



USER MANUAL

UHF Antenna

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UHF ANTENNA

USER MANUAL

This user manual is specially designed to describe the EnduroSat UHF Antenna module, its functions and features.

Please read carefully the manual before unpacking the antenna in order to ensure safe and proper use.

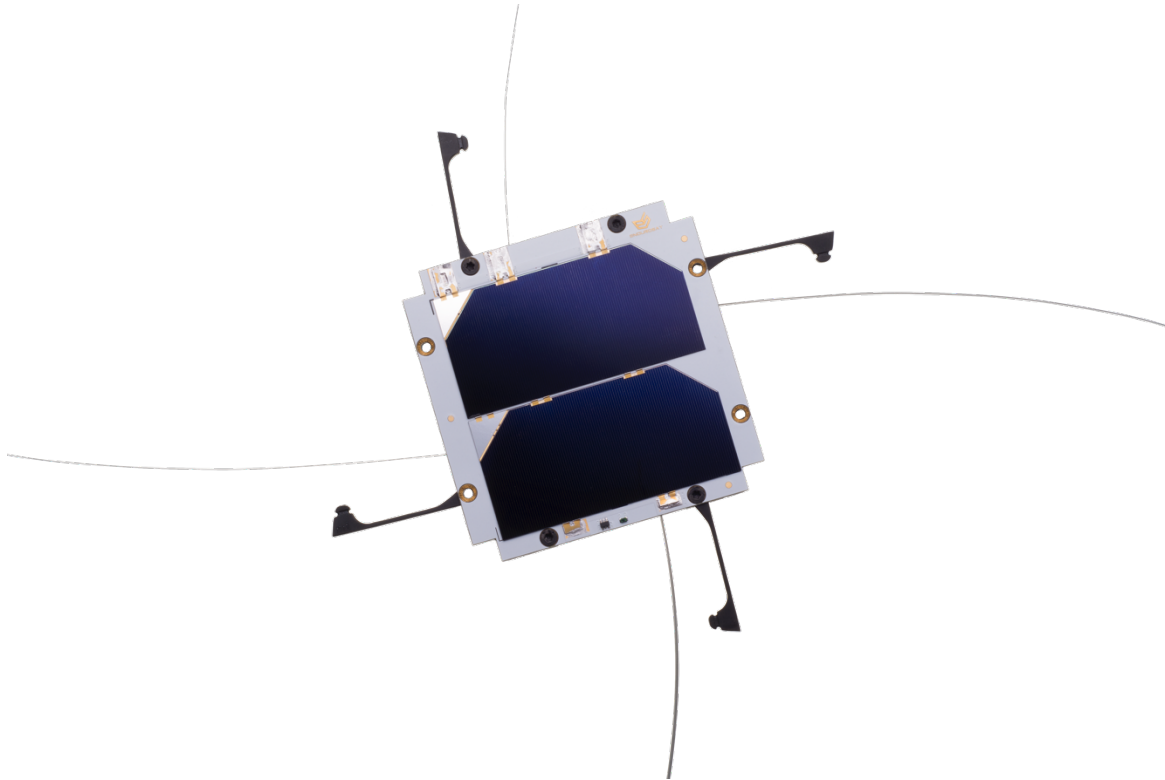


Figure 1 – EnduroSat UHF Antenna (Solar panel is a separate product)

1 CHANGE LOG

Date	Version	Note
10/04/2016	Rev 1	
01/08/2017	Rev 1.1	minor text enhancements
02/08/2017	Rev 1.2	power consumption and supply voltage for deployment added
21/11/2017	Rev 1.3	connectors added

2 ACRONYMS LIST

LHCP	Left Hand Circular Polarization
RHCP	Right Hand Circular Polarization
RF	Radio Frequency
UHF	Ultra-High Frequency
PCB	Printed Circuit Board

3 OVERVIEW

The antenna is designed to cover the amateur satellite band 435-438 MHz. It has a circular polarization and uses a redundant burn wire mechanism with feedback for the deployment of the radiating rods.

4 HIGHLIGHTED FEATURES

- UHF band for amateur satellite communications 435 – 438MHz;
- Compatible with EnduroSat Solar panels;
- Circularly polarized;
- Weight: 85 g;
- Gain > 0dBi*;
- Max RF output power 3.5W;
- Burn wire mechanism with feedback for deployment
- Supply voltage for deployment: 5V
- Max current consumption during deployment: 530mA (primary and back-up burning resistors working simultaneously)

*from simulation

5 FUNCTIONAL DESCRIPTION

The feed network for the RF part of the antenna is realized using strip lines. Each rod is fed with 90 degrees phase shift so that the antenna has a circular polarization. The antenna has a through hole for connecting it to EnduroSat' solar panel Z.

6 HARDWARE LAYOUT

Figure 2 depicts the bottom side of the antenna. All the dimensions are in mm. It uses up to 8 bolts for mounting to the satellite body (minimum 4 required: in this configuration, the bolts have to be installed in the proper locations as shown in figure 4). There is an opening in the PCB, through which an EnduroSat solar panel can be connected. The right angle MCX connector, used for connecting the antenna to the communication module, is located next to the opening.

The thickness of the antenna and the height of the connector are shown on Figure 3. The overall thickness (and weight) of the antenna depends on the top cover. It can be a solar panel, a cover or another module. On figure 3 is shown the thickness of the whole antenna with a top cover of 1.6 mm

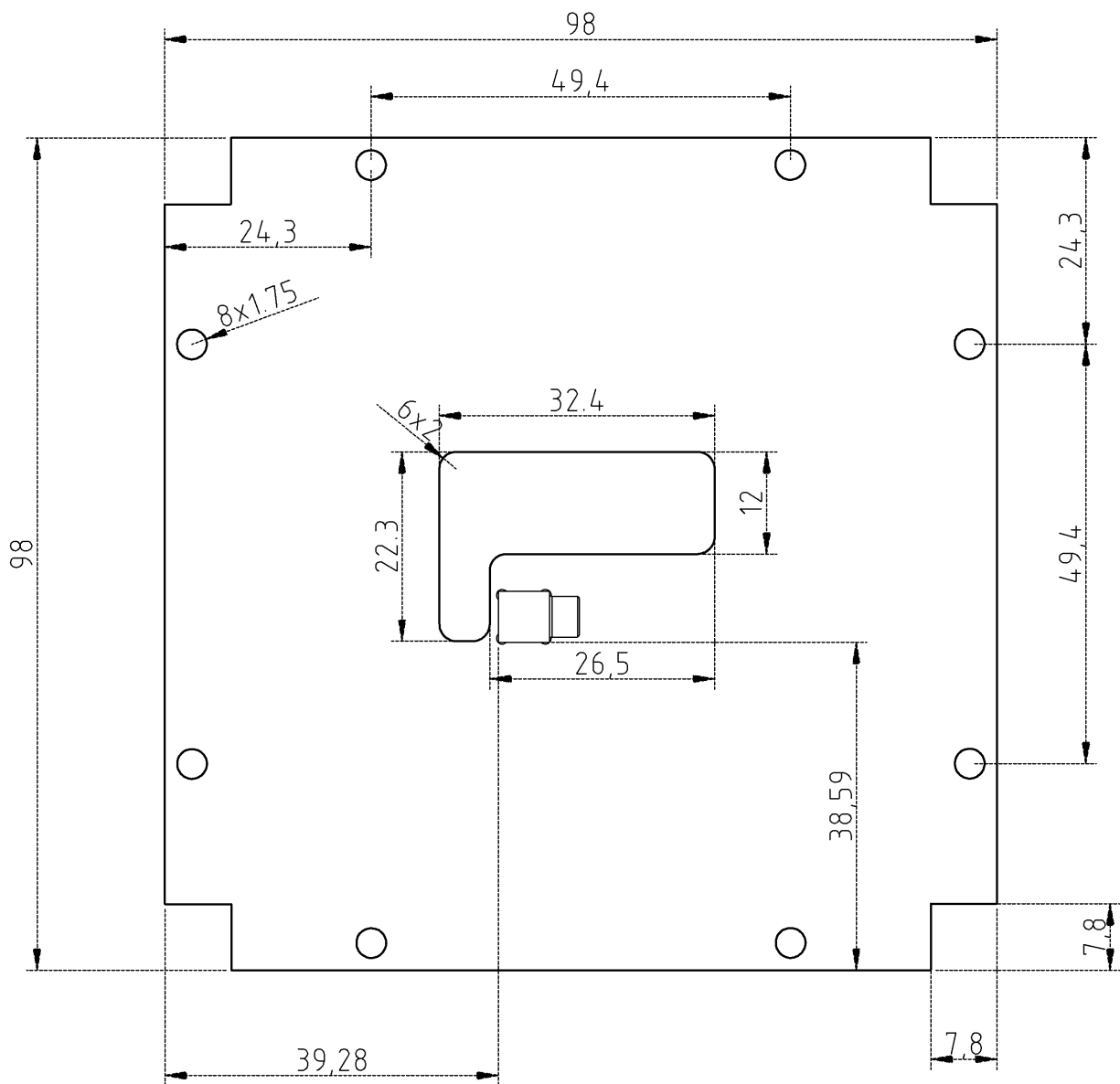


Figure 2 - Physical layout bottom side - Dimensions in mm.

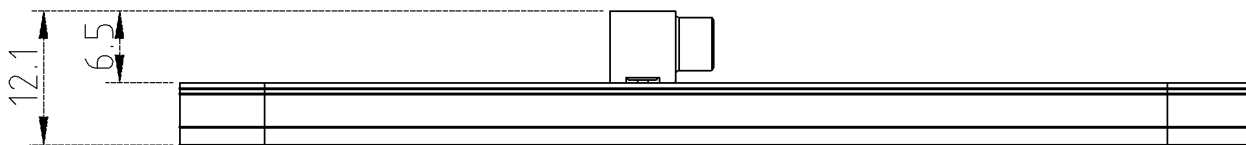


Figure 3 - Side view - Dimensions in mm.

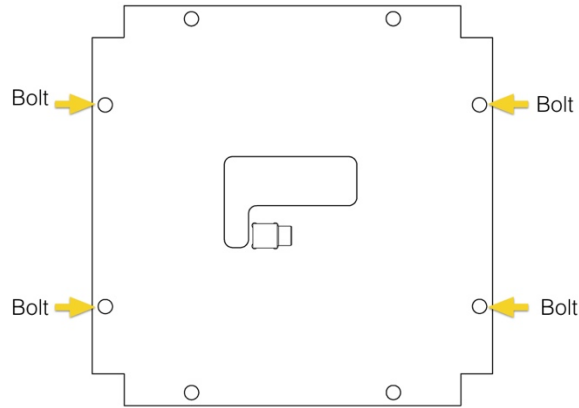


Figure 4 – Proper installation of the 4 bolts configuration.

7 CHARACTERISTICS

7.1 Frequency

Figure 4 shown the measured return loss of the UHF antenna

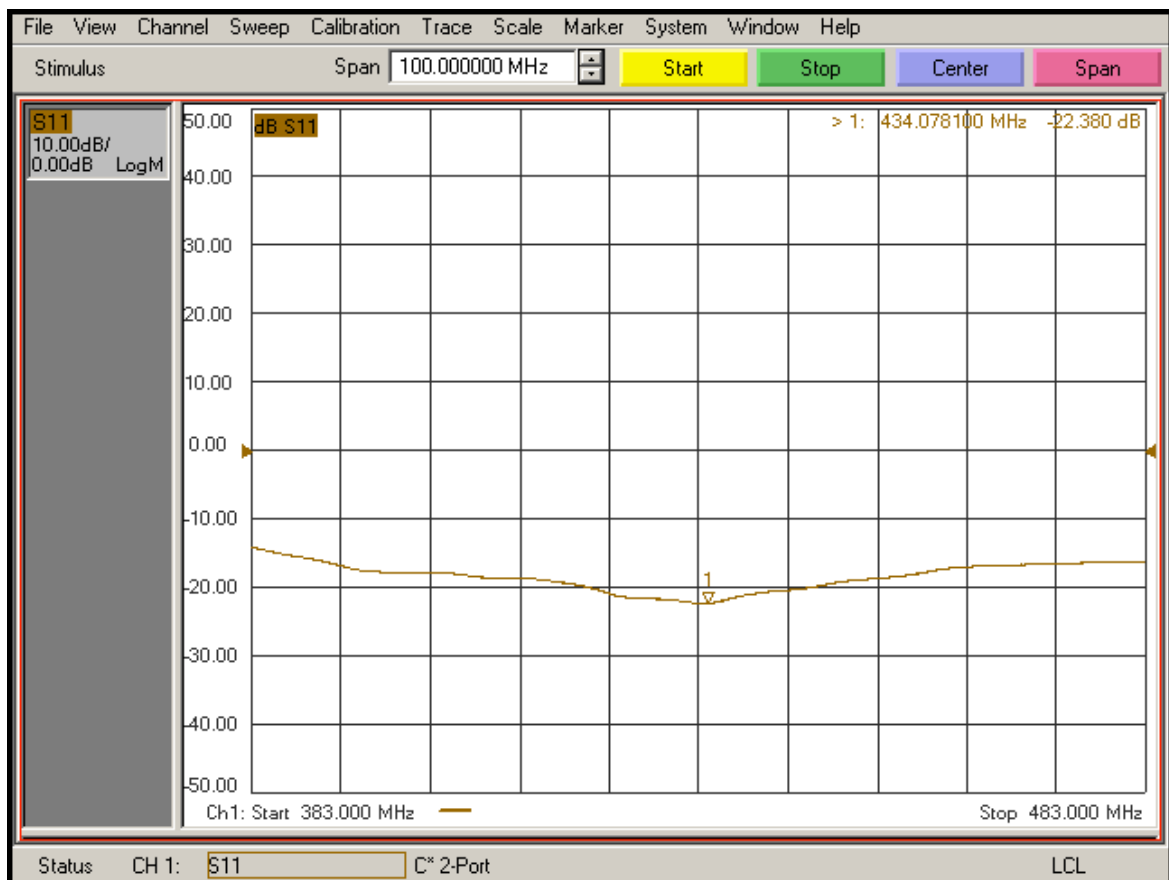


Figure 5 - measured return loss of the UHF antenna

7.2 Polarization

LHCP or RHCP with regards to antenna orientation.

7.3 Connectors

C1	MCX right angle (upon request, straight MCX or SMA)
C2	Four pin Molex Pico-Lock™

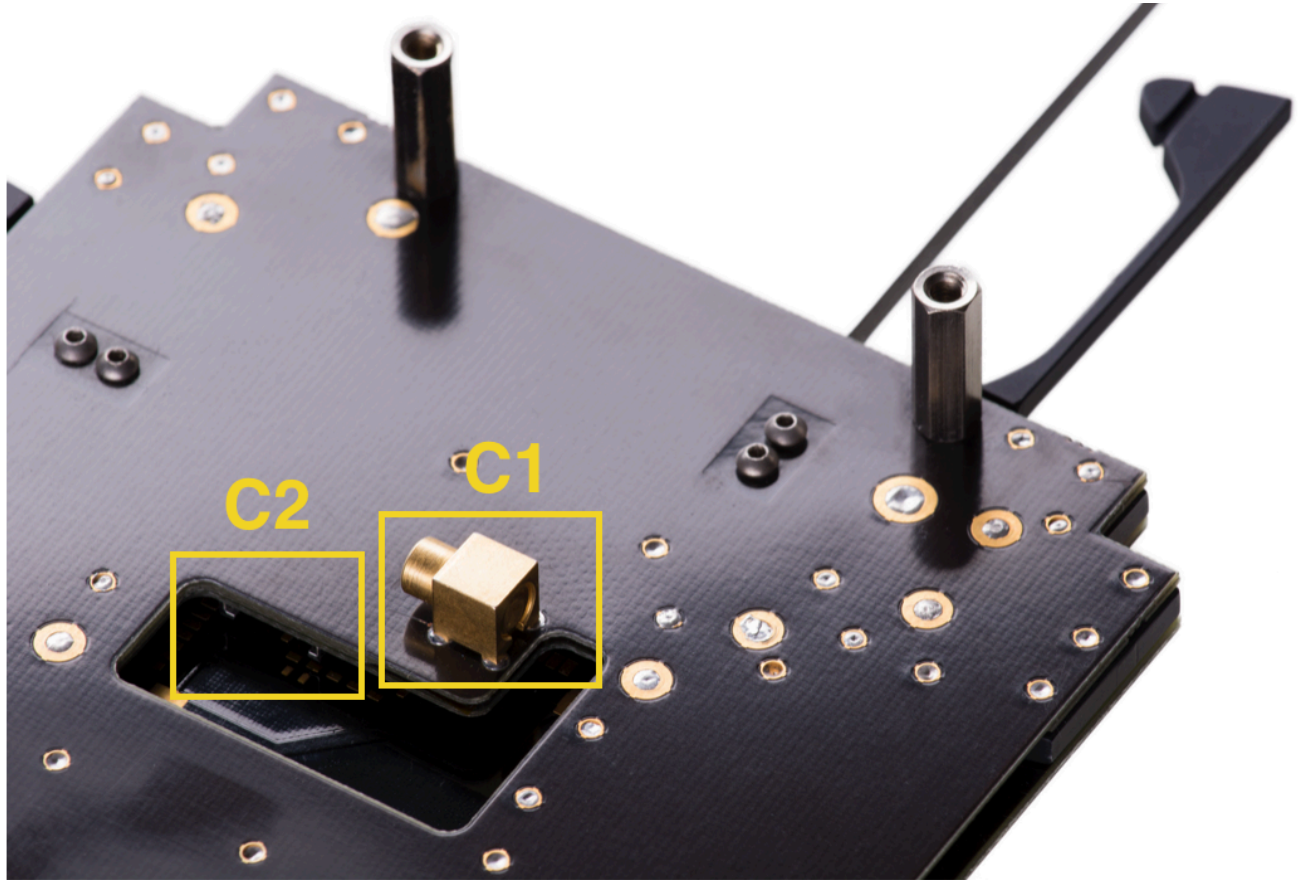


Figure 6 - Bottom Side - Connectors location

In the case of collision between the MCX connector and the structure of the satellite, U.FL connector on the internal side can be accessed by disassembling the top cover of the antenna.

C2 pinout:

Pin	Mnemonic	Description
1	+5V	Positive
2	I2C SCL	I2C Clock
3	I2C SDA	I2C Data
4	Ground	Ground

7.4 Gain

Figures 7 and 8 show the radiation pattern of the antenna

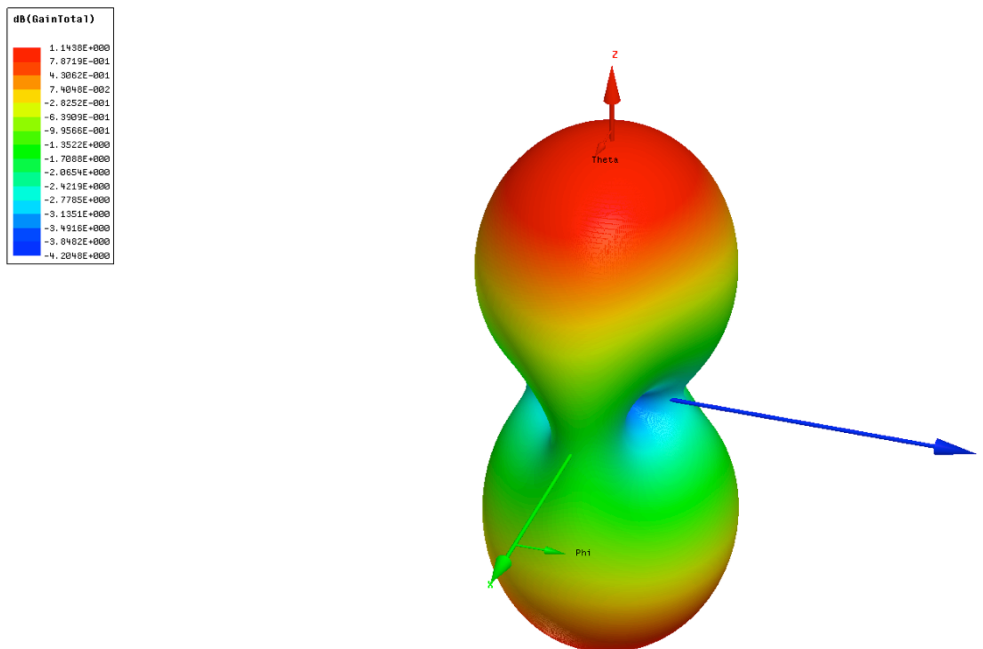


Figure 7

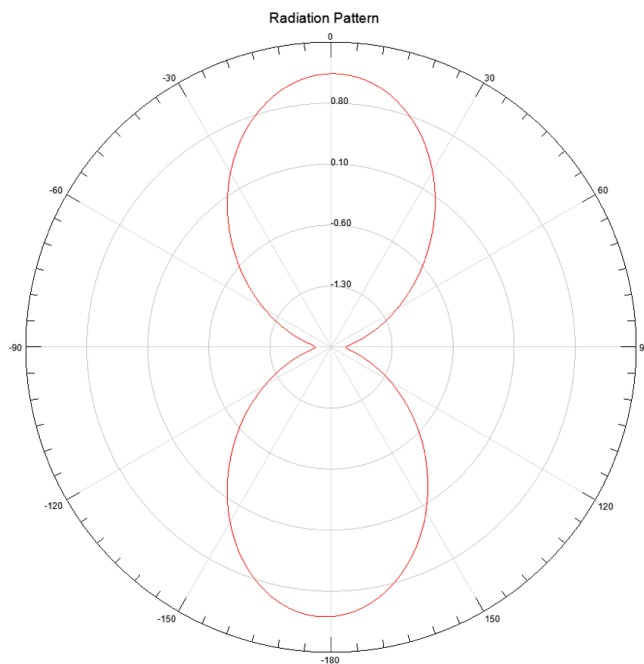


Figure 8

8 ELECTRICAL CHARACTERISTIC

Parameter	Condition	Min	Typ	Max
Supply Voltage [V]			5	
Current Consumption [mA]	Sleep mode		1	
	Primary burning resistor		250	
	Primary and Back-up burning resistor		500	

9 DEPLOYMENT MECHANISM

The deployment mechanism uses burn resistors to cut a wire and release the doors holding the antenna rods. Each antenna rod has two separated circuits of resistors for redundancy. The module features a feedback network for deployment. It uses a four pin Molex Pico-Lock™ connector with I2C interface for providing feedback regarding antenna deployment.

10 MATERIALS

The frame and doors used for holding the antenna rods rolled and encapsulated, is made of aluminum with hard anodization, which prevents a short circuit between the frame and the antenna rods. Rods are made from SMA – Shape Memory Alloy with super elastic properties to ensure straight shape after release. All the PCBs are made from FR-4.

11 MECHANICAL AND ENVIRONMENTAL TEST

A full campaign of tests at qualification level was performed on the qualification engineering model. Qualification tests level and duration follow the ESA standard ECSS-E-ST-10-03C and GEVS: GSFC-STD-7000A. Test performed:

- Thermal Cycling
- Thermal Vacuum
- Random Vibration
- Sine Vibration
- Shock Test

12 INCLUDED IN THE SHIPMENT

EnduroSat provides along with the UHF antenna:

- 2 Coaxial cable 50 Ohm, MCX to MCX and MCX to SMA connectors
- Power and command cable (PTFE Material Jacket, 24AWG), connector MOLEX 504051-0401
- USB stick with user manual

Customized cables and connectors can be provided upon request.

13 HANDLING AND STORAGE

Particular attention shall be paid to the avoidance of damage to the UHF antenna during handling, storage and preservation. The handling of the UHF antenna module should be performed in compliance with the following instructions:

- Handle using PVC, latex, cotton (lint free) or nylon gloves
- The environment where UHF antenna module will be handled shall meet the requirements for a class environment 100 000, free of contaminants such as dust, oil, grease, fumes and smoke from any source.
- Store in such a manner as to preclude stress and prevent damage
- To prevent the deterioration, the UHF antenna must be stored in a controlled environment, i.e. the temperature and humidity levels shall be maintained in the proper ranges:
 - Ideal storage temperature range: 15°C to 27°C
 - Ideal storage humidity range: 30% to 60% relative humidity (RH).

14 WARNINGS



This product uses very fragile components. Observe precautions for Handling.



This product uses semiconductors that can be damaged by electrostatic discharge (ESD). Observe precautions for Handling



Sensitive Electronic device. Do not ship or store near strong electrostatic, electromagnetic, magnetic or radioactive fields.