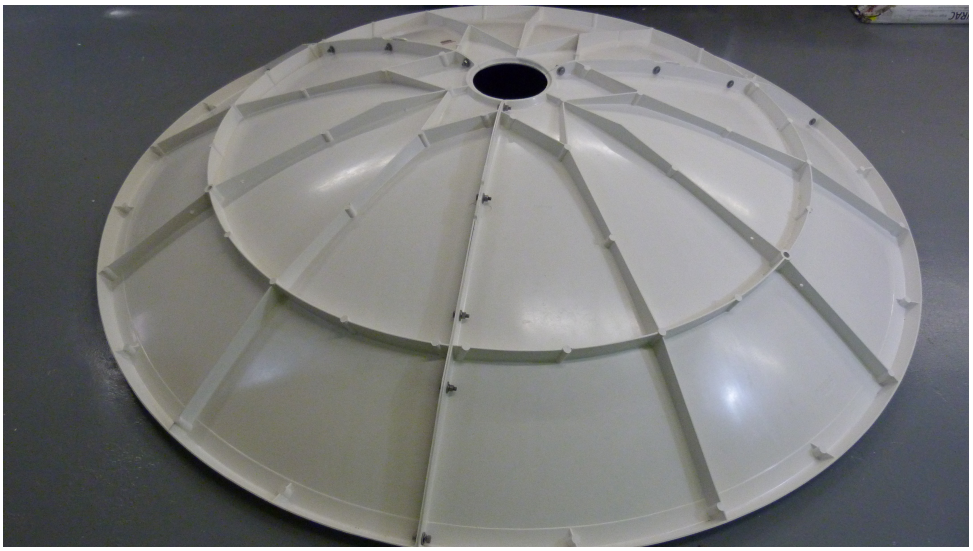


Photo of dish with bolts holding two petals together. The outside of the dish ('A' position) should be tightened first, then the 'B' position, and so forth to the 'E' position. NOTE: Unlike the picture, you should not insert and tighten bolts into the 'C' position. Yes. We didn't read our instructions carefully!

Hand tighten the bolts starting at A (the outside holes) and work towards the center / top of the dish. Add a little lithium grease or similar grease to the nut and bolts, before the nuts are fully tightened. While in most scenarios once a dish is put together it will not be disassembled or significantly realigned, there is always a possibility. Most oils will wash off and loose any protective property outside in the heat and rain. A high temperature and 'all weather' grease like lithium grease will provide some assurance that the nuts can be unfastened in the future without stressing or cracking the reflector of the dish.

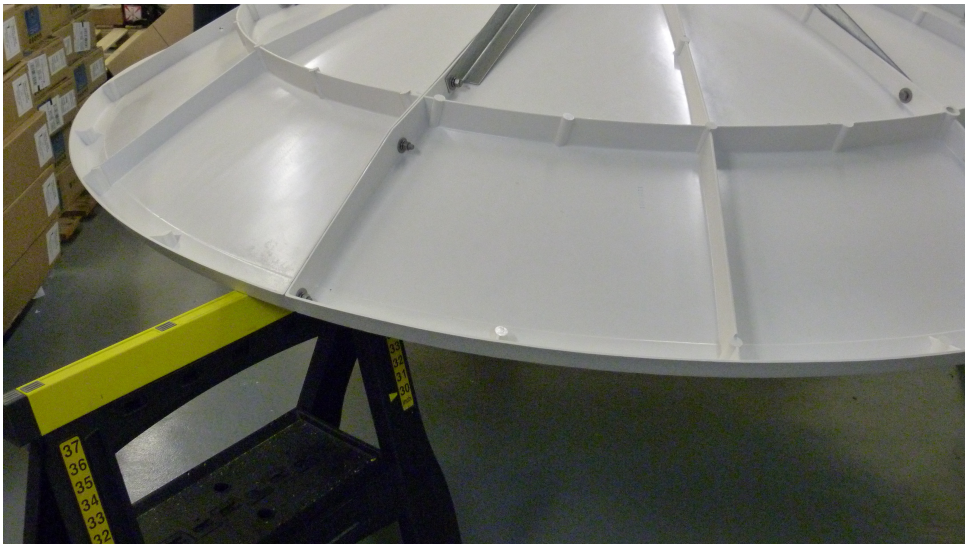
The petals should now be well aligned. All the bolts, except those in the third hole ('C' position) should also be inserted and 'hand tight'. If so, begin once again at the 'A' position (outside) bolts and begin to firmly tighten the nuts. While doing so, be sure that the seams and ribs of adjoining petals remain aligned.

You now have a completed reflector.



Completed reflector. Did we fail to follow instructions and insert a bolt into the third hole / 'C' position? Why yes. Yes we did.

With all three petals firmly connected and the bolts well tightened, lift the dish up onto three or more saw horses, or a similar set brace. Lifted up the 'face' of the dish should point to the ground while the convex portion ('back') points upward.



Completed reflector is lifted onto saw horses to help with installaiton of center hub and center plate. Three saw horses (or similar support) is necessary.

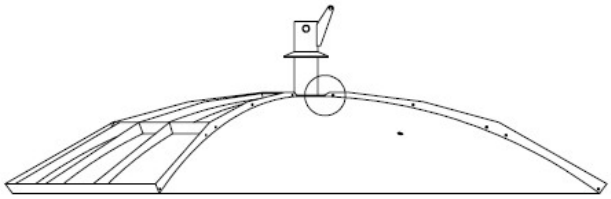
We found we really needed four people for this. Three to hold the dish while a fourth person positions the saw horses. While two individuals can lift the dish, it can be a bit awkward.

With the reflector elevated, install the feed support bolts. You will need to locate the three holes. There is one per petal and located roughly in the middle at the cross section of two spines. From the face of the petal / reflector insert the threads. Note assembly with bolt and washer order. Tighten the feed support bolts by hand only at this point. These will need to be adjusted at a future point in time.

Photo of feed support bolt.
Note that attachment hole is on the face side of the reflector.

5.1.4 Side Notes

If you are using the same model that is utilized in this manual, and if you read the manufacturers instructions, you will note that the first step is to put two petals together and then attach the center plate and center hub, before bolting on the third petal.



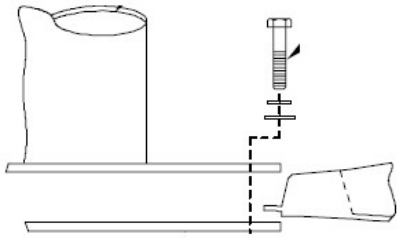


Image taken from General Dynamics Satcom Technologies 2.4 Meter Series 1252 Assembly Manual, 4096-356, July 14, 2009. The upper graphic shows two petals supporting the center hub. The bottom graphic is a close up, showing the lip on the petal that is inserted between the center hub and the center plate as the two are bolted together.

Photo of center hub and center plate attached to reflector with one petal removed. The center hub is attached to the center plate with bolts. The two, when bolted together 'pinch' the lip of the petals.

We found it easier to put all three petals together, and then lift the reflector onto saw horses or similar support. (You will need three saw horses at a minimum.)

At this point we attached the angle braces to the center hub. The center hub was then positioned on the back of the reflector -- the convex part of the dish that is facing up, while resting on the saw horses. Next we attached the angle braces to the reflector ribs, and then someone held center plate up while the center hub was bolted down. These steps will be detailed below, but I wanted to give you a short outline first, since our instructions deviate from the original manual. Our guess is that the original manual was designed with few hands in mind. We felt that with ample helpers, constructing the full dish reflector was easier, and the center hub and center plate did not warp or stress the edges of the reflector petals.

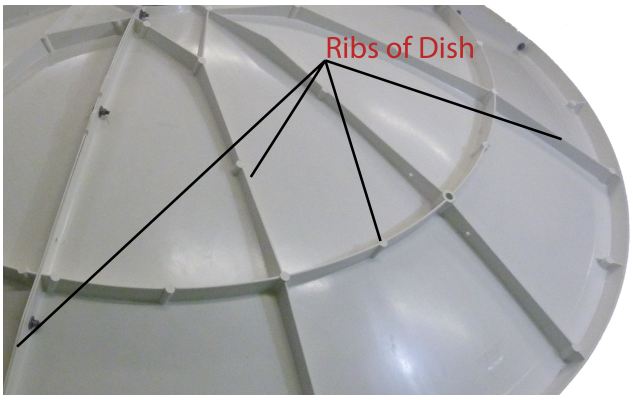
5.1.5 Helpful Hints

- Inspect and if necessary scrub the threads of the bolts with a wire brush before inserting into holes. Do so to remove metal burrs or other dirt. Be careful not to damage threads.

- Wipe bolt threads after inserting into the holes before screwing on nuts. Pieces of plastic may stick to the threads.

- Oil bolt threads and nuts with a light oil before screwing nuts onto the bolts. Use a dab of lithium grease or similar grease on the nut before tightening it in place.

- Hand tighten nuts until all bolts are inserted into the petals and the petals look aligned.
- If you cannot easily reach the center of the dish to work on it, DO NOT place your weight on a smooth portion of the reflector. Use the reflector ribs for support, if you must.



'Ribs' of the back side of the dish reflector. While you should avoid putting any weight on the reflector, if you need to do so during assembly, brace your weight on a rib.

- Work goes much faster with a ratchet.

5.2 Support Assembly

5.2.1 Steps

1. Attach angle braces to center hub.
2. Place center hub with angle braces on back / convex side of dish. This is best done with the dish face down and elevated on saw horses or other support.
3. Bolt angle braces to dish in hole left open during reflector assembly.
4. Hold center plate on face of dish covering the opposite side of the hole from the center hub. You will need a friend or two to crawl under the reflector and to hold the plate up. Be sure that the dish is safely elevated and secured so that it does not fall on anyone.
5. Bolt center hub to center plate. Put a small amount of lithium or similar grease on all bolts.

5.2.2 Tool Requirements and Suggestions

- Ratchet
- Pliers
- Light Oil
- Lithium Grease (or equivalent)
- Three or More Saw Horses (or equivalent supports)

5.2.3 Installation Instructions

As noted earlier in the Reflector Assembly 'Side Notes', when setting up the General Dynamics Series 1252 dish, we deviated from the instruction manual by putting all three petals together and leaving the support assembly to be constructed and attached to the reflector in a separate step. You of course can follow the instructions as provided by the manufacturer. We found constructing the reflector separately to be easier. If you follow these instructions, you will need to have the reflector face down and elevated on supports like saw horses.

Begin by standing the center hub up / vertical on a flat surface. Then attach the angle braces to the ring on the central hub. The tapered end of the angle braces should be attached to the hub.

Photo of center hub. The bottom part will be set on top of the back side of the reflector, once angle braces are attached.

Photo of angle braces, as shipped in box. The tappered end is attached to the center hub.

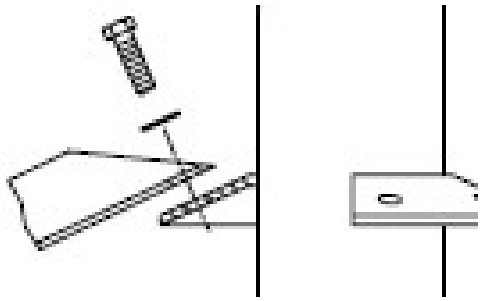


Image taken from General Dynamics Satcom Technologies 2.4 Meter Series 1252 Assembly Manual, 4096-356, July 14, 2009. The graphic shows an angle brace being attached to the center hub.

As with all pieces, you will want to potentially brush off and lightly oil all bolts and nuts. As the bolts and nuts get closer to their final position, a quick spray or lithium grease or similar is recommended. Do not tighten the angle braces completely at this point. You will need to be able to adjust the braces somewhat when the hub is placed on the reflector dish.

The following photo shows the 'end goal' with the center hub and angle braces placed on the back of the reflector. The angle braces are attached to the ribs of the reflectors, where two petals were joined and on a center hub along each petal. Earlier in the Reflector Assembly instructions the bolt in the 'C' position was left out. Now you will use a bolt to attach the angle braces to the reflector. Hand tighten the braces to both center hub and reflector until everything is well positioned and aligned. The angle braces should be slightly offset from, but as straight as and parallel to, the ribs of the reflector. When aligned add grease and tighten.

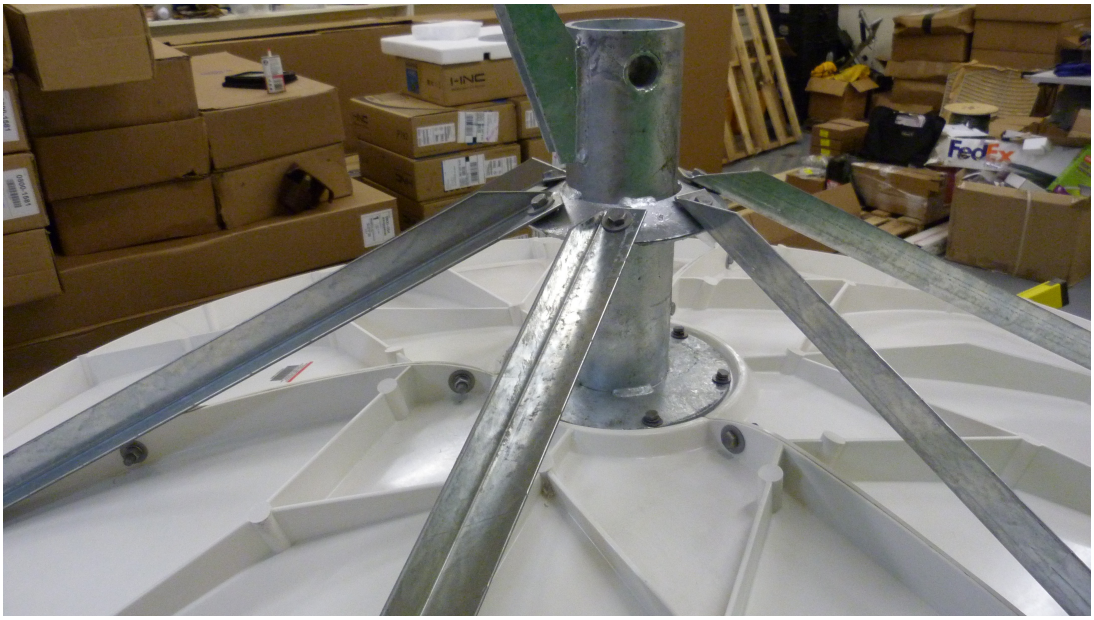


Photo of center hub with angle braces attached to the back of the reflector dish.

With a set of helping hands, someone should place the center plate opposite of the center hub.

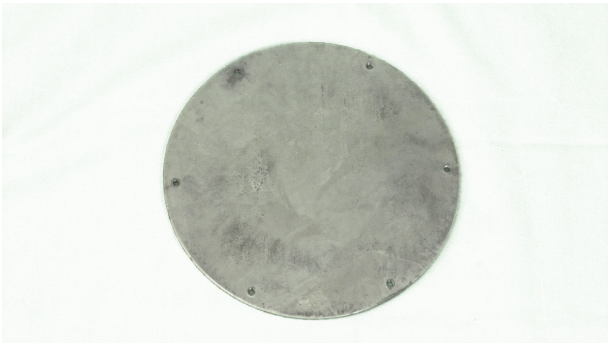


Photo of center plate. The plate will be placed on the face of the reflector over the center hole. The center hub, placed on the back of the reflector, will be bolted onto the plate.

Photo of center plate bolted to center hub. The center hub sits on the back of the dish. Bolted together these two pieces 'pinch' the reflector and are part of the main support structure.

Align holes of the center plate and center hub together. Grease and bolt the two pieces together. A ratchet is extremely helpful in this task, as the bolts are difficult to reach and the threads between the plate and hub offer a lot of resistance.

Tightening without a ratchet will be long and tedious.

Check all the bolted connections on the center hub and angle braces. Your work is now complete.

5.2.4 Helpful Hints

- If you or a friend do not have long enough arms to reach the center of the reflector, get an old cardboard box and fill it with loose packing material. Get two friends to help you raise the dish vertical with the reflector edge resting on this support. Similar soft support will suffice. While two people hold the dish, you and another can bolt on the center plate.

- Use a ratchet while attaching the center plate. It is difficult to reach and the bolts offer considerable resistance.

5.3 Canister & Elevation Assembly

5.3.1 Steps

1. Position canister on pole mount. Insert square head bolts. Tighten bolts enough to prevent canister from moving while attaching the dish via the support assembly.

2. Put together the elevation rod by screwing on one nut. Place it about 6" up the thread. Attach the elevation block to the rod. It will move freely. Now attach the next nut.

3. Attach the elevation rod to the canister via the elevation block.

5.3.2 Tool Requirements and Suggestions

- Wrench

- Pliers

- Lithium Grease (or equivalent)

5.3.3 Installation Instructions

The canister assembly will connect to the support assembly, thereby attaching the reflector and entire dish to a pole. The canister sits as a cap on top of the pole, and as it is rotated, you can adjust your dishes azimuth (pointing in a N, S, E, W direction). The elevation rod and assembly is connected to both the canister and support assembly. It pretty well describes its purpose. It helps you adjust the elevation (up and down) of the dish.

Begin by simply placing the canister on your pole. If you have the same model of antenna used here, and you acquired the correct pipe size, it should be a relatively snug fit. There should be very little gap between the inside of the canister and the outside of the pipe. A light amount of grease on the canister and pole will help with adjustment and prevent corrosion.

Canister. Elevation block held in place by plastic tie.

Now insert the six square bolts into the holes of the canister. Hand tighten, but not to the point where the canister cannot turn. Now adjust / rotate the canister to its final position. The protruding bars should be on the opposite side of the pole from where the antenna will be placed. Look at the following image to see how the canister and elevation assembly will look in relation to the dish when mounted on a pole.

Back of the dish showing the support assembly attached to the canister and elevation assembly.

Now tighten the bolts on the canister to secure it to the pole and prevent it from rotating.

Next assembly the elevation rod. Begin by screwing on one nut. Place it about 6" up the thread. Attach the elevation block to the rod. It will move freely. Now attach the next nut.

Finally, attach the elevation rod to the canister assembly with the two bolts. The threaded end of the elevation rod should point to the ground, while the hole which will attach to the support assembly (see above image) should point upward. It is okay if the elevation rod hangs loose.

5.3.4 Helpful Hints

- Your dish will be out in the elements, and hopefully it will be there for some time to come. While you generally don't want to rotate the dish once it is correctly pointed, there may be times when it is beneficial. Lightly grease the pole and the inside of the canister. This will help prevent future corrosion from locking the pieces together. When pointing your dish, it will also ensure you can more precisely adjust the azimuth.

5.4 Attachment of Reflector to Mount

5.4.1 Steps

1. Position dish close to mount.

2. With help lift reflector up, such that the top of the center hub is between the brackets of the canister.

3. Position and mount antenna to the pole by attaching the support assembly to the canister and elevation assembly. Connect with the 1" bolt.

5. Attach elevation rod to the support assembly.

4. Have fun changing the elevation (raise and lower) of the dish, as well as its azimuth (rotate). Actually, now is a good time to check everything moves, bolts are tightened, etc. Do a general inspection.

5.4.2 Tool Requirements and Suggestions

- Wrench
- Pliers
- Lithium Grease (or equivalent)
- Hammer

5.4.3 Installation Instructions

Attaching the dish, and specifically the support assembly, to the canister is one of the more difficult tasks. Its not complicated, but the dish is heavy and cumbersome. You will need several people to help with installation. Based upon our experience, I would recommend three people to raise up and hold the dish, while a forth person bolts the support assembly to the canister assembly. Prior to attempting attachment, be sure to lubricate canister and support assembly very well; particularly the 1" bolt. A hammer may be necessary to get the bolt in to the assembles.

Begin positioning the antenna as shown in the manual. If you have enough helpers the cushion (carton) show in the image will not be necessary for propping up the dish.

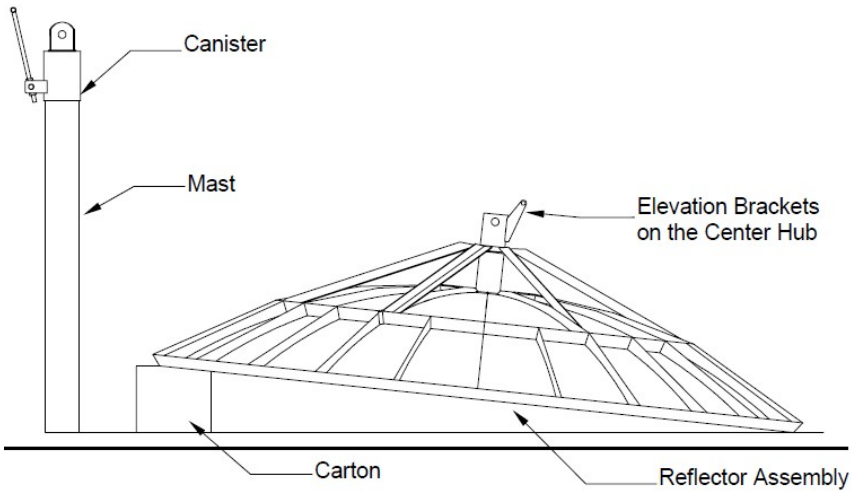


Image taken from General Dynamics Satcom Technologies 2.4 Meter Series 1252 Assembly Manual, 4096-356, July 14, 2009. The graphic shows positioning of the canister assembly and dish before mounting.

The top of the support assembly (the rectangular portion) should point away from the pole. When attached it should be pointing upward. Again view the following image to see how the assembly will look when complete.

Back of the dish showing the support assembly attached to the canister and elevation assembly.

With two people holding the sides of the dish (3 and 9 o'clock positions), and a third holding the bottom (six o'clock position), lift the dish. Position the hub of the support assembly between the brackets of the canister. A fourth person can help guide the hub into the brackets. The four person should then insert the 1" bolt and related hardware (lock washer, washer, nut).

Once fastened, those holding the dish should lift or lower the dish so that the fourth person can attach

the elevation assembly.

If the elevation assembly is secure (ensure bolt below the elevation block is threaded on safely), and the 1" bolt firmed tightened, those holding the dish can slowly let go. Your dish is now secured.

Now is a good time to tighten up anything on the entire dish, as well as to check that you can rotate the dish (loosen bolts on the canister), as well as change elevation. To change elevation someone needs to hold the bottom of the reflector dish to help lower and raise.

5.4.4 Helpful Hints

- The 1" bolt that goes through and attaches the support assembly to the canister can sometime be difficult to push through the pieces. We had to insert the bolt a couple times with lithium grease to ensure that it could easily be attached when the canister and support assembles are joined.
- Get at least three people to hold and position the dish while a four person guides the assembles together and inserts the 1" bolt and other hardware. Have a hammer handy.
- Be careful of pinched fingers!!

5.5 Feed Assembly

5.5.1 Steps

1. Examine feedhorn to determine if there are two or one positions for an LNB. In dual-pole scenarios more than one position may exist. If more than one exists, attach cover plate to side position.
2. Attach LNB to open position on feedhorn. Before attaching, place gasket in groove. Place small amount of silicone grease over and around gasket (using a cloth, finger, or similar). Do not spray lubricant or sealant into hole of feedhorn. Generally be sure to avoid dirt and other particles from getting inside feedhorn.
3. Attach the feed horn assembly, with LNB securely attached, to the three feed support rods. Each feed rod will have one end with an 'L' bend. The other will be straight. Attach the 'L' bent end to the feed horn. Attach these somewhat less than hand tight, as there will need some room for adjustment when attaching to the reflector.

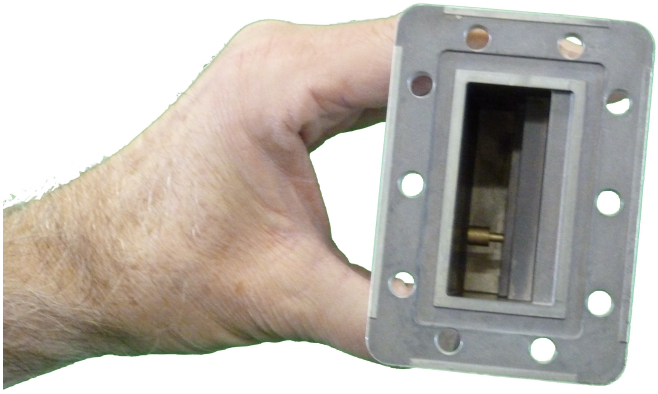
5.5.2 Tool Requirements and Suggestions

- Ratchet
- Pliers
- Locking Pliers
- Light Oil
- Silicon Grease (or equivalent)
- Drill Press with Appropriate Bits for Metal (option / may not be necessary)
- Tape (electrical, duct, or similar)

5.5.3 Installation Instructions

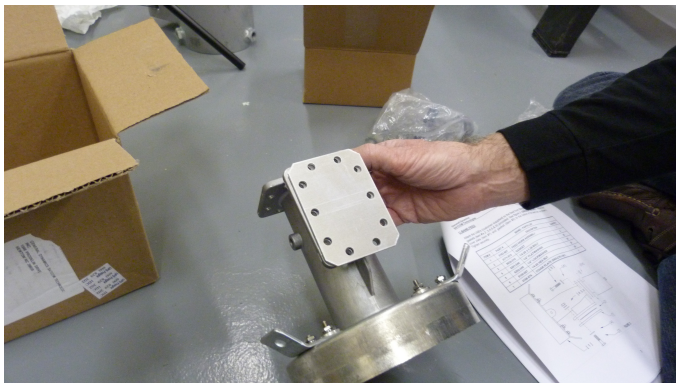
The feed assembly will hold your LNB in the proper position relative to the dish reflector. In short, it's the part that actually captures and converts the broadcast.

While it will matter only later on, take note of the inside of the LNB. You will see a little protruding piece of metal. In our LNB it is a brass color. When it points up, that is a vertical position. This will be important to know and reference when adjusting the tilt of the LNB.



Inside of LNB. The protruding piece of metal (brass color) points to the polarity direction. Currently this is shown pointing horizontal. If the LNB were turned 90 degrees, it would be pointing vertical.

Begin making the assembly by attaching the plate to the side position. The feedhorns we had were designed for dual polarity, which in essence allows two LNBs to be attached at once. In our case we only need one position / LNB. Use the plate to cover the open position. Be sure to use a gasket and silicon grease to ensure the position is properly sealed.



Shown here is a feedhorn with two LNB positions. A plate is place over the side position.

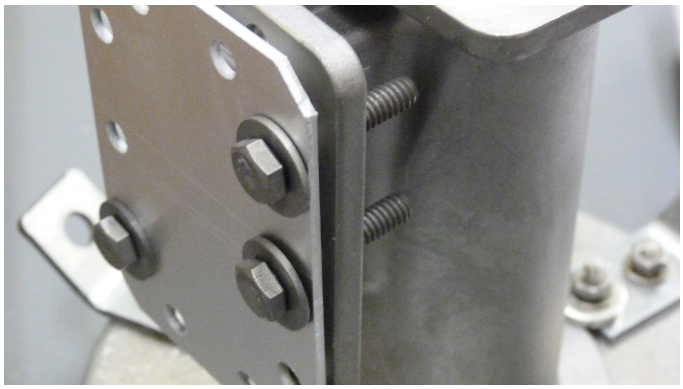


Plate being attached to side position of feedhorn. Note that the instructions show the bolts facing inward. However, we think reversing the bolt direction (different than that shown in the picture) will make it easier to attach the plate.

After the plate is attached, attach the LNB to the top position. See side notes regarding potential problems attaching the LNB.

Once the feedhorn is complete, attach the three feed support rods. Each feed rod will have one end with an 'L' bend. The other will be straight. Attach the 'L' bent end to the feed horn. Attach these somewhat less than hand tight, as there will need some room for adjustment when attaching to the reflector.

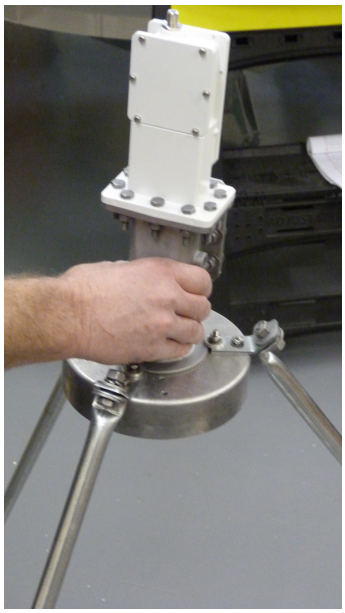


Photo of feed supports attached to feed horn with LNB in place.

5.5.4 Side Notes

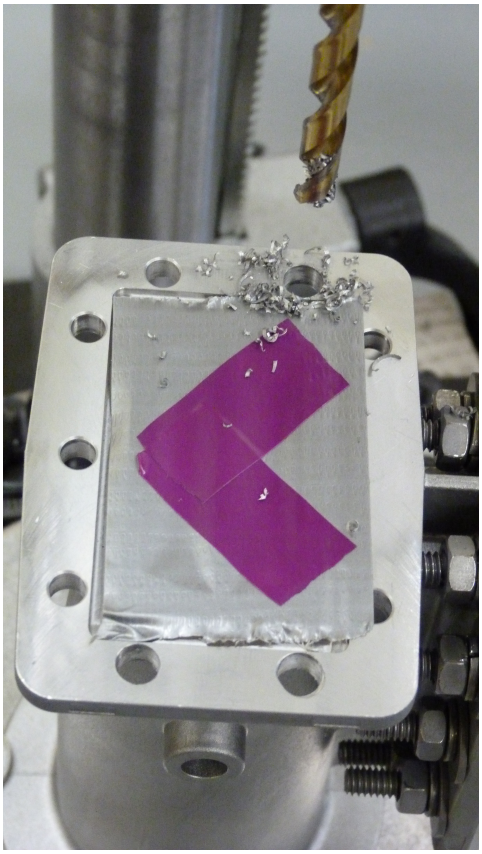
I am not quite sure why, but in our installation we had 3 LNBs of one model, 1 LNB of another make, and then three feedhorns. While supposedly compatible, we could not get any combination of LNB or feedhorn to align correctly, such that all the bolts could be inserted. We could only get 6 of the 8 bolts inserted. While it probably would not matter if the remaining two bolts were not inserted, you do not want any potential for water leaks or other.
To overcome this we had to use a drill press to slightly widen a couple holes. If doing this be sure you

don't make things worse -- with regard to water leaks.

A few helpful hints. Use a drill press if you can, as opposed to a hand held drill. This will help you ensure you are properly aligned.

Do not drill in a way that will cut into the groove that the gasket will sit. Drill opposite of the groove. As you can see when examining the feedhorn, there is little space between the holes and gasket groove.

Before drilling, apply a piece of tape over the hole. This will prevent metal shavings from getting inside the feedhorn. Also be sure to lightly oil the drill bit. Finally ***do not drill into the LNB***, as this is made of harder metal and precision made. Altering it could damage the LNB and its performance.



Here we are widening the bolt holes in the feedhorn. This will allow the bolts to be inserted. Note that we are careful not to cut into the gasket groove. We also used a piece of tape to ensure metal shavings did not get inside the feedhorn.

5.6 Attachment of Feed Assembly to Reflector

5.6.1 Steps

1. Lower dish so reflector is perpendicular to the ground. You will need easy access to the feed support bolts on the reflector. A ladder or other support will likely be necessary.

2. Attach the feed support assembly rods to the reflector via the feed support bolts. Tighten the bolts holding the feed support rods to the feed horn.

3. Adjust the feed support bolts until the feed horn is centered on the reflector and distance from the feedhorn to center plate is 35.8". This distance is the focal length and should be as accurate as possible. **The focal length on other dishes may be different.**

5.6.2 Tool Requirements and Suggestions

- Ratchet
- Pliers
- Light Oil
- Lithium Grease (or equivalent)
- Ladder
- Measuring stick or other measuring device.

5.6.3 Installation Instructions

Begin by lowering the dish. To do so you will need someone to gentle lift from the bottom of the reflector, such that tension and weight on the elevation assembly is released. Unscrew the lower bolt, but do not remove it from the elevation adjust rod. Just move it further down. Gently lower the dish.

With a ladder or other assistant, align the feed support rods of the feed assembly to the feed support bolts, which are in the reflector. Once all rods are attached, tighten the bolts connecting the rods to the feedhorn assembly.

Now comes the tricky part, and frankly there is no good recommendation or easy way to approach it. You will be position the feedhorn on the reflector; hopefully with some accuracy.

First, make sure the feedhorn is perfectly centered on the dish. You may need to loosen connections on the feed support rods, then re-tighten after adjusting the position. Using a measuring tape or marked string to measure the distance of the feedhorn to the edge of the reflector. Do so at multiple positions around the feedhorn so it is centered in all directions. You will likely center it in one direction only to have to recenter it in another. You may also have to adjust the feed support bolts to get the proper height.

Now it is time to adjust the focal length. The focal length is the distance from the center plate of the reflector to the bottom of the feedhorn. On our make and model of dish the focal length is 35.8". On a different sized dish and feed assembly, the focal length will differ. In any case the focal length is sensitive and it is important you get it as accurate as possible. To adjust the focal length, loose and move the feed support bolts that are in the reflector. Adjust the bolt on the face side of the reflector to adjust the height of the bolt. Again, this will take some time, most likely to get it perfect. Be sure to

take multiple measurements from multiple spots on the feedhorn.

6 Dish Pointing

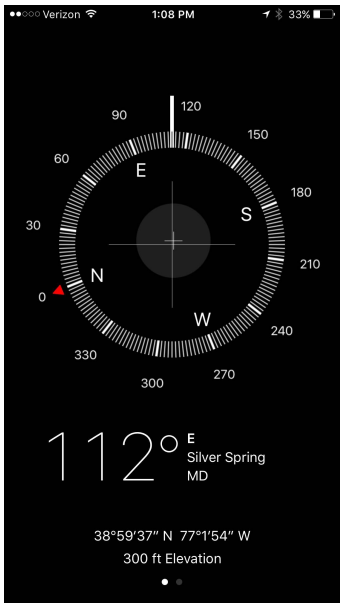
Pointing the dish at the satellite is actually easy to do, however, it does require some patience and attention to detail. Here we assume you have a satellite signal meter or finder, like the Birdog pictured here. If not, this section is still worth reading now, but keep in mind you will not be able to test for signal until you have installed your receiver and receiver software; described in following sections.

Photo of the Birdog, which is a satellite finder and signal meter we used as part of a test installation. While not strictly necessary for deployments, it is certainly a lot handier than attempting to find a signal with the dish attached to your DVB-S receiver using the receiver software on your computer to test for a lock.

6.1 Azimuth, Elevation, and Polarization Angle

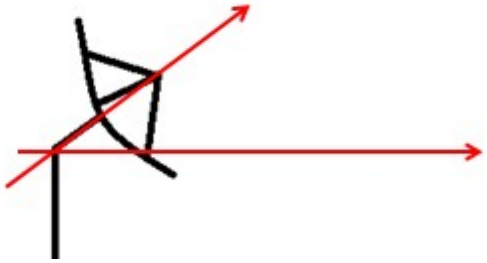
Before you try to adjust the antenna you need to know three separate range of motion the antenna can make. If you did the installation of the dish antenna, you likely already know these and know how to adjust them on the dish. In case you did not do the installation, we will review the angles.

There is azimuth. Azimuth is just a compass direction. It is the dish rotating on the pole. You adjust your azimuth by loosening the six square bolts on the canister. A compass with degree markings is necessary to adjust the azimuth. A phone compass application could be used (see below). After pointing the phone until the desired angle is shown, you then point the dish in towards that direction.



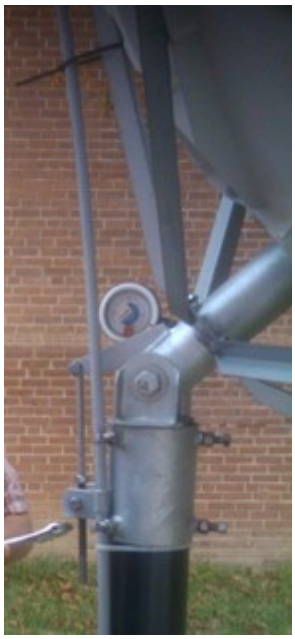
Phone compass application showing by a white bar the azimuth corresponding to 112 degrees.

Elevation is the 'up down' tilt or vertical position of the reflector. If pointed at zero degree elevation, the reflector face is perpendicular to the ground. A 90 degree elevation is pointing straight up with the back of the reflector parallel to the ground. Elevation is adjusted with the elevation rod connected to the support assembly and canister. To adjust elevation you will need two people. One to hold the reflector to remove tension from the rod, and another to adjust the bolts on the rod. Once bolts are moved, the person holding the dish can move it higher or lower until the correct angle is achieved.

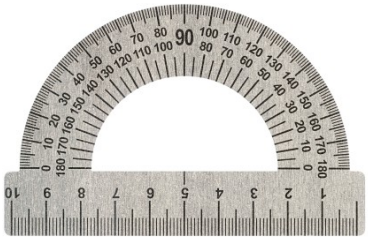


Cartoon showing the concept of dish elevation.

A protractor like that shown is a handy tool in this case. It is likely that when letting go of the dish, even after tightening the elevation assembly, the angle will not be correct any longer. Measure before and after letting go of the dish and then adjust until the angle is correct.



The magnetic protractor here is a handy tool. It attaches to the dish mount and a gauge shows the angle as you move the dish up or down.



While not very accurate and more difficult to use than a digital or magnetic reader, a standard protractor can be utilized to adjust your antenna elevation.

Finally there is the polarization angle. Sometimes this is referred to as tilt. It is the angle of the LNB. In the image below, when our LNB is flat side towards the ground, it has a vertical polarization angle of 0 degrees. Of course your LNB will be attached to the feedhorn, in which case you simple offset it a certain number of degrees for your installation.

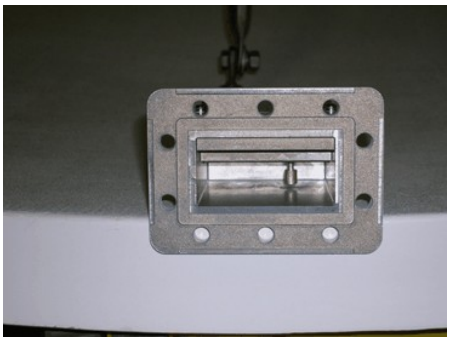
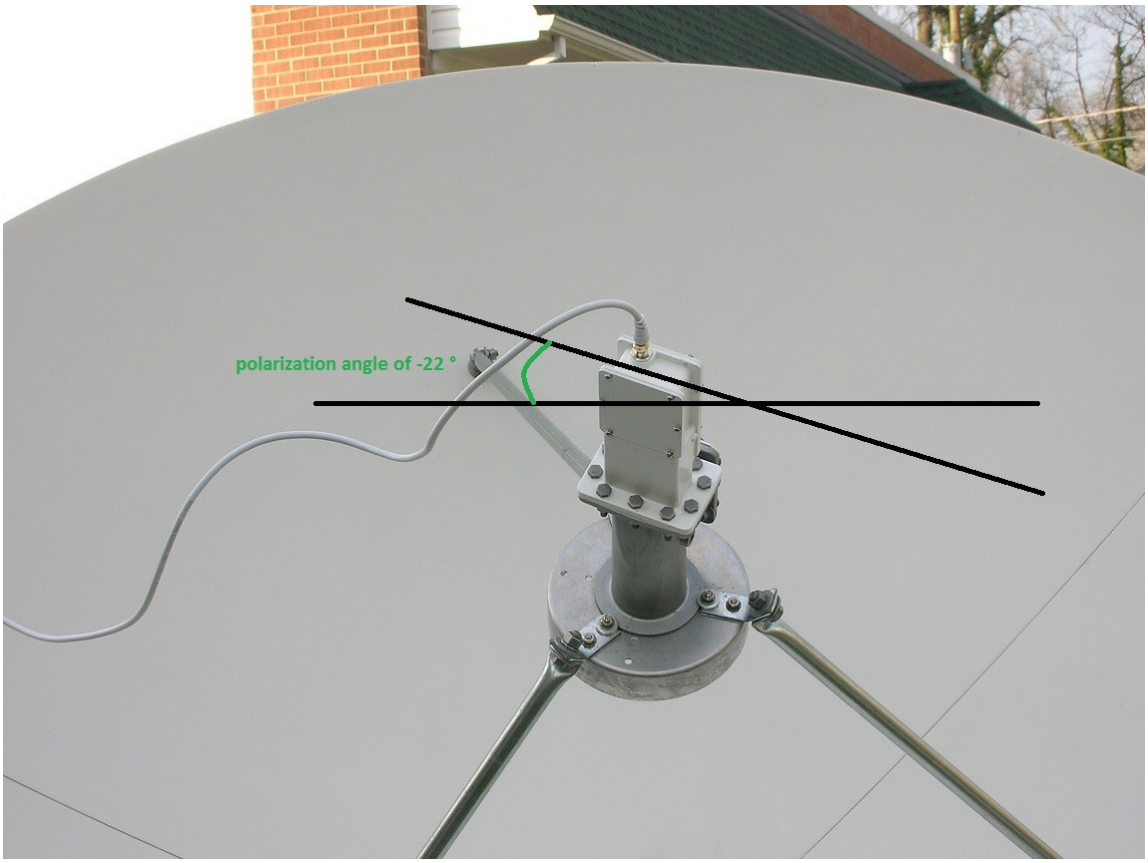


Image of LNB showing it positioned at a vertical polarization of zero degrees.

You can see below the setting of a polarization angle of -22 degrees



While facing towards the satellite, negative polarization requires a counterclockwise turn

To adjust the polarization angle of your LNB, simply loosen the screws feedhorn. Do not remove these altogether. Just loosen the screws enough to allow the horn and LNB to rotate. Using a protractor as shown helps with accuracy.

Martin Steinson adjusts the polarization angle of the LNB using a protractor.

The use of the wrong polarization can cause the reception of the wrong signal or no signal at all. The horizontal polarization of the 7C transponder of the IS-21 satellite (3840 MHz) corresponds to "INTELSAT ATLANTA" instead of "INTELSAT ELLENWOOD" which corresponds to the vertical polarization of the GNC-A broadcast. Additional information about the polarization angle can be found in Appendix II.

6.2 Finding the Angles

To find the pointing angles you can use websites like:

- http://www.dishpointer.com
- http://www.satsig.net/ssazelm.htm

Satsig.com will provide more complete information, but dishpointer.com is a little easier to use and provides some nice map integration. To use these sites, however, you will need the latitude and longitude of your dish, as well as the name / location of the broadcast satellite. GEONETCast Americas currently broadcasts over Intelsat 21, which is located at 58 degrees west. To get the latitude and longitude, you will need to use a GPS. You might be able to get this off of Google Maps or a similar service via a website like http://itouchmap.com/latlong.html, if you can zoom in close enough to the planned location. This isn't a very accurate way of doing it, but it will probably be close enough to allow you to point the dish and then optimize later.

6.3 Locking the Signal

Once you have your pointing angles, you should adjust the azimuth, elevation, and polarization as best possible. In our experience it is easier to adjust the azimuth, therefore spend a little more time getting the elevation and polarization as correct as possible.

After your angles are set, and the parts locked back down, attach a standard coaxial cable with F-type male connectors to the LNB and signal finder. You will need to read the instructions for your particular signal finder / meter, but for the Birdog we used, it was simply a matter of selecting the satellite (IS-21) from list and then turning on the meter. When the meter gets a good signal and lock it will chirp or beep. The better the signal, the more chirping or other cue. Our meter also provided little signal graphs of signal strength and noise.

Do not be discouraged if upon hooking up your meter / finder you do not lock into a signal immediately. You likely need to adjust the pointing angles of the dish. The bigger the dish, the more precisely you have to point it. In our case the antenna is a 2.4 meter dish. I am not sure of the precise measurement, but from experience a very small movement of a centimeter or more can greatly affect your received

signal or altogether lose it.

Because it is easier to adjust, start with the azimuth if you do not have a signal or you want to strengthen it. Move the dish very slowly and very slightly. Once you have a signal, you can begin to find the edges and the best / strongest spot.

How strong a signal do you need? Honestly, I am not sure. Two GNC-A stations at the U.S. NOAA National Satellite Operations Facility (NSOF) typically receive a signal of 50-65 dB and operate just fine. The test and temporary installation we performed didn't reach above 75 dB.

If you get a good signal, monitor it for a number of days. If your antenna is not firmly bolted and tightened, wind might move it out of place. You can then try adjusting elevation and polarization to get it better placed.

Once you are reasonable sure you have your dish optimally pointed, with a permanent marker or paint, draw a line over the canister down a few inches to the pole. Similarly, mark the mount assembly and canister to show where the elevation is pointed. Next mark one of the feed support bolts and feed support rods, and make a small mark on the LNB and feed horn.

These various lines will help you readjust your dish, should wind take it out of alignment. If you need to move it around on the premises or dissemble for repair, that will also help you reassemble it more quickly. You can simply align the marks you made previously.

7 Final Installation Items of the Dish Antenna

Once your dish is installed and correctly pointed, you will need to run cable from the LNB to the location of your receiver. I will not say much about how to do this, as it is really dependent upon your installation location and building. Your cable should be shielded, and if a run of over 100 feet will be needed, then you should consult a supplier about thicker, higher grade cabling. Based on expert technical advice, it is advisable to install the receiver as close as possible to the antenna. If the receiver is less than 60 feet from the antenna, a RGB#6 coax cable seems to be enough. However, to avoid losses, it is better to use an RGB#11 if the cable from the antenna to the receiver is more than 60 feet. Another important detail is that it is better to put the receiver as close as possible to the antenna and buy a longer Ethernet cable to connect the receiver to the computer instead of using a long coax cable from the antenna to the receiver and use the short Ethernet cable that comes with the receiver.

When attaching your cable, use heat shrinks over connectors located in conduit and outside.. This should include the connections to the LNB as well as any connectors used to link small pieces of cable. Secure the cable with cable ties to various parts of the antenna, and if possible use conduit to further protect the cable as it runs from the dish to your building. Drip loops at multiple points and before the cable enters conduit or the building is also useful.

Securing you cable is not an aesthetic issue, but rather ensures that the dish, LNB and cable itself is not damaged.

Depending upon your installation location, your dish may point up nearly vertically so that the dish can collect water. In this situation drill a few, small drain holes. Simply use a small diameter bit and power drill to make a few holes where you imagine water pooling. Do so a few inches from the spines, so you do not affect the integrity of the dish. Do not worry. This won't affect your reception.

8 Antenna Care and Maintenance

All too often dish antenna are installed with great effort, only to fail at some later date because minimal maintenance was not performed. Maintenance and inspection is easy and should be performed every two to four weeks. More inspections are certainly not harmful.

Use a log book and create a regular schedule and inspect your dish installation along the following:

- Look at the received signal strength on the receiver software installed on the station computer. If you notice significant drops or improvements, look at the antenna (and particularly your positioning marks) to see if the azimuth, elevation, or polarization angle is changing over time. This might happen due to wind or perhaps bolts were not fully tightened. Temperature fluctuations may also affect your signal, as might other RF interference and a whole host of other factors. Keep a record of the fluctuations so that over time you understand what factors and conditions, such as temperature, might affect station performance. You can then adjust the dish as necessary if it affects or threatens operations.

- Remove debris (dirt, leaves, etc.) from the reflector dish. If you made drainage holes in the dish, ensure these are not plugged. If algae or other plant growth begins to grow on the dish, with a solution of water and dish soap, scrub the dish with a soft plastic brush. Then rinse well with water. Now with a solution of water and bleach (10:1), wipe the dish again. Do not mix the bleach and dish soap.

- Check cables and cable ties for signs of cracking, animal chewing, and other damage due to exposure outside. Where there are deep cracks or cuts in the insulation of the cable, paint these with liquid electrical tape. After the liquid tape has dried, cover with electric tape rated for outdoor (UV and water) use. If metal on the cable is damaged or partially cut, consider replacing the entire cable length. Patches with connectors will likely reduce your signal strength more than desired.

- Examine conduit and other entry points into and out of the building (for the cable) for signs of insect entry or water leaks. Seal as appropriate.

- Regularly grease (monthly) the movement mechanisms for the elevation and azimuth of the dish. This will help prevent rust / corrosion, and it will allow you to make adjustments easily in the future.

- Check the feed support rods, feed support bolts, and feedhorn for excessive corrosion. Use oil on the bolt connections as needed.

- Use penetrating oil or grease on all bolts connecting the reflector petals together, as well as around the center plate. This simply gives you the opportunity to take the dish apart in the future without damaging it.

9 Installing the Kencast Fazzt Professional Client

The Kencast Fazzt Professional Client is used to un-encapsulate the GEONETCast Americas broadcast. The client also serves to manage incoming data files. There is a lot of functionally contained within Fazzt. In this manual, however, we only provide the basics overview necessary for installation and to have it interface with your receiver card. It is important to note that unlike other software package you may use within the hydro-meteorological community to manage a communications link, Fazzt is a data management and communications client only. It does not provide any capability to visualize or manipulate data. You will need to have an appropriate graphic user interface (GUI) program for that aspect.

9.1 Preparing the Installation

First ensure that the computer or server you will use has enough capacity. The requirements for a GEONETCast station are:

- 2.0 GHz Pentium IV;
- 1Gb RAM
- 36Gb internal disk;
- USB port;
- MS Internet Explorer 5.5+

Any new computer is likely to exceed these requirements. Frankly, however, if you plan to download the entire broadcast and will store most of the data files for a period of time, a hard disk of 500GB or greater (which is mostly free space) is desired. A disk of 1 terabyte or greater would not be excessive.

You might also want to consider networking options. In all likelihood you will not want to view the data downloaded from GEONETCast on the same computer. You will want to view the data over a network on a variety of stations. It is beyond this manual, but the Fazzt Professional Client can be used to forward data over a local network or copy data to a shared drive.

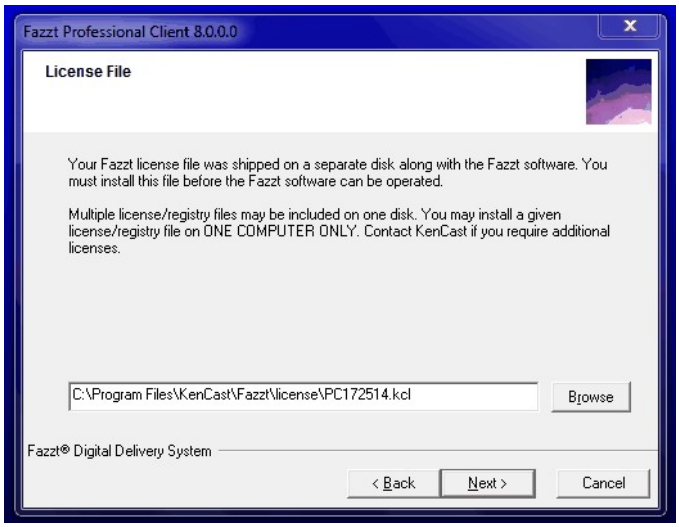
In any case, once you have your network and computer selected and setup, begin by installing the Fazzt Professional Client from the DVD provided. You will also be provided with Kencast Fazzt license file (.kcl). This is a key to unlock the software. It should only be used on one machine. Start the installation by ensuring you have Microsoft SQL Server 2000 or later installed. The easiest way to do this is to try to install the Fazzt Professional Client executable (FazztProfessionalClient.exe) located in 'Fazzt -> Windows'. If you are missing SQL Server, a warning notice will appear and the installation will terminate. If you have SQL server installed, the installation will continue by asking you for the license file. See the next section for how to proceed.

If you are missing SQL Server, navigate to the '3rdParty -> SQLExpress' folder in the DVD provided. Run the SQLEXPR.EXE file, and follow the installation instructions.

Note: As of the date of this publication you MUST USE the SQLEXPR.EXE version of SQL or Kencast FAZZT will not function correctly.

9.2 Installation of Fazzt Professional Client

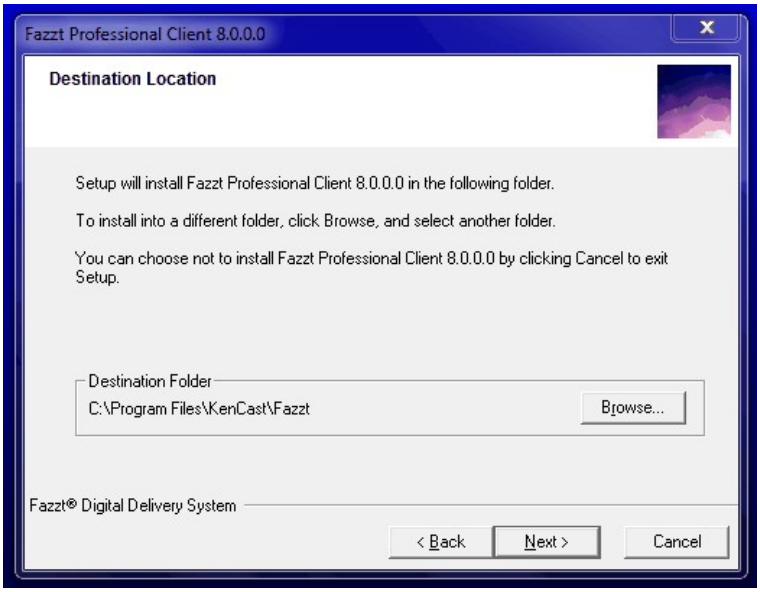
The installation executable (FazztProfessionalClient.exe) for the Fazzt Professional Client is located on the DVD in Fazzt -> Windows. Double click it and you will be prompted with a standard installation dialog. After reading and accepting the terms of service, the installation will ask for the license file mentioned earlier.



Before you can proceed with installation of the Fazzt Professional Client, you will be asked to provide the location of the Fazzt license file.

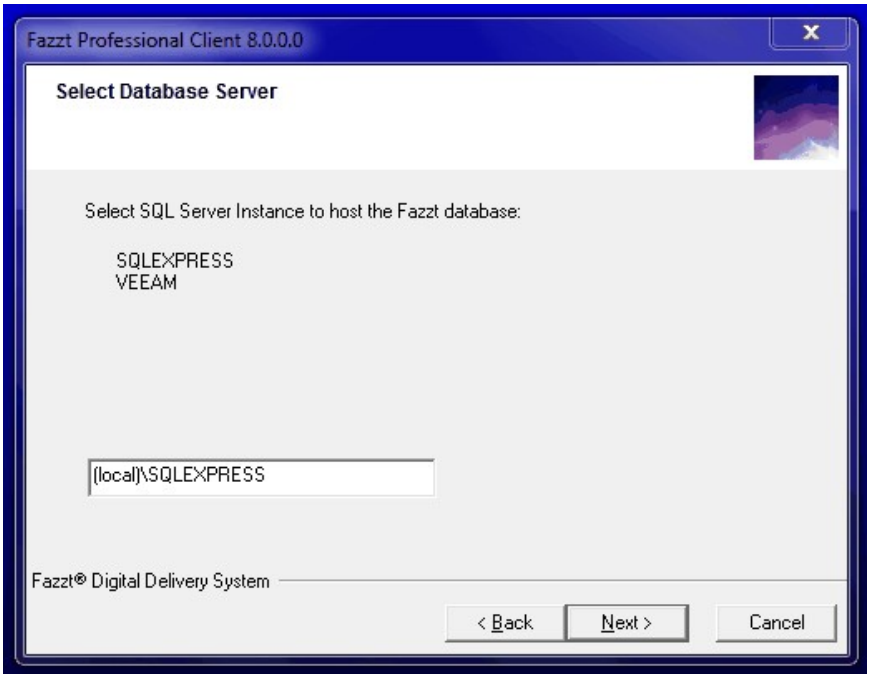
Browse to the file and click next. Now, simply accept the default installation. If you did not already, it's a good idea to put the license file on somewhere 'safe' on your drive. Don't store it in a temporary or download directory, or mix it with a lot of document files.

The next screen will provide you with an opportunity to customize the installation directory. Generally you will want to select the default location on the c:/ drive. You can, however, change this. Note that within Fazzt you can change the drive where content is downloaded and saved, so it is possible to have the installation of the program / client on the c:/ drive while the data is downloaded to a different local or even network drive.



The Kencast Fazzt Professional Client installation can be changed from the default location. Note that this directory is the program installation directory. The data download directory can be changed within Fazzt.

Next it will ask you for the SQL instance to utilize. It is best to leave the default selection unless you have multiple SQL databases / instances running on the same machine and know how to manage SQL Server.



The installation will ask for the SQL instance. It is best to use the default selection unless you are familar with and actively managing SQL Server.

By pressing next again you will be given a warning that Fazzt will be installed. Press next again if you are ready and complete the installation as you would normally for any program.

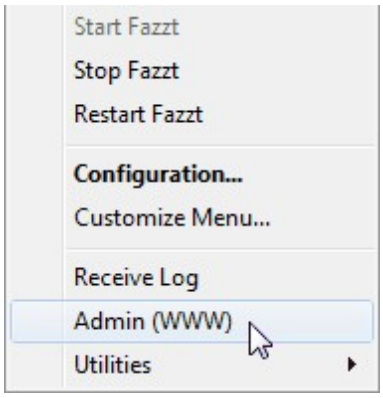
9.3 Configuration of Fazzt

To operate and configure Fazzt you will need to open the web browser administration interface. This is basically a local (to your computer) web page you use to control Fazzt on your computer.

You can access this interface by right clicking the Fazzt icon on your system tray.

Fazzt Professional Client system tray icon.

After right clicking a menu will appear. Select and click the 'Admin (WWW)' option. This will open up the administration interface in your default web browser.



Select the 'Admin (WWW)' menu option after right clicking the Fazzt system tray icon to open the administration interface.

To access the interface, assuming Fazzt is running, simply open your browser and navigate to the following URL: http://127.0.0.1:4039/admin/index.fsp

We will not go over all configuration options here, however, most of the setup, as you might guess can be done from the 'Configuration' menu item and sub-items. Click on 'Configuration' and then 'Storage Settings'. Here you can change where files are temporarily and permanently stored. Similarly you can change the log directory. Changing the data storage directories may be necessary for networked applications.

10 Installing the DVB-S Receiver

10.1 Technisat DVB-S USB Receiver

We initially used the TechniSat Skystar 2 USB box receiver. This is an external receiver (not installed inside a computer), which makes installation and transfer to other machines easier.

*Note- For later installations we used the Novra S75+, which have instructions here in this revision of the manual. The Technisat DVB-S USB receiver, relying on a USB connection, experienced driver issues with Windows 7 systems.

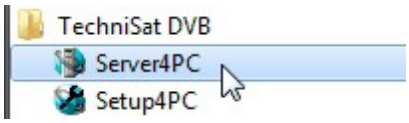
10.1.1 Installation

Begin installation by plugging in the power cord to the USB box and then connecting the box to the computer via a USB cable. The computer will ask to find the driver, which can be found on the CD that came with the receiver. Allow Windows to find the driver automatically, with the CD inserted into your computer. Following the basic installation; dismiss security or other warning dialogs. Now **restart** your computer, leaving the receiver plugged in and attached to the computer.

The card is now installed. Configuration is a bit more involved.

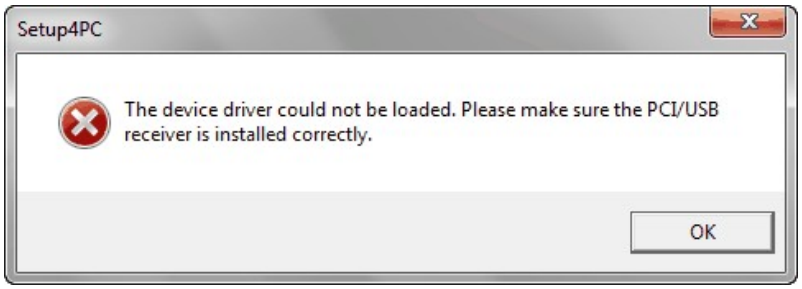
10.1.2 Configuration

To begin configuration of the receiver you will need to start the Technisat software. From the start menu, navigate to the Technisat program folder and click the 'Server4PC' option.



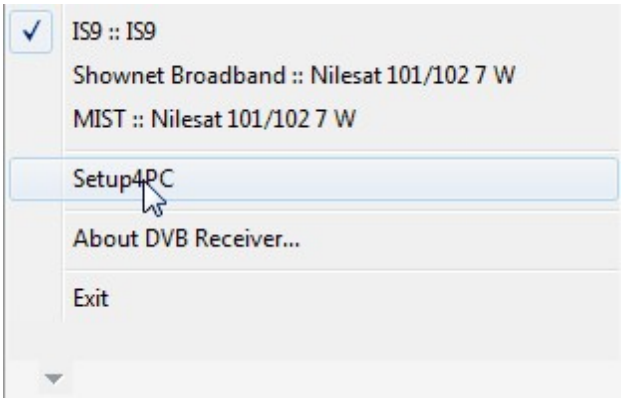
Nothing will happen or you may see a window flash. This is okay. You are just ensuring the server (network), which Fazzt will connect to, is running.

Now go back to the same menu select the 'Setup4PC' option. If your receiver is not attached, recognized, or powered the software will not start.

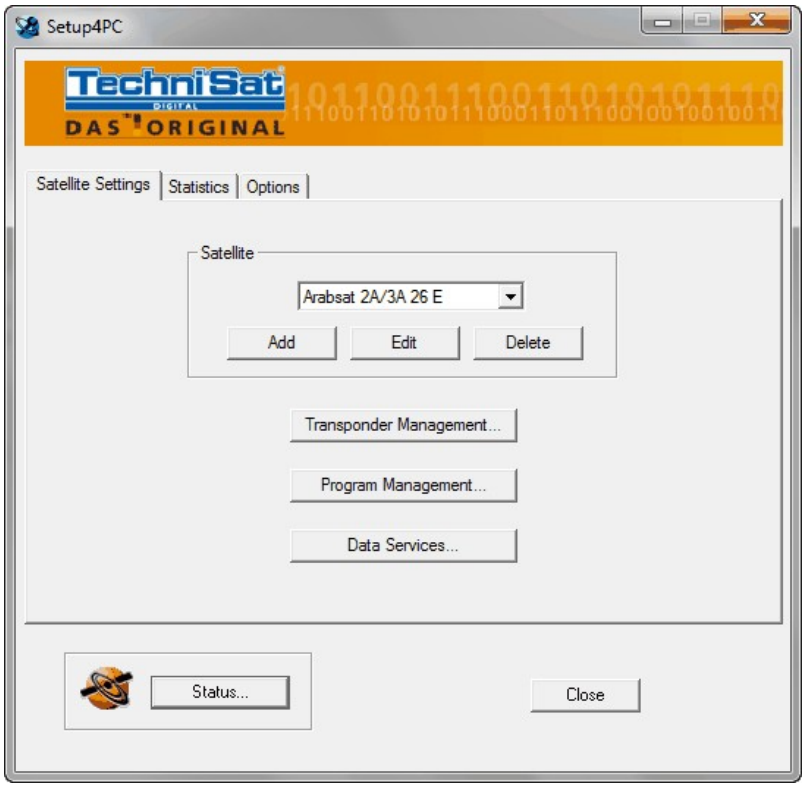


With your USB box receiver attached and recognized by your computer, when you start 'Setup4PC' you should see the following icon appear in your system tray.

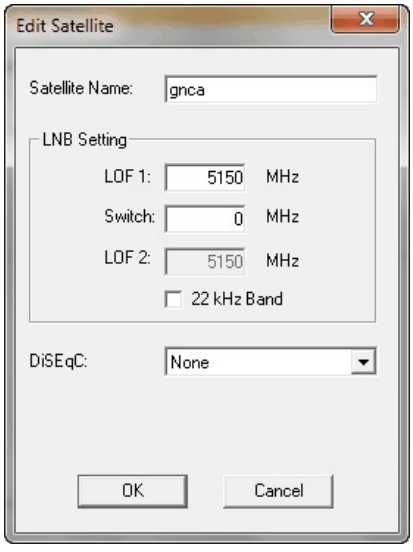
Now right click the icon, scroll down to 'Setup4PC' and click this menu option.



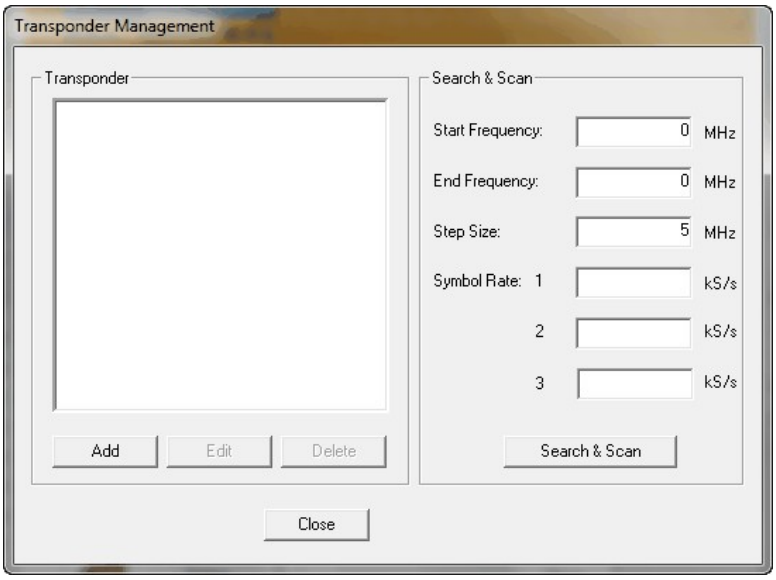
The following window should now pop up.



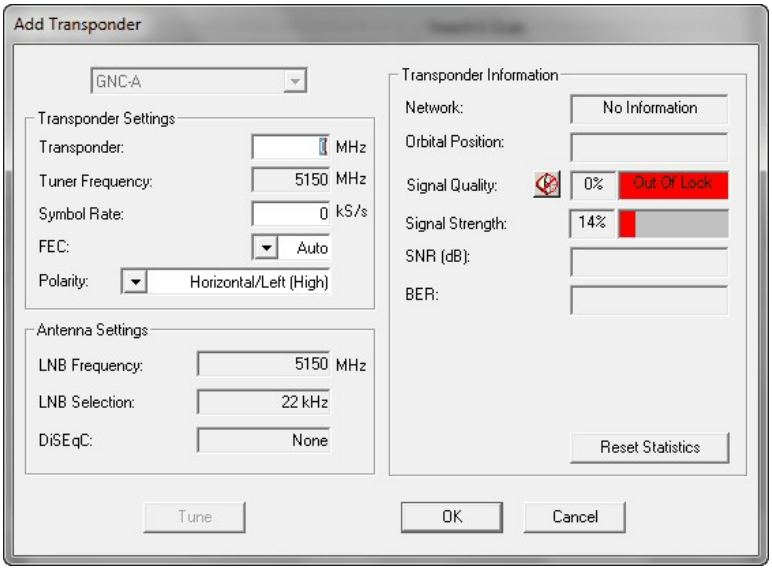
This window allows you to create different satellite profiles. You will want to create a new profile for GEONETCast. Begin by selecting the Add button, which will pop up a new smaller window. Name your profile something recognizable and descriptive like GNC-A, IS21, etc. You will also need to enter values for the other fields in this window. Set LOF1 to 5150. Make Switch blank, and by doing so LOF 2 will grey out and automatically set to 5150. Leave the 22 kHz Band selection unchecked. Leave DiSEqC set to none. Now select OK.



Now select the Transponder Management button. In the window that opens we will need to identify the transponder that we will be using / receiving from on the satellite. Click the Add button.

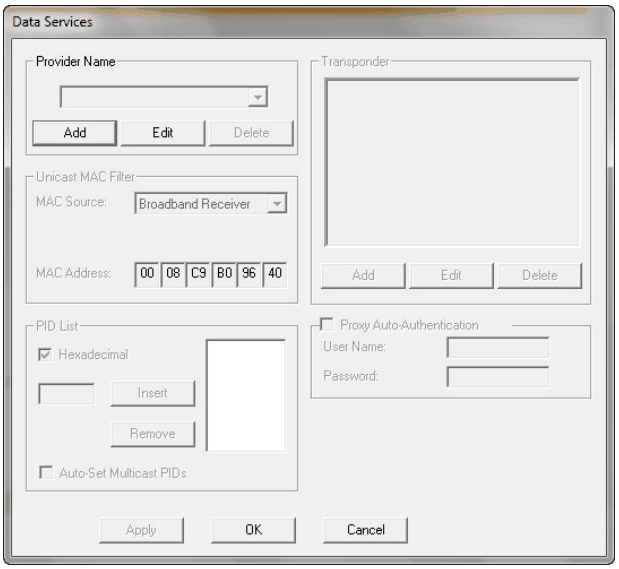


The following will now appear.



Set the transponder to 3840. Set the Symbol Rate to 27690, and select 7/8 for the FEC (forward error correction). Polarity should also be set to Vertical / Right. Now click OK. Do not try to Tune just yet.

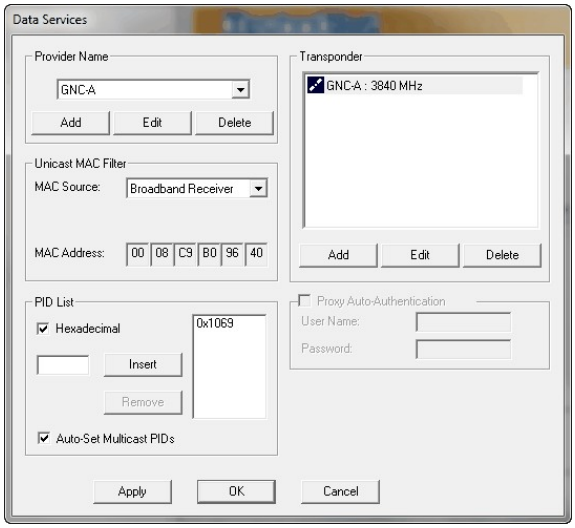
From the main window, click Data Services. The following window will appear.



The data services button helps us select the GNC-A broadcast from the satellite. The transponder information we provided earlier helped us lock on to the satellite. In essence we point the dish at the satellite and listen for it on a specific transponder. On that transponder we further listen for our data service (GEONETCast Americas). But we can't simply provide the GEONETCast name. We have to provide a special ID, called the PID (Parameter Identification).

Click the Add button in the upper left under Provider Name. This is any name you like. I tend to use the same name that I entered in the profile. So if my profile was 'GNC-A', then I also make the provider 'GNC-A'. Now add a transponder by pressing the Add button from the Transponder section of the window. It should only provide you with one option that has a frequency of 3840. Make sure it is selected and provide a name. Again the name is arbitrary. I, however, also like to use the same name I used in the profile. Select this as the Initial Locking Transponder. Press okay.

Now we need to provide the PID. With the Hexadecimal option in the PID section of the window checked (selected) enter 4201 in the box to the left of the Insert button. Now click the Insert button and check the Auto-Set Multicast PIDs option. Then press Apply and click OK.



You will likely receive a notification or alert. Simply read and dismiss this. Also click close on the main window.

Now we need to select our profile, as the alert, if you received it, instructed. From the software icon in the system tray, right click to pull up the list of profiles and select the name of the profile made earlier. Note that the menu is not always in alphabetical order. Sometimes, too, new profiles are not in the menu list. If this is the case, exit / close the Setup4PC software. Then restart it.

With your newly created profile, we are ready to lock to the satellite.

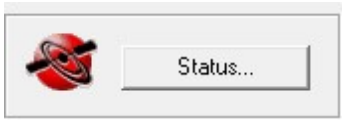
10.1.3 Locking the Broadcast Signal

Before we can lock the signal from the satellite and GNC-A broadcast, we need to have things setup correctly and ready. I assume at this point the dish is correct setup and operating. I assume too that the DVB-S receiver (in case of the instruction in this book the Technisat Skystar USB) is attached to the computer, as well as the cable from the LNB on the satellite dish. I also assume you have pointed your dish correctly. If you have not been able to do this for lack of a satellite finder or meter, you can use this process to help. It will take some time, and you'll need a friend or two to point the dish while you look at the signal indicators on your computer.

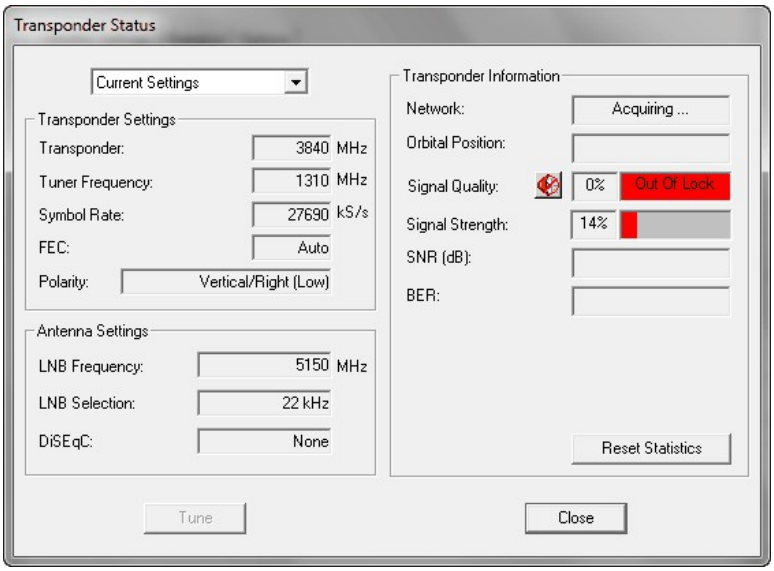
Begin by making sure Server4PC is running, and then start the Technisat Setup4PC. This will bring up an icon in your system tray that looks like this.

Right click the icon and select the profile you made earlier. If a window does not pop up, double click the same tray icon.

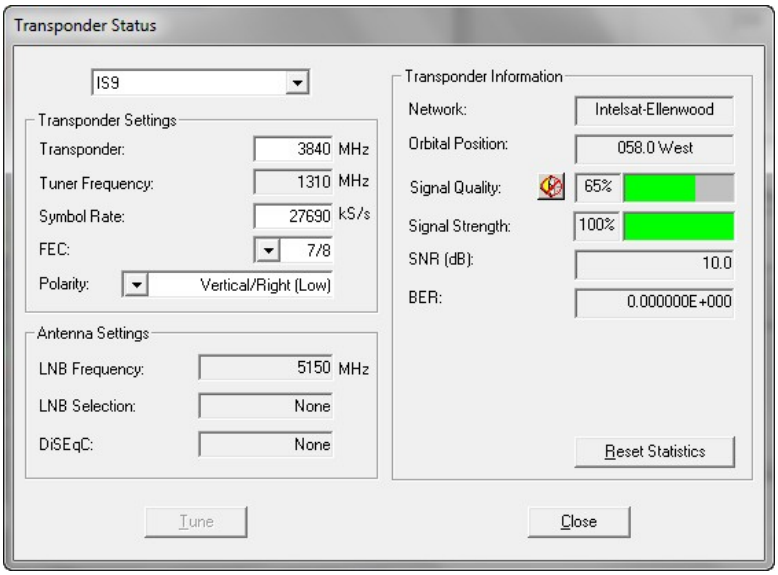
Make sure the menu selection in the Satellite pull down menu on the Satellite Settings tab has your profile name. If not, select your profile. If so, or once selected, click the status button in the lower left.



The following window will pop up. If you are trying to use this to point to the satellite, let it attempt to 'Acquire' the signal. Give it time. If it times out, continue to adjust the dish position while looking at Signal Strength and Signal Quality. Continue to press the 'Tune' button in the lower left as you try to move the dish. Remember, very minor adjustments matter. Therefore, move your dish only a tiny amount and slowly as you attempt to lock a signal.



If you do have a locked signal, the window will display something like the figure below. Note how the Network and Orbital Position and SNR automatically fill in, and the meters turn green and update. How good a signal should you have? Most installations do not appear to have much higher Signal Quality that 70-75%, and many appear in the 40-50s with the bar turning yellow. That is okay. As long as the signal remains locked, the service will be workable. You should monitor your signal levels over a number of days and attempt to slightly re-point your dish to achieve a better signal.



10.2 Novra S75+ Receiver

The Novra S75+ is now the standard receiver used in our station ground deployments for GEONETCast. We chose the receiver due to its use of Ethernet to connect to a client computer. The software and construction are also solid, however, use of Ethernet allows us to avoid many of the driver issues surrounding receivers that utilize a USB connection.

10.2.1 Installation

Installation is extremely straightforward, although configuration, while not complicated, is a bit more involved. Begin by installing the GUI (graphical user interface). If a CD or other media did not come with your receiver, the GUI and manual can be downloaded from the Novra website. At the time this manual was updated, the website to download the S75+ GUI was at: http://www.novra.com/Website/Novra_Support.html. Go to "Configuration GUIs & Manuals". Under GUI, download the receiver for the product S75+..

Once the software is downloaded, or you find it on your CD, simply copy the executable to some location on your computer. This might be the desktop, a documents folder, or similar. The executable runs independently and does not require installation.

Before running the executable, power on the S75+ receiver and connect it to your computer with an Ethernet cable.

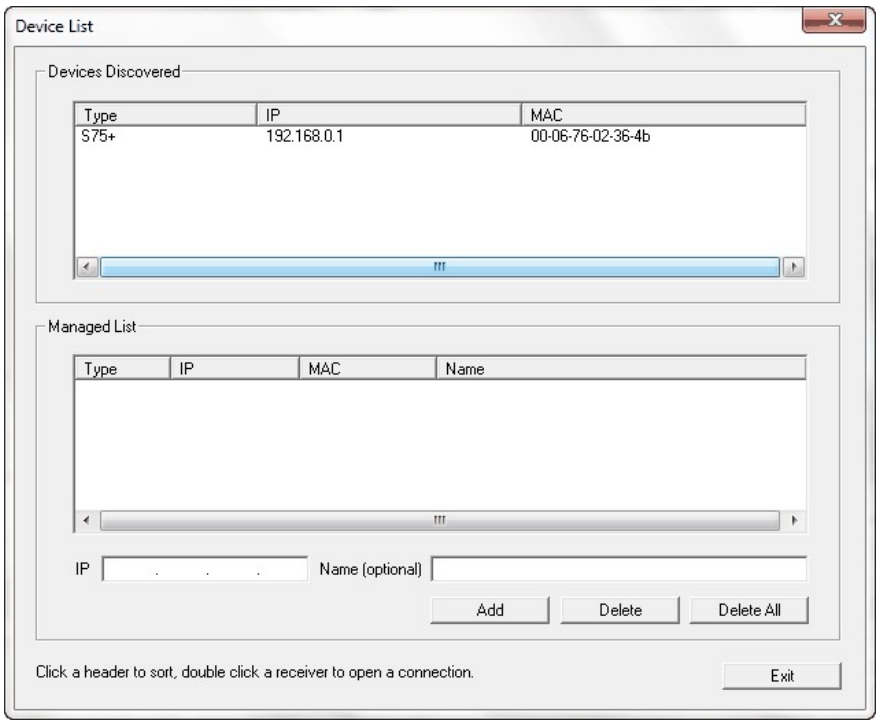
Believe it or not, but you have installed the receiver. Time to configure it.

10.2.2 Configuration

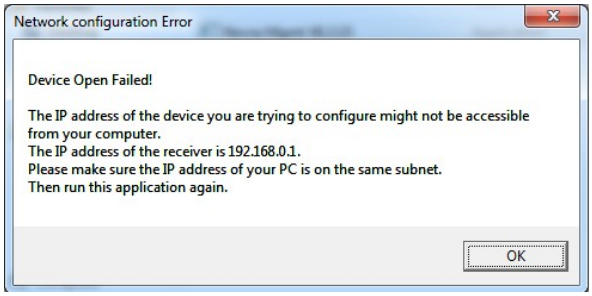
With the receiver powered on and connected to your computer via an Ethernet cable, now run the GUI executable you located during the installation.

When the software starts, it may minimize to a small icon in the system tray of your Windows OS; the lower right bar typically. You should see this icon in the system tray.

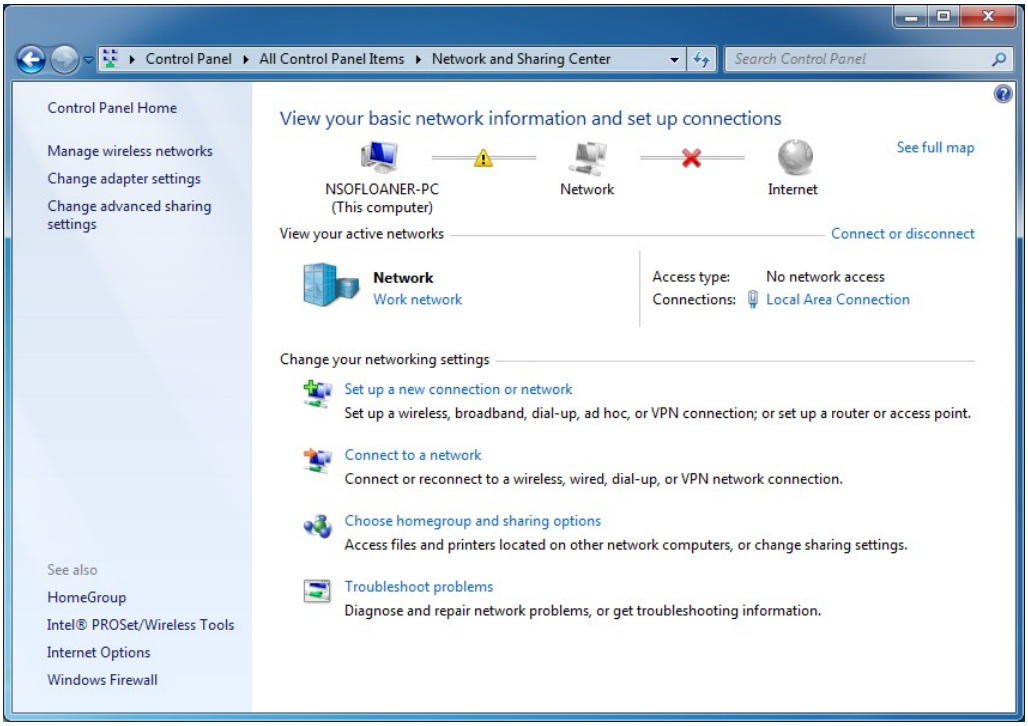
If there are not any other windows present, double click this icon. You should see the following window -- although your device list might be different.



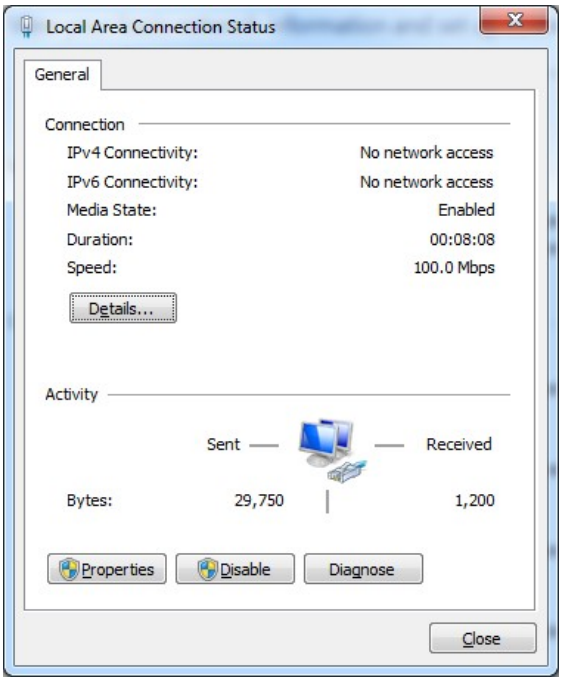
Unless you have attached a gaggle of Ethernet based receivers to one computer, you should only see the one device listed. Double click it. If you get the following error (see below), do as shown next. If not, skip steps until you find the window to enter the password for the device.



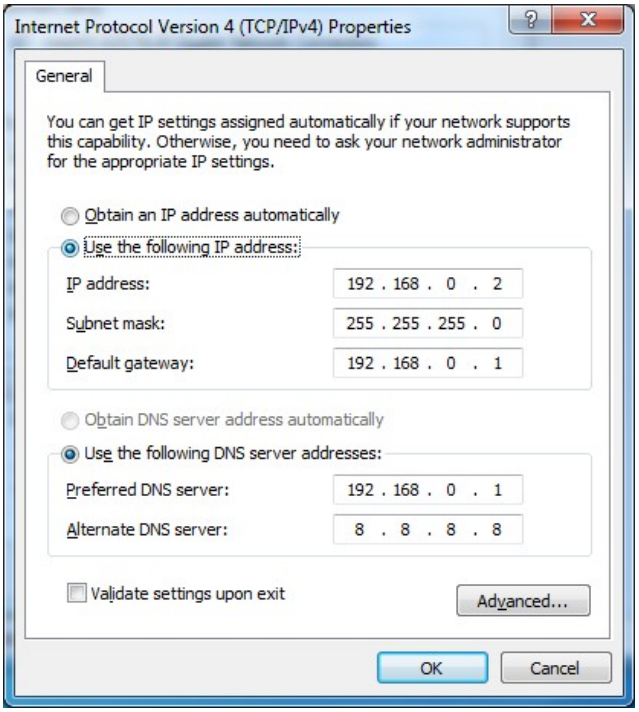
Go to Control Panel -> Network and Sharing Center



Then click on Local Area Connection or the network connection you have. This can vary for each computer. This is an example with what we had.



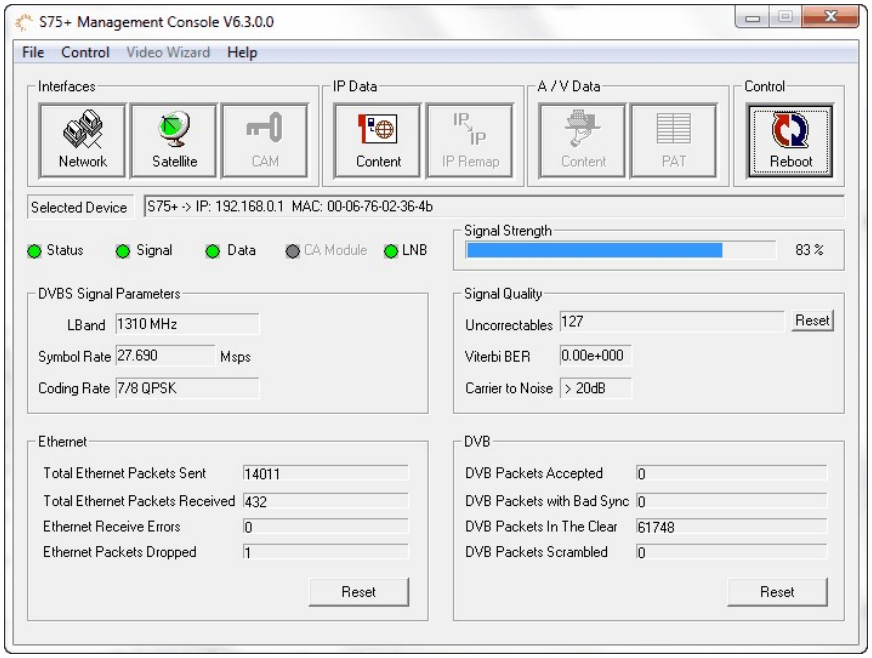
Go to Details to get the information of the IPv4 Subnet Mask. In this case it was 255.255.255.0. Then close the window and go to Properties. Double click on Internet Protocol Version 4 (TCP/IPv4) and fill the information as shown below.



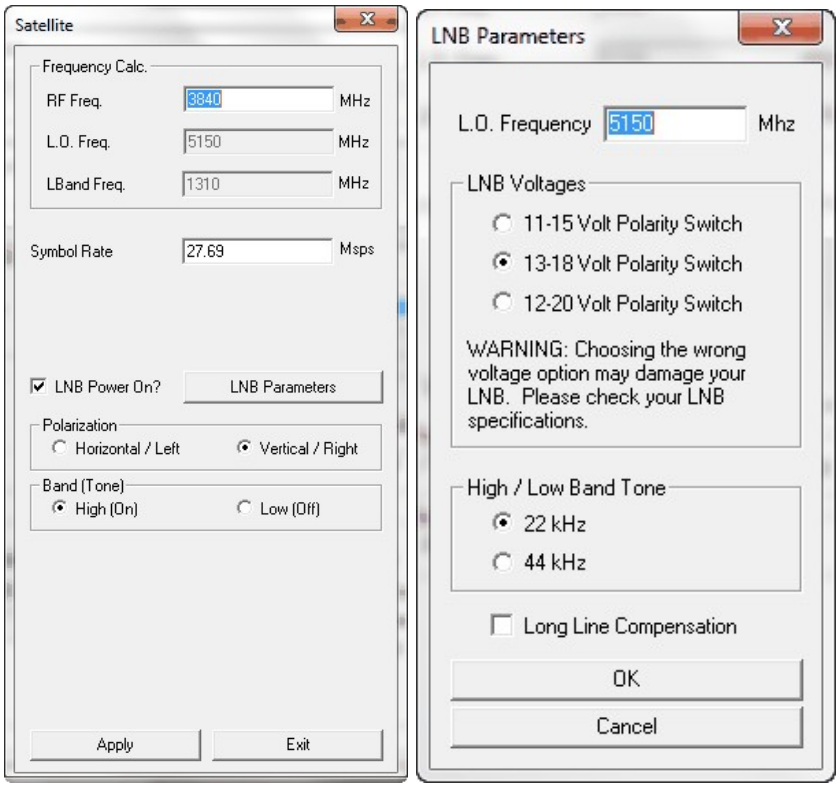
Then click OK, OK and close. Close the Network and Sharing Center too. Open the Novra software again and double click on S75+ in the Device List window. If everything is OK, you will not have the error message you had before. Instead you will now be asked to enter a password (next figure).

If your receiver is connected to a router, you can find an example of the appropriate configuration for this case in Appendix III.

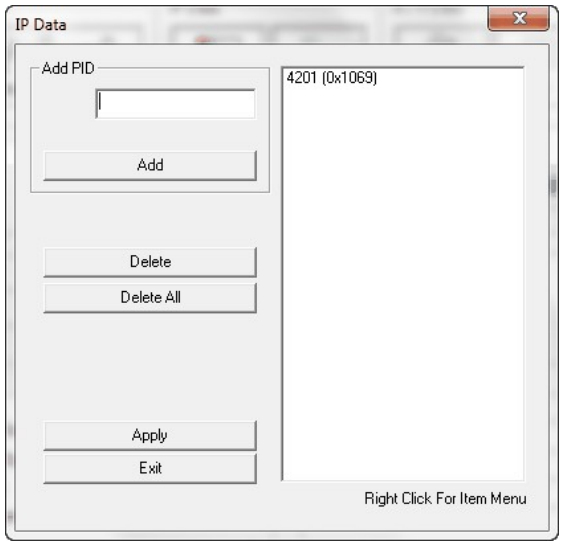
The default password for devices is 'Novra'. You can change this in the future. Follow the Novra S75+ manual for details on how to change the password if you want to do so. After you ckick OK, you should have a basic status screen / window. The image here is a little misleading, in that it reflects a fully configured receiver, which is downloading.



Begin configuration by clicking on the satellite button under 'interfaces'. You should see a similar window pop up (down left). We are going to tell the receiver what frequency to listen to and the parameters of our LNB. To do so, fill in the values displayed in that window. Put RF Frq as 3840. The Symbol Rate for Intelsat-21 is 27.69. Check the other fields and then press the "LNB Parameters" button. Doing so will open another window (down right). Again, fill in the values as shown there.



Press OK, then apply. You should have a window with the following message: "New configuration successfuly applied". Click OK. Then from the main status window, select the content button under the IP data. Each transponder on a satellite may carry multiple channels. We're telling the receiver to listen to the GEONETCast Americas channel. When the window opens, use 4201 for the "Add PID" field and click Add. The hexadecimal 4201 (0x1069) will be automatically shown. The window looks like this.



Apply. You will get again a success window letting you know that the new configuration was successfully applied. Now let's configure the network. The button is located in the interfaces section. You may not need to make changes at all, particularly if the computer you are on is not connected to any other network. Then click Apply. You should get a window that says "Network Configuration

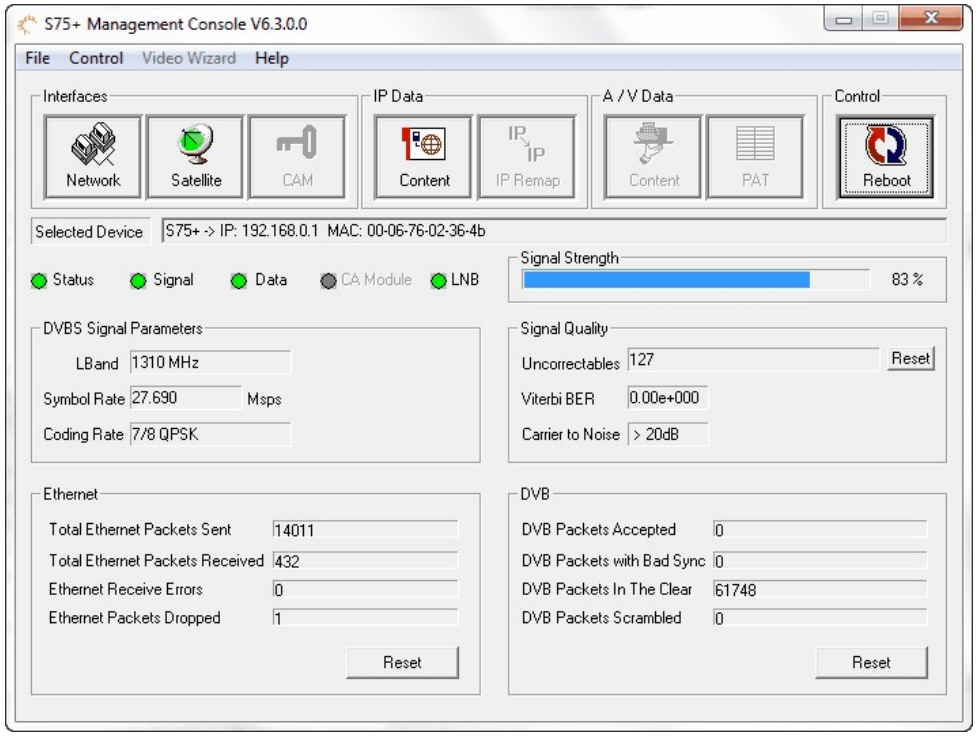
Applied".

Some possible values obtained from one of the first configurations accomplished are shown below. Your IP address could be different.

That's it. All configured.

10.2.3 Locking the Broadcast Signal

Unlike the Technisat receiver, you really don't need to lock the receiver to the broadcast. If you've set everything up correctly, you should see a status window like the following, showing that the signal is locked and content is downloading. Check the Signal Strength as shown below. Green is good.



11 Running Fazzt: Watching the Download

The Kencast Fazzt Professional Client software is fairly easy to use for most applications and common installations. I would bet that in most installations no configuration of the software is necessary at all.

Since the Kencast Fazzt system encapsulates data, the Client can recognize data streams it should manage by packets encapsulated in the Fazzt format. This simply means that Fazzt will, in most instances auto-detect the receiver card / incoming broadcast automatically.

If your receiver software is running, and if the broadcast is locked and coming down, then as a rule of thumb Fazzt should be able to connect to the broadcast on its own, and you should see files downloading in the logs in **10-15 minutes**. Sometimes this happens more quickly, but I would generally give Fazzt a good 10-15 minutes the first time.

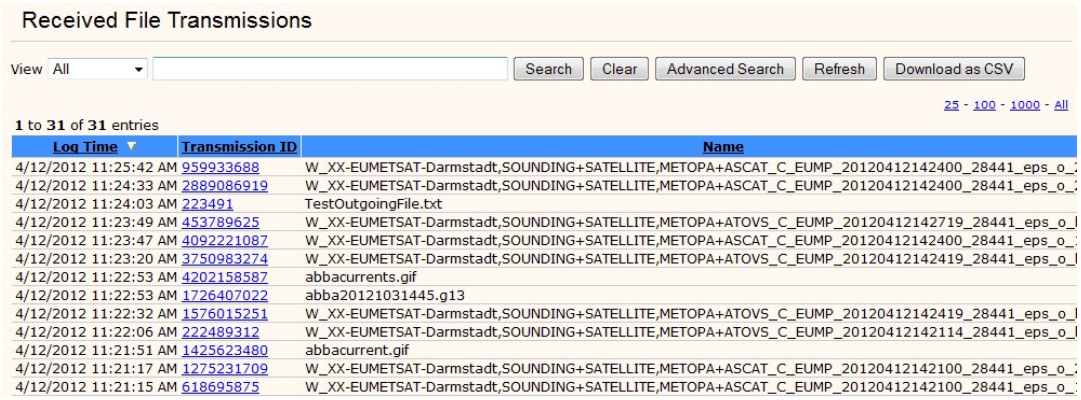
First, make sure Fazzt is running. If the tray icon looks like this, you are good.

If the tray icon looks like this, you need to start Fazzt.

You can start Fazzt by going to the tray icon, right clicking, and selecting 'Start Fazzt'. This is also how you can stop and restart Fazzt. On Windows 7 (and probably Vista) machines, you may need special Administrative privileges to open Fazzt. In this case open the services window by typing 'Services' in the search bar from the start menu. In the window that opens, select services, then scroll down to Fazzt, select it, and then click start, stop, or restart -- whichever is the appropriate action for you.

Once Fazzt is running, open the web management interface (right click on the icon and choose "admin www). Navigate to 'Logs' and then select 'Received Files'.

The resulting window may look something like this if you have successfully begun to download files. If not, it may be blank, but that is no reason for worry.



Received File Transmissions

View All | Search | Clear | Advanced Search | Refresh | Download as CSV

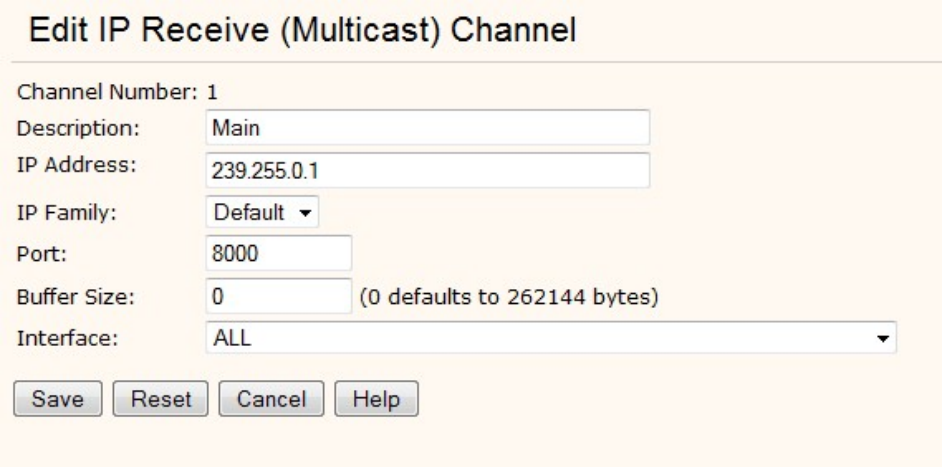
25 - 100 - 1000 - All

1 to 31 of 31 entries

Log Time	Transmission ID	Name
4/12/2012 11:25:42 AM	959933688	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ASCAT_C_EUMP_20120412142400_28441_eps_o_
4/12/2012 11:24:33 AM	2889086919	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ASCAT_C_EUMP_20120412142400_28441_eps_o_
4/12/2012 11:24:03 AM	223491	TestOutgoingFile.txt
4/12/2012 11:23:49 AM	453789625	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ATOVS_C_EUMP_20120412142719_28441_eps_o_
4/12/2012 11:23:47 AM	4092221087	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ASCAT_C_EUMP_20120412142400_28441_eps_o_
4/12/2012 11:23:20 AM	3750983274	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ATOVS_C_EUMP_20120412142419_28441_eps_o_
4/12/2012 11:22:53 AM	4202158587	abbacurrents.gif
4/12/2012 11:22:53 AM	1726407022	abba20121031445.g13
4/12/2012 11:22:32 AM	1576015251	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ATOVS_C_EUMP_20120412142419_28441_eps_o_
4/12/2012 11:22:06 AM	222489312	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ATOVS_C_EUMP_20120412142114_28441_eps_o_
4/12/2012 11:21:51 AM	1425623480	abbacurrent.gif
4/12/2012 11:21:17 AM	1275231709	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ASCAT_C_EUMP_20120412142100_28441_eps_o_
4/12/2012 11:21:15 AM	618695875	W_XX-EUMETSAT-Darmstadt,SOUNDING+SATELLITE,METOPA+ASCAT_C_EUMP_20120412142100_28441_eps_o_

If the page is blank wait and every few minutes click the refresh button. If after 10-15 minutes you have not received anything, you may need to help Fazzt see the proper network connection for the download. **If you just installed Fazzt for the first time, try restarting your computer.**

If after a restart and another 10-15 minute wait, you still do not see anything, go to 'Configuration' and then 'Channels'. Here you will see an entry for 'Main'. **(Under no circumstances should you ever delete the Main channel. Do not do it!)** Click on the 'Main' hyperlink. You will now see something like the following.



If the interface is not set to 'ALL' change it back, and click the save button. If it is set to 'ALL', and if you know how to recognize different network adapters, try to find the IP of the virtual server associated with your receiver card and set it to that. Kencast will list all of the network connections on your computer in the menu bar. Once you make a change, you will need to go back to the previous screen and click the 'Reload' option. Do not click Delete!

Again wait 10-15 minutes and wait for new files to download. Trouble shooting beyond this may require special assistance.

If your files do happen to download, then there is not much more to it. You can explore the more advanced features and scripting associated with Fazzt to help manage incoming files and data. Keep in mind that **you will need to do a script to delete or transfer files to another computer** since the computer's hard drive could fill very easily. To avoid this, disable those channels whose information is not useful to you. You can do this by using the FAZZT interface as follows: go to "Configuration", then to "Channels" and choose "Disable" in those channels that you don't want to receive. **THE ONLY CHANNEL YOU SHOULD NOT DISABLE IS "MAIN"**. In addition, you can see in Appendix IV simple examples used by some GEONETCast users to automatically delete files from the hard drive.

It is also possible to communicate with other computers to share files received by the computer connected to the receiver. You can find more information in the "Documentation" section at the bottom of the vertical panel on the left hand side of the Fazzt interface. Sub-sections include: Admin Guide, Scripting Guide, Scripts Library, FAQ and Tutorial. Use them at your convenience.

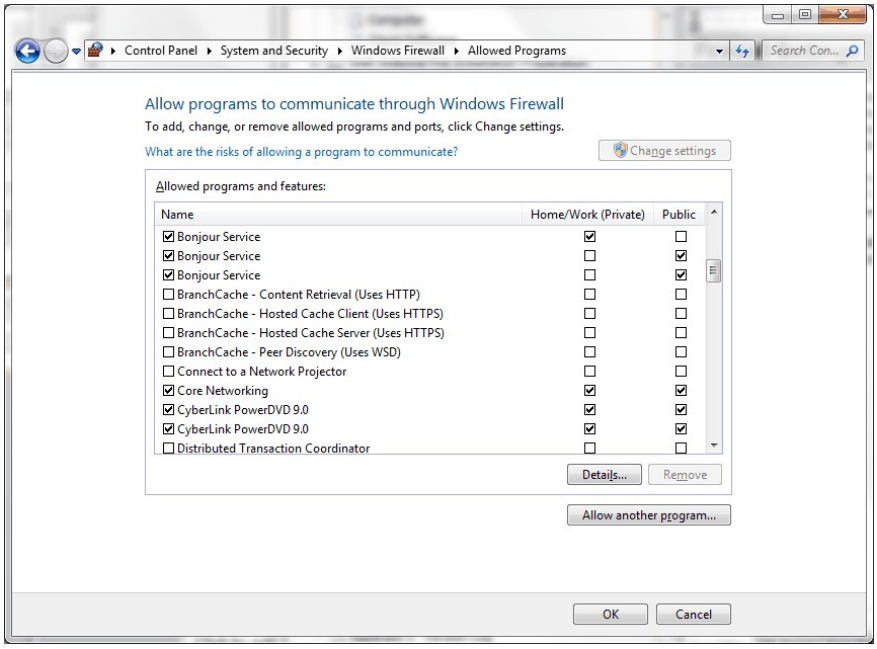
12 Firewall Settings

Sometimes the Windows firewall will block the multicast traffic / packets, which are incoming from the receiver. To allow the Kencast Fazzt client to listen to the network and incoming data, we'll need to make an exception. If you are using other security software, you may need to make a similar exception for Fazzt.

Begin by opening the Windows Firewall. You can do this by navigating, on Windows 7, to Control Panel->System and Security->Windows Firewall. You could also simply type firewall in the Windows

start button and select Windows Firewall.

Now select the option to the left that states "Allow a program or feature through Windows Firewall". You should see a screen like this pop up.



Click the 'Change Settings' button and then press the "Allow another program." button. Add the "FazztSrv" to the list of allowed programs. Ensure it is enabled. This should now allow Fazzt to receive files incoming over your receiver.

If after following the instructions described in this Manual and making sure your angles are set correctly and your receiver has the proper configuration, you are still not receiving data, go to Appendix III, where you can find a basic check list you should review before requesting additional support for troubleshooting your system.

13 Appendix I: Version Log

v2.1.1 Minor edits and updates (R. Alfaro & P. Seymour, July 18, 2016)

v2.1.0 Minor edits and updates (R.Alfaro & P. Seymour, November 12, 2015)

v2.0.0 Added section on Novra S75+ receiver and appropriately updated and changed layout of section describing the Technisat DVB-S USB receiver. Minor edits and updates throughout. (K. Sponberg, September 27, 2013)

v1.1.1 Minor edits and updates. (K. Sponberg, May 26, 2012)

v1.1.0- DVB-S configuration and signal locking added. (K. Sponberg, April 24, 2012)

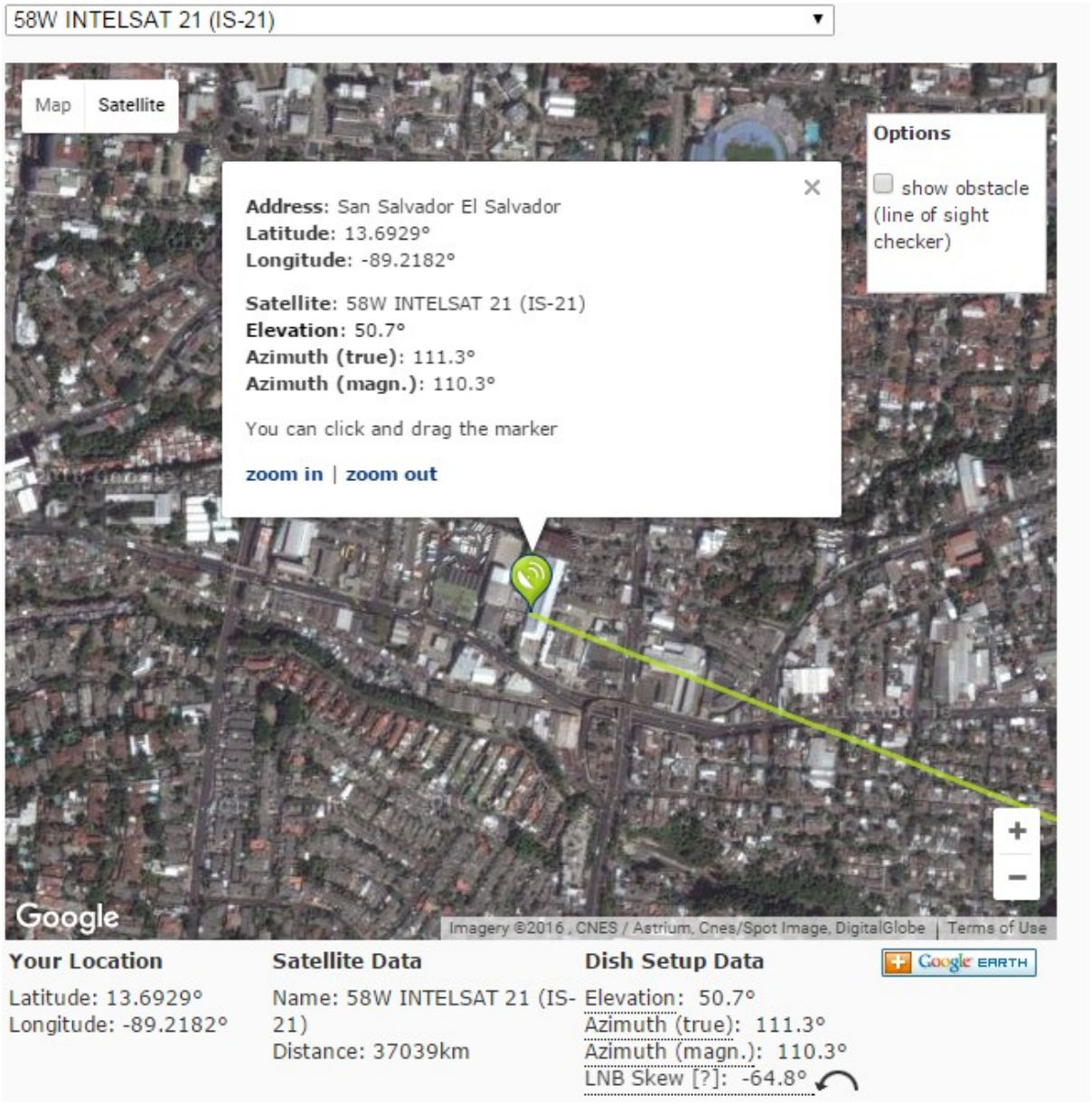
v1.0.0- Manual written. (K. Sponberg, April 22, 2012). 'Configuring the DVB-S Receiver' incomplete.

14 Appendix II: Polarization angle examples

Assuming you have set the focal point of your antenna correctly, instead of moving the LNB of your antenna randomly to find the polarization angle, it is better to know first what's the position of the 0° polarization angle of your LNB and what is the polarization angle your antenna should have to move the LNB in that direction. Keep in mind that the rotation of your LNB will depend on the equipment you have.

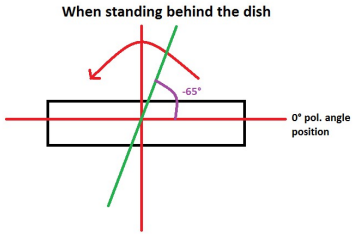
As follow you will find the setting of the polarization angle for one of the GNC-A antennas El Salvador.

The polarization angle for El Salvador is found using the following web site: www.dishpointer.com. See below.



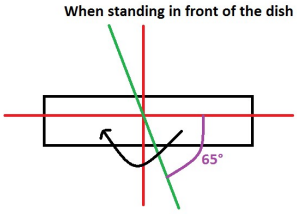
Using www.dispointer.com to find the angles to set the antenna in El Salvador, Central America

The polarization angle is -64.8, which means, rotate the LNB counter-clockwise from the 0° polarization position if you are standing behind the dish or clockwise if you are in front.
The pictures below show how to move the LNB to find the appropriate angle for this antena.



Cartoon showing the correct rotation for the LNB to set the polarization angle when looking at the dish from behind

Another way to get to the same result is shown below when standing in front of the dish:

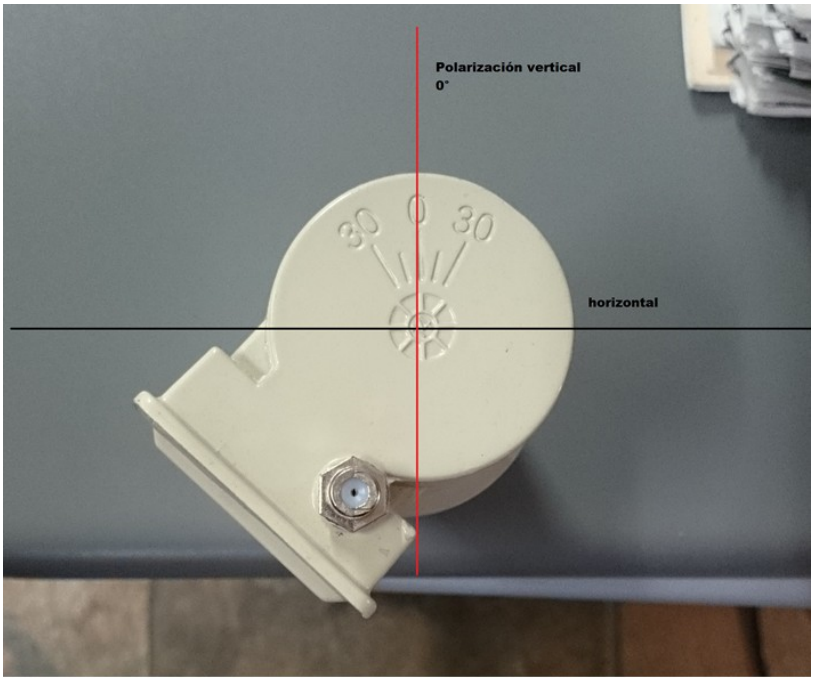


You can see below the antenna with the correct polarization angle in El Salvador.

GNC-A antenna installed in Acajutla, El Salvador

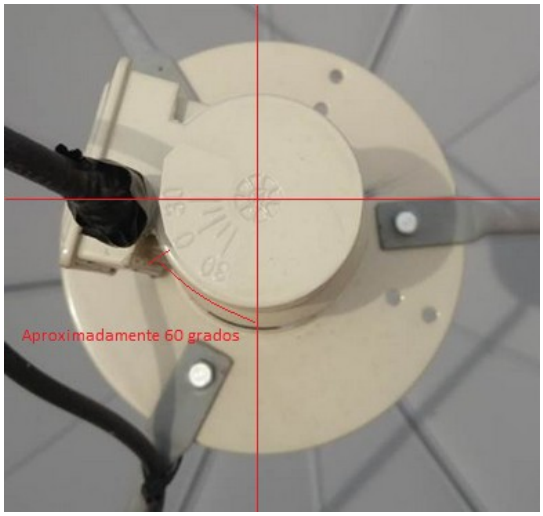
As follows you find an example of an antenna installed in Mexico City. The polarization angle is -61.9 for this antenna.
This is the picture of the LNB they used for this antenna.

Below you can see the 0° polarization angle for this LNB, when the previous picture is looked from above.



Position of the 0 polarization angle for the LNB used in Mexico's antennas.

In this case, moving the 30 mark to the horizontal position will move the 0 mark aproximately 60 degrees away from the vertical, so the angle is shown next.



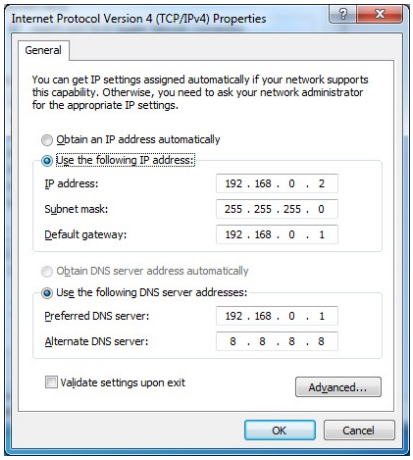
Polarization angle aproximated to -60 degrees in one of the antennas in Mexico.

15 Appendix III: Check list

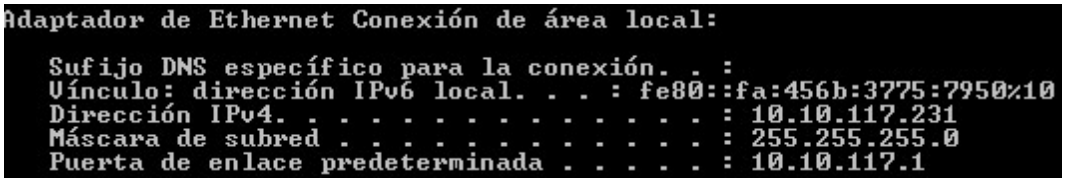
Once the angles are set, the signal is received, the software is configured and Fazzt is allowed through the Windows Firewall, you should begin receiving files within 10-15 minutes. If that doesn't happen, review the following before additional trouble shooting.

1. Check the IPv4 properties for the receiver. The IP address of your receiver and the IP address of your computer should be on the same subnet.

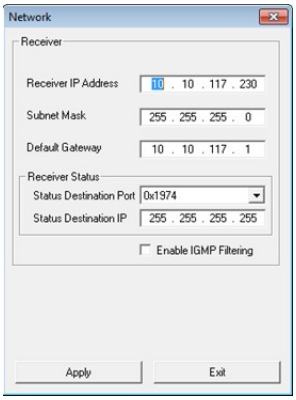
This is an example of a receiver connected to a laptop through an Ethernet cable.



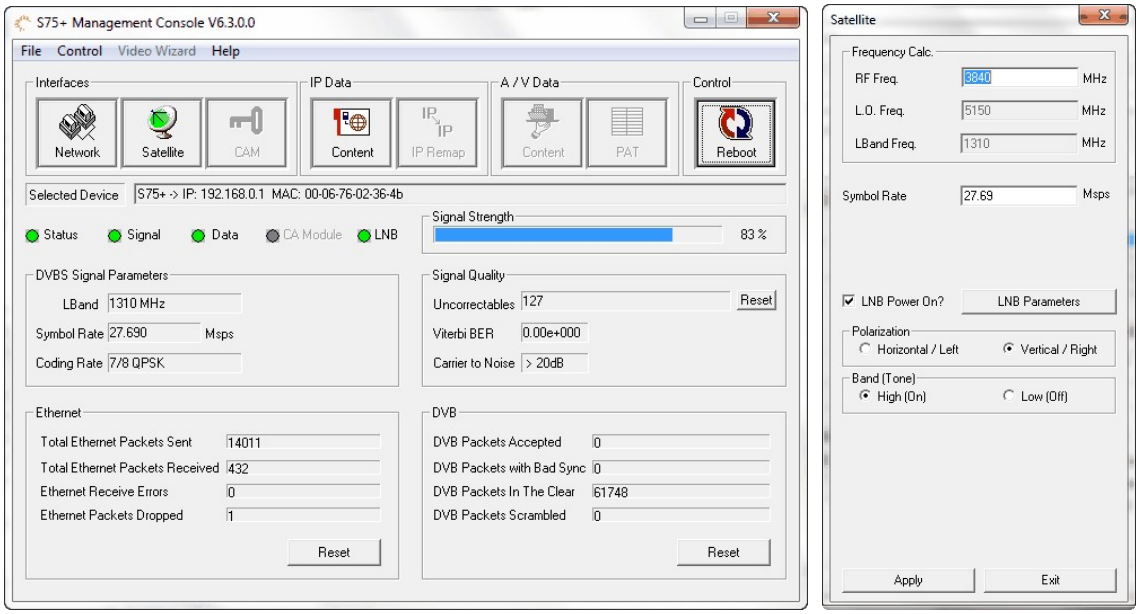
This is an example of a receiver that has been connected through a router.
The network configuration at the PC site is as follows:

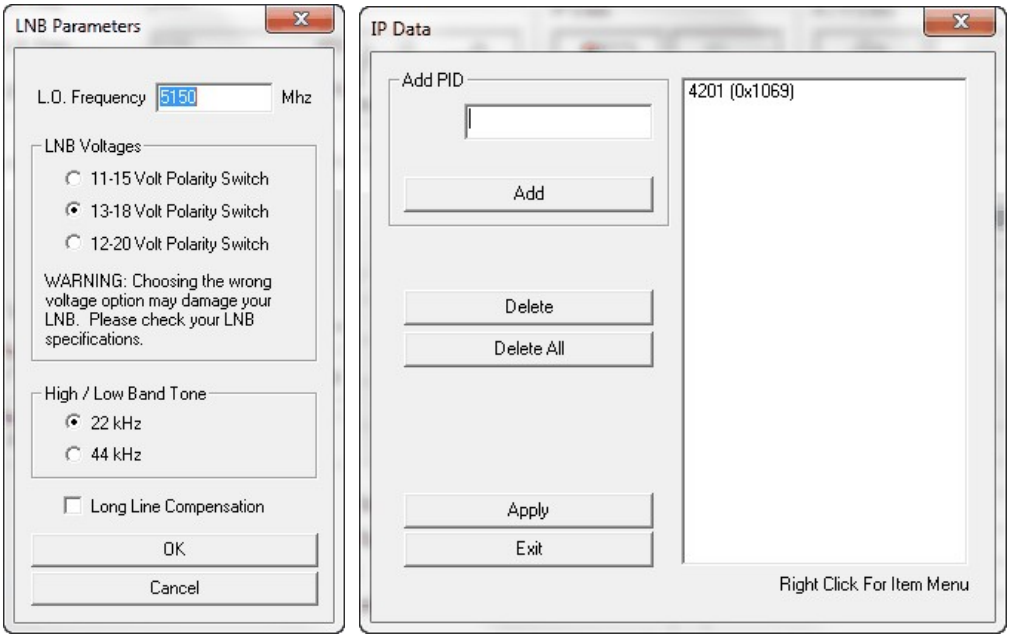


The network configuration for the receiver is this:

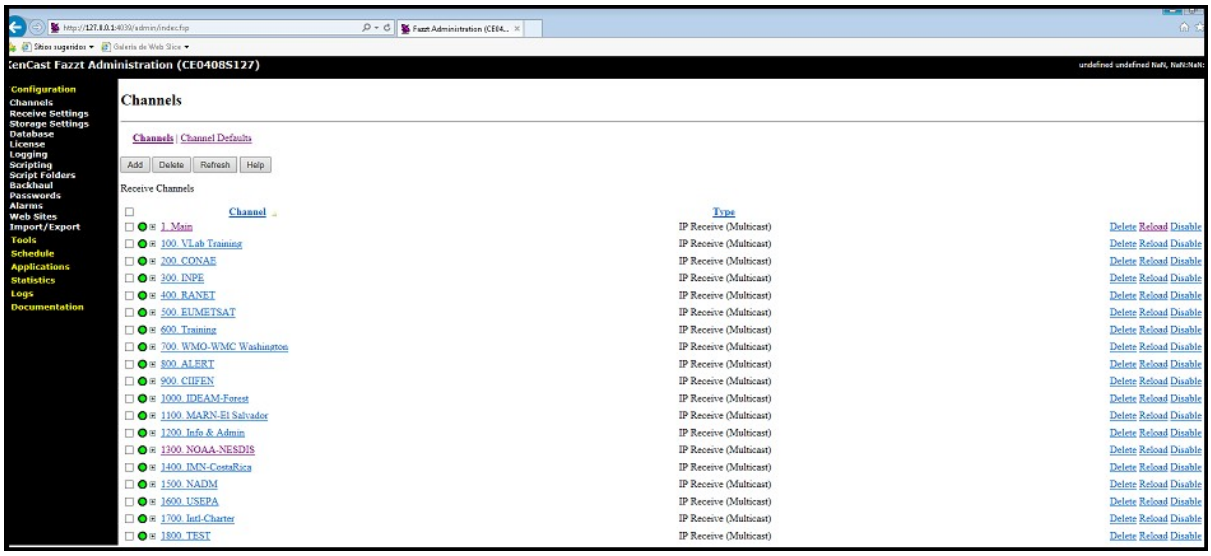


2. Check the configuration of the following windows of the Novra software:

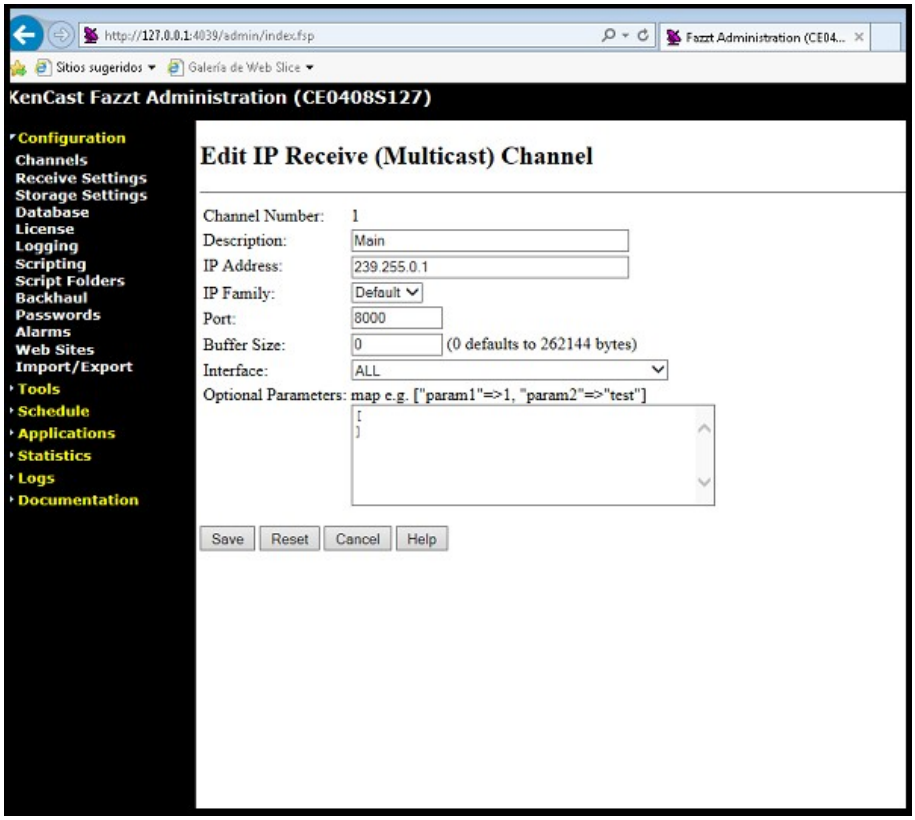




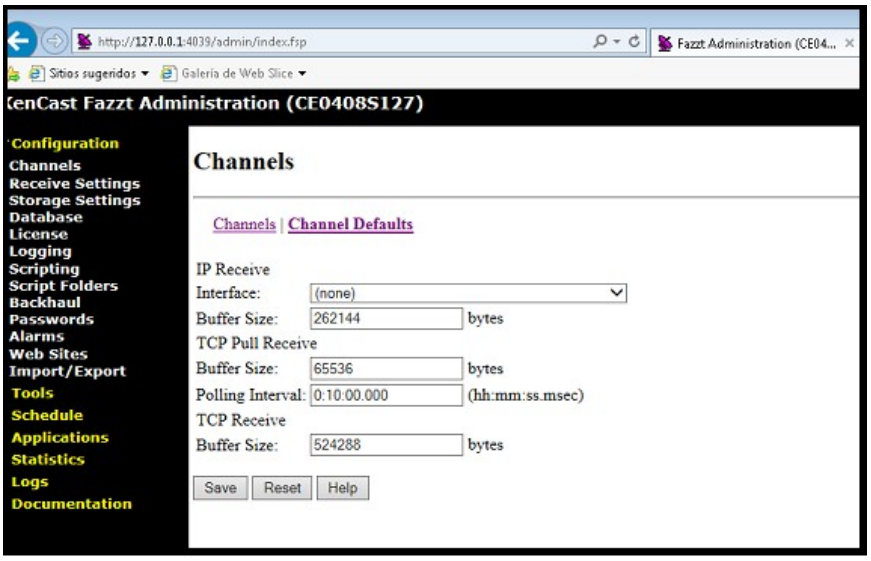
3. Go to Fazzt Client. Review the configuration as follows.
Open the window "Configuration"->"Channels". You should see something like this if you are receiving the signal.



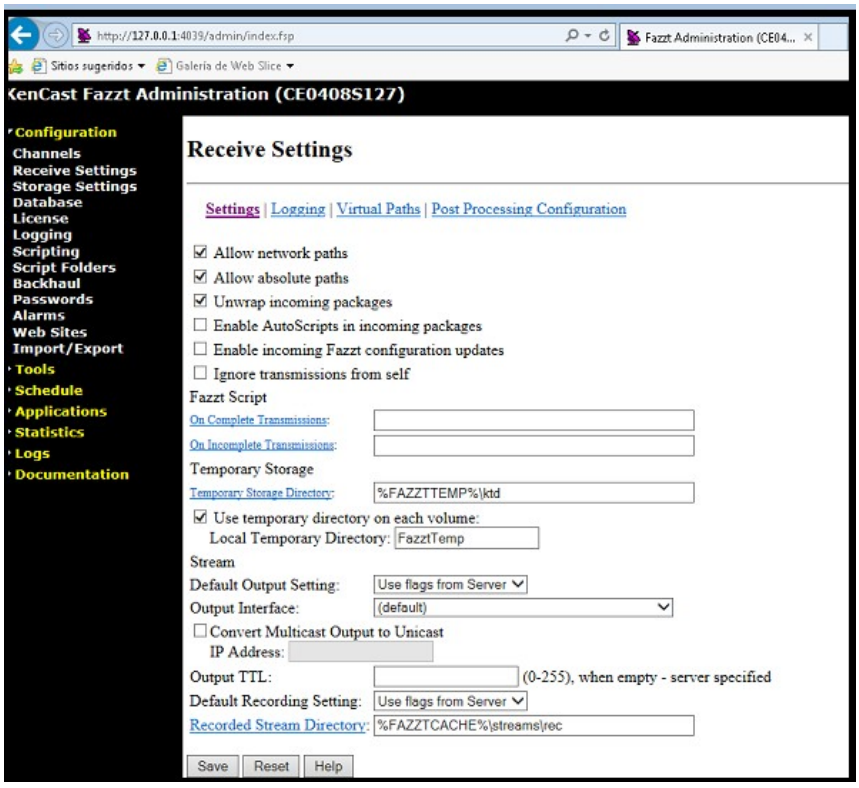
Go to channel 1.Main. Make sure in "Interface" you have the receiver or default and then "Save".



Go back to Channels and go to Channel Defaults. In the field "Interface" make sure you have the receiver. Then save.



Then go to Receive Settings.



Make sure in "Default Output Setting" you have "output", in "Output Interface" you have "default". Then "Save".
Then go back to Channels and click on the "Refresh" button.
To make sure files are being downloaded, right click on the Fazzt icon and choose "admin www". Navigate to 'Logs' and then select 'Received Files'. You should see a window with the files received. Trouble shooting beyond this may require special assistance.

16 Appendix IV: Deleting files automatically

Using the computer system's Task Scheduler, one GEONETCast station from El Salvador uses the .bat file shown below to automatically delete files stored in the hard drive of the computer that receives the GEONETCast broadcast.

Beginning of the .bat file

```
----------------------------------xx----------------------------------
        echo PROGRAMA PARA LIBERAR ESPACIO EN HDD DE GNC
        echo ESTE PROCESO PUEDE DURAR VARIOS MINUTOS, FAVOR ESPERE...

        cd C:\Kencast\Alert
        del *.txt

        cd C:\Kencast\NOAA-NESDIS-GEOTIFFS\IMAGERY
        del *.tif.gz

        cd C:\Kencast\EUMETSAT
        del *.bufr
        del *.bin

        C:\Kencast\IMN-CostaRica
        del *.jpg
        del *.png
        del *.txt
        del *.bfr
        del *.aed
----------------------------------xx----------------------------------
```

End of the .bat file

Other GEONETCast station located in Mexico uses the following .bat file in the Task Scheduler to delete files. The batch file only has the following line:

```
        forfiles /p "C:\Program Files (x86)\KenCast\Fazzt\incoming" /s /m *.* /d -7 /c "cmd  /c del @PATH"
```

The software Fazzt stored by default the received files in the following directory: "C:\Program Files (x86)\Kencast\Fazzt\incoming". The batch file that has the line shown previously only keeps the files of the most recent 7 days in the directory "C:\Program Files (x86)\Kencast\Fazzt\incoming" and its subdirectories. The rest of the files are deleted. This way, this GEONETCast station always keep the files transmitted from the last 7 days.

17 Appendix V: User Notes

Your Notes: