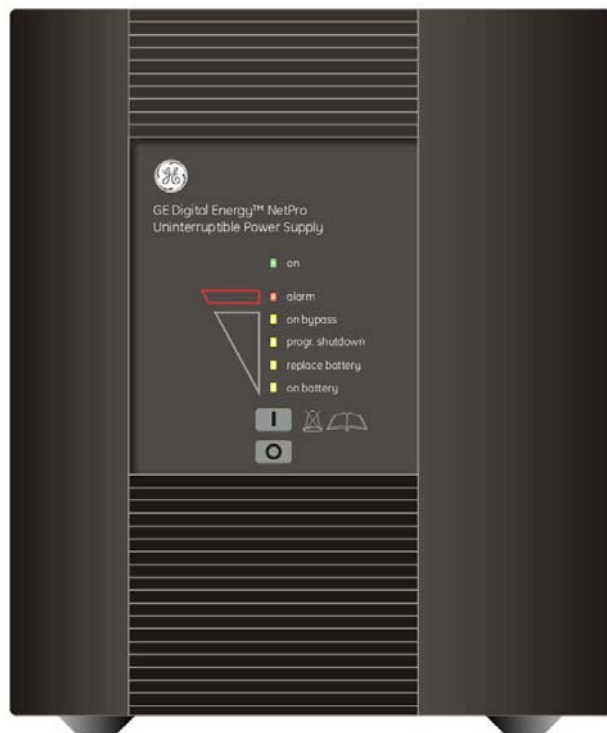


Product description

Digital Energy™ Uninterruptible Power Supply
On-line NetPro UPS / 600 - 1000 - 1500 VA



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1 - Introduction

The **GE (General Electric) Digital Energy™ NetPro 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 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 NetPro 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

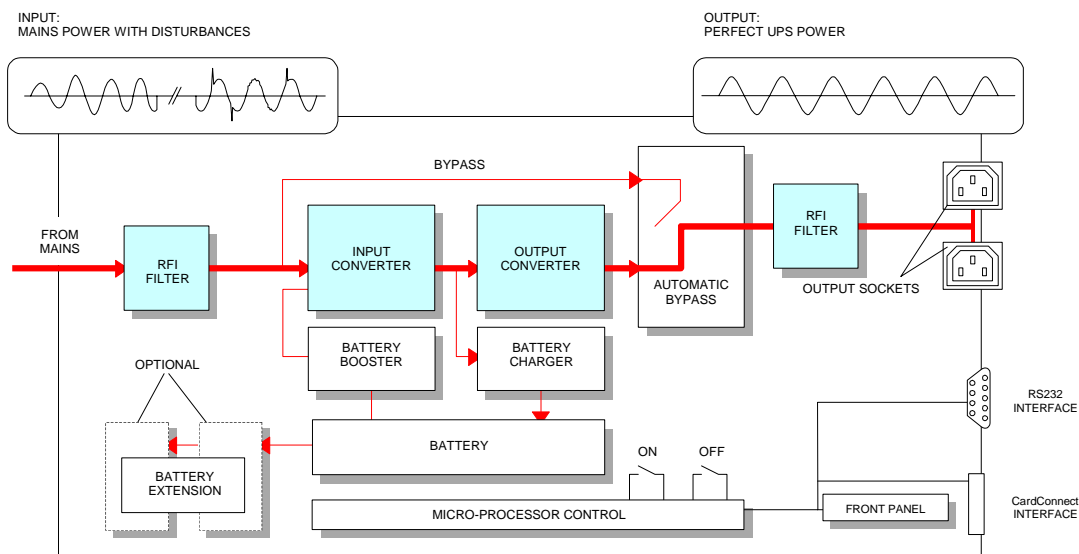


Figure 1 Block diagram of the NetPro 600-1500 UPS, mains present

2.2 Normal conditions

Under normal input conditions (see section 4.2) energy from the mains is channeled 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 mains can be supported. The output converter synthesizes a completely new AC output sine wave to supply the load (electrical equipment).

2.3 Mains failure

In the event of a mains 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.

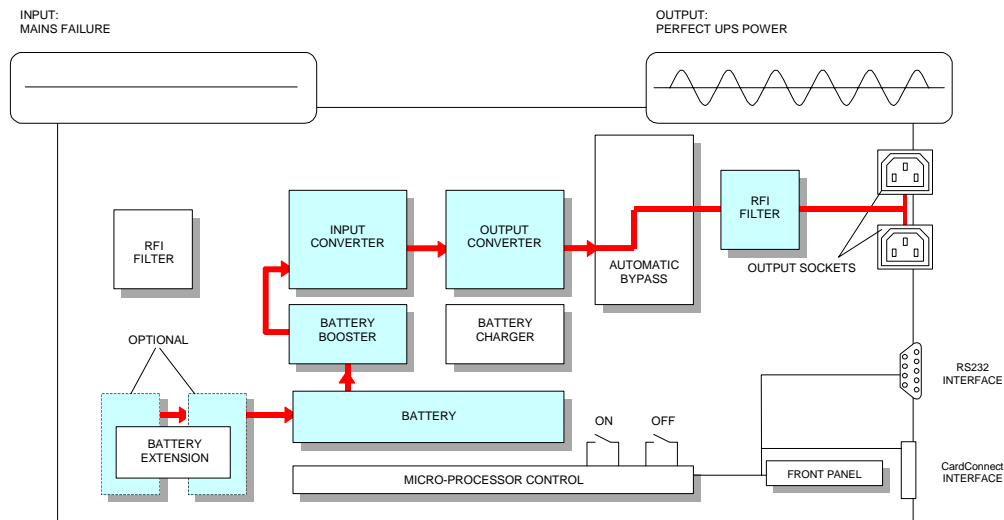


Figure 2 Block diagram of the NetPro 600-1500, mains failure

In the event of an extended mains 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 mains is re-established within tolerance, the input converter will be supplied again by the mains 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. If bypass operation is caused by an overload situation, the UPS will try to switch back to output converter after 0.1 seconds, without generating any alarm. This way bypass alarms due to inrush currents, which normally last less than 0.1 seconds, are avoided. If the overload situation still exists after three switch-back attempts (i.e. the overload is not caused by inrush currents), the unit will remain in bypass mode, generating a bypass alarm. 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 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.

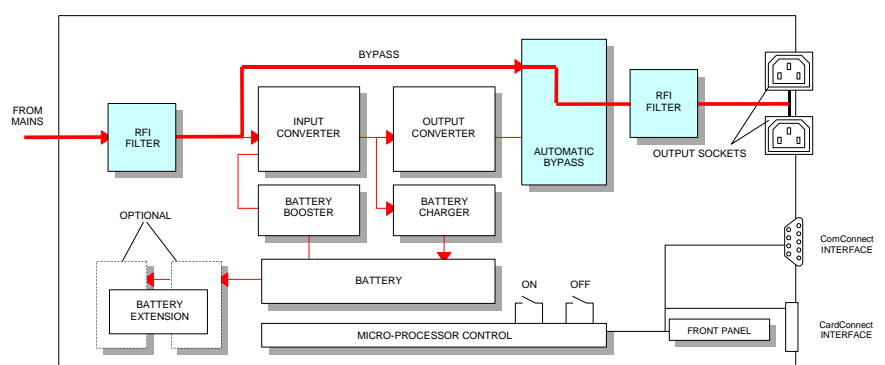


Figure 3 Bypass operation

3 - External description

3.1 Front and rear panel



Figure 4 Front and rear panel NetPro 600-1500

FRONT

On	: green LED
Alarm	: red LED
On bypass	: yellow LED
Progr.shutdown	: yellow LED
Replace batt.	: yellow LED
On battery	: yellow LED
Push-buttons	

REAR

ComConnect	: 9-pin Sub-D male
Input socket	: IEC 320 C14 male
Output sockets (2)	: IEC 320 C13 female
Input fuse	: TCB (thermal circuit breaker)
DC connector	: 1000 VA model only
CardConnect Slot	: for optional SNMP or relay card

3.2 Enclosure

UPS enclosure	: VMC25
Battery cabinet (<i>NetPro 1000 VA only</i>)	: VMCB1
Construction	: steel/plastic
Colour	: RAL 9005 (black)
Protection	: IP 20

3.3 Dimensions

Dimensions (h _x w _x d, mm)	: 225 x 185 x 430
Shipping dimensions (h _x w _x d, mm)	: 320 x 290 x 530

3.4 Weight

NetPro model	: 600	1000	1500
Weight (kg)	: 13	15.5	18
Shipping weight (kg)	: 14	17	20

4 - Electrical specifications

4.1 Ratings

NetPro model	:	600	1000	1500
Voltage Amperes (VA) with computer type load	:	600	1000	1500
Watts (W) with resistive load	:	360	600	900
Input thermal circuit breaker (A)	:	5	5	7
Input fuses (A)	:	8	8	10

4.2 Input converter

AC input voltage	:	220 - 240 V		
AC input voltage range	:	187 - 264 V		
at 100% load	:	120 - 264 V		
at 70% load	:	187 V (at any load)		
Minimum start-up AC voltage	:	above 264Vac the UPS will disconnect the mains and switch to battery operation		
High voltage protection	:			
Input current (A), at nominal input voltage	:	2.0	3.3	5.0
Input current waveform	:	sinusoidal, conform or better than EN 61000-3-2 (IEC 555-2)		
Input power factor	:	1		
Input frequency range	:	50 or 60 Hz \pm 10% (front selectable)		

4.3 Output converter

AC output voltage	:	230 V (suitable for 220-240 V loads)		
AC output voltage tolerance	:	\pm 2% (static and dynamic)		
Output frequency	:	50 or 60 Hz (front selectable)		
Output frequency range	:	nominal \pm 0.15% unless synchronized to the mains		
Output waveform	:	sine wave		
Harmonic distortion	:	< 2% (typical 1.5%) with linear load		
Power factor	:	0.6 (0.7 at 90% load)		
Crest factor (peak to RMS current):	:	up to 6:1		
Capacity appliance outlets	:	max. 10 A per outlet		

4.4 Bypass

AC input voltage range	:	195 - 264 V
Frequency tracking rate	:	2 Hz/sec.
Frequency tracking range	:	nominal \pm 10%
Phase difference	:	< 7°
Transfer time	:	< 4 msec.

4.5 General design criteria

Safety	:	EN 50091-1-1; EN 60950; IEC 950
Electromagnetic compatibility	:	EN 50091-2; EN 50081-1 + EN 50082-1; IEC 801-5: 6kV

Note: The NetPro UPS is intended for use in normal domestic and office situations (see Safety: EN 50091-1-1)

5 - Performance characteristics

NetPro model : **600** **1000** **1500**

5.1 Efficiency (battery fully charged)

Efficiency (%) on mains

- 20% load	: 80	82	82
- 50% load	: 88	88	88
- 100% load	: 89	91	91

Efficiency (%) on battery (at nominal battery voltage)

- 20% load	: 72	79	78
- 50% load	: 79	86	87
- 100% load	: 82	85	86

Max. heat output (W/h)

100% load on mains	: 36	60	89
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5.2 No-load power consumption (battery fully charged)

On mains

No load power consumption (W)

normal operation / sleep mode	: 27/17	29/17	39/14
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On battery

No-load power consumption (W)	: 37	39	45
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5.3 Environment

Ambient temperature : -10 to +40°C

Audible noise at 1 meter : < 45dB(A), load and temperature dependent

Max. relative humidity : 95% (non-condensing)

5.4 Runtimes (ratings given for 25°C)

VA / Watts

runtime in minutes

At typical UPS load (75%)	14	13	11
100 / 60	55	85	116
200 / 120	32	51	71
400 / 240	16	27	38
600 / 360	9	17	25
1000 / 600	-	8	13
1500 / 900	-	-	7

NetPro 1000 VA units connected to battery cabinets will have longer runtimes. See section 8.5.

5.5 Overload capability

Overload protection : Fully protected against overload and short circuits.

Overload behaviour:

- battery operation	: 110% during 5 minutes, 150% during 2 seconds
- bypass operation	: depends on rating of thermal circuit breaker; typical 125% of TCB value: for 200 seconds 200% of TCB value: for 10 seconds 300% of TCB value: for 4 seconds

5.6 Standard features

Wide AC input voltage window

Minimises need for battery operation

High voltage protection

Above the maximum input voltage (264Vac), the NetPro will protect itself and the load by disconnecting the mains and switching to battery operation. Reducing the mains voltage will recover the normal situation. If the mains voltage rises above 312Vac the NetPro shuts down immediately and must be restarted manually.

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.

Bypass operation enable/disable

In case of an unstable bypass voltage and/or frequency you may not wish the load to be transferred to the bypass. Front selectable.

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.

No load inrush current (Softstart of the connected load)

Also when switching on, the bypass is disabled for a short while, avoiding high inrush currents of the load through the bypass, which also can cause tripping the distribution fuse.

Battery start (cold start)

Allows you to switch on the unit while the mains input is absent.

Superior battery management for maximum battery life and reliability:

- **Automatic (quick) battery test**
The *NetPro* UPS conducts automatic battery tests to ensure that the batteries and the wiring are healthy and able to support power failures. The tests are executed 5 hours after starting up or return of mains, and every 30 days. The tests can also be initiated through UPS monitoring software.
- **Deep battery calibration test**
The actual battery capacity can be tested by the UPS monitoring software, ensuring accurate runtime prediction. During a deep battery test the batteries will be discharged until 'battery low' alarm level. Please refer to the manual of the appropriate monitoring software package.
- **Temperature compensated battery charging**
This feature reduces the battery charge voltage with increasing temperature. As a result poor charging of the batteries under low temperature conditions and overcharging of the batteries under high temperature conditions are prevented.
- **Load dependent battery-end voltage**
The allowable final battery voltage depends on the discharge current: the higher the current, the lower the 'end-of-discharge' battery voltage. This gives maximum capacity without overdischarging. Overdischarging results in failure to recover normal capacity and in shortened battery life.
- **Automatic boost charge**
Reduces the recharge time to 1.5 hours for approx. 90% capacity without overcharging the batteries.
- **Charger off at end of charge**
Only charging when necessary, increases battery life time.
- **No-load shutdown**
Whenever load <5% of maximum load and no mains power is present the UPS will switch off automatically. Load sensing during battery mode prevents unnecessary discharging of the batteries. The function is default activated (front selectable) to avoid accidentally switching on during transport.

6 - Communications port: ComConnect

6.1 Principles of operation

All models in the NetPro series are equipped with a communications port, the ComConnect, located at the back of the unit. The ComConnect is a plug-in interface port (9-pin, Sub-D, male) which enables advanced communication between the UPS and the computer (interface kit required).

Communication can be done in serial format (ComProt) or through contact closure interfacing. The electrical interface of ComProt is part of the ComConnect standard. It supports ComConnect 5: Plug and Play ready, and standard with open collector contacts. Relay contacts are available as an option (see section 8).

The microprocessor controlled and galvanically isolated ComConnect sends information concerning power levels and UPS condition to the computer or network interface. In the event that batteries are near exhaustion, it sends commands for unattended controlled shutdown of the computer system. The ComConnect can also receive UPS shutdown signals from the computer or network interface.

When signals are sent to the computer, a written message can appear on the screen to inform the user. Monitored conditions include:

- mains voltage availability
- discharge level of batteries
- temperature of unit (during output converter operation)
- interactive control- and diagnostic information for stand-alone and network systems

ComConnect is operative as soon as the mains power cord is plugged into a live wall outlet, even if the UPS is switched off.

Interface kits (cables and/or software) are available for operating systems supporting JAVA and most commonly used network operating systems, including Novell, UNIX, VMS, Windows, IBM AS/400, IBM OS/2, LINUX.

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

The ComConnect cable should be shielded

6.2 Pin functions

Pin #	Function
1	RS232 input
2	RS232 output
3	General alarm ¹⁾
4	PnP: Plug and Play
5	Common
6	Bypass active
7	Battery low
8	UPS connected
9	Mains failure

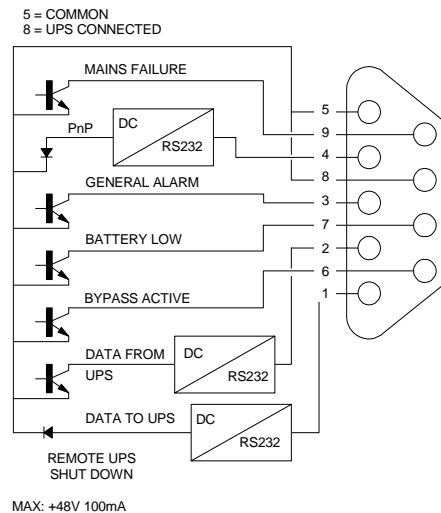


Fig. 5 RS232 / contact interface

¹⁾ Active if the output voltage of the UPS is no longer guaranteed due to other circumstances than already indicated by pin 6-7-9:

- Output converter overload
- Overtemperature (pre-alarm)
- Battery failure
- Bypass out of limits
- Inverter shutdown (due to inverter failure or battery failure)

The ComConnect port conforms to EN 50091 and is independent of the UPS function.

7 - Batteries (ratings given for 25°C)

NetPro model	: 600	1000	1500
Nominal voltage (V)	: 24	36	48
Number of 7 Ah batteries	: 2	3	4
Type	: sealed and maintenance free		
Service life	: up to 6 years (depending on operating conditions)		
Runtime	: see section 5.4, Runtimes		
Battery recharge current	: 1.5 A		
Battery recharge time	: 1.5 hours for 90% capacity		
Automatic (quick) battery test	: 5 hrs after return of mains, 5 hrs after manual switch on, and 30 days from last battery test		

Long term storage: see chapter 9.

8 - Options

8.1 SNMP interface card

An SNMP interface card can be placed in the CardConnect slot in the rear panel of the UPS, and allows the data interface to be connected directly to an Ethernet network. When this option is installed the ComProt communication link is no longer available to the user.

8.2 Relay interface card

An interface card supporting ComConnect-05 can be placed in the CardConnect slot in the rear panel of the UPS. Potential free change-over contacts are available for the following alarms: mains failure, general alarm, battery low, bypass active. The contacts are wired to a terminal strip and to a 9-pole sub-D connector.

8.3 Alarm boxes

The **contact UPS relay box**, linked to the ComConnect port, translates the ComConnect signals to five independent change-over contacts, with a maximum switching capacity of 230V/5A each.

A wall mounted plastic **contact UPS alarm box** is available for remote audible and visual alarm indication.

8.4 Connectivity products

A **splitter box** translates information from the ComConnect to several computers.

Interface kits (cables and/or software) are available for operating systems supporting JAVA and most commonly used network operating systems, including Novell, UNIX, VMS, Windows, IBM AS/400, IBM OS/2, LINUX. Please contact your dealer for specific information.

8.5 Longer runtimes (NetPro 1000 VA)

By adding extra battery packs the runtime of the NetPro 1000 VA can be extended.

Battery packs for the NetPro 1000 VA are available in 36V/14Ah.

The battery pack has the same dimensions as the UPS and can be stacked underneath the UPS.

	Battery extension voltage/capacity V/Ah	total capacity Ah	typical runtime 100% / 50% load minutes	enclosure	weight (kg)
std. UPS	36 / 7	7	8 / 21	-	-
1 pack:	36 / 14	21	37 / 76	VMCB	19
2 packs:	36 / 14+14	35	67 / 131	2 x VMCB	38

If longer runtimes are required for higher power ratings please refer to the NetPro 2000/3000/4000.

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.

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.

If the unit is stored for an extended period of time, the batteries must be recharged periodically. Be sure that the batteries are connected to the UPS. Subsequently connect the unit to a wall outlet and recharge the batteries for 24 hours:

- if the storage temperature is within -20 and +30°C: every 3 months,
- if the storage temperature is within -20 and +45°C: every month.

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