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1569 Energy Monitor
and
Energy Analyzer Application
Quick Integration Guide
Ethernet Version

Revision: 1.09
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NOTE:

Because of the fast pace of software development it is possible that there will be minor differences between the manual and the actual release of the program.

Trademarks

All trademarks are hereby acknowledged.

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1569 Energy Monitor and Energy Analyzer Application User Manual

Introduction

The Energy Monitor is a 3-phase current transformer data logger with either an Ethernet or a USB interface. The Energy Monitor may be programmed to monitor various different aspects of electrical power. An application is required to set up the Energy Monitor and to analyse the various types of readings it will produce.

The application has multiple modes of operation. It is first used to set up the Energy Monitor so that it may collect data. Later it is used to retrieve and analyse that data. It may also analyse data as it arrives in real time.

The part number for the Ethernet version of the product is 00-11-0569-0000. For the USB Version, see part number 00-11-0569-0001.

Energy Monitor Hardware

The Energy Monitor is available with either an Ethernet or a USB interface.

Ethernet Connected

The device is connected to a LAN and may be powered by either PoE or a 12V supply. In this mode the unit may send emails or other alerts when programmed conditions are encountered or in response to a programmed schedule. Data may be transmitted on the LAN and also stored on an external flash drive. The User interface will be through either the Energy Analyzer application or with a web browser.

USB Flash Drive

Data may be transmitted to the computer for storage and/or stored on an external flash drive.

The Energy Monitor offers a USB port for connection of a Flash Drive. Data samples will be written to a compatible Flash Drive as they are obtained and may be viewed and analysed later. The Flash Drive may be removed (when safe to do so) and plugged directly into a PC for data analysis using the EnergyAnalyzer application.

The Flash Drive must use the 'USB Mass Storage Class' with a sub-class of 'SCSI transparent' and the transport protocol 'Bulk-Only Transport'.

Examples of Flash Drives that use these standards are:

Ringdale USB 2.0 1GB	Toshiba 2GB
Pretec I-Disk	Verbatim 8GB (formatted for 2GB)
SanDisk 1GB Cruzer Micro	

The Flash Drive must be formatted as FAT or FAT16.

The Energy Monitor expects a file named "DATALOG.BIN" in the root directory and the data area of that file to be contiguous. Once created, the same file will be re-used. Do not move or copy the file on the drive as this may result in fragmentation and the possible corruption of the disk storage structures.

The file size determines the maximum number of samples that may be stored within it. At the maximum file size of 512MB, approximately 16.7 million data sample records may be stored, 19.4 days when sampling at a 1/10 second frequency.

Energy Analyzer Application

The Energy Analyzer Application is used to configure, program and monitor one or more devices.

Configure

The term "configure" means setting up the Energy Monitor's name, TCP/IP, E-mail, and Time & Date parameters.

Program

This refers to instructing the Energy Monitor when to start sampling and how often.

Monitor

This function is used to 1) set the application to listen to the device, 2) set it to collect records and determine where the record file is kept, and 3) whether to save records and/or logs.

Records are binary data.

Log Records are interpreted records that are readable text.

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Connecting an Energy Monitor

Types of Service Supported
Supported electric services include 50 or 60-hertz, alternating current, single-phase or three-phase.

Nominal secondary voltages are listed below:

Type	Volt(nominal)	Conductors	Mode	Description
Single-phase,	100 to 240-Volt,	two-wire, grounded	00	Mainly Japan and US small user power
Single-phase,	120/240-Volt,	three-wire, grounded	00	mainly US Household power
Three-phase,	208Y/120-Volt,	*four-wire, grounded, wye*	10	US 3 phase
Three-phase,	385Y/220-Volt,	four-wire, grounded, wye	10	mainly Germany high power users, In Germany also used as Household Power.
Three-phase,	420Y/230-Volt,	four-wire, grounded, wye	10	mainly UK, Canada, Australia high power users
Three-phase,	480Y/277-Volt,	*four-wire, Delta*	11	mainly US
Three-phase,	208 to 480-Volt,	*three wire, Delta*	01	US, Europe, Japan high power user

Programming Location

For convenience, an Energy Monitor should be configured before locating it at the place where it will be coupled to the power lines. Although this is not mandatory, there may not be easy access to the network.

For the purpose of programming, connect the device to the network in any convenient location.

Connect the power supply into the wall socket and the Energy Monitor.

Once programmed and ready to install

1) Plug in the USB Flash Drive if you have it.

2) If Ethernet is available, plug the Ethernet cable into the RJ45 jack.

   Note: Power over Ethernet (PoE) cables are limited to a maximum of 36 feet.

   When not using PoE:

   You can connect up to a maximum of 100 Meters (328 feet, 109 yards) for 100baseT
   or 500 meters (1500 feet) for 10baseT.

IMPORTANT NOTE: The user should exercise caution in connecting the voltage and current inputs since the connection points may be live. It would be best to disconnect power when connecting but that may not be practical in all cases. Inspect the voltage and current sensing cables for damaged insulation and exposed conductors before each use and do not use if damage is found. Replacement voltage cables and current transformers may be purchased from Ringdale and current transformers with damaged cables may be returned for repair.

3) There is only one way to connect the voltage and current sensing cables to the Energy Monitor:

- ./   The current transformers clip around current-carrying conductors and connect to the Energy Analyzer at the AØ, BØ, and CØ Current inputs.
- ./   The red and green connectors are used to measure voltage.
- ./   The green connects to the neutral (grounded) conductor.
- ./   The red wires connect to each of the 3 voltage phases. The red wire adjacent to the green wire is for the AØ. The next red wire is the BØ. The last red wire is the CØ.

4) Unless using PoE, connect the power supply into the wall socket and the Energy Monitor.

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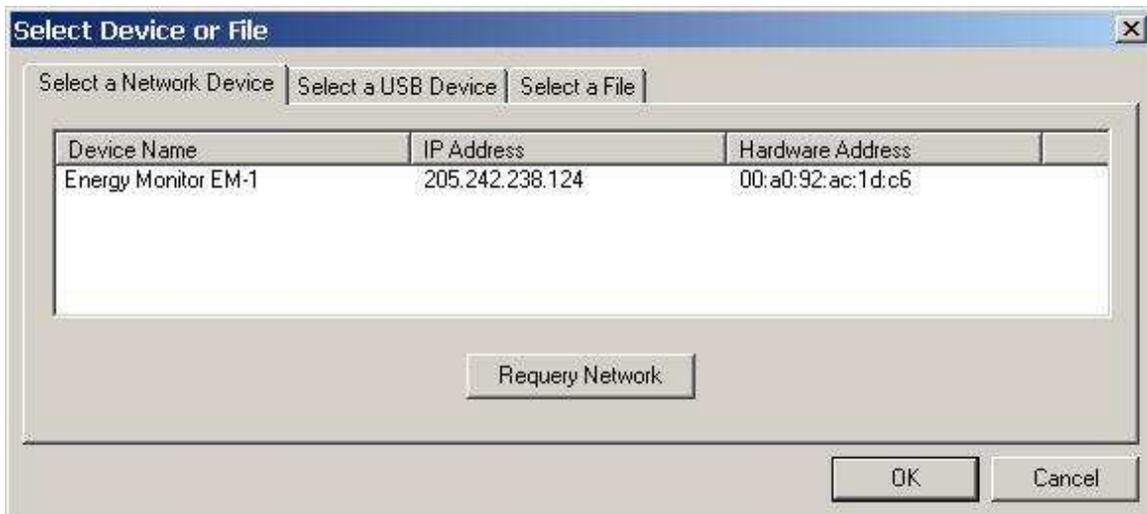
Configuring an Energy Monitor

Network configuration of an Energy Monitor device may be done using the Energy Analyzer Application or a web browser. Basic setup includes setting the device IP address, specifying the e-mail server address and destination e-mail recipients for alert messages.

For configuration using a web browser, please go to page 14. To use the application, please read on.

Start the Energy Analyzer Application.
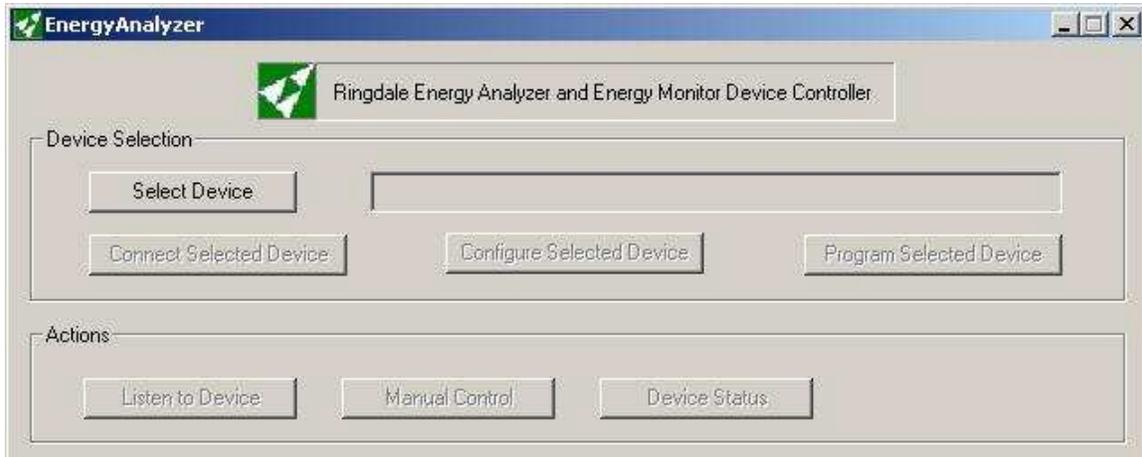
A device must first be selected. Click "Select Device".

Any Energy Monitors on your network will show up in the panel as shown above. If it doesn't appear straight away, use the Requery Network button to try again to find the device. Click on the device that is to be configured to highlight it and then click the ⌐OK⌐ button.

If you have a USB version of the Energy Monitor, select that tab to see it.

Use the Select a File for a previously saved file.

IMPORTANT NOTE:

All Energy Monitors are shipped with a factory default IP address of 11.22.33.44. To avoid TCP/IP conflicts, only one device that has not been configured should be connected to the network at a time.
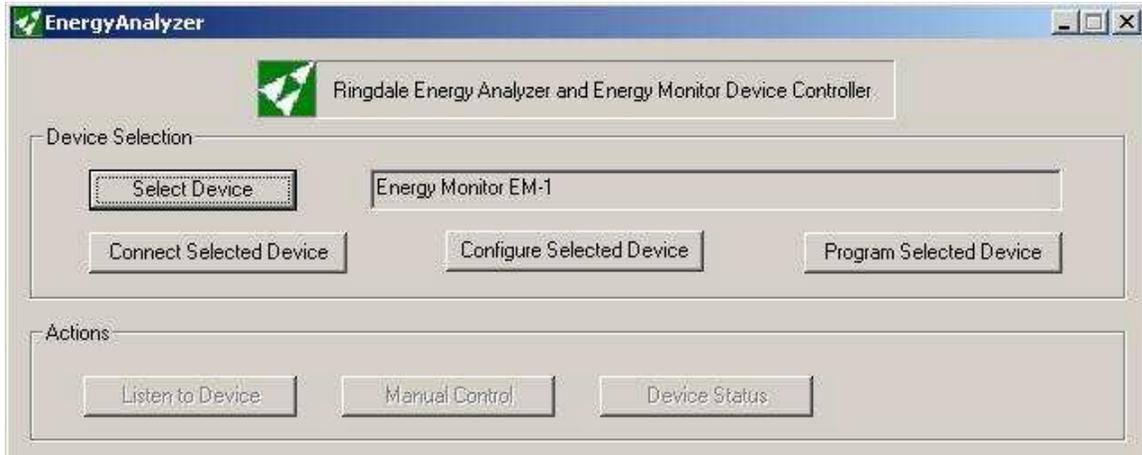
Once selected, the device's name will appear in the main panel and the three options "Connect Selected Device", "Configure Selected Device", and "Program Selected Device" will become available.

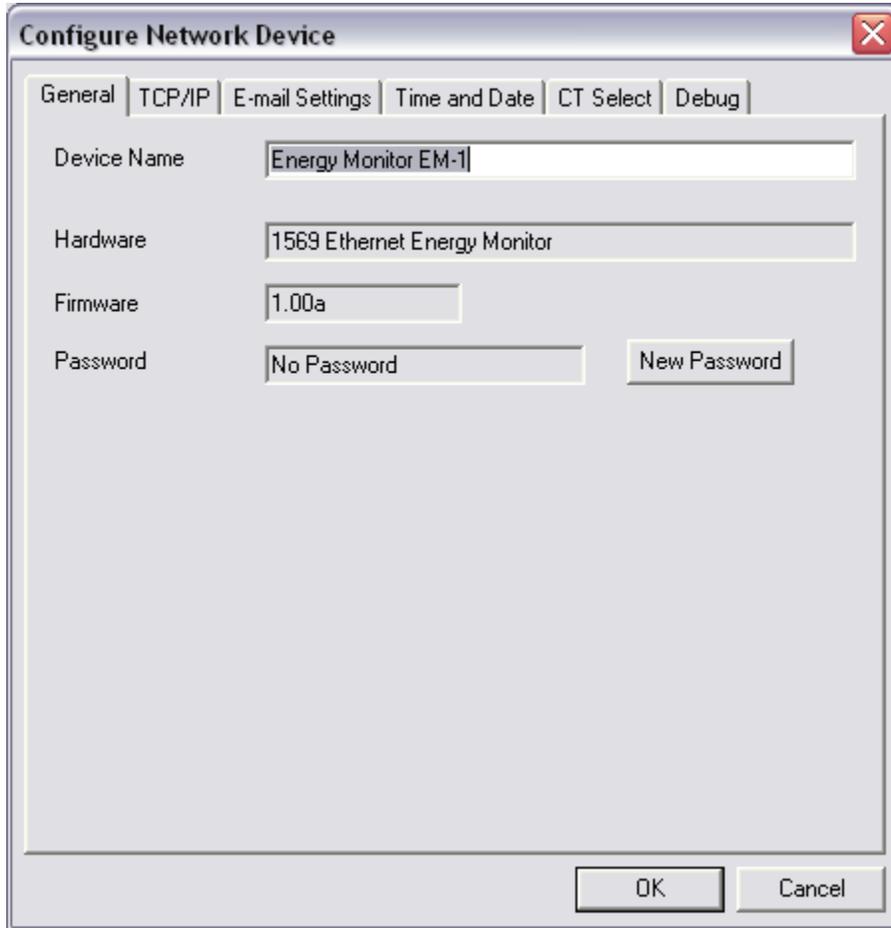The first step is to configure the Energy Monitor's name, TCP/IP, E-mail, and Time & Date parameters.

Click on the Configure Selected Device button and the Configure Network Device panel will come up.

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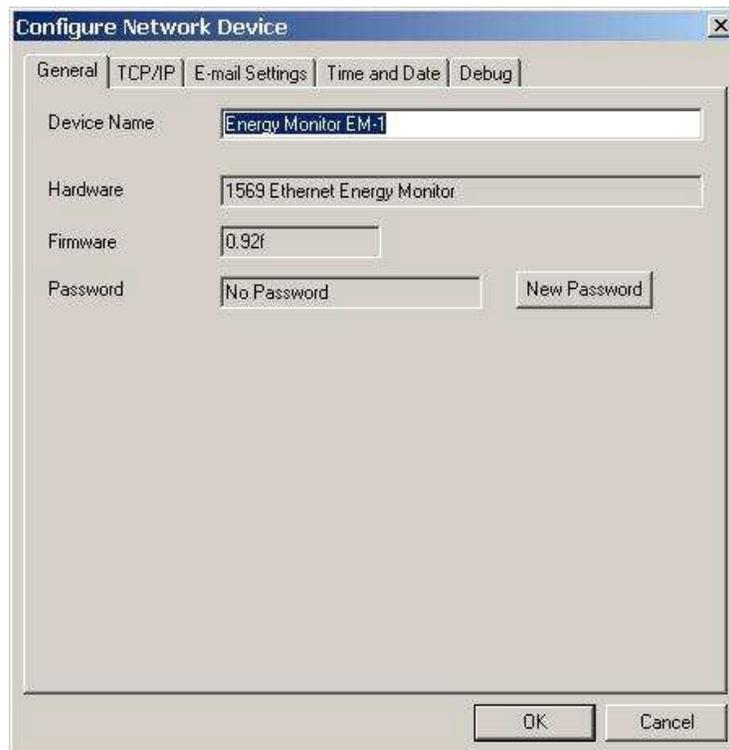
General

The General tab allows you to modify the device name and set or change a password.

It also shows the Hardware model and Firmware revision.

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TCP/IP

This tab is used to assign the Energy Monitor with an appropriate IP address for your network. It also allows you to set the IP addresses that the Energy Monitor will contact for e-mail sending and accurate time keeping. When changing the IP address of the Energy Monitor, it is best to make just that change first, then go back to "Select Device" to re-select the device using its new IP address, and then make the other changes.

1) Enter an unused IP Address from your network, or click on the DHCP/RARP Enable.

NOTE: If you change to an address that is NOT in the same network range that your PC is, you will still be able to see the Energy Monitor with the Energy Monitor utility, but you will not be able to change any parameters until you are on the same subnet.
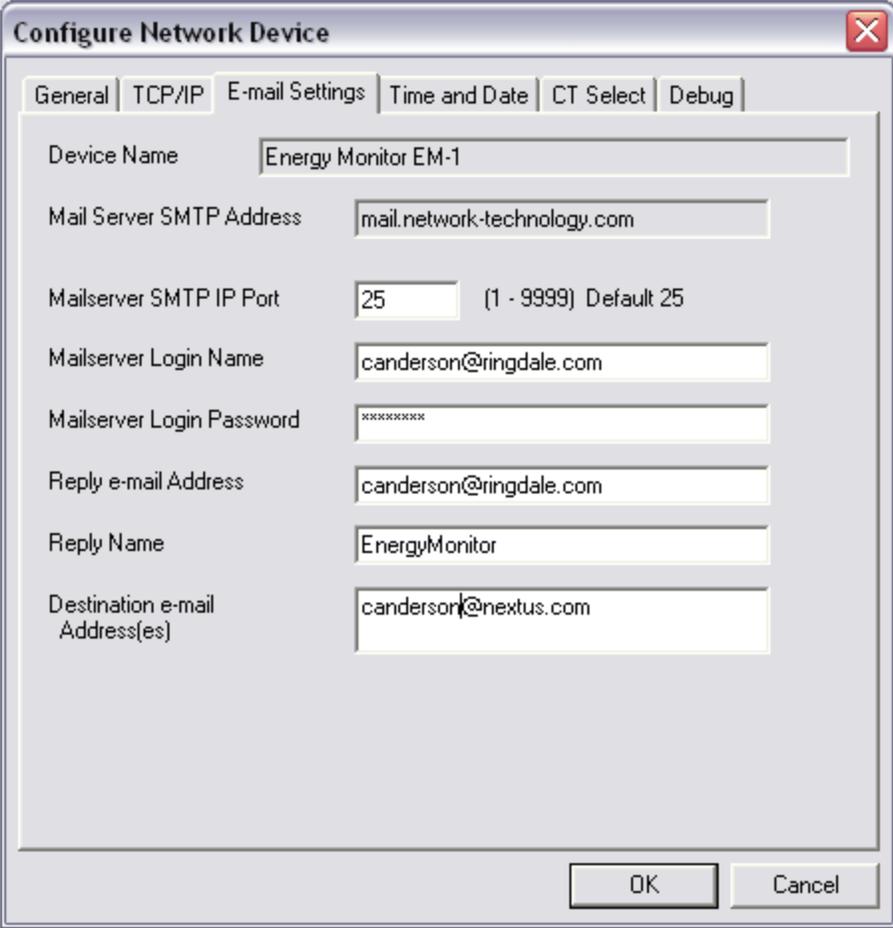
2) If you are not using DHCP or RARP, enter the Subnet Mask.

3) If you are not using DHCP or RARP, set the Default Gateway.

4) DNS Servers, 1 and 2, are the Domain Name Servers provided by your ISP. It is used to convert the Mail Server SMTP Address's URL to an IP Address.

5) If you have a DNS server defined, the Mail Server SMTP Address can be entered either as a URL (for example smtp-server.austin.rr.com) or an IP Address. Using the URL is recommended if you may be changing your network, and you have your own mail server.

6) Time Server IP 1,2, & 3. You can either set the time manually on the Time and Date panel or configure up to three preferred timeservers. Without the correct time, the timestamp will be incorrect on all records, and if you email Alert conditions, your spam filter may trap the email. The 192.043.244.018 address is the timeserver at NCAR.

TIME SERVER NOTE: All timeservers send the time UTC. In order to set the time stamps correctly you must adjust your Time Zone Offset under the Time and Date tab. There is a list of public timeservers at this URL: http://tf.nist.gov/service/time-servers.html

E- mail Settings

The e-mail settings are used to send an Alert message if certain triggers are met.

1) Mail Server SMTP Address – Use the TCP/IP tab to change this.

2) Mailserver SMTP IP Port – The default is 25. This is most common. Other common ports used are 26, and 2525.

3) Mailserver Login Name – Often this is an email address. When a fax is received in the email box, it will come from this user. Max 58 characters.

4) Mailserver Login Password – This is the password for the above email account. There is a maximum of 58 characters. NOTE: case-sensitive.

5) Reply e-mail Address – If the person who receives the fax does a reply, it will go to this address.

6) Reply Name – This is the name that shows in the email header when you receive a fax.

7) Destination e-mail Address(es) - This is where the email will be sent. This can be the same as item 2) or it may be an alias set up to forward to multiple users. Simply enter the addresses you wish to send to as one entry, each address separated by either a semi-colon (;) or a

comma (,). There is a limitation of a maximum of 80 characters for all addresses. No spaces are allowed. Enter each address on a new line.
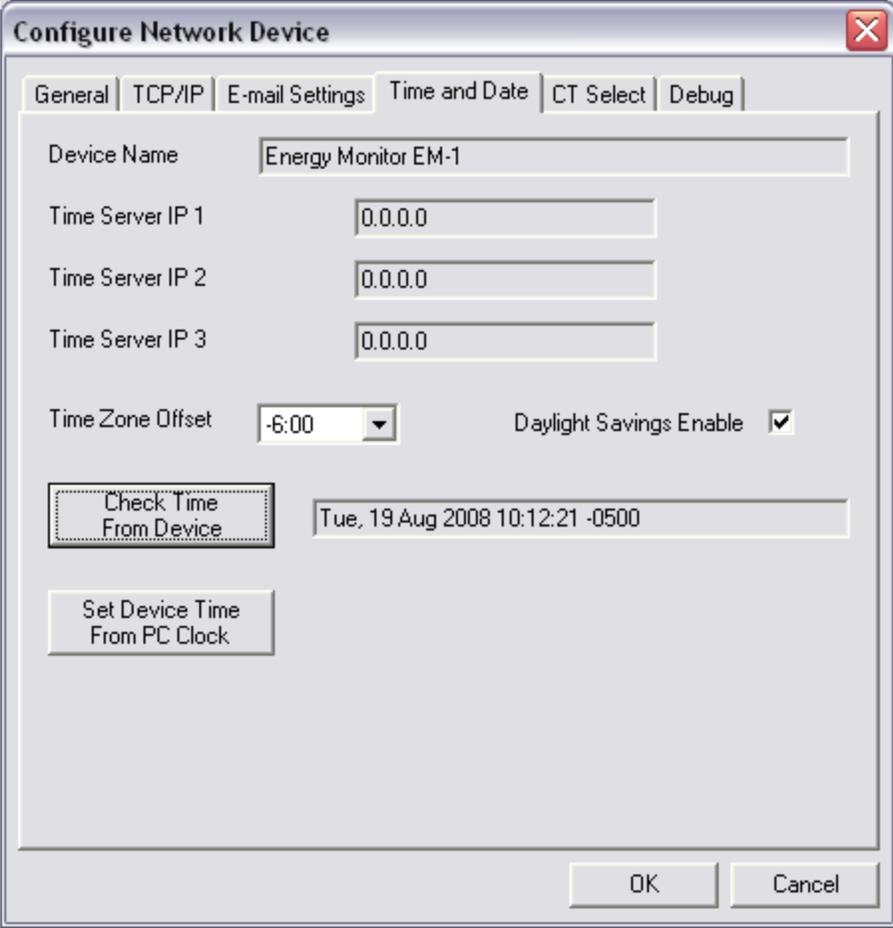
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Time and Date

The Energy Monitor features a battery backed up clock. When first set up and periodically after, the clock may be (re) synchronized with a time server or the PC running the Energy Analyzer application.

If at least one Time Server IP address has been specified, the Energy Monitor will automatically contact a Time Server to keep its clock accurate. Note that it will not adjust its clock while it is monitoring to avoid spoiling the record sequence.

The "Set Device Time From PC Clock" function allows you to synchronize the device time with the PC time. This option is only available if no Time Servers have been specified.
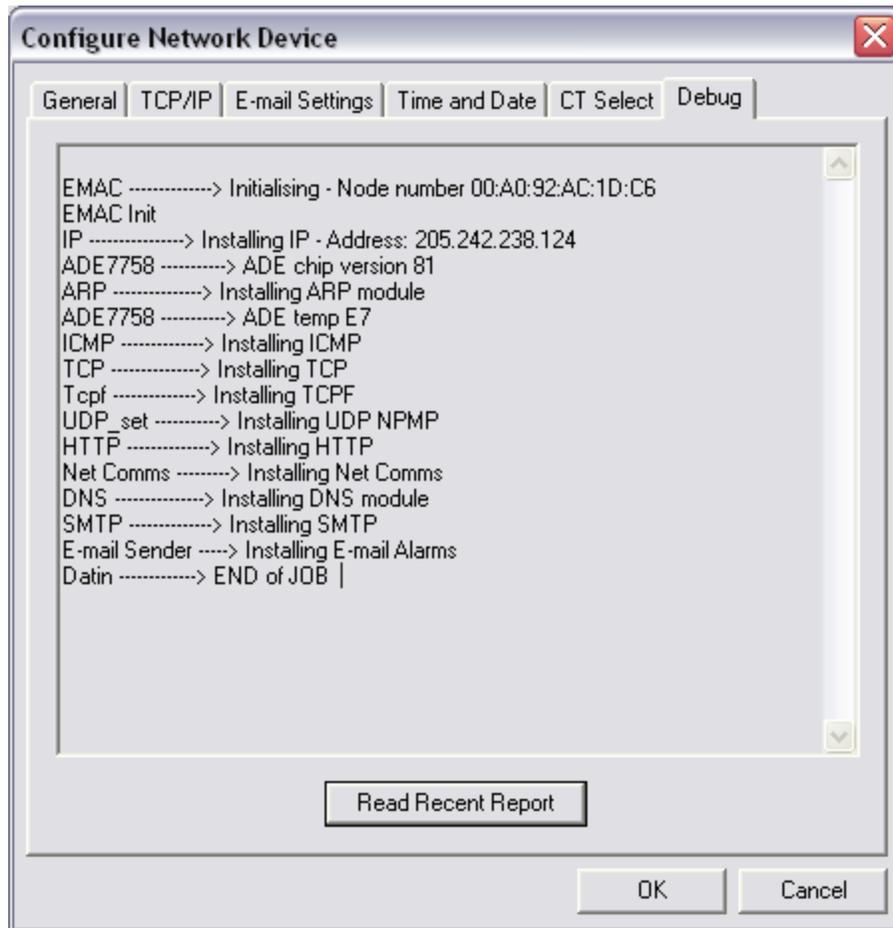
TIME SERVER NOTE: Some local timeservers and all Internet timeservers send the time in UTC. In order to set the time stamps correctly you may need to adjust your Time Zone Offset and select or de-select the Daylight Savings Enable option.

CT Select

Select the value of the current transformers that you are using.

Debug

The Energy Monitor keeps a log of various messages. This panel is useful only if a problem should arise, at which time obtaining the recent messages may prove informative. Under normal circumstances there is no need to use this panel.

Controlling the Energy Monitor

Select the device to monitor and connect to it using the [Connect Selected Device] button.
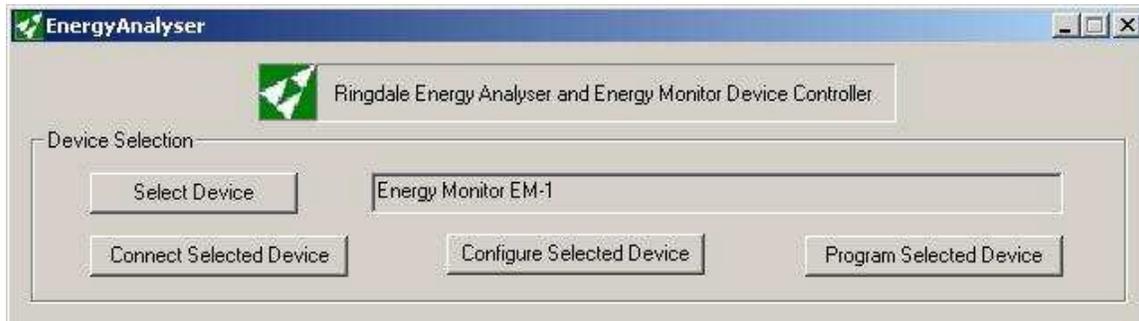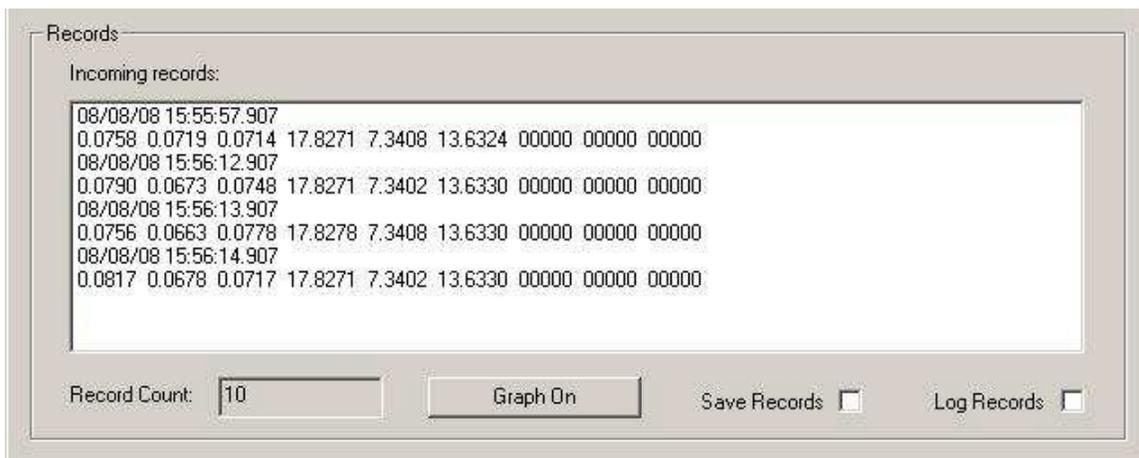

When successfully connected the Actions buttons will become available.

Listen to Device

This will tell the Energy Monitor to send a copy of each sample record to you. If the device is not actually running, then you will not receive any records. Sample records will still be recorded into a flash drive if fitted, regardless of this setting.

Manual Control

This window only stays up for 30 seconds. The eight buttons give you the choice of action you want the device to take.

Start and Stop Sampling are normally used to begin and end a sampling session if there is no automatic start and stop Time and / or Date defined.

When the Energy Monitor is running, the Stop Sampling button must be used before removing a flash drive to ensure that the sample record file is closed properly, and to ensure that the flash drive can safely be removed.

Pause and Resume are used where sampling is temporarily stopped.

IMPORTANT NOTE: The flash drive should not be removed while the device is running or paused. Removal of the flash drive without stopping the unit may result lost data of up to 16 of the last records sampled.

Device Status

This button will show you the status of the Energy Monitor but is currently not implemented.

Use the web interface to get status of the sampling and the levels of each channel.

Records Panel

Incoming Records

The device must be in Listen mode by selecting the Listen to Device button. You must also set the device to sample records either manually or using the Program Start/Stop Times.

Save Records

Put a check in the Save Records box to bring up the location where the records binary file will be kept. If you select the same name as a previously saved bin file, it will be overwritten.

The device must be in Listen mode by selecting the Listen to Device button. You must also set the device to sample records either manually or using the Program Start/Stop Times.

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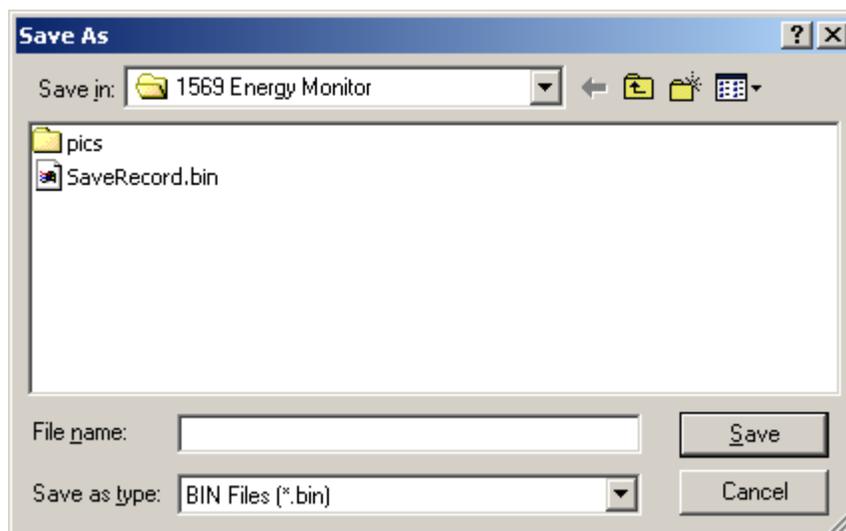
Log Records

Put a check in the Log Records box to bring up the location where the records binary file will be kept. If you select the same name as a previously saved bin file, it will append to the previous data.

The device must be in Listen mode by selecting the Listen to Device button. You must also set the device to sample records either manually or using the Program Start/Stop Times.
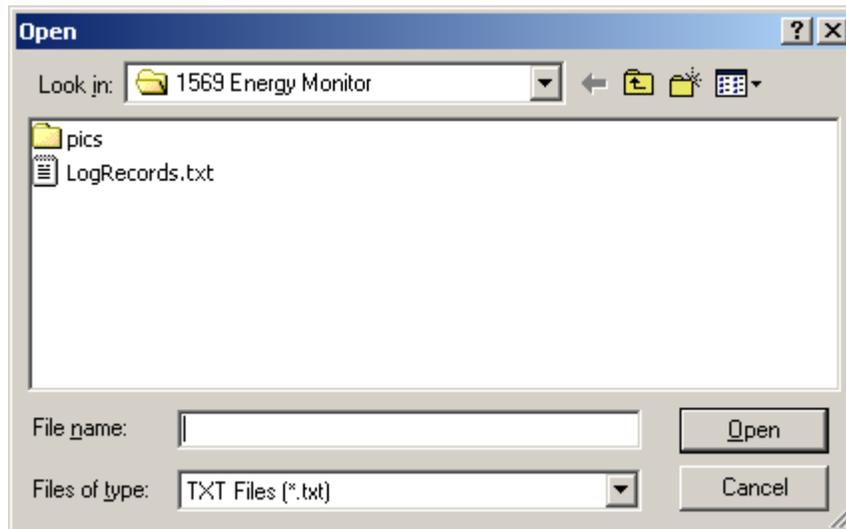
About

Click on the About button to find the version of the EnergyAnalzer software.

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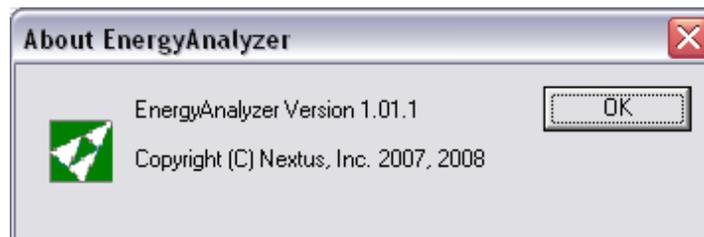
Programming an Energy Monitor

Sample records will be recorded into a flash drive (if one is plugged in) as soon as either the Manual Control / Start Sampling has been selected or it is between the Start Time and Stop Time.
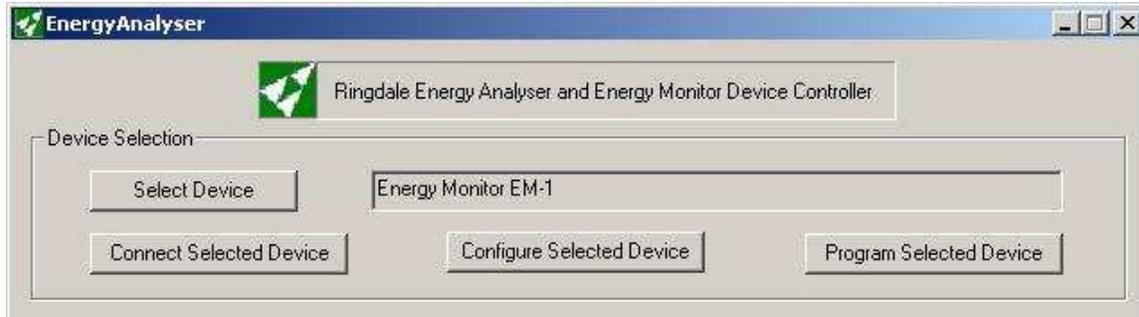
Click on the Program Selected Device button to call up the Program Device panel.

Program Device

Program Network Device

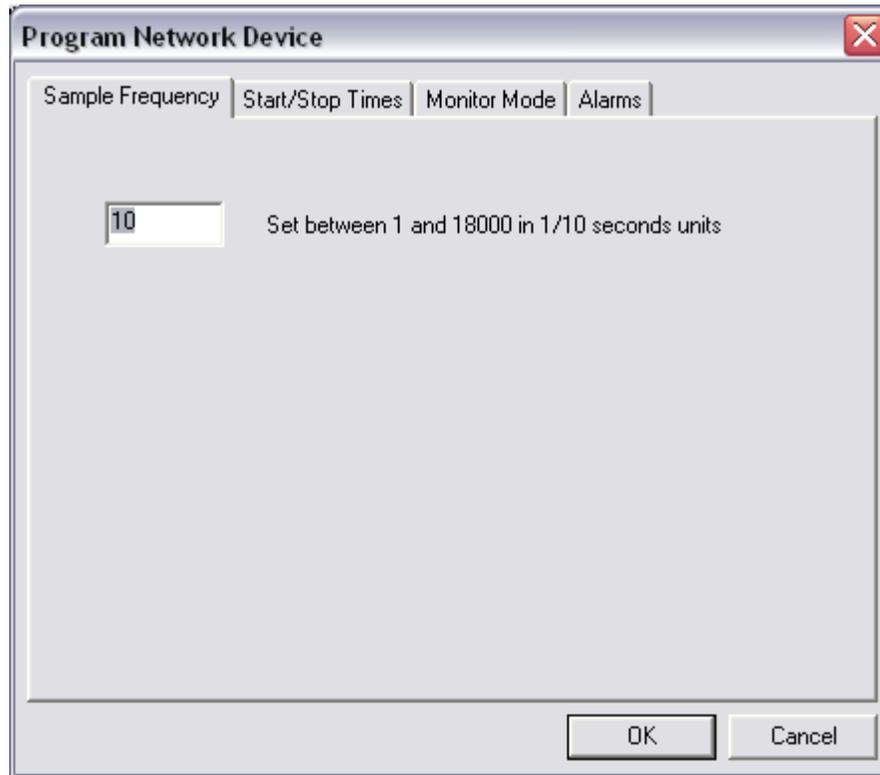Sample Frequency | Start/Stop Times | Monitor Mode | Alarms

10   Set between 1 and 18000 in 1/10 seconds units

OK   Cancel
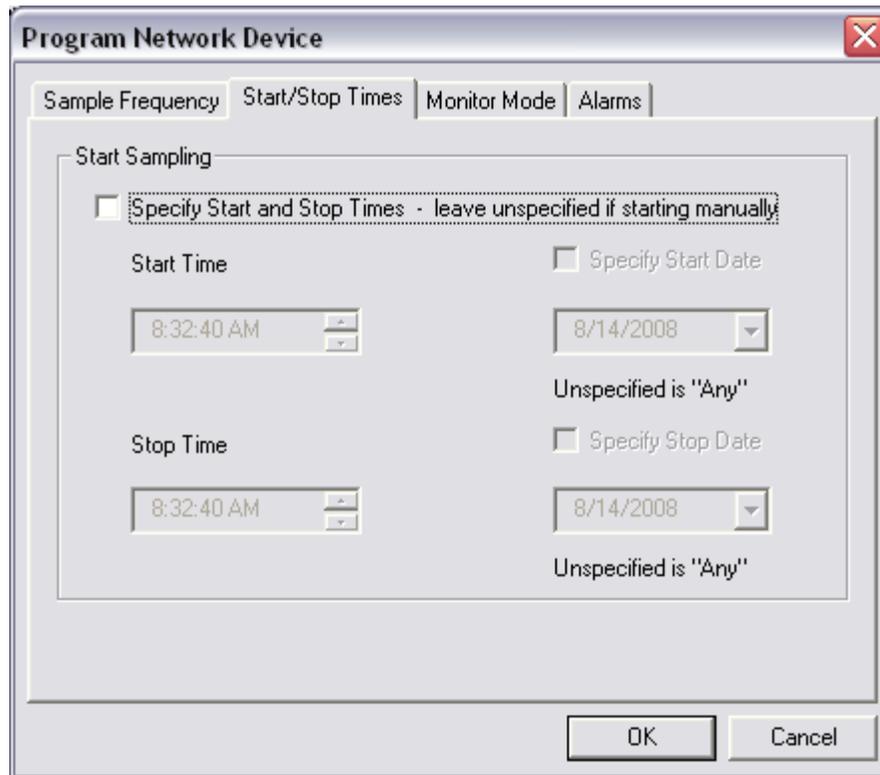
Sample Frequency

The sample frequency determines how often a sample is reported. At 18000, one sample is taken every 30 minutes. At 10, one sample is taken per second. At 1, ten samples are taken per second.

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Start and Stop Times

Each of the Start and Stop Times, Start Date and Stop Date may be given a value or left undefined. Leave all of these values undefined if you intend to start and stop the device manually.

Specifying Start and Stop times but leaving the Dates undefined will set a repetition pattern. It is possible to define the Start Time as 9:00 pm and the Stop Time as 6:00 am for monitoring through each night if the dates are left undefined, or for a particular night or nights if the dates are defined.

Specifying a Start Date without specifying a Start Time, and the same for the Stop values, will have no effect.

NOTE:

If Start and Stop times defined, you will not always be able to start and stop the device manually. For example, if the device is programmed to start at 4:00 pm and stop at 10:00 pm, the device will automatically restart if manually stopped between 4:00 pm and 10:00 pm. Similarly, manually starting the device after 10:00 pm will result in an automatic stop. As a rule, it is better to not define Start and Stop times if you wish to manually start and stop the unit, or to re-program with undefined times prior to manually starting or stopping.
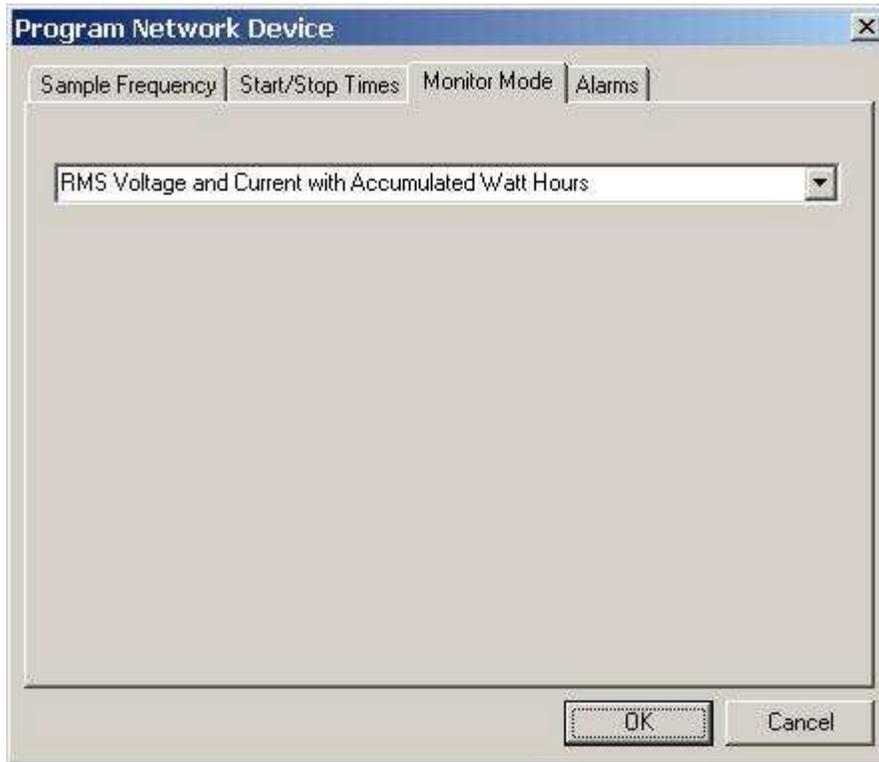
Monitor Mode

The initial option is RMS Voltage and Current with Accumulated Watt Hours. Other Monitor Mode options may be available by requesting through Technical Support. Email support@ringdale.com.

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Alarms
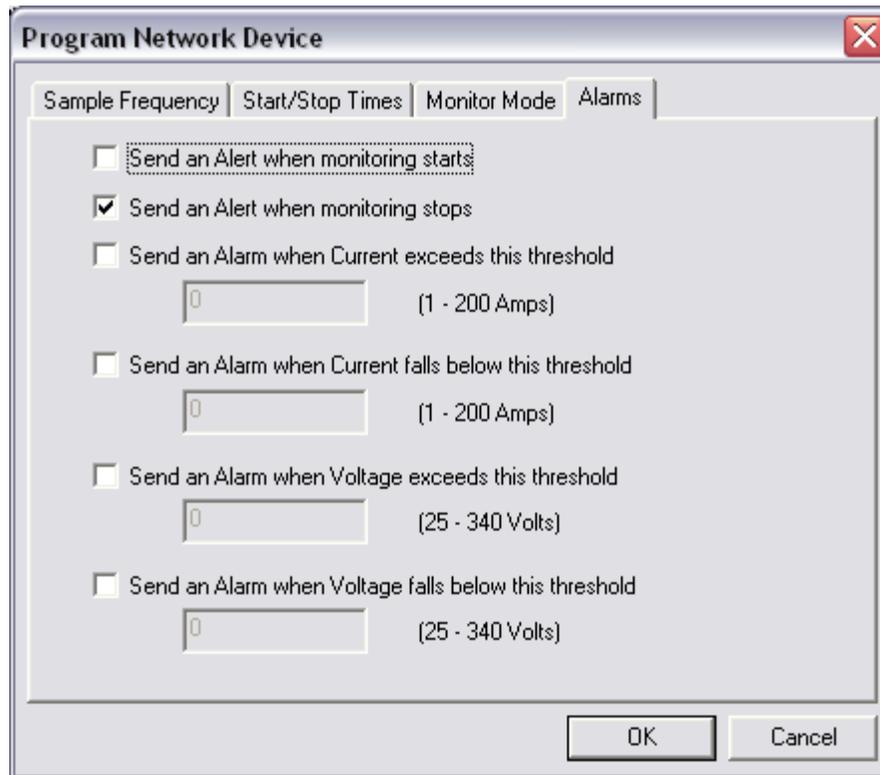
You can set an Alert to be sent to the Destination Email Address when monitoring starts and/or stops. Future revisions will current/voltage threshold triggers.

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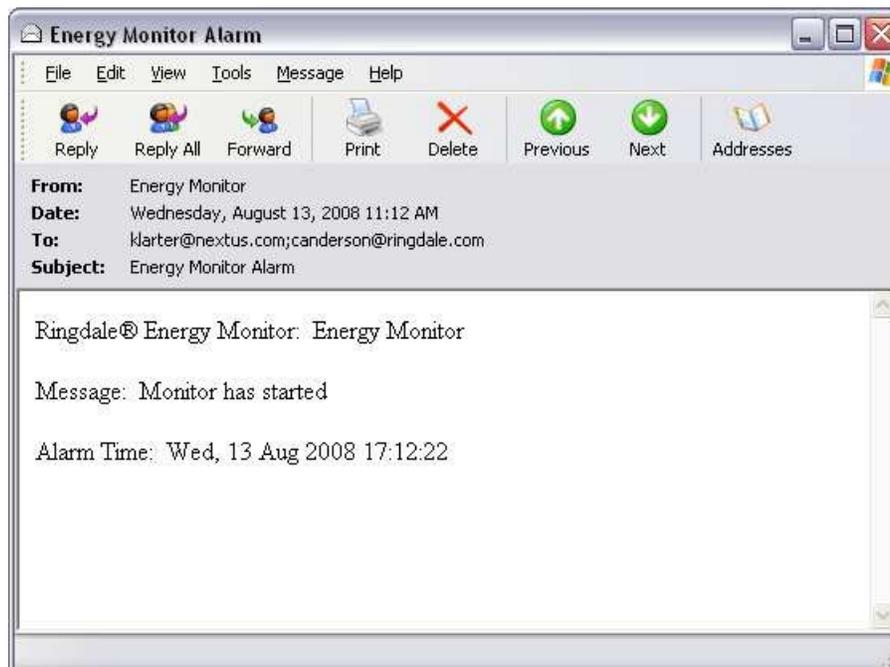
Setting up an Energy Monitor – Using a Web Browser

Open the Home page of the device. In our example here the device has an IP address of 205.242.238.124.

Note: You need to be on the same virtual network (subnet) as the device in order to be able to communicate with it.
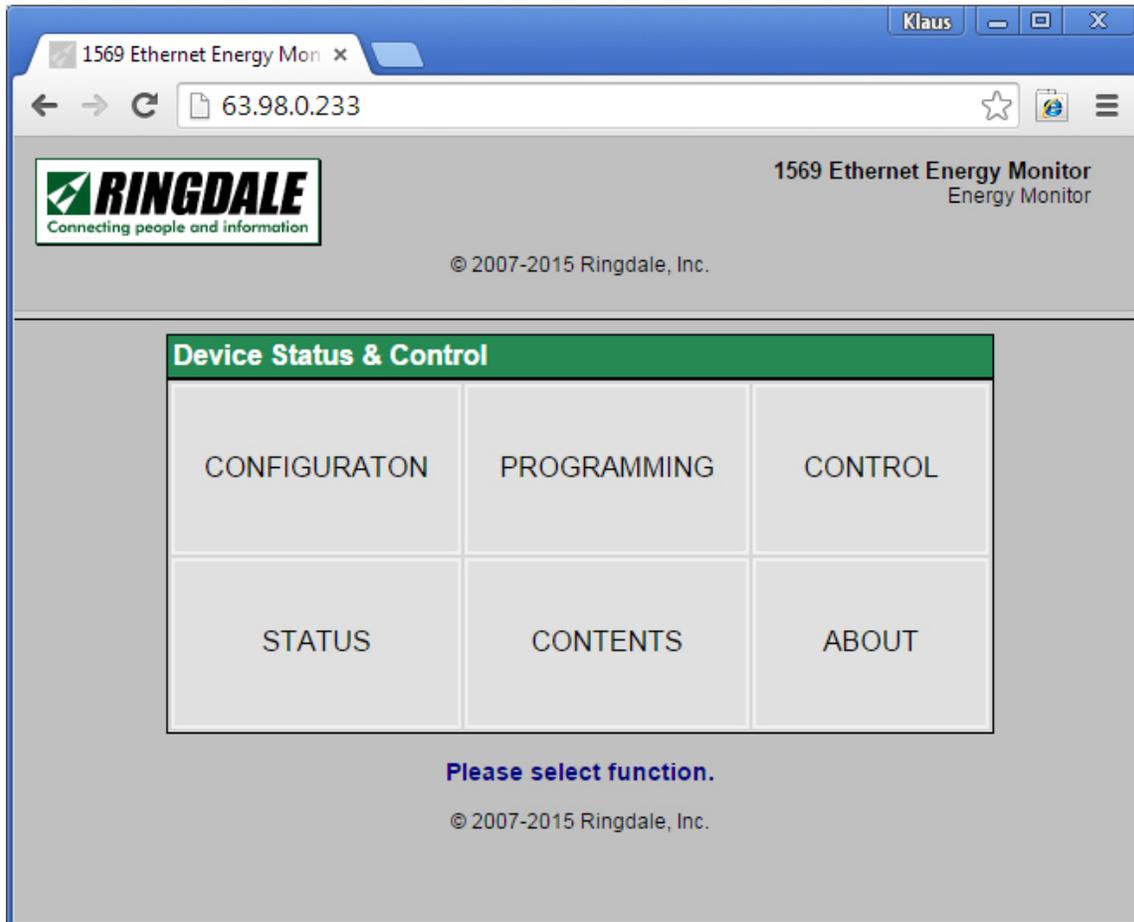
The upper panel shows the device description and the name currently assigned to the device – "Energy Monitor" in our example.

Configuration

Configuration is used for setting up the Energy Monitor's name, TCP/IP, E-mail, and Time & Date parameters. It also will allow you to change the password, download firmware, and reset to defaults.
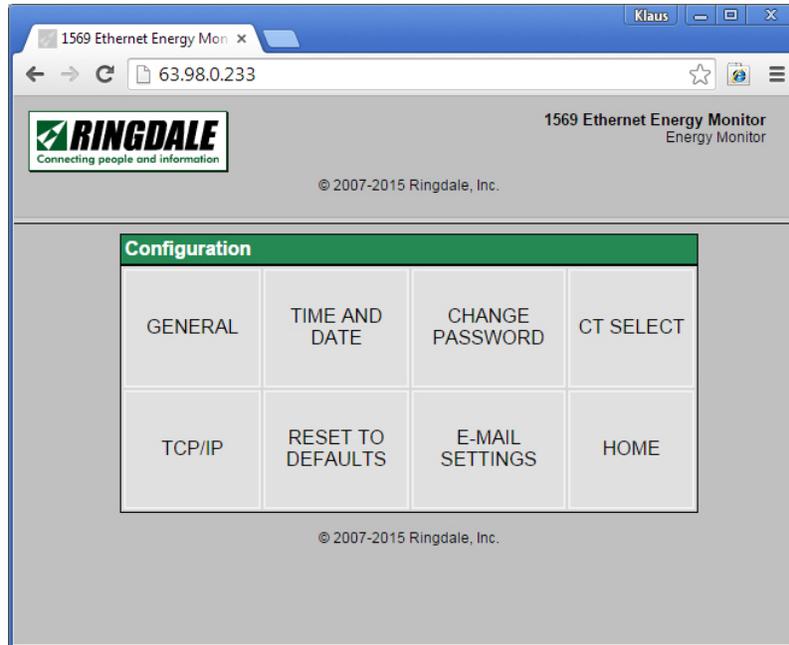
Configuration - General Settings

This section allows you configure a unique name for each Energy Analyzer that you have.

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Configuration – Password

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Configuration – TCP/IP

IP Address – Enter an unused IP Address from your network, or click on the DHCP/RARP Enable.

NOTE: If you change to an address that is NOT in the same network range that your PC is, you will still be able to see the Energy Monitor with the Energy Monitor utility, but you will not be able to change any parameters until you are on the same subnet.

Subnet Mask – Enter the subnet mask.

DHCP can be used if you do not use static IP addresses on the network.

Gateway IP is the default gateway.

DNS Server 1,2 – DNS Servers can be used to resolve the Mail Server IP from the URL.

Mail Server IP/URL - If you will be configuring the Energy Monitor to report threshold trigger events, you must enter an IP Address for the SMTP mail server.

Mail Server SMTP Address – Use the TCP/IP tab to change this.

Mail Server SMTP IP Port – The default is 25. This is most common. Other common ports used are 26, and 2525.

Mail Server Login Name – Often this is an email address. When a fax is received in the email box, it will come from this user. Max 58 characters.

Mail Server Login Password – This is the password for the above email account. There is a maximum of 58 characters. NOTE: case-sensitive.

Reply e-mail Address – If the person who receives the fax does a reply, it will go to this address.

Reply Name – This is the name that shows in the email header when you receive a fax.

Destination e-mail Address(es) - This is where the email will be sent. This can be the same as the Mail Server Login Name or it may be an alias set up to forward to multiple users. Simply enter the addresses you wish to send to as one entry, each address separated by either a semi-colon (;) or a comma (,). There is a limitation of a maximum of 80 characters for all addresses. Max 80 characters. No spaces are allowed. Enter each address on a new line.

Configuration – Time and Date

The Time and Date option brings up the Clock Setting options and the current time. You can either select time servers, or set the time and date manually. If the time is not set correctly the timestamp will be incorrect and your spam filter may trap the email.

Use Time Server(s)

Time Server 1 IP Address	129.006.015.029
Time Server 2 IP Address	129.006.015.028
Time Server 3 IP Address	0.0.0.0
Time Zone Offset	-6:00

Submit **Reset**

Time Server IP 1,2, & 3 – You can either set the time manually or use time servers. You can add up to three time servers.

TIME SERVER NOTE: There is a list of public time servers at this URL: http://tf.nist.gov/service/time-servers.html

Time Zone Offset – All time servers send the time UT. In order to set the time stamps correctly you must adjust your Time Zone Offset. This is the offset from UT. If you are in Greenwich, England, this number will be 0. If your time zone is east of Greenwich, England), the number is positive. If your time zone is west of GMT, the number is negative. For EST, use –5, CST –6, MST –7, PST –8, AKST –9, and HAST –10.

Enter Current Time

Date	20 August 2008
Time	08 hrs 56 mins am

Submit

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Configuration – CT Select

The CT Select option brings up the CT Selection menu where you can select either 150 Amp or 30 Amp Current Transformers.

Configuration – Reset to Defaults

This will normally only be used under the direction of Technical Support. It will not change the IP Address of the Energy Monitor.

Programming

The Programming option brings up the following Programming page.
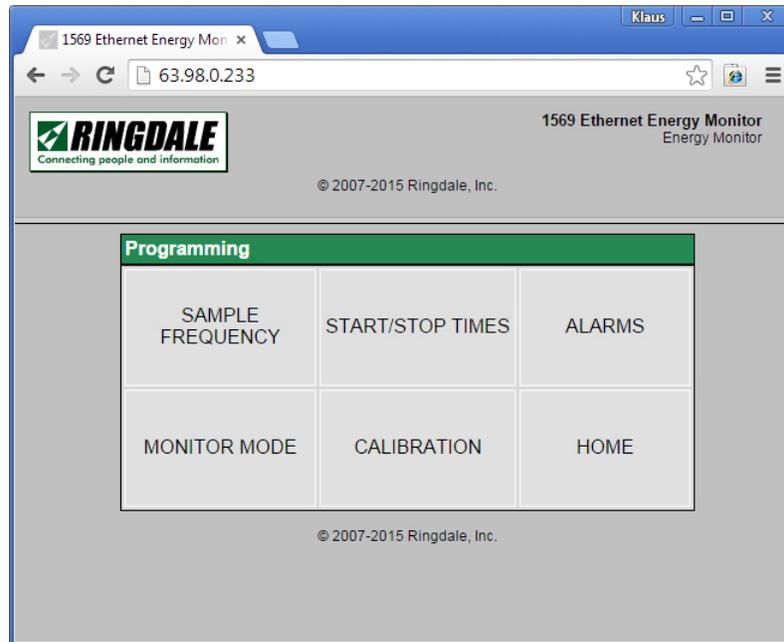
Sample Frequency

The sample frequency determines how often a sample is reported. At 18000, one sample is taken every 30 minutes. At 10, one sample is taken per second. At 1, ten samples are taken per second. The default value is 20, the equivalent to a 2 second sample rate.

Start / Stop Times

Each of the Start and Stop Times, Start Date and Stop Date may be given a value or left undefined. Leave all of these values undefined if you intend to start and stop the device manually.

Specifying Start and Stop times but leaving the Dates undefined will set a repetition pattern. It is possible to define the Start Time as 9:00 pm and the Stop Time as 6:00 am for monitoring through each night if the dates are left undefined, or for a particular night or nights if the dates are defined.

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Specifying a Start Date without specifying a Start Time, and the same for the Stop values, will have no effect.

NOTE:

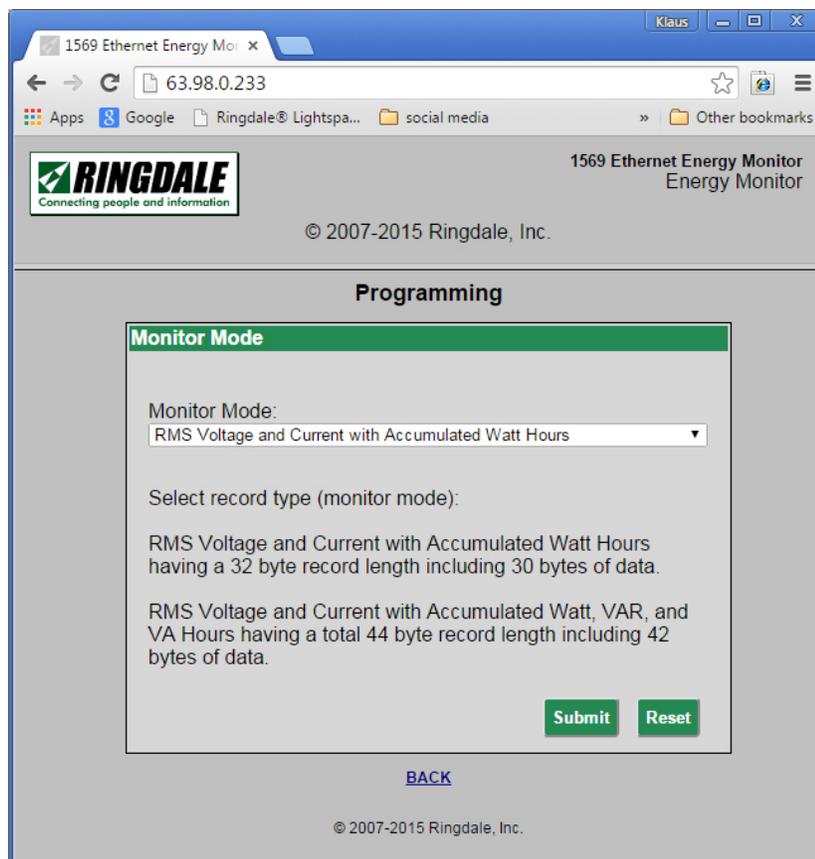If Start and Stop times defined, you will not always be able to start and stop the device manually. For example, if the device is programmed to start at 4:00 pm and stop at 10:00 pm, the device will automatically restart if manually stopped between 4:00 pm and 10:00 pm. Similarly, manually starting the device after 10:00 pm will result in an automatic stop. As a rule, it is better to not define Start and Stop times if you wish to manually start and stop the unit, or to re-program with undefined times prior to manually starting or stopping.

Monitor Mode

There are two fundamental monitor modes the first being the smallest record size recording only the basic information of voltage, current and watt hours occupying 32 bytes per record and thus allowing to store the maximum amount of records on the USB Flash drive. The extended mode records in addition reactive power and VA.

Alarms

Alarm Parameters

Please use the Energy Monitor Application to set alarm parameters.

Control
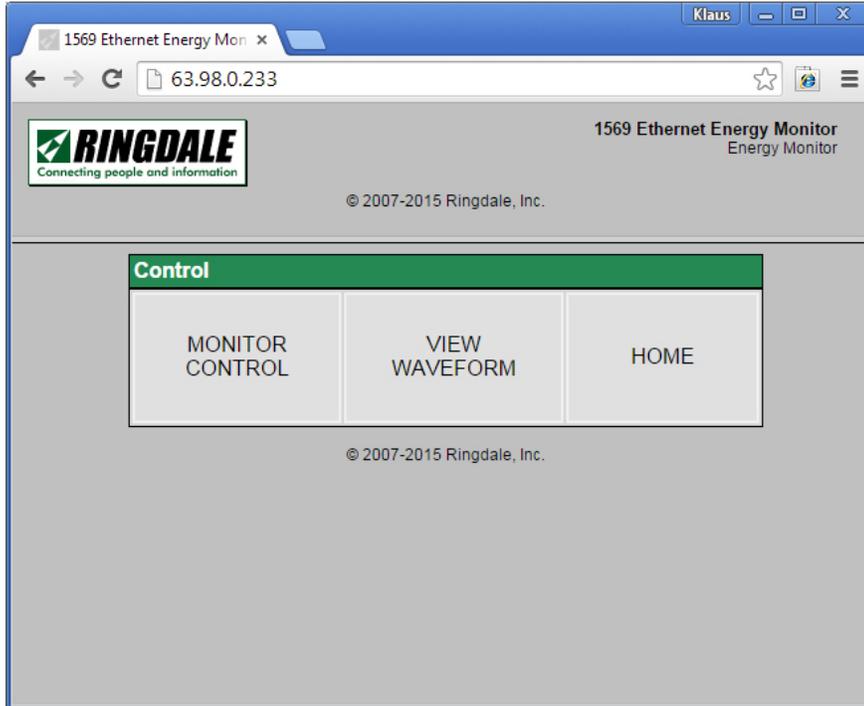
The Control Panel provides access to Waveform and Montor Control Functions.

The Monitor Control option brings up the following Monitor Control page.
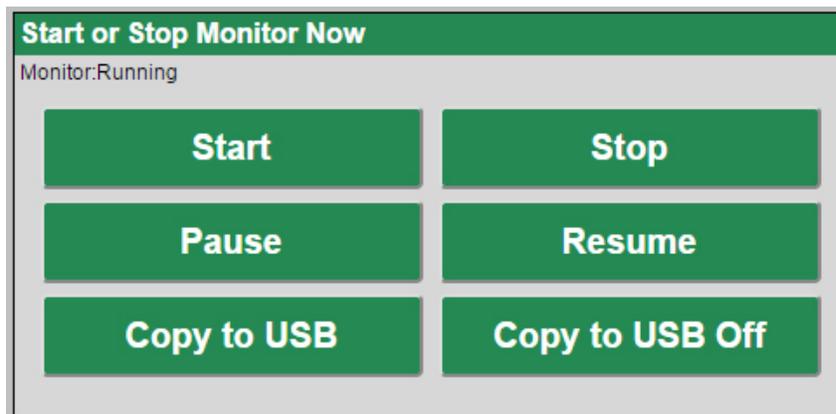
Start or Stop Monitor Now

Start and Stop are normally used to begin and end a sampling session.

Pause and Resume are used where sampling is temporarily stopped.

IMPORTANT NOTE: The flash drive should not be removed while the device is running or paused. Removal of the flash drive without stopping the unit may result in corrupted data.

Status

Click the Status option to verify if the unit is running or not.

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Contents

Clicking on Contents brings up an Index page. The functions on this page are the same as those on the Home page.

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About

This page provides information about the unit.

Information	
Product:	1569 Ethernet Energy Monitor
Serial Number:	00-A0-92-FF-FF-FF
Firmware Version:	1.12 of 12-01-15
For support go to	**Ringdale Support**
To learn more about this or other Ringdale products, Visit our website at	**www.ringdale.com**

Collecting Monitor Records

Data Records may be obtained from one of three sources, 1) from a Network device, 2) from a USB device and 3) from a folder that includes the file from the USB flash drive that has been written by the device.

Records should be considered to come in a stream.

The Energy Monitor may be started and stopped manually using the Manual Control panel, or it can be programmed to start and/or stop automatically at certain times and dates.

You can take the compact flash; plug it into a PC with the EnergyAnalyzer for analysis. This is the procedure:

1) Take the compact flash, plug it into a PC.

2) Open the EnergyAnalyzer application. Click the ⎮ Select Device ⎮ button, then the Select A File tab

3) Click the ⎮ Browse ⎮ button and choose the datalog.bin

4) Click Connect Selected Device.

5) Put a check in Log Records. Provide a file name for the text file.

6) Click Listen to Device to see the data go by.

The text file is space delimited.

When it is done you can import the file into Excel and generate a chart.

USB Flash Device

The only USB Flash devices supported are up to 2GB with FAT format 2048 bytes per sector.

The filename is DATALOG.BIN and is not case sensitive since version 1.10.

The file should be pre-formatted with all 0xFF for the length of the file. However the file gets overwritten on every power-up of the device.

Since version 1.12 The device will always append data to the end of previously recorded data. To erase the data use a PC to reformat and re-apply the preformatted datalog.bin file.

Output files

Sample log file:

```
Date     Time         IA      IB      IC      VA      VB       VC      WHA    WHB    WHC
08/03/07 12:39:11.499 0.2124  0.1941  0.1960  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:13.499 0.2017  0.2061  0.1985  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:15.499 0.2029  0.2174  0.1847  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:17.499 0.2048  0.2168  0.1973  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:19.499 0.2193  0.2010  0.1966  1.5321  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:21.499 0.2080  0.2092  0.2036  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:23.499 0.2004  0.2162  0.1985  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:25.499 0.2067  0.1998  0.1954  1.5327  12.6643  7.0982  00000  00000  00000
08/03/07 12:39:27.499 0.2055  0.2136  0.1992  1.5327  12.6650  7.0988  00000  00000  00000
08/03/07 12:39:29.499 0.1979  0.1960  0.1966  1.5327  12.6643  7.0988  00000  00000  00000
08/03/07 12:39:31.499 0.2080  0.1985  0.2036  1.5327  12.6643  7.0988  00000  00000  00000
08/03/07 12:39:33.499 0.2061  0.2143  0.2029  1.5321  12.6650  7.1789  00000  00000  00000
08/03/07 12:39:35.499 0.2080  0.2111  0.1865  1.5327  12.6643  7.0988  00000  00000  00000
08/03/07 12:39:37.499 0.2023  0.2067  0.1809  1.5327  12.6643  7.0988  00000  00000  00000
08/03/07 12:39:39.499 0.2092  0.1941  0.1985  1.5327  12.6650  7.1789  00000  00000  00000
08/03/07 12:39:41.499 0.2017  0.1947  0.1941  1.5327  12.6650  7.1789  00000  00000  00000
08/03/07 12:39:43.499 0.2029  0.1960  0.1985  1.5321  12.6650  7.1789  00000  00000  00000
```

IA-IC = Current readings for channel A-C.
VA-VA= Voltage readings for channel A-C.
WH=Watt/Hours for channel A-C.

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Technical Specifications

Power Supply	External All Voltage
Power Input	12..48 Volt DC, 1A
Power Consumption	3 watts typical
Operating Temperature	−40°C to +85°C
LAN Connection	RJ-45
Network Type	Ethernet 10/100baseTx
Data Collection	USB Thumb Drive or via Ethernet to a PC running application

Records Definitions

This is the general record description. It is beneficial to programmers performing an analysis of the .bin record file.

```
struct   dataloggerRecord {
        BYTE              rectype;
        BYTE              length;             // length following
        USHORT            dateStamp;                  // 16 bit date stamp
        ULONG timeStamp;                  // 32bit 1/32768sec count from midnight
        BYTE              data[length - 6];
};
```

```
5.3 powerRecord
//
// Record Type == 0
// RMS Power consumption monitor
//
struct   powerRecord {

        BYTE    rectype = 0;
        BYTE    length = 30;
        USHORT          dateStamp;
        ULONG timeStamp;
        BYTE    phaseACurrent[3];       // 24bit Phase A current RMS
        BYTE    phaseBCurrent[3];       // 24bit Phase B current RMS
        BYTE    phaseCCurrent[3];       //24bit Phase C current RMS
        BYTE    phaseAVoltage[3];       //24bit Phase A voltage RMS
        BYTE    phaseBVoltage[3];       //24bit Phase B voltage RMS
        BYTE    phaseCVoltage[3];       //24bit Phase C voltage RMS
        BYTE    phaseAWattHr[2];        //16bit Phase A Watt-Hour Accumulation
        BYTE    phaseBWattHr[2];        //16bit Phase B Watt-Hour Accumulation
        BYTE    phaseCWattHr[2];        //16bit Phase C Watt-Hour Accumulation

};
```

```
//
// Record Type == 1
// Alarm
```

```
//
        to be specified
//
// Record Type == 2
// Waveform data
//
struct    waveRecord {

        BYTE            rectype = 2;
        BYTE            reserved;
        USHORT          dateStamp;
        ULONG timeStamp;
        BYTE            waveData[16][3];        // 6x x 24bit values
};
```

waveRecords will come in batches of 32 records

Notes
For non waveRecord types:

    dateStamp is bit packed yyyyyyymmmmdddddd
   timeStamp is 1/32768sec from midnight

For waveRecord type:

    To be specified

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Current Transformers (CT)

This is a specification for current transformers useable with the Ringdate Energy Monitor. Current transformers can be purchased in a wide range of clamp sizes and rated current configurations from the Ringdale Online Store.

**Note:** Only use CTs with burden resistors for Ringdale Energy Monitor Device.
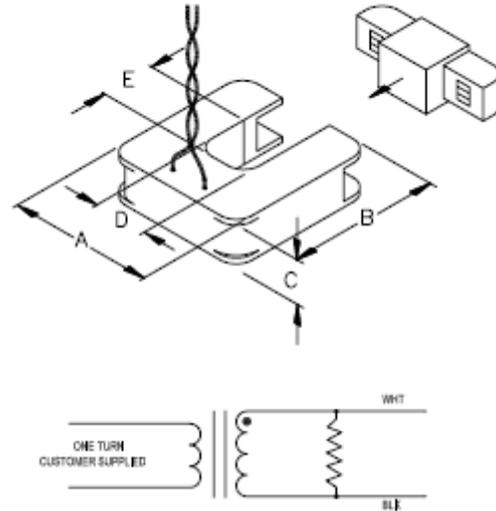
Part No.	Rated Current (Amps)	Dimension (inches)				
		A	B	C	D	E
00-11-0750-0000*	0-200					
00-11-0750-0005	5					
00-11-0750-0010	10					
00-11-0750-0015	15					
00-11-0750-0020	20					
00-11-0750-0025	25					
00-11-0750-0030	30	2.00	2.10	0.61	0.75	0.75
00-11-0750-0050	50					
00-11-0750-0060	60					
00-11-0750-0070	70					
00-11-0750-0100	100					
00-11-0750-0150	150					
00-11-0750-0200	200					
*Products with -0000 have no burden resistor.						

The following table shows the output voltage of the versus the percentage of 'Rated Current' (see table above).
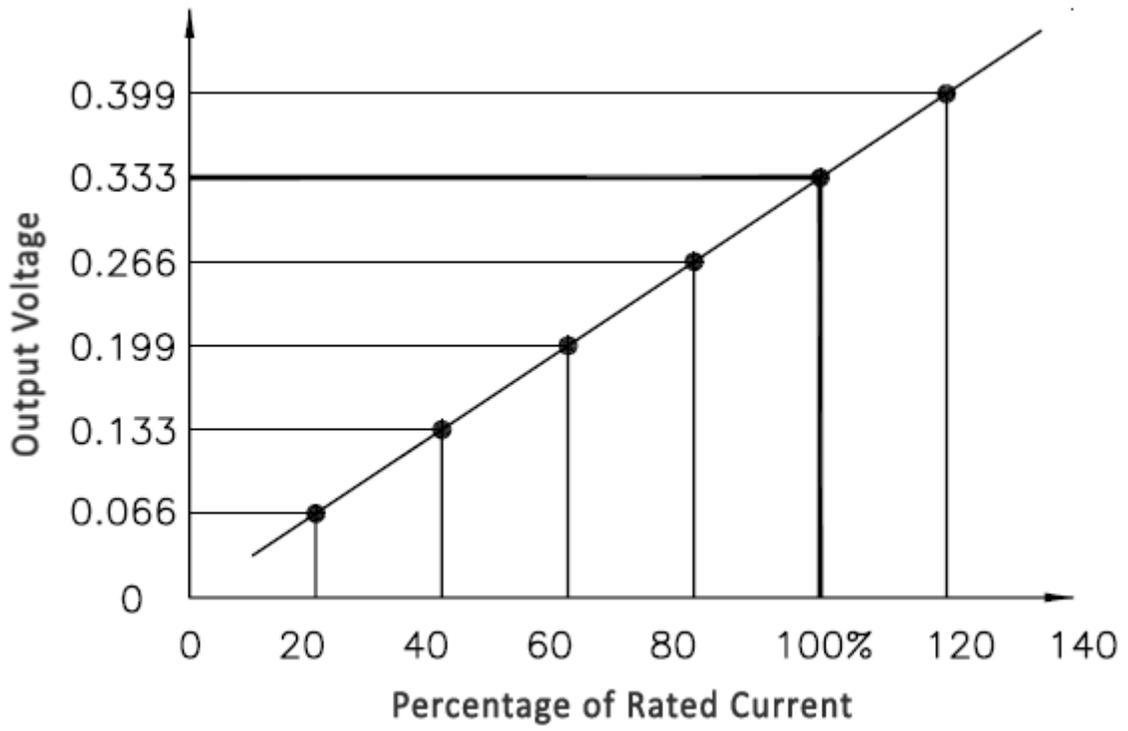
Glossary

CT   Current Transformer is the device used to determine the amount of current flow based on the electrical induction of the wire. For a list of purchasable 333mV current transformers see the Ringdale website.

IEC   The International Electrotechnical Commission is the international standards and conformity assessment body for all fields of electrotechnology.

NCAR   National Center for Atmospheric Research

NPMP   Network Peripheral Management Protocol, a protocol developed by Ringdale for communicating with Ringdale devices.

NTP   Network Time Protocol - It uses ports 123 for TCP and UDP.

RMS   Root Mean Square - The RMS value is the effective value of a varying voltage or current.

USB   Universal Serial Bus A widely used hardware interface for attaching peripheral devices

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