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6\_10K  
UPS Communication Protocol

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## 1 Document Description

### 1.1 Goals

This document specifies the RS232 communication protocol used in the UPS.

### 1.2 Organization

There are three parts in this manual:

1. Introducing the Inquiry Command. By sending the commands you can get the information of the UPS you need. In the part some signals and their inquiry command are listed too.
2. Introducing the control Command. By sending the control commands you can control the UPS.
3. Introducing the parameter setting Command. By sending the parameter setting Command you can set some parameter of the UPS.
4. Computer will control information exchange by a query followed by <cr>.
5. Computer and UPS respond both the "<cr>" as the end of a response.
6. UPS respond with "(" start, and with one space separate the data.  
(exception: off-line Arista UPS)
7. In a UPS's response, if there is no data, with "-" instead of data, and the length of the "-" as long as data.
8. In a UPS's response, if some data length is less than the definition, type enough "#" before the data.

### 1.3 Reference document

### 1.4 Glossary – Abbreviations – Notations

## 2 Hardware Description

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

Cabling:

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COMPUTER

UPS

```

=====
RX (pin2)  <----->  TX
TX (pin3)  <----->  RX
GND (pin5) <----->  GND
(9 pins female D-type connector)

```

### 3 Inquiry Command

#### 3.1 QPI<cr>: Protocol ID Inquiry

Computer: QPI<cr>

UPS: (PI <NN><cr>

N is an integer number ranging from 0 to 9.

Function : To request the UPS Protocol ID.

Protocol ID for this model: 02.

#### 3.2 QMD<cr>: Model Inquiry

Computer: QMD<cr>

UPS: (TTTTTTTTTTTTTTTT WWWWWW KK P/P MMM NNN RR BB.B <cr>

(a) UPS Model: TTTTTTTTTTTTTTTT

This whole length is 15bits, if the model value less than 15 bits, please enter “#” before the UPS model instead, for example: #####G10KS.

(b) Output rated VA: WWWWWW

W is an integer number ranging from 0 to 9. The unit is watt.

The whole length is 7 bits, if the VA value less than 7 bits, please enter “#” before the VA value instead, for example: ##10000.

(c) Output power factor: KK

K is an integer number ranging from 0 to 9.

KK is the percentage of power factor, for example: 70

(d) Input phase/Output phase: P/P

P is an integer number of 1 or 3.

(e) Nominal I/P Voltage: MMM

M is an integer number ranging from 0 to 9. The unit is volt.

(f) Nominal O/P Voltage: NNN

N is an integer number ranging from 0 to 9. The unit is volt.

(f) Battery Piece Number: RR

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R is an integer number ranging from 0 to 9.

(g) Battery standard voltage per unit: BB.B

B is an integer number ranging from 0 to 9. The unit is volt.

For example:

Computer: QMD<cr>

UPS: (#####G10KS ##10000 70 1/1 220 220 20 12.0<cr>

### 3.3 QGS<cr>: The general status parameters inquiry

Computer: QGS<cr>

UPS: (MMM.M HH.H LLL.L NN.N QQQ.Q DDD KKK.K VVV.V SSS.S XXX.X TTT.T  
b9b8b7b6b5b4b3b2b1b0a0a1<cr>

	Data	Description	Notes
a	(	Start byte	
b	MMM.M	Input voltage	M is an Integer number 0 to 9. The units is V.
c	HH.H	Input frequency	H is an Integer number 0 to 9. The units is Hz.
d	LLL.L	Output voltage	L is an Integer number 0 to 9. The units is V.
e	NN.N	Output frequency	N is an Integer number from 0 to 9. The units is Hz.
g	QQQ.Q	Output current	Q is an Integer number from 0 to 9. The units is A.
h	DDD	Output load percent	For Off-line UPS: DDD is a percent of maximum VA, not an absolute value. For On-line UPS: DDD is Maximum of W% or VA%. VA% is a percent of maximum VA. W% is a percent of maximum real power.
j	KKK.K	Positive BUS voltage	K is an Integer ranging from 0 to 9. The units is V.
k	VVV.V	Negative BUS voltage	V is an Integer ranging from 0 to 9. The units is V.
l	SSS.S	P Battery voltage	S is an Integer ranging from 0 to 9. The units is V.
m	XXX.X	N Battery voltage	X is an Integer ranging from 0 to 9. The units is V.
n	TTT.T	Max Temperature of the detecting pointers	T is an integer ranging from 0 to 9. The units is °C
o	b9b8b7b 6b5b4b3 b2b1b0 a0a1	Ups status	B9,b8: 00: standy; 01: line-interactive; 10: on-line. B7: Utility Fail

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			b6: Battery Low b5: Bypass/Boost Active b4: UPS Failed b3: EPO b2: Test in Progress b1: Shutdown Active b0: bat silence a0: Bat test fail a1: Bat test OK
--	--	--	---

Example:

Computer: QGS<cr>

UPS: (220.2 50.0 220.0 50.0 027.0 100 345.8 344.9 241.0 241.5 045.0 100011000000<cr>

Means:

I/P voltage is 220.2V.

I/P frequency is 50.0Hz

O/P voltage is 220.0V

O/P frequency is 50.0Hz.

O/P current is 27.0A

O/P load 100%

Positive BUS voltage is 345.8V

Negative BUS voltage is 344.9V

P Battery voltage is 241.0V.

N Battery voltage is 241.5V.

Temperature is 45.0 degrees of centigrade.

On-line mode, Utility OK, Bypass Active, UPS failed.

### 3.4 QFS<cr>: Fault Status Inquiry

If there are no UPS fail occur:

computer: QFS<cr>

UPS: (OK<cr> (no fault)

If there are UPS fail occur:

Computer: QFS<cr>

UPS: (KK PPP.P FF.F OOO.O EE.E LLL CCC.C HHH.H NNN.N BBB.B TTT.T  
<b7b6b5b4b3b2b1b0><cr>

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Fault	Fault Description	Fault Code
Bus fault	Bus volt over	0x02
	Bus volt under	0x03
	Bus volt unbalance	0x04
Inverter fault	Inverter soft fail	0x11
	Inverter volt high	0x12
	Inverter volt low	0x13
	L1 inverter short	0x14
	L1 inverter negative power	0x1A
Electric link fault	Bat SCR fault	0x21
	Inverter relay short fault	0x24
Others	Over temperature	0x41
	CPU communication fault	0x42
	Overload fault	0x43

(a) Start byte: (

(b) Fault kind: KK

K is 2 bytes of ASCII code, define as following:

(c) I/P voltage before fault: PPP.P

P is an integer number ranging from 0 to 9. The unit is Volt.

(d) I/P frequency before fault: FF.F

F is an integer number ranging from 0 to 9. The unit is Hz.

(e) Inverter O/P voltage before fault: OOO.O

O is an integer number ranging from 0 to 9. The unit is Volt.

(f) Inverter O/P frequency before fault: EE.E

E is an integer number ranging from 0 to 9. The unit is Hz.

(g) O/P load before fault: LLL

LLL is the maximum of W% or VA%.

VA% is a percent of maximum VA.

W% is a percent of maximum real power.

(h) O/P current before fault: CCC.C

CCC is a percent of maximum current.

(i) Positive Bus voltage before fault: HHH.H

P is an integer number ranging from 0 to 9. The unit is volt.

(j) Negative Bus voltage before fault: NNN.N

N is an integer number ranging from 0 to 9. The unit is volt.

(k) Battery voltage before fault: BBB.B



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B is an integer number ranging from 0 to 9. The unit is volt

(l) Temperature before fault: TTT.T

T is an integer number ranging from 0 to 9. The unit is degree of centigrade.

(m) UPS running status before fault: <b7b6b5b4b3b2b1b0>

<b7b6b5b4b3b2b1b0> is one byte of binary information.

Each bit is transferred into ASCII code. <bn> is a binary number “0” or “1”.

Bit	Remarks
7	1:DCTODC on
6	1:PFC on
5	1: INVERTER on
4	Reserved(always 0)
3	1:input relay on
2	1:O/P relay on
1	Reserved(always 0)
0	Reserved(always 0)

This fault data stream will be saved into EEPROM.

Example:

Computer: QFS<cr>

UPS: (01 208.3 41.0 160.2 50.0 102 027.0 160.0 190.0 041.0 069.0 01101100<cr>

Means: Bus start fault.

I/P voltage is 208.3V.

I/P frequency is 41.0HZ.

O/P voltage is 160.2V.

O/P frequency is 50.0HZ

Load is 102%

O/P current is 27.0A

Positive Bus voltage is 160.0V

Negative Bus voltage is 190.0V

Battery voltage is 41.0V.

Temperature is 69.0 °C

IC3525 off, PFC on, INVERTER on, input relay on, O/P relay on

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### 3.5 QWS<cr>: Warning Status Inquiry

Computer: QWS<cr>

UPS: (a0a1.....a62a63<cr>

a0,...,a63 is the warning status. If the warning is happened, the relevant bit will set 1, else the relevant bit will set 0. The following table is the warning code.

bit	Warning code	warning
a0	01	Battery open
a6	07	Battery over charge
a7	08	Battery low
a8	09	Overload warning
a9	0A	Fan lock warning
a10	0B	EPO active
a12	0D	Over temperature
a13	0E	Charger fail
a15	10	L1 IP fuse fail
a57	3A	Cover of maintain switch is open

### 3.6 QMOD<cr>: UPS Mode inquiry

Computer: QMOD<cr>

UPS: (M<cr>

Mode	Code(M)
Power on mode	P
Standby mode	S
Bypass mode	Y
Line mode	L
Battery mode	B
Battery test mode	T
Fault mode	F
HE/ECO mode	E
Converter mode	C
Shutdown mode	D

For example:

Computer: QMOD<cr>

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UPS: (Y<cr>  
means: the current UPS mode is bypass mode.

### 3.7 QRI<cr>: UPS Rating Information inquiry

Computer: QRI<cr>  
UPS: (MMM.M QQQ SSS.S 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 Output Voltage : MMM.M
- b. Rating Output Current : QQQ
- c. Battery Voltage: SSS.S.
- d. Rating Output Frequency : RR.R

### 3.8 QBYV<cr>: The bypass voltage range inquiry

Computer: QBYV<cr>  
UPS: (HHH LLL <cr>

	Data	Description	Notes
a	(	Start byte	
b	HHH	Voltage high loss point	H is an Integer number 0 to 9. The unit is V.
c	LLL	Voltage low loss point	L is an Integer number 0 to 9. The unit is V.

The bypass voltage rang from 176 to 264, default 176V, the precision is 1 volt.

### 3.9 QBYF<cr>: The bypass frequency range inquiry

Computer: QBYF<cr>  
UPS: (HH.H LL.L <cr>

	Data	Description	Notes
a	(	Start byte	
b	HH.H	Freq high loss point	H is an Integer number 0 to 9. The unit is Hz.
c	LL.L	Freq low loss point	L is an Integer number 0 to 9. The unit is Hz.

The bypass frequency rang from 40.0 to 49.0, default 46.0Hz, the precision is 0.1Hz.

### 3.10 QFLAG<cr>: Setting flag status inquiry

Computer: QFLAG<cr>  
UPS: (ExxxDxxx <cr>  
ExxxDxxx is the flag status. E means enable, D means disable

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<b>x</b>	<b>Control setting</b>
<b>a</b>	Enable/disable audible alarm
<b>b</b>	Enable/disable battery mode audible warning
<b>d</b>	Enable/disable battery open status check
<b>f</b>	Enable/disable bypass forbidding
<b>o</b>	Enable/disable bypass when UPS turn off.
<b>p</b>	Enable/disable bypass audible warning
<b>r</b>	Enable/disable auto-Restart.
<b>v</b>	Enable/disable converter mode

### 3.11 QVFW<cr> : Main CPU Firmware version inquiry

Computer: QVFW<cr>

UPS: (VERFW: <NNNNN.NN><cr>

<n> is a HEX number from 0...9 or A...F.

Example:

Computer: QVFW<cr>

UPS: (VERFW: <00123.01><cr>

00123: firmware series number; 01: version.

### 3.12 QBV<cr>: The P battery information inquiry

Computer: QBV<cr>

UPS: (RRR.R NN MM CCC TTT<cr>

	Data	Description	Notes
a	(	Start byte	
b	RRR.R	Battery voltage	R is an Integer number 0 to 9. The units is V.
c	NN	Battery piece number	NN is from 01 to 20.
d	MM	Battery group number	MM is an Integer number 01 to 99.
e	CCC	Battery capacity	CCC is an Integer number 000 to 100.
f	TTT	Battery remain time	T is an Integer number 0 to 9. The units is minutes.

### 3.13 QL DL<cr>: Load level inquiry

Computer: QL DL<cr>

UPS: (XXX YYY<cr>

	Data	Description	Notes
--	------	-------------	-------

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a	(	Start byte	
b	XXX	Watt percent	X is an Integer number 0 to 9. The unit is %.
c	YYY	VA percent	Y is an Integer number 0 to 9. The unit is %.

### 3.14 Q5<cr>: Firmware current version release time inquiry

Computer: Q5<cr>

UPS: (yyyymmdd<cr>

For example:

Computer: Q5<cr>

UPS: (20081009<cr>

Means: the Firmware current version release time is 2008-10-09

### 3.15 QCHGC<cr>: Setting Charging current inquiry

Computer: QCHGC<cr>

UPS: (CHGC<nn><cr> nn is from 00 to 60

### 3.16 QV<cr>: Output voltage setting value inquiry

Computer: QV<cr>

UPS: (V208/220/230/240<cr>

## 4 Control Command

### 4.1 T<cr>: 10 seconds test

Computer: T<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: Test for 10 seconds and then return to utility.

(1) If battery low occurs during testing, UPS will return to utility immediately.

(2) Only when UPS is in line mode, and the battery voltage is not less than 13V/pcs, the command is executed.

### 4.2 TL<cr>: Test until battery low

Computer: TL<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: Test until battery low and then return to utility.

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This command is used to let the user to discharge the battery by setting the time to test, that is to say that the user should discharge the battery by periods, with this command the ups will do it by itself.

#### 4.3 S<n><cr>: Shutdown

Computer: S<n><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

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

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

But if the battery under occur before <n> minutes, the output is turned off immediately.

After UPS shut down, the controller of UPS monitors the utility. If the utility is there, the UPS will wait for 10 seconds and connect the utility to output.

<n> is a number ranging from .2, .3, ..., 01, 02, ..., to 10.

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

#### 4.4 S<n>R<m><cr>: Shutdown and restore

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

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

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

The shut down 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 waiting shutdown status, the "C" command can let the shut down command cancelled.

If UPS is in restore waiting status, 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 from .2, .3, ..., 01, 02, ..., to 99.

<m> is a number ranging from 0001 to 9999.

#### 4.5 CS<cr>: Cancel shutdown

Computer: CS<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: Cancel the S<n><cr> and S<n>R<m><cr> **and SON** command.

If UPS is in waiting shutdown state, the shut down command is cancelled.

If UPS is in waiting restore state, the UPS output is turned on, but UPS must be hold off at least 10 seconds. (If utility is present)

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#### 4.6 CT<cr>: Cancel test

Computer: CT<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

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

#### 4.7 SON<cr>: Remote turn on UPS

Computer: SON<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: Remote turn on UPS.

#### 4.8 SOFF<cr>: Remote turn off UPS

Computer: SOFF<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: Remote turn off UPS.

#### 4.9 BZOFF<cr>: Silence buzzer beep

Computer: BZOFF <cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: The buzzer beep silence .

#### 4.10 BZON<cr>: buzzer beep open

Computer: BZON <cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Means: The buzzer beep open

## 5 Setting parameters Command

### 5.1 PE<XXX>/PD<XXX><cr>: setting some status enable/disable

Computer: PE<XXX>/PD<XXX><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

<b>X</b>	<b>Control setting</b>
<b>A</b>	Enable/disable audible alarm
<b>B</b>	Enable/disable battery mode audible warning

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<b>D</b>	Enable/disable battery open status check
<b>F</b>	Enable/disable bypass forbidding
<b>O</b>	Enable/disable bypass when UPS turn off.
<b>P</b>	Enable/disable bypass audible warning
<b>R</b>	Enable/disable auto-reboot.
<b>V</b>	Enable/disable converter mode

### 5.2 PSF<m><cr>: Set bypass frequency loss loss point

Computer: PSF<m><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

In 50Hz system, <m> is a number ranging from 40.0 to 49.0, default 46.0Hz; in 60Hz system, <m> is a number ranging from 50.0 to 59.0, default 56.0Hz; the precision is 0.1Hz;

Computer: PSF42.1<cr>

UPS: (ACK<cr>

Means: The bypass frequency low loss point has been set to 42.1Hz

### 5.3 PGF<n><cr>: Set bypass frequency high loss point

Computer: PGF<n><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

In 50Hz system, <n> is a number ranging from 51.0 to 60.0, default 54.0Hz; in 60Hz system, <n> is a number ranging from 61.0 to 70.0; the precision is 0.1Hz.

Computer: PGF54.6<cr>

UPS: (ACK<cr>

Means: The bypass frequency high loss point has been set to 54.6Hz.

### 5.4 PLV<p><cr>: Set bypass voltage low loss point

Computer: PLV<p><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

<p> is a number ranging from 176 to 264, default 176V. The precision is 1 volt.

For example:

Computer: PLV<p><cr>

UPS: (ACK<cr>

Means: Set the bypass voltage low loss point to 185V.



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### 5.5 PHV<q><cr>: Set bypass voltage high loss point

Computer: PHV<q><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>  
<q> is a number ranging from 176 to 276, default 276V. The precision is 1 volt.

For example:

Computer: PHV<q><cr>

UPS: (ACK<cr>

Means:Set the bypass voltage low loss point to 260V

### 5.6 PF<cr>: Setting control parameter to default value

Computer: PF<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

All UPS parameters set to default value.

- (a) Setting bypass frequency low loss point to 46.0Hz.
- (b) Setting bypass frequency high loss point to 54.0Hz.
- (c) Setting bypass voltage low loss point to 176V.
- (d) Setting bypass voltage high loss point to 264V.

<b>X</b>	<b>Control setting</b>
<b>a</b>	Enable/disable audible alarm
<b>b</b>	Enable/disable battery mode audible warning
<b>d</b>	Enable/disable battery open status check
<b>f</b>	Enable/disable bypass forbidding
<b>o</b>	Enable/disable bypass when UPS turn off.
<b>p</b>	Enable/disable bypass audible warning
<b>r</b>	Enable/disable auto-reboot.
<b>v</b>	Enable/disable converter mode

Notes: 1 is enable, 0 is disable.

### 5.7 BATGN<nn><cr>: Setting battery group number

Computer: BATGN <nn><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>  
nn is from 01 to 99

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### 5.8 V<n><cr>: Setting output rating voltage

Computer: V<n><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Output Voltage: <n>. n is 208,220,230,240.

Default status: Output nominal voltage 220V. (It can be set only in bypass mode)

For example:

Computer: V230<cr>

UPS: (ACK<cr>

Means: set output nominal voltage to 230V.

### 5.9 F50<cr>: Setting UPS output rating frequency to 50Hz

Computer: F50<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Set UPS output rating frequency to 50Hz. (Only in bypass mode)

### 5.10 F60<cr>: Setting UPS output rating frequency to 60Hz

Computer: F60<cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Set UPS output nominal frequency to 60Hz. (Only in bypass mode)

### 5.11 CHGC<nn><cr>: Setting charging current of the charger

Computer: CHGC <nn><cr>

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

nn is form 01 to 60.

### 5.12 V±<n> <cr>: Fine-turning output voltage

Computer: V+<n> <cr> n= 0, 1....., 6

Computer: V-<n> <cr> n= 0, 1....., 6

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Example:

Computer: V+1<cr>

UPS: (ACK<cr>

Means: Output voltage will increase about 1 Volt.

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**5.13 VLINE ±<n> <cr>: Fine-turning line voltage sampling value**

Computer: VLINE+<n><cr> n= 0, 1....., 6

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>

Computer: VLINE-<n><cr> n= 0, 1....., 6

UPS: (ACK<cr> if UPS accepts this command, otherwise, responds (NAK<cr>