

# **SOFTWARE LICENSE AGREEMENT FOR APPA WinDMM100 95 / 98**

## **IMPOTANT :**

### **Please read carefully before using the Software.**

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The RS-232 protocol is one part of the APPA WinDMM and is exactly and completely the same as the APPA WinDMM, but no other warranties for the end user to write a driver using the RS-232 protocol.

### **The RS-232 protocol :**

1. Communication Type : RS-232C

2. Communication protocol :

A : Baud Rate : 9600 bps

B : Data length : 8 bits

C : Parity check : None

D : Stop bit : 1 bit

3. Data format : The data format is ASCII code.

A. PC sends a command to DMM for requesting to read as follow :

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 55H | 55H | 80H | 00H | AAH |
|-----|-----|-----|-----|-----|

After sending the command, wait for receiving data format from DMM, the time out setting must be bigger than 450ms.

B. When DMM receives the command from PC, will send the data format to PC as follow :

|     |     |     |     |               |            |           |            |                        |  |
|-----|-----|-----|-----|---------------|------------|-----------|------------|------------------------|--|
| 55H | 55H | 00H | 29H | Data Function | Rotor Code | Blue Code | Range Code | Main Reading (5 Bytes) |  |
|-----|-----|-----|-----|---------------|------------|-----------|------------|------------------------|--|

|  |   |
|--|---|
|  | Sub-reading (5 Bytes) , A/D Conversion Data A (3 Bytes) |
|--|---|

|                                    |                                    |                                   |                         |
|------------------------------------|------------------------------------|-----------------------------------|-------------------------|
| A/D Conversion Data<br>B (3 Bytes) | A/D Conversion Data<br>C (3 Bytes) | A/D Read Zero Data<br>A (3 Bytes) | A/D Read<br>Zero Data B |
|------------------------------------|------------------------------------|-----------------------------------|-------------------------|

|           |                         |                         |                         |             |             |
|-----------|-------------------------|-------------------------|-------------------------|-------------|-------------|
| (3 Bytes) | External Off-Set Data 1 | External Off-Set Data 2 | External Off-Set Data 3 | Gain Data 1 | Gain Data 2 |
|-----------|-------------------------|-------------------------|-------------------------|-------------|-------------|

|             |              |
|-------------|--------------|
| Gain Data 3 | Check<br>sum |
|-------------|--------------|

a. Data Function

| CODE |    | ROTOR    | CODE |    | ROTOR    |
|------|----|----------|------|----|----------|
| 00H  | 0  | NONE     | 0BH  | 11 | AC mA    |
| 01H  | 1  | ACV      | 0CH  | 12 | DC mA    |
| 02H  | 2  | DCV      | 0DH  | 13 | AC+DC mA |
| 03H  | 3  | AC+DC V  | 0EH  | 14 | ACA      |
| 04H  | 4  | AC mV    | 0FH  | 15 | DCA      |
| 05H  | 5  | DC mV    | 10H  | 16 | AC+DC A  |
| 06H  | 6  | AC+DC mV | 11H  | 17 | CAP.     |
| 07H  | 7  | Ohm      | 12H  | 18 | □        |
| 08H  | 8  | LV Ohm   | 13H  | 19 | □        |
| 09H  | 9  | Diode    | 14H  | 20 | Freq.    |
| 0AH  | 10 | Beeper   |      |    |          |

b. Rotor code

|     |     |     |     |       |     |     |      |     |       |
|-----|-----|-----|-----|-------|-----|-----|------|-----|-------|
| 00H | 01H | 02H | 03H | 04H   | 05H | 06H | 07H  | 08H | 09H   |
| OFF | V   | mV  | Ohm | Diode | mA  | A   | Cap. | Hz  | Temp. |

c. Blue code

|     |           |           |            |        |           |           |       |                |       |
|-----|-----------|-----------|------------|--------|-----------|-----------|-------|----------------|-------|
|     | V         | mV        | Ohm        | Diode  | mA        | A         | Cap.  | Hz             | Temp. |
| 00H | AC        | AC        | Ohm        | Diode  | AC        | AC        | Cap   | Hz             | deg.C |
| 01H | DC        | DC        | Low<br>Ohm | Beeper | DC        | DC        | ----- | Duty<br>Factor | deg.F |
| 02H | AC+<br>DC | AC+<br>DC | -----      | -----  | AC+<br>DC | AC+<br>DC | ----- | -----          | ----- |

d. Range code

|                 | DC V  | AC V | (AC+DC)<br>V | DC mV | AC mV | (AC+DC)<br>mV |
|-----------------|-------|------|--------------|-------|-------|---------------|
| 00H<br>(auto)   | 2V    | 2V   | 2V           | 20mV  | 20mV  | 20mV          |
| 01H<br>(auto)   | 20V   | 20V  | 20V          | 200mV | 200mV | 200mV         |
| 02H<br>(auto)   | 200V  | 200V | 200V         |       |       |               |
| 03H<br>(auto)   | 1000V | 750V | 750V         |       |       |               |
| 80H<br>(manual) | 2V    | 2V   | 2V           | 20mV  | 20mV  | 20mV          |
| 81H<br>(manual) | 20V   | 20V  | 20V          | 200mV | 200mV | 200mV         |
| 82H<br>(manual) | 200V  | 200V | 200V         |       |       |               |
| 83H<br>(manual) | 1000V | 750V | 750V         |       |       |               |

|                 | DC mA | AC mA | (AC+DC)<br>mA | DC A | AC A | (AC+DC)<br>A |
|-----------------|-------|-------|---------------|------|------|--------------|
| 00H<br>(auto)   | 20mA  | 20mA  | 20mA          | 2A   | 2A   | 2A           |
| 01H<br>(auto)   | 200mA | 200mA | 200mA         | 10A  | 10A  | 10A          |
| 80H<br>(manual) | 20mA  | 20mA  | 20mA          | 2A   | 2A   | 2A           |
| 81H<br>(manual) | 200mA | 400mA | 200mA         | 10A  | 10A  | 10A          |

|                 | Ohm     | Low Ohm | Cap   | Hz     | <input type="checkbox"/>      | <input type="checkbox"/>      |
|-----------------|---------|---------|-------|--------|-------------------------------|-------------------------------|
| 00H<br>(auto)   | 200Ohm  | 2kOhm   | 4nF   | 20Hz   | 400 <input type="checkbox"/>  | 400 <input type="checkbox"/>  |
| 01H<br>(auto)   | 2kOhm   | 20kOhm  | 40nF  | 200Hz  | 1200 <input type="checkbox"/> | 2192 <input type="checkbox"/> |
| 02H<br>(auto)   | 20kOhm  | 200kOhm | 400nF | 2kHz   |                               |                               |
| 03H<br>(auto)   | 200kOhm | 2MOhm   | 4μF   | 20kHz  |                               |                               |
| 04H<br>(auto)   | 2Mohm   | 20MOhm  | 40μF  | 200kHz |                               |                               |
| 05H<br>(auto)   | 20Mohm  |         | 400μF | 1MHz   |                               |                               |
| 06H<br>(auto)   |         |         | 4mF   |        |                               |                               |
| 07H<br>(auto)   |         |         | 40mF  |        |                               |                               |
| 80H<br>(manual) | 200Ohm  | 2kOhm   | 4nF   | 20Hz   | <input type="checkbox"/>      | <input type="checkbox"/>      |
| 81H<br>(manual) | 2kOhm   | 20kOhm  | 40nF  | 200Hz  | 400 <input type="checkbox"/>  | 400 <input type="checkbox"/>  |
| 82H<br>(manual) | 20kOhm  | 200kOhm | 400nF | 2kHz   | 1200 <input type="checkbox"/> | 2192 <input type="checkbox"/> |
| 83H<br>(manual) | 200kOhm | 2MOhm   | 4μF   | 20kHz  |                               |                               |
| 84H<br>(manual) | 2Mohm   | 20MOhm  | 40μF  | 200kHz |                               |                               |
| 85H<br>(manual) | 20Mohm  | 200Mohm | 400μF | 1MHz   |                               |                               |
| 86H<br>(manual) | 200Mohm | 2Gohm   | 4mF   |        |                               |                               |
| 87H<br>(manual) | 2Gohm   |         | 40mF  |        |                               |                               |

e. Main Reading

|             |             |              |       |          |
|-------------|-------------|--------------|-------|----------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte | State | Function |
|-------------|-------------|--------------|-------|----------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)]

f. Sub-reading

|             |             |              |       |          |
|-------------|-------------|--------------|-------|----------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte | State | Function |
|-------------|-------------|--------------|-------|----------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)]

g : A/D Conversion Data A

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)]

h : A/D Conversion Data B

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)]

i : A/D Conversion Data C

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)

j : A/D Read Zero Data A

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)

k : A/D Read Zero Data B

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)

l : A/D Read Zero Data C

|             |             |              |
|-------------|-------------|--------------|
| Low<br>Byte | 2nd<br>Byte | High<br>Byte |
|-------------|-------------|--------------|

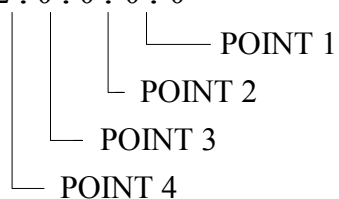
Reading = [(Low byte)+(2nd byte x 256)+(High Byte x 65536)+(High Byte x 16777216)

m : State: Bit7 to Bit3 are for Unit ; Bit2 to Bit0 are for Decimal Point.

## 1.POINT CODE :

| Bit2 | Bit1 | Bit0 | Point  |
|------|------|------|--------|
| 0    | 0    | 0    | None   |
| 0    | 0    | 1    | Point1 |
| 0    | 1    | 0    | Point2 |
| 0    | 1    | 1    | Point3 |
| 1    | 0    | 0    | Point4 |

Remark : 2 . 0 . 0 . 0 . 0



## 2.UNIT CODE :

| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Unit | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Unit |
|------|------|------|------|------|------|------|------|------|------|------|------|
| 0    | 0    | 0    | 0    | 0    | None | 0    | 1    | 1    | 1    | 0    | %    |
| 0    | 0    | 0    | 0    | 1    | V    | 0    | 1    | 1    | 1    | 1    | Hz   |
| 0    | 0    | 0    | 1    | 0    | mV   | 1    | 0    | 0    | 0    | 0    | KHz  |
| 0    | 0    | 0    | 1    | 1    | A    | 1    | 0    | 0    | 0    | 1    | MHz  |
| 0    | 0    | 1    | 0    | 0    | mA   | 1    | 0    | 0    | 1    | 0    | □    |
| 0    | 0    | 1    | 0    | 1    | dB   | 1    | 0    | 0    | 1    | 1    | □    |
| 0    | 0    | 1    | 1    | 0    | dBm  | 1    | 0    | 1    | 0    | 0    | s    |
| 0    | 0    | 1    | 1    | 1    | nF   | 1    | 0    | 1    | 0    | 1    | ms   |
| 0    | 1    | 0    | 0    | 0    | uF   | 1    | 0    | 1    | 1    | 0    | ns   |
| 0    | 1    | 0    | 0    | 1    | mF   |      |      |      |      |      |      |
| 0    | 1    | 0    | 1    | 0    | Ω    |      |      |      |      |      |      |
| 0    | 1    | 0    | 1    | 1    | KΩ   |      |      |      |      |      |      |
| 0    | 1    | 1    | 0    | 0    | MΩ   |      |      |      |      |      |      |
| 0    | 1    | 1    | 0    | 1    | GΩ   |      |      |      |      |      |      |



n : External Offset Data 1

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

$$\text{Reading} = [(\text{Low byte}) + (\text{High byte} \times 256)]$$

o : External Offset Data 2

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

$$\text{Reading} = [(\text{Low byte}) + (\text{High byte} \times 256)]$$

p : External Offset Data 3

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

$$\text{Reading} = [(\text{Low byte}) + (\text{High byte} \times 256)]$$

q : Gain Data 1

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

$$\text{Reading} = [(\text{Low byte}) + (\text{High byte} \times 256)]$$

r : Gain Data 2

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

$$\text{Reading} = [(\text{Low byte}) + (\text{High byte} \times 256)]$$

s : Gain Data 3

|             |              |
|-------------|--------------|
| Low<br>Byte | High<br>Byte |
|-------------|--------------|

Reading = [(Low byte)+(High byte x 256)]

Checksum:

The last byte is the SUM of every byte in the received data format except Checksum itself, you can use the Checksum (using the last two digits) to check the data receiving from DMM is correctly or not.

Example for Checksum :

55+55+0+36+41+50+50+41+33+30+35+20+53+61+6E+64+72+61+20+20+30+  
2E+30+30+2E+30+36+1+0+0+0+1+0+80+1+0+0+8+1+1+0+0+0+0+0+0+0+0+  
0+0+0+0+0+0+0+0+0+0 = 732

Checksum = 32