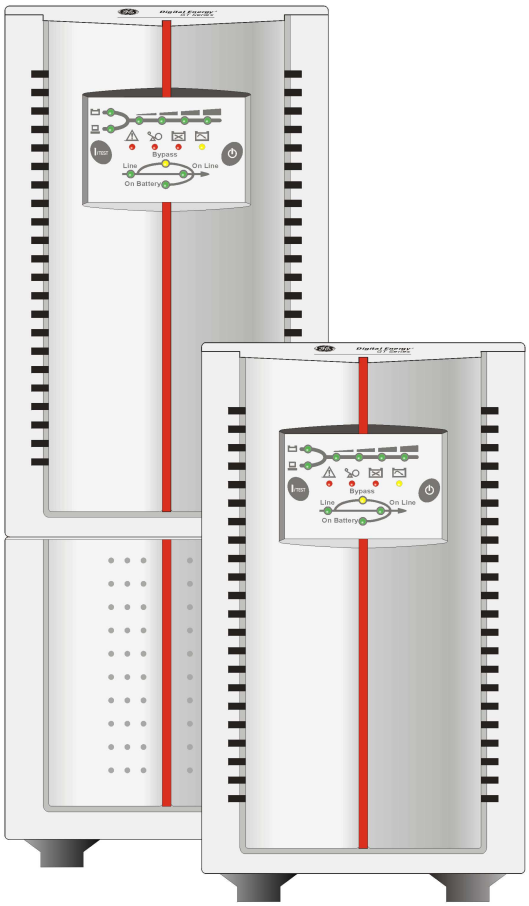
GE Industrial Systems

Product Description

Digital Energy™ GT Series

On-Line Uninterruptible Power Supply
1000, 2000, 3000 VA
UL-version



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Certified Quality System
SQS
ISO 9001 / EN 29001
Reg. No. 10448

Contents:

1 - Introduction

The **GE (General Electric) Digital Energy™ GT Series UPS** series is a compact, truly on-line system (VFI, Voltage and Frequency Independent) which incorporates the most advanced power electronics technology to provide exceptional protection for electrical equipment.
Each **GE Digital Energy™** UPS is thoroughly tested and conforms within tolerance to the following specifications. (Data are mean values and are subject to change without notice.) Information applies to all models unless otherwise specified.

2 - Functional Explanation

2.1 Principles of Operation

The **Digital Energy™ GT Series** UPS stores electric energy in batteries housed in the unit. This allows the UPS to supply output power even when the incoming mains power is cut off completely. Energy is stored as Direct Current (DC), while input and output energy are Alternating Current (AC) in sine wave form. Therefore the UPS contains an input converter (AC to DC) and an output converter (DC to AC) (See fig.1).

The **Digital Energy™ GT Series** UPS is a SECOND GENERATION On-Line UPS with:

* a capacitor bank in the DC line
* battery not in line with the DC link, resulting in:
  - enhanced battery life
  - optimal battery charging
* full wave input converter with power factor correction
* extremely wide input voltage and input frequency tolerance
* no inrush current at start up

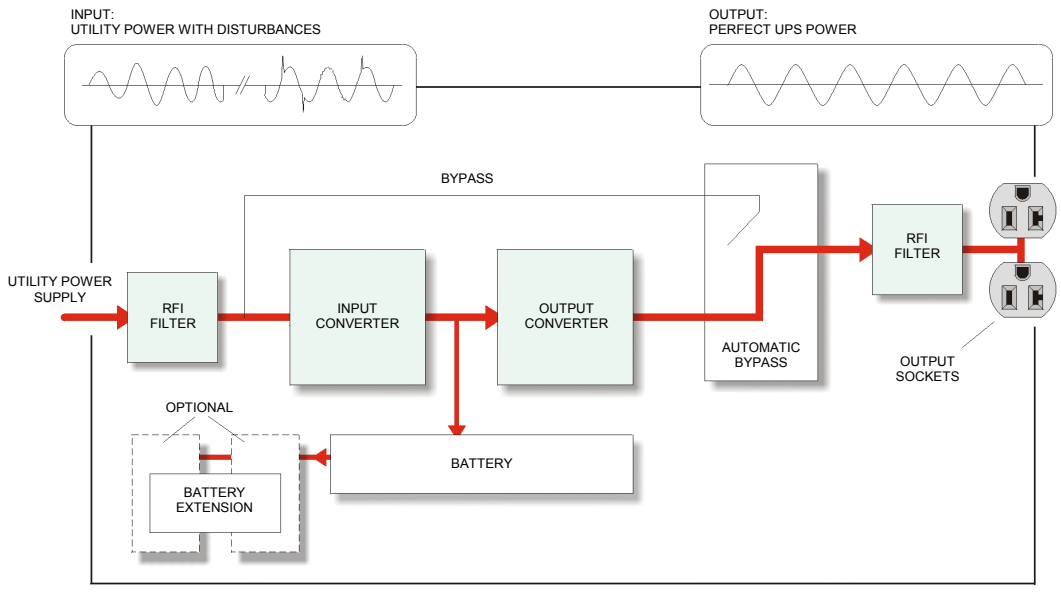


*Figure 1 Block diagram of the **Digital Energy™ GT Series** 1000-3000 UPS, mains present*

2.2 Normal Conditions

Under normal input conditions (see section 4.2) energy from the utility is channelled through the input converter, which supplies the output converter and, together with the battery charger, keeps the battery fully charged. Surges and spikes are blocked completely at the input converter and very instable utility power can be supported. The output converter synthesizes a completely new AC output sine wave to supply the load (electrical equipment).

2.3 Utility Failure

In the event of a utility power failure (i.e. mains absent or outside tolerance) the output converter uses the energy reserve stored in the battery to continue to produce AC power, ensuring unbroken output (fig. 2).
No interruption or alteration will ever be noticed in the output power.

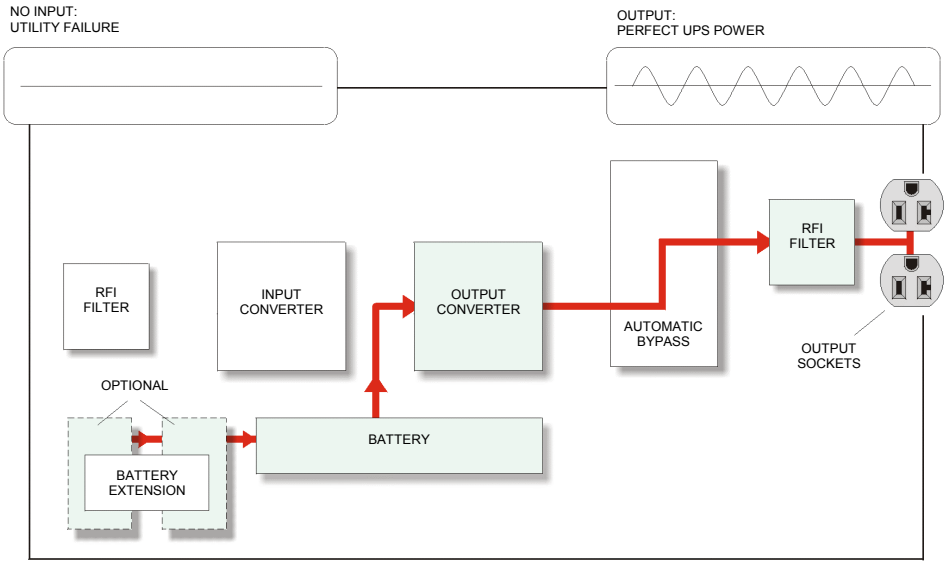


*Figure 2 Block diagram of the **Digital Energy™ GT Series** 1000-3000, utility failure*

In the event of an extended utility failure, the output converter will stop when the battery energy has been used up. At this point, the UPS is no longer able to power the connected equipment.

When the utility power is re-established within tolerance, the input converter will be supplied again by the utility and the batteries will be recharged, making them ready to support future power failures.

2.4 Bypass Operation

If the output converter is unable to deliver the demanded output power (overload, overtemperature) the bypass switch will automatically transfer the load to the mains. It will switch back to output converter when the overload has been removed. If bypass operation is caused by overtemperature, the unit will switch back when the temperature has dropped below alarm level.
When the normal situation is restored, the load will be transferred back to the output converter.

The transfer time is less than 4 msecs and is sufficiently short for modern computers, which can ride through 10-20 milliseconds.

If a utility power failure occurs during bypass operation, the UPS will switch back to inverter and eventually, when the batteries are depleted, output power is lost. If the UPS functions under overload conditions it may not be able to protect the load.

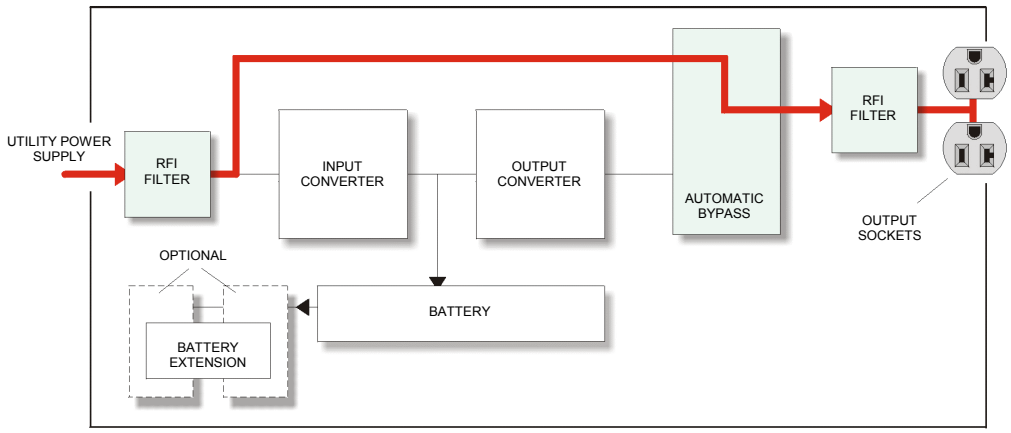


Figure 3 Bypass operation

3 - External Description

3.1 Operating Panel and Rear View

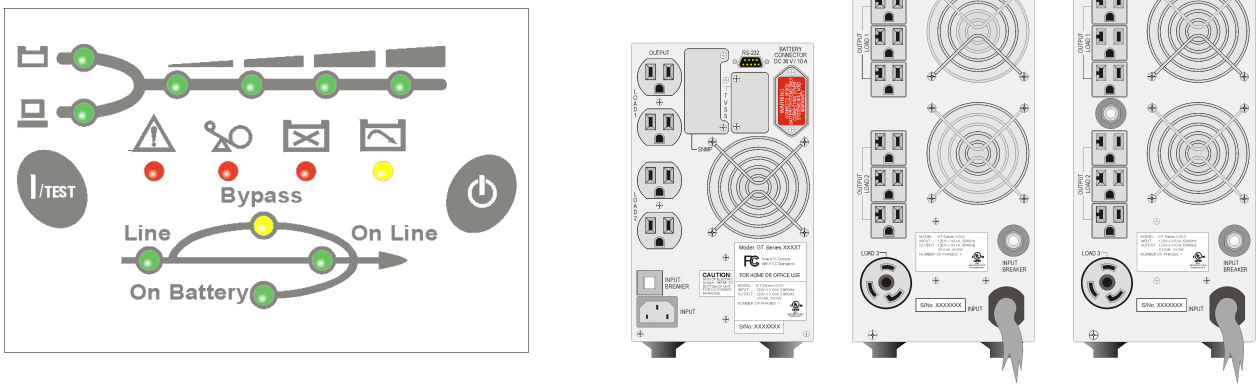


Figure 4 Operating panel and rear view ***Digital Energy™ GT Series*** *1000 –2000 - 3000*

FRONT		***REAR***	
Line	green LED	Output receptacles (NEMA-type)	1kVA: 4x5-15R
On Line	green LED		2kVA: 6x5-20R, 1xL5-20R
Bypass	yellow LED		3kVA: 6x5-20R, 1xL5-30R
On Battery	green LED	Input	1kVA: IEC320;
Overload	red LED		2/3kVA: fixed cord 6ft.
Battery low	yellow LED	Input fuse	TCB (thermal circuit breaker)
Replace battery	red LED	SNMP slot	for optional SNMP adapter
Fault	red LED	Surge protector slot	for optional Transient Voltage Surge Suppressor (to protect telephone and network line)
Load level meter	4 green LEDs	Comm. interface	RS232 and dry contact
Battery level meter	4 green LEDs	Fan(s)	electronically controlled
Push-buttons	power on - 3 functions:	DC Connector	to connect optional battery pack
	- power on,	Output fuse	circuit breaker (3kVA only)
	- battery test		
	- mute buzzer		
	power off		

3.2 Enclosure

Construction	:	steel/plastic
Colour	:	RAL 9006 (aluminum grey) - front panel; RAL 9010 (white) - cabinet
Protection	:	IP 20

Digital Energy™ GT Series model	:	**1000T UL**	**2000T UL**	**3000T UL**

3.3 Dimensions

Dimensions (hxwxd, mm)	:	242 x 140 x 366	373 x 140 x 425	
Dimensions (hxwxd, inches)	:	9.5 x 5.5 x 14.4	14.7 x 5.5 x 16.7	
Shipping dimensions (hxwxd, mm)	:	326 x 241 x 506	493 x 249 x 605	
Shipping dimensions (hxwxd, inches)	:	12.8 x 9.5 x 19.9	19.4 x 9.8 x 23.8	

3.4 Weight

Weight (kg / lbs)	:	15 / 33	30 / 66.0	30 / 66.0
Shipping weight (kg / lbs)	:	18 / 39.6	33 / 72.7	33 / 72.7

4 - Electrical Specifications

Digital Energy™ GT Series model	:	1000T UL	2000T UL	3000T UL

4.1 Ratings

Voltage Amperes (VA) with computer type load	:	1000	2000	3000
Watts (W) with resistive load, pf. 0.8	:	800	1600	2400

4.2 Input

AC input voltage, nominal	:	120 Vac single phase		
AC input voltage range				
at 100% load	:	80~138 V		
at 70% load	:	65~80 V (programmable)		
Minimum start-up AC voltage	:	50Vac (at any load)		
High voltage protection	:	above 138Vac the **GT Series UPS** will disconnect the mains and switch to battery operation		
Input current (A), fully charged, at 120Vac input voltage	:	8.6	16.7	24.6
Input frequency, nominal	:	50 or 60 Hz (auto-selectable)		
Input frequency range	:	45~65 Hz		
Input current waveform	:	sine wave		
Input power factor	:	≥ 0.97 (full computer load, fully charged)		
Input protection breaker (A)	:	15	40	40

4.3 Output

AC output voltage, nominal	:	120 Vac single phase		
AC output voltage tolerance	:	± 2% (static)		
Output frequency	:	50 or 60 Hz, auto-selectable (default at cold start 60 Hz)		
Output frequency range (free running)	:	nominal ± 0.05Hz		
Output frequency range (sync. to util.)	:	nominal ± 5Hz		
Output waveform	:	pure sine wave		
Harmonic distortion, linear load	:	< 3%	<3%	<4%
Harmonic distortion, computer load	:	< 6%		
Power factor	:	0.8		
Crest factor (peak to RMS current):	:	3:1		
Output protection breaker	:	n.a.	n.a.	15Ax2

4.4 Bypass

AC input voltage range	:	65 - 135 Vac
Frequency tracking rate (slew rate)	:	>1Hz/sec - <5 Hz/sec.
Frequency tracking range	:	nominal ± 10%
Phase difference	:	no phase difference – the unit is single loop
Transfer time inverter < > bypass	:	< 4 msec.

4.5 General Design Criteria

Safety	:	UL/cUL, TÜV/GS
EMC - Electromagnetic compatibility	:	FCC Class A (2,3kVA)/B(1kVA) CISPR PUB 22 Class B; TÜV/EMC; CE

Note: The **GT Series UPS** is intended for use in normal domestic and office situations

5 - Performance Characteristics

Digital Energy™ GT Series model	:	1000T UL	2000T UL	3000T UL

5.1 Efficiency (battery fully charged)

Normal operation (AC-AC) at full linear load, %	:	≥ 87	≥ 87	≥ 87
Battery operation (DC-AC) At full linear load, %	:	85	85	85
Max. heat output (W/h) 100% load Normal operation (AC-AC)	:	120	240	360

5.2 No-load Power Consumption (battery fully charged)

Normal operation (AC-AC) (W)	:	<35	<70	<105
Battery operation (DC-AC) (W)	:	<40	<80	<120

5.3 Environment

Audible noise at 1 meter, db(A)	:	40	42	45
		the audible noise is load and temperature dependent		
Ambient temperature	:	0 ~ +40°C (32 ~ 104°F)		
Relative humidity	:	max. 95% (non-condensing)		

5.4 Runtimes, ratings given for 25°C (77°F)

Runtime (mins@typical load in W)				
Half computer load	:	14 @ 400W	14 @ 800W	14 @ 1200W
Full computer load	:	5 @ 800W	5 @ 1600W	5 @ 2400W

Units connected to battery cabinets will have longer runtimes. See section 8.3.

5.5 Overload Capability

Overload protection	:	Fully protected against overload and short circuits.
Overload behaviour:		
synchronized	:	~105% ±3% - continuous
	:	~125% ±4% - 3 minutes
	:	~150% ±5% - 30 seconds (linear load only)
	:	>150% ±5% - 0.5 seconds
not-synchronized	:	<70% continuous
		>70% shutdown after 24 hours of overload warning

5.6 Standard Features

Wide AC input voltage window
Minimises the need for battery operation

High voltage protection
Above the maximum input voltage, the **GT Series UPS** will protect itself and the load by disconnecting the mains and switching to battery operation. Reducing the mains voltage will recover the normal situation.

Power factor one input
The AC input current drawn by the UPS is less than that supplied to the load. Contrary to UPSs and computers without this feature, no disturbances which may cause problems to other electrical equipment are fed back to the mains. This feature will become mandatory within a few years.

No UPS inrush current
When switching on, the UPS causes no inrush current. Inrush currents result in voltage dips on the mains which can disturb other equipment or even blow the fuse of the distribution board.

Battery start (cold start)
Allows you to switch on the unit while the mains input is absent.

6 - Communication Interface

6.1 Principle of Operation

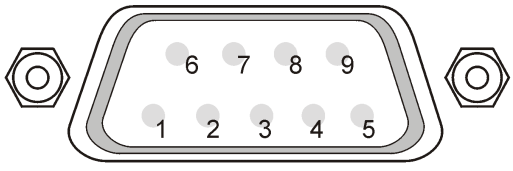
The **GT Series UPS** is equipped with a communications interface, providing RS232 and dry contact protocols in one sub-D 9-pin female connector located at the back of the unit. The interface port enables advanced communication between the UPS and the computer (interface kit required).

For specific information on **GE Digital Energy™** connectivity products please contact your local dealer or Internet: www.gedigitalenergy.com.

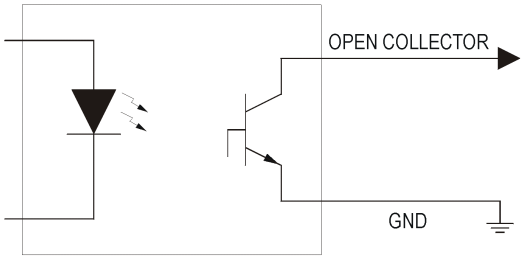
The interface cable should be shielded.

The pin assignment of the interface connector is defined as follows:

PIN	ASSIGNMENT DESCRIPTION	
	RS-232	Dry Contact
1		Low battery (Open collector)
2	UPS TxD (typical RS-232 level)	
3	UPS RxD (typical RS-232 level)	Remote shutdown (5~12V)
4	Reserved for PNP	
5	GND	GND
6	Reserved for PNP	Reserved
7	Reserved for PNP	Reserved
8		Utility Fail (Open collector)
9		



Pin Assignment



Open Collector Circuit

The maximum voltage and current on pin 1,8 is 30VDC, 10mA.

6.2 RS232

The ***RS-232 communication port*** provides the following functions:

1 - Monitoring charger status
2 - Monitoring battery status and condition
3 - Monitoring inverter status
4 - Monitoring UPS status
5 - Monitoring the AC utility status
6 - Turn on/off UPS on schedule for power saving
7 - Adjust transfer voltage

Pin Assignment:
Pin 2 : PC receives line RS-232 data from UPS.
Pin 3 : PC transmits line RS-232 data to UPS.
Pin 5 : Signal ground.
Pin 4,6,7 : Reserved for plug and play function.

The UPS data is provided at 2400 bps baud rate and made up of 8-bit, 1 stop-bit and no parity bit. All information is encoded in ASCII format.

Hardware:

Baud rate	2400 bps
Data length	8 bits
Stop bit	1 bit
Parity	none

Cabling:
Standard sub-D 9 cable (UPS side: male, PC side: female)

6.3 Dry Contact

The communication port on the UPS can be connected to a computer. This port allows the computer to monitor the UPS status and control the operation of the UPS in some conditions.
Its major functions are some or all of the following:

1 - to broadcast a warning when the AC utility fails.
2 - to close the files before the battery is exhausted.
3 - to turn off the computer(s) connected to the UPS.

Pin Assignment:
Pin 1 : Normally open. When the battery voltage level is low, pin 1 and pin 5 are connected together via a photo coupler.
Pin 3 : UPS will shut down when a high level (5~12V) is applied for at least 3.8 seconds.
Pin 5 : Signal ground.
Pin 6,7 : Reserved.
Pin 8 : Normally open. When the AC utility fails, pin 8 and pin 5 are connected together via a photo coupler.

Cabling:
A special cable should be used with a pin assignment as follows:

PC (female)	**UPS (male)**
Pin 1	Pin 1 (battery Low)
Pin 3	Pin 5 (GND)
Pin 4	Pin 3 (Shutdown)
Pin 7	Pin 6
Pin 7	Pin 7
Pin 8	Pin 8 (AC Fail)

Some computers may have a special connector to link this communication port, or require a special plug-in card, or need a special UPS monitoring software. Contact your local dealer for more information about different interface kits.

The dry contacts and (optional) SNMP card can be connected at the same time. However, if both are operating simultaneously the remote shutdown facility for the dry contacts will not be available. Battery low and AC failure functions remain unaffected.

6.4 SNMP Plug-in Card (optional)

SNMP (Simple Network Management Protocol) is the most popular protocol in the network. Via NMS (Network Management Station) you can detect the status of all facilities in the network.

An SNMP Interface Card can be plugged into the built-in SNMP slot on rear panel of the UPS. This optional interface unit can integrate the UPS into the network allowing you to easily monitoring the UPS status.
NOTE: Once you install the SNMP card in the UPS, you can not get any information from the UPS via RS232. i.e. only either an SNMP card or the RS232 port can be used as a communication interface. The dry contacts and (optional) SNMP card can be connected at the same time. However, if both are operating simultaneously the remote shutdown facility for the dry contacts will not be available. Battery low and AC failure functions remain unaffected.

The SNMP card also supports SHTTP protocol, you can use browser Microsoft IE or Netscape Communicator to monitor or configure the UPS. Besides, the SNMP card supports Telnet and FTP for remote monitoring and firmware upgrading.

Specifications:
1 - Auto detecting 10/100M Network speed.
2 - Supporting protocol: TCP/IP, UDP, HTTP, ICMP, ARP, TELNET, BOOTP, DHCP, FTP and SNMPv1.
3 - Remote firmware upgradeable and configurable.
4 - Web server built-in, allow monitoring/controlling UPS via browser.
5 - VT100 terminal mode or Telnet to configure SNMP.

Functions:
1 - Schedule: Shutdown/Restart UPS, testing and control outlets.
2 - Testing: Scheduled testing of the battery can insure that the UPS will operate properly during a utility power failure.
3 - Event log: Auto-record the power event.
4 - Historical records: Keep records of UPS status in specified interval.
5 - Event handling: configure special action for each power event to meet your requirements.
6 - On/Off UPS: setup the power on/off timer.
7 - Outlet control: configure UPS outlets.

7 - Batteries - ratings given for 25°C (77°F)

Digital Energy™ GT Series model	:	**1000T UL**	**2000T UL**	**3000T UL**
Nominal battery voltage (V) / capacity	:	12 / 7	12 / 7	12 / 9
Nominal UPS internal DC voltage	:	36	72	72
Number of batteries	:	3	6	6
Type	:	sealed lead acid, maintenance free		
Service life	:	up to 3 years (depending on operating conditions)		
Runtime	:	see section 5.4, Runtimes		
Battery recharge current, (A)	:	0.7~1.4	1.2~2.4	1.2~2.4
Typical batt. recharge current (A)	:	1	1.8	1.8
Battery recharge voltage (Vdc)	:	41.1 ± 1	82.2 ± 2	82.2 ± 2
Battery recharge time	:	< 6 hours for 80% capacity		
Battery leakage current (mA)	:	<0.4		
Battery protection, fuse x2x2 (A)	:	25	30	30
Automatic (quick) battery test	:	The user can define a scheduled test through the data protection software		

Long term storage: see chapter 9.

8 - Options

8.1 SNMP Interface Adapter

An SNMP interface adapter can be placed in the SNMP slot in the rear panel of the UPS, and allows the data interface to be connected directly to an Ethernet network. See section 6.4 for more information.

8.2 Longer runtimes

By adding extra battery packs the runtime of the **GT Series UPS** can be extended.

	Battery extension voltage/capacity V/Ah	total capacity Ah	typical runtime 100% / 50% load minutes	enclosure	weight (kg)
For GT 1000T UL					
Std UPS	36 / 7	7	5 / 14	A	15 / 33
Batt cab 1	36 / 21	21	32 / 83	A + A	35 / 77
Batt cab 2	36 / 35	35	57 / 132	A + A + A	55 / 121
Batt cab 3	36 / 49	49	87 / 205	A + A + A + A	75 / 165
Batt cab 4	36 / 63	63	116 / 268	A + A + A + A + A	95 / 209
For GT 2000T UL					
Std UPS	72 / 7	7	5 / 14	B	30 / 66
Batt cab 1	72 / 14	14	32 / 83	B + A	50 / 110
Batt cab 2	72 / 21	21	57 / 132	B + A + A	70 / 154
Batt cab 3	72 / 28	28	87 / 205	B + A + A + A	90 / 198
Batt cab 4	72 / 35	35	116 / 268	B + A + A + A + A	110 / 242
For GT 3000T UL					
Std UPS	72 / 9	9	5 / 14	B	30 / 66
Batt cab 1	72 / 18	18	22 / 53	B + A	50 / 110
Batt cab 2	72 / 27	27	42 / 102	B + A + A	70 / 154
Batt cab 3	72 / 36	36	65 / 145	B + A + A + A	90 / 198
Batt cab 4	72 / 45	45	90 / 213	B + A + A + A + A	110 / 242

Cabinet dimensions hxwxd, inches : A = 9.5 x 5.5 x 14.4
B = 14.7 x 5.5 x 16.7

9 - Transport / Storage

No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging. Store the UPS in a dry location with the batteries in a fully charged state. The storage temperature must be within –15 ~ +50 °C (5 °F ~ 122 °F). If the unit is stored for a period exceeding 3 months, optimal battery lifetime is obtained if the storage temperature does not exceed 25°C (77 °F).
If the unit is stored for an extended period of time, the batteries must be recharged periodically. Connect the unit to a wall outlet and recharge the batteries for 24 hours:

- if the storage temperature is within -20 ~ +30°C (-4 ~ 86 °F): every 3 months,
- if the storage temperature is within -20 ~ +45°C (-4 ~ 113 °F): every month.