OPTICON

Electronic shelf label

EE200

SPA Orange 1,5 liter
1,5l

7Up 1,5 liter
1,5l

Hero Cassis 1,5 liter
€1,74
1,5l   €1,16/l

The EE200 is a E-ink based electronic shelf label with a screen size of 2″ and with 802.15.4 based wireless communication.

Specifications Manual

All information subject to change without notice.

Document History

Model Number:	EE200	**Specification Number:**	
Edition:	2	**Original Spec Number:**	
Date:	June 3 2012		

Copyright 2012 Opticon. All rights reserved.

This manual may not, in whole or in part, be copied, photocopied, reproduced, translated or converted to any electronic or machine readable form without prior written consent of Opticon.

Limited Warranty and Disclaimers

PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE PRODUCT.

Serial Number

A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

Warranty

Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

Packaging

The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

Trademarks

Trademarks used are the property of their respective owners.

Opticon Inc. and Opticon Sensors Europe B.V. are wholly owned subsidiaries of OPTOELECTRONICS Co., Ltd., 12-17, Tsukagoshi 4-chome, Warabi-shi, Saitama, Japan 335-0002. TEL +81-(0) 48-446-1183; FAX +81-(0) 48-446-1184

SUPPORT

USA	Europe
Phone: 800-636-0090	
Email: support@opticonusa.com	Email: support@opticon.com
Web: www.opticonusa.com	Web: www.opticon.com

Contents

Table of Figures

1. Abstract

This manual provides specifications for the EE200 electronic shelf label (hereafter referred to as "ESL").

2. Overview

The EE200 is an E-ink based ESL with a 2.4GHz radio for data communication. This product uses Direct Sequence Spread Spectrum RF technology that allows for an ultra-low power consumption combined with a reduced sensitivity to background noise. That means less interference by other radios that operate in the 2.4GHz band. The radio protocol that is used is based on the IEEE 802.15.4 standard that specifies the physical layer and media access control for low-rate wireless personal area networks. The protocol is entirely implemented, except for some small changes that have all to do with the connection protocol to a base station. When the base station is not available the EE200 switches to a non-802.15.4 standard to lower the power. That is especially meaningful when the EE200 is not being used for a prolonged period of time (e.g. during shipping)

A development kit is available that consists out of a base station and several EE200 tags plus a PC demo application that allows people to quickly test the system and makes it easier to integrate this ESL system into an existing back office system.

3. Physical Features
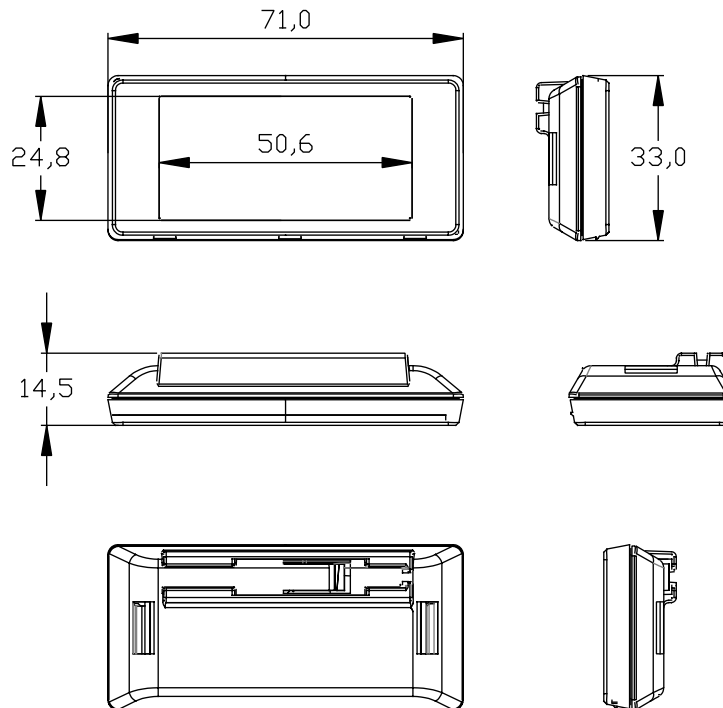
3.1. Dimensions

W 71.0 x H 33.0 x D 14.5 mm

Figure 1: Dimensions

3.2. Weight

40 g (including batteries)

4. Environmental Specifications

4.1. Operating Temperature and Humidity

Temperature: 10 to 50° C

Humidity: 20% to 85% RH

4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 20% to 85% RH

4.3. Static Electricity

Air discharge:	± 8 kV MAX (No malfunction)
	± 15 kV MAX (No destruction)
Contact discharge:	± 4 kV MAX (No malfunction)
	± 8 kV MAX (No destruction)

4.4. Drop resistance.

There will be no sign of decreased performance after the following drop test:

Drop the ESL from 0.5 M above the concrete floor (6 sides, 3 times each).

Scratches or discoloration of the casing do not decrease product performance.

4.5. Dust and Drip Proof

Not rated

5. Controls

Items	Specifications		Remarks
CPU	Type	8051 core 8-bit MCU	
	Internal flash ROM	96KB	
	Internal RAM	6 KB	
	Clock frequency	32 MHz	
LCD	Active area	W 45.8 x H 22.0 mm	
	Number of dots	W 200 x H 96	
	Dot pitch	111 Horizontal 111 Vertical	Dots per Inch
Radio	Modulation	DSSS	
	Frequency	2394 ~ 2507 MHz	Globally approved 2.4GHz band.
	Baud rate	250 Kbits / second	

6. Electrical Specifications

6.1. Electrical Characteristics

Conditions: Operating voltage 3.0V unless otherwise specified

Parameter	Typ	Unit	Remarks
Operating voltage	2.0–3.3	V	Lithium primary battery
Sleep current	<1	uA	When the transmitter and receiver are idle
Poll time	20	seconds	See below

The ESL is in sleep mode almost the entire time. The device wakes up at regular intervals (called the poll time) and it then transmits a poll request to the base station. When the base station has no data to send, it just acknowledges the poll after which the ESL immediately goes back to sleep. The poll rate is configurable and is set to 20 seconds by default. A higher poll rate will decrease the power consumption but will increase the response time.

6.2. Battery

The power is supplied to the ESL by two coin shaped Lithium CR2450 batteries:

- Nominal capacity: 1200 mAh (two times 600mAh)

- Nominal voltage: 3.0 V.

- Maximum self-discharge rate: <1% per year

- Usable time: 7 years minimum (Update frequency: 4 times per day, poll time 20seconds)

7. Radio Specifications

Parameter	Min	Typ	Max	Unit	Remarks
Receiver sensitivity		-97	-89	dBm	Over the entire temp. and operating voltage range
Nominal output power	-3	4.5	7	dBm	
Frequency	2394		2507	MHz	Over the entire temp. and operating voltage range
Transfer rate		250Kbit/s			
RSSI range		100		dB	Signal strength indication that can be reported to the base station

7.1. Protocol

Modified 802.15.4 (Physical layer and Media Access Control layer).

7.1.1. The physical layer

The physical layer (PHY) provides the data transmission service, as well as the interface to the physical layer management entity, which offers access to every layer management function and maintains a database of information on related personal area networks. Thus, the PHY manages the physical RF transceiver and performs channel selection and energy and signal management functions. It operates on the above mentioned frequency band. The PHY layer is 100% compliant and is based on direct sequence spread spectrum (DSSS) technique with a transfer rate of 250 kbit/s.

7.1.2. The medium access control layer

The medium access control (MAC) layer enables the transmission of MAC frames through the use of the physical channel. Besides the data service, it offers a management interface and itself manages access to the physical channel. It also controls frame validation, guarantees time slots and handles node associations. Finally, it offers hook points for secure services. The EE200 does not make use of the optional network beaconing, instead it used a polling mechanism to increase power efficiency. Some changes are made to the standard to allow for more efficient data frames and better power efficiency, especially when nodes are not connected to a base station.

7.2. Security

The 802.15.4 standard 128-bit AES encryption is supported. A secure method for key management is implemented as well. The encryption is optional though and can be configured via the base station. By default the radio traffic is unencrypted.

8. Labeling

8.1. Product label

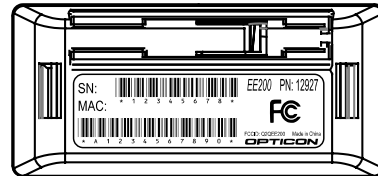The product label is affixed to the ESL as shown below.

Figure 2: product label

There are two barcodes on the label: The serial number on the top and the device's MAC address below. The serial number barcode simply shows the 8-digit serial number that allows for a 100 million range of numbers.

The MAC address barcode is shown below the serial number code; the MAC's factory code is not shown to save some space. Instead it is replaced by a character that defines the factory code. For now only the 'A' is defined and stands for "00124B". Future versions might get another character.

The 'A' is followed by 10 hexadecimal digits. The complete MAC address on the label should match the address that is defined by the radio chip manufacturer so during production of the ESL, the MAC address has to be obtained and then printed on the label.

Barcode symbology is code 39.

Material: Base + laminate protection against wear.
Base: PP film, thickness 80µm, backing with glue.
Laminate: PET film, clear, thickness 50µm.

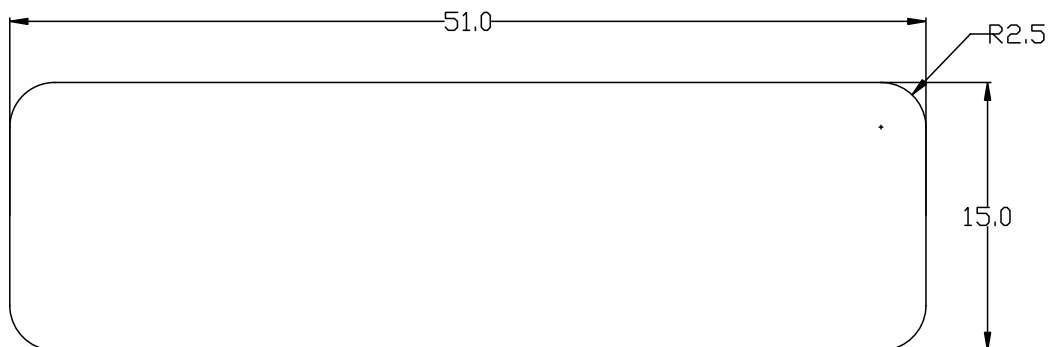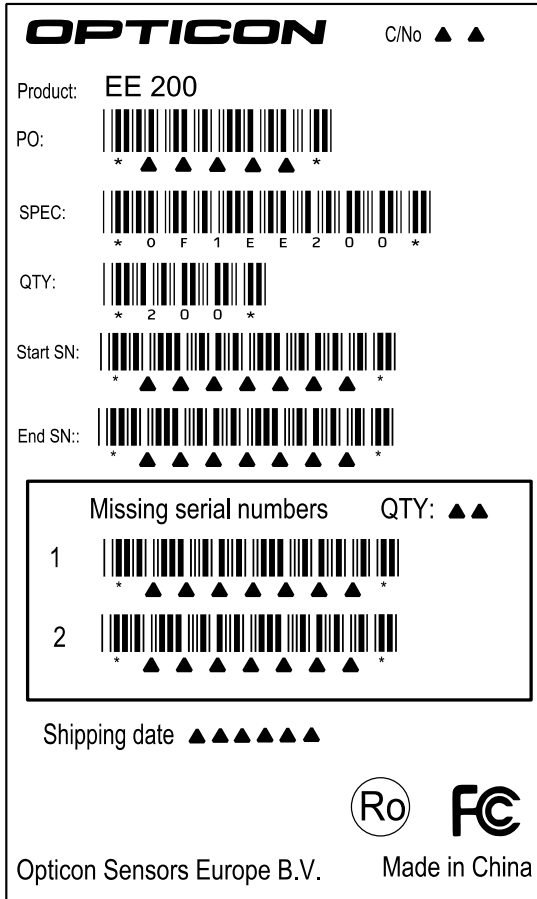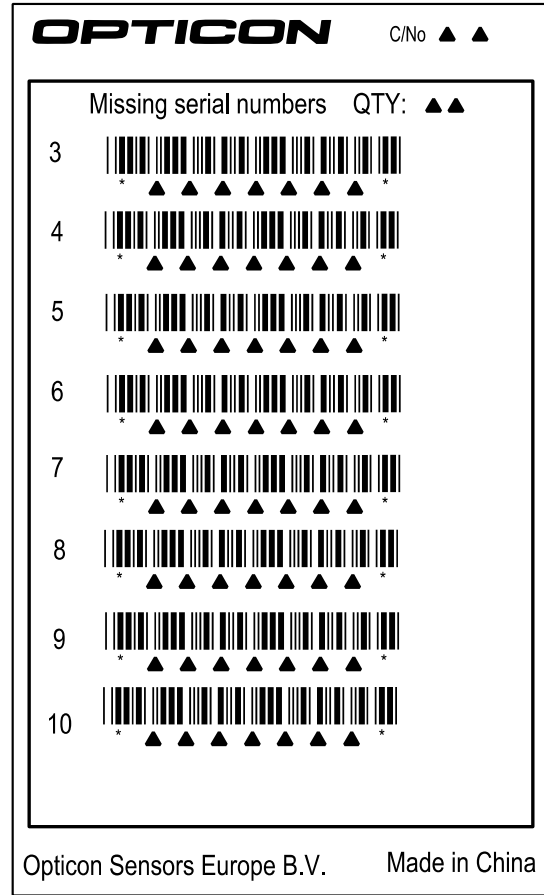The dimensions of the product label are as follows:

Figure 3: product label dimensions

8.2. Shipment box labels

The shipment box labels are made from plain paper and are meant to show the regulatory information on the shipment box as well as the quantity and the serial numbers for the ESL's in the box. The label designs are shown below:

Label A   Label B

Figure 4: shipment box labels

The size of both labels is 104mm (width) x 172mm (height)

9.   Accessories

The EE200 can be fitted with a clip that allows for easy assembly to a shelf. Several types are available so contact your nearest Opticon dealer for more information on this.

.

10. Packaging Specifications

10.1. Individual Packaging Specification

The ESL's do not need to be packed separately. To easily pack them, 25 pcs need to be packed in a plastic molder tray:
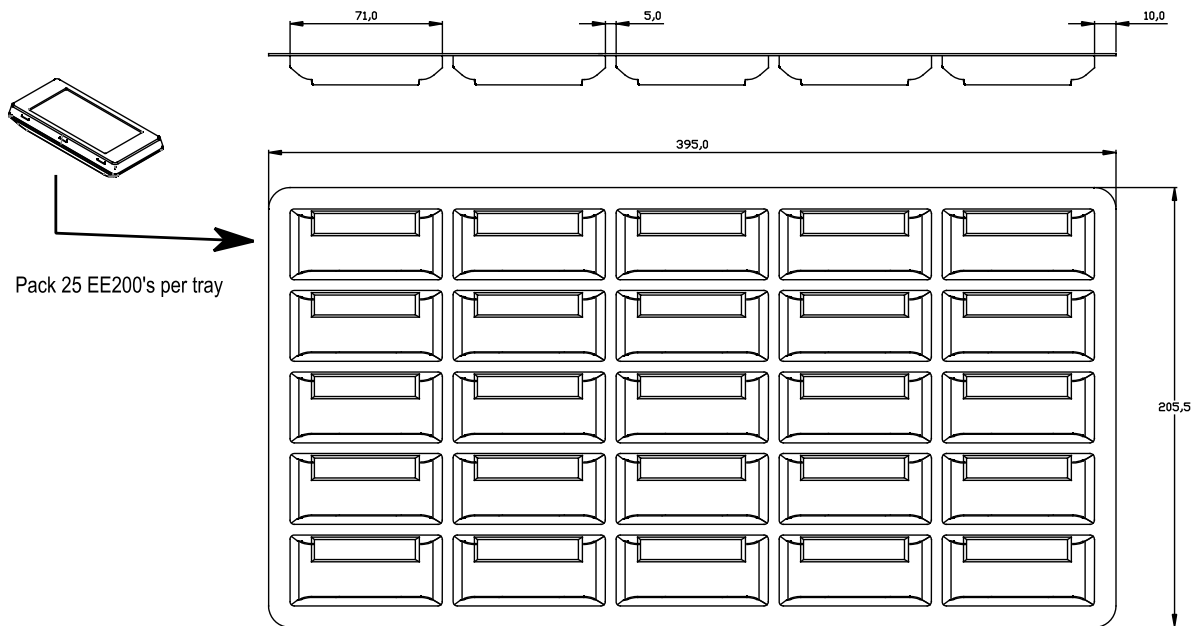
Pack 25 EE200's per tray

Figure 5: Individual packaging

10.2. Collective Packaging Specification

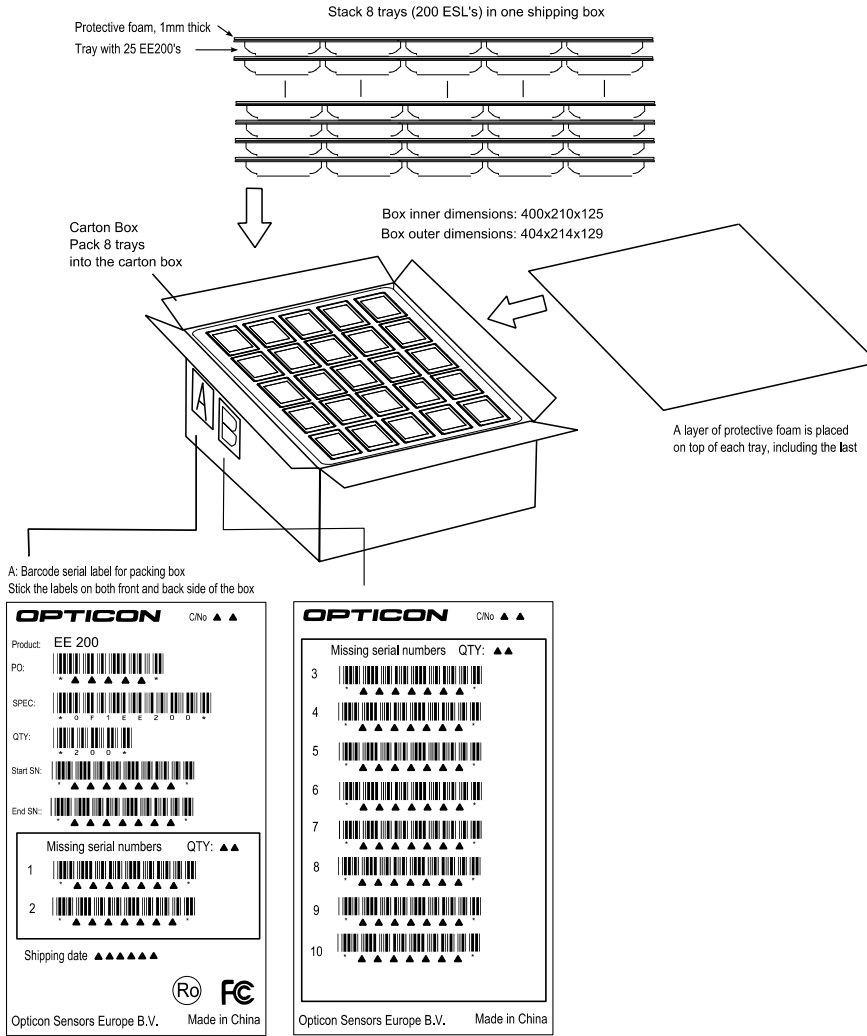Put 8 stacks, containing 200 ESL's inside a box and affix the shipment box label on the indicated position.

Figure 6: Collective packaging

Note: The "RO" mark labeled on the package tray or package box guarantees that the applicable product has passed our test of RoHS restrictions compliance (the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC). However, this document does **not** have any legal weight in the European Union.

11. Regulatory Compliance

11.1. EMC

FCC Part 15 Subpart B Class B

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may

cause undesired operation.

FCC Part 15 Subpart C Clause 247 (Spread spectrum radio systems)

11.2. RoHS

RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC.

12. Safety

Handle this product carefully. Do not deliberately subject it to any of the following.

12.1. Shock

Do not throw or drop the ESL.

Do not place heavy objects on the ESL.

12.2. Temperature Conditions

Do not use the ESL at temperatures outside the specified range.

Do not pour boiling water on the ESL.

Do not throw the ESL into the fire.

Do not leave the ESL on the dashboard of a car.

12.3. Foreign Materials

Do not immerse the ESL in liquids.

Do not subject the ESL to chemicals.

12.4. Battery

Replace the ESL when its lifetime has expired. This is after max. 10 years of operation or sooner when the battery is depleted. If the battery is depleted sooner, replace the ESL and treat it as chemical waste and dispose of it according to local regulations.

12.5. Other

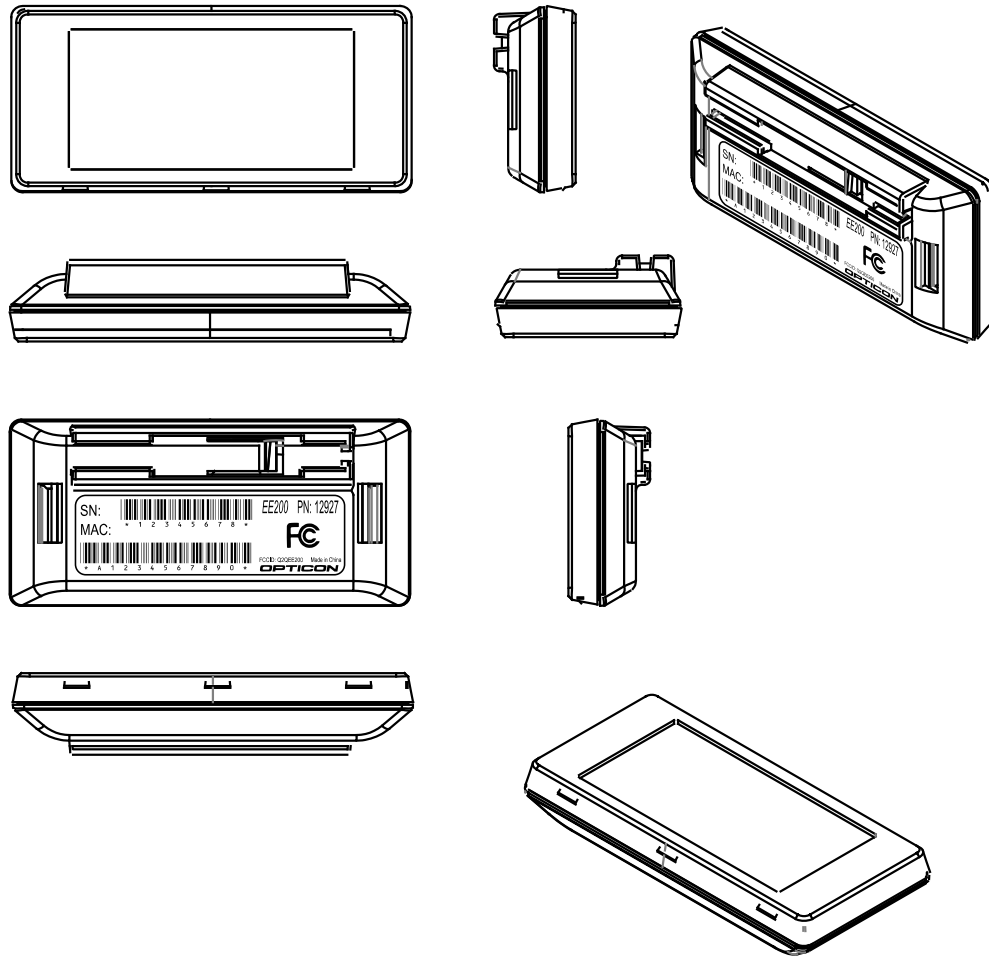Do not disassemble this product.

The ESL may be damaged by high voltage discharges.

13. Mechanical Drawing

Figure 7: Mechanical drawing