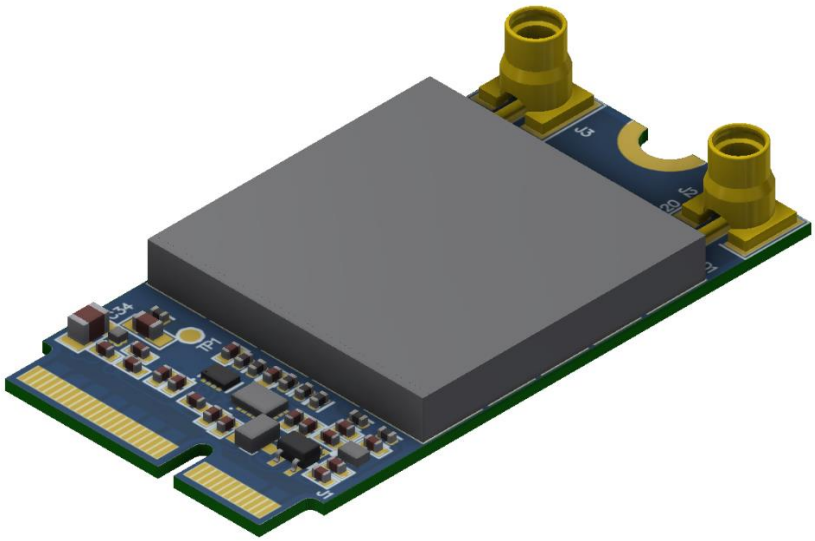
Digital Mining Technology

ASMB0876

MINI 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

These materials are provided for information purposes only, “as is” without express or implied warranty of any kind. Wabtec makes no ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY REGARDING ANY PRODUCTS DESCRIBED in these materials.

To the maximum extent permitted by law, Wabtec disclaims any and all implied warranties that might otherwise arise or apply, including any implied warranty of merchantability or of fitness for a particular purpose. Wabtec further makes no representation or warranty of accuracy of these materials and neither Wabtec will have no responsibility or liability for any error or omission in these materials.

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
	GETProductionIMT@wabtec.com
	www.wabteccorp.com

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

2. OVERVIEW

2.1. GENERAL FEATURES

The ASMB0876 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
- Power supply regulation/conditioning
- Serial interface
- Dual RF antennae ports under firmware control for antennae diversity

2.2. ABBREVIATIONS

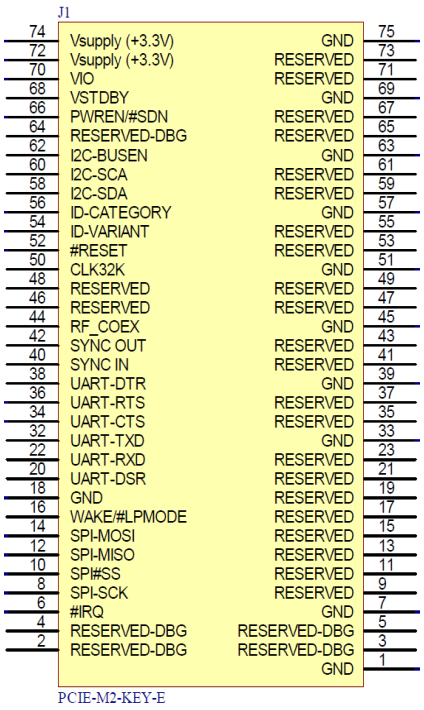
ABBREVIATION	DESCRIPTION
V2V	Vehicle to Vehicle
N/C	Not Connected

2.3. SCOPE & SPECIFICATION

This user manual covers Mini RF UHF Module Silabs Radio Module, Model No.: ASMB0876.

FEATURE	DETAIL
Operating Frequency Band	869.40 - 869.650 MHz 902 – 928 MHz
Maximum Transmit Power	20 dBm at MMCX Pins
Chipset	SiLabs Si4463
Chipset Frequency Range	142–1050 MHz
Modulation	4GFSK
Antenna Type	Two MMCX antenna pins for antenna diversity
Antenna Gain	902-928 MHz: Peak Gain +8 dBi max 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	42 mm x 22 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

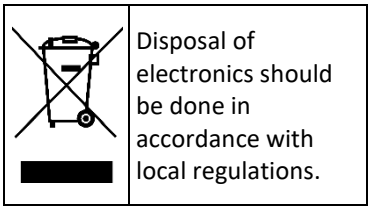
This equipment is not intended to be maintained by the end user. Opening the enclosure should not be attempted, will void any warranty and could compromise the safe operation of the unit.

No user-serviceable parts.

Contact your local authorized representative for service arrangements.

3.3. DECOMMISSION AND DISPOSAL

Power should be disconnected before decommissioning.



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** 3 Co-Wyn Close Fountaindale, NSW, 2258 Australia	Telephone	+61 (2) 8863 4730
			GETProductionIMT@wabtec.com
			www.wabteccorp.com
Brazil	**Wabtec Brasil Fabricação e Manutenção de Equipamentos Ltda** Avenida General David Sarnoff n 4600 Cidade Industrial Contagem, MG 32210-110 Brazil	Telephone	+55 (31) 2103 5348
		Fax	+55 (31) 2103 5100
			www.wabteccorp.com
Canada	**Wabtec Transportation Canada Inc** 27047 Oakwood Road, Oakbank, Manitoba, R0E 1J2 Canada	Telephone	+1 (905) 251 0074
			www.wabteccorp.com
India	**Wabtec India Industrial Private Ltd** ITC Green Centre 6th Floor, Southwest Tower No.18, Banaswadi Main Road, Maruthisevanagar Bangalore, Karnataka, 560005, India	Telephone	+91 (080) 6838 7816
			www.wabteccorp.com
Indonesia	**PT Intecs Teknikatama Industri** Jl. Ciputat Raya No. 18D Kebayoran Lama Selatan, Jakarta, 12240 Indonesia	Telephone	+62 (21) 729 3351
		Fax	+62 (21) 729 3352
			www.intecs.co.id
Mexico	**Comercializadora Minera Norte, S.A. DE C.V.** Ave. H. Colegio Militar No. 2000-B Col. Las Fuentes Piedras Negras, Coahuila México. C.P. 26010	Telephone	+52 (878) 783 8215 +1 (830) 352 5519
		Fax	+52 (878) 783-8218
			www.cominsa.com.mx
North America	**Digital Mining** 2901 East Lake Road Erie, Pennsylvania, 16531 USA	Telephone	+1 (480) 264 2063
		Fax	+1 (480) 264 6402
			www.wabteccorp.com
Sub Saharan Africa	**Probe Integrated Mining Technologies (PTY) Ltd** 245 Albert Amon Road Meadowdale, Germiston, 1614 South Africa	Telephone	+27 (11) 453 0924
		Fax	+27 (11) 453 2141
			www.probebattery.co.za

4. PRODUCT APPROVALS AND REGULATORY INFORMATION

ASMB0876 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-ASMB0876
IC:	8903A-ASMB0876

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:	ASMB0876
Product Name	Mini RF UHF Module Silabs
FCC ID:	YIY-ASMB0876
Responsible Party:	Digital Mining 2901 East Lake Road Erie, PA, 16531 (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. 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.

4.3. 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.

4.4. 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

4.4.1. 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.

4.4.2. 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.

4.4.3. 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.

4.4.4. 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.

4.4.5. 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.

4.5. 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
ASMB0876-HARWARE INTEGRATION MANUAL-R1	Original document
ASMB0876-HARWARE INTEGRATION MANUAL-R2	Sec 2.1: Replaced Software design radio to Digitally controlled radio

DOCUMENT SIGN OFF

DOCUMENT REVISION NO.	
POSITION	**Certification Engineer**
DATE	CREATED: By P C Shivalingam at 8:45 pm, Jan 28, 2022
POSITION	**Design Engineering**
DATE	REVIEWED: By Peter O'Donnell at 4:27 pm, Jan 31, 2022
POSITION	**Engineering Manager**
DATE	APPROVED: By Steve Clifton at 3:39 pm, Feb 01, 2022