



APC UPS Monitoring Module Application Guide






Description

This module allows you to monitor an APC UPS via RS-232 connection to your Crestron processor. This module will work with all APC Uninterruptible Power Supplies that support APC's 'Smart Signaling Protocol' and have a DB9 serial port, including the BackUPS Pro, SmartUPS, MatrixUPS and Symmetra families.

At this time Backups RS- and XS- series UPS, as well as any other APC UPS that does not have a DB9 'Smart Signaling' capable port is not supported. This module may function with some non-APC UPS, however ControlWorks is unable to support this module when used with any other manufacturer's UPS.

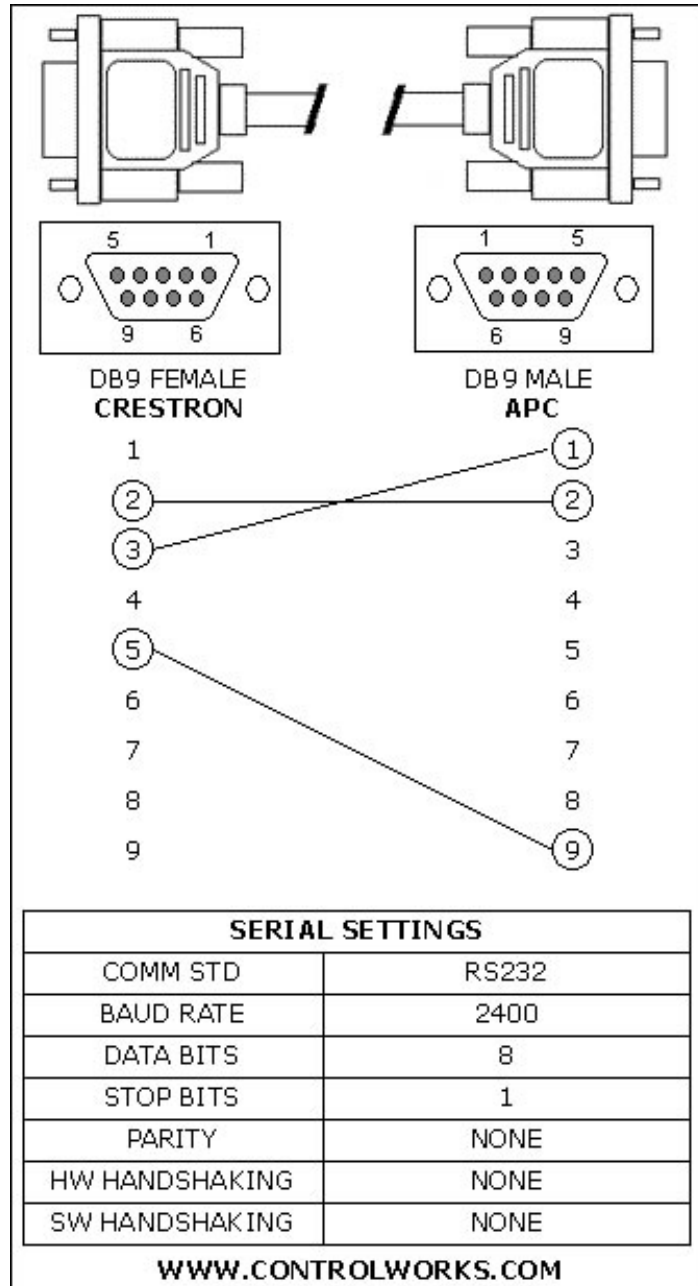
Supported Processors

This module is supported on any 2-series or X-Generation processor with at least one bidirectional RS-232 capable serial port (including those on outboard devices such as a ST-COM, CNX-RMC, etc.). This module will not work properly on a one-way serial port.

| Compatibility | | | Processor Requirements | |
|--|--|---|---|--|
|  2-Series Compatible |  CNMSX Compatible |  NOT System Builder Compatible |  Ethernet NOT NEEDED |  Compact Flash NOT NEEDED |

Serial Cable Pinout

IMPORTANT NOTE: The serial cable between the Crestron processor and the UPS must be pinned out exactly as shown below. Alternate configurations, including standard straight-through serial cables **will not work properly** and **may cause the UPS to shut down unexpectedly**.



Module Application

This module is helpful for monitoring the status of an APC UPS installed as a component of an audio visual system. The only information the UPS provides 'unsolicited' is the transition to and from battery power (i.e. power failure) as well as a low battery situation. All other information must be polled for.

You may either poll on demand – helpful for use on a “system service” page, or you may poll continuously (if you would like to monitor a critical value).

Note that many of the analog outputs of this module have a notation similar to “_(x100)” at the end of the signal name. This indicates that the value reported by the module has been multiplied by 100; to get the true value divide by 100 or, on a touchpanel, move the decimal two places to the left. For example, an “**input_line_frequency_(x100)**” value of 6000 means that the true value is 60.00 Hz

The [enter_smart_mode] digital input should be pulsed once at program startup; otherwise the UPS may not respond properly to serial commands and also may not provide unsolicited feedback.

While this module will also function with the BackUPS Pro UPS line, the BackUPS Pro supports only a very small subset of the Smart Signaling protocol and most of the features of this module will not function (including voltage, temperature, load, and frequency readings).

Signal And Parameter Descriptions

Bracketed signals such as "[signal_name]" are optional signals

DIGITAL INPUTS

| | |
|-------------------------------|--|
| [enter_smart_mode] | Pulse to activate the smart signaling mode. This input must be pulsed or the UPS will not react to other serial commands. |
| [exit_smart_mode] | Returns the UPS to 'basic signaling' mode. In mode applications this input should be left disconnected. |
| [front_panel_test] | Activates the front panel test sequence on the UPS; will also test the sounder. |
| [query_ups_model] | Requests the model name of the connected UPS |
| [query_ups_identity] | Requests the user-defined identity of the UPS; a maximum of 8 characters.* |
| [query_internal_temperature] | Requests the UPS internal temperature reading (in degrees celcius)* |
| [query_input_line_frequency] | Requests the line frequency of the AC input line (in the US the typical value is 60.00 Hz)* |
| [query_input_line_voltage] | Requests the current voltage reading at the UPS's AC input* |
| [query_max_line_voltage] | Requests the maximum voltage read at the UPS's AC input since the last reading*,** |
| [query_min_line_voltage] | Requests the minimum voltage read at the UPS's AC input since the last reading*,** |
| [query_output_voltage] | Requests the current voltage reading at the UPS's AC output* |
| [query_power_load_percent] | Requests the current load on the UPS as a percentage of the UPS's total capacity. |
| [query_battery_level] | Requests the current battery charge* |
| [query_battery_voltage] | Requests the current voltage reading of the UPS's battery packs* |
| [query_last_transfer_cause] | Requests the cause of the last transfer from commercial (line) to battery power. |
| [perform_self_test] | Instructs the UPS to perform a self test; will also automatically query for the self test results after the amount of time specified in the Self Test Results Delay parameter. |
| [query_self_test_results] | Queries the UPS for the results of the last self test. |
| [query_ups_status] | Queries the UPS for its current status |
| [perform_runtime_calibration] | Instructs the UPS to perform a runtime calibration. This step is necessary to obtain an accurate Runtime Estimate from the UPS. |

ANALOG INPUTS

This module does not utilize any analog inputs

SERIAL INPUTS

| | |
|----------|--|
| ups_rx\$ | Tie to the rx\$ line of the serial driver for the serial port that your UPS is connected to. |
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** The UPS responds with the value since the last time the setting was read; refer to the demonstration program for a method of tracking the long-term maximum and minimum values.

* This feature is not supported by the BackUPS Pro Family

DIGITAL OUTPUTS

| | |
|---|--|
| [last_transfer_cause_no_transfer_fb] | High when the UPS has not transferred to battery power since it was last turned on. |
| [last_transfer_cause_ups_test_fb] | High when the UPS last transferred to battery power as part of a self test. |
| [last_transfer_cause_line_rate_of_cange_fb] | High when the UPS last transferred to battery power because the rate of change of the AC input was unacceptable. |
| [last_transfer_cause_high_voltage_fb] | High when the UPS last transferred to battery because the line voltage was above the UPS's maximum threshold. |
| [last_transfer_cause_low_voltage_fb] | High when the UPS last transferred to battery because the line voltage was below the UPS's minimum threshold. |
| [last_transfer_cause_notch_or_spike_fb] | High when the UPS last transferred to battery because of a notch or spike in utility power. |
| [selftest_result_good_battery_fb] | High when the results of the last selftest indicate that the battery is in good condition. |
| [selftest_result_failed_insufficient_capacity_fb] | High when the self test could not be completed because of insufficient battery capacity. |
| [selftest_result_failed_overload_fb] | High when the self test could not be completed because the UPS is in an overload condition. |
| [selftest_result_no_results_fb] | High when there are no valid self test results from within the past 5 minutes. |
| [status_on_line_fb] | High when the UPS is on line (commercial) power |
| [status_on_battery_fb] | High when the UPS is on battery power |
| [status_low_battery_fb] | High when the UPS is reporting a low battery condition |
| [status_replace_battery_fb] | High when the UPS is indicating that it is necessary to replace the battery |
| [status_abnormal_condition_fb] | High when the UPS is indicating an abnormal condition not covered elsewhere |
| [status_preforming_runtime_calibration_fb] | High when the UPS is busy performing a runtime calibration. |

ANALOG OUTPUTS

NOTE: These outputs are not supported by the BackUPS Pro series.

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|---|--|
| [internal_temperature_deg_c_(x100)] | Reports the internal temperature of the UPS in degrees Celsius typical value 3750 = 37.50 degrees Celsius |
| [input_line_frequency_(x100)] | Reports the line frequency of the AC input to the UPS. Typical value 6000 = 60.00 Hz |
| [input_line_voltage_(x10)] | Reports the voltage of the AC input to the UPS. Typical value 1200 = 120.0 VAC. |
| [max_line_voltage_(x10)] | Reports the maximum voltage read at the AC input to the UPS since the last time this setting was read. Typical value 1218 = 121.8 VAC. |
| [min_line_voltage_(x10)] | Reports the minimum voltage read at the AC input to the UPS since the last time this setting was read. Typical value 1185 = 118.5 VAC. |
| [estimated_runtime_in_minutes] | Reports the estimated runtime of the UPS in full minutes. Typical value depends on battery configuration and load on UPS. |
| [battery_level_(x10)] | Reports the current battery charge level. Typical value 1000 = 100.0% charge. |
| [battery_voltage(x100)] | Reports the voltage of the battery packs. Typical value 5518 = 55.18 VDC |

SERIAL OUTPUTS

ups_tx\$..... Tie to the tx\$ of the serial driver for the serial port that the UPS is connected to.

PARAMETERS

Query Timeout Amount of time to wait for a response to any query. Recommended setting is 0.5s

Self Test Results Delay Amount of time to wait before polling to the self test results after initiating a self test. Recommended setting is 10s.

Support

This module is supported by ControlWorks Consulting, LLC. Should you need support for this module please email support@controlworks.com or call us at 440-449-1100. ControlWorks normal office hours are 9 AM to 5 PM Eastern, Monday through Friday, excluding holidays.

Before calling for support, please ensure that you have loaded and tested operation using the included demonstration program and touchpanel(s) to ensure that you understand the correct operation of the module. It may be difficult for ControlWorks to provide support until the demonstration program is loaded.

Updates, when available, are automatically distributed via Email notification to the address entered when the module was purchased. In addition, updates may be obtained using your username and password at <http://www.thecontrolworks.com/customerlogin.aspx>.

Distribution Package Contents

The distribution package for this module should include:

| | |
|--|--|
| apc_smartups_smart_signalling_v1.umc | Crestron User Module |
| apc_smart_signalling_demo_v1.vtp..... | Demo touchpanel for TPMC-10 touchpanel |
| apc_smart_signalling_demo_v1.smw..... | Demo program for PRO2 processor |
| apc_smart_signalling_help_v1.pdf | Help file for module |

Revision History

V1 lincoln@controlworks.com 2007.03.01

Initial release

Development Environment

Version 1 of this module was developed on the following hardware and software. Different versions of hardware or software may or may not operate properly. If you have questions, please contact us.

Hardware

| | |
|-----------------------------|-------------|
| Crestron PRO2 Processor | v3.155.1240 |
| Crestron TPS4500 Touchpanel | v2.002 |

Software

| | |
|-----------------------------|-----------------|
| Crestron SIMPL Windows | Version 2.08.26 |
| Crestron Vision Tools Pro-e | Version 3.6.1.3 |
| Crestron Database Version | 18.6.1 |
| Crestron Symbol Library | Version 444 |
| Crestron Device Library | Version 444 |

ControlWorks Consulting, LLC Software License Agreement

Definitions:

ControlWorks, *We*, and *Us* refer to ControlWorks Consulting, LLC, with headquarters located at 701 Beta Drive, Suite 22 Mayfield Village, Ohio 44143-2330. *You* and *Dealer* refer to the entity purchasing the module. *Client* and *End User* refer to the person or entity for whom the Crestron hardware is being installed and/or will utilize the installed system. *System* refers to all components described herein as well as other components, services, or utilities required to achieve the functionality described herein. *Module* refers to files required to implement the functionality provided by the module and may include source files with extensions such as UMC, USP, SMW and VTP. *Demo Program* refers to a group of files used to demonstrate the capabilities of the Module, for example a SIMPL Windows program and VisionTools Touchpanel file(s) illustrating the use of the Module but not including the Module. *Software* refers to the Module and the Demo Program.

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Provision of Support

We provide limited levels of technical support only for the most recent version of the Module as determined by Us. We do not provide support for previous version of the module, modifications to the module not made by Us, to persons who have not purchased the module from Us. In addition, we may decline to provide support if the Demo Program has not been utilized. We may withdraw a module from sale and discontinue providing support at any time and for any reason, including, for example, if the equipment for which the Module is written is discontinued or substantially modified. The remainder of your rights and obligations pursuant to this license will not be affected should ControlWorks discontinue support for a module.

Modification of Software

You may not decrypt (if encrypted), reverse engineer, modify, translate, disassemble, or de-compile the Module in whole or part. You may modify the Demo Program. In no event will ControlWorks Consulting, LLC be liable for direct, indirect, incidental or consequential damages resulting from You modifying the Software in any manner.

Indemnification/Hold Harmless

ControlWorks, in its sole and absolute discretion may refuse to provide support for the application of the Module in such a manner that We feel has the potential for property damage, or physical injury to any person. Dealer shall indemnify and hold harmless ControlWorks Consulting LLC, its employees, agents, and owners from any and all liability, including direct, indirect, and consequential damages, including but not limited to personal injury, property damage, or lost profits which may result from the operation of a program containing a ControlWorks Consulting, LLC Module or any component thereof.

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