

PowerTronics

THE Detective Series

Model D200/D300

User's Manual

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All information and specifications written or implied in this manual are current at the time of printing. However due to the ongoing process of adding improvements to the products, PowerTronics / Eastern Time Designs, Inc. reserves the right to make changes at any time without notice.

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SAFETY NOTICE

The power cable attached to the device is supplied with a safety and reference ground. Do not use **THE DETECTIVE** when powered from an ungrounded outlet. **THE DETECTIVE will not operate properly with an ungrounded outlet.**

High voltage exists at many points inside the cabinet. Qualified personnel **ONLY!** should open the cover. **DO NOT** open the cover; there are no user serviceable parts inside. Also, opening the cover may affect the warranty.

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18 MONTH WARRANTY

Eastern Time Designs, Inc. (PowerTronics) warrants to the original retail purchaser that each DETECTIVE D200/D300 Power line analyzer sold by PowerTronics or any authorized representative is free from defects in material and workmanship for 18 MONTHS from date of purchase.

In the event of malfunction or other indication of failure attributable directly to faulty workmanship and/or materials, Eastern Time Designs, Inc. (PowerTronics) will at its option, repair or replace the defective product, to whatever extent it shall deem necessary to restore the product to proper operating condition, provided the purchaser includes proof of the date of purchase of the product along with the defective product.

Please note that Eastern Time Designs, Inc. may replace the defective product with a new or re-manufactured functionally equivalent product of equal value.

Before returning a product for repair, the customer must call Eastern Time Designs, INC. (PowerTronics) Customer Service at (603) 483-5876 for a RMA return authorization number. This number should be included with the customer's mailing address and telephone number when the product is returned. Products should be returned to:

PowerTronics: RMA #
Attention : CUSTOMER SERVICE DEPARTMENT,
143 Raymond Rd.
Candia, NH 03034.

During the first 18 months after the date of purchase, all labor and materials will be provided without charge. There shall be no warranty for either parts or labor after the expiration of 18 months from the date of purchase.

The customer shall be solely responsible for the failure of any Eastern Time Designs product, or component thereof resulting from accident, abuse, or misapplication of the product, and Eastern Time Designs assumes no liability as a consequence of such events under the terms of this warranty. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and may also have other rights which vary from state to state.

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EXTENDED UPGRADE SERVICE

PowerTronics is continuously making improvements to all products. These improvements can be in the form of hardware changes, such as finer resolution of a test specification, or firmware changes that make THE DETECTIVE easier to use and interpret.

In order to give the customer the best possible unit the following offer is available. The customer may return THE DETECTIVE for an upgrade to the most current revision of firmware. This service may be utilized as often as the customer chooses.

INTRODUCTION

THE DETECTIVE Power Line Analyzer is a portable diagnostic instrument designed to monitor the AC Power line, analyze and capture disturbances, and record these deviations in battery backed RAM.

THE DETECTIVE incorporates the latest technology in its surface mount assembled circuit board to provide the user with detailed information describing all types of power line disturbances. Once detected, up to 1500 of these events have the most important information, such as the event type, magnitude, duration, time and date of the occurrence, and the location on the sine wave, stored in RAM where they are formatted into an easily read format that may be printed, displayed, or downloaded to your computer.

To use THE DETECTIVE, simply plug the power cable into the AC outlet that will be used for your equipment. It is recommended that you test the power source for a period of 72 hours. After testing, attach THE DETECTIVE to your printer or computer through the ports on the back of the instrument, and scroll through the list of output functions on the LCD screen to choose the report or display that you need.

When connected to the printer or computer, THE DETECTIVE will provide you with a listing of disturbances in either summary, detail, or graphic analysis form. These disturbances are recorded as specifically numbered events which are analyzed according to their magnitude, duration, time, date, and location on the sine wave as specified in the Analysis Specification section of this manual.

Several models of THE DETECTIVE are available. Base units (D100) will test for all of the common power line problems while the full feature units (D200) will also test for environmental conditions such as temperature and DC voltage. (The Full Feature unit is also available with a carrying case and built-in printer, as the D300.)

THE DETECTIVE is an important onsite tool that can be used by installers of electronic equipment, service technicians,

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medical facilities' technicians, or anyone that needs to identify the power line quality of a particular site. For more detailed descriptions of THE DETECTIVE's features, be sure to read the entire specifications section.

We believe that THE DETECTIVE Power Line Analyzer is the most cost effective and practical AC line monitor on the market. Look for more advanced diagnostic products from PowerTronics (Eastern Time Designs, Inc.) in the near future.

Notice:

This manual serves both the D100 (base) model and the D200 (full feature model). Therefore, not all options mentioned herein may apply to your unit.

CALIBRATION PROCEDURE

THE DETECTIVE is designed to test the Power Line with a high degree of accuracy. In this unit all measurements are referenced to a state of the art, temperature compensated voltage source, however, with the passing of time, certain components may require calibration. Therefore, it is suggested that each unit be calibrated annually by the factory. The procedure typically takes three days and will be provided upon request for a nominal fee. To take advantage of this service, refer to the warranty section of this manual and mention CALIBRATION PROCEDURE when calling for an RMA number.

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Model Descriptions: DETECTIVE Series

D100:

- * 1500 Event Storage
- * Data Retention for 5 Years
- * Parallel and Serial Communications ports
- * Tests for Spikes on Hot and Neutral
- * Tests for Sags and Surges
- * Tests for High Frequency Noise
- * Identifies Phase Changes
- * Identifies Frequency Deviations
- * Detects Dropouts
- * Security Feature
- * 32 Character LCD with Intensity Control

D200:

- * All the Features of the D100 plus...
- * Ambient Temperature Probe
- * DC Voltage Test Probe
- * Ground Reference Probe
- * Detects Spikes on Ground

D300:

- * All the Features of the D100 plus...
- * Ambient Temperature Probe
- * DC Voltage Test Probe
- * Ground Reference Probe
- * Detects Spikes on Ground
- * Rugged Carrying Case
- * Built-in 80 Column Printer

DESCRIPTION OF FUNCTIONS

All operations of THE DETECTIVE are accessed through the operator control panel on the front of the unit. When these keys are pressed the internal microprocessor allows the operator to scroll through menu options selecting whichever feature is desired.

Many functions of THE DETECTIVE may be set up, or modified by the operator from the front panel. It is recommended that several of these features be set up prior to beginning power line testing. Setting the time and date will allow THE DETECTIVE to keep accurate track of when each event occurs, while setting the site number will help identify where the testing was performed.

THE DETECTIVE is designed for easy operation and maximum adaptability. Upon power up, all selected testing functions are enabled, so that when anomalies are detected the information will be stored in RAM. If desired, any of these functions may be disabled so that they are no longer stored in RAM.

The RAM is capable of storing 1500 separate events. To prevent the RAM from filling with too many of one type of event, a software filter is employed which will allow no more than 100 of any single type of event to be stored.

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The following is a list of all functions:

SETUP

- Set Baud Rate
- Serial Port On/Off
- Parallel Port On/Off
- Set the Date
- Set the Time
- Set the Site Number
- Clear the Event Counter
- Set Buzzer On/Off
- Select Sag/Surge Thresholds
- Select Temperature Thresholds *
- Select DC Voltage Thresholds *
- Select Fahrenheit/Celsius *
- Select Event Storage On/Off

DISPLAY

- Display Summary on LCD
- Display All Events on LCD
- Display a Single Event on LCD

PRINT

- Print a Graphics Event
- Print a Summary Report
- Print All Events
- Print One Event

ON-LINE

- Enable/Disable Security Feature
- Adjust LCD Intensity
- Select Menu Functions

*Available in the full-feature unit (D200/D300) only.

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Step - By - Step Operations Guide

- 1) Turn the key switch located on the back panel to the **ON** (vertical) position. This connects the battery to the on-board power sensing circuit. The switch should be left **ON** whenever the unit is testing a line.
- 2) Plug THE DETECTIVE into an appropriate AC outlet.

NOTE: There is no display on the LCD when the unit is unplugged.

- 3) A sample display would show:

**11:06:19 117V
60 Hz 3 EVENTS**

This display shows the current time, line voltage, line frequency, and total number of events stored in RAM.

- 4) Set the Time, Date, and Site number. Refer to the SETUP section of this manual for instructions. (These settings need only be set once; the time and date are continually updated in the RAM for a period of at least five years.)

NOTE: If more than 30 seconds pass without a key being pressed, the unit will exit the MAIN MENU, and return to current DISPLAY SCREEN.

- 5) The unit is now monitoring the AC line, and will report any variations. It is recommended that the unit be left on the test site for 72 hours, in order to get a comprehensive report of the power conditions at that site.
- 6) After or during the test period, the information stored in RAM may be displayed on the LCD or printed through the Serial or Parallel ports. To display the information refer to the DISPLAY section of this manual. To output data to a parallel or serial device refer to the section on PRINTING

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ON-LINE OPERATIONS

THE DETECTIVE is considered on-line when the LCD is showing the Time, Line Voltage, Frequency, and Number of Events

11:06:19 117V
60 Hz 3 EVENTS

SECURITY FEATURE

THE DETECTIVE is provided with a Security Feature which prevents anyone from tampering with any factory or user set options such as time, date, trigger points, baud rate, etc. This feature can be enabled when THE DETECTIVE is on-line (monitoring power; e.g. when date and time are displayed).

To enable security feature, press the buttons SCROLL UP, SCROLL DOWN, and while holding them down press SELECT ITEM. The unit will then sound one short tone and the LCD will read:

SECURITY ON

While this option is enabled, the SETUP FUNCTIONS are unavailable.

To enable the SETUP FUNCTIONS, simply repeat the above procedure. The unit will again sound the tone and the LCD will read:

SECURITY OFF

Now the user may update any available features.

LCD INTENSITY CONTROL

The intensity of the LCD can be controlled when THE DETECTIVE is on-line. Pressing SCROLL UP causes the characters to become darker, while pressing SCROLL DOWN lightens them.

This action may be performed at anytime during power monitoring.

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Front Panel Operations

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Pressing the MENU key when THE DETECTIVE is on-line will cause the unit to go into the menu functions. While in the menus, pressing the SCROLL UP or SCROLL DOWN keys will display the various options available. Pressing the SELECT key will execute these options.

Pressing the MENU key while in the menu functions will allow the operator to exit the menus, and return to AC power testing.

There are three major functions of THE DETECTIVE: **SETUP**, **DISPLAY**, and **PRINT**. To access these features:

- 1) Press the MENU key. This will display:

****MAIN MENU****
EXIT FROM MENUS

Pressing the SELECT key at this time will cause the unit to exit from the menus.

- 2) Press the SCROLL UP key. This will display:

****MAIN MENU****
SETUP FUNCTIONS

Pressing the SELECT key at this time will allow the operator to program the unit. (**Note:** If the security feature is enabled this option will not appear.)

- 3) Press the SCROLL UP key. This will display:

****MAIN MENU****
DISPLAY FUNCTION

Pressing the SELECT key at this time will allow the operator to display stored events on the LCD.

- 4) Press the SCROLL UP key. This will display:

****MAIN MENU****
PRINT FUNCTIONS

Pressing the SELECT key at this time will allow the operator to print stored events through the parallel or serial ports.

SETUP FUNCTIONS

This is a step by step procedure for programming THE DETECTIVE. For ease of explanation each section assumes that the operator is starting with the unit operating in test mode (Time being displayed on the LCD).

The following items may be programmed.

- The Baud Rate (300 to 19, 200)
- Enable/Disable the Serial Port
- Enable/Disable the Parallel Port
- The Time (hours, minutes, seconds)
- The Date (days, months, years)
- A Site Number (0 to 255)
- Reset the Event Counter to Zero
- Enable/Disable the Buzzer
- Enable/Disable the Security Feature
- Adjust the Sag Trigger Point
- Adjust the Surge Trigger Point
- Adjust the DC Trigger Point *
- Select the DC Input Range *
- Adjust the Temperature Trigger Point *
- Select Fahrenheit/Celsius *
- Select which events to store in RAM

* Available only in the Full Feature Board (D200/D300)

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SETTINGS AS SHIPPED FROM THE FACTORY

Baud Rate = 19,200 baud
Serial Port Enabled
Parallel Port Enabled
Time set to Eastern Standard Time
Date set to Current Date
Site Number 0
Buzzer Enabled
Security Feature OFF
Sag Trigger at 10% under average
Surge Trigger at 10% over average
DC enabled *
DC trigger at 10% deviation *
DC range +/- 12V *
Temperature Enabled *
Temperature Trigger at 10% deviation *
Spikes on Ground Enabled *
Spikes on Neutral Enabled
All Events are stored in RAM

* Available only in the Full Feature Board (D200/D300)

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SETTING THE BAUD RATE

| | |
|-----------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |
| SCROLL UP | SET OUTPUT PORTS SET BAUD RATE |
| SELECT | SET BAUD RATE SELECT 300 BAUD |
| SCROLL UP | Use scroll keys until the baud rate you desire is displayed. |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |

The new baud rate is now selected. Pushing the SCROLL UP key will allow setting other options, pushing the MENU key will exit menus.

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ENABLING THE SERIAL PORT

| | |
|-----------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |
| SCROLL UP | SET OUTPUT PORTS SET BAUD RATE |
| SCROLL UP | SET OUTPUT PORTS SERIAL ON/OFF |
| SELECT | SERIAL ON/OFF SERIAL PORT ON |
| SCROLL UP | Use the scroll keys for on or off, then push the SELECT key. |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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ENABLING THE PARALLEL PORT

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |
| SCROLL DOWN | SET OUTPUT PORTS PARALLEL ON/OFF |
| SELECT | PARALLEL ON/OFF PARALLEL PORT ON |
| SCROLL UP | Use the scroll keys for on or off, then push the SELECT key. |
| SELECT | SET OUTPUT PORTS GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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SETTING THE DATE

| | |
|-----------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SCROLL UP | SETUP FUNCTIONS TIME DATE & SITE |
| SELECT | TIME DATE & SITE GO TO PRIOR MENU |
| SCROLL UP | TIME DATE & SITE SET DATE |
| SELECT | SET DATE MONTH: 01 |
| SCROLL UP | Use the scroll keys to select the proper month. |
| SELECT | SET DATE DAY: 01 |
| SCROLL UP | Use the scroll keys to select the proper day. |
| SELECT | SET DATE YEAR: 01 |

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SCROLL UP

Use the scroll keys to
select the proper year.

SELECT

TIME DATE & SITE
GO TO PRIOR MENU

Pushing the SCROLL UP key will allow setting of other options,
pushing the MENU key will exit the menus.

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SETTING THE TIME

| | |
|-----------|---|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SCROLL UP | SETUP FUNCTIONS TIME DATE & SITE |
| SELECT | TIME DATE & SITE GO TO PRIOR MENU |
| SCROLL UP | TIME DATE & SITE SET DATE |
| SCROLL UP | TIME DATE & SITE SET TIME |
| SELECT | SET TIME HOUR: 01 |
| SCROLL UP | Use the scroll keys to select the proper hour. |
| SELECT | SET TIME MINUTE: 01 |
| SCROLL UP | Use the scroll keys to select the proper minute. |

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SELECT

SET TIME
SECONDS: 01

SCROLL UP

Use the scroll keys to
select the proper
seconds.

SELECT

TIME DATE & SITE
GO TO PRIOR MENU

Pushing the SCROLL UP key will allow setting of other options,
pushing the MENU key will exit the menus.

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SETTING THE SITE NUMBER

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL UP | SETUP FUNCTIONS SET OUTPUT PORTS |
| SCROLL UP | SETUP FUNCTIONS TIME DATE & SITE |
| SELECT | TIME DATE & SITE GO TO PRIOR MENU |
| SCROLL DOWN | TIME DATE & SITE SET SITE NUMBER |
| SELECT | SET SITE NUMBER SITE # 01 |
| SCROLL UP | Use the scroll keys to select the site. |
| SELECT | TIME DATE & SITE GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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CLEARING THE EVENT COUNTER

WARNING!!! Executing this option will cause any events stored in RAM to become unavailable.

| | |
|-------------|-------------------------------------|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL DOWN | SETUP FUNCTIONS SET ALARM MODES |
| SELECT | SET ALARM MODES CLR EVENT COUNT |
| SELECT | CLR EVENT COUNT PRESS SELECT KEY |
| SELECT | SET ALARM MODES CLR EVENT COUNT |

The event counter has been cleared to 0. Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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ENABLING/DISABLING THE BUZZER

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL DOWN | SETUP FUNCTIONS SET ALARM MODES |
| SELECT | SET ALARM MODES CLR EVENT COUNT |
| SCROLL UP | SET ALARM MODES BUZZER ON/OFF |
| SELECT | BUZZER ON/OFF DEVICE IS ON |
| SCROLL UP | Use the scroll keys for on or off, then push the SELECT key. |

The event counter has been cleared to 0. Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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PROGRAMMING THE SAG SETPOINT

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL DOWN | SETUP FUNCTIONS SET ALARM MODES |
| SELECT | SET ALARM MODES CLR EVENT COUNT |
| SCROLL UP | SET ALARM MODES BUZZER ON/OFF |
| SCROLL UP | SET ALARM MODES TRIGGER SETPOINT |
| SELECT | TRIGGER SETPOINT SAG TRIGGER |
| SELECT | SAG TRIGGER 10% DEVIATION |
| SCROLL UP | Use the scroll keys to determine the desired setpoint percentage, then push the SELECT key. |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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PROGRAMMING THE SURGE SETPOINT

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL DOWN | SETUP FUNCTIONS SET ALARM MODES |
| SELECT | SET ALARM MODES CLR EVENT COUNT |
| SCROLL UP | SET ALARM MODES BUZZER ON/OFF |
| SCROLL UP | SET ALARM MODES TRIGGER SETPOINT |
| SELECT | TRIGGER SETPOINT SAG TRIGGER |
| SCROLL UP | TRIGGER SETPOINT SURGE TRIGGER |
| SELECT | SURGE TRIGGER 10% DEVIATION |
| SCROLL UP | Use the scroll keys to determine the desired setpoint percentage, then push the SELECT key. |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

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NOTE ON SAG & SURGE SETPOINTS

Sags and Surges are determined by comparing the instantaneous RMS voltages value against the average value over the prior hour. An event occurs when this value differs from the average by more than the setpoint percentage.

For example if the average RMS for the prior hour was 120V, and the trigger setpoint is 10% then a sag would be detected at 108V, and a surge at 132V

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SELECT EVENTS TO BE STORED

| | |
|-------------|---|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SELECT | SETUP FUNCTIONS GO TO PRIOR MENU |
| SCROLL DOWN | SETUP FUNCTIONS SET ALARM MODES |
| SELECT | SET ALARM MODES CLR EVENT COUNT |
| SCROLL DOWN | SET ALARM MODES SELECT EVENTS |
| SELECT | SELECT EVENTS ON NOISE HITS |
| SCROLL UP | Use the scroll keys to locate each type of event to be enabled or disabled. Typing the SELECT key will change the status ON/OFF. Pressing the MENU key will exit this function. |

Pushing the SCROLL UP key will allow setting of other options, pushing the MENU key will exit the menus.

NOTE ON SELECTING EVENTS

THE DETECTIVE can store up to 1500 power disturbing events in battery backed-up RAM. This data will be stored for more than five years, unless cleared by the operator. The operator has the option of selecting which events will or will not be stored, however the operator does not have to execute this option, as the unit will automatically store every event it is capable of measuring.

However, if the operator would like to make THE DETECTIVE more selective about the types of events to be stored this procedure should be run. This function will allow the operator to selectively enable or disable each type of event being measured.

DISPLAY FUNCTION

This is a step by step procedure for having THE DETECTIVE display stored information on the LCD. For ease of explanation each section assumes that the operator is starting with the unit in test mode (Time being displayed on the LCD).

There are three different formats that the data may be displayed in:

- 1) Summary Report - Displays the total count of each event type that has been detected. (Example: 127 10V SPIKES.) Even though THE DETECTIVE stops storing all the detail information after the first 100 occurrences of an events, the unit continues to count the total number of times that event type occurs.
- 2) Detail Report - Shows the event number, type of event, and time. Pushing the SCROLL buttons allows the display of every event in RAM.
- 3) Single Event - Displays the time and type of any event.

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DISPLAY SUMMARY

| | |
|-----------|---|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SCROLL UP | **MAIN MENU** DISPLAY FUNCTION |
| SELECT | DISPLAY FUNCTION GO TO PRIOR MENU |
| SCROLL UP | DISPLAY FUNCTION DISPLAY SUMMARY |
| SELECT | DISPLAY SUMMARY 0001 INITIALIZED |
| SCROLL UP | Use the scroll keys to view the summary count of each event type. When finished viewing the summary report press the MENU key. |
| MENU | DISPLAY FUNCTION GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow other display options, pushing the MENU key will exit the menus.

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DISPLAY ALL EVENTS

| | |
|-----------|---|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SCROLL UP | **MAIN MENU** DISPLAY FUNCTION |
| SELECT | DISPLAY FUNCTION GO TO PRIOR MENU |
| SCROLL UP | DISPLAY FUNCTION DISPLAY SUMMARY |
| SCROLL UP | DISPLAY FUNCTION SHOW ALL EVENTS |
| SELECT | EVENT # 0001 00:00 INITIALIZED |
| SCROLL UP | Use the scroll keys to view the time and type of each event number. When finished press the MENU key. |
| MENU | DISPLAY FUNCTION GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow other display options, pushing the MENU key will exit the menus.

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DISPLAY ONE EVENT

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL UP | **MAIN MENU** SETUP FUNCTIONS |
| SCROLL UP | **MAIN MENU** DISPLAY FUNCTION |
| SELECT | DISPLAY FUNCTION GO TO PRIOR MENU |
| SCROLL DOWN | DISPLAY FUNCTION DISPLAY ONE EVENT |
| SELECT | NUMBER : EVENT # 0001 |
| SCROLL UP | Use the scroll keys to change the event number. When finished press the SELECT key to display the information. Press the SELECT key again to exit. |
| SELECT | DISPLAY FUNCTION GO TO PRIOR MENU |

Pushing the SCROLL UP key will allow other display options, pushing the MENU key will exit the menus.

PRINT FUNCTIONS

This is a step by step procedure for having THE DETECTIVE print stored information through the Serial or Parallel Ports. For ease of explanation each section assumes that the operator is starting with the unit in test mode (Time being displayed on the LCD).

In order for the data to be sent to either port, the port must be enabled (see SETUP FUNCTIONS). If a port is unused it **MUST BE DISABLED**. THE DETECTIVE will abort the PRINT function after a timeout period and resume monitoring power if an unused port is enabled or if a printer is offline at a specified port.

There are four different formats that data may be printed in.

- 1) Graphics Report - The operator may select a single graphics type event that has been stored and print a representation of that event. This report makes the event easy to understand, by referencing the event to its location on the sine wave
- 2) Summary Report - The total count of each event type that has been detected. (Example: 127 10V SPIKES.) Even though THE DETECTIVE stops storing all the detail information after the first 100 occurrences of an event, the unit continues to count the total number of times that event type occurs. The summary report also prints the time, date, and site number at the time of printing.
- 3) Detail Report - First, prints the entire Summary Report, then a complete description of every event stored in RAM, including the Time, Date, Magnitude, Duration, and Location on the sine wave.
- 4) Single Event - Prints out all detail information for any event selected.

Detective Series D200/D300

PRINT GRAPHICS

| | |
|-------------|--|
| MENU | **MAIN MENU** EXIT FROM MENUS |
| SCROLL DOWN | **MAIN MENU** PRINT FUNCTIONS |
| SELECT | PRINT FUNCTIONS PRINT GRAPHICS |
| SELECT | PRINT GRAPHICS EVENT # 0000 |
| SCROLL UP | Use the scroll keys to select the event number you wish to print. When finished press the SELECT key to begin printing. When the item is finished printing, the unit will return to the menu option: PRINT FUNCTIONS PRINT GRAPHICS |

Pushing the SCROLL UP key will allow other printing options, pushing the MENU key will exit the menus.

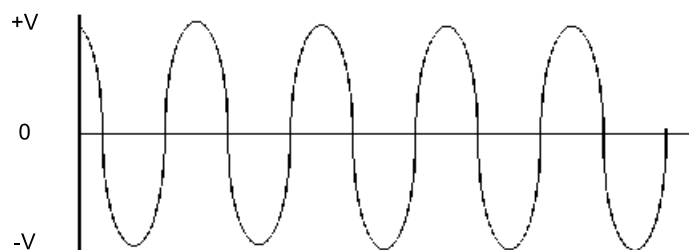
Types of Power Problems and what they look like.

There are many types of power problems that can affect the quality of the AC power being delivered to a piece of equipment. Different types of problems will have different effects on the operation, or even life expectancy of this equipment. Knowing what these problems are, and what some of the consequences are of having these problems, can help in the process of identifying what can be done to help protect this equipment.

The following pages describe several of the more common types of Power disturbances and list what some of the causes are.

- ◆ Dropout - Power Failure
- ◆ Sag
- ◆ Impulse
- ◆ Common Mode Noise
- ◆ Surge
- ◆ High Frequency Noise

Figure PT 1 Typical AC Waveform



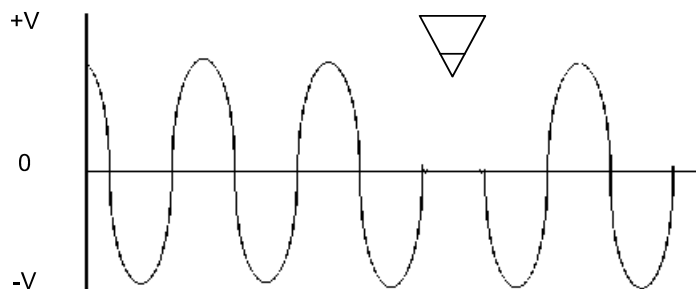
DROPOUT (NOTCH)

A condition where a portion of the sine wave has a lower than expected value or is missing entirely, usually for a portion of a cycle. These types of problems can be caused when large motors are started, Lightning arresters are employed (during a lightning hit), or when electrical equipment fails. Dropouts can lead to failures in computers and electronic equipment, reduced life of motors and flickering lights.

POWER FAILURE

When the duration of a dropout exceeds 1 cycle it is usually referred to as a Power Failure, or Blackout. A blackout is a reduction in RMS (Root Mean Square) line voltage below 80 volts for several cycles or longer, often recognized as a complete power failure for varying lengths of time. System hang-ups, data erasures, and erroneous data transfers often result from this problem.

Figure PT 2 - Dropout

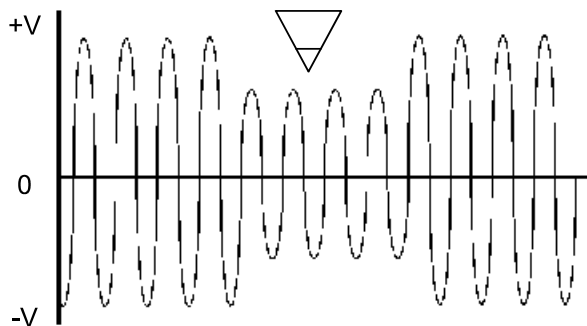


(UNDER-VOLTAGE, DIP, or BROWNOUT)

A power sag (or low line voltage) is a decrease in line voltage of at least 10% of the average line voltage for half a cycle or longer. The power sag is often caused by large inductive equipment (e.g. photocopy, postage equipment) being applied on the same AC line as is being tested. Sags can be caused by external factors as well, such as large power draining equipment used in other buildings. Sags can be particularly detrimental to electronic equipment because of the malfunctions caused by the sudden decrease of available voltage to the power supply. Complete failure rarely occurs, and often the equipment user continues to operate the device, unaware of the potential logic circuit problems that may have occurred.

A **Brownout** is a common example of a sag. Due to the ever increasing demands for energy, brownouts are often intentionally caused by electric utilities as a method of conserving energy. Brownouts decrease the margin of voltage available to protect equipment from the effects of power sags.

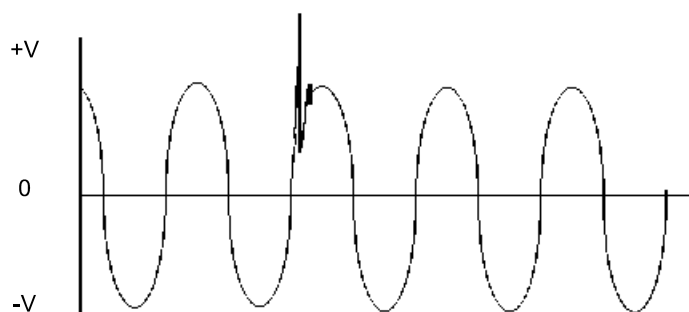
Figure PT 3 - Sag



IMPULSE (SPIKE, SURGE)

The spike is a surge of energy superimposed on the AC line, usually with a relatively short duration. Spikes can potentially have the most serious effects on electronic equipment due to their high energy content, and the Integrated Circuits inability to absorb the energy. Many events can cause spikes, such as lightning bolts, utility grid switching, switching inductive loads on and off, and SCR (Silicon Control Rectifier) dimmers. Although properly designed equipment has some built-in spike protection, repeated hits by high energy spikes can eventually render these components useless.

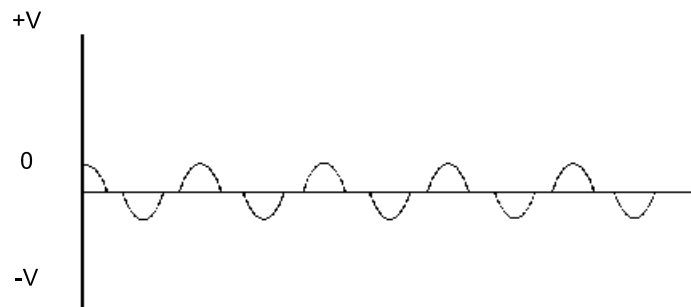
Figure PT 4 - Impulse



COMMON MODE NOISE

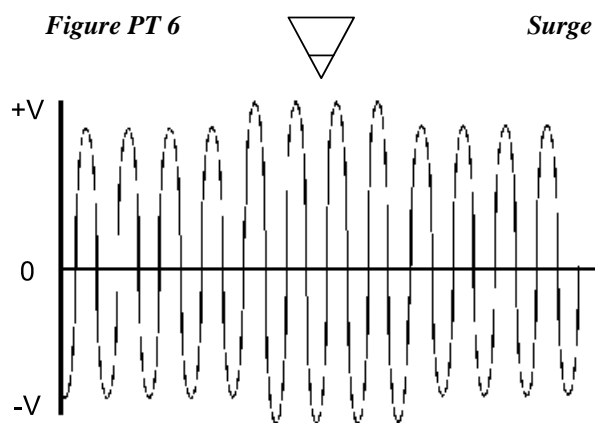
In single phase power systems, as found in many countries such as the USA, the load (computer or equipment) is connected between the hot and neutral line. Usually the neutral line is connected to earth ground at the service entrance, so that in effect the neutral line should have 0 volts at the load. At a typical site, voltage is induced onto the neutral line by other equipment. This voltage can appear in the form of impulses, or a continuous pseudo sine wave.

Figure PT 5 - Common Mode Noise



SURGE **(SWELL OR OVER-VOLTAGE)**

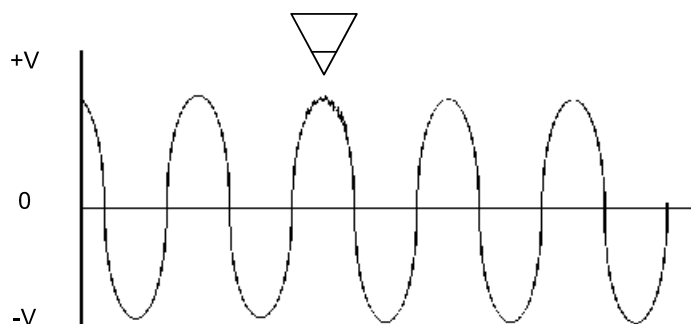
A power surge is the opposite of a sag and is often referred to as "High Line Voltage". A surge is defined as an increase in line voltage above 128 volts (on a 115V Line) for a half cycle or longer. Like the sag, the power surge is often caused by large inductive loads being applied on the same line. Power surges cause some of the most dangerous occurrences, and their results are the most difficult to correct.



HIGH FREQUENCY NOISE

High frequency noise can be caused by electronic equipment feeding internal noise back onto the power line, or logic induced noise from switching power supplies. This noise is transferred to the AC line causing disturbances greater than 2V peak-to-peak superimposed on the AC sine wave (normal mode noise). This noise can cause internal component degradation and eventual system failure. During this degradation period, system lockups, resets and data transfer errors will increase.

Figure PT 7 - High Frequency Noise



Detective Series D200/D300

Master Product List

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PowerTronics offers a wide variety of Power Monitors to meet all of the monitoring needs of today's Power Quality Specialist. The following is a list of the various products which are built.

PQR Series for 1, 2, 3 Phase, and Environmental applications.

- ◇ PQR 2020 3 Phase and Neutral Voltage
- ◇ PQR 1010 2 Ch AC, 2 Ch DC, Current and Temp.
- ◇ PQR D52 Single Phase Voltage with Temp/Humidity

Single Phase “Detective” Series Products

- ◇ D300 Service Call Edition w/ printer & options
- ◇ D250 Service Call Edition w/ printer
- ◇ D200 Table Top unit with options
- ◇ D100 Table Top unit

Single Phase “Probe” Series Products

- ◇ PI-500 Power Investigator
- ◇ P200⁺ LED Probe for 220V AC
- ◇ P100⁺ LED Probe for 110V AC

Optional Probes

- ◇ Temperature (PQR 1010, PQR D52)
- ◇ Humidity (PQR 1010, PQR D52)
- ◇ Current (PQR 1010)

Detective Series D200/D300

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PQR Series Power Quality Recorders

For **SINGLE, DUAL, TRIPLE PHASE**, and
ENVIRONMENTAL applications.

- ◆ User - Friendly
- ◆ Data Logging
- ◆ Multiple Channel Monitoring
- ◆ Fast Impulse Detection
- ◆ Easy to Understand Reports
- ◆ Reasonable Pricing
- ◆ Made in USA

The PQR Series of Power Quality Recorders are designed to meet a wide range of Power and Environmental testing needs. Models range from the simple - PQR D52, Single Phase to the Sophisticated - PQR 1010, Dual AC, Dual DC, Current, and Temperature recorder, with many Models in between.



**PQR Series
Power Quality
Recorders**

Detective Series D200/D300

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PQR D52

Monitor 2 AC Channels

Hot and Neutral + Humidity and Temperature

- ◆ User - Friendly
- ◆ Programmable
- ◆ Multiple Phase Monitoring
- ◆ Fast Impulse Detection
- ◆ Easy to Understand Reports
- ◆ Made in USA

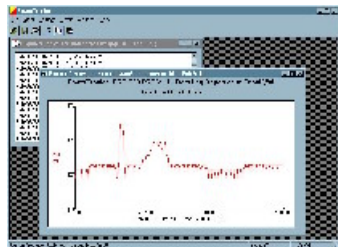


The PQR D52 Power Line Analyzer provides a complete analysis of your AC Power for a fraction of the cost of other Monitors.

Disturbances detected on the Hot and Neutral Lines , as well as Temperature and Humidity channels are recorded by their time, date, magnitude, and duration in a non-volatile RAM memory. This data is then retrieved from the analyzer through it's serial communications port.

The power to operate the unit comes from any standard 110v / 220v AC outlet. Once plugged in, the PQR D52 immediately begins testing the signals on the input connectors.

GRAPHICS SOFTWARE INCLUDED!



Provided with the **PQR D52** is the **PQR HOST COMMUNICATIONS** Software. This software allows you to easily download the data and display or print the **DATALOG** chart over time, the **PIE CHART** of the summary of events or the **HISTOGRAM** of the detail of events.

PQR 1010

The PQR 1010 is one of a series of practical power line monitors, designed and priced to be outfitted to everyone who services or installs electrical, and electronic equipment.

In addition to full Text Detail and Summary reports, event information such as the Magnitude, Time, and Date of each of the disturbances is also reported.



- ◆ User - Friendly
- ◆ Multi Channel - AC Voltage, DC Voltage, Current, Humidity and Temperature
- ◆ Disturbance Recorder and Voltage Logger
- ◆ Easy to Understand Reports
- ◆ Simple connection to a Computer or Terminal
- ◆ Made in USA

The PQR1010 Power Quality Recorder is a state of the art, fully integrated instrument which measures, records, and reports power disturbances, aiding in the analysis of power quality in medical, commercial and industrial applications.

Disturbances detected on multiple channels are recorded by their time, date, magnitude, and duration in a non-volatile RAM memory. This data is then retrieved from the analyzer through its' serial communications port.

Connections to the PQR-1010 are made between the safety connectors on the back of the unit, and the circuit panel to be tested. The power to operate the unit comes from any standard 110v / 220v AC outlet. Once plugged in, the PQR-1010 immediately begins testing the signals on the input connectors.

PQR 2020

Three Phase Voltage Power Disturbance Monitor

- ◆ User - Friendly
- ◆ Programmable
- ◆ Multiple Phase Monitoring
- ◆ Fast Impulse Detection
- ◆ Easy to Understand Reports
- ◆ Made in USA



The PQR2020 Power Disturbance Analyzer is a state of the art, fully integrated instrument which measures, records, and reports power disturbances, aiding in the analysis of power quality for AC power in medical, commercial and industrial applications.

Power disturbances detected on multiple channels are recorded by their time, date, magnitude, and duration in a non-volatile RAM memory. This data is then retrieved from the analyzer through it's serial communications port.

Connections to the PQR-2020 are made between the safety connectors on the back of the unit, and the circuit panel to be tested. The power to operate the unit comes from any standard 110v / 220v AC outlet. Once plugged in, the PQR-2020 immediately begins testing the signals on the input connectors.

PI-500

Power Investigator

- ◆ Full Function Power Disturbance Monitor
- ◆ Very Low Cost
- ◆ Measures all types of disturbances



- * Spikes
 - * Sags
 - * Line Frequency
 - * Dropouts
 - * Surges
 - * AC Voltage
 - * Common Mode Noise
 - * High Frequency Noise
 - * Power Failures
- ◆ Input Voltage Range 80 - 300 VAC
 - ◆ Simple to operate:
 - 1) Plug cord into a grounded outlet
 - 2) Let the unit monitor the line for 24-72 hours
 - 3) Connect to printer for printouts

EASY TO USE, EASY TO UNDERSTAND,

The Power Investigator generates a Cause and Effect Report which gives a clear understanding of what causes the type of power problems which were detected ON SITE. To fix the problems there's no more guessing. The Power Investigator Solutions Guide Report helps you find the problems and make the right power protection decision.

Detective Series D200/D300

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Detective Specifications

AC RMS LINE VOLTAGE

Records true RMS LINE VOLTAGE, and TIME, DATE, and MAGNITUDE of deviations.

The current line voltage is continuously measured by the Detective and values are updated to the LCD display each second.

Response time: 100ms

Range 110v Model: 75-150v RMS

Accuracy: +/- 1.5%

Range 220v Model: 150-300v RMS

Deviation: Any change in RMS line voltage Lasting longer than 50 ms greater than 2%.

LINE FREQUENCY

Records the AVERAGE line frequency, TIME, DATE, and DURATION of any frequency change.

Range: 40 to 70 hz Accuracy +/- .1%

Response Time: 1 AC cycle

NEUTRAL LINE RMS LINE VOLTAGE

The Detective monitors the neutral line continuously and records any RMS neutral line voltage. The voltage on the neutral line will be shown as an event after each AC power restore.

Deviation: 1v change or 10% of average neutral line voltage, whichever is greater.

Resolution: +/- 1v Accuracy: +/- 1.5%

Response Time: 100ms

Detective Series D200/D300

AC VOLTAGE SPIKE ANALYSIS

Measures all spikes on the AC line and stores their MAGNITUDE, TIME, DATE, and LOCATION on the sine wave.

Minimum Spike Width: 750 ns

Trigger Point: +/- 10, 20, 50, 100, 500, 1000v

Accuracy: +/- 10%

HIGH LINE VOLTAGE (SURGE)

Records the MAGNITUDE, TIME, DATE, and DURATION of any surge in line voltage.

Range: 75-150v RMS (110v models)

Response Time: 16 ms 150-300v RMS (220v models)

Accuracy: +/- 1.5%

Trigger Point: Programmable trigger points 10% to 50%.

LOW LINE VOLTAGE (SAG)

Records the MAGNITUDE, TIME, DATE, and DURATION of any drop in line voltage. The Detective determines a SAG as any 10% drop in line voltage from the actual RMS line voltage.

Range: 75-150v RMS (110v models)

Response Time: 16 ms 150-300v RMS

(220v models) Accuracy: +/- 1.5%

Trigger Point: Programmable trigger points 10% to 50%.

HIGH FREQUENCY NOISE

Records TIME, DATE, and DURATION of noise.

Amplitude: +/- 2v P-P (minimum)

Frequency: 10khz to 10 khz

Response time: 1 ms

PHASE SHIFT

Records TIME and DATE of AC line Phase Shift. (Also captured as line frequency change of +/- 5 degrees in magnitude of the recorded average line frequency.)

POWER FAILURE

Records the TIME, DATE, and DURATION of any power failure. A power failure is any drop in line voltage below 80v RMS.
Trigger point: Below 80v RMS +/-1.5% Minimum
Duration: 100ms

DROPOUT

Records TIME, DATE, and DURATION of any drop in line voltage lasting 1/2 cycle or longer.
Trigger Point: 50% reduction in line voltage
Response Time: 8ms

MECHANICAL SPECIFICATIONS

Display Size: 2.75" x .75"
Power Cord: 6 Ft.
Case Size: 16"w x 12"d x 10.5"h
Display Type: 16 x 2 LCD display
Case Weight: 23 pounds
RAM Memory: 5 yr battery backed