Monitoring the UPS

eG Enterprise v6

Restricted Rights Legend

The information contained in this document is confidential and subject to change without notice. No part of this document may be reproduced or disclosed to others without the prior permission of eG Innovations Inc. eG Innovations Inc. makes no warranty of any kind with regard to the software and documentation, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Trademarks

Microsoft Windows, Windows NT, Windows 2000, Windows 2003 and Windows 2008 are either registered trademarks or trademarks of Microsoft Corporation in United States and/or other countries.

The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

Copyright

Table of Contents

Table of Figures

Chapter

1

Introduction

An **uninterrupted power supply** (**UPS**), also known as a **battery back-up**, provides emergency power and, depending on the topology, line regulation as well to connected equipment by supplying power from a separate source when utility power is not available. It differs from an auxiliary or emergency power system or standby generator, which does not provide instant protection from a momentary power interruption. A UPS, however, can be used to provide uninterrupted power to equipment, typically for 5–15 minutes until an auxiliary power supply can be turned on or utility power is restored.

Since a UPS is typically used to protect computers, data centers, telecommunication equipment or other electrical equipment, issues in its performance – eg., the depletion of the battery charge - can cause injuries, fatalities, serious business disruption or data loss. It is therefore imperative that the UPS is monitored periodically, and its 24 x 7 availability ensured.

Chapter 2

Monitoring a Generic UPS

eG Enterprise provides a specialized *UPS* monitoring model (see Figure 2.1) to monitor the external availability and internal health of a generic UPS and its core components.

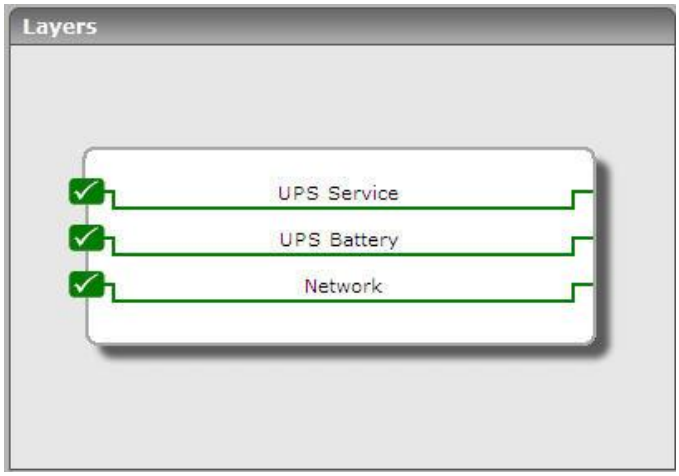

Figure 2.1: The layer model of a Generic UPS

Every layer of Figure 2.1 is mapped to a variety of tests which connect to the SNMP MIB of the UPS to collect critical statistics pertaining to its performance. The metrics reported by these tests enable administrators to answer the following questions:

- Is the UPS currently running on battery or on power?
- If running on battery, what is the time for which the battery has been used? Is very little running time left with the battery?
- How much charge is still remaining with the battery? Has the battery status already turned to Deplete?
- Has the battery temperature suddenly spiked?
- Were any bad input lines detected to the UPS?
- Were any severe power/voltage fluctuations discovered in the input lines?
- Is any output line consuming the power capacity of the UPS excessively?

Since the **Network** layer has been dealt with extensively in the previous chapters, the sections to come will discuss the top 2 layers of Figure 2.1 only.

2.1 The UPS Battery Layer

One of the key components of a UPS is its battery. A defective battery can often cause failure of the UPS, thus disrupting the delivery of the critical business services it supports. Using the tests mapped to the **UPS Battery** layer, users can accurately determine the current health of the UPS battery.

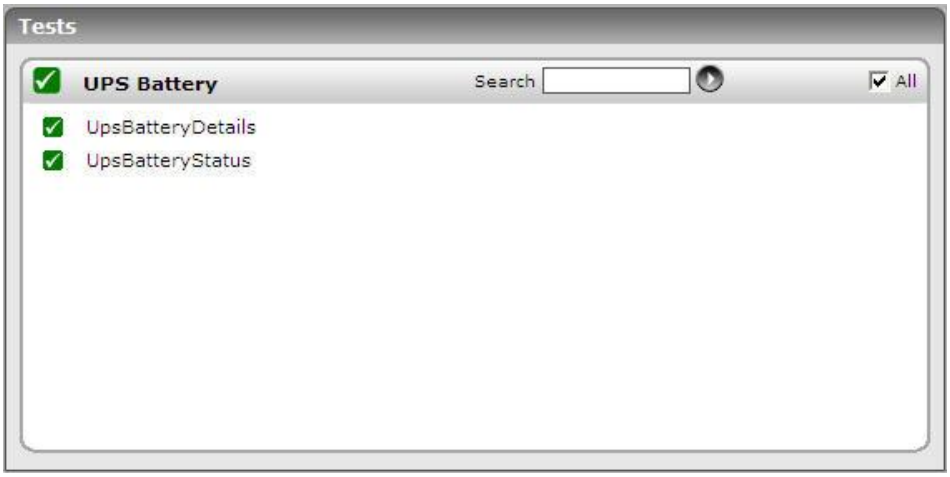

Figure 2.2: The tests mapped to the Ups Battery layer

2.1.1 UpsBatteryDetails Test

This test reports critical statistics indicating the level of performance and overall health of the UPS battery.

Purpose	Reports critical statistics indicating the level of performance and overall health of the UPS battery
Target of the test	An UPS
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TESTPERIOD** – How often should the test be executed 2. **HOST** – The IP address of the UPS 3. **SNMPPORT** – The port at which the UPS exposes its SNMP MIB. The default is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the target device. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for the UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Battery usage time: Indicates the battery discharge time.	Secs	This measure indicates the value in secs if the unit is on battery power. The value might return to Zero if the unit is not on battery power.
	Running time left: Indicates the running time left in mins, to battery charge depletion under the present load conditions if the utility power is off.	Mins	Ideally, the value of this measure should be high. A low value or a value that is consistently decreasing is indicative of rapid depletion of the battery charge. If this condition is left unattended, it could result in a UPS failure. Under such circumstances, you might want to turn on the utility power and make sure that the UPS is no longer on battery power, so as to safeguard your equipment and data from irrepairable damage/loss.
	Charge remaining: Indicates the percentage of charge currently remaining in the battery.	Percent	Ideally, this value should be high. If the charge is full, this value would be 100. A value close to 0 or a value that is consistently decreasing is indicative of rapid depletion of the battery charge. If this condition is left unattended, it could result in a UPS failure. Under such circumstances, you might want to turn on the utility power and make sure that the UPS is no longer on battery power, so as to safeguard your equipment and data from irrepairable damage/loss.
	Battery voltage: Indicates the current battery voltage.	DC_volts	

	Battery current: Indicates the amount of current presently conducted by the battery.	DC_Amps	A high value is indicative of excessive usage of the UPS.
	Battery temperature: Indicates the current ambient temperature at or near the UPS battery.	Celcius	Ideally, the value of this measure should be low. A very high value is indicative of a rise in battery temperature that can be caused by excessive usage of the UPS. The temperature of the battery should always be maintained at optimal levels, so as to avoid failure of the UPS and the resultant disruption of power supply. To ensure this, it is recommended that you install a cooling unit (AC unit) in the area where the UPS is installed.

2.1.2 UpsBatteryStatus Test

This test reports the current status of the UPS battery.

Purpose	Reports the current status of the UPS battery
Target of the test	A UPS
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TESTPERIOD** – How often should the test be executed 2. **HOST** – The IP address of the UPS 3. **SNMPPORT** – The port at which the UPS exposes its SNMP MIB. The default is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the target device. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds.		
Outputs of the test	One set of results for the UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Battery status: Indicates the current battery status.	Number	➢ The value 1 indicates that the battery status is unknown ➢ The value 2 indicates that the battery status is normal, which implies that the remaining run-time is greater than Ups ConfigLowBatteryTime. ➢ The value 3 indicates that the battery status is Low, which implies that the remaining battery run-time is less than or equal to UpsConfigLow BattTime. ➢ The value 4 indicates that the battery status is Depleted, which implies that the UPS will be unable to sustain the present load when and if the utility power is lost .

2.2 The UPS Service Layer

To evaluate the performance of the input lines and output lines to the UPS, and to measure the I/O activity handled by these lines, use the tests associated with the **UPS Service** layer.

Figure 2.3: The tests mapped to the Ups Service layer

2.2.1 UpsLines Test

Typically, input lines enable the UPS to draw power from the source. Using this power, the UPS not only recharges its batteries, but also supplies power to all ports attached to it via output lines.

This test monitors the health of the input and output lines, and reports bad input lines (if any).

Purpose	Monitors the health of the input and output lines, and reports bad input lines (if any)
Target of the test	A UPS
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TESTPERIOD** – How often should the test be executed 2. **HOST** – The IP address of the UPS 3. **SNMPPORT** – The port at which the UPS exposes its SNMP MIB. The default is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the target device. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds.		
Outputs of the test	One set of results for the UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Bad input lines to the UPS: Indicates the current number of bad input lines to the UPS.	Number	An input line is deemed bad when the input it transmits enters an out-of-tolerance condition as defined by the manufacturer. Ideally, the value of this measure should be 0.
	Input lines to the UPS: Indicates the number of input lines currently utilized by this UPS.	Number	A high value is indicative of high activity on the UPS.
	UPS output frequency: Indicates the current output frequency.	Hertz	
	UPS output lines: Indicates the number of output lines currently utilized by this UPS.	Number	A high value is indicative of high activity on the UPS.

2.2.2 UpsInputs Test

This test monitors the inputs to the UPS via input lines, and reveals the level of activity on the UPS. Any drop in the level (i.e., a sudden voltage drop) could indicate an imminent power failure at the source.

Purpose	Monitors the inputs to the UPS via input lines, and reveals the level of activity on the UPS
Target of the test	A UPS
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TESTPERIOD** – How often should the test be executed 2. **HOST** – The IP address of the UPS 3. **SNMPPORT** – The port at which the UPS exposes its SNMP MIB. The default is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the target device. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds.		
Outputs of the test	One set of results for every input line to the UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Input frequency: Indicates the current input frequency.	Hertz	
	Input voltage: Indicates the current input voltage.	RMS_Volts	A sudden dip in the voltage could indicate a problem condition.
	Input current: Indicates the input current presently handled by the input lines.	RMS_Amps	
	Input power: Indicates the magnitude of present input true power.	Watts	A sudden/consistent dip in the power supply in the input lines could indicate that the power source may go down any time.

2.2.3 UpsOutputs Test

This test monitors the outputs sent by the UPS via its output lines to the loads. Any discrepancy in the level of activity on the output lines could be indicative of a problem with the UPS.

Purpose	Monitors the inputs to the UPS via input lines, and reveals the level of activity on the UPS
Target of the test	A UPS
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TESTPERIOD** – How often should the test be executed 2. **HOST** – The IP address of the UPS 3. **SNMPPORT** – The port at which the UPS exposes its SNMP MIB. The default is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the target device. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds.		
Outputs of the test	One set of results for every output line from the UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Output voltage: Indicates the current output voltage.	RMS_Volts	
	Output current: Indicates the present output current.	RMS_Amps	
	Output power: Indicates the magnitude of present output true power.	Watts	A sudden dip in the power supplied through the output lines could indicate a problem with the UPS that requires investigation.
	Output load: Indicates the percentage of the UPS power capacity presently being used on this output line.	Percent	Comparing the value of this measure across output lines will reveal which output line is utilizing the maximum power.

Chapter 3

Monitoring the APC UPS

APC Smart-UPS® is a leading server class UPS that protects critical data by supplying reliable, network-grade power in either traditional tower or rack-optimized form factors. These UPS devices play a crucial role in ensuring the 100% availability and uninterrupted delivery of business-critical services such as voice and data networks, point of sale, retail/bank back office and ATMs, as they provide timely and adequate power backups to these services in the event of a power crisis. Hence, these mission-critical devices need to be monitored continuously, and any deviation from the norm should be instantly brought to the notice of the relevant personnel.

eG Enterprise provides a specialized monitoring model for APC UPS' (see Figure 3.1) that monitors the network connectivity and the internal workings of a UPS, and proactively alerts administrators to potential performance issues.

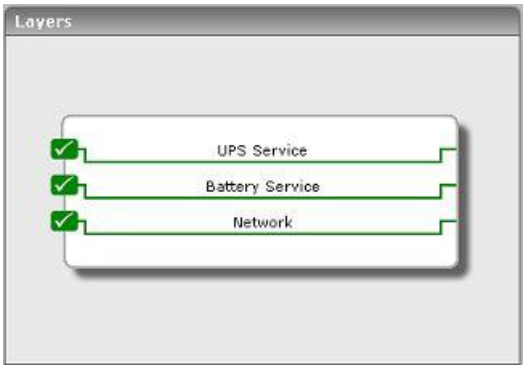

Figure 3.1: The layer model of the APC UPS

Every layer of Figure 3.1 is mapped to some tests, which collect a wide range of performance data from the SNMP MIB of the UPS device, so that administrators can find accurate answers to the following performance queries:

- What is the current state of the UPS?
- Is the UPS accessible over the network?
- What is the current state of the UPS battery? Will the battery be able to sustain the current load?
- Has the battery capacity been utilized fully?

- Are any defective battery packets in use currently? Do they need to be replaced?
- Is the battery bus currently handling a very high voltage?
- Is the battery temperature maintained at a minimum or has it increased?
- Are any UPS components in an abnormal state currently?
- Did your environment experience a power shutdown recently? For how long were the systems supported by the UPS battery when there was no power supply? How much longer can the UPS battery be used?

The following sections deal with the first two layers of Figure 3.1, as the final layer has already been discussed in the *Monitoring Unix and Windows Servers* document.

3.1 The Battery Service Layer

The tests associated with this layer focus on the performance of the UPS battery, and helps administrators decide whether the battery configuration needs to be changed or the battery needs to be replaced to ensure peak performance.

Figure 3.2: The tests associated with the Battery Service layer

3.1.1 Basic Battery Status Test

This test reports on the status of the batteries used for a monitored APC UPS device.

Purpose	Reports on the status of the batteries used for a monitored APC UPS
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

<table>
<tr><td></td><td colspan="3">14. TIMEOUT - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the TIMEOUT text box. The default is 10 seconds.

15. DATA OVER TCP – By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the DATA OVER TCP flag to Yes. By default, this flag is set to No.

16. DD FREQUENCY - Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default for this test is 1:1. This indicates that, by default, detailed measures will be generated every time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire.

17. DETAILED DIAGNOSIS - To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are detected. To enable the detailed diagnosis capability of this test for a particular server, choose the On option. To disable the capability, click on the Off option.

The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled:
➢ The eG manager license should allow the detailed diagnosis capability
➢ Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.</td></tr>
<tr><td>Outputs of the test</td><td colspan="3">One set of results for every UPS monitored</td></tr>
<tr><td>Measurements made by the test</td><td>Measurement</td><td>Measurement Unit</td><td>Interpretation</td></tr>
<tr><td></td><td>Battery normal:
Indicates the current status of the UPS batteries.</td><td>Status</td><td>The value 1 for this measure indicates a 'Battery normal' state, and 0 indicates 'Battery low' state. A ‘Battery low’ (0) value indicates that the UPS will be unable to sustain the current load, and its services will be lost if power is not restored. The amount of run time in reserve at the time of low battery can be configured by the upsAdvConfigLowBatteryRunTime.

A ‘Battery low’ state may occur due to less charge in battery, low acid in battery, a weak battery, etc.

Use the detailed diagnosis of this measure to know when the battery was last replaced.</td></tr>
</table>

3.1.2 Battery Backup Details Test

This test reports statistics related to battery backup.

Purpose	Reports statistics related to battery backup
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Battery discharge time: Indicates the battery discharge time.	Mins	The battery discharge time refers to the duration for which the system(s) supported by the UPS has been running using the battery.
	Battery backup time: Indicates the battery backup time.	Mins	This indicates how much longer systems can run using the battery. Typically, this depends upon the output load. Normally, at half load, the battery backup time is 18.7 minutes, and at full load, it is 5.7 minutes.

3.1.3 Battery Line Details Test

This test monitors the power and voltage levels handled by the UPS' batteries.

Purpose	Monitors the power and voltage levels handled by the UPS' batteries
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Num of external battery: Indicates the number of external battery packs currently connected to the UPS.	Number	
	Num of bad battery: Indicates the number of defective external battery packs currently connected to the UPS.	Number	A zero value is desired for this measure.
	Nominal voltage: Indicates the nominal battery voltage.	Volts	
	Actual voltage: Indicates the actual battery bus voltage.	Volts	Ideally, this value should be lesser than the *Nominal voltage* value.
	Nominal current: Indicates the nominal battery current.	Amps	
	DC current: Indicates the total DC current (in amps) currently handled by the battery.	Amps	Ideally, this value should be lesser than the *Nominal current* value.

3.1.4 External Battery Status Test

The External Battery Status test monitors the external batteries used by an UPS.

Purpose	Monitors the external batteries used by an UPS
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Percent charge: Indicates the percentage of unused battery capacity.	Percent	Ideally, the value of this measure should be high. A low value is indicative of high battery utilization.
	Battery temperature: Indicates the current internal UPS temperature.	Celsius	Ideally, this value should be low.
	Battery replace indicator: Indicates whether the UPS batteries need replacing.	Status	While the value 1 indicates that the battery does not require replacing, the value 0 indicates that the battery has to be replaced.

3.2 The UPS Service Layer

The test associated with this layer continuously monitors the status of an APC UPS, and reports statistics related to the voltage and power handled by the UPS.

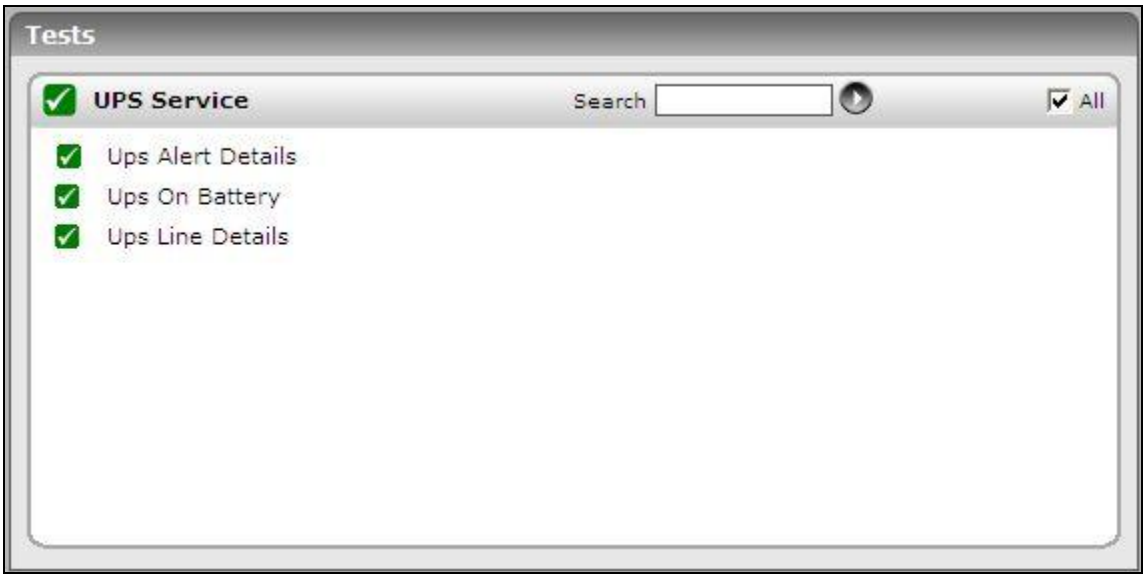

Figure 3.3: The test associated with the UPS Service layer

3.2.1 Ups Line Details Test

This test monitors the current status of a target UPS, and reports a wide variety of performance statistics pertaining to that UPS.

Purpose	Monitors the current status of a target UPS, and reports a wide variety of performance statistics pertaining to that UPS
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

<table>
<tr><td></td><td colspan="3">14. TIMEOUT - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the TIMEOUT text box. The default is 10 seconds.

15. DATA OVER TCP – By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the DATA OVER TCP flag to Yes. By default, this flag is set to No.

16. DD FREQUENCY - Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default for this test is 4:1. This indicates that, by default, detailed measures will be generated every fourth time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire.

17. DETAILED DIAGNOSIS - To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are detected. To enable the detailed diagnosis capability of this test for a particular server, choose the On option. To disable the capability, click on the Off option.

The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled:
➢ The eG manager license should allow the detailed diagnosis capability
➢ Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.</td></tr>
<tr><td>Outputs of the test</td><td colspan="3">One set of results for every UPS monitored</td></tr>
<tr><td>Measurements made by the test</td><td>Measurement</td><td>Measurement Unit</td><td>Interpretation</td></tr>
<tr><td></td><td>Ups operation mode:
Indicates the current state of the UPS.</td><td>Status</td><td>If this measure reports the value 1, it indicates that the UPS is currently in the safe or online state. If the value 0 is reported, it indicates that the UPS is in an unsafe state currently.

If the value of this measure is 0, you can use the detailed diagnosis of the measure to determine the exact state of the UPS. Typically, unsafe is the generic term that the eG agent uses to indicate one of the following abnormal states:

<table><tr><th>State ID</th><th>Description</th></tr><tr><td>1</td><td>Unknown</td></tr><tr><td>3</td><td>onBattery</td></tr></table></td></tr>
</table>

			4	onSmartBoost
			5	timedSleeping
			6	softwareByPass
			7	off
			8	rebooting

			9	SwitchedBypass
			10	hardwareFailurebypass
			11	SleepingUntilpowerReturn
			12	onSmartTrim
	Input voltage: Indicates the current utility line voltage.	Volts	While the nominal voltage is 120 volts, the variable range is 92-147 volts.	
	Input frequency: Indicates current input frequency to the UPS system.	Hz		
	Output voltage: Indicates the current output voltage of the UPS system.	Volts	The nominal voltage is 120 volts.	
	Output frequency: Indicates the current output frequency delivered by the UPS.	Hz		
	Percent load: Indicates the percent output load.	Percent		
	Output current: Indicates the current drawn by the load on the UPS.	Amps	This measure is directly proportional to the percentage of output load.	

3.2.2 UPS Battery Test

This test reports the input line state of the UPS. The state of the input line determines the mode of operation of the UPS – i.e., whether the UPS is running in the Battery mode or not.

Purpose	Reports the input line state of the UPS
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

<table>
<tr><td></td><td colspan="3">14. TIMEOUT - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the TIMEOUT text box. The default is 10 seconds.

15. DATA OVER TCP – By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the DATA OVER TCP flag to Yes. By default, this flag is set to No.

16. DD FREQUENCY - Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default is 1:1. This indicates that, by default, detailed measures will be generated every time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire.

17. DETAILED DIAGNOSIS - To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are detected. To enable the detailed diagnosis capability of this test for a particular server, choose the On option. To disable the capability, click on the Off option.

The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled:
➢ The eG manager license should allow the detailed diagnosis capability
➢ Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.</td></tr>
<tr><td>Outputs of the test</td><td colspan="3">One set of results for every UPS monitored</td></tr>
<tr><td>Measurements made by the test</td><td>Measurement</td><td>Measurement Unit</td><td>Interpretation</td></tr>
</table>

<table>
<tr>
<td></td>
<td>Ups input line state:
Indicates the current input line state of the UPS.</td>
<td>Status</td>
<td>This measure reports the following states while indicating the input line state of the UPS.

No Transfer
Highline Voltage
BrownOut
BlackOut
Small Momentary Sag
Deep Momentary Sag
Small Momentary Spike
Large Momentary Spike
SelfTest
Rate Of Voltage Change

The numeric values that correspond to the above-mentioned states are as follows:
<table>
<tr><th>Numeric Value</th><th>State</th><th>Description</th></tr>
<tr><td>1</td><td>No Transfer</td><td>Indicates that the UPS battery is not transferred to power i.e., the UPS is still utilizing the battery power.</td></tr>
<tr><td>2</td><td>Highline Voltage</td><td>Indicates that the transfer to battery power is caused by a voltage greater than the high transfer voltage.</td></tr>
<tr><td>3</td><td>BrownOut</td><td>A brownout is when the line voltage is severely reduced for a few minutes up to a few days.
This state is shown if the duration of the outage is greater than five seconds and the line voltage is between 40% of the rated output voltage and the low transfer voltage.</td></tr>
</table>
</td>
</tr>
</table>

					and the low transfer voltage
			4	BlackOut	A blackout is the complete absence of AC power. This state is shown if the duration of the outage is greater than five seconds and the line voltage is between 40% of the rated output voltage and ground.
			5	Small Momentary Sag	This state is shown if the duration of the outage is less than five seconds and the line voltage is between 40% of the rated output voltage and the low transfer voltage.
			6	Deep Momentary Sag	This state is shown if the duration of the outage is less than five seconds and the line voltage is between 40% of the rated output voltage and ground.
			7	Small Momentary Spike	This state is shown if the line failure is caused by a rate of change of input voltage less than ten volts per cycle.

			8 | Large Momentary Spike | This state is shown if the line failure is caused by a rate of change of input voltage greater than ten volts per cycle. 9 | SelfTest | This state is shown if the UPS was commanded to do a self test. 10 | Rate Of Voltage Change | This state is shown if the failure is due to the line voltage. **Note:** By default, this measure reports the above-mentioned states while indicating the input line state of the UPS. However, the graph of this measure will be represented using the corresponding numeric equivalents of the states as mentioned in the table above. The detailed diagnosis of this measure, if enabled, displays the current configuration of the UPS; the configuration details include: a) Model no b) Firmware version c) Manufacture date d) Serial no e) State id f) Battery state

3.2.3 Ups Alert Details Test

This test reports the number of enabled output states and abnormal states of the APC UPS 3000 that is being monitored.

Purpose	Reports the number of enabled output states and abnormal states of the APC UPS 3000 that is being monitored
Target of the test	An APC UPS device
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

<table>
<tr><td></td><td colspan="3">14. TIMEOUT - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the TIMEOUT text box. The default is 10 seconds.

15. DATA OVER TCP – By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the DATA OVER TCP flag to Yes. By default, this flag is set to No.

16. DD FREQUENCY - Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default is 1:1. This indicates that, by default, detailed measures will be generated every time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire.

17. DETAILED DIAGNOSIS - To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are detected. To enable the detailed diagnosis capability of this test for a particular server, choose the On option. To disable the capability, click on the Off option.

The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled:
➢ The eG manager license should allow the detailed diagnosis capability
➢ Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.</td></tr>
<tr><td>Outputs of the test</td><td colspan="3">One set of results for every UPS monitored</td></tr>
<tr><td rowspan="3">Measurements made by the test</td><td>Measurement</td><td>Measurement Unit</td><td>Interpretation</td></tr>
<tr><td>Output state count:
Indicates the total number of enabled output states of this APC UPS 3000 server.</td><td>Number</td><td>Use the detailed diagnosis of this measure to figure out which are the output states that are enabled. Here, the detailed diagnosis will show the Flag number and description for each output state individually.</td></tr>
<tr><td>Abnormal state count:
Indicates the total number of enabled abnormal states of this APC UPS 3000 server.</td><td>Number</td><td>Use the detailed diagnosis of this measure to figure out which are the abnormal states that are enabled. Here, the detailed diagnosis will show the Flag number and description for each abnormal state individually.</td></tr>
</table>

Chapter 4

Monitoring the XUps

The XUPs Series provides UPS backup with line-interactive automatic voltage regulation (AVR), over/under-voltage protection, surge protection with heavy duty noise filtering and communications capability.

Since this UPS plays a crucial role in protecting computers, data centers, telecommunication equipment or other electrical equipment, issues in its performance – eg., the depletion of the battery charge - can cause injuries, fatalities, serious business disruption or data loss. It is therefore imperative that the UPS is monitored periodically, and its 24 x 7 availability ensured.

For this purpose, eG Enterprise provides a dedicated *XUps Server* monitoring model. By periodically polling the SNMP MIB of the XUps, the eG external agent collects a wealth of performance information pertaining to the device, and proactively reveals abnormalities (if any).

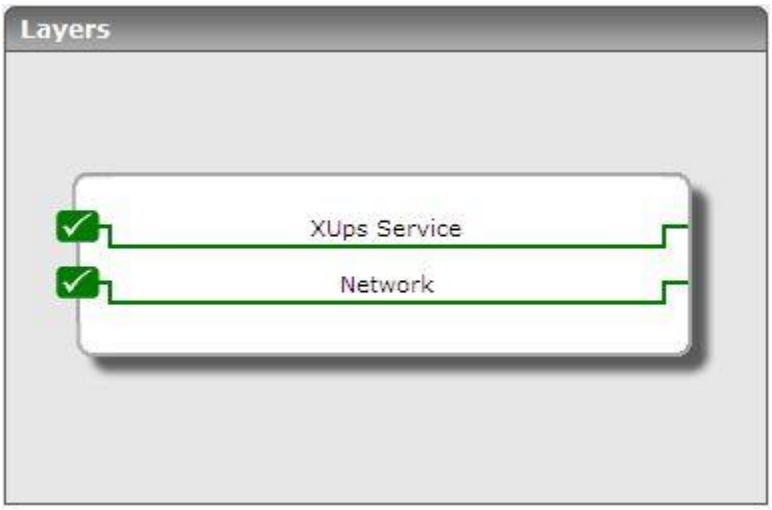

Figure 4.1: The XUps server monitoring model

Each layer of Figure 4.1 above is mapped to a variety of tests, each of which periodically polls the SNMP MIB of the UPS to retrieve a plethora of statistics revealing the overall health of the device. These statistics enable administrators to figure out the following:

- What is the current status of the UPS battery?
- How long would it be before the UPS runs out of battery?

- How much charge is left on battery?
- What is the bypass voltage of the UPS?
- What is the current external source of input power and source of output power?
- Did input power exceed tolerance level more than once?
- Is the output load of the UPS too high?
- Is the input voltage and current within prescribed limits?
- Is the output voltage and current within prescribed limits?

The sections that follow will discuss each layer of Figure 4.1 in detail.

4.1 The Network Layer

To determine the health of network connections leading to and from the XUps, use th **Network** test mapped to this layer.

Figure 4.2: The test mapped to the Network layer

Since this test has already been discussed in the previous chapters, let us proceed to the next layer.

4.2 The XUps Service Layer

Using this layer, you can monitor the following:

- The status of the battery;
- The battery charge;
- The input and output frequency of the battery;
- The input and output voltage, current, and real power of the batterty

Figure 4.3: The tests mapped to the Battery Status layer

4.2.1 Battery Status Test

This test reports the status of the UPS battery, and also indicates whether or not the batter needs to be recharged.

Purpose	Reports the status of the UPS battery
Target of the test	An XUPs
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

<table>
<tr><td></td><td colspan="3">14. TIMEOUT - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the TIMEOUT text box. The default is 10 seconds.
15. DATA OVER TCP – By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the DATA OVER TCP flag to Yes. By default, this flag is set to No.</td></tr>
<tr><td>Outputs of the test</td><td colspan="3">One set of results for every UPS monitored</td></tr>
<tr><td rowspan="4">Measurements made by the test</td><td>Measurement</td><td>Measurement Unit</td><td>Interpretation</td></tr>
<tr><td>Remaining battery time:
Indicates the battery run time in seconds before UPS turns off due to low battery.</td><td>Status</td><td>A very low value for this measure could indicate that the UPS battery is fast running out of charge and may have to be recharged.</td></tr>
<tr><td>Battery voltage:
Indicates the battery voltage.</td><td>Volts</td><td></td></tr>
<tr><td>Battery current:
Indicates the amount of power that is being conducted by the battery.</td><td>Amps</td><td>The status of the current is positive when discharging the battery and the status of the current is negative when recharging the battery.</td></tr>
<tr><td></td><td>Battery capacity:
Indicates the charge of the battery in percentage.</td><td>Percent</td><td>A high value is typically desired for this measure. A very low value could indicate that the UPS battery is fast running out of charge and may have to be recharged.</td></tr>
</table>

<table>
<tr>
<td></td>
<td>Advanced battery mgmt status:
Indicates the status of the Advanced Battery Management.</td>
<td>Number</td>
<td>This measure can take any of the following values:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>1</td><td>Battery Charging</td></tr>
<tr><td>2</td><td>Battery Discharging</td></tr>
<tr><td>3</td><td>Battery Floating</td></tr>
<tr><td>4</td><td>Battery Resting</td></tr>
<tr><td>5</td><td>unknown</td></tr>
</table>
</td>
</tr>
</table>

4.2.2 Bypass Details Test

This test measures the bypass voltage of the UPS.

Purpose	Measures the bypass voltage of the UPS
Target of the test	An XUPs
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Bypass voltage: Indicates the measured UPS bypass voltage in volts.	Volts	

4.2.3 Frequency Details Test

This test reports the input and output frequency, and provides the load details of the XUps.

Purpose	Reports the input and output frequency, and provides the load details of the XUps.
Target of the test	An XUPs
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Input frequency: Indicates the utility line frequency in tenths of Hz.	Hz	
	Bad input lines: Indicates the number of times the Input was out of tolerance.	Number	

<table>
<tr>
<td></td>
<td>Output source:
Indicates the current external source of input power.</td>
<td>Number</td>
<td>This measure can take any of the following values:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>1</td><td>Other</td></tr>
<tr><td>2</td><td>None</td></tr>
<tr><td>3</td><td>PrimaryUtility</td></tr>
<tr><td>4</td><td>BypassFeed</td></tr>
<tr><td>5</td><td>Secondary Utility</td></tr>
<tr><td>6</td><td>generator</td></tr>
<tr><td>7</td><td>flywheel</td></tr>
<tr><td>8</td><td>fuelcell</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>Output frequency:
Indicates the UPS output frequency in tenths of Hz.</td>
<td>Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output load:
Indicates the UPS output load in percent of rated capacity.</td>
<td>Percent</td>
<td></td>
</tr>
</table>

<table>
<tr>
<td></td>
<td>Output source:
Indicates the current source of output power.</td>
<td>Number</td>
<td>This measure can take any of the following values:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>1</td><td>Other</td></tr>
<tr><td>2</td><td>None</td></tr>
<tr><td>3</td><td>Normal</td></tr>
<tr><td>4</td><td>Bypass</td></tr>
<tr><td>5</td><td>Battery</td></tr>
<tr><td>6</td><td>Booster</td></tr>
<tr><td>7</td><td>Reducer</td></tr>
<tr><td>8</td><td>ParallelCapacity</td></tr>
<tr><td>9</td><td>ParallelRedundant</td></tr>
<tr><td>10</td><td>HighEfficiencyMode</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>Bypass frequency:
Indicates the bypass frequency in tenths of Hz.</td>
<td>Hz</td>
<td></td>
</tr>
</table>

4.2.4 Input Details Test

This test reports the input voltage and input current of the XUps.

Purpose	Input voltage and input current of the XUps
Target of the test	An XUPs
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Input voltage: Indicates the input voltage of the UPS.	Volts	
	Input current: Indicates the input current of the UPS.	Amps	

4.2.5 Output Details Test

This test reports the output voltage, output current, and output watts of the UPS.

Purpose	Reports the output voltage, output current, and output watts of the UPS
Target of the test	An XUPs
Agent deploying the test	An external agent

Configurable parameters for the test	1. **TEST PERIOD** - How often should the test be executed 2. **HOST** - The host for which the test is to be configured. 3. **SNMPPORT** - The port number through which the UPS exposes its SNMP MIB. The default value is 161. 4. **SNMPVERSION** – By default, the eG agent supports SNMP version 1. Accordingly, the default selection in the **SNMPVERSION** list is **v1**. However, if a different SNMP framework is in use in your environment, say SNMP **v2** or **v3**, then select the corresponding option from this list. 5. **SNMPCOMMUNITY** – The SNMP community name that the test uses to communicate with the UPS. This parameter is specific to SNMP **v1** and **v2** only. Therefore, if the **SNMPVERSION** chosen is **v3**, then this parameter will not appear. 6. **USERNAME** – This parameter appears only when **v3** is selected as the **SNMPVERSION**. SNMP version 3 (SNMPv3) is an extensible SNMP Framework which supplements the SNMPv2 Framework, by additionally supporting message security, access control, and remote SNMP configuration capabilities. To extract performance statistics from the MIB using the highly secure SNMP v3 protocol, the eG agent has to be configured with the required access privileges – in other words, the eG agent should connect to the MIB using the credentials of a user with access permissions to be MIB. Therefore, specify the name of such a user against the **USERNAME** parameter. 7. **AUTHPASS** – Specify the password that corresponds to the above-mentioned **USERNAME**. This parameter once again appears only if the **SNMPVERSION** selected is **v3**. 8. **CONFIRM PASSWORD** – Confirm the **AUTHPASS** by retyping it here. 9. **AUTHTYPE** – This parameter too appears only if **v3** is selected as the **SNMPVERSION**. From the **AUTHTYPE** list box, choose the authentication algorithm using which SNMP v3 converts the specified **USERNAME** and **PASSWORD** into a 32-bit format to ensure security of SNMP transactions. You can choose between the following options: ➢ **MD5** – Message Digest Algorithm ➢ **SHA** – Secure Hash Algorithm 10. **ENCRYPTFLAG** – This flag appears only when **v3** is selected as the **SNMPVERSION**. By default, the eG agent does not encrypt SNMP requests. Accordingly, the **ENCRYPTFLAG** is set to **NO** by default. To ensure that SNMP requests sent by the eG agent are encrypted, select the **YES** option. 11. **ENCRYPTTYPE** – If the **ENCRYPTFLAG** is set to **YES**, then you will have to mention the encryption type by selecting an option from the **ENCRYPTTYPE** list. SNMP v3 supports the following encryption types: ➢ **DES** – Data Encryption Standard ➢ **AES** – Advanced Encryption Standard 12. **ENCRYPTPASSWORD** – Specify the encryption password here. 13. **CONFIRM PASSWORD** – Confirm the encryption password by retyping it here.

	14. **TIMEOUT** - Specify the duration (in seconds) within which the SNMP query executed by this test should time out in the **TIMEOUT** text box. The default is 10 seconds. 15. **DATA OVER TCP –** By default, in an IT environment, all data transmission occurs over UDP. Some environments however, may be specifically configured to offload a fraction of the data traffic – for instance, certain types of data traffic or traffic pertaining to specific components – to other protocols like TCP, so as to prevent UDP overloads. In such environments, you can instruct the eG agent to conduct the SNMP data traffic related to the equalizer over TCP (and not UDP). For this, set the **DATA OVER TCP** flag to **Yes**. By default, this flag is set to **No**.		
Outputs of the test	One set of results for every UPS monitored		
Measurements made by the test	**Measurement**	**Measurement Unit**	**Interpretation**
	Output voltage: Indicates the output voltage of the UPS.	Volts	
	Output current: Indicates the output current of the UPS.	Amps	
	Output watts: Indicates the real output power.	Watts	

Chapter 5

Conclusion

This document has described in detail the monitoring paradigm used and the measurement capabilities of the eG Enterprise suite of products with respect to **the UPS**. For details of how to administer and use the eG Enterprise suite of products, refer to the user manuals.

We will be adding new measurement capabilities into the future versions of the eG Enterprise suite. If you can identify new capabilities that you would like us to incorporate in the eG Enterprise suite of products, please contact support@eginnovations.com. We look forward to your support and cooperation. Any feedback regarding this manual or any other aspects of the eG Enterprise suite can be forwarded to feedback@eginnovations.com.