ELECTRONIC COMMUNICATION AND MULTIMEDIA EQUIPMENT SERVICING

NTQF Level-II

Learning Guide-28

Unit of Competence:	**Install and Repair Antenna and Satellite System**
Module Title:	**Installing and Repairing Antenna and Satellite System**
LG Code:	**EEL CMS2 M08 LO2- LG- 280919**
TTLM Code:	**EEL CMS2 M08 TTLM 0919 v1**

LO2: Install satellite/ antenna system

Instruction Sheet	Learning Guide #28

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- *Determining location of satellite / antenna for good reception*
- *Assembling and fixing petals/arms of the dish and LNB unit*
- *Tightening firmly dish/antenna with stand after optional signal obtained*
- *Connecting/disconnecting signal finder between LNB and satellite /antenna receiver to tune until the system obtain maximum output*
- *Performing operational check according to manual*
- *Determining azimuth and elevation using service manual*

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, **upon completion of this Learning Guide, you will be able to**:

- *Determine location of satellite / antenna for good reception*
- *Assemble and fixe petals/arms of the dish and LNB unit*
- *Tighten firmly dish/antenna with stand after optional signal obtained*
- *Connect/disconnect signal finder between LNB and satellite /antenna receiver to tune until the system obtain maximum output*
- *Perform operational check according to manual*
- *Determine azimuth and elevation using service manual*

Learning Instructions:

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
5. Try to answer self-check, you can ask your trainer for correction. If you finished answering the Self-check, take correction or explanation from your trainer if it is not clear.
6. Submit your accomplished Self-check. This will form part of your training portfolio.
7. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you Instructor for assistance if you have hard time understanding them.
   Ask from your teacher for correction (key answers) if any.
8. Read the information written in the “Information Sheets 3. Try to understand what are being discussed and ask you teacher for assistance if you have hard time understanding them.

Information sheet-1	determine location of satellite / antenna for good reception

2.1. determine location of satellite / antenna for good reception

Dear Trainees! we are going to align a satellite dish using a satellite finder analog or digital type.

1. Find out our location and the satellite's
2. Choose the optimum location
3. Align the satellite dish on a provisional basis
4. Select the proper configuration for the satellite
5. Set up the analyzer to take measurements
6. adjustment and polarization
7. Test signal quality

Conduct a site survey with the customer to identify a suitable location for the antenna. The first and most important consideration when choosing a prospective site is whether the site can provide an acceptable LOS to the satellite. Choose a site where the antenna will be able to receive the strongest signal available. A clear, unobstructed view of the sky is necessary for proper transmission. Also, consider obstructions that may occur in the future, such as construction in the area or the growth of trees.

When orienting a TV satellite dish, it's very useful to know in advance the required azimuth and elevation, since the operation is not easy. A misalignment of one degree is enough to completely loose the signal. Trying to find a satellite simply by blindly and randomly moving the antenna has very little chances of succeeding. Just looking at the neighbor's satellite antenna to see its orientation is of very little help.

Location calculator:- There are many different types of tools to calculate antenna's location.

Example :-

1. **Dish Alignment Calculator using Google Maps:** - It is the most practical and compact than competitors and you do not need a fast internet connection to use it. TrackingSat detects the city where you are and shows latitude, longitude and magnetic declination of the dish site. You can calculate at once the azimuth, azimuth magnetic, elevation and LNB skew from your city

2. **Inclinometer: -** is an instrument used for measuring angles of slope (or tilt), elevation, or depression of an object with respect to gravity's direction. It is also known as a *tilt indicator* or *tilt sensor*


Fig. a) magnetic compass b) analog inclinometer integrated device c) digital inclinometer

- A *tilt sensor* can measure the tilting in often two axes of a reference plane in two axes. In contrast, a full motion would use at least three axes and often additional sensors. One way to measure tilt angle with reference to the earth's ground plane, is to use an accelerometer. Typical applications can be found in the industry and in game controllers

3. Mobile application of Smart phone location calculator: - There are several applications that can be downloaded from Google Play store and installed onto android smart phone and used to locate best signal reception location by the help of GPS locator integrated into the device.

Mobile tool can be very handy to calculate the exact bearing (azimuth and elevation) of an antenna for a given location (defined by its latitude and longitude), when this antenna is pointing to a geo-stationary satellite located at a given longitude. All geostationary satellites are located at the same hight of 35'800 km, so this parameter is hardcoded in the calculator. The earth radius of 6'370 km is also treated as a constant and hard coded.

Receiver location:	Longitude:	°	(Decimal format, positive = East, negative = West)
	Latitude:	°	(Decimal format, positive = North, negative = South)
Satellite location:	Longitude:	°	(Decimal format, positive = East, negative = West)
Antenna bearing:	Azimuth:	°	(Decimal format, 0° = North, 90° = East, 180° = South, 270° = West)
	Elevation:	°	(Decimal format, 0° = Horizontal, 90° = Vertical)

To use this calculator, just enter the required coordinates and hit "calculate bearing". The "get current location" button will try to obtain your current coordinates from your browser: it only works if relocation is supported and enabled in your browser, and works better with devices equipped with a GPS.

Self-check 1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (2 point each)

1. Why dish antenna location is selected?
   A) To protect theft crime
   B) To accept technology **C)** to receive strong signal D) all
2. Which of the following is necessary to receive strong signal?
   A) Obstructed sky **B)** unobstructed C) rainy whether D) none
3. Which of the following instrument is not used to select best location?
   A) Inclinometer B) Finder
   C) signal calculator apps **D)** micrometer
4.

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-2	Assemble and fixe petals/arms of the dish and LNB unit

2.2. Assemble and fixe petals/arms of the dish and LNB unit

To make assembling activity the following accessories are necessary

Dish Antenna Assembly

Item	Part	Description	Quantity	Comments
1	Bolt	M8 x 35	1	LNBF Arm Braces to LNBF Arm
2	Bolt	M6 x 35	2	LNBF Clamp to LNBF Arm
3	Hex Nut	M6	2	LNBF Clamp
4	Round Head Phillips Bolt	M6 x 25	2	LNBF Clamp
5	Bolt	M8 x 15	4	LNBF Braces to Reflector, LNBF Arm Bracket
6	Flange Nut	M8	22	
7	Carriage Bolt	M8 x 16	8	Reflector, Angle Bracket
8	U-Bolt	M8	2	
9	Bolt	M8 x 75	2	Mast Supports, Base
10	Concrete Anchor Bolt	M8 x 60	4	Expansion bolts
11	Elevation Adjust Bolt	M8	1	
12	Bolt	M6 x 12	2	Bracket pivot
13	Flange Nut	M6	4	
14	Dish Reflector	1.2M	1	
15	Reflector Mount Bracket	1		
16	Mast Reflector Bracket	1		
17	LNBF Arm Bracket	1		On bottom of reflector to attach LNBF Arm
18	Mast/J-pipe		1	
19	Mast Support (Left)		1	
20	Mast Support (Right)		1	
21	Mast Base Bracket		1	
22	LNBF Arm	1		LNBF Clamp on one end , Reflector on other
23	LNBF Arm Brace	2		

24	LNBF Clamp (Top)	1		
25	Flat Washer	M8	8	
26	LNBF Clamp (Bottom)	1		

Assemble Universal Mount

1. Pre drill holes in mounting surface using base (21) as a template
2. Attach base to mounting surface with 2 anchor bolts (8)
3. Install mount arm/pipe (18) into base (21)
4. Insert and loosely tighten both mast/pipe support legs (20), using nut (7), screw (19)

Fig. dish antenna and its accessory

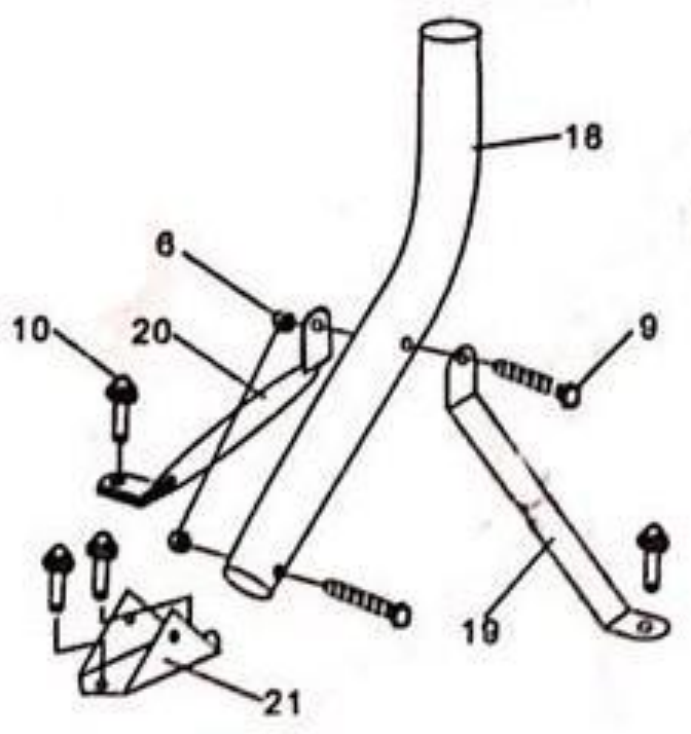


Fig. antenna's stand

Assemble LNBF Feed Support Arm

1. Assemble top and bottom LNBF holder/mount/clamp (12 and 13) with 2 screws (1)
2. Attach bottom LNBF holder (12) to LNBF feed arm (11) with screw (2)
3. Insert plastic plug (14) into top of LNBF feed arm

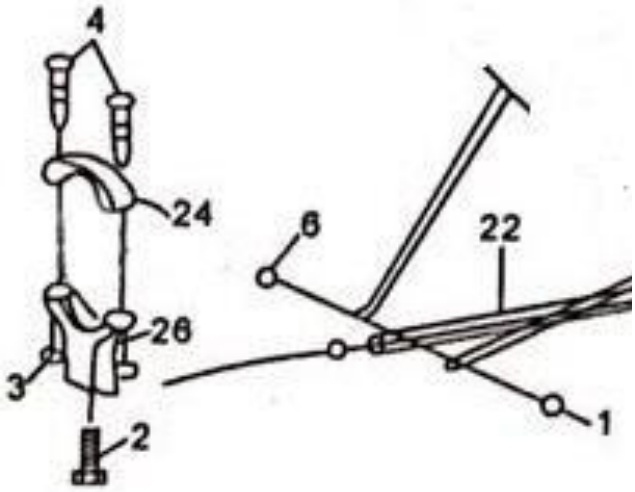


Fig. a) stand supporter b). LNB holder

Attach LNBF feed arm (11) to reflector bracket/mount (10) with 2 nuts (5) and 2 screws (3).

Assemble Satellite Dish and Mount

1. Attach satellite dish reflector (14) to satellite reflector bracket/mount (15) with 4 nuts (6) and screws (7)

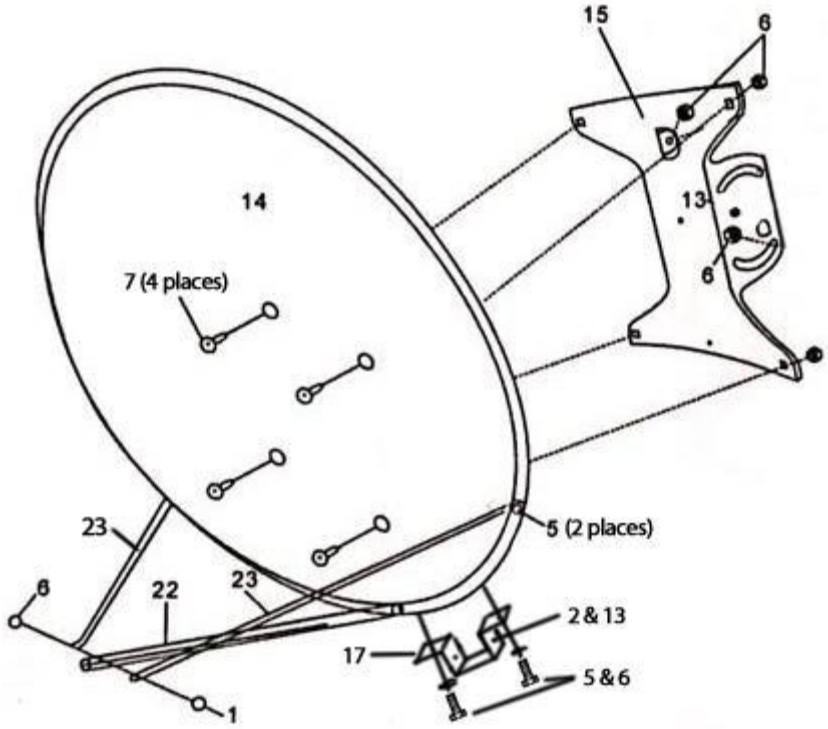
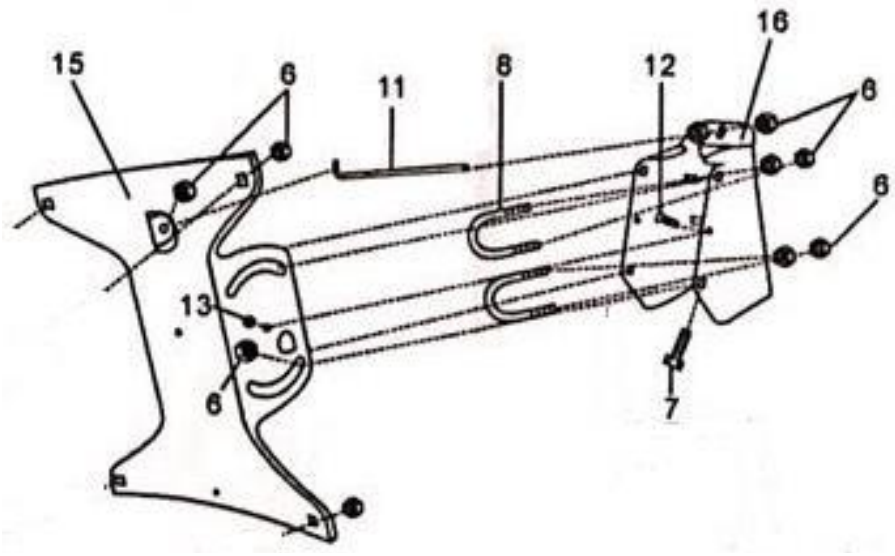


Fig. dish assembling and Tighten all pieces

Assemble Mast/Pipe Mount and Clamp

- Loosely assemble 2 u-bolts (8) through the pipe mount (16) using 4 nuts (6)
- Mount the pipe mount assembly (16) into the satellite reflector bracket (15) using 4 bolts (4) with their heads on the inside and 4 nuts (5) on the outside.
- Mount the dish assembly on the mast/pipe, orient and then tighten all screws/nuts.



Install LNBF

1. Take care to align LNBF so that it is positioned correctly (not rotated and so that it is facing dish).
2. Mount with F-connectors facing downwards.
3. Do not over tighten LNB clamp.
4. Use high quality compression connector on coaxial cable.
5. Attach and tighten coaxial cable to LNBF – take care not to overstress F-connector.
6. Route coaxial cable along the LNB feed arm and use the cable clip or cable ties to attach to the arm.

Fig. Assembling LNB

Satellite Dish Alignment Instructions

1. Write down desired the azimuth and elevation to point the dish
2. Using a magnetic/electronic compass to determine the azimuth direction
3. Adjust the azimuth – making sure the U-bolts are loosened first, then tighten when in place at the correct azimuth.
4. Using a protractor determine the elevation
5. Adjust the elevation with the long elevation adjustment bolt and its nut at the top of the mast clamp – making sure the elevation bolts/nuts are loosened first

Fig. Assembling and alignment of dish

Self-check 2	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (2 point each)

1. Which of the following hand tool is not necessary for dish installation?
   A) Wrench B) Ladder
   C) drill **D**) DVD
2. Which of the following is not a part of dish accessory?
   A) Dish Stand B) LNB
   C) Coaxial Cable **D**) Finder E) all
3. Which of the following device is used to indicate the signal strength during dish installation?
   A) Receiver **B**) finder
   C) Dish D) TV E) all

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-3	Tighten firmly Dish/antenna with stand after optional signal obtained

2.3. Tighten firmly Dish/antenna with stand after optional signal obtained

- Tightening is the process of bolting and fitting all the above assembled connections/ bolts and connected antenna..

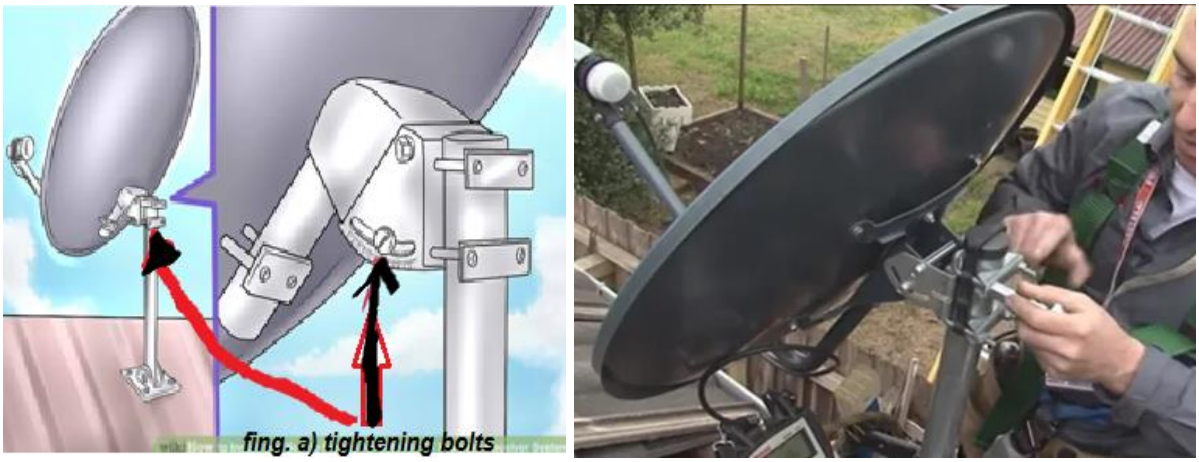


Fig. Tightening loosely connected bolts and nuts

Fig. tightening and connection to base or wall

Self-check 3	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (1 point each)

4. Why tightening is made after installation?

   A) To avoid miss alignment

   B) To disconnect coaxial cable

   C) To Bore the hole

   D) To select place

5. Which of the following tool can help to tight dish or its accessory?

   B) Screw driver B) multi meter C) Side cutter **D**) finder

6. Which of the following device is used to indicate the signal strength during dish installation?

   B) Multimeter **B**) Signal meter C) TV set D) Dish E) all

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-4	**determine location of satellite / antenna for good reception**

2.4. Connect/disconnect signal finder between LNB and satellite /antenna receiver to tune until the system obtain maximum output

- **Connect the satellite tuner/finder.** Using long coaxial cable on your satellite, plug in the satellite tuner. A satellite finder detects power over the entire spectrum of the LNBF. It gives an indication of the total power received from all transponders on the satellite. When using a satellite finder, there is a danger of aligning the antenna with the wrong satellite. During an actual installation, it is important to verify with a receiver that the correct satellite was selected.

How to connect:

1. Connect a jumper cable from the LNB to the “Satellite” port on the digital SATFINDER.
2. Connect the cable from your satellite receiver to the “Receiver” port on the digital SATFINDER

Fig. Finder connection

Self-check – 4	**Written test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (3 point each)

1. What is the direct role of finder during dish installation?

   A) To measure voltage

   B) to measure Resistance C) to measure signal strength D) Sound E) all

2. Most of the time, why we install dish antenna outdoor?

   A) To receive strong signal

   B) To avoid obstruction C) to keep setting direction D) all E) non

3. Which of the following order of connection is correct?

A) Receiver ➔finder ➔ Dish

B) Finder ➔TV ➔ dish

C) Dish ➔Receiver ➔ finder

D) Finder ➔ Dish ➔ TV

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-5	**Perform operational check according to manual**

2.5. Perform operational check according to manual

While aligning your dish, you can measure your signal strength by using either the indicator built in to your satellite receiver's software or a signal level meter.

- Signal strength updates every few seconds, so there will be some delay from when you move the dish and when the change registers on the TV screen.
- If you can't see the screen, have someone watch it for you during the moving process so you can ensure the best-possible signal.

1. Switch the satellite receiver on, the digital SATFINDER will turn on by itself.
2. Set your dish to the proper azimuth and elevation settings.(The information should be supplied with your satellite dish).
3. Adjust the knob until the signal strength display at 0%(the critical point).
4. Peak the signal by slowly moving the azimuth and elevation of your dish. The higher values, the better signal. If the digital SATFINDER's reading becomes full scale, you can adjust the “ATT” to reduce the incoming signal to a lower level. Continue to move the dish until you have the highest possible meter reading and the highest possible buzzer pitch.
5. Remove the jumper cable and digital SATFINDER, and reconnect the LNB/LNBF to your receiver.

IMPORTANT NOTES:

- To avoid a continuous full scale reading, do not use the digital SATFINDER directly in front of the dish.
- When using a LNB with gain higher than 60dB, insert a 5dB attenuator between the LNB/LNBF and the digital SATFINDER.
- In case no satellite receiver is at hand a 13-18V DC power supply with F-connector can be connected on the “Receiver” side of the digital SATFINDER to power the SATFINDER.

Input frequency	950-2150MHz	Input impedance	75Ohm , F-connector	Operating range	(LNB gain) 52 -60dB
Input level min.	40dBm	Output impedance	75Ohm , F -Connector		
Input level max.	10dBm	Power supply	DC 13-18V		

- Under the following test condition: LNB gain =55dB, the carrier C/N=15dB.
- Insert a 5dB attenuator when operating with LNB gain =60 ~ 65dB.

Note:

- ✓ All specifications cited in this leaflet are subject to change without notice.

Self-check – 5	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (2 point each)

1. Operation check is performing _____
   A) Maintenance of the circuit
   B)Purchase C) Measuring signal strength D) all
2. Most of the time, why we install dish antenna outdoor?
   B) To receive strong signal
   B) To avoid obstruction C) to keep setting direction D) all E) non
3. Which of the following order of connection is correct?
   E) Receiver ➔finder ➔ Dish
   F) Finder ➔TV ➔ dish
   G) Dish ➔Receiver ➔ finder
   H) Finder ➔ Dish ➔ TV

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-6	**Determine azimuth and elevation using service manual**

2.6. Determine azimuth and elevation using service manual

The hardware inside your antenna is quite complex. The antenna must point in a certain direction, ascertained by a pinpoint in the sky where azimuth and elevation meet. When a satellite antenna moves to the left or right, that is the azimuth, or X-axis, plane of view. When the machine moves on the Y-axis, this is where elevation comes into play.

You will adjust the dish as follows to set the azimuth, elevation, and skew:

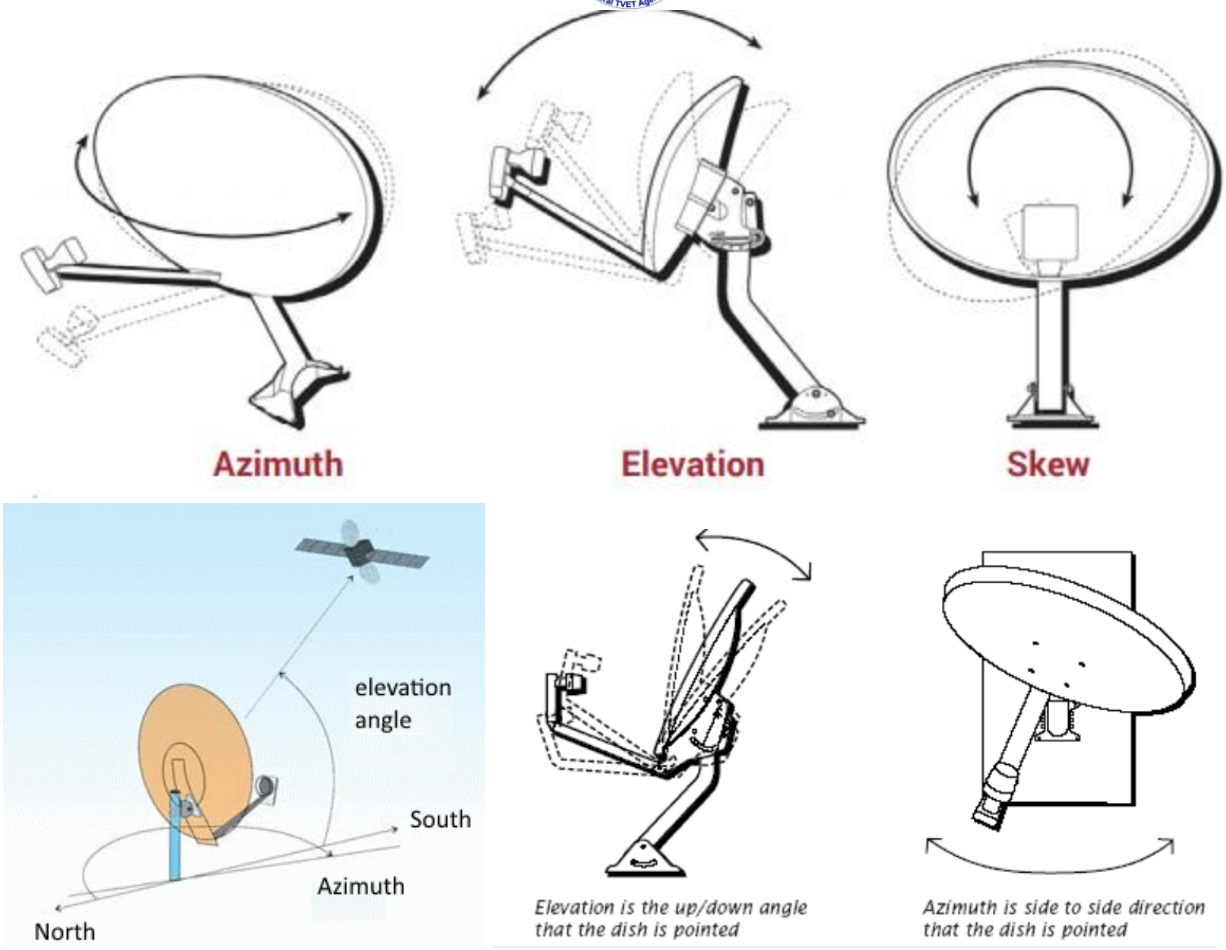


Fig. angle adjustment

The is by rotating the system on a 360° axis to scan the sky and find the exact elevation and azimuth of the satellite with the strongest signal. The system must be checked turning as shown in the above figure. By gathering information using satellite finder we can scan and see from which direction can be received the strongest RF signal.

The antenna Azimuth and elevation be adjusted according the signal intensity and signal quality which are showed in the meter. Stop to adjust the antenna when signal quality to be max value (attention: when you start to adjust the antenna, please set the signal intensity to be max value)

Self-check – 6	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part I. Choose the best answer for the following questions? (1 point each)

1. What is azimuth angle?

A) **Horizontal** B)Vertical

C) Measuring device D) all

2. Which of the following device is signal reflector?

3. Receiver B) LNB

C) **Dish** D) all E) non

B) Tuning is the process of _____adjusting?

A) Turning of dish

B) Selection of Location

C) **Scanning** of quality signal

D) Cleaning of receiver

Note: **Satisfactory rating 3 and 6 points** **Unsatisfactory below 3 and 6points**

You can ask you teacher for the copy of the correct answers.

Answer sheet

Score _____
Rating _____

Name: _____ Date: _____

Short Answer Questions

Reference

1. Satellite Orbits, Coverage,and Antenna Alignment, By the staff of Festo Didactic, 04/2016
2. Satellite Dish Installation Manual (Ver. 1), HOME 2 US,
3. MUL-1.2M-KU Satellite Dish Manual
1. https://www.youtube.com/watch?v=pC8JPazn_8U

2. https://www.wikihow.com/Install-and-Set-Up-Free-to-Air-Satellite-TV-Program-Receiver System
3. https://www.youtube.com/watch?v=53w7QRNFmLY
4. https://www.youtube.com/watch?v=MI5UY2yvjaY