

**Series 600T**

**LIEBERT:  
A CLEAR PATH  
TO THE FUTURE**

**YOU CAN TRUST THE LIEBERT NAME**

For a quarter of a century Liebert has been an industry leader, renowned world-wide for our advanced computer protection equipment, including air conditioning, UPS, battery and security and environmental control systems.

Today we are one of the largest suppliers of equipment for telecommunication and computer installations, clean rooms, high security areas and many other critical applications, with an impressive customer list which includes thousands of companies, large and small, all around the world.

We place a high priority on using the most advanced technology, designed and built to the stringent ISO9000 standard, and we continue to invest heavily in research and development.

All our systems are built to make the most efficient use of energy and to have the highest level of reliability. And all our products are backed by the international resources of the Liebert Corporation, the name you can trust.

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# POWER PROTECTION



Series 600T 500 - 800 kVA, 50 Hz



## RELIABLE PROTECTION FOR MISSION CRITICAL APPLICATIONS

A compact, high reliability three phase system ensuring continuous, clean power.

Modern businesses in all industries demand reliable electrical power. A transient power problem lasting a few milliseconds could be enough to cause major problems if sensitive telecommunications, data processing equipment or sophisticated industrial machinery is being supplied directly from the public supply. A complete failure might well spell disaster.

The solution for mission-critical operations is a Liebert Series 600T Uninterruptible Power System, which will ensure that all power is clean and free from transients, brown-outs and the many other electrical variations delivered from unregulated mains supplies.

And in the event of a complete mains failure, the three phase Series 600T will provide the power to ensure that critical systems can be closed down in a controlled manner. For mission-sensitive operations there is no substitute for the 600T Series.

**A COMPACT, HIGH RELIABILITY  
THREE PHASE SYSTEM  
ENSURING CONTINUOUS,  
CLEAN POWER.**

- **Complete dual-bus systems capability**
- **Field proven reliability**
- **High efficiency**
- **Small footprint**
- **High quality graphics display & diagnosis**
- **Fully digital logic and operator controls**
- **Range of installation options**
- **CE marked, complies with EMC and low voltage directives**

# TRUST YOUR BUSINESS TO THE PROVEN LEADER IN POWER PROTECTION

The Series 600T is the latest product from the Series 600 family, the most reliable and durable UPS Uninterruptible Power System (UPS) in the industry. Since the Series 600 was first introduced a decade ago, Liebert's field performance database has demonstrated a critical bus MTBF of more than one million hours, a remarkable figure.

The new Series 600T retains all the best, proven elements of the original product. But it now has transistorised inverters and new packaging technologies which put it in the forefront of mission critical UPS units designed for the needs of today's users.

#### ■ Big performance with small footprint

All the Series 600T models have exceptionally small footprints, even those supplied with input isolation transformers and 12-pulse rectifiers. For example, a standard 500 kVA module with 6-pulse rectifier is less than two metres wide, and the top-of-the-range 800 kVA module with input isolation transformer and 12-pulse rectifier is only three metres wide.

This is a significant feature, particularly when space is at a premium. Because now it is possible to install two Liebert UPS modules in the space formerly occupied by one conventional UPS.

#### ■ Outstanding efficiency

As one would expect from Liebert, the Series 600T has excellent operating efficiency in all configurations, and with all type of load.

Even with input isolation transformer and 12-pulse rectifier, the 600T offers better than 92.5% efficiency from 50% to 100% load. And models with the standard 6-pulse rectifier are approximately 94% efficient throughout the same range.

#### ■ All-digital logic and operator controls

The reliability and performance of the Series 600T is enhanced by putting all the key control logic functions into Application Specific Integrated Circuits (ASICs). The computer-tested ASICs replace the old-fashioned logic boards still used by many manufacturers, greatly reducing the parts count and number of connection points, and so enhancing system reliability.

The unique Series 600T interface makes the system easy to operate and to understand. All relevant information is displayed in both text and graphics on a clear Liquid Crystal Display (LCD) screen. The controls are intuitive, and all functions are available through menus and simple pushbuttons.



*Application-Specific Integrated Circuits (ASICs) reduce the parts count and significantly increase system reliability.*

■ **Using the best hardware for the job**

The exclusive inverter design of the Series 600T inverter reduces stress on each power semiconductor and eliminates the need for parallel devices. Earlier IGBT's could only do the job if they were run in parallel, which reduces reliability. So the Liebert design team waited until the right devices became available.

However, it should be noted that some other manufacturers do still use conventional bipolar transistors or bipolar Darlington's, and may put power semiconductors in parallel to achieve higher power ratings. Sometimes even entire inverter modules are paralleled.

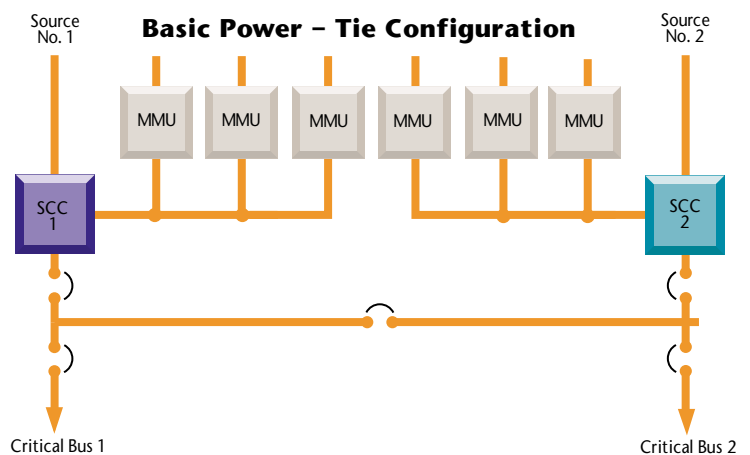
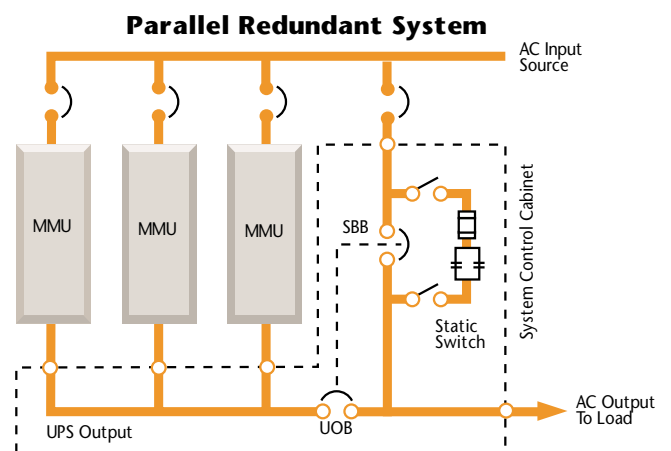
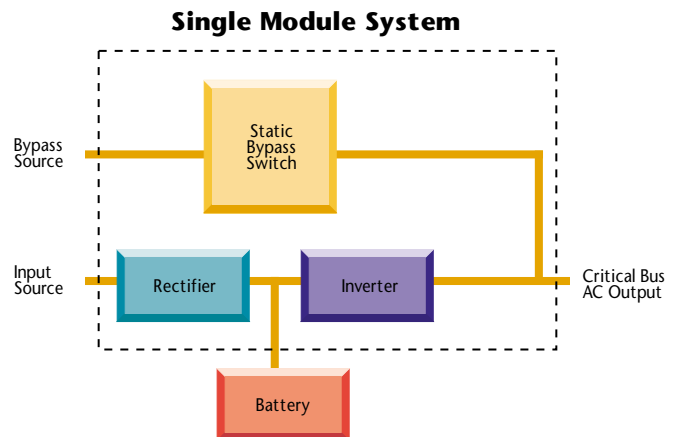
But Liebert's first consideration is quality and reliability, so our designers waited until they could take full advantage of the new generation of IGBT's, so they would not have to compromise performance in any way. The result is the Series 600T.

■ **Variety of Configuration Options**

The digital controls and unique inverter design allow the Series 600T to be used in any of the conventional single-bus system configurations, single module, parallel redundant or isolated redundant.

In addition, the Series 600T is also ideal for Power-Tie™ and Load Bus Sync (LBS), the emerging new standards for high-availability systems.

The diagrams show the standard module and multi-module system configurations, although many others are also possible.



- MMU = Multi-Module Unit
- SCC = System Control Cabinet
- UOB = UPS Output Breaker
- SBB = System Bypass Breaker

# CONFIGURATIONS FOR A WIDE RANGE OF APPLICATIONS

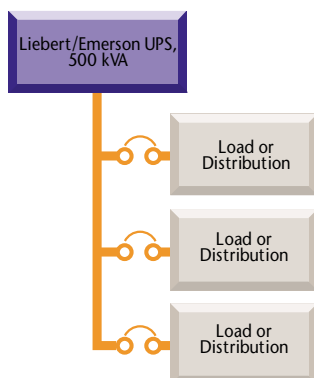
The Series 600T is available in both single module and multi-module configurations. However, it is not optimised for just one or two specific configurations, and can be used reliably and efficiently across a wide variety of applications without modification.

The simplest application is the single module, but new needs have led customers to add redundant UPS modules to their critical power systems.

A redundant UPS module makes maintenance easier, because one can be taken off line for service without having to shut down the whole system. And it also adds fault tolerance by preventing a single module or battery failure from bringing down the critical facility bus.

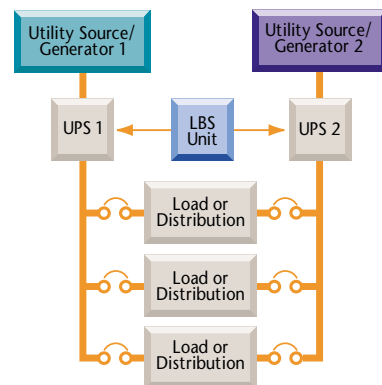
The normal practice is parallel redundancy, where the system has one UPS module more than is required to carry the rated critical load. An alternative configuration, isolated-redundant, incorporates a reserve UPS module idling as the first bypass source for one or more primary modules.

Both systems improve the ability of the critical bus to survive outside disturbances. But both share a common weakness – their redundancy ends where the critical bus begins. All the critical load equipment is downstream, with two or more circuit breakers in series between the UPS output and load input.

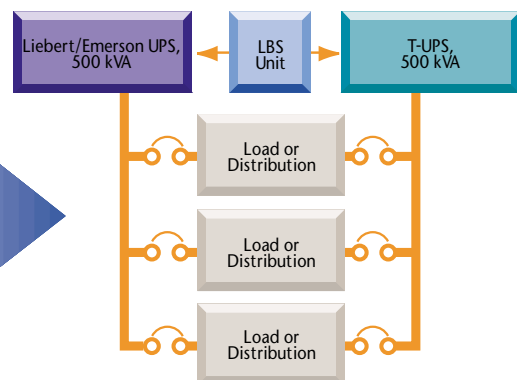
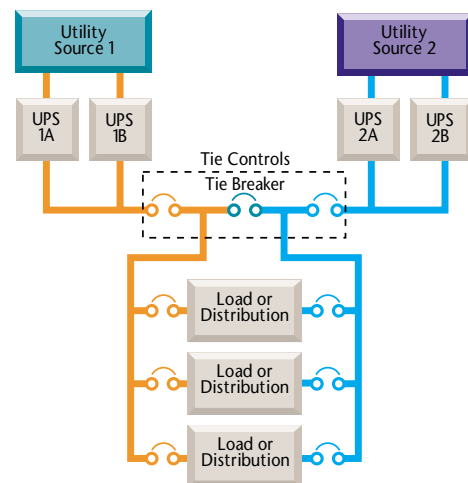


Before:  
Existing UPS works well, but needs more maintainability.

## Load Bus Sync Configuration



## Power-Tie™ Configuration



After:  
Additional UPS module, LBS and PDUs give optimum availability and maintainability.

# TAKING REDUNDANCY OUT TO THE CRITICAL LOAD EQUIPMENT

## ■ Load Bus Sync

The simplest way to create a dual-bus system is with Liebert's exclusive **Load Bus Sync (LBS)** option, which keeps two or more UPS systems in sync, even when operating on batteries or asynchronous gensets. Each UPS powers its own downstream distribution equipment, so that each piece of load equipment can be connected to both.

With the correct transfer devices, any connected load can be switched transparently between sources, so that one complete UPS and distribution system can be powered down for maintenance. The LBS can be used to synchronise any two Liebert Series 600/9000 UPS systems.

## ■ Power-Tie™

Another approach is Liebert's **Power-Tie™** which uses a tie breaker to transfer loads between UPS systems when maintenance is required. Power-Tie™ can be used between any two identical Liebert 600/900 single or multi-module systems.

## ■ Static Transfer Switch

A further option is the Liebert **Static Transfer Switch (STS)** which connects to both power distribution networks and can make an almost instantaneous (less than quarter-cycle) transfer of its connected load from one power source to the other. It can be used with a Power Distribution Unit (PDU) or dedicated to a specific piece of load equipment.

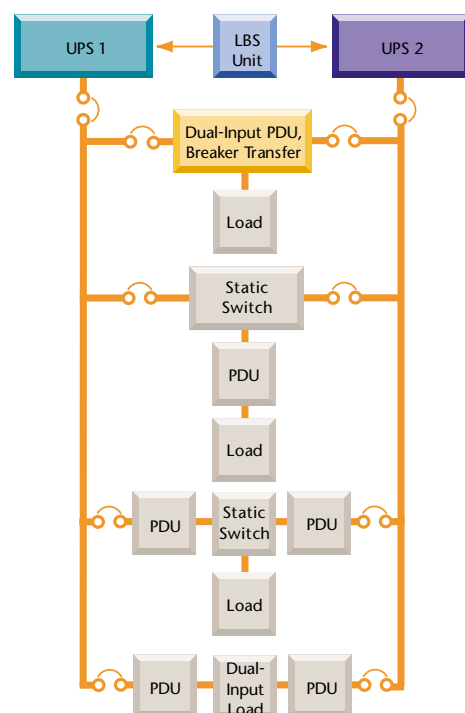
## DISTRIBUTION OPTIONS FOR DUAL-BUS SYSTEMS

The next stage in the system design is to configure the power distribution system to suit the specific need. The simplest approach is a dual-input PDU with a breaker arrangement (manual or motorised) feeding single-input loads.

Breakers are used to transfer the PDU from one UPS to another when one needs servicing. The limitation is that the PDU itself cannot be completely serviced while the load is on-line.

An alternative arrangement which gives a higher level of fault tolerance is to introduce a Liebert Static Transfer Switch (STS) ahead of the PDU, to allow uninterrupted transfers between the UPS systems. The fast switching capabilities of the STS also provide protection against 'fast' power system failures, such as source failures, breaker trips and even operator error. But the PDU still cannot be serviced while the load is on-line.

The third arrangement has a single-input load receiving power from a static switch on the output of two PDU. The switch is capable of receiving power from either PDU, so one UPS and one PDU can be serviced, while the other PDU provides UPS power. The final option uses a dual power-cord machine fed by two conventional PDUs, which allows everything to be serviceable even when the load is on-line. However this option is only available if the load equipment has dual power cords and the equipment has 100% functionality with either input.



## SPECIFICATIONS

| UPS Rating |     |              | RECTIFIER TYPE | AC INPUT / OUTPUT VOLTAGE | % EFFICIENCY AT VARIOUS LOADS <sup>1</sup> |     |      | RANGE OF BATTERY REQUIREMENTS | MAXIMUM HEAT DISSIPATION AT FULL LOAD | DIMENSIONS WxDxH <sup>2</sup> | APPROX. WEIGHT (KG.) <sup>2</sup> |       |
|------------|-----|--------------|----------------|---------------------------|--|-----|------|-------------------------------|---------------------------------------|-------------------------------|-----------------------------------|-------|
| kVA        | kW  | Power Factor |                |                           | 50%  | 75% | 100% |                               |                                       |                               | (CELLS)                           | (kW)  |
| 500        | 400 | 0.8          | 6-Pulse        | 400                       | 93.5                                       | 94  | 94   | 234-244                       | 25.5                                  | 1830x990x2000                 | 3,100                             | 3,050 |
| 500        | 400 | 0.8          | 12-Pulse       | 400                       | 92.5                                       | 93  | 92.5 | 234-244                       | 32.4                                  | 2440x990x2000                 | 4,450                             | 4,400 |
| 600        | 480 | 0.8          | 6-Pulse        | 400                       | 93.5                                       | 94  | 94   | 234-244                       | 30.6                                  | 2750x990x2000                 | 3,900                             | 3,850 |
| 600        | 480 | 0.8          | 12-Pulse       | 400                       | 92.5                                       | 93  | 92.5 | 234-244                       | 38.9                                  | 3050x990x2000                 | 5,600                             | 5,550 |
| 800        | 640 | 0.8          | 6-Pulse        | 400                       | 93.5                                       | 94  | 94   | 234-244                       | 40.9                                  | 2750x990x2000                 | 4,350                             | 4,300 |
| 800        | 640 | 0.8          | 12-Pulse       | 400                       | 92.5                                       | 93  | 92.5 | 234-244                       | 51.9                                  | 3050x990x2000                 | 6,600                             | 6,550 |

<sup>1</sup> Efficiency measured at rated power factor and load. Input filter loss is less than 0.5%.

<sup>2</sup> Dimensions and weights do not include System Control Cabinet furnished with Multi-Module Systems

### INPUT

**Voltage:** 380, 400 or 415 VAC, 3-phase, 3-wire plus earth

**Voltage Range:** +10, -15% (no battery discharge at -20%)

**Power Factor:** 0.85 lagging; 0.92 lagging with optional input filter.

**Frequency Range:** 50 Hz,  $\pm 5\%$ . 60 Hz models also available.

**Current Distortion:** 9% reflected THD at full load with optional input filter. 4% reflected THD at full load with optional 12-pulse rectifier and input filter.

**Subcycle Magnetizing Inrush:** 2-3 times normal full load current; 5-8 times normal for units with optional input isolation transformer or 12-pulse rectifier. Walk-in of 20% to 100% over 15 seconds.

### OUTPUT AND BYPASS

**Voltage:** 380, 400 or 415 VAC, 3-phase, 3-wire or 4-wire.

**Voltage Adjustment:**  $\pm 5\%$ .

**Voltage Regulation:**  $\pm 0.5\%$  for balanced load;  $\pm 2\%$  for 50% unbalanced load.

**Dynamic Regulation:**  $\pm 7\%$  deviation for 100% load step.  $\pm 5\%$  deviation for 50% load step.  $\pm 1\%$  for loss or return of AC input. Manual return of load to UPS:  $\pm 4\%$ .

**Transient Response Time:** Recover to  $\pm 1\%$  of steady state within 50 milliseconds.

**Voltage Distortion:** For linear loads, less than 4% THD. Maximum of 2% RMS for any single harmonic. Less than 5% THD for 100% nonlinear loads without kVA/kW derating.

**Phasing Balance:**  $120^\circ \pm 1^\circ$  for balanced load.  $120^\circ \pm 3^\circ$  for 50% unbalanced load.

**Frequency Regulation:**  $\pm 0.1\%$ .

**Load Power Factor Range:** 1.0 to 0.7 lagging without derating.

**Overload:** 125% of full load for ten minutes. 150% for 30 seconds. 104% continuous.

**Fault-Clearing Current:** Up to 1000% for 40 milliseconds.

### ENVIRONMENTAL

**Operating Temperature:**  $0^\circ$  to  $40^\circ\text{C}$  without derating.

**Non-Operating Temperature:**  $-20^\circ\text{C}$  to  $+70^\circ\text{C}$ .

**Humidity:** 0-95% relative humidity without condensation.

**Operating Altitude:** Up to 1200 meters without derating.

**Non-Operating Altitude:** Up to 15,000 meters.

### COMPLIANCE

The equipment is compliant with standards:

CEI EN50091-2 and European Directive EEC 89/336/CEE

# FEATURES & OPTIONS

## STANDARD FEATURES

- LCD 80-character x25 line monitor/control panel
- Self-diagnostics
- 2-stage battery charge current limit
- 2-stage input AC current limit
- Programmable automatic retransfer
- Automatic line-drop compensation
- Battery overdischarge protection
- Battery-time-remaining display
- Automatic equalise charge timer
- Emergency Power Off
- Year 2000 compliant

## OPTIONS AND ACCESSORIES

- Input filter/power factor correction
- 12-pulse rectifier input
- Power-Tie™ Dual Bus System
- Load Bus Sync for dual-bus systems
- Input isolation transformer
- Maintenance bypass transformer
- Maintenance bypass cabinet
- Power distribution unit (single or dual input)
- Standard and custom switchgear packages
- SNMP capabilities
- SiteScan centralised monitoring system
- Remote monitor panel
- Communications interfaces
- Alarm status contacts
- Customer alarm inputs

