

INSTRUCTION SHEET
UPS SERIES
SERIAL CONTROL PROTOCOL



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TABLE OF CONTENTS

1	Protocol Overview	3
1.1	Signal characteristics	3
1.2	Primary DB9 Pin out	3
2	Communication Flow Description.....	4
2.1	Status Communication	4
2.1.1	Polling Mode (Default)	4
2.1.2	Command Communication	4
2.1.3	Unsolicited feedback Mode.....	4
2.2	Format.....	5
2.2.1	Controller to UPS String structure	5
2.2.1.1	(XXX).....	5
2.2.1.2	<Y>.....	5
2.2.2	UPS to Controller String Structure.....	5
2.2.2.1	{Z}	5
2.2.2.2	[R]	5
3	Protocol Definition	6
3.1	Definition of (XXX).....	6
3.2	Definition of {Z}.....	6
	Example polling mode:	6
	Example unsolicited feedback mode:	6
3.3	Control	7
3.3.1	Control String format:	7
3.3.2	Command Definition.....	7 - 9
3.4	Status flags	10
3.4.1	Status Flag Responses.....	10
3.4.2	Status Flag 1 UPS Status	10
3.4.3	Status Flag 2 Battery Status	11
3.4.4	Status Flag 3 Electrical Status.....	11
3.4.5	Status Flag 4 Non Critical Load Bank status	12
3.5	Confirmation & Error definition [R].....	12

Protocol Overview

Signal characteristics:

Baud rate	2400
Data bits	8 bits
Parity bits	none
Stop bit	1 bit
Flow control	None

Primary DB9 Pinout:

Pin Number	Pin Name	Description
1	CD	Not used
2	RSD	Receive data
3	TXD	Transmit data
4	DTR	Not Used
5	GND	Ground
6	DSR	Not used
7	RTS	Not used
8	CTS	Not used
9	RI	Not used

Communication Flow Description

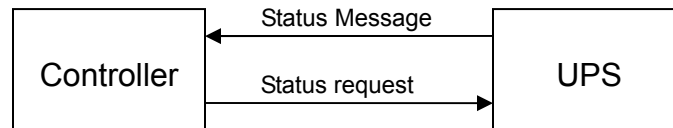
The UPS uses Command, Poll and Status messages to communicate with a third party controller. This protocol is designed for point to point RS-232 communication between the UPS and a third party system.

Status Communication:

The UPS has two modes for obtaining status data. Polling mode and unsolicited feedback mode. The default mode is polling. The UPS must be put in to unsolicited mode.

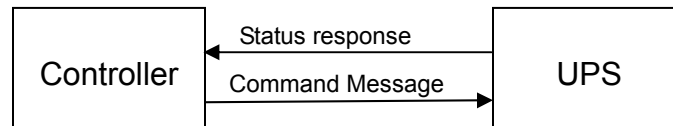
Polling Mode (Default):

Send a "Status request" message to the UPS from the controller to get status. UPS will respond with a "Status" message.



Command Communication:

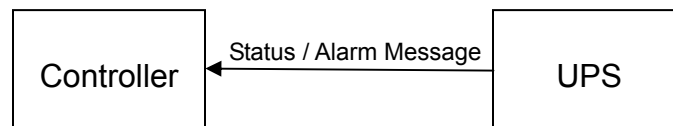
Send a "Command" message to The UPS from a controller to control the UPS.



Unsolicited feedback Mode:

If the system status changes or in the event of an alarm condition, the UPS will send a "Status" message.

Note, when the UPS is in this mode the only commands the UPS will respond to is 104 (communication mode)



Format:

All characters are ASCII. All parameters are enclosed in parentheses, all commands and settings are enclosed in angle brackets, all responses and values are enclosed in braces and errors are enclosed in brackets. The characters `)`, `>`, `}`, `]` act as a delimiter.

Controller to UPS String structure:

`(XXX)`

Where `(` is a start character

Where `X` is a fixed length string of decimals that identify parameters or functions

Where `)` is an end character that initiates the command

`<Y>`

Where `<` is a start character

Where `Y` is a variable length string of decimals that identify commands or value settings

Where `>` is an end character that initiates the command

UPS to Controller String Structure:

`{Z}`

Where `{` is a start character

Where `Z` is a variable length string of decimals that identifies a condition or value

Where `}` is an end character

`[R]`

Where `[` is a start character

Where `R` is a variable length of decimals that identifies switch conformations and errors.

Where `]` is an end character

Protocol Definition

Definition of (XXX):

001	Utility Voltage
002	Reserved
003	Output Voltage
004	Output Frequency
005	Load Current
006	Load Percentage
007	Output Load (Watts)
008	Battery Capacity
009	Battery Voltage
010	Remaining Battery Time
011	Remaining Charging Time
012	Cabinet Temperature
021	Status Flag 1 UPS status
022	Status Flag 2 Battery status
023	Status Flag 3 Electrical status
024	Status Flag 4 Non Critical Load Bank status
094	Power control
103	Status Flag - Permission to Change
104	Communication mode
123	Outlet State
124	Obtain NCL Attribute (-8 Models Only)

Definition of {Z}:

Example

Utility Voltage:	0 – 999.0 in 1 volt increments	121V = {1210}
Output Voltage:	0 – 999.0 in 1 volt increments	121V = {1210}
Output Frequency:	0 – 999.0 in 1 Hertz increments	60HZ = {0600}
Load Current:	0 – 20 in 1 Ampere increments	4A = {040}
Load Percentage	0 - 100 in %	78% = {078}
Wattage Load:	0 – 2000 in 1 watt increments	587 Watts = {0587}
Battery Capacity:	0 – 100 in %	90% = {090}
Battery Voltage:	0 – 99.0 in 1 volt increments	48V = {480}
Remaining Battery Time:	0 – 65535 in seconds	8,263 sec = {08263}
Remaining Charging Time:	0 – 65535 in seconds	1440 sec = {01440}
Cabinet Temperature:	0 – 999 in degrees Celsius	25 deg C = {025}

Example polling mode:

Poll the UPS for input voltage, the UPS responds 119 volts.

Controller: (001)

UPS: {1190}

Example unsolicited feedback mode:

Input voltage has changed to 120 volts.

UPS: (001){1200}

Control:

Note unsolicited feedback mode does not support control. The UPS must be in polling mode. Some of these features require associated settings to be configured with Middle Atlantic Power Manager Software such as delay times. Commands must be sent in four separate strings as shown below.

(XXX) = 103 is used to precede commands and must be followed with <65535> in order for the UPS to accept commands

Control String format:

Controller: (103)
UPS: {0}
Controller: <65535>
UPS: [0]
Controller: (XXX)
UPS: {00}
Controller: <Y>
UPS: [R]

Note: By programming the control system to send a (103) string followed by a <65535> string every 25 seconds, commands can be sent in the following format:

Shut UPS down command
Controller: (094)
UPS: {0}
Controller: <2>
UPS: [0]

Command Definition:

XXX = 094 Power Commands

Y =	Command Description
2	Standby Mode
3	Recover from Standby Mode
4	Reboot UPS
7	Turn Non Critical Load Bank off *
8	Turn Non Critical Load Bank on *

To verify Permission to Change status:

Controller: (103)
UPS: {Z}

0 = Change to UPS Status Not Permitted
1 = Change to UPS Status Permitted

* Not supported for UPS-xxxR-8x Series Models.

(123) Obtain outlet state/set outlet state (-8 Series Models Only)

PC: (123)

UPS: {y}

PC: <z>

UPS: [r]

Where {y} denotes current outlet state, <z> sets outlet state, and [r] denotes UPS response

- {y} is an eight character string containing any of the characters '1', '0' and 'X' (example 1010XXXX) where:
 - Field 1 denotes outlet no. 1
 - Field 2 denotes outlet no. 2
 - Field 3 denotes outlet no. 3
 - Etc.
- and where:
- 1 = Outlet is On
 - 0 = Outlet is Off
 - X = Outlet not supported
- <z> is an eight character string containing any of the characters '1', '0' and 'X' (example 1010XXXX) where:
 - 'X' = do not change outlet state
 - '1' = turn outlet On.
 - '0' = turn outlet Off.
 - [r] is the UPS response, where:
 - [0] = Successful.
 - [10] = The UPS does not support this operation code.
 - [11] = The setting value is out of range.
 - [14] = This field is read only in flag operation

(124) To Obtain the NCL attribute of each outlet (-8 Series Models Only)

PC: (124)

UPS: {y}

Where {y} denotes whether or not the outlet is on the Non Critical Load bank

- {y} is an eight character string containing any of the characters '1', '0' and 'X' (example 1010XXXX) where:

- Field 1 denotes outlet no. 1
- Field 2 denotes outlet no. 2
- Field 3 denotes outlet no. 3
- Etc.

and where:

- '1' = outlet is on the NCL bank
- '0' = outlet is not on the NCL bank
- 'X' = outlet not supported

Communication Modes

XXX = 104 is used to set the communication mode

Set to Unsolicited mode =

Controller: (104)

UPS: {0}

Controller: <1>

UPS: [1]

y =	Command Description
0	Set to polling mode
1	Set to unsolicited feedback mode
Z =	Response definition
0	UPS is in polling mode
1	UPS is in unsolicited feedback mode

Status flags

Status flags allow a single string to poll for group of data.

Status Flag Responses:

Where Z = a fixed length string of "1" "0" or "X"

Example:

Poll UPS for status flag 1 UPS status

Controller: (021) UPS: {00101000}

Status Flag 1 UPS Status:

Field	Character	Definition
1	0	Utility Power is Present
	1	Utility Power Failure
2	0	Utility Frequency is normal
	1	Utility Frequency is abnormal
3	0	Utility Voltage is normal
	1	Utility Voltage is abnormal
4	0	Hardware is normal
	1	A hardware problem is present
5	0	No warnings present
	1	UPS is in a Warning condition
6	0	Battery Test not in progress
	1	Battery Test in progress
7	0	A Shut down is not pending
	1	A Shut down is pending
8	0	UPS power on is not pending
	1	UPS power on is pending

Status Flag 2 Battery Status:

Field	Character	Definition
1	X	Reserved
2	0	Battery is not fully charged
	1	Battery is fully charged
3	0	Battery is not charging
	1	Battery is charging
4	0	Battery is not discharging
	1	Battery is discharging
5	0	Battery capacity is not lower than stored threshold
	1	Battery capacity is lower than stored threshold
6	0	Battery capacity is not critically low
	1	Battery capacity is critically low
7	0	Battery remaining discharging time is not less than the threshold of remaining discharge time setting
	1	Battery remaining discharging time is less than the threshold of remaining discharge time setting to indicate the battery will be exhausted
8	X	Reserved

Status Flag 3 Electrical Status:

Field	Character	Definition
1	0	Output Voltage is not being boosted stage 1
	1	Output Voltage is being boosted stage 1
2	0	Output Voltage is not being boosted stage 2
	1	Output Voltage is being boosted stage 2
3	0	Output Voltage is not being bucked
	1	Output Voltage is being bucked
4	0	Outlets are on
	1	Outlets are off
5	0	A load is present
	1	No load present
6	0	Load is below maximum
	1	An overload is present
7	0	No shorts present on outlets
	1	A short is present on an outlet
8	X	Reserved

Status Flag 4 Non Critical Load Bank status:

Field	Character	Definition
1	0	Non Critical load bank is on
	1	Non Critical load bank is off
	X	UPS does not support this field
2	0	Non Critical load bank has no scheduled power off pending
	1	Non Critical load bank has a scheduled power off processing
	X	UPS does not support this field
3	0	Non Critical load bank has no scheduled power on pending
	1	Non Critical load bank has a scheduled power on processing
	X	UPS does not support this field
4	0	Non Critical load bank is not off due to low battery capacity threshold (settings
	1	Non Critical load bank is off due to low battery capacity threshold settings
	X	UPS does not support this field
5	X	Reserved
6	X	Reserved
7	X	Reserved
8	X	Reserved

Confirmation & Error definition [R]:

- 0: Successful
- 1: Successful, but operation will not take effect
- 2: Successful, but the writing value will be adjusted to fit
- 3: Successful, but it will take effect after rebooting

- 10: The UPS does not support this function
- 11: The setting value is out of range.
- 12: Invalid setting format.
- 13: This item is not allowed.
- 14: This field is not allowed in flag operation.
- 15: The operation is denied.
- 16: Not in command mode, (send (103) then <65535>)
- 17: The parameter is invalid.
- 19: The second parameter is invalid.
- 20: The third parameter is invalid.
- 25: UPS is in unsolicited mode. All operations are prohibited except 104.