

# Field MTBF Numbers: What do they really mean?

## A Liebert White Paper

### SUMMARY

*The Liebert Series 600 has established itself as the most reliable static Uninterruptible Power System in the industry. Our sales literature speaks of critical bus MTBF in excess of one million hours. This paper explains where these numbers come from and what they mean to the customers buying the product.*

### What is MTBF?

MTBF is an acronym for Mean Time Between Failures. In general, a higher MTBF number indicates a more reliable product. Beyond this simple definition, you'll find a wide variety of special meanings.

In the military/aerospace industries, MTBF is defined by a specific set of calculations. The formula for system longevity is based on the thermal, electrical and environmental stresses on each component. The engineer evaluates the components and subassemblies in a particular product by these formulas and produces an overall number called *calculated MTBF*.

Another way to compute MTBF is to evaluate product reliability based on the product's actual performance in the field. Instead of theoretical calculations of what might occur, *field MTBF* is a measure of the numbers and types of failures that the products actually experience in real applications.

At Liebert, we track two types of field MTBF statistics: *critical bus MTBF* and *hardware MTBF*. In the next few paragraphs, we will explain each of these.

### Critical Bus MTBF

Our primary focus is on critical bus MTBF. This measures how effectively the UPS, batteries and bypass source can support the customer's critical load without a failure attributable to the UPS or System Control Cabinet.

Liebert maintains a database with information on every Series 600 UPS ever shipped. We also keep records of all reported failures. Each quarter we evaluate the reliability information and tally up the critical bus outages that were attributable to the UPS or System Control Cabinet.

Some events are excluded from the total. For example, if a UPS experiences an alarm condition and successfully transfers the load to bypass, there is no critical bus outage.

Likewise if utility input power fails and the UPS and batteries support the critical load for the proper number of minutes, the UPS has done its job. If the utility power (or backup Diesel generator) is not available when the UPS has drained the batteries, the UPS -- with ample warning to the operator -- will perform an orderly shutdown. This is not a chargeable critical bus outage since the equipment performed as designed.

Other excluded situations are those caused by site conditions or operator error. For example, one customer wired his facility fire alarm system to trigger the Emergency Power Off circuit on the UPS. Unfortunately, he forgot to disconnect the circuit before performing a routine test of the fire alarm system. This caused a critical bus outage, but did not count against UPS MTBF.

### **What have we done lately?**

Each quarter we tally up the cumulative system operating hours and the total number of critical bus outages reported since the introduction of the Series 600 UPS.

As of this writing, we have records of more than 3,700 Series 600 modules in approximately 3,000 systems. System operating hours at last count were approximately 85 million. Since shipments began in March of 1989, we have records of just 37 critical bus failures.

We compute our field MTBF numbers by dividing system operating hours by “failures plus one.” We do this to be conservative and to be consistent with earlier published documents. Dividing 85 million hours by 38 (37 + 1) gives us a number considerably in excess of 2 million hours. Since the denominator is relatively small, a single failure either way could cause the results to vary significantly. Likewise, some Series 600 sites are not under contract to Liebert Global services and might not be reporting all failures. Therefore we don’t advertise this number to three-decimal-place accuracy. “In excess of one million hours” is sufficient.

### **Module MTBF**

The other way we track reliability is the field MTBF of the UPS modules. For these purposes, we count *every* type of module or System Control Cabinet failure that causes the module to take itself off-line. As before, we exclude incidents of operator error, site problems or instances of shutdown after successful discharge of batteries.

To compile this number, we have taken two 30-day sample periods. For a challenge, one of the months was chosen to coincide with one of the worst heat waves on record in large portions of the Midwest and Northeast. A difficult test indeed!

During the sample periods, Series 600 UPS modules accumulated approximately 3.3 million operating hours and 19 hardware failures. Of these, only one caused a critical bus outage. The other 18 events featured the UPS successfully transferring the load to the bypass source. Dividing 3.3 million hours by 20 (19 + 1) gives a module MTBF of 165,000 hours.

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