

Reliability Monitoring System

Telemetric's Reliability Monitoring System consists of hardware, software, and communications components designed for monitoring power interruptions, outages and over and under voltages on utility distribution feeders. Wireless voltage monitors located on distribution feeders report these events through the wireless network and a secure web based application. The data collected by the system is used to automatically generate industry-standard power reliability performance indicators as defined in the IEEE Guide on Electric Power Reliability Indices 1366-2001, including:

- SAIDI (System Average interruption Duration Index)
- SAIFI (System Average Interruption Frequency Index)
- CAIDI (Customer Average Interruption Duration Index)
- MAIFI (Momentary Average Interruption Frequency Index)

The system provides a utility with powerful tools for gathering and reporting regulatory data required by public utility commissions or other regulatory bodies. The primary purpose of the Reliability Monitoring System is to provide accurate interruption data and automatic calculations of industry-standard power reliability performance indicators. This information is especially important to utilities operating under Performance Based Rate (PBR) Systems.

As an option the system can also send information to a utility's SCADA system, Outage Management System (OMS) or other applications.

Features

The Reliability Monitoring System reporting software provides the following functions and features:

- Generates regulatory style summary reports including the calculations of SAIDI, SAIFI, CAIDI and MAIFI.
- Reports can be run at multiple levels including state, area, substation, and feeder.
 - Reports the duration of outages.
 - Categorizes interruptions as sustained or momentary.
- Allows input of equipment location data by State, Area, Customer Service Center, Substation, and Feeder.
- Allows the user to create and edit a system "Interruption Type" table.
- Allows the user to view and sort detailed interruption data in a tabular style.
- Allows the user to enter or edit an "Interruption Type" and "Notes".
- Allows authorized users to audit interruption data.
- Allows the user to export detailed interruption information to a CSV file.
- Allows the user to access and report on multiple years of historical data.
- System provides multiple security/access levels.

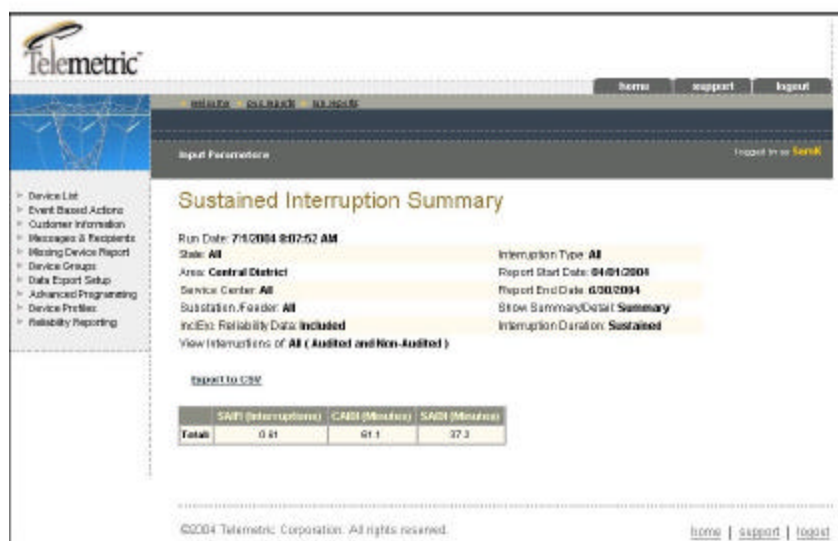


Figure 1: Sustained Interruption Summary

Benefits

- Provides immediate and automatic notification of service interruptions, outages or over and under voltages via wireless communications.
- Automatically generates industry-standard power reliability performance indicators as defined in IEEE Guide 1366-2001.
- Improve maintenance by tracking and categorizing interruptions along with over and under voltage conditions.
- Page or e-mail operations staff automatically when events occur.
- Improves outage recovery using real time data.
- Optionally sends data to SCADA or OMS systems.
- Operations data can be remotely accessed via a secure web site.
- Generate performance reliability reports centrally or remotely.
- Removes the need to access customer phone lines by using wireless communications.
- Monitors and tracks battery life using automated tools.
- Provides valuable information for planning, maintenance and upgrade projects.

Implementation

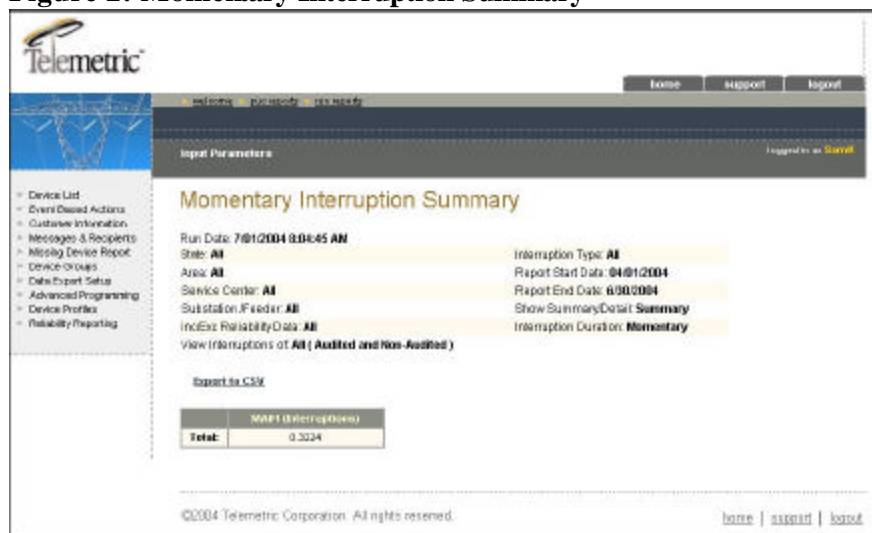
The Reliability Monitoring System is comprised of the following components:

- **Hardware** – Telemetric TVM1 & TVM3 voltage monitors
- **Communications** – Control Channel Cellular via Aeris.net
- **Device Management** – Web-based, centrally-maintained software
- **Reporting** – Web-based, centrally-maintained software

Hardware – The TVM1 monitors single phase 120 VAC line voltage and provides real-time notifications of steady state values, interruptions or outages, and under or over voltage conditions. The TVM3 monitors three phase 208Y/120VAC (also suitable for 240/120VAC, 3 wire single phase) or 480Y/277VAC. The units include an integrated two-way radio that communicates over the control channel of the cellular data network. The units also include battery backup for interruption reporting.

Communications – The control channel of the cellular system provides coverage to over 98% of the population in North America. No license or local cellular account is required. By using the public cellular phone network, Telemetric allows customers to communicate with remote equipment at a fraction of the cost of the alternatives.

Figure 2: Momentary Interruption Summary



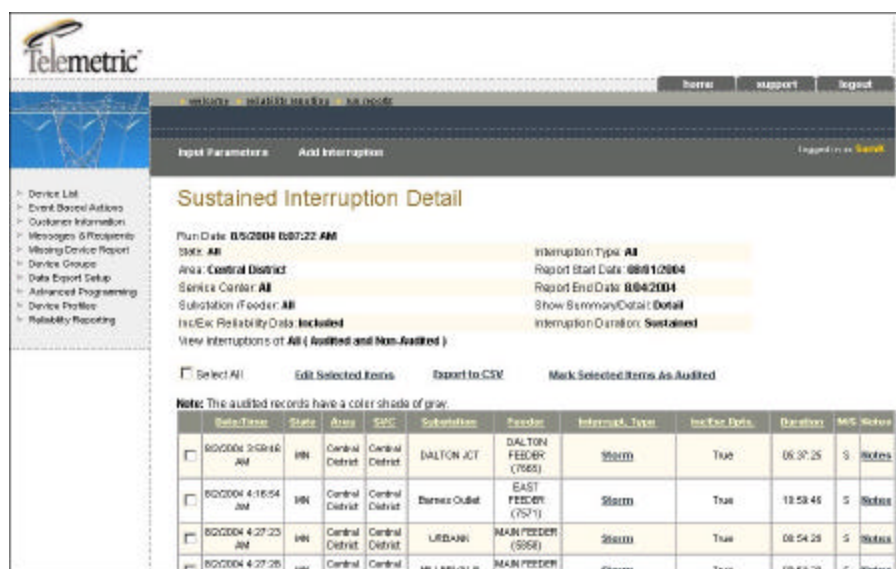
Device Management – Telemetric’s software platforms are based on an open, object-oriented, web-based architecture giving users the ability to manage, monitor and obtain interruption information through a private, secure server. The web site provides management tools for changing setpoints or parameters in the TVM units without costly site visits. The software provides users with the ability to send text-based messages via e-mail to cell phones and pagers when system interruptions or events occur.

As an option the Telemetric system provides the ability to interface data

seamlessly into existing utility Supervisory Control and Data Acquisition (SCADA) systems, Energy Management Systems (EMS), Outage Management Systems (OMS) and other applications using the Telemetric SCADA-Xchange™ program.

Reporting – The reporting component provides a common interface to view all customer and system interruption data. This includes both individual interruption details and interruption summaries suitable for PUC reporting. In addition, this same reporting interface can be used to view both sustained interruptions and momentary interruptions. This simplifies the user interface and also gives operations staff one location to view all interruption activity. The software allows users to view interruption data on-line and print reports using Telemetric’s secure web site. In addition, all report screens allow users to export report data into a Comma Separated Value (CSV) file that is easily imported into Microsoft Access, Microsoft Excel, or similar software packages.

Figure 3: Sustained Interruption Detail



Summary - To gather interruption and outage data, Telemetric single phase (TVM1) or three-phase (TVM3) interruption monitoring devices are installed on each

feeder, or segment of a feeder, in the utility’s distribution system. When a feeder interruption or outage occurs at a TVM1 or TVM3 device, it is reported via wireless cellular communications to the application software at the network operations center.

The number of customers on a distribution feeder or feeder segment is determined by a “Number of Customers” value, set or imported by the utility, that is tied to each Telemetric TVM1 or TVM3 installed on the system. When an interruption occurs, this “Number of Customers” value is automatically applied to the interruption or outage as it is processed by the system. The system categorizes interruptions as either “Sustained”, or “Momentary”. A “Sustained” interruption is typically an interruption greater than or equal to one minute and a “Momentary” interruption is any interruption lasting less than one minute. The period of time to categorize an interruption as “Sustained” is definable by the utility and is typically 1, 2, 3 or 5 minutes.

The system handles over and under voltage events in a similar manner, but it does not categorize them as “Sustained” or “Momentary”. They must simply meet the predefined conditions established by the utility.

After the information has been logged in the database, any user-defined actions take place automatically, such as pager or e-mail notifications of interruptions, outages and over or under voltage conditions.

The reporting software is then used to generate interruption reports and to calculate industry-standard power reliability performance indicators in accordance with the IEEE Guide on

Electric Reliability Indices 1366-2001.