

PowerSight can automatically supply relevant measurements to your Data Collection system.

Introduction

Every PowerSight meter has an “Automatic Data Reporting” mode of operation built into it. Following power-up, a single command from a host system can put PowerSight in this mode. While in the mode, PowerSight reports the relevant RMS voltages, PMS currents, true power, and apparent power information to the host once per second. Once started, this mode continues until either PowerSight is turned off or a command to exit the mode is received.

The summary data is provided in a rigidly-defined binary floating point format. It is provided without being prompted, once per second.

Communications Basics for Automatic Data Reporting Mode

The data communications speed depends on the speed that your PowerSight can support. PS2500 and PS3500 meters are limited to 9600 baud. PS4500 is set to 57.6kbps.. Characters for an RS232 link are sent with 1 start bit, followed by 8 data bits, and ending with 1 stop bit. Communications are half-duplex. PS2500 and PS3500 meters will not receive commands while doing harmonic analysis, so it is best to have them out of that recording mode when initiating Automatic Data Reporting mode. PS2500 and PS3500 may delay in their response to communications up to one second, so there needs to be at least a one second timeout when waiting for a response from those meters. Characters are transmitted to and received from PowerSight starting with the most significant bit (bit 7) and ending with the least significant bit (bit 0). All measurements are transmitted big-endian.

Initiating Automatic Data Reporting mode

PowerSight must be powered “on” and connected to the host system via its serial link. To verify that the serial link is working, you may wish to use our PSM software to “Connect to Unit”. A successful connection (the green “Unit Connected” bar appearing), indicates that all the physical and data link layers are working correctly.

The command to PowerSight to initiate Automatic Data Reporting mode is:

1. transmit 0xFF to PowerSight to indicate the beginning of a command
2. transmit the meter’s single byte network identifier or transmit 0x00 to indicate that this is a broadcast message. In most cases, the host is communicating to just one meter via the link so 0x00 is a good choice since it will work with any meter that may be connected. If you do send out the network identifier, you must wait for an acknowledge character (0x01) from the meter before you proceed to the next step.
3. Transmit the command byte. To initiate Automatic Data Reporting mode, send the ASCII “V” character (0x56).
4. Wait for an acknowledge character (0x01) from the meter. If the acknowledge is not received in 5 seconds, repeat steps 1 through 3 until you get the acknowledge
5. Following receipt of the acknowledge character, the meter will automatically send the summary information to the host at the conclusion of each second.

Receiving Data in Automatic Data Reporting Mode

The order of receiving data while in Automatic Data Reporting mode is:

1. Synchronizer characters = 0xFFDF
2. Compatibility Level = 0x00
3. Measurement Modes:
 - Bit0 = voltage mode: 0=phase-neutral, 1=phase-phase
 - Bits2-4 = power mode: 000= absolute power only
001= negative power allowed
010= 2 current power mode
 - Bits5-7 = frequency mode: 000= variable frequency, 22-200Hz
001= fixed frequency DC and 50Hz
010= fixed frequency DC and 60Hz
011= fixed frequency DC and 400Hz
100= variable frequency, 360-440Hz
4. Voltage Normalization Ratio. If this float is negative, then measurements have been “normalized” and they need to be restored to their proper value. To normalize,
 - find the absolute value of the Voltage Normalization Ratio
 - multiple the ratio times each voltage and each wattage that follows
 - Note: this ratio is only used in very large power systems.
5. Current Normalization Ratio. If this float is negative, then measurements have been “normalized” and they need to be restored to their proper value. To normalize,
 - find the absolute value of the Current Normalization Ratio
 - multiple the ratio times each current and each wattage that follows
 - Note: this ratio is only used in very large power systems.
6. V_{1N} RMS voltage (float) – PS2500/3500 supplies V_{1x}, according to voltage mode
7. V_{2N} RMS voltage (float) – PS2500/3500 supplies V_{2x}, according to voltage mode
8. V_{3N} RMS voltage (float) – PS2500/3500 supplies V_{3x}, according to voltage mode
9. reserved (float)
10. V₁₂ RMS voltage (float) – PS2500/3500 supplies V_{1x}, according to the voltage mode
11. V₂₃ RMS voltage (float) – PS2500/3500 supplies V_{2x}, according to the voltage mode
12. V₃₁ RMS voltage (float) – PS2500/3500 supplies V_{3x}, according to the voltage mode
13. I₁ RMS current (float)
14. I₂ RMS current (float)
15. I₃ RMS current (float)
16. I_N RMS current (float)
17. W₁ true power (float)
18. W₂ true power (float)
19. W₃ true power (float)
20. W_T true power (float)
21. Checksum: 1 byte sum of all preceding bytes of the transmission, modulus 256
22. 0x17 (End Of Text) to indicate end of the transmission

Interpreting Data in Automatic Data Reporting Mode

Although the data received is always the most relevant data, given the operating mode of PowerSight, its meaning varies, depending on the operating modes of PowerSight.

The PS2500/3500 only report the voltages according to the active voltage mode. Therefore V_{1N}, V_{2N}, and V_{3N} are actually phase-phase voltages when operating in phase-phase voltage mode and V₁₂, V₂₃, and V₃₁ are actually phase-neutral voltages when in phase-

neutral voltage mode. The PS4500 reports both phase-phase and phase-neutral voltages. For all meters, the phase-phase voltages are V_{12} , V_{23} , and V_{32} when operating in 2 current power mode. In all cases, the volts are reported in binary 4 byte floating point format, big-endian, and scaled in decivolts (i.e. 12.3 V is reported as 123, in floating point format).

The currents are I_1 , I_2 , I_3 , and I_N . When in 2 current mode, I_2 may or may not be present, but it has no bearing on the power readings. In all cases, the current is reported in binary 4 byte floating point format, big-endian, and scaled in milliamps (i.e. 12.3 A is reported as 12,300, in floating point format).

The true powers are W_1 , W_2 , and W_3 . When in “positive power only” mode, they are reported in deciwatts (i.e. 12.3 W is reported as 123, in floating point format). When in “negative power allowed” mode, they are reported in watts (i.e. 12.3 W is reported as 12). When in 2 current mode, depending on the firmware of the meter, the W_1 term may express the $V_{12} * I_1$ term of total power, the W_2 term will equal 0, and the W_3 term will express the $V_{32} * I_3$ term of total power. In this case, The W_1 , W_2 , and W_3 terms do not actually represent the true power of each phase, although their total, W_T , is the correct total true power. In all cases, true power is reported in binary 4 byte floating point format, big-endian.

Using Data Obtained From Automatic Data Reporting Mode

Once the voltages, currents, true powers, and apparent powers are received. They can yield additional measurements of great interest. Specifically:

$$VA_1 = V_{1N} * I_1$$

$$VA_2 = V_{2N} * I_2$$

$$VA_3 = V_{3N} * I_3$$

$$VA_T = \text{total apparent power} = VA_1 + VA_2 + VA_3$$

$$TPF_1 = \text{true power factor of phase 1} = W_1/VA_1.$$

$$TPF_2 = \text{true power factor of phase 2} = W_2/VA_2.$$

$$TPF_3 = \text{true power factor of phase 3} = W_3/VA_3.$$

$$TPF_T = \text{total true power factor} = TPF_1 + TPF_2 + TPF_3.$$

Please note: VA_2 , VA_T , TPF_2 , and TPF_T cannot be calculated in 2 current mode.

Terminating Automatic Data Reporting mode

Automatic Data Reporting mode can be terminated by either turning PowerSight off and then back on or by sending the terminating command to it. To send the terminating command, PowerSight must be “on” and connected to the host system via its serial link.

The communications sequence to terminate the mode is identical to the sequence used to start the mode except the command byte that is sent to the meter is “v” (0x76). If the command transmission is successful, the meter will acknowledge receipt of the command (0x01) and then be silent.

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