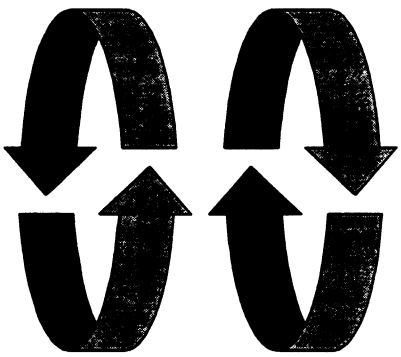
ORION ATLANTIC EUROPE, Inc.

VSAT Certification Training Course



Ground Operator Procedures Manual

ORION ATLANTIC EUROPE, Inc.

Ground Operator Procedures Manual

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Chapter 1
Site Survey Procedure

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Site Survey Prerequisites

- Prior to the site survey, contact the customer and explain what is expected from him during the survey. Explain the purpose of the site survey to the customer and give him the details to the best of your knowledge.
- Advise the customer to contact the building owner and the civil engineer and request their presence during the site survey.
- Inform the appropriate Orion program manager of the day and the time during which the survey is to be completed.
- To perform the site survey, bring the following documents: the Orion Service Order; the Orion Preliminary Engineering Document (PED), if applicable; and the Orion Site Survey Form.
- To perform the site survey, bring the following tools: a compass, an inclinometer, a camera, a measuring tape, a marker, and some basic tools such as screwdrivers and pliers.
- During the site survey please follow the guidelines as stated on the Site Survey Form. Try to provide as detailed information as possible, and feel free to add comments wherever there is a need for it. Do not hesitate to provide alternative solutions for possible problems.
- Please use photos and sketches to clarify layouts and diagrams.
- Please take the time to represent Orion according to international hospitality standards and with respect to local customs and culture. Remember, you represent an international telecommunications company, Orion will be judged by your actions.
- **Immediately inform the Orion program manager for this project, if, at any time, you feel there are issues which could jeopardize the progress of the project.**

SITE SURVEY FORM

Customer

Site: _____
Name: _____
Address: _____
_____
Contact Name: _____
Phone: _____
Fax: _____

Landlord, Building Manager, or Owner

Name: _____
Address: _____
_____
Phone: _____
Fax: _____

Alternate Contact: _____
Phone: _____
Fax: _____

Shipping Address

_____
_____
_____
_____

Zoning Permit Contact

_____
_____
_____
_____

Section 1: Building/Site Information

Section 1 is designed to present information about the building/site. Pay special attention to site access approval issues from building manager or owner. Look for the best possible location for placing the antenna system.

Building/site type: Owned: ☐ Leased: ☐
Explain: _____

Building/site height: Stories: _____ Feet: _____
Explain: _____

Building external wall composition: Glass: ☐ Brick: ☐
Explain: _____

Approval obtained for access to building/site: Yes: ☐ No: ☐
Explain: _____

Approval obtained for placing antenna: Yes: ☐ No: ☐
Explain: _____

Any special requirements for access to building/site: Yes: ☐ No: ☐
Explain: _____

Is there a place on site where equipment may be stored prior to installation: Yes: ☐ No: ☐
Explain: _____

Will the antenna system be placed on the roof: Yes: ☐ go to section 2A No: ☐
Explain: _____

Will the antenna system be placed on floor level: Yes: ☐ go to section 2B No: ☐
Explain: _____

If both previous questions where answered, "No," please go to section 2C and follow the instructions.

Section 2A: Antenna Location, Roof

Complete Section 2A if the antenna system is to be placed on rooftop level using a standard non-penetrating mount. Pay speciall attention to rooftop load capacity and rooftop composition. A standard 2.4m antenna system assembled on a non-penetrating mount, including the ballast that keeps the system stable, weighs approximately 900 kg. The weight is spread over approximately 25m².

Landlord approval for placing antenna obtained: Yes: ☐ No: ☐
Explain: _____

Is sufficient roof space available (at least 5m x 5m): Yes: ☐ No: ☐
Explain: _____

Is the roof flat (maximum inclination 5°): Yes: ☐ No: ☐
Explain: _____

Roof composition: Built-up: ☐ Membrane: ☐
Other: _____

Roof strut spacing: _____

Roof access: Penthouse: ☐ Hatch: ☐
Explain: _____

Location and type of roof access: _____
_____

Size of roof access opening: _____

Method of transporting dish to roof: _____

Is service elevator available: Yes: ☐ No: ☐
Explain: _____

Is the antenna easily seen from ground: Yes: ☐ No: ☐
Explain: _____

Is the antenna allowed to display the Orion name and logo. : Yes: ☐ No: ☐
Explain: _____

Is the antenna safe from unauthorized access: Yes: ☐ No: ☐
Explain: _____

Section 2B: Antenna Location, Floor Level

Complete Section 2B if the antenna system is to be placed on ground level using either a standard non-penetrating mount or a pole mount. Pay special attention to trench and/or conduit requirements.

Landlord approval for placing antenna obtained: Yes: ☐ No: ☐
Explain: _____

Is sufficient floor space available (at least 5m x 5m): Yes: ☐ No: ☐
Explain: _____

What is the soil composition: _____

Standard non-penetrating mount or pole: Standard: ☐ Pole: ☐

Height of pole: Above ground: _____ Below ground: _____

Trench and/or conduit required: Yes: ☐ No: ☐
Explain: _____

Is the antenna easily visible to public: Yes: ☐ No: ☐
Explain: _____

Is the antenna allowed to display the Orion name and logo: Yes: ☐ No: ☐
Explain: _____

Is the antenna safe from unauthorized access: Yes: ☐ No: ☐
Explain: _____

Section 2C: Antenna Location, Alternative solution

Complete Section 2C only if the antenna system cannot be placed on either rooftop or floor level. Please contact the Orion program manager for this project as stated in the Preliminary Engineering Document and discuss the situation before you leave the site. Provide as much detail as possible when describing the alternative solution for placing the antenna system. Add drawings and photos of the proposed solution.

Explain: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please provide a sketch of the alternative location:

Section 3: Satellite ARC Clearance

Section 3 is designed to gather information on the satellite ARC clearance for the chosen antenna position. Please contemplate magnetic deviation for the azimuth. Also pay special attention to possible obstructing elements anticipating future building construction, cranes, air traffic, growing trees, etc. Keep an adequate margin for azimuth and elevation angles to assure a clear view to the spacecraft.

Please state the site latitude: _____ Please state the site longitude: _____

Satellite name # 1 : _____

Elevation angle # 1 : _____ Azimuth angle # 1 : _____ Clear view: Yes: ☐ No: ☐
Explain: _____

Satellite name # 2 : _____

Elevation angle # 2 : _____ Azimuth angle # 2 : _____ Clear view: Yes: ☐ No: ☐
Explain: _____

Is the view blocked for the above range: Yes: ☐ No: ☐
Note exceptions: _____

Section 4: Electrical Wiring for Transceiver—and Antenna De-icing Power

Section 4 is designed for gatherinng information about the electric wiring. Unless prohibited by local law, Orion provides a 240V/50Hz weather proof junction box for connecting de-ice and transceiver power. Note: The junction box also provides connectivity for the M&C cable. Keep in mind that the system requires 2 separate, 3 lead, single phase, AC, heavy duty, outdoor, power cables that are normally provided and isntalled by the customer. M&C and IF cables are provided by Orion.

Electrical wiring to be done by: _____

Electrical wiring safe from unauthorized access: Yes: ☐ No: ☐
Explain: _____

Note: In certain territories where Orion does not consider snow and ice to present a potential problem, the antenna may not be equipped with a de-ice system. If no de-ice system is provided, only one power cable is required. If uncertain, please contact the Orion program manager.

Section 5: Cabling

Section 5 covers inter-facility, monitor & control, and customer interface cabling. Pay special attention to any required wall and floor penetrations, and notify the customer that he is repsponsible for the wall and floor penetrations. Also notify the customer that any cable ducts or trays that may be required to aid the routing of the cable, must be provided and installed by the customer in advance of the Orion installation. Orion provides high quality shielded IF and M&C cabling. Note: A standard cable run is 150m. For longer cable runs the non-standard portion is charged to the customer. The customer is responsible for providing the cable between his equipment and Orion's.

Total length of cable run from antenna to indoor equipment: _____ m

Is there an existing cable entrance in building: Yes: ☐ No: ☐
Explain: _____

Do wall penetrations have to be made: Yes: ☐ No: ☐
Explain: _____

Do floor penetrations have to be made: Yes: ☐ No: ☐
Explain: _____

Does the building owner agree to the penetrations: Yes: ☐ No: ☐
Explain: _____

By local regulation, what cable type is required: No Regulation: ☐ Vinyl: ☐ Teflon: ☐
Other: _____

Does plan compromise fire break: Yes: ☐ No: ☐
Explain: _____

Please state distance between the Orion indoor unit and the Customer's circuit: _____ m
Explain: _____

Section 6: Indoor Equipment

Section covers the location of the Orion indoor unit. Pay special attention to environmental condition and security (access) properties of the location. Also, anticipate cable entrance issues. The Orion indoor unit utilizes approx. 1m² of floor space.

Describe location of indoor equipment: _____

_____

Describe environment for indoor equipment (check all that apply):

Computer room:	☐	Normal temperature:	☐	Auto fire detection:	☐
Phone room:	☐	Normal humidity:	☐	Auto fire extinguisher:	☐
Storage room:	☐	Ventilated:	☐	Burglar alarm:	☐
Other: _____		Air Conditioned:	☐	Authorized access:	☐

Is there sufficient space to place indoor equipment: Yes: ☐ No: ☐
Explain: _____

AC power available to equipment: Dedicated: ☐ Yes: ☐ No: ☐
Explain: _____

Is an Uninterruptable Power Supply (UPS) , with sufficient capacity for the Orion equipment (typically 6 amps or less) available: Yes: ☐ No: ☐
Explain: _____

Where is the A.C. circuit controlled? Yes: ☐ No: ☐
Explain: _____

Section 7: Management & Control Connection

The Orion VSAT equipment requires a standard 2 wire telephone connection for network management and control. The connection is made through a low speed (14.4 kbaud or lower) telephone modem.

How is dial-up M&C connection to be made:

Direct inward dial extension from PBX:	☐	Direct (to PSTN) outside line:	☐
Operator assisted extension from PBX:	☐	Other: _____	

Is the M&C line currently available: Yes: ☐ No: ☐

If yes, list the number, if available: _____

If no or if number is not known, name contact person for arranging the line: _____

_____

Section 8A: Existing Telecommunications Equipment, Voice and Fax

Section 8A covers voice and fax communication equipment. Complete this section only if customer voice or fax are to be connected to the Orion equipment.Please state any abnormality that you think could hold up or delay the installation of the VSAT station. Pay special attention to interfaces, cables and protocols.

State PBX manufacturer and model: _____

State PBX interface capabilities (check all that apply):

Ring/Loop start:	☐ type: ____	E1:	☐ type: ____	DID:	☐
E&M 2W:	☐ type: ____	CAS:	☐ type: ____	DOD:	☐
E&M 4W:	☐ type: ____	BRA-ISDN:	☐ type: ____	DISA:	☐
AC 15:	☐ type: ____	PRA-ISDN:	☐ type: ____	LCR:	☐

State distance from PBX to Orion equipment: _____ m

Preferred interface between PBX and Orion IDU: Telco: ☐ RJ45: ☐ 66-Block: ☐ BNC: ☐

How many facsimile machines at the site are to access the Orion system: _____

Section 8B: Existing Telecommunications Equipment, Data

Section 8B covers data communication equipment. Complete this section only if customer data equipment is to be connected to the Orion equipment. Please state any abnormality that you think could hold up or delay the installation of the VSAT station. Pay special attention to interfaces, cables and protocols.

What data equipment is to interface with the Orion equipment: _____

Equipment manufacturer: _____ Model: _____

Please state: Electrical interface: V/RS _____ Mechanical interface: _____ M/F

Please state: Cable Type: _____ Shielded: ☐ Un-shielded: ☐

Please state: Protocol: _____ Application: _____

Comments: _____

Section 9: Permits & Union Issues

Complete Section 9 when union approval or special permits must be obtained.

What permits are required for installation of the satellite earth station:
No permits are required: ☐ Building permit required: ☐
Zoning permit required: ☐ Other: _____

If a permit is required, does the customer want to proceed with the installation without obtaining the permit:
Yes: ☐ No: ☐

Explain: _____

If a permit is required, what documentation/information is required:
Explain: _____
_____

Can you, as GO, secure all the documentation required for the permit: Yes: ☐ No: ☐

What information do you need, Explain: _____
_____

Estimated time needed to secure permits: _____

Comments: _____

Does the local union require involvement in the installation: Yes: ☐ No: ☐

If yes, in what area(s) do they require involvement:
Electrical: ☐ Mechanical (dish installation): ☐ General labor: ☐

What is the cost of the union involvement: _____

Comments: _____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Section 10: Photographs

Attach photos of building below.

Attach photos of indoor equipment location below.

Section 10: Photographs

Attach photos of antenna location below.

Attach view to satellite arc below.

Section 10: Photographs

Attach cable run photos below.

Attach other photos here.

Section 11: VSAT Equipment Room Layout Sketches

Chapter 2
Site Preparation Procedures

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2.1. Preparation of the Outdoor Unit location

t.b.d

2.2. IF/NMC/Power cables and ducting

t.b.d

2.3. Preparation of the Indoor Unit location

t.b.d

2.4. IF-Cable Connector Assembly and Mounting

Scope
The intention of "Chapter 2.3, IF-cable connector assembly and mounting" is to describe a practical procedurefor creating a perfect IF-cable. Orion Atlantic uses twin coaxial cable, specifically, a double RG-11, 75Ω impedance cable manufactured by Olympic Wire & Cable.

The cable is marked TX & RX and has // marks every meter on the back of the cable for easy hand measuring.

Orion ships the Siamese coaxial cable together with Orion Connector Kit part # SHU-61005 which includes three each of Suhner connector part # 11BNC-75-7-5c (to be used indoors), and part # 11N-50-7-60 (to be used outdoors). Two of each connector is needed to build the cable (one for TX, and one for RX), the third is a spare in case one is damaged while building the cable. Also included in the kit are two sheets of instructions and 5 pieces of heat shrink tubing. Four pieces of shrink tubing are to be used on each of the 4 connectors, and the fifth is a spare.

Use *only* Suhner connectors provided by Orion Atlantic.

Orion uses Olympic cable because of its 1.02 mm stranded center. The previously used Belden 9292 cable has a 1.63 mm stranded center conductor and therefore the connectors do not fit.

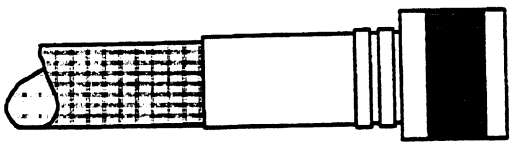
At the Outdoor Unit

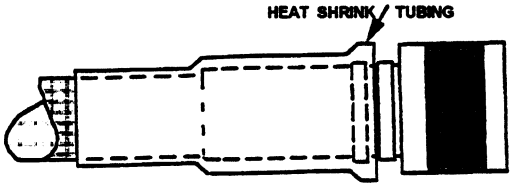
1. Build and attach the two 11N-50-7-60 connectors on the outdoor end of the cable following the instructions found in the kit or in "8.3 Assembly Procedure Suhner BNC-connector on RG-11 Cable." Always double check the quality of the assembly by testing on short-circuit with, *e.g.*, an Ohm meter and on mechanical construction.

2. After the connectors are installed on the coax cable (see figure below), the heat shrink tubing can be installed over the coax connectors and heated with a heat gun or a gas torch. Be careful not to overheat the coax cable when applying heat.

3. After the coax cable is connected to the radio, the connection at the radio must be wrapped with waterproof tape.

Do not install heat shrink over connector and radio!





The heat shrink tubing is a heavy wall tubing with a 3:1 shrink ratio and has an adhesive lining. When the tubing is heated, the internal adhesive melts and produces a strong, waterproof, mechanical bond between the cable and the connector body.

At the Indoor Unit

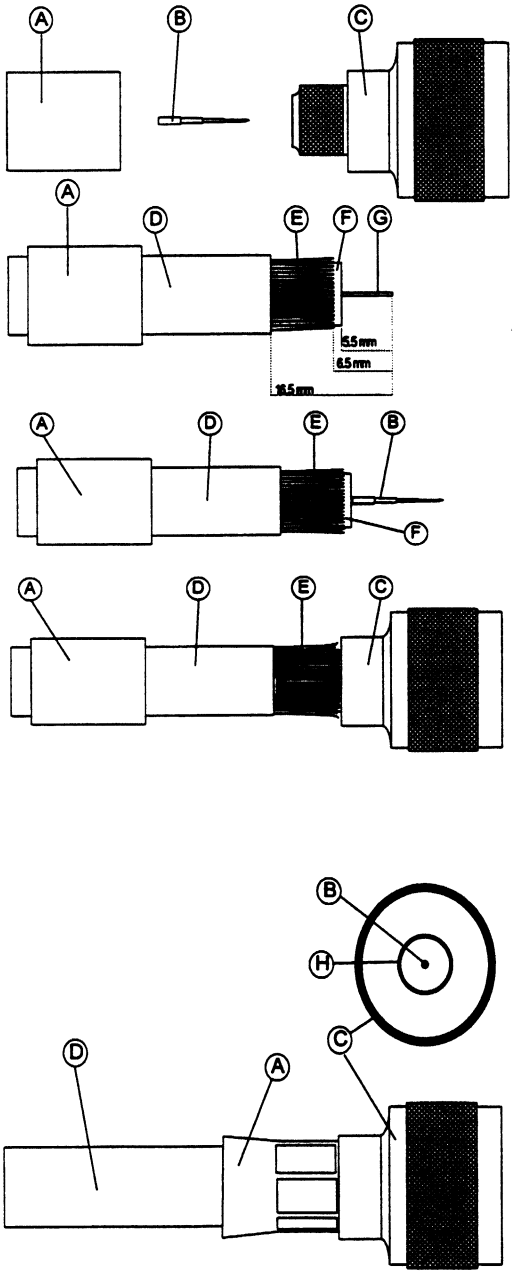
Attach the 11BNC-75-7-5c connectors to the indoor ends of the cable. The indoor connectors are slightly more difficult to build, because they have more pieces, and because the pin is smaller and more difficult to handle. Follow theassembly instructions from the kit, or the instructions in section 8.2.) rather than N connectors. While the shrink tubing is not essential on the indoor end of the cable because the indoor ends do not need to be waterproofed, shrink tubing adds strength to the connection, and is therefore, recommended.

Assembly Procedure Suhner Crimp Type N Connector, Part #11N-50-7-60 on Olympic RG-11 Cable

Tools and materials required:

- Stanley blade
- Scissors
- Wire cutters, diagonal cutters
- Crimp tool HCT-637
- Ruler
- Heat gun or gas torch

The connector is supplied with 3 parts a, b and c. Each half of the twin sections of the cable consists of d, e, f, and g.



A = ferrule
B = center contact
C = connector body
D = cable outer jacket
E = cable braid
F = cable dielectric
G = cable inner conductor
H = inner protective shell

1. Slide ferrule A onto cable. Prepare cable according to diagram.

CAUTION: Do not damage braid and inner conductor cable!

2. Push contact B over inner conductor of cable and abut to cable dielectric. Crimp to secure.

Center contact pin requires the larger of the two square crimps, 0.0944 inches or 2.4 mm on HCT-637 crimp tool.

3. Splay out cable braid E. Slide small end (crimp neck) of connector body c over the the cable dielectric f but under the braid, at the same time inserting center contact B into small hole in connector body. Firmly push through hole until contact tip is nearly even with the end of protective shell H inside the connector body..

4. Slide ferrule A over braid and crimp as close to connector body as possible.

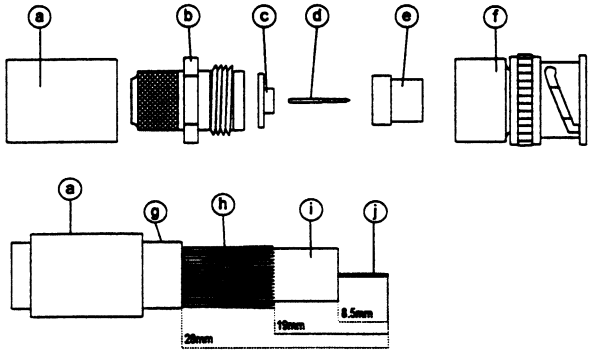
Use only a HCT-637 crimp tool *(Hex crimp, 0.4213 inches or 10.7 mm)*

Assembly Procedure Suhner Crimp Type BNC Connector Part # 11BNC-75-7-5c on RG-11 Cable

Tools and materials required:

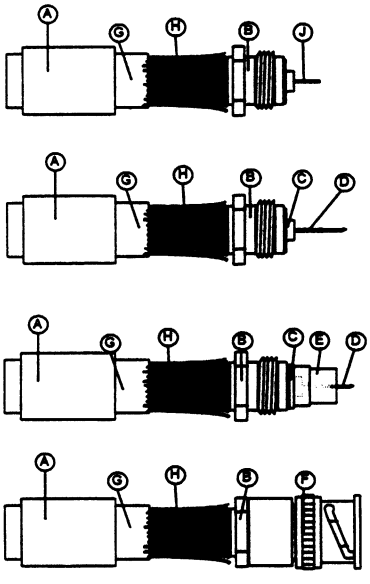
- Stanley or razor blade
- Scissors
- Wire cutters, diagonal cutters
- Crimp Tool HCT-637
- Ruler
- Heat gun or gas torch

The connector is supplied in 6 parts A, B, C, D, E and F. Each half of the twin sections of the cable cinsists of G, H, I, J.



A = ferrulle
B = cable body part
C = insulator
D = contact
E = contact centering insulator
F = connector body part
G = cable outer jacket
H = cable braid
I = cable dielectric
J = cable inner conductor
K = inner protective shell

1. Slide ferrule A onto cable. Prepare cable according to diagram.



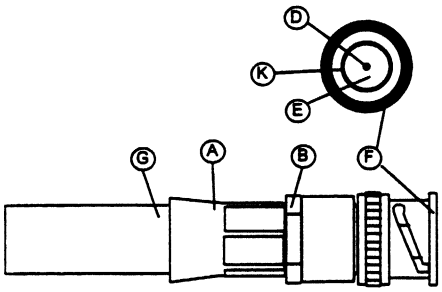
CAUTION: Do not damage braid and inner conductor cable!

2. Splay out braid and insert cable in body part B. Push insulator C and contact D over inner conductor and abut with cable dielectric I and crimp.

Center contact pin requires the smaller of the two square crimps, 0.063 inches or 1.6 mm on HCT-637 tool crimp.

3. Set insulator E on contact D and push as far as you can.

4. Push the connector body part F over the insulator. and tighten everything into place by screwing the connector body part F to the cable body part B. Inner contact D must engage perceptibly.



5. Slide ferrule A over braid until it abuts with connector body and crimp as close to connector body as possible.

Use only a HCT-637 crimp tool *(Hex crimp, 0.4213 inches or 10.7 mm)*

2.5. System Grounding Requirements

Introduction
The RF Unit should be grounded to the antenna support structure by a ground wire to a 1/4-20 grounding bolt on the Az/El positioner. Additionally, the installer has to run a #10 gauge or larger ground wire from a ground origination point to the canister grounding bolt.

Requirements
As part of the site preparation work, the Customer is to provide an appropriate origination point for this ground (a grounded structural steel building member, a metallic cold water pipe, source side of metallic power service race way, source side of equipment enclosure, or a driven ground rod). Depending upon the terms of a particular contract, an installer may be required to drive a ground rod at additional customer cost if a satisfactory grounding point is not available at the time of installation.

- Verify the IFL is connected to the indoor unit, and the indoor unit is connected to a pre-tested ac receptacle.

A pre-tested AC receptacle is one that has a good ground and no polarity reversals. This may be checked with a standard ac receptacle checker.)

- With the IFL cable disconnected from the RF Unit, measure the AC voltage between the shield of the IFL cable and the proposed ground wire.

- If no AC voltage is present, change the meter to read resistance and measure the resistance from the IFL shield (still not connected to RF Unit) to the ground wire.

- If the resistance is 25 ohms or less, connect the ground wire to the canister assembly. If the resistance is greater than 25 ohms, identify and eliminate the cause of high resistance or select another building ground source.

- Run a minimum #10 gauge wire from the canister assembly to the RF Unit grounding lugs.

Some grounding points are:

Grounding Point	Gauge Wire
Metallic cold water pipe	10 gauge or greater diameter
Grounded structural steel member	10 gauge or greater diameter
Metallic power service raceway(source side)	10 gauge or greater diameter
Service equipment enclosure(source side)	10 gauge or greater diameter
Driven ground rod	6 gauge or greater diameter

It should be noted that the next greater diameter gauge wire from number 10 gauge is number 8 gauge, that is, a larger diameter wire has a smaller gauge number.

Do not ground to any branch circuit conduit or any conduit on the load (or output) side of the service equipment enclosure (power distribution panel). The metallic power service raceway is defined as the input power service conduit which is on the input side of the service equipment enclosure.

Do not ground the antenna to an air conditioning unit. Grounding to an air conditioner mounting frame is not recommended because the frame may not be connected to building steel, and may provide a ground loop condition. Ohmmeter measurement will not detect a ground loop condition, since the EFL is connected to ground via the third wire of the indoor unit power cord, and the air conditioner metal frame is connected to ground via the air conditioner third wire. A low resistance value will be measured even though the metal frame is floating. The ground wire should be routed securely to prevent a possible tripping hazard. If possible, route the ground wire along the EFL cable to the point of entry.

Chapter 3
Indoor Unit Installation Procedures

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3. Indoor Unit installation procedures

3.1. Introduction

The following chapter outlines the steps to be taken for the successful installation and configuration of the Orion indoor equipment. Please note that the steps outlined represent those taken after the equipment has been delivered to site and has been confirmed as complete.

It is important that once on site, the Ground Operator first ensures that an inventory check is made as stated in chapter 9 (Logistics procedures) of the procedure manual. Any issue concerning missing, damaged or in-complete equipment, immediately has to be reported to either the Program Manager or Logistics Department.

3.2. Installing the Orion Indoor Unit (IDU)

OAE normally will integrate all indoor equipment (satellite modems, multiplexers, monitor and control systems etc.) into a standard 19 inch equipment rack prior to shipping the equipment to site. The primary reason for this is in order to assist the Ground Operator to provide trouble-free and consistent implementation of the equipment, as well as to make it easier for the GO to work with Orion engineers to locate any failed equipment should the need arise after the installation has been completed.

During the site survey, which normally has taken place several weeks prior to the installation of the Orion equipment, the GO should have identified the location in the customer's equipment room where the Orion rack is to be located. It is desirable that this space should be selected so that there is at least a meter clearance both to the front and to the rear of the rack, in order to allow access to the equipment.

It should also be clearly determined whether the cables which will be run to and from the customer interfaces and the power supply should enter the rack from above or below. This should allow the rack to be prepared correctly.

Once the rack has been delivered to the site, the GO should always reconfirm with the customer the desired location for the rack. In some cases, where there has been a change of mind by the customer as to the location of the rack, there will be an implication for the length of the cables which need to be run to and from the rack and this should be considered and reported immediately to Orion's Project Manager if likely to cause a problem.

Once the location of the rack has been confirmed and the rack moved into place, the GO should begin the installation with the connection of the earth cable to the rack. Where possible the source of the earth should be checked to ensure low resistance to ground is provided at the rack. The customer should be encouraged to provide support for this, as well as for the connection of the power to the rack, as the customer is ultimately responsible for the quality of these items.

Before connecting up the power cables from the customer's distribution panel (the cables for this should normally be provided by the customer), ensure that the circuit breaker at the source has been switched off and that the connectors at the rack are not live. For safety, ensure also that the UPS is turned off, before connecting the power cable. Normally the rack will be delivered with the UPS installed and already connected to the power strip which is mounted at the back of the rack and from which power is provided to the station equipment. Once all connections are made, turn on the power first at the customer's breaker and then on the UPS. Using a Voltmeter, check that the voltage present on the sockets of the power strip is within specification.

Although none of the Orion equipment operates at very high current levels, care should be taken at all times to ensure safety of all personnel on site. Customers should be encouraged to have qualified Electricians available to assist with electrical cabling and connections to the Orion antenna system and the indoor rack. Normal safety standards should be adhered to and Orion's GO should avoid at all times taking any risks where electrical connections are concerned.

It is also the customer's responsibility to ensure that a direct dial in (DDI) line is made available for Monitor and Control purposes at the location of the rack. The GO should confirm that this line is provided. If not, this should be reported as soon as possible to the Orion Project Engineer or Program Manager for their action.

3.3. Assembling the Indoor Unit

The station equipment is normally delivered for safety in its original packaging and needs to be mounted by the GO into the rack. It is important that the GO follows the engineering instructions for this, in particular taking account of the proposed layout of the equipment in the rack which is shown in the Orion provided Field Installation Manual for the site (Rack Elevation Diagram). In particular at sites where more than one modem is to be installed, it is important that the order in which the modems are placed in the rack is consistent with the documentation. To ease the identification of equipment, each modem should be labeled clearly on the front panel with the name of its destination site.

The Orion equipment is normally mounted in the rack in such a way that it is resting on brackets which have been integrated in the rack. It is important to take care that most of the equipment which Orion uses is not suitable for mounting by means of its front panel alone and must be supported elsewhere on the chassis. This may require on some occasions moving the brackets which have been supplied in order to optimize the support which can be provided to the equipment. As the racks are American 19" standard, with industry standard "Rack Unit" spacing (i.e., 1 RU = 1.75", 4.4 cm), care must be taken to ensure that the equipment is positioned so that the bolt holes on the front panel always align with the correct number of holes on the rack mounting strips to ensure maximum support. Furthermore, it is normal practice for a space of at least 1RU to be maintained between each unit of equipment in order to reduce the heat transfer between the units.

Sufficient hardware is normally supplied with the rack to allow all the units to be installed with the full complement of bolts and nuts. Blank face plates are also supplied to enhance the appearance of the rack and should be installed to fill the gaps between each unit of equipment.

3.4. Installing equipment in a customer provided rack

On occasion some customers will insist that Orion install its equipment in a rack which will be provided on site by the customer. Although Orion will try to persuade the customer to allow an Orion integrated rack to be used, it is understood that due to limitations on space, this is not always possible and agreement may be reached whereby an existing rack will be used. In such cases, the GO should find out from the customer if there is any equipment already working in the rack and if possible, this should be turned off for the duration of the time that the Orion equipment is being installed.

Orion's GO should always take care to ensure that whenever they are working close to any equipment other than Orion equipment, it should be made clear to the customer that it is the customer's responsibility to ensure that the equipment is switched off if necessary. Orion's GO should never take responsibility to switch either off or on any equipment other than that which is being installed on behalf of Orion.

Further, in the case where Orion is required to share a rack with customer equipment, particular care must be taken by the GO to ensure that the Orion equipment is clearly identified and labeled. In particular all cables should be run as neatly as possible and labeled to indicate to which equipment they are connected at each end.

3.5. Switching on the Equipment

At this point, with all the equipment installed in the rack, it is advisable to record the part numbers and serial numbers of each piece of equipment which has been installed, noting the position in the rack of each unit.

Now the power cord can be connected and power applied to the equipment.

It is important to ensure that no transmit cables are connected to any modem before it is switched on. This is to prevent any possibility of transmission at the wrong frequency or power being passed to the satellite and possibly causing interference to other users.

Each unit should be powered on in turn and checked to see if any abnormal faults are showing. It is possible for a unit to develop a fault during shipment and if this happens, the GO should try to diagnose which card in the unit is responsible for the fault condition. It may be necessary to ensure a spare unit is brought on site and either the identified faulty card swapped or the complete unit replaced. Careful note should always be taken of any failed units and a detailed report of the fault should be sent to Orion's Project Engineer and arrangements made to send the defective parts for repair as soon as possible. It is important to note the serial number and part number of any failed unit to ensure that it does not inadvertently get used again elsewhere before being repaired.

Before connecting any cables to the satellite modem, ensure that the carrier is turned off from either the front panel of the modem or using the hand held controller or laptop PC as appropriate. In general it is advisable to fully configure the modem as outlined in the FIM (see also the Configuration section in this manual) before connecting the cable between the modem and the uplink combiner. Continue cabling as outlined in the FIM and be sure to insert the appropriate attenuators where indicated. Complete installation of cables for all units of equipment.

Note that all unused ports on the uplink combiner or downlink divider need to be terminated with a 75 ohm BNC termination. This is to reduce the possibility of reflections from open connectors causing interference on the signal cables.

Finally, take care to ensure that any connectors which have screw terminals are properly tightened and that all cables including M&C cables are equipped. Any missing or damaged cables should be reported to Orion's project engineer immediately and a replacement ordered.

3.6. General Points of Quality

In general, Orion is determined to establish a high degree of quality on each of its installations. To assist with this, please follow the following basic guidelines:

a) It is important that care should always be taken to make cabling as neat as possible in the rack, not only from a point of view of the way it looks, but also to ensure that an engineer who is unfamiliar with the site might be able to easily identify and trace any cables in the event of any fault arising. Use cable ties every 50 cms (18 inches) or so to keep cables bundled together where appropriate.

b) Where cables enter the rack from either above or below, ensure that the opening through which they are placed does not have rough edges which are likely to cause any damage to the cables. Also, try to ensure that customer cables which are brought into the rack to connect into the Orion equipment are brought in from either above or below and not through the back of the rack in such a way that the door will not close.

c) While it is the customer's responsibility to provide the use of a telephone to assist with the implementation and line up of the station, the GO should always be conscious of the time spent on international calls and should try to limit any wasted time on these calls. Where possible, the GO should try to arrange to receive calls rather than make them (obviously when calling the other customer site, this does not apply).

d) The GO should always remember that they are representing Orion in the field and should remain courteous to the customer at all times. In particular it is important that the GO should always try to arrive on site when agreed and agree in advance with the customer any need to work outside of normal office hours.

e) Finally, when leaving the site every day, the GO should do their best to ensure that all work areas are left clean and tidy. In particular, when finishing on site at the end of an installation, ensure that all pieces of cable, tie wraps, etc., which have been dropped are picked up and removed from site for disposal. Also all side panels and doors on the equipment rack should be fitted and closed before leaving the site.

All rules of safety or otherwise which the customer imposes should be strictly adhered to - any complaints about this should always be addressed to the Orion Project Engineer or Program Manager and not directly with the customer.

ORION ATLANTIC, L.P.

TECHNICAL BULLETIN

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PRODELIN 2.4M, 4 PIECE ANTENNA ASSEMBLY CONCERNS

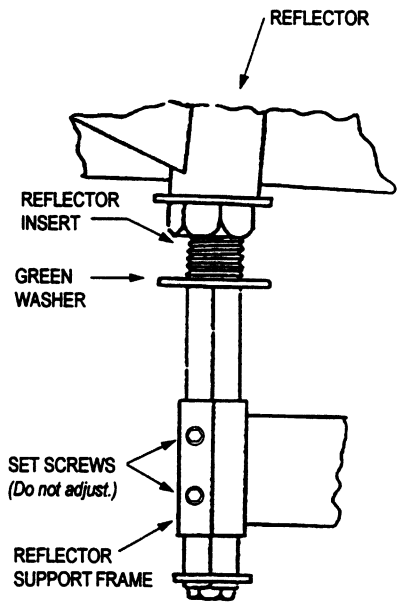
Purpose: To ensure proper assembly of the Prodelin 2.4m, 4 piece antennas, thereby ensuring good antenna gain and cross-pol isolation.

It has come to our attention that many Prodelin 2.4m 4 piece antennas, model number 1244-371, 1244-373, 1244-376, and 1244-378, are being assembled incorrectly in the field. Improper assembly could cause poor antenna gain and poor cross-pol isolation. The areas of concern are 1) the antenna back frame, and 2) the antenna quadrant installation.

Pay special attention to the following.

1. Do not adjust the antenna back frame.
2. Install the major and minor axis templates correctly.
3. Install the (4) quadrant thru-bolts properly.
4. Ensure that the placement and installation of the antenna quadrants is correct.
5. Install the (4) GREEN washers properly.
6. Ensure that the correct boom arm part number and cradle height combination is used.
7. Ensure that the correct feedhorn is used.

FIGURE 1. *PLACEMENT OF GREEN WASHERS*



1. ANTENNA BACK FRAME

Under no circumstances should the 4 sets of Allen or hex socket screws on the corners of the back frame assembly be loosened or removed. The 4 square alignment tubes are factory set and should not be tampered with. If these screws are loosened and the square tubes are adjusted, Prodelin suggests

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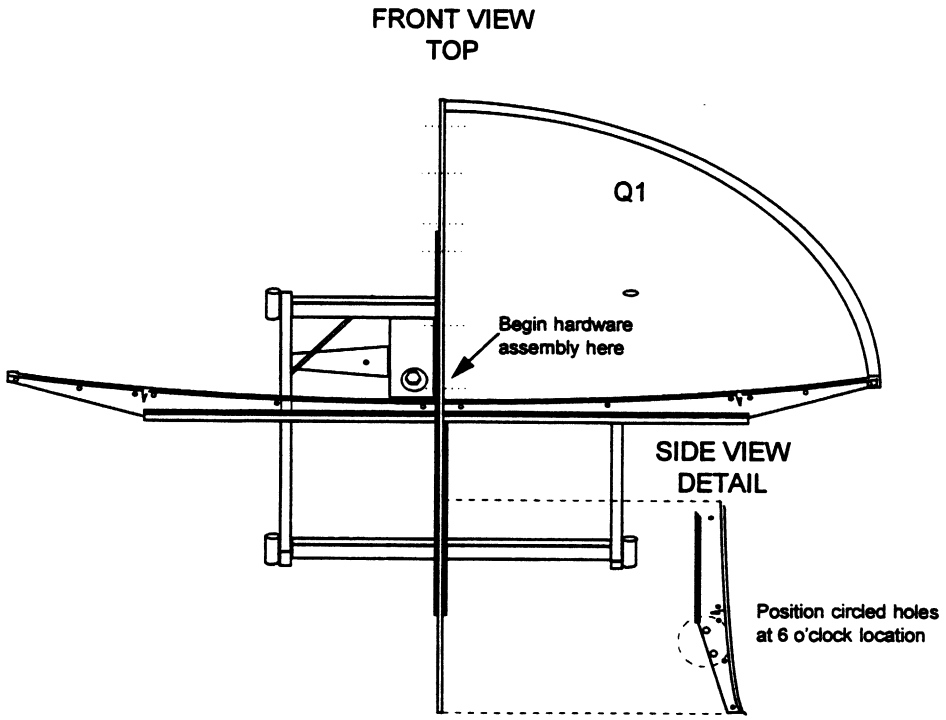
replacement of the complete back frame assembly. Please see Figure 1 for location of set screws.

FIGURE 2. *CORRECT MAJOR AND MINOR AXIS*



ALIGNMENT

2. MAJOR AND MINOR AXIS INSTALLATION

The correct installation of the major and minor axis templates is shown in Figure 2. Please note an easy way to determine the axis alignment is to position the 2 small holes, circled in Figure 2, at the 6 o'clock position on the antenna back frame.

3. QUADRANT THRU-BOLT INSTALLATION

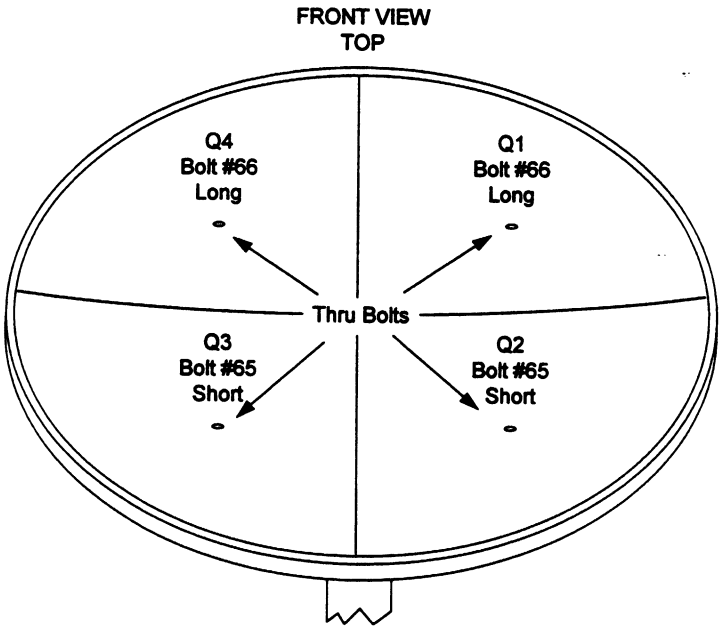
Many of the new 2.4m antennas are being shipped without the quadrant thru-bolts installed at the factory. Note: There are 2 different length bolts. Correct installation is very important. The longer bolts [4.863" (123.5mm)], with 66 stamped on the head, are installed in the top 2 quadrants Q1 & Q4.

The shorter bolts [4.527" (115mm)], with 65 stamped on the head, are installed in the bottom 2 quadrants Q2 and Q3. (See Figure 3)

4. ANTENNA QUADRANT POSITION

When standing at the end of the boom arm and looking into the front of the antenna, the quadrants are numbered in clockwise order from the top right, Quad # 1 (Q1), to the top left Quad #4 (Q4). (See Figure 3)

FIGURE 3 *CORRECT BOLT PLACEMENT*



5. GREEN WASHER INSTALLATION

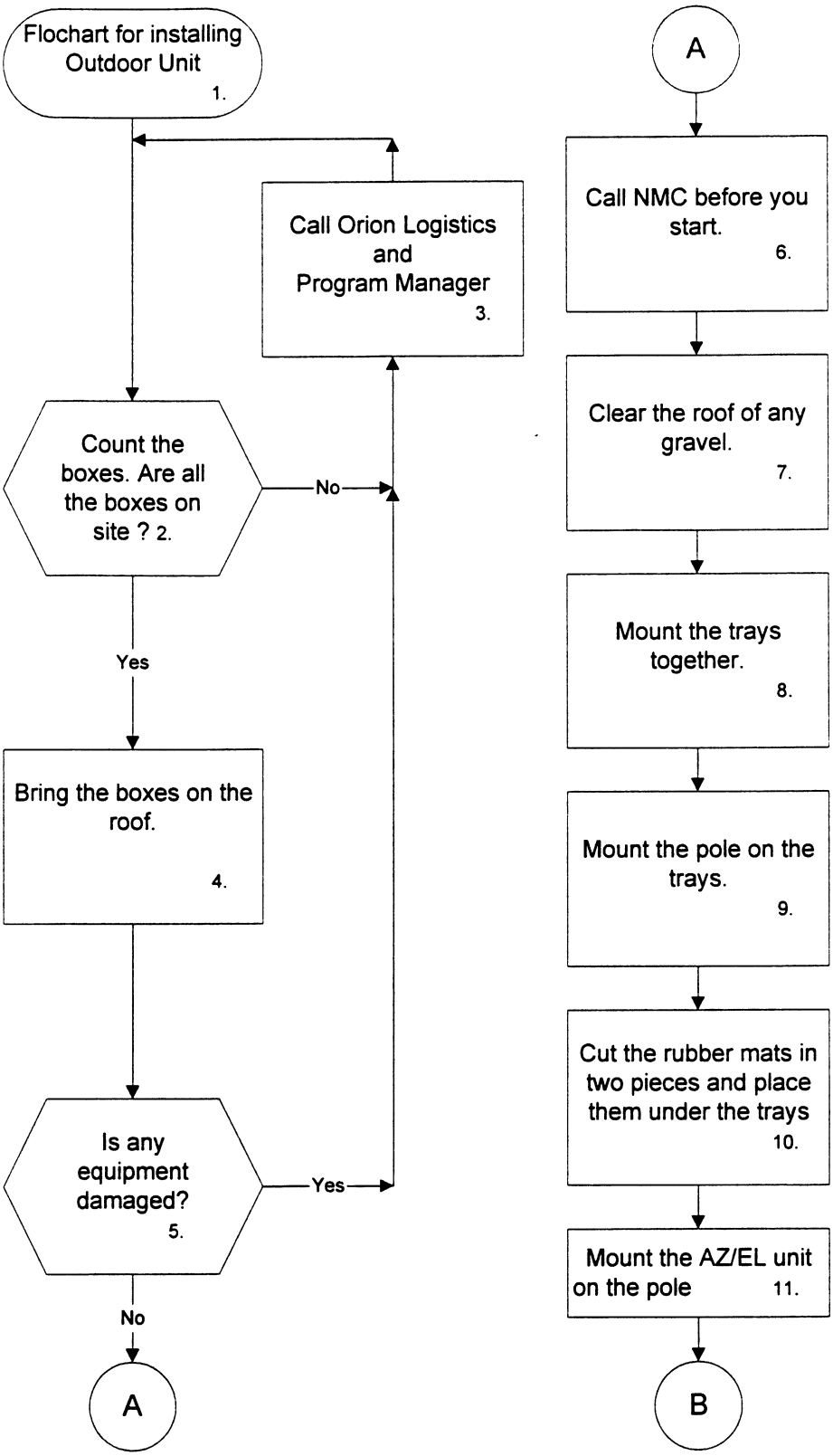
There are (4) green washers that need to be installed in a special location. The washers are installed between the back frame quadrant supports and the (4) quadrant thru-bolts. (See Figure 1)

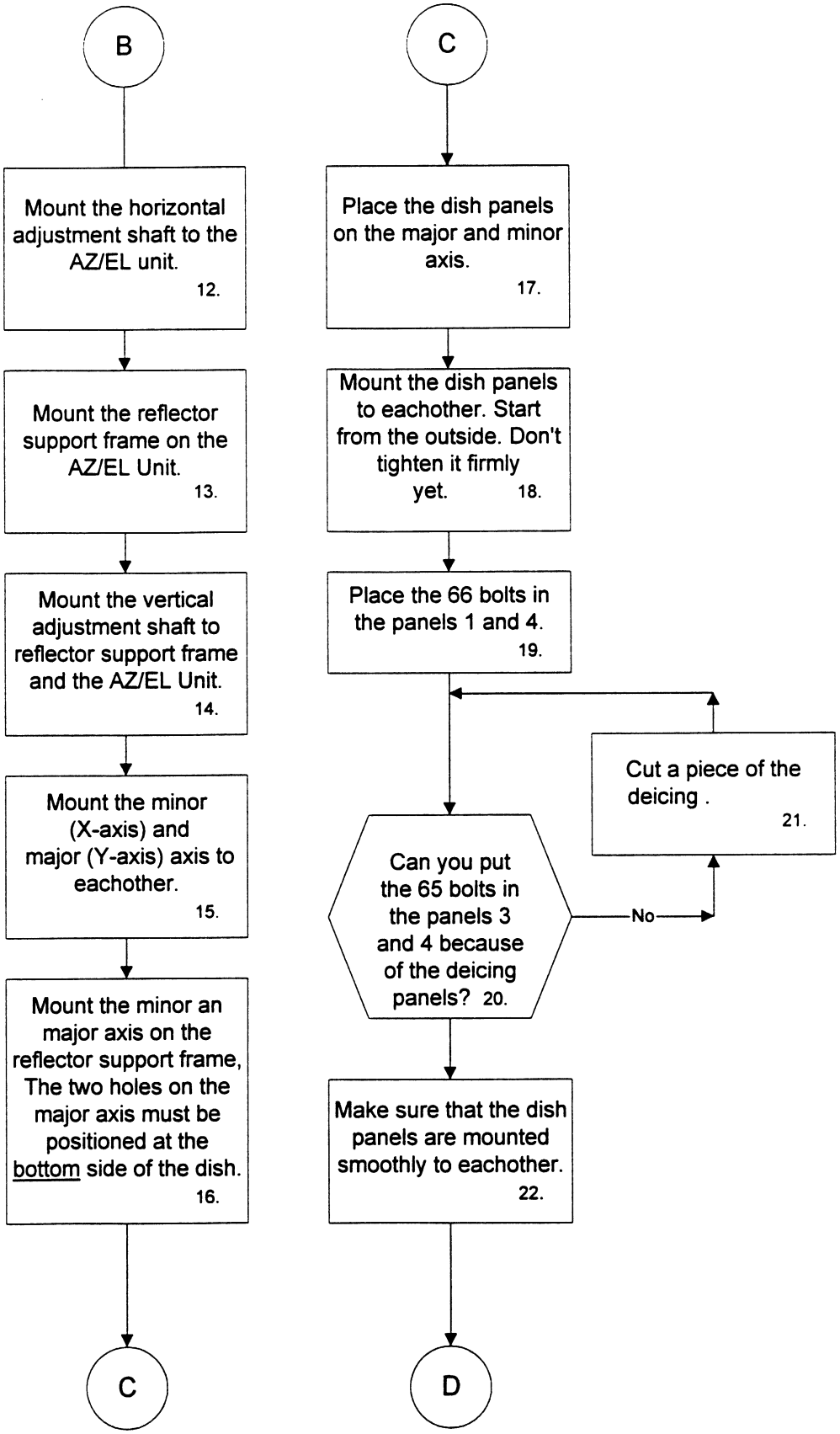
6. BOOM ARM AND CRADLE MATCH.

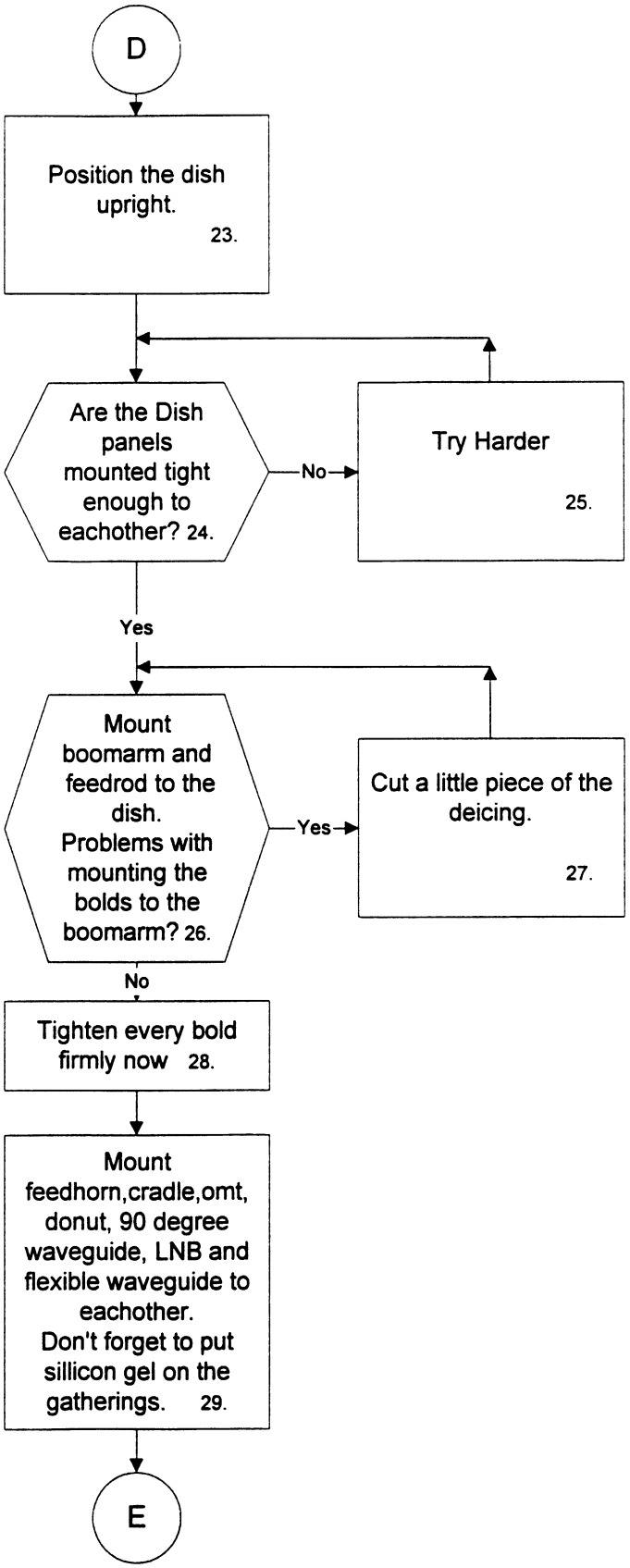
The 2.4m 4 piece antenna has 2 boom arm/cradle options. It is very important that correct boom arm and cradle combination is installed on the antenna. For the 1244-37X 2.4m antennas use the #0800-1451 OMT interface kit. This kit has feed support #0490-488 ("488" is stamped on the bottom of the feed support where it attaches to the base of the antenna). The cradle has a feedhorn centerline height of 3.74" (95 mm). The cradle bottom plate is part number 0156-111 ("111" is stamped on bottom of plate). This cradle is used for SSE radios.

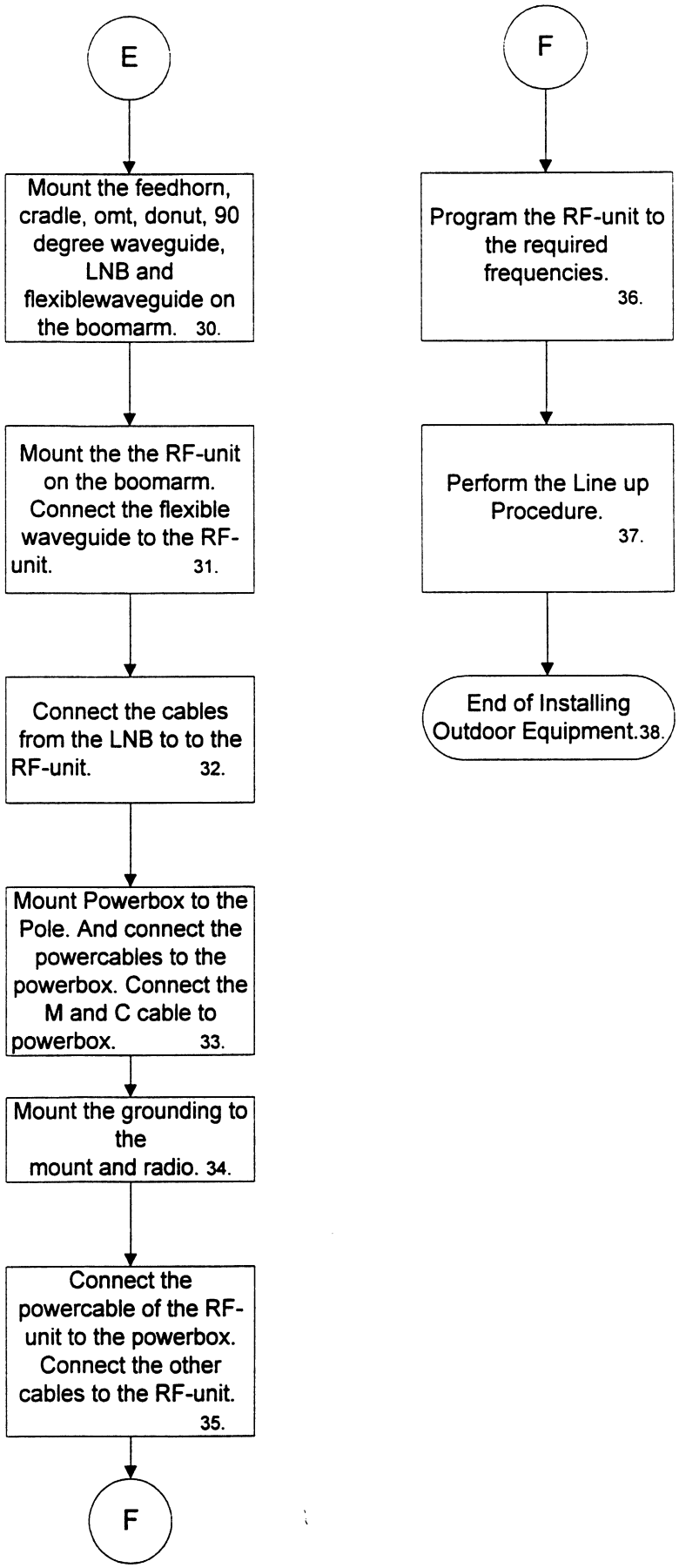
7. FEEDHORN

The 2.4m 4 piece antenna uses a 39° feedhorn. At this time no Prodelin part numbers are on the feedhorn. One way to verify that the correct feedhorn has been installed on the antenna is to measure the Outside Diameter of the feedhorn face. The 39° feedhorn outside diameter (O.D) is 5.76 inches (146 mm) O.D.


Flochart for installing Outdoor Unit 1.
Call Orion Logistics and Program Manager 3.
Count the boxes. Are all the boxes on site ? 2.
No
Yes
Bring the boxes on the roof. 4.
Is any equipment damaged? 5.
Yes
No
A
A
Call NMC before you start. 6.
Clear the roof of any gravel. 7.
Mount the trays together. 8.
Mount the pole on the trays. 9.
Cut the rubber mats in two pieces and place them under the trays 10.
Mount the AZ/EL unit on the pole 11.
B


B
Mount the horizontal adjustment shaft to the AZ/EL unit. 12.
Mount the reflector support frame on the AZ/EL Unit. 13.
Mount the vertical adjustment shaft to reflector support frame and the AZ/EL Unit. 14.
Mount the minor (X-axis) and major (Y-axis) axis to eachother. 15.
Mount the minor an major axis on the reflector support frame, The two holes on the major axis must be positioned at the bottom side of the dish. 16.
C
C
Place the dish panels on the major and minor axis. 17.
Mount the dish panels to eachother. Start from the outside. Don't tighten it firmly yet. 18.
Place the 66 bolts in the panels 1 and 4. 19.
Can you put the 65 bolts in the panels 3 and 4 because of the deicing panels? 20.
No
Cut a piece of the deicing . 21.
Make sure that the dish panels are mounted smoothly to eachother. 22.
D


D
Position the dish upright. 23.
Are the Dish panels mounted tight enough to eachother? 24.
No
Try Harder 25.
Yes
Mount boomarm and feedrod to the dish. Problems with mounting the bolds to the boomarm? 26.
Yes
Cut a little piece of the deicing. 27.
No
Tighten every bold firmly now 28.
Mount feedhorn,cradle,omt, donut, 90 degree waveguide, LNB and flexible waveguide to eachother. Don't forget to put sillicon gel on the gatherings. 29.
E


E
Mount the feedhorn, cradle, omt, donut, 90 degree waveguide, LNB and flexiblewaveguide on the boomarm. 30.
Mount the the RF-unit on the boomarm. Connect the flexible waveguide to the RF-unit. 31.
Connect the cables from the LNB to to the RF-unit. 32.
Mount Powerbox to the Pole. And connect the powercables to the powerbox. Connect the M and C cable to powerbox. 33.
Mount the grounding to the mount and radio. 34.
Connect the powercable of the RF-unit to the powerbox. Connect the other cables to the RF-unit. 35.
F
F
Program the RF-unit to the required frequencies. 36.
Perform the Line up Procedure. 37.
End of Installing Outdoor Equipment.38.

Chapter 5
Satellite Access Procedures

Tabel of contents

5. Line-up and R.F. System Performance Veification.

Scope
The intention of theLine-up and R.F. System Pefromance Verification is to describe, from a practical point of view, all the procedures needed to line-up the VSAT antenna with the spacecraft, to measure the receive system performance and the antenna cross-pol in cooperation with the Orion Network Management Center (NMC) and Operations Center (OOC).

For more detailed information about satelite access, refer to the following documents:

- Access Procedures for the Orion Satellite System, Version 2.0, dated 22 October 1996.
- Customer Service and Operations G/T Measurement,Version 0.2 , dated 27 January 1997.

These reference documents are incorporated in this chapter under 5.x and 5.y. The documents are issued by Orion and updated when new revisions are necessary.

Preparation
- Contact the OOC at least 24 hours prior to the actual line up of the antenna to schedule the cross-pol adjustment.

OOC Phone Number : + 1 - 301 - 258 - 3390

- Allow the radio to warm up at least 15 minutes before any transmission.
- Tell the person you speak to at the OOC the name of the customer and the ID of the carrier you are going to bring up.
- Confirm the transmit and receive frequencies with the person at the OOC.
- Build the antenna according to the "Antenna Assembly Procedure," chapter 4 of the procedure manual.

5.1 Pointing the antenna.

The following procedure describes the method used to align the antenna to the satellite. Needless to say that we are trying to achieve the best possible Elevation and Azimuth.

Step 1: Elevation.
- Lookup the elevation and azimuth values for the antenna on the "Antenna and Radio Configuration" sheet of the field installation manual (FIM).
- Place an inclinometer on the metal frame at the rear of the antenna.
- Adjust the elevation until the inclinometer indicates the correct value.

Because the Prodelin antenna is an offset dish, subtract the antenna offset (17.35° for 0.8 F/P series antennas) from the elevation that is given in the field installation manual to get the value for the inclinometer reading.

Step 2: Azimuth.
Azimuth measurements can be made with a compass; however, a compass does not work well near steel commonly found in buildings and frames, or near strong magnetic fields.

- Read the compass at ground level, away from motors and large steel structures. Account for local magnetic declination.
- Identify a landmark in the assigned azimuth pointing direction and refer to the landmark when pointing the antenna.
- Connect the spectrum analyzer to connector J2 RECEIVE IF OUTPUT of the radio, leave the connector J1 TRANSMIT IF INPUT unconnected.
- Connect the power to the radio.
- Hook up a laptop to the radio using cable 00F/33M-03T-01-10F (formerly TST 14).

Communication interface to radio: 1200 Baud, 7 Data bits, ODD Parity, No hardware flow control.To use the M&C connection, all DIP switches except T.DLY should be on.

Program the radio receive center frequency to the frequency of the satellite pilot.

Pilot frequencies : 12 528 000 kHz for a Eutelsat band radio.
11 656 260 kHz for a Panamsat band radio.
11 728 000 kHz for a North American band radio.

- Set the position of the polarizer at the Polarization Offset per the "Antenna and Radio Configuration" sheet in the FIM.
- Setup the spectrum analyzer for a center frequency of 70 MHz, a span of 30 MHz and to maximum sensitivity.
- Move the antenna 10° to the left so that it is definitely pointing left of the satellite.
- Start moving the antenna slowly (not faster than two degrees per second) to the right, while looking at the spectrum analyzer.
- At a point during this sweep you should see changes in the noise floor and see a signal appear. If you do not see any change, continue until you go about 10° beyond where you think the satellite should be. Turn the elevation rod by one half turn. Repeat the steps, making azimuth sweeps at progressively higher or lower elevations until you see changes in the noise floor.
- Make the span of the spectrum analyzer smaller. (You only want to see the pilot.)
- Continue turning the antenna very slowly in the same direction, the level of the signal first increases and then decreases as you continue to sweep. The signal peak is possibly only a side lobe , in which case, the main lobe is further to the right. To be certain the peak is not a side lobe, continue to sweep to the right. If you find no bigger signal peak after you move another 5° to the right, assume that the peak you found was the main lobe. Sweep back until you reach maximum signal level.
- If you do find a bigger signal, assume you have found the main lobe. To be certain that it is the main lobe, continue sweeping to the right past the second lobe, if you find another signal that has approximately the same amplitude as the first lobe you can be sure the second one was the main lobe. Sweep back to it until maximum signal level is reached. If the third lobe has a higher level than the second one and the difference in amplitude between the lobes is small, something may be wrong with the antenna.

Step 3: Fine tune antenna pointing.

- Temporarily lock the azimuth.
- Begin changing the elevation very slowly in one direction while looking at the level of the received signal. If the signal level decreases, adjust the elevation in the other direction.
- Keep changing the elevation, the signal level increases to a maximum and begins decreasing again. When you see the signal level drop move back to the point were you saw the maximum signal level.
- Lock the elevation.
- Unlock the azimuth again.
- If you have seen the side lobes in your first azimuth sweep, make a very slow and small azimuth sweep left and right until you have found the azimuth which gives maximum signal level.
- If you could not see the side lobes the first time, you should be able to see them now since the elevation is peaked. Sweep to the left and to the right until you have seen a side lobe on both sides of the current azimuth. Both side lobes should be approximately the same level and at least 20 dB smaller than the main lobe. Then go back to the main lobe and find the azimuth where you have maximum signal level.
- Lock the azimuth.
- Unlock the polarizer and tune for maximum pilot signal level.

5.2. Measure Receive System Performance.

When measuring the receive system performance, change only the reference level of the spectrum analyzer.

Preparation.

- Find the test results page for the Receive System Performance test in the FIM. Use it for recording the results of the test. A sample is attached.
- Record the current weather conditions on the test results page.
- Record the manufacturer and model number of the spectrum analyzer.
- Adjust spectrum analyzer for pilot carrier center frequency. Set the Span to 100 kHz, the Resolution Bandwidth to 10 kHz, the Video bandwidth to 10 Hz, the sweep time to automatic, the dB per division to 5. If your spectrum analyzer does not allow for a resolution bandwidth of 10 kHz, ask the NMC for the appropriate setting for your spectrum analyzer.
- Contact the NMC (have the customer's name and the carrier ID at hand) and ask them to assist you with measuring the receive system performance.

NMC Phone Number : + 1 - 301 - 258 - 3365

Step 1: Point Antenna to the clear sky.

- Unlock the elevation screw; move the antenna up in elevation just enough so that the pilot signal falls below the noise in the spectrum analyzer display. Move well past the first side lobe, about 2 degrees.

Step 2: Record the noise floor level.

- Disconnect the cable from the spectrum analyzer input and observe the drop in dB of the noise floor.
- If the noise floor drop is less than 12 dB, check for excessive loss between the LNB and the spectrum analyzer. Also, check for too much attenuation on the spectrum analyzer.
  If the noise floor drop is more than 25 dB, increase input attenuation on spectrum analyzer until noise floor drop is between 12 and 25 dB. For HP spectrum analyzers and SSE radios, about 40 dB is needed.
  Reconnect cable from radio to spectrum analyzer and **record the noise floor level** on the Receive System Performance test results page.

Step 3: Peak Antenna to satellite and record peak signal power.

- Lower the elevation screw, and peak the elevation on the pilot signal.
- Lock the elevation.
- **Record the peak signal power** of pilot on test results page.
- Wait while the person at the NMC calculates the Receive System Performance from these measurements. Record the final Receive System Performance value on the Receive System Performance test results page.

5.3. Antenna Cross-pol Adjustment.

Preparation.

- At the scheduled time, contact the OOC (have the customer's name and the carrier ID at hand) and ask them to assist you with measuring the cross-pol isolation.

OOC Phone Number : + 1 - 301 - 258 - 3390

- Ask the OOC for a test frequency were you can bring up a pure carrier so the cross-pol isolation can be measured.

Step 1: Bring up the carrier at the test frequency.

- Program the radio to the receive center frequency found on the antenna and radio configuration sheet.
- Program the radio transmit center frequency to the test frequency the OOC has given to you.
- Configure the modem according to the Modem configuration sheet, except set to unmodulated carrier.
- **Switch modem carrier off!** Set the Modem Tx frequency to 70 MHz.
- If the Tx clock reference on the Modem configuration sheet is not internal, set the clock to internal.
- Program the Modem carrier power level to -25 dBm.

- After OOC approval, connect the Modem to the radio. (Make sure there is at least 20 dB attenuation in the transmit IF cable.)
- Give a PTXON and a TXON command to the radio.
- Adjust TX-level according to OOC directions.

Step 2: Record pilot level.
- Program receive frequency on the radio to the pilot frequency.
- Measure pilot level. Record this as reference.

Step 3: Fine tune antenna pointing.
- Program receive frequency on radio to view the carrier you are transmitting.
- Connect spectrum analyzer to the RX If cable.
- When looking at your own carrier. Verry careful tune the azimut and elevation. The objective is to gain from 0.1 to 0.5 dB of signal strength.

Step 4:. Check Pilot level.
- Re-adjust the receive frequency on the radio and measure the pilot signal power.
- Lock the elevation and azimuth screws, monitor for any level changes.
- Note this level on the Receive System Performance test results page in the blank space at the bottom. Compare this with the level found at step 2. If you have lost more than 0.5 dB of pilot signal level, notify the project engineer. Proceed with the following steps.

Step 5: Cross-pole adjustment in cooperation with the OOC.
- Unscrew the screws that lock the feed horn until you can turn it.
- Contact the OOC again and tell the individual who answers the phone that you are ready to start measuring cross-pol.
- When he asks you to bring up a pure carrier, turn the pure carrier on with the transmit power enabled.
- Adjust the level according to the directions the OOC gives to you.
- When the OOC directs you, make changes to the polarization exactly as they direct. Do not make any changes unless the individual at the OOC asks you to make a change. After each change, step away from the feed horn and tell your contact at the OOC that you have made the requested change.

Be patient during the measuring process! Communicate each step carefully with your contact at the OOC. If you change the polarization before the OOC completes the measurement, the quality of the measurement is compromised. You may never be able to establish a good cross-pol isolation if the measurements are not accurate.

- If the OOC asks you to change the azimuth and elevation to fine tune the peaking of the antenna, follow the directions given from the OOC as carefully as possible.
- When the maximum isolation is achieved, lock the feed horn. When the feed horn is locked, tell your contact at the OOC so he can recheck the isolation one more time. If the cross-pol isolation is still good, the line up of the antenna is completed.

The cross-pol isolation must be at least 30 dB

- Turn the Modem output power off. Turn off the pure carrier.

5.4. Line -up at operational frequency.

Preparation

- Program the radio transmit center frequency and the Modem transmit frequency according the configuration sheets.
- Confirm interconnection of the radio and VSAT modem acoording Rack Wire Diagram.
- Disconnect if cable from the modem IF output.

Step 1: Set transmit level in cooperation with the OOC.

- Ask the OOC to assist with line up at the operational frequency to set the level of the carrier.
- After aproval from OOC, connect modem transmitter to radio.
- Adjust level acording OOC directions.
- If needed changes transmit attenuator, make changes on the Rack Wire Wiagram.

Receive System Performance Test Results

Item	(Check one)	
Weather condition:	clear sky light clouds dark thunder-clouds snow light rain heavy rain thunderstorms	☐ ☐ ☐ ☐ ☐ ☐ ☐
Spectrum analyzer manufacturer:	HP Tektronix Anritsu	☐ ☐ ☐
Spectrum analyzer model number:		
	Value	**Units**
Record noise floor level:		dBm
Record peak signal power:		dBm
Calculated G/T value from OOC:		dB/K

SAMPLE

Orion Atlantic Europe 3/17/97
Purchase Requisition Log

P.R. no.	Date	Name	Description of items purchased	Total Value
OCTOBER				
PR9610001	2-Oct-96	LvO	Computer equipment for new employees	fl- 5092,31
PR9610002	1-Oct-96	RB	Lab work bench	fl- 6852,60
PR9610003	1-Oct-96	RB	Lab work bench	fl- 6833,80
PR9610004	2-Oct-96	HdV	Tools for technicians, and for the Mercedes van	fl- 1533,25
PR9610005	2-Oct-96	LvO	Larger monitors for the Program Engineers	fl- 7589,50
PR9610006	29-Oct-96	LvO	Notebook for new PE Wilfried Wouters	fl- 7441,63
PR9610007	2-Oct-96	HdV	Tools for Orion Technicians and for the Mercedes van	fl- 569,93
PR9610008	2-Oct-96	HdV	Tools for Orion Technicians and for the Mercedes van	fl- 762,19
PR9610009	7-Oct-96	CMM	Office furniture rental	fl- 4958,40
PR9610010	21-Oct-96	LvO/EB	HP ScanJet (colorscanner)	fl- 499,00
PR9610011	24-Oct-96	LvO	GSM Telephones	fl- 4247,35
PR9610012	29-Oct-96	LvO	Additional processing memory for our server	fl- 1092,75
PR9610013	29-Oct-96	LvO	LaserJet 5Si with A4, Letter and A3 tray	fl- 8167.56
NOVEMBER				
PR9611001	8-Nov-96	LvO	Printerette, covers for the Ground Operators Manuals	fl- 334.29
PR9611002	14-Nov-96	**Cancelled**	The complete telephone book of the Netherlands	Fl. 528.75
PR9611003	21-Nov-96	JdV	Euphonic Fax Selector	fl. 299.00
DECEMBER				
JANUARY				
PR9701001	8-Jan-97	HdV	Printing and copies for manuals	Fl. 785.00
PR9701002	20-Jan-97	RB	Lab tools and lab equipment	Fl. 666.31
PR9701003	20-Jan-97	RB	Lab tools and lab equipment	Fl. 359.21
PR9701004	20-Jan-97	RB	Lab tools and lab equipment	Fl. 245.76
PR9701005	27-Jan-97	CMM	Accessoires for printer	Fl. 8248.50
FEBRUARY				
PR9702001	3-Feb-97	PR	GSM telephone and accessories	Fl. 1839.17
MARCH				
PR9703001	3-Mar-97	EdK	PS/2 to PC Adaptor	Fl. 110.00
PR9703002	5-Mar-97	CMM	Dell Modem card for Evert Bleijenberg	Fl.
PR9703003	6-Mar-97	RJ	Pagers for Logistics Department	Fl.

ORION

Access Procedures

for the

Orion Satellite System

Version: 2.0

22 October 1996

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2440 Research Blvd., Rockville, Maryland, USA 20850-3238 301-258-8101 Fax: 301-258-8119

Contents

Contents (continued)

Notice: This document may be revised at any time by Orion without prior notice.

Revision History

REV	DATE	REV BY	REMARKS
0.5	4FEB94	JEE	Initial draft
0.6	2MAR94	JEE	Incorporated comments from Sorbello, Lee, Sweeney
0.7	2MAY94	JEE	Includes comments from ONS and transponder sales.
1.0	27JUN94	jee	Included comments from engineering and Marketing
1.5	14DEC94	jee	Added Occas. Use Access. Reduced UL Xpol from 35 to 30 dB. Added 2.5 kHz BW alloc. increment
1.6	16JAN95	RMS & jee	Incorporated comments from S. Salamoff, R Sorbello, and S. Blanton
1.7	1MAR95	jee	Incorporated comments from S. Blanton
1.8	14May95	jee	Incorporated changes from S. Salamoff, Jim Budden but never officially released.
1.9	4Jun96	ERM, JB, RS, DG, JEE	Incorporated comments from list at right.
2.0	22Oct96	JEE	Removed references to Orion Atlantic and made ES description form OLE.

1.0 Introduction

These satellite access procedures contain technical requirements defining the responsibilities of the customer and of Orion for accessing Orion satellites. Given operating parameters specified in the customer's contract, such as:

- transponder beam configurations, and
- power levels,

this document describes how to:

- initiate,
- maintain, and
- terminate satellite access.

Three types of satellite users are defined[1] for customers utilizing:

- full transponder services,
- partial transponder services, or
- occasional-use services.

Orion satellites includes multiple antenna beams, dual linear polarization, and beam switching networks designed to achieve high capacity and service flexibility. This design means that, in many instances, stations transmitting to the satellite may not be able to observe their own signal on the downlink. Consequently, to minimize interference to Orion and other satellite systems, it is essential that the procedures are followed as described in this document.

The following appendices are included:

Appendix 1: Definitions contains the definitions of terms.

Appendix 2: Earth Station Performance Requirements contains both mandatory and recommended performance requirements for all earth stations accessing Orion satellites. Compliance with the mandatory requirements is essential for all uplink earth stations to prevent interference to Orion and other satellite systems. Recommended requirements are provided to protect satellite users from excessive downlink interference. The earth station operator can verify compliance with the mandatory requirements by independent means such as previously obtained

[1] *Formal definitions are given in Appendix 1.*

4. Upon successful completion of the Access Procedures, user initiates service at the assigned frequencies and power levels by again contacting the Orion Operations Center on or after the Service Commencement Date.

Table 1 summarizes the access requirements by the type of service. The requirements are discussed in Sections 3 and 4.

Table 1: Access Requirements by Type of Service

Requirement	Service Type		
	Full Transponder Service Capacity	**Fractional Transponder Capacity**	**Occasional Use Service**
Transmission plan developed by:	Customer and Orion	Customer and Orion	Orion
Third Party Resale Permitted	Yes[3]	No	No[4]
Earth Station Performance Verification procedures	Required per "Appendix 4: Specific Steps for Customers Accessing the Orion Satellite System"		
Notify Orion of carrier initiation	Mandatory, per Section "4.6 Contact Orion Operations Center when Ready to Initiate Circuit"		
Logging	Required per Section "4.7 Maintain a Log of Transmitted Signals"		
Notify Orion of carrier cessation	Required, per Section "4.8 Notify Orion Operations Center prior to Cessation of Transmission"		
Fault Isolation	Orion will commence fault isolation after customer confirms their equipment is operating nominally.		

3.0 Orion's Responsibilities

This section describes Orion's responsibilities in providing for satellite services. Orion is responsible for:

- operating the satellite,
- maintaining the quality of service required to meet contractual obligations, and
- maintaining satellite and transponder integrity contingent upon on-board spare component availability.

Disciplined access and control procedures ensure that Orion can maintain transponder and satellite integrity as well as quality of service at the highest possible levels.

3.1 Transmission Plan

Prior to accessing the Orion satellite, a transmission plan must be prepared which outlines the specific Orion space segment resources required to satisfy the contracted service. This plan includes details

[3] *Third party resale only according to conditions given in the contract.*
[4] *Certain exceptions can be made to this restriction.*

pertaining to the actual transponder, frequency, and power level assignments, and is made by considering:

1. transponder loading (both current and projected),
2. co-frequency traffic on the cross-polarized transponders on Orion, and
3. co-polarized traffic on transponders on adjacent satellites, and
3. the specific nature of the contracted service (site locations, connectivity requirements, performance characteristics of the ground segment which will be used to provide the service, *etc.*).

The party responsible for the transmission plan is defined in Table 1.

3.2 Telephone Contact and Coordination

All mail correspondence should be sent to the attention of the relevant department listed in Table 2 and addressed to:

Orion Satellite Corp.
2440 Research Boulevard
Rockville, Maryland, USA 20850-3238

Important telephone and facsimile numbers are listed in Table 2:

Table 2: Important Access Numbers at Orion

Department	Function	Phone/Fax Number
Orion Satellite Services Sales Department:	Obtain contract for capacity services	Phone: 301-258-3233 Fax: 301-258-3256
Orion Satellite Services Scheduling Office:	Schedule occasional-use use capacity services	Phone: 301-670-6570 Fax: 301-670-6575
Orion Operations Center:	Arrange for satellite access and operations support	Phone: 301-258-3390 Fax: 301-258-3389
Orion Satellite Engineering Services:	Technical support	Phone: 301-258-3251 Fax: 301-258-3319
General:	For addresses, phone, fax, and telex numbers	Phone: 301-258-8101 Fax: 301-258-8119

4.0 Responsibilities of All Satellite Users

This section describes the responsibilities of all customers accessing Orion satellites. Each section below contains tasks that must be completed to establish a satellite communications circuit.

4.1 Obtain Contract *via* Orion Satellite Services Sales

Contact numbers for the Orion Satellite Services Sales Department are given in the table above.

4.2 Schedule Occasional-Use Access *via* Orion Satellite Services Scheduling Office

All satellite users are required to contact the Orion Scheduling Office to make the necessary arrangements to access Orion satellites. The access numbers are given in Table 2.

4.3 Identify Person Responsible for Uplink

Each uplink earth station must have a person, called the uplink point of contact, who is responsible for all uplink transmissions from that station, and who satisfies the following requirements:

1. The uplink point of contact shall be accessible by telephone and must have complete and total responsibility for control of the uplink equipment.
2. This uplink point of contact is ultimately is responsible for maintaining a transmission log as described in "4.7 Maintain a Log of Transmitted Signals".
3. In the event of an anomalous condition, the uplink point of contact shall have the absolute authority and technical capability, either by directly or, in the case of a remotely-controlled uplink, by alternate means, to modify or cease transmission immediately upon, and in accordance with, direction from the Orion Operations Center.
4. Should the Orion Operations Center request modification or cessation of transmission to an Orion satellite, the uplink point of contact must have the authority to do so without recourse to a higher authority.

The uplink point of contact is to be identified on the Earth Station Description Form, Appendix 3.

4.4 Complete and Forward the Earth Station Description Forms to Orion

To aid Orion in effectively managing its space segment, information on each earth station capable of transmitting to an Orion satellite must be collected and stored in an earth station database. The maintenance of this earth station database requires each customer to provide Orion with a completed copy of the earth station description form (included in "Appendix 3: Earth Station Description Forms") for each earth station deployed subject to the following conditions:

1. The earth station description form must be received by Orion within 10 working days prior to accessing the satellite unless otherwise agreed to by customer and Orion.
2. A revised earth station description form must also be received, *via* mail or fax, at least thirty (30) days prior to the customer changing any parameter included on the sheet or included in the Earth Station Performance Requirements given in Appendix 2.

Earth station description forms should be faxed or mailed to:

Orion Operations Center
Orion Satellite Corporation
2440 Research Boulevard
Rockville, Maryland, USA 20850-3238

Phone: 301-258-3390
Fax: 301-258-3389

4.5 Perform Initial Earth Station Performance Verification

Prior to commencement of any uplink transmissions from any site for the first time (or after performing certain modifications to an existing station such as repointing, repolarizing, antenna and/or feed replacement, etc.; refer to Section 4.8), it is mandatory that the Orion Operations Center be contacted to assist in performing an initial earth station performance verification test. To schedule testing, the Orion Operations Center should be contacted at least twenty-four (24) hours in advance. The Orion Operations Center may be contacted at the following numbers:

Phone: 301-258-3390
Fax: 301-258-3389

Service Representatives in the Orion Operations Center will first verify that the uplink station is authorized to access the Orion satellite system. Next, Orion Service Representatives will assist the earth station operator in initial pointing to the Orion satellite by identifying beacon frequencies, faxing transponder spectrum plots, and/or providing data on identifying features that may be required. The Orion Service Representative will then coordinate with the customer to perform the Earth Station Performance Verification and Access Procedures given in "Appendix 4: Specific Steps for Customers Accessing the Orion Satellite System".

Initial performance verification is the process whereby the customer, under the direction of an Orion Service Representative, certifies the suitability of a new or reconfigured uplink earth station prior to the operation of that station using Orion transponders. The purpose of the process is to prevent any harmful interference into Orion or adjacent satellite space segments due to an out-of-tolerance anomaly of the earth station and to allow the customer to correct problems with the earth station prior to entering into operation.

It is recommended that all uplink earth stations be verified in accordance with "Appendix 4: Specific Steps for Customers Accessing the Orion Satellite System" at least 3 business days prior to the Service Commencement Date to ensure:

1. that adequate access time is available for testing the earth station, and

2. that most problems can be corrected prior to the Service Commencement Date.

However, Orion is not responsible for any delays in the customer's Service Commencement Date where the customer has not obtained performance verification of an earth station in sufficient time prior to the Service Commencement Date to allow for the correction of any problems the customer may have in passing the performance verification test and subsequently accessing the satellite.

4.6 Contact Orion Operations Center when Ready to Initiate Circuit

Most anomalous conditions occur on satellites during circuit initiation. Consequently, it is mandatory that the Orion Operations Center be contacted any time a customer commences or recommences transmission of any carrier to the satellite.

Even after the customer has obtained performance verification and is ready to transmit the normal communications signal, it is still necessary to contact the Orion Operations Center. As with performance verification testing, and excepting scheduled occasional-use services, it is also necessary to contact the Orion Operations Center at least twenty-four (24) hours in advance to schedule access on or after the Service Commencement Date . This restriction *may* be relaxed on a case-by-case basis.

4.7 Maintain a Log of Transmitted Signals

All users must maintain a log of all signals transmitted to the Orion satellite system. These logs are essential for the timely resolution of anomalous conditions on the satellite. The log should contain, as a minimum, the following information:

1. date and time (in Universal Coordinated Time) of transmission commencement,
2. frequency of transmission,
3. uplink polarization,
4. uplink power at feed flange,
5. description of uplink signal (including information rate, overhead rate, coding rate(s), signal modulation type, and bandwidth), and
6. date and time of transmission cessation.

The uplink point of contact is ultimately responsible for the transmission log, and this person must be able to access the log when requested by Orion. Logs should be kept for a minimum of 1 year after cessation of transmission.

For ONI/OANS customers, transmission logs will be maintained by the Network Management Center as part of red-lined field installation manuals and the master station log.

4.8 Notify Orion Operations Center prior to Cessation of Transmission

All customers are required to contact the Orion Operations Center immediately *prior* to cessation of transmission to the satellite.

4.9 Retesting Earth Station Performance

Users must contact Orion if any changes are made to the uplink earth station that could affect system performance, *i.e.*, contact with Orion is required if earth station changes will change any of the requirements given in the Earth Station Performance Requirements, Appendix 2. Any earth station that modifies equipment which affects any of the requirements given in the Earth Station Performance Requirements, Appendix 2, is required to again perform the Earth Station Performance Verification and Access Procedures in Appendix 4. Orion should again be given at least 3 days notice prior to the date that the earth station is to be placed back in service and reverification testing performed.

4.10 Fault Isolation

When a customer detects degraded link performance, the customer should first verify that their equipment is not causing the anomalous condition. After this verification, the customer should contact the Orion Operations Center who will commence fault isolation.

4.11 Cessation of Transmission for Anomalous Conditions

When a customer's transmission is determined by Orion to be the cause, or to be contributing to an anomalous condition, Orion has the authority to require the customer to modify or cease transmission to the satellite. Failure of the customer to immediately rectify the anomaly may result in the Customer becoming liable for penalties as provided in the Capacity Agreement. If the Orion Operations Center Service Representative is unable to contact the customer or if the customer fails to correct the anomaly, the Orion Operations Center Service Representative has the authority and responsibility to take appropriate action to prevent possible degradation to the satellite or transponder life or interference to other satellite users. Such actions may include suspension of service to the offending customer as detailed in the customer's contract.

Appendix 1: Definitions

The **Service Commencement Date** is the date and time defined in the contract upon which the customer may initiate their satellite communications service on the Orion satellite system. Note that all earth stations associated with the service must successfully complete performance verification testing in conjunction with the Orion Operations Center prior to the Service Commencement Date.

An **Uplink** originates a signal, either modulated or unmodulated, which has been amplified to a suitable power level and transmitted through an antenna to the satellite. The uplink **earth station** typically contains the signal source, modulator, frequency upconverter, amplifier, and antenna to transmit the uplink signal. The term **Earth Station** includes fixed and transportable earth stations. The key uplink characteristics are frequency, information rate, coding rate(s), transmission rate, modulation type, symbol rate, occupied bandwidth, Effective Isotropic Radiated Power (EIRP), and transponder access technique. Uplink interference levels into the Orion satellite system are determined by the uplink station's cross polarization performance and emissions outside of the bandwidth or time-slot authorized for the uplink station. Interference into adjacent satellite systems is determined by the uplink antenna's co-polarized and cross-polarized sidelobe characteristics.

The **Downlink** includes the signal transmitted from the satellite and the equipment at the downlink earth station where the signal is received by an antenna, amplified by a low noise amplifier (LNA), translated in frequency by a frequency downconverter, and demodulated by a demodulator. The key downlink characteristics are the receiving system figure of merit, which is the antenna gain to system noise temperature ratio (G/T), frequency, information rate, coding rate(s), transmission rate, modulation type, symbol rate, occupied bandwidth, and demodulator performance (*i.e.* modem Eb/No vs. bit error rate performance). Downlink interference levels into the Orion satellite system are determined by adjacent satellite characteristics, the earth station antenna co-polarized and cross-polarized sidelobe characteristics, and local terrestrial interference sources.

The satellite **Transponder** receives the uplink signal, translates it to the downlink frequency, amplifies it, and retransmits it into the appropriate downlink beam . The important transponder characteristics are saturation flux density, G/T, transfer characteristics, and downlink EIRP.

An **Anomalous Condition** (or an **anomaly**) is an event on the earth station to earth station path which causes or threatens to cause interference to the transmissions of others, harm to the Orion satellite or the satellite(s) of other carrier(s), or degraded service to a customer of Orion or to the customer of another carrier.

Occasional-Use Service(s) is assigned to a customer for access on a part-time basis or non-exclusive channel usage by prior agreement with Orion. Users of occasional-use services include occasional-use video customers. The minimum time interval allocated to a occasional-use channel user is 10 minutes.

DTH Service(s) which means Direct to Home, refers to broadcast carriers assigned to specific frequency bands allocated by the International Telecommunications Union for such service.

Partial Transponder Service is assigned to a customer for full time access by prior agreement with Orion. Uses for fractional transponder leases include single channel per carrier (SCPC) digital data and half-transponder analog video. Traffic planning will be jointly coordinated between the customer and Orion to obtain maximum benefit for the customer and to optimize satellite usage with regards to both power and bandwidth.

Full Transponder Service is assigned to a customer for full time access by prior agreement with Orion. Uses for fully-leased transponders include full-time analog video and high-speed digital data (e.g., 45 Mbps DS3). Traffic planning will be jointly coordinated between the customer and Orion to obtain maximum benefit for the customer and to optimize satellite usage.

The **Orion Satellite Services Sales Department,** located at Orion's headquarters in Rockville, Maryland, USA, is the customer's contact point for ordering capacity services and capacity contract arrangements.

The **Orion Satellite Services Scheduling Office,** located at Orion's headquarters in Rockville, Maryland, USA, is the customer's contact point for scheduling occasional-use satellite accesses.

The **Orion Operations Center**, located at Orion's headquarters in Rockville, Maryland, USA, is the customer's contact point for performance verification and link establishment.

Service Representatives at the Orion Operations Center are responsible for all activities involved in establishing the uplink, including coordination of earth station access to the satellite, initial performance verification, termination of earth station access, and fault isolation, and restoration operations.

Each Service Representative has the authority and responsibility to direct a customer to modify an uplink transmission when it exceeds the tolerances specified in these procedures. The Service Representative may also order termination of any transmission or take other appropriate action as defined in the Terms and Conditions when out-of-tolerance operation creates an anomalous condition.

The **Space Segment** is that portion of the communications uplink and downlink that is received and transmitted by the satellite.

A Very Small Aperture Terminal (**VSAT**) is an earth station characterized by reduced dimensions and capable of transmitting/receiving a limited volume of traffic. Generally, VSATs:

1. have an antenna transmit gain that is lower than 49 dBi, and
2. transmit signal signals at information rates is less than of 2 Mbps or less.

Further, Each a VSAT generally consists of an antenna, an **Outdoor Unit,** an intrafacility frequency link (IFL), and an **Indoor Unit.** The outdoor unit includes an integrated electronics package which is responsible for transceiving all signals which pass through the VSAT and for converting them between radio frequency (RF) and intermediate frequency (IF); as such, it integrates the traditional standalone components which perform transmit power amplification and receive low-noise amplification at RF as well as transmit up-conversion and receive down-conversion between RF and IF. The indoor unit is an electronics package whose main purpose is conversion between IF and baseband, including modulation, demodulation, forward error correction (FEC), and, occasionally, either multiplexing or protocol conversion capabilities. As such, the indoor unit is typically simply a traditional satellite modem.

Appendix 2: Earth Station Performance Requirements

1.0 Scope

This appendix identifies the characteristics and the performance requirements which must be guaranteed by stations accessing the Orion satellite system. The primary concern of this appendix is the performance of the radio frequency (RF) subsystem.

1.1 Mandatory and Recommended Standards

This appendix presents two classes of standards for the Orion satellite system:

1. **Mandatory standards** are specified to protect Orion space segment users as well as users of other nearby satellite systems which use the same frequency spectrum as Orion from harmful interference.;

2. **Recommended standards** relate to characteristics affecting the quality of the received signal by providing earth stations with minimum interference protection from other systems.

Total compliance must be assured between the earth station specifications and the *mandatory* standards. Deviations from the *recommended* standards can be accepted, but service performance, as defined in the contract, will not be assured in this case. In those cases where existing earth stations, installed in previous years for operation with different satellite systems, are not compliant, a case by case analysis shall be required before approval of operation on the Orion satellite system.

The customer must provide Orion with detailed descriptions of those parameters that are not compliant with the mandatory standards. This will allow Orion Satellite engineering personnel to estimate the link performance that is available with the proposed earth station, and to identify measures required to prevent interference to Orion and other satellite systems.

1.2 Requirements & Recommendations for RF Parameters

The following specifications and recommendations shall be verified by earth stations accessing the Orion satellite system, either by testing with Orion, testing with another satellite system, or by providing type acceptance data.

1.3 Frequency Bands

Earth stations accessing the Orion satellite system should have the ability to operate in any of the available transponders, and with any of the carrier frequencies that Orion deems necessary.

It is therefore *recommended* that:

1.3.1 Orion 1

Earth stations accessing the Orion 1 satellite system should be capable of transmitting carriers at any assigned frequency in the range 14.0-14.5 GHz.

European earth stations should be capable of receiving signals at any frequency in the bands:

11.45-11.7 GHz, and
12.5-12.75 GHz

U.S. earth stations should be capable of receiving signals at any frequency in the band:

11.7-12.2 GHz.

1.4 Frequency Resolution

It is *recommended* that:

Earth stations accessing the Orion system should have transmit and receive equipment that allows the carrier frequency to be set with a precision of 2.5 kHz.

1.5 Polarization Angle Steerability

Since polarization orientation with respect to the local horizon can vary over the coverage area, it is necessary to provide a means to adequately adjust this polarization.

It is therefore *mandatory* that:

The earth station shall be capable of adjusting its polarization angle over a range of ± 90°.

1.6 Transmit Cross Polarization Isolation

For efficient operation over both linear polarization senses, earth stations accessing the Orion satellite system must maintain good isolation between the two available polarizations. This limits the interference from cross-polarization components.

It is therefore *mandatory* that:

The earth station shall assure a transmission cross-polarization isolation within the tracking beamwidth of its antenna of :

30 dB

For transportable earth stations, it is *recommended* that a motorized polarization adjustment system be employed which can be operated while the user is in voice communication with the Service Representative in the Orion Operations Center. Orion reserves the right to charge the customer for transponder time in excess of 5 minutes used to optimize the polarization of a transportable earth station.

1.7 Receive Cross Polarization Isolation

The quality of the downlink signal depends, among the other factors, on the capability of the earth station to discriminate the received desired signals from the undesired signals on the orthogonal polarization. To limit the excess downlink interference, it is highly desirable that the earth station provide good receive cross-polarization isolation.

It is *mandatory* that:

The earth station shall assure a receive cross-polarization isolation within the pointing or tracking accuracy of its antenna of

30 dB

1.8 Maximum Emission Levels Outside Allocated Bandwidth

To protect other satellite users from interference, the level of earth station emissions must be limited in the frequency range outside of the allocated bandwidth of the customer. This limitation includes all multicarrier intermodulation products, TDMA carrier energy spreading, spurious signals, harmonic products, and broadband noise.

It is *mandatory* that:

The maximum emission level radiated by an earth station antenna into its assigned transponder, but outside its allocated bandwidth (as defined in the Circuit Parameter Sheet), must not exceed 6 dBW per 25 kHz.

For emissions outside the earth station's assigned transponder, it is *required* that:

The emissions radiated by an earth station antenna which fall outside of the assigned transponder bandwidth must not exceed 4 dBW per 25 kHz.

1.9 EIRP Stability and Control

To guarantee the earth station user the service quality specified in the contract, and also to protect the Orion satellite system from excessive unbalancing among the carriers transmitted into each transponder, it is required that proper stability of the earth station's EIRP be guaranteed.

It is therefore *mandatory* that:

The EIRP of any carrier transmitted in the direction of the Orion satellite system, measured in a continuous 24 hour period, shall not vary by more than ± 0.5 dB. Stations employing uplink power control shall not exceed authorized satellite flux densities by more than 1 dB at any time.

All carrier levels must be adjusted for nominal operation at a power no greater that their assigned EIRP.

Orion may, over the life of a satellite, adjust the gain setting of any transponder to maximize satellite throughput efficiency and performance. It is recognized that SFD settings may be adjusted from the nominal values of the original setting, and, as a result, earth stations accessing the transponder may be required to their carrier levels up or down accordingly to accommodate such a change.

It is therefore *recommended* that:

All transmitting earth stations shall be capable of providing transmit level control of up to ± 6 dB from the nominal EIRP value.

1.10 Earth Station Transmitter Termination

Unauthorized power levels transmitted from earth stations degrades the integrity of the space segment. Removing only the radio frequency drive to the earth station output amplifier is *not* sufficient to terminate the transmission.

It is *mandatory* that:

The output amplifier must be switched into a waveguide load, or its power source must be removed, to affect the termination of transmission.

1.11 Uplink Power Limits

Uplink power control allows continuity of service during periods of heavy rainfall, but it must be carefully maintained to guarantee proper operation.

Consequently, it is *mandatory* that:

Uplink power control be performed in an automated fashion (*i.e.*, manual control is not permitted) and the response of the system shall be sufficiently agile to guarantee that the flux density at the satellite never exceeds the nominal value by more than 1 dB.

Earth stations using uplink power control may not relax the out-of-band emission requirements stated in Paragraph 1.8 of this Appendix as received at the satellite.

EARTH STATIONS WITHOUT UPLINK POWER CONTROL MAY NOT CHANGE UPLINK POWER FOR ANY REASON (INCLUDING ADVERSE WEATHER) WITHOUT PRIOR APPROVAL OF THE ORION OPERATIONS CENTER.

1.12 Antenna Transmit Co-Polarized Sidelobe Pattern

To avoid excess interference to adjacent satellites, a defined transmit co-polarized sidelobe pattern is required for earth stations accessing the Orion satellites.

It is therefore *mandatory* that:

The off-axis transmit antenna co-polarized gain of the earth station at an angle of Θ from the main beam shall not be higher than the following values:

$$\text{Gain [dBi]} \leq \begin{cases} 29 - 25\log_{10}(\Theta) & \text{for } \varphi_{min}° \leq \Theta \leq 7° \\ +8 \text{ dBi} & \text{for } 7° \leq \Theta \leq 9.2° \\ 32 - 25\log_{10}(\Theta) & \text{for } 9.2° \leq \Theta \leq 48° \\ -10 \text{ dBi} & \text{for } \Theta \geq 48° \end{cases}$$

where φ_{min} is the smaller of 1° or $\frac{100\lambda}{dia}$ and λ is the wavelength which corresponds to the frequency of interest. For example, φ_{min} at 14.25 GHz is: {1.75° for 1.2m; 1.17° for 1.8m; 1.0° for 2.4m and larger}.

Deviations from the above mentioned limits shall be allowed for earth stations installed before 1995, but an adequate power reduction (up to 3 dB with respect to the nominal value established for compliant earth stations, dependent on sidelobe location in violation) might be required.

1.13 Antenna Transmit Cross-Polarized Sidelobe Pattern

To avoid excess interference to adjacent satellite systems, a defined transmit cross-polarized sidelobe pattern is required for earth stations accessing the Orion satellite system.

It is therefore *mandatory* that:

The off-axis transmit antenna cross-polarized gain of the earth station at an angle of Θ from the main beam shall not be higher than the following values:

$$\text{Gain [dBi]} \leq \begin{cases} 19 - 25\log_{10}(\Theta) & \text{for } \varphi_{min}° \leq \Theta \leq 7° \\ -2.1 \text{ dBi} & \text{for } 7° \leq \Theta \leq 23.2° \\ 32 - 25\log_{10}(\Theta) & \text{for } 23.2° \leq \Theta \leq 48° \\ -10 \text{ dBi} & \text{for } \Theta \geq 48° \end{cases}$$

where φ_{min} is the smaller of 1° or $\frac{100\lambda}{dia}$ and λ is the wavelength which corresponds to the frequency of interest. For example, φ_{min} at 14.25 GHz is: {1.75° for 1.2m; 1.17° for 1.8m; 1.0° for 2.4m and larger}

Deviations from the above mentioned limits shall be allowed for earth stations installed before 1995, but an adequate power reduction (up to 3 dB with respect to the nominal value established for compliant earth stations) might be required.

1.14 Antenna Receive Co-Polarized Sidelobe Pattern

The quality of desired received signals depend upon, among other factors, the capability of the earth station to discriminate the desired receive signal from interfering signals that originate on adjacent satellites.

It is therefore *mandatory* that:

The off-axis receive antenna co-polarized gain of the earth station at an angle of Θ from the main beam shall not be higher than the following values:

$$\text{Gain [dBi]} \leq \begin{cases} 29 - 25\log_{10}(\Theta) & \text{for } \varphi_{min}° \leq \Theta \leq 7° \\ +8 \text{ dBi} & \text{for } 7° \leq \Theta \leq 9.2° \\ 32 - 25\log_{10}(\Theta) & \text{for } 9.2° \leq \Theta \leq 48° \\ -10 \text{ dBi} & \text{for } \Theta \geq 48° \end{cases}$$

where φ_{min} is the smaller of 1° or $\frac{100\lambda}{dia}$ and λ is the wavelength which corresponds to the frequency of interest. For example, φ_{min} at 11.95 GHz is: {2.09° for 1.2m; 1.39° for 1.8m; 1.05° for 2.4m and larger}

1.15 Antenna Receive Cross-Polarized Sidelobe Pattern

The quality of desired received signal depends upon, among other factors, the capability of the earth station to discriminate the desired receive signal from interfering signals that originate on adjacent satellites.

t is therefore *mandatory* that:

The off-axis receive antenna cross- polarized gain of the earth station at an angle of Θ from the main beam shall not be higher than the following values:

$$\text{Gain [dBi]} \leq \begin{cases} 19 - 25\log_{10}(\Theta) & \text{for } \varphi_{min}° \leq \Theta \leq 7° \\ -2.1 \text{ dBi} & \text{for } 7° \leq \Theta \leq 23.2° \\ 32 - 25\log_{10}(\Theta) & \text{for } 23.2° \leq \Theta \leq 48° \\ -10 \text{ dBi} & \text{for } \Theta \geq 48° \end{cases}$$

where φ_{min} is the smaller of 1° or $\frac{100\lambda}{dia}$ and λ is the wavelength which corresponds to the frequency of interest. For example, φ_{min} at 11.95 GHz is: {2.09° for 1.2m; 1.39° for 1.8m; 1.05° for 2.4m and larger}

1.16 Pointing Stability

To protect adjacent satellites from excess interference, and to meet EIRP stability requirements in the direction of the Orion satellite system, the pointing stability of the uplink antenna must be specified.

It is *mandatory* that:

Uplink antenna pointing stability shall be such that environmental conditions, both internal and external to the uplink earth station, will not cause sufficient antenna movement to produce more than a ±1 dB change in operational flux density at the satellite. Under no conditions may the earth station violate cross-polarization isolation requirements of Section "1.6 Transmit Cross Polarization Isolation" of this Appendix.

1.17 Local Control and Monitoring

Customers accessing the Orion satellite system must design the uplink earth station with network analysis, RF monitoring and control systems that allow station operators to have, at a minimum, basic status information and control over the earth station's operating parameters. Earth stations shall either be manned or equipped to allow immediate correction of anomalies in the signal transmitted by the earth station.

Appendix 3: Earth Station Description Forms

e operator of each uplink station must complete and transmit the form on the following page so that it is eived by Orion *at least 10 days prior* to accessing the satellite. Systems with large numbers of identically ıipped sites, such as VSAT systems, may merge the required information, and need only to provide the ation for each station .

ORION Earth Station Description Form

Please print

Confirmation that Station Meets Orion Specifications

Owner/Operator of Earth Station	
Mailing Address:	
Voice Telephone Number *(country code-city code-number)*	FAX Telephone Number *(country code-city code-number)*

I certify that the earth station(s) meet the *mandatory* performance standards given in Appendix 2 of Orion's Access Procedures.
❑ Yes ❑ No *If no, provide explanation on separate sheet.*

Does the earth station(s) meet the *recommended* performance standards given in Appendix 2 of Orion's Access Procedures?
❑ Yes ❑ No *If no, provide explanation on separate sheet.*

What procedure was used to confirm that the earth station(s) complies with the mandatory performance standards given in Appendix 2:

❑ Tested in other satellite system ← *If checked, print name of system and antenna designator issued:*

❑ Antenna manufacture's data (please attach)

❑ Other ← *If checked, describe test procedures on separate sheet.*

Signature	Title	Date *(day/month/year)*

Contact Name: Provide name and phone numbers of person who is responsible for operation of this station

Contact Name *(Last, First)*

Contact Voice Phone # *(country code-city code-number)*	Contact FAX Phone # *(country code-city code-number)*

Antenna:	Diameter *(meters)*:	Manufacturer:	Model Number:
	Shape: ❑circular ❑elliptical ❑diamond ❑torus ❑other:	No. Transmit Feed Ports:	No. Receive Feed Ports:

Tracking System: ❑ Autotrack ❑ Program Track ❑ Fixed Mount (no tracking) ❑ Steptrack ❑ Manual Pointing

If Fixed Antenna Give Distance, Direction, and Name of Nearest City and the Earth Station Location Coordinates.

Longitude *(degs, mins, secs or fractional degs)*	❑ West ❑ East	Latitude *(degs, mins, secs or fractional degs)*	❑ North ❑ South

Transmit Specifications

Frequency Range: ❑ 14.0 - 14.5 GHz ❑ other *(provide frequency range)*:

Modulator/Upconverter Step Size: kHz

No. of HPAs: Phase Comb	**Maximum Transmit** ❑ Watts	**Max Power available** ❑ Watts
Size of HPAs: ❑Y ❑N	**Power Available**: ❑ dBW	**at Feed:** ❑ dBW

High Power Amplifier Termination:	Can a command be sent by the contact to remotely terminate the HPA into a a load or to remotely remove the HPA supply voltage? ❑ Yes ❑ No
Uplink Power Control:	Will the earth station use uplink power control? ❑ Yes ❑ No If yes, what is amount of control in dB?

Receive Specifications

Frequency Range: ❑ 11.45-11.7 GHz ❑ 12.5-12.75 GH ❑ 11.7-12.2 GHz ❑ other *(provide range)*:

Demodulator/Downcoverter Step Size: kHz

G/T (dB/K): **at** **GHz and** **° Elevation** How was G/T measured?

Appendix 4: Specific Steps for Customers Accessing the Orion Satellite System

Summary

Customers accessing the Orion satellite system must follow the procedures in this appendix. These procedures have been designed to ensure that the customer operates according to assigned levels and frequencies and to ensure that other customers are protected from interference.

Steps Prior to Access

Prior to accessing the Orion satellite system, the following steps must be completed:

1 Arrange for full-period, partial- or full-transponder **space segment capacity** through the Orion Satellite Services Sales Department, or, for occasional-use capacity, by contacting the Orion Satellite Services Scheduling Office at:

Phone: 301-670-6570
Fax: 301-670-6575

With the exception of occasional-use capacity, Orion will assign and forward **Carrier ID Numbers** which are required below.

2 Read and understand the Orion **Satellite Access Procedures.**

3 Fill out the Orion **Earth Station Description Form** and forward it to the Orion Operations Center at least 24 hours prior to access:

Phone: 301-258-3390
Fax: 301-258-3389

Steps to Access the Orion Satellite System

After the above arrangements have been made, follow these steps:

1 After verifying that all transmitters are off, point to the Orion-1 satellite at 37.5° W. The beacon frequency is 11.4505 GHz, LHCP. The circularly polarized beacon cannot be used to adjust polarization angles. The Orion Operations Center can provide spectrum plots and polarization predictions upon request. Polarization angle predictions provided by Orion are based on the definition given in Figure 1.

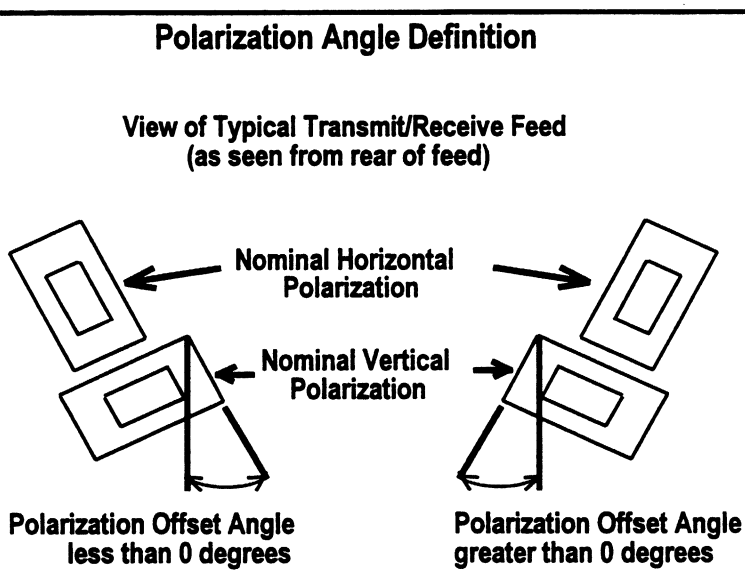

Figure 1: Polarization Angle Definition

2 Call the Orion Operations Center at 301-258-3390 and provide the following information:

Customer name
Carrier ID Number

3 The Service Representative in the Orion Operations Center will ask for confirmation of the following:

transmit site phone number
uplink operator's name
transmit frequency
transmit polarization
specified uplink time (for occasional-use services)
signal type and bandwidth
carrier cessation (goodnight) time (for occasional-use services).

4 When requested by the Service Representative , transmit a low power CW carrier at the proper frequency and polarization. **Do not transmit until authorized by the Service Representative.** Power levels are estimated in Figure 2: Initial Uplink Powers.

Feed Power for 35 dBW EIRP		
Antenna Dia	Transmit Power at Feed	
meters	mW	dBW
1.8	67.43	-11.7
2.4	37.93	-14.2
3.1	22.73	-16.4
4.5	10.79	-19.7
5	8.74	-20.6
6	6.07	-22.2
7	4.46	-23.5
9	2.70	-25.7
11	1.81	-27.4
18	0.67	-31.7
21	0.50	-33.1
30	0.24	-36.1

Figure 2: Initial Uplink Powers

5 Transmit cross-polarization isolation will also be measured by Orion. **For most satellite beam configurations, transmit stations cannot see the downlink resulting from their uplink.** The Service Representative will measure cross-pol levels and may request a polarization adjustment to minimize the cross-pol level.

6 Upon instruction from Orion, increase the EIRP of your CW carrier to 5 dB below authorized maximum level. You may be instructed to again readjust your feed or polarizer to minimize cross-pol levels.

7 Upon instruction from Orion, increase the EIRP of your CW signal to nominal levels.

8 Upon instruction from Orion, commence modulating.

9 Orion will measure the bandwidth occupied by your signal and confirm it is within specified limits.

Index

Note: Entries referenced by page numbers such as "1-4" refer to page 4 of Appendix 1, and references such as "0-4" are on page 4 of the main section.

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ORION ATLANTIC

Customer Service and Operations

G/T Measurement

(Receive System Performance)

Version 0.2

29 January 1997

File: H:\PRODUCTS\G_T_TEST\CSO_GT.DOC

Contents

Revision History

Revision	Date	Who	Comments
0.1	27 Jan 97	rlk	Edited John Effland's 17 January edition for CS&O department's needs.
0.2	29 Jan 97	rlf	Added of few helpful comments based on a test measurement of a 2.4m/110K LNB antenna system in Fredrick, Md. Added sample values that the NMC can expect to get when measuring a 2.4m/110K LNB system.

1.0 Introduction

This document provides the technique to measure the gain to system noise ratio (G/T) of a satellite receive antenna system.

The Network Management Center works with the ground operator to complete this test. The GO makes several key measurements, and the NMC collects other needed parameters to calculate the G/T. The project engineer provides two parameters needed for this measurement: the design-value G/T (from the link calculation) and the aspect correction from the attached plots. The PE includes these values in the appropriate data fields in the ARC file in the FIM.

This test is used together with the "Line-up, Receive System Performance, and Antenna Cross-pol Procedure" found in the GO Procedures Manual, Chapter 5.

This technique is for antennas that are not carrying live traffic because the antenna will be pointed off the satellite to measure the system noise level. This mis-pointing is most conveniently performed prior to carefully peaking up on the satellite signal. The technique is to nominally peak up on the satellite pilot signal, then move the antenna up in elevation (if that is the most convenient axis) just until the satellite pilot signal is no longer visible on the spectrum analyzer. Then the noise power is measured and recorded, which corresponds to the system noise. **Without changing any spectrum analyzer settings**, the antenna is carefully peaked on the satellite, and the pilot signal power is measured and recorded.

Table 1: Orion 1 Pilot Frequencies

Region	Polarization	Frequency
Europe High band	V	12,528.00 MHz
Europe Low Band	V	11,656.26 MHz
North America	H	11,728.00 MHz

2.0 Measurement Procedures

Table 2 describes the measurement procedures. Measured values should be recorded in Table 3.

Table 2: G/T Measurement Procedures

Step	Task	Procedures
1	Record the sitecode and date of measurement.	The NMC records the sitecode and date of measurement in Table 3, Step 1. The sitecode is found in the ARC file in the FIM.
2	Confirm that weather is clear.	Ideally, G/T should always be measured in clear weather. Otherwise, the system noise temperature measurement will be higher than normal. The GO records the current weather conditions as one of the following: clear sky, light clouds, dark thunder-clouds, snow, light rain, thunderstorms The feed must be kept clear of all forms of precipitation during the system noise temperature measurement, and snow and ice must be kept off the reflector during the entire measurement.
3	Record the manufacturer and model number of spectrum analyzer.	The GO and the NMC record the manufacturer and model number of spectrum analyzer. The NMC needs this information to determine the correct noise bandwidth to use in Step 18 of the calculation. The noise bandwidth (NBW) is the bandwidth of an ideal filter that corresponds to the resolution bandwidth used. The NBW for some spectrum analyzers, together with the recommended resolution bandwidths are given below: Spec. An. / Res. BW / NBW / NBW in dB-Hz HP / 10 kHz / 11.3 kHz / 40.5 Tektronix / 30 kHz / ~19 kHz / 42.8 Anritsu
4	Configure spectrum analyzer	The GO configures the spectrum analyzer as follows: Center Frequency: Adjust for pilot signal frequency shown in Table 1 Frequency Span: 100 kHz Resolution Bandwidth: Per NMC direction (Step 3 above) Video Bandwidth: 10 Hz

		Sweep Time: Automatic Attenuator: See Step 7 below. dB/Div. 5 dB
5	Point antenna up and slightly away from Orion 1	The GO moves the antenna up in elevation just enough so that the pilot signal falls below the noise in the spectrum analyzer display.
6	Check spectrum analyzer noise floor	The GO checks that the spectrum analyzer is primarily measuring LNA/LNB noise and is not overdriven. The GO disconnects the cable to the spectrum analyzer input. The noise level should drop at least 12 dB, and no more than 25 dB.
7	Is spectrum analyzer noise floor at least 12 dB below system noise floor?	**Yes -** The GO continues. **No -** The GO checks for excessive loss between the LNA/LNB and the spectrum analyzer or for too much attenuation on the spectrum analyzer's attenuator.
8	Is spectrum analyzer noise floor more than 25 dB below system noise floor?	**Yes-** The GO increases RF attenuation on spectrum analyzer, until noise floor drop is between 12 and 25 dB. Typical RF attenuation on HP with SSE radio is 40 dB. **No -** The GO continues.
9	Record system noise power	The GO measures and records the system noise power. The NMC records it in Table 3, Step 9. Don't touch the spectrum analyzer controls.
10	Note the spectrum analyzer noise power correction	Spectrum analyzers do not correctly measure random noise. The noise trace on HP spectrum analyzers is 2.5 dB higher than the correct value[1]. For the purpose of this measurement, we assume that all spectrum analyzers use this 2.5 dB value. The spectrum analyzer correction factor is in Table 3, Step 10.
11	Calculate the corrected system noise power	The NMC calculates the corrected system noise power by adding the values in Table 3 (Step 9 + Step 10). Example for HP spectrum analyzers: Displayed System Noise Power = -47.5 dBm, Noise Correction Factor = -2.5 dB Corrected System Noise Power = -47.5 + (-2.5) = -50 dBm Record the calculated value in Table 3, Step 11.
12	Carefully point antenna to Orion 1	The GO moves the antenna back to Orion 1 and carefully peaks up on the pilot signal. **Change only the reference level control on the spectrum analyzer.**
13	Record peak signal power	The GO measures and records the peak signal power. The NMC records it in Table 3, Step 13.
14	Calculate C/N	The NMC calculates the C/N by subtracting the value in the table for Step 11 from the value for Step 13. Example[2]: Peak signal power = -20 dBm,

[1] *"Spectrum Analysis Basics," HP Spectrum Analysis Application Note 150, 1Nov89, page 33.*

[2] *It is assumed that C/N and C+N/N are the same, which is essentially true for C/N's greater than 15 dB.*

		System noise power = -50 dBm C/N = -20 -(-50) = 30 dB Record the calculated value in Table 3, Step 14.
15	Record EIRP towards IOT Station	The NMC obtains the EIRP for the pilot of interest towards the IOT station from the Orion Operations Center (+1) 301 258 3390. Record this in Table 3, Step 15.
16	Record path loss towards IOT Station	The NMC picks the path loss based on the pilot used: European Hi Band: 206.4 dB European Low Band: 205.7 dB North American Band: 205.6 dB Record this in Table 3, Step, Step 16
17	Obtain aspect correction for the site under test.	The NMC gets the aspect correction from the ARC file in the FIM for this site. Alternatively, the NMC can estimate the aspect correction by locating the site on the appropriate plot. The plot depends on the pilot signal used: European Hi Band: Plot 1 European Low Band: Plot 2 North American Band: Plot 3 Find the downlink location on the proper plot and interpolate to find the aspect correction. Record this in Table 3, Step 17.
18	Correct the resolution bandwidth to obtain the noise bandwidth.	The NMC selects the correct noise bandwidth based on Step 2, and converts this value to dB-Hz. For HP spectrum analyzers, the noise bandwidth is about 1.13 times the resolution bandwidth[3]. Since the resolution bandwidth was set earlier to 10 kHz, the noise bandwidth is 11.3 kHz for HP spectrum analyzers. The noise bandwidth in dB is: $10\log(11.3\times10^3) = 40.5$ dB-Hz. Enter the appropriate value in Table 3, Step 18.
19	Add the relevant measurements to obtain the G/T	The NMC adds together those rows with signs in Table 3. That is, add (paying attention to signs) the following steps: (14) - (15) + (16) - (17) + (18) - 228.6 This value should be recorded in Table 3, Step 19.
20	Compare measured versus design-value for G/T. Determine if antenna G/T is acceptable.	The NMC compares the calculated G/T from this test to the design-value G/T found in the ARC file of the FIM. If the G/T is within 0.5 dB of the design-value, antenna installation is acceptable.
21	Troubleshoot possible problems when test FAILs.	The NMC guides the GO to: Review antenna assembly. Review Tech. Bulletin 96-004 Repoint antenna: possible sidelobe, adjust polarization. Review weather conditions on site and at IOT station. Review measurements and spec. an. settings. Review Feed, OMT, LNB, cabling to radio

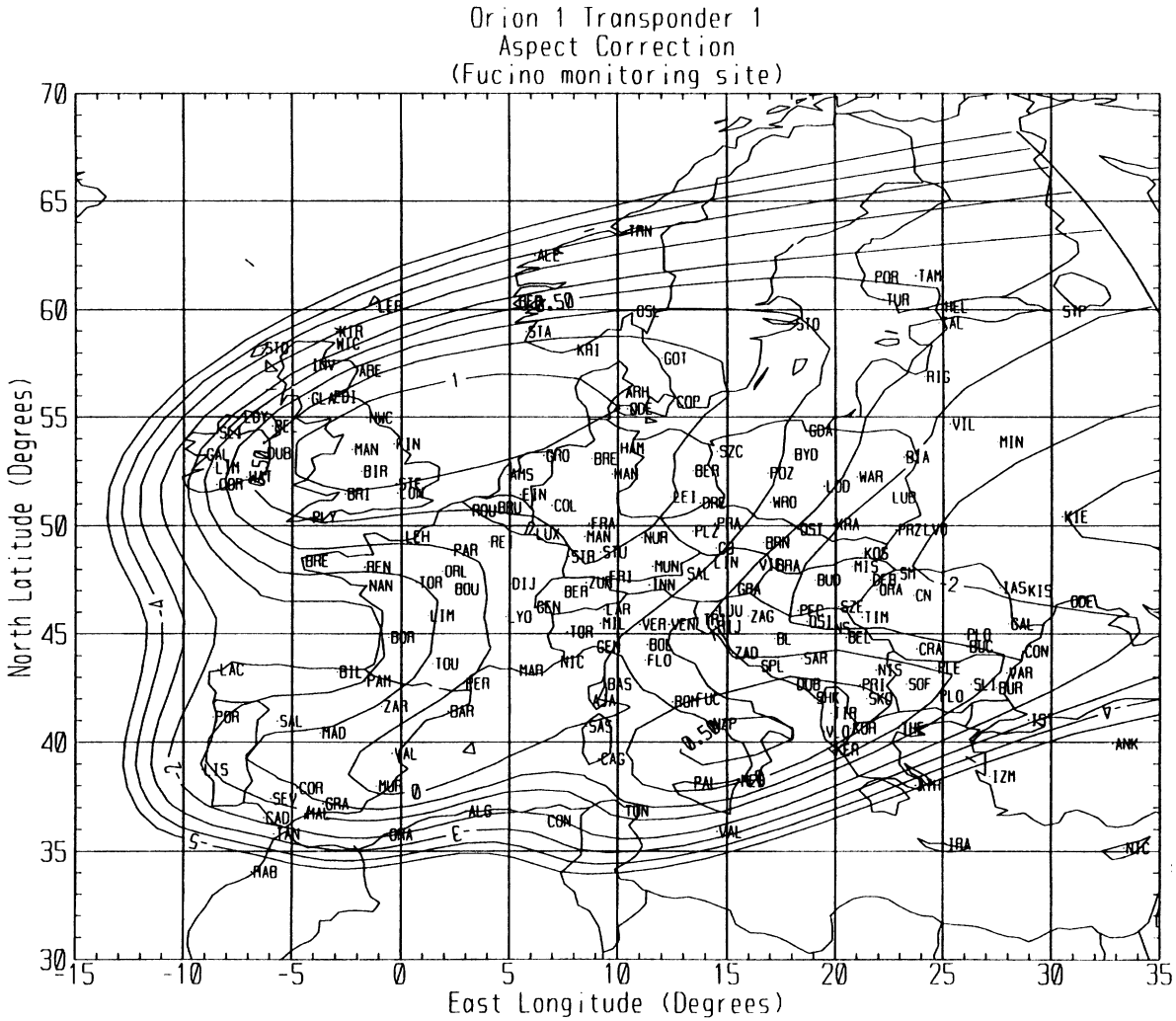
[3] *"Spectrum Analysis Basics," HP Spectrum Analysis Application Note 150, 1Nov89, page 32.*

3.0 Results Table

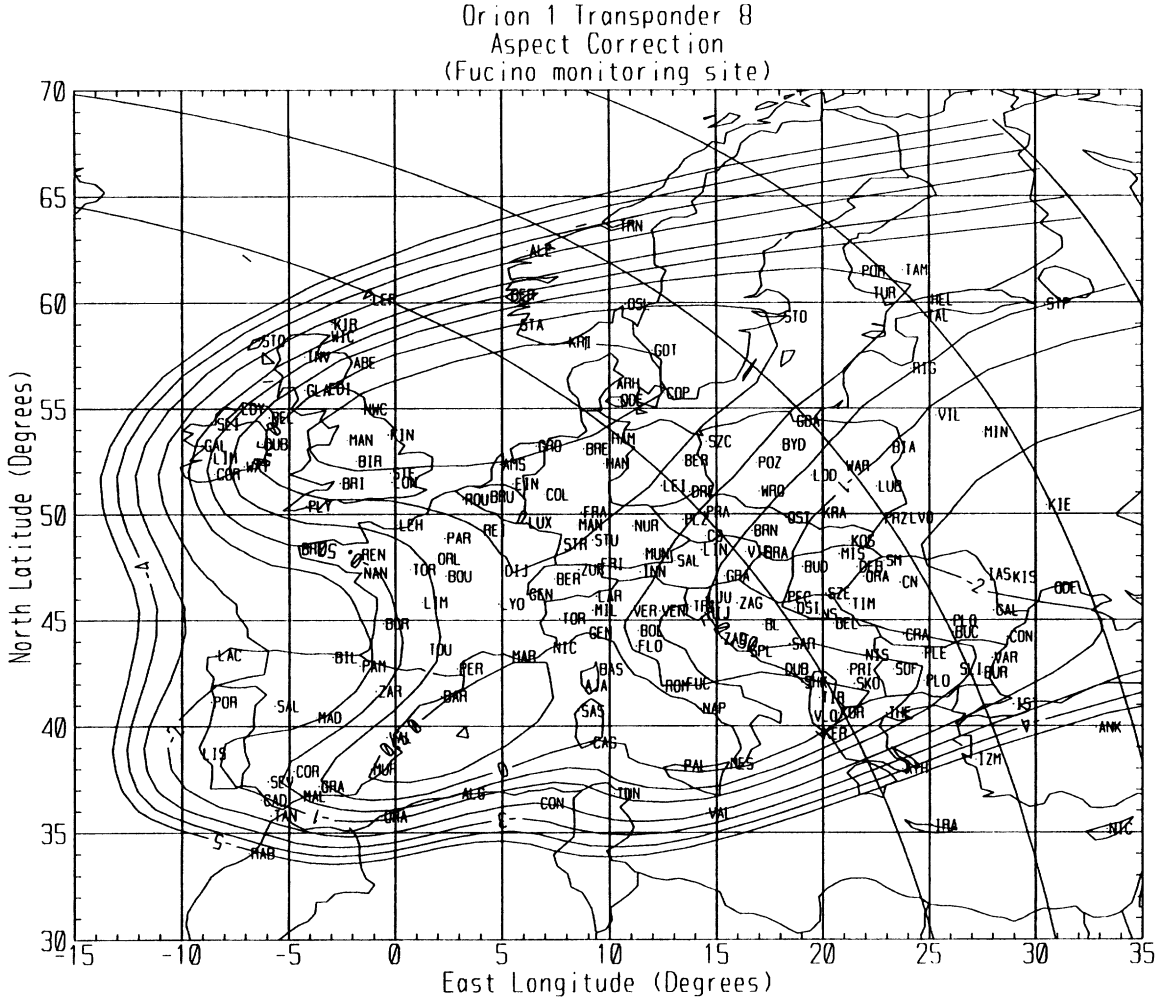
The measured results should be recorded in Table 3. Each measurement is fully described in Table 2 at the step number given in Table 3. Sample values were measured on a 2.4m / 110K LNB antenna system in Fredrick, Md., USA.

Table 3: G/T Measurement Results

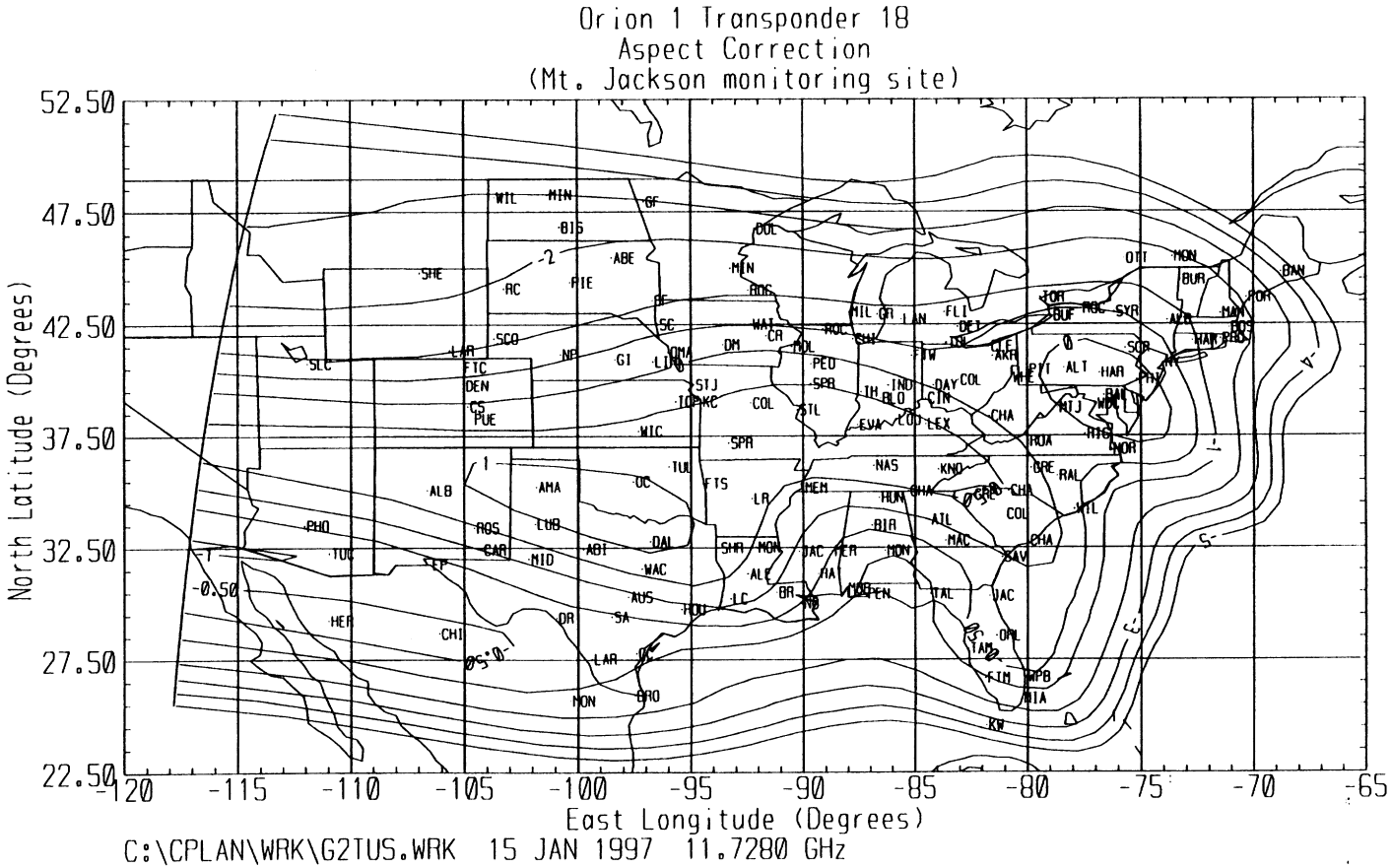
Step	Who ?	Description	Sign	Value	Units	Sample Values
1a	NMC	Record date:				
1b	NMC	Record sitecode:				
2	GO	Record weather conditions:				
3a	GO	Spectrum analyzer manufacturer:				
3b	GO	Spectrum analyzer manufacturer:				
9	GO	**Record receive system noise power:**			dBm	-51.7
10		Noise Correction Value:	-	2.5	dB	
11	NMC	Corrected receive system noise power (Add Steps 9 and 10):			dBm	-54.2
13	GO	**Record peak signal power:**			dBm	-13.3
14	NMC	C/N: Subtract Step 11 from Step 13	+		dB	40.9
15	NMC	Enter EIRP towards IOT Station:	-		dBW	32.0
16	NMC	Enter path loss towards IOT Station:	+		dB	EH: 206.4 EL: 205.7 NA: 205.6
17	NMC	Enter aspect correction:	-		dB	
18	NMC	Enter noise bandwidth:	+		dB-Hz	
		Boltzmann's constant:	-	228.6	dBW/K /Hz	
19	NMC	G/T Calculation: (13) - (14) + (15) - (16) + (17) - 228.6			dB/K	
20	NMC	PASS / FAIL:				



Plot 1: Aspect Correction Plot for European High Band Pilot



Plot 2: Aspect Correction Plot for European Low Band Pilot



Plot 3: Aspect Correction Plot for North American Pilot

Chapter 7
Test Procedures

Tabel of contents

OA-1.1. Local Satellite Modem Loopback Test.

1. Purpose of Test.

To confirm proper satellite Modem operation

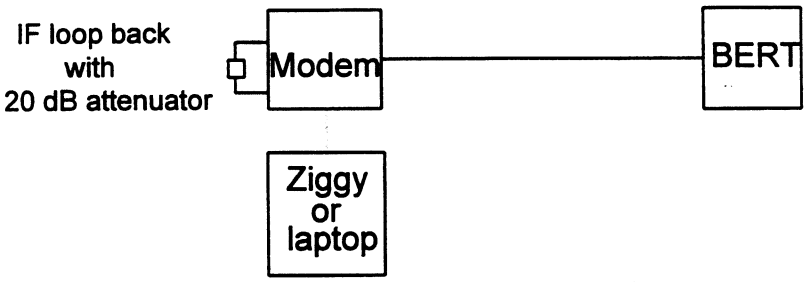


Figure 1. Local Loopback connection

2. Required Test Equipment

- BER test set with printer or Laptop and 00F/02M-08U-01-04F (formerly AA) cable.
- Laptop or hand-held terminal "Ziggy".
- BNC - BNC coax cable 41M/41M-01I-01-04F (formerly UU).
- 20dB attenuator

3. Equipment Configuration

Table 1—Configuration Settings for FIREBERD and Modem

FIREBERD Settings:		**Modem Settings**	
Data rate	per Modem config.	Data rate	per Modem config.
GEN CLK	INTF	TX freq.	70 MHz
Pattern	2047	RX freq.	70 MHz
Print event	15 minutes	RX buffer	Off
Mode	Error analyze	CLK TX REF	INT
Auto sync	Enable	CLK TX DATA	SCT
		CLK RX	RXC
		TX DATA ENC	See Modem config.
		RX DATA ENC	See Modem config.
		RX DATA SCRaMbler	See Modem config.
		TX DATA SCRaMbler	See Modem config.

Configure the following parameters; confirm the modem configuration sheet.

- TX DATA ENCoder TYPE, TX DATA ENCoder RATE, RX DATA Decoder TYPE.
- RX DATA DECoder TYPE, RX DATA DECoder RATE, RX /TX DATA SCRaMbler.

If the RX and TX ENCoding TYPE and / or RATE are not the same make RX ENCoding and / or RATE equal to TX. RX and TX DATA SCRaMbler must be the same too.

4. Procedure

Step 1.
- Connect FIREBERD, IF cable, and attenuator as shown in Figure 1.
- Configure FIREBERD and Modem as shown in Table 1.
- Set Modem output power level to -20 dBm.

Step 2.
- Run BER test for 15 minutes.

Step 3.
- Record results on the "Results of Local Satellite Modem Loopback Test" sheet

There is a sample sheet attached at the end of this document.

5. Criteria for Successful Test
- Error free BER test
- No sync slips
- No pattern slips

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Results of Local Satellite Modem Loopback Test

Orion
Representative: _____
Date: _____

1. Test ran error free.

Start Time: _____
Start Date: _____

Stop Time: _____
Stop Date: _____

2. Test indicated following Error Rate (less than 10^{-7}).

Error Rate: _____

Notes:

SAMPLE

OA-1.2. Absolute Receive Level Measurement at Satellite Modem.

Prior to performing this test, ensure that the earth station has met the requirements set out in the "Access Procedures for the Orion Satellite System, Ver.2.0."
The VSAT must be lined up and crosspolled as discribed in the Line-up procedure.

1. Purpose
- To record absolute receive signal level at satellite Modem.
- To determine fixed attenuator "if any" before demodulator input.

2. Test Equipment and Materials
- Spectrum analyzer
- Firebird or customer data equipment.
- Modem configuration sheet
- "Antenna and Radio Configuration" sheet

3. Procedure
Determine spectrum analyzer correction factor.

Table 1— Recommended Resolution Bandwidths

Information rate	RBW
32 kbps	3 kHz
48 kbps	10 kHz
64 kbps	10 kHz
96 kbps	10 kHz
128 kbps	30 kHz
	1544 kbps
2048 kbps	100 kHz

When measuring the signal level use a spectrum analyzer resolution bandwidth (RBW) that is less than 20 % of the signal bandwidth. The spectrum analyzer video bandwidth and sweep rate must be set so that the spectrum analyzer indicates that it is in calibrated mode. Use the following RBW settings for the following signal transmission rates.

Step 1.
Use the satellite Modem as a signal generator to determine the spectrum analyzer correction factor, as follows:

- Connect the satellite Modem to the spectrum analyzer. Select a resolution bandwidth consistent with the signal bandwidth per Table 1.
- Record Spectrum analyzer resolution bandwidth at the result sheet in the FIM.
- Set the satellite Modem to the proper carrier encoding and modulation parameters found in the modem config sheet.
- Hook either customer data equipment or firebird to the satellite modem.
- Turn the Modem modulation off (Ziggy keystrokes: TX CARR PURE OFF).
- Record the unmodulated signal amplitude (Amp. CW) at the result sheet in the FIM.
- Turn the Modem modulation on (Ziggy keystrokes: TX CARR PURE ON)
- Record the modulated signal amplitude (Amp. Mod) at the result sheet in the FIM.
- The difference between the umodulated and modulated signal level is the required correction factor.

Step 2.
- **Turn the Modem transmitter off "TX CARR PWR OFF".**
- Contact other site and verify status.
- Set Modem TX and RX to the frequency stated on the Modem configuration sheet.
- Set radio to the center frequency documented in the "Antenna and Radio Configuration" sheet.
- Connect IF cables to Modem.
- Bring up the satellite carriers at both sides.

Step 3.
- Connect the spectrum analyzer to the IF input line from the radio and measure RX carrier amplitude. Adjust frequency to view the carrier to be measured.
- Record RX Carrier level at the result sheet in the FIM.

Step 4.
- Calculate the absolute receive power by adding the spectrum analyzer correction factor to the receive carrier amplitude.
- Record the results at the result sheet in the FIM

Step 5.
- Add fixed attenuation to the RX line to adjust the signal level between -35 to -55 dBm (Fairchild Modem).
- Record absolute receive level after adding the fixed attenuator at the result sheet in the FIM

Although the demodulator input range is from -35 dBm to -55 dBm per carrier, consideration must be made to allow the (C+N)/N value to reach the "demod loss of lock" point before the lower end of the input range (-55 dBm) is reached during fade conditions. **Therefore, the ideal input operating level would be set for a value in the range of -40 dBm to -45 dBm.**

4. Absolute Receive Level Result Sheet

See "Step 1" "Test procedure OA-1.2 "

Record resolution bandwidth here: RBW = _____ kHz

Record data rate: Data rate = _____ kbps

Record unmodulated signal amplitude: Amp. CW = _____ dBm

Record modulated signal amplitude: Amp. Mod = _____ dBm

Correction Factor C.F.= _____ dB

See "Step 3" "Test procedure OA-1.2 "

RX Carrier level RX Carr. Amp= _____ dBm

See "Step 4" "Test procedure OA-1.2 "

Absolute RX Carrier = _____ dBm = RX Carr Amp _____ dBm + C.F. _____ dB

See "Step 5" "Test procedure OA-1.2 "

Absolute Rx level = _____ dBm

SAMPLE

OA-1.3. Sync Loss and Fade-Margin Test.

1. Purpose

- Determine (C+N)/N at which the local satellite Modem looses and regains lock.
- Set **final Modem output level** by achieving target fade margin found in "Antenna and Radio Configuration" page of field installation manual

2. Required Test Equipment

- Full installed VSAT modem.
- BER tester.
- Laptop or hand-held terminal (If applicable).

3. Procedure

Step 1.
Establish telephone communications with the transmitting earth station.

Step 2.
The transmitting side operator reduces the associated transmit carrier level in 1.0 dB or 0.5 dB steps. The receiving side operator fills in the worksheet noting when the demodulator loss of lock occurs and records the (C+N)/N. The transmit carrier is then increased in small increments until the demodulator again recovers solid lock. (The process may take 60 seconds or more). he associated (C+N)/N is then recorded. The final Modem output level is determined by finding the target Eb/No (listed on the "Radio and Antenna Configuration" page of field installation manual) and its associated Modem output level on the worksheet, and adding the target fade margin (listed on the "Radio and Antenna Configuration" page of field installation manual) to the associated Modem output level.

The Loss of lock point is determined when the modem carrier "Lock" indicator flickers on and off over a cycle of 10 to 20 seconds, **not** when the BER test set looses lock

It is very important that the receive carrier IF level must remain within the specified input dynamic range of the satellite Modem AGC, so that the results are purely a function of the demodulator/decoder circuitry

Step 3.
Assist the remote earth station in measuring its Modem sync loss point. Bring local carrier up, with coordination of OOC, to a nominal level which produces a margin equal to the target fade listed on the "Radio and Antenna Configuration" page of field installation manual. That nominal level is the final Modem output level, which provides a fade margin consistent with the 99.5% availability in Orion's standard contract.

4. Data Recording
Record the results at the OA - 1.3 result sheet in the FIM.
A sample sheet is attached.

OA 1.3 Result sheet Page 1 of 2.

Weather conditions (check one) ☐ Clear ☐ Cloudy ☐ Rain ☐ Snow
Spectrum Analyzer Make and Model: _____
Spec. An. Resolution Bandwidth used for the following measurements: _____
Nominal operating (C+N)/N: _____ dB
Demod loss of lock (C+N)/N: _____ dB
Demod lock (C+N)/N: _____ dB

SAMPLE

Note: Demod sync loss normally occurs at a (C+N)/N<6.5 dB. Have the transmitting station adjust to this level as a starting point.

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OA - 1.3 Result sheet Page 2 of 2.

From: _____ **To:** _____

Local Target Fade Margin from ARC	Modem Output Level	Modem Eb/No	Modem Lock Condition	Measured (C+N)/N	Bert Sync Condition
Nominal					
-1					
-2					
-3					
-4					
-5					
-6					
-7					
-8					
-9					
-10					

From: _____ **To:** _____

Distance Target Fade Margin from ARC	Modem Output Level	Modem Eb/No	Modem Lock Condition	Measured (C+N)/N	Bert Sync Condition
Nominal					
-1					
-2					
-3					
-4					
-5					
-6					
-7					
-8					
-9					
-10					

SAMPLE

OA-1.4. Satellite Modem to Modem BER Test.

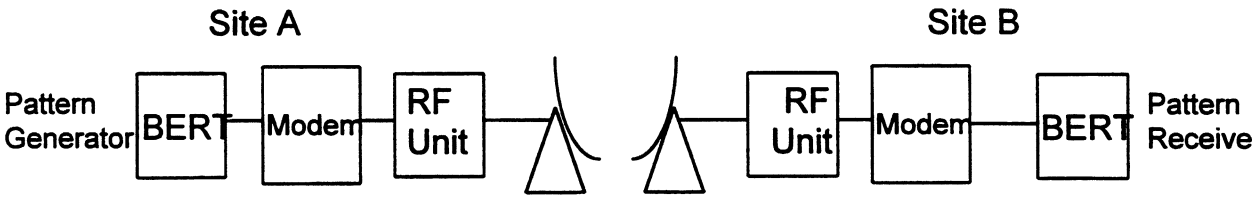
Before proceeding to "Satellite Modem to Modem BER Test," set satellite Modem to final levels found in test procedures;
OA-1.2 "Absolute Receive Level Measurement at Satellite modem Spectrum Analyzer Method!"
OA-1.3 "Sync Loss and Fade-margin Test"

1. Purpose of Test

To confirm proper satellite Modem, radio, and earth station operation

2. Test Equipment and Materials (for each site)

- Laptop
- Bit error rate tester with printer
- Test cable



3. Equipment Configuration

FIREBIRD		Modem		Modem		FIREBIRD	
Data Rate	per config.	Data Rate	per config.	Data Rate	per config	Data Rate	per config
GEN CLK	INTF	RX Buffer	ON	RX Buffer	OFF	GEN CLK	INTF
Pattern	2047	CLK TX REF	INT	CLK TX REF	RT	Pattern	2047
Timing	Sync	CLK TX DATA	SCT	CLK TX DATA	SCT	Timing	Sync
Interface	per config	CLK RX	INT	CLK RX	RXC	Interface	per config
						Print event	60 min.

4. Procedure

Step 1.
- Connect bit error rate testers at both ends of circuit as shown in above diagram.

Step 2.
- Run BER test(s) for 8 hrs. Attach FIREBERD printout at the OA -1.4 result sheet in the FIM.

A sample sheet is attached.

5. Results
Record results at OA -14 result sheet. A sample is attached.

6. Criteria for Succesful Test.
- Error free BER test ($< 10^{-7}$)
- No sync slips
- No pattern slips

OA -14 Results of Satellite Modem to Modem BER Test.
Orion
Representative:
Date:

Weather conditions (check one)

☐ Clear ☐ Cloudy ☐ Rain ☐ Snow

1. Test ran error free

Start time: _____
Start date: _____

Stop time: _____
Stop date: _____

2. Test indicated following error rate (less than 10^{-7}).

_____

Notes:

SAMPLE

Attached fireberd printout here.

OA-2.1. IF Cable Loss Measurement.

1. Purpose of Test
To measure and record the IF cable loss

2. Required Test Equipment and Materials
- IF signal generator (a spare satellite Modem can be utilized)
- Spectrum analyzer or power meter
- Handheld terminal "Ziggy" or laptop computer with Fairchild configuration program
- BNC RG-59 test cable 41M/41M-01I-01-04F (formerly UU).
- BNC or N coaxial "barrel," whichever is applicable

3. Procedure

Step 1.
- Make sure that the RFT unit is disconnected from the IF cables at the rooftop end.
- Make sure the spectrum analyzer or power meter is calibrated and operational.
- Connect the BNC test cable (RG-59) to the spectrum analyzer or power meter input and the IF generator output.
- If the satellite Modem is used as a signal generator set the carrier to "unmodulated" or "pure. "
- Set test signal generator to a known output level, for example: -10 dBm.
- Measure and record the output level of the signal generator.
- Record this value on the "Results of Measuring IF Cable Loss" sheet at the "A. Modem output" box.

Step 2.
- Connect the indoor end of the TX IF cable to the output of the test generator.

Step 3.
- Transport the spectrum analyzer or power meter and the BNC test cable to the opposite end (normally the rooftop end) of the cable to be measured.
- Connect the spectrum analyzer or power meter and test cable to the TX cable.
- Measure and record the signal level on the "Results of Measuring IF Cable Loss" sheet at the "B. IF level box."
- The difference between the "B" value and the "A" value measured in Step 1 is the cable loss.
- *If desired, other frequency points can be measured in the same manner.*

When measuring other frequencies, calibrate as in Step 1.

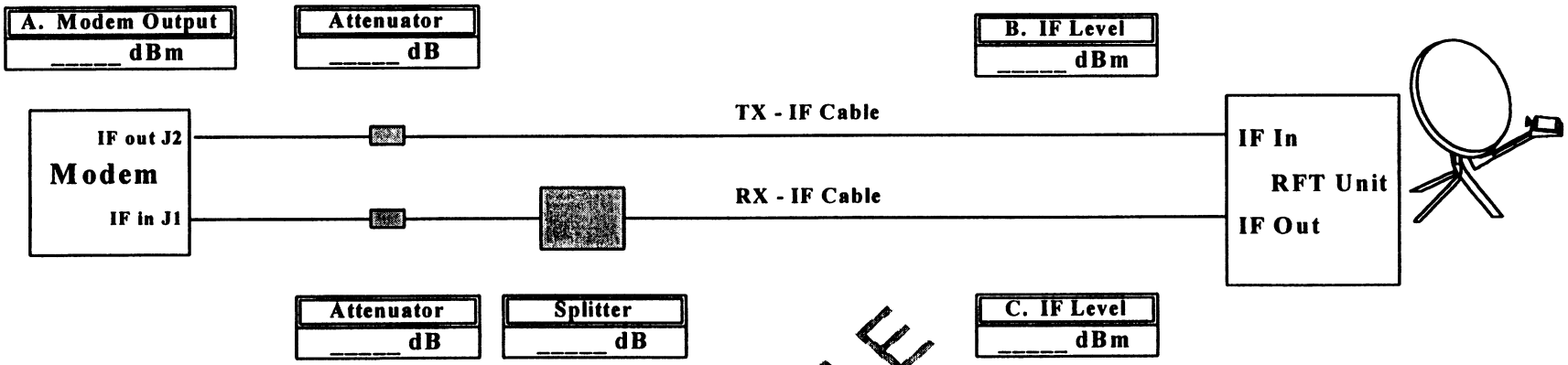
Step 4.

- Connect the indoor end of the RX IF cable to the test generator.
- Connect at the spectrum analyzer or power meer and test cable to the RX IF cable at the outdoor end.
- Measure and record the signal level on the "Results of Measuring IF Cable Loss" sheet at the "C. IF level box."
- The difference between the "C" value and the "A" value measured in Step 1 will be the cable loss.
- *If desired, other frequency points can be measured in the same manner.*

When measuring other frequencies, calibrate as in Step 1.

Step 5.

- Calculate cable loss.
- Turn the Modem transmitter off "TX CARR PWR OFF."
- Disconnect the test generator from the IF cable.
- Connect the RX and TX IF cable to the Modem (J1-RX, J2-TX).
- Connect the RX and TX IF cables to the RFT.



SAMPLE

TX Cable Loss _____ dB = A. Modem Output _____ dBm − B. IF Level _____ dBm

RX Cable Loss _____ dB = A. Modem Output _____ dBm − B. IF Level _____ dBm − Splitter _____ dB − Attenuator _____ dB

Ron Blok
14-March-96
Rev.0.5

OA-2.2. Determine Initial Modem Output Level.

1. Purpose of test

To determine Modem output level to compensate cable loss and transmit to the spacecraft with the nominal EIRP
To determine the fixed attenuator for a mid-range transmit level

2. Required Test Equipment and Materials

- "Antenna and Radio Configuration" sheet
- "Initial Modem Output Level Worksheet"
- Appropriate IF/RF radio curve (See attached radio curves)
- TX IF cable loss from "Results of Measuring IF Cable Loss" sheet

No test equipment needed.

3. Procedure

Step 1.
- Collect the information and complete "Calculation A" on "Initial Modem Output Level Worksheet."
- Lookup the HPA gain to accomplish the necessary HPA power.
- See appropriate IF/RF radio curves on attached radio curves.

Step 2.
- Calculate initial Modem output level ("Calculation B" on "Initial Modem Output Level Worksheet."
- Calculate the radio TX IF input level.
- Modem output level = HPA output power - HPA gain + IF TX cable loss.

Step 3.
- Calculate fixed attenuator if necessary.
- Chose the initial Modem output level so that the Modem output is approximately -15 dBm. If the difference between the calculated Modem output level and -15 dBm is >3 dB, install a fixed attenuator.

For example, if the calculated Modem output level is -21dBm, set Modem level to -15 dBm and install fixed attenuator 6 dB on Modem IF OUT, J2.

The nominal gain of a 2Watt SSE radio = 63 dBm.
The nominal gain of a 4 Watt SSE radio = 66 dBm
The nominal gain of a 8 Watt SSE radio = 69 dBm.
The input level at then radio IF Input may never exceed -30 dBm

Initial Modem Output Level Worksheet

Calculation A

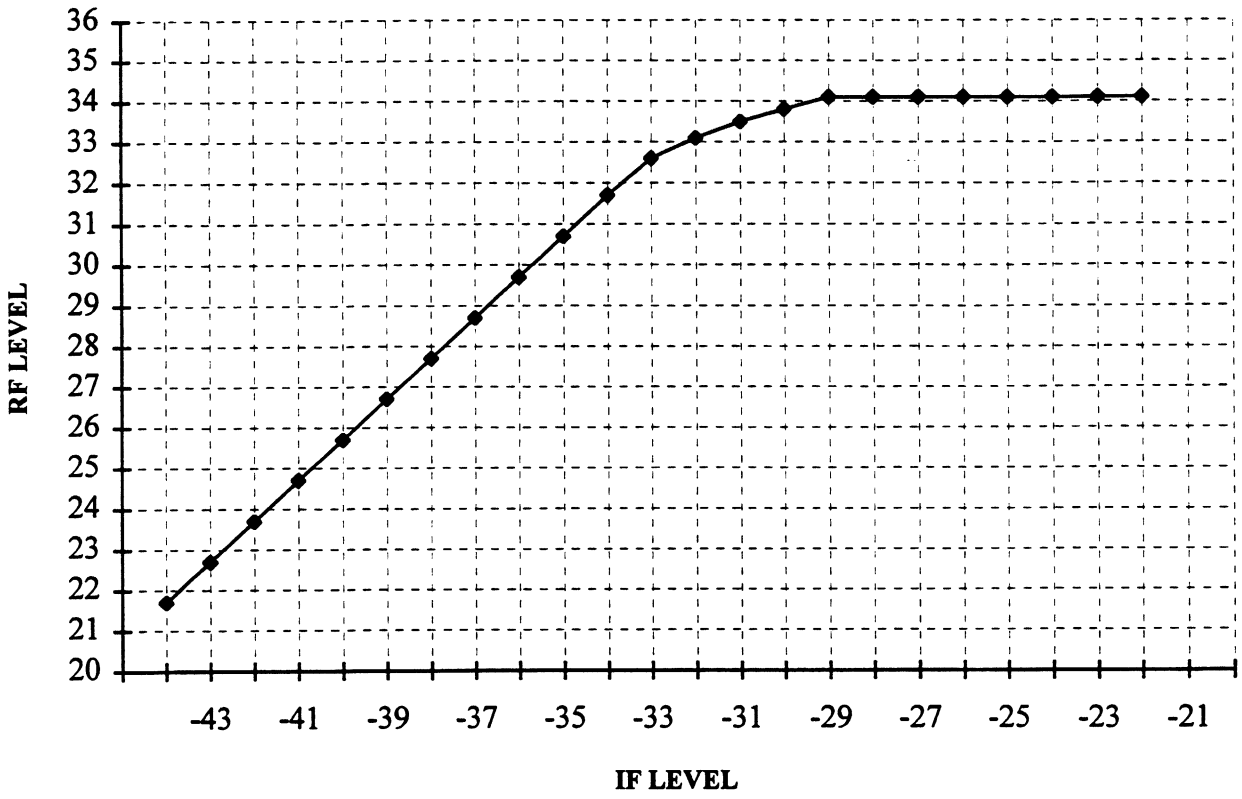
HPA output power		dBm	From "Antenna And Radio Configuration" sheet
HPA gain		dB	From radio curve at specified HPA output power
HPA input		dBm	HPA out/HPA gain
IF TX cable loss		dB	From "Results of Measuring IF Cable Loss" sheet

Calculation B

	dBm	HPA output power
-	dB	HPA gain
+	dBm	IF TX cable loss
	dB	Modem output

SAMPLE

Typical IF/RF Radio Curve—2 Watt



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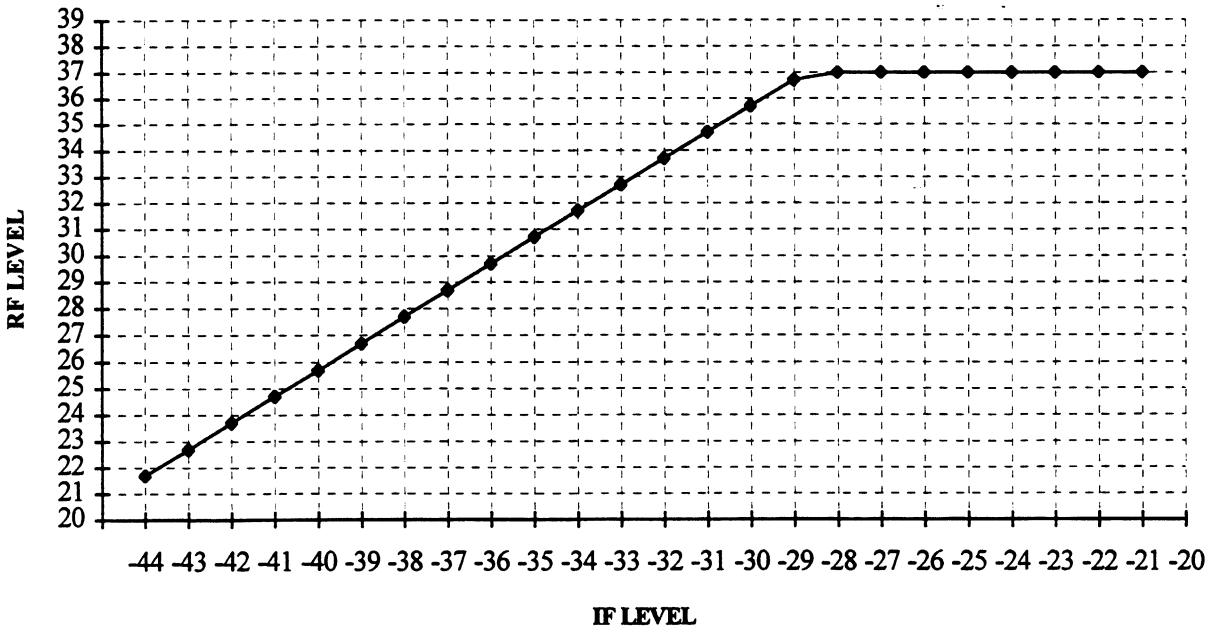
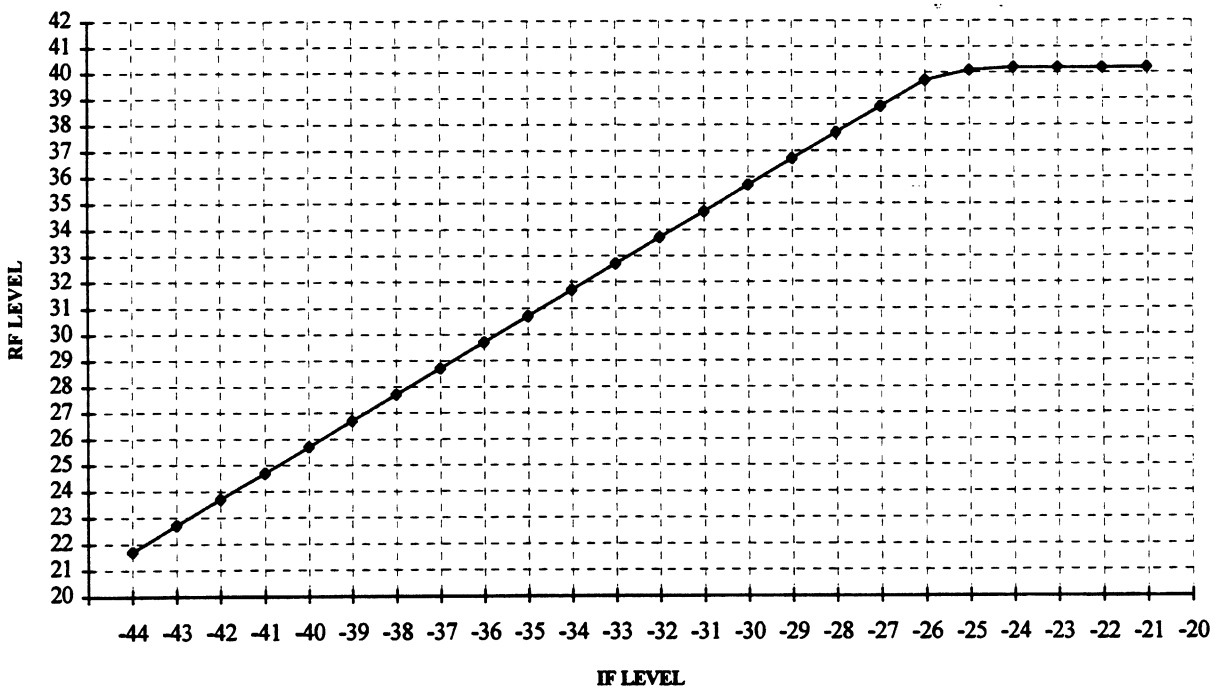
Typical IF/RF Radio Curve—4 Watt



Typical IF/RF Radio Curve—8 Watt



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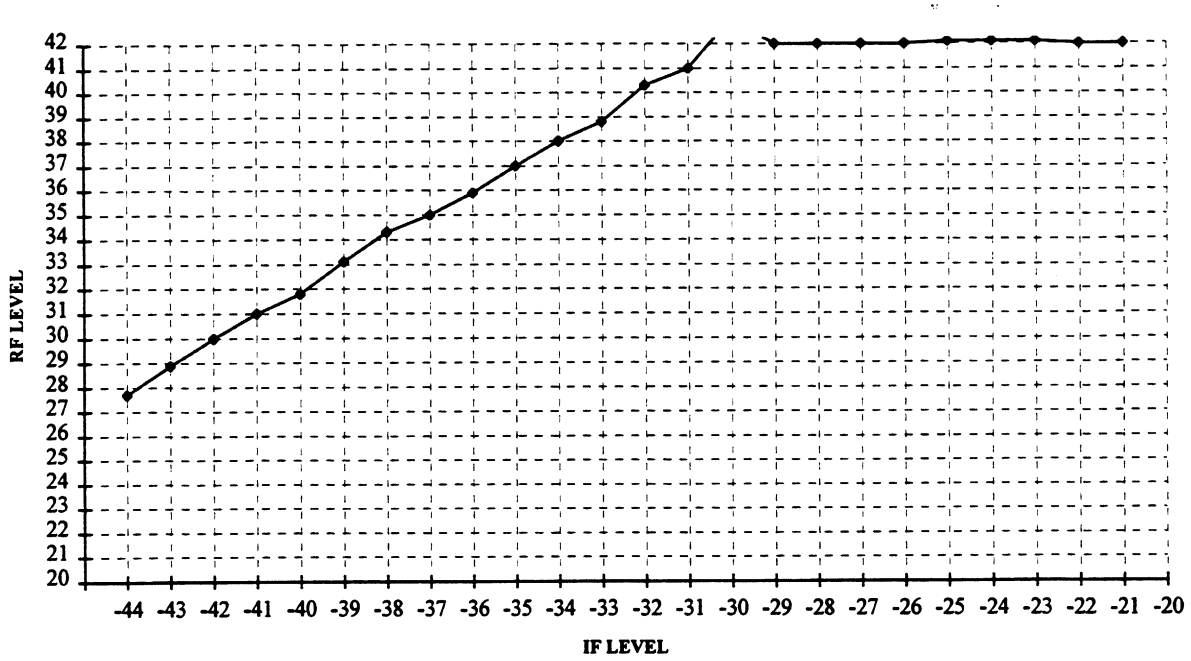
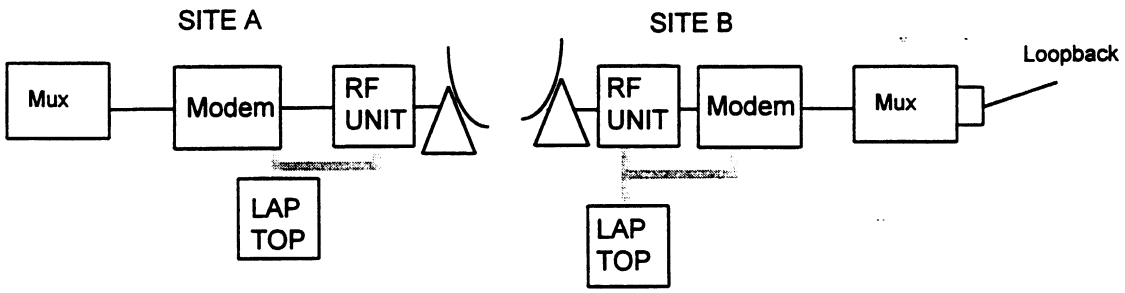
Typical IF/RF Radio Curve 16 Watt



OA-3.1. PCSI Multiplexer Voice Port Test.



To communicate with the multiplexer you need to configure the laptop for 9600 baud, 8 bits, 1 stopbit. Factory setting 1200,8,1

1. Purpose of Test:
To test end-to-end voice circuits by a series of loopbacks: first, loopback at multiplexer network card; second, loopback at modem; and third, loopback at distant end

2. Test Equipment and Materials
Digital telecom analyzer or built-in test capability of PCSI multiplexer
Laptop with terminal programma.
Cable between laptop and console port.

3. Procedure

Step 1.
- Connect equipment as shown above.
- Check if the communication between laptop and console port is working.

Step 2.
- Configure multiplexer as specified in field installation manual.

Step 3.
- Use the multiplexer controller to set the multiplexer for network port loopback toward subscriber by typing:
- **Network_port P3 Loop Subscriber**

Step 4.
Multiplexer should have a green sync light and no alarms. If multiplexer has alarms type: **show status Unit** and use Access Plus manual Tables 6.6 to 6-11 for remedy.

Step 5.
Use built-in test function on multiplexer to test voice ports by typing:

- **Analog** **Digital**
- **Voice V1-Vx off** **Voice V1a-Vx off**
- **Voice V1-Vx bit** **Voice V1a-Vx bit**
- Replace the "x" with the actual number of voice channels
- Check on laptop if voice ports are "OK"

Step 6.
Remove loopback on multiplexer by typing :

- **Network_port P3 loop off**
- Switch the satellite modem in IF- loopback by handheld terminal or front panel controls.
- Repeat steps 4 and 5.

Step 7.

- Remove loopback on satellite modem and put equipment in normal configuration. Verify that sync light on multiplexer is on.

Step 8.
Put the remote multiplexer voice ports in loopback toward network by typing:

- **Remote**
- Wait for remote multiplexer prompt.

Analog: Voice_port V1-Vx loop net
Digital: Voice_port V1a-Vx loop net

Replace the "x" with the actual number of voice channels
Repeat steps 4 and 5.

Step 9.
Remove distance loopback by typing :

- **Remote**
- Wait for remote multiplexer prompt.

Analog: Voice_port V1-Vx loop off
Digital: Voice_port V1a-Vx loop off

Replace the "x" with the actual number of voice channels
Verify that sync light on multiplexer is on.

4. Criteria for successful test
All voice channels show OK test.

5. Results
Record results on OA - 3.1 "Results of PCSI Multiplexer Voice port Tests" sheet.
A sample result sheet is attached.

OA-3.1 Results of Multiplexer Voice port Tests

Orion
Representative: _____
Date: _____

Test conducted between following two sites:

Site A: _____
Site B. _____

I. Multiplexer Network Loop Tests
Voice Channel Test OK? Yes ☐ No ☐

II. Modem IF Loop Tests
Voice Channel Test OK? Yes ☐ No ☐

III. Remote Multiplexer Loop Tests
Voice Channel Test OK? Yes ☐ No ☐

Notes:

SAMPLE

Site: _____ Customer Witness: _____

Date/Time: _____ Performed By: _____

OA-3.2. PCSI Multiplexer customer voice interface Test.

1. Purpose of Test
To allow for the voice connections to the customer PBX to be proven out, and for the levels at the multiplexers and the PBXs to be adjusted to optimize voice quality.

2. Test Equipment and Materials
None

3. Procedure

Step 1.
- Determine the recommended transmit and receive levels for the local PBX.

Step 2.
- Adjust levels on multiplexer voice cards using the command below to adjust voice levels to the levels recommended for the PBX:
- **Analog:** **Digital:**
- **Voice V1-Vx Tx_Level (gain).** **Voice V1a-Vx Tx_Level (gain).**
- **Voice V1-Vx Rx_Level (gain).** **Voice V1a-Vx Rx_Level (gain).**
- Replace the "x" with the actual number of voice channels

Step 3.
- Place calls between site A and site B and adjust levels on multiplexer and PBX as necessary to optimize voice quality. Record final voice levels on OA-4.2"Results of Customer Interface voice Test" sheet in the FIM.
- A sample result sheet is attached

OA-3.2 Results of Customer Voice Interface Test

Interface Type: _____ FXO, _____ FXS, _____ E&M

Record final voice levels transmit and receive in the following table:
(Note only one channel from each card need be tested, e.g. V1, V2)

SAMPLE

Digital voice cards Local Site	Site A PBX		Site B PBX	
	T x Lvl	Rx Lvl	T x Lvl	Rx Lvl
V1A				
V1B				
V1C				
V1D				
V2A				
V2B				
V2C				
V2D				
V3A				
V3B				
V3C				
V3D				
V4A				
V4B				
V4C				
V4D				
V5A				
V5B				
V5C				
V5D				
V6A				
V6B				
V6C				
V6D				

Analog voice cards Local Site	Site A PBX		Site B PBX	
	T x Lvl	Rx Lvl	T x Lvl	Rx Lvl
V1				
V2				
V3				
V4				
V5				
V6				
V7				
V8				

OA-3.3. Multiplexer Customer Acceptance Test.

1. Purpose of Test:
To review End-to-End BER results, and demonstrate voice call functionality.

2. Test Equipment and Materials
None

3. Procedure

Step 1.
Review Overnight End-to-end BER test results with customer. This data should demonstrate a reliable data path from Site A to Site B between multiplexers.

Step 2. Demonstrate Voice/Fax Calling
- Place calls repeatedly between Site A and Site B. Verify that each successive voice call received at a site is routed to a different voice card. For example, if one call uses voice card number one, then the next call should use voice card number two. Thus, to exercise all voice cards, at least six calls should be placed to the remote site.
- Send a short fax repeatedly between Site A and Site B.
- Record results in "Results of Customer Witness Test—Voice/Fax Calling".

4. Criteria for successful Voice/Fax tests
Voice calls are completed. No chopping is heard. Adequate voice quality is demonstrated. Fax calls are completed. A short fax is sent and normal fax quality is observed.

OA-3.3 Results of Customer Witness Test—Voice/Fax Calling
Enter P for Pass or F for Fail for each connection below:

Voice (Analog)	
Call Using Voice/Fax Card #	P/F
V1	
V2	
V3	
V4	
V5	
V6	
V7	
V8	

Fax (Analog)	
Call Using Voice/Fax Card #	P/F
V1	
V2	
V3	
V4	
V5	
V6	
V7	
V8	

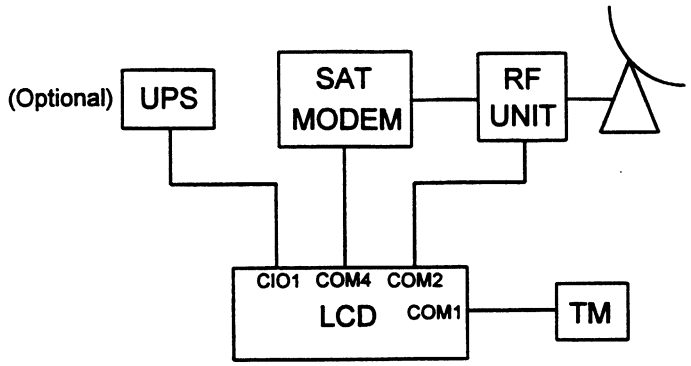
Fax (Digital)	
Call Using Voice/Fax Card #	P/F
V1a	
V2b	
V3c	
V4d	
V5a	
V6b	
V7c	
V8d	

Voice (Digital)	
Call Using Voice/Fax Card #	P/F
V1a	
V1b	
V1c	
V1d	
V2a	
V2b	
V2c	
V2d	
V3a	
V3b	
V3c	
V3d	
V4a	
V4b	
V4c	
V4d	
V5a	
V5b	
V5c	
V5d	
V6a	
V6b	
V6c	
V6d	
V7a	
V7b	
V7c	
V7d	
V8a	
V8b	
V8c	
V8d	

Site: _____ Customer Witness:_____

Date/Time: _____ Performed By: _____

OA-4.1. Monitor & Control Test for LCD.



1. Purpose of Test

To verify the proper operation of the LCD, the telephone Modem (TM), all M&C cabling and communication between the Orion Rockville/Stevenage Network Management Center (NMC)NMS and equipment under test

2. Test Equipment and Materials

- Laptop PC
- Fairchild modem software
- Windows terminal or Procomm terminal software
- Cable Type 00F/20M-03U-01-XXF (formerly TST010)
- Cable Type 00F/33M-03T-01-XXF (formerly TST014)

3. Procedure

Step 1.

Verify connection of devices under test using appropriate "Rack Wiring Diagram" and "Cable Run List." Verify the site telephone number to be used for the LCD M&C.

Step 2.

Place a call to Orion Rockville or Stevenage Network Management Center (NMC) at the following numbers:

- Rockville NMC +1-301-258-3365, or 3366, or 3367, or 3368
- Stevenage NMC +44-438-740-181

Ask the NMC to call into the TM (telephone Modem) and LCD at the site under test and verify that the NMC can read the correct configuration of each device under test. Refer to Table 1 on the next page for configuration parameters which can be locally observed (on the equipment front panel or using a laptop computer) and remotely monitored by the NMC for each piece of equipment.

Table 1—Equipment Configuration Parameters

Equipment Description	Configuration Parameters
Comstream CM701 Modem	RX IF Frequency TX IF Frequency TX IF Power TX Enable
Fairchild SM2800 Modem	RX IF Frequency TX IF Frequency TX IF Power TX Enable
Fairchile SM2900 Modem	RX IF Frequency TX IF Frequency TX IF Power
SSE S1214 Transceiver	Downlink Frequency

Step 3.

- Refer to Table 2 below and take the indicated action to generate a LCD fault based on the equipment type.
- Confirm that the LCD dials out to report the alarms and connects with the distant end.
- After the modem releases the phone line, contact the NMC and ask them to list the faults observed for each device. Confirm that these faults are consistent with those generated.

Table 2—Generating LCD Faults Using Various Equipment

Equipment Description	Action	LCD Fault
Comstream CM701 Modem	Disconnect M&C cable Modem Reset	AC Power Failure/Comm Loss Modem Reset
Fairchild SM2800 Modem	Disconnect M&C cable Press Reset button on M&C board	AC Power Failure/Comm Loss M&C Power Up Reset
Fairchile SM2900 Modem	Disconnect M&C Cable Press Reset button on M&C board	AC Power Failure/Comm Loss M&C Power Up Reset
SSE S1214 Transceiver	Disconnect LNC output to the Radio Disconnect TX IF input to the Radio	RX Level TX Level
UPS (if equipped)	Disconnect AC power	UPS Power Failure

Step 4.

- Record the test results on the OA-4.1 "Results of Monitor and Control Test for LCD " Sheet in the FIM. A sample result sheet is attached.
- If the LCD does not function properly, contact the NMC for further instructions. Be sure to have the LCD Site Disk on hand before making the call.

4. Criteria for Successful Test

NMC can communicate with each device under test. Each device initiates a call and reports alarms to the NMC when faulted.

5. Results

The test results are located on the OA 4.1 "Results of Monitor and Control Test for LCD " Sheet. A sample result sheet is attached.

OA-4.1 Results of Monitor and Control Test for LCD

Orion
Representative: _____
Date: _____

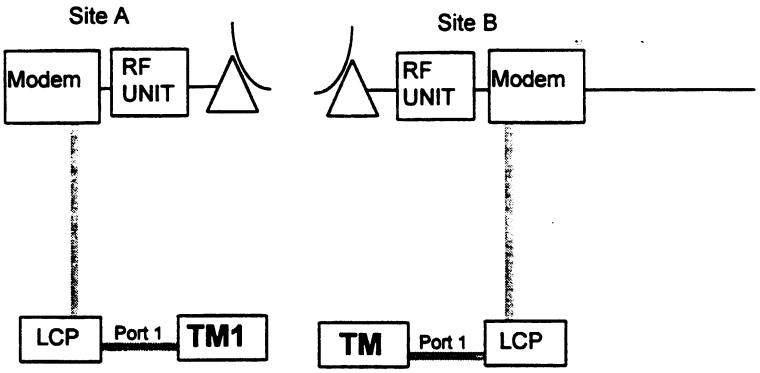
Telephone number of PSTN modem (TM) connected to COM1 on the LCD: _____

Devise under test	NMC Communicating System	NMC Reads Correct Configuration	Device Reports Correct Alarm
	IMACS	Yes☐ No☐	Yes☐ No☐
	IMACS	Yes☐ No☐	Yes☐ No☐
	IMACS	Yes☐ No☐	Yes☐ No☐
	IMACS	Yes☐ No☐	Yes☐ No☐
	IMACS	Yes☐ No☐	Yes☐ No☐

Notes:

SAMPLE

OA-4.2. Monitor & Control Test for LCP.



1. Purpose of Test

To verify the proper operation of the LCP, the telephone Modems (TM), all M&C cabling and communication between the Orion Rockville/Stevenage Network Management Center (NMC)NMS and equipment under test

2. Test Equipment and Materials

On-site technician does not require any test equipment.

3. Procedure

Step 1.

- Verify connection of devices under test using appropriate "Rack Wiring Diagram" and "Cable Run List."
- Verify with if the NMC is ready to check site and NMC configuration.

Step 2.

- Configure the LCP using the LCP section of the field installation manual.

Step 3.

- Generate a fault on each device under test, one at a time.
- Confirm that the LCP dials into the NMC and reports the correct alarm each time.

Step 4.

- Place a call to Orion Rockville or Stevenage Network Management Center (NMC) at the following numbers:
- Rockville NMC +1-301-258-3365, or 3366, or 3367, or 3368
- Stevenage NMC +44-438-740-181

- Ask the NMC to call into the TM (telephone Modem) and LCP at the site under test and verify that the NMC can read the correct configuration of each device under test. For example ask the NMC to read the Modem receive frequency and verify that the receive frequency is correct.
- Hang-up phone after test.

4. Criteria for Successful Test
NMC can communicate with each device under test. Each device initiates a call and reports alarms to the NMC when faulted.

5. Results
Record the test results on the OA-4.2 "Results of Monitor & Control Test for LCP " Sheet. A sample result sheet is attached.

OA-4.2 Results of Monitor and Control Test for LCP.

Orion
Representative: _____
Date: _____

Telephone number of TM: _____

Devise under test	NMC Communicating System	NMC Reads Correct Configuration	Device Reports Correct Alarm
	Open News/System 90	Yes☐ No☐	Yes☐ No☐
	Open News/System 90	Yes☐ No☐	Yes☐ No☐
	Open News/System 90	Yes☐ No☐	Yes☐ No☐
	Open News/System 90	Yes☐ No☐	Yes☐ No☐
	Open News/System 90	Yes☐ No☐	Yes☐ No☐

Notes:

SAMPLE

Site: _____ Customer Witness: _____

Date/Time: _____ Performed By: _____

Chapter 9
Logistics Procedures

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Table of Contents

9. Logistics Procedures

9.1. Introduction

Orion operates two Logistics departments, one at Orion Atlantic in Rockville/USA and another at Orion Atlantic Europe in Amsterdam/The Netherlands. At both locations the respective Logistics departments supervise the local integration activities for all new installations. The actual integration of a VSAT- or VISN-system and the testing of the integrated system is carried out by outside companies. Each Logistics department also manages two inventories; a stock of materials for integration purposes and a separate stock of spare parts. In addition, all actions in relation to the transportation of shipments to and from any country, including the return and repair of defective items are coordinated by the two Logistics departments.

Generally speaking all integration activities in relation to a site which is to be installed in a country within the European Union (EU) will be carried out in The Netherlands and are coordinated by the Amsterdam Logistics department. They also arrange the transportation of the integrated equipment. The same is applicable for any other shipment, for example a spares-shipment; If its destination is an EU-country, the shipment will either be sent from Amsterdam or, if the items are supplied by Rockville, the shipment will first be customs cleared into the EU in Amsterdam and from there be forwarded to the final destination. This is done to avoid payment of VAT. If the final destination is a non-EU country, integration can be done at either location and the shipment will usually be sent directly to the country of the installation.

9.2. General Statements

a) All transportation arrangements will be made by Orion. This includes all shipments to a country as well as all returns (defective items or de-installs) from a country. The Ground Operator (GO) is generally not required to take any action in the support of customs clearance, but may be requested by Orion Logistics to assist with the clearing of equipment on a case by case basis. Needless to say that any information on specific domestic regulations and requirements the GO can give to Orion will be appreciated.

b) As a standard all shipments to a country will be addressed to the GO. VSAT installations may be shipped to the customers location by advising the Orion Program Manager.

c) For all shipments the Logistics department in Amsterdam will fax a pre-alert to the responsible GO prior to the arrival of the shipment. This pre-alert consists of a (proforma) invoice and information on flight details.

d) The GO should always check a shipment upon receipt to see if any damages during transportation have occurred and to verify that all items on the (proforma) invoice are accounted for. Any damages and/or missing items should be reported by the GO to the Logistics department in Amsterdam within a maximum of 5 (five) working days after receipt of the shipment.

e) Orion will take care of all freight cost in relation to a shipment to or from a country, provided that the shipment was arranged by Orion.

f) Any questions or concerns on (the status of) shipments of integrated systems or spare parts can be addressed to the Logistics department in Amsterdam, regardless if they were shipped from Rockville or Amsterdam. The same applies to the collections of defective items. Your contact person in Amsterdam is Karin Dekkers. She can be reached at Tel. # +31 20 448 7132 or Fax. # +31 20 587 9955.

9.3. Spares

It is Orion's policy to have an adequate stock of spare parts at all GO's. The quantities and the number of different spare parts obviously depend on the number of installations the GO in question is responsible to maintain. In principle the availability of sufficient spares at a GO is the responsibility of Orion so that in case the Orion Network Management Center (NMC) opens a Trouble-Ticket and a GO is requested to go to the customer site to solve the problem, the GO should be able to draw from his own stock of Orion spare parts to support the maintenance call.

As you will understand this can only be achieved if Orion is fully aware of the deployment of spares by the GO's. Therefore all GO's are requested to supply a monthly overview to the Orion Logistics Departments, containing the following information:

- All spare-parts (Part number(s) and Serial number(s)) in stock;
- All spare-parts (Part number(s) and Serial number(s)) used during the past month, referencing the Orion Customer Site-code(s) and Trouble-Ticket Number(s);
- All defective items returned from a customer site (Part number(s) and Serial-number(s)).

This overview needs to be faxed by the 1st of every month to:

Logistics department Rockville, attn. David Klein at Fax. # +1 301 590 7401 OR Logistics department Amsterdam, attn. Karin Dekkers at Fax. # +31 20 587 9955

Based on this information Orion may decide to send additional spares to a GO. Additional spares will also be needed when new installations are put into operation within the area/country covered by the GO. As a standard the Logistics department in Rockville or Amsterdam will arrange for any spares required for a new installation to be sent to the GO. In other words additional spares for new sites will be sent to the GO automatically.

If for some reason a spare needed to solve an urgent problem at customer site is NOT in stock, the GO should contact the Orion Network Management Center and request an urgent spares shipment from one of the Orion spare parts inventories.

9.4. How to obtain Replenishment Spares

Once a problem at a customer's has been solved and the Trouble-Ticket closed, the following steps should be taken to replenish the GO spare parts stock:

- The GO calls the Orion NMC and provides the following information:
  - Trouble Ticket number;
  - Customer Site-code;
  - Parts used (state part-number(s) and serial number(s));
  - Parts needing replenishment (state part-number(s) and quantity(s)).
- The NMC transfers the request for replenishment spares to the Logistics department in Rockville who will determine where the items will be sent from, i.e. Rockville or Amsterdam;
- The Logistics department in Rockville or Amsterdam arranges for the shipment to be sent to the GO.

9.5. How To Return Defective Items

Based on the monthly overview faxed by the GO to Orion (as described under "Spares") the Logistics department in Amsterdam will arrange for a domestic freight forwarder to collect any defective items at the GO address and to ship these back to Amsterdam.

The GO is requested to do the following:

- Pack defective item(s) in box(es);
- Include a "Failure Report" with the defective item, stating among others the following details:
  - Tech Name & Ground Operator;
  - Customer Site-code;
  - Failure symptoms.

Note: Some blank Failure Reports are included in the procedures manual. New ones can be obtained by contacting the Logistics department in Amsterdam or Rockville.

- Put label(s) on the box(es) with the following ship-to address:

Muller Logistics c/o Orion
Attn. Rene Kleijnen
Snipweg 3
1118 DN Schiphol-South
The Netherlands

- Keep box(es) available for pick-up by the local freight forwarder.

Chapter 10
Tools and Test Equipment Requirements

11. Required Tools, Materials and Test Equipment for VSAT Installations

The following is a list of tools, materials and test equipment required to perform installation and repair of Orion VSAT systems.

11.1. TOOLS, BASIC KIT

1 ratchet wrench, 3/8 or 1/2 inch drive
1 socket, 1/2 inch or 13 mm deep well
1 socket, 3/4 inch or 19 mm deep well
1 socket, 1-1/8 inch or 29 mm deep well
1 combination wrench, 5/16 inch or 8 mm
1 combination wrench, 1/2 inch or 13 mm
1 combination wrench, 3/4 inch or 19 mm
1 combination wrench, 15/16 inch or 24 mm
1 combination wrench, 1-1/8 inch or 29 mm
1 combination wrench, 1-1/2 inch or 38 mm
1 pocket caliper, 4 inch capacity
1 fuse puller, midget non-slip, 1/4 to 1/2 inch
1 center punch, 3/32 inch
1 socket extension, 4 inch
1 hex key set, metric short arm
1 tweezers
1 solder removal tool
1 screw-starter, 3/16 inch standard blade
1 screw-starter, Phillips
1 metal file, fine
1 punch down tool with #66 and #101 blades
1 pliers, linemans
1 diagonal cutter, 8 inch
1 compass
1 electric heat gun or paint stripper, 750 watt
Cable Prep IF crimptool HCT-637 or equivalent
1 adjustable wrench, 10 inch
1 Allen wrench set, .05 to 3/8 inch
1 Allen wrench set, 1.5 to 10 mm
1 crescent or pipe wrench, 3 inch or 76 mm or larger, for 3 inch bolt
1 screwdriver set, standard blade
1 screwdriver set, cross blade
1 midget slip joint ignition pliers, 5 inch
1 long nose or long chain nose pliers
1 hammer, ballpeen, 16 oz. or larger
1 V.35 pin extraction/insertion tool
1 ignition wrench set, 7/32 to 7/16 inch
1 pin insertion/extraction tool, 4-48 pin
1 metal file, course
1 RJ 11 connector crimp tool
1 utility knife w/replacement blades
1 soldering iron and solder
1 flashlight w/batteries
1 RJ 45 connector crimp tool
1 RS-232 pin insertion/extraction tool
1 analog (SLT) telephone
1 inclinometer, 0.2 % accuracy

11.2. ADDITIONAL MATERIALS

- adhesive caulking compound
- electrical tape, Scotch 33 +, or equivalent
- shrink tubing, pre-shrink dia. 1/2 inch
- rubber tape, Scotch +C130, or equivalent
- data connector gender changers- 9, 15, 25 pin
- shrink tubing, adhesive lined, (weather seal for 5/8 inch, 3/4 inch)
- duct seal putty
- tie wraps, ultra-violet rated, 12 to 24 inch
- marking pen, fine point, indelible ink
- cable labels, adhesive and tie-wrap types
- 1/4 and 0.35 inch cable with 9/16 inch connector
- assorted male and female cable connectors for F, BNC, SMA, and N type applications

11.3. TEST EQUIPMENT

- Spectrum analyzer, 50 MHz to 2 GHz, RBW to 3 kHz or better, sensitivity to -95 dBm or better with +/- 250 MHz frequency accuracy or better (Hewlett-Packard model 8591 or equivalent)
- Data error analyzer, BER, average BER, sync loss, pattern loss recording, with V.35, RS449,
- data interface capability (TTC Fireberd 6000 with TCC 42522 data interface, or equivalent)
- Laptop computer, 286 or higher CPU, DOS-based, preferably with Windows 3.1 or higher with comport and terminal emulator software, such as Procomm Plus, with DOS-only configurations
- Orion-provided vendor software for Skydata and Fairchild products
- Fluke 12 Multimeter VOM, or equivalent
- Set probes for VOM (Fluke #17 angled, #13 curved, #6 curved)
- Fixed Attenuators, 75 ohm BNC; 1, 2, 3, 5, 10, 20 dB
- Fixed attenuators, 50 ohm BNC; 1, 2, 3, 5, 10, 20 dB
- Assorted IF/RF adapters, BNC-to-BNC, N-to-N, BNC-to-SMA, N-to-F, F-to-F, etc.
- Set Orion test cables, (as identified in Orion cable manual)
- Laptop to Fireberd cable, Orion AA
- Set male and female gender changers for DB 9, DB 25, DB 37 connectors
- DB 25 null modem adapter
- DB 9-to-DB 9 cable
- DB 25-to-DB 25 cable
- DB 9-to-DB 25 cable

11.3.1. OPTIONAL TEST EQUIPMENT

- RS-232 light box
- RS 232 breakout box, Techni-tool 474TE061, or equivalent
- V.35 breakout box, Black Box HK-TS291A, or equivalent
- TTC Firebert printer