

Beta Site Report



**LS 4
Circuit Breaker Control**

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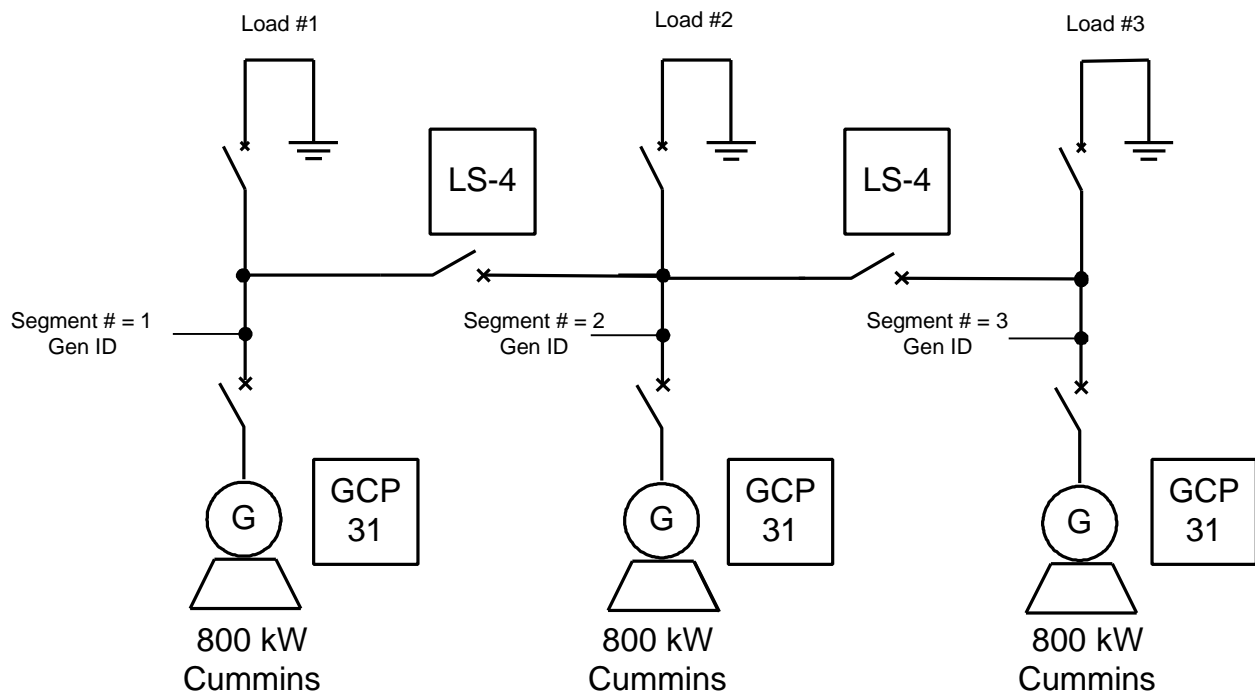
Chapter 1.

General Information

System Description

Three Cummins diesel engines generators are used in a prime power application for Hotel Resort in the Seychelles. These generators are operated 24 hours a day. As shown in the following graphic, the generator bus is divided into three segments by two tie breakers. Each load segment services its own load breakers. The customer needed the generator control system to operate as a whole and individually. Now with Woodward's LS 4 control, this is done quite simply.

Each generator is controlled by a GCP-31 and each tie breaker is controlled by an LS 4. The LS 4 allows the user to tie multiple bus segments together automatically and also reduce generator power on a segment to isolate a generator.



Equipment

- Three 800 kW diesels, using GCP-31 controls, 8440-1199.
- Speed control was a Cummins EFC.
- Voltage Regulator was a Leroy Somer.

Description of Operation

Typically both ties are closed and all three engines are used to supply the load. The load dependent start/stop feature of the GCP's is used to manage the engines and maintain better efficiency by taking off generators when the load is decreased and bringing on generators as load is increased.

In certain situations it was desired to have the bus isolated into separate segments. To do this the LS 4 is used to measure the power flow through the tie breaker and effectively reduce this power to zero before opening the breaker.

Then after some time the system can be returned to normal operation and the LS 4 is used to automatically synchronize generators and close the tie breaker.

Important items to note

- The LS 4 can be configured to have a variable side and a fixed side. For this application the two outside generators have been used as the variable sources.
- While one generator transfers the load, the other two generators remain in isochronous load sharing mode. This increases the stability, as then there are two gensets in load control mode while only one remains in isochronous mode.
- Power measuring of the LS 4, is taken from the perspective of power flowing from the A side to the B side of the device. Positive would be power from A to B, negative is power from B to A. The direction of the current transformer must be installed correctly for proper power measurement.
- It is not possible to use the direct configuration plug, while the breaker is closed for safety reasons.
- Configuration via PC is always possible by CAN bus independent of the reply of the breakers.
- When setting the rated power, use the situation where the power would be at its maximum, so in this application it was 1,600 kW, because at any one time the maximum power flow on one segment of the LS 4 would be two generators.
- The mains decoupling configuration item of the GCP-31 was set to "GCB" for this application.
- For dead bus closing (black start), the GCP has priority over an LS 4, so if an engine is started and then the LS 4 is enabled at the same time, the GCP will close to the bus first and then the LS 4 will synchronize this generator.



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