

## The ENSCO E7500 Power Management System: Design, Functionality and Testing

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### Abstract

The E7500 is a DPS-2 class semi-submersible. The unit has eight (8) 3000 hp thrusters for positioning and is powered by six EMD 710-G7B engines with Baylor S855YNV generators. Each generator produces 3580 kW/5114 kVA at 4160 volts with 0.7 pf for a total power plant capacity of 21.5 MW. The generators are connected to two main buses with an integral tie circuit breaker between them. The Power Management system functions are implemented in three independent control systems. They are the Dynamic Positioning, drilling DC power and the Data Management systems. In this design, each system's power management functions work independently and have dedicated sensor inputs from the main electrical buses. The systems calculate the total power available and the total load. If the total system load exceeds pre-defined limits, they will reduce power to their respective loads. The systems will also reduce loading if any individual generator exceeds a pre-set limit. This design allows the system not to exceed the capacity of any one generator even during a reverse power situation on an individual generator or failure of a sensor component. In the event of an overload condition, the Dynamic Position and drilling DC power systems will cut back power at pre-defined limits thus reducing the bus load. The Data Management System will start additional engines to increase the main bus capacity. The systems were tested for all generator configurations. The results of this testing are presented and discussed. The issues of compliance with DPS-2, FMEA considerations and problems that were encountered during the operational phase are discussed. The combinations of the functions within this total system make it unique with respect to other similar ones. First, each system is totally independent even to the sensor hardware level. Second, the systems not only reduce power based on the total load calculations, but also on the load of an individual generator. The system response during overload conditions is fast enough to allow operation under any abnormal situation without overloading the main power distribution.

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