

**DRAFT OF INSTALLATION MANUAL**



## PRE-INSTALLATION CHECKLIST

**Refer to Appendix “A” for the “NOMAD MXU Pre-Installation Checklist”. The checklist should have been completed before the NOMAD MXU was ordered, or at least before the MXU shipment arrived on site. The intent of the checklist is to prevent problems during the installation stages defined in this document.**

## SERVICE INFORMATION

**Contact the Gateway for questions concerning the installation, initialization and operation of the NOMAD MXU System**

## MANUAL REVISION HISTORY

Version	Date	Name	Reason
<b>Version</b>	<b>Date</b>	<b>name</b>	<b>Change</b>
XA	3/Feb/99	KHS	Initial draft copy, engineering release, Note: Copy sent to FCC
XB			

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

### TABLE OF CONTENTS

<b>1</b>	<b>Introduction.....</b>	<b>4</b>
1.1	How To Install The NOMAD MXU System.....	4
1.2	How To Use This Manual.....	5
1.3	Acronyms and Definitions.....	6
<b>2</b>	<b>Safety.....</b>	<b>7</b>
2.1	Safety Procedures and Precautions.....	<b>Error! Bookmark not defined.</b>
2.1.1	General Hazard Areas.....	7
<b>3</b>	<b>Description of Material Received.....</b>	<b>9</b>
3.1	User Site, Material Received.....	9
3.1.1	Console and Mounting Kit.....	9
3.1.2	Antenna Assembly and Mounting Kit.....	9
3.1.3	Interconnecting Cable Kits.....	10
3.1.4	Manual and Monitor CD, Users Location.....	10
3.2	Administrative Site, Material Received.....	10
3.2.1	Manuals and Administrative CD, Gateway Location.....	10
<b>4</b>	<b>Installation.....</b>	<b>11</b>
4.1	Console Installation.....	11
4.2	Antenna Installation.....	12
4.2.1	Placement.....	12
4.2.2	Installation.....	13
4.3	System Interconnections.....	15
4.3.1	Building Ground.....	15
4.3.2	Antenna Interconnections.....	15
4.3.3	Power Connection.....	18
4.3.4	PSTN to MXU Inter-Connections.....	18
<b>5</b>	<b>Checkout.....</b>	<b>19</b>
5.1	Initial Power Up Checks.....	19
5.2	PSTN Check.....	20
5.3	Monitor Station Check (Optional).....	21
5.4	Satellite Link Checks (Optional).....	21
5.5	Request Initialization.....	22
<b>6</b>	<b>Trouble Shooting Guidelines.....</b>	<b>23</b>
6.1	Power Problems.....	23
6.2	Telephone Line Problems.....	23
6.3	Antenna Line Problems.....	24
	<b>APPENDIX "A" –User Site, Pre Installation Check List.....</b>	<b>25</b>
	<b>APPENDIX "B" – Coax Cable Options.....</b>	<b>27</b>

### TABLE OF FIGURES

Figure 4.1-1:	Console Mounting.....	11
Figure 4.2.2-1:	Antenna / Mast Mounting.....	13
Figure 4.3-1:	MXU Console Interconnections.....	15
Figure 4.3.2-2:	NOMAD MXU Coax Connections.....	17
Figure 4.3.4-1:	MXU PSTN Interconnections.....	18
Figure 5.2-1:	PSTN Test Setup.....	20

DRAFT COPY

# 1 Introduction

## 1.1 How To Install The NOMAD MXU System.

The administration and installation manuals are intended to identify and clearly describe the procedures for a successful installation and configuration of the NOMAD MXU. Before proceeding, the local installer and gateway personnel are highly encouraged to read both manuals and completely understand the responsibilities of all parties.

The installation of the NOMAD MXU, Control Station and Monitor Station (optional) can proceed simultaneously as illustrated in Figure 1.1-1.

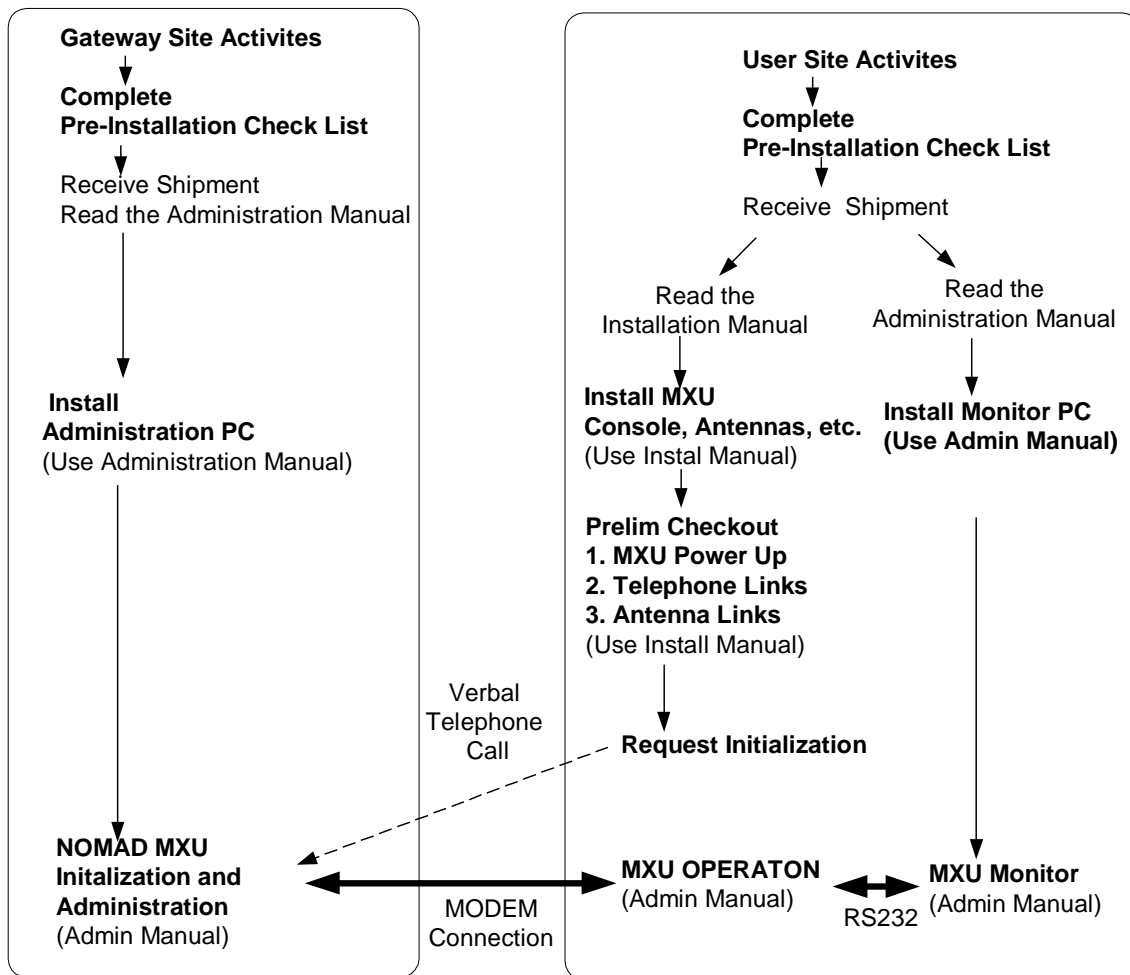


Figure 1.1-1: Installation Overview

## 1.2 How To Use This Manual

An overview, of the NOMAD MXU's console, antenna, monitor and interconnections, is illustrated in Figure 1.2-1. The installer should follow the instructions in this manual in the order they are presented.

Section 2.0 Review the Safety Procedures and Precautions

Section 3.0: Inventory the material received

Section 4.1: Install the MXU Console

Section 4.2: Assemble, locate and install the antenna

Section 4.3: System interconnections

Section 5.0: Checkout

Section 5.4 Request Initialization

Refer to the detailed instructions in this manual before connecting or assembling the components.

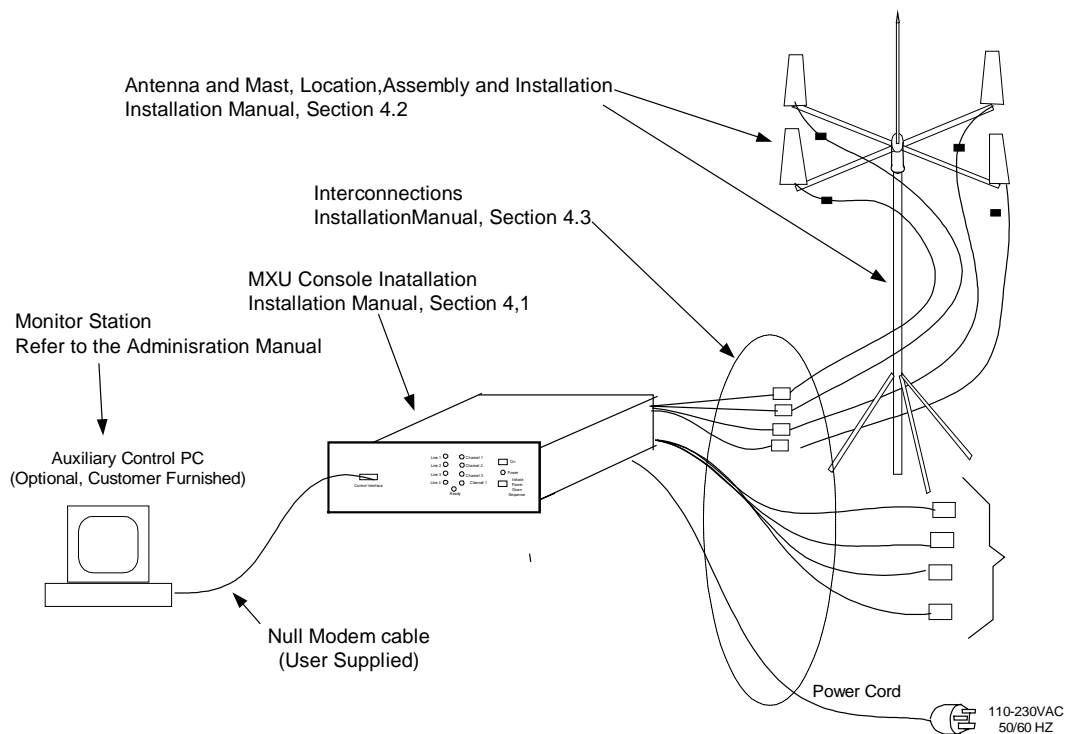


Figure 1.2-1: User Site, NOMAD MXU Console Installation Overview

### **1.3 Acronyms and Definitions**

CDR	Call Detail Record
CD ROM	Compact Disk Read Only Memory
CFB	Call Forward on subscriber Busy
DTMF	Dual tone Multi-Frequency
ISDN	Integrated Service Digital Network
ISU	Iridium Subscriber Unit, i.e. an Iridium phone
LBT	L Band Transceiver
LEO	Low Earth Orbit
MCM	MXU Configuration Management
MSISDN	Mobile Service Integrated Service Digital Network
MXU	MultiExchange Unit
NOMAD	An Iridium program utilizing commercial MXUs and ISUs with modified features
NOMAD MXU	A Standard MXU modified with special features specific to the NOMAD program
NOMAD ISU	A standard ISU modified with special features specific to the NOMAD program
PBX	Public Branch Exchange
PC	Personal Computer
PSTN	Public Switched Telephone Network
SIM	Subscriber Identity Module

## 2 Safety

### 2.1 General Hazard Areas.

**Those safety issues that could pose a concern are discussed within this document and listed below:**

- AC power is not removed internal to the NOMAD MXU console by pushing the front panel switch.
- Do not open the unit. There are no serviceable components within the system. Contact the Iridium gateway for service instructions.
- RF energy emitted by the antennae is of a very low level but as a precaution, it is recommended to maintain a physical distance of 30 cm while the unit is operating.

### 2.2 Specific Hazard Areas

**The specific areas of concern are detailed as follows:**

The precautions stated below must be observed to prevent personal injury, death or equipment damage:

- When possible, the power supply in the unit should be shut off before beginning work on the equipment. Note: Power can only be removed from the unit by disconnecting the AC power cable from the building mains power .
- The telephone lines have hazardous DC voltages and currents associated with the ringing system.
- The main power (i.e. 50/60 Hertz, 115/240 VAC) supplies hazardous AC voltage and current to the unit via the power cable.
- The antenna array is exposed to lighting hazards. Installation of lightning arrestors and proper connection to the building ground is necessary to avoid personal injury or death. Note: The attached ground wire may burn or vaporize during electrical storms.
- Outside communications wiring connected to the equipment should be handled with caution because of possible lightning voltages or ring voltages/currents that could be present and hazardous while in a disconnected condition.
- AC mains power can **ONLY** be removed from this equipment by disconnecting the AC power cable from the building mains power. **Always** disconnect the cable by handling the connector, not the cable itself.
- The AC power cable supplied has been selected to comply with the units power requirements and all applicable safety standards. **Do not** use another cable or otherwise modify it without contacting the Iridium Gateway for instructions.

### 2.3 Labels

The following labels either warn or caution service and operator personnel of safety hazards that could be associated with the MXU. They are located within this document as well as on the unit itself.



**WARNING**

**Improper AC Mains Grounding Hazard**

Ensure the AC mains power is properly grounded before connecting the equipment. Failure to observe this warning can result in serious injury or death by electrocution.

**WARNING**

**Improper Lightning Rod Grounding Hazard**

Ensure the lightning rod is properly grounded before connecting the equipment. Failure to observe this warning can result in serious injury or death by electrocution.

**WARNING**

**Electrical Storm Hazard**

Electrical storms can cause the antennae to be charged to high voltages. Do not touch outside of equipment, or grounding wires and rods during electrical storms. Failure to observe this warning can cause serious injury or death.

**CAUTION**

**Antenna Radiation Emission**

As a precaution, maintain a minimum distance of 30 centimeters (12 inches) from the antenna array while in operation.

**CAUTION**

**Replaceable Battery**

Danger of explosion if battery is incorrectly replaced.  
Replace only with the same or equivalent type recommended by the manufacturer.  
Dispose of used batteries according to the manufacturer's instructions.

**CAUTION**

**Digital Telephone Line**

Ensure the telephone lines are capable of accepting analog signals. DO NOT attempt to connect to a digital telephone line – equipment damage will result.

### 3 Description of Material Received

#### 3.1 User Site, Material Received

This section contains lists of material received at the user and gateway installation sites, Figure 3.1-1 illustrates the assembly and location of the various line items.

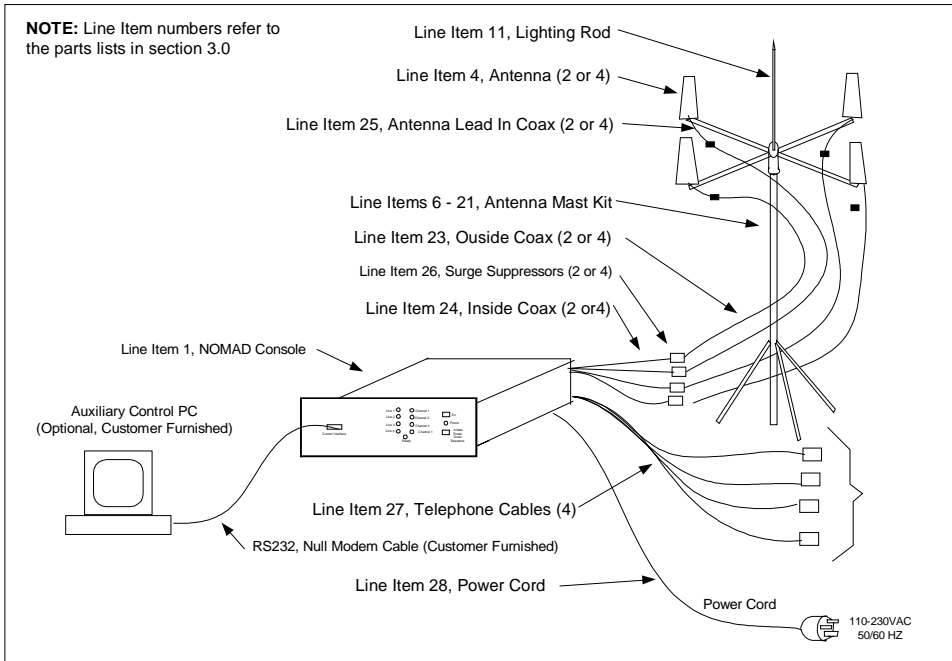


Figure 3.1-1: User Site, NOMAD Equipment Assembly

#### 3.1.1 Console and Mounting Kit

##### NOMAD MXU CONSOLE

1	Console	????????????	1
---	---------	--------------	---

#### 3.1.2 Antenna Assembly and Mounting Kit

##### 01-P43455F001 ANTENNA KIT

2	CROSSBAR	07-P43411F001	1 or 2
3	CABLE MOUNTING BRACKET	07-P43412F001	2 or 4
4	ANTENNA	85-P43415F001	2 or 4
5	ENDCAP	FCR-16	2 or 4

##### 01-P43460F001 ANTENNA MAST KIT

6	UNIVERSAL TRIPOD	RONNIE 5	1
7	TARPADS	78	1
8	LAG BOLTS	91478A546	14

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

9	LAG SCREW ANCHORS	97039A029	14
10	WASHER, FLAT	90108A029	14
11	LIGHTNING ROD	585CCAT-2/0	1
12	LIGHTNING ROD MOUNT	07-P43416F001	1
13	3 WAY FITTING	07-P43417F001	1
14	UBOLTS	3043T78	2
15	WASHER, LOCK	91102A031	4
16	TIE WRAPS	7130K56	25
17	SURGE SUPPRESSOR MOUNT	07-P43418F001	1
18	CABLE, GROUNDING	1/0-19	7620 MM
19	LUG, TERMINAL, OFFSET	GEOL4	1
20	BOLT	HHCS008M0025Z	1
21	NUT, LOCKING	NFL008MJISZ	1
22	5/32 ALLEN WRENCH	7122A21	1

### 3.1.3 Interconnecting Cable Kits

#### 01-P43465F001 INTER-CONNECTIONS KIT

23	CABLE, ASSEMBLY W1	AE50738	2 or 4
24	CABLE, ASSEMBLY W2	AE50739	2 or 4
25	CABLE, ASSEMBLY W3	AE50774	2 or 4
26	SURGE SUPPRESSOR	IS-CLF50LN	2 or 4

#### 01-P43470F001 TELEPHONE CABLE

27	CABLES TELEPHONE	LC14S	4
----	------------------	-------	---

#### 01??????????? Power Cord

28	Power Cord	???????????	1
----	------------	-------------	---

### 3.1.4 Manual and Monitor CD, Users Location

#### User Manuals and Monitor CD

29	Administration Manual	?????????//	1
30	Installation Manual	??????????????	1
31	Monitor CD	?????????????	1

### 3.2 Administrative Site, Material Received

#### 3.2.1 Manuals and Administrative CD, Gateway Location

##### Gateway Manual and Monitor CD

32	Administration Manual	???????????????	1
33			
34	Administrative CD	?????????????	1

DRAFT COPY

## 4 Installation

### 4.1 Console Installation

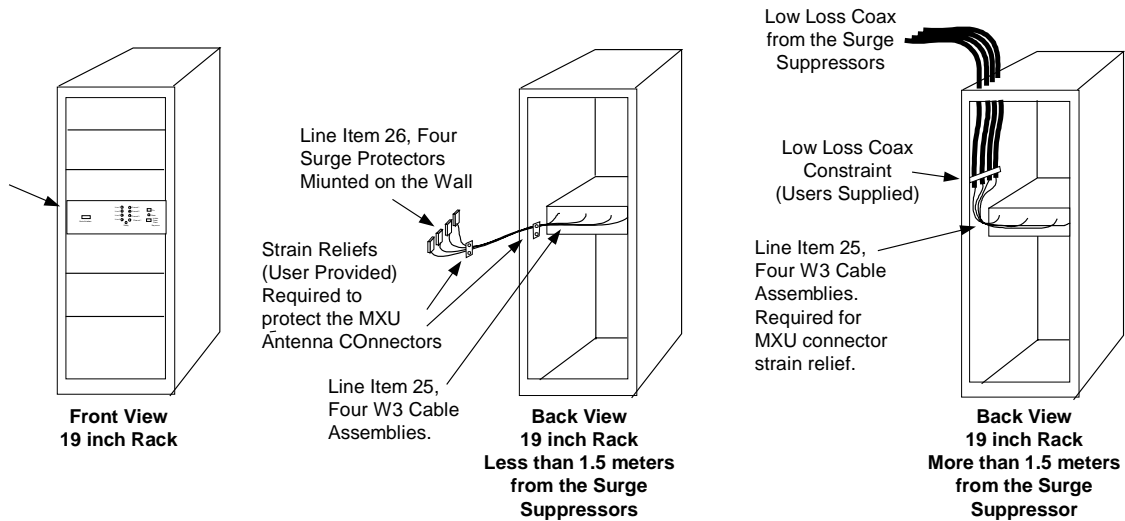


Figure 4.1-1: Console Mounting

The NOMAD MXU is designed to be mounted in a standard 19 inch rack as illustrated in left front view of figure 4.1-1. Slides, shelves or supports to mount the MXU in a rack are not included in the MXU package.

Interconnection of the antenna to the NOMAD MXU is covered in section 4.3.2; however, the location of the MXU console is directly related to the length of the cables supplied with the NOMAD MXU. If the back of the NOMAD MXU is mounted less than 1.5 meters from the surge protectors (Line Item 26), the standard W3 cables (line item 25) supplied with the MXU will work as illustrated in the center view of Figure 4.1-1. If the back of the NOMAD MXU is mounted more than 1.5 meters of the surge protectors, the user will have to procure custom cables as defined in Appendix "B" of this document and illustrated in the right view in Figure 4.1-1.

## 4.2 Antenna Installation

<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;"><b>Electrical Storm Hazard</b></p> <p>Electrical storms can cause the antennae to be charged to high voltages. Do not touch outside of equipment, or grounding wires and rods during electrical storms. Failure to observe this warning can cause serious injury or death.</p>
---

### 4.2.1 Placement

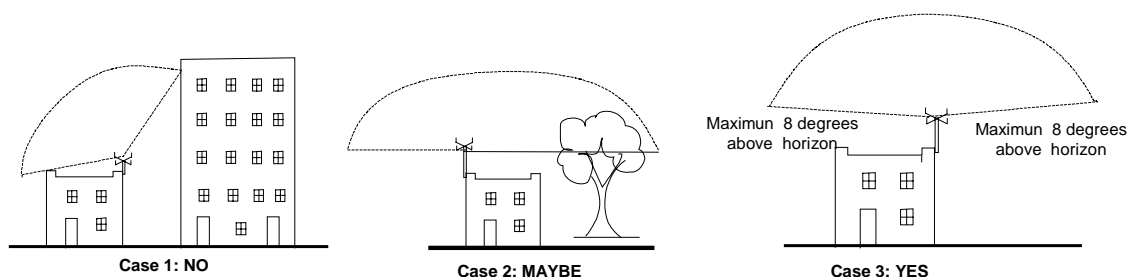


Figure 4.2.1-1: Antenna Location, Un-obstructed Sky

The NOMAD MXU system relays telephone conversations via satellites in Low Earth Orbit (LEO) around the world. Only one satellite at a time is in contact with the MXU console. Because of the rotation of the earth, the satellite may be moving, in a south/north direction across any part of the sky, while it maintaining contact with the MXU console. Before the satellite departs over the north horizon, it will hand off the telephone conversation to the next satellite arriving on the south side of the horizon. If the antennas are not correctly located, the satellites will not have a “line of sight” with the antennas and the service will be unreliable.

The antennas must be located to provide a clear view of the sky, from horizon to horizon. Figure 4.2.1-1 illustrates three possible cases.

- Case 1 The NOMAD MXU system will work intermittently because half of the sky is blocked by a large building. This will result in some passing satellites not having a clear “line of sight” to the antennas.
- Case 2: This NOMAD MXU will probably work better than in case 1; however, depending on the size of the tree, intermittent operation of the NOMAD MXU is probable because of the addition attenuation and the periodic blockage of the signal between the antenna and satellites.
- Case 3: This will give the best operation of the NOMAD MXU system because there is direct “line of sight” to the satellite regardless of its location in the sky.

### 4.2.2 Installation

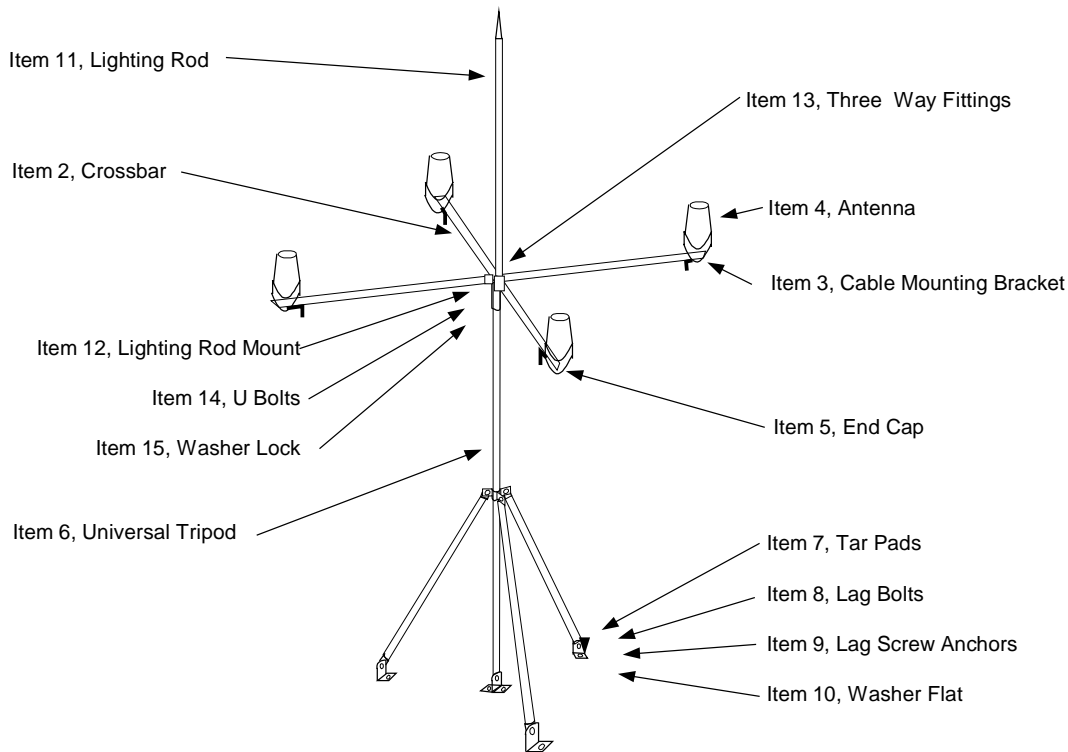


Figure 4.2.2-1: Antenna / Mast Mounting

Figure 4.2.2-1 depicts the Nomad Antenna Assembly Kit (01-P43410F) as it would be configured for a quad antenna system and mounted on a flat surface. None of the cabling is depicted above.

**Step 1: Mast Assembly:** The Antenna Mast kit 01-P43460F001 should be assembled first.

**Step 2: Install Mast:** The mast must be located in the position determined in section 4.2.1. The mast assembly may be mounted on a flat or pitched (slanted) surface. It will be configured as a two or four antenna system in step 5 below. Lag bolts, item 8 (9178546), are provided to attach the universal tripod item 6 (Ronnie 5) to any surface material that will accept the lag bolt. Flat washers, item 10 (90108A029), are to be installed on the lag bolts prior to installation on the tripod foot. Tarpads, item 7 (78), are to be installed between the foot of the tripod and the mounting surface to waterproof the attachment point. All of the lag bolts, except 2 that will be used later for installation of the surge suppressor mounting bracket, should be used for mounting the mast assembly. If the surface is concrete or some other material that will not readily accept the lag bolt, lag bolt anchors, item 9 (97039A029), have been included in the kit.

**Step 3: Lighting Rod:** Install the 3-way fitting, item 13 (07-P43417F001), over the circular portion of the lighting rod mount, item 12 (07-P43416F001), and secure the set screws using the 5/32 allen wrench, item 22 (7122A21), included in the kit. Prior to tightening the set-screws, the 3-way fitting should be located as far onto the lightning rod mount as possible. Secure the lightning rod mount to allow installation of the lightning rod, item 11(585CCAT-2/0). Prepare the lightning rod for installation by removing all of the

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

fasteners from the threaded end. Re-install one each of the nut, lock washer, and flat washer. Thread the lightning rod into the mount and secure the jam nut.

The lightning rod mount shall be secured to the top of the mast by engaging the circular cut out portion of the mount to the top of the mast and installing the u-bolts, item 14 (3043T78), and lock washers, item 15 (91102A031).

**Step 4: Grounding Cable:** The lightning rod that extends from the top of the array has a grounding cable (not shown above) attached and should be attached to the building ground in accordance with the instructions in Section 4.3, step 5, below.

**Step 5: Antennas:** The Antenna kit 01-P43455F001 is now required to continue the assembly. The cross bar(s), item 2 (07-P43411F001), slip through the 3-way fitting and should extend from the fitting an equal distance on each side. Tighten the set-screws with the enclosed allen wrench to secure the cross bars.

The metal plate that the antenna, item 4 (07-P43412F001), is supplied with, is to be replaced by the cable-mounting bracket, item 3 (07-P43415F001), included in the kit. If necessary, reorient the u-bolts to allow the antenna, when installed on to the cross bar, to have the cone shape perpendicular to the cross bar. Install the antenna onto the cross bar so that the antenna and its clamps are resting on the tape on the end of the cross bar, and the cone is inverted above the cross bar as shown. The plastic end caps, item 5 (FCR-16), that have been supplied shall be installed on the end of the cross bars.

Installation of the surge suppressors and coax cables are described in the following section.

# DRAFT COPY

### 4.3 System Interconnections

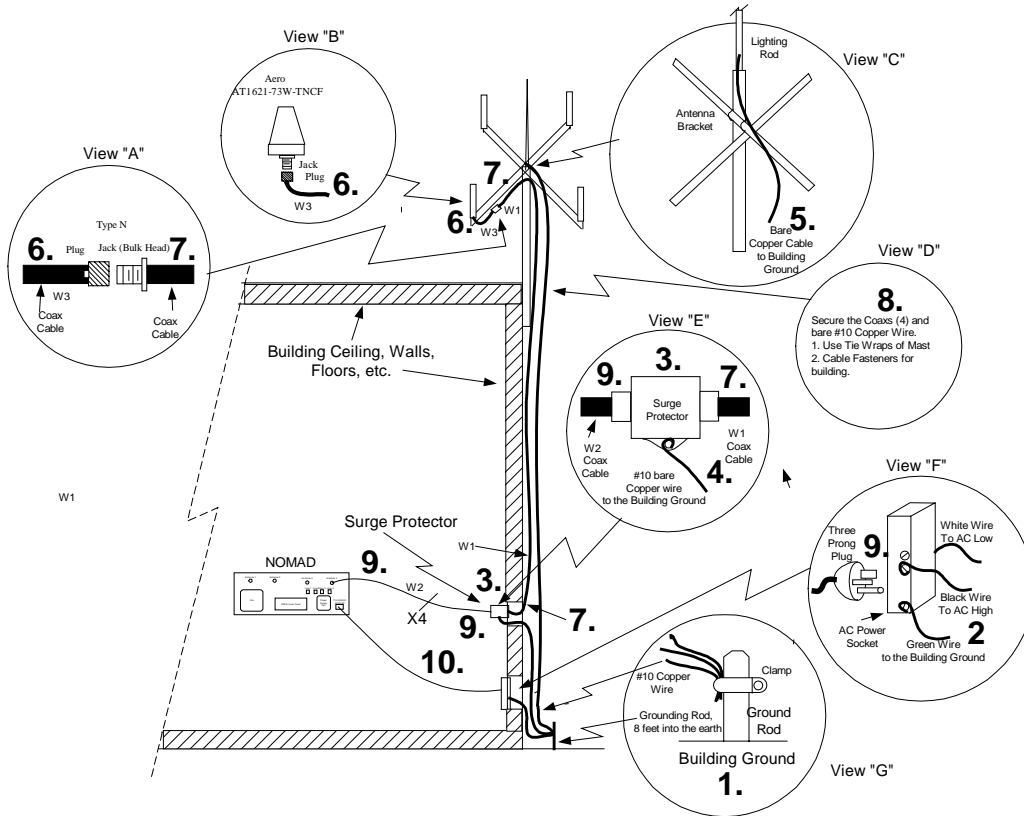


Figure 4.3-1: MXU Console Interconnections

Interconnections between the antennas, power and the MXU console are illustrated in Figure 5.4-1. Each step numbered in Figure 5.4-1 is discussed below in the following paragraphs.

#### 4.3.1 Building Ground

Step 1. Locate the “Building Ground”. It is extremely important to ground the antenna assembly, surge protectors, and power outlet to the central building ground. If not properly grounded, a nearby lightning strike can easily damage the MXU system and can cause personal injury or death. In figure 4.3-1 the building ground is illustrated, in view G, as a ground rod. **If any doubt exists as to the location of the building ground consult with a local certified electrician.**

Step 2. Verify the MXU power outlet, view “F” will accept the three prong electrical pug (Line Item 28) supplied with the MXU shipment. Consult with a certified electrician to verify the power outlet is properly wired and verify ground is properly connected to the building ground. If the power cord does not match the power outlet, the user is responsible for securing the correct power cord. Refer to Pre-Installation Checklist, Check 10, Appendix “A”.

#### 4.3.2 Antenna Interconnections



# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

Step 3. Install the four surge suppressors (Line Items 26) just inside the building where the coax cables W1 (Line Item 23) enter the building as illustrated in view “E” of Figure 5.4-1. The surge suppressors, are mounted to the surge suppressor bracket, Line Item 17), which has been mounted with the 2 remaining lag bolts, and lag bolt anchors (if required).

Step 4. The surge suppressor bracket needs to be attached to the same building ground, view E, that the antenna mast and power outlet are grounded to. The enclosed ground wire, (Line Item 18), lug, (Line Item 19) nut and bolt, (Line Items 20 and 21) will allow the attachment of the ground wire to the surge suppressor bracket

Step 5: Connect the bare cable from the lightning rod to the building ground as illustrated in view “C” and view “G”.

### WARNING

#### Improper Lightning Rod Grounding Hazard

Ensure the lightning rod is properly grounded before connecting the equipment. Failure to observe this warning can result in serious injury or death by electrocution.

Step 6. Connect the short (1ft) coax wire W3 from one of the antennas (View “B”) to coax W1 (View “A”) and secure to the antenna’s crossbars. Repeat for the other 3 antennas.

Step 7. Connect the long coax W1 (30 feet) from the cross bar to one of the lightning arrestors (View “E”). Repeat for the other 3 long pieces of coaxes

Step 8. Tie wrap the four coax cables and ground wire to the mast.

Step 9. Connect the 6 feet coax W2 to the lightning arrestor.

**BEFORE CONNECTING THE W2 COAX TO THE BACK OF THE MXU, VERIFY THE CENTER CONDUCTOR OF THE COAX IS NOT SHORTED TO OUTER SHELL OF THE CONNECTOR. REFER TO FIGURE 4.3.2-1**

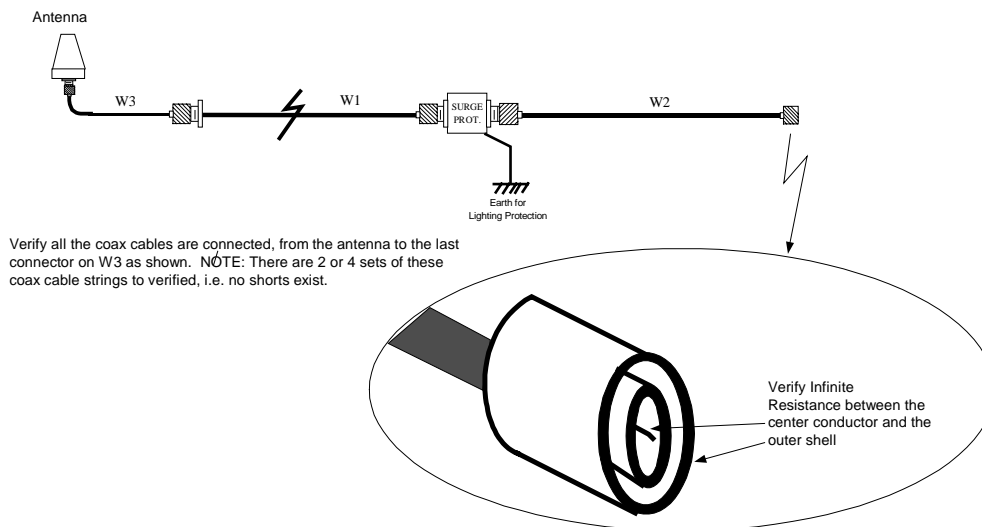


Figure 4.3.2-1: Verify Coax Cables, No Shorts

# DRAFT COPY

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

Connect the other end of the W2 coax to the antenna connection on the back of the MXU console as illustrated in Figure 4.3.2-2. Repeat for the other W2 coax. If the W2 coax is not of sufficient length, refer to Appendix "B".

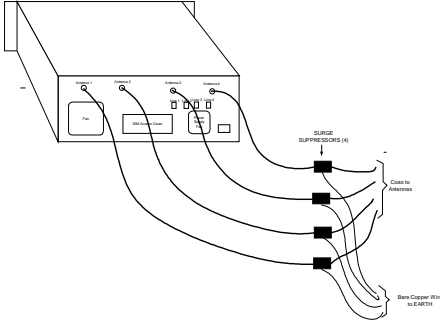


Figure 4.3.2-2: NOMAD MXU Coax Connections

# DRAFT COPY

### 4.3.3 Power Connection

**WARNING**

**Improper AC Mains Grounding Hazard**

Ensure the AC mains power is properly grounded before connecting the equipment. Failure to observe this warning can result in serious injury or death by electrocution.

Step 10. Using the correct power cord, connect the local power (110 VAC, 60 HZ or 230 VAC 50 HZ) to the MXU's back panel's power outlet. If the local power wall socket is not the correct configuration for the supplied power cord, Go back to Section 4.3.2, step 2.

### 4.3.4 PSTN to MXU Inter-Connections

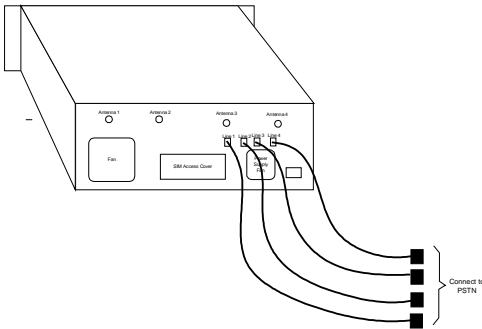


Figure 4.3.4-1: MXU PSTN Interconnections

**CAUTION**

**Digital Telephone Line**

Ensure the telephone lines are capable of accepting analog signals. DO NOT attempt to connect to a digital telephone line – equipment damage will result.

Using the four supplied telephone lines, connect the local PSTN to MXU back panel connectors Lines 1,2,3 and 4. **NOTE:** If the PSTN socket is not a RJ-11 type, refer to the “Pre-Installation Check List”, Appendix “A”, Check 5.

## 5 Checkout

### **CAUTION**

#### **Antenna Radiation Emission**

As a precaution maintain a minimum distance of 30 centimeters (12 inches) from the antenna array while in operation.

### **5.1 Initial Power Up Checks**

You are now ready to power on the MXU and start the checkout sequence.

Power on the NOMAD MXU Console by pushing the "ON" push button.  
In less than 2 seconds, the "Power LED" should light.

If the "Power Up" LED does not light

STOP: Go to section 6.1 "Power Problems" section of this document.

## 5.2 PSTN Check

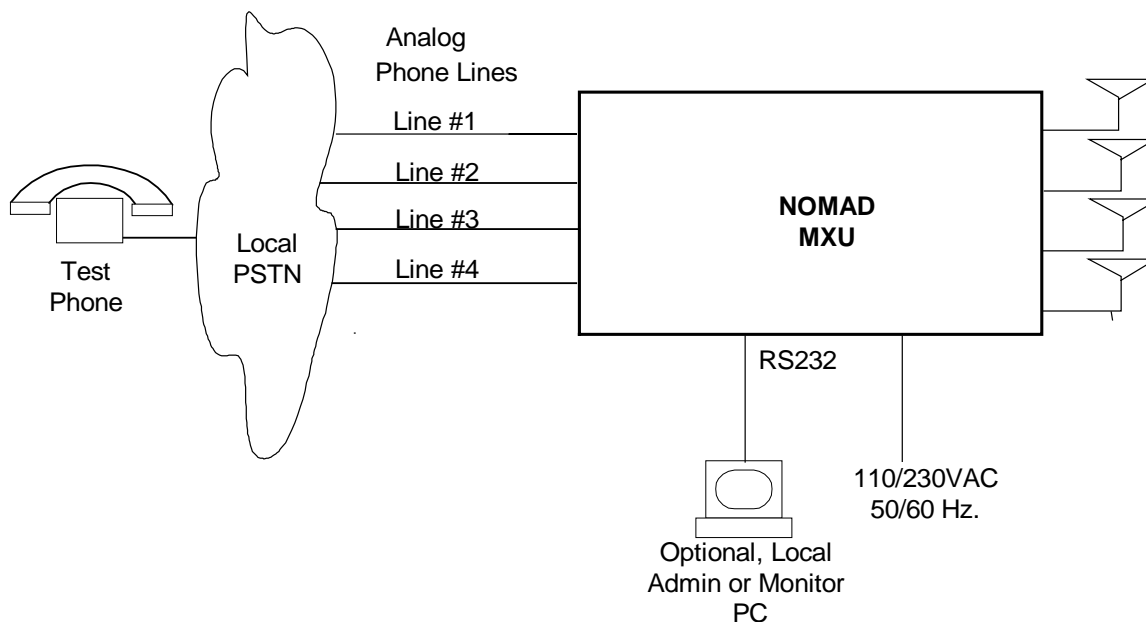


Figure 5.2-1: PSTN Test Setup

Three to five minutes after the Power LED lite, the Ready LED should light. The Power LED = ON and Ready LED = ON, indicates the MXU has successfully completed its internal self testing and at least one channel is capable of passing traffic between the PSTN and the Iridium System. NOTE: This does not insure all four channels are capable of passing traffic. Continue on with the checkout procedure.

Figure 5.2-1 illustrates the setup to initially test and determine if the PSTN is correctly connected to the NOMAD MXU console. Using the test telephone attached to the PSTN complete the following steps.:

### Line # 1 Telephone connection check:

Dial the phone number for MXU line #1 and verify the following:

1. Listen on the test phone and verify the MXU picks up the phone.
2. Observe the MXU front panel and verify the "Line 1" LED" lights.
3. Listen on the test phone and verify the modem tone occurs, (may take up to 1 minute).
4. Hang up the test phone, the MXU front panel "Line 1" LED should go out.

If steps 1,2,3 and 4 happened, the connection is valid.

Go to "Line # 2 Telephone connection check"

If steps 1,2,3 and 4 are not correct the telephone line may be at fault"

Go to section 6.2 "Telephone Problems"

### Line # 2 Telephone connection check:

Dial the phone number for MXU line #2 and verify the following:

1. Listen on the test phone and verify the MXU picks up the phone.
2. Observe the MXU front panel and verify the "Line 2" LED" lights.
3. Listen on the test phone and verify the modem tone occurs, (may take up to 1 minute).
4. Hang up the test phone, the MXU front panel "Line 2" LED should go out.

If steps 1,2,3 and 4 happened, the connection is valid.

Go to "Line # 3 Telephone connection check"

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

If steps 1,2,3 and 4 are not correct the telephone line may be at fault”  
Go to section 6.2 “Telephone Problems”

Line # 3 Telephone connection check:

Dial the phone number for MXU line #3 and verify the following:

1. Listen on the test phone and verify the MXU picks up the phone.
2. Observe the MXU front panel and verify the “Line 3” LED” lights.
3. Listen on the test phone and verify the modem tone occurs, (may take up to 1 minute).
4. Hang up the test phone, the MXU front panel “Line 3” LED should go out.

If steps 1,2,3 and 4 happened, the connection is valid.

Go to “Line # 4 Telephone connection check”

If steps 1,2,3 and 4 are not correct the telephone line may be at fault”

Go to section 6.2 “Telephone Problems”

Line # 4 Telephone connection check:

Dial the phone number for MXU line #4 and verify the following:

1. Listen on the test phone and verify the MXU picks up the phone.
2. Observe the MXU front panel and verify the “Line 4” LED” lights.
3. Listen on the test phone and verify the modem tone occurs, (may take up to 1 minute).
4. Hang up the test phone, the MXU front panel “Line 4” LED should go out.

If steps 1,2,3 and 4 happened, the connection is valid.

Go to “Section 5.3, Monitor Station Checkout”

If steps 1,2,3 and 4 are not correct the telephone line may be at fault”

Go to section 6.2 “Telephone Problems”

### **5.3 Monitor Station Check (Optional)**

It is possible to configure a user supplied personal computer (PC) to interface with the NOMAD MXU console through the RS232 connector on the front panel, This will enable the user to monitor MXU activities and retrieve diagnostic logs from the MXU. For details on setup and operation of the monitor station refer to the administrative manual.

### **5.4 Satellite Link Checks (Optional)**

If the “Ready Light came on during the power up sequence described in section 5.1, at least one channel exists between the NOMAD MXU console and the Iridium satellites. There are several ways to determine if all RF channels, antenna, coax cables, and the RF side of the MXU console are operating correctly. Methods 1 and 2 are preferred for verification but method three can be used for verification or isolation of the problem to either the antenna and coax, or to the RF portion of the MU console.

1. If the user setup the monitor station, described in section 5.3, the diagnostic logs can be retrieved and the signal strength between the satellites and the MXU can be verified. Refer to the Administration Manual for details.
2. If the user did not setup the monitor station, the Gateway can retrieve the diagnostic logs, over the PSTN modem connection, and inform the user of the status of the Iridium channels. Refer to the Administration Manual for details. If one of the channels is not present or has a weak signal refer to section 6.3.
3. If the Ready LED on the MXU’s front panel came on, all four RF channels can be verified without a diagnostic log as follows.

First Step: We need to determine the good and bad RF channels as follows:

- a. Power Down the MXU
- b. Disconnect all the antenna cables but one, from the back of the MXU.

DRAFT COPY

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

- c. Power on the NOMAD MXU.
- d. If the Ready LED comes on within 3 to 5 minutes mark the Coax cable and MXU connector as good. Else mark both “questionable”.
- e. Repeat steps a,b,c & d for each of the three remaining channels.

Second Step: We need to determine which “Questionable” cables are bad.

- a. Power Down the MXU
- b. Disconnect all the antenna cables from the back of the MXU.
- c. Connect the questionable coax from a bad channel to a good MXU channel.
- d. Power on the NOMAD MXU.
- e. If the Ready LED comes on within 3 to 5 minutes mark the questionable Coax cable good. Else mark the cable bad.
- f. Repeat steps a,b,c d & e for each of the three remaining “questionable” cables.

TO REPAIR ANTENNA/ COAX CABLES, REFER TO Section 6.3.

Third Step: We need to determine which “Questionable” MXU RF channels are bad.

- a. Power Down the MXU
- b. Disconnect all the antenna cables from the back of the MXU.
- c. Connect a “good” coax to a “questionable MXU channel.
- d. Power on the NOMAD MXU.
- e. If the Ready LED comes on within 3 to 5 minutes mark the questionable MXU Channel “good”. Else mark the RF Channel “bad”.
- f. Repeat steps a,b,c d & e for any remaining “questionable” MXU RF channels.

NOTIFY THE GATEWAY OF ANY BAD MXU RF CHANNELS.

### **5.5 Request Initialization**

When all the initial checks are OK, call gateway and request initialization

DRAFT COPY

## 6 Trouble Shooting Guidelines

**CAUTION**

**Replaceable Battery**

Danger of explosion if battery is incorrectly replaced.  
 Replace only with the same or equivalent type recommended by the manufacturer.  
 Dispose of used batteries according to the manufacturer's instructions.

### 6.1 Power Problems

---

**NOMAD MXU POWER UP SERVICE PROBLEMS**

---

Problem(s)	Possible Cause(s)	Solution(s)
Power Up LED does not Light.	Verify MXU power cord is connected to the building power outlet.	Insert plug into outlet. If the plug does not fit the outlet, refer to Section 4.3.3, Step 10, or section 4.3.1, Step 2, or Appendix "A" Pre-Installation Checklist, Check 10.
	No power at the building outlet	Verify power, must be 90 to 135 VAC, 47 to 63Hz.; or, 180 to 265VAC, 47 to 63 Hz
	Building Circuit Breaker opens, or Building Fuse blows.	Verify the building power outlet is correctly polarized, refer to Section 4.3.1, Step 1, or Appendix "A", Pre-Installation Checklist, Check 9

---

### 6.2 Telephone Line Problems

---

**NOMAD MXU TELEPHONE SERVICE PROBLEMS**

---

Problem(s)	Possible Cause(s)	Solution(s)
Test Step 1: Can not verify the MXU picks up the phone.	Telephone line is not connected	Connect per section 4.3.4
	Incorrect phone jack, can not connect the phone line.	Refer to Appendix "A", Pre-Installation Checklist, Checks 5 and 6.



# DRAFT COPY

---

## NOMAD MXU TELEPHONE SERVICE PROBLEMS

---

Problem(s)	Possible Cause(s)	Solution(s)
.	Bad telephone line.	Remove the telephone cable plug from the back of the MXU and connect it to a 2 wire analog phone, Note: you may need a RJ11 adapter. Make a test phone call between the test telephone and the 2 wire analog phone. <b>NOTE: Do not connect a phone directly to the MXU, it will not work.</b>
Test Step 2: MXU front panel "Line n LED" does not light when the MXU picks up the phone	If the Power On LED is lite, and the MXU phone pickup is heard, and the modem tone is heard, but the Line LED is not lite, Probably a bad LED	Contact the Gateway to determine the repair procedure. NOTE: The MXU probably can still be initialized and made operational.
Test Step 3: No modem tone occurs, (may take up to 1 minute).	If the Power On LED is lite, and the MXU phone pickup is heard, and the Line LED is lite, but no Modem tone. Probably a bad MXU modem	Contact the Gateway to determine the repair procedure. NOTE: Without the NOMAD MXU modem the unit can not be controlled remotely.
Test Step 4: The Line n LED does not go out when the test phone is hung up.	PSTN non hanging up.	Disconnect the telephone line at the MXU and verify the Line "n" LED goes out. If so there is a PSTN problem,

### 6.3 Antenna Line Problems

---

## NOMAD MXU ANTENNA SERVICE PROBLEMS

---

Problem(s)	Possible Cause(s)	Solution(s)

---

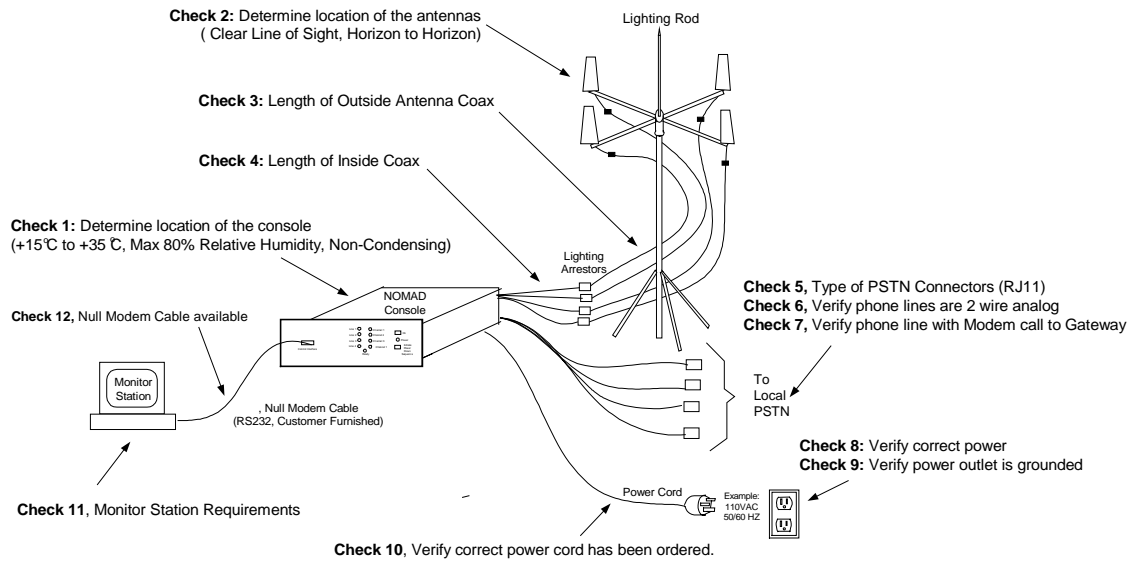
# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

### APPENDIX "A" –User Site, Pre Installation Check List

**PURPOSE:** The purpose of this checklist is to prevent problems during the installation phase. This checklist is not an installation guide, it should be completed before the NOMAD MXU equipment arrives on site. Figure A1 below is a summary of the checklist.



Typical User MXU Installation.

### NOMAD MXU CONSOLE

Check 1: Determine the environment of the NOMAD MXU console will be +15°C to +35°C and a maximum 80% relative humidity , non-condensing. \_\_\_\_\_

### ANTENNAS

Check 2: Location of Antennas  
Clear line of sight, Horizon to Horizon \_\_\_\_\_

Check 3: Verify an 8 meter outside antenna coax (W1) is of sufficient length \_\_\_\_\_   
If the length is not sufficient, see Appendix "B".

Check 4: Verify 1.5 meter inside antenna coax (W2) is of sufficient length \_\_\_\_\_   
If the length is not sufficient, see Appendix "B"

### PSTN

Check 5, Verify local PSTN Connections will accept PJ11 type plugs \_\_\_\_\_   
Cables supplied with the MXU, have RJ11 plugs on each end.  
If the PSTN receptacles are not RJ11 types, adapters have to be procured by the user.

Check 6: Verify all four sets of phone lines are 2 wire analog \_\_\_\_\_

# DRAFT COPY

# DRAFT COPY

## NOMAD MXU Installation Manual

3:36 PM 02/12/99

If not the MXU will not function.

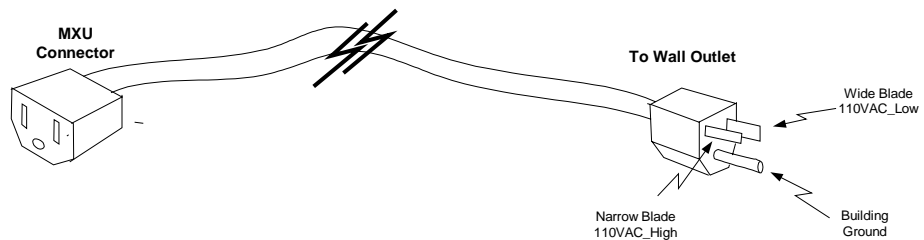
Check 7: Verify all four phone lines, can make modem calls between the users location and the Gateway. \_\_\_\_\_   
 If not, the MXU can not be controlled from the gateway and must be configured at the factory.

### POWER

Check 8: Verify the Power Voltage is 90 to 135 VAC, 47 to 63Hz, or, 180 to 265VAC, 47 to 63 Hz \_\_\_\_\_   
 if one of these two voltages is not available, the MXU will not work.

Check 9: TO REDUCE THE RISK OF ELECTRIC SHOCK, HAVE A CERTIFIED \_\_\_\_\_   
 ELECTRICIAN VERIFY THE POWER OUTLET IS CORRECTLY GROUNDED.  
 If the outlet is not properly grounded, have the electrician replace it.

Check 10 Verify the correct AC Power Cord has been ordered \_\_\_\_\_   
**If a power cord was not specified, the user will receive the power cord illustrated below.**

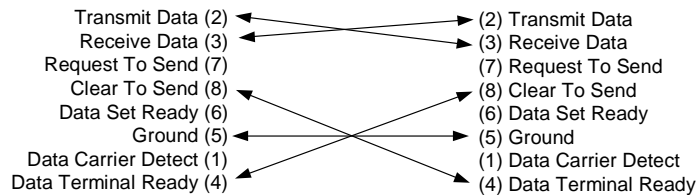


The correct power cord is the responsibility of the user. A possible source of power cords can be contacted at the following website. <http://www.panelcomponents.com>

### MONITOR STATION (Optional, User Supplied)

Check 11, Verify the configuration of the Monitor Station PC (user supplied) \_\_\_\_\_   
 IBM compatible a Pentium class PC  
 at least 50 MB of free disk space,  
 Microsoft NT 4.0 installed  
 NT Service Pack Three installed  
 CDROM drive (required to install the NOMAD MCM program) \_\_\_\_\_

Check 12: Verify, Null Modem Cable per following schematic. (user supplied) \_\_\_\_\_



## APPENDIX "B" – Coax Cable Options

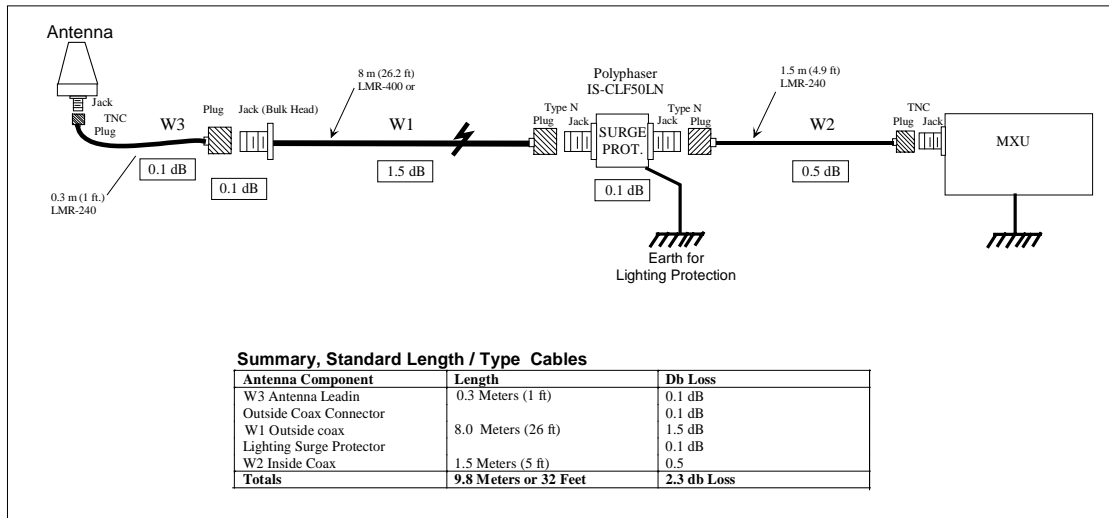
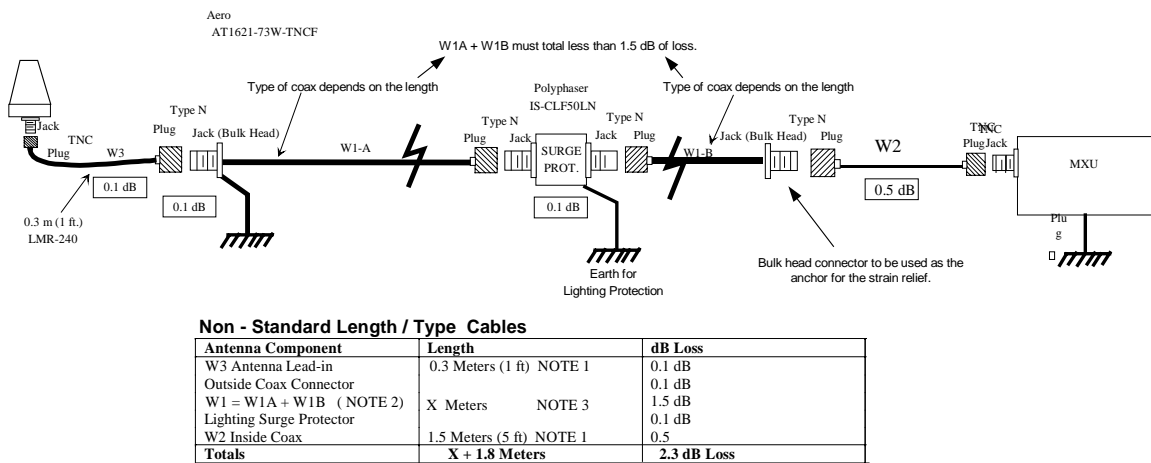


Figure B1: Standard cable lengths as shipped with the NOMAD MXU.



**NOTE 1:** Supplied coax cables W3 and W2 must be used in the installation to serve as strain reliefs; else, damage to the antenna or the antenna connections on the MXU will occur..

**NOTE 2:** Depending on the installation, W1 and or W3 may be too short. If so, custom coax cable W1, or two custom cables W1A and W1B, may be procured from a cable vendor.

**NOTE 3:** The allowable length of the W1 cable, or W1A + W1B cables, is based on dB loss. The total dB loss through W1, or W1A + W1B, and related connectors and adapters must be less than 1.5 dB.

Figure B2: Custom cable lengths to be ordered by the user.