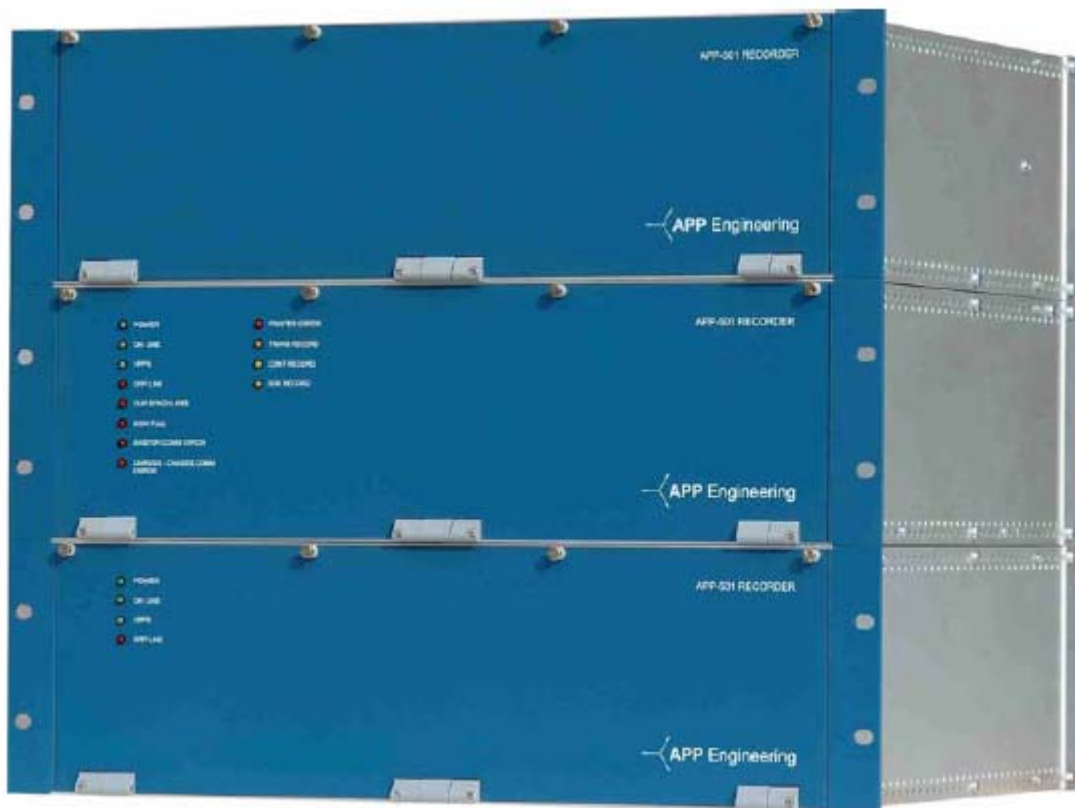




# Operating Manual



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**Manual Part Number**

APP00029

**Edition**

Edition 4, July 2012

Printed in USA

APP Engineering, Inc.

5234 Elmwood Avenue

Indianapolis, IN 46203

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Do not install substitute parts or perform any unauthorized modification to the product. Return the product to APP Engineering, Inc. for service and repair to ensure that safety features are maintained.

### **\*WARNING\*** (Definition)

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, that if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

### **\*CAUTION\*** (Definition)

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

### **\*WARNING\*** (Personnel)

Only qualified, service-trained personnel who are aware of the hazards involved should install, open any doors, remove any covers, or disconnect the instrument (APP-501 Recorder). Disconnect power before attempting any service or maintenance.

### **\*WARNING\*** (Fuse)

For continued protection against fire, replace the line fuse only with a fuse of the specified type and rating.

### **\*WARNING\*** (Live Circuits)

Replacement of chassis, components, fuses, and internal adjustments **must** be performed by qualified personnel. The system main power must always be disconnected before servicing. If the system utilizes voltage and/or current test switches make sure they are open and understand that the back of these switches are still live! If the system utilizes sliding link terminal blocks for the digital channels and alarm outputs, ensure that the sliding links are open and understand that one side of the sliding link terminal block is still live!

### **\*WARNING\*** (Operating Environment)

This instrument should not be used in an explosive environment. It should not be used in the presence of flammable gases or liquids. This instrument should not be used in a damp or wet environment or an environment that is subject to condensation.

### **\*WARNING\*** (Grounding)

All chassis, cabinets, panels, and rack mount equipment **must** be connected to an electrical earth ground. Grounding must be done to prevent shock hazard to people. Instruments provided with a power terminal block are provided with an appropriate means for connecting an electrical safety earth ground. Only qualified and trained

personnel should connect power to this instrument. If the instrument includes a three prong AC power cord, ensure that your power receptacle is properly earth grounded.

**\*WARNING\*** (Two Person Rule)

Do not service or adjust equipment alone. Ensure that another person is present that knows emergency procedures and is capable of giving first aid.

**NOTES:**

Starting serial number is 100

Ending serial number is TBD

Throughout this manual the APP-501 Recorder™ may be referred to as the “recorder” or the APP-501 Multifunction Recorder.

Throughout this manual an event channel or event input may be referred to as a digital channel or digital input.

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## **Introduction**

The APP-501 multifunction recording instrument was designed to meet the monitoring and reporting needs in the power transmission, power distribution, and power generating areas. The APP-501 lends itself useful to other industrial applications because of its wide voltage input range, current input range, digital input range, status output capability and various recording speeds. When coupled with APP ClearView™, a master station software package and COMTRADE viewer, it provides a powerful platform for data acquisition, analysis, and reporting.

## **Features**

Major features of the APP-501 recorder include the following:

- Windows based software
- Distributed or centralized architecture
- Easy and intuitive setup
- Simultaneous recording functions
- DC coupling
- Data alignment within 1usec
- Auto diagnostics
- Remote power toggle
- Independent data acquisition channels
- Analog channels configurable as voltage or current
- Multiple triggers per channel
- Automatic COMTRADE files
- Auto calling, polling, emailing
- Network, modem, DNP-3 communications
- Digital channels configurable as DFR, SER, or both
- Integrated monitor and keyboard
- Superior analysis software
- AC or DC input power
- Designed and manufactured by APP Engineering

## **Functions**

Major recording functions of the APP-501 recorder include the following:

- > Transient Oscillography
- > Extended Oscillography
- > Extended RMS
- > Continuous Oscillography
- > Continuous RMS
- > Continuous Frequency
- > Continuous Phasor
- > Sequence of Events
- > Real Time Monitoring

## **Chapter 1 Specifications**

### **1.1 Analog Inputs**

#### **Voltage**

Max channels per chassis	30
Max input voltage	440VACrms
True DC Coupling	Yes
Rin	100K $\Omega$
Accuracy (uncalibrated)	Typical 0.15%, Max 0.5%

#### **Current**

Internal shunt	2m $\Omega$
Continuous current	15A
Max amp-seconds (not to exceed)	140A RMS for 2 seconds, 250A RMS for 0.5 seconds
Max current (not to exceed)	250A
Accuracy (uncalibrated)	Typical 0.61%, Max 1.5%

#### **General**

Max Ch to Ch phase angle error	$\geq 0.004$ degrees
Cut-off frequency	(-3db) 5KHz
Common mode rejection	80dB Min
Temperature Error	$\leq 75$ ppm/ $^{\circ}$ C
Channel to channel isolation	$\geq 3500$ VDC
Channel to ground isolation	$\geq 3500$ VDC
Channels per card	3
Channel type	Each channel can be setup as voltage or current
Data alignment	With 1PPS rising edge
Data accuracy	1usec with unmodulated IRIG-B input
Connector type	#6 screw terminal double barrier
Max wire size	12AWG

### **1.2 Event Inputs**

Max channels per chassis	80
Channels per card	8
Channel type	DFR, SER or Both
Standard input voltage range	45-200VDC
Optional input voltage	24VDC, 250VDC or internally wet
Contact configuration	Programmable normally open/normally closed
Configuration	Isolated or common return
Channel to channel isolation	$\geq 3500$ VDC
Channel to ground isolation	$\geq 3500$ VDC
Connector type	Pluggable, 16 pole
Max wire size	14AWG

### 1.3 Power Supply

Standard	125VDC or 115VAC (50/60Hz)
DC Range	86VDC to 150VDC
Power draw @ 125VDC	90W, 54 analog channels & 96 event channels
Input to ground isolation	≥ 3500VDC

### 1.4 Status Relays

Cards per system	1 standard (more optional)
Outputs per card	8
Contact ratings	0.5A @ 125VDC 0.35A @ 250VDC
Dielectric coil to contacts	5KVac
Contact Configuration	Board jumper normally open/normally closed
Physical Alarm outputs	8 (can be assigned to any alarm below)
Alarms	Power On line Off line Clock sync loss Disk Full Master Communication error Chassis Communication error Transient Record Disturbance Record SOE Record DSP Board Temperature Continuous Record
Connector type	Pluggable, 16 pole
Max wire size	14AWG

### 1.5 Time Synchronization

Modulated IRIG-B Input	Yes
Unmodulated IRIB-B Input	Yes
Selection method	Board jumper
Connector type	BNC
Chassis to chassis signal	1PPS – BNC connector

**See time quality in Chapter 5 Other Information for additional information**

### 1.6 Communications

Recorder to master station	Ethernet 10/100Mbit, TCP/IP (Fiber optional) Modem 56K
Chassis to chassis	Ethernet 100Mbit, UDP (Fiber optional)
DNP-3	Ethernet 10/100Mbit, TCP/IP (Fiber optional) RS232 (9-Pin Connector)
PMU	Ethernet 10/100Mbit, UDP (Fiber optional)

1.7 System Computer	
Operating system	XP Professional
Processor	Intel Dual Core Minimum
RAM	2GB DDR Minimum
Internal HDD	120GB IDE Min. (Option: Flash 32GB Min.)
External HDD (option)	250GB IDE Minimum
CDRW	24X
CDRW & DVDRW (option)	8X
Ports	1-RS232 2-Ethernet (1 for DSP, 1 for LAN) 3-USB (1 on back panel, 2 on side)
Display	Integrated Flip Up
Keyboard	Integrated
Touchpad	Integrated
1.8 Ethernet Switch	
Data rate	10Base-T/100Base-TX
Ports	5 (8 port optional)
Power	10-36Vdc or 8-24Vac
Input frequency	47-63 Hz
Port connectors	RJ-45
LED indicators	Activity, Link, Data Rate, Power
1.9 Enclosures	
Computer control chassis	19" W x 5.25" H x 16" D (Rack Mount)
Level 1 chassis	19" W x 5.25" H x 16" D (Rack Mount)
Level 2 chassis	19" W x 5.25" H x 16" D (Rack Mount)
Hub/Switch	1" W x 4.75" H x 3" D (Din Rail Mount)
1.10 Environment	
Operating temperature	5 to 55° C
Storage temperature	-40 to 70° C
Operating relative humidity	0 to 90% non-condensing
Storage relative humidity	0 to 95% non condensing
Operating altitude	10,000 ft maximum
1.11 Approvals	
Standard	ANSI/IEEE C37.90.1-2002
Standard	IEC 60255-22-1 Cat III (Osc)
Standard	IEC 60255-22-4 cat IV (EFT)
Standard	IEC 60255-5 cat IV (Isolation)
Standard	ANSI/IEEE C37.111 (COMTRADE)

## **Chapter 2 Installation**

### 2.1 Installation Types

Three types of installations are possible. The first is a centralized installation, the second is a distributed installation, and the third is a turn-key.

A centralized installation is used when the recorder chassis are installed in the same panel/cabinet or in close proximity to each other. Close proximity would be within 40' (even longer with special discussions with the factory). A centralized installation will generally consist of a computer control chassis, Level 1 chassis, and one or more Level 2 chassis. In this type of installation there is only one power supply, located in the Level 1 chassis and there is only one satellite clock IRIG-B input. 1PPS signals are daisy chained from chassis to chassis.

A distributed installation is used when the recorder chassis are installed in panels/cabinets that are greater than 40' apart or even in separate buildings. A distributed installation will generally consist of a computer control chassis, and several Level 1 chassis. In this type of installation each Level 1 chassis has its own power supply, on/off switch, IRIG-B input, and alarm outputs. All chassis must connect back to the system hub/switch. The chassis should not be greater than 100meters from the hub/switch if straight Ethernet is used. Longer distance can be achieved with Ethernet boosters. Very long distances can be achieved by using fiber optic interfaces or using the company network.

The most common installation is probably a turn-key. APP Engineering, Inc. mounts and wires the chassis, and other associated components, in a customer specified panel/cabinet. All work is completed at the APP factory and a complete turn-key cabinet is delivered to the customer.

**\*WARNING\* Only qualified, service-trained personnel who are aware of the hazards involved should install, open any doors, remove any covers, or disconnect the instrument (APP-501 Recorder). Disconnect power before attempting any installation, service, or maintenance. See pages 3 and 4 for more very important, must read, safety information. Please call APP Engineering, Inc. at 317-536-5300 with any installation or service questions. Installation service is available by APP Engineering, Inc. please call the number above for additional information.**



## 2.2 Centralized Installation

When a chassis only system is purchased, the minimum number of chassis in the system will be two (Computer Control Chassis & Level 1 Chassis). More than likely, the system will also include one or more Level 2 chassis. Below, chassis front views are provided for reference.

The major difference between a Level 1 chassis and Level 2 is; a Level 1 chassis contains a power supply that powers the computer control chassis and all Level 2 chassis. Also, Level 1 chassis has an IRIG-B input and contains an alarm output circuit board. Additional alarm outputs can be added to Level 2 chassis, as an option.



**Figure-1 Computer Control Chassis Front View**



**Figure-2 Level 1 Chassis Front View**



**Figure-3 Level 2 Chassis Front View**

Chassis can be located in the same panel or distributed in 2 or more panels. Unless special arrangements were made, the computer control chassis and first Level 1 chassis should be housed in the same panel. When shipped from the factory, these two chassis will be bolted together.

The installation steps, discussed below, do not include software setup steps. Most always, the factory will have obtained a point assignment list, satellite clock information, event input information, and other information that allowed them to configure the software and setup the hardware jumpers. Software settings and screens are discussed in later sections of this manual.

### Installation Steps (centralized)

1. Inspect the shipping cartons to see if any obvious shipping damage as occurred. If the items have been damaged, contact the carrier immediately and file a damage claim. Take pictures of the damaged cartons.
2. Unpack the instruments and keep the cartons. If you filed a claim, with the freight company, their inspector may want to see the boxes. Inspect the instruments and associated peripherals. If damaged, take pictures and file a claim with the freight company if you feel they are at fault. Contact APP Engineering, Inc. if any kind of damage has occurred.
3. Carefully review the print set that was provided with the recorder.
4. Remove any power from the panels that you will be installing equipment into or working in.
5. Install the rack mount Computer Control chassis and Level 1 chassis into your desired panel. Each chassis should be installed with (4) fasteners. Since panels utilize various size screws for rack mount instruments, fasteners have not been provided (unless special arrangements have been made).
6. Install the din rail mount Ethernet hub/switch. It is preferred that the hub/switch be mounted in the same panel as the Computer Control chassis and Level 1 chassis. A small piece of din rail has been provided.
7. If Level 2 chassis were purchased install them in the desired panel. Again, each chassis should be installed with four fasteners. All Level 2 chassis should be installed within 40 feet of the hub/switch.
8. Ensure that all circuit board cards are seated properly and the holding screws are tight. Open the front panel doors on each chassis and ensure that internal power supplies, connectors, and computer are in proper position and secured in place. Ensure that no foreign objects are lying in the chassis.
9. Ground all chassis to your panel grounding bars. The distance from any chassis to a panel grounding bar(s) should not exceed 16". Grounding braid has been provided. Ensure that your panel ground bars are properly earth grounded.  
**\*WARNING\* Proper grounding procedures must be followed to prevent serious injury or death to people who may come in contact with this recording equipment.**
10. Review the point assignment record that your company provided to APP Engineering, Inc. APP strives to get these records prior to shipment so the instrument internal settings are complete. Prior to connecting signals to the analog channels, the user must know if a particular channel has been designated as a voltage channel or current channel. Each analog channel has two jumpers that configure it for a voltage or current input. If the point assignment record was

received prior to shipment, the factory has already made the correct jumper settings.

11. Wire the recorder analog channels. The analog channels will accept a maximum wire size of 12AWG. The terminal block screws are #6. The maximum input to a voltage channel is 440VAC. The maximum continuous current thru a current channel is 15Amps.
12. Wire the recorder event (digital) channels. The event channels utilize a pluggable 16 position connector. The maximum wire size for this connector is 14AWG. The standard input voltage range is 45-200Vdc. Event boards with 24Vdc and 250Vdc are available as options. If the system contains one of these boards it will be designated with a red dot/sticker. Also, reference the print set for any notes designating event channels that require 24Vdc or 250Vdc inputs. The event contacts are dry and need to be wetted from power inside the panel. If the events have a common return and the customer provided that information to the factory, they will have connected jumpers between the (-) event terminals. Again, reference the print set for electrical drawings.
13. Wire the recorder alarm outputs. The alarm outputs utilize a pluggable 16 position connector. The maximum wire size for this connector is 14AWG. The alarm contact is dry. The contacts can handle 0.5Amps @ 125VDC or 0.35A @ 250VDC.
14. Connect your IRIG-B signal to the back of the DSP/IRIG circuit board. The IRIG-B connector is labeled and is a standard BNC type connector. This board can accept a modulated or un-modulated IRIG-B signal. However, a board jumper must be set to reflect the input type. This information should have been provided to the factory and the jumper should already be set in the appropriate position. Unless a satellite controlled clock was purchased with the system, a coax cable will not have been provided.
15. Connect the 1PPS signal from chassis to chassis. Connect the 1PPS out signal from the Level 1 chassis to the 1PPS input of the first Level 2 chassis. Connect the 1PPS out signal from the first Level 1 chassis to the 1PPS input of the second Level 2 chassis. Keep daisy chaining until the remaining Level 2 chassis are connected. The 1PPS connector is a standard BNC connector. 1PPS interconnecting cables have been provided with the system.
16. Ethernet cables have been provided with the system. Each chassis has one Ethernet RJ45 connector. On the Level 1 and Level 2 chassis this connector is located on the DSP/IRIG circuit board. On the Computer Control chassis it is simply located on the back panel. A cable should be connected to each chassis and routed back to the system hub/switch. For consistency, reserve position 1 on the hub/switch for an Ethernet cable that will allow the recorder and master station to talk. If communication to the master station is via a modem then do not worry about reserving space 1. The remaining chassis can be connected to the hub/switch in any order. However, for organization sake, you might consider a connecting sequence of Computer Control chassis, Level 1 chassis, closest Level 2 chassis, and so on. If a system only consists of a Computer Control chassis and Level 1 chassis, a hub/switch is not required and was not provided. Simply make a connection between the two chassis.

17. Connect power cables to the hub/switch. A power cable has been provided. It should be connected from the Level 1 power supply circuit board (terminals 3&4) to the input terminal block of the hub/switch. The voltage is 15Vdc.
18. Main input power to the system connects to the Level 1 chassis. Input voltage can be 120Vac or 125Vdc. Other voltage input options are available. Before connecting main power, connect the provided power cables from chassis to chassis. Connect from the Level 1 chassis power supply board (terminals 5&6) to the first Level 2 chassis power supply board (terminals 1&2). Daisy chain the remaining power cables from the Level 1 chassis (terminals 1&2) to the remaining Level 2 chassis. (Reference the print set for clarity)
19. Ensure that the power switch, located on the Level 1 chassis, is in the OFF position.  
**\*WARNING\* ensure that your power source wires are not live (turned off or disconnected). Follow OSHA power safety lock out procedures. Ensure that your source can provide 3 amps to the recording system. Ensure that your power source is fused and properly earth grounded.**
20. Connect power from your source to the Level 1 chassis power supply board (terminals 1&2).
21. Open the hinged front door of the Computer Control chassis, pull out the computer, and flip up the monitor.
22. Carefully and with great prior inspection and thought, turn on your power source.
23. Turn on the power switch located at the rear of the Level 1 chassis.
24. If a proper turn on occurs you should see the following:
  - a) Computer startup
  - b) APP Recorder service program begin
  - c) The Level 1 chassis front panel POWER LED illuminate green, the ON LINE LED illuminate green, the 1PPS LED illuminate green, and only if the continuous recording is enabled the CONT RECORD LED illuminate amber (yellow).
  - d) On a Level 2 chassis front panel, the POWER LED illuminate green, the ON LINE LED illuminate green, and the 1PPS LED illuminate green.
25. If the system has not powered up correctly, please recheck your wiring and review the wiring prints that came with the recorder.
26. Please call the factory for any required assistance (317) 536-5300.

## 2.3 Distributed Installation

### Installation Steps (distributed)

1. Inspect the cartons to see if any obvious shipping damage as occurred. If the items have been damaged contact the carrier immediately and file a damage claim. Take pictures of the damaged cartons.
2. Unpack the instruments and keep the cartons. If you filed a claim, with the freight company, their inspector may want to see the boxes. Inspect the instruments and associated peripherals. If damaged, take pictures and file a claim with the freight company if you feel they are at fault. Contact APP Engineering, Inc. if any kind of damage has occurred.
3. Carefully review the print set that was provided with the recorder.
4. Remove any power from the panels that you will be installing equipment into or working in.
5. Install the rack mount Computer Control chassis and Level 1 chassis into your desired panel. Each chassis should be installed with (4) fasteners. Since panels utilize various size screws for rack mount instruments, fasteners have not been provided (unless special arrangements have been made).
6. Install the din rail mount Ethernet hub/switch. It is preferred that the hub/switch be mounted in the same panel as the Computer Control chassis and Level 1 chassis. A small piece of din rail has been provided.
7. If additional Level 1 chassis were purchased install them in the desired panel. Again, each chassis should be installed with four fasteners.

**NOTE: Unless fiber optic converters or Ethernet extenders were purchased with the instruments, all Level 1 chassis should be installed within 100 meters (328 feet) of the hub/switch.**

8. Ensure that all circuit board cards are seated properly and the holding screws are tight. Open the front panel doors on each chassis and ensure that internal power supplies, connectors, and computer are in proper position and secured in place. Ensure that no foreign objects are lying in the chassis.
9. Ground all chassis to your panel grounding bars. The distance from any chassis to a panel grounding bar(s) should not exceed 16". Grounding braid has been provided. Ensure that your panel ground bars are properly earth grounded.  
**\*WARNING\* Proper grounding procedures must be followed to prevent serious injury or death to people who may come in contact with this recording equipment.**
10. Review the point assignment record that your company provided to APP Engineering, Inc. APP strives to get these records prior to shipment so the instrument internal settings are complete. Prior to connecting signals to the analog channels, the user must know if a particular channel has been designated as a voltage channel or current channel. Each analog channel has two jumpers that configure it for a voltage or current input. If the point assignment record was received prior to shipment, the factory has already made the correct jumper settings.

11. Wire the recorder analog channels. The analog channels will accept a maximum wire size of 12AWG. The terminal block screws are #6. The maximum input to a voltage channel is 440VAC. The maximum continuous current thru a current channel is 15Amps.
12. Wire the recorder event (digital) channels. The event channels utilize a pluggable 16 position connector. The maximum wire size for this connector is 14AWG. The standard input voltage range is 45-200Vdc. Event boards with 24Vdc, 250Vdc, or internally wet are available as options. If the system contains one of these boards it will have labels to indicate that. Also, reference the print set for any notes designating event channels that require 24Vdc or 250Vdc inputs, or internally wet. If the event contacts are dry, they need to be wetted from power inside the panel. If the events have a common return and the customer provided that information, the factory will have connected jumpers between the (-) event terminals. Again, reference the print set for electrical drawings.
13. Wire the recorder alarm outputs. The alarm outputs utilize a pluggable 16 position connector. The maximum wire size for this connector is 14AWG. The alarm contact is dry. The contacts can handle 0.5Amps @ 125VDC or 0.35A @ 250VDC.
14. Connect IRIG-B or 1PPS signal to the back of each DSP/IRIG circuit board (one board per chassis) according to point assignment record. The IRIG-B or 1PPS-IN/OUT connectors are labeled and are standard BNC type connectors. This board can accept a modulated or un-modulated IRIG-B signal, or 1PPS-IN signal. It also can output 1PPS signal. However, board jumpers must be set to reflect the input type. This information should have been provided to the factory and the jumpers should already be set in the appropriate positions.
15. Ethernet cables have been provided with the system. Each chassis has one Ethernet RJ45 connector. This connector is located on the DSP/IRIG circuit boards. On the Computer Control chassis it is simply located on the back panel. A cable should be connected to each chassis and routed back to the system hub/switch. For consistency, reserve position 1 on the hub/switch for an Ethernet cable that will allow the recorder and master station to talk. If communication to the master station is via a modem then do not worry about reserving space 1. The chassis can be connected to the hub/switch in any order. However, for organization sake, you might consider a connecting sequence of Computer Control chassis, closet Level 1 chassis, next closest Level 1 chassis, and so on. If a system only consists of a Computer Control chassis and Level 1 chassis, a hub/switch is not required and was not provided. Simply make a connection between the two chassis.
16. Connect power cables to the hub/switch. A power cable has been provided. It should be connected from first Level 1 power supply circuit board (terminals 3&4) to the input terminal block of the hub/switch. The voltage is 15Vdc.
17. In a distributed architecture, each Level 1 chassis receives its own power input from your power source (station battery or AC Input). Input voltage can be 125Vdc or 120Vac. Other voltage input options are available.

18. Ensure that the power switches, located on the back of each Level 1 chassis, is in the OFF position.  
**\*WARNING\* ensure that your power source wires are not live (turned off or disconnected). Follow OSHA power safety lock out procedures. Ensure that your source can provide 1 amp to each Level 1 chassis. Ensure that your power source is fused and properly earth grounded.**
19. Connect power from your source to all the Level 1 chassis power supply boards (terminals 1&2).
20. Open the hinged front door of the Computer Control chassis, pull out the computer, and flip up the monitor.
21. If factory does not know the chassis arrangement prior to shipping, the Ethernet and IP address of the each chassis have to be set accordingly. If this is the case, unplug all Ethernet cables from the chassis prior to power up. Then set each chassis Ethernet address and IP address using ClearView by clicking menu Tools\“DSP Board Ethernet Settings” and the RS232 cable + adaptor provided by the factory after power up. The prefer Ethernet address is 1-35-69-86-120-X where X is 1, 2, 3 etc. according to the chassis number. The prefer IP address is 195.168.3.X where X is 1, 2, 3 etc. according to the chassis number. The prefer default gateway is 195.168.3.220. Plug all Ethernet cables back to the chassis after finishing the settings.
22. Carefully and with great prior inspection and thought, turn on your power source.
23. Turn on the power switch located at the rear of each Level 1 chassis.
24. If a proper turn on occurs you should see the following:
  - a) Computer startup
  - b) APP Recorder service program begin
  - c) On each Level 1 chassis, the front panel POWER LED illuminate green, the ON LINE LED illuminate green, the 1PPS LED illuminate green, and only if the continuous recording is enabled the CONT RECORD LED illuminate amber (yellow).
25. If the system has not powered up correctly, please recheck your wiring and reference the wiring prints that came with the recorder.
26. Please call the factory for any required assistance (317) 536-5300.

## 2.4 Turn-Key Installation

1. Inspect the cabinet to see if any obvious shipping damage as occurred. If the cabinet or any smaller auxiliary boxes have been damaged contact the carrier immediately and file a damage claim. Take pictures of the damaged cabinet or boxes. Keep damaged boxes to show the freight company inspector.
2. Unpack any auxiliary boxes. Inspect the contents and if damaged, take pictures and file a claim with the freight company. Contact APP Engineering, Inc. if any kind of damage has occurred.
3. Carefully review the print set that was provided with the recorder.
4. Ensure that all circuit board cards are seated properly and the holding screws are tight. Open the front panel doors on each chassis and ensure that internal power

supplies, connectors, and computer are in proper position and secured in place. Ensure that no foreign objects are lying in the chassis.

5. Earth ground the cabinet.  
**\*WARNING\* Proper grounding procedures must be followed to prevent serious injury or death to people who may come in contact with this recorder equipment.**
6. Review the point assignment record that your company provided to APP Engineering, Inc. APP strives to get these records prior to shipment so the recorder internal settings are complete. Prior to connecting signals to the field side of the analog terminal blocks, the user should know if a particular channel has been designated as a voltage channel or current channel. Each analog channel contains two jumpers per channel that configures it for voltage or current input. If the point assignment record was received prior to shipment, the factory has already made the correct jumper settings.
7. Wire the analog channel terminal blocks (field side). The maximum input to a voltage channel is 440VAC. The maximum continuous current thru a current channel is 15Amps.
8. Wire the event (digital) channel terminal blocks (field side). The standard input voltage range is 45-200Vdc. Event boards with 24Vdc or 250Vdc inputs, or internally wet are available as options. If the system contains one of these boards it will be labeled accordingly. Also, reference the print set for any notes designating event channels that require 24Vdc or 250Vdc inputs, or internally wet. If the event contacts are dry, they need to be wetted from power inside the panel. If the events have a common return and the customer provided that information, the factory will have connected jumpers between the (-) event terminals. Again, reference the print set for electrical drawings.
9. Wire the recorder alarm output terminal block(s) (field side). The alarm contact is dry. The contacts can handle 0.5Amps @ 125VDC or 0.35A @ 250VDC.
10. Connect your IRIG-B signal to the back of the DSP/IRIG circuit board. The IRIG-B connector is labeled and is a standard BNC type connector. This board can accept a modulated or un-modulated IRIG-B signal. However, a board jumper must be set to reflect the input type. This information should have been provided to the factory and the jumper should already be set in the appropriate position. If a satellite controlled clock is installed in the system, the antenna must be installed on the building roof and the antenna connected to the back of the satellite controlled clock.
11. Ensure that the power switch, located on the back of the Level 1 chassis, is in the OFF position.  
**\*WARNING\* ensure that your power source wires are not live (turned off or disconnected). Follow OSHA power safety lock out procedures. Ensure that your source can provide 3 amps to the recording system. Ensure that your power source is fused and properly earth grounded.**
12. Connect power from your source to the cabinet power terminal block(s) (field side). You must reference the print set for additional detail.
13. Open the hinged front door of the computer control chassis, pull out the computer, and flip up the monitor.



14. Carefully and with great prior inspection and thought, turn on your power source.
15. Turn on the power switch located at the rear of the Level 1 chassis.
16. If a proper turn on occurs you should see the following:
  - a. Computer startup
  - b. APP Recorder service program begin
  - c. On the Level 1 chassis front panel the POWER LED illuminate green, the ON LINE LED illuminate green, the 1PPS LED illuminate green, and only if the continuous recording is enabled the CONT RECORD LED illuminate amber.
  - d. On a Level 2 chassis front panel the POWER LED illuminate green, the ON LINE LED illuminate green, and the 1PPS LED illuminate green.
17. If the system has not powered up correctly, please recheck your wiring and reference the wiring prints that came with the recorder.
18. Please call the factory for any required assistance (317) 536-5300.

## 2.5 Basic Connection Diagram

**IMPORTANT: Diagram shown in Figure-4 is intended to give the user a general picture of chassis interconnections. It is NOT to be used for wiring and installation purposes. The user must use the detailed print set provided with each system for wiring and installation.**



## **Chapter 3 Hardware**

### **3.1 Computer Control Chassis**

The Computer Control chassis consists of a 19" rack mount computer hide away enclosure, sliding shelf, computer, optional external HDD space, and easy access rear panel computer ports.

The computer is powered from the 12Vdc output of the DC to DC converter located inside the Level 1 chassis. The battery has been removed from the computer to allow system power down and restart via the master station computer and the APP ClearView software.

The major duties of the Computer Control chassis are:

- Communicate with each DSP circuit board carrying out functions such as; collecting data, downloading settings, and downloading new software.
- Receive, organize, and store raw data.
- Convert raw data into COMTRADE C37.111-2002 format.
- Calculate continuous frequency, RMS, and phase data.
- Communicate with the APP ClearView master station software via modem, network, or directory.
- Output data in DNP-3 format via RS232 or Ethernet to a remote terminal unit or similar.
- Output data in PMU format via Ethernet to a remote terminal unit or similar.
- Provide a means for a local user to look at settings, change settings, view real-time oscillograms, look at stored records, communicate with someone at a master station, or even call another recorder and download records for review and analysis.

Standard computer features are listed below. As an option, the standard computer can be replaced with a higher end computer or server. To inquire about computer upgrades please call our engineering department at 317-536-5300.

Minimum computer features include:

- XP Professional Operating System
- Intel Dual Core Processor
- 2GB DDR
- 120GB Internal Hard Drive
- 24x CDRW
- 15" XGA Display, Keyboard, Touchpad
- Ports – (1) RS232, (2) Ethernet, (3) USB



**Figure-5 Computer Control Chassis 3D View**



**Figure-6 Computer Control Chassis Front View**



**Figure-7 Computer Control Chassis Rear View**

### 3.2 Level 1 Chassis

The Level 1 chassis is housed in a 19" rack mount enclosure with a hinged front panel.

Circuitry contained in the Level 1 chassis includes:

- Power Supply Circuit Board With Fuse & Switch
- AC to DC and DC to DC Module
- Inverter
- Alarm Circuit Board
- Event Circuit Boards
- DSP/IRIG Circuit Board
- Analog Circuit Boards
- Front Panel With LED Indicators

A Level 1 chassis has 13 card slots. Three slots are always reserved; (1) for the power supply board, (1) for the alarm board, and (1) for the DSP/IRIG board. The other 10 slots can be populated with analog or event circuits. Therefore, the maximum number of analog circuit boards in a Level 1 chassis is ten (no event circuit boards). Or, the maximum number of event circuit boards is ten (no analog circuit boards). A mix of analog and event boards can be inserted in the chassis, so long as the sum total does not exceed ten.

Functions and features of the Level 1 Chassis circuit boards are discussed below:

#### 3.2.1 Power Supply Circuit Board

- Fuses the input power (2Amp/250V, 3AG, Slo-Blo, Glass Cartridge)
- Uses a six position black barrier terminal block for input & output power connections.
- Accepts input voltages of **120VAC, 125VDC, or 250VDC**.
- Input voltage is connected to terminals 1 & 2.
- Terminals 3 & 4 are used for a 15VDC output to power the system Ethernet switch/hub.
- Terminals 5 & 6 are used for 120VAC output to power Level 2 Chassis.
- This board contains an on board relay that drops power to the system, if it receives an appropriate command from the master station computer. After a momentary power interruption, used as a last resort to reboot the computer and reset the entire system, the relay automatically closes to restore system power.
- This board generates 5VDC & 15VDC that is used by various boards on the Level 1 Chassis.

#### 3.2.2 AC-DC/DC-DC Module

- This module allows the system to have a wide range of input voltages, which include 120VAC, 125VDC, and 250VDC (50/60Hz)
- The output of this module is 12VDC, 200W

- The module includes over load, over voltage, and over temperature protection.
- This unit is mounted in the front compartment of the Level 1 chassis.

### 3.2.3 12VDC to 120VAC Inverter

- This module generates 120VAC for the analog circuit boards and power for Level 2 chassis.
- This unit mounted in the front compartment of the Level 1 chassis

### 3.2.4 Alarm Circuit Board

- The alarm board contains (8) relay outputs.
  - Power  
Relay is energized when system power is applied. Most users will put contact in the normally closed position.
  - On Line  
Relay is energized when the system program starts and the system is ready to record or is recording. Most users will put this contact in the normally closed position.
  - Off Line  
Relay is energized when the system program is stopped. Most users will set this contact to the normally open position.
  - Clock Sync Loss  
Relay is energized when the DSP/IRIG board has completely lost its IRIG-B input, such as disconnecting the cable, or the satellite clock sends a signal (4 bits per the IEEE standard) that an error greater than 1ms has occurred. The relay will stay energized until a synchronized condition is reestablished. Most users will set this contact as normally open.
  - Chassis to Chassis Communication Error  
Relay will energize if any data acquisition chassis (Level 1 or Level 2) stops communicating with the computer control chassis for a period of 5 minutes or more. The relay will stay energized until the problem chassis begins proper communication. Most users will set this contact in the normally open position.
  - Chassis to Master Station Communication Error  
Relay will energize if the recorder attempts to call a master station and fails. The recorder software contains a user programmable maximum number of attempts setting. It is considered a failure after the max number of attempts is reached. The relay will remain energized until the APP Recorder Program has been re-initialized or proper communications has resumed.
  - Disk Full  
Relay will energize when the computer hard drive memory falls below a user programmable limit. The relay will remain energized until the hard drive free space goes above the user programmable limit. However, if the history overwrite feature is enabled, the alarm relay will not energize. Most users set this contact in the normally open position.

- Trigger
 

Relay will energize when the recorder trips, records a transient record. The relay will remain energized for 10 seconds. Most users will set this contact in the normally open position.
- The relays are indirectly energized via a 5V signal coming from the DSP circuit board. See “Specifications” for relay contact ratings.
- Each relay uses an on board jumper that will allow the contact to be either normally open or normally closed. The board is labeled for easy jumper placement.
- The relay board utilizes a 16 position pluggable connector. The plug will accept a maximum wire size of 14AWG.

### 3.2.5 Event Circuit Board

- An event board contains 8 event inputs. The maximum number of event channels in a Level 1 chassis or Level 2 chassis is 80 (10 boards x 8 channels per board).
- The standard voltage range for an event input is 45-200VDC. Other input voltage ranges are available as an option.
- An event board utilizes a 16 position pluggable connector. The plug will accept a maximum wire size of 14AWG.
- Inputs are user programmable as either normally open or normally closed.
- Inputs are dry contact and need to be wetted.
- For common return simply daisy chain the (-) negative terminals together and connect to station battery return (DC return).
- Event channels are scanned at the same rate as the analog channels. The scan rate is user programmable and includes choices of 1200Hz, 2400Hz, 4800Hz, 9600Hz, and 19,200Hz.
- Event channels can be user programmed as DFR, SER, or BOTH. If a channel is setup as DFR, all channels on the recorder begin recording and a COMTRADE record is created when it goes abnormal. If a channel is setup as SER, it alone is recorded in the Sequence of Event Report when it goes abnormal. If a channel is setup as BOTH, then both DFR and SER recordings occur simultaneously.
- If an event channel is setup as a DFR channel, it can also be user programmed to trigger on a rising edge, falling edge, or both.
- To prevent nuisance event triggers, user programmable settings are available to automatically shut down and then restart event triggers.
- Event channels can be user programmed to include a debounce time.

### 3.2.6 DSP/IRIG Circuit Board

The DSP/IRIG board is the heart of a Level 1 or Level 2 chassis. The DSP IC contains the recorder driver program and is responsible for collecting data from the analog and event inputs. The DSP IC performs mathematical calculations on the data received from each analog and event channel and decides if a trigger condition exists. Prefault data is

stored in a circular buffer. If a trigger condition does not exist, the oldest prefault data is overwritten by new incoming prefault data (FIFO). If a trigger condition is measured, the prefault data plus incoming data is routed to the Computer Control chassis via the Ethernet connection. If continuous recording is enabled, the above triggering process is carried out and incoming data from the analog channels are continuously routed to the Computer Control chassis.

The DSP/IRIG board can accept a modulated or unmodulated IRIG-B input signal from a satellite controlled clock (See Table-1). The top BNC connector, J6, is the IRIG-B input. Each data sample is time stamped to the microsecond. Data is aligned with the 1PPS rising edge and the accuracy of the time stamp is no better than the accuracy of the 1PPS signal coming from the satellite controlled clock.

**Table-1 Synch Method & Corresponding Hardware 3-PIN Jumper Position**

<b>Synch Method</b>	<b>JP2 3-PIN Jumper (DSP/IRIG Circuit Board)</b>
Un-modulated IRIG-B	Short middle pin & pin close to panel
Modulated IRIG-B	Short middle pin & pin away from panel
Oncore	Either On or Off

Note: there are “unmod” and “mod” labels on back of DSP board under the JP2.

If the DSP/IRIG board loses the 1PPS signal from the satellite controlled clock, the DSP IC no longer receives a 1PPS interrupt signal. In this case, the DSP will rely on its own 1PPS signal that is generated from an onboard 25MHz crystal. The crystal has an accuracy of 100ppm which translates to an error of 0.1msec/1sec (8.6sec/day).

The system computer, located in the Computer Control chassis, is time synchronized with the satellite controlled clock. If the recorder is powered up and there is no satellite controlled clock present, the beginning time of day is obtained from the computer.

If the recorder contains Level 2 chassis, the 1PPS signal is routed from the Level 1 chassis down to the Level 2 chassis via the 1PPS out/in connectors.

- The DSP/IRIG circuit board is always located in the 7<sup>th</sup> board slot, from the left side of the chassis. There is one DSP/IRIG circuit board per Level 1 and Level 2 chassis.
- Major hardware/firmware items on this board include the following:
  - High Performance Digital Signal Processing IC (100MHz, 32bit, 1MB On Chip Dual-Ported SRAM, Integrated I/O Processor With Multiprocessing Support and Multiple Internal Buses To Prevent I/O Bottlenecks, 15x15 BGA style package)
  - 256MB High Speed SDRAM IC
  - Microcontroller With Ethernet Media Access Controller 10/100
  - 2MB Serial Flash Memory IC
  - IRIG Isolation IC & Isolation Transformer
  - IRIG-B Demodulating Circuit



- BNC Connectors for IRIG-B Input, 1PPS Output & 1PPS Input
  - RJ45 Connector (Ethernet Connection)
  - Mini Din Connector (Used by the factory for initial IP address and board setup)
- Jumper Settings
- JP1 – Jumper On =Normal Operating State  
Jumper Off =Factory Debug Position
  - JP2 – Jumper On =Unmodulated IRIG-B Input  
Jumper OFF =Modulated IRIG-B Input
  - J1 is used to connect an emulator. Under normal operating conditions J1 must have four jumpers in the following positions:
 

5 to 6		
7 to 8	Pin layout	1 3 5 7 9 11 13
9 to 10		2 4 6 8 10 12 14
11 to 12		(Note: Pin 3 is cutoff)
  - J2 is used by the factory to download a program to the microprocessor/Ethernet IC. During normal operation J2 has no jumpers.

### 3.2.7 Analog Circuit Board

See Chapter 3 Hardware for additional analog channel specifications.

- An analog board contains 3 channels. The maximum number of analog channels in a Level 1 chassis or Level 2 chassis is 30 (10 boards x 3 channels per board).
- A channel can be setup as a voltage channel or current channel. To make this selection, software settings must be made and two hardware jumpers per channel must be set. Software settings are made in the point assignment record and are discussed in a later section. The hardware setting is made via two jumpers on each channel (J1 & J2 on the 1<sup>st</sup> board channel, J3 & J4 on the 2<sup>nd</sup> board channel, and JP5 & JP6 on the 3<sup>rd</sup> board channel). These are 3 pin headers.
- **To setup a channel for voltage input**, place the shorting jumper on the middle pin and the pin towards the green transformers.
- **To setup a channel for current input**, place the shorting jumper on the middle pin and the pin towards the 9 position black analog terminal block and blue rear panel.
- **CAUTION: Ensure that the voltage/current jumper is set properly before wiring to the circuit board terminal block.**
- For a voltage channel, the input should be wired between V & C (voltage and common).
- For a current channel, the input should be wired between I & C (current and common).
- **WARNING:**
  - The maximum input voltage for a voltage channel is 440VAC.**
  - The maximum continuous current for a current channel is 15Amps.**
  - The maximum current into a current channel for 2 seconds is 200Amps**

## **The maximum wire size for an analog terminal block is 12AWG**

### **3.2.8 Front Panel LED's**

The Level 1 Chassis uses front panel LED's to give a quick indication of system status. Green LED's will illuminate when the recorder is operating properly. Red LED's will illuminate if a recorder problem exists. Yellow LED's will illuminate when the system is recording data. An explanation of each LED is listed below:

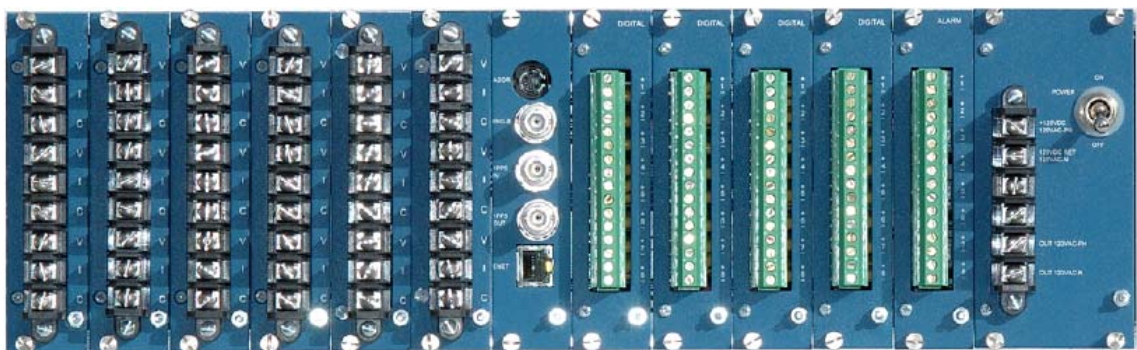
- POWER (Green) – Illuminates when the system power is switched on and is normal.
- ON LINE (Green) – Illuminates after the APP-501 Recorder Program/Service is running and normal system operation has started.
- 1PPS (Green) – Illuminates if the 1PPS signal is present from an external satellite controlled clock. If no satellite controlled clock is connected, this LED will illuminate if the internally generated 1PPS signal is present and normal.
- OFF LINE (Red) – Illuminates if the system is not ready to record.
- CLK SYNCH LOSS (Red) – Illuminates if an IRIG-B signal is not connected to the recorder or the satellite controlled clock has sent a lost synch signal. The LED will remain illuminated until synchronization occurs. Error information will appear in the system trace file.
- DISK FULL (Red) – Illuminates if the hard drive free space has reached a user programmed minimum amount. This LED will remain illuminated until the hard drive free space exceeds the minimum limit.
- MASTER COMM ERROR (Red) – Illuminates if the recorder has tried to reach a master station and has failed. The LED will remain illuminated until the APP Recorder Program has been re-initialized or proper communication has resumed. Failed communications attempts will appear in the system trace file.
- CHASSIS – CHASSIS COMM ERROR (Red) – Illuminates if any data acquisition chassis (Level 1 or Level 2) stops communicating with the computer control chassis for a period of 5 minutes or more. The LED will remain illuminated until the problem chassis begins proper communication. Error information will appear in the system trace file.
- PRINTER ERROR (Red) – Illuminates if a printer, connected to the recorder, fails to perform an automatic print function. This LED will remain illuminated until the print function is carried out or the APP Recorder Program is re-initialized.
- TRANS RECORD (Yellow) – This LED will illuminate after the recorder trips and creates a transient fault record. The LED will remain illuminated for 10 seconds.
- CONT RECORD (Yellow) – This LED will illuminate if the system is currently performing any continuous recording function.
- SOE RECORD (yellow) – This LED will illuminate if any event channel setup as a sequence of event channel goes abnormal. The LED will remain illuminated for 10 seconds.



**Figure-8 Level 1 Chassis 3D View**



**Figure-9 Level 1 Chassis Front View**



**Figure-10 Level 1 Chassis Rear View**

### 3.3 Level 2 Chassis

A Level 2 chassis is similar to a Level 1 chassis. However, a Level 2 chassis does not contain a system power supply or alarm circuit board, and has fewer front panel LED indicators.

The Level 2 chassis is housed in a 19" rack mount enclosure with a hinged front panel. Circuitry contained in the Level 2 chassis includes:

- Power Supply Circuit Board
- Event Circuit Boards
- DSP/IRIG Circuit Board
- Analog Circuit Boards
- Front Panel With LED Indicator

A Level 2 chassis has 13 card slots. Three slots are always reserved, (1) for the power supply board, (1) for an optional or additional alarm board, and (1) for the DSP/IRIG board. The other 10 slots can be stuffed with analog or event circuits. Therefore, the maximum number of analog circuit boards in a Level 2 chassis is ten (no event circuit boards). Or, the maximum number of event circuit boards is ten (no analog circuit boards). A mix of analog and event boards can be inserted in the chassis, so long as the sum total does not exceed ten.

Functions and features of the alarm circuit board, event circuit boards, DSP/IRIG circuit board, and analog circuit boards are same as those discussed for the Level 1 Chassis. See the Level 1 Chassis for detailed descriptions.

#### 3.3.1 Power Supply Circuit Board

- Uses a six position black barrier type terminal block for input & output power connections.
- Input voltage comes from the Level 1 Chassis. A connection should be made from the 120VAC output of the Level 1 Chassis to the input of the Level 2 Chassis. The input connection is on terminals 1 & 2 of Level 2 power supply board.
- This board generates 5VDC & 15VDC that is used by various boards on the Level 2 Chassis.

#### 3.3.2 Front Panel LED's

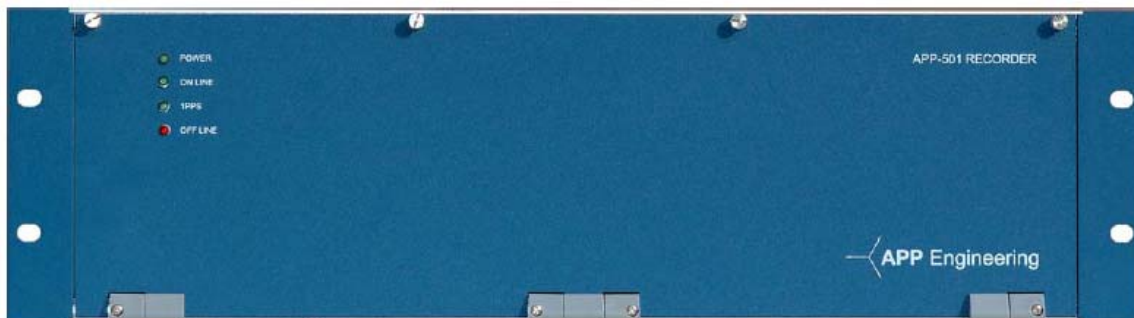
The Level 2 Chassis uses front panel LED's to give a quick indication of chassis status. Green LED's will illuminate when the recorder is operating properly and red LED's will illuminate if a recorder problem exists. An explanation of each LED is listed below:

- POWER (Green) – Illuminates when the system power is switched on and is normal.

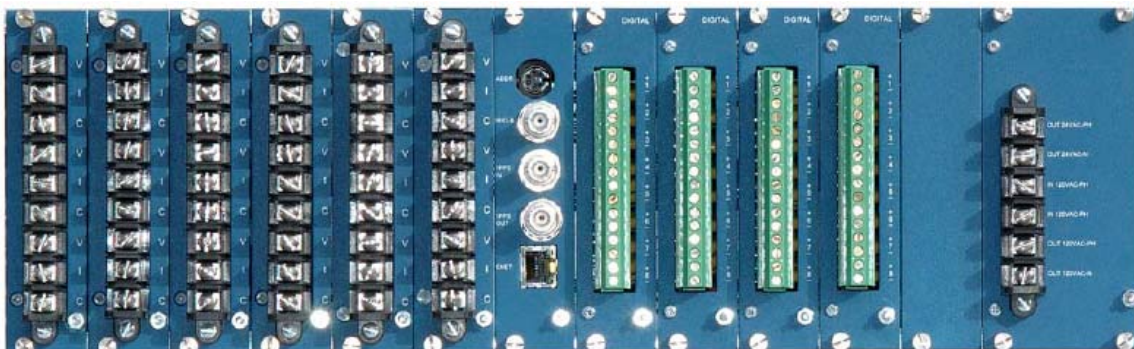
- ON LINE (Green) – Illuminates after the APP-501 Recorder Program/Service is running and normal chassis operation has started.
- 1PPS (Green) – Illuminates only if the 1PPS signal is present from the Level 1 Chassis or another Level 2 Chassis.
- OFF LINE (Red) – Illuminates if the chassis is not ready to record.



**Figure-11 Level 2 Chassis 3D View**



**Figure-12 Level 2 Chassis Front View**



**Figure-13 Level 2 Chassis Rear View**

### 3.4 Ethernet Switch

The Ethernet switch allows flow of information between the Computer Control Chassis, Level 1 Chassis, Level 2 Chassis, station LAN, and the corporate WAN. The standard Ethernet switch, that is included with the recorder, is a five or eight port EISK series plug and play switch. The EISK switches are intended for commercial and industrial applications. They have a wide temperature and operating range and comply with electromagnetic compatibility and EFT/Surge standards.

The auto-negotiate protocol allows it to link with any compatible 10BASE-T or 100BASE-TX device. It will allow function with any application layer that works with Ethernet, including Modbus/TCP or Ethernet/IP. The switch has built-in broadcast storm control to prevent excess broadcasts from degrading network performance.

To aid in troubleshooting, each port LED is lit solid if a valid link exists to an attached device, flashes to show activity, and indicates data rate by color: green for 100Mbps and yellow for 10Mbps. A separate green LED indicates the device is powered.

In most cases power for the switch comes from a Level 1 Chassis. The Level 1 Chassis outputs 15VDC via the power supply circuit board terminal block. The 15VDC output is located on terminals 3 & 4.

Switch specifications are as follows:

- Input voltage: 10-36VDC or 8-24VAC
- Power: 5 Watts
- AC Input Frequency: 47-63Hz
- Operating Temperature: 0 to 60° C
- Relative Humidity: 0 to 95% non-condensing
- Data Rate: 10/100 Mbps
- Protection: IP30
- Signaling: 10Base-T/100Base-TX
- Port Connectors: Shielded RJ-45

Pin out:

<b><u>RJ-45</u></b>	<b><u>Usage</u></b>
1	TD+
2	TD-
3	RD+
4	Not Used
5	Not Used
6	RD-
7	Not Used
8	Not Used

(Ports normally assume the internal crossover function, but will automatically adapt to connected devices. Straight instead of crossover cable is preferred. When daisy chaining switches, straight cable is a must.)

### 3.5 Networking

The Computer Control Chassis uses two separate network setups. One is for recorder functionality (chassis to chassis communication & data transfer) and the second is for communication between the recorder (APP Recorder Software) and the master station (APP ClearView Software). Under standard circumstances, recorder chassis to chassis activity will not use station LAN or corporate WAN bandwidth.

## **Chapter 4 Recorder Software**

The APP-501 Multifunction Recorder runs a service named APP Recorder. When the system is powered up the APP Recorder service will automatically start. This service must run for the recorder to be functional. When this service starts properly and correct recorder settings have been made, the system will come On Line.

In most cases, APP Engineering, Inc. will have obtained information from the customer that allowed the factory to make the necessary hardware and software settings to your APP-501 Recorder prior to shipment. However, in some cases the information is not available, before the system ships, or only partial information was available and it will be necessary for the user to enter information or make certain settings.

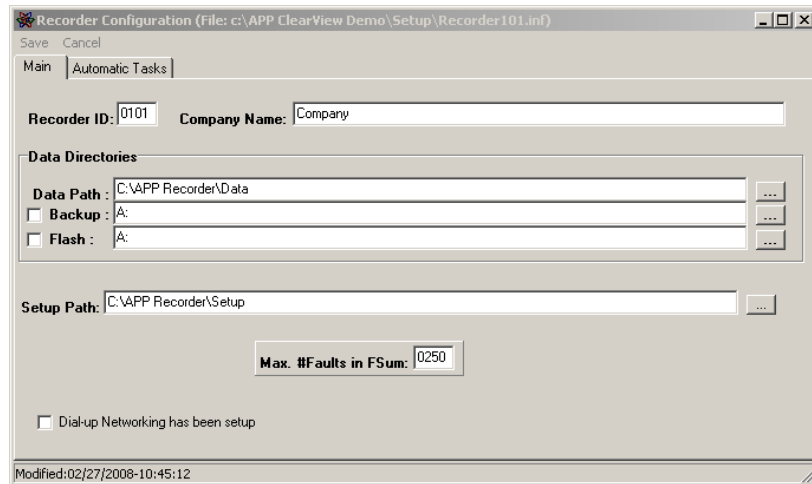
This chapter will cover program installation & quick start settings and then a detailed description of all the menu choices.

### 4.1 Program Installation & Quick Start Settings

**NOTE: Installation of the APP Recorder Program should not be necessary. It will be installed and setup at the factory. The installation steps, below, are being provided in the event a future software load is required.**

1. Insert the APP Recorder CD in the system computer CD Drive.
2. The install shield wizard should start automatically.
3. After agreeing to the terms and conditions of the software license allow the wizard to install the program in **C:\APP Recorder**
4. Create a folder in the APP Recorder Folder called "Data".
5. Create a folder in the APP Recorder Folder called "Setup"
6. Start the APP Recorder Program by double clicking on the "APPRecorder.exe" file.
7. After the program starts click on "Edit" then "Configuration". The screen as shown in Figure-14 will be displayed.





**Figure-14 Recorder Configuration Screen**

8. Enter the system “Recorder ID” and the “Company Name”. Each recorder has a unique Recorder ID. This allows the master station program (APP ClearView) to identify which recorder it is communicating with.  
**\*CAUTION\* Do not duplicate Recorder ID’s.**
9. Enter the “Data Path” by clicking the browse button and browsing to the Data Folder created in step 4. **C:\APP Recorder\Data**
10. Enter the “Setup Path” in the same manner. **C:\APP Recorder\Setup**
11. If you want the Data (data means transient records, extended records, and SER information) written to a backup folder then place a check mark next to “Backup” and enter the path.
12. Towards the bottom of the screen you can enter the number of fault records to appear in the “FSum” file (fault summary file). The fault summary file is retrieved by the master station program, APP ClearView, and displayed in its Fault Summary Table. Settings under the “Automatic Tasks” tab are not required for recorder startup and will be discussed in a later section.
13. Click “Save” in the upper right hand corner if the screen. The basic configuration is set.
14. At the main screen, click on “Edit” then “Point Assignment Record” then “Edit Record”. If a message box pops up [New Point Assignment Record] click OK.
15. Next, the point assignment record must be created. As mentioned above, the factory usually obtains point assignment information from the customer and creates a point assignment record/file in advance. If the point assignment record was not created by the factory, it may have been created by someone in your company. If this is the case, the point assignment file can be copied into the “Setup” folder (**C:\APP Recorder\Setup**) or it can be down loaded from the master station to recorder.

**NOTE: before the point assignment record can be downloaded, the recorder must be operating and ready to communicate with the master station computer and APP ClearView Program. The following steps create a bare minimum point**

assignment record which allows the recorder to become operational. Details covering the point assignment record will be discussed in a later section.

16. At the bottom of the point assignment page click on the “Chassis Config.” tab, it may already be selected, see Figure-15. At the top of the page enter the name of station or location the recorder. Next to “#chassis” enter the sum total of Level 1 and Level 2 chassis.

Figure-15 shows the 'Edit Point Assignment Record' window. The 'Station' field is set to 'Dummy Station' and 'Recorder ID' is 'R01'. The 'Chassis#1 Port#' is '4310'. The 'Place Analog Board' radio button is selected. The table below shows the chassis configuration:

Chassis#	Slot-1	Slot-2	Slot-3	Slot-4	Slot-5	Slot-6	Slot-7	Slot-8	Slot-9	Slot-10	Slot-11	DSP IP Address	Ext-1PPS
1							DSP					195.168.3.1	

On the right side, the summary statistics are:

- Total #
- Analog Boards: 0
- Event Boards: 0
- Analog Channels: 0
- Trigger Channels: 0
- Event Channels: 0

**Figure-15 Point Assignment Screen’s Chassis Configuration**

17. For each chassis enter the type of circuit board inserted into slots 1, 2, 3, 4, 5, 6, 8, 9, 10, and 11. For example....

If slot-1 contains an analog board then click on “Place Analog Board” then click in the Chassis 1/Slot-1 box. An “A” will appear in the box. An “A” can also be placed in the box by simply selecting the box and typing the letter “A”.

If slot-1 contains an event board then click on “Place Event Board” then click in the Chassis 1/Slot-1 box. An “E” will appear in the box. An “E” can also be placed in the box by simply selecting the box and typing the letter “E”.

Slot-7 is always reserved for the DSP circuit board. Slot-12 is always reserved for the alarm output circuit board and slot-13 is always reserved for the chassis power supply board.

18. Each DSP circuit board, one per chassis, was assigned an IP address at the factory. That IP address must be entered in the “IP Address” column for each chassis/DSP board. The default IP address is 195.168.3.X where X is the chassis number such as 1, 2, 3 etc.
19. Towards the upper right hand portion of the page is a “Chassis #1 Port#”, a port number is automatically selected for each chassis. This number can be changed if any conflict arises.
20. After the chassis and slot information are entered, the number of Analog Boards, Event Boards, Analog Channels, and Event Channels will appear at the far right hand side of the page.
21. Click on the tab at the bottom of the page labeled “General Settings”. The screen shown in Figure-16 should appear.

**Figure-16 Point Assignment Screen “General Settings”**

22. Default values of 60Hz and a sampling rate of 4800Hz should be shown.
23. With these default settings the system is ready to create transient records only.
24. Click “Save” at the top of the page.
25. You should see the “APP Recorder Driver” pop-up momentarily and then the system should go On-Line. When the system goes on line you should hear the On-Line output relay click. If the system is not synchronized with a satellite controlled clock you will hear the “CLK SYNC LOSS” relay click after approximately 1½ minutes.

26. The system is now operational and the complete point assignment record can be downloaded from the master station or completed at your convenience.
27. At this point the APP Recorder Program has been installed and is running as an application. Though the application can be started automatically, by placing it the “startup” folder **C:\Documents and Settings\All Users\Start Menu\Programs\Startup**, it is more desirable to run the program as a service. To run the program as a service reference Chapter 5 Other Information.

## 4.2 Detailed Software Review

The APP Recorder Program must be running for the recorder to operate. The APP Recorder Program contains information and settings that contribute to the recorders versatile, user-friendly, state-of-the-art functionality. The APP Recorder Program has been configured to run as a service. Running as a service allows the program to automatically restart on its own should someone shutting it down.

### 4.2.1 APP Recorder Program Functions

The APP Recorder Program carries out the following major functions

- Receives transient and extended data from the DSP circuit boards and stores the data in path location **C:\APP Recorder\Data**. Before storing the transient and extended data in this directory the program automatically converts the files into COMTRADE C37.111 – 1999 format. If the extended recording feature is enabled, three records are created each time the recorder trips; transient oscillography, extended oscillography, and extended RMS. The program automatically names the transient and extended records per the IEEE COMNANES requirement.
- Receives continuous streaming data from the DSP circuit boards and writes that data in path location of **C:\APP Recorder\Data\OscIgrData**. This data is used when the analysis software is requesting a time slice of continuous oscillography information.
- From the continuous streaming data, discussed above, the program calculates the following quantities and writes that information to the path indicated.  
 Continuous RMS Data ..... **C:\APP Recorder\Data\RMSData**  
 Continuous Frequency Data..... **C:\APP Recorder\Data\FreqData**  
 Continuous Phase Data..... **C:\APP recorder\Data\PhaseData**
- Receives Sequence Of Event Records for the DSP circuit boards and writes that information in path location **C:\APP Recorder\Data\SerData**
- Displays near real time analog RMS values, frequency, phase, event status, trigger status, and sequence of event log on its main screen.
- Displays real time analog channel oscillograms via its Oscope feature.
- Coordinates communication with the master station program, APP ClearView, via Ethernet or Modem.
- Outputs DNP-3 analog RMS values and event status via RS-232 or Ethernet.
- Outputs PMU analog vector values via Ethernet.

## 4.2.2 Main Screen

The main screen is divided into four sections; menu choices at the top, setup information at the far left, a message window towards the middle, and real time metering towards the bottom.

Menu choices will be discussed shortly. The setup information is simply a display of the major parameters that are setup or selected in the menu choices. The message window displays information related to program startup, program re-initialization, information sent to the APP Recorder Driver, error messages, and even possible chatting with someone at the master station. The metering section can be quite handy for a quick look at RMS values for all the analog channels, event status, trigger status, and sequence of event log.

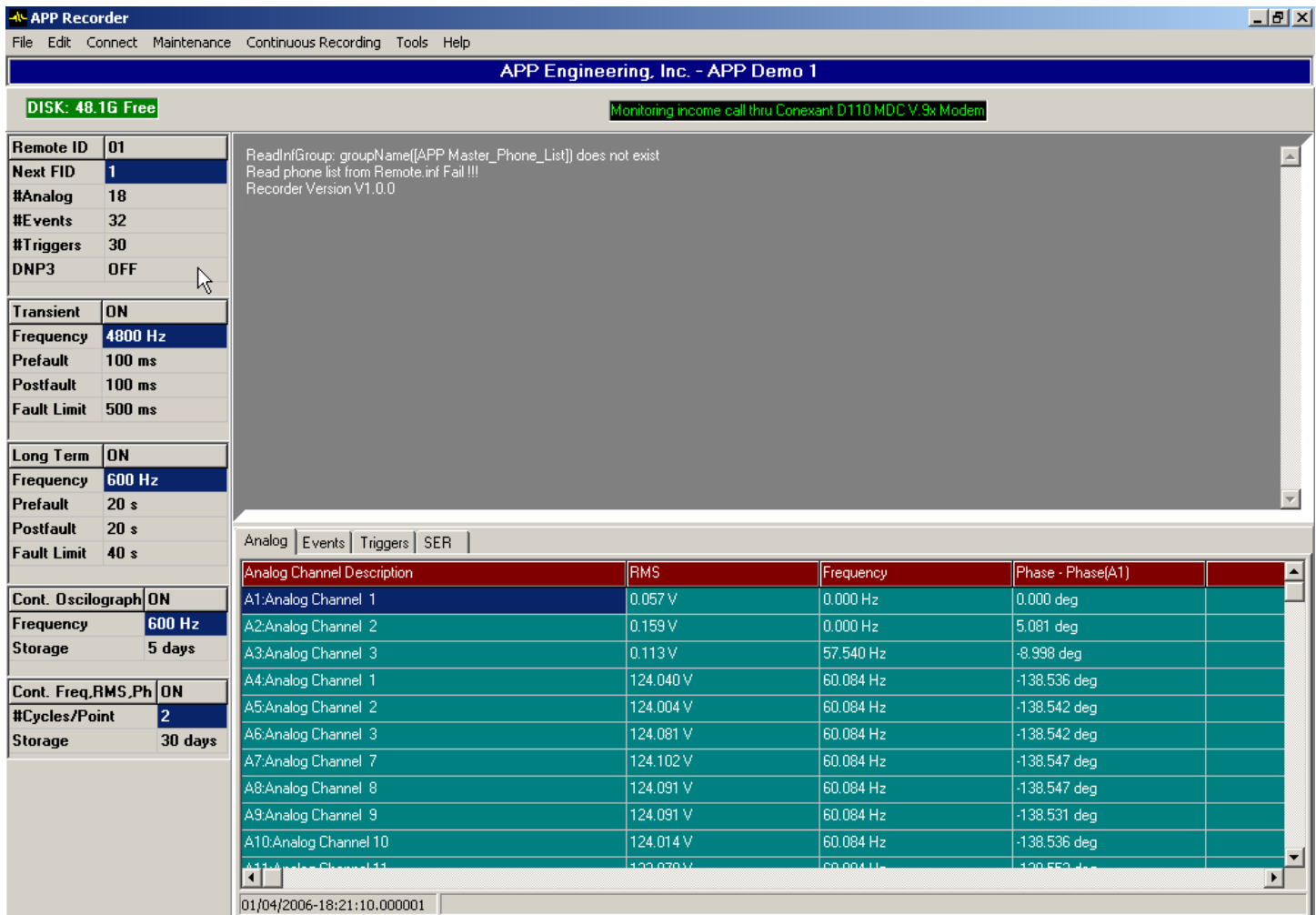
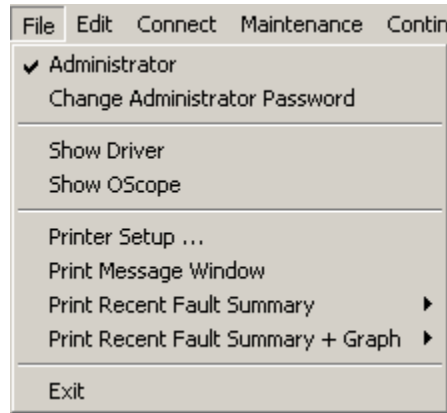


Figure-17 APP Recorder Program Main Screen

### 4.2.3 File Menu

Clicking on “File” displays the menu shown below.



**Figure-18 APP Recorder File Menu**

#### 4.2.3.1 Administrator

If a check mark is next to “Administrator” then the user has administrative privileges. The administrator can make changes to passwords, recorder configuration, point assignment record, and line group record. If you can check and uncheck “Administrator” without a password box popping up, you have not activated the administrator feature.

To activate this feature, place a check mark by “Administrator” and then click on “Change Administrator Password”. Enter your desired password (twice). Now the user must know the password to have administrative privileges.

If “Administrator” is unchecked and there is an administrative password, “Change Administrator Password” will not appear on the menu.

#### 4.2.3.2 Show Driver

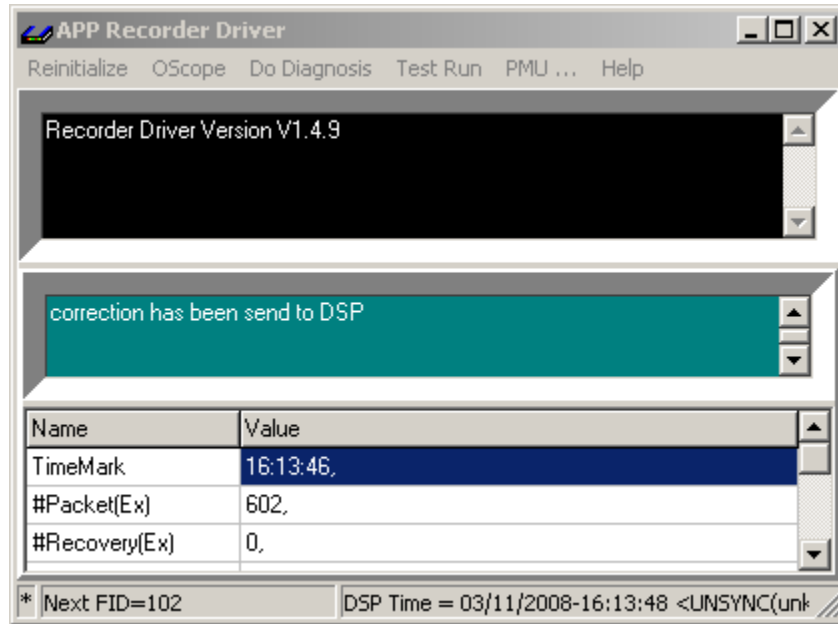
This screen shows communications between the computer control chassis and all the Level 1 and Level 2 chassis. The screen is divided into five sections, menu, driver message window, DSP message window, information area, and bottom tray.

##### 4.2.3.2.1 Driver Menu

###### 4.2.3.2.1.1 Reinitialize

Clicking on “Reinitialize” will cause the remote driver to reset and restart.

**\*CAUTION\* during this process the recorder will momentarily go Off Line.**



**Figure-19 APP Recorder Driver Main Screen**

#### 4.2.3.2.1.2 OScope

**\*CAUTION\*** clicking on “Oscope” will cause the recorder to go off line and will display an oscilloscope screen. This same function can be done at the APP Recorder main screen and is discussed in the section 4.2.3.3.

#### 4.2.3.2.1.3 Do Diagnosis

Clicking on “Diagnosis” will cause the system to do a diagnostic check. This same function can be carried out from the APP Recorder main screen. Results can be displayed by returning to the APP Recorder main screen and clicking on “Maintenance” then “Show Results”.

#### 4.2.3.2.1.4 Test Run

Clicking on “Test Run” will force the recorder to trip. This will create a transient COMTRADE record and if the extended recording feature is enabled, an Extended COMTRADE record. The record can be viewed with the APP ClearView program, which is loaded on the recorder computer, or any COMTRADE viewer. The records will contain a snap shot of all the analog channel signals plus the current status of the event inputs. If the auto-call feature is enabled, the recorder will call the master station(s) and upload the records.

#### 4.2.3.2.1.5 “PMU ...”

“PMU ...” menu will be visible only if PMU check box in point assignment record being check marked. Clicking on this menu will display a PMU screen as shown in Figure-20. Then follow the procedure below to setup.

1. Enter IP address where the data is going to send to.
2. Enter Port# for send and receive
3. Select Va, Vb, Vc and Ia, Ib, Ic
4. Check box "Use Va to measure frequency" should be uncheck if Va, Vb, Vc input are true 3-phase
5. Click Save to use the setting. The screen will close itself.
6. Click "PMU ..." again to open the screen to check the PMU progress

PMU

Save Cancel

**Where Data Go (UDP):**

IP: 200.200.200.200 Data Rate: 04 per second

Port#: 4713

**What to Send:**

Va A1:Analog Channel 1

Vb A2:Analog Channel 2

Vc A3:Analog Channel 3

Ia A4:Analog Channel 4

Ib A5:Analog Channel 5

Ic A6:Analog Channel 6

☒ Use Va to measure frequency (Default: use V1)

Sending Format: Va,Vb,Vc,V1,Ia,Ib,Ic,I1 where V1 and I1 are Positive Sequences

**Data**

Va 0.00 V, 18.435 deg Freq (Hz): 60.0000 DFreq (Hz/s): 0.0000

[3/11/2008 4:13:10 PM] Start PMU

**Figure-20 PMU Screen**

#### 4.2.3.2.1.6 About

Clicking on “About” reveals a screen that indicates the driver version plus factory contact information.



#### 4.2.3.2.2 Driver Message Window

Communication between the APP Recorder Program and the driver are shown in this message window.

#### 4.2.3.2.3 DSP Message Window

Communication between the driver and all the system DSP circuit boards are shown in this window.

##### Information Area

###### Time Mark:

The absolute times of the 1PPS signal, for all the DSP boards, are displayed here.

The times are updated every 30 seconds. If multiple times are displayed, meaning two or more DSP boards, they should be the same/match.

###### #Packet (Ex):

If extended recoding is enabled, packet transfers or data flow, from the DSP circuit boards to the computer hard drive, can be seen here.

###### #Recovery (Ex):

If extended recording is enabled, this area will keep a running total of the number of times a packet had to be resent from the DSP board to the computer hard drive.

###### (>65C, C):

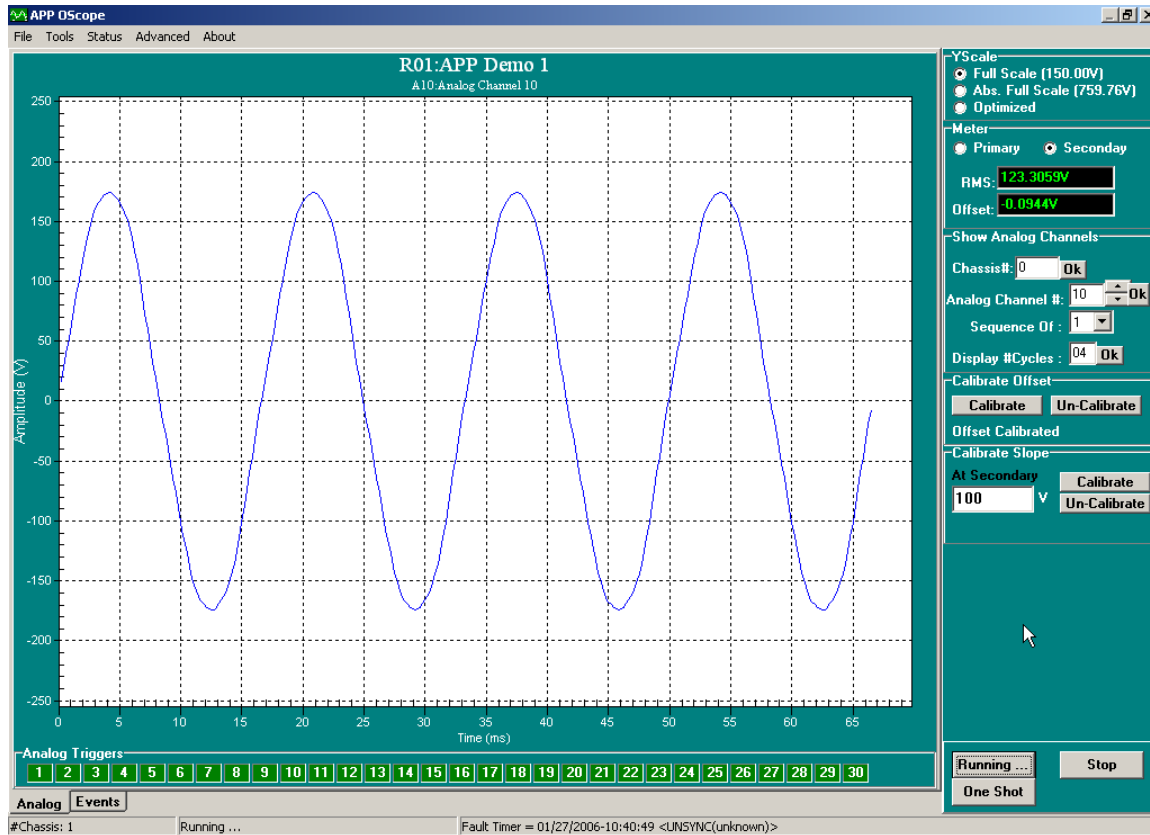
The temperatures of the DSP boards are displayed here. In normal situation the display may look something like (0, 45C). The zero indicated that the temperature is below 65C and it is now 45C. If the temperature on the board is over 65C, the zero will become one. Using both the indicator (0 or 1) and the reading will ensure the temperature reading is somewhat correct since the indicator and the reading are sense differently.

#### 4.2.3.2.4 Bottom Tray Area

The bottom tray area displays the next fault identification number, the fault date and time, and the synch status of the fault time.

#### 4.2.3.3 Show Oscscope

**\*CAUTION\*** Clicking on “Oscope” will cause the recorder to go off line. After clicking Oscope the screen below will be displayed.



**Figure-21 Oscope Screen**

The OScope is very useful when setting up the recorder for the first time. It allows the user to view real-time analog signals, analog trigger status, event status, and perform analog channel calibration. Sections of the screen include menu, analog channel display screen, analog trigger bar, right hand side information/calibration column, event tab, and bottom tray area.

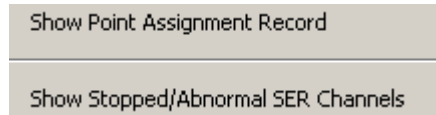
#### 4.2.3.3.1 OScope Menu

##### 4.2.3.3.1.1 File

Clicking on “File” prompts a pull down menu containing reinitialize and exit. Clicking on reinitialize causes the function to restart and update the display. Clicking exit will cause this function to stop and the recorder to return to its normal On Line status.

**NOTE: Oscope will not quit if it is “Running”. Click the “Stop” button, in the lower right hand corner of the screen, to stop and then exit Oscope.**

#### 4.2.3.3.1.2 Tools



**Figure-22 OScope Tools Menu**

“Show Point Assignment Record”

Clicking on this choice displays the point assignment record screen as show in Figure-15.

“Show Stopped/Abnormal SER Channels”

Clicking on this choice displays a screen as show in Figure-23.

Stopped/Abnormal SER Channels						
DATE-TIME	Event	State	Normal	Sync	Description	
01/07/2006-17:51:09.968125	E1	O	A	U	Event Channel 1	
01/07/2006-17:51:09.968125	E2	O	A	U	(M.Stop)Event Channel 2	

**Figure-23 Stopped/Abnormal SER Channels Screen**

SER channels that are in a stopped or abnormal state are displayed. In the “State” column and “O” represents an open contact and a “C” is represents a closed contact. In the “Normal” column an “A” indicates the channel is currently in an abnormal state and an “N” indicates the channel is currently in a normal state. In the Sync column a “U” indicates an unsynchronized time and a “S” represents a synchronized time.

If an SER channel is stopped, the word “Stopped” will appear at the beginning of the channel description. The letter “M” or “A” will also appear with the stop message. “M” indicates that the channel has been stopped manually via the point assignment record and an “A” indicates that the channel stopped automatically.

The point assignment record contains a setting, under the “General Settings Tab”, that allows the user to auto shut down an SER channel if it changes state to many times in a fixed period. The SER channel will auto restart after a user programmed shut down period.

#### 4.2.3.3.1.3 Status

Clicking on “Status” displays a communication status box, shown below. Key messages between the system DSP boards and the system computer are displayed. The Information area at the bottom of the screen contains the following information:

**Time Mark:**

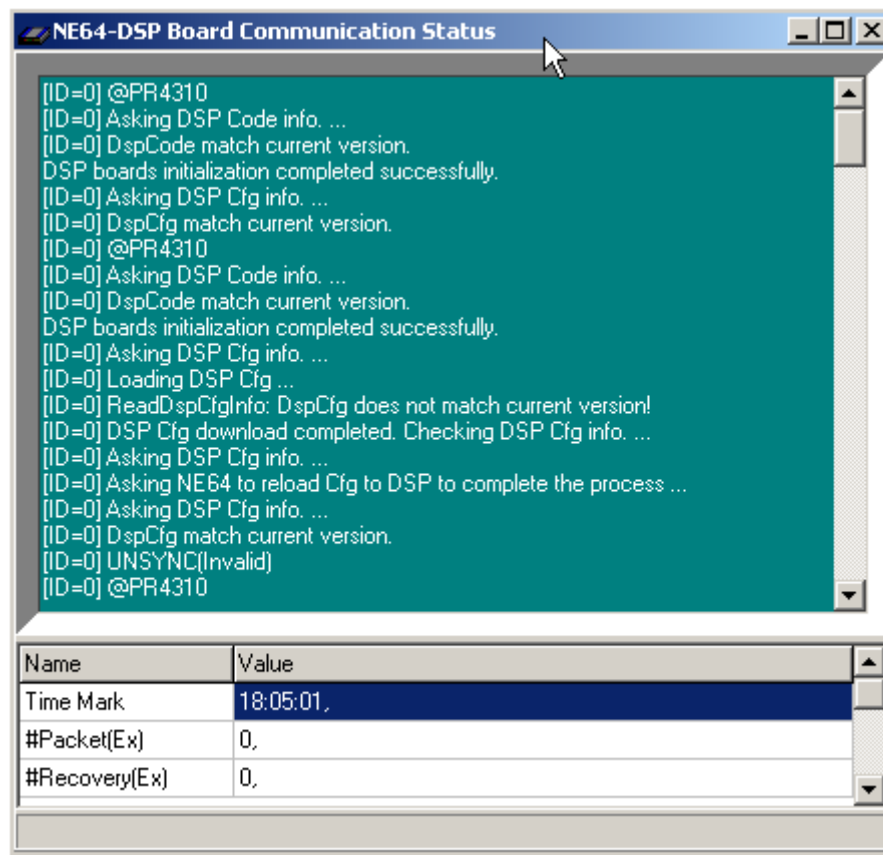
The absolute times of the 1PPS signal, for all the DSP boards, are displayed here. The times are updated every 30 seconds. If multiple times are displayed, meaning two or more DSP boards, they should be the same/match.

**#Packet (Extended):**

If extended recoding is enabled, packet transfers or data flow, from the DSP circuit boards to the computer hard drive, can be seen here.

**#Recovery (Extended):**

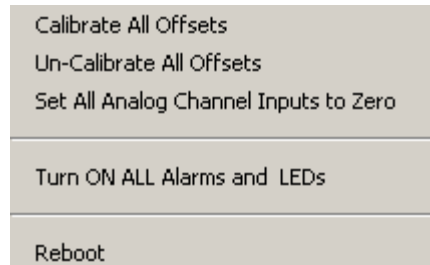
If extended recording is enabled, this area will keep a running total of the number of times a packet had to be resent from the DSP board to the computer hard drive.



**Figure-24 DSP To Computer Communication Screen**

#### 4.2.3.3.1.4 Advanced

Clicking on “Advanced” will show the menu below.



**Figure-25 Scope Advanced Menu Selection**

“Calibrate All Offsets” or “Un-Calibrate All Offsets”

The DC offset on every analog channel can be calibrated out by clicking on “Calibrate All Offsets”. If the scope is running, it will automatically stop and the user will need to click “Run” to start the scope. The time that it takes to calibrate is dependent on the number of channels but is usually less than 20 seconds. The factory performs an offset calibration, with no signals attached, before a recorder leaves the factory. Once the system is installed and signals are connected, performing another offset calibration will eliminate externally induced DC offset. Offset can also be calibrated out one channel at a time. See the right hand column of the scope screen. Click Un-Calibrate to reverse the process, which deletes software correction factors.

“Set All Analog Channel Inputs to Zero”

Check marked this menu to stop each analog channel input from reaching the analog board signal acquisition circuitry. This can be use to calibrating internal offset or use as a troubleshooting tool.

“Turn ON All Alarms and LED’s”

To test the front panel LED’s and alarm outputs, click “Turn ON ALL Alarms and LED’s”. All the relay coils should energize and the front panel LED’s should illuminate. The Trans Record and SOE Record lights will stay illuminated for 10 seconds. To reset all the lights and relays click “Reinitialize” under the file menu.

“Reboot”

The reboot command causes power to be momentarily cut to the recorder. The computer and all circuit boards will see a hard power shutdown. Power is cut via a normally closed relay on the Level 1 Chassis power supply circuit board. After 5-10 seconds power will return and the system will begin to restart. It takes approximately 1minute and 30 seconds for the system to return to an online state.

#### 4.2.3.3.1.5 About

Clicking on menu choice “About” displays the driver version running the Oscope function. Factory contact information is also displayed.

#### 4.2.3.3.2 Display Area

DC or AC analog signals can be observed in the display area. The X-axis is defined by signal frequency and the desired number of cycles to be displayed. The Y-axis is determined by the channel full scale setting, in the point assignment record, and the Y-scale setting in the upper right hand corner of the Oscope screen (Full Scale, Abs. Full Scale, and Optimize).

#### 4.2.3.3.3 Analog Trigger Bar

The analog trigger bar simply indicates which analog channels are in a trip condition has defined in the point assignment record. Green indicates a normal condition and red indicates a trip condition.

#### 4.2.3.3.4 Information & Calibration Column

The YScale box includes three choices, Full Scale, Abs. Full Scale, and Optimize. If Full Scale is selected the displayed Y-axis maximum and minimum will be approximately 20% greater than the channel full scale listed in the point assignment record.

Abs. Full Scale is short for absolute full scale. This value is also dependent on the channel full scale setting but reflects the absolute full scale has defined by the hardware divider and gain circuitry. In other words, hardware divider values are limited to 16 choices that range from 2 to 465 and only apply to voltage inputs. Hardware gain values are limited to 16 choices that range from 1 to 13 and apply to voltage and current inputs. Therefore, when the user selects a full scale value, the software automatically calculates an absolute full scale value based on the finite hardware choices. The absolute full scale is the amplitude at which the input signal will clip.

If Optimize is selected, the Y-axis will automatically adjust to display the input signal(s) as large as possible.

The next box down allows the user to display the RMS meter value and DC Offset value in primary or secondary values. The CT and PT multiplying values can be seen in the point assignment record.

The 3<sup>rd</sup> box down the column allows the user to select which chassis and channel number to display. More than one input signal can be viewed at a time. Simply click the starting analog channel, then how many sequential channels you would like to view, and the

number of cycles to display. 14 sequential channels can be displayed at one time. It is not possible to view channels not in sequence

#### 4.2.3.3.5 Calibrate Offset

DC offset can be calibrated out, ONE CHANNEL AT A TIME, by clicking the “Calibrate” button. If the scope is running, it will automatically stop and the user will need to click “Run” to start the scope. The factory performs an offset calibration, with no signals attached, before a recorder leaves the factory. Once the system is installed and signals are connected, performing another offset calibration will eliminate externally induced DC offset. To calibrate all the channels at the same time click “Advanced” then “Calibrate All Offsets”.

The offset calibration process creates a file named *RxxExCal.ini* in path location **C:\APP Recorder\Setup**. The “xx” in the file name is the unique recorder ID number. This is an ASCII file and can be viewed by doubling clicking it. An example file entry is, **A1=0,0.999965**. **A1** is the analog channel number, **0** is the offset calibration factor for the DC offset, and **0.999965** is the external calibration factor.

#### 4.2.3.3.6 Calibrate Slope (External Calibration)

The APP-501 Recorder will have accurate un-calibrated analog channel accuracy, see the specifications section. Therefore, unless permanent damage as occurred to an analog channel, you may not see much improvement in channel accuracy by performing an external calibration. If the un-calibrated accuracy is not within specification, please contact the factory.

**\*WARNING\* calibration should only be performed by trained, qualified technical personnel. Never calibrate a system alone. Ensure that another person is present who knows emergency procedures and is capable of rendering first aid.**

**\*WARNING\* carefully disconnect station analog input signals from the recorder before applying a know signal from your calibrated high precision certified source. If connecting an external metering device use caution and proper connecting leads and equipment.**

The procedure below begins from the Main APP Recorder Program Screen and assumes that your known analog signal is connected to a recorder analog input.

1. Click on “File”
2. Click on “Show Oscop”
3. Enter the “Analog Channel #” to be calibrated.
4. Enter your known accurate secondary input calibration voltage or current value into edit box below “External Calibration (Slope)”.
5. Click the “Calibrate” button. A warning message may pop-up saying, “The given value (xxx.xx) is very different to the actual value (xxx.xx).

Do you still want to run External Calibration?” Click “Yes” to proceed or “No” to abort the calibration process.

6. The calibration process will only take a few seconds. Repeat steps 3-5 to calibrate additional channels.

The calibration process creates a file named *RxxExCal.ini* in path location **C:\APP Recorder\Setup**. The “xx” in the file name is the unique recorder ID number. This is an ASCII file and can be viewed by doubling clicking it. An example file entry is, **A1=0,0.999965**. **A1** is the analog channel number, **0** is the internal calibration factor for the DC offset, and **0.999965** is the external calibration factor.

The external calibration factor can be reset to **1** by clicking on the “Un-Calibrate” button.

The bottom box in the right hand column contains “Run”, “One Shot”, and “Stop” buttons. The “Run” button puts the scope in free run and allows the user to see continuous updates in the display area and in the meter boxes. A one time update to the display area and meter boxes is performed if the “One Shot” button is clicked. The “Stop” button freezes the display and meter boxes. The “Stop” button must be clicked before doing an external calibration.

Click the “Event” tab to see the status of the event channels. An “O” indicates an open contact and an “X” indicates a closed contact. If the box is green then that channel is in a normal state. If the box is red then that channel is in an abnormal state.

The bottom tray shows the chassis number being viewed, the run/stop status of the Oscop, and the fault timer. The synch status of the fault timer is also shown. If the synch status is followed by (unknown), the recorder cannot detect any IRIG-B input. See Chapter 5 Other Information for time quality details.

#### 4.2.3.4 Printer Setup

Selecting “Printer Setup...” displays the standard Windows print setup screen.

#### 4.2.3.5 Print Message Window

Selecting “Print Message Window” immediately prints the content of the Message Window to the default printer.

#### 4.2.3.6 Print Recent Fault Summary

Selecting “Print Recent Fault Summary” allows the user to preview or print a fault summary report for the last recorded fault. If the APP Recorder Program is stopped and restarted, a new fault record must be generated for this function to work. It does not read prior fault records.



#### 4.2.3.7 Print Recent Fault Summary + Graph

Selecting “Print Recent Fault Summary + Graph” allows the user to preview or print a fault summary report that includes analog and event graphs. After selecting preview or print a format page appears. Parameters such as Y-scale, print channels, print range, channels per page, and event channel formatting can be setup.

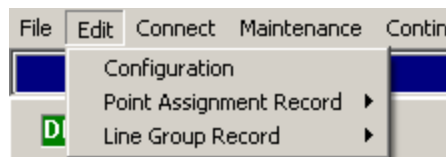
#### 4.2.3.8 Exit

**\*CAUTION\* Stopping the APP Recorder Program takes the recorder OFF LINE. No recording can be performed if the APP Recorder Program is stopped.**

When the APP-501 Recorder leaves the factory, the APP Recorder Program runs as a service. Therefore, when the computer starts, the program automatically starts. If the APP Recorder Program is stopped (Exit), it will automatically restart in approximately 60 seconds. If the program is running as an application, clicking on “Exit” will immediately close the APP Recorder Program and it **will not** automatically restart. In either case, service or application, if the password protection feature is enabled, the user must enter an appropriate password before the program stops.

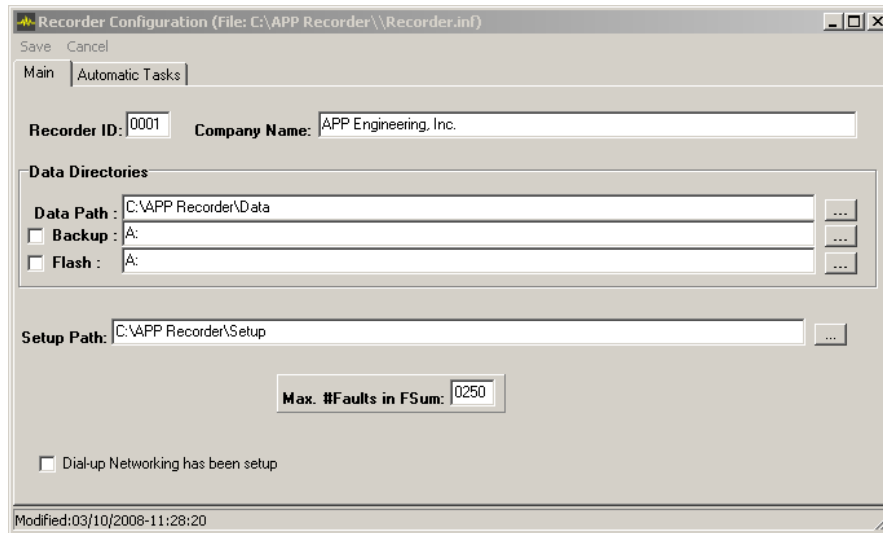
#### 4.2.4 Edit Menu

Clicking on “Edit” displays the menu shown below.



**Figure-26 Edit Menu**

#### 4.2.4.1 Configuration



**Figure-27 Recorder Configuration Screen**

##### 4.2.4.1.1 Main

Configuration refers to the configuration of the APP-501 Recorder. Some minimum configuration parameters must be setup for the recorder to operate. It must know where to place the recorded data and where to find point assignment information. Before the recorder leaves the factory it must have parameters are already entered and the user should not have to make changes to those settings. Clicking on “Configuration” displays a screen as shown in Figure-27.

As mentioned above, the fields that must be filled-in are “Recorder ID”, “Data Path”, and “Setup Path”.

“Recorder ID:”

Each recorder has a unique Recorder ID. This allows the master station program (APP ClearView) to identify which recorder it is communicating with.

**\*CAUTION\* Do not duplicate Recorder ID’s. The factory will try to obtain this information from a customer before a system ships and enter it for the customer.**

“Company Name:”

Enter any name you would like. It will appear at the top of the APP Recorder Program main page. The factory will enter the name of the company or person that purchased the system.

“Data Path:”

The data path is the location that transient and extended recording information will be written.

By default the factory will create the path C:\APP Recorder\Data  
If desired, the user can create another path.

“Backup:”

The transient and extended recording information can be written to more than one path.  
To create a second location, click the box next to “Backup:” and enter a desired path.

“Setup Path:”

Files such as the point assignment record, calibration factors, line group record, trace files, and diagnostic record are in this location.

By default the factory will create the path C:\APP Recorder\Setup

If desired the user can create another path.

“Max #Faults in FSum:”

This is the number of fault summary files that are uploaded to the master station, APP ClearView Program, when a FSum file is created. The larger the number, the longer it takes to get the summary file. Typically a reasonable number for this “fast” retrievable file is between 50 and 500.

“Dial-up Networking has been setup”

Check marked this check box if dial-up networking has been setup.

See Section 4.2.4.1.1.2 Setting up dial-up networking for further detail.

#### 4.2.4.1.1.2 Setting up dial-up networking

DailNet is for users who want to use Remote Desktop or a similar program to access the recorder using the same phone line of the recorder. The following is the procedure to setup DialNet, which is also written in Readme.txt inside of the ClearView directory.

Dial-up Networking Setup Procedure:

----

On Recorder Computer (Server):

----

- Go to Network Connections folder (properties under My Network Places)
- Click Create new connection (then click next)
- Select "Setup an advance connection" (then click next)
- Select "Accept incoming connection" (then click next)
- Under devices for incoming connection, check only the modem (then click next)
- Select "Do not allow virtual private connections" (then click next)
- Under user permissions, select the users (then click next)
- Under Networking Software, check all and select "Internet Protocol (TCP/IP)" then click Properties.
- Under "Incoming TCP/IP Properties",
  - a. Check "Allow caller to access my local network"
  - b. Uncheck "Allow caller to specify its own IP address"
  - c. Select specify TCP/IP address:
    - From: 200.200.200.200
    - To: 200.200.200.201
- Then click next, then click Finish
- Check the box "Dial-up Networking has been setup" in APPRecorder's Configuration

----

On ClearView Computer (Client):

----

- Goto Network Connections folder (properties under My Network Places)
- Click Create new connection (then click next)
- Select "Connect to the network at my workplace" (then click next)
- Select "Dial-up connection" (then click next)
- Under "company name", type the name of this connection \*\* This is the name to use for ClearView \*\* (then click next)
- Under "Phone Number to Dial", type the recorder Phone Number (then click next)
- Click Finish
- Open ClearView's "Phone & Network List", choose DialNet, and type in the connection name that you just setup (NOT IP address or phone#)

----

Things to remember:

----

- Dial-up network IP: Recorder(200.200.200.200) ClearView(200.200.200.201)
  - Use IP:200.200.200.200 to call the Recorder when using Remote Desktop or UltraVNC or whatever
  - The dial-up network can only be disconnect by the application that started it
  - The dial-up network will stop the internet connection and also could stop some local LAN
  - Internet will resume automatically after dial-up network disconnected
-

#### 4.2.4.1.2 Automatic Tasks

The recorder has the ability to perform automatic tasks that are shown in Figure-28. Setting up automatic parameters takes full advantage of the records ability to become an integral part of your substation or plant automation.

Recorder Configuration (File: C:\APP Recorder\Remote.inf)

Save Cancel

Main Automatic Tasks

**When Fault Arrived, Do**

Call Master YES - always (Send FSum and Data) ☒ Data means transient only Max. # Attempt: 00010

Print YES - always (Print FSum Only) Printing Format

☒ Email Email Settings

Logic (OR='|', AND='&') :  
(T1|T2|T3|T4|T5)&(E1|E2|E3|E4|E5)

**When SER Events Occured, Do**

☒ Auto Print SER Reports on Receipt Printer (LPT1)

Master Phone List # Rings before Answering: 01 Recorder Password

**Figure-28 Recorder Automatic Tasks**

#### “Call Master”

For the APP Recorder Program to call the master station and transfer data, the master station must be running the APP ClearView Program. The APP ClearView Program must be set to monitor in coming calls (see APP ClearView Manual).

The “Call Master” feature allows the recorder to call the master station and carryout any of the functions shown in the pull down menu shown below.

- NO
- YES - always (Send FSum Only)
- YES - always (Send FSum and Data)**
- YES - if logic true (Send FSum Only)
- YES - if logic true (Send FSum and Data)
- YES - always (FSum), if logic true (Data)

**Figure-29 Auto Call Master Pull Down Menu**

NO: The recorder will not automatically call the master station. Manually activated calls can still be made.

Yes – always (Send FSum Only): If the recorder triggers, it will call the master station and upload a fault summary record. The number of fault files in the summary record is dependent on the setting shown the “Main” configuration tab.

Yes – always (Send FSum and Data): If the recorder triggers, it will call the master station and upload the fault summary record and the fault records that were just created. If there is a check mark by “Data means transient only” then just the transient record(s) will be uploaded to the master station. If there is no check mark, then transient records and extended records will be uploaded to the master station.

Yes – if logic true (Send FSum Only):

If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will send a fault summary to the master station. Again, the number of fault files in the summary record is dependent on the setting shown in the “Main” configuration tab.

Yes – if logic true (Send FSum and Data):

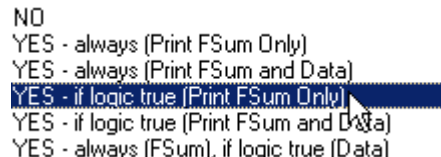
If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will send a fault summary to the master station and the fault records that were just created. Again, if there is a check mark by “Data means transient only” then just the transient record(s) will be uploaded to the master station. If there is no check mark, then transient records and extended records will be uploaded to the master station.

Yes – always (FSum), if logic true (Data)

If the recorder triggers, it will call the master station and upload a fault summary record. The number of fault files in the summary record is dependent on the setting shown the “Main” configuration tab. If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will send fault records that were just created. Again, if there is a check mark by “Data means transient only” then just the transient record(s) will be uploaded to the master station. If there is no check mark, then transient records and extended records will be uploaded to the master station.

“Print”

For the APP Recorder Program to print there must be a local or network printer connected to the recorder. The automatic “Print” feature allows the recorder to print and carryout any of the functions shown in the pull down menu below.



NO  
YES - always (Print FSum Only)  
YES - always (Print FSum and Data)  
YES - if logic true (Print FSum Only)  
YES - if logic true (Print FSum and Data)  
YES - always (FSum), if logic true (Data)

**Figure-30 Auto Print Pull Down Menu**

NO: The recorder will not automatically print. Manually activated printing can still be initiated.

Yes – always (Print FSum Only): If the recorder triggers, it will print a fault summary report.

Yes – always (Print FSum and Data): If the recorder triggers, it will print a fault summary report, all the analog waveforms, and event graphs.

Yes – if logic true (Send FSum Only):

If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will print a fault summary report.

Yes – if logic true (Send FSum and Data):

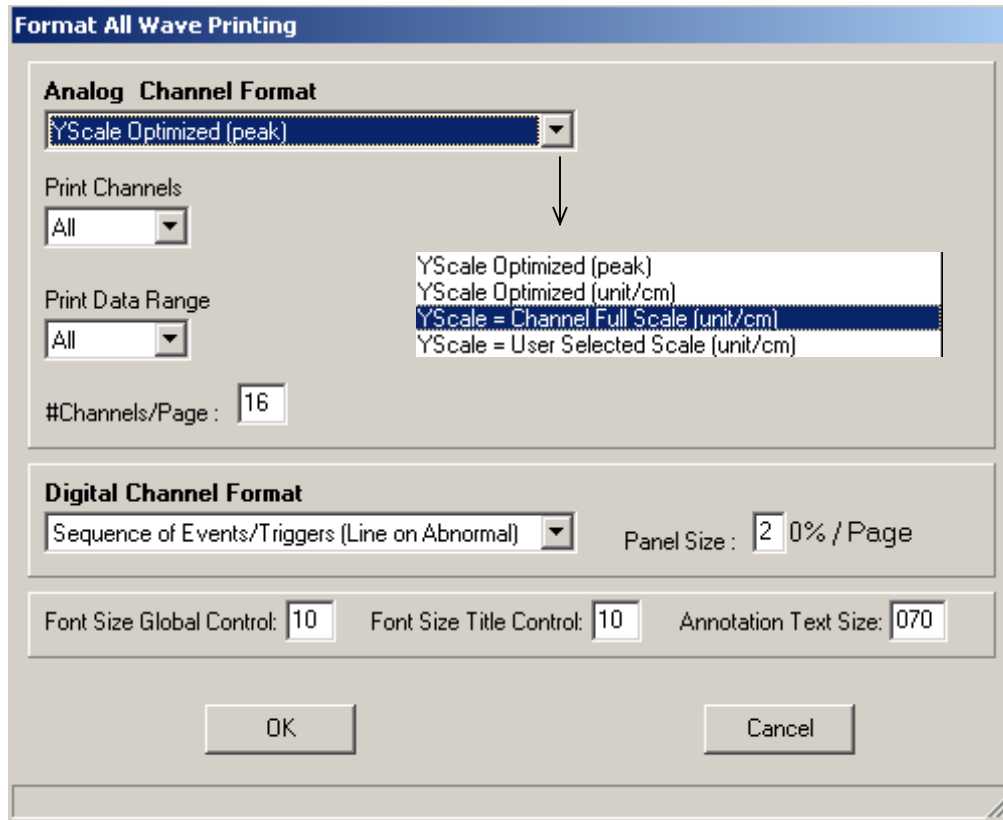
If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will print a fault summary report, all the analog waveforms, and event graphs.

Yes – always (FSum), if logic true (Data)

If the recorder triggers, it will print a fault summary report. If a user defined Boolean Logic Equation (filter) has been entered and a recorded fault passes the filter, the recorder will print a fault summary report, all the analog waveforms, and event graphs.

“Printing Format”

Clicking this button will show the screen as shown in Figure-31.



**Figure-31 Printing Format Screen**

#### Analog Channel Format

- **YScale Optimized (peak)**  
Prints the highest peak value measured to the right hand side of each oscillogram printed.
- **YScale Optimized (unit/cm)**  
Prints a volts/cm or amps/cm scale to the right hand side of each oscillogram printed. Fewer channels printed on a page yields more resolution on the Yscale.
- **YScale = Channel Full Scale Optimized (unit/cm)**  
Prints a volts/cm or amps/cm scale to the right hand side of each oscillogram printed. The value is based on the full scale setting in the point assignment record and the number of oscillograms printed on the page. Fewer channels printed on a page yields more resolution on the Yscale.
- **Yscale = User Select Scale (unit/cm)**  
If selected, a user programmable Yscale pops up. The user can enter their desired volts/cm or amps/cm scale. Prints a volts/cm or amps/cm scale to the right hand side of each oscillogram printed. The value is based on a user entered



Yscale (unit/cm). If the scale is too small waveform clipping will occur. Fewer channels printed on a page yields more resolution on the Yscale.

### Print Channels

- ALL  
Prints an oscillogram for each analog channel listed in the point assignment record.
- Selected  
When selected a “Select Channels” button pops-up. From here the user can pick specific channels to be printed.
- Group  
When selected specific preset line groups can be printed.

### Print Data Range

- ALL  
Prints the entire length (X-axis) of all the oscillograms selected for printing.
- Selected  
Each data point in an oscillogram has a number. The starting number is “0” which is usually the prefault portion of the waveform. The ending number depends on how long the fault or recording lasted. To print a partial record, X-axis length, enter the data range.

### #Channels/Page

Enter the number of oscillograms you want to appear on each page of the print out. Fewer oscillograms per page could increase the resolution of the Yscale.

### Digital Channel Format

There are two types of triggers, analog triggers and event triggers. These triggers can be printed in conjunction with oscillograms. Triggers are represented by horizontal lines at the bottom of a printed or displayed page. The menu shown below allows the user to select the representation of a trigger line as normal or abnormal.



```
Sequence of Events/Triggers (Line on Abnormal)
Sequence of Events/Triggers (Line on Normal)
All Events/Triggers (Line on Abnormal)
All Events/Triggers (Line on Normal)
```

**Figure-32 Printing Format Event Channel Menu**

- **Sequence Of Events /Triggers (Line on Abnormal)**  
This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was abnormal.
- **Sequence Of Events /Triggers (Line on Normal)**  
This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was normal.
- **All Events/Triggers (Line on Abnormal)**  
This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was abnormal.
- **All Events/Triggers (Line on Normal)**  
This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was normal.

#### Panel Size

The number entered in this field defines the amount of space the event and analog trigger lines will use at the bottom of a printed page.

#### Font Size Global Control

This setting controls the font size of everything except, fault summary report, the title of the waveform pages, and any annotations that may have been added.

#### Font Size Title Control

This setting controls the font size of the title that appears at the top of each waveform or oscillogram page.

#### Annotate Text Size

This setting controls the font size of any annotations that may have been added to a waveform or oscillogram page.

#### “Data means transient only”

If this box is check marked only transient records, not extended records, will be transmitted to the master station

#### “Max #Attempt”

This field defines the number of times the APP Recorder Program will attempt to call, via modem or network, the master station before stopping.

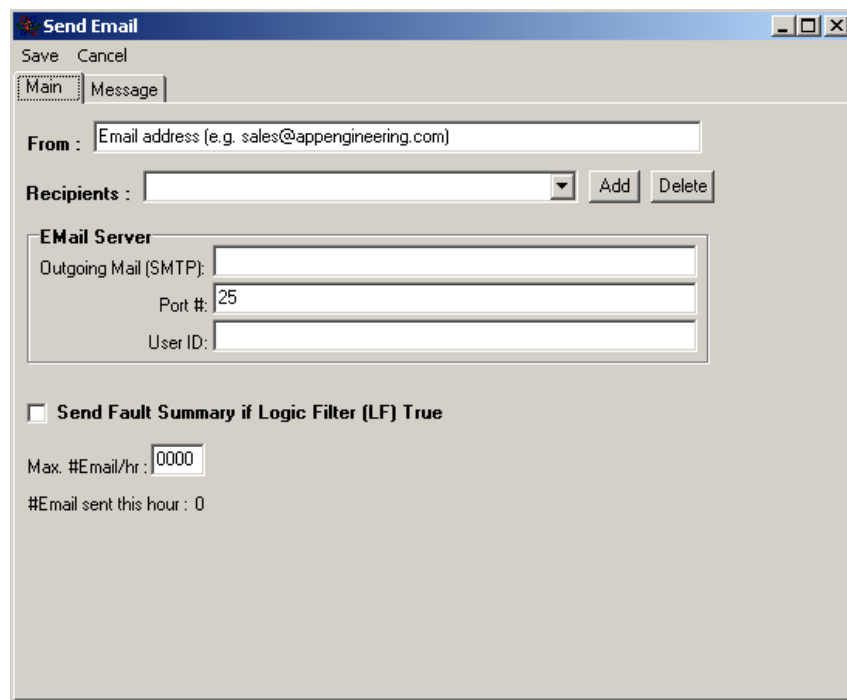
### “Email Settings”

The check box and the Email button configure the recorder to automatically Email fault summary information.

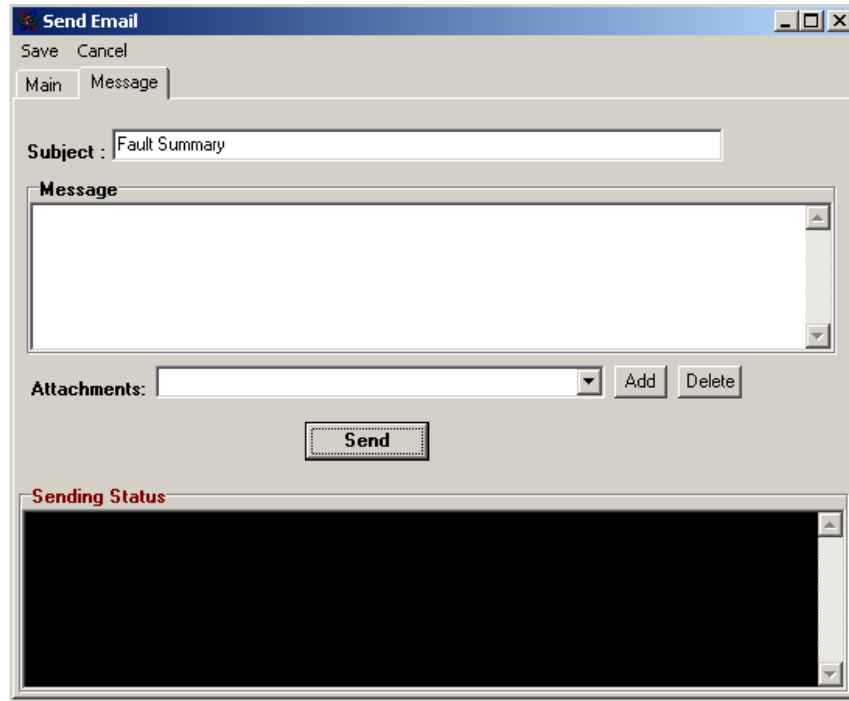
Clicking the Email button will cause a setup screen, shown below, to pop-up. Make your desired enters in the “From” and “Recipients” fields. Contact your network administrator to obtain “SMTP”, “Port#”, and “User ID” information. The master station must have a SMTP/POP3 email account and connectivity in order to use the Email feature.

When the recorder sends an Email it sends a text message containing a summary of a fault. Information includes; recorder ID, fault ID number, fault date and time, fault duration, and fault location report (if calculable). If Auto Emailing is enabled, a summary of every fault is automatically emailed each time the master station automatically retrieves a fault record or a fault record is automatically called in. To filter the Auto Emailing process, the user can setup a Boolean Logic Filter in the Recorder Configuration and then place a check mark next to “Send Fault Summary if Logic Filter (LF) True”.

Clicking the “Message Tab” shows a manually activated emailing screen, see Figure-34. From here, a user can type an email and manually send it to the recipient list.



**Figure-33 Auto Email Setup Screen**



**Figure-34 Manual Emailing Screen**

“Email Check Box”

There must be a check mark in this box to enable the Emailing feature.

“Logic (OR= “|”, AND= “&”)”

This is a user programmable field. A Boolean Logic equation can be entered that filters automatic functions such as auto call master, auto print, and auto Email. The table below contains available equation variables and field entries.

**Table-2 Logic Filter Variables & Entries**

Entry	Description
0	False, nothing will pass filter
1	True, everything passes filter
Blank (Nothing Entered)	True, everything passes filter
T1, T2, T3.....	Represents Analog Channels
t1, t2, t3.....	Also Represents Analog Channels
E1, E2, E3....	Represents Event Channels
e1, e2, e3....	Also Represents Event Channels

“Auto Print SER Reports On Receipt Printer (LPT1)”

If a receipt printer is connected to the computer parallel port and this box is check marked, a change in state of a SER (SOE) channel will print. Printing includes the date, time, channel description, channel number, and if the channel has switched to a normal or abnormal state.

#### “Master Phone List”

The master phone list contains the phone numbers, IP Address, or Master ID's of the master stations that the APP Recorder Program is to automatically call. The master phone list screen is shown below.

Drag	Use	Type	Address/Phone#	Password
	X	Phone	317-536-5300	xyz
	X	Phone	317-536-501	abc
	X	IP	195.145.3.3	
	X	ID	APP Master Station	
		Phone	317-665-0987	

**Figure-35 Master Phone & Network List Screen**

To enter a number; select type of number (phone or IP), enter the number, and click the add button. To delete a number; highlight the number, right click, and click delete.

#### 4.2.4.2 Point Assignment Record

The point assignment record is a user defined record. Information in this record is used by the recorder to control system operation, perform calculations, and perform analysis. If PA information is provided by the customer, factory personnel will enter that information into the recorder. A PA record contains information concerning the recorder hardware, analog channels, analog triggers, events, sampling rates, and different types of recording. A PA record can be created or edited via the APP Recorder Software or the APP ClearView Software. The PA file can be downloaded from the master station (APP ClearView) to the recorder or vice versa.

**NOTE: If the administrator feature is used, only the administrator has privileges to save a newly created record or save changes to an edited record.**

**NOTE: See APP ClearView Operating Manual for complete detail of editing Point Assignment Record.**

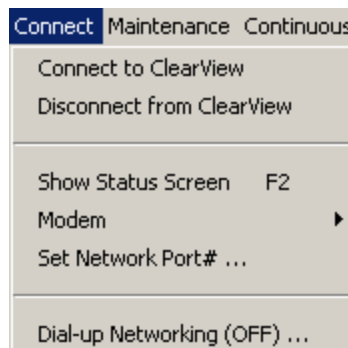
#### 4.2.4.3 Line Group Record

The line group record is a user defined record. Here channels that form a line group are linked together. This permits the software to perform distance to fault calculations, various power calculations, and provides a quick convenient means for viewing oscillograms of different line groups. If line group information is provided by the customer, factory personnel will enter that information into the recorder. The line group record can be created or edited via the APP Recorder Software or the APP ClearView Software. The line group file can be downloaded from the master station (APP ClearView) to the recorder or vice versa.

**NOTE: If the administrator feature is used, only the administrator has privileges to save a newly created record or save changes to an edited record.**

**NOTE: See APP ClearView Operating Manual for complete detail of editing Line Group Record.**

#### 4.2.5 Connect Menu



**Figure-36 Connect Menu**

##### 4.2.5.1 Connect to ClearView

Clicking this menu choice causes the APP Recorder Program to call the master station phone numbers or IP Address that are entered in the APP Recorder Master Phone List. Upon a successful connection to a master station the recorder uploads designated information (summary file only, summary file and data, etc.). After uploading the appropriate information the recorder disconnects from the master station. The recorder only calls those numbers/IP addresses that have a check mark beside them. If more than one number has a check mark, the recorder will call them in sequential order.

**IMPORTANT: The APP ClearView master station program will not receive a call unless it is set to “monitor incoming calls”.**

#### 4.2.5.2 Disconnect from ClearView

Click this to break the connection between the recorder and master station.

#### 4.2.5.3 Show Comm. Screen

Click this menu choice to display a communication screen. The communication screen shows messages related to master station and recorder communications and data transfer progress. This screen is very useful in determining if a successful connection has been established between the master station and recorder. Right clicking in the communication screen will display cut, copy, paste and delete functions.

#### 4.2.5.4 Modem

Clicking this menu choice allows the user to see the currently installed modems and select which modem to use for communications. After selecting an installed modem the user can edit data connection preferences such as baud rate, data protocol, compression, etc.

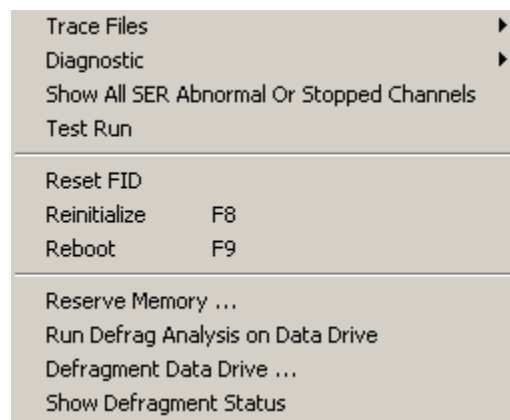
#### 4.2.5.5 Set Network Port#...

For communications via network the default port number is 1024. The port number can be changed via this menu choice.

#### 4.2.5.6 Dial-up Networking

Click this menu to turn ON/OFF dial-up networking if dial-up networking has been setup. See Section 4.2.4.1.1.2 Setting up dial-up networking for further detail.

#### 4.2.6 Maintenance Menu



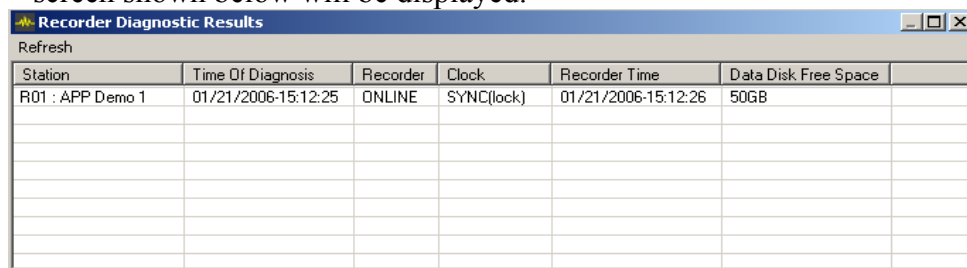
**Figure-37 Maintenance Menu**

#### 4.2.6.1 Trace Files

- **Show Trace File**  
Clicking this choice displays a text file that lists the major processes carried out by the APP Recorder Program. This file is primarily used for troubleshooting purposes. Once the trace file grows to approximately 500Kbytes it will close and a new trace file will be created.  
The location of the trace file is **C:\APP Recorder\Setup**
- **Show Driver Trace File**  
Clicking this choice displays a text file that lists the major processes carried out by the APP Recorder Driver. This file is primarily used for troubleshooting purposes. Once the file grows to approximately 500Kbytes it will close and a new trace file will be created.  
The location of the trace file is **C:\APP Recorder\Setup**

#### 4.2.6.2 Diagnostic

- **Show Results**  
This will show a table with the results of the last diagnostic.
- **Redo Diagnostics**  
Clicking this choice will prompt the system to perform a diagnostic test and the screen shown below will be displayed.



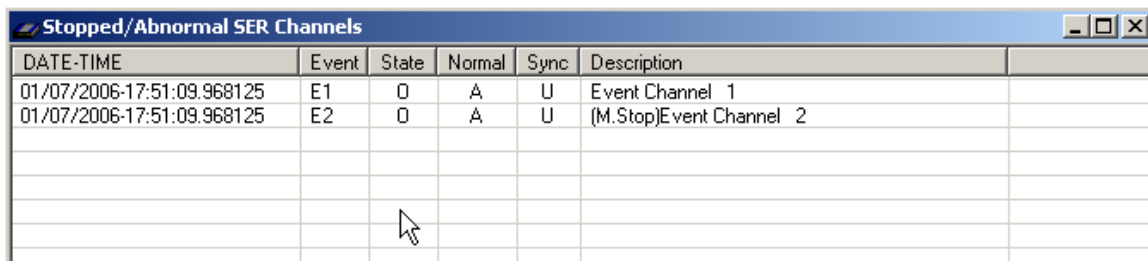
The image shows a window titled "Recorder Diagnostic Results" with a "Refresh" button. It contains a table with the following data:

Station	Time Of Diagnosis	Recorder	Clock	Recorder Time	Data Disk Free Space
R01 : APP Demo 1	01/21/2006-15:12:25	ONLINE	SYNC(lock)	01/21/2006-15:12:26	50GB

**Figure-38 Diagnostic Screen**

#### 4.2.6.3 Show All SER Abnormal Or Stopped Channels

Clicking on this choice displays the following screen:



The image shows a window titled "Stopped/Abnormal SER Channels" with a table containing the following data:

DATE-TIME	Event	State	Normal	Sync	Description
01/07/2006-17:51:09.968125	E1	0	A	U	Event Channel 1
01/07/2006-17:51:09.968125	E2	0	A	U	(M.Stop)Event Channel 2

**Figure-39 Stopped/Abnormal SER Channels Screen**



SER channels that are in a stopped or abnormal state are displayed. In the “State” column and “O” represents an open contact and a “C” is represents a closed contact. In the “Normal” column an “A” indicates the channel is currently in an abnormal state and an “N” indicates the channel is currently in a normal state. In the Sync column a “U” indicates an unsynchronized time and an “S” represents a synchronized time.

If an SER channel is stopped, the word “Stopped” will appear at the beginning of the channel description. The letter “M” or “A” will also appear with the stop message. “M” indicates that the channel has been stopped manually via the point assignment record and an “A” indicates that the channel stopped automatically.

The point assignment record contains a setting, under the “General Settings Tab”, that allows the user to auto shut down an SER channel if it changes state to many times in a fixed period. The SER channel will auto restart after a user programmed shut down period.

#### 4.2.6.4 Test Run

The test run command provides a “snap shot” of all the analog channels and the state of all DFR event channels. A transient COMTRADE record is created. If extended recording is enabled, an extended RMS COMTRADE record and extended oscillography COMTRADE record will also be created. The record length will be prefault + post fault. The trigger alarm will not energize during a test run but the trigger front panel LED will illuminate.

#### 4.2.6.5 Reset FID

Clicking this menu item causes the Fault Identification Number to be reset to 1. As each fault record is created the FID is incremented by one. Remember, if the extended recording feature is on, a single trigger will create two new FID numbers, one FID for the transient record and one FID for the extended records.

**\*CAUTION\* resetting the FID causes the APP Recorder Program to re-initialize and the recorder to momentarily go off line.**

**NOTE: an old record with the same FID as newly created record will not be overwritten due to date and time difference.**

#### 4.2.6.6 Re-initialize

Clicking re-initialize will cause the APP Recorder Program to restart.

**\*CAUTION\* the re-initialize command will take the recorder off line for a few moments.**

#### 4.2.6.7 Reboot

The reboot command causes power to be momentarily cut to the recorder. The computer and all circuit boards will see a hard power shutdown. Power is cut via a normally closed relay on the Level 1 Chassis power supply circuit board. After 2-3 seconds power will return and the system will begin to restart. It takes approximately 1 minute and 30 seconds for the system to return to an online state.

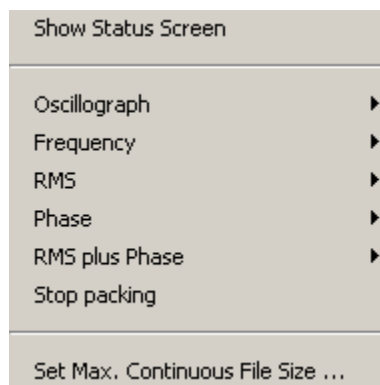
**\*CAUTION\* the recorder will be off line during the restart period.**

#### 4.2.6.8 Reserve Memory and Data Drive Defragmentation

Occasionally there might be a reason to reserve memory and/or defragment the data hard drive remotely. Reserving memory or defragmenting the hard drive will take up CPU time considerably. It is recommended to do that only if no anticipated event could happen for few hours to a day. There are four menu “Reserve Memory”, “Run Defrag Analysis on Recorder Data Drive”, “Defragment Recorder Data Drive”, and “Get Defragment Status” to help this process. If the user wants to know whether the data drive fragmentation status, click “Run Defrag Analysis on Recorder Data Drive”, wait a minute or two and then click “Get Defragment Status”. “Reserve Memory” or “Defragment Recorder Data Drive” can take hours and once it is started, it cannot be stopped remotely. To check if “Reserve Memory” is finished, the user can get the recorder trace file back. A message, “Begin Reserve Memory” will appear when started, and “End Reserve Memory” will appear when finished. To check the “Defragment Recorder Data Drive” process, click “Get Defragment Status”.

#### 4.2.7 Continuous Recording Menu

Continuous recording is enabled or disabled thru the “Edit Point Assignment Record” menu selection. Two types of continuous recording can be enabled. The first is a combination of continuous RMS, Frequency, and Phase. These three choices are enabled and disabled together (30-day maximum circular buffer). The second is continuous oscillography recording (5-day maximum circular buffer).



**Figure-40 Continuous Recording Menu**

Continuous RMS, Frequency, and Phase Angle can be viewed in near real time on the APP Recorder Program main screen. Note, phase angle is shown relative to a selected channel.

#### 4.2.7.1 Show Status Screen

To view the continuous recording function(s), click on show status screen. The screen below will appear.



**Figure-41 Continuous Recording Status Screen**

This screen allows the user to see that the continuous recording feature is calculating quantities and saving data. The APP Recorder program stores the continuous oscillography data and calculated RMS, Frequency, and Phase quantities to folders:

**C:\APP Recorder\Data\OscgrData**

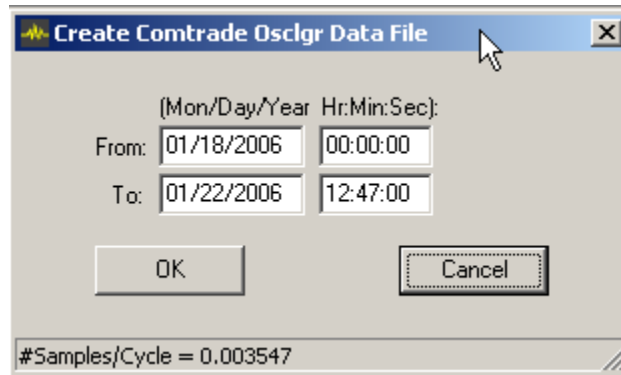
**C:\APP Recorder\Data\RmsData**

**C:\APP Recorder\Data\FreqData**

**C:\APP Recorder\Data\PhaseData**

#### 4.2.7.2 Oscillograph

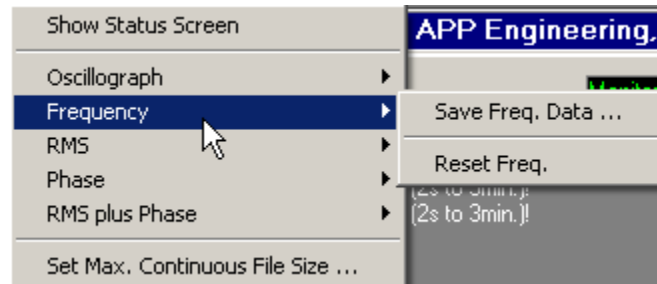
Here the user can save a time slice of data. The file can then be opened with the APP ClearView program and viewed.



**Figure-42 Time Slice Entry Screen**

#### 4.2.7.3 Frequency

Here the user can save a time slice of data. The file can then be opened with the APP ClearView program and viewed. Also, the frequency calculation process can be reset by clicking “Reset Freq.”.



**Figure-43 Continuous Frequency Menu**

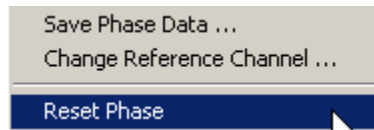
Continuous frequency is calculated using a sliding window. A single frequency data point is calculated using 5000 data samples (total cycles/time). At a recording rate of 600Hz it will take 8 seconds to obtain the first data point. Thereafter, a point is calculated every X cycles (X is the user entered cycles/point value, see point assignment record) but still using 5000 data points. Clicking “Reset Frequency” will restart the calculation process and it will again take 8 seconds, at 600Hz, to obtain the 1<sup>st</sup> frequency data point.

#### 4.2.7.4 RMS

Here the user can save a time slice of data. The file can then be opened with the APP ClearView program and viewed. Also, the RMS calculation process can be reset by clicking “Reset Freq.”.

#### 4.2.7.5 Phase

Here the user can save a time slice of data. The file can then be opened with the APP ClearView program and viewed. Also, the Phase calculation process can be reset by clicking “Reset Freq.” and the relative phase angle shown on the continuous metering screen can be changed.



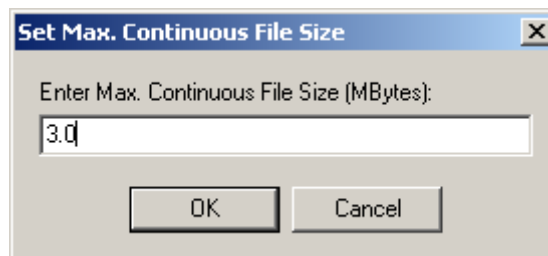
**Figure-44 Continuous Phase Menu**

#### 4.2.7.6 RMS plus Phase

Here the user can save a time slice of data that contains both continuous RMS values and continuous Phase values. The file can then be opened with the APP ClearView program and viewed.

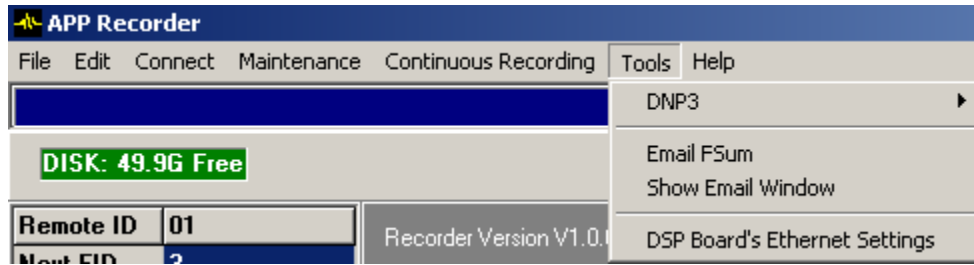
#### 4.2.7.7 Set Max. Continuous File Size

This menu selection allows the user to determine the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user defined maximum limit the software program will reduce the resolution of the file. Resolution is reduced by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user defined maximum limit. The entry screen is shown below.



**Figure-45 Continuous Maximum File Size Entry Screen**

## 4.2.8 Tools Menu

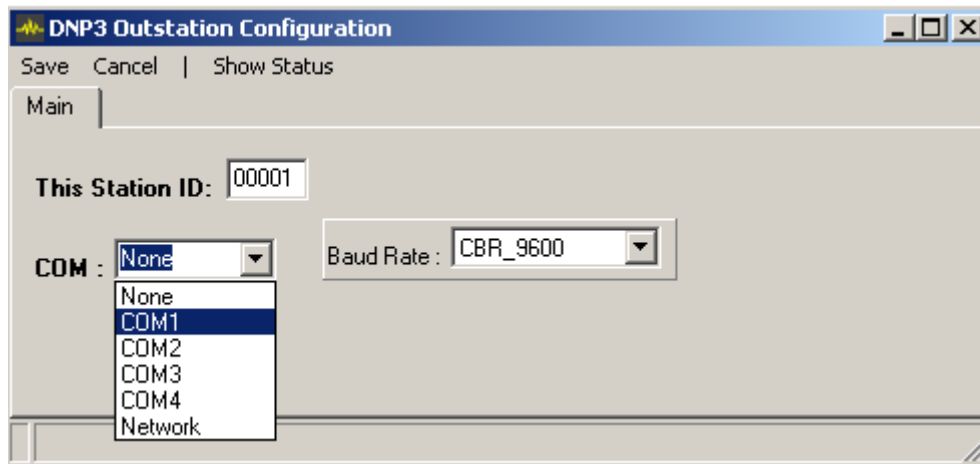


**Figure-46 Tools Menu Screen**

### 4.2.8.1 DNP3

This menu is only visible if DNP-3 check box in point assignment record is checked.

To generate data to output via DNP-3 the extended recording and continuous recording features must be enabled. Extended recording and continuous recording can be enabled via the general tab setting on the point assignment setup screen.



**Figure-47 DNP-3 Configuration Screen**

Enter the recorders unique ID number. This was setup in the recorders configuration file (see “Edit” menu and then “Configuration” menu). Select your desired communication port from the pull down menu. If using an RS232 port, select a baud rate that will work with your RTU. If using Network (protocol: TCP/IP), enter IP address and port number.

APP-501 Recorder provides the following information through DNP-3:

1. Analog Channel RMS
2. Analog Channel Frequency
3. Analog Channel Phase
4. Event Channel Status

**IMPORTANT:** The analog channel frequency and phase are obtained by asking for an extended range of the analog information. The information needed for DNP-3 master to translate the data after received is located in the file RxxDnp3.txt in setup folder of the recorder. This file is generated by APP-501 Recorder software automatically.

APP-501 Recorder accepts the DNP-3 Objects and Variations as shown in Table-3.

**Table-3 DNP-3 Objects and Variations**

Object	Variation	Description	Request Function Codes (dec)	Request Qual Codes (Hex)	Response Function Codes (dec)	Response Qual Codes (Hex)
1	1	Binary Input	1	06	129	
2	2	Binary Input Change with Time	1	06	129	28
30	4	16-Bit Analog Input without Flag	1	06, 01, 28	129	01, 28
60	1	Class 0 Data	1	06	129	01
100	1	Short Floating Point	1	06, 01, 28	129	01, 28

#### 4.2.8.2 Email FSum

Clicking this menu choice will immediately Email a summary file to those address listed in the Email setup configuration.

#### 4.2.8.3 Show Email Window

The Email setup window can be viewed thru the “Edit”, “Configuration”, “Automatic Tasks” menu and tab path. (See Figure-33 Auto Email Setup Screen for further information)

#### 4.2.8.4 DSP Boards Ethernet Settings

Before an APP-501 Recorder leaves the factory, each DSP/IRIG board is programmed with an Ethernet Address, IP Address, Subnet Mask, and Default Gateway. It is highly unlikely that the Ethernet Address will ever need to be changed. However, your company’s network administrator may want to change the IP Address and related Subnet Mask, and Default Gateway.

To change the information shown in the screen below, connect a cable from the computer control chassis RS232 port (which is usually COM1) to the 6 pin Mini-Din on the DSP circuit board. A RS232 to Mini-Din converter and serial cable was provided with the recorder.

**DSP Board Ethernet Settings**

**RS232**

COM1 (115200, 8, N, 1)

**DSP Board**

Ethernet Address: 1-35-69-86-120-161 Update

IP address: 195.168.3.3 Update

Subnet mask: 255.255.255.0 Update

Default gateway: 195.168.3.1 Update

Refresh

**Status**

@AHJ|@AH1-35-69-86-120-161  
@ILJ|@IL195.168.3.3  
@INJ|@IN255.255.255.0  
@IGJ|@IG195.168.3.1

**Free Hand Entry**

**Figure-48 DSP Board Setup Screen**

With the APP Recorder Program running, click on “Tools” then click “DSP Board’s Ethernet Settings”. The screen above should appear and display the Ethernet and IP settings. If changes are required, type in the new settings and click update.

**\*CAUTION\*** If the IP Address is being changed, the new DSP IP Address must be entered in the Point Assignment Record (see Figure-15).



## **Chapter 5 Other Information**

### 5.1 Time Quality

A 4-bit time quality indicator is used by several manufactures of satellite controlled clocks. It is an indicator of time accuracy or synchronization to UTC and is based on a clocks internal parameters. Per the IEEE standard, the code recommended is by order of magnitude relative to 1ns. The 1ns basic reference is fine enough to accommodate present industry requirements now and into the foreseeable future. With present GPS technology at 100ns accuracy Level, a 0000 code indicating locked will go to 0011 or a 0100 code at unlock. The Table-4 and Table-5 contain the IEEE 1344 quality indicator codes.

**IMPORTANT: APP-501 clock accuracy/alignment with the 1PPS is 0.6usec with an un-modulated IRIG-B input. The accuracy with a modulated IRIG-B input is 1msec.**

If the satellite controlled clock does not output a time quality code, APP-501 keys off the clocks synch/un-synch signal. If the clock is synchronized then the fault record tag will show **locked**. If the clock is un-synchronized then the fault record tag will show **unlocked**.

If there is no signal connected to the APP-501 IRIG input then the fault record tag will display **unknown**.

**Table-4 IEEE 1344 Time Quality**

<b>Binary</b>	<b>Hex</b>	
1111	F	fault –unknown – clock fail
1011	B	10s
1010	A	1s
1001	9	100ms
1000	8	10ms
0111	7	1ms
0110	6	100us
0101	5	10us
0100	4	1us
0011	3	100ns
0010	2	10ns
0001	1	1ns
0000	0	Normal Operation Clock Locked

**Table-5 Time Quality and APP-501 Action**

<b>Value From GPS Clock</b>	<b>Binary</b>	<b>APP-501 Fault Record Tag</b>	<b>APP-501 Loss Synch LED Status</b>	<b>APP-501 Loss Synch Relay Status (coil)</b>
Fault	1111	Fault	ON	Energized
10s	1011	10s	ON	Energized
1s	1010	1s	ON	Energized
100ms	1001	100ms	ON	Energized
10ms	1000	10ms	ON	Energized
1ms	0111	1ms	OFF	Not energized
100us	0110	100us	OFF	Not energized
10us	0101	10us	OFF	Not energized
1us	0100	1us	OFF	Not energized
100ns	0011	100ns	OFF	Not energized
10ns	0010	10ns	OFF	Not energized
1ns	0001	1ns	OFF	Not energized
Normal Operation Clock Locked	0000	Locked	OFF	Not energized

## 5.2 Running APP Recorder Software as a Service

The following steps will guide a user through the process of running the APP Recorder Software as a service as opposed to an application. By default the APP Recorder Software is configured to run as a service before it leaves the factory.

An advantage to running the program as a service is automatic start and restart. If the computer is hard started or soft restarted the program will automatically startup. If the program is shutdown it will automatically restart after approximately 60 seconds.

1. If running, shut down the APP Recorder Program.
2. If other Windows applications are running shut them down if possible.
3. Browse to **C:\APP Recorder**
4. Double click on the file "RunMonitorAsService.bat"
5. The Windows "Services" screen will appear.
6. Right click on the service named "APPMonitor" and click on "Properties"
7. Click the "Log On" tab and place a check mark next to "Allow service to interact with desktop". Click "Apply" then "OK".
8. Click on the Windows "Start" button then select "Run...". Type "regedit" in the blank field and click OK.
9. Browse to  
**HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\APPMonitor**
10. Inside the APPMonitor folder, shown on the right hand side of the computer screen, right click. After an ICON appears saying, "New" click on "Key". Name this newly created folder, look back to the left side of the screen, "Parameters".

11. Go inside the newly created folder, shown on the right hand side of the computer screen, and right click. After an ICON appears saying “New” click on “String Value”. Name the string value “Application”.
12. Double click on the “Application” file you just created. An “Edit String” box should pop-up. In the value data field enter C:\APP Recorder\APPMonitor.exe and click “OK”
13. Close the Registry Editor then restart the computer.

### 5.3 Stopping APP Recorder Program Service

**\*CAUTION\* Stopping the APP Recorder Program takes the recorder OFF LINE. No recording can be performed if the APP Recorder Program is stopped.**

1. Click the Windows “Start” button
2. Click “Settings”
3. Click “Control Panel”
4. Click “Administrative Tools”
5. Click “Services”
6. Stop the APP Recorder Program
7. Go back to the “Services” window and right click on “APPMonitor”
8. Click “Stop”

### 5.4 Restarting APP Recorder Program Service

1. Click the Windows “Start” button
2. Click “Setting”
3. Click “Control Panel”
4. Click “Administrative Tools”
5. Click “Services”
6. Right click on “APPMonitor”
7. Click “Start”

### 5.5 Recommended Maintenance and Calibration

APP Engineering recommends a combination performance-based and time-based maintenance.

#### 5.5.1 Performance-based Maintenance

APP recommends that you complete performance-based maintenance by utilizing the Auto-Polling feature in ClearView. The following procedure explains how to complete the minimum recommended performance-based maintenance procedure.

- To Complete the Minimum Recommended Performance-based Maintenance Procedure
1. In the APP ClearView program running on your master station computer, set the APP ClearView Configuration to auto-poll all the APP Recorders once per day. This retrieves a Fault Summary Report and the SER dates.
  2. After auto-polling, review the Auto-Transfer Notification Report to ensure that the last received date is correct and that each APP Recorder is online.
  3. The auto-polling process retrieves the latest diagnostic or status file for each APP Recorder. The **Alarm** box in the upper right hand corner of the **APP ClearView** window displays alarms for APP Recorder. Alarms appear as a red background with the text **Alarms On**. If an APP Recorder has an alarm, double-click the **Alarm** box to see which APP Recorder is in alarm.
  4. During normal use of the APP ClearView analysis software, review the analog and digital data to ensure that there is an acceptable measurement of the power system input values.

#### 5.5.2 Time-based Maintenance

The following table describes the minimum recommended time-based maintenance procedures.

**Table-6 Time-based Maintenance Procedures**

<b>Chassis Type</b>	<b>Comments</b>
APP-501 Computer Control Chassis	Once every year, ensure that the fan mounted to chassis rear panel is functioning properly.  Once every two years, run Windows disk defragmenter “Analyze” and follow Windows Recommendations. You can run the defrag analysis and defragmenter from the master station computer running APP ClearView (Maintenance.)
APP-501 Level 1 Chassis	Once every year, ensure the fans mounted to the chassis right and left side panels are functioning properly.  Calibrate analog channels once every 5 years.
APP-501 Level 2 Chassis	Calibrate analog channels once every 5 years.

## 5.6 Recommended Setup for MW Channels (Using 4ma-20ma Transducer)

### To Complete the Recommended Setup for MW Channels

#### 1. Calculate the CT/PT value.

For example, suppose the resistor used with the transducer is 143 ohms and the transducer full scale is 550MW @ 20ma. In this case, the calculation would be as follows:

4ma (143 ohms) = 0.572V, which needs to equal 0MW

20ma (143 ohms) = 2.860V, which needs to equal 550MW

$2.860V - 0.572V = 2.288V$

$550MW / 2.288V = 240.3846$  which is the CT/PT that needs to be used in order to display proper primary values.

2. In the Point Assignment record for this analog channel, enter w(Mwatt) for the Channel Type. Then enter 240.384 for the CT/PT value, and enter 5 for the Full Scale value (on the secondary 1MW-1V). Click Save in the Point Assignment window.

3. In the APP Recorder, open the OScope (File menu, Show OScope). View the analog channel that is being setup for MW.

4. With no signals attached to this MW channel, uncalibrate the offset and the slope.

5. Apply a 0.572VDC signal (representing 4ma, 0MW) and calibrate the offset.

6. Apply a 2.86VDC signal. You should read a primary value of 550MW for this MW channel.

## 5.7 Recommended Setup for MVAR Channels (Using 4ma-12ma-20ma Transducer)

### To Complete the Recommended Setup for MVAR Channels

#### 1. Calculate the CT/PT value.

For example, suppose the resistor used with the transducer is 143 ohms and the transducer full scale is - 400MVAR @ 4ma and +400MVAR @ 20ma. In this case, the calculation would be as follows:

4ma (143 ohms) = 0.572V, which needs to equal -400MVAR

$12\text{ma} (143 \text{ ohms}) = 1.716\text{V}$ , which needs to equal 0 MVAR

$20\text{ma} (143 \text{ ohms}) = 2.860\text{V}$ , which needs to equal +400MVAR

$2.860\text{V} - 1.716\text{V} = 1.144\text{V}$  as does  $1.716\text{V} - 0.572\text{V} = 1.144\text{V}$

$400\text{MVAR}/1.144\text{V} = 349.650$  which is the CT/PT that needs to be used in order to display proper primary values.

2. In the Point Assignment record for this analog channel, enter q(MVar) for the Channel Type, enter 349.650 for the CT/PT value, and enter 5 for the Full Scale value (on the secondary  $1\text{V}=1\text{MVAR}$ .) Click Save on the Point Assignment window.

3. In the APP Recorder, open the OScope (File menu, Show OScope). View the analog channel that has been set up for MVAR.

4. With no signals attached to this MVAR channel uncalibrate the offset and the slope.

5. Apply a 1.716VDC signal (representing 12ma, 0MW) and calibrate the offset.

6. Apply a 0.572VDC signal and you should read a primary value of -400MVAR in the offset meter box. The RMS meter box will read 400MVAR (no negative on RMS).

7. Apply a 2.86VDC signal. You should read a primary value of +400MVAR in the offset meter box. The RMS meter box will read 400MVAR.