Technical report:

RPT_1003_01 TPMS Receiver and Repeater Comparison

Revision

Version	Statut (Draft or Final) / Status	Date	Auteur/Editor	Details des Changements / Details of changes
00	Final	30/01/2023	Pierre Grenet	Initial Version
01	Final	23/05/2023	Pierre Grenet	In Conclusion, replace values of FCC ID with 2A8SB31110 and IC ID with 29178-31110

Content

Acronyms

Acronym	Definition	Comment
BOM	Bill of Materials	From ARENA PLM
PCBA	Printed Circuit Board Assembly	
PRODASM	Product Assembly	Product in BOM
SUBASM	Sub-Assembly	Sub-assembly in BOM
RF	Radio Frequency	
TPMS	Tire Pressure Monitoring System	

Introduction

This document presents the differences and similitudes between Masternaut ranges of products named:

- TPMS Wireless Receiver units PCBA 434 MHz,
- TPMS Wireless Receiver units 434 MHz,
- TPMS Wireless Repeater units 434 MHz.

Each one of those ranges of products has three declinations, with one reference per product, as presented in following table.

Product full name	Product reference
TPMS Wireless Receiver unit PCBA 434 MHz – F01	720-31100
TPMS Wireless Receiver unit PCBA 434 MHz – A01	720-31101
TPMS Wireless Receiver unit PCBA 434 MHz – F02	720-31102
TPMS Wireless Receiver unit 434 MHz – F01	720-31110
TPMS Wireless Receiver unit 434 MHz – A01	720-31111
TPMS Wireless Receiver unit 434 MHz – F02	720-31112
TPMS Wireless Repeater unit 434 MHz – F01	720-31180
TPMS Wireless Repeater unit 434 MHz – A01	720-31181
TPMS Wireless Repeater unit 434 MHz – F02	720-31182

Each type of unit receives, at production step, one radio parameter byte as F01 or A 01 or F02 configuration value written in flash memory.

Products BOM

High level BOM for all TPMS Wireless unit products

The high level BOMs of all the TPMS Wireless units are lightly different, as presented into following tables and explanations.

BOM for TPMS wireless receiver PCBA product equals BOM for TPMS Receiver product without the RJ45 cable, the plastic enclosure, the warranty label and the screws. Software version is the same for all these units.

BOM for TPMS Wireless Receiver PCBA products presents the following differences with the BOM for TPMS Wireless Receiver/Repeater products:

- Receiver PCBA product is based on 620-00038 PCBA,
- Receiver and Repeater products are based on the same 620-00025 PCBA,
- Plastic enclosure is present only on Receiver and Repeater products,

- Screws are present only on Receiver and Repeater products,
- Warranty label is only present on Receiver and Repeater products,
- Magnet and rubber cap are only present on Repeater products,
- 5 points RJ45 cable is present only on Receiver products,
- 2 points cable is present only on Repeater products,
- No cable is present on Receiver PCBA products.

BOM for TPMS Wireless Receiver PCBA products presents the following similitudes with the BOM for TPMS Wireless Receiver/Repeater products:

- Software version is the same for all these units,
- Generic product label is based on the same drawing,
- Software configuration definition in flash memory is common for each F01 (FSK modulation 1) type of products but is different from the configuration for A01 (ASK modulation 1) type of products and different from the configuration for each F02 (FSK modulation 2) type of products.

BOM list, PRODASM level **TPMS Wireless Receiver PCBA**	**720-31100-002 TPMS Wireless Receiver Unit 434MHz PCBA - F01**	**720-31101-001 TPMS Wireless Receiver Unit 434MHz PCBA - A01**	**720-31102-001 TPMS Wireless Receiver Unit 434MHz PCBA - F02**
Label 440-00013-004 LABEL, Generic Product Sticker, 66x26mm,	✓	✓	✓
Subassembly 710-00037-001 SUBASM, TPMS Wireless Receiver Unit 434MHz PCBA - F01	✓		
Subassembly 710-00036-001 SUBASM, TPMS Wireless Receiver Unit 434MHz PCBA - A01		✓	
Subassembly 710-00038-001 SUBASM, TPMS Wireless Receiver Unit 434MHz PCBA - F02			✓

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BOM for TPMS Wireless Receiver products presents the following similitudes with the BOM for TPMS Wireless Repeater products:

- Receiver and Repeater units are based on the same PCBA (620-00025),
- Software version is the same for all these units,
- Plastic enclosure and PCBA fixation screws inside this box are the same,

BOM for TPMS wireless Receiver products presents the following differences with the BOM for TPMS Repeater products:

- Cable for TPMS receiver is a 5 points RJ45 since the cable for TPMS repeater is 2 points with fuse for vehicle power source,
- Magnet and rubber cap are only present on Repeater products.

BOM list, PRODASM level **TPMS Wireless Receiver**	**720-31110-006 TPMS Wireless Receiver Unit 434MHz - F01**	**720-31111-001 TPMS Wireless Receiver Unit 434MHz - A01**	**720-31112-001 TPMS Wireless Receiver Unit 434MHz - F02**
Enclosure 425-00001-001 ENCLOSURE, WRFI Housing with Gaskets and Fasteners, Black	✓	✓	✓
Label 440-00013-004 LABEL, Generic Product Sticker, 66x26mm,	✓	✓	✓
Label 440-00015-002 LABEL, Tamper Proof Warranty Sticker Masternaut, 50.8X25.40mm	✓	✓	✓
Screw/Bolt 472-00001-001 SCREW, Pan head, Pozi, 2.2x5	✓	✓	✓
Subassembly 710-00014-002 SUBASM, WRFI to RJ45M Cable Subassembly	✓	✓	✓
Subassembly 710-00039-001	✓		

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BOM list, PRODASM level TPMS Wireless Receiver	720-31110-006 TPMS Wireless Receiver Unit 434MHz - F01	720-31111-001 TPMS Wireless Receiver Unit 434MHz - A01	720-31112-001 TPMS Wireless Receiver Unit 434MHz - F02
SUBASM, TPMS Wireless Receiver Unit 434MHz - F01			
Subassembly 710-00040-001 SUBASM, TPMS Wireless Receiver Unit 434MHz - A01		✓	
Subassembly 710-00041-001 SUBASM, TPMS Wireless Receiver Unit 434MHz - F02			✓

BOM list, PRODASM TPMS Wireless Repeater	720-31180-001 TPMS Wireless Repeater Unit 434MHz - F01	720-31181-001 TPMS Wireless Repeater Unit 434MHz - A01	720-31182-001 TPMS Wireless Repeter Unit 434MHz - F02
Enclosure 425-00001-001 ENCLOSURE, WRFI Housing with Gaskets and Fasteners, Black	✓	✓	✓
Label 440-00013-004 LABEL, Generic Product Sticker, 66x26mm,	✓	✓	✓
Label 440-00015-002 LABEL, Tamper Proof Warranty Sticker Masternaut, 50.8X25.40mm	✓	✓	✓
Misc. Mechanical 445-00001-001 MAGNET, D=20 x 6mm, M4 mounting, Neodyme	✓	✓	✓
Misc. Mechanical 445-00002-001	✓	✓	✓

BOM list, PRODASM TPMS Wireless Repeater	720-31180-001 TPMS Wireless Repeater Unit 434MHz - F01	720-31181-001 TPMS Wireless Repeater Unit 434MHz - A01	720-31182-001 TPMS Wireless Repeter Unit 434MHz - F02
CAP, Rubber Cap, Black, 21mm*5mm, 0.5mm Thickness			
Screw/Bolt 472-00001-001 SCREW, Pan head, Pozi, 2.2x5	✓	✓	✓
Screw/Bolt 472-00007-001 SCREW, TBHC M4x8, 2.5mm Hex	✓	✓	✓
Washer 495-00001-001 WASHER, Star M4	✓	✓	✓
Subassembly 710-00042-001 SUBASM, TPMS Wireless Repeater Unit 434MHz - F01	✓		
Subassembly 710-00043-001 SUBASM, TPMS Wireless Repeater Unit 434MHz - A01		✓	
Subassembly 710-00044-001 SUBASM, TPMS Wireless Repeater Unit 434MHz - F02			✓
Cable Assembly 740-00019-001 CABLEASM, 434Mhz repeater power loom	✓	✓	✓

Intermediate level BOM for all TPMS Wireless unit products

The intermediate level BOM of all the TPMS Wireless unit products is quite similar, as presented into following tables.

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The only difference between TPMS Wireless Receiver PCBA product subassembly with TPMS Wireless Receiver/Repeater product subassemblies leads on the PCBA that is included, with reference 620-00038 for the receiver PCBA product and 620-0005 for the receiver/repeater products. The software version is the same for all types of products. The configuration for radio frequency parameters F01 or A01 or F02 is also depicted into those tables.

BOM list, SUBASM level **TPMS Wireless Receiver PCBA**	**710-00037-001 TPMS Wireless Receiver Unit 434MHz PCBA - F01**	**710-00036-001 TPMS Wireless Receiver Unit 434MHz PCBA - A01**	**710-00038-001 TPMS Wireless Receiver Unit 434MHz PCBA - F02**
Label 440-00012-003 LABEL, Generic PCBA Serialisation, 24 Digit, 19x6mm, White	✓	✓	✓
Initial Binary 510-00008-002 BIN, 434MHz Wireless Microcontroller Firmware, V1.465	✓	✓	✓
Configuration Parameters 540-00001-001 CFGPARAM, Enable F-01 on Wireless Firmware	✓		
Configuration Parameters 540-00002-001 CFGPARAM, Enable A-01 on Wireless Firmware		✓	
Configuration Parameters 540-00003-001 CFGPARAM, Enable F-02 on Wireless Firmware			✓
Printed Circuit Board Assembly (PCBA) 620-00038-001 PCBA, 434MHz Wireless receiver IP6X	✓	✓	✓

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BOM list, SUBASM level TPMS Wireless Receiver/Repeater	710-00039-001 / 710-00042-001 TPMS Wireless Receiver/Repeater Unit 434MHz - F01	710-00040-001 / 710-00043-001 TPMS Wireless Receiver/Repeater Unit 434MHz - A01	710-00041-001 / 710-00044-001 TPMS Wireless Receiver/Repeater Unit 434MHz - F02
Label 440-00012-003 LABEL, Generic PCBA Serialisation, 24 Digit, 19x6mm, White	✓	✓	✓
Initial Binary 510-00008-002 BIN, 434MHz Wireless Microcontroller Firmware, V1.465	✓	✓	✓
Configuration Parameters 540-00001-001 CFGPARAM, Enable F-01 on Wireless Firmware	✓		
Configuration Parameters 540-00002-001 CFGPARAM, Enable A-01 on Wireless Firmware		✓	
Configuration Parameters 540-00003-001 CFGPARAM, Enable F-02 on Wireless Firmware			✓
Printed Circuit Board Assembly (PCBA) 620-00025-003 PCBA, 434MHz Wireless receiver or repeater	✓	✓	✓

Low level BOM differences for all TPMS Wireless unit products

The low level BOM differences of all the TPMS Wireless unit products is presented into following table. A red marking presents a difference on the TPMS Wireless Receiver/Repeater product PCBA board (620-00025) versus the TPMS Wireless Receiver PCBA product one (620-00038).

The only difference which is presented in following table is the presence of a connector (125-00019-002 as J101) into 620-00038 BOM that is absent into 620-00025 BOM.
At a Radio Frequency point of view, the components that use RF path are the same, as S2-LP (220-00035), Balun (130-00003) and 434 MHz antenna (160-00008).
The PCB0000093 support (310-00009), quartz (150-00007, 150-00008) and micro-controller (220-00032) are the same in both BOMs.

ITEM NUMBER	ITEM NAME	QUANTITY		REF DES	
		620-00025-003 (Receiver & Repeater)	620-00038-001 (Receiver PCBA)	620-00025-003 (SUBASM = 710-00039 to 710-00044 PRODASM = 720-31110/11/12 Receiver & 720-31180/81/82 Repeater)	620-00038-001 (SUBASM = 710-00037/36/38 PRODASM = 720-31100/01/02 Receiver PCBA)
100-00002-001	RES, 0R, 5%, 63mW, +/-200ppm, 0402	each	10	10	R108, R112-R113, R203, R208, R304, R306, R308, R310, R313
110-00015-001	IND, 10nH, 500mA, 170mOhm, 5500MHz, 0402	each	1	1	R311
110-00016-001	IND, 22nH, 310mA, 300mOhm, 4GHz, 0402	each	1	1	R312
110-00014-001	IND, 150nH, 160mA, 1.5Ohm, 1.4GHz	each	1	1	L304
105-00067-001	CAP, CER, 1uF, X5R, 50V, +/-20%, 0402	each	1	1	C104
105-00063-001	CAP, CER, 3.9pF, C0G/NPO, 50V, +/-0.25pF, 0402	each	2	2	C213-C214
220-00035-002	IC, Transceiver RF, sub-1GHz, QFN24	each	1	1	U301
125-00020-001	CONN,Header,5 way,1.25 mm,SMD, Vert	each	1	1	J102
100-00009-001	RES, 10k, 1%, 63mW, +/-100ppm, 0402	each	3	3	R207, R210, R301

ITEM NUMBER	ITEM NAME	QUANTITY		REF DES	
		620-00025-003 (Receiver & Repeater)	620-00038-001 (Receiver PCBA)	620-00025-003 (SUBASM = 710-00039 to 710-00044 PRODASM = 720-31110/11/12 Receiver & 720-31180/81/82 Repeater)	620-00038-001 (SUBASM = 710-00037/36/38 PRODASM = 720-31100/01/02 Receiver PCBA)
110-00010-001	IND, 39nH, 200mA, 550mOhm, 2.1GHz, 0402	each	1	1	L302
105-00070-001	CAP, CER, 12pF, C0G, 50V, +/-2%, 0402	each	2	2	C307, C309
105-00069-001	CAP, CER, 1uF, X5R, 16V, +/-10%, 0402	each	3	3	C109, C204, C310
105-00064-001	CAP, CER, 470pF, C0G, 50V, 10%, 0402	each	1	1	C313
105-00061-001	CAP, CER, 4.7uF, X5R, 16V, +/-10%, 0603	each	5	5	C201, C205, C207, C209, C302
105-00059-001	CAP, CER, 150nF, X7R, 16V, +/-10%, 0402	each	7	7	C301, C304, C308, C311-C312, C314-C315
105-00056-002	CAP, CER, 10nF, X7R, 50V, +/-10%, 0402	each	1	1	C202
105-00016-001	CAP, CER, 10pF, C0G, 50V, +/-5%, 0402	each	2	2	C113-C114
105-00010-001	CAP, CER, 100pF, C0G, 50V, +/-5%, 0402	each	6	6	C303, C305-C306, C316-C318
105-00004-001	CAP, CER, 100nF, X7R, 25V, +/-10%, 0402	each	9	9	C101-C102, C106-C108, C203, C206, C208, C210
100-00072-001	RES, 10R, 1%, 63mW, +/-100ppm, 0402	each	1	1	R302
100-00005-001	RES, 100k, 1%, 63mW, +/-100ppm, 0402	each	3	3	R204, R217, R219

ITEM NUMBER	ITEM NAME	QUANTITY		REF DES	
		620-00025-003 (Receiver & Repeater)	620-00038-001 (Receiver PCBA)	620-00025-003 (SUBASM = 710-00039 to 710-00044 PRODASM = 720-31110/11/12 Receiver & 720-31180/81/82 Repeater)	620-00038-001 (SUBASM = 710-00037/36/38 PRODASM = 720-31100/01/02 Receiver PCBA)
105-00066-001	CAP, ALU, 100uF, 50V, +/-20%	each	1	1	C103
220-00032-001	IC, Microcontroller, STM32L412CBT6, 80MHz, 128kB ROM, 40kB RAM, 3.6V, LQFP-48	each	1	1	U201
200-00017-001	DIODE,Uni-directional TVS, 3Vf, 33Vrm, x, 69.7Vc, 130pF, SMB	each	1	1	D102
410-00005-001	ADHESIVE, 3M Scotch-Weld, Liquid Acrylic, 45 ml, Wireless Probe	each	1	1	G1
150-00008-001	XTAL, 12MHz, +/-10PPM,100uW, 4pF, SMD 3.2x2.5mm	each	1	1	Y202
110-00011-001	IND, 10uH, 15mA, 1.15Ohm, Shielded, 0805	each	1	1	L303
130-00003-001	FILTER, Baluns, 433MHz to 470MHz, 50Ohm, SMD	each	1	1	U302
310-00009-001	PCB, PCB WRFI, PCB000093	each	1	1	PCB1
220-00034-001	IC, LDO, Fixed 3.3V, 400mA, 38V, DFN-6	each	1	1	U102
220-00033-001	IC, RS-232 Interface,	each	1	1	U101

ITEM NUMBER	ITEM NAME	QUANTITY		REF DES	
		620-00025-003 (Receiver & Repeater)	620-00038-001 (Receiver PCBA)	620-00025-003 (SUBASM = 710-00039 to 710-00044 PRODASM = 720-31110/11/12 Receiver & 720-31180/81/82 Repeater)	620-00038-001 (SUBASM = 710-00037/36/38 PRODASM = 720-31100/01/02 Receiver PCBA)
	500kb/s, 5.5V, TSSOP-16				
150-00007-001	XTAL, 50MHz, +/-10PPM, 100uW, 12pF, SMD 1.6x1.2mm	each	1	1	Y301
160-00008-001	ANT, RF, 433Mhz, 433MHz to 435MHz, TH, 35.35x10x7mm	each	1	1	L308
135-00003-001	FUSE, Resetable PPTC, 200mA, 24V, 1206	each	3	3	F101-F103
125-00019-002	CONN,Header, 9 way,2 mm, SMD, Vert	each	—	1	—

Conclusion

First objective of this document is to clearly present differences and similitudes of a range of Masternaut TPMS Wireless products, as Receiver PCBA, Receiver and Repeater units, with three different variants for each of those types.

The second objective is to bring the proof that those nine products may use the same certification reference number, in USA and Canada, since:

- Those nine products present minor differences, at a BOM point of view,
- Many of those BOM differences do not impact the radio frequency path,

- If a BOM difference, as F01, A01, F02 configuration, impacts radio frequency path, the relevant measurements have been performed by Emitech laboratory, according to delivered document “TestRpt_RRA-EMIESS22M181MAS-02A v0.pdf”
- The embedded software version is common to all of them, including different radio frequency schemes,
- The list of electronic components on the different PCBA, including the RF path, soldered on the PCB board, is largely common to the nine products.

As a consequence, the following list of TPMS Wireless unit products are allowed to use a unique FCC identifier, as FCC ID, and a unique ISED identifier, as IC ID, for the full range of those products, according to following table.

Product full name	**Product reference**	**FCC ID (USA. 14 char max) Masternaut ID = 2A8SB**	**IC ID (Canada. 11 char max) Masternaut ID = 29178**
TPMS Wireless Receiver unit 434 MHz PCBA – F01	720-31100	2A8SB31110	29178-31110
TPMS Wireless Receiver unit 434 MHz PCBA – A01	720-31101		
TPMS Wireless Receiver unit 434 MHz PCBA – F02	720-31102		
TPMS Wireless Receiver unit 434 MHz – F01	720-31110		
TPMS Wireless Receiver unit 434 MHz – A01	720-31111		
TPMS Wireless Receiver unit 434 MHz – F02	720-31112		
TPMS Wireless Repeater unit 434 MHz – F01	720-31180		
TPMS Wireless Repeater unit 434 MHz – A01	720-31181		
TPMS Wireless Repeater unit 434 MHz – F02	720-31182		