

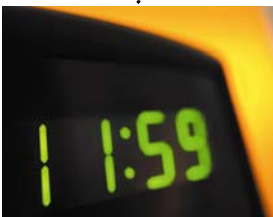


# GPS ANTENNA SETS

## INSTALLATION INSTRUCTIONS

Manual P/N: 60500012  
Doc. No.: 001023AD  
Published: July 2003

... applicable for **GPS Antenna Sets** **P/N 8300900x**



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# 1. How to Use This Manual

## 1.1. Purpose of this Document

This Installation Instruction provides necessary information for installation of a GPS antenna, the antenna cable and associated mounting parts. Additionally it includes installation instructions concerning lightning protection of the connected GPS receiver.

Furthermore it contains repacking and return procedures and procurement information.

## 1.2. Structure of this Document

This document contains the following sections and appendixes:

Chapter	Title of the Chapter	Description
1	How to Use This Manual	Contains a general overview of this document, the intended audience, the conventions used, and lists related documents available for the user.
2	Description of the Parts	Provides a brief description of the parts and lists important technical data.
3	Unpacking and Inspection	Contains procedures for unpacking and inspecting the delivered parts.
4	Installation of the GPS Antenna	Contains instructions for installing the GPS antenna.
5	Assembly of the Antenna Cable and the Connector	Describes the assembly procedure of different connectors used for different types of antenna cables.
6	Installation of the Lightning Protection	Contains instructions for installing the lightning protection.
7	Installation of the Grounding Kit	Contains instructions for installing the grounding kit.
8	Repacking and Return	Contains repacking and return.
A	Procurement Information	Lists necessary procurement information to purchase a GPS antenna and parts associated to it.

### 1.3. Who Should Read This Document

This publication is written for technical audiences. It describes instructions for installation as well as technical details primarily intended for qualified technical personnel.

### 1.4. Related Documentation

If additional documentation of the original manufacturer of the parts is available, it is included in the delivery package.

At time of issue of this document no further documentation related to the parts described herein are published. See our web-site [www.symmetricom.com](http://www.symmetricom.com) for a complete list of actual documentation.

### 1.5. Conventions

#### 1.5.1. Acronyms and Abbreviations

Terms are spelled out the first time they appear in text. Thereafter, the acronym or abbreviation is used. In addition, the glossary defines the acronyms and abbreviations.

#### 1.5.2. Typographical Conventions

When text appears this way...	... it means:
Installation	The title of a document or the title of a chapter
Symmetricom <b>does not</b> recommend...	A word or term given special emphasis.

#### 1.5.3. Warnings, Cautions, Recommendations and Notes

Warnings, Cautions, Recommendations and Notes attract attention to essential or critical information in this document. The types of information in each are explained in the following:



#### Warning

To avoid serious personal injury or death, do not disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.



#### Caution

To avoid personal injury, do not disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.



**ESD Caution**

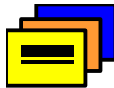
To avoid personal injury and electrostatic discharge (ESD) damage to equipment, do not disregard ESD cautions. All ESD cautions use this symbol. ESD cautions are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in possible personal injury, electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.

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**Electrical Shock Caution**

To avoid electrical shock and possible personal injury, do not disregard electrical shock cautions. All electrical shock cautions use this symbol. Electrical shock cautions are practices, procedures, or statements, that if not strictly observed, may result in possible personal injury, electrical shock damage to, or destruction of components of the equipment.

---

**Recommendation**

All recommendations use this symbol. Recommendations indicate manufacturer-tested methods or known functionality. Recommendations contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.

---

**Note**

All notes use this symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information, which may make your task easier or increase your understanding.

---

## 1.6. Where to Find Answers to Product and Document Questions

For additional information about the parts described in this guide, please contact your Symmetricom representative or our service office.

We appreciate your suggestions of ways to improve any part of this guide. Please make your suggestions on a copy of the concerned page and send it to us.

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## 2. Description of the Parts

### 2.1. GPS Antenna

The supplied GPS antenna is an active antenna, especially designed for GPS timing applications. The housing is specially constructed to withstand continuous, long-term exposure to rugged or highly corrosive environments.

The antenna receives the satellites signals (GPS frequency: 1575.42 MHz) and passes it through a narrow band pass filter and a preamplifier. The GPS antenna will be supplied with 5 V DC from the GPS receiver unit by the coaxial cable, which also conducts the GPS signal to the GPS receiver unit. The antenna is terminated with an "N" female connector.

### 2.2. Mounting Device

The kit for mast mounting consists of a 300 mm metal tube, one mounting fixture, two clamps, four brackets and attaching parts. With the Symmetricom mounting device the GPS antenna can be mounted on a mast with a diameter up to 60 mm or at a wall.

If wall mounting is applicable, the mounting fixture and the clamps can be used while attaching parts are not included.

### 2.3. Antenna Cables and Connectors

For connection between antenna and GPS receiver unit (e.g. GPS LC) different coaxial-cables are provided to be used. Dependent on the distance between GPS antenna and GPS receiver unit different coaxial cables must be used. The difference of the cables are cable diameter and insertion loss (see technical data). Each cable has an impedance of 50  $\Omega$ .

Because of the different cable diameter different N-type connectors must be used. At the antenna only the straight N- type connector can be used and at the unit both, the straight and the right-angle type of N- type connector can be used.

### 2.4. Lightning Protection

To protect the GPS receiver unit to be damaged by lightning strokes, a surge protector should be installed. Surge protectors remove transient current that may be induced onto the inner conductor of coaxial cables.

To protect the GPS receiver unit, the surge protector should be installed as close as possible to the GPS receiver unit. To prove a proper work of the surge protector it is very important that the surge protector is grounded to a low impedance ground.

## 2.5. Grounding Kit

Lightning transients can also be conducted via the outer conductor of an coaxial cable. To protect the GPS receiver unit from become damaged from this transients, a grounding kit can be attached along the coaxial cable and grounded to a low impedance ground (e.g. bus bar) to lead the transients to earth.

During the installation of the grounding kit, it must be taken care to avoid nicking of the copper conductor and the grounding kit connection must be kept dry to prevent corrosion which reduces effectiveness. The weather-proofing materials, which should be part of each grounding kit, must be properly applied.

## 2.6. Technical Data

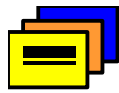
GPS Antenna	
Color	White
Weight	0.16 kg Nominal
RF Input	Type N connector, female
Operating Temperature	-40 degrees C. to +85 degrees C.
Humidity	95% relative Humidity
Frequency	1575.42 +/- 10.0 MHz (GPS L1)
Impedance	50 Ohms Nominal
DC Voltage	5 to 26 VDC
DC Current @ 5V	37 mA TYP, 45mA Max (50dB)
Wind Load	7.05 N @ 120 km/h 9.68 N @ 140 km/h 12.7 N @ 160 km/h
CABLE INSERTION LOSS (typically)	
RG 58	0,75 dB/m @1575 MHz
RG 213	0,3333 dB/m @ 1575 MHz
LowLoss	0,1736 dB/m @ 1575 MHz
LCF ½ "	0,094 dB/m @ 1575 MHz

### 3. Unpacking and Inspection

This chapter contains recommended procedures for unpacking the delivered parts. It also lists instructions for inspection the delivered items for correct condition and completeness.

#### 3.1. Unpacking

- (1) Open the package.
- (2) Remove the upper protection material
- (3) Remove all parts. Check the shipping container for loose parts.



#### **Recommendation**

Keep all packaging materials in the event the equipment or components must be returned or shipped to another location.

---

#### 3.2. Inspection

- (1) Check the items against packing list.
- (2) Inspect the items for shipping damage, including bent or loose parts, broken connectors, or other visible defects.
- (3) Notify Symmetricom GmbH and the carrier who delivered the equipment if you suspect that it was damaged in transit.

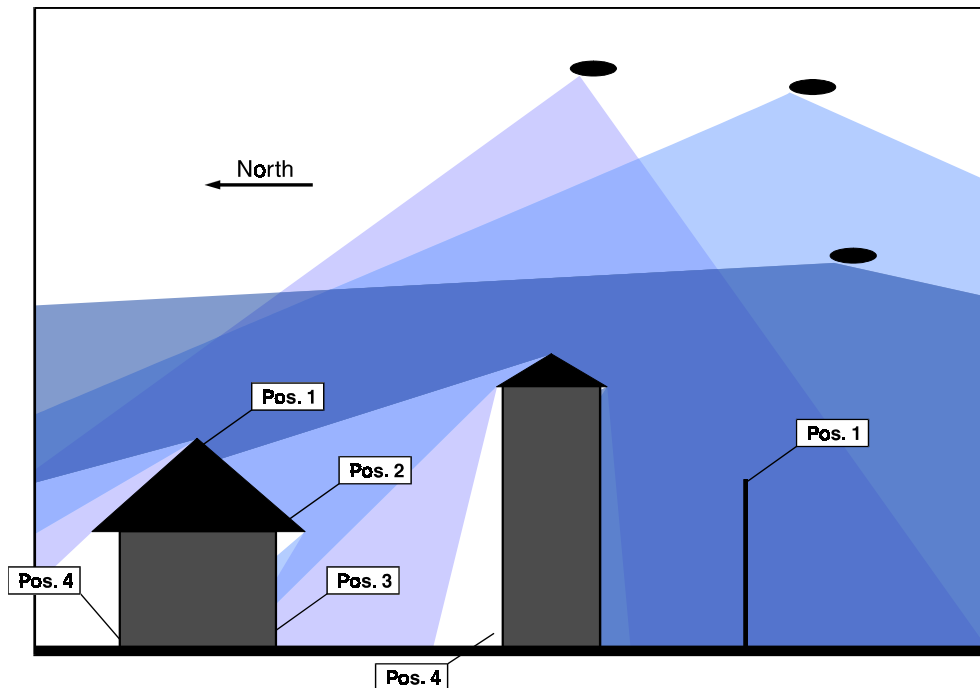
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## 4. Installation of the GPS Antenna

This chapter provides procedures to be performed when installing a GPS antenna

### 4.1. Selection of a Suitable Location

GPS signals don't penetrate walls, roofs, solid metal structures or dense foliage. Tracking more satellites improves the GPS system performance. Typically at least 4 satellites are needed for start-up and at least 1 satellite continuously. For best results select an outdoor location providing as much unobstructed view to the sky as possible. Obstructions not rising more than 10° above the horizon can be ignored. Since the moving GPS satellites don't cross the polar regions view towards the earth's equator is preferable. Hence, in the northern hemisphere (Europe, North America, most of Asia) the sector E-S-W must be considered while in the southern hemisphere (Australia, South America) it's W-N-E. Rooftop mounting is ideal. Wall mounting may be acceptable, particularly at higher levels.



The figure shows different location options and their pros and cons are discussed below.

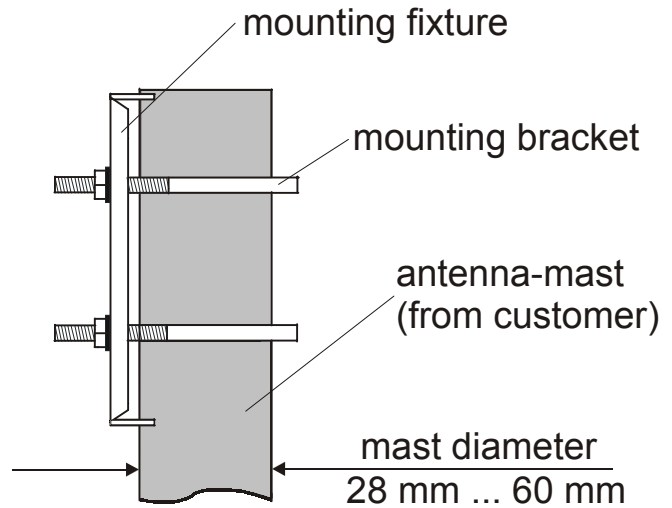
- Position 1: Few obstructions towards the important region. Potential to track up to 8 satellites. Best results.
- Position 2: Some obstructions. Potential to track 4 to 6 satellites. Reasonable results.
- Position 3: Many obstructions. Potential to track 1 to 4 satellites. Depending on time of day (satellite constellation) start-up may be delayed significantly. Marginal results.
- Position 4: GPS satellite signal blocked almost completely. Potential to track up to 2 satellites. No performance.

Lightning protection may be important. If the desired location is not within the area protected against direct strikes the building's protection system must be modified accordingly. Local building codes may apply.

## 4.2. Mast Mounting

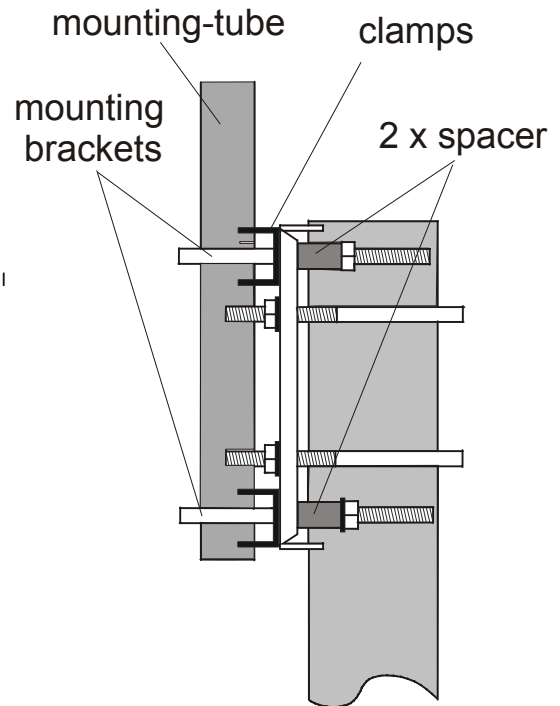
### 4.2.1. Pre-Assembly of the Mounting Fixture

Install the mounting fixture at the upper end of the mast by putting two mounting brackets around the mast. Fix it by using four plain washers and four nuts. (see sketch beside)



### 4.2.2. Fixing of the Mounting Tube

Install the mounting tube at the mounting fixture by using the clamp putting the other two mounting brackets around the mounting tube. Fix it by using four spacers and four nuts. (see sketch beside)

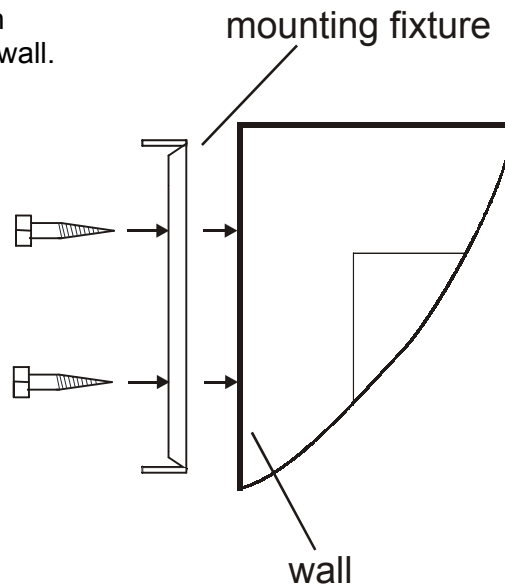




### 4.3. Wall Mounting

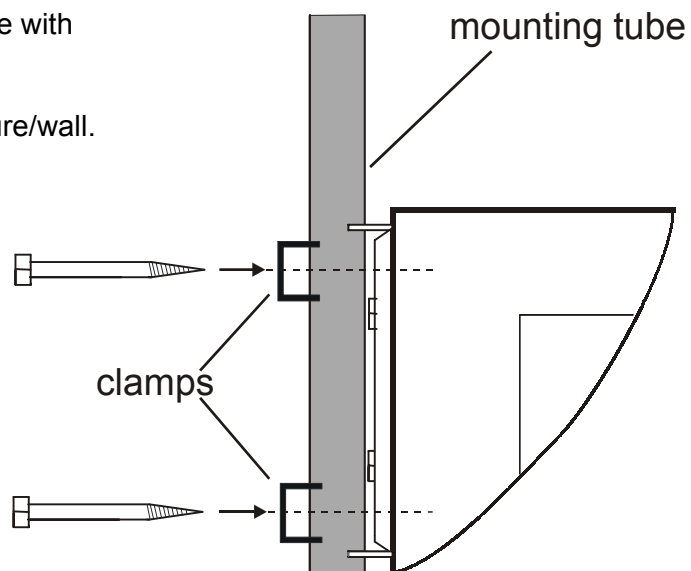
#### 4.3.1. Pre-Assembly of the Mounting Fixture

Fix the mounting fixture with four suitable screws on the wall.  
(see sketch beside)



#### 4.3.2. Fixing of the Mounting Tube

Fix the mounting tube with clamps by means of suitable long screws on the mounting fixture/wall.  
(see sketch beside)



#### 4.4. Assembly of the GPS Antenna

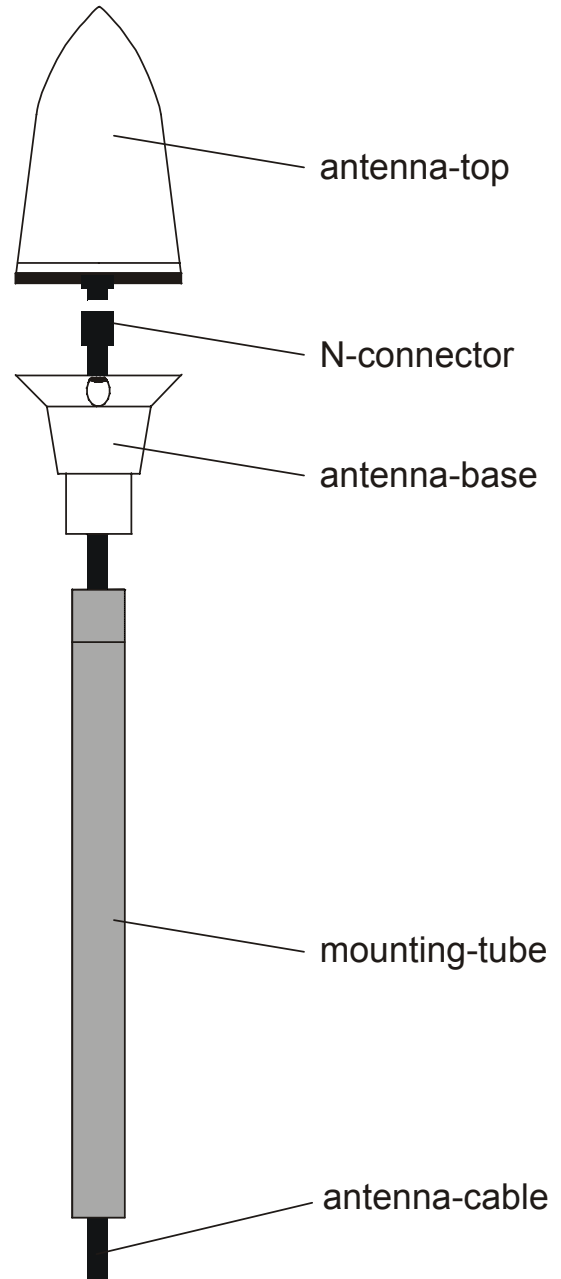
Install the antenna base on the mounting tube and fasten it.

Feed the antenna cable through the mounting tube (bottom to top).

Assemble the connector according chapter 5. of this manual.

Connect the antenna cable to the GPS antenna.

Assemble the GPS antenna to the antenna base by fastening the four screws.



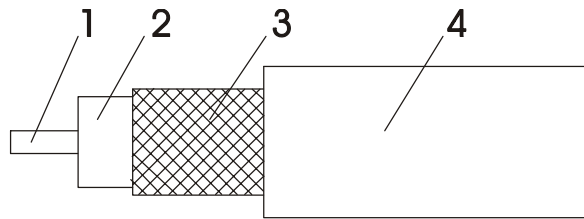
## 5. Assembly of the Antenna Cable and the Connector

This chapter provides principal assembly instruction to put the connector onto the corresponding antenna cable. Furthermore describes the specific features of the individual connectors to be considered.

### 5.1. Antenna Cable and Connector

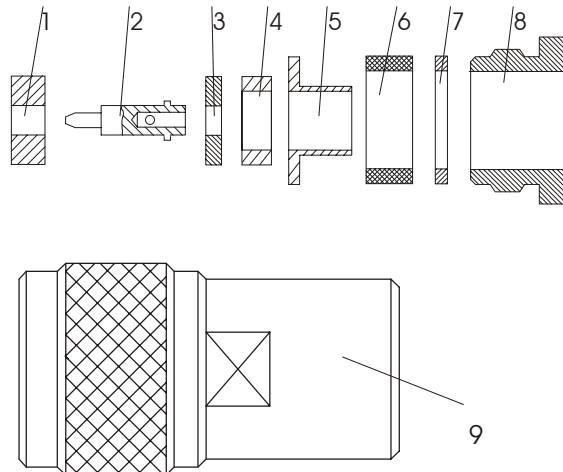
Typically an antenna cable consists of:

- 1 inner conductor
- 2 dielectric
- 3 braid
- 4 jacket



Typically a connector consists of the following parts as shown at the sketch below:

- 1 Front Isolator
- 2 Contact Pin
- 3 Rear Isolator
- 4 Bush or Ring (optional)
- 5 Braid Clamp
- 6 Gasket
- 7 Washer (optional)
- 8 Hex Nut
- 9 Main Body or Housing

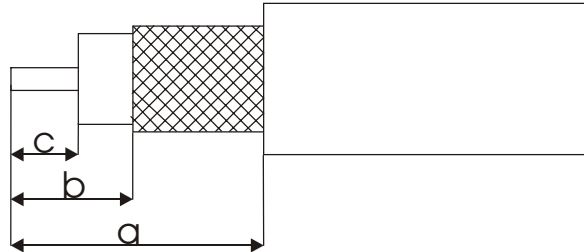


### 5.2. Preparation of the Antenna Cable

Usually the connectors are assembled as follows:

Slide the hex nut, washer and gasket onto the antenna cable one by one.

Strip the antenna cable (inner conductor, dielectric, braid and jacket) as follows:



Combination cable - connector	a jacket strip length	b conductor strip length	c braid strip length
Connector for cable type RG58, straight	8,5	5,5	5,5
Connector for cable type RG213, straight	13	6,5	6,5
Connector for cable type RG213 and Low Loss, angle	19,0	5,5	3
Connector for cable type LowLoss, straight	6,4	6	6

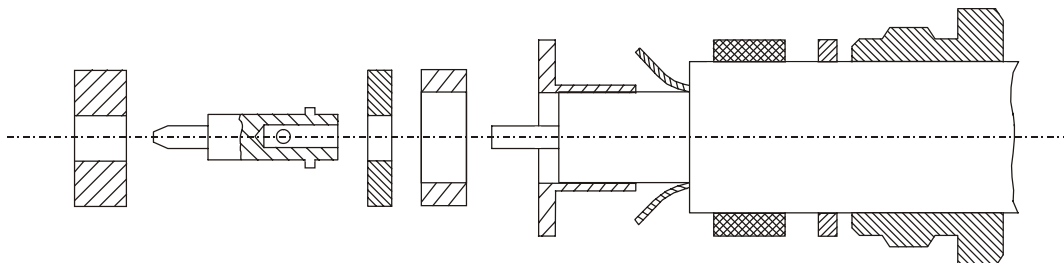
### 5.3. Assembly of the Connector

Place the braid clamp over braid and push back against cable. Fold back braid wire.

Slide ring and rear isolator against the braid clamp

Insert inner conductor of the cable into the contact and solder it.

Insert front isolator together with cable and parts into the main body, screw the hex nut until it is tightened



## 6. Installation of the Lightning Protector

This chapter provides principal instructions to install a lightning protector in the line between GPS antenna and GPS receiver unit.



### Warning

Do not install the lightning protector in the presence of thunderstorms. Failure to obey this warning may result in injury or death to you or to others.



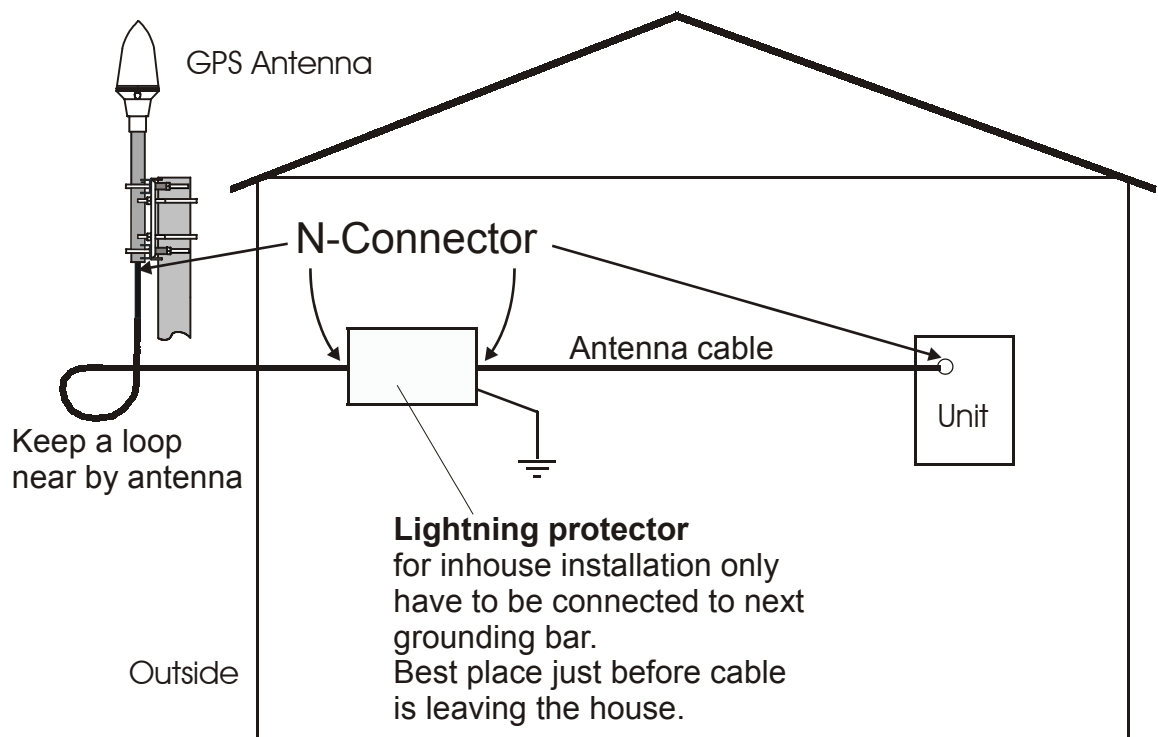
### Note

For further information refer to manufacturer's installation instructions enclosed to the lightning protector.

### 6.1. Mounting of the Lightning Protector

Mount the lightning protector at the customer's high voltage eliminator (if suitable use separate angle).

### 6.2. Connection of the Lightning Protector



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## 7. Installation of the Grounding Kit

This chapter provides principal instructions to install a grounding kit in the line between GPS antenna and the building.



### Warning

Do not install the grounding kit in the presence of thunderstorms. Failure to obey this warning may result in injury or death to you or to others.



### Note

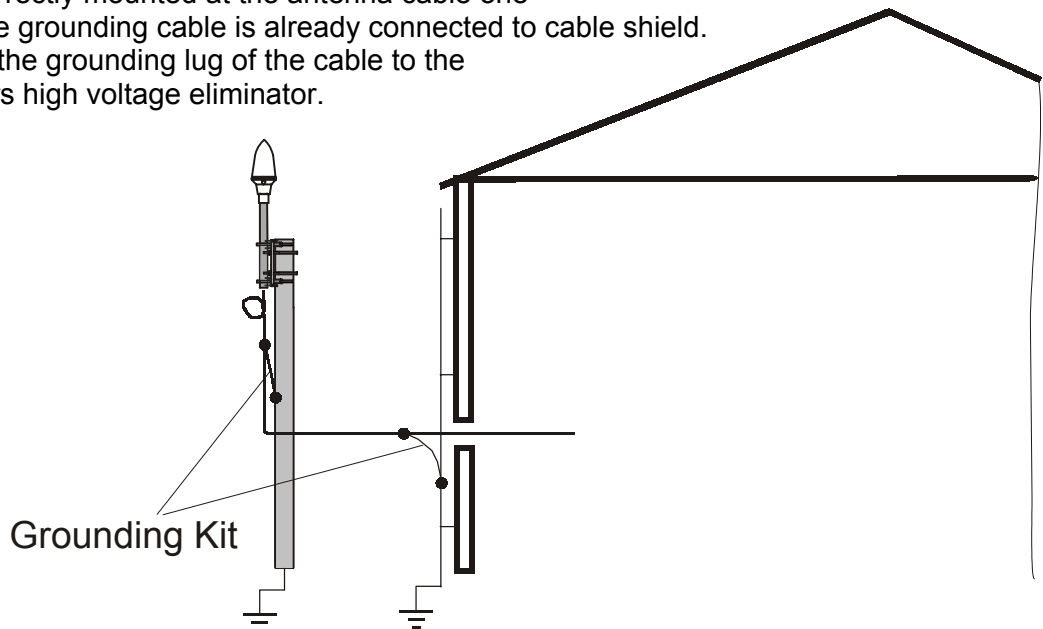
For further information refer to manufacturer's installation instructions enclosed to the grounding kit.

### 7.1. Mounting the Grounding Kit

It is recommended to mount a grounding kit at the antenna cable every 60 m. At least one has to be installed close to the antenna and one at the entry point of the building.

### 7.2. Connection of the Grounding Kit

When correctly mounted at the antenna cable one end of the grounding cable is already connected to cable shield. Connect the grounding lug of the cable to the customer's high voltage eliminator.



This is an example only. Antenna position may be also on roof or wall mounting pipes.

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## 8. Repacking and Return

This chapter contains repacking and return procedures.

### 8.1. Return Procedure

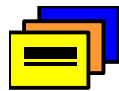
To return the unit to the manufacturer for repair, use the following instructions:

- (1) Contact the service department of Symmetricom GmbH (see back cover of this document) to announce the repair/service case before returning the product.
- (2) Follow the procedure provided by the service department.

### 8.2. Repacking

The unit is portable and may be carried unpacked at normal environmental conditions.

Use standard packing procedures to protect the unit during shipment. Custom foam packing material is preferred because it conforms to the shape of the instrument.



#### **Recommendation**

Use transport case and original packing materials in the event the unit must be returned or shipped to another location.

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## **A. Procurement Information**

This appendix provides information needed to procure GPS antenna and antenna cable including associated connectors and mounting parts as well as lightning protection.

For further information than outline herein and for ordering please contact Marketing/Sales of Symmetricom GmbH.

<b>Symmetricom GmbH</b>	Phone: +49 – 8104-6624-29
Marketing/Sales	Fax: +49 – 8104-6624-28
Fichtenstrasse 25	e-mail: <a href="mailto:sales@symmetricom.de">sales@symmetricom.de</a>
D-85649 Hofolding / Munich	web: <a href="http://www.symmetricom.com">www.symmetricom.com</a>
Germany	

Please provide the parts name together with the part number when ordering.

### **A.1. GPS Antenna Sets**

An antenna set includes a GPS antenna, the antenna cable with the chosen length, 2 connectors and the mounting device with attachment parts.

<b>Type of cable and available length</b>	<b>Part Number</b>
RG58 / 25 m	83009002
RG213/50 m	83009003
RG213/75 m	83009004
RG213/100 m	83009005
LowLoss/150 m	83009006
LowLoss/200 m	83009007
LCF ½ " /250 m	83009008

### **A.2. GPS Antenna and Mounting Device**

<b>Name of the Component</b>	<b>Part Number</b>
GPS Antenna	23120015
Mounting device for Antenna	44301802

### A.3. Antenna Cables

Please order the cable per meter needed.

Type of the cable	Part Number
RG58	36000010
RG213	36000030
LowLoss	36000055
LCF ½ "	36000060

### A.4. Connectors

Name of the Component	Part Number
Connector for cable type RG58, straight	13113006
Connector for cable type RG213, straight	13113000
Connector for cable type RG213 and Low Loss, angle	13113002
Connector for cable type LowLoss, straight	13113013
Connector for cable type LCF ½ " , straight	13113009

### A.5. Lightning Protection

An Lightning Protection includes a Hardware kit and 2 necessary connectors

Name of the Component	Part Number
Lightning Protector for cable type RG58	83009025
Lightning Protector for cable type RG213	83009024
Lightning Protector for cable type LowLoss	83009023

### A.6. Grounding Kit

Name of the Component	Part Number
Grounding Kit for cable type RG58/RG213	36102045

**GLOSSARY**

(ONLY NON-STANDARD ABBREVIATIONS ARE LISTED)

<b>EC</b>	<i>European Council</i>
<b>EN</b>	<i>Europäische Norm</i> Abbreviation for German expression of European Standard
<b>ESD</b>	<i>Electro Static Discharge</i> The rapid, spontaneous transfer of electrostatic charge induced by a high electrostatic field.
<b>GPS</b>	<i>Global Positioning System</i> (satellite navigation system) A satellite-based global navigation system that consists of (a) a constellation of 24 satellites in orbit 18 000 km above the Earth, (b) several on-station (i.e., in-orbit) spares, and (c) a ground-based control segment. The satellites transmit signals that are used for extremely accurate three-dimensional (latitude, longitude, and elevation) global navigation (position determination), and for the dissemination of precise time.
<b>Hz</b>	<i>Hertz</i> A unit of frequency equal to one cycle per second (cps.). One kilohertz (kHz) equals 1000 cps; One megahertz (MHz) equals 1 million cps; One gigahertz (GHz) equals 1 billion cps.
<b>N</b>	<i>Navy Connector</i> Coaxial Connector with screw type coupling mechanism. Available in 50 Ohm and 75 Ohm versions. Frequency range DC – 18GHz (50 Ohm) and 1 GHz (75 Ohm) respectively.
<b>RG</b>	<i>Symbol used to designate coaxial cables that are made to Government Specification</i> e.g., RG58-U, in this designation the “R” means radio frequency, the “G” means Government, the “58” is number assigned to the government approval, and the “U” means it is an universal specification.
<b>VA</b>	<i>Voltage Ampere</i> The unit of electrical apparent power. In alternating-current power systems, the product of the rms voltage and amperage.
<b>VAC</b>	<i>Volts, Alternating Current</i> The unit of electromotive force
<b>VDC</b>	<i>Volts, Direct Current</i> The unit of electromotive force

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**Service/Support**

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The logo features a stylized swoosh above the text. The swoosh is black on the left and blue on the right, curving over the word.

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