


<b>BLE RCU</b> SERVO CALIBRATION SUPPORT SOW HW/SW SRS		 <small>Exceptional Pool Experience</small>		
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<b>Written by:</b> Hagai Flexer-	<b>Date:</b> 2-Jul-19	<b>Project Manager:</b>	-	-

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FCC ID:WCH99954230

Model Name:M800

R&D Document

## BLE Remote Control Unit (RCU) - SRS


Submitted by: Hagai Flexer

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## Change History

Rev.	Date	Author	Change Description
1	17/08/17	Hagai Flexer	First Draft
1.1	30/08/17	Hagai Flexer	After meeting comments
1.2	25/09/17	Hagai Flexer	Adding buzzer, SW button behavior, BLE protocol
1.3	11/10/17	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Wake-up (power up) touching any button. (Section 3.3.)</li> <li>2. Display: sections 3.5.3 to 3.5.6.</li> <li>3. Production instructions.</li> <li>4. Removing OTA update.</li> <li>5. BLE protocol updates.</li> </ol>
1.4	17/10/17	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Changing the number of buttons.</li> <li>2. Features default state is enabled.</li> </ol>
1.5	11/01/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Manual drive update (section 3.5.5)</li> <li>1. BLE Protocol updates (section 3.6).</li> </ol>
1.6	06/02/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Advertising MU S/M (section 3.5.1)</li> <li>2. Display graphics (section 3.5.3)</li> <li>3. Cycle setting updates (section 3.5.4).</li> </ol>
1.7	09/09/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.4 cycle setting adding the M5 cycle time</li> <li>2. Section 3.6.6 adding every 3<sup>rd</sup> day to the RCU commands.</li> <li>3. Section 3.6.4 / 5 removing 0x07 and instead 0xD7 filter state.</li> <li>4. Removing 0xFFE9 profile.</li> </ol>
1.8	29/10/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.4 adding clarifications and pointers to the BLE command.</li> <li>2. Section 3.6.2, adding notes regarding the “:”.</li> <li>3. Section 3.6.3, PWS to RCU path = 0x0E.</li> <li>4. Section 3.6.3, drive command always with 100% = 0x64.</li> <li>5. Section 3.6.5, Changing the FBI (filter indication) from 5 levels into number between 0-100 i.e. 0x00 to 0x64</li> <li>6. Section 3.6.6, adding Pickup and demo cycle modes.</li> </ol>
1.9	13/11/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Exit from “demo” mode section 3.5.9.</li> <li>2. Delete feature enable op-code, see section 3.6.6.</li> </ol>
1.91	19/11/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.6.3 changed to RCU to PWS value = 0x0D</li> <li>2. Section 3.6.5 explain the DataLen.</li> </ol>

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2.0	03/12/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Updating the BLE connection pairing process, see section 3.5.2.</li> <li>2. Adding 3.5.4 section "Display area behavior".</li> <li>3. Updating the Technician mode testing, see section 3.5.9.</li> <li>4. Status after RCU powerup op-code update, see section 3.6.5.</li> </ol>
2.1	04/12/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.2: <ol style="list-style-type: none"> <li>a. Added time for searching the last paired PWS.</li> </ol> </li> <li>2. Section 3.5.4: pairing indication.</li> <li>3. Section 3.6.5 op-code 0xD6: <ol style="list-style-type: none"> <li>a. Add 1 byte to the RSSI level.</li> <li>b. Default robot type = 0x01 (m600).</li> </ol> </li> <li>4. Section 3.6.6. op-code 0x0D3 – value 0x03 not used.</li> </ol>
2.2	04/12/18	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.4 pairing process update (see also picture).</li> </ol>
2.3	02/01/19	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Sections 3.5.2 and 3.5.3 new diagrams and explanations.</li> <li>2. Section 3.5.5 bullet #3 select and approve behavior.</li> </ol>
2.4	16/01/19	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.2: <ol style="list-style-type: none"> <li>a. User case flow adding 3 seconds limit for entering the pairing process.</li> <li>b. Average time 1 second.</li> </ol> </li> <li>2. Section 3.5.5: 1.b.i adding left most icon.</li> <li>3. 2. Section 3.5.5: 2.c.i. the sound for roll over as well.</li> </ol>
2.5	27/01/19	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.5.: 2 if user moves left or right and then down without Ok, the display stays with the last approved action.</li> </ol>
2.6	12/03/19	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.5.: adding pairing behavior.</li> <li>2. Section 3.5.10: Technician mode: Down button instead of OK button and adding display behavior.</li> <li>3. Section 3.6.5: adding production mode robot type to op-code.</li> </ol>
2.7	28/03/19	Hagai Flexer	<ol style="list-style-type: none"> <li>1. Section 3.5.11: Demo mode activation using the forward (^) instead of the backward. Display blinks.</li> <li>2. Section 3.5.7: sending message every 2 seconds.</li> <li>3. Section 3.5.8: sending status request at turn on.</li> </ol>
2.8	02/07/19	Hagai Flexer	<p>Per manufacturer requests:</p> <ol style="list-style-type: none"> <li>1. 3.2. bullet #7 (MIL STD 810F 514.5 C-3) deleted.</li> <li>2. 3.7.1.1 Each unit shall have its dedicated Nylon bag.</li> <li>3. 3.7.1.3 A transport box shall contain 50 units per export carton.</li> <li>4. 3.7.3.1 adding CE recycling pictures.</li> </ol>

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**File Location:**

<C:\Maytronics Vault\PROJECT DOCS\Q8 PS\D-Tech. Spec\HW&SW Docs\BLE RCU SRS- Semicom.docx>

**Related Documents**


Type	Date	Author	Path
MRD	02/04/17	Yermi Herut	<a href="..\..\B-MRD\Power Supply RES19 MRD V2.docx">..\..\B-MRD\Power Supply RES19 MRD V2.docx</a>
Tech Spec	01/02/17	Boaz Ben Dov	<a href="..\Q8 PS - Tech Spec 1.2.17.docm">..\Q8 PS - Tech Spec 1.2.17.docm</a>
SRS	08/06/17	Hagai Flexer	<a href="Q8 PWS HW-SW SRS.docx">Q8 PWS HW-SW SRS.docx</a>
BLE RCU SOW		Hagai Flexer	<a href="BLE RCU SOW.docx">BLE RCU SOW.docx</a>
Production Spec		Pavel Stessin	<a href="BLE RCU Tester AT-Commands Advertising REV5.docx">BLE RCU Tester AT-Commands Advertising REV5.docx</a>

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## Definitions, Acronyms and Abbreviation

Term	Description
SOW	Statement of Work
Q8	Robot
PWS	Power Supply
Mobile App	Dolphin Tech App
RCU	Remote Control Unit
BLE	Bluetooth Low Energy

Table 1 Acronyms and Abbreviation

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## 1. Document objectives

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This document purpose is to describe the **system specification (SRS)** for the BLE remote control units (RCU).

## 2. Project Objectives

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### 2.1 IoT PWS Project Objectives

The main goals of the IoT PWS project are:


1. New, cutting edge, PS design with simple MMI.
2. Wi-Fi connection to Mobile App with extra options.
3. **New RC module with BLE connection.**

In this document, only the specifications for the RCU shall be listed.

### 2.2 Remoter Control Unit Objectives

The main purposes of the RCU shall be:

1. Operating (on/off) the robot.
2. Robot manual navigation.
3. Selecting cleaning modes cycles.
4. Setting the weekly timer and delay.

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1 RCU General view Figure

### 3. Specifications

#### 3.1 Environment

1. Outdoor usage (UV).
2. Working Temperature: -10° - +50° Celsius
3. Storage/Transportation conditions: -20° - +60° Celsius
4. Humidity: 5% - 95%


#### 3.2 Mechanical specifications

1. Artistic design was done by Maytronics and it shall be transfer to contractor (using *SOLIDWORKS 2014*).
2. IP67
3. The case plastic material shall be PC.
4. User shall be able to replacement the battery, by using a regular screwdriver opening few screws. After closing the box, the sealing shall be kept.
5. The display shall have a plastic protection.
6. The unit shall withstand 1-meter fall on concrete.
7. Each button shall withstand minimum 1,000 pressing during its life span.



Figure 2 Artistic design



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### 3.3 HW specifications

#### 1. Display:

- a. Icon display (Icons shall be defined in a different document).
- b. Active display size 40 mm x 40 mm.
- c. Black background.
- d. Backlight:
  - 1) The backlight shall be lighted after pushing any button, only in case the power is on.
  - 2) It shall be **on** for 10 seconds and then turn off.
- e. RGB colors.

#### 2. BLE connection to the PWS:

- a. Standard: Bluetooth 4.1 and above.
- b. It shall be compatibility with the BLE device used in the PWS (Atmel BTLC1000).
- c. Operation range: 30 meters from PWS location (ground or caddy), and 360° direction line of sight. Including RCU holding in different direction (horizontal and vertical towards the PWS).

#### 3. 6 x buttons for selecting modes and for manual navigation:

- a. 4 x navigation (straight, backward, left and right)
- b. 1 x on & selection & Ok.
- c. 1 x Navigation or mode select

#### 4. Buzzer:

- a. The RCU shall have a small buzzer. It main purpose is to give sound feedback/acknowledgement to successful command delivery to the PWS.
- b. The buzzer shall make a short, 1 second, sound upon receiving "ACK" message from PWS.

#### 5. On/Off


- a. While RCU is off (power off) any button touch shall wake-up the unit i.e. power-up.
- b. The RCU shall turn off, automatically, after 30 seconds of no button usage.

#### 6. Power:

- a. The RCU shall use 2 pieces of off-the-shelf Alkaline 1.5V AAA size battery manufactured by Duracell/Energizer or similar.

#### 7. RCU Reliability:

- a. RCU life expectancy shall be 5 years.
- b. User shall use the RCU about 15 minutes a week (about 1 hour per month).
- c. Battery replacement after 3 years i.e. after **40 hours of usage**.

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d. Low battery detection indication (see SW section).

8. Feedback:

a. The CPU shall read the input power, using ADC (Analog to Digital Controller).

9. Production information


a. HW revision: 2 resistors.

b. Silk information:

- 1) Company name and logo: Maytronics Exceptional Experience
- 2) Board name: RCU
- 3) Part number: TBD
- 4) Revision 00

c. PCB instructions

- 1) Surface finish shall be immersion gold.
- 2) PCB FR 4 and Tg=170.
- 3) Solder mask shall be shiny green.
- 4) Silkscreen shall be in white.
- 5) Twist & Bow < 0.75%

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### 3.4 Regulation requirements

Please note table below (All at the latest revision/ediiton):

STANDARD	NAME	NOTES
<b>CSA/CS22.2 No108-14</b>	LIQUID PUMPS	General for materials and PCBs For Canada To perform together with UL1081
<b>UL 1081</b>	STD FOR SAFETY-SWIMMING POOL PUMPS, FILTERS AND CHLORINATORS	General for materials and PCBs
<b>IEC60259</b>	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODES)	
<b>IEC/EN 60335-1/ 60335-2-41</b>	HOUSEHOLD AND SIMILAR APPLIANCES SAFETY	
<b>EN55014-1/2</b>	EMC REQ FOR HOUSEHOLD APPLIANCIES PART1-EMMISSION PART2- IMMUNITY	EMC CE
<b>EN61000 SERIES</b>	EMC TESTING METHODS STDS	61000-3-2/3-3/4-2/4-3/4-4/4-5/4-6/4-11
<b>EN62233</b>	EMC OF HOUSEHOLD APPLIANCES REGARDING HUMAN EXPOSURE	PART OF CE
<b>FCC TITLE 47 PART 15</b>		EMC FOR US/RADIO Need To get FCC grant Register to use Wi-Fi mark
<b>ETSI EN 300328</b>	EMC&EMR, DATA TRANS. IN 2.4GHz ISM BAND...	
<b>ETSI EN 301 489</b>	EMC FOR RADIO EQUIP. PART 1 COMMON TECH REQ.	
<b>UL157</b>	GASKETS AND SEALS	REQ. ARE IN UL1081
<b>UL158</b>	CABLES	REQ. ARE IN UL1081 for internal wiring
<b>UL746C</b>		REQ FOR PLASTIC OF ENCLOSURES OVER ELECTRONICS- UV AND WATER IMMERSION ARE A MUST FOR OUTDOOR UNITS
<b>UL969</b>	LABELS	OUTDOOR LABELS REQUIREMENTS

Table 2 Regulation requirements

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### 3.5 SW Specifications

#### 3.5.1 BLE Interface

The PWS has two devices that connects via BLE:

1. Mobile App (smartphone) – shall not be discussed in this document.
2. Remote control unit

#### 3.5.2 1<sup>st</sup> time connection (acquire MAC)

This scenario shall take place:

1. At the production line
2. PWS or RCU replacement

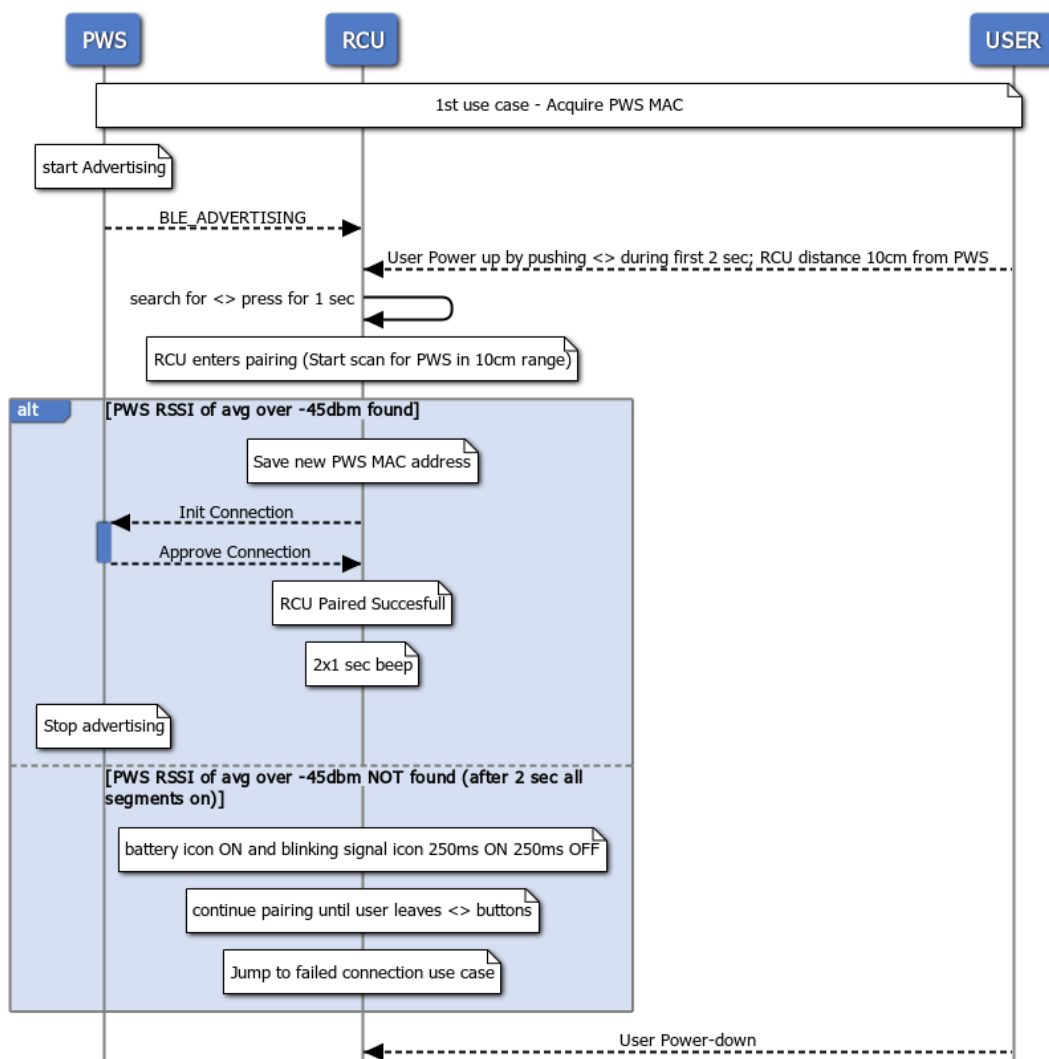



Figure 3 Acquire PWS MAC

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Use case flow

1. User power up (AC cable) PWS
2. PWS starts advertising (Green communication LED blinks).
3. User holds the RCU up to 10 cm from the PWS.
4. User press the <>, during the first 3 seconds from RCU power up.
5. RCU shall scan and pair to the PWS with average (over 1 seconds) of RSSI above -45 dBm.
6. It shall store the Mac address of this PWS for further connections.
7. Upon pairing, the buzzer shall make a short, 2 x 1 second, sound.
8. See section 3.5.4 for the display behavior.

**3.5.3 Normal operation BLE advertising and connection**

The use case is the normal operation mode after 1<sup>st</sup> time connection.

Successful connection

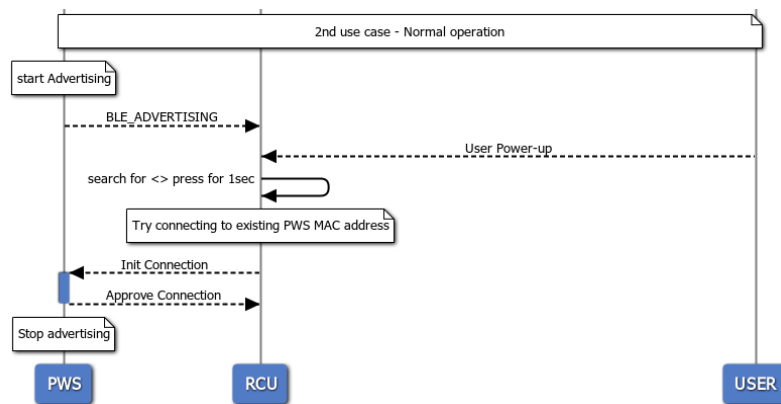



Figure 4 Normal Operation

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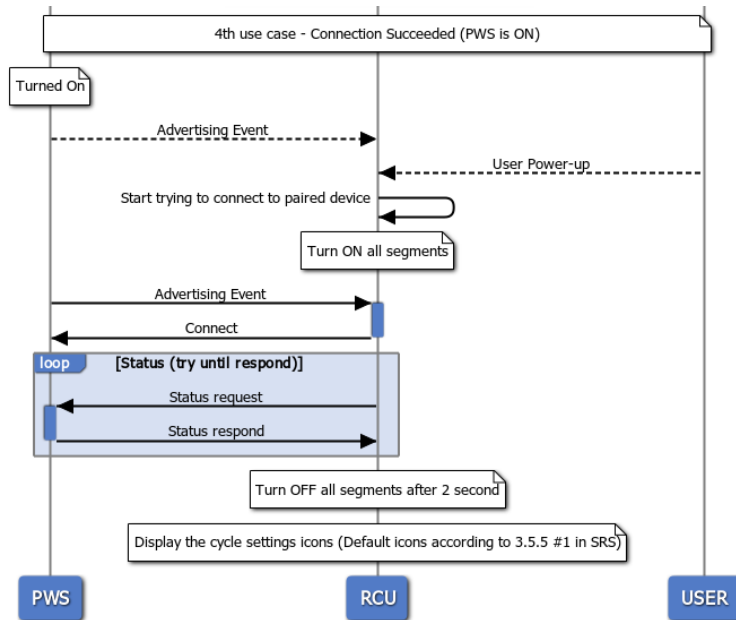



Figure 5 Successful connection

1. After power up, it shall search for the last Mac address that was stored in it's memory.
2. Once found it shall connect to it.
3. It shall send status request and shall wait for a response.
4. It shall search indefinitely (see failed connection scenario).

After connection was established the display area behavior is explained in section [3.5.5](#).

**Failed connection**

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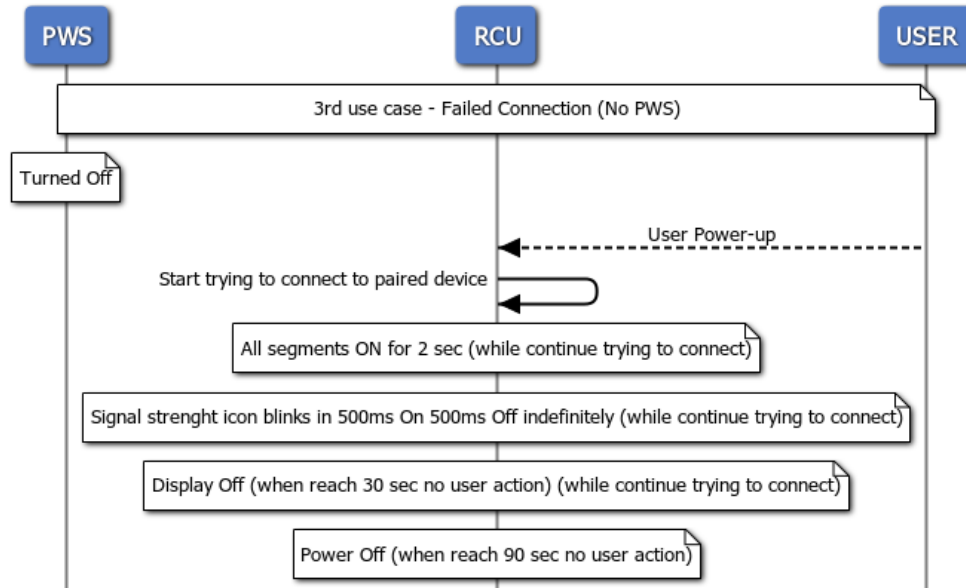



Figure 6 Failed connection

Use case flow

1. PWS is off or far away from the RCU.
2. User press the power-up the RCU (press any button).
3. All segments are **on** for 2 seconds
4. Signal strenght icon blinks 500 msec on 500 msec off indefinitely and battery icon is constantly on.
5. If no user action the RCU shall turn off after 30 seconds.

For the display area behavior see in section [3.5.5](#).

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All Field will be Fill automatically from the ePDM System.

### 3.5.4 Display Area

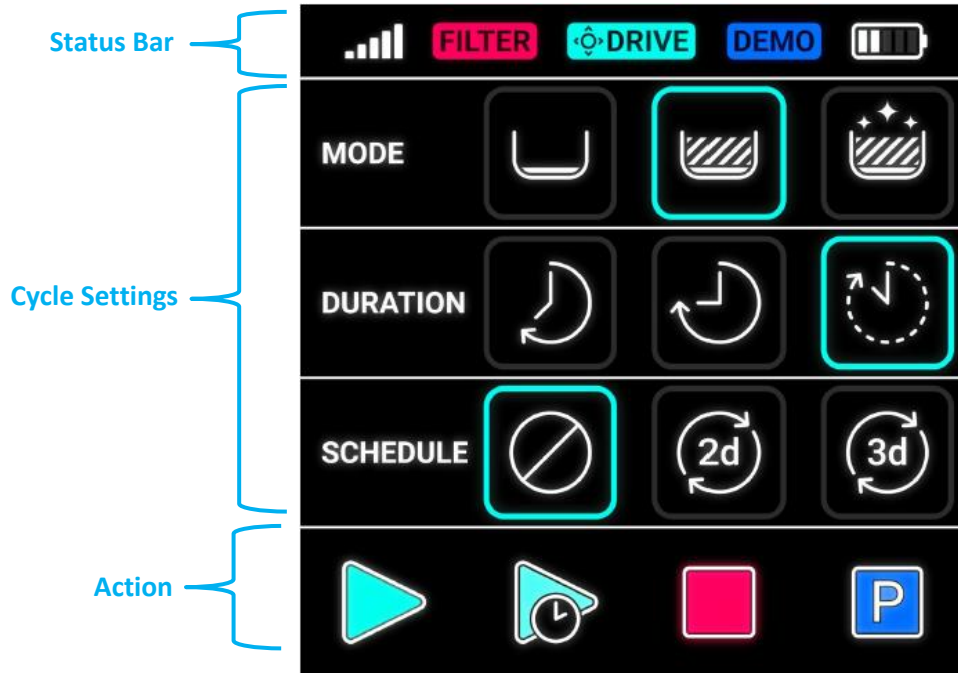


Figure 7 Display Area

The display has 3 areas:

1. Status bar: see section [3.5.7](#).

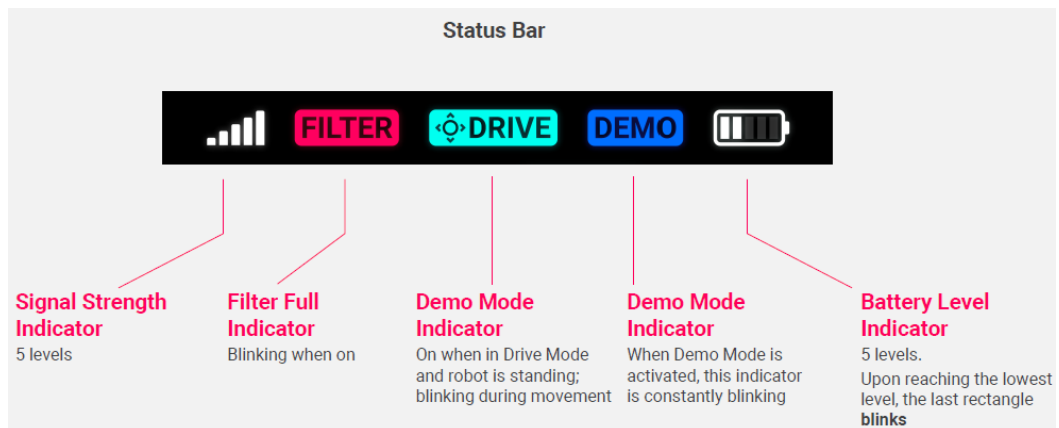



Figure 8 Status bar



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All Field will be Fill automatically from the ePDM System.

2. Cycle settings: see section [3.5.5](#).

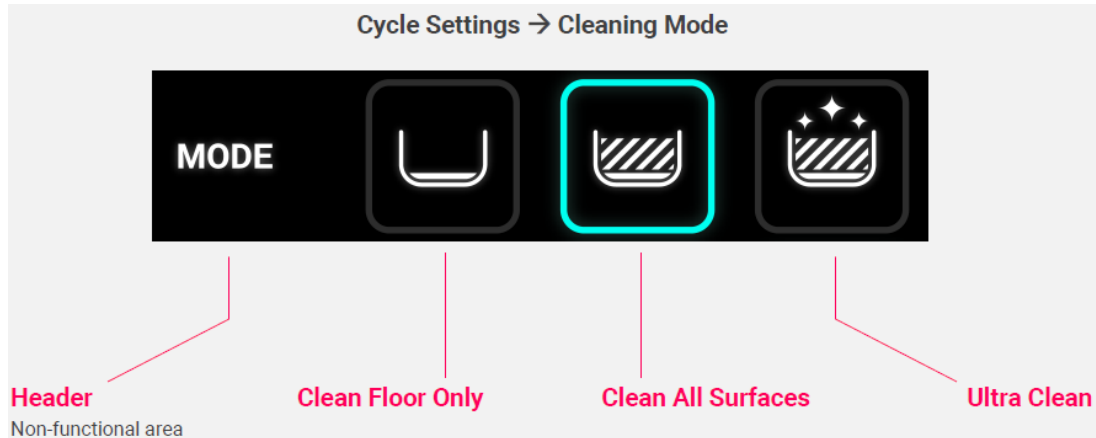


Figure 9 Mode options

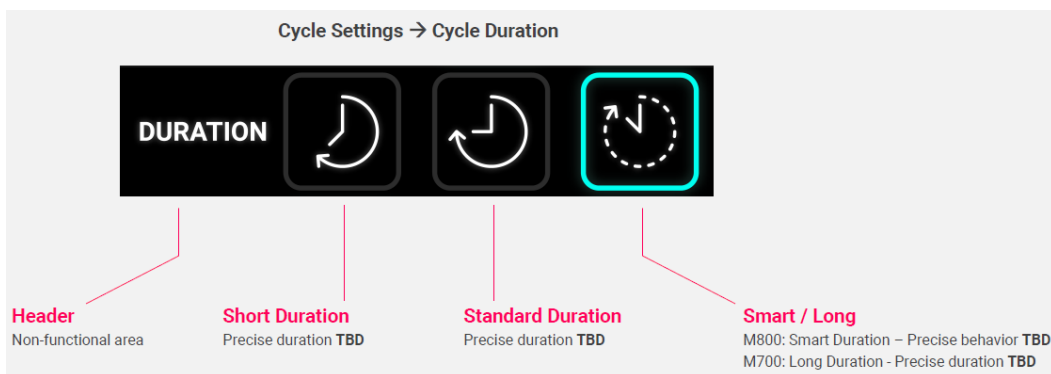


Figure 10 Duration options

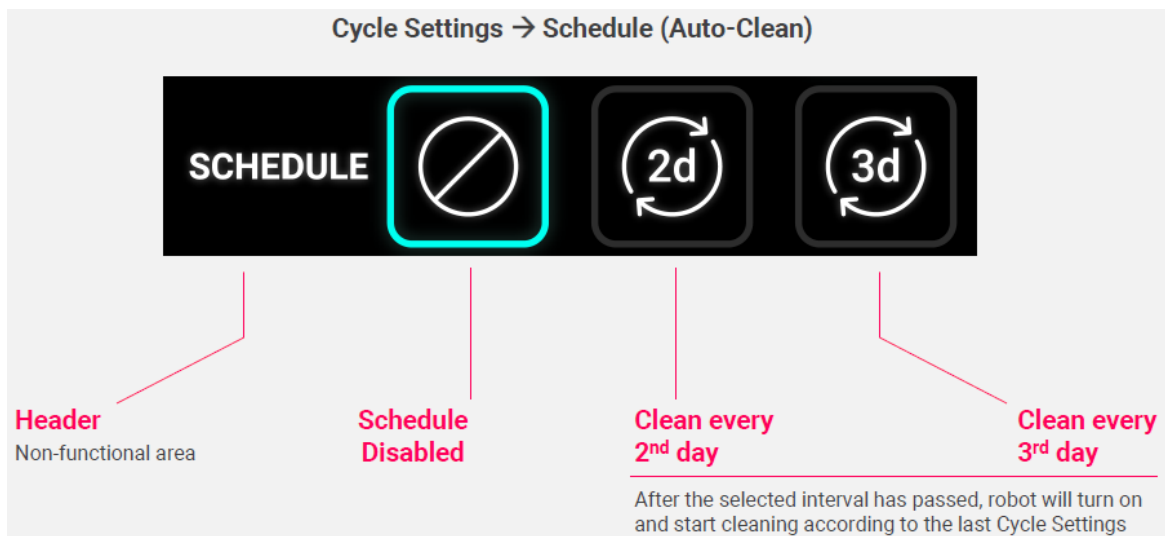



Figure 11 Schedule options

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All Field will be Fill automatically from the ePDM System.

3. Actions: manual and on screen, section [3.5.6](#).

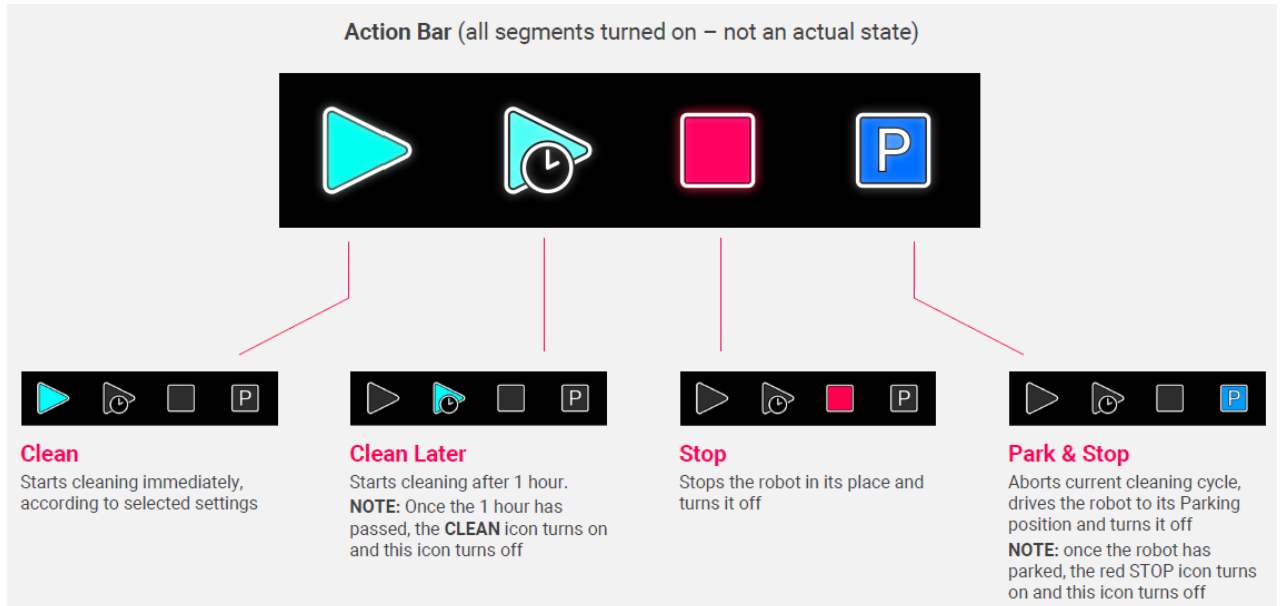


Figure 12 Actions options

### 3.5.5 Display area behavior


The display area shall have the following behavior.

#### 1. Power up

- a. All icons and segments shall be displayed for 2 seconds.
- b. After 2 seconds:
  - i. If a connection to a PWS was already established, then the cycle settings icons shall be displayed 1<sup>st</sup> row (mode) left most blinks. Left most icon in 2<sup>nd</sup> and 3<sup>rd</sup> row (duration and schedule) turn on constantly.
  - ii. If there is no connection, the RCU "Signal Strength" icon blinks in 500ms **on** 500ms **off** indefinitely (while continue trying to connect) and "Battery" icon shall be displayed as well (constantly).

#### 2. Select and approve

- a. The user shall use the "direction" buttons to move between rows (up and down) or inside the row (left or right).
- b. To select, the user shall scroll to the desired icon, and then press "Ok".
- c. Once the "Ok" was pressed, the RCU shall send the selection command to the PWS (see relevant op-code):

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All Field will be Fill automatically from the ePDM System.

- i. If received ACK from PWS: cursor shall move 1 row down and the buzzer shall make a short, 1 second, sound. If the row was the lowest it shall scroll to the upper row.
  - ii. If received NACK or nothing from PWS: cursor shall stay on the selected icon and no buzzer sound.
- d. When navigating with the left and right arrows and pressing down without pressing OK, the icon shall return to the last selected state (pressing down shall not send command, only OK).


### 3. Pairing mode

- a. All icons and segments shall be displayed for 2 seconds.
- b. After 2 seconds:
  - i. If pairing and connection to a PWS was already established, then the cycle settings icons shall be displayed 1<sup>st</sup> row (mode) left most blinks. Left most icon in 2<sup>nd</sup> and 3<sup>rd</sup> row (duration and schedule) turn on constantly (UX the user shall stop pressing the <> buttons).
  - ii. If pairing is not yet successful, then all icons and segments will continue to be displayed until leaving pairing mode (either paired or user let go or <+> buttons).

### 3.5.6 Cycle settings

The following options are available for the user to control (set):

1. Mode: selecting cleaning programs (see op-code 0xD3 in section [3.6.6](#)):
  - a. All surface
  - b. Floor only
  - c. Ultra-clean
2. Duration: cycles time selector (see op-code 0xD1 in section [3.6.6](#)):
  - a. Smart (Q8)
    - i. Smart = right icon in schedule bar
    - ii. Smart short = left icon in schedule bar
  - b. Classic (Q7/S2):
    - i. Short = 1.5 hours (left icon in schedule bar)
    - ii. Standard = 2 hours (central icon in schedule bar)
    - iii. Long = 2.5 hours (right icon in schedule bar)
  - c. Classic (M5)
    - i. Short = 1.5 hours (left icon in schedule bar)
    - ii. Standard = 2.5 hours (central icon in schedule bar)

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All Field will be Fill automatically from the ePDM System.

iii. Long = 3.5 hours (right icon in schedule bar)

d. The RCU shall send a command to know whether a Q8 or Q7/M5M2 robot is paired. See section [3.6.3](#).

3. Schedule: weekly timer selector:

- a. No timer
- b. Cleaning cycle once every 2<sup>nd</sup> day or every 3<sup>rd</sup> day (see op-code 0xD4 in section [3.6.6](#)).

4. **General notes:**

- a. After power-up, the RCU shall display left icon for each of the 3 rows (mode, duration and schedule).
- b. All settings have a corresponding BLE command (to PWS).

### 3.5.7 Actions

1. **Manual navigation**

- a. The user shall have the ability to manually navigating the robot using the navigation buttons.
- b. There are 4 buttons: forward, backward, left and right.
- c. When a user press one of these buttons a BLE command is sent to the PWS (see instruction 0x03 in [section 3.6.4](#)).
- d. While holding the button, the RCU shall send a BLE command every **2,000 msec**.
- e. When a user unpress the button, a BLE command (Stop) is sent to the PWS.
- f. When user is in manual navigation, all setting icons shall turn-off.


2. **On screen actions (part of the setting display)**

- a. It is part of the setting display.
- b. Turning Robot on / off (clean icon) - see op-code 0x05/0x06 in section [3.6.4](#)
  - i. Default icon state is off.
  - ii. Selecting the button shall turn it on and shall turn the robot on.
  - iii. While **ON**, selecting again shall turn the icon **off** and shall turn the robot off.
- c. Delay = clean later options (see op-code 0xD2 in section [3.6.6](#)):
  - i. No delay (default) = icon off.
  - ii. Classic: 1-hour delay = icon on.

### 3.5.8 Status bar notifications

The following shall be display notification

1. Communication
2. FBI

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All Field will be Fill automatically from the ePDM System.

3. Manual navigations
4. Demo mode
5. Low battery

When the user shall turn on the RCU, the RCU shall send a status command request (see instruction 0x03 in [section 3.6.4](#)).

### 3.5.9 BIST (Built in Self-Test)

The RCU shall have built in self-test. It shall be used in two cases:

1. For testing the board during production.
2. Technician mode.

#### Production tests

See reference file [BLE RCU Tester AT-Commands Advertising\\_REV5.docx](#).

#### Power on tests

The following items shall be checked after power up:


1. Power input level
2. HW revision

### 3.5.10 Technician mode

By pressing, simultaneously, the “Down” and “Toggle” buttons for 10 seconds the RCU shall enter “technician mode”. During the technician mode buttons test, the display shall show only the “Demo”, “Filter” and “Drive” icons, blinking in a 0.5 second “on”, 0.5 second “off” rate.

Upon entering this mode, the technician shall have to:

1. Buttons
  - a. The user shall press all 6 buttons one by one.
  - b. After each press, the buzzer shall make a short, 1 second, sound.
  - c. After all buttons are pressed, the buzzer shall make a long, 2 seconds, sound.
2. After the buttons press sequence ended, the RCU shall jump to display test.
3. Display test:
  - a. All icons shall be off.
  - b. By pressing the “Selection right” button, a sequential turning on all display icons (one by one).
  - c. Once finished, the user shall press the “Ok” and the RCU shall exit from test mode.
4. Exit (before finish)
  - a. If user stops the test i.e. stops pressing the buttons, after 5 seconds the RCU shall exit from test mode.


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All Field will be Fill automatically from the ePDM System.

### 3.5.11 Demo mode

By pressing, simultaneously, the “Toggle” and “Forward” (^) buttons for 10 seconds the RCU shall send enter “Demo” mode to the PWS. While in “Demo” mode, all icons shall be off and in the notification area the “Demo” shall blink 500 msec on and 500 msec off.

To exit demo mode, press, simultaneously, the “Toggle” and “Forward” buttons for 10 seconds again. The RCU shall send “All surface” cleaning mode (see section 3.6.6 op-code 0xD3).

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All Field will be Fill automatically from the ePDM System.

## 3.6 BLE Protocol

### 3.6.1 BLE Settings

1. The BLE profile shall be custom serial chat.
2. The PWS shall be defined as “Slave/Peripheral” device i.e. it shall be the advertising device.
3. The RCU shall be the defined as “Master/central” device i.e. it shall scan for PWS devices.

To operate the PWS/Robot the PWS – RCU protocol shall uses the following commands (see next sections).

### 3.6.2 Protocol Structure

#### 3.6.2.1. JSON Protocol

JSON (JavaScript Object Notation) is a lightweight data-interchange format.

This format shall be used to send message over the air (BLE / Wi-Fi).

The JSON packet format shall be:

{ **String : Value** }

1. **String** is used to describe the message content/purpose (see table below).
2. **:** is used to separate between the string and value
3. **Value** contains the “message structure” as described in the following sections. The HEX bytes that are listed in these sections converted to ASCII characters in the JSON format.

**Note: when RCU sends JSON packet it should at least include “:” and “value”**

**Example: Set “Delay”**

SOP	Path	Profile	Instruction	DataLen	Data	CS
0xAB	0x03	0xFFF9	0xD2	0x0001	0x02	037B
Start of Packet	From RCU to PWS	PWS	Op-code	Data length = 1	1-hour delay	Check sum

#### Convert to JSON


PWS command: ab03fff9d2000102037b

#### 3.6.2.2. String name

The string is used to describe the message content as defined in the differet profiles.

Profile name	Value	String Name
Commands to Robot	0xFFF7	Robot command
Commands to PWS	0xFFF8	PWS command
Write parameters to PWS	0xFFF9	Write PWS

**Table 3 String name**

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All Field will be Fill automatically from the ePDM System.

### 3.6.3 Message Structure

The message has the following fields:

Field Name	Position in Message	Description	Size [Bytes]	Value
<b>SOP</b>	0	Start of packet	1	0xab
<b>Path</b>	1	Describes the path source and destination	1	See path table below
<b>Profile</b>	2	Inherited from the BLE. Each profile describes different interaction with the PWS	2	See section 3.1.2 and details in section 4
<b>Instruction</b>	4	Command or Code	1	See command table for each of the different profiles
<b>DataLen</b>	5	Number of bytes in the data field	2	Number of bytes in HEX format
<b>Data</b>	7	Included the command, code or parameters or status data	N bytes	Depends on profile
<b>CS</b>	7 + N	Include all fields	2	Calculated each time <b>CS = sum of all bytes</b>

Table 4 RCU to PWS Message

The different paths (source to destination) are:

Source	Destination	Value
BLE (RCU)	PWS	0x04
PWS	BLE (RCU)	0x0D

Table 5 Path description

#### Acknowledgment message

In the **instruction** field, the same instruction values should be written.


The **data** field shall contain a message **code** as described in each profile section (**DataLen** field value is usually = 0x01) and sometimes more data.

For each profile acknowledgment, a DataLen should be calculated separately.

#### **Note:**

*Ack message is sent to wireless entity only after PWS / Robot received the message and performed the action.*



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All Field will be Fill automatically from the ePDM System.

### 3.6.4 Commands: RCU to PWS

Profile	Instruction	Description	ARGS	LEN of ARGS [bytes]
0xFFFF7	0x03	Joystick command: 1. 1 <sup>st</sup> byte: direction 2. 2 <sup>nd</sup> byte (SS): speed value from 0x00 to 0x64 (set the PWM 0% - 100%)	Stop = 0x0100 Forward = 0x0264 Backward = 0x0364 Right = 0x0464 Left = 0x0564	2
0xFFFF7	0x04	Quit RC mode	None	0
0xFFFF8	0x05	Shutdown dolphin	None	0
0xFFFF8	0x06	Startup dolphin	None	0
0xFFFF8	0xD6	Robot status	None	0

Table 6 Instructions list

### 3.6.5 Commands: PWS to RCU

The acknowledgment is sent without a delay.


The DataLen in the message equals to = 1 + Param DataLen (if exists)

For example, 0xD6 DataLen = 2 i.e. 0005 (Ack no error + M5)

Code values:

Profile	Value	Name	Description
0xFFFF7/8	0x00	NOERR	No Error
0xFFFF7/8	0x01	RC Command CRC error	CRC error between RCU and PWS
0xFFFF7/8	0x04	Invalid op-code	Invalid CMD
0xFFFF7/8	0x0A	Wait	CMD is processed yet
0xFFFF8	0xD6	Robot status: 1. Robot type (1 byte) 2. Robot status (1 byte) 3. Filter state (1 byte): Number between 0% to 100% 4. Pairing RSSI desired level e.g. -40 = 0xFFD8 (default -30 = 0xFFE2)	1. 1 <sup>st</sup> byte robot type: 1. 0x01 = m600 2. 0x02 = iO 3. 0x03 = s2 4. 0x04 = s1 (future) 5. 0x05 = m5 6. 0x1f = PWS_FDT (production) 2. 2 <sup>nd</sup> byte robot status: 1. 0x01 = On 2. 0x02 = Off 3. 0x03 = Delay 4. 0x04 = Pickup mode active 5. 0x05 = Demo mode active 3. 3 <sup>rd</sup> byte filter state: 1. 100% (full) = 0x64 2. 0% (clean) = 0x00 4. 2 bytes: desired RSSI level in hex format
0xFFFF8	0xCC	Command not supported	For development process

Table 7 Commands ACK Error codes

<b>BLE RCU</b> SERVO CALIBRATION SUPPORT SOW HW/SW SRS		 <small>Exceptional Pool Experience</small>		
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All Field will be Fill automatically from the ePDM System.

### 3.6.6 Write parameters: RCU to PWS

Instructions list:

Profile	Instruction	Description	ARGS	LEN of ARGS [bytes]
0xFFFF9	0xD1	RC - Cycle time	1 - Smart 2 - Smart (short) - once only Classic: 3 – 1.5 hours (M600/S2/M5) 4 – 2 hours (M600/S2) 5 – 2.5 hours (M600/S2/M5) 6 – 3.5 hours (for M5)	1
0xFFFF9	0xD2	RC - Delay mode time	1 – No delay 2 – 1-hour delay	1
0xFFFF9	0xD3	RC - Working/clean mode (regular/fast)	1 - All surface 2 - Floor only (till next change) 3 – Not used 4 - Ultra clean (Once only) 5 – Pickup mode (Once only) 6 – Demo mode (Once only)	1
0xFFFF9	0xD4	RC - Weekly Timer settings	1 – Non 2 – Every 2 <sup>nd</sup> day 3 – Every 3 <sup>rd</sup> day	1

Table 8 Codes list


### 3.6.7 Write parameters: PWS to RCU

This is a description of one ACK packet to parameters write setting.

Code values:

Profile	Value	Name	Description
0xFFFF9	0x00	NOERR	No Error
0xFFFF9	0x01	CRC ERROR	CRC error between RCU and COM board
0xFFFF9	0x04		Invalid CMD
0xFFFF9	0x0C		Failed to write Weekly Scheduler to flash
0xFFFF9	0xCC	Command not supported	For development process

Table 9 Write Parameter ACK Error codes

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All Field will be Fill automatically from the ePDM System.

## 3.7 Production Specifications

### 3.7.1 Transport

1. Each unit shall have its dedicated nylon bag.
2. The battery shall be inside the unit.
3. A transport box shall contain 50 units per export carton.

### 3.7.2 Production tests

1. Each unit shall be tested as described in section [3.5.7](#).

### 3.7.3 Labeling

1. The units shall have the following labels imprinted on it:
  - a. CE



Figure 13 CE mark

- b. Recycling



Figure 14 Recycling mark

2. The units shall have the following sticker on it:
  - a. Part number.
  - b. Serial number.

FCC Caution.

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.