

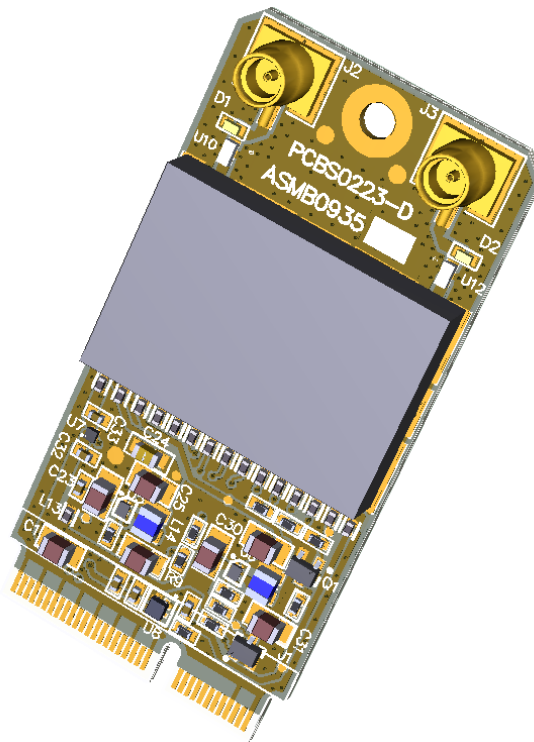


Digital Mining
Technology

ASMB0935

MINI RF UWB MODULE DW3000

HARDWARE INTEGRATION MANUAL



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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:

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Fountaindale, New South Wales, 2258

Australia

Telephone +61 2 8863 4730

dm.fulfilment@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 ASMB0935 is a digitally controlled radio module implemented on an industry standard M2.xx style circuit board. This module is intended for use in Industrea Mining Technology's host controller board to provide a short range, power limited UWB radio link for point to multi-point radio, providing two-way ranging based on ToF, TDoA and PDoA ranging methods for a variety of CAS applications.

Key features include:

- Qorvo DW3220 digitally controlled radio
- Power supply regulation/conditioning
- Serial interface
- Dual RF antenna connectors

2.2. ABBREVIATIONS

ABBREVIATION	DESCRIPTION
CAS	Collision Awareness System
PDoA	Phase Difference of Arrival
ToF	Time of Flight
TDoA	Time Difference of Arrival
UWB	Ultra-Wide Band
N/C	Not Connected

2.3. SCOPE & SPECIFICATION

This user manual covers Mini RF UWB Module DW3000 Radio Module, Model No.: ASMB0935.

FEATURE	DETAIL
Operating Frequency band	FCC/ISED: 6.2446 - 6.7346 GHz ETSI EN: 6.1896 – 6.7896 GHz
Bandwidth	FCC/ISED: <500 MHz; ETSI EN: <600 MHz
No. of Channels	Single (Channel No. 5)
Maximum Transmit Power	-41.3 dBm
Chipset	DW3220
Modulation	BPM - BPSK
Antenna Type	External - Two MMCX antenna connectors
Antenna Gain	Dipole type: Peak Gain +3.44 dBi max Monopole type: Peak Gain +3.7 dBi max
Rated Voltage	3.3 Vdc
Operating Temperature	-40°C to +85°C
Module Dimensions	45 mm x 22 mm

2.4. PIN CONFIGURATION AND FUNCTION

74	V _{supply} (+3.3V)	GND	75
72	V _{supply} (+3.3V)	RESERVED	73
70	V _{IO}	RESERVED	71
68	V _{STDBY}	GND	69
66	PWREN/#SDN	RESERVED	67
64	RESERVED-DBG	RESERVED	65
62	I2C-BUSEN	GND	63
60	I2C-SCA	RESERVED	61
58	I2C-SDA	RESERVED	59
56	ID-CATEGORY	GND	57
54	ID-VARIANT	RESERVED	55
52	#RESET	RESERVED	53
50	CLK32K	GND	51
48	RESERVED	RESERVED	49
46	RESERVED	RESERVED	47
44	RF_COEX	GND	45
42	SYNC OUT	RESERVED	43
40	SYNC IN	RESERVED	41
38	UART-DTR	GND	39
36	UART-RTS	RESERVED	37
34	UART-CTS	RESERVED	35
32	UART-TXD	GND	33
22	UART-RXD	RESERVED	23
20	UART-DSR	RESERVED	21
18	GND	RESERVED	19
16	WAKE/#LPMODE	RESERVED	17
14	SPI-MOSI	RESERVED	15
12	SPI-MISO	RESERVED	13
10	SPI#SS	RESERVED	11
8	SPI-SCK	RESERVED	9
6	#IRQ	GND	7
4	RESERVED-DBG	RESERVED-DBG	5
2	RESERVED-DBG	RESERVED-DBG	3
		GND	1

PCIE-M2-KEY-E

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 UWB 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.

ANTENNA PART NO.	HOST EQUIPMENT	ANTENNA TYPE	PEAK GAIN
MISC0601 (PCUWB65.4111)	PROD1198 (PRU) PROD1187A (RUA)	Monopole	+3.7 dBi Max
MISC1622 (TU.60.3H31)	PROD1187R (RUR)	Dipole	+3.17 dBi Max
MISC0606 (TU.63.2111)	PROD1182H (PCU)	Dipole	+3.44 dBi Max

2.6. WARNINGS

	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 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.

Note: ASMB0935 is intended for installation only in Industrea Mining Technology Pty Ltd's host equipment. This device requires professional installation, Industrea Mining Technology Pty Ltd trained Personnel would install this radio module into the specific host equipment. FCC and ISED requirements will be followed by Industrea Mining Technology Pty Ltd

ASMB0935 can be used with optional RF antenna cable, <3m length, eg: AC-N01SP-N01SP-L40-250, ...

3.2. MAINTENANCE

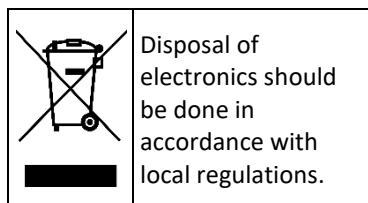
This equipment is not intended to be maintained by the end user. Opening the enclosure should not be attempted, will void any warranty and could compromise the safe operation of the unit.

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 	Industree Mining Technology Pty Ltd, Trading as Digital Mining Technology 3 Co-Wyn Close Fountaindale, NSW, 2258 Australia	Telephone +61 (2) 8863 4730 dmfulfilment@wabtec.com www.wabteccorp.com
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Canada 	Wabtec Transportation Canada Inc 84 Terracon Pl. Winnipeg Manitoba, R2J 4G7 Canada	Telephone +1 204-951-4320 www.wabteccorp.com
India 	Wabtec India Industrial Private Ltd ITC Green Centre 6 th 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

ASMB0935 module have modular approval and comply with FCC Part 15 and Canada Innovation, Science and Economic Development Canada (ISED) RSS-210 and RSS-Gen.

FCC ID:	YIY-ASMB0935
IC:	8903A-ASMB0935



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:	ASMB0935
Product Name	Mini RF UWB Module DW3000
FCC ID:	YIY-ASMB0935
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. MODULE STATEMENT, LABELLING & USER INSTRUCTIONS

The ASMB0935 has single module approval and comply with FCC Part 15 and Canada Innovation, Science and Economic Development Canada(ISED) RSS-210 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 ASMB0935 module has been labelled 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-ASMB0935 or Contains FCC ID: YIY-ASMB0935
Contains Transmitter Module IC: 8903A-ASMB0935 or Contains IC: 8903A-ASMB0935

PROHIBITION:

- Operation on board an aircraft or a satellite is prohibited.
- Module shall not be employed for the operation of toys.
- Except for operation onboard a ship or a terrestrial transportation vehicle, the use of a fixed outdoor infrastructure is prohibited. A fixed infrastructure includes antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole.

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 Equipment (General) Rules 2021 + Amendment Rules 2023 (No. 1), Electromagnetic Radiation – Human Exposure Standard RPS-1 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
ASMB0935-HARWARE INTEGRATION MANUAL-A	Original document
ASMB0935-HARWARE INTEGRATION MANUAL-B	Included Prohibited application in Sec. 4.2 & Operating frequency band in Sec. 2.3
ASMB0935-HARWARE INTEGRATION MANUAL-C	Revised Dipole Antenna gain to 3.17 dBi and Included Professional installation note in Sec. 3

DOCUMENT SIGN OFF

DOCUMENT REVISION NO.	
POSITION	Certification Engineer
DATE	 CREATED: By P C Shivalingam at 12:27 pm, May 20, 2025
POSITION	Design Engineering
DATE	 REVIEWED: By Rohan Kennedy at 5:09 pm, May 20, 2025
POSITION	Engineering Manager
DATE	 APPROVED: By Peter O'Donnell at 9:28 am, May 21, 2025