GE Digital Energy
Power Quality

User Manual

Digital Energy™ Uninterruptible Power Supply

ML Series UPS

350-500-700-1000 VA

GE imagination at work

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User Manual

Digital Energy™ Uninterruptible Power Supply

ML Series UPS

Please read these instructions carefully before installation and start-up of the ***Digital Energy™ ML Series*** UPS. Keep this manual in a safe place for future reference.

CONTENTS

1 - INTRODUCTION

1.1 Introduction

The GE (General Electric) Digital Energy™ ML Series UPS, an uninterruptible power supply, protects your equipment from all forms of power interference, including complete power failures.

1.2 Safety Rules

- **CAUTION: RISK OF ELECTRICAL SHOCK.** The UPS contains batteries. The appliance outlets may be electrically live, even when the UPS is disconnected from the mains.
- The UPS contains potentially hazardous voltages. Do not open the UPS, there are no user serviceable parts inside.
- Apart from battery replacement on the ML 350/500/700 models, all maintenance and service work should be performed by qualified service personnel.
- Always isolate the UPS from the mains during battery replacement.

1.3 Transport / Storage

- No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.
- Before storing, charge the batteries for at least 24 hours.
- Store the UPS in a dry location, storage temperature must be within -20 +45 °C. 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. Be sure that the UPS is switched off, and that no cable is connected to the interface port.
- If the unit is stored for a period exceeding 3 months, the batteries must be recharged periodically. Connect the unit to a wall outlet for a period of approx. 48 hours, minimum every 3 months.

2 - INSTALLATION

The shipping box contains a Digital Energy™ ML Series UPS, a power cord, a computer interface cable, a CD ROM and this manual. After unpacking, inspect the UPS for damage. If you find any damage please immediately notify the carrier and place of purchase.

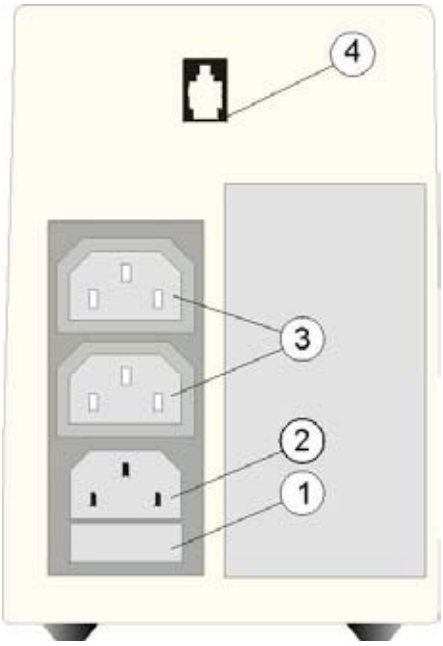
IMPORTANT:
Before making any connection and switching on the Digital Energy™ ML Series UPS, please check the following conditions:

- your mains supply is 220 - 240 Volts and 50 Hz, and
- the total power demand of the connected equipment does not exceed the rated output power of the UPS (indicated on the rear panel).

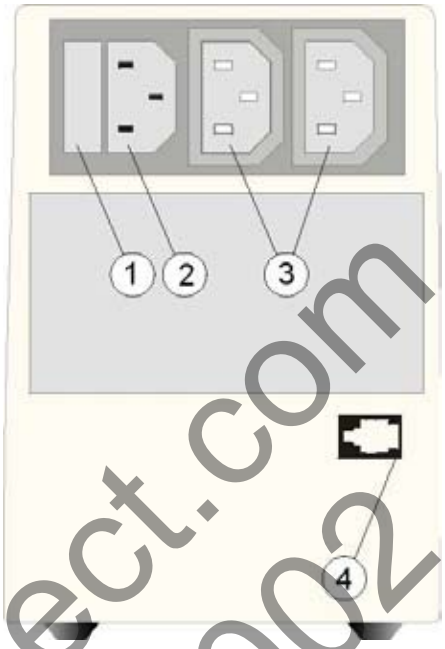
2.1 Installation Rules

- The UPS is intended to be used in normal domestic and office situations.
- Protect the UPS, according to the wiring rules, with a 16A D-type fuse.
- The UPS must be powered from a single phase grounded wall outlet. Do not use extension cords.
- Avoid locations that are excessively humid, near water, near heat sources or in direct sunlight.
- The ambient temperature should not exceed 40°C. Optimal battery lifetime is obtained if the ambient temperature does not exceed 30°C.
- It is important that ventilation air can move freely around and through the unit. Do not block the air vents.
- Do not plug appliances such as electric heaters, toasters and vacuum cleaners into the UPS.
- The UPS output can be used only for electronic loads such as computers and telecommunications equipment.
- Be careful when connecting laser printers: be sure that the demanded power does not exceed the capacity of the UPS.

2.2 Installation Procedure

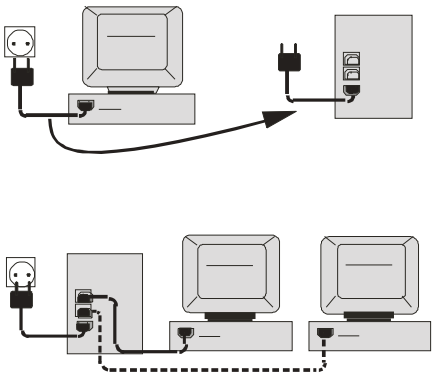


ML 350-700



ML 1000

1. Switch off your computer, and unplug it from the socket-outlet.
2. Disconnect the power cord from the computer (rating 250Vac/10A) and connect this cord to the male input socket (2) at the rear of the UPS (figures on the right show simplified ML 350-700 model).
3. Using the output cord provided, connect the computer to the appliance outlets (3) of the unit.
4. Connect the mains cord of the UPS to a working, grounded AC wall socket outlet. The green LED 'LINE' will blink now: mains power is available and the batteries are charging.
5. For best results, allow the UPS to recharge the batteries for a period of approx. 10 hours. It is acceptable to use the UPS without first charging the battery, but the runtime may be reduced.
6. For advanced communication possibilities, the RS232 interface port (4) can be connected to a computer system. See chapter 4.



3 - OPERATION

3.1 Start-up

3.1.1 Start-up, mains available

1 Press keypad 'ON' for 2 seconds
LED 'LINE' (already blinking) will illuminate continuously now.
2 The equipment connected to the UPS can now be switched on.

3.1.2 Start-up, mains not available ('battery start')

If the mains input is absent (power cord not connected, or mains failure):
1 Press keypad 'ON' for 2 seconds until LED 'BAT' illuminates.
The UPS operates on battery: it discharges the batteries.

3.2 Use: Normal Operation

3.2.1 Normal operation conditions:

- the mains supply is present,
- the UPS is on,
- the load does not exceed the capacity of the UPS and
- the operating temperature is below alarm level.

AVR (Automatic Voltage Regulation):
If the quality of the incoming mains is poor, the AVR boosts a low incoming voltage or reduces a high one. The load receives a voltage within the normal range (see chapter 7).

3.2.2 Self test (UPS operation and battery condition)

In case of a system failure the output voltage can be lost. It is therefore recommended to switch off the load before performing a self test. See chapter 6.
1 During normal operation, press keypad 'ON' for 2 seconds.
2 If the battery does not pass the self test, a 'replace battery' alarm is given. See 3.3.

3.2.3 Auto-off (no-load shutdown)

When mains is not available (mains failure or battery start) the UPS will switch off when the load is less than 5% of the maximum load. In this way unnecessary discharging of the batteries is avoided. The unit will automatically turn on again when mains power is restored. The no-load shutdown function cannot be de-activated.

3.2.4 Switching off

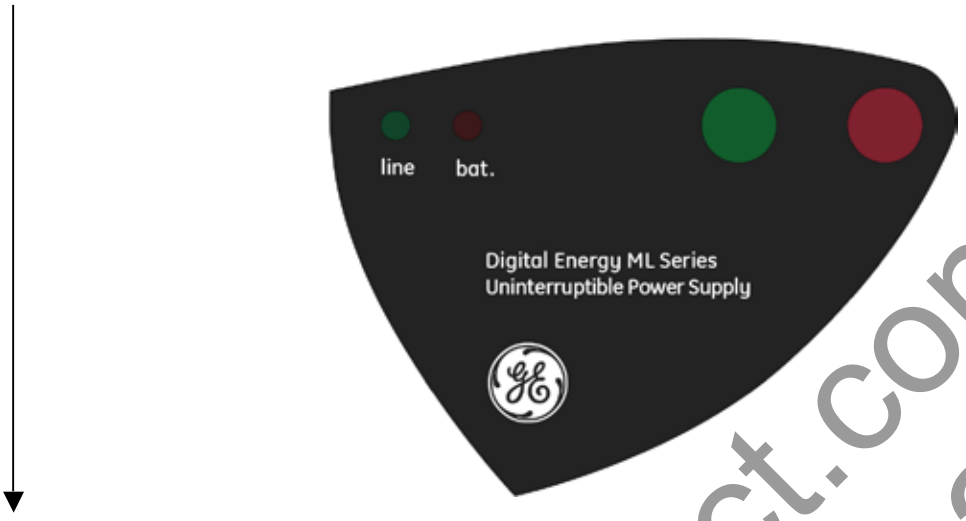
1 Press keypad 'OFF' for 2 seconds.
2 If electric isolation is required, unplug the power cord from the wall outlet.

3.3 Use: Status and Alarm Indications o status indications

the operating mode

! low priority alarms abnormal operating situations

!! high priority alarms situations in which the actual output voltage of the UPS is no longer guaranteed; immediate action should be taken



SITUATION			LINE	BAT	BUZZER	RESET BUZZER
O	Charger on (3.3.1)	Mains on. UPS output off	Green blinking 1x /sec			
O	Normal operation (3.3.2)	Mains on. UPS output on	Green on			
!	On battery (3.3.3)	Mains off or abnormal, UPS output on		Red on	Beeps 1x /4 sec	Possible*
!!	Battery low (3.3.4)	UPS on battery, battery under drained condition		Red on	Beeps 1x /sec	Not possible
!	Replace battery (3.3.5)	Mains on, UPS output on. UPS has failed to pass the previous self test	Green on (mains mode) Green blinking 1x /sec (standby mode)	Red blinking 1x /30 sec	Beeps 1x /30 sec	
!!	Overload on mains (3.3.6)	Mains on, output power > 105% of the rated capacity.	Green on		Continuous	Not possible
!!	Overload on battery (3.3.6)	Mains off or abnormal, Output power > 105% of the rated capacity.		Red on	Continuous	Not possible
O	Self test (3.3.7)	Mains on, unit switches to battery mode for 6 secs to check the bat. condition	Green on	Red on		

Operating modes and corresponding indications, see 3.3.1 – 3.3.7.

* Reset Buzzer alarm: Press keypad 'ON' for 2 seconds.
Only the actual buzzer is muted; a next alarm re-activates the buzzer.
A buzzer reset does not affect the computer interface alarm.

3.3.1 Charger on

Mains on, UPS output off, the batteries are charging.

3.3.2 Normal operation

Mains on, UPS output on, see also 3.2.1.

3.3.3 On battery

The UPS uses the energy stored in the batteries: see chapter 7 'Batteries - autonomy'.
The UPS will shutdown

- after the batteries have been discharged (automatic restart), or
- if keypad 'OFF' is pressed for >2 seconds (manual restart required) or
- if a 'UPS shutdown' command is given by the computer (automatic restart).

3.3.4 Battery low (end of autonomy)

The batteries are nearly discharged. Controlled shutdown of your computer equipment should be completed within 1 minute.

3.3.5 Replace battery

The battery is bad. Perform the self test again (see 3.3.7) to confirm the 'replace battery' condition. The alarm only goes out after the next self test: if the battery has either been sufficiently charged (discharged battery) or replaced by a new one (worn out battery). See also 5.3.

3.3.6 Overload on mains/battery

The demanded power of the equipment exceeds the UPS's rated output power. If the load exceeds 150% of the rated power:

- during battery operation, the UPS output will be switched off immediately
- during mains operation, the UPS output will be switched off after 30 seconds.

3.3.7 Self test

The self test can be started manually: when the UPS operates in mains mode press the 'ON' button for 2 seconds. During the test the unit will switch to battery operation for 6 seconds to check the battery condition. After 6 seconds the unit will switch back to normal operation: mains mode. See also 3.2.2.

4 - COMMUNICATION

The RS232 port is a plug-in interface port (4-pin, RJ-11, 4P-4C) which enables advanced communication between the UPS and the computer. Use UPS software for unattended operation of workstations, power quality related data logging, shutdown notification and control, auto-restart, diagnostics, and battery conservation features.
We strongly recommend using only original GE Digital Energy™ software in combination with the RS232 interface port.

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

The communication port is available as long as the UPS is ON.

Pin #	Function
1	Tx
2	Rx
3	No connection
4	GND

RJ-11 4P-4C


ML 350-700


ML 1000

5 - MAINTENANCE

5.1 General

The UPS is virtually maintenance free: take care of proper environmental conditions and keep air inlets-outlets free of dust. Please read 2.1.

5.2 Fuses

If the AC input fuse (1) is defective, be sure it is replaced by a compatible fuse from the same make and type. Fuse ratings: see chapter 7.

5.3 Batteries

5.3.1 General

The service life of the battery is up to 6 years.
As a healthy battery is critical to the UPS, keypad 'ON' allows a battery test (3.2.2). When the condition of the battery is critical, a 'replace battery' alarm will be given (see 3.3). Charge the batteries for at least 10 hours, switch the UPS off and back on, and perform a self test. If the alarm persists replace the batteries as soon as possible.

5.3.2 Battery replacement

- Warning: first read the safety rules in section 1.2.
- When replacing the batteries, use the same number and voltage(V)/capacity(Ah).
- Proper disposal or recycling of the batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire: they may explode.
- Do not open or mutilate batteries: their contents (electrolyte) may be extremely toxic. If exposed to electrolyte, wash immediately with plenty of water.
- Avoid charging in a sealed container.
- Never short circuit batteries. When working with batteries, remove watches, rings or other metal objects, and only use insulated tools.

Battery replacement procedure (ML 350/500/700)

NOTE: *This procedure refers to the ML 350/500/700 models only. The batteries of the ML 1000 are not user replaceable, please contact your dealer.*

1 press keypad "OFF' and remove the UPS input power cord from the AC mains supply
2 remove UPS front panel (two screws on bottom side)
3 pull out the battery and disconnect the battery wires
4 connect the new battery (black -, red +); small sparks can occur, this is normal
5 reinstall the new battery, do not pinch or clamp the wires
6 reinstall UPS front panel.

6 - TROUBLESHOOTING

Whenever a malfunction occurs, first check external factors (e.g. connections, temperature, humidity or load) to determine whether the problem is caused by the unit itself or by its environment. Subsequently check the input fuse: it may be blown. If so: replace the fuse (see 5.2) and be sure that the UPS is not overloaded.

The following chart is a simple troubleshooting checklist only. If the suggested solution does not succeed, or if the information is insufficient to solve the problem, please contact your dealer or consult www.gedigitalenergy.com.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Blown input fuse	Output overload	Reduce load, replace fuse
	System failure	Please contact your dealer or consult www.gedigitalenergy.com
No output voltage during self test (3.2.2)	System failure	Please contact your dealer or consult www.gedigitalenergy.com
Only battery start possible	Blown input fuse	See above
No communication between computer and UPS	Computer interface problem	Check interface cable and attached computer.
UPS operates on battery though mains is present	Blown input fuse	See above
	Very high, low or distorted mains voltage	Check mains voltage, contact qualified electrician
Continuously sounding buzzer mains present	UPS overload	Reduce load
Continuously sounding buzzer mains not present	UPS overload in battery mode	Reduce load
UPS does not provide the expected back-up time, no alarm 'replace battery'	Weak battery: recent outage or worn out battery	Charge the battery. If the battery is near the end of its service life, consider replacing the battery even if the 'replace battery' alarm is not yet active.
Blinking LED 'BAT', intermittent buzzer	Battery test just after installation or mains failure	Allow the UPS to recharge the batteries
	Weak battery	Read 5.3
UPS output switches OFF	Battery depleted during mains failure: end of runtime	Wait until mains returns
	Load is less than 5% of rated output and no mains power is present (no-load shutdown function is active)	Wait until mains returns
	Load is more than 150% of rated output	Reduce load

7 - SPECIFICATIONS

ML Series model	:	**350**	**500**	**700**	**1000**
Ratings					
Voltage Amperes (VA) / Watts (W)	:	350 / 210	500 / 300	700 / 420	1000 / 600
Input					
AC input voltage (Vac)	:	220 - 240			
AC input voltage window (Vac) (mains)	:	140 - 300V	140 - 300V	140 - 300V	160 - 265V
Maximum AC input voltage (Vac)	:	350			
Minimum start-up AC voltage (Vac)	:	150	150	150	170
Input frequency (Hz)	:	50			
Input frequency range	:	nominal ± 10 %			
Typical no-load power consumption, normal operation (W)	:	12	12	27	27
AC input current (A)	:	2.5	3.6	5	6.3
AC input fuse (A)	:	5	5	6.3	10
Output					
AC output voltage (Vac)	:	230 (suitable for 220-240 Vac loads)			
AC output voltage tolerance	:	nominal ± 5% (before battery low)			
Output frequency (Hz)	:	50			
Output frequency stability (Hz)	:	< ± 0.1 (battery operation)			
Output waveform	:	step sine wave			
Power factor	:	0.6 (0.7 at 90% load)			
Transfer time (ms)	:	typically 4, max 10			
Buck/Boost voltage regulation	:	if the input voltage is within the input voltage window, the output voltage varies between 198-265Vac			
Batteries (ratings given for 25ûC)					
Nominal voltage (Vdc)	:	12	12	24	24
Number x capacity (Ah) of batteries	:	1x5	1x7	2x5	2x7
Type	:	12Vdc, sealed lead acid, maintenance free			
Service life	:	up to 6 years (depending on use)			
Recharge current (A)	:	0.5	0.7	0.5	0.7
Battery recharge time for 80% capacity (hours, approximation)	:	3			
Runtime in minutes					
VA / Watts					
100/60		25	40	60	85
350/210		3	8	14	24
500/300		-	3	7	11
700/420		-	-	3	7
1000/600		-	-	-	3
General					
Weight (kg)	:	6.5	7.5	11	13
Dimensions (hxwxd, mm)	:	150x110x300	150x110x420	150x110x450	
Enclosure / protection	:	steel-plastic / IP20			
Colour (operating panel / case)	:	RAL 9006 (aluminium) / RAL 7035 (light grey)			
Environment					
Safety	:	EN 50091-1-1 (EN 60950)			
Electromagnetic compatibility	:	EN 50091-2			
Ambient temperature	:	-10 to +40ûC;			
Sound at 1 meter	:	< 35 dB(A)			
Maximum relative humidity	:	95% (non-condensing)			