

Encore Series[®] Software

User's Guide

WARNING

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2011) of USA and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as “one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved.”

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2009) of USA and any additional workplace safety requirements applicable to your installation.

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Safety Summary

ADVERTENCIA

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento debe ser hecha de acuerdo con las normas del Código Eléctrico Nacional (ANSI/NFPA 70-2011) de EE. UU., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como “una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados.”

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2009) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.

AVERTISSEMENT

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2011) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si “elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique.”

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2009) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

WARNUNG

Der falsche Anschluss dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschliessen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Der Anschluss dieses Instruments muss in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70-2011) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche “mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist.”

Qualifiziertes Personal, das an bearbeiten oder herausgestellte angezogene elektrische Leiter sich nähern, muß anwendbare Sicherheit bezogener Arbeit Praxis und Verfahren einschließlich passende persönliche schützende Ausrüstung gemäß dem Standard für elektrische Sicherheitsauflagen für Angestellt-Arbeitsplätze (ANSI/NFPA 70E-2009) der Vereinigten Staaten und alle zusätzlichen Arbeitsplatzsicherheitsauflagen folgen, die auf Ihre Installation anwendbar sind.

Safety Summary

Definitions

WARNING statements inform the user that certain conditions or practices could result in loss of life or physical harm.

CAUTION statements identify conditions or practices that could harm the Encore Series, its data, other equipment, or property.

NOTE statements call attention to specific information.

Symbols

The following International Electrotechnical Commission (IEC) symbols are marked on the top and rear panel in the immediate vicinity of the referenced terminal or device:



Caution, refer to accompanying documents (this manual).



Alternating current (ac) operation of the terminal or device.



Direct current (DC) operation of the terminal or device.



Protective conductor terminal.

Safety Summary

Definiciones

Las ADVERTENCIAS informan al usuario de ciertas condiciones o prácticas que podrían producir lesiones mortales o daño físico.

Las PRECAUCIONES identifican condiciones o prácticas que podrían dañar la Encore Series, sus datos, otros equipos o propiedad.

Las NOTAS llaman la atención hacia la información específica.

Símbolos

Los siguientes símbolos de la Comisión Internacional Electrotécnica (IEC) aparecen marcados en el panel superior y el posterior inmediatos al terminal o dispositivo en referencia:



Precaución, consulte los documentos adjuntos (este manual).



Operación de corriente alterna (ca) del terminal o dispositivo.



Operación de corriente continua (CC) del terminal o dispositivo.



Terminal de protección del conductor.

Safety Summary

Définitions

Les messages d'AVERTISSEMENT préviennent l'utilisateur que certaines conditions ou pratiques pourraient entraîner la mort ou des lésions corporelles.

Les messages de MISE EN GARDE signalent des conditions ou pratiques susceptibles d'endommager "Encore Series", ses données, d'autres équipements ou biens matériels.

Les messages NOTA attirent l'attention sur certains renseignements spécifiques.

Symboles

Les symboles suivants de la Commission électrotechnique internationale (CEI) figurent sur le panneau arrière supérieur situé à proximité du terminal ou de l'unité cité:



Mise en garde, consultez les documents d'accompagnement (ce manual).



Fonctionnement du terminal ou du dispositif sur le courant alternatif (c.a.).



Fonctionnement du terminal ou de l'unité courant continu (CC).



Borne conductrice de protection.

Safety Summary

Definitionen

WARNUNGEN informieren den Benutzer darüber, daß bestimmte Bedingungen oder Vorgehensweisen körperliche oder tödliche Verletzungen zur Folge haben können.

VORSICHTSHINWEISE kennzeichnen Bedingungen oder Vorgehensweisen, die zu einer Beschädigung von Encore Series, seiner Daten oder anderer Geräte bzw. von Eigentum führen können.

HINWEISE machen auf bestimmte Informationen aufmerksam.

Symbole

Die folgenden Symbole der Internationalen Elektrotechnischen Kommission (International Electrotechnical Commission; IEC) befinden sich auf der Abdeck- und Seitenplatte unmittelbar am betreffenden Terminal oder Gerät.



Vorsichtshinweis, siehe Begleitdokumente (dieses Handbuch).



Wechselstrombetrieb des Terminals bzw. Geräts.



Gleichstrombetrieb im Terminal oder Gerät.



Terminal-Schutzleiter.

Safety Summary

Safety Precautions

The following safety precautions must be followed whenever any type of connection is being made to the instrument.

- Connect the green safety (earth) ground first, before making any other connections.
- When connecting to electric circuits or pulse initiating equipment, open their related breakers. DO NOT install any connection of the instrument on live power lines.
- Connections must be made to the instrument first, then connect to the circuit to be monitored.
- Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Make sure the unit is turned OFF before connecting probes to the rear panel.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

Medidas de seguridad

Las medidas de seguridad siguientes deberán observarse cuando se realice cualquier tipo de conexión al instrumento.

- Antes de hacer cualquier conexión, deberá enchufarse el conector de seguridad verde a tierra.
- Cuando se haga conexiones a circuitos eléctricos o a equipo de activación por pulso, deberá abrirse sus respectivas cajas de seguridad. NO deberá hacerse ninguna conexión del instrumento en líneas eléctricas bajo tensión.
- Las conexiones deberán hacerse primero al instrumento y, luego, al circuito a ser monitorizado.
- Al hacer conexiones a circuitos eléctricos, deberá utilizar anteojos y guantes protectores.
- Sus manos, zapatos y el piso deberán estar secos en todo momento en que se haga una conexión a un cable eléctrico.
- Verifique que la unidad esté DESACTIVADA antes de conectar sondas en el panel posterior.
- Previo a cada uso, deberá verificarse que los cables no estén rotos y que el material aislante no tenga rajaduras. Reemplace de inmediato cualquier parte defectuosa.

Mesures de Sécurité

Les mesures de sécurité suivantes doivent être prises chaque fois qu'un type de connexion quelconque est effectué sur l'instrument.

- Connecter d'abord la prise de terre de sécurité verte (terre) avant d'effectuer toute autre connexion.
- Ouvrir les disjoncteurs correspondants lors d'une connexion à des circuits électriques ou à des équipements de génération d'impulsions. NE PAS effectuer de connexion d'instrument sur des lignes électriques sous tension.
- Une fois toutes les connexions de l'instrument effectuées, connecter au circuit à contrôler.
- Porter des lunettes de protection et des gants isolants pour effectuer des connexions aux circuits électriques.
- S'assurer que les mains, les chaussures et le sol soient secs lors de connexions à une ligne électrique.
- S'assurer que l'unité est ÉTEINTE avant de connecter les sondes au panneau arrière.
- Inspecter tous les câbles, avant chaque utilisation, pour s'assurer que les isolants ne sont pas coupés ou fendus. Remplacer immédiatement tous les équipements défectueux.

Sicherheitsvorkehrungen

Die folgenden Sicherheitsvorkehrungen sind immer dann zu befolgen, wenn eine Verbindung zum Instrument hergestellt wird.

- Schließen Sie zuerst die grüne Sicherheits-/Erdleitung an, bevor Sie eine andere Verbindung herstellen.
- Öffnen Sie beim Anschluß an elektrische Stromkreise oder Impulsauslösungseinrichtungen die entsprechenden Unterbrecher. Es dürfen KEINE Anschlüsse an das Instrument unter stromführenden Spannungsleitungen montiert werden.
- Die Verbindungen müssen zuerst am Instrument und danach an der zu überwachenden Schaltung hergestellt werden.
- Tragen Sie Schutzbrillen und Isolierhandschuhe, wenn Sie Anschlüsse an den Stromkreisen vornehmen.
- Hände, Schuhe und Fußboden müssen trocken sein, wenn Sie Anschlüsse an den Stromkreisen durchführen.
- Stellen Sie sicher, daß das Gerät AUSgeschaltet ist, bevor Sie an der rückwärtigen Konsole Meßfühler anschließen.
- Prüfen Sie vor jedem Gebrauch alle Kabel auf Bruchstellen und Risse in der Isolierung. Wechseln Sie schadhafte Kabel sofort aus.

FCC Statement

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Warranty

Dranetz warrants that the Encore Series Software will be free from defects in workmanship and materials for a period of one year from the date of purchase. Dranetz will, without charge, replace or repair, at its option, any warranted product returned to the Dranetz factory service department.

Dranetz shall not be held liable for any consequential damages, including without limitation, damages resulting from loss of use, or damages resulting from the use or misuse of this product. Some states do not allow limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have rights which vary from state to state.

Exclusions: *This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized repairs or alterations.*

Need Help?

How to Contact Dranetz

Regardless of your location, Dranetz sales and product support are within easy reach through an established network of representatives and distributors worldwide.

For Sales, Technical Support, or the name of a Dranetz Sales Representative in your area, call:

1-800-372-6832 or 732-287-3680

Fax: 732-248-1834

Web site: www.dranetz.com

Welcome to the Encore Series Software

Congratulations on your purchase of the Encore Series Software.

The Encore Series Software is loaded onto the computer or the InfoNode hardware platform, and becomes a service of the computer's Windows® operating system. Encore Series Software provides a centralized connection point for remote devices, turning the computer into a self-contained server for a user designed power monitoring network. It requires the proper Dranetz computer hardware lock (called a HASP). The user interface is a conventional Internet browser, with access restricted only to users with the correct password.

The optional DataNodes serve as data and information gathering devices, connected to the Encore Series Software via RS-485/422/232 or Ethernet. By logging onto the Encore Series service from any computer having Internet access (or access to the network in which the system operates) or via modem, users can obtain extensive monitoring data, information, and answers from all the connected DataNodes.

More DataNodes can be added at any time, increasing the size and capabilities of the monitoring network. The individual capabilities and features of each different type of DataNode are covered in their own separate user's guides.

Please read this and all user's guides carefully to obtain the greatest value from your power monitoring equipment and to avoid damage and injury that can occur from misuse and improper connection.

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Encore Series Software Overview

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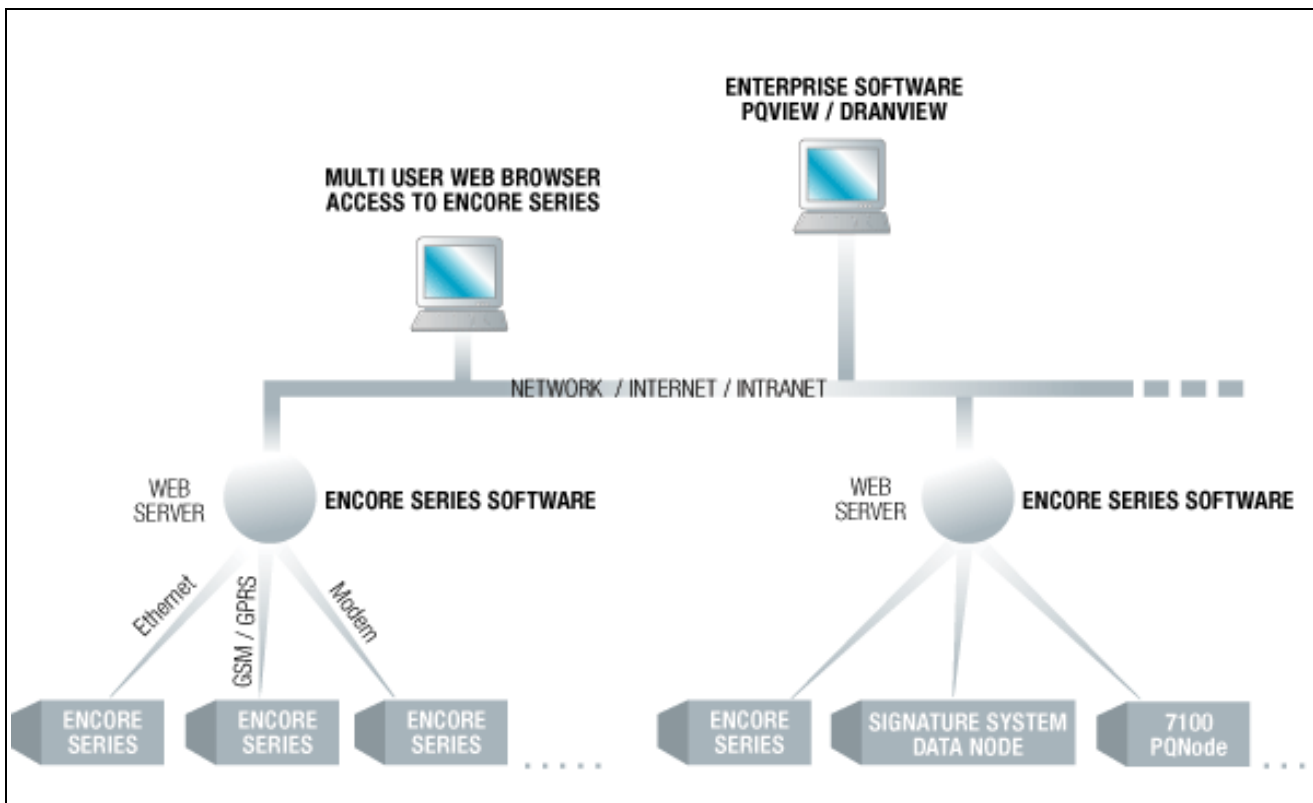
Encore Series Software

The Encore Series Software is loaded onto the computer or the InfoNode hardware platform, and becomes a service of your Windows® operating system. This computer-centric design allows you to manage information through the computer, without the need to install and set up separate Encore Series hardware. However, for purposes of this document, the information describing the Encore Series Software running on a computer is applicable to the InfoNode platform, unless specifically noted otherwise. In addition, the HTML screen images may include the words InfoNode, which would also be applicable to the Encore Series Software running on a computer.

A typical Encore Series Software system setup is built from several DataNodes, with the software program loaded onto the computer. DataNodes gather readings from circuits and

processes. Inexpensive, small and easy to install, DataNodes have the intelligence to collect data to be transferred to the Encore Series Software.

The Encore Series Software gathers DataNode data, converts the data to information, manages and presents the information. Value-added software Answer Modules, also available from Dranetz, can further enhance program capabilities of the Encore Series Software. Depending on the Answer Modules installed, data from one or more DataNodes can be analyzed to provide such answers as the direction of the PF cap switching transient (upstream or downstream), sag directivity, location of faults on radial feeders, reliability-benchmark indices for power quality, and different characterizations of data, such as QOS (Quality of Supply), IEEE 1159, and EPRI DPQ.



Encore Series Software Architecture: A Conceptual Illustration

Encore Series Software Overview

A Virtual Encore Series Software

Once the Encore Series Software package is loaded onto a PC or laptop with the required Windows® 2000 or Windows® XP operating system, the software program runs as a typical Windows® service. Encore Series Software converts the computer into a web server that enables you to browse data and information collected by the application. The Encore Series service will operate for a period of 30 days upon installation. To continue to use the service after the trial period, you must install a hardware lock called HASP on your computer. **NOTE THAT YOU MUST INSTALL THE ENCORE SERIES SOFTWARE BEFORE YOU INSTALL THE HASP.** The HASP is connected to the USB port in the computer. See Encore Series Software with HASP on page 2-10 for more information.

Once the Encore Series Software is installed and running, and the required HASP driver is properly installed in the computer, access to software application is possible from anywhere in the world - through Intranet, Internet, or via modem. The Encore Series Software service uses the standard web browser (Microsoft® Internet Explorer V5.5 and higher or Netscape® Navigator 6.x and higher running the Sun Java Virtual Machine 1.3.x or higher (Sun Java VM 1.4.x is recommended)). Earlier versions of Netscape that use the Netscape Java VM are no longer supported.

Access time is dependent primarily on the communication media, with direct network connection being the fastest. See Communicating with the Encore Series Software on page 2-3 for more information.

Some of the most important optional add-ons to the Encore Series Software program are the Answer Modules software. Answer Modules convert information into application-specific answers using patented and proprietary expertise developed by Dranetz, Electrotek Concepts, and Electric Power Research Institute (EPRI). These plug-in, application-specific answers will cover applications from identifying power disturbance origins, to reporting based on evolving standards, to predicting maintenance schedules at substations.

Software optional accessories can be part of the initial purchase or easily added later. For more information on optional accessories for the Encore Series Software, see Chapter 15 Optional Accessories and/or contact Dranetz Customer Service Department at (732) 287-3680 or 1-800-372-6832.

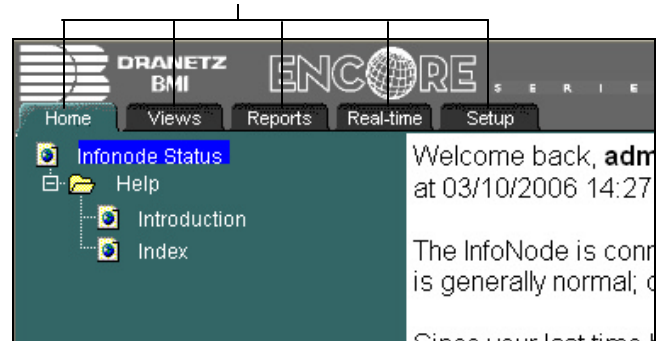
Encore Series Software User Interface

The Encore Series Software user interface consists of a series of tab pages. The pages are labelled as follows: Home, Views, Reports, Real-time, and Setup.

Each page has its own tree directory located in the left window pane. The tree can be expanded or collapsed. Click on the plus (+) sign to expand the tree and show more options available. Click on the minus (-) sign to collapse the tree one level backward.

All detailed tab page information is found in the right window pane. The Encore Series Software system provides a direct, no-fuss interface which displays information called out in tab, hyperlink and button format. Each tab is provided with a Help option to provide users with immediate, onscreen assistance. Below is a sample screen showing the five main tab pages of the Encore Series Software.

main menu tabs of the Encore Series Software



The Home page provides basic status information about the Encore Series Software and DataNodes connected, along with easy access to the first, last, and most recent events in memory.

The Views page provides access to three interactive sections: the QOS (Quality of Supply) Status, Timeline, and Smart Views. The QOS module reports voltage compliance as recorded by a QOS DataNode. QOS Status will appear in Encore Series Software systems that have QOS data acquisition modules in it i.e. 5560 DataNode, 61000 PQ DataNode, or 61000 Voltage DataNode. The Timeline is a two pane browser, with the timeplot of selected parameters and channels in the top pane, and the event list and details (waveshapes) in the lower pane. The Smart Views include: 3D RMS Mag/Dur (Magnitude/Duration), RMS Mag/Dur, Smart Trends, Event Summary, Rms Variations, Snapshots, and Transients.

The Reports page generates reports formatted for direct printing, through Smart Reports and Standard Reports. Smart Reports have pre-selected output formats and include: DataNode Summary, QOS Compliance, Voltage Quality, Energy & Demand, Event Summary, and Top 10 Events. Standard Reports have output formats that can be customized by the user and include: Event Summaries, Top 10 Events, Event Statistics, Quality of Supply, Waveform Distortion, Energy & Demand, and Encore Series Software Summary. The Answer Modules are a customized facility which enables you to identify the source, cause and time of faults or disturbances like sags and swells. The system is able to record and document the source of the problem, whether coming from inside your facility or in the supply from your power supplier.

The Real-time page displays real time metered data in one of three formats: Meter Dials, Meter Panel, and Scope Mode. Meter Panel shows a textual list of metered parameters for the selected DataNode. Parameters displayed are those configured for logging and trending. Meter Dial shows the same information as Meter Panel but in an analog meter dial format. Scope Mode shows real time waveforms for all enabled channels in an oscilloscope type of display. Note that Scope Mode is not available for all DataNode types.

The Setup page allows the user to configure both the Encore Series Software and any DataNodes connected to it. Additional users and their access permissions and passwords are programmed on this page. Additional DataNodes connected to the Encore Series Software are also set up on this page. Other parameters which you can view and/or customize (depending on your user access privilege) are: Notifications, Communications, Answer Module, DataNodes.

Encore Series Software Access Levels

The Encore Series Software firmware can function at different security levels: *Guest*, *Viewer*, *Operator* and *Administrator*.

Guest: Can view data only. Cannot change any settings or data.

Viewer: Can view data and change their own password and display settings.

Operator: Can change DataNode settings (e.g. instrument thresholds), upload and delete measurements.

Administrator: Full access to all settings (e.g. Network, Time, Locale, Users).

NOTE: The Administrator mode is accessible only to users with administrative privileges. This mode is not normally used except to initially configure the Encore Series Software, upload new firmware, or run extensive diagnostic tests on the system.

1 Encore Series Software Overview

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Encore Series Software Package

Contents

One CD-ROM containing the Encore Series Software program and Tardis 2000 Time Server program (in order to use the Encore Series NTP Time service, the Tardis program must be installed)

Encore Series Software User's Guide

System Requirements

Operating System	MS Windows® 2000 or MS Windows® XP
Processor	Pentium III or higher
Memory	512 MB or more
Disk Requirements	25 MB hard disk space for installation 40 GB hard drive
Monitor	VGA or better; Hi-color 1024 x768 or higher recommended

NOTE 1: The Encore Series Software runs as a service on a Windows® 2000 or Windows® XP computer. Services are special programs that run in the background without any visible windows. Services can be set to automatically start, when the computer starts, even if no one logs onto the computer. If your computer is running on Windows® 2000, refer to the procedure on page 2-3 to authorize the InfoNode system installed for modem communication.

NOTE 2: The Encore Series Software service turns the computer into a web server supporting HTTP, FTP, SYSLOG, NTP and Telnet services. For this reason, make sure no other programs or services are running that use these protocols. Specifically, the computer must not be running web server software MS IIS®, MS Personal Web Server®, or Apache®. If the computer is connected to the Internet, these protocols can be a security risk. It is recommended that the computer be dedicated to running the Encore Series system.

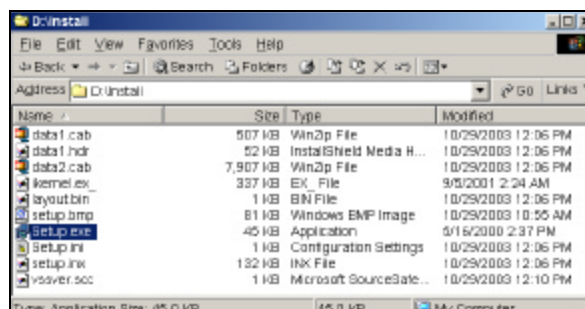
IMPORTANT: The following procedure will install the Encore Series Software on your PC for a trial period of 30 days. The software setup program copies the service onto your computer, performs all the necessary service registration, and creates Start Menu items for controlling the service. The Encore Series Software will operate for a period of 30 days upon installation. To continue to use the service beyond 30 days, you must install a hardware lock called HASP on your computer. The HASP can also be installed even before the 30-day trial period expires. NOTE THAT YOU MUST INSTALL THE ENCORE SERIES SOFTWARE BEFORE YOU INSTALL THE HASP. See page 2-10 for information on how to install the Encore Series Software with HASP.

Encore Series Software Installation and Setup

Getting Started

To install Encore Series Software, insert the CD-ROM with the Encore Series Software program on the disc drive, and do the following:

- Click on the 'Install Encore Series Software' link provided in the program disc. OR
Browse the contents of the disc to locate the 'Install' folder, then select the 'Setup.exe' file.
- Double-click the 'Setup.exe' file.
- Follow the instructions on-screen and/or in the next pages to continue installing Encore Series Software.



2 Preparation for Use

Encore Series Software Setup

1. The Encore Series Software Setup program initially displays the Welcome screen. Read the message then click **Next** to continue.
2. Read the Encore Series Software license agreement terms, then click **Yes** to accept and to continue with the installation.
3. Setup prompts you to select the destination folder where the Encore Series Software program will be installed. To use the default destination folder, click **Next** and proceed to Step 4. Default settings typically work well in most situations.
To change the destination folder location, click **Browse** then select the directory path where Encore Series Software will be installed. When changing the destination location where software will be installed, consider the availability of disk space on your computer. When done, click **Next** and proceed to Step 4.
4. There are five different Encore Series Software setup types to choose from depending on your application needs. Select a setup type and read its description on the right side of the screen. Once a setup type has been selected, click **Next** to install the Encore Series Software Setup and proceed to Step 5.
5. Setup will ask if you want the Encore Series Software service to start automatically each time your computer starts. Click **Yes** to enable the Encore Series Software service auto-start or click **No** to disable auto-start. In most cases, auto-start should be enabled to allow an unattended computer running the Encore Series Software service to automatically recover in case of a power outage.

In case users decide to change auto-start settings, there are two ways to reset the Encore Series Software start mode:

- a. Re-run the setup program. Each time the setup program is run, the service registration is updated and the program will ask if you want to enable/disable auto-start. Re-running the setup program also allows you to remove the service altogether.
 - b. Use the Windows® Service Manager to change auto-start settings. To do this, click on the following menu items: Start > Settings > Control Panel > Administrative Tools > Services.
6. Once program installation is complete, setup will ask if you want to start the Encore Series Software service. Click **Yes** to launch Encore Series Software immediately or click **No** to close the program.

Users have the option to manually start/stop the Encore Series Software Service by clicking on the following menu items: Start > Programs > Encore Series Software > Start Encore Series Software or Stop Encore Series Software.

Authorizing the InfoNode in Windows® 2000 System for Modem Communication

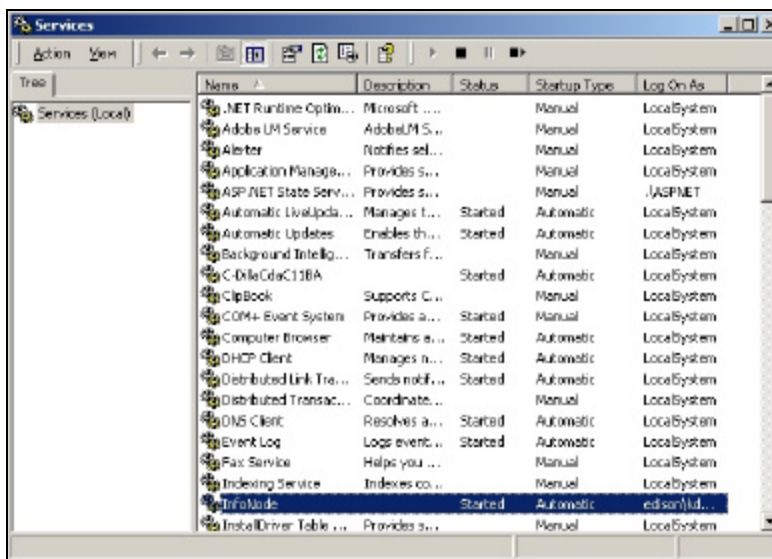
Users can communicate with the InfoNode/Encore Series Software via modem connection. If you are using a Windows® 2000 operating system, you need to add a modem authorization to your InfoNode service for modem communication.

Perform the steps below to configure your InfoNode system running in Windows® 2000 for modem communication.

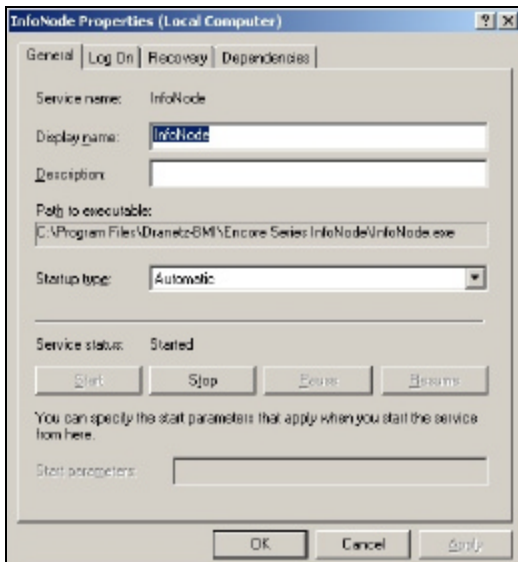
Step 1. Do the following to open the Administrator Tools. Click on **Start > Control Panel > Administrator Tools**.

Step 2. Double-click to open **Services** in Administrator Tools.

Step 3. Click to select **InfoNode** from the Services window. Right click on InfoNode to display the menu list.



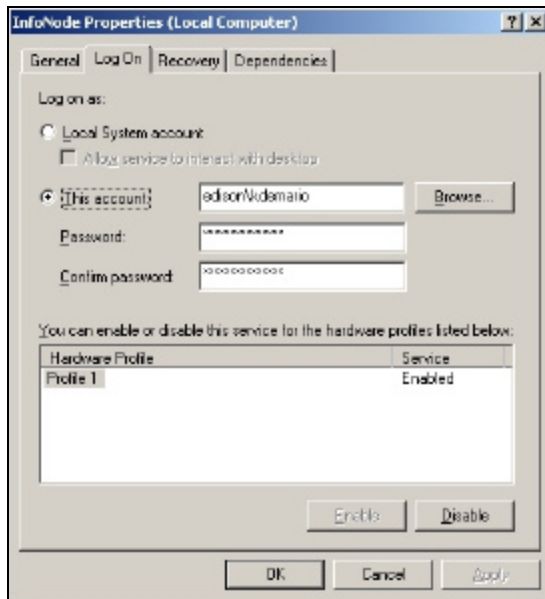
Step 4. Proceed to select **Properties** from the menu list.



2 Preparation for Use

Authorizing the InfoNode in Windows 2000® System for Modem Communication, continued

Step 5. Click to open the **Log On** tab.



Step 6. Click on the **Browse** button.

Step 7. Choose a user of the computer who has authorization to run the computer as an administrator. Proceed to enter the authorized user password. This will allow the InfoNode system installed in the computer to communicate via modem.

NOTE: Steps 1 through 7 must be done every time the software is updated.

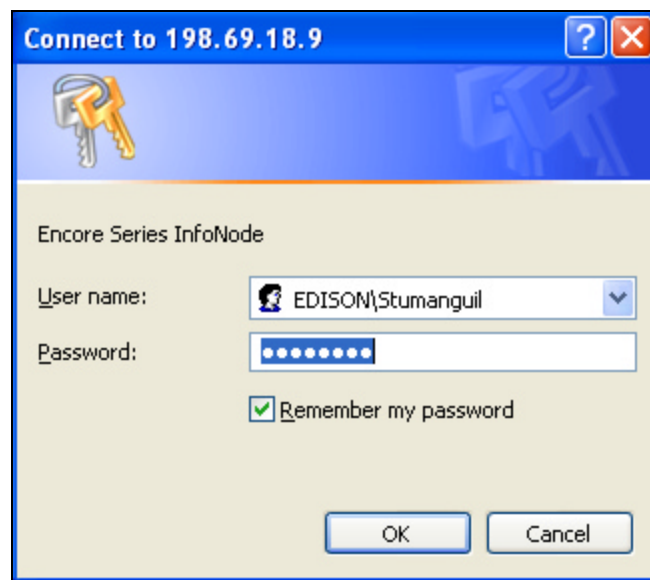
Communicating with the Encore Series Software using a Web Browser

Users can communicate with the Encore Series Software using a web browser.

NOTE: The Encore Series Software service must be installed and running before you can connect to it via a web browser. If you have a large database, it may take several minutes for the Encore Series Software service to respond to web requests.

When the browser used to access the programs is on the same computer where Encore Series Software is installed, specify 'localhost' as the site address from which to access the Encore Series Software home page. The software setup program provides a Start Menu icon to enable you to specify the local host site address setting.

Other computers connected to the same network can also access the Encore Series Software program installed on your computer. To communicate with the software using a browser from another computer, enter either the network name or the IP address of the computer running the software service in the site address field of the browser. Contact your network administrator for guidance to access your network system.



Once the proper site address is entered into the web browser, the Encore Series Software service will ask you to log-on. You can log-on as the 'admin' user. The default password for the 'admin' user is 'password'. Enter the user name and password into the appropriate boxes and click OK to access the Encore Series Software Home page. Refer to Chapter 3 Home Page for details.

Time Service Installation and Setup

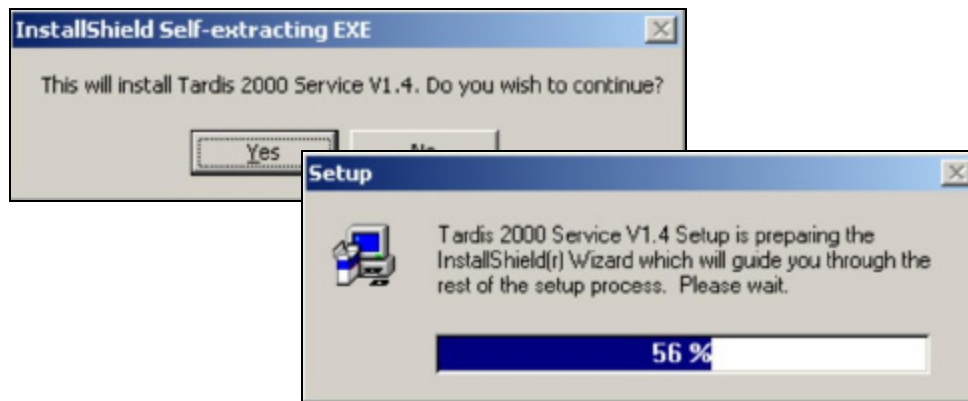
Time synchronization for the Encore Series Software requires a reliable time source. More often than not, the real-time clock (RTC) built into most computers is not accurate nor reliable. In order to use the Encore Series NTP time service, a time server must be available. A licensed copy of the 'Tardis 2000 Time Server' is included in the Encore Series Software disc application package. This software utility serves as a time server providing a time source for any device (including EPQ DataNodes) that share the network as the computer where the software is installed.

The Tardis software can detect the right time in various ways i.e. accessing Internet-based Atomic Clocks, using networked time servers, Global Positioning System or GPS technology, radio clocks, and by listening for time broadcasts over a LAN. The Service version of Tardis 2000 runs as a Windows® 2000/XP service, just like any other Windows® application service.

Getting Started

To begin installation of Tardis 2000 Time Server, insert the CD-ROM with the Encore Series Software program on the disc drive. To install the Tardis program on your PC, you may either:

- a. Click on the 'Install TARDIS Time Server' link provided in the disc.
OR
Browse the contents of the disc to locate the 'TardisNTPServers\WIN2000XP' folder, then select the 'tardis2000ntService.exe' file.
- b. Double-click the 'tardis2000ntService.exe' file.

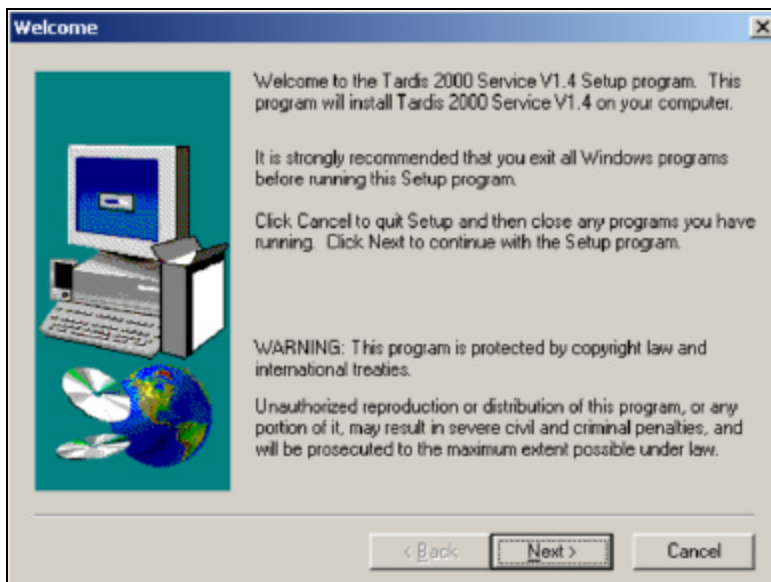


- c. Follow the instructions on-screen and/or in the next pages to continue installing Tardis 2000 Time Server.

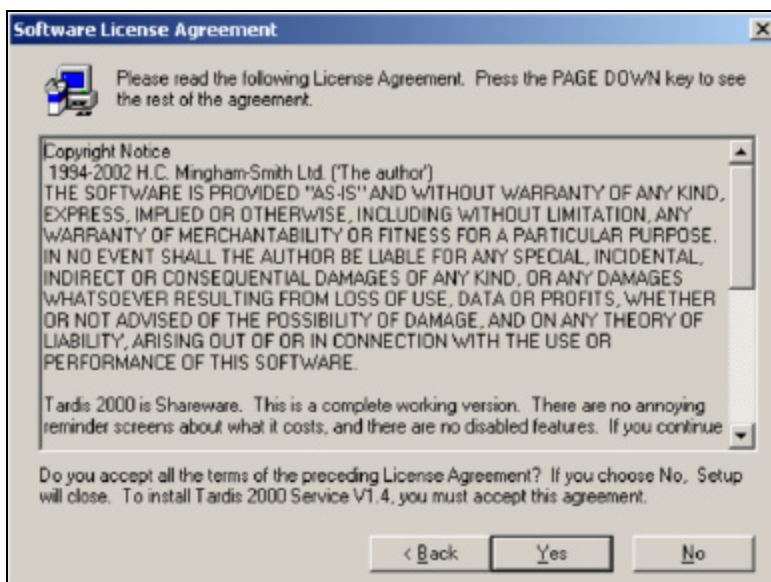
Tardis 2000 Time Server Setup

1. The Tardis installation program initially displays the Welcome screen. Read the message then click **Next** to continue.

NOTE: Exit all Windows® programs before attempting to install Tardis 2000 Time Server in your computer.



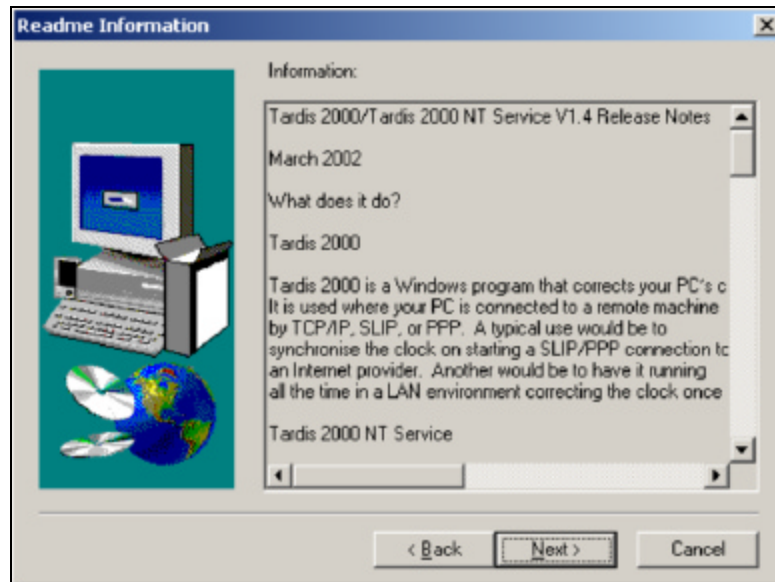
2. Read the Tardis license agreement terms, then click **Yes** to accept and continue with the installation.



2 Preparation for Use

Tardis 2000 Time Server Setup, continued

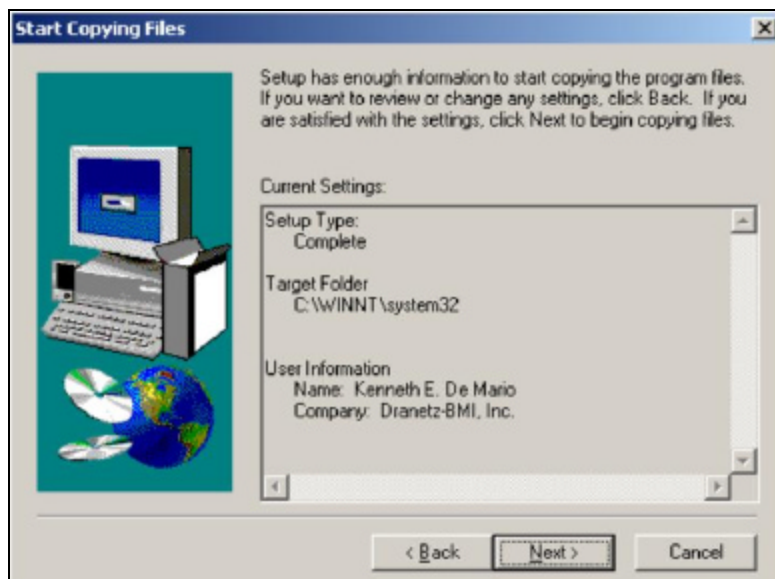
3. After accepting the Tardis license agreement, the Readme Information screen containing detailed description of the Tardis program appears. Read the program description then click **Next** to continue with the installation.



4. Tardis current settings notify users of the Tardis setup type and destination folder where program will be installed.

To use the current settings, click **Next**. Installation of Tardis program will proceed.

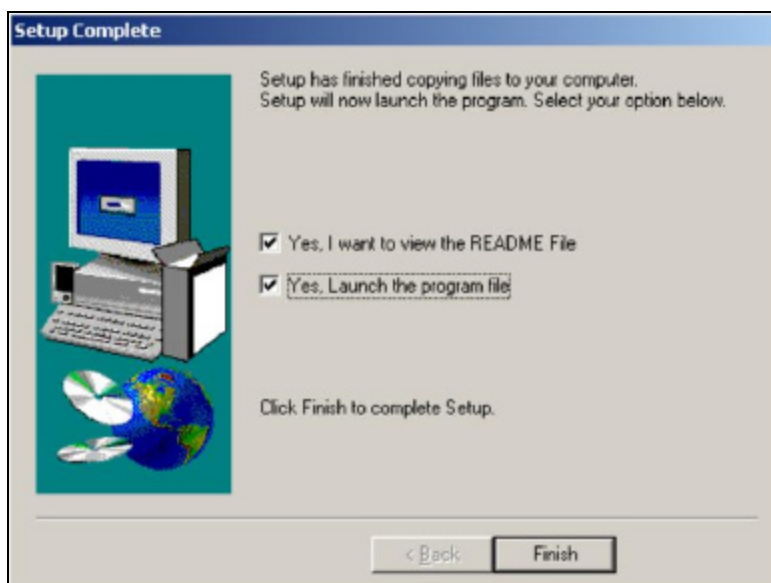
To review and/or change settings, click **Back**. When changing the destination location where software will be installed, consider the availability of disk space on your computer.



Tardis 2000 Time Server Setup, continued

5. After the Tardis program is installed, users have the option to view more information about the program by enabling the Readme File and/or to start/launch the Tardis Service immediately. In most cases, you should answer yes.

If you select **Yes** to launch the program, Tardis Service will start immediately once you click **Finish** to complete setup.



IMPORTANT: YOU MUST DISABLE THE WINDOWS® TIME SERVER WHEN USING TARDIS 2000 TIME SERVICE. IF YOU HAVE TARDIS 2000 SERVICE V1.6, THE INSTALL PROGRAM INCLUDES THE WINDOWS® TIME SERVER DISABLE FUNCTION. YOU DO NOT HAVE TO USE THE STEPS BELOW TO MANUALLY DISABLE THE TIME SERVER PROGRAM.

You can disable the 'Windows® Time Server' and enable the 'Tardis 2000 Time Server' to auto-start under the 'Service Manager Control Box'.

To access 'Service Manager Control Box' in Windows® 2000 Professional or Windows® XP, click on the following menu items: Start > Settings > Control Panel > Administrative Tools > Services. For detailed instructions on how to customize Windows® 2000/XP time settings, refer to the online documentation 'Installing Tardis 2000 Time Service' on the CD-ROM.

Encore Series Software with HASP

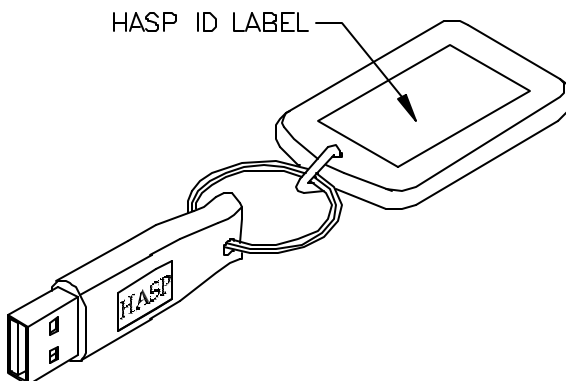
The Encore Series Software service will operate only for a period of 30 days from the date of installation. To continue to use the software beyond 30 days, you must install a HASP on your computer. The HASP can be installed even before the 30-day trial period for Encore Series Software ends.

WARNING: DO NOT insert the HASP before installing the Encore Series Software program. Otherwise, MS Windows® will fail to find the proper driver for the HASP but may still add a non-working HASP driver to the Device Manager (Control Panel System). In this case, the HASP driver needs to be manually removed from the Device Manager (Control Panel System). When done, restart the computer and reinstall Encore Series Software from the CD-ROM.

Encore Series Software: To install the Encore Series Software program from the CD-ROM, follow the instructions on Encore Series Software Installation and Setup on pages 2-1 to 2-2.

HASP: The Encore Series Software HASP (see figure below) can be keyed to the USB port. Align the HASP to the keyed port and push gently to lock it in place. Keep the HASP in the port while using the Encore Series Software program.

NOTE: Make sure to write down the serial number of your HASP and keep this information in a secure place. The serial number is required to replace HASP in case it gets lost or destroyed.



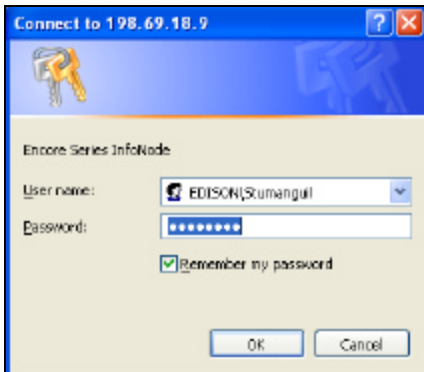
For pricing and availability of HASP, contact the Dranetz Customer Service Department at tel. nos. (732) 287-3680 or 1-800-372-6832.

This chapter explains how authorized users log in and access the Encore Series Software system.

Log-in

Users connect to the Encore Series Software using a web browser as explained on page 2-3. Before gaining access to the Home page, the user must first log-in using a proper user name and password. If the user name or password is not correct, the Enter Network Password dialog box shown below will re-appear. Setting up the names, passwords, and privilege level require administrative permission (see Chapter 7 *Setup Page, Users* section).

Contact your Encore Series Software Administrator (someone with Admin privileges) to set up your user account in order to access the system. Only the Administrator can create accounts for other people and change Security Levels. The system is shipped with a default Admin account, which the Administrator should customize with your own user name and password.



Enter Network Password dialog box

NOTE: When you upgrade your operating Encore Series Software firmware version, the Encore Series Java Classes will automatically be installed in your computer upon log-in. The Java wizard program will install the setup files necessary for your computer to support the Encore Series interactive controls. If you do not allow installation of the Java program, then some Encore Series Software screens will not be visible and you will not be able to take advantage of some features of the application. The setup program will not change any system configuration. It just stores a small number of Java files on your computer. Once installation is done, the program will prompt you to click on Finish to complete setup. You may have to restart your web browser once setup is complete.

Home Page

The Home page provides basic system status information, and links to events that occurred since you last logged on. The Home page is automatically displayed after successfully logging on, or by selecting the Home tab. In the left-hand frame of the page, you will see the Encore Series Software Status and Help options. The software Status displays general information on both the DataNode and Encore Series Software (see sample screen display next page). Click on one of the underscored links or hyperlinks on the right-hand screen display to go directly to the event detail or status information.

You may log out of the Encore Series Software at any time by closing your browser.

Note that some pages may take longer than usual to download when viewed for the first time, or after a firmware revision has been uploaded to the Encore Series Software.

The standard home page can be augmented with a custom HTML page at extra cost. Contact the Dranetz Customer Service Department at (732) 287-3680 or visit www.dranetz.com.

Encore Series Software Status

The Encore Series Software Status table provides general information about the software and the data that it retrieved from the connected DataNodes, including the following:

DataNode Information

DataNode health status is based on continual checks of the communication links and internal processes.

Database usage shows the amount (%) of memory used. As a reference, the total available memory is shown.

of Disturbances (Total disturbances, First disturbance, Last disturbance) is defined by the type of DataNode connected. For a power quality-type DataNode, these include events triggered by limit or threshold crossings.

of Disturbances (Since your last logon, In the last 48 hours) is the amount of events that have occurred since the user last logged on and in the last 48 hours.

#Disturbances is linked to the Event SummaryView.

3 Home Page

Home, Views, Reports, Real-time: where DataNode data and information are displayed in meaningful format

Setup: where users view and/or customize the Datanode settings

Welcome back, **admin**, to Edison Service Entrance. The time is 03/12/2006 00:23:04. You were last logged on at 03/11/2006 23:40:59

The InfoNode is connected to [5 DataNodes](#). All DataNodes are in good health. The database is 100% full (this is generally normal; old data is automatically purged when the database is full). There are 114 disturbances.

Since your last time here, no disturbances have been logged. In the last 48 hours, [6 disturbances](#) have been logged.

[Click here for custom home page](#)

There is one DataNode for monitoring Quality of Supply compliance. [This DataNode](#) is reporting non-compliance.

DataNode information	
DataNode health status	There are 5 DataNodes . All DataNodes are in good health
Database usage	100% used (98 MB out of 112 MB)
Total disturbances	114
First disturbance	02/07/2006 05:47:27
Last disturbance	03/10/2006 18:26:48 by DataNode Edison 5530
Since your last logon	None

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Encore Series Software Home page

61 SE216	
Description	
Last connection	03/12/2006 00:24:17
Next connection	03/12/2006 00:27:00
Connection status	Idle
Health	Normal
Model	61000 Power Quality DataNode
Serial number	Unknown
Version	H/V0.2.4, C/E0.2.11

click any DataNode hyperlink to view specific DataNode information

Database usage	100% used (98 MB out of 112 MB)
Total disturbances	114
First disturbance	02/07/2006 05:47:27
Last disturbance	03/10/2006 18:26:48 by DataNode Edison 5530
Since your last logon	None
In the last 48 hours	6 disturbances
Quality of Supply Compliance	For the current compliance interval the following DataNodes have an undetermined compliance status: <ul style="list-style-type: none"> Edison SE 5560

click any DataNode hyperlink to view specific DataNode information

DataNode Status

You can select the DataNode Status from either the linked text on the Home Page, or by selecting the Setup tab and clicking on the desired DataNode site in the tree directory. This page provides information about specific DataNodes connected to the Encore Series Software. This includes DataNode *Description*, the *Last Connection* made, the *Next Connection* to be made, *Connection Status*, DataNode site *Health* status, DataNode *Model* type, *Serial number*, and software *Version*.

Quality of Supply (QOS) Compliance

NOTE: Information on QOS Compliance only appears when a QOS-data acquisition module is installed i.e. the 5560 DataNode, 61000 PQ DataNode, or 61000 Voltage DataNode.

The Home page reports Quality of Supply compliance status for the latest complete evaluation period of each DataNode. Information about QOS compliance appears in two parts of the Home page: the DataNode status paragraph and the DataNode status table.

Compliance Message on DataNode Status Paragraph

An additional message on QOS compliance is appended to the DataNode Status. Sample messages include “There is one DataNode for monitoring Quality of Supply Compliance. This DataNode is reporting non-compliance”. Like other DataNode messages in the status paragraph, the compliance message is hyperlinked to the Quality of Supply Compliance section in the DataNode status table.

Compliance Message on DataNode Status Table

An additional section showing the compliance status of DataNodes is added to the DataNode status table. The table indicates which DataNodes are in compliance, not in compliance, or have undetermined compliance status for the specified interval. DataNodes that are non-compliant are hyperlinked to the QOS Status view.

Encore Series Software Information

This table provides the following information about the Encore Series Software: *Name*, *Description*, *Model*, *Serial number*, *Firmware version* containing the different support packages installed in the software, and *Uptime* duration.



Help

Much of what is written in this manual can be found in the Help option onscreen. Expanding the Help tree will produce Introduction and Index links.



Introduction

The Introduction page orients users that they are currently viewing the Home page. Four active buttons are found in this page: Contents, Index, <<, and >>. These buttons present different ways to access the same Help information. The differences lay only in the way each button organizes and lists information.

The >> button brings the user forward to the next linked page. It covers information across pages in all tabs, not just the Home tab. Some pages have hyperlinks which contain further detailed information on the topic.

The << button brings the user backward to the previously linked page. It helps the user scan for information quickly and easily through the linked pages.



Index

The Index page operates exactly like the Index portion of a book. Information is listed and categorized in alphabetical order. Click any button from A to Z to show various related topics under each letter. The topics are featured as hyperlinks.

The Contents button operates exactly like the Table of Contents in books. Information is listed and organized under different headings. The headings normally used here are the menu tab names. Sub-topics per heading appear as hyperlinks.

This page intentionally left blank.

This chapter describes the various interactive graphical display screens formatted primarily for viewing data through the browser, as opposed to printing out. If you want to generate reports in print format, please select the Reports tab and turn to Chapter 5 *Reports Page*.

General Procedures In Making Queries

The Views and Reports tabs both use a common Query section where you select whether to display graphs or reports in a new window or an existing window, select which DataNodes are to be included in the presentation, and over what time period to select the data from. To arrive at your desired information, follow the designated procedures below:

To Select Multiple DataNodes - keep the Control key depressed while using the mouse and its left button to select the DataNodes of choice.

NOTE: This option functions for all Views and Reports except the Timeline.

To Select the Time Range - select one of thirteen pre-formatted time-range radio buttons, or enter any valid starting and ending time/date range. Pre-filtered Time Ranges and their definitions include:

All Time - first event in memory to last event

Last Hour - previous hour from present time

Today - from 00:00 midnight of the present day until the present time

Yesterday - the 24 hour period ending at 00:00 midnight of present day

Last 48 Hours - previous 48 hours from present time

This Week - from 00:00 of Sunday of the present week until the present time

Last 7 Days - previous 7 days plus the current day until the present time

Last 14 Days - previous 14 days plus the current day until the present time

Last 30 days - previous 30 days plus the current day until the present time

This month - from 00:00 of the first day of the month until present day

Last month - from 00:00 of the first day of the previous month until 00:00 of the first day of the current month

This year - from January 1 of the present year until the present day

Last year - from January 1 to December 31 of the previous year

To Customize Time/Date Ranges - enter the starting and ending month/day/year as well as hour/minute/second in the format selected in the Setup page (i.e. European date format, 24 hour military time, etc.)

Views Page

The Views page offers three ways to display data sourced from the DataNode settings. First is through the QOS Status which displays data relative to quality of supply compliance. QOS Status appears in Encore Series systems that have 5560, 61000 PQ-configured, or 61000 Voltage DataNodes in use. See Chapter 7 Setup Page - Quality of Supply for more information. Second is through Timeline, featuring graphs of user-selected parameters over user-selected time periods. Third is through the Smart Views featuring different views of data that have been pre-filtered or specified based on typical uses of other Dranetz products. These include magnitude-versus-duration graphs, lists of all events or only those events that are classified by IEEE 1159 as rms variations or transients.

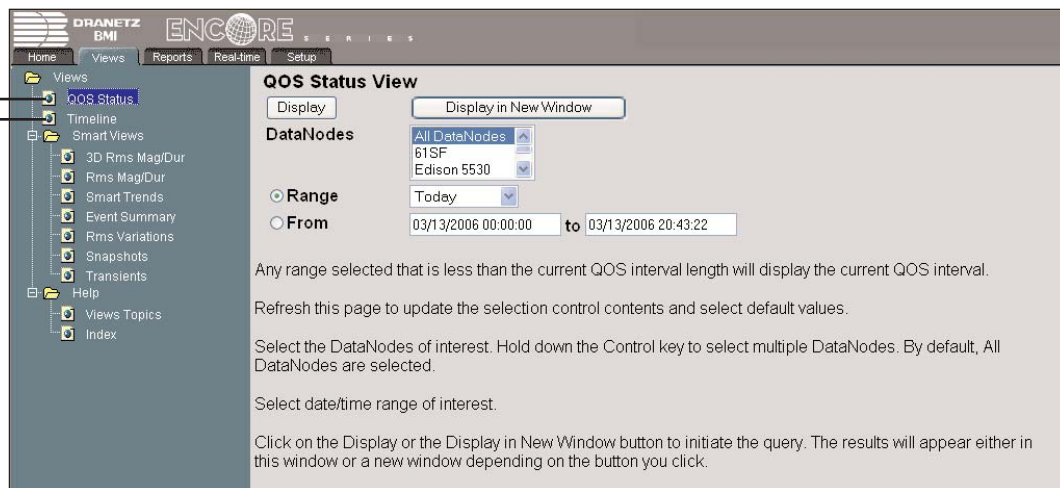
The left window pane contains the tree directory which presents the QOS Status, Timeline, Smart Views and Help options. Clicking on any Timeline or Smart View option will direct you to a common Query Section

screen. The Query section is used to select which specific DataNode you want to view as well as the Time/Date Range when that particular DataNode information was captured. Once you have made those selections, click on either the *Display* or *Display in New Window* button to view the information that you are interested in.

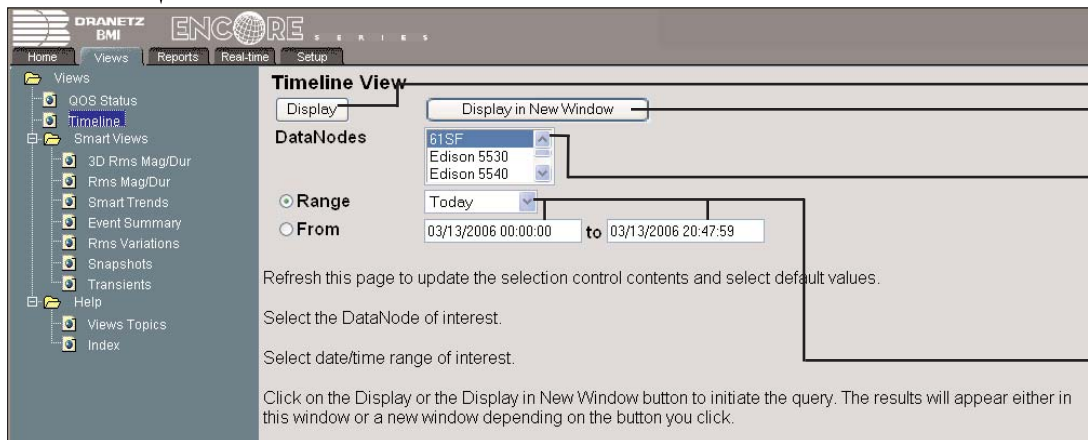
The Timeline option displays a graph of user-selected parameters over a user-selected time period. For some parameters, the minimum, maximum and average values are plotted, along with event markers that indicate detailed waveform information also available at that specific time. The lower portion of the screen displays a list of events recorded over that time period.

Smart Views are similar to Reports of the same name, except that they are designed to be viewed onscreen instead of printed out. Smart Views selections include: 3D Rms Mag/Dur (Magnitude-and-Duration), Rms Mag/Dur, Smart Trends, Event Summary, Rms Variations, Snapshots, Transients.

Displays QOS Status query screen



Views Page



Query Section screen

click to display Timeline View in existing window
 click to display Timeline View in a new browser window (see page 4-3)
 click desired DataNode(s) to view
 set time period of data to view

Timeline

Once the DataNodes and time ranges have been selected, you can select the *Display* or *Display in New Window* button to create a plot of one or two specified parameter(s) on the vertical axis and the time range on the horizontal axis. This plot is the Timeline View, which consists of two areas: the Timeline Graph (top) and the Event List/Detail (bottom). Click and drag the horizontal line that separates the two areas to enlarge either of them.

Timeline Graph

The Timeline graph is auto-scaled to use the maximum amount of space for viewing the data. Key features of the timeline graph include:

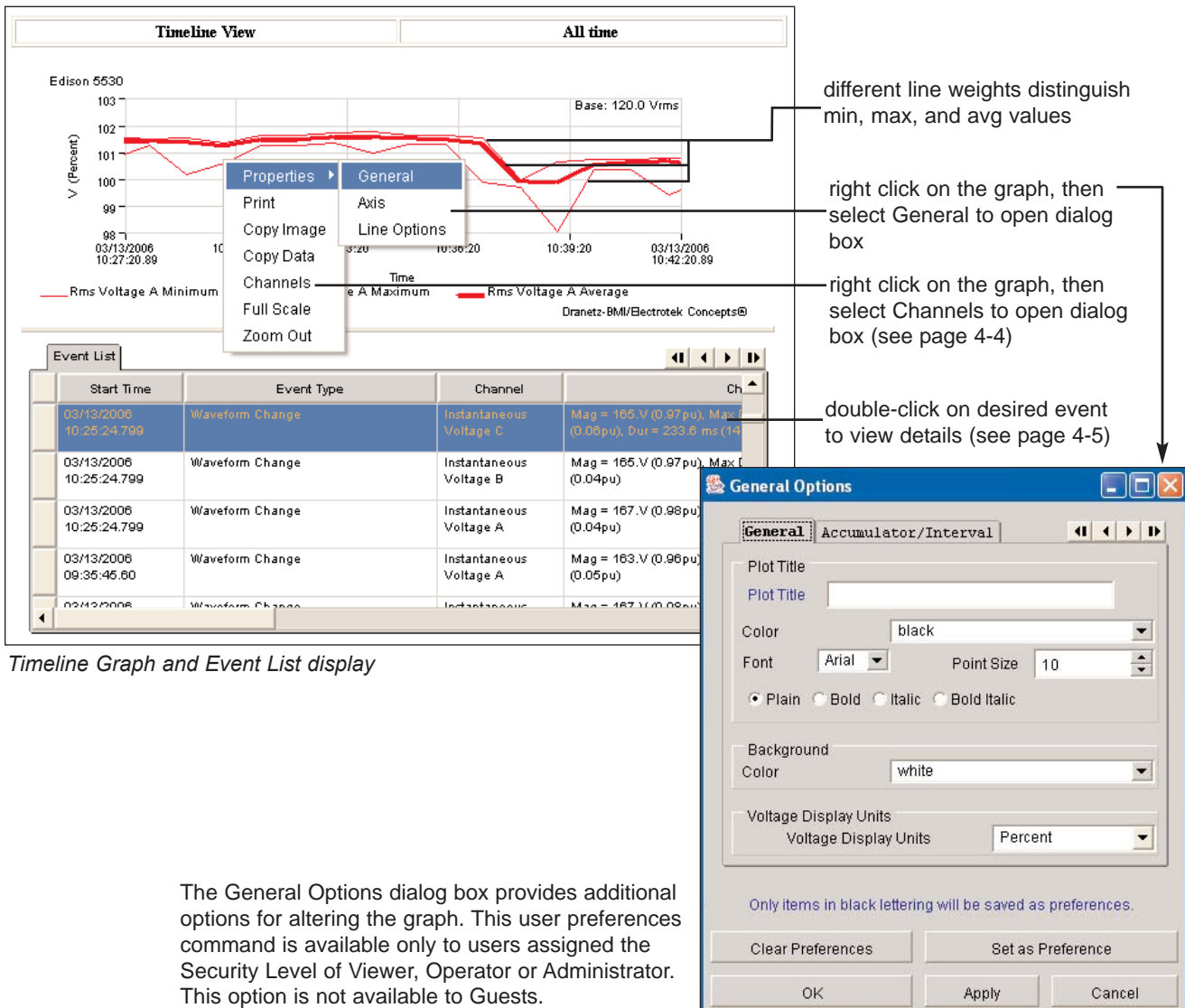
1. Graphs of the minimum, average and maximum values of the parameter over a user selectable time interval are simultaneously displayed. The default average value has a

heavier line weight to distinguish it from the min/max lines.

2. Graphs will show any timed readings, limit crossing or threshold triggered events that occurred during the selected time range. These are indicated by an Event Marker on the horizontal time axis. Click on the event marker to display the Event Detail in the lower portion of the screen.

3. Graphs support zooming via a rectangle drag.

Zooming in on specific data can be done in both the horizontal and vertical axis. Position the cursor into the graph area at one of the corners of the area of interest and depress the left mouse button while dragging the cursor towards the opposite corner of the area of interest. A box will appear as the mouse is moved, indicating the area being selected. Once the selection is complete, release the left mouse button. The display will be resized to show the area of interest.



Timeline Graph and Event List display

The General Options dialog box provides additional options for altering the graph. This user preferences command is available only to users assigned the Security Level of Viewer, Operator or Administrator. This option is not available to Guests.

4 Views Page

4. Graphs support a right mouse button context menu that displays additional options for altering the graph:
General Properties of the Timeline - will allow you to change the title of the graph, font type, font size, background color, and whether parameters are displayed in units of % or magnitude. In addition, accumulated data such as Energy can be set for display on an internal basis, in accumulated values, or as a normalized accumulated graph.

Axis Properties for the Timeline - will allow you to change the title, fonts, scaling for the horizontal time axis, label characteristics for the vertical axis, and grid color.

Print - will print to specified printer.

Copy Image - will save the displayed timeline to a new window clipboard as a GIF file. This can then be saved to any folder using the standard browser File|Save As... command.

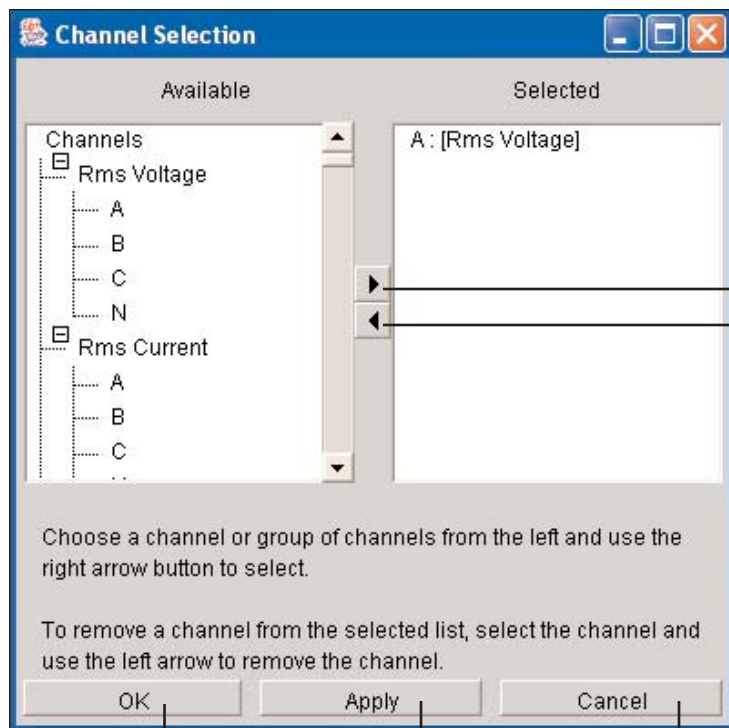
Copy Data - will allow you to copy the data that makes up the graph to the clipboard. Data can then be pasted into applications such as Excel.

Channels - channels to be displayed can be selected from the expanding tree.

Full Scale - will return to the original, unzoomed data.

Zoom Out - will undo the previous zoom.

To Add/Remove Channel-Parameters: The Channel Selection box below allows the user to add or remove channels/parameters from the graph. If there is a plus sign [+], then you can click on the plus sign to further expand the tree to show more options available. A minus sign [-] shows that the tree directory has already been fully expanded. Clicking on the minus sign will collapse the tree back up one level.



To display an additional parameter for a specific channel, expand the tree to the necessary detail and then click on the item. Click on the right arrow in the middle to move the channel-parameter to the list of displayed data.

To move all channels of a given parameter at once to the display list, highlight the parameter (rather than the individual channel) then click on the right arrow key.

To remove a channel-parameter from the display list, highlight the parameter from the table on the right side then use the left arrow to move it out of the display list.

Once the selections have been made, click on the APPLY button to see the results without exiting the selection window. OK will exit the selection window and apply the changes. CANCEL will exit the window without applying the selection changes.

Event List/Detail

The Event List shows a tabular display of the limit crossing or threshold triggered events that are displayed in the timeline (see display screen below). The data associated with an event depends on the type of DataNode and type of event. Key features of the Event List/ Detail include:

1. The Event List table shows the *Time/date* of start of event recording, *Event Type*, *Channel* (phase), and *Characteristic* (description) of the event. The description may contain additional information, such as minimum/maximum values, duration, frequency and category.

NOTE: Event summary time refers to the time of start of event recording, not the time of event. The actual event will be some time offset from the time of event recording, based on how many pre-trigger cycles the user has specified.

2. Events are listed from most recent to oldest.

NOTE: If there are a very large number of events in the range selected, only the most recent 250 events are listed.

3. To step through the events or to jump to the start or end

of the list, click on the arrow keys in the upper right hand corner of the list. Use the horizontal and vertical scroll bars to pan through the Event Listing table. Click on the field descriptor on the top of the table to sort by that particular field, instead of chronological order.

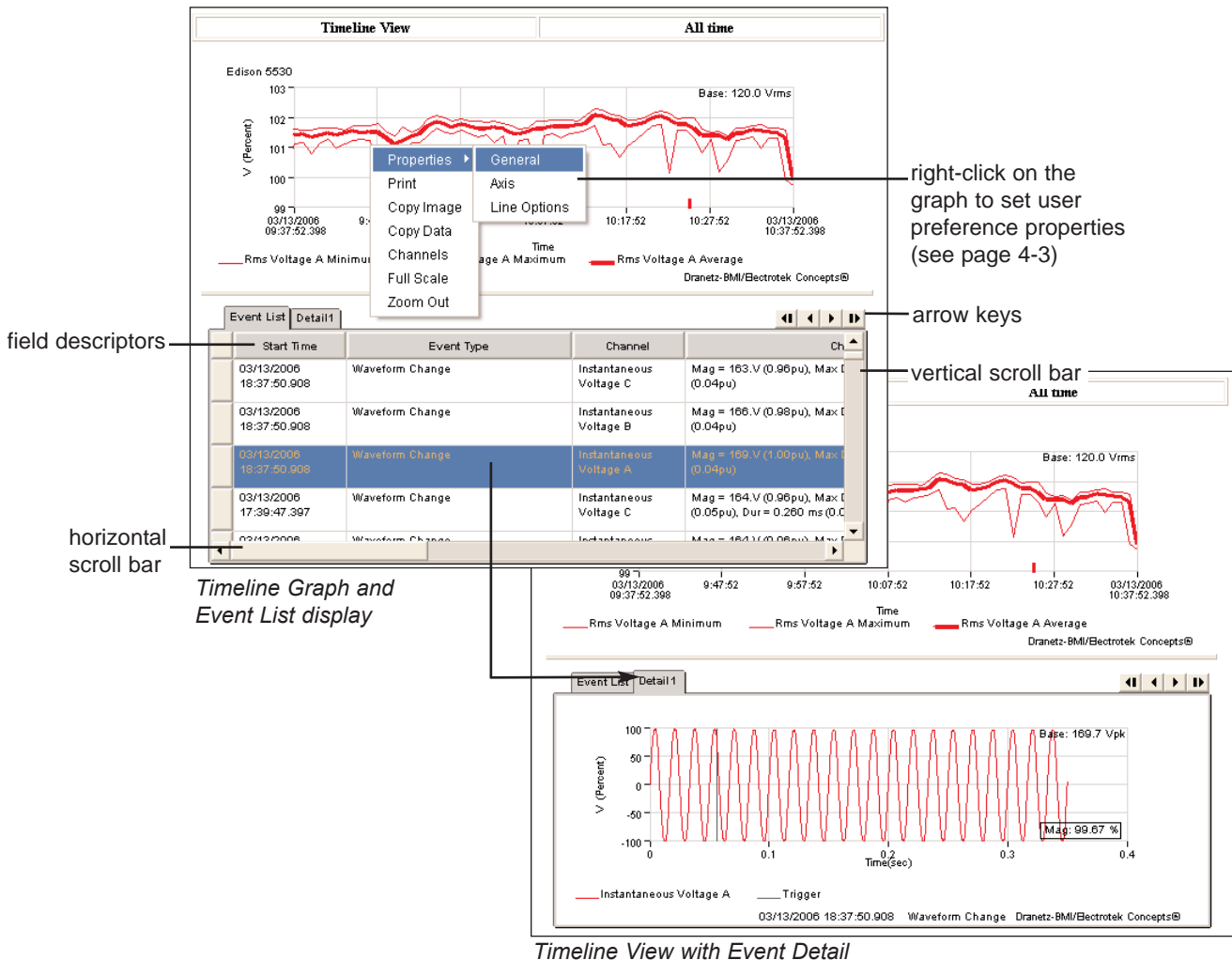
4. If there are Event Details or waveforms associated with those events, they can be displayed in additional tabs. Double click on the row containing the event of interest. This will produce additional tabs showing the event details.

5. The event detail viewer supports overlay of multiple channels with left and right axes.

6. You can zoom on the waveform by using the left mouse button as was done in the Timeline Graph section.

7. Click the right mouse button with the cursor in this display area to produce a similar menu to the Timeline Graph section to allow you to change the properties of the graph, as well as save the image.

8. Click on the arrow keys in the upper right corner to step through the available waveforms.





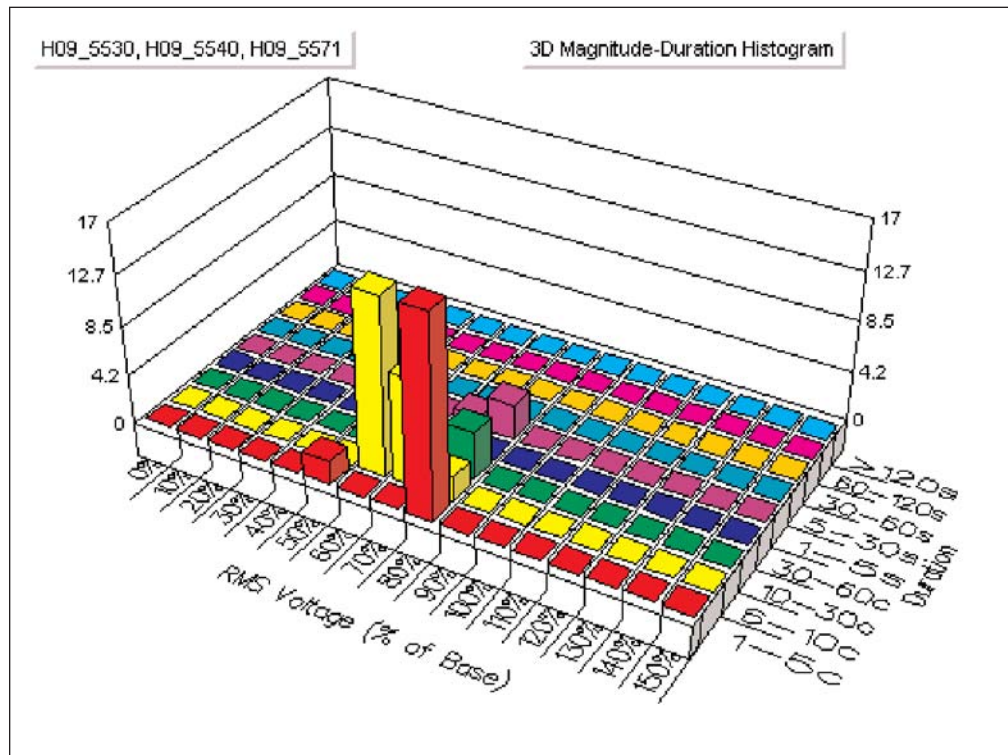
Smart Views

There are a number of different views of the data that have been specified by type. These include magnitude-versus-duration graphs, lists of all of the events, or lists of events that are classified by IEEE 1159 as rms variations or transients. The same Query Section in the Timeline appears to allow you to select what date/time range and which DataNodes are to be included in the views.



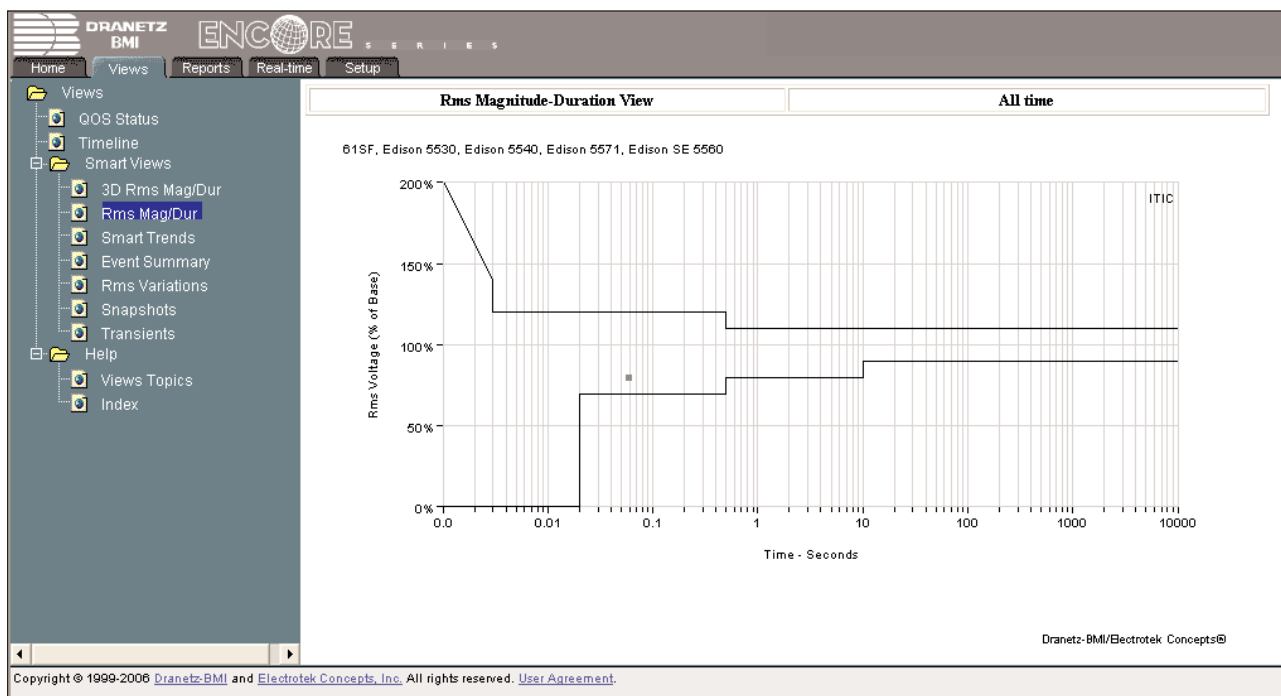
3D Rms Mag/Dur View

3-D Mag-dur graphs show the number of rms variations of a specified range of magnitude and duration, also called bins. For example, an RMS variation with a magnitude of 80-90% of nominal and 1-5 cycles in duration is one bin, whereas 80-90% and 10-30 cycles is another, 70-80% and 10-30 cycles is another, and so on. Each time that the characteristics of an rms variation match the criteria of the bin, the counter is incremented. Certain types of phenomena are typically found in certain bin groupings such as: sags cleared by fuses versus sags cleared by breaker operations; versus sags caused by the starting of large horsepower motors; versus the swells caused by loads being turned off and the response time of the automatic tap changer. In the 3-D mag dur graph, it is a quick visual way to see what category most of the disturbances fall into. This helps determine the source of the disturbance.



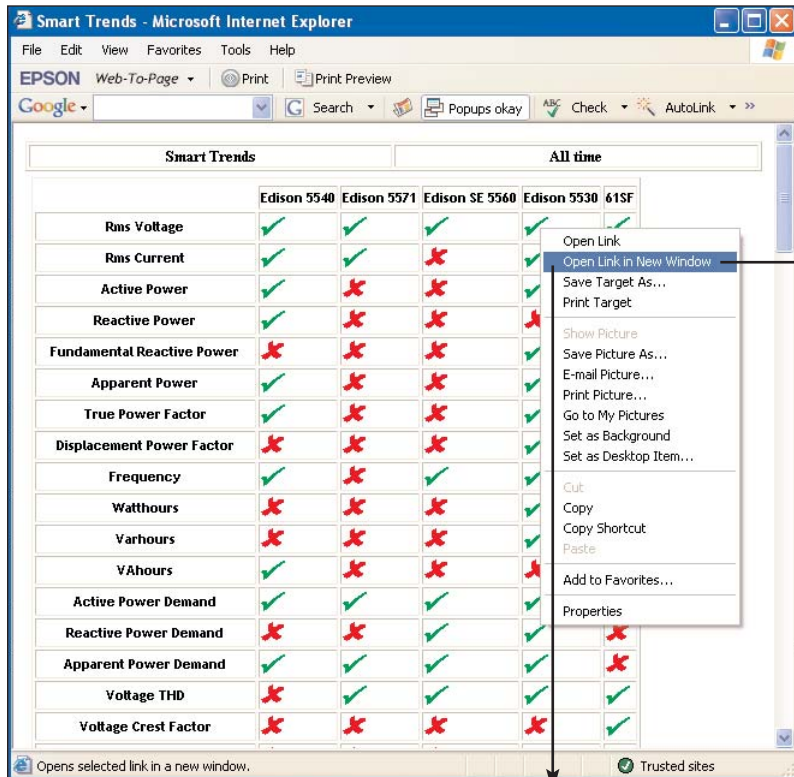
Rms Mag/Dur View

The Rms Magnitude-and-Duration graph is a plot of the magnitude of the event versus duration of the event with the time plotted on a logarithmic scale. A data point is plotted for each event and the graph is overlaid with equipment susceptible or safe-operating type curves, such as the ITIC curve or CBEMA. Events that fall between the two curves will not usually cause equipment to malfunction (equipment with a similar set of susceptibles to those used to develop the curve), whereas those outside the limits are likely to cause problems.

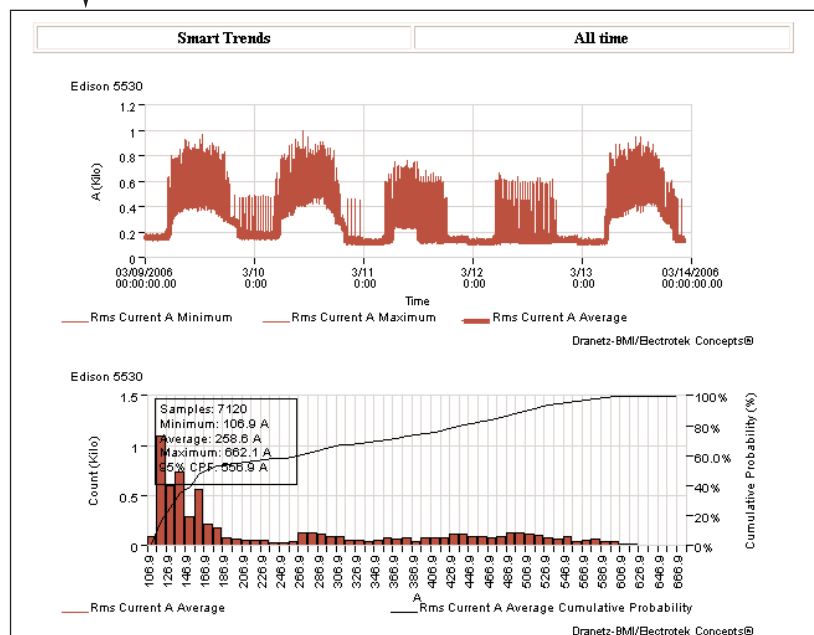


Smart Trend

Smart Trend will display a timeline type graph for a large range of parameters, based on the type of DataNode and which parameters were saved for trending. After using the standard query to select the DataNodes and time/date range, a display of all possible parameters that can be trended is shown. Clicking on a green check mark onscreen will trend that parameter for the selected phase and will also show a histogram of the different values with a cumulative probability line. Red X marks onscreen indicate that the particular parameter is not available for trending. See sample display screens below.





Two ways to view trend displays:
Left-click on the check mark of the parameter you want to trend;
OR
Right-click on the check mark to display this drop down menu, then click Open Link/Open Link in New Window to view trend display



Event Summary

The Event Summary table seen below is a listing of the newest to oldest events in memory of the Encore Series for the DataNode selected. The data contained in the table include the: Event Time/Date, Monitor that recorded the event, Event Type, Phase (channel), and event Characteristics as found in the Event List details. Click the Event Time/Date (in hyperlinks) to display the Event Details.

 					
Home Views Reports Real-time Setup					
Views QOS Status Timeline Smart Views 3D Rms Mag/Dur Rms Mag/Dur Smart Trends Event Summary Rms Variations Snapshots Transients Help Views Topics Index					
04/13/2006 10-07-01.70	61SF-SE	Instantaneous Sag	Rms Voltage B	Mag = 75.7 (0.63pu), Dur = 818.5 ms (49.11 cyc.), Category = 3	
04/13/2006 10-07-01.70	61SF-SE	Instantaneous Sag	Rms Voltage A	Mag = 69.7 (0.57pu), Dur = 183.8 ms (11.03 cyc.), Category = 3	
04/13/2006 10-07-01.44	Edison 5571	Transient	Instantaneous Voltage A	Mag = 166.6V (0.57pu), Max Deviation (Peak-to-Peak) = 16.2V (0.06pu)	
04/13/2006 10-07-00.00	61SF-SE	Momentary Sag	Rms Voltage C	Mag = 97.7 (0.81pu), Dur = 708.6 ms (42.51 cyc.)	
04/13/2006 10-07-00.00	61SF-SE	Momentary Sag	Rms Voltage B	Mag = 100.7 (0.83pu), Dur = 700.2 ms (42.01 cyc.)	
04/13/2006 10-06-54.02	Edison SE 5560	Waveform Change	Instantaneous Voltage C	Mag = 124.7 (0.01pu), Max Deviation (Peak-to-Peak) = 8.7 (0.00pu)	
04/13/2006 10-06-54.02	Edison SE 5560	Waveform Change	Instantaneous Voltage B	Mag = 100.7 (0.01pu), Max Deviation (Peak-to-Peak) = 11.7 (0.00pu)	
04/13/2006 10-06-54.02	Edison SE 5560	Waveform Change	Instantaneous Voltage A	Mag = 112.7 (0.01pu), Max Deviation (Peak-to-Peak) = 22.7 (0.00pu)	
04/13/2006 10-06-53.90	Edison SE 5560	Waveform Change	Instantaneous Voltage C	Mag = 129.7 (0.01pu), Max Deviation (Peak-to-Peak) = 4.7 (0.00pu)	
04/13/2006 10-06-53.90	Edison SE 5560	Waveform Change	Instantaneous Voltage B	Mag = 115.7 (0.01pu), Max Deviation (Peak-to-Peak) = 7.7 (0.00pu)	
04/13/2006 10-06-53.39	Edison SE 5560	Waveform Change	Instantaneous Voltage C	Mag = 123.7 (0.01pu), Max Deviation (Peak-to-Peak) = 43.7 (0.00pu)	
04/13/2006 10-06-53.39	Edison SE 5560	Waveform Change	Instantaneous Voltage B	Mag = 97.7 (0.01pu), Max Deviation (Peak-to-Peak) = 39.7 (0.00pu)	
04/13/2006 10-06-53.35	Edison 5530	Momentary Sag	Rms Voltage C	Mag = 75.7 (0.63pu), Dur = 816.6 ms (49.00 cyc.), Category = 3	
04/13/2006 10-06-53.35	Edison 5530	Momentary Sag	Rms Voltage B	Mag = 59.7 (0.50pu), Dur = 816.6 ms (49.00 cyc.), Category = 5	

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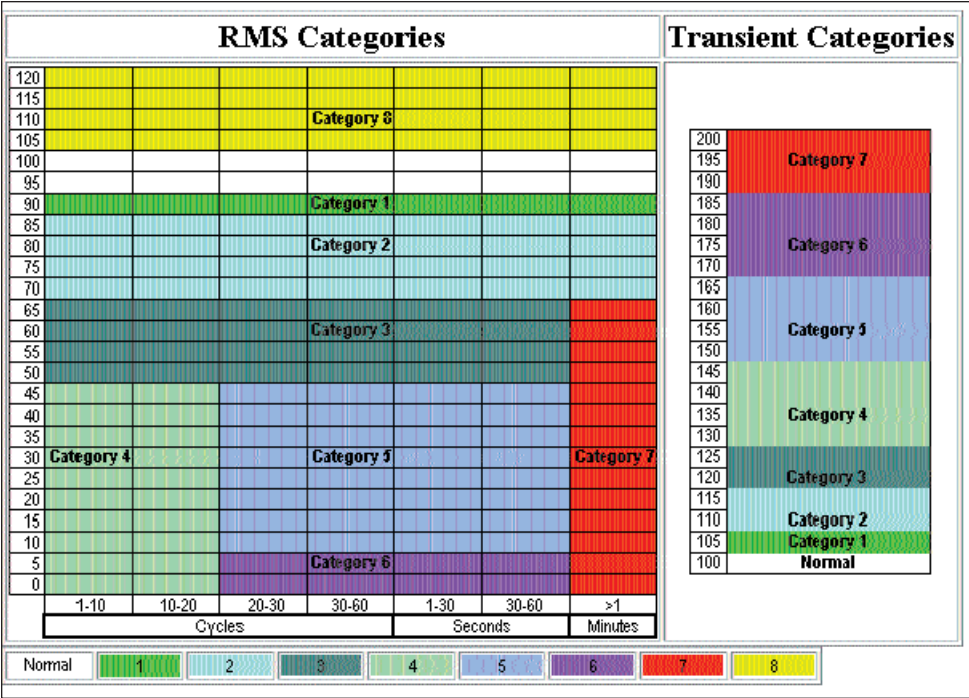
The event Characteristics include magnitude, duration, frequency, and category. The categories are defined according to the graph explained next.

NOTE: If there are too many events in the selected range to be displayed in a timely manner, the most recent 500 events will be displayed along with the message “more data is selected than can be displayed”. This also applies to any of the other Views.

Rms Variations

The Rms Variations table is a filtered version of the Event List. It includes only those events of rms variation type (sags, swells, and interruptions).

4 Views Page



Definition of the Category Event Characteristic

Snapshots

Some DataNodes have the ability to periodically save a specified number of cycles of the voltage and/or current waveforms from one or more phases. These recordings are known as snapshots and they can be viewed by the user, similar to selecting a specific event in the Event Summary (see page 4-9).

Transients

The Transients table is a filtered version of the Event List; only those events of Transient type are included.

Refer to Chapter 7 *Setup Page, Answer Module* section, for further discussions on the above topics.

Help

Much of what is written in this manual can be found in the Help option onscreen. Expanding the Help tree will provide Views Topics and Index links.

Views Topics

The Views Topics page simply says that the user is currently in the Views page. Four active buttons are found in this page: Contents, Index, <<, and >>. These buttons

present different ways to access the same Help information. The differences lay only in the way each button organizes and lists information.

The >> button brings the user forward to the next linked page.

The << button brings the user backward to the previously linked page.

Index

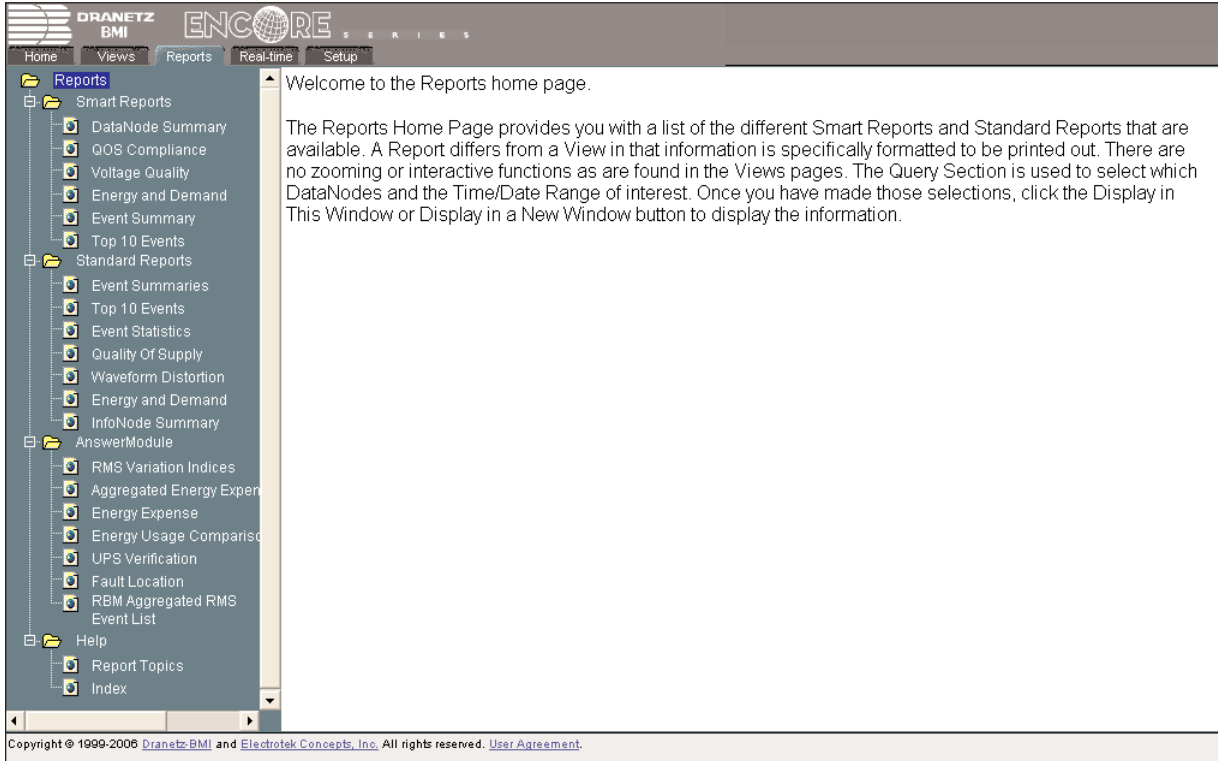
The Index page operates exactly like the Index portion of a book. Information is listed and categorized in alphabetical order. Click any button from A to Z to show various related topics under each letter. The topics are featured as hyperlinks.

The Contents button operates exactly like the Table of Contents in books. Information is listed and organized under different headings. The headings normally used here are the tab names. Sub-topics per heading appear as hyperlinks.

This chapter describes the different types of reports that users can generate using the Encore Series Software. It explains how reports can be customized to suit the preference and needs of individual users.

Reports Page

The Reports home page shown below displays a list of the different Smart Reports, Standard Reports, and Answer Module reports that are available. If a QOS DataNode is in use, the Quality of Supply Compliance smart report will also be included.



Reports home page

A Report differs from a View in couple of ways. If a report contains multiple sections then the report will contain a Table of Contents. The Table of Contents provides a summary of what is in the report, and it provides a quick method for getting to a particular section of the report thru a hyperlink. A sample Table of Contents can be found next page. The Reports do not allow for interactive functions, but they will always be printed in their original form. The Views should be used for interactive functions.

5 Reports Page



Sample Table of Contents

Smart Reports

Smart Reports provides several types of reports and allows only minimal pre-filtering. The query setup for all Smart Reports is identical. The only variance between the reports is that some allow the selection of multiple DataNodes. The query setup screen seen next page is similar for all Smart Reports with its respective title.

DataNode Summary

The DataNode Summary Smart Report is a listing of information about a selected DataNode over the specified time period. This report includes Rms Variation Summary, Transient Summary, Monitor Status, DataNode Log, and the DataNode Setup.

QOS Compliance

The QOS Compliance Smart Report will generate tables and graphs indicating voltage compliance information as recorded by the QOS DataNodes selected. For example, for 5560 DataNode which monitors and reports QOS compliance as specified by EN50160, the following reports are presented: Compliance Summary, Compliance Graph, Event Statistics, Harmonics Graph, Interharmonics Graph, Power Frequency Graph, and Min/Max Tables. See page 10-11.

Voltage Quality

The Voltage Quality Smart Report consists of a series of timeplots of available voltage phases, along with event summaries, histograms of event magnitudes, a Mag/Dur curve, and a 3D Mag/Dur curve.

Energy and Demand

The Energy and Demand Smart Report consists of trends, tables, and histograms for demand and energy parameters.

Event Summary

The Event Summary Smart Report consists of a table of events that occurred within the date/time that were selected for the query. This report allows for the selection of multiple DataNodes. Events are displayed in chronological order with the most recent event appearing first.

Top 10 Events

The Top 10 Events Smart Report is similar to the Event Summary Smart Report, except that it groups the events by type (sags, swell, interruptions, and transients) and only includes the 10 most severe events of each type. The severity of the events is based on their category. Events of each type are displayed in chronological order with the most recent event appearing first.

DataNode Summary Report

DataNodes

Analyzer 1
cee modem test
IP.243.5530.Delta.60Hz

☒ **Range**

Today

☐ **From**

03/18/2006 00:00:00 to 03/18/2006 08:41:34

☐ Specify Report Headings

Refresh this page to update the selection control contents and select default values.

Select the DataNode of interest.

Select date/time range of interest.

Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.

Smart Reports Query Selection

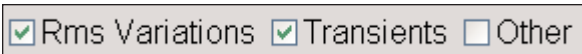
5 Reports Page

Standard Reports

Standard Reports provide the user with a greater ability to customize the contents of each report. The Smart Reports Query Setup is also used for the standard reports, with each Standard Report adding query parameters that are specific to its report type.

Event Summaries

The Event Summaries Report of the Standard Reports is very similar to that of the Smart Reports. The Standard Report version allows the user to select which event types will be included in the report. The user selects the types of events they want included in the report by checking the box(es) next to the desired event type(s). See figure below.



☒ Rms Variations ☒ Transients ☐ Other

Event Summaries Specific Query Setup

Top 10 Events

The Top 10 Events Report of the Standard Reports is very similar to that of the Smart Reports. The Standard Report version allows the user to select the method or criteria for determining which events will be included in the report. The method options are magnitude, duration, area, or category. The user may specify whether to include sags, swells, and/or transients. The user may also select to include time plots of only the triggered phase, the worst phase, or all monitored phases. See figure below for the additions to the Query Setup for this report.

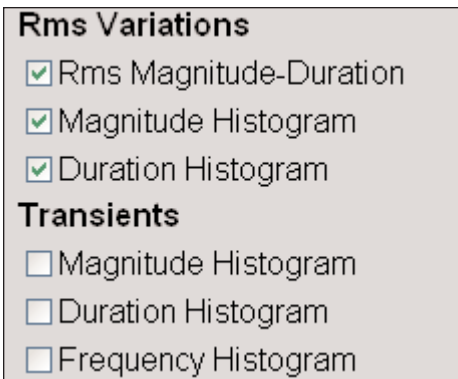


Method:
Include: ☒ Plots ☐ Sags ☒ Swells ☒ Transients
Display:

Top 10 Events Specific Query Setup

Event Statistics

Event Statistics Report is a series of statistical analysis reports that you select for Rms variations and/or transients. The selections are shown in the following figure.



Rms Variations
☒ Rms Magnitude-Duration
☒ Magnitude Histogram
☒ Duration Histogram
Transients
☐ Magnitude Histogram
☐ Duration Histogram
☐ Frequency Histogram

Event Statistics Specific Query Setup

Rms Variations

Rms Mag-Dur - a plot of the magnitude of the event versus duration of the event. A data point is plotted for each event, and the graph is overlaid with equipment susceptible or safe-operating type curves, such as the ITIC curve or CBEMA.

Magnitude Histogram - the magnitude of the rms variation versus the number of occurrences as a bar chart, with a cumulative frequency occurrence line graph overlaid.

Duration Histogram - the duration of the variation versus the number of occurrences as a bar chart, with a cumulative frequency of occurrence line graph overlaid.

Transients

Magnitude Histogram - the magnitude of the transient versus the number of occurrences as a bar chart, with a cumulative frequency occurrence line graph overlaid.

Duration Histogram - the duration of the transient versus the number of occurrences as a bar chart, with a cumulative frequency of occurrence line graph overlaid.

Frequency Histogram - the principal frequency of the transient versus the number of occurrences as a bar chart, with a cumulative frequency of occurrence line graph overlaid.

Quality of Supply

The Quality of Supply Report is an analysis of voltage compliance information as recorded by the QOS DataNode, i.e. 5560 DataNode which monitors voltage compliance as specified by compliance limits such as the EN50160 Standard. The user may select from an analysis of the Voltage Regulation and Frequency. The user may also select the presentation of the data in trend and/or histogram form. The selections available are shown below.

Data to Plot:	
<input checked="" type="checkbox"/> Regulation	<input checked="" type="checkbox"/> Frequency
Plot Types:	
<input checked="" type="checkbox"/> Trend	<input checked="" type="checkbox"/> Histogram

Quality Supply Specific Query Setup

Waveform Distortion

The Waveform Distortion Report is an analysis of harmonics. The user may select which data type at which components they would like to include in the report. The user may select Voltage THD (Total Harmonic Distortion) and/or IEEE 519 Current TDD. The user may select to present the data in trend and/or histogram form. The selections available are shown below.

<input checked="" type="checkbox"/> Harmonics Components	3,5,7,11,13	
<input checked="" type="checkbox"/> THD	<input type="checkbox"/> TDD	
<input checked="" type="checkbox"/> Voltage	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Neutrals
<input checked="" type="checkbox"/> Trend	<input checked="" type="checkbox"/> Histogram	

Waveform Distortion Specific Query Setup

Energy and Demand

The Energy and Demand Report of the Standard Reports is very similar in content to that of the Smart Reports. The Energy and Demand Report will allow you to produce a trend, table and/or histogram for demand and energy. An additional feature of the Standard report version is that the user may include Power data. The user

may elect to include real, imaginary, apparent power, displacement power factor and true power factor calculations in a trend and/or histogram form. The selections available are shown below.

<input checked="" type="checkbox"/> Demand	
<input checked="" type="checkbox"/> Trend	
<input type="checkbox"/> Demand Summary Table	
<input checked="" type="checkbox"/> Demand Exception Table	
<input type="checkbox"/> Per Phase	<input checked="" type="checkbox"/> Total
<input checked="" type="checkbox"/> Energy	
<input checked="" type="checkbox"/> Trend	
<input type="checkbox"/> Per Phase	<input checked="" type="checkbox"/> Total
<input checked="" type="checkbox"/> Net	<input type="checkbox"/> Fundamental
<input type="checkbox"/> Forward	<input type="checkbox"/> Reverse
<input checked="" type="checkbox"/> Power - P, Q, S, DPF, TPF	
<input checked="" type="checkbox"/> Trend	
<input type="checkbox"/> Per Phase	<input checked="" type="checkbox"/> Total
<input checked="" type="checkbox"/> Net	<input type="checkbox"/> Fundamental

Energy and Demand Specific Query Setup

InfoNode Summary

The InfoNode Summary table is a listing of the oldest to newest administrative activity recorded by the InfoNode. The table includes the following data:

Entry Time - the time that the logged activity occurred.

Entry - a name for the activity, such as "User login" or "DataNode added".

User - identifies who carried out the activity.

Source Name - the part of the system affected by the activity that could be the name of a user or a DataNode.

Description - provides additional information about the entry. For example, if the Entry is "DataNode communication OK", then the Description could be "System health is normal".

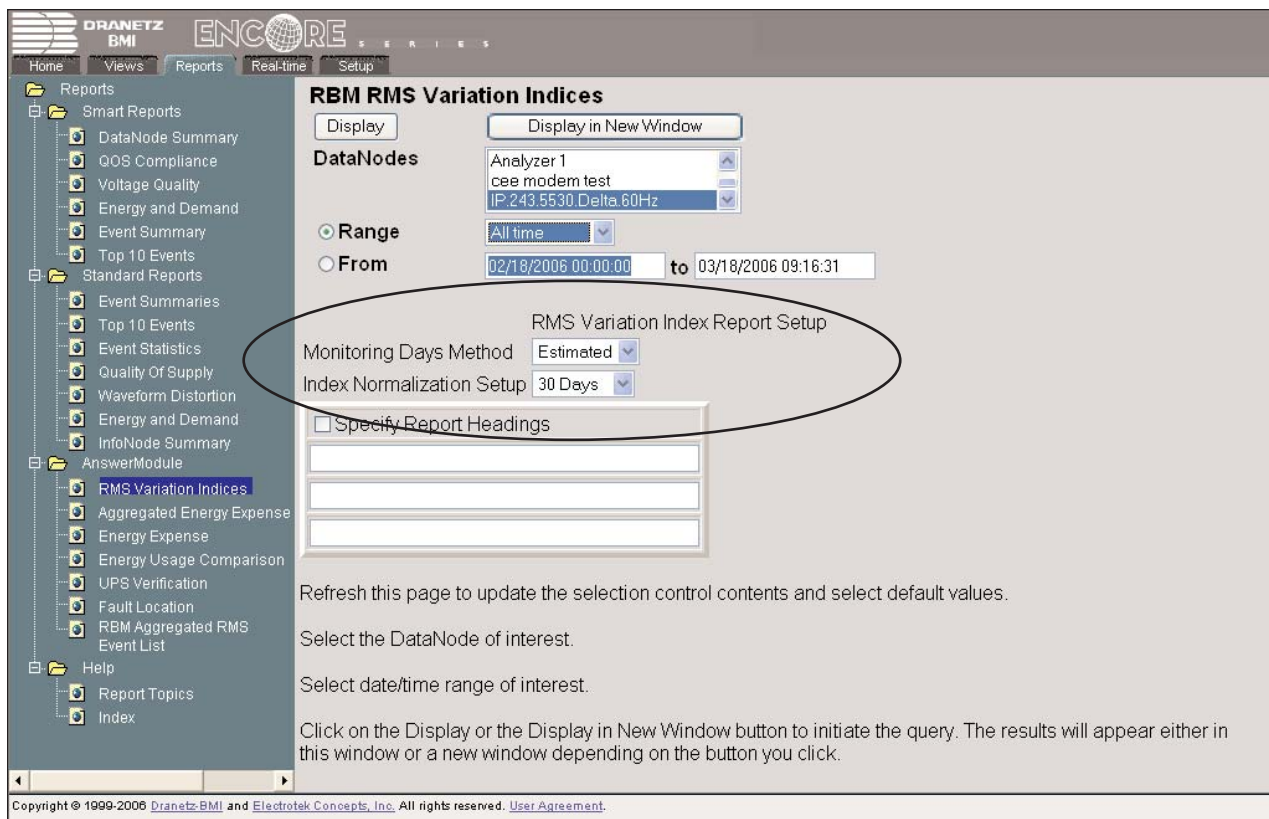
5 Reports Page

Answer Module

Some Answer Modules provide information via a separate report. Other Answer Modules may just add characteristics to the events that are displayed in the event summary table, such as direction of disturbance. Answer Modules that create a separate report will be covered in this section.

Rms Variation Indices

The query information required for the Rms Variation Indices is very similar to all other reports. First, select the DataNode of interest and then select the time range. The query setup for this report requires that two additional parameters be set. The query setup specific to this report is shown below.



The screenshot shows the 'RBM RMS Variation Indices' setup screen. The left sidebar lists various reports under 'Reports', 'Smart Reports', 'Standard Reports', 'AnswerModule', and 'Help'. The main content area is titled 'RBM RMS Variation Indices' and includes buttons for 'Display' and 'Display in New Window'. Below these are fields for 'DataNodes' (Analyzer 1, cee modem test, IP: 243.5530.Delta.60Hz), a 'Range' radio button selected, and a time range from '02/18/2006 00:00:00' to '03/18/2006 09:16:31'. A red circle highlights the 'RMS Variation Index Report Setup' section, which contains 'Monitoring Days Method' set to 'Estimated' and 'Index Normalization Setup' set to '30 Days'. There is also a checkbox for 'Specify Report Headings' and a section for 'Refresh this page to update the selection control contents and select default values.' with instructions on how to use the buttons.

Setup Screen for RMS Variation Indices Report

Monitoring Days Method

Many of the EPRI RBM Rms variation indices provide frequency of occurrence information or rates of occurrence. The EPRI RBM technical report, TR-107938, discusses in detail the necessity of normalizing these rates based on the data upon which the indices are calculated. There are two normalization methods: "Estimated" and "None (No Normalization)".

Estimated

The "Estimated" normalization method algorithm estimates the number of days a monitor is considered on-line by calculating the number of days between the 'From' and 'To' dates specified on the Date and Time Selection of the report setup.

None (No Normalization)

The "No Normalization" method results in a count rather than a rate. Thus, all frequency of occurrence indices calculated using this normalization method are counts of all aggregate measurements occurring during the specified time period.

Index Normalization Setup

The Normalization Rate control designates the time period (number of day's data) to which the rate indices are normalized. If the Normalization Method control is set to "None", there is no rate used so the Rate control is disabled.

This report is generated using the RBM Aggregation Parameters and the query information described above. For more information on the RBM Aggregation Parameters see page 7-37 of Chapter 7 *Setup Page*. The RBM Sag Index Report calculates the indices listed below for 90%, 80%, 70%, 50%, and 10% voltage thresholds.

NOTE: SARFI - System Average RMS (Variation) Frequency Index
 SIARFI - System Instantaneous Average RMS (Variation) Frequency Index
 SMARFI - System Momentary Average RMS (Variation) Frequency Index
 STARFI - System Temporary Average RMS (Variation) Frequency Index

RBM Sag Index Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

DRANETZ BMI

RBM Sag Index Report

IP 243.5530.Delta.60Hz
 02/18/2006 00:00:00 to 03/18/2006 09:05:18
 admin

Index	90%	80%	70%	50%	10%
SARFI	2.069	1.034	0.000	0.000	0.000
SIARFI	2.069	1.034	0.000	0.000	0.000
SMARFI	0.000	0.000	0.000	0.000	0.000
STARFI	0.000	0.000	0.000	0.000	0.000

see note above

Query and Aggregation Parameters

Monitoring Days Method - Estimated
 Index Normalization - 30 days
 Monitor Days in query - 29, actual range 29
 Characterization Level - Temporal Aggregation
 Worst Case Method - Max V Deviation
 Aggregation Time - 60

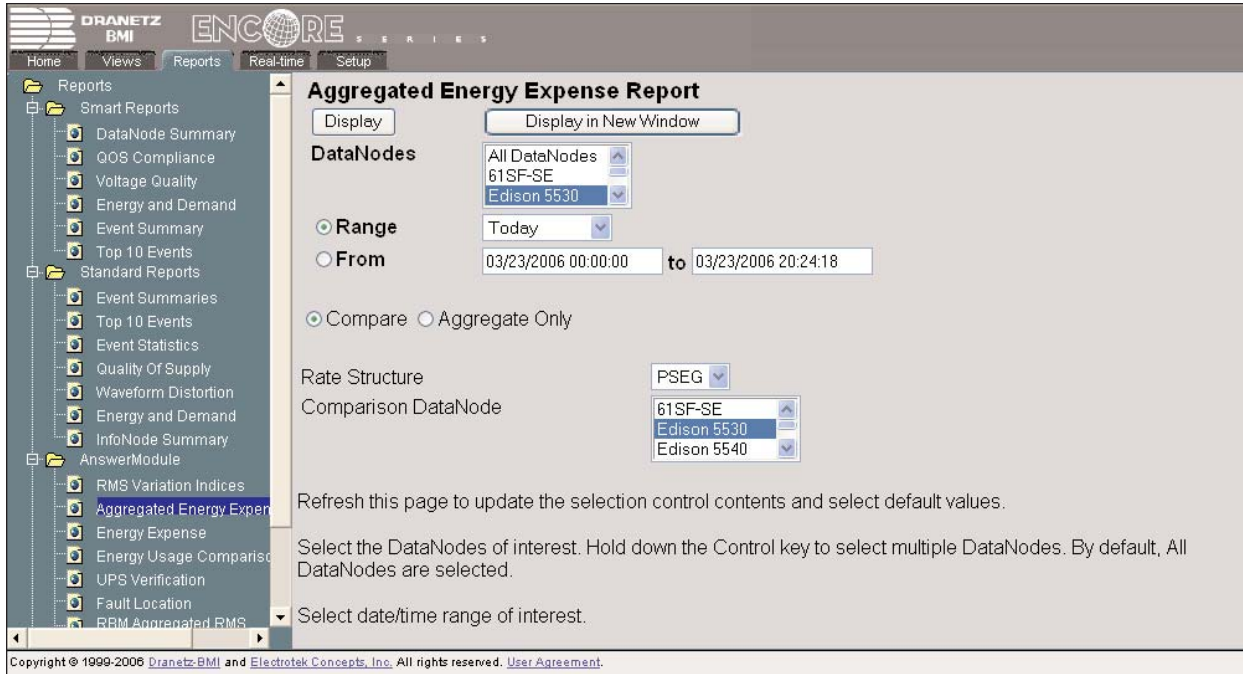
Done Trusted sites

Sample RBM Sag Index Report

5 Reports Page

Aggregated Energy Expense

The Aggregated Energy Expense features a query setup to enable users to generate a comparative expense report for different DataNodes. Data is only available when the Energy Usage Answer Module is installed.



Setup screen for Aggregated Energy Expense Report


Select the DataNodes to aggregate in the expense report under the DataNodes window. As with the other reports, specify the date and time range of interest.

Click on the Compare button if you want to compare the total of the aggregated DataNodes to that of another DataNode. Click on the Aggregate Only button if you simply want to view the aggregate total.

Select any Rate Structure that is enabled under the Setup Page, Answer Module - Energy Usage. See page 7-27 of Chapter 7 *Setup Page* for details on the Energy Usage - Rate Structures. If doing a comparison, select the desired DataNode under the Comparison DataNode window.

NOTE: If a comparison is being performed, the comparison DataNode will not be included in the aggregation even if selected.

A sample Aggregated Energy Expense report is shown below. The report is divided into four sections: Energy Usage kWhr, Energy Usage kvarHr, Demand Max kW, and Expense Summary.



Edison 5530

03/23/2006 00:00:00 to 03/23/2006 20:27:10

Rate Structure: PSEG

Aggregated Energy Expense

Energy Usage kWhr									
		On Peak		Partial		Off Peak		Cost	
DataNodes	Days	Usage	Percent	Usage	Percent	Usage	Percent	Per Sq Foot (cents)	Actual (dollars)
Edison 5530	1	1,791.94	71.26	143.10	5.69	579.78	23.05	19,067.73	179.88

Energy Usage kvarhours									
		On Peak		Partial		Off Peak		Cost	
DataNodes	Days	Usage	Percent	Usage	Percent	Usage	Percent	Per Sq Foot (cents)	Actual (dollars)
Edison 5530	1	417.19	70.52	27.97	4.73	146.42	24.75	4,506.90	42.52

Demand Max kW									
		On Peak		Partial		Off Peak		Cost	
DataNodes	Days	Max kW	Time	Max kW	Time	Max kW	Time	Per Sq Foot (cents)	Actual (dollars)
Edison 5530	1	184.79	03/23/2006 13:15:00	114.56	03/23/2006 19:40:00	155.60	03/23/2006 07:55:00	140,622.46	1,406.22

Expense Summary

DataNodes	Days	Actual (dollars)	Tax Rate	Tax (dollars)				Per Sq Foot (cents)	Total (dollars)
Aggregated DataNodes	1	0.00	0.06	0.00				0.00	0.00
Edison 5530	1	1,628.63	0.06	97.72				172,634.43	1,726.34

Done

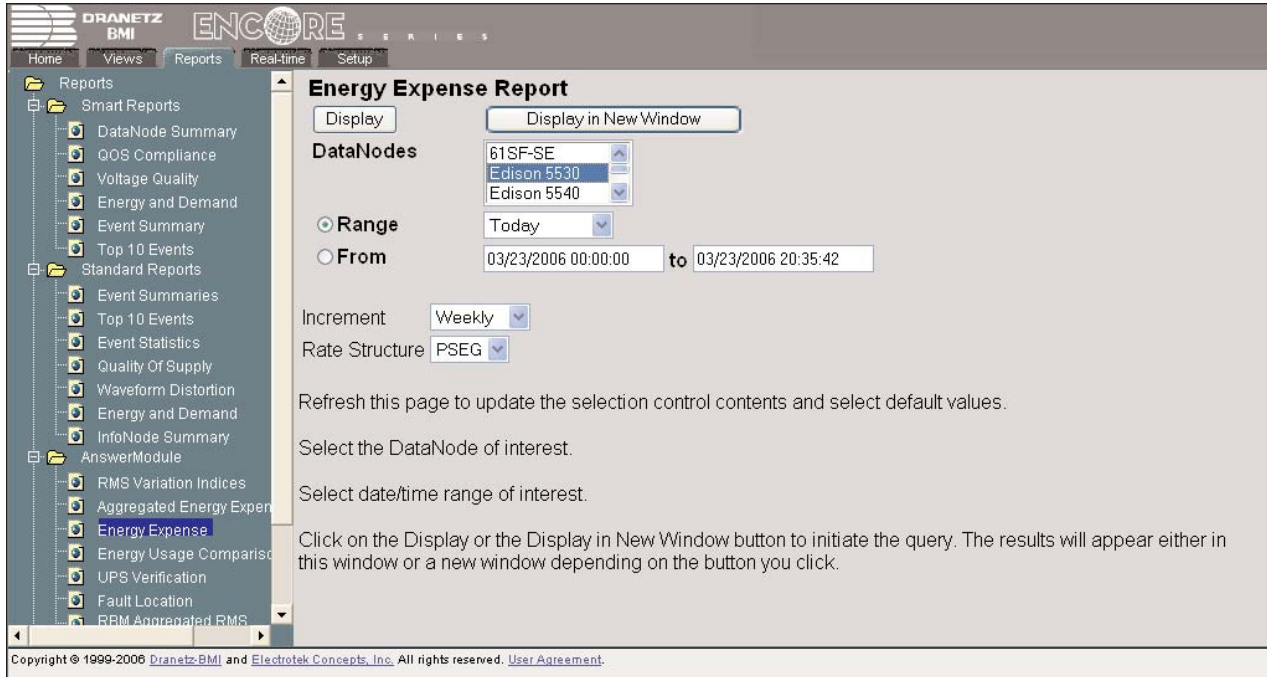
Trusted sites

Sample Aggregated Energy Expense Report

5 Reports Page

Energy Expense

The Energy Expense features a query setup to enable users to generate an expense report for each DataNode. Data is only available when the Energy Usage Answer Module is installed.



Energy Expense Report

Display Display in New Window

DataNodes 61SF-SE
Edison 5530
Edison 5540

☒ **Range** Today

☐ **From** 03/23/2006 00:00:00 to 03/23/2006 20:35:42

Increment Weekly

Rate Structure PSEG

Refresh this page to update the selection control contents and select default values.

Select the DataNode of interest.

Select date/time range of interest.

Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.

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Setup screen for Energy Expense Report


Select the DataNode with which you want to generate an expense report. As with the other reports, specify the date and time range of interest. The user may choose to divide the time range into smaller increments under the Increment window. A typical selection for billing purposes is *Weekly*.

Select any Rate Structure that is enabled under the Setup Page, Answer Module - Energy Usage. See page 7-27 of Chapter 7 *Setup Page* for details on the Energy Usage - Rate Structures.

A sample Energy Expense report is shown below. The report is divided into four sections: Energy Usage kWhr, Energy Usage kvarHr, Demand Max kW, and Expense Summary.

Energy Expense Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help



Rate Structure: PSEG
Increment: Weekly
Square Footage: Not Specified

Edison 5530
03/23/2006 00:00:00 to
03/23/2006 20:35:37

Energy Expense									
Energy Usage kWhr									
Period		On Peak		Partial		Off Peak		Cost	
From	Days	Usage	Percent	Usage	Percent	Usage	Percent	Per Sq Foot (cents)	Actual (dollars)
03/23/2006	1	1,791.94	71.14	147.07	5.84	579.78	23.02	0.00	179.88

Energy Usage kvarhours									
Period		On Peak		Partial		Off Peak		Cost	
From	Days	Usage	Percent	Usage	Percent	Usage	Percent	Per Sq Foot (cents)	Actual (dollars)
03/23/2006	1	417.19	70.52	27.97	4.73	146.42	24.75	0.00	0.00

Demand Max kW									
Period		On Peak		Partial		Off Peak		Cost	
From	Days	Max kW	Time	Max kW	Time	Max kW	Time	Per Sq Foot (cents)	Actual (dollars)
03/23/2006	1	184.79	03/23/2006 13:15:00	114.56	03/23/2006 19:40:00	155.60	03/23/2006 07:55:00	0.00	1,406.22

Expense Summary									
From	Days	Actual (dollars)	Tax Rate	Tax (dollars)				Per Sq Foot (cents)	Total (dollars)
03/23/2006	1	1,586.11	0.06	95.17				0.00	1,681.28

Done

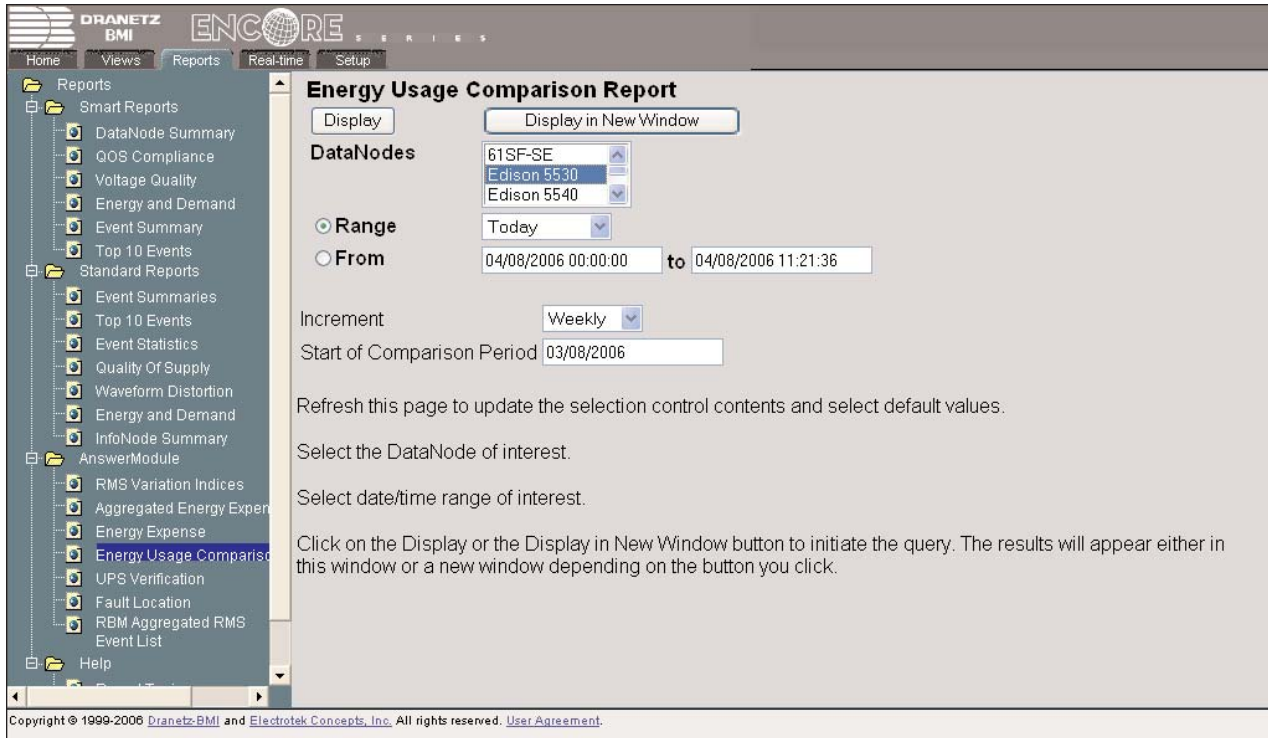
Trusted sites

Sample Energy Expense Report

5 Reports Page

Energy Usage Comparison Report

The Energy Usage Comparison Report features a query setup to enable users to generate a comparative energy usage report for each DataNode. Data is only available when the Energy Usage Answer Module is installed.



Energy Usage Comparison Report

Display Display in New Window

DataNodes

61SF-SE
Edison 5530
Edison 5540

☒ Range
☐ From

Today

04/08/2006 00:00:00 to 04/08/2006 11:21:36

Increment: Weekly

Start of Comparison Period: 03/08/2006

Refresh this page to update the selection control contents and select default values.

Select the DataNode of interest.

Select date/time range of interest.

Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.

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Setup screen for Energy Usage Comparison Report

Select the DataNode with which you want to generate a comparative usage report. As with the other reports, specify the date and time range of interest. The user may choose to divide the time range into smaller increments under the Increment window. Then enter the reference period in which you want to compare the current usage against under the Start of Comparison Period.

NOTE: If the reference period has more days than the current period, then it will be reduced to the number of days in the current period. The start time will remain as selected.

A sample Energy Usage Comparison report is shown below. The report is divided into three sections: Energy Usage kWhr, Energy Usage kvarHr, and Demand Max kW. Each section displays the current usage vis-a-vis the percent change from the reference period for On Peak time, Partial Peak time, Off Peak time, and Total. A negative number indicates that the current usage is smaller than that of the reference period.

Energy Usage Comparison Report - Microsoft Internet Explorer



Range for Comparison: 2002-10-19 00:00:00 to 2002-10-19 16:51:54
Increment: Weekly

H09_5530
2002-11-19 00:00:00 to 2002-11-19 16:51:54

Energy Usage Comparison									
Energy Usage kWhr									
Period		On Peak		Partial		Off Peak		Total	
From	Days	Current Usage	Percent Change	Current Usage	Percent Change	Current Usage	Percent Change	Percent Change	
2002-11-19	0	109.62		0.00		82.47	-54.95	4.93	

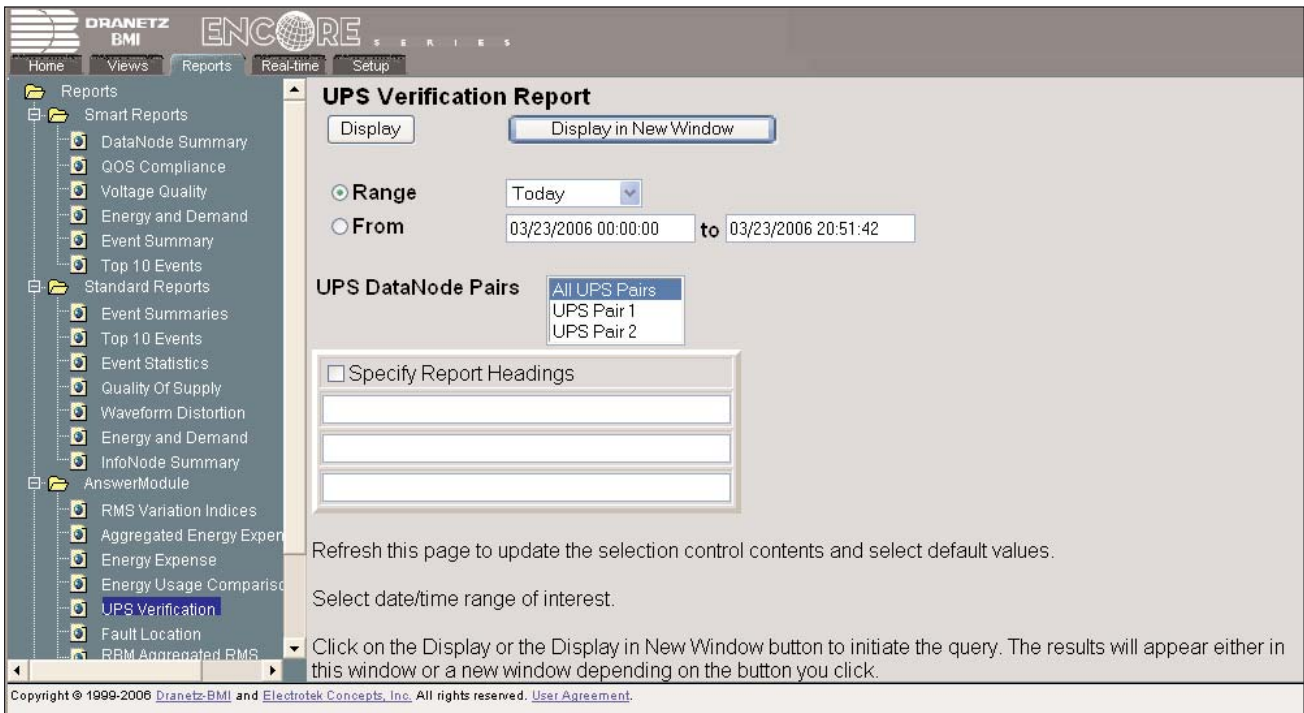
Energy Usage kvarHr									
Period		On Peak		Partial		Off Peak		Total	
From	Days	Current Usage	Percent Change	Current Usage	Percent Change	Current Usage	Percent Change	Percent Change	
2002-11-19	0	47.00		0.00		25.00	-66.59	-4.33	

Demand Max kW									
Period		On Peak		Partial		Off Peak		Total	
From	Days	Current Max kW	Percent Change	Current Max kW	Percent Change	Current Max kW	Percent Change	Percent Change	
2002-11-19	0	13.02		0.00		10.63	-3.74	17.94	

Sample Energy Usage Comparison Report

5 Reports Page

UPS Verification



The screenshot shows the 'UPS Verification Report' setup screen. On the left is a sidebar with a tree view containing 'Smart Reports' (DataNode Summary, QOS Compliance, Voltage Quality, Energy and Demand, Event Summary, Top 10 Events) and 'Standard Reports' (Event Summaries, Top 10 Events, Event Statistics, Quality Of Supply, Waveform Distortion, Energy and Demand, InfoNode Summary, AnswerModule, RMS Variation Indices, Aggregated Energy Expense, Energy Expense, Energy Usage Comparison, **UPS Verification**, Fault Location, RBM Aggregated RMS). The main panel is titled 'UPS Verification Report' and contains: 'Display' and 'Display in New Window' buttons; 'Range' radio button selected with a 'Today' dropdown; 'From' radio button with a date range '03/23/2006 00:00:00 to 03/23/2006 20:51:42'; a 'UPS DataNode Pairs' dropdown menu showing 'All UPS Pairs', 'UPS Pair 1', and 'UPS Pair 2'; a 'Specify Report Headings' checkbox; three empty text input fields; and instructional text: 'Refresh this page to update the selection control contents and select default values.', 'Select date/time range of interest.', and 'Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.' The footer contains copyright text: 'Copyright © 1999-2006 Dranetz-BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

Setup Screen for UPS Verification Report

This report has a different query setup than the standard query setup. This report is produced for defined instrument pairs. The instrument pairs were created under the Setup tab for the UPS Verification Answer Module. The query setup for the UPS Verification report is shown above.

As with other reports, a date range or a start and end time need to be specified. However, for the UPS report instead of selecting an instrument, the user selects one or more instrument pairs.

The purpose of the UPS Verification Answer Module is to verify that the UPS or another mitigation device is functioning properly. A UPS DataNode pair consists of a DataNode monitoring the input of the UPS and another DataNode monitoring the output of the UPS. This was designed to be done with DataNodes that support cross-triggering. If the UPS is functioning properly, the DataNode at the UPS output will only see cross-triggered events. If the DataNodes being used do not support cross-triggering, then no event should be seen on the output DataNode. However, without cross-triggering, the absence of an event is not conclusive. The status determined by the UPS Verification Answer Module may be one of the following:

PASS

The UPS DataNode Pair has a status of PASS when an event is seen at the input DataNode, and only the cross-triggered event is seen on the output. The UPS has been determined to be functioning properly, as the disturbance on the input was not seen on the output.

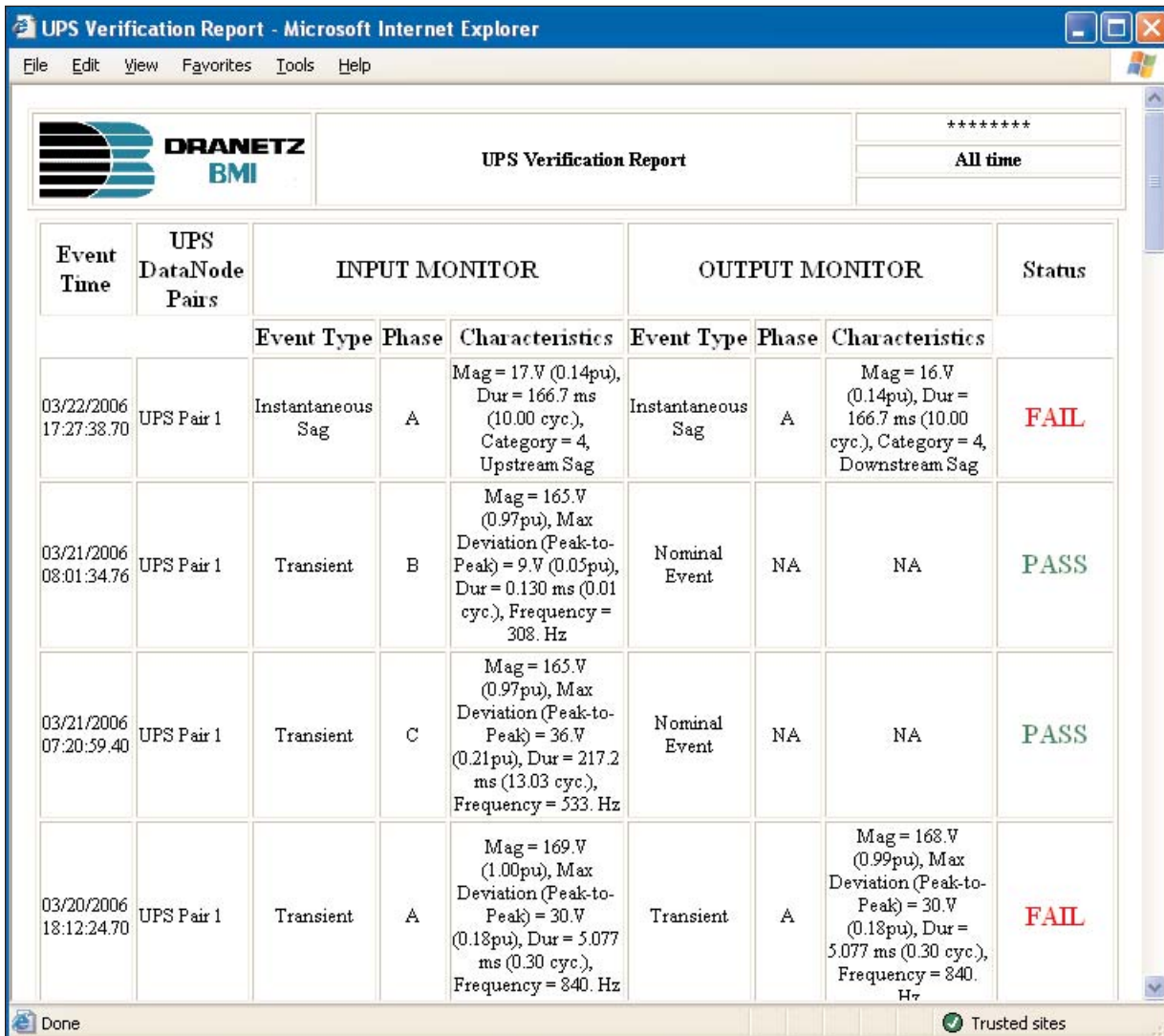
FAIL

The UPS DataNode Pair has a status of FAIL when an event is seen at the input DataNode, and a disturbance event is also seen on the output DataNode within the time window defined at setup. The UPS has been determined to be not functioning properly.

Indeterminate

The UPS DataNode Pair has a status of Indeterminate when an event is seen at the input DataNode, and no event is seen on the output DataNode. The status is Indeterminate because no cross-triggered event was seen to verify that the output DataNode itself is functioning correctly.

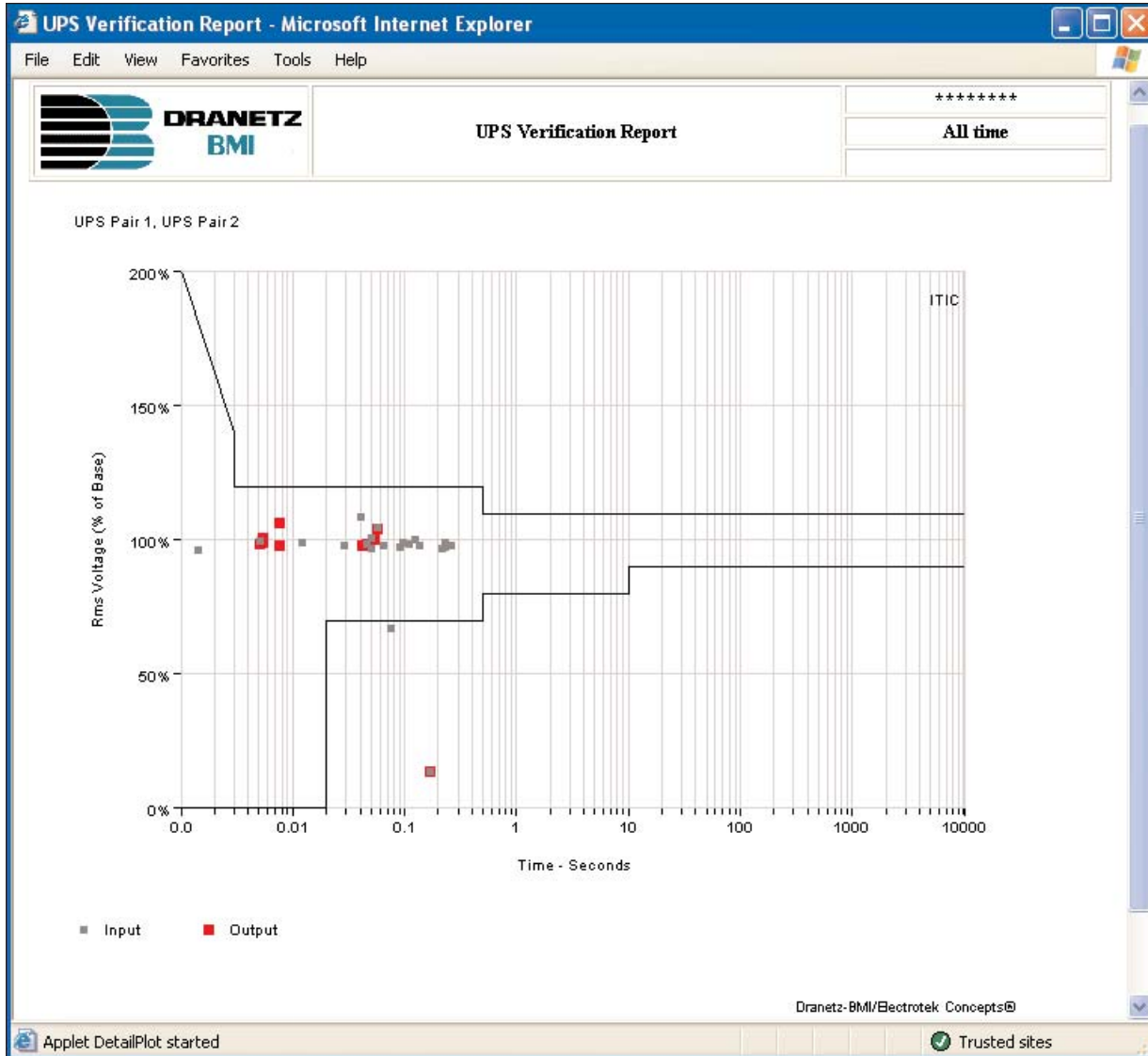
The report consists of a table with event summary information for both the input and output DataNodes of the UPS Pairs and status information. The report also contains a Mag/Dur plot with data from both DataNode marked separately. A sample report can be seen below.



Event Time	UPS DataNode Pairs	INPUT MONITOR			OUTPUT MONITOR			Status
		Event Type	Phase	Characteristics	Event Type	Phase	Characteristics	
03/22/2006 17:27:38.70	UPS Pair 1	Instantaneous Sag	A	Mag = 17.V (0.14pu), Dur = 166.7 ms (10.00 cyc), Category = 4, Upstream Sag	Instantaneous Sag	A	Mag = 16.V (0.14pu), Dur = 166.7 ms (10.00 cyc), Category = 4, Downstream Sag	FAIL
03/21/2006 08:01:34.76	UPS Pair 1	Transient	B	Mag = 165.V (0.97pu), Max Deviation (Peak-to-Peak) = 9.V (0.05pu), Dur = 0.130 ms (0.01 cyc), Frequency = 308. Hz	Nominal Event	NA	NA	PASS
03/21/2006 07:20:59.40	UPS Pair 1	Transient	C	Mag = 165.V (0.97pu), Max Deviation (Peak-to-Peak) = 36.V (0.21pu), Dur = 217.2 ms (13.03 cyc), Frequency = 533. Hz	Nominal Event	NA	NA	PASS
03/20/2006 18:12:24.70	UPS Pair 1	Transient	A	Mag = 169.V (1.00pu), Max Deviation (Peak-to-Peak) = 30.V (0.18pu), Dur = 5.077 ms (0.30 cyc), Frequency = 840. Hz	Transient	A	Mag = 168.V (0.99pu), Max Deviation (Peak-to-Peak) = 30.V (0.18pu), Dur = 5.077 ms (0.30 cyc), Frequency = 840. Hz	FAIL

Sample UPS Verification Report

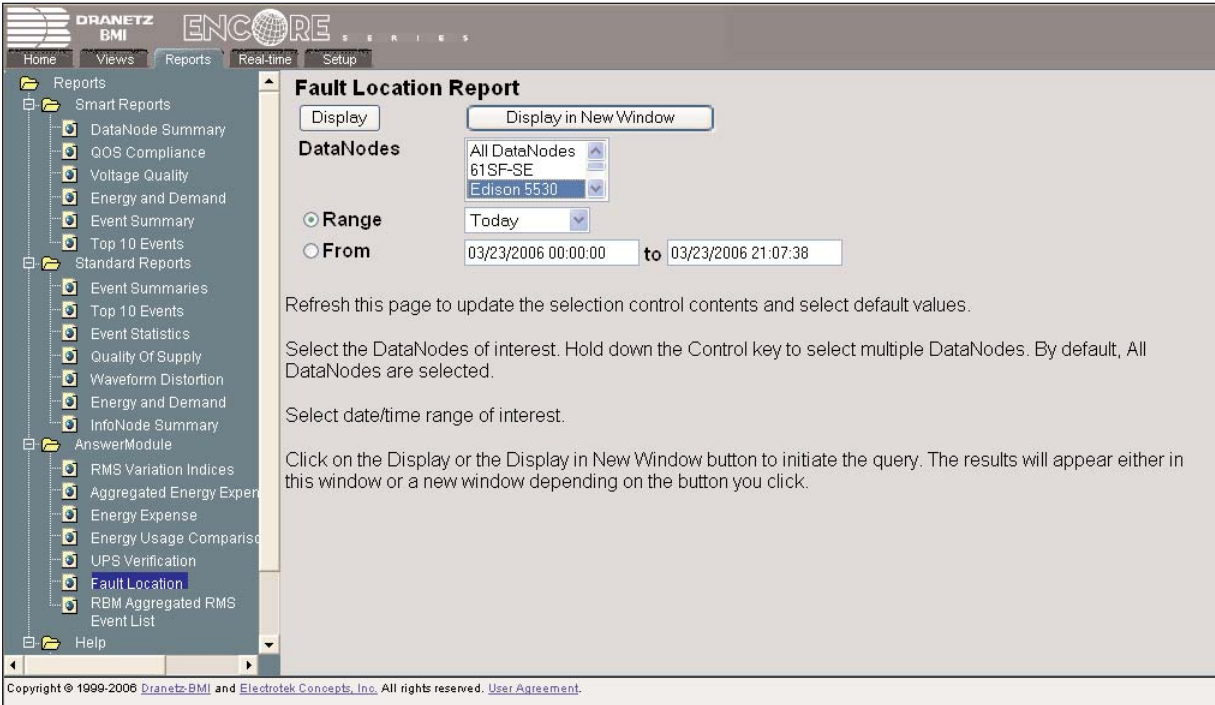
5 Reports Page



Sample UPS Mag-Dur plot

Fault Location

This report requires no additional query parameters. It allows for the selection of multiple DataNodes. The information required for this Answer Module can be seen in page 7-36 of Chapter 7 *Setup Page*. The module computes distance-to-fault for all possible balance and unbalance faults, i.e. three-phase fault; single-line-to-ground (SLG) fault of phases A, B, and C; double-line-to-ground (DLG) faults of phases AB, BC, and CA; and line-to-line-to-ground (LLG) of phases AB, BC, and CA. Thus, there are ten types of faults considered. The distance-to-faults are estimated using two different equations; therefore, there are two estimates (lower and upper) for each fault type. A sample report is shown below.



Fault Location Report

Display Display in New Window

DataNodes

All DataNodes
61SF-SE
Edison 5530

☒ Range Today

☐ From 03/23/2006 00:00:00 to 03/23/2006 21:07:38

Refresh this page to update the selection control contents and select default values.

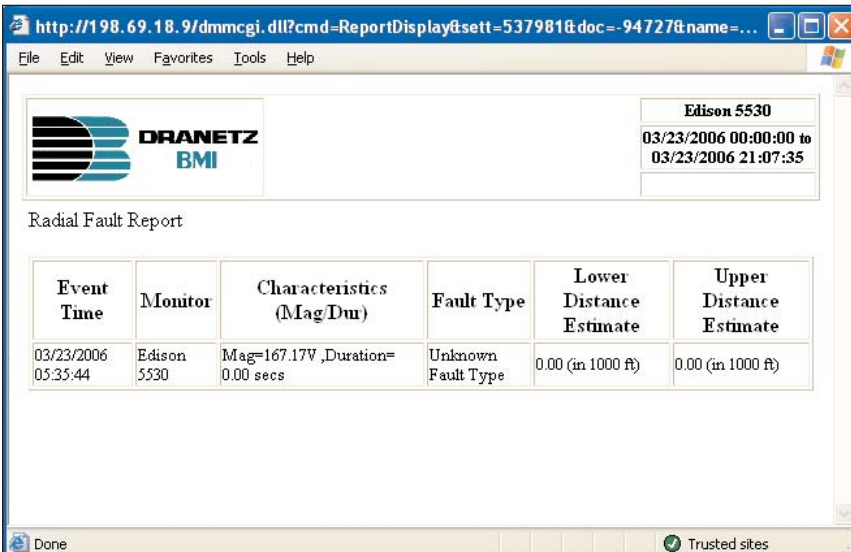
Select the DataNodes of interest. Hold down the Control key to select multiple DataNodes. By default, All DataNodes are selected.

Select date/time range of interest.

Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.

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Setup Screen for Fault Location Report



http://198.69.18.9/dmmcgi.dll?cmd=ReportDisplay&sett=537981&doc=-94727&name=...

File Edit View Favorites Tools Help

DRANETZ BMI

Edison 5530
03/23/2006 00:00:00 to 03/23/2006 21:07:35

Radial Fault Report

Event Time	Monitor	Characteristics (Mag/Dur)	Fault Type	Lower Distance Estimate	Upper Distance Estimate
03/23/2006 05:35:44	Edison 5530	Mag=167.17V ,Duration=0.00 secs	Unknown Fault Type	0.00 (in 1000 ft)	0.00 (in 1000 ft)

Done Trusted sites

Sample Radial Fault Report

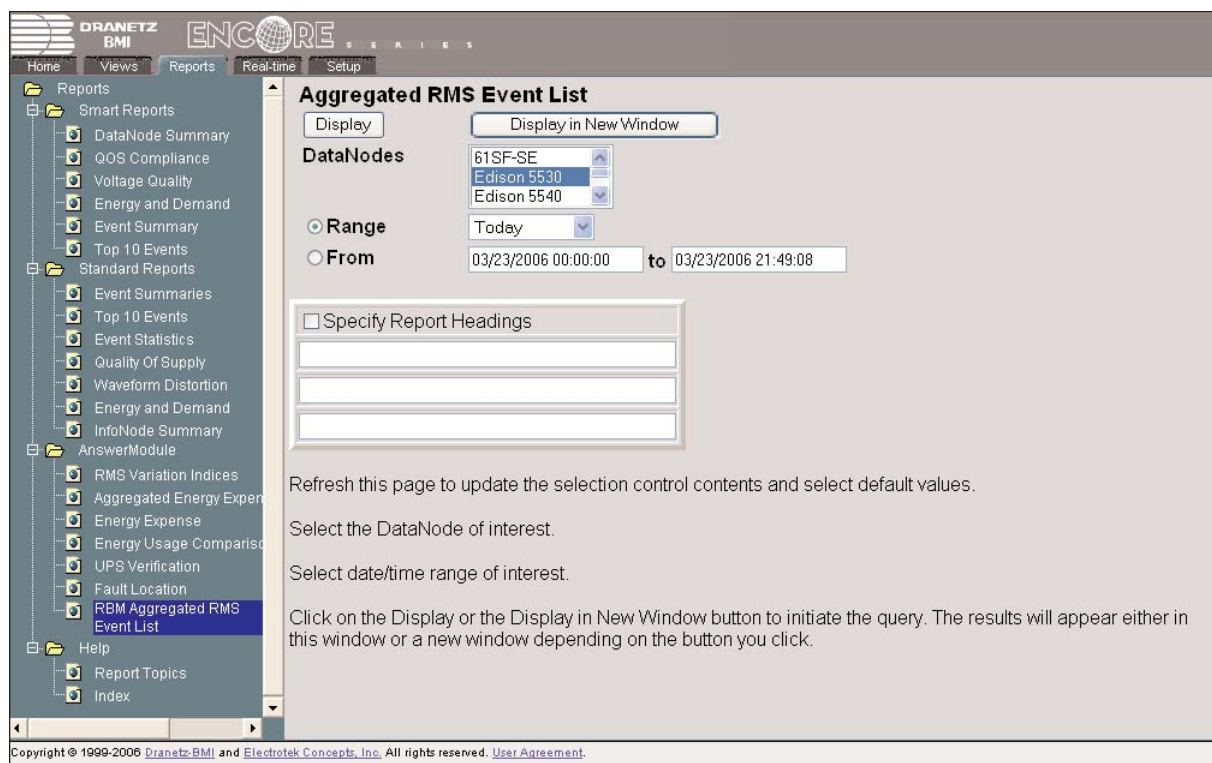
5 Reports Page

RBM (Reliability Benchmarking Methodology)

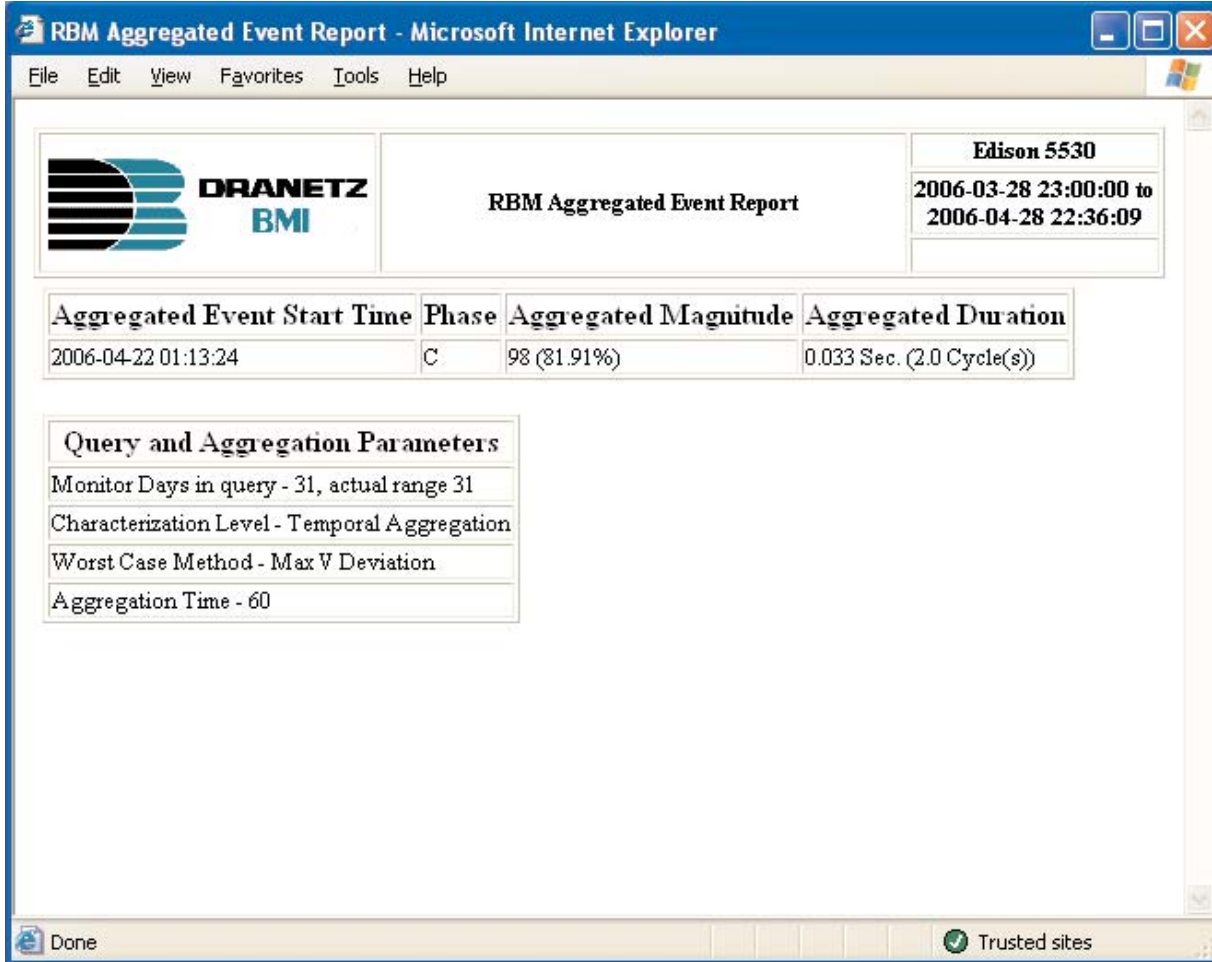
The RBM Answer Module adds two reports. The first is the RBM RMS Variation Indices (see page 5-6 for description) and the second is the RBM Aggregated Rms Event List described next.

RBM Aggregated RMS Event List

This report is a table of RBM Aggregated Events for the specified DataNode and time range. The RBM Aggregation Parameters define how the events are aggregated. For more information on the RBM Aggregation Parameters refer to page 7-37 of Chapter 7 *Setup Page*. The query setup for this report is the standard report query information, and requires no additional parameters to be selected. More parameters such as type of aggregation and method are set up in the Setup tab. A sample report is shown on page 5-19.



Setup Screen for Aggregated RMS Event List Report



Sample RBM Aggregated Event Report

5 Reports Page

Help

Much of what is written in this manual can be found in the Help option onscreen. Expanding the Help tree will provide Reports Topics and Index links.

Report Topics

The Report Topics page simply says that the user is currently in the Reports page. Four active buttons are found in this page: Contents, Index, <<, and >>. These buttons present different ways to access the same Help information. The differences lay only in the way each button organizes and lists information.

The >> button brings the user forward to the next linked page.

The << button brings the user backward to the previously linked page.

Index

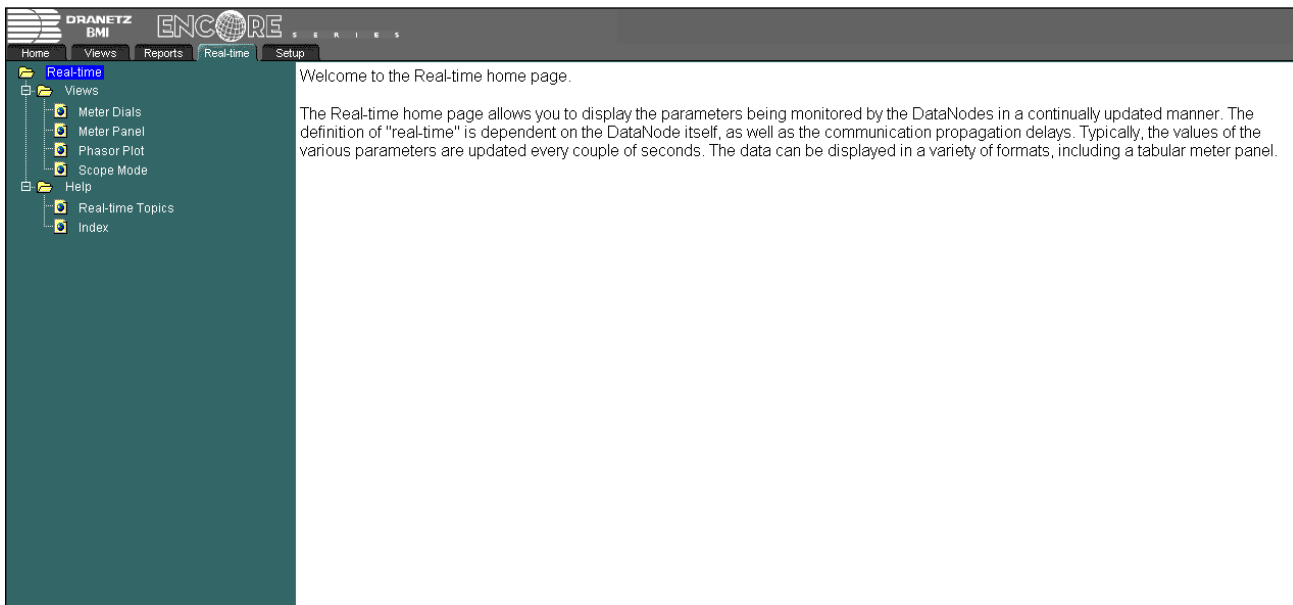
The Index page operates exactly like the Index portion of a book. Information is listed and categorized in alphabetical order. Click any button from A to Z to show various related topics under each letter. The topics are featured as hyperlinks.

The Contents button operates exactly like the Table of Contents in books. Information is listed and organized under different headings. The headings normally used here are the tab names. Sub-topics per heading appear as hyperlinks.

This chapter describes how the system enables users to view DataNode information in real-time mode. Through the different display options available, the users are able to view and capture DataNode information as it happens and when it happens on site.

Real-time Page

The Real-time page allows you to display the parameters being monitored by the DataNodes in a continually updated manner. The definition of "real-time" is dependent on the DataNode itself, as well as the communication propagation delays. Typically, the various parameter values are updated every couple of seconds. The data can be displayed in a variety of formats, including a tabular meter panel. The Real-time menu page appears as follows.



Real-time home page

Views

Meter Dials

The Meter Dials enable you to define the parameters and create dial-type readings of each enabled DataNode parameter. The readings are updated at approximately once per second.

After selecting the parameters and creating the meter panel, the attributes of the meter panel can be changed by right-clicking the mouse button when the cursor is over the dial. Three categories can be selected:

- General (contains options for changing color of the background and the needle)
- Axis (contains options for changing min/max limits, label and line color, and text font)
- Set Points (contains options for changing color, value and active status)

In the sample screens found next page, parameter values for a Service Entrance DataNode have been checked, after which the Create Meter Panel button was clicked. This resulted in the screen showing dial-type readings. Right-clicking on the dials shows Properties for General, Axis and Set Point options. A sample Set Point display screen also appears next page.

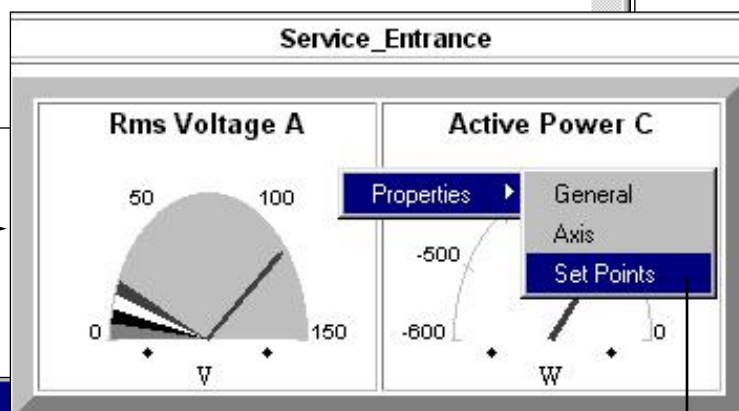
For a 5560 DataNode, new parameters are defined to support real-time display of flicker measurements. These parameters are required to meet the specification of a flicker meter. See page 10-20 for more information.

6 Real-time Page

	A	B	C	II	Total	LII Average
Rms Voltage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Rms Current	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Active Power	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
Total Fund Freq Q	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Apparent Power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
True Power Factor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>
VI Angle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Frequency	<input type="checkbox"/>					

Create Meter Panel Reset selections

click to display parameters
in dial-type readings



click to display the
Set Point dialog box

Color	Value	Active
gray	5	<input checked="" type="checkbox"/>
black	10	<input checked="" type="checkbox"/>
dark gray	15	<input checked="" type="checkbox"/>
light gray	20	<input checked="" type="checkbox"/>

Only items in black lettering will be saved as preferences.

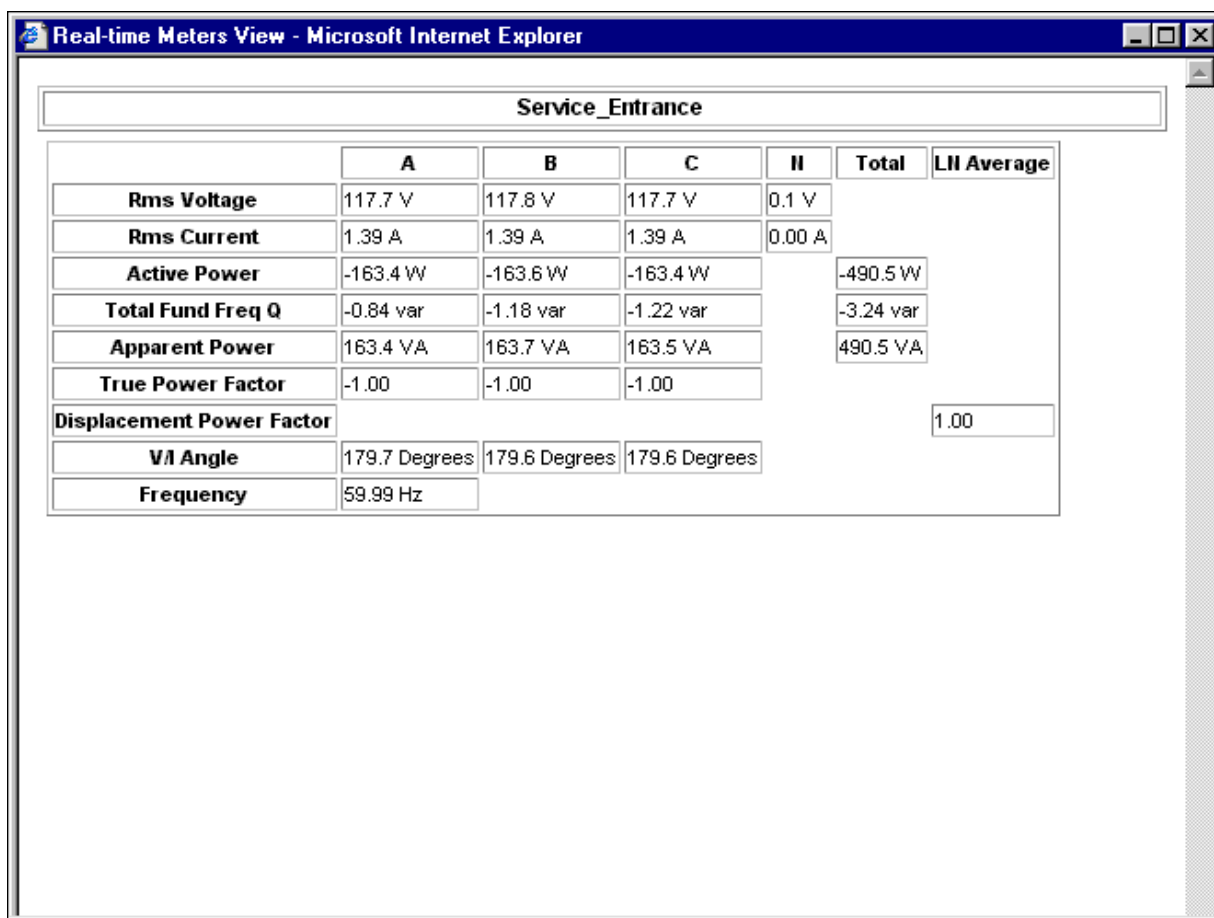
Clear Preferences Set as Preference

OK Apply Cancel

The following are the reference points when using the Set Point color drop down menus: The 1st set point color originates from the bottom (left of the dial), while the 2nd set point color applies from the 1st going clockwise. The 4th set point color originates from the top (right of the dial), while the 3rd set point color applies from the 4th going counterclockwise.

Meter Panel

The Meter Panel real time display consists of a table showing the parameters being measured by the DataNode for each of its channels. It is updated approximately every five seconds. Some power measurement information for a Service Entrance DataNode is shown in the sample Meter Panel table below.



Service_Entrance						
	A	B	C	H	Total	LII Average
Rms Voltage	117.7 V	117.8 V	117.7 V	0.1 V		
Rms Current	1.39 A	1.39 A	1.39 A	0.00 A		
Active Power	-163.4 W	-163.6 W	-163.4 W		-490.5 W	
Total Fund Freq Q	-0.84 var	-1.18 var	-1.22 var		-3.24 var	
Apparent Power	163.4 VA	163.7 VA	163.5 VA		490.5 VA	
True Power Factor	-1.00	-1.00	-1.00			
Displacement Power Factor						1.00
V/I Angle	179.7 Degrees	179.6 Degrees	179.6 Degrees			
Frequency	59.99 Hz					

Meter panel screen display

6 Real-time Page



Phasor Plot

The Phasor Plot displays a graph that indicates phase relations between the voltage and current based upon the angles of the fundamentals, as determined by Fourier analysis. Phasor plot is only available for use with the 61000.

The phasor screen shows eight phasors autoscaled with zero degrees to the right (normally channel A voltage) for clockwise rotation and with synchronized channels. Users are allowed to display up to four channels at any one time for either volts or amps, or a single channel for both volts and amps, depending on the phases being monitored.

The left sidebar shows rms values for:

- Volts/Amps for channels A, B, C and D

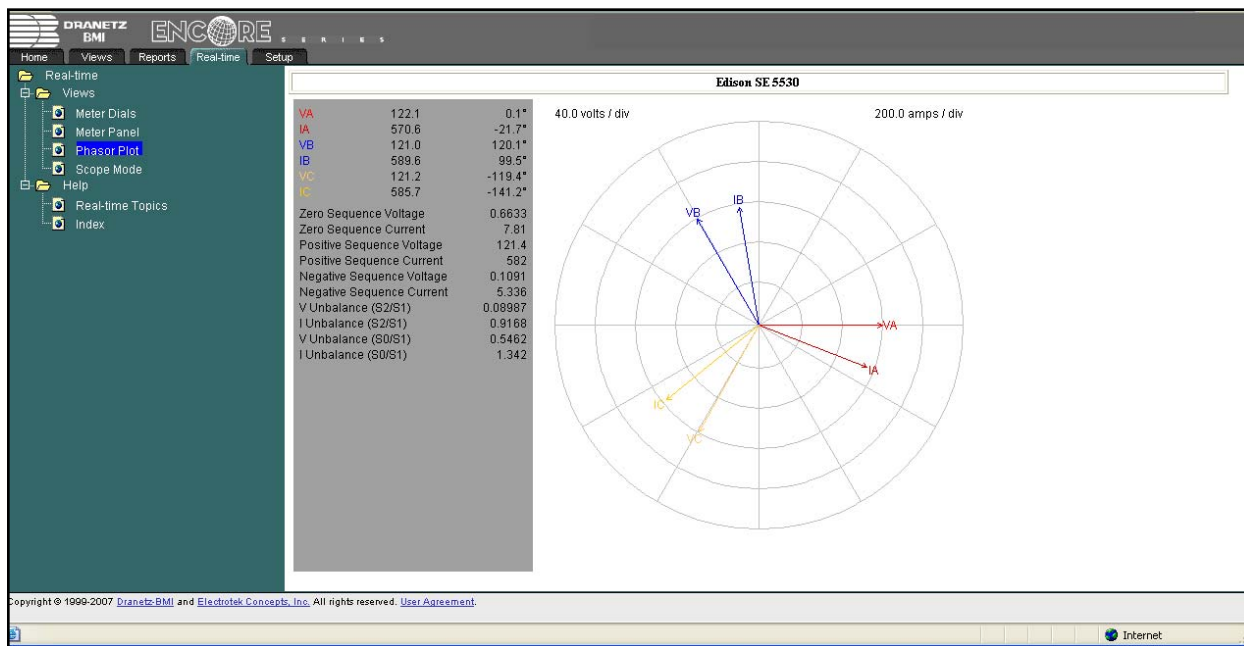
NOTE: For Channel D, if rms value is less than 20% of the maximum voltage (or current), the phasor is not displayed;

- Zero, positive and negative values for Volts/Amps;

- Zero, positive and negative sequence component values for Volts/Amps.

Depending on the phases being monitored, up to four channels may be displayed at any one time for either Volts or Amps, or a single channel for both Volts and Amps. An arrow head and channel label are displayed on the vector.

NOTE: The phasors shown in sample screen below rotate Clockwise from 0°, versus the more typical Counter Clockwise rotation.

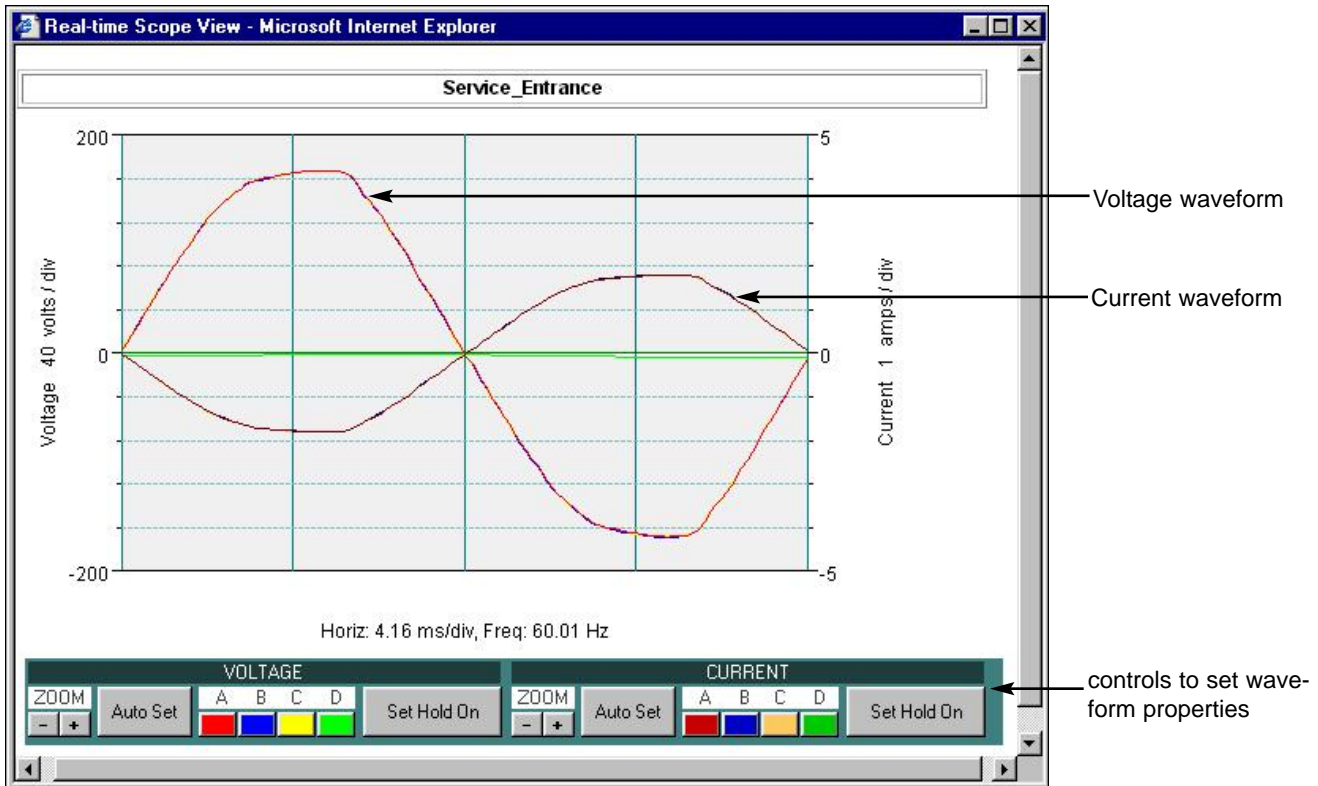


Phasor Plot screen display



Scope Mode

The Scope display shows real time waveform data for up to 8 channels. Scope mode is only available in certain DataNode types, such as in EPQ DataNodes.



Help

Much of what is written in this manual can be found in the Help option onscreen. Expanding the Help tree will provide Real-time Topics and Index links.



Real-time Topics

The Real-time Topics page simply says that the user is currently in the Real-time page. Four active buttons are found in this page: Contents, Index, <<, and >>. These buttons present different ways to access the same Help information. The differences lay only in the way each button organizes and lists information.

The >> button brings the user forward to the next linked page.

The << button brings the user backward to the previously linked page.



Index

The Index page operates exactly like the Index portion of a book. Information is listed and categorized in alphabetical order. Click any button from A to Z to show various related topics under each letter. The topics are featured as hyperlinks.

The Contents button operates exactly like the Table of Contents in books. Information is listed and organized under different headings. The headings normally used here are the tab names. Sub-topics per heading appear as hyperlinks.

6 Real-time Page

This page intentionally left blank.

This chapter explains the various programmable settings for the Encore Series Software. For security reasons, the settings can be changed only by persons with admin access privileges.

Setup Page

The Setup page is used to view and/or change any of the programmable features of the Encore Series Software and any DataNodes connected to the system. The Encore Series Setup page is generic, without regard to which types of DataNodes are connected to the system. The DataNode Setup pages are specific to the type of DataNode. The left-hand frame contains the interactive tree from which users can view the setup information they need. The Setup tree can be expanded or collapsed. Click on the plus sign to further expand the tree and show more of the options available. Click on the minus sign to collapse the tree back up one level.

In order for a new user to access the system, the system administrator (someone with Admin privileges) must first set up an account for the new user. The system is shipped with default Admin, Guest and other accounts, which the system administrator should customize with your own name and password. Any changes made in the setup parameters are not confirmed until the Save Setup button found on the bottom of the page has been clicked.

InfoNode

InfoNode Setup can be expanded to reveal the following data folders: Users, Notifications, Communications, Answer Module, DataNodes, and Help Desk.

Users

The Users section includes Guest, Viewer, Operator and Admin User. An Admin User can add new users by right clicking the mouse while the cursor is over the User folder. Only the Admin User can create accounts for others and change Security Levels. Once the accounts are created, the other types of User can change the *User Name*, *Password* and *Proficiency Level*.

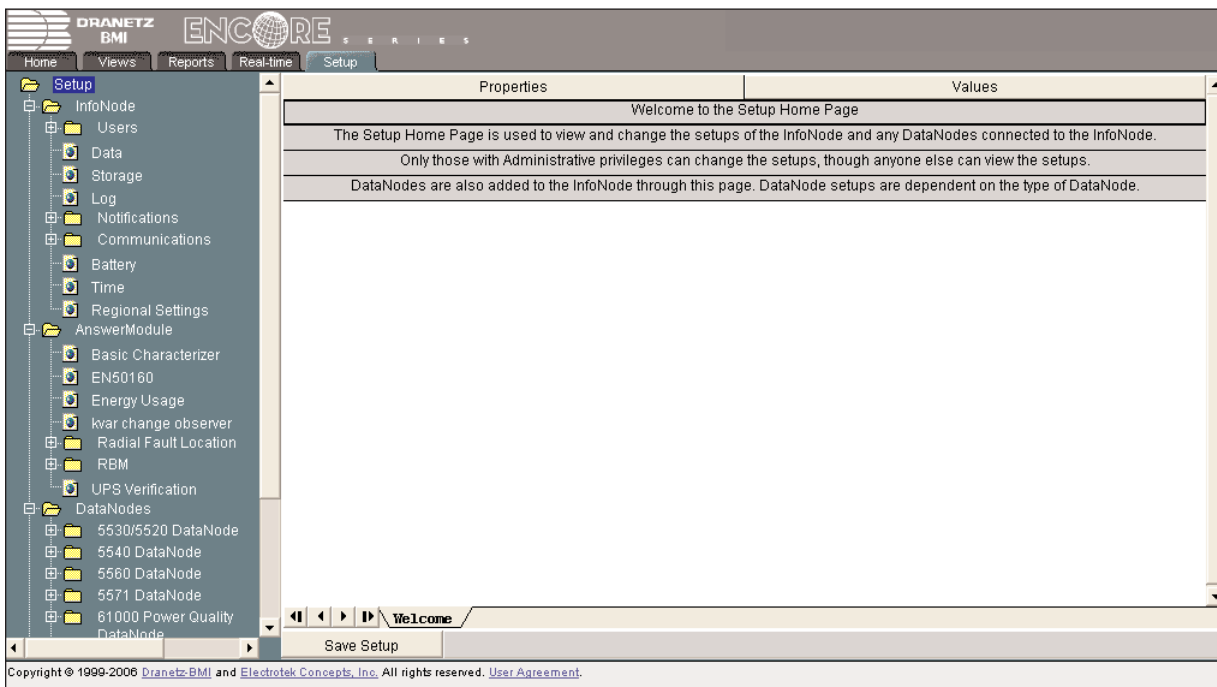
User Name - up to 30 alphanumeric characters can be entered for the name.

Password - up to 12 alphanumeric characters can be used for the password. A confirmation window pops up to verify the password before proceeding.

Description - usually contains descriptive nature of the account created for a particular user.

Security Level - can only be assigned by someone with Admin privileges.

Proficiency Level - select either Novice or Expert user, where the setting will determine which types of reports and views will be displayed.



Setup home page

Properties	Values
User name	guest
Password	*****
Description	Free access for demos
Security level	Guest
Proficiency level	Novice

Sample display window screen for a user named 'guest'. By selecting an item on the Properties column, a cursor or choices will appear on the right column space. Enter your desired Values.

Certain property items can be accessed only by those with admin privileges. Read next sections on Security Level and Proficiency Level.

Security Level

There are four levels of security provided. The security levels can only be assigned by someone with Admin privileges. These levels are known as roles and are defined as follows:

Guest - Can only view data. Cannot change user preferences or system setups. Cannot change the configuration of the instrument in any way.

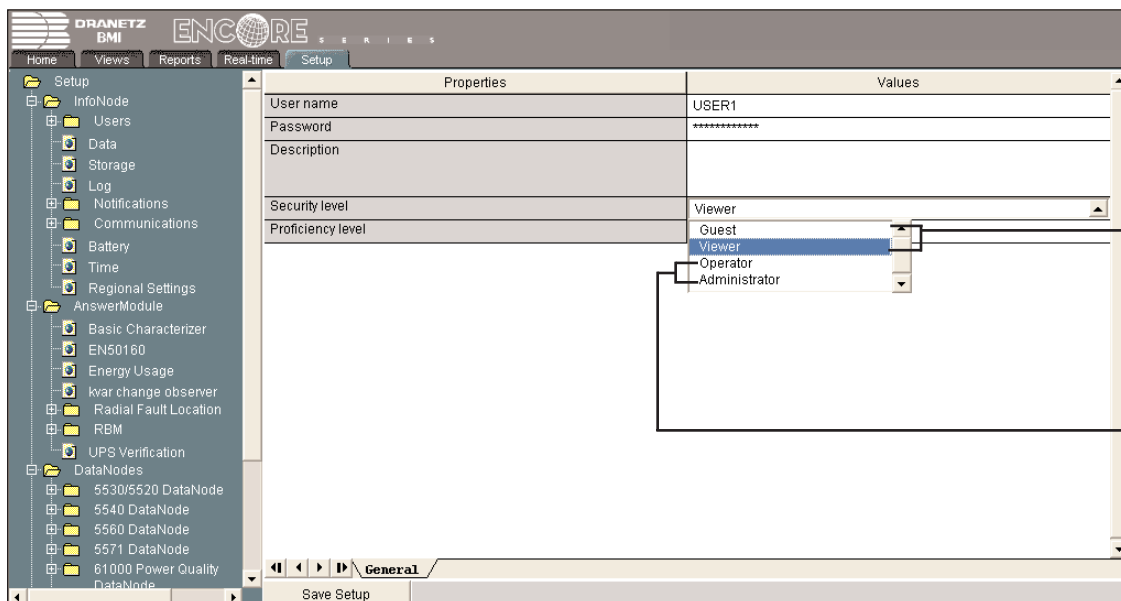
Viewer - Can view data and access basic setup features. Can change only basic user preferences, e.g plot title, text size/color, background color, etc. You can open user preferences dialog box by right clicking on the event image and selecting properties.

Operator - Can view data, change user preferences, and change select DataNode and Encore Series Software setups. Cannot add users or change security levels.

Administrator - Can access basic setup, security account management, and network configuration parameters. Can access all features of the Encore Series Software including factory setup.

NOTE: The Administrator mode is accessible only to users with administrative privileges.

Encore Series Software supports log-in accounts that have a user name, password and security level/role associated with each account. The application is able to support more than 50 accounts.



allow basic user privileges limited to viewing (for Guest) and changing only user preferences data (for Viewer)

allow advanced user privileges; however only the Administrator can add users and change security levels

Encore Series Software Setup page. Above screen shows sample new user account being entered by the System Administrator. The Administrator assigns the security level that determines extent of user privileges.

Proficiency Level: Novice or Expert

Users may select between Novice or Expert modes which determine the number of DataNode tab settings that can be viewed and the types of reports and views that can be displayed.

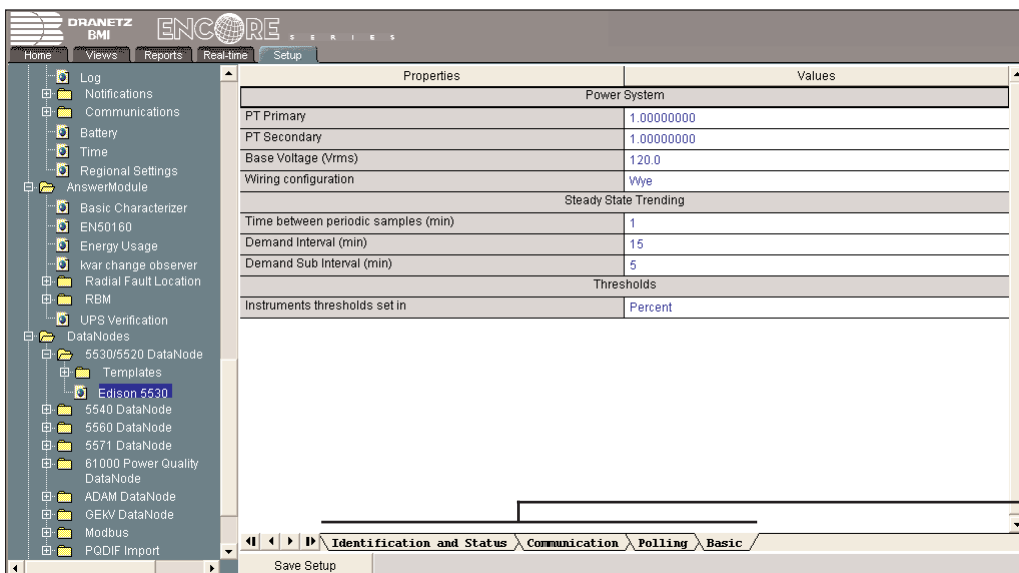
Users assigned the security level of Guest can only view, not change, DataNode settings. All Setup tab options for Guests are disabled.

The Novice mode displays only those options absolutely essential to the operation of the system. This entails only allowing users to access four DataNode Setup tabs - the Identification and Status tab, Communication tab, Polling tab, and Basic tab.

The Expert mode displays all the Setup tabs available in a particular DataNode.

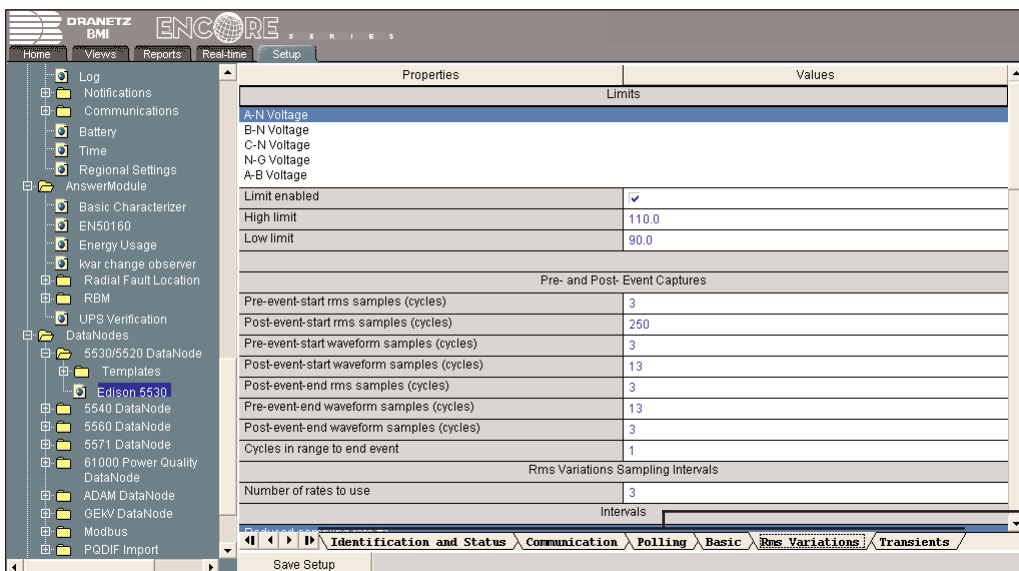
To switch between Novice and Expert mode:

1. Click on Setup > > InfoNode > Users > User name.
2. Click on Proficiency Level to display drop down menu.
3. Select between Novice and Expert mode.
4. When done, click on Save Setup found at the bottom of the page. A Save confirmation window will pop up.
5. Click on Yes to save changes or No to exit without saving changes.



limited tab settings

Sample DataNode screen set under Novice mode; Basic tab activated



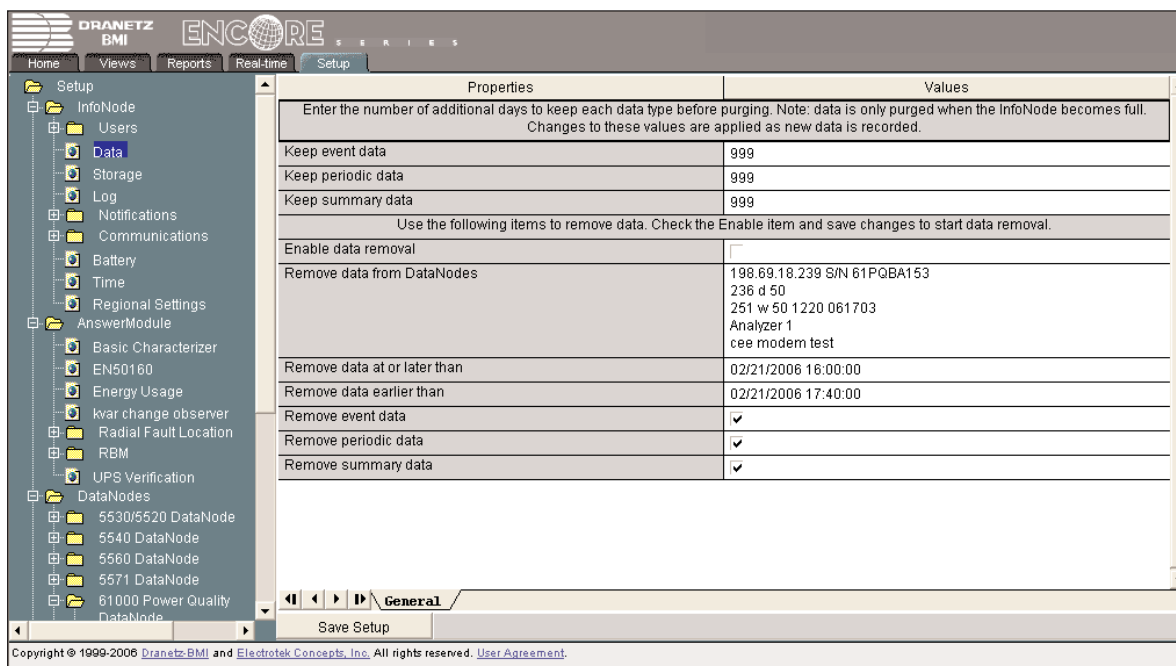
complete tab settings
(other tabs not captured
on screen)

Sample DataNode screen set under Expert mode

Data

Data setup allows you to specify the number of additional days to keep each data type (*Keep event data*, *Keep periodic data*, *Keep summary data*) before purging. When the Encore Series application becomes full, it purges data in a first-in-first-out order. This feature allows you to prioritize the order in which data is purged. The number of days to keep data values are used to bias the purge time of each type of data respectively. In an Encore Series Software system with sufficient storage, this results in the lifetime of one type of data being extended by the specified number of days relative to other data types. The Encore Series Software always purges old data when it needs space for new data. Consequently, the lifetime of data is only extended by the specified number of days when sufficient storage is available. The purge time for data is biased and stored when the data is saved. Changes to the bias values are not applied to previously stored data.

The Data setup also allows you to remove data stored in the Encore Series Software. Select any one or a combination of DataNodes opposite *Remove data from DataNodes*. Specify the date and time range when you want the data removed from the DataNodes using *Remove data at or later than* or *Remove data earlier than*. Choose one or more data types to remove (*Remove event data*, *Remove periodic data*, *Remove summary data*). Once the data removal selection is specified, check the *Enable data removal* property and save the properties to start removing data. When data removal is in progress, all selection fields are disabled. You can stop data removal by clearing the Enable data removal property and saving the properties. Data removal can be a long process, particularly in a busy software application with large amounts of data. Refresh the Data tab to see if data removal is complete.



The screenshot shows the 'Data' setup window in the Encore Series Software. The left sidebar contains a tree view with 'Data' selected under 'Setup'. The main window is divided into 'Properties' and 'Values' sections. The 'Properties' section includes fields for 'Keep event data', 'Keep periodic data', and 'Keep summary data', all set to 999. Below these is a section for 'Remove data from DataNodes' with checkboxes for 'Remove event data', 'Remove periodic data', and 'Remove summary data', all checked. The 'Values' section shows the selected DataNodes (198.69.18.239 S/N 61PQBA153, 236 d 50, 251 w 50 1220 061703, Analyzer 1, cee modem test) and the date and time range for removal (02/21/2006 16:00:00 to 02/21/2006 17:40:00). The 'General' tab is selected at the bottom.

Properties	Values
Enter the number of additional days to keep each data type before purging. Note: data is only purged when the InfoNode becomes full. Changes to these values are applied as new data is recorded.	
Keep event data	999
Keep periodic data	999
Keep summary data	999
Use the following items to remove data. Check the Enable item and save changes to start data removal.	
Enable data removal	<input type="checkbox"/>
Remove data from DataNodes	198.69.18.239 S/N 61PQBA153 236 d 50 251 w 50 1220 061703 Analyzer 1 cee modem test
Remove data at or later than	02/21/2006 16:00:00
Remove data earlier than	02/21/2006 17:40:00
Remove event data	<input checked="" type="checkbox"/>
Remove periodic data	<input checked="" type="checkbox"/>
Remove summary data	<input checked="" type="checkbox"/>

Data - General tab properties

Storage

Storage setup is related to how much memory *Space to keep free (MB)* to add other software modules in the future, and whether to *Rebuild index* or *Rebuild query table* to compact the memory.

Log

The Log setup allows you to specify the number of additional days to keep each log entry type (*Encore Series activity*, *User activity*, *DataNode management*, *Alarms*) before purging. This mechanism is the same as that used for handling other purgeable data in the InfoNode. Refer to Data setup for more information on purging data. Right-click on the Log setup tree item to access the Clear Log menu command. Selecting this command removes all log entries stored in the Encore Series Software.

NOTE: Only Admin users can configure the log settings and delete log entries.

Notifications

The Notifications section is subdivided into Recipients and Senders. Notifications allow the system to automatically inform users about specific events related to every DataNode connected to the Encore Series Software. Notifications also inform users whether DataNode connection is lost or re-established, and when the Encore Series starts.

Recipients

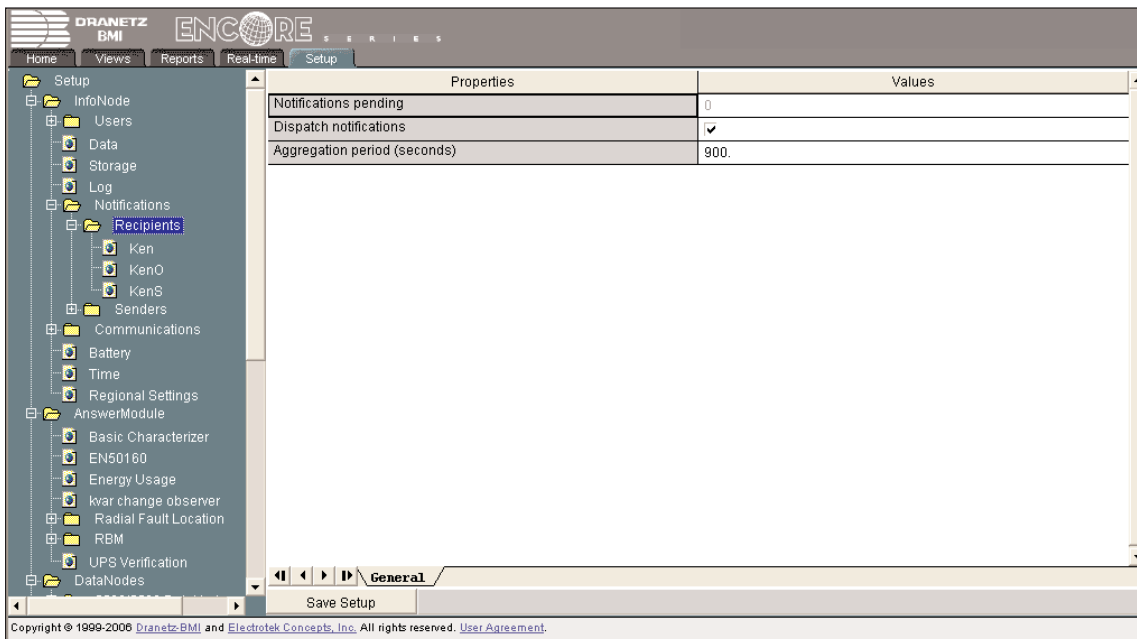
Recipients define who will receive notifications. The General tab contains properties to indicate recipient notification status. Only those with Admin privileges may set whether to dispatch notifications or not. Users who access the Encore Series system as Guest, Viewer or Operator will find the General properties automatically disabled. They are not allowed to dispatch notifications nor change time settings when notifications will be sent to recipients.

Notifications pending - a counter on the number of notifications that will be dispatched to recipients at specified time interval. The counter will reset to zero once the pending notifications are sent to recipients. The counter sets automatically and is not user-programmable.

Dispatch notifications - the enable/disable checkbox indicate whether recipients will receive/not receive notifications.

Aggregation period (seconds) - the time interval upon which notifications are sent to recipients and updated.

Notifications update is done every specified number of seconds (i.e. every 900 sec = 15 minutes).



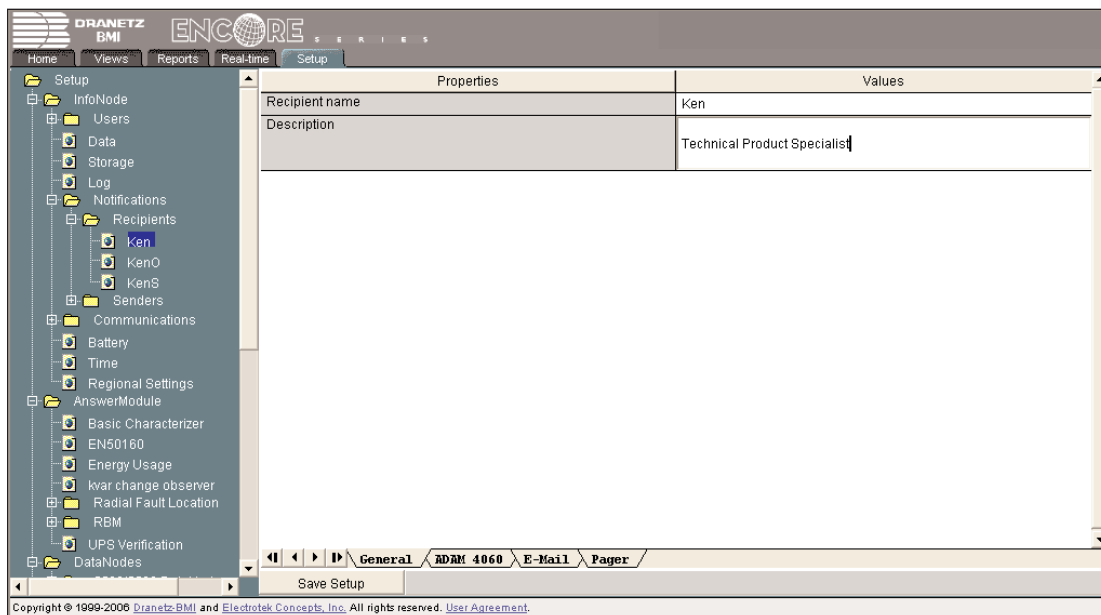
Recipients setup screen - General tab properties

To Add/Delete Recipient names:

- Right-click on the Recipient folder. The following options will appear: Add Recipient or Clear Notifications.
- Click on Add Recipients if you want to add a name in the list of recipients. Click on Clear Notifications if you want to delete any pending notifications to all recipients.
- Click on the Recipient Name to enter or change name and to program information about the type of recipient. Note the following tabs available on the bottom portion of the viewing area: General, ADAM 4060, E-Mail, Pager.
- Right-click on the recipient name if you want to Copy Recipient (duplicate recipient name and properties), Delete Recipient (remove recipient on the list), Test Recipient (send test messages to recipient), or Clear Notifications (reset pending notifications for the recipient).

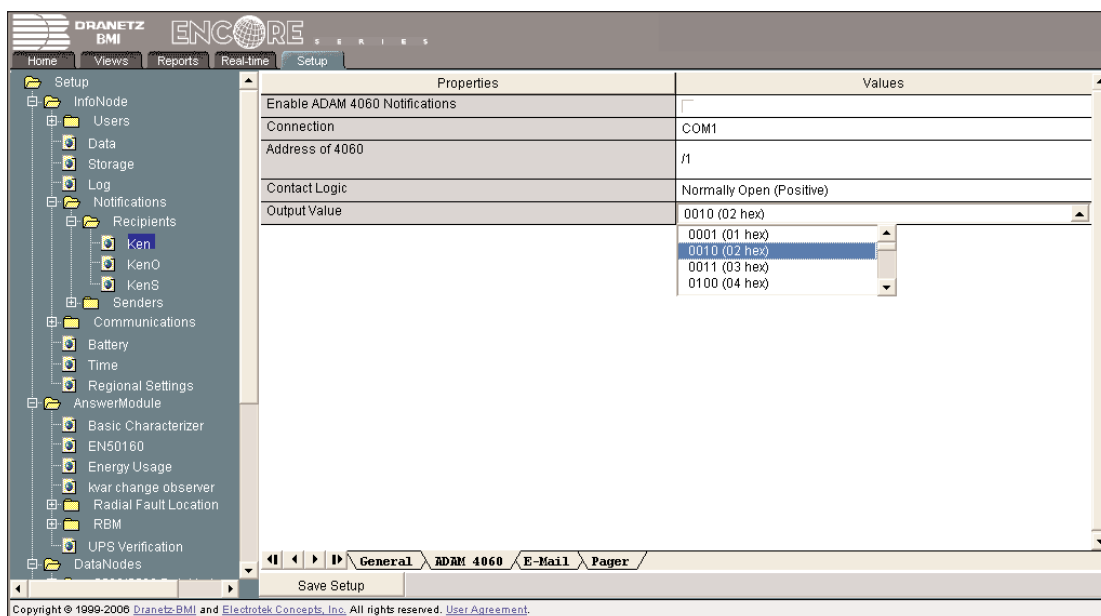
Notifications are dispatched to recipients in three ways: through ADAM 4060 Relay outputs, E-Mail, and/or Pager. Recipients must be set up before items in the Senders folder are programmed.

Click on a recipient to display the General tab properties. The *Recipient name* provided will be used to identify recipient and will appear under the Recipients folder on the left-hand frame. Further *Description* can be added to aid in recipient identification. Each recipient has a corresponding ADAM 4060 Relay outputs tab, E-Mail tab, and Pager tab described next. Note that when changing from one tab to another, a save confirmation box appears to confirm whether user wants to save the most recent changes in settings or not.



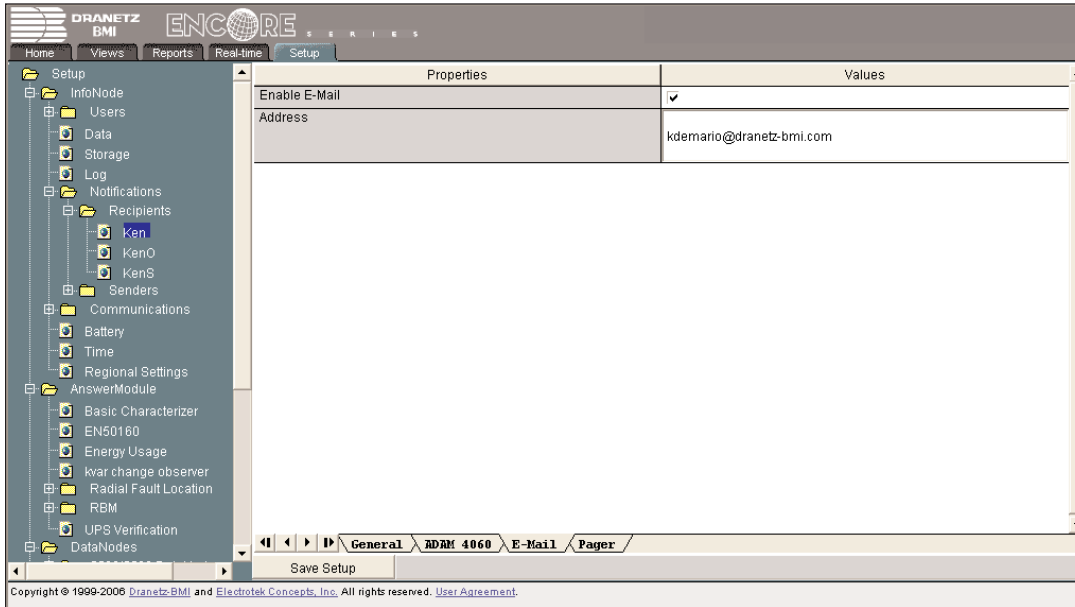
Recipient Name/General properties setup

Click on the ADAM 4060 tab. The *Enable ADAM 4060 Notifications* box must be checked for communication signals to ADAM modules to occur. The ADAM 4060 relay contact closure module is used to signal notifications to designated recipients. See page 14-3 for instructions on how to set up the ADAM 4060 contact closure module. Data for the ADAM modules may be configured in various format, one of which is the hexadecimal format displayed opposite the *Output Value* property. This format is selected by setting bits 0 and 1 of the data format. ASCII's condensed hexadecimal representation of data allows high resolution, quick communication and easy conversion to computer-compatible integer format. See Chapter 14 ADAM Handler Setup for more information on ADAM Communication modules.



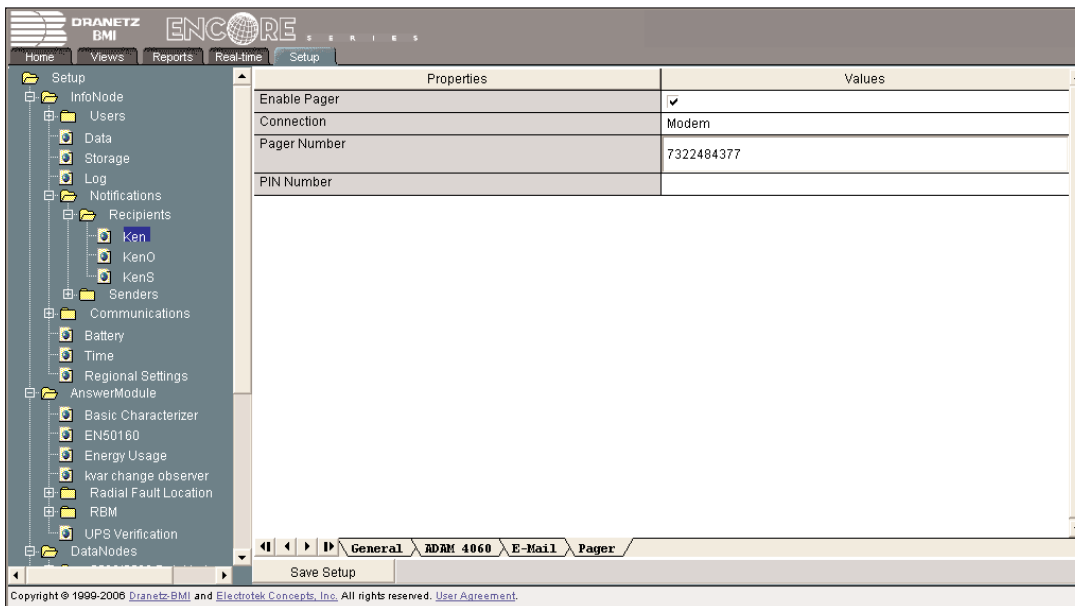
Recipient ADAM 4060 notification setup

Click on the E-mail tab. The *Enable E-mail* must be checked to allow notifications to be sent to the recipient's email address. Since an e-mail can be of a larger size than a page, messages are more descriptive. Hyperlinks to event details are also available. Type in the recipient's electronic mail *Address* in the space provided.



Recipient E-mail notification setup

Click on the Pager tab. The *Enable Pager* must be checked to allow notifications to be sent to the recipient's pager unit. Type in the corresponding *Pager Number* and *PIN Number* where notification signals will be sent. Alphanumeric or numeric page containing alarm details are sent to a list of recipients. In order to prevent nuisance pages when many problems occurs at or around the same time, pages are aggregated over a short period of time. Therefore, one page will be sent instead of many pages.



Recipient Pager notification setup



Senders

The Senders section branches out into DataNodes and InfoNodes.

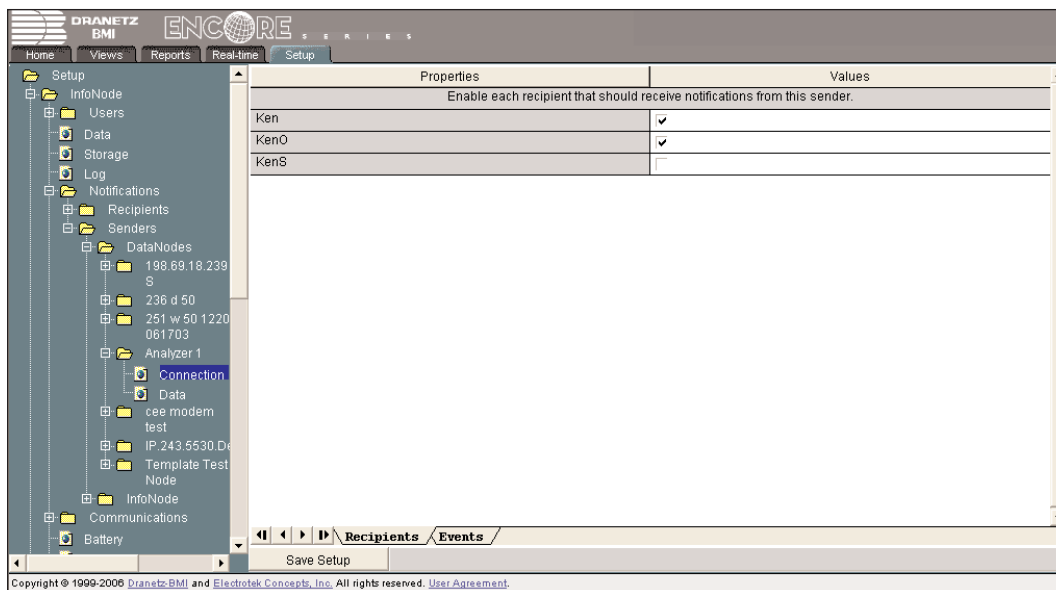


DataNodes - each DataNode has its own unique identification and is monitored on their Connection status (whether connection is lost or re-established) and on the Data that they register.



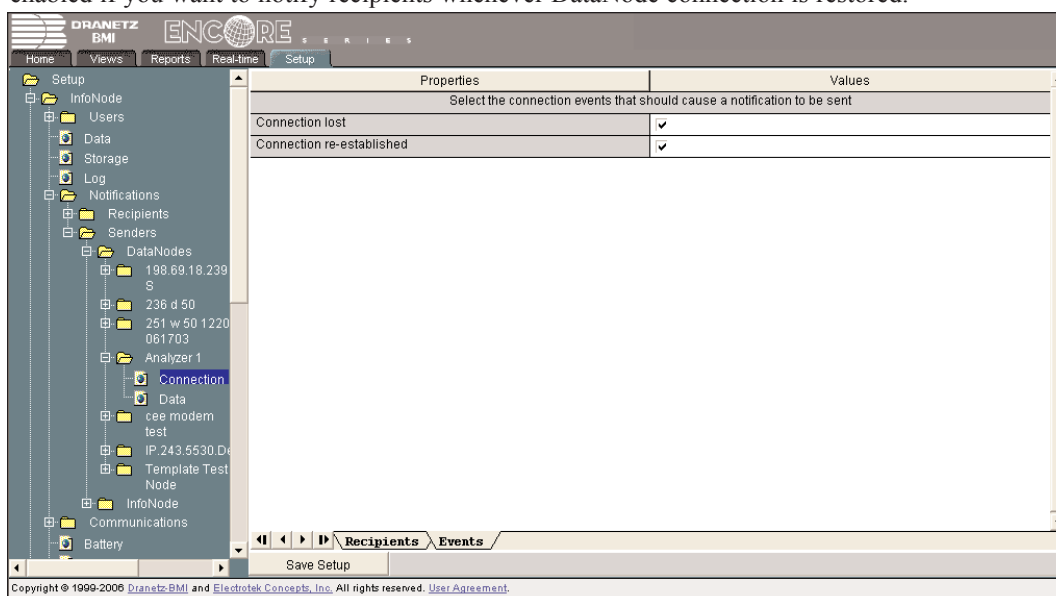
Connection

The *Recipients* tab indicate the names of recipients who are currently connected to the DataNode. Enable each recipient that should receive notifications pertaining to DataNode connection described next, provided the Administrator enabled/granted Dispatch Notifications (see page 7-5).



DataNode Recipients connection setup

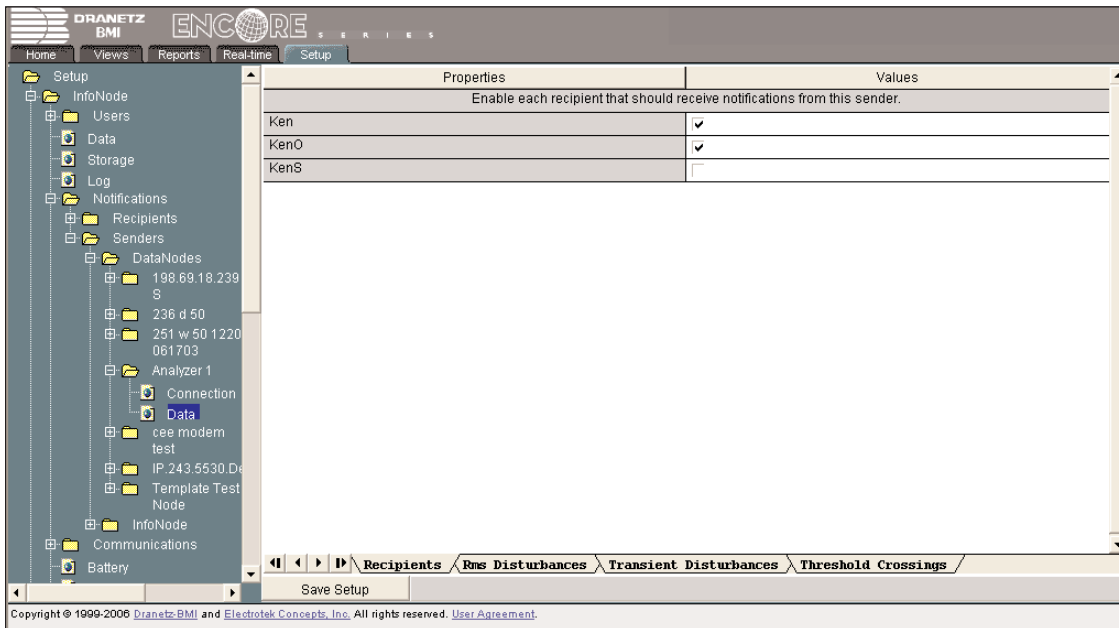
The Events tab contains the facility to communicate DataNode connection status to recipients. *Connection lost* must be enabled if you want to notify recipients whenever DataNode connection is lost. *Connection re-established* must be enabled if you want to notify recipients whenever DataNode connection is restored.



DataNode Events connection setup

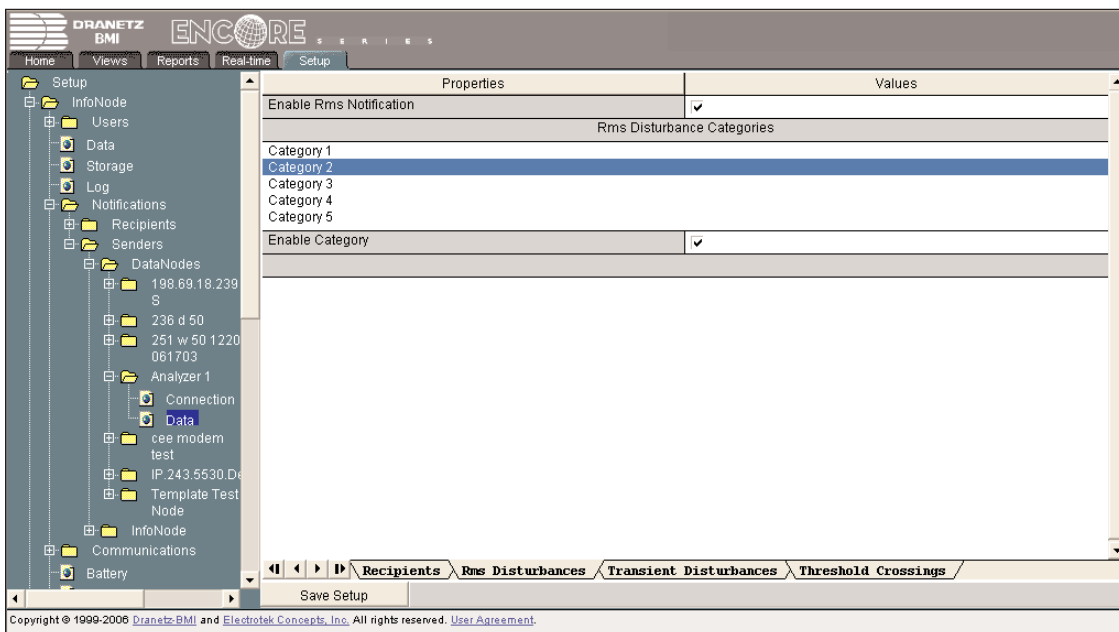
Data

The Recipients tab indicate the names of *Recipients* who are currently connected to the DataNode. Enable each Recipient that should receive notifications pertaining to specified events detected by the DataNode, provided the Administrator enabled/granted Dispatch Notifications (see page 7-5).



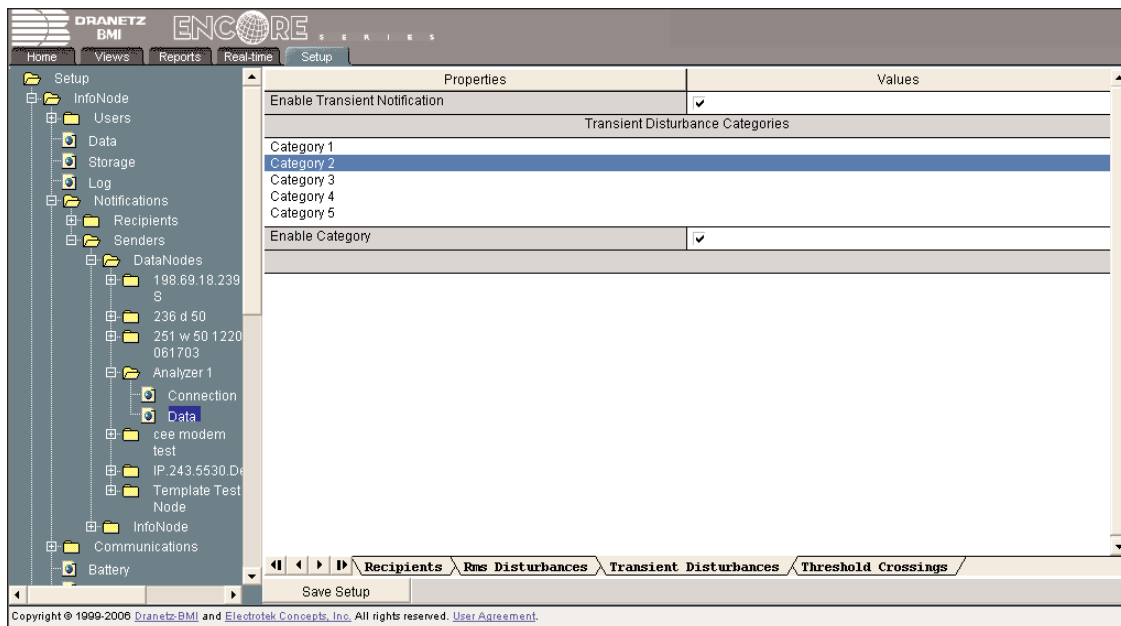
DataNode Recipients notification setup

The *Enable Rms Notification* must be checked to allow the system to send rms disturbance event notifications to recipients. Threshold properties for the different *Rms Disturbance Categories* have been set under the Basic Characterizer - Rms Disturbance Categories tab (see page 7-23). The *Enable Category* allows users to select which category they want to activate and, as per the rms disturbance category definition on page 7-22, register as rms event. This selective enabling process allows users more control over the event notifications they receive.



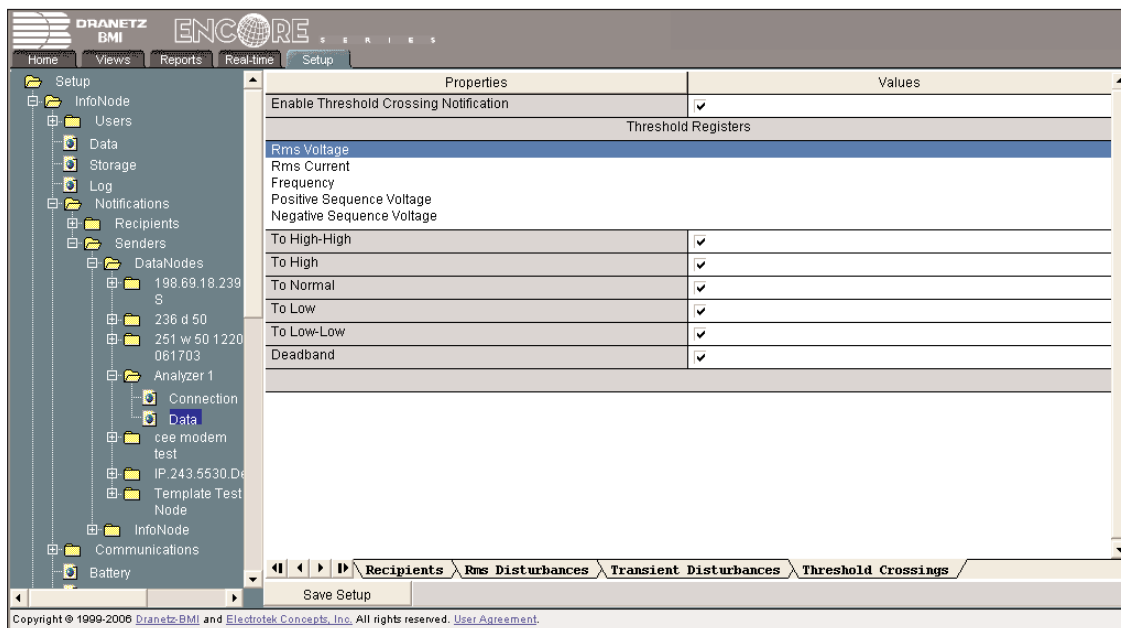
DataNode Rms Disturbances event notification setup

The *Enable Transient Notification* must be checked to allow the system to send Transient disturbances event notifications to recipients. Threshold properties for the different *Transient Disturbance Categories* have been set under the Basic Characterizer - Transient Disturbance Categories tab (see page 7-24). The *Enable Category* allows users to select which category they want to activate and, as per the transient disturbance category definition on page 7-24, register as transient event. This selective enabling process allows users more control over the event notifications they receive.



DataNode Transient Disturbances event notification setup

The *Enable Threshold Crossing Notification* must be checked to allow the system to send specified parameter threshold crossing notifications to recipients. The *Threshold Registers* lists the parameters available for which various threshold limits can be defined. Click on a parameter (i.e. Harmonic Voltage) and select the threshold limit/s (High-High, High, Normal, Low, Low-Low, Deadband) that you want enabled/disabled for that particular parameter. This means that once an enabled parameter has exceeded the threshold limit, an event will be registered. This selective enabling process allows users more control over the event notifications they receive and prevent the processing of unwanted data.

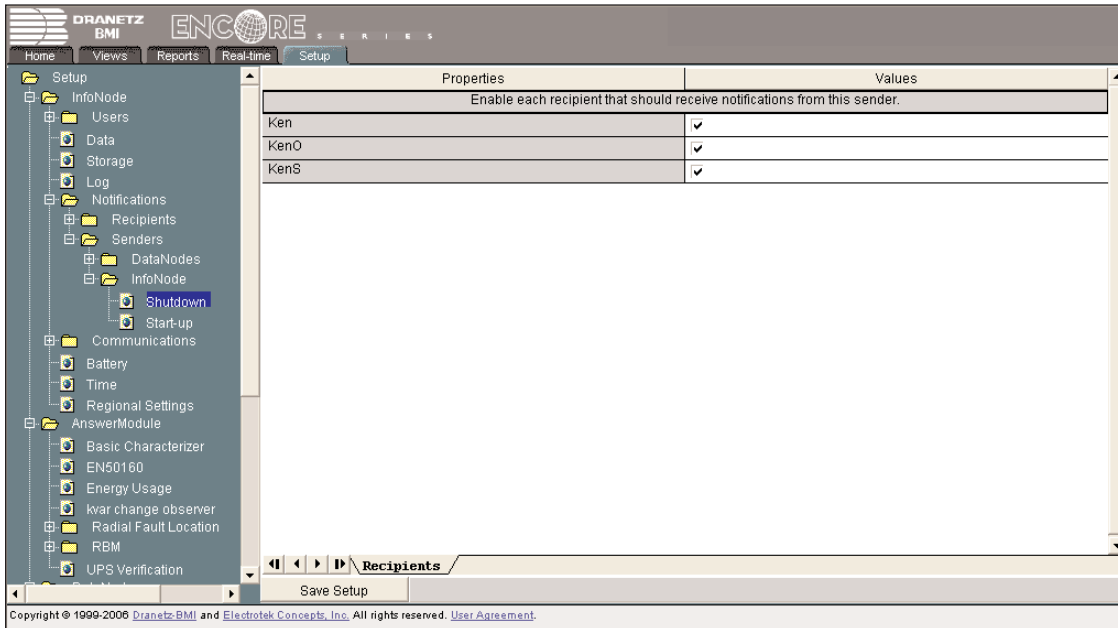


DataNode Parameter Threshold Crossing notification setup

 **InfoNodes** - contains notifications regarding InfoNode system shutdown and start-up.

Shutdown

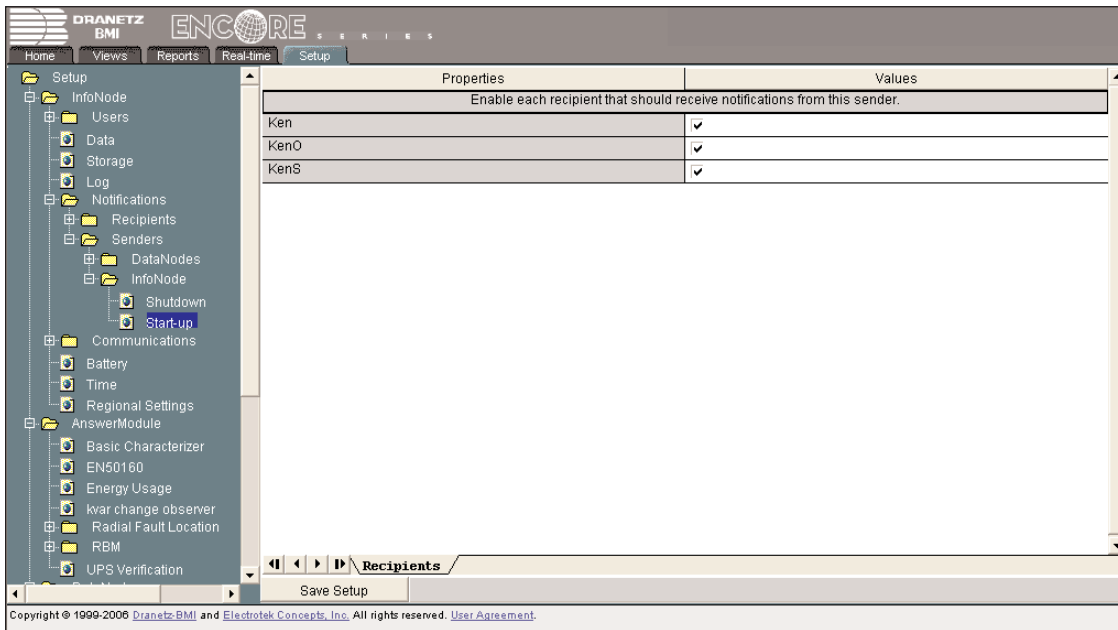
The Encore Series Software *Recipients* tab indicates the names of recipients who will receive notifications when the Encore Series shuts down operation. See page 7-5 for the procedure on how to add/delete recipients.



Encore Series Software Shutdown notification setup

Start-up

The Encore Series Software *Recipients* tab indicate the names of recipients who will receive notifications when the Encore Series starts up operation. See page 7-5 for the procedure on how to add/delete recipients.



Encore Series Software Start-up notification setup

7 Setup Page


Encore Series Software automatically communicates with each DataNode connected to the system via different communications methods to download and store data. From high-speed fiber connections to analog modems, Encore Series supports industry-standard communications methods such as:

Standard: 10/100BaseT Ethernet Port, RS232 and RS485


Optional: analog Modem, GSM/GPRS

Supported protocols include TCP/IP, HTTP, XML, Modbus TCP/RTU

Notifications: email, contact closure, pager

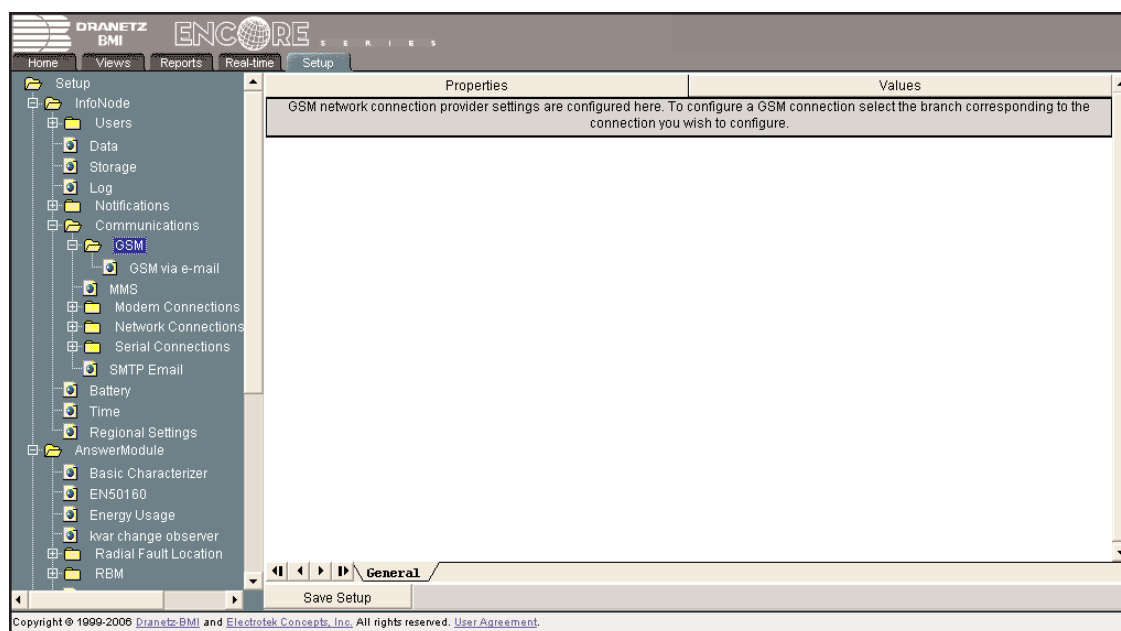
 **Communications** - The Communications data folder contains information on Internet Protocols and network settings; this is where communications address settings for the Encore Series are configured.

Configuring a GSM/GPRS Connection to a 61000 Power Quality DataNode

 **GSM/GPRS** - Unlike standard network connections that are initiated by the Encore Series Software to a 61000 DataNode, GSM/GPRS connections are initiated from the 61000 DataNode to the Encore Series. This is required because GSM/GPRS service providers implement a routing scheme similar to a NAT firewall.

GSM/GPRS devices do support incoming messages which the 61000 DataNode utilizes as a signal to initiate a message to the Encore Series. For sending messages to a GSM/GPRS device via SMTP, the service provider implements an e-mail address for the device. Generally the e-mail address is composed of the phone number for the GSM/GPRS device followed by the domain name of the service provider. For example, Cingular Wireless uses xxxxxxxxxx@mmode.com to address a device where xxxxxxxxxx is the phone number of the remote GSM/GPRS device.

To connect to a 61000 DataNode via GSM/GPRS, the Encore Series Software sends a message to the service provider via SMTP e-mail. The service provider in turn signals the 61000. Finally the 61000 DataNode connects to the Encore Series. For this to work, the software must be configured to send e-mail to the GSM/GPRS service provider and must have a range of TCP/IP ports open for incoming connections.



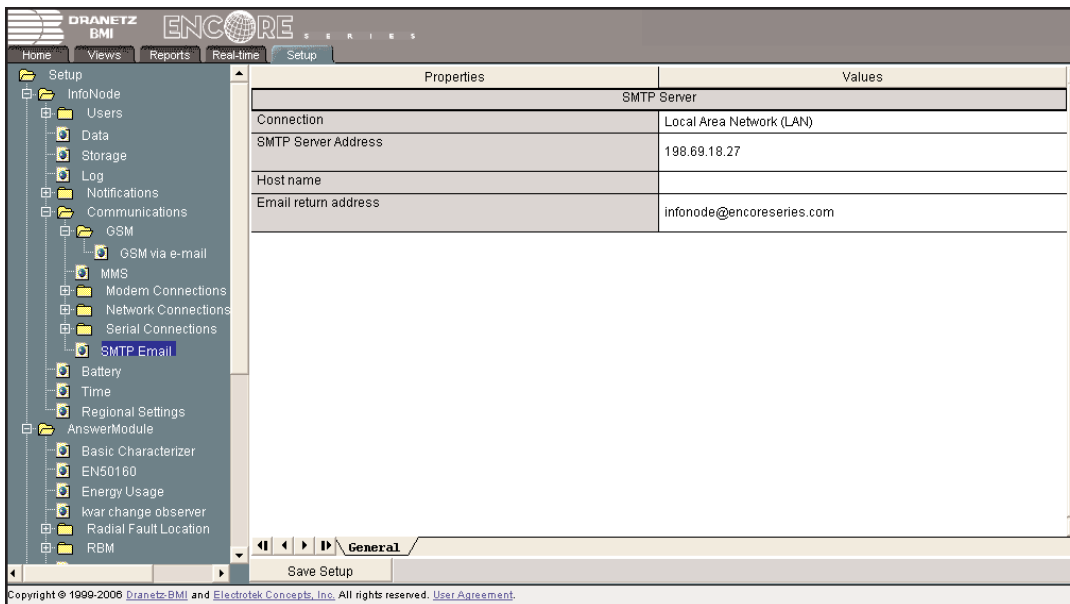
GSM/GPRS setup page

The procedure below shows how to configure Encore Series Software for GSM/GPRS connections to a 61000 DataNode.

Make sure that the Encore Series Software is configured to send e-mail. This generally involves entering the address of a SMTP server on the Communications > Serial Connections > SMTP Email setup page.

Serial Connections

SMTP Email



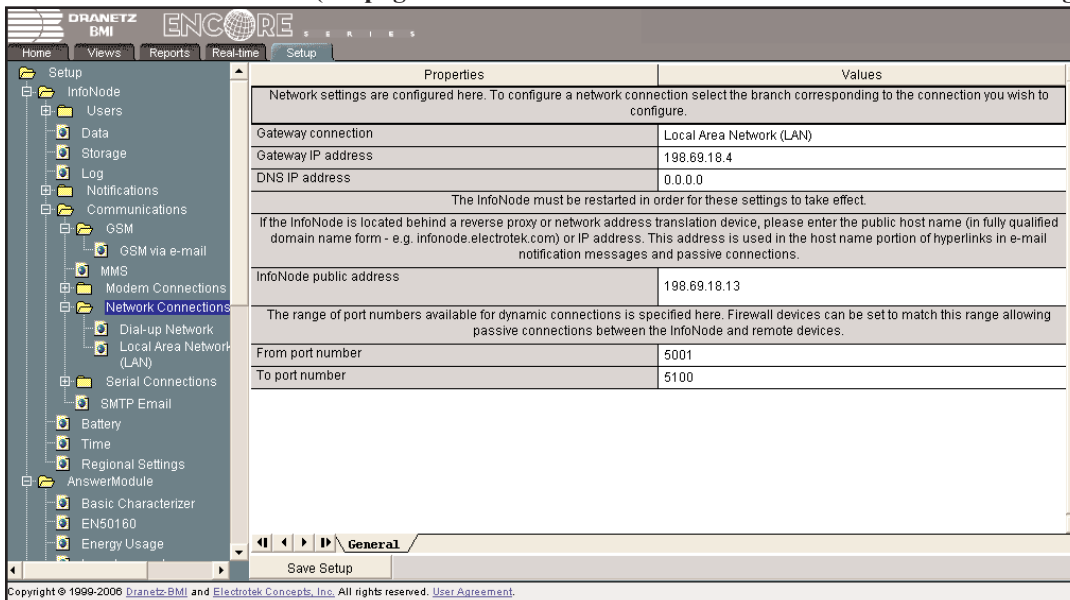
The screenshot shows the 'Setup' window of the Encore Series Software. The left sidebar contains a tree view with categories like InfoNode, Users, Data, Storage, Log, Notifications, Communications, GSM, MMS, Modern Connections, Network Connections, Serial Connections, and SMTP Email. The 'SMTP Email' option is selected. The main area displays the 'Properties' and 'Values' for the 'SMTP Server'. The 'Connection' is set to 'Local Area Network (LAN)'. The 'SMTP Server Address' is '198.69.18.27'. The 'Host name' is empty. The 'Email return address' is 'infonode@encoreseries.com'. At the bottom, there is a 'Save Setup' button and a copyright notice: 'Copyright © 1999-2006 Dranetz BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

Properties	Values
SMTP Server	
Connection	Local Area Network (LAN)
SMTP Server Address	198.69.18.27
Host name	
Email return address	infonode@encoreseries.com

SMTP Email General setup tab

Make sure a range of TCP ports are open through any firewall between the Encore Series and the GSM/GPRS service provider. Enter this range along with the public address of the Encore Series Software on the Communications > Network Connections setup page.

Network Connections (see page 7-18 for more information on network connection settings)




The screenshot shows the 'Setup' window of the Encore Series Software. The left sidebar contains a tree view with categories like InfoNode, Users, Data, Storage, Log, Notifications, Communications, GSM, MMS, Modern Connections, Network Connections, Serial Connections, and SMTP Email. The 'Network Connections' option is selected. The main area displays the 'Properties' and 'Values' for the 'Network settings'. The 'Gateway connection' is set to 'Local Area Network (LAN)'. The 'Gateway IP address' is '198.69.18.4'. The 'DNS IP address' is '0.0.0.0'. A message states: 'The InfoNode must be restarted in order for these settings to take effect.' Below this, a message states: 'If the InfoNode is located behind a reverse proxy or network address translation device, please enter the public host name (in fully qualified domain name form - e.g. infonode.electrotek.com) or IP address. This address is used in the host name portion of hyperlinks in e-mail notification messages and passive connections.' The 'InfoNode public address' is '198.69.18.13'. A message states: 'The range of port numbers available for dynamic connections is specified here. Firewall devices can be set to match this range allowing passive connections between the InfoNode and remote devices.' The 'From port number' is '5001' and the 'To port number' is '5100'. At the bottom, there is a 'Save Setup' button and a copyright notice: 'Copyright © 1999-2006 Dranetz BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

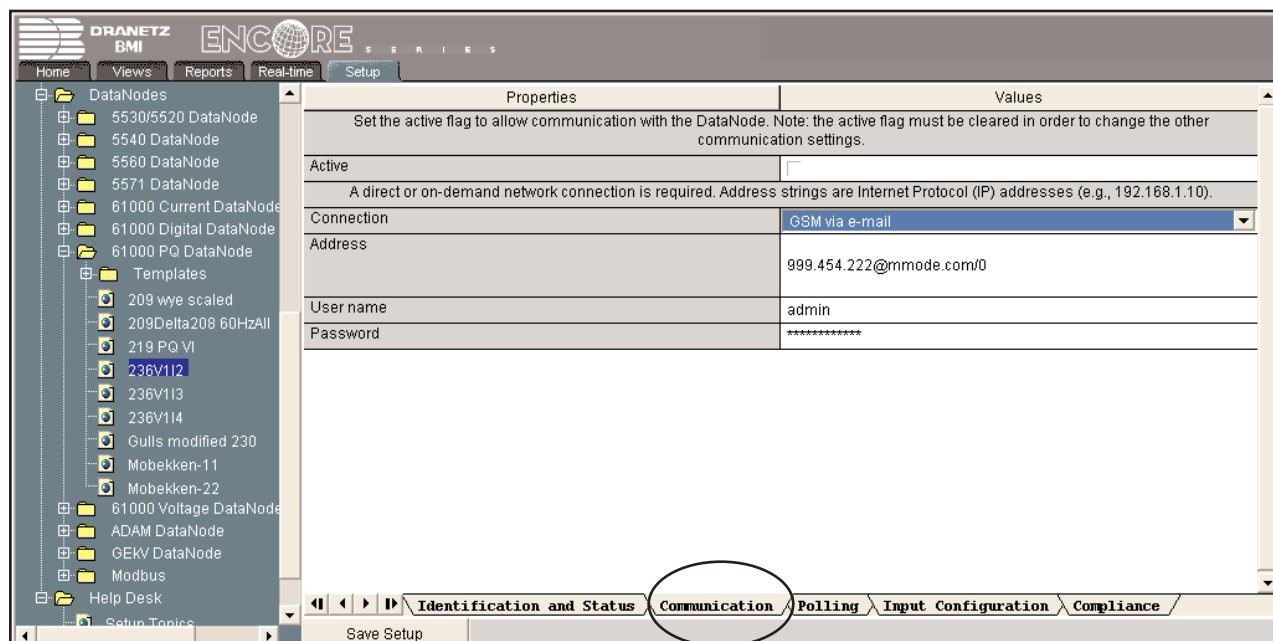
Properties	Values
Network settings are configured here. To configure a network connection select the branch corresponding to the connection you wish to configure.	
Gateway connection	Local Area Network (LAN)
Gateway IP address	198.69.18.4
DNS IP address	0.0.0.0
The InfoNode must be restarted in order for these settings to take effect.	
If the InfoNode is located behind a reverse proxy or network address translation device, please enter the public host name (in fully qualified domain name form - e.g. infonode.electrotek.com) or IP address. This address is used in the host name portion of hyperlinks in e-mail notification messages and passive connections.	
InfoNode public address	198.69.18.13
The range of port numbers available for dynamic connections is specified here. Firewall devices can be set to match this range allowing passive connections between the InfoNode and remote devices.	
From port number	5001
To port number	5100

Network Connections General setup tab

7 Setup Page

Select the "GSM via e-mail" connection and enter the e-mail address of the 61000's GSM/GPRS device as part of the device address on the 61000 Power Quality DataNode setup page - Communication tab.

 **61000 Power Quality DataNode** (see Chapter 13 61000 PQ DataNode Setup for more information on DataNode settings)



The screenshot shows the 'Setup' window for a 61000 Power Quality DataNode. The left sidebar lists various DataNodes, with '236V112' selected. The main area is divided into 'Properties' and 'Values' sections. The 'Properties' section contains a note about the active flag and a direct/on-demand network connection requirement. The 'Values' section contains fields for 'Active' (checkbox), 'Connection' (dropdown menu set to 'GSM via e-mail'), 'Address' (text field with '999.454.222@mmode.com/0'), 'User name' (text field with 'admin'), and 'Password' (text field with '*****'). At the bottom, there is a 'Save Setup' button and a series of tabs: 'Identification and Status', 'Communication' (circled), 'Polling', 'Input Configuration', and 'Compliance'.

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input type="checkbox"/>
A direct or on-demand network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).	
Connection	GSM via e-mail
Address	999.454.222@mmode.com/0
User name	admin
Password	*****

61000 Power Quality DataNode Communication setup tab

MMS

MMS or Manufacturing Messaging Specification is where communications address settings for the Encore Series Software are configured. The MMS protocol is used for connections to UCA compliant devices such as the 5520, 5530 and 5560 DataNodes. The Encore Series application also accepts incoming MMS connections for system discovery functions.

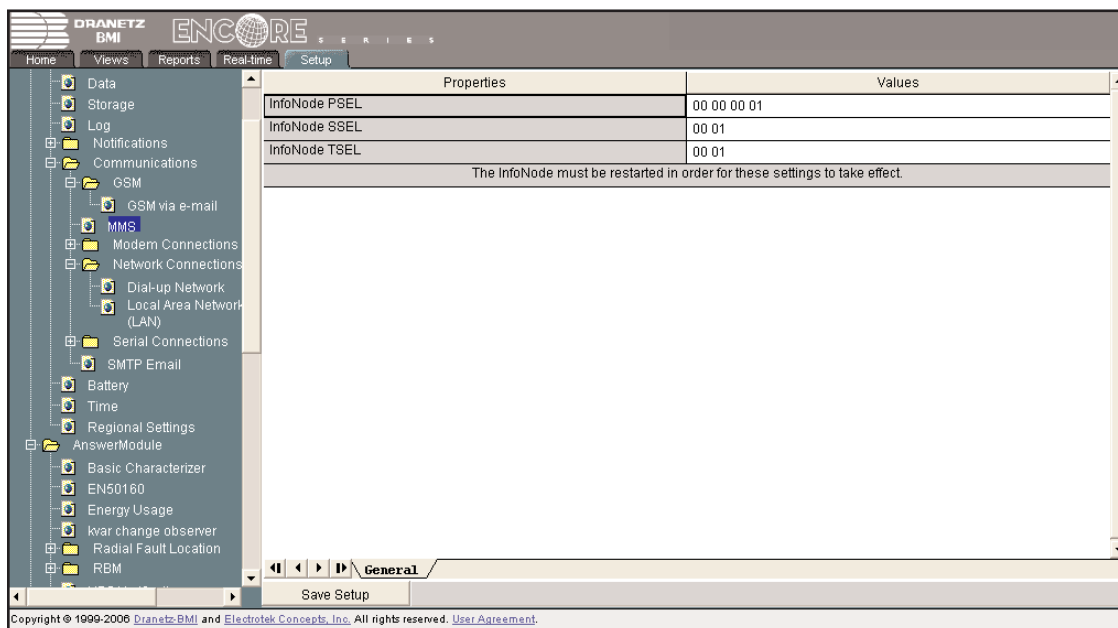
MMS contains the following property settings:

PSEL stands for Presentation Selector with default value 00 00 00 01.

SSEL refers to Session Selector with default value 00 01.

TSEL means Transport Selector with default value 00 01.

In general, you do not need to change the MMS settings from their default settings. The PSEL, SSEL, and TSEL values must match those of the DataNode that the Encore Series communicates with. A mismatch results in “Connection Failures”.



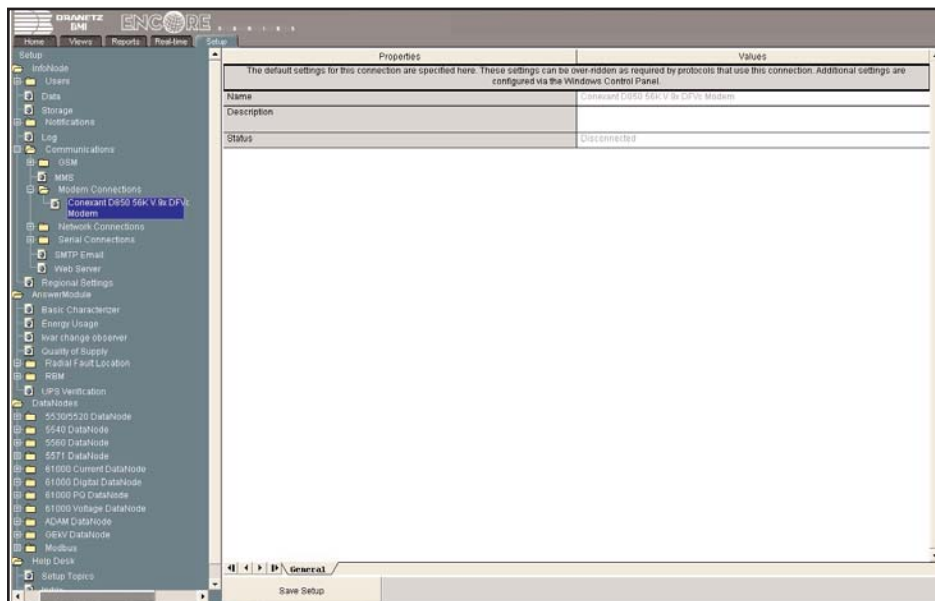
MMS General setup tab

Modem Connections

The Modem Connections is a branch under “Communications”. There are two types of setups: one is for the “Encore Series Software on PC” software, the other is for “InfoNode”.

Encore Series Software on PC

Encore Series Software on PC uses the computer’s modem setting for communications.



The Encore Series Software uses the Windows® TAPI when accessing modem communications resources. The assumption is that the Windows® modem to be used for communications with the Encore Series 61000 device has been properly installed prior to executing this procedure. If the modem is not on, or was not on when Windows® was started, it may be necessary to turn the modem on and restart Windows®. Windows® searches for installed serial modems at startup. If it does not find them, it may not allow them to be configured in the Control Panel.

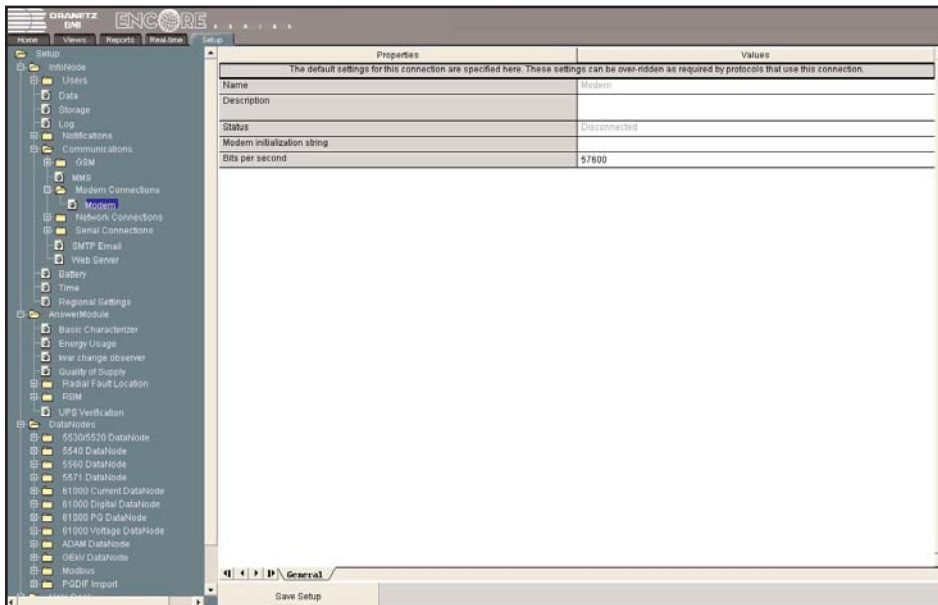
Follow the steps below to configure the port speed for the Windows® modem connected to the computer:

1. Press the Start button.
2. Select Settings and then Control Panel.
3. Double-click on Phone and Modem Options.
4. Select Modems in the subsequent dialog box.
5. In the list of modems that is displayed, click to highlight the modem in question and select Properties.
6. On the General tab of the modem properties dialog box, select 57600 as the maximum port speed.
7. Click OK to exit from the open dialog box.
8. Close the Control Panel.

NOTE: The port speed of 57600 (57.6kbps) may be substituted with 115000. You may experiment to find the maximum port speed that will work for your system.

InfoNode

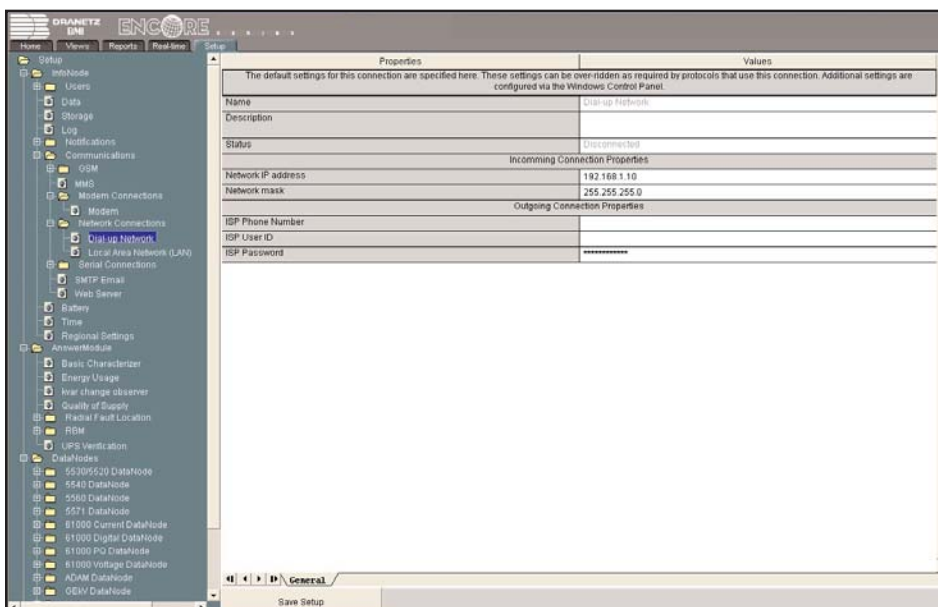
The InfoNode has only 2 types of Network connection, the LAN Connection (see page 7-20) and the Modem Connection. For the Modem Connection, expand the Modem Connection branch, then click on the Modem branch. Proceed to set the baud rate. In most cases the default rate is the correct setting. If desired, you can also set a custom modem initialization string.



Next expand the Network Connection branch and then select Dial-Up networking to display the modem's networking settings. You can specify settings for both incoming and outgoing connections.

For incoming connections specify a network IP address and network mask value. In most cases the default values should suffice.

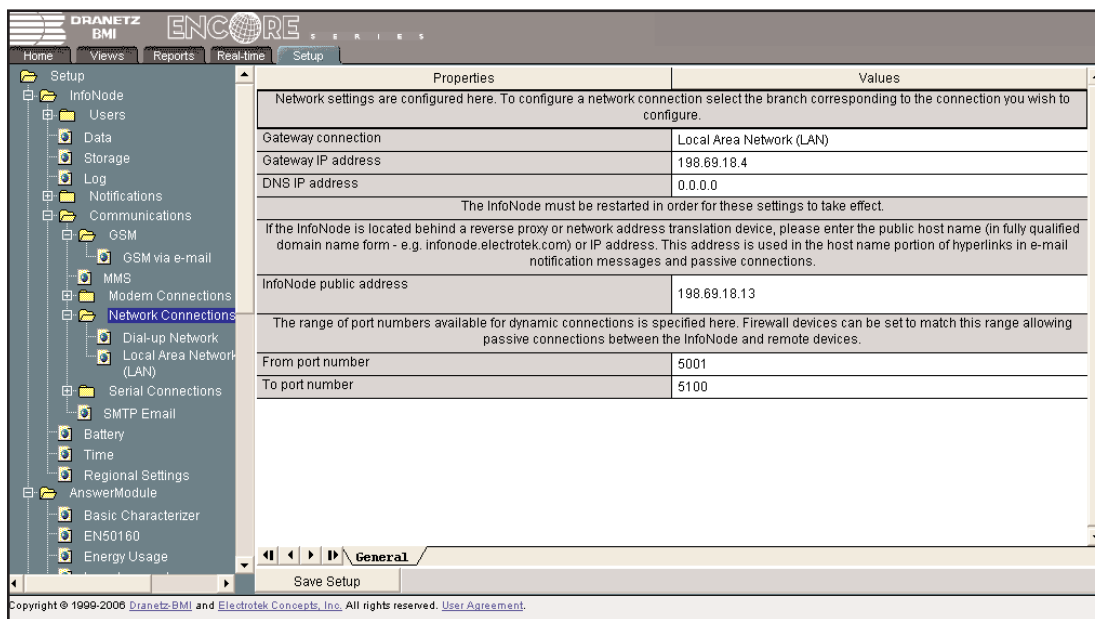
For out going connections, enter your ISP Phone Number, ISP User Name and ISP Password.



7 Setup Page

Network Connections

Network contains the properties that allow the Encore Series Software to link DataNodes and ADAM modules to its self-contained web server and user interface. It is possible to communicate with the Encore Series Software through either Dial-up Network or Local Area Network (LAN) connections. Each communication method requires specific configuration settings. The Network Connections - General setup tab shown below features the settings required for the Encore Series Software to operate on the network.



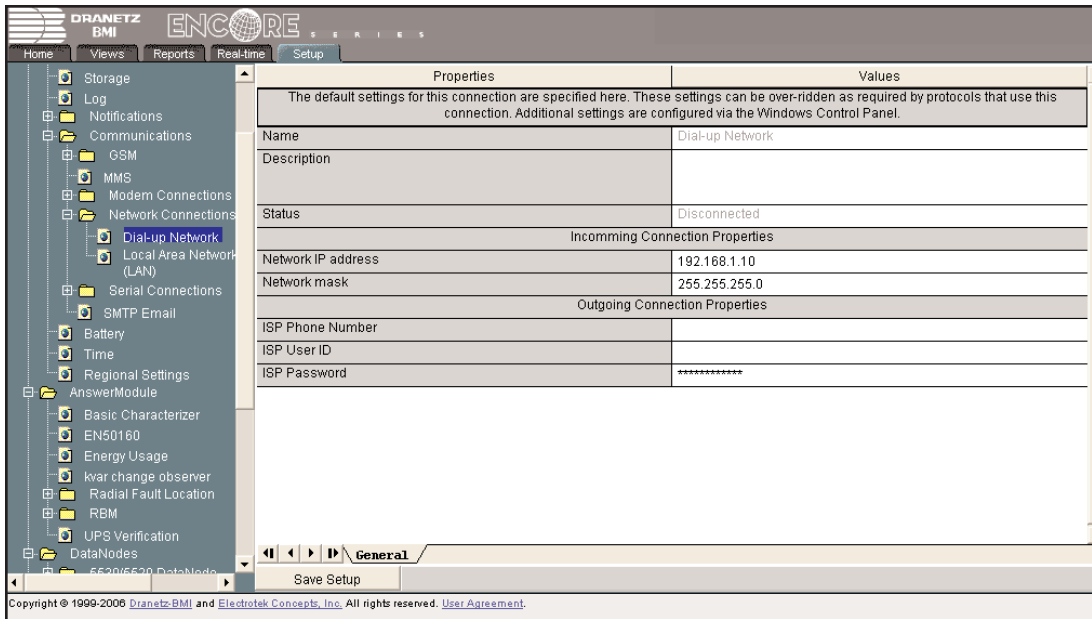
The screenshot shows the 'Setup' window for the 'ENCORE' series software. The left sidebar contains a tree view with categories like InfoNode, Users, Data, Storage, Log, Notifications, Communications, GSM, MMS, Modem Connections, Network Connections (selected), Dial-up Network, Local Area Network (LAN), Serial Connections, SMTP Email, Battery, Time, Regional Settings, AnswerModule, Basic Characterizer, EN50160, and Energy Usage. The main area is titled 'Properties' and 'Values'. It contains a table for network settings. The 'Gateway connection' is set to 'Local Area Network (LAN)'. The 'Gateway IP address' is '198.69.18.4' and the 'DNS IP address' is '0.0.0.0'. A note states: 'The InfoNode must be restarted in order for these settings to take effect.' Below this, the 'InfoNode public address' is '198.69.18.13'. Another note states: 'The range of port numbers available for dynamic connections is specified here. Firewall devices can be set to match this range allowing passive connections between the InfoNode and remote devices.' The 'From port number' is '5001' and the 'To port number' is '5100'. At the bottom, there is a 'Save Setup' button and a copyright notice: 'Copyright © 1999-2006 Dranetz-BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

Properties	Values
Network settings are configured here. To configure a network connection select the branch corresponding to the connection you wish to configure.	
Gateway connection	Local Area Network (LAN)
Gateway IP address	198.69.18.4
DNS IP address	0.0.0.0
The InfoNode must be restarted in order for these settings to take effect.	
InfoNode public address	198.69.18.13
The range of port numbers available for dynamic connections is specified here. Firewall devices can be set to match this range allowing passive connections between the InfoNode and remote devices.	
From port number	5001
To port number	5100

Network Connections - General setup tab

Dial-upNetwork

Dial-up Network features the settings required for dial-up or PPP connections to establish communication links between the appropriate Encore Series DataNodes and the modem where Encore Series Software is installed.



The screenshot shows the 'Setup' window for the 'Dial-up Network' configuration. The left sidebar contains a tree view with categories like Storage, Log, Notifications, Communications, GSM, MMS, Modem Connections, Network Connections, Local Area Network (LAN), Serial Connections, SMTP Email, Battery, Time, Regional Settings, AnswerModule, Basic Characterizer, EN50160, Energy Usage, kvar change observer, Radial Fault Location, RBM, UPS Verification, DataNodes, and 6620/6630 DataNode. The main area is titled 'Properties' and 'Values'. It contains a table with the following data:

Properties	Values
The default settings for this connection are specified here. These settings can be over-ridden as required by protocols that use this connection. Additional settings are configured via the Windows Control Panel.	
Name	Dial-up Network
Description	
Status	Disconnected
Incoming Connection Properties	
Network IP address	192.168.1.10
Network mask	255.255.255.0
Outgoing Connection Properties	
ISP Phone Number	
ISP User ID	
ISP Password	*****

At the bottom, there is a 'General' tab and a 'Save Setup' button. The footer contains the copyright notice: 'Copyright © 1999-2006 Dranetz-BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

Dial-up Network - General setup tab

The Encore Series Software uses the PAP protocol for PPP dial-up connection authentication. This is a simple, unencrypted authentication protocol. It is more secure than the standard web page authentication but less secure than an encryption based PPP authentication protocol. You must therefore use an ISP that supports PPP dial-up accounts that allow PAP authentication. Most ISPs permit PAP authentication.

Windows® 2000 server is used by some enterprises to provide remote access. Windows® 2000 defaults to a very secure configuration and hence does not support PAP authentication by default.

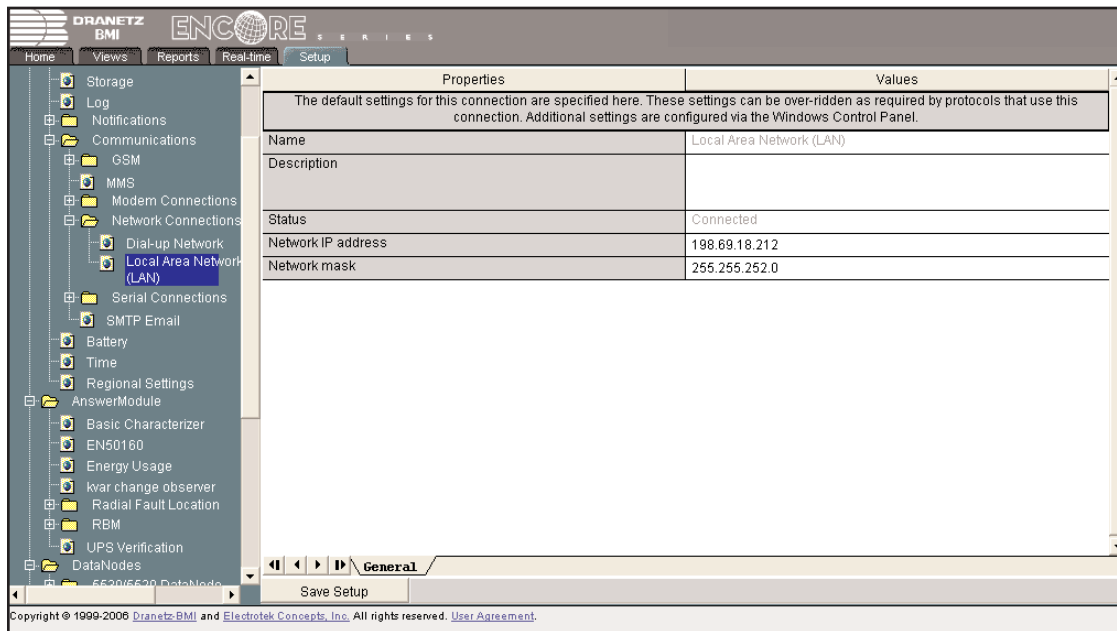
To enable PAP authentication on Windows® 2000 server, there are several configuration options that must be set:

- PAP must be enabled in the Routing and Remote Access Service management console for the RRAS server
- PAP must be enabled in the RRAS policy object in the RRAS management console
- Clear text authentication must be permitted in the RRAS policy object

Only when PAP is enabled in all three places will a Windows® 2000 RRAS server authenticate a PAP authenticated PPP login. In addition to this, you must specify the login ID in the Encore Series Software using DOMAIN\UserID notation for PAP authenticated logins to a Windows® 2000 RRAS server. This is described in the Microsoft Knowledge Base article at <http://support.microsoft.com>.

Local Area Network (LAN)

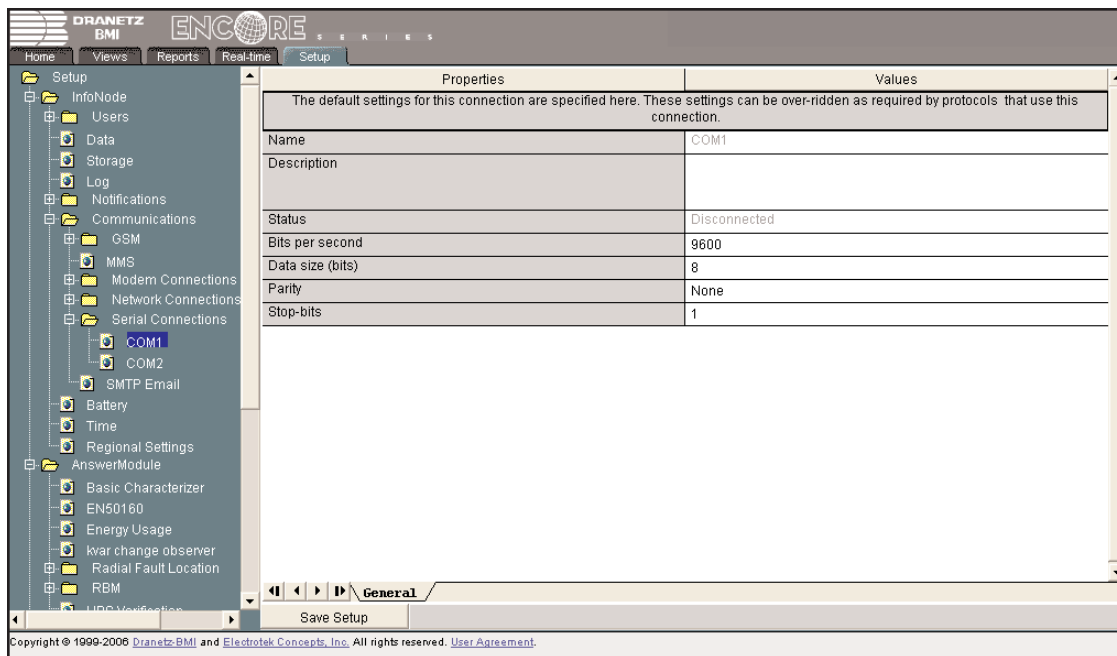
LAN features the settings required for administrative set up of the Encore Series Software for IP addressing.



LAN - General setup tab

Serial Connections

Serial connections can be used to communicate with modems, or with DataNodes that utilize such communication types, i.e. the 554x and ADAM modules. The COM ports can have a Name and Description added. Serial connection status is also displayed. Users can also set the baud rate or Bits per second {110 - 115k}, Data size (bits) {5, 6, 7, 8}, Parity {None, Even, Odd}, and number of Stop-bits {1, 1.5, 2}.



Serial Connections - General setup tab

Battery

Where the software is running on a 5502 or 5504 InfoNode, the Encore Series system allows users to check on the *Battery status* (whether charged or discharged) and the remaining *Battery capacity*. For convenience, the system allows users to keep date/time records when the *Last discharge* test was and when the *Next discharge* test will be.

Time

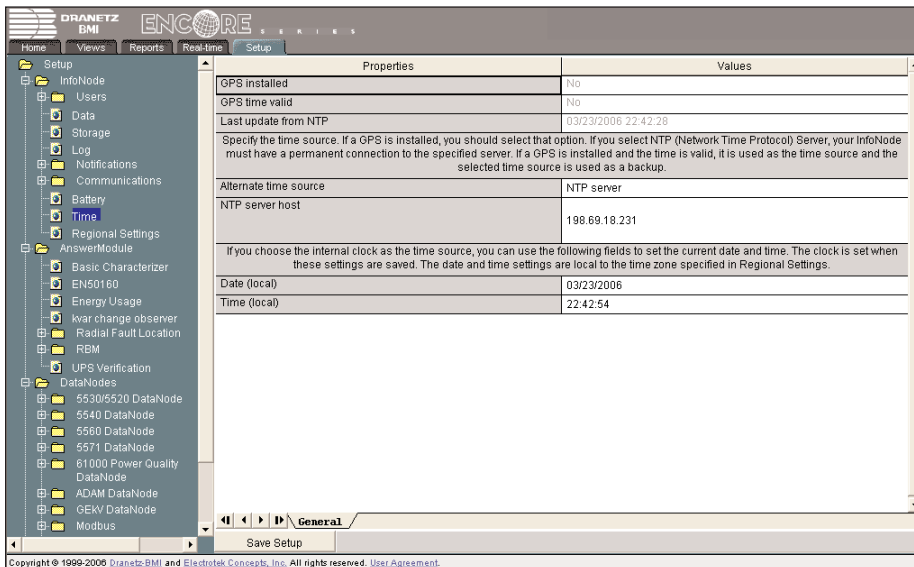
Where the software is running on a 5502 or 5504 InfoNode, the Encore Series optionally provides for an on-board GPS receiver capable of receiving time signals from the GPS system and utilizing those signals to continuously update the system clock. If there is no GPS present or the GPS is present but a signal is not available, then you can specify whether the Time Manager uses the Internal clock or an Internet clock source (NTP).

To use the Internet clock source (NTP), specify the IP address of the NTP Server Host. The procedure below describes how to set up Encore Series Software to communicate with the NTP server.

1. Go to the tree branch “Regional Settings” and set the Encore Series Software for the region it is in (refer to the next section for a brief discussion of Regional Settings setup properties).
2. Go to the Tree branch “Time”.
 - a. Click on the drop down list for “Alternate time source” and choose “NTP server”.
 - b. Enter the IP address (in numeric form - ###.###.###.###) of the NTP server in which Encore Series Software will synchronize with under the “NTP server host”.

NOTE: You may use a name such as “bitsy.mit.edu” for NTP server but then you must enter the IP address of a DNS server in the Encore Series Software. The DNS server address is entered under Setup > Communications > Network Connections.

A sample Time window screen appears as follows.



Setup screen for Communications - Time

Regional Settings

Regional Settings allow you to use different formatting conventions found in different parts of the world. The following properties are found under the Date and Time tab. Select the applicable *Time zone* depending on your geographic location. Enable/Disable the option to *Adjust for daylight saving changes*. Select your preferred date and time settings to include *Date separator* (/ or - or .), *Date ordering* (mm/dd/yy, dd/mm/yy, yy/mm/dd), *Time separator* (: or .), and *Time format* (12 versus 24 hour format).

Under the Number tab, users can set the *Measurement system* using the U.S. system or the Metric system of measurement.



Answer Module

Answer Modules provide different types of reports that answer specific questions about data, such as whether the transient event was caused by a PF capacitor switching or whether the event occurred upstream or downstream from the monitoring point. The list of Answer Modules depends upon which optional modules were purchased and installed to communicate with the Encore Series Software.



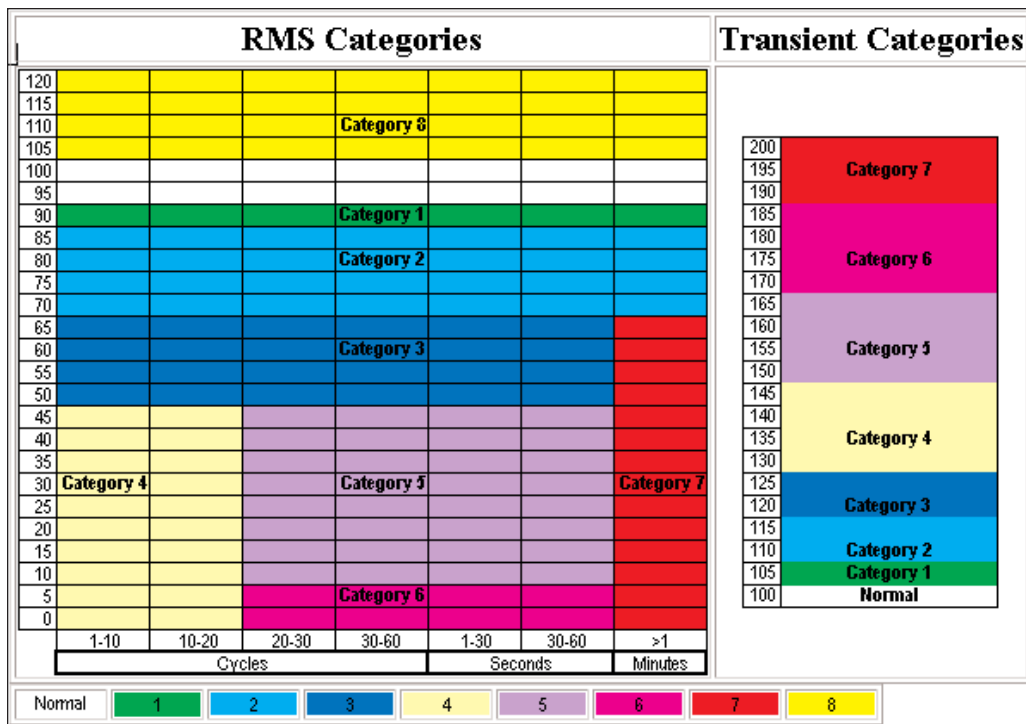
Basic Characterizer

Basic Characterizer enables automatic detection of voltage sags which are often the most common type of power disturbance. Once detected, the Answer Module characterizes the sag. This Answer Module is the general and/or basic characterizer of the data. It characterizes RMS events as sags, swells, or interruptions. This Answer Module characterizes data based upon categories. The default settings of the categories are based on IEEE 1159 guide for characterizing power quality events, and these default settings can be seen in the figure next page.

The number in the magnitude column represents the range of values starting from that number up to but not including the number in the cell above it.

For Rms Variations, the categories do not necessarily represent a continuum; they are simply numbers that represent non-overlapping rectangles in mag/dur space. The categories generally represent increased risk of equipment malfunction. Note that Category 8 (swells) only stops at 125% for display purposes and in reality represents any swell greater than 105%.

For Transient Variations, the categories represent a continuum of peak transient over voltage. Note that Category 7 only stops at 205% for display purposes and in reality represents any transient with a peak magnitude greater than 190%.



Definition of Rms & Transient Disturbance Categories

The user may modify the categories. The setup for this Answer Module allows the user to define the criteria for rms and Transient Disturbance Categories.

Rms Disturbance Categories

The user may define up to nine rms disturbance categories using the threshold property settings found in the setup screen. Click on a desired category, then set the corresponding threshold property limit (see definitions of the threshold properties below). Assign different threshold settings for each category. Once the threshold limits are crossed and the Category Enabled box checked, the rms disturbance category will be classified as an event. These pre-defined rms disturbance event categories are then reported as notifications to recipients (see page 7-9).

For example, in the Rms Disturbance Categories setup screen below, Category 1 was selected. Limit values for Category 1 were defined in the respective threshold property fields. The Category Enabled box has been checked to activate Category 1 as an event when threshold limits have been crossed.

Properties	Values
Rms Disturbance Categories	
Category 1	
Category 2	
Category 3	
Category 4	
Category 5	
Category Enabled	<input checked="" type="checkbox"/>
Minimum Magnitude (%)	90.0
Maximum Magnitude (%)	95.0
Minimum Time (seconds)	0.0
Maximum Time (seconds)	60.0
Category Name	Under/Overvoltage Category 1

Setup screen for Rms Disturbance Categories

For the selected category, the following fields need to be defined. Care should be taken so that categories do not overlap or that dead areas are created.

Category Enabled

For this to be a disturbance category it must be enabled. Check the box to activate or clear the box to deactivate.

Minimum Magnitude

The minimum magnitude is defined as a percent of normal that defines this category.

Maximum Magnitude

The maximum magnitude is defined as percent of normal that defines this category.

Minimum Time

The minimum duration is the minimum amount of time that the magnitude must be sustained.

Maximum Time

The maximum duration is the maximum amount of time that the magnitude can be sustained.

Category Name

The category name describes the defined category, and will appear in the characteristics field in Event Summaries and Notifications.

Transient Disturbance Categories

The user may define up to nine transient disturbance categories using the threshold property settings found in the setup screen. Click on a desired category, then set the corresponding threshold property limit (see definitions of the threshold properties below). Assign different threshold limits for each category. Once the threshold limits are crossed and the Category Enabled box checked, the Transient disturbance category will be classified as an event. These pre-defined Transient disturbance event categories are then reported as notifications to recipients (see page 7-9).

For example, in the Transient Disturbance Categories setup screen below, Category 2 was selected. Limit values for Category 2 were defined in the respective threshold property fields. The Category Enabled box has been checked to activate Category 2 as an event when threshold limits have been crossed.

Properties	Values
Transient Disturbance Categories	
Category 1	
Category 2	
Category 3	
Category 4	
Category 5	
Category Enabled	<input checked="" type="checkbox"/>
Minimum Magnitude (%)	105.0
Maximum Magnitude (%)	110.0
Category Name	

Setup screen for Transient Disturbance Categories

Category Enabled

For this to be a disturbance category it must be enabled. Check the box to activate or clear the box to deactivate.

Minimum Magnitude

The minimum magnitude is defined as a percent of normal that defines this category.

Maximum Magnitude

The maximum magnitude is defined as percent of normal that defines this category.

Category Name

The category name describes the defined category.

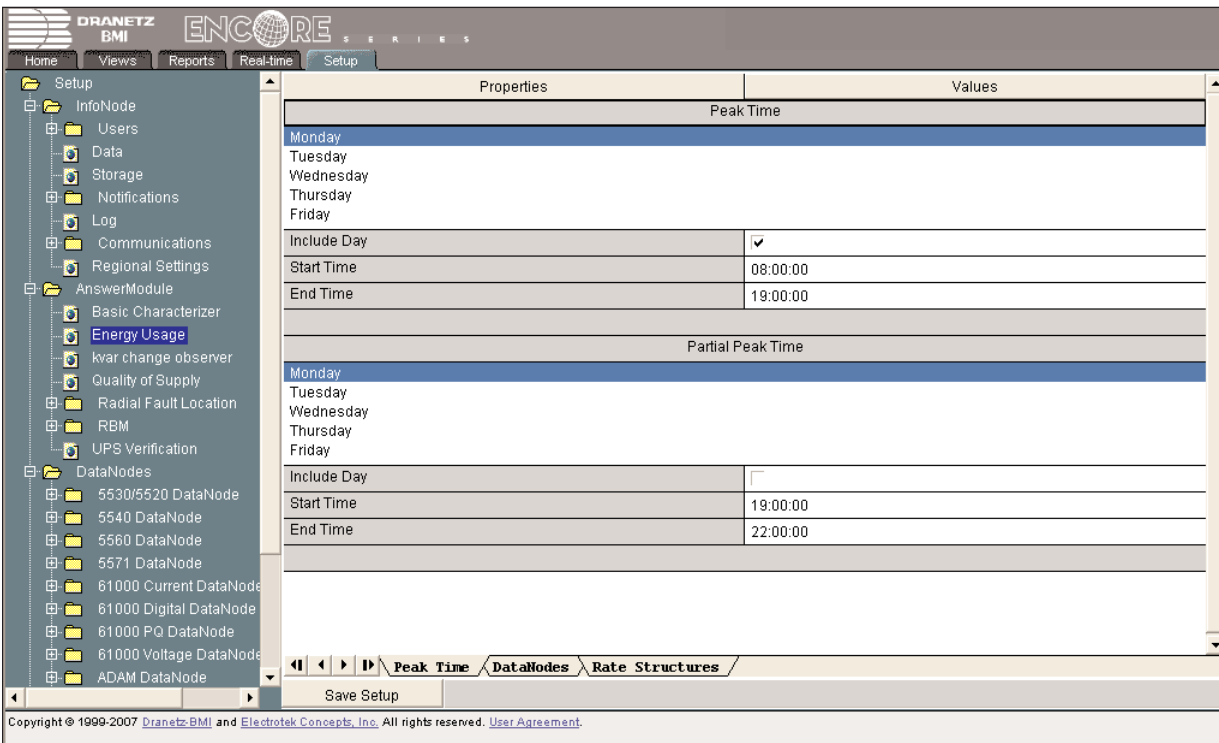
Energy Usage

The Encore Series Software provides users the ability to track power flow and generate reports for the purpose of monitoring energy usage and expense. The setup necessary for the expense reports has three sections, namely Peak Time, DataNodes, and Rate Structures. See page 5-8 of Chapter 5 *Reports Page* for details on the energy expense and usage reports.

NOTE: Utility rate structures are very complex and vary greatly. Therefore, the Energy Usage Answer Module is not intended to completely replicate your utility bill and is intended for comparison only.

Peak and Partial Peak Time

Reducing consumption during peak times or shifting loads to off-peak times amounts to significant savings on energy costs. Energy providers typically charge different rates for energy consumption during peak time and energy consumption during off-peak times. The setup for peak time is described below.



Setup screen for Energy Usage - Peak Time

Under Peak Time or Partial Peak Time category, select the desired day (for bank select click+shift) and check the *Include Day* box to enable time settings. Clear the box to disable the selected days.

Start Time

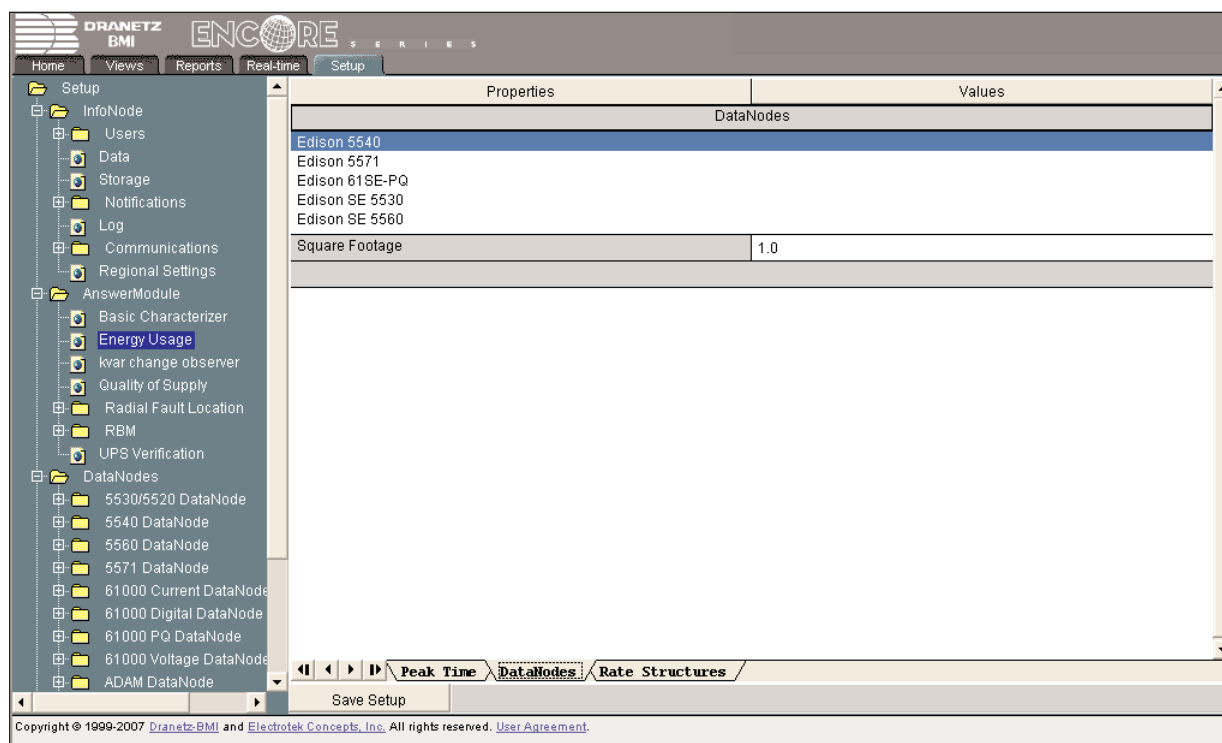
Start time refers to when the peak time begins.

End Time

End Time refers to when the peak time ends.

DataNodes tab

The DataNodes tab allows users to select the DataNode site where they are monitoring energy consumption. The user may specify the square footage that each DataNode is monitoring. This will allow users to view energy expense on per square foot basis. The setup required for the DataNodes energy usage can be seen below.



Setup screen for Energy Usage - DataNodes

Square Footage

Select the desired DataNode and enter the square footage that the DataNode is monitoring.

Rate Structures tab

The user may define up to twenty different rate structures. The user-defined rate structures allow users to produce energy expense reports that accurately reflect the charges being applied by a respective energy provider. The Rate Structures setups required are discussed below.

Properties	Values
Rate Structure	
Rate Structure 1	
Rate Structure 2	
Rate Structure 3	
Rate Structure 4	
Rate Structure 5	
Enable Rate Structure	<input checked="" type="checkbox"/>
Rate Structure Name	PSEG
On-peak energy consumption \$/kWhr	0.082347
Partial-peak energy consumption \$/kWhr	0.0
Off-peak energy consumption \$/kWhr	0.055752
On-peak power consumption \$/kW	7.61
Partial-peak power consumption \$/kW	0.0
Off-peak power consumption \$/kW	1.17
On-peak energy consumption \$/kvarhour	0.0
Partial-peak energy consumption \$/kvarhour	0.0
Off-peak energy consumption \$/kvarhour	0.0
Tax Rate	0.07

Save Setup

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Setup screen for Energy Usage - Rate Structures

Enable Rate Structure

For the rate structure to be available in the energy expense reports, it must be enabled. Check the box to activate or clear the box to deactivate.

Rate Structure Name

The name used to describe the rate structure. This name will be displayed in the list for selecting a rate structure.

On-peak energy consumption \$/kWhr

The cost of energy consumption, measured in kWhr, during the peak time.

Partial-peak energy consumption \$/kWhr

The cost of energy consumption, measured in kWhr, during the partial peak time.

Off-peak energy consumption \$/kWhr

The cost of energy consumption, measured in kWhr, during the off-peak time.

On-peak power consumption \$/kW

The penalty charged for the maximum demand (kW) that occurred during peak time over the billing period.

Partial-peak power consumption \$/kW

The penalty charged for the maximum demand (kW) that occurred during partial peak time over the billing period.

Off-peak power consumption \$/kW

The penalty charged for the maximum demand (kW) that occurred during off-peak time over the billing period.

On-peak energy consumption \$/kvarHr

The cost of energy consumption, measured in kvarHr, during the peak time.

Partial-peak energy consumption \$/kvarHr

The cost of energy consumption, measured in kvarHr, during the partial peak time.

Off-peak energy consumption \$/kvarHr

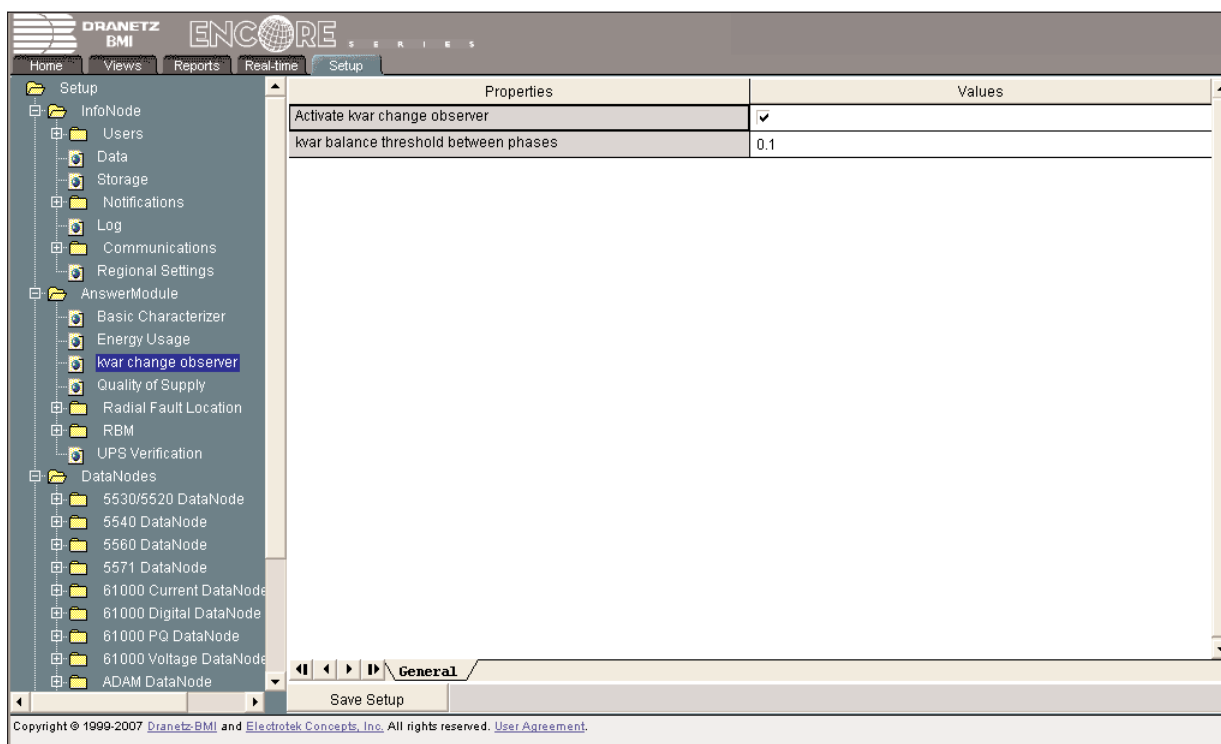
The cost of energy consumption, measured in kvarHr, during the off-peak time.

Tax Rate

The tax applied on billings.

**kvar Change Observer**

The kvar Change Observer Answer Module is for substation applications only. The Answer Module is an add-on to the PF Capacitor switching module and determines if the kvar change is balanced or unbalanced. The setup required for this Answer Module is described below.



Setup screen for kvar Change Observer

Activate kvar Change Observer

Check the box to activate or clear the box to deactivate.

kvar balance threshold between phase

If the difference between the phases is greater than the set threshold, the kvar change is unbalanced.

Quality of Supply

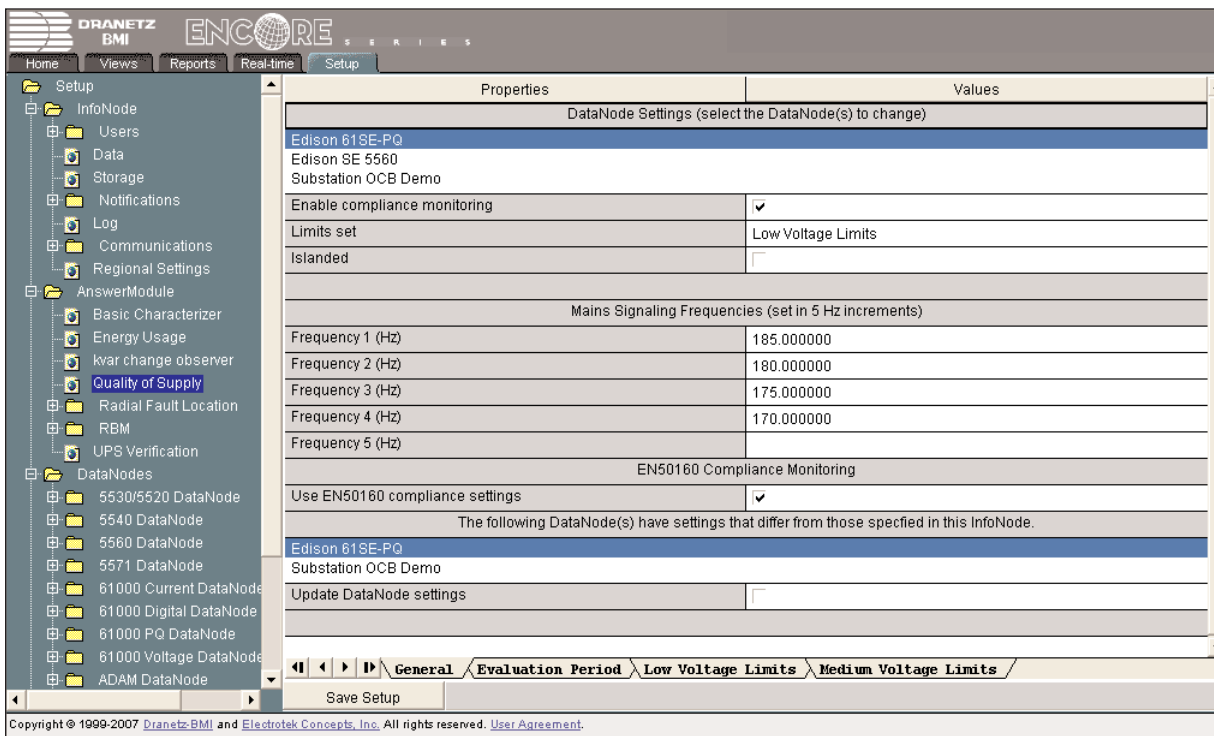
Quality of Supply or QOS encompasses the compliance standards for voltage characteristics in public distribution networks. QOS monitoring and compliance require either a 5560 DataNode, 61000 Power Quality (PQ) DataNode, or a 61000 Voltage DataNode for data acquisition.

The Quality of Supply module has multiple tab setup parameters discussed below. All Answer Module setups are global to the Encore Series Software and apply to all instruments that are gathering QOS information. For specific information on QOS data acquisition instruments i.e. 5560 DataNode refer to Chapter 10 *5560 QOS DataNode Setup* or 61000 PQ DataNode refer to Chapter 13 *61000 PQ DataNode Setup*.

The QOS setup properties include the General datanode settings; Evaluation Period to include *Start day*, *Start time*, and *Length* of time; and Limit compliance settings for low voltage and medium voltage.

Quality of Supply General Setup tab

QOS GENERAL setup properties include **Enable compliance monitoring**, which describes current communications interface between the DataNode and the Encore Series Software. When checked, this means that the QOS DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is wise to disable the box first, make the changes, then enable compliance box again. This helps ease and speed up processing time. Also when adding a new DataNode, the Enable compliance monitoring box must be checked to establish link with the DataNode site. Check the Home page to see which DataNodes are actively communicating with the software.



Properties	Values
DataNode Settings (select the DataNode(s) to change)	
Edison 61SE-PQ	
Edison SE 5560	
Substation OCB Demo	
Enable compliance monitoring	<input checked="" type="checkbox"/>
Limits set	Low Voltage Limits
Islanded	<input type="checkbox"/>
Mains Signaling Frequencies (set in 5 Hz increments)	
Frequency 1 (Hz)	185.000000
Frequency 2 (Hz)	180.000000
Frequency 3 (Hz)	175.000000
Frequency 4 (Hz)	170.000000
Frequency 5 (Hz)	170.000000
EN50160 Compliance Monitoring	
Use EN50160 compliance settings	<input checked="" type="checkbox"/>
The following DataNode(s) have settings that differ from those specified in this InfoNode.	
Edison 61SE-PQ	
Substation OCB Demo	
Update DataNode settings	<input type="checkbox"/>

General / Evaluation Period / Low Voltage Limits / Medium Voltage Limits

Save Setup

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Setup screen for QOS General tab

The QOS functionality is equipped with monitoring and setup protocols to meet the measurements required for voltage-compliance monitoring. Users can configure voltage class, Low Voltage Limits and Medium Voltage Limits, under **Limits Set**. Low voltage is defined as <1kV nominal. Medium voltage is 1kV to 35kV nominal. **Islanded** indicates that the system being monitored is synchronized to grid or not isolated from the power grid. The Islanded box is not checked by default indicating that the system is synchronized, not islanded.

Under MAINS SIGNALING, users can enter **Frequencies to Trend**. This value field is editable. Use None if no frequency values will be trended or enter a delimited list of signalling frequencies to monitor using a comma to separate the frequency values. Only the first five valid frequencies in the list are stored. A valid frequency is divisible by 5 Hz. and is less than 3.84 kHz. The Mains Signaling graph can be accessed from the Views page, but the signaling frequency is not trended or available for real-time meter.

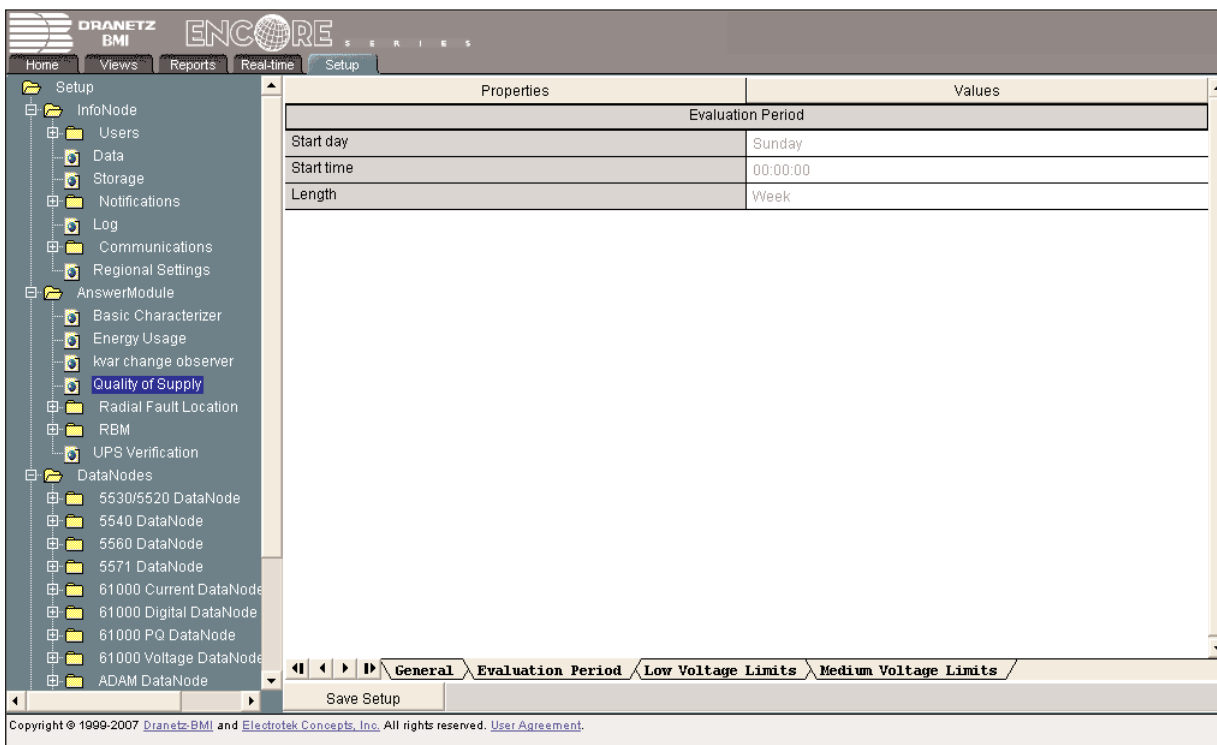
QOS specifies that various parameters must be within a specified percentage, such as 95% of the standard one week monitoring period in the case of EN50160. EN50160 is a European standard which specifies that various parameters must be within a specified percentage for 95% of the standard one week monitoring period. Particularly for users of EN50160 COMPLIANCE MONITORING, the parameter **Use EN50160 compliance settings** is provided as an easy option where EN50160 settings can be defined once and applied as necessary to the specified DataNode/s (selected in field underneath). When this box is checked, all limits in the specified DataNode will be set to the EN50160-defined settings. The EN50160 settings will overwrite those in the Encore Series Software and be used for monitoring. Unchecking this box will allow users to modify limit settings to their local standards, or they can enter each on their own.

Update DataNode settings provides an easy way for users to update settings for the selected DataNode following the configurations specified in the Encore Series/InfoNode system.

Remember to click the Save Setup button found at the bottom of the page to save any change that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

Quality of Supply Evaluation Period tab

QOS EVALUATION PERIOD properties consist of the Start day, Start time, and Length of the evaluation period. The setup properties include *Start day* and *Start time*, where users can program their preferred day and time when they want the evaluation period to commence. Users can also set the *Length* of the evaluation period in days, weeks, or months. To program the properties, click on the respective value fields to display the drop down menu.



Setup screen for QOS Evaluation Period

Start day - Specifies the day of the week when the statistics will be reset. Day is selected from a drop down menu containing the days of the week. The default start day is Sunday.

Start time - Specifies the time of day when the statistics will be reset. Time is an edit box that defaults to 00:00:00 (midnight of Sunday according to standard). Click on the value field to change time.

Length - Allows the user to set the evaluation period in days, weeks or months.

QOS evaluation period specifies the day of the week when compliance monitoring ends, and statistics will be reset. Start day is selected from a drop down menu containing the days of the week. The default compliance monitoring start day is Sunday. In the case of the EN50160 standard, the start day can be altered and the unit will remain in strict compliance with EN50160. However, the length of the evaluation period cannot be altered due to the 7-day week period by which the unit calculates information in strict compliance with EN50160. The monitoring site is said to be IN COMPLIANCE if the statistical value over a 7-day week period for the specified parameters is 95% or greater.

Quality of Supply Limits tab

QOS LOW VOLTAGE LIMITS and **HIGH VOLTAGE LIMITS** indicate the limit numbers or range of values required for each parameter to satisfy the voltage compliance standard.

Properties	Values
Interval Validation Voltage Limits	
Maximum voltage (%)	115.0
Minimum voltage (%)	85.0
Compliance Limits	
Supply voltage variation maximum (%)	110.0
Supply voltage variation minimum (%)	90.0
Unbalance	2.0
Flicker	1.0
Harmonic voltage (%)	8.0
Inter-harmonic voltage (%)	1.0
The percentages below represent the pass/fail criteria for each parameter type of the Quality of Supply reports. For example a 95.0 for the Power Frequency value states that 95 percent of the Power Frequency sample intervals must be within limits in order for Power Frequency to pass the compliance test.	
Power frequency	95.0
Supply voltage variations	95.0
Flicker	95.0
Supply voltage unbalance	95.0
Harmonic voltage	95.0
Inter-harmonic voltage	95.0
Mains signaling	99.0
Individual Harmonic Limits (select the harmonic(s) to change)	
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>	

Navigation: General | Evaluation Period | **Low Voltage Limits** | Medium Voltage Limits

Save Setup

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Setup screen for QOS Low Voltage Limits

Properties	Values
Interval Validation Voltage Limits	
Maximum voltage (%)	115.0
Minimum voltage (%)	85.0
Compliance Limits	
Supply voltage variation maximum (%)	110.0
Supply voltage variation minimum (%)	90.0
Unbalance	2.0
Flicker	1.0
Harmonic voltage (%)	8.0
Inter-harmonic voltage (%)	1.0
The percentages below represent the pass/fail criteria for each parameter type of the Quality of Supply reports. For example a 95.0 for the Power Frequency value states that 95 percent of the Power Frequency sample intervals must be within limits in order for Power Frequency to pass the compliance test.	
Power frequency	95.0
Supply voltage variations	95.0
Flicker	95.0
Supply voltage unbalance	95.0
Harmonic voltage	95.0
Inter-harmonic voltage	95.0
Mains signaling	99.0
Individual Harmonic Limits (select the harmonic(s) to change)	
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>	

Navigation: General | Evaluation Period | Low Voltage Limits | **Medium Voltage Limits**

Save Setup

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Setup screen for QOS Medium Voltage Limits

The **Minimum and Maximum values for rms Voltage parameters** can be configured. The table below shows the limit numbers or range of values required for each parameter to satisfy the voltage compliance standard.

Parameter	Limits for QOS Compliance to Pass
Un = Low Voltage (LV) Supply nominal voltage, upper limit 1kV Uc = Medium Voltage (MV) Supply Characteristics - declared voltage, range 1kV to 35kV	
Supply voltage variations (Under normal operating conditions, excluding situations arising from faults or voltage interruptions)	Mean rms over 10 minutes <ul style="list-style-type: none"> ±10% of Un or Uc during 95% of one week ±10%, -15% of Un for 100% of one week
Supply voltage unbalance (Under normal operating conditions) 10 minute mean rms values of the negative phase sequence component/positive phase sequence component	10 minute mean rms values of the negative phase sequence component/positive phase sequence component <ul style="list-style-type: none"> ≤2% during 95% each period of one week
Flicker	Plt ≤ 1 for 95% of the time Also 5% normal, 10% infrequent for LV, 4 & 6 for MV
Harmonic voltage (Under normal operating conditions)	10 minute mean rms values Individual Harmonic voltage up to the 25th shall be ≤ the value of Un given under Harmonic Compliance Limits (see table below) during 95% of one week <ul style="list-style-type: none"> ≤8% THD (THD up to the 40th)
Interharmonic voltage	Individual Interharmonic voltage up to the 24th-25th shall be < the value of Un given under Interharmonic Compliance Limits (see table on page 8-8) during 95% of one week <ul style="list-style-type: none"> <8% TID (TID up to the 39th/40th)

Statistical data is calculated based on the parameters required by the voltage monitoring standard for determining QOS compliance. Encore Series Software displays the parameters in the form of tables and graphs available in the QOS Compliance Smart Report, under Reports tab. The following is a description of each measurement parameter required for determining QOS compliance.

Power Frequency: In case of fault operation, parts of an interconnected system may become isolated. Compliance will be assessed over an observation period of one week, by a statistical analysis carried out over the sequence of 10 seconds measurement.

Supply Voltage Variations: Under normal operating conditions, load changes cause variations of the 10 minute average supply voltage. Generally this is compensated by automatic voltage regulation within a period of a few tenths of seconds.

Flicker: Typical rapid voltage changes or flicker do not exceed a magnitude of +5% or -5% of the nominal or declared voltage. This limitation is possible because connection of loads capable of creating rapid voltage changes is usually subjected to regulations. However under certain conditions, higher values of up to 10% may occur. These higher values can occur for instance in areas where high power motor equipment (blower, pumps, compressors, etc.) is used.

Supply Voltage Unbalance: The unbalance of a three phase supply voltage consists of a loss of symmetry of the phase voltage vectors (magnitude and/or angle), created mainly by unbalanced load. Compliance is verified when 95% of the sequence of valid 10 minute values are within the specified tolerance of normally 2% (in single phase/two phase supplies 3%).

Harmonics are waveform distortion, a steady-state deviation from an ideal power frequency sinusoid and is characterized by the spectral content of the waveform. See page 12-19 for detailed discussion of harmonics.

Interharmonics are frequency components between the harmonic frequencies.

NOTE: Harmonic and Interharmonic values are specified only up to a certain order i.e. order 25 in EN50160 limit, for the practical reason that higher order values are generally so small as to be impractical to measure. Another reason is because of the difficulty of giving values which would be relevant to all networks.

Mains signaling compliance or non-compliance is determined by calculating/adding the status of each of the defined frequencies. Mains signaling limits for QOS compliance should be within the 3 second mean of signal voltages compared against the Meister curve.

QOS Calculations and Statistics

This section lists the calculations and statistics that are gathered from incoming data collected by the DataNode and processed by the Quality of Supply Answer Module.

For each QOS-data acquisition DataNode configured in the system, the Answer Module compiles the required statistics and persists them to the database for retrieval under the Views and Reports pages of the Encore Series. The partial statistics are persisted as each set of incoming data is analyzed so that partial period statistics are available, even though it cannot predict that a site will pass in compliance until interval is complete.

Intermediate statistics for the current evaluation period are made available but are marked as incomplete. Early in an evaluation period there may not be enough data to provide meaningful statistics and Pass/Fail evaluations for the various criteria. Due to this fact, partial statistics are not available until at least 100 valid samples have been accumulated and evaluated.

As disturbance based statistics (DISDIP) are simple counts of events in various ranges, this information is

made available at any time during an evaluation period. At the end of the evaluation period, the statistic calculations are completed and the statistical observation is marked as Complete. If for some reason, the evaluation period was less than a complete period, the observation is marked as an Incomplete period so the reporting elements can take appropriate action.

All QOS compliance statistics are calculated from data retrieved from the DataNode journal (steady state values) and characterized events (transients and rms variations).

For all periodic quantities, the total number of valid measurements in the evaluation period is tabulated. A particular period is excluded from the analysis if a sag below 85% of nominal or a swell above 115% of nominal occurred based on cycle-by-cycle rms voltage minima and maxima. For those items tabulated in the Encore Series, the exclusion is based on the minimum and maximum value available in 10-minute rms voltage min/max/avg trend value log.

The table below details the statistical information gathered by the Answer Module.

Parameter	Interval (default)	Data Source	Stats	Additional Data Collection			
				Avg	Min w/TS	Max w/TS	3 Phase
Magnitude of Supply	10 Min	SS VRMS	Valid Intervals Within +/- 10%	YES	YES	YES	YES
Supply Voltage Unbalance	10 Min	SS S2/S1	Valid Intervals <= 2%	YES	NO	YES	NO
Power Frequency	10 Min*	SS Count Reports from DataNode	DataNode Calculation - Pass in all intervals within broad limit and 95% of intervals with narrow limits	NO	NO	NO	YES
Rapid Voltage Changes – Flicker	2 Hours	SS Plt	2 Hour Plt <= 1.0	YES	YES	YES	YES
Rapid Voltage Changes - Step Changes	1 Week	RMS Variations	90% to 95% LV, 94% to 96% MV	NO	NO	NO	YES
Harmonic Voltage	10 Min	SS Harmonic Group Spectra, THD + 2 to 25 Harmonics	THD <= 8%, Table for Individual Harmonics	YES	NO	YES	YES
Interharmonic Voltage	10 Min	SS Interharmonic Group, TID and components 2 to 25	TID <= 1%, All components <= 0.5%	YES	NO	YES	YES
Mains Signaling Frequencies	10 Min**	SS Count Reports from DataNode	DataNode Calculation - Pass if in range 99% of intervals	NO	NO	NO	YES

Notes:

*Power Frequency sampling done in DataNode at 10 second intervals, reported to journal every 10 minutes.

**Mains Signalling sampling done in DataNode at 3 second intervals, reported to journal every 10 minutes.



Radial Fault Location

The Radial Fault Location helps to identify the source of radial line faults as they occur by estimating the distance to fault locations, allowing a quick dispatch of linemen for repairs, and reducing the time for locating the problem source.

Properties	Values
Activate AnswerModule	<input checked="" type="checkbox"/>
Ground fault pickup current threshold (amperes):	150.0
Phase fault pickup current threshold (amperes):	800.0
Ratio of fault peak current to pre-fault peak current:	2.0
Sequence impedance unit:	Ohms per 1000 ft
Length of primary feeder (unit is based on the unit length in sequence impedance unit)	120.0
Positive-sequence impedance of the primary feeder (real):	0.057
Positive-sequence impedance of the primary feeder (imaginary):	0.1225
Zero-sequence impedance of the primary feeder (real):	0.179
Zero-sequence impedance of the primary feeder (imaginary):	0.415

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Setup screen for Radial Fault Location

Activate Answer Module

Check the box to activate or clear the box to deactivate.

Ground fault pickup current threshold (amperes)

The value of the current that needs to be exceeded before it is considered a ground fault.

Phase fault pickup current threshold (amperes)

The value of the current that needs to be exceeded before it is considered a phase fault.

Ratio of fault peak current to pre-fault peak current

A threshold to compare RMS values before and during a fault.

Sequence impedance unit

Units used for impedance and feeder length.

Length of primary feeder

This information is optional. If it is available, it should be supplied. If it is not available, enter feeder length = 0.

Positive-sequence impedance of the primary feeder (real)

The real part of the complex number positive sequence impedance.

Positive-sequence impedance of the primary feeder (imaginary)

The imaginary part of the complex number positive sequence impedance.

Zero-sequence impedance of the primary feeder (real)

The real part of the complex number zero sequence impedance.

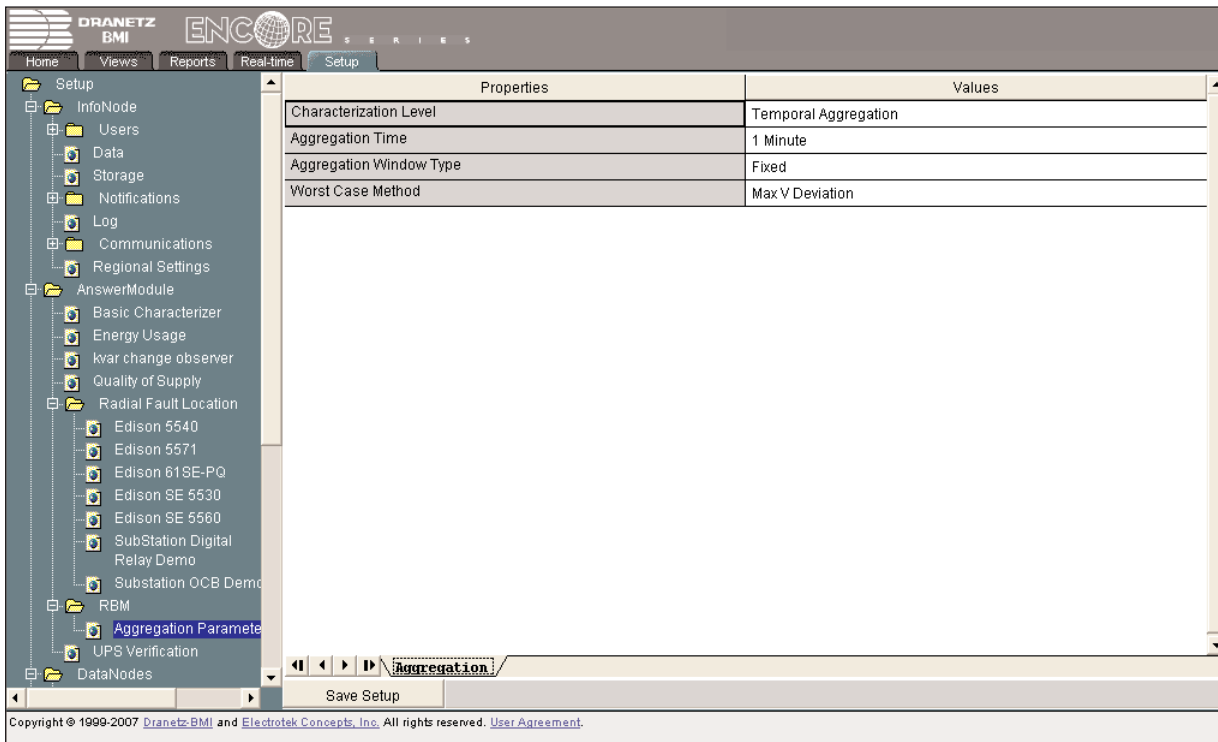
Zero-sequence impedance of the primary feeder (imaginary)

The imaginary part of the complex number zero sequence impedance.

RBM (Reliability Benchmarking Methodology)

Aggregation Parameters

The RBM Answer Module is an Rms Variation Index. Setup for this Answer Module consists of setting up aggregation parameters. At different times it may be necessary to either break apart measurements into measurement components or combine them through aggregation. The setup required for aggregation can be seen below.



Setup screen for RBM Aggregation Parameters

Characterization Level

· Phase Aggregation

The most basic of the three aggregation levels is phase aggregation. This characterizes the data in such a way that all of the phases are analyzed. Measurement components are the constituent recordings of a three-phase measurement. By definition, measurement components are single-phase. The process of phase aggregation entails finding the worst-case of a series of measurement components associated with a single phase or channel.

· Measurement Aggregation

Measurement aggregation represents all of the data from all phases of a measurement by the characteristics of the worst-case phase. An event determined by measurement aggregation is a combination of measurement components.

· Temporal Aggregation

The goal of temporal aggregation is to collect all measurements taken by a monitoring instrument or instruments that were due to the same power system occurrence, and identify them as one event.

Aggregation Time

This control specifies the width of the temporal aggregation window (in seconds). Selecting one of the pre-defined intervals from the drop-down list sets the aggregation window.

Aggregation Window Type

· Fixed

When a "Fixed" aggregation window type is specified, the length of the aggregation window is fixed by the aggregation time. Thus, all measurements occurring within the specified number of seconds are aggregated.

· Variable

When a "Variable" aggregation window is specified, the length of the aggregation window is not fixed and is determined by how closely the events occur to each other in time.

Worst Case Method

The Worst Case Method control allows the user to specify which measurement component characteristics are used to represent the aggregated measurement. A popular method of performing phase aggregation is by finding the "worst-case" measurement component from the measurement components associated with that phase.

· Max V Deviation

Using this method, the component exhibiting the maximum deviation from nominal voltage is used to represent the aggregate measurement. Thus, the sag or swell that deviates the farthest in absolute value from nominal voltage (1.0 per unit) is selected.

· Max Area

Using this method, the component exhibiting the maximum product of voltage deviation and duration from within tolerance is used to represent the aggregate measurement. Thus, the sag or swell that has the largest volt-seconds area deviation from nominal voltage is selected.

· Min V

Using this method, the component exhibiting the minimum voltage is used to represent the aggregate measurement. Thus, the largest sag is selected.

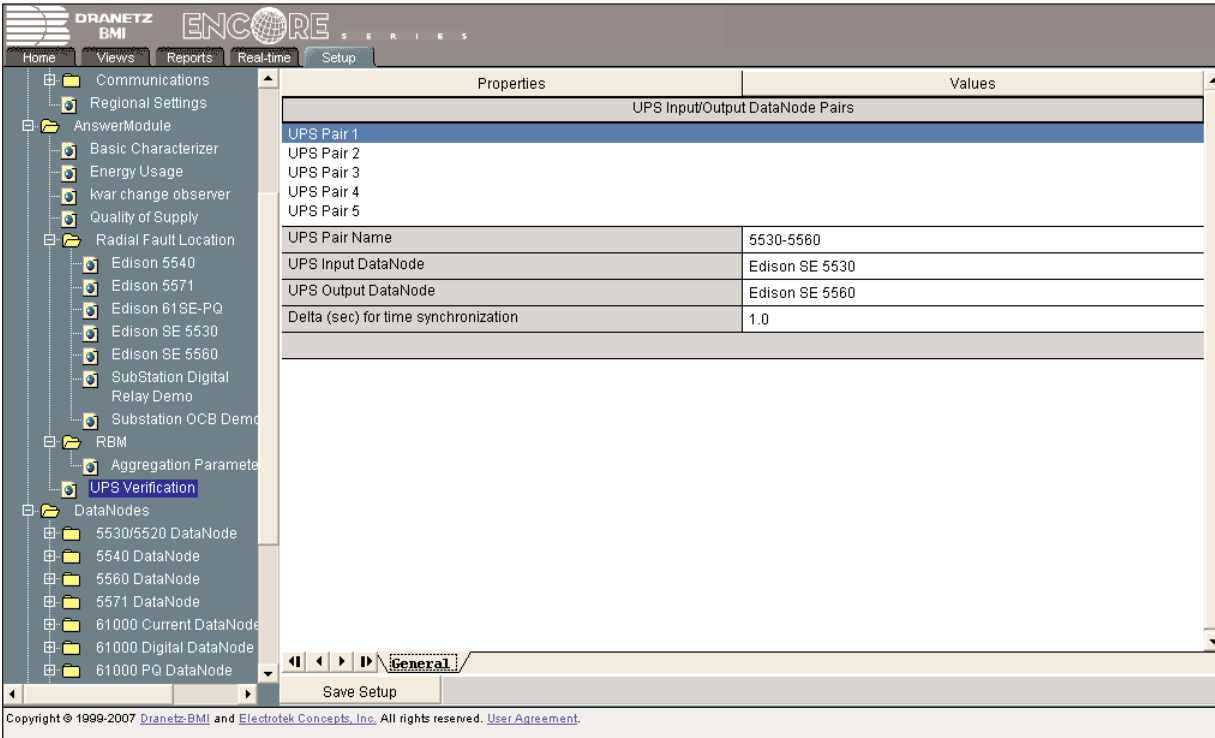
· Max V

Using this method, the component exhibiting the maximum voltage is used to represent the aggregate measurement. Thus, the largest swell is selected.

UPS Verification

The UPS Verification Answer Module verifies the operation of a UPS or another mitigation device. This requires a pair of DataNodes for monitoring the UPS, one monitoring input and another monitoring output. This Answer Module allows for creating up to five UPS DataNode pairs. See setup screen below.

The implementation of UPS Verification requires Cross Triggering between each DataNode pair. See page 8-26 for instructions on how to enable cross triggering functions in the Advanced Tab under 5530/5520 DataNode Setup.



UPS Input/Output DataNode Pairs	
UPS Pair 1	
UPS Pair 2	
UPS Pair 3	
UPS Pair 4	
UPS Pair 5	
UPS Pair Name	5530-5560
UPS Input DataNode	Edison SE 5530
UPS Output DataNode	Edison SE 5560
Delta (sec) for time synchronization	1.0

Setup screen for UPS Verification

UPS Pair Name

This is a descriptive name for the DataNode pair monitoring the UPS.

UPS Input DataNode

Select the DataNode monitoring the UPS input from the list of available DataNodes. Selecting "Not Set" deactivates this pair for the Answer Module.

UPS Output DataNode

Select the DataNode monitoring the UPS output from the list of available DataNodes. Selecting "Not Set" deactivates this pair for the Answer Module.

Delta (sec) for time synchronization

The delta between the input event time and the output event time allowed for it to be considered the same event. If the DataNodes are time-synched together, this should be set to 1.

DataNodes

DataNodes, being the frontline, data-acquisition component of the Encore Series Software system, are available in various models and configurations. The setup of a DataNode is dependent on the DataNode type. Click on DataNodes in the left frame to view the different DataNode types that the Encore Series Software currently supports. The list of DataNodes supported by the Encore Series Software system appears below.

The Encore Series Software system can handle up to 32 DataNodes with full parameter monitoring of about 200 parameters for each DataNode. The system can also handle up to 50 DataNodes with reduced parameter monitoring of about 100 parameters for each DataNode.

5530/5520 DataNode

The 5530/5520 belong to the Enhanced Power Quality (EPQ) family of DataNodes. EPQ DataNode is available in three model types: Model 5530, Model 5520, and Model 5510. They are designed to do comprehensive and PQ-optimized acquisition of power quality related disturbances and events. The salient features of EPQ DataNode include voltage and current trigger and capture mechanisms, increased system performance allowing users to identify data of interest and to record only that data, cross-triggering feature that permits linking of many DataNodes, and TCP/IP Ethernet communications.

5540 DataNode

The 5540 is known as the Energy Management (EM) DataNode. It is designed to help users manage their energy consumption. The 5540 is equipped with a 3-line LED display for viewing all measured parameters without the use of a computer. Among the more important parameters it can measure are true RMS voltage and current, kW, kVA, power factor, frequency, kWh, and kVAR. Energy data from the 5540 EM DataNode can be viewed in real time by multiple users using Encore Series Software via a standard web browser.

5560 DataNode

The 5560 DataNode is designed to monitor quality of supply compliance as specified by European Standard EN50160. It can be set in Strict compliance with EN50160 or can be customized using Custom setups. Under Strict compliance, only the Identification and

Status, Communication, Polling, and Basic tabs are visible and modifiable. This is the standard method in using the 5560. For those who have unique applications requiring modification of the standard setups, the Compliance Setup selection box on the Basic tab can be changed to Custom.

5571 DataNode

The 5571 DataNode is an upgrade path for users of the 7100 PQNode who wish to access the Encore Series Software and its web-based interface. An inexpensive upgrade kit is available to convert existing 7100 PQNodes into 5571s for use in the Encore Series Software system. The 5571 is available in two model types, distinguished by their enclosures and connections to the circuit: Model 5571 and Model 5571S.

61000 Digital DataNode

Encore Series Model 61MDIS (61000 series, module, digital, input, screw terminals) is an eight channel, digital input module, providing the user with the capability to monitor on/off-type digital signals, such as breaker or switch position indicators. The functionality of the inputs can be configured on a channel basis to also provide pulse counting, KYZ metering, or start/stop monitoring control.

61000 Power Quality DataNode

Encore Series Model 61000 is a modular instrument that allows the user to choose the appropriate modules for their application. The instrument can support up to 4 modules. It provides dedicated processing power via the separate and independent connection for each input module installed. This modular configuration is packaged in groups of typically 4 measuring channels with a maximum of 4 input modules, for a total of 16 analog channels per instrument.

Model 61000 also has built-in standard support for Ethernet, RS232 and RS485 communications. Modem and GSM/GPRS communications are also available using external interfaces that are available from Dranetz. Encore Series Software supports all of these methods of communications so users can choose what is appropriate for their application.

 **ADAM Modules**

The Encore Series Software system readily interfaces with and acquires data from the popular Advantech® ADAM-4000 and ADAM-5000 series data acquisition and control modules. The ADAM-4000 series modules interface through RS-485 to an Encore Series Software. The ADAM-5000 series system is a backplane configuration. Any combination of 5000 series plug-in modules may be used to monitor various types of applications. The 5000 series is one of the most diverse and flexible DA&C systems and is available in four or eight slot configurations. Both are equipped with CPU, Watchdog Timer, RS-232 & RS-485 (x2) interfaces, error checking, system diagnostics, and diagnostic display.

 **GEkV DataNode**

GE's kV Vector Electricity Meter is the first of a new generation of electronic meters that extend functionality beyond the the bounds of traditional metering. The kV Meter adds automatic installation verification plus power quality and cost of service measurements. The kV Meter also improves traditional meter tasks by adding consolidated forms, 57 to 120 or 120 to 480 volt measurement capability, improved billing protection, and standardized meter reading and programming.

 **Modbus DataNode**

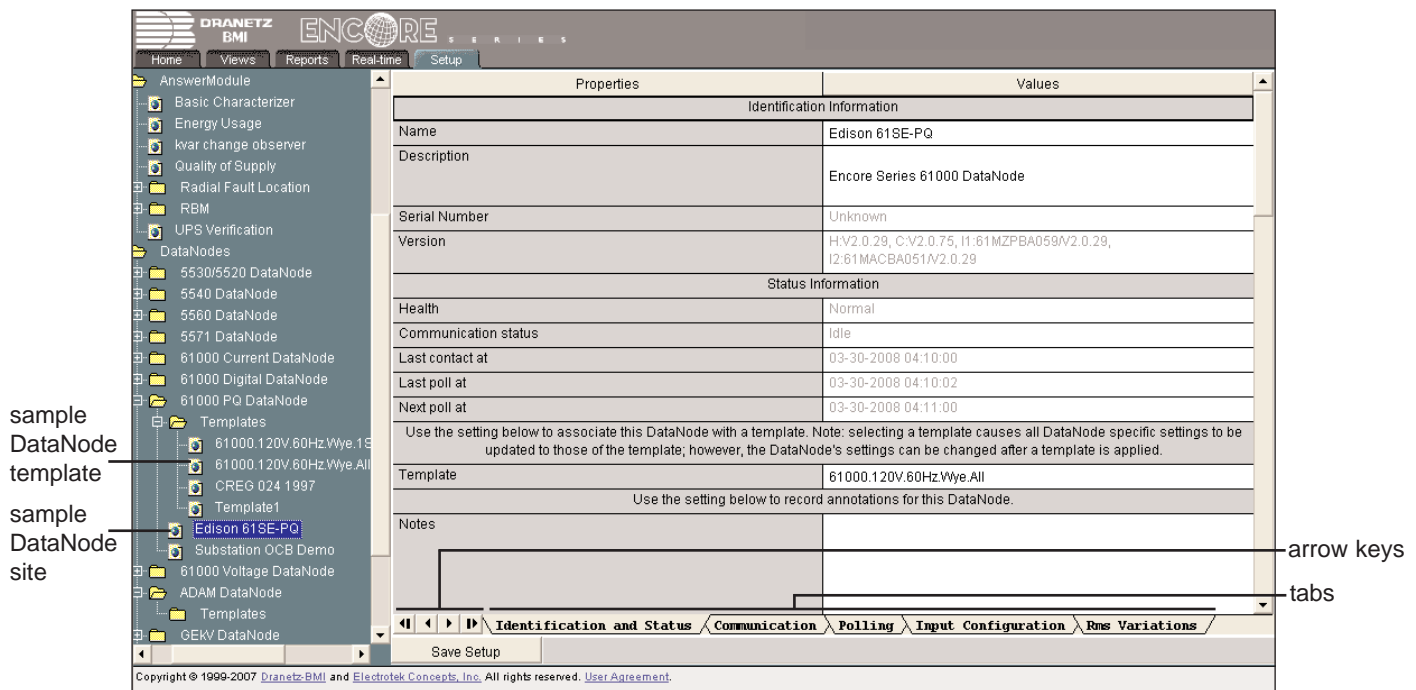
The Generic Modbus DataNode setup allows the user to connect Modbus-compatible instruments or meters into the Encore Series Software, communicating over direct connect (RS484) or network (Modbus TCP/IP). Both analog and status registers can be read, scaled, stored, and compared against thresholds to detect out of limit conditions. Data can also be calculated over user specified intervals.

General Guidelines in Setting Up DataNodes through the Encore Series Software Setup Page

The following guidelines help promote smooth and optimal system performance of DataNode program settings. Bear in mind that while the Encore Series Software system setup is generic, the DataNode is not. This means that the software setup section is not affected by the types of DataNodes connected to it. On the other hand, the DataNode setup section is customized and dependent on particular DataNode model configurations.

1. Privileges to change DataNode settings depend on the Security Level assigned by the system administrator (see page 7-2). Without the proper access privileges, you can only view the setup pages.
2. Make sure to select the appropriate DataNode type that you wish to configure under the DataNode setup tree. The Tree Directory of groups and sites is displayed on the left side of the screen. It uses the standard convention of collapsible trees and folders.
3. Clicking on a plus sign (+) that is adjacent to a DataNode type will open up that folder and display the elements (Template and specific DataNodes site/s) contained within it. Clicking on a minus sign (-) will collapse that folder and no longer display the elements within it.
4. Each type of DataNode can have its own set of templates. The templating functionality allows you to copy the same setups that work well for most applications and then modify a few of the settings specific to your application as they apply to one or more DataNodes. Adding a template is just like adding a DataNode: you right-click on the appropriate Template tree branch and select the "Add Template" button. A new template appears in the "Templates" setup tree branch. You can then change the template settings as you would those of an actual DataNode. See page 7-44 for a full discussion of the Template function.
5. To add a DataNode site, select the appropriate DataNode type and click on the right mouse button. The "Add DataNode" button will appear; click on it. A new DataNode name will appear in the tree directory. Click on the new name to display the DataNode parameter screen on the right window pane. Use this screen to modify the DataNode parameters.

Below is a sample DataNode site setup display.



6. The Encore Series Software Setup page provides a wide variety of user-configured features represented as tabs located across the bottom of the Setup page. Click on a specific DataNode site to display the various parameters on the right hand pane. Consider this screen area as your work space. The parameters change depending on which tab is selected.

7. Use the arrow keys to navigate through the different tabs.

- < - automatically selects the first or leftmost tab
- <| - selects one tab left of another
- > - selects one tab right of another
- |> - automatically selects the end or rightmost tab

8. DataNode setup display screens appear in two column format: the Properties column and the Values column. The Properties column lists the names of available parameters in each tab. The Values column contains either textual notations, numeric values, or check boxes pertaining to the parameters described. Use the scroll bars to view and access the different properties and values available on screen.

9. Parameters are enabled when Value settings appear in black (or blue when selected) and the field is clickable. Users may make appropriate changes on enabled parameters anytime.

10. Parameters are disabled when value settings appear in gray. Disabled value settings have either been configured as such so they cannot be altered or they need to be activated in order to trend the values listed on the page.

11. After putting in the desired value changes, click on the Save Setup button. You must always save the changes you made before exiting or selecting a different setup tab. Otherwise, the changes will not take effect. To help ensure that changes are saved, a confirmation window appears after encoding new value settings and just before you switch to a different tab or exit setups.

12. Checkboxes may be found under the Values column of select properties in various tabs. A checked box means that the parameter it represents is activated/enabled. An unchecked box means that the parameter is not activated /disabled.

13. The *Active* property is found under the Communications tab in all DataNode types. Click on the Active checkbox in the value field. The Encore Series Software does not start communications with the DataNode until the Active box is checked. It is recommended that all changes and settings are made prior to activating the DataNode.

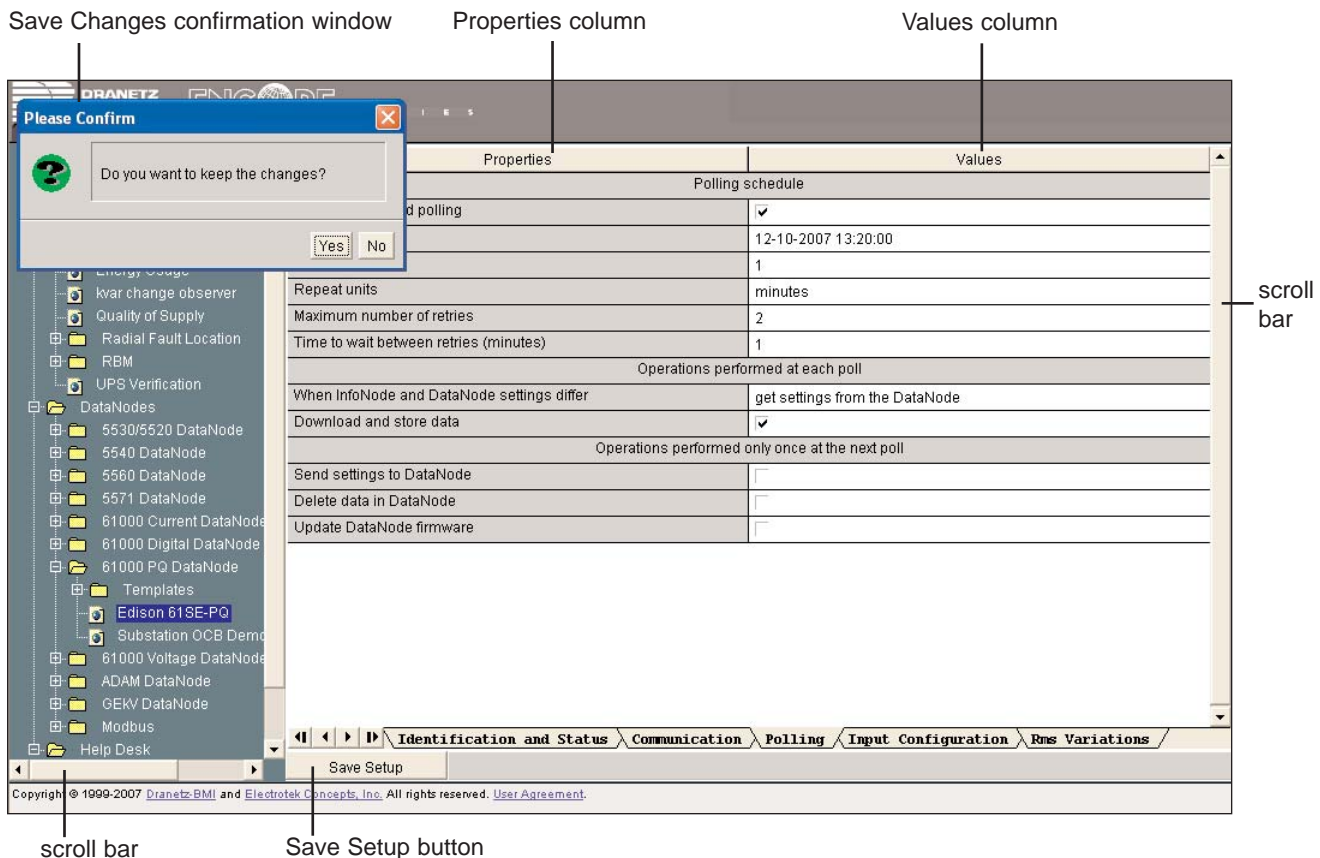
14. Remember that the Encore Series Software acts as a complete gateway for the various data captured and stored in the DataNode. The application's Setup tab is where users configure properties and values for specific

DataNode sites. Users can view the resulting data using the Views tab, Real-time tab, and Reports tab.

15. Help is available from any page, though it is tab-sensitive, not context-sensitive. On-screen help is available for various topics under the Help Desk folder. The Help Desk can be accessed through hyperlinks to jump to a selected topic, or by using the index.

16. Further assistance can be obtained by contacting Dranetz Technical Support staff at 1-800-372-6832.

Below is a sample display screen showing the Save Setup button, the confirmation window for saving changes, and scroll bar to view the different properties and values available on screen.



Using the Template Function in DataNode Setup

The Encore Series Software is designed with a powerful templating functionality that can be used in setting up DataNodes. The templating feature allows users to:

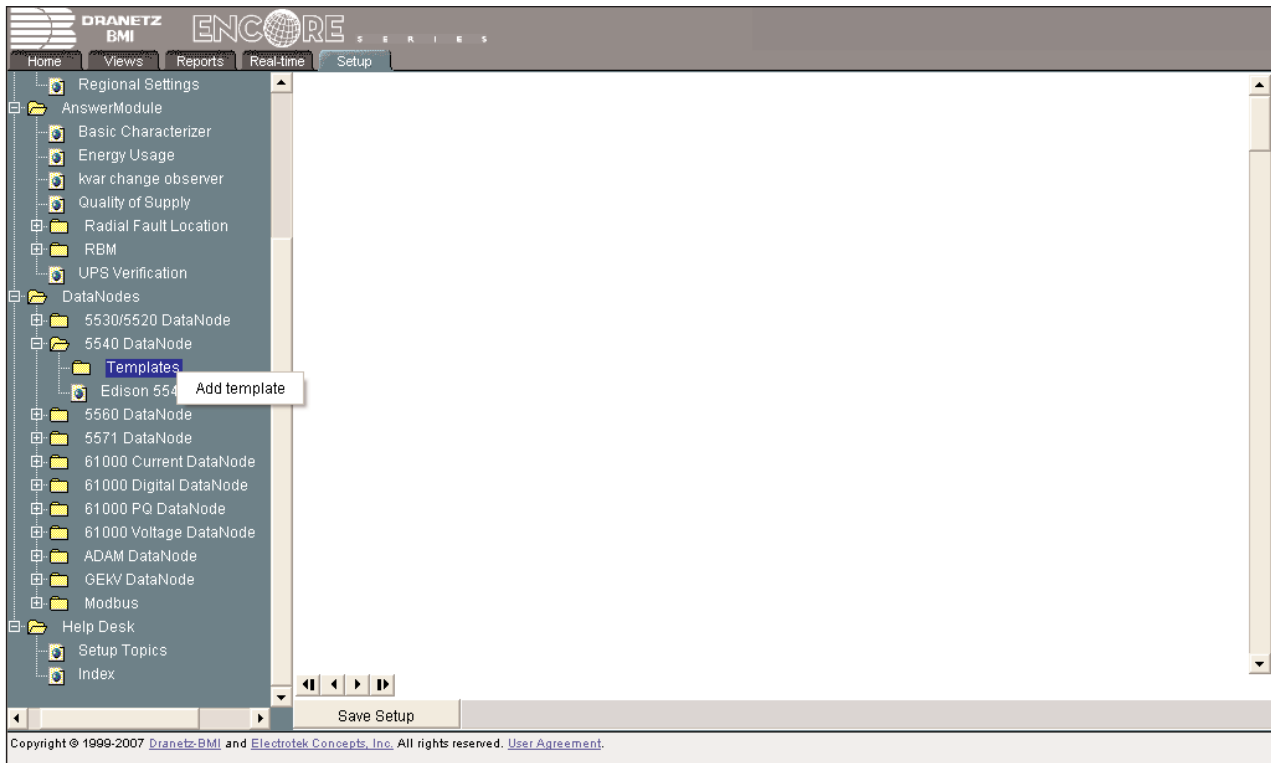
- Choose from pre-defined settings when adding a DataNode;
- Create settings specific to user application and apply them to one or more DataNode;
- Apply settings to one or more DataNode/s by modifying settings on the template.

Template settings look and work just like actual DataNode settings. Each type of DataNode has its own set of templates. These are listed on a special setup tree branch within the DataNode type.

Template

When you first add in a template, the default settings for that type of DataNode are stored in the template. The name and description, along with all of the setup information displayed for that particular type of DataNode, can then be customized for your particular application. Multiple templates can be created and saved for each type of DataNode, or a basic one can be copied to each DataNode and then the settings modified uniquely for that DataNode.

Adding a template is just like adding a DataNode: you right-click on the appropriate Template tree branch and select the "Add Template" item.

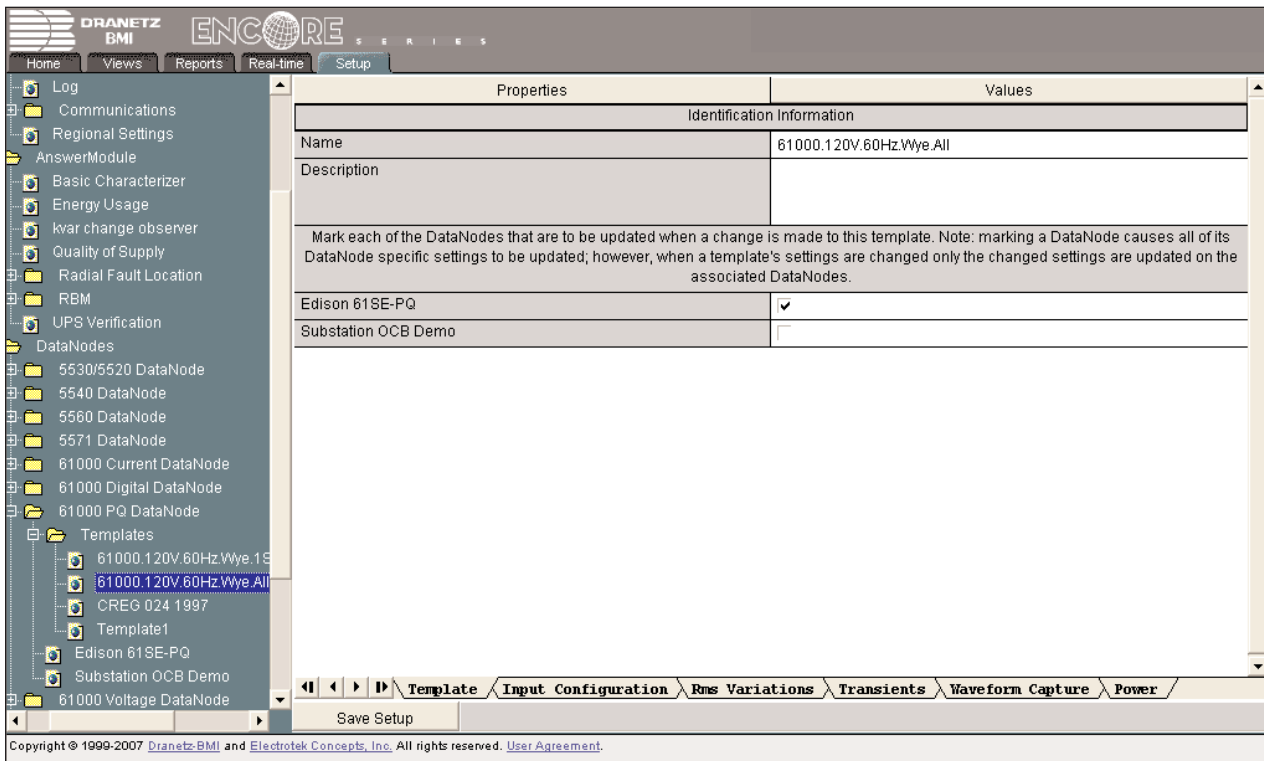


Right-click on the Template folder to display the Add template button

A new template appears in the "Templates" setup tree branch. The users can then change the template settings as they would those of an actual DataNode. They can create as many templates as they like. They can delete a User Defined template by "right-clicking" on the template's setup tree branch and selecting the "Delete Template" menu item.

Template Setup Tab

Each template has a "Template" setup tab. From this tab, users can set the name and description of the template. In addition, this tab contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a check box that indicates if the template is associated with the respective DataNode. When a template is associated with a DataNode, all of the setup values from the template are initially copied to the DataNode's setup values. Thereafter, any change that the user makes to the template is copied to all of the DataNodes associated with the template. The user can modify specific DataNode settings after such.



Sample template setup tab for 61000 Power Quality DataNode

All of the setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by changes to the Templates.

Associating a DataNode with the Template Settings

The templating feature adds a setup item to the DataNode's Identification and Status tab. This drop down list allows users to select the template that is associated with the DataNode. Changing this value has the same effect as selecting the DataNode on the respective Template's list of associated DataNodes.

Properties		Values
Identification Information		
Name	Edison 61SE-PQ	
Description	Encore Series 61000 DataNode	
Serial Number	Unknown	
Version	HV2.0.29, CV2.0.75, I1.61MZPBA059V2.0.29, I2.61MACBA051V2.0.29	
Status Information		
Health	Normal	
Communication status	Idle	
Last contact at	03-21-2008 22:46:00	
Last poll at	03-21-2008 22:46:02	
Next poll at	03-21-2008 22:47:00	
Use the setting below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.		
Template	61000.120V.60Hz.Wye.All	
Use the setting below to record		
Notes	None 61000.120V.60Hz.Wye.1Sec 61000.120V.60Hz.Wye.All CREG 024 1997	

Save Setup

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*Sample 61000 Power Quality DataNode Setup - Identification and Status tab;
Users may associate this DataNode with a template in the drop down list*

Once the template has been applied to a DataNode, individual setup parameters can then be altered on the individual DataNode's setup pages. For example, the threshold limits of a particular parameter could be changed to reflect the operational requirements at the site, such as High and Low limits for Vthd. The initial copying of the template into a DataNode will overwrite all existing setup parameters. If the template is changed subsequently, only those setup parameters that were altered will be sent to the associated DataNodes.

This chapter describes the procedures on how to program the 5530/5520 DataNode. It covers the following topics:

Template and DataNode Tabs

Where Data for Programmed Settings Appear
Programming the Tabs

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Below is a list of the various 5530/5520 Template and DataNode tabs available and the programmable setups found in each tab. Template settings look and work just like actual DataNode settings. All of the DataNode setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by changes to the Templates.

The list also notes which tabs are trending pages. A trending page contains an enable/disable checkbox which allows trending of values listed on that page. All trending pages are displayed and the enabling checkboxes can be found in the individual tabs.

Template tab (available in Template setup only) - features template Name and Description, and allows users to select which DataNode to associate with the template settings.

Identification and Status tab (available in DataNode setup only) - features Identification and Status information of a specific DataNode, Polling status, and Template selection.

Communication tab (available in DataNode setup only) - features parameters to enter Connection type and Address to establish communication between the Encore Series Software and DataNode.

Polling tab (available in DataNode setup only) - features parameters to schedule when Encore Series Software can poll the DataNode for new data, can retrieve and/or delete data stored in DataNode, and can update DataNode firmware version.

Basic tab - features Power System, Steady State Trending, and Thresholds data.

Rms Variations tab - features Limit, Pre- and Post-Event Captures, Rms Variations Sampling Intervals, and Intervals data.

Transients tab - features Cycle Counts and Individual Channel Parameters data.

Metering tab - this trending page features checkboxes to Enable Trending of Metering properties and to Select the journal entry/entries to change.

Revenue tab - this trending page features checkboxes to Enable Trending of Revenue properties and to Select the journal entry/entries to change.

Demand tab - this trending page features checkboxes to Enable Trending of Demand properties and to Select the journal entry/entries to change.

Advanced Energy tab - this trending page features checkboxes to Enable Trending of Advanced Energy properties and to Select the journal entry/entries to change.

Advanced Metering tab - this trending page features checkboxes to Enable Trending of Advanced Metering properties and to Select the journal entry/entries to change.

Unbalance tab - this trending page features checkboxes to Enable Trending of Unbalance properties and to Select the journal entry/entries to change.

Harmonics tab - this trending page features checkboxes to Enable Trending of Harmonics properties and to Select the journal entry/entries to change.

Flicker tab - this trending page features checkboxes to Enable Trending of Flicker properties and to Select the journal entry/entries to change; it also allows the setting of Sample Intervals (minutes).

Advanced Harmonics tab - this trending page features checkboxes to Enable Trending of Advanced Harmonics properties and to Select the journal entry/entries to change.

Transducers tab - features data on Phase rotation, Channel Mapping and Transducer Ratios.

Advanced tab - features data on Cross Triggering, additional data on Communications, Passwords, One Time Operations, Channel Mapping, and One Time Firmware Operations.

Accumulator Resets tab - features checkboxes to enable/disable Demand Resets and Energy Accumulators.

5530/5520 DataNode Setup

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.

Properties		Values
Identification Information		
Name	Template1	
Description		
Mark each of the DataNodes that are to be updated when a change is made to this template. Note: marking a DataNode causes all of its DataNode specific settings to be updated; however, when a template's settings are changed only the changed settings are updated on the associated DataNodes.		
Edison 5530	<input type="checkbox"/>	

check box to
associate template
with DataNode

DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates .

Properties		Values
Identification Information		
Name	Edison 5530	
Description		
Serial Number	00-01-32-00-01-b9	
Version	V1.2.1040513, V3.0.49050524, V1.2.1040513, V3.0.21050920	
Status Information		
Health	System health is normal	
Communication status	Getting real-time data	
Last poll at	03/26/2006 15:56:17	
Next poll at	03/26/2006 15:57:00	
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.		
Template	<div>Template1</div> <div>None</div> <div>Template1</div>	

To illustrate DataNode program settings in detail, this Chapter provides a detailed discussion of the functionalities in each tab.

Where Data for Programmed Settings Appear

The Encore Series Software/DataNode is designed to provide programming support as well as data display. The software setup page is where the parameters and value settings are programmed. The programmed parameters and value settings are translated and displayed in meaningful data format under the Views page, Real-time page, and Reports page. Refer to the previous chapters for more details on the Views, Real-time, and Reports pages.

Programming the Tabs

LEGEND (Please note the following conventions are used in the screen displays):

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings unless there are applications which require advanced setups.

1. Identification and Status tab

Properties		Values	
Identification Information			
Name	Edison 5530		typically describes where DataNode is located
Description	Service Entrance		
Serial Number	00-01-32-00-01-b9		
Version	V3.0.21050920		
Status Information			
Health	System health is normal		indicate when Encore Series last requested data from DataNode & when next data poll will take place
Communication status	Getting real-time data		
Last poll at	03/26/2006 15:56:17		
Next poll at	03/26/2006 15:57:00		
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.			
Template	Template1 {None, Template1}		select template to associate DataNode settings

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series Software.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not.

It also includes status of Encore Series Software to DataNode **Communications**.

Polling Status is also displayed, indicating when the Encore Series Software last requested data from the DataNode and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

2. Communication tab

Properties	Values	
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.		
Active	<input checked="" type="checkbox"/>	enable to activate communication between DataNode and Encore Series Software
A direct network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).		
Connection	Local Area Network (LAN)	
Address	198.69.18.235	
User name	admin	
Password	*****	

COMMUNICATION parameters for 5530/5520 DataNode include the following:

Active which indicates whether communications between the Encore Series Software and DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the software application. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series.

Connection can be through local area network, Internet, Intranet using 10/100BaseT Ethernet, RS232, RS485.

Address is where the IP information for the specific DataNode is entered. Each 5530/5520 DataNode is shipped from the factory with an IP Address. This IP Address is entered here.

User name and **Password** are the name and password for Encore Series Software to DataNode communications. The password is typically left at factory default. A wrong IP or password will result in DataNode communication error and users will not be able to access the particular DataNode.

NOTE: The password entered must match that of the DataNode.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	01/01/2006 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>
Update DataNode firmware	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that Encore Series Software will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include a **Download and store data** checkbox to enable the

Encore Series Software to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include checkboxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the software; **Delete data in DataNode** - use to remove stored data in the DataNode; and **Update DataNode firmware** - use to update DataNode firmware with the version stored on the Encore Series Software.

4. Basic tab

Properties	Values
Power System	
PT Primary	1.00000000
PT Secondary	1.00000000
Base Voltage (Vrms)	120.0
Wiring configuration	Wye {Single Phase, Wye, Delta, Split Single Phase}
Steady State Trending	
Time between periodic samples (min)	5
Demand Interval (min)	15
Demand Sub Interval (min)	5
Thresholds	
Instruments Thresholds set in	Percent {Volts, Per Unit, Percent}

click fields to display drop down menu

The Basic tab contains value settings for the following: Power System, Steady State Trending, and Thresholds.

Under POWER SYSTEM, users can set values for PT Primary, PT Secondary, and Base Voltage (Vrms). **PT Primary** and **PT Secondary** allow the setting of the primary and secondary components respectively, of all transducer ratios. Ratios for all three phases are set when this field is changed and saved. If the values for the individual phases are different, the phase A setting is displayed. No setup values are changed unless the user modifies this field and saves the changes. The values being modified here are the same as the individual values on the Transducers page (see page 8-24). For a 5530/ 5520, the default value of both PT Primary and PT Secondary is 1.

Users can also input values for the **Base voltage (Vrms)**. This field is where the user specifies the nominal line voltage. The value serves as the basis for computing High and Low limits under the Rms Variations tab when percent of nominal or per unit options are used. Users can also select the **Wiring configuration** of the circuit. Simply click on the value field and a drop down menu lists Single Phase, Wye, Delta, and Split Single Phase.

When making voltage connections to a Single phase circuit, use channel A differential inputs. Neutral to ground measurements are recommended but not required for proper operation. When making Split Phase measurements, use both channels A and B for voltage and current connections. The neutral is chosen as the reference for measurement purposes. Neutral to ground measurements are recommended but not required for proper operation. When using the Wye setup mode, channels A, B and C are connected to voltage and

current. The neutral is connected to common and is the reference for the three channels. Neutral to ground measurements are recommended but not required for proper operation. Various setups are possible when using the Delta setup mode. For example, the 3 Phase Delta uses voltage channels A, B and C as differential inputs with channel A using source voltage A-B, channel B using B-C, and channel C using C-A as the reference. Use channels A, B and C for current connections. Neutral to ground measurements are recommended but not required for proper operation. Refer to the Series 5500 DataNode User's Guide, Chapter 2 Preparation for Use, for illustrations of the different wiring configurations using DataNode 5520 and DataNode 5510/5530.

STEADY STATE TRENDING allows for the periodic sampling of the voltage and/or current waveforms. For instance, the **Time between periodic samples** allows users to set the time (in minutes) of how often rms and waveform snapshots will be recorded.

Demand Interval and **Demand Sub-Interval** refer to that time period used in calculating power demand values. Both Demand properties can be assigned value settings within the range of 1 to 120 minutes. Note however that the value set for Demand Sub-interval must be an integer-divisor of Demand Interval since the former applies when updating certain parameters of the latter.

Under THRESHOLDS, users can choose the threshold units under **Instruments thresholds set in**. Click on the value field and a drop down selection of Volts, Per Unit, and Percent appears. The limits entered in subsequent tabs will correspond to the setting made here.

5. Rms Variations tab

Properties	Values	
Limits		
A-N Voltage {Bank selection enables programming limits below}		phase-to-neutral or phase-to-phase values displayed depend upon the Wiring Configuration set under the Basic tab
B-N Voltage		
C-N Voltage		
N-G Voltage		
A-B Voltage		
B-C Voltage		
C-A Voltage		
A Current		
B Current		
C Current		
N Current		
Limit enabled	<input type="checkbox"/>	units of measure depend on setting in Basic tab
High limit	110.0	
Low limit	90.0	
Pre- and Post- Event Captures		
Pre-event start rms samples (cycles)	2	
Post-event start rms samples (cycles)	238	
Pre-event start waveform samples (cycles)	2	
Post-event start waveform samples (cycles)	6	
Post-event end rms samples (cycles)	2	
Pre-event end waveform samples (cycles)	6	
Post-event end waveform samples (cycles)	2	
Cycles in range to end event	1	
Rms Variations Sampling Intervals		
Number of Rates to Use	3	
Intervals		
Reduced sampling rate #1		
Reduced sampling rate #2		
Reduced sampling rate #3		
Sample min/max/avg every N cycles	6	
Number of seconds to use this rate	6.000000	

RMS stands for root mean square, a mathematical formula used to measure the average voltage and current behaviors. Voltage and current activities are measured to check their behavior patterns within a set or programmed threshold. Threshold is the point within which the voltage or current parameter is said to be within tolerance. Thresholds are set in ranges with high limit (threshold above the programmed limit) and low limit (threshold below the programmed limit). Rms Variations result whenever voltage or current behaviors rise above or fall below the programmed thresholds. Dranetz instruments label rms voltage or current variations as either sags (voltage or current decreases below low limit) or swells (voltage or current increases above high limit) as per IEEE 1159.

In the Rms Variations tab, the following properties can be set: Limits, Pre and Post- Event Captures, Rms Variations Sampling Intervals, and Intervals.

Under LIMITS, letters A, B and C represent each leg or phase of a three-phase system, while letter N represents the neutral conductor. The channels used to trigger threshold values are automatically set depending on the wiring configuration selected under the Basic tab. **High limit** and **Low limit** values can be enabled and programmed individually for each phase-to-neutral and phase-to-phase setting.

To program individual limit values, select the appropriate line that describes the phase-neutral or phase-to-phase

setting that you wish to change. If the same limit value will be assigned to more than one phase, press Shift + click to select multiple phases. Enter your limit value for the corresponding phase in the High limit and Low limit fields. Click the **Limit enabled** box to activate. Click the Save Setup button every time you assign different limit values.

PRE- AND POST- EVENT CAPTURES contain parameters that help users program the number of rms and waveform cycles to be saved before (pre-) and after (post-) the start and the end of the event. These parameters are **Pre-event start rms samples, Post-event start rms samples, Pre-event start waveform samples, Post-event start waveform samples, Post-event end rms samples, Pre-event end waveform samples, and Post-event end waveform samples**. The parameters capture rms sample or rms waveform cycles that may be used to analyze and manage power event patterns and behavior.

With regard to the beginning and end of rms variation events, such transition points are determined according to the following rules. As per IEC and IEEE standards for multi-phase systems, the beginning of the event occurs when any phase goes outside the limits. The start of an rms variation event is denoted as the time one or more phases of voltage or current goes outside of the programmed high or low thresholds. The end point of the event is defined as the point when all channels for which triggers are enabled have come back within limits (plus internally calculated hysteresis) for a minimum duration of **Cycles in range to end event**. Until this criteria is met, any subsequent excursions beyond the thresholds are considered part of the original disturbance. Disturbance monitoring requires that voltage be continuously sampled, and recorded only if the signals exceed specified values. Most types of disturbances, with the exception of voltage variations, require that current be recorded as well.

The user also has the ability to specify how rms trace data is recorded during the event. This mechanism is found under RMS VARIATIONS SAMPLING INTERVALS, where **Number of rates to use** refers to the number of reduced sampling rate ranges to be used to record rms variation activities. The sampling data referred to here may be any or all of the three sample rates found under INTERVALS - **Reduced sampling rate #1, Reduced**

sampling rate #2, and Reduced sampling rate #3. When one of these items is selected, the reduced sampling rate parameters can be set for that item. Data for the sample rates only apply to rms, not waveform, variations.

The reason behind storing sampling rates is that the memory capacity of the monitoring instrument makes it impractical to record an entire long duration sag or swell point by point. The waveforms before and after the trigger are digitized to help identify the cause of the excursion, but only rms values are stored over the full duration event that is longer than the pre- and post- trigger setting. If the event has not ended after a programmed time period, the instrument switches to averaging cycles of rms data to further conserve memory yet accurately represent the event. At this point, the rms plot diverges from a single-valued line to a band of minimum, maximum and average values. During extremely long events, the instrument switches to successively longer averaging periods explained next.

The sample rates represent three supplemental recording interval or chart speeds defined for recording long events. When recording at reduced rates, three values are saved for each data point - the minimum, maximum, and average value of the previous interval. The **Sample min/max/avg every N cycles** refers to the number of cycles to average for the selected reduced sampling rate. While **Number of seconds to use this rate** refer to the number of seconds to record at the selected reduced sampling rate.

The following default sequence is used to program reduced sampling rates:

For 60 Hz systems

- a. 6 cycle intervals for 8 seconds (80 samples)
- b. 30 cycle intervals for 20 seconds (40 samples)
- c. 60 cycle intervals for 90 seconds (90 samples)

For 50 Hz systems

- a. 5 cycle intervals for 8 seconds (80 samples)
- b. 25 cycle intervals for 20 seconds (40 samples)
- c. 50 cycle intervals for 90 seconds (90 samples)

For further discussion on RMS Variation Triggering and Recording, please refer to the EPQ DataNode Series User's Guide.

6. Transients tab

Properties	Values
Cycle Counts	
Number of pre-trigger cycles	1
Number of post-trigger cycles	2
Individual Channel Parameters	
A-N Voltage	phase-to-neutral or phase-to- phase values displayed depend upon the Wiring Configuration set under the Basic tab
B-N Voltage	
C-N Voltage	
N-G Voltage	
A Current	
B Current	
C Current	
N Current	
Instantaneous limit enabled	<input type="checkbox"/>
Instantaneous limit	120.0
Peak detector limit enabled	<input type="checkbox"/>
Peak detector limit	100
Waveform change limit enabled	<input type="checkbox"/>
Waveform change magnitude limit	10.0
Waveform change duration limit (% of cycle)	10.0

Transients are disturbances which are shorter in duration than sags and swells. There are two basic types of transients: 1) impulsive transients commonly caused by lightning and load switching, and 2) oscillatory transients often attributed to capacitor bank switching. The EPQ DataNode has extensive transient recording capabilities for all transient events, using waveshape, instantaneous peak, and dual positive and negative high frequency peak detectors.

Impulsive transients are characterized by a very rapid change in the magnitude of the measured quantity. Because these types of disturbances exhibit high frequencies, they are quickly damped by the system. They tend to be unidirectional when close to their source. Impulses are commonly caused by capacitors or inductors switching on line, loose wires, lightning, static, and power failures.

Oscillatory transients are defined as a temporary, rapid discontinuity of the waveform. Frequency is the most important characteristic in identifying this type of transient event. Frequencies are further classified into high (500 kHz or greater), medium (5 to 500 kHz), or low (5 kHz or less).

Transient events in the form of wave faults are captured using the waveform change detection technique. This is done by recording present cycle samples and comparing it to samples from the previous cycle. Waveshape trigger values include the magnitude and duration of the difference between the present and previous cycle.

Transients can be captured using the high frequency positive/negative peak detectors, crest factor peak (instantaneous), and/or the waveshape variation triggering functions. The high frequency detected transient uses special circuitry to detect and capture impulsive transients as small as 1 microsecond. These transients are the positive and/or negative value above or below the low frequency waveshape. **These are only enabled if the flicker tab is disabled.** The crest factor or instantaneous peak is the absolute peak sample value within one cycle. The high frequency peak detector and instantaneous transients are triggerable for voltage and current.

Under the CYCLE COUNTS, the user can define a number of cycles of waveform to record prior to the

trigger point. This is set under the value field **Number of pre-trigger cycles**. Users can also define the number of cycles of waveform to record after the trigger. This value is set under **Number of post-trigger cycles**. Typical values for these settings are 1 and 2 respectively. Setting these values to 0 causes one cycle of data to be recorded for each event - the cycle in which the transient was detected. Note also that the cycle of waveform containing the trigger point is always recorded. For example, if the pre-trigger cycle count is 1 and the post-trigger count is set to 2, then a total of 4 cycles (including the cycle containing the trigger point) of waveform and peak detector values are recorded.

Under INDIVIDUAL CHANNEL PARAMETERS, letters A, B and C represent different channels, N stands for neutral, while G stands for ground conductor. The channel values are pre-defined and automatically set depending upon the Wiring configuration selected under the Basic tab.

The DataNode provides configuration variables that specifies how many cycles to record the **Instantaneous limit**, **Peak detector limit** and **Waveform change magnitude limit**. These limit values can be enabled and programmed individually for each phase and phase-to-phase setting.

The instantaneous limit value is compared against the absolute value of each A/D sample of the voltage and current channel waveforms (128 A/D samples taken per cycle). If any point is greater than the specified limit, the cycle the trigger occurred on plus the specified number of

pre- and post- trigger cycles will be recorded as an event. Enter your limit values in the corresponding field for each phase-neutral or phase-to-phase setting, and click the **Instantaneous limit enabled** box to activate. In earlier versions of the software, this same value is used for the high frequency dual peak detectors as well.

The instantaneous limit is in units of Volts or Percent of base depending on the unit of thresholds selected under the Basic tab. If the instantaneous limit is set at or below 100%, transients are effectively disabled because a permanent trigger condition exists and locks out further events. The Peak detector limit can also be set in units of Volts or Percent of base depending on the thresholds unit set under the Basic tab. Since the fundamental frequency component is filtered out using the peak detector trigger mechanism, peak detector limits set below 100% can be specified.

Other configuration variables that determine the operation of transient capture capability of the DataNode are the waveform trigger parameter, instantaneous peak waveform trigger level, and dual peak high frequency detector output trigger level. Values for these parameters are set under **Waveform change magnitude limit** and **Waveform change duration limit**. Normally the default values for these is 10%. These limit values can be enabled and programmed individually for each phase and phase-to-phase setting. To activate the waveform limit values, click the **Waveform change limit enabled** box.

For further discussion on Transient Event Recording, refer to the EPQ DataNode Series User's Guide.

Trending Tabs

The following tabs are known as trending pages: Metering, Revenue, Demand, Advanced Energy, Advanced Metering, Imbalance, Harmonics, Flicker, and Advanced Harmonics. These tabs contain an enable/disable checkbox at the top of the page. The purpose of the checkbox on any trending page is to enable trending of properties and values listed on that page. If the box is checked, the settings on that page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect. When exiting from the page, a save confirmation window appears. Click on Yes to save changes. Click on No to exit the menu tab without saving changes.

NOTE: All trending tabs operate in the same manner, the difference being the parameter measured. Therefore the same description of how to use can appear once and not be repeated.

7. Metering tab

Properties	Values
Enable Trending (This page)	
Basic Metering (Metering, MMXUO)	<input checked="" type="checkbox"/>
Trending options	
Enable high-resolution frequency monitoring	<input type="checkbox"/>
Select the journal entry/entries to change	
Line-Neutral Voltage (A-N)	Apparent Power (A)
Line-Neutral Voltage (B-N)	Apparent power (B)
Line-Neutral Voltage (C-N)	Apparent Power (C)
Neutral-Ground Voltage	Total Apparent Power
Line-Line Voltage (A-B)	Power Factor (A)
Line-Line Voltage (B-C)	Power Factor (B)
Line-Line Voltage (C-A)	Power Factor (C)
Line Current (A)	Average Power Factor
Line Current (B)	Angle Between Phases (A)
Line Current (C)	Angle Between Phases (B)
Line Current (N)	Angle Between Phases (C)
Active Power (A)	Frequency
Active Power (B)	
Active Power (C)	
Total Active Power	
Enable Periodic Sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

phase-to-neutral or phase-to-phase values displayed depend upon the Wiring Configuration set under the Basic tab

The rms voltage variations have their own tab relative to capturing and monitoring power quality events such as sags and swells (see page 8-7 Rms Variations). In addition, the

rms voltage and current values can be trended using periodic readings that are stored in a journal.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Basic Metering**. The box enables the trending of values listed in Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT JOURNAL ENTRY/ENTRIES TO CHANGE, the various phase-neutral and phase-to-phase parameters are displayed. High and low limits can be enabled and individually set for each phase-neutral and phase-to-phase value. Note however that the available phase values depend on the Wiring Configuration selected under the Basic tab. For instance, for wye circuits L-N, N-G and L-L limits can be set. For delta circuits, only L-L limits can be set.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box, and then enter the value for that threshold. Repeat this for all parameters of interest. NOTE: The 5530 DataNode has an internal limit on the number of variables it can track for the purpose of periodic recording and limit rule evaluation. Indiscriminate selection of parameters should be avoided.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. The hysteresis values assigned to limits are set by the system and not programmable by the user. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

For example, if the frequency is detected to cross the threshold limit, then an event is recorded. If the frequency goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis) then another event is recorded.

Enabling the parameters for periodic sampling make them appear in the Real-time tab.

8. Revenue tab

Properties	Values
Enable Trending (This page)	
Basic Revenue Metering (Revenue, MMTR0)	<input type="checkbox"/>
Select the journal entry/entries to change	
Phase Energy (A)	
Phase Energy (B)	
Phase Energy (C)	
Total Energy	
Integrated Reactive Power (A)	
Integrated Reactive Power (B)	
Integrated Reactive Power (C)	
Total Integrated Reactive Power	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Basic Revenue Metering**. The box enables the trending of values listed in Basic Revenue Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Each of the individual phase and three phase total energy and integrated reactive power values found under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE can be enabled.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

For example, if the Total Energy is detected to cross the threshold limit, then an event is recorded. If the Total Energy goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

Enabling the parameters for periodic sampling make them appear in the Real-time tab.

9. Demand tab

Properties	Values
Enable Trending (This page)	
Demand (Demand, MDMDUO)	<input type="checkbox"/>
Select the journal entry/entries to change	
Real Power, Dmd, Total	
Reactive Power, Dmd, Total	
Apparent Power Dmd, Total	
Average PF Over Last Interval	
Peak Real Power Dmd Total	
Var Dmd Coincident w/Pk W Dmd	
VA Dmd Coincident w/Pk W Dmd	
Avg PF Coincident w/Pk W Dmd	
Peak Reactive Power Dmd, Total	
W Dmd Coincident w/Pk Var Dmd	
VA Dmd Coincident w/Pk Var Dmd	
Avg PF Coincident w/Pk Var DMD	
Peak Apparent Power Dmd, Total	
W Dmd Coincident w/Pk W Dmd	
Var Dmd Coincident w/Pk VA Dmd	
Avg PF Coincident w/Pk VA Dmd	
Predicted Real Power Dmd, Total	
Predicted Reactive Power Dmd, Total	
Predicted Apparent Power Dmd, Total	
Current Demand (A)	
Current Demand (B)	
Current Demand (C)	
Average Current Demand	
Peak Current Demand (A)	
Peak Current Demand (B)	
Peak Current Demand (C)	
Average Peak Current Demand	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

Demand values are computed as the average value over the demand interval, which can be programmed as a different value than the periodic readings. The following parameter values can be enabled: individual phase and three phase total real power demand, reactive demand, apparent power demand, average PF and peak real power values.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Demand**. The box enables the trending of values listed in Demand page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

The following parameter values can be enabled under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE: individual phase and three phase total real power demand, reactive demand, apparent power demand, average PF, and peak real power values.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box, and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

For example, if the Real Power Demand is detected to cross the threshold limit, then an event is recorded. If the Real Power Demand goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

10. Advanced Energy tab

Properties	Values
Enable Trending (This page)	
Advanced Energy (Adv. Anergy, MFLOO)	<input type="checkbox"/>
Select the journal entry/entries to change	
Forward fund. freq. WHrs (A)	
Forward fund. freq. WHrs (B)	
Forward fund. freq. WHrs (C)	
Reverse fund. freq. WHrs (A)	
Reverse fund. freq. WHrs (B)	
Reverse fund. freq. WHrs (C)	
Forward tot. fund. freq. WHrs	
Reverse tot. fund. freq. WHrs	
Forward fund. freq. VarHrs (A)	
Forward fund. freq. VarHrs (B)	
Forward fund. freq. VarHrs (C)	
Reverse fund. freq. VarHrs (A)	
Reverse fund. freq. VarHrs (B)	
Reverse fund. freq. VarHrs (C)	
Forward tot. fund. freq. VarHrs	
Reverse tot. fund. freq. VarHrs	
Fundamental freq. VA hours (A)	
Fundamental freq. VA hours (B)	
Fundamental freq. VA hours (C)	
Total fundamental freq. VA hours	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

The Advanced Energy tab shows various energy parameters on per phase and total basis as well as in forward and reverse mode. Fundamental frequency is used as the reference unit. Frequency is specified in hertz. Fundamental frequency refers to the principal component of a wave, i.e. the component with the lowest frequency or greatest amplitude.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Advanced Energy**. The box enables the trending of values listed in Advanced Energy page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, highlight the phase value parameter you wish to change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high, High, Low, Low-Low, and Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

For example, if the Total Fundamental Frequency VA hours is detected to cross the threshold limit, then an event is recorded. If the Total Fundamental Frequency VA hours goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

11. **Advanced Metering** tab

Properties	Values
Enable Trending (This page)	
Advanced Metering (Adv. Metering, MADVO)	<input type="checkbox"/>
Select the journal entry/entries to change	
Total VA - Arith. Method	
Total VA - Vect. Method	
Total Fund. VA - Arith. Method	
Total Fund. VA - Vect. Method	
Worst True Power Factor	
Total Arithmetic True PF	
Total Vector True Power Factor	
Displacement Power Factor (A)	
Displacement Power Factor (B)	
Displacement Power Factor (C)	
Worst Displacement Power Factor	
Average Displacement PF	
Total Arithmetic Disp. PF	
Total Vector Disp. Power Factor	
Residual Current	
Net Current	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

Under **ENABLE TRENDING (THIS PAGE)** is a checkbox in the value field opposite **Advanced Metering**. The box enables the trending of values listed in Advanced Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under **SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE**, multiple total apparent power and power factor parameters, calculated using arithmetic and vector sums of the individual phases, can be enabled. Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box, and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-High**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Displacement Power Factor is detected to cross the threshold limit, then an event is recorded. If the Displacement Power Factor goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

12. Unbalance tab

Properties	Values
Enable Trending (This page)	
Unbalance and Sequence Components (Sequence,MSQIO)	<input type="checkbox"/>
Select the journal entry/entries to change	
Sequence Voltage (Pos)	
Sequence Voltage (Neg)	
Sequence Voltage (Zero)	
Sequence Current (Pos)	
Sequence Current (Neg)	
Sequence Current (Zero)	
V Imbalance: L-N dev. from avg (A-N)	
V Imbalance: L-N dev. from avg (B-N)	
V Imbalance: L-N dev. from avg (C-N)	
V Imbalance: L-L dev. from avg (A-B)	
V Imbalance: L-L dev. from avg (B-C)	
V Imbalance: L-L dev. from avg (C-A)	
V Imbalance: L-N Max from avg	
V Imbalance: L-L Max from avg	
V Imbalance: Neg. Seq. Method	
V Imbalance: Zero Seq. Method	
I Imbalance: dev. from avg (A)	
I Imbalance: dev. from avg (B)	
I Imbalance: dev. from avg (C)	
I Imbalance: Max dev. from avg	
I Imbalance: Neg. Seq. Method	
I Imbalance: Zero Seq. Method	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

The voltage and current imbalance for each phase from the average value for all three phases can be trended and limits set. The positive, negative and zero sequence components for voltage and current can be trended.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Unbalance and Sequence Components**. The box enables the trending of values listed in Unbalance page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box, and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity.

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13. Harmonics tab

Properties	Values
Enable Trending (This page)	
Harmonics (MHAIO)	<input type="checkbox"/>
Percent Eddy Current Loss	8.000
Maximum Demand Load Current	100.000
Select the journal entry/entries to change	
Voltage THD - Fund. Normalized (A-N)	Current TID - Fund. Normalized (A)
Voltage THD - Fund. Normalized (B-N)	Current TID - Fund. Normalized (B)
Voltage THD - Fund. Normalized (C-N)	Current TID - Fund. Normalized (C)
Voltage THD - Fund. Normalized (N-G)	Current TID - Fund. Normalized (N)
Voltage THD - RMS Normalized (A-N)	Current TID - RMS Normalized (A)
Voltage THD - RMS Normalized (B-N)	Current TID - RMS Normalized (B)
Voltage THD - RMS Normalized (C-N)	Current TID - RMS Normalized (C)
Voltage THD - RMS Normalized (N-G)	Current TID - RMS Normalized (N)
Voltage TID - Fund. Normalized (A-N)	Current Harmonic RMS (A)
Voltage TID - Fund. Normalized (B-N)	Current Harmonic RMS (B)
Voltage TID - Fund. Normalized (C-N)	Current Harmonic RMS (C)
Voltage TID - Fund. Normalized (N-G)	Current Harmonic RMS (N)
Voltage TID - RMS Normalized (A-N)	Current Interharmonic RMS (A)
Voltage TID - RMS Normalized (B-N)	Current Interharmonic RMS (B)
Voltage TID - RMS Normalized (C-N)	Current Interharmonic RMS (C)
Voltage TID - RMS Normalized (N-G)	Current Interharmonic RMS (N)
Voltage Harmonic RMS (A-N)	IT Product (A)
Voltage Harmonic RMS (B-N)	IT Product (B)
Voltage Harmonic RMS (C-N)	IT Product (C)
Voltage Harmonic RMS (N-G)	IT Product (N)
Voltage Interharmonic RMS (A-N)	Current Crest Factor (A)
Voltage Interharmonic RMS (B-N)	Current Crest Factor (B)
Voltage Interharmonic RMS (C-N)	Current Crest Factor (C)
Voltage Interharmonic RMS (N-G)	Current Crest Factor (N)
Voltage TIF - Fund. Normalized (A-N)	Current Total Demand Distortion (A)
Voltage TIF - Fund. Normalized (B-N)	Current Total Demand Distortion (B)
Voltage TIF - Fund. Normalized (C-N)	Current Total Demand Distortion (C)
Voltage TIF - Fund. Normalized (N-G)	K Factor (A)
Voltage TIF - RMS Normalized (A-N)	K Factor (B)
Voltage TIF - RMS Normalized (B-N)	K Factor (C)
Voltage TIF - RMS Normalized (C-N)	K Factor (A)
Voltage TIF - RMS Normalized (N-G)	Transformer Derating Factor (A)
Voltage Crest Factor (A-N)	Transformer Derating Factor (B)
Voltage Crest Factor (B-N)	Transformer Derating Factor (C)
Voltage Crest Factor (C-N)	Total Phase Harmonic Power (A-N)
Voltage Crest Factor (N-G)	Total Phase Harmonic Power (B-N)
Current THD - Fund. Normalized (A)	Total Phase Harmonic Power (C-N)
Current THD - Fund. Normalized (B)	Signed Phase Harmonic Power (A-N)
Current THD - Fund. Normalized (C)	Signed Phase Harmonic Power (B-N)
Current THD - Fund. Normalized (N)	Signed Phase Harmonic Power (C-N)
Current THD - RMS Normalized (A)	
Current THD - RMS Normalized (B)	
Current THD - RMS Normalized (C)	
Current THD - RMS Normalized (N)	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	135.0
High limit enabled	<input type="checkbox"/>
High limit	125.0
Low limit enabled	<input type="checkbox"/>
Low limit	105.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	90.0
Deadband enabled	<input type="checkbox"/>
Deadband	3.0

Harmonics are waveform distortion, a steady-state deviation from an ideal power frequency sinusoid and is characterized by the spectral content of the waveform. Many non-linear devices such as battery chargers, switching power supplies or transformers inject currents at harmonic (integer multiples of the fundamental) frequencies into the system. Harmonic currents and the voltage distortion they create as they flow through system impedances can reduce equipment operating reliability and service life. Harmonics can be particularly troublesome where capacitors are applied on the distribution system. Capacitors may result in resonance at a harmonic frequency, leading to high harmonic voltages and currents throughout the system.

Interharmonics are frequency components between the harmonic frequencies. The IEC 1000-4-7 Standard dictates that harmonic analysis is done using 5Hz bins. The rms of the frequency bins between the 2nd and 3rd harmonic is referred to as the H_{2-3} interharmonic.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Harmonics**. The box enables the trending of values listed in Harmonics page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT JOURNAL ENTRY/ENTRIES TO CHANGE, various harmonic parameters can be trended using periodic readings that are stored in a journal. Harmonic distortion of voltage or current is calculated through a Fourier transformation of the waveform into harmonic magnitudes and phase angle spectra. These spectra are used to determine figures of merit such as total harmonic distortion (THD) and telephone influence factor (TIF). The total interharmonic distortion (TID) is calculated similar to the THD. (See Appendix A *Quantities Calculated from Periodic Voltage and Current Measurements*)

The Encore Series Software/DataNode system allows simultaneous measurements of voltage and current so that harmonic power flow can be obtained. Depending on value parameters set, the program can record a sampling of the waveform synchronized to the fundamental frequency, to

ensure accurate calculation of harmonic phase angles. The sampling rate is sufficient to determine up to the 50th harmonic and interharmonic or better. A comprehensive range of high and low limits can be enabled and individually set for each measured parameter. Highlight the value parameter you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high, High, Low, Low-Low, and Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

For example, if the Voltage Harmonic RMS is detected to cross the threshold limit, then an event is recorded. If the Voltage Harmonic Rms goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded. All activated Harmonic parameters and value settings defined can be viewed under the Real-time tab.

For further discussion on Harmonic Distortion, please refer to the EPQ DataNode Series User's Guide.

14. Flicker tab

Properties	Values
Enable Trending (This page)	
Flicker (Flicker, MFLKO)	<input checked="" type="checkbox"/>
Sample Intervals	
Pst Sample Interval (minutes)	10
Plt Sample Interval (Pst intervals)	180
Select the journal entry/entries to change	
Pst of last complete interval (A) Pst of last complete interval (B) Pst of last complete interval (C) Plt of last complete interval (A) Plt of last complete interval (B) Plt of last complete interval (C) Sliding window Plt calculation (A) Sliding window Plt calculation (B) Sliding window Plt calculation (C) Output 5-Pinst-peak value (A) Output 5-Pinst-peak value (B) Output 5-Pinst-peak value (C) Output 4-1 min TC LPF of Pinst (A) Output 4-1 min TC LPF of Pinst (B) Output 4-1 min TC LPF of Pinst (C) Output 3-square root of Pinst (A) Output 3-square root of Pinst (B) Output 3-square root of Pinst (C) LPF of Output 3 (A) LPF of Output 3 (B) LPF of Output 3 (C)	
Enable periodic sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	0.00
High limit enabled	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low threshold	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.00
Deadband enabled	<input type="checkbox"/>
Deadband	0.00

There are three flicker values available for trending: the Short term flicker or Pst, the long term flicker or Plt, and Plt calculated on a sliding window. The other parameters shown above (journal entries) are used primarily for specialized testing. Flicker measurements are classified per IEC 1000-4-15.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Flicker** which enables the trending of values listed in this page. If the box is checked, the settings on the page go into effect. **Enabling this will automatically disable the high-frequency dual peak detectors located in the Transients tab.** If the box is not checked, the remaining settings are persisted but are not in effect.

Under SAMPLE INTERVALS are two numeric edit controls: the **Pst Sample Interval** and the **Plt Sample Interval**. Pst is short term perceptibility, used to set the Pst calculation interval. Typical calculation is over 10 minute interval, though this can be programmed. Plt is long term perceptibility, used to set Plt calculation interval. Typical calculation is over 2 hour interval, though this can also be programmed. The Plt interval must be an integer multiple of the Pst interval. Sliding Plt recalculates the Plt value at each Pst interval, rather than only at the Plt interval.

Under SELECT JOURNAL ENTRY/ENTRIES TO CHANGE, various flicker parameters can be trended using periodic readings that are stored in a journal.

Highlight the value parameter you wish to change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high, High, Low, Low-Low, and Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit

High limit - specifies an absolute limit for comparison that is higher than the low limit

Low limit - specifies an absolute limit for comparison that is lower than the high limit

Low-Low limit - specifies an absolute limit for comparison lower than the low limit

Deadband limit - specifies how much a value can change before another event is recorded

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage RMS Variation and Transients limits.

15. Advanced Harmonics tab

Properties	Values	
Enable Trending (This page)		
Advanced Harmonics (Individual, MHAIO)	<input checked="" type="checkbox"/>	
Trend harmonics for phase A	<input checked="" type="checkbox"/>	
Trend harmonics for phase B	<input checked="" type="checkbox"/>	
Trend harmonics for phase C	<input checked="" type="checkbox"/>	
Harmonics to Trend		
Phase Voltages	2-25	sample Harmonic values to trend
Neutral Voltages		
Phase Currents		
Neutral Current		
Interharmonics to Trend		
Phase Voltages	2-25	sample Interharmonic values to trend
Neutral Voltages		
Phase Currents		
Neutral Current		

The following parameters are found under ENABLE TRENDING (THIS PAGE): **Advanced harmonics (Individual)** and **Trend harmonics for phases A, B and C**. Opposite these parameters are checkboxes which enable the trending of values listed in Advanced harmonics page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Caution: Selection of numerous harmonics and interharmonics can exceed the total number of journal parameters (typically 200) that can be trended. Harmonics will not be trended unless the corresponding channel is selected for Harmonic/Interharmonic RMS Voltage or Current under the Harmonics tab.

Voltage and current harmonics for each phase and neutral channel can be trended under HARMONICS TO TREND.

Similarly, voltage and current interharmonics for each phase and neutral channel can also be trended under INTERHARMONICS TO TREND. The value fields are left blank to allow the users to choose the numbers or the range of harmonic frequencies to trend.

Numbers can be entered individually with commas separating the numbers, or a range of harmonics can be specified using a dash between lower and upper values. Also, the suffix 'o' or 'e' can be used to specify only the odd or even harmonics, respectively, in a given range. Selecting numerous harmonics indiscriminately can take up all of the allowable trending parameters. Users are advised to select harmonics to trend prudently.

Resulting individual harmonic sampling and graphs can be seen in the Smart Trends folder under the Views tab.

16. Transducers tab

Properties	Values
Phase rotation	Normal (counter clockwise) {Normal (counter clockwise), Reverse (clockwise)}
Channel Mapping	
Phase A voltage	
Phase A current	
Phase B voltage	
Phase B current	
Phase C voltage	
Phase C current	
Neutral voltage	
Neutral current	
Signal is connected to	Channel 1
Channel is inverted	<input type="checkbox"/>
Transducer Ratios	
Phase A-N VT	
Phase B-N VT	
Phase C-N VT	
Neutral VT	
Phase A CT	
Phase B CT	
Phase C CT	
Neutral CT	
Phase A-B VT	
Phase B-C VT	
Phase C-A VT	
Transducer Primary	1.00000000
Transducer Secondary	1.00000000
Magnitude correction	<i>1.00000000</i>
Phase correction	<i>0.00000000</i>
DC offset	<i>0.00000000</i>

phase-to-neutral or
phase-to-phase
values displayed
depend upon the
Wiring Configuration
set under the Basic
tab

Transducers are typically PTs (potential transformers) and CTs (current transformers) that are used to interface the instrument to the power circuit. PTs allow the instrument to measure circuits that are not within the measurement range of the instrument. CTs measure the current of the circuit and convert it to within the measurement range of the instrument.

For **Phase rotation**, users can choose whether to have phasor shift clockwise or counterclockwise, depending on the way they have set up their system. Click the value field to display the drop down menu featuring Normal (counter clockwise) or Reverse (clockwise). Either orientation will yield the same mathematical calculations of voltage and current measurements. The 5530 is able to automatically determine phase rotation of the voltage channels and then match up the current channels.

The 5530 DataNode will swap voltage phases to ensure positive sequence phase rotation (counter clockwise according to IEEE definitions) and then swap and invert current channels to match.

The Encore Series Software allows users to do channel swapping and inversion information. Channel mapping is used to correct for errors in wiring the instrument to the circuit. If a mistake is made, such as an inverted CT or a phase is connected to the wrong channel, it can be corrected in the software instead of changing the wiring to the instrument. Note that it is recommended that the actual wiring be changed, but channel mapping can correct the problem if this is not practical.

A channel-mapping array is provided to permit manual configuration of channel swapping and inversion. Under

CHANNEL MAPPING, click on the corresponding voltage or current phase to show which channel the **Signal is connected to**. Click and enable the value field opposite **Channel is inverted to** as it applies.

The channel-mapping array works by specifying a numeric code in each array slot that indicates which phase is connected to the physical 5530 DataNode channel.

Normally, the channels and phases are matched as shown below. Channels can be swapped and/or inverted to correct mistakes in wiring.

Voltage Phase A	Channel 1
Voltage Phase B	Channel 2
Voltage Phase C	Channel 3
Voltage Neutral	Channel 4
Current Phase A	Channel 5
Current Phase B	Channel 6
Current Phase C	Channel 7
Current Neutral	Channel 8

The DataNode employs two A/D converters to sample the voltage and current channels for a given phase simultaneously. Measurement errors may result if the voltage and current signals are not correctly paired.

Under TRANSDUCER RATIOS, users can set values for the **Transducer Primary** and **Transducer Secondary**. Values to account for any voltage or current transformers can be entered for each input channel. The primary and secondary values are entered. For example, if the primary voltage is 2400 volts and the secondary voltage is 120 volts, then those values should be entered. This gives an effective 20:1 reduction in voltage. When the input voltage to the DataNode is 120V, the displayed value will be 2400 volts. The **Phase correction** and **DC offset** values are not programmable.

17. Advanced tab

Properties	Values
Cross Triggering	
Broadcast Group ID	1234
Enable sending rms trigger	<input type="checkbox"/>
Enable responding to received rms trigger	<input type="checkbox"/>
Enable sending transient trigger	<input type="checkbox"/>
Enable responding to received transient trigger	<input type="checkbox"/>
Broadcast address - if empty, uses local	
Communications	
When configurations differ use the DataNode setup {use the DataNode setup} {use the InfoNode setup}
Passwords	
User Account Password	*****
Admin Account Password	*****
InfoNode Access User ID	admin
InfoNode Access Password	*****
Firmware Access User ID	admin
Firmware Access Password	*****
One Time Operations	
Reset 302 Default Setup	<input type="checkbox"/>
Clear 332 Database and reboot	<input type="checkbox"/>
Don't save data from next download	<input type="checkbox"/>
Clear last journal ID	<input type="checkbox"/>
One Time Firmware Operations	
CAUTION: These operations will copy new firmware to the DataNode	
Load IOP (302) firmware	<input type="checkbox"/>
Load ACP (332) firmware	<input type="checkbox"/>
Load both IOP (302) and ACP (332) firmware	<input type="checkbox"/>
Load both to all DataNodes	<input type="checkbox"/>

click to
display drop
down menu

Parameters under the Advanced tab allow the administrator or user to set up functions that affect communications, information access, and download between the Encore Series Software and DataNode systems.

The 5530/5520 can be configured to issue a UDP (cross trigger) broadcast message when an RMS variation and/or transient occurs. The 5530/5520 can also be configured to listen for such messages and cause an rms variation or transient recording to occur regardless of whether or not its own trigger conditions for that instrument were met. Under CROSS TRIGGERING, a **Broadcast Group ID** is assigned to allow for different groups of cross trigger senders/recipients.

The broadcast ID number in the Encore Series Software must match the broadcast group ID set under the TCP/IP parameter of the Datanode. The DataNode also uses this ID mechanism for multiple DataNode cross triggering, and is guaranteed only on an un-routed network. The group ID is sent along with the broadcast message and only those receivers with the same group ID will respond to the broadcast if so enabled. The broadcast address can be specified to send a broadcast to a directed address other than the local network if desired. However, results cannot be guaranteed and data may be lost if the message takes too long to arrive at its destination.

Checkboxes are seen opposite the next four items **Enable sending rms trigger**, **Enable responding to received rms trigger**, **Enable sending transient trigger**, **Enable responding to received transient trigger**. The user specifies which event types are generated and/or listened for through these checkboxes. When said parameters are activated, the system in effect utilizes trigger messages as trip signals. If **Broadcast address is empty**, message broadcast is routed through the local network. The user specifies a group ID and optionally a broadcast address.

Under COMMUNICATIONS, users are given the option to return to the default Encore Series Software or DataNode settings **When configurations differ** and communication errors occur.

Access privileges are determined under PASSWORDS. The passwords entered in the Encore Series system must match the ones stored under the Password section of the Signature System DataNode. Otherwise, access to information may be denied. The **User Account Password** and **Admin Account Password** refer to two different user categories. An Admin User can create and add an account for a new Basic User. Both Admin and Basic users can assign properties such as their own user name and password. See page 7-1 User section for more details.

The default **Encore Series Access User ID** is 'admin'. The default **Encore Series Access Password** is 'password'. These parameters allow access to view and change information in the Encore Series Software system. The default **Firmware Access User ID** is 'admin'. The default **Firmware Access Password** is 'password'. These parameters allow access to view and change information in the DataNode system. To change passwords, simply click on the Password value fields. A confirmation window appears everytime you click on the password value field. The window asks whether you want to change and save a new password.

Parameters are also available for ONE TIME OPERATIONS on the EPQ DataNode. These one time procedures include configuring the DataNode to its default settings and/or clearing memory space by rebooting. Observe caution in undertaking these procedures since they cannot be undone. To return to the default DataNode settings, activate the **Reset 302 default setup** value field. To clear old data and reboot DataNode, activate the **Clear 332 Database and reboot** value field. To save memory space, the administrator or user may choose to activate **Don't save data from next download**. To discard the most recent journal ID entries, activate the **Clear last journal ID** value field.

Finally, parameters for downloading new or updated firmware are available under ONE TIME FIRMWARE OPERATIONS. A firmware is a program or instruction stored in Flash memory which implements the communications interface and data acquisition between the outside world and the instrument.

Based on the parameters available, the administrator or user can activate value fields to **Load IOP firmware** or to **Load ACP firmware** or to **Load both IOP and ACP firmware**. The IOP and ACP firmware are two different sets of firmware. The IOP communicates directly with the Encore Series Software, while the ACP is comprised of the host CPU and DSP. If the value fields are activated, new firmware is downloaded on demand from the software to DataNode. New firmware is downloaded automatically if the boot ROM finds that the existing firmware in the DataNode is missing or corrupt. The administrator or user also has the option to **Load Both (IOP and ACP) firmware to all DataNodes**. Download is accomplished using the standard Internet File Transfer Protocol (FTP). The DataNode must be connected to the network where the updates are to be extracted from to ensure a successful download. Since these one time operations cannot be undone, observe caution when performing download firmware procedures.

18. Accumulator Resets tab

Properties	Values
Demand Resets	
Reset Real Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Reactive Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Apparent Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (A) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (B) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (C) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (N) (Never reset)	<input type="checkbox"/>
Reset Average Peak Current Demand (Never reset)	<input type="checkbox"/>
Reset All Values	<input type="checkbox"/>
Energy Accumulators	
Reset Phase Energy (Never reset)	<input type="checkbox"/>
Reset Total Energy (Never reset)	<input type="checkbox"/>
Reset Integrated Reactive Power (Never reset)	<input type="checkbox"/>
Reset Total integrated Reactive Power (Never reset)	<input type="checkbox"/>
Reset Forward fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Reverse fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Forward tot. fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Reverse tot. fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Forward fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Reverse fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Forward tot. fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Reverse tot. fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Fundamental freq. V A Hours (Never reset)	<input type="checkbox"/>
Reset Total Fund. freq. VA Hours (Never reset)	<input type="checkbox"/>

In connection with electric utility billing practices, the Encore Series Software and DataNode system has an interface to reset demand and energy accumulation readings. The Accumulator Resets tab allows one to reset the parameters to defined values, but not to change or configure new values. The notation 'Never reset' appears to mean that the parameter values register original readings and have never been reset at any time. The moment the reset parameter is activated/enabled, the notation will change and will reflect the date and time of last reset.

Under DEMAND RESETS, Real or True Phase power demand, Reactive power demand, and Apparent power demand can be reset. See Appendix F *Glossary* for the definitions of the various power parameter values. The system maintains a running maximum known as "peak demand" on per phase basis and per average demand

current value. It also stores the date and time of each peak demand. Peak demand is the maximum electrical power load consumed or produced in a defined period of time.

Under ENERGY ACCUMULATORS, the system calculates and stores accumulated values for energy (in kWhr unit), reactive energy (in kVarH unit), and apparent energy (in kVAH unit). Kilowatt-Hour (kWhr) is the equivalent energy supplied by a power of 1000 watts for one hour. Watt is the unit for real power. Kilovar-hour (kVarH) is equal to 1000 reactive volt-ampere hours. Var is an abbreviation for volt ampere reactive. It measures the integral of the reactive power of the circuit into which the instrument is connected. Var is the unit for reactive power. Kilovolt-ampere (kVA) is equivalent to 1000 volt-amperes. VA is the unit for apparent power. Apparent power is the product of voltage and current of a single-phase circuit in

which the two reach their peaks at different times. See Appendix F *Glossary* for the definitions of the various power parameter values.

The accumulated energy values include real power factor (average three-phase) which is mathematically defined as "demand kW/demand kVA". It also displays integrated and total integrated reactive power. The system also calculates and stores apparent energy (VA). Real Power (W) and Apparent Power (VA) are reset together; you cannot reset one without resetting the other. Likewise, the Watthour

Meter and Varhour Meter are reset together.

The system uses the fundamental frequency as reference for calculating energy values in one of two modes: forward or reverse. In forward mode, the circuit monitor considers the direction of power flow, allowing the accumulated energy magnitude to both increase and decrease. In reverse mode, the circuit monitor accumulates energy as positive, regardless of the direction of power flow. In other words, the energy value increases, even during reverse power flow. The default accumulation mode is reverse.

Summary of EPQ DataNode Setup Parameters and Tabs Where they can be Found

PARAMETERS	TAB WHERE FOUND
Active Power	METER
Active Power Demand	DEMAND
ANSI Transformer Derating Factor	HARMONICS
Apparent Power	METER
Apparent Power Demand	DEMAND
Arith. Sum PF	ADVANCED METER
Arithmetic Sum DF	ADVANCED METER
Arithmetic Sum VA	ADVANCED METER
Avg PF @ Peak P Dmd	DEMAND
Avg PF @ Peak Q Dmd	DEMAND
Current Crest Factor	HARMONICS
Current THD	HARMONICS
Current THD (Rms)	HARMONICS
Current TID	HARMONICS
Current TID (Rms)	HARMONICS
Displacement Power Factor	ADVANCED METER
Frequency	METER
Fund Arithmetic Sum VA	ADVANCED METER
Fund Freq VA Hrs	ADVANCED ENERGY
Fund Vector Sum VA	ADVANCED METER
Fwd Fund Freq varHrs	ADVANCED ENERGY
Fwd Fund. Freq WHrs	ADVANCED ENERGY
Harmonic Power	HARMONICS
HRms Voltage	HARMONICS
I Imbalance (rms/rms avg)	UNBALANCE
I Imbalance (S0/S1)	UNBALANCE
I Imbalance (S2/S1)	UNBALANCE
IEEE 519 Current TDD	HARMONICS
Interharmonic Rms Current	HARMONICS
Interharmonic Rms Voltage	HARMONICS
IT Product	HARMONICS
Negative Sequence Current	UNBALANCE
Negative Sequence Voltage	UNBALANCE
Net Current	ADVANCED METER
P Dmd @ Peak Q Dmd	DEMAND
P Dmd @ Peak S Dmd	DEMAND
Peak Active Power Demand	DEMAND
Peak Apparent Power Demand	DEMAND
Peak Demand Current	DEMAND
Peak Reactive Power Demand	DEMAND
PF @ Peak VA Dmd	DEMAND
PF Demand	DEMAND
Positive Sequence Current	UNBALANCE
Positive Sequence Voltage	UNBALANCE
Predicted P Dmd	DEMAND
Predicted Q Dmd	DEMAND
Predicted VA Dmd	DEMAND

Summary of EPQ DataNode Setup Parameters and Tabs where they can be Found

PARAMETERS	TAB WHERE FOUND
Pst	FLICKER
Plt	FLICKER
Plt Sliding	FLICKER
Q Dmd @ Peak P Dmd	DEMAND
Q Dmd @ Peak VA Dmd	DEMAND
Reactive Power Demand	METER
Reactive Power Demand	DEMAND
Residual Current	ADVANCED METER
Rms Current	RMS Variation, TRANSIENTS, METER
Rms Current Demand	DEMAND
Rms Current Individual Harmonics	ADVANCED HARMONICS
Rms Harmonic Current	HARMONICS
Rms Voltage	RMS Variation, TRANSIENTS, METER
Rms Voltage Individual Harmonics	ADVANCED HARMONICS
Rvs Fund Freq varHrs	ADVANCED ENERGY
Rvs. Fund. Freq. WHrs	ADVANCED ENERGY
Total Fund Freq Q	ADVANCED ENERGY
Transformer K Factor	HARMONICS
True Power Factor	METER, ADVANCED METER
V Imbalance (rms/rms avg)	UNBALANCE
V Imbalance (S0/S1)	UNBALANCE
V Imbalance (S2/S1)	UNBALANCE
V RMS Harmonic	HARMONICS
V/I Angle	METER
VA Dmd @ Peak Q Dmd	DEMAND
VA Dmd @ Peak P Dmd	DEMAND
Var Hours	REVENUE
Vector Sum DF	ADVANCED METER
Vector Sum PF	ADVANCED METER
Vector Sum VA	ADVANCED METER
Voltage Crest Factor	HARMONICS
Voltage THD	HARMONICS
Voltage THD (Rms)	HARMONICS
Voltage TID	HARMONICS
Voltage TID (Rms)	HARMONICS
Voltage TIF	HARMONICS
Voltage TIF (Rms)	HARMONICS
Watt Hours	REVENUE
Zero Sequence Current	UNBALANCE
Zero Sequence Voltage	UNBALANCE

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5540 Energy Management (EM) DataNode Setup

Refer to the 5540 DataNode User's Guide for more detailed information about connections and setups.



A 5540 Series DataNode

Recommended Setup before connecting to an Encore Series Software

The 5540 DataNode must be programmed from its front panel to properly communicate with the Encore Series Software. To enter the program mode, see the DataNode 5540 User's Guide. The communications should be set as follows:

- 8 BIT EVEN
- 9600 baud
- XON/XOFF
- BINARY RS232
- ADDRESS x (where x matches the value setup in the Encore Series for that 5540)

If using RS232 or RS485, the cables between the Encore Series and 5540 must go through a null modem; that is, transmit and receive must be interchanged, as well as interchanging the positive (+) and negative (-) lines for both transmit and receive.

Specifications for 5540 EM DataNode

Measurements

23 parameters including true RMS voltage and current, kVA, kW, PF, frequency, kVAR, kWh, kVAh, kVARh, current demand, kVA demand, kW demand

Voltages

3-phase L-L or L-N (660 Vrms L-L, 500 Vrms L-N FS), 45-65 Hz fundamental, accuracy $\pm 0.3\%$ RDG (FS for 10%-120% FS)

Currents

3-phase (5 Arms or 1Arms FS), accuracy $\pm 0.3\%$ RDG (FS for 2%-120% FS)

Instrument Power

96-138 Vac / 185-250 Vac; 50-60 Hz, 10 Va

Enclosure Environments

ABS panel mount, cutout 92x92mm (3.375" square); screw terminal connections for voltage and current; operating -20°C to +60°C, 0-95% RH non-condensing

Front Panel

GE Lexan film; daylight-visible display, sealed tactile feedback controls

Communications

Mechanism for information exchange between Encore Series Software and 5540 DataNode: either MODBUS or ASCII.

Additional Features

External synchronization via dry contacts; supports voltage and current multipliers, user-selected wiring configuration, communications address, kW demand period, and Ampere demand period

9 5540 DataNode Setup

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.

The screenshot shows the '5540 Template' setup window. The left sidebar lists various setup categories, with 'DataNodes' expanded to show '5540 Template'. The main window has tabs for 'Template', 'Basic', and 'Advanced'. The 'Template' tab is active, showing fields for 'Name' (5540 Template) and 'Description'. Below these is a table with a checkbox for 'Edison 5540'. A callout points to this checkbox with the text 'check box to associate template with DataNode'.

Identification Information	
Name	5540 Template
Description	
Mark each of the DataNodes that are to be updated when a change is made to this template. Note: marking a DataNode causes all of its DataNode specific settings to be updated; however, when a template's settings are changed only the changed settings are updated on the associated DataNodes.	
Edison 5540	<input checked="" type="checkbox"/>

DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates.

The screenshot shows the DRANETZ BMI ENCORE SERIES software interface. The left sidebar contains a tree view with the following structure:

- Regional Settings
 - AnswerModule
 - Basic Characterizer
 - EN50160
 - Energy Usage
 - kvar change observer
 - Radial Fault Location
 - RBM
 - UPS Verification
- DataNodes
 - 5530/5520 DataNode
 - 5540 DataNode
 - Templates
 - 5540 Template
 - Edison 5540
 - 5560 DataNode
 - 5571 DataNode
 - 61000 Power Quality DataNode
 - ADAM DataNode
 - GEKV DataNode
 - Modbus
 - PQDIF Import
 - Help Desk
 - Setup Topics
 - Index

The main content area is titled "Properties" and "Values". It contains the following tabs: Identification and Status, Communication, Polling, Basic, and Advanced. The "Identification and Status" tab is active, showing the following fields:

Properties	Values
Identification Information	
Name	Edison 5540
Description	
Serial Number	Unknown
Version	980
Status Information	
Health	System health is normal
Communication status	Idle
Last poll at	03/28/2006 20:46:38
Next poll at	03/28/2006 20:51:34
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5540 Template

At the bottom of the window, there is a "Save Setup" button and a copyright notice: "Copyright © 1999-2006 Dranetz-BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement."

9 5540 DataNode Setup

Programming Standard Tabs

LEGEND (Please note the following conventions used in the screen displays):

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings unless there are applications which require advanced setups.

1. Identification and Status tab

Properties	Values
Identification Information	
Name	Edison 5540
Description	
Serial Number	Unknown
Version	980
Status Information	
Health	System health is normal
Communication status	Idle
Last poll at	03/28/2006 20:46:38
Next poll at	03/28/2006 20:51:34
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5540 Template {None, 5540 Template}

The Identification and Status tab contains identification and health status description of the DataNode.

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not. It also includes status of Encore Series Software to DataNode **Communications**.

Polling Status is also displayed, indicating when the Encore Series Software last requested data from the DataNode and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

2. Communication tab

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input checked="" type="checkbox"/>
Direct serial connections are supported. Address strings are of the form /ID where ID is the unit id number (0-255).	
Connection	COM2
Address	/1
Protocol	Modbus

COMMUNICATION parameters for 5540 DataNode include the following:

Active which indicates whether communications between the Encore Series Software and DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series.

Connection can be through Serial Port COM 1 thru COM 255 (Hardware or Virtual ports) or Modem as installed and recognized by the Windows operating system.

Address must be a unique address between 1 and 99 for each DataNode. However, if only one DataNode is connected to the COM port and the present address is unknown, zero (0) can be used. If the connection is via Modem as opposed to Serial Port, then the telephone number would be entered before the “/” separating the device address.

Protocol mechanism for information exchange between Encore Series Software and 5540 DataNode: either MOD-BUS or ASCII.

9 5540 DataNode Setup

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	01/01/2006 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include a **Download and store data** checkbox to enable the Encore Series Software to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include checkboxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series Software, and **Delete data in DataNode** - use to remove stored data in the DataNode.

4. Basic tab

Properties	Values
Communications	
Time between periodic samples (sec)	300
Display	
Display Thresholds as:	Percent {Volts, Per Unit, Percent}
Base Voltage	208.0
Inputs	
Wiring Configuration	4-wire, L-N {3-wire, open delta} {3-wire, direct} {4-wire, L-L}
PT Ratio	1.0000
CT Primary	20
Registers	
Phase A Rms Voltage (L-L or L-G)	<input type="checkbox"/>
Phase B Rms Voltage (L-L or L-G)	<input checked="" type="checkbox"/>
Phase C Rms Voltage (L-L or L-G)	<input checked="" type="checkbox"/>
Phase A Rms Current (Amps)	<input checked="" type="checkbox"/>
Phase B Rms Current (Amps)	<input checked="" type="checkbox"/>
Phase C Rms Current (Amps)	<input checked="" type="checkbox"/>
Phase A Active Power (kW)	<input type="checkbox"/>
Phase B Active Power (kW)	<input type="checkbox"/>
Phase C Active Power (kW)	<input type="checkbox"/>
Total Active Power (kW)	<input type="checkbox"/>
Phase A Reactive Power (kvar)	<input type="checkbox"/>
Phase B Reactive Power (kvar)	<input type="checkbox"/>
Phase C Reactive Power (kvar)	<input type="checkbox"/>
Total Reactive Power (kvar)	<input type="checkbox"/>
Phase A Apparent Power (kVA)	<input type="checkbox"/>
Phase B Apparent Power (kVA)	<input type="checkbox"/>
Phase C Apparent Power (kVA)	<input type="checkbox"/>
Total Apparent Power (kVA)	<input type="checkbox"/>
Phase A Power Factor (PU)	<input type="checkbox"/>
Phase B Power Factor (PU)	<input type="checkbox"/>
Phase B Power Factor (PU)	<input type="checkbox"/>
Total Power Factor (PU)	<input type="checkbox"/>
Frequency (Hz)	<input type="checkbox"/>
Total Positive Energy Flow (kWh)	<input type="checkbox"/>
Total Negative Energy Flow (kWh)	<input type="checkbox"/>
Total Positive Integrated Reactive Power Flow (kvarhours)	<input type="checkbox"/>
Total Negative Integrated Reactive Power Flow (kvarhours)	<input type="checkbox"/>
Total Integrated Apparent Power Flow (kVAhours)	<input type="checkbox"/>
kVA Demand	<input type="checkbox"/>
kW Demand	<input type="checkbox"/>

9 5540 DataNode Setup

Basic tab setup contains data on Communications, Display, Inputs, and Registers.

COMMUNICATIONS parameters include the following:

- **Polling Interval (sec):** typically 300 seconds

DISPLAY parameters include the following:

- **Display Thresholds as:** displays parameters in either Volts, Percent, or PU (per unit)
- **Base Voltage:** needed if using percent or per unit
- **Base Power:** needed if using percent or per unit

INPUTS parameters include the following:

- **Wiring Configuration:** set to either 3 wire open delta, 4 wire Line-to-Neutral, 3 wire direct, or 4 wire L-L
- **PT Ratio:** if the voltage inputs are connected to an external PT
- **CT Primary:** the maximum nominal current on the primary side of the CT; the secondary ratio is determined by the version of the instrument in use

REGISTERS parameters include the following:

- **Registers:** checkboxes to select those to save for trending

- **RMS Voltage and Current**
- **Active Power** in kilowatts, **Reactive Power** in kVARs, **Apparent Power** in kVA, **Power Factor**
- **Frequency** in Hz
- **Total Energy Flow:** three phase sum of the real or active energy flowing from the source to the load (positive) and from the load to the source (negative) in kWhr
- **Total Reactive Integrated Power Flow:** three phase sum of the reactive energy flowing from the source to the load (positive) and from the load to the source (negative) in kVARhr
- **Total Apparent Integrated Power Flow:** three phase sum of the apparent energy flowing in kVAhr
- **KW Demand:** average real or active power over the demand interval
- **KVA Demand:** average apparent power over the demand interval

5. Advanced tab

Properties	Values
Reset Accumulators on Next Connect	<input type="checkbox"/>
Demand Period (min)	15
Average Buffer Size	8 entries
Front Panel Reset Enabled	<input checked="" type="checkbox"/>
Phase A Rms Voltage (L-L or L-G)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	120.000
High Threshold	110.000
Low Threshold	90.000
Low-Low Threshold	80.000
Phase B Rms Voltage (L-L or L-G)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	120.000
High Threshold	110.000
Low Threshold	90.000
Low-Low Threshold	80.000
Phase C Rms Voltage (L-L or L-G)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	120.000
High Threshold	110.000
Low Threshold	90.000
Low-Low Threshold	80.000
Phase A Rms Current (Amps)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	24.000
High Threshold	20.000
Low Threshold	5.000
Low-Low Threshold	0.000
Phase B Rms Current (Amps)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	24.000
High Threshold	20.000
Low Threshold	5.000
Low-Low Threshold	0.000
Phase C Rms Current (Amps)	
Enabled	<input checked="" type="checkbox"/>
High-High Threshold	24.000
High Threshold	20.000
Low Threshold	5.000
Low-Low Threshold	0.000

Advanced tab screen display continued next page

9 5540 DataNode Setup

... continued

Phase A Active Power (kW)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Phase B Active Power (kW)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Phase C Active Power (kW)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Total Active Power (kW)	
Enabled	<input type="checkbox"/>
High-High Threshold	17250.000
High Threshold	13260.000
Low Threshold	2955.000
Low-Low Threshold	0.000
Phase A Reactive Power (kvar)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Low Threshold	0.000
Low-Low Threshold	0.000
Phase B Reactive Power (kvar)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Low Threshold	0.000
Low-Low Threshold	0.000
Phase C Reactive Power (kvar)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Low Threshold	0.000
Low-Low Threshold	0.000

Advanced tab screen display continued next page

... continued

Total Reactive Power (kvar)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Low Threshold	0.000
Low-Low Threshold	0.000
Phase A Apparent Power (kVA)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Phase B Apparent Power (kVA)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Phase C Apparent Power (kVA)	
Enabled	<input type="checkbox"/>
High-High Threshold	5750.000
High Threshold	4420.000
Low Threshold	985.000
Low-Low Threshold	0.000
Total Apparent Power (kVA)	
Enabled	<input type="checkbox"/>
High-High Threshold	17250.000
High Threshold	13260.000
Low Threshold	2955.000
Low-Low Threshold	0.000
Phase A Power Factor (PU)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000
Phase B Power Factor (PU)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000
Phase C Power Factor (PU)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000

Advanced tab screen display continued next page

9 5540 DataNode Setup

... continued

Total Power Factor (PU)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000
Frequency (Hz)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Low Threshold	0.000
Low-Low Threshold	0.000
Total Positive Energy Flow (kWh)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Total Negative Energy Flow (kWh)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000
Total Positive Integrated Reactive Power Flow (kvarhours)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
Total Negative Integrated Reactive Power Flow (kvarhours)	
Enabled	<input type="checkbox"/>
Low Threshold	0.000
Low-Low Threshold	0.000
Total Integrated Apparent Power Flow (kVAhours)	
Enabled	<input type="checkbox"/>
High-High Threshold	0.000
High Threshold	0.000
kVA Demand	
Enabled	<input type="checkbox"/>
High-High Threshold	17250.000
High Threshold	13260.000
kW Demand	
Enabled	<input type="checkbox"/>
High-High Threshold	17250.000
High Threshold	13260.000

Advanced Setup provides you with the ability to set limits for triggering of various parameters, as well as to setup other functions, such as demand interval.

- Demand Period:** in minutes, typically 15
- Average Buffer Size:** typically 8

•**Front Panel Reset Enabled:** check box to set

•**Limits for each parameter, typically HI-HI, HI, LO, LO-LO:** Some parameters will only have the first two or the last two, where the numbers could only be positive or negative, respectively

Introduction

The 5560 DataNode is designed to monitor and report quality of supply compliance as specified by European Standard EN50160. The 5560 DataNode provides the full set of data required to verify compliance with EN50160, while maintaining the power quality diagnostic capabilities expected from Dranetz.

Scope of EN50160 Standard*

It is important to note that EN50160 is defined for the electricity supplied at the supply terminals, and does not deal with the supply system or the consumer's installation or equipment itself.

As the standard deals with the voltage characteristics in public distribution networks, other aspects essential for the supply quality (for instance short circuit power) are not treated in this standard. The standard is applicable only under normal operating conditions of the supply system. This includes also the correct operation of protection devices in the case of a fault in the network (blowing of a fuse, operation of a circuit-breaker, etc.), the operation of loads agreed between customer and supplier, and changes in the network.

The standard lists several specific examples of exceptional conditions, out of supplier's control, that can cause one or more of the characteristics to go beyond the values given. These conditions include exceptional weather conditions and other natural disasters, third party interference, acts by public authorities, industrial action, force majeure, and power shortages resulting from external events. Under such conditions the EN50160 does not apply.

EN50160 is not an EMC standard. It does not give compatibility levels or emission limits. Moreover the standard does not have the function of specifying the requirements for electrical equipment. Its sole function is to give values for the main voltage characteristics of electricity supplied by Low Voltage (LV) and Medium Voltage (MV) public networks. That means EN50160 is a product standard giving the voltage characteristics which can be expected at the supply terminals. This standard does not describe the average situation in the public supply networks but the maximum values or variations of the voltage characteristics under normal operating conditions which can be expected by the customer at any place of the network.

*Based on Draft Guide to the Application EN50160, CENELEC Report, CLC/BTTF 68-6(SG)1 Rev., January 1999.

5560 DataNode QOS Functional Components

The QOS compliance monitoring functionality of the 5560 DataNode is optimized to ensure error-free setup and reporting for EN50160 applications. Selections are provided to allow a user to configure the system to collect either a super-set or sub-set of the measurements required for EN50160 monitoring. Statistical data is calculated on the required 12 parameters specified in EN50160 over the (1 week) interval to produce a PASS/FAIL decision of compliance. Statistical and trending visualizations show what the values of each of the parameters were over the interval, and at what time did they approach or exceed limits.

As with other Dranetz DataNodes, the 5560 DataNode is set up and viewed through a web browser, with no software to learn and install.

The QOS functional components built into the 5560 DataNode are incorporated into the various tab pages of the Encore Series Software system. The user interface employed by the 5560 DataNode is identical to that of other DataNodes, except that additional monitoring and setup protocols were installed to meet the data acquisition requirements of the QOS compliance standards.

This Chapter describes the following QOS functional components built into the 5560 DataNode.

- Specifications for 5560 DataNode
- Home Page Reporting of QOS Compliance
- QOS Status Views
 - > QOS Status Query
 - > QOS Status Summary
 - > Compliance Statistical Graph
 - > Smart Views
- QOS Compliance Reports
 - > Smart Reports
 - > Standard Reports
- Real-time Display of QOS Data
- 5560 DataNode System Setup
 - >EN50160 General Setup tab
 - >5560 DataNode Setup

References to the sections above are advertently made in the other Chapters of this manual where they relate.

10 5560 QOS DataNode Setup

5560 DataNode Specifications

Configurations: External CT and voltage pods; 1A/5A current with 5x overcurrent.

Voltages: 4 channels, accuracy +/- 0.1% of reading, +/- 0.1% FS.

Currents: 4 channels, accuracy +/- 0.1% of reading, +/- 0.1% FS.

Instrument Power: 90-250Vac, 50/60Hz; optional 105-150Vdc; built-in UPS with 4-year battery life.

Enclosure/Environments: Rack, panel, desktop, NEMA 4x options; 0-60 deg C standard.

Communications: 10BaseT Ethernet to Encore Series. Software access through Internet, Intranet, dial-up or wireless telephone line.

Additional Features: Remote firmware update; automatic report writer software option.

Certifications and design standards: CE, ISO9001, EMC Directive (89/366/EEC), IEC 61000-4-7, IEC 61000-4-15, EN61010-1 (1993), EN61010-1/A2.

NOTE: The 5560 DataNode is actually a 5520/5530 EPQ DataNode with different firmware. EPQ DataNodes can be upgraded to 5560. Please contact Dranetz factory for details.

Measurements:

Power Frequency - Mean value based on time between zero crossings of voltage of Phase A calculated over 10 second window.

Magnitude of the supply voltage - Rms calculated over 1 cycle with 1/2 cycle steps.

Supply voltage variations - Ten minute mean of rms calculated over 1 cycle with 1/2 cycle steps.

Rapid voltage changes (Flicker) - As per EN61000-4-15.

Supply voltage dips - 1% to 90% of Un. Depth of Rms calculated over 1 cycle with 1/2 cycle steps, along with 10msec to 60 seconds in duration, reported in tabular form.

Short interruptions of the supply voltage - <1% of Un on 1/2 cycle RMS with duration less or equal to 3 min. Rms calculated over 1 cycle with 1/2 cycle steps.

Temporary power - Frequency overvoltage between live conductors and earth - 110% of Un or Uc. Rms calculated over 1 cycle with 1/2 cycle steps

Transient overvoltages between live conductors and earth - Captured at 128 samples/cycle along with crest and waveshape triggers.

Supply voltage unbalance - Negative phase sequence divided by positive phase sequence components.

Harmonic voltage - As per EN61000-4-7.

Interharmonic voltage - As per EN61000-4-7.

Mains signalling voltage on the supply voltage - User selectable 5 frequencies below 3KHz.

Parameters measured include kVA, KW, True PF, DPF, KVAR, kWhr, kVAR and other power related parameters.

Home Page Reporting of QOS Compliance

The Quality of Supply compliance status for the latest complete evaluation period of each DataNode is reported via the Encore Series Software Home page. Information about QOS compliance appears in two parts of the Home page: the DataNode status paragraph and the DataNode status table.

NOTE: Other types of DataNode (EPQ, 5540, 61000 Digital, 61000 PQ, etc.) may exist in the system. Voltage compliance status applies to DataNodes with QOS data-acquisition modules in it i.e. 5560, 61000 PQ, and 61000 Voltage DataNodes.

Compliance Message on DataNode Status Paragraph

A report on QOS compliance appears in the DataNode status paragraph. If the 5560 DataNode is compliant, the following message is shown “There is one DataNode for monitoring Quality of Supply compliance. This DataNode is reporting compliance.” If the 5560 DataNode is non-compliant or have undetermined compliance, further messages appear under the DataNode status table described next. The non-compliance message is hyperlinked to the Quality of Supply Compliance section in the DataNode status table.

Compliance Message on DataNode Status Table

An additional section featuring the non-compliance status of 5560 DataNodes appear in the DataNode status table. The table indicates which DataNodes are not in compliance and/or have undetermined compliance status for the specified interval. DataNodes that are non-compliant are hyperlinked to the QOS Status view.

The screenshot displays the '5560 DataNode Home Page' with a navigation menu on the left and a main content area. The main content area includes a paragraph about QOS compliance, a 'DataNode information' table, and a 'Quality of Supply Compliance' section. Two callouts point to specific parts of the page: 'Compliance message on DataNode status paragraph' points to the paragraph stating 'There is one DataNode for monitoring Quality of Supply compliance. This DataNode is reporting non-compliance.', and 'Compliance message on DataNode status table' points to the 'Quality of Supply Compliance' section.

DataNode information

DataNode health status	There are 5 DataNodes . This DataNode is reporting failures: <ul style="list-style-type: none"> Edison SE 5560
Database usage	100% used (100 MB out of 112 MB)
Total disturbances	197
First disturbance	03/12/2006 07:05:07
Last disturbance	03/29/2006 14:16:24 by DataNode 61SF-SE
Since your last logon	None
In the last 48 hours	19 disturbances
Quality of Supply Compliance	For the current compliance interval the following DataNodes have an undetermined compliance status: <ul style="list-style-type: none"> Edison SE 5560

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5560 DataNode Home Page

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QOS Status View

QOS Status Query

The QOS Status functionality is found in Views page. QOS Status will appear in Encore Series Software systems that have QOS data-acquisition modules i.e. 5560 DataNode in it. Click on the QOS Status to display the standard query selection shown below. Users have the option to view QOS status data for single or multiple DataNode(s). Users can also select the time range or specify a time period to view data from. Only data for 5560 DataNodes will be displayed in the set once the Display or Display in New Window button is clicked.

Once selections have been made, click on either Display or Display in New Window. The QOS Status Summary table shown next page is displayed.

QOS Status Query Screen

QOS Status Summary

The QOS Status Summary table lists the monitoring periods (weeks) that fall within the selected date range for the selected DataNode(s), as well as how many rms and transient events occurred during the monitoring periods. The standard monitoring period is one complete week, beginning Sunday 00:00. Any Time/Date Query that specifies a range that would include part of a monitoring period (less than one week) will have that particular Evaluation Status marked as Incomplete and the Compliance marked as Undetermined. For completed monitoring periods, Compliance status may either be PASS or FAIL. A PASS or FAIL status is hyperlinked to the Compliance Statistical Bar Chart. See text below for the description of the items contained in the QOS Status Summary table.

Evaluation Status	Evaluation Period	Monitor	Compliance	Rms Variation Event Count	Transient Event Count
Incomplete	03/26/2006 00:00:00	Edison SE 5560	Pass	0	1
Complete	03/19/2006 00:00:00	Edison SE 5560	Pass	1	1
Incomplete	03/12/2006 23:00:00	Edison SE 5560	Pass	0	3
Incomplete	03/12/2006 00:00:00	Edison SE 5560	Pass	0	0

PASS/FAIL status is hyperlinked to the Compliance Statistical Graph (see page 10-6)

QOS Status Summary Table

Evaluation Status: The evaluation status is either Complete (full week) or Incomplete (less than a week). An evaluation status is Incomplete under the following scenarios.

- It is the current evaluation period and it has simply not completed.
- It is a previous evaluation period but not enough data samples were included in the statistical analysis. This may be due to the following reasons: data was not collected or too many samples were tagged as unusable due to RMS variations or some other EN50160 criteria.

NOTE: The criteria defining completeness of an evaluation period is described on page 10-21 QOS General Setup tab.

Evaluation Period: This column displays the date and time of the beginning of the evaluation period. Each evaluation period is independent of each other.

Monitor: This column displays the name of the DataNode to which the evaluation period belongs.

Compliance: The Quality of Supply Answer Module determines voltage compliance. For completed periods, Compliance displays PASS (Green) or FAIL (Red). For incomplete periods, Compliance displays Undetermined (Black). A PASS or FAIL voltage compliance status is hyperlinked to the Compliance Statistical Bar Chart featuring the 7 parameters required for determining compliance. See sample bar chart on page 10-6.

Rms Variation Event Count: The rms variation event count is a hyperlink to EN50160 DISDIP table for rms variation events. See page 10-15 for the EN50160 DISDIP Table and 3D Bar Chart for Rms Variations

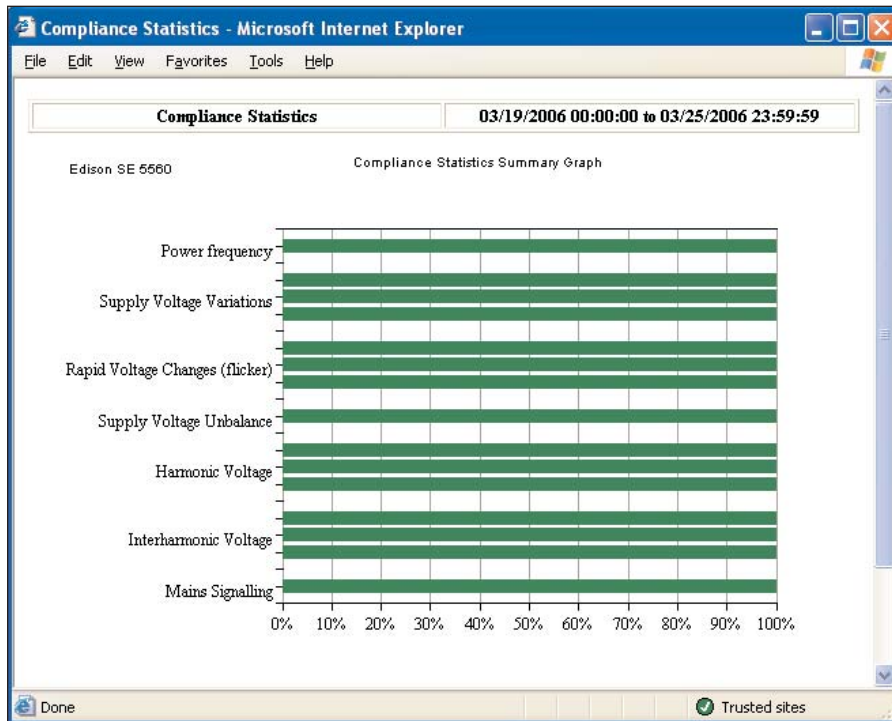
Transient Event Count: The Transient event count is a hyperlink to EN50160 Transient DISDIP table for Transient Events and Transient Overvoltages. See page 10-15.

10 5560 QOS DataNode Setup

Compliance Statistical Graph

The Compliance Statistical Bar Chart shown below displays the seven parameters that are required for determining compliance. The bar chart indicates the percentage of the intervals passing the specified compliance criteria. The color of the bar indicates the compliance status. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160 Standard.

The graph autoscales to enable maximum viewing. The minimum value on the left of the horizontal axis will be the 10% multiple that is less than the lowest compliance level for the seven parameters displayed. If the value is less than 1%, the bar will graph 1% so that is visible. See text below for the description of each parameter. For QOS compliance limits of each parameter, refer to the Compliance Limits in QOS Setups and Reports table on page 10-8.



Compliance Statistical Bar Chart

Power Frequency: In case of fault operation, parts of an interconnected system may become isolated. Compliance will be assessed over an observation period of one week, by a statistical analysis carried out over the sequence of 10 seconds measurements. Frequency is represented by a single value and a single bar. The bar is a hyperlink to the Power Frequency Graph. See page 10-17.

Supply Voltage Variations: Under normal operating conditions, load changes cause variations of the 10 minute average supply voltage. Generally this is compensated by automatic voltage regulation within a period of a few tens of seconds. Supply Voltage Variations display a cluster of bars, one for each phase. The color of each bar indicates the compliance status for its phase. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160.

Rapid Voltage Changes (Flicker): Typical rapid voltage changes do not exceed a magnitude of + 5% or - 5% of the nominal or declared voltage. This limitation is possible because connection of loads capable of creating rapid voltage changes is usually subjected to regulations. But under certain conditions, higher values up to 10% may occasionally occur. These higher values can occur for instance in areas where higher power motor equipment (blowers, pumps, compressors, etc.) is used. Flickers display a cluster of bars, one for each phase. The color of each bar indicates the compliance status for its phase. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160.

Supply Voltage Unbalance: The unbalance of a three phase supply voltage consists of a loss of symmetry of the phase voltage vectors (magnitude and/or angle), created mainly by unbalanced load. Compliance is verified when 95% of the sequence of valid 10 minute values are within the specified tolerance of normally 2% (in single phase/two phase supplies 3%). Supply Voltage Unbalance is represented by a single value and a single bar. The color of the bar indicates the compliance status. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160.

Harmonic Voltage: Harmonics display a cluster of bars, one for each phase. The color of each bar indicates the compliance status that is calculated by 'anding' the statuses of Total Harmonic Distortion (THD) and each Harmonic 2 thru 25. The bars for Harmonic Voltage all link to the same graph. See page 10-16.

With regard to the Harmonic bars (see graph on page 10-6), if 3 bars all go to 100% but one phase is red, this indicates that the THD is in compliance but one or more of the individual harmonic components is not in compliance. Clicking on the bars will show harmonic component detail.

Many instruments used for harmonic measurements of power supply systems express their output with reference to the fundamental component of the voltage, especially those indicating the THD Factor.

Harmonic values are specified only up to order 25 (EN50160 limit), for the practical reason that for higher orders the values are generally so small as to be impractical to measure. Another reason is because of the difficulty of giving values which would be relevant to all networks.

Interharmonic Voltage: Interharmonics display a cluster of bars, one for each phase. The color of each bar indicates the compliance status that is calculated by adding the statuses of Total Interharmonic Distortion (TID) and each Interharmonic 2 thru 25. The bars for Interharmonic Voltage all link to the same graph. See page 10-16.

Mains Signaling: With regard to signal transmission over the public supply network it is necessary to distinguish between ripple control systems (frequency range from 100 Hz to 3 kHz) and mains communication systems (frequency range 3 kHz to 148,5 kHz).

Mains Signalling display a cluster of bars, one for each phase. The color of each bar indicates the compliance status that is calculated by adding the statuses of each of the defined frequencies (a maximum of five) for its phase. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160.

Harmonic Compliance Limit Values

Harmonic Number	Limit
DC	
2	2%
3	5%
4	1%
5	6%
6 thru 24	0.5%
7	5%
9	1.5%
11	3.5%
13	3%
15	0.5%
17	2%
19	1.5%
21	0.5%
23	1.5%
25	1.5%

The general approach of EN50160 is to express all voltage characteristics by reference to the nominal voltage or declared voltage, as appropriate. The following are the Harmonic Compliance Limit values in relation to the nominal voltage.

10 5560 QOS DataNode Setup

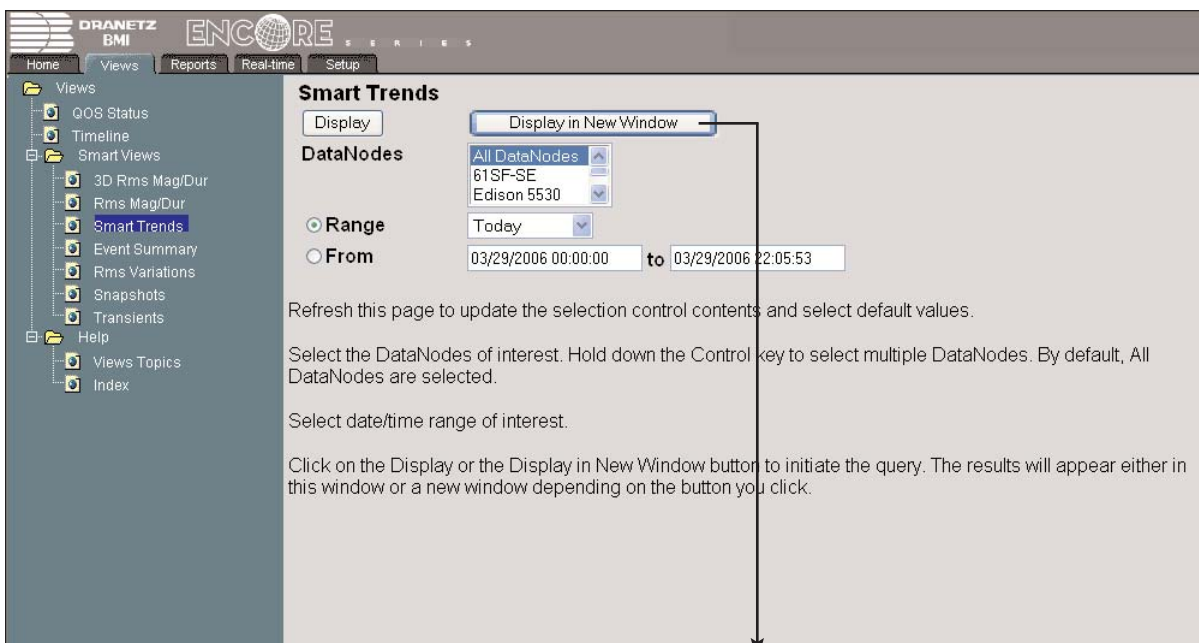
Compliance Limits in QOS Setup and Reports	
<ul style="list-style-type: none"> Low-Voltage Supply nominal voltage Un, upper limit 1Kv Medium-Voltage Supply Characteristics - declared voltage Uc, range 1kV to 35kV 	
Category	Limits for QOS Compliance to Pass
Power frequency with synchronous connection to an interconnected system	Mean value over 10 seconds <ul style="list-style-type: none"> ± 1% during 95% of a week +4% / -6% during 100% of a week
Power frequency with no synchronous connection to an interconnected system	Mean value over 10 seconds <ul style="list-style-type: none"> ±2% during 95 % of a week ±15% during 100% of a week
Magnitude of the supply voltage (In low voltage systems, declared and nominal voltage are equal)	Mean rms over 10 minutes <ul style="list-style-type: none"> ±10% of Un or Uc during 95% of one week ±10%, -15% of Un during 100% of one week
Supply voltage variations (Under normal operating conditions, excluding situations arising from faults or voltage interruptions)	Mean rms over 10 minutes <ul style="list-style-type: none"> ±10% of Un or Uc during 95% of one week ±10%, -15% of Un during 100% of one week
Rapid voltage changes	$Plt \leq 1$ for 95 % of the time Also 5% normal, 10% infrequent for LV, 4 & 6 for MV
Supply voltage dips	No criteria specified, just reported in DISDIP table
Short interruptions of the supply voltage	<1 second for 70 % of the short interruptions
Temporary power-frequency overvoltage between live conductors and earth	1.5KV for LV 170% for solidly or impedance earth, 200% (unearthed or resonate earth)
Transient overvoltages between live conductors and earth	Short duration surges: < 1 μ s Medium duration surges: > 1 to < 100 μ s Long duration surges: > 100 μ s
Supply voltage unbalance (Under normal operating conditions)	10 minute mean rms values of the negative phase sequence component / positive phase sequence component <ul style="list-style-type: none"> ≤2 % during 95 % each period of one week
Harmonic voltage (Under normal operating conditions)	10 minute mean rms values Individual harmonic voltage up to 25 th shall be less than or equal to the value of Un given under Harmonic Compliance Limits (on page 10-7) during 95% of one week <ul style="list-style-type: none"> ≤8% THD (THD up to the 40)
Interharmonic voltage	No criteria specified so use same as Harmonics Individual interharmonic voltage up to 24-25 th shall be less than or equal to the value of Un given under Harmonic Compliance Limits (on page 10-7) during 95% of one week <ul style="list-style-type: none"> ≤8% THD (THD up to the 39/40)
Mains signaling voltage on the supply voltage	3 second mean of signal voltages compared against the Meister curve

Smart Views

Smart Views are similar to Reports of the same name. While Reports are used to summarize data, Smart Views are typically used to zoom in on data, fix data properties, and add/change channels for data trending (see page 10-10).

Smart Trend

Smart Trend displays timeline types of graph of a large range of parameters, based on the type of DataNode and which parameters were saved for trending. After using the standard query to select the DataNodes and time/date range, a display of all possible parameters that can be trended is shown. Clicking a green check mark will trend that parameter for the selected phase and will also show a histogram of the different values with a cumulative probability line. Red X marks indicate that the particular parameter is not available for trending. In the sample screens below, a 5560 DataNode is selected for display under the standard query selection. Clicking on the Display or Display in New Window will show the list of parameters available for trending as the bottom screen shows.



Smart Trends Query Screen

Click the green check mark to trend the parameter for the selected DataNode. See page 10-10. (Screen capture shows only a partial list of parameters)

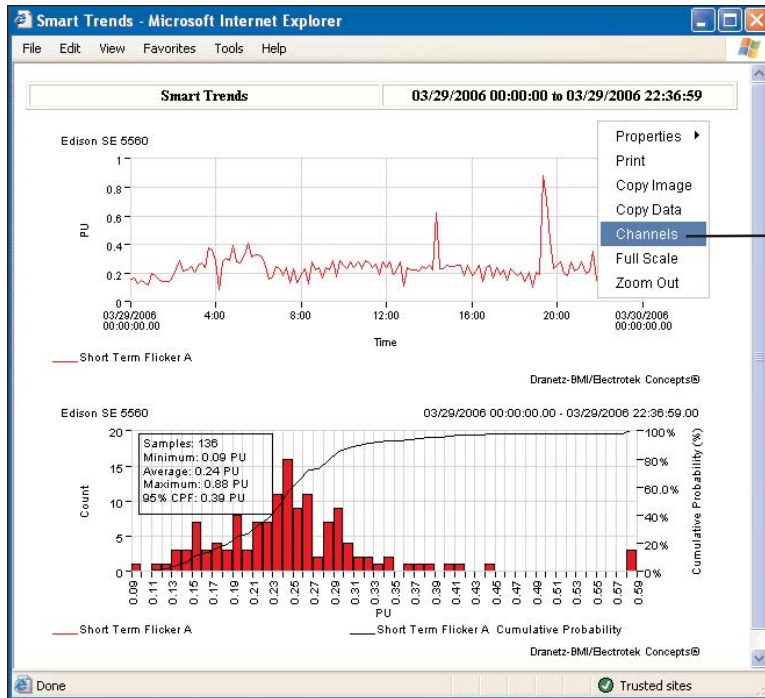
I Unbalance (Rms/Rms Avg)	X	X	X	✓	✓
IT Product	X	X	X	X	✓
ANSI Transformer Derating Factor	X	X	X	X	✓
Transformer K Factor	X	X	X	X	✓
Short Term Flicker	X	X	✓	✓	✓
Long Term Flicker	X	X	✓	✓	✓
VA Dmd at Peak Q Dmd	X	X	X	✓	X
Voltage to Current Angle	X	X	X	✓	✓
VA (Vector)	X	X	X	✓	X
Fundamental VA (Vector)	X	X	X	✓	X
True PF (Vector)	X	X	X	✓	X
VA (Arithmetic)	X	X	X	✓	X
Fundamental VA (Arithmetic)	X	X	X	✓	X
True PF (Arithmetic)	X	X	X	✓	X
Fwd Watthours	✓	X	X	X	X
Rev Watthours	✓	X	X	X	X
Fwd Varhours	✓	X	X	X	X
Rev Varhours	✓	X	X	X	X
Harmonic Voltage (2)	X	X	✓	X	X
Harmonic Voltage (3)	X	X	✓	X	X

Trend Parameters for 5560 DataNode

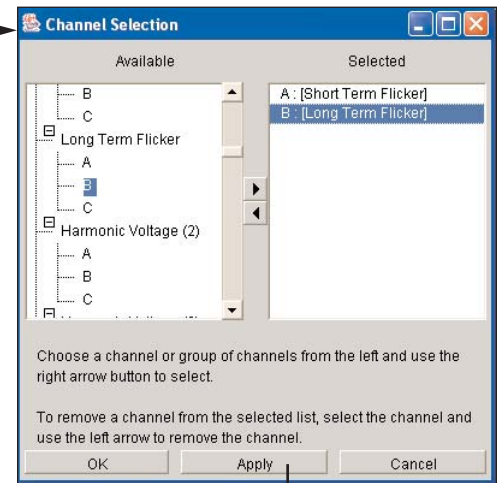
10 5560 QOS DataNode Setup

Timeline Graphs for Smart Trends

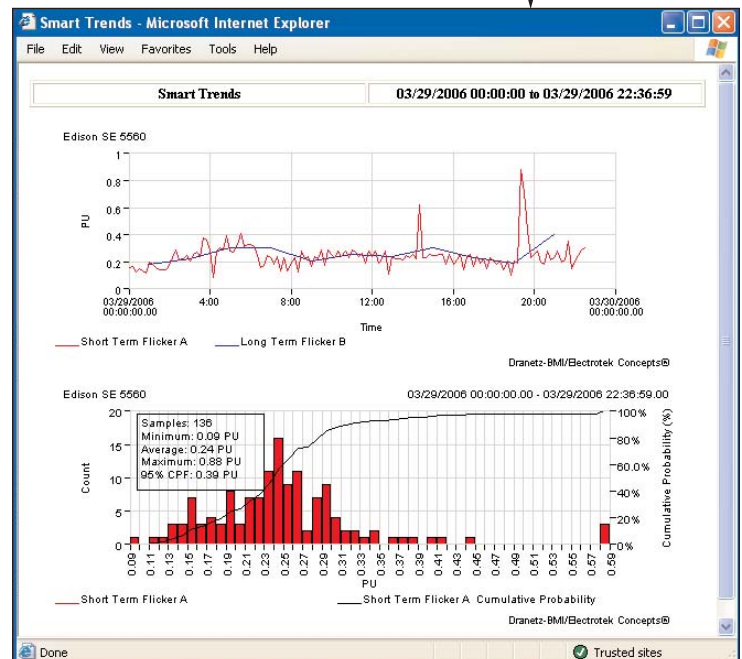
As discussed in the previous page, clicking on a green check mark will trend the parameter for the selected phase and will also show a histogram of the different values with a cumulative probability line. Sample display screens below show timeline graphs for Long Term Flicker (Pst) and Short Term Flicker (Plt) quantities. Plt Slide is also available for trending. See page 10-45 for the list of other Flicker parameters available for trending. Smart trends which are linked from the EN50160 Status View display an item for 95% CPF in the data block.



Right-click to view menu options for other parameters. For example, to view data plots of other channels, select Channels and follow instructions on the Channel Selection dialog box below.



Timeline Graph with data trend for Short Term Flicker



Timeline Graph with additional data trend for Long Term Flicker

QOS Compliance Reports

Smart Reports

QOS Compliance allows the user to look at voltage compliance information for DataNodes with QOS data-acquisition modules in it. Click on QOS Compliance to display the standard query selection shown below. Users have the option to view compliance reports for single or multiple DataNode(s). Users can also select the time range or specify a time period to view data from. Only data for QOS DataNodes will be displayed in the result set once the Display or Display in New Window button is clicked.

Once selections have been made, click on either Display or Display in New Window. The QOS Compliance table shown next page is displayed.

The screenshot shows the 'Compliance Smart Report' interface. On the left is a sidebar with a tree view containing categories like 'Reports', 'Smart Reports', 'Standard Reports', 'AnswerModule', and 'Help'. The 'QOS Compliance' item is selected. The main area has a title 'Compliance Smart Report' and two buttons: 'Display' and 'Display in New Window'. Below these are 'DataNodes' selection boxes with 'Edison 5540', 'Edison 5571', and 'Edison SE 5560' listed. There are radio buttons for 'Range' (selected) and 'From'. The 'Range' section has a 'Today' dropdown and a date range from '03/29/2006 00:00:00' to '03/29/2006 22:50:54'. Below this is a checkbox for 'Specify Report Headings' and three empty text input fields. A paragraph of instructions follows: 'Any range selected that is less than the current QOS interval length will display the current QOS interval. Refresh this page to update the selection control contents and select default values. Select the DataNodes of interest. Hold down the Control key to select multiple DataNodes. By default, All DataNodes are selected. Select date/time range of interest. Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.'

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QOS Compliance Query Screen

10 5560 QOS DataNode Setup

QOS Compliance Summary Table and Table of Contents

The QOS Compliance table shown below displays the 5560 DataNodes and time intervals specified in the QOS Compliance Query screen. A check sign indicates the availability of a report for the DataNode in the specified interval. The check sign is color coded: green means the DataNode is compliant during the specified interval; red means the DataNode is non-compliant during the specified interval; gray means undetermined since evaluation status is still incomplete. The 'X' sign indicates the inavailability of a compliance report (the interval specified in the query screen is not available for the DataNode device). Select and click on a check sign to produce the desired QOS Compliance Summary Report. The report is summarily presented in Table of Contents format, wherein content data appear in hyperlinks. See sample QOS Compliance Table of Contents at the bottom of this page.

Interval Date/Time	Edison SE 5560
03/29/2006 21:40:00.00	✓
03/26/2006 00:00:00.00	✓

Click on a ✓ (Compliant), ✗ (Non-Compliant), or ✓ (Undetermined) to produce the desired QOS Compliance Report. An X indicates that this interval is not available for the device

QOS Compliance Summary Table

- See page 10-13 →
10-14 →
10-15 →
10-16 →
10-16 →
10-17 →
10-18 →

Compliance Summary Report		Edison SE 5560
		03/26/2006 00:00:00 to 03/29/2006 21:40:00
Table of Contents		
1.	Compliance Summary	
2.	Compliance Graph	
3.	Event Statistics	
4.	Harmonics Graph	
5.	Interharmonics Graph	
6.	Power Frequency Graph	
7.	Min/Max Tables	

(TOC) TOC 1 2 3 4 5 6 7 8 >> Next >>

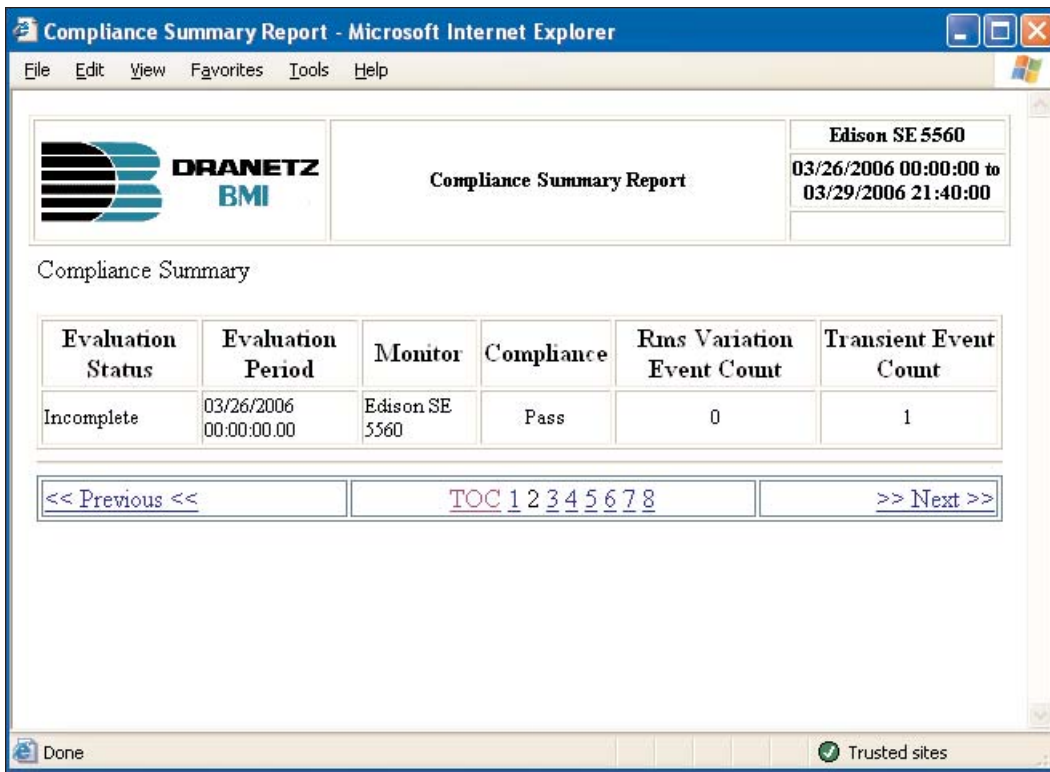
QOS Compliance Table of Contents

QOS Compliance Reports

The compliance reports listed under the Table of Contents are for a single 5560 DataNode and appear as hyperlinks. Click on the hyperlink to view the report in detail. Each compliance report, graph and statistical data is described below. Note that these reports are identical to data that are accessible from the Views tab, except that Reports do not produce data in hyperlinks (e.g. user will not be able to click on a bar as if it is a link).

1. Compliance Summary

The QOS Status Summary table lists the evaluation periods that fall within the selected date range of a single DataNode. For completed periods (weeks), Compliance status may either be PASS or FAIL. For incomplete periods (less than a week), Compliance status is Undetermined. Unlike the QOS Status Summary (see page 10-5) accessible from Views, Compliance information accessed from Reports (i.e. PASS or FAIL status) is not hyperlinked. Refer to page 10-5 for the description of each column heading found in the Compliance Summary table below.



Compliance Summary Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

DRANETZ BMI

Compliance Summary Report

Edison SE 5560
03/26/2006 00:00:00 to 03/29/2006 21:40:00

Compliance Summary

Evaluation Status	Evaluation Period	Monitor	Compliance	Rms Variation Event Count	Transient Event Count
Incomplete	03/26/2006 00:00:00.00	Edison SE 5560	Pass	0	1

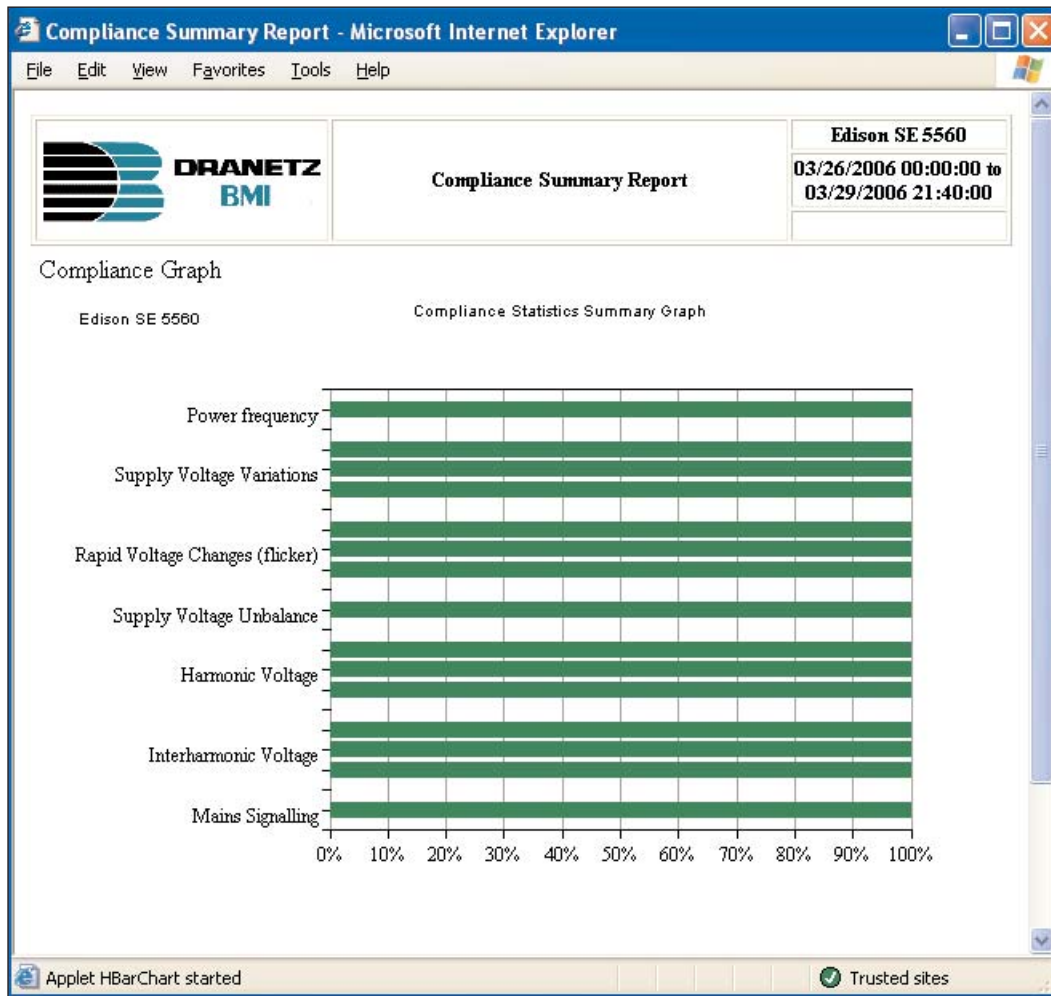
<< Previous << [TOC](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) >> Next >>

Done Trusted sites

10 5560 QOS DataNode Setup

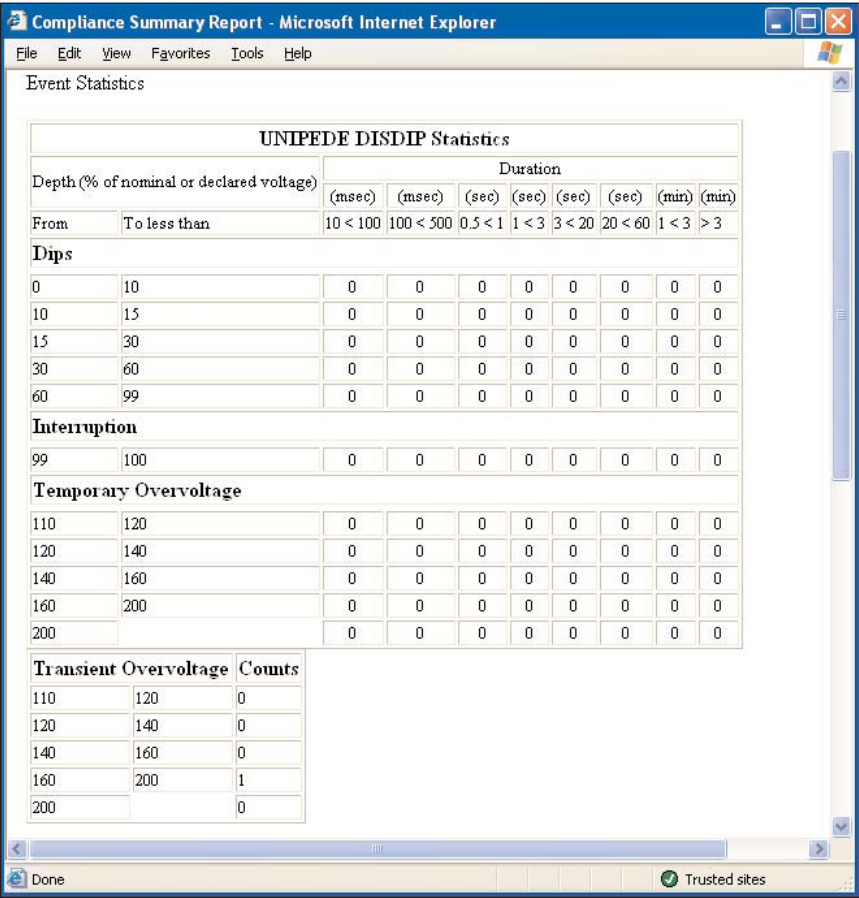
2. Compliance Graph

The Compliance Graph displays the seven parameters that are required for determining compliance. The bars indicate the percentage of the intervals passing the specified compliance criteria. A green bar indicates that the parameter is within compliance. A red bar indicates that the parameter does not comply with EN50160 Standard. Unlike the Compliance Statistical Bar Chart (see page 10-6) accessible from Views, users cannot click on the bar as if it is a link. Refer to page 10-6 for the description of each parameter contained in the graph below.

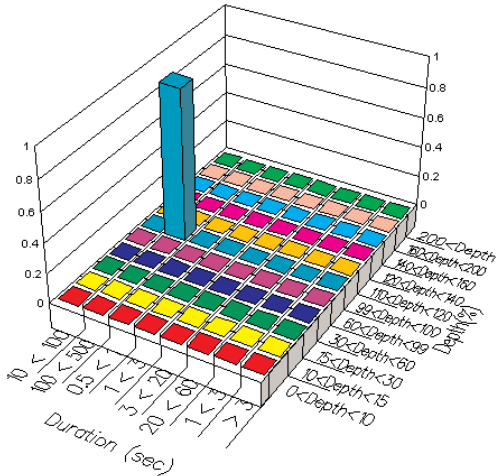


3. Event Statistics

The DISDIP table is based upon the statistics calculated by the 5560 Answer Module. It includes the Table for Transient Overvoltages and the DISDIP 3D Graph. UNIPED DISDIP data is collected and saved on a weekly basis with the counts reset as the final save occurs. If additional data is detected for an evaluation period after that period has been saved, that interval data is retrieved and updated. The DISDIP sag and swells table is shown below. All data required for this table is collected and saved. The observations containing the weekly data are marked for one-year expiration allowing the data to be retained in the InfoNode for at least one year.



DISDIP Table for Transient Events & Transient Overvoltages

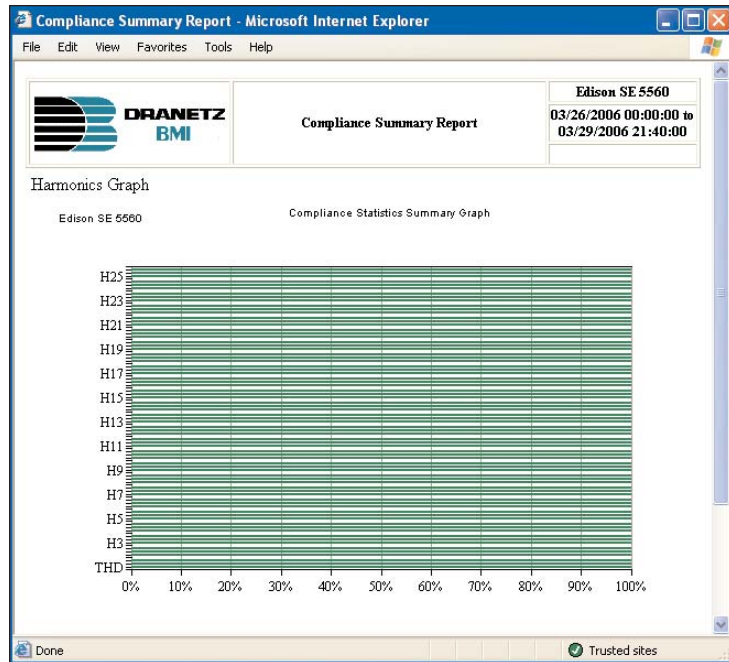


3D Graph for Rms Variations

10 5560 QOS DataNode Setup

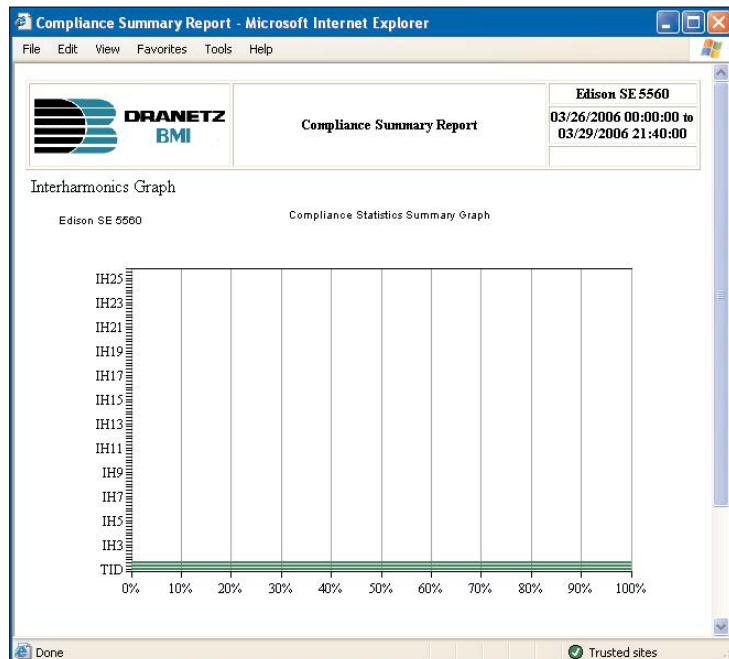
4. Harmonics Graph

The Harmonics Graph displays the status of each of the individual harmonics and THD for each phase. The bar chart indicates the percentage of the intervals passing the specified compliance. Odd harmonic numbers are marked on vertical axis. Even harmonic numbers are located in between. A sample harmonics plot is shown below.



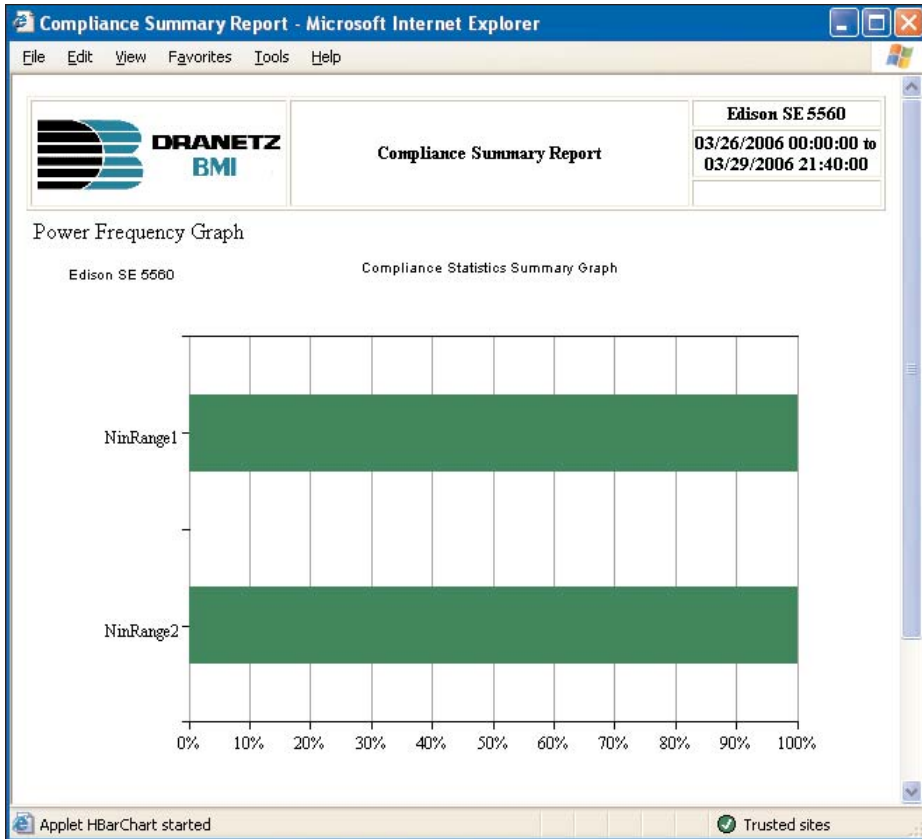
5. Interharmonics Graph

The Interharmonics Graph displays the status of each of the individual interharmonics and TID for each phase. The bar chart indicates the percentage of the intervals passing the specified compliance. Interharmonic numbers are actually groups of 5Hz frequency bars between the adjacent harmonic values. For example, the IH3 is the interharmonic values between 2nd and 3rd harmonic. A sample plot is shown below.



6. Power Frequency Graph

The Power Frequency parameter has two ranges considered for compliance. This graph displays the status of parameter with respect to each range. The bar chart indicates the percentage of the intervals passing the specified compliance. A sample plot is shown below.



10 5560 QOS DataNode Setup

7. Min/Max Tables

The Min/Max table displays the minimum, maximum and average values for Power Frequency and Rms Voltage along with time and date of occurrence. Maximum phase values of Rapid Voltage Change, Flicker, Supply Voltage Unbalance, and Harmonics are also displayed along with time and date of occurrence. A sample min/max table is shown below.

Compliance Summary Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

DRANETZ BMI **Compliance Summary Report** **Edison SE 5560**
03/26/2006 00:00:00 to 03/29/2006 21:40:00

Min/Max Tables

	Min	Max	Avg
Power Frequency - V Unbalance (S2/S1)	0.00	0.69	0.14
	03/28/2006 01:30:00	03/26/2006 09:50:00	
Magnitude of Supply Voltage - Rms Voltage	115.86	124.69	121.97
	03/29/2006 14:20:00	03/28/2006 22:10:00	

Maximum Values	Phase A	Phase B	Phase C
Rapid Voltage Change	124.69	123.88	124.01
	03/28/2006 22:10:00	03/27/2006 19:50:00	03/28/2006 00:30:00
Flicker (Plt)	0.47	0.41	0.44
	03/29/2006 21:00:00	03/26/2006 09:00:00	03/28/2006 23:00:00

Maximum Values: Harmonic #	Phase A	Phase B	Phase C
THD	3.95	4.70	4.82
	03/27/2006 19:50:00	03/27/2006 19:50:00	03/27/2006 19:50:00
2	1.05	1.04	0.77
	03/29/2006 02:40:00	03/26/2006 01:00:00	03/26/2006 01:00:00
3	4.59	5.43	5.58
	03/27/2006 19:50:00	03/27/2006 19:50:00	03/27/2006 19:50:00
4	0.33	0.77	0.61

Done Trusted sites

Harmonic values up to order no. 25 (complete harmonic values not captured on screen)

Standard Reports

Quality of Supply

Quality of Supply Report is an analysis of the voltage, similar to the requirements of the EN50160, which specifies that various parameters must be within a specified percentage for 95% of the time. Users can select from an analysis of the Voltage Regulation, Unbalance, and Frequency, with the information presented as a trend and/or histogram. The screen below shows the standard query selection for Quality of Supply Report. Once DataNode, Date, Time range, Data to Plot, and Plot type selections have been made, click on the Display or Display in New Window button. A table of contents featuring data trends in hyperlinks will appear as shown at the bottom of this page. QOS Regulation Trend and Frequency Trend link to the same graphs as that of Rms Voltage and Frequency respectively under Views - Smart Trends (see pages 10-9 thru 10-10).

Quality Of Supply Report

Display Display in New Window

DataNodes

Edison 5540
Edison 5571
Edison SE 5560

☒ Range Today

☐ From 03/29/2006 00:00:00 to 03/29/2006 23:27:08

Data to Plot:

☒ Regulation ☒ Frequency

Plot Types:

☒ Trend ☒ Histogram

☐ Specify Report Headings

Refresh this page to update the selection control contents and select default values.

Select the DataNode of interest.

Select date/time range of interest.

Click on the Display or the Display in New Window button to initiate the query. The results will appear either in this window or a new window depending on the button you click.

Quality of Supply Query Screen

Quality Of Supply Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

DRANETZ BMI **Quality Of Supply Report** **Edison SE 5560**
03/29/2006 00:00:00 to 03/29/2006 23:29:33

Table of Contents

1. [Regulation Trend - Phase A](#)
2. [Regulation Trend - Phase B](#)
3. [Regulation Trend - Phase C](#)
4. [Regulation Trend - Phase N](#)
5. [Frequency Trend - Phase A](#)

(TOC) TOC 1 2 3 4 5 >> Next >>

Quality of Supply Table of Contents

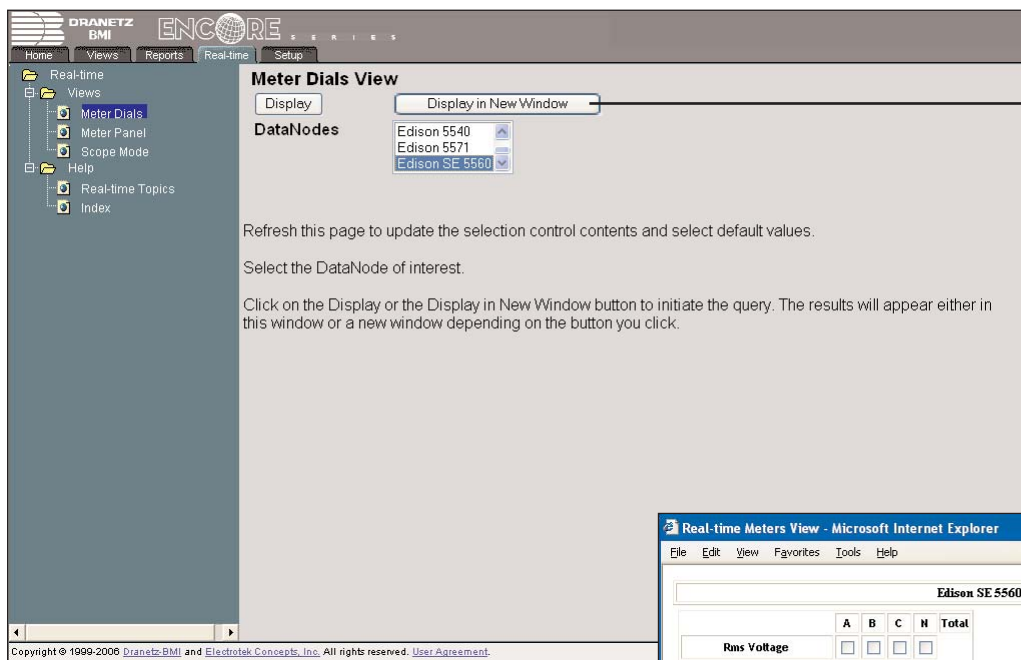
10 5560 QOS DataNode Setup

Real-time Display of QOS Data

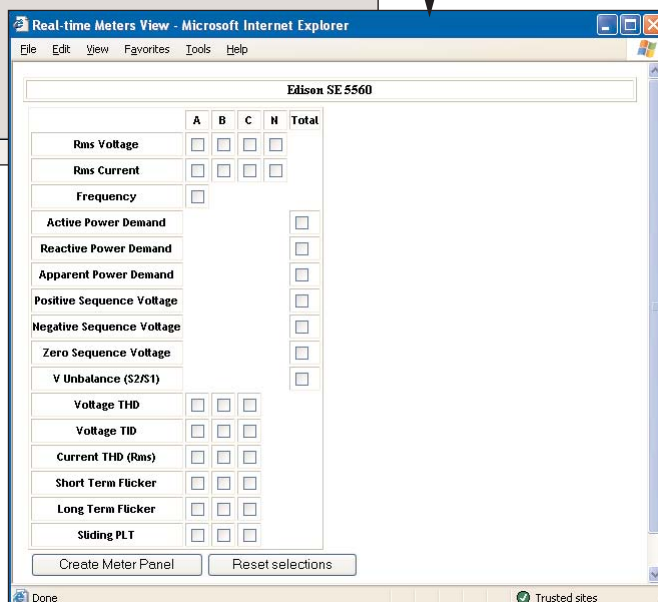
Among the parameters included in the 5560 DataNode, in addition to those available in DataNode 5530/5520, are those required to meet the specification of a flicker meter as per EN61000-4-15. Channels are defined under Real-time page to support real-time display of flicker measurements. Flicker is the effect on the visual human perception by a changing emission of light by lamps subjected to fluctuations of their supply voltage. Voltage fluctuations consist of a sequence of rapid voltage changes, spaced in time close enough to stimulate the response of the eye-brain is defined as flicker.

As the annoyance created by flicker is a function of both the intensity of Flicker and the duration of exposure, the severity of the disturbance is described by two parameters: the short term severity (Pst) and the long term severity (Plt).

Values for the flicker parameter include the Pst of last complete interval, Plt of last complete interval, Plt calculated using a sliding interval, maximum instantaneous P (Max. P_{inst}), LPF of P_{inst} , the square root of P_{inst} , and LPF of the square root of P_{inst} . These values are included in the channel selection when configuring the journal recordings (see Flicker setup tab on page 10-48). Note that only channels for which flicker data is present in the system are included in the selection. A sample real time display parameter screen is shown below. Users can choose which channels (A, B, C, N, Total) to activate by clicking on the respective checkbox. Refer to Chapter 6 Real-time Page for information on how to generate meter-type readings.



Real Time Setup Tab



Real Time Display Parameters

5560 DataNode System Setup

Quality of Supply (QOS) General tab requires several setup parameters. All Answer Module setups are global to the Encore Series Software and apply to all instruments that are gathering voltage compliance information.

Quality of Supply General Setup tab

QOS GENERAL setup properties include **Enable compliance monitoring**, which describes current communications interface between the QOS DataNode and the Encore Series Software. When checked, this means that QOS DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is wise to disable the box first, make the changes, then enable compliance box again. This helps ease and speed up processing time. Also when adding a new DataNode, the Enable compliance monitoring box must be checked to establish link with the DataNode site. Check the Home page to see which DataNodes are actively communicating with the software.

Properties	Values
DataNode Settings (select the DataNode(s) to change)	
Edison 61SE-PQ	
Edison SE 5560	
Substation OCB Demo	
Enable compliance monitoring	<input checked="" type="checkbox"/>
Limits set	Low Voltage Limits
Islanded	<input type="checkbox"/>
Mains Signaling Frequencies (set in 5 Hz increments)	
Frequency 1 (Hz)	185.000000
Frequency 2 (Hz)	180.000000
Frequency 3 (Hz)	175.000000
Frequency 4 (Hz)	170.000000
Frequency 5 (Hz)	170.000000
EN50160 Compliance Monitoring	
Use EN50160 compliance settings	<input checked="" type="checkbox"/>
The following DataNode(s) have settings that differ from those specified in this InfoNode.	
Edison 61SE-PQ	
Substation OCB Demo	
Update DataNode settings	<input type="checkbox"/>
General / Evaluation Period / Low Voltage Limits / Medium Voltage Limits	

Save Setup

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EN50160 is a European standard that stipulates the voltage characteristics that can be expected in public distribution networks. The QOS functionality is equipped with monitoring and setup protocols to meet the measurements required for EN50160 monitoring. EN50160 specifies that various parameters must be within a specified percentage for 95% of the standard one week monitoring period.

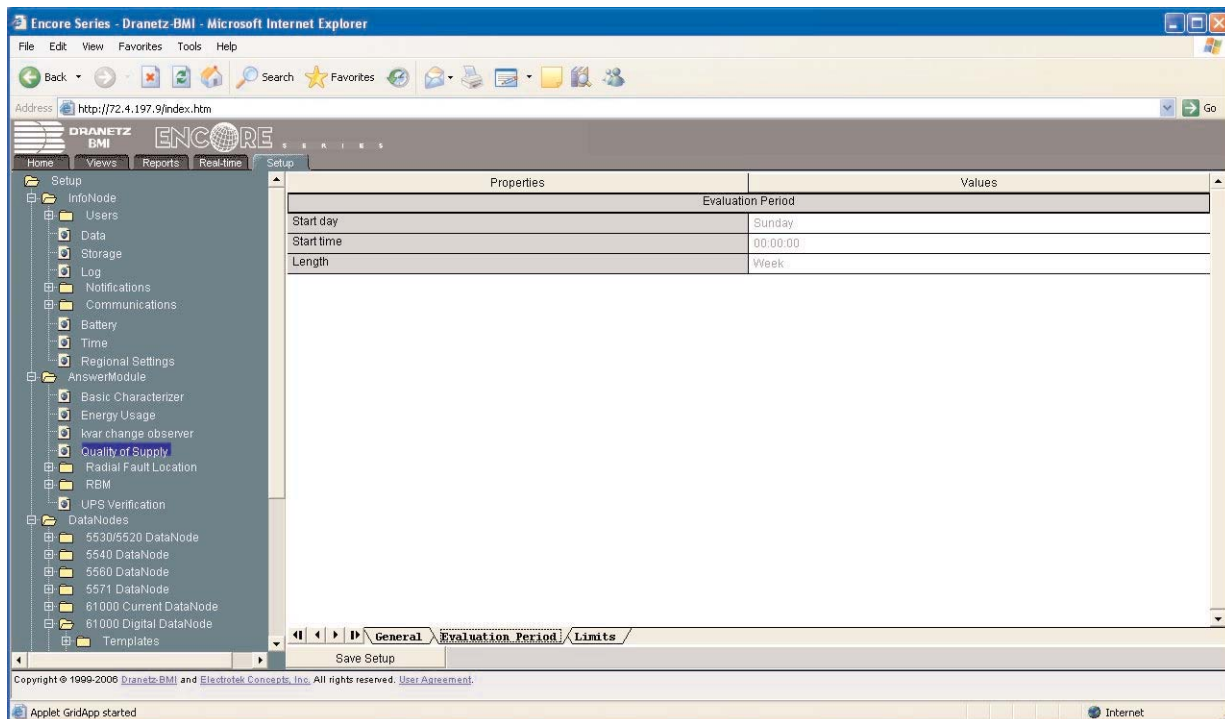
Users also have the option to **Use EN50160 compliance settings**. When checked, the default 61000 DataNode EN50160 settings will be re-configured and re-displayed. All fields will populate with EN50160 settings. The settings in DataNode EN50160 will overwrite those in the Encore Series Software and be used for monitoring.

Remember to click the Save Setup button found at the bottom of the page to save any change that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

10 5560 QOS DataNode Setup

Quality of Supply Evaluation Period tab

QOS EVALUATION PERIOD properties consist of the Start day, Start time, and Length of the evaluation period. The Start day and Start time properties can be altered and the unit will remain in strict compliance with EN50160. The Length cannot be altered due to the 7-day week period by which the unit calculates information in strict compliance with the EN50160. To program the properties, click on the respective value fields to display the drop down menu.



Start day - Specifies the day of the week when the statistics will be reset. Day is selected from a drop down menu containing the days of the week. The default start day is Sunday.

Start time - Specifies the time of day when the statistics will be reset. Time is an edit box that defaults to 00:00:00 (midnight of Sunday according to standard). Click on the value field to change time.

Length - Allows the user to set the evaluation period to a value other than the EN50160 specified period of 1 week. Users are cautioned against changing this value as this will result in a non-standard evaluation. The default is 1 week.

EN50160 compliance period specifies the day of the week when compliance monitoring **Period ends**, and statistics will be reset. Day is selected from a drop down menu containing the days of the week. The default compliance monitoring start day is Sunday. The start day can be altered and the unit will remain in strict compliance with EN50160. However, the length of the evaluation period cannot be altered due to the 7-day week period by which the unit calculates information in strict compliance with EN50160. The monitoring site is said to be IN COMPLIANCE if the statistical value over a 7-day week period for the specified parameters is 95% or greater.

Quality of Supply Limits tab

QOS LIMITS indicate the limit numbers or range of values required for each parameter to satisfy EN50160 standard.

Properties	Values
Interval Validation Voltage Limits	
Maximum voltage (%)	115.0
Minimum voltage (%)	85.0
Compliance Limits	
Supply voltage variation maximum (%)	110.0
Supply voltage variation minimum (%)	90.0
Unbalance	2.0
Flicker	1.0
Harmonic voltage (%)	8.0
Inter-harmonic voltage (%)	1.0
The percentages below represent the pass/fail criteria for each parameter type of the Quality of Supply reports. For example a 95.0 for the Power Frequency value states that 95 percent of the Power Frequency sample intervals must be within limits in order for Power Frequency to pass the compliance test.	
Power frequency	95.0
Supply voltage variations	95.0
Flicker	95.0
Supply voltage unbalance	95.0
Harmonic voltage	95.0
Inter-harmonic voltage	95.0
Mains signaling	99.0
Individual Harmonic Limits (select the harmonic(s) to change)	
2	
3	
4	
5	
6	
7	
8	
9	
Harmonic voltage (%)	2.0
Individual Interharmonic Limits (select the interharmonic(s) to change)	
0, 1	
1, 2	
2, 3	
3, 4	
4, 5	

The **Minimum and Maximum values for Rms Voltage parameters** can be configured. The table on page 10-24 shows the limit numbers or range of values required for each parameter to satisfy EN50160 standard.

Statistical data is calculated based on the parameters required by EN50160 for determining QOS compliance. Encore Series Software displays the parameters in the form of tables and graphs available in the QOS Compliance Smart Report, under Reports tab. The following is a description of each measurement parameter required by EN50160 for determining QOS compliance.

Power Frequency: In case of fault operation, parts of an interconnected system may become isolated. Compliance will be assessed over an observation period of one week, by a statistical analysis carried out over the sequence of 10 seconds measurement.

Supply Voltage Variations: Under normal operating conditions, load changes cause variations of the 10 minute average supply voltage. Generally this is compensated by automatic voltage regulation within a period of a few tenths of seconds.

Flicker: Typical rapid voltage changes or flicker do not exceed a magnitude of +5% or -5% of the nominal or declared voltage. This limitation is possible because connection of loads capable of creating rapid voltage changes is usually subjected to regulations. However under certain conditions, higher values of up to 10% may occur. These higher values can occur for instance in areas where high power motor equipment (blower, pumps, compressors, etc.) is used.

Supply Voltage Unbalance: The unbalance of a three phase supply voltage consists of a loss of symmetry of the phase voltage vectors (magnitude and/or angle), created mainly by unbalanced load. Compliance is verified when 95% of the sequence of valid 10 minute values are within the specified tolerance of normally 2% (in single phase/two phase supplies 3%).

10 5560 QOS DataNode Setup

EN50160 Compliance Limits

Parameter	Limits for QOS Compliance to Pass
Un = Low Voltage (LV) Supply nominal voltage, upper limit 1kV Uc = Medium Voltage (MV) Supply Characteristics - declared voltage, range 1kV to 35kV	
Supply voltage variations (Under normal operating conditions, excluding situations arising from faults or voltage interruptions)	Mean rms over 10 minutes <ul style="list-style-type: none">±10% of Un or Uc during 95% of one week±10%, -15% of Un for 100% of one week
Supply voltage unbalance (Under normal operating conditions) 10 minute mean rms values of the negative phase sequence component/positive phase sequence component	10 minute mean rms values of the negative phase sequence component/positive phase sequence component <ul style="list-style-type: none">≤2% during 95% each period of one week
Flicker	$Plt \leq 1$ for 95% of the time Also 5% normal, 10% infrequent for LV, 4 & 6 for MV
Harmonic voltage (Under normal operating conditions)	10 minute mean rms values Individual Harmonic voltage up to the 25th shall be ≤ the value of Un given under Harmonic Compliance Limits (see table below) during 95% of one week <ul style="list-style-type: none">≤8% THD (THD up to the 40th)
Interharmonic voltage	Individual Interharmonic voltage up to the 24th-25th shall be < the value of Un given under Interharmonic Compliance Limits (see table on page 8-8) during 95% of one week <ul style="list-style-type: none"><8% TID (TID up to the 39th/40th)

Harmonics are waveform distortion, a steady-state deviation from an ideal power frequency sinusoid and is characterized by the spectral content of the waveform. See page 12-19 for detailed discussion of harmonics.

Interharmonics are frequency components between the harmonic frequencies.

NOTE: Harmonic and Interharmonic values are specified only up to order 25 (EN50160 limit), for the practical reason that for higher orders, the values are generally so small as to be impractical to measure. Another reason is because of the difficulty of giving values which would be relevant to all networks.

Mains signaling compliance or non-compliance is determined by calculating/adding the status of each of the defined frequencies. Mains signaling limits for QOS compliance should be within the 3 second mean of signal voltages compared against the Meister curve.

EN50160 Calculations and Statistics

This section lists the calculations and statistics that are gathered from incoming data collected by 5560 DataNode and processed by the Quality of Supply Answer Module.

For each 5560 DataNode configured in the system, the Answer Module compiles the required statistics and persists them to the database for retrieval under the Views and Reports pages of the Encore Series. The partial statistics are persisted as each set of incoming data is analyzed so that partial period statistics are available, even though it cannot predict that a site will pass in compliance until interval is complete.

Intermediate statistics for the current evaluation period are made available but are marked as incomplete. Early in an evaluation period there may not be enough data to provide meaningful statistics and Pass/Fail evaluations for the various criteria. Due to this fact, partial statistics are not available until at least 100 valid samples have been accumulated and evaluated.

As disturbance based statistics (DISDIP) are simple counts of events in various ranges, this information is made available at any time during an evaluation period.

At the end of the evaluation period, the statistic calculations are completed and the statistical observation is marked as Complete. If for some reason, the evaluation period was less than a complete period, the observation is marked as an Incomplete period so the reporting elements can take appropriate action.

All EN50160 compliance statistics are calculated from data retrieved from the 5560 DataNode journal (steady state values) and characterized events (transients and rms variations).

For all periodic quantities, the total number of valid measurements in the evaluation period is tabulated. A particular period is excluded from the analysis if a sag below 85% of nominal or a swell above 115% of nominal occurred based on cycle-by-cycle rms voltage minima and maxima. For those items tabulated in the Encore Series, the exclusion is based on the minimum and maximum value available in 10-minute rms voltage min/max/avg trend value log.

The table below details the statistical information gathered by the Answer Module.

Parameter	Interval (default)	Data Source	Stats	Additional Data Collection			
				Avg	Min w/TS	Max w/TS	3 Phase
Magnitude of Supply	10 Min	SS VRMS	Valid Intervals Within +/- 10%	YES	YES	YES	YES
Supply Voltage Unbalance	10 Min	SS S2/S1	Valid Intervals <= 2%	YES	NO	YES	NO
Power Frequency	10 Min*	SS Count Reports from DataNode	DataNode Calculation - Pass in all intervals within broad limit and 95% of intervals with narrow limits	NO	NO	NO	YES
Rapid Voltage Changes – Flicker	2 Hours	SS Plt	2 Hour Plt <= 1.0	YES	YES	YES	YES
Rapid Voltage Changes - Step Changes	1 Week	RMS Variations	90% to 95% LV, 94% to 96% MV	NO	NO	NO	YES
Harmonic Voltage	10 Min	SS Harmonic Group Spectra, THD + 2 to 25 Harmonics	THD <= 8%, Table for Individual Harmonics	YES	NO	YES	YES
Interharmonic Voltage	10 Min	SS Interharmonic Group, TID and components 2 to 25	TID <= 1%, All components <= 0.5%	YES	NO	YES	YES
Mains Signaling Frequencies	10 Min**	SS Count Reports from DataNode	DataNode Calculation - Pass if in range 99% of intervals	NO	NO	NO	YES

Notes:

*Power Frequency sampling done in DataNode at 10 second intervals, reported to journal every 10 minutes.

**Mains Signalling sampling done in DataNode at 3 second intervals, reported to journal every 10 minutes.

10 5560 QOS DataNode Setup

5560 DataNode Setup

General Information

DataNodes have a wide variety of user-programmable features that can be set under the DataNode Setup tab of the Encore Series. Select the appropriate folder under the DataNode setup tree, then select the DataNode type that you wish to program. DataNode Properties and Values will be displayed on the right frame. Use the tabs across the bottom of the page to select the appropriate category of programmable features. Users can change the tab setups depending on their access privileges.

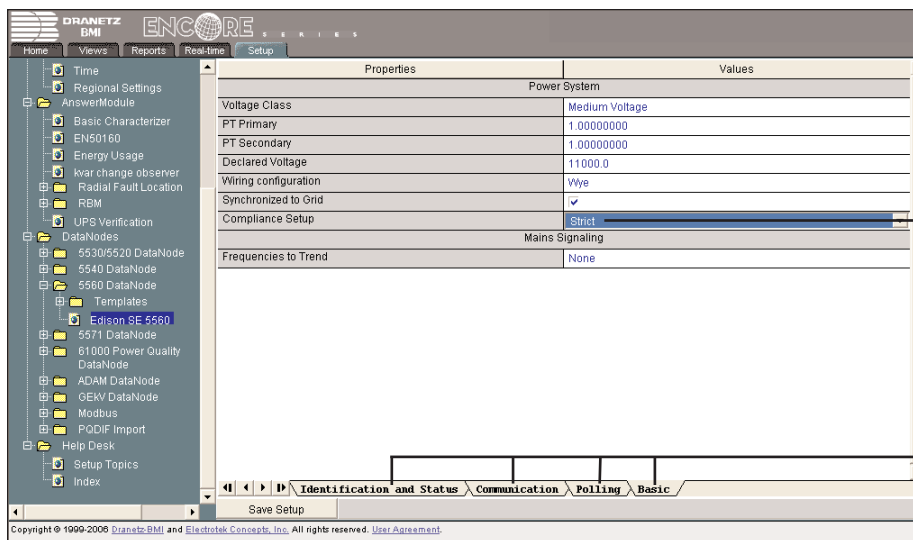
5560 DataNode

The setup of a DataNode is dependent on the DataNode type. 5560 DataNodes can be set up in **Strict** compliance with EN50160 or can be set up using **Custom** setups.

Under Strict compliance, only the Identification and Status, Communication, Polling, and Basic tabs are visible and modifiable. This is the standard method for using the 5560. For those who have unique applications requiring modification of the standard setups, the Compliance Setup selection box on the Basic tab can be changed to Custom. See sample screens below.

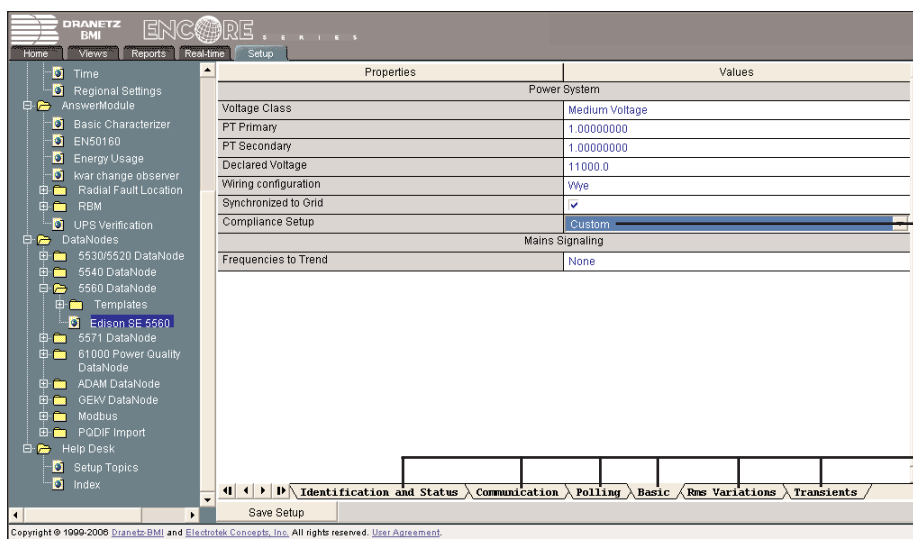
Where Data for Programmed Settings Appear

Data is recorded based upon programmed settings and displayed in Views page, Real-time page and Reports page. Refer to the previous pages of this chapter as well as to the previous chapters for more details on the Views, Real-time and Reports pages.



5560 DataNode with Compliance Setup: Strict

Tabs available under Strict compliance: Identification and Status, Communication, Polling, and Basic (Basic tab shown)



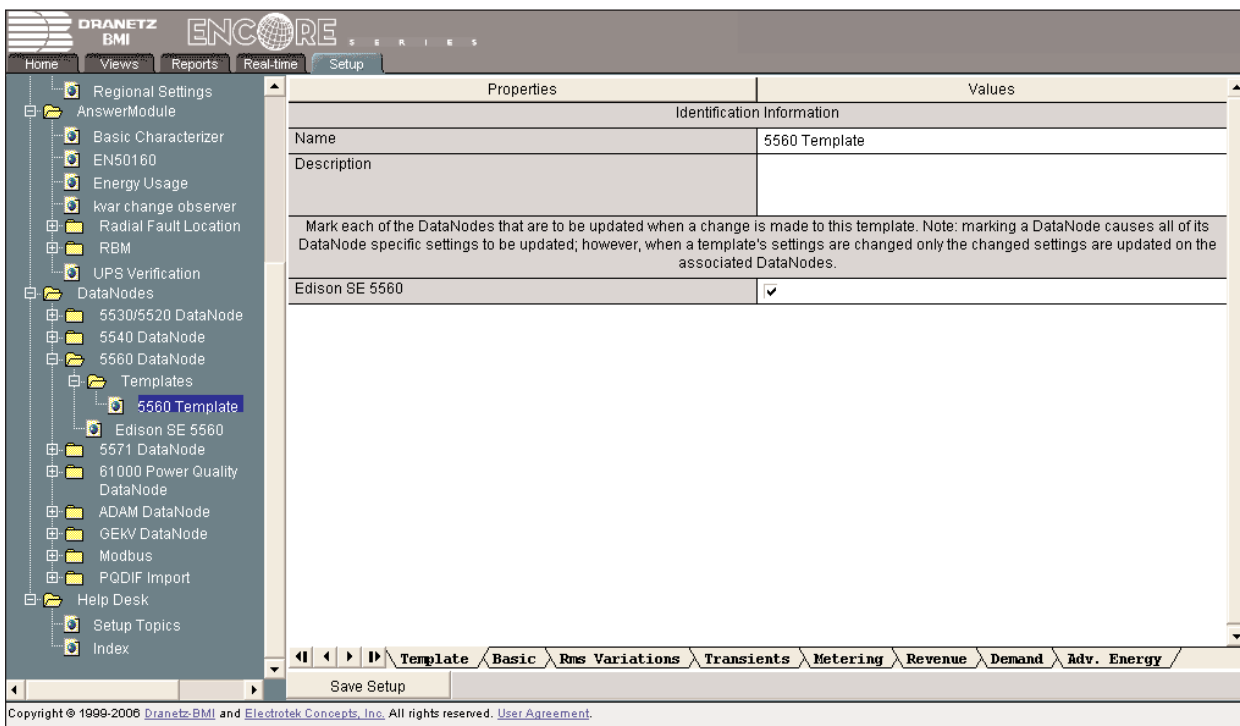
5560 DataNode with Compliance Setup: Custom

Tabs available under Custom compliance: Identification and Status, Communication, Polling, Basic, Rms Variations, Transients, Metering, Revenue, Demand, Adv. Energy, Adv. Metering, Imbalance, Harmonics, Flicker, Adv. Harmonics, Transducers, Advanced, Accumulated Resets

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.



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DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates .

Properties	Values
Identification Information	
Name	Edison SE 5560
Description	
Serial Number	00-01-32-00-01-eb
Version	V1.2.1040513, V3.0.49050524, V1.2.1040513, V3.0.21050920
Status Information	
Health	The phase rotation is incorrect (0x10).
Communication status	Idle
Last poll at	03/30/2006 20:22:06
Next poll at	03/30/2006 20:23:00
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5560 Template

Save Setup

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5560 DataNode Tabs

The parameters available in each tab are discussed in detail in the next sections. Note the following conventions used in the screen displays.

LEGEND:

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings (except user-defined properties i.e. Name, IP Address, etc.) unless there are applications which require advanced setups.

1. Identification and Status tab

Properties	Values
Identification Information	
Name	Edison SE 5560
Description	Encore Series QOS DataNode
Serial Number	00-01-32-00-08-30
Version	V3.0.21050920
Status Information	
Health	System health is normal
Communication status	Idle
Last contact at	03/24/2008 21:07:00
Last poll at	03/24/2008 21:07:05
Next poll at	03/24/2008 21:08:00
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5560 Template {None, 5560 Template}
Use the setting below to record annotations for this DataNode.	
Notes	

The Identification and Status tab contains identification and health status description of the DataNode.

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not.

It also includes **Communication status** of Encore Series Software to DataNode.

Polling Status is also displayed, indicating when the Encore Series Software last contacted the DataNode, when data was last requested from the DataNode, and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

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2. Communication tab

Properties		Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.		
Active	<input checked="" type="checkbox"/>	
A direct network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).		
Connection	Local Area Network (LAN)	
Address	198.69.18.234	
User name	admin	
Password	*****	

enable to activate communication between DataNode and Encore Series Software

COMMUNICATION parameters for 5560 DataNode include the following:

Active which indicates whether communications between the Encore Series Software and DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series.

Connection can be through local area network, Internet, Intranet using 10/100BaseT Ethernet, RS232, RS485.

Address is where the IP information for the specific DataNode is entered. Each 5560 DataNode is shipped from the factory with an IP Address. This IP Address is entered here.

User name and **Password** are the name and password for Encore Series to DataNode communications. The password is typically left at factory default. A wrong IP or password will result in DataNode communication error and users will not be able to access the particular DataNode.

NOTE: The password entered must match that of the DataNode.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	04/01/2008 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
When InfoNode and DataNode settings differ	send settings to the DataNode {get settings from the DataNode, send settings to the DataNode}
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>
Update DataNode firmware	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include the following parameters: **When InfoNode and DataNode settings differ** allows users to match DataNode setups with those listed in the Encore

Series/InfoNode system when configurations differ and/or communication errors occur; the **Download and store data** check box enables the Encore Series to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include check boxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series Software; **Delete data in DataNode** - use to remove stored data in the DataNode; and **Update DataNode firmware** - use to update DataNode firmware with the version stored on the Encore Series Software.

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4. Basic tab

Properties	Values
Power System	
PT Primary	1.00000000
PT Secondary	1.00000000
Declared Voltage	230
Wiring configuration	Wye {Single Phase, Wye, Delta, Split Single Phase}
Compliance Setup	Custom {Strict, Custom}

click fields to display drop down menu

For a 5560 DataNode, the Basic page highlights those fields necessary for the DataNode to properly acquire data.

PT Primary allows for setting the primary component of all the transducer ratios. Ratios for all three phases are set when this field is changed and saved. If the values for the individual phases are different, the phase A setting is displayed. No setup values are changed unless the user modifies this field and saves the changes. The values being modified here are the same as the individual values on the Transducers page. For a 5560 DataNode, the default PT Primary value is 1.0 if the Voltage Class is Low and 120.0 if the Voltage class is Medium (120:1 with 10V nominal input is for monitoring 13kV distribution voltage).

PT Secondary allows for setting the secondary component of all the transducer ratios. Ratios for all three phases (A, B, C) are set when this field is changed and saved. If the values for the individual phases are different when using custom setups, the phase A setting is displayed. No setup values are changed unless the user modifies this field and saves the changes. The values being modified here are the same as the individual values on the Transducers page. The default value is 1.0 in all cases.

Declared Voltage (also known as Nominal Voltage in a 5530 DataNode) is where users specify the nominal input line voltage. For a 5560 DataNode, the default is 230.0 when using Wye configuration. For Delta configuration, Declared Voltage is set to 400 if the Voltage Class is Low and to 11000.0 if the Voltage Class is Medium.

To set **Wiring Configuration**, click on the value field and a drop down menu lists Single Phase, Wye, Delta and Split Single Phase. The default wiring configuration is Delta.

Compliance Setup is a drop down selection box containing two entries: Strict EN50160 and Custom EN50160. Compliance setup determines which pages are visible to the user and therefore which setup fields may be changed. If Strict EN50160 is selected, only the Identification and Status, Communication, Polling, and Basic pages are displayed. If Custom EN50160 is selected, all Setup pages are visible. Strict EN50160 compliance setup is the default.

5. Rms Variations tab

Properties	Values	
Limits		
A-N Voltage {Bank selection enables programming limits below}		phase-to-neutral or phase-to- phase values displayed here depend upon the Wiring Configuration set under the Basic tab
B-N Voltage		
C-N Voltage		
N-G Voltage		
A-B Voltage		
B-C Voltage		
C-A Voltage		
A Current		
B Current		
C Current		
N Current		
Limit enabled	<input checked="" type="checkbox"/>	units of measure depend on setting in Basic tab
High limit	110.0	
Low limit	90.0	
Pre- and Post- Event Captures		
Pre-event start rms samples (cycles)	2	
Post-event start rms samples (cycles)	238	
Pre-event start waveform samples (cycles)	2	
Post-event start waveform samples (cycles)	6	
Post-event end rms samples (cycles)	2	
Pre-event end waveform samples (cycles)	6	
Post-event end waveform samples (cycles)	2	
Cycles in range to end event	1	
Rms Variations Sampling Intervals		
Number of Rates to Use	3	
Intervals		
Reduced sampling rate #1		
Reduced sampling rate #2		
Reduced sampling rate #3		
Sample min/max/avg every N cycles	6	
Number of seconds to use this rate	6.000000000	

RMS stands for root mean square, a mathematical formula used to measure the average voltage and current. Voltage and current changes are measured and checked against their programmed limits. Thresholds are set in ranges with high limit (threshold above the programmed limit) and low limit (threshold below the programmed limit). Rms Variations result whenever voltage or current rms value rises above or fall below the programmed thresholds.

The following properties can be set in the Rms Variations page: Limits, Pre- and Post- Event Captures, Rms Variations Sampling Intervals, and Intervals.

Under LIMITS, letters A, B and C represent each leg or phase of a three-phase system, while letter N represents the neutral conductor. The channels used to trigger are auto set. **High limit** and **Low limit** values can be enabled and programmed individually for each phase-to-neutral and phase-to-phase setting.

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To program individual limit values, select the appropriate line that describes the phase-to-neutral or phase-to-phase setting that you wish to change. If the same limit value will be assigned to more than one phase, press Shift + click to select multiple phases. Enter your limit value for the corresponding phase in the High limit and Low limit fields. Click on the **Limit enabled** box to activate. Click the Save Setup button every time you assign different limit values.

PRE- AND POST- EVENT CAPTURES contain parameters that help users program the number of rms and waveform cycles to be saved before (pre-) and after (post-) the start and the end of the event. These parameters are **Pre-event start rms samples, Post-event start rms samples, Pre-event start waveform samples, Post-event start waveform samples, Post-event end rms samples, Pre-event end waveform samples, and Post-event end waveform samples**. The parameters capture rms sample or rms waveform cycles that may be used to analyze and manage power event patterns and behavior.

With regard to the beginning and end of rms variation events, such transition points are determined according to the following rules. As per IEC and IEEE standards for multi-phase systems, the beginning of the event occurs when any phase goes outside the limits. The start of an rms variation event is denoted as the time one or more phases of voltage or current goes outside of the programmed high or low thresholds. The end of the event is denoted as the time all phase voltages and currents are back within the limits and the number of cycles specified within limits has been satisfied. Disturbance monitoring requires that voltage be continuously sampled, and recorded only if the signals exceed specified values. Most types of disturbances, with the exception of voltage variations, require that current be recorded as well.

The user also has the ability to specify how rms trace data is recorded during the event. This mechanism is found under RMS VARIATIONS SAMPLING INTERVALS, where **Number of rates to use** refer to the number of reduced sampling rate ranges to be used to record rms variation activities. The sampling data referred to here may be any or all of the three sample rates found under INTERVALS - **Reduced sampling rate #1, Reduced sampling rate #2, and Reduced sampling rate #3**. When one of these items is selected, the reduced sampling rate parameters can be set for that item. Data for the sample rates only apply to rms, not waveform, variations.

The reason behind storing sampling rates is that the memory capacity of the monitoring instrument makes it impractical to record an entire long duration sag or swell point by point. The waveforms before and after the trigger are digitized to help identify the cause of the excursion, but only rms values are stored over the full duration of the event that are longer than the pre- and post- trigger settings. If the event has not ended after a programmed time period, the instrument switches to averaging cycles of rms data to further conserve memory yet accurately represent event. At this point, the rms plot diverges from a single-valued line to a band of minimum, maximum and average values. During extremely long events, the instrument switches to successively longer averaging periods explained next.

The sample rates represent three supplemental recording interval or chart speeds defined for recording long events. When recording at reduced rates, three values are saved for each data point - the minimum, maximum, and average value of the previous interval. The **Sample min/max/avg every N cycles** refers to the number of cycles to average for the selected reduced sampling rate. While **Number of seconds to use this rate** refer to the number of seconds to record at the selected reduced sampling rate.

The following default sequence is used to program reduced sampling rates:

For 60 Hz systems

- a. 6 cycle intervals for 8 seconds (80 samples)
- b. 30 cycle intervals for 20 seconds (40 samples)
- c. 60 cycle intervals for 90 seconds (90 samples)

For 50 Hz systems

- a. 5 cycle intervals for 8 seconds (80 samples)
- b. 25 cycle intervals for 20 seconds (40 samples)
- c. 50 cycle intervals for 90 seconds (90 samples)

6. Transients tab

Properties	Values
Cycle Counts	
Number of pre-trigger cycles	1
Number of post-trigger cycles	2
Individual Channel Parameters	
A-N Voltage	phase-to-neutral or phase-to-phase values displayed here depend upon the Wiring Configuration set under the Basic tab
B-N Voltage	
C-N Voltage	
N-G Voltage	
A Current	
B Current	
C Current	
N Current	
Instantaneous limit enabled	<input checked="" type="checkbox"/>
Instantaneous limit	200.0
Waveform change limit enabled	<input checked="" type="checkbox"/>
Waveform change magnitude limit	10.0
Waveform change duration limit (% of cycle)	10.0

Transients are disturbances which are shorter in duration than sags and swells. There are two basic types of transients: 1) impulsive transients commonly caused by lightning and load switching, and 2) oscillatory transients often attributed to capacitor bank switching. The DataNode program has extensive transient recording capabilities for all transient events, using waveshape, instantaneous peak, and dual positive and negative high frequency peak detectors.

Under CYCLE COUNTS, the user can define a number of cycles of waveform to record prior to the trigger point. This is set under **Number of pre-trigger cycles**. Users can also define the number of cycles of waveform to record after the trigger. This value is set under **Number of post-trigger cycles**. Typical values for these settings are 1 and 2 respectively.

Under INDIVIDUAL CHANNEL PARAMETERS, letters A, B and C represent different channels, N stands for neutral, while G stands for ground conductor. The channel values are pre-defined and automatically set depending upon the Wiring Configuration selected under the Basic tab.

The DataNode program provides configuration variables that specifies how many cycles to record the **Rms**

Instantaneous limit and **Waveform change magnitude limit**. These limit values can be enabled and programmed individually for each phase-to-neutral and phase-to-phase setting.

The instantaneous limit value is compared against the absolute value of each A/D sample of the voltage and current channel waveforms (128 A/D samples taken per cycle). Enter your limit values in the corresponding field for each phase or phase-to-phase setting, and click the **Instantaneous limit enabled** box to activate.

Other configuration variables that determine the operation of transient capture capability of the DataNode are the waveform trigger parameter, instantaneous peak waveform trigger level, and dual peak high frequency detector output trigger level. Values for these parameters are set under **Waveform change magnitude limit** and **Waveform change duration limit**. Limit values can be enabled and programmed individually for each phase-to-neutral and phase-to-phase setting. To activate the waveform limit values, click the **Waveform change limit enabled** box.

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Trending Tabs

The following tabs are known as trending pages: Metering, Revenue, Demand, Adv. Energy, Adv. Metering, Unbalance, Harmonics, Flicker, and Adv. Harmonics. These pages contain an enable/disable checkbox at the top of the page. The purpose of the checkbox on any trending page is to enable trending of properties and values listed on that page. If the box is checked, the settings on that page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect. Trending pages are available only for Custom EN50160 Compliance Setup. Trending pages are hidden under Strict EN5160 Compliance Setup.

7. Metering tab

Properties	Values	
Enable Trending (This page)		
Basic Metering (Metering, MMXUO)	<input checked="" type="checkbox"/>	
Select the journal entry/entries to change		
Line-Neutral Voltage (A-N)	Apparent Power (A)	phase-to-neutral or phase-to-phase values displayed here depend upon the Wiring Configuration set under the Basic tab
Line-Neutral Voltage (B-N)	Apparent power (B)	
Line-Neutral Voltage (C-N)	Apparent Power (C)	
Neutral-Ground Voltage	Total Apparent Power	
Line-Line Voltage (A-B)	Power Factor (A)	
Line-Line Voltage (B-C)	Power Factor (B)	
Line-Line Voltage (C-A)	Power Factor (C)	
Line Current (A)	Average Power Factor	
Line Current (B)	Angle Between Phases (A)	
Line Current (C)	Angle Between Phases (B)	
Line Current (N)	Angle Between Phases (C)	
Active Power (A)	Frequency	
Active Power (B)		
Active Power (C)		
Total Active Power		
Enable Periodic Sampling	<input checked="" type="checkbox"/>	
High-High limit enabled	<input type="checkbox"/>	
High-High limit	112.49	
High limit enabled	<input type="checkbox"/>	
High limit	154.16	
Low limit enabled	<input type="checkbox"/>	
Low limit	87.50	
Low-Low limit enabled	<input type="checkbox"/>	
Low-Low limit	75.00	
Deadband enabled	<input type="checkbox"/>	
Deadband	2.50	

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Basic Metering**. The box enables the trending of values listed in Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, the various phase-to-neutral and phase-to-phase parameters are displayed. High and low limits can be enabled and individually set for each phase-to-neutral and phase-to-phase value. Note however that the available phase values depend on the Wiring Configuration selected under the Basic Tab. For instance, for wye circuits L-N,

N-G and L-L limits can be set. For delta circuits, only L-L limits can be set.

Highlight the phase value parameter you wish to change then check the enable box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

The enable box refers to the **Enable periodic sampling** parameter. Note that the 5560 DataNode has an internal limit on the number of variables it can track for the purpose of periodic recording and limit rule evaluation. Indiscriminate selection of parameters should be avoided.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. The hysteresis values assigned to limits are set by the system and not programmable by the user. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if a frequency is detected to cross the threshold limit, then an event is recorded. If the frequency goes from out of limits to within limits (that is, below the high limit minus the hysteresis and above the low limit plus the hysteresis) then another event is recorded.

Enabling parameters for periodic sampling make them available in the Real-time tab.

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8. Revenue tab

Properties	Values
Enable Trending (This page)	
Basic Revenue Metering (Revenue, MMTRO)	<input checked="" type="checkbox"/>
Select the journal entry/entries to change	
Phase Energy (A)	
Phase Energy (B)	
Phase Energy (C)	
Total Energy	
Integrated Reactive Power (A)	
Integrated Reactive Power (B)	
Integrated Reactive Power (C)	
Total Integrated Reactive Power	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	00.0
High limit enabled	<input type="checkbox"/>
High limit	00.0
Low limit enabled	<input type="checkbox"/>
Low limit	00.0
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	00.0
Deadband enabled	<input type="checkbox"/>
Deadband	00.0

Under ENABLE TRENDING (THIS PAGE) is a check-box in the value field opposite **Basic Revenue Metering**. The box enables the trending of values listed in Basic Revenue Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Each of the individual phase-to-neutral and three phase total energy and integrated reactive power values found under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE can be enabled.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Threshold enable refers to the checkboxes opposite the limits. Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**. High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.
Low limit - specifies an absolute limit for comparison that is lower than the high limit.
Low-Low limit - specifies an absolute limit for comparison lower than the low limit.
Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Total Energy is detected to cross the threshold limit, then an event is recorded. If the Total Energy goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

Enabling parameters for periodic sampling make them available in the Real-time tab.

9. Demand tab

Properties	Values
Enable Trending (This page)	
Demand (Demand, MDMDO)	<input checked="" type="checkbox"/>
Select the journal entry/entries to change	
Real Power, Dmd, Total	
Reactive Power, Dmd, Total	
Apparent Power Dmd, Total	
Average PF Over Last Interval	
Peak Real Power Dmd Total	
Var Dmd Coincident w/Pk W Dmd	
VA Dmd Coincident w/Pk W Dmd	
Avg PF Coincident w/Pk W Dmd	
Peak Reactive Power Dmd, Total	
W Dmd Coincident w/Pk Var Dmd	
VA Dmd Coincident w/Pk Var Dmd	
Avg PF Coincident w/Pk Var Dmd	
Peak Apparent Power Dmd, Total	
W Dmd Coincident w/Pk W Dmd	
Var Dmd Coincident w/Pk VA Dmd	
Avg PF Coincident w/Pk VA Dmd	
Predicted Real Power Dmd, Total	
Predicted Reactive Power Dmd, Total	
Predicted Apparent Power Dmd, Total	
Current Demand (A)	
Current Demand (B)	
Current Demand (C)	
Average Current Demand	
Peak Current Demand (A)	
Peak Current Demand (B)	
Peak Current Demand (C)	
Average Peak Current Demand	
Enable periodic sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	1.00
High limit enable	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low limit	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.00
Deadband enabled	<input type="checkbox"/>
Deadband	0.00

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Demand values are computed as the average value over the demand interval, which can be programmed as a different value than the periodic readings.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Demand**. The box enables the trending of values listed in Demand page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

The following parameter values can be enabled under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE: individual phase and three phase total real power demand, reactive demand, apparent power demand, average PF, and peak real power values.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box, and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Real Power Demand is detected to cross the threshold limit, then an event is recorded. If the Real Power Demand goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

10. Advanced Energy tab

Properties	Values
Enable Trending (This page)	
Advanced Energy (Adv. Energy, MFLOO)	<input checked="" type="checkbox"/>
Select the journal entry/entries to change	
Forward fund. freq. WHrs (A)	
Forward fund. freq. WHrs (B)	
Forward fund. freq. WHrs (C)	
Reverse fund. freq. WHrs (A)	
Reverse fund. freq. WHrs (B)	
Reverse fund. freq. WHrs (C)	
Forward tot. fund. freq. WHrs	
Reverse tot. fund. freq. WHrs	
Forward fund. freq. VarHrs (A)	
Forward fund. freq. VarHrs (B)	
Forward fund. freq. VarHrs (C)	
Reverse fund. freq. VarHrs (A)	
Reverse fund. freq. VarHrs (B)	
Reverse fund. freq. VarHrs (C)	
Forward tot. fund. freq. VarHrs	
Reverse tot. fund. freq. VarHrs	
Fundamental freq. VA hours (A)	
Fundamental freq. VA hours (B)	
Fundamental freq. VA hours (C)	
Total fundamental freq. VA hours	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	1.00
High limit enabled	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low limit	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.00
Deadband enabled	<input type="checkbox"/>
Deadband	0.00

Journal entries in the Advanced Energy tab show various energy parameters on per phase and total basis as well as in forward and reverse mode. Fundamental frequency is used as the reference unit. Frequency is specified in hertz. Fundamental frequency refers to the principal component of a wave, i.e. the component with the lowest frequency or greatest amplitude.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Advanced Energy**. The box enables the trending of values listed in Advanced Energy

page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, highlight the phase value parameter you wish to change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

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Threshold enable refers to the checkboxes opposite the limits. Each parameter has five threshold limits: **High-high**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Total Fundamental Frequency VA hours is detected to cross the threshold limit, then an event is recorded. If the Total Fundamental Frequency VA hours goes from out of limits to within limits (that is below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

11. Advanced Metering tab

Properties	Values
Enable Trending (This page)	
Advanced Metering (Adv. Metering, MADVO)	<input type="checkbox"/>
Select the journal entry/entries to change	
Total VA - Arith. Method	
Total VA - Vect. Method	
Total Fund. VA - Arith. Method	
Total Fund. VA - Vect. Method	
Worst True Power Factor	
Total Arithmetic True PF	
Total Vector True Power Factor	
Displacement Power Factor (A)	
Displacement Power Factor (B)	
Displacement Power Factor (C)	
Worst Displacement Power Factor	
Average Displacement PF	
Total Arithmetic Disp. PF	
Total Vector Disp. Power Factor	
Residual Current	
Net Current	
Enable periodic sampling	<input type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	1.00
High limit enabled	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low limit	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	00.0
Deadband enabled	<input type="checkbox"/>
Deadband	0.0

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Advanced Metering**. The box enables the trending of values listed in Advanced Metering page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, multiple total apparent power and power factor parameters, calculated using arithmetic and vector sums of the individual phases, can be enabled. The parameters include: Total Arithmetic VA, Total Vector VA, Total Fundamental Arithmetic VA, Total Fundamental Vector VA, True Power Factor (PF), Worst True PF, Total Arithmetic True PF, Total Vector PF, Displacement PF, Worst Displacement PF, Average Displacement PF, Total Arithmetic Displacement PF, Total Vector PF, Residual Current, and Net Current. Definitions of these terms can be found on Appendix G *Glossary*.

Highlight the parameter value you wish to change, then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-High**, **High**, **Low**, **Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Displacement Power Factor is detected to cross the threshold limit, then an event is recorded. If the Displacement Power Factor goes from out of limits to within limits (that is, below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

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12. Unbalance tab

Properties	Values
Enable Trending (This page)	
Imbalance and Sequence Components (Sequence, MSQIO)	<input checked="" type="checkbox"/>
Select the journal entry/entries to change	
Sequence Voltage (Pos) Sequence Voltage (Neg) Sequence Voltage (Zero) Sequence Current (Pos) Sequence Current (Neg) Sequence Current (Zero) V Imbalance: L-N dev. from avg (A-N) V Imbalance: L-N dev. from avg (B-N) V Imbalance: L-N dev. from avg (C-N) V Imbalance: L-L dev. from avg (A-B) V Imbalance: L-L dev. from avg (B-C) V Imbalance: L-L dev. from avg (C-A) V Imbalance: L-N Max from avg V Imbalance: L-L Max from avg V Imbalance: Neg. Seq. Method V Imbalance: Zero Seq. Method I Imbalance: dev. from avg (A) I Imbalance: dev. from avg (B) I Imbalance: dev. from avg (C) I Imbalance: Max dev. from avg I Imbalance: Neg. Seq. Method I Imbalance: Zero Seq. Method	
Enable periodic sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	0.00
High limit enabled	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low threshold	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.00
Deadband enabled	<input type="checkbox"/>
Deadband	0.00

The voltage and current imbalance for each phase from the average value for all three phases can be trended and limits set. The positive, negative and zero sequence components for voltage and current can be trended.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Imbalance**. The box enables the trending of values listed in Imbalance page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT THE JOURNAL ENTRY/ENTRIES TO CHANGE, highlight the parameter value you wish to

change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Threshold enable refers to the checkboxes opposite the limits. Each parameter has five threshold limits: **High-high, High, Low, Low-Low, and Deadband**.
 High-High limit - specifies an absolute limit for comparison that is higher than the high limit.
 High limit - specifies an absolute limit for comparison that is higher than the low limit.
 Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system.

All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Positive Sequence Voltage is detected to cross the threshold limit, then an event is recorded. If the Positive Sequence Voltage goes from out of limits to within limits (that is, below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded.

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13. Harmonics tab

Properties	Values
Enable Trending (This page)	
Harmonics (Harmonics, MHAIO)	<input checked="" type="checkbox"/>
Percent Eddy Current Loss	8.000
Maximum Demand Load Current	100.000
Select the journal entry/entries to change	
Voltage THD - Fund. Normalized (A-N)	Current THD - RMS Normalized (C)
Voltage THD - Fund. Normalized (B-N)	Current THD - RMS Normalized (N)
Voltage THD - Fund. Normalized (C-N)	Current TID - Fund. Normalized (A)
Voltage THD - Fund. Normalized (N-G)	Current TID - Fund. Normalized (B)
Voltage THD - RMS Normalized (A-N)	Current TID - Fund. Normalized (C)
Voltage THD - RMS Normalized (B-N)	Current TID - Fund. Normalized (N)
Voltage THD - RMS Normalized (C-N)	Current TID - RMS Normalized (A)
Voltage THD - RMS Normalized (N-G)	Current TID - RMS Normalized (B)
Voltage TID - Fund. Normalized (A-N)	Current TID - RMS Normalized (C)
Voltage TID - Fund. Normalized (B-N)	Current TID - RMS Normalized (N)
Voltage TID - Fund. Normalized (C-N)	Current Harmonic RMS (A)
Voltage TID - Fund. Normalized (N-G)	Current Harmonic RMS (B)
Voltage TID - RMS Normalized (A-N)	Current Harmonic RMS (C)
Voltage TID - RMS Normalized (B-N)	Current Harmonic RMS (N)
Voltage TID - RMS Normalized (C-N)	Current Interharmonic RMS (A)
Voltage TID - RMS Normalized (N-G)	Current Interharmonic RMS (B)
Voltage Harmonic RMS (A-N)	Current Interharmonic RMS (C)
Voltage Harmonic RMS (B-N)	Current Interharmonic RMS (N)
Voltage Harmonic RMS (C-N)	IT Product (A)
Voltage Harmonic RMS (N-G)	IT Product (B)
Voltage Interharmonic RMS (A-N)	IT Product (C)
Voltage Interharmonic RMS (B-N)	IT Product (N)
Voltage Interharmonic RMS (C-N)	Current Crest Factor (A)
Voltage Interharmonic RMS (N-G)	Current Crest Factor (B)
Voltage TIF - Fund. Normalized (A-N)	Current Crest Factor (C)
Voltage TIF - Fund. Normalized (B-N)	Current Crest Factor (N)
Voltage TIF - Fund. Normalized (C-N)	Current Total Demand Distortion (A)
Voltage TIF - Fund. Normalized (N-G)	Current Total Demand Distortion (B)
Voltage TIF - RMS Normalized (A-N)	Current Total Demand Distortion (C)
Voltage TIF - RMS Normalized (B-N)	K Factor (A)
Voltage TIF - RMS Normalized (C-N)	K Factor (B)
Voltage TIF - RMS Normalized (N-G)	K Factor (C)
Voltage Crest Factor (A-N)	K Factor (A)
Voltage Crest Factor (B-N)	Transformer Derating Factor (A)
Voltage Crest Factor (C-N)	Transformer Derating Factor (B)
Voltage Crest Factor (N-G)	Transformer Derating Factor (C)
Current THD - Fund. Normalized (A)	Total Phase Harmonic Power (A-N)
Current THD - Fund. Normalized (B)	Total Phase Harmonic Power (B-N)
Current THD - Fund. Normalized (C)	Total Phase Harmonic Power (C-N)
Current THD - Fund. Normalized (N)	Signed Phase Harmonic Power (A-N)
Current THD - RMS Normalized (A)	Signed Phase Harmonic Power (B-N)
Current THD - RMS Normalized (B)	Signed Phase Harmonic Power (C-N)
Enable periodic sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	0.000
High limit enabled	<input type="checkbox"/>
High limit	0.000
Low limit enabled	<input type="checkbox"/>
Low limit	0.000
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.000
Deadband enabled	<input type="checkbox"/>
Deadband	0.000

Harmonics are waveform distortion, a steady-state deviation from an ideal power frequency sinusoid and is characterized by the spectral content of the waveform. Many non-linear devices such as battery chargers, switching power supplies or transformers inject currents at harmonic (integer multiples of the fundamental) frequencies into the system.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Harmonics**. The box enables the trending of values listed in Harmonics page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SELECT JOURNAL ENTRY/ENTRIES TO CHANGE, various harmonic parameters can be trended using periodic readings that are stored in a journal. Harmonic distortion of voltage or current is calculated through a Fourier transformation of the waveform into harmonic magnitudes and phase angle spectra. These spectra are used to determine figures of merit such as total harmonic distortion (THD) and telephone influence factor (TIF). (See Appendix A *Quantities Calculated from Periodic Voltage and Current Measurements*)

The Encore Series Software/DataNode system allows simultaneous measurements of voltage and current so that harmonic power flow can be obtained. Depending on value parameters set, the program can record a sampling of the waveform synchronized to the fundamental frequency, to ensure accurate calculation of harmonic phase angles. The sampling rate is sufficient to determine up to the 50th harmonic or better. A comprehensive range of high and low limits can be enabled and individually set for each measured parameter.

Highlight the value parameter you wish to change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Each parameter has five threshold limits: **High-high, High, Low, Low-Low, and Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

For example, if the Voltage Harmonic rms is detected to cross the threshold limit, then an event is recorded. If the Voltage Harmonic rms goes from out of limits to within limits (that is, below the high limit minus the hysteresis and above the low limit plus the hysteresis), then the event is recorded. All activated Harmonic parameters and value settings defined can be viewed under the Real-time tab.

14. **Flicker** tab

Properties	Values
Enable Trending (This page)	
Flicker (Flicker, MFLKO)	<input checked="" type="checkbox"/>
Sample Intervals (minutes)	
Pst Sample Interval	10
Plt Sample Interval	180
Select the journal entry/entries to change	
Pst of last complete interval (A)	
Pst of last complete interval (B)	
Pst of last complete interval (C)	
Plt of last complete interval (A)	
Plt of last complete interval (B)	
Plt of last complete interval (C)	
Sliding window Plt calculation (A)	
Sliding window Plt calculation (B)	
Sliding window Plt calculation (C)	
Output 5-Pinst-peak value (A)	
Output 5-Pinst-peak value (B)	
Output 5-Pinst-peak value (C)	
Output 4-1 min TC LPF of Pinst (A)	
Output 4-1 min TC LPF of Pinst (B)	
Output 4-1 min TC LPF of Pinst (C)	
Output 3-square root of Pinst (A)	
Output 3-square root of Pinst (B)	
Output 3-square root of Pinst (C)	
LPF of Output 3 (A)	
LPF of Output 3 (B)	
LPF of Output 3 (C)	
Enable periodic sampling	<input checked="" type="checkbox"/>
High-High limit enabled	<input type="checkbox"/>
High-High limit	0.00
High limit enabled	<input type="checkbox"/>
High limit	0.00
Low limit enabled	<input type="checkbox"/>
Low threshold	0.00
Low-Low limit enabled	<input type="checkbox"/>
Low-Low limit	0.00
Deadband enabled	<input type="checkbox"/>

The Flicker page is an extended trending setup page unique to the 5560 DataNode. There are three flicker values available for trending: the Short term flicker or Pst, the long term flicker or Plt, and Plt calculated on a sliding window. Flicker is measured as per IEC 1000-4-15.

Under ENABLE TRENDING (THIS PAGE) is a checkbox in the value field opposite **Flicker** which enables the trending of values listed in this page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Under SAMPLE INTERVALS are two numeric edit controls: the **Pst Sample Interval** and the **Plt Sample Interval**. Pst Interval is used to set the Pst calculation interval. The default value is 10 minutes. Plt interval is used to set the Plt calculation interval. The default value is 120 minutes.

Under SELECT JOURNAL ENTRY/ENTRIES TO CHANGE, various flicker parameters can be trended using periodic readings that are stored in a journal.

Highlight the value parameter you wish to change then check the **Enable periodic sampling** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest.

Threshold enable refers to the checkboxes opposite the limits. Each parameter has five threshold limits: **High-high, High, Low, Low-Low**, and **Deadband**.

High-High limit - specifies an absolute limit for comparison that is higher than the high limit.

High limit - specifies an absolute limit for comparison that is higher than the low limit.

Low limit - specifies an absolute limit for comparison that is lower than the high limit.

Low-Low limit - specifies an absolute limit for comparison lower than the low limit.

Deadband limit - specifies how much a value can change before another event is recorded.

The High-High must be greater than High, Low-Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system. All limit values are used to determine if corresponding reporting or logging action should take place.

15. **Advanced Harmonics** tab

Properties	Values	
Enable Trending (This page)		
Advanced Harmonics (Individual, MHAIO)	<input checked="" type="checkbox"/>	
Trend harmonics for phase A	<input checked="" type="checkbox"/>	
Trend harmonics for phase B	<input checked="" type="checkbox"/>	
Trend harmonics for phase C	<input checked="" type="checkbox"/>	
Harmonics to Trend		
Phase Voltages	2-25	sample Harmonic values to trend
Neutral Voltages		
Phase Currents		
Neutral Current		
Interharmonics to Trend		
Phase Voltages	2-25	sample Interharmonic values to trend
Neutral Voltages		
Phase Currents		
Neutral Current		

The following parameters are found under ENABLE TRENDING (THIS PAGE): **Advanced harmonics (Individual)** and **Trend harmonics for phases A, B and C**. Opposite these parameters are checkboxes which enable the trending of values listed in Advanced harmonics page. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Voltage and current harmonics for each phase and neutral channel can be trended under HARMONICS TO TREND. Similarly, voltage and current interharmonics for each phase and neutral channel can also be trended

under INTERHARMONICS TO TREND. The value fields are left blank to allow the users to choose the numbers or the range of harmonic frequencies to trend.

Numbers can be entered individually with commas separating the numbers, or a range of harmonics can be specified using a dash between lower and upper values. Also, the suffix 'o' or 'e' can be used to specify only the odd or even harmonics, respectively, in a given range.

Resulting individual harmonic sampling and graphs can be seen in the Smart Trends folder under the Views tab.

16. Transducers tab

Properties	Values
Phase rotation	Normal (counter clockwise) {Normal (counter clockwise), Reverse (clockwise)}
Channel Mapping	
Phase A voltage	
Phase A current	
Phase B voltage	
Phase B current	
Phase C voltage	
Phase C current	
Neutral voltage	
Neutral current	
Signal is connected to	Channel 1
Channel is inverted	<input type="checkbox"/>
Transducer Ratios	
Phase A-N VT	
Phase B-N VT	
Phase C-N VT	
Neutral VT	
Phase A CT	
Phase B CT	
Phase C CT	
Neutral CT	
Phase A-B VT	
Phase B-C VT	
Phase C-A VT	
Transducer Primary	1.00000000
Transducer Secondary	1.00000000
Magnitude correction	1.00000000
Phase correction	0.00000000
DC offset	0.00000000

phase-to-neutral or phase-to-phase values displayed depend upon the Wiring Configuration set under the Basic tab

Transducers are typically PTs (potential transformers) and CTs (current transformers) that are used to interface the instrument to the power circuit. PTs allow the instrument to measure circuits that are not within the measurement range of the instrument. CTs measure the current of the circuit and convert it to within the measurement range of the instrument.

For **Phase rotation**, users can choose whether to have phasor shift clockwise or counterclockwise, depending on the way they have set up their system. Click the value field to display the drop down menu featuring Normal (counter clockwise) or Reverse (clockwise). Either orientation will yield the same mathematical calculations of voltage and current measurements. The 5560 is able to

automatically determine phase rotation of the voltage channels and then match up the current channels. The 5560 DataNode will swap voltage phases to ensure positive sequence phase rotation (counter clockwise according to IEEE definitions) and then swap and invert current channels to match.

Channel mapping is used to correct for errors in wiring the instrument to the circuit. If a mistake is made, such as an inverted CT or a phase is connected to the wrong channel, it can be corrected in software instead of changing the wiring to the instrument. Note that it is recommended that the actual wiring be changed but channel mapping can correct the problem if this is not practical.

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A channel-mapping array is provided to permit manual configuration of channel swapping and inversion. Under CHANNEL MAPPING, click on the corresponding voltage or current phase to show which channel the **Signal is connected to**. Click and enable the value field opposite **Channel is inverted to** as it applies.

The channel-mapping array works by specifying a numeric code in each array slot that indicates which phase is connected to the physical 5560 DataNode channel.

Normally, the channels and phases are matched as shown below. Channels can be swapped and/or inverted to correct recurring mistakes.

Voltage Phase A	Channel 1
Voltage Phase B	Channel 2
Voltage Phase C	Channel 3
Voltage Neutral	Channel 4
Current Phase A	Channel 5

Current Phase B	Channel 6
Current Phase C	Channel 7
Current Neutral	Channel 8

The DataNode employs two A/D converters to sample the voltage and current channels for a given phase simultaneously. Measurement errors may result if the voltage and current signals are not correctly paired.

Under TRANSDUCER RATIOS, users can set values for the **Transducer Primary** and **Transducer Secondary**. Values to account for any voltage or current transformers can be entered for each input channel. The primary and secondary values are entered. For example, if the primary voltage is 2400 volts and the secondary voltage is 120 volts, then those values should be entered. This gives an effective 20:1 reduction in voltage. When the input voltage to the DataNode is 120V, the displayed value will be 2400 volts. The **Phase correction** and **DC offset** values are not programmable.

17. Advanced tab

Properties	Values
Cross Triggering	
Broadcast Group ID	1234
Enable sending rms trigger	<input type="checkbox"/>
Enable responding to received rms trigger	<input type="checkbox"/>
Enable sending transient trigger	<input type="checkbox"/>
Enable responding to received transient trigger	<input type="checkbox"/>
Broadcast address - if empty, uses local	
Passwords	
User Account Password	*****
Admin Account Password	*****
InfoNode Access User ID	admin
InfoNode Access Password	*****
Firmware Access User ID	admin
Firmware Access Password	*****
One Time Operations	
Reset 302 default setup	<input type="checkbox"/>
Clear 332 database and reboot	<input type="checkbox"/>
Don't save data from next download	<input type="checkbox"/>
Clear last journal ID	<input type="checkbox"/>
One Time Firmware Operations	
CAUTION: These operations will copy new firmware to the DataNode	
Load IOP (302) firmware	<input type="checkbox"/>
Load ACP (332) firmware	<input type="checkbox"/>
Load both IOP (302) and ACP (332) firmware	<input type="checkbox"/>
Load both to all DataNodes	<input type="checkbox"/>

click to display drop down menu

Parameters under the Advanced tab allow the administrator or user to set up functions that affect communications, information access and download between the Encore Series Software and DataNode systems.

The 5560 can be configured to issue a UDP cross-trigger broadcast message when rms variation and/or transient event occurs. The 5560 can also be configured to listen for such messages and cause rms variation or transient recording to occur regardless of whether or not its own trigger conditions for that instrument were met. Under CROSS TRIGGERING, a **Broadcast Group ID** is assigned to allow for different groups of cross-trigger senders/recipients. The broadcast ID number in the Encore Series must match the broadcast group ID set under the TCP/IP parameter of the DataNode. The DataNode also uses this ID mechanism for multiple DataNode cross triggering and is guaranteed only on an un-routed network. The group ID is sent along with the broadcast message and only those receivers with the same

group ID will respond to the broadcast if so enabled. The broadcast address can be specified to send a broadcast to a directed address other than the local network if desired, but results cannot be guaranteed and data may be lost if the message takes too long to arrive at its destination.

Checkboxes are seen opposite the next four items **Enable sending rms trigger**, **Enable responding to received rms trigger**, **Enable sending transient trigger**, **Enable responding to received transient trigger**. The user specifies which event types are generated and/or listened for through these checkboxes. When said parameters are activated, the system in effect utilizes trigger messages as trip signals. If **Broadcast address is empty**, message broadcast is routed through the local network. The user specifies a group ID and optionally a broadcast address.

Access privileges are determined under PASSWORDS. The passwords entered in the Encore Series system must match the ones stored under the Password section of the

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DataNode. Otherwise, access to information may be denied. The **User Account Password** and **Admin Account Password** refer to two different user categories. An Admin User can create and add an account for a new Basic User. Both Admin and Basic users can assign properties such as their own user name and password. Refer to the Users section on Chapter 7 *Setup Page* for more details on this.

The default **Encore Series Access User ID** is 'admin'. This has a matching valid **Encore Series Access Password**. The default password is 'password'. These parameters allow access to view and change information in the Encore Series system. The default **Firmware Access User ID** is 'admin'. This also has a matching valid **Firmware Access Password**. These parameters allow access to view and change information in the DataNode system. To change passwords, simply click on the Password value fields. A confirmation window appears everytime you click on the password value field. The window asks whether you want to change and save a new password.

Parameters are also available for ONE TIME OPERATIONS on the 5560 DataNode. These one time procedures include configuring the DataNode to its default settings and/or clearing memory space by rebooting. Observe caution in undertaking these procedures since they cannot be undone. To return to the default DataNode settings, activate the **Reset 302 default setup** value field. To clear old data and reboot DataNode, activate the **Clear 332 Database and reboot** value field. To save memory space, the

administrator or user may choose to activate **Don't save data from next download**. To discard the most recent journal ID entries, activate the **Clear last journal ID** value field.

Finally, parameters for downloading new or updated firmware are available under ONE TIME FIRMWARE OPERATIONS. A firmware is a program or instruction stored in Flash memory which implements the communications interface and data acquisition between the outside world and the instrument. Based on the parameters available, the administrator or user can activate value fields to **Load IOP firmware** or to **Load ACP firmware** or to **Load both IOP and ACP firmware**. The IOP and ACP firmware are two different sets of firmware. The IOP communicates directly with the Encore Series, while the ACP is comprised of the host CPU and DSP. If the value fields are activated, new firmware is downloaded on demand from Encore Series to DataNode. New firmware is downloaded automatically if the boot ROM finds that the existing firmware in the DataNode is missing or corrupt. The administrator or user also has the option to **Load Both (IOP and ACP) firmware to all DataNodes**. Download is accomplished using the standard Internet File Transfer Protocol (FTP). The DataNode must be connected to the network where the updates are to be extracted from to ensure a successful download. Since these one time operations cannot be undone, observe caution when performing download firmware procedures.

18. Accumulator Resets tab

Properties	Values
Demand Resets	
Reset Real Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Reactive Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Apparent Power, DMD, total (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (A) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (B) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (C) (Never reset)	<input type="checkbox"/>
Reset Peak Current Demand (N) (Never reset)	<input type="checkbox"/>
Reset Average Peak Current Demand (Never reset)	<input type="checkbox"/>
Reset All Values	<input type="checkbox"/>
Energy Accumulators	
Reset Phase Energy (Never reset)	<input type="checkbox"/>
Reset Total Energy (Never reset)	<input type="checkbox"/>
Reset Integrated Reactive Power (Never reset)	<input type="checkbox"/>
Reset Total integrated Reactive Power (Never reset)	<input type="checkbox"/>
Reset Forward fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Reverse fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Forward tot. fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Reverse tot. fund. freq. WHrs (Never reset)	<input type="checkbox"/>
Reset Forward fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Reverse fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Forward tot. fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Reverse tot. fund. freq. VarHrs (Never reset)	<input type="checkbox"/>
Reset Fundamental freq. V A Hours (Never reset)	<input type="checkbox"/>
Reset Total Fund. freq. VA Hours (Never reset)	<input type="checkbox"/>

In connection with electric utility billing practices, the Encore Series Software and DataNode system has an interface to reset demand and energy accumulation readings. The Accumulator Resets tab allows one to reset the parameters to defined values, but not to change or configure new values. The notation 'Never reset' appears to mean that the parameter values register original readings and have never been reset at any time. The moment the reset parameter is activated/enabled, the notation will change and will reflect the date and time of last reset.

Under DEMAND RESETS, Real or True Phase power demand, Reactive power demand, and Apparent power demand can be reset. See Appendix G *Glossary* for the definitions of the various power parameter values. The system maintains a running maximum known as "peak demand" on per phase basis and per average demand current value. It also stores the date and time of each peak

demand. Peak demand is the maximum electrical power load consumed or produced in a defined period of time. Under ENERGY ACCUMULATORS, the system calculates and stores accumulated values for energy (in kWhr unit), reactive energy (in kVarH unit), and apparent energy (in kVAH unit). Kilowatt-Hour (kWhr) is the equivalent energy supplied by a power of 1000 watts for one hour. Watt is the unit for real power. Kilovar-hour (kVarH) is equal to 1000 reactive volt-ampere hours. Var is an abbreviation for volt ampere reactive. It measures the integral of the reactive power of the circuit into which the instrument is connected. Var is the unit for reactive power. Kilovolt-ampere (kVA) is equivalent to 1000 volt-amperes. VA is the unit for apparent power. Apparent power is the product of voltage and current of a single-phase circuit in which the two reach their peaks at different times. See Appendix G *Glossary* for the definitions of the various power parameter values.

10 5560 QOS DataNode Setup

The accumulated energy values include real power factor (average three-phase) which is mathematically defined as "demand kW/demand kVA". It also displays integrated and total integrated reactive power. The system also calculates and stores apparent energy (VA). Real Power (W) and Apparent Power (VA) are reset together; you cannot reset one without resetting the other. Likewise, the Watthour Meter and Varhour Meter are reset together.

The system uses the fundamental frequency as reference for calculating energy values in one of two modes: forward or reverse. In forward mode, the circuit monitor considers

the direction of power flow, allowing the accumulated energy magnitude to both increase and decrease. In reverse mode, the circuit monitor accumulates energy as positive, regardless of the direction of power flow. In other words, the energy value increases, even during reverse power flow. The default accumulation mode is reverse.

EN50160 Compliance Default Trending Setup

PARAMETERS	TAB WHERE FOUND	STATUS	DEFAULT VALUES & COMMENTS
Total Fund Freq Q	ADV. ENERGY	OFF	
Fund Freq VA Hrs	ADV. ENERGY	OFF	
Fwd Fund Freq varHrs	ADV. ENERGY	OFF	
Fwd Fund. Freq WHrs	ADV. ENERGY	OFF	
Rvs Fund Freq varHrs	ADV. ENERGY	OFF	
Rvs. Fund. Freq. WHrs	ADV. ENERGY	OFF	
Rms Current Individual Harmonics	ADV. HARMONICS	OFF	
Rms Voltage Individual Harmonics	ADV. HARMONICS	ON	2-25 for Va,Vb,Vc. Limits per table.
Arith. Sum PF	ADV. METER	OFF	
Arithmetic Sum DF	ADV. METER	OFF	
Arithmetic Sum VA	ADV. METER	OFF	
Displacement Power Factor	ADV. METER	OFF	
Fund Arithmetic Sum VA	ADV. METER	OFF	
Fund Vector Sum VA	ADV. METER	OFF	
Vector Sum DF	ADV. METER	OFF	
Vector Sum PF	ADV. METER	OFF	
Vector Sum VA	ADV. METER	OFF	
Residual Current	ADV. METER	OFF	
Net Current	ADV. METER	OFF	
Active Power Demand	DEMAND	ON	is TOTAL only
Apparent Power Demand	DEMAND	ON	is TOTAL only
Avg PF @ Peak P Dmd	DEMAND	OFF	
Avg PF @ Peak Q Dmd	DEMAND	OFF	
P Dmd @ Peak Q Dmd	DEMAND	OFF	
P Dmd @ Peak S Dmd	DEMAND	OFF	
Peak Active Power Demand	DEMAND	OFF	
Peak Apparent Power Demand	DEMAND	OFF	
Peak Demand Current	DEMAND	OFF	
Peak Reactive Power Demand	DEMAND	OFF	
PF @ Peak VA Dmd	DEMAND	OFF	
PF Demand	DEMAND	OFF	
Predicted P Dmd	DEMAND	OFF	
Predicted Q Dmd	DEMAND	OFF	
Predicted VA Dmd	DEMAND	OFF	
Q Dmd @ Peak P Dmd	DEMAND	OFF	
Q Dmd @ Peak VA Dmd	DEMAND	OFF	
Reactive Power Demand	DEMAND	ON	is TOTAL only
Rms Current Demand	DEMAND	OFF	
VA Dmd @ Peak P Dmd	DEMAND	OFF	
VA Dmd @ Peak Q Dmd	DEMAND	OFF	
ANSI Transformer Derating Factor	HARMONICS	OFF	
Current Crest Factor	HARMONICS	OFF	
Current THD	HARMONICS	OFF	
Current THD (Rms)	HARMONICS	ON	A,B,C,TOT. no limits
Current TID	HARMONICS	OFF	

10 5560 QOS DataNode Setup

EN50160 Compliance Default Trending Setup

PARAMETERS	TAB WHERE FOUND	STATUS	DEFAULT VALUES & COMMENTS
Current TID (Rms)	HARMONICS	OFF	
Harmonic Power	HARMONICS	OFF	
HRms Voltage	HARMONICS	OFF	
IEEE 519 Current TDD	HARMONICS	OFF	
Interharmonic Rms Current	HARMONICS	OFF	
Interharmonic Rms Voltage	HARMONICS	ON	2/3 thru 24/25, Va,Vb, Vc. Limits per table.
IT Product	HARMONICS	OFF	
Rms Harmonic Current	HARMONICS	OFF	
Transformer K Factor	HARMONICS	OFF	
Voltage Crest Factor	HARMONICS	OFF	
Voltage THD	HARMONICS	OFF	
Voltage THD (Rms)	HARMONICS	OFF	
Voltage TID	HARMONICS	OFF	
Voltage TID (Rms)	HARMONICS	OFF	
Voltage TIF	HARMONICS	OFF	
Voltage TIF (Rms)	HARMONICS	OFF	
V RMS Harmonic	HARMONICS	OFF	
I Imbalance (rms/rms avg)	UNBALANCE	OFF	
I Imbalance (S0/S1)	UNBALANCE	OFF	
I Imbalance (S2/S1)	UNBALANCE	OFF	
Negative Sequence Current	UNBALANCE	OFF	
Negative Sequence Voltage	UNBALANCE	ON	Is TOTAL only. No limit
Positive Sequence Current	UNBALANCE	OFF	
Positive Sequence Voltage	UNBALANCE	ON	Is TOTAL only. No limit
V Imbalance (rms/rms avg)	UNBALANCE	OFF	
V Imbalance (S0/S1)	UNBALANCE	OFF	
V Imbalance (S2/S1)	UNBALANCE	ON	Is TOTAL only. Limits per table.
Zero Sequence Current	UNBALANCE	OFF	
Zero Sequence Voltage	UNBALANCE	ON	Is TOTAL only. No limit
Active Power	METER	OFF	
Apparent Power	METER	OFF	
Frequency	METER	ON	Is TOTAL only. Limits per table.
Reactive Power Demand	METER	OFF	
V/I Angle	METER	OFF	
True Power Factor	METER, ADV. METER	ON	Total, no limits.
Var Hours	REVENUE	OFF	
Watt Hours	REVENUE	OFF	
Rms Current	RMS VARIATION, TRANSIENTS, METER	OFF	
Rms Voltage	RMS VARIATION	ON	For Va, Vb, Vc: Low and High to 90 and 110%. All related values per 5530 defaults.
Transient Voltage	TRANSIENTS	ON	For Va, Vb, Vc: Waveshape 10%/10%; Crest set to 200%.
Rms Voltage	METER	ON	For Va, Vb, Vc : H-Hi to 150%; Hi to 115%; Lo to 85%; Lo-Lo to 1%, Deadband off.

5571/5571S DataNode Setup

Refer to the DataNode 5571/5571S User's Guide for more detailed information about connections and setups.



A 5571S DataNode

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.

The screenshot displays the DRANETZ BMI ENCORE SERIES software interface. The left sidebar shows a tree view with categories like Regional Settings, AnswerModule, Basic Characterizer, EN50160, Energy Usage, kvar change observer, Radial Fault Location, RBM, UPS Verification, DataNodes, and Help Desk. The 'DataNodes' category is expanded, showing various DataNode types, including '5571 DataNode' and '5571 Template'. The main window shows the 'Template Setup' tab for the '5571 Template'. The 'Properties' section includes 'Identification Information' with fields for 'Name' (5571 Template) and 'Description'. Below this is a table listing associated DataNodes with checkboxes:

DataNode	Associated
Edison 5571	<input checked="" type="checkbox"/>

At the bottom, there are tabs for 'Template', 'Basic', 'Memory', 'Thresholds', and 'Advanced'. A 'Save Setup' button is located at the bottom left of the main window.

11 5571 DataNode Setup

DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates .

The screenshot shows the DRANETZ BMI ENCORE SERIES software interface. The left sidebar contains a tree view with the following structure:

- Regional Settings
 - AnswerModule
 - Basic Characterizer
 - EN50160
 - Energy Usage
 - kvar change observer
 - Radial Fault Location
 - RBM
 - UPS Verification
- DataNodes
 - 5530/5520 DataNode
 - 5540 DataNode
 - 5560 DataNode
 - 5571 DataNode
 - 5571 Template
 - Edison 5571
 - 61000 Power Quality DataNode
 - ADAM DataNode
 - GEKV DataNode
 - Modbus
 - PQDIF Import
- Help Desk
 - Setup Topics
 - Index

The main pane shows the 'Properties' tab for the '5571 DataNode'. The 'Identification Information' section contains the following fields:

Properties	Values
Identification Information	
Name	Edison 5571
Description	
Serial Number	7100UA53
Version	4H
Status Information	
Health	System health is normal
Communication status	idle
Last poll at	03/28/2006 23:06:05
Next poll at	03/28/2006 23:07:00
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5571 Template

The 'Template' dropdown menu is open, showing the following options:

- None
- 5571 Template

The bottom of the window shows a 'Save Setup' button and a copyright notice: Copyright © 1999-2006 Dranetz BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.

Programming Standard Tabs

LEGEND (Please note the following conventions used in the screen displays):

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings unless there are applications which require advanced setups.

1. Identification and Status tab

Properties	Values
Identification Information	
Name	Edison 5571
Description	
Serial Number	7100UA53
Version	4H
Status Information	
Health	System health is normal
Communication status	Idle
Last poll at	03/28/2006 23:06:05
Next poll at	03/28/2006 23:07:00
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	5571 Template {None, 5571 Template}

The Identification and Status tab contains identification and health status description of the DataNode.

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series Software.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not. It also includes status of Encore Series Software to DataNode **Communications**.

Polling Status is also displayed, indicating when the Encore Series Software last requested data from the DataNode and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

11 5571 DataNode Setup

2. Communication tab

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input checked="" type="checkbox"/>
Direct and dialup serial connections are supported. Address strings are of the form DIAL/ID where DIAL is the phone number (ignored for direct connections) and ID is the unit id number (0-99).	
Connection	COM1
Address	/1

COMMUNICATION parameters for 5571 DataNode include the following:

Active which indicates whether communications between the Encore Series Software and DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series Software.

Connection can be through Serial Port COM 1 thru COM 255 (Hardware or Virtual ports) or Modem as installed and recognized by the Windows operating system.

Address must be a unique address between 1 and 99 for each DataNode. However, if only one DataNode is connected to the COM port and the present address is unknown, zero (0) can be used. If the connection is via Modem as opposed to Serial Port, then the telephone number would be entered before the “/” separating the device address.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	01/01/2006 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>
Update DataNode firmware	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include a **Download and store data** check box to enable the Encore Series to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include check boxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series; **Delete data in DataNode** - use to remove stored data in the DataNode; and **Update DataNode firmware** - use to update DataNode firmware with the version stored on the Encore Series.

11 5571 DataNode Setup

4. Basic tab

Properties	Values
Display	
Display thresholds as:	Percent {Volts, Per Unit, Percent}
Input	
Low Neutral Range	<input type="checkbox"/>
Power Type	Three Phase Wye {Single Phase, Split Single Phase, Three Phase Wye, Three Phase Delta}
Input Frequency (Hz.)	60 {50, 60}
Base Voltage (Vrms)	208.0
Voltage A - Transformer Ratios	
Primary	1.000
Secondary	1.000
Current A - Transformer Ratios	
Primary	1.000
Secondary	1.000
Voltage B - Transformer Ratios	
Primary	1.000
Secondary	1.000
Current B - Transformer Ratios	
Primary	1.000
Secondary	1.000
Voltage C - Transformer Ratios	
Primary	1.000
Secondary	1.000
Current C - Transformer Ratios	
Primary	1.000
Secondary	1.000
Voltage N - Transformer Ratios	
Primary	1.000
Secondary	1.000
Current N - Transformer Ratios	
Primary	1.000
Secondary	1.000

BASIC Setup contains data on Display, Input, and Registers.

DISPLAY parameters include:

- Display Thresholds as:** to display parameters in either volts, percent, or PU (per unit)

INPUTS parameters include:

- Low Neutral Range:** check box to enable Low Range on Neutral Voltage Channel

•**Power Type:** sets the wiring configuration to either single phase, split phase, 3 phase delta, 3 phase wye

•**Input Frequency (Hz):** either 50 or 60 Hz

•**Base Voltage:** needed if using percent or per unit

TRANSFORMER RATIOS include:

•**PT Ratios:** if the voltage inputs are connected to an external PT, enter the primary and secondary values

•**CT Ratios:** if the current inputs are connected to an external CT, enter the primary and secondary values

5. Memory tab

Properties	Values
Waveform Changes	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	10
Cycles Before	1
Cycles After	4
Rms Events	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	46
Cycles Per Sample	1
Max. Event Duration (samples)	512
Cycles To Trigger	1
Cycles To End	1
Impulses	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	4
Cycles Before	1
Cycles After	1
Snapshots	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	9
Interval (sec.)	10860
Timeline	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	19
Interval (sec.)	900
Demand Report	
Enabled	<input checked="" type="checkbox"/>
Memory allocated (%)	12
Demand Interval (min.)	15 {1, 5, 15, 30, 60}
Sliding Interval (min.)	15 {1, 5, 15, 30, 60}

MEMORY Setup allocated memory along with number of cycles captured to different types of events.

WAVEFORM CHANGES parameters include:

- Enabled:** Waveshape (distortion) enabled check box
- Cycles Before:** number of cycles before (typically 1)
- Cycles After:** number of cycles after (typically 4)

RMS EVENTS parameters include:

- Enabled:** RMS variation enabled check box
- Cycles per Sample:** cycles per measurement sample (typically 1)
- Max. Event Duration (samples):** maximum event duration (typ. 512)
- Cycles to Trigger:** cycles to trigger (typ. 1)
- Cycles to End:** cycles to end (typ. 1)

IMPULSES parameters include:

- Enabled:** Impulses (transients) enabled check box

- Cycles Before:** cycles before (typ. 1)

- Cycles After:** cycles after (typ. 1)

SNAPSHOTS parameters include:

- Enabled:** Snapshot (waveforms) enabled check box
- Interval (sec.):** interval between recording in seconds (typ. 10860)

TIMELINE parameters include:

- Enabled:** Timeline (steady state min/max/avg) enabled check box
- Interval (sec.):** interval between recording in seconds (typ. 900)

DEMAND REPORT parameters include:

- Enabled:** Demand report (power) check box enabled
- Demand Interval (min.):** demand interval in minutes (typ. 15)
- Sliding Interval (min.):** sliding demand interval in minutes (typ. 15)

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6. Thresholds tab

Properties	Values
Waveform Changes	
Voltage (Percent)	5.7
Duration (% of cycle)	10
Rms Events	
Rms Event - Voltage A	
Swell (Percent)	66.3
Sag (Percent)	51.9
Rms Event - Voltage B	
Swell (Percent)	63.4
Sag (Percent)	51.9
Rms Event - Voltage C	
Swell (Percent)	63.4
Sag (Percent)	51.9
Rms Event - Voltage N	
Swell (Percent)	110.0
Impulses	
Peak Voltage (Vpk)	200.0

Thresholds Setup provides you with the ability to set limits for triggering of various parameters. Values entered are based on the display settings under the Basic tab (volts, percent, or per unit).

WAVEFORM CHANGES parameters include:

- Voltage:** waveshape faults voltage variation from previous cycle (typ 8%)
- Duration:** duration or window over which to compare against in % of cycle (typ. 10)

RMS EVENTS parameters include Rms Events on per phase basis:

- Swell** (hi limit, typically 110%)
- Sag** (low limit typically 90%)

IMPULSES parameter consists of:

- Peak Voltage (Vpk):** Impulse in volts peak (typ. 200)

7. Advanced tab

Properties	Values
New Device Address	1
UPS Duration (sec.)	300
Showing check sum error?	<input type="checkbox"/>
Send cal. on next connect?	<input type="checkbox"/>
5571 GPS option installed?	<input type="checkbox"/>

Advanced Setup provides you with the ability to set limits to setup other functions such as UPS time, not previously described.

•**New Device Address:** must be a unique address between 1 and 99 for each DataNode. If more than one DataNode is to be connected on the same port, they should be added one at a time. Trying to connect to multiple units with the default address of 1 would not be successful.

•**UPS Duration (sec.):** typ 300

•**Showing check sum error?:** check box to enable such in log

•**Send calibration on next connect?:** check box to enable such from DataNode to Encore Series Software

•**5571 GPS option installed?** check box for response if true

11 5571 DataNode Setup

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This chapter shows the procedures on how to set up the 61000 Digital Input DataNode. It covers the following topics:

Overview

Template and DataNode Tabs

Where Data for Programmed Settings Appear Programming the Tabs

Overview

The 61MDIS (61000 series, module, digital, input, screw terminals) is an eight channel, digital input module, providing the user with the capability to monitor on/off-type digital signals, such as breaker or switch position indicators. The functionality of the inputs can be configured on a channel basis to also provide pulse counting, KYZ metering, or start/stop monitoring control.

The Meter screens will report the present state of the inputs. Trends and Events timeplots will indicate the signal level at either 1 or 0 state at the time of data storage, as will waveform data. There is no min/max/average value, just the instantaneous value.

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Below is a list of the various 61000 Digital Template and Digital DataNode tabs available and the programmable setups found in each tab. Template settings look and work just like actual DataNode settings. The Input Configuration setup parameters are part of the template. While setup values on other non-template tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by changes to the Templates.

Template tab (available in Template setup only) - features template Name and Description, and allows users to select which DataNode to associate with the template settings.

Identification and Status tab (available in DataNode setup only) - features Identification and Status information of a specific DataNode, Polling status, and Template selection.

Communication tab (available in DataNode setup only) - features parameters to enter Connection type and Address to establish communication between the Encore Series Software and DataNode.

Polling tab (available in DataNode setup only) - features parameters to schedule when Encore Series Software can poll the DataNode for new data, retrieve and/or delete data stored in DataNode, and update DataNode firmware version.

Input Configuration tab (available in Template setup and DataNode setup) - allows users to select what function each of the eight digital channels will perform, the channel name or descriptor, which physical channel maps to a displayed channel, debounce time or how long the signal must be in the next state before becoming valid, which transition is used in the function, and how often the date is journalled.

Change of State tab (available in Template setup if one or more input channel/s is set to COS (Change of State); also available in DataNode setup) - the 61000 Digital Input DataNode can be programmed to record events that occur on a change of state (edge-triggered).

Counters tab (available in Template setup if one or more input channel/s is configured as Counter; also available in DataNode setup) - this tab only appears when one or more channel/s is programmed as such.

Cross-Triggering tab (available in Template setup and DataNode setup) - digital cross triggers are initiated with a Change of State only and only the status of state is recorded when a digital module responds to a cross trigger. The user may determine what type of cross trigger is initiated for a Change of State and what type of cross trigger will cause the digital module to record its status of state. Cross triggering can also initiate one of the analog modules to cause either an equivalent rms or transient event recording.

Template Setup tabs

Template - You can set the name and description of the template from the Template setup tab shown below. This tab contains a list of DataNodes of the same type as the template. Use the check box if you want to associate the template with the respective DataNode. Template setup values are configured in the Input Configuration tab (see bottom screen). The template for Digital DataNodes also has the Cross-Triggering tab where you can configure cross-trigger Communication parameters (Group ID and Address) and Change of State event messaging when applicable. The COS (Change of State) tab or Counters tab only appear if one or more of the inputs is configured to be such.

Properties		Values
Identification Information		
Name	Substation Template	
Description		
Mark each of the DataNodes that are to be updated when a change is made to this template. Note: marking a DataNode causes all of its DataNode specific settings to be updated; however, when a template's settings are changed only the changed settings are updated on the associated DataNodes.		
SubStation Digital Relay Demo	<input checked="" type="checkbox"/>	

check box to
associate
template with
DataNode

Input Configuration - All setup parameters for Input Configuration tab are part of the template. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.

Properties		Values
Channels (select the channel(s) to change)		
D1		
D2		
D3		
D4		
D5		
D6		
D7		
D8		
Channel name	D1	
Function	Change of state	
Input	Unused	
Active state	Change of state	
Debounce time (microseconds)	Counter reset	
	Counter	
Journaling Setup (for all appropriate channels)		
Journaling interval	10 minutes	

61000 Digital DataNode Setup 12

This chapter provides a detailed discussion of the functionalities in each of the 61000 Digital DataNode setup tab.

Where Data for Programmed Settings Appear

The Encore Series Software/DataNode is designed to provide programming support as well as data display. The software setup page is where the parameters and value settings are programmed. The programmed parameters and value settings are translated and displayed in meaningful data format under the Views page, Real-time page, and Reports page. Refer to the previous chapters for more details on the Views, Real-time, and Reports pages.

Programming the Tabs

LEGEND (Please note the following conventions are used in the screen displays):

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings unless there are applications which require advanced setups.

1. Identification and Status tab

Properties		Values
Identification Information		
Name	61DIN-SE	
Description		
Serial Number	Unknown	
Version	H:/V1.2.12, C:/V1.3.11	
Status Information		
Health	Normal	
Communication status	Idle	
Last contact at	11/28/2006 13:03:04	
Last poll at	11/28/2006 13:03:22	
Next poll at	11/28/2006 13:04:44	
Use the setting below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.		
Template	61000 Template {None, 61000 Template}	
Use the setting below to record annotations for this DataNode.		
Notes		

typically describes where DataNode is located

indicate when Encore Series was last contacted, the last requested data from DataNode, & when next data poll will take place

select template to associate DataNode settings

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series Software.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not.

It also includes status of Encore Series Software to DataNode **Communications**.

Contact and Polling Status are also displayed, indicating when the software was last contacted, when data was last requested from the DataNode, and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

12 61000 Digital DataNode Setup

2. Communication tab

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input checked="" type="checkbox"/>
A direct or on-demand network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).	
Connection	Local Area Network (LAN)
Address	15.4.2.154/2
User name	admin
Password	*****

enable to activate communication between DataNode and Encore Series Software

COMMUNICATION parameters for 61000 Digital DataNode include the following:

Active which indicates whether communications between the Encore Series Software and Digital DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the Encore Series. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series Software.

61000 Digital DataNode **Connection** has built-in standard support for Ethernet, RS232 and RS485 communications. Modem and GSM/GPRS communications are also available using external interfaces that are available from Dranetz. Encore Series Software supports all these methods of communications so users can choose what is appropriate for your application.

Encore Series Software can directly connect to, or be easily adapted for use with, virtually any network that

supports the TCP/IP Internet protocol. The RJ-45 connector allows for direct connection to most networks in use today. Other types of network like Fiber, coaxial (10Base2) or other, inexpensive off the shelf adapters should be available to connect to such networks.

Address is where the IP information for the specific DataNode is entered. Each 61000 DataNode is shipped from the factory with an IP Address. This IP Address is entered here. After typing in the IP address, enter a slash sign (/), followed by the number to represent which Virtual Analyzer within the same mainframe this setup is for. Start with 0 to indicate the first virtual analyzer, 1 for the second, 2 for the third, and/or 3 for the fourth.

User name and **Password** are the name and password for Encore Series Software to DataNode communications. The password is typically left at factory default. A wrong IP or password will result in DataNode communication error and users will not be able to access the particular DataNode.

NOTE: The password entered must match that of the DataNode.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	11/28/2006 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
When InfoNode and DataNode settings differ	send settings to the DataNode {get settings from the DataNode send settings to the DataNode}
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>
Update DataNode firmware	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series Software will poll the Digital DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include the following parameters: **When InfoNode and DataNode settings differ** allows users to match DataNode setups with those listed in the Encore

Series/InfoNode when configurations differ and/or communication errors occur; the **Download and store data** check box enables the Encore Series Software to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include checkboxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series Software; **Delete data in DataNode** - use to remove stored data in the DataNode; and **Update DataNode firmware** - use to update DataNode firmware with the version stored on the Encore Series Software.

12 61000 Digital DataNode Setup

4. Input Configuration tab

Properties	Values
Channels (select the channel(s) to change)	
Overcurrent Trip	
Trip Counter	
D3	
D4	
D5	
D6	
D7	
D8	
Channel name	Overcurrent Trip
Function	Change of state {Unused, Change of state, Counter reset, Counter, KYZ counter (A), KYZ counter (C), KYZ counter (Q), Frequency monitor}
Input	I1 {I1, I2, I3, I4, I5, I6, I7, I8}
Active state	All transitions {Low to high transitions, High to low transitions, All transitions}
Debounce time (microseconds)	5
Journaling Setup (for all appropriate channels)	
Journaling interval	1 second {1 second, 1, 2, 3, 5, 10, 15, or 60 minutes}

Model 61000 has eight digital input channels labeled A, B, C, D, E, F, G, H. Users must turn on any input channel to be used for monitoring. If a channel is not turned on, no data will be collected for it. *Refer to the Encore Series 61000 Installation Guide for more information on Series 61000 setup and configuration.*

The Encore Series Software has a user interface for Input Configuration, giving users the ability to select channel input/s to change. Users can enter up to 32 alphanumeric characters for each digital input **Channel name** or descriptor of channel represented.

Each channel can be independently set to **Function** as either a change of state detector, a counter, a counter reset (back to count=0), a frequency monitor, or be considered unused. See page 12-7 if digital channel is set to function as Change of state detector. See page 12-8 if channel function is set as a Counter.

Input maps the physical channel to the displayed channel to correct wiring mistakes. Input channel mapping is used to correct for errors in wiring the instrument to the circuit. If a

mistake is made, for example a phase is connected to the wrong channel, it can be corrected in the software instead of changing the wiring to the instrument.

NOTE: It is recommended that the actual wiring be changed, but input channel mapping can correct the problem if this is not practical.

Each digital channel can be individually labeled, is triggerable, and the transition set from low-to-high state, high-to-low state, or either. **Active state** determines on which transition the function will be applied, such as when to count to the next number or when to record a trigger as a change of state, from low to high, high to low, or either.

Debounce time (microseconds) refers to the 'n' sample intervals of "dead time" before looking for the next valid transition, ranging from 0 to 9999 microseconds.

The **Journaling interval** menu allows users to set the interval to save the min/max/avg (where applicable) to either 1second, 1, 2, 3, 5, 10, 15, 60 minutes.

5. Change of State tab

Properties	Values
Channels (select the channel(s) to change)	
Overcurrent Trip	
Enable triggers	<input checked="" type="checkbox"/>
Enable trending	<input checked="" type="checkbox"/>

The 61000 Digital DataNode can be programmed to record events that occur on a change of state (edge-triggered). The Change of State tab only appears if one or more channels is programmed as such.

Highlight the individual channel/s under CHANNELS (SELECT THE CHANNEL/S TO CHANGE) that you

wish to trend. Then check the **Enable triggers** and/or **Enable trending** box. This enabling property signals that data for the selected channel is to be monitored and stored. The checkboxes enable the trending of values listed in the page. If the boxes are not checked, the settings are persisted but not in effect.

12 61000 Digital DataNode Setup

6. Counters tab

Properties	Values
Channels (select the channel(s) to change)	
Trip Counter	
Reset channel	None
Scale factor	1000
Offset	0
Quantity measured	Power
Characteristic	Real
Units	W
Phase	Generic
Enable trending	<input checked="" type="checkbox"/>
Enable limit checking	<input checked="" type="checkbox"/>
Very high	
High	
Low	
Very low	
Deadband	

The Counters tab only appears when one or more channel/s is programmed as such.

The CHANNELS (SELECT THE CHANNEL/S TO CHANGE) shows for which channel the counter parameters are set.

A transition of a channel programmed as **Reset Channel** will clear the counter values of all channels programmed as Counters.

Scale factor specifies the number used to scale the value read from the digital module to the value you wish to record. This depends on the transducers that are measuring the real signal. For instance, a flow sensor might output 5 counts per liter. If the unit is measured in liters, the scale would be 1/5 or .20.

The **Offset** field allows an offset to be applied to the signal measured from the digital module. This value must be specified in scaled units.

Quantity measured, **Characteristic** and **Units** are used to define the channel type in the Encore Series database. Selection from these properties allow the Encore Series Software to group the channel with the appropriate channels during selection, and allow some reports to include the signals measured in more meaningful ways.

Sample property values are Power (for Quantity measured), Real (for Characteristic), and W (for Units). The next field allows you to select the appropriate **Phase** setting that you wish to change. The limit values can be enabled and programmed individually for each phase and phase-to-phase setting.

The **Enable trending** box allows trending of values listed in this Counter page. If the box is checked, the settings on the page go into effect. If the box is not checked, the settings are persisted but not in effect.

High and low limits can also be enabled and individually set for each selected channel. Check the **Enable limit checking** box, then enter the value for the five threshold limits in the fields below.

Very high - specifies an absolute limit for comparison that is higher than the high limit.

High - specifies an absolute limit for comparison that is higher than the low limit.

Low - specifies an absolute limit for comparison that is lower than the high limit.

Very low - specifies an absolute limit for comparison that is lower than the low limit.

Deadband - specifies how much a value can change before another event is recorded.

7. Cross-Triggering tab

Properties	Values
Communication Configuration (common to all messages)	
Broadcast group ID	1234
Broadcast address (empty for local)	192.168.0.255
1 – Change of State Event Message Configuration	
Send this message when a channel 1 – Change of State event is detected	8 (default for RMS events) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}
Record a channel 1 – Change of State event when this message is received	0 (default for Transient events) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}

The 61000 Digital DataNode can be configured to issue a UDP (cross trigger) broadcast message when a Change-of-State event occurs. A digital cross trigger is initiated with a Change of State only, and only the Status of State is recorded when a digital module responds to a cross trigger.

Under COMMUNICATION CONFIGURATION, a **Broadcast group ID** is used to determine what group of digital modules will react together so that only those receivers with the same group ID will respond to the broadcast if so enabled. The group ID can be any number between 1 and 9999. With this number you can split the DataNodes into groups.

The broadcast ID number in the Encore Series Software must match the broadcast group ID set under the TCP/IP parameter of the Datanode. The DataNode also uses this ID mechanism for multiple DataNode cross triggering, and is guaranteed only on an un-routed network. The group ID is sent along with the broadcast message and only those receivers with the same group ID will respond to the broadcast if so enabled.

The **Broadcast address** is the address of the network on which the cross triggers are to be broadcast. This address acts like a mask and is typically the local address in which the Encore system is deployed on. In the sample screen shown above, all units with IP address starting

with 192.168.0.xxx can respond to the cross trigger. Users can specify to send a broadcast to a directed address other than the local network i.e. across a router, if desired. However, results cannot be guaranteed and data may be lost if the message takes too long to arrive at its destination. UDP **Broadcast address (empty for local)** is typically not routed and only works on the local network.

The next parameters allow users to determine what type of cross trigger is initiated and what type of cross trigger will cause the digital module to record its status of state. For example, in the Cross Triggering tab shown above, suppose you chose to initiate a rms cross trigger on an analog module for a digital event and respond to a transient cross trigger from an analog module with a digital recording.

Under 1-CHANGE OF STATE EVENT MESSAGE CONFIGURATION, the range of values that can be entered is between 0 to 15. **Send this message when a channel 1 - Change of State event is detected** enables the sending of the rms cross trigger. The default ID value for rms cross trigger is 8. **Record a channel 1 - Change of State event when this message is received** enables the DataNode to respond to received transient cross trigger. The default ID value for receiving rms cross trigger is 0.

12 61000 Digital DataNode Setup

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This chapter shows the procedures on how to set up the 61000 Power Quality (PQ) DataNode. It covers the following topics:

Template and DataNode Tabs

Where Data for Programmed Settings Appear
Programming the Tabs

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-41) and *Using the Template Function in DataNode Setup* (page 7-44) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Below is a list of the various 61000 PQ Template and PQ DataNode tabs available and the programmable setups found in each tab. Template settings look and work just like actual DataNode settings. All of the DataNode setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by changes to the Templates.

The list also notes which tabs are trending pages. A trending page contains an enable/disable checkbox which allows trending of values listed on that page. All trending pages are displayed and the enabling checkboxes can be found in the individual tabs.

Template tab (available in Template setup only) - features template Name and Description, and allows users to select which DataNode to associate with the template settings.

Identification and Status tab (available in DataNode setup only) - features Identification and Status information of a specific DataNode, Polling status, and Template selection.

Communication tab (available in DataNode setup only) - features parameters to enter Connection type and Address to establish communication between the Encore Series Software and DataNode.

Polling tab (available in DataNode setup only) - features parameters to schedule when Encore Series Software can

poll the DataNode for new data, retrieve and/or delete data stored in DataNode, and update DataNode firmware version.

Input Configuration tab - allows users to select channel input/s to change, set current probe and circuit type, configure nominal values for threshold settings, and set parameters for frequency tracking.

Rms Variations tab - features Limit, Pre- and Post-Event Captures, Rms Variations Sampling Intervals, and Intervals data.

Transients tab - features Cycle Counts and Individual Channels/Parameters data.

Waveform Capture tab - allows users to set the trigger channels/ parameters for waveform capture.

Power tab - this trending page features checkboxes to Enable Trending of power parameters and to Select the journal entry/entries to change.

Energy and Demand tab - this trending page features checkboxes to Enable Trending of Energy and Demand properties and to Select the journal entry/entries to change.

Harmonics tab - this trending page features checkboxes to Enable Trending of Harmonics properties and to Select the journal entry/entries to change.

Flicker tab - this trending page features checkboxes to Enable Trending of Flicker properties and to Select the journal entry/entries to change; it also allows the setting of Sample Intervals (minutes).

Cross-Triggering tab - allows the sending and receiving of UDP (port 38642) broadcast messages and, depending on module type, causes an rms variation, transient, or input snapshot equivalent event recording to occur whether or not the local trigger conditions for the instrument were met.

13 61000 PQ DataNode Setup

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.

Properties	Values
Identification Information	
Name	61000.120V.60Hz.Wye.All
Description	
Mark each of the DataNodes that are to be updated when a change is made to this template. Note: marking a DataNode causes all of its DataNode specific settings to be updated; however, when a template's settings are changed only the changed settings are updated on the associated DataNodes.	
Edison 61SE-PQ	<input checked="" type="checkbox"/>
Substation OCB Demo	<input type="checkbox"/>

DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates .

Properties	Values
Identification Information	
Name	Edison 61SE-PQ
Description	Encore Series 61000 DataNode
Serial Number	Unknown
Version	HV2.0.29, C.V2.0.75, I1:61MZIPBA059V2.0.29, I2:61MACBA051V2.0.29
Status Information	
Health	Normal
Communication status	Idle
Last contact at	03-21-2008 23:29:00
Last poll at	03-21-2008 23:29:02
Next poll at	03-21-2008 23:30:00
Use the setting below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	61000.120V.60Hz.Wye.All
Use the setting below to record annotations for this DataNode.	
Notes	

This chapter provides a detailed discussion of the functionalities in each of the 61000 PQ DataNode setup tab.

Where Data for Programmed Settings Appear

The Encore Series Software/DataNode is designed to provide programming support as well as data display. The software setup page is where the parameters and value settings are programmed. The programmed parameters and value settings are translated and displayed in meaningful data format under the Views page, Real-time page, and Reports page. Refer to the previous chapters for more details on the Views, Real-time, and Reports pages.

Programming the Tabs

LEGEND (Please note the following conventions are used in the screen displays):

Items in gray text are not programmable, but included for information purpose to the user.

Items in **bold** are examples of what can be entered.

Selections available in drop down menu are enclosed in brackets { xxxx }.

Caution: Dranetz has already set default values for the various parameters in each DataNode. The default values have been tested to result in optimal system performance. Users are advised not to change the default value settings unless there are applications which require advanced setups.

1. Identification and Status tab

Properties	Values
Identification Information	
Name	Edison 61 SE-PQ
Description	Encore Series 61000 DataNode
Serial Number	Unknown
Version	H:V2.0.29, C:V2.0.25
Status Information	
Health	Normal
Communication status	Idle
Last contact at	03-21-2008 20:48:03
Last poll at	03-21-2008 20:48:03
Next poll at	03-21-2008 20:49:00
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	61000.120V.60Hz.Wye.All {None, 61000.120V.60Hz.Wye.All}
Use the settings below to record annotations for this DataNode.	
Notes	

indicate when
Encore Series last
requested data
from DataNode &
when next data poll
will take place

select template to
associate
DataNode settings

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series Software.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not. It also includes **Communication status** between Encore

Series Software and DataNode.

Polling Status is also displayed, indicating the date and time when the software was last contacted by the DataNode (**Last contact at**), last requested data from the DataNode (**Last poll at**), and when the next poll is scheduled to take place (**Next poll at**).

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

13 61000 PQ DataNode Setup

2. Communication tab

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input checked="" type="checkbox"/>
A direct or on-demand network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).	
Connection	Local Area Network (LAN)
Address	198.69.18.216/0
User name	admin
Password	*****

enable to activate communication between DataNode and Encore Series Software

COMMUNICATION parameters for 61000 PQ DataNode include the following:

Active indicates whether communications between the Encore Series Software and PQ DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the Encore Series. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series Software.

61000 PQ DataNode **Connection** has built-in standard support for Ethernet, RS232 and RS485 communications. Modem and GSM/GPRS communications are also available using external interfaces that are available from Dranetz. Encore Series Software supports all these methods of communications so users can choose what is appropriate for their application.

Encore Series Software can directly connect to, or be easily adapted for use with, virtually any network that supports the TCP/IP Internet protocol. The RJ-45

connector allows for direct connection to most networks in use today. Other types of network like Fiber, coaxial (10Base2) or other, inexpensive off the shelf adapters should be available to connect to such networks.

Address is where the IP information for the specific DataNode is entered. Each 61000 PQ DataNode is shipped from the factory with an IP Address. This IP Address is entered here. After typing in the IP address, enter a slash sign (/), followed by the number to represent which Virtual Analyzer within the same mainframe this setup is for. Start with 0 to indicate the first virtual analyzer, 1 for the second, 2 for the third, and/or 3 for the fourth.

User name and **Password** are the name and password for Encore Series Software to DataNode communications. The password is typically left at factory default. A wrong IP or password will result in DataNode communication error and users will not be able to access the particular DataNode.

NOTE: The password entered must match that of the DataNode.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input checked="" type="checkbox"/>
Start at	04/01/2008 00:00:00
Repeat every	1
Repeat units	minutes {minutes, hours, days, weeks, months}
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
When InfoNode and DataNode settings differ	get settings from the DataNode {get settings from the DataNode send settings to the DataNode}
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>
Update DataNode firmware	<input type="checkbox"/>

POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series Software will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include the following parameters: **When InfoNode and DataNode settings differ** allows users to match DataNode setups with those listed in the Encore

Series/InfoNode system when configurations differ and/or communication errors occur; the **Download and store data** check box enables the Encore Series Software to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include checkboxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series Software; **Delete data in DataNode** - use to remove stored data in the DataNode; and **Update DataNode firmware** - use to update DataNode firmware with the version stored on the Encore Series Software.

13 61000 PQ DataNode Setup

4. Input Configuration tab

Properties	Values
Input Configuration (select the input(s) to change)	
A	
B	
C	
D	
Voltage transducer primary	1.000000
Voltage transducer secondary	1.000000
Voltage input inverted	<input checked="" type="checkbox"/>
Voltage input order	V1 {V1, V2, V3, V4}
Current transducer primary	3000.000000
Current transducer secondary	1.500000
Current input inverted	<input checked="" type="checkbox"/>
Current input order	I1 {I1, I2, I3, I4}
Current probe type	Other {TR2500 (10A-500A RMS) TR2510 (0A-10A RMS), TR2520 (300A-3000A RMS) AC/DC (0A-150A RMS), AC/DC (0A-1500A RMS) TR2019B (1A-300A RMS) TR2021 (1A-30A RMS), TR2022 (10A-1000A RMS) TR2023 (100A-3000A RMS) LEMFlex RR3000-SD (Range 1, 300A) LEMFlex RR3000-SD (Range 2, 3000A) LEMFlex RR3035 (Range 1, 30A) LEMFlex RR3035 (Range 2, 300A) LEMFlex RR3035 (Range 2, 3000A) LEMFlex RR3035A (Range 1, 30A) LEMFlex RR3035A (Range 2, 300A) LEMFlex RR3035A (Range 2, 3000A) LEMFlex RR6035 (Range 1, 30A) LEMFlex RR6035 (Range 2, 300A) LEMFlex RR6035 (Range 2, 3000A) LEMFlex RR6035A (Range 1, 30A) LEMFlex RR6035A (Range 2, 300A) LEMFlex RR6035A (Range 2, 3000A) LEM PR150 AC/DC (0A-150A) LEM PR1500 AC/DC (0A-1500A) TR2501 (1A RMS), TR2530 (300A RMS) TR2540 (1000A RMS), TR2550 (100A RMS)}
Circuit Type	Wye {Single Phase, Split Phase, Wye, Delta, Delta 2 - Watt Meter, Generic, Wye 2.5 element No B, Wye 2.5 element No C}
Nominal Values	
Nominal voltage	120.0000
Nominal current	300.0000
Nominal frequency	60.0000
Normalize thresholds	<input checked="" type="checkbox"/>
Frequency Tracking	
Tracking mode	Internal {Standard (utility power line), Fast (local generator), Internal}
Sync channel	A {A, D}
Minimum frequency	45.0000

click fields
to display
drop down
menu

Model 61000 has input channels for voltage, current, and eight digital inputs labelled A, B, C, D, E, F, G, H. In addition, there will also be transducer inputs and digital relay output modules, with four channels each. Users must turn on any input channel to be used for monitoring. If a channel is not turned on, no data will be collected for it. *Refer to the Encore Series 61000 Installation Guide for more information on Series 61000 setup and configuration.* The input modules allow a variety of voltage and current measurement cables, probe types, or pods to connect to the Encore Series 61000 instrument for voltage, current, and/or digital signal monitoring.

The Encore Series Software has a user interface for INPUT CONFIGURATION, giving users the ability to select channel input/s to change. Users can set values for **Voltage/Current transducer primary** and **Voltage/Current transducer secondary**. Values to account for any voltage or current transformers can be entered for each input channel. The primary and secondary values are entered. For example, if the primary voltage is 2400 volts and the secondary voltage is 120 volts, then those values should be entered. This gives an effective 20:1 reduction in voltage. When the input voltage to the DataNode is 120V, the displayed value will be 2400 volts. No setup values are changed unless the user modifies this field and saves the changes.

The Encore Series Software also allows users to do channel swapping and polarity inversion. Channel mapping is used to correct for errors in wiring the instrument to the circuit. If a mistake is made, such as an inverted CT or a phase is connected to the wrong channel, it can be corrected in the software instead of changing the wiring to the instrument. Note that it is recommended that the actual wiring be changed, but channel mapping can correct the problem if this is not practical. Enable the checkbox opposite **Voltage/Current input inverted** as it applies, and then click on the corresponding **Voltage or Current input order** to show which channel the signal is connected to.

The channel mapping array works by specifying a numeric code in each array slot that indicates which phase is connected to the physical 61000 PQ DataNode channel. Normally, the channels and phases are matched as follows:

Voltage Phase A	Channel V1
Voltage Phase B	Channel V2
Voltage Phase C	Channel V3

Voltage Neutral	Channel V4
Current Phase A	Channel I1
Current Phase B	Channel I2
Current Phase C	Channel I3
Current Neutral	Channel I4

Measurement errors may result if the voltage and current signals are not correctly paired.

Various **Current probe types** are available for current monitoring. If the current probe type that you are using is not on the list, select **Other**. You need to set the CT scale factor when using a current probe that is not on the list.

Users can also select from the following **Circuit types**: Single Phase, Split Phase, Wye, Delta, Delta 2-Watt Meter, Generic, Wye 2 1/2 Element without Ch B, and Wye 2 1/2 Element without Ch C. When making voltage connections to a Single phase circuit, use channel A differential inputs. Neutral to ground measurements are recommended but not required for proper operation. When making Split Phase measurements, use both channels A and B for voltage and current connections. The neutral is chosen as the reference for measurement purposes. When using the Wye setup mode, channels A, B and C are connected to voltage and current. The neutral is connected to common and is the reference for the three channels. Various setups are possible when using the Delta setup mode. For example, the 3 Phase Delta uses voltage channels A, B and C as differential inputs with channel A using source voltage A-B, channel B using B-C, and channel C using C-A as the reference. Use channels A, B and C for current connections. *Refer to the Encore Series 61000 Installation Guide for illustrations of the different wiring configurations.*

NOMINAL VALUES are used as basis for setting default thresholds and other parameters for monitoring. The Encore Series Software allows users to override the default settings to customize and enter **Nominal voltage**, **Nominal current**, and **Nominal frequency** values best suited for their application, or they can use the computed nominal values displayed on screen. Users also have the option to accept default threshold settings and enable the **Normalize thresholds** checkbox.

NOTE: Make sure that the nominal values computed by the instrument are correct. These values are used as basis for setting threshold parameters for circuit monitoring.

13 61000 PQ DataNode Setup

5. Rms Variations tab

Properties		Values
RMS Variation Limits (select the channel(s) to change)		
Rms Voltage A		phase-to-phase values displayed depend upon the Wiring Configuration set under the Input Configuration tab
Rms VoltageB		
Rms Voltage C		
Rms Voltage N		
Rms Voltage AB		
Rms VoltageBC		
Rms Voltage CA		
Rms Current A		
Rms Current B		
Rms Current C		
Rms Current N		
High	110.0%	
Low	90.0%	
Very low	10.0%	
Rapid Voltage Change Limits (select the channel(s) to change)		
Rms Voltage A		
Rms VoltageB		
Rms Voltage C		
Rms magnitude change (%)		
RMS Summary		
Pre-trigger (Cycles)	6	
In-out post trigger (Cycles)	6	
Out-in post trigger (Cycles)	6	
Waveform Capture		
Pre-trigger (Cycles)	2	
Post-trigger (Cycles)	2	

RMS stands for root mean square, a mathematical formula used to compute the equivalent value of the voltage and current. Voltage and current changes are measured and checked against the programmed limits. Thresholds are set as high limits (threshold above the programmed limit) and low limits (threshold below the programmed limit). Rms variations result whenever voltage or current rms value rise above or fall below the programmed threshold limits. The limits determine how sensitive the instrument should be (note that statistical and trending information is always captured regardless of the limit settings, so the user will never be without a data even if he/she did not set the limits to the ideal values).

Encore Series Software allows users to set the limits for each of the triggers, as well as the amount of rms and waveform sample (cycles) to record before and after trigger cycle.

Under RMS VARIATION LIMITS, letters A, B and C represent each leg or phase of a three-phase system, while letter N represents the neutral conductor. The channels used to trigger threshold values are automatically set depending on the wiring configuration selected under the Input Configuration tab. **High limit**, **Low limit**, and **Very low limit** values can be enabled and programmed individually for each phase-to-neutral and phase-to-phase setting.

To program individual limit values, select the appropriate line that describes the phase-neutral or phase-to-phase setting that you wish to change. If the same limit value will be assigned to more than one phase, press Shift + click to select multiple phases. Enter your limit value for the corresponding phase in the High limit and Low limit fields. Click the Save Setup button every time you assign different limit values.

Rapid Voltage Change (RVC) is a change in the rms voltage that is generally more severe than voltage fluctuations that result in light flicker but less severe than what would be termed as sags (dips) or swells. Specifically, an RVC is defined as a single rapid variation of the rms value of the voltage between two consecutive levels, which are sustained for a definite but unspecified duration.

A rapid voltage change is expressed by:

$$\%U_{change} = \frac{\Delta U_{max}}{U_N} \cdot 100\% , \text{ where}$$

ΔU_{max} is the maximum difference of the rms values of a voltage change characteristic and U_N is the nominal voltage.

If the voltage is stable for at least one second, an additional fast change is to be considered as another rapid voltage change.

Under RAPID VOLTAGE CHANGE LIMITS, users can also set corresponding threshold limits for rms voltage categories A, B, and C. The **Rms magnitude change (%)** is defined as a percent of normal cycle for each voltage category. Once the threshold limits are crossed, the rms disturbance category will be classified as an event.

Users can also define the number of rms summary and waveform cycles to be saved before the start (pre-), after the start (post-start), and after the end (post-end) of the event. Under RMS SUMMARY, **Pre-trigger (Cycles)** set the number of cycles for Pre-event start rms samples. This setting is also used for Pre-event end cycles. Enter the number of cycles of rms samples to record before the event start trigger cycle in the value field.

Use the **In-out post trigger (Cycles)** to set the number of cycles for Post-event start cycles. Enter the number of cycles to record after the event start cycle. On the other hand, **Out-in post trigger (Cycles)** allows you to set the number of cycles for Post-event end cycles. Enter the number of cycles to record after the event end point. The Pre- and Post- trigger settings under WAVEFORM CAPTURE specify the number of waveform cycles to record before, during, and after the event. Although waveform cycle recording is enabled by default, users have the option not to record waveform cycles.

Use **Pre-trigger (Cycles)** to set the number of cycles for Pre-event start waveform cycles. Enter the number of waveform cycles to be saved before the event start and event end cycles. Use **Post-trigger (Cycles)** to set the number of cycles for Post-event end waveform cycles. Enter the number of waveform cycles to be saved after the event start and event end cycles.

The parameters capture rms sample or rms waveform cycles that may be used to analyze and manage power event patterns and behavior.

NOTE: The number of pre-trigger cycles for waveform capture should be less than or equal to the number of pre-trigger cycles for rms summary. The same applies to the post-trigger cycles.

13 61000 PQ DataNode Setup

6. Transients tab

Properties	Values
Transient Limits (select the channel(s) to change)	
Instantaneous Voltage A	phase-to-neutral or phase-to- phase values displayed depend upon the Wiring Configuration set under the Input Configuration tab
Instantaneous Voltage B	
Instantaneous Voltage C	
Instantaneous Voltage N	
Instantaneous Current A	
Instantaneous Current B	
Instantaneous Current C	
Instantaneous Current N	
Absolute instantaneous peak	150.3
Integrated high frequency trigger	8.8
Cycle-to-cycle waveshape threshold	
Cycle-to-cycle waveshape duration (% of cycle)	24.000000
RMS distortion waveshape	14.1
Waveform Capture	
Pre-trigger and post-trigger (Cycles)	Use RMS Variation settings {Default (1 pre-trigger, 2 post-trigger cycles) Use RMS Variation settings}

Dranetz instruments label rms voltage or current variations as either sags (voltage or current decreases below low limit) or swells (voltage or current increases above high limit) as per IEEE 1159. Voltage disturbances which are shorter in duration than typical sags and swells are classified as transients. Two basic types of transients are: 1) impulsive transients characterized by very rapid changes in the magnitude of measured quantities and commonly caused by capacitors or inductors switching on line, loose wires, lightning, static, and power failures; and 2) oscillatory transients defined as a temporary, rapid discontinuity of the waveform.

The Encore Series Software uses the following algorithms to detect and record transients:

Peak or Instantaneous trigger magnitude
High frequency negative/positive peak detectors magnitude
Waveshape threshold duration or window
Waveshape threshold magnitude or tolerance

INDIVIDUAL CHANNELS/PARAMETERS, represented by letters A, B and C refer to different channels, while N stands for neutral. The channel values are pre-defined and automatically set depending upon the wiring configuration.

The crest factor or **Absolute instantaneous peak** is the absolute peak sample value within one cycle. The instantaneous peak triggers on the absolute peak value of the entire waveform. This value is compared against the absolute value of each A/D sample of the V and I channel waveforms.

NOTE: Do not set this value to less than or equal to the peak of the normal waveform. For a sinusoidal waveform, the peak is 1.414 x the rms value. Failure to do this will result in continuous triggering.

Integrated high frequency detected transients use special circuitry to detect and capture transients as small as 1 microsecond in duration. These transients can be positive and/or negative values above or below the low frequency waveshape.

Users have the option to have their Encore Series 61000 instrument installed with the high speed sampling analog board that can capture voltage and current transients. Because these types of disturbances usually exhibit very narrow widths and fast rise and fall times, they are quickly dumped by the system. They tend to be unidirectional when close to their source.

Oscillatory transients are types of disturbances usually captured as waveshape faults. The PQ DataNode captures pre-trigger and post-trigger waveform cycles. The waveshape fault triggering algorithm essentially compares samples for each cycle to the corresponding samples from the previous cycle. If the samples differ by more than the threshold tolerance for a length of time exceeding window percent of the power frequency cycle, a waveshape fault is registered. A trigger occurs when either waveshape or rms deviation rise above the programmed **Cycle-to-cycle waveshape threshold**. Waveshape trigger values include the magnitude and **Cycle-to-cycle waveshape duration** of the difference between the present and previous cycle.

Once a record trigger is detected, instantaneous waveform information is recorded for the prescribed voltage and current channel(s). Disturbance monitoring requires that voltage be continuously sampled, and recorded only if the signals exceed specified values. Waveshape changes are only triggerable for voltage transients as the current waveshapes are usually continually changing on a normally operating distribution system. However most types of disturbances require that current be recorded as well to help determine the source of the disturbance.

Users can also specify the number of waveform cycles to record before (**Pre-trigger**) and after (**Post-trigger**) the trigger cycle.

Select the **Default (Pre-trigger cycles = 1, Post-trigger cycles = 2)** setting if you want to use the default waveform trigger cycle counts for transient events. Select **Use RMS Variation settings** if you want to use the same waveform trigger cycle counts to capture transient events and rms events (Pre-trigger cycles = 2, Post-trigger cycles = 2).

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7. Waveform Capture tab

Properties	Values
Waveform Capture Enables (Select the trigger channel(s) to enable or disable)	
Voltage A	
Voltage B	
Voltage C	
Voltage N	
Voltage AB	
Voltage BC	
Voltage CA	
Current A	
Current B	
Current C	
Current N	
Voltage A	<input checked="" type="checkbox"/>
Voltage B	<input checked="" type="checkbox"/>
Voltage C	<input checked="" type="checkbox"/>
Voltage N	<input type="checkbox"/>
Current A	<input checked="" type="checkbox"/>
Current B	<input checked="" type="checkbox"/>
Current C	<input checked="" type="checkbox"/>
Current N	<input type="checkbox"/>

Encore Series Software allows users to set the trigger channels/parameters for waveform capture.

WAVEFORM CAPTURE ENABLES show the channels that will have waveforms recorded should a trigger occur. Select from the available Volts or Amps channel in the

window provided. Then check/uncheck a channel field to enable/disable channel for waveform capture.

This cross-trigger function prevents recording of meaningless data from unused (disabled) channels.

8. Power tab

Properties	Values
Journaling interval	1 minute {Off, 1 second, 1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 1 hour}
Journal Channels (select the channel(s) to change)	
Rms Voltage A	
Rms Voltage B	
Rms Voltage C	
Rms Voltage N	
Rms Voltage AB	
Rms Voltage BC	
Rms Voltage CA	
Rms Current A	
Rms Current B	
Rms Current C	
Rms Current N	
Enable trending	<input checked="" type="checkbox"/>
Enable limit checking	<input checked="" type="checkbox"/>
Very high	144.000000
High	132.000000
Low	108.000000
Very low	96.000000
Deadband	

Encore Series Software allows power parameters to be trended using periodic readings that are stored in a journal. Statistical information is always captured regardless of the limit settings, so users will never be without a trend even if he/she did not set the limits correctly. The system collects data even when no disturbances occur by recording periodical statistical data (By Time).

The **Journaling Interval** menu allows users to set the time of how often the instrument will record power parameter values.

JOURNAL CHANNELS contain the list of journal parameters that can be trended. Select from the available Volts or Amps channel in the window tab. Then check/uncheck **Enable trending** to enable/disable parameter for trending. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Enable limit checking allows users to set the threshold units by which high and low limits of voltage trigger and current trigger are calculated. Thresholds are set in ranges with high limit (threshold above the normal range) and low

limit (threshold below the normal range). The following threshold limits are used to trend journal parameters:

Very High: specifies an absolute limit for comparison that is higher than the high limit

High: specifies an absolute limit for comparison that is higher than the low limit

Low: specifies an absolute limit for comparison that is lower than the high limit

Very Low: specifies an absolute limit for comparison that is lower than the low limit

Deadband: specifies how much a value can change before another event is recorded

The Very high must be greater than High, Very low less than Low. Deadbands or sensitivity is used to record incremental changes in the parameter besides when limits are crossed. The hysteresis values assigned to limits are fixed and not programmable by the user. All limit values are used to determine if corresponding reporting or logging action should take place.

NOTE: Users can record data simultaneously by limits and by time. Make sure to enable the parameters to trend.

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9. Energy and Demand tab

Properties	Values
Demand sub-interval	10 minutes {Off 3 minutes 5 minutes 10 minutes 15 minutes}
Sub-intervals per demand interval	3
Journal Channels (select the channel(s) to change)	
Watthours A	
Watthours B	
Watthours C	
Watthours Total	
Varhours A	
Varhours B	
Varhours C	
Varhours Total	
Enable trending	<input type="checkbox"/>
Enable limit checking	<input checked="" type="checkbox"/>
Very high	144.000000
High	132.000000
Low	108.000000
Very low	96.000000
Deadband	

Demand Sub-Interval and **Sub-Intervals per Interval** refer to the time interval used in calculating power demand values. Demand calculations are made every sub-interval on the values that occurred during the most recent Demand Interval. Values set for Demand Sub-Interval must be an integer-divisor of the Demand Interval since the former applies when updating certain parameters of the latter.

Demand values are computed as the average value over the demand interval, which can be programmed as a different value than the periodic readings. The following parameter values can be enabled: individual phase and three phase total real power demand, reactive demand, apparent power demand, average PF and peak real power values.

JOURNAL CHANNELS contain the list of journal parameters that can be trended. Select from the available Energy and Demand parameters in the window tab. Then check/uncheck **Enable trending** to enable/disable parameter for trending. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Enable limit checking allows users to set the threshold units by which high and low limits of voltage trigger and

current trigger are calculated. Thresholds are set in ranges with high limit (threshold above the normal range) and low limit (threshold below the normal range). The following threshold limits are used to trend journal parameters:

Very High: specifies an absolute limit for comparison that is higher than the high limit

High: specifies an absolute limit for comparison that is higher than the low limit

Low: specifies an absolute limit for comparison that is lower than the high limit

Very Low: specifies an absolute limit for comparison that is lower than the low limit

Deadband: specifies how much a value can change before another event is recorded

The Very high must be greater than High, Very low less than Low. Deadbands or sensitivity is used to record incremental changes in the parameter besides when limits are crossed. The hysteresis values assigned to limits are fixed and not programmable by the user. All limit values are used to determine if corresponding reporting or logging action should take place.

10. Harmonics tab

Properties	Values
Journaling Interval	10 minutes {Off, 30 seconds, 1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 1 hour}
Journal Channels (select the channel(s) to change	
Positive Sequence Voltage Total	Current THD A
Negative Sequence Voltage Total	Current THD B
Zero Sequence Voltage Total	Current THD C
Positive Sequence Current Total	Current THD N
Negative Sequence Current Total	Current TID A
Zero Sequence Current Total	Current TID B
V Unbalance (S2/S1) Total	Current TID C
V Unbalance (S0/S1) Total	Current TID N
I Unbalance (S2/S1) Total	IT Product A
I Unbalance (S0/S1) Total	IT Product B
Voltage THD A	IT Product C
Voltage THD B	IT Product N
Voltage THD C	Current Crest Factor A
Voltage THD N	Current Crest Factor B
Voltage TID A	Current Crest Factor C
Voltage TID B	Current Crest Factor N
Voltage TID C	Transformer K Factor A
Voltage TID N	Transformer K Factor B
Voltage TIF A	Transformer K Factor C
Voltage TIF B	ANSI Transformer Derating Factor A
Voltage TIF C	ANSI Transformer Derating Factor B
Voltage TIF N	ANSI Transformer Derating Factor C
Voltage TIF (Rms) A	Unsigned Harmonic Power A
Voltage TIF (Rms) B	Unsigned Harmonic Power B
Voltage TIF (Rms) C	Unsigned Harmonic Power C
Voltage TIF (Rms) N	Harmonic Power A
Voltage Crest Factor A	Harmonic Power B
Voltage Crest Factor B	Harmonic Power C
Voltage Crest Factor C	
Voltage Crest Factor N	
Enable trending	<input type="checkbox"/>
Enable limit checking	<input type="checkbox"/>
Very High	
High	
Low	
Very Low	
Deadband	
Individual Harmonic Trending	
Harmonic Voltage A	Harmonic Current A
Harmonic Voltage B	Harmonic Current B
Harmonic Voltage C	Harmonic Current C
Harmonic Voltage N	Harmonic Current N
Interharmonic Voltage A	Interharmonic Current A
Interharmonic Voltage B	Interharmonic Current B
Interharmonic Voltage C	Interharmonic Current C
Interharmonic Voltage N	Interharmonic Current N
Harmonics to trend	0

Harmonics setup tab continued on next page

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Harmonics setup tab continued

Properties	Values
Individual Harmonic Limits	
Harmonic Voltage A #1	Harmonic Current A #1
Harmonic Voltage A #2	Harmonic Current A #2
Harmonic Voltage A #3	Harmonic Current A #3
Harmonic Voltage A #4	Harmonic Current A #4
Harmonic Voltage B #1	Harmonic Current B #1
Harmonic Voltage B #2	Harmonic Current B #2
Harmonic Voltage B #3	Harmonic Current B #3
Harmonic Voltage B #4	Harmonic Current B #4
Harmonic Voltage C #1	Harmonic Current C #1
Harmonic Voltage C #2	Harmonic Current C #2
Harmonic Voltage C #3	Harmonic Current C #3
Harmonic Voltage C #4	Harmonic Current C #4
Harmonic Voltage N #1	Harmonic Current N #1
Harmonic Voltage N #2	Harmonic Current N #2
Harmonic Voltage N #3	Harmonic Current N #3
Harmonic Voltage N #4	Harmonic Current N #4
Harmonic	0
Enable limit checking	<input type="checkbox"/>
Very High	
High	
Low	
Very Low	
Deadband	

Harmonics are waveform distortion, a steady-state deviation from an ideal power frequency sinusoid and is characterized by the spectral content of the waveform. Many non-linear devices such as battery chargers, switching power supplies or transformers inject currents at harmonic (integer multiples of the fundamental) frequencies into the system. Harmonic currents and the voltage distortion they create as they flow through system impedances can reduce equipment operating reliability and service life. Harmonics can be particularly troublesome where capacitors are applied on the distribution system. Capacitors may result in resonance at a harmonic frequency, leading to high harmonic voltages and currents throughout the system.

Interharmonics are frequency components between the harmonic frequencies. The IEC 1000-4-7 Standard dictates that harmonic analysis is done using 5Hz bins.

The rms of the frequency bins between the 2nd and 3rd harmonic is referred to as the H_{2-3} interharmonic.

Various harmonic parameters such as total harmonic distortion (THD), total interharmonic distortion (TID), and telephone influence factor (TIF) can be trended using periodic readings that are stored in the journal. Depending on the harmonic **Journaling Interval** set, the instrument records a sampling of the waveform synchronized to the fundamental frequency, to ensure accurate calculation of harmonic phase angles.

JOURNAL CHANNELS contain various harmonic parameters that can be trended using periodic readings that are stored in a journal. Harmonic distortion of voltage or current is calculated through a Fourier transformation of the waveform into harmonic magnitudes and phase angle spectra. These spectra are used to determine figures of

merit such as total harmonic distortion (THD) and telephone influence factor (TIF). The total interharmonic distortion (TID) is calculated similar to the THD. (See Appendix A *Quantities Calculated from Periodic Voltage and Current Measurements*)

The Encore Series/DataNode system allows simultaneous measurements of voltage and current so that harmonic power flow can be obtained. Depending on value parameters set, the program can record a sampling of the waveform synchronized to the fundamental frequency, to ensure accurate calculation of harmonic phase angles. The sampling rate is sufficient to determine up to the 50th harmonic and interharmonic or better. A comprehensive range of high and low limits can be enabled and individually set for each measured parameter.

Highlight the value parameter you wish to change, then check the **Enable trending** box. Check the threshold enable box and then enter the value for that threshold. Repeat this for all parameters of interest. If the box is checked, the settings on the page go into effect. If the box is not checked, the remaining settings are persisted but are not in effect.

Enable limit checking allows users to set the threshold units by which high and low limits of voltage trigger current trigger are calculated. Thresholds are set in ranges with high limit (threshold above the normal range) and low limit (threshold below the normal range). The following threshold limits are used to trend journal parameters:

Very High - specifies an absolute limit for comparison that is higher than the high limit

High - specifies an absolute limit for comparison that is higher than the low limit

Low - specifies an absolute limit for comparison that is lower than the high limit

Very Low - specifies an absolute limit for comparison lower than the low limit

Deadband - specifies how much a value can change before another event is recorded

The Very High must be greater than High, Very Low less than Low. Deadband is the equivalent of sensitivity. The hysteresis values assigned to limits are set by the system.

All limit values are used to determine if corresponding reporting or logging action should take place. Note that these limits are the absolute or actual values to trigger on, not a percent of fixed or floating base as can be used in Voltage Rms Variation and Transient limits.

Voltage and current harmonics for each phase and neutral channel can be trended under INDIVIDUAL HARMONIC TRENDING. The value fields are left blank to allow the users to choose the numbers or the range of harmonic frequencies to trend.

Numbers can be entered individually with commas separating the numbers, or a range of harmonics can be specified using a dash between lower and upper values. Also, the suffix 'o' or 'e' can be used to specify only the odd or even harmonics, respectively, in a given range. Selecting numerous harmonics indiscriminately can take up all of the allowable trending parameters. Users are advised to select harmonics to trend prudently.

Caution: Selection of numerous harmonics and interharmonics can exceed the total number of journal parameters (typically 200) that can be trended. This can also result in download times when communicating through a GSM/GPRS connection that are extremely long (and costly).

Resulting individual harmonic sampling and graphs can be seen in the Smart Trends folder under the Views tab.

Users can also set threshold limits under INDIVIDUAL HARMONIC LIMITS. **Enable limit checking** allows users to set the threshold units by which high and low limits of harmonic voltage trigger and harmonic current trigger are calculated.

All activated Harmonic parameters and value settings defined can be viewed under the Real-time tab.

For further discussion on Harmonic Distortion, please refer to the EPQ DataNode Series User's Guide.

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11. Flicker tab

Properties	Values
Pst (short term) interval	10 minutes {Off, 30 seconds, 1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes}
Plt (long term) interval	2 hours {Off, 1 hour, 2 hours, 3 hours, 4 hours, 8 hours}
Journal Channels (select the channel(s) to change)	
Short Term Flicker A Short Term Flicker B Short Term Flicker C Long Term Flicker A Long Term Flicker B Long Term Flicker C Sliding PLT A Sliding PLT B Sliding PLT C Instantaneous Flicker A Instantaneous Flicker B Instantaneous Flicker C Flicker Meter Output 4 A Flicker Meter Output 4 B Flicker Meter Output 4 C Flicker Meter Output 3 A Flicker Meter Output 3 B Flicker Meter Output 3 C Predicted Short Term Flicker A Predicted Short Term Flicker B Predicted Short Term Flicker C	
Enable trending	<input checked="" type="checkbox"/>
Enable limit checking	<input checked="" type="checkbox"/>
Very High	144.000000
High	132.000000
Low	108.000000
Very Low	96.000000
Deadband	

Pst is short term perceptibility, used to set calculation for **Pst (short term) interval**. Typical calculation is over 10 minute interval, though this can be programmed. Plt is long term perceptibility, used to set calculation for **Plt (long term) interval**. Typical calculation is over 2 hour interval, though this can also be programmed. The Plt interval must be an integer multiple of the Pst interval. Sliding Plt recalculates the Plt value at each Pst interval, rather than only at the Plt interval.

Under JOURNAL CHANNELS various flicker parameters can be trended using periodic readings that are stored in a journal.

There are three flicker values available for trending: the short term flicker or Pst, the long term flicker or Plt, and Plt calculated on a sliding window. The other parameters are used primarily for specialized testing. Flicker measurements are classified per IEC 1000-4-15.

Enable trending features a checkbox which enables trending of values listed in this page. If the box is checked, the settings on the page go into effect.

Enabling this will automatically disable the high-frequency dual peak detectors located in the Transients tab. If the box is not checked, the remaining settings are persisted but are not in effect.

Enable limit checking allows users to set the threshold units by which high and low limits of voltage trigger and current trigger are calculated. Thresholds are set in ranges with high limit (threshold above the normal range) and low limit (threshold below the normal range). The following threshold limits are used to trend journal parameters:

Very High: specifies an absolute limit for comparison that is higher than the high limit

High: specifies an absolute limit for comparison that is higher than the low limit

Low: specifies an absolute limit for comparison that is lower than the high limit

Very Low: specifies an absolute limit for comparison that is lower than the low limit

Deadband: specifies how much a value can change before another event is recorded

The Very high must be greater than High, Very low less than Low. Deadbands or sensitivity is used to record incremental changes in the parameter besides when limits are crossed. The hysteresis values assigned to limits are fixed and not programmable by the user. All limit values are used to determine if corresponding reporting or logging action should take place.

13 61000 PQ DataNode Setup

12. Cross-Triggering tab

Properties	Values
Communication Configuration (common to all messages)	
Broadcast group ID	4789
Broadcast address (empty for local)	72.4.197.255
RMS Event Message Configuration	
Send this message when a RMS event is detected	None (disabled) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}
Record a RMS event when this message is received	8 (default for RMS events) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}
Transient Event Message Configuration	
Send this message when a Transient event is detected	None (disabled) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}
Record a Transient event when this message is received	0 (default for Transient events) {None, 0 (default for Transient events), 1, 2, 3, 4, 5, 6, 7, 8 (default for RMS events), 9, 10, 11, 12, 13, 14, 15}

The 61000 PQ DataNode can be configured to issue a UDP (cross trigger) broadcast message when an rms variation and/or transient event occurs. The UDP broadcast message is not triggerable from the Journal limit crossings. The PQ DataNode can also be configured to listen for such message and cause an rms variation or transient recording to occur whether or not the local trigger conditions for that instrument were met. These settings are configured using the parameters under CROSS-TRIGGERING tab.

Depending on the values configured, the 61000 PQ DataNode will not only initiate and respond to rms and/or transient cross triggers from other PQ DataNodes, but it will also initiate and respond to cross-triggers from the other cross-trigger enabled DataNodes.

Under COMMUNICATION CONFIGURATION, a **Broadcast group ID** is used to determine what group of analyzers will react together so that only those receivers with the same group ID will respond to the broadcast if so enabled. The group ID can be any number between 1 and 9999. With this number you can split the DataNodes into

groups, i.e. 2147483647 for 61000 PQ; 16595 for EPQ, etc. The broadcast ID number in the Encore Series Software must match the broadcast group ID set under the TCP/IP parameter of the Datanode. The DataNode also uses this ID mechanism for multiple DataNode cross triggering, and is guaranteed only on an un-routed network. The group ID is sent along with the broadcast message and only those receivers with the same group ID will respond to the broadcast if so enabled.

The broadcast address is the address of the network on which the cross triggers are to be broadcast. This address acts like a mask and is typically the local address in which the Encore system is deployed on. In the sample screen shown above, all units with IP address starting with 72.4.197.xxx can respond to the cross trigger. Users can specify to send a broadcast to a directed address other than the local network i.e. across a router, if desired. However, results cannot be guaranteed and data may be lost if the message takes too long to arrive at its destination. UDP **Broadcast address (empty for local)** is typically not routed and only works on the local network.

The next parameters specify the cross trigger send/receive settings. The users determine which event types the analyzer will broadcast a cross trigger for, which type of cross trigger it will respond to, and what information it will record. For a 61000 PQ DataNode, the cross trigger ID is divided into two groups: one for rms events and another for transient events.

Under RMS EVENT MESSAGE CONFIGURATION, the range of values that can be entered is between 0 to 15. **Send this message when a RMS event is detected** enables the sending of rms cross trigger. The default ID value for rms cross trigger is 8. **Record a RMS event when this message is received** enables the DataNode to respond to received rms cross trigger. The default ID value for receiveing rms cross trigger is also 8.

Under TRANSIENT EVENT MESSAGE CONFIGURATION, the range of values that can be entered is also between 0 to 15. **Send this message when a Transient event is detected** enables the sending of a transient cross trigger. The default ID value for rms cross trigger is 0. **Record a Transient event when this message is received** enables the DataNode to respond to received transient cross trigger. The default ID value for receiveing transient cross trigger is also 0.

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ADAM Instrument Handler Setup

This section applies to the set up of the ADAM instrument handler in Encore Series Software. Programming of individual ADAM modules are accomplished via switch settings on the modules themselves. ADAM instrument handler supports both the 4000 and 5000 series modules from Advantech. The 4000 series consists of stand alone modules, where each module is assigned a unique RS-485 address between 1 and 254. The 5000 series uses a single chassis to hold 4 or 8 modules. The chassis is assigned a single RS-485 address and the individual modules are addressed by slot number within the chassis. Note that the ADAM 5000 chassis can communicate with the Encore Series Software via RS-485 (requires external adaptor) or RS-232.

ADAM Module Connection Setup

The following are required to set up and configure an ADAM environment:

ADAM Modules

A host computer, such as an IBM PC/AT, that can output ASCII characters with an RS-232 or RS485 port

Power supply for the ADAM Modules (+10 and +30 VDC)

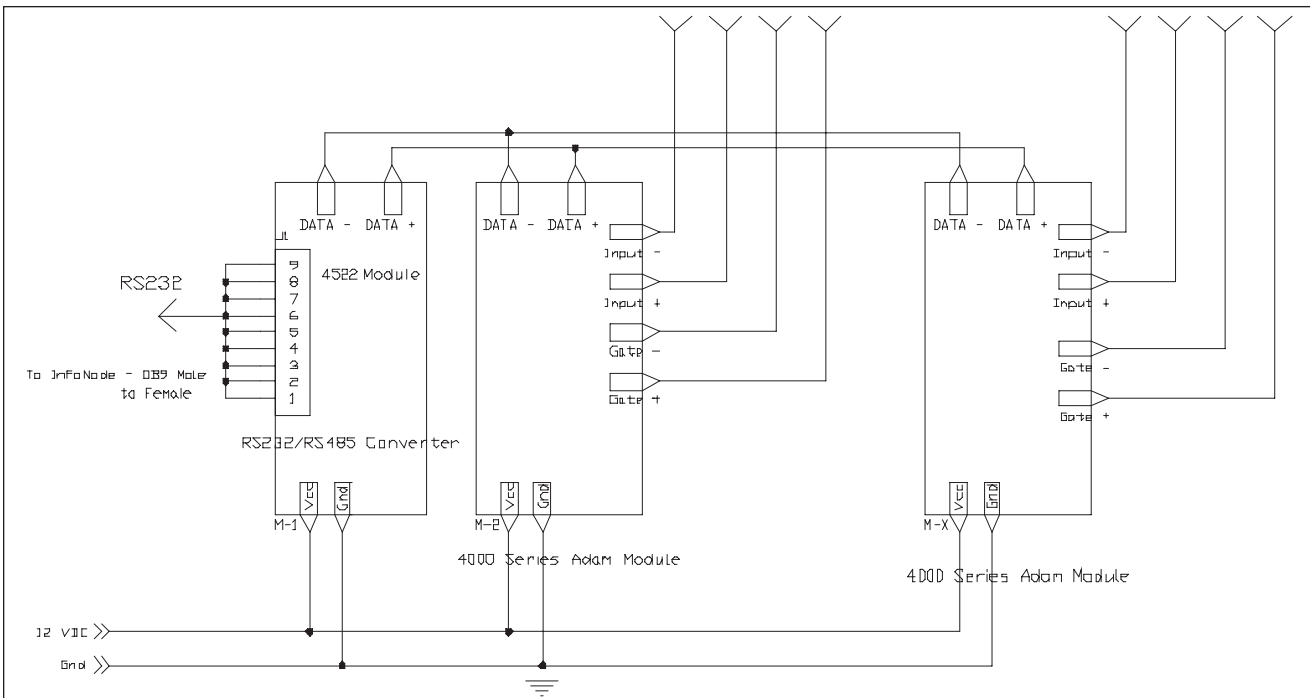
ADAM Series Utility software

ADAM Isolated RS-232/RS-485 Converter (optional)

ADAM Repeater (optional)

Host Computer: Any computer or terminal that can output in ASCII format over either RS-232 or RS-485 can be connected as the host computer. When only RS-232 is available, an ADAM RS-232/RS-485 Converter is required to transform the host signals to the correct RS-485 protocol. Since this module is not addressable by the host, the baud rate must be set using a switch inside the module. The factory default setting is 9600 baud. The converter also provides opto-isolation and transformer-based isolation to protect your equipment.

Power Supply: ADAM Module operation is guaranteed when using a power supply between +10 and +30 VDC. All power supply specifications are referenced at the module connector. When modules are powered remotely, the effects of line voltage drops must be considered. All modules use on-board switching regulators to sustain good efficiency over the +10 and +30 V input range, therefore one can assume that the actual current draw is inversely proportional to the line voltage. Select power cables according to the number of modules connected and the length of the power lines.

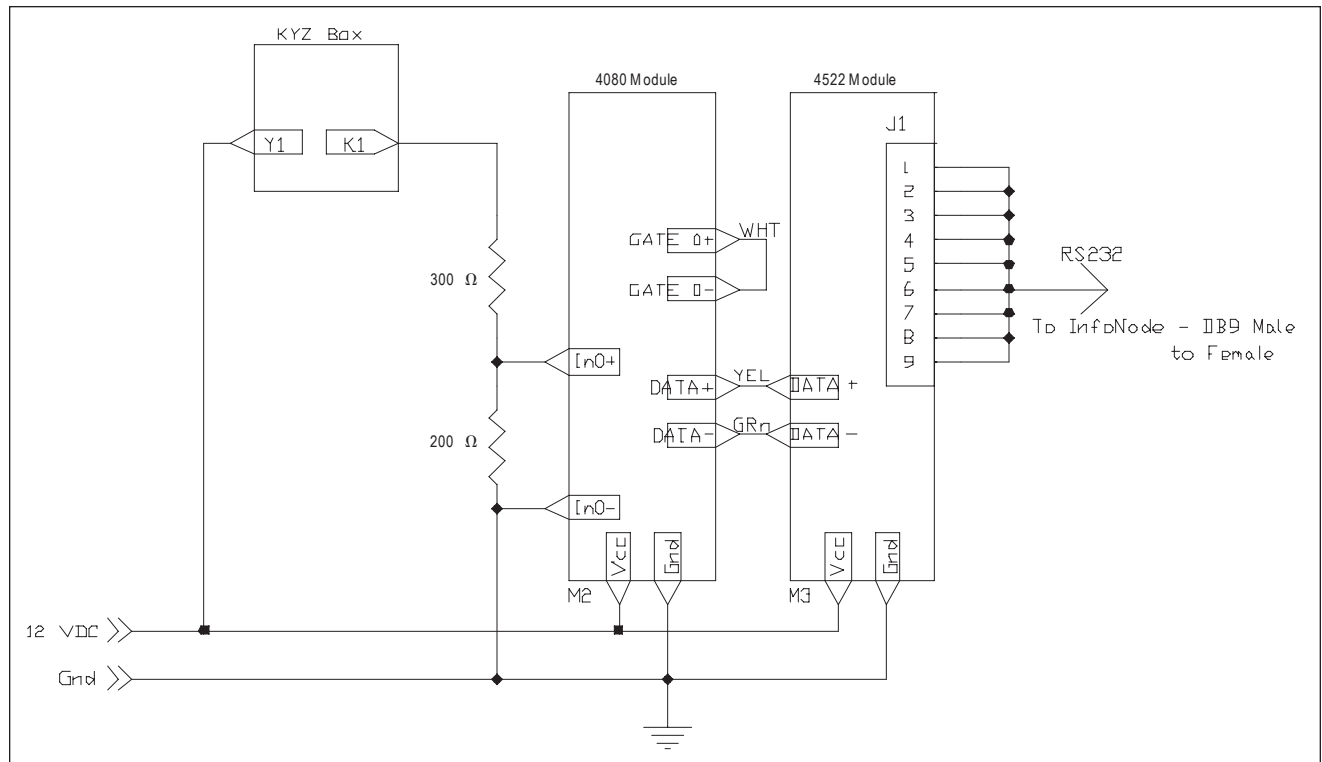


Generic Connections for the 4000 Series ADAM Module

14 ADAM Handler Setup

ADAM Utility Software: A menu-driven program is provided for ADAM Module configuration, monitoring and calibration. Dranetz ships ADAM Modules with the necessary Windows driver and Utility software disk.

ADAM Repeater: When communication lines exceed 4,000 ft (1200 meter) or the number of ADAM modules connected is more than 32, a repeater should be connected to expand the first segment. Up to 8 Repeater modules can be connected allowing connection of up to 256 ADAM modules.



ADAM 4080 Module to KYZ Box Connection

For more information on ADAM Module setup, installation and configuration:

Refer to the *ADAM 4000 Series User's Manual* for more details on how to configure, set up and install the ADAM modules. The Windows driver and the Utility disk for the ADAM-4000 Series are shipped along with the *ADAM 4000 Series User's Manual*, Copyright ©1997 Advantech Co., Ltd. The user's manual can also be accessed online at http://service.advantech.com.tw/download/Files/1-A2XID/Adam-4000_ed7.pdf

ADAM Instrument and Communications Handler Setup

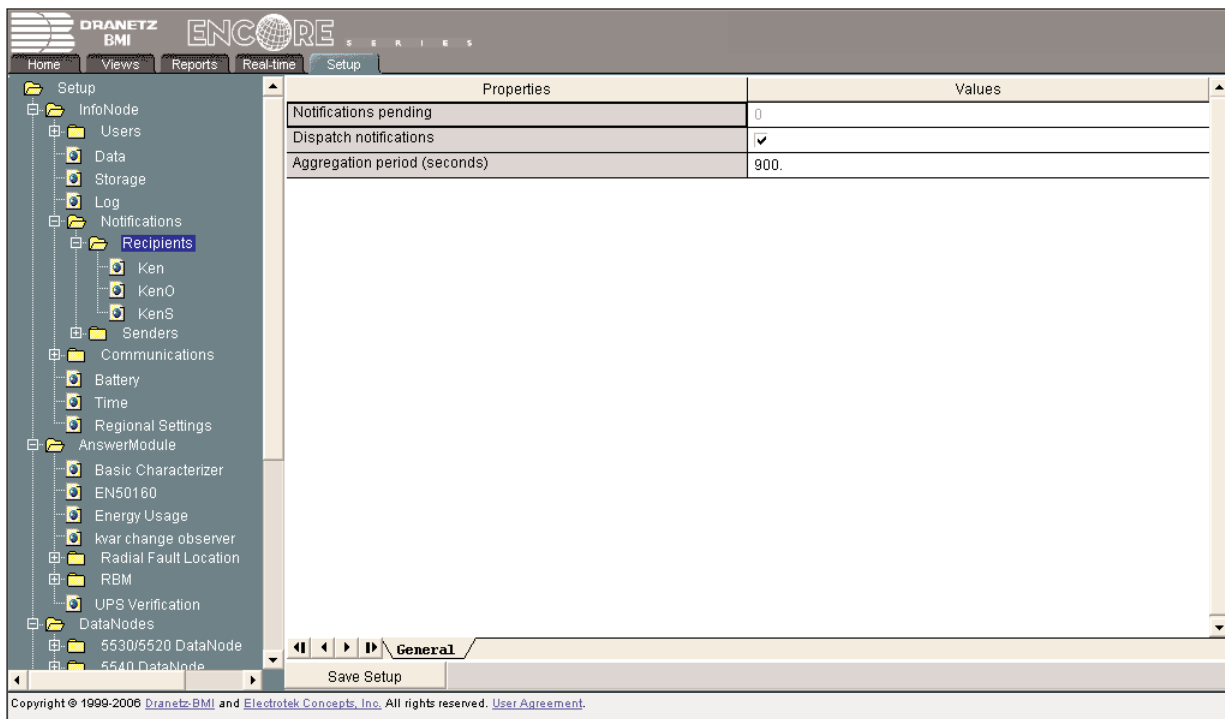
The ADAM handler supports the Advantech ADAM 4000 and 5000 series of distributed general purpose I/O modules. All input modules are supported through the ADAM instrument handler. Relay output functions for notifications are set as part of the communications handler. At this time only input modules are supported with the exception of the notification feature.

ADAM 4060 Contact Closure Module Setup

The ADAM 4060 relay contact closure module is used to signal notifications to designated recipients. Data for the ADAM modules may be configured in various format, one of which is the hexadecimal format. The procedure below describes how to set up the optional ADAM contact module to relay notifications to designated recipient.

NOTE: Only those with admin privileges may set whether to dispatch notifications or not. Users who access the Encore Series Software system as Guest, Viewer or Operator are not allowed to dispatch notifications nor change time settings when notifications will be sent to recipients.

1. The RS232 cable between COM1 or COM2 on the InfoNode/PC InfoNode/DualNode and the ADAM 232 to 485 converter is wired 'straight' (as in Dranetz 8010 PQNode) i.e. not null Modem.
2. There is no need to set up an ADAM 4060 or 5060 DataNode. It is just an alarm feature programmed in the Recipients section.
3. Using the setup functions under Setup Page, set the unit up as a recipient. Recipients determine who will receive notifications.
4. Enable the *Dispatch Notifications* field in the Recipients setup screen. Go to Setup Page - Notifications > Recipients > General tab. See page 7-5 for more information on the Recipients - General properties tab.



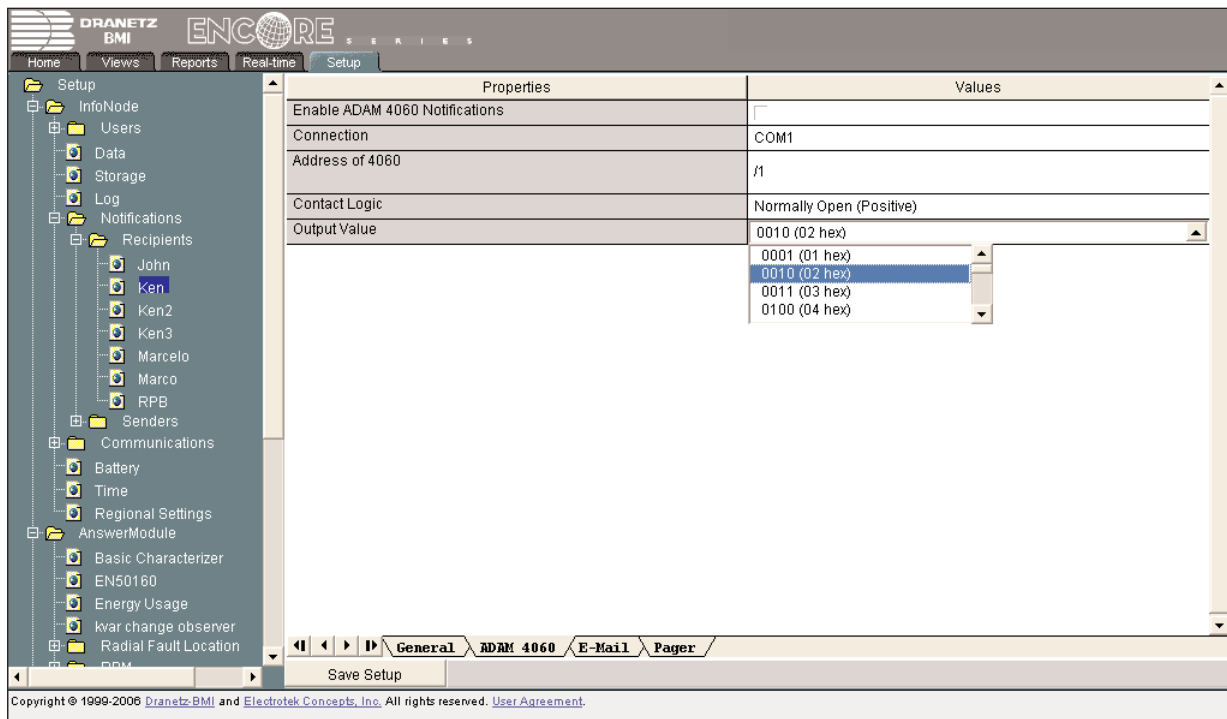
14 ADAM Handler Setup

5. The Hex value in the ADAM 4060 tab is the given HEX value of the particular 4060 viz 01. Go to Setup Page - InfoNode > Notifications > Recipients > ADAM 4060 tab (see sample screen below).

The relay (1-4) HEX address is chosen from the drop down box in the recipient section. For example, Relay 1 is 0001 and is HEX 01; Relay 4 is 1000 and is HEX 8.

NOTE: It takes approximately 4 seconds for a test transmission to close the relay and around 3.5 minutes for a rms sag to be alarmed.

See pages 7-6 for more information on the Recipients - ADAM 4060 properties tab.



ADAM 4060 tab

Enabling ADAM Communications

The Active control must be checked for any communications to ADAM modules to occur. All ADAM communications will occur on the indicated port. Set the COM Port that will be used for ADAM modules. Only one ADAM RS-485 and RS-232 network on one COM port is supported. The ADAM 4060 relay contact closure module is used to signal notifications to a third-party system (i.e. SCADA, BMS-Building Management System, etc.) that can only accept relay contacts as input. This portion of the setup allows for global setup of the properties that will be common to all uses of the single 4060 allowed on the system.

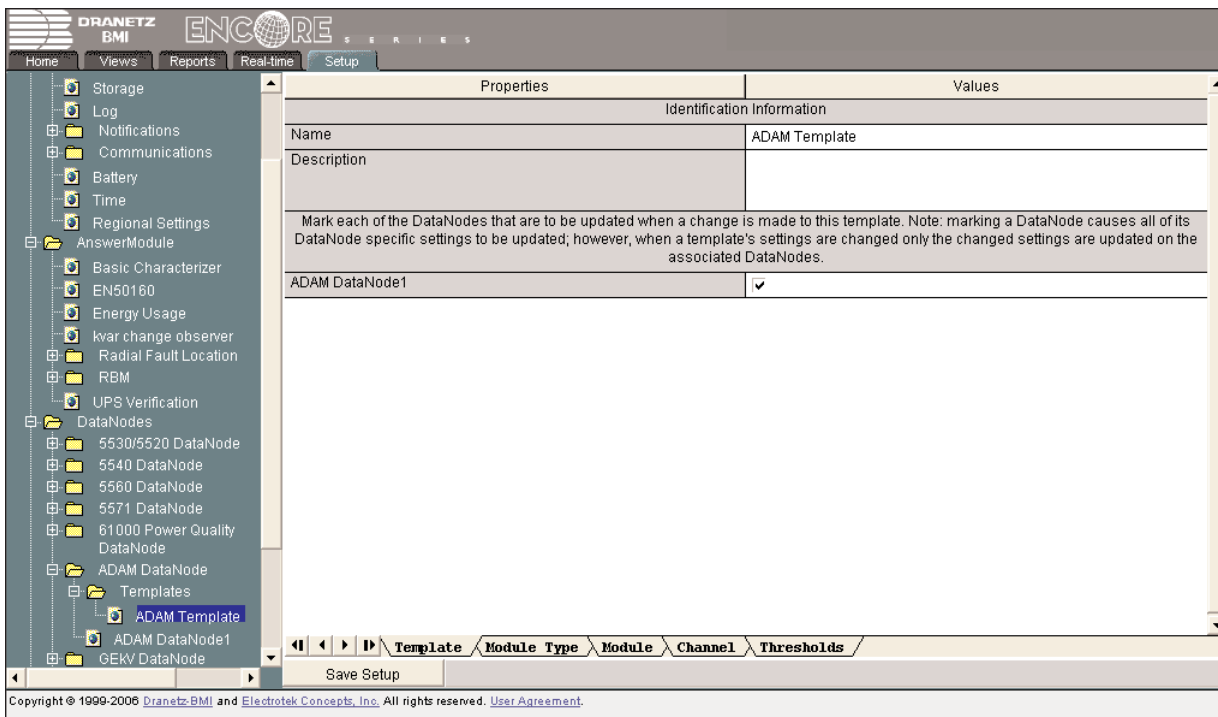
Hexadecimal Address

The *Hex (Hexadecimal) Address* property specifies the address of the 4060. The *Contact Logic* property allows specification of the logic "sense" of the messages to be sent. The default value of "Positive" (or Normally Open) means that a logical value of "1" is a closed contact and a logical "0" is an open contact. "Negative" (or Normally Closed) logic means the opposite: logical "1" is an open contact and logical "0" is closed. The *Contact Pulse Time* specifies how long the contacts should be actuated to signal the notification.

Template and DataNode Tabs

The *General Guidelines in Setting Up DataNodes* (page 7-34) and *Using the Template Function in DataNode Setup* (page 7-37) provide important background information for DataNode setup. Read these sections before continuing on with the discussion below.

Template Setup tabs - All tabs except Template are the same as that of its associated DataNode tabs. From the Template setup tab shown below, you can set the name and description of the template. This tab also contains a list of all of the DataNodes of the same type as the template. Each DataNode in the list has a checkbox that indicates if the template is associated with the respective DataNode. When you associate a template with a DataNode, all of the setup values from the template are copied to the DataNode's setup values. Thereafter, any change that you make to the template is copied to all of the DataNodes associated with the template.



14 ADAM Handler Setup

DataNode Setup tabs - All setup parameters except for those on the Identification and Status, Communication, and Polling tabs are part of the template. The setup values on these tabs (e.g. DataNode name, IP address, polling rate, etc.) are not affected by the changes to Templates .

The screenshot displays the DRANETZ BMI ENCORE SERIES software interface. The left sidebar shows a tree view of system components, including Storage, Log, Notifications, Communications, Battery, Time, Regional Settings, AnswerModule, Basic Characterizer, EN50160, Energy Usage, kvar change observer, Radial Fault Location, RBM, UPS Verification, DataNodes, and various DataNode instances. The main area is divided into two sections: Properties and Values. The Properties section contains Identification Information (Name, Description, Serial Number, Version) and Status Information (Health, Communication status, Last poll at, Next poll at). The Values section shows the current values for these properties. A note indicates that selecting a template updates the DataNode's settings. The bottom status bar shows the current tab is Identification and Status, and a Save Setup button is available.

Properties	Values
Identification Information	
Name	ADAM DataNode1
Description	
Serial Number	Unknown
Version	Unknown
Status Information	
Health	Unknown
Communication status	Inactive
Last poll at	Unknown
Next poll at	Unknown
Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.	
Template	None
	None
	ADAM Template

Save Setup

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Encore Series Software supports a wide variety of ADAM modules to fit various applications. See page 14-10 for the list of available ADAM modules supported by the Encore Series Software. Right-click on the ADAM DataNode and click on Add DataNode to add your particular ADAM module. Select the ADAM DataNode site name and the ADAM properties will be displayed on the right window. Polling rate for ADAM modules typically last from 2 to 5 seconds (not a guaranteed rate). Use the tabs across the bottom of the page to select the appropriate group of programmable features. The parameters available in each tab are discussed in detail in the next section.

1. Identification and Status tab

The screenshot shows the Encore Series Software interface. On the left is a tree view with categories like Regional Settings, AnswerModule, Basic Characterizer, EN50160, Energy Usage, kvar change observer, Radial Fault Location, RBM, UPS Verification, DataNodes, and Templates. Under DataNodes, 'ADAM DataNode1' is selected. The main window is divided into 'Properties' and 'Values' sections. The 'Identification Information' section includes fields for Name (ADAM DataNode1), Description, Serial Number (Unknown), and Version (Unknown). The 'Status Information' section includes Health (Unknown), Communication status (Inactive), Last poll at (Unknown), and Next poll at (Unknown). A note states: 'Use the settings below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template; however, the DataNode's settings can be changed after a template is applied.' The Template field is set to 'None'. At the bottom, there are tabs for Identification and Status (selected), Communication, Polling, Module Type, Module, and Channel. A 'Save Setup' button is at the bottom left. Copyright information is at the very bottom: 'Copyright © 1999-2006 Dranetz-BMI and Electrotek Concepts, Inc. All rights reserved. User Agreement.'

The Identification and Status tab contains identification and health status description of the DataNode.

IDENTIFICATION INFORMATION includes the Name and Description which users can assign for a particular DataNode type. Simply click on the **Name** or **Description** value field and the cursor is set for users to type in the space provided. Description typically describes the place where the DataNode hardware is located. Users are allowed to enter up to 30 alphanumeric characters under the Name and Description fields. The **Serial Number** and **Version** of the DataNode hardware are automatically set by default. This instrument-specific information is available only for viewing and cannot be altered or changed from the Encore Series Software.

STATUS INFORMATION properties includes **Health** status, whether the DataNode system is functioning normally or not. It also includes status of Encore Series Software to DataNode **Communications**.

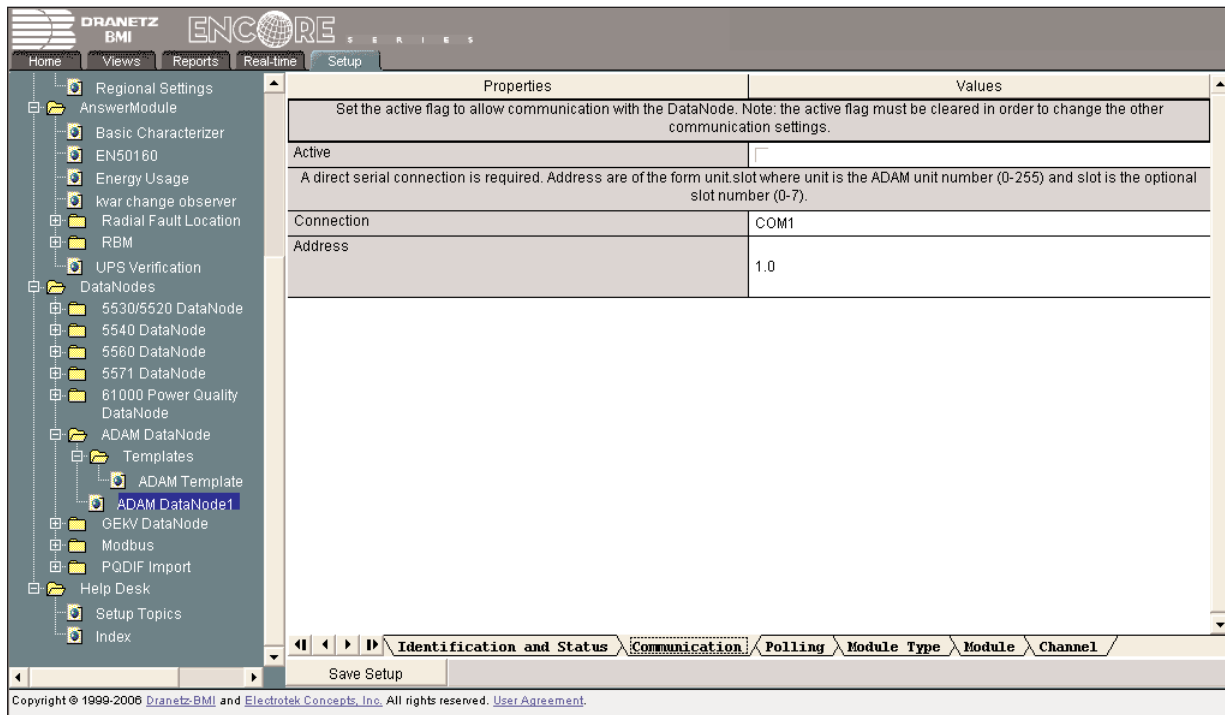
Polling Status is also displayed, indicating when the Encore Series Software last requested data from the DataNode and when the next poll is scheduled to take place.

Template users may also associate this DataNode with the settings from a template.

Remember to click the Save Setup button found at the bottom of the page to save any changes that have been done. To aid users, a Save confirmation window appears after changes have been made and when users are about to switch to a different tab.

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2. Communication tab



COMMUNICATION parameters for ADAM DataNode include the following:

Active which indicates whether communications between the Encore Series Software and DataNode is enabled. When checked, this means that the DataNode is actively communicating and exchanging information with the software. When making changes in the different value settings of a DataNode, it is recommended to uncheck the Active box again. Also when adding a new DataNode, the Active box should be checked last to establish link with the DataNode site. Click on the Home page to see which DataNodes are actively communicating with the Encore Series Software.

Connection can be through Serial Port COM 1 thru COM 255 (Hardware or Virtual ports) or Modem as installed and recognized by the Windows operating system. Set the COM *Port* that will be used for ADAM modules. Only one ADAM RS-485 and RS-232 network on one COM port is supported. The ADAM communications handler is configured to use a specific serial port on the Encore Series.

Address must be a unique address between 1 and 99 for each DataNode. However, if only one DataNode is connected to the COM port and the present address is unknown, zero (0) can be used. If the connection is via Modem as opposed to Serial Port, then the telephone number would be entered before the "/" separating the device address.

3. Polling tab

Properties	Values
Polling schedule	
Enable scheduled polling	<input type="checkbox"/>
Start at	01/01/2006 00:00:00
Repeat every	1
Repeat units	minutes
Maximum number of retries	3
Time to wait between retries (minutes)	1
Operations performed at each poll	
Download and store data	<input checked="" type="checkbox"/>
Operations performed only once at the next poll	
Send settings to DataNode	<input checked="" type="checkbox"/>
Delete data in DataNode	<input type="checkbox"/>

Save Setup

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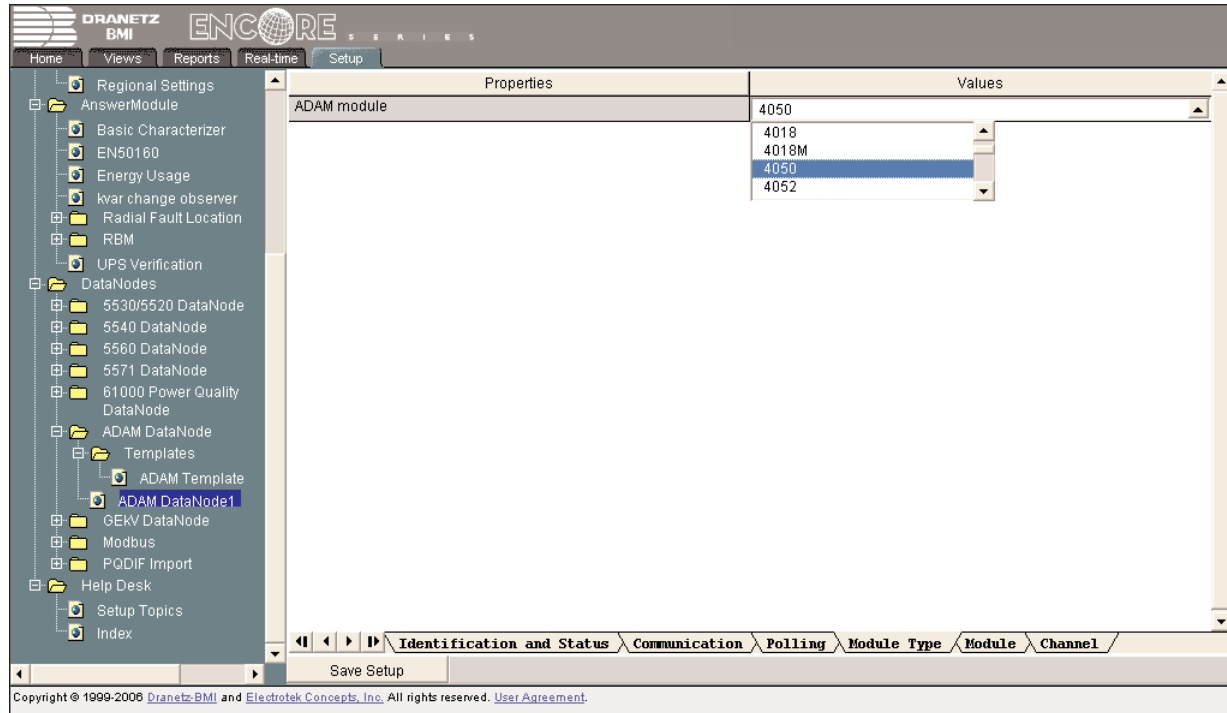
POLLING SCHEDULE parameters include **Enable scheduled polling**, which indicates whether scheduled polling of the DataNode should take place. When checked, this means that the Encore Series Software will poll the DataNode for new information according to a defined schedule. This includes a **Start at** date and time, a **Repeat every** numerical value, and **Repeat units** which can be minutes, hours, days, weeks, or months. The **Maximum number of retries** can be specified along with the **Time to wait between retries** (in minutes).

OPERATIONS PERFORMED AT EACH POLL include a **Download and store data** check box to enable the Encore Series Software to retrieve data stored in the DataNode.

OPERATIONS PERFORMED ONLY ONCE AT THE NEXT POLL include checkboxes to enable/disable: **Send settings to DataNode** - use to match DataNode setups with those listed in the Encore Series Software, and **Delete data in DataNode** - use to remove stored data in the DataNode.

4. Module Type tab

The **ADAM Module** drop down property allows selection of the desired module from the available module types.



The Module Type tab is used to set the Module address. Module Address property is used to specify the RS-485 address where ADAM 4000 series modules will be found. For ADAM 5000 series modules, this is the address of the 5000 or 5000e chassis. The 5000 Series Slot Number is used to indicate the position of the module in the chassis. Positions start at 0.

The following **ADAM modules** are supported:

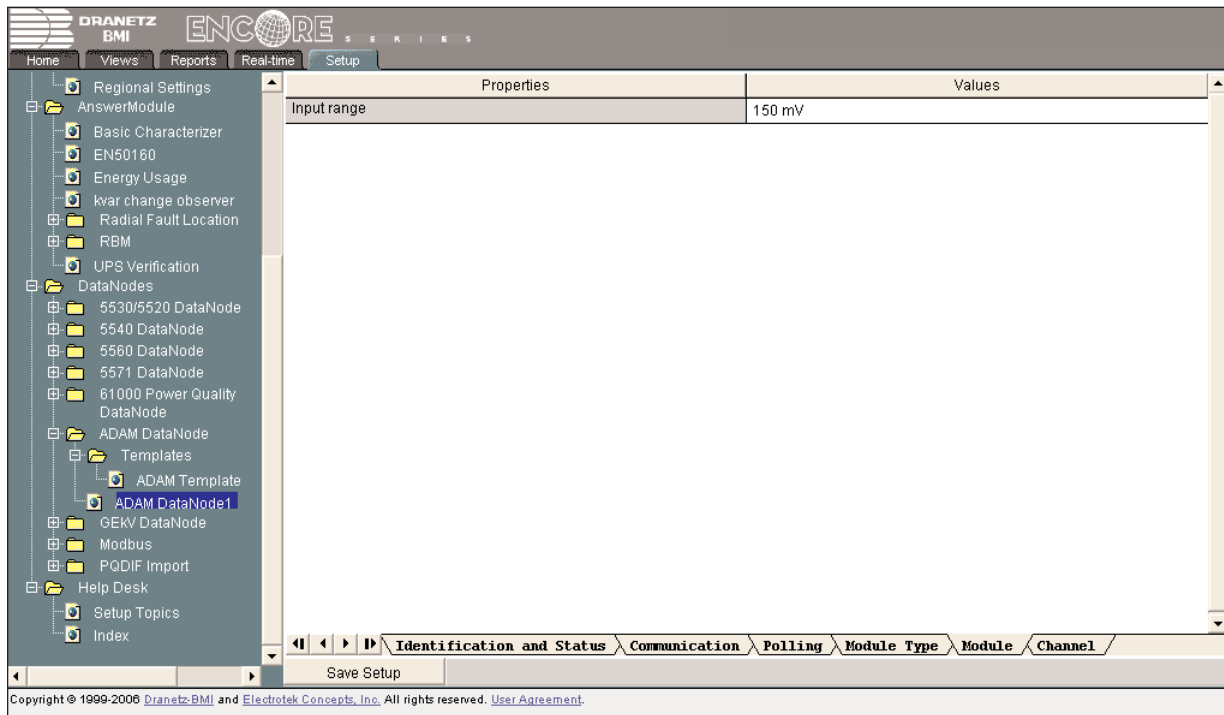
4000 Series

- 4017 8 Channel Analog Input
- 4018 8 Channel Thermocouple/General Analog Input
- 4018M 8 Channel Thermocouple/General Analog Input with memory
- 4050 7 Channel Digital Input/8 Channel Digital Output (Output not supported)
- 4052 8 Channel Digital Input (6 differential, 2 single ended)
- 4053 16 Channel Digital Input
- 4080 2 Channel Counter/Frequency Module (up/down counter mode only)

5000 Series

- 5000 4 Slot Chassis
- 5000E 8 Slot Chassis
- 5017 8 Channel Analog Input
- 5018 7 Channel Thermocouple/General Analog Input
- 5050 16 Channel Digital Input/Output (Output not supported)
- 5051 16 Channel Digital Input/Output
- 5052 8 Channel Isolated Digital Input
- 5080 4 Channel Counter/Frequency Module (up/down counter mode only)

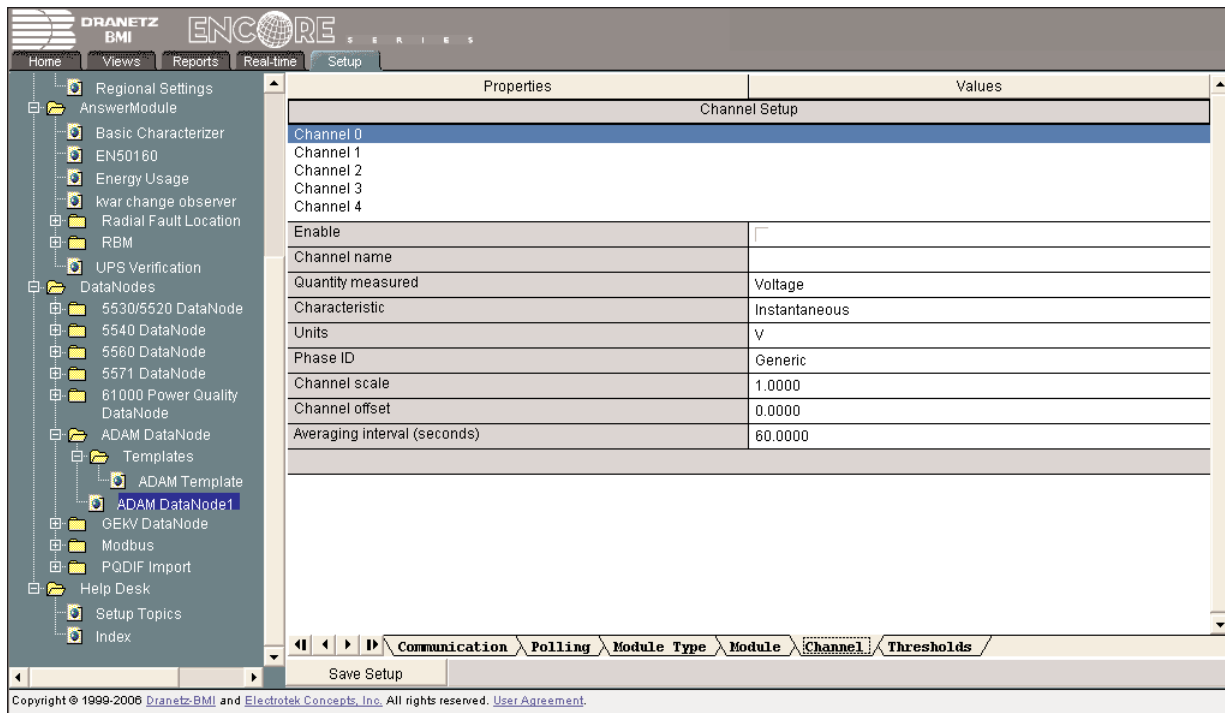
5. Module tab



Once the Module type has been selected, the remaining tabs apply to the specific Module selected. The Module tab is module-specific and tabs vary depending on module type.

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6. Channel tab (for Thermocouple/General Analog Input Modules - ADAM 4018, 5018)



When a general purpose analog input module or thermocouple module with voltage or current range is selected the Channel Tab contains the following properties.

The tab shows each channel available for the selected module and range. The channels are labeled **Channel 0** through **Channel n** where n is the number of channels available. By selecting one of the entries in the list, you will be setting the parameters for that channel.

The **Enable** property signals that the selected channel is to be monitored and stored.

The **Channel Name** property is used to label and select this channel in other interfaces in the Encore Series Software. Any arbitrary name with up to 80 characters can be specified .

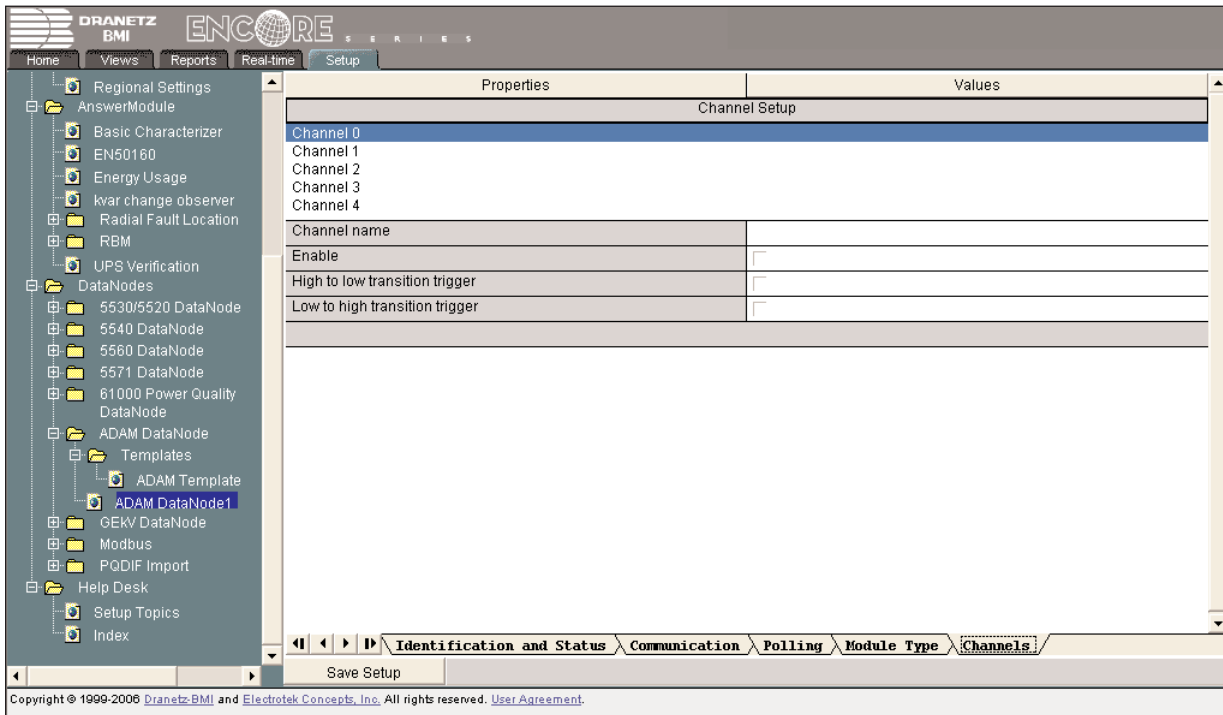
The **Quantity Measured**, **Characteristic** and **Units** properties are used to define the channel type in the Encore Series Software database. An example might be Voltage (Quantity Measured), Instantaneous Sampled (Characteristic), and Volts (Units).

The **Channel Scale** property specifies the number used to scale the value read from the ADAM Module. This depends on the transducers that are measuring the real signal. For instance, a speed sensor might output 1 Volt per 50 rpm which would give a Channel Scale of 50.

The **Channel Offset** property allows an offset to be applied to the signal measured from ADAM module. This must be specified in scaled units. If a pressure transducer were to output 0 volts at 1000 mbar and you desire a reading of 1000 mbar, specify 1000 for the offset assuming the appropriate scale was specified in the Channel Scale to convert input signal to mbar.

The **Averaging Interval** property is used to tell the system how often to store values for this unit. The signals are sampled as quickly as the system can depending upon the number of instruments attached. The data is aggregated into minimum, maximum and average values over the averaging period and stored at the end of the interval.

7. Channel tab (for General Digital Input Modules - ADAM 4050/4052, 5050/5052)



The tab shows each channel available for the selected module. The channels are labeled **Channel 0** through **Channel n** where n is the number of channels available. By selecting one of the entries in the list, you will be setting the parameters for that channel. Note that while channels on the ADAM units begin numbering at 0, the channel numbering here begins at 1. Input 0 maps to channel 1, input 1 maps to channel 2, etc.

The **Channel Name** property is used to label and select this channel in other interfaces of the Encore Series Software. Any arbitrary name with up to 80 characters can be specified.

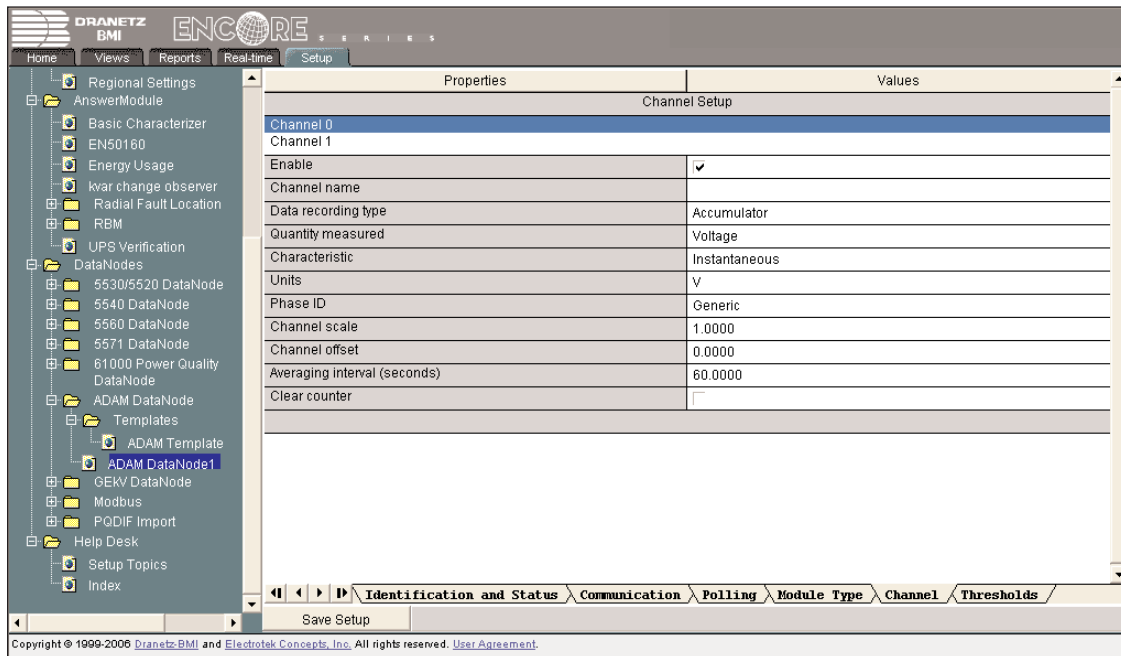
The **Enable** property signals that this channel is to be monitored and stored. When the channel is enabled, a steady state trend entry is made at every transition from low to high or high to low.

The **High to low transition trigger** property when checked will cause an event to be generated whenever the signal transitions from a logical 1 to a logical 0.

The **Low to high transition trigger** property when checked will cause an event to be generated whenever the input signal transitions from a logical 0 to logical 1.

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8. Channel tab (for Counter Input Modules - ADAM 4080, 5080)



The tab shows each channel available for the selected module and range. The channels are labeled **Channel 0** through **Channel n** where n is the number of channels available. By selecting one of the entries in the list, you will be setting the parameters for that channel.

The **Enable** property signals that the selected channel is to be monitored and stored.

The **Channel Name** property is used to label and select the channel in other interfaces of the Encore Series Software. Any arbitrary name with up to 80 characters can be specified.

The **Data Recording Type** property specifies how the data is to be stored. Data storage options are either Interval or Accumulator. For Interval data, the value of the counter at the beginning of the sampling interval is subtracted from the value of the counter at the end of the interval. For Accumulator data, accumulated value of the counter is stored.

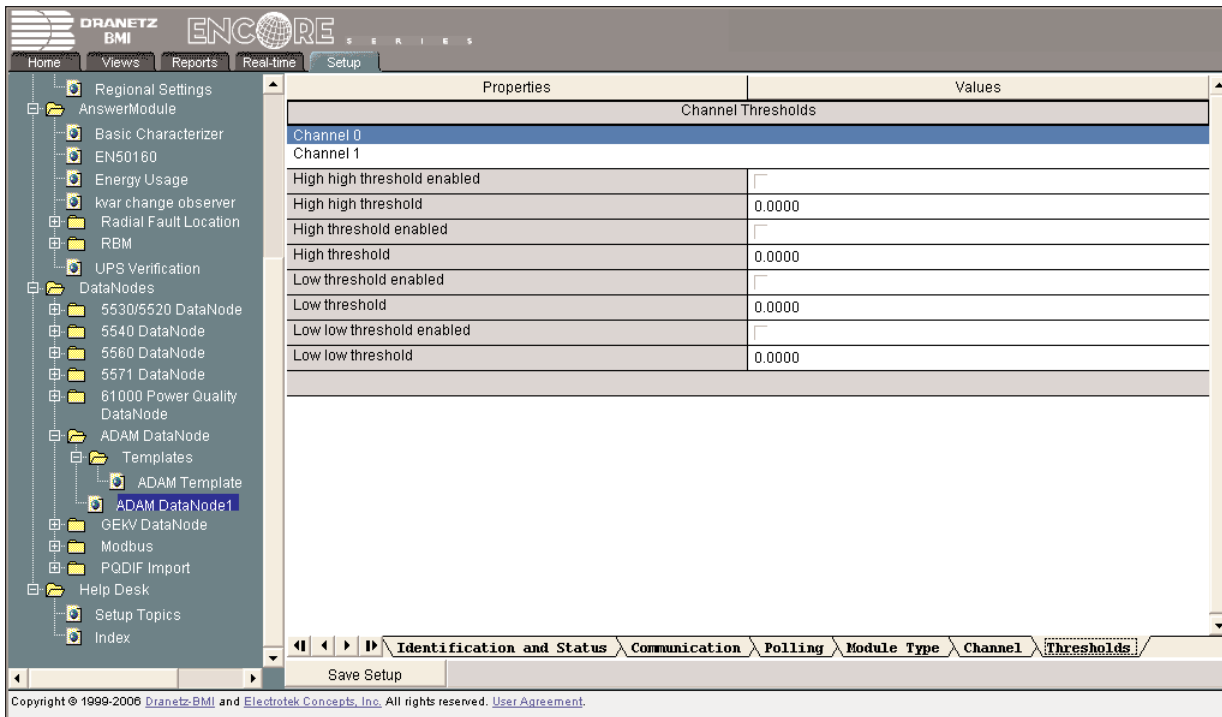
The **Quantity Measured**, **Characteristic** and **Units** properties are used to define the channel type in the Encore Series Software database. Selection from these characteristics allows the Encore Series Software to group the channel with appropriate channels during selection, and allow some reports to include the signals measured in more meaningful ways. Sample input values are Voltage (for Quantity Measured), Instantaneous Sampled (for Characteristic), and Volts (for Units).

The **Channel Scale** property specifies the number used to scale the value read from the ADAM unit to the value you wish to record. This depends on the transducers that are measuring the real signal. For instance, a flow sensor might output 5 counts per liter. If the unit of measure is in liters, the scale would be 1/5 or 0.20.

The **Channel Offset** property allows an offset to be applied to the signal measured from ADAM module. This must be specified in scaled units. If a pressure transducer were to output 0 volts at 1000 mbar and you desire a reading of 1000 mbar, specify 1000 for the offset assuming the appropriate scale was specified in the Channel Scale to convert input signal to mbar.

The **Averaging Interval** property indicates how often the value should be saved. The values are read as fast as possible to allow trigger checking as specified on the Advanced tab.

9. Thresholds tab



The **Thresholds** tab is available for all analog and counter modules. It allows the specification of threshold limits for the input channels.

The tab shows each channel available for the selected module and range. The channels are labeled **Channel 0** through **Channel n** where n is the number of channels available. By selecting one of the entries in the list, you will be setting the thresholds for that channel.

There are four threshold settings available. These are used to specify the four available threshold trigger levels: **Low-Low**, **Low**, **High**, and **High-High**. Each threshold can be independently enabled and set.

14 ADAM Handler Setup

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Optional Accessories

The following optional accessories are available to enhance the functions and capabilities of the Encore Series Software.

Specifications are subject to change without notice. Contact Dranetz Customer Service for the latest information on options and accessories.

Internal Software Options

- PF Cap Directivity Answer Module: SW-PFCAP
- VAR Verifier Answer Module: SW-kVAR (Requires SW-PFCAP - PF Cap Directivity SW Module)
- RBM Indices Software Module: SW-RBMI
- Radial Line Fault SW Module: SW-RADL
- Sag Directivity SW Module: SW-SAG
- UPS Verification SW Module: SW-UPSV
- Advantech 4000/5000 ADAM Modules: SW-IADAM
- GE KV Series of Wattmeters SW Module: SW-GEKV

ADAM Module Accessories

- 8 Channel Analog Input: ADAM 4017
- 8 Channel Thermocouple/General Analog Input: ADAM 4018
- 8 Channel Thermocouple/General Analog Input w/ memory: ADAM 4018M
- 7 Channel Digital Input/8 Channel Digital Output: ADAM 4050 (Output not supported)
- 8 Channel Digital Input (6 differential, 2 single ended): ADAM 4052
- 16 Channel Digital Input: ADAM 4053
- Relay contact closure model: ADAM 4060
- 2 Channel Counter/Frequency Module (up/down counter mode only): ADAM 4080
- 4 Slot Chassis: ADAM 5000
- 8 Slot Chassis: ADAM 5000E
- 8 Channel Analog Input: ADAM 5017
- 7 Channel Thermocouple/General Analog Input: ADAM 5018
- 16 Channel Digital Input/Output: ADAM 5050 (Output not supported)
- 16 Channel Digital Input/Output: ADAM 5051
- 4 Channel Isolated Digital Input: ADAM 5052
- 4 Channel Counter/Frequency Module (up/down counter mode only): ADAM 5080
- RS-232 to RS-485 Converter: ADAM 4522
- Isolated RS-232 to RS-485 Converter: ADAM 4520
- 12VDC 820ma power supply: ADAMPWR

15 Optional Accessories

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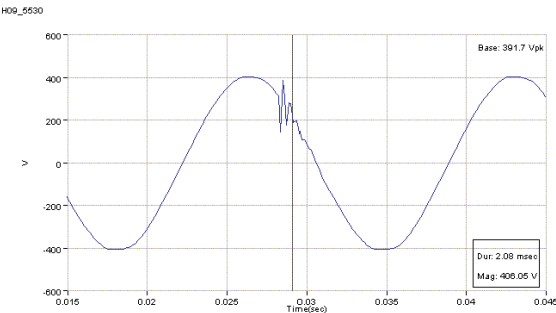
Quantities Calculated from Periodic Voltage and Current Measurements

Quantity	Defining Equation	Comments
Apparent Power	$S = V_{RMS} \cdot I_{RMS}$ (eq. 1)	
Real Power	$P = \frac{1}{N} \sum_{i=1}^N V_i \cdot I_i$ (eq. 2)	N = Samples per cycle V_i = Voltage at i^{th} sample I_i = Current at i^{th} sample
True Power Factor	$PF = \frac{P}{S}$ (eq. 3)	
Total Harmonic Distortion (THD)	$= \frac{1}{X_1} \sqrt{\sum_{h=2}^{h_{max}} X_h^2}$ (eq. 4)	X_h = rms voltage or current at harmonic h h_{Max} = Highest resolved harmonic
Telephone Influence Factor	$= \frac{\sqrt{\sum_{h=1}^{h_{max}} (X_h \cdot W_h)^2}}{X_{RMS}}$ (eq. 5)	W_h = Harmonic weighting factor from table
IT Product	$IT = I_{RMS} \cdot TIF$ (eq. 6)	Calculated for voltage by replacing I_{rms} with kV_{rms}
Crest Factor	$CF = \frac{Max X_i}{X_{RMS}}$ (eq. 7)	X_i = Voltage or current at i^{th} sample in one cycle. Note that CF for sinusoidal wave is 1.414, not 1.0.

h	W	h	W	h	W	h	W
1	0.5	17	5,100	31	7,820	50	9,670
3	30	18	5,400	33	8,330	53	8,740
5	225	19	5,630	35	8,830	55	8,090
6	400	21	6,050	36	9,080	59	6,730
7	650	23	6,370	37	9,330	61	6,130
9	1,320	24	6,650	39	9,840	65	4,400
11	2,260	25	6,680	41	10,340	67	3,700
12	2,760	27	6,970	43	10,600	71	2,750
13	3,360	29	7,320	47	10,210	73	2,190
15	4,350	30	7,570	49	9,820	83.3	840

Summary of Power Quality Variations

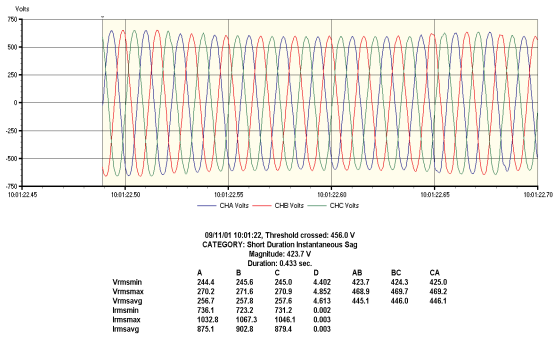
Transients
Oscillatory Transient
Impulsive Transient



Decaying Oscillation
Low frequency < 5 kHz
Med. frequency 5-500 kHz
High frequency > 500 kHz

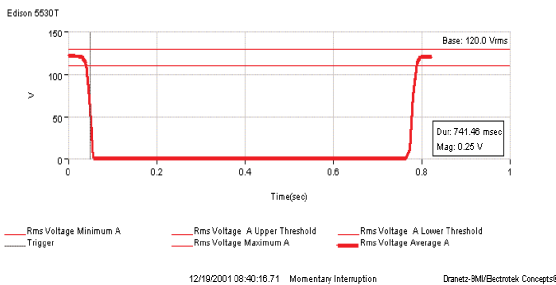
Unidirectional
Typical duration < 200 msec

Short Duration Variations
Sag



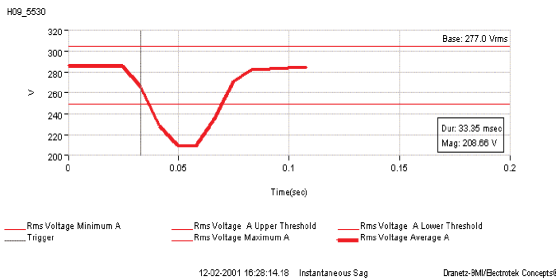
Instantaneous ½ - 30 cycles
Momentary ½ - 3 seconds
Temporary 3 sec - 1 min

Long Duration Variations
Undervoltage
Overvoltage



Duration > 1 minute

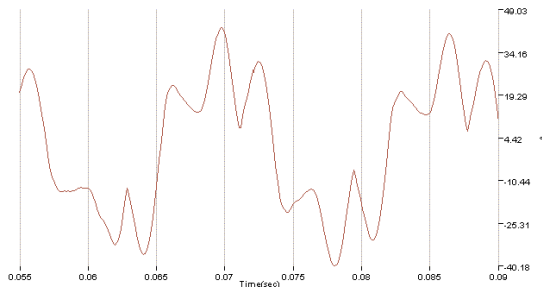
Interruptions
Momentary
Temporary
Outage



½ - 3 seconds
3 sec - 1 min
> 1 minute

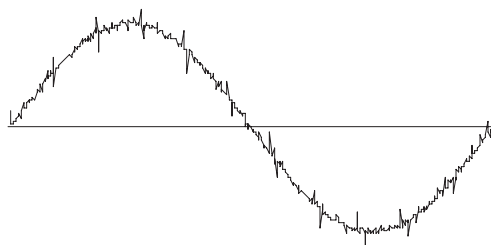
Summary of Power Quality Variations

Waveform Distortion Harmonic Distortion



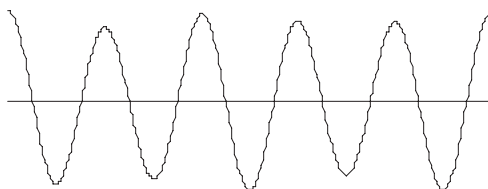
Continuous distortion
2nd - 49th harmonic
components

Noise



High frequency distortion
Broadband spectral
components < 200 kHz

Voltage Fluctuations Flicker



Intermittent magnitude variations
Frequency components < 25 Hz

C Appendix

System Parameters Affecting Power Quality and Diagnostic Evaluations

Category	Causes	Impacts
Impulses	<ul style="list-style-type: none"> Lightning 	<ul style="list-style-type: none"> Transformer failures Arrester failures Customer equipment damage due to low-voltage surges
Low frequency transients	<ul style="list-style-type: none"> Capacitor switching 	<ul style="list-style-type: none"> Tripping of ASDs and other sensitive equipment Voltage magnification at customer capacitors
Medium frequency transients	<ul style="list-style-type: none"> Traveling waves from lightning impulses Capacitor and circuit switching transients 	<ul style="list-style-type: none"> Failure of customer equipment (transient is coupled to customer system through transformer winding capacitances)
High frequency transients	<ul style="list-style-type: none"> Switching on secondary systems Lightning-induced ringing Local ferroresonance 	<ul style="list-style-type: none"> Radiated noise may disrupt sensitive electronic equipment High rate of rise oscillations may cause low voltage power supplies to fail
Voltage sags	<ul style="list-style-type: none"> Local and remote faults 	<ul style="list-style-type: none"> Dropouts of sensitive customer equipment
Voltage swells	<ul style="list-style-type: none"> Single-line-to-ground faults 	<ul style="list-style-type: none"> Equipment overvoltages Failure of MOVs forced into conduction
Long duration voltage variations	<ul style="list-style-type: none"> Load switching Capacitor switching System voltage regulation 	<ul style="list-style-type: none"> Problems with equipment that require constant steady-state voltage
Harmonics	<ul style="list-style-type: none"> Nonlinear loads 	<ul style="list-style-type: none"> Misoperation of sensitive equipment Capacitor failures or fuse blowing Telephone interference
Voltage flicker	<ul style="list-style-type: none"> Arc furnaces and other intermittent loads 	<ul style="list-style-type: none"> Lighting flicker Misoperation of sensitive loads

Protocols Supported for InfoNode and DataNodes

EPQ DataNodes	Internet Communication Protocols/Ports		
HTTP	port 80	normal web requests, replies, file transfers, XML	server only
FTP	port 20 and 21	firmware update	client only
SNTP	port 123	time synchronization	client only
TELNET	port 23	remote management	server only
SMTP	port 25	email protocol	
SYSLOG	port 514	debug logging	slave only
ModBUS/TCP	port 502	ModBUS over TCP/IP	slave only
ISO/TCP	port 102	RFC 1006 ISO protocol over TCP/IP	for MMS protocol
WPT Private	port 38642	cross trigger protocol	
WPT Private	ports 38643 and 38644	discovery protocol	

EPQ DataNodes	High Level/Non-Internet Protocols and Formats		
UCA GOMSFE 0.9 over MMS/TCP		primary InfoNode to DataNode communication protocol	
COMTRADE		event capture format converted to PQDIF in InfoNode	create only

InfoNode	Internet Communication Protocols/Ports		
HTTP	port 80	normal web requests, replies, file transfers, XML	server only
FTP	ports 20 and 21	firmware update	client/server
ISO/TCP	port 102	RFC 1006 ISO protocol over TCP/IP	for MMS protocol
SNTP	port 123	time synchronization	client and server
SYSLOG	port 514	debug logging	client and server
SMTP	port 25	email protocol	

InfoNode	High Level/NonInternet Protocols and Formats (dependent on installed handlers)		
UCA GOMSFE 0.9 over MMS/TCP		primary InfoNode to DataNode communication protocol	
COMTRADE		event capture format converted to PQDIF in InfoNode read only	
IEEE 1159.3		PQDIF primary data storage and exchange format	
XML		used for HTTP based information transfer between InfoNode and client software	
Advantech ADAM	RS232 & RS485	serial protocol	master only
ModBUS	RS232 & RS485	serial protocol	master only
MetOne	RS232	proprietary protocol for meteorological stations	master only
DBMI 7100	RS232 & RS485	proprietary serial protocol	master only
ANSI C18.12	RS232 & RS485	metering protocol	master only
TAP		pager modem protocol	

Encore Series Network Capabilities

The Encore Series system uses industry standard TCP/IP network communication. Encore Series is configurable to work with most popular network addressing schemes, including Classes A, B, and C. Most company local area networks or LANs utilize the Class C addressing scheme. Class C is also well suited for small stand-alone networks. For these reasons, the factory default and the shipped network settings of the Encore Series makes use of the Class C addressing scheme.

For proper operation, the addressing scheme of the Encore Series devices must match the addressing scheme of the network to which they are connected. For example, you cannot mix Class C and Class B hosts on the same physical network.

Description of Networking Classes

IP Addressing

An IP address is a 32-bit number, usually represented in a dotted decimal notation (i.e. 146.34.47.24), which uniquely identifies every host connected to an internet network.

Each field between the periods is an 8-bit number (called an octet), with values between 0 and 255.

The numbers 0, 127, and 255, however, have special meanings when they appear.

For an unknown address, Zeros are used, i.e. when a machine is requesting that a server assign to it an IP address.

When a machine refers to its own address, 127 is used. The terminology for this is loopback.

To broadcast a packet to every host on a local network, the value 255 is used.

Hosts use these addresses to send each IP packet along to its final destination. Routing is the process of deciding how a particular packet travels to its final destination.

There are several classes of IP addresses as defined by the IETF (Internet Engineering Task Force):

Class A - very large networks

Class B - large networks

Class C - small networks

Class D - multicast

Class E - reserved future use

There are two parts to an IP address. Where the division takes place depends on the network class. The first part of the address is the network address; the remaining part is the host address.

Class A

Class A is for very large networks. The first octet is of the form 0xxxxxxx, which means it can range from 1 to 126. Networks of this type use only the first octet as the network address. This means there can only be 126 Class A Networks. The remaining portion, the next 3 octets or 24 bits, form the host address. This allows 16,194,277 computers on a Class A network. An example of a Class A IP Address is 10.0.0.0, with a Subnet Mask of 255.0.0.0.

Class B

Class B is for large networks. It is common for universities to have Class B addresses assigned to them. The first octet has the form 10xxxxxx, which can range from 128 to 191. The definition of network address for Class B is the first two octets, which allows 16,382 Class B networks. The last two octets form the host address, allowing 64,009 hosts (remember that 0, 127, and 255 cannot be used) on each Class B network. An example of a Class B IP Address is 129.10.0.0, with a Subnet Mask of 255.255.0.0.

Class C

Class C is for small networks, where the first octet is of the form 110xxxxx, which can range from 192 to 223. The network address consists of the first three octets, allowing 1,984,279 different Class C networks with only 253 hosts per network. An example of a Class C IP Address is 192.168.1.0, with a Subnet Mask of 255.255.255.0.

Other Classes

The IP specification states that addresses whose first octet have the form 111xxxxx are 'extended' addresses, reserved for future use. Since the first three classes were defined, Class D, Multicast, was added to the list.

The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of the IP address space for private networks:

Class A	10.0.0.0	- 10.255.255.255 (10/8 prefix)
Class B	172.16.0.0	- 172.31.255.255 (172.16/12 prefix)
Class C	192.168.0.0	- 192.168.255.255 (192.168/16 prefix)

Note that by definition, these test network addresses are not routable on the Internet.

Configuring the Encore 61000 DataNode for Modem Communication

Encore 61000 DataNode

The Encore 61000 DataNode can be configured to communicate with the Encore Series Software running on a computer using analog or land-based modems (versus GSM/GPRS wireless modems). For communication to operate properly, a compatible modem would need to be connected to the serial port on the rear panel of the 61000, as well as to the computer (either internal card-based or external modem). The recommended modem for the 61000 is a 61MDM, which is a 56kbps modem.

NOTE: The 61000 can collect a large amount of data, depending on how it is set up and on the amount of event activity. Data size of 10Mbytes per day is not unusual. Downloading this amount of data from a number of 61000 units through analog modems may not be practical in larger systems, since download time multiplied by the number of units may exceed the polling rate. A 56kbps modem will typically download maximum of 3-5kbytes per second, which requires approximately an hour to download a day's data. The number of waveforms per event and the number of journalled parameters should be limited in such applications.

Procedure

Configuring the Encore 61000 DataNode for modem communications consists of five major steps: 1) setting up the modem for use with the 61000 unit; 2) configuring the computer to set up 61000 for direct Ethernet communications; 3) configuring the 61000 communications for modem operation; 4) setting up the dial-up network for the computer; and 5) 61000 DataNode setup in Encore Series Software. Follow the instructions below to configure the system for modem communications.

STEP 1: Set up the modem for use with the 61000 unit.

1.1 Connect the modem to the computer's serial port with a "straight-through" serial cable.

1.2 Use HyperTerminal to connect to the modem with the following settings:

HyperTerminal Settings:

Baud	115200
Data Bits	8
Parity	None
Stop Bits	1

1.3 Turn off the ECHO function by typing **ATE0<cr>**.

1.4 Turn on the RTS/CTS hardware flow control by typing **AT&K3 <cr>**.

1.5 Save the changes to the modem's setup memory by typing **AT&W<cr>**.

STEP 2: Set up the computer for direct Ethernet communication.

NOTE: This step may be skipped if you already have Ethernet communication with the 61000.

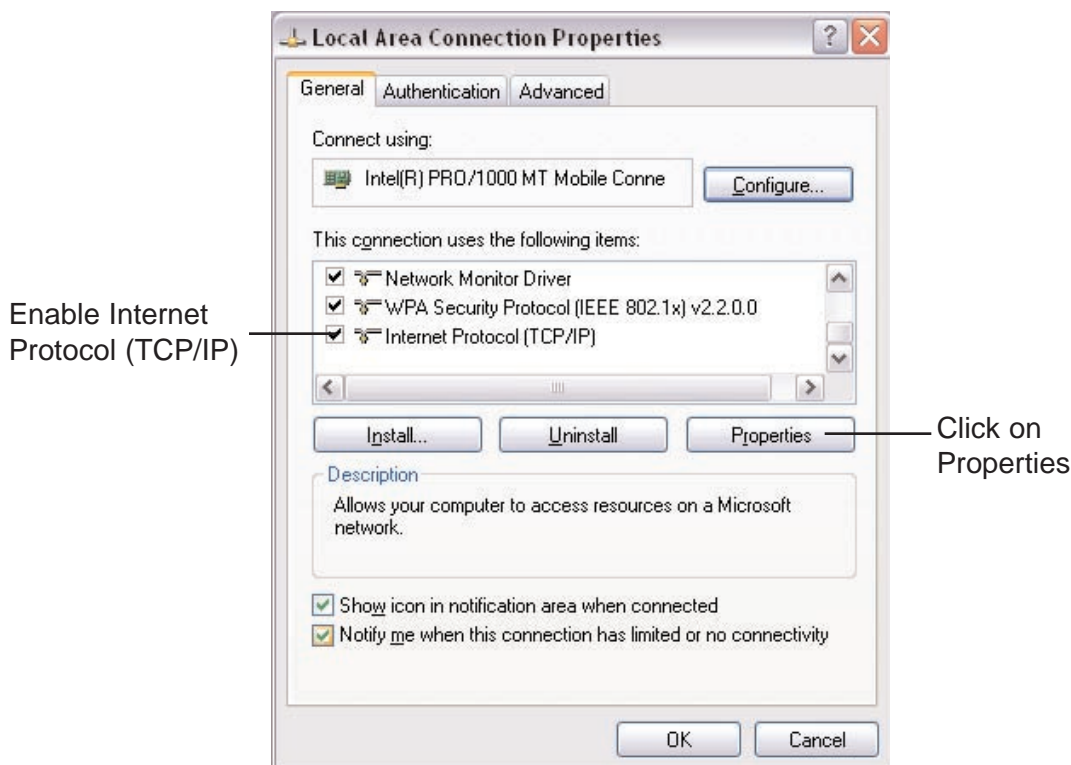
2.1 Connect a “crossover” Ethernet cable (typically orange in color) from the 61000's RJ45 Ethernet port to the computer's Ethernet network port

2.2 From the desktop, select: **Start > Control Panel > Network Connections**.

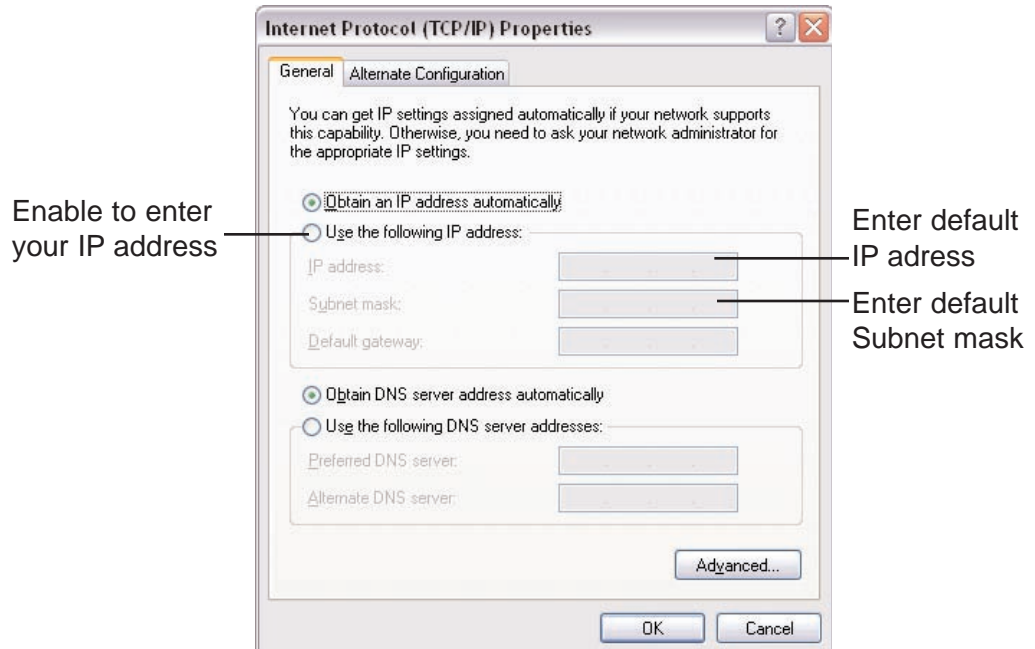
2.3 Depending on the type of modem and other communication options in the computer, a screen similar to the example below will appear. Right-click on the **Local Area Connection** icon to display menu selection.



2.4 Select **Properties** in menu list to display the Local Area Connection Properties screen shown below.



2.5 Check to enable **Internet Protocol (TCP/IP)** then click on the **Properties** button. The following screen will appear:



2.6 Select **Use the following IP address** to set up the IP in a range compatible with the range of the 61000. Once you click on the radio button, the fields to enter the IP address and Subnet mask will be enabled.

If this is an uninstalled system where the IP of the 61000 has not been configured by the user, use the default settings shown below.

Default Settings:

IP Address	192.168.0.5
Subnet Mask	255.255.255.0

If the IP is already configured on the 61000, then the first three sets of digits of the IP must be the same. The last set of number should be in the range of 1 to 255, but not the identical number as the 61000.

2.7 When done configuring the IP address, click on the **OK** button.

STEP 3: Configure the 61000 communications for modem operation.

- 3.1 Open a web browser e.g. **Internet Explorer** and type in the default IP address (192.168.0.20) in the address bar.
- 3.2 When done entering IP address, click on the **Go** button or press return. The 61000 log-in screen will be displayed.

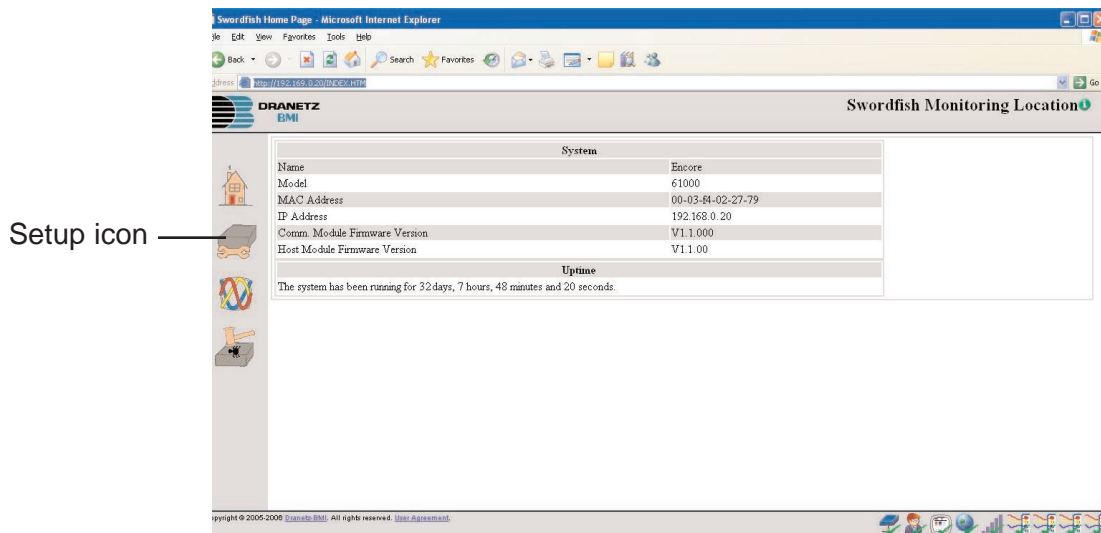


Enter the user-configured User name and Password.

If the User name and Password have not been configured by the user, use the following default settings: type in **admin** for User name and **password** for Password.

NOTE: Use lowercase characters when entering user name and password.

- 3.3 After typing in the user name and password, click on the **OK** button. The 61000 Home Page will be displayed.



3.4 Click on the **Setup** icon on the left side bar. The 61000 Setup page will be displayed.

The screenshot shows the 'Instrument Commissioning' page with several configuration sections. Annotations include:

- An arrow pointing to the 'Serial Port' section with the text: 'Serial port settings to be used for modem'.
- An arrow pointing to the 'PPP' section with the text: 'Select Yes to enable modem'.

The form contains the following sections and fields:

- TCP/IP**
 - DHCP?: ☐ Yes ☒ No
 - IP Address: 72.4.197.236
 - Subnet Mask: 255.255.255.0
 - Gateway: 72.4.197.4
 - DNS Server: 0.0.0.0
 - HTTP Port: 80
- Serial Port**
 - Baud Rate: 115200
 - Data Bits: 8
 - Stop Bits: 1
 - Parity: None
 - Used for: Modem (PPP)
- PPP**
 - Enabled?: ☒ Yes ☐ No
 - DataNode IP: 192.168.1.200
 - Remote IP: 192.168.1.201
 - Modem Init: AT&C0SD0
- GSM/GPRS**
 - Enabled?: ☐ Yes ☒ No
 - Access Point Name: proxy
 - Use Static IP?: ☐ Yes ☒ No
 - Static IP: 0.0.0.0
 - User Name:
 - Password:
 - Signal Strength: 99
- MODBUS**
 - Enabled?: ☐ Yes ☒ No
 - Enable MODBUS TCP: ☐ Yes ☒ No
 - Modbus Address: 0.0.0.0
 - TCP Port: 0
- NTP**
 - Enable: ☒ Yes ☐ No
 - Server Address: 72.4.197.149
 - Max. Adjust (sec): 0
 - Update Interval (hr): 168

At the bottom of the form is a 'Submit Changes' button.

3.5 Specify the instrument to which the **Serial port** settings apply. Click on the **Used for** down arrow to display the pull down menu and select **Modem (PPP)**.

3.6 Proceed to the **PPP** setup box and make sure it is Enabled. Click on the **Yes** radio button.

The DataNode IP and Remote IP are left in their default settings. The PPP Modem Init (initialization) string should also be left in its default setting.

NOTE: Use a different modem initialization string if the modem requires something specific.

3.7 When done setting up the 61000 for modem operation, press **Submit Changes** at the bottom of page.

3.8 Disconnect the cross-over Ethernet cable from the instrument and the computer.

3.9 Reconfigure the computer for normal operation on the LAN, which will usually require restoring the original configurations modified in Step 2.1.

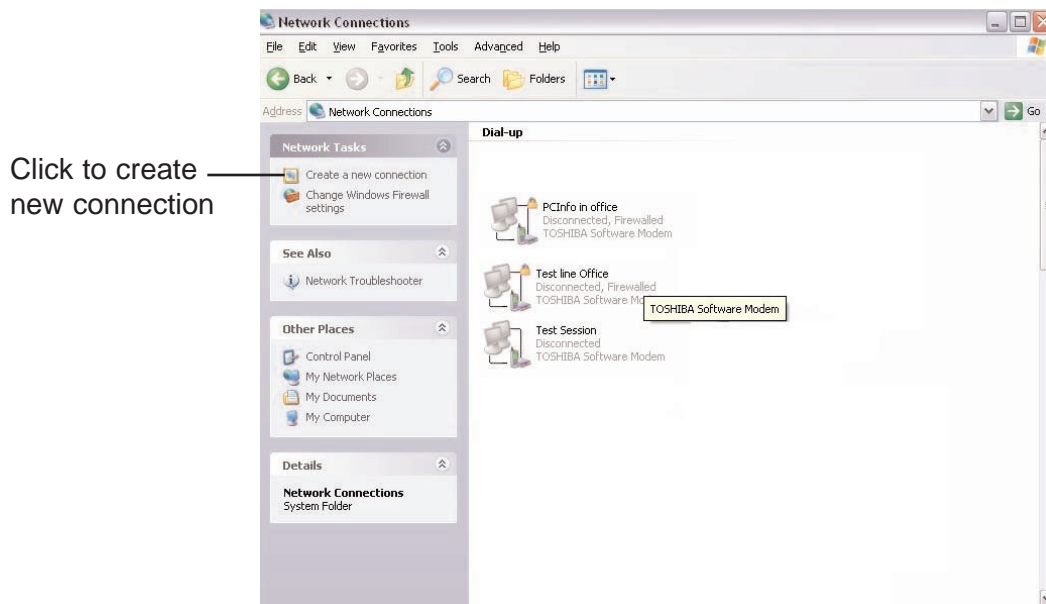
3.10 The 61000 can now be contacted using the Encore Series Software using a dial-up modem.

STEP 4: Set the dial-up network for the computer.

4.1 Dial-up networking should be set up on the computer running the Encore Series Software. This will allow the computer modem to communicate with the 61000 modem. Dial-up network uses the typical operating system communication functions found in Windows XP or similar operating systems.

4.2 From the desktop, select **Start > Control Panel > Network Connections**. The Network Connections window will be displayed.

4.3 Click on **Create a new connection** on the left side bar.

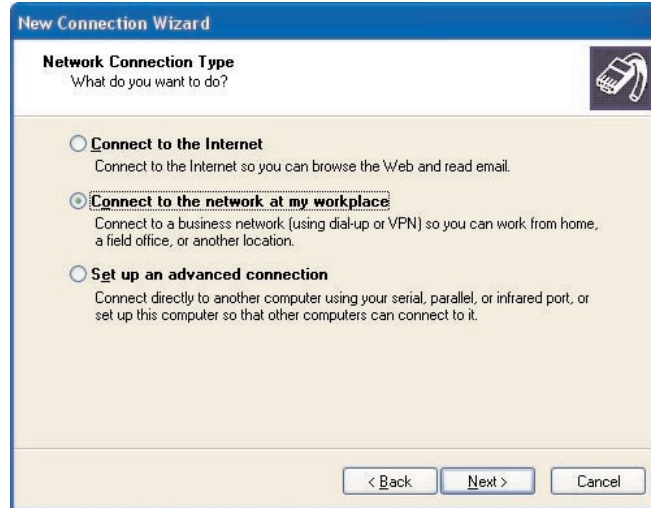


4.4 Follow the screen prompts for New Connection Wizard.

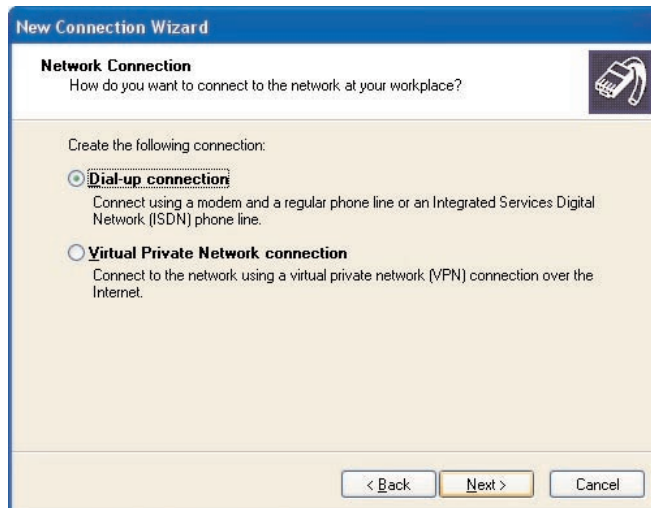
4.4.1 The New Connection Wizard will guide you through the steps to set up network connection. Click on **Next** to proceed.



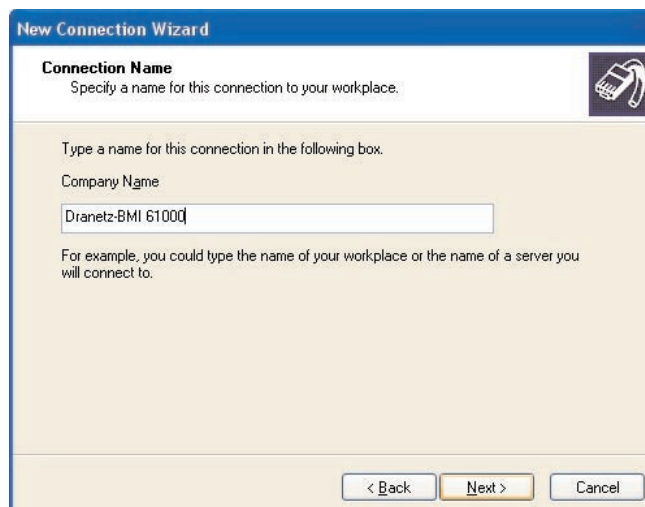
- 4.4.2 Choose what network connection you want to set up. Select the option to **Connect to the network at my workplace**. When done, click on the **Next** button.



- 4.4.3 Choose how you want to connect to the network. Select **Dial-up connection** type. When done, click on the **Next** button.



- 4.4.4 Enter a name for your network connection setup in the field provided. When done, click on the **Next** button.



New Connection Wizard

Connection Name
Specify a name for this connection to your workplace.

Type a name for this connection in the following box.

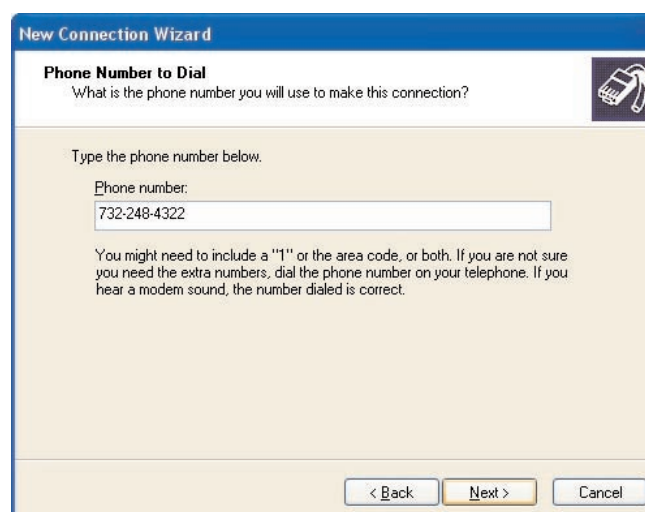
Company Name

Dranetz-BMI 6100Q

For example, you could type the name of your workplace or the name of a server you will connect to.

< Back Next > Cancel

- 4.4.5 Enter the phone number of the modem that you will use for your dial-up connection. When done, click on the **Next** button.



New Connection Wizard

Phone Number to Dial
What is the phone number you will use to make this connection?

Type the phone number below.

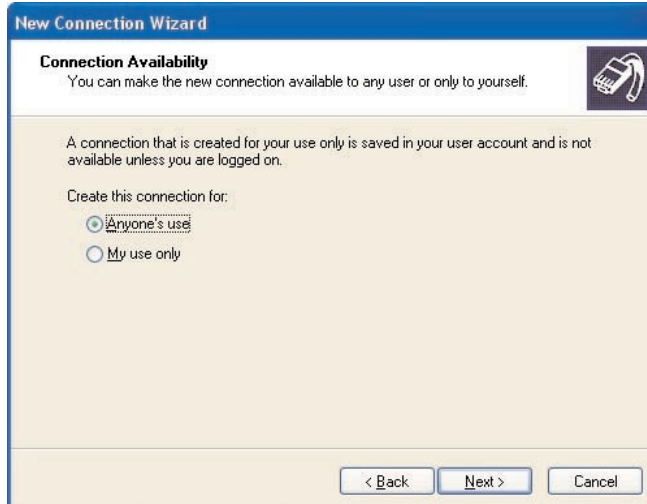
Phone number:

732-248-4322

You might need to include a "1" or the area code, or both. If you are not sure you need the extra numbers, dial the phone number on your telephone. If you hear a modem sound, the number dialed is correct.

< Back Next > Cancel

- 4.4.6 Choose the type of connection availability you want for your setup. Select the connection option for **Anyone's use**. When done, click on the **Next** button.



- 4.4.7 When done completing setup for New Connection Wizard, click on the **Finish** button.



- 4.4.8 Once network connection is successfully set up, the network dial-up box will be displayed. Enter the appropriate **User name** (admin) and **Password** (password) and save these settings for **Anyone who uses this computer**. When done, click on the **Dial** button to confirm that the connection wizard was performed correctly.



- 4.5 Once the new site has been created, the new icon representing the information that you entered will appear in the dial-up networking list.

STEP 5: Set up the 61000 DataNode in Encore Series Software.

5.1 The 61000 DataNode can now be added to the Encore Series Software system as a DataNode using modem communications.

The screenshot shows the Encore Series Software interface with the 'Setup' tab selected. The left sidebar displays a tree view of the system configuration, including 'DataNodes' and 'Templates'. The main window is divided into 'Properties' and 'Values' sections. The 'Properties' section is currently set to 'Identification Information'.

Properties	Values
Identification Information	
Name	238V113
Description	
Serial Number	Unknown
Version	HY1 3.5, C-V1 3.20, I1-61M2PBA205V1 3.5, I2-61M2PBA204V1 3.5, I3-61M2PBA203V1 3.5, I4-61M2PBA202V1 3.5
Status Information	
Health	Normal
Communication status	Idle
Last contact at	12/14/2006 07:33:59
Last poll at	12/14/2006 08:00:00
Next poll at	12/14/2006 18:00:00
Use the setting below to associate this DataNode with a template. Note: selecting a template causes all DataNode specific settings to be updated to those of the template, however, the DataNode's settings can be changed after a template is applied.	
Template	120V40A
Use the setting below to record annotations for this DataNode.	
Notes	

At the bottom of the window, there is a navigation bar with tabs: Identification and Status, Communication, Polling, Input Configuration, Compliance, Pms Variations, and Transients. The 'Save Setup' button is visible at the bottom right.

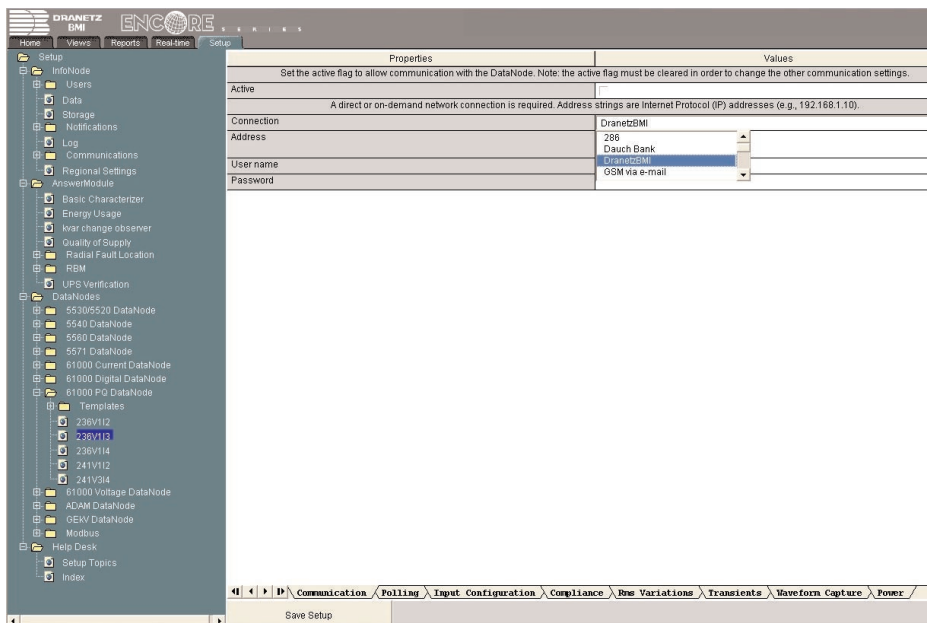
5.2 Dial-up networking name and settings are automatically detected by the Encore Series Software and will appear under the **Network Connections** folder.

The screenshot shows the Encore Series Software interface with the 'Setup' tab selected. The left sidebar displays a tree view of the system configuration, including 'DataNodes' and 'Templates'. The main window is divided into 'Properties' and 'Values' sections. The 'Properties' section is currently set to 'Communication'.

Properties	Values
Set the active flag to allow communication with the DataNode. Note: the active flag must be cleared in order to change the other communication settings.	
Active	<input checked="" type="checkbox"/>
A direct or on-demand network connection is required. Address strings are Internet Protocol (IP) addresses (e.g., 192.168.1.10).	
Connection	286
Address	/1
User name	admin
Password	*****

At the bottom of the window, there is a navigation bar with tabs: Identification and Status, Communication, Polling, Input Configuration, Compliance, Pms Variations, and Transients. The 'Save Setup' button is visible at the bottom right.

5.3 In the setup tree and in the drop-down box under the **Communication** tab, select the desired dial-up site for the appropriate DataNode.



G Appendix

Glossary

Amp, Ampere

The quantitative unit measurement of electrical current.

Angle between Phases

The phase angle between the Phase Fundamental Voltage and Current at power line Frequency.

Apparent Phase Power

RMS voltage * RMS current on per phase basis.

Average DPF

Arithmetic average of each phase displacement power factor.

Current

The flow of electricity in a circuit as expressed in amperes. Current refers to the quantity or intensity of electrical flow. See *voltage*.

Deadband (or Sensitivity)

A value programmed as an incremental/decremental threshold from the last deadband value that would be recorded as an event, making it the new value to be compared with.

Delta

A type of connection in a three-phase circuit, often the primary side of a transformer. A delta connection may or may not have a neutral conductor.

Demand Interval

Time interval used for the power demand values to be calculated. The values are updated every sub-interval.

Demand Sub-interval

An interval less than the demand interval, equal to the demand interval divided by an integer value. Demand calculations are made every sub-interval, on the values that occurred during the most recent Demand Interval. Values become valid after the first Demand Interval has expired.

Displacement PF

Cosine of angle between fundamental frequency voltage and current on a per phase basis.

Distortion

An abnormal waveshape.

Distribution

Outside the building, distribution refers to the process of routing power from the power plant to the users. Inside the building, distribution is the process of using feeders and circuits to provide power to devices.

Fixed Base

A fixed nominal value that is used with the limits in percent.

Floating Base

The nominal value is the average value over the specified update interval.

Frequency Deviation

A change in the power frequency lasting from several cycles to several hours.

Ground

The point at which other portions of a circuit are referenced when making measurements. Power systems grounding is that point to which the neutral conductor, safety ground, and building ground are connected. This grounding electrode may be a water pipe, driven ground rod, or the steel frame of the building.

High Limit

Set point or threshold above the normal range.

High-High or Very High Limit

Set point or threshold above the high limit.

Hz, Hertz

The frequency of alternating current. The term Hertz is synonymous with cycles per second.

Harmonic

A frequency that is a multiple of the fundamental frequency. For example, 120 Hz is the second harmonic of 60 Hz, 180 Hz is the third harmonic, and so forth.

Harmonic Distortion

Excessive distortion in the voltage or current waveform that introduces harmonic frequencies. Harmonic distortion can be caused by electronic loads drawing current in non-sinusoidal waveshapes. It can shorten equipment life and cause serious safety problems by overheating transformers and conductors.

Hysteresis

An amount by which a threshold is altered to suppress disturbance graphs that would otherwise be triggered by small fluctuations in the measured signal. If hysteresis is used, the threshold is altered by the specific amount (equal to the hysteresis value) after an initial disturbance is triggered until the signal crosses the altered threshold.

Impulse

Instantaneous voltage deviation which may not affect rms voltage because of its short time duration. Impulses can be caused by loads switching on line, loose wires, lightning, static and power failures. Impulses can cause data disruption and equipment malfunction and damage. See *transient*.

Instantaneous or Crest Transient

The largest magnitude value in a cycle.

KHz, Kilohertz

1000 Hertz or cycles per second

Line

A current carrying conductor.

Line-to-Line

A given condition between conductors of a multi-phase feeder.

Line-to-Line values for wye circuits

$V_{ab} = V_{an} - V_{bn}$; $V_{bc} = V_{bn} - V_{cn}$; $V_{ca} = V_{cn} - V_{an}$

Line-to-Neutral

A given condition between a phase conductor and a neutral conductor.

Load

Any electrical device connected to a power source.

Low-Low or Very Low Limit

Set point or threshold below the low limit.

Low Limit

Set point or threshold below the normal range.

MHz, Megahertz

One million Hertz or cycles per second.

Negative Sequence

The three phase vectors that would make a motor rotate in the reverse direction. $U_{2a} = 1/3 (U_a + a^{2*}U_b + a^*U_c)$,

where a^* is the 120 degree vector operator, a^{2*} is the 240 degree vector operator.

Net Current

Vector sum of all phase currents, including neutral.

Neutral Conductor

One of the conductors of a three-phase wye system. Sometimes called the return conductor, it carries the entire current of a single-phase circuit and the resultant current in a three-phase system. The neutral conductor is bonded to the ground on the output of a three-phase delta wye transformer.

Peak

The maximum instantaneous measurement of an electrical event.

Peak Detected Transient

High frequency deviation from low frequency or normal sine wave value in either the positive or negative direction that exceeds programmed limits.

Periodic Reading Interval

Time interval used to periodically record the parameter for trending or time plots.

Phase

The timing between two or more events tied to the same frequency.

Phase Balancing

The practice of placing equal electrical loads on each leg of a three phase system. See *balance* and *neutral conductor*.

Phase Shift

The displacement in time of one periodic waveform relative to other waveforms.

Positive Sequence

The three phase vectors that would make a motor rotate in the positive direction. $U_{1a} = 1/3 (U_a + a^*U_b + a^{2*}U_c)$, where a^* is the 120 degree vector operator, a^{2*} is the 240 degree vector operator.

Power

The capacity for doing work. In the electrical environment, this is usually measured in watts.

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Power Factor

Watts divided by volt amperes, or the ratio of actual power to apparent power.

Power Factor - (true PF)

Watts divided by Volt-amperes on per phase basis (except delta) and total values.

Power Factor Displacement

The ratio of the power of the fundamental wave, in watts, to the apparent power on the fundamental wave, in volt-amperes.

Power Quality

The concept of powering and grounding sensitive electronic equipment in a manner that is suitable to the operation of that equipment.

Primary

The input winding of a transformer.

Reactive Phase Power

Volt ampere reactive power for individual phases.

Residual Current

Vector sum of phase currents (not including neutral).

RMS, Root Mean Square

The square root of the arithmetic mean of the squares of a set of electrical amplitudes.

RMS Sag

Low RMS voltage or current excursions below some programmed threshold. Motor starts and faults on the utility system are two common causes of sags. Sags can cause loads to turn off and reset circuits to operate unexpectedly.

RMS Swell

High RMS voltage or current excursions above the programmed threshold. Swells can be caused by voltage regulation problems, removing loads from the system, or adding loads with stored energy. Swells can damage equipment or disrupt electronic loads.

RMS Variation

RMS voltage excursions exceeding some programmed threshold. See *RMS sag* and/or *RMS swell*. A change in square root of the sum of samples squared divided by number of samples (128) that crosses limit.

Sag

A short term RMS voltage decrease that exceeds an established lower limit.

Secondary

The output winding of a transformer.

Sequence Imbalance

Negative sequence component divided by positive sequence.

Single Phase

Portions of a power source that represents only a single phase of the three phases that are available.

Sinusoid

A sine wave.

Surge

See *swell*.

Swell

A short term voltage increase that exceeds an established upper limit.

THD, Total Harmonic Distortion

A percentage describing how much a measured waveform differs from an ideal sine wave.

Total

The phases used in computing the totals depend on the wiring configuration and parameter. Typically, wye and delta configurations use the three individual phases, except for power related, which use the IEEE 1459 equivalent wye method.

Three Phase

An electrical system with three different voltage lines or legs each carrying sine waves that are 120 degrees out of phase from one another.

Threshold

The point within which the measured parameter is said to be within tolerance.

Total Apparent Power

Square root of (total WATTS squared + total VARs squared).

Total Arithmetic True PF

Total Real Power divided by Total Arithmetic Volt-Amperes.

Total Arithmetic VA

Arithmetic sum of individual phase volt-ampere values.

Total Fundamental Arithmetic VA

Arithmetic sum of the volt amperes of the fundamental frequency components of each phase.

Total Fundamental Vector VA

Square root of (fundamental frequency component of WATTS squared + fundamental VARs squared).

Total Power

Arithmetic sum of phase Watts.

Total Reactive Power

Arithmetic sum of phase VARs.

Total Vector VA

Square root of (total WATTS squared + total VARs squared).

Transformer

A device used for changing the voltage of an AC circuit and/or isolating a circuit from its power source.

Transient

A subcycle disturbance in the AC waveform that is evidenced by a sharp, brief discontinuity of the waveform. May be of either polarity and may be additive to or subtractive from the nominal waveform.

Trend

A plot of an event characteristic versus time.

True PF

Total Real Power divided by Total VA.

True Phase Power or Real Power

Measured in watts, of each phase, calculated over 1 second from cycle-by-cycle power values (voltage sample * current sample). Not valid for delta configurations.

Volt

The quantitative measurement of electrical force or potential also called electromotive force.

Voltage

The force of electricity in a circuit as expressed in volts. It is the measure of work it takes to move a charge through a circuit.

Waveform

The graphic form of an electrical power.

Waveshape Fault

A cycle-to-cycle change in the voltage waveform characteristic. A waveshape fault may not be large enough or fast enough to have impulse characteristics, and at the same time, may not add or subtract significantly from the voltage to create a sag or swell. Waveshape faults can be caused by loose wiring, switching between two power sources, etc. Waveshape faults can cause damage and disruption to all types of loads.

Worst Displacement PF

Displacement PF of phase with largest deviation from 1.

Worst PF

True PF of the individual phase with largest deviation from 1.

Zero Sequence

$U_{0a} = 1/3 (U_a + U_b + U_c)$.

G Appendix

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