



Australian Technical Production Services

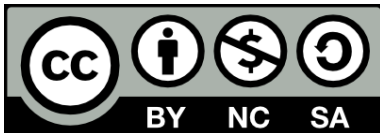
Talking to your Sola UPS

Notes on UPS communications using the Phoenixtec Serial protocol and the Bestpower SNMP/WEB adapter (this may be the same as 0999-IPK0320A).

I have tested some of this with a Sola 620 UPS but while documentation suggests that other UPSes are compatible I have not tested other models, so where other models are mentioned, I am merely passing on information from other sources.

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Any future updates and other notes may be found at my website at: www.atps.net.

While you are under no obligation to send me any updates, improvements or corrections they would be appreciated (contact via the website).

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Credits:

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Conventions

The protocol is case sensitive and all commands are upper case. re fixed length and will require leading zeroes if the desired value uses less digits than specified by the command.

Data structure consists of a command, Data (if required) and ends with a Carriage return in the event of a query the UPS will respond with the required data ending with a Carriage return, however action commands will not be acknowledged by the UPS.

In this document commands are shown in upper case and bold, with variables shown in italicised bold lower case.

↵ Denotes Carriage return (ASCII – 0D0h).

n variables are shown in lower case and in italics. Note the number of digits may vary depending on the command, also a digit may often be replaced by a decimal point (see specific command details for more information)

While I understand commercial power supply may be referred to as 'utility power' in some countries I use the term 'mains power' in keeping with Australian terminology.

UPS serial Interface

Sola 620

while the Sola 620 UPS uses a female db9 connector this is NOT a regular RS232 Interface and instead uses the following Pin out:

Pin	Type	Description
1	RS232 input	Receive Data – RS232, 2400 bps, No parity, 1 start/stop *1
2	RS232 output	Transmit Data – RS232, 2400 bps, No parity, 1 start/stop *1
3	N/O Open collector	On Battery alarm – Normally open contact - closes (pulled to Ground) when the UPS is operating from the Battery.
4	Common	Signal Ground
5	N/O Open collector	Low Battery alarm – Normally open contact - closes (pulled to Ground) when the UPS has a low Battery alarm.
6		Reserved
7	Input	Remote Shutdown or Emergency Power Off – shorting this pin to Ground (pin 4) while the UPS is on Battery initiates a shutdown Note: Shut down will continue even if AC mains is restored before the shut down.
8	N/C Open collector	On Battery alarm – Normally closed contact (pulled to ground) - opens when the UPS is operating off the Battery.
9	N/O Open collector	Bypass alarm – Normally open contact - closes (pulled to Ground) when the UPS is bypassed either internally due to a failure or an external command.

*1 note this is with no interface card installed (such as the Bestlink SNMP/Web adapter discussed later in these notes).

Suggested Serial cable:

UPS interface (db9 - male)	External alarm connector	Serial interface (db9 - Female)
1		3
2		2
3	Mains fail N/O	
4	GND	5
5	Low Batt N/O	
6		
7	EPO	
8	Mains fail N/C	
9	UPS Fail N/O	

Serial interface Command set

The Phoenixtec protocol supports commands that allow the user to monitor or check the status of the UPS, charger, inverter Battery and Mains (utility) power. There are also commands that shutdown power to the UPS load with options to restore power after a predetermined delay.

Command summary

Command	Description
Q	Status Inquiry
Q1	Status Inquiry 1
T	10 Second Test
TL	Test until Low Battery
Tn	Test for <i>n</i> Minutes
Sn	Shut down in <i>n</i> minutes
SnRn	Shut down in <i>n</i> minutes then Restore in <i>n</i> minutes
C	Cancel Shut down
CT	Cancel Test
RT	UPS Runtime remaining query
BPn	Set number of attached Battery packs
BP?	Query number of attached Battery packs
ID	UPS ID query
SSn	Set Shut down options
SS?	Query Shut down options

Where *n* is an ASCII integer or integers.

Command Details

Q Status Query

Requests status of the UPS. The reply data is not separated by spaces and the flags are presented as Raw Binary, so this format is more useful for machine read data. For human read data I suggest Status Query 1.

Format: **Q**↵

Returns: **(mmm.mnnn.nppp.pqqqrrr.rsssstt.tf**↵

Variable	Data type	Description
(ASCII (028h)	Start byte - this delineates the start of the response
mmm.m	ASCII Integers	Input mains (utility) Voltage measured in Volts
nnn.n	ASCII Integers	Input Fault Voltage measured in volts The Input fault voltage is the last measured fault condition (i.e. brown out) that has caused the UPS to switch to back up mode – note this reading will be held by the UPS until it receives a Status query – after it receives a Status query the fault voltage reading will revert back to the Input voltage reading.
ppp.p	ASCII Integers	Output Voltage measured in volts
qqq	ASCII Integers	Output load expressed as a percentage of the maximum output of the UPS
rrr.r	ASCII Integers	Input frequency measured in Hertz
ss.s or ssss	ASCII Integers	Battery Voltage measured in volts For battery strings less than 100V the voltage is measured in the form <i>ss.s</i> Battery strings exceeding 100V this voltage is measured as <i>ssss</i>
tt.t	ASCII Integers	Temperature measured in Degrees Centigrade
f	Binary	UPS Status Flags D7 = Mains Failure D6 = Battery Low D5 = Bypass or Boost is active D4 = UPS has failed D3 = UPS Off line D2 = UPS Test in progress D1 = Shut down in progress D0 = Reserved – always 0

Q1 Status Query 1

Format: **Q1**↵

Returns: **(mmm.m nnn.n ppp.p qqg rrr.r ssss tt.t f7f6f5f4f3f2f1f0**↵

while superficially this may look the same as the other Status query the Data is presented in a more friendly manner with spaces between each measurement and flags presented as 8 ASCII characters rather than a single Byte.

Variable	Data type	Description
(ASCII (028h)	Start byte - this delineates the start of the response
mmm.m	ASCII Integers	Input mains (utility) Voltage measured in Volts
nnn.n	ASCII Integers	Input Fault Voltage measured in volts The Input Fault voltage is the last measured fault condition (e.g. a brown out) that has caused the UPS to switch to back up mode. Note this reading will be held by the UPS until it receives a Status query – once a Status query has been received the fault voltage reading will revert back to the Input voltage reading.
ppp.p	ASCII Integers	Output Voltage measured in volts
qqg	ASCII Integers	Output load expressed as a percentage of the maximum output of the UPS
rrr.r	ASCII Integers	Input frequency measured in Hertz
ss.s or ssss	ASCII Integers	Battery Voltage measured in volts. For battery strings less than 100V the voltage is measured in the form ss.s for battery strings over 100V this voltage is measured as ssss
tt.t	ASCII Integers	Temperature measured in Degrees Centigrade
f7	ASCII Integer	1 = Mains Failure, 0 = Mains OK
f6	ASCII Integer	1 = Battery low, 0 = Battery OK
f5	ASCII Integer	1 = Bypass or Boost Active 0 = Not Bypassed or Boosted
f4	ASCII Integer	1 = UPS Failure 0 = UPS OK
f3	ASCII Integer	1 = UPS Off line 0 = UPS online
f2	ASCII Integer	1 = UPS Test in progress 0 = no test in progress
f1	ASCII Integer	1 = Shut down in progress 0 = UPS running
f0	ASCII Integer	Reserved always set to 0

T 10 Second Test

Format: **T**↵

UPS Returns: nil – action only

UPS runs a 10 second test and then returns to Mains power. If battery low occurs during testing, UPS will return to mains power immediately.

This command is available in all Best Power/Sola UPS models.

TL test until low battery

Format: **TL**↵

UPS Returns: nil – action only

UPS runs a Test that lasts until a Low Battery condition exists when then the UPS returns to mains power.

This command is available on all Best Power/Sola UPS models.

Tn test for n Minutes

Format: **Tnn**↵

UPS Returns: nil – action only

UPS runs a Test for **nn** minutes unless a low battery condition occurs first in which case the UPS will return immediately to Mains power.

Where **nn** is the number of minutes (01 – 99)

This command is available on all Best Power/Sola UPS models.

Sn shut down in n Minutes

Format: **Snn**↵

UPS Returns: nil – action only

UPS will shut down after **nn** Minutes regardless of the availability of Mains power. If a Low Battery condition occurs before **nn** minutes, the UPS output is turned off immediately.

After the UPS shuts down it will not restart even though the input power is restored or is still present unless the user turns the unit on again.

Where **nn** is a two digit number ranging from .2 to 01 to 99.

note this is a 2 digit entry either leading with a decimal point, leading 0 or 2 digits.

Note: Best/SOLA 610 and Patriot Pro/SOLA 320 Models will restart after a 10 second delay upon the return of AC input power.

The Cancel Shut down command (C) may be used to cancel the shutdown of the UPS output during the countdown period defined by **nn** minutes (shutdown waiting status).

SnRm Shut down in n then Restore in m minutes

Format: **SnnRmmmm**↵

UPS Returns: nil – action only

UPS will shut down after **n** Minutes regardless of the availability of Mains power. If a Low Battery condition occurs before **n** minutes, the UPS output is turned off immediately.

Following shut down the UPS will restart **m** minutes after input power is restored, or if mains was still present when the UPS shuts down it will restart **m** minutes after shut down

Where **nn** is a two digit number ranging from .2 to 01 to 99.

note this is a 2 digit entry either leading with a decimal point, leading 0 or 2 digits.

And **mmmm** is a 4 digit number between 0001 to 9999 (note leading zeroes).

The Cancel Shut down command (C) may be used to cancel the shutdown of the UPS output during the countdown period defined by **nn** minutes (shutdown waiting status).

The Cancel Shut down command (C) may be used to cancel the delay before turning the UPS on

again after restoration of mains power during the countdown period *mmmm* minutes (restore waiting status). The UPS output must remain off for at least 10 additional seconds before turning on (if mains power is present).

C Cancel Shut down

Format: **C**←

UPS Returns: nil – action only

Cancel shut down stops any programmed shut down event from occurring or restart the UPS before any programmed restart event.

Note if a low Battery event occurs the UPS will still shut down.

CT Cancel Test

Format: **CT**←

UPS Returns: nil – action only

Cancels any Battery tests running and reconnects mains power

RT UPS Runtime remaining query

Format: **RT**←

UPS Returns: **ttt**←

Queries the estimated remaining running time in minutes before a low Battery shut down is required where **ttt** is the remaining time in minutes

This command is not available on the Best/SOLA 610 model series. It is also not available on Patriot Pro/SOLA 320 model series.

BPn Set number of attached Battery packs

Format: **BPn**←

UPS Returns: nil – action only

Tells the UPS how many battery packs are connected – where **n** ranges from 0 to 5

BP? Query number of attached Battery packs

Format: **BP?**←

UPS Returns: **nn**←

Asks the UPS how many Battery packs it understands it has connected.

Where **nn** has a leading 0, assuming that less than 10 battery packs are connected.

This command is only available on the Axxium/SOLA 620 model series.

ID UPS ID query

Format: **ID**←

UPS Returns: **aaa,bbbb,cccc,ddd,ee.e,ff.f**←

Asks the UPS for an ID code and data.

Where:

aaa is the three-character identification for the UPS model as defined by Best Power and listed in the table below:

Identifier (<i>aaa</i>)	UPS Model
PRO	Patriot Pro U or E models
320	SOLA 320 A models
FOR	Fortress 520 U or E models
520	SOLA 520 A models
PR2	Patriot Pro II U or E models
325	SOLA 325 A models
FTC	Fortress TeleCom U or E models
525	SOLA 525 A models
AX1	Axxium U or E models
620	SOLA 620 A models

bbbb is the output power rating in VA

ccc is the nominal mains input voltage in AC volts

ddd is the nominal output voltage in AC volts

ee.e is the low battery shut down voltage in volts DC

ff.f or **fff.f** is the Full charge Battery voltage in volts DC. Typically for a UPS between 700VA and 1.5KVA the format is **ff.f** for 2KVA and above the format is **fff.f**

SSn Set Shut down options

Format: **SSn←**

UPS Returns: nil – action only

Configures functionality of the shut down pins on the UPS port (pin 7 only on the SOLA 620 however other UPSes may also use pin 1).

Mode (<i>n</i>)	Pin 7 functionality (when pin 7 is pulled to ground)
0	EPO Emergency Power Off immediate shut down UPS will not restart.
1	Shut down after 2 minutes on battery, even if mains power returns.
2	Shut down after 1 minute on battery, even if mains power returns.
3	Shut down after 3 minutes on battery, even if mains power returns.
4	Shut down after 5 minutes on battery, even if mains power returns.
5	Shut down after 10 minutes on battery, even if mains power returns.
6	Shut down after 20 minutes on battery, even if mains power returns.

SS? Query Shut down options

Format: SS?↵

UPS Returns: *n*↵

Returns the external pin shut down mode as per the table above.

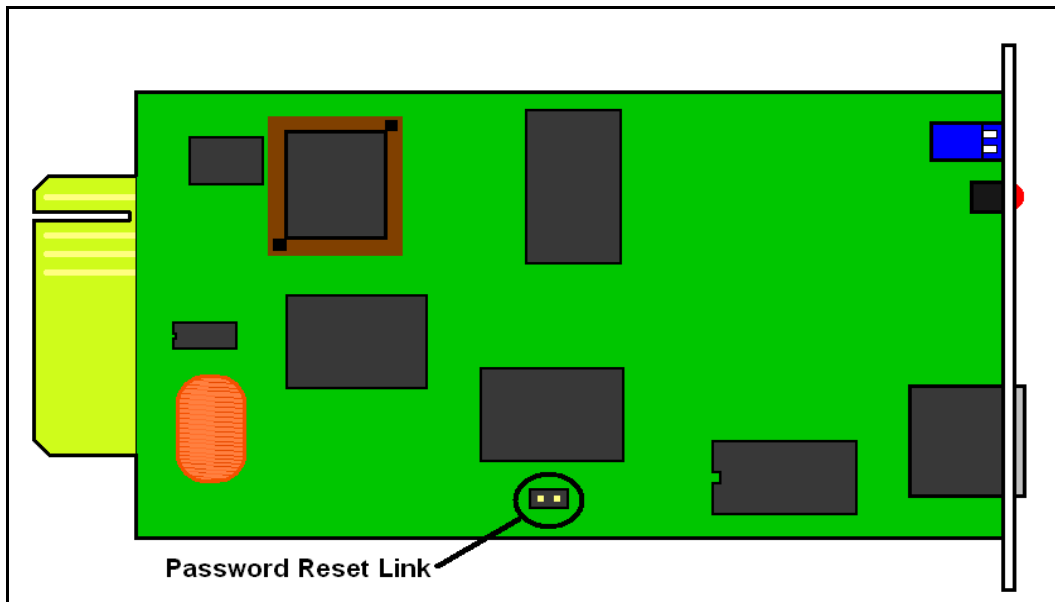
Bestlink SNMP/Web adapter

May also be relevant to 0999-IPK0320A (not sure if this is a part number for my SNMP/WEB adapter or a different version – as I could not see this part number on my board)



Password Reset

To clear the password install a jumper on the password reset link (there was only one link on the card I had) and then install the card and power up the UPS.



The UPS will need to be powered completely off (i.e. battery and mains disconnected) when inserting or removing the adapter card.

After the password has been reset you will need to power down, pull the card, remove the reset strap, then reinstall etc.

This will reset the password back to **admin** and the super user account to username **admin** with a password **admin**.

Configuring the IP address

The default IP Address for the SNMP/Web card is **192.168.7.18** and you can telnet to the card however if the address is unknown (as far as I know password reset does not change the IP Address) then you will need to use the serial port on the UPS.

The db9 connector on the UPS is not a standard serial port, so you will need to use an adapter cable as described [in the section on the serial interface](#) note that when the SNMP/Web adapter is installed you will need to set your serial port to 9600bps, 8 bits, no parity, 1 start/stop and no flow control instead of 2400bps.

If you have a new computer with no serial port and no terminal software then you will need to buy a USB to serial adapter and I recommend using TeraTerm.

Connect to the UPS and power it up (or hit the enter key a few times) and you should be greeted with the following banner:

```
=====+
|           [ BestLink SNMP/WEB Adapter Configuration Utility ]           |
+=====+

Enter Password:
```

Enter the password (default password is **admin**) if you do not know the password then follow the earlier instructions for resetting the password.

```
=====+
|           [ BestLink SNMP/WEB Adapter Configuration Utility ]           |
+=====+

  1. SNMP/WEB Card Settings
  2. Reset Configuration to default
  3. Restart SNMP/WEB Card
  0. Exit

Please Enter Your Choice => 1
```

I suggest you start by defaulting the card using option 2 then select option 1 to configure IP address

```
=====+
|           [ BestLink SNMP/WEB Adapter Configuration Utility ]           |
+=====+

  1. Set the IP Address, Gateway Address and MIB System Group
  2. Set SNMP/WEB Card Control Group
  3. Set Write Access Managers
  4. Set Trap Receivers
  5. Set IP Addresses of Primary and Secondary Date Server
  6. UPS Event Actions
  7. Set UPS Information
  8. Set Superuser Name and Password
  9. Email Notification
  0. Back to Main Menu

Please Enter Your Choice => 1
```

option 1 again will take you to the setup for the IP address etc.

```
=====+
|           [ BestLink SNMP/WEB Adapter Configuration Utility ]           |
+=====+

SNMP/WEB Card Version : BestLink V4.30
Ethernet address      : 00-E0-D8-08-5D-E5
  1. IP Address       : 192.168.0.210
  2. Gateway Address  : 192.168.0.1
  3. Network Mask     : 255.255.255.0
  4. sysContact       : Contact name
  5. sysName          : UPS name
  6. SysLocation      : UPS location
  0. Return to previous menu
```

```
Please Enter Your Choice => 0
```

once you have set the IP Address, you can either continue using the serial port or if telnet access is enabled (it is enabled by default but if you have a second hand card it may not be) access the UPS via telnet.

For brevity I will show command commands from here in hierarchical order assuming you are starting from the top menu.

Menu selections will be in **red** while the string (for reference) will be in normal font and the final menu will be shown completely – so for example to change the IP address (as previously described) would be:

1 SNMP/WEB Card Settings

1 Set the IP Address, Gateway Address and MIB System Group

```
+=====+
|           [ BestLink SNMP/WEB Adapter Configuration Utility ]           |
+=====+
SNMP/WEB Card Version : BestLink V4.30
Ethernet address      : 00-E0-D8-08-5D-E5
1. IP Address         : 192.168.0.210
2. Gateway Address   : 192.168.0.1
3. Network Mask      : 255.255.255.0
4. sysContact        : Contact name
5. sysName           : UPS name
6. SysLocation       : UPS location
0. Return to previous menu

Please Enter Your Choice => 0
```

enabling SNMP read/write

For security reasons before the UPS will not accept an SNMP read or write requests from another machine unless they have been added to an SNMP access list.

This access list is not available via the HTTP (Web) interface and can only be modified via telnet or using the serial port.

1 SNMP/WEB Card Settings

3 Set Write Access Managers

```
+=====+
| IP Address      Community String      Access      |
+=====+
[1] 192.168.0.13  *                      Read Only
[2] 192.168.0.200 *                      Read Only
[3] 192.168.0.201 *                      Read Only
[4] 0.0.0.0      *                      No Access
[5] 0.0.0.0      *                      No Access
[6] 0.0.0.0      *                      No Access
[7] 0.0.0.0      *                      No Access
[8] 0.0.0.0      *                      No Access

COMMANDS -
1. Modify - Modify a table entry
2. Reset - Reset a table entry to default
0. Return to previous menu

Please Enter Your Choice =>
```

Note that while the menu describes this as the “write access manager table” it would be more accurately described as the SNMP access manager as you cannot do an SNMP read or write from the UPS unless your IP address is listed in this table.

To add (or modify) a table entry select option **1 Modify - Modify a table entry** then one of the table entries, 1-8.

The UPS will then prompt you for an IP address, SNMP community string, and then access rights, i.e. read, or read and write.

For example:

```
Please Enter Your Choice => 1
Entry Number : 1
Enter IP address : [0.0.0.0] 192.168.0.200
Enter Community String : [*] test
Select Access Type - [No Access]
  1. Read Only
  2. Read/Write
  3. No Access

Please Enter Your Choice => 2
```

Adds **192.168.0.200** to the SNMP access list using a community string of “**test**” with read and write access.

SNMP traps

Snmp traps can be configured via the serial/telnet menu or via the web interface (just enter the IP address of the UPS in place of a URL in your web browser).

To configure SNMP traps via menu:

1 SNMP/WEB Card Settings

4 Set Trap Receivers

```
=====+
| Receiver IP Address  Community String  Severity  Accept  |
+=====+
[1] 192.168.0.13      public      Informational  Enabled
[2] 0.0.0.0          public      Informational  Disabled
[3] 0.0.0.0          public      Informational  Disabled
[4] 0.0.0.0          public      Informational  Disabled
[5] 0.0.0.0          public      Informational  Disabled
[6] 0.0.0.0          public      Informational  Disabled
[7] 0.0.0.0          public      Informational  Disabled
[8] 0.0.0.0          public      Informational  Disabled

  1. Modify - Modify a table entry
  2. Reset - Reset a table entry to default
  0. Return to previous menu

Please Enter Your Choice => 1
```

The menu prompts you for the IP address of the trap receiver, an SNMP community string, the severity of traps to be sent to the SNMP receiver: 'Informational' (sends all events) 'warnings' or 'severity' (major alarms) and 'Accept' enables or disables the SNMP trap.

```
Please Enter Your Choice => 1
Entry Number : 4
Enter Receiver IP address : [0.0.0.0] 10.98.87.65
Enter Community String : [public] public
Select Severe - [Informational]
  1. Informational
  2. Warning
  3. Severity

Please Enter Your Choice => 3
Accept - [Disabled]
  1. Enable
  2. Disable

Please Enter Your Choice => 1
```

SNMP MIB

The MIB for the Best power SNMP/WEB adapter is available at www.atps.net/notes/UPS/bestpower.mib or in Text format www.atps.net/notes/UPS/bestpower_mib.txt