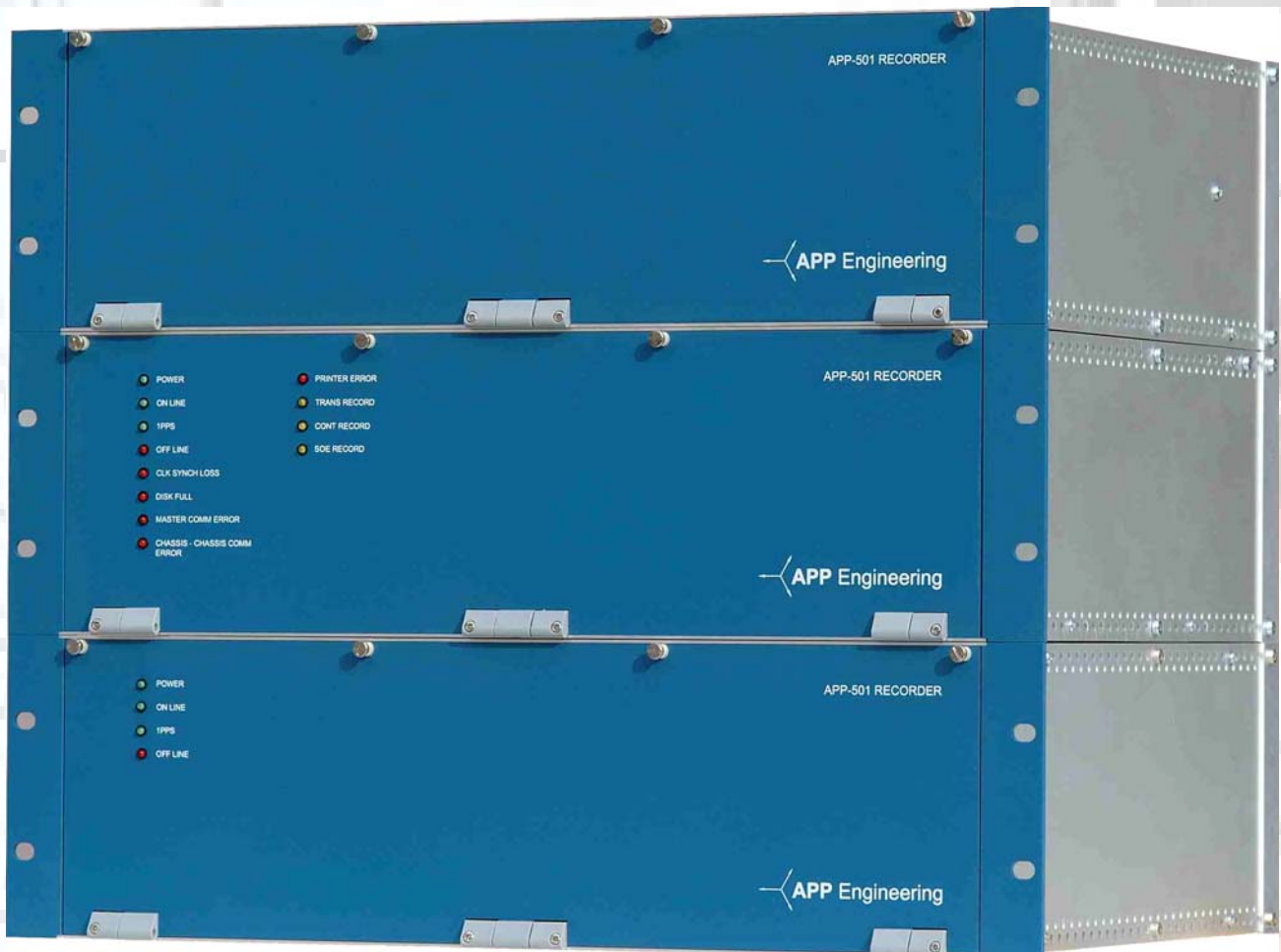


# APP-501 Recorder<sup>TM</sup>

Multifunction Recorder



The most advanced, affordable, user-friendly recorder on the market.

 **APP Engineering, Inc.**

## Applications

- Transmission
- Generation
- Distribution
- Research
- Case studies

## Features

- Windows based software
- Distributed or centralized architecture
- Data alignment within 1usec
- Simultaneous recording functions
- DC coupling
- Analog channels configurable as voltage or current.
- Hot swappable cards
- Auto diagnostics
- Remote power toggle
- Independent data acquisition channels, if one channel or chassis fails the others continue to operate
- Multiple triggers per channel
- Automatic COMTRADE files
- Automatic ComNames
- Auto calling, polling, emailing
- Network, modem, DNP-3 communications
- Event channels configurable as DFR, SER, or both
- Integrated monitor & keyboard
- Easy expandability
- Superior analysis software, loaded on the recorder and your master station computer
- Excellent EFT and oscillatory immunity
- AC or DC power input power
- Designed & manufactured by APP Eng.
- Six year warranty<sup>1</sup>

## Functions

- Transient oscillography recording
- Extended oscillography recording
- Extended RMS recording
- Continuous oscillography recording
- Continuous RMS recording
- Continuous frequency recording
- Continuous phasor recording
- Sequence of events
- Real time monitoring

## Transient Oscillography Recording

Transient recording rates are 600, 1200, 2400, 4800, 9600, 16,800 and 19,200 Hz. The maximum record length is 40 seconds. Voltages, currents and events are recorded before, during, and after the fault. Each data sample is time stamped for convenient protection analysis, circuit breaker operation, clearance times, and waveform overlaying.

Transient records can be started by the following analog channel triggers:

- Voltage (over, under, both)
- Over current
- Frequency (over, under, both, step)
- Positive, Negative, and Zero Sequence
- THD
- Harmonics
- Active Power (over, under, both)
- Reactive Power (over, under, both)
- Rate of change for all the above
- Duration setting for all the above
- Hysteresis settings for all the above
- Post fault retriggering
- Continuous triggering

## Extended Oscillography Recording

An extended oscillography record is generated each time the recorder trips and creates a transient record. The recording rates are 240, 600, 1200 or 2400 Hz. The maximum record length is 30 minutes. This feature is useful for calculating a variety of power system quantities, reclose events, and stability status.

## Extended RMS Recording

An extended RMS record is generated each time the recorder trips and creates a transient record. Analog inputs are sampled at 1 sample per cycle or slower. This RMS file is smaller in size and can be retrieved faster than the extended oscillography discussed above.

# Functions

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## Continuous Oscillography

The continuous oscillography recording rate is 600Hz. Data is recorded in a circular buffer having a maximum period of 5 days. The user can retrieve any time over the 5 day period. Subtle events that did not trip the recorder can be retrieved and analyzed.

## Continuous RMS, Frequency, & Phase

All three recordings are enabled with a single setting. Data is recorded at one point per cycle or slower. Data is recorded in a 30 day circular buffer. To view subtle events that may not have tripped the recorder, the user can retrieve any time slice over the 30 day period.

## Trending

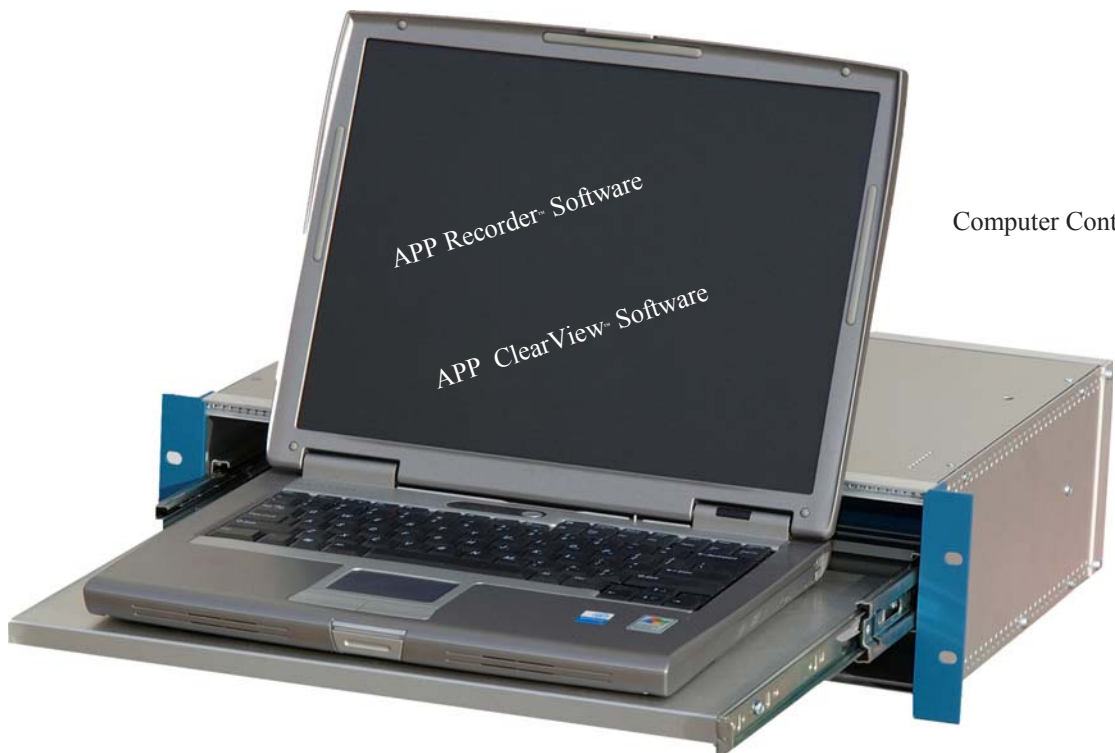
After time slices are retrieved, trends can be viewed with APP ClearView™ Software. Maximum, minimum, average, peak, voltage profiles, frequency profiles, and a host of other information can be viewed.

## Event Recording

Event inputs are scanned at the transient recording rate. Events can be setup as normally open or normally closed. They can also be setup as DFR, SER, or both. If an event channel is setup as a “DFR” it will cause all channels to record when it goes abnormal. The event will be part of the transient record. The event will be recorded before, during, and after the fault. If setup as a “SER” channel, the event will only be logged in the Sequence of Event Report. A global event debounce time parameter is available for the user. To handle nuisance event triggers, a global event auto shutdown auto restart parameter can be setup. Event records can be displayed independently or with a transient record. For easier viewing, recorded events can be turned on/off with the APP ClearView™ Software.

## Fault Locator

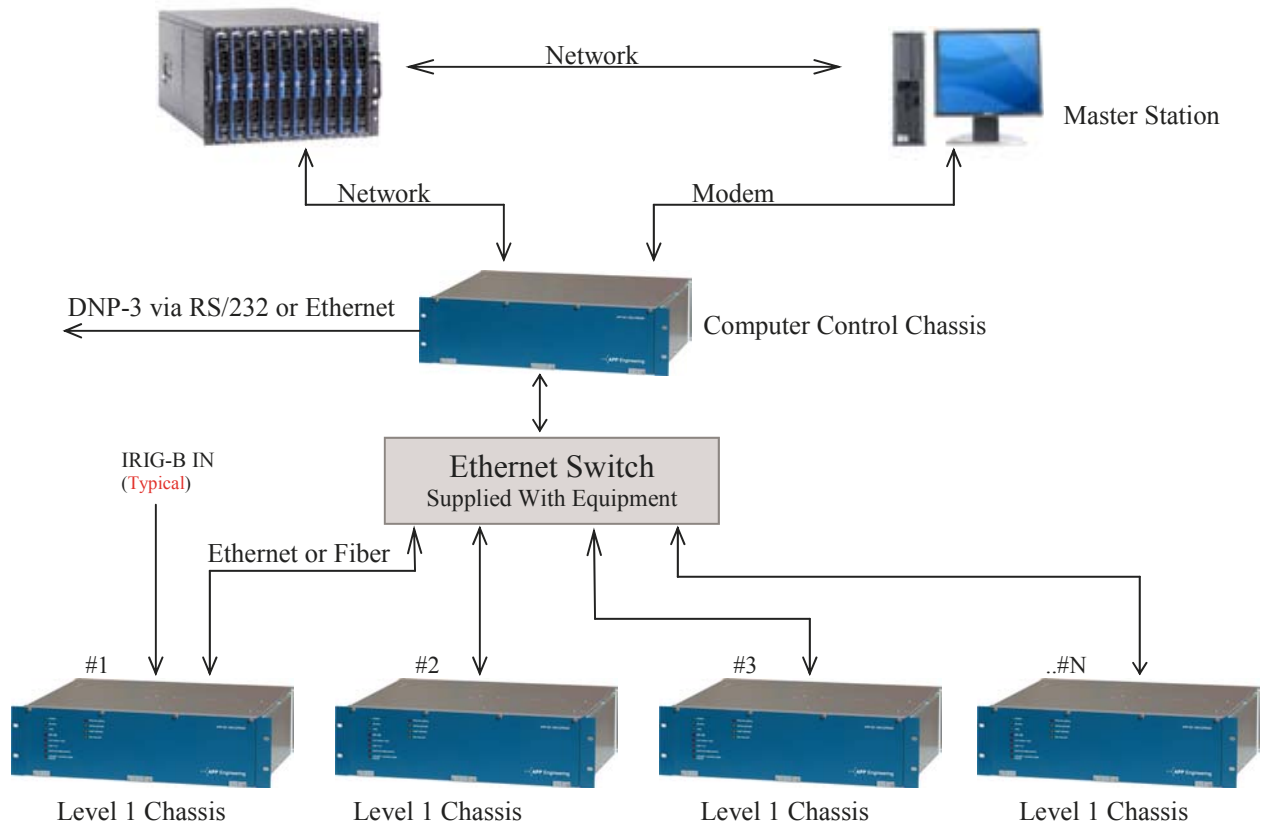
Based on data in the transient record, the recorder automatically performs a distance to fault calculation. Information such as distance, line, phase involvement, and duration are uploaded when the transient record is retrieved or automatically called in.



Computer Control Chassis

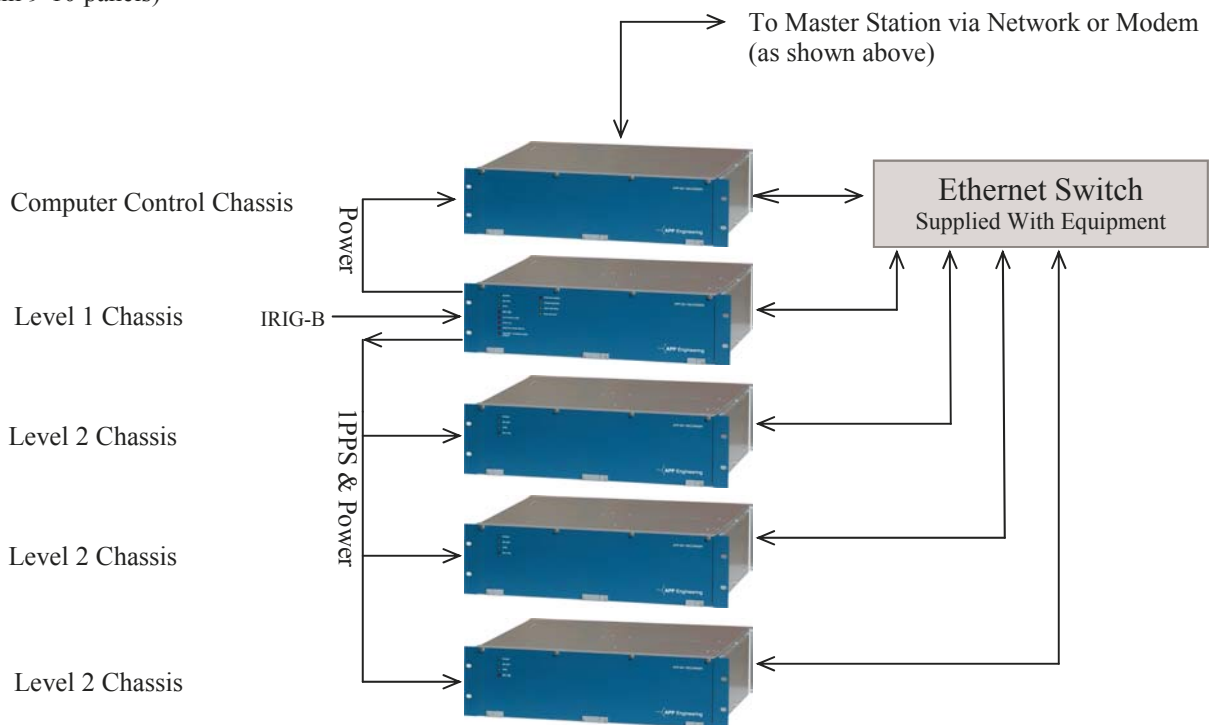
# Configurations

Distributed



Centralized

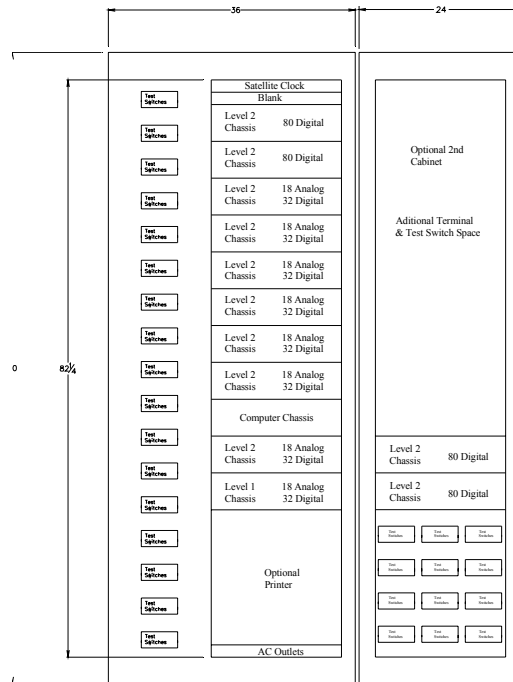
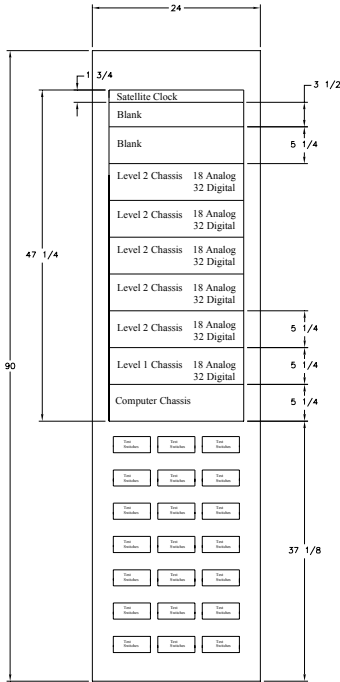
In the same panel or close proximity  
(within 9-10 panels)



# Configurations

Turn-key

- Any Cabinet/Panel Size
- Manufactured To Your Specs.
- Analog Terminal Blocks
- Event Sliding Link Terminal Blocks
- Test Switches
- Lights
- Receptacles
- Complete Wiring
- Complete Setup
- Comprehensive Testing
- Quick Turn
- Affordable



## Computer Chassis

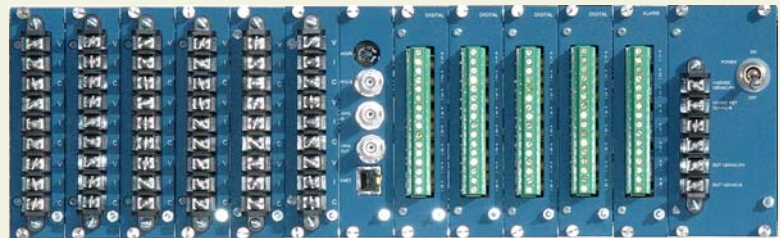
- Integrated keyboard & monitor
- Optional external HDD
- Optional computer upgrades

## Level 1 & Level 2 Chassis

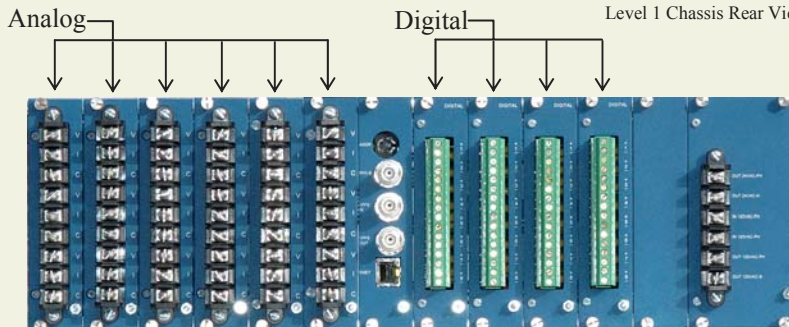
- 10 slots for analog or digital cards
- Configure with all analog or all digital or any mix
- 3 Channels per analog card, both voltage & current
- 8 Channels per digital card
- All cards hot swappable
- Level 1 chassis contains power supply
- Level 1 chassis contains alarm board with 8 outputs
- Level 1 chassis IRIG-B input and 1PPS Output
- Level 2 chassis 1PPS input & 1PPS Output
- Level 2 chassis optional alarm boards



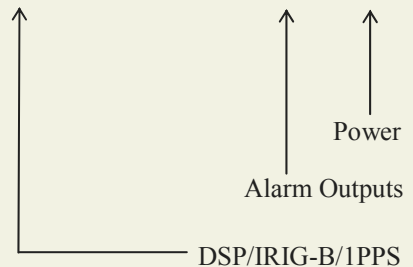
Computer Chassis Rear View



Level 1 Chassis Rear View



Level 2 Chassis Rear View



- Analog & Power - 12AWG Wire Max
- Digital & Alarm - 14AWG Wire Max
- IRIG & 1PPS - BNC Connector

# Specifications

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## Analog Channels

### Voltage:

Up to 30 analog channels per chassis  
Up to 440VAC Max  
True DC Coupling  
Rin 100K $\Omega$   
Accuracy 0.15% of reading + 0.005% of range (typical, uncalibrated)

### Current:

2m $\Omega$  Shunt  
15Arms Continuous  
140Arms for 2 sec, 250Arms for 1/2 sec  
Accuracy 0.61% of reading + .005% of range (typical, uncalibrated)

### General:

16 Bit A/D  
Data aligned with 1PPS rising edge  
Ch to Ch phase angle error <0.004 $^{\circ}$   
Cut-off frequency (-3db) 5KHz  
Common Mode Rejection 80dB Min  
Temperature Error 70ppm/ $^{\circ}$ C  
Channel to channel isolation 3500VDC  
Channel to ground isolation 3500VDC

## Event Channels

Up to 80 event channels per chassis  
Standard input operating range 45-200VDC (24VDC, 250VDC options available)  
Channel to channel isolation 3500VDC  
Channel to ground isolation 3500VDC

## Power Supply

Standard 125VDC, 250VDC or 115VAC  
Range 86VDC to 370VDC  
Over load, Over Voltage, Over Temp Protect  
Power @ 125VDC and 54 analog channels and 96 event channels is approximately 140W  
Input to ground isolation 3500VDC

## Status Relays

8 alarm outputs, N.O. or N.C, SPST  
Contact ratings: 0.5A @ 125VDC  
.35A @ 250VDC, dielectric 5KVac

### Alarms

Power, On Line, Off Line, Clock Sync  
Loss, Communication Error (chassis to chassis), Communication Error (with master station), Disk Full, Trigger (additional outputs available)

## Timing

Modulated or unmodulated IRIG-B  
Data aligned within 1usec  
1PPS in/out chassis to chassis  
Optional built-in satellite clock

## Communications

Recorder to master station  
TCP/IP Ethernet 10/100  
Modem  
Chassis to chassis  
Ethernet 10/100  
Fiber (option)  
DNP-3  
RS-232  
Ethernet 10/100

## System Computer

### System minimum includes:

XP Professional OS  
Intel Pentium M740 Processor  
1GB DDR  
80GB HDD  
CDRW Drive  
RS232, Ethernet, Parallel , USB ports  
Integrated keyboard &, flip up display  
Internal Modem

## Enclosure

19" Rack x 5.25"H x 16D" (All Chassis)  
Many cabinet/panel sizes available

## Compliant Standards

ANSI/IEEE C37.90.1 (Surge Withstand)  
IEC 60255-22-1 Cat III (Osc.)  
IEC 60255-22-4 Cat IV (EFT)  
IEC 60255-5 Cat IV (Isolation)  
ANSI/IEEE C37.111 (COMTRADE)

## Environment

Operating Temperature 5 to 55 $^{\circ}$ C  
Humidity 0 to 90% non condensing

Phone: 317-536-5300  
Fax: 317-536-5301  
Email: sales@appengineering.com

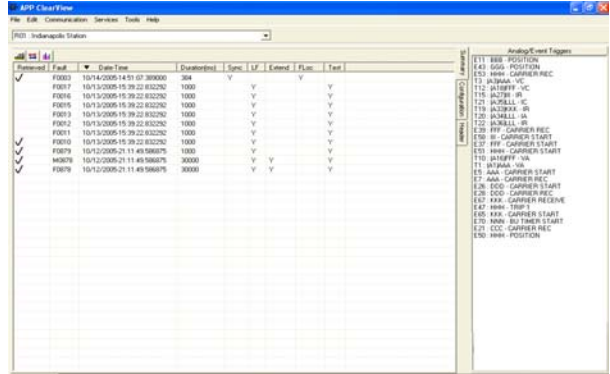
# Software

One of APP Engineering's premier strengths is our ability to provide time saving, valuable, user-friendly software. Years of experience in software development, logical algorithm formulation, engineering, mathematics, and customer service, has given us the tools to provide world class software solutions. Our commitment to provide software that is truly valuable is enhanced by our ability to respond quickly to customer requested changes and upgrades.

The APP-501 Recorder™ includes our **APP ClearView™ Program** and our **APP Recorder™ Program**. The APP ClearView™ program is run on your master station computer and it is loaded on the recorder for “on the spot” record review and analysis. The APP Recorder™ Program controls the functionality of the APP-501 Recorder and includes many features to make setup quick and easy. Both pieces of software can run as an application or service. The APP ClearView™ Program will run on Windows 95, 98, NT, 2000, or XP

**APP ClearView™ -summary table**

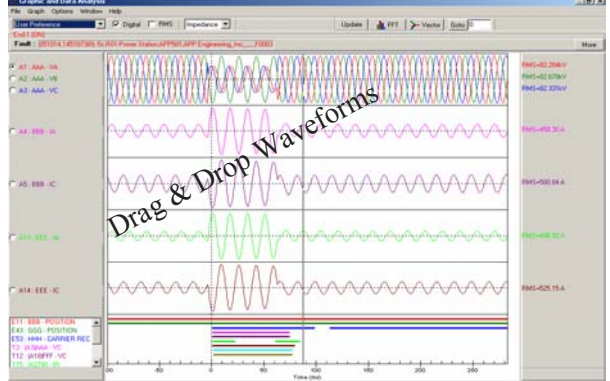
View	Configure	Functions
Fault number	Printing	Easy station selection
Triggered channels	Directories	Manually retrieve data
Fault date	Backups	Auto retrieve data
Fault time	Auto polling	Test runs
Synch status	Passwords	Diagnostics
Event reports	Emailing	Time check
Fault location	Phone numbers	Time synch
Polling report	IP addresses	Recorder restart
Recorder config	Point assignments	Recorder updates
Comm. status	Line groups	Sorting
	Recorder setup	Analysis



Summary Table

**APP ClearView™ -analysis**

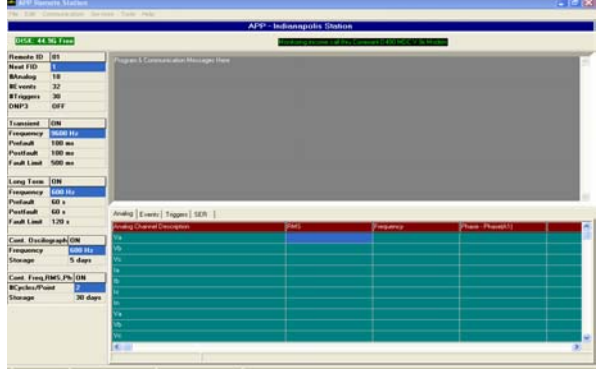
Highlights	Measurements & Math
Quick viewing of retrieved records	Magnitude, RMS, DC, Phase
Open any COMTRADE record	Frequency, Peak, Average,
Overlay or merge 2 records	Max, Min, Max-Min, Positive
Re-Save data in binary or ASCII	Sequence, Negative Sequence,
Multiple setups for viewing channels	Zero Sequence, Add, Subtract,
Drag & drop waveforms	Invert, Phase shift,
Convenient screen resizing	Wide Variety Of Math Functions,
Versatile digital viewing	FFT, Vector, Delta
Easy zoom in, zoom out, Y-scale setup	Measurements, Cut, Copy,
User annotation drag & drop	Paste
Extended printout capabilities	
Export	



Analysis

**APP Recorder™**

View	Configure
Fault number	Point assignments
Recorder Settings	Line groups
RMS Metering	Printing
Frequency Metering	Directories
Phase Metering	Backups
Event Status	Auto call-in
Trigger Status	Passwords
SER Reporting	Emailing
Real Time Oscilloscope	Phone numbers
Communication Status	IP addresses



Recorder

If a picture speaks a 1000 words then our analysis software speaks volumes!

## Options

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- Additional Alarm Outputs
- Satellite Controlled Clock For Multiple IED's
- Internal Satellite Controlled Clock For Recorder Only
- Phone Switch
- Computer Upgrade
- External HDD or Flash Disk
- Recorder Printer
- Fiber Optic Chassis To Chassis Interface
- Portable Configuration
- Clamp On or Donut CT's
- APP ClearView™ Multi-User License
- Master Station Computer
- Master Station Printer
- Extended Warranty
- Service Contract
- Leasing



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<sup>1</sup>A six year warranty applies to all items manufactured by APP Engineering, Inc. System computers and computer peripherals carry a three year warranty. Items such as satellite controlled clocks and antennas carry the OEM warranty.

Specifications subject to change without notice.

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Rev 3, 03-09-2006