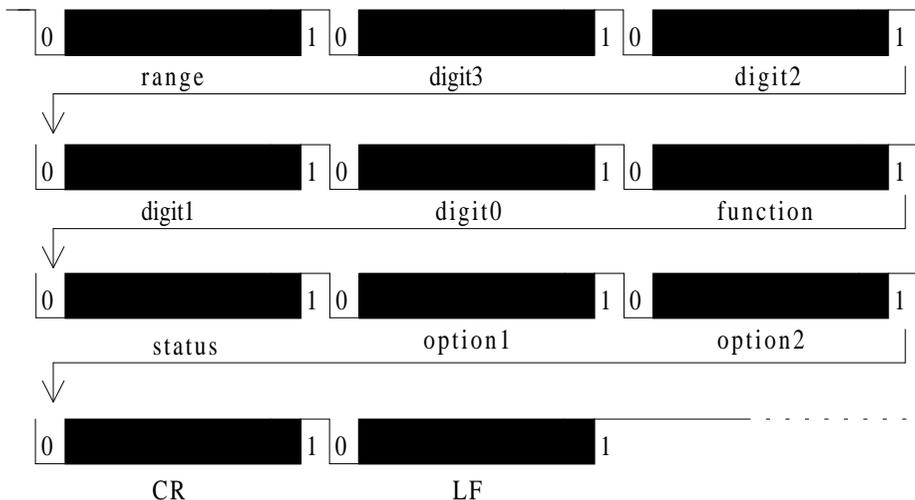


4 Serial Data Output

The serial data is sent to SDO pin twice every A/D conversion cycle. The data format complies with JIS 7BIT transmission code with a baud rate of 2400. The host can use RS-232 interface to read the data. A single data packet includes a start bit (always 0), 7 data bits, an odd parity check bit, and a stop bit (always 1). The following figure shows the data format of a single packet. The LSB is sent first and the MSB is sent last.



One data block consists of 11 packets, or 110 bits. The following figure shows the format of a data block. The range packet indicates the full scale range of the meter. Digit 3 through digit 0 is just the digits on the LCD panel. The function packet indicates the measurement mode of the meter. Status, option 1 and option 2 gives the status of the meter. CR and LF are delimiters used to separate the blocks.



The meter always outputs the current input value to the serial port. Each block is repeated twice in one conversion cycle. The detailed data format of each packet is listed below.

4.1 FUNCTION

This packet indicates the measurement mode of the meter. The following table summarizes the transmitted code for each mode. Note that the encoding of this packet is different from the encoding of FC1–FC4 switch.

| Code | Measurement Mode |
|---------|------------------------------|
| 0111011 | Voltage |
| 0111101 | μA Current |
| 0111001 | mA Current |
| 0111111 | A Current |
| 0110011 | Ω |
| 0110101 | Continuity |
| 0110001 | Diode |
| 0110010 | Frequency / RPM ¹ |
| 0110100 | Temperature ² |
| 0111110 | ADP0 |
| 0111100 | ADP1 |
| 0111000 | ADP2 |
| 0111010 | ADP3 |

Note:

1. The Judge bit in the Status packet determines whether it is frequency mode or RPM mode.
2. The Judge bit in the Status packet determines whether the unit is Celcius or Fahrenheit.

4.2 RANGE

This packet indicates the full scale range of the meter. When the meter operates in continuity mode, diode mode, or current (A) mode, this packet is always 0110000 since the full scale range in these modes are fixed. The following table lists the code for each range in each measurement mode.

| Code | V | mA | μA | Ω | Frequency | RPM |
|---------|---------|---------|---------------------|-----------------|-----------|-----------|
| 0110000 | 340.0mV | 34.00mA | 340.0 μA | 340.0 Ω | 3.400KHz | 34.00KRPM |
| 0110001 | 3.400V | 340.0mA | 3400 μA | 3.400K Ω | 34.00KHz | 340.0KRPM |
| 0110010 | 34.00V | | | 34.00K Ω | 340.0KHz | 3.400MRPM |
| 0110011 | 340.0V | | | 340.0K Ω | 3.400MHz | 34.00MRPM |
| 0110100 | 3400V | | | 3.400M Ω | 34.00MHz | 340.0MRPM |
| 0110101 | | | | 34.00M Ω | | |

4.3 DIGIT 3 – DIGIT 0

Digit 3 is the most significant digit on the LCD panel, and digit 0 is the least significant digit. When the LCD panel shows OL, the serial port outputs 3400.

| Digit | Code |
|-------|---------|
| 0 | 0110000 |
| 1 | 0110001 |
| 2 | 0110010 |
| 3 | 0110011 |
| 4 | 0110100 |
| 5 | 0110101 |
| 6 | 0110110 |
| 7 | 0110111 |
| 8 | 0111000 |
| 9 | 0111001 |

4.4 STATUS

The format of this packet is shown below. The Judge field is meaningful only when the Function packet indicates Frequency/RPM mode or Temperature mode. In Temperature mode, judge is 1 if the unit is $^{\circ}C$ and is 0 if the unit is $^{\circ}F$. In Frequency/RPM mode, judge is 1 if the meter operates in RPM mode; otherwise, it is 0. Sign field indicates whether the minus sign on the LCD panel is on or off. BATT field is one if battery low condition is true. OL indicates input overflow.

| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 0 | 1 | 1 | Judge | Sign | BATT | OL |
| Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

4.5 OPTION 1

This packet contains information on VAHZ measurement modes. The least significant bit indicates whether the VAHZ mode is enabled or not.

| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 0 | 1 | 1 | 0 | 0 | 0 | VAHZ |
| Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

4.6 OPTION 2

This packet contains information on the operation mode of the meter. The format is shown below. The DC field indicates that the meter operates in DC measurement mode, either voltage or current. The AC field indicates that the meter operates in AC measurement mode. The AUTO field is set to one if the meter operates in automatic mode, and is set to zero when the meter operates in manual mode. The APO field indicates whether auto power off function is enabled or not.

| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 0 | 1 | 1 | DC | AC | AUTO | APO |
| Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

4.7 CR

Carrage return. The transmitted code is 0001101.

4.8 LF

Line feed. The transmitted code is 0001010.

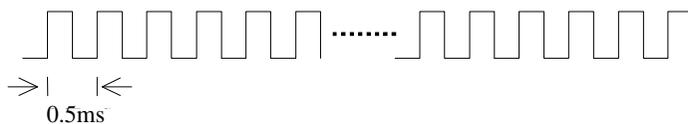
5 Miscellaneous

5.1 The Buzzer

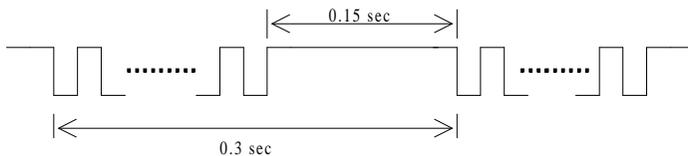
The conditions which the meter turns on the buzzer include:

- (1) Changing measurement mode generates one beep.
- (2) Pressing any of the push functions generates one beep, if the function is valid.
- (3) Power on and re-power on generate one beep.
- (4) Input over flow in voltage and current measurement mode generates one beep every 0.3 seconds (or 3.33 beeps per second.)
- (5) Continuity check and diode measurement generate a continuous 2KHz beep whenever the bar graph count is less than 3.
- (6) Auto power off generates a 2KHz beep which lasts for 1.5 seconds.

The following figures shows the output waveform from the BUZOUT pin.



(a) Continuous 2KHz beep



(b) 3.33 beep/sec