

UPS - Protocol

A. General :

This document specifies the RS232C communication protocol of the Advance-Intelligent UPS.

The protocol provided the following features:

- i. Monitor charger status.
- ii. Monitor battery status and condition.
- iii. Monitor the utility status.
- iv. Provide the power switch function for computer to turn on and off the utility on schedule for power saving.

Computer will control information exchange by a query followed by <cr>.UPS will respond with information followed by a <cr> or action.

B. Hardware :

BAUD RATE.....: 2400bps
DATA LENGTH.....: 8 bit
STOP BIT.....: 1 bit
PARITY.....: NONE

RX ←----- TX (pin 9)
TX -----→ RX (pin6)
GND ←----- GND (pin 7)
(9 pins female D-type connector)

C. Communication protocol :

1. Status Inquiry : Computer:Q1<cr>

UPS :UPS status data stream, such as

(MMM.M NNN.N PPP.P QQQ RR.R S.SS TT.T b7b6b5b4b3b2b1b0<cr>

UPS status data stream:

There should be a space character between every field for data separation. The meaning of each field is list as followed:

a. Start byte : (

b. I/P voltage :MMM.M

M is an integer number ranging from 0 to 9.

The unit is Volt.

c. I/P fault voltage :NNN.N

N is an integer number ranging from 0 to 9.

The unit is volt.

**** For OFF LINE UPS****

Its purpose is to identify a short duration voltage glitch which cause OFF line UPS to go to Inverter mode. If this occurs input voltage will appear normal at query prior to glitch and will still appear normal at next query.

The I/P fault voltage will hold glitch voltage till next query. After query, the I/P fault voltage until next glitch occurs.

**** For ON LINE UPS ****

Its purpose is to identify a short duration utility fail

Which cause ON line UPS to go to battery mode. If this occurs input voltage will appear normal at query prior to fail and will still appear normal at next query.

The I/P fault voltage will hold utility fail voltage till next query. After query, the I/P voltage will be same as I/P voltage until next utility fail occurs.

d. O/P voltage :PPP.P

P is an integer number ranging form 0 to 9.

The unit is Volt.

e. O/P current :QQQ

QQQ is a percent of maximum current, not an absolute value.

f. I/P frequency :RR.R

R is an integer number ranging from 0 to 9.

The unit is HZ.

g. Battery voltage :SS.S or S.SS

S is an integer number ranging from 0 to 9.

For on-line units actual battery voltage is provided in the form SS.S .

For standby units actual battery voltage is provided in the form SS.S .

UPS type in UPS status will determine which reading was obtained.

h. Temperature :TT.T

T is an integer number ranging form 0 to 9.

The unit is degree of centigrade.

i. UPS Status :<U>

<U>is one byte of binary information such as

<b7b6b5b4b3b2b1b0>

Bit	Description
7	1 : Utility Fail (Immediate)
6	1 : Battery Low
5	1 : Bypass/Boost Or Buck Active
4	1 : Ups Failed 2 : Overload
3	1 : UPS Type In Progress (0 is Online / 1 is Offline) 2 : Battery Fail (Online UPS) 3 : Battery Fail (Offline UPS)
2	1 : Test In Progress
1	1 : Shutdown Active
0	1 : Beeper ON

j. Stop Byte :<cr>

Example : Computer: Q1<cr>

UPS :

(208.4 140.0 208.4 034 59.9 2.05 35.0 00110000<cr>

Means :I/P voltage is 208.4V.

I/P fault voltage is 140.0V.

O/P voltage is 208.4V.

O/P current is 34%

I/P frequency is 59.9HZ.

Battery voltage is 2.05V.

Temperature is 35.0 degrees of centigrade.

UPS type is on-line ,UPS failed. Bypass

Active, and shutdown not active.

2. Status Inquiry : Computer:DQ1<cr>

UPS :UPS status data stream, such as

(MMM.M NNN.N PPP.P QQQ RR.R CCCC TT.T b7b6b5b4b3b2b1b0<cr>

UPS status data stream:

There should be a space character between every field for data separation. The meaning of each field is list as followed:

a. Start byte : (

b. I/P voltage :MMM.M

M is an integer number ranging from 0 to 9.

The unit is Volt.

c. I/P fault voltage :NNN.N

N is an integer number ranging from 0 to 9.

The unit is volt.

**** For OFF LINE UPS****

Its purpose is to identify a short duration voltage glitch which cause OFF line UPS to go to Inverter mode. If this occurs input voltage will appear normal at query prior to glitch and will still appear normal at next query.

The I/P fault voltage will hold glitch voltage till next query. After query, the I/P fault voltage until next glitch occurs.

**** For ON LINE UPS ****

Its purpose is to identify a short duration utility fail

Which cause ON line UPS to go to battery mode. If this occurs input voltage will appear normal at query prior to fail and will still appear normal at next query.

The I/P fault voltage will hold utility fail voltage till next query. After query, the I/P voltage will be same as I/P voltage until next utility fail occurs.

d. O/P voltage :PPP.P

P is an integer number ranging form 0 to 9.

The unit is Volt.

e. O/P current :QQQ

QQQ is a percent of maximum current, not an absolute value.

f. I/P frequency :RR.R

R is an integer number ranging from 0 to 9.

The unit is HZ.

g. Battery Level :CCCC

C is an integer number ranging from 0 to 9.

CCCC is a percent of maximum battery capacity.

h. Temperature :TT.T

T is an integer number ranging form 0 to 9.

The unit is degree of centigrade.

i. UPS Status :<U>

<U>is one byte of binary information such as

<b7b6b5b4b3b2b1b0>

Bit	Description
7	1 : Utility Fail (Immediate)
6	1 : Battery Low
5	1 : Bypass/Boost Or Buck Active
4	1 : Ups Failed 2 : Overload
3	1 : UPS Type In Progress (0 is Online/ I is Offline) 2 : Battery Fail (Online UPS) 3 : Battery Fail (Offline UPS)
2	1 : Test In Progress
1	1 : UPS turn off
0	1 : Beeper ON

j. Stop Byte :<cr>

Example : Computer: DQ1<cr>

UPS :

(208.4 140.0 208.4 034 59.9 0100 35.0 00110000<cr>

Means :I/P voltage is 208.4V.

I/P fault voltage is 140.0V.

O/P voltage is 208.4V.

O/P current is 34%

I/P frequency is 59.9HZ.

Battery Level is 100%

Temperature is 35.0 degrees of centigrade.

UPS type is on-line ,UPS failed. Bypass

Active, and shutdown not active.

3. Test for 10 seconds:

Computer :**T<cr>**

UPS : Test for 10 seconds and return to utility.

If battery low occur during testing, UPS will return to utility immediately.

4. Test until battery low:

Computer :**TL<cr>**

UPS : Test until battery low and return to utility.

5. Test for specified time period :

Computer :**T<n><cr>**

UPS : Test for <n>minutes.

a. During testing, UPS returns to utility immediately, if battery low occur.

b. <n> is a number ranging from 01 to 99.

6. Turn On/Off beep – Toggle the UPS beeper:

Computer :**Q<cr>**

When the AC power failed, UPS will generate a warning beep to inform the manager.

Manager could toggle the warning beep by sending this command.

7. Shutdown Command :

Computer :**S<n><cr>**

UPS : Shut UPS output off in <n> minutes.

a. The UPS output will be off in <n> minutes., even if the utility power is present.

b. If the battery low occurs before <n> minutes ,the output is turned off immediately.

c. After UPS shutdown , the controller of UPS monitors the utility power. If the utility is recovered, the UPS will wait for 10 seconds and connect the utility to output.

d.<n> is a number ranging form .2,.3,...,01,02,...,up to 10.

For example : S.3<cr>---shut output off in (.3) minutes

8. Shutdown and Restore Command:

Computer :**S<n>R<m><cr>**

UPS :shut UPS output off in <n> minutes, and waiting for <m> minutes then turn on UPS output again.

- The shutdown sequence is the same as the previous command.
When the <m> minutes expired, the utility do not restore, the UPS will wait until utility restore.
- If UPS is in restore waiting state ,the “C” command can let the shutdown procedure cancelled.
- If UPS is in restore waiting state ,the “C” command can let the UPS output turned on, but UPS must be hold off at least 10 seconds.(if utility is present)
- <n> is a number ranging form .2,.3,...,01,02,...,up to 10.
<m>is a number ranging form 0001 to 9999.

9. Cancel Shutdown Command:

Computer :**C<cr>**

UPS :Cancel the SN<n><cr> and SN<n>R<m><cr> command.

- a. If UPS is in shutdown waiting state, the shutdown command is cancelled.
- b. If UPS is in restore waiting state, the UPS output is turned on, but UPS must be hold off at least 10 seconds.(if utility is present)

10. Cancel Test Command :

Computer :**CT<cr>**

UPS :Cancel all test activity and connect the utility to output immediately.

11. UPS Information Command:

Computer : **I<cr>**

UPS : #Company_Name UPS_Model Version<cr>

This function will make the UPS respond with the basic information about the company who manufacture the UPS, the model name of the UPS and the version number of the UPS firmware. The length of every field is listed as follows:

Company_Name : 15 characters, leave space if less than 15 characters

UPS_Model : 10 characters, leave space if less than 10 characters

Version : 10 characters, leave space if less than 10 characters

There should be a space character between every field for separation.

12. UPS Rating Information:

Computer : **F**<cr>

UPS : #MMM.M QQQ SS.SS RR.R<cr>

This function makes the UPS answer the rating value of UPS .There should be a space character between every field for separation. The UPS's response contains the following information field:

- a. Rating Voltage :MMM.M
- b. Rating Current :QQQ
- c. Battery Voltage :SS.SS or SSS.S
- d. Frequency :RR.R

13. Estimated battery remaining time command

Computer : **Rt**<cr>

UPS :#XXX<cr>

X is integer number ranging from 0 to 9.

The unit is mins .

example : 999mins

14. Multi-Outlets Condition Command

Computer : **OI**<cr>

UPS : #<XX>B₁B₂B₃...B_i...B_{xx} <cr>

<XX>: 01 to 99

ex : 02 => means 2 outlets

ex : 10 => means 10 outlets

B_i : i means the sequence of outlets. In this place, 0 is OFF and 1 is ON.

<For example>

#0210 → There are two outlets. The condition of the first one is ON and the second is OFF.

15. Immediately switch the <XX>-outlet ON Command

Computer : **O<XX>ON**<cr>

Turn ON the <XX> outlet

<XX>: 01 to 99

<For example>

O01ON<cr> → Turn outlet 1 ON

16. Immediately switch the <XX>-outlet OFF Command

Computer : **O<XX>OFF<cr>**

Turn OFF the <XX> outlet

<XX>: 01 to 99

<For example>

O02OFF<cr> → Turn outlet 2 OFF

17. Shutdown the XX-outlet Command (Condition : AC Fail)

Computer : **O<XX>S<NN><cr>**

→ Shutdown the <XX> Outlet in <NN> minutes

<XX>:01 to 99

<NN>:01 to 99

<For example>

O01S02<cr> → Shutdown the outlet 1 after 2 minutes

18. Shutdown Outlet and Restore Command (Condition : Schedule)

Computer : **O<XX>S<NN>R<MMMM><cr>**

Shutdown UPS <XX>-Outlet in <NN> minutes and waiting for <MMMM> minutes then turn on <XX> outlet.

<XX>:01 to 99

<NN>:01 to 99

<MMMM>:00001 to 99999

<For example>

O02S02R00005<cr> → Shutdown the outlet 2 after 2 minutes and automatically turn its ON after 5 minutes

19. Achieve both minimum battery capacity <AA> and waiting time <BBBB>, the ups auto supply its power

Computer : **WX02<s>AA<s>BBBB<cr>**

<s>space char

AA : Battery capacity % (default : 00)

<s> space char

BBBB : Waiting time seconds (default : 0030)

UPS : **WX02A<cr>**

A:1 Success

A: the other number : Fail

20. Get the ups minimum battery capacity and waiting time from point 19

Computer : **RX02**<cr>
UPS : RX02AABBBB<cr>
AA : Battery capacity (default : 00)
BBBB:Waiting time seconds (default : 0030)

21. Out put Power (w)

Computer : **Yop**<cr>
UPS : *XXXXXX<cr>
==> X is integer number ranging from 0 to 9.
The unit is watt .
Example : *00999

22. Ouput VA

Computer : **Yva** <cr>
UPS : *XXXXXX <cr>
==> X is an integer number ranging from 0 to 9

23. Ouput Current (A)

Computer : **Ycu** <cr>
UPS : *XX.X <cr>
==> X is an integer number ranging from 0 to 9

24. UPS unit power factor

Computer : **Yof** <cr>
UPS : *XXX <cr>

25. Green Mode

Green Mode ON : **G1** <cr>
Green Mode OFF : **G0** <cr>

26. UPS enter idle mode >> Turn off ups output power

Computer : **IDLE** <cr>
UPS : *R00 <cr> >> success
UPS : * >> fail

27. UPS enter line mode >> Turn on ups output power

```
Computer    WAKE <cr>
UPS         : *R00 <cr>  >> success
UPS         : *          >> fail
```

28. UPS output voltage setting >> Setup ups output voltage 100, 110, 120, 127, 208, 220, 230 or 240

```
Computer    : PMo100 <cr>
Computer    : PMo110 <cr>
Computer    : PMo120 <cr>
Computer    : PMo127 <cr>
Computer    : PMo208 <cr>
Computer    : PMo220 <cr>
Computer    : PMo230 <cr>
Computer    : PMo240 <cr>
UPS         : OK <cr>   >> success
UPS         : NOK <cr> >> fail
```

29. UPS serial number and data : Read

```
Computer    : RX03 <cr>
UPS         : RX03AAAAAAAAAAAAABBBBBB
            : AAAAAAAAAAAA : serial number >> 11 char
            :BBBBBB : manufacturing date >> 6 char
            : Ex : 2014/12/24 >> 141224
```

30. UPS serial number and date: Write

```
Computer    : WX03<s>AAAAAAAAAAAA<s>BBBBBB
            : <s> : space
            : AAAAAAAAAAAA : serial number : 11 char
            :BBBBBB : manufacture date : 6 char
            : Ex : 2014/12/24 >> 141224
UPS         : WX03A <cr>
            : A : 1 >> success
            : A : other number : fail
```

31. UPS-Battery replace date : Write

Computer : **WX04**<s>**AAAAAA**<cr>

<s> space

AAAAAA : battery replace year, month and date

Ex : 2014/12/24 : 141224

UPS : **WX04A** <cr>

A : 1 : success

A : other number : fail

32. UPS-Battery replace date : Read

Computer : **RX04**<cr>

UPS : **RX04AAAAAA**<cr>

AAAAAA : battery replace year, month and date

Ex : 2014/12/24 : 141224

33. UPS external battery pack number : Write

Computer : **WX05**<s>**AA**<cr>

<s> space

AA : external battery pack number

UPS : **WX05A** <cr>

A : 1 : success

A : other number : fail

34. UPS external battery pack number : Read

Computer : **RX05** <cr>

UPS : **RX05AA** <cr>

AA : battery pack number

Ex : RX0502 >> 2 external battery packages

35. UPS return to factory default

Computer : **WXSD** <cr>

Computer : **PCMUPS** <cr>

UPS : Stay at idle mode

36. UPS accumulated backup mode time and times : Read

Computer : **RX09** <cr>

UPS : RX09AAAAABBB<cr>

AAAAA : accumulated backup mode minutes : 5char

BBB : accumulated backup mode times : 3 char