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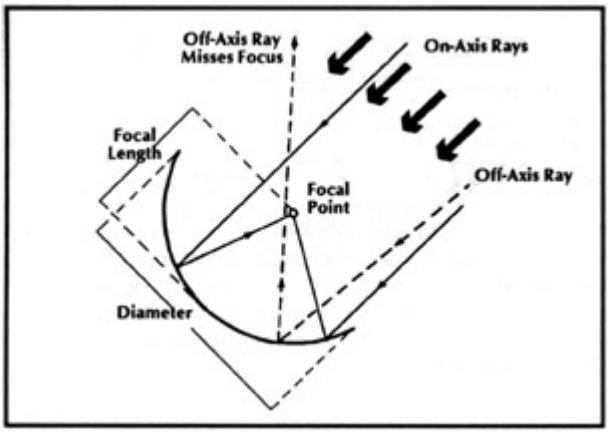
INSTALLING YOUR OWN Ku-BAND DISH SYSTEM

The past year has seen a voluminous increase if the sales of hardware for the reception of Ku signals in India. Small dish antenna systems for reception of the DTH signals from the NSS 6 satellite have proven, for the past year, to be the driving force in the industry. With the start of the DD DIRECT DTH service, sales of dish receiving systems reminded one of the start of the cable industry in the mid-nineties, when the launch of every new satellite of channel in India, would send sales of dish antennae, LNBs and receivers soaring. Similar is the case of what is happening now with Ku-system sales.

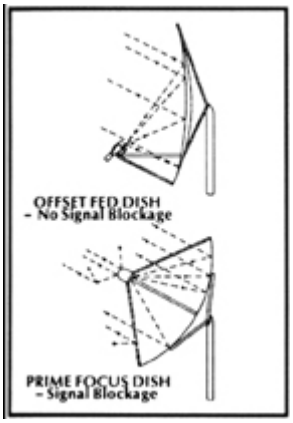
However, many questions arise. The use and installation of the Ku antenna is not the same as for a C-band antenna. In fact we receive numerous queries at our office, whether an existing C-band antenna can be used for reception of Ku signals. The answer is yes and no - depends on how good quality your existing antenna is. If it's a solid sheet or perforated antenna (with tiny holes) then yes, however you would have to change your LNB of course.



Parabolic Dish Geometry

If you are using the old chicken-mesh type of antenna, then no way are you going to be able to receive Ku signals with it.

Lets look at the dish first.



Offset and Prime Focus

Offset dishes are commonly found in DTH systems. The surface of an offset fed dish is a section of a larger prime-focus parabola. The feed assembly, which is still located at the focus of the larger "parent" dish, appears to be offset from that portion of the reflective surface in use. Since the feed/LNB structure is offset, it does not block incoming signals.

In practice, no dish is perfect for a number of reasons. The feed at the focal point is bigger than a "point" so it intercepts some signals arriving from directions slightly off the main axis. Also, irregularities and imperfections in the shape of the surface causes reflection errors so that some off-axis signals are detected while some targeted signals pass by unobserved.

Dish Reflections
An offset dish is angled more towards the horizon than a prime focus parabola.

Signals striking a dent are reflected away from its focus. This loss of gain with surface imperfections becomes more important at higher frequencies.

Thus, a dish that may be perfectly adequate at C-band may not have a "tight" enough surface tolerance for quality performance at Ku-band frequencies.

INSTALLATION

The installation of home DTH systems has become easier as dish size has shrunk and as technology has improved. With the introduction of small-dish systems installation has evolved to the point where a technically oriented consumer should be able to manage the entire process. A simplified overview of the process is presented in this article.

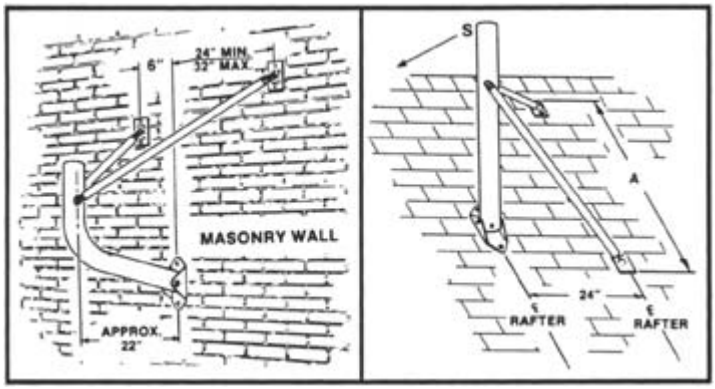
CHECKLIST

The first step in any installation is the site survey, a critical yet often occasionally neglected step. This involves making a number of decisions that include:

* Where the dish will be located. This involves finding a position with a clear view of the satellite. A dish must have a clear line-of sight view because any obstruction absorbs or reflects microwaves and subsequently lowers the amount of signal received. Moisture in trees is a particularly strong absorber of microwaves, especially in the higher Ku band frequency range.

* How the dish will be grounded. A well electrically grounded system reduces the potential for damage resulting from power surges or nearby lightning during a storm. In extreme cases, severe injury or even death could result, including damage to television sets or receiving equipment. A ground point must be connected to the home electrical ground connection or a grounding rod.

* How the dish will be mounted. The small DTH dishes can be supported on poles, roofs, terraces, on external walls, or on grills outside windows and in balconies. The mounting chosen should be rigid and structurally sound as well as safe. High winds can topple even the smallest receive dish. You may need permission from your building society to install a dish on the external wall of the building - or on the terrace.



Small-Dish Roof And Wall Mounts
These mounts were designed to support a 36 inch dish used. The crucial supports must be securely attached to the underlying structure, rafters in the case of a roof mount and with lag bolts of sufficient size in the case of the wall mount.

* Cable routes from the dish to the indoors satellite receiver. Coax can be run in underground conduits, down the side of buildings or through false ceilings. The goal should be to keep cable runs as short as possible and out of sight.

* Where will the satellite receiver will be placed relative to other audio/video home entertainment components. More than one television set as well as an audio system that consists of a DVD player, or your cable set-top box might be hooked up. Don't forget, all DTH signals are in stereo sound, especially the music channels. You may want to hook-up the audio to your stereo system for great sound.

STEP-BY-STEP INSTALLATION PROCEDURE

Any satellite system can be installed by following a series of rather straightforward steps. Although the complexity of each step may vary between installations, most jobs are quite similar.

Here's a general procedure for installing fixed dishes.

1. INSTALL THE DISH SUPPORT

Satellite dishes are usually mounted on poles that are set in concrete.

However, other types of supporting structures can be successfully used. The critical element of this step is to be sure that the pole is mounted in a perfectly vertical (plumb) orientation. Any tilting in the east/west direction can result in poor tracking.

2. TRENCHING AND CABLE RUNS

The route from the dish to the indoor equipment is then prepared. Conduit of 1" diameter or larger is recommended when cable is to be installed underground. This ensures that extra cable can be pulled in or the old cable can be repaired at some future date. Use solvent to connect joints so the conduit is leak proof. Install a separate large diameter grounding conductor, if it is not part of the cable. Lay the conduit and cable in the trench but do not cover it up until the entire installation has been completed and everything is working properly.

3. ASSEMBLE THE MOUNT

Whenever possible, the mount should be assembled independently of the dish and then lifted onto the pole. Bolting the dish and the heavy mount together and then lifting them onto the pole together can easily warp the reflective surface. This mistake should be avoided.

It is also usually easier to set the declination angle on the mount at this stage.

4. ASSEMBLE THE DISH

After assembly, the dish can either be lifted onto the mount so it sits horizontally like a bird bath or it can be rolled into alignment with a vertically oriented mount. Secure the reflector to the mount. Then attach the feed support struts or buttonhook to the dish. While most large reflectors must be assembled, some smaller dishes of 8 feet or less in diameter are pre-assembled. Assemble reflectors on a flat surface and do not tighten the bolts until all pieces are in place and the accuracy of the panel alignment can be ensured.

5. LNB SUPPORT

The next step is to secure the dish onto the LNB support arm by attaching four pan head bolts, to mount the LNB and then to attach the coaxial cable to the LNB. It is easiest to complete this step on the ground and then lift the lightweight assembly to its final location and attach it to the mounting bracket. Before fixing the LNB to the support arm, route the coax through the center of this arm and back down the supporting pipe.

Use only RG-6 coax with at least a 60% woven braid. Install an F-connector on the cable end, screw it onto the LNB, waterproof this connection and finally bolt the LNB to the support arm with the supplied hardware. Take the coax from the dish and run it into the home to the satellite receiver.

It is important to create a drip loop in the cable on both sides of wall, a loop that has its lowest point below the grounding block, so moisture will drip off below and not into the connection.

After bolting the LNB and feed together lower the dish by adjusting the elevation angle and possibly by loosening the bolt in the clamp so the LNB/feed assembly can be attached to its supports. It is crucial to always install a weather cover to protect the LNB. Attach the dish to the mount.

Then after bolting the LNB and feed together, also bolt these components onto the mount.

6. ELECTRICAL CONNECTIONS

Complete the necessary connection to the LNB, and to the indoor receiver. Be sure both the dish and receiver are properly grounded. Always attach a copper or aluminum grounding wire to the pole and run it to a grounding rod or to a point where it can be electrically secured to the home ground. The BIS defines codes regarding installing and wiring grounding attachments for electronic equipment. Proper grounding is essential to protecting life and property.

7. POWER ON AND ALIGN ANTENNA

Carefully set the elevation and declination angles. Then check that all wires are connected correctly, turn on the power and align the dish to the arc of satellites. Set the azimuth and elevation angles and turn the power on. Fine tune the alignment of the dish to optimize signal reception. The azimuth and Elevation angle is relative to your location on the map, and the location of the satellite which you are trying to receive. See section at the end of this article which deals with Determining Aiming Angles'.

Two basic instruments are required to both conduct a site survey and aim a dish:

An angle finder or inclinometer and a compass.

When a polar mount is installed, these instruments are used to aim the mount towards true south and then to set the polar axis and declination angles. When installing a fixed dish an az-el mount, adjusting the azimuth and elevation angle can target each satellite. The azimuth is measured in degrees of rotation from true north and the elevation in degrees up from the horizon.

The azimuth (Az) heading as well as Elevation (El) angle towards any chosen satellite can be found by calculation or from computer programs. For example, NSS 6 has different azimuth and elevation angles in the various parts of the country. Some of these are in the table alongside. In Bombay, the NSS satellite has an elevation angle of 56° and a compass heading of 128°East.

It would therefore be found by rotating 128° from the north compass heading and then by aiming up to an elevation of 56°.

If a tree or any other obstruction blocks the view, the proposed installation site would have to be changed. The Az & El settings are the same for installation anywhere in the same town / city.

Elevation angles are measured with an angle finder (also known as an inclinometer or protractor). The protractor (also referred to as the 'D') from a school geometry box serves the purpose quite well. Placing it on a long ruler or any other straight edge increases sighting ease and accuracy when it is used in a fashion similar to sighting a rifle. The ruler can then be raised until the desired elevation is reached. If a protractor is used, its base must be kept level before checking elevation angles. When the correct elevation and azimuth angle is found, check to ensure that no objects are blocking a clear view to any satellite.

There is an important difference in the process of aiming an analog C-band TVRO and a DTH digital dish. With C-band analog, even with a faint signal received, a hint of a television picture appears. Then fine adjustments can be made to improve reception. In contrast, digital receivers usually either lock onto the signal, if it is strong enough, or give no indication of a signal, if it is weak and below "threshold." Therefore the aiming angles should be set as accurately as possible before powering on. Once the signal has been acquired, then the signal strength can be monitored for fine tuning. One saving grace with small dish systems is that the beamwidth is so wide that aiming errors of even a degree or more will not have a major impact.

The next step is to adjust the elevation and azimuth (compass heading). The DTH system has fortunately been designed to make this process quite easy.

The dish can be rotated to the correct elevation by loosening one bolt and then reading the angle as marked on the side of the LNB support arm. This is accurate to within at least a half a degree when the pole is vertically aligned. The compass heading is set by sighting with a compass and then by rotating the dish about its support arm by loosening the bolts behind the dish.

A database of channels is mostly pre-programmed into the satellite receiver.

Simply turn the power on, select the main menu from the remote control or front panel buttons, select "Options," then "Setup" from the next menu, and finally tune channels from the menu.

Once the aiming angles have been manually set the receiver can be used to peak the signal. Again

select the main menu via the remote control or front panel buttons, select "Options," then "Setup" and "Dish Pointing" from the two subsequent menus and finally "Signal Strength Meter" from the last menu.

Most digital satellite receivers provide an on-screen signal strength meter, which show up as a progressive vertical or horizontal bar on the TV screen.

This can also be used for fine tuning the alignment. The process involves adjusting the elevation and then the azimuth to peak this meter.

The system requires a three second wait between each read-out on the meter to allow it to complete its cycle. Both a graphic display and a number that varies between 0 and 99 are provided to facilitate this process.

Once the setup has been done, sit back and auto-tune the receiver using the remote.

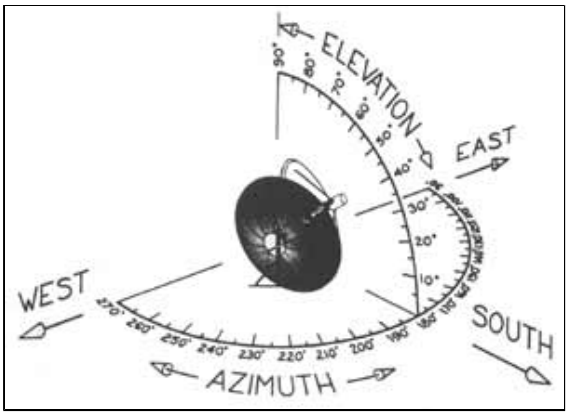
Most receivers will automatically tune the downlink frequencies and the other parameters, and store these in memory.

These can also be manually tuned, by going into the setup menu as described earlier, and manually inputting the downlink frequency of the channel you wish to watch, along with the polarization of that transponder, the Symbol rate (SR) and the FEC. These parameters for the various channels are also available on the CHANNEL GUIDE pages of each months issue of the SATELLITE & CABLE TV magazine, or on the CHANNEL GUIDE pages at the website www.scatmag.com. ■

Look Angle Table: NSS 6 at 95 Degrees East
All angles in Degrees

Location	Lat	Long	AZ	EL	Location	Lat	Long	AZ	EL
Ahmadabad	23.05N	72.67E	133.62	53.13	Jodhpur	26.30N	73.13E	137.83	50.82
Allahabad	25.47N	81.90E	151.58	56.81	Jullundur	31.30N	75.67E	145.97	47.91
Amritsar	31.58N	74.93E	145.11	47.25	Junagadh	21.53N	70.53E	128.89	52.57
Andaman	12.00N	92.67E	168.91	75.63	Lucknow	26.92N	80.98E	151.13	54.90
Bangalore	12.97N	77.58E	125.58	64.70	Ludhiana	30.92N	75.90E	146.02	48.40
Bhopal	23.27N	77.60E	141.57	56.44	Madras	13.08N	80.30E	130.79	67.03
Bhubaneswar	20.25N	85.87E	155.09	64.07	Maldives	5.50N	73.00E	103.35	63.48
Bombay	18.93N	72.85E	128.56	56.37	Panaji	15.50N	73.92E	124.73	59.66
Calcutta	22.57N	88.40E	163.22	62.53	Patna	25.62N	85.20E	158.22	58.11
Chandigarh	30.70N	76.90E	147.37	49.13	Pune	18.52N	73.92E	129.48	57.57
Delhi	28.67N	77.23E	146.26	51.24	Salem	11.63N	78.13E	123.63	66.09
Dibrugarh	27.48N	94.97E	179.93	57.90	Sholapur	17.72N	75.93E	131.36	59.84
Hyderabad	17.33N	78.50E	135.17	62.20	Srinagar	34.10N	74.85E	146.80	44.86
Imphal	24.73N	93.97E	177.53	61.05	Trivandrum	8.68N	76.95E	114.86	66.59
Indore	22.73N	75.83E	138.03	55.71	Vishakhapatnam	17.70N	83.40E	145.97	65.32
Jabalpur	23.17N	79.98E	145.71	58.02					
Jagdalpur	19.07N	82.08E	144.93	63.19					
Jaipur	26.88N	75.83E	142.45	52.07					
Jalgaon	21.02N	75.65E	135.60	57.01					

Jalna	19.83N	75.97E	134.52	58.21	
Jalpaiguri	26.50N	88.83E	166.39	58.28	
Jamnagar	22.47N	70.10E	129.46	51.55	
Jamshedpur	22.78N	86.20E	158.21	61.52	
Jaunpur	25.73N	82.68E	153.30	56.91	
Jeypore	18.85N	82.68E	145.95	63.77	
Jhelum	31.07N	72.17E	140.79	46.11	



Azimuth & Elevation

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