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## MegaTec Extended Communications Protocol -- for Three- Phase UPS

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## MEGATEC EXTENDED COMMUNICATIONS PROTOCOL FOR THREE-PHASE UPS

A. General: This document specifies the RS232C communication protocol of Advanced-Intelligent UPS. This protocol provides the following features :

1. Monitor charge status.
2. Monitor battery status and conditions.
3. Monitor main power status.

**Computer gives command to UPS. All commands have to end with a < cr >. UPS responds to computer. All responses have to end with a < cr> .**

**\*\*\* UPS must respond to every command within 500ms \*\*\***

B. Hardware:

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

CABLING :

COMPUTER		UPS
RX <-----		TX (pin 9)
TX ----->		RX (pin 6)
GND <----->		GND (pin 7)

(9 pins female D-type connector)

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### C. COMMUNICATION PROTOCOL:

#### 1. UPS real time data

Computer : G1 <cr>

UPS :!SSS PPP NNNN RRR.R +TT.T FF.F EE.E QQ.Q <cr>

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

- a. Start byte : !
- b. Battery voltage: SSS  
**SSS** is an integer number ranging from 000 to 999.  
The unit is "Volt".
- c. Battery Capacity percentage : PPP  
**PPP** is an integer number ranging from 000 to 100.  
The unit is "Percentage"..
- d. Battery Time Remaining : NNNN  
**NNNN** is an integer number ranging from 0000 to 9999.  
The unit is "Minute".
- e. Battery current in charge mode or discharge mode: RRR.R  
Battery is in charge or discharge mode depends on a2 (Rectifier Status),  
When a2 =1 , means battery is in discharge mode.  
When a2 = 0, means battery is in charge mode.  
**R** is an integer number ranging from 0 to 9.  
The unit is "Amp".
- f. Temperature : +TT.T  
**T** is an integer number ranging from -99.9 to +99.9.  
The unit is "Degree of centigrade".
- g. I/P frequency : FF.F  
**F** is an integer number ranging from 0 to 9.  
The unit is "Hz".
- h. Frequency of Bypass Source: EE.E  
**E** is an integer number ranging from 0 to 9.  
The unit is "Hz".

i. O/P frequency : QQ.Q

**Q** is an integer number ranging from 0 to 9.  
The unit is “Hz”.

j. Stop Byte : <cr>

Example: Computer : G1<cr>

UPS : !240 094 0123 025.0 +35.0 60.1 62.0 60.0<cr>

Means : Battery voltage is 240V.  
Battery Capacity is 94 %.  
Battery Time Remaining is 123 minutes.  
Charge current is 25 Amps.  
Temperature is 35.0 degrees centigrade.  
I/P frequency is 60.1 Hz.  
Frequency of Bypass Source is 62.0 Hz.  
O/P frequency is 60.0 Hz.

## 2. UPS status inquiry

Computer : G2

UPS : !a7a6a5a4a3a2a1a0 b7b6b5b4b3b2b1b0 c7c6c5c4c3c2c1c0<cr>

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

a. Start byte : !

b. The Status of Rectifier and DC : <U>

<U> is one byte of binary information such as <a7a6a5a4a3a2a1a0>.

“aN” is an ASCII character ‘0’ or ‘1’.

Status of Rectifier and DC :

Byte	Description
7	No Use
6	RECTIFIER ROTATION ERROR
5	1 : Low Battery Shutdown
4	1 : Low Battery
3	1 : Three in –One out 0 : three in –Three out
2	1 : Back Up 0 : AC Normal
1	1 : Boost Charge 0 : Float Charge
0	1 : Rectifier Operating

## c. The Status of UPS : &lt;U&gt;

<U> is one byte of binary information such as <b7b6b5b4b3b2b1b0>.

“bN” is an ASCII character ‘0’ or ‘1’.

## Status of UPS :

Byte	Description
7	No Use
6	No Use
5	No Use
4	BYPASS FRQUENCY FAIL
3	1 : Manual Bypass Breaker On 0 : Manual Bypass Breaker Open
2	1 : Bypass AC Normal 0 : Bypass AC Abnormal
1	1 : Static Switch in Inverter Mode 0 : Static Switch in Bypass Mode
0	1 : Inverter Operating

## d. The Fault Condition of Inverter: &lt;U&gt;

<U> is one byte of binary information such as <c7c6c5c4c3c2c1c0>.

“cN” is an ASCII character ‘0’ or ‘1’.

## The Fault Condition of Inverter :

Byte	Description
7	No Use
6	1 : Emergency Stop (EPO)
5	1 : High DC Shutdown
4	1 : Manual Bypass Breaker on Shutdown
3	1 : Over Load Shutdown
2	1 : Inverter O/P Fail Shutdown
1	1 : Over Temperature Shutdown
0	1 : Short Circuit Shutdown

Example: Computer : G2<cr>

UPS : !00000010 00000100 00000000<cr>

Means : Three in-Three out UPS.  
Boost Charge.  
Bypass AC Normal

## 3. UPS real time data for 3 phases

Computer : G3

UPS : !NNN.N/NNN.N/NNN.N PPP.P/PPP.P/PPP.P QQQ.Q/QQQ.Q/QQQ.Q SSS.S/SSS.S/SSS.S<cr>

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

## a. Start byte : !

- b. I/P voltage of R/S/T 3 phases : NNN.N/NNN.N/NNN.N  
N is an integer number ranging from 0 to 9.  
The unit is “Volt”.
- c. Bypass AC source voltage of R/S/T 3 phases : PPP.P/PPP.P/PPP.P  
P is an integer number ranging from 0 to 9.  
The unit is “Volt”.
- d. O/P voltage of R/S/T 3 phases : QQQ.Q/QQQ.Q/QQQ.Q  
Q is an integer number ranging from 0 to 9.  
The unit is “Volt”.
- e. Load percentage of R/S/T 3 phases : SSS.S/SSS.S/SSS.S  
S is an integer number ranging from 0 to 9.  
The unit is “Percentage”.

Example: Computer : G3<cr>  
UPS :!222.0/222.0/222.0 221.0/221.0/221.0 220.0/220.0/220.0 014.0/015.0/014.0<cr>

Means : I/P voltage R phase is 222V , S phase is 222V , T phase is 222V.  
Bypass AC voltage source R phase is 221V , S phase is 221V , T phase is 221V.  
I/P voltage R phase is 220V , S phase is 220V , T phase is 220V.  
Loading of R phase is 14 % , S phase is 15% , T phase is 14% ..

#### 4. UPS Information Command:

Computer : I<cr>  
UPS : !Company\_Name UPS\_Model Version<cr>

This function makes UPS respond with the basic information about UPS. This includes UPS manufacture’s name , UPS model name and UPS firmware version. The length of every field is listed as below:

Company\_Name : 15 characters (bytes). Fill in with space characters if data cannot complete the field length .  
UPS\_Model : 10 characters(bytes), Fill in with space characters if data cannot complete the field length .  
Version : 10 characters(bytes), Fill in with space characters if data cannot complete the field length .

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

Example: Computer : I<cr>  
UPS : !MegaTec^^^^^^^^ M1000K^^^^ V001203.12<cr>

Means : Company\_Name: MegaTec^^^^^^^^  
UPS\_Model : M1000K^^^^  
Version : V001203.12  
”^” means a space character.

#### 5. UPS Rating Information:

Computer : GF<cr>  
UPS : !Rect\_Volt CCC Bpss\_Volt FFF O/P\_Volt QQQ SSS Power\_Rating <cr>

This function makes UPS respond with rating value of UPS.

There should be a space character between every field for data separation.  
The UPS response contains the following information fields.

a. Rectifier Voltage of Phase to Neutral and Phase to Phase (Rect\_Volt) :  
14 characters(bytes).

Fill in with space characters if data cannot complete the field length .  
For example : 220V 3P3W, 220V/380V 3P4W

b. Rectifier Frequency : CCC

c. Bypass Source Voltage of Phase to Neutral and Phase to Phase (Bpass\_Volt) :  
14 characters(bytes).

Fill in with space characters if data cannot complete the field length .  
For example : 220V 3P3W, 220V/380V 3P4W

d. Bypass Source Frequency : FFF

e. O/P Voltage of Phase to Neutral and Phase to Phase (O/P\_Volt) :  
14 characters(bytes).

Fill in with space characters if data cannot complete the field length .  
For example : 220V 3P3W, 220V/380V 3P4W

f. O/P Frequency : QQQ

g. Battery Voltage: SSS

h. Power\_Rating :

10 characters( bytes),  
Fill in with space characters if data cannot complete the field length .

Example: Computer : GF<cr>

UPS : !220V/380V^3P4W 060 220V/380V^3P4W 061 220V/3P3W^^^^ 060 396 150KVA^^^^<cr>

Means : UPS Id: 01

Rectifier Voltage of Phase to Neutral and Phase to Phase: 220V/380V^3P4W .

Rectifier Frequency : 60Hz

Bypass Source Voltage of Phase to Neutral and Phase to Phase: 220V/380V^3P4W

Bypass Source Frequency : 61Hz

O/P Voltage of Phase to Neutral and Phase to Phase: 220V/3P3W^^^^

O/P Frequency : 60Hz

Battery Voltage : 396Vdc

Power\_Rating : 150KVA^^^^

^^^ means a space character

*( The document stated below is Megatec Protocol. We suggest integrating Megatec Protocol into MegaTec Extended Communication Protocol for complete UPS safeguarding and control. )*

7. Test for 10 seconds:

Computer : T<cr>

UPS : Test for 10 seconds and return to main power .

UPS will return to main power immediately if battery low occurs during testing.

## 8. Test until battery low :

Computer : TL<cr>  
 UPS : Test until battery low and return to main power.

## 9. Test for specified time period :

Computer : T<n><cr>  
 UPS : Test for <n> minutes.

- a. UPS will return to main power immediately if battery low occurs during testing.
- b. <n> is a number ranging from 01 to 99.

## 10. Turn On/Off beep -- Toggle the UPS beeper :

Computer : Q<cr>

When main power fails, UPS will generate a warning beep to inform the network manager. The network manager can toggle the warning beep by sending this command .

## 11. Shutdown Command :

Computer : S<n><cr>  
 UPS : Shut UPS output off in <n> minutes.

- a. The UPS output will be turned off in <n> minutes, even if main power is present .
- b. If battery low occurs during <n> minutes, the output will be turned off immediately.
- c. After UPS shutdown, the controller of UPS will keep monitoring main power . If main power restores, UPS will wait for 10 seconds and connect to main power to output.
- d. <n> is a number ranging from .2, .3, ..., 01, 02, ..., up to 10.

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

## 12. Shutdown and Restore Command :

Computer : S<n>R<m><cr>  
 UPS : **Shut UPS output off in <n> minutes, and wait for <m> minutes then turn on UPS output again.**

- a. The shutdown sequence is the same as the previous command. When the <m> minutes times is out, if main power does not restore, UPS will wait until main power restores.
- b. If UPS is in shutdown waiting state, "C" command can cancel the shutdown procedures .
- c. If UPS is in restore waiting state, "C" command can turn on UPS output , but UPS must be hold off at least 10 seconds. (if main power is present.)
- d. <n> is a number ranging from .2, .3, ..., 01, 02, ..., up to 10.
- e. <m> is a number ranging from 0001 to 9999.

## 13. Cancel Shutdown Command :

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

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



## 14. Cancel Test Command :

Computer : CT<cr>  
 UPS : Cancel all test activities and connect to main power to output immediately.

## 15. UPS Rating Information:

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

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

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

## 16. 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 follows:

- 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 that causes OFF-line UPS to go to Inverter mode. When 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 will be as same as I/P voltage until next glitch occurs.

\*\* For ON- LINE UPS\*\*

Its purpose is to identify a short duration main power failure which causes ON- line UPS to go to battery mode. When 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 main power failure voltage till next query. After query, the I/P voltage will be same as I/P voltage until next main power failure occurs.

d.O/P voltage : PPP.P

P is an integer number ranging from 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 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.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>.

“ bN” is an ASCII character ‘0’ or ‘1’.

UPS status :

Bit	Description
7	1 : Utility Fail (Immediate)
6	1 : Battery Low
5	1 : Bypass/Boost or Buck Active
4	1 : UPS Failed
3	0 : UPS Type is Online (1 is Standby)
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 59.9 HZ.  
Battery voltage is 2.05V.  
Temperature is 35.0 degrees centigrade.  
UPS type is on-line , UPS failed. Bypass active , and shutdown not active.

## D. COMMAND SUMMARY:

ITEM	COMMAND	DESCRIPTION
1	G0	Scan UPS
2	G1	UPS real time data
3	G2	UPS status inquiry
4	G3	UPS real time data for 3 phase
6	GF	UPS Rating Information
7	Q1	Status Inquiry
8	T	10 Seconds Test
9	TL	Test until Battery Low
10	T<n>	Test for Specified Time Period
11	Q	Turn On/Off beep
12	S<n>	Shut Down Command
13	S<n>R<m>	Shut Down and Restore Command
14	C	Cancel Shut Down Command
15	CT	Cancel Test Command
16	I	UPS Information Command
17	F	UPS Rating Information