

VSAT INSTALLATION GUIDE

The VSAT system consists of the following hardware:

The Outdoor unit assembly

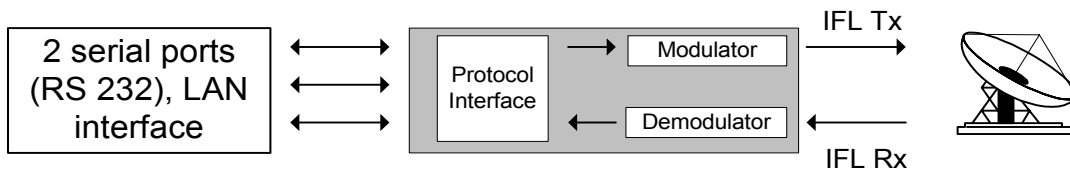
The Indoor unit assembly

The outdoor unit assembly consists of:

1. 1.2 m antenna operating in the Ku band
2. Standard L-band LNB for the receiving signal. The LNB converts the Ku band signal received from the satellite into an L band signal.
3. Transmitter for the transmitting signal. The transmitter converts the L band signal transmitted from the VSAT into a Ku band signal.
4. OMT (Orthomode Transducer) separates the transmit signal from the received signal, taking advantage of their different polarization and frequency.
5. Two IFL cables connecting the indoor unit assembly with the outdoor unit assembly. The IFL cabling carries the inbound and the outbound signals and the 24 VDC for the LNB.

The indoor unit assembly consists of the Indoor Unit (IDU) which contains the following:

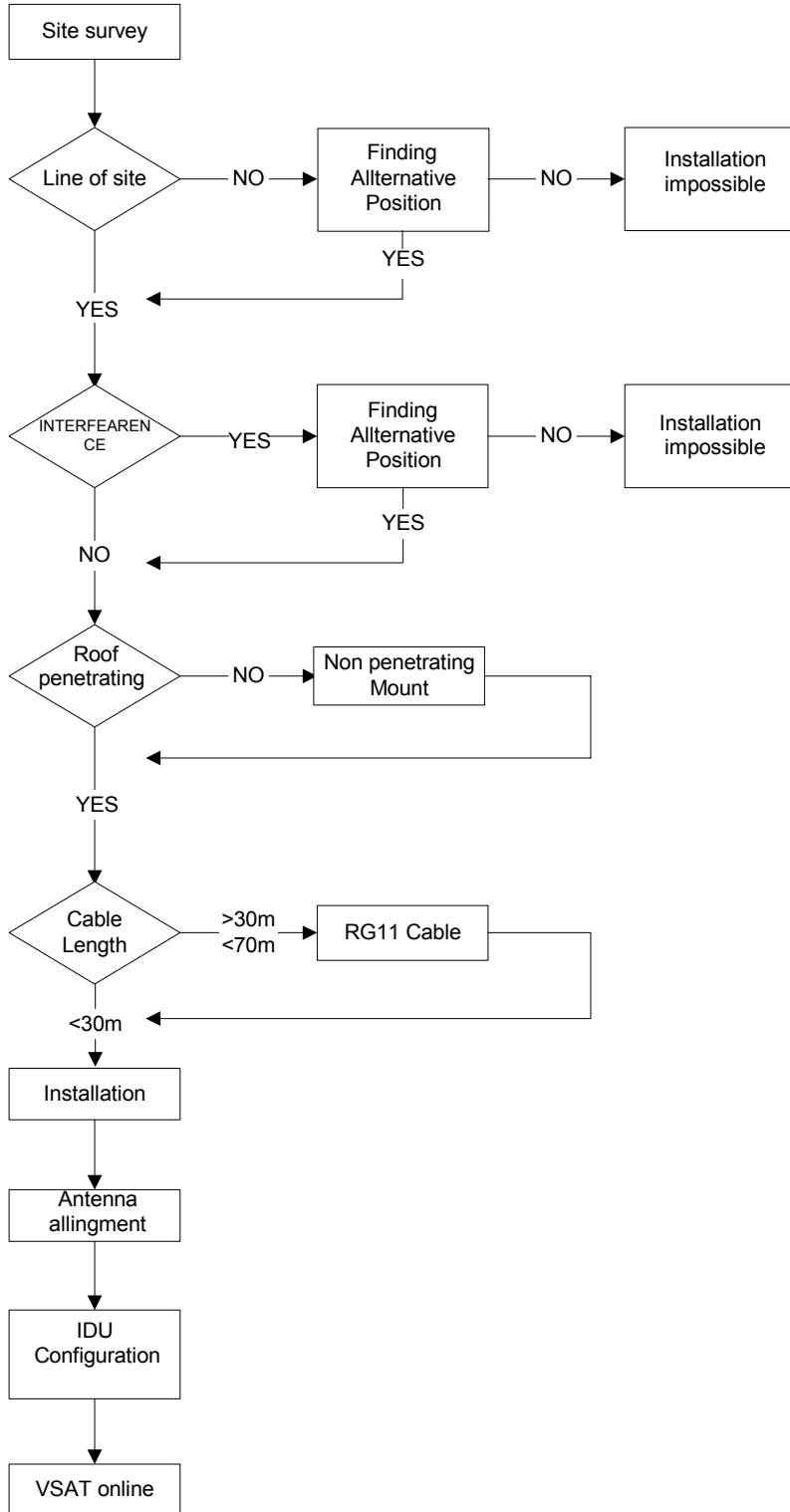
1. The Modulator
2. The Demodulator
3. Two serial and one Ethernet port.



VSAT system architecture (block diagram)

General flow chart concerning VSAT installation

The actions that will follow the site survey until bringing the VSAT online are:



Site Survey

Before installation, a field operations engineer should visit the site that the VSAT is to be installed. The engineer has to take care of the following:

1. Absence of high-rise buildings, trees etc, which may block the signal path.
2. Absence of interference by using a gun and a field meter.
3. Existence of AC power during installation.
4. Existence of a clear, unobstructed line of sight to the designated satellite
5. Acquisition of the longitude and latitude using GPS.
6. Existence of a LAN network near the IDU.
7. Estimation of the maximum cable length.
8. Free access to the roof of the building.

The IDU is designed for installation indoors. It may be placed on top of a bench or on a shelf in a rack. While placing the IDU the following requirements should be met:

The IDU includes a fan for ventilation. To allow proper airflow and to guarantee safe operation of the VSAT equipment, make sure that:

The rear panel of the IDU is not covered.

The IDU is not placed in an unventilated enclosure.

At least 10 cm of space along the IDU sides are left for ventilation.

The maximum ambient temperature is 50 °C.

Place the IDU where it can be easily accessed by a technician during maintenance.

Place the IDU away from electromagnetic field emitting devices.

Installing a VSAT

Roof penetrating

If penetrating the roof is allowed, secure the pole to the roof by penetrating large bolts. Apply silicon for additional rain protection.

In case penetration of the roof is not possible, a non-penetrating mount should be used.

ODU assembly and installation

Install the AZ/EL cap on the ground pole by inserting the four plow bolts into the holes in the reflector face and insert the exposed portion of the bolts into the holes in the antenna mount flange. Tighten the clamp nuts so that the cap is held stationary on the pole.

After setting the antenna to the approximate azimuth and elevation angles, assemble and attach the ODU to the antenna as described in the following sections. Attach the LNB and the transmitter to the OMT (Orthomode Transducer) after placing the "O"- Ring on its corresponding groove on them.(figure 1) Verify that the wave-guide polarization is correct both in the LNB and the transmitter.(figure 2) **The correct**

polarization is set by rotating the outdoor electronics to the appropriate position (this is need to be made through a phone call to the NOC). The VSAT is designed to receive and transmit on opposite polarization. Tight the four screws. Assemble the feed legs to the antenna. The bottom feed leg is the shortest one. Assemble the feed mounting block to the feed support legs. Tighten the hardware securing side and the bottom feed legs to the feed support block and the reflector.

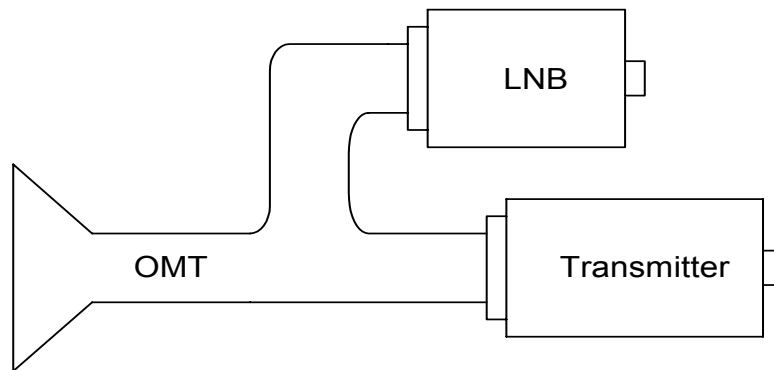


figure 1: LNB and Transmitter assembly

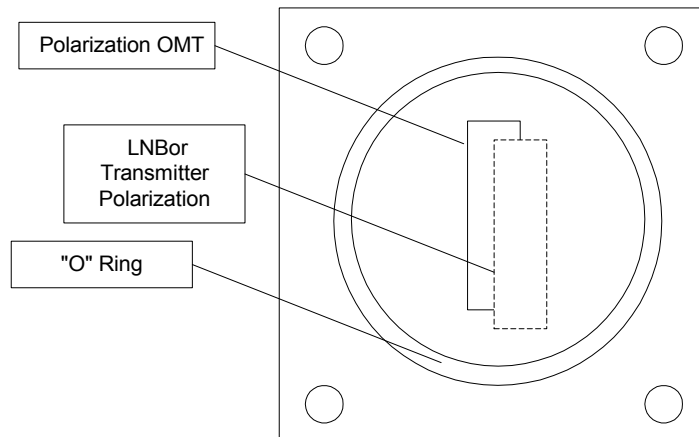


figure 2: correct wave guide polarization

Place the ODU assembly on the antenna support arm. Tighten the nuts and finally connect the two coaxial cables to the LNB OUT port and the Transmitter IN port.

Antenna alignment

Point your dish to Telestar 12, if you have a spectrum analyzer, you can see your signal at 11597.408 MHz RF frequency, or 1597.408 L-band frequency (the output of the VSAT is

L-band) and try to maximize it by slowly turn the feeder to the left or right. Screwing the feeder back, will have to be done extremely cautiously (one screw at a time, just 1 turn until all screws are in place)

Set the antenna to the approximate azimuth and elevation angle. The exact azimuth and elevation angles come out of the exact geographical longitude and latitude. Notice that the specific channel master antenna has a 17 degrees offset. So, add 17 degrees to the calculated elevation angle. Connect a field meter to the receive IFL cable. Set the antenna elevation, using the antenna adjust mechanism, until the inclinometer indicates the calculated elevation. Move the antenna's azimuth and elevation until carriers are displayed on the field meter. Adjust the field meter controls. Slowly rotate the antenna for largest possible carrier amplitude. When found, tight the antenna hardware.

IFL cable connections

Connect the ODU to the IDU using two IFL coaxial cables as follows:
Connect one IFL cable from the transmitter to the RF OUT port of the IDU.
Connect the second IFL cable from the RF IN port of the IDU.
The cable length should not exceed the 30 meters for an RG 6 type cable. Use RG 11 type coaxial cable for longer distances.

Final checklist

Ensure that all the cables are connected to the correct terminals and are firmly tightened. Tie wrap cables to the antenna assembly. Leave enough extra cable at the antenna. Tie wrap the cable to the mast. Make sure that all outdoor connectors are weatherproofed after any necessary testing has been completed.

Polarization adjustment

Contact the hub operator.

VSAT powering up

After proper installation and configuration, the VSAT system is now ready to go online with the hub. The VSAT operations during power up process is shown below:

Connect the receive IFL cable with the RF IN socket and the transmit IFL cable with the RF OUT socket. Set all dip switches OFF and power up the IDU. The VSAT goes through a self test routine. After the successful completion of the self test, the LCD goes blank and displays **REMOTE IS READY**.

VSAT begins scanning its RF input, looking for a valid outbound signal transmitted from the hub. The LCD displays **IFL SCANNING**.

If the scanning process is valid, the following messages are displayed on the LCD:

IFL OK M

SCANNING xxx where xxx is the number that monitors the scanning process.

If the input level is too low, VSAT will continue scanning the RF input.

When the VSAT detects a signal in the scanned range, the receiver locks.

VSAT begins searching for the Outbound ID.

If the ID is not found, the VSAT returns in the scanning mode, the Rx LOCK LED turns off, and the process is repeated until an Outbound signal with the correct ID is found.

When the ID is detected, the LCD displays the estimated BER of the inbound signal. In a normal network, with clear sky conditions the message should be

BER<1x10⁻⁸

VSAT transmits a request to go online.

If the request is correctly received at the hub, an acknowledgment of the received message and a permission to go online is transmitted to VSAT.

If the answer from the hub is not received, the VSAT continues to transmit this message at random intervals.

VSAT goes on line.

VSAT transmits a software download request.

If the boot request is granted, VSAT starts software downloading process. To monitor the downloading process, view the following LCD messages via arrow push buttons:

Rxx of 25. This message displays the number of retries to download software from the NMS.

xx- the current retry number, 25- the maximum number of retries. After 25 unsuccessful attempts to download the software, VSAT resets.

Txxx of Nyyy. This message is displayed if there is no download on the Outbound.

Txxx- timer, Nyyy- indicator of the next boot request transmission. When the timer value becomes equal to the indicator value, the boot request is issued.

DL xxxx. This message monitors the downloading process. xxxx- is the number of the downloaded packets. A download usually takes about 4500 packets. (this number may vary due to the retry process).

At the end of the successful download, the LCD freezes.

Within a random interval (usually less than a minute) VSAT transmits a request for configuration parameters download.

Within a few seconds VSAT resets, repeats scanning, locking on the Outbound and connecting to the hub processes.

VSAT goes online. At this point, it is running the downloaded software and is ready for normal operation.

VSAT normal operation

When the VSAT is in normal operation, all DIP switches are set to OFF, the three LEDs in the front panel: POWER, RX LOCK and ON LINE are on. The list below shows some of the messages on the LCD display during normal operation.

- USAT M: VSAT ID
- PORT 3 Ether: Port Status
- PORT 2 x 25 LP: Port Status
- FW VER: Current EPROM Version

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- OS.VER x.x.x: Software Download Version
- Receiver Lock: P VSAT is locked on the Outbound
- Outbound ID OK: Outbound ID is detected
- Rx=747 Tx=757 M: Outbound signal frequency
- IFL OK M: Receive level (IFL)

CONFIGURATION PARAMETERS

IDU configuration

The IDU configuration is performed via a VT 100 terminal or a PC emulating VT 100 operation using configuration cable. Attach from the VT 100 serial port to the port 1 of the VSAT's rear panel a 25-pin RS-232 cable [**You just need a typical PC-to-modem (9pin-->25pin) straight through serial RS-232 cable**], set dip switch 1 ON and power on the IDU. Set the communication parameters according to VT 100 configuration as follows:

Bits per second: 9600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

Insert the following parameters:

INDOOR UNIT CONFIGURATION PARAMETERS

General parameters: (of both MAIN & BACKUP satellites)

USAT OWN ADDRESS ¹		
USAT GROUP ADDRESS	8176	
OUTBOUND RATE	1024	
OUTBOUND MODULATION	Q	
OUTBOUND REED SOLOMON	Y	
TIME SLOT DURATION	7888	
OUTBOUND ID		1fe
OUT CODE RATE n/4	2	
INTERLEAVER ID	0	
ESTABLISH LINK	Y	
INBOUND MODULATION	M	
INBOUND RATE RA	76800	
DUAL INBOUND RATE		Y
INBOUND RATE RA	153600	
INBOUND REED SOLOMON	N	
INBOUND CONVOLUTION	Y	
INBOUND RA FRAME LENGTH	450	
INBOUND DA FRAME LENGTH	928	
K FOR INB CODING	7	
HPP ID	1	
HSP LINK NUMBER	1	
LOAD PROBE	N	
Enter installation PASSWORD	123	
Do you want to change password?	N	

MAIN satellite parameters :

¹ Provided by the hub operator

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OUTBOUND frequency 1594
channel DELAY Related to the exact geographical location of the VSAT. To be assigned by EgyptSat
inbound REFERENCE frequency 1335048
inbound IDLE frequency 0
DAY parameters : (of MAIN satellite)

NUMBER of inbound bands 1
inbound BAND 1 (lower frequency):
START frequency 1346808
STOP frequency 1348128

NIGHT parameters : (of MAIN satellite)

NUMBER of inbound bands 1
inbound 1 (lower frequency) :
START frequency 1346808
STOP frequency 1348128

for both DAY & NIGHT bands:

inbound INITIAL frequency 1347408
inbound initial OFFSET

BACKUP satellite parameters:

OUTBOUND frequency 1594
channel DELAY Related to the exact geographical location of the VSAT. To be assigned by EgyptSat
inbound REFERENCE frequency 1335048
inbound IDLE frequency 0
DAY parameters: (of BACKUP satellite)

NUMBER of inbound bands 1
inbound BAND 1 (lower frequency):
START frequency 1346808
STOP frequency 1348128

NIGHT parameters: (of BACKUP satellite)

NUMBER of inbound bands 1
inbound BAND 1 (lower frequency) :
START frequency 1346808
STOP frequency 1346808

For both DAY & NIGHT bands:

inbound INITIAL frequency 1347408

In the option **VSAT OWN ADDRESS** insert the number **499068** in order to enter in another menu where the serial number of the specific VSAT can be entered. Much care must be taken with the **LAPU parameter** value. Set this value to **10**.

In order to erase the EEPROM memory of the IDU, insert the value **499068** in the option **VSAT OWN ADDRESS** and also insert the value **-1** in the field **ENTER SERIAL NUMBER**. Power off and then power on the IDU. After power up, the IDU serial number will be asked. Insert the IDU serial number

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and then power off and power on the VSAT. Insert the new configuration parameters. Reboot the IDU. The message **BUS ERROR!!!** will be displayed in the LCD. Reboot the IDU (power off and then power off) twice.

Appendix A

The procedure for setting the Indoor Unit in Carrier Wave (CW) Mode (only for trouble shooting and it need to be requested by EgyptSat

In order to set the IDU in CW mode, switch off the IDU. Connect a VT 100 terminal to port 1 of the IDU. Set the communication parameters according to VT 100 configuration as follows:

Bits per second: 9600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

Set dip switch 5, from the rear panel, ON.

Switch the IDU on.

From the menu, choose the option number 5 and press Enter.

Enter value 1347408 and press Enter.

The word O.K. appears.

Choose the option number 1 to transmit a CW signal with no modulation and press Enter.

Call EgyptSat. for proper antenna adjustment.

Stop the CW transmission by entering 0 at the VT 100 terminal.

Set dip switch 5 off, and reboot the IDU.

In order to set the IDU in CW mode, switch off the ICU. Connect a VT 100 terminal to port 1 of the IDU. Set dip switch 5, from the rear panel, ON. Switch the IDU on. From the menu, choose the option number **5** and press **Enter**. **Enter the desired frequency in KHZ** and press Enter. The word **O.K.** appears. Choose the option number **1** to transmit a CW signal with no modulation and press **Enter**. Stop the CW transmission by entering **0** at the VT 100 terminal. Set dip switch **5** off, and reboot the IDU.