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Case Study

Bonneville Power Administration [BPA]

The Challenge

BONNEVILLE POWER ADMINISTRATION

BPA is a self-financing U.S. federal agency based in the Pacific Northwest. It generates, sells and distributes wholesale electricity to public and private utilities and industries on the grid.

A brand new Central Timing System (CTS) was required to replace the current system at two locations: the Dittmer Control Center in Vancouver, Washington and the Munro Control Center in Spokane, Washington.

Some older components of the existing CTS could no longer be repaired or replaced and were at increasing risk of suffering equipment failure. This meant the system was potentially no longer fully redundant or even functional.

One of the primary goals for procuring a replacement CTS system was to utilise standard vendor supportable off-the-shelf components, to eradicate the high cost of replacing parts in a custom-built solution.

The Solution

For this requirement, we supplied two M211 Modular Timing Systems with expansion chassis in dual-redundant cofiguration.

M211 Modular Time & Frequency System

Our M211 Modular Time & Frequency System provided the primary time source. Two M211s were configured as a pair of dual-redundant Master Clocks and were fitted with a selection of modules (see over). As both a GPS Receiver module and a NTP Time Server module are included, the M211 is classified as a Stratum 1 Time Server.

Dual Redundant Configuration

Either M211 system can be manually selected as the main unit to allow maintenance or upgrading to take place without loss of system operation.

The simplicity of this unit, especially its lack of power supply, ensures that the unit is highly reliable with a failure rate of less than 1 failure per million hours. As this unit constitutes the only single point failure of the dual redundant system this ensures that system availability is maintained as close to unity as possible.

Network Management System (NMS)

The Windows-based Network Management System (NMS) enables monitoring of both the local and remote systems using SNMP, and allows the user to remotely make configuration changes to the M211's.

The Result

BPA now benefits from a brand new Central Timing System that not only provides reliable time and frequency to its critical systems involved in power grid control, but also has many up-to-date features lacking from the previous system.

- Fully Redundant System – due to the fault-monitoring and relay-switching capabilities of the M211 Timing Systems and modules.
- Fully serviceable and maintainable system – each component of the system can be isolated for servicing, maintenance or replacement where necessary.
- Highly reliability and accuracy due to selection of GPS time source together with rubidium oscillator, sufficient fault-monitoring via internal alarms, and an efficient redundancy set-up.

Reports received indicate that it has exceeded the capabilities of the previous system, using Standard Vendor Components rather than a complex custom design.

This is expected to considerably reduce time and expenses related to operating and repairing the system throughout its expected life of operation.

TIME & FREQUENCY SOLUTIONS LTD

25 Eastways, Witham, Essex, CM8 3AL UK | Tel: +44 (0) 1376 514114 | Fax: +44 (0) 1376 516116

E-mail: sales@timefreq.com | Web: www.timefreq.com

M211 Dual Redundant System

Configuration for BPA

The M211 has a front panel keyboard and alphanumeric display for information and unit configuration, including settings of any local time offset and IP address for the NTP Time Server module. The non-volatile memory automatically restores these details in the event of loss of power. The M211 has an 110V 60Hz AC mains power supply.

Each of the pair of M211's was fitted with the following modules (as only seven of the available nine option slots are taken there is potential for future upgrade):

1. GPS Receiver Module

Universal Co-ordinated Time (UTC) is automatically acquired from the GPS Receiver module and its external antenna* and used to synchronise the M211's time base.

2. Disciplined Oscillator Module*

Provides a highly stable time base for the M211 Time & Frequency System. In the event of the GPS signal being interrupted, the rubidium oscillator provides a backup time source so that the CTS will still function at an exceptionally high accuracy level.

3. AC Measurement Module

Compares its frequency and time characteristics against references derived from the GPS-disciplined oscillator then reports any deviation via outputs through switching relays to the M842 Changeover & Interface unit.

4. NTP Time Server Module (100-BaseT)

Distributes time information across an Ethernet network using Network Time Protocol (NTP). Client systems and Sub-Timing Systems can then be synchronised to the timeserver by accessing it across the network. Inclusion of this module also provides the capability of remote monitoring of the entire CTS using SNMP.

5. Intelligent Octal Serial Module with Precision Time Input

Provides eight fully independent serial channels (7 output; 1 input). Outputs are all routed via switching relays to the M842 Changeover & Interface unit.

6. Intelligent Timecode Module

Generates four timecode outputs simultaneously. In this instance it was configured to provide serial IRIG-B timecode modulated on a 1kHz carrier, 1P/100s and 1PPS outputs, all of which were routed via switching relays to the M842 Changeover & Interface unit.

7. Enhanced BITE (Built-in Test Equipment) Module

This module monitors the M211 CPU, power supply and modules for faults. In addition, both BITE modules in each of the M211 Timing Systems continually monitor each other. If one raises an alarm, or fails to respond to interrogation, the other assumes control. Each module also provides line-driven status indication directly to LED indicators on the front panel of the M842 Changeover Unit.

*supply responsibility of Brandywine Communications Inc.

M211 Expansion Chassis

Each chassis contains 1 x Timecode Module and 8 x NTP Time Server modules to provide enough NTP feeds for each of the computer networks.

M211 Dual Redundant Time & Frequency System

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