

Description Differences between MU-2-R (434 MHz) and MU-2-429 (429 MHz)

For customers that would like to integrate the modem MU-2-429 (429 MHz) modules into their products for exporting to the Japanese market needs to read this guide and be aware of the differences in operation as follows:

### 1. Conformity

MU-2-R 434 MHz	MU-2-429 429 MHz
RED compliant EN 300 220 standard for Europe	Technical Regulation Conformity Certification ARIB STD-T67 standard for Japan



### 2. Frequency (see channel tables)

MU-2-R 434 MHz	MU-2-429 429 MHz
433.200 to 434.775 MHz 127 channels, 12.5 kHz step	429.250 to 429.7375 MHz 40 channels, 12.5 kHz step

### 3. Carrier sensing (Listen Before Talk) – see “Carrier sensing”

MU-2-R 434 MHz	MU-2-429 429 MHz
None	Incorporated in module operation (required in Japan)

### 4. Labels

MU-2-R 434 MHz	MU-2-429 429 MHz
 <p>CE mark</p>	 <p>Technical Conformity mark</p>

### 5. Antenna

MU-2-R 434 MHz	MU-2-429 429 MHz
Use the supplied ANT-LEA-01 or equivalent	Only to be used with the specified antennas.

### 6. Receiver only model : MU-2R-429

No conformity certification applied. Customer allowed to use gain antenna.

See “Using MU-2R-429 (429 MHz) receiver example”.



MU-2-R 434 MHz							
Channel Frequency		Channel Frequency		Channel Frequency		Channel Frequency	
Dec. (Hex)	MHz	Dec. (Hex)	MHz	Dec. (Hex)	MHz	Dec. (Hex)	MHz
1(01)	433.2000	33(21)	433.6000	65(41)	434.0000	97(61)	434.4000
2(02)	433.2125	34(22)	433.6125	66(42)	434.0125	98(62)	434.4125
3(03)	433.2250	35(23)	433.6250	67(43)	434.0250	99(63)	434.4250
4(04)	433.2375	36(24)	433.6375	68(44)	434.0375	100(64)	434.4375
5(05)	433.2500	37(25)	433.6500	69(45)	434.0500	101(65)	434.4500
6(06)	433.2625	38(26)	433.6625	70(46)	434.0625	102(66)	434.4625
7(07)	433.2750	39(27)	433.6750	71(47)	434.0750	103(67)	434.4750
8(08)	433.2875	40(28)	433.6875	72(48)	434.0875	104(68)	434.4875
9(09)	433.3000	41(29)	433.7000	73(49)	434.1000	105(69)	434.5000
10(0A)	433.3125	42(2A)	433.7125	74(4A)	434.1125	106(6A)	434.5125
11(0B)	433.3250	43(2B)	433.7250	75(4B)	434.1250	107(6B)	434.5250
12(0C)	433.3375	44(2C)	433.7375	76(4C)	434.1375	108(6C)	434.5375
13(0D)	433.3500	45(2D)	433.7500	77(4D)	434.1500	109(6D)	434.5500
14(0E)	433.3625	46(2E)	433.7625	78(4E)	434.1625	110(6E)	434.5625
15(0F)	433.3750	47(2F)	433.7750	79(4F)	434.1750	111(6F)	434.5750
16(10)	433.3875	48(30)	433.7875	80(50)	434.1875	112(70)	434.5875
17(11)	433.4000	49(31)	433.8000	81(51)	434.2000	113(71)	434.6000
18(12)	433.4125	50(32)	433.8125	82(52)	434.2125	114(72)	434.6125
19(13)	433.4250	51(33)	433.8250	83(53)	434.2250	115(73)	434.6250
20(14)	433.4375	52(34)	433.8375	84(54)	434.2375	116(74)	434.6375
21(15)	433.4500	53(35)	433.8500	85(55)	434.2500	117(75)	434.6500
22(16)	433.4625	54(36)	433.8625	86(56)	434.2625	118(76)	434.6625
23(17)	433.4750	55(37)	433.8750	87(57)	434.2750	119(77)	434.6750
24(18)	433.4875	56(38)	433.8875	88(58)	434.2875	120(78)	434.6875
25(19)	433.5000	57(39)	433.9000	89(59)	434.3000	121(79)	434.7000
26(1A)	433.5125	58(3A)	433.9125	90(5A)	434.3125	122(7A)	434.7125
27(1B)	433.5250	59(3B)	433.9250	91(5B)	434.3250	123(7B)	434.7250
28(1C)	433.5375	60(3C)	433.9375	92(5C)	434.3375	124(7C)	434.7375
29(1D)	433.5500	61(3D)	433.9500	93(5D)	434.3500	125(7D)	434.7500
30(1E)	433.5625	62(3E)	433.9625	94(5E)	434.3625	126(7E)	434.7625
31(1F)	433.5750	63(3F)	433.9750	95(5F)	434.3750	127(7F)	434.7750
32(20)	433.5875	64(40)	433.9875	96(60)	434.3875		

MU-2-429 429 MHz			
Channel Frequency		Channel Frequency	
Dec. (Hex)	MHz	Dec. (Hex)	MHz
7(07)	429.2500	35(23)	429.6000
8(08)	429.2625	36(24)	429.6125
9(09)	429.2750	37(25)	429.6250
10(0A)	429.2875	38(26)	429.6375
11(0B)	429.3000	39(27)	429.6500
12(0C)	429.3125	40(28)	429.6625
13(0D)	429.3250	41(29)	429.6750
14(0E)	429.3375	42(2A)	429.6875
15(0F)	429.3500	43(2B)	429.7000
16(10)	429.3625	44(2C)	429.7125
17(11)	429.3750	45(2D)	429.7250
18(12)	429.3875	46(2E)	429.7375
19(13)	429.4000		
20(14)	429.4125		
21(15)	429.4250		
22(16)	429.4375		
23(17)	429.4500		
24(18)	429.4625		
25(19)	429.4750		
26(1A)	429.4875		
27(1B)	429.5000		
28(1C)	429.5125		
29(1D)	429.5250		
30(1E)	429.5375		
31(1F)	429.5500		
32(20)	429.5625		
33(21)	429.5750		
34(22)	429.5875		

 - default

## Carrier sensing

Specified low power radio stations are required to radiate emissions according to the carrier sensing rule prescribed in the Radio Law.

In case a radio wave of the same frequency is radiated from another system in the same area, there is a possibility that communication cannot be established in the both systems.

It is not allowed to radiate emissions if a carrier sensing finds another system using the same frequency.

**The MU-2 internally has a function to automatically perform carrier sensing to prevent illegal radiations.**

The carrier sensing in the MU-2 are performed with some margin to the specified threshold. If data cannot be transmitted as a result of carrier sensing, an "Information response 1" will be returned.

### Important notice

The Information response is returned only when the MU-2 is in the command mode. There is no response returned in the binary and text modes.

- **About carrier sensing**

The Radio Law regulates that a radio station should be idle when the voltage induced in an antenna with absolute gain of 2.14 dB is more than or equal to  $7\mu V_{EMF}$  in the 429 MHz band.

This threshold value equals to the power of -96.1 dBm with the MU-2, however the threshold in the MU-2 is set to -100 dBm to be on the safe side.

If the MU-2 receives a radio wave of more than the threshold level by carrier sensing, it does not transmit data and returns the Information response 1 (\*IR=01'). The transmission data will be discarded.

- **Using the result of carrier sensing**

If transmission data is not transmitted, it will be discarded and the Information response 1 (\*IR=01') will be returned. Processing such as switching channels, waiting for channel vacancy, displaying error messages should be executed.

In case 'xx-byte' data sent with a '@DT' command is not transmitted as a result of carrier sensing, the following responses will be returned in a row. Ensure that the both responses are processed.

Transmission response: \*DT = xx CRLF  
Information response 1 \* IR = 01 CRLF

#### Note

In case an Information response 1 is returned during transmitting successive 255-byte frames for a file transmission in one way, the whole file should be discarded. (In fact, this kind of one-way transmission is unpractical since errors between radios cannot be handled.)

**Using MU-2R-429 (429 MHz) receiver example**

- It is possible to use gain antenna e.g. Yagi antenna
- Please consider the cable loss.
- For low speed applications using relay station\*, long distance, relatively error free communication is possible.  
\* Relay station only requires power supply, so reduced impact from noise.
- For effective communication install as high as possible away from obstacles.

