

# **RV-5/MV-5**

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## ***Serial Protocol Definitions***

Software Version: V4.0x

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## 1 Documents

The following documents should also be used with this document to understand how this protocol can be used with an RV-5 Receiver and the MV-5 Processor.

**070-18144 RV-5 User Guide**

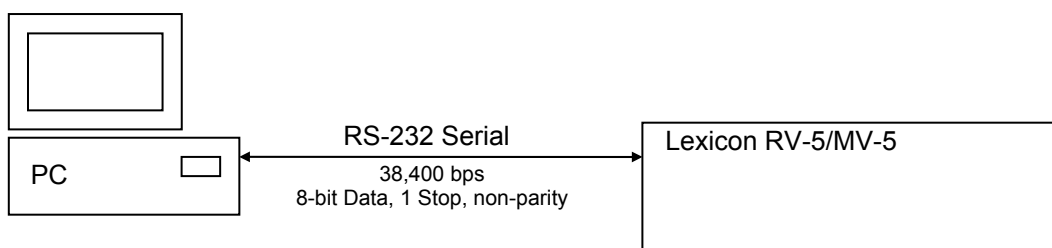
**070-18137 MV-5 User Guide**

### 1.1 Change List

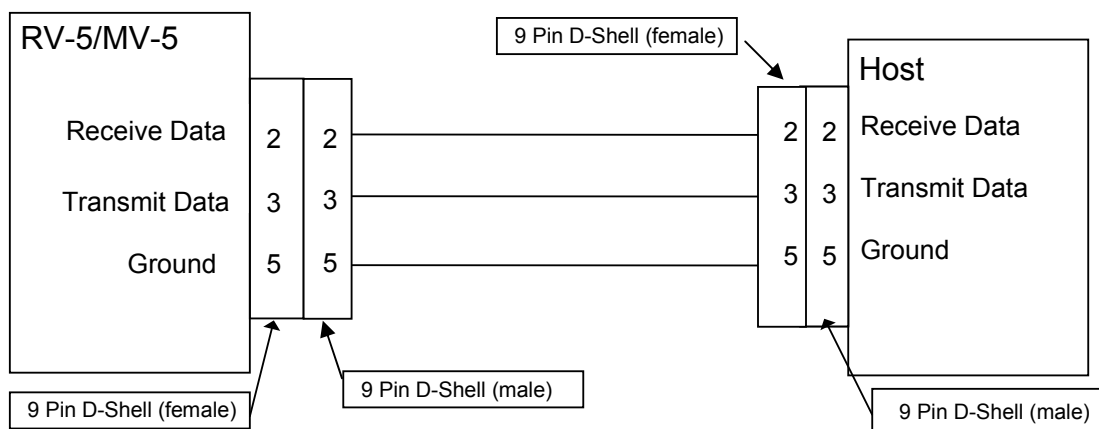
No changes have been made.

## 2 General Description

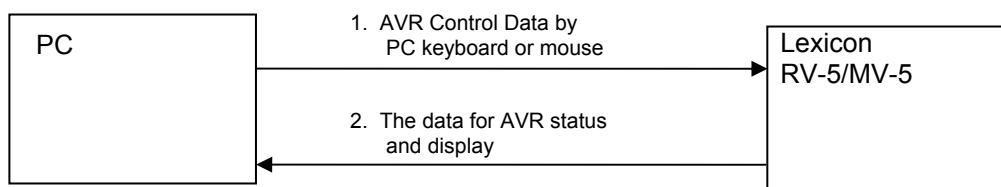
The intention of the RV-5/MV-5 serial port and protocol communication is for an external connected PC to control and obtain status from the RV-5/MV-5.



### 2.1 DB-9 RS232 Connector



### 2.2 Command Block Map



### 3 Data Communication Format

| Start Code | Data Type | Data Length | Information Field |
|------------|-----------|-------------|-------------------|
|------------|-----------|-------------|-------------------|

#### 3.1 Start Code

- PC -> AVR: "0xFF"
- AVR -> PC: "0xFE"

#### 3.2 Data Type

- Remote Control through PC: 0x02
- AVR Display Status: 0x03
- AVR Ram Status: 0x04
- AVR Flag Status: 0x05

#### 3.3 Data Length

Information Field's Byte

- Remote Control through PC: 4byte
- AVR Status Display on PC: variable

#### 3.4 Information Field

In hex code's Data

## 4 Command Data

PC -> AVR, Data length: 4 byte

| Selected Input | COMMAND               | Information Field (HEX ) |     |     |     |
|----------------|-----------------------|--------------------------|-----|-----|-----|
|                |                       | 1st                      | 2nd | 3rd | 4th |
|                | Standby Power On      | 82                       | 0B  | 9A  | 65  |
|                | Standby Power Off     | 82                       | 0B  | 9B  | 64  |
|                | Main MUTE (toggle)    | 82                       | 0B  | 15  | EA  |
|                | Main HD select        | 82                       | 0B  | 20  | DF  |
|                | Main DVD select       | 82                       | 0B  | 21  | DE  |
|                | Main Game select      | 82                       | 0B  | 34  | CB  |
|                | Main SAT select       | 82                       | 0B  | 24  | DB  |
|                | Main CABLE select     | 82                       | 0B  | 23  | DC  |
|                | Main DVR select       | 82                       | 0B  | 25  | DA  |
|                | Main CD select        | 82                       | 0B  | 26  | D9  |
|                | Main Dock select      | 82                       | 0B  | 38  | C7  |
|                | Main PC select        | 82                       | 0B  | 39  | C6  |
|                | Main Tuner select     | 82                       | 0B  | 2A  | D5  |
|                | Main Aux1 select      | 82                       | 0B  | 2B  | D4  |
|                | Main Aux2 select      | 82                       | 0B  | 32  | CD  |
|                | Main Volume + (cw)    | 82                       | 0B  | 17  | E8  |
|                | Main Volume - (ccw)   | 82                       | 0B  | 16  | E9  |
| √              | Mode <                | 82                       | 0B  | 1B  | E4  |
| √              | Mode >                | 82                       | 0B  | 1A  | E5  |
| √              | Video Status (toggle) | 82                       | 0B  | 5C  | A3  |
| √              | Audio status (toggle) | 82                       | 0B  | 1C  | E3  |
|                | MENU select           | 82                       | 0B  | 09  | F6  |
|                | (Menu) UP             | 82                       | 0B  | 01  | FE  |
|                | (Menu) DOWN           | 82                       | 0B  | 1D  | E2  |
|                | (Menu) LEFT           | 82                       | 0B  | 0A  | F5  |
|                | (Menu) RIGHT          | 82                       | 0B  | 08  | F7  |

| Selected Input | COMMAND                             | Information Field (HEX ) |     |     |     |
|----------------|-------------------------------------|--------------------------|-----|-----|-----|
|                |                                     | 1st                      | 2nd | 3rd | 4th |
|                | (Menu) SELECT                       | 82                       | 0B  | 3A  | C5  |
|                | (Menu) Exit                         | 82                       | 0B  | 95  | 6A  |
|                | Main Z1:OFF                         | 82                       | 0B  | 06  | C9  |
|                | FPD Brightness (toggle)             | 82                       | 0B  | 31  | CE  |
| √              | LOGIC 7                             | 82                       | 0B  | 0D  | F2  |
| √              | STEREO                              | 82                       | 0B  | 1F  | E0  |
| √              | DOLBY                               | 82                       | 0B  | 0C  | F3  |
| √              | DTS                                 | 82                       | 0B  | 0F  | F0  |
| √              | DSP                                 | 82                       | 0B  | 90  | 6F  |
| √              | ANALOG/DIGITAL IN (toggle)          | 82                       | 0B  | 9E  | 61  |
| √              | TONE ON/OFF (toggle)                | 82                       | 0B  | 9F  | 60  |
|                | EQ ON/OFF (toggle)                  | 82                       | 0B  | 0E  | F1  |
|                | EQ PRESET 1                         | 82                       | 0B  | D7  | 28  |
|                | EQ PRESET 2                         | 82                       | 0B  | D6  | 29  |
|                | EQ PRESET 3                         | 82                       | 0B  | D5  | 2A  |
| √              | TREBLE -1dB                         | 82                       | 0B  | AA  | 55  |
| √              | TREBLE +1dB                         | 82                       | 0B  | A7  | 58  |
| √              | BASS -1dB                           | 82                       | 0B  | A9  | 56  |
| √              | BASS +1dB                           | 82                       | 0B  | A6  | 59  |
|                | (Tuner RV-5 only) PRESET -          | 82                       | 0B  | 3B  | C4  |
|                | (Tuner RV-5 only) PRESET +          | 82                       | 0B  | 3C  | C3  |
|                | (Tuner RV-5 only) TUNE -            | 82                       | 0B  | 3F  | C0  |
|                | (Tuner RV-5 only) TUNE +            | 82                       | 0B  | 3E  | C1  |
|                | (Tuner RV-5 only) AUTO/MAN (toggle) | 82                       | 0B  | 33  | CC  |
|                | (Tuner RV-5 only) SAVE              | 82                       | 0B  | 35  | CA  |
|                | (Tuner RV-5 only) ST/MONO (toggle)  | 82                       | 0B  | 36  | C9  |
|                | (Tuner RV-5 only)FM/AM (toggle)     | 82                       | 0B  | 3D  | C2  |

| Selected Input | COMMAND            | Information Field (HEX ) |     |     |     |
|----------------|--------------------|--------------------------|-----|-----|-----|
|                |                    | 1st                      | 2nd | 3rd | 4th |
|                | iPOD  ◀ ◀ (IPOD-)  | 82                       | 0B  | 4F  | B0  |
|                | iPOD ▶ ▶   (IPOD+) | 82                       | 0B  | 4E  | B1  |
|                | iPOD CCW (CLIK◀ )  | 82                       | 0B  | 0B  | F4  |
|                | iPOD CW (CLIK▶ )   | 82                       | 0B  | 10  | EF  |
|                | iPOD MENU          | 82                       | 0B  | 81  | 7E  |
|                | iPOD SELECT        | 82                       | 0B  | 9D  | 62  |
|                | iPOD ▶             | 82                       | 0B  | 89  | 76  |
|                | PC  ◀ ◀            | 82                       | 0B  | CC  | 33  |
|                | PC ▶               | 82                       | 0B  | CE  | 31  |
|                | PC ▶ ▶             | 82                       | 0B  | CD  | 32  |
|                | Z2:Volume + (cw)   | 82                       | 0B  | 57  | A8  |
|                | Z2:Volume – (ccw)  | 82                       | 0B  | 56  | A9  |
|                | Z2:OFF             | 82                       | 0B  | 46  | B9  |
|                | Z2:MUTE (toggle)   | 82                       | 0B  | 55  | AA  |
|                | Z2:HD select       | 82                       | 0B  | 60  | 9F  |
|                | Z2:DVD select      | 82                       | 0B  | 61  | 9E  |
|                | Z2:GAME select     | 82                       | 0B  | 37  | C8  |
|                | Z2:SAT select      | 82                       | 0B  | 64  | 9B  |
|                | Z2:CABLE select    | 82                       | 0B  | 63  | 9C  |
|                | Z2:DVR select      | 82                       | 0B  | 65  | 9A  |
|                | Z2:CD select       | 82                       | 0B  | 66  | 99  |
|                | Z2:DOCK select     | 82                       | 0B  | 30  | CF  |
|                | Z2:PC select       | 82                       | 0B  | 4C  | B3  |
|                | Z2:TUNER select    | 82                       | 0B  | 6A  | 95  |
|                | Z2:AUX1 select     | 82                       | 0B  | 6B  | 94  |
|                | Z2:AUX2 select     | 82                       | 0B  | 4D  | B2  |
|                | Main Mute ON       | 83                       | 0B  | 01  | x   |

| Selected Input | COMMAND                       | Information Field (HEX ) |     |     |     |
|----------------|-------------------------------|--------------------------|-----|-----|-----|
|                |                               | 1st                      | 2nd | 3rd | 4th |
|                | Main Mute OFF                 | 83                       | 0B  | 02  | x   |
|                | Zone2 Mute ON                 | 83                       | 0B  | 03  | x   |
|                | Zone2 Mute OFF                | 83                       | 0B  | 04  | x   |
|                | Auto EQ ON                    | 83                       | 0B  | 05  | x   |
|                | Auto EQ OFF                   | 83                       | 0B  | 06  | x   |
| √              | Tone ON                       | 83                       | 0B  | 07  | x   |
| √              | Tone OFF                      | 83                       | 0B  | 08  | x   |
| √              | Analog IN                     | 83                       | 0B  | 09  | x   |
| √              | Digital IN                    | 83                       | 0B  | 0A  | x   |
|                | 2Line OSD time (toggle)       | 83                       | 0B  | 0E  | x   |
| √              | V-Process (toggle)            | 83                       | 0B  | 0F  | x   |
|                | EQ HF Shelf +dB               | 83                       | 0B  | 10  | x   |
|                | EQ HF Shelf -1dB              | 83                       | 0B  | 11  | x   |
|                | (Tuner RV-5 only) FM Band     | 83                       | 0B  | 12  | x   |
|                | (Tuner RV-5 only) AM Band     | 83                       | 0B  | 13  | x   |
|                | (Tuner RV-5 only) STEREO      | 83                       | 0B  | 14  | x   |
|                | (Tuner RV-5 only) MONO        | 83                       | 0B  | 15  | x   |
|                | (Tuner RV-5 only) Tune Auto   | 83                       | 0B  | 16  | x   |
|                | (Tuner RV-5 only) Tune Manual | 83                       | 0B  | 17  | x   |

| Direct Setting Command |                                                                                                                                                                        |                          |     |                 |     |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----|-----------------|-----|
| Selected Input         | COMMAND                                                                                                                                                                | Information Field (HEX ) |     |                 |     |
|                        |                                                                                                                                                                        | 1st                      | 2nd | 3rd             | 4th |
|                        | 2Line OSD time setting                                                                                                                                                 | 84                       | 02  | 0~6             | x   |
|                        | Note: 0~1:2-Line OSD Off, 2,3:2-Line OSD 3 Sec, 4~6:2-Line OSD Off time(sec).<br>Note: Device cannot be in menu item to accept direct setting                          |                          |     |                 |     |
|                        | VFD Bright Setting                                                                                                                                                     | 84                       | 03  | 0~2             | x   |
|                        | 0:FULL 1:HALF 2:OFF<br>Note: Device cannot be in menu item to accept direct setting                                                                                    |                          |     |                 |     |
| √                      | V-Process Setting                                                                                                                                                      | 84                       | 04  | 0~2             | x   |
|                        | 0:BYPASS 1:VIDEO CONV ON 2:FAROUDJA<br>Note: Device cannot be in menu item to accept direct setting                                                                    |                          |     |                 |     |
|                        | Main Volume Setting                                                                                                                                                    | 84                       | 05  | 0~0x5A          | x   |
|                        | 0(-80dB) ~ 0x5A(+10dB)                                                                                                                                                 |                          |     |                 |     |
|                        | Zone2 Volume Setting                                                                                                                                                   | 84                       | 06  | 0~0x5A          | x   |
|                        | 0(-80dB) ~ 0x5A(+10dB)                                                                                                                                                 |                          |     |                 |     |
| √                      | Bass Level Setting                                                                                                                                                     | 84                       | 07  | 0~0x0C          | x   |
|                        | 0(-6dB)~0x0C(+6dB)<br>Note: Device cannot be in menu item to accept direct setting                                                                                     |                          |     |                 |     |
| √                      | Treble Level Setting                                                                                                                                                   | 84                       | 08  | 0~0x0C          | x   |
|                        | 0(-6dB)~0x0C(+6dB)<br>Note: Bass/Treble are not global parameters so they apply only to input selected<br>Note: Device cannot be in menu item to accept direct setting |                          |     |                 |     |
|                        | EQ HF Shelf Level Setting                                                                                                                                              | 84                       | 09  | 0~0x10          | x   |
|                        | 0(-8dB)~0x10(+8dB)<br>Note: Device cannot be in menu item to accept direct setting                                                                                     |                          |     |                 |     |
|                        | (Tuner RV-5 only) FM Frequency Direct                                                                                                                                  | 84                       | 0A  | 0x222E ~ 0x2A30 |     |
|                        | 0000 x10kHz (ex 87.50Mhz :0x222E,100.00Mhz:0x2710, 108.00Mhz:0x2A30)<br>Note: Device cannot be in menu item to accept direct setting                                   |                          |     |                 |     |
|                        | (Tuner RV-5 only) AM Frequency Direct                                                                                                                                  | 84                       | 0B  | 0x208 ~ 0x6B8   |     |
|                        | 0000 x1khz (ex 520khz:0x0208, 1000khz:0x03e8, 1720khz:0x06B8)<br>Note: Device cannot be in menu item to accept direct setting                                          |                          |     |                 |     |
|                        | (Tuner RV-5 only) Preset Direct Access                                                                                                                                 | 84                       | 0C  | 0~0x1E          | x   |
|                        | 0(Preset 1)~1E(Preset 30), 0 & 1 are same = 1<br>Note: Device cannot be in menu item to accept direct setting                                                          |                          |     |                 |     |

| Direct Setting Command |                                                                                                             |                          |     |        |     |
|------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------|-----|--------|-----|
| Selected Input         | COMMAND                                                                                                     | Information Field (HEX ) |     |        |     |
|                        |                                                                                                             | 1st                      | 2nd | 3rd    | 4th |
|                        | FL Trim Level Setting                                                                                       | 84                       | 10  | 0~0x14 | x   |
|                        | 0(-15dB)~0x14(+5dB) CE,FR,SR....SUB2 : same<br>Note: Device cannot be in menu item to accept direct setting |                          |     |        |     |
|                        | CEN Trim Level Setting                                                                                      | 84                       | 11  | 0~0x14 | x   |
|                        | FR Trim Level Setting                                                                                       | 84                       | 12  | 0~0x14 | x   |
|                        | SR Trim Level Setting                                                                                       | 84                       | 13  | 0~0x14 | x   |
|                        | RR Trim Level Setting                                                                                       | 84                       | 14  | 0~0x14 | x   |
|                        | RL Trim Level Setting                                                                                       | 84                       | 15  | 0~0x14 | x   |
|                        | SL Trim Level Setting                                                                                       | 84                       | 16  | 0~0x14 | x   |
|                        | SUB1 Trim Level Setting                                                                                     | 84                       | 17  | 0~0x14 | x   |
|                        | SUB2 Trim Level Setting                                                                                     | 84                       | 18  | 0~0x14 | x   |

| Status Request Command |                         |                          |     |     |     |
|------------------------|-------------------------|--------------------------|-----|-----|-----|
| Selected Input         | COMMAND                 | Information Field (HEX ) |     |     |     |
|                        |                         | 1st                      | 2nd | 3rd | 4th |
|                        | Display Status Request  | 83                       | 0B  | 80  | x   |
|                        | Ram Status Request      | 83                       | 0B  | 81  | x   |
|                        | Flag Status Request     | 83                       | 0B  | 82  | x   |
|                        | Display Status Auto ON  | 83                       | 0B  | 90  | x   |
|                        | Display Status Auto OFF | 83                       | 0B  | 91  | x   |
|                        | Ram Status Auto ON      | 83                       | 0B  | 92  | x   |
|                        | Ram Status Auto OFF     | 83                       | 0B  | 93  | x   |
|                        | Flag Status Auto ON     | 83                       | 0B  | 94  | x   |
|                        | Flag Status Auto OFF    | 83                       | 0B  | 95  | x   |

## 5 Status Data

AVR -> PC, Data length: 4 byte

### 5.1 Display Status

Data type: 3

| Byte  | Content           | Code type |
|-------|-------------------|-----------|
| 1-20  | FL UPPER (20byte) | ASCII     |
| 21-40 | FL Down (20byte)  | ASCII     |

The RV-5/MV-5 includes two custom characters:

| Code | Character Definition | Comment                                                  |
|------|----------------------|----------------------------------------------------------|
| 0x13 | Pause symbol         | Displays when the Dock/iPod input is paused              |
| 0x13 | Roman numeral “II”   | Displays when the Dolby PLIIx listening mode is selected |

The RV-5/MV-5 includes two custom characters that are defined as Dock/iPod pause symbol and Roman Numeral II in PLIIx displays in front panel and OSD. In data type 3 above these are both sent as control character 0x13. All of display status (data type: 3) data is ASCII, except when dock is selected stings from iPod are displayed, those are UTF-8 characters (U+0000 to U+00FF)

### 5.2 Ram Status

Data type: 4

| Selected Input | Byte                                                                                                                                 | Content     | Code type |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
|                | 1                                                                                                                                    | Main Input  | Hex       |
|                | 2                                                                                                                                    | Zone2 Input | Hex       |
|                | See table below with values returned that correspond to setting since they do not map to setting input values in other section above |             |           |
|                | Table: Values returned byte 1-2 “INPUT”                                                                                              | MAIN        | ZONE2     |
|                | HD                                                                                                                                   | 0x06        | 0x01      |
|                | SAT                                                                                                                                  | 0x08        | 0x03      |
|                | CD                                                                                                                                   | 0x03        | 0x07      |
|                | TUNER                                                                                                                                | 0x00        | 0x00      |
|                | DVD                                                                                                                                  | 0x07        | 0x02      |
|                | CABLE                                                                                                                                | 0x09        | 0x04      |

|                | DOCK | 0x0E                                     | 0x09      |
|----------------|------|------------------------------------------|-----------|
| Selected Input | Byte | Content                                  | Code type |
|                | AUX1 | 0x0A                                     | 0x05      |
|                | GAME | 0x0B                                     | 0x0E      |
|                | DVR  | 0x05                                     | 0x06      |
|                | PC   | 0x0F                                     | 0x0C      |
|                | AUX2 | 0x04                                     | 0x08      |
|                | OFF  | 0x20                                     | 0x20      |
|                | 3    | MAIN Volume                              | Hex       |
|                | 4    | Zone2 Volume                             | Hex       |
| √              | 5    | Bass Level                               | Hex       |
| √              | 6    | Treble Level                             | Hex       |
|                | 7    | EQ HF Shelf Level                        | Hex       |
|                | 9    | 2Line OSD Time                           | Hex       |
|                |      | Note: Values returned are 1 off, 3-6 sec |           |
|                | 10   | Front VFD Brightness                     | Hex       |
| √              | 11   | V-Process Setting                        | Hex       |
|                | 12   | FL Trim Level Setting                    | Hex       |
|                | 13   | CEN Trim Level Setting                   | Hex       |
|                | 14   | FR Trim Level Setting                    | Hex       |
|                | 15   | SR Trim Level Setting                    | Hex       |
|                | 16   | RR Trim Level Setting                    | Hex       |
|                | 17   | RL Trim Level Setting                    | Hex       |
|                | 18   | SL Trim Level Setting                    | Hex       |
|                | 19   | SUB1 Trim Level Setting                  | Hex       |
|                | 20   | SUB2 Trim Level Setting                  | Hex       |

### 5.3 Flag Status

Data type: 5

| Selected Input | Byte | Content                                   | Code type |
|----------------|------|-------------------------------------------|-----------|
|                | 1    | Power ON/OFF (bit set=on)                 | Bit7      |
|                |      | Main Mute ON/OFF (bit set=on)             | Bit6      |
|                |      | Zone2 Mute ON/ OFF (bit set=on)           | Bit5      |
|                |      | Auto EQ ON/ OFF (bit set=on)              | Bit4      |
| √              |      | Tone ON/ OFF (bit set=on)                 | Bit3      |
| √              |      | Analog/Digital (bit set=digital)          | Bit2      |
|                |      | unused SPARE                              | Bit1      |
|                |      | (Tuner RV-5 only) FM/AM (bit set=FM)      | Bit0      |
|                | 2    | (Tuner RV-5 only) ST/MONO (bit set=ST)    | Bit7      |
|                |      | (Tuner RV-5 only) AUTO/MAN (bit set=auto) | Bit6      |
|                |      | Display status transfer auto (bit set=on) | Bit5      |
|                |      | Ram status transfer auto (bit set=on)     | Bit4      |
|                |      | Flag status transfer auto (bit set=on)    | Bit3      |
|                |      | unused SPARE                              | Bit2      |
|                |      | unused SPARE                              | Bit1      |
|                |      | unused SPARE                              | Bit0      |

## 6 Examples

### 6.1 FM Frequency Direct Example

The specification states that:

| COMMAND                                                              | Information Field (HEX ) |     |                 |     |
|----------------------------------------------------------------------|--------------------------|-----|-----------------|-----|
|                                                                      | 1st                      | 2nd | 3rd             | 4th |
| FM Frequency Direct                                                  | 84                       | 0A  | 0x222E ~ 0x2A30 |     |
| 0000 x10kHz (ex 87.50Mhz :0x222E,100.00Mhz:0x2710, 108.00Mhz:0x2A30) |                          |     |                 |     |

Here are some examples:

| Start Code                                                                                                                                                                                                                                                                                        | Date Type | Length Data | Data |      |      |      | Result |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|------|------|------|------|--------|
| 0xFF                                                                                                                                                                                                                                                                                              | 0x02      | 0x04        | 0x84 | 0x0A | 0x28 | 0xAA | 104.10 |
| 0xFF                                                                                                                                                                                                                                                                                              | 0x02      | 0x04        | 0x84 | 0x0A | 0x24 | 0xEA | 94.50  |
| 0xFF                                                                                                                                                                                                                                                                                              | 0x02      | 0x04        | 0x84 | 0x0A | 0x23 | 0x5A | 90.50  |
| If the direct FM frequency is 104.10<br>1. Remove decimal from decimal number (10410)<br>2. Convert to decimal 10410 to HEX (0x28AA)<br>3. Send word as two bytes 0x28 0xAA in the last two bytes of 4 byte data<br>Others:<br>94.50 > 9450 > 0x24EA 0x24 0xEA<br>90.50 > 9050 > 0x235A 0x23 0x5A |           |             |      |      |      |      |        |

### 6.2 Main Volume Setting Example

The specification states that:

| COMMAND                | Information Field (HEX ) |     |        |     |
|------------------------|--------------------------|-----|--------|-----|
|                        | 1st                      | 2nd | 3rd    | 4th |
| Main Volume Setting    | 84                       | 05  | 0~0x5A |     |
| 0(-80dB) ~ 0x5A(+10dB) |                          |     |        |     |

Here are some examples:

| Start Code | Date Type | Length Data | Data |      |      |  | Result |
|------------|-----------|-------------|------|------|------|--|--------|
| 0xFF       | 0x02      | 0x03        | 0x84 | 0x05 | 0x00 |  | -80dB  |
| 0xFF       | 0x02      | 0x03        | 0x84 | 0x05 | 0x22 |  | -46dB  |
| 0xFF       | 0x02      | 0x03        | 0x84 | 0x05 | 0x5A |  | +10dB  |