

Digi International OEM WiFi module Specification and Integration Guide.

Model 50002100-01

NOTE: WBM = 50002100-01

7.0 PROCEDURE/ INTIGRATION INSTRUCTIONS

7.1 Communications

7.1.1. Contains a 3.3V logic level asynchronous receive and transmit port for connection to the battery terminals for communication with the pump.

[HRS 35195-002-001].

7.1.2. Contains a Power port for power connection to the Pump. Vin is 6.0Vdc – 9.5Vdv,

[HRS 35195-002-036]

7.1.3. Contains a Ground port for ground connection to the Pump.

[HRS 35195-002-037]

7.2 Charging Subsystem

7.2.1. The WBM charge management system shall be designed with a Low Power RISC based Microcontroller. **[HRS 35195-002-035]**

7.2.1.1 The WBM charge management CPU shall have a minimum of one Universal Asynchronous Receive Transmit (UART) interface. **[HRS 35195-002-039]**

7.2.1.2 The WBM Charge management CPU shall have a minimum of one Serial Peripheral Port (SPI) interface. **[HRS 35195-002-040]**

7.2.1.3 The WBM Charge management CPU shall have a minimum of nine (9) General Input/Output (GPIO) interfaces. **[HRS 35195-002-041]**

7.2.1.4 The WBM Charge management CPU shall have a minimum of one Pulse Width Modulator (PWM) interface. **[HRS 35195-002-042]**

7.2.1.5 The WBM Charge management CPU shall have a minimum of four (4) Analog-To-Digital converter interfaces **[HRS 35195-002-043]**

7.2.1.6 The WBM Charge management CPU shall have a reset port. **[HRS 35195-002-044]**

7.2.1.7 The WBM Charge management CPU shall have the capability of disabling or enabling the WIFI CPU **[HRS 35195-002-045]**

7.2.2. WBM contains circuitry to detect the presence of a Li-Ion battery pack. **[HRS 35195-002-002]**

7.2.3. WBM contains circuitry which is capable of supplying a constant charge current to the battery pack. **[HRS 35195-002-003]**

7.2.4. WBM contains circuitry which is capable of reading the battery pack temperature. **[HRS 35195-002-004]**

7.2.5. The battery module shall contain circuitry that is capable of reading a battery voltage. **HRS 35195-002-005]**

7.2.6. The battery voltage measurement shall use an operational amplifier (Op-Amp) for voltage measurement. **[HRS 35195-002-148]**

7.2.7. The configuration resistors of the Op-Amp within the battery voltage measuring circuit shall be 0.1% or less precision. **[HRS 35195-002-149]**

7.3 Radio Subsystem: The WBM is a self-contained 802.11 a,b,g,n,ac WiFi client communication module. The WBM is designed for and used by single OEM customer for use in this customer's hosting product.

7.3.1. Processor system

7.3.1.1 The battery module WIFI system shall have an ARM9 class Central Processing Unit (CPU). **[HRS 35195-002-006]**

7.3.1.1.1 The WBM WIFI CPU shall have a minimum of one (1) SPI interface. **[HRS 35195-002-047]**

7.3.1.1.2 The WBM WIFI CPU shall have a minimum of one (1) UART interface. **[HRS 35195-002-048]**

7.3.1.1.3 The WBM WIFI CPU shall have a minimum of seven (7) GPIO interfaces. **[HRS 35195-002-049]**

7.3.1.1.4 The WBM WIFI CPU shall have a minimum of one (1) Joint Test Action Group (JTAG) interface. **[HRS 35195-002-050]**

7.3.1.1.5 The WBM WIFI CPU shall have a reset port. **[HRS 35195-002-051]**

7.3.1.1.6 The WBM WIFI CPU shall have a voltage monitoring circuit. **[HRS 35195-002-052]**

7.3.1.2 The Radio subsystem shall have minimum 8MByte flash **[HRS 35195-002-007]**

7.3.1.3 The Radio subsystem shall have minimum 16MByte RAM **[HRS 35195-002-008]**

7.3.1.4 The Radio subsystem shall have 1 serial port (Tx and Rx) for communication to pump **[HRS 35195-002-009]**

7.3.1.5 The Radio subsystem shall have 1 serial port (Tx and Rx) for debug purposes; may be shared with the SPI bus. **[HRS 35195-002-010]**

7.3.1.6 The Radio subsystem shall have SPI bus connected to battery charging CPU, the battery charger is the SPI slave. **[HRS 35195-002-011]**

7.3.1.7 The Radio subsystem shall have 3 GPIO connected to battery charging CPU. **[HRS 35195-002-012]**

7.3.1.8 The Radio subsystem shall have JTAG interface for software debug **[HRS 35195-002-013]**

7.3.2. Radio

7.3.2.1 The Radio subsystem shall operate on DC voltages from 6.0 – 9.5 VDC **[HRS 35195-002-014]**

7.3.2.2 The Radio subsystem shall contain an Integrated primary antenna that is part of the PCB layout. This antenna layout is defined in the **31000003-01 Antenna Spec.docx document.** **[HRS 35195-002-015]**

7.3.2.3 N/A

7.3.3. N/A

7.3.3.1 Tx Power:

7.3.3.1.1 2.4 GHz operation

7.3.3.1.1.1 802.11 b

7.3.3.1.1.1.1 The WBM Typical TxPower shall be 10.5 dBm (+/- 2dBm) **[HRS 35195-002-136]**

7.3.3.1.1.2 802.11 g

7.3.3.1.1.2.1 The WBM Typical TxPower shall be 11 dBm (+/- 2dBm) **[HRS 35195-002-137]**

7.3.3.1.1.3 802.11 n

7.3.3.1.1.3.1 The WBM Typical TxPower shall be 13 dBm (+/- 2dBm) **[HRS 35195-002-138]**

7.3.3.1.2 5 GHz operation

7.3.3.1.2.1 802.11 a

7.3.3.1.2.1.1 The WBM Typical TxPower shall be 13 dBm (+/- 2dBm) **[HRS 35195-002-139]**

7.3.3.1.2.2 802.11 n

7.3.3.1.2.2.1 The WBM Typical TxPower shall

be 13 dBm (+/- 2dBm) [**HRS 35195-002-140**]

7.3.3.2 Rx Sensitivity (*larger negative numbers represent better performance*):

7.3.3.2.1 2.4 GHz operation

7.3.3.2.1.1 802.11 b

7.3.3.2.1.1.1 The WBM Typical Rx Sensitivity

shall be less or equal to -86 dBm

(depending on the data rate) [**HRS 35195-002-141**]

7.3.3.2.1.2 802.11 g

7.3.3.2.1.2.1 The WBM Typical RxSensitivity

shall be less or equal to -74 dBm

(depending on the data rate). [**HRS**

35195-002-]

7.3.3.2.1.3 802.11 n (2.4 GHz, 20 MHz Bandwidth)

The WBM Typical Rx Sensitivity shall be

greater or equal to -70 dBm (depending

on the data rate [**HRS 35195-002-142**]

7.3.3.2.2 5 GHz operation

7.3.3.2.2.1 802.11 a

7.3.3.2.2.1.1 The WBM Typical Rx Sensitivity

shall be less or equal to -72 dBm

(depending on the data rate) [**HRS 35195-**

002-143]

7.3.3.2.2.2 802.11 n (5 GHz, 20 MHz Bandwidth)

7.3.3.2.2.2.1 The WBM Typical Rx Sensitivity

shall be less or equal to -69 dBm

(depending on the data rate) [**HRS 35195-**

002-144]

7.3.3.2.2.3 802.11 n (5 GHz, 40 MHz Bandwidth)

7.3.3.2.2.3.1 The WBM Typical Rx Sensitivity

shall be less or equal to -65 dBm

(depending on the data rate) [**HRS 35195-**

002-145]

7.3.3.3 Integrated Antenna

Gain. see Document **31000003-01_A Antenna Spec.docx**

7.3.3.3.1 Integrated Antenna gain in the 2.4 GHz band is 0 dBm. [**HRS 35195-002-146**]

7.3.3.3.2 Integrated Antenna gain in the 5 GHz band is 3.5 dBi. [**HRS 35195-002-147**]

Integrated Antenna gain is not included in the conducted Tx/Rx radio performance specifications outlined in this document.

7.3.3.4 Operating Band

7.3.3.4.1 The 802.11 b shall operate in a 2.4 GHz band.

[**HRS 35195-002-130**]

7.3.3.4.2 The 802.11 g shall operate in a 2.4 GHz band.

[**HRS 35195-002-131**]

7.3.3.4.3 The 802.11 a shall operate in a 5 GHz band [**HRS**

35195-002-132]

7.3.3.4.4 The 802.11 n shall operate in a 2.4 GHz and a 5

GHz band. [**HRS 35195-002-133**]

7.3.3.5 Power Consumption

7.3.3.5.1 Power consumption shall be less than or equal to

2 W (606mA @ 3.3VDC) when transmitting continuously.

[**HRS 35195-002-030**]

7.3.3.5.2 Power consumption shall be less than or equal to 1 W when not transmitting. **[HRS 35195-002-031]**

Note: Continuous power is defined as a maximum transmission in a realistic situation such as continuous attempt to associate with the Access Point. This is relative to the 1.4 mAh cell capacity requirement for 4hrs of operation.

7.3.3.5.3 The WBM module shall only be enabled upon sensing of the LVP Rx port being active. **[HRS 35195-002-152]**

7.3.3.5.4 The WBM module contains an integrated 3.3V voltage regulator that supplies the power to the WiFi radio subsystem.

7.3.3.6 Radio certifications

7.3.3.6.1 For use in the following locales:

7.3.3.6.1.1 United State of America

FCC Part 15 Subpart C 15.247 (DTS)

FCC CFR 47 Part 15 Subpart E 15.407

FCC CFR 47 Part 1.1310 **[HRS 35195-002-033]**

7.3.3.6.1.2 Canada **[HRS 35195-002-034]**

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7.3.3.6.2 The assemblies shall be delivered with Federal Communications Commission (FCC) Certification Document (90002571-88). **[HRS 35195-002-053]**

7.3.4 Additional testing The OEM customer is responsible for any additional certification testing (i.e. FCC Part 15 Subpart B) of the final hosting product that contains the WBM.

7.4 Manufacturing:

7.4.1. The WBM PCB shall be inspected to IPC-A-610 Class 2. **[HRS 35195-002-055]**

7.4.2. The WBM PCB shall be manufacturer to IPC-A-610 Class 2. **[HRS 35195-002-056]**

7.4.3. The WBM PCB material shall meet IPC 4101/126. **[HRS 35195-002-057]**

7.4.4. The WBM assembly shall be compliant to the Restriction of Hazardous Substances (RoHS). **[HRS 35195-002-058]**

7.4.5. The following nodes shall have a minimum of one (1) accessible test point: **[HRS 35195-002-059]**

7.4.5.1 GND, PWR

7.4.5.2 SPI_MISO, SPI_CLK, SPI_MOSI

7.4.5.3 ATMEL_SS

7.4.5.4 GPIO6, GPIO7

7.4.5.5 WIFI_CPU-RX, WIFI_CPU-TX

7.4.5.6 JTAG_TRST, JTAG_TDI, JTAG_TDO, JTAG_TMS, JTAG_TCK

7.4.5.7 Charging CPU_RX, Charging CPU_TX

7.4.5.8 Battery Type, Battery Voltage, Battery Temperature

7.4.5.9 RESET

7.4.6. Areas on the PCB subject to de-penalization shall be defined. **[HRS 35195-002-071]**

7.4.7. The areas of the PCB that are subjected to de-penalization shall be free of sharp edges and burrs and shall fit into the plastic enclosure used by the customer (Ex."mouse bites")**[HRS 35195-002-072]**

7.5 Safety:

7.5.1. The WBM shall be short circuit protected by a 2.5A fuse. **[HRS 35195-002-061]**

7.5.2. RF exposure. The WBM is not to be used within 20cm of a human body.

7.5.3 The OEM customer must include a statement in the host products user manual that states that the product must not be used within 20cm of a human body.

7.5.4 The WBM must not be used with any other co-existing transmitters.

7.6 Label:

7.6.1. The PCB shall be labeled with a MAC address. **[HRS 35195-002-062]**

7.6.2. The manufacturer name shall be embedded or Silk Screened within the bare board. **[HRS 35195-002-063]**

7.6.3. The manufacturer bare board part number shall be embedded within the bare board. **[HRS 35195-002-064]**

7.6.4. The bare board shall be labeled with the PCB flammability rating. **[HRS 35195-002-065]**

7.6.5. The AVR programmed part shall be labeled with the number and revision at a minimum. **[HRS 35195-002-066]**

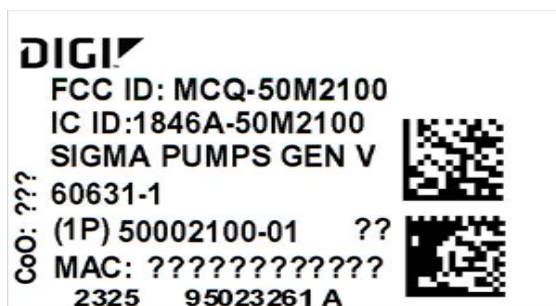
7.6.6. The AVR Battery Charger controller shall be programmed with Baxter provided Boot Loader, Application and Fuse/Lock Bits. **[HRS 35195-002-150]**

7.6.7. The PCB shall be labeled with the Manufacturer Assembly part number. **[HRS 35195-002-067]**

7.6.8. FCC and ISED labeling

7.6.8.1 The OEM integrator must clearly display the text “Contains FCC ID: MCQ-50M2100” and “Contains IC: 1846A-50M2100” on the exterior of final hosting product.

7.6.8.2 The WBM PCB shall be labeled with the FCC ID, ISED information, and model name (example below). See 50002100-XX.pdf page 3 for placement. **[HRS 35195-002-068]**



7.6.9. All PCBs and flexible printed circuit base layers and coverlay layers, excluding membrane switches and tail, shall be constructed of polyimide or a material with a minimum flammability rating of UL 94 V0 or VTM-0. **[HRS 35195-002-069]**

7.7 Composition

7.7.1. Areas of the battery module PCB, with the exception of the Integrated Antenna, Connectors and RF Section, shall be covered by conformal coating per IPC-A-610. **[HRS 35195-002-032]**

7.7.2. The layout of the A/B/G/N PCB shall be compatible with the development boards P/N 55001610 **[HRS 35195-002-134]**

7.7.3. The physical dimensions of the A/B/G/N PCB shall be the same as the A/B/G PCB P/N 60202 **[HRS 35195-002-135]**

7.7.4. The stack up of the PCB, including connector shall not exceed 0.494 inch.

[HRS 35195-002-070]

7.7.5. The design of the A/B/G/N PCB shall be fully functional and tested. **[HRS 35195-002-151]**

7.8 FCC and ISED statements

FCC

The Sigma Pumps Gen V 802.11abgn Module has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 Subpart B, of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, 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 and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the 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.

This device complies with Part 15 of FCC rules Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

ISED

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications,

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

--IC (Industry Canada) RSS-247:2015, Issue 1.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.