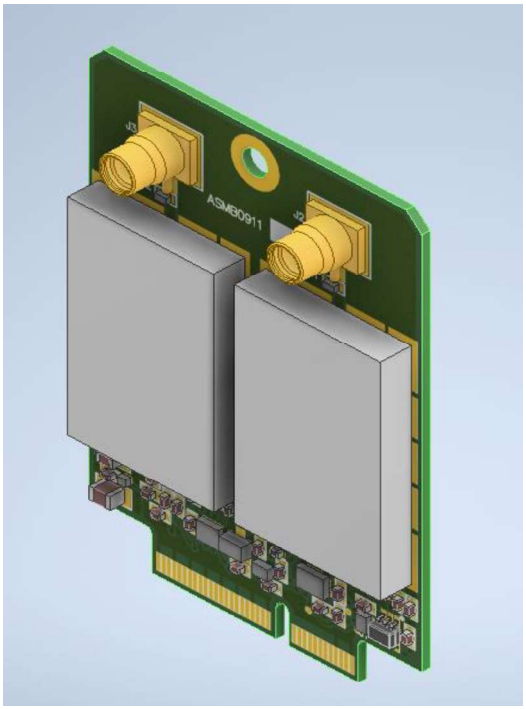
Digital Mining Technology

# ASMB0911

## *MINI DUAL RF UHF MODULE SILABS*

# HARDWARE INTEGRATION MANUAL



# CONTENTS

# 1. MANUFACTURER INFORMATION

## 1.1. INTRODUCTION

The product or product family described under scope of this document will be henceforth referred to as DEVICE.

This manual provides the information on the DEVICE, its variants, specifications, operation, maintenance, decommission and disposal.

## 1.2. SAFETY INFORMATION

The safety section includes safety precautions which must be observed when working on items that appear throughout the manual. Examples of safety precautions and labels are outlined below:

| | |
|---|---|
|   | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. |
|   | Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. |
|   | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. |
|   | Indicates a potential for equipment damage. |

## 1.3. DISCLAIMER

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These specifications are subject to change without notice.

## 1.4. COMPANY DETAILS


**Manufacturer:**

**Industrea Mining Technology Pty Ltd (trading as Digital Mining Technology)**
3 Co-Wyn Close
Fountaindale, New South Wales, 2258
Australia

| | |
|---|---|
| Telephone | +61 2 8863 4730 |
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| | www.wabteccorp.com |


Industrea Mining Technology Pty Ltd is a registered business subsidiary of Wabtec Corporation

# 2. OVERVIEW

## 2.1. GENERAL FEATURES

The ASMB0911 is a digitally controlled radio module implemented on an industry standard M2.xx style circuit board. This module can use used in a host controller board to provide a short range, power limited UHF radio link for a variety of applications.

Key features include:

- Silabs Si4463 digitally controlled radio – Qty: 2 Nos.
- Power supply regulation/conditioning
- Serial interface
- Dual RF antennae connectors

## 2.2. ABBREVIATIONS

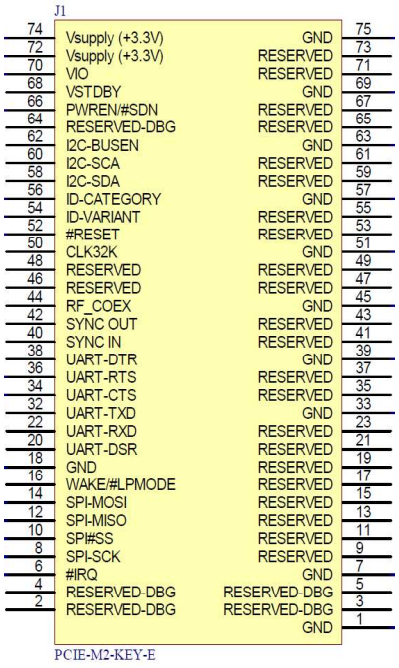
| ABBREVIATION | DESCRIPTION |
|---|---|
| V2V | Vehicle to Vehicle |
| N/C | Not Connected |

## 2.3. SCOPE & SPECIFICATION

This user manual covers Mini Dual RF UHF Module Silabs Radio Module, Model No.: ASMB0911.

| FEATURE | DETAIL |
|---|---|
| Operating Frequency Band | 869.40 - 869.650 MHz<br>902 – 928 MHz |
| Maximum Transmit Power | 20 dBm at MMCX Pins |
| Chipset | SiLabs Si4463 – 2 Nos. |
| Chipset Frequency Range | 142–1050 MHz |
| Modulation | 4GFSK |
| Antenna Type | Two MMCX antenna connectors |
| Antenna Gain | 902-928 MHz: Peak Gain +8 dBi max<br>869.40 - 869.650 MHz: Peak Gain +2.9 dBi max |
| Additional Mitigation Techniques | Listen Before Talk |
| Rated Voltage | 3.3 Vdc |
| Operating Temperature | -40°C to +75°C |
| Module Dimensions | 45 mm x 32 mm |

## 2.4. PIN CONFIGURATION AND FUNCTION




| PIN | SIGNAL | TYPE |
|---|---|---|
| 74 | $V_{supply}$ (+3.3V) | PWR |
| 72 | $V_{supply}$ (+3.3V) | PWR |
| 70 | $V_{IO}$ | PWR |
| 68 | $V_{STDBY}$ | PWR |
| 66 | PWREN/#SDN | CMOS |
| 64 | RESERVED-DBG | N/C |
| 62 | I2C-BUSEN | CMOS |
| 60 | I2C-SCA | CMOS-OD |
| 58 | I2C-SDA | CMOS-OD |
| 56 | ID-CATEGORY | Passive |
| 54 | ID-VARIANT | Passive |
| 52 | #RESET | CMOS-OD |
| 50 | CLK32K | CMOS |
| 48 | RESERVED | N/C |
| 46 | RESERVED | N/C |
| 44 | RF_COEX | CMOS-OD |
| 42 | SYNC OUT | CMOS |
| 40 | SYNC IN | CMOS |
| 38 | UART-DTR | CMOS |
| 36 | UART-RTS | CMOS |
| 34 | UART-CTS | CMOS |
| 32 | UART-TXD | CMOS |
| 30 | MECH E KEY | |
| 28 | MECH E KEY | |
| 26 | MECH E KEY | |
| 24 | MECH E KEY | |
| 22 | UART-RXD | CMOS |
| 20 | UART-DSR | CMOS |
| 18 | GND | PWR |
| 16 | WAKE/#LPMODE | CMOS |
| 14 | SPI-MOSI | CMOS |
| 12 | SPI-MISO | CMOS(HiZ) |
| 10 | SPI#SS | CMOS |
| 8 | SPI-SCK | CMOS |
| 6 | #IRQ | CMOS-OD |
| 4 | RESERVED | N/C |
| 2 | RESERVED | N/C |
| | | |

| PIN | SIGNAL | TYPE |
|---|---|---|
| 75 | GND | PWR |
| 73 | RESERVED | N/C |
| 71 | RESERVED | N/C |
| 69 | GND | PWR |
| 67 | RESERVED | N/C |
| 65 | RESERVED | N/C |
| 63 | GND | PWR |
| 61 | RESERVED | N/C |
| 59 | RESERVED | N/C |
| 57 | GND | PWR |
| 55 | RESERVED | N/C |
| 53 | RESERVED | N/C |
| 51 | GND | PWR |
| 49 | RESERVED | N/C |
| 47 | RESERVED | N/C |
| 45 | GND | PWR |
| 43 | RESERVED | N/C |
| 41 | RESERVED | N/C |
| 39 | GND | PWR |
| 37 | RESERVED | N/C |
| 35 | RESERVED | N/C |
| 33 | GND | PWR |
| 31 | MECH E KEY | |
| 29 | MECH E KEY | |
| 27 | MECH E KEY | |
| 25 | MECH E KEY | |
| 23 | RESERVED | N/C |
| 21 | RESERVED | N/C |
| 19 | RESERVED | N/C |
| 17 | RESERVED | N/C |
| 15 | RESERVED | N/C |
| 13 | RESERVED | N/C |
| 11 | RESERVED | N/C |
| 9 | RESERVED | N/C |
| 7 | GND | PWR |
| 5 | RESERVED | N/C |
| 3 | RESERVED | N/C |
| 1 | GND | PWR |

## 2.5. APPROVED ACCESSORIES LIST

The below table outlines the accessories that are approved for operation with this Module:

For V2V Radio operation, this module has been tested and approved for use with the antenna listed below. The module may be integrated with other antennas of the same type and antenna gains of less than or equal than the approved.

For 902-928 MHz frequency band:

| ANTENNA PART NO. | FREQUENCY | ANTENNA TYPE | PEAK GAIN |
|---|---|---|---|
| PROD1196 | 865-930MHz | Omni-directional | +2.9 dBi Max |
| EA2-0287-N01SP-050 | 860-930 MHz | Omni-directional | +8 dBi Max |
| MISC1626 | 915 MHz | Monopole Type | +2 dBi Max |

For 869.400-869.650 MHz frequency band:

| ANTENNA PART NO. | FREQUENCY | ANTENNA TYPE | PEAK GAIN |
|---|---|---|---|
| PROD1196 | 865-930MHz | Omni-directional | +2.9 dBi Max |
| MISC1625 | 824-2170 MHz | Monopole Type | +1.9 dBi Max |

## 2.6. WARNINGS

| | |
|---|---|
| CAUTION | Keep this Integration Manual for later reference. |
|   | Do not leave this Module in an uncontrolled environment where the storage temperature is below-40°C (-40°F) or above 85°C (176°F). This may damage the DEVICE. |
|   | Do not operate this Module outside specified temperature range. Refer to specification table for further information. |

# 3. GENERAL INFORMATION

## 3.1. INTEGRATION

Module Integration should be in accordance with the procedures defined by Digital Mining Technology and only performed by the manufacturer or authorized representative. Host equipment must be configured to the modulation schemes and implement LBT to comply with the modular approval listed in Sec. 2.3 and adhere to all local regulations appropriate for automotive Installations in the end-user geographic region.

## 3.2. MAINTENANCE

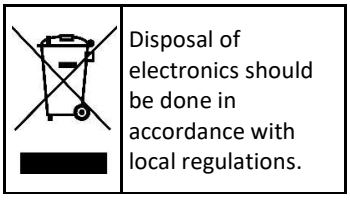
This equipment is not intended to be maintained by the end user. Opening the enclosure should not be attempted, will void any warranty and could compromise the safe operation of the unit.

No user-serviceable parts.

Contact your local authorized representative for service arrangements.

## 3.3. DECOMMISSION AND DISPOSAL

Power should be disconnected before decommissioning.



Disposal of electronics should be done in accordance with local regulations.

The unit must not be treated as general waste. By ensuring that this product is disposed of correctly, you will be helping to prevent potentially negative consequences for the environment and human health which could otherwise be caused by incorrect handling of this product.

**Waste Disposal Method:** Recycling is encouraged. Dispose of in accordance with local, state and federal laws and regulations.

**USA:** Dispose of in accordance with local, state and federal laws and regulations.

**Canada:** Dispose of in accordance with local, state and federal laws and regulations.

**EC:** Dispose of in accordance with relevant EC Directives.

## 3.4. AUTHORIZED REPRESENTATIVES

| | | | |
|---|---|---|---|
| **Australia** | **Industrea Mining Technology Pty Ltd, Trading as Digital Mining Technology**<br>3 Co-Wyn Close<br>Fountaindale, NSW, 2258<br>Australia | Telephone | +61 (2) 8863 4730 |
| | | | GETProductionIMT@wabtec.com |
| | | | www.wabteccorp.com |
| **Brazil** | **Wabtec Brasil Fabricação e Manutenção de Equipamentos Ltda**<br>Avenida General David Sarnoff<br>n 4600 Cidade Industrial Contagem, MG<br>32210-110<br>Brazil | Telephone | +55 (31) 2103 5348 |
| | | Fax | +55 (31) 2103 5100 |
| | | | www.wabteccorp.com |
| **Canada** | **Wabtec Transportation Canada Inc**<br>84 Terracon Pl.<br>Winnipeg Manitoba, R2J 4G7<br>Canada | Telephone | +1 204-951-4320 |
| | | | www.wabteccorp.com |
| **India** | **Wabtec India Industrial Private Ltd**<br>ITC Green Centre<br>6th Floor, Southwest Tower<br>No.18, Banaswadi Main Road,<br>Maruthisevanagar<br>Bangalore, Karnataka, 560005, India | Telephone | +91 (080) 6838 7816 |
| | | | www.wabteccorp.com |
| **Indonesia** | **PT Intecs Teknikatama Industri**<br>Jl. Ciputat Raya No. 18D<br>Kebayoran Lama Selatan, Jakarta, 12240<br>Indonesia | Telephone | +62 (21) 729 3351 |
| | | Fax | +62 (21) 729 3352 |
| | | | www.intecs.co.id |
| **Mexico** | **Comercializadora Minera Norte, S.A. DE C.V.**<br>Ave. H. Colegio Militar No. 2000-B<br>Col. Las Fuentes Piedras Negras, Coahuila<br>México. C.P. 26010 | Telephone | +52 (878) 783 8215<br>+1 (830) 352 5519 |
| | | Fax | +52 (878) 783-8218 |
| | | | www.cominsa.com.mx |
| **North America** | **Digital Mining**<br>2901 East Lake Road<br>Erie, Pennsylvania, 16531<br>USA | Telephone | +1 (480) 264 2063 |
| | | Fax | +1 (480) 264 6402 |
| | | | www.wabteccorp.com |
| **Sub Saharan Africa** | **Probe Integrated Mining Technologies (PTY) Ltd**<br>245 Albert Amon Road<br>Meadowdale, Germiston, 1614<br>South Africa | Telephone | +27 (11) 453 0924 |
| | | Fax | +27 (11) 453 2141 |
| | | | www.probebattery.co.za |

# 4. PRODUCT APPROVALS AND REGULATORY INFORMATION

ASMB0911 module have modular approval and comply with FCC Part 15 and Canada Innovation, Science and Economic Development Canada (ISED) RSS-247 and RSS-Gen.

| | |
|---|---|
| FCC ID: | YIY-ASMB0911 |
| IC: | 8903A-ASMB0911 |


Modifications to this product without written consent from the manufacturer or its designated authorized representatives could void the user's authority to operate the equipment.

## 4.1. DECLARATION OF CONFORMITY 47 CFR § 2.1077 COMPLIANCE INFORMATION

We, Industrea Mining Technology Pty Ltd, T/A Digital Mining Technology, at 3 Co-Wyn Close, Fountaindale, NSW, 2258, Australia declare under our sole responsibility the products:

| | |
|---|---|
| Trade Name: | Digital Mining Technology |
| Model Number: | ASMB0911 |
| Product Name | Mini Dual RF UHF Module Silabs |
| FCC ID: | YIY-ASMB0911 |
| Responsible Party: | Digital Mining<br>2901 East Lake Road Erie, PA, 16531<br>(814) 875-2234 |

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.

## 4.2. MODULE STATEMENT, LABELLING & USER INSTRUCTIONS

The ASMB0911 has single module approval and comply with FCC Part 15 and Canada Innovation, Science and Economic Development Canada(ISED) RSS-247 and RSS-Gen. Single-modular transmitter approval is defined as a complete RF transmission sub-assembly, designed to be incorporated into another device, that must demonstrate compliance with FCC/IC rules and policies independent of any host. A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that module.

The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.
The host product itself is required to comply with all other applicable FCC/IC equipment authorizations regulations, requirements and equipment functions that are not associated with the transmitter module portion. For example, compliance must be

demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators(Part 15 Subpart B, ICES-003), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Suppliers Declaration of Conformity (SDoC) or certification) as appropriate.

**LABELING AND USER INFORMATION REQUIREMENTS:**

The ASMB0911 module has been labeled with its own FCC/IC ID number, and if the FCC/IC ID number is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wordings as follows:
Contains Transmitter Module FCC ID: YIY-ASMB0911 or Contains FCC ID: YIY-ASMB0911
Contains Transmitter Module IC: 8903A-ASMB0911 or Contains IC: 8903A-ASMB0911

## 4.3. FCC INTERFERENCE STATEMENT FOR CLASS B DEVICES

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.

A shielded type Ethernet cord is required to meet FCC Class B emission limits and prevent interference to the nearby radio and television reception.

This device and its antenna(s) must not be co-located or operate in conjunction with any other antenna or transmitter.

The antenna is considered an integral system component. Use of any antenna other than those specified in the installation manual or supplied with the product may void the product's compliance.

## 4.4. FCC RADIATION EXPOSURE STATEMENT


To comply with FCC RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.


To comply with FCC RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

## 4.5. INDUSTRY CANADA COMPLIANT

This Class B digital apparatus complies with Canadian ICES-003. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

### 4.5.1. CONCERNING RADIO TRANSMITTERS

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

### 4.5.2. INDUSTRY CANADA - RADIATION EXPOSURE STATEMENT


To comply with Industry Canada RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

### 4.5.3. INDUSTRIE CANADA – DÉCLARATION SUR L'EXPOSITION AUX RADIATIONS


Afin de respecter les limites d'exposition pour l'ensemble de la population/l'exposition non contrôlée de la FCC/ IC RF, les antennes utilisées pour cet émetteur doivent être installées de manière à offrir une distance de séparation minimum de 20 cm pour les variantes de produits GSM ou de 20 cm pour les variantes de produits non GSM de toutes les personnes et ne doivent pas être utilisées en conjonction avec d'autres antennes ou émetteurs.

### 4.5.4. CONFORME AUX NORMES D'INDUSTRIE CANADA

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003. Les changements ou les modifications non approuvés expressément par la partie responsable de la conformité pourraient annuler l'autorisation de l'utilisateur de faire fonctionner l'équipement.

### 4.5.5. AU SUJET DES ÉMETTEURS RADIO

Cet appareil respecte les systèmes de satellite de radiodiffusion d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne peut pas causer de l'interférence; et
2. Cet appareil doit accepter toute interférence, y compris celle qui provoque un fonctionnement non souhaité de l'appareil.

Conformément aux règlements d'Industrie Canada, cet émetteur radio peut fonctionner uniquement au moyen d'une antenne de type et avec un gain maximal (ou plus petit) approuvés pour l'émetteur par Industrie Canada. Afin de réduire la possible interférence radio avec les autres utilisateurs, le type d'antenne et son gain devraient être choisis de manière à ce que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne soit pas plus grande que nécessaire pour une communication réussie.

## 4.6. AUSTRALIAN RADIO COMMUNICATIONS EQUIPMENT – RADIATION EXPOSURE STATEMENT

The equipment complies with the Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014 for General Public Exposure, Non-Aware User, for a Compliance Level 2 Radiocommunications Equipment, when the minimum safety distance is adhered to, and shall bear the RCM.

# DOCUMENT REVISION

| DOCUMENT NO | REVISION |
|---|---|
| ASMB0911-HARWARE INTEGRATION MANUAL-A | Original document |
| ASMB0911-HARWARE INTEGRATION MANUAL-B | Included Module statement, labelling & User Instruction in Sec. 4.2 |
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# DOCUMENT SIGN OFF

| DOCUMENT REVISION NO. | |
|---|---|
| **POSITION** | **Certification Engineer** |
| **DATE** | CREATED: By P C Shivalingam at 2:48 pm, Aug 07, 2024 |
| | |
| **POSITION** | **Design Engineering** |
| **DATE** | REVIEWED: By Rohan Kennedy at 8:26 am, Aug 08, 2024 |
| | |
| **POSITION** | **Engineering Manager** |
| **DATE** | APPROVED: By Peter O'Donnell at 10:17 am, Aug 08, 2024 |