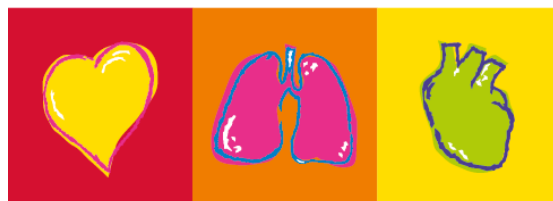# DEFIGARD HD-7

Defibrillator/monitor

DEFIGARD HD-7 PADDLES (1-130-98XX)   DEFIGARD HD-7 PADS (1-130-99XX)

Service manual

SCHILLER
The Art of Saving Lives

Information relating to distribution and maintenance
SCHILLER has an international network supplying customer and sales services and agencies providing advice.
Please contact your nearest SCHILLER subsidiary to obtain details of your local representative.

A complete list of all the representatives and subsidiaries can be found on our Website:

http://www.schiller.ch
Sales information can also be obtained from the following address:
sales@schiller.ch

Manufacturer

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4, rue Louis Pasteur	Fax: +33 (0) 388 94 12 82
F-67162 Wissembourg	Email: quality@schiller.fr
Website:	www.schiller-medical.com

CE **0459**

Item no./version	Date	Subject
0-48-0364/a	12/03/2020	First version
0-48-0363 / b	01/03/2022	Correction of Chapter 2: Description of the devices 1-130-9811 and 1-130-9911.

SCHILLER
The Art of Diagnostics

Table of contents

SCHILLER
DEFIGARD HD-7

1 Safety instructions

1.1 Responsibilities of the user entity

▲ This service manual is intended for qualified personnel and describes the operating, maintenance and troubleshooting procedures for the device. Compliance with its content is a prerequisite for proper device performance and for the safety of the patient and operator.

▲ The supply of this manual does not in any event constitute permission or approval to modify or repair a device.

▲ SCHILLER agrees to supply all the spare parts for a period of ten years.

▲ All rights reserved for the devices, circuits, processes and names appearing in this manual.

▲ In order to optimise patient safety, electromagnetic compatibility, accurate measurement indication and proper device performance, users are advised to use only original spare parts supplied by SCHILLER. Any use of accessories other than original accessories shall be at the exclusive risk of the user.

▲ SCHILLER shall not be liable for any damage due to the use of incompatible accessories or consumable supplies.

▲ SCHILLER shall not be liable in respect of the safety, reliability and characteristics of the device if any assembly or configuration operations, modifications, extensions or repairs have been performed by personnel other than those of SCHILLER or those duly authorised by SCHILLER.

▲ While testing the device defibrillator, the patient may only be simulated with fixed high-voltage and high-power resistors that are well insulated from the ground or earth. Poorly insulated devices or devices with loose contacts or devices containing components such as spark arresters or electronic flash lamps may never be used as they could irremediably destroy the device.

1.2 Symbols

1.2.1 Symbols used in the manual

Hazard levels are classified according to standard ANSI Z535.4. Below are the safety symbols and pictograms used in this technical manual. The terms Danger, Warning and Important featuring in this manual draw attention to risks and indicate the corresponding degree of hazard. Please read these definitions and their meanings carefully.

⚠ **DANGER**	Danger — Draws your attention to an imminent hazard. Failure to observe this instruction would result in death or extremely serious injury.
⚠ **AVERTISSEMENT**	Warning— Draws your attention to a hazard. Failure to observe this instruction could result in death or extremely serious injury.
⚠ **ATTENTION**	Important — Draws your attention to a situation that could be unsafe. Failure to observe this instruction could result in minor injury and/or device damage.

⚠	For general safety instructions.
⚡	For electrical hazards, warnings or precautionary measures relating to electricity.
i	For comments concerning operating and other useful information.
📖	Reference to other documents.

Symbols used on the device

|	
⊣ 👤 ⊢	BF type signal input, protected from defibrillation
⊣ ❤ ⊢	CF type signal input, protected from defibrillation
CE 0459	CE marking number (G-MED)
⚠	Follow the descriptive manuals provided!
📖	Comply with the instructions for use
🗑	Do not dispose of with household waste
▮▲	Manufacturer information
〽	Date of manufacture
((•))	Device with optional Wi-Fi or GSM
IP33	The device is protected from foreign bodies with a diameter above 2.5 mm and splashing water.
⚡	Symbol used to indicate an electrical hazard during defibrillation (DEFIGARD HD-7).
□→	CO2 gas outlet
⊏←	CO2 gas inlet for NomoLine sampling line
▽	Potential equalisation

1.2.2 Symbols used on electrode packaging
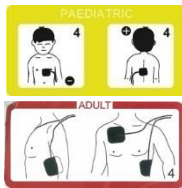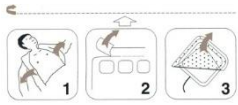
- Unbutton clothing
- Open the electrode packaging
- Remove the protective film
- Placing of electrodes

For single use only; not to be reused

Do not fold the packaging

Storage temperature range

Expiry date of defibrillation electrodes

Read the instructions before use

Use within one day of opening

Keep dry

Do not expose to direct sunlight

Do not use if the package is damaged

The packaging is made of low-density polyethylene and may be recycled.

For use by or as prescribed by a physician or an individual authorised by the laws of the country

Defibrillation electrodes for adults and children with a body weight above 25 kg

Defibrillation electrodes for children with a body weight below 25 kg

2 Introduction

2.1 Overview of versions/compatibility

2.1.1 DEFIGARD HD-7

DEFIGARD HD-7 is available in 22 versions, including 11 with paddle electrodes (PADDLES) and 11 without paddle electrodes (PADS).

Item nos of versions with paddles
They all have the basic functions: Manual defibrillation, AED, Printer, Wi-Fi, 6-lead ECG and paddle electrodes.

1-130-9802	DEFIGARD HD-7 PADDLES AED Basic version
1-130-9803	DEFIGARD HD-7 PADDLES AED PACER Basic version + pacer function (configurable).
1-130-9804	DEFIGARD HD-7 PADDLES AED PACER ETCO2 Basic version + pacer function (configurable) + capnography function (additional equipment and accessories).
1-130-9805	DEFIGARD HD-7 PADDLES AED SPO2 Basic version + Masimo SpO2 function (additional equipment and accessories).
1-130-9807	DEFIGARD HD-7 PADDLES AED SPO2 NELLCOR Basic version + Nellcor SpO2 function (additional equipment and accessories).
1-130-9808	DEFIGARD HD-7 PADDLES AED PACER SPO2 Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories).
1-130-9810	DEFIGARD HD-7 PADDLES AED pace SPO2 NELLCOR Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories).
1-130-9811	DEFIGARD HD-7 PADDLES AED PACER SPO2 NIBP Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories).
1-130-9813	DEFIGARD HD-7 PADDLES AED PACER SPO2 NELLCOR NIBP Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories).

1-130-9814	DEFIGARD HD-7 PADDLES AED PACER SPO2 NIBP ETCO2
	Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories) + capnography (additional equipment and accessories).

1-130-9816	DEFIGARD HD-7 PADDLES AED PACE SPO2 NEL NIBP ETCO2
	Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories) + capnography (additional equipment and accessories).

Item nos of versions with pads
They all have the basic functions: Manual defibrillator, AED, Printer, Wi-Fi and 6-lead ECG.

1-130-9902	DEFIGARD HD-7 PADS AED
	Basic version

1-130-9903	DEFIGARD HD-7 PADS AED PACER
	Basic version + pacer function (configurable).

1-130-9904	DEFIGARD HD-7 PADS AED PACER ETCO2
	Basic version + pacer function (configurable) + capnography function (additional equipment and accessories).

1-130-9905	DEFIGARD HD-7 PADS AED SPO2
	Basic version + Masimo SpO2 function (additional equipment and accessories).

1-130-9907	DEFIGARD HD-7 PADS AED SPO2 NELLCOR
	Basic version + Nellcor SpO2 function (additional equipment and accessories).

1-130-9908	DEFIGARD HD-7 PADS AED PACER SPO2
	Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories).

1-130-9910	DEFIGARD HD-7 PADS AED PACER SPO2 NELLCOR
	Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories).

1-130-9911	DEFIGARD HD-7 PADS AED PACER SPO2 NIBP
	Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories).

1-130-9913	DEFIGARD HD-7 PADS AED PACER SPO2 NELLCOR NIBP
	Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories).

1-130-9914	DEFIGARD HD-7 PADS AED PACER SPO2 NIBP ETCO2
	Basic version + pacer function (configurable) + Masimo SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories) + capnography (additional equipment and accessories).

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1-130-9916   DEFIGARD HD-7 PADS AED PACE SPO2 NEL NIBP ETCO2
Basic version + pacer function (configurable) + Nellcor SPO2 function (additional equipment and accessories) + NIBP (additional equipment and accessories) + capnography (additional equipment and accessories).
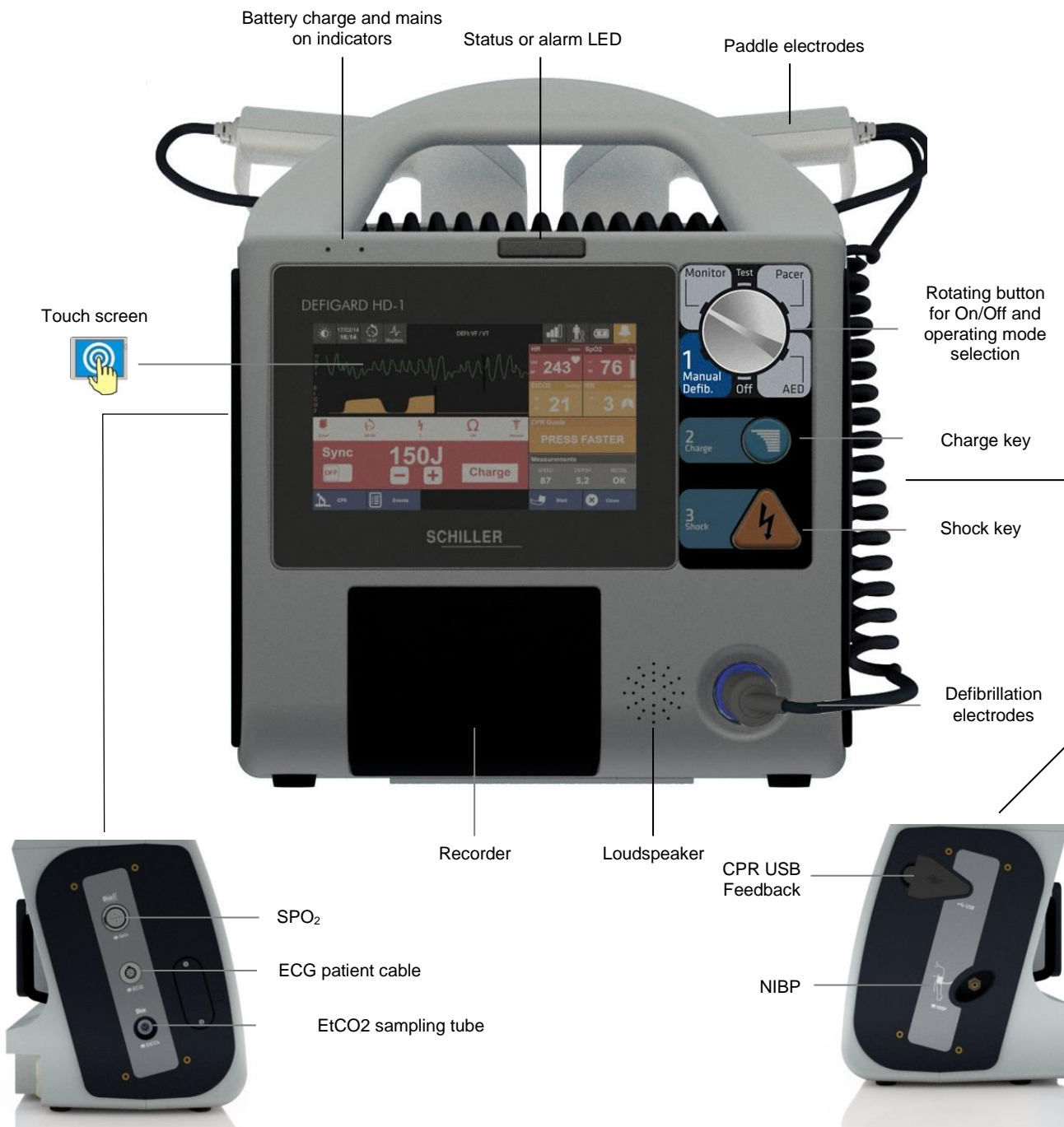
3 Operation

This section provides a brief description of device operation. For more details, please refer to the operating instructions.

3.1 Display and controls

3.1.1 Front panel of DEFIGARD HD-7

Battery charge and mains on indicators

Status or alarm LED

Paddle electrodes

Touch screen

Rotating button for On/Off and operating mode selection

Charge key

Shock key

Defibrillation electrodes

Recorder

Loudspeaker

CPR USB Feedback

SPO$_2$

ECG patient cable

EtCO2 sampling tube

NIBP

SCHILLER
DEFIGARD HD-7

Service manual

3.1.2 Rear of DEFIGARD HD-7

ISA exhaust
Sidestream module

Hook for fixing on rail

Equipotential bonding connector

2.5 AT fuse

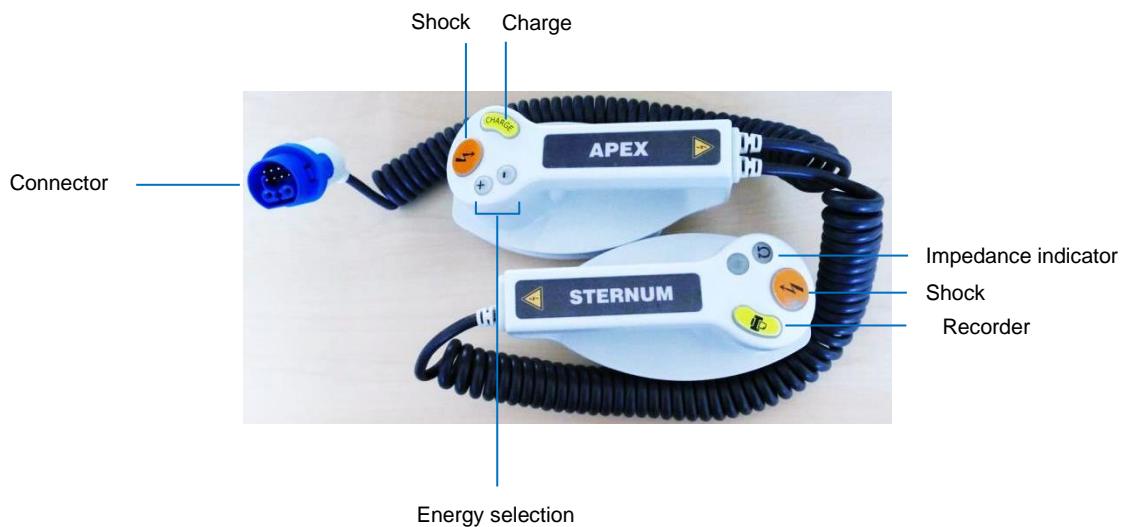Battery compartment   Mains connector

3.1.3 Indicator lamps

1   2

The indicators provide the following information:
(1) Flashes when the battery is being charged
(2) The device is connected to the mains.

3.1.4 Paddle electrodes

Shock   Charge

APEX

Connector

STERNUM

Impedance indicator

Shock

Recorder

Energy selection

3.2 Operation

DEFIGARD HD-7 is a portable external in-hospital defibrillator including a patient monitor. The device may be used for automated or manual defibrillation. It operates on the mains, but has a rechargeable battery. It has a system for monitoring the ECG, oxygen saturation (SpO2), non-invasive blood pressure (NIBP), EtCO2 gas measurement and an external cardiac pacer system (pacer).

Defibrillation in manual mode with the paddle electrodes is possible if the device is suitably equipped. In automated mode, the paddle electrodes cannot be used.

To start it up, turn the rotating button and select the operating mode.
To switch off the device, turn the rotating button to Off.

The Test mode provides access to the self-test, treatment memory, data transmission and the configuration panel.

A touch screen enables the user to select the different parameters depending on the selected mode.

The ECG may be collected by a four-wire cable, and the device can display six leads.

The (optional) SPO2 value is measured as soon as the sensor with the patient cable is connected. The display shows the continuous progress of the numerical SpO2 value, the pulse rate, the plethysmograph waveform and the signal quality.

The (optional) NIBP value is acquired by a cuff connected to the NIBP cuff connection. The module takes simple measurements and automatic measurements with interval selection. The NIBP parameters are selected via the NIBP measurement field of the touch screen .
- Patient types - adult or neonate (indicated at the top right).
- The cycle time is adjustable, or the measurement is manual.
- The NIBP measurement is started by pressing the Start key.

The (optional) CO2 value is acquired by a CO2 sensor connected to the device with an adapter cable. This is an ISA extraction gas sensor, which analyses the secondary stream (sidestream).

The (optional) pacer is an external pacer with two operating modes, on-demand pacing and pacing at a fixed frequency. In demand mode, the pacer requires an ECG signal for synchronisation. The same adhesive electrodes used for defibrillation are also used for pacing. Pacing is not possible with the paddle electrodes.

3.3 Defibrillation procedure

DEFIGARD HD-7 is a defibrillator with pulsed biphasic pulses. The device is factory set to switch automatically from the synchronised defibrillation mode to non-synchronised defibrillation, or the mode can be modified manually using the Sync button.

To switch to automated defibrillator mode, set the rotating selector to AED.

Defibrillation is achieved via single-use adhesive electrodes through which the ECG signals necessary for the analysis are also transmitted. These electrodes are connected to the defibrillation electrodes connector. Adhesive electrodes are available for children and adults. The device can identify the type of electrode applied and accordingly selects the appropriate defibrillation energy values.

While the device is in use, the user receives written instructions via the screen or voice instructions through the loudspeaker.

When a patient cable is connected, you can decide from the ECG menu whether the ECG is to be recorded through the separate ECG electrodes or the defibrillation electrodes.

A higher energy value can be selected when the defibrillator is being charged; the device will then charge to the new value. When a lower energy value is selected during the charge process, the capacitor is internally discharged and a new charge must be started.

The energy required for successful defibrillation depends on the patient's age, the thickness of the tissue and the constitution. For emergency medical treatment, AHA/ERC recommend biphasic pulses . If the first shock does not deliver the expected result, the second shock is given; if that shock fails, the third one is given.

The table below provides the default energy parameters for shocks 1 to 3.

Shock	Adult	Child
1	150 joules	50 joules
2	200 joules	50 joules
3	200 joules	50 joules

To switch to manual defibrillator mode, set the rotating selector to Manual Defib.

Manual defibrillation is possible with adhesive electrodes or with paddle electrodes if the device has such electrodes.

The energy can be selected on the screen or with the paddle electrodes.

4 Maintenance

4.1 Maintenance frequency

i

The **DEFIGARD HD-7** is an emergency response device which must be kept in perfect operational condition at all times. The device must therefore undergo regular maintenance.

Inspections and part replacements may be carried out as part of a maintenance agreement by the SCHILLER technical support department or by an approved distributor.

The table below provides the frequencies and skills required for the different maintenance operations.

Frequency	Maintenance - replacement	Party responsible
Before each use	• Visual inspection of device and accessories	➔ User
Every week/ every month	• Visual inspection of device and accessories.	➔ User
Every year	• Functional inspection of the device according to SCHILLER documentation (provided to technical personnel approved by SCHILLER).	➔ Technical service approved by SCHILLER
Every 5 years	• Replacement of the internal backup cell	➔ Technical service approved by SCHILLER

4.2 Device self-tests

DEFIGARD HD-7 carries out self-tests according to the following summary table. At any time, a self-test can be started manually by selecting the **Test** position with the rotating button and then the **Start self-tests** menu.

After the self-test, the device displays the number of failed tests and the number of passed tests. These results can be transferred by sending them to the SEMA server or to a USB stick via the USB connector, or they can be printed.

For transferring data, select: **Review/Send self-test results**, check the file to send and press **NEXT**, and select the destination

The RAM test (Memtest) is only used during factory testing. Select **Control Panel** and then enter the password. Then select **Maintenance** and then **Start factory tests**.

SCHILLER
DEFIGARD HD-7

Definition of tests

BATTERY_MAIN : main battery level
- main battery present
- voltage > 10V
- percentage > 5%

BUTTON_CELL : button cell level
- status OK according to the SOOR

DEVICE_TEMP : device temperature
- temperature [-5 °C, 70 °C]:

DEFI_RELAY : defibrillator relay tests

DEFI_IGBT : IGBT test

DEFI_BATTERY : low charge

DEFI_CAPACITOR : 200J charge + shock button

ECG : communication with ECG module

RFID_MODULE : communication with the RFID module

RFID_ELECTRODES : validity of electrodes/expiry (depending on configuration)

NIBP : communication with NIBP module

SPO2 : communication with the SpO2 module

ETCO2 : communication with the EtCO2 module

COM : communication internal to the device

LOGROTATE : log operating

MEMTEST : factory RAM test

BUTTON_SHOCK : shock button test

BUTTON_SHOCK_PADDLES : test of paddle shock buttons (each button must be tested and the test is passed only if the relevant button is pressed).

BUTTON_CHARGE : charge button test

BUTTON_CHARGE_PADDLES : paddle electrode button test (each button must be tested and the test is passed only if the relevant button is pressed).

BUTTON_PADDLES_DOCKER : test of the button for detecting the paddles in their base.

BUTTON_PADDLES_CHILD : test for switching the paddles to child mode.

Summary table of self-tests

	Daily/weekly	5 weeks	Factory	Manual
BATTERY_MAIN	✓	✓	✓	✓
BUTTON_CELL	✓	✓	✓	✓
DEVICE_TEMP	✓	✓	✓	✓
DEFI_RELAY	✓	✓	✓	✓
DEFI_IGBT	✓	✓	✓	✓
DEFI_BATTERY	✓	✓	✓	✓
ECG	✓	✓	✓	✓
RFID_MODULE	✓	✓	✓	✓
RFID_ELECTRODES	✓	✓	✓	✓
NIBP	✓	✓	✓	✓
SPO2	✓	✓	✓	✓
ETCO2	✓	✓	✓	✓

Service manual

SCHILLER
DEFIGARD HD-7

	Daily/weekly	5 weeks	Factory	Manual
COM	✓	✓	✓	✓
LOGROTATE	✓	✓	✓	✓
DEFI_CAPACITOR		✓	✓	✓
MEMTEST			✓	
BUTTON_SHOCK				✓
BUTTON_CHARGE				✓
BUTTON_SHOCK_PADDLES				✓
BUTTON_CHARGE_PADDLES				✓
BUTTON_ PADDLES_DOCKER				✓
BUTTON_ PADDLES_CHILD				✓

4.3 Cleaning and disinfecting

⚠ ATTENTION

The device must be switched off before it is cleaned. Remove the cell before you start cleaning the device in order to eliminate the risk of the device starting up accidentally. Also disconnect the defibrillation electrode cables from the device before cleaning.

⚠ ATTENTION

No liquid may be allowed to enter into the device. However, if that does happen, the device may not be used before it is verified by the after-sales service department.

⚠ ATTENTION

The device or electrodes may never be cleaned with substances such as ether, acetone, esters, aromatic chemicals etc.
Never use phenol-based cleaners or cleaners containing peroxide derivatives to disinfect the surfaces of the housing of the device.
• Dispose of all single-use electrodes immediately after use in order to eliminate the risk of accidental reuse (disposal with hospital waste).
• Before cleaning the electrode cables of sensors, disconnect them from the device. For cleaning and disinfecting, wipe the cables with gauze moistened with cleaner or disinfectant. Never immerse the connectors in liquid. The cleaning solution used may be any cleaning or disinfecting solution that is commonly used in hospitals.
• Proceed likewise with the device housing, with a cloth moistened with cleaner or disinfectant. No liquid must be allowed to enter the device during this operation.

4.4 Troubleshooting

This section describes the procedure for troubleshooting in the event of any malfunctioning of **DEFIGARD HD-7**. If you have trouble locating or correcting the problem, contact the after-sales service department of SCHILLER.

ℹ

When an error message is displayed, please remember to note the error number before starting any work and restart the device to make sure it is more than a mere program crash

⚠ ATTENTION

While testing the DEFIGARD HD-7 defibrillator, the patient may only be simulated with fixed high-voltage and high-power resistors that are well insulated from the ground or earth. Poorly insulated devices or devices with loose contacts or devices containing components such as spark arresters or electronic flash lamps may never be used as they could irremediably destroy the device.

⚠ DANGER

Before carrying out any work on the open device IT IS CRUCIAL TO MAKE SURE THAT THE HIGH-VOLTAGE CAPACITOR HAS BEEN PROPERLY DISCHARGED.

Error - observation	Possible cause	Solution
The device does not start	1. Problem with fuses 2. Button cell on CPU not activated 3. SOOR error 4. Cell discharged or out of order	→ Check the fuses → Activate the button cell. → Reset the SOOR → Replace the button cell.
No voice messages	1. Speaker fault 2. CPU board fault	→ Replace the speaker → Replace the CPU board
The capacitor will not charge	1. Faulty capacitor 2. CPU board fault	→ Replace the capacitor → Replace the CPU board
The battery will not charge	1. SOOR error 2. AC/DC module fault	→ Reset the SOOR → Replace the module
The SpO2 module is not recognised	1. Problem with ribbon cable 2. SpO2 module fault 3. CPU board fault	→ Replace the ribbon cable → Replace the SpO2 module → Replace the CPU board
The ECG module is not recognised	1. Peripheral device board fault 2. CPU board fault	→ Replace the peripheral board → Replace the CPU board
The EtCO2 module is not recognised	1. EtCO2 module fault 2. CPU board fault	→ Replace the EtCO2 module → Replace the CPU board

5 Replacement of parts

5.1 Device disassembly

5.1.1 Disconnect the mains cable and remove the battery.

To remove the battery:
- Unscrew the 6 screws (Torx T10) from the battery cover at the rear of the device.

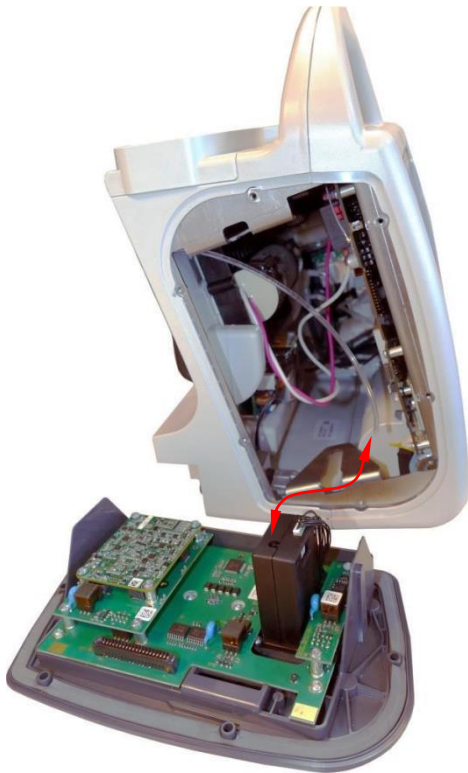- Remove the cover and disconnect the battery

5.1.2 Remove the left-hand side.

Screw cover

- Take off the 6 screw covers (e.g. with tweezers).
The covers are made in elastomer and just stuck on.

- Unscrew the 6 M3x16 screws (Torx T10).
  CAUTION! There are washers under the screws.

- Pull the side and remove it.

- Disconnect the tube connected to the EtCO2 module.

- The SpO2, ECG and EtCO2 functions can be found on the left-hand side. Depending on the device version, these functions are installed or absent.
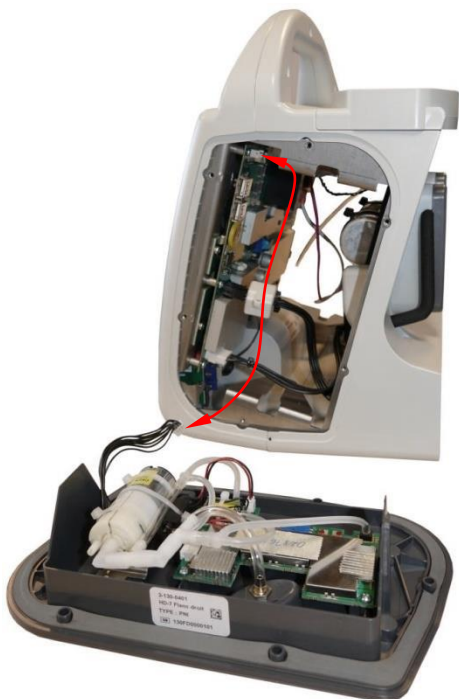
5.1.3   Remove the right-hand side

Screw cover (x6)

- Take off the 6 screw covers (e.g. with tweezers).
The covers are made in elastomer and just stuck on.

- Unscrew the 6 M3x16 screws (Torx T10).
 CAUTION! There are washers under the screws.

- Pull the side and remove it.
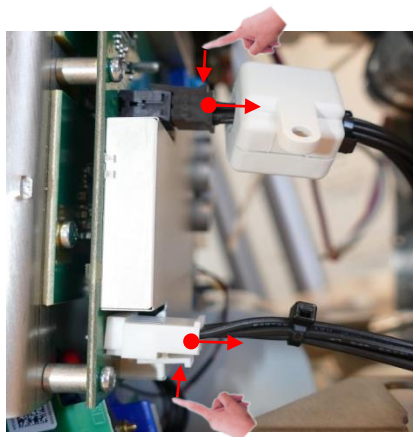
SCHILLER
DEFIGARD HD-7

- disconnect the NIBP cable

- The NIBP function can be found on the right-hand side. Depending on the device version, this function is installed or absent.
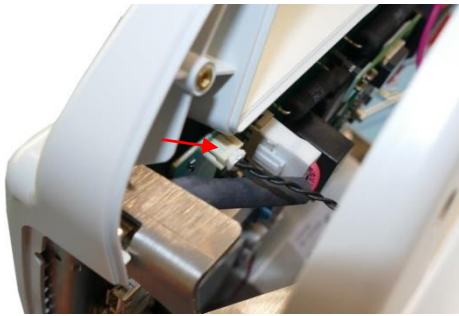
Separate the front from the rear of the device

- Unscrew the 7 M3x10 screws (Torx T10).

- Disconnect the two cables.
The connectors of these cables are locked; to disconnect them, press the tabs and pull the connectors.

- separate the front of the device from the rear.

- if the device has paddle electrodes, disconnect the connector connected to the paddle detection button.

5.1.4 Disconnect the high-voltage capacitor cables

This procedure relates to the high-voltage capacitor (64 µF - 2.5 kV), which can be charged to a fatal voltage. Before starting any work, take care to discharge the high-voltage capacitor completely. Never touch the terminals of the high-voltage capacitor directly. This operation may never be carried out other than by specially authorised and trained personnel.

ALWAYS REMEMBER TO MAKE SURE THAT THE HIGH-VOLTAGE CAPACITOR HAS BEEN PROPERLY DISCHARGED
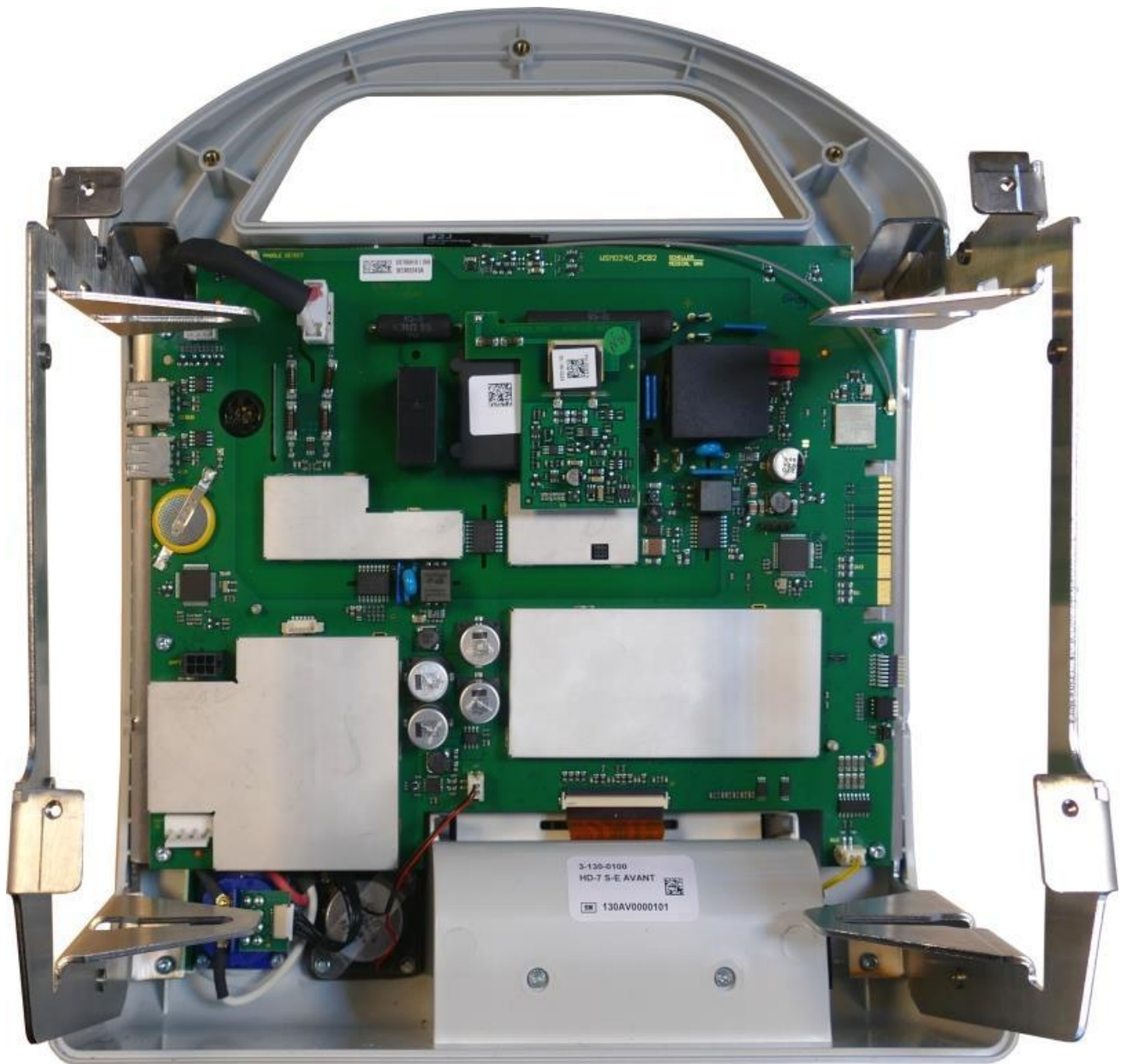

After disconnecting the (fully discharged) high-voltage capacitor, short the two capacitor terminals with conducting wire.
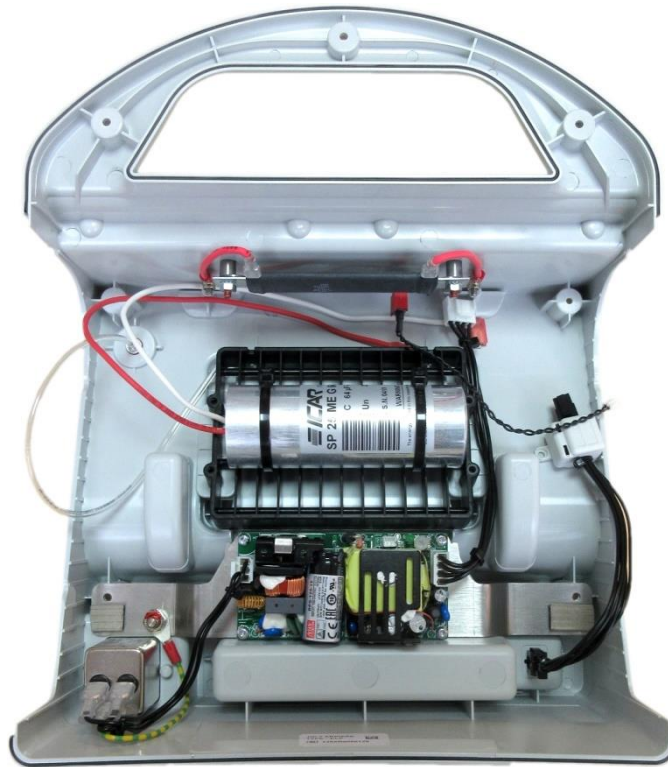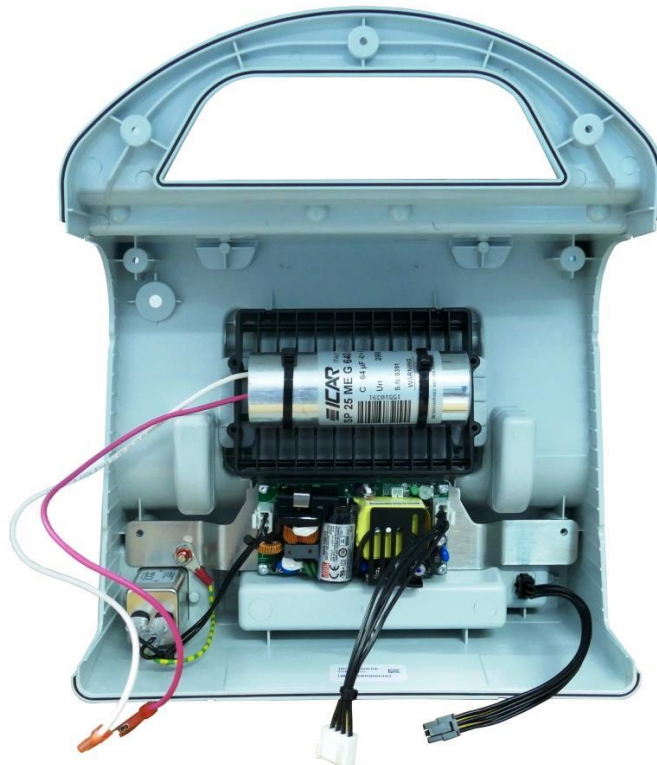

- Separate the front and rear parts

SCHILLER
DEFIGARD HD-7

<u>View of front of device</u>

View of rear of device, ELP version

View of rear of device, EC version

SCHILLER
DEFIGARD HD-7

<u>View of right-hand side</u>

Representation of side in the most complete version; also available without NIBP.

<u>View of left-hand sides</u>

Representation of sides in the most complete version, also available without EtCO2 or SPO2 or both.

- Left-hand side with EtCO2 and Masimo SPO2

- Left-hand side with EtCO2 and Nellcor SPO2

5.2 Replacing the high-voltage capacitor

The replacement of the high-voltage capacitor is an extremely rare operation, as its life is very long. However, it can be replaced if necessary.

The capacitor is located in the rear part of the device, but is connected to the board located in the front part, and is thus accessible after the two parts are separated in accordance with the safety instructions relating to the disconnection of the high-voltage wires (see paragraph 5.1.4).

To remove the capacitor, cut the cable ties that hold it on the support.
The new replacement capacitor must be placed in the same direction, with the label visible, and then fixed with the two cable ties.

⚠ ATTENTION
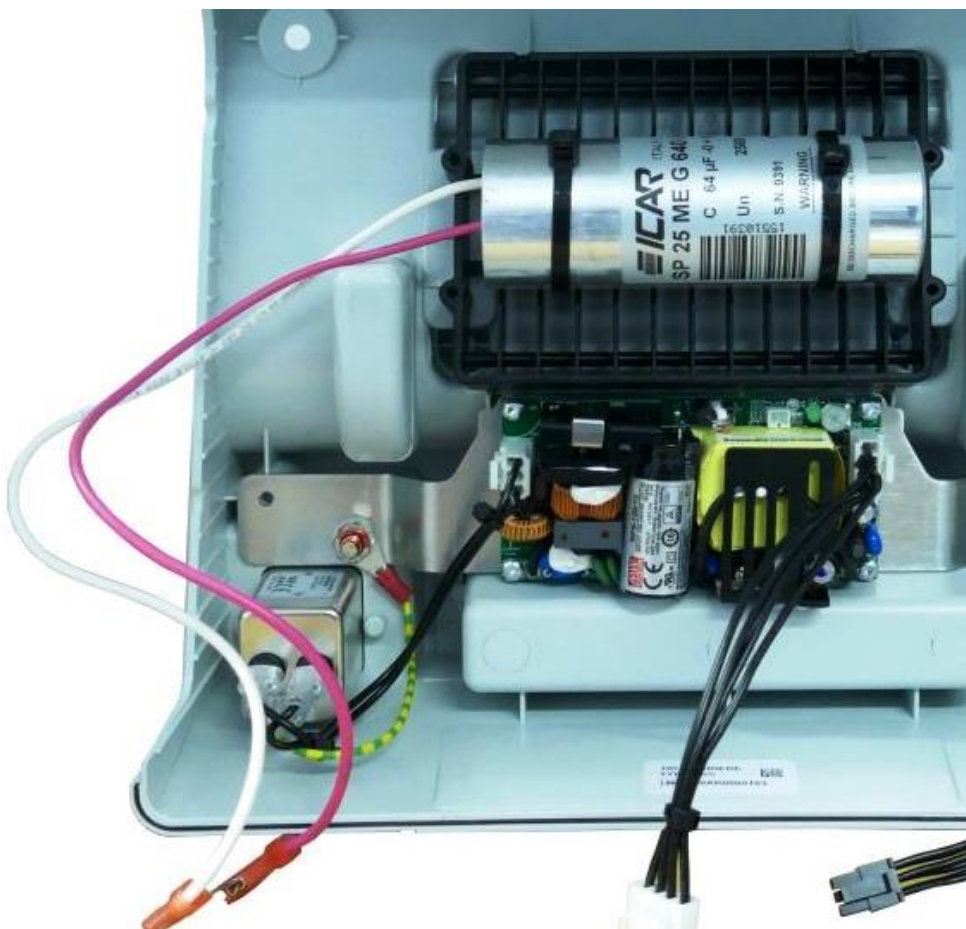
This operation relates to an essential component of the high-voltage part. It may only be performed by specially authorised personnel who have been trained in repairing DEFIGARD HD-7 devices.

A test of the energy discharged is required.

5.3 Replacement of the button cell

The button cell is soldered to the CPU board located in the front part of the device; you will need a soldering iron to replace it.

5.3.1 Replacing the CPU board

The CPU board is located in the front part of the device and is accessible when the two parts, rear and front, have been separated.

Disconnect the high-voltage cable connector.
Disconnect the GSM antenna connector
Disconnect the loudspeaker connector
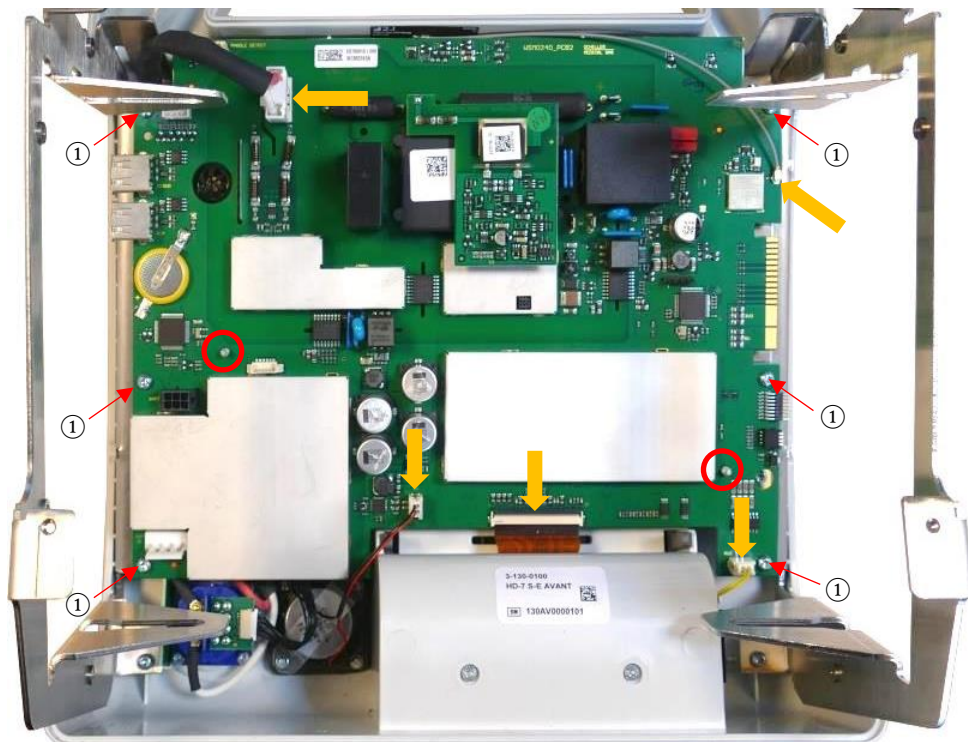Disconnect the recorder cable
Disconnect the buzzer connector

Unscrew the 6 screws with the reference ① (Torx T10).

Pull the board gently towards you to clear the two centring points marked with a red circle below.

Then remove the board by tilting it towards the bottom of the device.
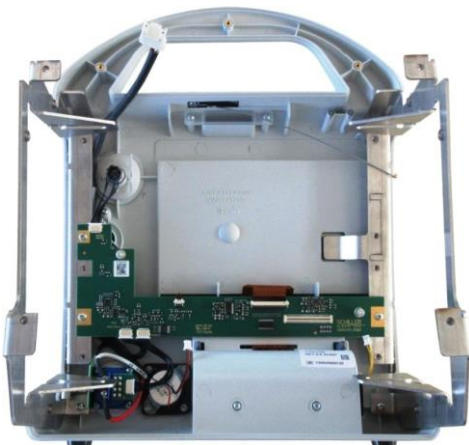
View of the removed CPU
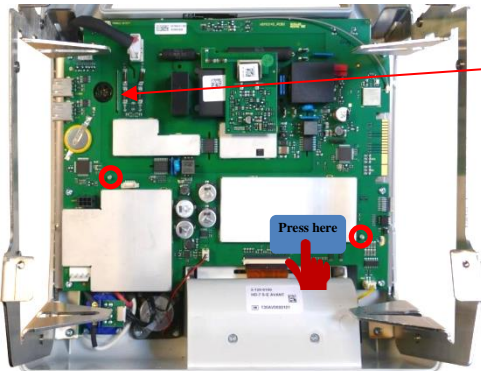
5.4 Assembling the device

To assemble the device, carry out the procedure in reverse order, paying particular attention to the comments below.

⚠ ATTENTION

Do not forget to connect the various cables.
During reassembly, check that cables are placed correctly, and will be safe from flattening when the housing is closed.

⚠ ATTENTION

While putting in the CPU board:

Pass the insulator of the rotating switch through the groove of the board.

The two circled studs are used to position the board. After it is positioned, press the blue area to engage the two connectors of the CPU and the button board located underneath.

⚠ ATTENTION

Before connecting the capacitor,
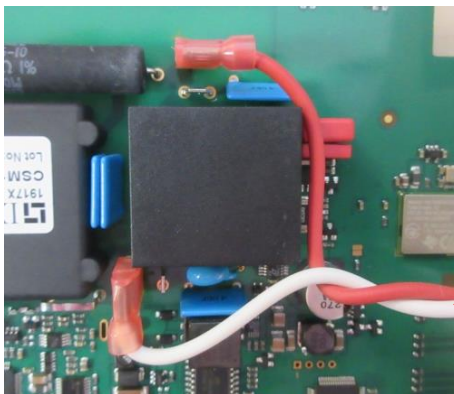
Twist the red and blue wire.

⚠ ATTENTION

While assembling the right-hand side:
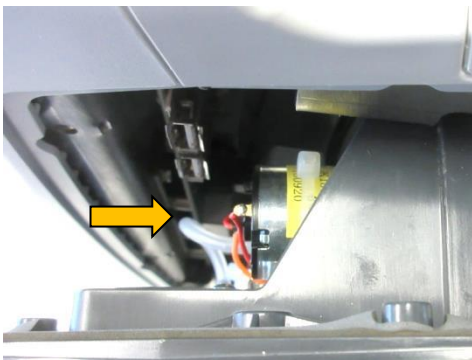
Do not catch the NIBP pipe with the edge of the CPU.

SCHILLER
DEFIGARD HD-7

Service manual

Check that the two USB connectors are entirely out of the side.

5.5 Replacement of parts

⚠ **AVERTISSEMENT**

Parts may only be replaced by a person trained in product repair, in accordance with all Schiller recommendations.

Besides, the replacement parts must be original SCHILLER parts. After each part replacement, the device must undergo a full inspection based on the recommendations of Schiller.

i To order a new part from SCHILLER, please state the type of device and serial number provided underneath the device. Then specify the part number of the part to be replaced.

5.6 Exploded views of the device

SCHILLER
DEFIGARD HD-7

Service manual

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-02-0152	W3M146626	Boitier arrière
2	1	6-90-0125	W3M146637	Support condensateur
3	2	4-19-0175	N/A	Condensateur
4	4	6-14-0253	N/A	EFX VIS PT TCB TORX KA30X10
5	1	4-38-0020	N/A	Prise secteur
6	14	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
7	1	3-10-0265	N/A	Connecteur batterie
8	1	4-07-0031	N/A	Batterie
9	1	6-38-0045	W3M146680	Joint couvercle batterie
10	2	W1401897	W3M146767	Mousse adhésivée NR (24X33X8mm)
11	1	6-09-0094	W3M146633	Couvercle batterie
13	1	6-90-0108	W3M146650	Traverse
14	1	35992	N/A	Prise de terre
15	1	4-04-0007	N/A	Alimentation AC/DC
16	11	6-14-0249	N/A	EFX VIS TCB TORX M3X10 ACNI
17	1	6-14-0204	W3M146649	Crochet
18	2	6-90-0107	W3M146630	Bride crochet
19	2	72107	N/A	Pied adhesif
21	1	6-64-0047	W3M146648	Cache support électrodes
23	1	9-99-0015	N/A	Microgaine noire 1.6X0.8mm
24	2	6-38-0049	W3M146769	WE LT mousse conductrice (13X13X3mm)
25	1	6-39-0247	W4M146830	Feuille adhésivée face arrière
26	1	6-39-0248	W4M146831	Pastille adhésivée exhaust

IH 17
Vue éclatée arrière

ART: **N/A**

DESS.: B. BARLIER DATE: 26/03/2019
VÉRIF.: Y. ABDOU DATE: 26/03/2019

N° DE PLAN **W3M146757**   A

INDICE DE RUGOSITÉ GÉNÉRALE
CASSER LES ANGLES VIFS

ÉCHELLE **2 : 5**

SCHILLER MEDICAL

IH 17
Vue éclatée arrière (avec palettes)

SYS : INVENTOR

B		
A	Date de création du plan	
	MODIFICATION	

MATIERE : N/A
TRAITEMENT : N/A

TOLÉRANCES GÉNÉRALES
N/A

INDICE DE RUGOSITÉ GÉNÉRALE
CASSER LES ANGLES VIFS

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-02-0152	W3M146626	Boîtier arrière
2	1	6-90-0125	W3M146637	Support condensateur
3	2	4-19-0175	N/A	Condensateur
4	4	6-14-0253	N/A	EFX VIS PT TCB TORX KA30X10
5	1	4-38-0020	N/A	Prise secteur
6	14	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
7	1	3-10-0265	N/A	Connecteur batterie
8	1	4-07-0031	N/A	Batterie
9	1	6-38-0045	W3M146680	Joint couvercle batterie
10	1	6-09-0094	W3M146633	Couvercle batterie
11	2	W1401897	W3M146767	Mousse adhésivée NR (24X33X8mm)
12	1	6-01-0029	N/A	Sortie ETCO2 Masimo
13	1	6-90-0108	W3M146650	Traverse
14	1	35992	N/A	Prise de terre
15	1	4-04-0007	N/A	Alimentation AC/DC
16	11	6-14-0249	N/A	EFX VIS TCB TORX M3X10 ACNI
17	1	6-14-0204	W3M146649	Crochet
18	2	6-90-0107	W3M146630	Bride crochet
19	2	72107	N/A	Pied adhésif
20	1	6-38-0044	W3M146682	Joint support bouton poussoir
21	1	6-90-0124	W3M146636	Support bouton poussoir
22	1	6-87-0020	N/A	Rondelle caoutchouc thermoplastique noir (d3.2 D6)
23	1	4-54-0038	N/A	Bouton poussoir detection des palettes
24	1	72510	N/A	Resistance de décharge
25	2	6-14-0251	N/A	EFX VIS TF CRUCI M4X20 ACNI
26	2	14771	N/A	Rondelle UNI 6592 M5- 1
27	2	32704	N/A	EFX ECROU HU M5 INX A2
28	2	11204	N/A	EFX RONDEL EVENT M5 INX A4
29	1	6-14-0240	W3M146665	Bouchon support électrode de poing
30	1	6-52-0009	W3M146634	Plateau porte électrodes
31	2	6-60-0027	W3M146681	Ressort plateau électrode
32	1	6-52-0011	W3M146670	Plateau électrode gauche
33	1	6-52-0010	W3M146669	Plateau électrode droit
34	2	6-14-0030	N/A	EFX ECROU HU M4 INX A4 + Rondelle à dents
35	2	N/A	N/A	Plan d'ensemble électrode de poing
36	1	9-99-0015	N/A	Microgaine noire 1.6X0.8mm
37	2	6-38-0049	W3M146769	WE LT mousse conductrice (13X13X3mm)

	Mis à jour le par		
	Le par		

ART:

DESS.: B. BARLIER
DATE: 26/03/2019
VÉRIF: Y. ABDOU
DATE: 26/03/2019

SCHILLER
MEDICAL

ÉCHELLE 2 : 5

VISA:
VISA:
VISA:

N° DE PLAN
W3M146758 A

A3H

SCHILLER
DEFIGARD HD-7

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-02-0151	W3M146627	Face avant
2	1	2.157044	N/A	Printer PT723F-B
3	1	6-64-0045	W3M146628	Cache mecanisme printer
4	1	6-25-0041	W3M146638	Tiroir papier printer
5	1	6-90-0121	W4M146508	SUPPORT ROULEAU PAPIER
6	1	2.157044	N/A	ROULEAU PAPIER L 80 / D 50
7	2	6-16-0017	W3M146651	Diffuseur
8	1	6-16-0013	W3M146640	Diffuseur LED alarme visuelle
9	16	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
10	1	6-03-0028	W3M146643	Bouton charge
11	1	6-03-0027	W3M146644	Bouton choc
12	1	6-14-0231	W3M146631	Bride bouton
13	1	6-87-0020	N/A	Rondelle caoutchouc thermoplastique noir (d3.2 D6)
14	1	6-28-0203	W3M146647	Isolant bouton rotatif
15	1	3-10-0266	N/A	Bouton rotatif Grayhill
16	1	6-03-0026	W3M146635	Selecteur
17	1	3-10-0211	PCINDO847	Buzzer
19	1	6-39-0246	W4M146809	Mousse étanchéité haut-parleur (7 mm)
20	1	3-10-0199	PCIND0846	Haut parleur
21	1	4-21-0454 WSM0253	N/A	Connecteur defi et carte HVcon
22	1	4-33-0010	N/A	Ferrite
23	1	WSM0252	N/A	Carte RFID
24	2	6-38-0048	W3M146770	WE LT Mousse conductrice (10X8mm)
25	1	6-90-0109	W3M146646	Support gauche
26	7	6-14-0249	N/A	EFX VIS TCB TORX M3X10 ACNI
27	1	6-90-0110	W3M146327	Support droit
28	1	6-38-0048	N/A	WE LT Mousse conductrice (10X8mm)
29	6	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
30	1	WSM0240	N/A	Carte CPU/Défi
31	1	WSM0245 PCB2	N/A	Carte bouton
32	2	72107	N/A	Pied adhesif
32	1	4-30-0006	W3M146496	COVER GLASS
34	1	3-47-0027	N/A	Antenne wifi
35	1	6-06-0067	W3M146700	Folio principal EN Moniteur/Defi./AED/Pacer
58	1	6-06-0075	W3M146708	Folio principal ES Moniteur/Defi./AED

IH 17
Vue éclatée avant

SCHILLER MEDICAL

ÉCHELLE 2 : 5

N° DE PLAN W3M146756   A

DESS: B. BARLIER DATE: 26/03/2019 VISA:
VÉRIF: Y. ABDOU DATE: 26/03/2019 VISA:

Mis à jour le par
Le par
NBR   REMARQUES
ART:

TOLÉRANCES GÉNÉRALES   INDICE DE RUGOSITÉ GÉNÉRALE
N/A   CASSER LES ANGLES VIFS
MATIÈRE: N/A
TRAITEMENT: N/A

MODIFICATION
A Date de création du plan
B

A3H

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0233	W3M146671	Flanc Droit
2	1	6-64-0044	W3M146642	Trappe connecteur USB
3	1	6-38-0043	W3M146679	Joint flanc droit
4	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
5	6	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
6	6	6-64-0048	W3M146641	Cache vis
7	1	6-06-0080	W3M146686	Folio flanc droit (USB)

SYS : INVENTOR

B					
A	Date de création du plan			Mis à jour le par	
	MODIFICATION		NBR	REMARQUES	

IH 17
Vue éclatée droit

MATIÈRE : N/A
TRAITEMENT : N/A

TOLÉRANCES GÉNÉRALES N/A

INDICE DE RUGOSITÉ GÉNÉRALE

CASSER LES ANGLES VIFS

SCHILLER
M E D I C A L

ÉCHELLE **2 : 3**

ART.: **N/A**

DESS: B. BARLIER DATE: 26/03/2019
VÉRIF: Y. ABDOU DATE: 26/03/2019

Le par

VISA:
VISA:

N° DE PLAN **W3M146759** **A**

A3H

Service manual

SCHILLER
DEFIGARD HD-7

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0206	W3M146629	Flanc Droit (PNI)
2	1	6-64-0044	W3M146642	Trappe connecteur USB
3	1	6-01-0020	W4M145658	Raccord PNI
4	1	3-55-0067	N/A	Carte NIBP
5	1	6-28-0140	W3M145600	Blindage PNI
6	6	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
7	1	3-47-0019	N/A	Pompe PNI
8	1	6-38-0043	W3M146679	Joint flanc droit
9	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
10	6	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
11	6	6-64-0048	W3M146641	Cache vis
12	1	6-06-0064	W3M146685	Folio flanc droit (USB, NIBP)

IH 17
Vue éclatée droit (PNI)

Date de création du plan
MODIFICATION
TOLÉRANCES GÉNÉRALES N/A
MATIÈRE : N/A
TRAITEMENT : N/A
SYS : INVENTOR SAS

INDICE DE RUGOSITÉ GÉNÉRALE N/A
CASSER LES ANGLES VIFS

Mis à jour le par
Le par
NBR REMARQUES
ART :
DESS : B. BARLIER DATE : 26/03/2019
VÉRIF : Y. ABDOU DATE : 26/03/2019

ÉCHELLE 2 : 3

SCHILLER MEDICAL

N/A
VISA :
VISA :

N° DE PLAN W3M146760 A

A3H

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0205	W3M1466632	Flanc gauche (ECG, ETC02, SPO2 Masimo)
2	1	WSM0241A		Carte paramètre
3	1	6-38-0050	W3M146790	Joint support connecteur ECG
4	1	6-14-0217	W3M146511	Support connecteur ECG
5	11	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
6	1	6-38-0046	W3M146683	Joint trappe connectique
7	1	6-64-0043	W3M146639	Trappe connectique
8	1	6-38-0042	W3M146678	Joint flanc gauche
9	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
10	6	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
11	6	6-64-0048	W3M146641	Cache vis
12	1	6-06-0058	W3M1466688	Folio flanc gauche (ECG)

IH 17
Vue éclatée gauche (ECG)

SCHILLER
MEDICAL

ÉCHELLE 1 : 2

N° DE PLAN: W3M146761 A

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Service manual

SCHILLER
DEFIGARD HD-7

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0205	W3M146632	Flanc gauche (ECG, ETC02, SPO2 Masimo)
2	1	6-01-0026	W3M146313	Adaptateur ETCO2 Masimo
3	1	3-55-0085	N/A	ISACapno
4	4	6-14-0241	N/A	EFX VIS TF CRUCI M2X8
5	15	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
6	1	WSM0241A WSM0246A	N/A	Carte paramètre Carte support SPO2
7	1	6-38-0050	W3M146790	Joint support connecteur ECG
8	1	6-14-0217	W3M146511	Support connecteur ECG
9	1	6-36-0037	N/A	Raccord module MASIMO
10	1	6-38-0046	W3M146683	Joint trappe connectique
11	1	6-64-0043	W3M146639	Trappe connectique
12	1	6-38-0042	W3M146678	Joint flanc gauche
13	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
14	8	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
15	6	6-64-0048	W3M146641	Cache vis
16	1	6-06-0059	W3M146687	Folio flanc gauche (ECG, ETCO2)

B					Mis à jour le par	
A	Date de création du plan				Le par	
	MODIFICATION			NBR	REMARQUES	
TOLÉRANCES GÉNÉRALES		INDICE DE RUGOSITÉ GÉNÉRALE		ART :		N/A
N/A		CASSER LES ANGLES VIFS				
MATIÈRE : N/A			ÉCHELLE	DESS : B. BARLIER	VISA :
TRAITEMENT : N/A			1 : 2	DATE : 26/03/2019	
				VÉRIF : Y. ABDOU	VISA :
IH 17		SCHILLER		DATE : 26/03/2019	
Vue éclatée gauche (ECG, ETCO2)		M E D I C A L		N° DE PLAN W3M146762	A

SYS : INVENTOR

A3H

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0205	W3M146632	Flanc gauche (ECG, ETC02, SPO2 Masimo)
2	1	4-15-0078	N/A	Connecteur SPO2
3	19	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
4	1	6-01-0026	W3M146313	Adaptateur ETCO2 Masimo
5	1	3-55-0085	N/A	ISACapno
6	4	A CREER	N/A	EFX VIS TF CRUCI M2X8
7	1	WSM0241A 3-55-0064 WSM0247A	N/A	Carte paramêtre Module Masimo SPO2 MX5 Carte support ETCO2
8	1	6-28-0212	W3M146808	Blindage SPO2
9	1	6-38-0050	W3M146790	Joint support connecteur ECG
10	1	6-14-0217	W3M146511	Support connecteur ECG
11	1	6-36-0037	N/A	Raccord module MASIMO
12	1	6-38-0046	W3M146683	Joint trappe connectique
13	1	6-64-0043	W3M146639	Trappe connectique
14	1	6-38-0042	W3M146678	Joint flanc gauche
15	6	11187	N/A	EFX RONDEL PLATE M3 INX
16	16	6-14-0250	N/A	EFX VIS TCB TORX M3X16 A2
17	6	6-64-0048	W3M146641	Cache vis ACNI
18	1	6-06-0062	W3M146690	Folio flanc gauche (ECG, ETCO2, SP02 MASIMO)

SYS : INVENTOR

IH 17
Vue éclatée gauche (ECG, ETCO2, SPO2 MASIMO)

MATIÈRE : N/A
TRAITEMENT : N/A
TOLÉRANCES GÉNÉRALES   N/A
INDICE DE RUGOSITÉ GÉNÉRALE
CASSER LES ANGLES VIFS

B
A   Date de création du plan
MODIFICATION

SCHILLER
M E D I C A L

ÉCHELLE 1 : 2

Mis à jour le par
Le par
NBR   REMARQUES

DESS: B. BARLIER   DATE: 26/03/2019
VÉRIF: Y. ABDOU   DATE: 26/03/2019
ART: N/A
VISA: VISA:
VISA:

N° DE PLAN
W3M146763 | A

A3H

SCHILLER
DEFIGARD HD-7

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0237	W3M146675	Flanc gauche (ECG, ETCO2, SPO2 Nellcor)
2	1	4-15-0104	N/A	Connecteur SP02 Nellcor
3	1	6-64-0049	W3M146668	Joint connecteur Nellcor
4	1	6-90-0126	W3M146684	Plaque support SPO2 NELLCOR
5	19	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
6	2	6-14-0255	N/A	EFX VIS TCB TORX M2,5X8
7	1	6-01-0026	W3M146313	Adaptateur ETCO2 Masimo
8	1	3-55-0085	N/A	ISACapno
9	4	6-14-0241	N/A	EFX VIS TF CRUCI M2X8
10	1	WSM0241A 3-55-0089 WSM0247A	N/A	Carte paramètre Module Nellcor SPO2 NELL1 Carte support ETCO2
11	1	6-28-0212	W3M146808	Blindage SPO2
12	1	W1401896	W3M146768	Mousse adhésivée NR (24X10X15mm)
13	2	6-13-0058	N/A	Entretoise male femelle ettinger L7
14	2	11202	N/A	EFX ECROU HU M3 INX A2
15	2	A CREER	N/A	EFX VIS TCB TORX M3X5 ACNI
16	1	6-38-0050	W3M146790	Joint support connecteur ECG
17	1	6-14-0217	W3M146511	Support connecteur ECG
18	1	6-36-0037	N/A	Raccord module MASIMO
19	1	6-38-0046	W3M146683	Joint trappe connectique
20	1	6-64-0043	W3M146639	Trappe connectique
21	1	6-38-0042	W3M146678	Joint flanc gauche
22	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
23	12	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
24	6	6-64-0048	W3M146641	Cache vis
25	1	6-06-0063	W3M146691	Folio flanc gauche (ECG, ETCO2, SPO2 NELLCOR)

B   Date de création du plan
A   MODIFICATION

Mis à jour le par
Le par
NBR   REMARQUES

TOLÉRANCES GÉNÉRALES   INDICE DE RUGOSITÉ GÉNÉRALE   N/A
N/A   CASSER LES ANGLES VIFS   ART: N/A

MATIÈRE.: N/A   ÉCHELLE   DESS: B. BARLIER   VISA:
TRAITEMENT: N/A   1 : 2   DATE: 26/03/2019

SCHILLER   VERIF: Y. ABDOU   VISA:
M E D I C A L   DATE: 26/03/2019

IH 17   N° DE PLAN   W3M146765   A
Vue éclatée gauche (ECG, ETCO2, SPO2 NELLCOR)

SYS : INVENTOR

A3H

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0205	W3M146632	Flanc gauche (ECG, ETC02, SPO2 Masimo)
2	1	4-15-0078	N/A	Connecteur SPO2
3	15	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
4	1	6-14-0217	W3M146511	Support connecteur ECG
5	1	6-38-0050	W3M146790	Joint support connecteur ECG
6	1	WSM0241A 3-55-0064	N/A	Carte paramètre Module Masimo SPO2 MX5
7	1	6-28-0212	W3M146808	Blindage SPO2
8	1	6-38-0046	W3M146683	Joint trappe connectique
9	1	6-64-0043	W3M146639	Trappe connectique
10	1	6-38-0042	W3M146678	Joint flanc gauche
11	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
12	14	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
13	6	6-64-0048	W3M146641	Cache vis
14	1	6-06-0060	W3M146689	Folio flanc gauche (ECG, SPO2 MASIMO)

IH 17
Vue éclatée gauche (ECG, SPO2 MASIMO)

SCHILLER MEDICAL

ECHELLE 1 : 2

DESS: B. BARLIER   DATE: 26/03/2019
VERIF: Y. ABDOU   DATE: 26/03/2019

W3M146764   A

A   Date de création du plan
B

MATIÈRE : N/A
TRAITEMENT : N/A
TOLÉRANCES GÉNÉRALES N/A
INDICE DE RUGOSITÉ GÉNÉRALE
CASSER LES ANGLES VIFS

SYS : INVENTOR

SCHILLER
DEFIGARD HD-7

Service manual

REP	QTE	CODE ARTICLE	N° DE PLAN	DESCRIPTION
1	1	6-14-0237	W3M146675	Flanc gauche (ECG, ETCO2, SPO2 Nellcor)
2	1	4-15-0104	N/A	Connecteur SPO2 Nellcor
3	1	6-64-0049	W3M146668	Joint connecteur Nellcor
4	1	6-90-0126	W3M146684	Plaque support SPO2 NELLCOR
5	15	6-14-0252	N/A	EFX VIS PT TCB TORX KA30X8
6	2	6-14-0255	N/A	EFX VIS TCB TORX M2,5X8
8	2	6-14-0217	W3M146511	Support connecteur ECG
9	1	6-38-0050	W3M146790	Joint support connecteur ECG
10	1	WSM0241A 3-55-0089	N/A	Carte paramètre Module Nellcor SPO2 NELL1
11	1	6-28-0212	W3M146808	Blindage SPO2
12	1	W1401896	W3M146768	Mousse adhésivée NR (24X10X15mm)
13	2	6-13-0058	N/A	Entretoise male femelle ettinger L7
14	2	11202	N/A	EFX ECROU HU M3 INX A2
15	2	A CREER	N/A	EFX VIS TCB TORX M3X5 ACNI
16	1	6-38-0046	W3M146683	Joint trappe connectique
17	1	6-64-0043	W3M146639	Trappe connectique
18	1	6-38-0042	W3M146678	Joint flanc gauche
19	6	11187	N/A	EFX RONDEL PLATE M3 INX A2
20	10	6-14-0250	N/A	EFX VIS TCB TORX M3X16 ACNI
21	6	6-64-0048	W3M146641	Cache vis
22	1	6-06-0061	W3M146692	Folio flanc gauche (ECG, SPO2 NELLCOR)

| | B | Date de création du plan | | | Mis à jour le par | |
| | A | MODIFICATION | | NBR | Le par REMARQUES | |

TOLÉRANCES GÉNÉRALES N/A   N/A
INDICE DE RUGOSITÉ GÉNÉRALE
CASSER LES ANGLES VIFS
ART: **N/A**

MATIÈRE : N/A
TRAITEMENT : N/A

ÉCHELLE **1 : 2**

DESS: B. BARLIER   DATE: 26/03/2019   VISA:
VÉRIF: Y. ABDOU   DATE: 26/03/2019   VISA:

SCHILLER MEDICAL

IH 17
Vue éclatée gauche (ECG, SPO2 NELLCOR)

N° DE PLAN **W3M146766**   **A**

SVS : INVENTOR   A3H

6 Technical explanations

6.1 Overall description

6.1.1 Overall description of the devices

DEFIGARD HD-7 is divided into four main subassemblies from the technical standpoint:

- The front, which includes the main CPU + Defibrillator board bearing the different functions of digital processing, analogue processing, data saving and the interfaces between the different components of the device (monitor, control, power supply, battery, measurement modules, printer, loudspeaker, buzzer) for the CPU board and the high-voltage circuits of the defibrillator, the different functions for specific digital processing, analogue processing (ECG and impedance measurements), for the defibrillator part. The front panel also includes the touch screen, printer, loudspeaker, buzzer, RFID board, high-voltage connector for electrodes or defibrillation paddles, and the user interface board, on which the physical Charge and Shock buttons and the rotating mode selection button can be found.
- The rear, which includes the mains filter, the AC/DC power supply, the battery, the high voltage capacitor and, if the version has defibrillation paddles, the internal discharge resistor and the paddle supports with a presence detector.
- The left-hand side including the peripheral board on which the ECG measurement part is found and where the SpO2 and EtCO2 interface boards are connected, to which the Masimo and/or Nellcor modules are connected.
- The right-hand side is made up only of the NIBP module.

6.1.2 Communication components

The different command, control and display components include:
- An LCD screen that acts as the visual interface between the device and the user.
- A touch panel, which provides controls.
- A six-position rotating button for switching the device on and off, and for selecting the operating mode: MONITOR, MANUAL, AED, PACER and TEST.
- A Charge key controls the charge with the energy required for defibrillation.
- A Shock key for giving a defibrillation shock.
- An orange LED indicator in the Shock key offers additional visual information to the user.
- Two blue LEDs indicate the power supply source, Battery or Mains.
- A status LED that continuously indicates the success of the last device self-test
- A buzzer to indicate any anomaly found at the last self-test
- A speaker to communicate messages to the user and generate the sound of the metronome. And different alarms.

- A USB connector for communicating with different peripheral devices.
- A USB connector dedicated to CPR.
- An RFID circuit to identify the type of defibrillator electrodes used
- A slot for an SD card to record the data relating to a procedure (sound, ECG, etc.) or update the software.

6.1.3 Power sources

- The device can operate when it is connected to a standard 230 VAC or 115 VAC mains connector depending on the country. The device can also be connected to the mains to recharge the internal battery.
- When the device is not connected to the mains, it is powered by a rechargeable internal 11 VDC 6.4 Ah Li-ion battery.

SCHILLER
DEFIGARD HD-7
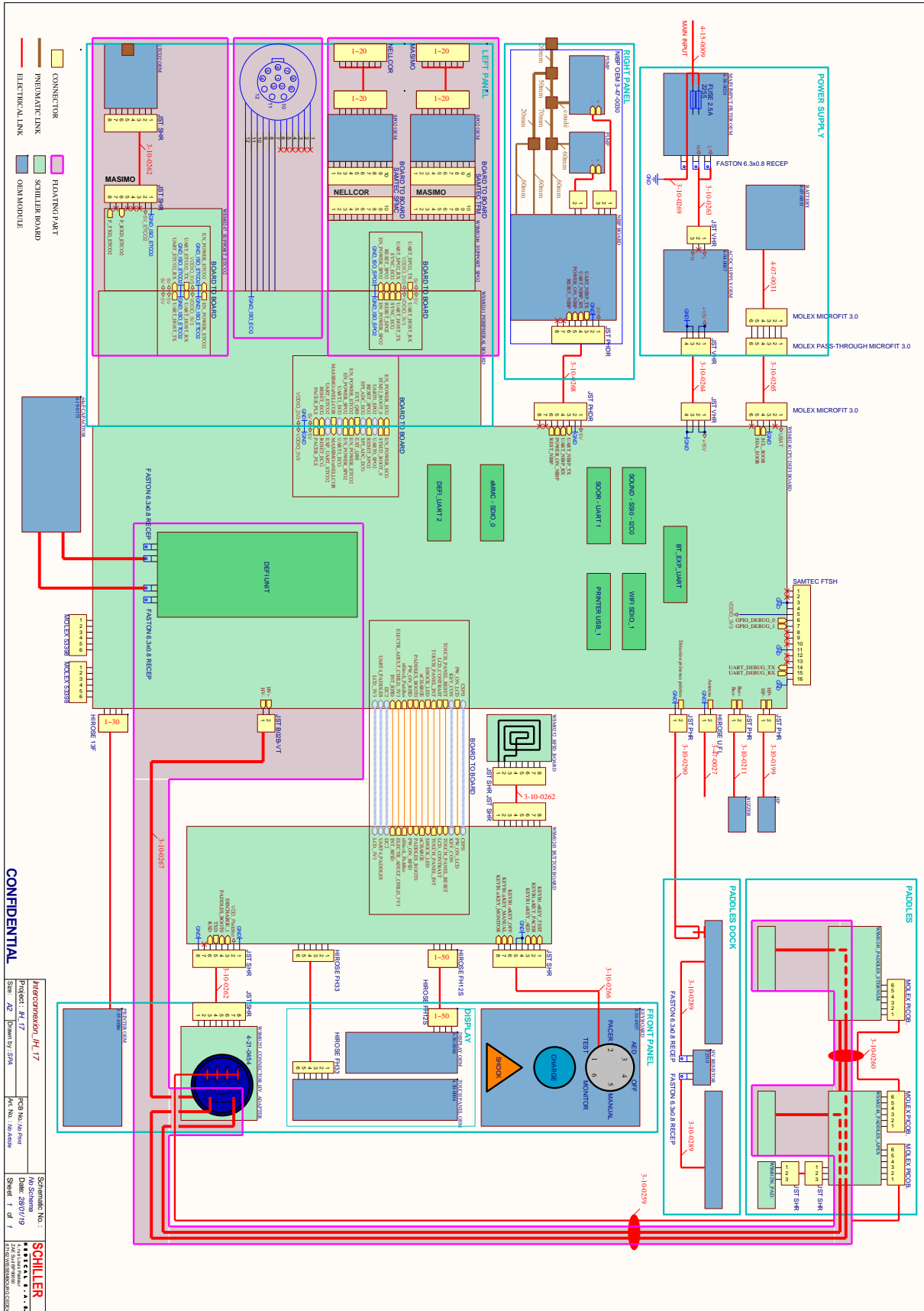
6.2 WSM0240A: CPU + DEFIBRILLATOR BOARD

6.2.1 CPU Unit

6.2.1.1   General

The CPU +Defibrillator board manages all the device modules and functions through its host controller (CPU i.MX28).

Some functions are directly integrated into the board:
- Power supply management circuit
- Defibrillator circuit
- Wi-Fi module
- Bluetooth module
- SOOR controller (**S**urveillance **O**N **O**FF **R**TC)
- Audio DAC for speaker
- Battery charger
- RTC power cell
- Printer feed and management

Other functions are provided by additional modules:
- ECG measurement module
- SpO2/SpCO module
- EtCO2 module
- NIBP module
- Defibrillation paddles

6.2.1.2   Connectors

NIBP · Paddles presence detector · HV electrodes front connector · HV capacitor · Wi-Fi/BT antenna (JP18)

Power supply (JP23) · Battery (JP14) · SOOR debug connector · Loudspeaker JP6 · Printer debug connector · Print · SD card (JP12) · Buzzer

SCHILLER
DEFIGARD HD-7

WSM0241 user
interface board

USB   CPR USB

WSM0241 user
interface board
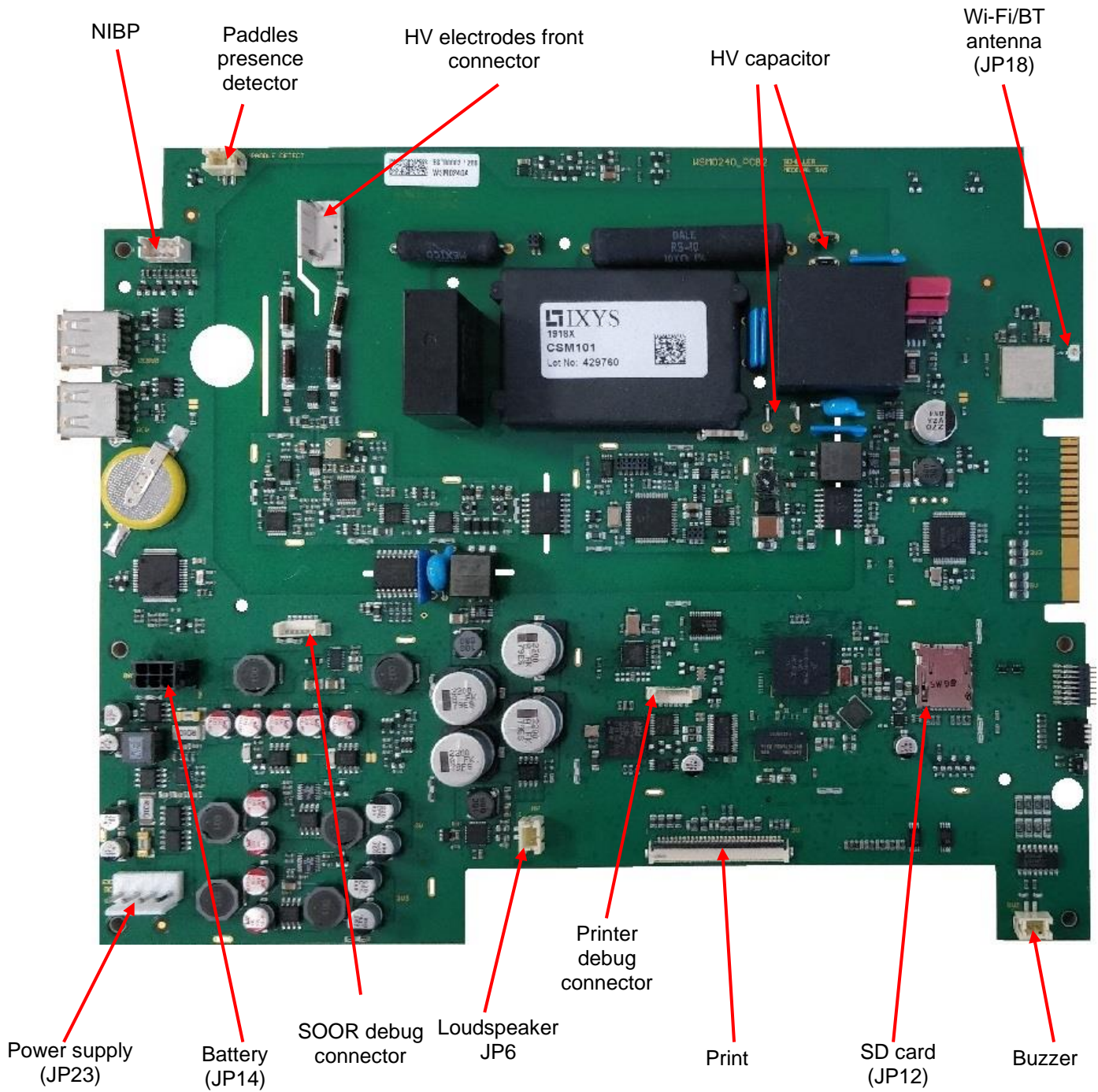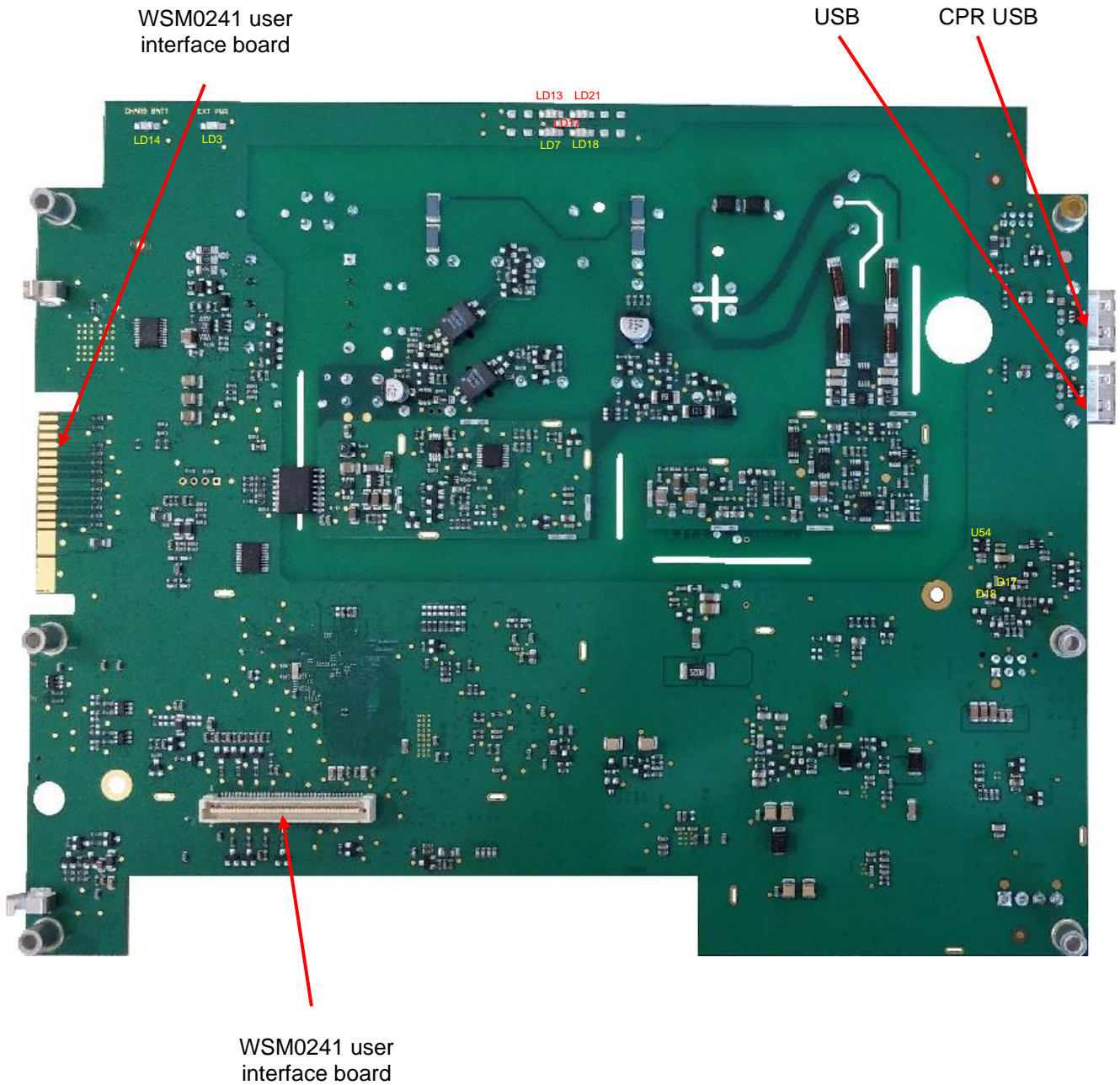
6.2.1.3   Main functions

SCHILLER
DEFIGARD HD-7
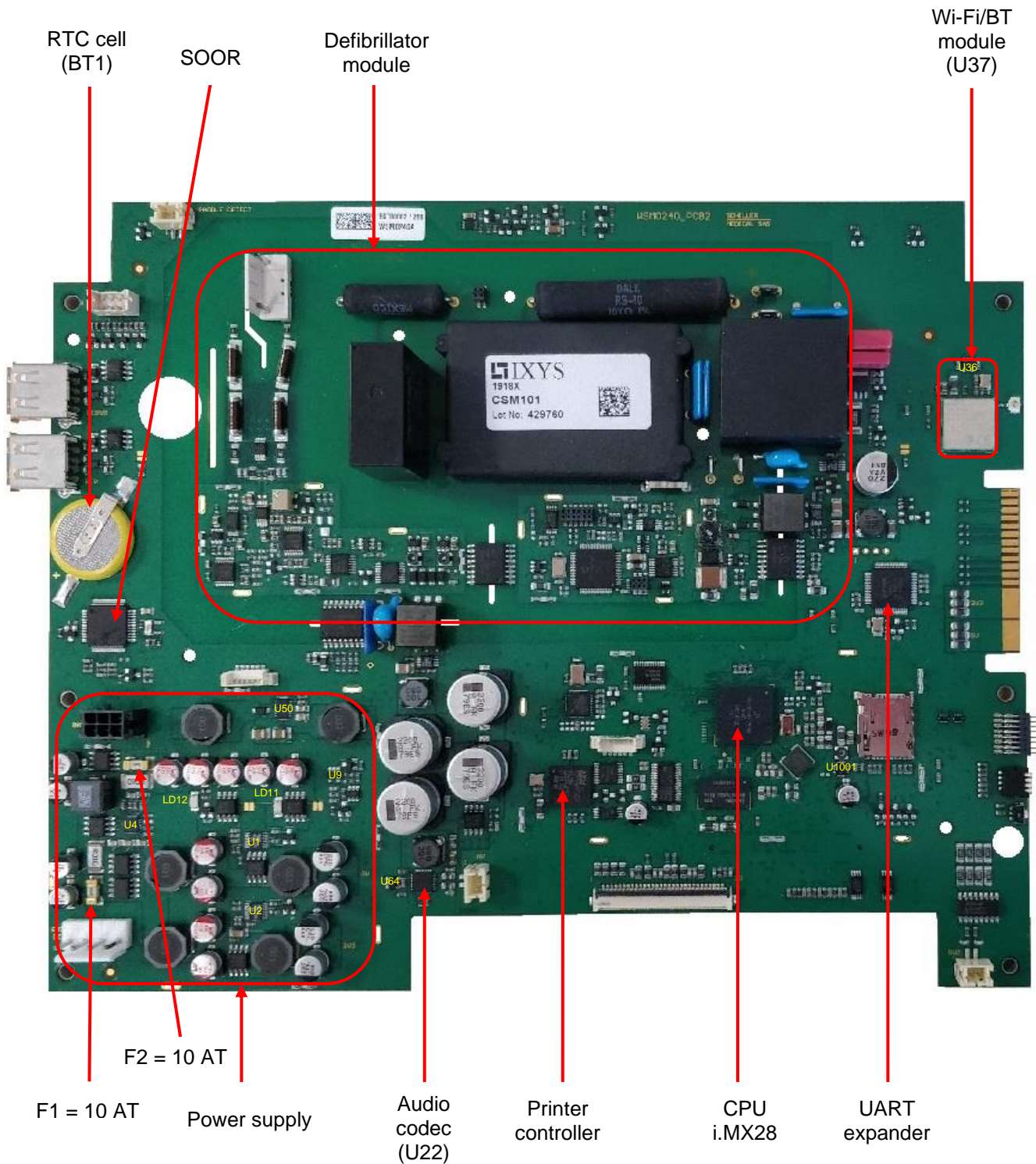
6.2.1.4   Power supply management

The device may be powered by two sources of voltage:
- 230 VAC/115 VAC mains power converted into 15 VDC using an internal switched-mode power supply (via JP23).
- Power supply with the rechargeable 11 VDC 6.4Ah Li-on battery (via JP14).

Uninsulated power supplies are created from the main voltage source. Three switched-mode power supplies generate the power supply voltage of the host (4.2V) and also 5V and 3.3V. Some modules with particular voltages are powered via linear regulators (Wi-Fi, audio codec etc.).

For modules that are electrically connected to the patient, the power supply is floating in order to keep the patient insulated and safe. The floating voltages are generated via transformers with 5kV insulation. The primary circuit supplies switched-mode current to the transformer; the voltage is rectified and regulated by a linear regulator in the secondary circuit.

When 15 VDC is present, it powers the CPU + Defibrillator board and the battery does not supply power. That allows the battery to be charged independently from the power needs of the circuitry. If the power demand from the circuitry is too large (while charging the defibrillator capacitor or printing), the battery charge may be limited or even stopped.

6.2.1.5   Description of power supplies

EXTERNAL_DC   EXTERNAL_DC is the voltage supplied by the switched-mode power supply RPS-120-15 and has a nominal value of 15 VDC.

UBAT   UBAT is the voltage supplied by the internal battery. Its nominal value is 11 VDC and may vary depending on the battery charge status.

UBAT_FUSED_CPU   UBAT_FUSED_CPU is the battery voltage after the 10 AT protective fuse (F2).

SUPPLY_CPU   This voltage is used to power the peripheral board as a whole. It may be generated by UBAT_FUSED_CPU or by EXTERNAL_DC depending on whether an external power supply is present or not.
The battery charger BQ24725A (U4) makes it possible to select the device power source based on the presence of the external power supply. The device, as indicated by its name, also manages the battery charge.

UBAT_SW_CPU   UBAT_SW_CPU is obtained from SUPPLY_CPU when the device is started up.

3V3_SW   This voltage is generated by a linear regulator TPS70933 (U9) and is present whenever UBAT_SW_CPU appears. It is used by different (monostable) circuits to be powered before the starting of the DC-DC converter generating the 3V3 voltage.

DC_DEFI   DC_DEFI is obtained from SUPPLY_CPU when the host of the CPU + DEFI board activates the defibrillator part.

3V3_Bat 3V3_Bat is generated by a linear regulator TPS70933 (U54) and is present whenever the battery or external power supply voltage appears.

U_BAT_CR2032 U_BAT_CR2032 is the voltage of the CR2032 button cell (BT1) present on the CPU + defibrillator board.

UC_PWR UC_PWR continuously powers the SOOR and the RTC module (U35), including when the device is switched off. UC_PWR is generated either from U_BAT_CR2032, via a diode BAS70-5 (D17), if there is no external power supply or if the internal battery is discharged, or from 3V3_Bat via a diode BAT54-A (D18) if that is not so.

BQ_POWER BQ_POWER is obtained from SUPPLY_CPU. This voltage is used to power the battery charger.

V_BUZ_SW V_BUZ_SW is obtained from SUPPLY_CPU. This voltage is used to power the device buzzer.

3V3 3V3 is generated by a DC-DC converter LTC3851EMSE-1 (U2) and powers the modules that consume the most power: LCD, Wi-Fi, Bluetooth, ECG module (via insulation), RFID.

5V 5V is generated by a DC-DC converter LTC3851EMSE-1 (U1) and powers the modules that consume the most power: Audio amp (integrated into the codec), SpO2 (via insulation), touch panel, screen back lighting, USB, NIBP module, defibrillation paddles (via insulation).

8V 8V is generated by a DC-DC converter LT8611EUDD (U50) and powers the device printer.

4V2 4V2 is generated by a DC-DC converter LTC3621 (U1001) and powers the host overall. It then generates its own power supplies using internal linear converters (VDDIO for example) in order to enable its different modules to operate.

1V8_SOUND 1v8_SOUND is generated by a linear regulator TLV70218 (U64) from the voltage 4V2. It powers the audio codec.

3V3_WIFI_BT 3V3_WIFI_BT is the voltage that powers the power and interface part of the Wi-Fi/BT module. It is supplied by the 3V3 voltage.

1V8_WIFI_BT 1V8_WIFI_BT is generated by a linear regulator TLV70218 (U36) from the voltage 3V3_WIFI_BT. It powers the core of the Wi-Fi/BT module.

6.2.1.6 Protective fuses

The board has two fuses that protect the circuitry from current surges:
- 10 AT fuse (F1) which prevents the battery from delivering more than 10 A to the circuitry of the device.
- 10 AT fuse (F2) which prevents the external power supply from delivering more than 10 A to the circuitry of the device.

6.2.1.7 SOOR controller

This controller has several functions:
- Starting up the device
- Keeping the date and time (RTC)

- Monitoring the board power supply voltages
- Managing the battery charge and its Coulomb meter
- Managing the LEDs

When the device is switched off, the SOOR is in standby mode and its low consumption (<5 µA) does not discharge the battery in that state, while retaining the functions required for keeping the date and for waking up. In standby mode, it continues to manage the LED_status in order to confirm the proper condition of the device.

The device is started up by putting the six-position rotating button on any position other than OFF.

When the device starts up, the SOOR checks if the device is in condition to start (battery OK, sufficiently charged etc.) and allows the circuitry to be powered (or inhibits it). It also monitors the other voltages present on the board to make sure that there is no problem.

When the device is on, the host can send a new date and time depending on the choice of the user. The frequency and date of the next self-test can also be configured.

When the internal battery is being charged, the SOOR retrieves information from the charger in order to identify the battery charge status. It also receives end-of-charge information and can thus update battery capacity information. It acts as the interface between the charger and the Coulomb meter. An LED controlled by the SOOR enables the user to know if the battery is under charge, charged or has a fault.

The SOOR also checks the internal temperature and can switch off the device if the temperature is outside the tolerating operating range.

The SOOR controls different indicator lamps.

The SOOR can control the buzzer if there is a technical alarm. It can only be triggered when the device is switched off.

6.2.1.8   i.MX28 host controller

The main processor of the board is an i.MX28 from NXP. It has 2GB of external RAM (Samsung). A Linux operating system is applied in the processor. The OS and the data from recent procedures are stored in a 2GB micro SD card (JP12).

It manages the UI, the many wireless communication systems, and information internal to the device:
- The host receives information from the touch panel via a UART and acts accordingly.
- It communicates using SPI with a component that generates an RFID wireless interface in order to read information about the type and validity of the electrodes used for defibrillation.
- It controls external communication via the different connections of the device (USB, Wi-Fi, Bluetooth).
- The display is controlled by a 16-bit RGB bus.
- It communicates with an audio codec, using I2C for configuration and SSI for digital sound data.

- It retrieves information about the status of the device via UART communication with the SOOR

It centralises the different patient parameters and controls the generation of the defibrillation shock in AED or manual mode:

- UART communication with the microcontroller PIC of the Defibrillator part (ECG DEFI, impedance)
- UART communication with the microcontroller STM32 of the ECG module (four-lead ECG, respiration etc.)
- UART communication with the Masimo MX-5 SPO2 module or the Nellcor Nell1 SpO2 module.
- UART communication with the NIBP module of Schiller AG.
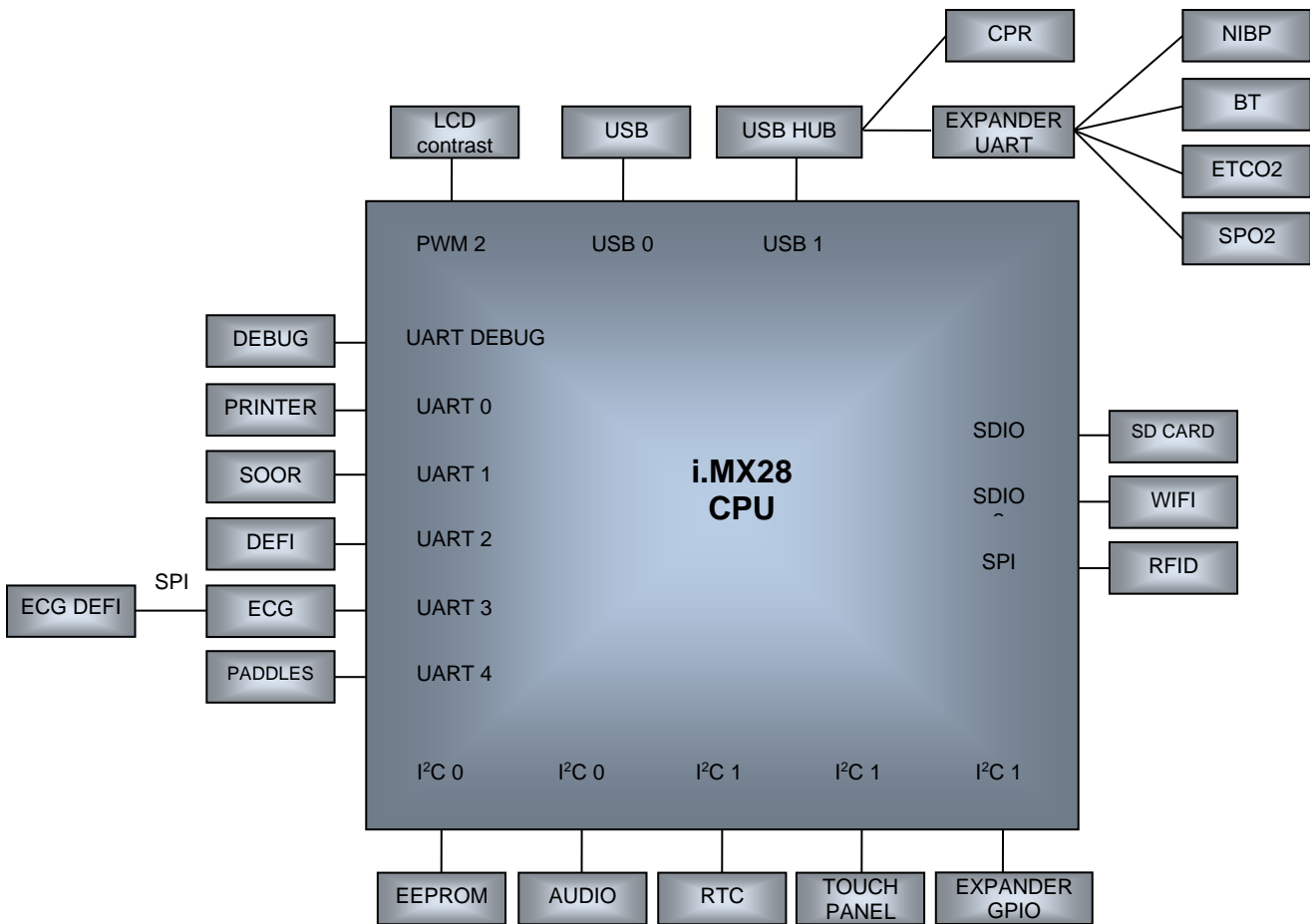
Analysis and a large part of the signal processing function are also implemented in the host.

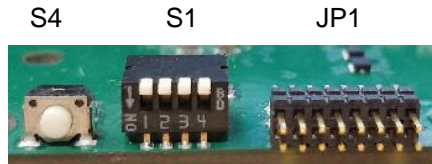The host controls the power supply of the different modules with which it communicates in order to reduce consumption when they are not active.

6.2.1.9   Flap

S4   S1   JP1

Several functions are accessible via the flap located on the left-hand side of the device:

- SOOR reset button (S4)
- DIP switch (S1)
- Debug connector (JP1)

The debug connector makes it possible to access the host console via a serial link (primary function).

4 DIP switches are accessible:
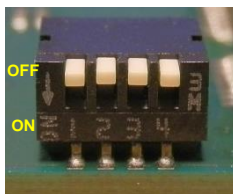
No 1:	Not active
No 2:	Not active
No 3:	Not active
No 4 OFF:	Access to the host console via the debug connector
No 4 ON:	Access to NIBP via the debug connector.

6.2.1.10   LEDs

The board has several LEDs controlled by the SOOR or the HOST:

Controlled by the SOOR:

BAT LED (LD14): Battery charge status
 - Flashing: Charging
 - Off: Charge complete or no external power supply
 - On: Battery fault

HIGH PRIORITY LED (LD13 - LD21): High priority patient alarm
LOW PRIORITY LED (LD7– LD18): Low-priority patient alarm
LED_STATUS (LD17): Device status
 Device off:
- Flashing: Device functional
- Off: Technical problem
 Device on:
- Off: Device functional

Controlled by the host:

SHOCK LED (LD5): On if the device is ready to deliver a shock.

Non-controlled:

EXTERNAL_POWER LED (LD3): On if the device is connected to the power mains.
CPU_SW LED (LD12): On if the main switch is closed.
DEFI_SW LED (LD11): On if the CPU board is supplying power to the defibrillator module.

6.2.1.11 HARDWARE NUMBER

A hardware number is available on the board to specify the PCB number and the ECL. Four bits generate the PCB number and four bits generate the ECL.
Coding is as follows:

PCB_NUMBER[3..0]:
PCB1 = 0000
PCB2 = 0001
PCB3 = 0010
…

ECL NUMBER [7..4]
ECL0 = 000
ECL1 = 001
…

	Bit on 0	Bit on 1
PCB_NUMBER [0]	R625 NI – R633 at 47kOhm	R625 at 47kOhm – R633 NI
PCB_NUMBER [1]	R626 NI – R634 at 47kOhm	R626 at 47kOhm – R634 NI
PCB_NUMBER [2]	R627 NI – R635 at 47kOhm	R627 at 47kOhm – R635 NI
PCB_NUMBER [3]	R628 NI – R636 at 47kOhm	R628 at 47kOhm – R636 NI
ECL NUMBER [1]	R629 NI – R637 at 47kOhm	R629 at 47kOhm – R637 NI
ECL NUMBER [2]	R630 NI – R638 at 47kOhm	R630 at 47kOhm – R638 NI
ECL NUMBER [3]	R631 NI – R639 at 47kOhm	R631 at 47kOhm – R639 NI
ECL NUMBER [4]	R632 NI – R640 at 47kOhm	R632 at 47kOhm – R640 NI

6.2.1.12 Voice message generation

The function is entirely carried out by the audio codec TLV320DAC3120 (U22) which changes the digital SSI signals from the i.MX28 into amplified analogue signals (max. power: 2.5W) directly connected to the loudspeaker by a JST connector B2B-PH-SM4-TB (JP6).

6.2.1.13 NIBP module

This measurement is incorporated into DEFIGARD HD-7 with an OEM NIBP module from SCHILLER AG.
This module is a device driver that allows access to the NIBP hardware. It is connected to the host via a 2400-baud UART.
The NIBP module manages the measurement sequences and communication details, observes time constraints, manages user configurations, manages errors and offers a file system interface for access to data and control.

6.2.1.14 Wi-Fi/Bluetooth/Bluetooth/Bluetooth LE

The Wilink WL1831MOD module (U37) is integrated directly on the CPU + Defibrillator board. It requires an external antenna connected via the Hirose U.FL connector (JP18).
It communicates with the host via an SDIO interface for the Wi-Fi part, which generates a protected Wi-Fi interface (WEP, WPA, WPA2-Enterprise), and via a UART for the Bluetooth part.

6.2.2 DEFI Unit

6.2.2.1   Overall description of the circuit

The defibrillation unit is activated on demand by the host and communicates with the host via a 115200-baud UART interface.

The DEFI section fulfils the following functions:
- Power supply management: distribution between floating (insulated) and non-floating power supply.
- Transmission of command and communication signals between the floating and non-floating part of the defibrillator circuit.
- Acquisition of the ECG signal via the defibrillation electrodes and A/D conversion (ADC DEFI).
- Patient impedance measurement.
- Forming of a signal for detecting cardiac massage.
- High-voltage generation circuit control.
- Circuit for detecting malfunctioning.
- Measurement of the charge of the high-voltage capacitor.
- High-voltage discharge circuits or IGBT module (defibrillation shock generation, safety discharge).
- Patient insulation relay.

The defibrillator operates in automatic (AED) and manual mode (Manual).
Shock attribution information is sent to the defibrillator from the:
- Host controller in AED mode.
- Device Shock button or Shock buttons of defibrillation paddles in Manual mode.
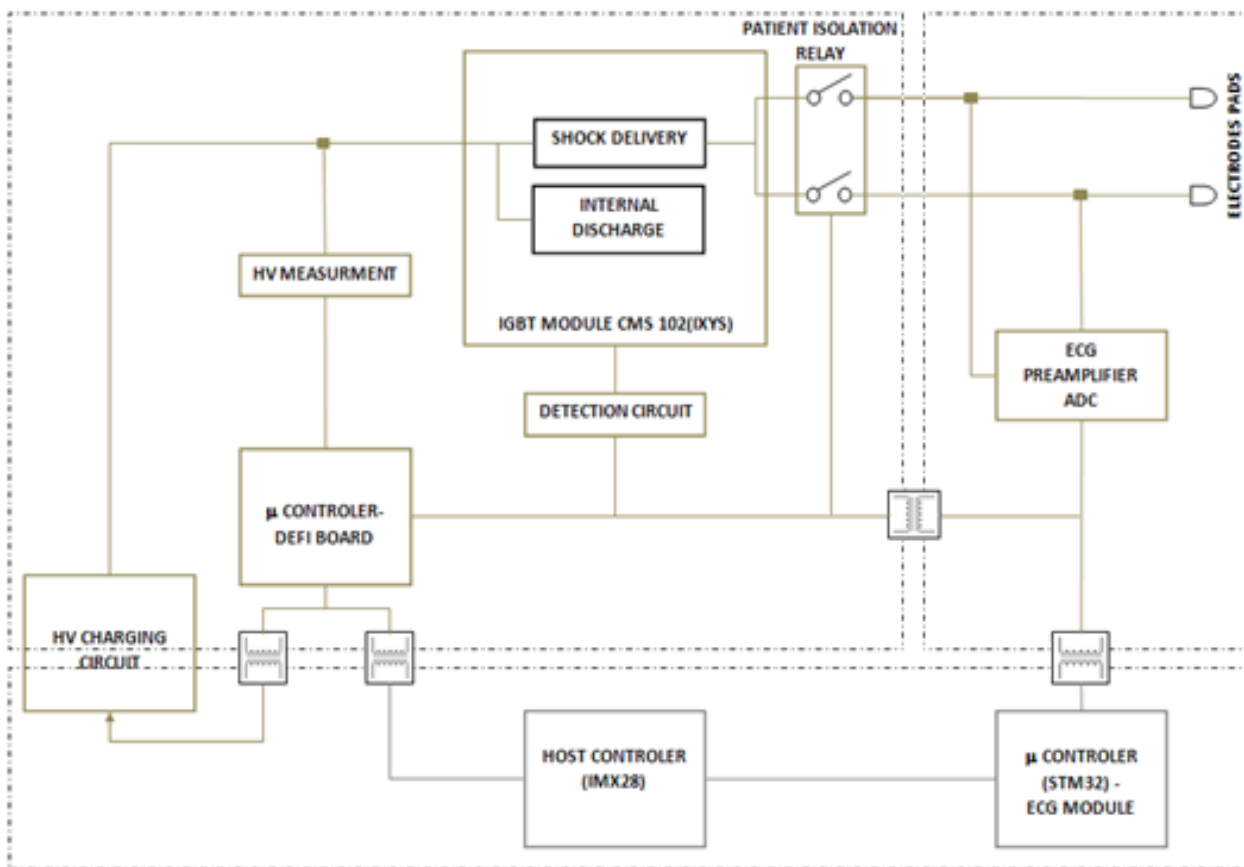
6.2.2.2   Defibrillation stages

Self-test: After the device has been switched on, the defibrillator conducts a self-test sequence to check that the module circuits are operating correctly.

Internal discharge: During the internal discharge, the high-voltage capacitor is discharged into a safety discharge circuit; however, the energy from the capacitor is dissipated into a specific resistor.

Standby stage: The high-voltage capacitor is completely discharged and all the functions of the defibrillation unit are deactivated. Capacitor charging may be triggered during this stage.

Pre-charge or charge: The capacitor is charged with the selected energy during this stage. Charging can be started by the charge or pre-charge command.

Pre-charge ready: This stage is reached when the high-voltage capacitor is charged with the selected energy after a pre-charge command. The defibrillation shock cannot be given during this stage.
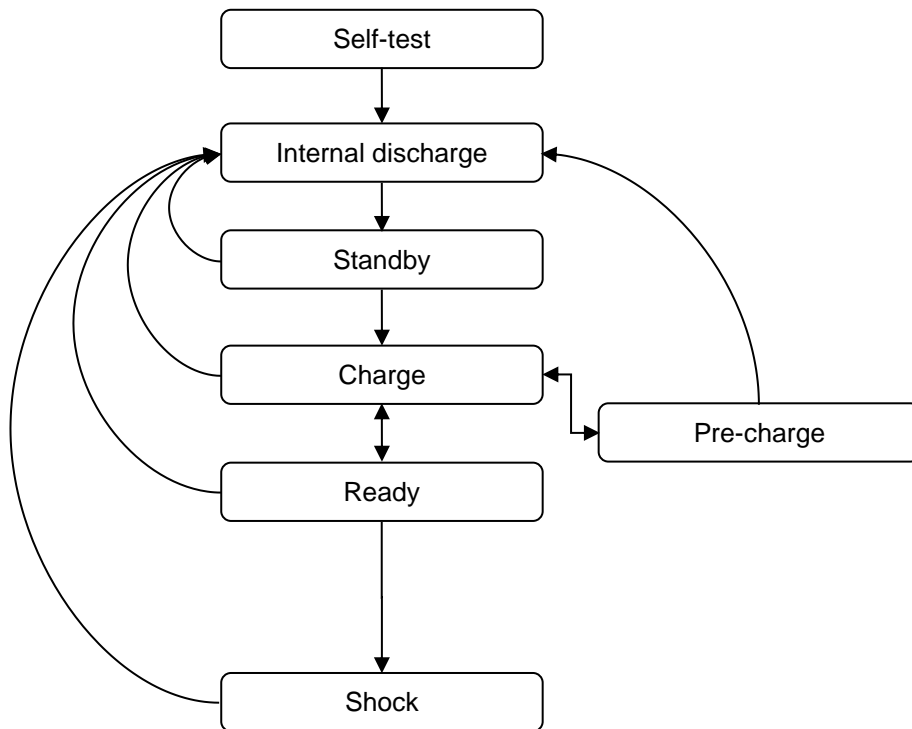
Ready: This stage is reached when the high-voltage capacitor is charged with the selected energy after a charge command. The defibrillation shock can be given during this stage.

Shock: This stage is only possible if the shock button is pressed during the Ready stage. The high-voltage capacitor is discharged, and gives a

SCHILLER
DEFIGARD HD-7

defibrillation shock to the patient with a Biphasic Multipulse Biowave waveform.

```
          ┌─────────────┐
          │  Self-test  │
          └─────────────┘
                 │
                 ▼
        ┌──────────────────┐
        │ Internal discharge │
        └──────────────────┘
                 │
                 ▼
          ┌─────────────┐
          │   Standby   │
          └─────────────┘
                 │
                 ▼
          ┌─────────────┐          ┌─────────────┐
          │   Charge    │─────────▶│ Pre-charge  │
          └─────────────┘          └─────────────┘
                 ▲│
                 │▼
          ┌─────────────┐
          │    Ready    │
          └─────────────┘
                 │
                 ▼
          ┌─────────────┐
          │    Shock    │
          └─────────────┘
```

6.2.2.3   Main components and connectors

**Floating part
ECG**

**Floating part
DEFI**

Non-floating part

HV electrodes
connector

Patient
insulation relay

IGBT module

HV transformer

ECG amplifier

Connectors
WSM0215A
Stimulator board

Defibrillator controller

HV capacitor connectors

SCHILLER
DEFIGARD HD-7

Service manual
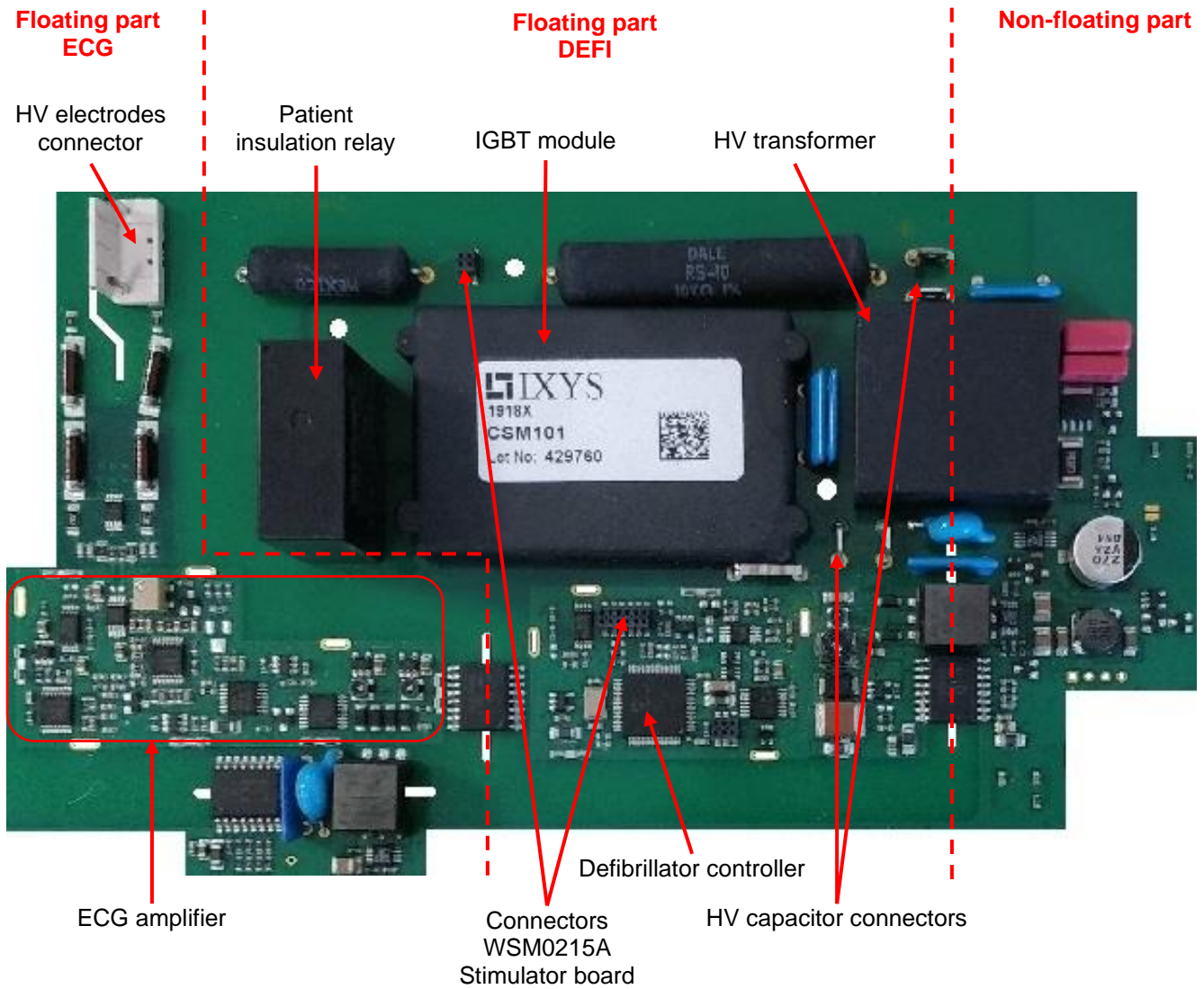
6.3 WSM0215A: PACER BOARD

A board with a pacer function management module may be put in place on the defibrillator circuit.

When the device sends pacing pulses in pacer mode, some components of the high-voltage circuit of the defibrillator are used, namely the high-voltage capacitor, the high-voltag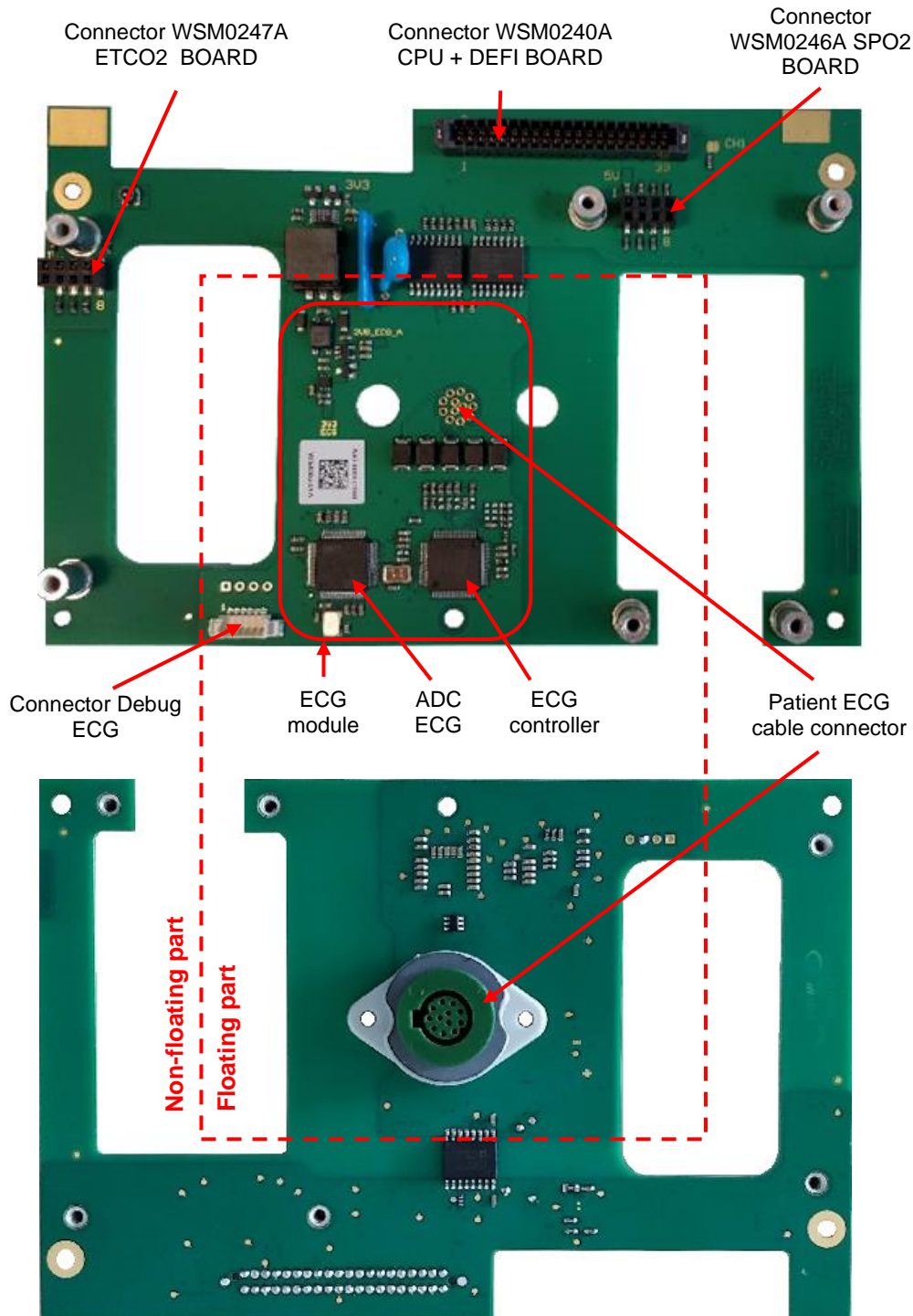e transformer and the IGBT module. In order to generate pulses at constant current, the pacer module comprises a current source connected to the IGBT module.

6.4   WSM0241A: PERIPHERAL BOARD

6.4.1   General

The Peripheral Board acts as the interface between the CPU + Defibrillator board and the power supply boards of the optional EtCO2 and SpO2 modules. It also contains the ECG module located on a ground plane that is insulated from the device earth.

6.4.2   Main functions and connectors

Connector WSM0247A ETCO2 BOARD

Connector WSM0240A CPU + DEFI BOARD

Connector WSM0246A SPO2 BOARD

Connector Debug ECG

ECG module

ADC ECG

ECG controller

Patient ECG cable connector

Non-floating part

Floating part

6.4.3 Description of power supplies

3V3 3V3 voltage is supplied directly by the CPU + Defibrillator board WSM0240A

5V 5V voltage is supplied directly by the CPU + Defibrillator board WSM0240A

3V3_ECG 3V3_ECG is a floating voltage generated by a transformer driver LT3999 (U2) from the 3V3 voltage, then regulated by a linear regulator LP5912 (U1). It powers the STM32 and the digital part of the ECG front-end.

3V8_ECG_A 3V3_ECG_A is a floating voltage also generated by a transformer driver LT3999 (U2) from the 3V3 voltage, then regulated by a linear regulator LP2985-N (U3). It powers the analogue part of the ECG front-end.

6.4.4 ECG module

The ECG module is defined as a subsystem placed on the device board. (With galvanic insulation). It carries out the following functions:
- Acquisition of the ECG signal and A/D conversion
- Acquisition of the four digital signals from the Defibrillator board
- Cable connection detection
- QRS segment detection and transmission of the QRS signal for the defibrillator.
- Heart rate measurement
- Filtering (noise reduction)

6.4.4.1 Operation

Patient ECG signals are received via the connector J1 by the ECG module, which digitises the signals with its ADC, also called ADAS circuit. The ADC acquires and converts three analogue signals (lead I, lead II and lead III), and a reference signal, and then sends them to the microcontroller (STM32), which in turn carries out a series of computations to extract other information:
- Three other leads (AVR, AVF and AVL)
- Heart rate from the duration of the interval of two QRS segments

6.4.4.2 ECG defibrillator connection

The ECG module microcontroller also controls the defibrillator ADC, which carries out the A/D conversion of the four signals below:

ECG DEFI SIGNAL: Patient ECG acquired by the defibrillation electrodes
Z DEFI SIGNAL: Patient impedance measured by the defibrillation electrodes
DZ DEFI SIGNAL: Patient movement signal measured by the defibrillation electrodes
INCH PACE SIGNAL: Pacer signal detected via the ECG signal

6.4.4.3   Synchronisation mode (cardioversion)

This operating mode synchronises defibrillation with the patient ECG measurement. In this mode, the defibrillation shock is delivered only when the QRS segment is detected by the microcontroller of the ECG module. The synchronised operating mode may be used with an ECG measurement from the defibrillation electrodes or control electrodes. After QRS segment detection, a synchronisation signal, known as the cardioversion signal, is sent from the ECG module to the defibrillation module in order to deliver the shock.

6.4.5   ECG module - Defibrillator module connections

SCHILLER
DEFIGARD HD-7
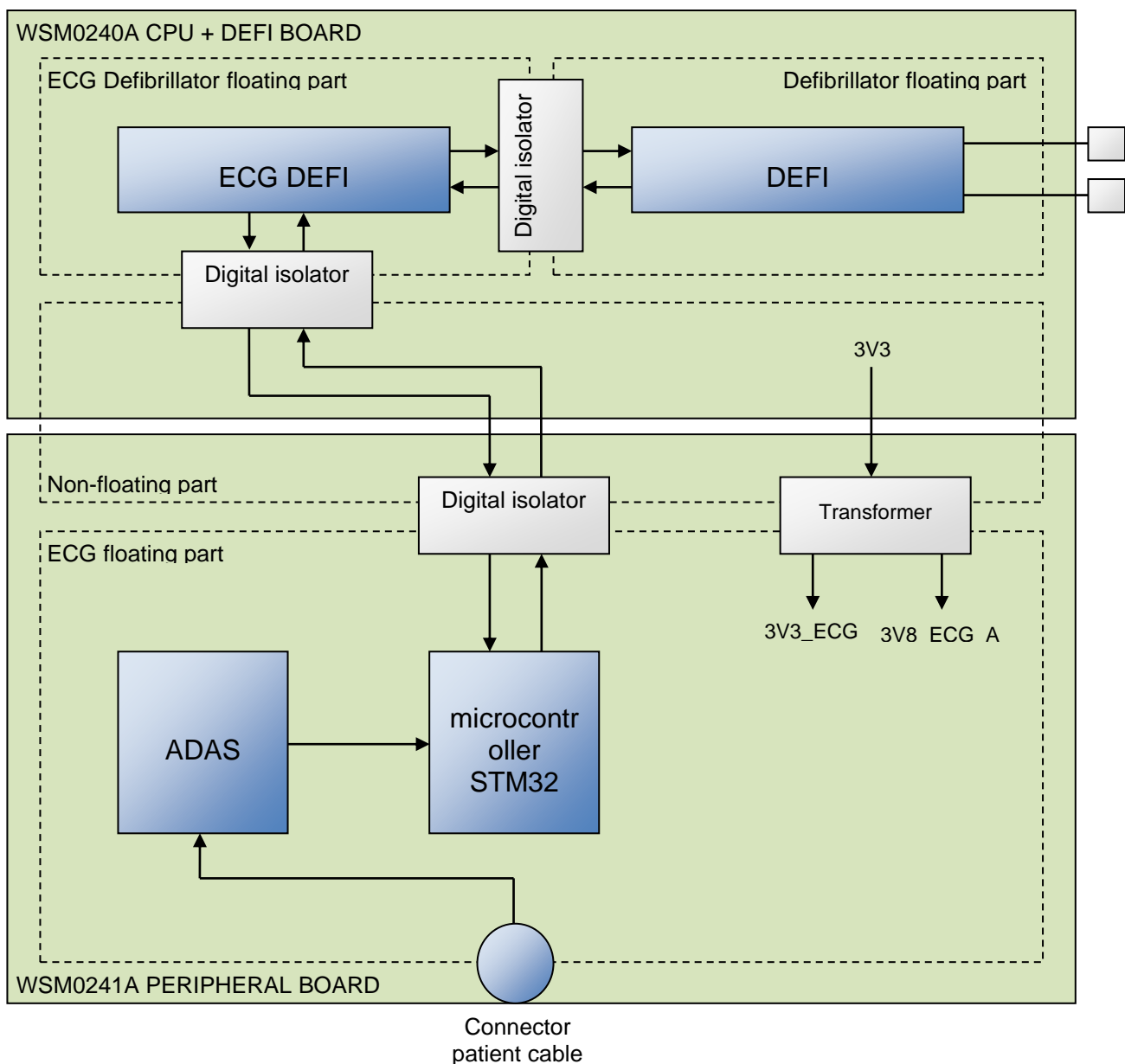
6.4.6 Optional SpO2 module

An SpO2 module can optionally be added to the device, with a choice of two modules, either the Masimo MX-5 module or the Nellcore Nell1 module. These two modules allow the measurement of two physiological parameters: pulse oximetry and pulse rate.

An additional board (WSM0246A SpO2 board) is required to act as the interface and galvanic insulation between the SpO2 module and the peripheral board. These modules operate under the control of the host controller with 19200-baud UART communication.

6.4.7 Optional EtCO2 module

A Masimo ISA Capno module may optionally be added to the device. That module allows the measurement of the capnometer physiological parameter.

An additional board (WSM0247A EtCO2 board) is required to act as the interface and galvanic insulation between the SpO2 module and the peripheral board. This module operates under the control of the host controller with 19200-baud UART communication.
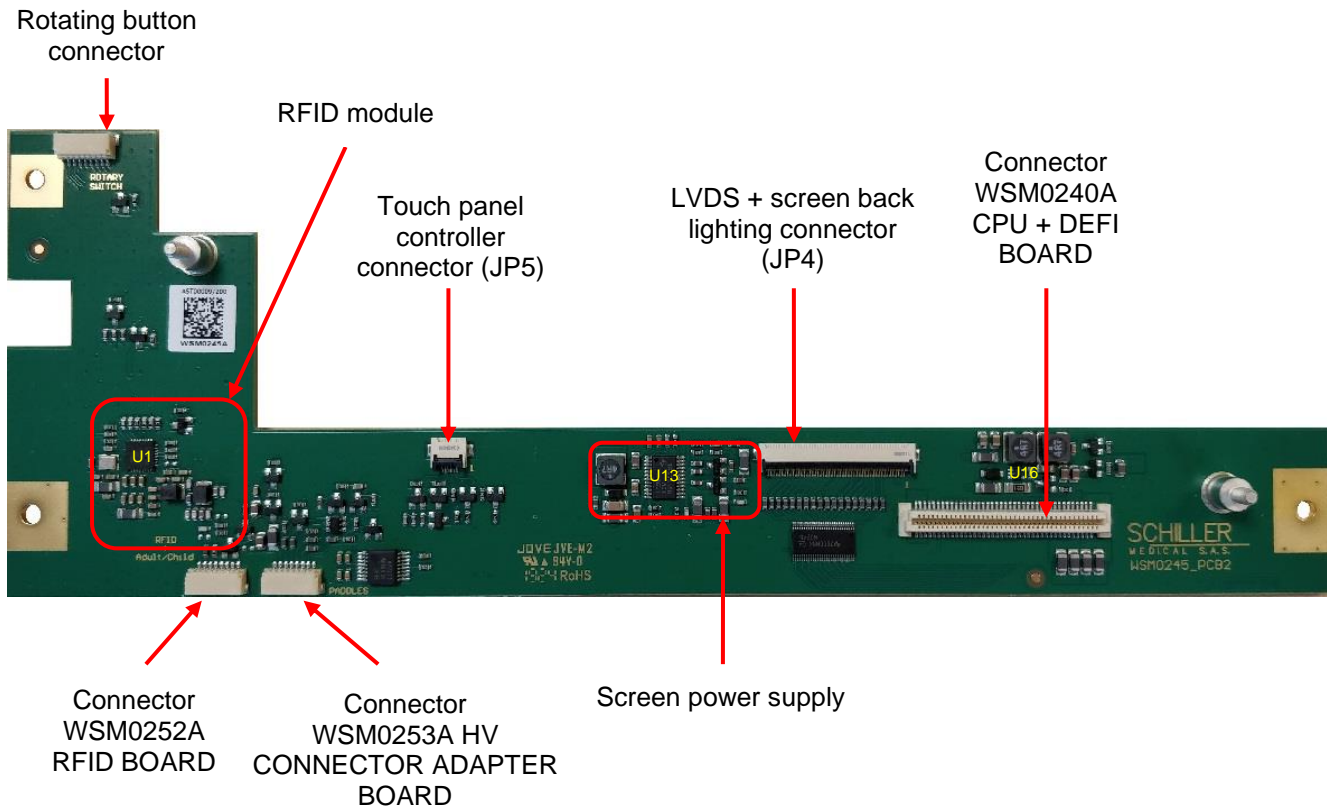
6.5 WSM0245A: BUTTON PCB

6.5.1 General

The User Interface board acts as the connection between the user interface of the device (physical buttons, rotating button, Shock LED and high-voltage connector) and the CPU + Defibrillator board. It also comprises the TRF7970 RFID module (U1) that communicates with the host through an SPI link.
The touch screen is also connected to that board via the connector JP4, for display and back lighting (BACKLIGHT) and via the connector JP5 for the touch panel (TOUCH PANEL) that communicates with the device host through an I^2C link. The two power modules of the touch screen (U13 TPS65150) and the back light (U16 TPS61169) are implemented on this board.

6.5.2 Main functions and connectors

Rotating button connector

RFID module

Touch panel controller connector (JP5)

LVDS + screen back lighting connector (JP4)

Connector WSM0240A CPU + DEFI BOARD

Connector WSM0252A RFID BOARD

Connector WSM0253A HV CONNECTOR ADAPTER BOARD

Screen power supply

6.5.3 Description of power supplies

3V3 3V3 voltage is supplied directly by the CPU + Defibrillator board WSM0240A

5V 5V voltage is supplied directly by the CPU + Defibrillator board WSM0240A

VDDIO_3V3 VDDIO_3V3 is directly supplied by the CPU + Defibrillator board WSM0240A and is a copy of the voltage VDDIO generated by the CPU.

URT_AVDD URT_AVDD is voltage generated by an LCD screen driver TPS65150 (U13) from the 3V3 voltage. It powers the analogue components of the LCD display.

URT_VGL URT_VGL is a voltage generated by an LCD screen driver TPS65150 (U13) from the 3V3 voltage. It is the low polarisation voltage of the pixel matrix of the LCD display.

URT_VGH URT_VGH is a voltage generated by an LCD screen driver TPS65150 (U13) from the 3V3 voltage. It is the high polarisation voltage of the pixel matrix of the LCD display.

VDD_BACKLIGHT VDD_BACKLIGHT is a voltage generated by an LCD screen driver TPS61169 (U16) from the 3V3 voltage. It provides back lighting for the screen.

6.5.4 RFID module

The function is carried out by a 13.56MHZ RF transmitter from Texas Instruments – TRF7970A (U3). An HF emission - reception circuit is implemented on the PCB and connected to the RFID antenna located on the RFID board WSM0252A, via the connector JP3.

6.5.5 Adult/Child electrode detection module

The Adult/Child detection function is carried out by a Hall-effect sensor that detects whether or not there is a magnet on the adhesive electrodes connector. The signal is of type the on/off type. If a magnet is present, the sensor level has the low logical status. Otherwise, it has the high logical status. The sensor, located on the RFID board WSM0252A, is connected to the user interface board via the connector JP3.

6.5.6 LCD screen and touch panel

The device has a 7" 16/9 LCD screen, part no. UMSH-9328MD-2T from URT.
The screen is connected to the User Interface board through connector JP4 (0.5 mm 50-contact ZIF connector) by means of a soft ribbon cable. The screen is controlled by the CPU. The LCD module is powered by means of a PW_ON_LCD signal. The backlight brightness is controlled by a signal PWM LCD_CONTRAST.

The interface with the touch panel is through an SP link. The controller board of the panel is connected to the User Interface board by a ZIF 6-pin 0.5 mm connector (JP5).

6.5.7 Keypad interface

The keypad has three buttons:

Charge button:	Starts charging the defibrillation capacitor with the selected energy.
Shock button:	Permits the defibrillator system to give the defibrillation shock.
Six-position rotating button:	**Off position** – Switches off the device.
	Monitor position – Switches the device to monitor mode
	Manual position – Switches the device to Manual defibrillator mode.
	AED position – Switches the device to Automated defibrillator mode.
	Pacer position – Switches the device to Pacer mode.
	Test position – Switches the device to Test mode.

6.6   WSM0246A: SPO2 BOARD

This board acts as the interface between the Peripheral board via the connector JP2 and the Masimo MX-5 SpO2 module (via the connector JP1) or the Nellcor Nell1 SpO2 module (via the connector JP3). It provides galvanic insulation between the ground plane of the device and that of the module, and UART transmission between the module and the host controller.

6.7   WSM0247A: ETCO2 BOARD

The board acts as the interface between the Peripheral board via the connector JP8 and the Masimo EtCO2 module (via the connector JP1). It provides galvanic insulation between the ground plane of the device and that of the module, and UART transmission between the module and the host controller.

6.8   WSM0248A: APEX PADDLES

This board is located in the first defibrillation paddle. It includes the microcontroller that manages the working of the two paddles. It collects the status of the different buttons located on the paddles (Shock, Charge, More, Less) and the Adult/Child detector and sends it to the host of the device via a 115200-baud UART. It also comprises an orange LED that goes on when the shock is ready to be given.
The board is connected to the device via the connector JP4, to the second paddle board via the connector JP3 and the Adult/Child Paddle Detector board via the connector JP1. A debug connector (JP2) that can flash the microcontroller is also located on the board.

6.9   WSM0249A: PADDLES STERNUM

This board is located in the second defibrillation paddle and is connected to the first one via the connector JP1. It has a Shock button and a Print button for setting off printing, and an orange LED that lights up when the shock is ready to be given, and another green LED that shows when the impedance measured between the two paddles is within the range suitable for giving a shock.

6.10 WSM0252A: RFID BOARD

This board has a Hall-effect sensor that can detect the type of electrode connected to the device (adult or child) and a copper trace that acts as the RFID antenna, and the whole is connected to a connector (JP1) for connecting the board to the User Interface board.

SCHILLER
DEFIGARD HD-7

6.11 WSM0253A: CONNECTOR HV ADAPTER

This board is used for connecting the User Interface board (JP2) to the high-voltage connector (JP1).

6.12 WSM0256A: ADULT/CHILD PADDLES DETECTOR

This board contains a Hall-effect sensor that makes it possible to detect the operating mode of paddles (Adult or Child) and a connector (JP1) for connecting it to the PADDLES_APEX board.

7 Technical data

7.1 See instructions for use

8 Index