

UPS Communications Protocol

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1 Document Description

1.1 Goals

This document specifies the RS232 communication protocol used in 1-20K UPS.

6-10K Tower UPS

10-20K 3/1 Tower UPS

1.2 Reference document

1.3 Glossary – Abbreviations – Notations

ECO Mode: High Efficiency Mode, same with HE mode.

CVCF: Converter Mode.

1.4 Series UPS Models

1-3K UPS

2 Hardware Description

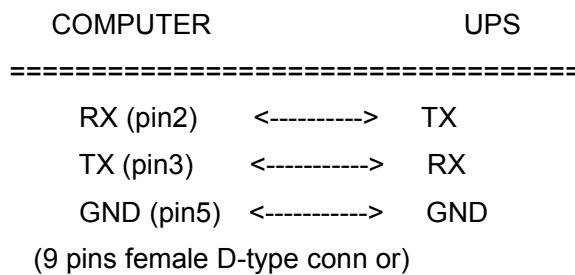
BAUD RATE.....: 2400 bps

DATA LENGTH.....: 8 bits

STOP BIT.....: 1 bit

PARITY.....: NONE

Cabling:



3 Standard Commands

3.1 single phase UPS Inquiry Command

3.1.1 Q1<cr>: Status Inquiry 1

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>

The binary code is modified to 8 bytes ASCII code for avoiding the binary code confused with ASCII control code. Between each data stream add one space for the data separation.

	Data	Description	Notes
a	(	Start byte	
B	MMM.M	I/P voltage	M is an integer number ranging from 0 to 9. The units is V.
c	NNN.N	I/P fault voltage	N is an integer number ranging from 0 to 9. The units is V. 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	PPP.P	O/P voltage	P is an integer number ranging from 0 to 9. The units is V.
e	QQQ	O/P load	QQQ is the maximum of W% or VA%. VA% is a percent of maximum VA. W% is a percent of maximum real power.
f	RR.R	I/P frequency	R is an integer number ranging from 0 to 9.The units is Hz.
g	SS.S or S.SS	Cell Volt of Battery	S is an integer number ranging from 0 to 9. For on-line units battery voltage/cell is provided in the form S.SS .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	TT.T	Temperature	T is an integer number ranging from 0 to 9. The unit is degree of centigrade.
i	B7 B6 B5 B4 B3B2 B1 B0	UPS status Where <bn> is a binary number "0" or "1".	Bit7 1 : Utility Fail (Immediate) Bit6 1 : Battery Low Bit5 1 : Bypass/Boost Active Bit4 1 : UPS Failed Bit3 1 : UPS Type is Standby (0 is On-line) Bit2 1 : Test in Progress Bit1 1 : Shutdown Active Bit0 0 : Bat silence

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 load is 34 %.

I/P frequency is 59.9 Hz.

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.

3.1.2 Q4<cr>: Status Inquiry 4

Computer: Q4<cr>

UPS: (MMM.M HHH.H LLL.L NNN.N PPP.P QQQ DDD RR.R KKK VVV SSS.S TT.T
XXXXXXXXX<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	HHH.H	Input maximum voltage	H is an Integer number 0 to 9. The units is V.
d	LLL.L	Input minimum voltage	L is an Integer number 0 to 9. The units is V.
e	NNN.N	Input fault voltage	N is an Integer number ranging from 0 to 9. The units is V.
f	PPP.P	Output voltage	P is an Integer number ranging from 0 to 9. The units is V.
g	QQQ	Output current percent	QQQ is a percent of maximum current, not an absolute value
h	DDD	Output load percentage	For Off-line UPS: LLL is a percent of maximum VA, not an absolute value. For On-line UPS: LLL is Maximum of W% or VA%. VA% is a percent of maximum VA. W% is a percent of maximum real power.
i	RR.R	Input frequency	R is an integer ranging from 0 to 9. The units is Hz.
j	KKK	Positive BUS voltage	K is an Integer ranging from 0 to 9. The units is V.
k	VVV	Negative BUS voltage	V is an Integer ranging from 0 to 9. The units is V.
l	SSS.S	Battery voltage	S is an Integer ranging from 0 to 9. The units is V.

I	TT.T	Temperature	T is an integer ranging from 0 to 9. The units is °C
m	XXXXXX XX	Ups status	<p>X :If several status occur at the same time, the X is 1~8 letters adjust, it means:</p> <p>A: Utility Fail</p> <p>B: Battery Low</p> <p>C: Bypass/Boost Active</p> <p>D: UPS Failed</p> <p>E: Test in Progress</p> <p>F: Shutdown Active</p> <p>G: SITE fault</p> <p>H: EPROM fail</p> <p>I: Test passed – Result: OK</p> <p>J: Test passed – Result: Failed</p> <p>K: Test not Possible or Inhibited</p> <p>L: Test Status Unknown</p> <p>M: UPS normal mode</p> <p>N: UPS 110% overload</p> <p>O~Z are reserved for the future use.</p>

Example:

Computer: Q4<cr>

UPS: (220.2 250.5 200.0 136.0 220.2 100 100 50.0 370 375 41.0 45.0 LM<cr>

Means: I/P voltage is 220.2V.

Maximum I/P voltage is 250.5V

Minimum I/P voltage is 200.0V

I/P fault voltage is 136.0V.

O/P voltage is 220.2V.

O/P current is 100%

O/P load 100%

I/P frequency is 50.0 HZ.

Positive BUS voltage is 370V

Negative BUS voltage is 375V

Battery voltage is 41.0V.

Temperature is 45.0 degrees of centigrade.

Test Status Unknown and UPS status is line mode.

3.1.3 Q6<cr>: Status Inquiry 6

Computer: Q6<cr>

UPS: (MMM.M ---.- ---.- NN.N PPP.P ---.- ---.- RR.R QQQ --- --- SSS.S

VVV.V TT.T tttt CCC KB fffffff wwwwwwww YO<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	---.-	Reserved	
d	---.-	Reserved	
e	NN.N	Input frequency	N is an Integer number ranging from 0 to 9. The units is Hz.
f	PPP.P	Output voltage	P is an Integer number ranging from 0 to 9. The units is V.
g	---.-	Reserved	
h	---.-	Reserved	
i	RR.R	output frequency	R is an integer ranging from 0 to 9. The units is Hz.
j	QQQ	output current %	Q is an Integer ranging from 0 to 9. The units is %.
k	---	Reserved	
l	---	Reserved	
m	SSS.S	Bat voltage SSS.S	S is an integer ranging from 0 to 9. The units is V
n	---.-	Reserved	
	TT.T	Temperature	T is an integer ranging from 0 to 9. The units is °C
	tttt	Battery Estimated Backup time in second	tttt is an integer ranging from 0 to 9. The units is Second
	K	UPS mode	UPS MODE K: 0 PowerOn mode 1 Standby mode 2 Bypass mode 3 Line mode 4 Bat mode 5 BatTest mode 6 Fault mode 7 Converter mode 8 ECO mode 9 Shutdown Mode
	B	battery test status	battery test status: 0 idle

			1 processing 2 result : no failure 3 result : failure / warning 4 Not possible or inhibited 5 Test cancel 6 Reserved 7 Other values
	ffffff	Fault code	
	wwwwww ww	warning code	

3.1.4 QF<cr>: Fault Status Inquiry

Computer: QF<cr>

UPS: (KK PPP FF.F OOO EE.E LLL CCC PPP NNN BB.B TT.T <b7b6b5b4b3b2b1b0><cr>

(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 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 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

CCC is a percent of maximum current.

(i) Positive Bus voltage before fault: PPP

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

(j) Negative Bus voltage before fault: NNN

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

(k) Battery voltage before fault: BBB.B

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

(l) Temperature before fault: TT.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: QF<cr>

UPS: (04 208 41.0 160 50.0 102 100 160 190 041.0 69.0 01101100<cr>

Means: Inverter fault in line mode

I/P voltage is 208V.

I/P frequency is 41.0HZ.

O/P voltage is 160V.

O/P frequency is 50.0HZ

Load is 102%

O/P current is 100%

Positive Bus voltage is 160V

Negative Bus voltage is 190V

Battery voltage is 41.0V.

Temperature is 69.0 °C

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

If there are no UPS fail notes in EEPROM, UPS reply (OK

Example: computer: QF<cr>

UPS: (OK<cr>

3.1.5 QP<cr>: Control parameters inquiry

Computer: QP<cr>

UPS: (MM.M NN.N PPP QQQ ExxDxxx<cr>

Example:

Computer: QP<cr>

UPS: (46.0 54.0 80 264 EpkraDbco<cr>

Means: Low det frequency on bypass is 46.0Hz.

High det frequency is on bypass is 54.0Hz.

Low voltage range on bypass is 80V.

High voltage range on bypass is 264V.

Enable bypass audible warning.

Disable battery mode audible warning.

Enable key control bypass audible warning.

Disable key control battery mode audible warning.

Enable auto-reboot.

Disable bypass when UPS off.

Enable audible alarm.

Although the "P" command set one or several parameters before, the "QP" command can inquiry all parameters

Example:

Computer: PG59.9<cr>

UPS: set high det frequency on bypass to 59.9Hz

Computer: QP<cr>

UPS: (46.0 59.9 80 264 EpkraDbco<cr>

3.1.6 RT<cr>: Model Inquiry

Purpose

Shows setup and type information about the UPS.

Command

To request setup and type information from the UPS the host should send:

Computer: RT<cr>

UPS :(VV.VV PP.PP TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT S/S P/P MMM FF.FF RRR BB.B NN
WWWWW<cr>

(a)UPS Firmware Version: VV.VV

V is an integer number ranging from 0 to 9.

(b)Protocol Number: PP.PP

P is an integer number ranging from 0 to 9.

Current value is 01.00

(c)UPS Name: TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT (30 Char.)

T is an Printable Character

For UPS, the ups named as :

(d)Input Source Number/Output Source Number: S/S

S is an integer number of 1 or 2.

(e)Input Phase Number/Output Phase Number: P/P

P is an integer number of 1 or 3.

(f)Nominal Output Voltage: MMM

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

(g)Nominal Output Frequency: FF.FF

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

(h)Number of Battery Unit in Series: RRR

R is an integer number ranging from 0 to 9.

(i)Nominal Volatge per Battery Unit: BB.B

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

(j)Maximum Number of UPS Module: NN

N is an integer number ranging from 0 to 9.

(k)Rated VA per UPS Module: WWWW

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

For example:

Computer: RT<cr>

UPS: 00.01, 01.00, E10KS, 1/1 ,1/1, 220, 50.00, 020, 12.0, 04, 10000<cr>

3.1.7 PI<cr>: To request the Protocol ID from the UPS

Computer: PI<cr>

UPS: (13<cr>

3.1.8 VS?<cr>: Output voltage inquiry command

Computer: VS?<cr>

UPS: (V200/208/220/230/240/250<cr>

3.1.9 BL?<cr>: Battery level query

computer: BL?<cr>
 UPS: xxx<cr>
 xxx from 000 ~ 100

3.1.10 BM?<cr>: query/set entity bypass en-disable;

computer: BM?<cr>
 UPS: x<cr>
 X: 0 entity bypass disable
 1 entity bypass enable
 Computer: BM<n><cr>
 UPS: <n>
 X: 0 SET entity bypass disable
 1 SET entity bypass enable

3.1.11 BO?<cr>: query/set auto bypass en-disable;

computer: BO?<cr>
 UPS: x<cr>
 X: 0 auto bypass disable
 1 auto bypass enable
 Computer: BO<n><cr>
 UPS: <n>
 X: 0 SET auto bypass disable
 1 SET auto bypass enable

3.1.12 RT? Query setup and type information about the UPS

Computer: RT
 UPS:(VV.VV PP.PP TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT S/S P/P MMM FF.FF RRR BB.B NN
 WWWW<cr>

aaaa: Code Part Number
 bb: Code Version
 cc: Code temporary modify version; for production version it is 00.

	Data	Description	Notes
a	(	Start byte	
b	VV.VV	UPS Firmware Version	V is an Integer number 0 to 9. unitless
c	PP.PP	Protocol Number	P is an Integer number 0 to 9. unitless
d	TTTTTTT TTTTTTT TTTTTTT	UPS Series and Model	T is an Integer number 0 to 9. unitless

	TTTTTT TT		
e	S/S	Input Source Number/Output Source Number	S is an Integer number 0 to 9. unitless
f	P/P	Input Phase Number/Output Phase Number	P is an Integer number 0 to 9. unitless
g	MMM	Nominal Output Voltage	M is an Integer number 0 to 9. Unit: V
h	FF.FF	Nominal Output Frequency	F is an Integer number 0 to 9. Unit: Hz
i	RRR	Number of Battery Unit in Series	R is an Integer number 0 to 9. Unit: pcs
j	BB.B	Nominal Voltage per Battery Unit	B is an Integer number 0 to 9. Unit: V
k	NN	Reserve	
l	WWWW W	Rated VA per UPS Module	1000VA,2000VA,3000VA

3.1.13 WC? query out power status of the UPS

Computer: WC

UPS:(PPPP SSSS<cr>

	Data	Description	Notes
a	(	Start byte	
b	PPPP	UPS op active power W	P is an Integer number 0 to 9. Unit: W
c	SSSS	UPS op total power VA	S is an Integer number 0 to 9. Unit: VA

3.1.14 SF?<cr>: query line Frequency range.

Computer: SF? query line Frequency range setted

UPS: (HH.HH LL.LL<cr>

Data	Description	Notes
(	Start byte	
HH.HH	Line frequency upper limit	H is an Integer number 0 to 9. Unit: Hz

LL.LL	Line frequency lower limit	L is an Integer number 0 to 9. Unit: Hz
-------	----------------------------	---

3.2 Control Command

3.2.1 T<cr>: 10 seconds test command

Computer: T<cr>

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

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

3.2.2 TL<cr>: Test until battery low command

Computer: TL<cr>

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

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.

3.2.3 T<n><cr>: Test for specified time command

Computer: T<n><cr>

UPS: battery test for <n> minutes

<n> is an integer number form 01 to 99.

3.2.4 S<n><cr>: Shutdown command

Computer: S<n><cr>

UPS: 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 conn 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

3.2.5 S<n>R<m><cr>: Shutdown and restore command

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

UPS: 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.

3.2.6 C<cr>: Cancel shutdown command

Computer: C<cr>

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

3.2.7 CT<cr>: Cancel test command

Computer: CT<cr>

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

3.2.8 ZON<cr>: Remote turn on UPS command

Computer: ZON<cr>

UPS: (ZON <cr>

Means: Remote turn on UPS.

3.2.9 ZOFF<cr>: Remote turn off UPS command

Computer: ZOFF<cr>

UPS: (ZOFF <cr>

Means: Remote turn off UPS.

3.3 Setting parameters Command

3.3.1 PE<n>/PD<n>: <cr>: enable or disable parameter that follow

X	Control setting
P	Enable/disable bypass audible warning
B	Enable/disable battery mode audible warning
K	Enable/disable key control bypass audible warning.
C	Enable/disable key control battery mode audible warning.
R	Enable/disable auto-reboot.
O	Enable/disable bypass when UPS turn off.
A	Enable/disable audible alarm

Example:

Computer: PEP<cr>

UPS: Enable bypass audible warning.

Computer: PDA<cr>

UPS: Disable audible alarm

3.3.2 PF<cr>: Set control parameter to default value

Computer: PF<cr>

UPS: ACK<cr>

All UPS parameters set to default value.

Note: Only in bypass mode and standby mode.

3.3.3 VS<rrrr><cr>: Set Output voltage inquiry command

Computer: VS<rrrr><cr>

UPS: (V200/208/220/230/240/250<cr>

3.3.4 BV?<cr>: Query /set bypass voltage rang

Computer: BV?<cr>

UPS: (MMM NNN<cr>

Data	Description	Notes
(	Start byte	
MMM	Upper limit of Bypass Voltage Range	M is an Integer number 0 to 9. Unit: V
NNN	Lower limit of Bypass Voltage Range	M is an Integer number 0 to 9. Unit: V

3.3.5 BV<ppp qq> <cr>: Set bypass voltage rang

Computer: BVmmm nnn <cr>

UPS: (MMM NNN<cr>

Data	Description	Notes
(	Start byte	
ppp	bypass high voltage range will be $(1+ppp/100) \times \text{nominal output voltage}$	p is an integer number from 0 to 9 unit is %
qqq	Lower limit of Bypass Voltage Range will be :	q is an integer number from 0 to 9 unit is %

	$(1 - \text{qqq}/100) \times \text{nominal}$ output voltage	
--	--	--

For example the output nominal voltage is 220V, and send command:

BV020 010<cr>

The bypass voltage upper limit will be: $220V \times (1+20\%) = 264V$

The bypass voltage lower limit will be: $220V \times (1-10\%) = 198V$

3.3.6 FS?<cr>: Query output frequency

Computer: FS?<cr>

UPS: (NN<cr>

Data	Description	Notes
(	Start byte	
NN	Output nominal frequency	50Hz/ 60Hz. Unit: Hz

3.3.7 FS<nn><cr>: Set output frequency

Computer: FS<kk><cr>

UPS: (kk<cr>

Data	Description	Notes
(	Start byte	
kk	Output nominal frequency	00/50Hz/ 60Hz. Unit: Hz 00 means that the output frequency will auto adjust according to bypass(input) frequency.