

SPECIFICATION FOR ENTERPRISE-WIDE ENERGY MANAGEMENT MONITORING SYSTEM

1. SUMMARY

The application suite shall provide a complete and comprehensive Enterprise-wide Energy Management solution, that incorporates modules offering: SCADA capability through graphical HMI interface; programming and configuration of meters; advanced real-time viewing capability; data-logging and viewing of historical logs; advanced communication with meters through Ethernet TCP/IP, direct Serial port, and remote Modem (Dial-up or Wireless); advanced charting, graphing, and analysis of data; viewing of waveform records with comprehensive data analysis; ODBC databases for all collected data; meter reading through IrDA or Serial port by Pocket PC PDA; full reporting capability, utilizing artificial intelligence to diagnose PQ events and provide possible cause scenarios; audible and email alarms of selected conditions; and web access to all meter data.

2. PRODUCT

The application suite shall consist of the following modules:

- a. Base software module that shall allow connection between remote meters via Serial, Ethernet, or Modem. The base software module shall work with all the meters in the monitoring system. Additional modules may be added without removal of the base software module.
- b. The base software module shall allow viewing of real-time metered data, configuring of meters, and analyzing of collected information from the remote power monitors.
 - i. The base software module shall allow users to view real-time readings of all electrical parameters.
 - ii. The base software module shall allow users to configure and analyze collected data from remote power monitors.

- iii. The base software module shall allow users to collect and archive all data.
- c. Base software module shall provide superior screen display, and offer graphing and reporting functions that allow for easy collection and archiving of data. The base software module shall use ODBC-compliant database structures, allowing the stored metering information to be integrated automatically into any 3rd party package. The base software module's database must fully support .csv file format and must be auto-configurable.

Base software module's real-time viewing capability shall include:

- Voltage, current, power, and energy
- Time of usage and accumulations
- Power quality
- Harmonics to the 255th order
- Actual real-time waveform scopes
- Alarms and limits
- Max. and min. for each parameter
- I/O device information

The base software module shall have an advanced communication structure that allows access to remote meters through Ethernet TCP/IP, remote modem (Dial-up or Wireless), or direct Serial port. The methods shall be interchangeable so that a monitoring system can consist of multiple paths back to a main computer.

The base software module shall allow real-time viewing of data in graphical format. It shall have charting and graphing functions that allow easy access to any desired data and that provide fast and simple analysis. Advanced graphical capabilities of the base software module shall include:

- Calculation of power quality on a scatter graph
- CBEMA plotting information

- 3D plots and histograms provided to aid in determining frequency and severity of PQ events.

Graphical data analysis features of the base software module shall include:

- Tabular data format with direct Microsoft Excel® Compliance
- 6-Pen charting and graphing
- Circular or XY chart formats
- Max./min. values printed directly on plot
- Unlimited zoom and pan
- Direct cut and paste into most Windows® applications

The base software module shall provide viewing of stored waveforms on events caused by PQ problems, faults, transients, and other conditions. The module shall allow:

- Viewing and superimposing of multiple waveforms
- Zooming and panning of events
- The placing of hash marks on waveform graphs to calculate delta time and differing event durations
- The conducting of harmonic analysis on waveform data using harmonic magnitudes, peak value, and RMS readings per cycle.

- d. PDA based software module that shall provide support for Pocket PC PDA devices. The PDA based software module shall allow communication with meters either through IrDA or Serial port. The software module shall allow the viewing of phasor diagrams and the reading of meter diagnostic information.
- e. Reporting software module that shall provide a comprehensive report on the meter being monitored, making use of artificial intelligence technology to diagnose the PQ events and provide the possible cause of the event. Accuracy of AI analysis shall be 80%, on average.

Reporting software module shall provide an AI generated industry-accepted solution as a result of the analysis of the PQ event. The AI program of the reporting software package shall make use of Fuzzy Logic, Neural Networks, embedded knowledge, and embedded rules to generate correct analysis and solutions.

Reporting software module shall support PQDIF data conversion formats, allowing you to take the PQ records and bring them back into existing EPRI/PEAC PQ reporting packages. The reporting software module shall also support Comtrade data conversion, allowing you to convert the waveform files into a standard format to be read by relay test sets or other such equipment.

- f. The Dial-in Server software module shall support the receiving of dial-in strings from remote meters in the field. The module shall have a the capability to check the PC for connected modems and assign incoming calls from the meter to an available modem. The Dial-in server software module shall have the ability to display warnings and to send email, pager, or phone notification of alarm conditions. Notification conditions shall include:
- CBEMA PQ event
 - High speed input change
 - Waveform record capture
 - Filling of meter memory
 - Meter communication failure
 - Control output change
- g. The HMI software module shall provide a fully functional SCADA (Supervisory Control and Data Acquisition) HMI (Human Machine Interface) package, offering a complete, fully customizable, graphical view of the monitoring system. The HMI Module shall have a runtime mode and a configuration mode.

- The runtime mode must be Windows-based and set to run in standard Windows 95 or NT environment.
- The Module shall utilize a Client/Server architecture.

The HMI software module shall have the following capabilities:

- The Module shall incorporate advance SCADA architecture. It must consist of a base system that acts as a data polling engine and data server. The base server package must also act as an HMI Display client. Remote clients must be able to be loaded on machines throughout the network and the module must be capable of supporting simultaneous users.
- The Module must be fully scalable and able to be expanded after installation.
- The Module shall be able to access and report on all levels of data necessary to determine power quality, revenue metering, alarm conditions, and control of meters.
- The Module shall provide reports in a variety of formats, at minimum: billing reports, data logs, and power quality reports. The Module shall allow alarm display and logging for user-defined conditions. Alarm functionality shall allow for emailing and paging on selected event occurrence. Alarm conditions shall be configurable to alter the appearance of objects on the graphical interface, e.g., cause an object to change color.
- The Module shall have a Modbus-based infrastructure that shall allow configuration of the system to poll any Modbus-based device for data viewing and control. The Module must feature a Modbus protocol delivered over the Ethernet to allow direct access via Ethernet or network configuration.
- The graphical interface of the Module must provide access to all other installed modules in the Energy Management Monitoring System.

- The graphical interface of the Module shall provide access to a Billing module that allows for viewing and printing of billing data for configured devices.

Additionally, the HMI software module shall also provide:

- The ability to resize up to 400,000 points without modifying existing hardware or software.
- The running of I/O, Alarms, Reports, Trends, and Displays from one or multiple servers and the distribution of processor loads.
- A manageable, cost-effective alternative to proprietary energy management systems.
- Standard Modbus TCP architecture that allows built-in server redundancy to prevent system downtime and insure resource protection.

SCALABILITY:

- The Module shall be fully scaleable. It must be able to grow to accommodate up to 250 client workstations.

SECURITY:

- The Module shall have advanced security features, allowing password protection through up to eight levels of privileges. The password protection shall allow restriction of access to specific screens and/or functions. The Module shall have a feature that allows the operator to be logged out after a specified amount of time. The Module will still be active, but the user will be restricted to 0 privilege level access after automatic logout.
- It must be possible for the Runtime mode of the HMI Module to be run as either a service or a shell under Windows NT, to disable switching to other Windows applications while the Module is running.

- The Module must allow disabling of the Ctrl-Alt-Delete shortcut key, to restrict operator access to other Windows applications.

ALARMS:

- The Module shall allow for two types of alarms: hardware alarms and configurable alarms. The Module shall issue alarms for devices going offline and other hardware conditions. The Module must allow the user to define alarm conditions for configurable alarms.

The Module must allow the following four types of configurable alarms: digital alarms, time-stamped alarms, analog alarms, and advanced alarms. The user must be able to create a project page to display alarms and allow for operator intervention. Alarms must be able to be ordered into categories for prioritization and display.

ONLINE HELP:

- The Module shall contain online Help functions, including a complete Help guide, navigable with forward and back buttons, an Index, and a Search function. The configuration mode shall have complete context-sensitive help in all of the development screens.

CONFIGURATION MODE

- The Module shall contain Wizards that allow quick and easy setup of configurable devices and the main control unit.
- The module shall contain Genies already programmed for metering devices. These Genies shall be configured to access and show real-time readings, including, at minimum:
 - Vab
 - Vbc
 - Vca
 - Ia
 - Ib

- Ic
- Watt Total
- VA Total
- Frequency
- Power Factor Total.
- The Module shall contain pre-programmed tags for trending and graphing, reporting, events logging, and alarm conditions. The module must allow up to 8 tags per trending graph.
- The graphical interface of the Module shall be fully customizable in Configuration mode, allowing for creation of screens displaying: configurable devices, trending, alarms, and reports. The Module must allow creation of consistent user interfaces using standard tools such as shaded lines, buttons, or polygons, and allow for easy manipulation of the objects using a wide range of dynamic properties, including animation.
- The configuration mode shall use forms for data entry during development.
- The configuration mode shall utilize vectoral graphics. The end user shall be capable of:
 - Importing graphics and editing them
 - Creating custom symbols and other objects and animating them, copying them, and moving them on the screen
 - Connecting symbols and objects and moving them around on the screen
 - Assigning tags to objects, such as metering devices, to display information and perform functions
 - Creating links to other screens and programs from devices and/or buttons
 - Assigning access rights to objects on the screen

- Assigning keyboard commands to objects on the screen, activated by clicking on an object, moving over an object, or releasing a “click” on an object
- Configuring objects to change when the project is in Runtime Mode, or when a pre-defined condition exists, e.g., a metering device has gone offline
- Assigning actions consequent on an object being clicked
- Configuring more than one project at a time, utilizing the same workstation

REPORTING:

- The Module shall have a primary Reports server and a Standby Reports server. If the primary server is not running, the user must be capable of connecting to the standby server.
- It must be possible to specify report writing at project startup or other user-defined times, or on the occurrence of user-defined triggers or conditions.
- It must be possible to specify report: printing when run or saved to disk for later printing. The Module must allow user to format report variables.

LANGUAGE:

- The Module must be configurable to allow for a language change to be made at runtime, for the graphic display. The Module must support an unlimited number of alternate language databases that can be used across multiple projects.

BACKUP:

- The HMI Module must provide full backup capability for all project files.
- The Module must allow restoration of all project files to the original or another project.

- The user must be able to specify the location for project backup and saving, allowing for the creation of a redundant system.

3. The Enterprise-Wide Energy Management System shall be Electro Industries/Gauge Tech's Energy Manager EXT.

a. The complete ordering grid for the Approved Modules of Energy Manager EXT is provided below.

Software Module	Description	Model Number	Details
Communicator EXT	One User Starter Pack	COMEXTS	Single user Starter Pack
Communicator EXT (Required for Purchase)	Base Software	COMEXT3	Required for Base System (Multiple User)
AI Reports EXT	Power Quality Reporting	AIEXT3	PQ Reporting Package
Dial-In Server	Dial-In Server Application	DISEXT	Optional for Dial-In Application
Copilot EXT	Windows CE Communicator	CPTEXT	Used for basic Polling, Programming, and Downloading
HMI EXT	HMI with 150 Points	HMIEXT150	Up to 10 Meters
HMI EXT	HMI with 500 Points	HMIEXT500	Up to 50 Meters
HMI EXT	HMI with 1500 Points	HMIEXT1500	Up to 100 Meters
HMI EXT	HMI with 5000 Points	HMIEXT5000	Up to 250 Meters
HMI EXT	Allow Simultaneous Clients. One License access through Internet.	HMIEXTC (Specify number of clients)	As many Simultaneous Clients as needed

b. To order, contact Electro Industries/Gauge Tech at:

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